GROUP TAB LOCATOR

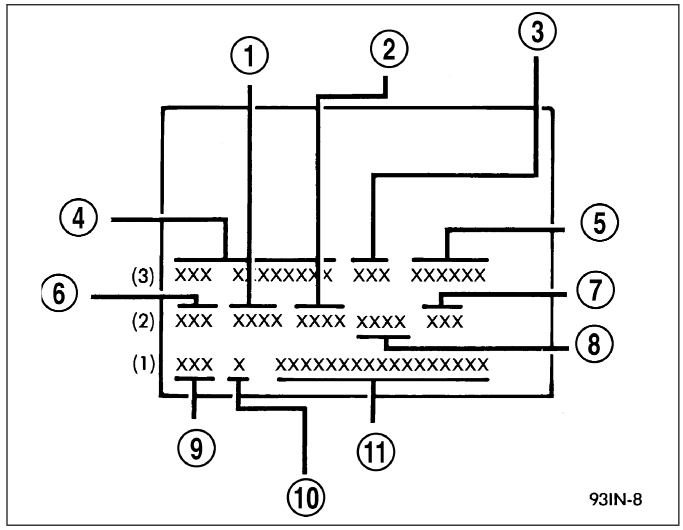
INTRODUCTION

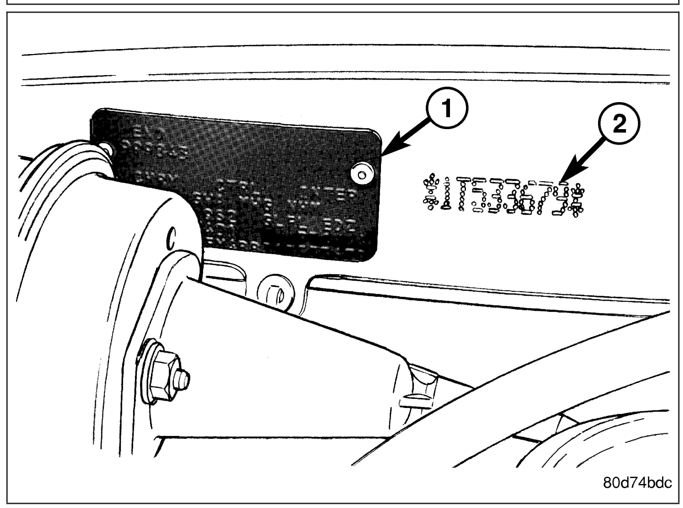
TABLE OF CONTENTS

BODY CODE PLATE

DESCRIPTION

The Body Code Plate is located in the engine compartment on the plenum behind the right side strut tower. There are seven lines of information on the body code plate. Lines 4, 5, 6, and 7 are not used to define service information. Information reads from left to right, starting with line 3 in the center of the plate to line 1 at the bottom of the plate.





BODY CODE PLATE LINE 2

DIGITS 1, 2, AND 3

Paint procedure

DIGIT 4

Open Space

DIGITS 5 THROUGH 7

Primary paint

(Refer to 23 - BODY/PAINT - SPECIFICATIONS) for Body Color Codes.

DIGIT 8 AND 9

Open Space

DIGITS 10 THROUGH 12

Secondary Paint

DIGIT 13 AND 14

Open Space

DIGITS 15 THROUGH 18

Interior Trim Code

DIGIT 19

Open Space

DIGITS 20, 21, AND 22

Engine Code
- EJD = 1.6L Four Cylinder 16 Valves SOHC Gasoline
- ECC = 2.0L Four Cylinder 16 Valves DOHC Gasoline
- EDJ = 2.2L Four Cylinder Turbo Diesel Engine
- EDZ = 2.4L Four Cylinder 16 Valves DOHC Gasoline
- EDV = 2.4L Four Cylinder 16 Valves DOHC H.O. Turbo Gasoline

DIGIT 23

Open Space

BODY CODE PLATE LINE 1

DIGITS 1, 2, AND 3

Transaxle Codes

- DGL = 41TE 4-Speed Electronic Automatic Transaxle
- DD5 = NV T350 5-Speed Manual Transaxle
- DDD = GETRAG 288 5-Speed Manual Transaxle

DIGIT 4

Open Space

DIGIT 5

Market Code

- C = Canada
- B = International
- M = Mexico
- U = United States

DIGIT 6

Open Space

DIGITS 7 THROUGH 23

Vehicle Identification Number

- (Refer to VEHICLE DATA/VEHICLE INFORMATION/VEHICLE IDENTIFICATION NUMBER - DESCRIPTION) for proper breakdown of VIN code.

IF TWO BODY CODE PLATES ARE REQUIRED

The last code shown on either plate will be followed by END. When two plates are required, the last code space on the first plate will indicate (CTD)

When a second plate is required, the first four spaces of each line will not be used due to overlap of the plates.

FASTENER IDENTIFICATION

DESCRIPTION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 8.9 and 10.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts.

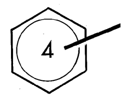
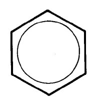
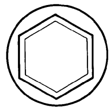
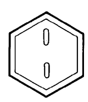
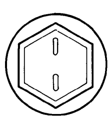
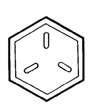
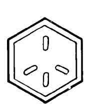
Bolt Markings and Torques - Metric

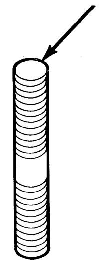
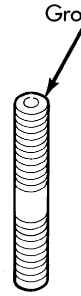
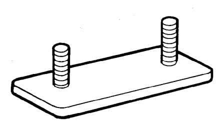
Bolt Markings	8.8/8.9		10.9		12.9	
Bolt Dia.	N·m	Ft. Lbs.	N·m	Ft. Lbs.	N·m	Ft. Lbs.
6	12	105*	14	120*	16	12
8	25	250*	32	23	38	28
10	54	40	60	45	74	55
12	95	70	108	80	135	100
14	155	115	175	130	216	160
16	243	180	324	210	324	240
* Inch Lbs.						

Bolt Markings and Torques - U. S. Customary

Bolt Markings	Grade 5		Grade 8	
Bolt Dia.	N·m	Ft. Lbs	N·m	Ft. Lbs
1/4 - 20	10	95*	14	125*
1/4 - 28	10	95*	17	150*
5/16 - 18	22	200*	30	270*
5/16 - 24	26	240*	33	300*
3/8 - 16	40	30	55	40
3/8 - 24	47	35	60	45
7/16 - 14	68	50	88	65
7/16 - 20	74	55	95	70
1/2 - 13	101	75	135	100
1/2 -20	115	85	150	110
9/16 - 12	135	105	182	135
9/16 - 18	155	115	202	150
5/8 - 11	202	150	263	195
5/8 - 18	215	160	284	210
3/4 - 10	230	170	297	220
3/4 - 16	236	175	304	225
7/8 - 14	405	300	540	400
* Inch Lbs.				

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 5 — 6 — 7 — 8 — 9 — 10 — 11 —	4T 5T 6T 7T 8T 9T 10T 11T
	 No mark	4T
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	 Grooved	6T
Welded bolt		4T

95IN-4

FASTENER USAGE

DESCRIPTION

FASTENER USAGE

WARNING: Use of an incorrect fastener may result in component damage or personal injury.

Fasteners and torque specifications references in this Service Manual are identified in metric and SAE format.

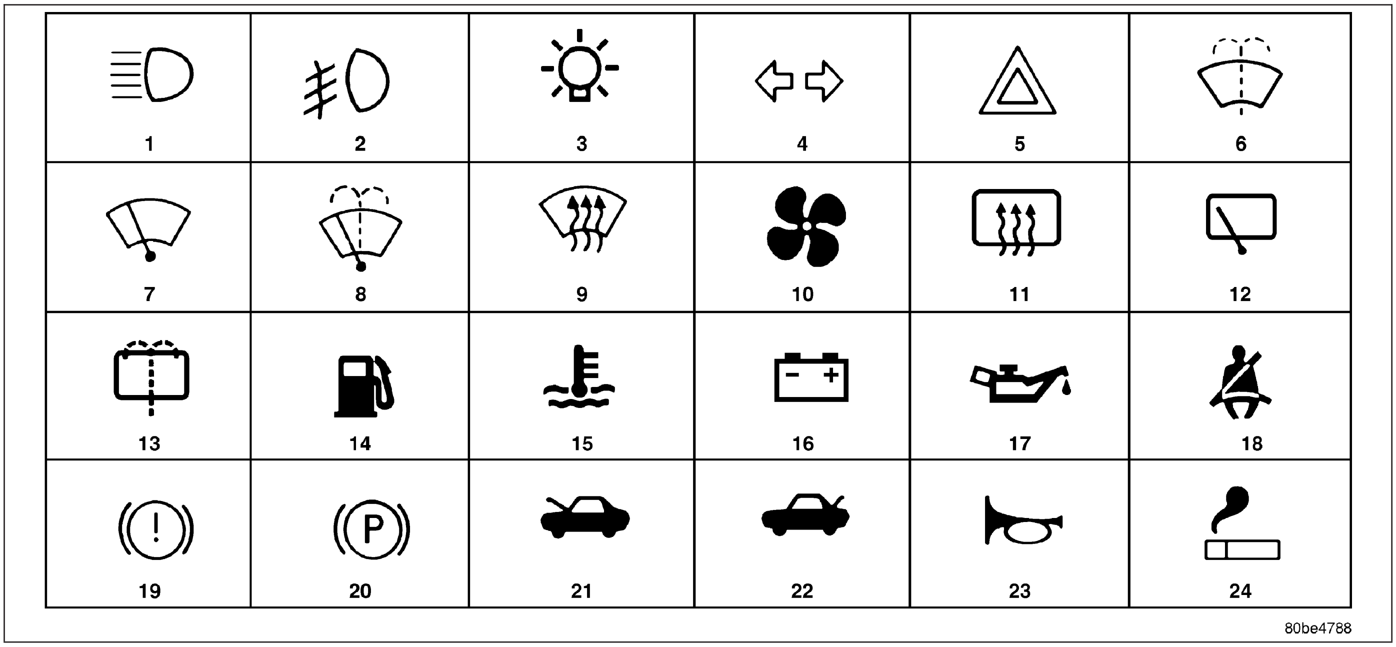
During any maintenance or repair procedures, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

THREADED HOLE REPAIR

Most stripped threaded holes can be repaired using a Helicoil®. Follow the vehicle or Helicoil® recommendations for application and repair procedures.

INTERNATIONAL SYMBOLS

DESCRIPTION



The graphic symbols illustrated in the following International Control and Display Symbols Chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

METRIC SYSTEM

DESCRIPTION

in-lbs to N•m

in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966

N•m to in-lbs

N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb
.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N•m

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820

N•m to ft-lbs

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

in. to mm

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384
.17	3.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400

mm to in.

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

J901N-10

The metric system is based on quantities of one, ten, one hundred, one thousand and one million.

The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

CONVERSION FORMULAS AND EQUIVALENT VALUES

MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET
in-lbs	x 0.11298	= Newton Meters (N·m)	N·m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton Meters (N·m)	N·m	x 0.7376	= ft-lbs
Inches Hg (60° F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters	M	x 1.0936	= Yards
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec	x 0.3048	= Meters/Sec (M/S)	M/S	x 3.281	= Feet/Sec
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

COMMON METRIC EQUIVALENTS

1 inch = 25 Millimeters	1 Cubic Inch = 16 Cubic Centimeters
1 Foot = 0.3 Meter	1 Cubic Foot = 0.03 Cubic Meter
1 Yard = 0.9 Meter	1 Cubic Yard = 0.8 Cubic Meter
1 Mile = 1.6 Kilometers	

Refer to the Metric Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.).

TORQUE REFERENCES

DESCRIPTION

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

Individual Torque Charts appear within many or the Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts.

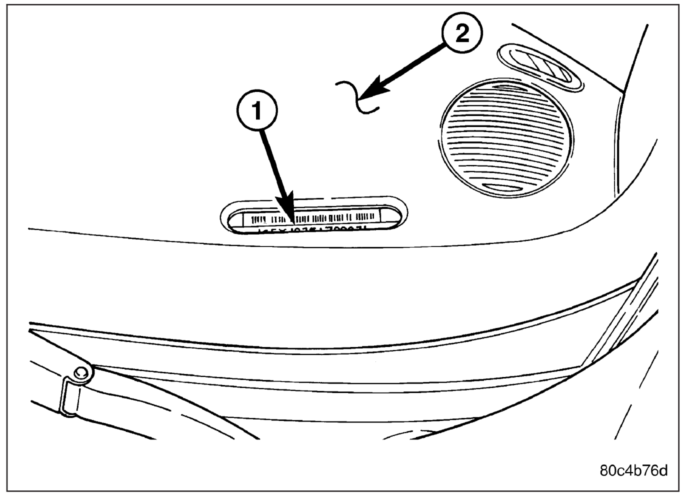
VEHICLE IDENTIFICATION NUMBER

DESCRIPTION - VEHICLE IDENTIFICATION NUMBER

The Vehicle Identification Number (VIN) is located on the upper left corner of the instrument panel, near the left A-Pillar. The VIN consists of 17 characters in a combination of letters and numbers that provide specific information about the vehicle. Refer to VIN Code Decoding Chart.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.

VIN CODE DECODING



POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = Manufactured by DiamlerChrysler Corporation
2	Make	B = Dodge
3	Vehicle Type	3 = Passenger Car
4	Restraint System	D = Restraint System With Out Air Bags Sales Code (CGJ) (Mexico) H = Restraint System Air Bags Front Next Generation Multi Stage Sales Code (CG1) With Side Air Bags Sales Code (CGS) J = Restraint System Air Bags Front Next Generation Multi Stage Sales Code (CG1) Without Side Air Bags Sales Code (CGS)
5	Vehicle Line	B = Caliber (FWD) (LHD U.S., Canada, Mexico , BUX E = Caliber (AWD) (LHD) U.S., Canada, Mexico 3 = Caliber (FWD) (RHD) BUX
6	Series	2 = L (Low Line) 4 = H (High Line) 6 = S (Sport) 7 = X (Special) C = 6 Speed Manual Heavy Duty, Sales Code (DEF) C = 6 Speed Manual, Sales Code (DEK) G = Continuously Variable, Sales Code (DAV) N = 5 Speed Manual, Sales Code (DD7)

POSITION	INTERPRETATION	CODE = DESCRIPTION
7	Body Style	8 = PM 49 4dr Hatchback

VIN CODE DECODING

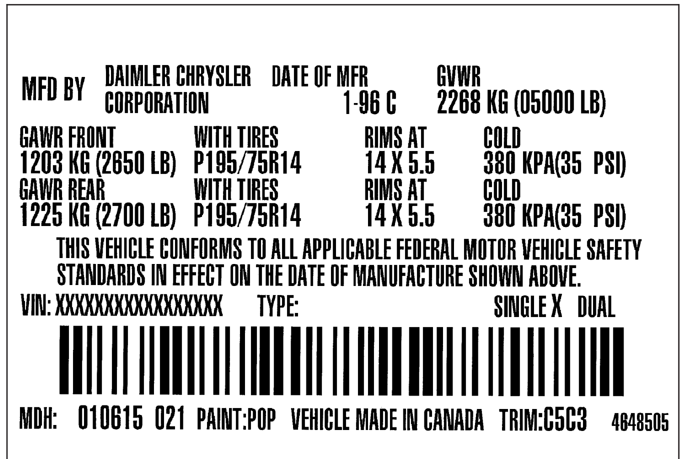
8	Engine	A = 2.0L I4 CYL 16V DOHC Diesel Sales Code (ECD) B = 2.0L I4 CYL 16V DOHC Dual VVT Gasoline Sales Code (ECN) C = 1.8L I4 CYL 16V DOHC Dual VVT Gasoline Sales Code (EBA) F = 2.4L I4 CYL 16V DOHC Turbo Gasoline Sales Code (ED4) K = 2.4L I4 CYL 16V Dual VVT Gasoline Sales Code (ED3)
9	Check Digit	0 Thru 9 or X.
10	Model Year	7 = Model Year 2007
11	Assembly Plant	D = Belvedere Assembly
12 Though 17	Vehicle Build Sequence	6 digit number assigned by assembly plant.

VEHICLE CERTIFICATION LABEL

DESCRIPTION

A vehicle certification label is attached to the rear shutface of the driver's door. This label indicates date of manufacture (month and year), Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating (GAWR) front, Gross Axle Weight Rating (GAWR) rear and the Vehicle Identification Number (VIN). The Month, Day and Hour of manufacture is also included.

All communications or inquiries regarding the vehicle should include the Month-Day-Hour and Vehicle Identification Number.



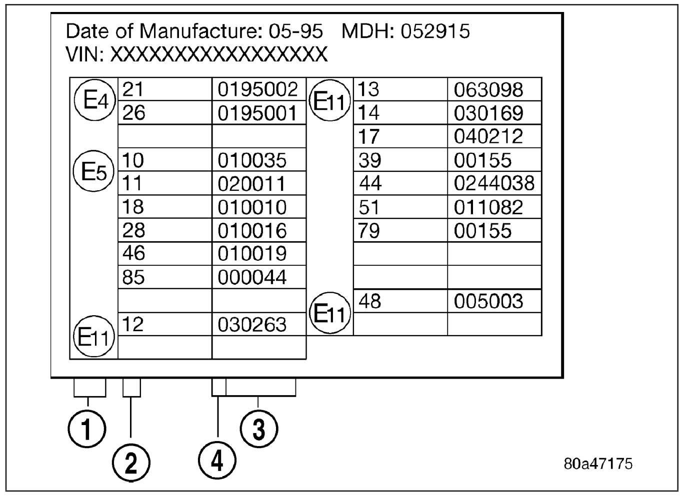
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E-MARK LABEL

DESCRIPTION

An E-mark Label is located on the rear shut face of the driver's door. The label contains the following information:

- Date of Manufacture
- Month-Day-Hour (MDH)
- Vehicle Identification Number (VIN)
- Country Codes
- Regulation Number
- Regulation Amendment Number
- Approval Number



VECI LABEL

DESCRIPTION

All models have a Vehicle Emission Control Information (VECI) Label. Chrysler permanently attaches the label in the engine compartment. It cannot be removed without defacing information and destroying the label.

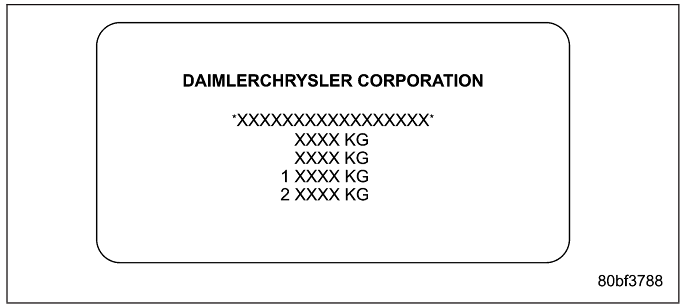
The label contains the vehicle's emission specifications and vacuum hose routings. All hoses must be connected and routed according to the label.

MANUFACTURER PLATE

DESCRIPTION

The Manufacturer Plate is located in the engine compartment on the passenger side rear corner of the hood. The plate contains five lines of information:

1. Vehicle Identification Number (VIN)
2. Gross Vehicle Mass (GVM)
3. Gross Train Mass (GTM)
4. Gross Front Axle Rating (GFAR)
5. Gross Rear Axle Rating (GRAR)



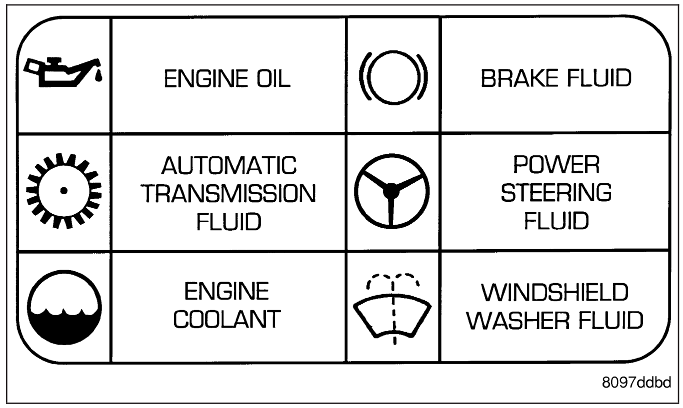
LUBRICATION & MAINTENANCE

TABLE OF CONTENTS

INTERNATIONAL SYMBOLS

DESCRIPTION

DaimlerChrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations.



FLUID TYPES

DESCRIPTION

ENGINE OIL

WARNING: New or used engine oil can be irritating to the skin. Avoid prolonged or repeated skin contact with engine oil. Contaminants in used engine oil, caused by internal combustion, can be hazardous to your health. Thoroughly wash exposed skin with soap and water. Do not wash skin with gasoline, diesel fuel, thinner, or solvents, health problems can result. Do not pollute, dispose of used engine oil properly. Contact your dealer or government agency for location of collection center in your area.

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)
- National Lubricating Grease Institute (NLGI)
- Association des Constructeurs Européens d' Automobiles (European Automobile Manufacturers Association) (ACEA)

API CERTIFICATION AND LICENSE SYMBOL

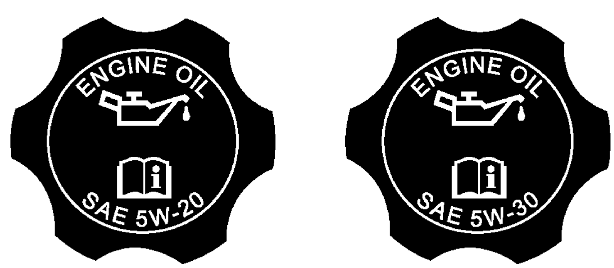
Use an engine oil that is API Certified and Licensed to display the certification mark. MOPAR® provides engine oils that meet or exceed, Material Standard MS-6395 requirement.



9400-9

SAE VISCOSITY

SAE 5W-20 and SAE 5W-30 engine oils are recommended for all operating temperatures. These engine oils are designed to improve low temperature starting and vehicle fuel economy. Refer to the engine oil filler cap for the preferred engine oil viscosity grade for each vehicle. SAE viscosity grades are used to specify the correct viscosity oil for an engine. Use only Multi-Viscosity oils such as SAE 5W-20 or 5W-30. These are specified with a dual SAE viscosity grade which indicates the cold (5W) to hot (20, 30) temperature performance range of the oil.



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ACEA CATEGORIES

For countries that use the ACEA European Oil Categories for service fill oils, use engine oils that meet the requirements of ACEA A1/B1, A2/B2, or A3/B3.

CONTAINER IDENTIFICATION

The Engine Oil Certification Mark was developed and trademarked by the API to refer customers to those engine oils preferred by the automobile manufacturers. This symbol means that the oil has been certified and licensed by the American Petroleum Institute (API). This certification mark will only be found on the front of the oil containers. Those oils that do not display the "Mark" on the front of the container should not be used.

9400-9

DaimlerChrysler only recommends API Certified engine oils that meet the requirements of Material Standard MS-6395. Use Mopar or an equivalent oil meeting the specification MS-6395.

SYNTHETIC ENGINE OILS

There are a number of engine oils being promoted as either synthetic or semi-synthetic. If you chose to use such a product, use **only** those oils that are certified by the American Petroleum Institute (API) to display the "Certification Mark" and show SAE viscosity grade recommended for each vehicle. Follow the service schedule that describes your driving type.

ENGINE OIL ADDITIVES/SUPPLEMENTS

The manufacturer **does not recommend** the addition of any engine oil additives/supplements to the specified engine oil. Engine oil additives/supplements should not be used to enhance engine oil performance. Engine oil additives/supplements should not be used to extend engine oil change intervals. No additive is known to be safe for engine durability and can degrade emission components. Additives can contain undesirable materials that harm the long term durability of engines and emission systems by:

- Increasing the level of Phosphorus and Sulfur in the engine oil. The API Certified Engine Oils control the Phosphorus and Sulfur contents of the oil to levels that reduce the contamination effect on the vehicles emission control system.
- Altering the viscosity characteristics of the engine oil so that it no longer meets the requirements of the specified viscosity grade.
- Creating potential for an undesirable additive compatibility interaction in the engine crankcase. The engine oils contain a performance additive system carefully developed to optimize the oils performance in the engine. The addition of supplements may cause the oil to thicken prematurely, cause excessive deposit build-up and potentially shorten engine life.

ENGINE COOLANT

WARNING: Antifreeze is an ethylene glycol base coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area. Seek medical attention immediately. Do not store in open or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene glycol. Keep out of reach of children. Dispose of glycol base coolant properly, contact your dealer or government agency for location of collection center in your area. Do not open a cooling system when the engine is at operating temperature or hot under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less boiling protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol base coolant

with hybrid organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

The green coolant **MUST NOT BE MIXED** with the orange or magenta coolants. When replacing coolant the complete system flush must be performed before using the replacement coolant.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Doing so will reduce the corrosion protection and may result in premature water pump seal failure. If non-HOAT coolant is introduced into the cooling system in an emergency, it should be replaced with the specified coolant as soon as possible.

TRANSMISSION FLUID

NOTE: Refer to the maintenance schedules in the Owner's Manual for the recommended maintenance (fluid/ filter change) intervals for this transaxle.

NOTE: All transaxles have a common transmission and differential sump. Filling the transaxle accommodates the differential as well.

TRANSMISSION FLUID

Mopar® CVT+4 is required in the CVT automatic transaxles.

Mopar® CVT+4 when new is green in color. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** A dark brown/black fluid accompanied with a burnt odor and/or deterioration in shift quality may indicate fluid deterioration or transmission component failure.

G288 and T350 Manual transaxles require the use of Mopar® ATF+4 (Automatic Transmission Fluid)

FLUID ADDITIVES

DaimlerChrysler strongly recommends against the addition of any fluids to the transmission, other than those automatic transmission fluids listed above. Exceptions to this policy are the use of special dyes to aid in detecting fluid leaks.

Various "special" additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of DaimlerChrysler and these additives **must not be used.** The use of transmission "sealers" should also be avoided, since they may adversely affect the integrity of transmission seals.

FUEL REQUIREMENTS

Your engine is designed to meet all emissions regulations and provide excellent fuel economy and performance when using high quality unleaded gasoline having an octane rating of 87. The use of premium gasoline is not recommended. The use of premium gasoline will provide no benefit over high quality regular gasoline, and in some circumstances may result in poorer performance.

Light spark knock at low engine speeds is not harmful to your engine. However, continued heavy spark knock at high speeds can cause damage and immediate service is required. Engine damage resulting from operation with a heavy spark knock may not be covered by the new vehicle warranty.

Poor quality gasoline can cause problems such as hard starting, stalling and hesitations. If you experience these symptoms, try another brand of gasoline before considering service for the vehicle.

Over 40 auto manufacturers world-wide have issued and endorsed consistent gasoline specifications (the Worldwide Fuel Charter, WWFC) to define fuel properties necessary to deliver enhanced emissions, performance and durability for your vehicle. We recommend the use of gasolines that meet the WWFC specifications if they are available.

REFORMULATED GASOLINE

Many areas of the country require the use of cleaner burning gasoline referred to as “reformulated” gasoline. Reformulated gasoline contain oxygenates, and are specifically blended to reduce vehicle emissions and improve air quality.

We strongly support the use of reformulated gasoline. Properly blended reformulated gasoline will provide excellent performance and durability for the engine and fuel system components.

GASOLINE/OXYGENATE BLENDS

Some fuel suppliers blend unleaded gasoline with oxygenates such as 10% ethanol, MTBE, and ETBE. Oxygenates are required in some areas of the country during the winter months to reduce carbon monoxide emissions. Fuels blended with these oxygenates may be used in your vehicle.

CAUTION: DO NOT use gasoline containing METHANOL. Gasoline containing methanol may damage critical fuel system components.

MMT IN GASOLINE

MMT is a manganese-containing metallic additive that is blended into some gasoline to increase octane. Gasoline blended with MMT provide no performance advantage beyond gasoline of the same octane number without MMT. Gasoline blended with MMT reduce spark plug life and reduce emission system performance in some vehicles. We recommend that gasoline free of MMT be used in your vehicle. The MMT content of gasoline may not be indicated on the gasoline pump; therefore, you should ask your gasoline retailer whether or not his/her gasoline contains MMT.

It is even more important to look for gasoline without MMT in Canada because MMT can be used at levels higher than allowed in the United States. MMT is prohibited in Federal and California reformulated gasoline.

SULFUR IN GASOLINE

If you live in the northeast United States, your vehicle may have been designed to meet California low emission standards with Cleaner-Burning California reformulated gasoline with low sulfur. If such fuels are not available in states adopting California emission standards, your vehicles will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be adversely affected. Gasoline sold outside of California is permitted to have higher sulfur levels which may affect the performance of the vehicle’s catalytic converter. This may cause the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon light to illuminate. We recommend that you try a different brand of unleaded gasoline having lower sulfur to determine if the problem is fuel related prior to returning your vehicle to an authorized dealer for service.

CAUTION: If the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon light is flashing, immediate service is required; see on-board diagnostics system section.

MATERIALS ADDED TO FUEL

All gasoline sold in the United States and Canada are required to contain effective detergent additives. Use of additional detergents or other additives is not needed under normal conditions.

FUEL SYSTEM CAUTIONS

CAUTION: Follow these guidelines to maintain your vehicle’s performance:

- The use of leaded gas is prohibited by Federal law. Using leaded gasoline can impair engine performance, damage the emission control system, and could result in loss of warranty coverage.
- An out-of-tune engine, or certain fuel or ignition malfunctions, can cause the catalytic converter to overheat. If you notice a pungent burning odor or some light smoke, your engine may be out of tune or malfunctioning and may require immediate service. Contact your dealer for service assistance.
- When pulling a heavy load or driving a fully loaded vehicle when the humidity is low and the temperature is high, use a premium unleaded fuel to help prevent spark knock. If spark knock persists, lighten the load, or engine piston damage may result.

- The use of fuel additives which are now being sold as octane enhancers is not recommended. Most of these products contain high concentrations of methanol. Fuel system damage or vehicle performance problems resulting from the use of such fuels or additives is not the responsibility of DaimlerChrysler Corporation and may not be covered under the new vehicle warranty.

NOTE: Intentional tampering with emissions control systems can result in civil penalties being assessed against you.

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar® Brake Fluid or equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from a container which has been left open. An open container of brake fluid will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

POWER STEERING FLUID

The recommended fluid for the power steering system is Mopar® Power Steering fluid + 4 or Mopar® ATF+4 Automatic Transmission Fluid. Both Fluids have the same material standard specifications (MS-9602).

Mopar® ATF+4 (and Mopar® Power Steering fluid + 4), when new, is red in color. ATF+4 is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, ATF+4 will begin to look darker in color and may eventually become brown. **THIS IS NORMAL**. ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

The power steering system is filled-for-life at the factory and requires no regular maintenance. Although not required at specific intervals, the fluid level may be checked periodically. Check the fluid level anytime there is a system noise or fluid leak suspected. (Refer to 19 - STEERING/PUMP/FLUID - STANDARD PROCEDURE)

FLUID CAPACITIES

SPECIFICATIONS - FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
Fuel Tank	57L (15 gal.)
Engine Oil* - 1.8L	4.3L (4.5 qts.)
Engine Oil* - 2.0L	4.3L (4.5 qts.)
Engine Oil* - 2.0L Diesel	4.2L (4.5 qts.)
Engine Oil* - 2.4L	4.3L (4.5 qts.)
Cooling System** - 1.8L, 2.0L, and 2.4L	6.2L (6.5 qts.)
Cooling System** - 2.0L Diesel	9.0L (9.5 qts.)
Automatic Transaxle - Estimated Service Fill	3.8L (4.0 qts.)
Automatic Transaxle - Overhaul Fill Capacity with Torque Converter Empty	8.1L (8.6 qts.)
Manual Transaxle - NV T355	2.4 - 2.7L (2.5 - 2.8 qts.)
Manual Transaxle - BG6	2.0L Turbo Diesel: 2.0L (2.1 qts.)
*(includes new filter)	
**(Includes heater and coolant recovery bottle filled to MAX level.)	

FLUID FILL/CHECK LOCATIONS

DESCRIPTION

The fluid check/fill point locations are located in each applicable service manual section.

LUBRICATION POINTS

DESCRIPTION

Lubrication point locations are located in each applicable Sections.

MAINTENANCE SCHEDULES

DESCRIPTION

MAINTENANCE SCHEDULE

There are three maintenance schedules that show **required** service for your vehicle.

First is Schedule **“B”- ALL ENGINES**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- Heavy Loading

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (170 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″ - ALL ENGINES.

Second is Schedule **“A”**. It is for vehicles that are not operated under any of the conditions listed under Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

Under no circumstances should oil change intervals exceed 6000 miles (10 000 km) or 6 months whichever comes first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add, if required.

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.

- Inspect the brake hoses.
- Inspect the CV joints (if equipped) and front suspension components.
- Check the manual transmission fluid level (if equipped).
- Check the coolant level, hoses, and clamps.

CAUTION: Do not check the automatic transaxle fluid. It must be check by a trained service technician every 15,000 miles and if required only the recommended fluid be added. Refer to the section “Fluids, Lubricants And Genuine Parts” for the proper fluid.

SCHEDULE B

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- Heavy Loading

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (170 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (15 000)**	**12,000 (20 000)**	**15,000 (25 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles (Kilometers)	**18,000 (30 000)**	**21,000 (35 000)**	**24,000 (40 000)**	**27,000 (45 000)**	**30,000 (50 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.	X				
Replace air cleaner filter.					X
Replace spark plugs.					X

Miles (Kilometers)	18,000 (30 000)	21,000 (35 000)	24,000 (40 000)	27,000 (45 000)	30,000 (50 000)
Inspect PCV valve, replace as necessary.**					X
Replace make-up air filter.					X

Miles (Kilometers)	33,000 (55 000)	36,000 (60 000)	39, 000 (65 000)	42,000 (70 000)	45,000 (75 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.		X			
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles (Kilometers)	48,000 (80 000)	51,000 (85 000)	54,000 (90 000)	57,000 (95 000)	60,000 (100 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter					X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.			X		
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.**					X
Inspect auto tension drive belt and replace, if required.					X
Flush and replace engine coolant at 60 months, or 102,000 miles (170 000 km) whichever comes first.					X

Miles (Kilometers)	63,000 (105 000)	66,000 (110 000)	69,000 (115 000)	72,000 (120 000)	75,000 (125 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.				X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles **(Kilometers)**	**63,000 (105 000)**	**66,000 (110 000)**	**69,000 (115 000)**	**72,000 (120 000)**	**75,000 (125 000)**
Inspect auto tension drive belt and replace, if required.					X

Miles **(Kilometers)**	**78,000 (130 000)**	**81,000 (135 000)**	**84,000 (140 000)**	**87,000 (145 000)**	**90,000 (150 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Rear Drive Assembly (RDA) fluid.		X			
Change Power Transfer Unit (PTU)		X			
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.					X
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.**					X
Inspect auto tension drive belt and replace, if required.					X

Miles **(Kilometers)**	**93,000 (155 000)**	**96,000 (160 000)**	**99,000 (165 000)**	**102,000 (170 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X
Rotate tires.		X		X
Check spare tire for proper pressure and correct stowage.		X		X
Flush and replace engine coolant, if not done at 60 months.				X

Miles **(Kilometers)**	**105,000 (175 000)**	**108,000 (180 000)**	**111,000 (185 000)**	**114,000 (190 000)**	**117,000 (195 000)**	**120,000 (200 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter						X
Rotate tires.		X		X		X
Check spare tire for proper pressure and correct stowage.		X		X		X
Inspect brake linings.		X				
Replace engine air cleaner filter.	X					X
Inspect and replace make-up air filter, if required.	X					
Replace make-up air filter.						X
Replace spark plugs.						X

Miles (Kilometers)	105,000 (175 000)	108,000 (180 000)	111,000 (185 000)	114,000 (190 000)	117,000 (195 000)	120,000 (200 000)
Inspect PCV valve, replace as necessary.**						X
Inspect auto tension drive belt and replace, if required.	X					X
Flush and replace engine coolant, if not replaced at 102,000 miles (170 000 km).						X

** This maintenance is recommended by the manufacturer to the owner, but not required to maintain the emissions warranty.

SCHEDULE A

Miles (Kilometers) [Months]	6,000 (10 000) [6]	12,000 (20 000) [12]	18,000 (30 000) [18]	24,000 (40 000) [24]	30,000 (50 000) [30]
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.			X		
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X

Miles (Kilometers) [Months]	36,000 (60 000) [36]	42,000 (70 000) [42]	48,000 (80 000) [48]	54000 (90 000) [54]	60,000 (100 000) [60]	66,000 (110 000) [66]
Change engine oil and engine oil filter.	X	X	X	X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X	X
Flush and replace engine coolant at 60 months, if not replaced at 102,000 miles (170 000 km).					X	
Inspect brake linings.	X			X		
Replace engine air cleaner filter.					X	
Replace make-up air filter.					X	
Replace spark plugs.					X	
Inspect PCV valve, replace as necessary.**					X	
Inspect auto tension drive belt and replace, if required.					X	

Miles **(Kilometers)** **[Months]**	**72,000** **(120 000)** **[72]**	**78,000** **(130 000)** **[78]**	**84,000** **(140 000)** **[84]**	**90,000** **(150 000)** **[90]**	**96,000** **(160 000)** **[96]**
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.	X			X	
Inspect engine air cleaner filter, replace if necessary.				X	
Replace engine air cleaner filter.				X	
Replace make-up air filter.				X	
Replace spark plugs.				X	
Inspect PCV valve, replace as necessary.**				X	
Inspect auto tension drive belt and replace, if required.				X	

Miles **(Kilometers)** **[Months]**	**102,000** **(170 000)** **[102]**	**108,000** **(180 000)** **[108]**	**114,000** **(190 000)** **[114]**	**120,000** **(200 000)** **[120]**
Change engine oil and engine oil filter.	X	X	X	X
Rotate tires.	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X
Flush and replace engine coolant, if not done at 60 months.	X			
Flush and replace engine coolant, if not done at 102,000 miles (170 000 km)				X
Inspect brake linings.		X		
Replace engine air cleaner filter.				X
Replace make-up air filter.				X
Replace spark plugs.				X
Inspect PCV valve, replace as necessary.**				X

** This maintenance is recommended by the manufacturer to the owner, but not required to maintain the emissions warranty.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

WARNING:
You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

MAINTENANCE SCHEDULES - GASOLINE ENGINES - EXPORT

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **"A"**. It lists all the scheduled maintenance to be performed under "normal" (if none of the conditions in Schedule **"B"** apply to you) operating conditions.

Second is Schedule **"B."** It is a schedule for vehicles that are operated under the conditions listed below.

Follow Schedule **"B"**if you usually operated you vehicle under one or more of the following conditions.

- Day or night temperatures are below 0° C (32° F).

- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.

NOTE: If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 163 000 km (102,000 miles) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading.
- Check the windshield washer solvent and add if required.

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints (if equipped) and front suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

SCHEDULE A

Kilometers **(Miles)** **[Months]**	**12 000** **(7,500)** **[6]**	**24 000** **(15,000)** **[12]**	**36 000** **(22,500)** **[18]**	**48 000** **(30,000)** **[24]**	**60 000** **(37,500)** **[30]**
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.			X		

Kilometers (Miles) [Months]	12 000 (7,500) [6]	24 000 (15,000) [12]	36 000 (22,500) [18]	48 000 (30,000) [24]	60 000 (37,500) [30]
Replace engine air cleaner filter.				X	
Replace make-up air filter.				X	
Replace spark plugs.				X	

Kilometers (Miles) [Months]	72 000 (45,000) [36]	84 000 (52,500) [42]	96 000 (60,000) [48]	108 000 (67,500) [54]	120 000 (75,000) [60]	132 000 (82,500) [66]
Change engine oil and engine oil filter.	X	X	X	X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X	X
Flush and replace engine coolant at 60 months, regardless of mileage.					X	
Inspect brake linings.	X			X		
Replace engine air cleaner filter.			X			
Replace make-up air filter.			X			
Replace spark plugs.			X			
Inspect PCV valve, replace as necessary.			X			
Inspect auto tension drive belt and replace if required.			X			

Kilometers (Miles) [Months]	144 000 (90,000) [72]	156 000 (97,500) [78]	160 000 (100,000)	168 000 (105,000) [84]	181 000 (112,500) [90]	192 000 (120,000) [96]
Change engine oil and engine oil filter.	X	X		X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X		X	X	X
Flush and replace engine coolant, if not done at 60 mos.			X			
Inspect brake linings.	X				X	
Replace engine air cleaner filter.	X					X
Replace make-up air filter.	X					X
Replace spark plugs.	X					X
Inspect PCV valve, replace as necessary.	X					X
Inspect auto tension drive belt and replace if required.	X					

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

SCHEDULE B

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (163 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

Kilometers (Miles)	**5 000 (3,000)**	**10 000 (6,000)**	**14 000 (9,000)**	**19 000 (12,000)**	**24 000 (15,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Kilometers (Miles)	**29 000 (18,000)**	**34 000 (21,000)**	**38 000 (24,000)**	**43 000 (27,000)**	**48 000 (30,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.	X				
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X

Kilometers (Miles)	**53 000 (33,000)**	**58 000 (36,000)**	**62 000 (39, 000)**	**67 000 (42,000)**	**72 000 (45,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	

Kilometers **(Miles)**	**53 000** **(33,000)**	**58 000** **(36,000)**	**62 000** **(39, 000)**	**67 000** **(42,000)**	**72 000** **(45,000)**
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.		X			
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Kilometers **(Miles)**	**77 000** **(48,000)**	**82 000** **(51,000)**	**86 000** **(54,000)**	**91 000** **(57,000)**	**96 000** **(60,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter.					X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.			X		
Replace engine air cleaner filter, replace if necessary.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X
Inspect auto tension drive belt and replace if required.					X
Flush and replace engine coolant at 60 months, or 102,000 miles (163, 000 km) whichever comes first.					

Kilometers **(Miles)**	**101 000** **(63,000)**	**106 000** **(66,000)**	**110 000** **(69,000)**	**115 000** **(72,000)**	**120 000** **(75,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.				X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X
Inspect auto tension drive belt and replace if required.					X

Kilometers **(Miles)**	**125 000** **(78,000)**	**130 000** **(81,000)**	**134 000** **(84,000)**	**139 000** **(87,000)**	**144 000** **(90,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Rear Drive Assembly (RDA) fluid.		X			
Change Power Transfer Unit (PTU)		X			
Rotate tires.	X		X		X

Kilometers (Miles)	125 000 (78,000)	130 000 (81,000)	134 000 (84,000)	139 000 (87,000)	144 000 (90,000)
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.					X
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X
Inspect auto tension drive belt and replace if required.					X

Kilometers (Miles)	149 000 (93,000)	154 000 (96,000)	158 000 (99,000)	160 000 (100,000)	163 000 (102,000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X		X
Rotate tires.		X			X
Check spare tire for proper pressure and correct stowage.		X			X
Flush and replace engine coolant, if not done at 60 months.					X

Kilometers (Miles)	168 000 (105,000)	173 000 (108,000)	178 000 (111,000)	182 000 (114,000)	187 000 (117,000)	192 000 (120,000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X	X
Change Automatic Transaxle (CVT) fluid and filter.						X
Rotate tires.		X		X		X
Check spare tire for proper pressure and correct stowage.		X		X		X
Inspect brake linings.		X				
Replace engine air cleaner filter.	X					X
Inspect and replace make-up air filter, if required.	X					
Replace make-up air filter.						X
Replace spark plugs.						X
Inspect PCV valve, replace as necessary.						X
Inspect auto tension drive belt and replace if required.	X					X

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

WARNING:
You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

HOISTING

STANDARD PROCEDURE - HOISTING

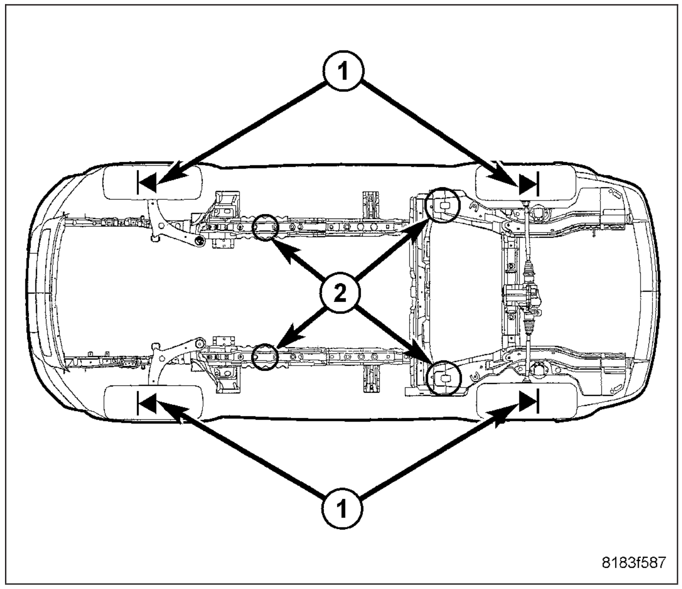
Refer to Owner's Manual provided with vehicle for proper emergency jacking procedures.

WARNING: The hoisting and jack lifting points provided are for a complete vehicle. When the engine or rear suspension is removed from a vehicle, the center of gravity is altered making some hoisting conditions unstable. Properly support or secure vehicle to hoisting device when these conditions exist.

CAUTION: Do not position hoisting device on suspension components, damage to vehicle can result. Do not attempt to raise one entire side of the vehicle by placing a floor jack midway between the front and rear wheels. This practice may result in permanent damage to the body.

When properly positioned, a floor jack can be used to lift the vehicle and support the raised vehicle with jack stands.

A floor jack or any lifting device, must never be used on any part of the underbody other then the described areas.



1 - DRIVE ON LIFT
2 - FRAME CONTACT LIFT (SINGLE POST)
2 - CHASSIS LIFT (DUAL POST)
2 - OUTBOARD LIFT (DUAL LIFT)
2 - FLOOR JACK

JUMP STARTING

STANDARD PROCEDURE - JUMP STARTING

WARNING: Review all safety precautions and warnings in battery/starting/charging sections. Do not jump start a frozen battery, personal injury can result. Do not jump start when maintenance free battery indicator dot is yellow or bright color. Do not jump start a vehicle when the battery fluid is below the top of lead plates. Do not allow jumper cable clamps to touch each other when connected to a booster source. Do not use open flame near battery. Remove metallic jewelry worn on hands or wrists to avoid injury by accidental arcing of battery current. When using a high output boosting device, do not allow battery voltage to exceed 16 volts. Refer to instructions provided with device being used.

CAUTION: When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

TO JUMP START A DISABLED VEHICLE:

1. Raise hood on disabled vehicle and visually inspect engine compartment for:
   - Battery cable clamp condition, clean if necessary.
   - Frozen battery.
   - Yellow or white color test indicator, if equipped.
   - Generator drive belt condition and tension.
   - Fuel fumes or leakage, correct if necessary.

CAUTION: If the cause of starting problem on disabled vehicle is severe, damage to booster vehicle charging system can result.

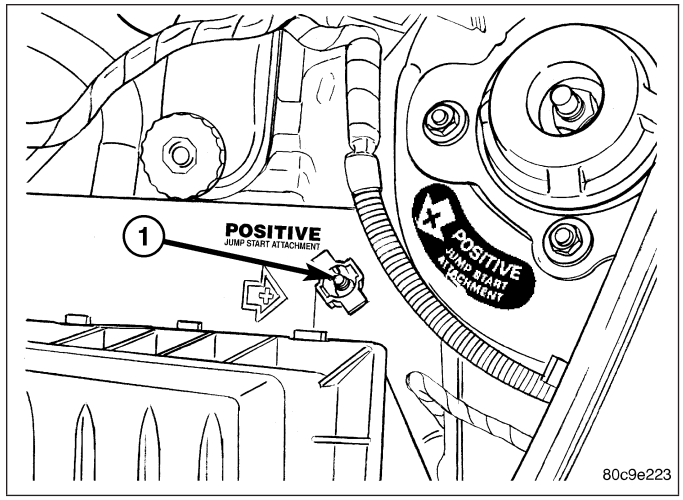
2. When using another vehicle as a booster source, park the booster vehicle within cable reach. Turn off all accessories, set the parking brake, place the automatic transmission in PARK or the manual transmission in NEUTRAL and turn the ignition OFF.
3. On disabled vehicle, place gear selector in park or neutral and set park brake. Turn off all accessories.
4. Connect jumper cables to booster battery. RED clamp to positive terminal (+) or remote terminal. BLACK clamp to negative terminal (-). DO NOT allow clamps at opposite end of cables to touch, electrical arc will result. Review all warnings in this procedure.
5. On disabled vehicle connect RED jumper cable clamp to positive (+) remote terminal. Connect BLACK jumper cable clamp to engine ground.
   a. Pull the protective sleeve from the remote positive terminal labeled Position Jump Post Attachment.
   b. Connect RED jumper cable clamp to positive (+) remote terminal.
   c. Connect BLACK jumper cable clamp to Negative Jump Post Attachment or engine ground as close to the ground cable attaching point as possible
6. Start the engine in the vehicle which has the booster battery, let the engine idle a few minutes, then start the engine in the vehicle with the discharged battery.

CAUTION: Do not crank starter motor on disabled vehicle for more than 15 seconds, starter will overheat and could fail.

7. Allow battery in disabled vehicle to charge to at least 12.4 volts (75% charge) before attempting to start engine. If engine does not start within 15 seconds, stop cranking engine and allow starter to cool (15 minutes), before cranking again.

DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp from engine ground on disabled vehicle.
- Disconnect RED cable clamp from battery positive remote terminal.



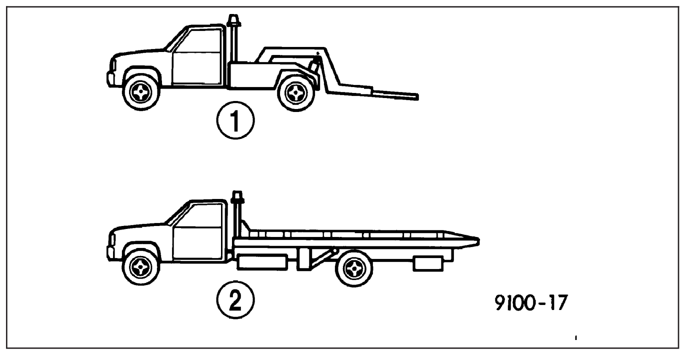
TOWING

STANDARD PROCEDURE - TOWING

WARNING: Do not allow towing attachment devices to contact the fuel tank or lines, fuel leak can result. Do not lift or tow vehicle by front or rear bumper, or bumper energy absorber units. Do not venture under a lifted vehicle if not supported properly on safety stands. Do not allow passengers to ride in a towed vehicle. Use a safety chain that is independent from the towing attachment device.

CAUTION: Do not damage brake lines, exhaust system, shock absorbers, sway bars, or any other under vehicle components when attaching towing device to vehicle. Do not attach towing device to front or rear suspension components. Do not secure vehicle to towing device by the use of front or rear suspension or steering components. Remove or secure loose or protruding objects from a damaged vehicle before towing. Refer to state and local rules and regulations before towing a vehicle. Do not allow weight of towed vehicle to bear on lower fascia, air dams, or spoilers.

To avoid damage to bumper fascia and air dams use of a wheel lift or flat bed towing device is recommended. When using a wheel lift towing device, be sure the unlifted end of disabled vehicle has at least 100 mm (4 in.) ground clearance. If minimum ground clearance cannot be reached, use a towing dolly. If a flat bed device is used, the approach angle should not exceed 15 degrees.



SUSPENSION

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FRONT SUSPENSION

TABLE OF CONTENTS

FRONT SUSPENSION

DESCRIPTION

This vehicle has a gas pressurized MacPherson strut type front suspension design.

Each side of the front suspension consists of these major components:

- Hub (pressed into Bearing)
- Bearing (pressed into Knuckle)
- Knuckle
- Lower Control Arm
- Stabilizer Bar
- Strut Assembly

The front suspension also includes a crossmember to support the lower half of the suspension. Service procedures for the front suspension crossmember can be found in the Frame & Bumpers Group.

WARNING

WARNINGS AND CAUTIONS

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand, or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposition of dust or debris that may contain asbestos fibers.

WARNING: Do not remove the strut shaft nut while strut assembly is installed in vehicle, or before the coil spring is compressed with a compression tool. The spring is held under high pressure.

CAUTION: Only frame contact hoisting equipment can be used on this vehicle. It cannot be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used, damage to rear suspension components will occur.

CAUTION: At no time when servicing a vehicle can a sheet metal screw, bolt, or other metal fastener be installed in the shock tower to take the place of an original plastic clip. It may come into contact with the strut or coil spring.

CAUTION: Wheel bearing damage will result if after loosening the hub nut, the vehicle is rolled on the ground or the weight of the vehicle is allowed to be supported by the tires for a length of time.

STANDARD PROCEDURE

LUBRICATION

There are no serviceable lubrication points on the front suspension. The ball joints and tie rod ends are sealed for life and require no maintenance.

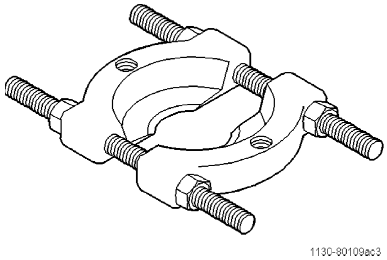
SPECIFICATIONS

FRONT SUSPENSION FASTENER TORQUE

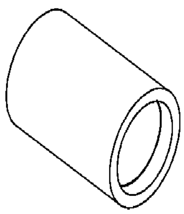
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Hub Nut	245	181	—
Lower Ball Joint Stud Pinch Bolt	82	60	—
Lower Control Arm Front Pivot Bolt	183	135	—
Lower Control Arm Rear Pivot Bolt	183	135	—
Stabilizer Bar Cushion Retainer Bolts	30	22	—
Stabilizer Bar Link Nuts	58	43	—
Strut Clevis-to-Knuckle Nuts	84	62	—
Strut Rod Nut	60	44	—
Strut-to-Tower Nuts	48	35	230
Tie Rod Adjuster Jam Nut	75	55	—
Tie Rod End-to-Knuckle Nut	102	75	—
Wheel Mounting (Lug) Nuts	135	100	—

SPECIAL TOOLS

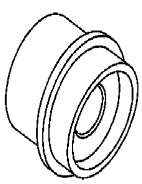
FRONT SUSPENSION



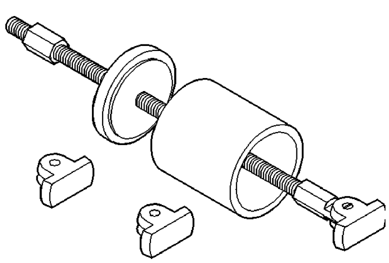
Splitter, Bearing/Gear 1130



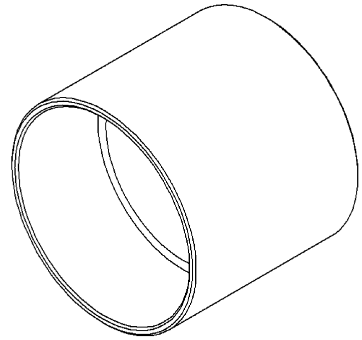
Remover/Installer 6289-4



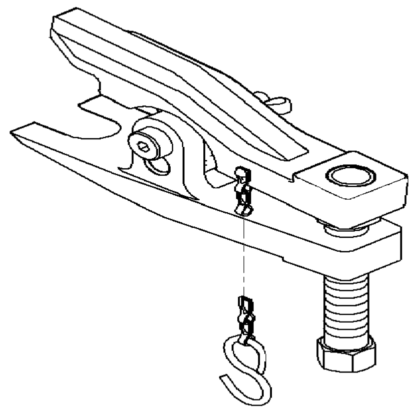
Remover/Installer 6289-6



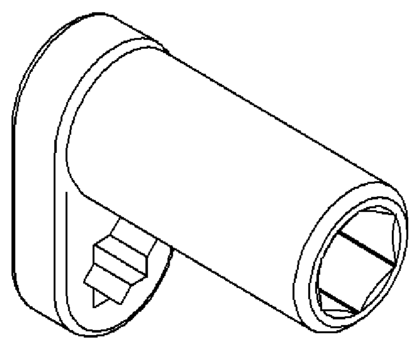
Remover 6310



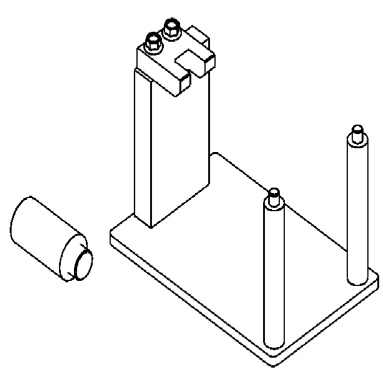
Receiver 8498



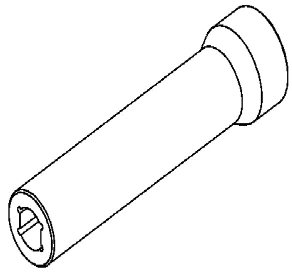
Remover, Ball Joint 9360



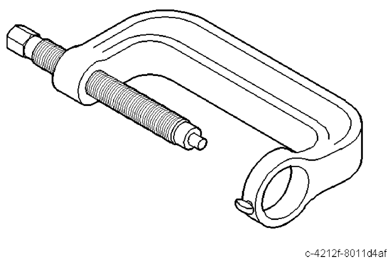
Wrench, Strut Nut 9362



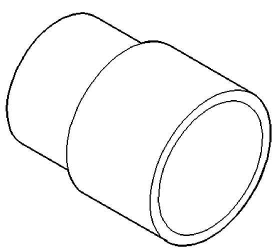
Fixture, Knuckle Support 9712



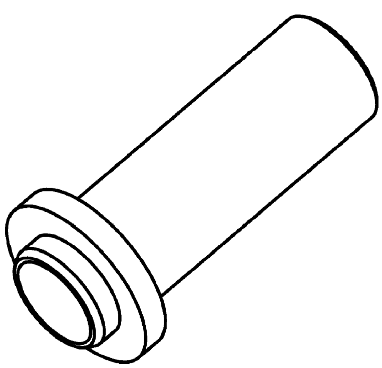
Socket, Strut Nut 9894



Press, Ball Joint C-4212F



Remover/Installer MB-990799

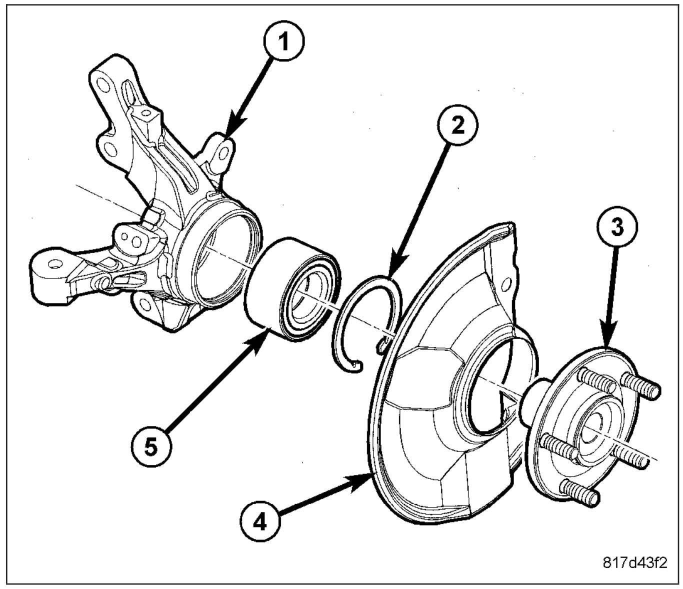


Installer MD998334

HUB / BEARING

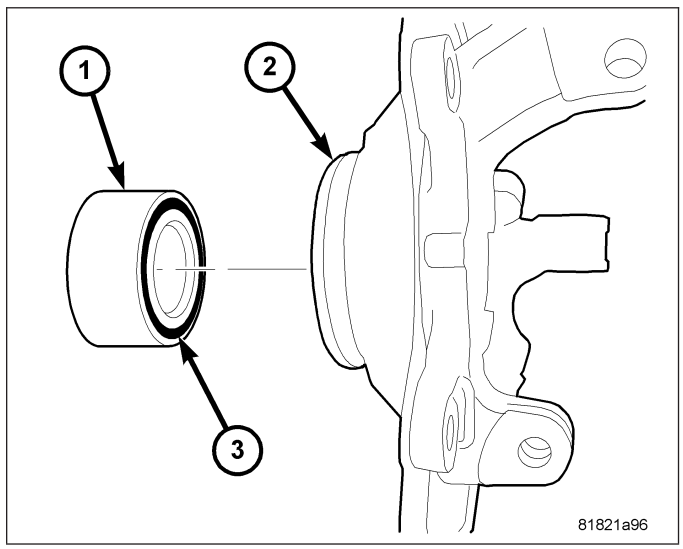
DESCRIPTION

The wheel bearing (5) and hub (3) are pressed into the knuckle (1). The wheel bearing is secured in place using a snap ring.



One side of the wheel bearing has an integrated magnetic encoder ring for wheel speed sensor usage as equipped. It is important that the wheel speed sensor magnetic encoder ring (dark band) (3) be positioned to the inside of the knuckle or the wheel speed sensor will not operate correctly.

The wheel bearing is a Unit 1 type cartridge bearing that requires no maintenance. The wheel bearing can be serviced separately from the hub.



The hub supports the driveline halfshaft outer constant velocity (C/V) joint. Each is splined and meshes in the center of the hub. The outer C/V joint is retained to the hub using a nut. The nut is locked to the outer C/V stub shaft using a cotter pin.

The hub has five studs pressed into its flange.

DIAGNOSIS AND TESTING

WHEEL BEARING AND HUB

NOTE: The wheel bearing is designed to last for the life of the vehicle and requires no type of periodic maintenance.

The following procedure may be used for diagnosing the condition of the wheel bearing and hub.

1. Remove the wheel and tire assembly, disc brake caliper and brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL)
2. Rotate the wheel hub checking for resistance or roughness.

Any roughness or resistance to rotation may indicate dirt intrusion or a failed hub bearing. If the bearing exhibits any of these conditions, the hub bearing will require replacement. Do not attempt to disassemble the bearing for repair. If the wheel bearing is disassembled for any reason, it must be replaced.

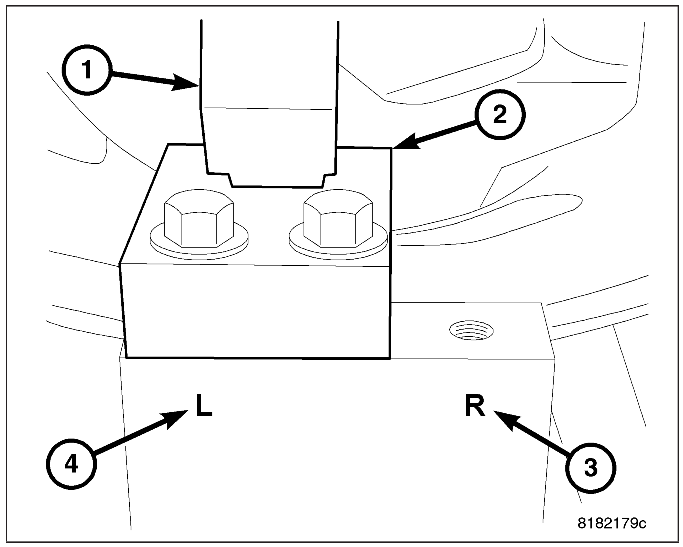
Damaged bearing seals and the resulting excessive grease loss may also require bearing replacement. Moderate grease weeping from the bearing is considered normal and should not require replacement of the wheel bearing.

To diagnose a bent hub, measure hub runout. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS AND TESTING)

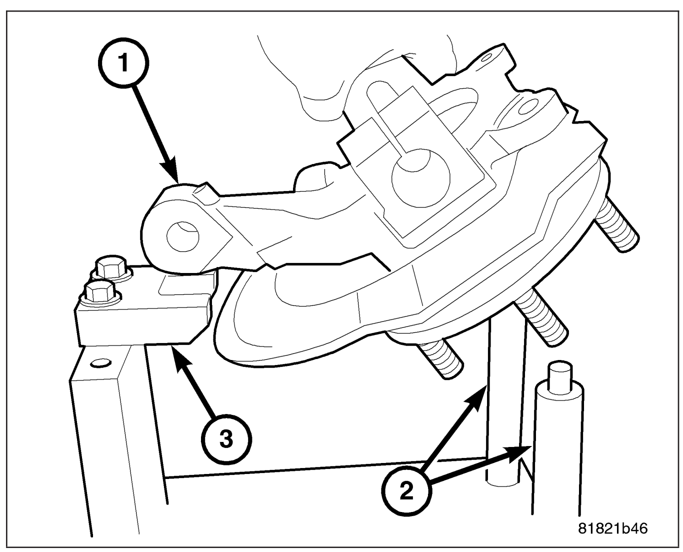
REMOVAL

NOTE: The removal and installation of the wheel bearing and hub from the knuckle is only to be done with the knuckle removed from the vehicle.

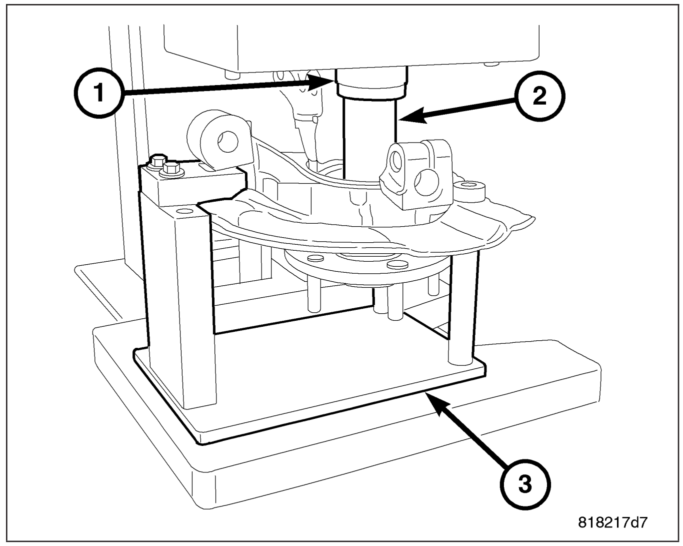
1. Remove the steering knuckle from the vehicle. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL)
2. Position the locator block (2) for Fixture, Special Tool 9712, as follows:
   a. For left side knuckles, place the locator block (2) to the left side (4) on the Fixture. The side of the locator block with the angle cut goes downward, toward the Fixture. Install the mounting screws and tighten them to approximately 54 N·m (40 ft. lbs.).
   b. For right side knuckles, place the locator block (2) to the right side (3) on the Fixture. The side of the locator block with the angle cut goes downward, toward the Fixture. Install the mounting screws and tighten them to approximately 54 N·m (40 ft. lbs.).



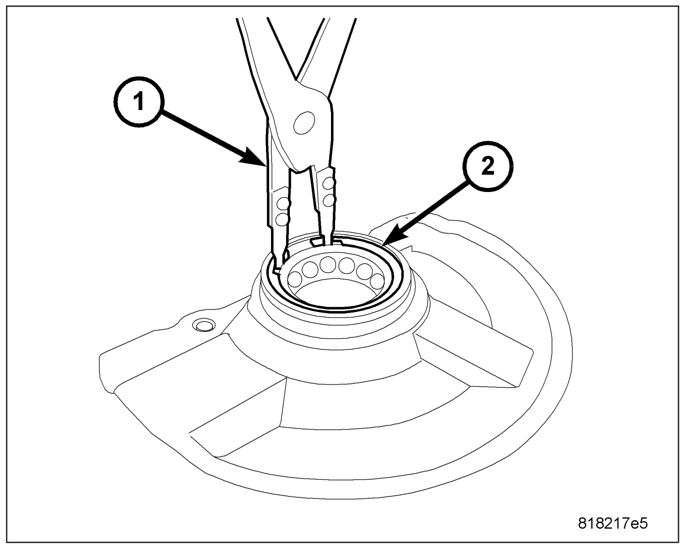
3. Install the knuckle in the Fixture as shown, guiding the steering arm (1) to rest on the locator block (3) and the brake caliper mounting bosses on the two Fixture pins (2).



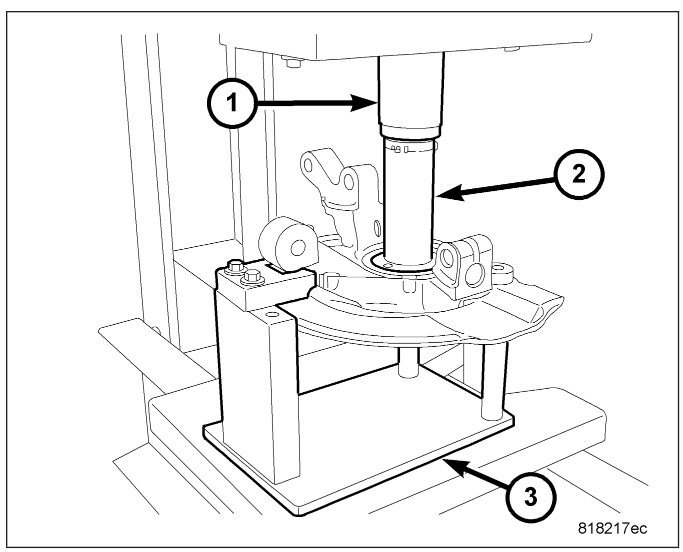
4. Place the Fixture (3) with knuckle in an arbor press.
5. Position Remover/Installer, Special Tool 9712-2 (2), in the small end of the hub. Lower the arbor press ram (1) and remove the hub from the wheel bearing and knuckle. The bearing race will normally come out of the wheel bearing with the hub as it is pressed out of the bearing.



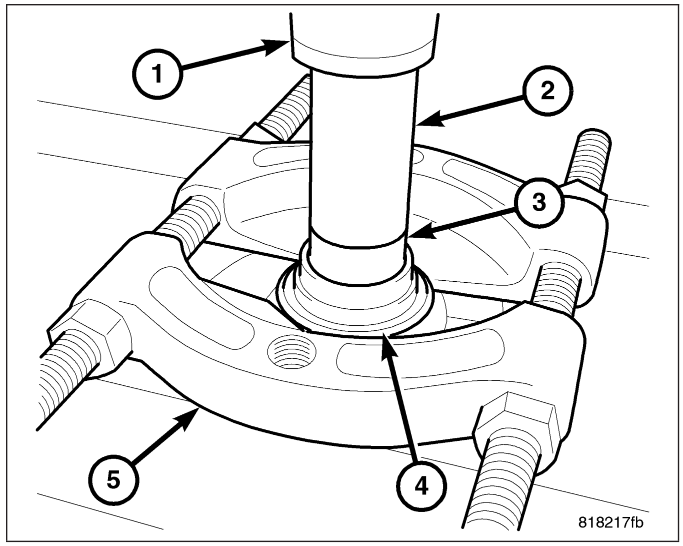
6. Remove the knuckle from the Fixture and turn it over.
7. Remove the snap ring (2) from the knuckle using an appropriate pair of snap ring pliers (1).



8. Place the knuckle back in the Fixture (3) in the arbor press ram.
9. Place Installer (2), Special Tool MD-998334, on the outer race of the wheel bearing. Lower the arbor press ram (1) and remove the wheel bearing from the knuckle.
10. Remove the knuckle and tools from arbor press.



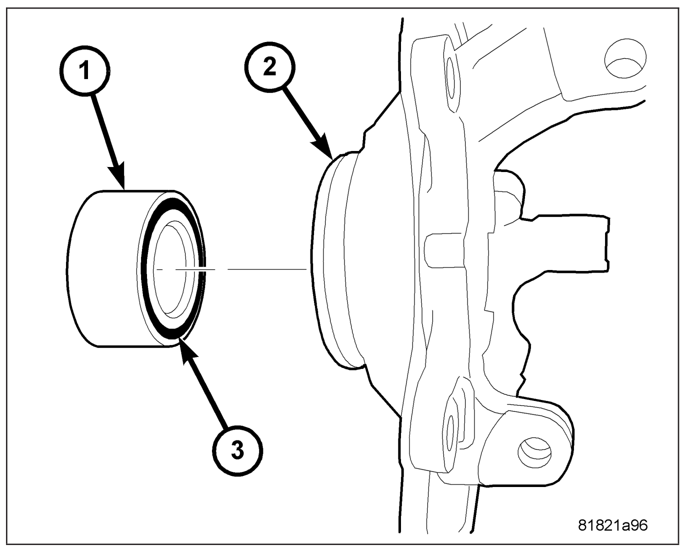
11. If the bearing race is still pressed onto the hub, install the Bearing Splitter (5), Special Tool 1130, between the hub flange and the bearing inner race (4).
12. Place the hub, bearing race and Bearing Splitter in an arbor press. The press support blocks must not obstruct the wheel hub while it is being pressed out of the bearing race.
13. Place Remover/Installer (2), Special Tool 9712-2, in the end of the hub (3). Lower the arbor press ram (1) and remove the hub from the bearing race.



NOTE: For installation, (Refer to 2 - SUSPENSION/FRONT/HUB / BEARING - INSTALLATION).

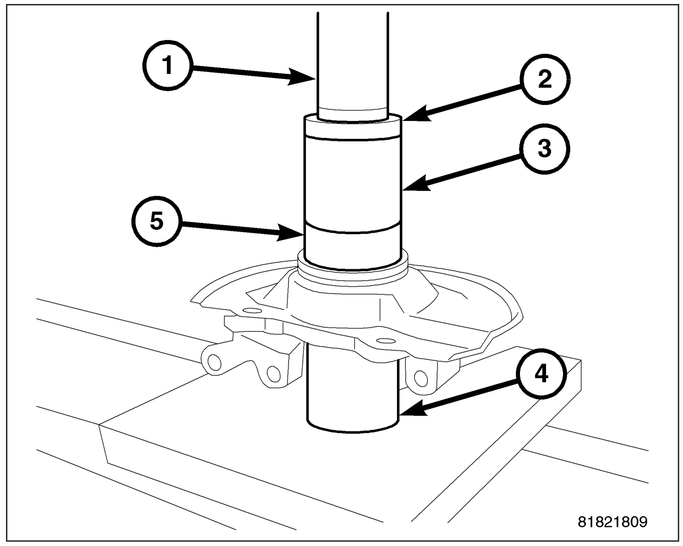
INSTALLATION

CAUTION: When installing the wheel bearing (1) in the knuckle (2) it is important to place the side of bearing with the wheel speed sensor magnetic encoder ring (dark band) (3) in the knuckle first. Otherwise, the wheel speed sensor will not operate correctly.

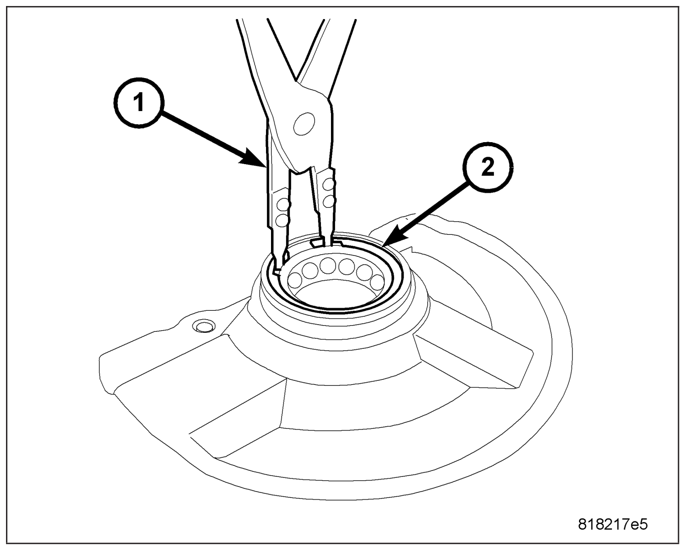


1. Wipe the bearing bore of the knuckle clean of any grease or dirt with a clean, dry shop towel.

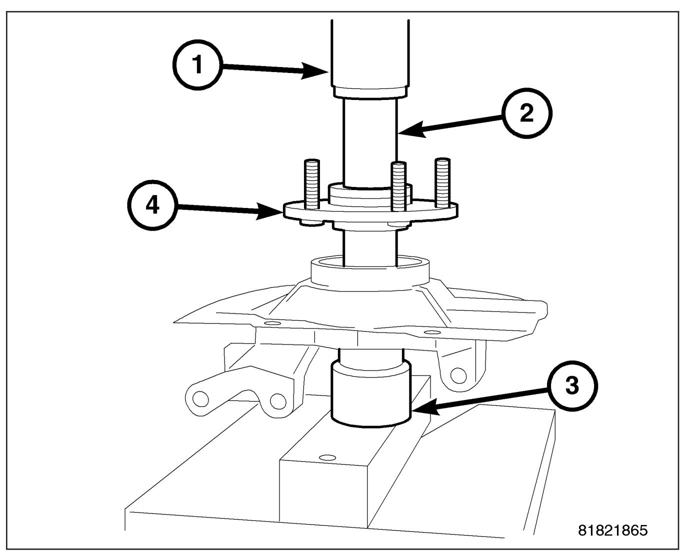
2. Place the knuckle in an arbor press supporting the knuckle from underneath using Cup (4), Special Tool 6310-1.
3. Place the NEW wheel bearing (5) magnetic encoder ring side down (see above Caution) into the bore of the knuckle. Be sure the wheel bearing is placed squarely into the bore.
4. Place Receiver (3), Special Tool 8498, larger inside diameter end down over the outer race of the wheel bearing.
5. Place Disc (2), Special Tool 6310-2, into top of Receiver 8498. Lower the arbor press ram (1) and press the wheel bearing into the knuckle until it is bottomed in the bore of the knuckle.
6. Remove the knuckle and tools from the arbor press.



7. Install a NEW snap ring (2) in the knuckle using an appropriate pair of snap ring pliers (1). Make sure the snap ring is fully seated.



8. Place the knuckle in an arbor press. Support the knuckle from underneath using Remover/Installer (3), Special Tool MB-990799, smaller end up against the wheel bearing inner race.
9. Place the hub (4) in the wheel bearing making sure it is square with the bearing inner race.
10. Position Remover/Installer, Special Tool 9712-2 (2), in the end of the hub. Lower the arbor press ram (1) and press the hub into the wheel bearing until it bottoms.
11. Remove the knuckle and tools from the press.



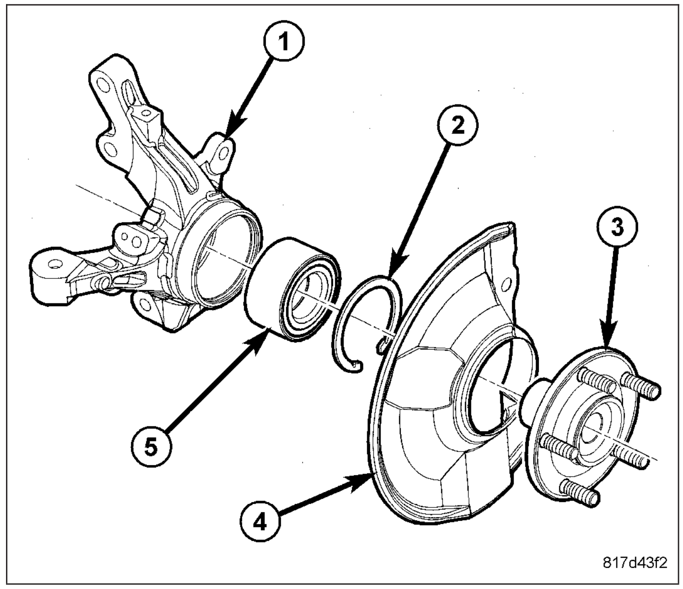
12. Verify the hub turns smoothly without rubbing or binding.
13. Install the knuckle on the vehicle. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - INSTALLATION)

KNUCKLE

DESCRIPTION

The knuckle (1) is a single casting with legs machined for attachment to the front strut assembly on the top, lower control arm ball joint on the bottom, and steering linkage on the trailing end. The knuckle also has two machined, drilled and tapped legs on the leading end casting to support and align the front disc brake caliper adapter.

The knuckle supports the wheel bearing (5) and hub (3). The hub is pressed into a sealed-for-life wheel bearing that is pressed into the knuckle. A snap ring also holds the bearing in place. A shield is pressed onto the knuckle behind the hub.



DIAGNOSIS AND TESTING

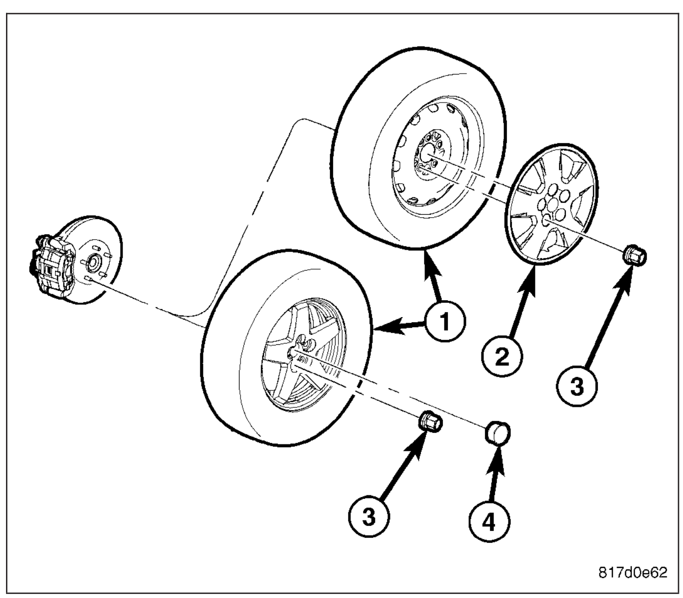
KNUCKLE

The front suspension knuckle is not a repairable component of the front suspension. It must be replaced if found to be damaged in any way. If it is determined that the knuckle is bent when servicing the vehicle, no attempt is to be made to straighten the knuckle.

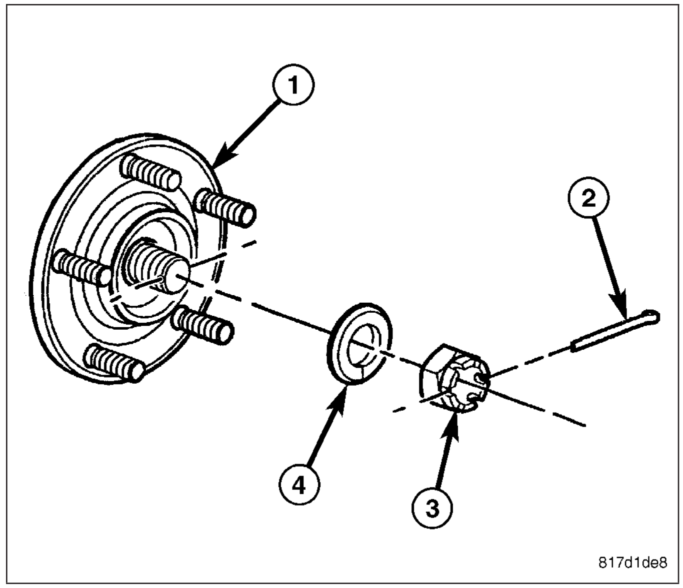
REMOVAL

NOTE: Before proceeding, review all Warnings and Cautions. (Refer to 2 - SUSPENSION/FRONT - WARNING)

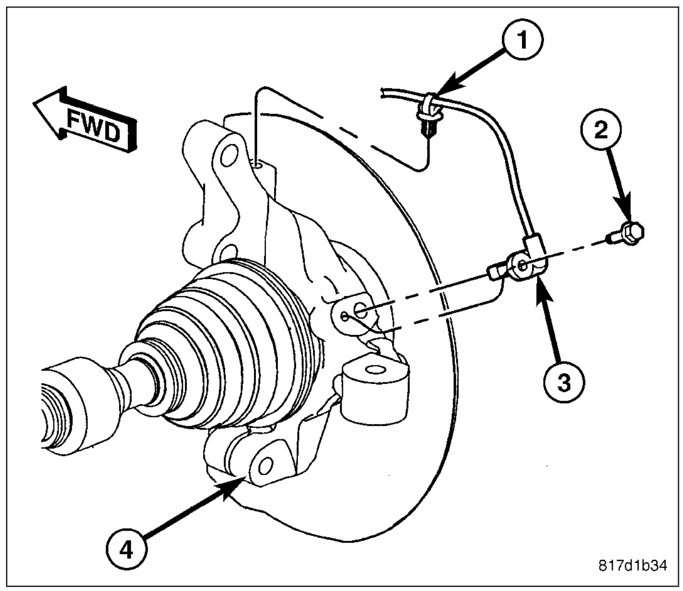
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



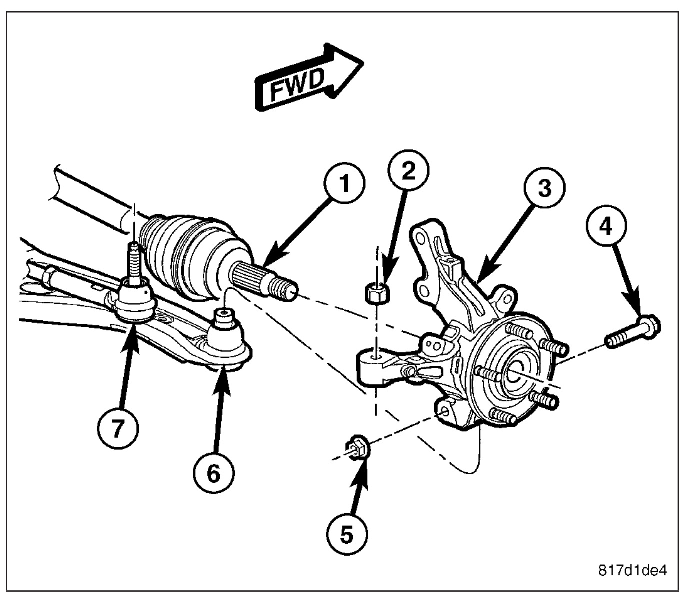
3. Remove the cotter pin (2) from the hub nut (3).
4. While a helper applies the brakes to keep the hub (1) from rotating, remove the hub nut (3) and washer (4) from the axle half shaft.
5. Access and remove the front brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)



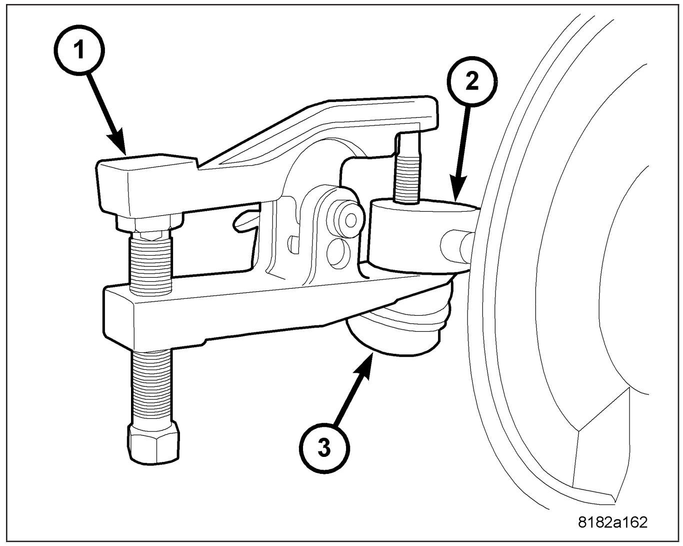
6. Remove the routing clip (1) securing wheel speed sensor cable to the knuckle (4).
7. Remove the screw (2) fastening the wheel speed sensor head (3) to the knuckle (4). Pull the sensor head out of the knuckle.



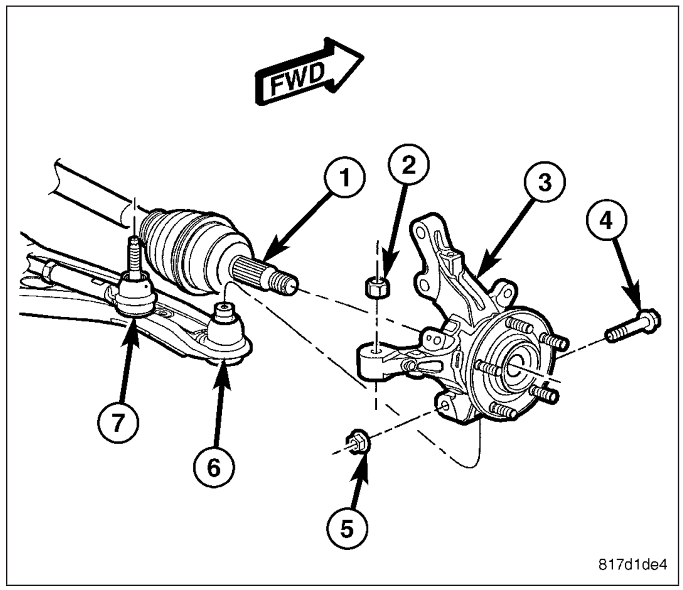
8. Remove the nut (2) attaching the outer tie rod (7) to the knuckle (3). To do this, hold the tie rod end stud with a wrench while loosening and removing the nut with a standard wrench or crowfoot wrench.



9. Release the outer tie rod end (3) from the knuckle (2) using Remover (1), Special Tool 9360.
10. Remove the outer tie rod from the knuckle.

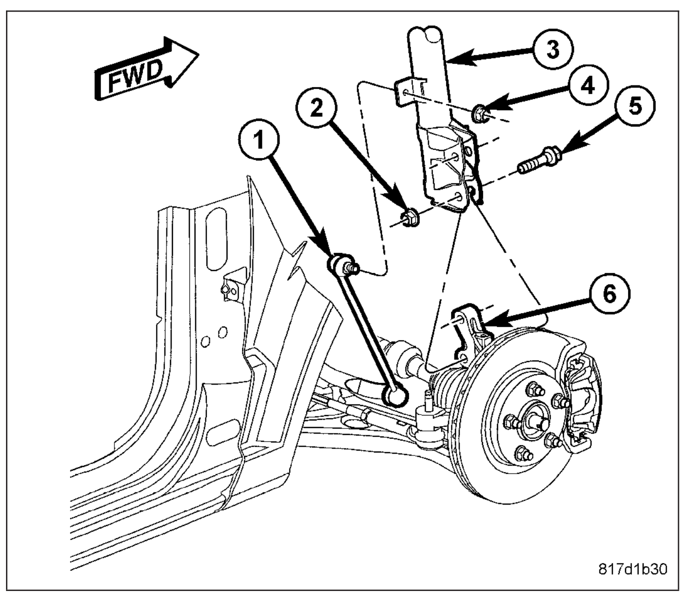


11. Remove the nut (5) and pinch bolt (4) clamping the ball joint stud (6) to the knuckle (3).



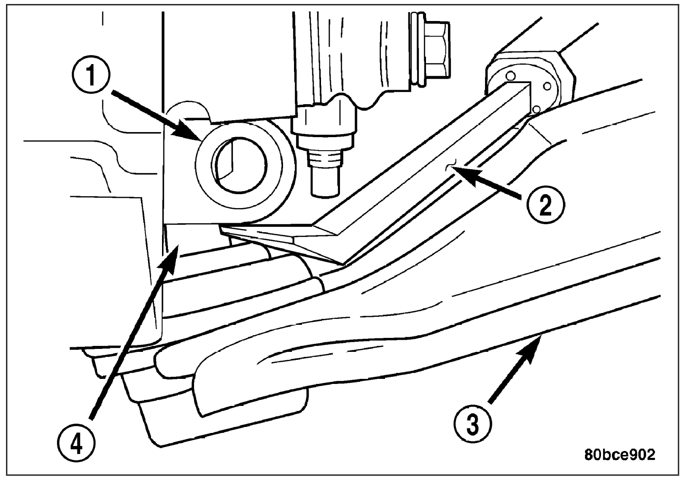
CAUTION: The strut assembly-to-knuckle attaching bolts (5) are serrated and must not be turned during removal. Proper removal is required. Refer to the following steps for the correct method.

12. While holding the bolt heads stationary, remove the two nuts (2) from the bolts (5) attaching the strut (3) to the knuckle (6).
13. Remove the two bolts (5) attaching the strut (3) to the knuckle (6) using a pin punch.



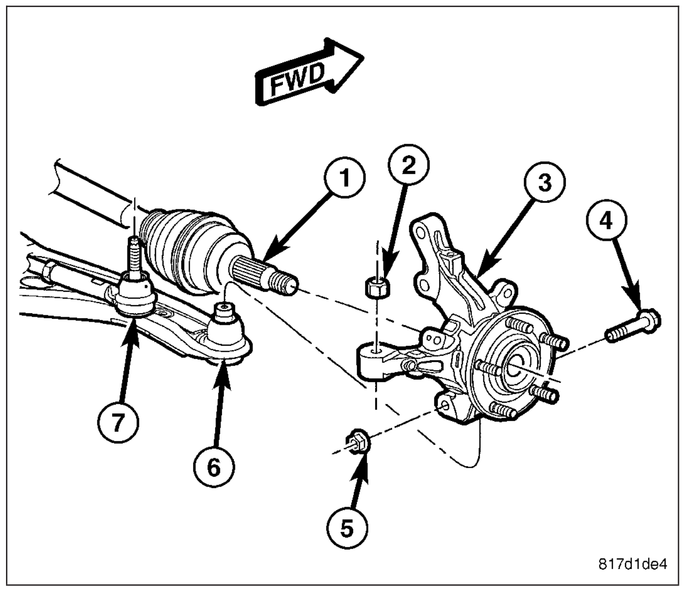
CAUTION: Use care when separating the ball joint stud (4) from the knuckle (1), so the ball joint seal does not get cut.

14. Using an appropriate prying tool (2), separate the ball joint stud (4) from the knuckle (1) by prying down on lower control arm (3) and up against the ball joint boss on the knuckle.



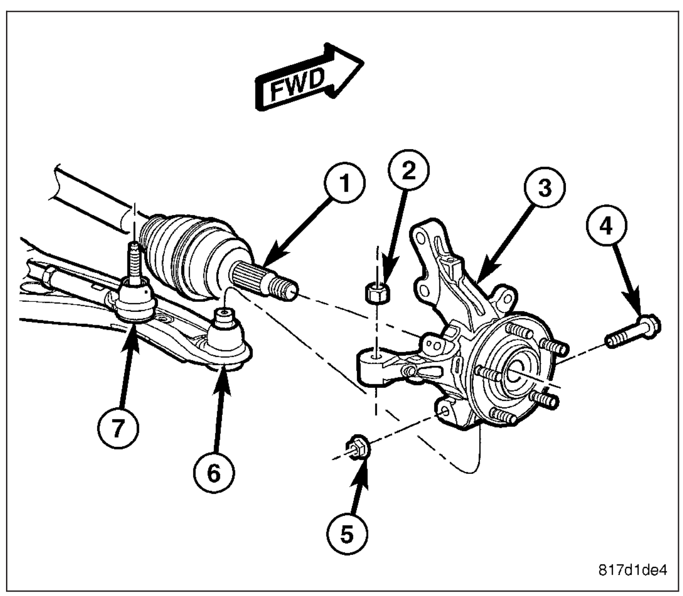
NOTE: Do not allow the half shaft (1) to hang by the inner C/V joint; it must be supported to keep the joint from separating during this operation.

15. Pull the knuckle (3) off the half shaft (1) outer C/V joint splines and remove the knuckle from the vehicle.

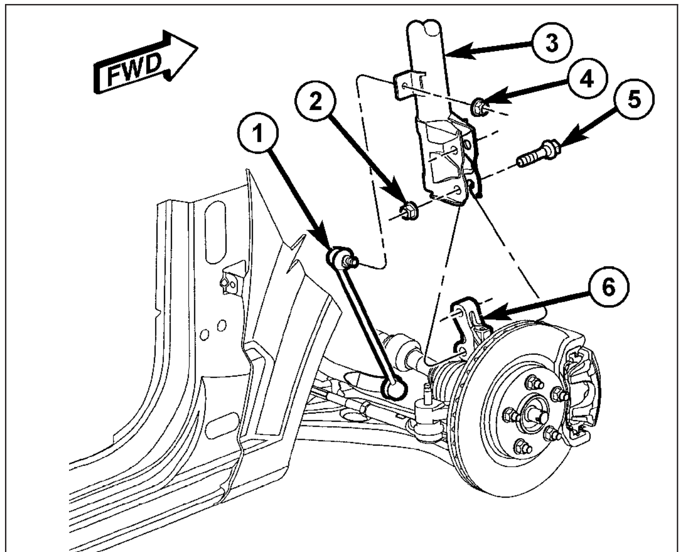


INSTALLATION

1. Slide the hub of the knuckle (3) onto the splines of the halfshaft outer C/V joint (1).
2. Install the knuckle (3) onto the ball joint (6) stud aligning the bolt hole in the knuckle boss with the groove formed into the side of the ball joint stud.
3. Install a NEW ball joint stud pinch bolt (4) and nut (5). Tighten the nut to 82 N·m (60 ft. lbs.).

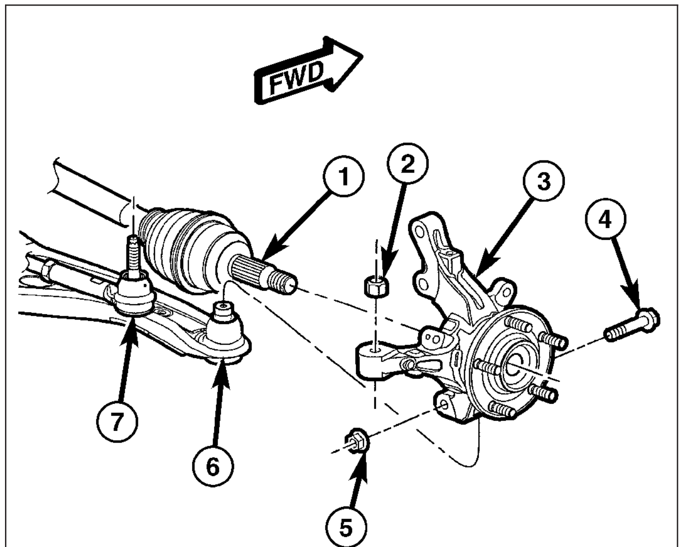


CAUTION: The strut assembly-to-knuckle attaching bolts (2) are serrated and must not be turned during installation. Install the nuts while holding the bolts stationary in the steering knuckle. Refer to the following step.



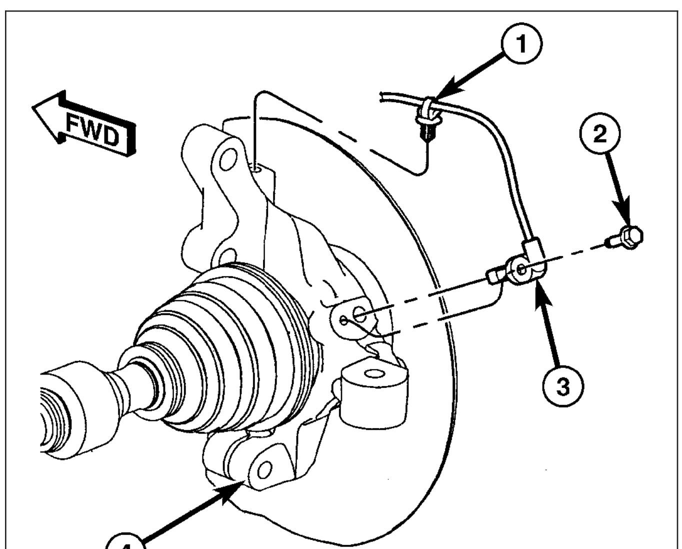
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4. Position the lower end of the strut assembly (3) in line with the upper end of the knuckle (6), aligning the mounting holes. Install the two mounting bolts (5).
5. Install the nuts (2) on the two bolts (5). While holding the bolts in place, tighten the nuts to 84 N·m (62 ft. lbs.).



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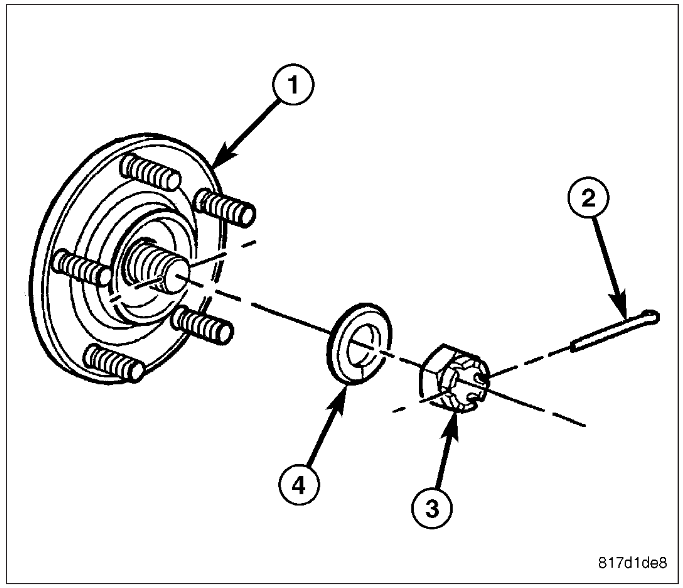
6. Install the outer tie rod (7) ball stud into the hole in the knuckle (3) arm. Start the tie rod mounting nut (2) onto the stud. While holding the tie rod end stud with a wrench, tighten the nut with a wrench or crowfoot wrench to 102 N·m (75 ft. lbs.).



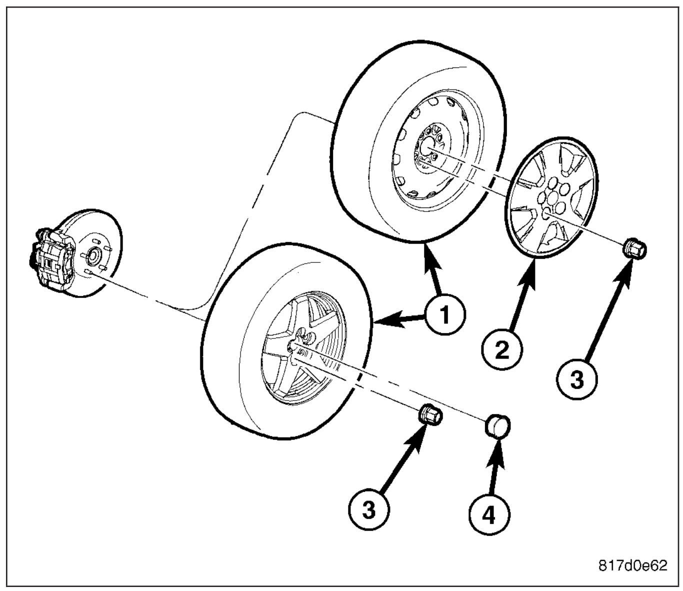
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7. Install the wheel speed sensor head (3) into the knuckle (4). Install the mounting screw (2) and tighten it to 12 N·m (106 in. lbs.).
8. Install the routing clip (1) securing the wheel speed sensor cable to the knuckle (4).
9. Install the brake rotor, disc brake caliper and adapter. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)

10. Clean all foreign matter from the threads of the halfshaft outer C/V joint.
11. Install the washer (4) and hub nut (3) on the end of the halfshaft and snug it.
12. While a helper applies the brakes to keep the hub (1) from rotating, tighten the hub nut (3) to 245 N·m (181 ft. lbs.).
13. Insert the cotter pin (2) through the notches in the nut and the hole in halfshaft. If the notches in the nut do not line up with the hole in the halfshaft, continue to tighten the nut until they do. **Do not loosen the nut.**
14. Wrap the cotter pin (2) ends tightly around the lock nut.



15. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
16. Lower the vehicle.
17. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

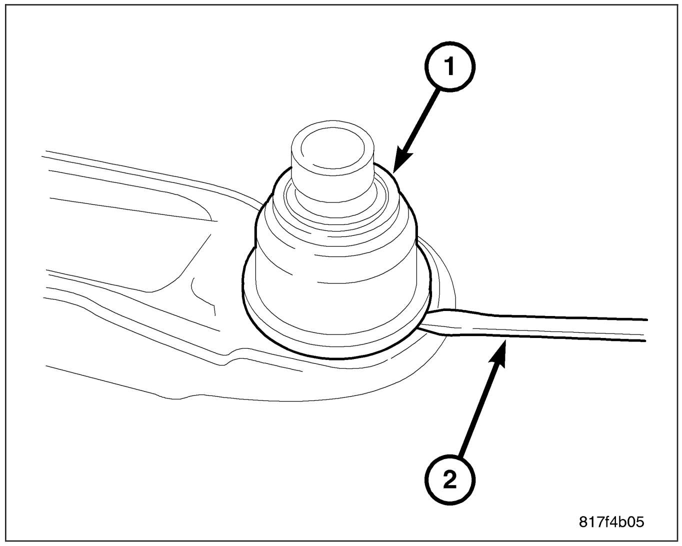


SEAL-LOWER BALL JOINT

REMOVAL

CAUTION: This procedure is designed to be used only if a seal boot is damaged during related service procedures. It is not to be used as a repair procedure for a cut seal boot on a vehicle that has been driven and exposed to road and weather conditions.

1. Remove the lower control arm from the vehicle. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL)
2. Using a screwdriver or other suitable tool (2), pry the seal boot (1) off of the ball joint.



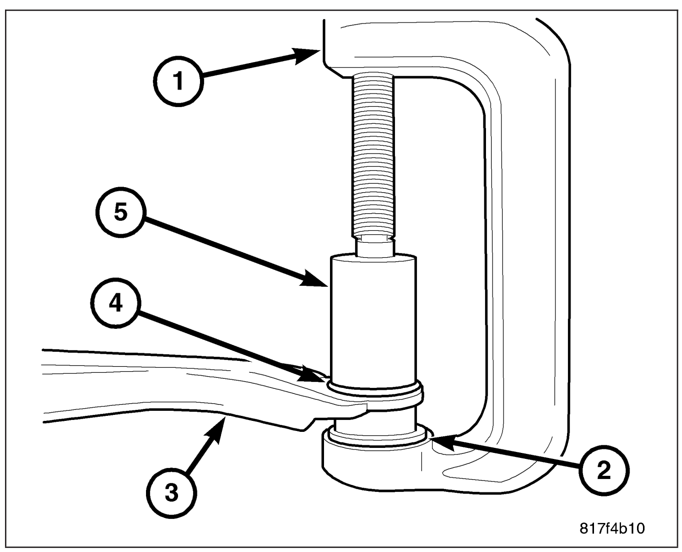
INSTALLATION

CAUTION: This procedure is designed to be used only if a seal boot is damaged during related service procedures. It is not to be used as a repair procedure for a cut seal boot on a vehicle that has been driven and exposed to road and weather conditions.

1. Place a liberal dab of Mopar® Multi-Mileage Lube (No more than 10g) or equivalent around the base of the ball joint stud at the socket.
2. Position the ball joint stud straight up.
3. Place the NEW ball joint seal boot over the ball joint stud.
4. By hand, start the seal boot over the sides of the ball joint.

CAUTION: Prior to installing the sealing boot using Remover/Installer, Special Tool 6289-4, make sure there are no burrs on the inside of the tool. Remove any burrs and lubricate with a small amount of Mopar® Multi-Mileage Lube or equivalent.

5. Place Remover/Installer, Special Tool 6289-4, onto the screw-drive of Ball Joint Press, Special Tool C-4212F.
6. Place Remover/Installer, Special Tool 6289-6, angle-cut end up into the cup of Ball Joint Press, Special Tool C-4212F. Before tightening the set, turn the Remover/Installer so that the tallest point of the angle-cut is away from the body of the control arm when installing the seal boot.
7. Place the control arm ball joint into Remover/Installer 6289-6. Rotate the arm left or right until the tallest point of the angle cut on the Remover/Installer is away from the body of the control arm.



8. Lower Remover/Installer 6289-4 onto outer lip of ball joint seal.
9. By hand, tighten the Ball Joint Press screw-drive installing the seal boot. Tighten the screw-drive until the seal boot is seated squarely down against the top surface of the lower control arm (3). It may be necessary to use a wrench to seat the seal boot, but do not overtighten.
10. Remove the tools and wipe any grease off the ball joint stud using a clean shop towel with Mopar® Brake Parts Cleaner applied to it.
11. Install the lower control arm. (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION)

ARM-LOWER CONTROL

DIAGNOSIS AND TESTING

LOWER CONTROL ARM

Inspect the lower control arm for signs of damage from contact with the ground or road debris. If the lower control arm shows any sign of damage, look for distortion. Do not attempt to repair or straighten a broken or bent lower control arm. If damaged, the lower control arm stamping is serviced only as a complete component.

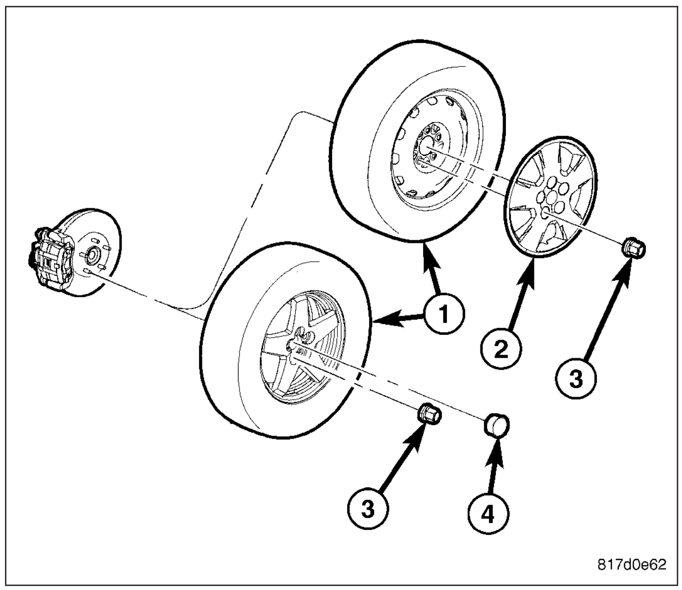
Inspect both lower control arm isolator bushings for severe deterioration and replace the lower control arm as required. Inspect the ball joint per the inspection procedure in this section of the service manual and replace the lower control arm required.

The only serviceable component of the lower control arm is the ball joint seal boot. It should only be replaced if damaged during service of a chassis component. Otherwise, replace the entire control arm.

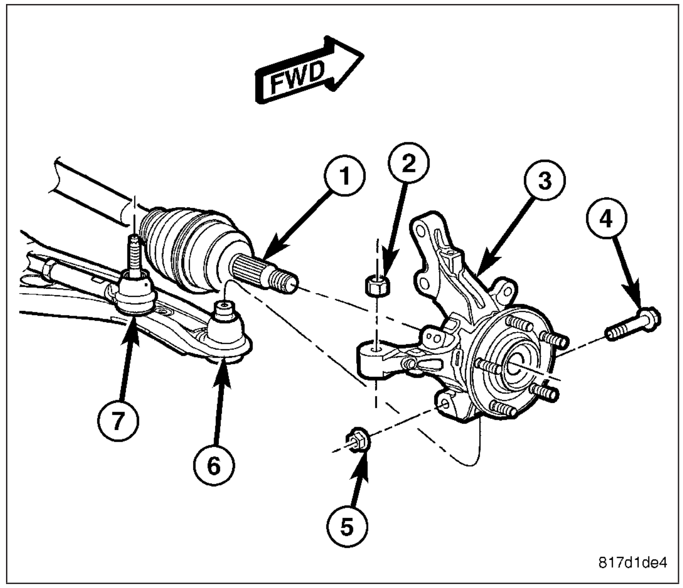
REMOVAL

NOTE: Before proceeding, (Refer to 2 - SUSPENSION/FRONT - WARNING).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



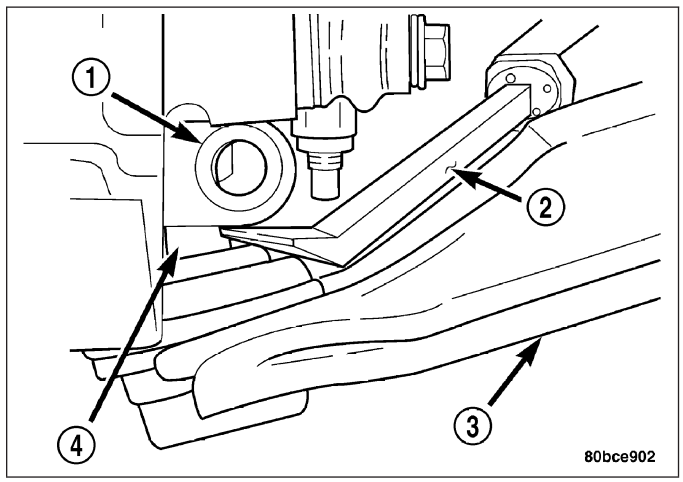
3. Remove the nut (5) and pinch bolt (4) clamping the ball joint (6) stud to the knuckle (3).



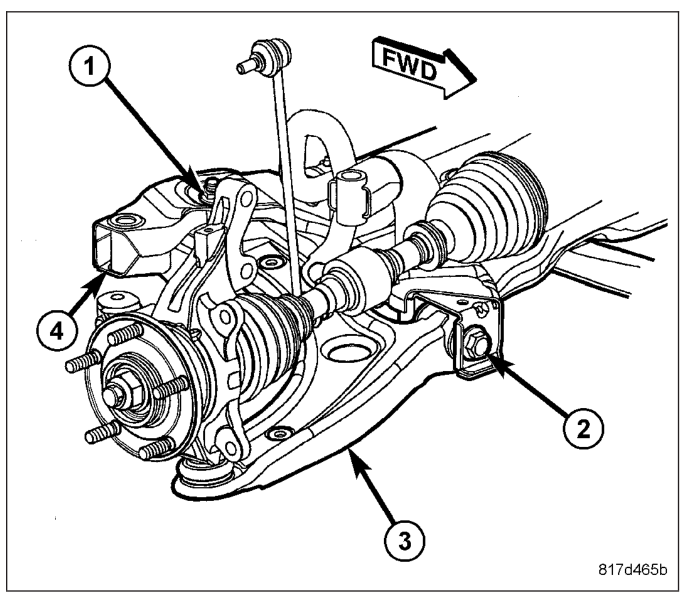
CAUTION: Upon removing the knuckle from the ball joint stud, do not pull outward on the knuckle. Pulling the knuckle outward at this point can separate the inner C/V joint on the halfshaft thus damaging it.

CAUTION: Use care when separating the ball joint stud (4) from the knuckle (1), so the ball joint seal does not get cut.

4. Using an appropriate prying tool (2), separate the ball joint stud (4) from the knuckle (1) by prying down on lower control arm (3) and up against the ball joint boss on the knuckle.

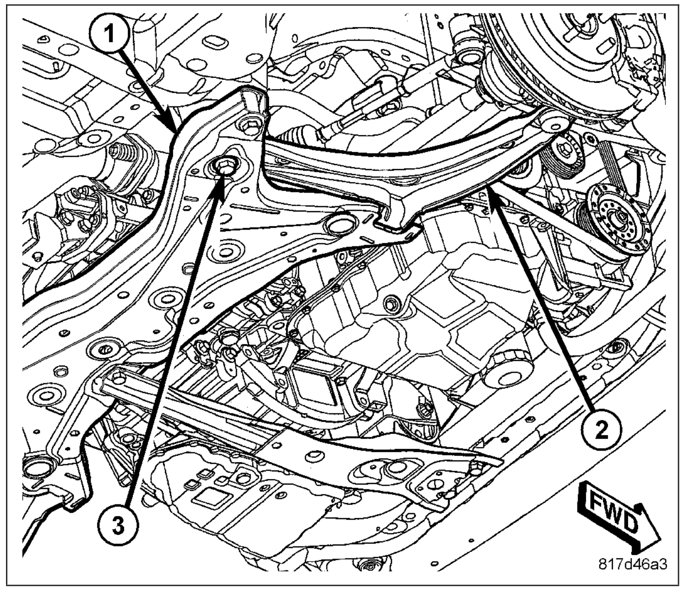


5. Remove the front bolt (2) attaching the lower control arm (3) to the front suspension crossmember (4).
6. Remove the nut (1) on the rear bolt attaching the lower control arm (3) to the front suspension crossmember (4). Remove the bolt.
7. Remove the lower control arm (3) from the crossmember (4).

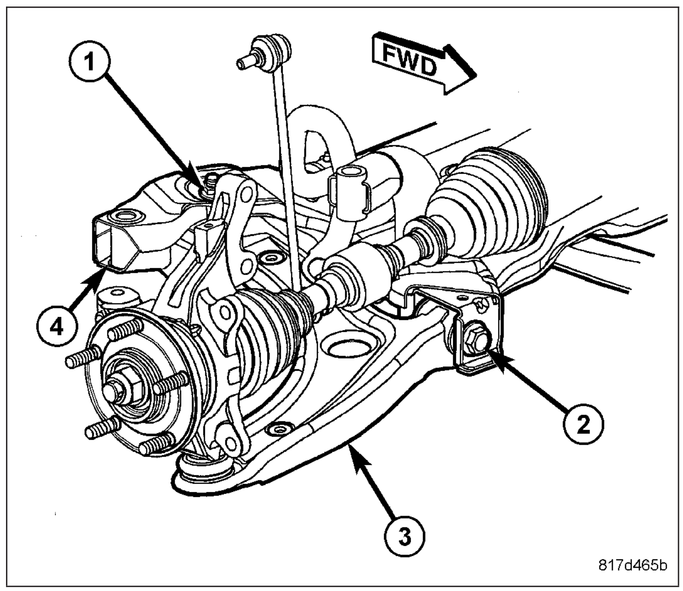


INSTALLATION

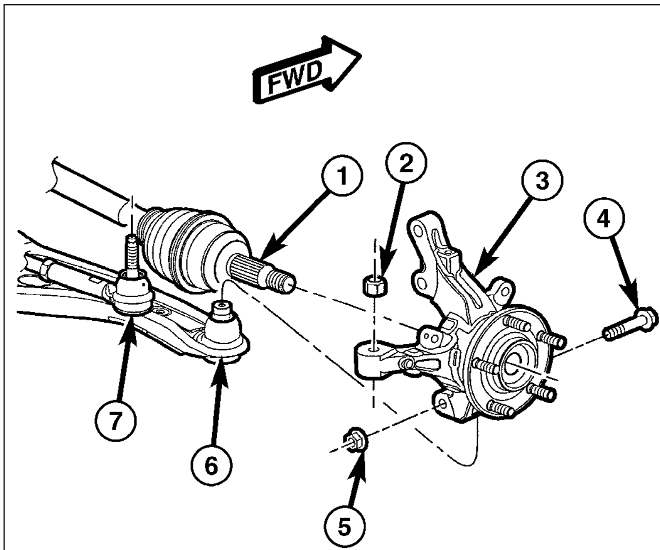
1. Place the lower control arm (2) into the front suspension crossmember (1).
2. Insert the rear bolt (3) up through the crossmember (1) and lower control arm (2).



3. Install, but do not fully tighten, the nut (1) on the rear bolt attaching the lower control arm (3) to the crossmember (4).
4. Install, but do not fully tighten, the front bolt (2) attaching the lower control arm to the crossmember.
5. With no weight or obstruction on the lower control arm, tighten the lower control arm rear mounting bolt nut (1) to 183 N·m (135 ft. lbs.).
6. With no weight or obstruction on the lower control arm, tighten the lower control arm front pivot bolt (2) to 183 N·m (135 ft. lbs.).

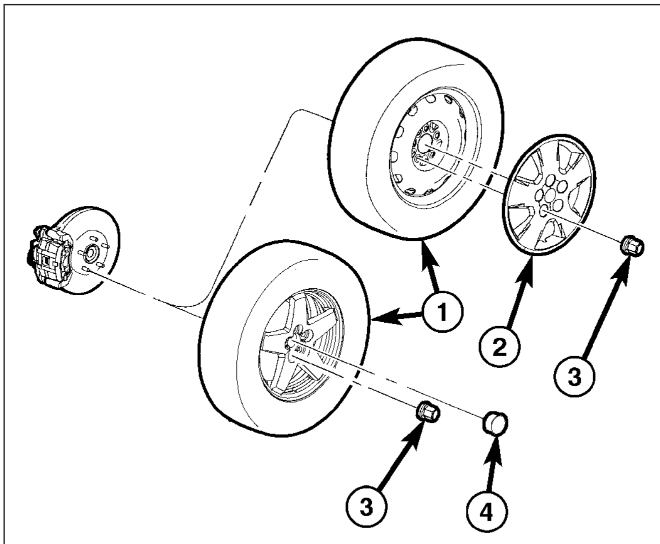


7. Install the ball joint (6) stud into the knuckle (3), aligning the bolt hole in the knuckle boss with the groove formed in the side of the ball joint stud.
8. Install a NEW ball joint stud pinch bolt (4) and nut (5). Tighten the nut to 82 N·m (60 ft. lbs.).



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9. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
10. Lower the vehicle.
11. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



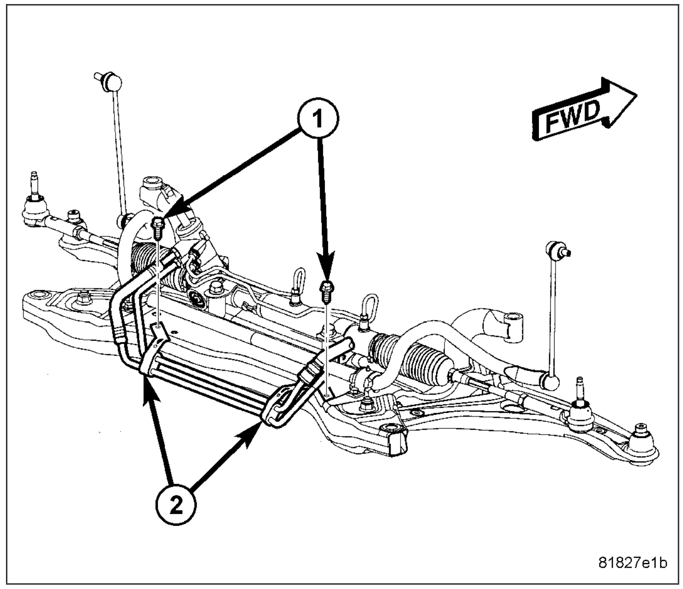
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BAR-STABILIZER

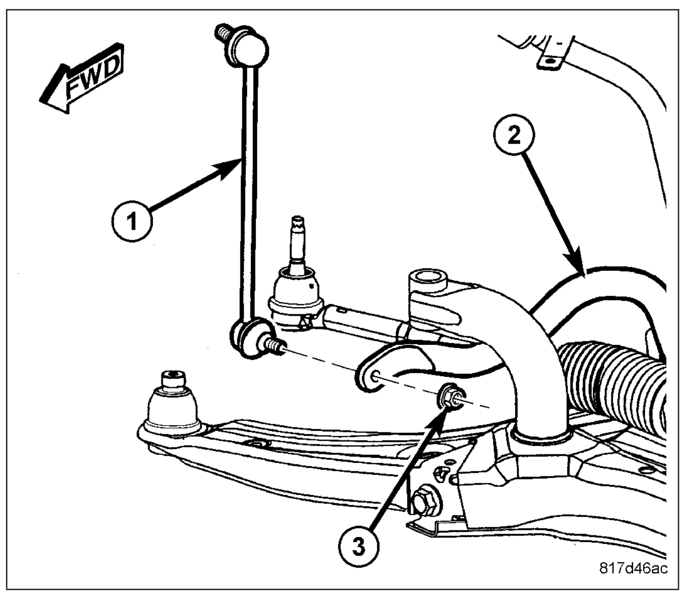
REMOVAL

NOTE: Before proceeding, (Refer to 2 - SUSPENSION/FRONT - WARNING).

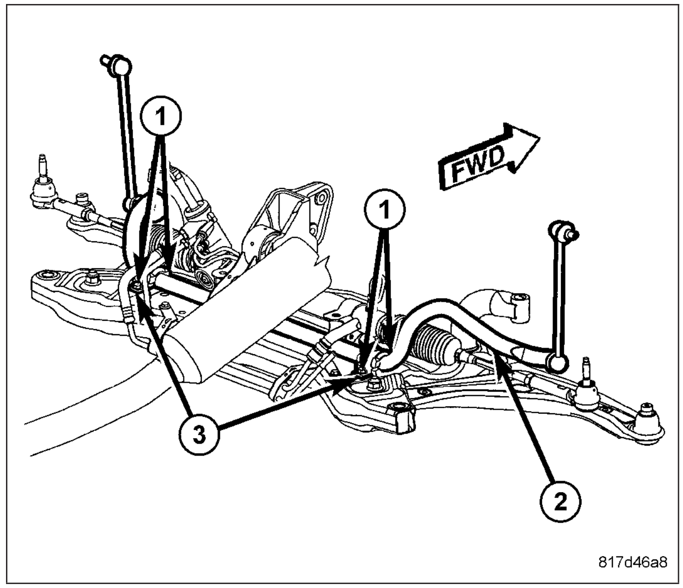
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. If equipped, remove the engine belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)
3. Remove the rear engine mount. (Refer to 9 - ENGINE/ENGINE MOUNTING/REAR MOUNT - REMOVAL)
4. Remove the front engine mount through-bolt.
5. Remove the bolts (1) securing the power steering hose routing clamps (2) to the crossmember.

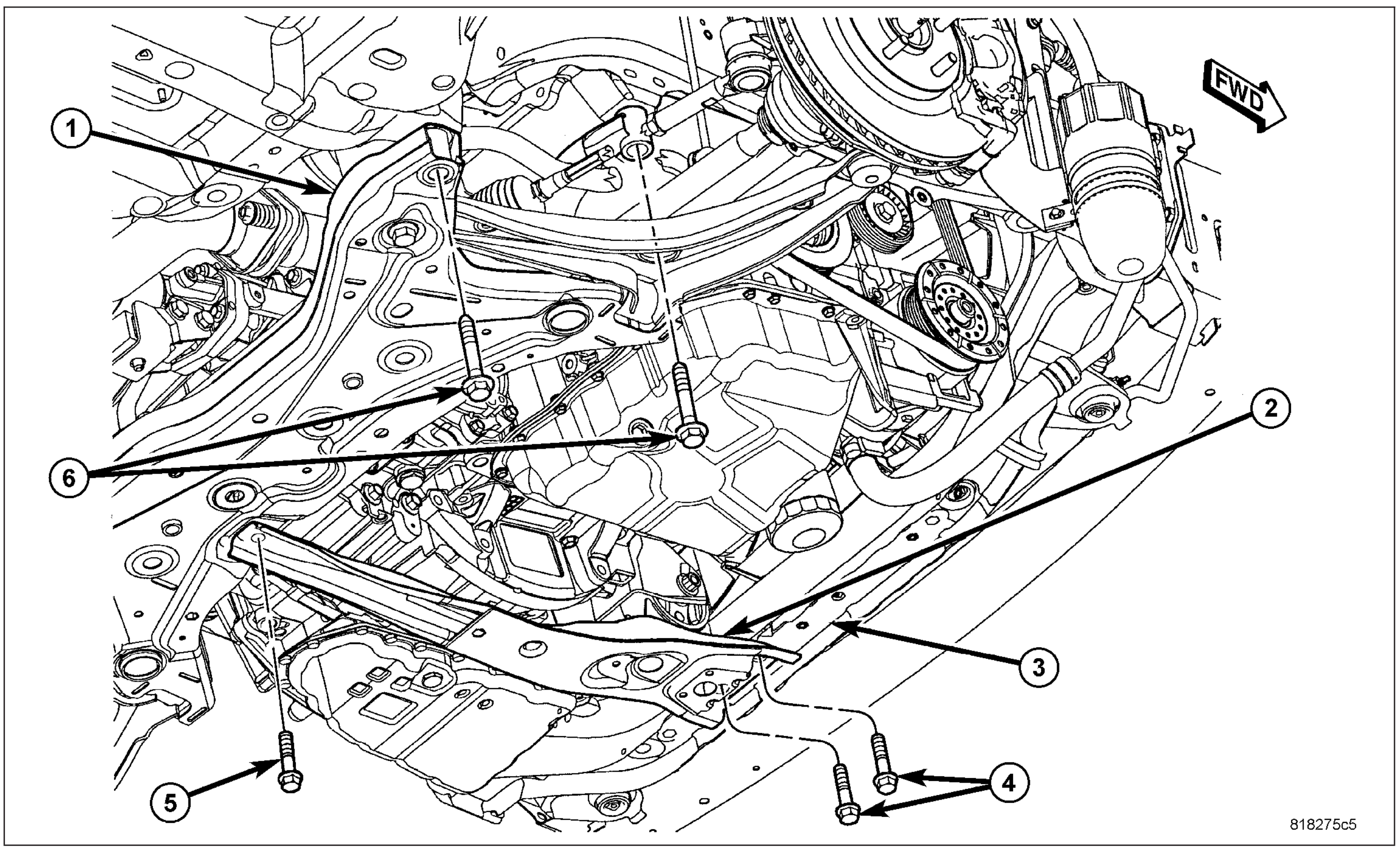


6. At each end of the stabilizer bar, while holding the stabilizer bar link (1) lower stud stationary, remove the nut (3) securing the link to the stabilizer bar (2).



7. Remove the screws (1) securing the stabilizer bushing retainers (3) to the crossmember.
8. Remove the two stabilizer bushing retainers.
9. Utilizing the slit cut into the cushions (bushings), remove the two cushions from the stabilizer bar.

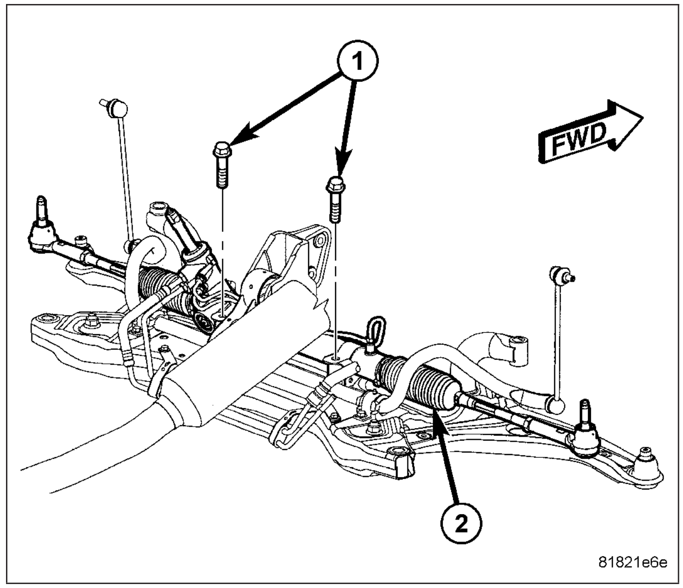




NOTE: Before removing the front suspension crossmember from the vehicle, the location of the crossmember must be marked on the body of the vehicle. Do this so the crossmember can be relocated, upon reinstallation, against the body of vehicle in the same location as before removal. If the front suspension crossmember is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) may be lost.

10. Mark the location of the front crossmember on the body near each mounting bolt.
11. Support the crossmember with a transmission jack.
12. Remove the four mounting bolts (6) securing the front crossmember (1) to the body.

13. Remove the two bolts (1) securing the steering gear (2) to the crossmember.
14. Support the steering gear using a bungee cord or other to keep the steering gear from lowering when the crossmember is lowered.
15. Slowly lower the crossmember until there is enough space present to remove the stabilizer bar between the rear of the crossmember and the body. Due to the fact that the fore-and-aft crossmember is still attached, do not lower crossmember any more than necessary to remove the stabilizer bar.
16. Remove the stabilizer bar out over rear of crossmember.

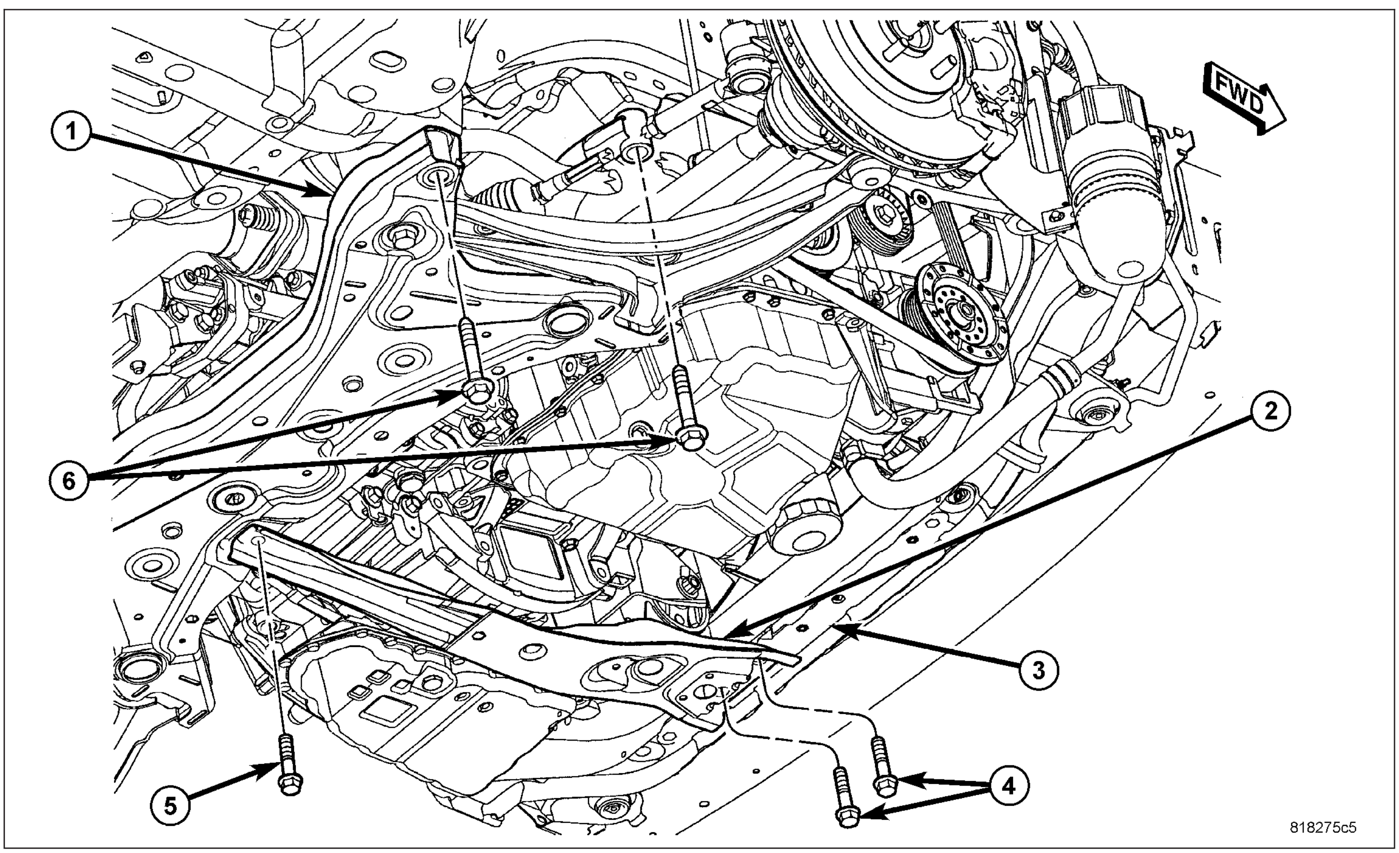


INSTALLATION

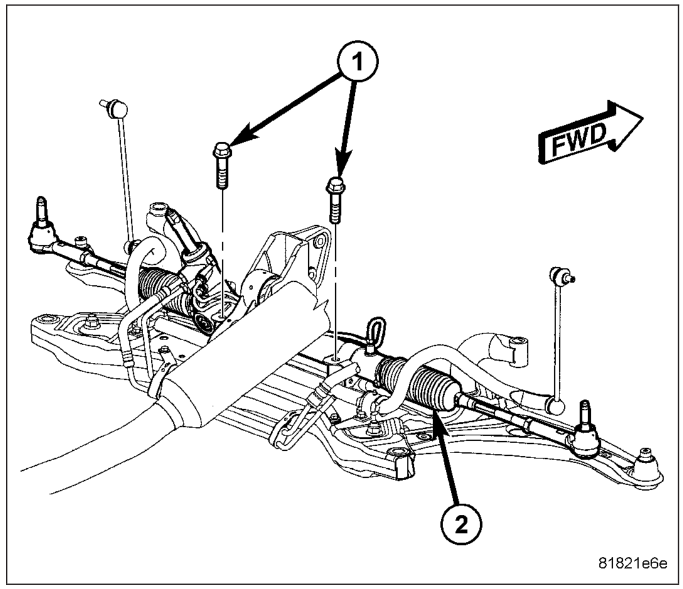
NOTE: Before stabilizer bar installation, inspect the cushions and links for excessive wear, cracks, damage and distortion. Replace any pieces failing inspection.

NOTE: Before installing the stabilizer bar, make sure the bar is not upsidedown. The stabilizer bar (1) must be installed so that when in mounted position, the ends of the bar curve over the top of the steering gear before attaching to the links.

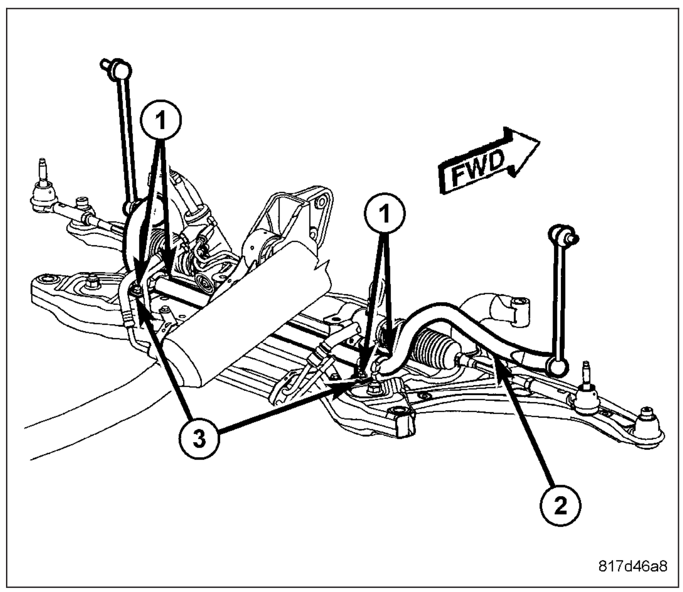
1. Install the stabilizer bar, link ends first, from the rear over top of the crossmember. Curve the ends of the bar over the steering gear.



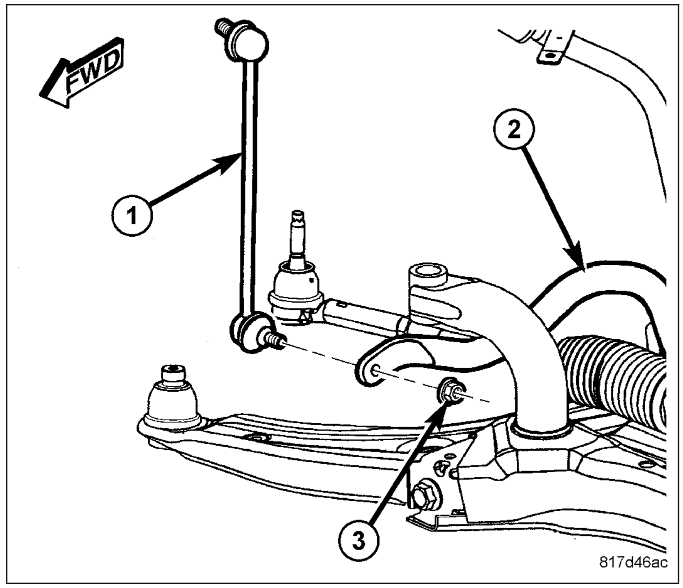
2. Slowly raise the crossmember (1) into mounted position using the transmission jack matching the crossmember to the marked locations on the body made during removal.
3. Install the four mounting bolts (6) securing the front crossmember (1) to the body. Tighten the crossmember mounting bolts to 190 N·m (140 ft. lbs.).
4. Remove the transmission jack.
5. Remove the bungee cord or other supporting the steering gear (2).
6. Install the two bolts (1) securing the steering gear (2) to the crossmember. Tighten the steering gear mounting bolts to 70 N·m (52 ft. lbs.).



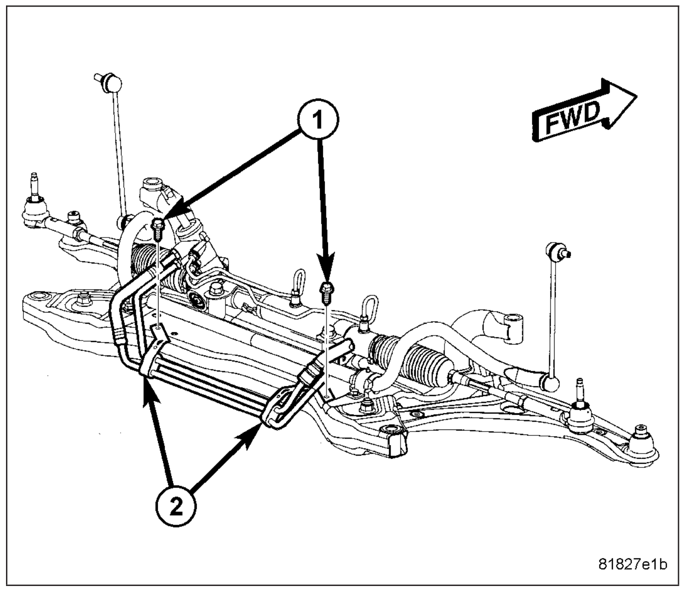
7. Install the two cushions (bushings) on the stabilizer bar utilizing the slit cut into the cushion sides.
8. Install the two stabilizer bushing retainers (3) over the cushions.
9. Install the screws (1) securing the stabilizer bushing retainers (3) to the crossmember. Tighten all four stabilizer bar cushion retainer screws to 30 N·m (22 ft. lbs.).



10. Attach the stabilizer bar link (1) at each end of the stabilizer bar (2). At each link, install and tighten the nut (3) while holding the stabilizer bar link lower stud stationary. Tighten the nuts to 58 N·m (43 ft. lbs.).



11. Position the power steering hose routing clamps (2) on the crossmember. Install the screws and tighten each to 8 N·m (71 in. lbs.).
12. Install the rear engine mount. (Refer to 9 - ENGINE/ENGINE MOUNTING/REAR MOUNT - REMOVAL)
13. If equipped, install the engine belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)
14. Lower the vehicle.



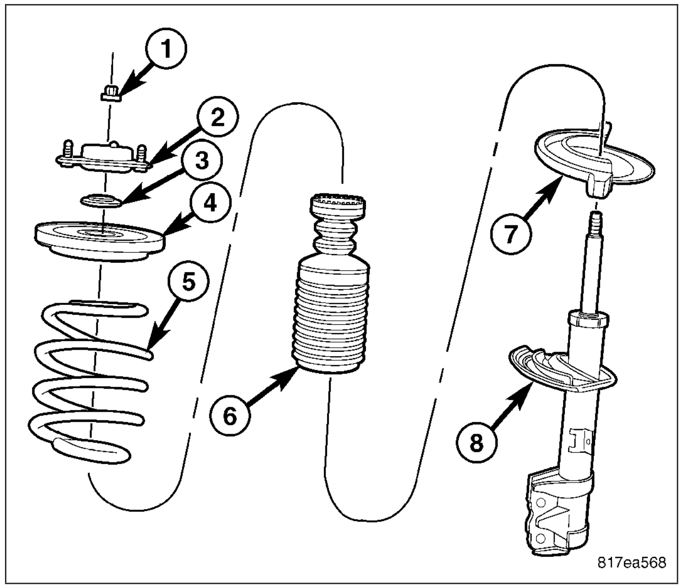
STRUT ASSEMBLY

DESCRIPTION

A Macpherson type design strut assembly is used in place of the front suspension upper control arm and upper ball joint. The bottom of the strut mounts directly to the steering knuckle using two attaching bolts and nuts going through the strut clevis bracket and knuckle. The top of the strut mounts directly to the strut tower of the vehicle using the three threaded studs on the strut assemblies upper mount.

The strut assembly includes the following components:

- Upper mount (rubber isolated) (2)
- Bearing (3)
- Upper spring seat and isolator (4)
- Coil spring (5)
- Dust shield and jounce bumper (6)
- Lower spring isolator (7)
- Strut (damper) (8)



Each component is serviced by removing the strut assembly from the vehicle and disassembling it.

Coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. If a coil spring requires replacement, be sure that it is replaced with a spring meeting the correct load rating for the vehicle and its specific options.

OPERATION

The strut assembly cushions the ride of the vehicle, controlling vibration, jounce and rebound of the suspension.

The coil spring controls ride quality and maintains proper ride height.

The spring isolators isolate the coil spring at the top and bottom from coming into metal-to-metal contact with the upper mounting seat and the strut.

The jounce bumper limits suspension travel and metal-to-metal contact under full jounce condition.

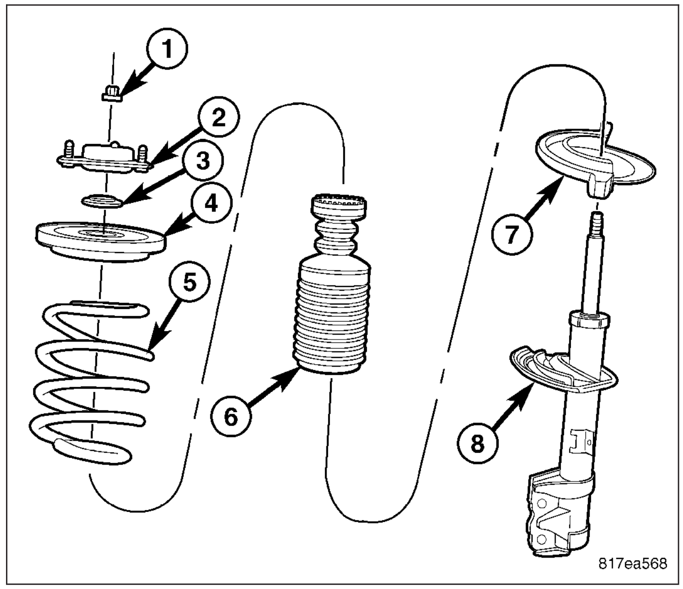
The strut dampens jounce and rebound motions of the coil spring and suspension.

DIAGNOSIS AND TESTING

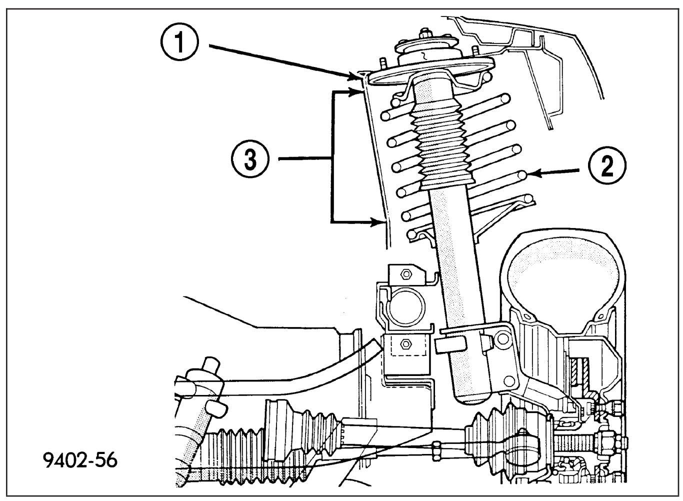
STRUT ASSEMBLY

Inspect the strut assembly for the following conditions:

- Inspect for a damaged or broken coil spring (5).
- Inspect for a torn or damaged dust shield (6).
- Lift the dust shield and inspect the strut assembly for evidence of fluid running from the upper end of the strut fluid reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off lower end of unit). A slight amount of seepage between the strut shaft and strut shaft seal is not unusual and does not affect performance of the strut assembly.
- Inspect the jounce bumper for signs of damage or deterioration.
- Inspect the clearance between the shock tower and the coil spring. Make sure no fasteners are protruding through the shock tower possibly contacting the coil spring and strut. Because of the minimum clearance in this area, installation of metal fasteners could damage the coil spring coating and lead to a corrosion failure of the spring.



CAUTION: At no time when servicing a vehicle can a sheet metal screw, bolt or other metal fastener be installed into the strut tower (1) to take the place of an original plastic clip. Also, do not drill holes into the front strut tower for the installation of any metal fasteners into the shock tower area indicated (3).

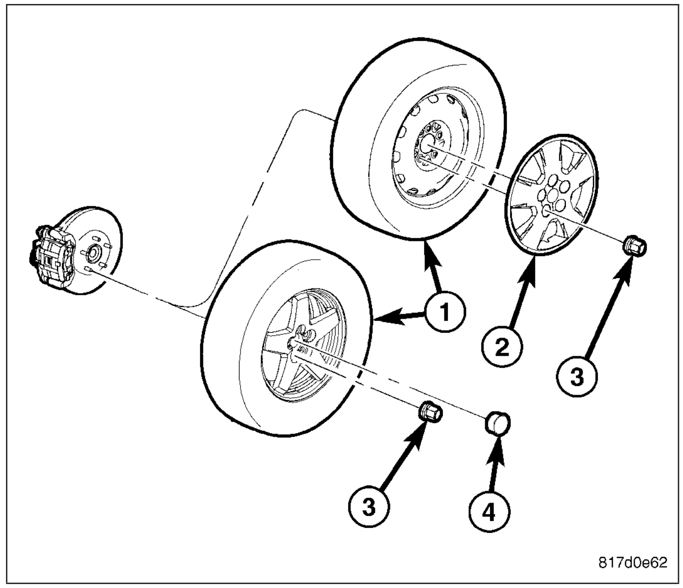


REMOVAL

NOTE: Before proceeding, (Refer to 2 - SUSPENSION/FRONT - WARNING).

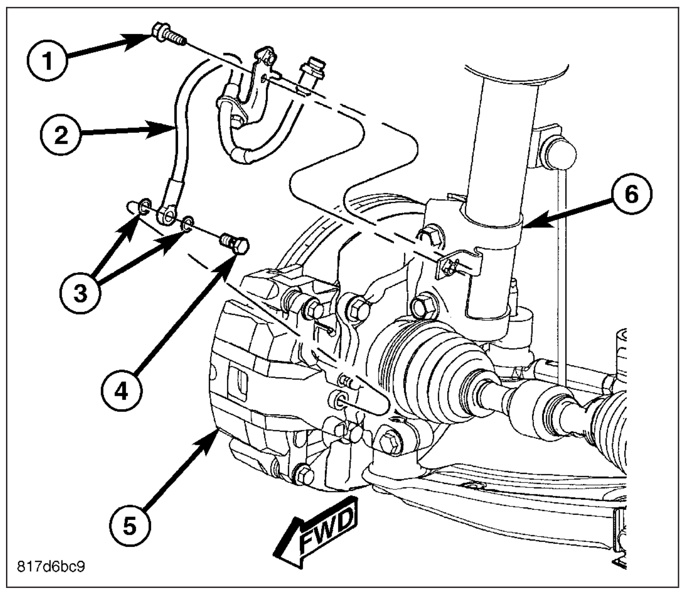
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



NOTE: If both strut assemblies are to be removed, mark the strut assemblies right or left and keep the parts separated to avoid mix-up. Not all parts of the strut assembly are interchangeable side-to-side.

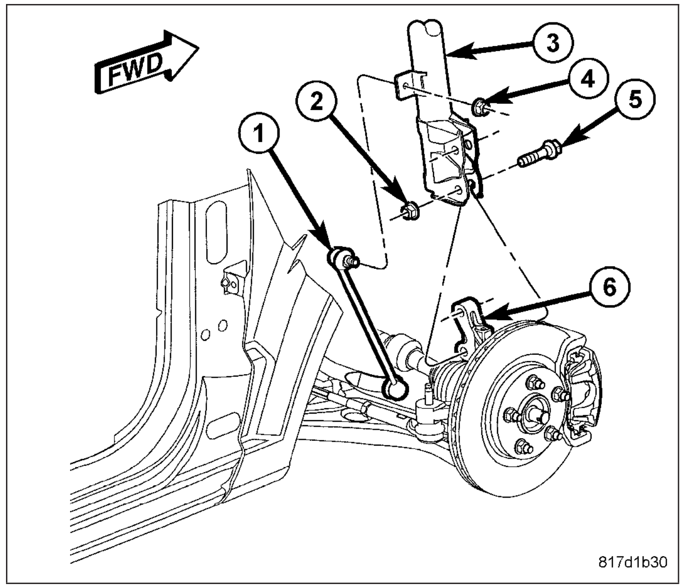
3. Remove the screw (1) securing the flex hose (2) routing bracket to the strut (6).



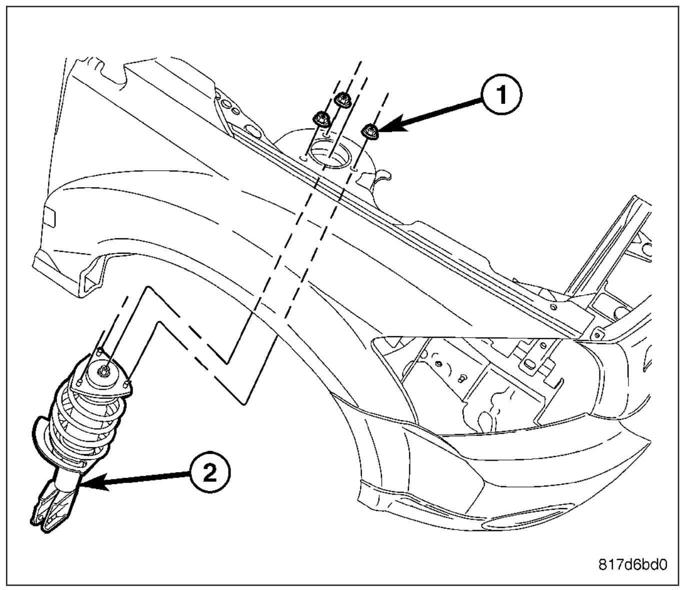
4. While holding the stabilizer bar link (1) stud stationary, remove the nut (4) securing the link to the strut (3).

CAUTION: The strut assembly-to-knuckle attaching bolts (5) are serrated and must not be turned during removal. Hold the bolts stationary in the knuckle while removing the nuts, then tap the bolts out using a pin punch.

5. While holding the bolt heads stationary, remove the two nuts (2) from the bolts (5) attaching the strut (3) to the knuckle (6).
6. Remove the two bolts (5) attaching the strut (3) to the knuckle (6) using a pin punch.



7. Lower the vehicle just enough to open the hood without allowing the tires to touch the floor.
8. Remove the three nuts (1) attaching the strut assembly (2) upper mount to the strut tower.
9. Remove the strut assembly (2) from the vehicle.
10. For disassembly, (Refer to 2 - SUSPENSION/FRONT/STRUT - DISASSEMBLY).



DISASSEMBLY

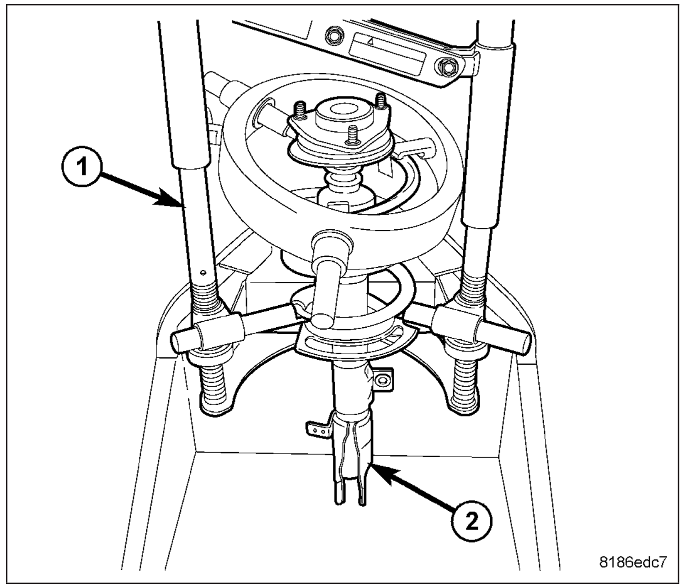
NOTE: The strut assembly must be removed from the vehicle for it to be disassembled and assembled. (Refer to 2 - SUSPENSION/FRONT/STRUT - REMOVAL)

For the disassembly and assembly of the strut assembly, use strut spring compressor, Pentastar Service Equipment (PSE) tool W-7200, or equivalent, to compress the coil spring. Follow the manufacturer’s instructions closely.

WARNING: Do not remove the strut rod nut before the coil spring is properly compressed. The coil spring is held under pressure. The coil spring must be compressed, removing spring tension from the upper mount and bearing, before the strut rod nut is removed.

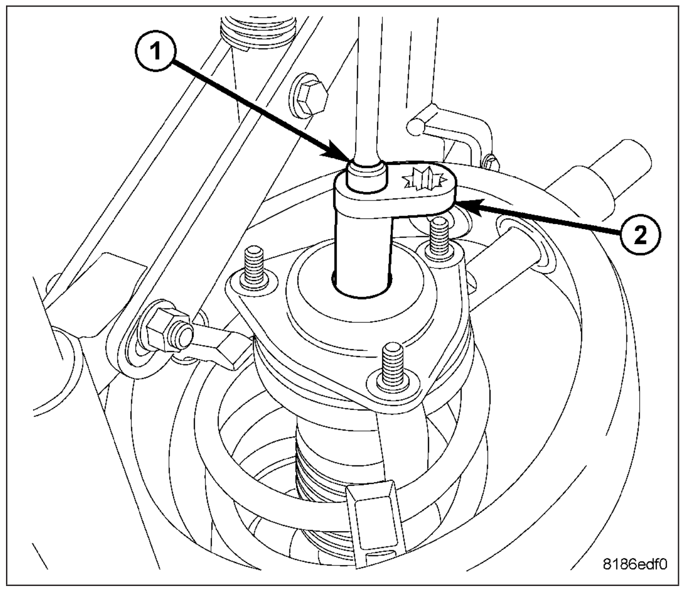
1. If both struts are being serviced at the same time, mark both the coil spring and strut assembly according to which side of the vehicle the strut is being removed from.

2. Position the strut assembly (2) in the strut coil spring compressor (1) following the manufacturers instructions and set the lower and upper hooks of the compressor on the coil spring. Position the strut clevis bracket (4) straight outward, away from the compressor.
3. Compress the coil spring until all coil spring tension is removed from the upper mount and bearing.

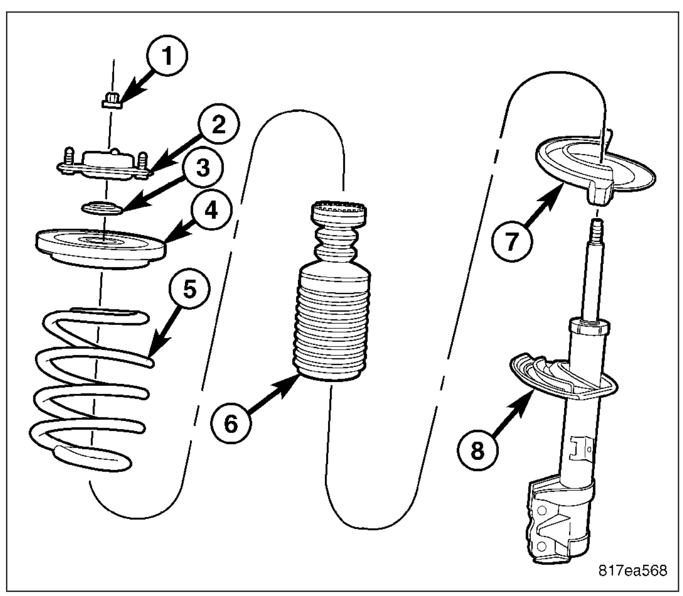


CAUTION: Never use impact or high speed tools to remove the strut rod nut. Damage to the strut internal bearings can occur.

4. Once the spring is sufficiently compressed, install Strut Nut Wrench (2), Special Tool 9362, on the strut rod nut. Next, install Strut Shaft Socket (1), Special Tool 9894, on the end of the strut rod. While holding the strut rod from turning, remove the nut using the strut nut wrench.

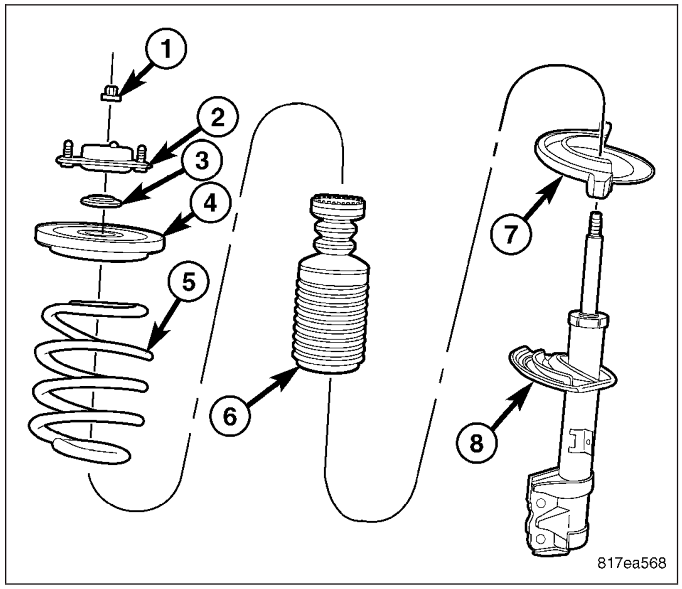


5. Remove the clamp (if installed) from the bottom of the coil spring and remove the strut (damper) (8) out through the bottom of the coil spring. the dust shield and jounce bumper will come out with the strut.
6. Remove the lower isolator (7) from the strut seat.
7. Slide the dust shield and jounce bumper (6) from the strut rod.
8. Remove the upper mount (2) and bearing (3) from the top of the upper spring seat and isolator (4).
9. Remove the upper spring seat and isolator (4) from the top of the coil spring (5).
10. Remove the lower spring isolator (2) from the lower spring seat on the strut (1).



NOTE: If the coil spring needs to be serviced, proceed with the next step, otherwise, proceed with step Step 12.

11. Release the tension from the coil spring by backing off the compressor drive completely. Push back the compressor hooks and remove the coil spring.
12. Inspect the strut assembly components for the following and replace as necessary:
    - Inspect the strut (damper) (8) for shaft binding over the full stroke of the shaft.
    - Inspect the jounce bumper (with dust shield) (6) for cracks and signs of deterioration.
    - Check the upper mount (2) for cracks and distortion and its retaining studs for any sign of damage.
    - Check the bearing (3) for any binding.
    - Check the upper spring seat and isolator (4) for cracks and distortion.
    - Inspect the upper and lower spring isolators (7) for material deterioration and distortion.
    - Inspect the coil spring (5) for any sign of damage to the coating.

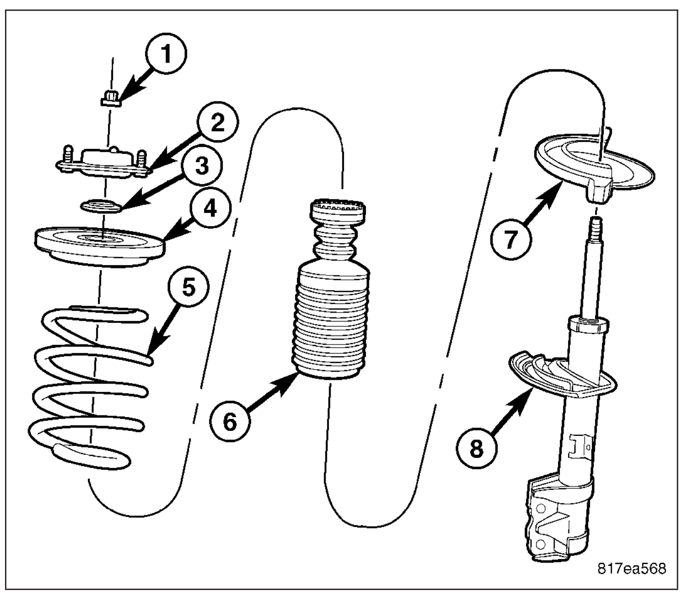


NOTE: For reassembly, (Refer to 2 - SUSPENSION/FRONT/STRUT - ASSEMBLY).

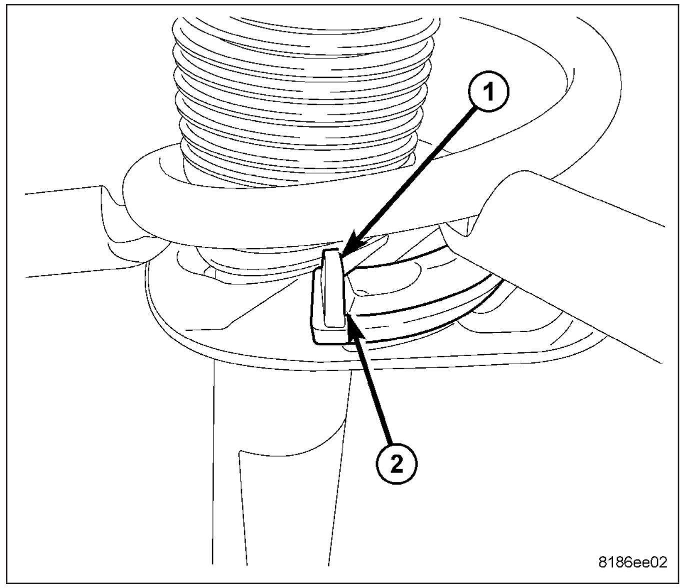
ASSEMBLY

NOTE: If the coil spring has been removed from the spring compressor, proceed with the next step, otherwise, proceed with step Step 3.

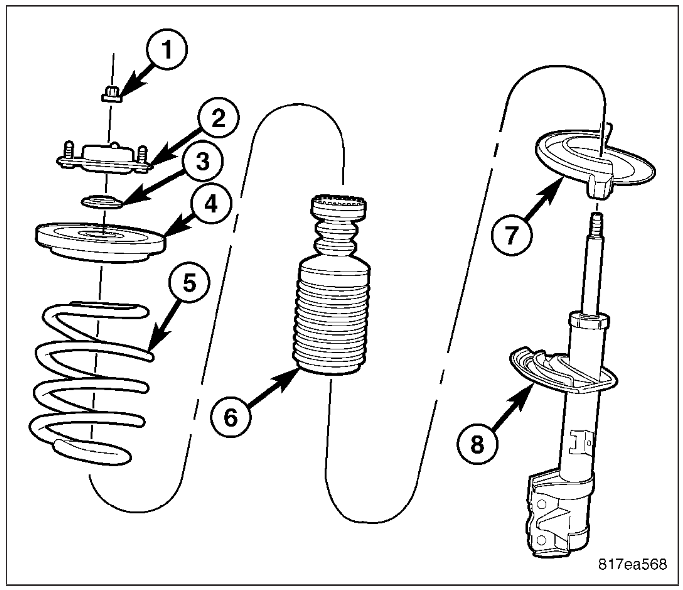
1. Place the coil spring in the spring compressor following the manufacturers instructions. Before compressing the spring, rotate the spring so the end of the bottom coil is at approximately the 9 o'clock position as viewed above (or to where the spring was when removed from the compressor). This action will allow the strut (damper) clevis bracket to be positioned outward, away from the compressor once installed.
2. Slowly compress the coil spring until enough room is available for strut assembly reassembly.
3. Install the upper spring seat and isolator (4) on top of the coil spring (5).
4. Install the bearing (3) and upper mount (2) on top of the upper spring seat and isolator (4).
5. Install the lower spring isolator (7) on the spring seat on the strut (8).
6. Slide the dust shield and jounce bumper (6) onto the strut rod.



7. Install the strut (3) up through the bottom of the coil spring and upper spring seat, mount, and bearing until the lower spring seat contacts the lower end of the coil spring. Rotate the strut as necessary until the end of the bottom coil (2) comes in contact with the stop (1) built into the lower spring isolator

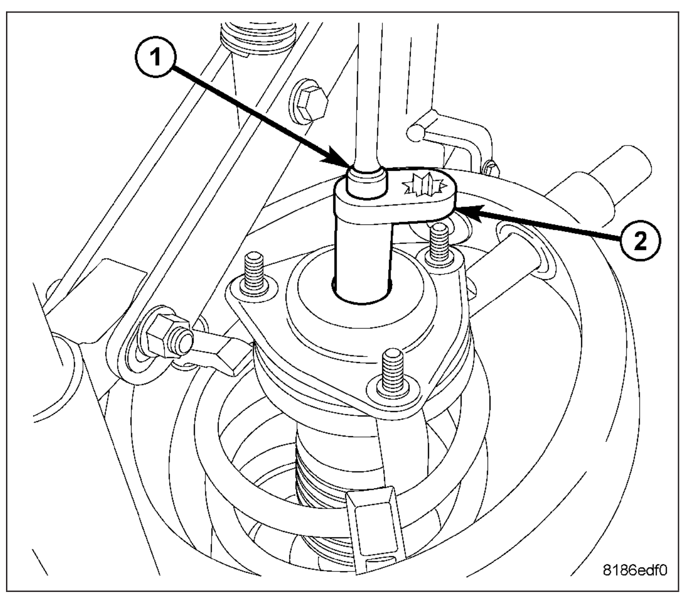


8. While holding the strut in position, install the nut (1) on the end of the strut rod.

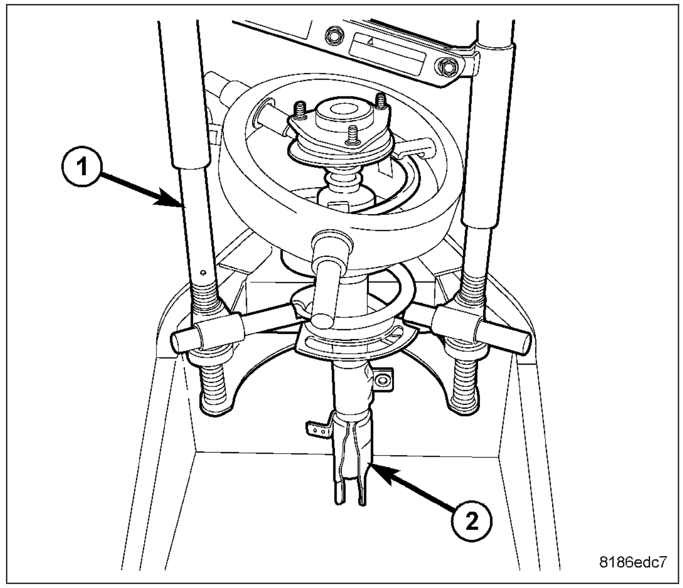


CAUTION: Never use impact or high speed tools to remove the strut rod nut. Damage to the strut internal bearings can occur.

9. Install Strut Nut Wrench (2), Special Tool 9362, on the strut rod nut. Next, install Strut Shaft Socket (1), Special Tool 9894, on the end of the strut rod. While holding the strut rod from turning, tighten the strut rod nut to 60 N·m (44 ft. lbs.) using a torque wrench on the end of Special Tool 9362.

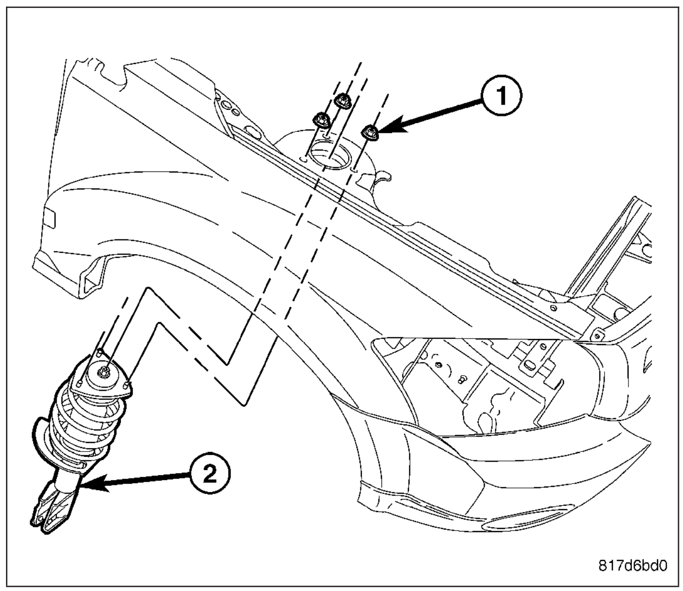


10. Slowly release the tension from the coil spring by backing off the compressor (1) drive completely. As the tension is relieved, make sure the upper mount and bearing align properly. Verify the upper mount does not bind when rotated.
11. Remove the strut assembly from the spring compressor.
12. Install the strut assembly on the vehicle. (Refer to 2 - SUSPENSION/FRONT/STRUT - INSTALLATION)



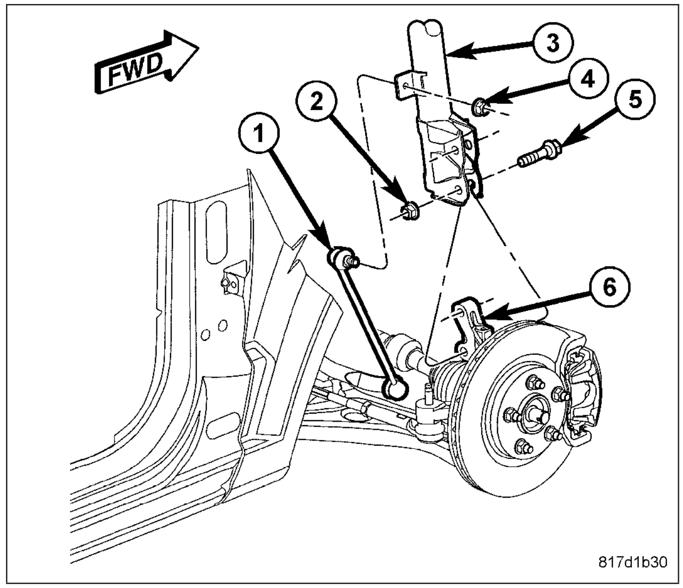
INSTALLATION

1. Raise the strut assembly (2) into the strut tower, aligning the three studs on the strut assembly upper mount with the holes in strut tower. Install the three mounting nuts (1) on the studs. Tighten the three nuts to 48 N·m (35 ft. lbs.).

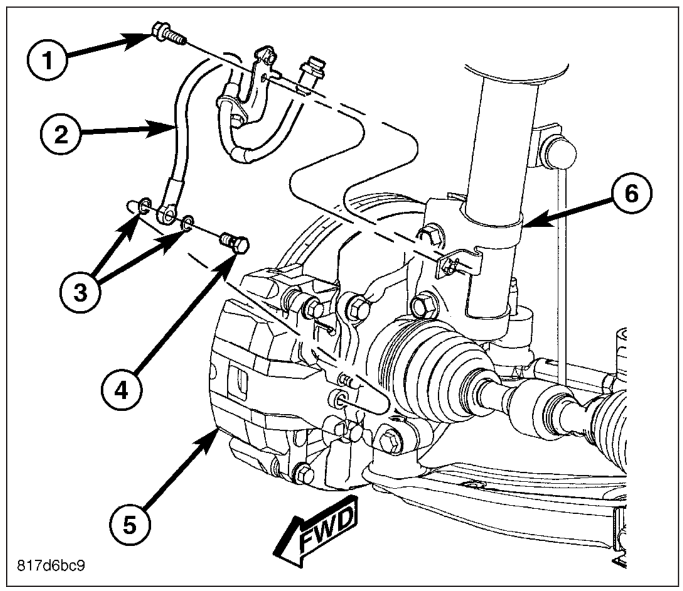


CAUTION: The strut assembly-to-knuckle attaching bolts (5) are serrated and must not be turned during installation. Install the nuts while holding the bolts stationary in the knuckle.

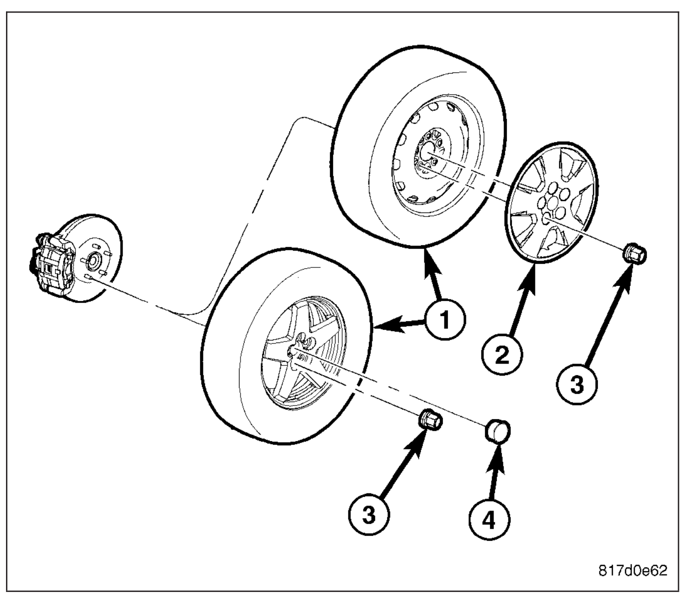
2. Position the lower end of the strut assembly (3) in line with the upper end of the knuckle (6), aligning the mounting holes. Install the two attaching bolts (5). Install the nuts (2). While holding the bolts in place, tighten the nuts to 84 N·m (62 ft. lbs.).
3. Attach the stabilizer bar link (1) to the strut (3). Install and tighten the nut (4) while holding the stabilizer bar link stud stationary. Tighten the nut to 58 N·m (43 ft. lbs.).



4. Secure the flex hose (2) routing bracket to the strut (6) with the mounting screw (1). Tighten the mounting screw to 13 N·m (120 in. lbs.).



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.



REAR SUSPENSION

TABLE OF CONTENTS

REAR SUSPENSION

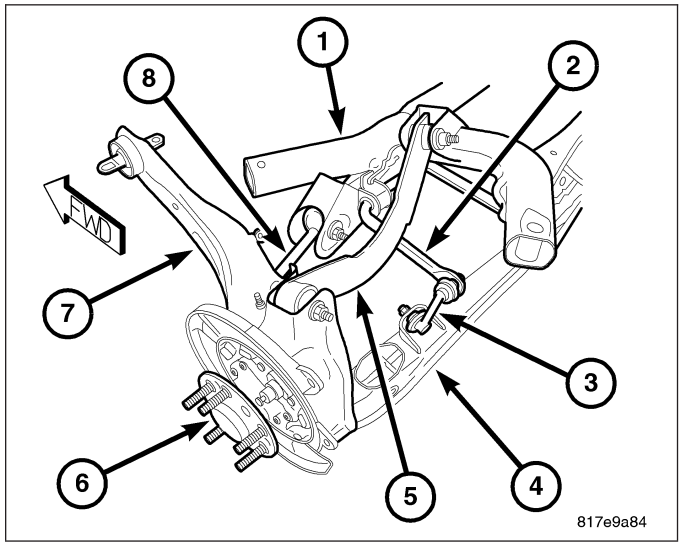
DESCRIPTION

This vehicle uses a multi-link rear suspension design.

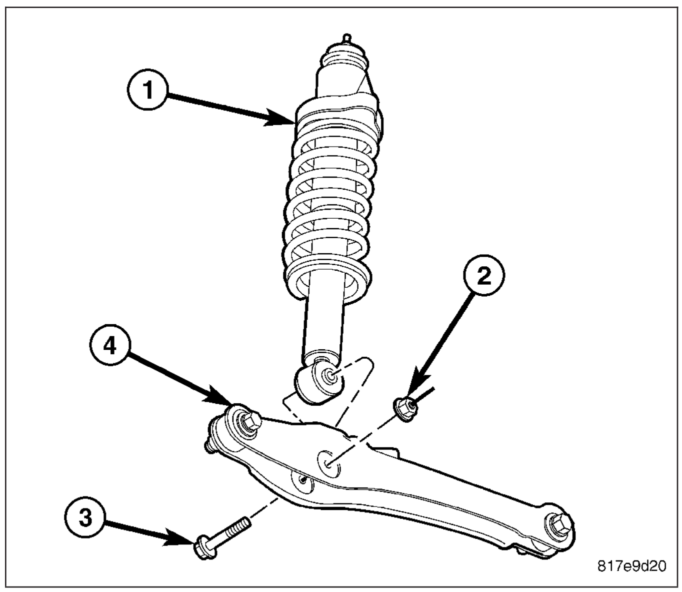
The rear suspension consists of these major components:

- (1) Rear Crossmember
- (2) Stabilizer Bar
- (3) Stabilizer Link
- (4) Lower Control Arm
- (5) Upper Control Arm
- (6) Hub And Bearing
- (7) Trailing Arm
- (8) Control Link

Information on the rear crossmember can be found in The Frame And Bumpers Group. Information on all other components can be found in this Group.



Also included in the rear suspension is a rear shock assembly (1). It fastens to the lower control arm (4) and body.



WARNING

WARNINGS AND CAUTIONS

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand, or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposition of dust or debris that may contain asbestos fibers.

CAUTION: Only frame contact or wheel lift hoisting equipment can be used on this vehicle. It cannot be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used, damage to rear suspension components will occur.

CAUTION: All-Wheel-Drive only - Wheel bearing damage will result if after loosening the hub nut, the vehicle is rolled on the ground or the weight of the vehicle is allowed to be supported by the tires for a length of time.

NOTE: If a rear suspension component becomes bent, damaged or fails, no attempt should be made to straighten or repair it. Always replace it with a new component.

SPECIFICATIONS

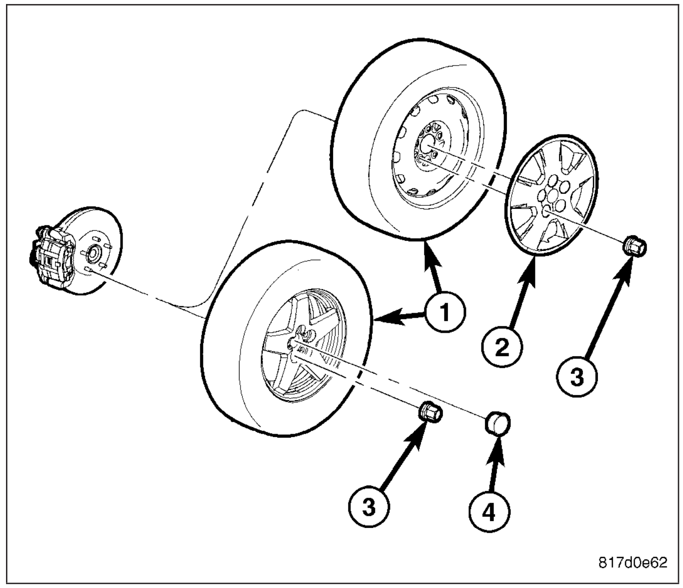
REAR SUSPENSION FASTENER TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Flex Hose Trailing Link Mounting Nut	15	11	—
Brake Flex Hose Trailing Link Mounting Screw	23	17	—
Crossmember Stay Brace Mounting screws	25	18	221
Hub And Bearing Mounting Bolts	105	77	—
Hub Nut	245	181	—
Lower Control Arm Trailing Link Bolt Nut	95	70	—
Lower Control Arm Crossmember Mounting Bolt Nut	95	70	—
Shock Assembly Lower Mounting Bolt Nut	99	73	—
Shock Assembly Upper Mounting Nuts	48	35	—
Shock Rod Nut	24	18	—
Stabilizer Bar Cushion Retainer Screws	34	25	—
Stabilizer Link Mounting Nuts	58	43	—
Toe Link Trailing Link Mounting Bolt	95	70	—
Toe Link Cam Bolt Nut	25	18	—
Trailing Link Body Mounting Bolts	60	44	—
Upper Control Arm Trailing Link Bolt Nut	95	70	—
Upper Control Arm Crossmember Mounting Bolt	95	70	—
Wheel Mounting (Lug) Nuts	135	100	—

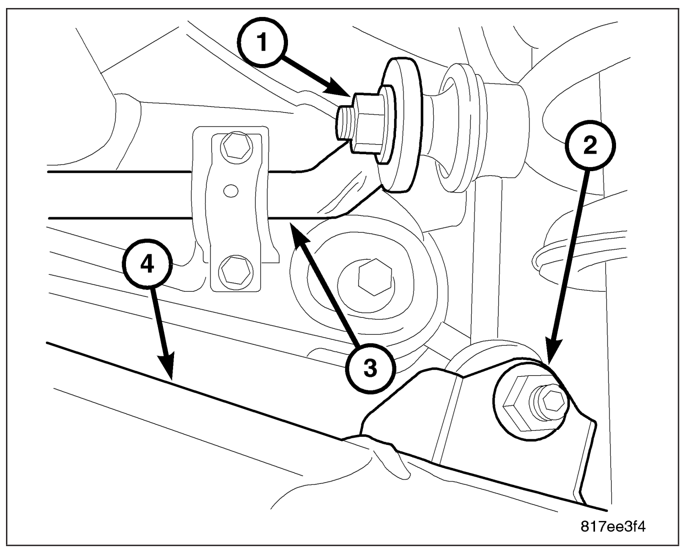
ARM-LOWER CONTROL

REMOVAL

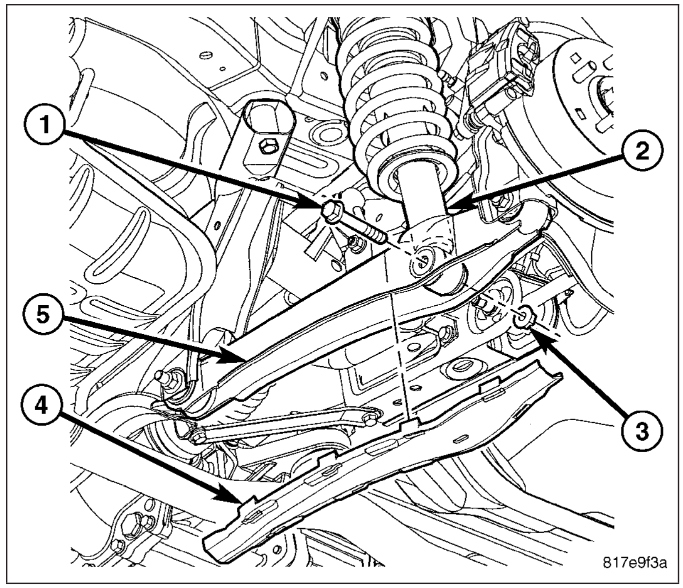
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



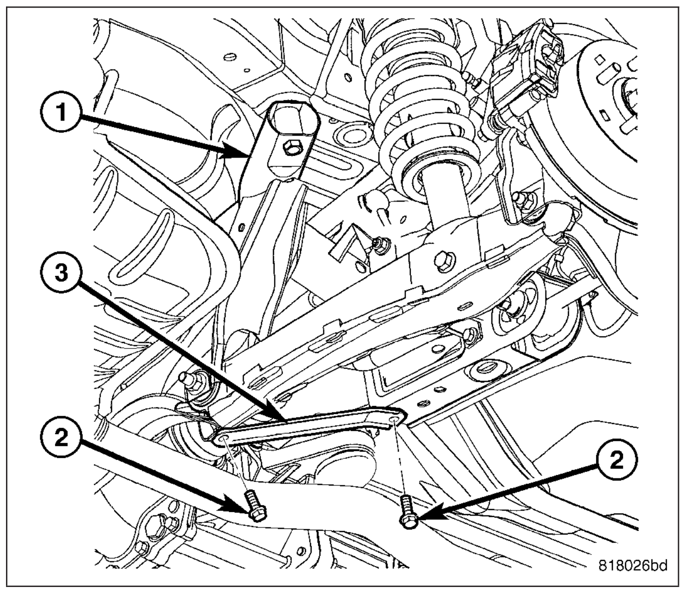
3. If equipped, while holding the stabilizer bar link lower stud stationary, remove the nut (2) securing the link to the lower control arm (4).



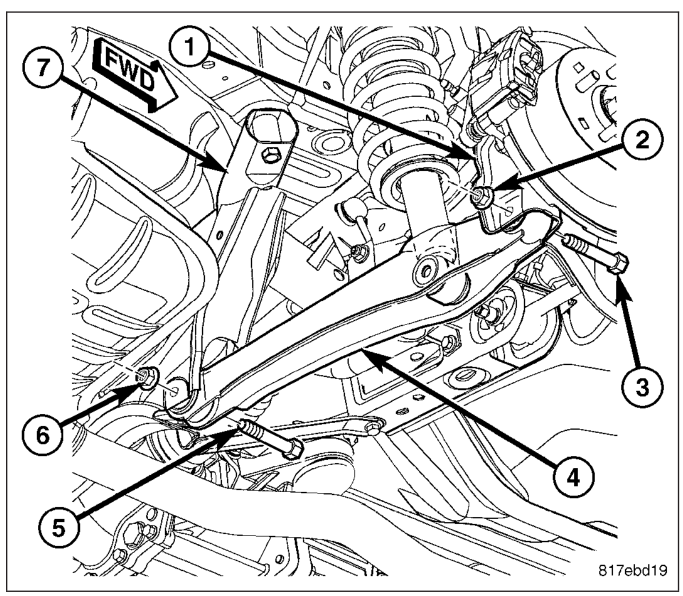
4. Remove the cover (4) on the bottom of the lower control arm (5).
5. Remove the lower shock (2) mounting nut (3) and bolt (1).



6. Remove the stay brace (3) mounting screws (2). Remove the stay brace.

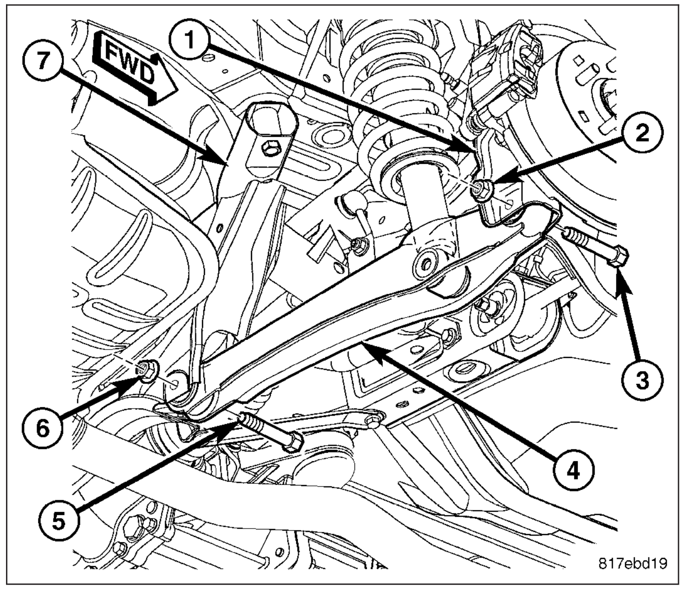


7. Remove the nut (2) and bolt (3) securing the lower control arm (4) to the trailing link (1).
8. Remove the nut (6) and bolt (5) securing the lower control arm (4) to the crossmember (7).
9. Remove the lower control arm (4).

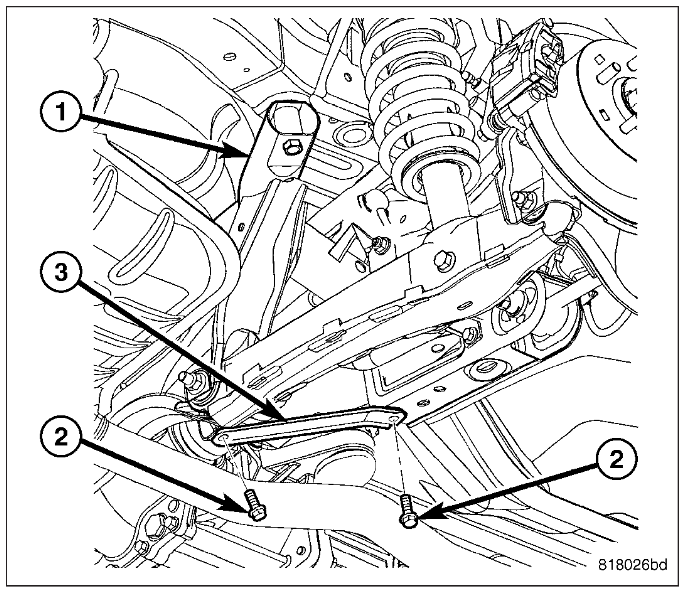


INSTALLATION

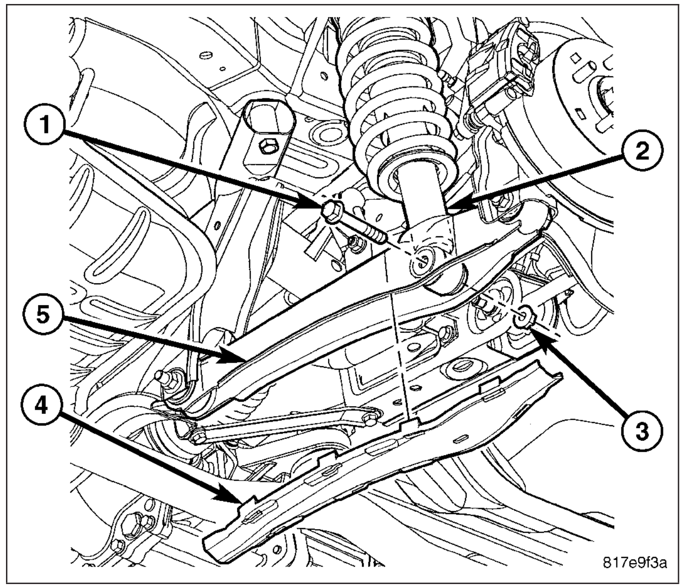
1. Position the lower control arm and install the bolt (5) and nut (6) securing the lower control arm (4) to the crossmember (7). Do not tighten at this time.
2. Install the bolt (3) and nut (2) securing the lower control arm (4) to the trailing link (1). Do not tighten at this time.



3. Install the stay brace (3) on the crossmember (1). Install and tighten the mounting screws (2) to 25 N·m (18 ft. lbs.).

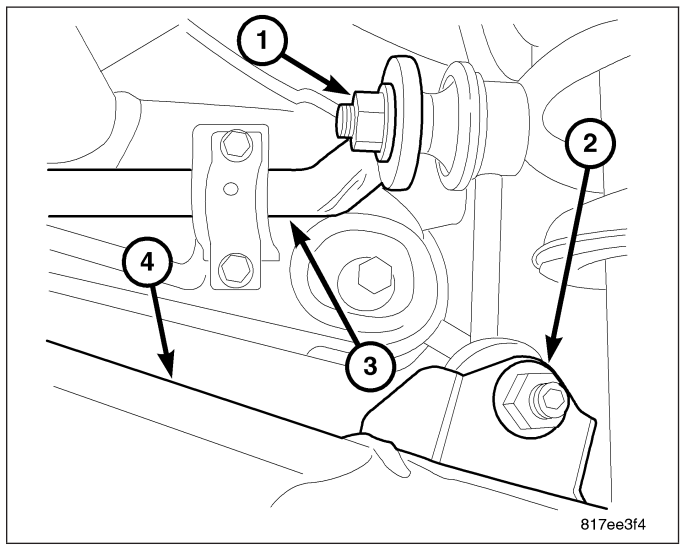


4. Install the mounting bolt (1) and nut (3) fastening the shock assembly (2) to the lower control arm (5). Do not tighten at this time.
5. Install the cover (4) on the bottom of the lower control arm (5).

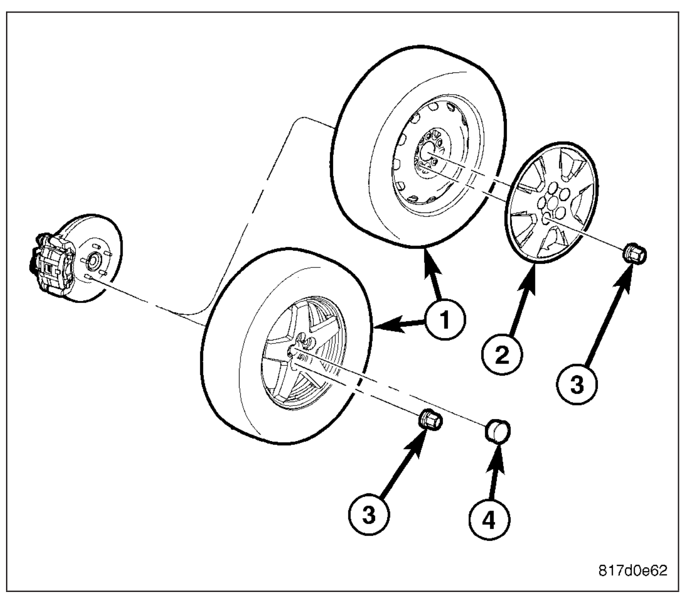


NOTE: When attaching a stabilizer bar link to the lower control arm it is important that the lower mounting stud be positioned properly. The lower mounting stud on the right side link needs to point toward the rear of the vehicle when inserted through the lower control arm mounting flange. The left side link lower stud needs to point toward the front of the vehicle. Otherwise the suspension geometry will not function properly.

6. If equipped, attach the stabilizer bar link to the lower control arm (4). Install the nut (2) and while holding the stabilizer bar link lower stud stationary, tighten the nut (2) to 58 N·m (43 ft. lbs.).



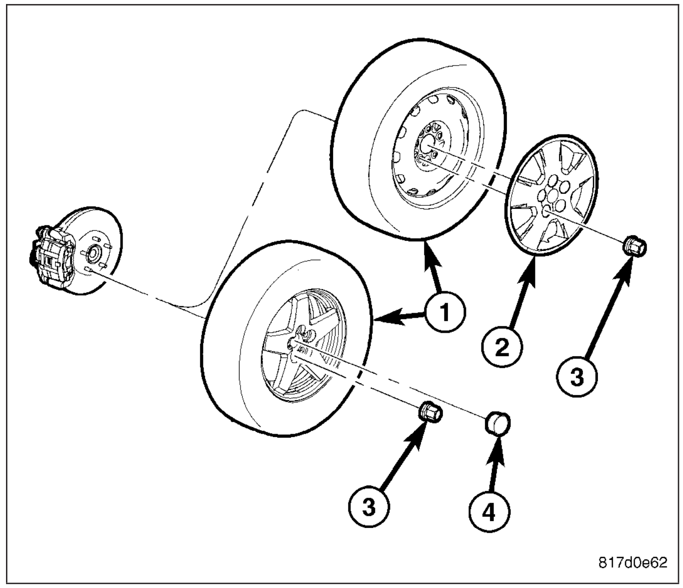
7. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
8. Lower the vehicle.
9. Position the vehicle on an alignment rack/drive-on lift. Raise the vehicle as necessary to access mounting bolts and nuts.
10. Tighten the lower control arm mounting bolt nut at the crossmember to 95 N·m (70 ft. lbs.).
11. Tighten the lower control arm mounting bolt nut at the trailing link to 95 N·m (70 ft. lbs.).
12. Tighten the shock assembly lower mounting bolt nut to 99 N·m (73 ft. lbs.).
13. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



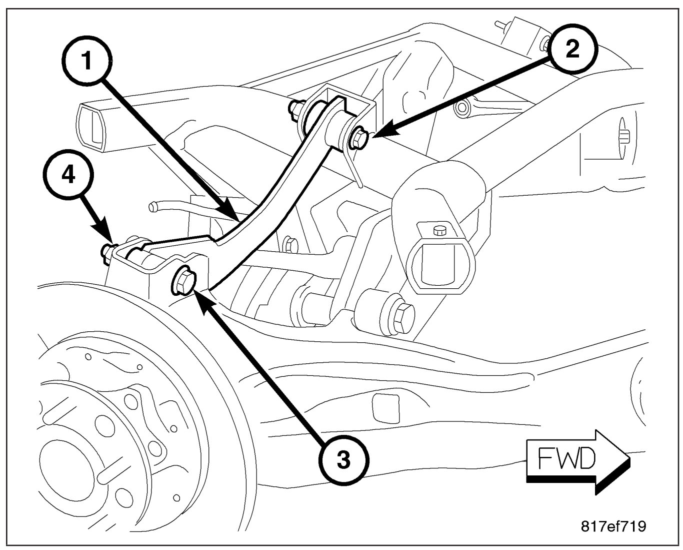
ARM-UPPER CONTROL

REMOVAL

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).

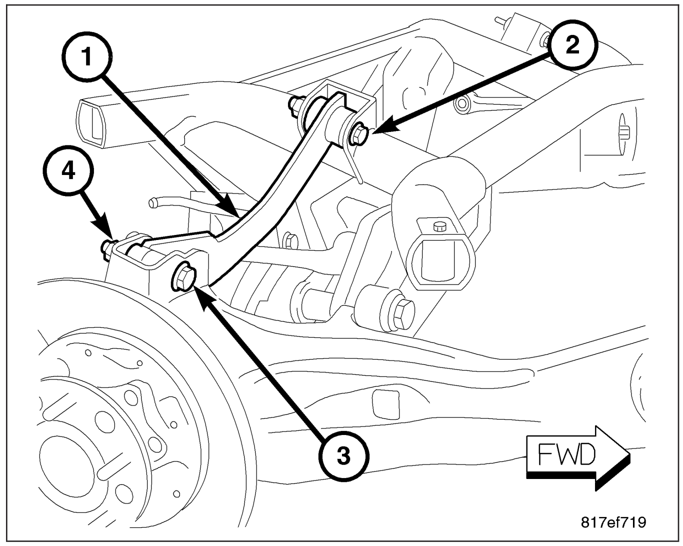


3. Remove the nut (4) and bolt (3) securing the upper control arm (1) to the trailing link.
4. Remove the bolt (2) securing the upper control arm (1) to the crossmember.
5. Remove the upper control arm (1).

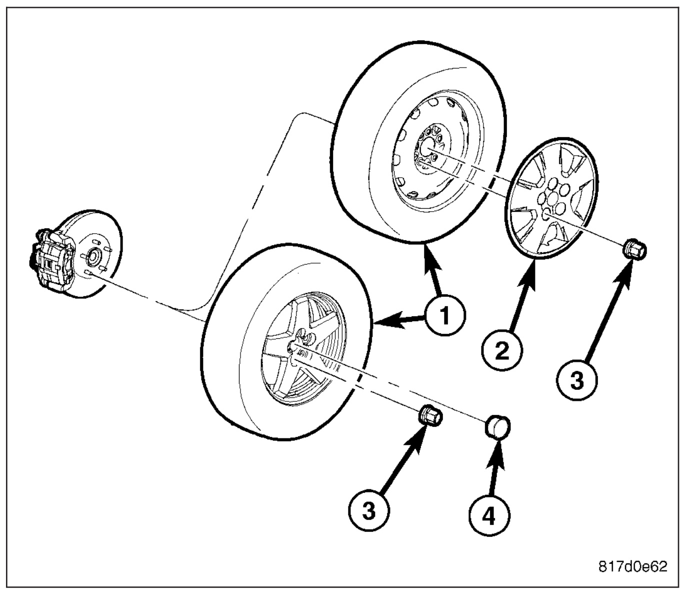


INSTALLATION

1. Position the upper control arm (1) and install the bolt (2) securing the arm to the crossmember. Do not tighten at this time.
2. Install the bolt (3) and nut (4) securing the upper control arm (1) to the trailing link. Do not tighten at this time.



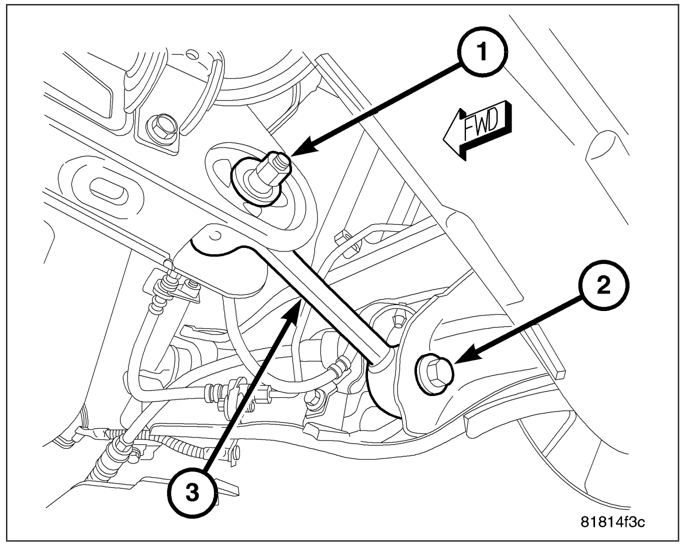
3. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
4. Lower the vehicle.
5. Position the vehicle on an alignment rack/drive-on lift. Raise the vehicle as necessary to access mounting bolts and nuts.
6. Tighten the upper control arm mounting bolt at the crossmember to 95 N·m (70 ft. lbs.).
7. Tighten the upper control arm mounting bolt nut at the trailing link to 95 N·m (70 ft. lbs.).
8. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



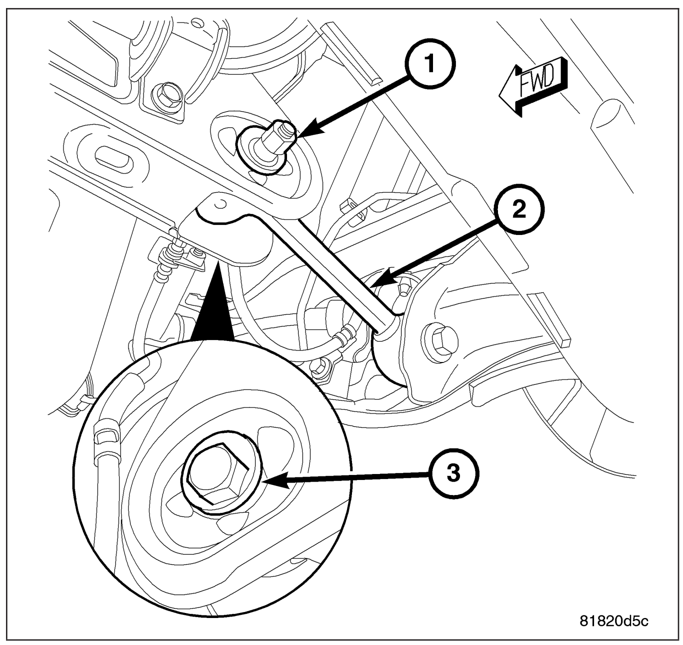
LINK-TOE

REMOVAL

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the bolt (2) securing the toe link (3) to the trailing link.

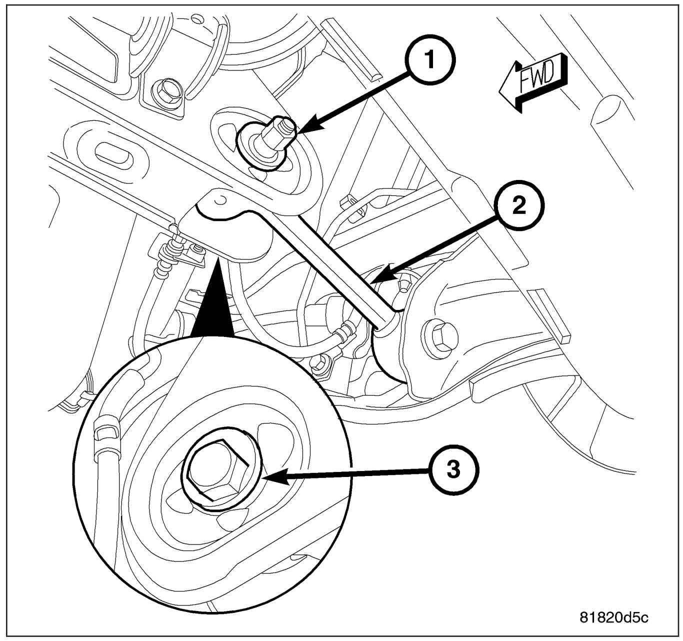


3. Mark the position of the cam bolt cam on the crossmember using a paint marker or crayon. Do not use any type marker that will scratch or damage the surface of the crossmember.
4. While holding the cam bolt head (3) stationary, loosen and remove the toe link mounting cam bolt nut (1) and washer. Remove the cam bolt.
5. Remove the toe link (2).

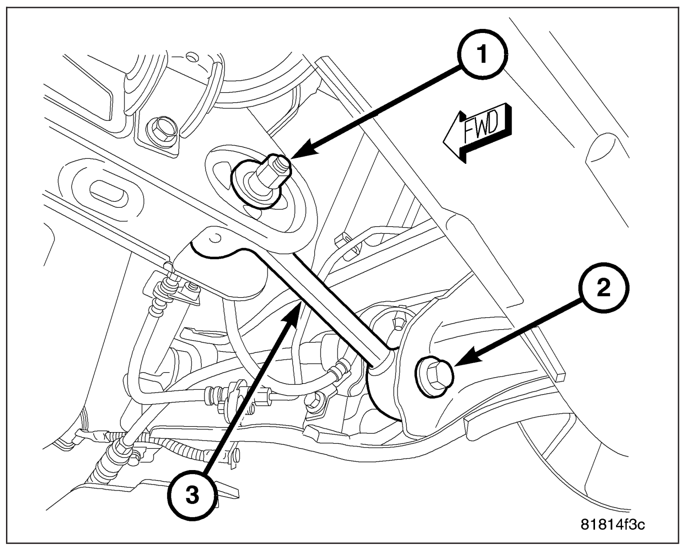


INSTALLATION

CAUTION: When installing the cam bolt (3) and washer make sure the cams stay inside the abutments built into the crossmember. Failure to do so can damage the abutments and make toe adjustment difficult.

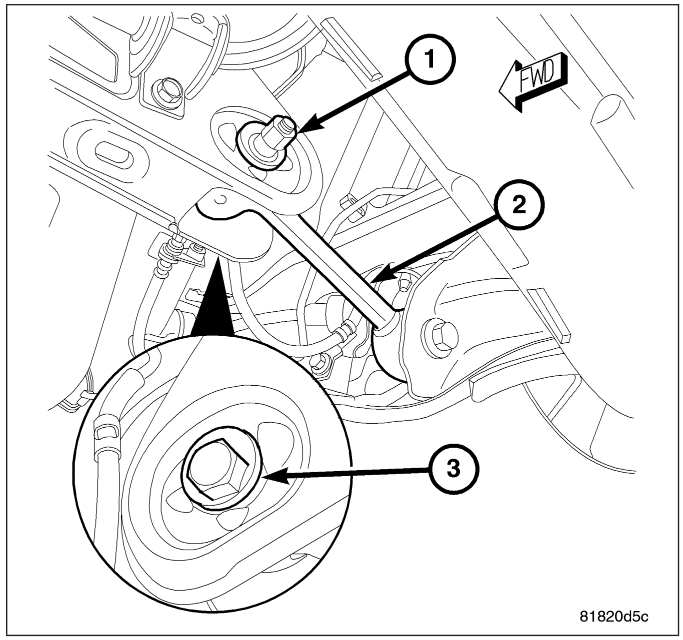


1. Position the toe link (2) and install the cam bolt (3) from the front through the crossmember and link. Match the cam on the bolt to the marks made during removal or position the top of the cam to the 12 O'clock position.
2. Install the cam washer and nut (1) securing the toe link (2) to the trailing link. Do not tighten at this time.



3. Install the bolt (2) securing the link to the crossmember. To install the bolt it may be necessary to flex the trailing link body mount bushing inward or outward using an appropriate prying tool. Do not tighten at this time.
4. Lower the vehicle.
5. Position the vehicle on an alignment rack/drive-on lift. Raise the vehicle as necessary to access mounting bolts and nuts.
6. Tighten the toe link mounting bolt at the trailing link to 95 N·m (70 ft. lbs.).
7. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

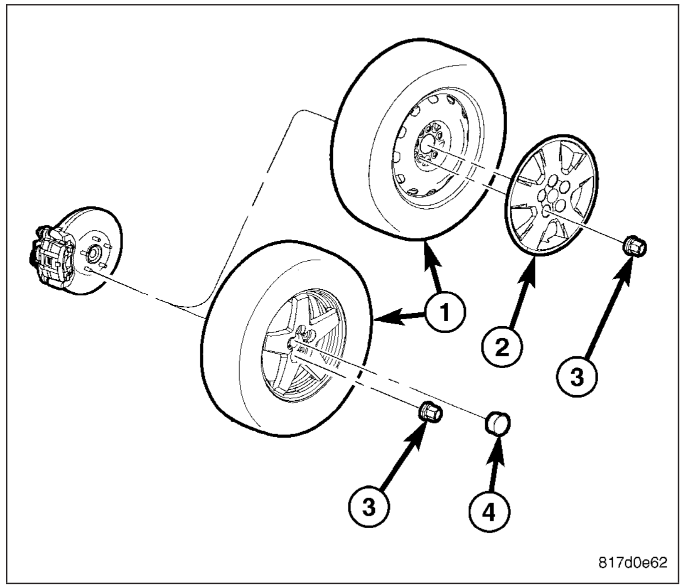
8. Once rear toe is set, while holding the cam bolt head (3) stationary, tighten the toe link mounting cam bolt nut (1) to 25 N·m (18 ft. lbs.).



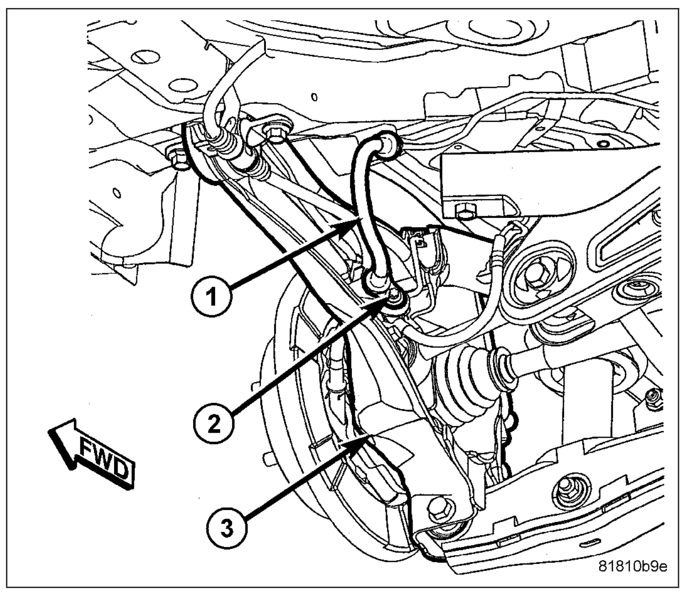
LINK-TRAILING

REMOVAL

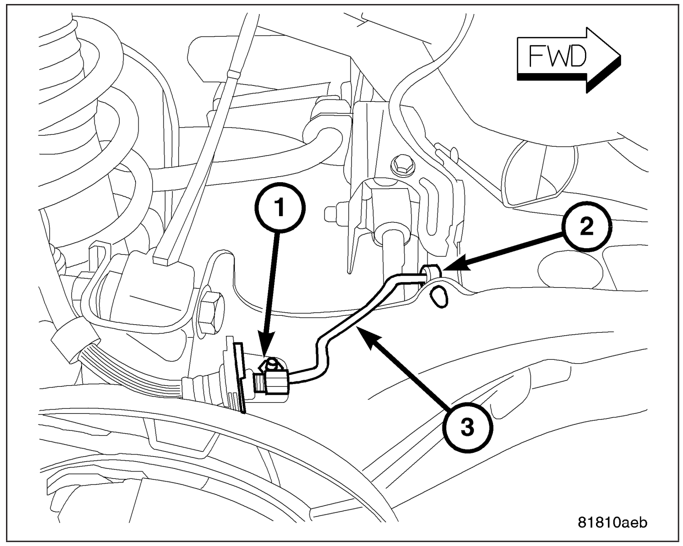
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



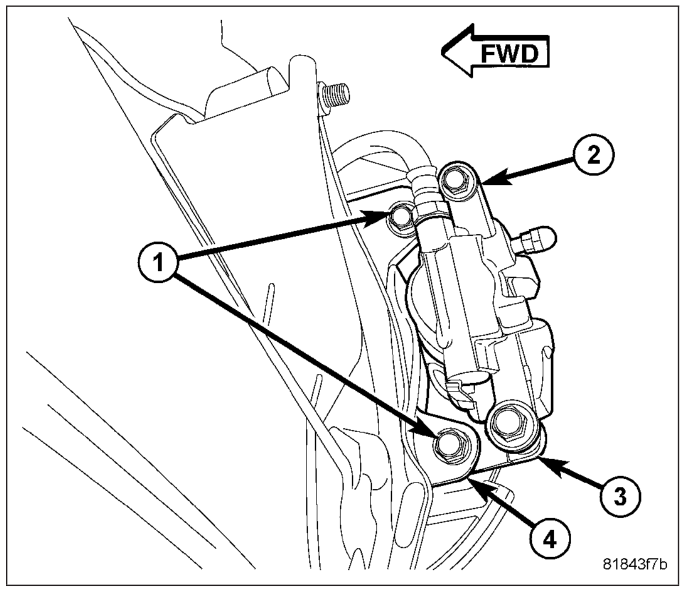
3. Remove the screw (2) securing the brake flex hose (1) to the trailing link (3).



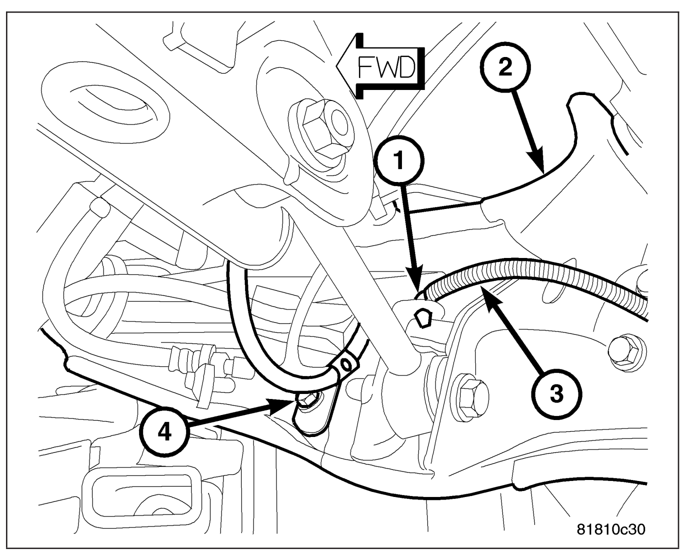
4. Remove the nut (1) securing the brake tube routing bracket to the trailing link.
5. Remove the brake tube (3) from the routing clip (2) on the trailing link.



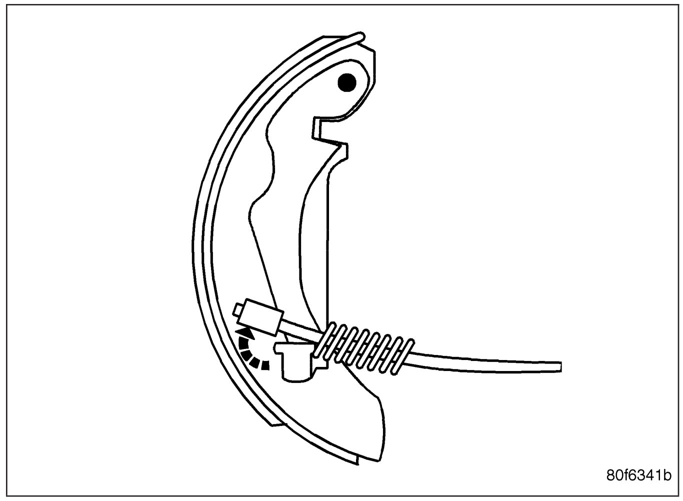
6. Remove the two bolts (1) securing disc brake caliper adapter (3) to the brake support plate (4).
7. Remove the disc brake caliper (2) and adapter (3) as an assembly. Hang the assembly out of the way using wire or a bungee cord. Use care not to overextend the brake hose and tubing when doing this.



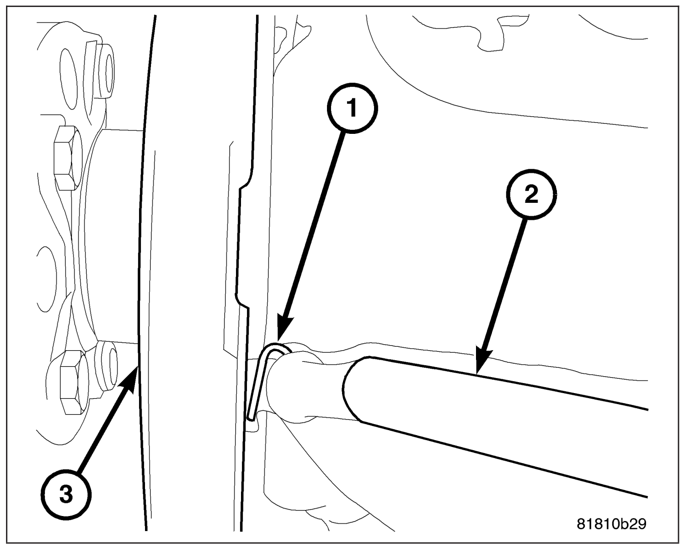
8. If equipped, remove the screw (4) fastening the wheel speed sensor (3) to the trailing link (2).
9. If equipped, remove the routing clip (1) fastening the wheel speed sensor (3) to the trailing link (2).
10. Remove the brake rotor, then hub and bearing. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)



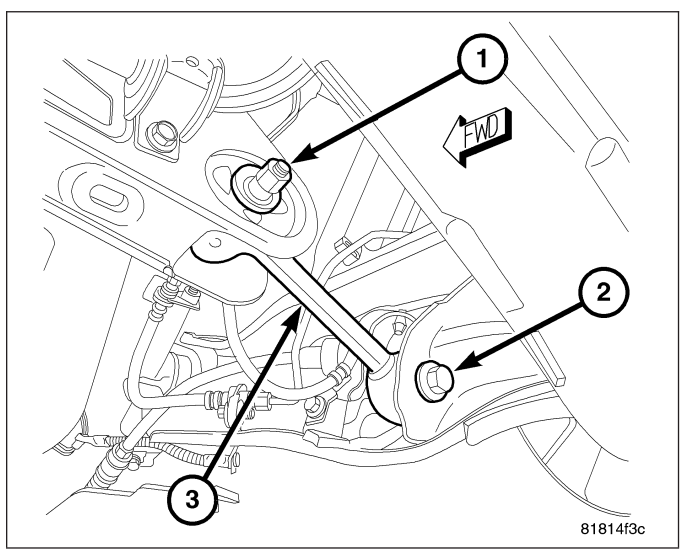
11. Remove the parking brake cable from the lever on the parking brake shoe.



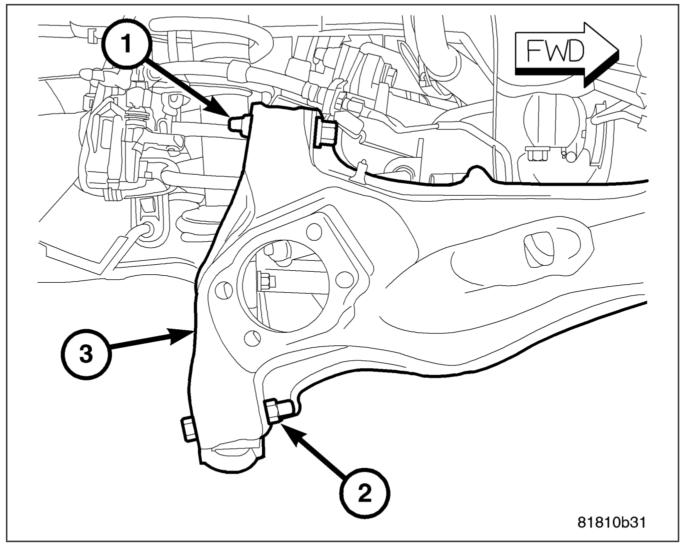
12. Remove the hair pin (1) securing the parking brake cable (2) to the brake support plate (3).
13. Slide the brake support plate (3) with parking brake shoes off the end of the parking brake cable (2) and remove.
14. Pull the parking brake cable from the trailing link.



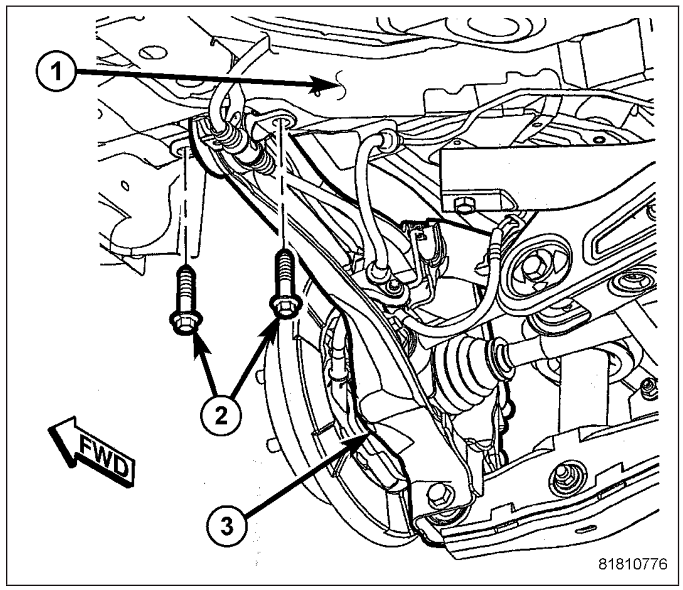
15. Remove the bolt (2) securing the toe link (3) to the trailing link.



16. Remove the nut (2) and bolt securing the lower control arm to the trailing link (3).
17. Remove the nut (1) and bolt securing the upper control arm to the trailing link (3).

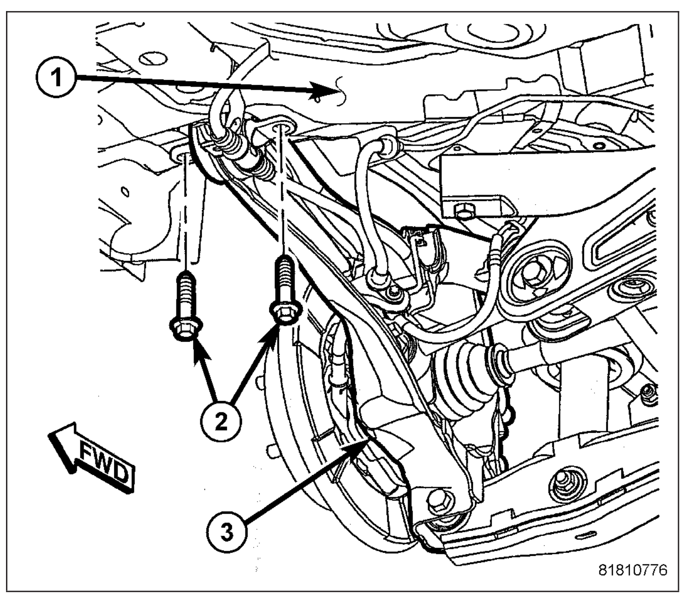


18. Remove the two bolts (2) fastening the leading end of the trailing link (3) to the body (1).
19. Remove the trailing link.

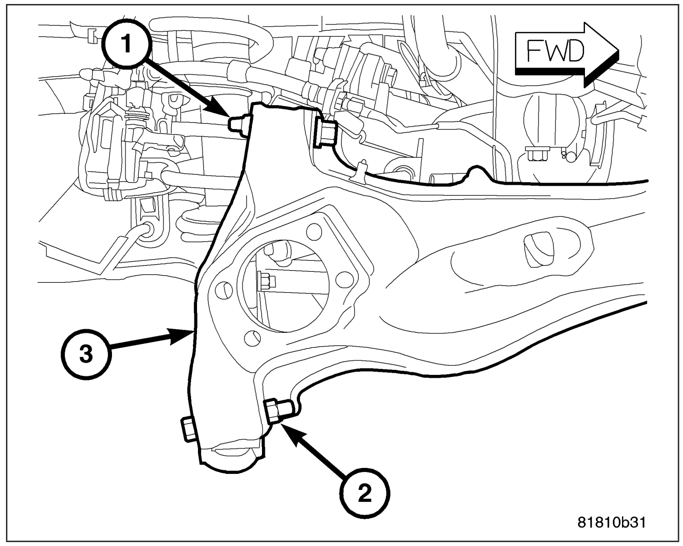


INSTALLATION

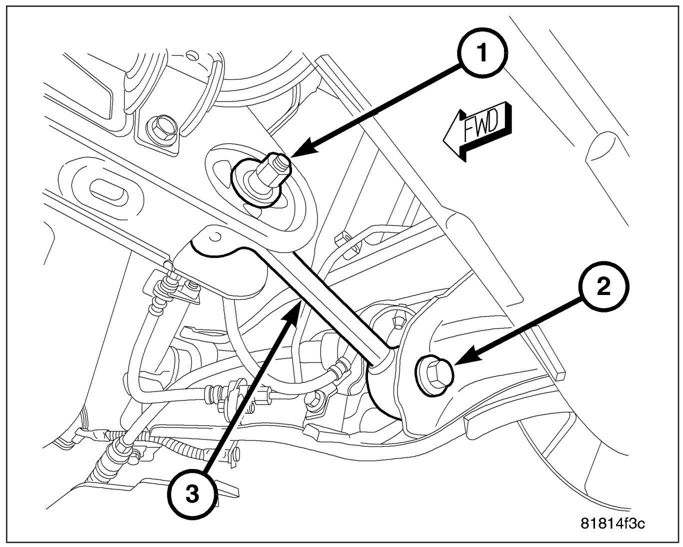
1. Position the trailing link and install the two bolts (2) fastening the leading end of the trailing link (3) to the body (1). Tighten the two mounting bolts to 60 N·m (44 ft. lbs.).



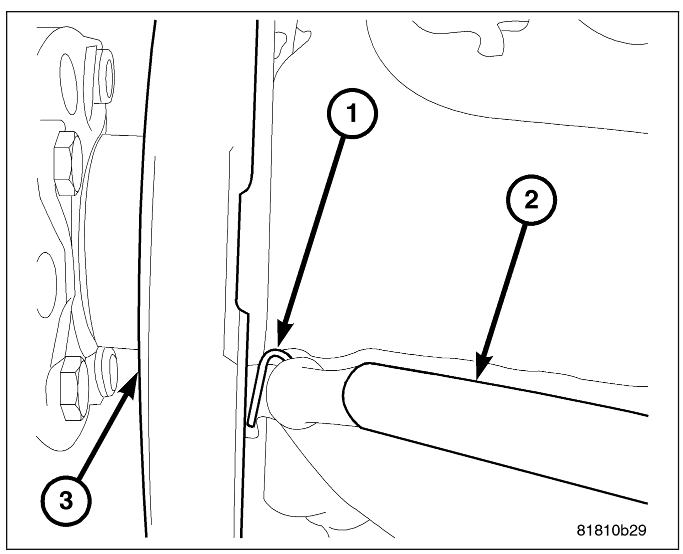
2. Position the upper control arm on the trailing link (3) and install the bolt and nut (1) securing the arm to the link. Tighten the mounting bolt nut to 95 N·m (70 ft. lbs.).
3. Position the lower control arm on the trailing link (3) and install the bolt and nut (2) securing the arm to the link. Tighten the mounting bolt nut to 95 N·m (70 ft. lbs.).



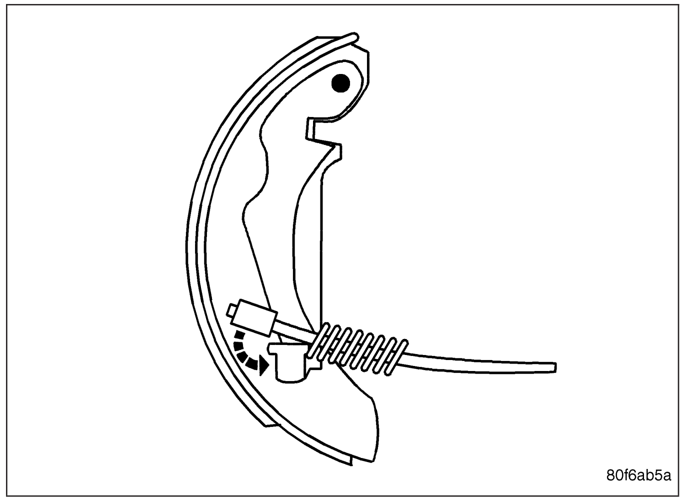
4. Install the bolt (2) securing the toe link to the trailing link. To install the bolt it may be necessary to flex the trailing link body mount bushing inward or outward using an appropriate prying tool. Tighten the mounting bolt to 95 N·m (70 ft. lbs.).



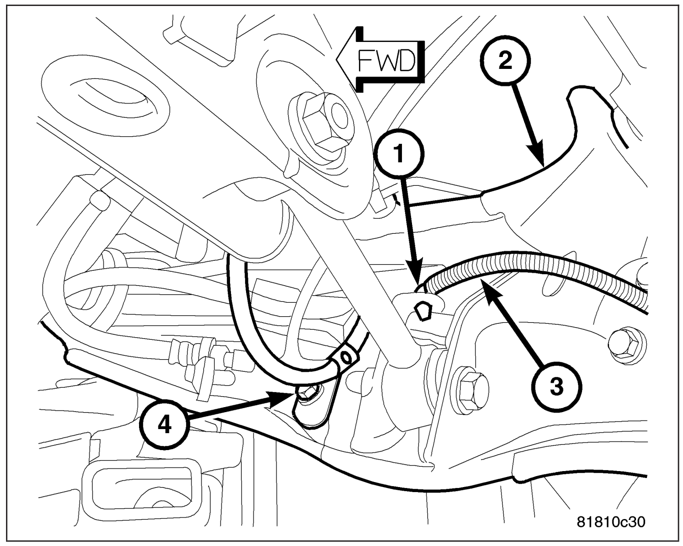
5. Insert the parking brake cable through the trailing link from the inboard side.
6. Slide the parking brake cable (2) into the brake support plate (3) with parking brake shoes.
7. Install the hair pin (1) securing the parking brake cable (2) to the brake support plate (3).



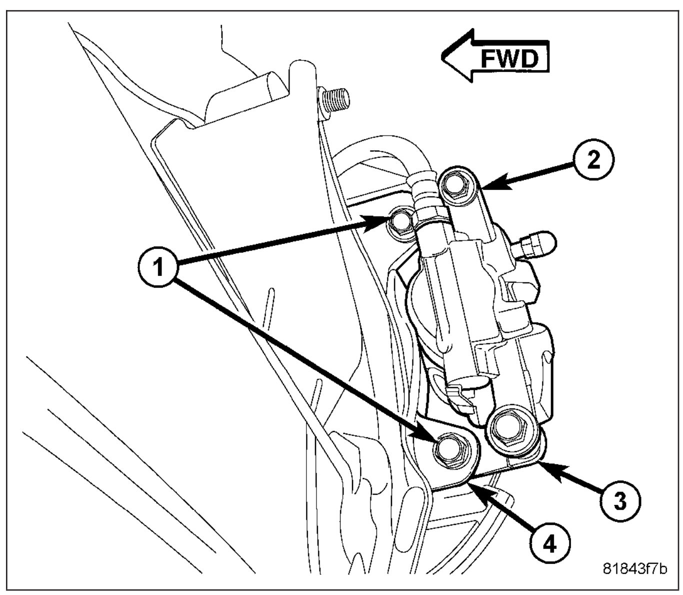
8. Install the parking brake cable onto the lever on the parking brake shoe.



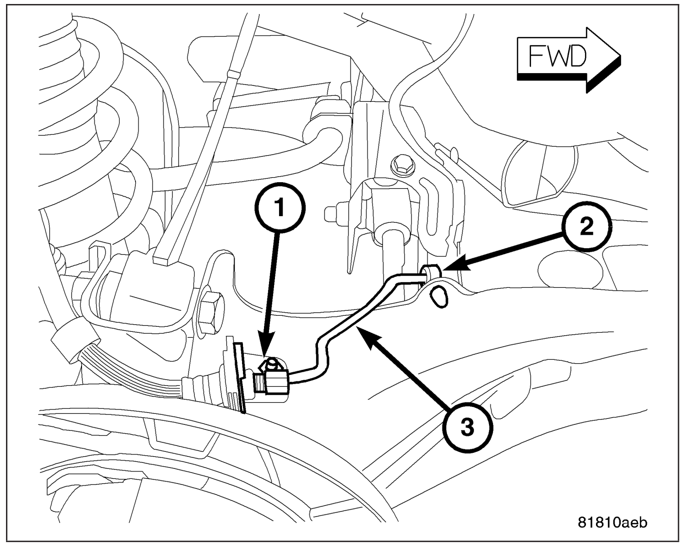
9. If equipped, position the wheel speed sensor (3) and install the screw (4) fastening the sensor to the trailing link (2). Tighten the mounting screw to 18 N·m (13 ft. lbs.).
10. If equipped, position the wheel speed sensor (3) and install the routing clip (1) fastening the sensor to the trailing link (2).
11. Install the hub and bearing, then install the brake rotor onto the wheel studs. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)



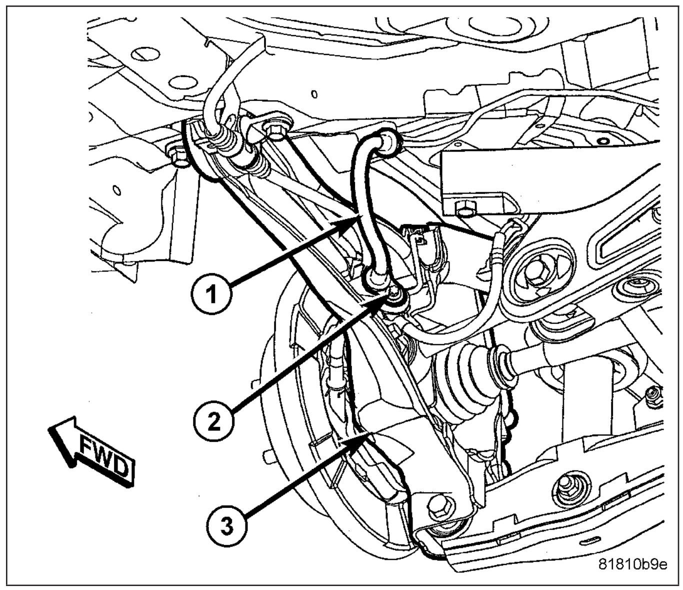
12. Slide the disc brake caliper (2) and adapter (3) assembly over brake rotor and brake support plate.
13. Install the two bolts (1) securing disc brake caliper adapter (3) to the brake support plate (4). Tighten the mounting bolts to 105 N·m (77 ft. lbs.).



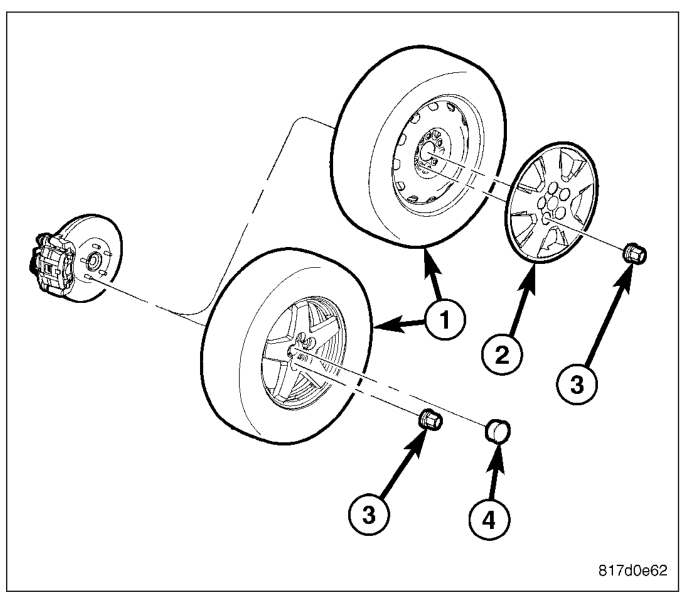
14. Position the brake tube on the trailing link inserting the tube into the routing clip (2) and routing bracket over the welded stud.
15. Install the nut (1) on the welded stud. Tighten the nut to 15 N·m (11 ft. lbs.).



16. Position the brake flex hose (1) at the trailing link (3) bracket and install the mounting screw (2). Tighten the screw to 23 N·m (17 ft. lbs.).



17. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
18. Lower the vehicle.
19. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



HUB / BEARING

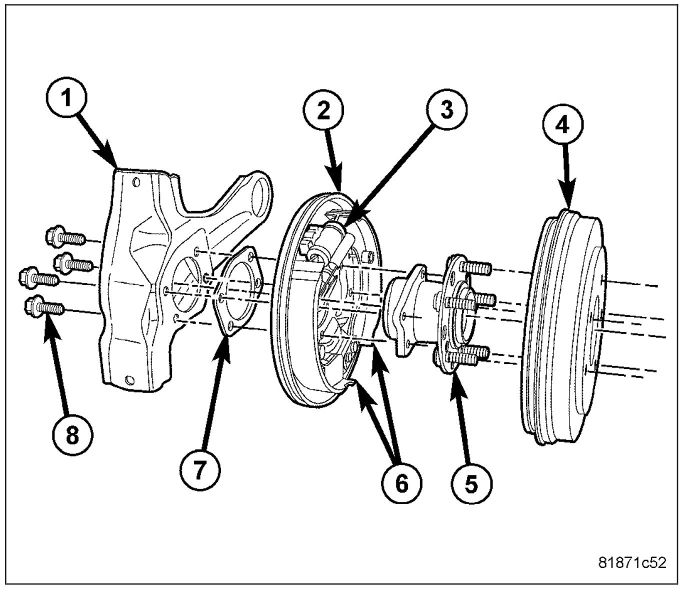
DESCRIPTION

The rear wheel bearing and wheel mounting hub used on this vehicle are a one-piece sealed unit or hub and bearing assembly. It is permanently lubricated when assembled and is sealed for life. There is no periodic lubrication or maintenance recommended for these units.

The hub and bearing (5) is mounted to the trailing link (1).

All vehicles have a magnetic encoder integrated into the right rear hub and bearing for speed sense. Vehicles equipped with antilock brakes have a magnetic encoder integrated into both rear hub and bearings. The encoder works with the rear wheel speed sensors to provide wheel speed signal. The sensor mounts by screw to the rear of the front-wheel-drive hub and bearing while the sensor clips to the rear of the all-wheel-drive hub and bearing.

The only serviceable components of the hub and bearing are the wheel mounting studs pressed into the hub.



DIAGNOSIS AND TESTING

HUB AND BEARING

NOTE: The wheel bearing is designed to last for the life of the vehicle and requires no type of periodic maintenance.

The following procedure may be used for diagnosing the condition of the wheel bearing and hub.

1. Remove the wheel and tire assembly, disc brake caliper and brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL)
2. Rotate the wheel hub checking for resistance or roughness.

Any roughness or resistance to rotation may indicate dirt intrusion or a failed hub bearing. If the bearing exhibits any of these conditions, the hub and bearing will require replacement. Do not attempt to disassemble the bearing for repair. If the wheel bearing is disassembled for any reason, it must be replaced.

Damaged bearing seals and the resulting excessive grease loss may also require bearing replacement. Moderate grease weapage from the bearing is considered normal and should not require replacement of the wheel bearing.

To diagnose a bent hub, measure hub runout. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS AND TESTING)

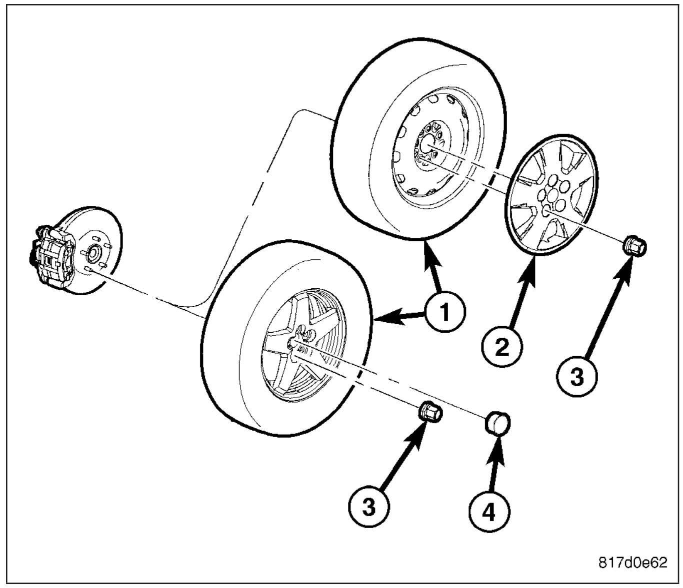
REMOVAL

ALL-WHEEL-DRIVE

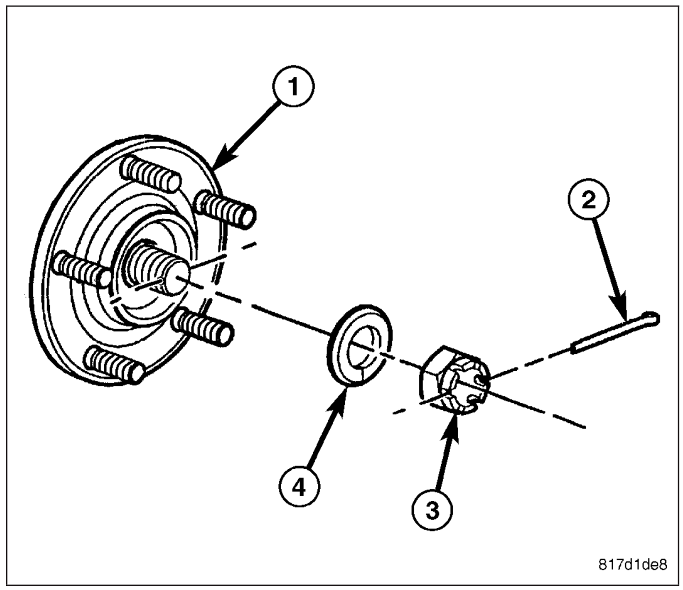
NOTE: Before proceeding, (Refer to 2 - SUSPENSION/REAR - WARNING).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

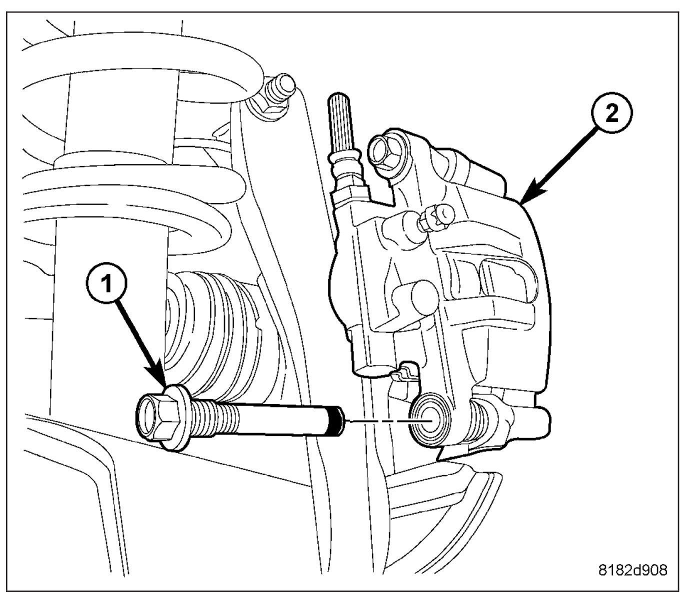
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



3. Remove the cotter pin (2) from the hub nut (3) on the end of the axle half shaft.
4. While a helper applies the brakes to keep the hub (1) from rotating, remove the hub nut (3) and washer (4) from the axle half shaft.
5. Tap the end of the half shaft inward, loosening it from the hub and bearing.

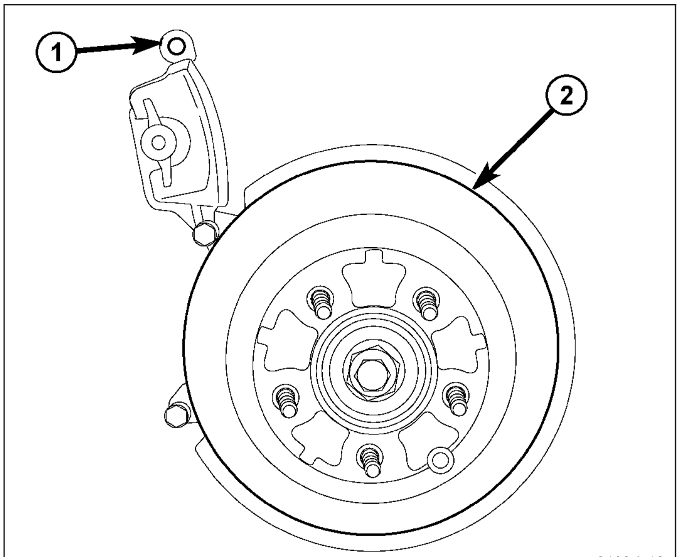


6. Remove the disc brake caliper (2) lower guide pin bolt (1).



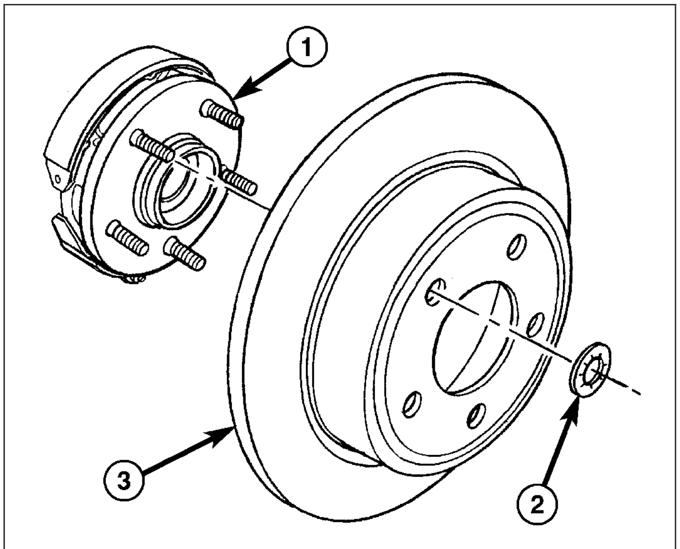
CAUTION: When moving rear brake caliper upward, use extreme care not to damage or over-extend the flex hose. Damage may occur.

7. Rotate the caliper upward hinging off the upper guide pin bolt. Rotate the caliper upward just enough to allow brake rotor removal. Hang the caliper assembly in this position using wire or a bungee cord.



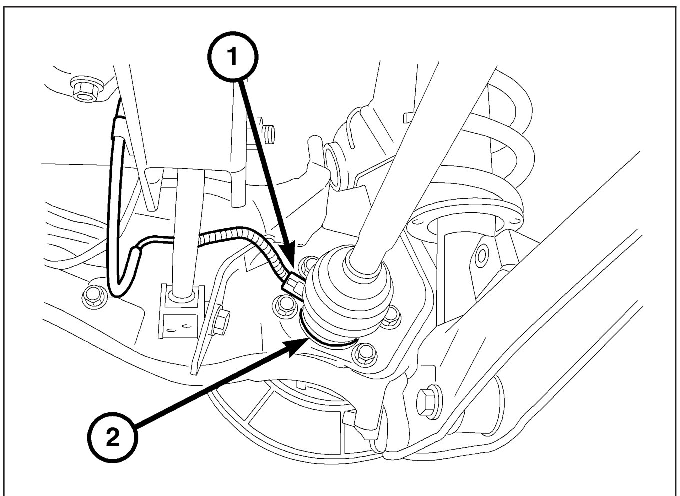
8182dc10

8. Remove any clips (2) retaining the brake rotor (3) to the wheel mounting studs.
9. Slide the brake rotor (3) off the hub and bearing (1).



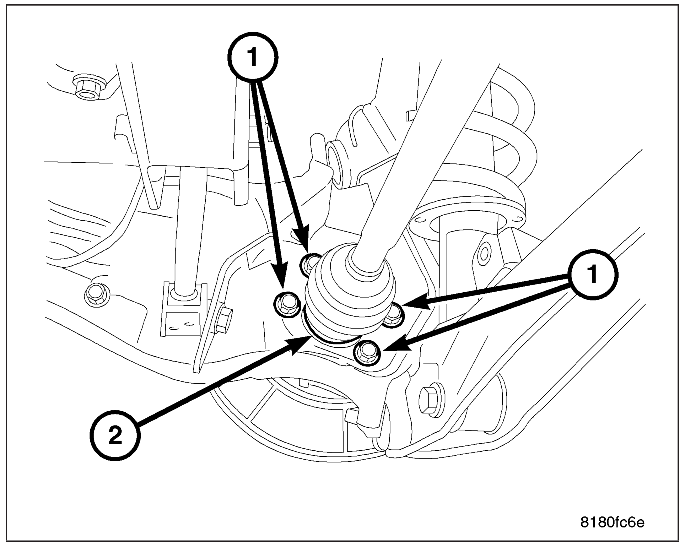
8138a4b2

10. Unclip the wheel speed sensor head (1) from the retainer on the rear of the hub and bearing (2).



8180fc67

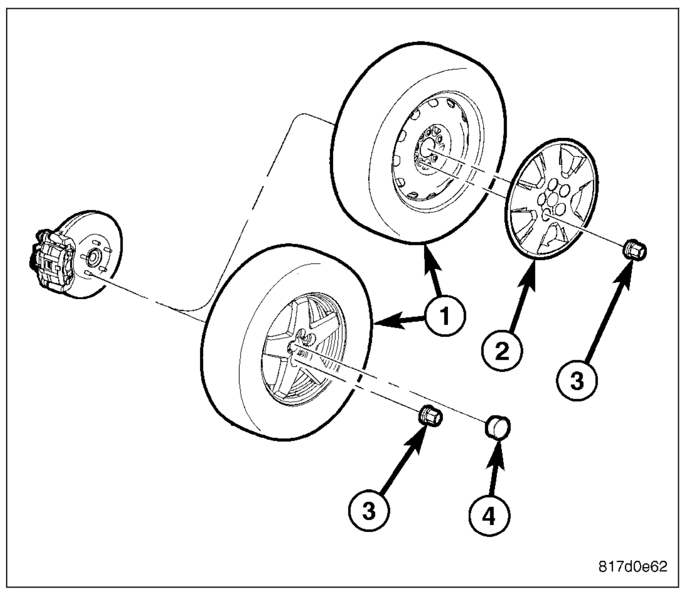
11. Remove the four bolts (1) securing the hub and bearing (2) to the trailing link.
12. Remove the hub and bearing.



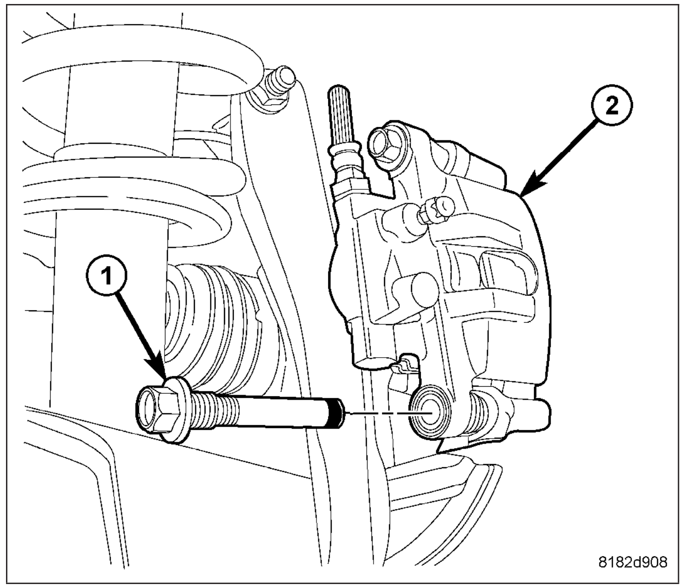
FRONT-WHEEL-DRIVE

NOTE: Before proceeding, (Refer to 2 - SUSPENSION/REAR - WARNING).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly.

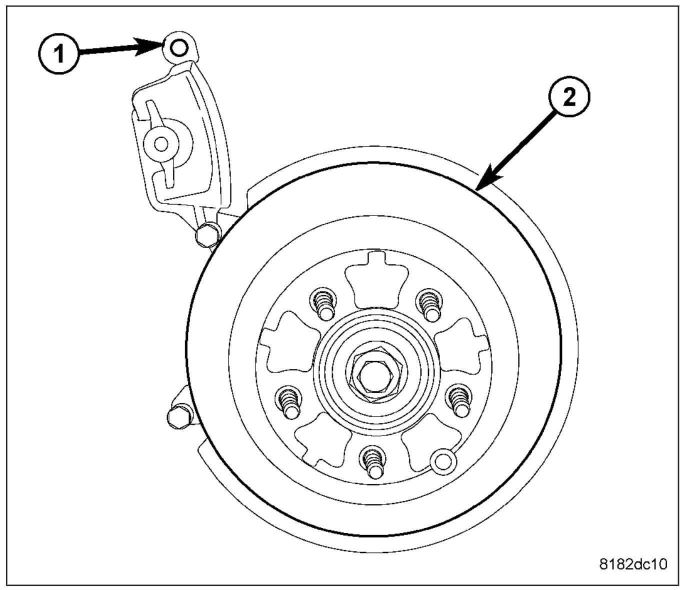


3. Remove the disc brake caliper (2) lower guide pin bolt (1).

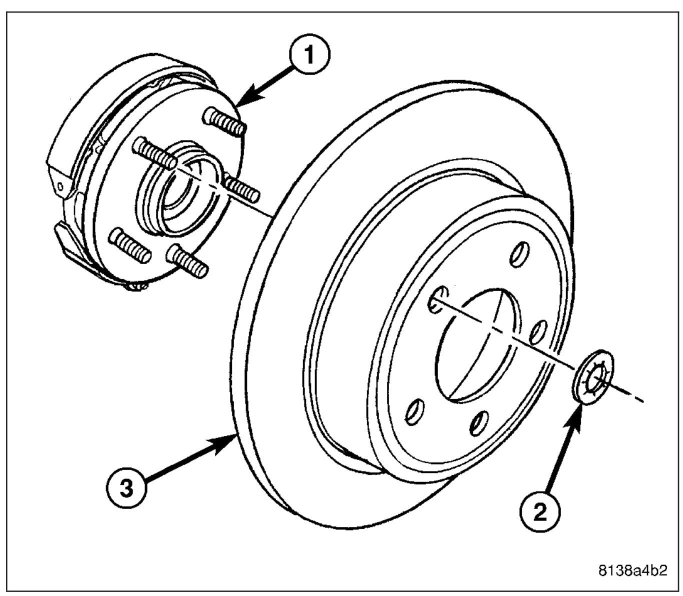


CAUTION: When moving rear brake caliper upward, use extreme care not to damage or over-extend the flex hose. Damage may occur.

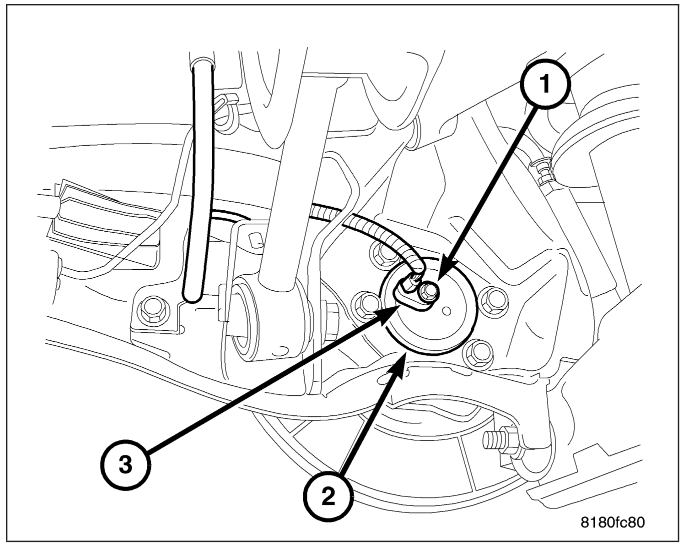
4. Rotate the caliper upward hinging off the upper guide pin bolt. Rotate the caliper upward just enough to allow brake rotor removal. Hang the caliper assembly in this position using wire or a bungee cord.



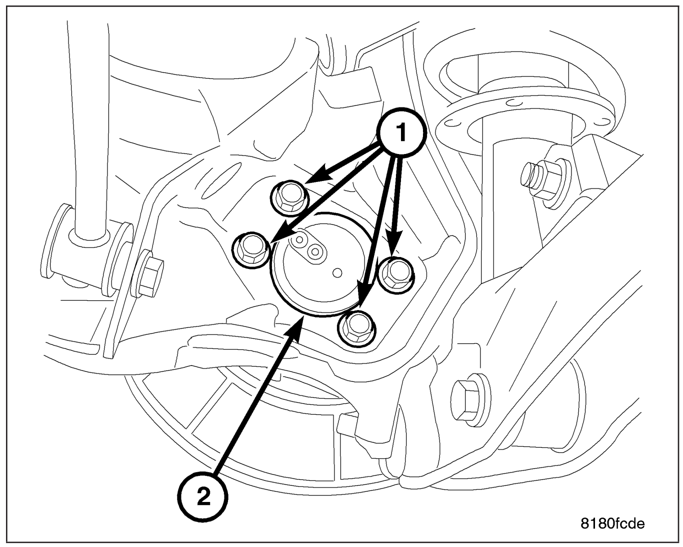
5. Remove any clips (2) retaining the brake rotor (3) to the wheel mounting studs.
6. Slide the brake rotor (3) off the hub and bearing (1).



7. Remove the screw (1) fastening the wheel speed sensor head (3) in the rear of the hub and bearing (2).



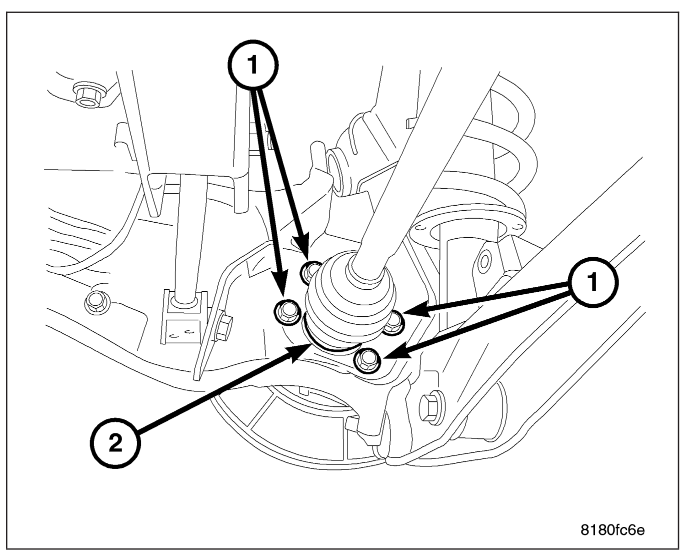
8. Remove the four bolts (1) securing the hub and bearing (2) to the trailing link.
9. Remove the hub and bearing.



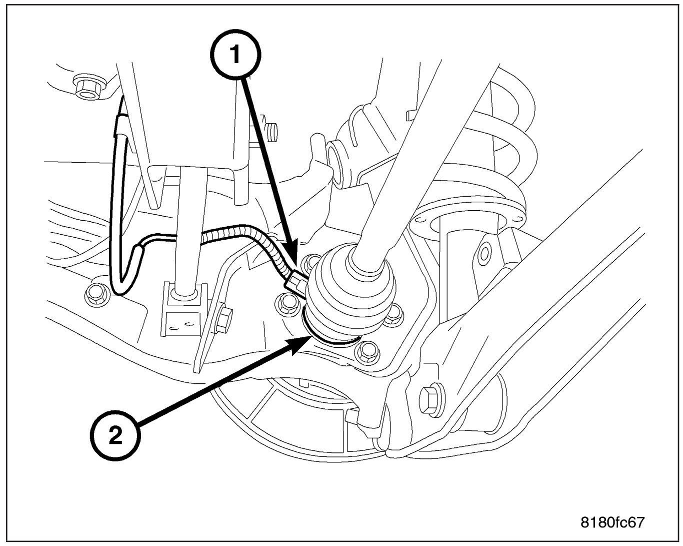
INSTALLATION

ALL-WHEEL-DRIVE

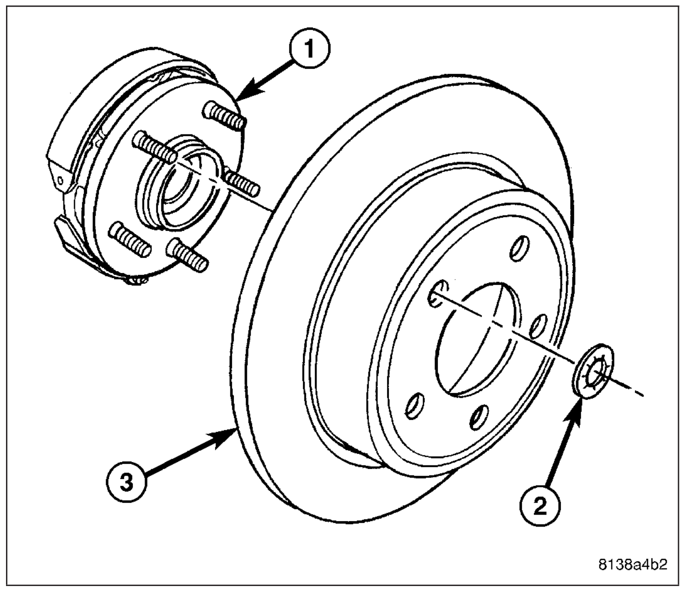
1. Slide the hub and bearing over the axle half shaft and position it on the brake support plate and trailing link.
2. Install the four bolts (1) securing the hub and bearing (2) to the trailing link. Tighten the bolts to 105 N·m (77 ft. lbs.).



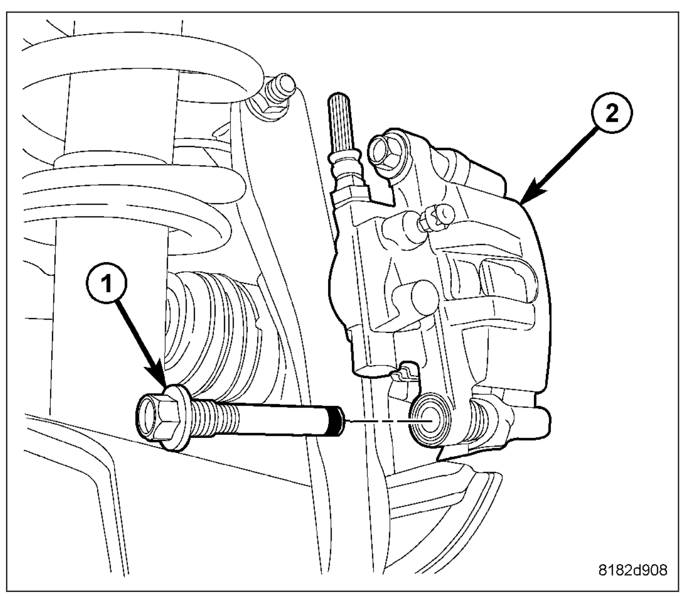
3. Clip the wheel speed sensor head (1) (flat side to bearing rear) into the retainer on the rear of the hub and bearing (2).



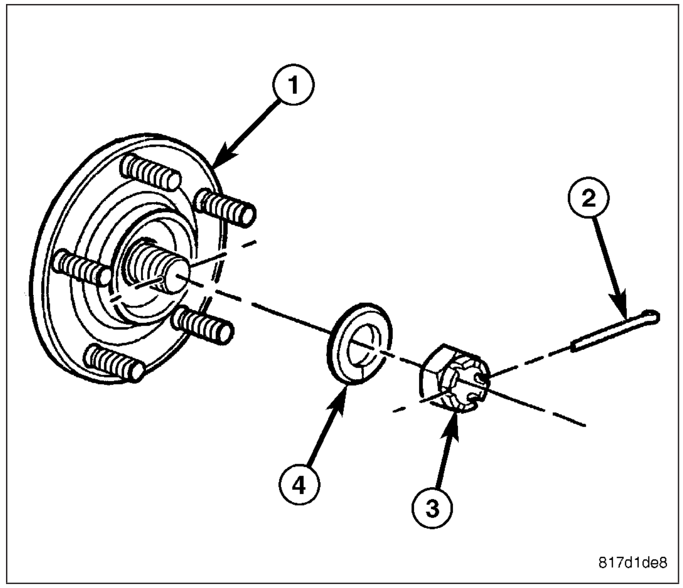
4. Slide the brake rotor (3) over the parking brake shoes and onto the hub and bearing (1).



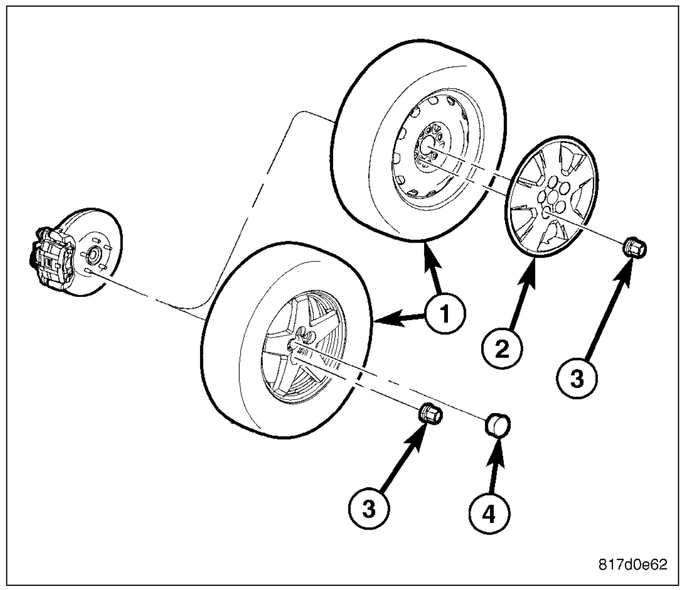
5. Rotate the disc brake caliper downward over the brake rotor and lower part of caliper adapter.
6. Install the disc brake caliper (2) lower guide pin bolt (1). Tighten the guide pin bolt to 60 N·m (44 ft. lbs.).



7. Clean all foreign matter from the threads of the half shaft outer C/V joint.
8. Install the washer (4) and hub nut (3) on the end of the half shaft and snug it.
9. While a helper applies the brakes to keep the hub (1) from rotating, tighten the hub nut (3) to 245 N·m (181 ft. lbs.).
10. Insert the cotter pin (2) through the notches in the nut and the hole in half shaft. If the notches in the nut do not line up with the hole in the half shaft, continue to tighten the nut until they do. **Do not loosen the nut.**
11. Wrap the cotter pin (2) ends tightly around the lock nut.



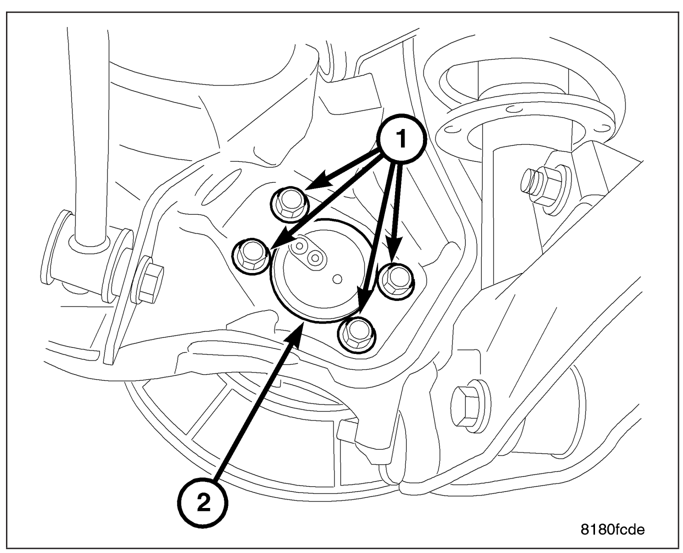
12. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
13. Lower the vehicle.
14. Pump the brake pedal several times to ensure the vehicle has a firm brake pedal before moving it.



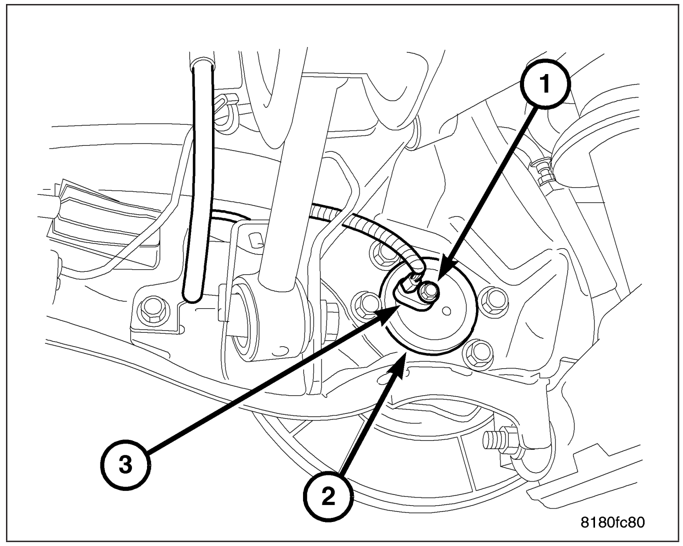
FRONT-WHEEL-DRIVE

NOTE: If equipped, make sure the wheel speed sensor mount on the rear of the hub and bearing is directed toward the front of the vehicle.

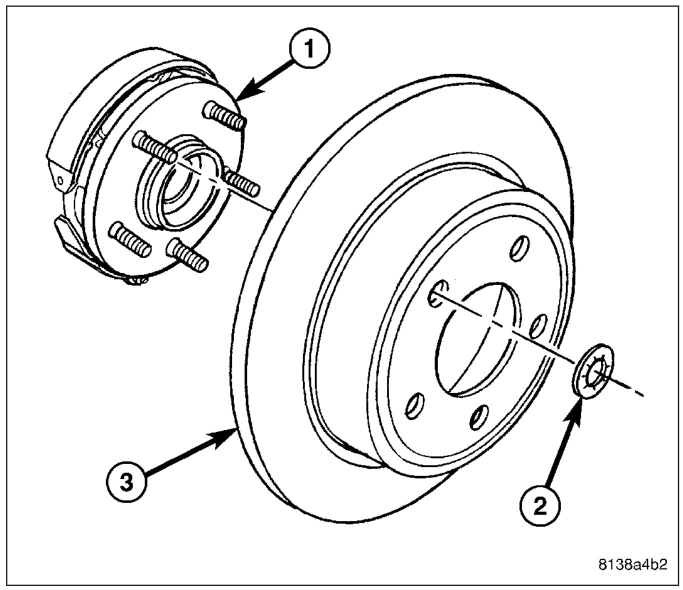
1. Position the hub and bearing on the brake support plate and trailing link.
2. Install the four bolts (1) securing the hub and bearing (2) to the trailing link. Tighten the bolts to 105 N·m (77 ft. lbs.).



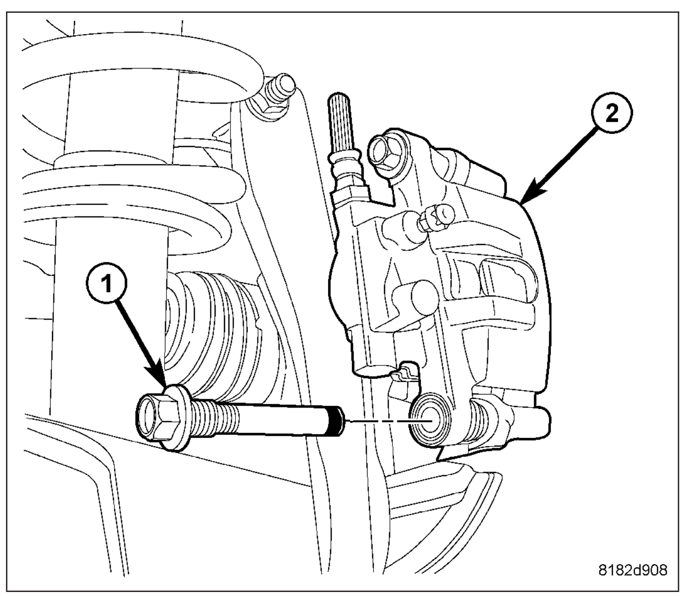
3. If equipped, install the wheel speed sensor head (3) into the rear of the hub and bearing (2).
4. Install the wheel speed sensor head mounting screw (1). Tighten the screw to 10 N·m (89 in. lbs.).



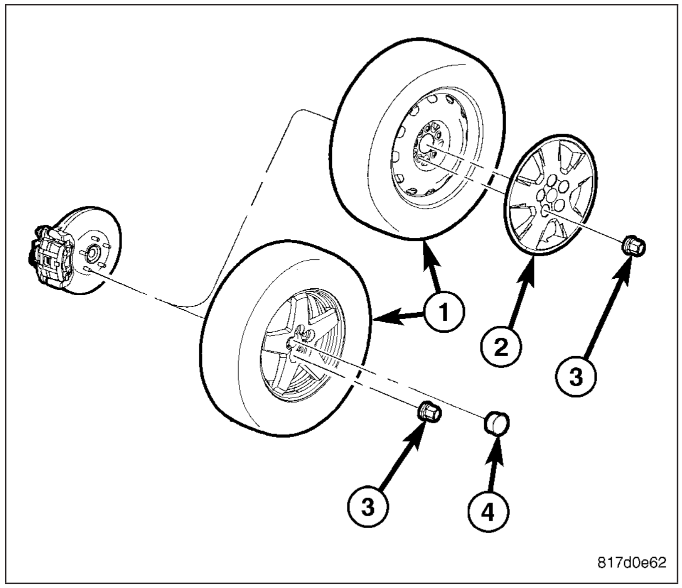
5. Slide the brake rotor (3) over the parking brake shoes and onto the hub and bearing (1).



6. Rotate the disc brake caliper downward over the brake rotor and lower part of caliper adapter.
7. Install the disc brake caliper (2) lower guide pin bolt (1). Tighten the guide pin bolt to 60 N·m (44 ft. lbs.).



8. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
9. Lower the vehicle.
10. Pump the brake pedal several times to ensure the vehicle has a firm brake pedal before moving it.

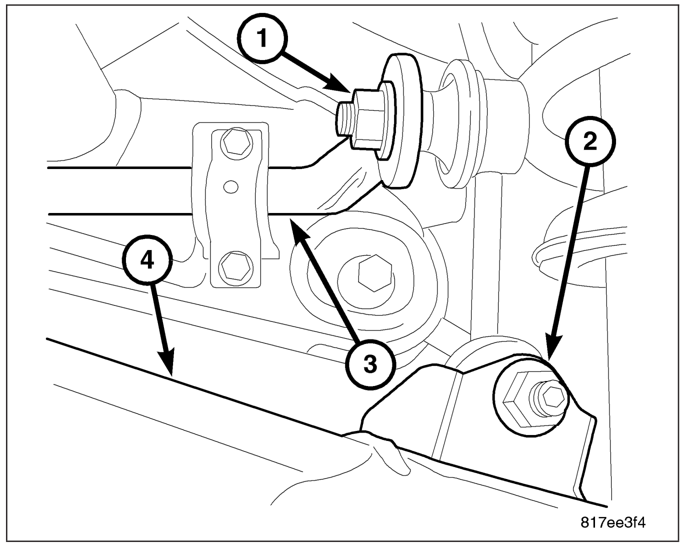


BAR-STABILIZER

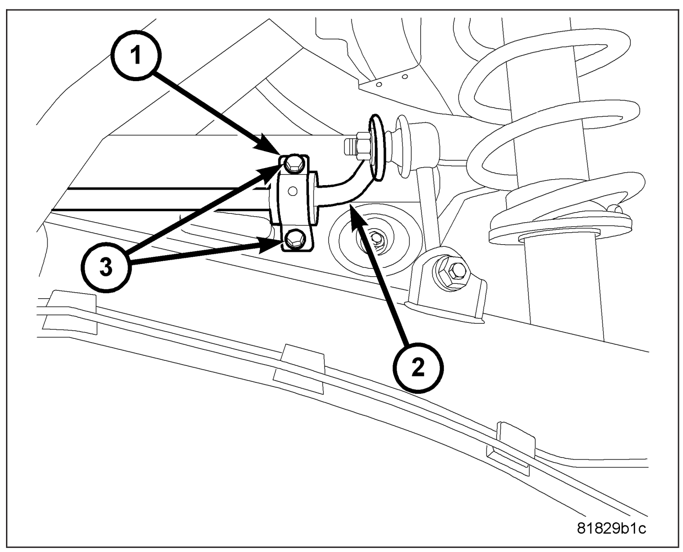
REMOVAL

NOTE: Before proceeding, (Refer to 2 - SUSPENSION/REAR - WARNING).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. On both sides of the vehicle, while holding the stabilizer bar link upper stud stationary, remove the nut (1) securing the link to the stabilizer bar (3).



3. If equipped with all-wheel-drive, remove the rear driveline module. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR DRIVELINE MODULE - REMOVAL)
4. On both sides of the vehicle, remove the screws (3) securing the stabilizer bushing retainers (1) to the crossmember.
5. Remove the two stabilizer bushing retainers.
6. Remove the stabilizer bar (2) from the vehicle.
7. If required, remove the two cushions from the stabilizer bar utilizing the slit cut into the cushions (bushings).

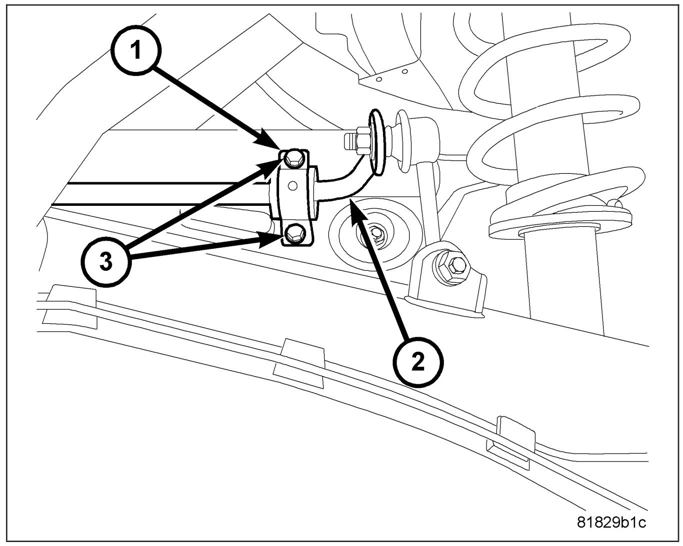


INSTALLATION

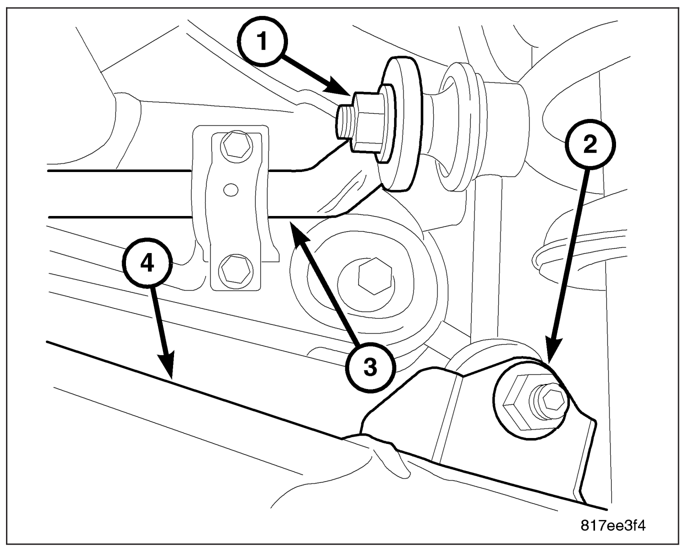
1. If required, install the two cushions on the stabilizer bar (one on each side) utilizing the slit cut into the cushions (bushings).

NOTE: When installing the stabilizer bar on a vehicle with all-wheel-drive, position the bar so that the bar loops under the axle half shafts once installed, not over the axle half shafts.

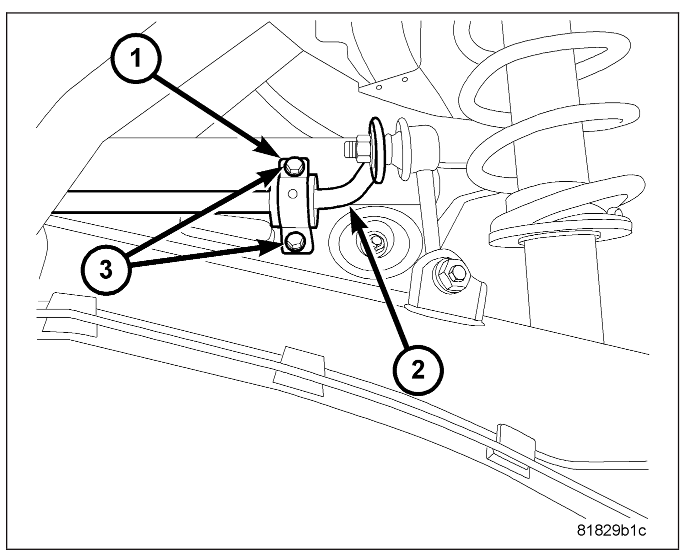
2. Position the stabilizer bar (2) on the rear crossmember.
3. Install the two retainers (1) over the cushions at the mounting holes and install the retainer screws (3). Do not tighten the screws at this time.



4. If equipped with all-wheel-drive, install the rear driveline module. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ REAR DRIVELINE MODULE - INSTALLATION)
5. On each side of the vehicle, install the stabilizer link upper stud in the end of the stabilizer bar (3). Install the nut (1) on each upper stud and while holding the stabilizer link stud stationary, tighten the nut (2) to 58 N·m (43 ft. lbs.).



6. Tighten the cushion retainer screws to 34 N·m (25 ft. lbs.).
7. Lower the vehicle.



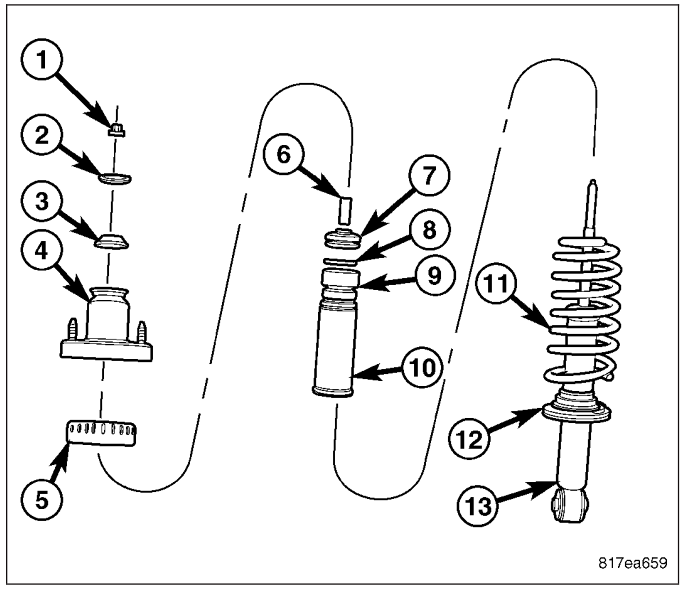
SHOCK ASSEMBLY

DESCRIPTION

A coil-over shock absorber assembly supports each side of the vehicle. The bottom of the shock assembly mounts to the lower control arm. The top of the shock assembly mounts to the body.

The shock assembly includes the following major components:

- Upper bushing (3)
- Upper mounting bracket (4)
- Upper spring isolator (5)
- Sleeve (6)
- Lower bushing (7)
- Jounce bumper (9)
- Dust shield (10)
- Coil spring (11)
- Lower spring isolator (12)
- Shock absorber (13)



Each component is serviced by removing the shock assembly from the vehicle and disassembling it.

Coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. If a coil spring requires replacement, be sure that it is replaced with a spring meeting the correct load rating for the vehicle and its specific options.

DIAGNOSIS AND TESTING

SHOCK ABSORBER

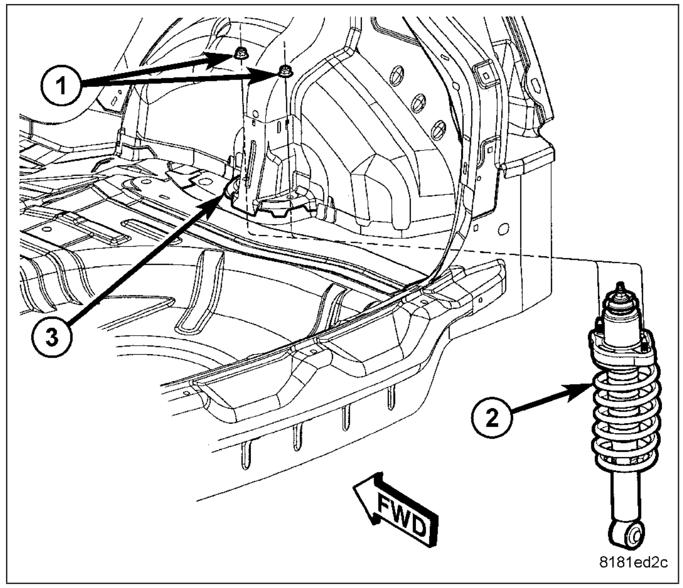
Inspect the shock absorber for damage and evidence of fluid running from the upper end of the fluid reservoir. (Actual leakage will be a stream of fluid running down the side of the reservoir tube and dripping off lower end of unit). A slight amount of seepage between the shaft and shaft seal is not unusual and does not affect performance of the shock absorber.

REMOVAL

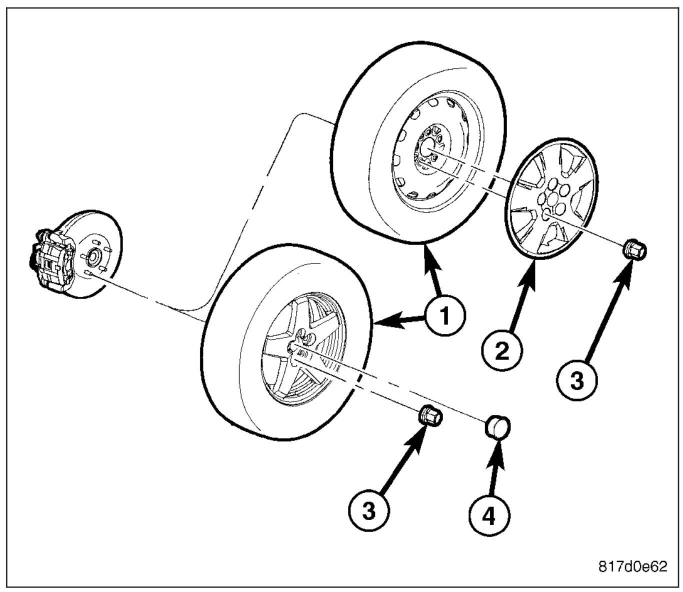
NOTE: Before proceeding, (Refer to 2 - SUSPENSION/REAR - WARNING).

1. Remove the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)

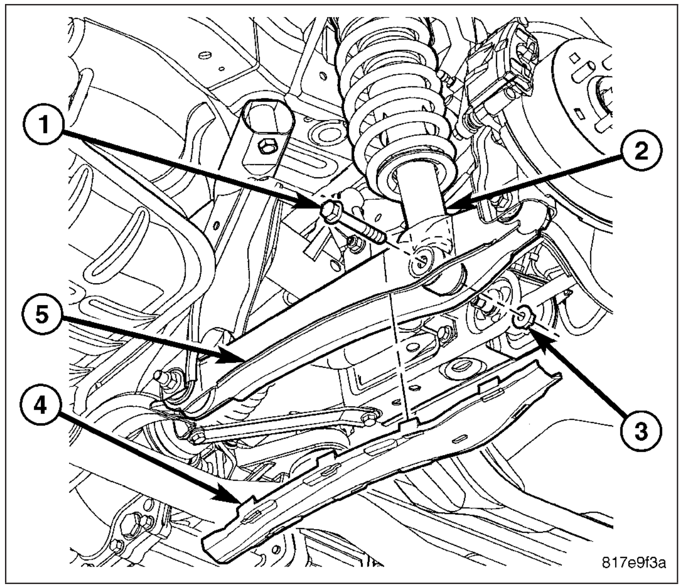
2. Remove the two nuts (1) securing the shock assembly (2) to the body bracket (3).



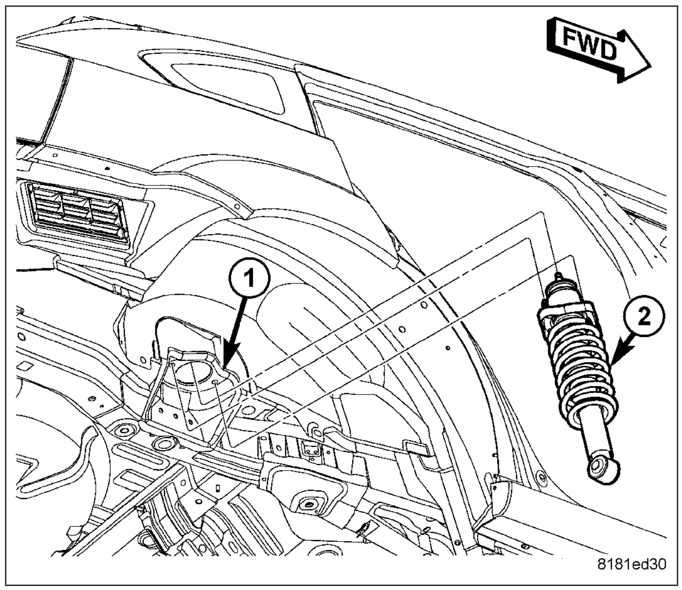
3. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
4. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly.



5. Remove the cover (4) on the bottom of the lower control arm (5).
6. Remove the shock (2) lower mounting nut (3) and bolt (1).



7. Lower the shock assembly (2) out of the body bracket (1) and lift out over rear suspension.



DISASSEMBLY

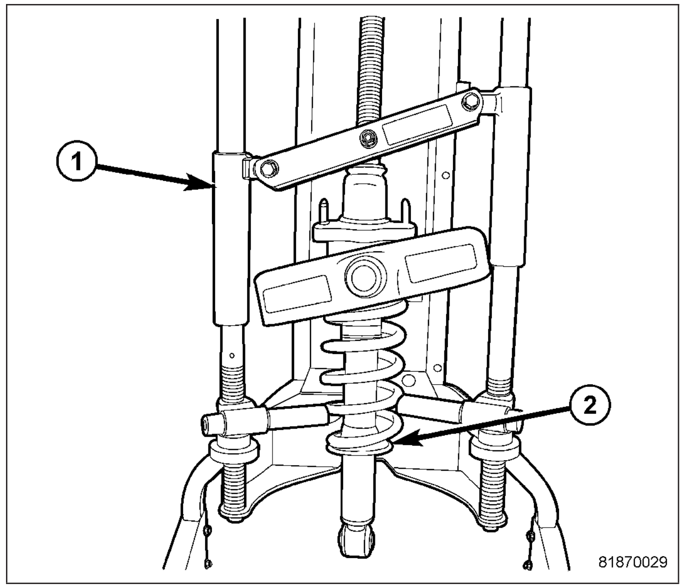
NOTE: The shock assembly must be removed from the vehicle for it to be disassembled and assembled. (Refer to 2 - SUSPENSION/REAR/SHOCK - REMOVAL)

For the disassembly and assembly of the shock assembly, use Strut Spring Compressor, Pentastar Service Equipment (PSE) tool W-7200, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

WARNING: Do not remove the shock rod nut before the coil spring is properly compressed. The coil spring is held under pressure. The coil spring must be compressed, removing spring tension from the upper mounting bracket, before the shock rod nut is removed.

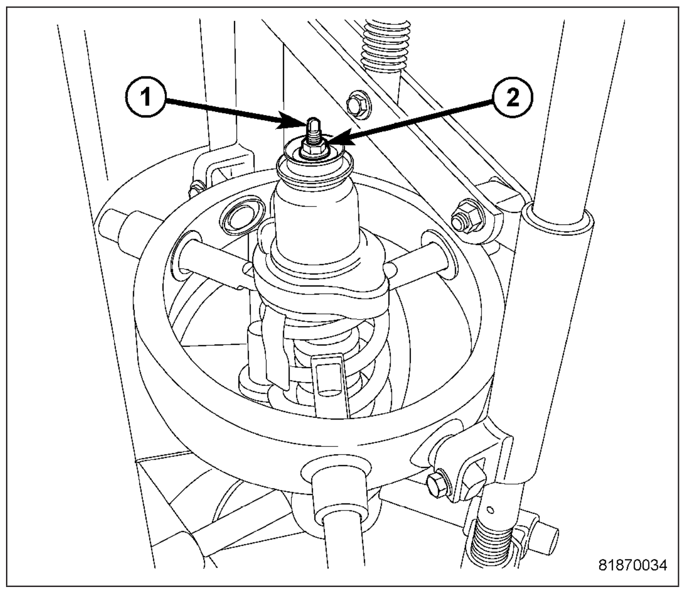
1. If both shocks are being serviced at the same time, mark both the coil spring and shock assembly according to which side of the vehicle the shock is being removed from.

2. Position the shock assembly (2) in the strut spring compressor (1) following the manufacturers instructions and set the lower and upper hooks of the compressor on the coil spring.
3. Compress the coil spring until all spring tension is removed from the upper mounting bracket and bushings.

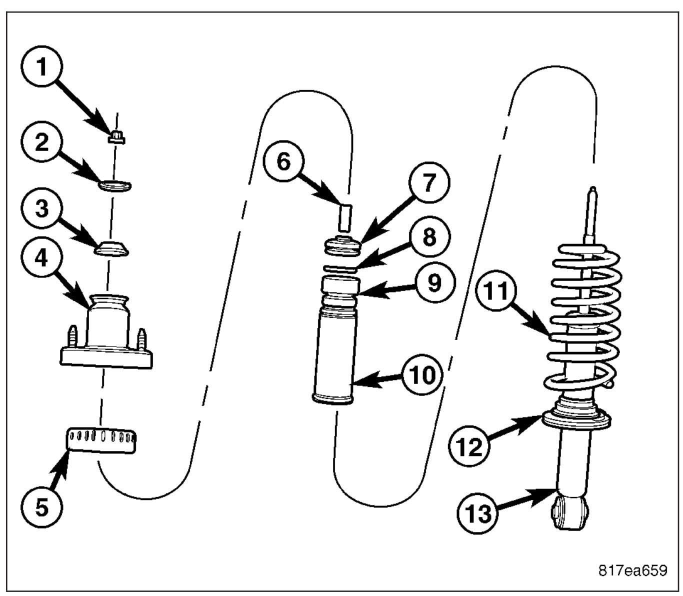


CAUTION: Never use impact or high speed tools to remove the shock rod nut. Damage to the shock internal bearings can occur.

4. Once the spring is sufficiently compressed, install Snap-On® Shock Absorber Socket A139, or equivalent, on the end of the shock rod (1). While holding the shock rod from turning, remove the nut (2) using a wrench. Remove the washer below the nut.

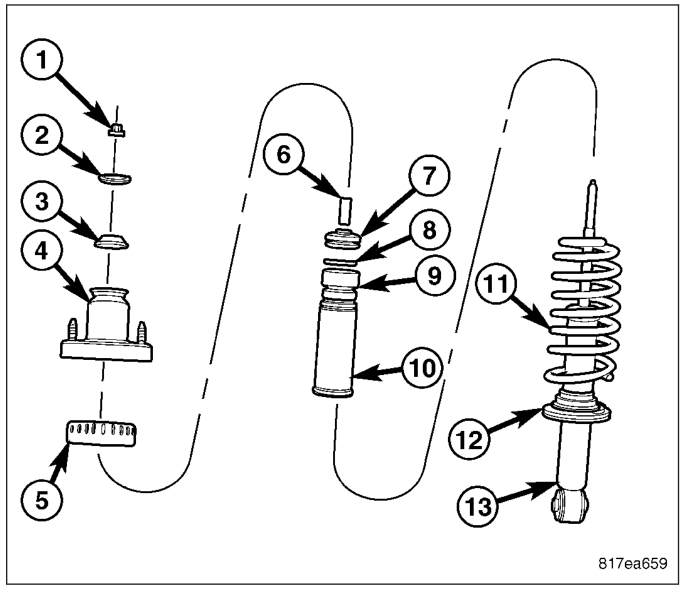


5. Remove the shock absorber (13) out through the bottom of the coil spring (11). The washer (8), jounce bumper (9), dust shield (10) and lower spring isolator will come out with the shock.
6. Slide the washer (8), jounce bumper (9), dust shield (10) from the shock rod.
7. Remove the lower isolator (12) from the shock spring seat.
8. Remove the upper mounting bracket (4), bushings (3, 7), sleeve (6) and upper spring isolator (5) from the top of the spring.
9. Remove the bushings (3, 7), sleeve (6) and upper spring isolator (5) from the upper mounting bracket (4).



NOTE: If the coil spring needs to be serviced, proceed with the next step, otherwise, proceed with step Step 12.

10. Release the tension from the coil spring by backing off the compressor drive completely. Push back the compressor hooks and remove the coil spring.
11. Inspect the shock assembly components for the following and replace as necessary:
    - Inspect the shock (13) for shaft binding over the full stroke of the shaft.
    - Inspect the jounce bumper (9) for cracks and signs of deterioration.
    - Inspect the dust shield (10) for cracks and tears.
    - Check the upper mounting bracket (4) for cracks and distortion and its retaining studs for any sign of damage.
    - Inspect the upper (3) and lower (7) bushings, for material deterioration and signs of deterioration. Inspect the sleeve (6) for wear and distortion.
    - Inspect the upper (5) and lower (12) spring isolators for material deterioration and distortion.
    - Inspect the coil spring (11) for any sign of damage to the coating.

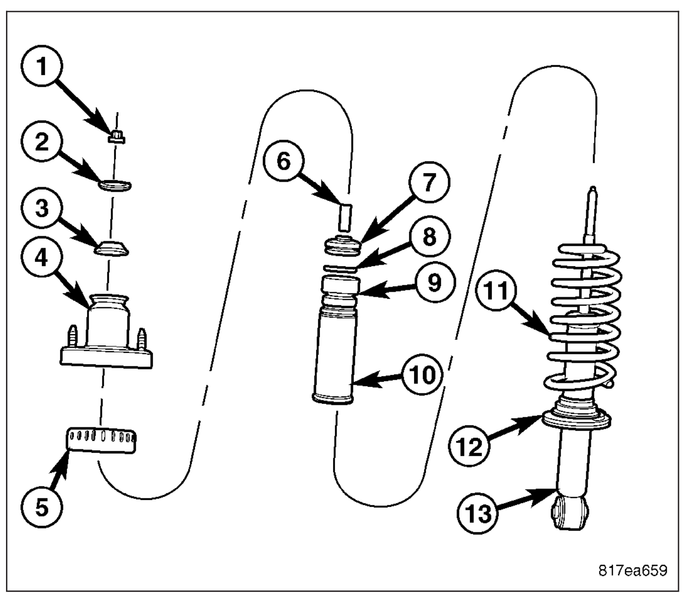


NOTE: For reassembly, (Refer to 2 - SUSPENSION/REAR/SHOCK - ASSEMBLY)

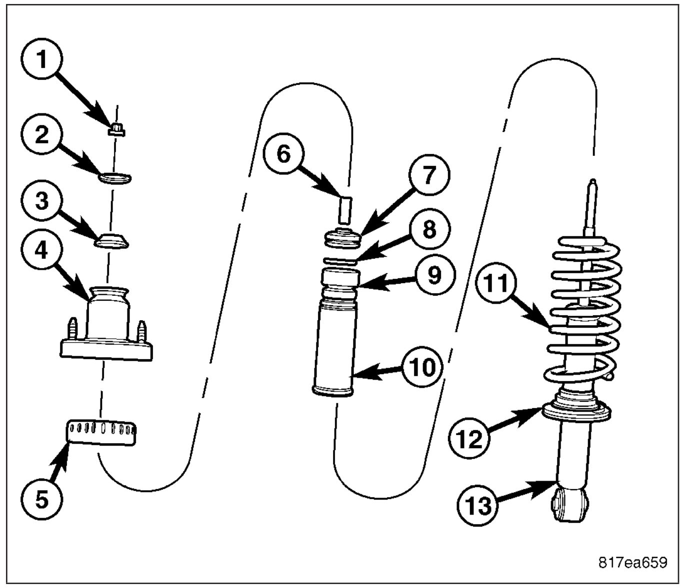
ASSEMBLY

NOTE: If the coil spring has been removed from the spring compressor, proceed with the next step, otherwise, proceed with step Step 3.

1. Place the coil spring in the spring compressor following the manufacturers instructions.
2. Slowly compress the coil spring until enough room is available for shock assembly reassembly.
3. Assemble the bushings (3, 7) and sleeve (6) through the upper mounting bracket (4).
4. Install the upper spring isolator (5) on the upper mounting bracket (4).
5. Install the upper mounting bracket (4) on top of the coil spring.

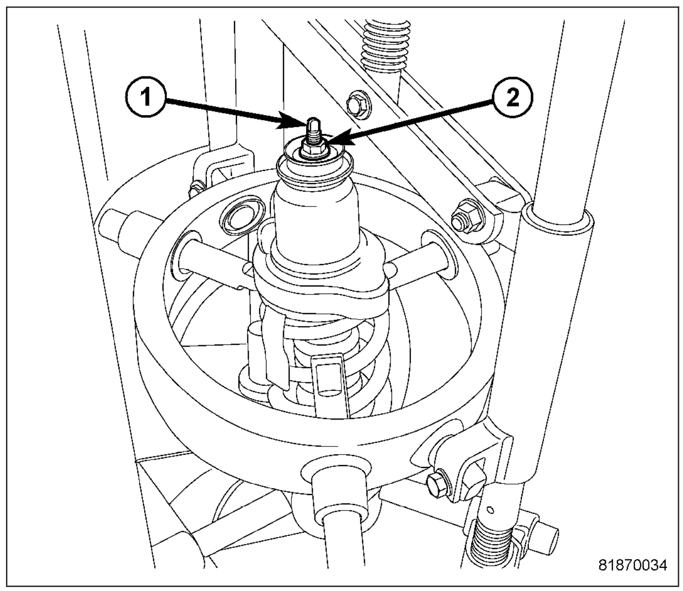


6. Install the lower spring isolator (12) on the spring seat of the shock absorber (13).
7. Slide the dust shield (10), jounce bumper (9) and washer (8) onto the shock rod.
8. Install the shock absorber (13) up through the bottom of the coil spring and upper mounting bracket until the lower spring seat contacts the lower end of the coil spring.
9. While holding the shock absorber in position, install the washer (2) and nut (1) on the end of the shock rod.

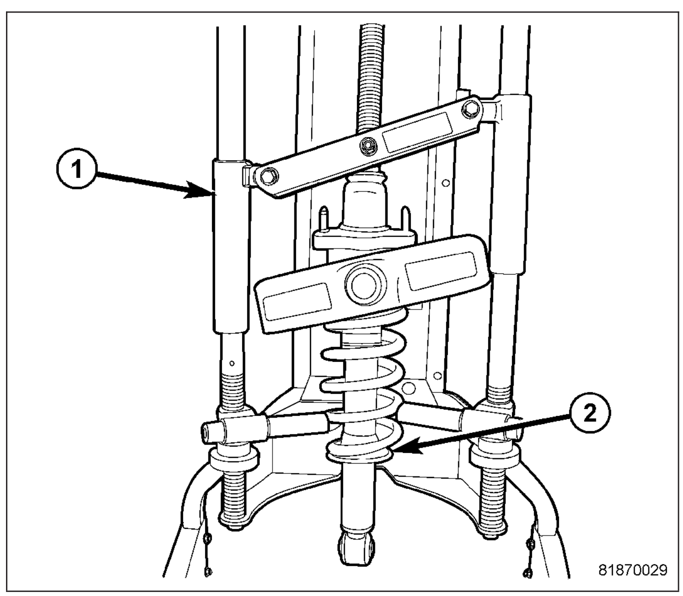


CAUTION: Never use impact or high speed tools to remove the shock rod nut. Damage to the shock internal bearings can occur.

10. Install Snap-On® Shock Absorber Socket A139, or equivalent, on the end of the shock rod (1). While holding the shock rod from turning, tighten the nut (2) using a crows foot wrench and a torque wrench. Tighten the shock rod nut to 24 N·m (18 ft. lbs.).

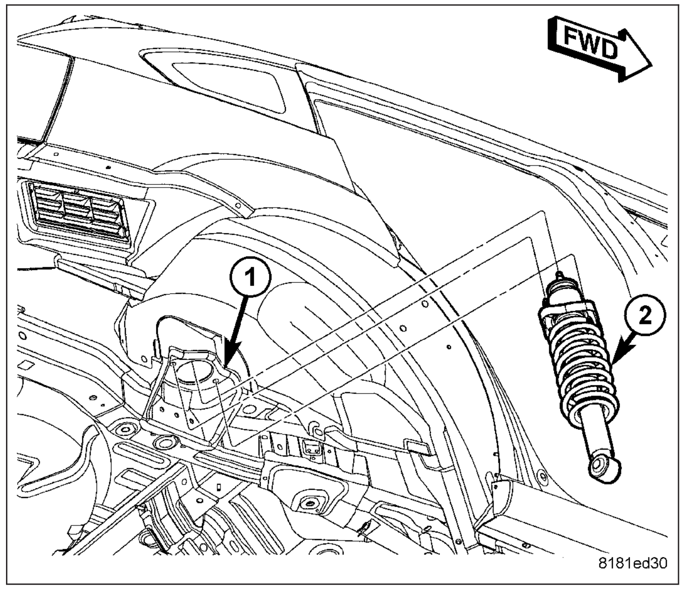


11. Turn the upper mounting bracket or shock absorber as necessary until the mounting studs on the mounting bracket line up with the lower mounting bolt eyelet at the bottom of the shock absorber.
12. Slowly release the tension from the coil spring by backing off the compressor (1) drive completely.
13. Remove the shock assembly from the spring compressor.
14. Install the shock assembly on the vehicle. (Refer to 2 - SUSPENSION/REAR/SHOCK - INSTALLATION)

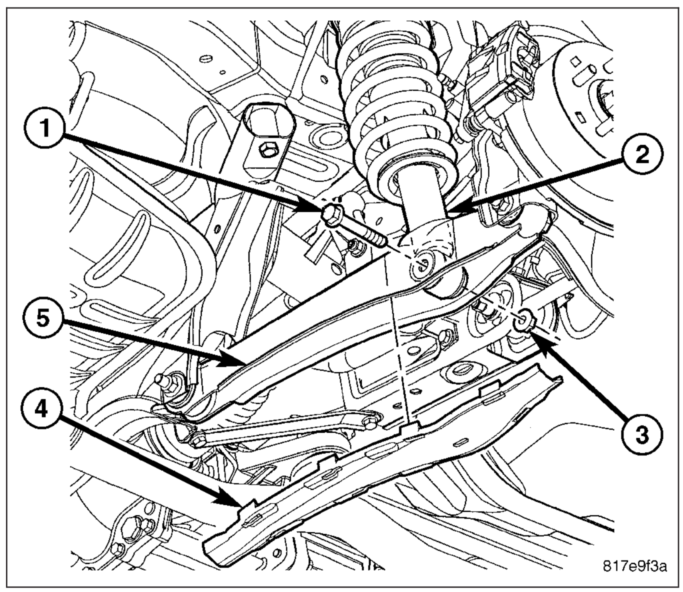


INSTALLATION

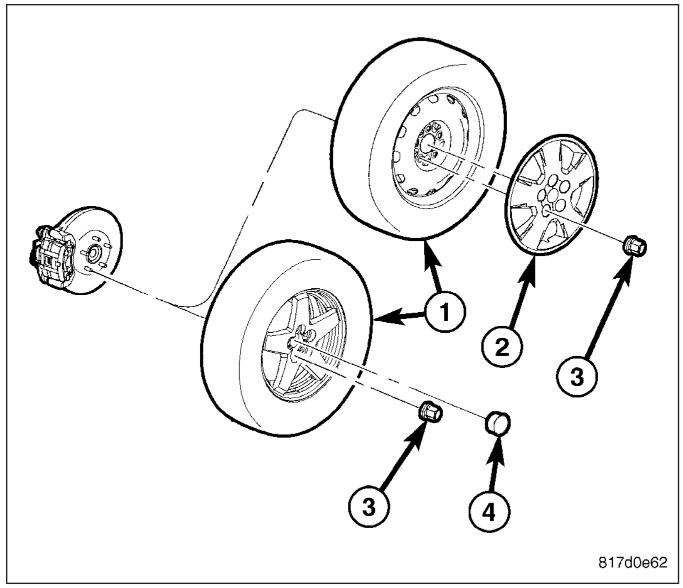
1. Insert the lower end of the shock assembly (2) down though the lower control arm from above just enough to clear the body, then lift it up into the body bracket (1).



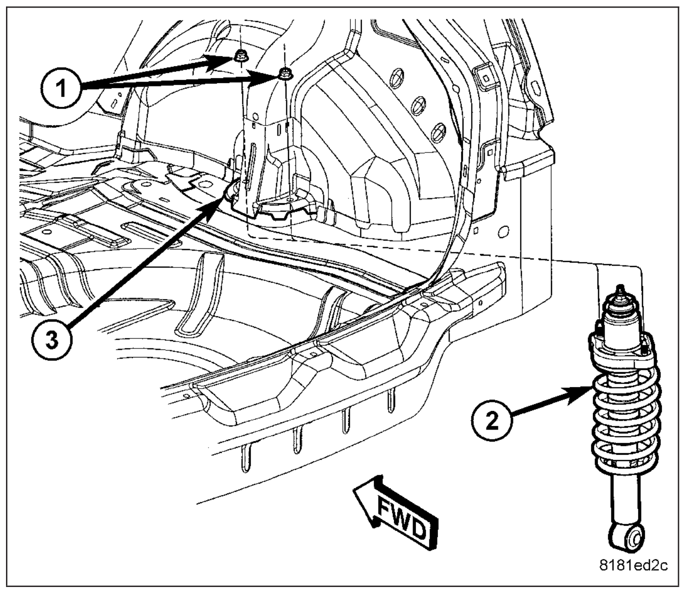
2. Install the mounting bolt (1) and nut (3) fastening the shock assembly (2) to the lower control arm (5). Do not tighten at this time.
3. Install the cover (4) on the bottom of the lower control arm (5).



4. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
5. Lower the vehicle.

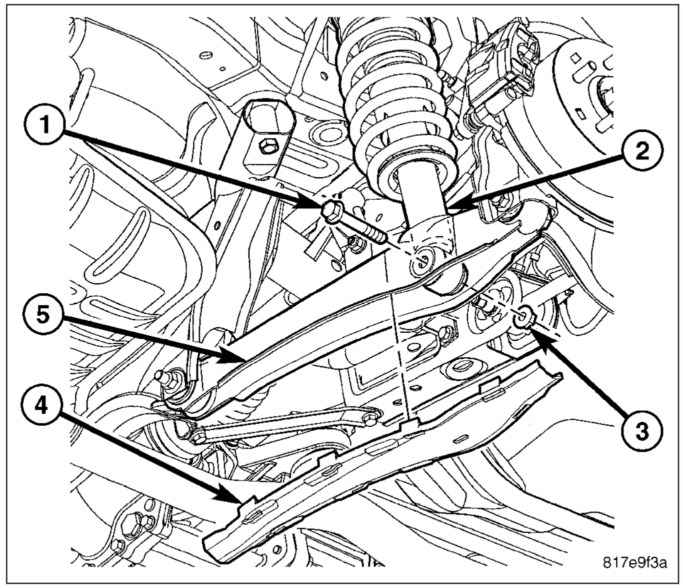


6. install the two nuts (1) securing the shock assembly (2) to the body bracket (3). Tighten the mounting nuts to 48 N·m (35 ft. lbs.).



7. Install the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)

8. Position the vehicle on an alignment rack/drive-on lift. Raise the lift as necessary to access the shock mounting bolt (1) and nut (3).
9. Tighten the shock assembly lower mounting bolt nut (3) to 99 N·m (73 ft. lbs.).



WHEEL ALIGNMENT

TABLE OF CONTENTS

WHEEL ALIGNMENT

DESCRIPTION

Vehicle wheel alignment is the positioning of all interrelated front and rear suspension angles. These angles affect the handling and steering of the vehicle when it is in motion. Proper wheel alignment is essential for efficient steering, good directional stability, and proper tire wear.

The method of checking a vehicle's front and rear wheel alignment varies depending on the manufacturer and type of equipment used. The manufacturer's instructions should always be followed to ensure accuracy of the alignment, except when DaimlerChrysler Corporation's wheel alignment specifications differ.

On this vehicle, the suspension angles that can be adjusted are as follows:

Front

- Camber
- Toe

Rear

- Camber
- Toe

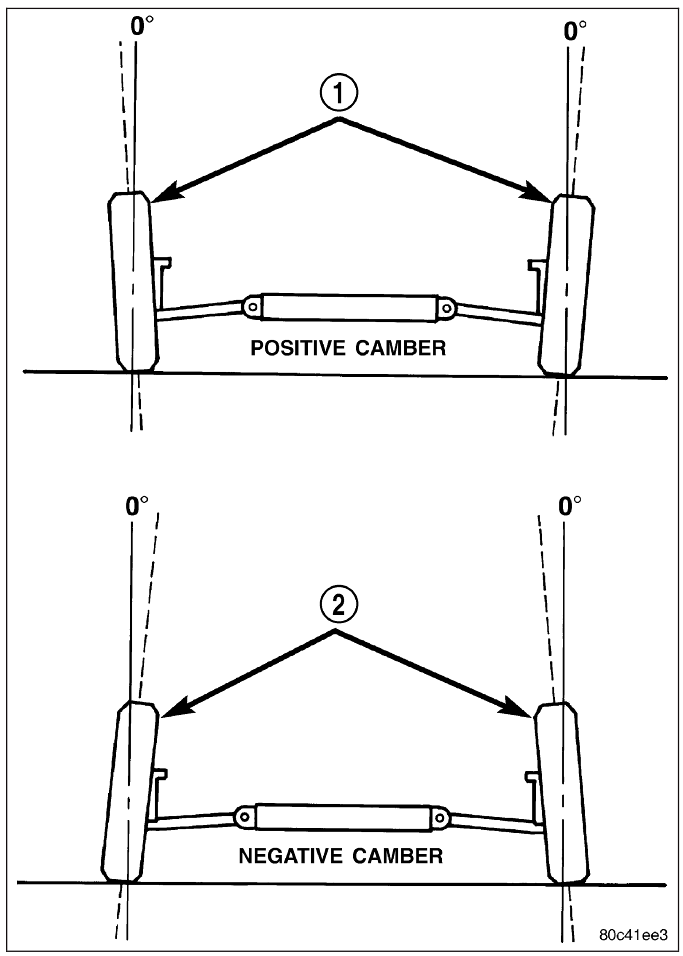
Check the wheel alignment and make all wheel alignment adjustments with the vehicle standing at its proper curb height specification. Curb height is the normal riding height of the vehicle. It is measured from a certain point on the vehicle to the ground or a designated area while the vehicle is sitting on a flat, level surface. Refer to Curb Height Measurement in this section for additional information.

Typical wheel alignment angles and measurements are described in the following paragraphs.

CAMBER

Camber is the inward or outward tilt of the top of the tire and wheel assembly. Inward tilt (2) is known as negative camber. Outward tilt (1) is known as positive camber. Camber is measured in degrees of angle relative to a true vertical line. Camber is a tire wearing angle.

- Excessive negative camber will cause tread wear at the inside of the tire.
- Excessive positive camber will cause tread wear on the outside of the tire.



CROSS CAMBER

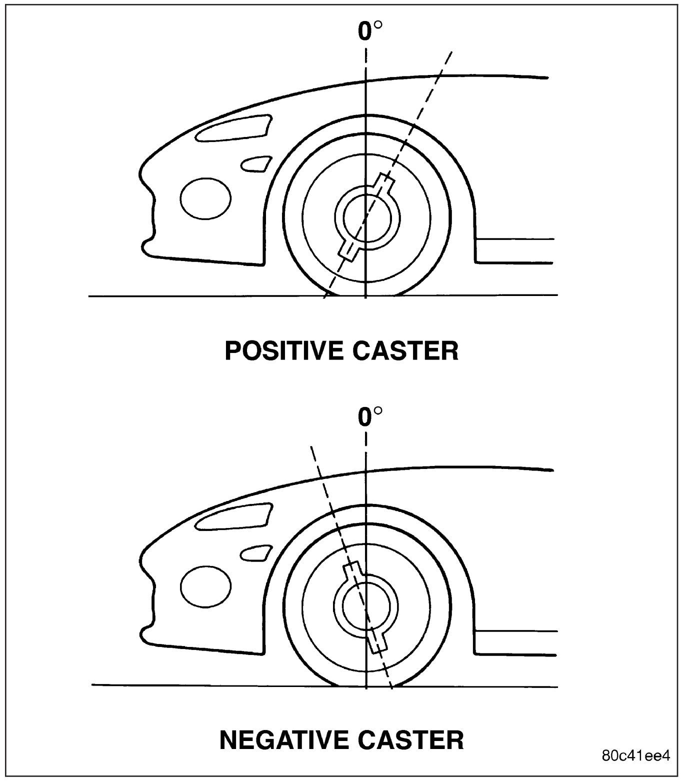
Cross camber is the difference between left and right camber. To achieve the cross camber reading, subtract the right side camber reading from the left. For example, if the left camber is +0.3° and the right camber is 0.0°, the cross camber would be +0.3°.

CASTER

Caster is the forward or rearward tilt of the steering knuckle in reference to the position of the upper and lower ball joints. Caster is measured in degrees of angle relative to a true vertical center line. This line is viewed from the side of the tire and wheel assembly.

- Forward tilt (upper ball joint ahead of lower) results in a negative caster angle.
- Rearward tilt (upper ball joint trailing lower) results in a positive caster angle.

Although caster does not affect tire wear, a caster imbalance between the two front wheels may cause the vehicle to lead to the side with the least positive caster.



CROSS CASTER

Cross caster is the difference between left and right caster.

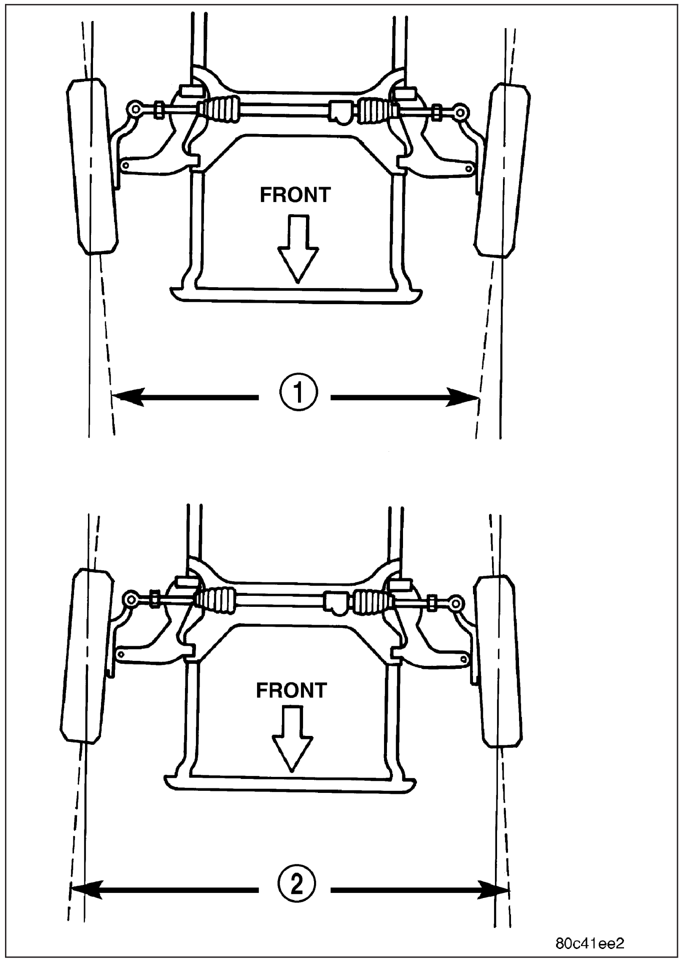
TOE

Toe is the inward or outward angle of the wheels as viewed from above the vehicle.

- Toe-in (1) is produced when the front edges of the wheels on the same axle are closer together than the rear edges.
- Toe-out (2) is produced when the front edges of the wheels on the same axle are farther apart than the rear edges.

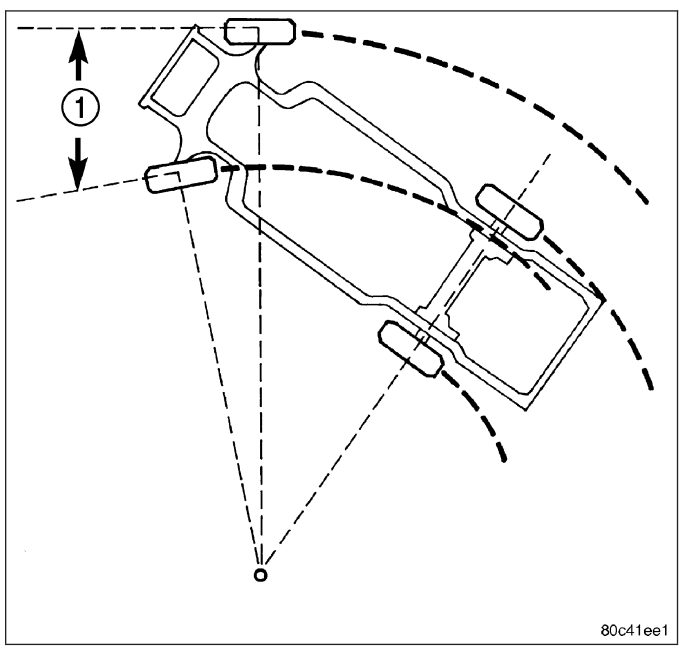
Toe-in and toe-out can occur at the front wheels and the rear wheels.

Toe is measured in degrees or inches. The measurement identifies the amount that the front of the wheels point inward (toe-in) or outward (toe-out). Toe is measured at the spindle height. Zero toe means the front and rear edges of the wheels on the same axle are equal distant.



TOE-OUT ON TURNS

Toe-out on turns (1) is the relative positioning of the front wheels while steering through a turn. This compensates for each front wheel's turning radius. As the vehicle encounters a turn, the outboard wheel must travel in a larger radius circle than the inboard wheel. The steering system is designed to make each wheel follow its particular radius circle. To accomplish this, the front wheels must progressively toe outward as the steering is turned from center. This eliminates tire scrubbing and undue tire wear when steering a vehicle through a turn.



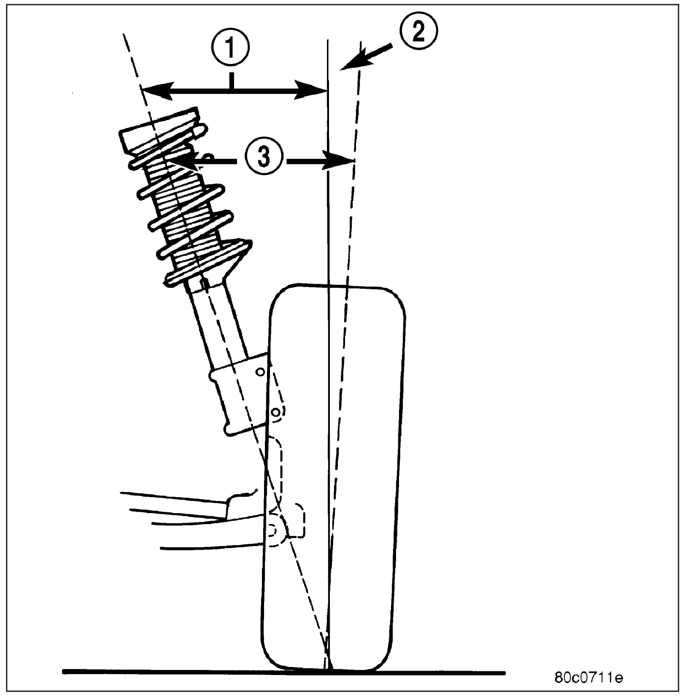
DYNAMIC TOE PATTERN

Dynamic toe pattern is the inward and outward toe movement of the front and rear tires through the suspension's jounce and rebound travel. As the vehicle's suspension moves up and down, the toe pattern varies. Toe pattern is critical in controlling the directional stability of the vehicle while in motion. Front and rear dynamic toe pattern is preset by the factory at the time the vehicle is assembled.

It is not necessary to check or adjust front or rear dynamic toe pattern when doing a normal wheel alignment. The only time dynamic toe pattern needs to be checked or adjusted is if the frame of the vehicle has been damaged.

STEERING AXIS INCLINATION (S.A.I.)

Steering axis inclination (1) is the angle between a true vertical line starting at the center of the tire at the road contact point and a line drawn through the center of the upper ball joint (or strut) and the lower ball joint. S.A.I. is built into the vehicle and is not an adjustable angle. If S.A.I. is not within specifications, a bent or damaged suspension component may be the cause.



INCLUDED ANGLE (I.A.)

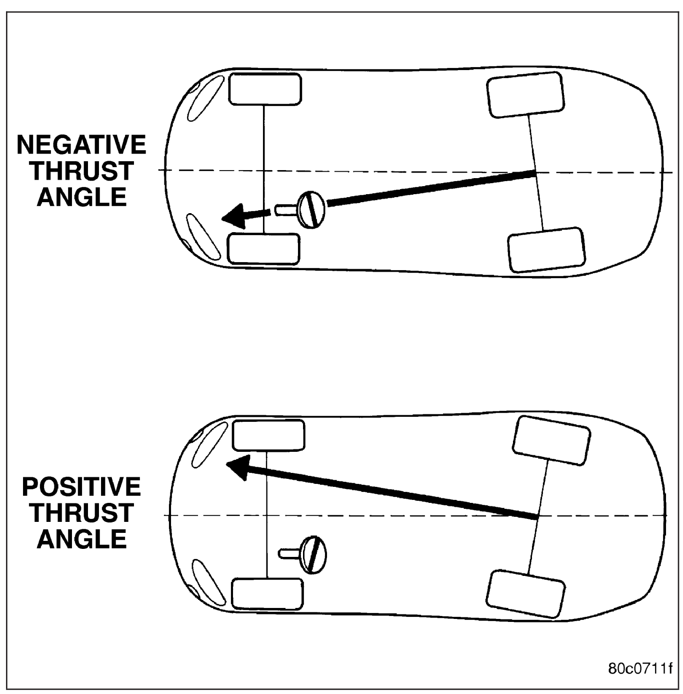
Included angle (3) is the sum of the S.A.I. angle (1) plus or minus the camber angle (2), depending on whether or not the wheel has positive or negative camber. If camber is positive, add the camber angle to the S.A.I angle. If camber is negative, subtract the camber angle from the S.A.I. angle. Included angle is not adjustable, but can be used to diagnose a frame misalignment or bent suspension component (spindle, strut).

THRUST ANGLE

Thrust angle is the averaged direction the rear wheels are pointing in relation to the vehicle's center line. The presence of negative or positive thrust angle causes the rear tires to track improperly to the left or right of the front tires (dog tracking).

- Negative thrust angle means the rear tires are tracking to the left of the front tires.
- Positive thrust angle means the rear tires are tracking to the right of the front tires.

Improper tracking can cause undue tire wear, a lead or pull and a crooked steering wheel. Excessive thrust angle can usually be corrected by adjusting the rear wheel toe so that each wheel has one-half of the total toe measurement.



DIAGNOSIS AND TESTING

SUSPENSION AND STEERING

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
Front End Whine On Turns	1. Defective Wheel Bearing 2. Incorrect Wheel Alignment 3. Worn Tires	1. Replace Wheel Bearing 2. Check And Reset Wheel Alignment 3. Replace Tires
Front End Growl Or Grinding On Turns	1. Defective Wheel Bearing 2. Engine Mount Grounding Against Frame Or Body Of Vehicle. 3. Worn Or Broken C/V Joint 4. Loose Wheel Lug Nuts 5. Incorrect Wheel Alignment 6. Worn Tires	1. Replace Wheel Bearing 2. Check For Motor Mount Hitting Frame Rail And Reposition Engine As Required 3. Replace C/V Joint 4. Verify Wheel Lug Nut Torque 5. Check And Reset Wheel Alignment 6. Replace Tires
Front End Clunk Or Snap On Turns	1. Loose Wheel Lug Nuts 2. Worn Or Broken C/V Joint 3. Worn Or Loose Tie Rod Or Ball Joint 4. Worn Control Arm Bushing 5. Loose Sway Bar Or Upper Strut Attachment	1. Verify Wheel Lug Nut Torque 2. Replace C/V Joint 3. Tighten Or Replace Tie Rod End Or Ball Joint 4. Replace Control Arm Bushing 5. Tighten Sway Bar Or Upper Strut Attachment To Specified Torque
Front End Popping/Clicking/ Snapping During Acceleration After Drive-To-Reverse Shift, Reverse-To-Drive Shift Or While Turning	1. Insufficient grease on mating surface of axle half shaft outer C/V joint mating surface to wheel hub/bearing.	1. Separate half shaft from hub and bearing and wipe mating surfaces clean. Apply light coating of wheel bearing grease to C/V joint mating surface and reassemble. Tighten hub nut to specified torque.
Front End Whine With Vehicle Going Straight At A Constant Speed	1. Defective Wheel Bearing 2. Incorrect Wheel Alignment 3. Worn Tires	1. Replace Wheel Bearing 2. Check And Reset Wheel Alignment 3. Replace Tires
Front End Growl Or Grinding With Vehicle Going Straight At A Constant Speed	1. Engine Mount Grounding 2. Worn Or Broken C/V Joint	1. Reposition Engine As Required 2. Replace C/V Joint
Front End Whine When Accelerating Or Decelerating	1. Worn Or Defective Transaxle Gears Or Bearings	1. Replace Transaxle Gears Or Bearings
Front End Clunk When Accelerating Or Decelerating	1. Loose Wheel Lug Nuts 2. Worn Or Broken Engine Mount	1. Verify Wheel Lug Nut Torque 2. Replace Engine Mounts

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
	3. Worn Or Defective Transaxle Gears Or Bearings	3. Replace Transaxle Gears Or Bearing
	4. Worn Or Broken C/V Joint	4. Replace C/V Joint
	5. Worn Or Loose Ball Joint	5. Tighten Or Replace Ball Joint
	6. Worn Or Loose Control Arm Bushing	6. Tighten To Specified Torque Or Replace Control Arm Bushing
	7. Loose Crossmember Bolts	7. Tighten Crossmember Bolts To Specified Torque
Road Wander	1. Incorrect Tire Pressure	1. Inflate Tires To Recommended Pressure
	2. Incorrect Front Or Rear Wheel Toe	2. Check And Reset Front Wheel Toe
	3. Worn Wheel Bearings	3. Replace Wheel Bearing
	4. Worn Control Arm Bushings	4. Replace Control Arm Bushing
	5. Excessive Friction In Steering Gear	5. Replace Steering Gear
	6. Excessive Friction In Steering Shaft Coupling	6. Replace Steering Coupler
	7. Excessive Friction In Strut Upper Bearing	7. Replace Strut Bearing
Lateral Pull	1. Unequal Tire Pressure	1. Inflate All Tires To Recommended Pressure
	2. Radial Tire Lead	2. Perform Vehicle Lead Diagnosis And Correction Procedure - Refer To Tires And Wheels
	3. Incorrect Front Wheel Camber	3. Check And Reset Front Wheel Camber
	4. Power Steering Gear Imbalance	4. Replace Power Steering Gear
	5. Wheel Braking	5. Correct Braking Condition Causing Lateral Pull
Excessive Steering Free Play	1. Incorrect Steering Gear Adjustment	1. Adjust Or Replace Steering Gear
	2. Worn Or Loose Tie Rod Ends	2. Replace Or Tighten Tie Rod Ends
	3. Loose Steering Gear Mounting Bolts	3. Tighten Steering Gear Bolts To The Specified Torque
	4. Loose Or Worn Steering Shaft Coupler	4. Replace Steering Shaft Coupler
Excessive Steering Effort	1. Low Tire Pressure	1. Inflate All Tires To Recommended Pressure
	2. Lack Of Lubricant In Steering Gear	2. Replace Steering Gear
	3. Low Power Steering Fluid Level	3. Fill Power Steering Fluid Reservoir To Correct Level
	4. Loose Power Steering Pump Belt	4. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	5. Lack Of Lubricant In Steering Ball Joints	5. Lubricate Or Replace Steering Ball Joints
	6. Steering Gear Malfunction	6. Replace Steering Gear

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
	7. Lack Of Lubricant In Steering Coupler	7. Replace Steering Coupler

STANDARD PROCEDURE

CURB HEIGHT MEASUREMENT

The wheel alignment is to be checked and all alignment adjustments made with the vehicle at its required curb height specification.

Vehicle height is to be checked with the vehicle on a flat, level surface, preferably a vehicle alignment rack. The tires are to be inflated to the recommended pressure. All tires are to be the same size as standard equipment. Vehicle height is checked with the fuel tank full of fuel, and no passenger or luggage compartment load.

Vehicle height is not adjustable. If the measurement is not within specifications, inspect the vehicle for bent or weak suspension components. Compare the parts tag on the suspect coil spring(s) to the parts book and the vehicle sales code, checking for a match. Once removed from the vehicle, compare the coil spring height to a correct new or known good coil spring. The heights should vary if the suspect spring is weak.

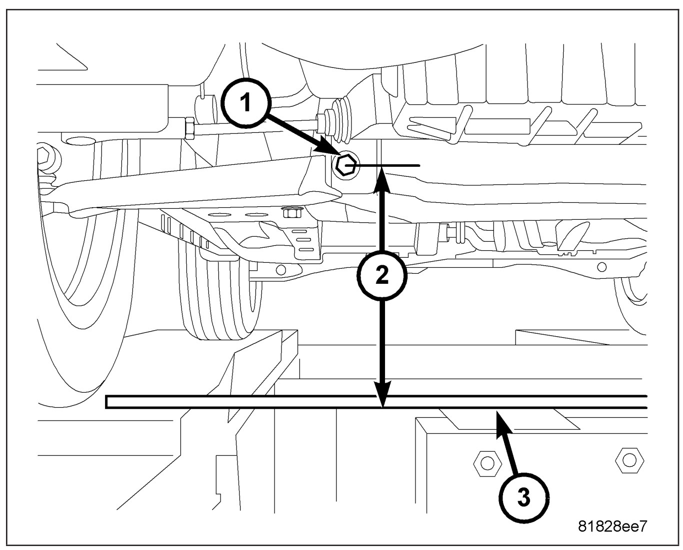
NOTE: Prior to reading the curb height measurement, the front and rear of the vehicle must be jounced to settle the suspension. Induce jounce by pushing down on the center of the bumper (fascia), using care not to damage the vehicle, moving the vehicle up and down, gradually increasing the suspension travel with each stroke. Release the bumper at the bottom of each stroke, repeating this action several times. Perform this to both front and rear suspensions an equal amount of times.

Measure curb height as follows:

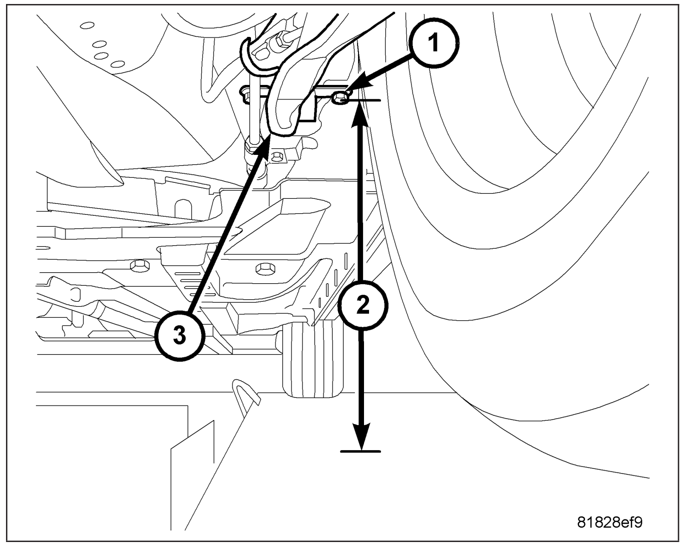
1. Jounce the vehicle. Refer to above note.

NOTE: On some vehicles it may be necessary to remove an engine belly pan in order to gain access to the lower control arm pivot bolt.

2. Front – On each side of the vehicle, measure the distance (2) from the center of the lower control arm pivot bolt head (1) to the floor or alignment rack/lift runway surface. It may be necessary to measure to the bottom of a straight edge, placed from lift runway to runway, to get an accurate measurement.



3. Rear – On each side of the vehicle, measure the distance (2) from the center of the outboard trailing arm-to-body mounting bolt (1) to the floor or alignment rack/lift runway surface.



4. Compare the measurements to specifications listed in the following CURB HEIGHT SPECIFICATIONS chart. Maximum left-to-right differential is not to exceed 12.5 mm (0.5 in.).
5. If curb height is found to be out of specification and there is no sign of excessive body damage, curb height can be changed by replacing the applicable spring with a spring offering a different check load. (Refer to 2 - SUSPENSION/FRONT/STRUT - REMOVAL)

CURB HEIGHT SPECIFICATIONS

VEHICLE	FRONT	REAR
ALL	205 mm ± 8 mm 8.07 in. ± 0.32 in.	328 mm ± 8 mm 12.91 in. ± 0.32 in.

WHEEL ALIGNMENT

PRE-WHEEL ALIGNMENT INSPECTION

Before any attempt is made to change or correct the wheel alignment, the following inspection and necessary corrections must be made to the vehicle to ensure proper alignment.

1. Verify the fuel tank is full of fuel. If the fuel tank is not full, the reduction in weight will affect the curb height of the vehicle and the alignment specifications.
2. The passenger and luggage compartments of the vehicle should be free of any load that is not factory equipment.
3. Check the tires on the vehicle. The tires are to be inflated to the recommended air pressure. All tires must be the same size and in good condition with approximately the same tread wear.
4. Check the front tire and wheel assemblies for excessive radial runout.
5. Inspect all suspension component fasteners for looseness and proper torque.
6. Inspect the lower front ball joints and all steering linkage for looseness and any sign of wear or damage.
7. Inspect the rubber bushings on all the suspension components for signs of wear or deterioration. If any bushings show signs of wear or deterioration, they should be replaced prior to aligning the vehicle.
8. Check vehicle curb height to verify it is within specifications. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE - CURB HEIGHT MEASUREMENT)

WHEEL ALIGNMENT SETUP

1. Position the vehicle on an alignment rack.
2. Install all required alignment equipment on the vehicle, per the alignment equipment manufacturer’s instructions. On this vehicle, a four-wheel alignment is recommended.

NOTE: Prior to reading the vehicle's alignment readouts, the front and rear of vehicle should be jounced. Induce jounce (rear first, then front) by grasping the center of the bumper and jouncing each end of vehicle an equal number of times. The bumper should always be released when vehicle is at the bottom of the jounce cycle.

3. Read the vehicle's current front and rear alignment settings. Compare the vehicle's current alignment settings to the vehicle specifications for camber, caster and toe-in. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)

REAR CAMBER

Rear camber settings on this vehicle are determined at the time the vehicle is designed, by the location of the vehicle's suspension components. This is referred to as Net Build. The result is no required adjustment of camber toe after the vehicle is built or when servicing the suspension components. Thus, when performing a wheel alignment, rear camber is not considered an adjustable angle.

CAUTION: Do not attempt to adjust the vehicles wheel alignment by heating or bending any of the suspension components.

FRONT CAMBER AND CASTER

Front camber and caster settings on this vehicle are determined at the time the vehicle is designed, by the location of the vehicle's suspension components. This is referred to as Net Build. The result is no required adjustment of camber and caster after the vehicle is built or when servicing the suspension components. Thus, when performing a wheel alignment, caster and camber are not normally considered adjustable angles. Camber and caster should be checked to ensure they meet vehicle specifications. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)

If front camber is found not to meet alignment specifications, it can be adjusted using an available camber adjustment bolt package. Before installing a camber adjustment bolt package on a vehicle found to be outside the specifications, inspect the suspension components for any signs of damage or bending.

No adjustment can be made to the caster setting on this vehicle. If the vehicle's caster is not within alignment specifications, check for damaged suspension components or body parts.

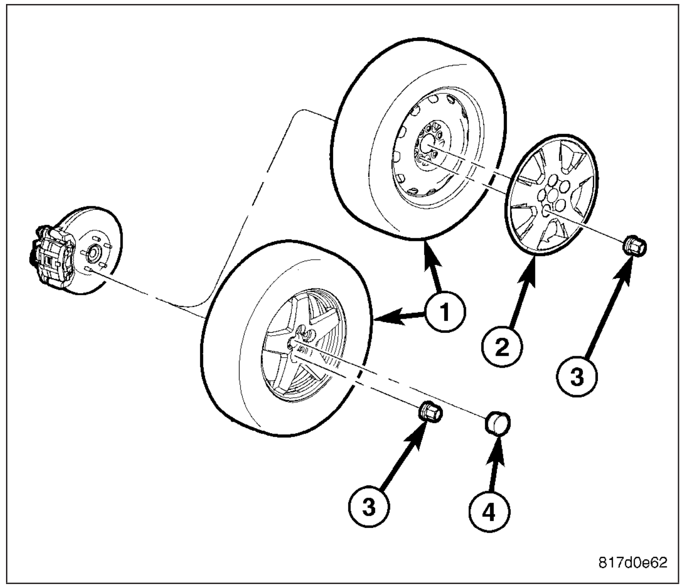
CAUTION: Do not attempt to adjust the vehicles wheel alignment by heating or bending any of the suspension components.

CAMBER ADJUSTMENT BOLT PACKAGE INSTALLATION

The camber adjustment bolt package contains new bolts and nuts for attaching the strut clevis bracket to the steering knuckle. The bolts contained in the package are slightly undersize allowing for movement between the strut clevis bracket and the steering knuckle. The movement allowed by the undersize bolts provide approximately two degrees of camber adjustment per side of the vehicle. To install and adjust the camber adjustment bolt package, follow the procedure below.

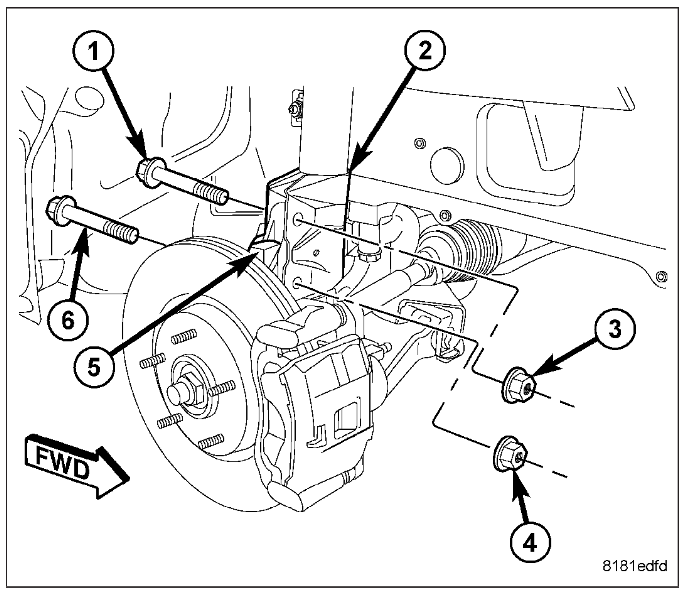
1. Raise the vehicle until its tires are not supporting the weight of the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

2. Remove the wheel mounting nuts (3), then the front tire and wheel assembly.

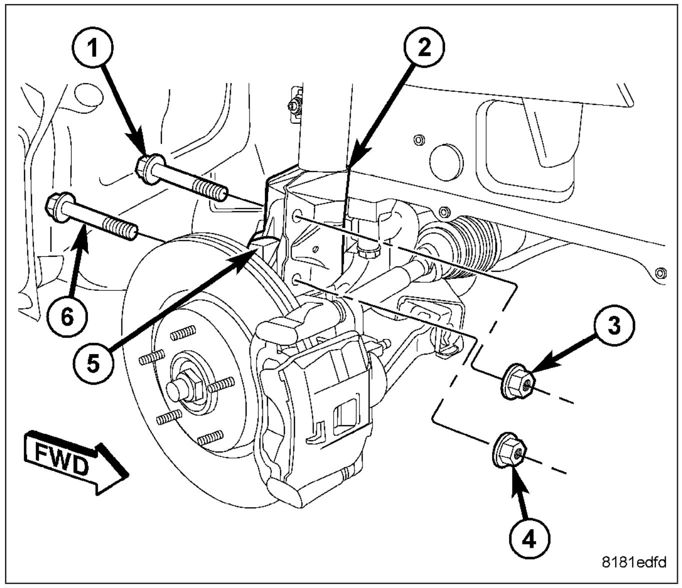


CAUTION: The knuckle-to-strut assembly bolt shanks are serrated and must not be turned during removal. Remove the nuts while holding the bolts stationary, then tap the bolts out using a punch.

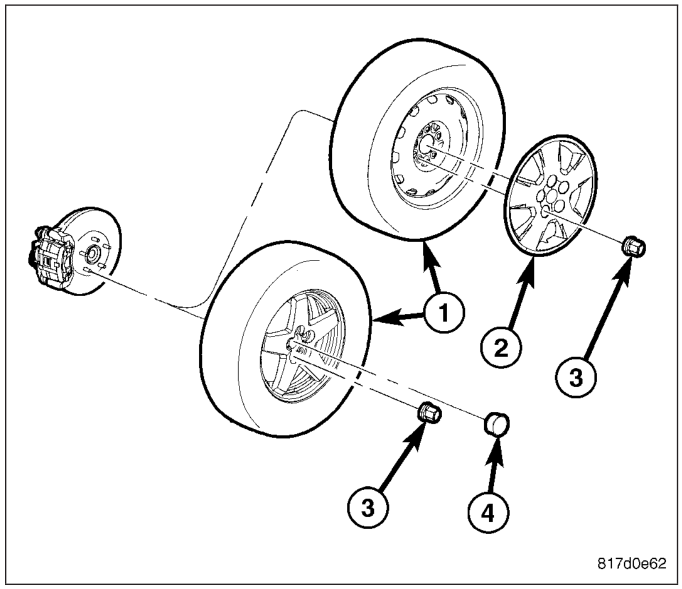
3. Remove the original upper bolt (1) and nut (3) attaching the strut clevis bracket (2) to the knuckle (5).
4. Install a bolt from the adjustment package into the hole where the original bolt was removed. Install the bolt as indicated.
5. Install a nut provided in adjustment package on the replacement bolt. Tighten the nut until it's snug, but still allows the knuckle to slide in the clevis bracket.



6. Remove the original lower bolt (6) and nut (4) attaching the strut clevis bracket (2) to the knuckle (5).
7. Install a bolt from the adjustment package into the bottom hole of the strut clevis bracket. Install the bolt as indicated.
8. Install a nut provided in adjustment package on the replacement bolt. Tighten the nut until it's snug, but still allows the knuckle to slide in the clevis bracket.



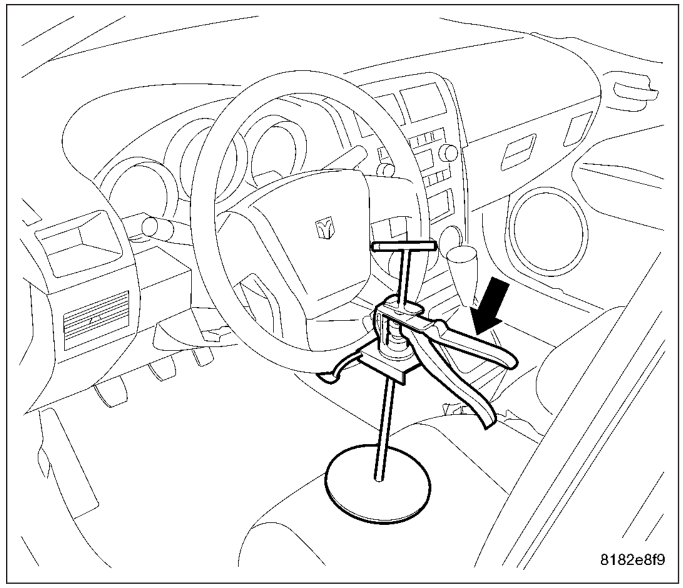
9. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).



10. Perform the above procedure to opposite strut as required.
11. Lower the vehicle and jounce the front and rear of the vehicle.
12. Adjust the front camber to the preferred setting by pushing or pulling on the top of the tire. When camber is set to specifications, tighten the upper and lower strut clevis bracket bolts. Again jounce the front and rear of the vehicle, then verify the camber settings.
13. Tighten front strut clevis bracket-to-steering knuckle attaching bolts to 84 N·m (62 ft. lbs.).
14. Once camber is within specifications, adjust toe to meet the preferred specification setting. Refer to FRONT TOE within this wheel alignment service procedure.

TOE

1. Center the steering wheel and lock it in place using a steering wheel clamp.

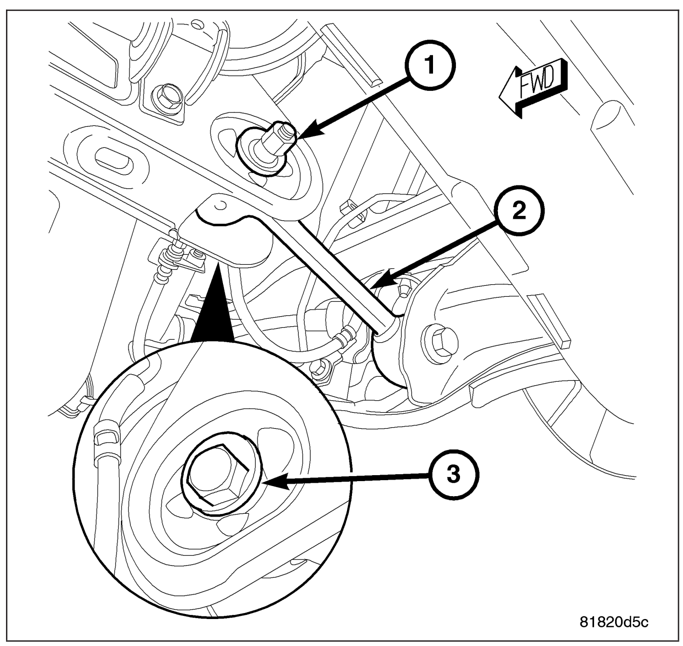


NOTE: When setting toe, make sure to set rear toe to the preferred specifications before setting front toe to the preferred specifications

REAR TOE

NOTE: Perform the following at each rear wheel as necessary.

1. While holding the cam bolt head (3) stationary, loosen the toe link mounting cam bolt nut (1).
2. Rotate the cam bolt head (3) left or right until the rear wheel toe for that rear wheel is set to the preferred specification. (Refer to 2 - SUSPENSION/ WHEEL ALIGNMENT - SPECIFICATIONS)
3. While holding the cam bolt head (3) stationary, tighten the toe link mounting cam bolt nut (1) to 25 N·m (18 ft. lbs.).

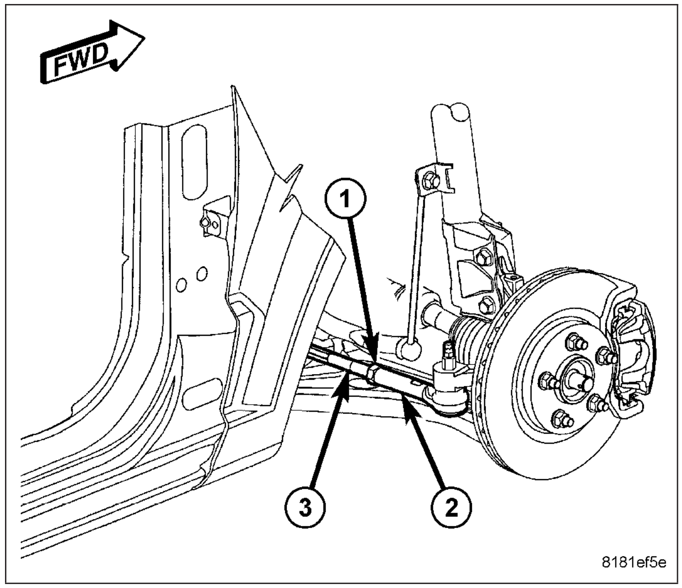


FRONT TOE

CAUTION: Do not twist the inner tie rod-to-steering gear rubber boots while turning the inner tie rods during the front toe adjustment.

NOTE: Perform the following at each front wheel as necessary.

1. Loosen the tie rod adjusting jam nut (1). Grasp the inner tie rod (3) and rotate it one way or the other until the front wheel toe is set to the preferred specification. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)
2. Tighten the tie rod adjusting jam nut to of 75 N·m (55 ft. lbs.).
3. Make sure the inner tie rod-to-steering gear rubber boot is not twisted.



2. Remove the steering wheel clamp.
3. Remove the alignment equipment.
4. Road test the vehicle to verify the steering wheel is straight and the vehicle does not pull or wander.

SPECIFICATIONS

WHEEL ALIGNMENT

NOTE: All specifications are given in degrees.

NOTE: All wheel alignments are to be set with the vehicle at curb height. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

FRONT WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
CAMBER	-0.43°	-0.83° to -0.03°
Cross Camber (Maximum Side-To-Side Difference)	0.00°	0.50
CASTER*	+2.50°	+1.50° to +3.50°
Cross Caster (Maximum Side-To-Side Difference)	0.00°	1.00°
TOE - INDIVIDUAL	+0.05°	-0.05° to +0.15°
TOE - TOTAL**	+0.10°	-0.10° to +0.30°
REAR WHEEL ALIGNMENT	**PREFERRED SETTING**	**ACCEPTABLE RANGE**
CAMBER*	-0.50°	-0.90° to -0.10°
TOE - INDIVIDUAL	+0.10°	0.00° to +0.20°
TOE - TOTAL**	+0.20°	0.00° to +0.40°
THRUST ANGLE	0.00°	-0.10° to +0.10°
Notes: * For reference only. These are nonadjustable angles. ** TOTAL TOE is the sum of both the left and right wheel toe settings. TOTAL TOE must be equally split between each wheel on the same axle to ensure the steering wheel is centered after setting toe. Positive toe (+) is toe-in and negative toe (−) is Toe-out.		

DIFFERENTIAL & DRIVELINE

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HALF SHAFT-FRONT

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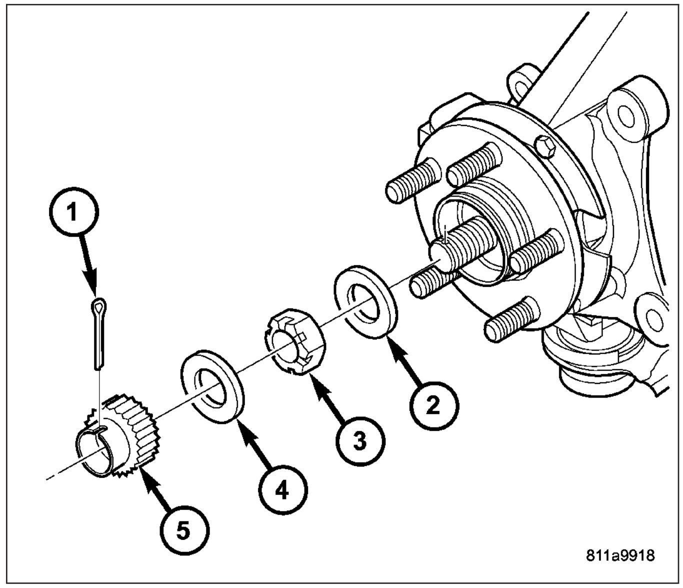
HALF SHAFT-FRONT

DESCRIPTION

Naturally aspirated models equipped with either an automatic or manual transmission use an unequal-length half-shaft system. The system incorporates two halfshaft assemblies (left and right) that consist of an inner and outer constant velocity (CV) joint and a solid interconnecting shaft. The right halfshaft is longer than the left due to trans-axle packaging and powertrain design.

Both halfshaft assemblies use the same type of inner and outer joints. The inner joint of both halfshaft assemblies is a tripod joint, and the outer joint of both halfshaft assemblies is a Rzeppa joint. Both tripod joints and Rzeppa joints are true constant velocity (CV) joint assemblies. The inner tripod joint allows for the changes in halfshaft length through the jounce and rebound travel of the front suspension.

The left halfshaft inner tripod joint and the intermediate shaft are both splined into the transaxle side gears. The inner tripod joints are retained using a snap ring located in the stub shaft of the tripod joint. The outer CV joint has a stub shaft that is splined into the wheel hub and retained by a hub nut (3) and washer (2), nut lock (5), spring washer (4) and cotter pin (1).



Halfshaft Retaining Hardware

1 - COTTER PIN
2 - WASHER
3 - HUB NUT
4 - SPRING WASHER
5 - NUT LOCK

OPERATION

Halfshaft assemblies are designed to transmit power from the transaxle to the front wheels, while allowing for pow-ertrain and suspension flex.

DIAGNOSIS AND TESTING

HALFSHAFT DIAGNOSIS

VEHICLE INSPECTION

1. Check for grease in the vicinity of the inboard tripod joint and outboard CV joint; this is a sign of inner or outer joint seal boot or seal boot clamp damage.

NOISE AND/OR VIBRATION IN TURNS

A clicking noise and/or a vibration in turns could be caused by one of the following conditions:

1. Loose hub nut. Using a click-style torque wrench, torque hub nut to 244 N·m (180 ft. lbs.).

2. Damaged outer CV or inner tripod joint seal boot or seal boot clamps, which is evident by the presence of grease slung outward from the joint. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.
3. Noise may also be caused by another component of the vehicle coming in contact with the halfshafts.

CLUNKING NOISE DURING ACCELERATION

This noise may be a result of one of the following conditions:

1. A torn seal boot on the inner or outer joint of the halfshaft assembly, which is evident by the presence of grease slung outward from the joint. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.
2. A loose or missing clamp on the inner or outer joint of the halfshaft assembly. This may be accompanied by the visible loss of grease.
3. A damaged or worn halfshaft CV joint. Isolate the noise to one side of the vehicle. Replace only the affected side. Replacing both halfshafts is not necessary.

SHUDDER OR VIBRATION DURING ACCELERATION

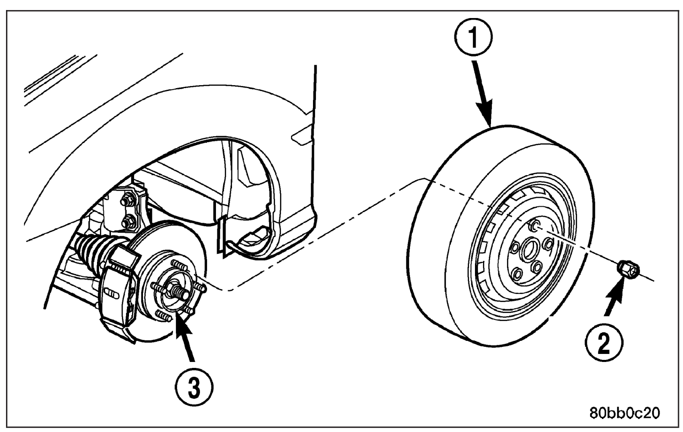
1. A worn or damaged halfshaft inner tripod joint. Isolate the condition to one side of the vehicle. Replace only the affected side. Replacing both halfshafts is not necessary.
2. A sticking tripod joint spider assembly (inner tripod joint only). Isolate the condition to one side of the vehicle. Replace only the affected side. Replacing both halfshafts is not necessary.
3. Improper wheel balance.

VIBRATION AT HIGHWAY SPEEDS

1. Foreign material (mud, etc.) packed on the backside of the wheel(s).
2. Out of balance front tires or wheels.
3. Improper tire and/or wheel runout.

REMOVAL

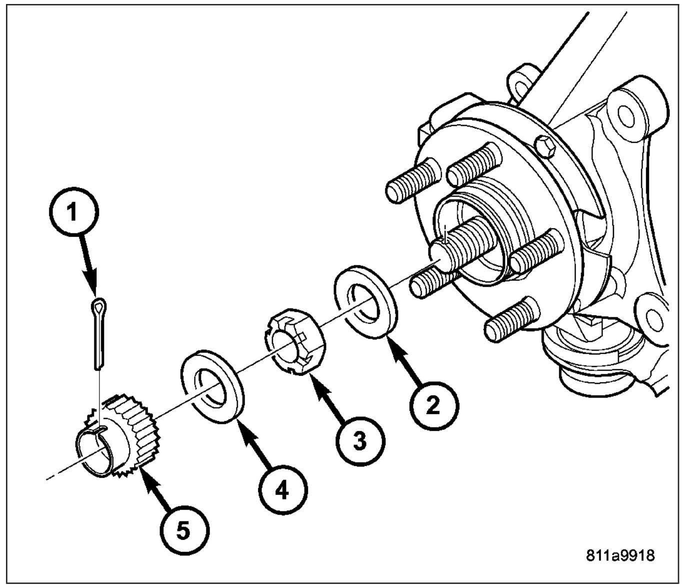
CAUTION: Boot sealing is vital to retain special lubricants and to prevent foreign contaminants from entering the CV joint. Mishandling, such as allowing the assemblies to dangle unsupported, or pulling or pushing the ends can cut boots or damage CV joints. During removal and installation procedures, always support both ends of the halfshaft to prevent damage.



CAUTION: The halfshaft, when installed, acts as a bolt and secures the front hub/bearing assembly. If vehicle is to be supported or moved on its wheels with a halfshaft removed, install a PROPER–SIZED BOLT AND NUT through front hub. Tighten bolt and nut to 244 N·m (180 ft. lbs.). This will ensure that the hub bearing cannot loosen.

1. Disconnect battery negative cable.
2. Place transaxle in gated park.
3. Raise vehicle on hoist.
4. Remove wheel and tire assembly (1).

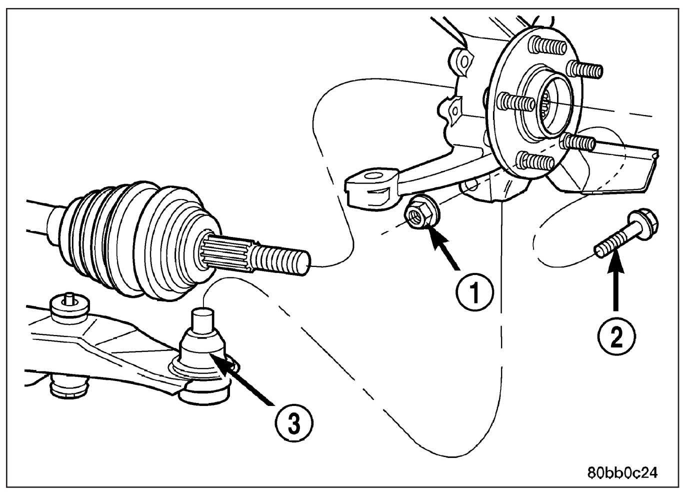
5. Remove the cotter pin (1), nut lock (5), spring washer (4), and hub nut (3) from the end of the outer C/V joint stub axle.



Halfshaft Retaining Hardware

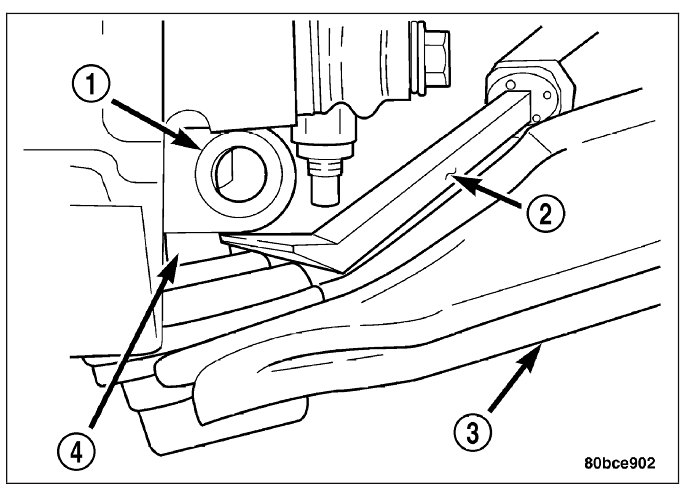
1 - COTTER PIN
2 - WASHER
3 - HUB NUT
4 - SPRING WASHER
5 - NUT LOCK

6. If equipped with ABS, disconnect the front wheel speed sensor and secure harness out of the way.
7. Remove nut and bolt (1,2) retaining ball joint stud (3) into steering knuckle.



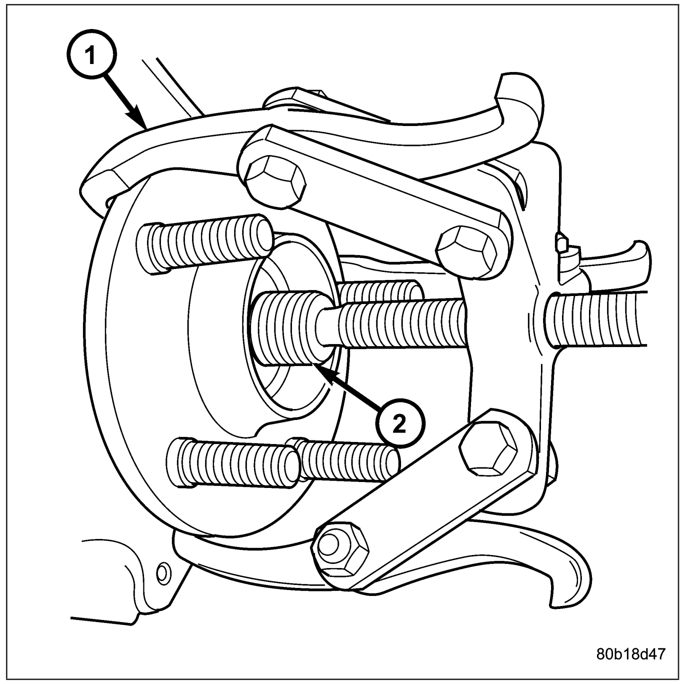
NOTE: Use caution when separating ball joint stud from steering knuckle, so ball joint seal does not get damaged.

8. Separate ball joint stud (4) from steering knuckle (1) by prying down on lower control arm (3).

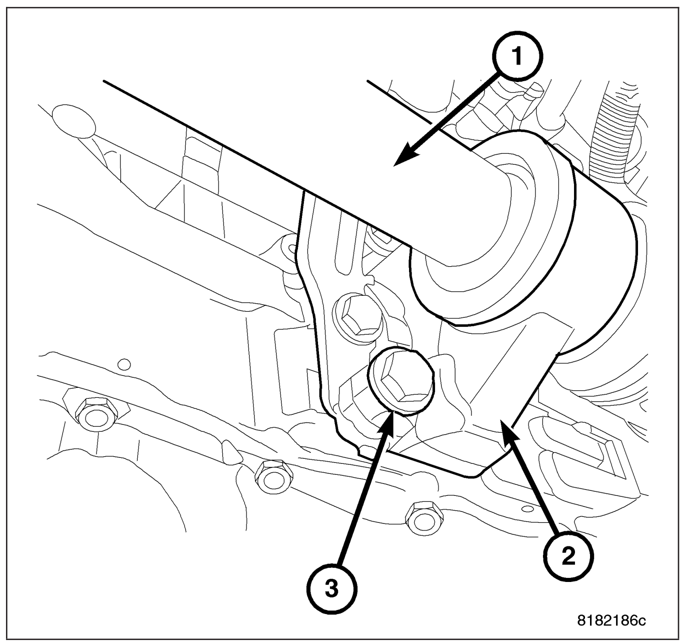


NOTE: Care must be taken not to separate the inner CV joint during this operation. Do not allow halfshaft to hang by inner CV joint, halfshaft must be supported.

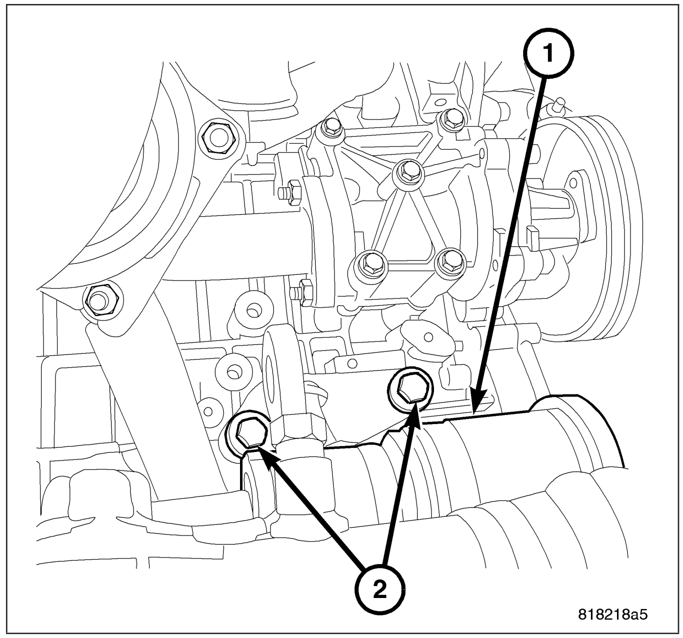
9. Remove halfshaft (2) from steering knuckle by pulling outward on knuckle while pressing in on halfshaft. Support outer end of halfshaft assembly. If difficulty in separating halfshaft from hub is encountered, **do not strike shaft with hammer,** instead use Puller 1026 (1) to separate.



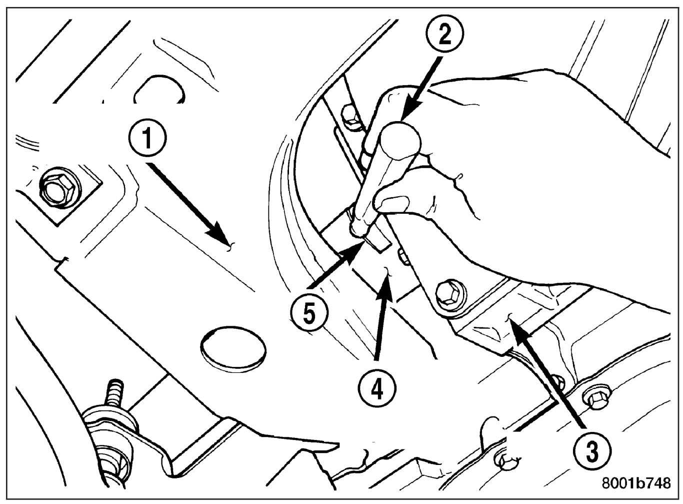
10. If the vehicle is two wheel drive remove the halfshaft bracket (2) to engine lower mounting bolt (3).



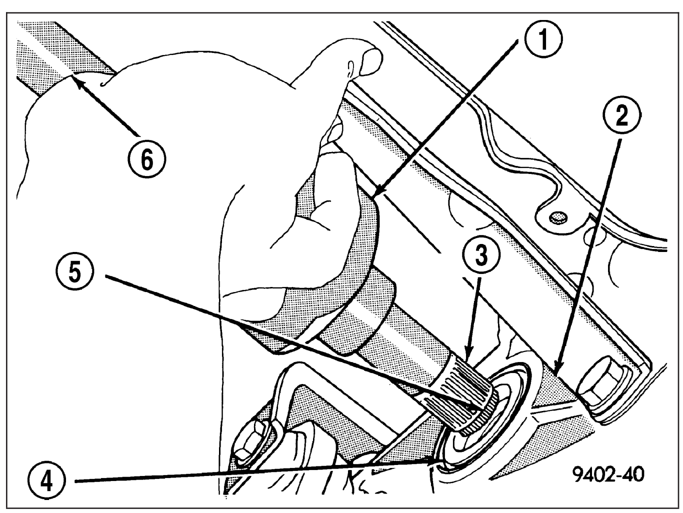
11. If the vehicle is two wheel drive remove the half-shaft bracket to engine upper mounting bolts (2).
12. Support outer end of the halfshaft assembly.



NOTE: Removal of the inner tripod joints is made easier if you apply outward pressure on the joint as you strike the punch with a hammer. Do not pull on interconnecting shaft to remove, as the inner joint will become separated.



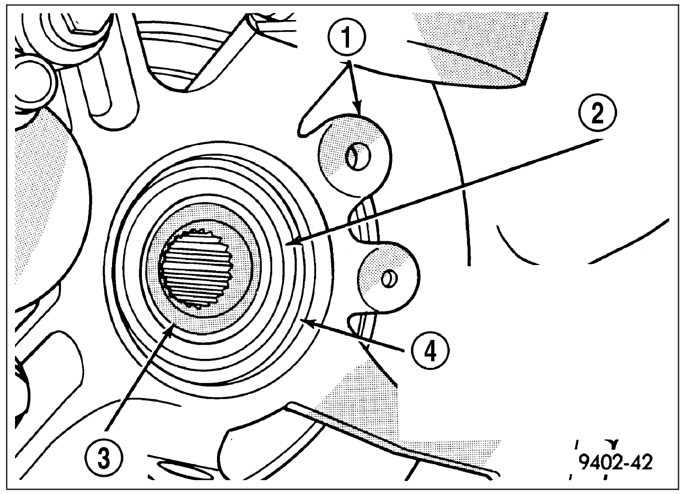
13. Remove the inner tripod joints (4) from the side gears of the transaxle using a punch (2) to dislodge the inner tripod joint retaining ring from the transaxle side gear. If removing the right side inner tripod joint, position the punch to the inner tripod joint extraction groove (5) (if equipped). Strike the punch sharply with a hammer to dislodge the right inner joint from the side gear. If removing the left side inner tripod joint, position the punch to the inner tripod joint extraction groove. Strike the punch sharply with a hammer to dislodge the left inner tripod joint from the side gear.
14. Hold inner tripod joint (1) and interconnecting shaft (6) of halfshaft assembly. Remove inner tripod joint from transaxle by pulling it straight out of transaxle side gear and transaxle oil seal (4). **When removing tripod joint, do not let spline or snap ring drag across sealing lip of the transaxle to tripod joint oil seal. When tripod joint is removed from transaxle, some fluid will leak out.**



CAUTION: The halfshaft, when installed, acts as a bolt and secures the front hub/bearing assembly. If vehicle is to be supported or moved on its wheels with a halfshaft removed, install a PROPER–SIZED BOLT AND NUT through front hub. Tighten bolt and nut to 244 N·m (180 ft. lbs.). This will ensure that the hub bearing cannot loosen.

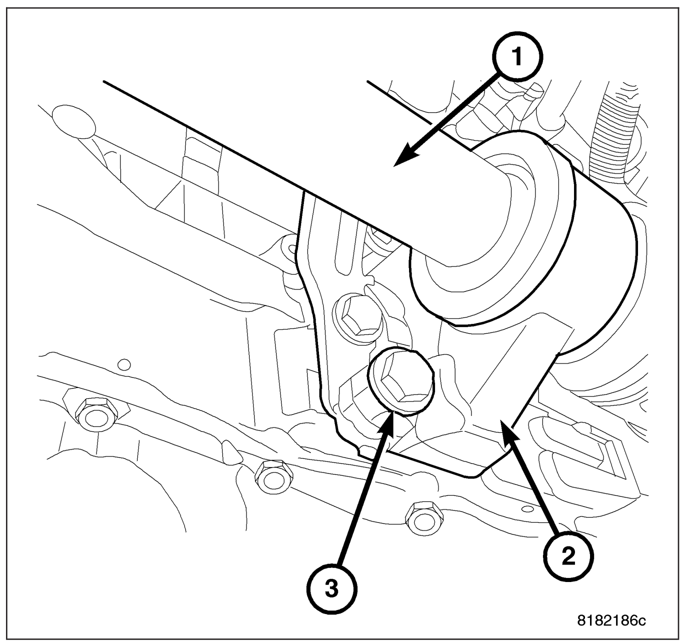
INSTALLATION

1. Clean all debris and moisture out of steering knuckle (4).

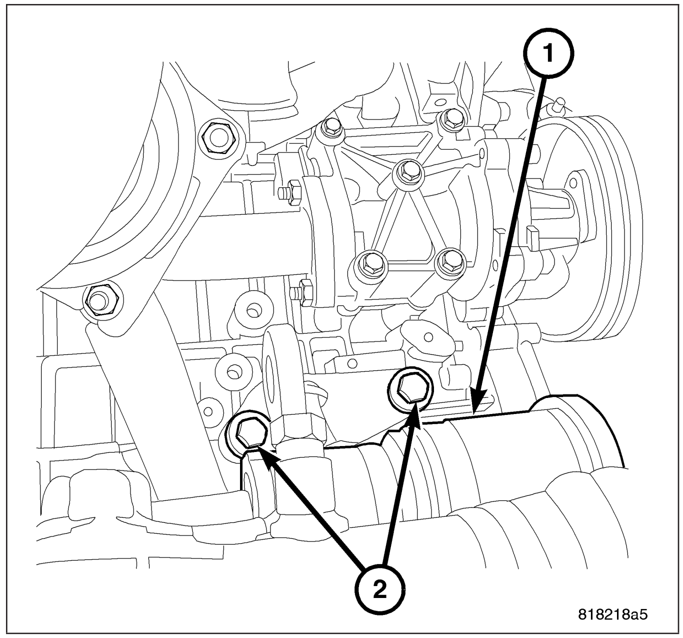


CAUTION: Boot sealing is vital to retain special lubricants and to prevent foreign contaminants from entering the CV joint. Mishandling, such as allowing the assemblies to dangle unsupported, or pulling or pushing the ends can cut boots or damage CV joints. During removal and installation procedures, always support both ends of the halfshaft to prevent damage.

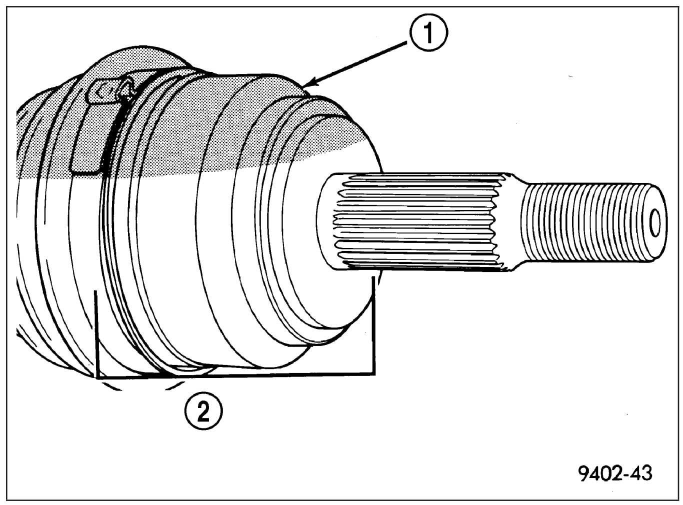
2. Thoroughly clean spline and oil seal sealing surface, on tripod joint. Lightly lubricate oil seal sealing surface on tripod joint with fresh clean transmission lubricant.
3. Holding halfshaft assembly by tripod joint and interconnecting shaft, install tripod joint into transaxle side gear as far as possible by hand.
4. Carefully align tripod joint with transaxle side gears. Then grasp halfshaft interconnecting shaft and push tripod joint into transaxle side gear until fully seated. **Test that snap ring is fully engaged with side gear by attempting to remove tripod joint from transaxle by hand. If snap ring is fully engaged with side gear, tripod joint will not be removable by hand.**
5. If the vehicle is two wheel drive install the halfshaft bracket (2) to engine lower mounting bolt (3) and torque to 75 N·m (55 ft. lbs.).



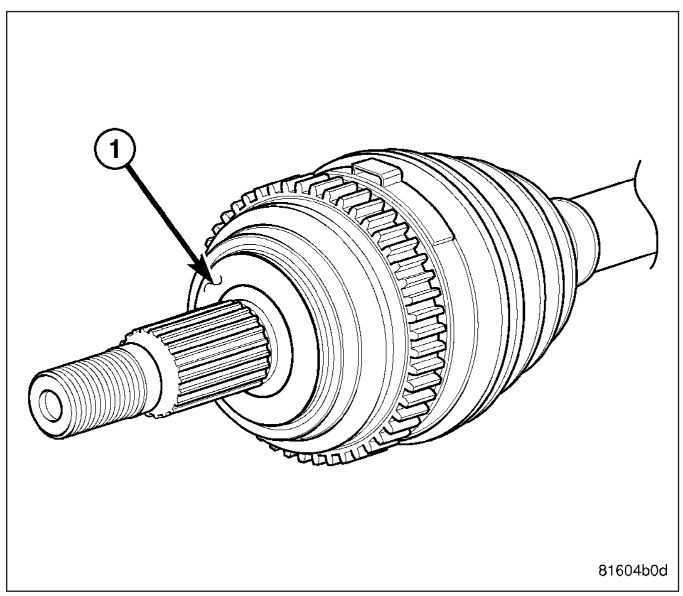
6. If the vehicle is two wheel drive install the halfshaft bracket upper mounting bolts (2) and torque to 75 N·m (55 ft. lbs.).



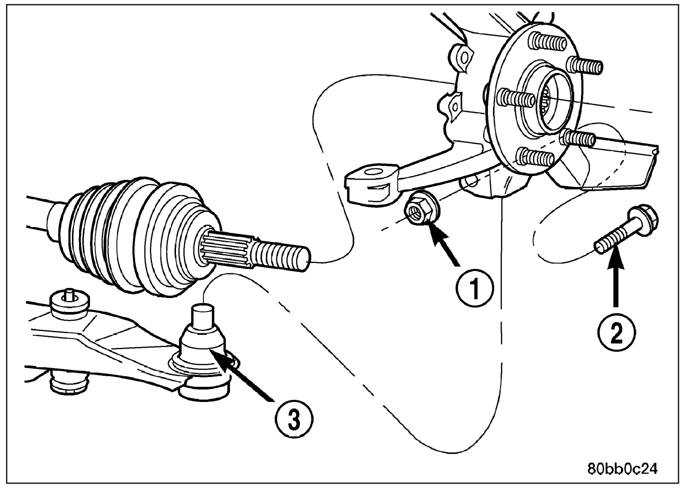
7. Ensure that front of outer CV joint (2) which fits into steering knuckle, is free of debris and moisture before assembling into steering knuckle.



8. Apply a light coating of MOPAR® multi-purpose wheel bearing grease around the circumference of the flat surface (1). **Do not apply too much grease, which could spill on to the non mating and adversely affect the function of the half-shaft.**
9. Wipe the rear of the hub and bearing in the knuckle clean where they contact the C/V joint.
10. Install halfshaft back into front hub.

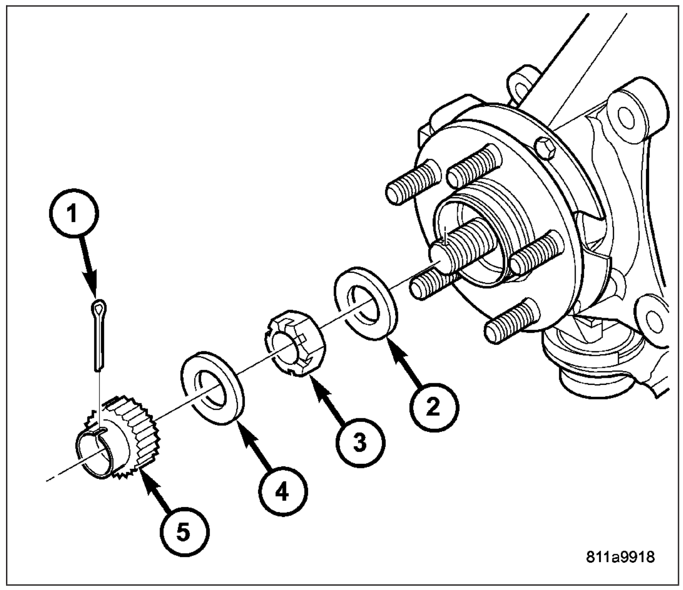


11. Install steering knuckle onto the ball joint stud (3).



NOTE: At this point, the outer joint will not seat completely into the front hub. The outer joint will be pulled into hub and seated when the hub nut is installed and torqued.

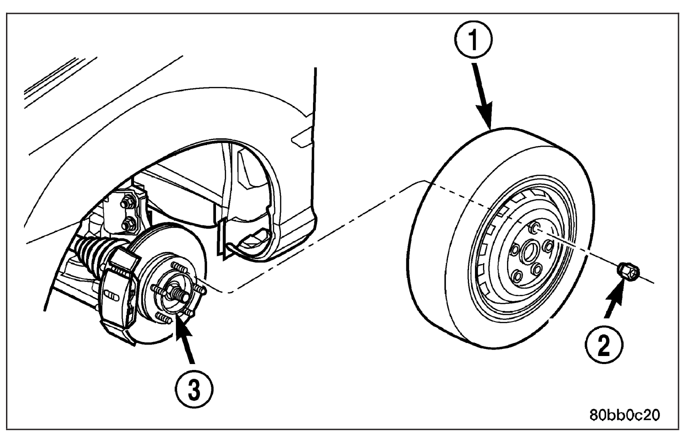
12. Install a **NEW** steering knuckle to ball joint stud bolt (2) and nut (1). Tighten the nut and bolt to 95 N·m (70 ft. lbs.).
13. Clean all foreign matter from threads of halfshaft outer stub axle. Install washer (2) and hub nut (3) onto the threads of the stub axle and tighten nut (3) to 244 N·m (180 ft. lbs.).
14. Install spring washer (4), nut lock (5), and cotter pin (1).



Halfshaft Retaining Hardware

1 - COTTER PIN
2 - WASHER
3 - HUB NUT
4 - SPRING WASHER
5 - NUT LOCK

15. Install front wheel and tire assembly (1). Install front wheel lug nuts (2) and tighten to 128 N·m (95 ft. lbs.).
16. Check for correct fluid level in transaxle assembly.
17. Lower vehicle.
18. Connect battery negative cable.



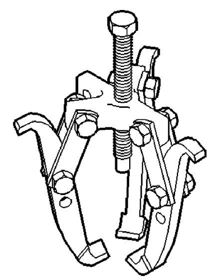
SPECIFICATIONS

TORQUE

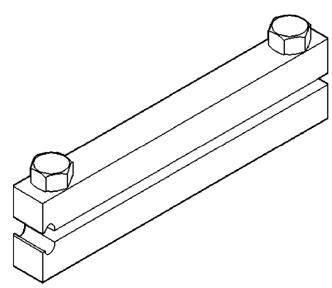
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolt, Intermediate Shaft Bracket-block	75	55	-
Nut, Driveshaft-to-Hub/ Bearing	244	180	-
Nut, Knuckle-to-Ball Joint Bolt	95	70	-
Nut, Wheel to Hub	128	95	-

SPECIAL TOOLS

HALFSHAFT



Puller 1026



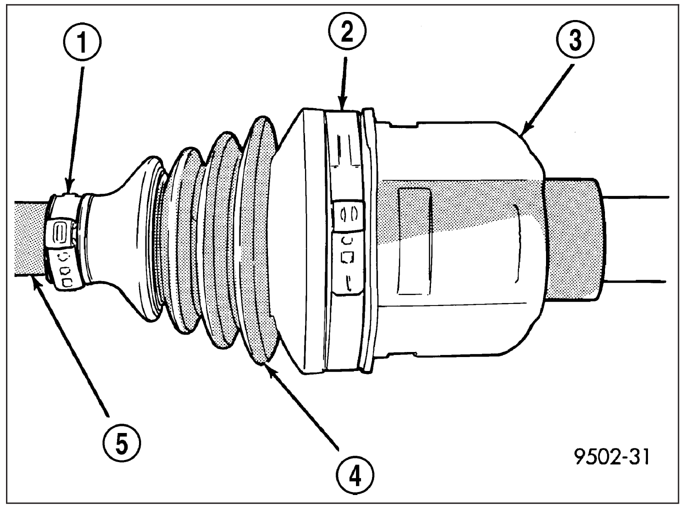
Crimping Tool C-4975A

CV BOOT-INNER

REMOVAL

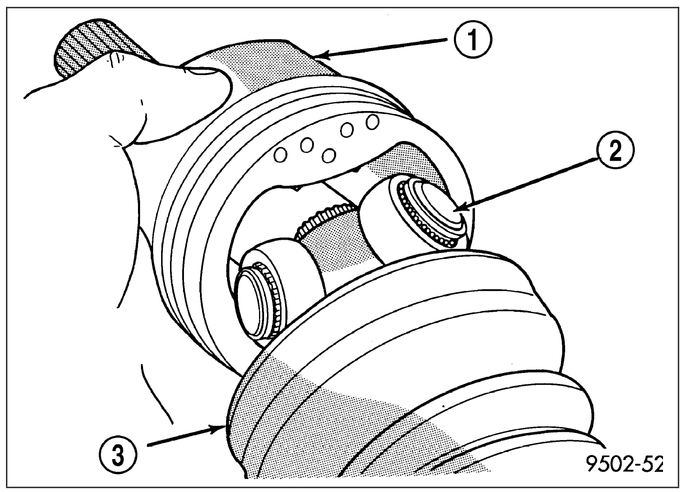
CAUTION: The inner tripod joints will use a retaining clips inside the housing to keep the spider assembly in the housing. Do not pull on the interconnecting shaft to disengage tripod housing from transmission stub shaft. Removal in this manner will cause damage to the inboard joint sealing boots.

1. Remove the halfshaft requiring boot replacement from the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)
2. Remove large boot clamp (2) that retains inner tripod joint sealing boot to tripod joint housing (3) and discard. Then remove small clamp (1) that retains inner tripod joint sealing boot to interconnecting shaft (5) and discard. Remove the sealing boot (4) from the tripod housing and slide it down the interconnecting shaft.

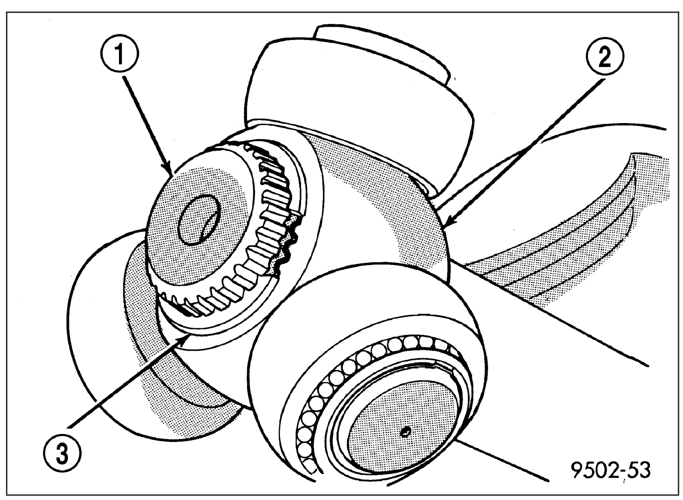


CAUTION: When removing the spider joint from the tripod joint housing, hold the rollers in place on the spider trunions to prevent the rollers and needle bearings from falling away.

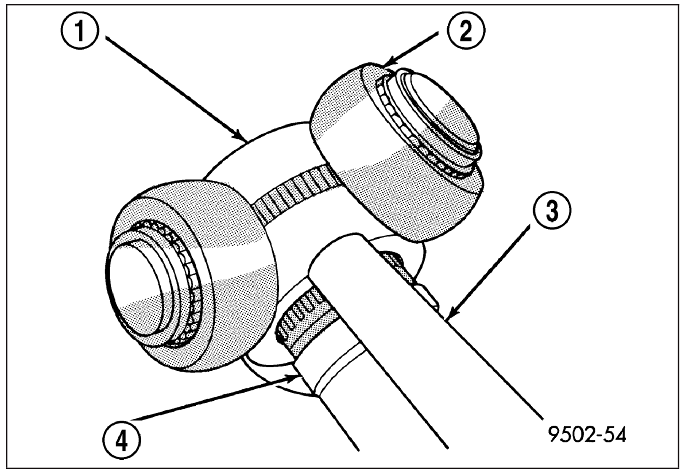
3. Slide the interconnecting shaft and spider assembly (2) out of the tripod joint housing (1).



4. Remove snap ring (3) that retains spider assembly (2) to interconnecting shaft (1).

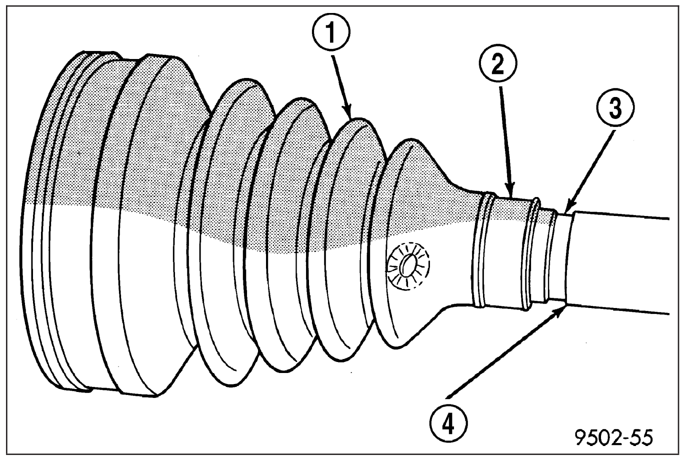


5. Remove the spider assembly (1) from interconnecting shaft (4). If spider assembly will not come off interconnecting shaft by hand, it can be removed by tapping spider assembly with a brass drift (3). **Do not hit the outer tripod bearings in an attempt to remove spider assembly from interconnecting shaft.**
6. Slide sealing boot off interconnecting shaft.
7. Thoroughly clean and inspect spider assembly, tripod joint housing, and interconnecting shaft for any signs of excessive wear. **If any parts show signs of excessive wear, the halfshaft assembly will require replacement. Component parts of these halfshaft assemblies are not serviceable.**



INSTALLATION

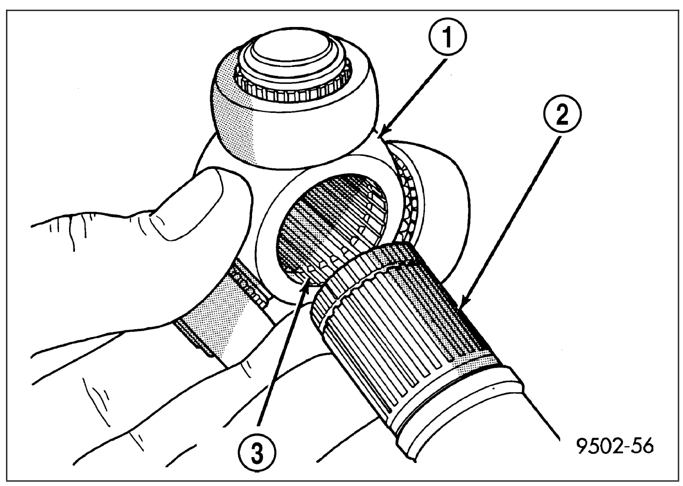
NOTE: The inner tripod joint sealing boots are made from two different types of material. High-temperature applications (close to exhaust system) use silicone rubber whereas standard temperature applications use Hytrel plastic. The silicone sealing boots are soft and pliable. The Hytrel sealing boots are stiff and rigid. The replacement sealing boot MUST BE the same type of material as the sealing boot that was removed.



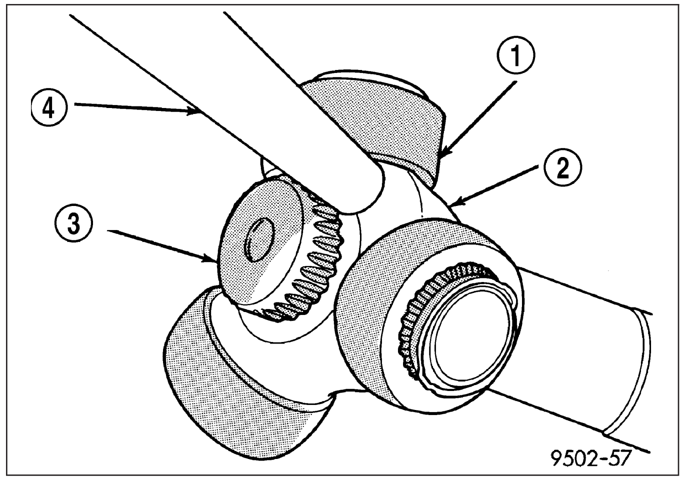
1. Slide inner tripod joint seal boot retaining clamp onto interconnecting shaft (4). Then slide the replacement inner tripod joint sealing boot (1) onto interconnecting shaft. **Inner tripod joint seal boot MUST be positioned on interconnecting shaft, so the raised bead on the inside of the seal boot is in groove (3) on interconnecting shaft.**

NOTE: The rollers can fall off use, caution when installing the tripod

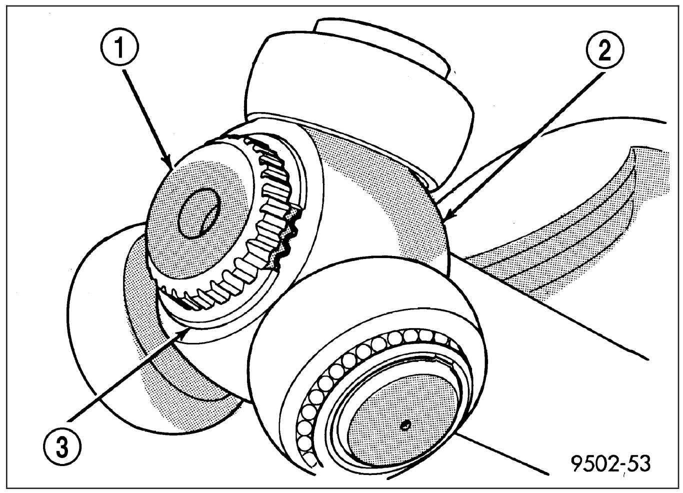
2. Install spider assembly (1) onto interconnecting shaft with chamfer (3) on spider assembly toward interconnecting shaft (3).



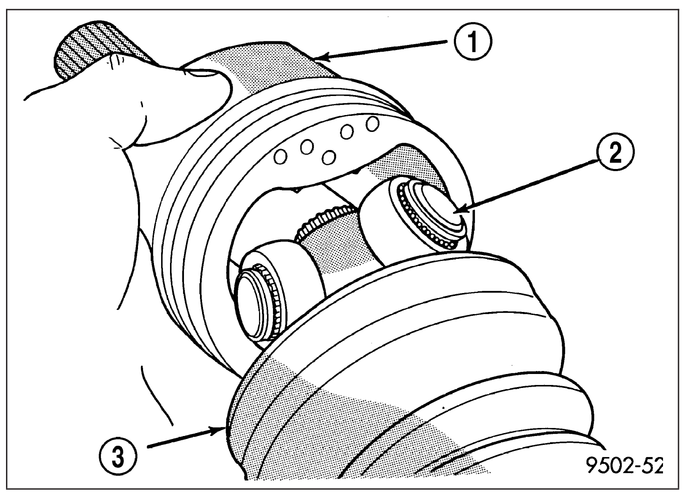
3. Spider assembly (2) must be installed on interconnecting shaft (3) far enough to fully install spider retaining snap ring. If spider assembly will not fully install on interconnecting shaft by hand, it can be installed by tapping the spider body with a brass drift (4). **Do not hit the outer tripod bearings in an attempt to install spider assembly on interconnecting shaft.**



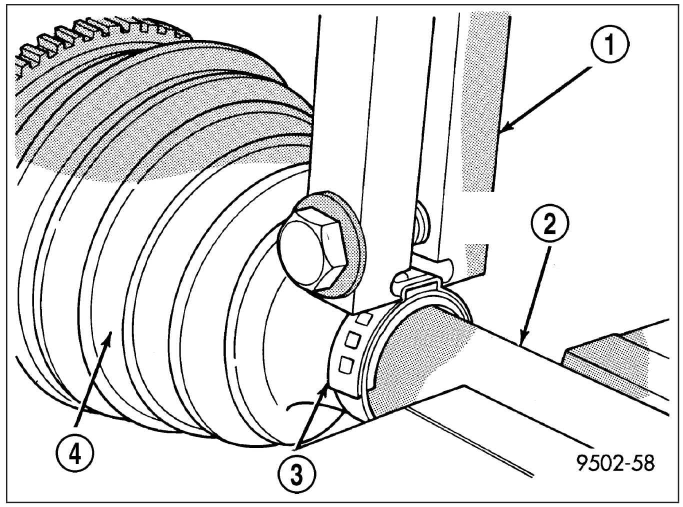
4. Install the spider assembly (2) to interconnecting shaft retaining snap ring (3) into groove on end of interconnecting shaft. Be sure the snap ring is fully seated into groove on interconnecting shaft (1).



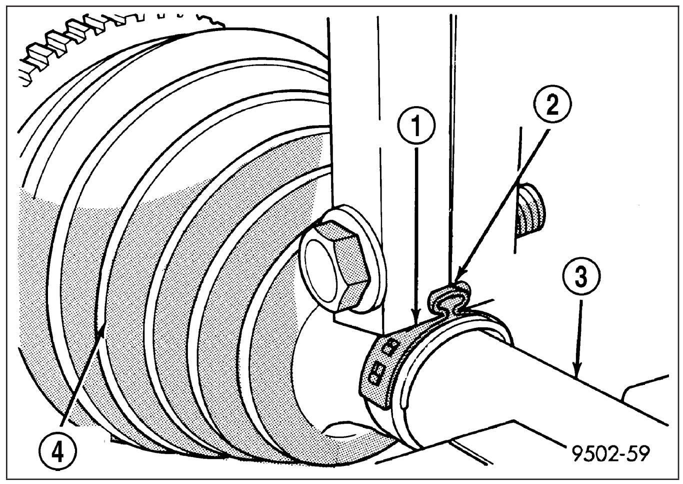
5. Distribute 1/2 the amount of grease provided in the seal boot service package (DO NOT USE ANY OTHER TYPE OF GREASE) into tripod housing. Put the remaining amount into the sealing boot (3).
6. Align tripod housing (1) with spider assembly (2) and then slide tripod housing over spider assembly and interconnecting shaft.



7. Install inner tripod joint seal boot to interconnecting shaft clamp (3) evenly on sealing boot (4).
8. Clamp sealing boot onto interconnecting shaft using Crimping Tool C-4975-A and the following procedure. Place Crimping Tool C-4975-A over bridge of clamp.



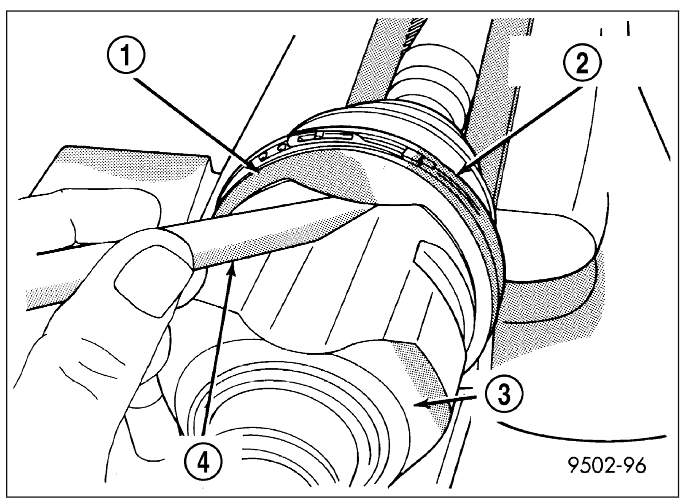
9. Tighten nut on crimping tool C-4975-A (2) until jaws on tool are closed completely together (2), face to face.



CAUTION: Seal must not be dimpled, stretched, or out–of–shape in any way. If seal is NOT shaped correctly, equalize pressure in seal and shape it by hand.

10. Position sealing boot into the tripod housing (3) retaining groove. Install seal boot retaining clamp (2) evenly on sealing boot (1).

CAUTION: The following positioning procedure determines the correct air pressure inside the inner tripod joint assembly prior to clamping the sealing boot to inner tripod joint housing. If this procedure is not done prior to clamping sealing boot to tripod joint housing, boot durability can be adversely affected.

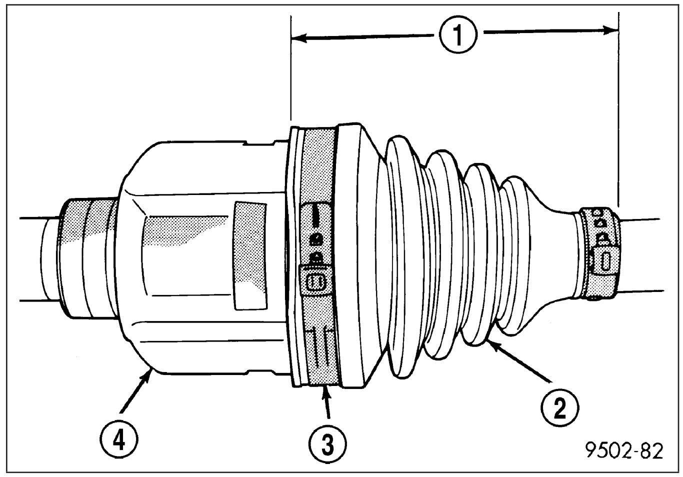


CAUTION: When venting the inner tripod joint assembly, use care so inner tripod sealing boot does not get punctured or, in any other way, damaged. If sealing boot is punctured or damaged while being vented, the sealing boot can not be used.

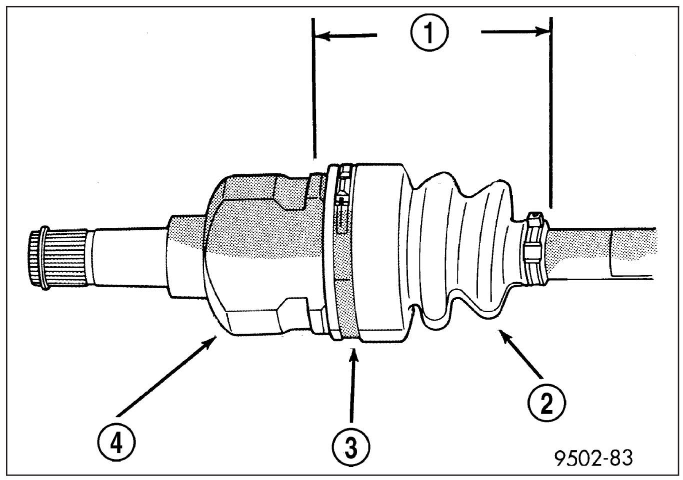
11. Insert a trim stick (4) between the tripod joint (3) and the sealing boot (1) to vent inner tripod joint assembly. **When inserting trim stick between tripod housing and sealing boot, ensure trim stick is held flat and firmly against the tripod housing. If this is not done, damage to the sealing boot can occur.** If inner tripod

joint has a Hytrel (hard plastic) sealing boot, be sure trim stick is inserted between soft rubber insert and tripod housing, and not the hard plastic sealing boot and soft rubber insert.

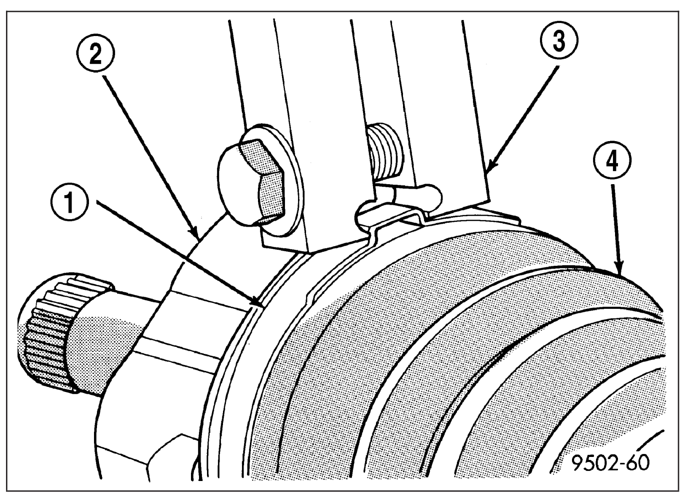
12. With trim stick inserted between sealing boot (2) and tripod joint housing (4), position inner tripod joint on halfshaft until correct sealing boot edge to edge length (1) is obtained for type of sealing boot material being used. Then remove the trim stick.



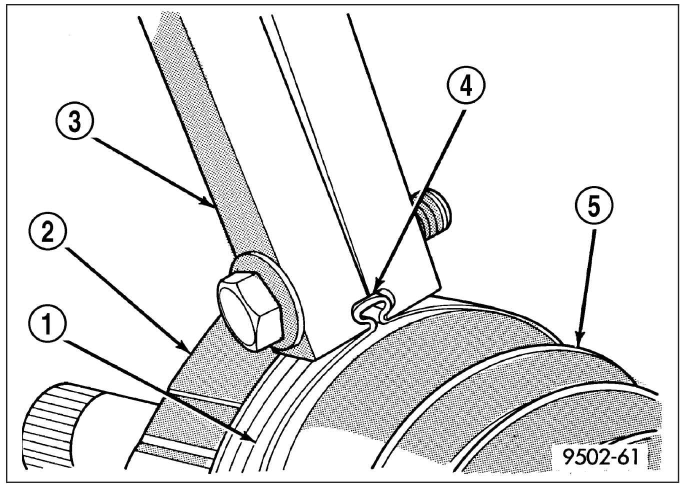
13. With trim stick inserted between sealing boot (2) and tripod joint housing (4), position inner tripod joint on halfshaft until correct sealing boot edge to edge length (1) is obtained for type of sealing boot material being used. Then remove the trim stick.



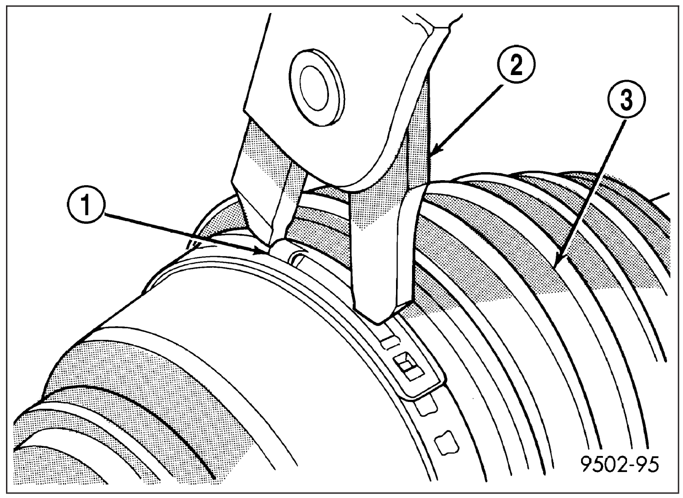
14. Clamp (1) tripod joint sealing boot (4) to tripod joint (2) using required procedure for type of boot clamp application. If seal boot uses crimp type boot clamp, clamp sealing boot onto tripod housing using crimper, Crimping Tool C-4975-A (3). Place Crimping Tool C-4975-A over bridge of clamp (1).



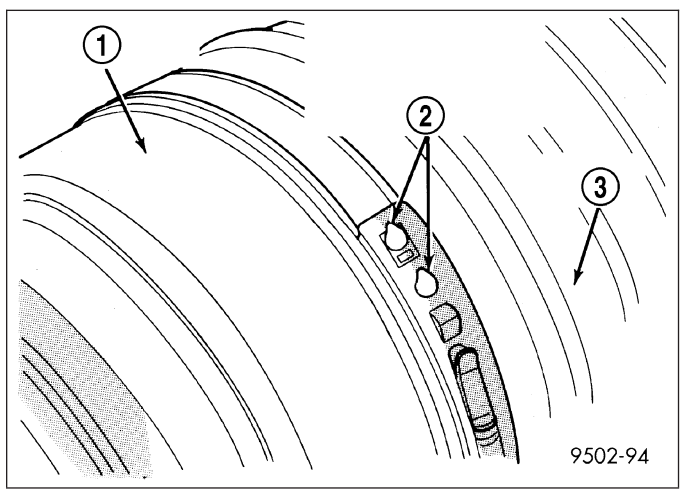
15. Tighten nut on Crimping Tool C-4975-A (3) until jaws on tool (4) are closed completely together (4), face–to–face.



16. If seal boot (3) uses low profile latching type boot clamp, clamp sealing boot onto tripod housing using Clamping Tool, Snap-On® YA3050 (2) (or an equivalent). Place prongs of Clamp Locking Tool in the holes of the clamp (1).



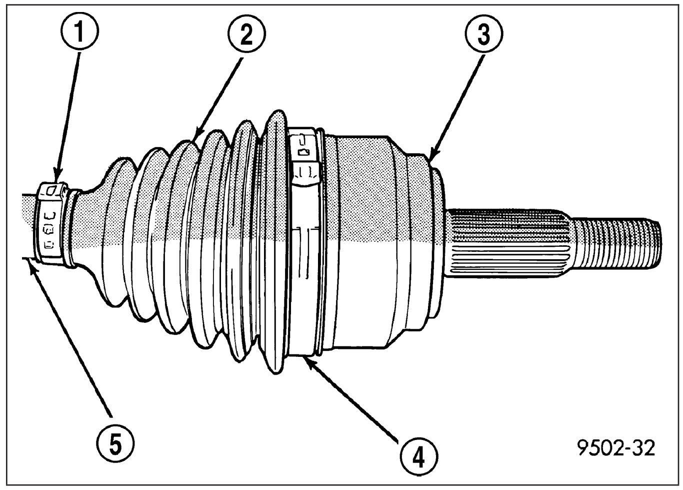
17. Squeeze tool together until top band of clamp is latched behind the two tabs (2) on lower band of clamp.
18. Install the halfshaft requiring boot replacement back on the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)



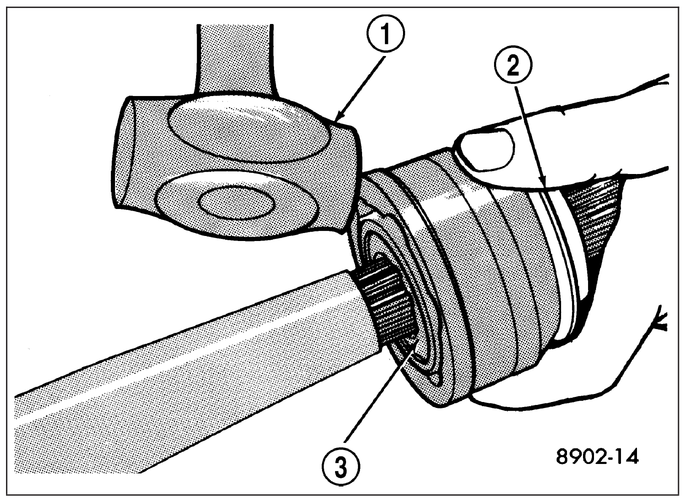
CV BOOT-OUTER

REMOVAL

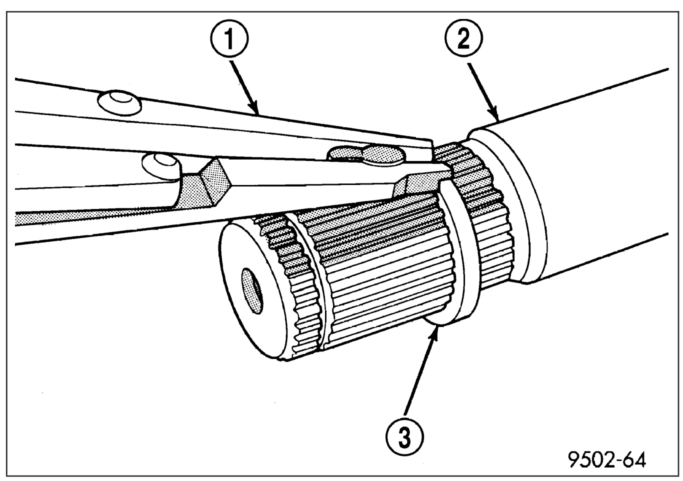
1. Remove halfshaft assembly requiring boot replacement from vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)
2. Remove large boot clamp (4) retaining CV joint sealing boot to CV joint housing (3) and discard. Remove small clamp (1) that retains outer CV joint sealing boot to interconnecting shaft (5) and discard. Remove sealing boot (2) from outer CV joint housing and slide it down interconnecting shaft.
3. Wipe away grease to expose outer CV joint and interconnecting shaft.



4. Remove outer CV joint from interconnecting shaft using the following procedure: Support interconnecting shaft in a vise equipped with protective caps on jaws of vise to prevent damage to interconnecting shaft. Then, using a soft–faced hammer (1), sharply hit the end of the CV joint housing to dislodge housing from internal circlip (3) on interconnecting shaft. Then slide outer CV joint off end of interconnecting shaft, joint may have to be tapped off shaft using a **soft–faced** hammer.

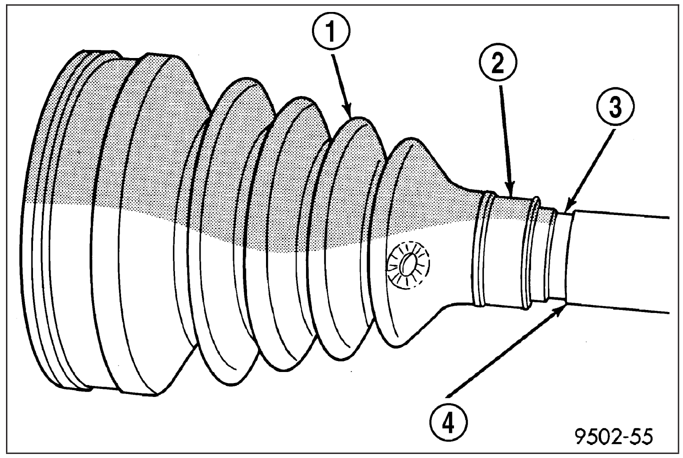


5. Remove large circlip (3) from the interconnecting shaft (2) before attempting to remove outer CV joint sealing boot.
6. Slide sealing boot off interconnecting shaft.
7. Thoroughly clean and inspect outer CV joint assembly and interconnecting joint for any signs of excessive wear. **If any parts show signs of excessive wear, the halfshaft assembly will require replacement. Component parts of these halfshaft assemblies are not serviceable.**

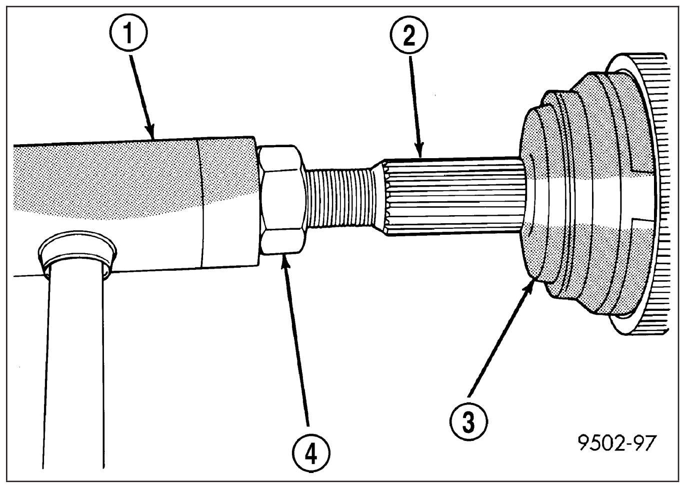


INSTALLATION

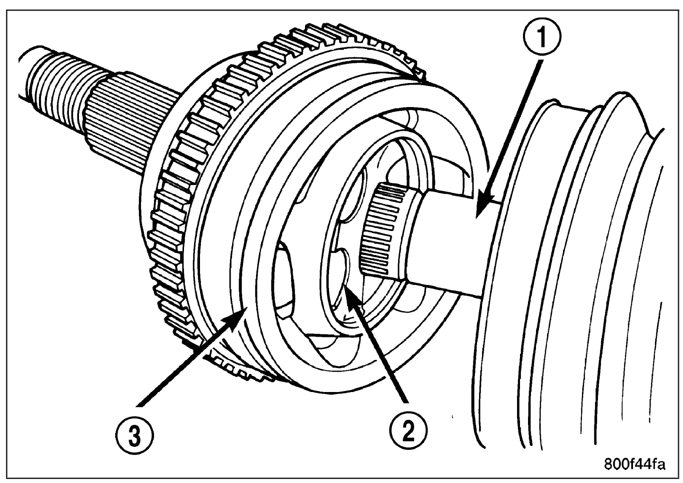
1. Slide new sealing boot clamp (2) onto interconnecting shaft (4). Slide the outer CV joint assembly sealing boot (1) onto the interconnecting shaft (4). **Seal boot MUST be positioned on interconnecting shaft so the raised bead on the inside of the seal boot is in groove on interconnecting shaft.**



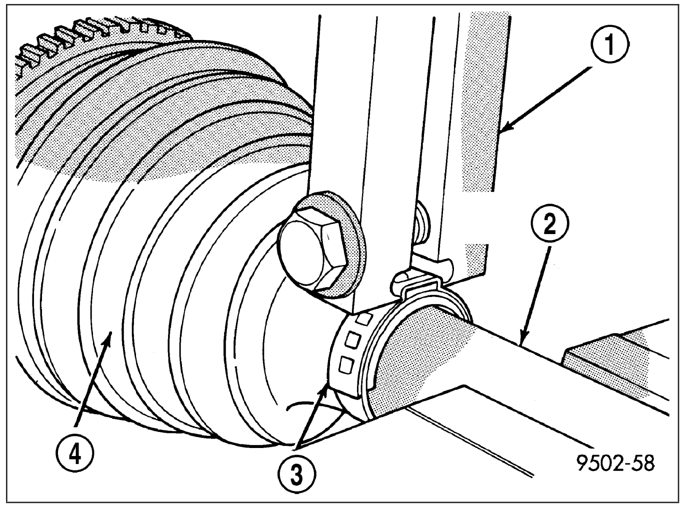
2. Align splines on interconnecting shaft with splines on cross of outer CV joint assembly and start outer CV joint onto interconnecting shaft.
3. Install outer CV joint assembly onto interconnecting shaft by using a **soft–faced** hammer (1) and tapping end of stub axle (2) (with hub nut (4) installed) until outer CV joint (3) is fully seated on interconnecting shaft.



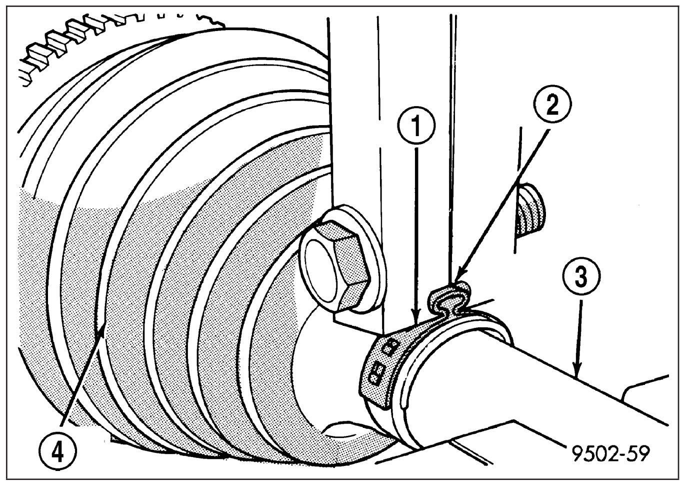
4. Outer CV joint assembly must be installed on interconnecting shaft until cross (2) of outer CV joint assembly (3) is seated against circlip on interconnecting shaft (1).



5. Distribute 1/2 the amount of grease provided in seal boot service package (DO NOT USE ANY OTHER TYPE OF GREASE) into outer CV joint assembly housing. Put the remaining amount into the sealing boot (4).
6. Install outer CV joint sealing boot to interconnecting shaft clamp evenly on sealing boot.
7. Clamp sealing boot onto interconnecting shaft (2) using crimper, Crimping Tool C-4975-A and the following procedure. Place Crimping Tool C-4975-A (1) over bridge of clamp (3).

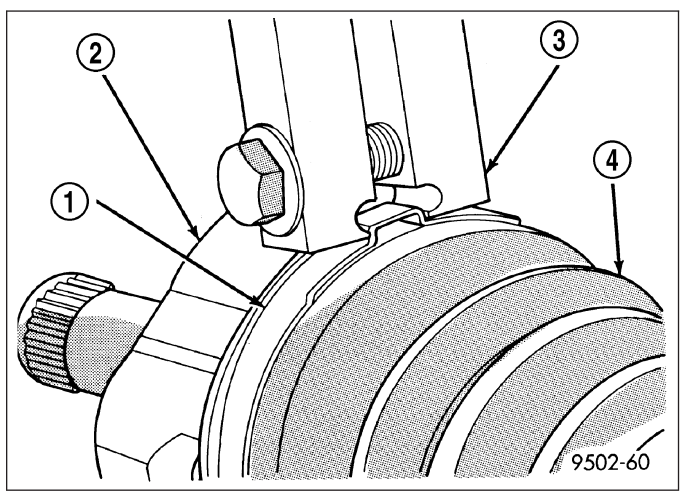


8. Tighten nut on Crimping Tool C-4975-A until jaws on tool (2) are closed completely together, face to face.

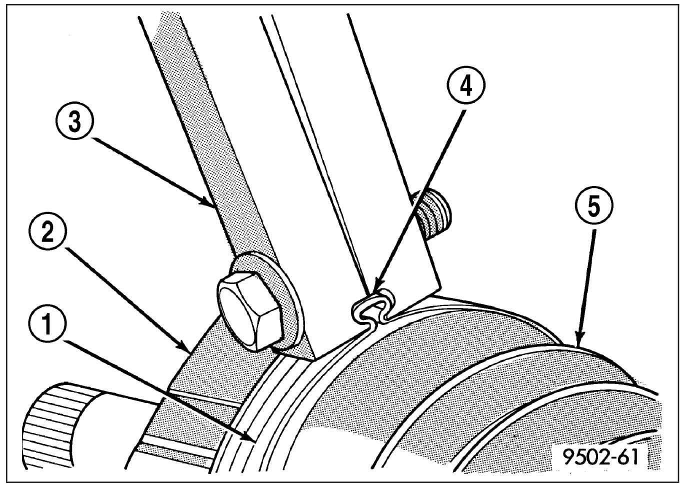


CAUTION: Seal must not be dimpled, stretched, or out–of–shape in any way. If seal is NOT shaped correctly, equalize pressure in seal and shape it by hand.

9. Position outer CV joint sealing boot (4) into its retaining groove on outer CV joint housing. Install sealing boot to outer CV joint retaining clamp (1) evenly on sealing boot.
10. Clamp sealing boot onto outer CV joint housing using Crimping Tool C-4975-A (3) and the following procedure. Place Crimping Tool C-4975-A over bridge of clamp (1).



11. Tighten nut on Crimping Tool C-4975-A until jaws on tool are closed completely together (4), face to face.
12. Install the halfshaft requiring boot replacement back on the vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)



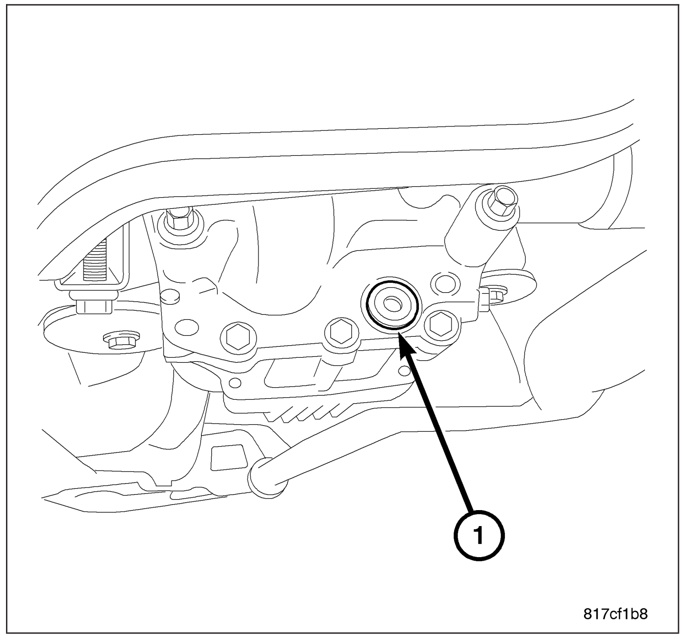
HALF SHAFT-LEFT REAR

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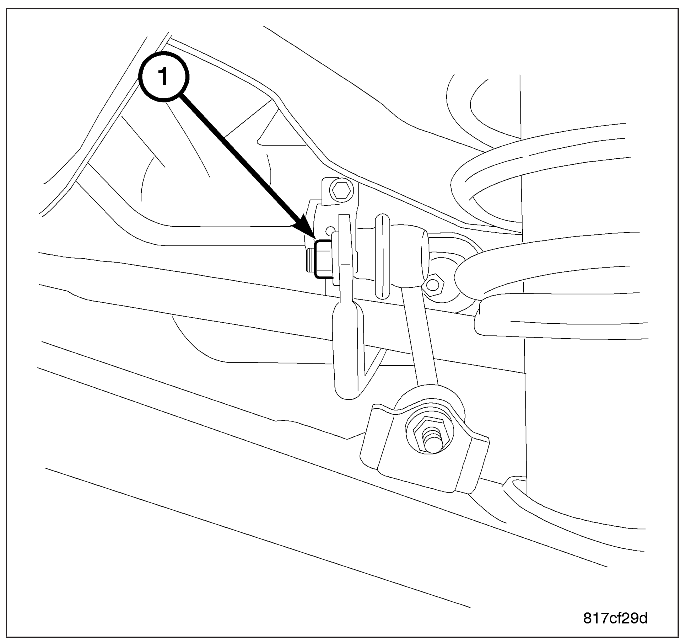
HALF SHAFT-LEFT REAR

REMOVAL

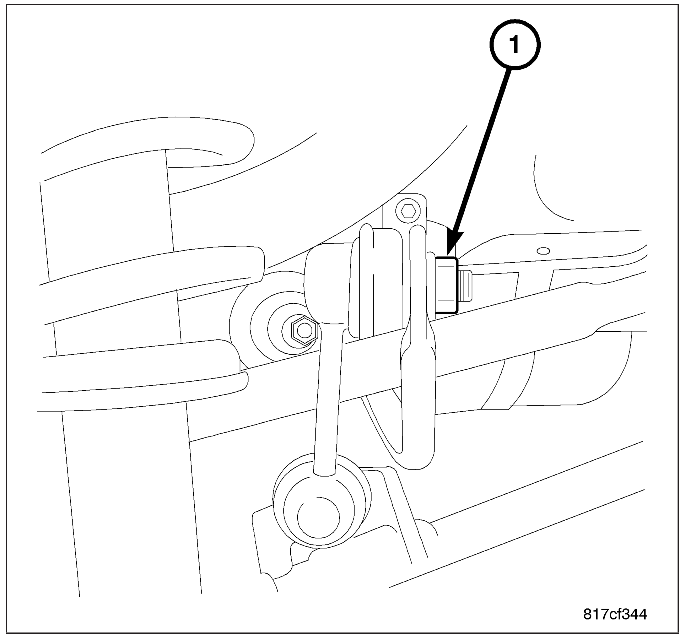
1. Raise vehicle on a hoist.
2. Remove the rear tires.
3. Drain the fluid from the rear drive line module.
4. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL)



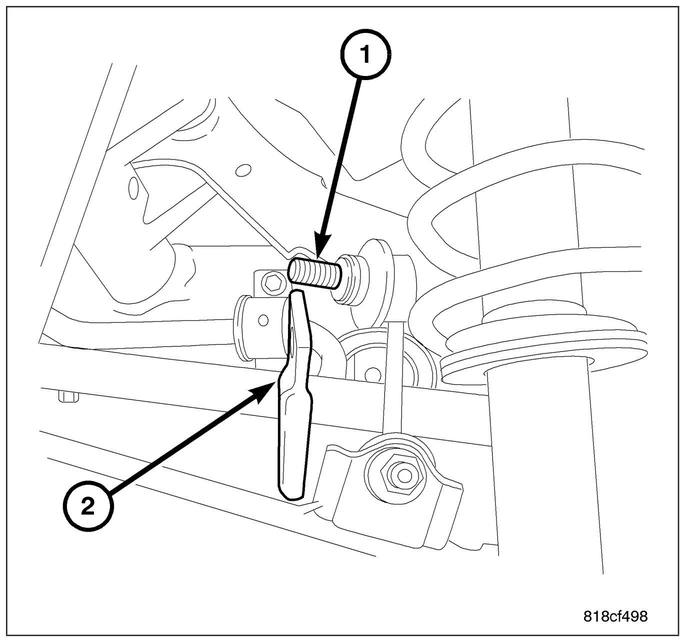
5. Remove right side sway bar nut (if equipped).



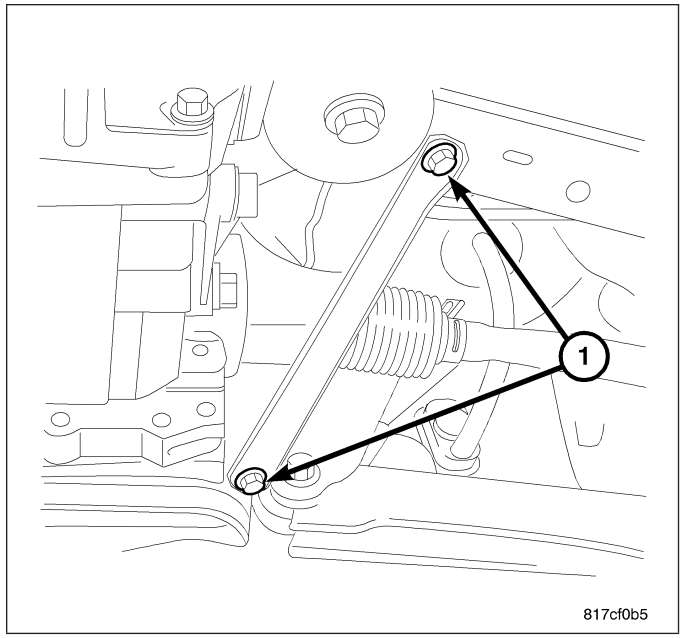
6. Remove left side sway bar nut (if equipped).



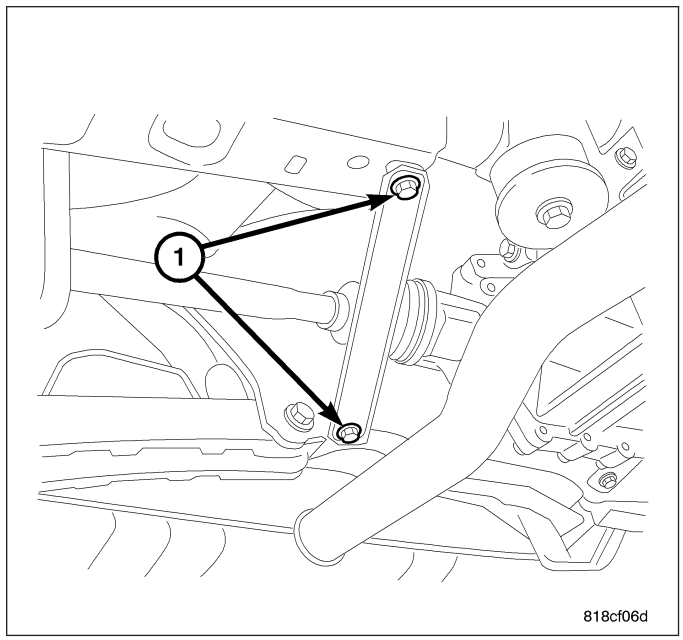
7. Roll sway bar down and out of the way (2) (if equipped).



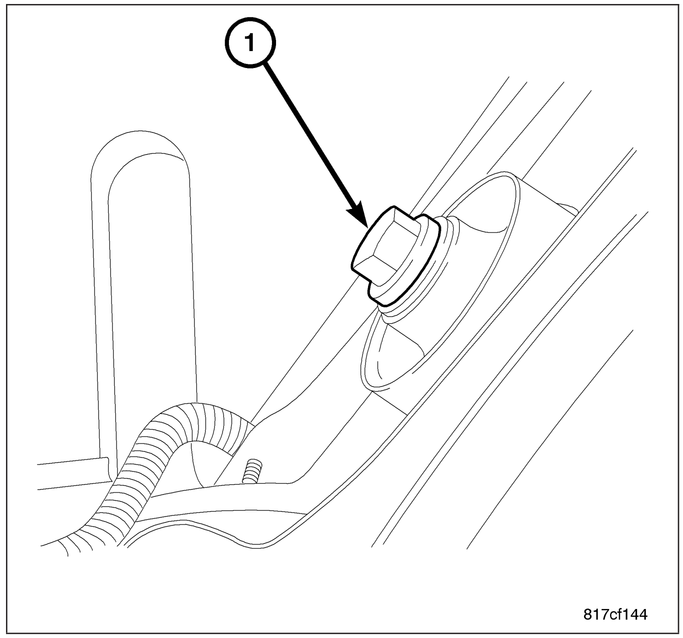
8. Remove the left side stay bracket bolts (1).



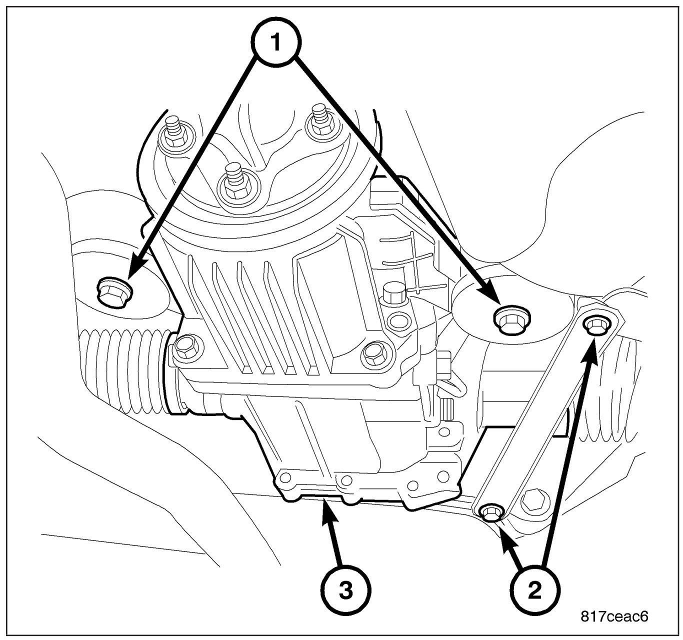
9. Remove the right side stay bracket bolts (1).
10. Remove the exhaust system up to the catalytic converter. (Refer to 11 - EXHAUST SYSTEM/ MUFFLER - REMOVAL)
11. Support the rear driveline module with a transmission jack.



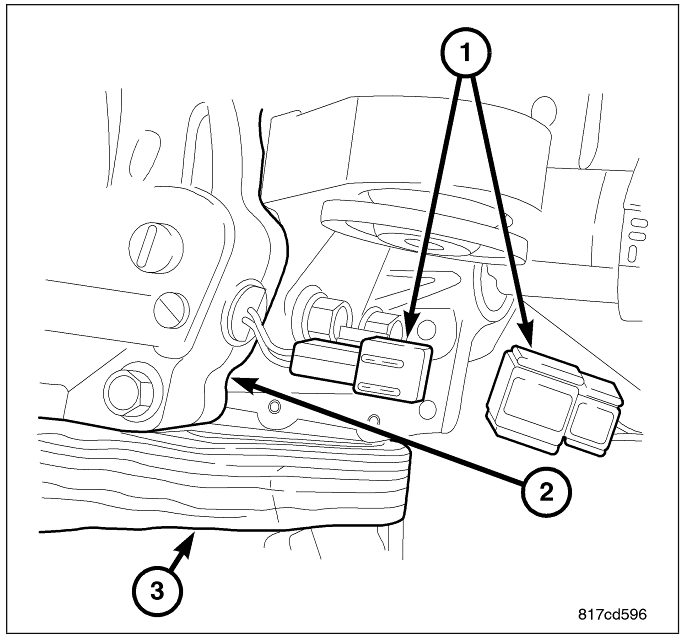
12. Remove the rear bolt (1) at the driveline module.



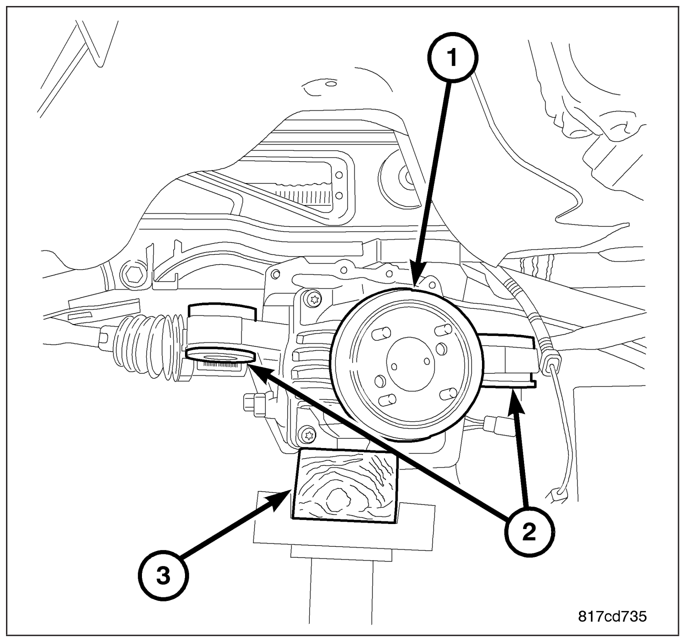
13. Remove the two side bolts (1) at driveline module (3).



14. Lower drive line module enough gain access to the electrical connector and bracket.
15. Remove the routing bracket bolt.
16. Unplug the electrical connector (1).

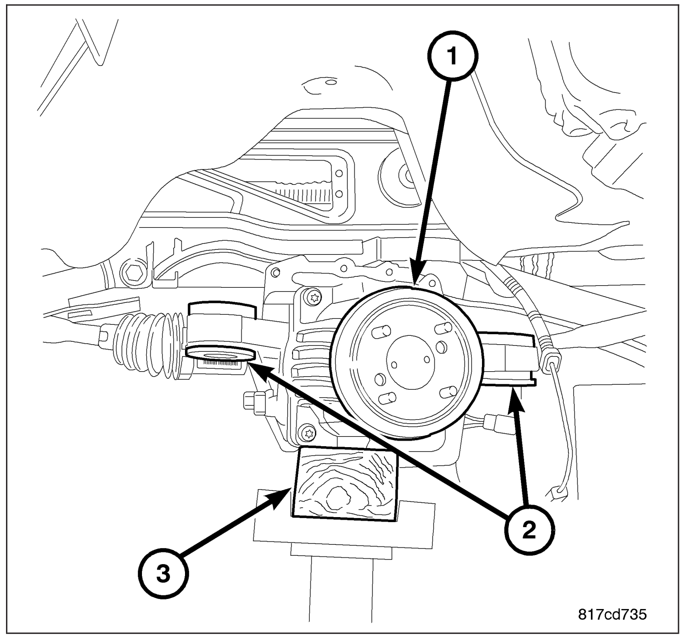


17. Lower the drive line module (1).
18. Disengage axle shaft.
19. Remove wheel if necessary.
20. Remove nut and washer halfshaft to left rear hub.
21. Remove halfshaft from rear hub, if hard to remove or sticking, use a punch and hammer to tap out.

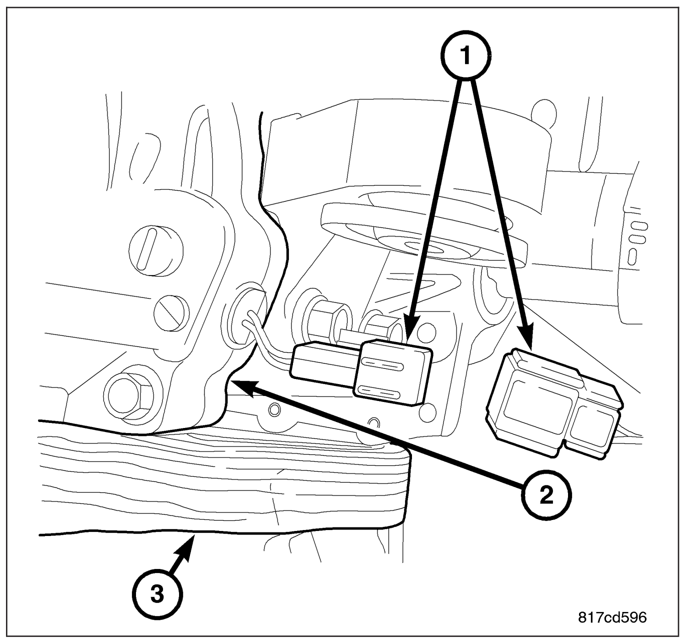


INSTALLATION

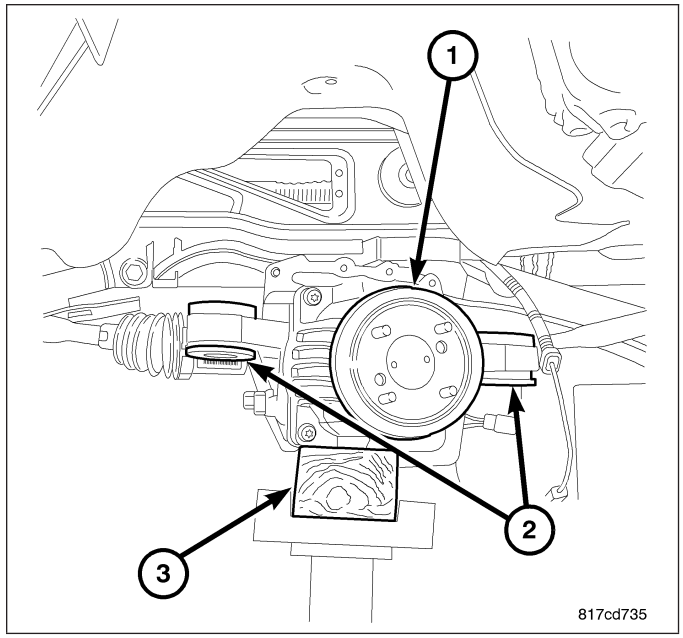
1. Lift driveline module (1) with a transmission jack while installing halfshaft.
2. Install nut and washer halfshaft to left rear hub and torque to 244 N·m (180 ft.lbs.).



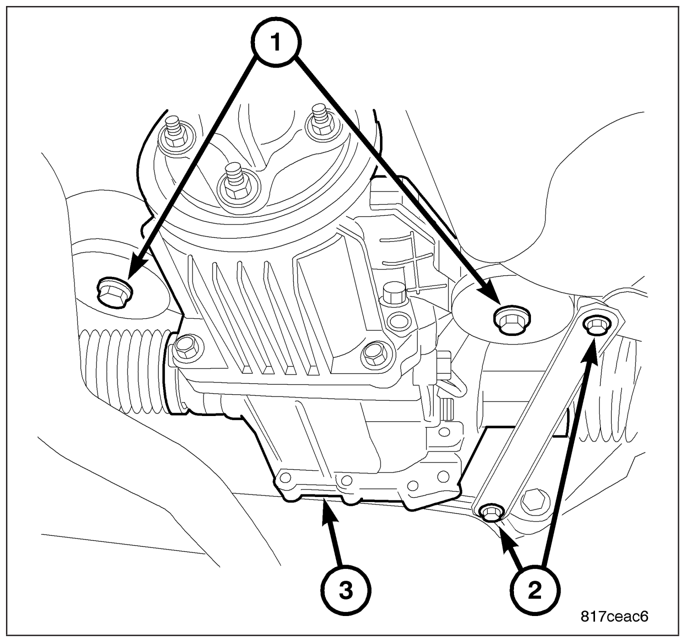
3. Connect the electrical connector (1).
4. Install wire harness bracket and two mounting bolts and torque to 45 Nm (33 ft. lbs.).



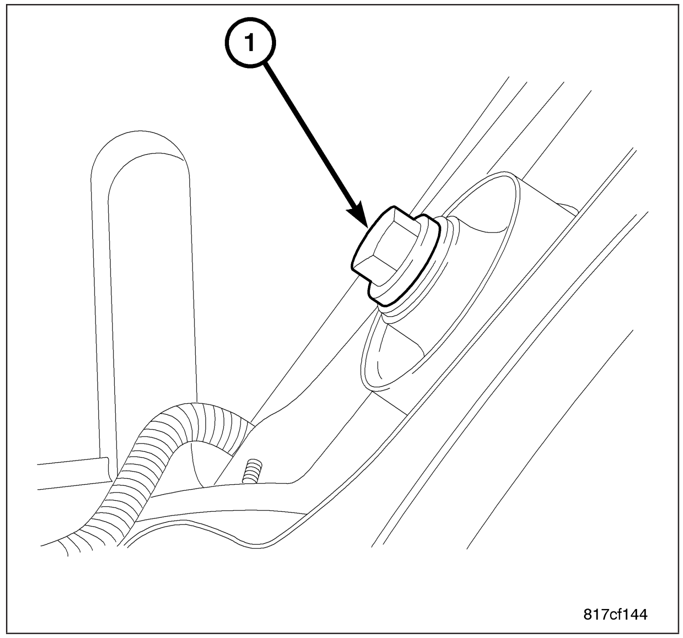
5. Lift driveline module into place.



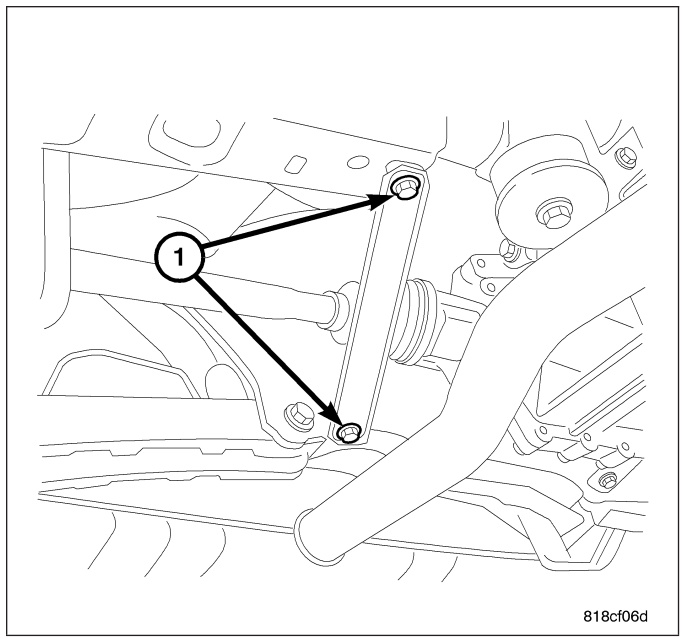
6. Install the two driveline module side mounting bolts (1) and torque to 102 N·m (75 ft. lbs.).



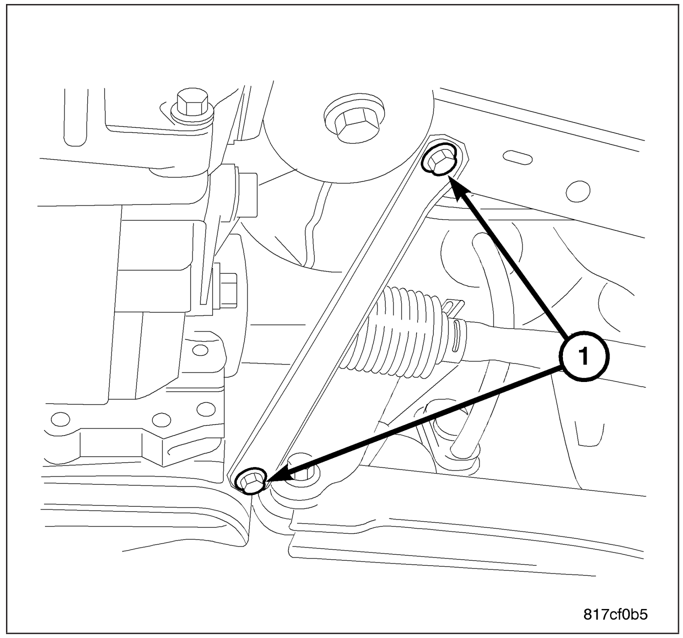
7. Install the rear driveline module mounting bolt (1) and torque to 102 N·m (75 ft. lbs.).



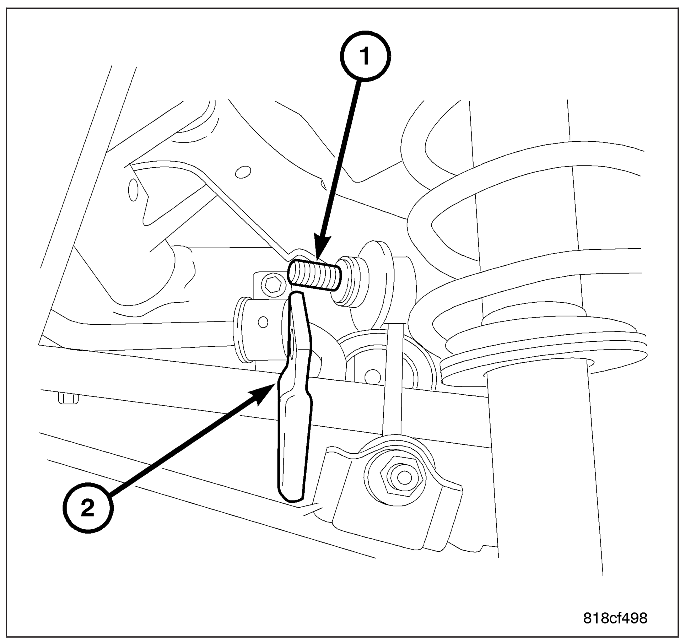
8. Install the right side stay bracket and bolts (1) torque to 61 N·m (45 ft. lbs.)



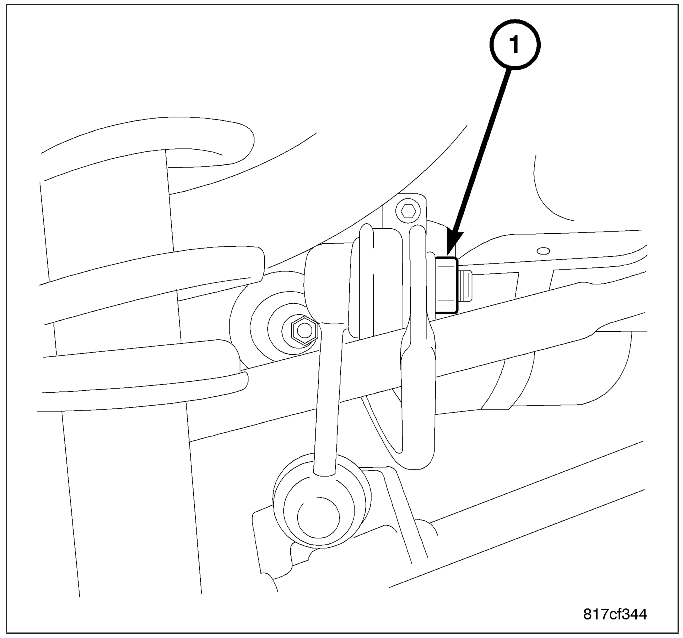
9. Install the left side stay bracket and bolts (1) torque to 61 N·m (45 ft. lbs.).



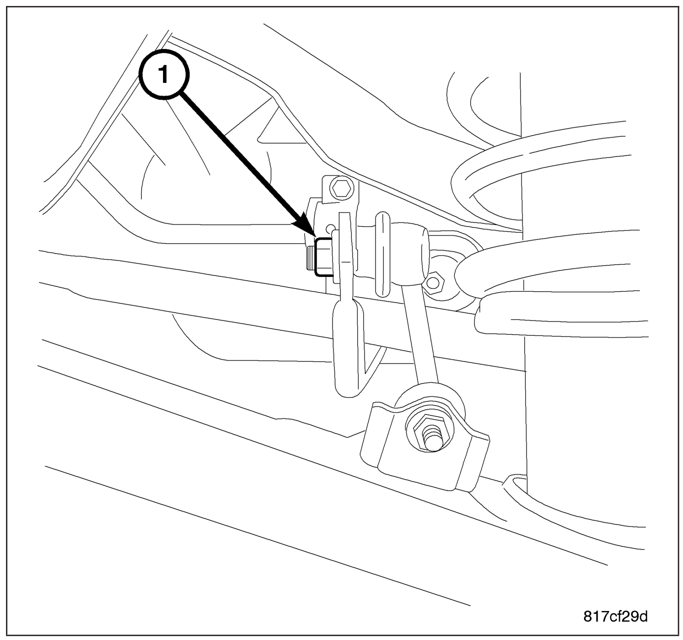
10. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
11. Fill the rear axle with fluid.
12. Roll sway bar into place (2) (if equipped).



13. Install left side sway bar nut (1) and torque to 61 N·m (45 ft. lbs.) (if equipped).



14. Install right side sway bar nut (1) and torque to 61 N·m (45 ft. lbs.) (if equipped).
15. install the exhaust (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
16. Install the wheels (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).



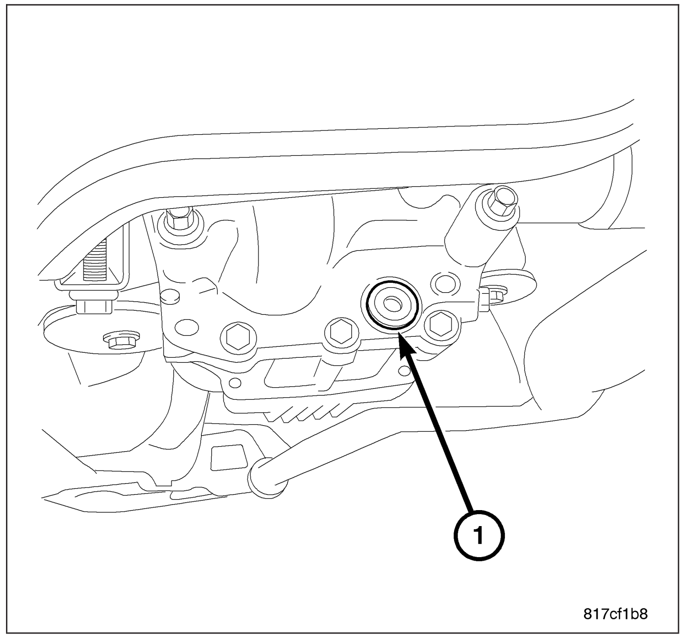
HALF SHAFT-RIGHT REAR

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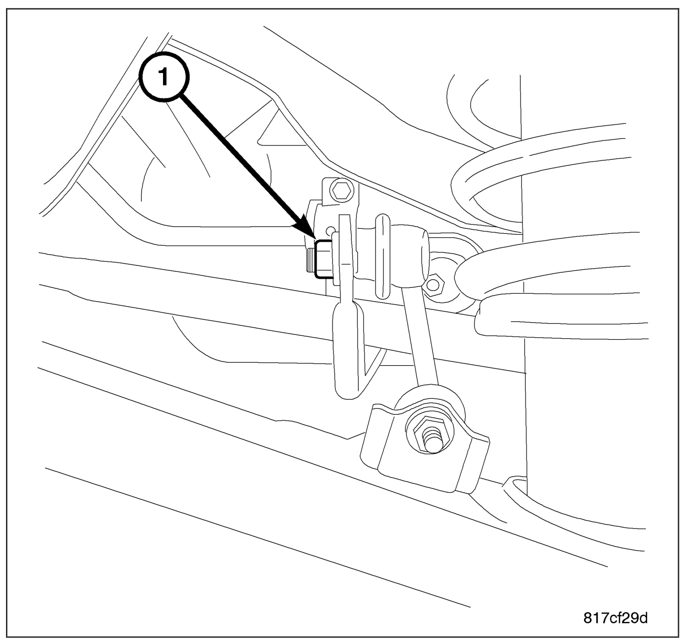
HALF SHAFT-RIGHT REAR

REMOVAL

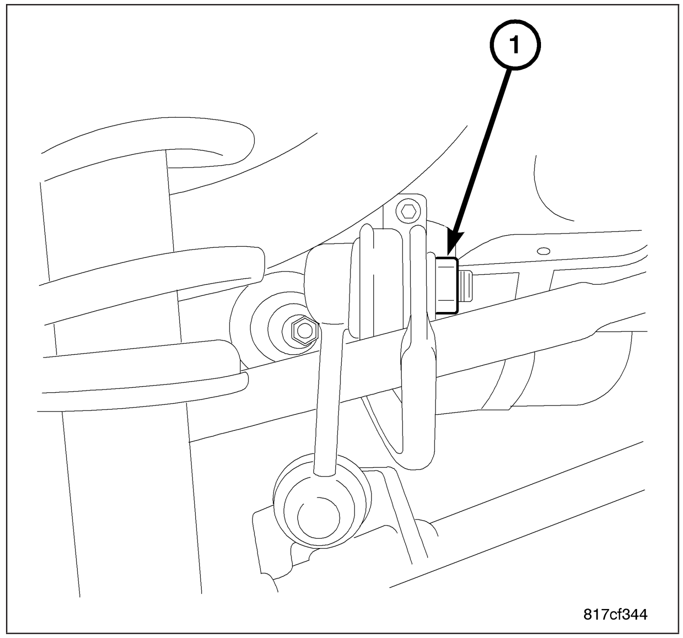
1. Raise vehicle on a hoist.
2. Remove the rear tires.
3. Drain the fluid from the rear drive line module.
4. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL)



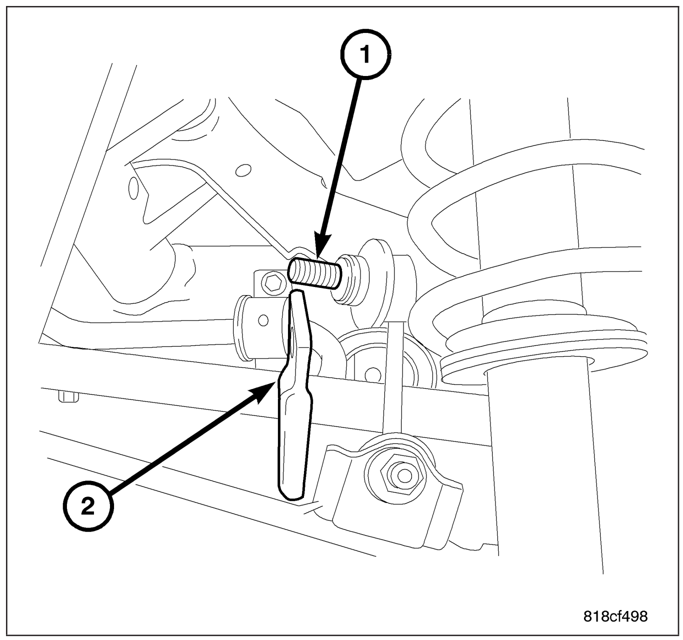
5. Remove right side sway bar nut (if equipped).



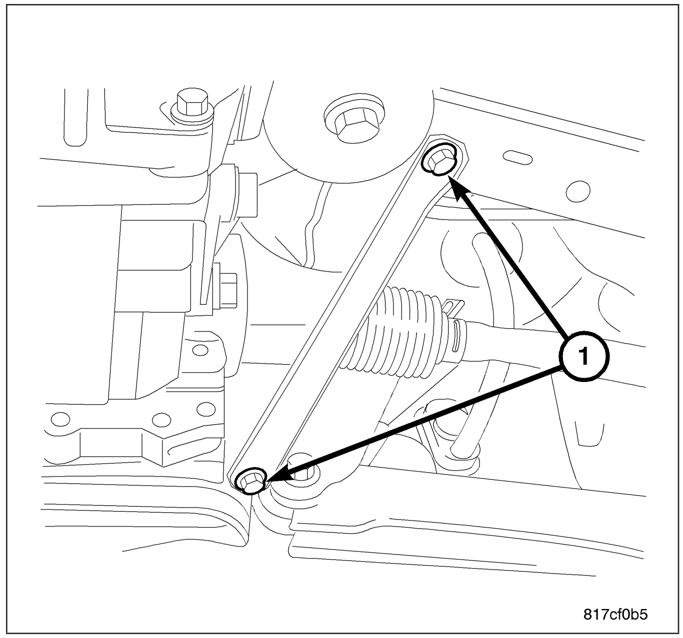
6. Remove left side sway bar nut (if equipped).



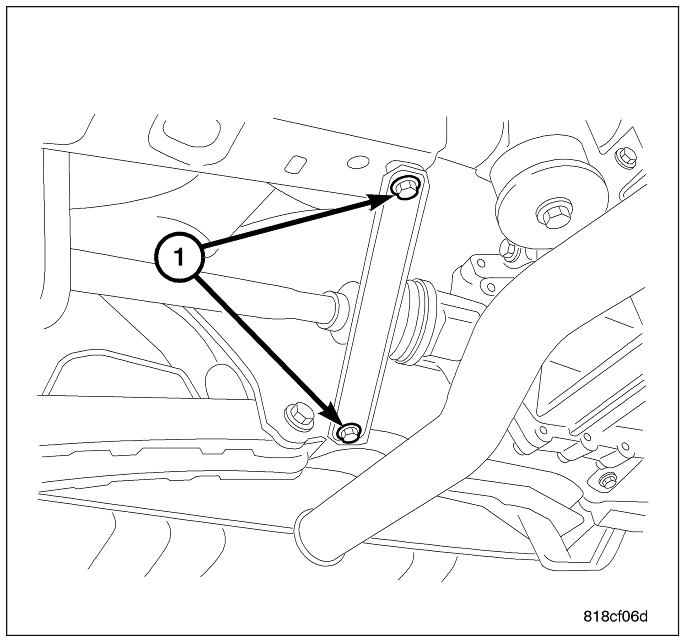
7. Roll sway bar down and out of the way (2) (if equipped).



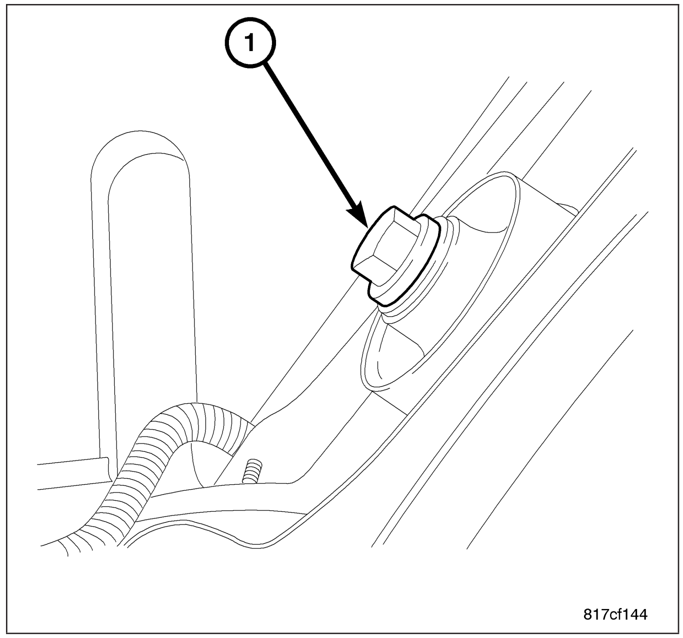
8. Remove the left side stay bracket bolts (1).



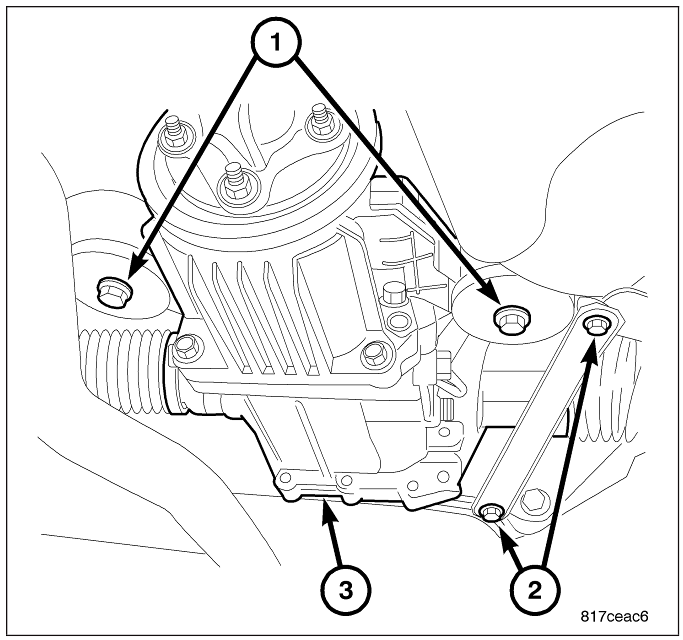
9. Remove the right side stay bracket bolts (1).
10. Remove the exhaust system up to the catalytic converter. (Refer to 11 - EXHAUST SYSTEM/ MUFFLER - REMOVAL)
11. Support the rear driveline module with a transmission jack.



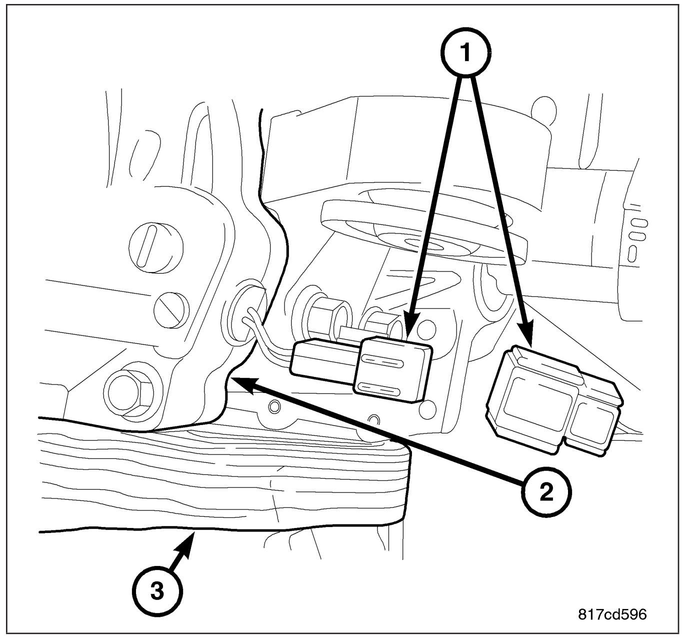
12. Remove the rear bolt (1) at the driveline module.



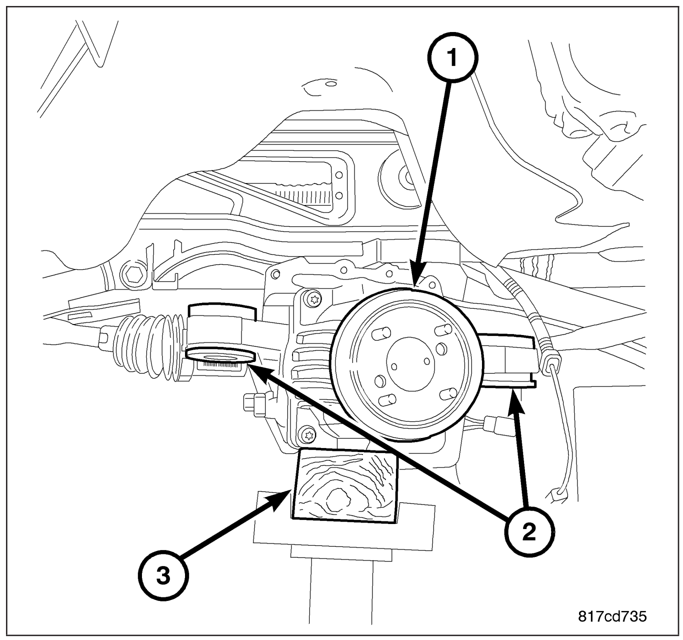
13. Remove the two side bolts (1) at driveline module (3).



14. Lower driveline module enough gain access to the electrical connector and bracket.
15. Remove the routing bracket bolt.
16. Unplug the electrical connector (1).

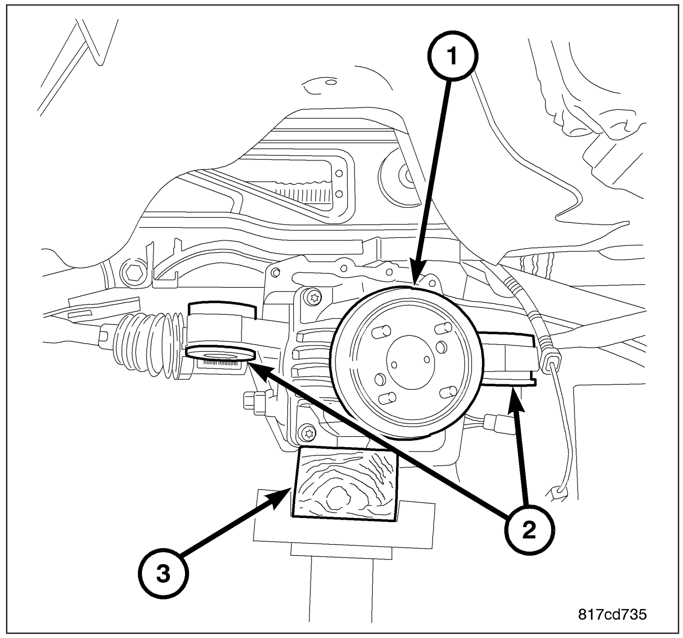


17. Lower the drive line module (1).
18. Disengage axle shaft (2).
19. Remove wheel if necessary.
20. Remove nut and washer halfshaft to left rear hub.
21. Remove half shaft from rear hub, if hard to remove, or sticking, use a punch and hammer to tap out.

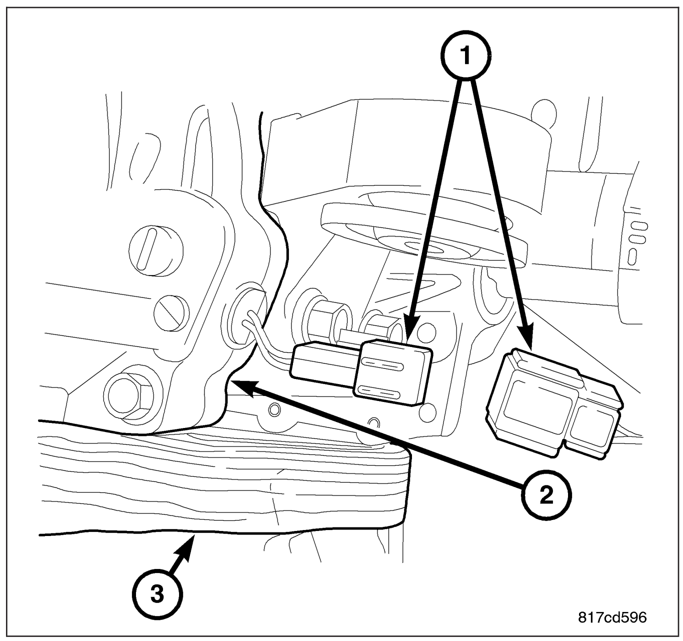


INSTALLATION

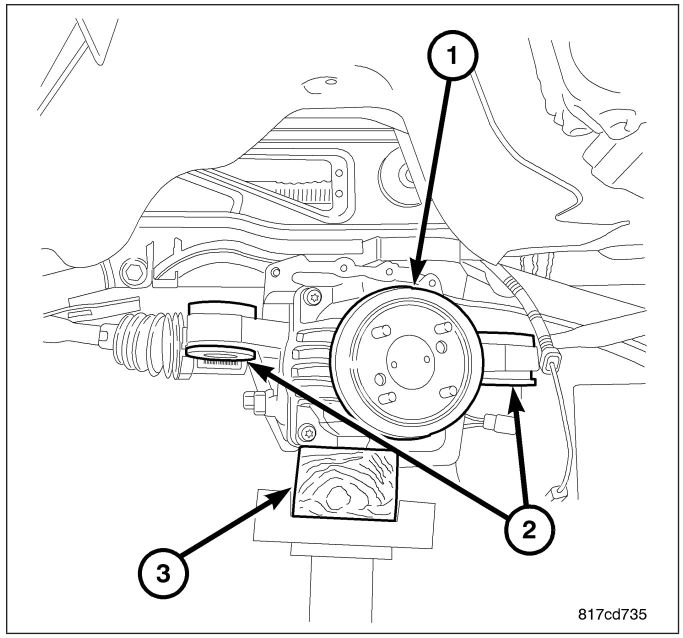
1. Lift driveline module (1) with a transmission jack while installing halfshaft (2).
2. Install nut and washer halfshaft to left rear hub and torque to 244 N·m (180 ft.lbs.).



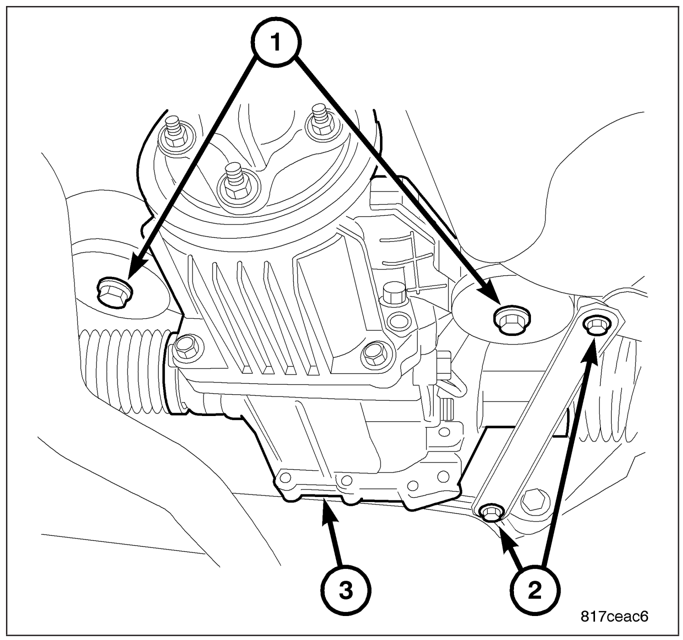
3. Connect the electrical connector (1).
4. Install wire harness bracket and two mounting bolts and torque to 45 N·m (33 ft. lbs.).



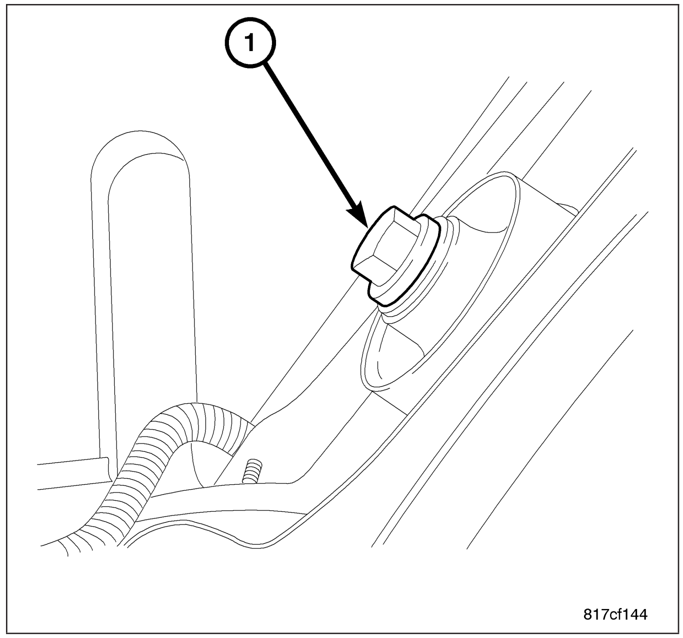
5. Lift driveline module into place.



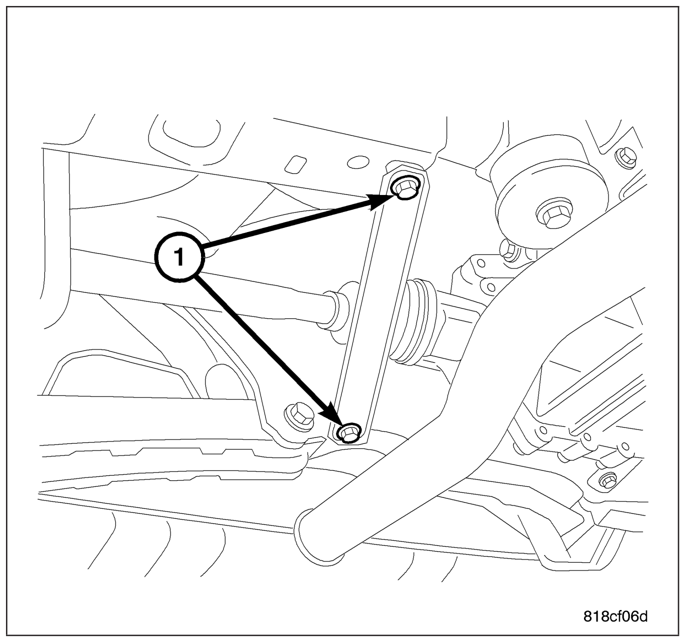
6. Install the two driveline module side mounting bolts (1)and torque to 102 N·m (75 ft.lbs.).



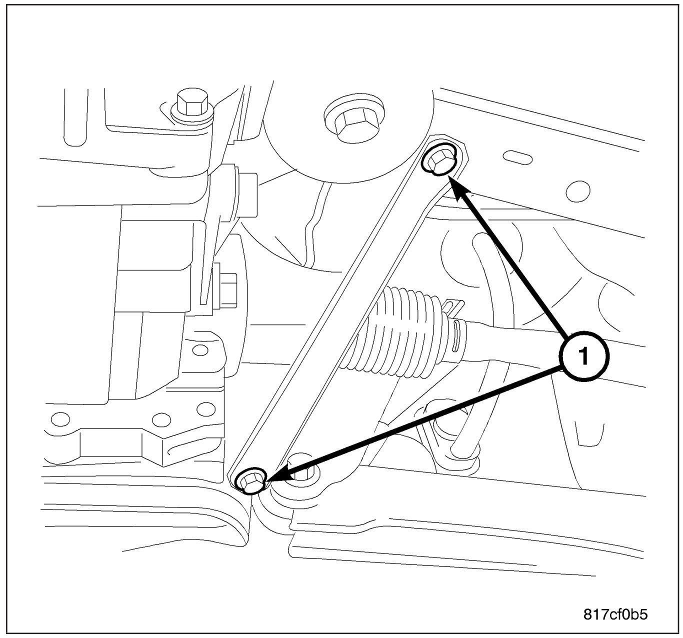
7. Install the one rear driveline module mounting bolt (1) and torque to 102 N·m (75 ft. lbs.).



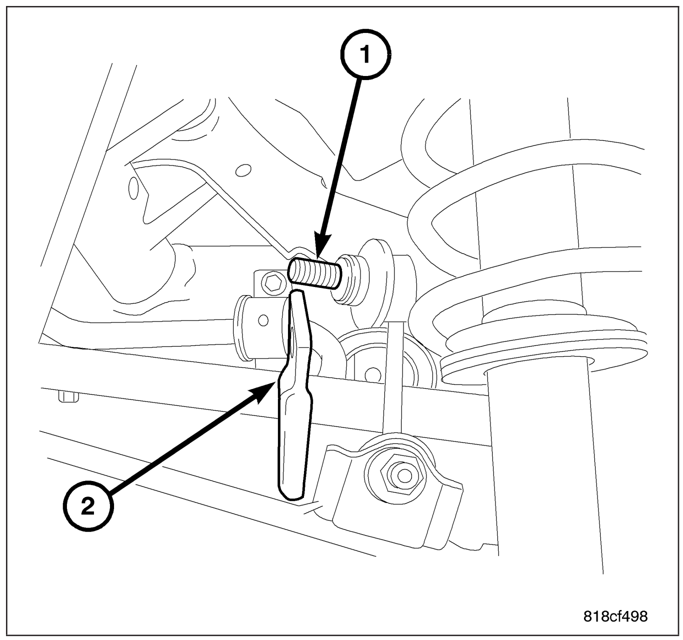
8. Install the right side stay bracket and bolts,(1) torque to 61 N·m (45 ft. lbs.)



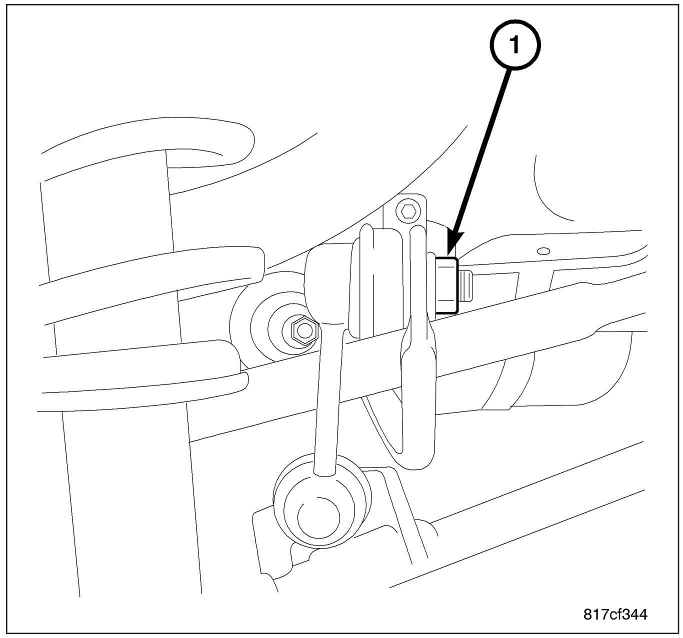
9. Install the left side stay bracket bolts, (1) torque to 61 N·m (45 ft. lbs.).
10. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
11. Fill the rear axle with fluid.



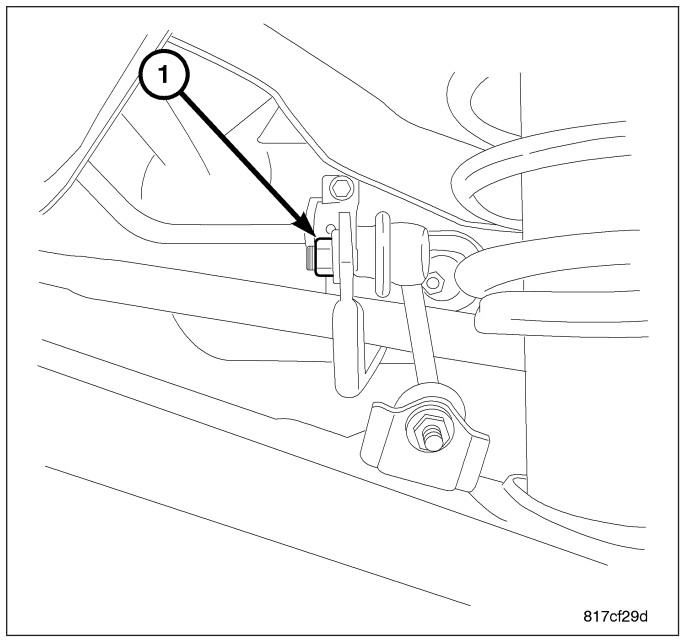
12. Roll sway bar into place (2) (if equipped).



13. Install left side sway bar nut (1) and torque to 61 N·m (45 ft. lbs) (if equipped).



14. Install right side sway bar nut (1) and torque to 61 N·m (45 ft. lbs.) (if equipped).
15. install the exhaust (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
16. Install the wheels (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).



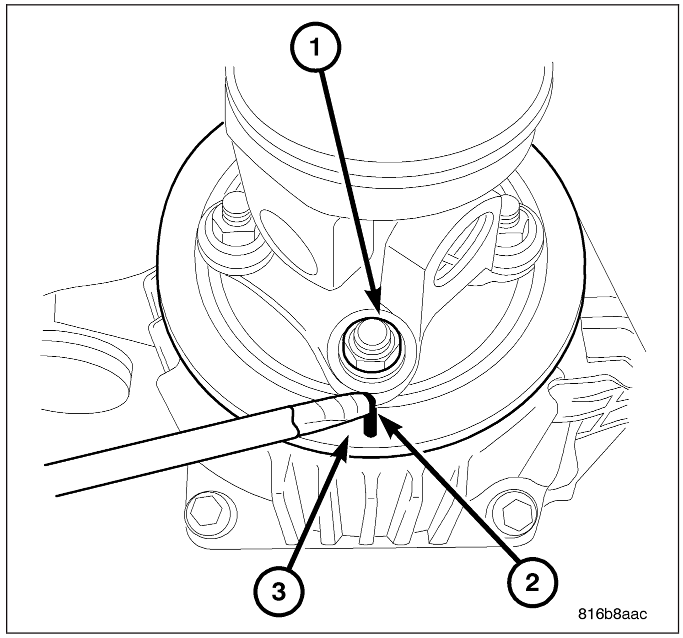
SHAFT-PROPELLER

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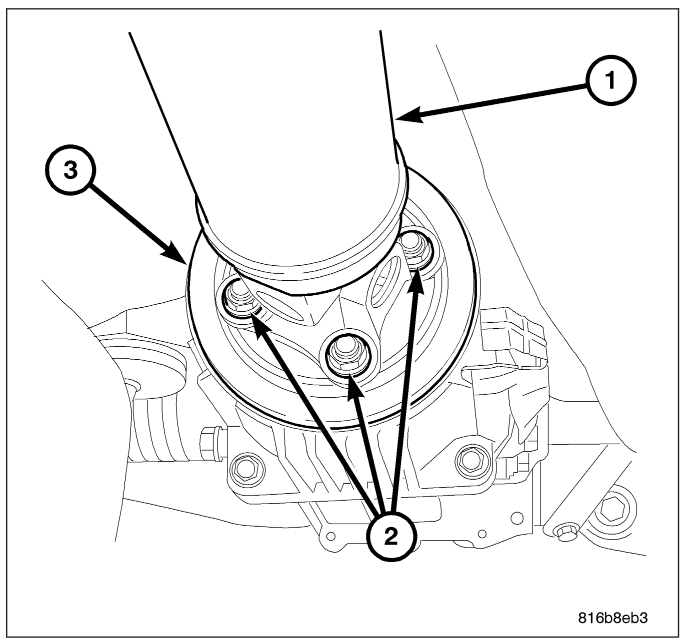
SHAFT-PROPELLER

REMOVAL

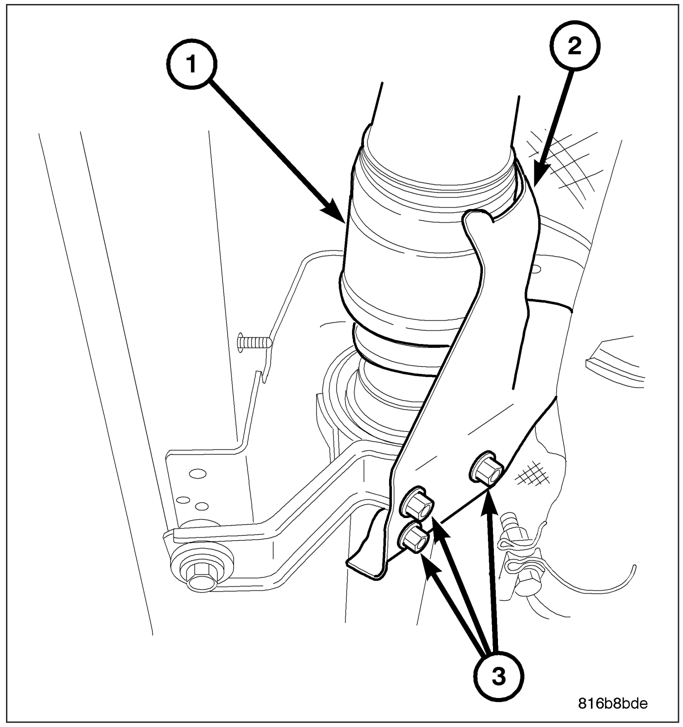
1. Raise the vehicle on the hoist.
2. Mark (2) prop shaft and differential (3) for proper installation.



3. Remove the four rear prop shaft to rear axle retaining nuts (2).

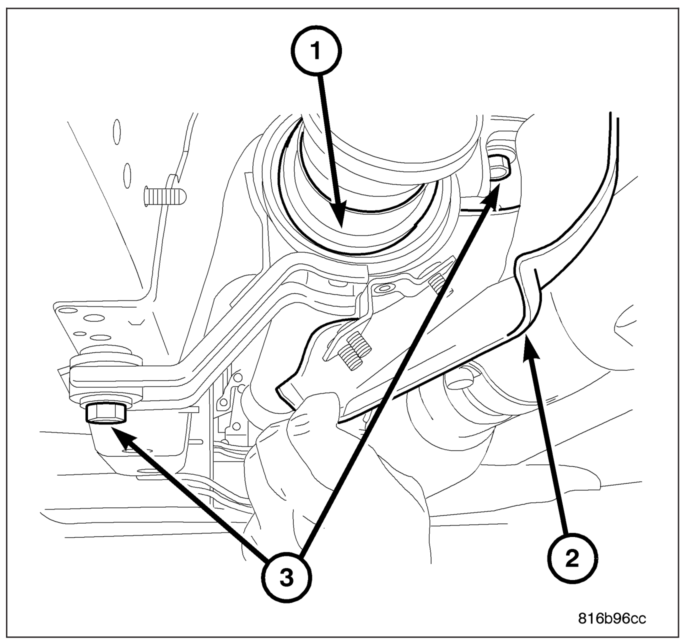


4. Remove the three bolts (3) from the center support heat shield (2).

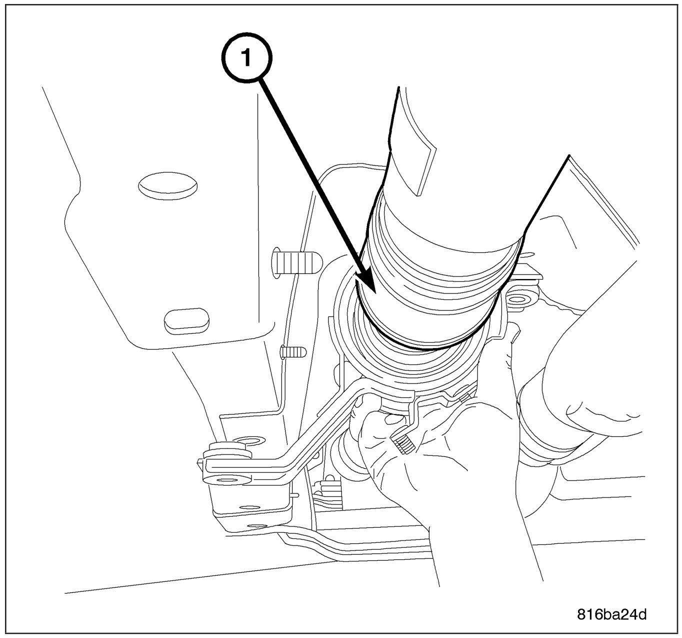


CAUTION: Propeller shaft removal. Never allow propeller shaft to hang while connected to Power Transfer Unit (PTU), rear driveline module flanges or center bearings. If propeller shaft section is hung unsupported, damage may occur to joint, boot and/or center bearing from over-angulation. This may result in vibration/balance issues. A helper may be needed.

5. Remove the heat shield (2).
6. Remove the two center support mounting bolts (3)



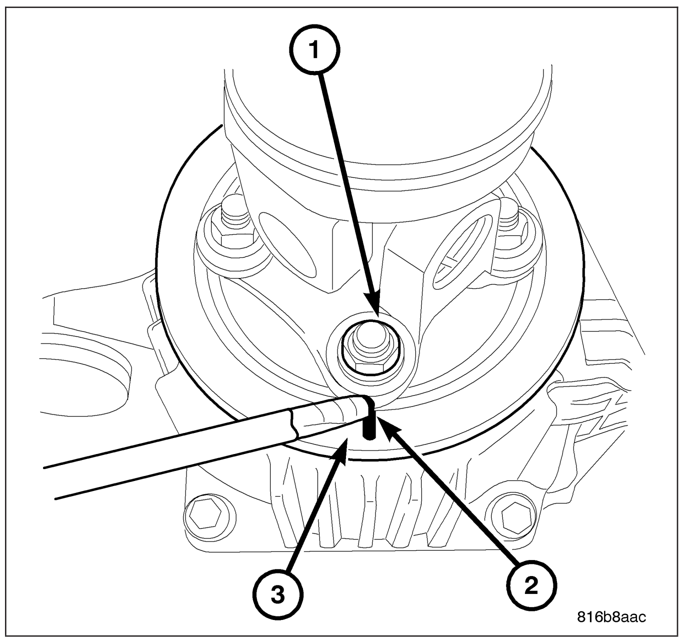
7. Remove the propeller shaft (1).



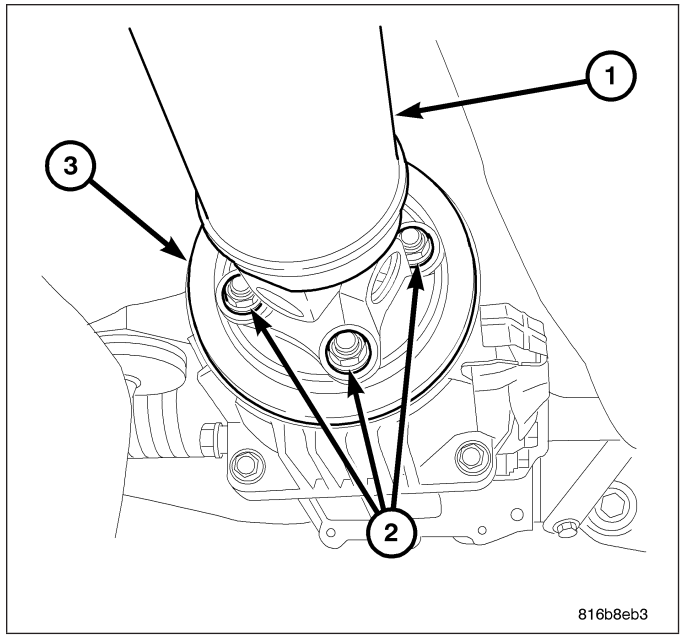
INSTALLATION

CAUTION: Propeller shaft installation. Never allow propeller shaft to hang while connected to Power Transfer Unit (PTU), rear driveline module flanges or center bearings. If propeller shaft section is hung unsupported, damage may occur to joint, boot and/or center bearing from over-angulation. This may result in vibration/balance issues. A helper may be needed.

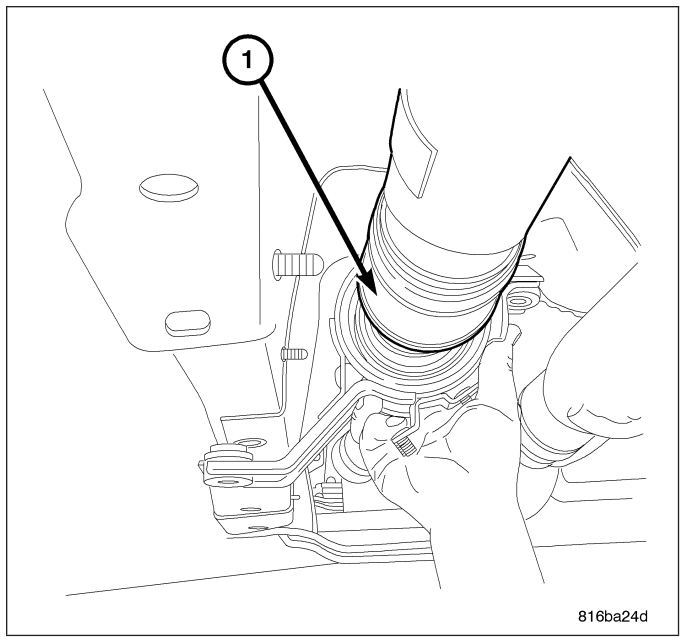
1. Make sure transaxle is in Neutral (N) position.
2. Obtain a helper if needed and lift propeller shaft assembly into position. Install propeller shaft spline into PTU.
3. Align index marks (2) on propeller shaft with marks on rear axle flange, slide propeller shaft over studs on rear axle flange.



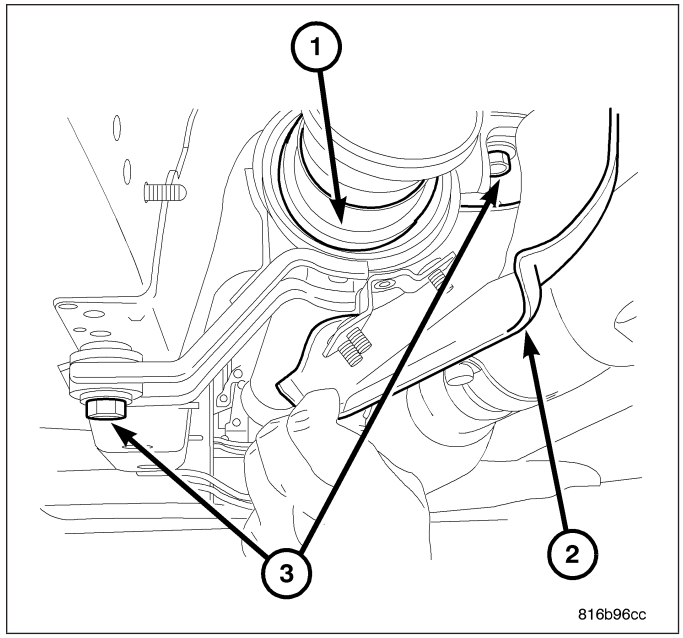
4. Install the four retaining nuts (2).



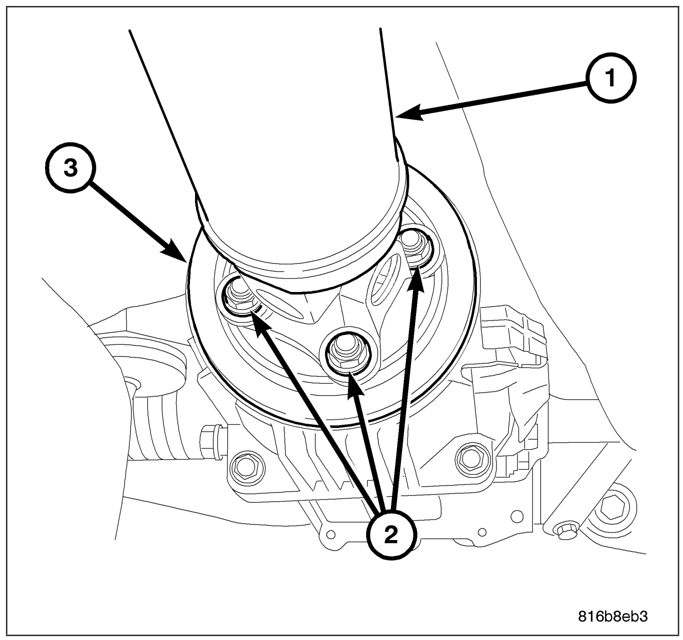
5. Raise the center support into position (1).



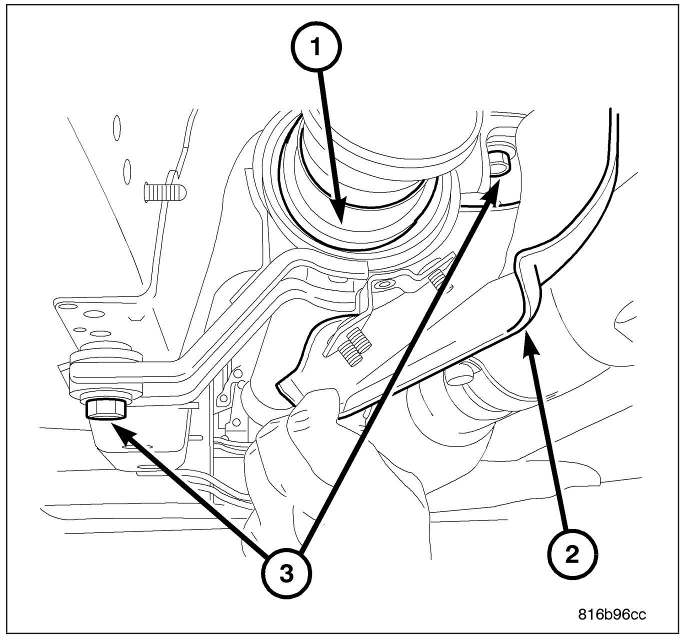
6. Install the two mounting bolts (3) and torque to 41 N·m (30 lbs.ft.).



7. Torque the four retaining nuts (2) to 47 N·m (35 ft. lbs.).



8. Install heat shield (2) and torque the retaining nuts and torque to 21 N·m (15 ft. lbs.).
9. Check fluid levels starting with PTU.



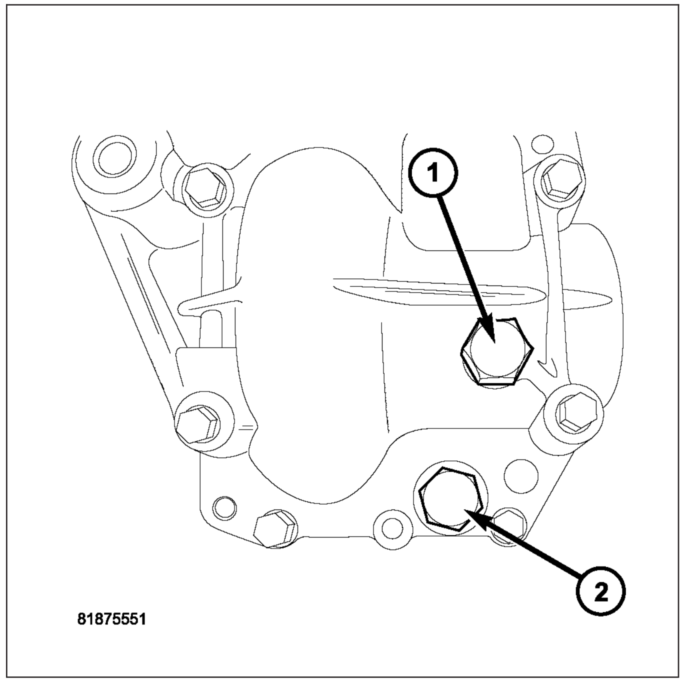
MODULE-REAR DRIVELINE

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MODULE-REAR DRIVELINE

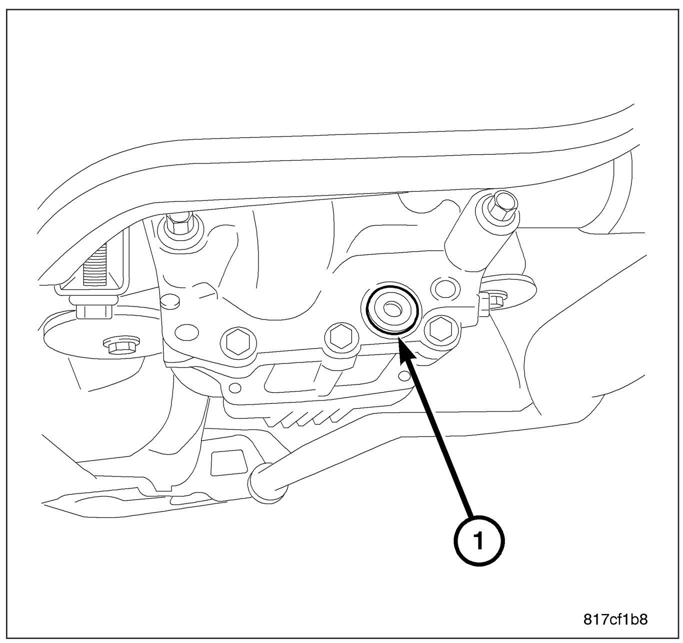
STANDARD PROCEDURE -

1. If fluid level is low or fluid change is required fill with PN 4874468 Mopar MS9020 SAE80W90 Gear Lube until to bottom of fill plug.
2. Torque fill plug (1) to 32 N-m (24 lbf-ft).
3. Torque drain plug (2) to 32 N-m (24 lbf-ft).

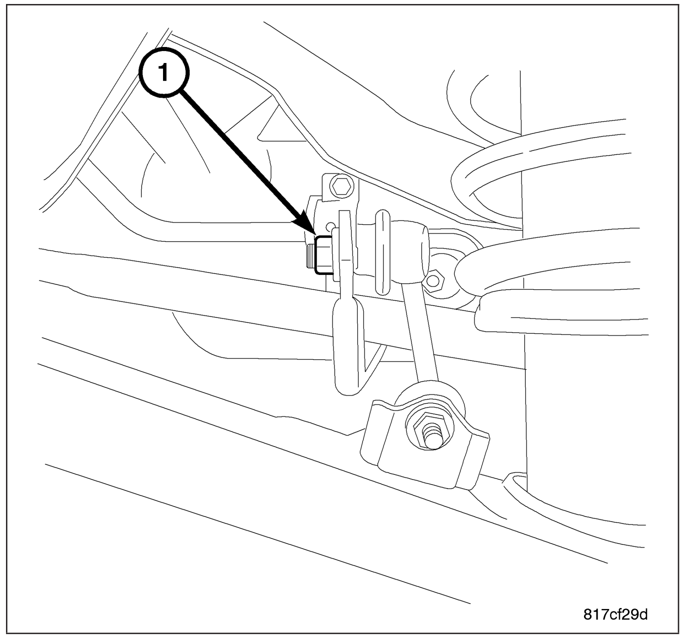


REMOVAL

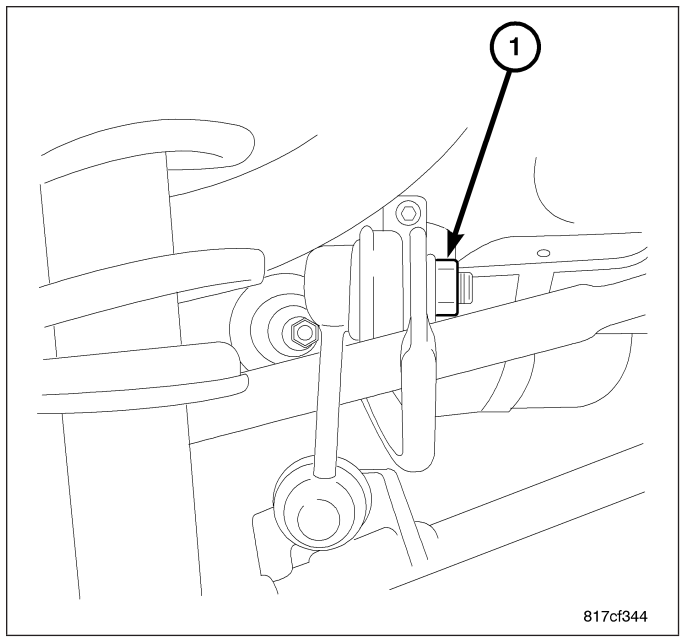
1. Raise vehicle on a hoist.
2. Remove the rear tires.
3. Remove the drain plug (1) and drain the fluid from the rear drive line module.
4. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL)



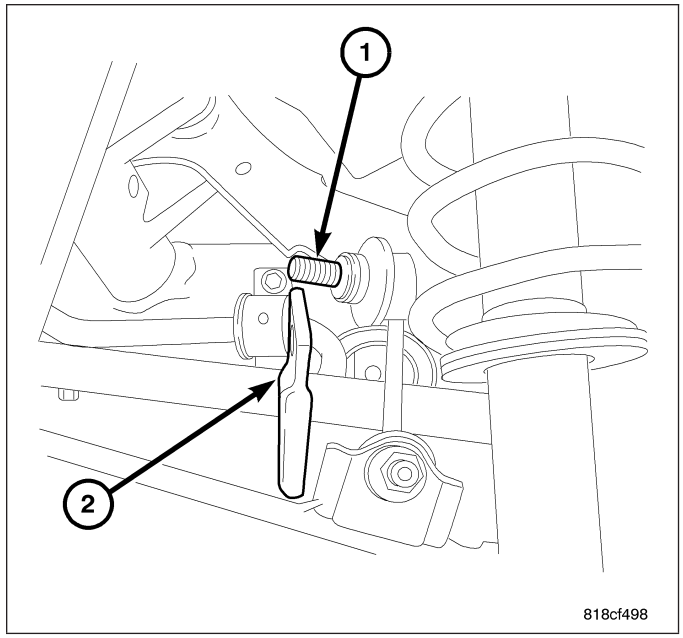
5. Remove right side sway bar nut (if equipped).



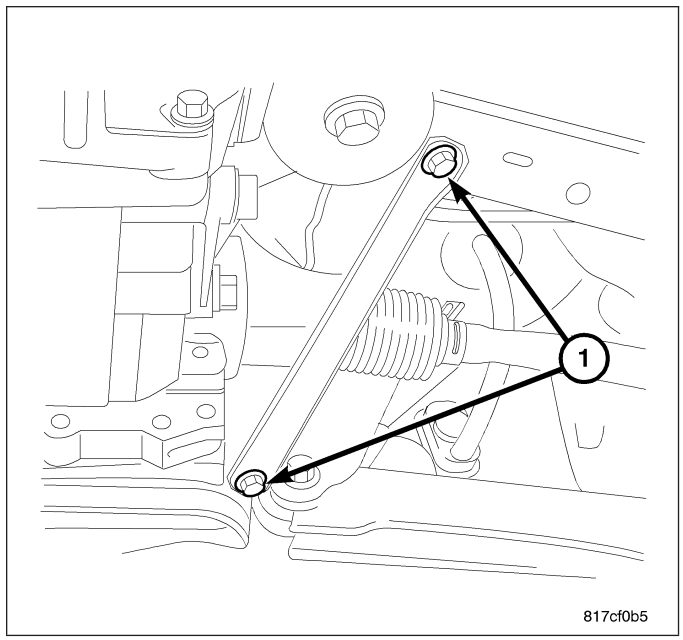
6. Remove left side sway bar nut (if equipped).



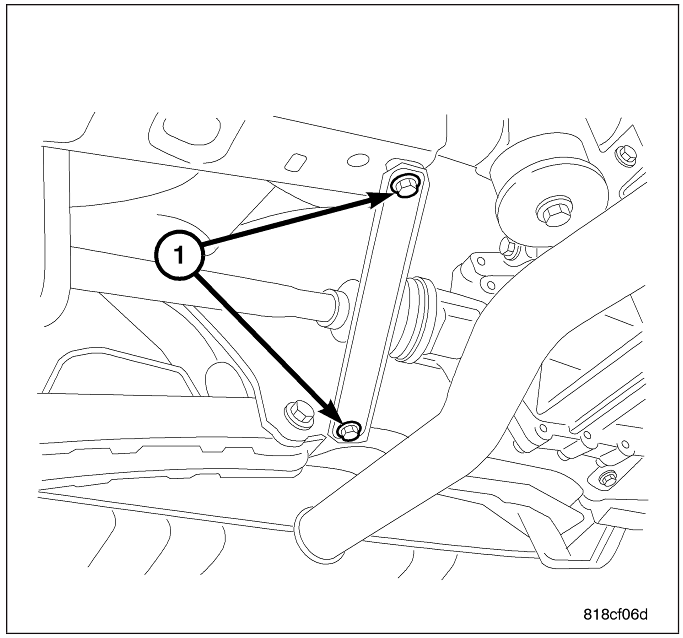
7. Roll sway bar down and out of the way (2) (if equipped).



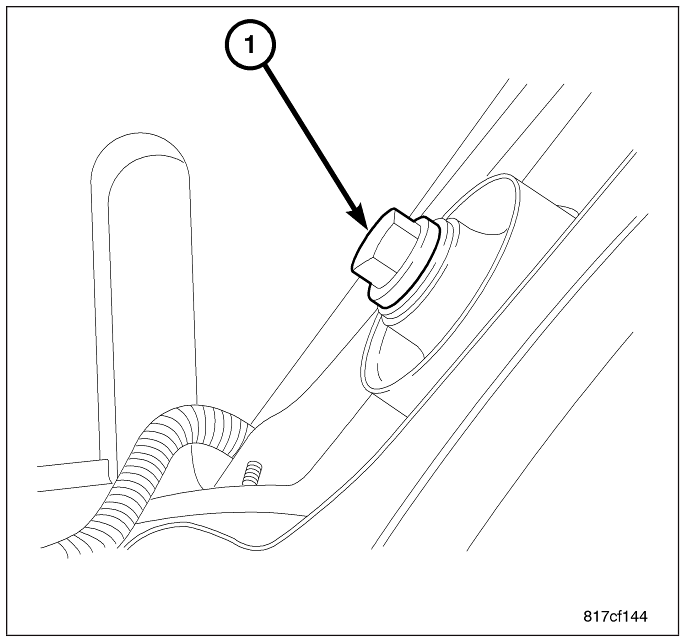
8. Remove the left side stay bracket bolts (1).



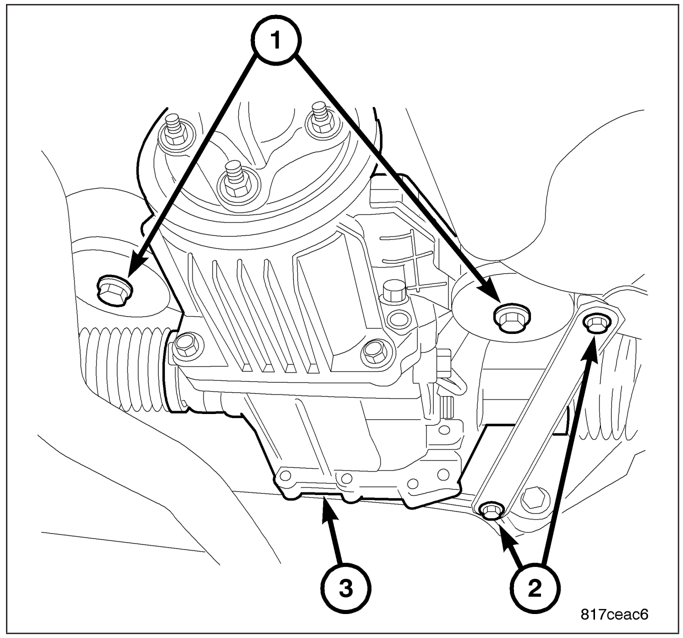
9. Remove the right side stay bracket bolts (1).
10. Remove the exhaust system up to the catalytic converter. (Refer to 11 - EXHAUST SYSTEM/ MUFFLER - REMOVAL).
11. Support the rear driveline module with a transmission jack.



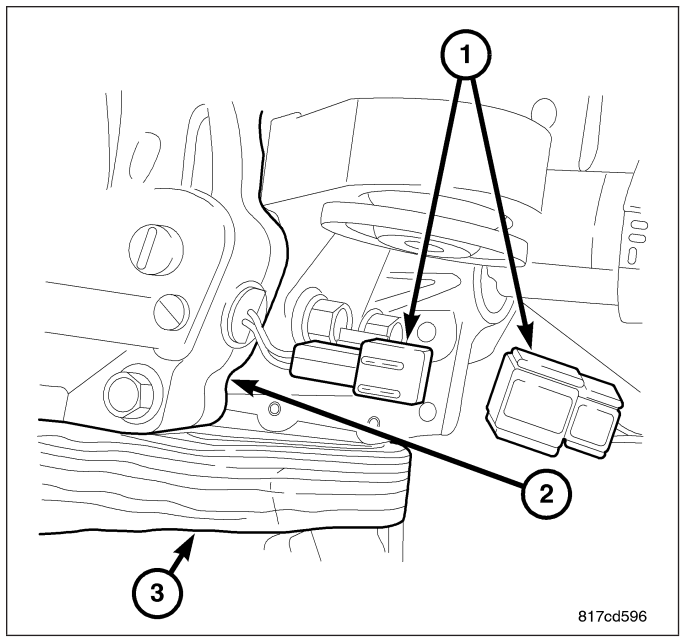
12. Remove the rear bolt (1) at the driveline module.



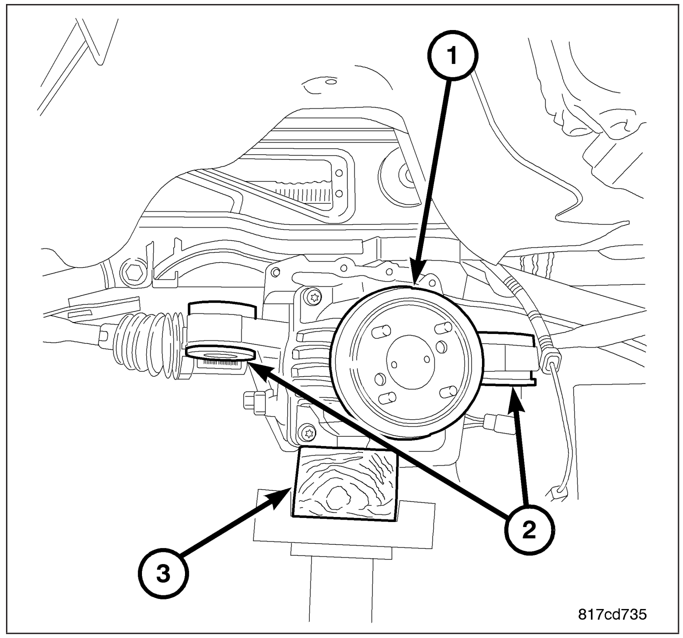
13. Remove the two side bolts (1) at driveline module (3).



14. Lower driveline module enough gain access to the electrical connector and bracket.
15. Remove the routing bracket bolt.
16. Unplug the electrical connector (1).

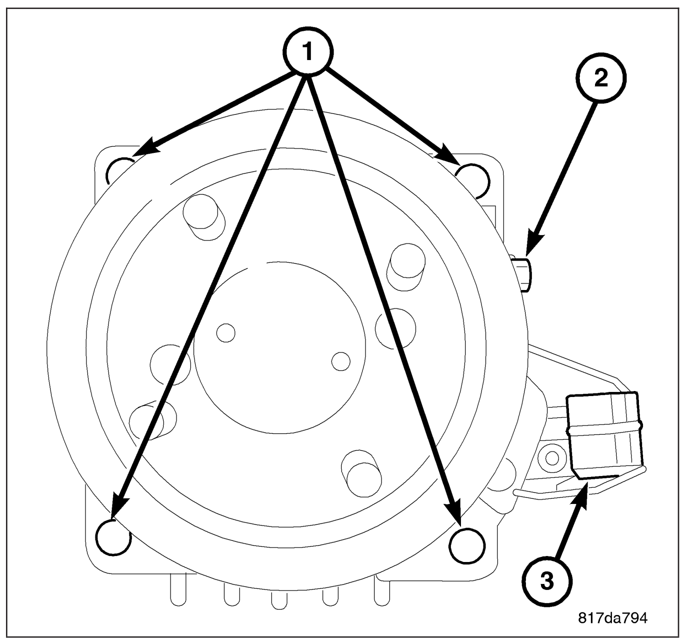


17. Lower the driveline module (1).
18. Disengage both axle shafts (2).
19. Remove driveline module.
20. Remove the ECC bolts.
21. Separate the ECC form the RDA.

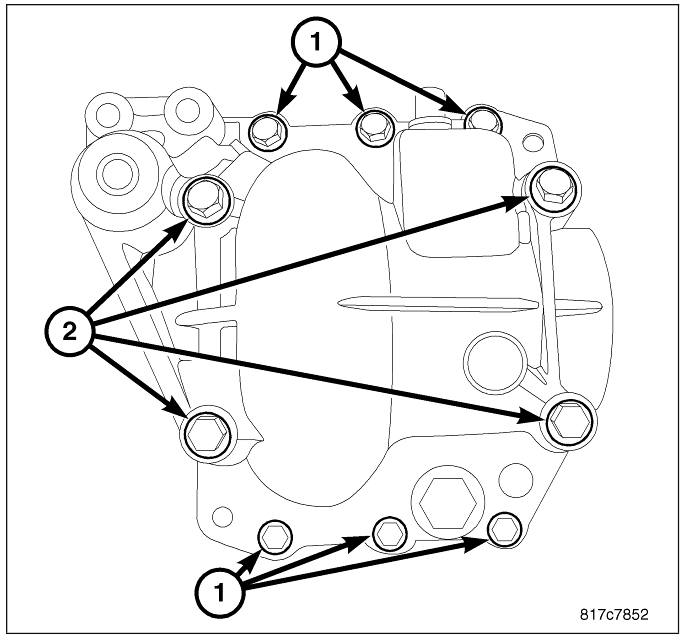


DISASSEMBLY

1. Remove the four bolts (1) holding the rear axle electric clutch.
2. Separate the rear axle electric clutch from the rear axle.

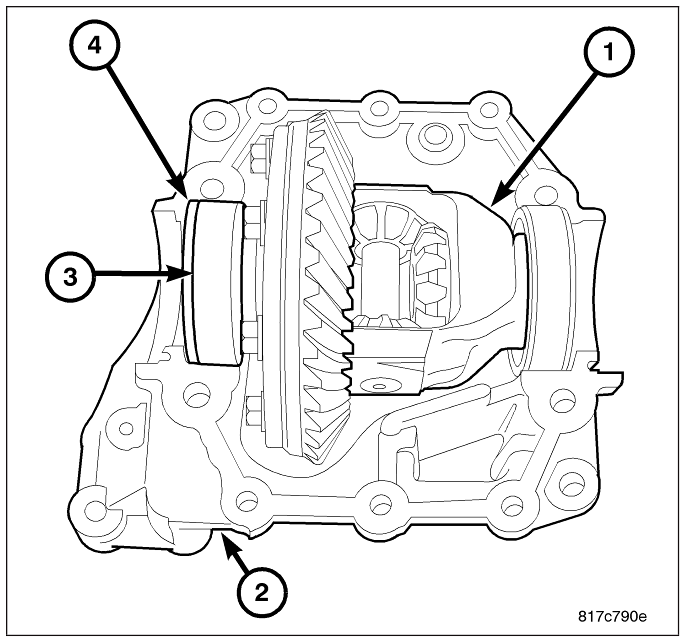


3. Remove the differential case bolts (1).
4. Remove the cap bolts (2).
5. Remove the differential cover and the both axle seals.

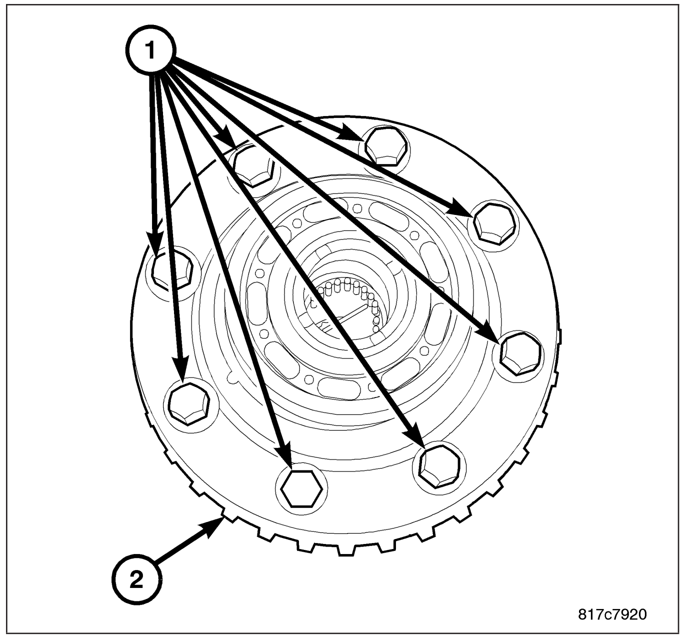


NOTE: There are select shims at each side of the carrier

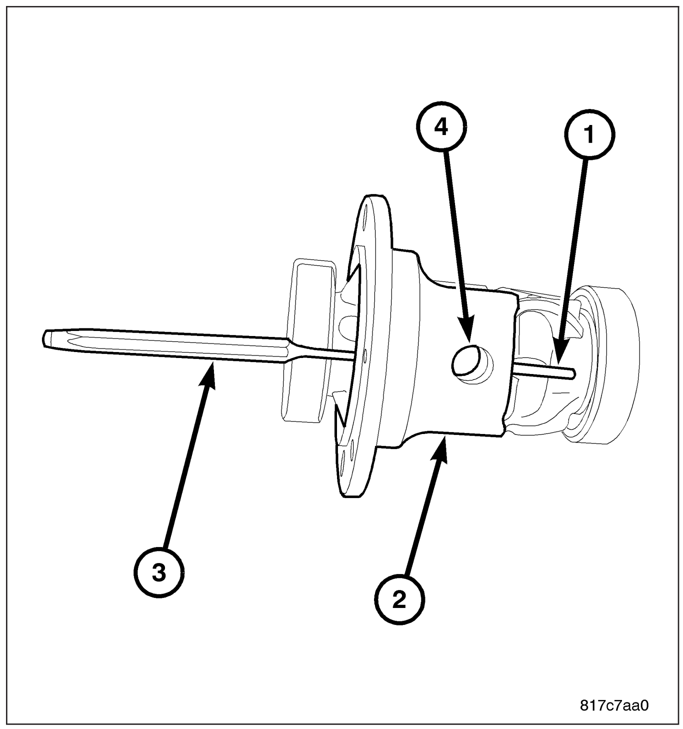
6. Remove the carrier (1) from the differential housing (2).
7. Measure the select shims on each side of the carrier roller bearings and note for installation.



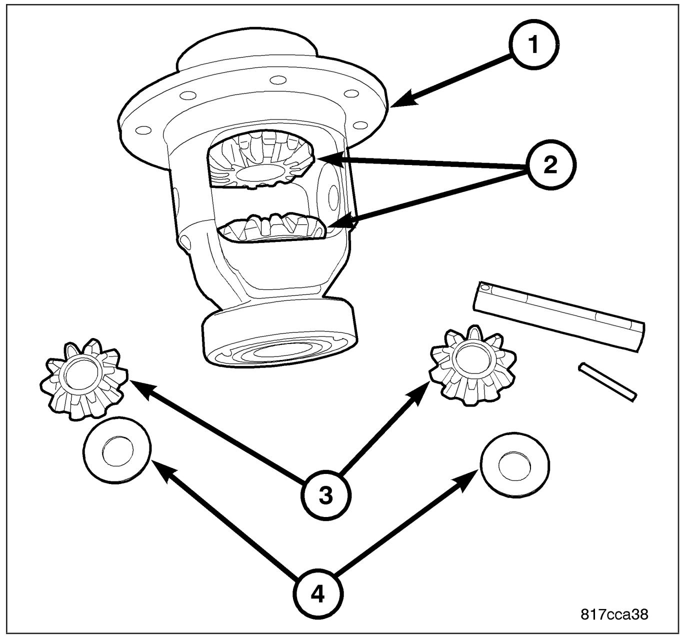
8. Remove the ring gear bolts (1).
9. Remove the ring gear (2).



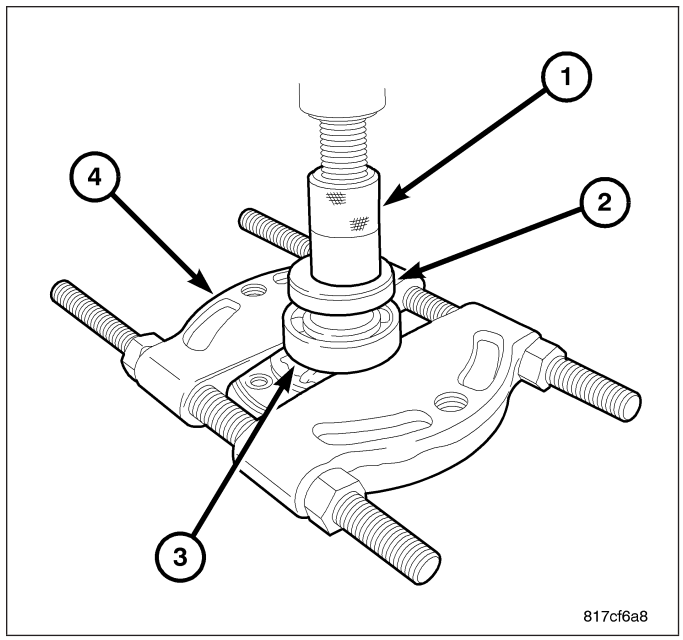
10. Remove roll pin (1) in carrier case (2) and through the pinion mate shaft (4) using a punch (3).



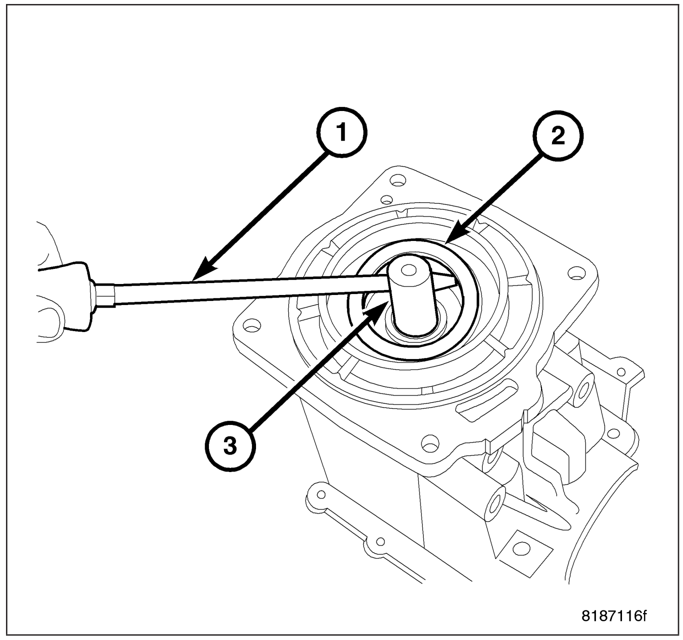
11. Remove spider gears, (3) thrust washers (4) and side gears (2).



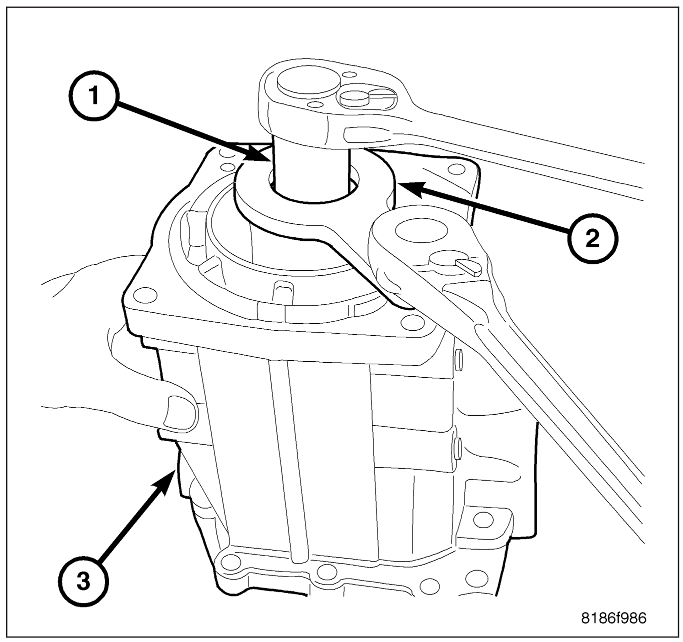
12. Remove carrier bearings (3) using Splitter 1130, (4) Installer 9643 (2) and a Press (1).



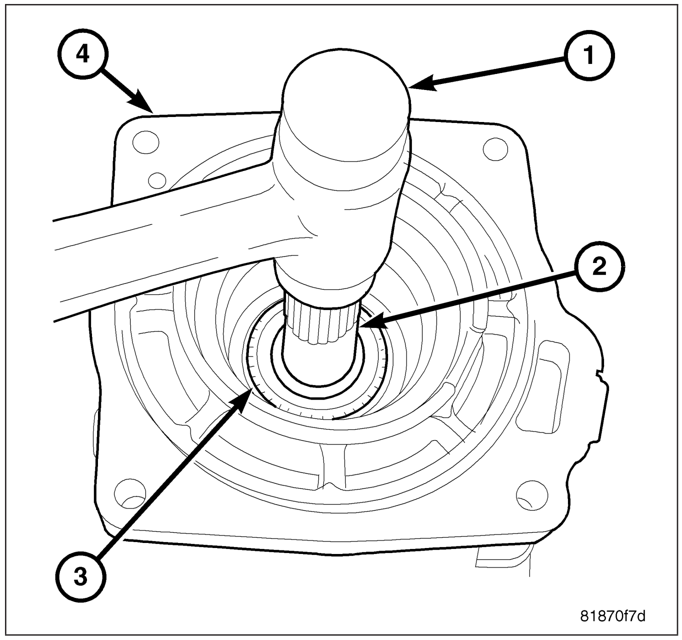
13. Use a screw driver to remove the pinion seal.



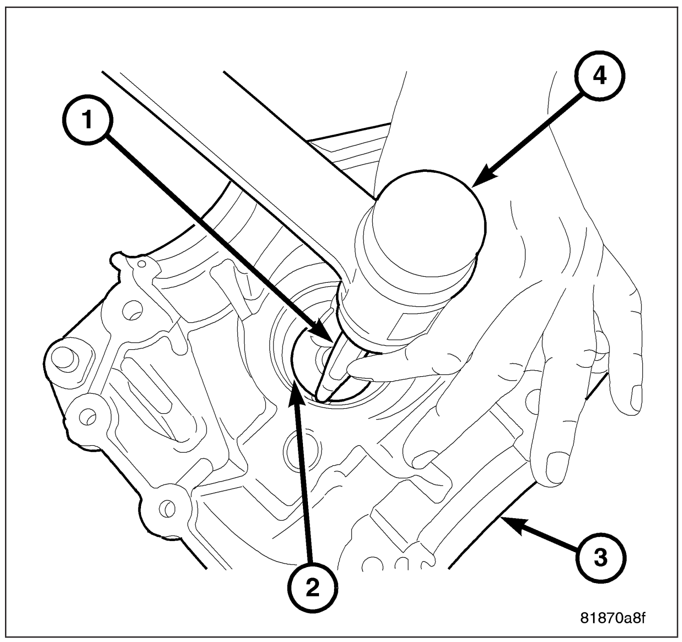
14. Remove the pinion retaining nut pinion nut using Spline Holder 9742 (1) and Socket 9921(2).



15. Tap the pinion (3) with a soft hammer (1) to remove it from case (4).

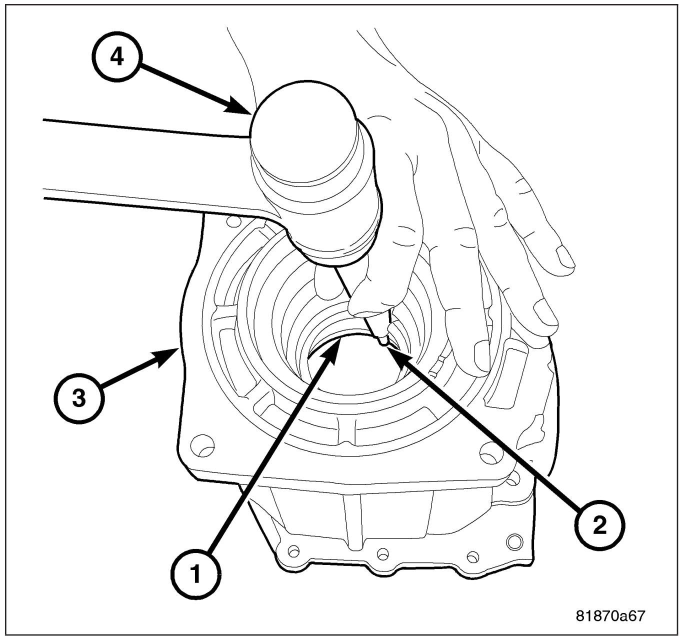


16. Using a hammer (4) and a punch (1) remove the outer pinion bearing cup (2)

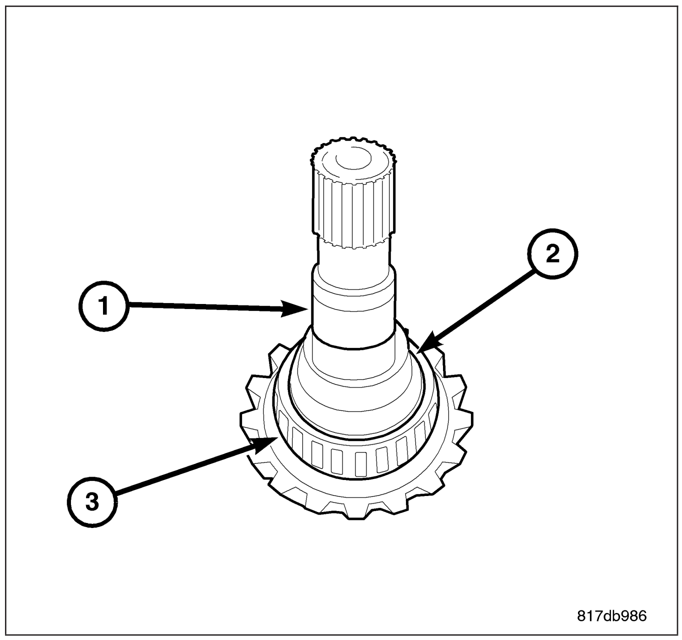


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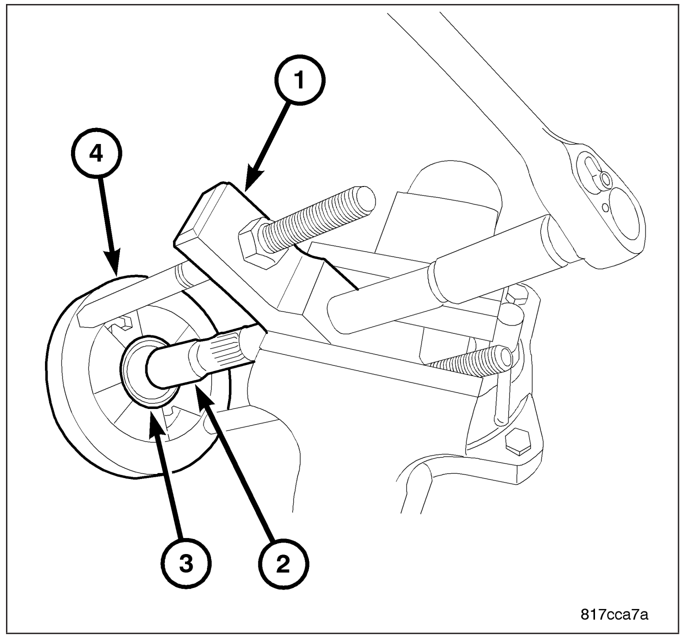
17. Using a hammer (4) and a punch (2) remove the pinion head bearing cup (1).



18. Remove collapsible spacer (2) from the pinion shaft (1).

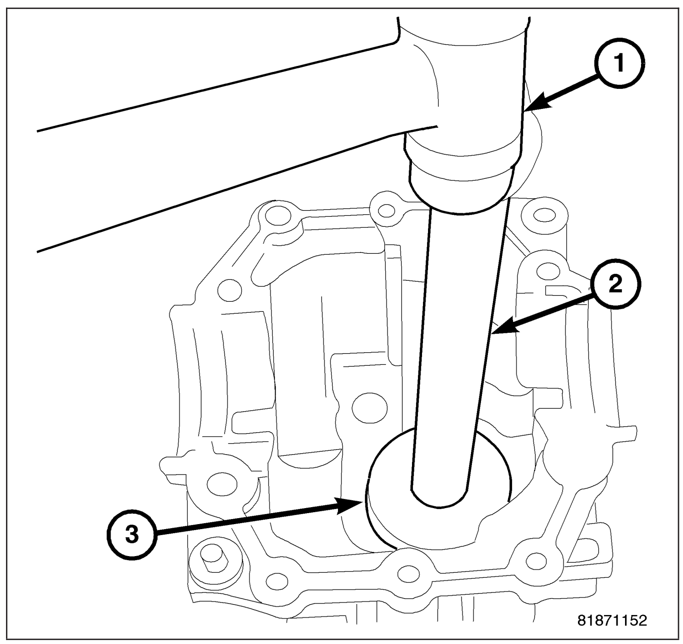


19. Remove the pinion bearing (3) using Puller C-293–PA (1) and Iinserts C293–45 (2).

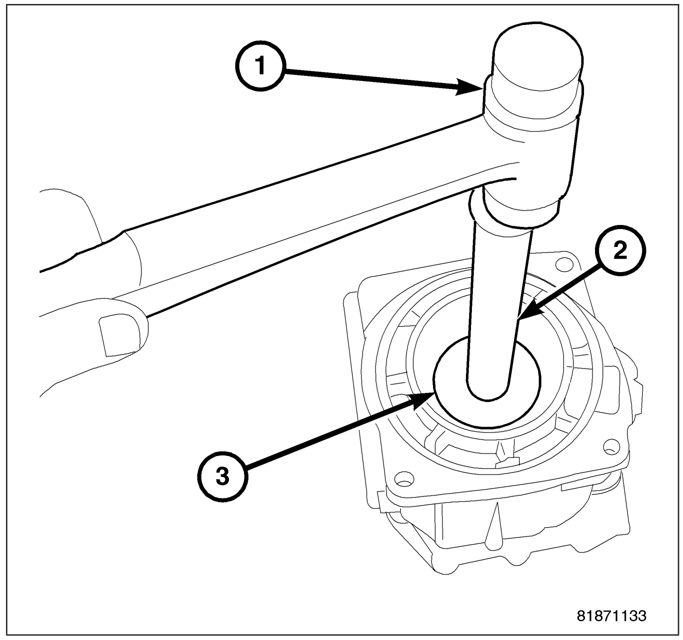


ASSEMBLY

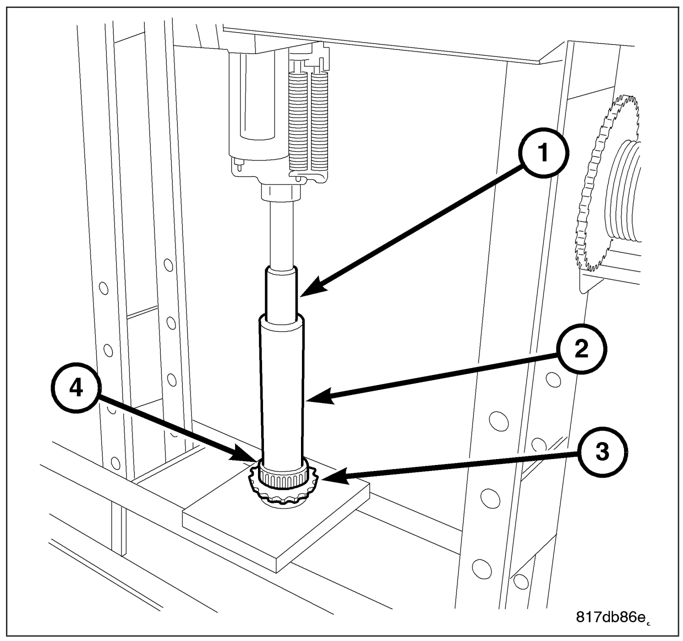
1. Install the pinion head bearing using Installer 5050A (3) and Handle C-4171 (2).



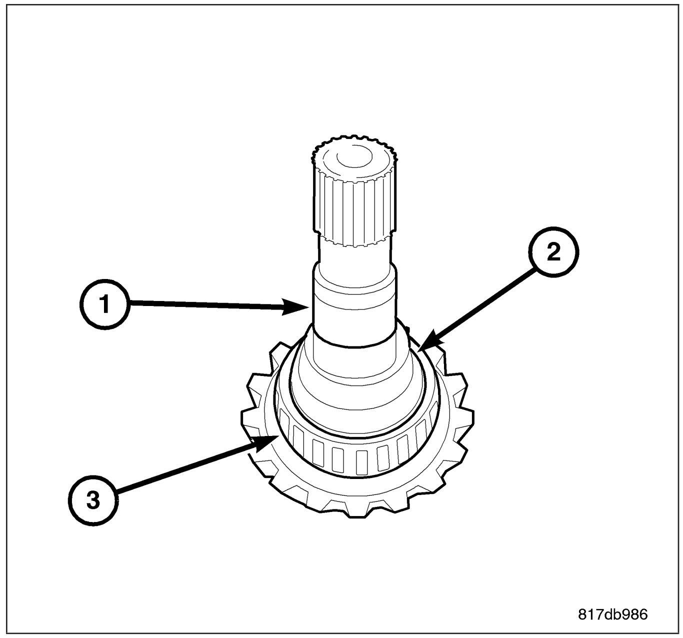
2. Install the outer pinion bearing cup using Installer 8594 and Handle C-4171.



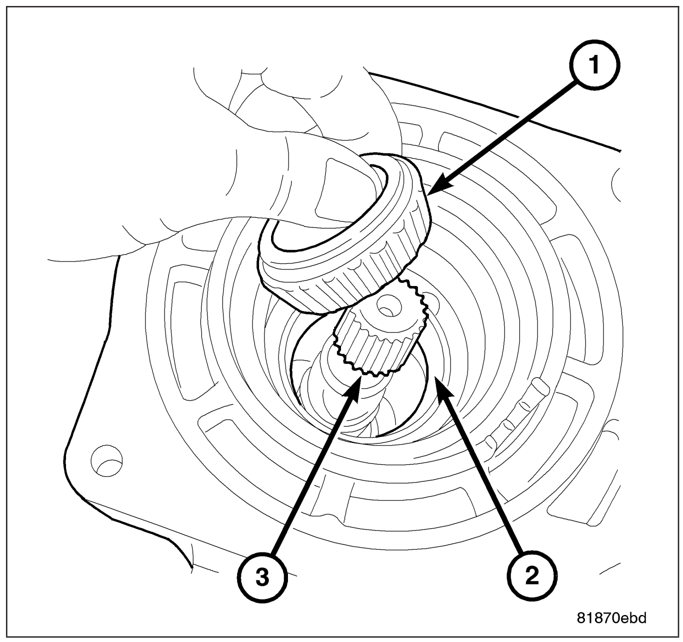
3. Install bearing (4) on pinion (3) using Installer 6052 (2) and a Press (1).



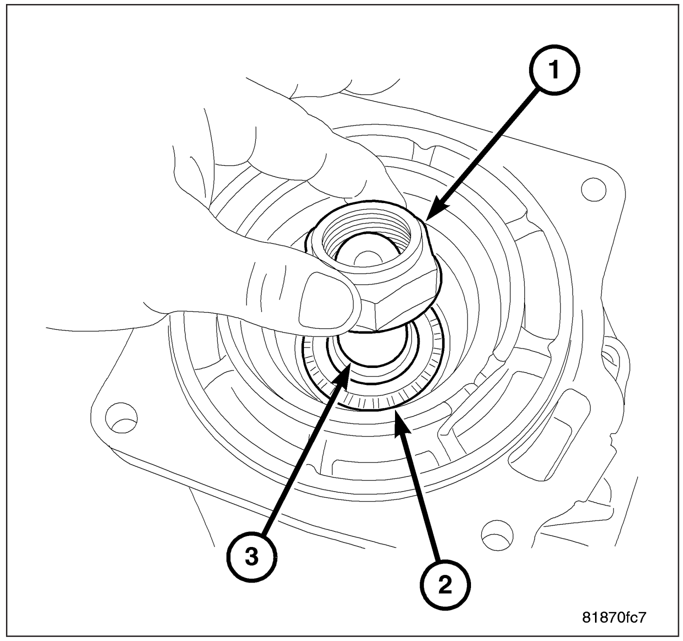
4. Install a new collapsible (2) spacer onto the pinion shaft (1).



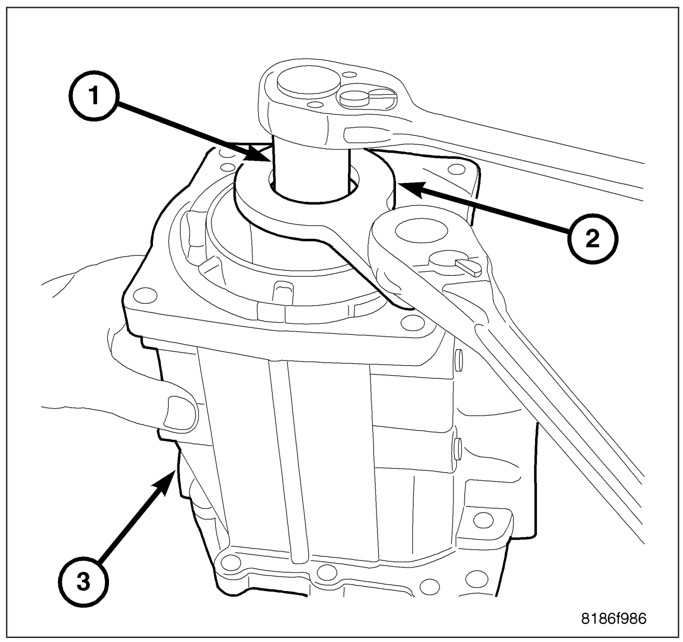
5. Install the pinion into the housing and place the outer bearing over the pinion.



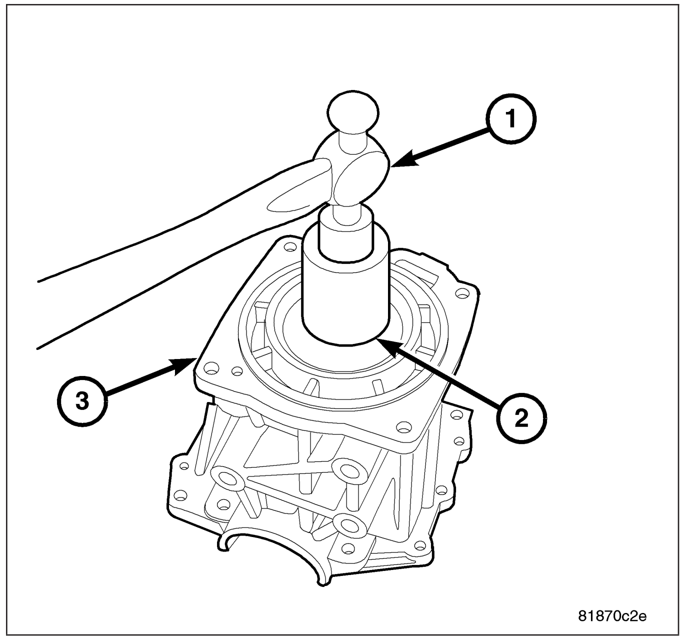
6. Install the pinion nut (1) onto the pinion shaft (3).



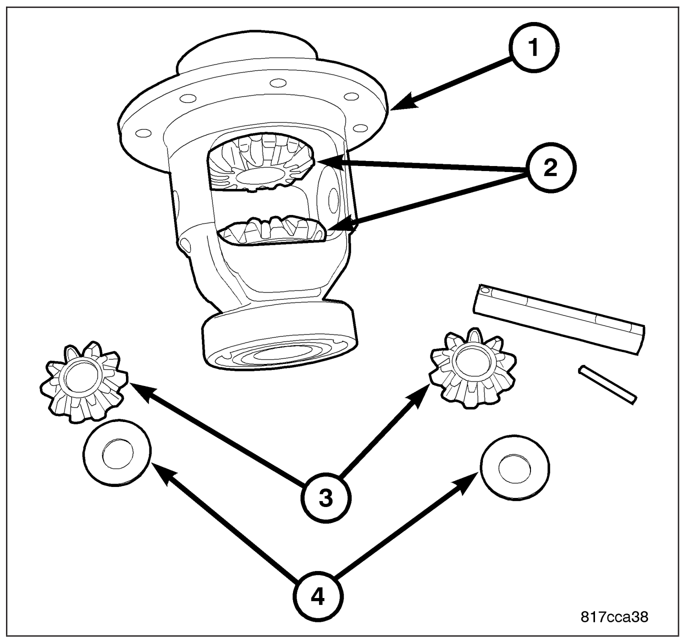
7. Install the pinion retaining nut pinion nut using Spline Holder 9742 (1) and Socket 9921 (2), torque the pinion nut to 74 N·m (133 ft. lbs.).



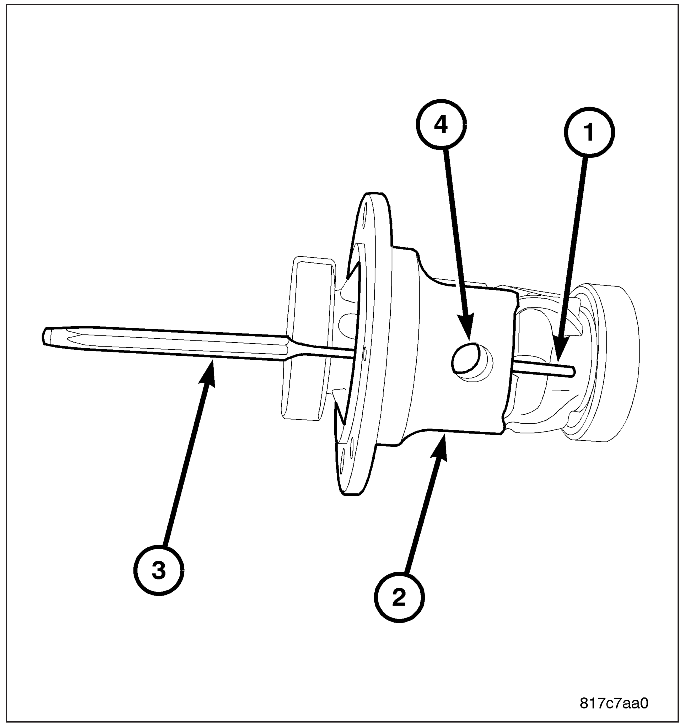
8. Install the pinion seal using Installer 9931(2) and a hammer (1).



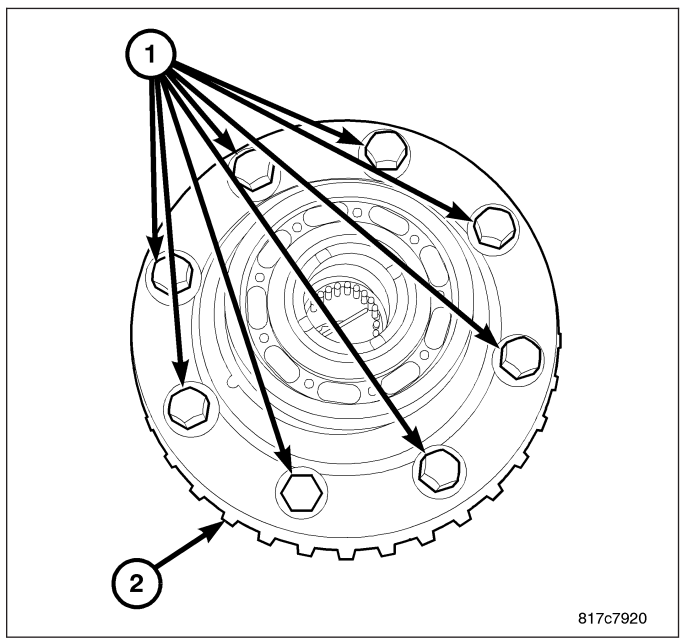
9. Install side gears (2), shims (4) and pinion gears (3) into carrier (1).
10. Install the pinion gear shaft into the pinion gears and start the roll pin.



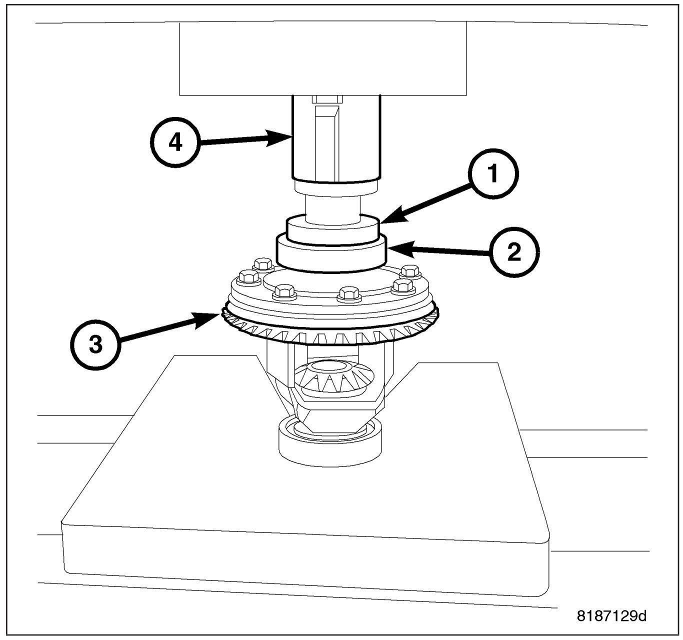
11. Use a Pin Punch to install the roll pin (1).



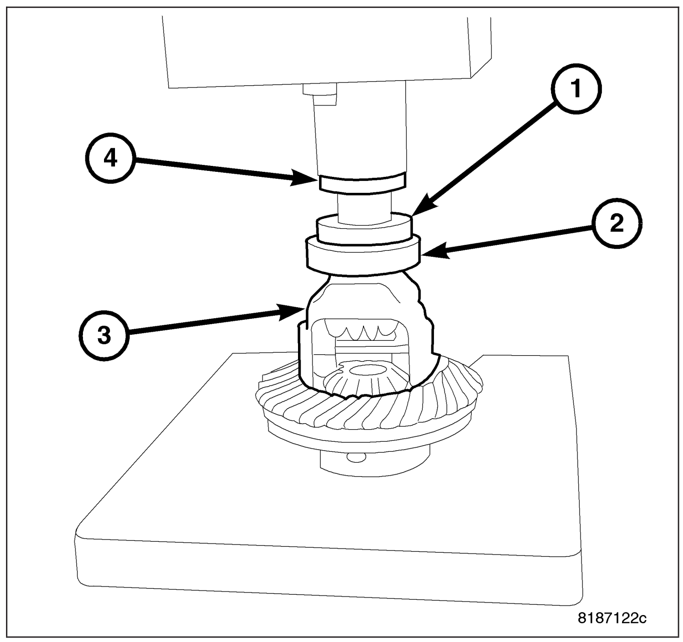
12. Install the ring gear (2) onto the carrier.
13. Install the ring gear bolts (1) and torque to 41 N·m (30 ft. lbs.).



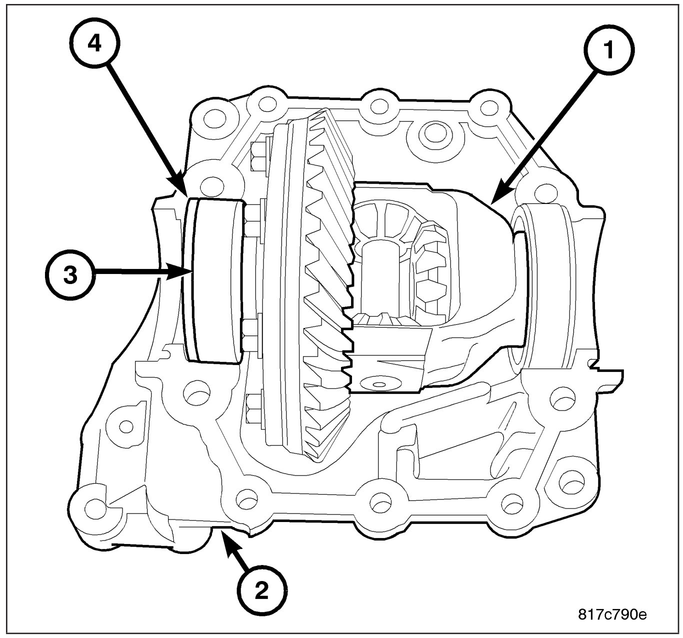
14. Press ring gear side (3) carrier bearing (2) on shaft using Installer 9643 (1) and a Press (4).



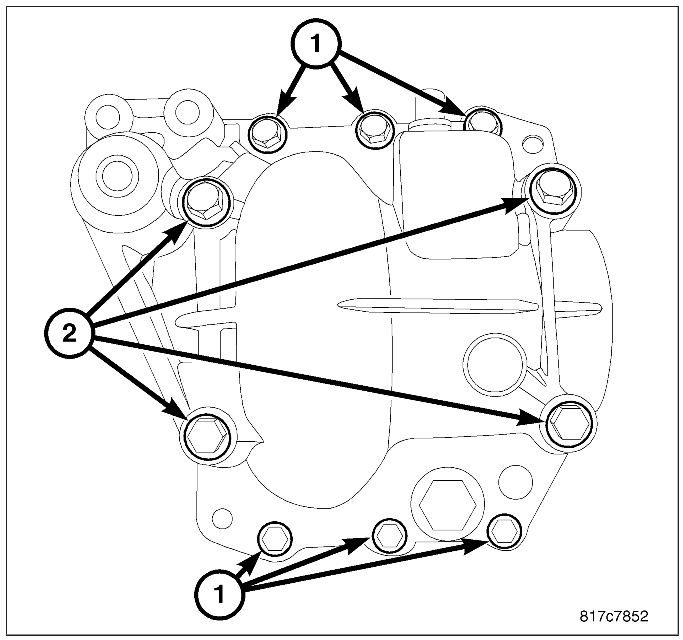
15. Press pinion gear side (3) carrier bearing (2) on shaft using Installer 9643 (1) and a Press (4).



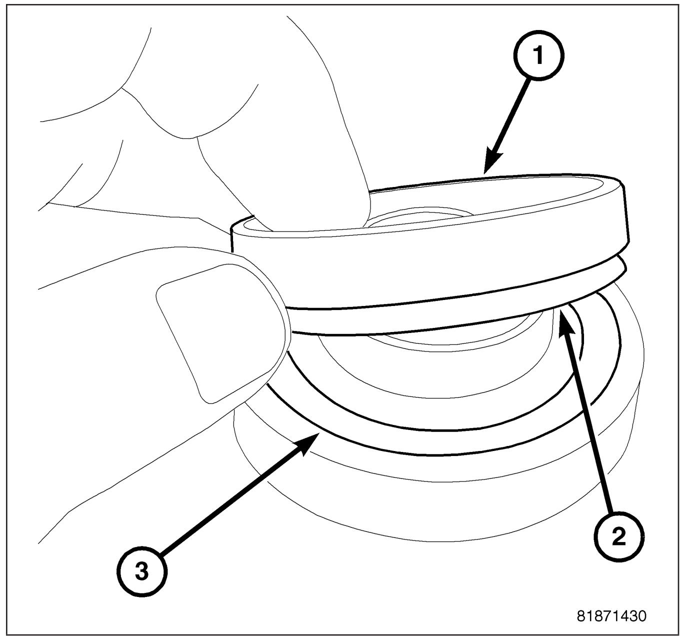
16. Install the pre measured side shims (3) and carrier (1) into the carrier housing (2).
17. Apply a bead of MOPAR© AXLE RTV on the case to seal the cover.



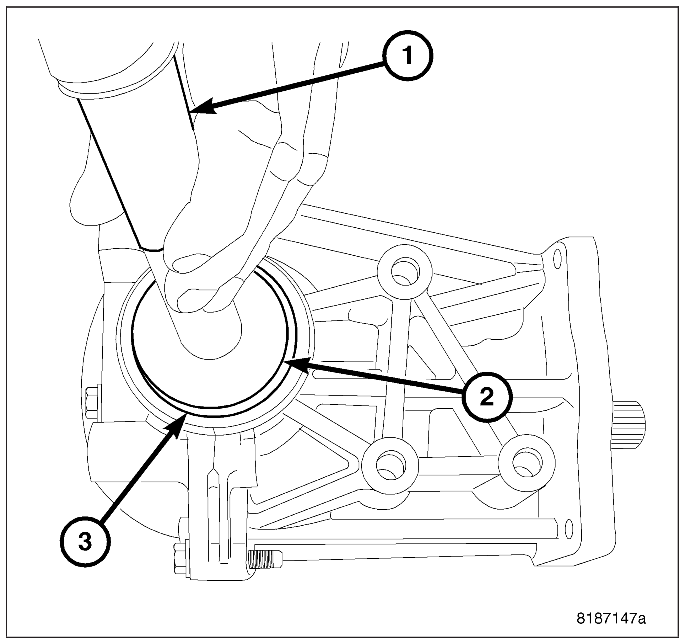
18. Install the cover onto the carrier case.
19. Install the cover bolts (1, 2).
20. Torque the cap bolts (2) to 48 N·m (35 ft. lbs.).
21. Torque the cover bolts (1) to 23 N·m (16 ft. lbs.).



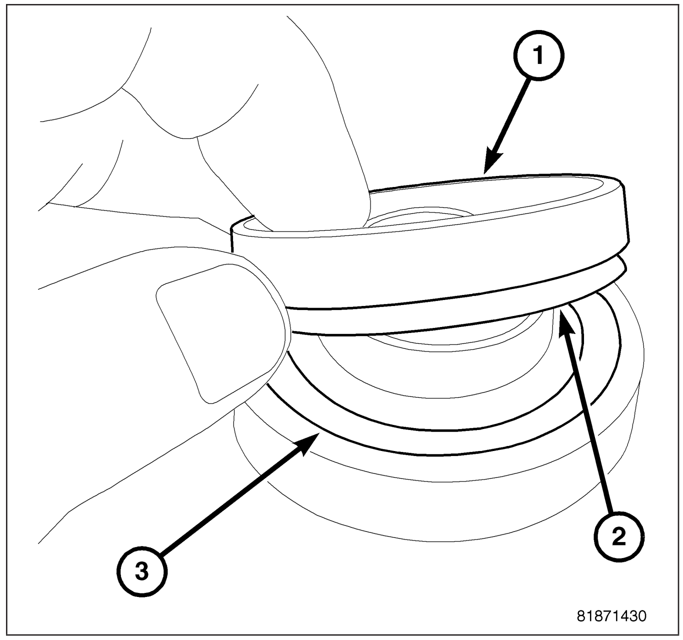
22. Install the pinion side axle seal (1) onto Installer 9893 (3) insure that the lip is down (2).



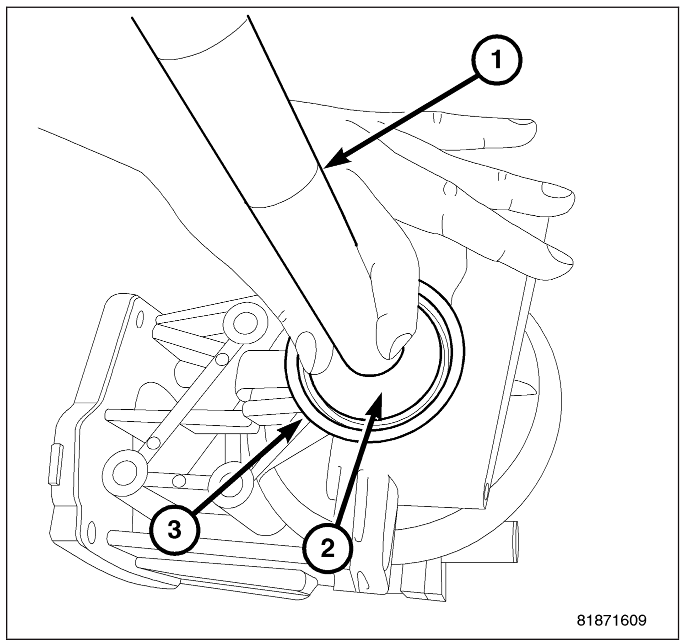
23. Install the pinion side axle seal using Installer 9893 (2) and Handle C-4171 (1).



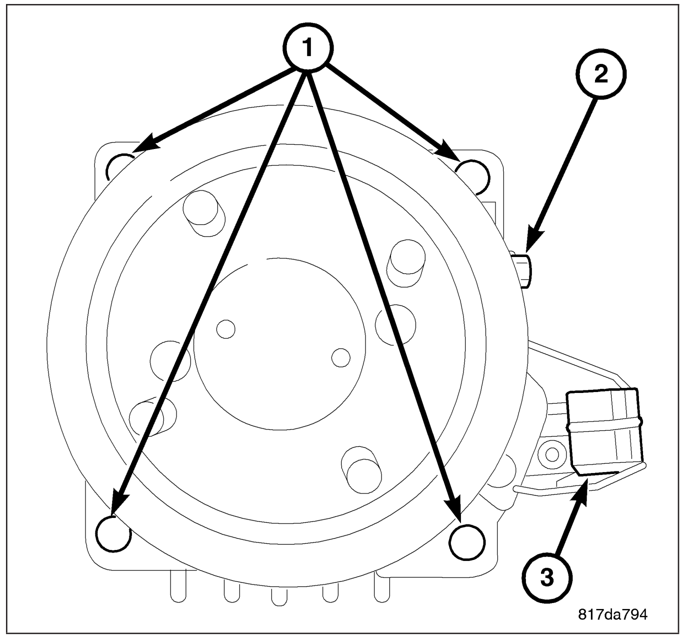
24. Install the pinion side axle seal (1) onto Installer 9893 (3) insure that the lip is down (2).



25. Install the ring gear side axle seal using Installer 9893 (2) and Handle C-4171 (1).

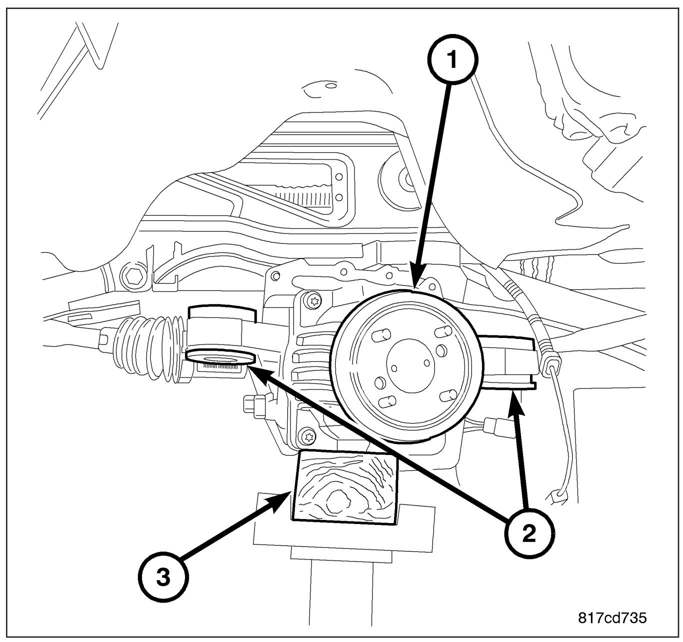


26. Install the ECC to the RDA and torque the bolts to 78 N·m (58 ft. lbs.).

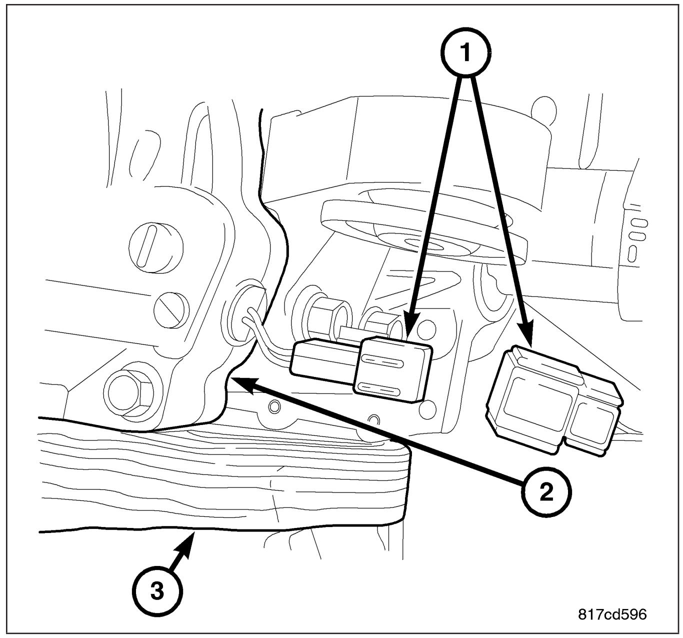


INSTALLATION

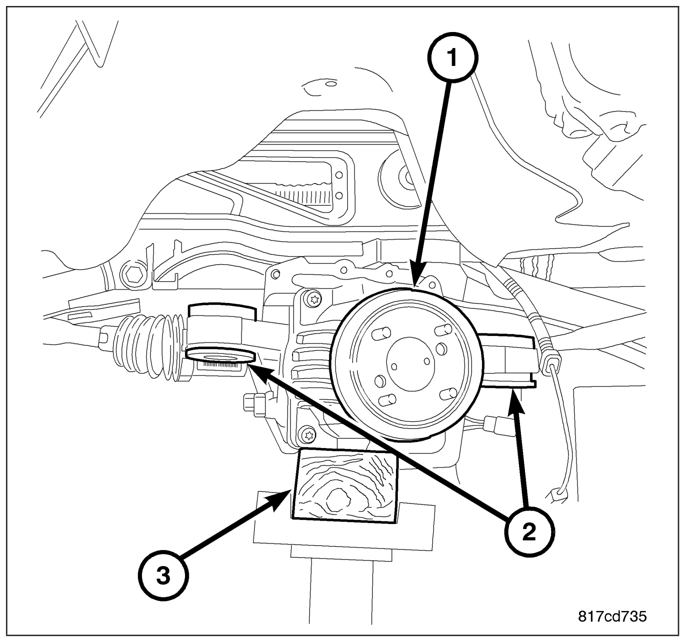
1. Lift driveline module (1) with a transmission jack while installing both axles (2).



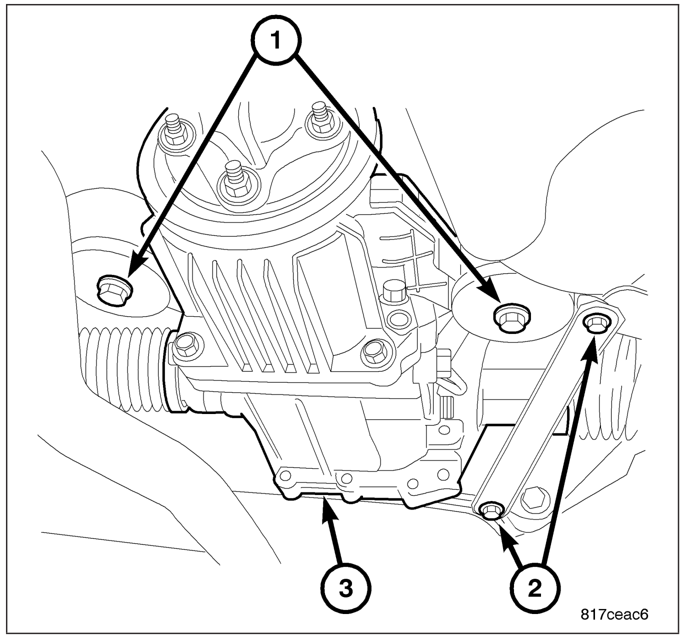
2. Connect the electrical connector (1).
3. Install wire harness bracket and two mounting bolts and torque to 45 N·m (33 ft. lbs.).



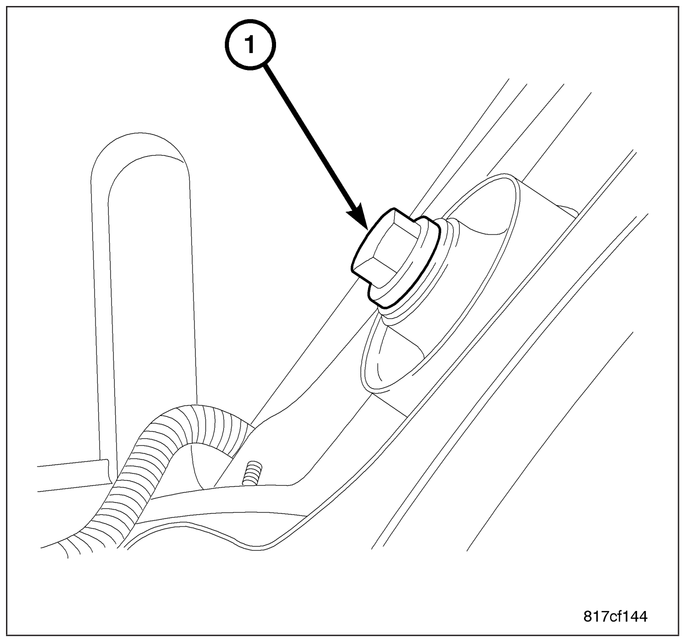
4. Lift driveline module into place.



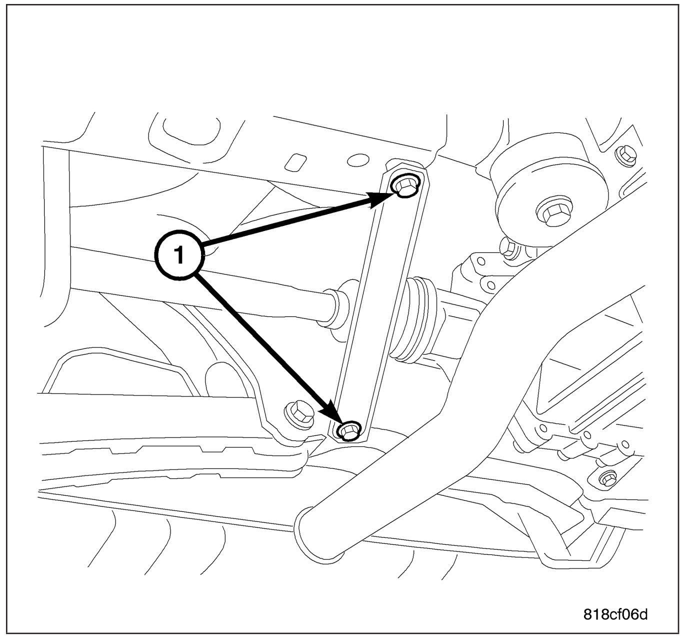
5. Install the two driveline module side mounting bolts (1) and torque to 102 N·m (75 ft. lbs.).



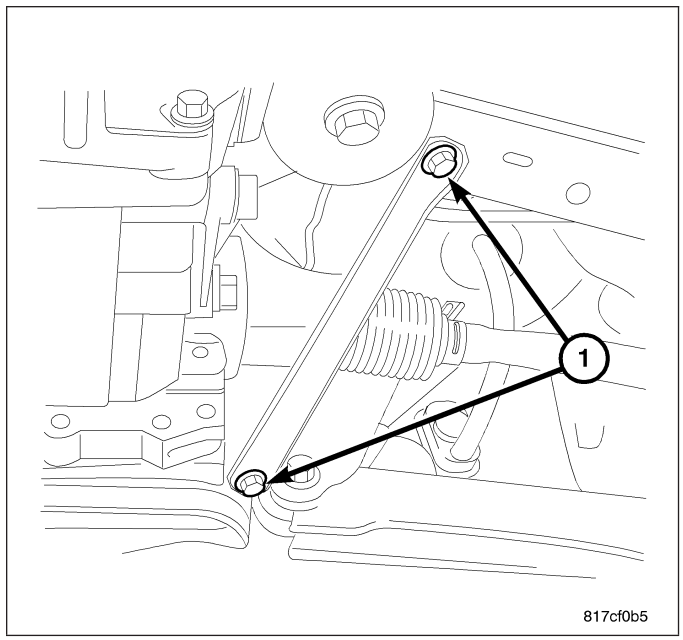
6. Install the one rear driveline module mounting bolt (1) and torque to 102 N·m (75 ft. lbs.).



7. Install the right side stay bracket and bolts, (1) torque to 61 N·m (45 ft. lbs.)

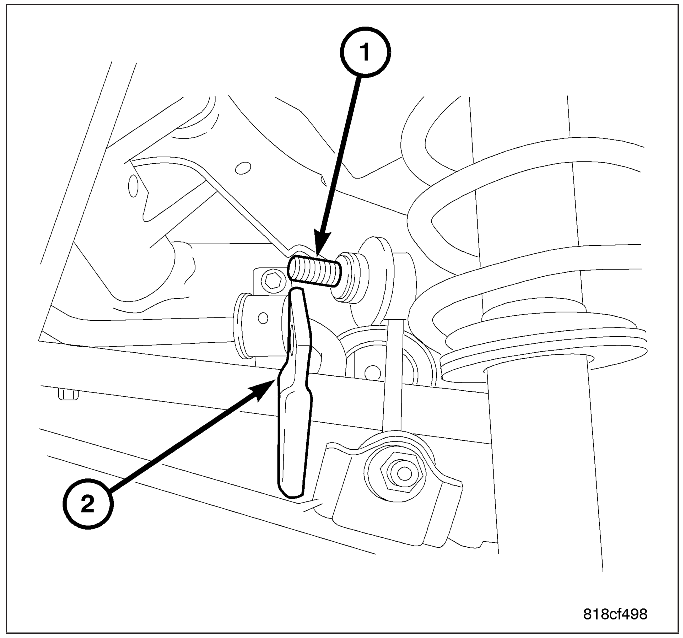


8. Install the left side stay bracket and bolts, (1) and torque to 61 N·m (45 ft. lbs.).

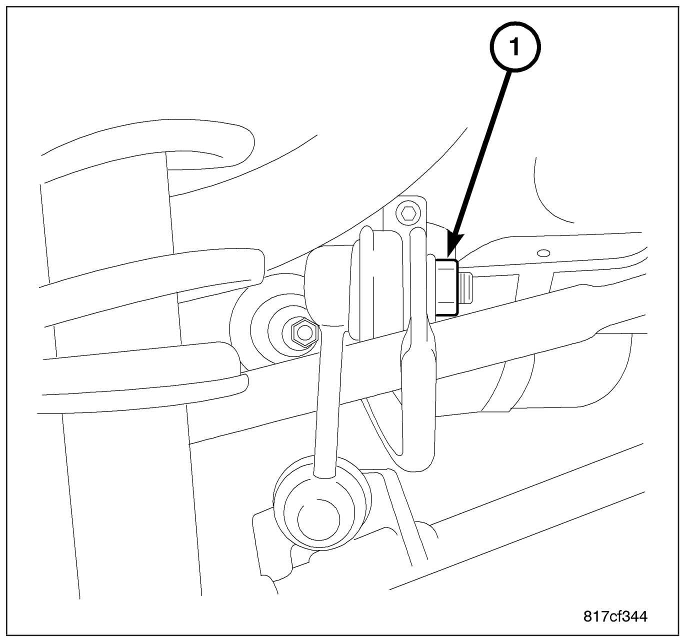


9. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
10. Fill the rear axle with fluid.

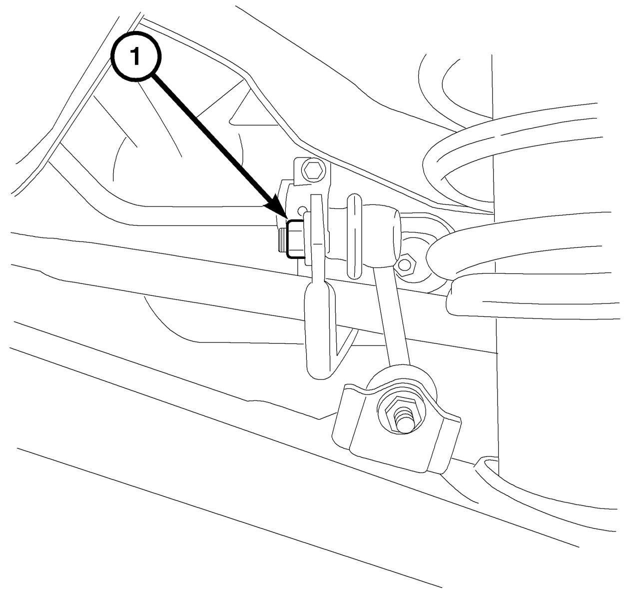
11. Roll sway bar into place (2) (if equipped).



12. Install left side sway bar nut and torque to 61 N·m (45 ft. lbs) (1) (if equipped).



13. Install right side sway bar nut and torque to 61 N·m (45 ft. lbs) (1) (if equipped).
14. Install the exhaust (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
15. Install the wheels (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).

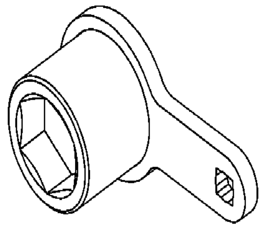


SPECIFICATIONS -

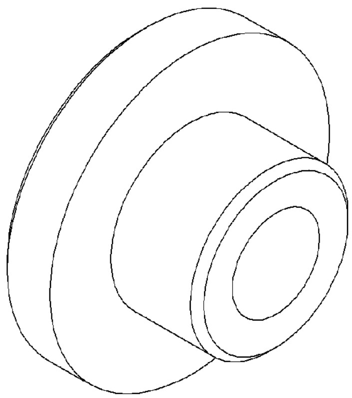
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolts, Harness Bracket	45	33	-
Bolts, Driveline Module Side Mounting	102	75	-
Bolt, Rear Driveline Module	102	75	-
Bolts, Stay Bracket	61	45	-
Nut, Sway Bar	61	45	-
Nut, Pinion	74	133	-
Bolts, Ring Gear	41	30	-
Bolts, Carrier Cap	48	35	-
Bolts, Deferential Cover	23	16	-
Bolts, ECC to RDA	78	58	-

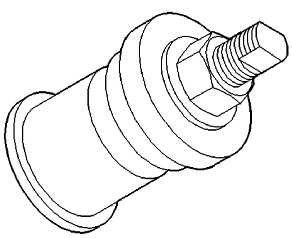
SPECIAL TOOLS



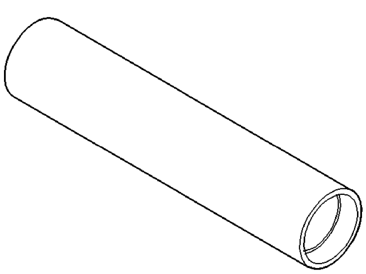
OUTPUT SHAFT NUT SOCKET 9921



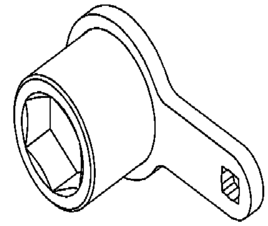
INSTALLER 9643



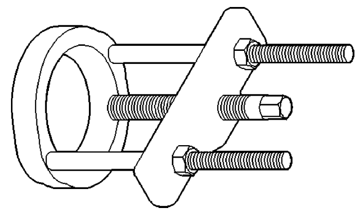
Installer - 5050A



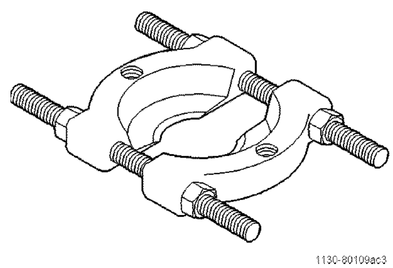
Installer 6052



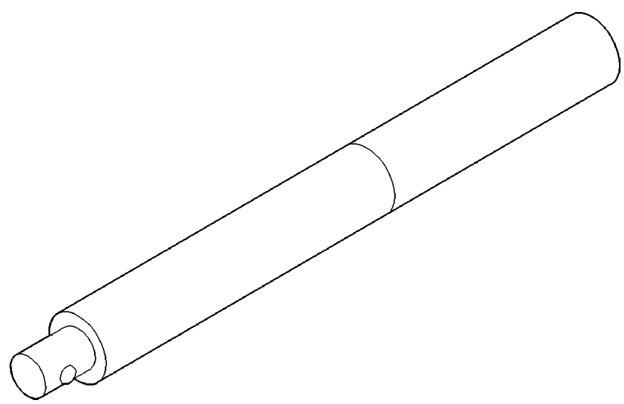
OUTPUT SHAFT NUT SOCKET 9921



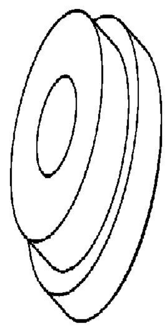
Puller Press C-293–PA



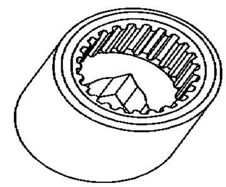
SPLITTER 1130



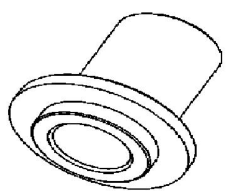
Universal Handle C- 4171



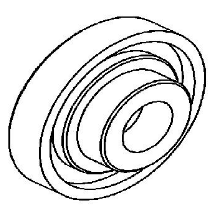
INSTALLER 8594



SPLINE TOOL 9742



INSTALLER 9931

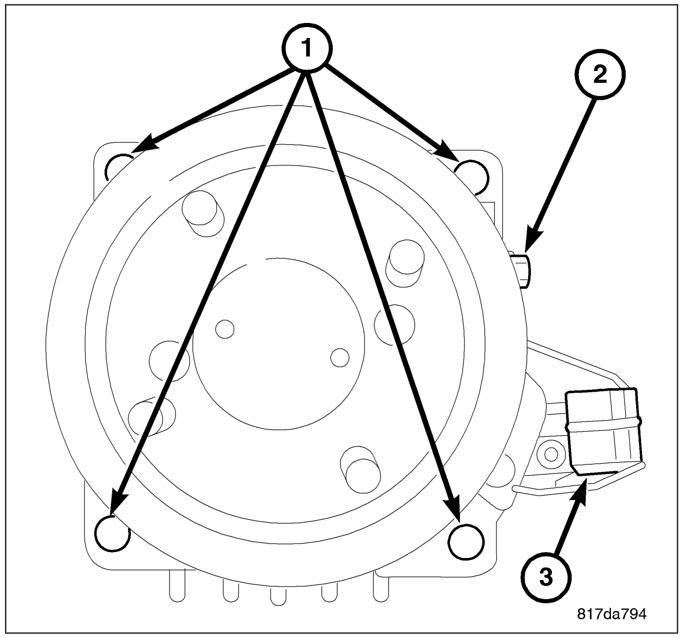


INSTALLER 9893

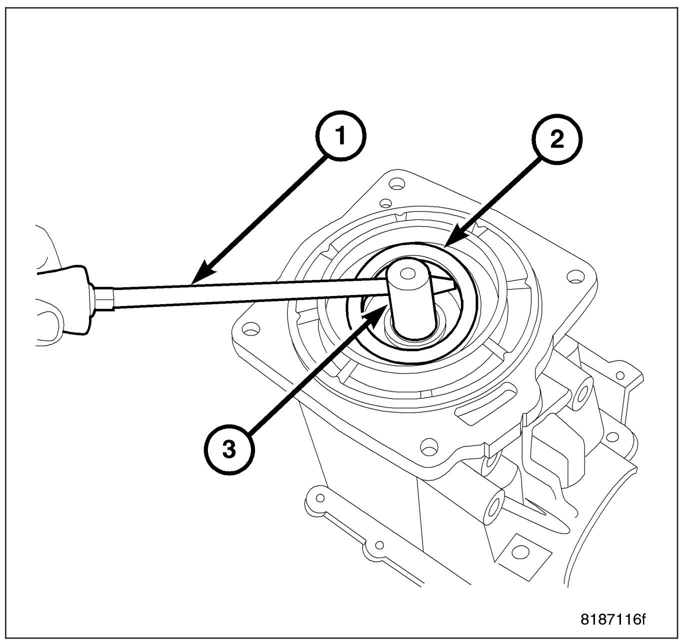
SEAL-INPUT FLANGE

REMOVAL

1. Raise the vehicle on a hoist.
2. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
3. Unplug the electrical connector (3) at the ECC.
4. Remove the ECC to RDA mounting bolts.
5. Separate and lower ECC.

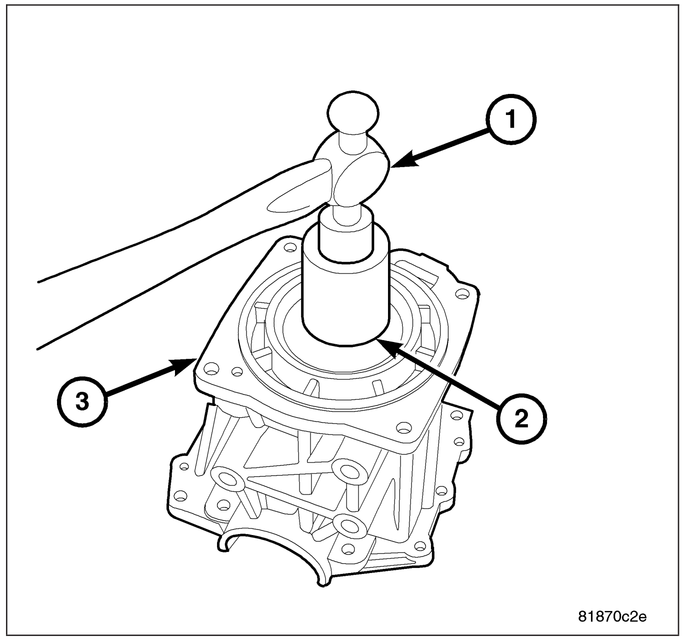


6. Remove the input flange seal.

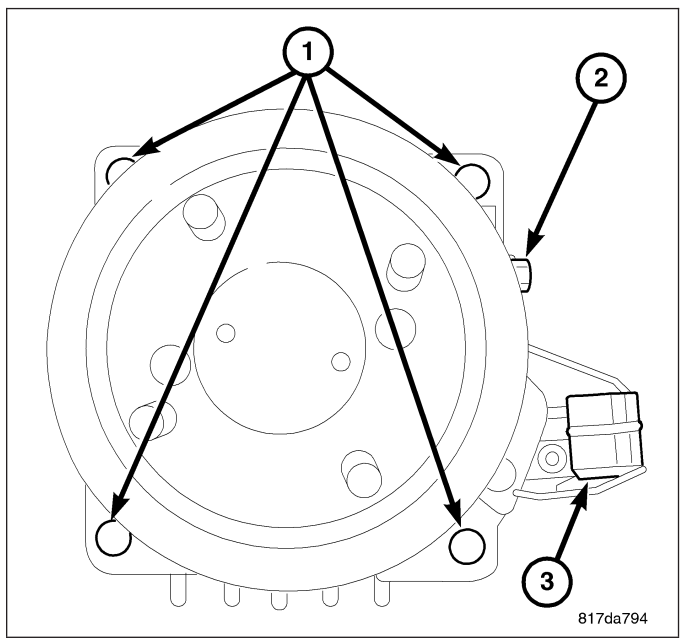


INSTALLATION

1. Install the pinion seal using Installer 9931.



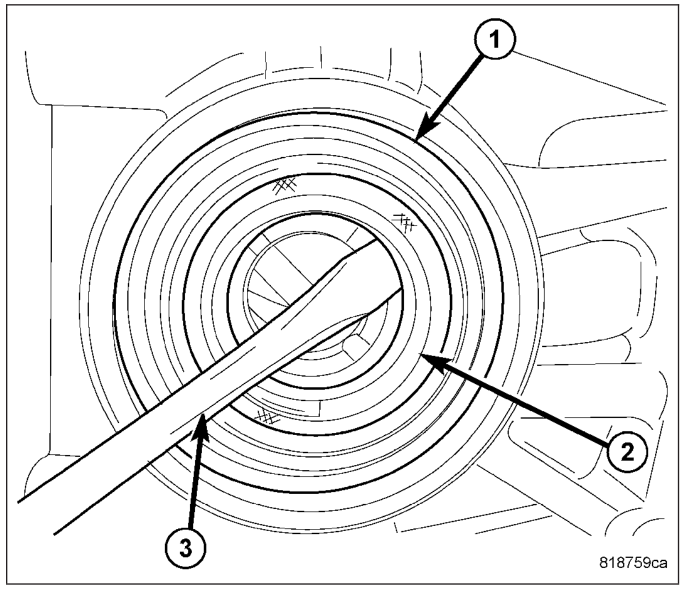
2. Install the ECC onto the RDA.
3. Install the mounting bolts (1) that hold the ECC to the RDA and Torque to 78 N·m (58 ft. lbs.).
4. Plug in the electrical connector (3).
5. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
6. Fill RDA as needed (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
7. Lower vehicle and road test.



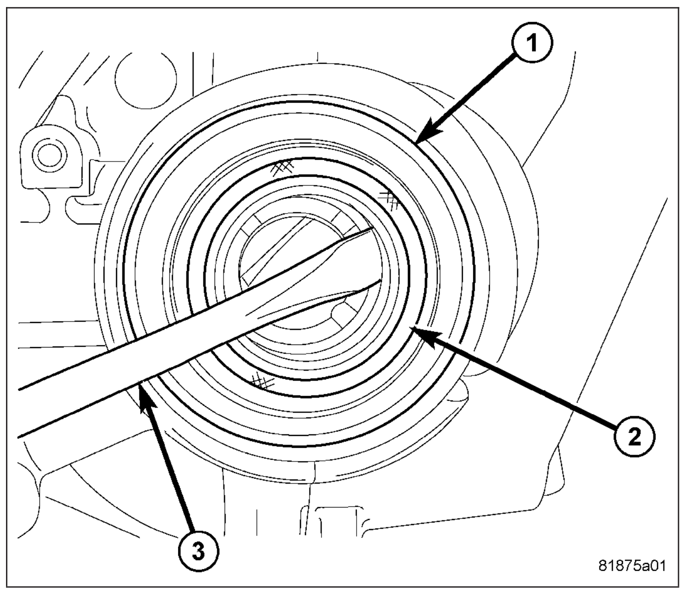
SEALS-OUTPUT FLANGE

REMOVAL

1. Raise the vehicle on a hoist.
2. Remove right side halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).
3. Remove the pinion side seal (2).

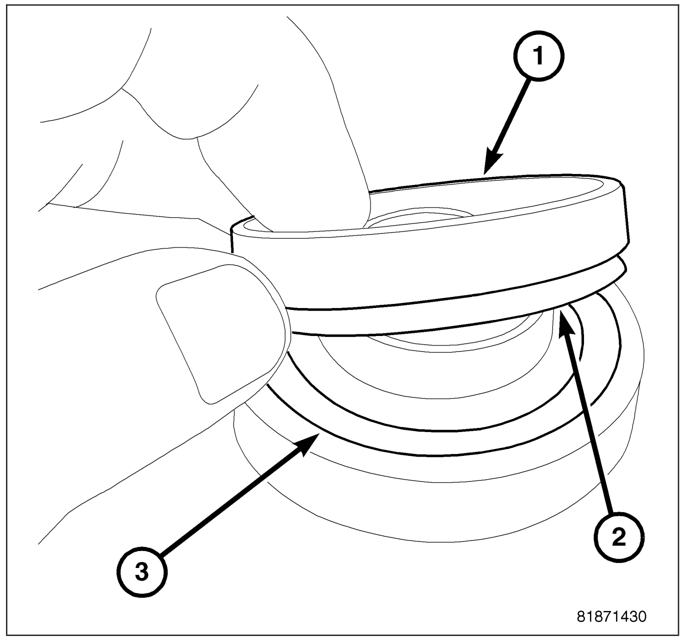


4. Remove left side halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).
5. Remove ring gear side seal.

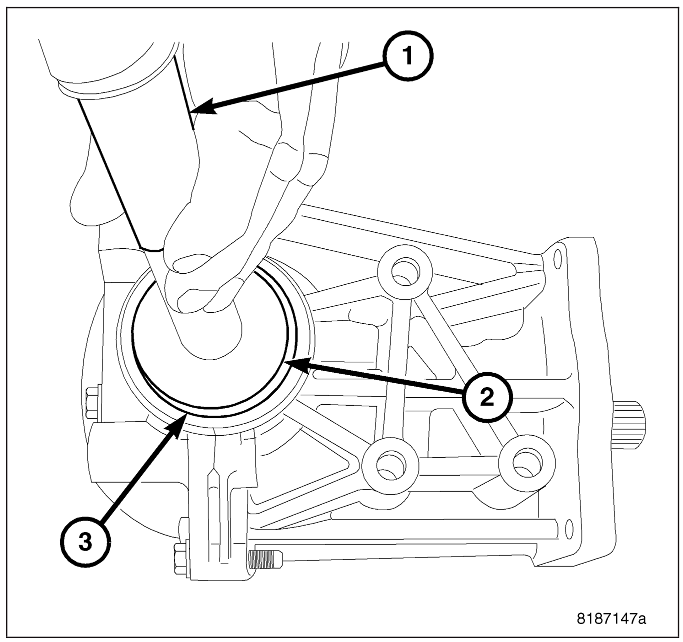


INSTALLATION

1. Place the seal on the installer.

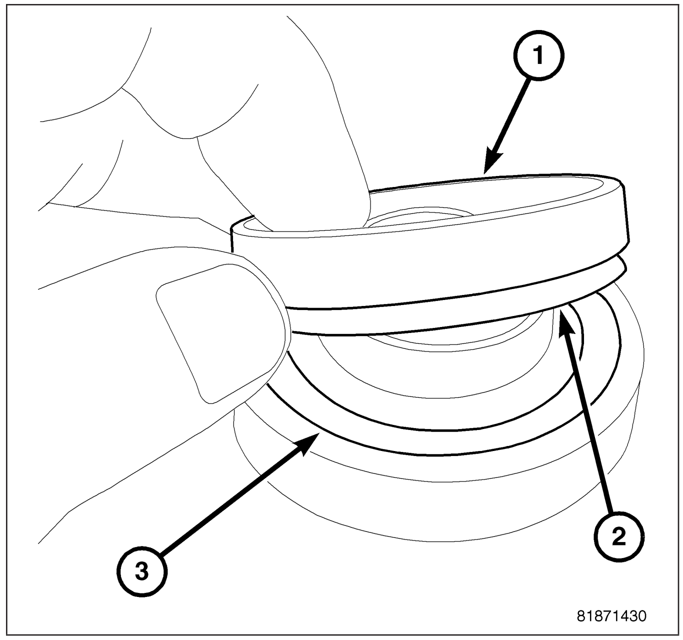


2. Install the pinion side seal using Installer 9893 and Handle C-4171.
3. Install right side halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).

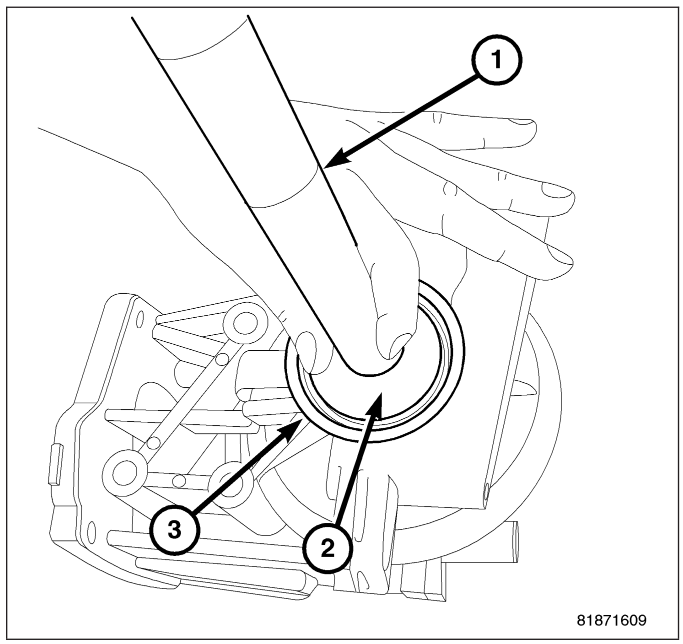


.

4. Place the seal on the installer.



5. Install the ring gear side seal using Installer 9893 and Handle C-4171.
6. Install left side halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
7. Fill RDA as needed (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR DRIVELINE MODULE - STANDARD PROCEDURE).
8. Lower vehicle and road test.



CLUTCH-ELECTRONICALLY CONTROLLED-ELECTRICAL DIAGNOSTICS

TABLE OF CONTENTS

CLUTCH-ELECTRONICALLY CONTROLLED-ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

C1078-TIRE REVOLUTIONS RANGE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous.
- **Set Condition:**
  Programmed value for tire size is not within acceptable range.

Possible Causes
INCORRECT VALUE PROGRAMMED INTO TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHECK FOR A DTC C1078-TIRE REVOLUTIONS RANGE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read and record DTCs.

Does the scan tool display: C1078-TIRE REVOLUTIONS RANGE PERFORMANCE?

Yes >> Go To 2

No >> Go To 3 Diagnostic Test

2. INCORRECT VALUE PROGRAMMED INTO TIPM

TIRE SIZE	BODY STYLE	ENGINE SIZE	SALES CODE	TIRE CIRCUMFERENCE (MM PER REV)
P205/70R 15 Dunlop SP50	PM	ALL	TPB	2112
P215/60R 17 BSW AS Touring Firestone Affinity 3	PM	ALL	TTU	2087
P215/55R 18 AS Performance Firestone Firehawk GTA 03	PM	ALL	TT1	2115
P215/60R 17 BSW Summer Performance Continental Premium Contact 2	PM	ALL	TMQ	2115
P215/55R 18BSW Summer Performance Continental Premium Contact 2	PM	ALL	TMZ	2117

Verify the correct tire/wheel information is programmed in the TIPM.

Is the correct value programmed in the TIPM according to the chart?

Yes >> Test complete.
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Program the correct Tire/Wheel information in the TIPM.
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

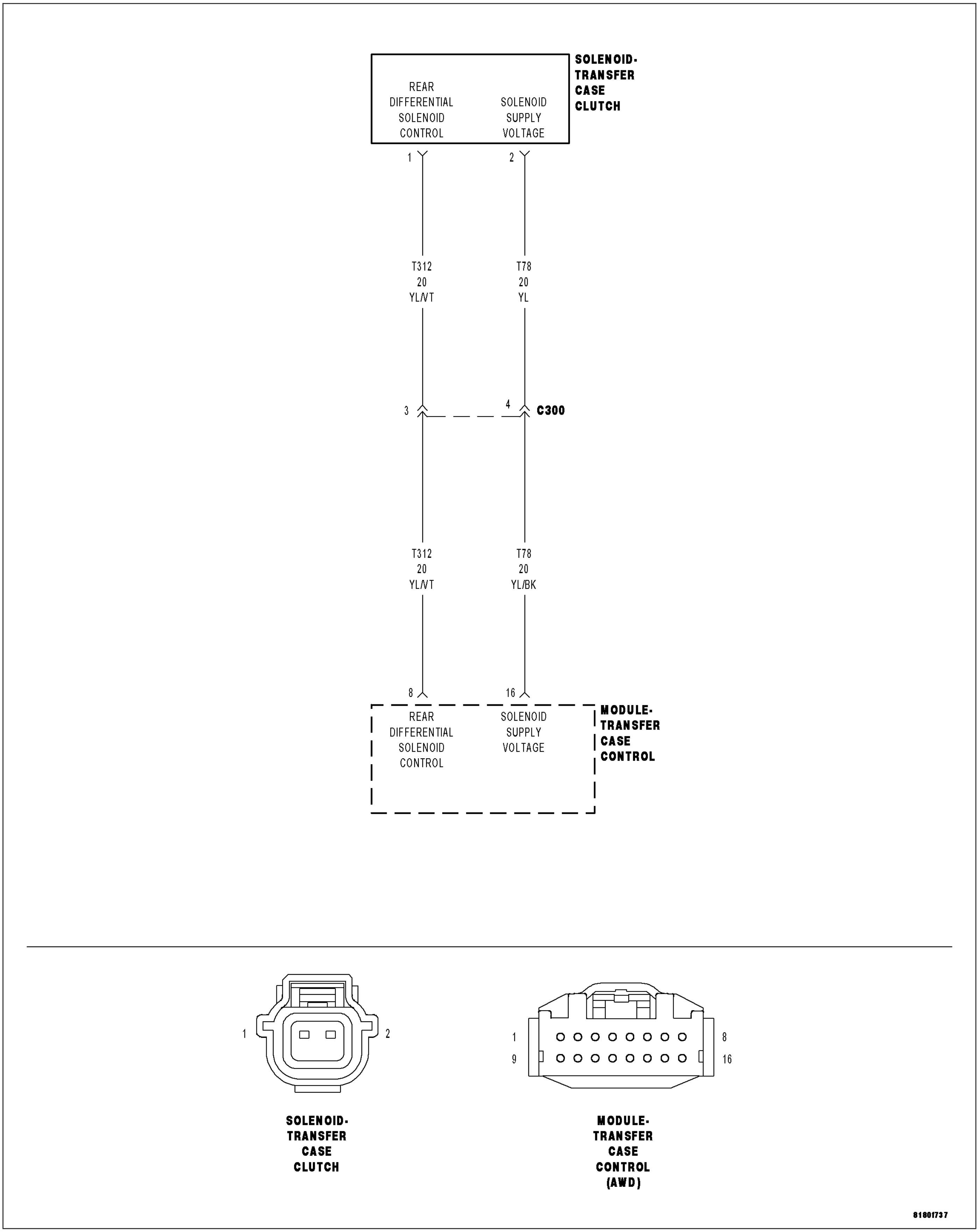
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C1456-AWD CLUTCH POWER CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Solenoid is active, no solenoid supply circuit DTCs are present and battery voltage is normal.
- **Set Condition:**
  The AWD Module detects the ECC Solenoid Power Control is shorted low.

Possible Causes
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN
(T78) SOLENOID SUPPLY VOLTAGE OPEN
(T78) SOLENOID SUPPLY VOLTAGE SHORTED TO GROUND
ALL WHEEL DRIVE (AWD) CONTROL MODULE
ELECTRONIC CONTROLLED CLUTCH (ECC)

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 9

2. ECC SOLENOID OPERATION

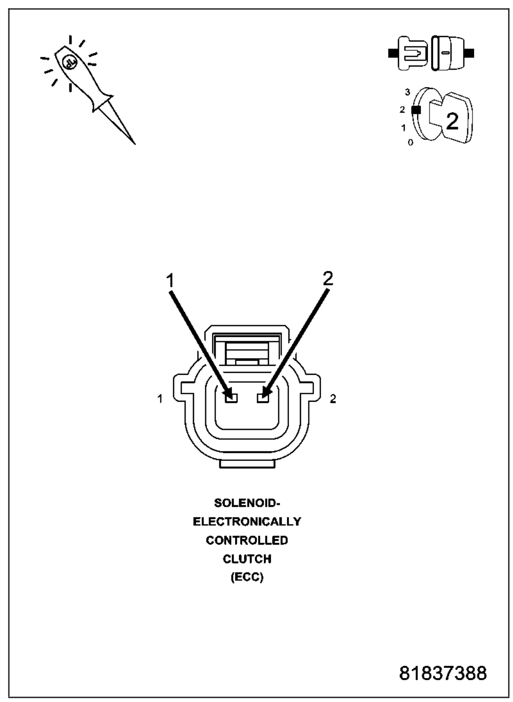
Turn the ignition off.

Disconnect the ECC Solenoid harness connector.

Ignition on, engine not running.

Using a 12-volt test light, jump across from the (T78) Solenoid Supply Voltage circuit and the (T312) Rear Differential Solenoid Control circuit in the ECC Solenoid harness connector.

With the scan tool, actuate the ECC Solenoid.



Does the test light illuminate brightly and flash on and off?

Yes >> Go To 8

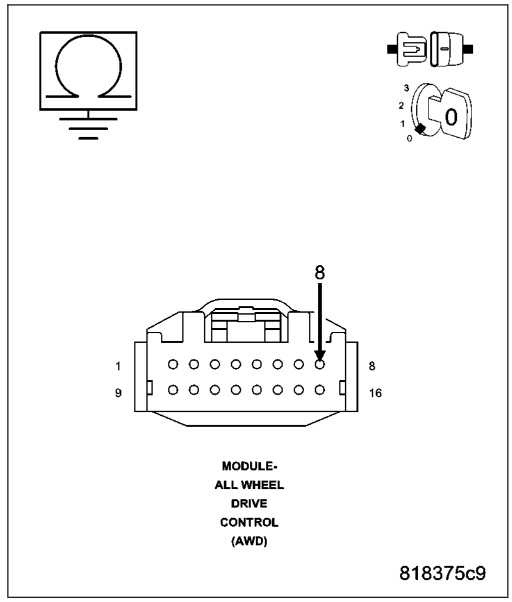
No >> Go To 3

3. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the AWD Control Module harness connector.

Measure the resistance between ground and the (T312) Rear Differential Solenoid Control circuit at the AWD Module harness connector.



Is the resistance below 100 ohms?

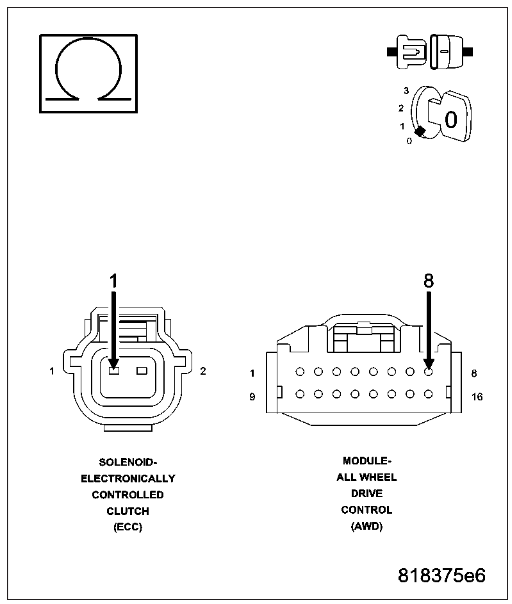
Yes >> Repair the short to ground in the (T312) Rear Differential Solenoid Control circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 4

4. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN

Measure the resistance of the (T312) Rear Differential Solenoid Control circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.



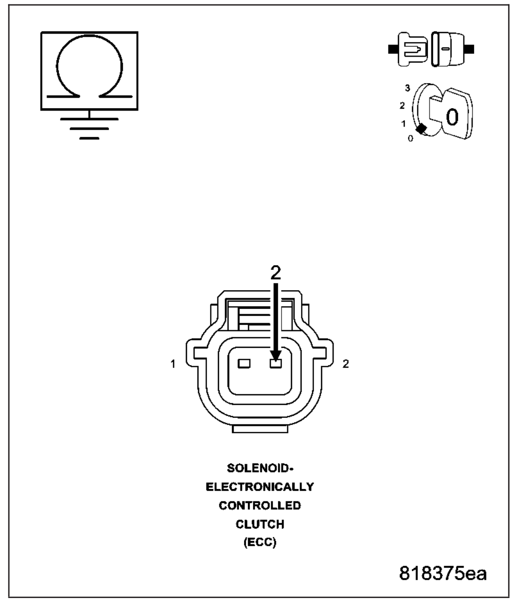
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (T312) ECC Solenoid Control circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

5. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (T78) Solenoid Supply Voltage circuit at the ECC Solenoid harness connector.

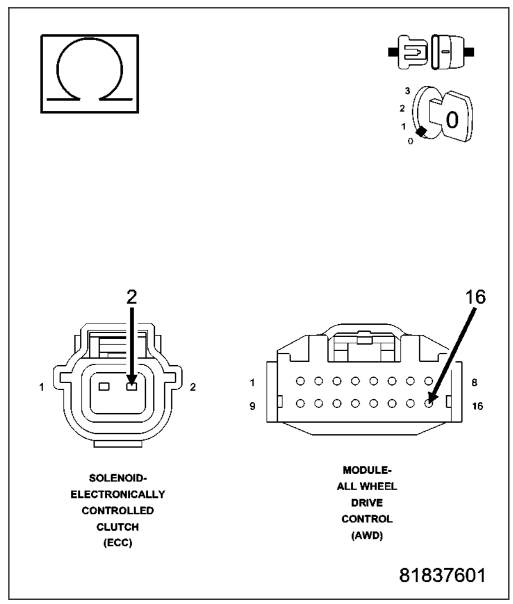
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 6

6. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN



Measure the resistance of the (T78) Solenoid Supply Voltage circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

7. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Control Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace AWD Control Module in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

8. ELECTRONICALLY CONTROLLED CLUTCH (ECC)

NOTE: Before continuing, check the ECC Solenoid jumper harness connector terminals for corrosion, damage, or terminals push out, repair/replace as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace ECC in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

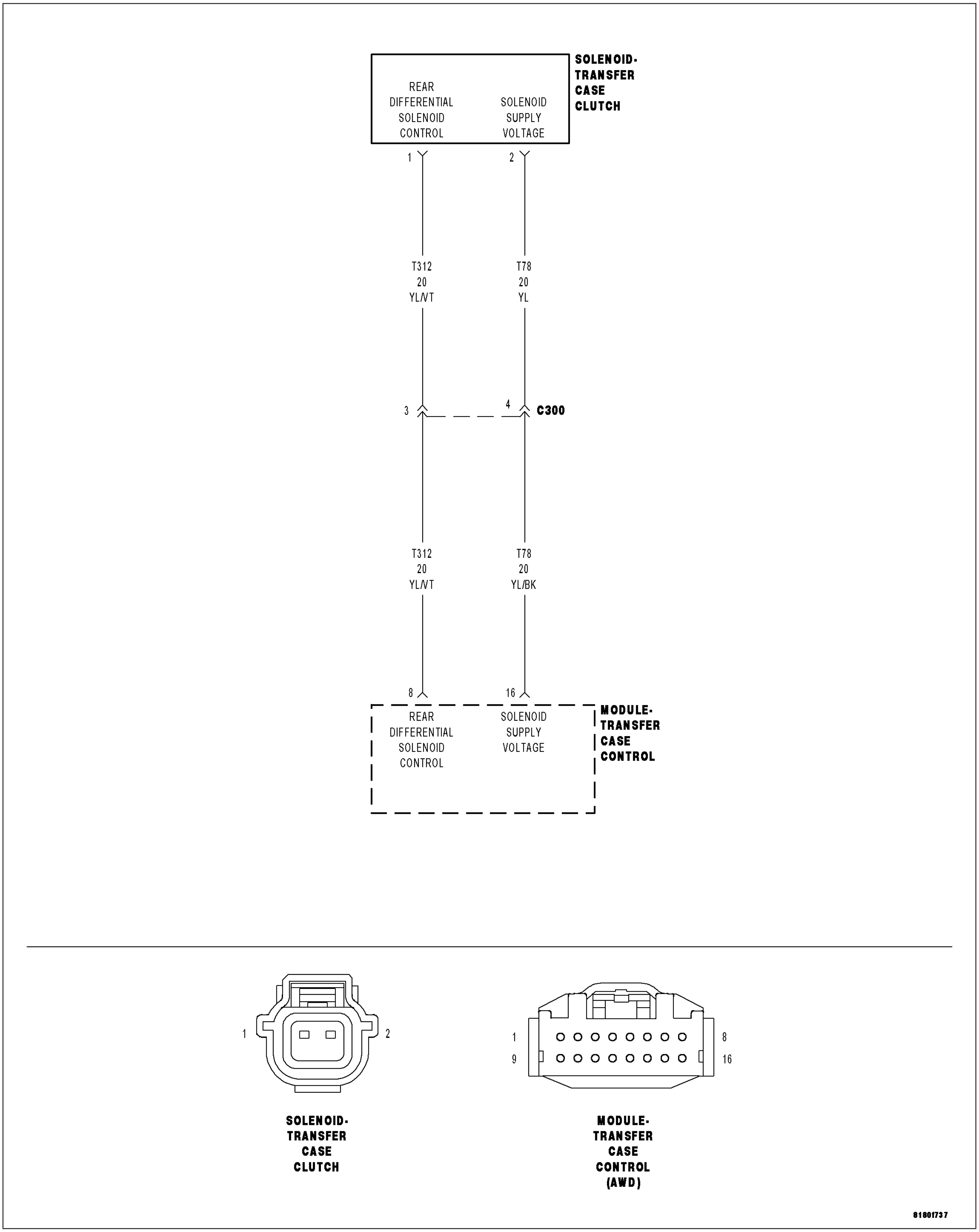
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C145A-AWD CLUTCH RETURN CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Solenoid is active, no solenoid supply circuit DTCs are present and battery voltage is normal.
- **Set Condition:**
  The AWD Module detects the Rear Differential Solenoid Supply is shorted low.

Possible Causes
(T78) SOLENOID SUPPLY VOLTAGE OPEN
(T78) SOLENOID SUPPLY VOLTAGE SHORTED TO GROUND
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN
(AWD) CONTROL MODULE
ELECTRONIC CONTROLLED CLUTCH (ECC)

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 9

2. ECC SOLENOID OPERATION

Turn the ignition off.

Disconnect the ECC Solenoid harness connector.

Ignition on, engine not running.

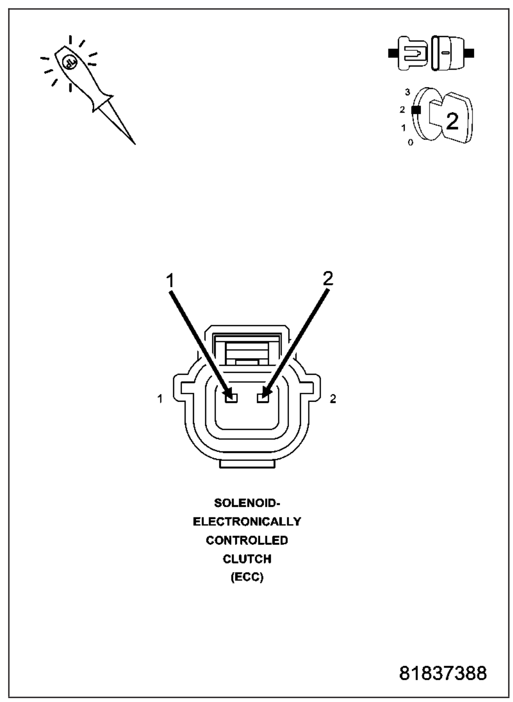
Using a 12-volt test light, jump across from the (T78) Solenoid Supply Voltage circuit and the (T312) Rear Differential Solenoid Control circuit in the ECC Solenoid harness connector.

With the scan tool, actuate the ECC Solenoid.

Does the test light illuminate brightly and flash on and off?

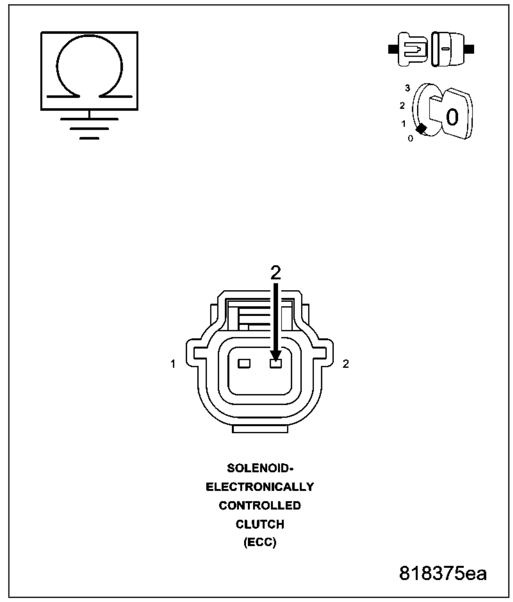
Yes >> Go To 8

No >> Go To 3



3. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T78) Solenoid Supply Voltage circuit at the ECC Solenoid harness connector.



Is the resistance below 100 ohms?

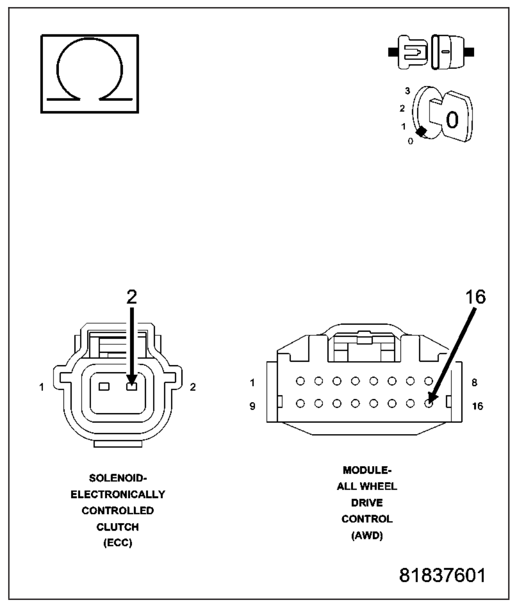
Yes >> Repair the short to ground in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 4

4. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN

Measure the resistance of the (T78) Solenoid Supply Voltage circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

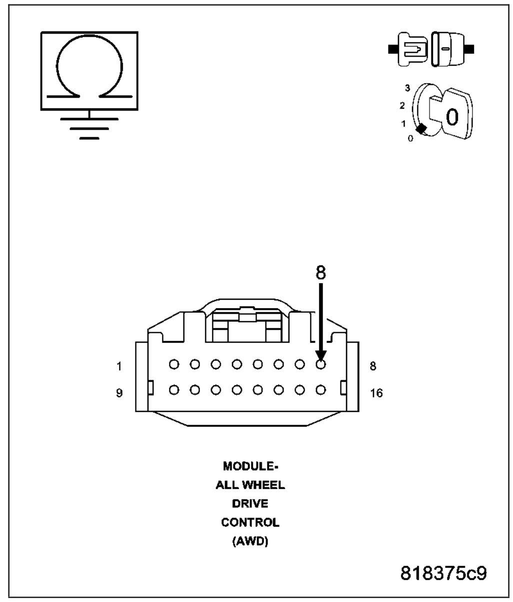
5. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the AWD Control Module harness connector.

Measure the resistance between ground and the (T312) Rear Differential Solenoid Control circuit at the AWD Module harness connector.

Is the resistance below 100 ohms?



Yes >> Repair the short to ground in the (T312) Rear Differential Solenoid Control circuit.

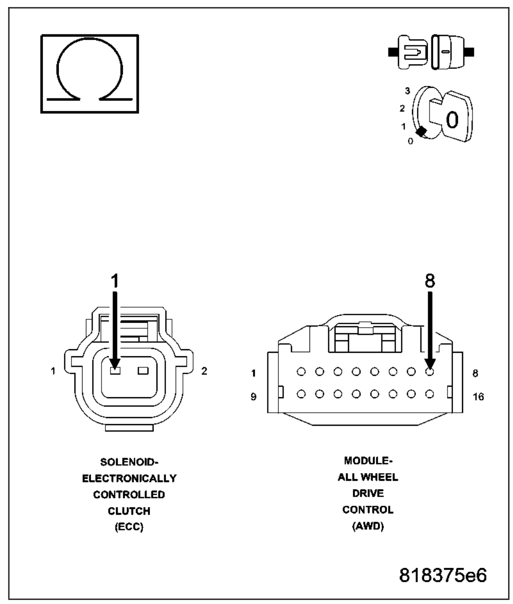
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 6

6. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN

Measure the resistance of the (T312) Rear Differential Solenoid Control circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.

Is the resistance below 5.0 ohms?



Yes >> Go To 7

No >> Repair the open in the (T312) Rear Differential Solenoid Control circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

7. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Control Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace AWD Control Module in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

8. ELECTRONICALLY CONTROLLED CLUTCH (ECC)

NOTE: Before continuing, check the ECC Solenoid jumper harness connector terminals for corrosion, damage, or terminals push out, repair/replace as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace ECC in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

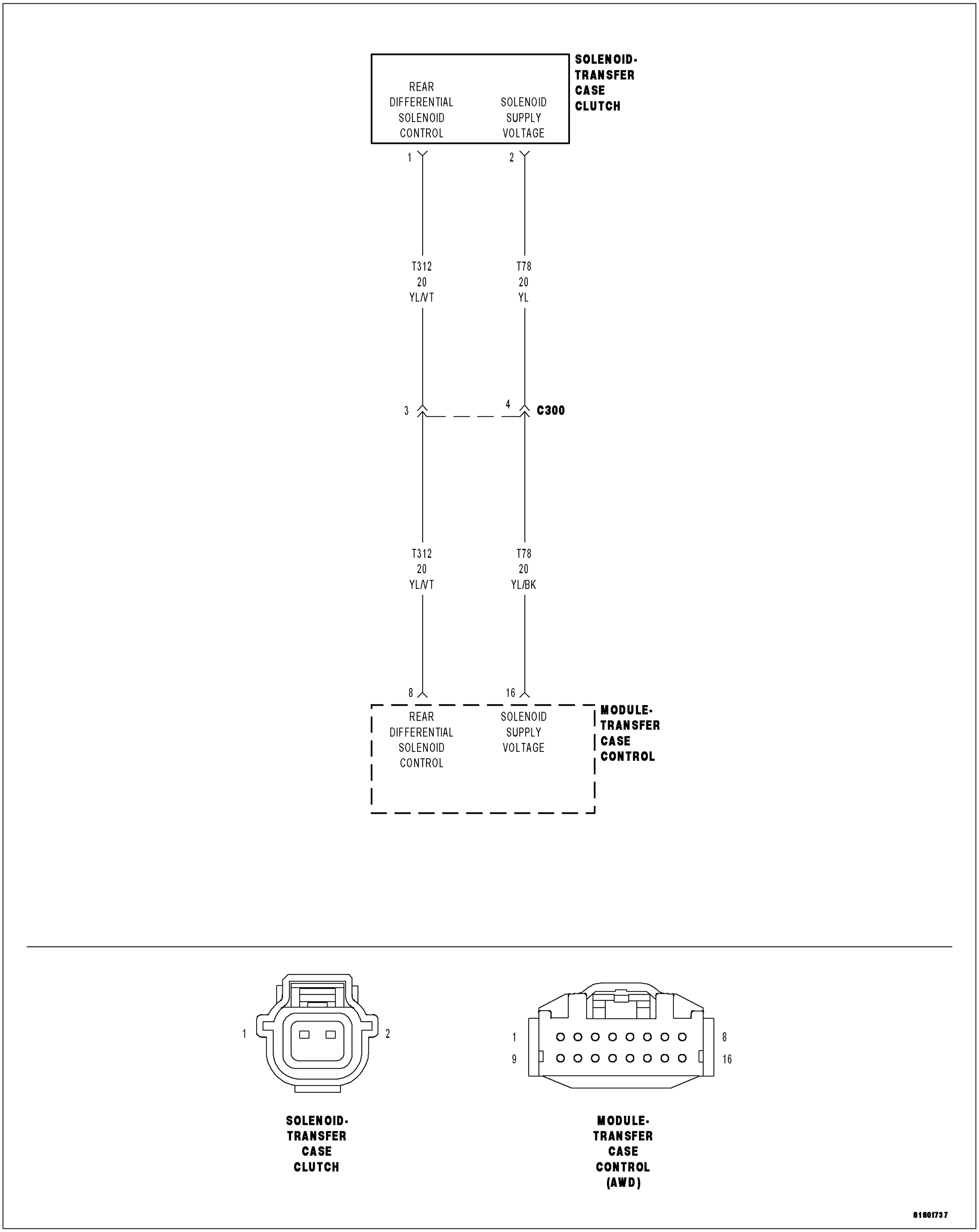
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C145D-AWD CLUTCH POWER/RETURN CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Solenoid is active, no solenoid supply circuit DTCs are present and battery voltage is normal.
- **Set Condition:**
  The AWD Module detects the Rear Differential Solenoid Power Control or Rear Differential Solenoid Return Control is open.

Possible Causes
(T78) SOLENOID SUPPLY VOLTAGE OPEN
(T78) SOLENOID SUPPLY VOLTAGE SHORTED TO GROUND
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN
ELECTRONIC CONTROLLED CLUTCH (ECC)
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 8

2. ECC SOLENOID OPERATION

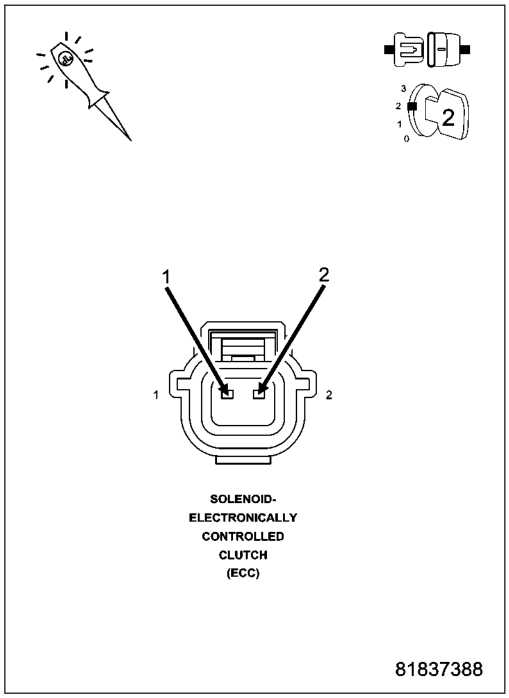
Turn the ignition off.

Disconnect the ECC Solenoid harness connector.

Ignition on, engine not running.

Using a 12-volt test light, jump across from the (T78) Solenoid Supply Voltage circuit and the (T312) Rear Differential Solenoid Control circuit in the ECC Solenoid harness connector.

With the scan tool, actuate the ECC Solenoid.



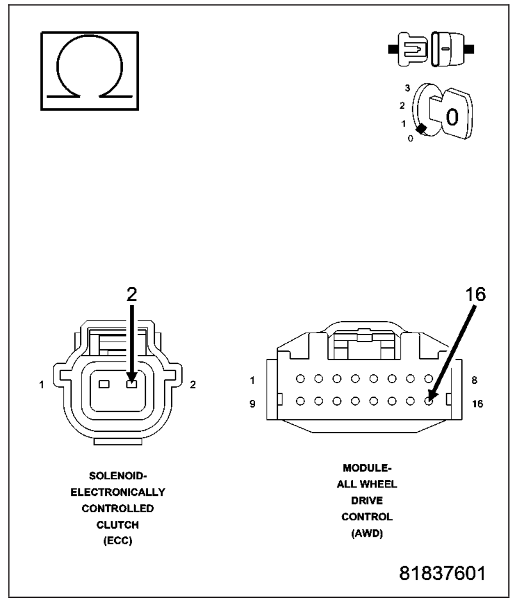
Does the test light illuminate brightly and flash on and off?

Yes >> Go To 7

No >> Go To 3

3. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT OPEN

Measure the resistance of the (T78) Solenoid Supply Voltage circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.



Is the resistance below 5.0 ohms?

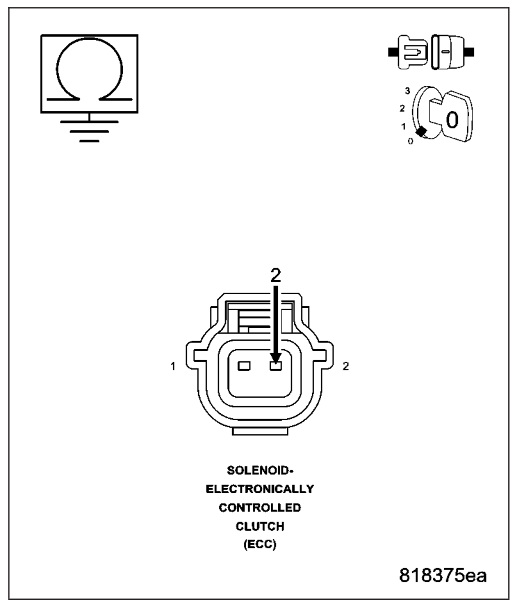
Yes >> Go To 4

No >> Repair the open in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

4. (T78) SWITCHED BATTERY SOLENOID SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T78) Solenoid Supply Voltage circuit at the ECC Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (T78) Solenoid Supply Voltage circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 5

5. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT OPEN

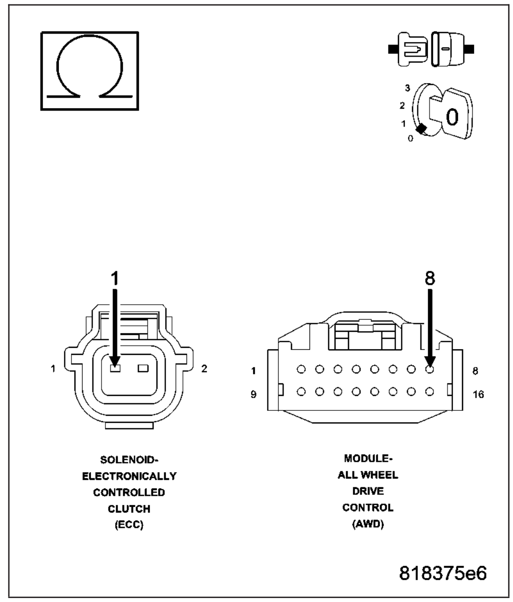
Measure the resistance of the (T312) Rear Differential Solenoid Control circuit between the ECC Solenoid harness connector and the AWD Control Module harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (T312) Rear Differential Solenoid Control circuit.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)



6. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Control Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace AWD Control Module in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

7. ELECTRONICALLY CONTROLLED CLUTCH (ECC)

NOTE: Before continuing, check the ECC Solenoid jumper harness connector terminals for corrosion, damage, or terminals push out, repair/replace as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace ECC in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C145F–AWD SYSTEM TEMPORARILY DISABLED — OVERTEMPERATURE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The AWD Control Module detects overload condition due to excessive torque being applied to the ECC from hard driving conditions (Mud, Sand, Snow etc.).

Possible Causes
DRIVING CONDITIONS
ALL WHEEL DRIVE (AWD) CONTROL MODULE
ELECTRONICALLY CONTROLLED CLUTCH (ECC)

Always perform the AWD Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If C1456, C145A or C145D has set along with this DTC, diagnose those DTC(s) first before continuing.

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 4

2. VERIFY SET CONDITION

Check with customer on driving terrain (e.g. mud, sand, snow) for set condition.

With the scan tool, erase DTC's.

Test drive vehicle on dry paved road.

With the scan tool, read DTC's.

Is the status Active for this DTC?

Yes >> Go To 3

No >> Test Complete.
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

3. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Control Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace AWD Control Module in accordance with Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

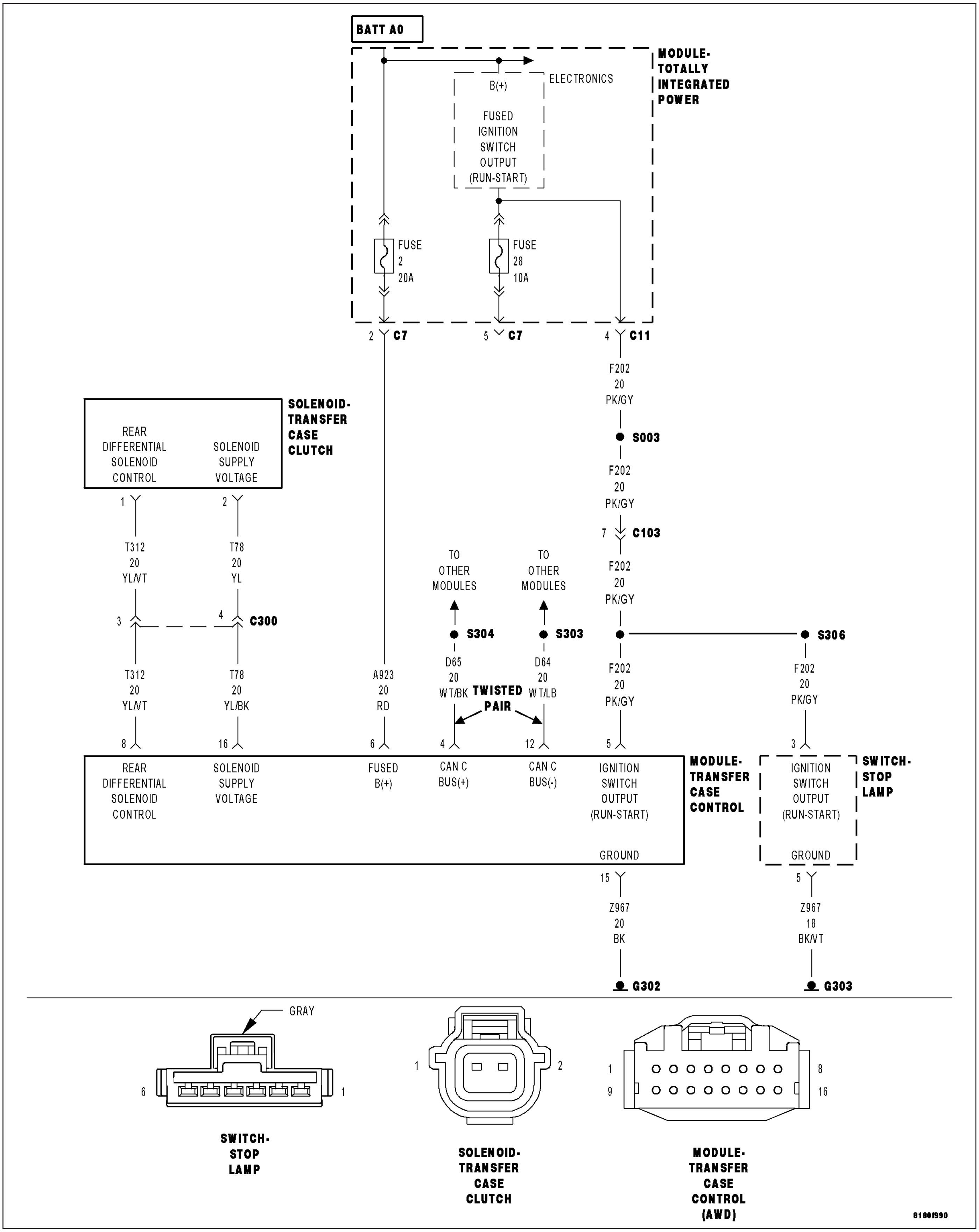
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C2100–BATTERY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The All Wheel Drive Control Module detects that system voltage is below 9.0 volts for 60 seconds.

Possible Causes
CHARGING SYSTEM DTCS PRESENT
(F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR HIGH RESISTANCE
(A923) FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

2. CHECK FOR ACTIVE DTC

With the scan tool, select View DTCs.

Is the DTC active at this time?

Yes >> Go to 3

No >> Go to 10

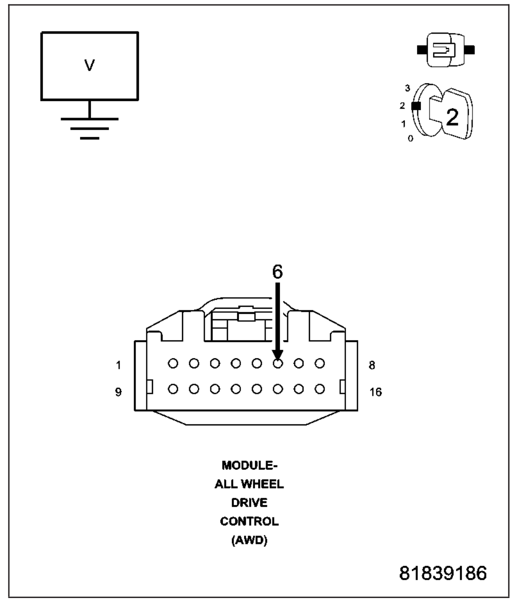
3. CHECK THE TIPM FUSED B(+) VOLTAGE

While back probing, measure the voltage of the (A923) Fused B(+) circuit in the TIPM C7 harness connector.

Is the voltage above 9 volts?

Yes >> Go to 4

No >> Go to 9



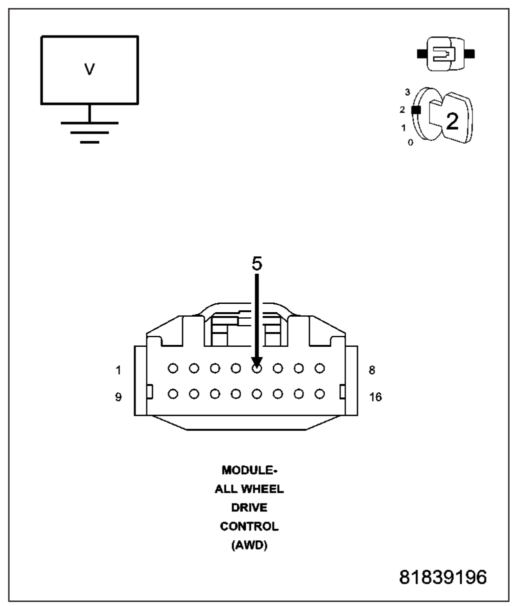
4. CHECK THE TIPM IGNITION SWITCH OUTPUT RUN/START VOLTAGE

While back probing, measure the voltage of the (F202) Ignition Switch Output Run/Start circuit in the TIPM C11 harness connector.

Is the voltage above 9 volts?

Yes >> Go to 5

No >> Go to 9



5. (A923) FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE

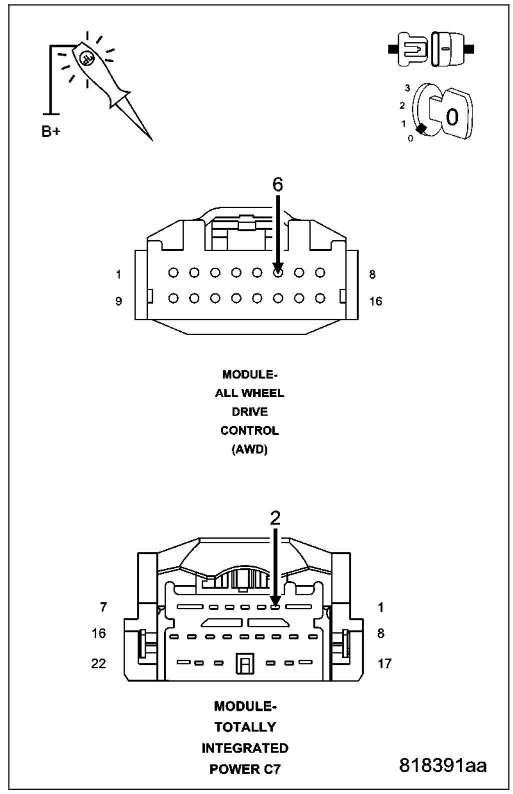
Turn the ignition off.

Disconnect the AWD Module harness connector.

Disconnect the TIPM C7 harness connector.

Connect a jumper wire between the (A923) Fused B(+) circuit and Ground in the TIPM C7 harness connector.

With a 12-volt test light connected to B(+), check the (A923) Fused B(+) circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 6

No >> Repair the (F202) Ignition Switch Output (RUN/START) circuit for an open circuit or high resistance.

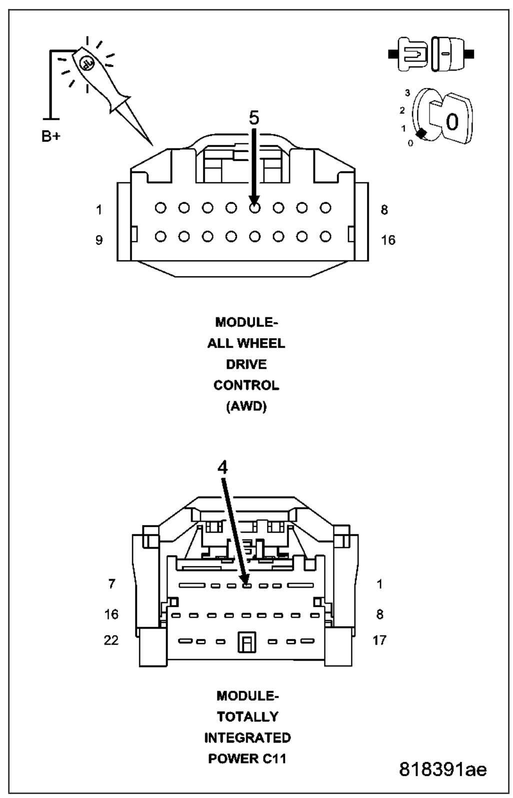
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. (F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR HIGH RESISTANCE

Disconnect the TIPM C11 harness connector.

Connect a jumper wire between the (F202) Ignition Switch Output (RUN/START) circuit and ground in the TIPM C11 harness connector.

With a 12-volt test light connected to B(+), check the (F202) Ignition Switch Output (RUN/START) circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 7

No >> Repair the (F202) Ignition Switch Output (RUN/START) circuit for an open circuit or high resistance.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

7. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

With a 12–volt test light connected to B(+), check the (Z967) ground circuit in the AWD Control Module harness connector.

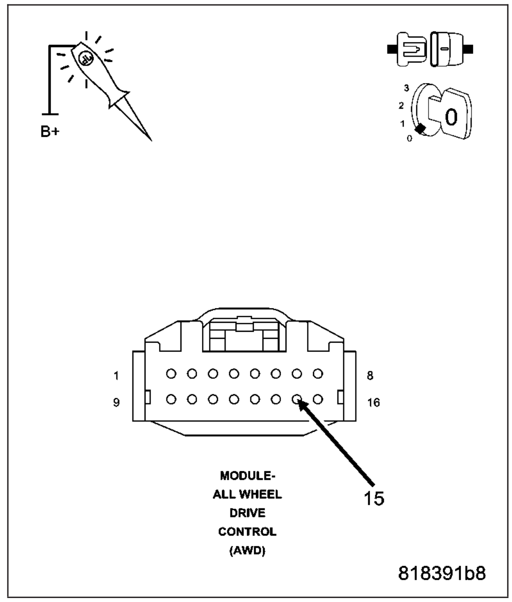
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 8

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).



8. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

9. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

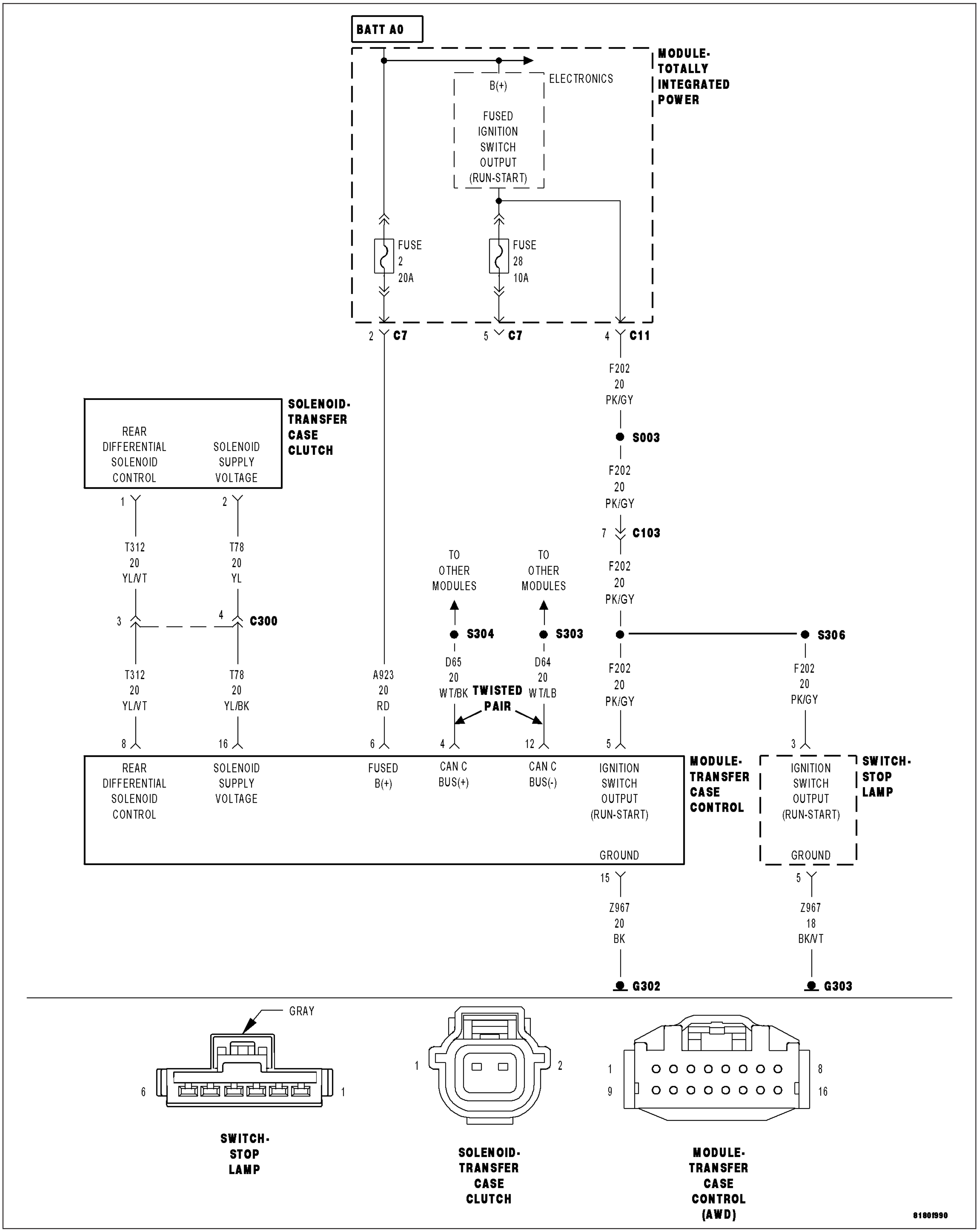
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C2101–BATTERY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The All Wheel Drive Control Module detects that system voltage is above 16.0 volts for 10 seconds with engine RPM greater than 350.

Possible Causes
CHARGING SYSTEM DTCS PRESENT
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

2. CHECK FOR ACTIVE DTC

With the scan tool, select View DTCs.

Is the DTC active at this time?

Yes >> Go to 3

No >> Go to 7

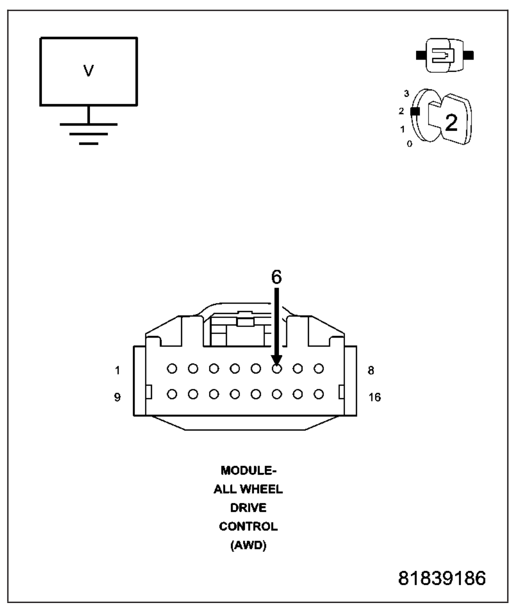
3. CHECK THE TIPM FUSED B(+) VOLTAGE

While back probing, measure the voltage of the (A923) Fused B(+) circuit in the TIPM C7 harness connector.

Is the voltage below 16 volts?

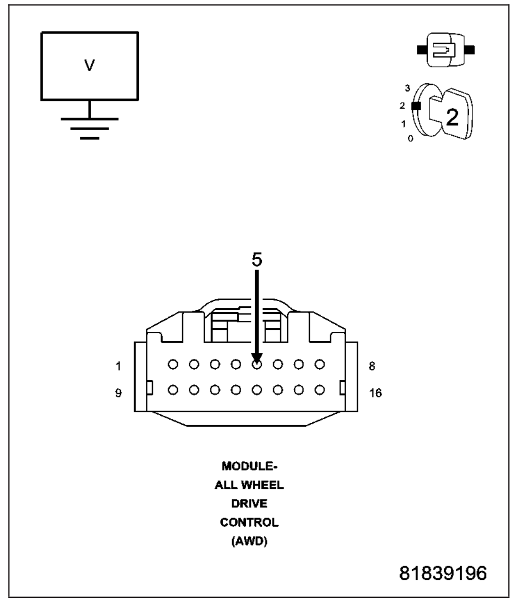
Yes >> Go to 4

No >> Go to 6



4. CHECK THE TIPM IGNITION SWITCH OUTPUT RUN/START VOLTAGE

While back probing, measure the voltage of the (F202) Ignition Switch Output Run/Start circuit in the TIPM C11 harness connector.



Is the voltage below 16 volts?

Yes >> Go to 5

No >> Go to 6

5. AWD CONTROL MODULE

NOTE: Before continuing, check the AWD Module harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

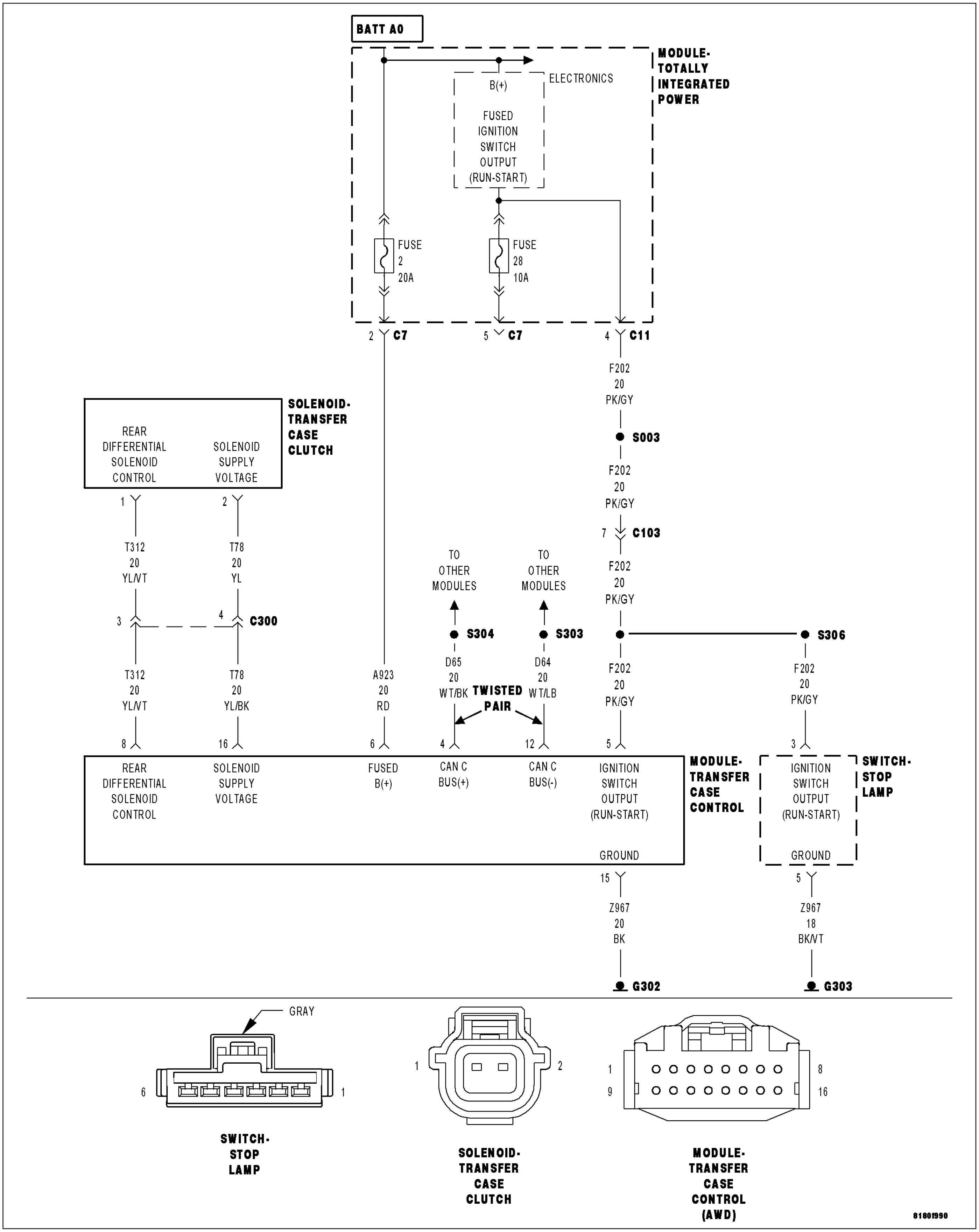
Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C211C-IGNITION RUN/START INPUT CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.



- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The AWD will set this DTC within 20ms if the Ignition Run/Start circuit voltage is less than the expected value.

Possible Causes
(F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read the active DTC.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> Go to 7

2. (F202) IGNITION SWITCH OUTPUT (RUN/START)

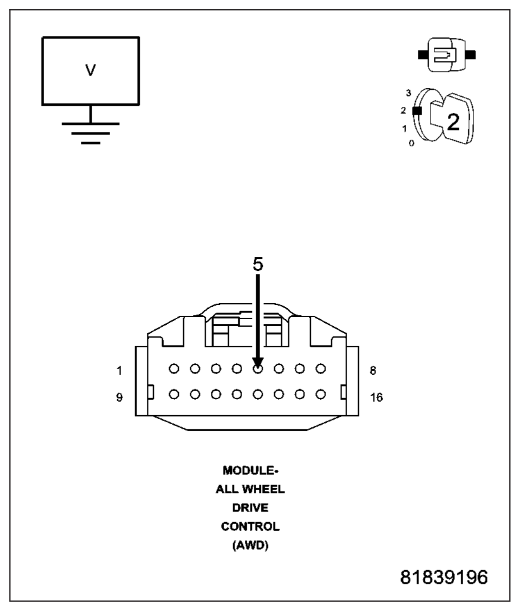
With a 12-volt test light connected to ground, backprobe the (F202) Ignition Switch Output (RUN/START) circuit in the TIPM C11 harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 3

No >> Go to 6

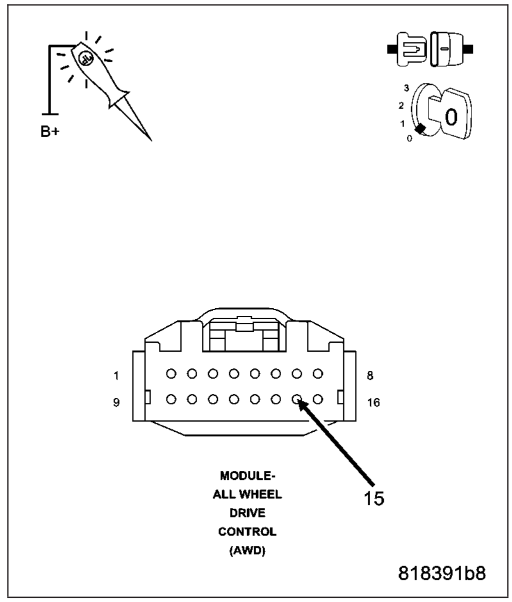


3. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the AWD Control Module harness connector.

With a 12-volt test light connected to B+, check the (Z967) Ground circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

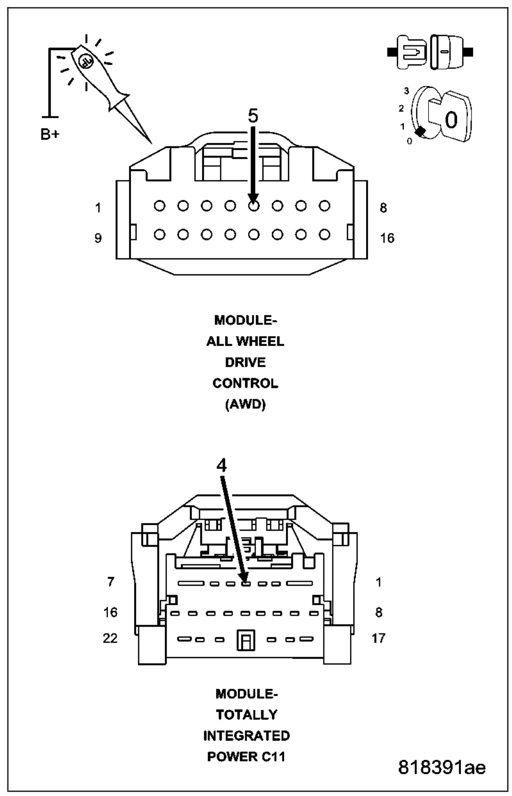
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

4. (F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR HIGH RESISTANCE

Disconnect the TIPM C11 harness connector.

Connect a jumper wire between the (F202) Ignition Switch Output (RUN/START) circuit and B(+) in the TIPM C11 harness connector.

With a 12-volt test light connected to ground, check the (F202) Ignition Switch Output (RUN/START) circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 5

No >> Repair the (F202) Ignition Switch Output (RUN/START) circuit for an open circuit or high resistance.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

5. AWD CONTROL MODULE

View repair.

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

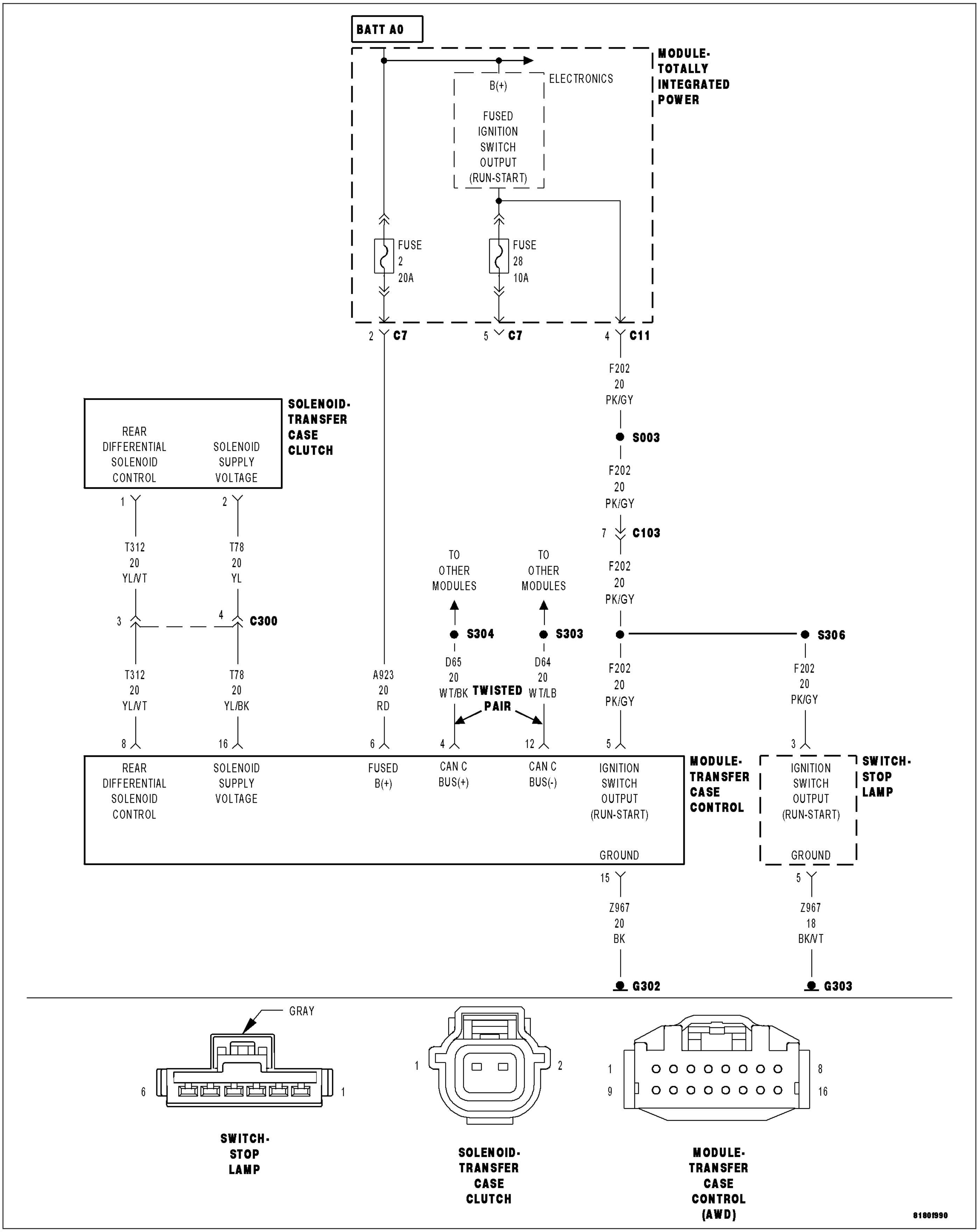
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C211D-IGNITION RUN/START INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition off.
- **Set Condition:**
  The AWD will set this DTC within 20ms if the Ignition Run/Start circuit voltage is above 17 volts or voltage is detected with the ignition in the OFF position for more than 1sec.

Possible Causes
(F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR HIGH RESISTANCE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2 Diagnostic Test

2. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read the active DTC.

Cycle the ignition switch from the OFF to ON position, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC.

Does the scan tool display this DTC as active?

Yes >> Go To 3

No >> Go to 7

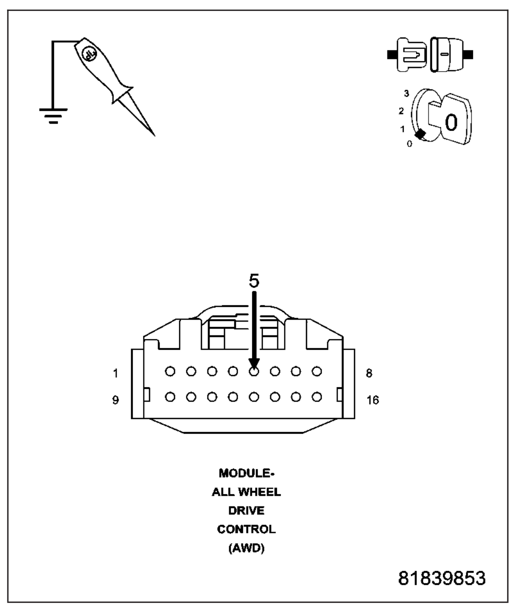
3. (F202) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C11 harness connector.

Disconnect the AWD Control Module harness connector.

With a 12-volt test light connected to ground, check the (F202) Ignition Switch Output (RUN/START) circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Repair the (F202) Ignition Switch Output (RUN/START) circuit for a short to voltage.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

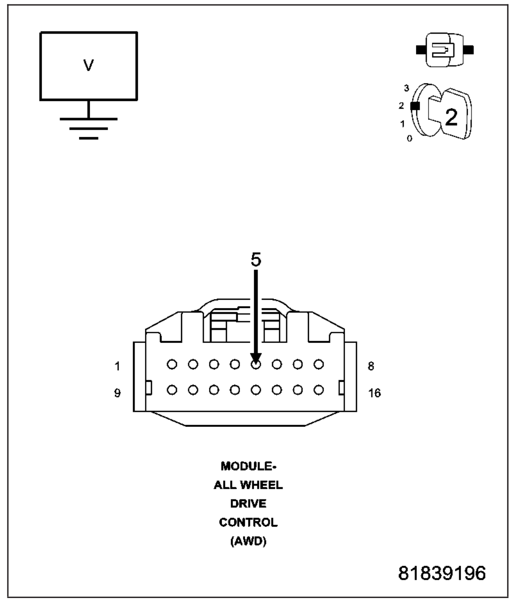
No >> Go to 4

4. (F202) IGNITION SWITCH OUTPUT (RUN/START)

Reconnect the AWD Control Module harness connector.

Reconnect the TIPM C11 harness connector.

With a 12-volt test light connected to ground, backprobe the (F202) Ignition Switch Output (RUN/START) circuit in the TIPM C11 harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 6

No >> Go to 5

5. AWD CONTROL MODULE

View repair.

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

View repair.

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

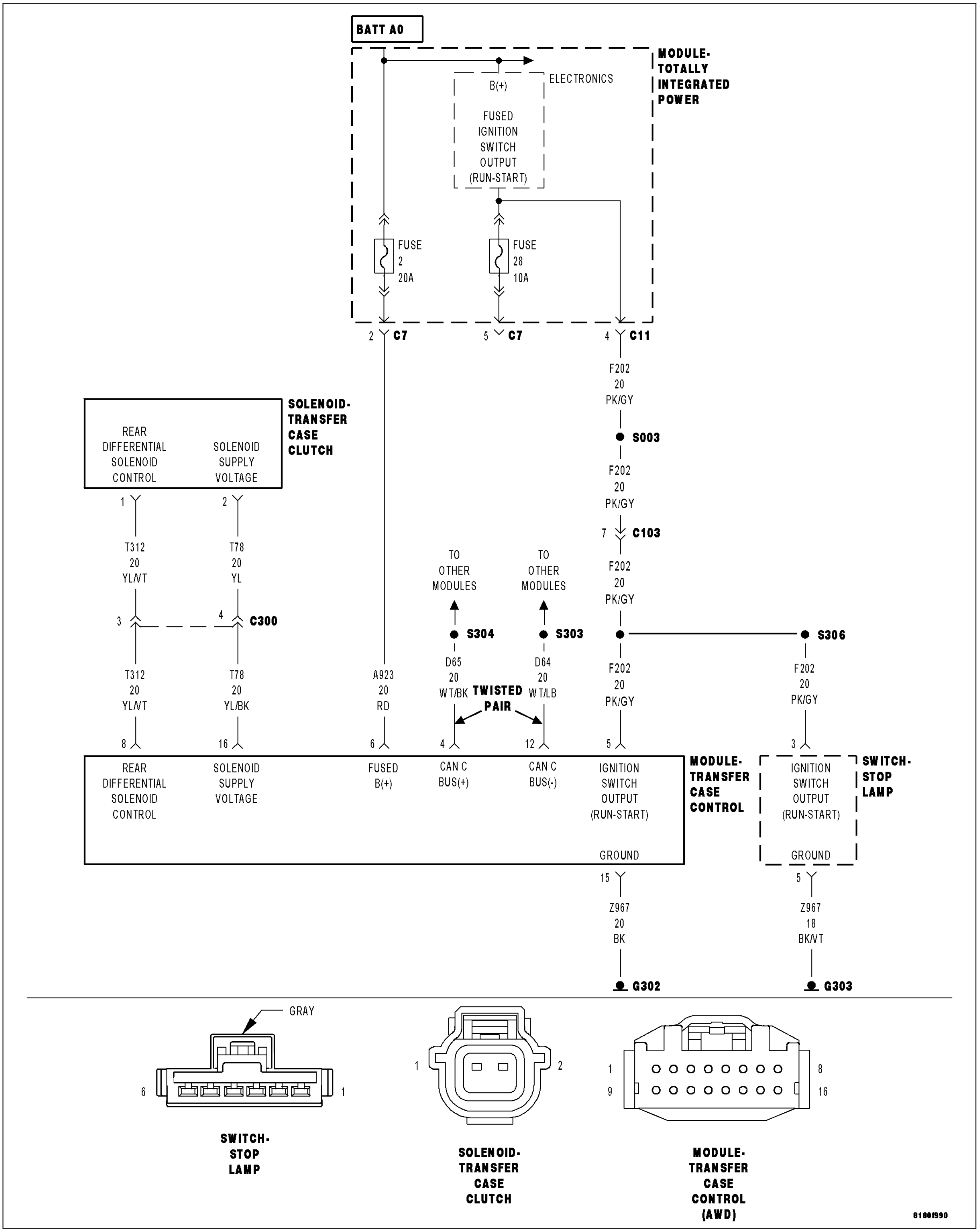
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C211E-BATTERY SUPPLY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The All Wheel Drive Control Module detects that system voltage is below 9.0 volts for 60 seconds.

Possible Causes
CHARGING SYSTEM DTCS PRESENT
(A923) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

2. CHECK FOR ACTIVE DTC

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go to 3

No >> Go to 8

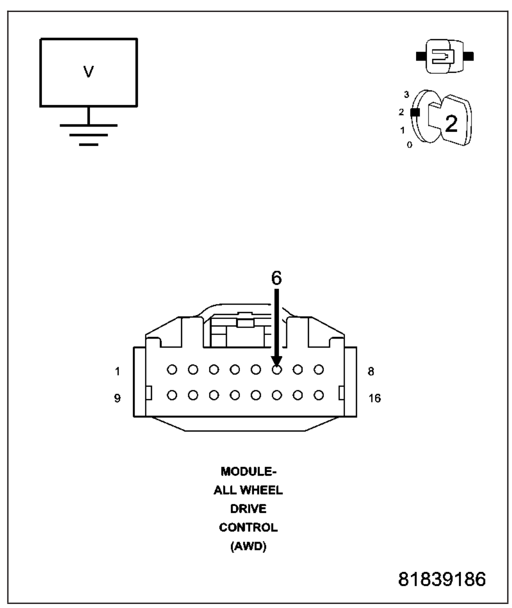
3. CHECK THE TIPM FUSED B+ VOLTAGE

While back probing, measure the voltage of the (A923) Fused B+ circuit in the TIPM C7 harness connector.

Is the voltage below 9 volts?

Yes >> Go to 7

No >> Go to 4



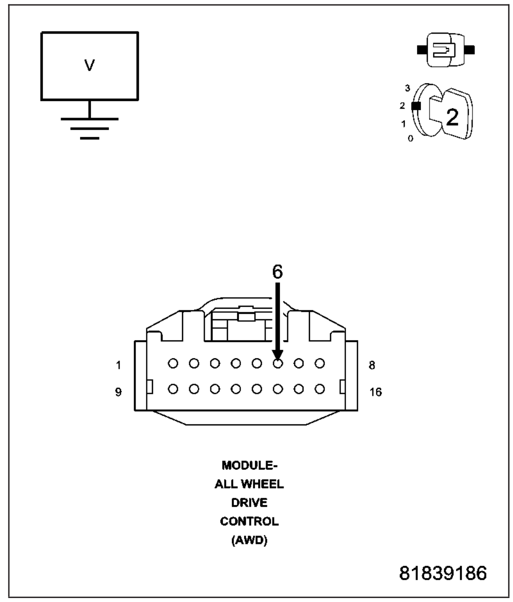
4. (A923) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the AWD module harness connector.

Ignition on, engine not running.

With a 12-volt test light connected to ground, check the (A923) Fused B(+) circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

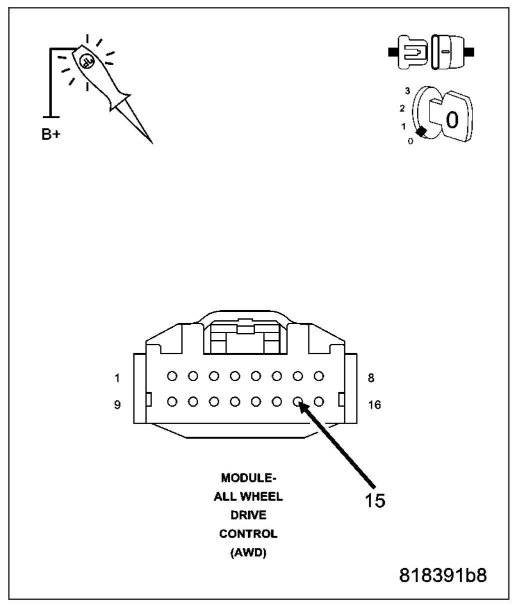
Yes >> Go to 5

No >> Repair the (A923) Fused B+ circuit for an open circuit or high resistance.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

5. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to B(+), check the (Z967) Ground circuit in the AWD Control Module harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 6

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. AWD CONTROL MODULE

View repair.

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

7. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

View repair.

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

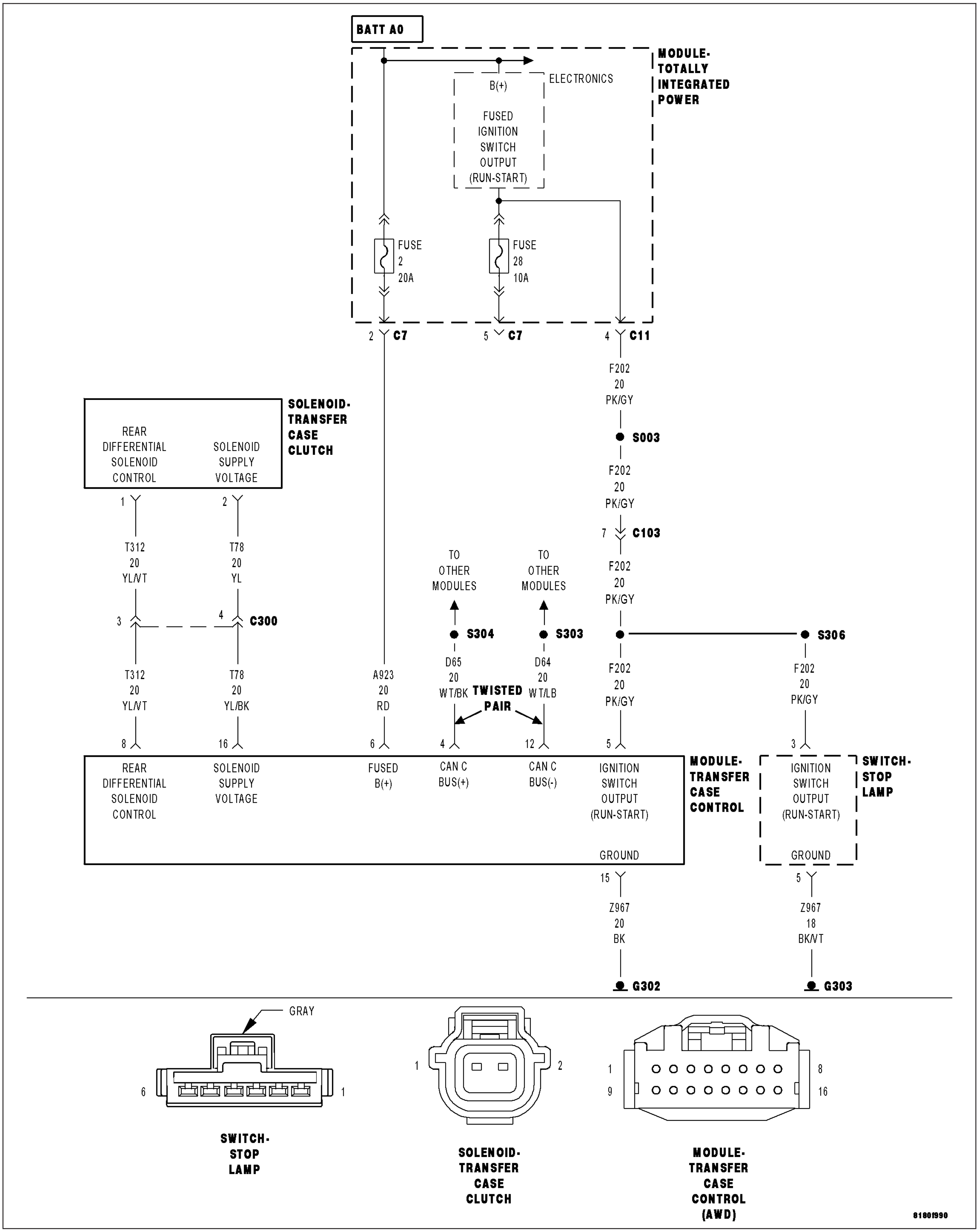
Were there any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Test Complete.

C211F–BATTERY SUPPLY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The All Wheel Drive Control Module detects that the battery supply voltage is above 16.0 volts for 10 seconds.

Possible Causes
CHARGING SYSTEM DTCS PRESENT
ALL WHEEL DRIVE (AWD) CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

2. CHECK FOR ACTIVE DTC

With the scan tool, select View DTCs.

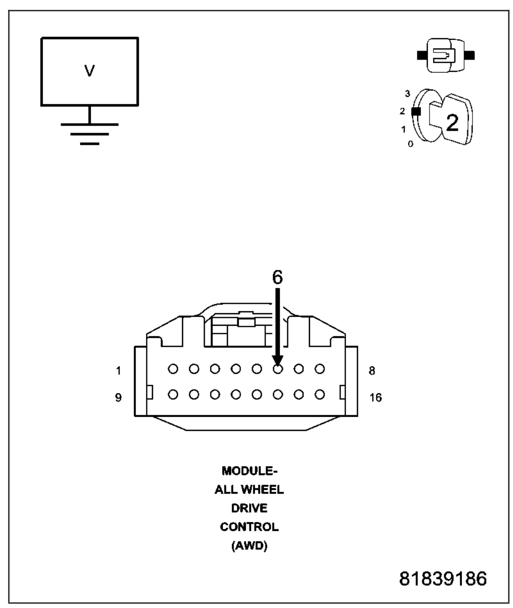
Is the DTC active at this time?

Yes >> Go to 3

No >> Go to 6

3. CHECK THE TIPM FUSED B+ VOLTAGE

While back probing, measure the voltage of the (A923) Fused B+ circuit in the TIPM C7 harness connector.



Is the voltage below 16 volts?

Yes >> Go to 4

No >> Go to 5

4. AWD CONTROL MODULE

View repair.

Repair

Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

5. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

View repair.

Repair

Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the scan tool, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

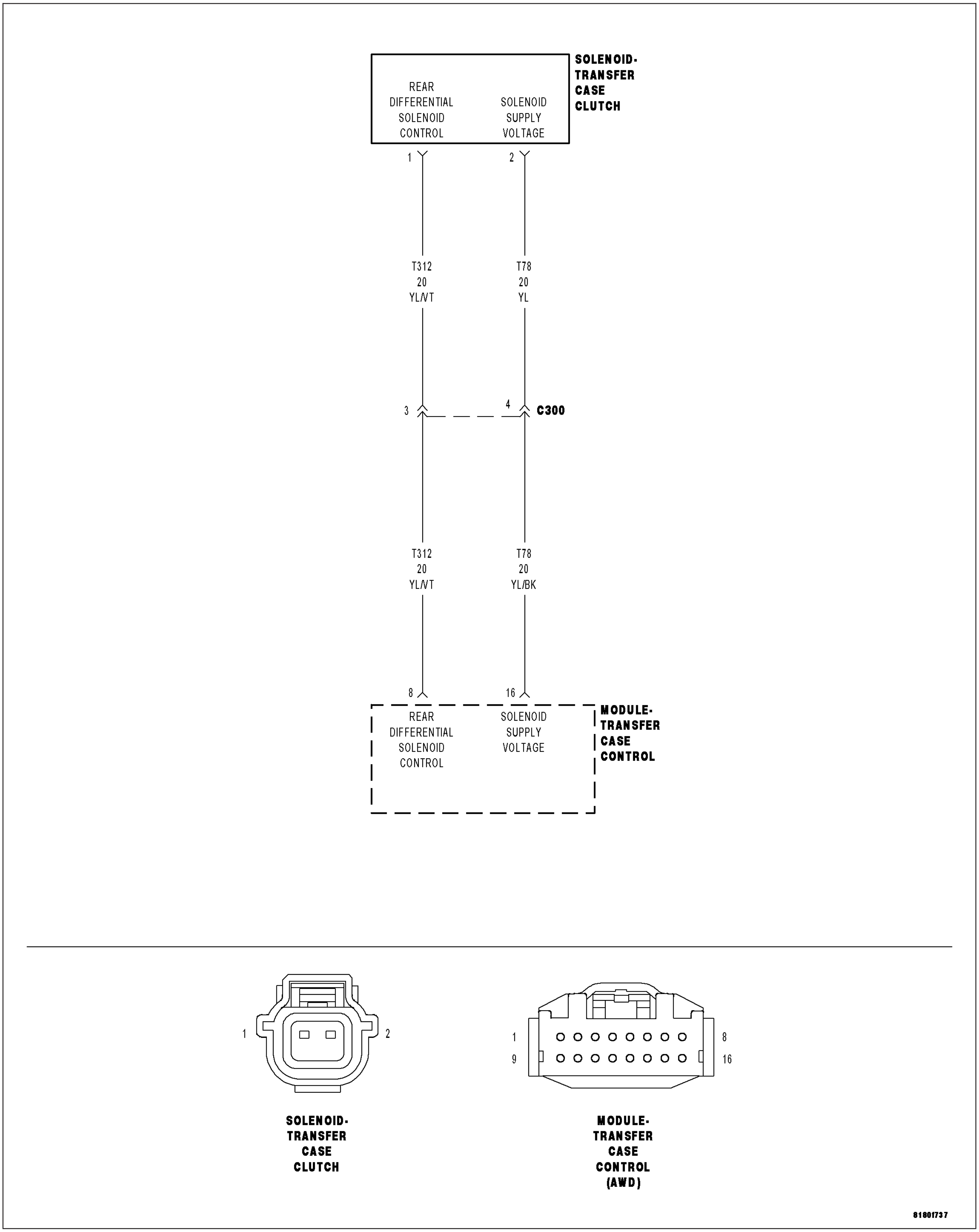
Were any problems found?

Yes >> Repair as necessary.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Test complete.

C2208-AWD ECU INTERNAL



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The All Wheel Drive (AWD) Module has detected a failure internal to the controller.

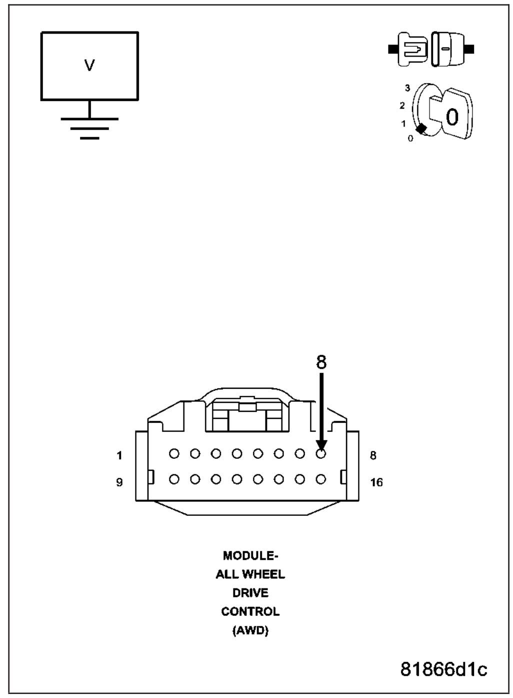
Possible Causes
(T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO VOLTAGE
ALL WHEEL DRIVE (AWD) MODULE

1. (T312) REAR DIFFERENTIAL SOLENOID CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the AWD Control Module harness connector.

Measure the voltage of the (T312) Rear Differential Solenoid Control circuit in the AWD Module harness connector.



) Is there any voltage present?

Yes >> Repair the short to voltage in the (T312) Rear Differential Solenoid Control circuit.
Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 2

2. ALL WHEEL DRIVE MODULE

The AWD Module has detected an internal failure.

View repair

Repair

Replace the All Wheel Drive Module in accordance with the Service Information.

Perform the AWD VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE) .

U0001-CAN C BUS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM loses communication over the CAN C Bus circuit. The circuit is continuously monitored. One Trip fault.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION ANTI-LOCK BRAKE SYSTEM (ABS) MODULE
ALL WHEEL DRIVE (AWD) CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read TIPM DTCs.

Is the DTC active at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U0100-LOST COMMUNICATION WITH ECM/PCM (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - TIPM is configured correctly
- **Set Condition:**
  Bus messages not received from the ECM/PCM for approximately 2 to 5 seconds.

Possible Causes
CAN C+ OR CAN C– BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
ECM/PCM POWER AND GROUND
ECM/PCM
TIPM
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for TIPM configuration, CAN C+ or C– hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Index for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS

Ignition on, engine not running.
With the scan tool, select Network Diagnostics.
Verify that the PCM is active on the bus.

Is the PCM active on the bus?

Yes >> Go To 4

No >> Refer to the No Response test procedure. Refer to the table of contents in this section.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the PCM?

Yes >> Replace the PCM in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

No >> Replace the module that set this DTC in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

U0121-LOST COMMUNICATION WITH ABS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**
  CAN C bus messages not received for 10 seconds.

Theory of Operation

The ABS communicates with other controllers over the CAN C bus. The AWD Module continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate AWD Control Module MIL status to the Engine Controller, therefor if the Engine Controller is unable to communicate with the AWD Control Module, the Engine Controller will light the MIL.

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0141 LOST COMMUNICATION WITH FCM (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**
  CAN C bus messages not received for 10 seconds.

Theory of Operation

Some NGC controllers communicate with other controllers over the CAN C bus. The AWD Control Module continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate PCM MIL status to the Engine Controller, therefor if the Engine Controller is unable to communicate with the AWD Control Module, the Engine Controller will light the MIL.

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, one valid CAN message received at least once, and no U0002-CAN C Bus Off Performance DTC present.
- **Set Condition:**
  When the AWD Control Module detects an incorrect CAN message from the Power Control Module (PCM).

Possible Causes
TIPM NOT CONFIGURED CORRECTLY
ABM CAN BUS DTCS
ENGINE DTCS
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Diagnostic Test

1. CHECK FOR DTC U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC’s.

Cycle the ignition switch from off to on.

With the scan tool, read DTC’s.

Does the scan tool display: U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE). Diagnostic Test

2. CHECK IF TIPM CAN BUS DTC’S ARE PRESENT

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTC’s present?

Yes >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK IF ENGINE DTC’S ARE PRESENT

With the scan tool, read Engine DTCs.

Are there any Engine DTC’s present?

Yes >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the AWD Control Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the AWD Control Module per the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

U0415-IMPLAUSIBLE DATA RECEIVED FROM ABS

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**
  Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**
  When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
TIPM CAN BUS DTC'S PRESENT
ABS DTC'S PRESENT
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Diagnostic Test

1. CHECK FOR TIPM CAN BUS DTCS

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTC's present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Go To 2

2. CHECK IF ABS DTC'S ARE PRESENT

With the scan tool, read ABS DTCs.

Are there any ABS DTC's present?

Yes >> (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the AWD Control Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The All Wheel Drive (AWD) Control Module verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**
  Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**
  When the AWD Control Module detects an incorrect CAN ID from the CLUSTER/CCN.

Possible Causes
TOTALLY INTEGRATED POWER MODULE (TIPM) NOT CONFIGURED CORRECTLY
CAN BUS DTC'S PRESENT
CLUSTER/CCN MODULE DTC'S PRESENT
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Diagnostic Test

1. CHECK FOR TIPM CAN BUS DTCS

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Go To 2

2. CHECK IF CLUSTER/CCN DTCS ARE PRESENT

With the scan tool, read CLUSTER/CCN DTCs.

Are there any CLUSTER/CCN DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING) category and perform the appropriate symptom.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the AWD Control Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the AWD Control Module per the Service Information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

U1120-LOST WHEEL SPEED MESSAGES

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The AWD doesn't receive a vehicle speed signal from the Anti-lock brake Module over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE (ABS) MODULE
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The AWD receives the wheel speed signal over the CAN C bus from the Anti-lock Brake Module.

Diagnostic Test

1. **ACTIVE DTC**

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

2. **U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE ALSO SET**

With a scan tool, select View DTCs.

Is the DTC U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE also set?

Yes >> Perform the diagnostic procedure for U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Replace the AWD Control Module in accordance with the Service information.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE).

U1415-IMPLAUSIBLE/MISSING VEHICLE CONFIGURATION RECEIVED

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  When the All Wheel Drive (AWD) Module detects an incorrect CAN messages from the Engine Control Module (ECM).

Possible Causes
TOTALLY INTEGRATED POWER MODULE (TIPM) NOT CONFIGURED CORRECTLY
TIPM CAN BUS DTCS
ENGINE DTCS
ALL WHEEL DRIVE (AWD) CONTROL MODULE

Diagnostic Test

1. CHECK IF TIPM CAN BUS DTC'S ARE PRESENT

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTC's present?

Yes >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.

Perform AWD VERIFICATION TEST - VER 1. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Go To 2

2. CHECK IF ENGINE DTC'S ARE PRESENT

With the scan tool, read Engine DTCs.

Are there any Engine DTC's present?

Yes >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.

Perform AWD VERIFICATION TEST - VER.

No >> Using the schematics as a guide, check the AWD Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the AWD Module per the Service Information.

Perform AWD VERIFICATION TEST - VER. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

STANDARD PROCEDURE

AWD - PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram **Refer to Section 8W**.

Perform the following pre-diagnostic troubleshooting procedures prior to performing any diagnostic test.

Always perform diagnostics with a fully charged battery to avoid false symptoms.

1. With the scan tool, read ABS DTCs. If ABS DTCs are present, (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) and perform to the appropriate diagnostic procedure(s) before proceeding.
2. Check the vehicles repair history.
3. If the vehicle has a repair history that pertains to the customer's current complaint, review the repair.
4. Check for any TSBs related to the customer's complaint.
5. Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.
6. With the scan tool, read All Wheel Drive (AWD) Control Module DTCs. Record all Stored, Active, and Pending DTC information. Diagnose any Pending DTC as a matured DTC.
7. Use the wiring diagram as a guide, inspect the wiring and connectors related to this circuit and repair as necessary.
8. Refer to the When Monitored and Set Conditions for this DTC. DTCs can set at ignition on, at start up, driving under specific conditions, and after controller diagnostic monitors have run or otherwise know as a Good Trip.
9. Check for any Service Information Tune-ups or Service Bulletins for any possible causes that may apply. Check for controller software update information. Some conditions can be corrected by upgrading the Engine (PCM) controller software.

1.

Did any of the above procedures repair the vehicle?

Yes >> Testing is complete.

Perform AWD Control Module VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - STANDARD PROCEDURE)

No >> Refer to the identified category and perform the appropriate symptom(s). (Refer to 3 - DIFFERENTIAL & DRIVELINE/ELECTRONICALLY CONTROLLED CLUTCH - DIAGNOSIS AND TESTING)

AWD CONTROL MODULE VERIFICATION TEST

Diagnostic Test

1. AWD CONTROL MODULE VERIFICATION TEST

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
With the scan tool, select Clear Stored DTCs.
Make sure that all accessories are turned off and that the battery is fully charged.
Test drive the vehicle and verify proper operation.
With the scan tool, select View DTCs in the AWD Control Module.

Are there any DTCs present in the AWD Control Module?

Yes >> Return to the symptom list and perform the appropriate diagnostic test.

No >> Repair is complete.

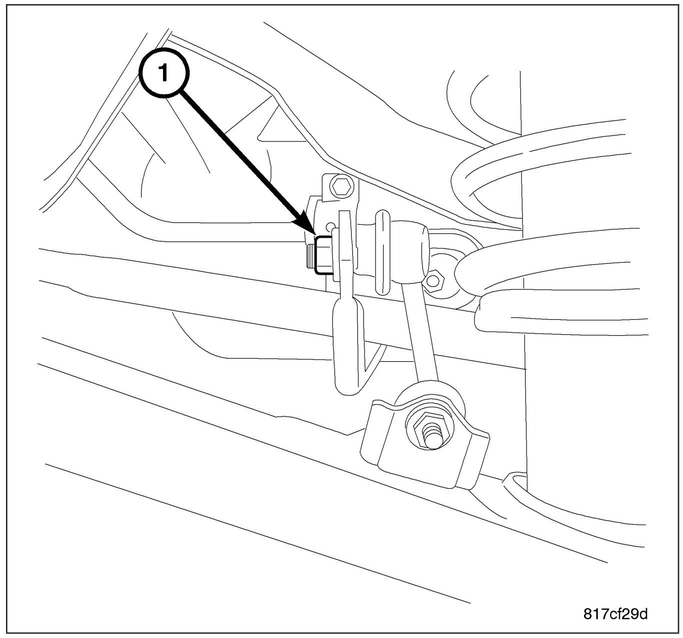
CLUTCH-ELECTRONICALLY CONTROLLED-SERVICE INFORMATION

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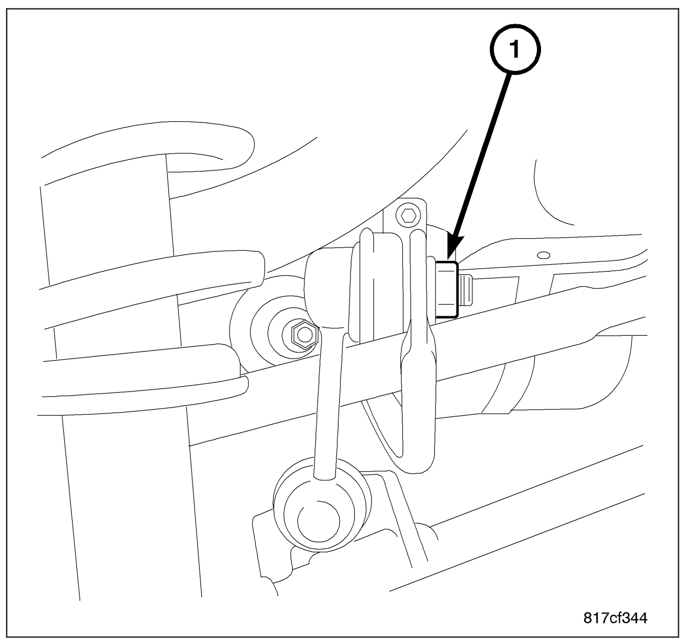
CLUTCH-ELECTRONICALLY CONTROLLED-SERVICE INFORMATION

REMOVAL

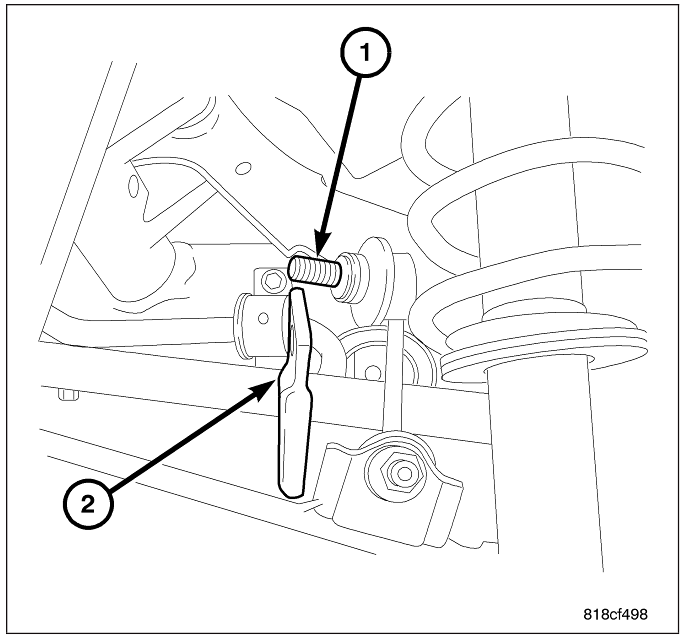
1. Raise vehicle on a hoist.
2. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL)
3. Remove right side sway bar nut (if equipped).



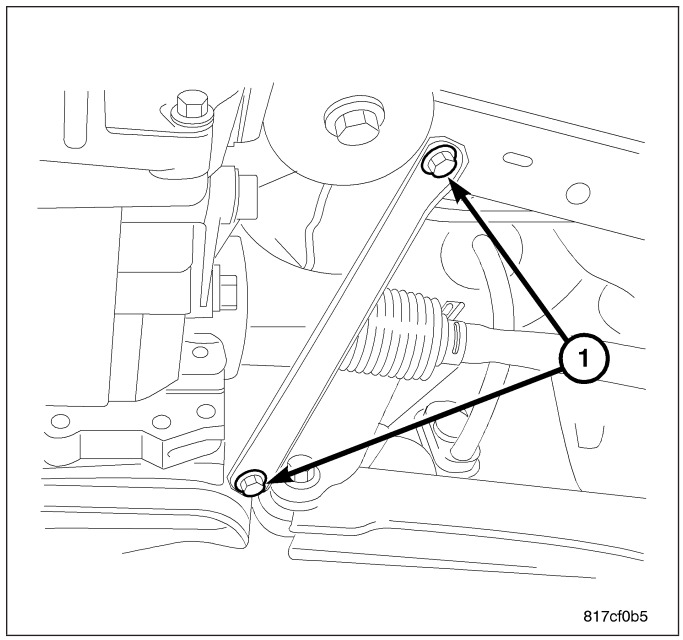
4. Remove left side sway bar nut (if equipped).



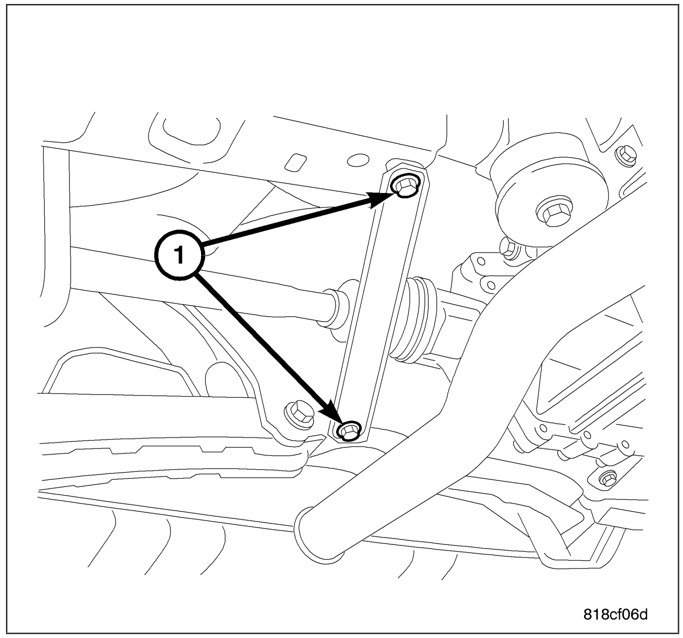
5. Roll sway bar down and out of the way (2) (if equipped).



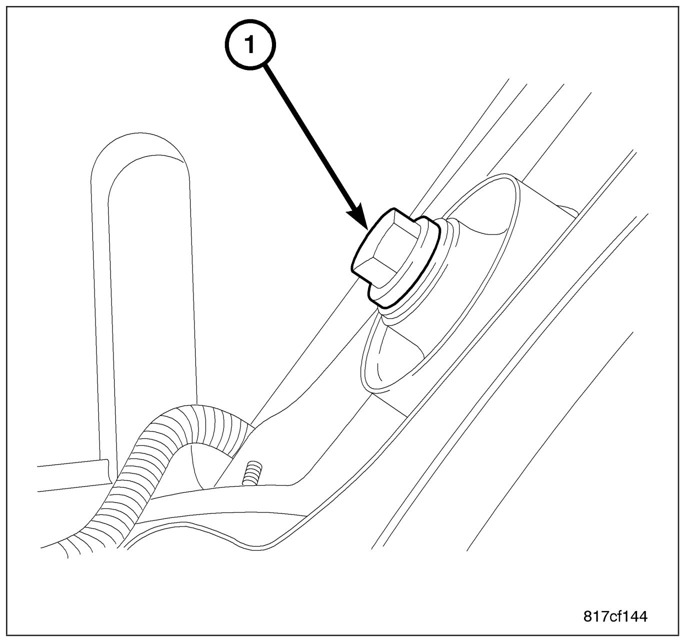
6. Remove the left side stay bracket bolts (1).



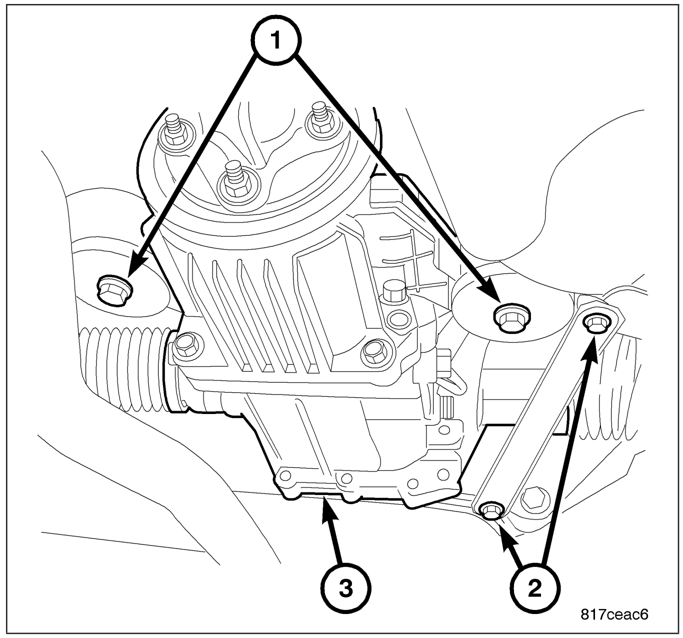
7. Remove the right side stay bracket bolts (1).
8. Remove the exhaust system up to the catalytic converter. (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL)
9. Support the rear driveline module with a transmission jack.



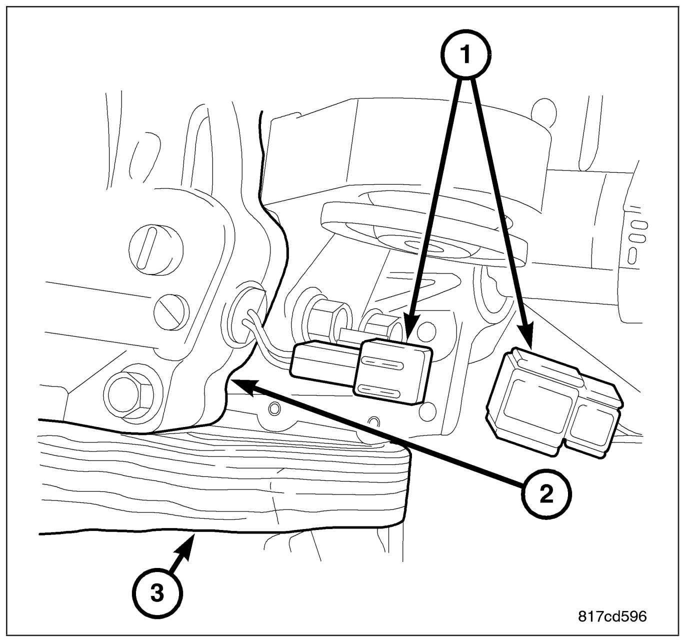
10. Remove the rear bolt (1) at the driveline module.



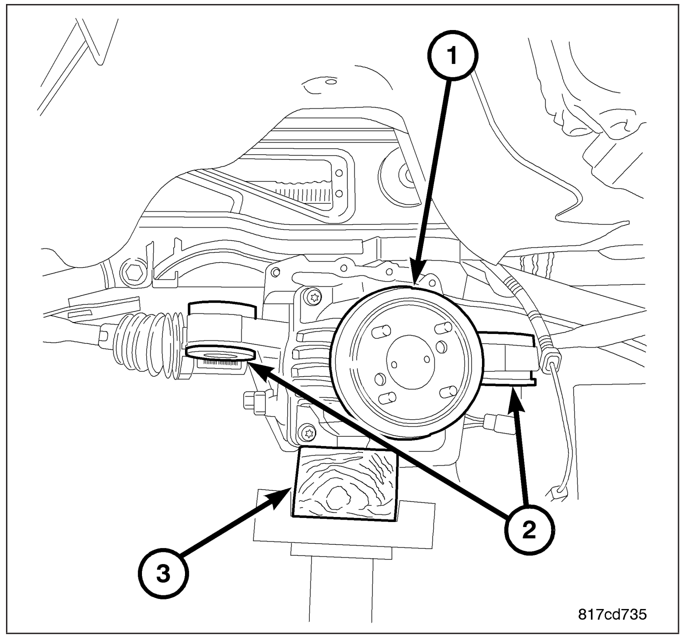
11. Remove the two side bolts (1) at driveline module (3).



12. Lower driveline module enough gain access to the electrical connector and bracket.
13. Remove the routing bracket bolt.
14. Unplug the electrical connector (1).

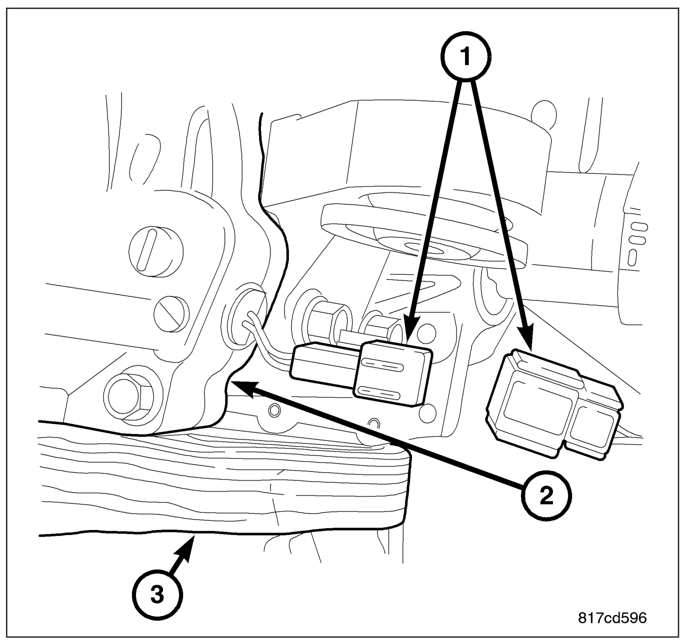


15. Remove the four ECC mounting bolts.
16. Slide ECC from rear axle and lower.

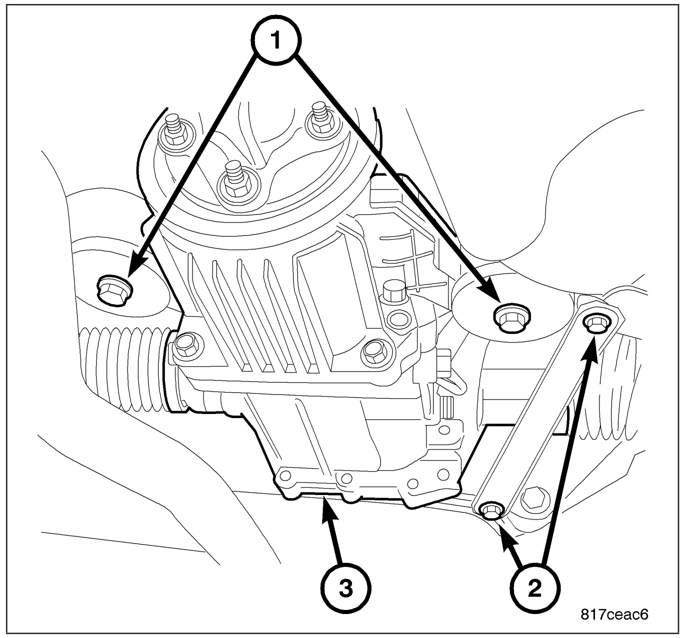


INSTALLATION

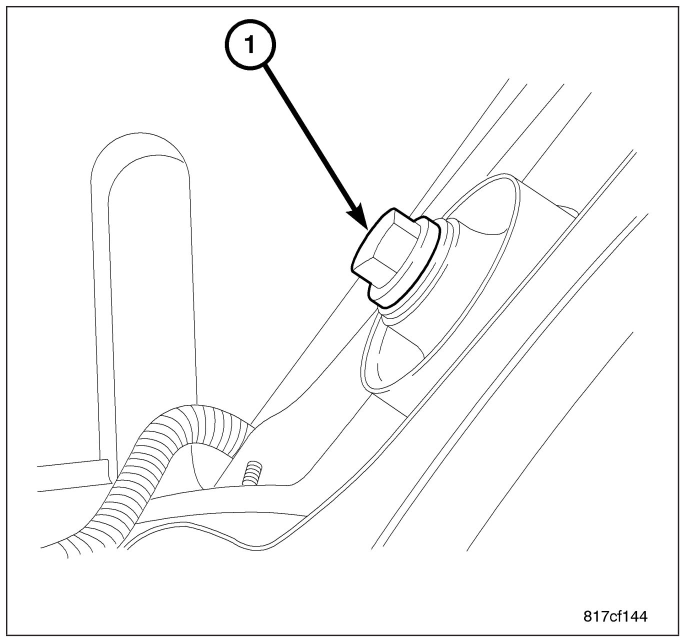
1. Slide ECC into rear axle.
2. Install the four ECC mounting bolts and torque to 68 N·m (50 ft. lbs.).
3. Plug the electrical connector (1) in.
4. Install the routing bracket bolt and torque to 14 N·m (124 in. lbs.).
5. Raise ECC and RDA into place.



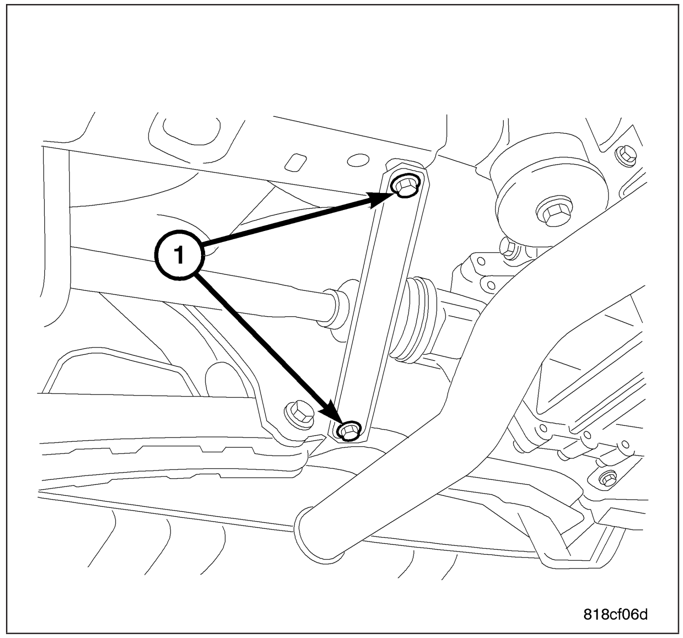
6. Install the two side bolts (1) at driveline module (3) and torque to 153 N·m (113 ft. lbs.).



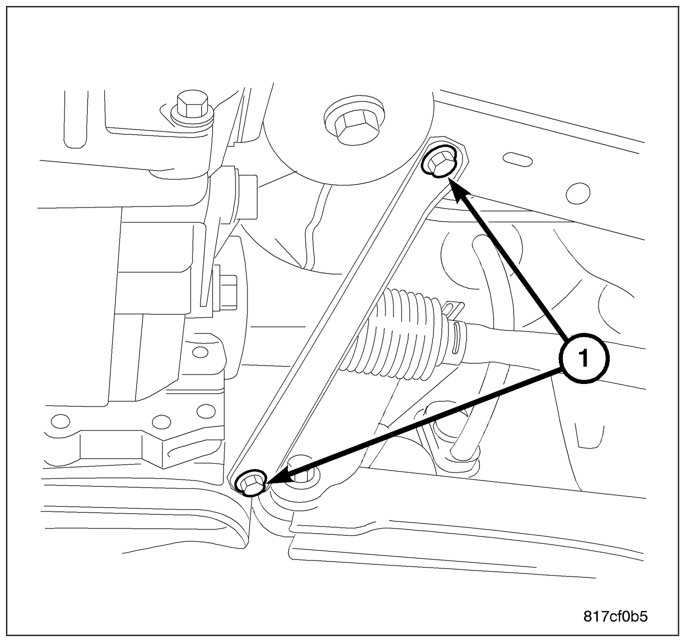
7. Install the rear bolt (1) at the driveline module and torque to 217 N·m (160 ft. lbs.).



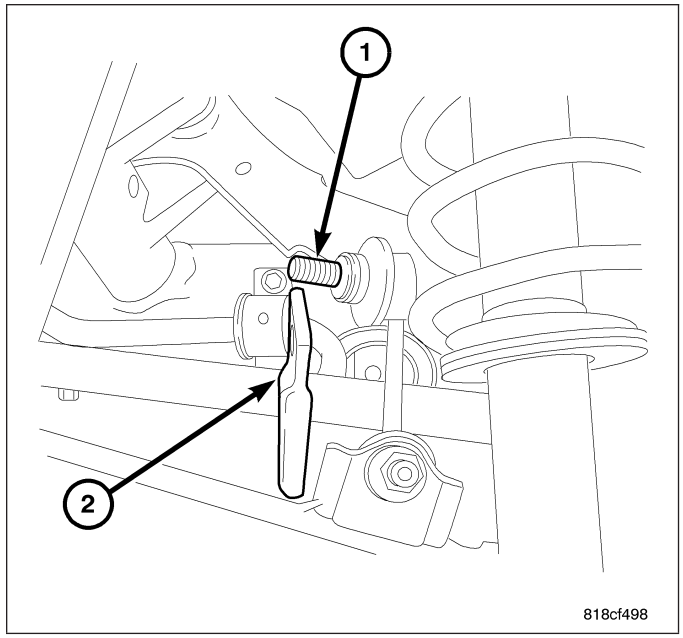
8. Remove the transmission jack.
9. Install the right side stay bracket bolts (1) and torque to 48 N·m (35 ft. lbs.).



10. Install the left side stay bracket bolts and torque to 48 N·m (35 ft. lbs.).



11. Roll sway bar (2) up into place and install the nuts (if equipped).
12. Install the rear propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
13. Install the exhaust system.



VEHICLE QUICK REFERENCE

TABLE OF CONTENTS

FLUID - CAPACITIES & RECOMMENDED

SPECIFICATIONS

FLUIDS, LUBRICANTS AND GENUINE PARTS

ENGINE

Component	**Fluids, Lubricants and Genuine Parts**
Engine Coolant	Mopar® Antifreeze/Coolant 5 Year/100,000 Mile Formula HOAT (Hybrid Organic Additive Technology) or equivalent.
Engine Oil	Use API Certified SAE 5W-20 Engine Oil. Refer to your engine oil filler cap for correct SAE grade meeting DaimlerChrysler Material Standard MS-6395.
Engine Oil Filter	Mopar® 04884900AB or equivalent.
Spark Plugs	Refer to the Vehicle Emission Control Information label in the engine compartment.
Fuel Selection	87 Octane (R + M)/2

CHASSIS

Component	**Fluids, Lubricants and Genuine Parts.**
Automatic Transaxle Fluid	Mopar®CVTF + 4
Manual Transaxle Fluid	Mopar®CVT+4
Rear Drive Assembly (RDA)	Mopar®80W-90 MS9020
Power Transfer Unit (PTU)	Mopar®80W-90 MS9020
Brake Master Cylinder	Mopar® DOT 3, SAE J1703 should be used. If DOT 3, SAE J1703 brake fluid is not available, then DOT 4 is acceptable. Use only recommended brake fluids or equivalent.
Power Steering Reservoir	Mopar® Power Steering Fluid +4 or Mopar® ATF+4 Automatic Transmission Fluid.

CAPACITIES

DESCRIPTION	**U.S.**	**Metric**
Fuel (Approximate)	13.5 Gallons	51.0 Liters
Engine Oil-With Filter		
All Gasoline Engines (Use API Certified SAE 5W-20 Engine Oil.)	4.5 Quarts	4.26 Liters
Cooling System *		
Mopar® Antifreeze/Coolant 5 Year/100,000 Miles Formula), or equivalent.	7.2 Quarts	6.8 Liters
Automatic Transmission Fluid with filter and fluid only	14.8 Pints	7.0 Liters
Automatic Transmission Fluid with transmission overhaul	17.1 Pints	8.1 Liters
Rear Drive Assembly (RDA)	500 ml or fill to bottom of fill plug	16.9 ml or fill to bottom of fill plug
Power Transfer Unit (PTU)	450 ml or fill to bottom of fill plug	15.2 ml or fill to bottom of fill plug
Manual Transaxle Fluid	2.5-2.8 Quarts	2.4-2.7 Liters
* Includes heater and coolant recovery bottle filled to MAX level.		

FUSE LOCATIONS & TYPES

SPECIFICATIONS

INTEGRATED POWER MODULE (IPM)

An Integrated Power Module is located in the engine compartment near the air cleaner assembly. This center contains cartridge fuses and mini fuses. A label that identifies each component may be printed on the inside of the cover.

Cavity	Cartridge Fuse	Mini Fuse	Description
1	40 Amp Green		Power Top Feed
2		20 Amp Yellow	AWD ECU Feed
3		10 Amp Red	CHMSL Brake Switch Feed
4		10 Amp Red	Ignition Switch Feed
5		20 Amp Yellow	Trailer Tow
6		10 Amp Red	IOD Sw/Pwr Mir/Ocm Steering Cntrl Sdar/Hfm
7		30 Amp Green	IOD Sense1
8		30 Amp Green	IOD Sense2
9	40 Amp Green		Power Seats
10		20 Amp Yellow	CCN Power Locks
11		15 Amp Lt Blue	Power Outlet
12		20 Amp Yellow	Ign Run/Acc Inverter
13		20 Amp Yellow	Pwr run/Acc Outlet RR
14		10 Amp Red	IOD CCN/ Interior Lighting
15	40 Amp Green		RAD Fan Relay Battery Feed
16		15 Amp Lt. Blue	IGN Run/Acc Cigar Ltr/Sunroof
17		10 Amp Red	IOD Feed Mod-Wcm
18	40 Amp Green		ASD Relay Contact PWR Feed
19		20 Amp Yellow	PWR Amp 1 & Amp 2 Feed
20		15 Amp Lt. Blue	IOD Feed Radio
21		10 Amp Red	IOD Feed Intrus Mod/Siren
22		10 Amp Red	IGN RUN Hvac/Compass Sensor
23		15 Amp Lt. Blue	ENG ASD Relay Feed 3
24		25 Amp Natural	PWR Sunroof Feed
25		10 Amp Red	Heated Mirror
26		15 Amp Lt. Blue	ENG ASD Relay Feed 2
27		10 Amp Red	IGN RUN Only ORC Feed
28		10 Amp Red	IGN RUN ORC/OCM Feed
29			Hot Car (No Fuse Required)
30		20 Amp Yellow	Heated Seats
31		10 Amp Red	Headlamp Washer Relay Control
32	30 Amp Pink		ENG ASD Control Feed 1
33		10 Amp Red	ABS MOD/J1962 Conn/PCM
34	30 Amp Pink		ABS Valve Feed
35	40 Amp Green		ABS Pump Feed

Cavity	Cartridge Fuse	Mini Fuse	Description
36	30 Amp Pink		Headlamp Washer Control / Smart Glass
37		25 Amp Natural	110 Inverter

CAUTION: When installing the Integrated Power Module cover, it is important to ensure the cover is properly positioned and fully latched. Failure to do so may allow water to get into the Integrated Power Module, and possibly result in an electrical system failure.

CAUTION: When replacing a blown fuse, it is important to use only a fuse having the correct amperage rating. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to blow, it indicates a problem in the circuit that must be corrected.

MAINTENANCE SCHEDULES

DESCRIPTION

MAINTENANCE SCHEDULE

There are three maintenance schedules that show **required** service for your vehicle.

First is Schedule **“B”- ALL ENGINES**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- Heavy Loading

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (170 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″ - ALL ENGINES.

Second is Schedule **“A”**. It is for vehicles that are not operated under any of the conditions listed under Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

Under no circumstances should oil change intervals exceed 6000 miles (10 000 km) or 6 months whichever comes first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add, if required.

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.

- Inspect the brake hoses.
- Inspect the CV joints (if equipped) and front suspension components.
- Check the manual transmission fluid level (if equipped).
- Check the coolant level, hoses, and clamps.

CAUTION: Do not check the automatic transaxle fluid. It must be check by a trained service technician every 15,000 miles and if required only the recommended fluid be added. Refer to the section “Fluids, Lubricants And Genuine Parts” for the proper fluid.

SCHEDULE B

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- Heavy Loading

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (170 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (15 000)**	**12,000 (20 000)**	**15,000 (25 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles (Kilometers)	**18,000 (30 000)**	**21,000 (35 000)**	**24,000 (40 000)**	**27,000 (45 000)**	**30,000 (50 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.	X				
Replace air cleaner filter.					X
Replace spark plugs.					X

Miles (Kilometers)	18,000 (30 000)	21,000 (35 000)	24,000 (40 000)	27,000 (45 000)	30,000 (50 000)
Inspect PCV valve, replace as necessary. **					X
Replace make-up air filter.					X

Miles (Kilometers)	33,000 (55 000)	36,000 (60 000)	39, 000 (65 000)	42,000 (70 000)	45,000 (75 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.		X			
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles (Kilometers)	48,000 (80 000)	51,000 (85 000)	54,000 (90 000)	57,000 (95 000)	60,000 (100 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter					X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.			X		
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary. **					X
Inspect auto tension drive belt and replace, if required.					X
Flush and replace engine coolant at 60 months, or 102,000 miles (170 000 km) whichever comes first.					X

Miles (Kilometers)	63,000 (105 000)	66,000 (110 000)	69,000 (115 000)	72,000 (120 000)	75,000 (125 000)
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.				X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Miles **(Kilometers)**	**63,000 (105 000)**	**66,000 (110 000)**	**69,000 (115 000)**	**72,000 (120 000)**	**75,000 (125 000)**
Inspect auto tension drive belt and replace, if required.					X

Miles **(Kilometers)**	**78,000 (130 000)**	**81,000 (135 000)**	**84,000 (140 000)**	**87,000 (145 000)**	**90,000 (150 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Rear Drive Assembly (RDA) fluid.		X			
Change Power Transfer Unit (PTU)		X			
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.					X
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.**					X
Inspect auto tension drive belt and replace, if required.					X

Miles **(Kilometers)**	**93,000 (155 000)**	**96,000 (160 000)**	**99,000 (165 000)**	**102,000 (170 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X
Rotate tires.		X		X
Check spare tire for proper pressure and correct stowage.		X		X
Flush and replace engine coolant, if not done at 60 months.				X

Miles **(Kilometers)**	**105,000 (175 000)**	**108,000 (180 000)**	**111,000 (185 000)**	**114,000 (190 000)**	**117,000 (195 000)**	**120,000 (200 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter						X
Rotate tires.		X		X		X
Check spare tire for proper pressure and correct stowage.		X		X		X
Inspect brake linings.		X				
Replace engine air cleaner filter.	X					X
Inspect and replace make-up air filter, if required.	X					
Replace make-up air filter.						X
Replace spark plugs.						X

Miles (Kilometers)	105,000 (175 000)	108,000 (180 000)	111,000 (185 000)	114,000 (190 000)	117,000 (195 000)	120,000 (200 000)
Inspect PCV valve, replace as necessary. **						X
Inspect auto tension drive belt and replace, if required.	X					X
Flush and replace engine coolant, if not replaced at 102,000 miles (170 000 km).						X

** This maintenance is recommended by the manufacturer to the owner, but not required to maintain the emissions warranty.

SCHEDULE A

Miles (Kilometers) [Months]	6,000 (10 000) [6]	12,000 (20 000) [12]	18,000 (30 000) [18]	24,000 (40 000) [24]	30,000 (50 000) [30]
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.			X		
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X

Miles (Kilometers) [Months]	36,000 (60 000) [36]	42,000 (70 000) [42]	48,000 (80 000) [48]	54000 (90 000) [54]	60,000 (100 000) [60]	66,000 (110 000) [66]
Change engine oil and engine oil filter.	X	X	X	X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X	X
Flush and replace engine coolant at 60 months, if not replaced at 102,000 miles (170 000 km).					X	
Inspect brake linings.	X			X		
Replace engine air cleaner filter.					X	
Replace make-up air filter.					X	
Replace spark plugs.					X	
Inspect PCV valve, replace as necessary. **					X	
Inspect auto tension drive belt and replace, if required.					X	

Miles **(Kilometers)** **[Months]**	**72,000** **(120 000)** **[72]**	**78,000** **(130 000)** **[78]**	**84,000** **(140 000)** **[84]**	**90,000** **(150 000)** **[90]**	**96,000** **(160 000)** **[96]**
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.	X			X	
Inspect engine air cleaner filter, replace if necessary.				X	
Replace engine air cleaner filter.				X	
Replace make-up air filter.				X	
Replace spark plugs.				X	
Inspect PCV valve, replace as necessary.**				X	
Inspect auto tension drive belt and replace, if required.				X	

Miles **(Kilometers)** **[Months]**	**102,000** **(170 000)** **[102]**	**108,000** **(180 000)** **[108]**	**114,000** **(190 000)** **[114]**	**120,000** **(200 000)** **[120]**
Change engine oil and engine oil filter.	X	X	X	X
Rotate tires.	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X
Flush and replace engine coolant, if not done at 60 months.	X			
Flush and replace engine coolant, if not done at 102,000 miles (170 000 km)				X
Inspect brake linings.		X		
Replace engine air cleaner filter.				X
Replace make-up air filter.				X
Replace spark plugs.				X
Inspect PCV valve, replace as necessary.**				X

** This maintenance is recommended by the manufacturer to the owner, but not required to maintain the emissions warranty.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

WARNING:
You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

MAINTENANCE SCHEDULES - GASOLINE ENGINES - EXPORT

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **"A"**. It lists all the scheduled maintenance to be performed under "normal" (if none of the conditions in Schedule **"B"** apply to you) operating conditions.

Second is Schedule **"B."** It is a schedule for vehicles that are operated under the conditions listed below.

Follow Schedule **"B"**if you usually operated you vehicle under one or more of the following conditions.

- Day or night temperatures are below 0° C (32° F).

- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.

NOTE: If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 163 000 km (102,000 miles) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading.
- Check the windshield washer solvent and add if required.

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints (if equipped) and front suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

SCHEDULE A

Kilometers (Miles) [Months]	**12 000 (7,500) [6]**	**24 000 (15,000) [12]**	**36 000 (22,500) [18]**	**48 000 (30,000) [24]**	**60 000 (37,500) [30]**
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X
Inspect brake linings.			X		

Kilometers **(Miles)** **[Months]**	**12 000** **(7,500)** **[6]**	**24 000** **(15,000)** **[12]**	**36 000** **(22,500)** **[18]**	**48 000** **(30,000)** **[24]**	**60 000** **(37,500)** **[30]**
Replace engine air cleaner filter.				X	
Replace make-up air filter.				X	
Replace spark plugs.				X	

Kilometers **(Miles)** **[Months]**	**72 000** **(45,000)** **[36]**	**84 000** **(52,500)** **[42]**	**96 000** **(60,000)** **[48]**	**108 000** **(67,500)** **[54]**	**120 000** **(75,000)** **[60]**	**132 000** **(82,500)** **[66]**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X	X	X	X	X
Flush and replace engine coolant at 60 months, regardless of mileage.					X	
Inspect brake linings.	X			X		
Replace engine air cleaner filter.			X			
Replace make-up air filter.			X			
Replace spark plugs.			X			
Inspect PCV valve, replace as necessary.			X			
Inspect auto tension drive belt and replace if required.			X			

Kilometers **(Miles)** **[Months]**	**144 000** **(90,000)** **[72]**	**156 000** **(97,500)** **[78]**	**160 000** **(100,000)**	**168 000** **(105,000)** **[84]**	**181 000** **(112,500)** **[90]**	**192 000** **(120,000)** **[96]**
Change engine oil and engine oil filter.	X	X		X	X	X
Rotate tires.	X	X	X	X	X	X
Check spare tire for proper pressure and correct stowage.	X	X		X	X	X
Flush and replace engine coolant, if not done at 60 mos.			X			
Inspect brake linings.	X				X	
Replace engine air cleaner filter.	X					X
Replace make-up air filter.	X					X
Replace spark plugs.	X					X
Inspect PCV valve, replace as necessary.	X					X
Inspect auto tension drive belt and replace if required.	X					

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

SCHEDULE B

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (163 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

Kilometers (Miles)	**5 000 (3,000)**	**10 000 (6,000)**	**14 000 (9,000)**	**19 000 (12,000)**	**24 000 (15,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Kilometers (Miles)	**29 000 (18,000)**	**34 000 (21,000)**	**38 000 (24,000)**	**43 000 (27,000)**	**48 000 (30,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.	X				
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X

Kilometers (Miles)	**53 000 (33,000)**	**58 000 (36,000)**	**62 000 (39, 000)**	**67 000 (42,000)**	**72 000 (45,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	

Kilometers (Miles)	**53 000 (33,000)**	**58 000 (36,000)**	**62 000 (39, 000)**	**67 000 (42,000)**	**72 000 (45,000)**
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.		X			
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X

Kilometers (Miles)	**77 000 (48,000)**	**82 000 (51,000)**	**86 000 (54,000)**	**91 000 (57,000)**	**96 000 (60,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Automatic Transaxle (CVT) Fluid and Filter.					X
Rotate tires.	X		X		X
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.			X		
Replace engine air cleaner filter, replace if necessary.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X
Inspect auto tension drive belt and replace if required.					X
Flush and replace engine coolant at 60 months, or 102,000 miles (163, 000 km) whichever comes first.					

Kilometers (Miles)	**101 000 (63,000)**	**106 000 (66,000)**	**110 000 (69,000)**	**115 000 (72,000)**	**120 000 (75,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Check spare tire for proper pressure and correct stowage.		X		X	
Inspect brake linings.				X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect and replace make-up air filter, if required.					X
Inspect auto tension drive belt and replace if required.					X

Kilometers (Miles)	**125 000 (78,000)**	**130 000 (81,000)**	**134 000 (84,000)**	**139 000 (87,000)**	**144 000 (90,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Change Rear Drive Assembly (RDA) fluid.		X			
Change Power Transfer Unit (PTU)		X			
Rotate tires.	X		X		X

Kilometers **(Miles)**	**125 000** **(78,000)**	**130 000** **(81,000)**	**134 000** **(84,000)**	**139 000** **(87,000)**	**144 000** **(90,000)**
Check spare tire for proper pressure and correct stowage.	X		X		X
Inspect brake linings.					X
Replace engine air cleaner filter.					X
Replace make-up air filter.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.					X
Inspect auto tension drive belt and replace if required.					X

Kilometers **(Miles)**	**149 000** **(93,000)**	**154 000** **(96,000)**	**158 000** **(99,000)**	**160 000** **(100,000)**	**163 000** **(102,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X		X
Rotate tires.		X			X
Check spare tire for proper pressure and correct stowage.		X			X
Flush and replace engine coolant, if not done at 60 months.					X

Kilometers **(Miles)**	**168 000** **(105,000)**	**173 000** **(108,000)**	**178 000** **(111,000)**	**182 000** **(114,000)**	**187 000** **(117,000)**	**192 000** **(120,000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X	X
Change Automatic Transaxle (CVT) fluid and filter.						X
Rotate tires.		X		X		X
Check spare tire for proper pressure and correct stowage.		X		X		X
Inspect brake linings.		X				
Replace engine air cleaner filter.	X					X
Inspect and replace make-up air filter, if required.	X					
Replace make-up air filter.						X
Replace spark plugs.						X
Inspect PCV valve, replace as necessary.						X
Inspect auto tension drive belt and replace if required.	X					X

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

WARNING:
You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

REPLACEMENT BULBS

SPECIFICATIONS

REPLACEMENT LIGHT BULBS - INTERIOR

LIGHT BULBS - INTERIOR	BULB NUMBER
Front Header Lamp	T578
Center Dome Lamp	T578
Rear Cargo/Flashlight	8–A35LF

REPLACEMENT LIGHT BULBS - EXTERIOR

LIGHT BULBS - EXTERIOR	BULB NUMBER
Low Beam/High Beam Headlight	H13
Front Park/Turn Signal/Side Marker Light	3157AK
Front Fog Light	9145
Center High Mounted Stop Light (CHMSL)	LED Assembly
Rear Tail/Stop	3157
Rear Turn Signal	3157AK
Backup Light	W16W (921)
License Light	W5W

TRAILER TOWING

SPECIFICATIONS

TRAILER TOWING

In this section you will find safety tips and information on limits to the type of towing you can reasonably do with your vehicle. Before towing a trailer carefully review this information to tow your load as efficiently and safely as possible.

To maintain warranty coverage, follow the requirements and recommendations in this manual concerning vehicles used for trailer towing.

Common Towing Definitions

The following trailer towing related definitions will assist you in understanding the following information:

Gross Vehicle Weight Rating (GVWR)

The GVWR is the total allowable weight of your vehicle. This includes driver, passengers, cargo and tongue weight. The total load must be limited so that you do not exceed the GVWR.

Gross Trailer Weight (GTW)

The gross trailer weight (GTW) is the weight of the trailer plus the weight of all cargo, consumables and equipment (permanent or temporary) loaded in or on the trailer in its ″loaded and ready for operation″ condition. The recommended way to measure GTW is to put your fully loaded trailer on a vehicle scale. The entire weight of the trailer must be supported by the scale.

Gross Combination Weight Rating (GCWR)

The gross combination weight rating (GCWR) is the total permissible weight of your vehicle and trailer when weighed in combination. (Note that GCWR ratings include a 68 kg (150 lbs) allowance for the presence of a driver).

Gross Axle Weight Rating (GAWR)

The GAWR is the maximum capacity of the front and rear axles. Distribute the load over the front and rear axles evenly. Make sure that you do not exceed either front or rear GAWR.

WARNING:
It is important that you do not exceed the maximum front or rear GAWR. A dangerous driving condition can result if either rating is exceeded. You could lose control of the vehicle and have an accident.

Tongue Weight (TW)

The downward force exerted on the hitch ball by the trailer. In most cases it should not be less than 10% or more than 15% of the trailer load. You must consider this as part of the load on your vehicle.

Frontal Area

The maximum height and maximum width of the front of a trailer.

Trailer Sway Control

The trailer sway control is a telescoping link that can be installed between the hitch receiver and the trailer tongue that typically provides adjustable friction associated with the telescoping motion to dampen any unwanted trailer swaying motions while traveling.

Weight-Carrying Hitch

A weight-carrying hitch supports the trailer tongue weight, just as if it were luggage located at a hitch ball or some other connecting point of the vehicle. These kind of hitches are the most popular on the market today and they're commonly used to tow small- and medium-sized trailers.

Weight-Distributing Hitch

A weight-distributing hitch includes a receiver attached to the tow vehicle, plus a removable hitch head and spring bar assembly that fits into the receiver opening and hook up brackets that connect the spring bars to the trailer frame.

Trailer Hitch Classification

The following chart provides the industry standard for the maximum trailer weight a given trailer hitch class can tow and should be used to assist you in selecting the correct trailer hitch for your intended towing condition. Refer to the Trailer Towing Weights (Maximum Trailer Weight Ratings) chart for the Max. GTW towable for your given drivetrain.

Trailer Hitch Classification	
Class	**Max. GTW (Gross Trailer Wt.)**
Class I - Light Duty	2,000 lbs (907 kg)
Class II - Medium Duty	3,500 lbs (1587 kg)
Class III - Heavy Duty	5,000 lbs (2268 kg)
Class IV - Extra Heavy Duty	10,000 lbs (4540 kg)

All trailer hitches should be professionally installed on your vehicle.

Trailer Towing Weights (Maximum Trailer Weight Ratings)

The following chart provides the maximum trailer weight ratings towable for your given drivetrain.

Engine/Transmission	Frontal Area	Max. GTW (Gross Trailer Wt.)	Max. Tongue Wt. (See Note 1)
2.0L Auto	22 Sq. Ft. (2.4 sq. m)	1000 lbs (450 kg)	150 lbs (50 kg)
2.4L Auto	22 Sq. Ft. (2.4 sq. m)	1000 lbs (450 kg)	150 lbs (50 kg)
1.8L Manual	22 Sq. Ft. (2.4 sq. m)	1000 lbs (450 kg)	150 lbs (50 kg)
2.4L Auto/Man with Trailer Tow Prep Package (AHC)	32 Sq. Ft. (2.4 sq. m)	2000 lbs (450 kg)	150 lbs (50 kg)
Refer to local laws for maximum trailer towing speeds.			

NOTE: The trailer tongue weight must be considered as part of the combined weight of occupants and cargo, and should never exceed the weight referenced on the Tire and Loading Information placard. Refer to the Tire–Safety Information Section in this manual.

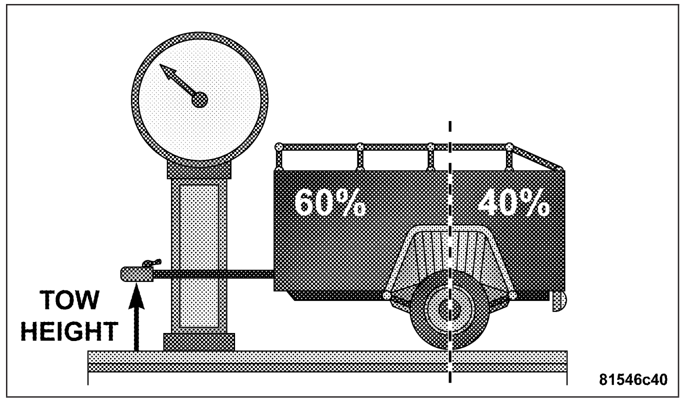
Trailer and Tongue Weight

Always load a trailer with 60% to 65% of the weight in the front of the trailer. This places 10% to 15% of the Gross Trailer Weight (GTW) on the tow hitch of your vehicle. Loads balanced over the wheels or heavier in the rear can cause the trailer to sway **severely** side to side which will cause loss of control of the vehicle and trailer. Failure to load trailers heavier in front is the cause of many trailer accidents.

Never exceed the maximum tongue weight stamped on your bumper or trailer hitch.

Consider the following items when computing the weight on the rear axle of the vehicle:

- The tongue weight of the trailer.
- The weight of any other type of cargo or equipment put in or on your vehicle.
- The weight of the driver and all passengers.



NOTE: Remember that everything put into or on the trailer adds to the load on your vehicle. Also, additional factory-installed options, or dealer-installed options, must be considered as part of the total load on your vehicle. Refer to the Tire and Loading Information placard in the Tire Safety Information Section of this manual for the maximum combined weight of occupants and cargo for your vehicle.

Towing Requirements

To promote proper break-in of your new vehicle drivetrain components the following guidelines are recommended:

CAUTION:
- **Avoid towing a trailer for the first 500 miles (805 km) of vehicle operation. Doing so may damage your vehicle.**
- **During the first 500 miles (805 km) of trailer towing, limit your speed to 50 mph (80 km/h).**

When towing a trailer, never exceed the GAWR, or GCWR, ratings.

WARNING:
Improper towing can lead to an injury accident. Follow these guidelines to make your trailer towing as safe as possible:
Make certain that the load is secured in the trailer and will not shift during travel. When trailering cargo that is not fully secured, dynamic load shifts can occur that may be difficult for the driver to control. You could lose control of your vehicle and have an accident.

- When hauling cargo or towing a trailer, do not overload your vehicle or trailer. Overloading can cause a loss of control, poor performance or damage to brakes, axle, engine, transmission, steering, suspension, chassis structure or tires.
- Safety chains must always be used between your vehicle and trailer. Always connect the chains to the frame or hook retainers of the vehicle hitch. Cross the chains under the trailer tongue and allow enough slack for turning corners.
- Vehicles with trailers should not be parked on a grade. When parking, apply the parking brake on the tow vehicle. Put the tow vehicle automatic transmission in P for Park. With a manual transmission, shift the transmission into reverse. Always, block or ″chock″ the trailer wheels.
- GCWR must not be exceeded.
- **Total weight must be distributed between the tow vehicle and the trailer such that the following four ratings are not exceeded:**
  - GVWR
  - GTW
  - GAWR
  - Tongue weight rating for the trailer hitch utilized (This requirement may limit the ability to always achieve the 10% to 15% range of tongue weight as a percentage of total trailer weight).

Towing Requirements — Tires

− Do not attempt to tow a trailer while using a compact spare tire.

− Proper tire inflation pressures are essential to the safe and satisfactory operation of your vehicle. Refer to the Tires–General Information section of this manual on Tire Pressures for proper tire inflation procedures.

− Also, check the trailer tires for proper tire inflation pressures before trailer usage.

− Check for signs of tire wear or visible tire damage before towing a trailer. Refer to the Tires–General Information section of this manual on Tread Wear Indicators for the proper inspection procedure.

− When replacing tires refer to the Tires–General Information section of this manual on Replacement Tires for proper tire replacement procedures. Replacing tires with a higher load carrying capacity will not increase the vehicle's GVWR and GAWR limits.

Towing Requirements — Trailer Brakes

− Do **not** interconnect the hydraulic brake system or vacuum system of your vehicle with that of the trailer. This could cause inadequate braking and possible personal injury.

− An electronically actuated trailer brake controller is required when towing a trailer with electronically actuated brakes. When towing a trailer equipped with a hydraulic surge actuated brake system, an electronic brake controller is not required.

− Trailer brakes are recommended for trailers over 1,000 lbs (450 kg) and required for trailers in excess of 2,000 lbs (907 kg).

CAUTION:
If the trailer weighs more than 1,000 lbs (450 kg) loaded, it should have its own brakes and they should be of adequate capacity. Failure to do this could lead to accelerated brake lining wear, higher brake pedal effort, and longer stopping distances.

WARNING:
Do not connect trailer brakes to your vehicle's hydraulic brake lines. It can overload your brake system and cause it to fail. You might not have brakes when you need them and could have an accident.
Towing any trailer will increase your stopping distance. When towing you should allow for additional space between your vehicle and the vehicle in front of you. Failure to do so could result in an accident.

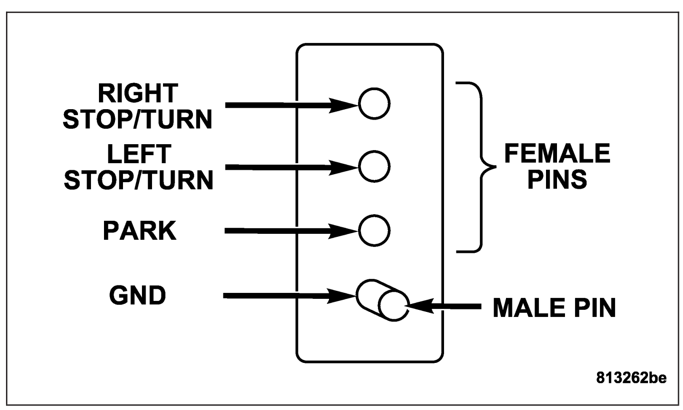
Towing Requirements — Trailer Lights & Wiring

Whenever you pull a trailer, regardless of the trailer size, stop lights and turn signals on the trailer are required for motoring safety.

The Trailer Tow Package may include a 4 and 7 pin wiring harness. Use a factory approved trailer harness and connector.

NOTE: Do not cut or splice wiring into the vehicles wiring harness.

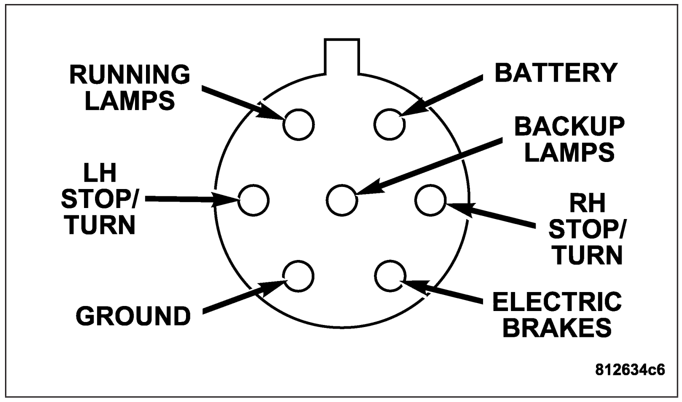
The electrical connections are all complete to the vehicle but you must mate the harness to a trailer connector. Refer to the following illustrations.



Towing Tips

Before setting out on a trip, practice turning, stopping and backing the trailer in an area away from heavy traffic.

If using a manual transmission vehicle for trailer towing, all starts must be in FIRST gear to avoid excessive clutch slippage.



Towing Tips — Electronic Speed Control (If Equipped)

− Don't use in hilly terrain or with heavy loads.

− When using the speed control, if you experience speed drops greater than 10 mph (16 km/h), disengage until you can get back to cruising speed.

− Use speed control in flat terrain and with light loads to maximize fuel efficiency.

Towing Tips — Cooling System

To reduce potential for engine and transmission overheating, take the following actions:

- City Driving - When stopped for short periods of time, put transmission in neutral and increase engine idle speed.
- Highway Driving - Reduce speed.
- Air Conditioning - Turn off temporarily.
- Refer to Cooling System Operating information in the Maintenance section of this manual for more information.

BRAKES

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BRAKES - BASE

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BRAKES - BASE

DESCRIPTION - BASE BRAKE SYSTEM

The base brake system consists of the following components:

- Brake pedal
- Power brake booster
- Master cylinder
- Proportioning valves (2) (non-ABS vehicles only)
- Brake tubes and hoses
- Disc brakes (front)
- Disc brakes (rear) (optional)
- Drum brakes (rear) (standard)
- Parking brake

The hydraulic brake system is diagonally split for both the non-antilock and antilock braking systems. That means the left front and right rear brakes are on one hydraulic circuit and the right front and left rear are on the other.

Front disc brakes control the braking of the front wheels; rear braking is controlled by rear drum brakes as standard equipment. Rear disc brakes and antilock brakes with or without traction control are optional.

Vehicles equipped with the optional antilock brake system (ABS) use a system that shares most base brake hardware used on vehicles without ABS. For more information on ABS (Refer to 5 - BRAKES - ABS - DESCRIPTION).

The parking brake system consists of a hand-operated lever mounted between the front seats that actuates parking brake cables connecting to the rear brakes. For more information on Parking Brakes, (Refer to 5 - BRAKES/PARKING BRAKE - DESCRIPTION).

For information on the Stop Lamp Switch, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - DESCRIPTION).

WARNING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

CAUTION

CAUTION: Use only Mopar® Brake Fluid DOT 3 Motor Vehicle or equivalent from a tightly sealed container. Do not use petroleum-based fluid because seal damage in the brake system will result. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - SPECIFICATIONS)

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean system components. These fluids damage rubber cups and seals.

CAUTION: During service procedures, grease or any other foreign material must be kept off the caliper assembly, brake linings, brake rotor and external surfaces of the hub.

CAUTION: When handling the brake rotor and caliper, be careful to avoid damaging the brake rotor and caliper, and scratching or nicking the brake shoe lining.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM DIAGNOSIS CHARTS

NOTE: There are three diagnosis charts following that cover the RED BRAKE WARNING INDICATOR, BRAKE NOISE and OTHER BRAKE CONDITIONS.

RED BRAKE WARNING INDICATOR

CONDITION	POSSIBLE CAUSES	CORRECTION
RED BRAKE WARNING INDICATOR ON	1. Parking brake lever not fully released.	1. Release parking brake lever.
	2. Parking brake warning switch on parking brake lever.	2. Inspect and replace switch as necessary.
	3. Brake fluid level low in reservoir.	3. Fill reservoir. Check entire system for leaks. Repair or replace as required.
	4. Brake fluid level switch.	4. Disconnect switch wiring connector. If lamp goes out, replace switch.
	5. Mechanical instrument cluster (MIC) problem.	5. Refer to Appropriate Diagnostic Information.
	6. ABS EVBP malfunction.	6. Refer to ABS section and Appropriate Diagnostic Information.

BRAKE NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC BRAKE CHIRP	1. Excessive brake rotor runout.	1. Refer to brake rotor - diagnosis and testing. Correct as necessary.
DISC BRAKE RATTLE OR CLUNK	1. Broken or missing spring clips.	1. Replace brake shoes.
	2. Caliper guide pin bolts loose.	2. Tighten guide pin bolts.
	3. Missing abutment shims.	3. Replace missing abutment shims.
DISC BRAKE SQUEAK AT LOW SPEED (WHILE APPLYING LIGHT BRAKE PEDAL EFFORT)	1. Brake shoe linings.	1. Replace brake shoes.
DRUM BRAKE CHIRP	1. Lack of lubricant on brake shoe support plate where shoes ride.	1. Lubricate shoe contact areas on brake shoe support plates.
	2. Wheel cylinder out of alignment.	2. Loosen wheel cylinder mounting bolts, realign wheel cylinder with brake shoes and tighten mounting bolts.
DRUM BRAKE CLUNK	1. Drum(s) have threaded machined braking surface.	1. Reface or replace drake drums as necessary.
DRUM BRAKE HOWL OR MOAN	1. Lack of lubricant on brake shoe support plate where shoes ride and at the anchor.	1. Lubricate shoe contact areas on brake shoe support plates and at the anchor.
	2. Rear brake shoes.	2. Replace rear brake shoes.

CONDITION	POSSIBLE CAUSES	CORRECTION
SCRAPING (METAL-TO-METAL).	1. Foreign object interference with brakes. 2. Brake shoes worn out.	1. Inspect brakes and remove foreign object. 2. Replace brake shoes. Inspect rotors and drums. Reface or replace as necessary.
SCRAPING OR WHIRRING	1. ABS wheel speed sensor hitting tone wheel.	1. Inspect, correct or replace faulty component(s).

OTHER BRAKE CONDITIONS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKES CHATTER	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
BRAKES DRAG (FRONT OR ALL)	1. Contaminated brake fluid. 2. Binding caliper pins or bushings. 3. Misadjusted brake lamp switch. 4. Master cylinder not fully returning. 5. Binding brake pedal.	1. Check for swollen seals. Replace all system components containing rubber. 2. Replace pins and bushings 3. Replace brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL) 4. Inspect master cylinder and replace as necessary. 5. Replace brake pedal/bushings.
BRAKES DRAG (REAR ONLY)	1. Parking brake cables binding or froze up. 2. Parking brake cable return spring not returning shoes. 3. Service brakes not adjusted properly (rear drum brakes only). 4. Obstruction inside the center console preventing full return of the parking brake cables.	1. Check cable routing. Replace cables as necessary. 2. Replace cables as necessary. 3. Adjust rear brake shoes. Refer to Brake Pads/Shoes - Drum Brake. 4. Remove console and remove obstruction.
BRAKES GRAB	1. Contaminated brake shoe linings. 2. Improper power brake booster assist.	1. Inspect and clean, or replace shoes. Repair source of contamination. 2. Refer to Power Brake Booster in this section.
EXCESSIVE PEDAL EFFORT	1. Obstruction of brake pedal. 2. Low power brake booster assist. 3. Glazed brake linings. 4. Brake shoe lining transfer to brake rotor.	1. Inspect, remove or move obstruction. 2. Refer to Power Brake Booster in this section. 3. Reface or replace brake rotors as necessary. Replace brake shoes. 4. Reface or replace brake rotors as necessary. Replace brake shoes.
EXCESSIVE PEDAL EFFORT (HARD PEDAL - CAN'T SKID WHEELS)	1. Power brake booster runout (vacuum assist).	1. Check booster vacuum hose and engine tune for adequate vacuum supply. Refer to Power Brake Booster.

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE PEDAL TRAVEL (VEHICLE STOPS OK)	1. Air in brake lines.	1. Bleed brakes.
	2. Rear drum brake auto-adjuster malfunctioning.	2. Inspect and replace drum brake components as necessary. Adjust rear brakes.
EXCESSIVE PEDAL TRAVEL (ONE FRONT WHEEL LOCKS UP DURING HARD BRAKING)	1. One of the two hydraulic circuits is malfunctioning.	1. Inspect system for leaks. Check master cylinder for internal malfunction.
PEDAL PULSATES/ SURGES DURING BRAKING	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
PEDAL IS SPONGY	1. Air in brake lines.	1. Bleed brakes.
PREMATURE REAR WHEEL LOCKUP	1. Contaminated brake shoe linings.	1. Inspect and clean, or replace shoes. Repair source of contamination.
	2. Inoperative proportioning valve (non-ABS vehicles only).	2. Test proportioning valves following diagnosis and testing procedure. Refer to Proportioning Valve. Replace valves as necessary.
	3. ABS EVBP not functioning.	3. Refer to the ABS section and Appropriate Diagnostic Information.
STOP LAMPS STAY ON	1. Brake lamp switch out of adjustment.	1. Replace brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL)
	2. Brake pedal binding.	2. Inspect and replace as necessary.
	3. Power brake booster not allowing pedal to return completely.	3. Replace power brake booster.
VEHICLE PULLS TO RIGHT OR LEFT ON BRAKING	1. Frozen brake caliper piston.	1. Replace frozen piston or caliper. Bleed brakes.
	2. Contaminated brake shoe lining (most likely front lining).	2. Inspect and clean, or replace shoes. Repair source of contamination.
	3. Pinched brake lines.	3. Replace pinched line.
	4. Leaking piston seal.	4. Replace piston seal or brake caliper.
	5. Suspension problem.	5. Refer to the Suspension section.
PARKING BRAKE - EXCESSIVE HANDLE TRAVEL	1. Rear brakes out of adjustment.	1. Adjust rear drum brake shoes, or rear parking brake shoes on vehicles with rear disc brakes.

STANDARD PROCEDURE

BASE BRAKE BLEEDING

NOTE: For bleeding the ABS hydraulic system, refer to Antilock Brake System Bleeding in the Antilock Brake System section.

CAUTION: Before removing the master cylinder cap, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder reservoir.

CAUTION: Use only Mopar® brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 3 specifications.

NOTE: For bleeding of the Antilock Brake System, (Refer to 5 - BRAKES - ABS - STANDARD PROCEDURE).

Do not pump the brake pedal at any time while having a bleeder screw open during the bleeding process. This will only increase the amount of air in the system and make additional bleeding necessary.

Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed.

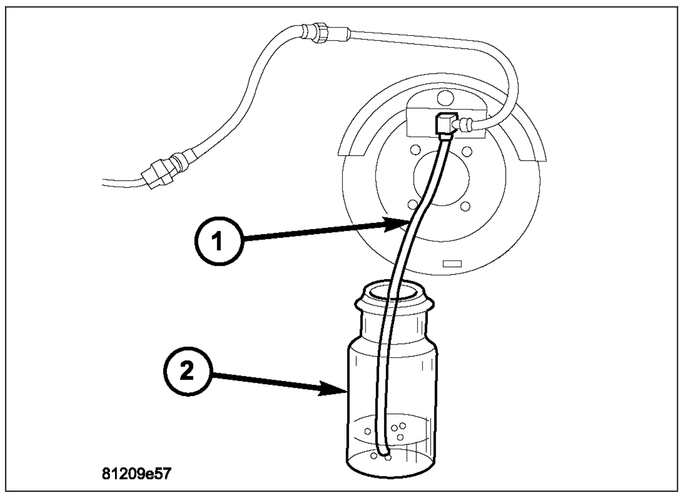
The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

- Left rear wheel
- Right front wheel
- Right rear wheel
- Left front wheel

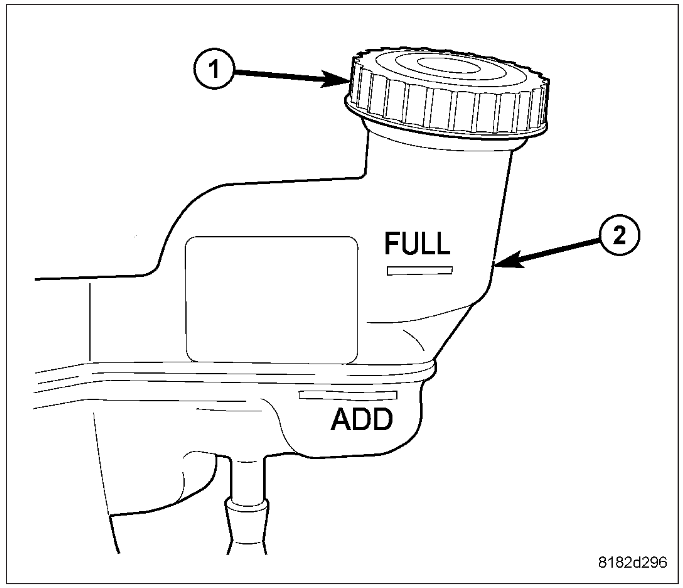
MANUAL BLEEDING

NOTE: To bleed the brakes manually, the aid of a helper will be required.

1. Attach a clear plastic hose (1) to the bleeder screw and feed the hose into a clear jar (2) containing enough fresh brake fluid to submerge the end of the hose.
2. Have a helper pump the brake pedal three or four times and hold it in the down position.
3. With the pedal in the down position, open the bleeder screw at least one full turn.
4. Once the brake pedal has dropped, close the bleeder screw. After the bleeder screw is closed, release the brake pedal.
5. Repeat the above steps until all trapped air is removed from that wheel circuit (usually four or five times).



6. Bleed the remaining wheel circuits in the same manner until all air is removed from the brake system. Monitor the fluid level in the master cylinder reservoir (2) to make sure it does not go dry.
7. Check and adjust brake fluid level to the FULL mark.
8. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
9. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

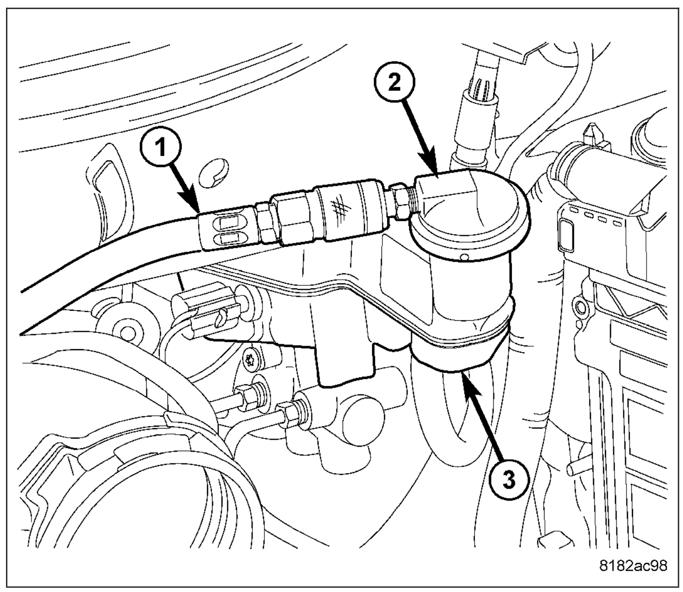


PRESSURE BLEEDING

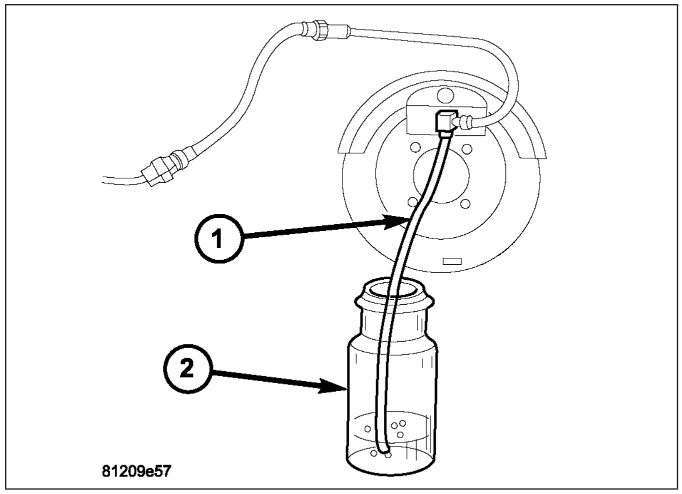
NOTE: Follow pressure bleeder manufacturer's instructions for use of pressure bleeding equipment.

Following the same wheel circuit sequence as prescribed for manual bleeding.

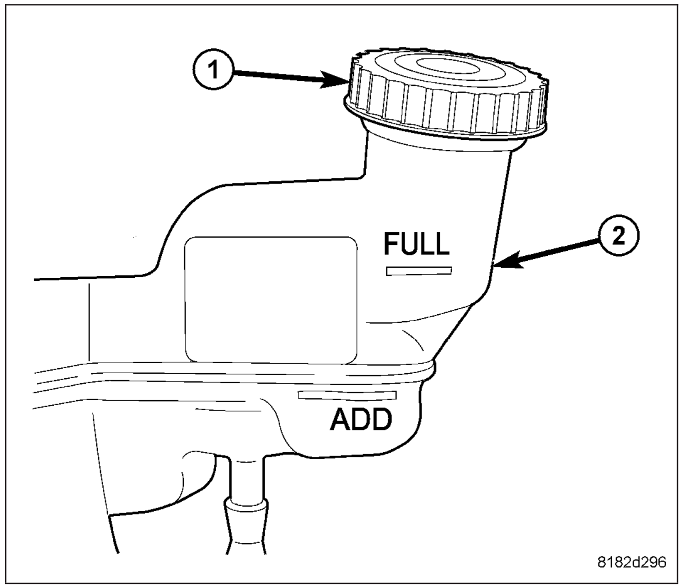
1. Attach Master Cylinder Cap (2), Special Tool 6921, in place of the filler cap on the master cylinder reservoir (3).
2. Attach Bleeder Tank (1), Special Tool C-3496-B, or an equivalent, to the Master Cylinder Cap 6921.



3. Attach a clear plastic hose (1) to the bleeder screw and feed the hose into a clear jar (2) containing enough fresh brake fluid to submerge the end of the hose.
4. Open the bleeder screw at least one full turn or more to obtain a steady stream of brake fluid.
5. After approximately 4–8 ounces of fluid have been bled through the brake circuit and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.
6. Repeat this procedure at all the remaining bleeder screws.



7. Check and adjust brake fluid level to the FULL mark on the reservoir (2).
8. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
9. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.



SPECIFICATIONS

BRAKE ACTUATION

ACTUATION:	
Vacuum Operated Power Brakes	Standard
Hydraulic System	Dual-Diagonally Split
BRAKE PEDAL:	
Pedal Ratio	3.3:1
POWER BRAKE BOOSTER:	
Type	Vacuum Assist
Mounting Studs	M8 x 1.25
Diaphragm Size/Type	250 mm /Single Diaphragm
MASTER CYLINDER ASSEMBLY:	
Type	Compact
Body Material	Anodized Aluminum
Reservoir Material	Polypropelene
Bore and Stroke	20.6 mm x 42 mm (0.812 in. x 1.654 in.)
Displacement Split	50 / 50
MASTER CYLINDER FLUID OUTLET PORTS:	
Tube Fitting Type	ISO Flare
Primary Tube Nut Thread - With ABS	M12 x 1
Primary Tube Nut Thread - Without ABS	M10 x 1
Secondary Tube Nut Thread - All	M12 x 1
PROPORTIONING VALVE:	
Material	Aluminum/Steel
Function	Fixed Pressure Proportioning
Outlet Tube Fitting Type	ISO Flare
Outlet Tube Nut Threads - Primary	M12 x 1
Outlet Tube Nut Threads - Secondary	M10 x 1
ABS HYDRAULIC CONTROL UNIT PORTS:	
Tube Fitting Type	ISO Flare
Inlet Port Threads (Both)	M12 x 1
Outlet Port Threads-Left Front and Left Rear	M12 x 1
Outlet Port Threads-Right Front and Right Rear	M10 x 1

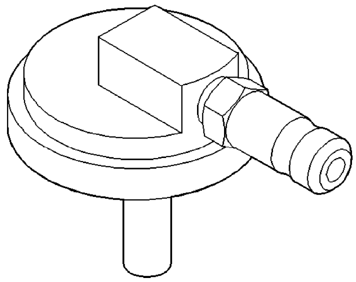
BRAKE FASTENER TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
ABS ICU Mounting Bolt (To Bracket)	11	—	97
ABS ICU Mounting Pins	11	—	97
ABS ICU Mounting Bracket Screws (To Frame)	23	17	203
ABS ABM Mounting Screws (To HCU)	2	—	17
ABS Dynamics Sensor Mounting Nuts	9	6.5	80
ABS Wheel Speed Sensor Head Mounting Screw - Front	12	9	106
ABS Wheel Speed Sensor Head Mounting Screw - Rear	10	7	89
ABS Wheel Speed Sensor Routing Bracket Mounting Screw	18	13	160

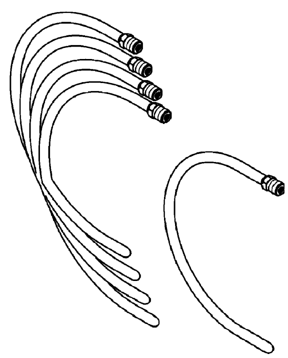
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Flex Hose Banjo Bolt - Front Caliper	24	18	210
Brake Flex Hose Fitting- Rear Caliper	15	11	133
Brake Pedal/Booster Mounting Nuts	23	17	200
Brake Tube Nuts	17	12.5	150
Disc Brake Caliper Adapter Bracket (To Knuckle) - Front	108	80	—
Disc Brake Caliper Adapter Bracket (To Knuckle) - Rear	72	53	—
Disc Brake Caliper Guide Pin Bolts - Front	43	32	—
Disc Brake Caliper Guide Pin Bolts - Rear	43	32	—
Disc Brake Caliper Bleeder Screw	8	6	71
Drum Brake Wheel Cylinder Mounting Screws	13	—	115
Drum Brake Wheel Cylinder Bleeder Screw	10	—	89
Fluid Reservoir Mounting Screw	5.5	4	48
Master Cylinder Mounting Nuts	25	18	221
Parking Brake Lever Mounting Nuts	28	21	250
Proportioning Valves	30	22	—
Wheel Mounting (Lug) Nuts	135	100	—

SPECIAL TOOLS

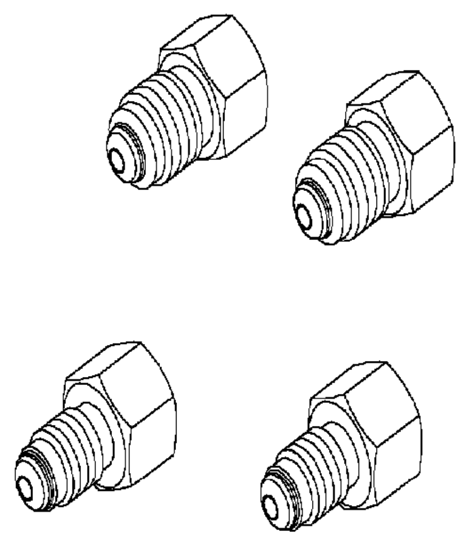
BASE BRAKE SYSTEM



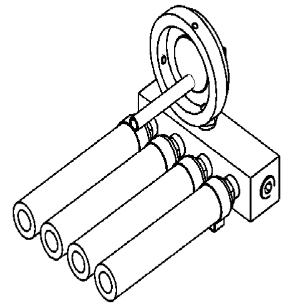
Cap, Master Cylinder 6921



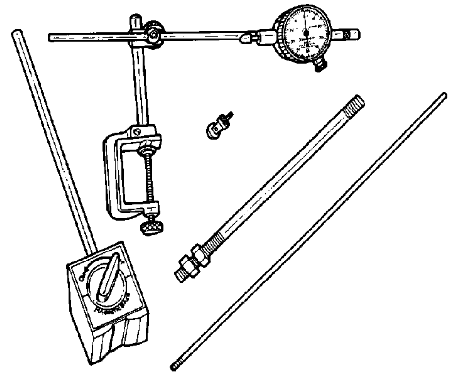
Bleeder Tubes 8358



Adapters, Bleeder Tube 8822



Adapter, Bleeder Tubes 9705

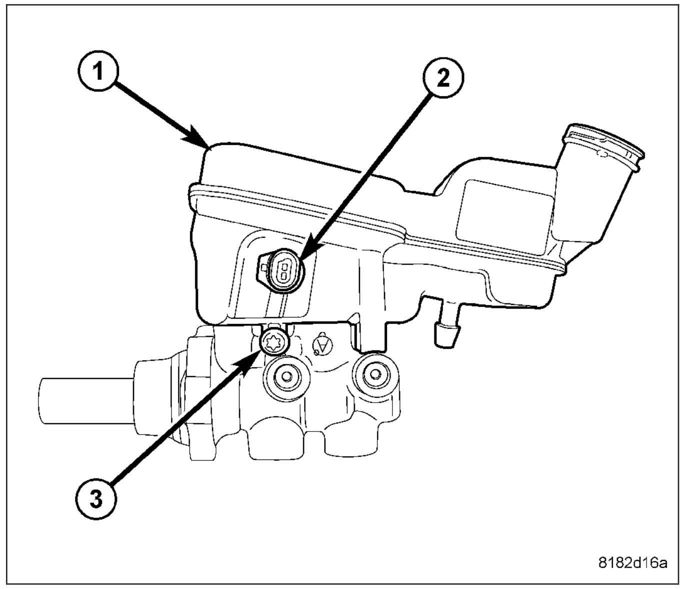


Dial Indicator C-3339A

SWITCH-BRAKE FLUID LEVEL

DESCRIPTION

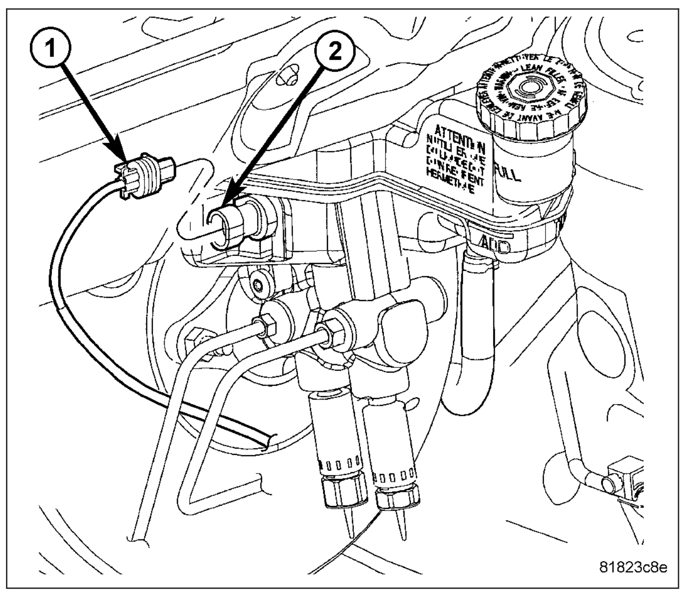
The brake fluid level switch (2) is mounted through the center of the fluid reservoir (1). The switch can be serviced separately from the master cylinder fluid reservoir.



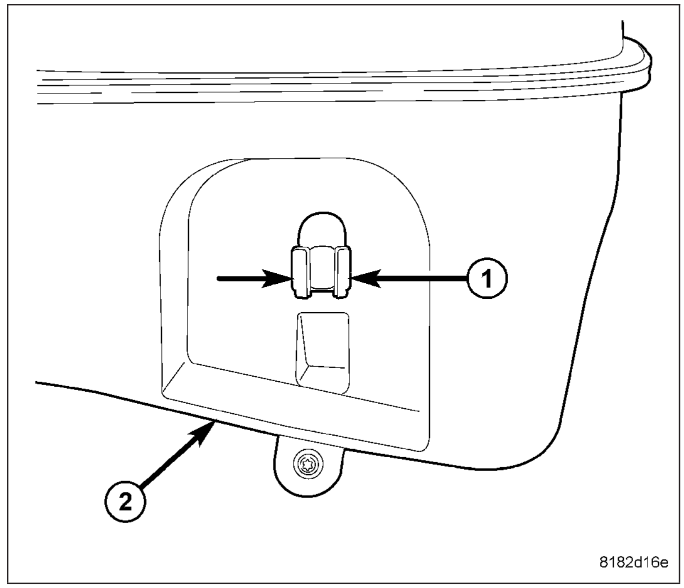
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Remove the wiring harness connector (1) from the brake fluid level switch (2) in the master cylinder brake fluid reservoir.

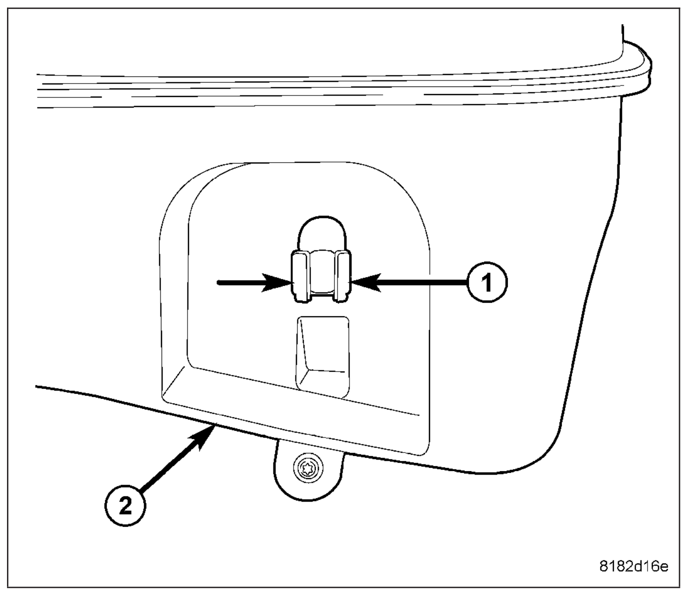


2. Push together the retaining tabs (1) holding the brake fluid level switch in place in the brake fluid reservoir (2).
3. Pull the brake fluid level switch out the right side of the reservoir.

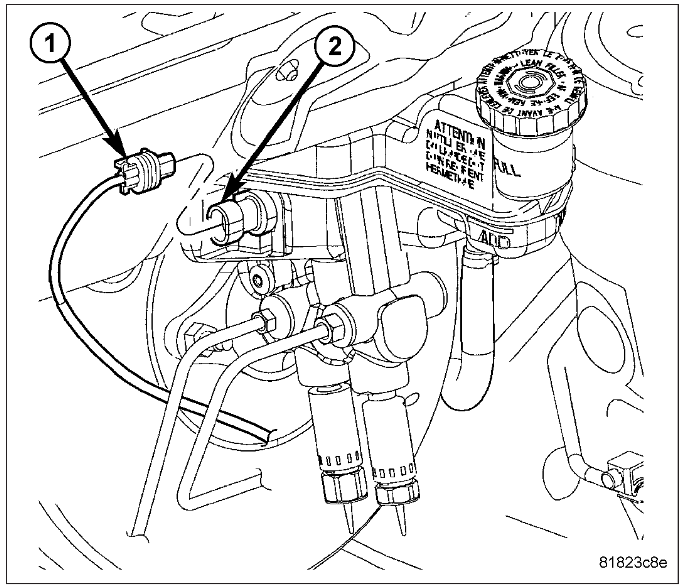


INSTALLATION

1. Align the brake fluid level switch with its mounting hole on the right side of the master cylinder brake fluid reservoir. Push the switch into the fluid reservoir until the switch retaining tabs (1) are expanded on the opposite side of the reservoir (2), locking it in place.



2. Connect the wiring harness connector (1) to the switch (2).



HYDRAULIC/MECHANICAL

DESCRIPTION

DISC BRAKES

There are several brake packages available featuring either a disc/drum combination or a disc/disc combination.

- “15-inch” vented front disc/9-inch rear drum (BRA)
- “15-inch” vented front disc/9-inch rear drum with ABS (BRK)
- “16-inch” vented front disc/9-inch rear drum with ABS (BRJ)
- “16-inch” vented front disc/”14-inch” solid rear disc with ABS (BRF)
- “16-inch” vented front disc/”14-inch” solid rear disc with ESP (BRF)

Only one package is available on Export vehicles, that is a “16-inch” vented front disc/”14-inch” (BR1) solid rear disc with ABS. It is like the BRF brake package, except the front brake linings are different.

“15-INCH” FRONT DISCS

“15-inch” front disc brakes (so called because they are designed to fit inside 15-inch or larger wheels) feature 2.2 inch (57 mm) single-piston floating calipers acting on 10.8 x 1.0 in. (276 x 26 mm) vented disc rotors.

“16-INCH” FRONT DISCS

“16-inch” front disc brakes (so called because they are designed to fit inside 16-inch or larger wheels) feature 2.2 inch (57 mm) single-piston floating calipers acting on 11.5 x 1.0 in. (294 x 26 mm) vented disc rotors.

“14-INCH” REAR DISCS

“14-inch” rear disc brakes feature 1.4 inch (35 mm) single-piston floating calipers acting on 10.3 x 0.39 in. (262 x 10 mm) solid disc rotors.

Each disc brake assembly consists of the following major components:

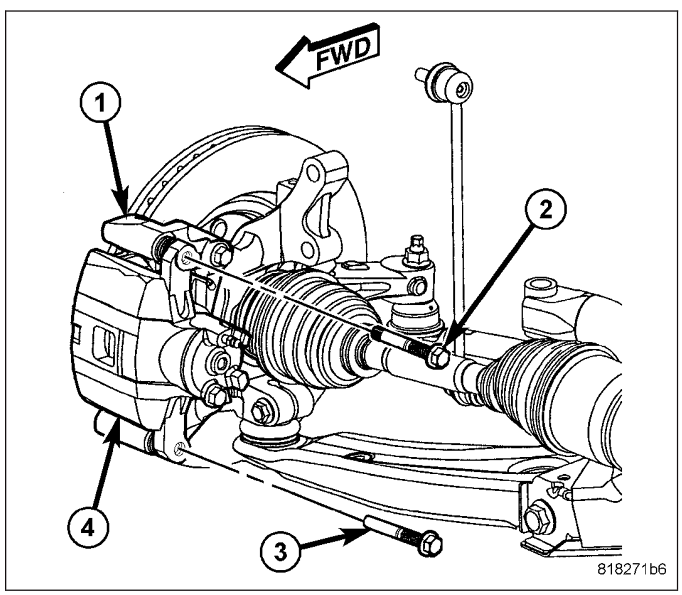
- Caliper
- Caliper adapter bracket
- Pads (Shoe and lining assemblies)
- Rotor

All calipers are the low-drag type. New technology caliper construction allows minimal drag of the pads on the discs with low clearance to the rotors to maintain maximum pedal feel and responsiveness.

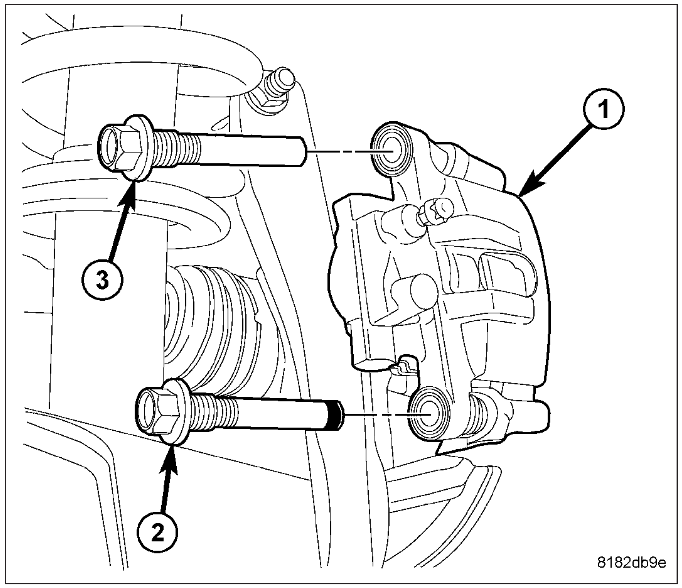
All calipers are coated, giving them a bright appearance. This coating offers corrosion protection and a long-term neat appearance. Steel pistons are used in all calipers.

The main difference between the two front disc brakes packages are rotor size (diameter) and caliper adapter bracket (1) length.

The caliper guide pin bolts are of special interest. There are two different caliper guide pin bolts used at each brake caliper, one of which has a special sleeve at the tip of the guide pin. It is there for anti-rattle and noise suppression issues and must be placed correctly to work properly. At each front brake caliper (4) this bolt (2) is placed at the upper location.



At each rear brake caliper (1) this bolt (2) is placed at the lower location.



Front disc brakes are equipped with an audible wear indicator on the right side inboard brake pad only. The left side pads do not include an audible wear indicator.

Rear disc brakes are equipped with audible wear indicators on both left side and right side inboard brake pads.

When the brake pads are replaced, only brake pads meeting the Original Equipment Manufacturer (OEM) formulation (such as Mopar® replacement parts) should be used.

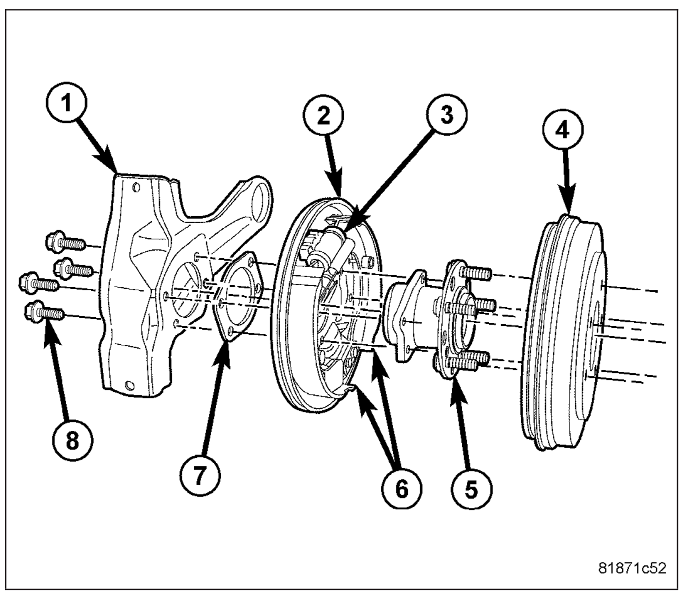
All brake rotors are fully coated with zinc dust, water-soluble, environmentally friendly corrosion preventive. Both the friction surfaces and the vents are coated. During initial brake applications of a new rotor, the brake pads scrub the coating off the friction surfaces, ensuring that the remainder will be rust free. Coating the vents also ensures that there will not be a loss of heat capacity over time.

REAR DRUM BRAKES

All rear drum brake equipped vehicles feature 9 inch (229 mm) rear drum brakes. The drum brakes are all two-shoe (7), internal-expanding type with an automatic adjuster screw.

Each rear drum brake consists of these major components as well as the attaching hardware:

- Adjuster
- Drum (4)
- Shoes (6)
- Support Plate (2)
- Wheel Cylinder (3)



The rear drum brakes also serve as part of the parking brake system. (Refer to 5 - BRAKES/PARKING BRAKE - DESCRIPTION)

DIAGNOSIS AND TESTING

DRUM BRAKE AUTOMATIC ADJUSTER

To properly test the drum brake automatic adjuster, the aide of a helper inside the vehicle to apply the brakes will be necessary.

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
2. Remove the access plug from the rear adjustment slot in each brake support plate.
3. Insert a thin screwdriver in the adjustment slot and push back the adjustment lever. With the lever in this position, back the star wheel adjustment off approximately 10 notches. This will eliminate the possibility that the brake is at full adjustment, and can be adjusted no further.
4. Remove the screwdriver from the adjustment slot.
5. Watch the star wheel through the adjustment slot, while a helper applies the brake pedal. As the brake shoes apply, the adjustment lever should move downward, turning the star wheel. A definite rotation of the adjuster star wheel can be observed if the automatic adjuster is working properly.

If the star wheel does not move as indicated, the brake drum needs to be removed and further inspection of the rear brakes is necessary.

6. If the star wheel is operating properly, readjust the brakes. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS).
7. Reinstall the adjustment slot access plug.
8. Lower the vehicle.

PADS-FRONT BRAKE

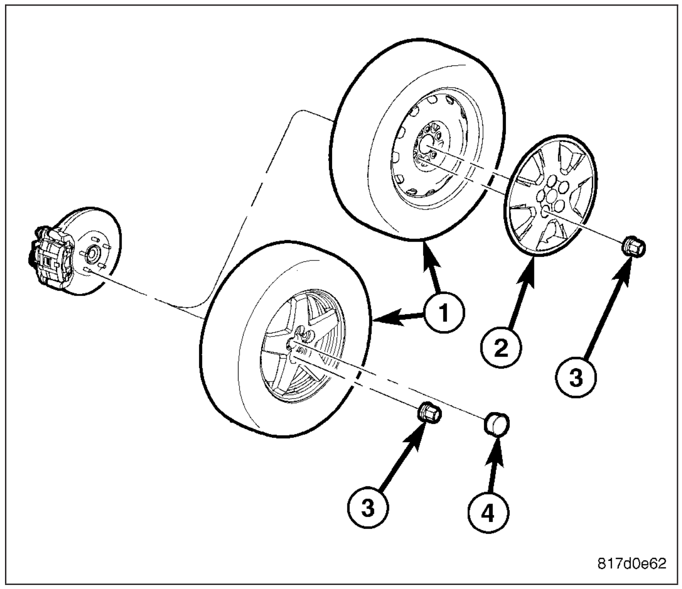
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

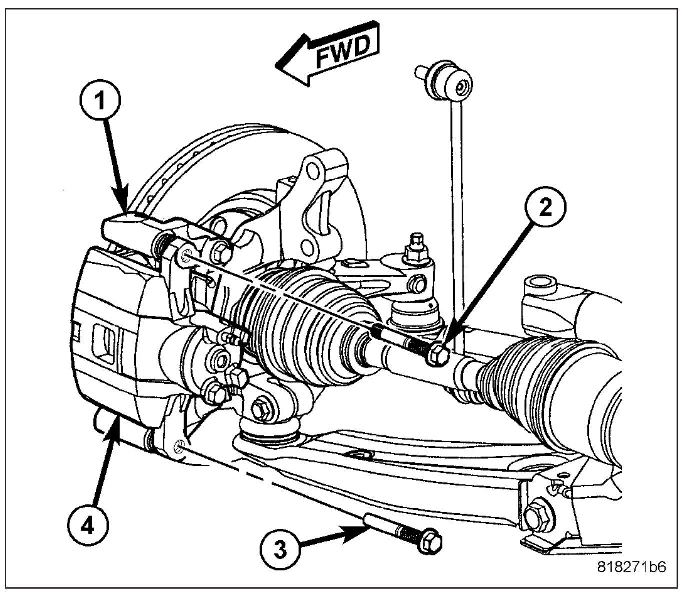
NOTE: Perform Step 2 through Step 5 on each side of the vehicle to complete pad set removal.

2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).

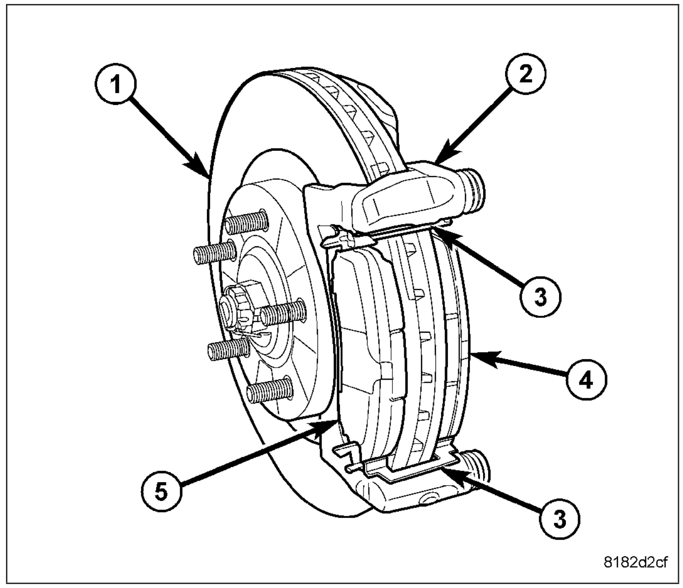


CAUTION: When removing the caliper guide pin bolts (2, 3) note that one (upper) has a special sleeve on the end. It important that his bolt be installed in the upper mounting hole when the caliper is installed.

3. Remove the two brake caliper guide pin bolts (2, 3).
4. Remove the disc brake caliper (4) from the disc brake adapter bracket (1) and hang it out of the way using wire or a bungee cord. Use care not to overextend the brake hose when doing this.



5. Remove the brake pads (4, 5) from the caliper adapter bracket (2).



CLEANING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

INSPECTION

Visually inspect brake pads for uneven lining wear. Also inspect for excessive lining deterioration. Check the clearance between the tips of the wear indicators (if equipped) on the pads and the brake rotors.

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the disc brake pads from the vehicle.

Measure brake pad minimum thickness. Brake pads must be replaced when usable material on a brake pad lining measured at its thinnest point measures one millimeter (0.04 inches) or less.

NOTE: It is important to inspect both front and rear brake pads during the same inspection. Typically, front and rear brake pads wear out at the same time.

Replace **both** disc brake pads (inboard and outboard) at each caliper. It is also necessary to replace the pads on the opposite side of the vehicle as well as the pads failing inspection to maintain proper braking characteristics.

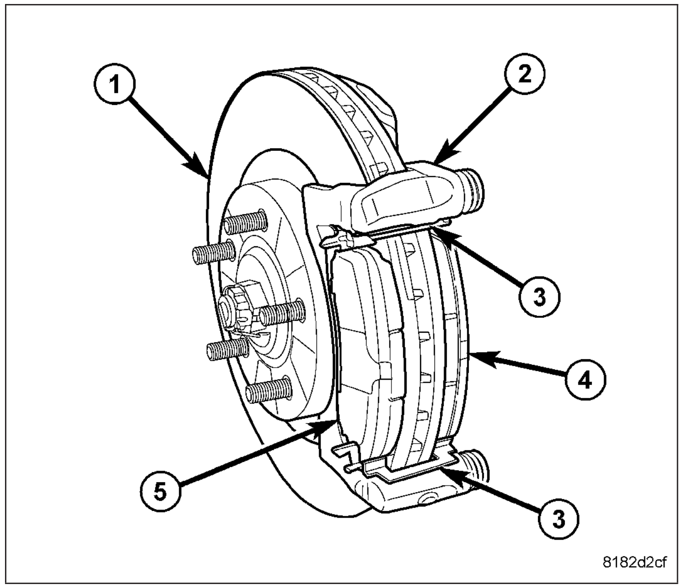
If the brake pad assemblies do not require replacement, be sure to reinstall the brake pads in the original position they were removed from.

INSTALLATION

NOTE: Perform Step 1 through Step 5 on each side of the vehicle to complete pad set installation, then proceed to Step 6.

NOTE: Make sure that the audible wear indicators (if equipped) are placed toward the top when the inboard brake pads are installed on each side of the vehicle.

1. Place the brake pads (4, 5) in the abutment shims (3) clipped into the disc brake caliper adapter bracket (2) as shown. Place the pad with the wear indicator attached on the inboard side (2).
2. Completely retract the caliper piston back into the bore of the caliper.

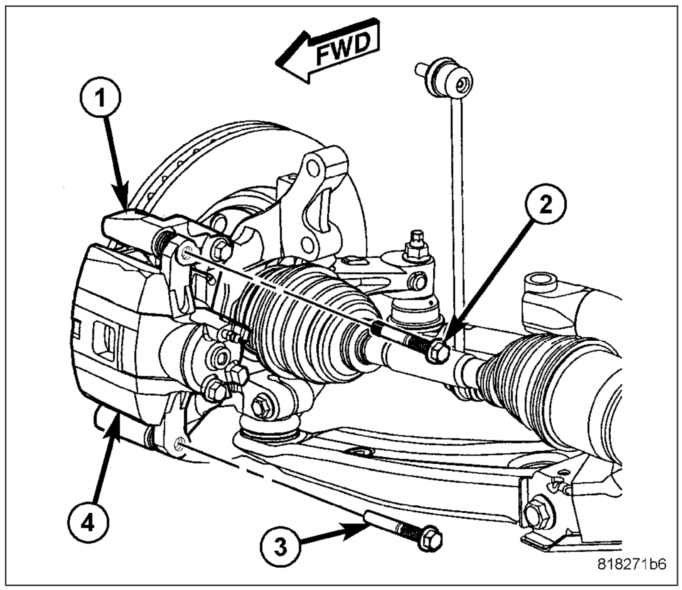


CAUTION: Use care when installing the caliper (4) onto the adapter bracket (1) to avoid damaging the boots.

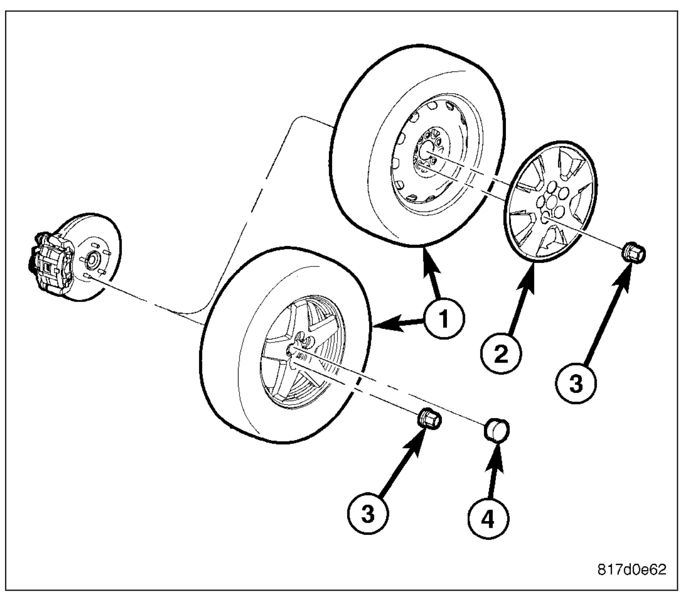
3. Install the disc brake caliper over the brake pads on the brake caliper adapter bracket.

CAUTION: When installing the caliper guide pin bolts (2, 3) make sure that the one that has a special sleeve on the end is installed in the upper mounting hole.

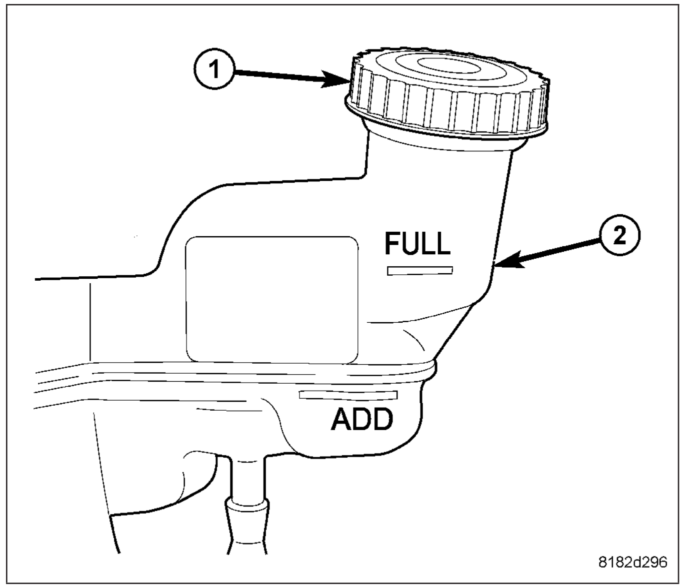
4. Align the caliper guide pin bolt holes with the adapter bracket. Install the upper (with special sleeve) (2) and lower (3) caliper guide pin bolts. Tighten the guide pin bolts to 43 N·m (32 ft. lbs.).



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.



7. Pump the brake pedal several times before moving the vehicle to set the pads to the brake rotor.
8. Check and adjust the brake fluid level in the reservoir (2) as necessary.
9. Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.



PADS-REAR BRAKE

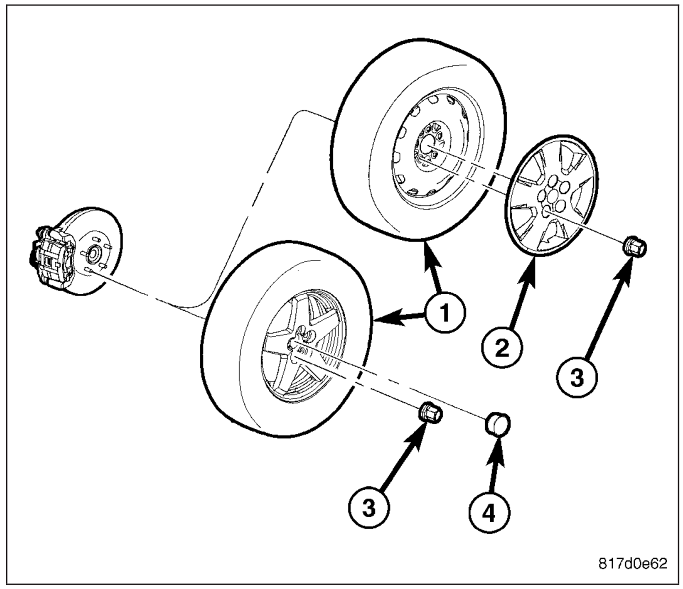
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

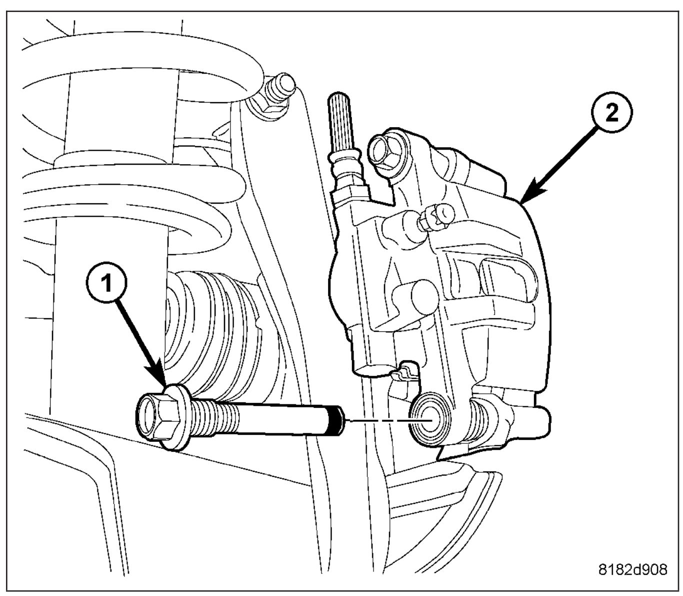
NOTE: Perform Step 2 through Step 6 on each side of the vehicle to complete pad set removal.

2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



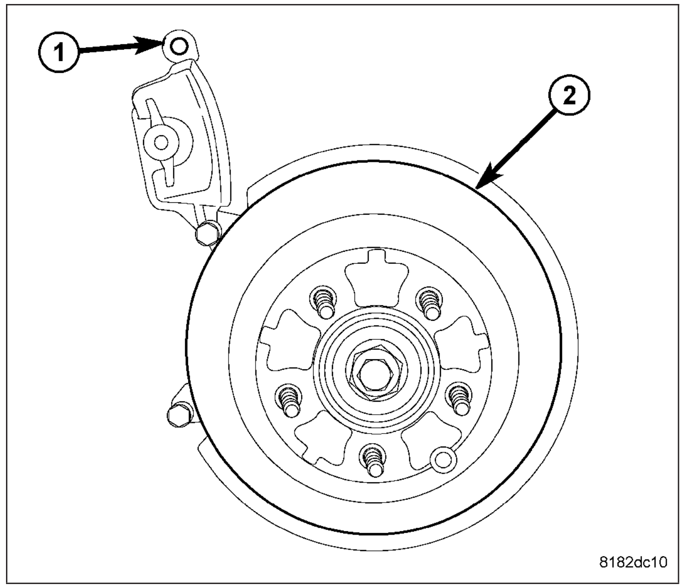
NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the pads and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the rear of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

3. Remove the disc brake caliper (2) lower guide pin bolt (1).

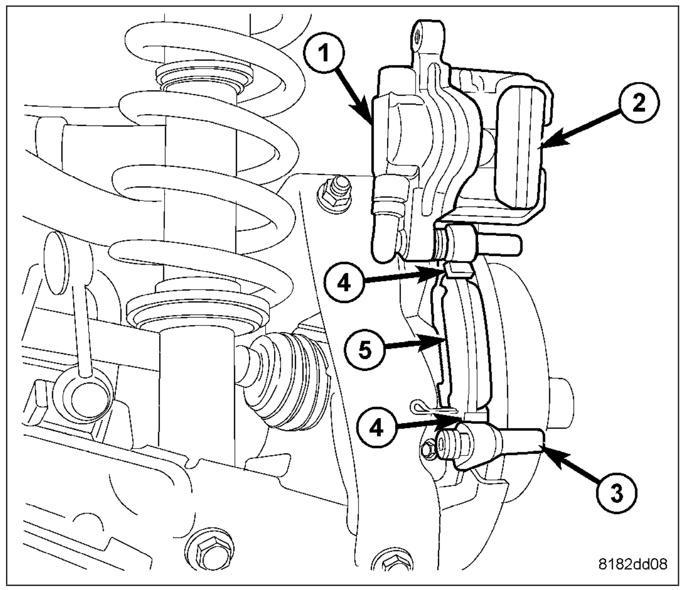


CAUTION: When moving rear brake caliper upward, use extreme care not to damage or over-extend the flex hose. Damage may occur.

4. Rotate the caliper (1) upward hinging off the upper guide pin bolt. Rotate the caliper upward just enough to allow brake pad removal. Hang the caliper assembly in this position using wire or a bungee cord.



5. Remove the inboard brake pad (5) from the caliper adapter bracket (3).
6. Remove the outboard brake pad (2) from the caliper (1) by prying the brake pad retaining clip over the raised area on the caliper. Slide the brake pad off of the brake caliper.



CLEANING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

INSPECTION

Visually inspect brake pads for uneven lining wear. Also inspect for excessive lining deterioration. Check the clearance between the tips of the wear indicators (if equipped) on the pads and the brake rotors.

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the disc brake pads from the vehicle.

Measure brake pad minimum thickness. Brake pads must be replaced when usable material on a brake pad lining measured at its thinnest point measures one millimeter (0.04 inches) or less.

NOTE: It is important to inspect both front and rear brake pads during the same inspection. Typically, front and rear brake pads wear out at the same time.

Replace **both** disc brake pads (inboard and outboard) at each caliper. It is also necessary to replace the pads on the opposite side of the vehicle as well as the pads failing inspection to maintain proper braking characteristics.

If the brake pad assemblies do not require replacement, be sure to reinstall the brake pads in the original position they were removed from.

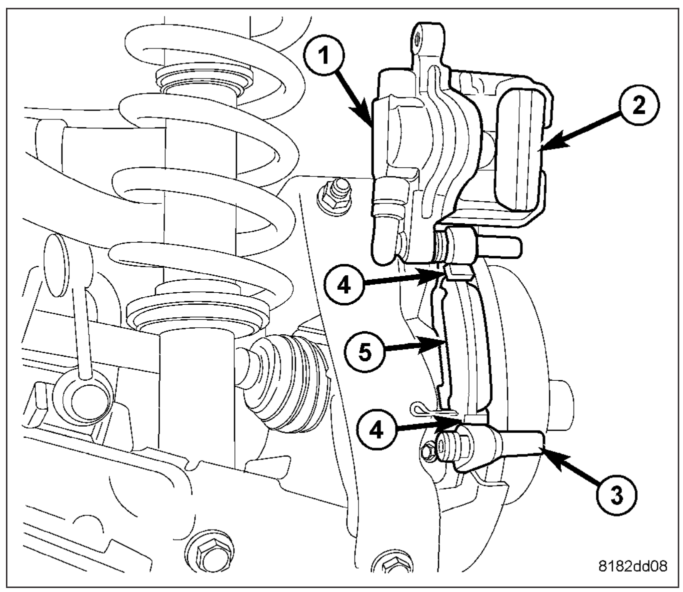
INSTALLATION

NOTE: Perform Step 1 through Step 6 on each side of the vehicle to complete pad set installation, then proceed to Step 7.

1. Completely retract the caliper piston back into the piston bore of the caliper. This is required to gain the necessary pad-to-rotor clearance for the caliper installation onto the steering knuckle.

NOTE: Place the brake pad with the audible wear indicator attached on the inboard side. The audible wear indicator should be positioned at the bottom when installed.

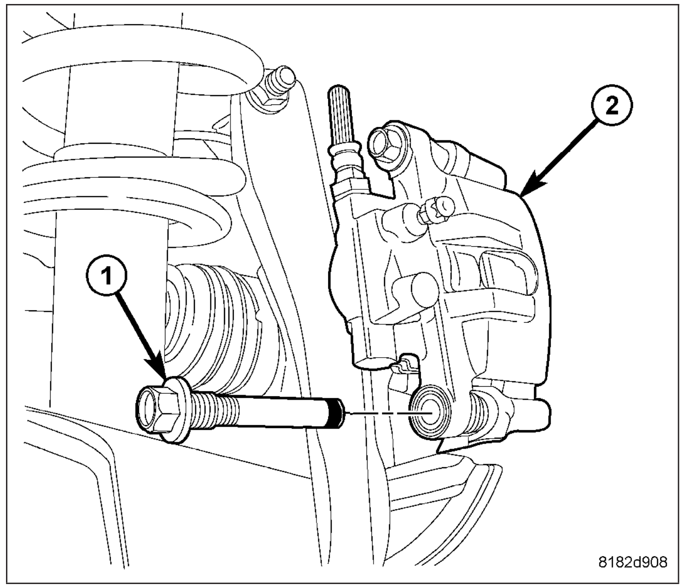
2. Slide the outboard brake pad (2) onto the caliper (1). Be sure the retaining clip is squarely seated in the depressed areas on the caliper beyond the raised retaining bead.
3. Place the inboard brake pad (5) in the abutment shims (4) clipped into the disc brake caliper adapter bracket (3) as shown (see preceding note).



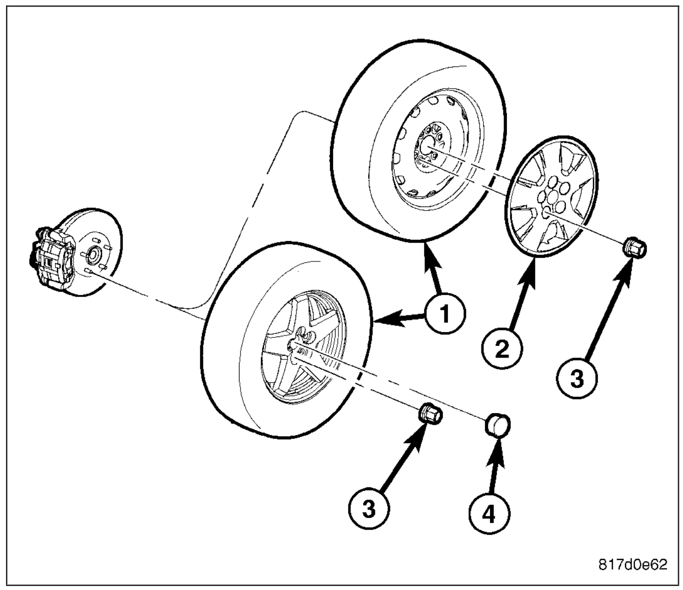
CAUTION: Use care when installing the caliper onto the adapter bracket to avoid damaging the guide pin boot.

NOTE: The lubricant used on the guide pin portion of the guide pin bolt is Niglube RM. Use the appropriate lubricant when necessary.

4. Rotate the disc brake caliper downward over the brake rotor and lower part of caliper adapter.
5. Install the disc brake caliper (2) lower guide pin bolt (1). Tighten the guide pin bolt to 43 N·m (32 ft. lbs.).



6. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
7. Lower the vehicle.
8. Pump the brake pedal several times to ensure the vehicle has a firm brake pedal before moving the vehicle.
9. Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.



SHOE AND LININGS-REAR DRUM BRAKE

REMOVAL

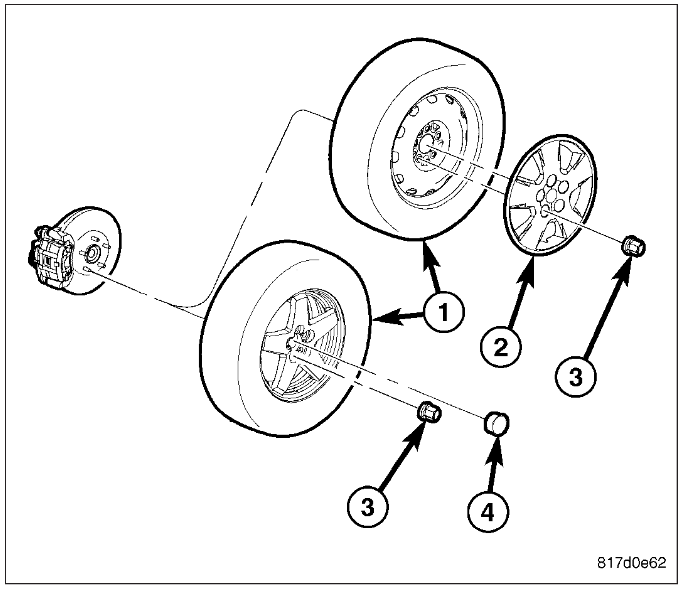
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

NOTE: Make sure parking brake is in "released" position before raising vehicle.

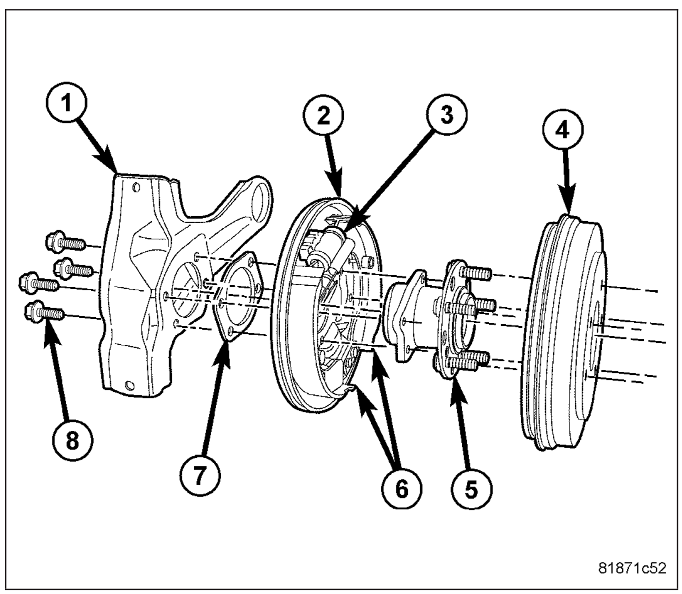
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

NOTE: Perform Step 2 through Step 16 on each side of the vehicle to complete shoe set removal. It may be easier to install the new components on the first side of the vehicle before disassembling the opposite side so it may be used as a reference guide for proper installation.

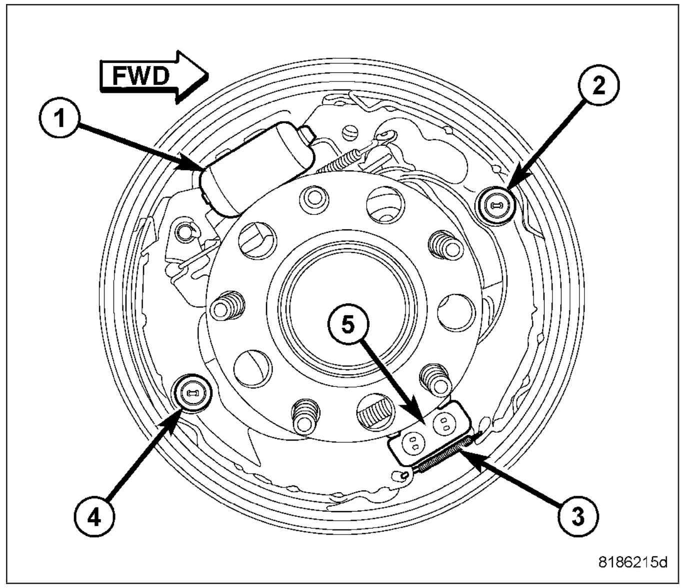
2. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly.



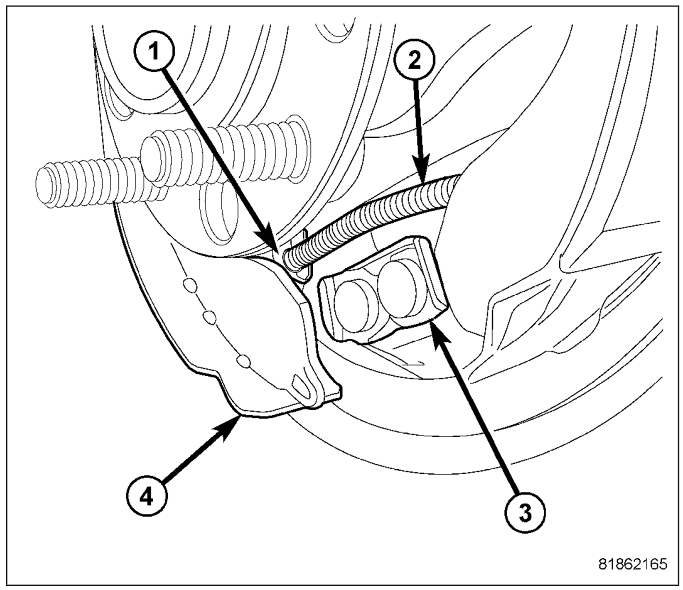
3. Remove the brake drum (4). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - REMOVAL)



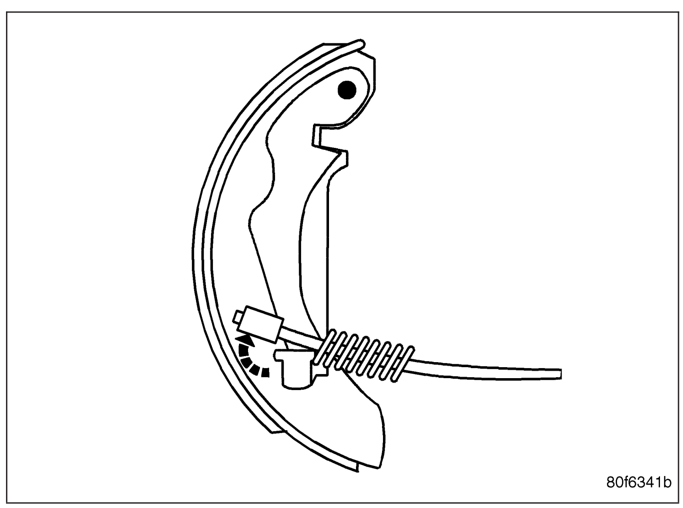
4. Remove the lower shoe spring (3).
5. Compress and remove the hold-down spring (4) retaining the rear shoe to the support plate.



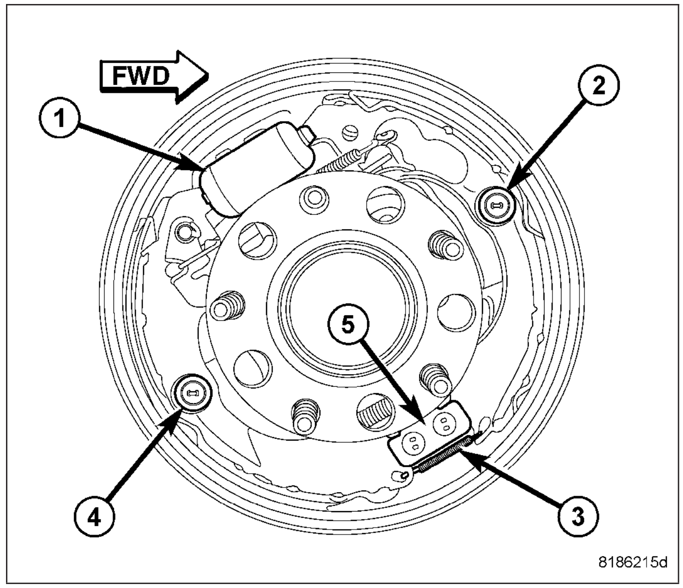
6. Pull the rear shoe (4) away from the anchor (3) allowing better access to the parking brake cable (2) connection at the lever (1).



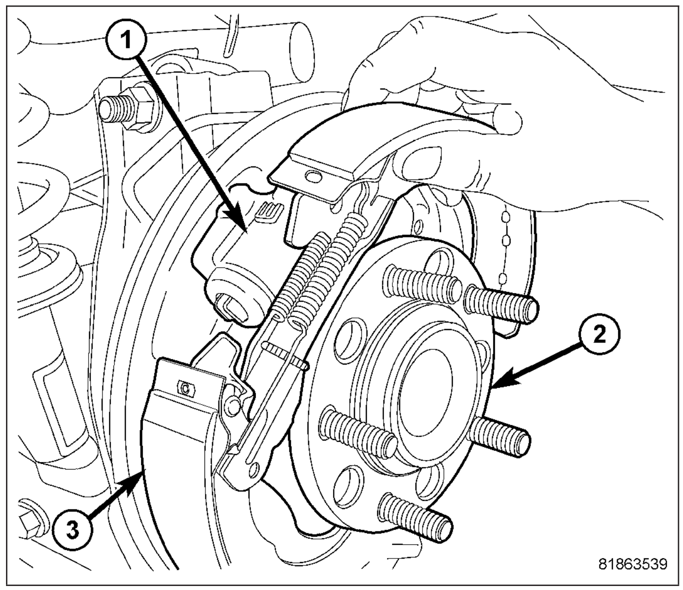
7. Compress the cable return spring, then remove the parking brake cable from the parking brake lever.



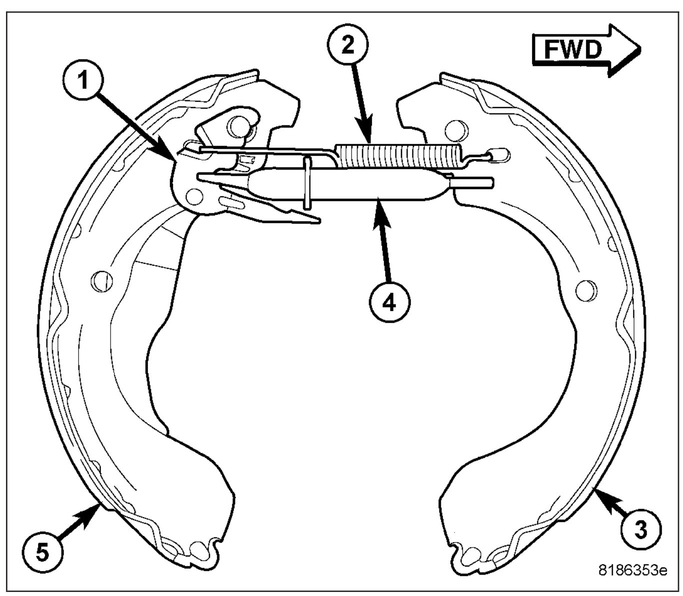
8. Compress and remove the hold-down spring (2) retaining the front shoe to the support plate.



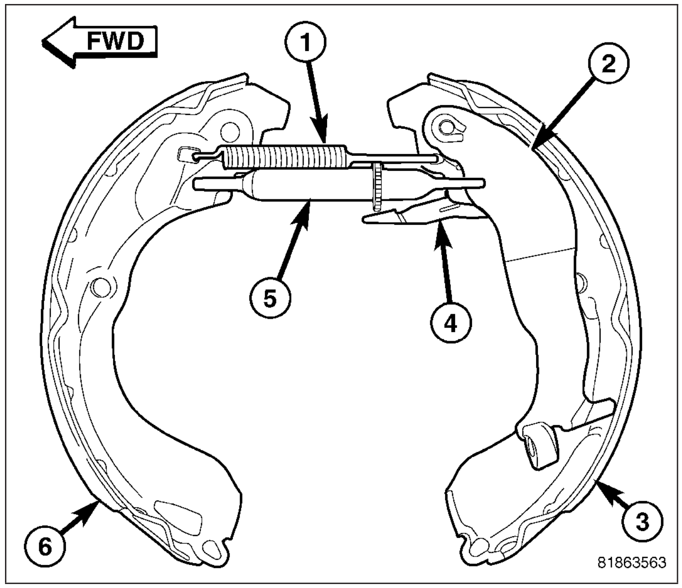
9. Remove both brake shoes from the wheel cylinder.
10. Remove both shoes and remaining parts as an assembly (3) through the opening between the wheel cylinder (1) and support plate hub and bearing.



11. Place the shoe assembly outboard-side-up on a flat surface.
12. Remove the adjuster spring (2) from the leading shoe (3) and the lever pawl (1).
13. Remove the lever pawl (1) from the pivot on the rear shoe (5).



14. Flip the shoe assembly over to show the inboard side.
15. Remove the upper shoe return spring (1).
16. Remove the adjuster (5) from the shoes and parking brake lever (2).



CLEANING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

INSPECTION

Inspect the shoe linings. Rear brake shoe linings should show contact across the entire width of the lining and also from the heel to the toe of the lining. Replace the shoes if noted otherwise. Brake shoes with lack of contact at the toe or heel of the brake shoe lining may be improperly ground.

Clean and inspect the brake support plate and shoe adjuster screw. Apply a thin coat of Mopar® Multi-Purpose Grease or equivalent to the threads of the self-adjuster. Replace the adjuster screw if it is corroded.

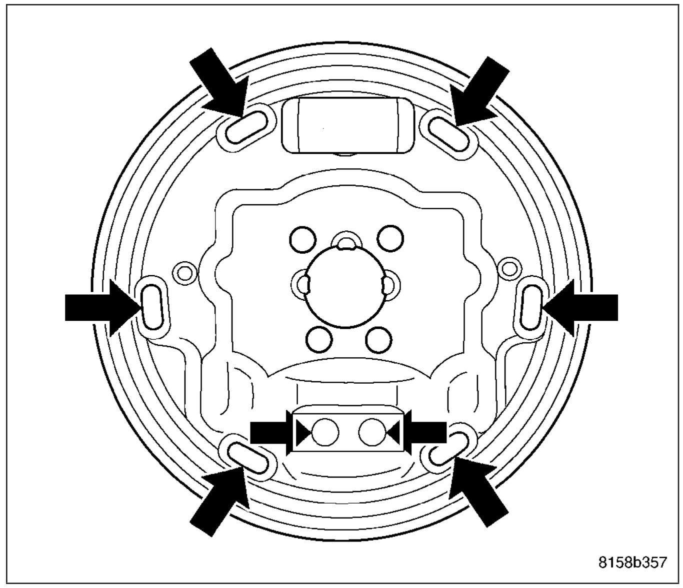
NOTE: Adjuster screws are different side-to-side. Left side adjuster screws have left-hand threads and right side adjuster screws have right-hand threads.

Inspect the return springs and hold-down spring clips. If the existing brake shoe return springs or hold-down spring clips have been overheated or damaged, replace them. Overheating indications are paint discoloration or distorted end coils.

INSTALLATION

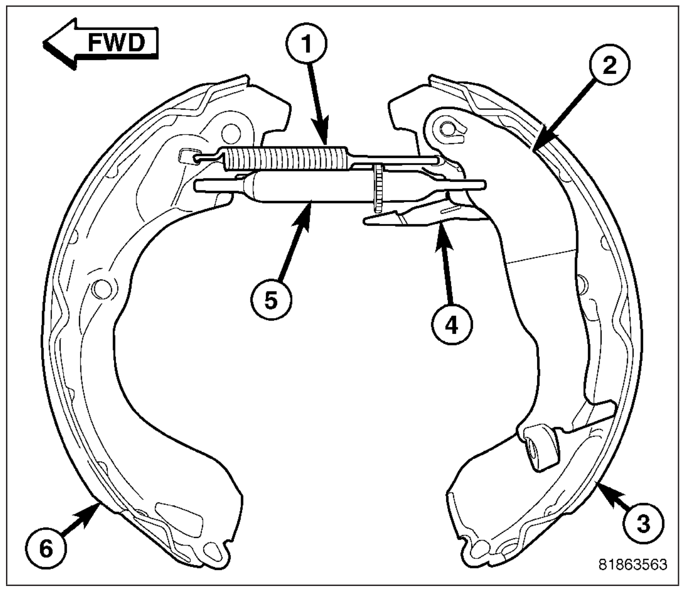
NOTE: Perform Step 1 through Step 21 on each side of vehicle to complete shoe set installation, then proceed to Step 22.

1. Lubricate shoe contact areas on support plate and anchor using Mopar® Brake Lubricant or equivalent.
2. Lubricate the adjuster screw threads with Mopar® Brake Lubricant or equivalent. Turn adjuster wheel in until it is completely seated.

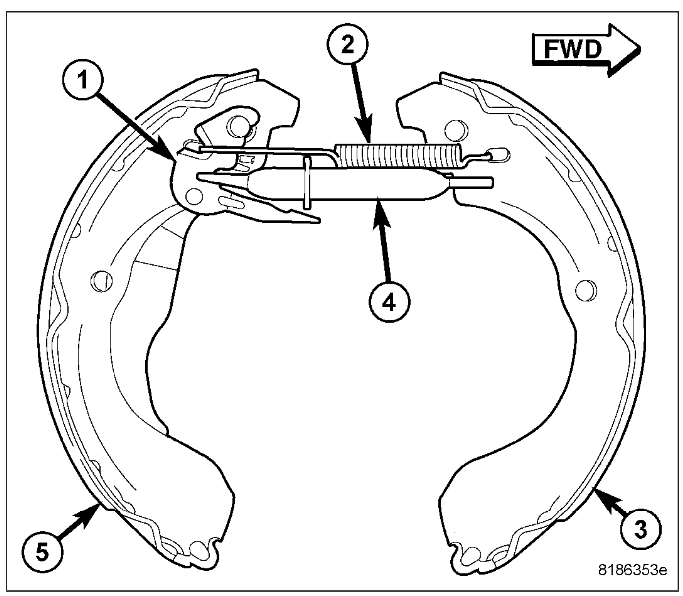


NOTE: Right side drum brake shown. Left side is typical.

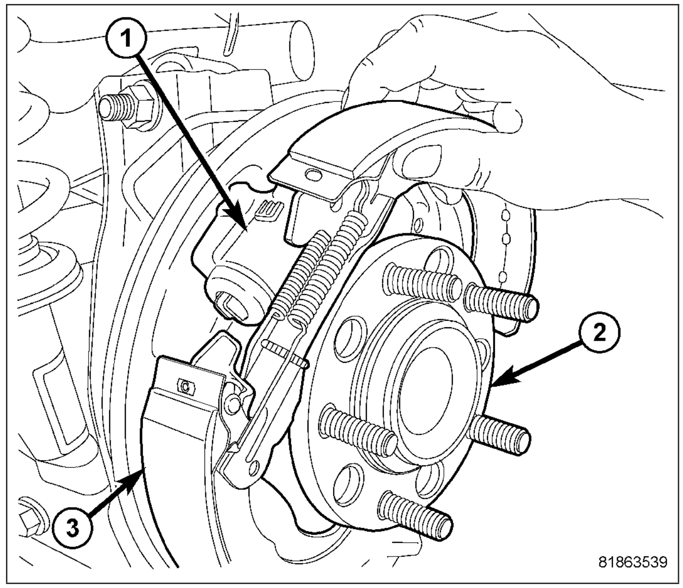
3. Place one front shoe (6) and one rear shoe (3) inboard-side-up on a flat surface. (rear shoe has parking brake lever attached to it).
4. Install the adjuster (5), adjuster wheel toward the rear, between the two brake shoes. Make sure the wide notch in the rear fork aligns with the parking brake lever (2).
5. Install the upper return spring (1) as shown.



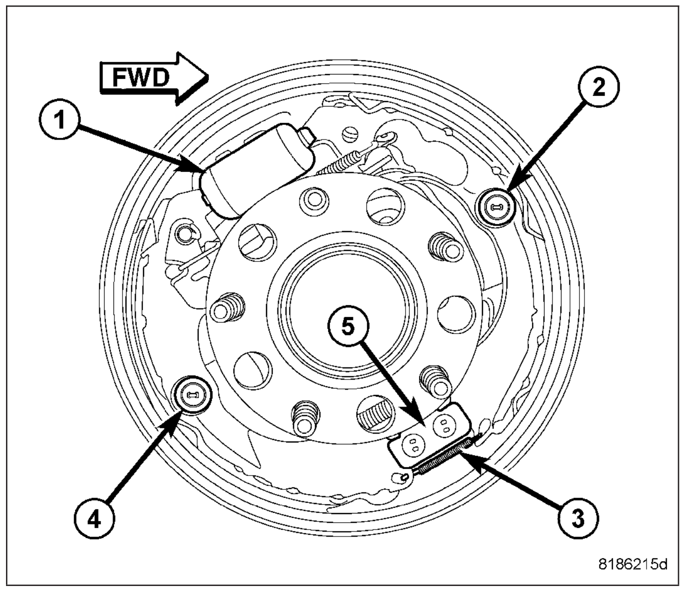
6. Flip the shoe assembly over to show the outboard side.
7. Install the lever pawl (1) onto the pivot located on the rear shoe (5).
8. Install the adjuster spring (2) between the front shoe (3) and the lever pawl (1).



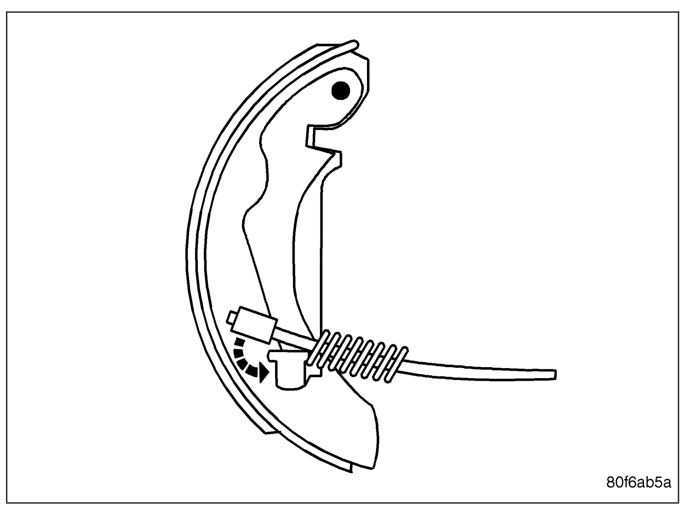
9. Install the pre-assembled brake shoe assembly (3) through the opening between the wheel cylinder (1) and support plate hub and bearing.



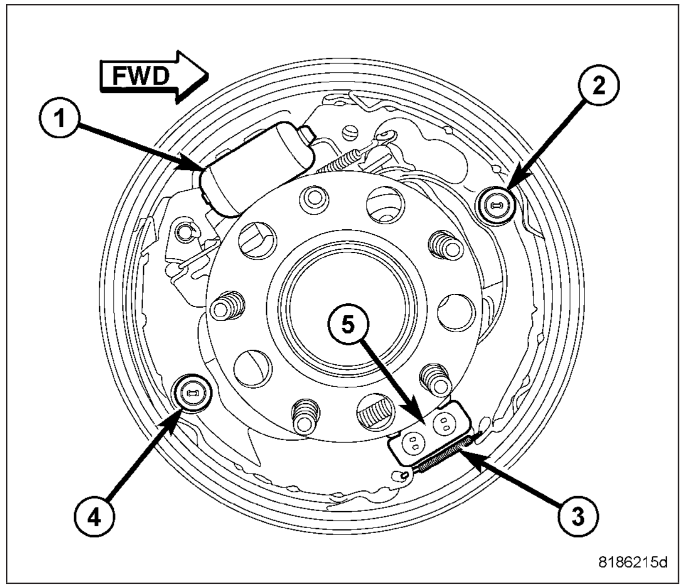
10. Insert the upper tips of the brake shoes into the grooves of the wheel cylinder (1) pistons.
11. Position the bottom of the front shoe against the anchor pin (5).
12. Install a shoe hold-down pin from the rear, through the support plate and the front shoe.
13. Compress and install the hold-down spring (2) retaining the front shoe to the support plate.



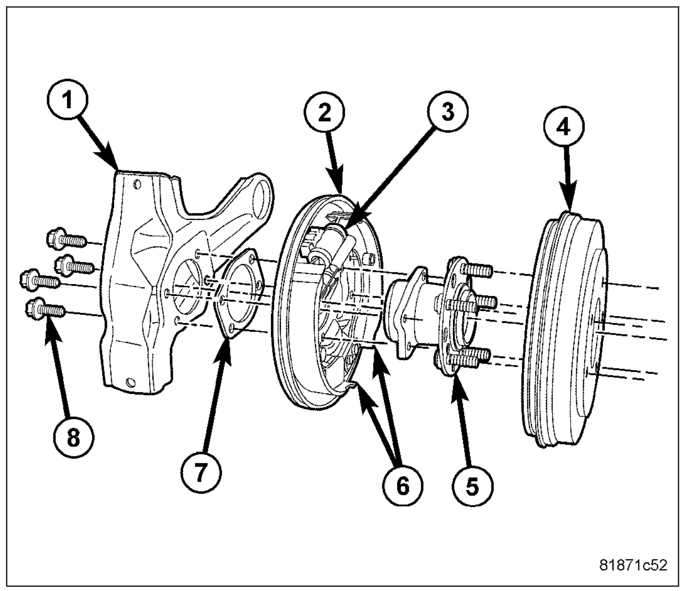
14. Compress the parking brake cable return spring, then carefully install the cable onto the parking brake lever. Release the spring guiding it beneath the retaining tab on the lever.



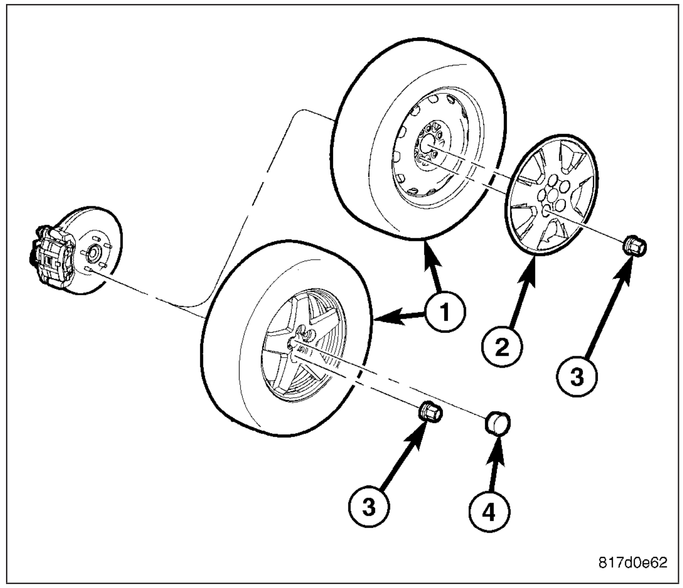
15. Position the bottom of the rear shoe against the anchor pin (5).
16. Install a shoe hold-down pin from the rear, through the support plate and the rear shoe.
17. Compress and install the hold-down spring (4) retaining the rear shoe to the support plate.
18. Install the lower shoe spring (3).



19. Adjust the brake shoes to the drum diameter using a brake shoe gauge. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS)
20. Install the brake drum (4). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - INSTALLATION)



21. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
22. Slowly rotate both rear wheels and verify that the brake drums **lightly** drag on the shoes. Further adjustments may be done using the adjustment procedure as necessary. (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/BRAKE PADS/ SHOES - ADJUSTMENTS)
23. Lower the vehicle.
24. Road test vehicle stopping in both forward and reverse directions. The automatic-adjuster will continue to adjust brakes as necessary during road test.



ADJUSTMENTS

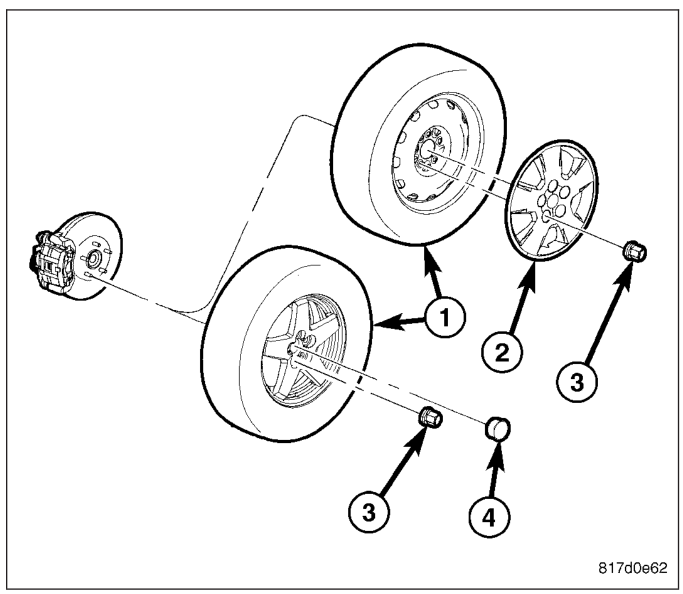
DRUM BRAKE SHOE ADJUSTMENT

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

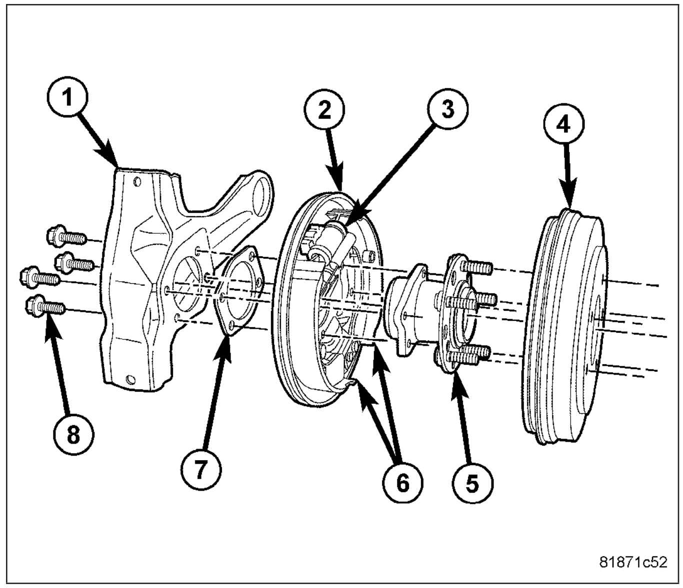
1. Verify the parking brake lever is in the fully released position.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

NOTE: Perform the following steps on each rear drum brake assembly as necessary.

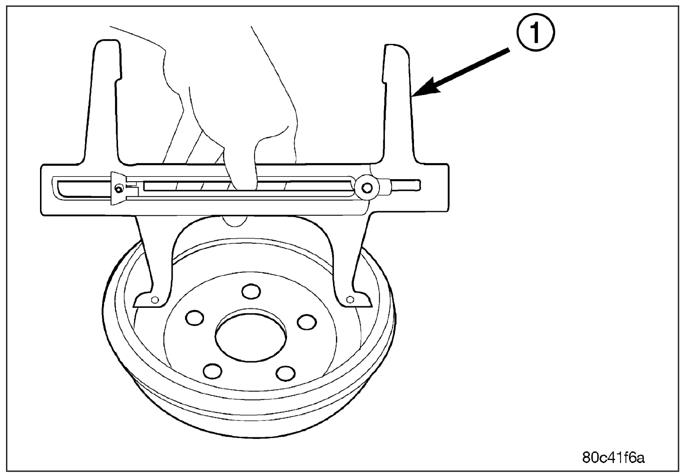
3. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly.



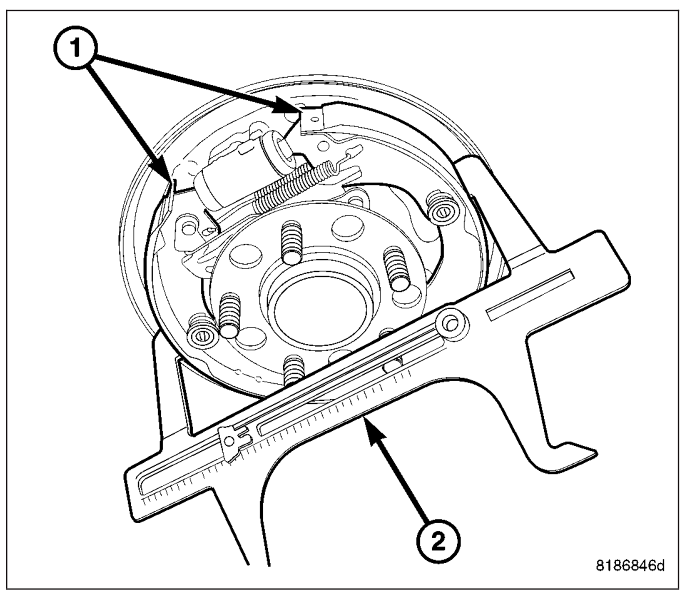
4. Remove the brake drum (4). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - REMOVAL)



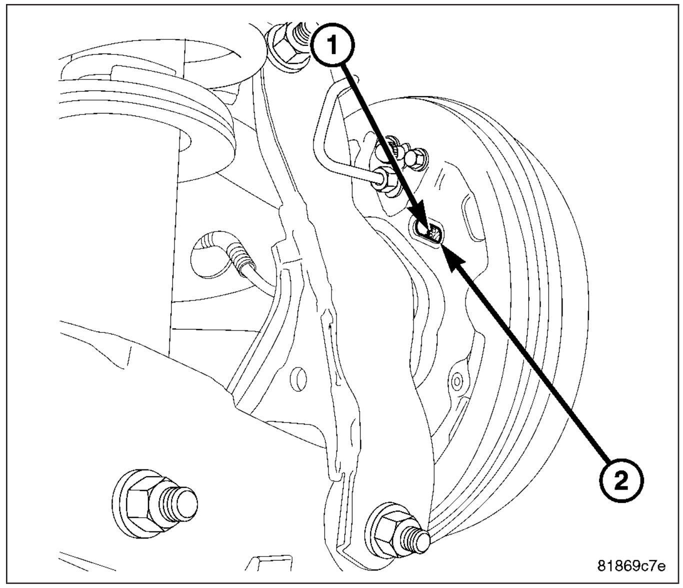
5. Using a Brake Shoe Gauge (1), Special Tool C-3919 or equivalent, measure the inside diameter of the brake drum at the center of the shoe contact area. Tighten the Gauge setscrew at this measurement.



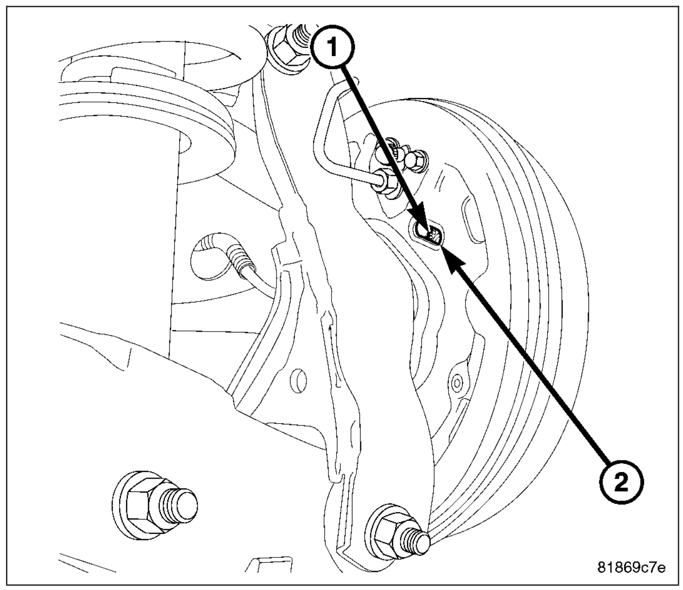
6. Place the opposite side of the brake shoe gauge (2) over the brake shoes (1) as shown.



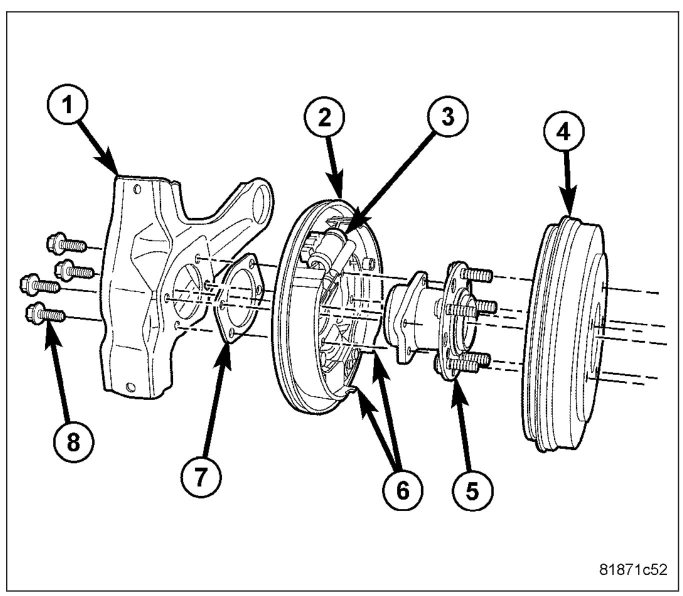
7. Adjust the shoe diameter to the setting on the gauge. To adjust the shoe diameter, turn the adjuster wheel using a screwdriver inserted through the adjusting hole in the rear of the shoe support plate. Once the tip of the screwdriver contacts the adjuster wheel teeth, move the handle of tool upward using the support plate as a pivot to adjust the shoes outward.



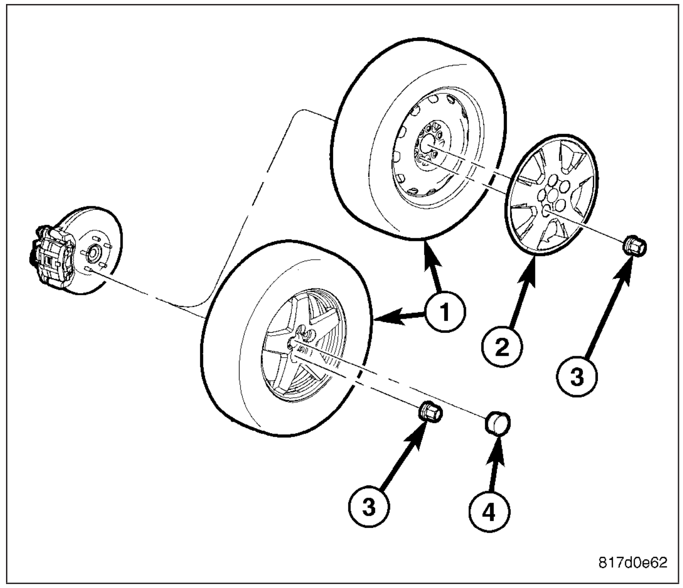
8. If at any time the adjustment needs to be backed off, perform the following:
   a. Remove the plug from the rear of the support plate below the wheel cylinder.
   b. Insert a small screwdriver through the access hole (2) in the support plate, under the adjuster, against the lever pawl. The pawl is attached to and pivots from the rear brake shoe.
   c. While pushing on the pawl with the screwdriver to disengage it from the adjuster wheel teeth, rotate the wheel (1) upward to back off the adjustment using another screwdriver or a brake adjuster tool.



9. Once the shoe diameter is set, remove the tool and install the brake drum (4). (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/DRUM - INSTALLATION)
10. Turn the brake drum. A **slight** drag should be felt while rotating the drum. If not, repeat the above procedure.



11. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
12. After adjusting both rear drum brakes as necessary, lower the vehicle.



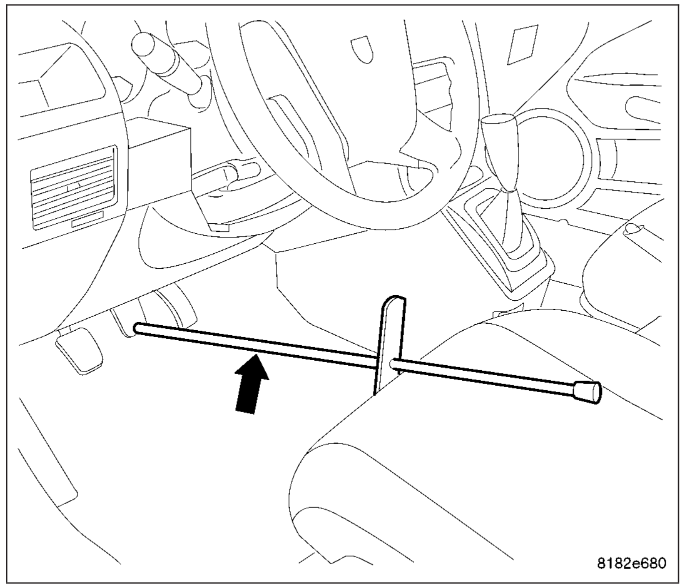
13. Apply and release the parking brake lever one time after the adjustment process is completed checking parking brake operation.
14. Road test the vehicle stopping in both forward and reverse directions. The automatic-adjuster will continue to adjust the brakes as necessary during the road test.

CALIPER-FRONT DISC BRAKE

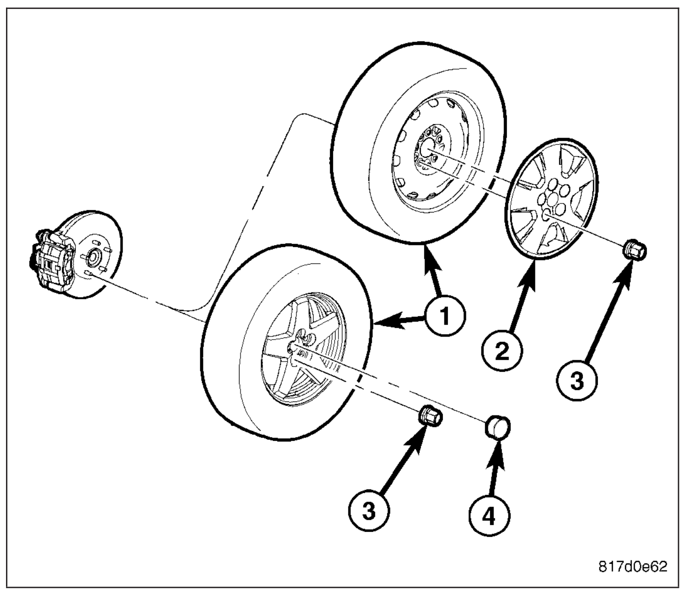
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

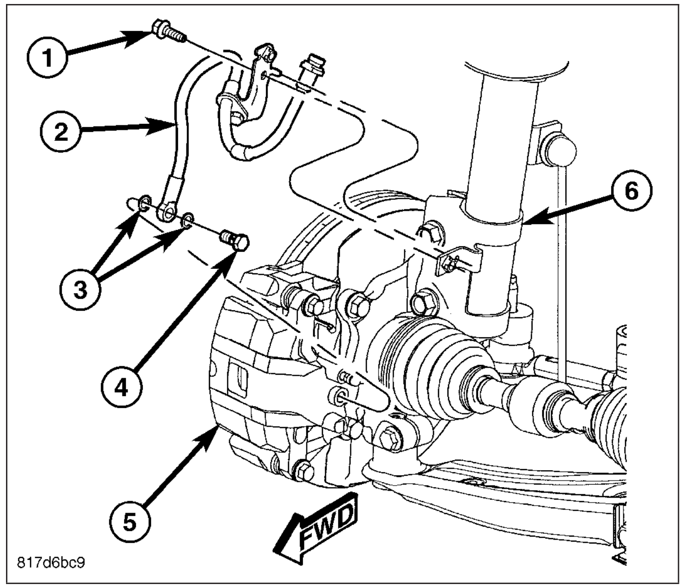
1. Using a brake pedal holding tool as shown, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir when the lines are opened.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



3. Remove the wheel mounting nuts (3), then the tire and wheel assembly.

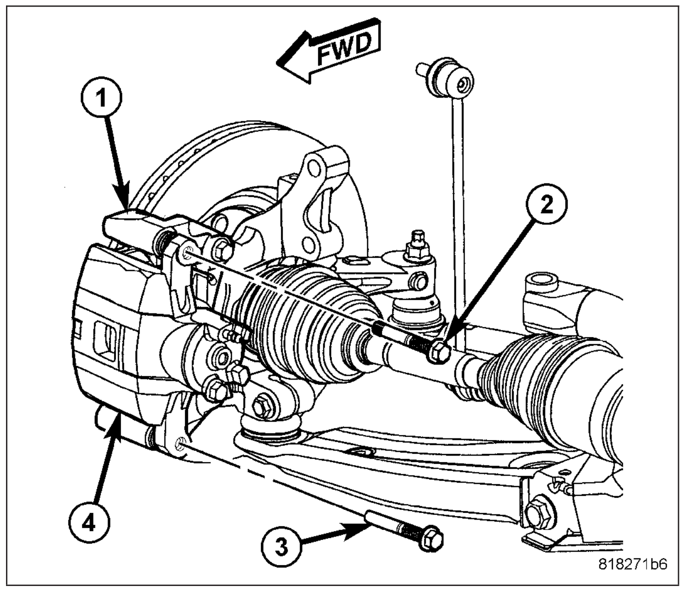


4. Remove the banjo bolt (4) connecting the brake flex hose (2) to the brake caliper (5). There are two washers (3) that will come off with the banjo bolt. Discard the washers.



CAUTION: When removing the caliper guide pin bolts (2, 3) note that one (upper) has a special sleeve on the end. It important that his bolt be installed in the upper mounting hole when the caliper is installed.

5. Remove the two brake caliper guide pin bolts (2, 3).
6. Slide the disc brake caliper (4) from the disc brake adapter bracket (1) and brake pads and remove.



DISASSEMBLY

NOTE: Before disassembling the brake caliper, remove it from the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - REMOVAL)

NOTE: Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

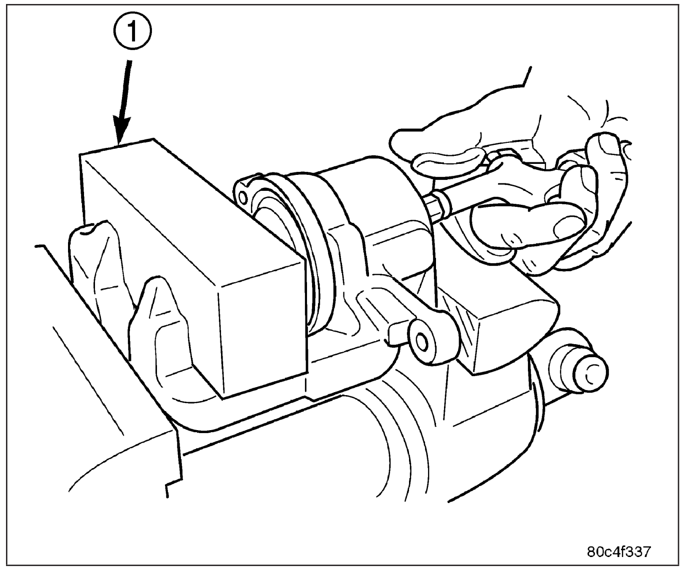
WARNING: Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such a practice.

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

1. Mount the caliper in a vise equipped with protective jaws.

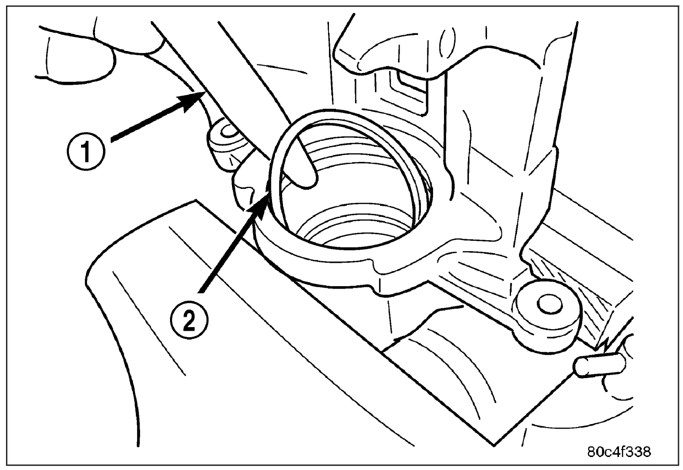
WARNING: Do not place face or hands near caliper and piston if using compressed air pressure to remove piston. Do not use high pressure.

2. Place a wooden block (1) in the caliper as shown.
3. If necessary, apply low pressure compressed air to the caliper fluid inlet in short spurts to force the piston out.
4. Remove the piston from the caliper.
5. Remove the dust boot from the piston and discard it.



CAUTION: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

6. Using a soft tool such as a plastic trim stick (1), work the piston seal (2) out of its groove in caliper piston bore. Discard the used seal.
7. Clean the piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.
8. Inspect both the piston and bore for scoring or pitting. Bores that show light scratches or corrosion can usually be cleared of the light scratches or corrosion using crocus cloth.



CLEANING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

INSPECTION

Inspect the disc brake caliper for the following:

- Brake fluid leaks in and around piston boot area
- Ruptures, brittleness or damage to the piston dust boot

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots.

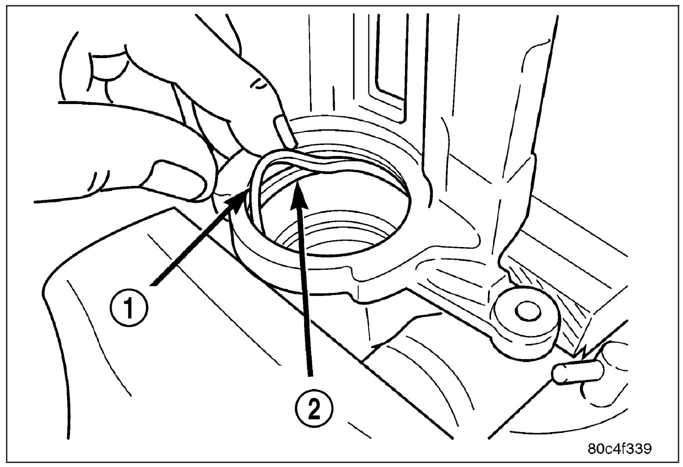
ASSEMBLY

NOTE: Always have clean hands when assembling a brake caliper.

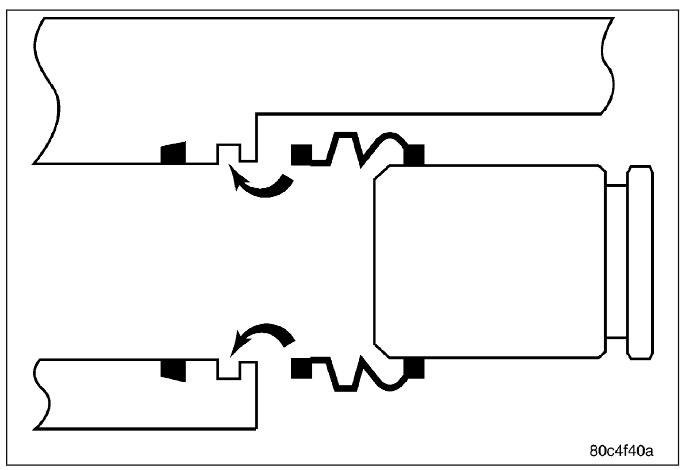
NOTE: Always use fresh, clean brake fluid when assembling a brake caliper.

NOTE: Never use an old piston seal.

1. Dip the NEW piston seal in clean brake fluid and install it in the groove (2) of the caliper bore. The seal (1) should be started at one area of the groove and gently worked around into the groove using only your clean fingers to seat it.

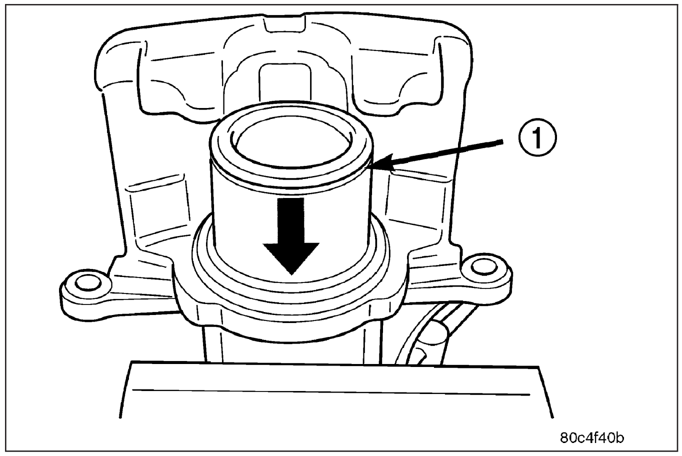


2. Coat the NEW piston with clean brake fluid.
3. Coat the NEW piston boot with clean brake fluid leaving a generous amount inside the boot.
4. Position the dust boot over the lower section of the piston.
5. Extend the dust boot below the bottom of the piston and guide the lip seal into the groove in the caliper piston bore.



CAUTION: Force applied to the piston (1) to seat it in the bore must be applied uniformly to avoid cocking and binding of the piston.

6. Install the piston (1) into the bore, carefully pushing it past the piston seal using **hand pressure**. Push the piston in until it bottoms in the caliper bore and the dust boot lip seal falls into the groove near the top of the piston.
7. Install the caliper on the vehicle and bleed the brakes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



INSTALLATION

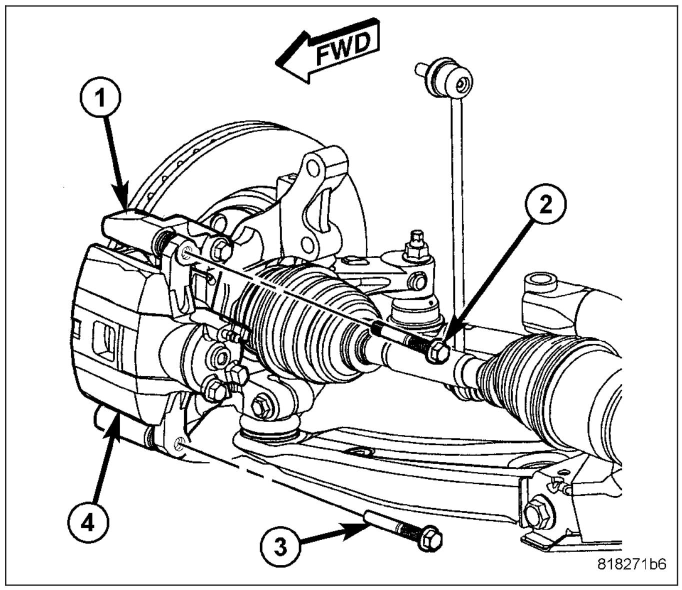
1. Completely retract the caliper piston back into the bore of the caliper. Use a C-clamp to retract the piston. Place a wood block over the piston before installing the C-clamp to avoid damaging the piston.

CAUTION: Use care when installing the caliper (4) onto the adapter bracket (1) to avoid damaging the guide pin boots.

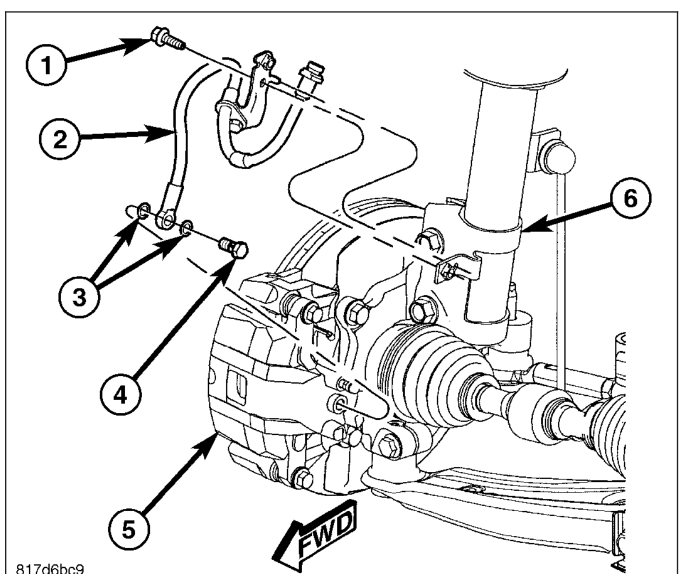
2. Install the disc brake caliper over the brake pads on the brake caliper adapter bracket.

CAUTION: When installing the caliper guide pin bolts (2, 3) make sure that the one that has a special sleeve on the end is installed in the upper mounting hole.

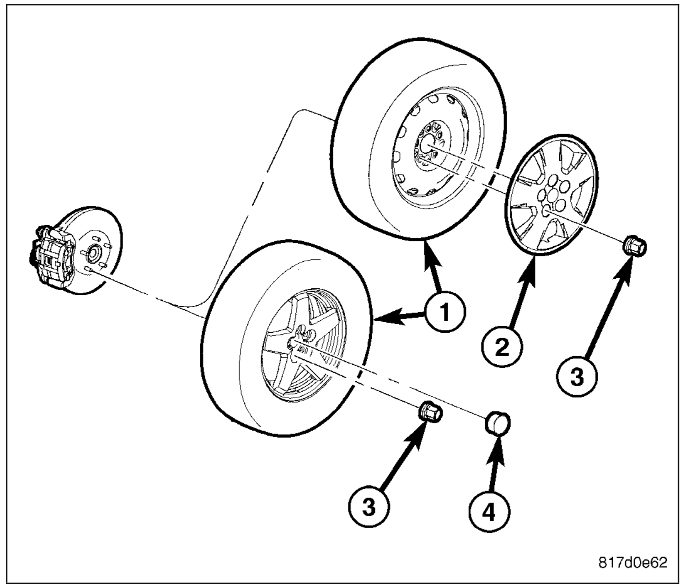
3. Align the caliper guide pin bolt holes with the adapter bracket. Install the upper (with special sleeve) (2) and lower (3) caliper guide pin bolts. Tighten the guide pin bolts to 43 N·m (32 ft. lbs.).



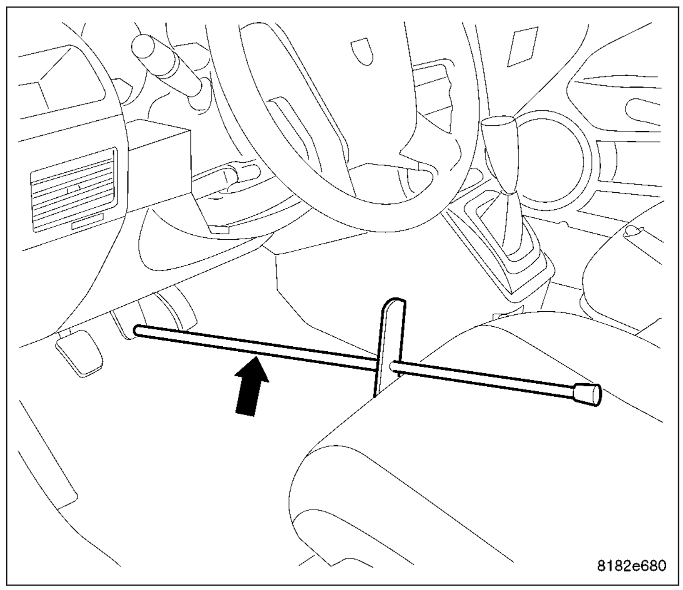
4. Install the banjo bolt (4) connecting the brake flex hose (2) to the brake caliper (5). Install NEW washers (3) on each side of the hose fitting as the banjo bolt is guided through the fitting. Thread the banjo bolt into the caliper and tighten it to 24 N·m (18 ft. lbs.).



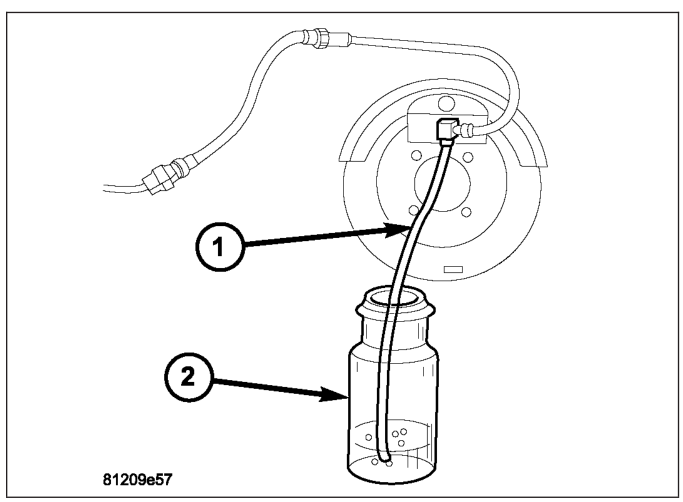
5. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.



7. Remove the brake pedal holding tool.



8. Bleed the caliper as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
9. Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.

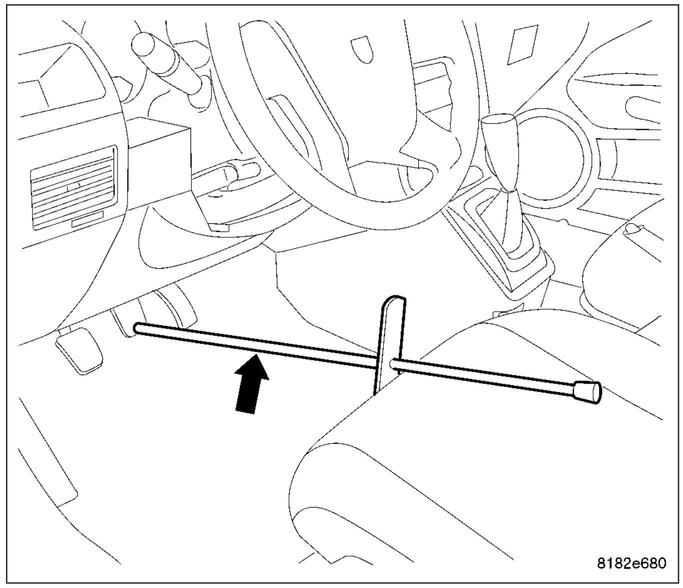


CALIPER-REAR DISC BRAKE

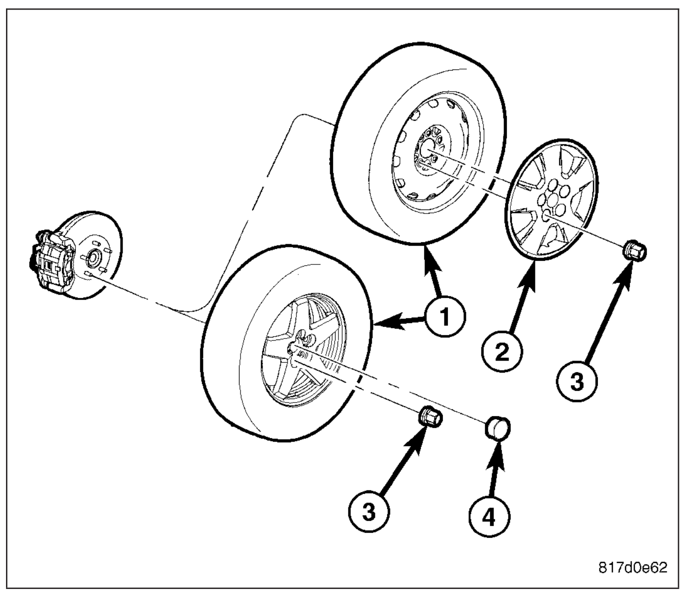
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

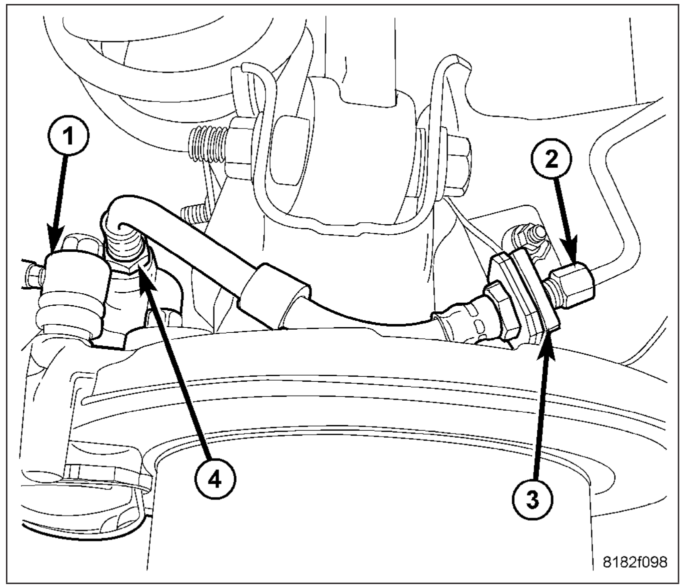
1. Using a brake pedal holding tool as shown, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.



2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
3. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly.

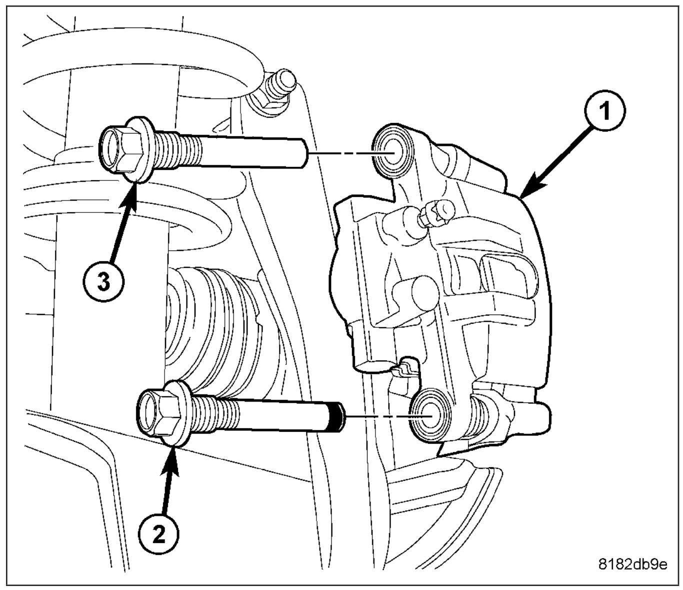


4. Unthread the brake tube nut (2) at the rear flex hose.
5. Remove the clip (3) securing the rear flex hose to the trailing link mounted bracket. Remove the flex hose from the bracket.
6. Unthread and remove the brake flex hose (4) from the brake caliper (1).



CAUTION: When removing the caliper guide pin bolts (2, 3) note that one (lower) has a special sleeve on the end. It important that his bolt be installed in the lower mounting hole when the caliper is installed.

7. Remove the two brake caliper guide pin bolts (2, 3).
8. Slide and remove the disc brake caliper (1) with outboard brake pad attached from the disc brake adapter bracket, inboard brake pad and rotor.
9. Remove the outboard brake pad from the caliper by prying the brake pad retaining clip over the raised area on the caliper. Slide the brake pad off of the brake caliper.



DISASSEMBLY

NOTE: Before disassembling the brake caliper, remove it from the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - REMOVAL)

NOTE: Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

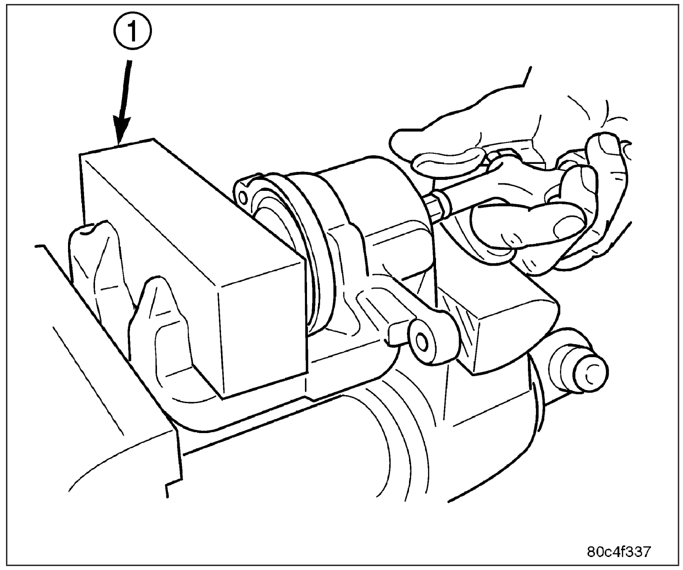
WARNING: Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such a practice.

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

1. Mount the caliper in a vise equipped with protective jaws.

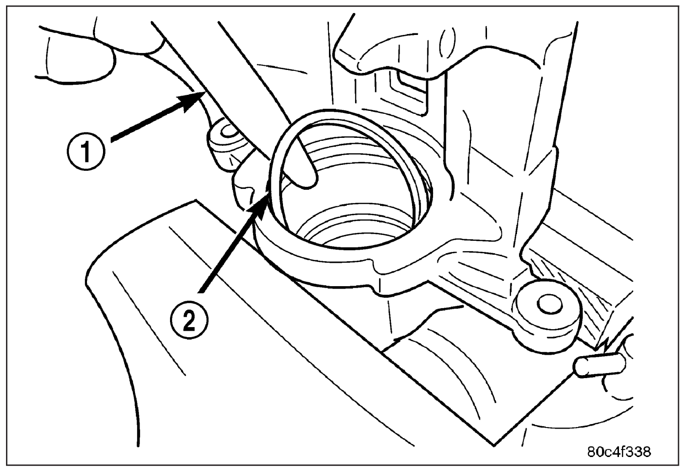
WARNING: Do not place face or hands near caliper and piston if using compressed air pressure to remove piston. Do not use high pressure.

2. Place a wooden block (1) in the caliper as shown.
3. If necessary, apply low pressure compressed air to the caliper fluid inlet in short spurts to force the piston out.
4. Remove the piston from the caliper.
5. Remove the dust boot from the piston and discard it.



CAUTION: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

6. Using a soft tool such as a plastic trim stick (1), work the piston seal (2) out of its groove in caliper piston bore. Discard the used seal.
7. Clean the piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.
8. Inspect both the piston and bore for scoring or pitting. Bores that show light scratches or corrosion can usually be cleared of the light scratches or corrosion using crocus cloth.



CLEANING

WARNING: Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

INSPECTION

Inspect the disc brake caliper for the following:

- Brake fluid leaks in and around boot area and inboard lining
- Ruptures, brittleness or damage to the piston dust boot
- Damaged, dry or brittle guide pin dust boots

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots.

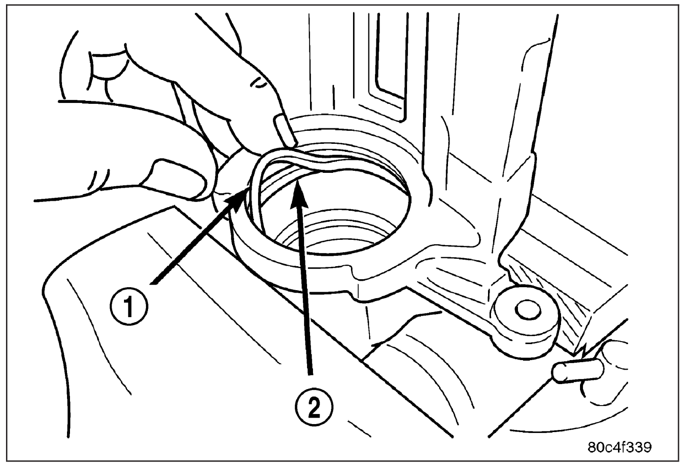
ASSEMBLY

NOTE: Always have clean hands when assembling a brake caliper.

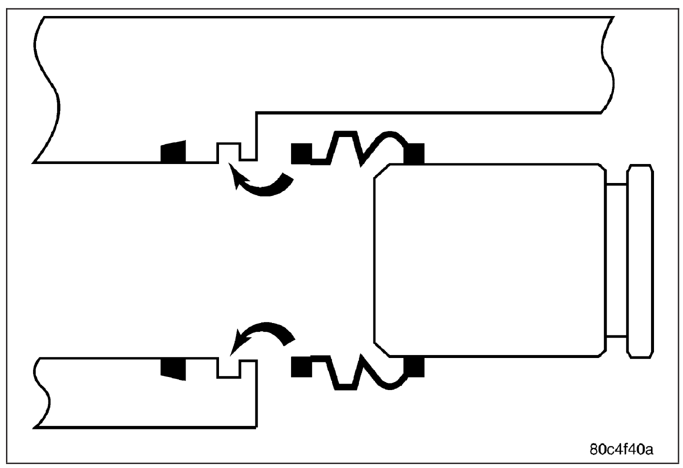
NOTE: Always use fresh, clean brake fluid when assembling a brake caliper.

NOTE: Never use an old piston seal.

1. Dip the NEW piston seal in clean brake fluid and install it in the groove (2) of the caliper bore. The seal (1) should be started at one area of the groove and gently worked around into the groove using only your clean fingers to seat it.

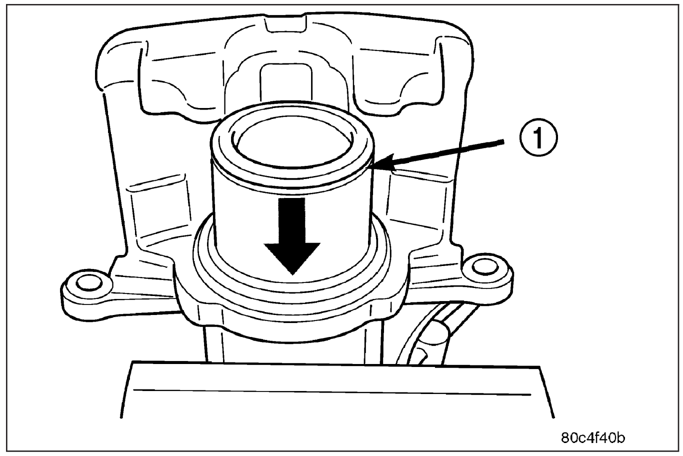


2. Coat the NEW piston with clean brake fluid.
3. Coat the NEW piston boot with clean brake fluid leaving a generous amount inside the boot.
4. Position the dust boot over the lower section of the piston.
5. Extend the dust boot below the bottom of the piston and guide the lip seal into the groove in the caliper piston bore.



CAUTION: Force applied to the piston (1) to seat it in the bore must be applied uniformly to avoid cocking and binding of the piston.

6. Install the piston (1) into the bore, carefully pushing it past the piston seal using **hand pressure**. Push the piston in until it bottoms in the caliper bore and the dust boot lip seal falls into the groove near the top of the piston.
7. Install the caliper on the vehicle and bleed the brakes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



INSTALLATION

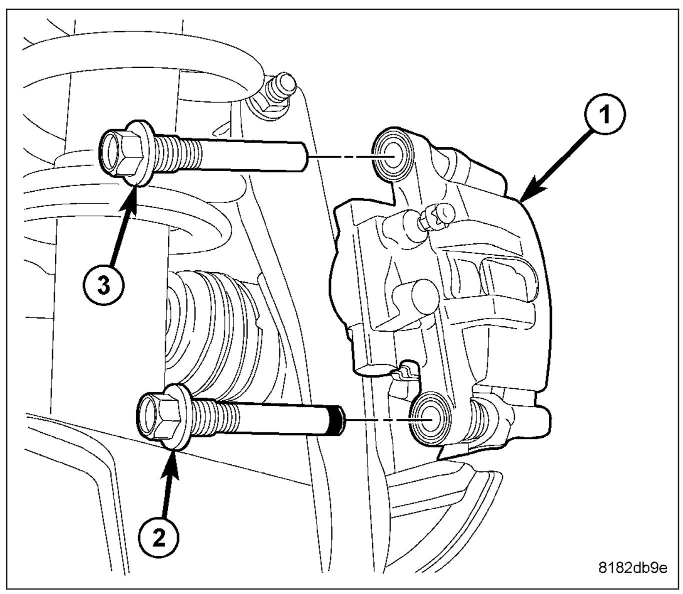
1. If not already performed, completely retract the caliper piston back into the piston bore of the caliper. Use a C-clamp to retract the piston. Place a wood block over the piston before installing the C-clamp to avoid damaging the piston.
2. Slide the outboard brake pad onto the caliper. Be sure the retaining clip is squarely seated in the depressed areas on the caliper beyond the raised retaining bead.

CAUTION: Use care when installing the caliper onto the disc brake adapter to avoid damaging the guide pin boots.

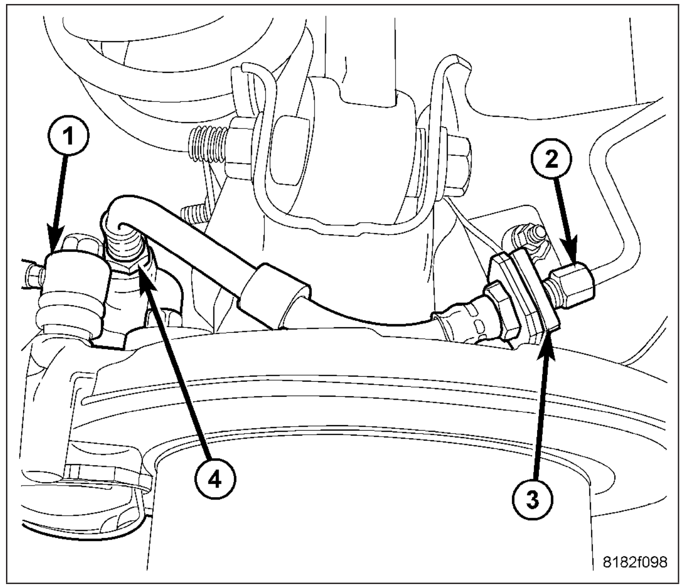
3. Install the disc brake caliper with outboard brake pad attached over the inboard brake pad and rotor, onto the brake caliper adapter bracket.

CAUTION: When installing the caliper guide pin bolts (2, 3) make sure that the one that has a special sleeve on the end is installed in the lower mounting hole.

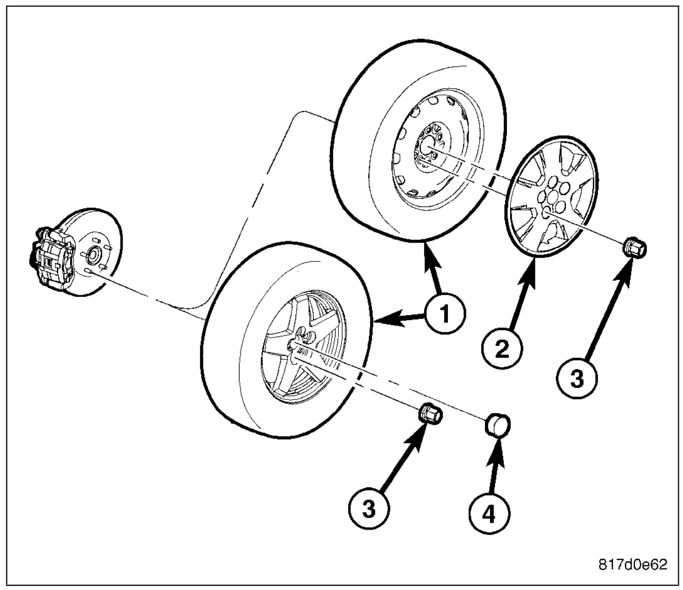
4. Align the caliper guide pin bolt holes with the adapter bracket. Install the lower (with special sleeve) (2) and upper (3) caliper guide pin bolts. Tighten the guide pin bolts to 43 N·m (32 ft. lbs.).



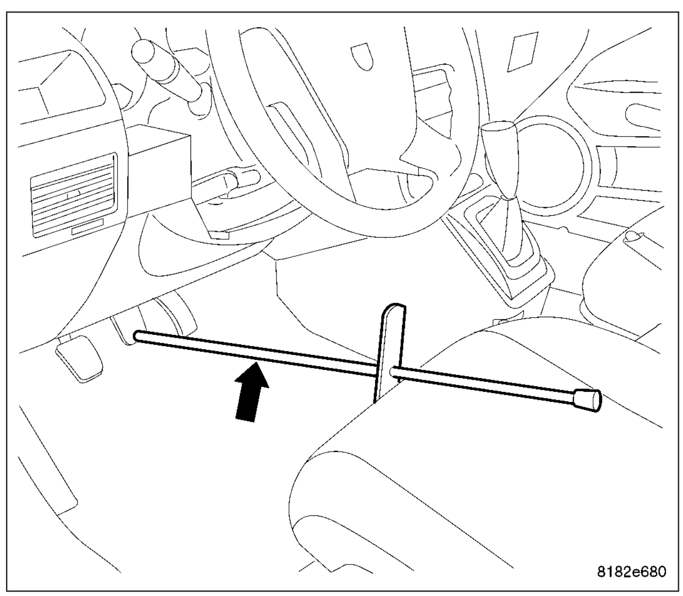
5. Thread the rear brake flex hose (4) into the brake caliper (1). Tighten the flex hose fitting at the caliper to 15 N·m (133 in. lbs.).
6. Route and install the brake flex hose into the trailing link mounted bracket. Install the clip (3) securing the flex hose to the bracket.
7. Thread the brake tube nut (2) into brake flex hose. Tighten the brake tube nut to 17 N·m (150 in. lbs.).



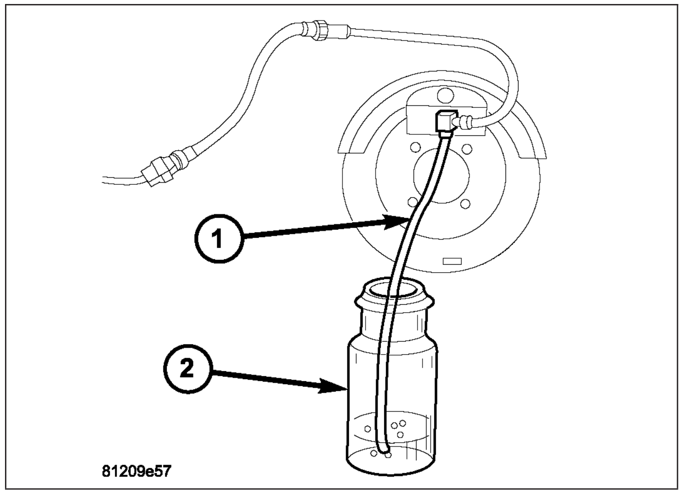
8. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
9. Lower the vehicle.



10. Remove the brake pedal holding tool.



11. Bleed the caliper as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
12. Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoes.



DRUM

DIAGNOSIS AND TESTING

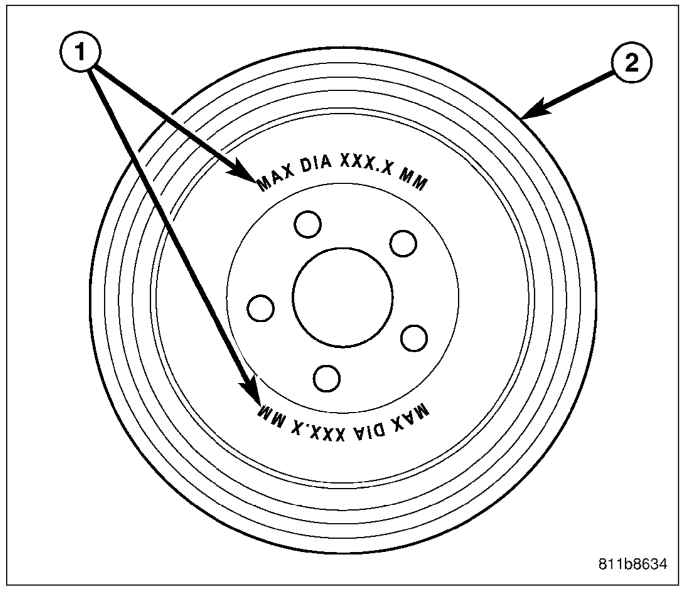
BRAKE DRUM

With the drum off the vehicle, measure the drum for diameter variation (oval shape). The diameter variation of the drum braking surface must not exceed specifications listed in the following table.

Measure brake drum runout. Brake drum runout should be checked with the drum mounted on a brake lathe. Brake drum runout should not exceed specifications listed in the following table.

If either of these measurements are not within specification, reface or replace the drum. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DRUM - STANDARD PROCEDURE).

Always replace the drum if machining will cause the diameter to exceed drum maximum diameter. All brake drums (2) are marked on the inside with the maximum allowable brake drum diameter (1). Maximum brake drum diameter can also be found in the following table.



BRAKE DRUM LIMITS

SALES CODE	DIAMETER VARIATION	RUNOUT	MAXIMUM DIAMETER
ALL	0.20 mm 0.008 in.	0.06 mm 0.002 in.	230.60 mm 9.079 in.

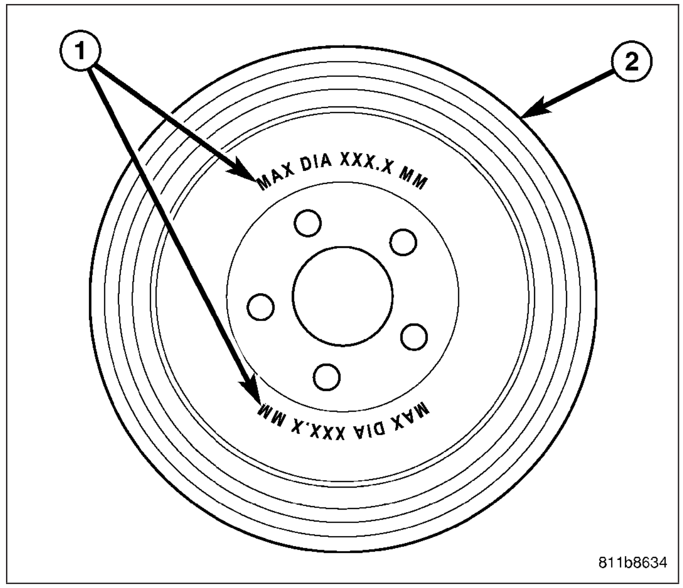
STANDARD PROCEDURE

BRAKE DRUM MACHINING

If a brake drum is deeply scored or warped, it can be machined on a brake lathe equipped to machine brake drums. Follow the manufacturers instructions on the machining procedure.

Measure the brake drum diameter before machining. If machining the drum will cause the drum to exceed maximum allowable diameter, do not machine the brake drum. It needs to be replaced.

CAUTION: Do not machine the brake drum if it will cause the drum to exceed maximum allowable diameter.



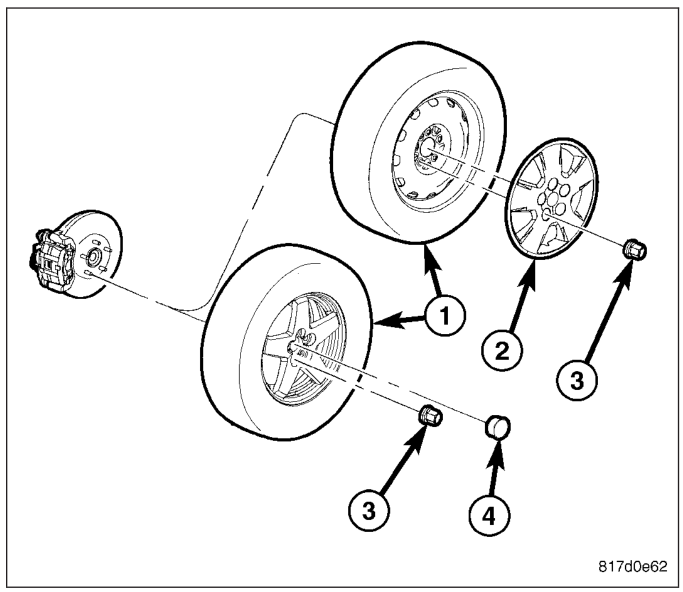
All brake drums (2) are marked with the maximum allowable brake drum diameter. All vehicles have it marked on the inside of the drum (1).

When machining, make sure the feed rate for the final cut is set to deliver a fine finish. A fine finish helps to avoid a screw effect on the brake shoes when the brakes are applied. This final feed cut specification varies from lathe manufacturer to lathe manufacturer.

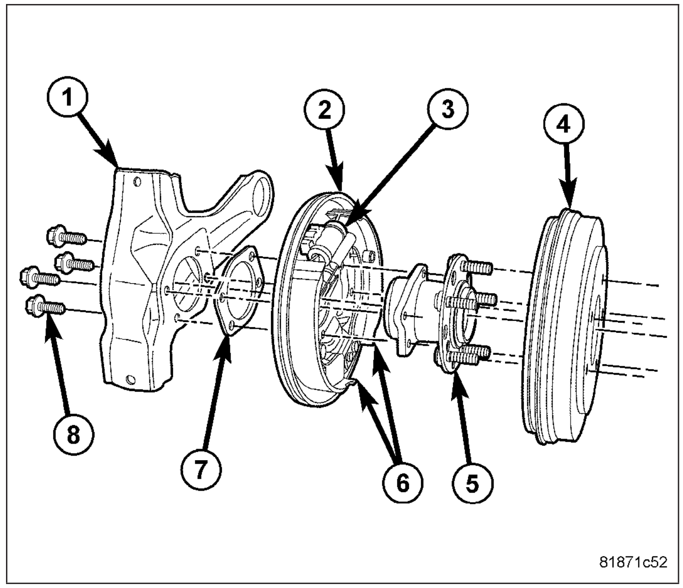
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Raise vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly.

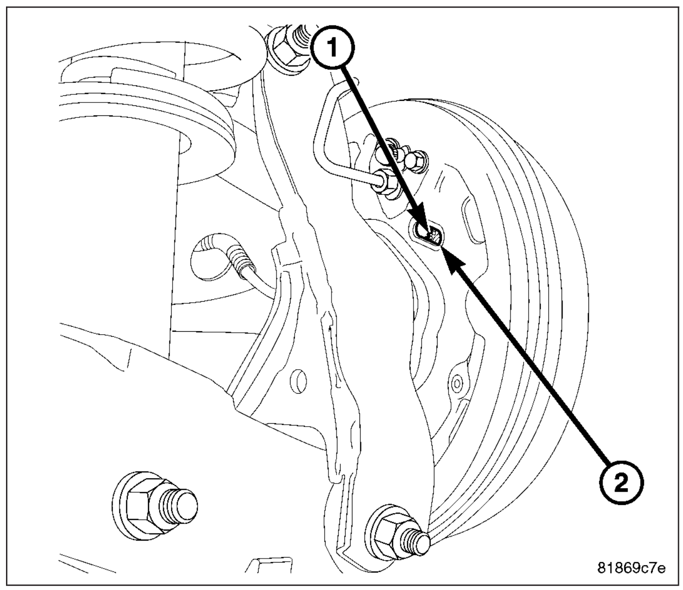


3. Slide the brake drum (4) off the wheel mounting studs of the hub and bearing (5) and remove it from the vehicle. If the drum does not come off, further brake clearance can be obtained by backing off the brake adjuster screw. To do so, perform the following procedure.



BACKING OFF SHOE ADJUSTMENT

1. Remove the plug from the rear of the support plate below the wheel cylinder.
2. Insert a small screwdriver through the access hole (2) in the support plate, under the adjuster, against the lever pawl. The pawl is attached to and pivots from the rear brake shoe.
3. While pushing on the pawl with the screwdriver to disengage it from the adjuster wheel teeth, rotate the wheel (1) upward to back off the adjustment using another screwdriver or a brake adjuster tool.
4. Once the adjuster screw is backed off a sufficient amount, slide the drum off the wheel mounting studs.



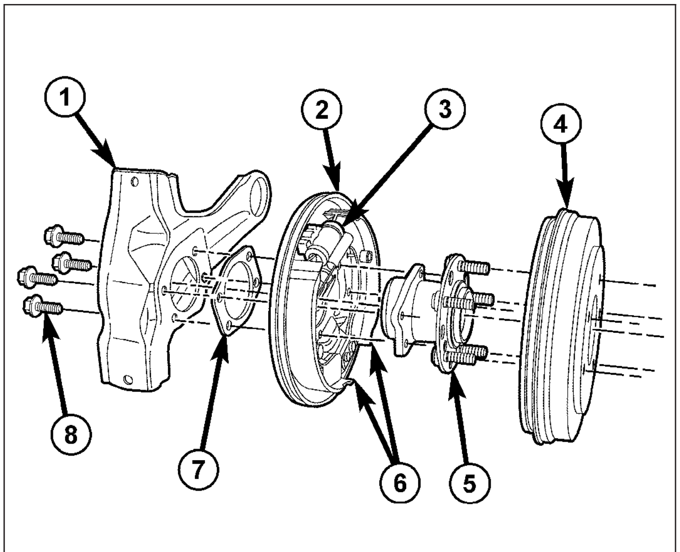
INSTALLATION

NOTE: Before installing drum, inspect brake shoe linings for wear, alignment, and contamination. Repair or replace as necessary.

NOTE: If rust or any foreign material is present on hub, drum or wheel mating surfaces, wet wire brush these areas to remove prior to assembly of parts.

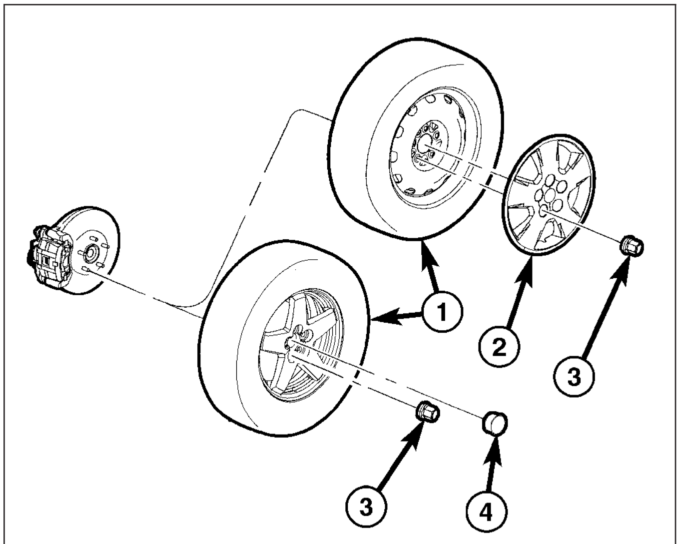
1. Properly remove any buildup formed along outer edge of drum's machined braking surface.
2. Adjust the brake shoes-to-drum diameter using a brake shoe gauge. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - ADJUSTMENTS)

3. Slide the brake drum (4) onto the wheel mounting studs on the hub and bearing (5).



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4. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
5. Lower the vehicle.
6. Road test the vehicle stopping in both forward and reverse directions. The automatic-adjuster will continue to adjust the brakes as necessary during the road test.



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FLUID

DIAGNOSIS AND TESTING

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts. Swelling indicates the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If the fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If the brake fluid is contaminated, drain and thoroughly flush the brake system. Replace all the rubber parts or components containing rubber coming into contact with the brake fluid including: the master cylinder and reservoir; proportioning valves (non-ABS); caliper seals; wheel cylinder seals; ABS hydraulic control unit; and all hydraulic fluid hoses.

STANDARD PROCEDURE

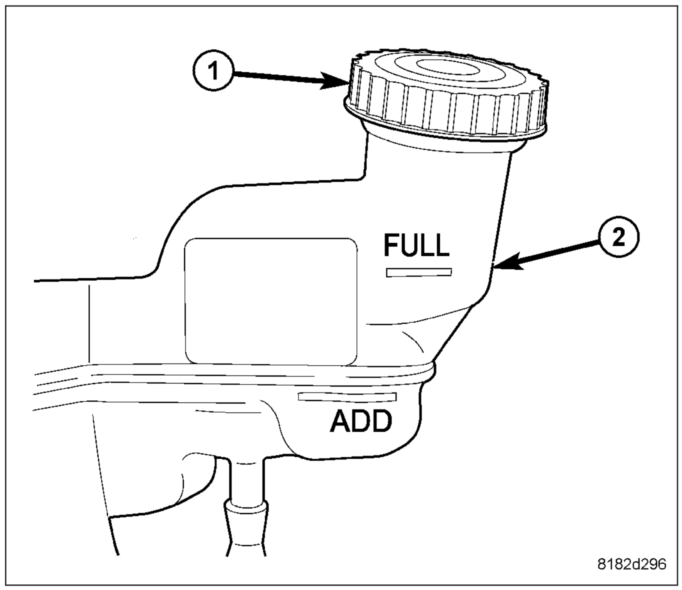
BRAKE FLUID LEVEL CHECKING

NOTE: Brake fluid level should be checked a minimum of twice a year.

Master cylinder reservoirs (2) are marked, FULL and ADD, indicating the allowable brake fluid level range in the master cylinder fluid reservoir.

CAUTION: Use only Mopar® Brake Fluid DOT 3 Motor Vehicle or equivalent from a tightly sealed container. Do not use petroleum-based fluid because seal damage in the brake system will result. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - SPECIFICATIONS)

NOTE: Although there is a range, the preferred level is FULL.



1. Remove the cap (1).
2. Adjust the brake fluid level to the FULL mark listed on the side of the master cylinder fluid reservoir (2) as necessary. Do not overfill the system.
3. Install the cap (1).

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar® Brake Fluid DOT 3 Motor Vehicle or equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from a container which has been left open. An open container will absorb moisture from the air and contaminate the fluid.

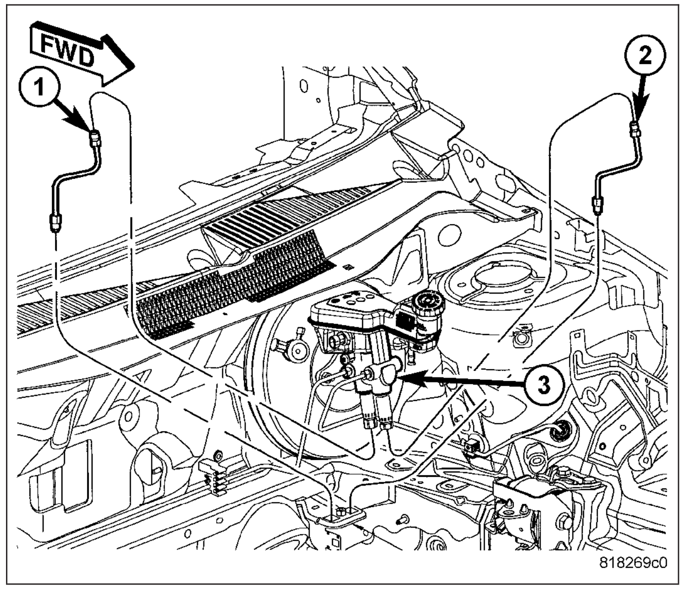
CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

MASTER CYLINDER

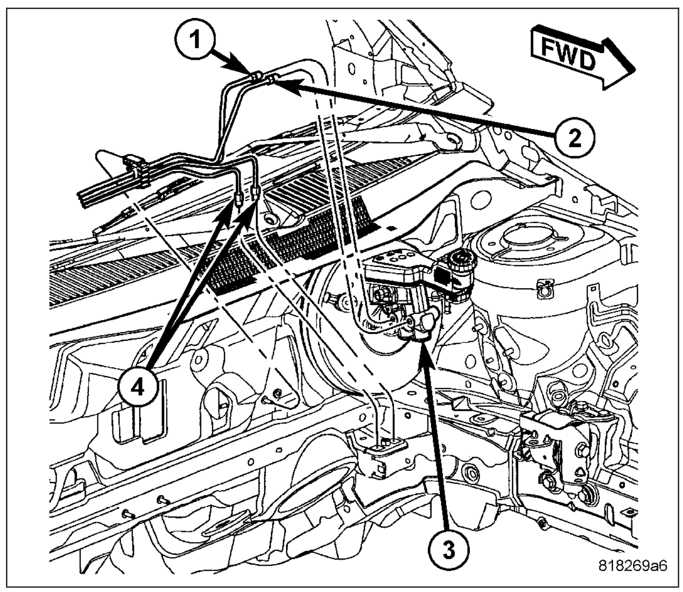
DESCRIPTION

The master cylinder used on this vehicle is a Plunger II design supplied by Continental Teves. The bore diameter for all applications is 20.6 mm (0.812 in.).

The non-ABS master cylinder (3) is a four-outlet design (one for each wheel brake). There are two ports at each piston. One feeds a front wheel brake while the other feeds the opposite side rear wheel brake. The rear wheel brake ports are drilled and threaded to accept screw-in proportioning valves. Both valves are threaded into the bottom of the master cylinder housing.



All ABS master cylinders (3) are a two-outlet design and the brake tubes from these primary and secondary outlet ports lead directly to the Integrated Control Unit (ICU) before going to each wheel brake.



All master cylinders mount to the power brake booster in the same manner.

The master cylinder body is an anodized aluminum casting. It has a machined bore to accept the master cylinder pistons and also has threaded ports with seats for hydraulic brake tube connections.

The master cylinder has the brake fluid reservoir mounted on top of it which gravity feeds brake fluid to the master cylinder when it is required. On manual transmission model vehicles the brake fluid reservoir also feeds the clutch hydraulic circuit. The reservoir is made of see-through plastic and it houses the brake fluid level switch. A removable brake fluid level switch is mounted in the right side.

OPERATION

When the brake pedal is pressed, the master cylinder primary and secondary pistons apply brake pressure through the proportioning valves (on non-ABS vehicles) and chassis brake tubes to each brake assembly. The brake fluid reservoir supplies the brake hydraulic system with the necessary fluid to operate properly.

The non-ABS master cylinder's primary outlet ports supply hydraulic pressure to the right front and left rear brakes while the secondary outlet ports supply hydraulic pressure to the left front and right rear brakes. ABS equipped master cylinder outlet ports supply hydraulic pressure to the ABS Integrated Control Unit (ICU) where it is distributed to the individual wheel brakes.

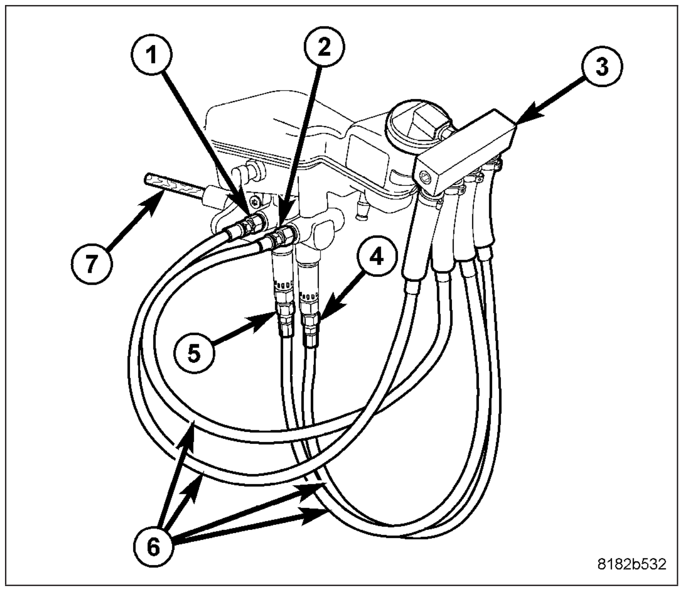
The master cylinder reservoir cap diaphragm is slit to allow atmospheric pressure to equalize on both sides of the diaphragm.

STANDARD PROCEDURE

MASTER CYLINDER BLEEDING

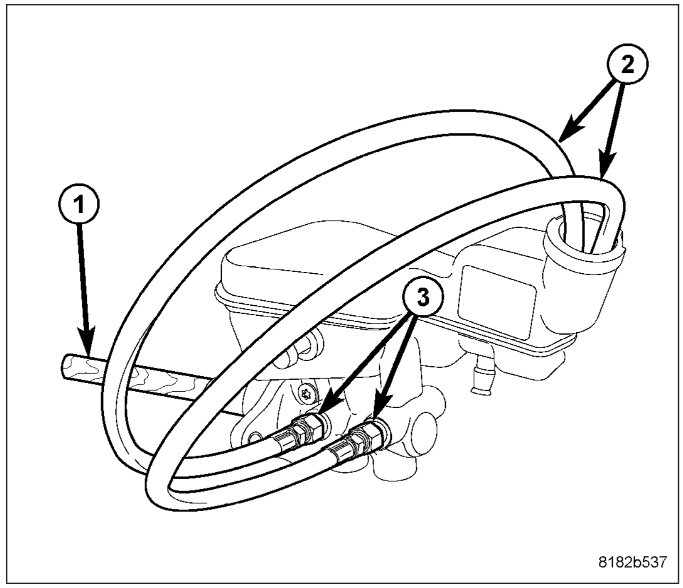
NOTE: On vehicles without ABS this procedure is designed to be performed with the proportioning valves installed in the master cylinder.

1. Clamp the master cylinder in a vise with soft-jaw caps.
2. Master Cylinder without ABS – Attach the special tools for bleeding the master cylinder in the following fashion:
   a. Thread Bleeder Tube Adapter (1), Special Tool 8822-1, into the primary outlet port of the master cylinder without a proportioning valve. Tighten Adapter to 17 N·m (150 in. lbs.).
   b. Thread Bleeder Tube Adapter (2), Special Tool 8822-2, into the secondary outlet port of the master cylinder without a proportioning valve. Tighten Adapter to 17 N·m (150 in. lbs.).
   c. Thread Bleeder Tube Adapter (4), Special Tool 8822-1, into the proportioning valve in the lower secondary outlet port of the master cylinder. Tighten Adapter to 17 N·m (150 in. lbs.).
   d. Thread Bleeder Tube Adapter (5), Special Tool 8822-2, into the proportioning valve in the lower primary outlet port of the master cylinder. Tighten Adapter to 17 N·m (150 in. lbs.).



   e. Thread a Bleeder Tube (6), Special Tool 8358-1, into each Adapter. Tighten tube nuts to 17 N·m (150 in. lbs.).
   f. Install Bleeder Tubes Adapter (3), Special Tool 9705, in place of the fill cap as shown.
   g. Flex and place the open ends of the Bleeder Tubes into open hose tips on Adapter 9705. Be sure Bleeder Tubes are inserted into Adapter 9705 far enough not to come loose during bleed procedure.

3. Master Cylinder with ABS – Attach the special tools for bleeding the master cylinder in the following fashion:
   a. Thread Bleeder Tube Adapters (3), Special Tool 8822-2, into the primary and secondary outlet ports of the master cylinder. Tighten Adapters to 17 N·m (150 in. lbs.).
   b. Thread a Bleeder Tube (2), Special Tool 8358-1, into each Adapter. Tighten tube nuts to 17 N·m (150 in. lbs.).
   c. Flex each Bleeder Tube and place the open ends into the neck of the master cylinder reservoir. Position the open ends of the tubes into the reservoir so their outlets are below the surface of the brake fluid in the reservoir when filled.



NOTE: Make sure the ends of the Bleeder Tubes stay below the surface of the brake fluid in the reservoir at all times during the bleeding procedure.

4. Fill the brake fluid reservoir with fresh Mopar® Brake Fluid DOT 3 Motor Vehicle, or equivalent. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - SPECIFICATIONS)
5. Using an appropriately sized wooden dowel as a pushrod, slowly press the pistons inward discharging brake fluid through the Bleeder Tubes, then release the pressure, allowing the pistons to return to the released position. Repeat this several times until all air bubbles are expelled from the master cylinder bore and Bleeder Tubes.
6. Remove the Bleeder Tubes and Adapters from the master cylinder and plug the master cylinder outlet ports.
7. Install the fill cap on the reservoir.
8. Remove the master cylinder from the vise.
9. Install the master cylinder on the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)

REMOVAL

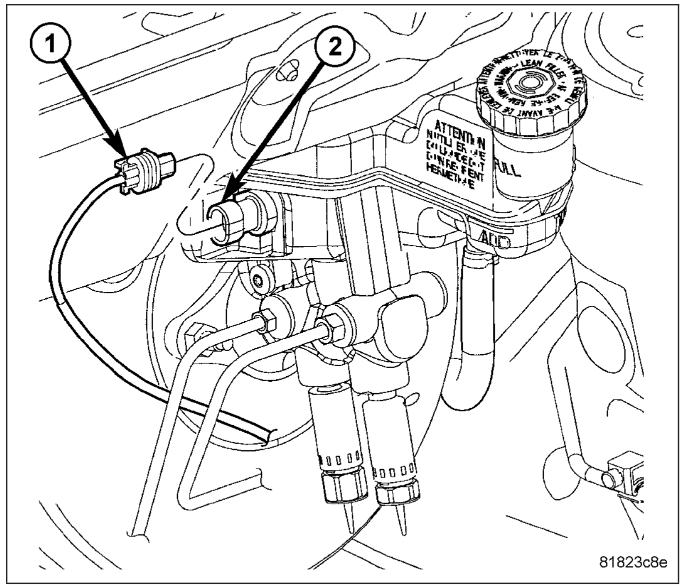
LEFT-HAND-DRIVE WITH ABS

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

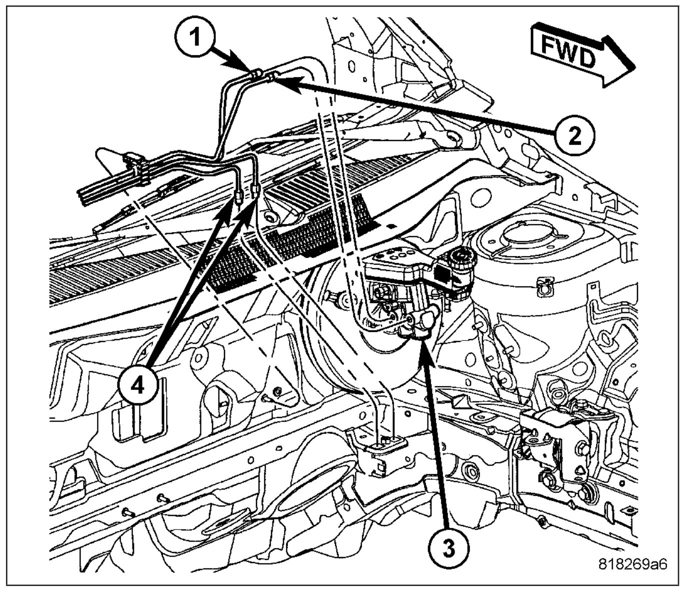
CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

1. With the engine not running, pump the brake pedal 4-5 strokes until the pedal feel is firm.
2. Disconnect the negative (ground) cable from the battery and isolate the cable.

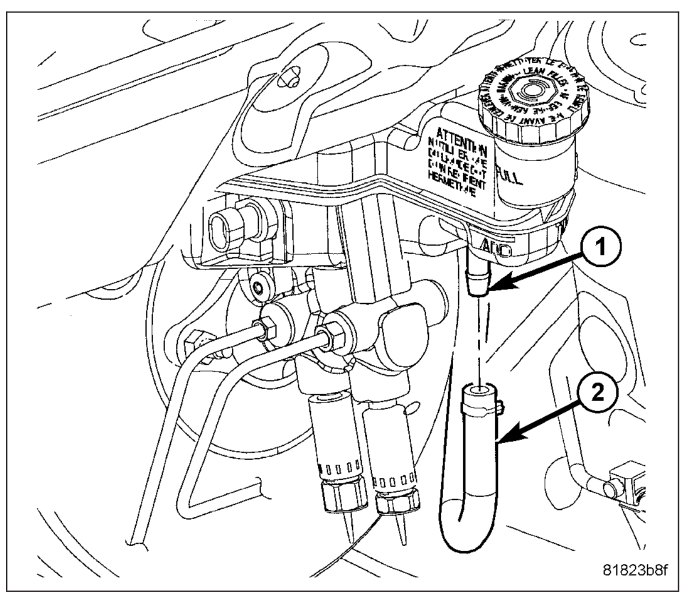
3. Disconnect the wiring harness connector (1) from the brake fluid level switch (2) in the master cylinder brake fluid reservoir.



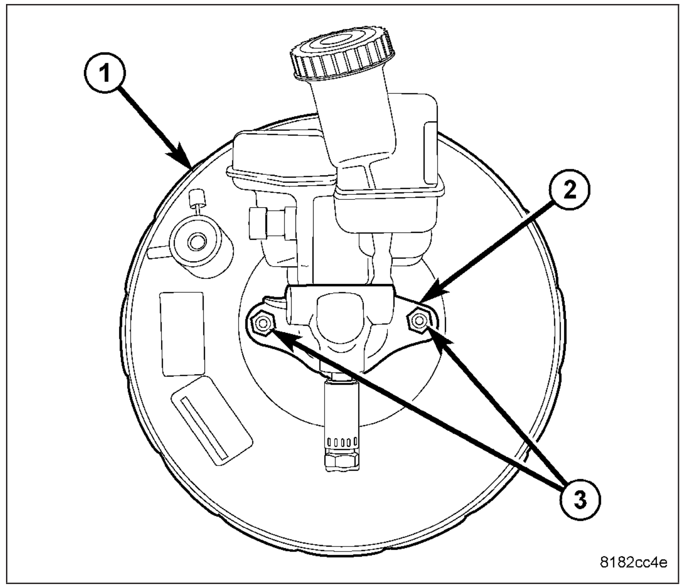
4. Disconnect the primary (1) and secondary (2) brake tubes at the master cylinder outlet ports. Install plugs at all of the open brake tube outlets on the master cylinder.



5. If equipped with a manual transaxle, remove the clamp and slide the clutch actuator hose (2) off the reservoir port (1).



6. Clean the area around where the master cylinder (2) attaches to the power brake booster (1) using a suitable brake cleaner such as Mopar® Brake Parts Cleaner or an equivalent.
7. Remove the two nuts (3) attaching the master cylinder (2) to the power brake booster (1).
8. Slide the master cylinder straight out of the power brake booster.

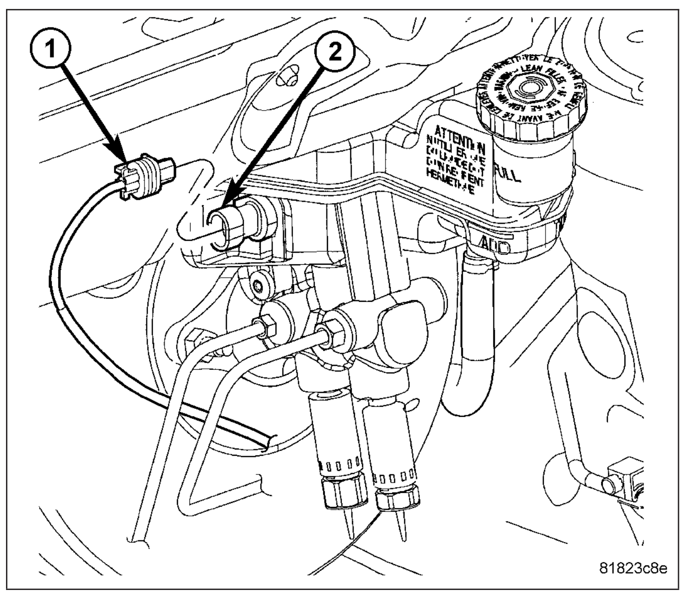


LEFT-HAND-DRIVE WITHOUT ABS

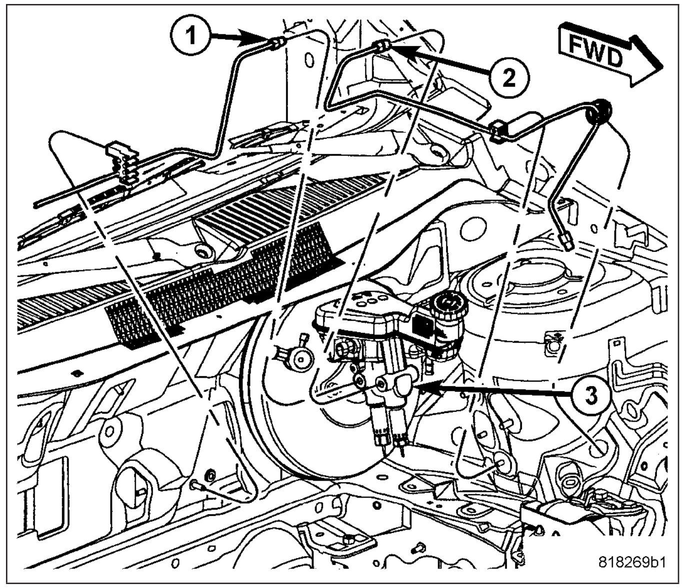
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

CAUTION: The vacuum in the power brake booster must be pumped down before removing the master cylinder to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

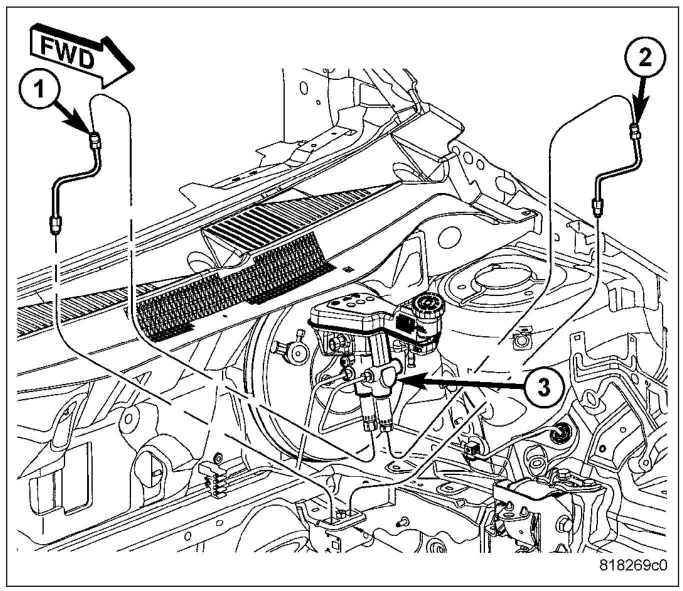
1. With the engine not running, pump the brake pedal 4-5 strokes until the pedal feel is firm.
2. Disconnect the negative (ground) cable from the battery and isolate the cable.
3. Remove the wiring harness connector (1) from the brake fluid level switch (2) in the master cylinder brake fluid reservoir.



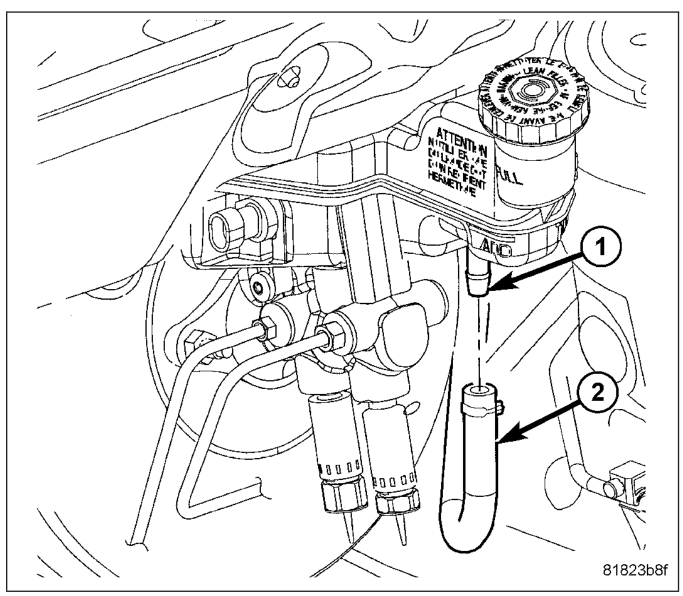
4. Disconnect the two front brake tubes (1, 2) from the master cylinder. Install plugs at the open brake tube outlets on the master cylinder.



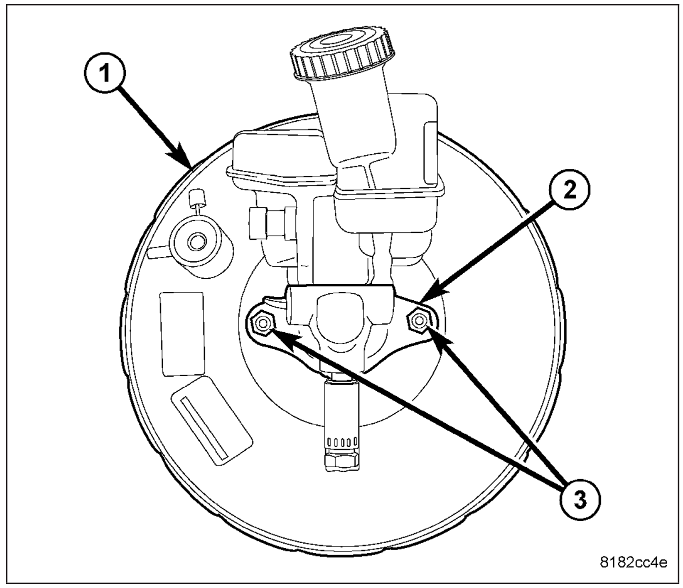
5. Disconnect the two rear brake tubes (1, 2) from the proportioning valves on the master cylinder (3). Install plugs at the open brake tube outlets on the proportioning valves.



6. If equipped with a manual transaxle, remove the clamp and slide the clutch actuator hose (2) off the reservoir port (1).

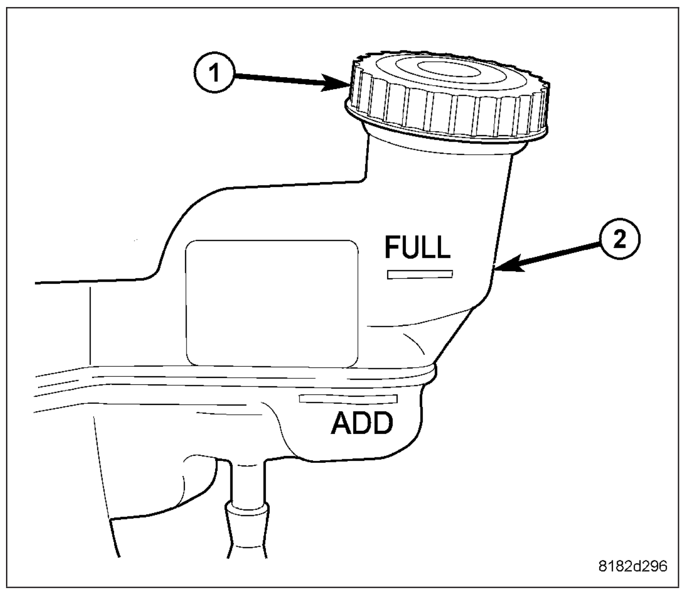


7. Clean the area around where the master cylinder (2) attaches to the power brake booster (1) using a suitable brake cleaner such as Mopar® Brake Parts Cleaner or an equivalent.
8. Remove the two nuts (3) attaching the master cylinder (2) to the power brake booster (1).
9. Slide the master cylinder straight out of the power brake booster.
10. To remove the proportioning valves, unthread each from the master cylinder.



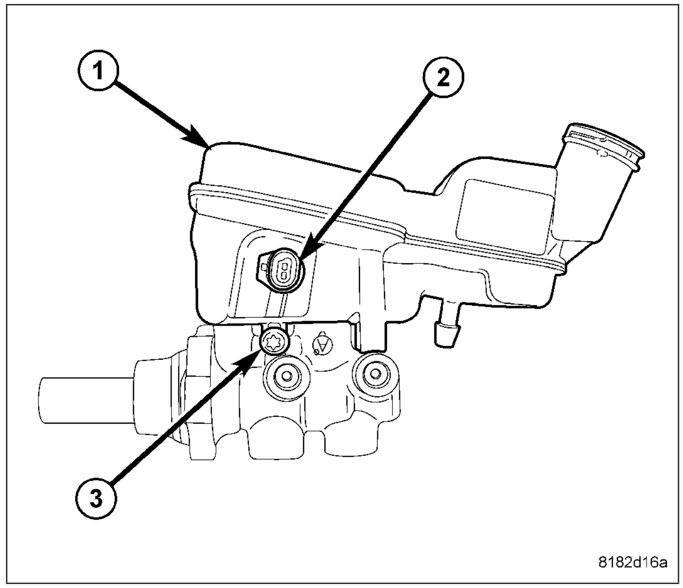
DISASSEMBLY

1. Clean the master cylinder housing and brake fluid reservoir. Use only Mopar® Brake Parts Cleaner or equivalent.
2. Remove the brake fluid reservoir cap (1). Using a syringe or equivalent type tool, empty as much brake fluid as possible from the reservoir.

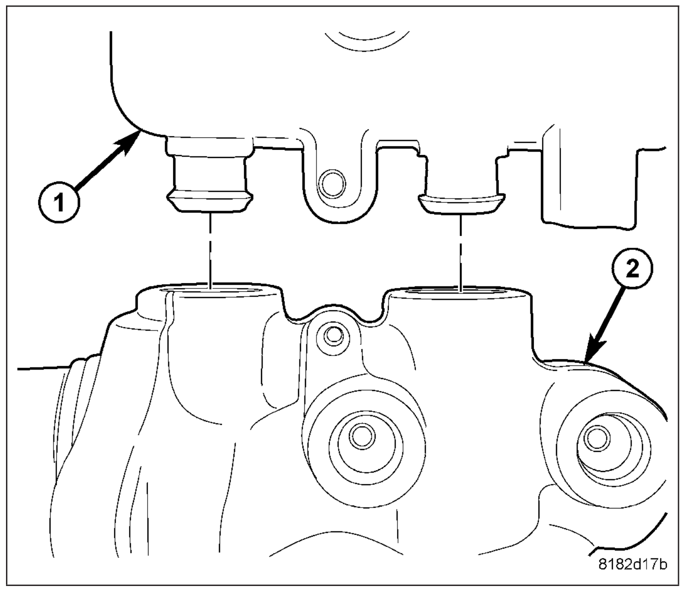


CAUTION: When removing the fluid reservoir (1) from the master cylinder, do not attempt to pry it off using any type of tool. This can damage the fluid reservoir or master cylinder housing.

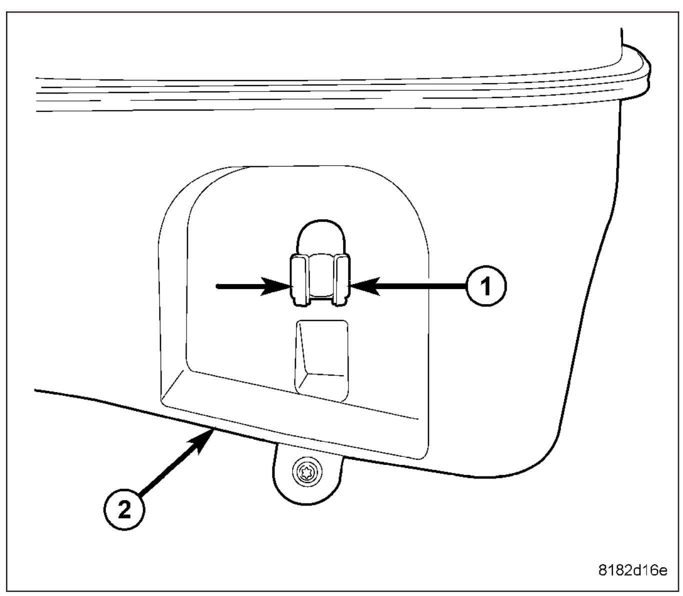
3. Remove the screw (3) fastening the fluid reservoir (1) to the master cylinder housing.



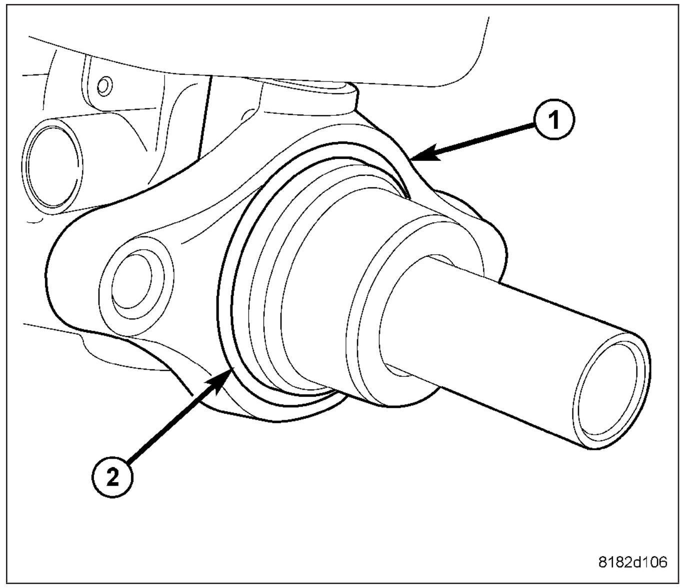
4. Pull the reservoir (1) straight up and remove it from the grommet seals in master cylinder housing (2).



5. If the reservoir is being replaced, remove the fluid level switch. Push together the retaining tabs (1) holding the brake fluid level switch in place in the brake fluid reservoir (2), then pull the brake fluid level switch out the opposite side of the reservoir.

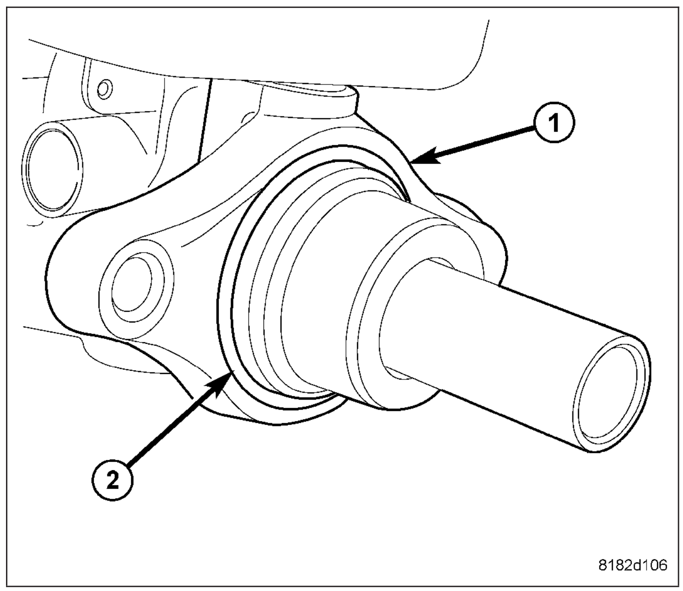


6. Remove the vacuum seal (2) from the master cylinder mounting flange (1).

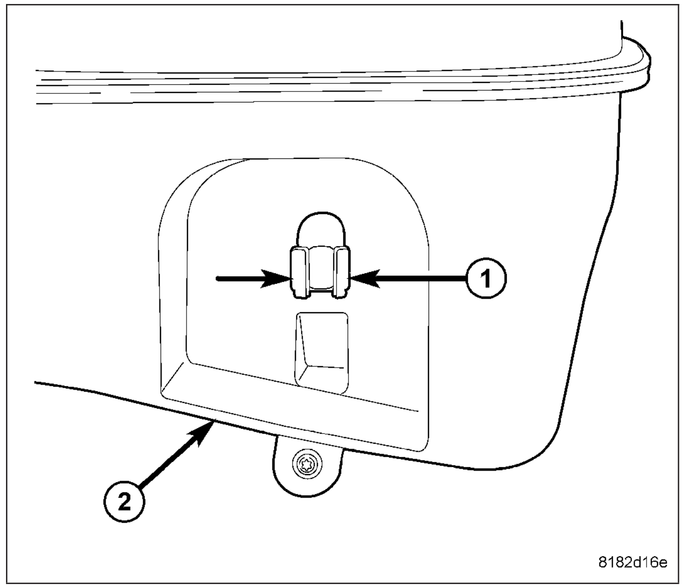


ASSEMBLY

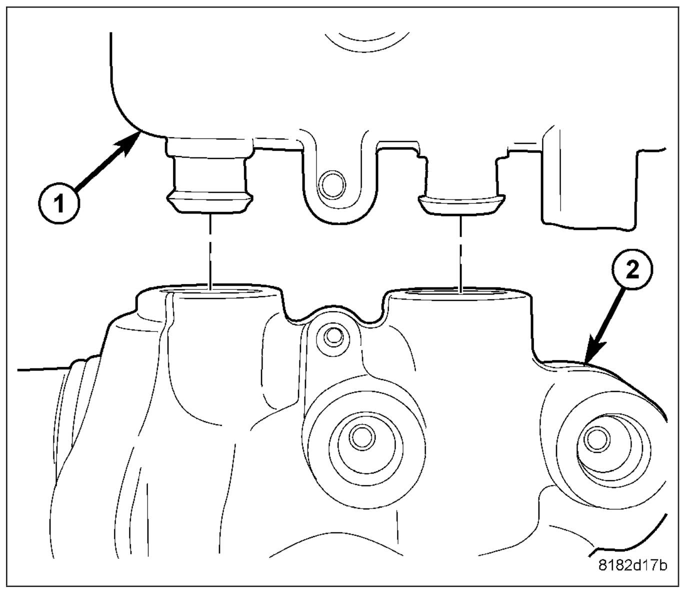
1. Install a NEW vacuum seal (2) on the master cylinder mounting flange (1) making sure the seal fits squarely in its groove.



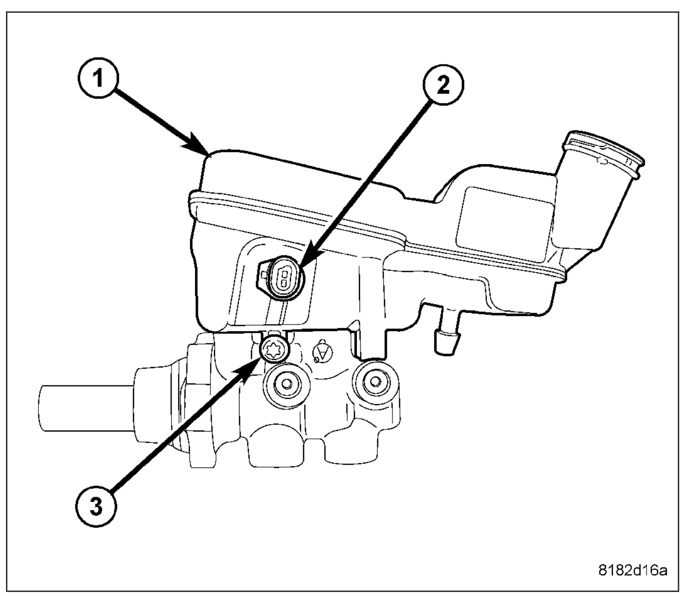
2. If the reservoir is being replaced, align the brake fluid level switch with its mounting hole on the left side of the master cylinder brake fluid reservoir. Push the switch into the fluid reservoir until the switch retaining tabs (1) are expanded on the other side of the reservoir (2), locking it in place.



3. Lubricate the reservoir mounting area with fresh clean brake fluid. Place the reservoir (1) in position over the grommet seals in the master cylinder (2). Slide the reservoir into the grommet seals by firmly pressing down on the fluid reservoir. Once installed, make sure fluid reservoir is touching the top of both grommet seals.



4. Install the fluid reservoir mounting screw (3). Tighten the screw to 5.5 N·m (48 in. lbs.).
5. Thoroughly bleed the master cylinder before installing it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE)
6. Install the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)



INSTALLATION

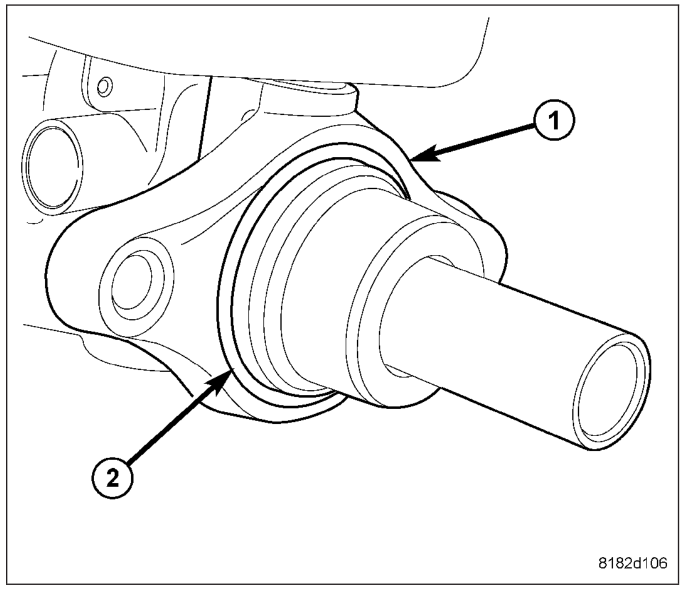
LEFT-HAND-DRIVE WITH ABS

NOTE: The master cylinder must be bled before installing it on the vehicle.

1. Bench bleed the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE)
2. Wipe the face of the power brake booster clean where the vacuum seal on the rear of the master cylinder comes in contact when it's installed. Do not get any cleaner or debris inside the booster.

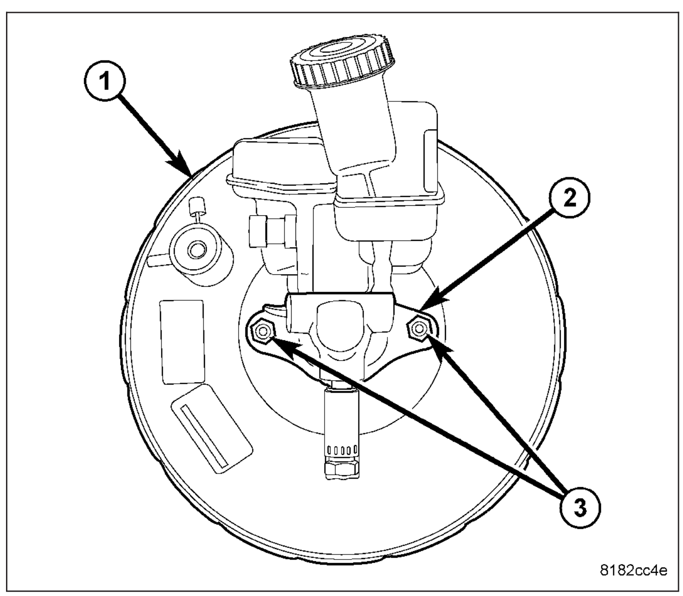
CAUTION: When installing a master cylinder on the vehicle, a NEW vacuum seal (2) MUST be installed on the master cylinder mounting flange (1).

3. If the master cylinder does not have a new vacuum seal (2) on the mounting flange (1), remove it. Install a NEW vacuum seal on the master cylinder mounting flange making sure the seal fits squarely in its groove.

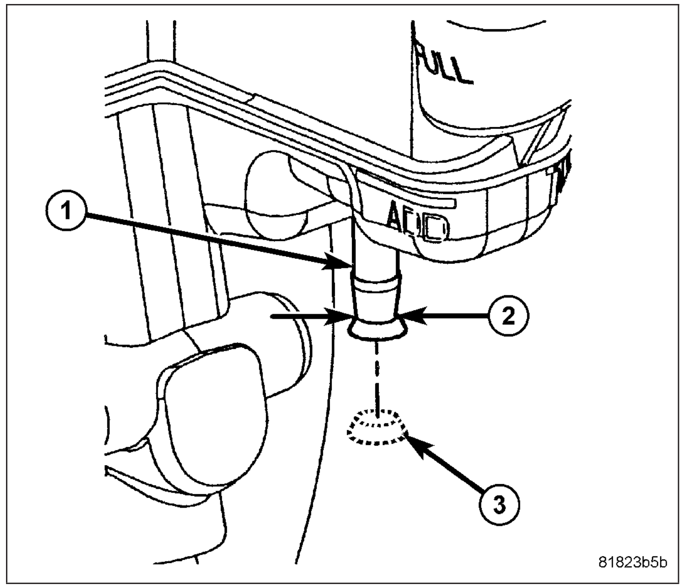


CAUTION: If resistance is met during master cylinder insertion into power brake booster, the master cylinder push rod may not be lined up with the booster push rod. Remove the master cylinder, realign and insert it again.

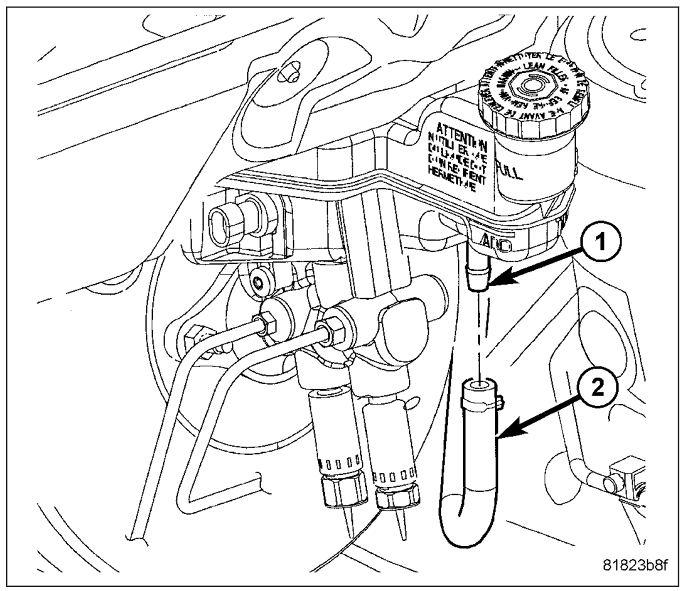
4. Line the master cylinder mounting holes up with the mounting studs on the power brake booster. Ensure the master cylinder piston push rod lines up with the booster push rod, then carefully slide the master cylinder into the power brake booster until it contacts the face of the booster.
5. Install two NEW master cylinder mounting nuts (3). Tighten each nut to 25 N·m (18 ft. lbs.).



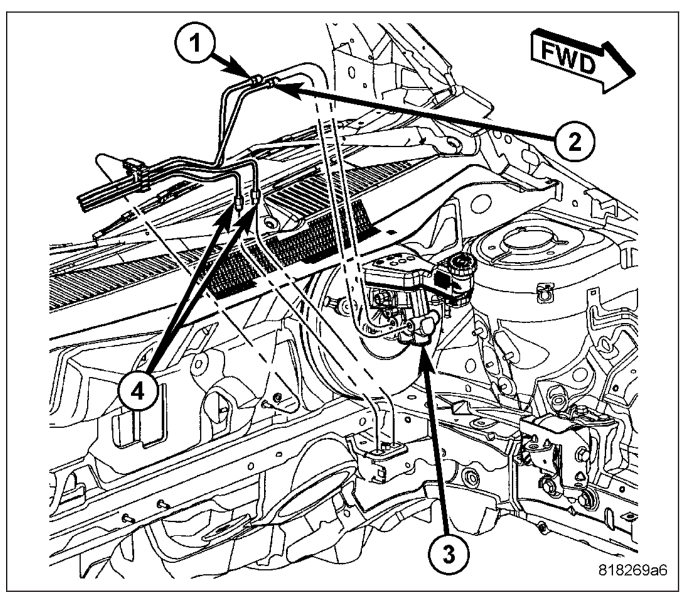
6. If equipped with a manual transaxle and a new reservoir is being installed, using an appropriate cutting tool, cut the clutch actuator port at the center of the “V” groove (2) opening the hydraulic clutch port (1). Discard the severed plug (3).



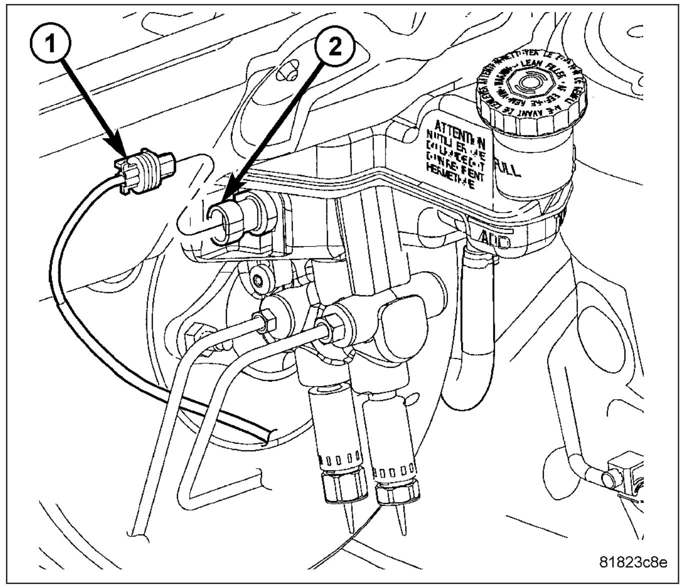
7. If equipped with a manual transaxle, slide the clutch actuator hose (2) onto the reservoir port (1). Install the hose clamp just past the upset bead on the port.



8. Connect the primary (1) and secondary (2) brake tubes to the master cylinder outlet ports. Tighten the tube nuts to 17 N·m (150 in. lbs.).



9. Connect the wiring harness connector (1) to the brake fluid level switch (2).
10. Connect the negative (ground) cable on the battery.
11. Fill the master cylinder reservoir to the proper level. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - STANDARD PROCEDURE)



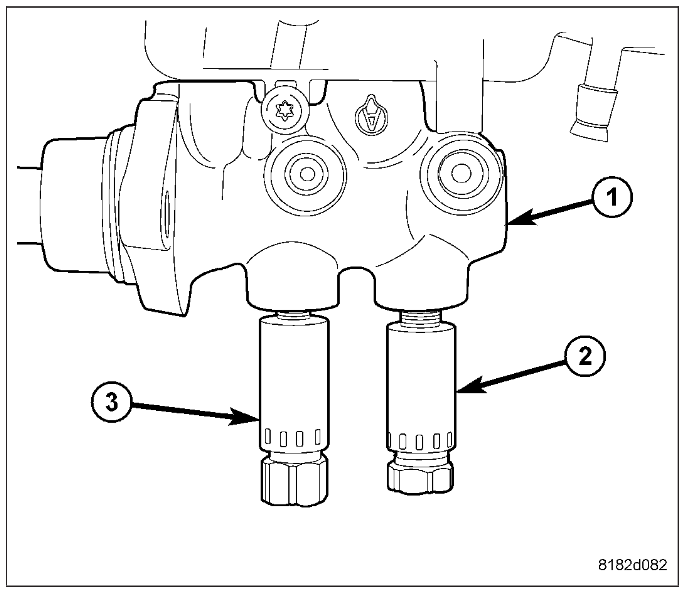
WARNING: Be certain a firm brake pedal is achieved prior to attempting to operate the vehicle. If a firm brake pedal cannot be achieved, bleed the brake hydraulic system and check for leaks. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

12. Road test the vehicle to ensure proper operation of the brakes.

LEFT-HAND-DRIVE WITHOUT ABS

NOTE: The proportioning valves are not identical and cannot be interchanged. The proportioning valve that threads into the primary port (3) has M10 x 1 threads going into the master cylinder (1). The proportioning valve that threads into the secondary port (2) has M12 x 1 threads going into the master cylinder (1).

1. If removed, install the proportioning valves (2, 3) in their master cylinder ports. Tighten the proportioning valves to 30 N·m (22 ft. lbs.).

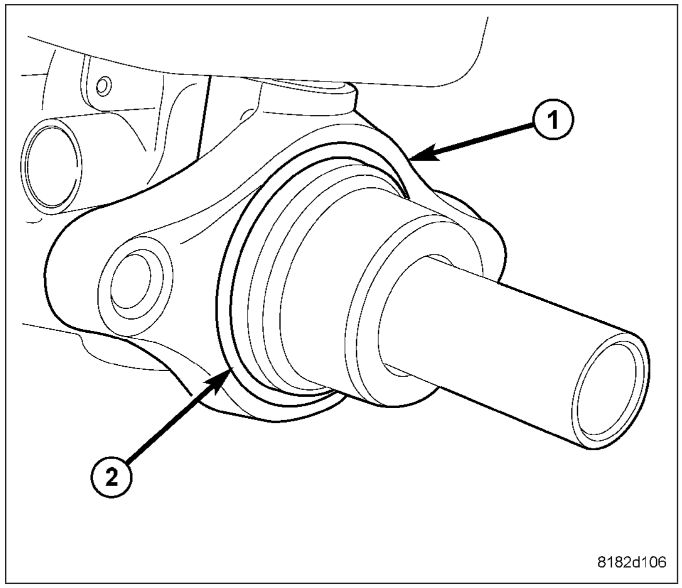


NOTE: The master cylinder must be bled before installing it on the vehicle.

2. Bench bleed the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE)
3. Wipe the face of the power brake booster clean where the master cylinder seal comes in contact when it's installed. Do not get any cleaner or debris inside the booster.

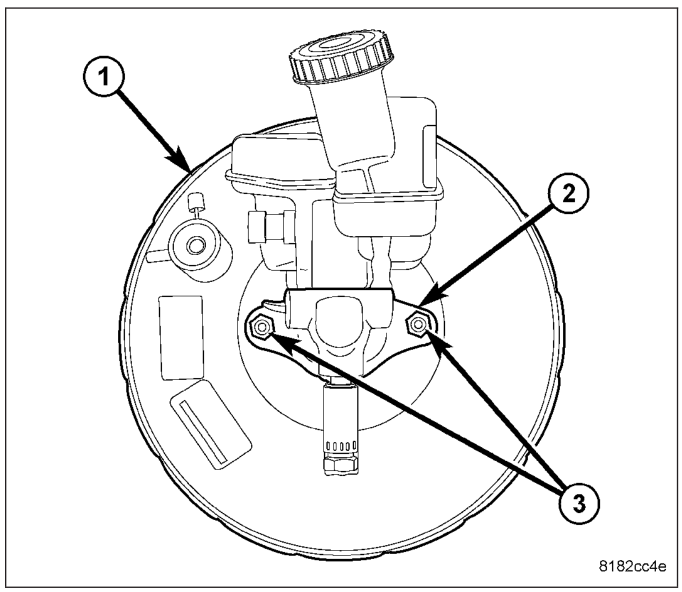
CAUTION: When installing a master cylinder on the vehicle, a NEW vacuum seal (2) MUST be installed on the master cylinder mounting flange (1).

4. If the master cylinder does not have a new vacuum seal (2) on the mounting flange (1), remove it. Install a NEW vacuum seal on the master cylinder mounting flange making sure the seal fits squarely in its groove.

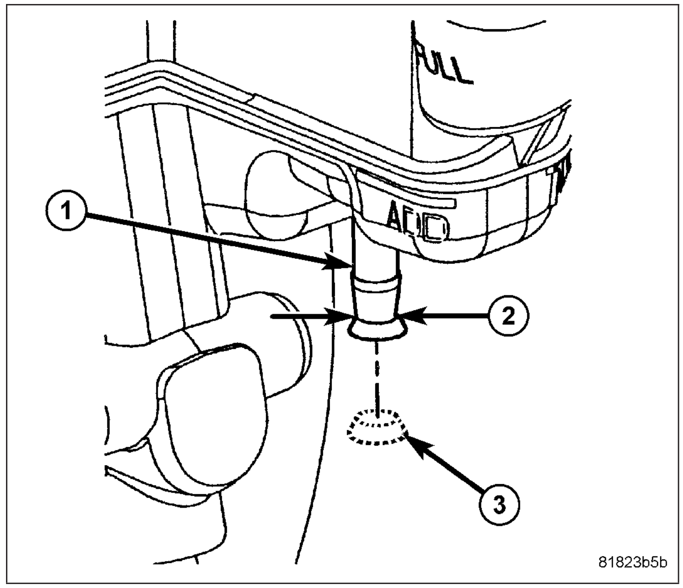


CAUTION: If resistance is met during master cylinder insertion into power brake booster, the master cylinder push rod may not be lined up with the booster push rod. Remove the master cylinder, realign and insert it again.

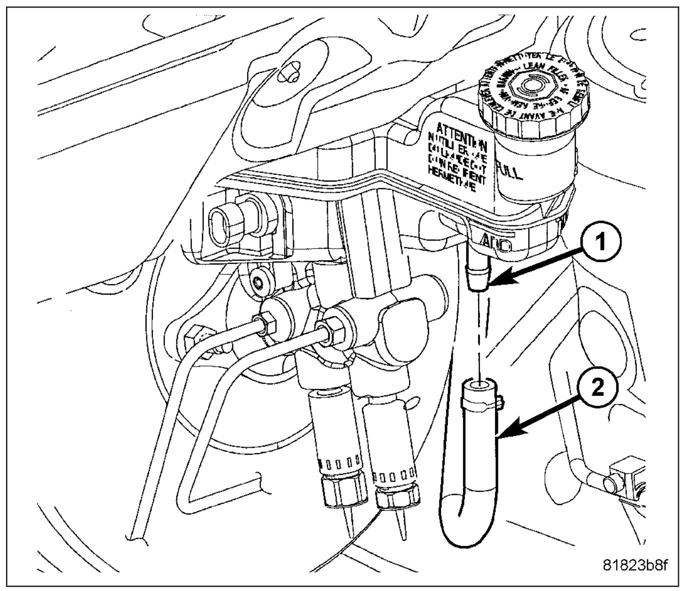
5. Line the master cylinder mounting holes up with the mounting studs on the power brake booster. Ensure the master cylinder piston push rod lines up with the booster push rod, then carefully slide the master cylinder into the power brake booster until it contacts the face of the booster.
6. Install two NEW master cylinder mounting nuts (3). Tighten each nut to 25 N·m (18 ft. lbs.).



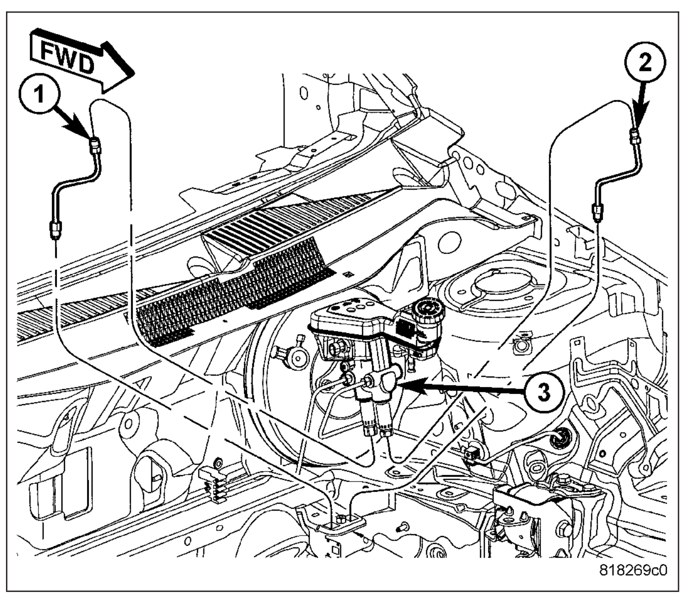
7. If equipped with a manual transaxle and a new reservoir is being installed, using an appropriate cutting tool, cut the clutch actuator port at the center of the "V" groove (2) opening the hydraulic clutch port (1). Discard the severed plug (3).



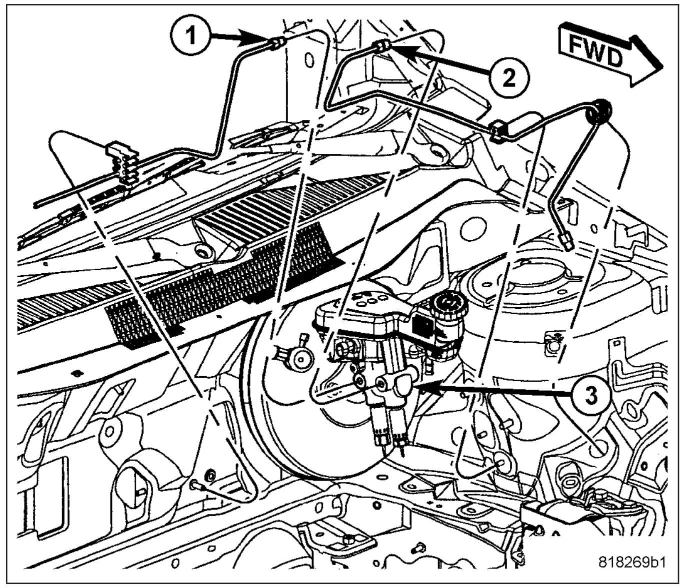
8. If equipped with a manual transaxle, slide the clutch actuator hose (2) onto the reservoir port (1). Install the hose clamp just past the upset bead on the port.



9. Connect the two rear brake tubes (1, 2) to the proportioning valves on the master cylinder (3). Tighten the tube nuts to 17 N·m (150 in. lbs.).



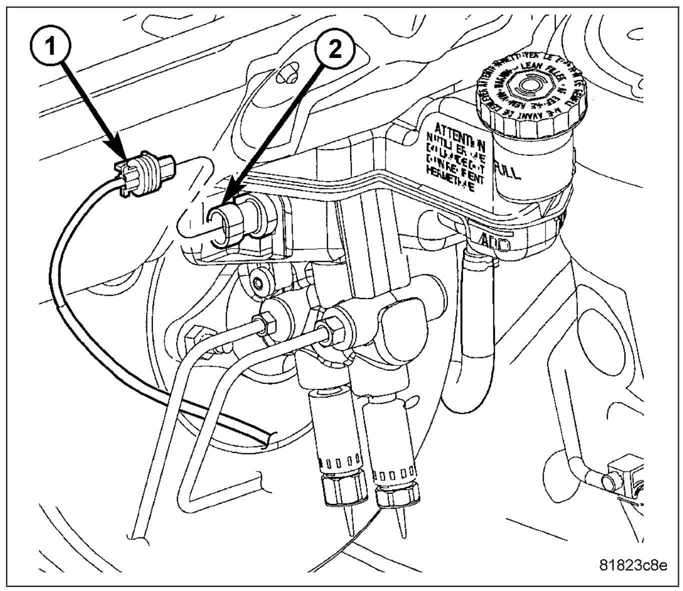
10. Connect the two front brake tubes (1, 2) to the master cylinder. Tighten the tube nuts to 17 N·m (150 in. lbs.).



11. Connect the wiring harness connector (1) to the brake fluid level switch (2).
12. Connect the negative (ground) cable on the battery.
13. Fill the master cylinder reservoir to the proper level. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - STANDARD PROCEDURE)

WARNING: Be certain a firm brake pedal is achieved prior to attempting to operate the vehicle. If a firm brake pedal cannot be achieved, bleed the brake hydraulic system and check for leaks. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

14. Road test the vehicle to ensure proper operation of the brakes.

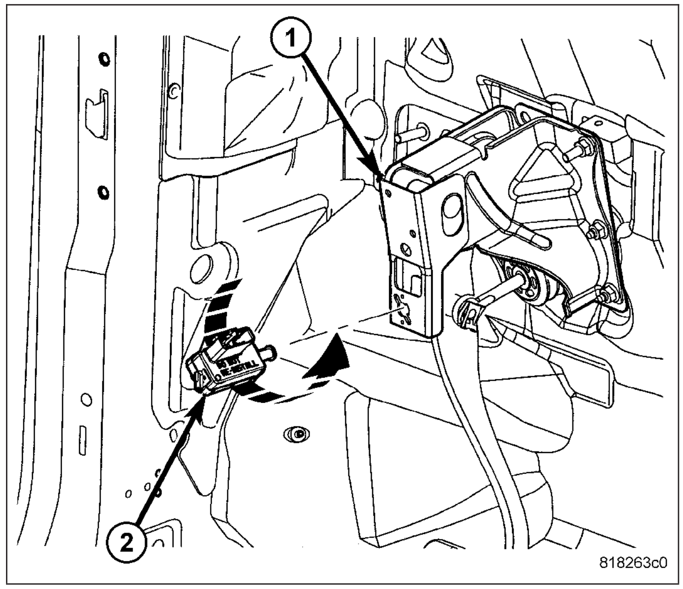


PEDAL

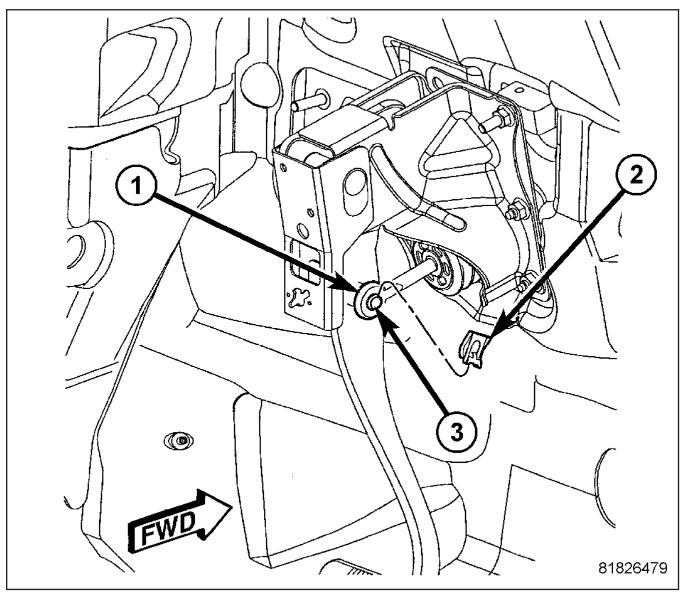
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

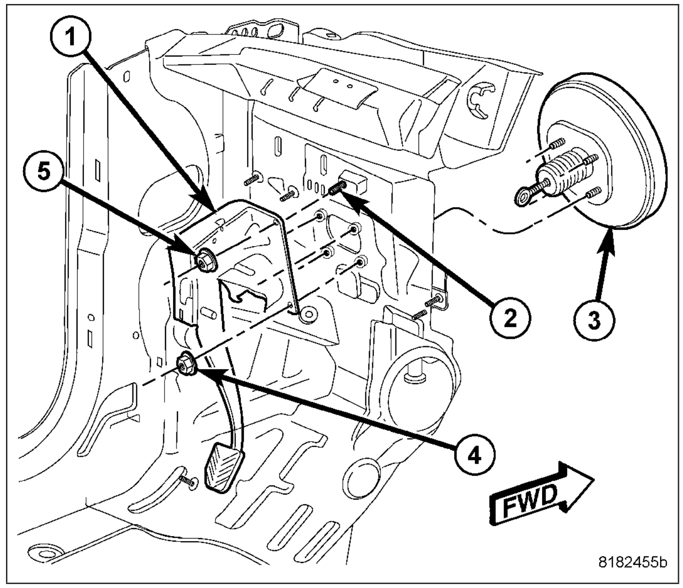
1. Disconnect and isolate the battery negative cable from its post on the battery.
2. If equipped, remove the silencer pad below the steering column opening cover.
3. Remove the steering column opening cover on the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL)
4. Remove the reinforcement behind the steering column opening cover.
5. Remove the stop lamp switch (2) and discard it. **Do not reuse the stop lamp switch.** (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - REMOVAL)



6. Remove the retaining clip (2) securing the power brake booster push rod (1) to the brake pedal. To do so, position a small screwdriver under the center tang of the retaining clip, then rotate the screwdriver enough to allow the retaining clip tang to pass over the end of the brake pedal pin (3). Remove and discard the clip. **Do not reuse the clip.**
7. Slide the booster push rod (1) off the brake pedal pin (3).

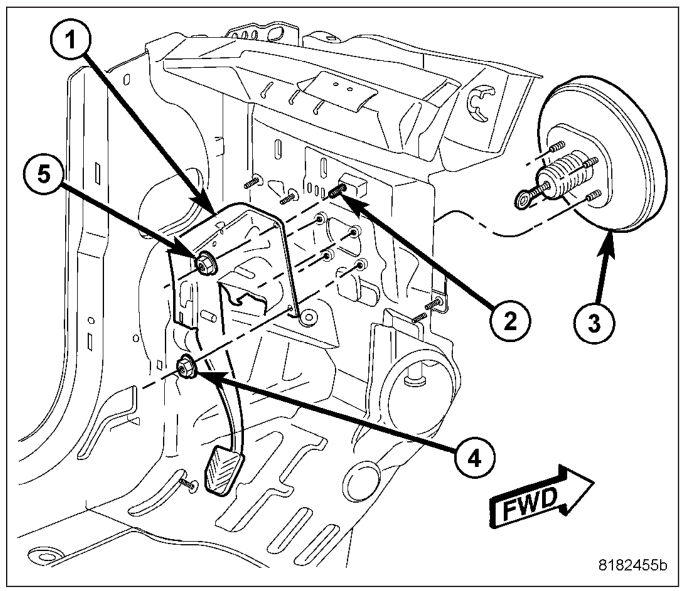


8. Remove the four nuts (4) attaching the brake pedal (1) (and power brake booster) to the dash panel.
9. Remove the remaining nut (5) attaching the brake pedal (1) to the dash panel.
10. Remove the brake pedal (1).



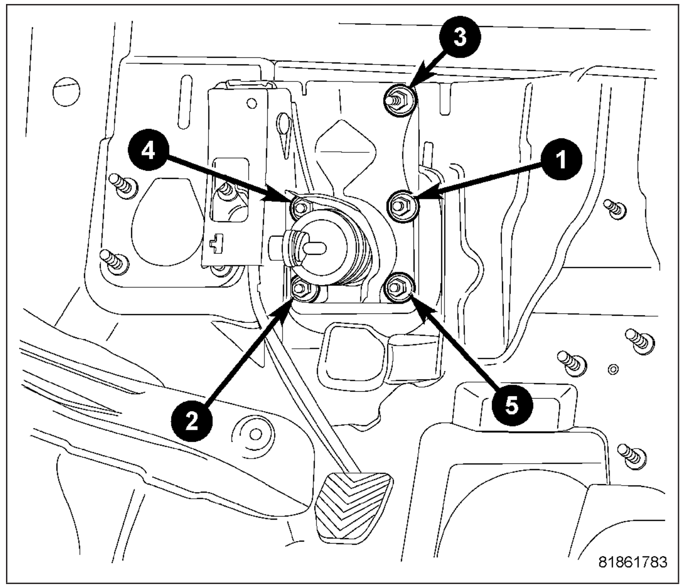
INSTALLATION

1. Carefully install the brake pedal and bracket assembly (1) in the vehicle lining up the bracket with the power brake booster mounting studs and the stud (2) on the dash panel.
2. Install the four nuts (4) attaching the brake pedal (1) (and power brake booster) to the dash panel. **Do not tighten the nuts at this time.**
3. Install the remaining nut (5) attaching the brake pedal (1) to the dash panel. To tighten this nut, refer to the following step.

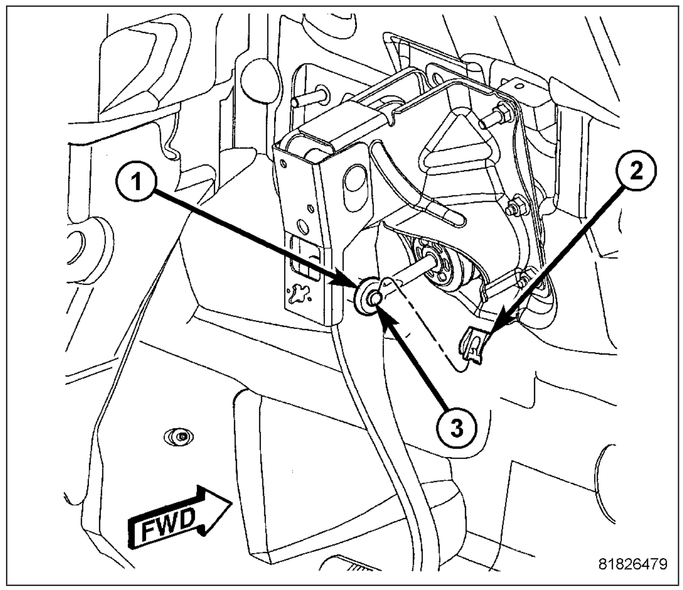


CAUTION: Because of power brake booster design, it is very important to tighten the mounting nuts in the proper sequence.

4. Tighten the brake pedal/booster mounting nuts in the proper sequence to 23 N·m (17 ft. lbs.).

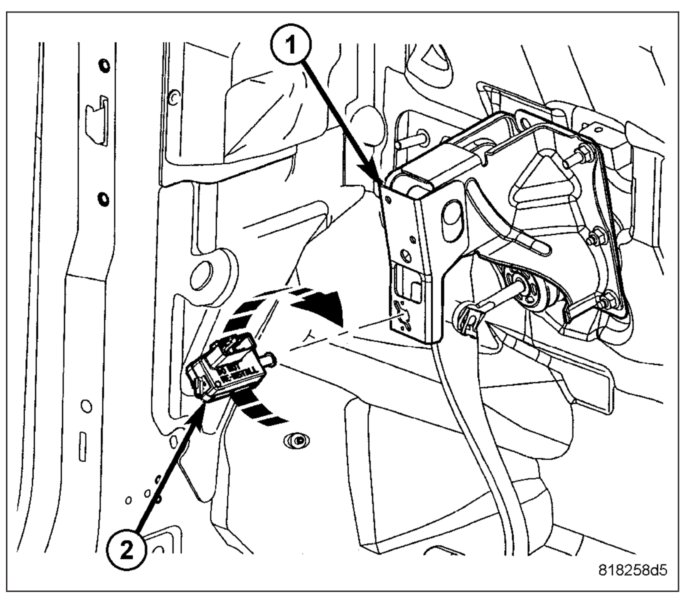


5. Using Mopar® Lubriplate, or an equivalent, coat the surface of the brake pedal pin (3) where it contacts the brake booster input rod (1).
6. Install the power brake booster push rod (1) on the pin (3) mounted on the side of the brake pedal. Install a NEW retaining clip (2) on the end of the pin. **Do not reuse the old clip.**



CAUTION: Do not reuse the original stop lamp switch. The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.

7. Install and adjust a NEW stop lamp switch (2) in the brake pedal bracket (1). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION)
8. Install the steering column opening cover reinforcement in the steering column opening.
9. Install the steering column opening cover on the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION)
10. If equipped, install the silencer pad below the instrument panel.



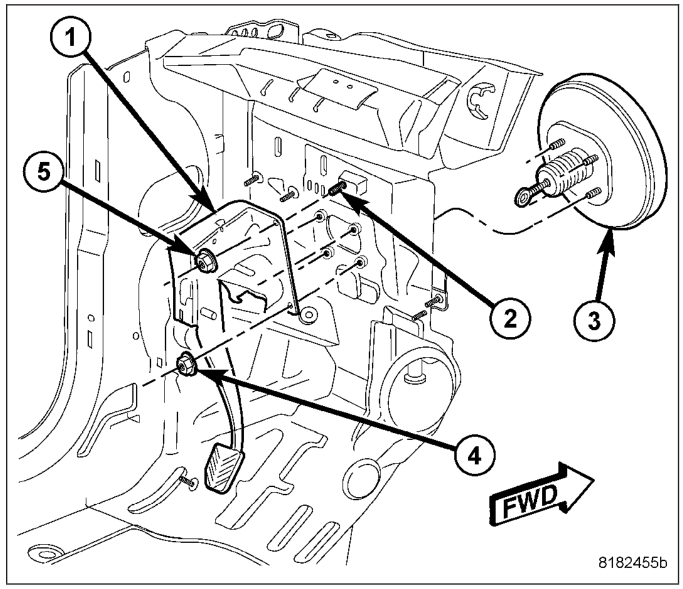
11. Connect the battery negative cable to its post on the battery.
12. Check the stop lamps to verify they are operating properly and not staying on when the pedal is in the released position.
13. Road test the vehicle to ensure proper operation of the brakes.

BOOSTER-POWER BRAKE

DESCRIPTION

The power brake booster (3) is mounted to the engine side of the dash panel. The master cylinder is bolted to the front of the booster. A vacuum check valve is also mounted on the front of the booster. A vacuum line connects the check valve to engine source vacuum. The booster input rod extends through the dash panel and connects to the brake pedal.

This vehicle uses a 254 mm single diaphragm power brake booster. Power brake boosters are internally tuned differently depending on whether the vehicle is equipped with ABS or without ABS. If the power brake booster requires replacement, be sure it is replaced with the correct part.



The power brake booster can be identified by the tag attached to the body of the booster. This tag contains the following information:

- The production part number
- The date it was built, and
- The booster manufacturer.

DIAGNOSIS AND TESTING

POWER BRAKE BOOSTER

BASIC TEST

1. With engine off, depress and release the brake pedal several times to purge all vacuum from the power brake booster.
2. Depress and hold the pedal with light effort (15 to 25 lbs. pressure), then start the engine.

The pedal should fall slightly, then hold. Less effort should be needed to apply the pedal at this time. If the pedal fell as indicated, perform the VACUUM LEAK TEST listed after the BASIC TEST. If the pedal did not fall, continue on with this BASIC TEST.

3. Disconnect the vacuum hose at the vacuum check and tee-in a vacuum gauge.
4. Start the engine.
5. When the engine is at warm operating temperature, allow it to idle and check the vacuum at the gauge.

If the vacuum supply is 12 inches Hg (40.5 kPa) or more, the power brake booster is defective and must be replaced. If the vacuum supply is below 12 inches, continue on with this BASIC TEST.

6. Shut off the engine.
7. Connect the vacuum gauge to the vacuum reference port on the engine intake manifold.
8. Start the engine and observe the vacuum gauge.

If the vacuum is still low, check the engine tune and repair as necessary. If the vacuum is above 12 inches, the hose or check to the booster has a restriction or leak.

Once an adequate vacuum supply is obtained, repeat the BASIC TEST.

VACUUM LEAK TEST

1. Disconnect the vacuum hose at the vacuum check and tee-in a vacuum gauge.
2. Start the engine.
3. Allow the engine to warm up to normal operating temperature and engine idle.
4. Using vacuum line pliers, close off the vacuum supply hose near the booster and observe the vacuum gauge.

If the vacuum drop exceeds 1.0 inch Hg (3.3 kPa) in one minute, repeat the above steps to confirm the reading. The vacuum loss should be less than 1.0 inch Hg in one minute time span. If the loss is more than 1.0 inch Hg, replace the power brake booster. If it is not, continue on with this test.

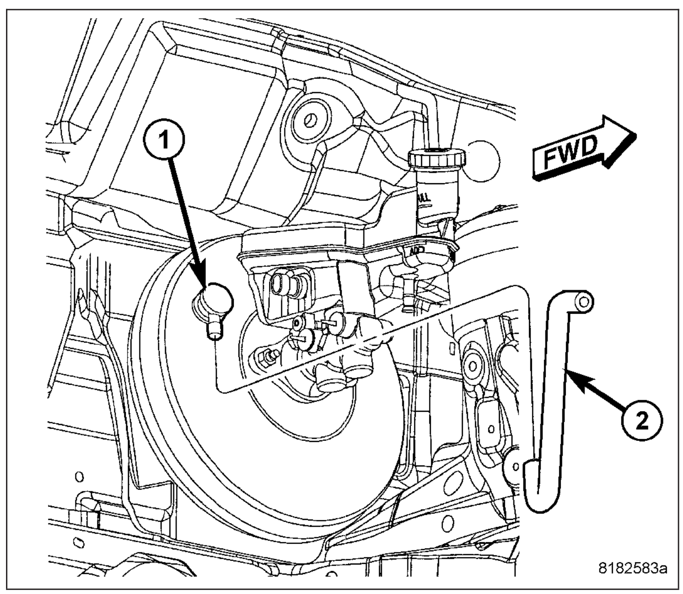
5. Remove the pliers from the hose temporarily.
6. Apply light effort (approximately 15 lbs. of force) to the brake pedal and hold the pedal steady. Do not move the pedal once the pressure is applied or the test results may vary.
7. Have an assistant reattach the pliers to the vacuum supply hose.
8. Allow 5 seconds for stabilization, then observe the vacuum gauge.

If the vacuum drop exceeds 3.0 inches Hg (10 kPa) in 15 seconds, repeat the above steps to confirm the reading. The vacuum loss should be less than 3.0 inches Hg in 15 seconds time span. If the loss is more than 3.0 inches Hg, replace the power brake booster. If it is not, the booster is not defective.

REMOVAL

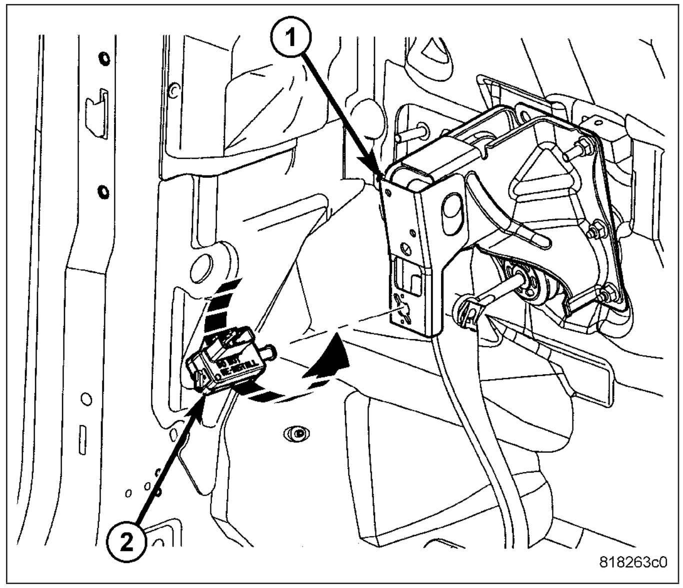
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Disconnect and isolate the battery negative cable from its post on the battery.
2. Remove the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL)
3. Disconnect the vacuum hose (2) from the check valve (1) on the power brake booster. **Do do not remove the check valve from power brake booster.**

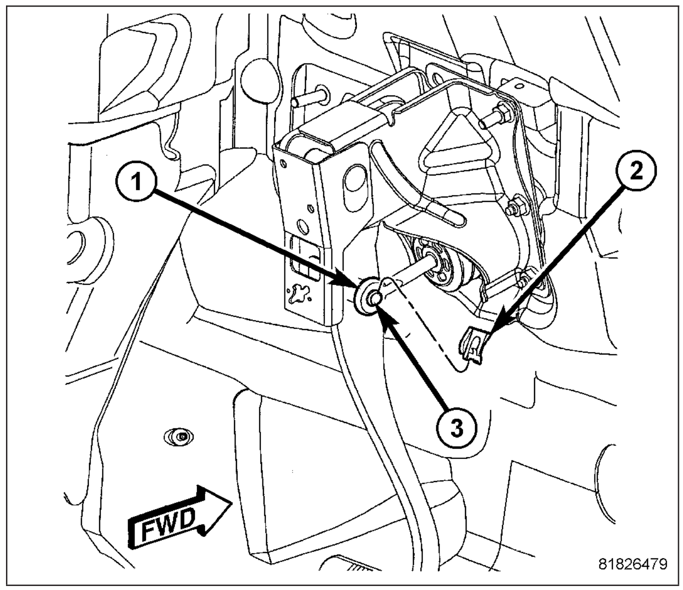


4. If equipped, remove the silencer pad below the steering column opening cover.
5. Remove the steering column opening cover on the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL)
6. Remove the reinforcement behind the steering column opening cover.

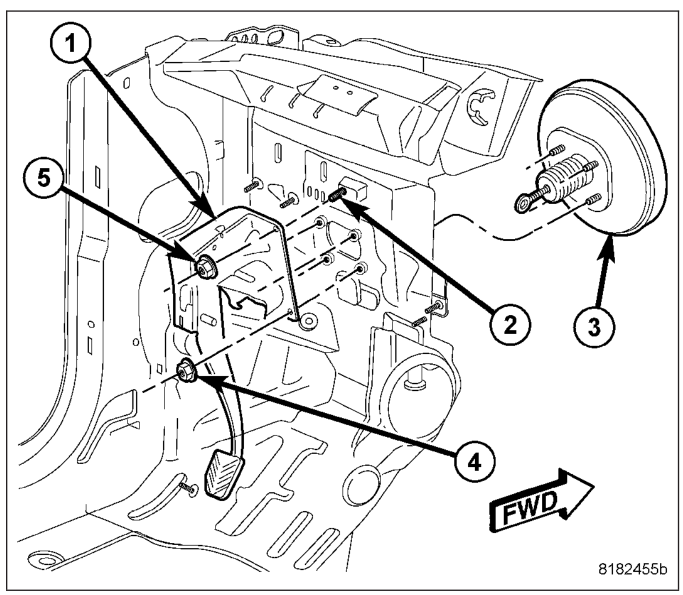
7. Remove the stop lamp switch (2) and discard it. **Do not reuse the stop lamp switch.** (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ STOP LAMP SWITCH - REMOVAL)



8. Remove the retaining clip (2) securing the power brake booster push rod (1) to the brake pedal. To do so, position a small screwdriver under the center tang of the retaining clip, then rotate the screwdriver enough to allow the retaining clip tang to pass over the end of the brake pedal pin (3). Remove and discard the clip. **Do not reuse the clip.**
9. Slide the booster push rod (1) off the brake pedal pin (3).

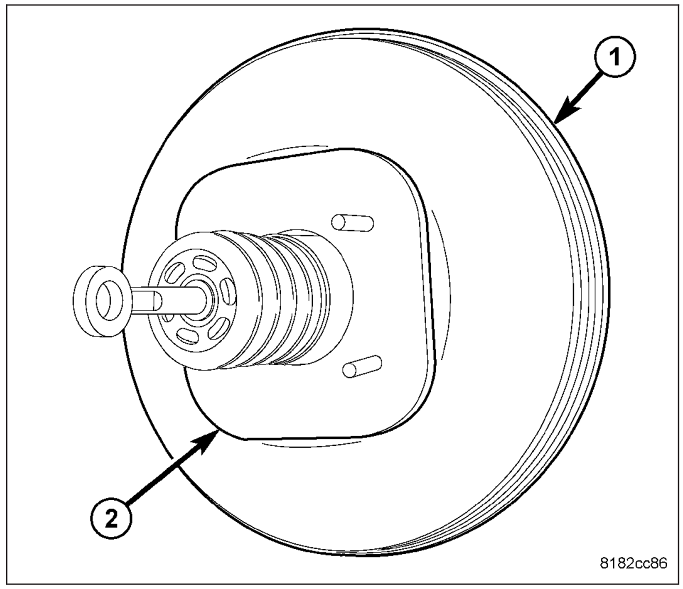


10. Remove the four nuts (4) attaching the power brake booster (3) to the dash panel.
11. Slide the power brake booster (3) forward until its mounting studs clear the dash panel, then remove it through the engine compartment.

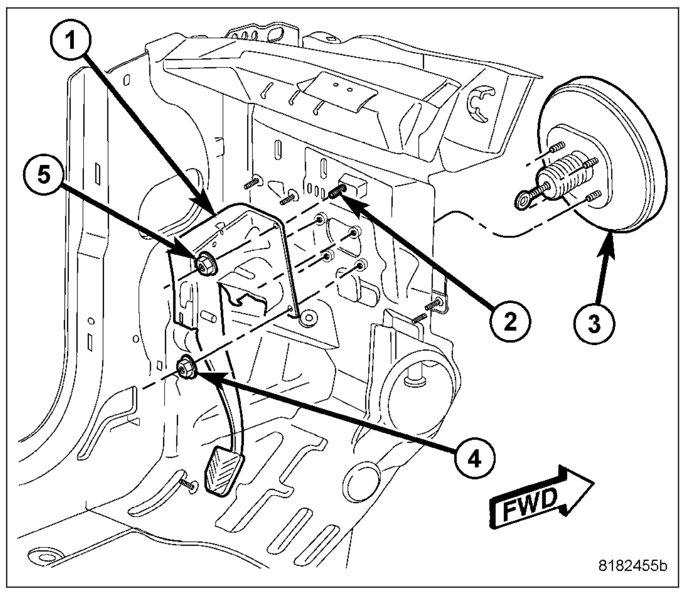


INSTALLATION

NOTE: Before power brake booster (1) installation, be certain a NEW dash seal (2) is installed on the booster mounting studs.

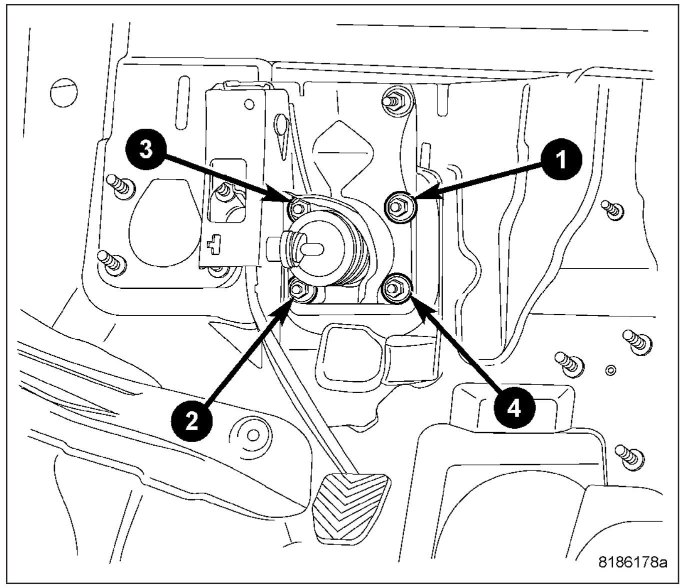


1. Install the power brake booster (3) by sliding the push rod and studs through the dash panel and into mounting position.
2. Under the instrument panel, install the four power brake booster mounting nuts (4). To tighten the nuts, refer to the following step.

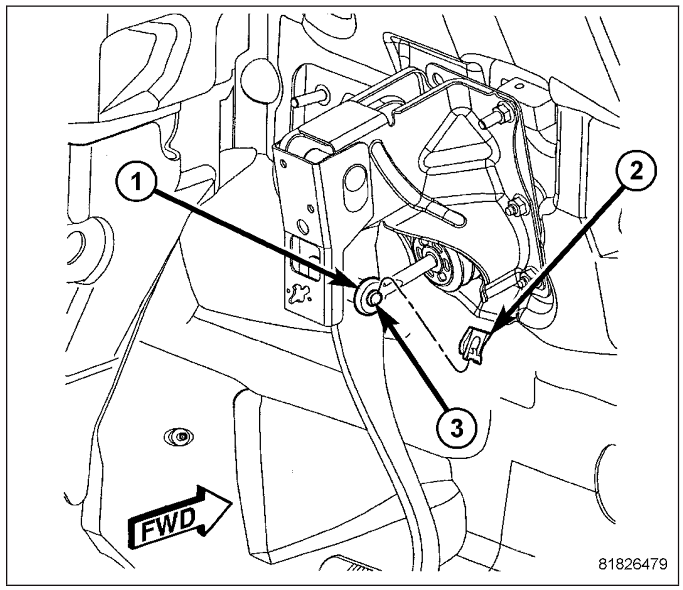


CAUTION: Because of power brake booster design, it is very important to tighten the mounting nuts in the proper sequence.

3. Tighten the brake pedal/booster mounting nuts in the proper sequence to 23 N·m (17 ft. lbs.).

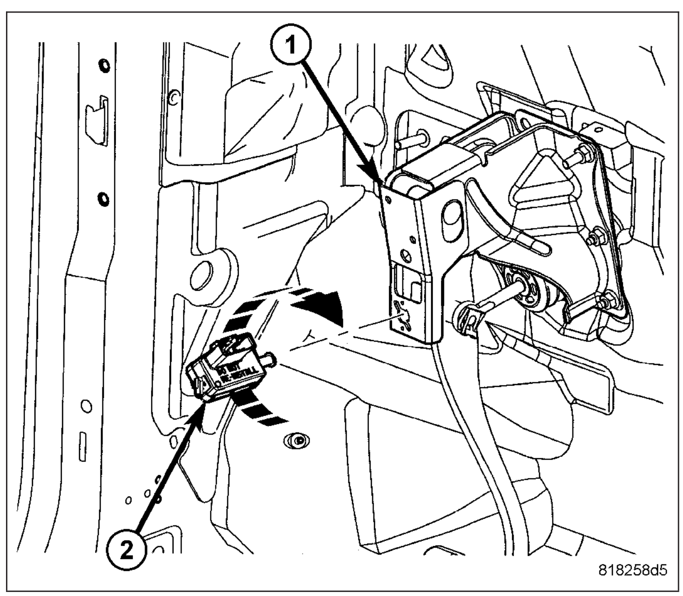


4. Using Mopar® Lubriplate, or an equivalent, coat the surface of the brake pedal pin (3) where it contacts the brake booster input rod (1).
5. Install the power brake booster push rod (1) on the pin (3) mounted on the side of the brake pedal. Install a NEW retaining clip (2) on the end of the pin. **Do not reuse the old clip.**



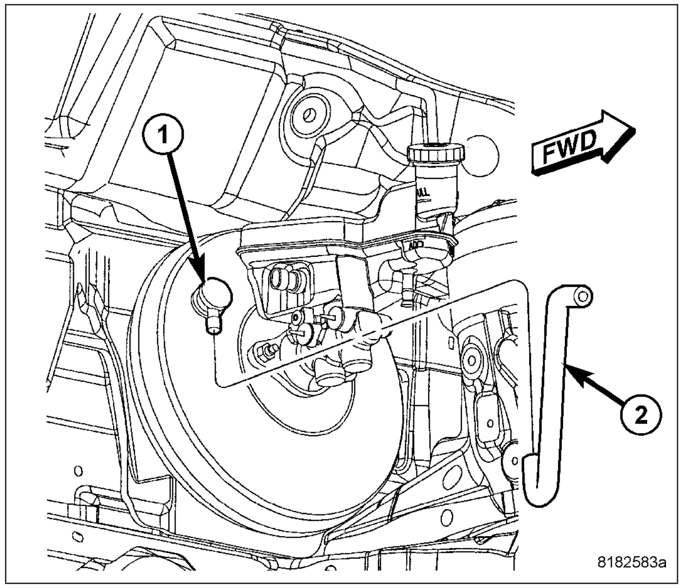
CAUTION: Do not reuse the original stop lamp switch. The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.

6. Install and adjust a NEW stop lamp switch (2) in the brake pedal bracket (1). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION)
7. Install the steering column opening cover reinforcement in the steering column opening.
8. Install the steering column opening cover on the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION)
9. If equipped, install the silencer pad below the instrument panel.



CAUTION: When installing the vacuum hose on the check valve (1), make sure the hose is routed properly to avoid possible contact with unfriendly surfaces.

10. Connect the vacuum hose (2) to the vacuum check valve (1).
11. Install the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)
12. Connect the battery negative cable to its post on the battery.
13. Bleed the base brake system if necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
14. Road test the vehicle to ensure proper operation of the brakes.



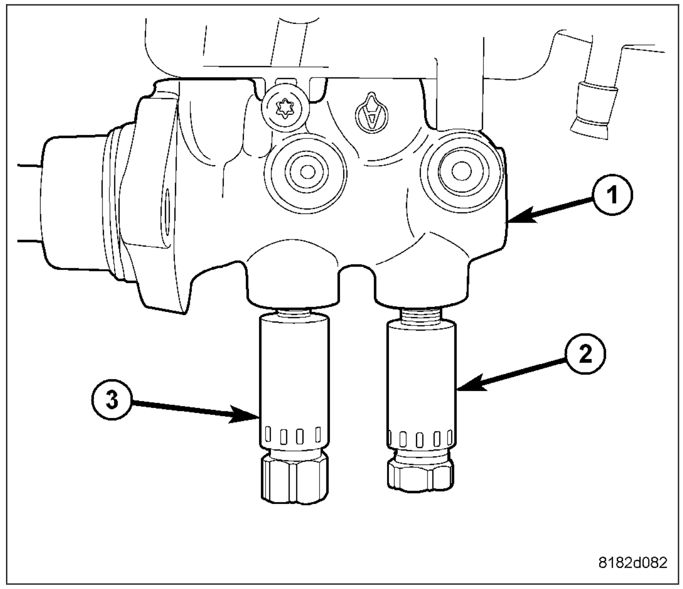
VALVE-PROPORTIONING

DESCRIPTION

NOTE: Only vehicles without antilock brakes have proportioning valves. Vehicles with antilock brakes have Electronic Variable Brake Proportioning (EVBP) that is built into the Integrated Control Unit (ICU).

On the non-antilock master cylinder (1), two screw-in proportioning valves (2, 3) are screwed directly into the rear brake outlet ports. The chassis brake tubes leading to the rear brakes attach to the outlets of the proportioning valves. One proportioning valve controls each rear brake.

The proportioning valves are not identical and cannot be interchanged. The proportioning valve that threads into the primary port (3) has M10 x 1 threads going into the master cylinder (1). The proportioning valve that threads into the secondary port (2) has M12 x 1 threads going into the master cylinder (1).



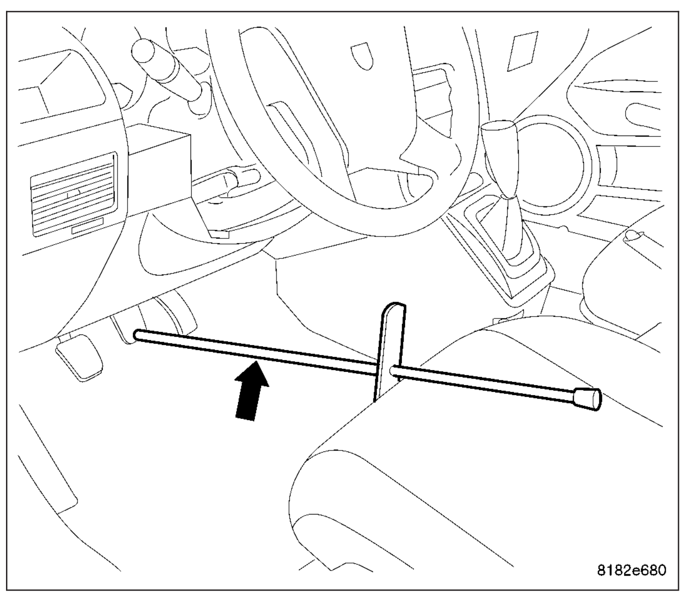
OPERATION

Proportioning valves balance front to rear braking by controlling the brake fluid hydraulic pressure to the rear brakes above a preset level (split point). Under light pedal application, the proportioning valve allows normal fluid flow to the rear brakes. Under higher pedal effort, the valve reduces fluid pressure to the rear brakes. This helps prevent rear wheel skid tendencies.

REMOVAL

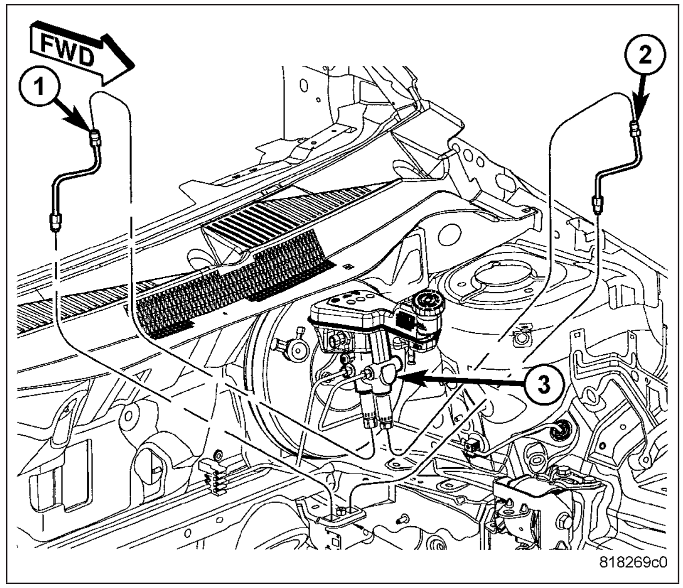
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Using a brake pedal holder, depress the brake pedal past its first one inch (25 mm) of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.

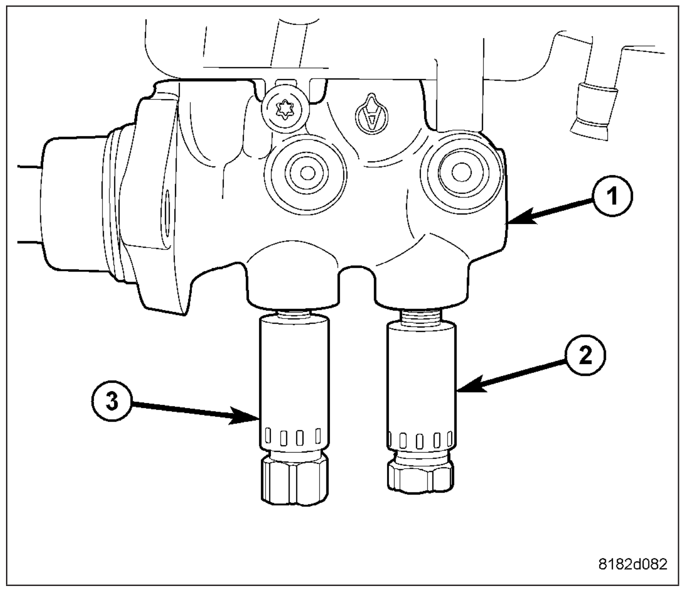


NOTE: To access the lower (left rear) proportioning valve, it may help to remove the air cleaner cover and hose to the throttle body.

2. Disconnect the brake tube (1 or 2) from the proportioning valve requiring removal.

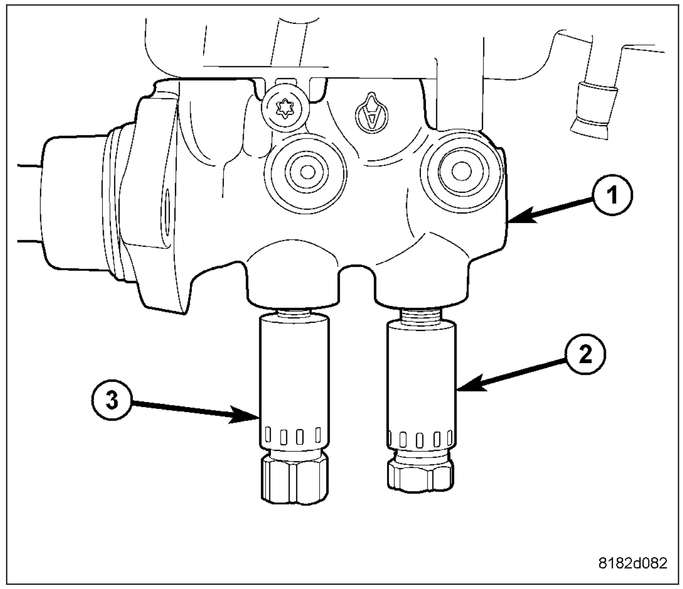


3. Unscrew the proportioning valve (2 or 3) from the master cylinder (1).

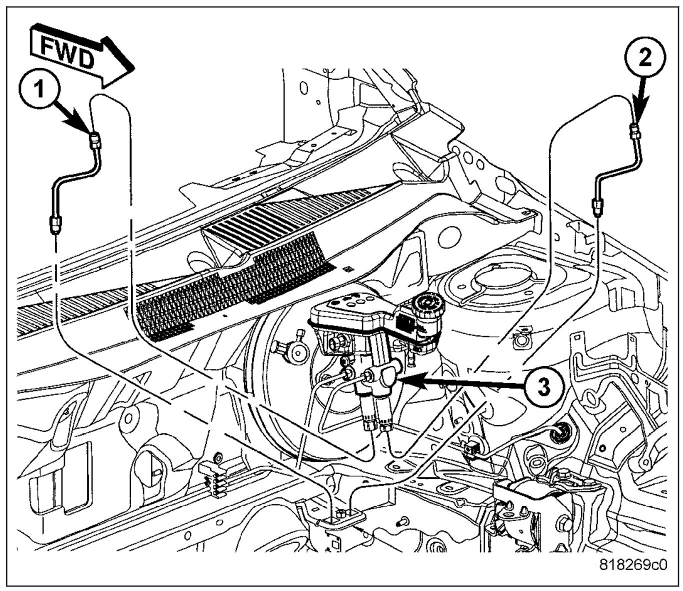


INSTALLATION

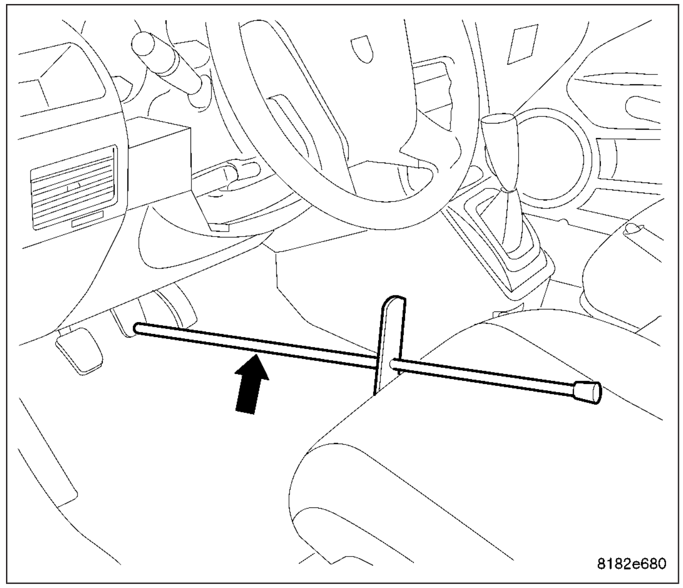
1. Install the proportioning valve (2 or 3) in its master cylinder (1) port. Tighten the proportioning valve to 17 N·m (150 in. lbs.).



2. Install the correct brake tube (1 or 2) to the proportioning valve. Tighten the tube nut to 30 N·m (22 ft. lbs.).



3. Remove the brake pedal holder.
4. Bleed the affected brake line(s). (Refer to 5 - BRAKES - STANDARD PROCEDURE)
5. Road test the vehicle to ensure proper operation of the brakes.



ROTOR

DIAGNOSIS AND TESTING

BRAKE ROTOR

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

Excessive runout or wobble in a rotor can increase pedal travel due to piston knock-back. This increases guide pin sleeve wear due to the tendency of the caliper to follow the rotor wobble.

When diagnosing a brake noise or pulsation, the machined disc braking surface should be inspected.

BRAKING SURFACE INSPECTION

Light braking surface scoring and wear is acceptable. If heavy scoring or warping is evident, the rotor must be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - STANDARD PROCEDURE).

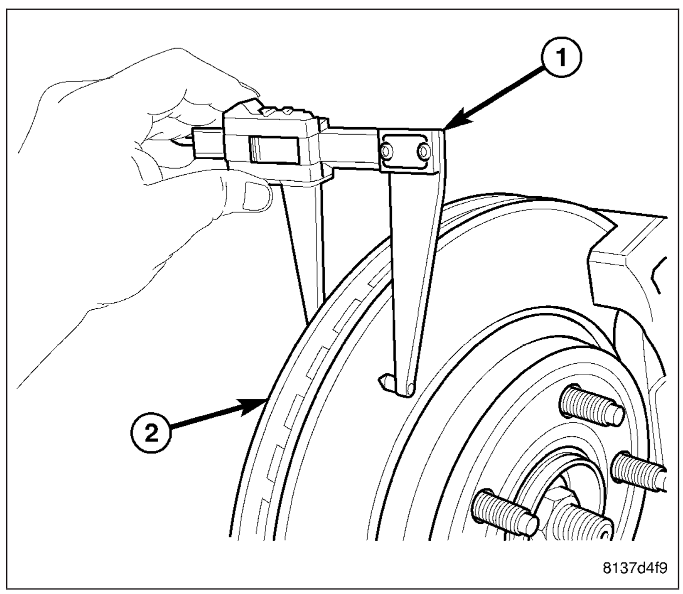
Excessive wear and scoring of the rotor can cause improper lining contact on the rotor's braking surface. If the ridges on the rotor are not removed before new brake shoes are installed, improper wear of the shoes will result.

If a vehicle has not been driven for a period of time, the rotor's braking surface will rust in the areas not covered by the brake shoes at that time. Once the vehicle is driven, noise and chatter from the disc brakes can result when the brakes are applied.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced. If cracks or burned spots are evident, the rotor must be replaced.

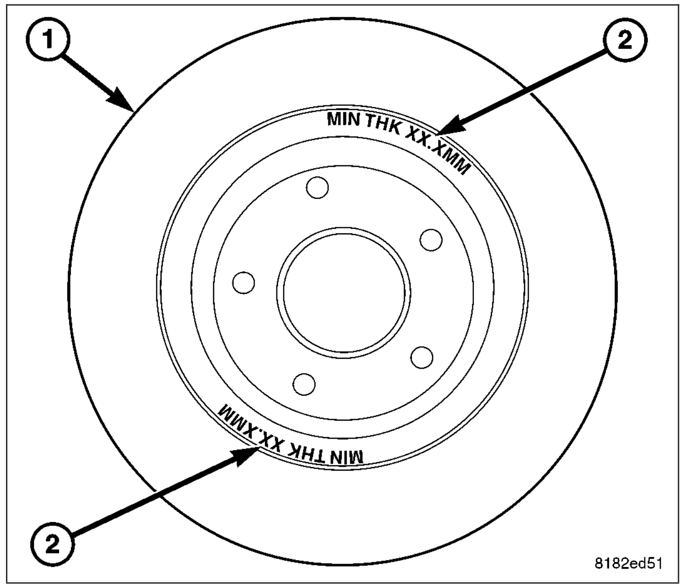
ROTOR MINIMUM THICKNESS

Measure rotor thickness (1) at the center of the brake pad contact surface. Replace the rotor if it is worn below minimum thickness or if machining the rotor will cause its thickness to fall below specifications.

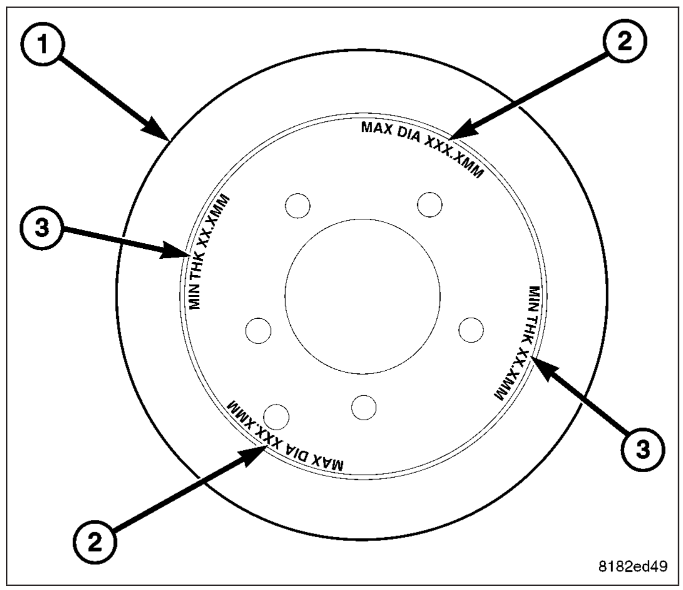


CAUTION: Do not machine the rotor if it will cause the rotor to fall below minimum thickness.

On front rotors, Minimum thickness specifications (2) are cast on the rotor's unmachined surface on the inside of the rotor (1). Limits can also be found in this component's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)



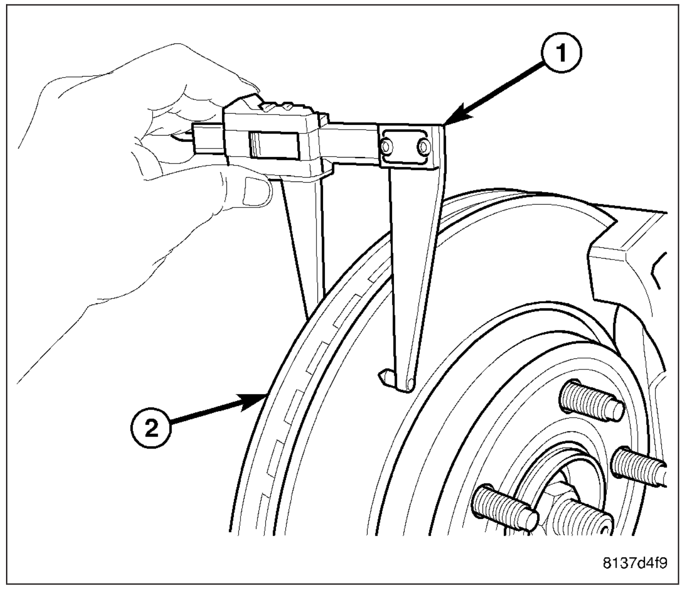
On rear rotors, Minimum thickness specifications (3) are cast into the rotor's unmachined surface on the outside of the rotor (1). This area also shows the maximum thickness specifications (2) for the hat section of the rotor. Limits can also be found in this component's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)



ROTOR THICKNESS VARIATION

Thickness variation in a rotor's braking surface can result in pedal pulsation, chatter and surge. This can also be caused by excessive runout in the rotor or the hub.

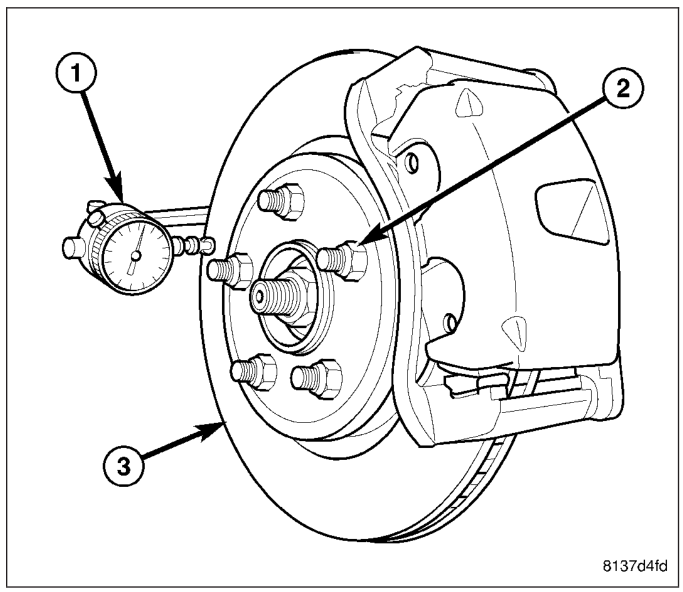
Rotor thickness variation measurements should be made in conjunction with measuring runout. Measure thickness of the brake rotor (2) at 12 equal points around the rotor braking surface with a micrometer (1) at a radius approximately 25 mm (1 inch) from edge of rotor. If thickness measurements vary beyond the specification listed in the specification table (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS), the rotor should be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - STANDARD PROCEDURE).



ROTOR RUNOUT

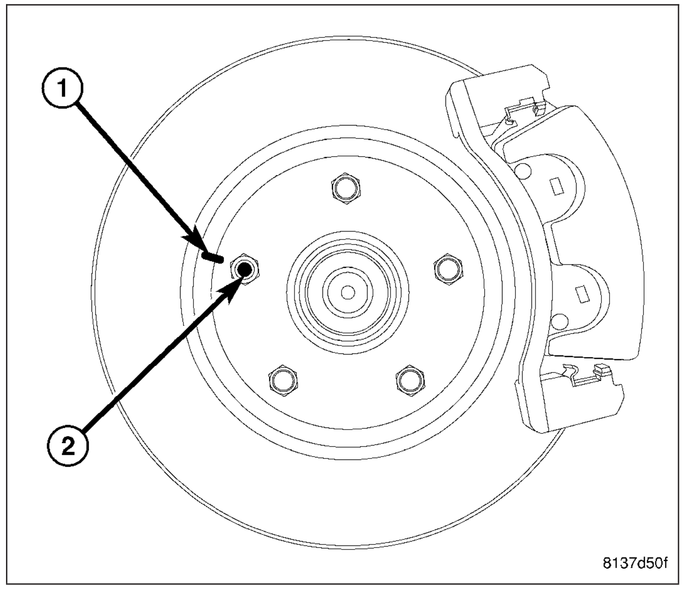
On-vehicle rotor runout is the combination of the individual runout of the hub face and the runout of the brake rotor (hub runout can be measured separately). To measure rotor runout on the vehicle:

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
3. Install standard wheel mounting nuts, flat side to rotor, on all the wheel studs (2). Progressively tighten the nuts in a crisscross pattern to 135 N·m (100 ft. lbs.).
4. Mount Dial Indicator (1), Special Tool C-3339A, with Wheel, Special Tool 25w, or equivalent, to the knuckle. Position the dial indicator wheel to contact the rotor braking surface approximately 10 millimeters from the outer edge of the rotor (3).



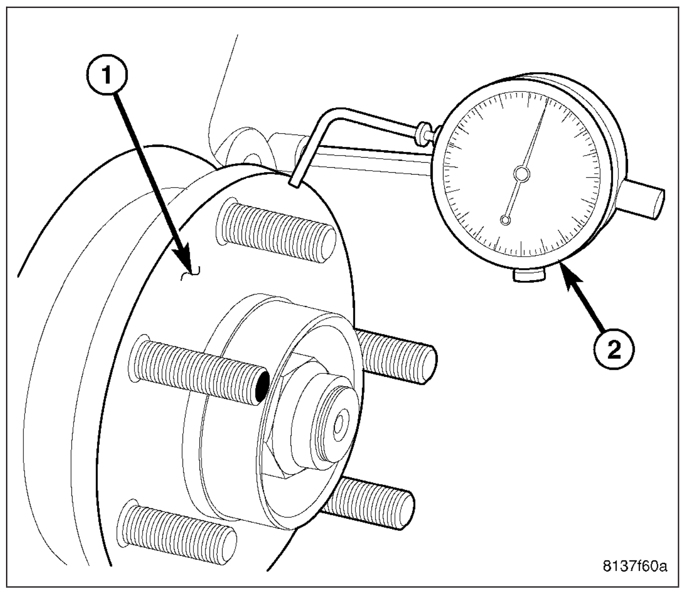
5. Slowly rotate the brake rotor checking lateral runout, marking the low and high spots. Record these measurements.
6. Check and record the runout on the opposite side of the rotor in the same fashion, marking the low and high spots.

7. Compare runout measurement to specifications. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)
8. If runout is in excess of specifications, check the lateral runout of the hub face. Before removing the rotor from the hub, place a chalk mark across both the rotor (1) and the one wheel stud (2) closest to where the high runout measurement was taken. This way, the original mounting spot of the rotor on the hub is indexed.
9. Remove the rotor from the hub. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)



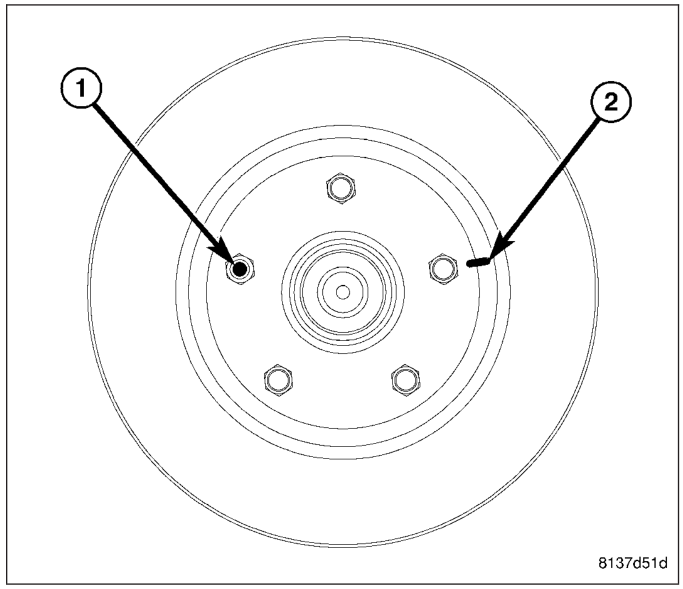
NOTE: Before measuring hub runout, clean the hub face surface with an appropriate cleaner. This provides a clean surface to get an accurate indicator reading.

10. Mount Dial Indicator (2), Special Tool C-3339A, to the knuckle. Position the dial indicator stem so it contacts the hub face (1) near the outer diameter. Care must be taken to position the stem outside of the stud circle, but inside of the chamfer on the hub rim.
11. Slowly rotate the hub measuring runout. Hub runout should not exceed 0.08 mm (0.003 inch). If runout exceeds this specification, the hub must be replaced. (Refer to 2 - SUSPENSION/FRONT/

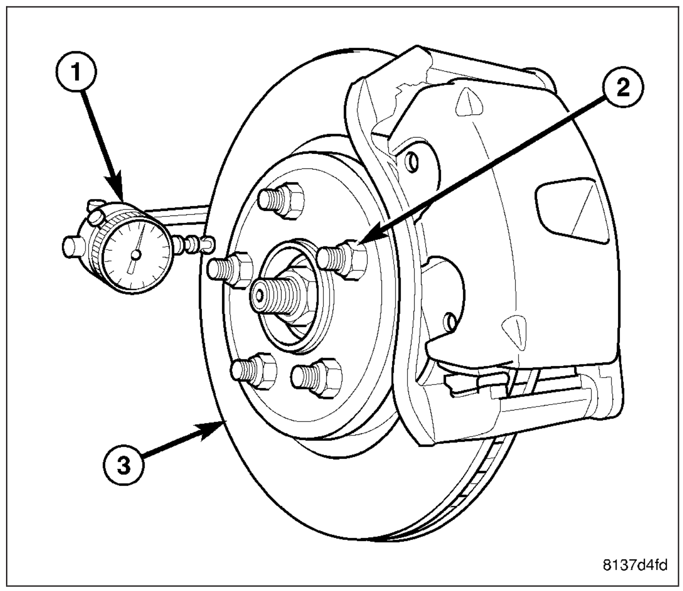


KNUCKLE - REMOVAL) (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)

12. If hub runout does not exceed this specification, install the original rotor back on the hub, aligning the chalk mark on the rotor (2) with a wheel mounting stud, two studs apart from the original stud (1).



13. Install standard wheel mounting nuts, flat side to rotor, on all the wheel studs (2). Progressively tighten the nuts in a crisscross pattern to 135 N·m (100 ft. lbs.).
14. Mount the Dial Indicator (1), Special Tool C-3339A, and remeasure runout on both sides of the brake rotor as explained in earlier steps to see if runout is now within specifications. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)
15. If runout is still not within specifications, reface or replace brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - STANDARD PROCEDURE)



STANDARD PROCEDURE

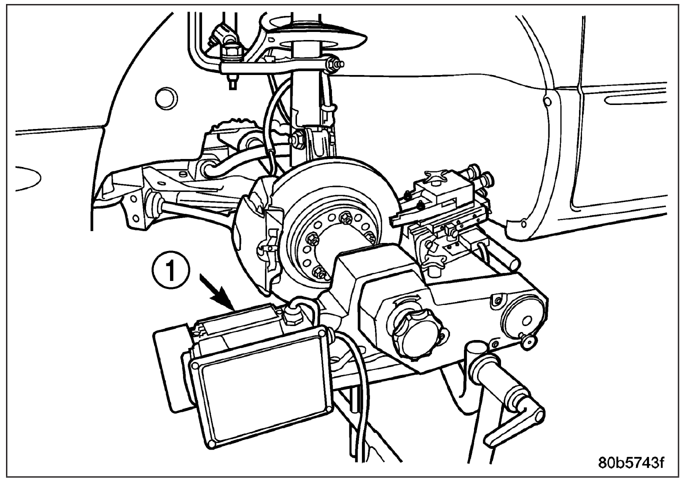
BRAKE ROTOR MACHINING

NOTE: Refacing the rotor is not required each time the brake pads are replaced, only when the need is foreseen.

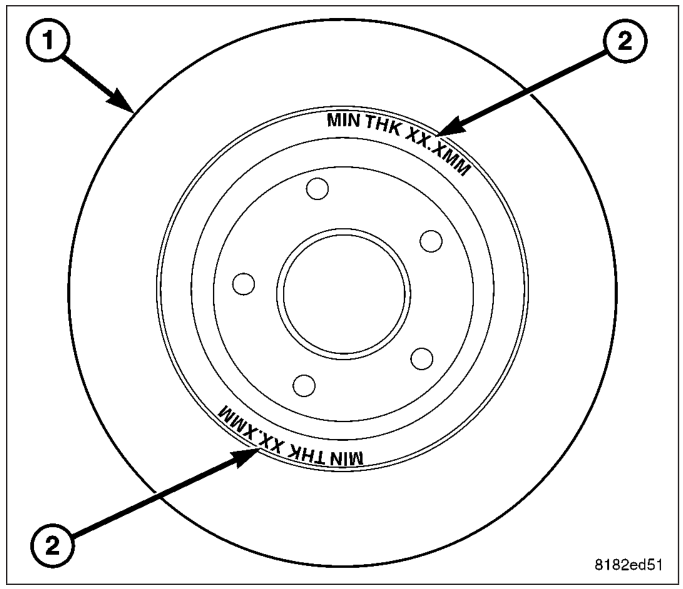
Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

If the rotor surface is deeply scored or warped, or there is a complaint of brake roughness or brake pedal pulsation, the rotor should be refaced using a hub-mounted on-car brake lathe (1), or replaced.

The use of a hub-mounted on-car brake lathe (1) is highly recommended to eliminate the possibility of excessive runout. It trues the brake rotor to the vehicle's hub and bearing.



NOTE: All brake rotors (1) have markings for minimum allowable thickness cast on an unmachined surface of the rotor (2) or stamped into the hat section. On this vehicle, the minimum thickness specification for the front brake rotor is located on the inside of the rotor. The minimum thickness specification for the rear brake rotor is located on the outside of the rotor. Minimum thickness specifications can also be found in this component's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)



Minimum allowable thickness is the minimum thickness which the brake rotor machined surface may be cut to.

CAUTION: Do not machine the rotor if it will cause the rotor to fall below minimum thickness.

Before lathe installation, verify the brake rotor face and the hub adapters are free of any chips, rust, or contamination.

When mounting and using the brake lathe, strict attention to the brake lathe manufacturer's operating instructions is required.

Machine both sides of the brake rotor at the same time. Cutting both sides at the same time minimizes the possibility of a tapered or uneven cut.

When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits MUST BE MAINTAINED. Extreme care in the operation of rotor turning equipment is required. Specifications for brake rotor machining can be found in this sections specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

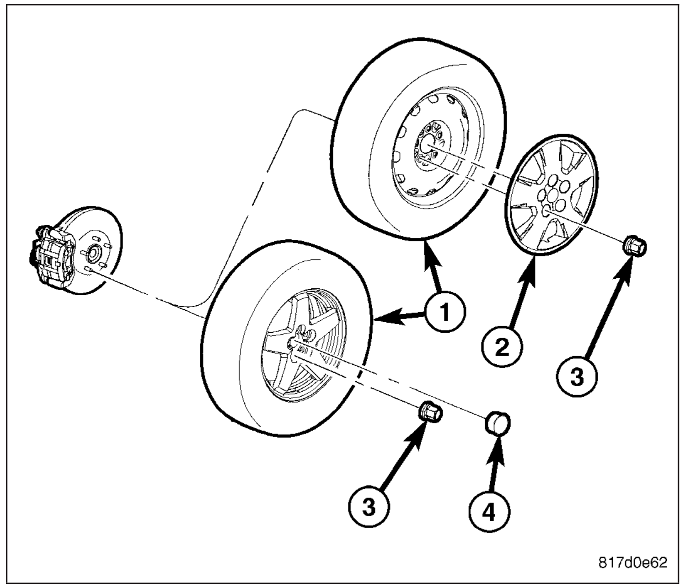
REMOVAL

FRONT BRAKE ROTOR

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

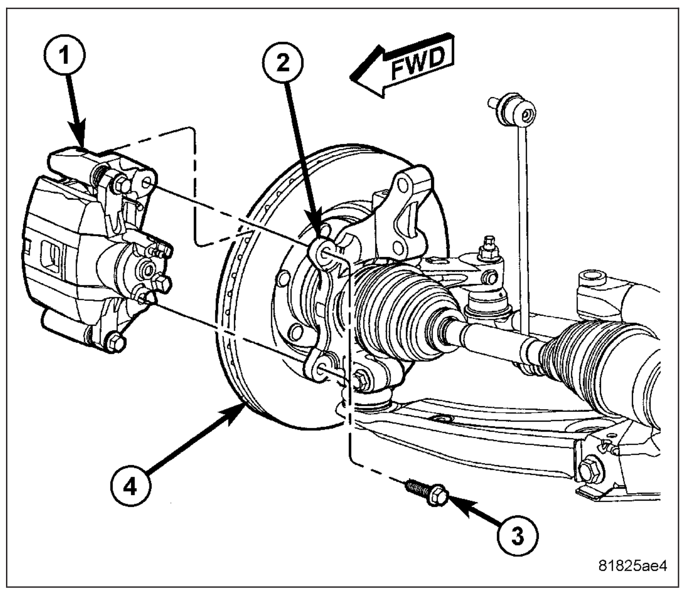
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

2. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).

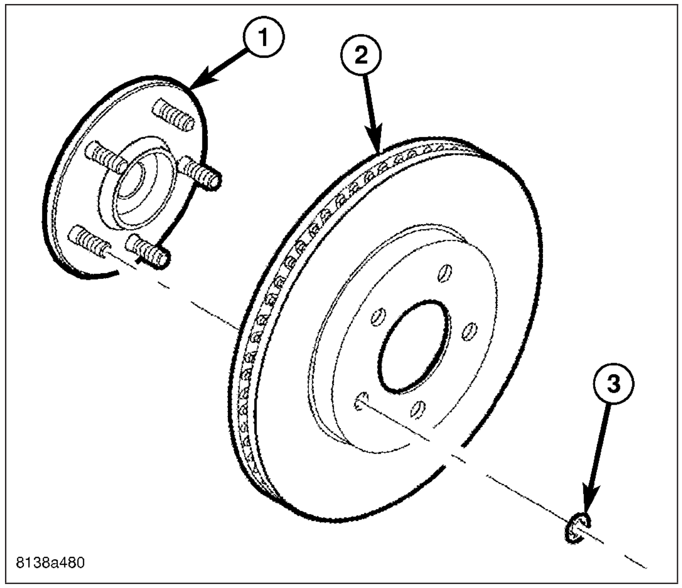


NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the pads and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the inboard side of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

3. Remove the two bolts (3) securing disc brake caliper and adapter bracket (1) to the steering knuckle (2).
4. Remove the disc brake caliper and adapter bracket (1) from the knuckle (2) and rotor (4) as an assembly. Hang the assembly out of the way using wire or a bungee cord. Use care not to overextend the brake hose when doing this.



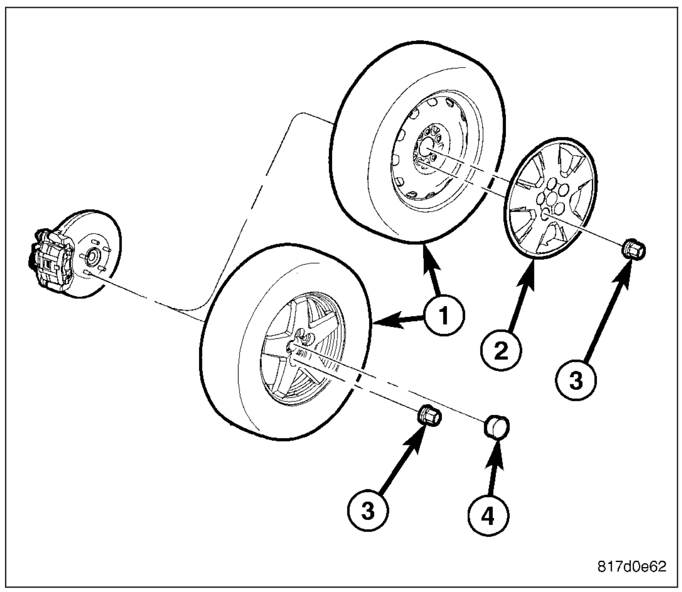
5. Remove any clips (3) retaining the brake rotor (2) to the wheel studs.
6. Slide the brake rotor (2) off the hub and bearing (1).



REAR BRAKE ROTOR

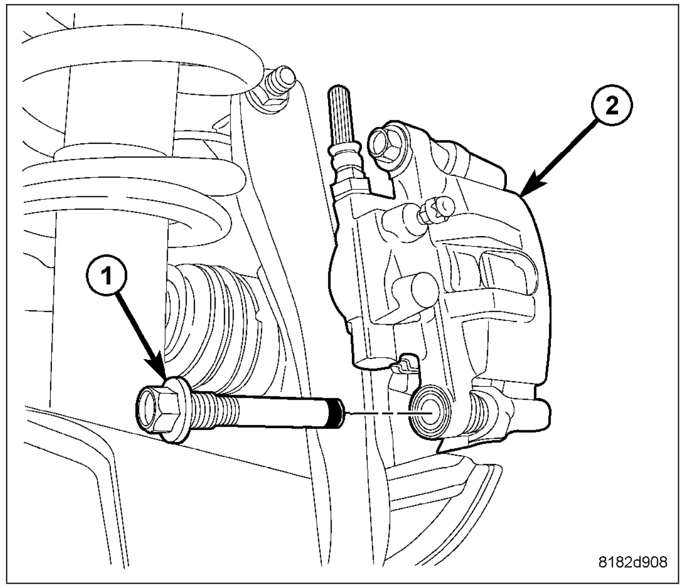
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3), then the tire and wheel assembly.



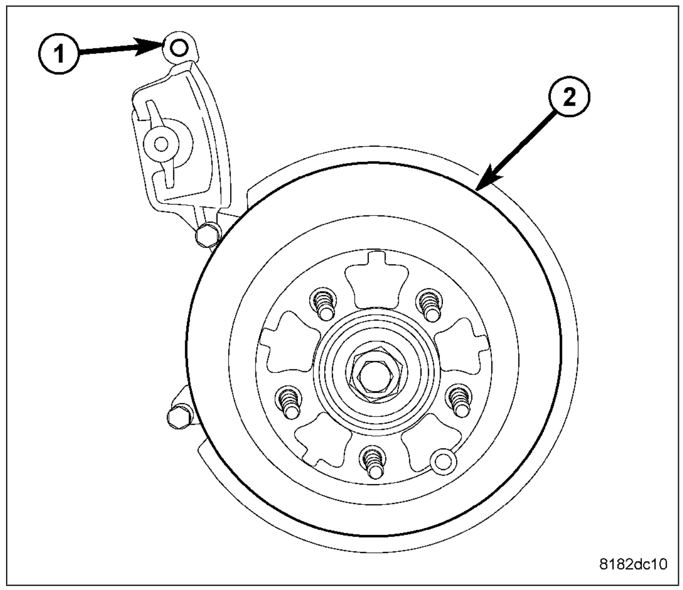
NOTE: In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the pads and the rotor to easily remove the caliper from the knuckle. This can usually be accomplished before the guide pin bolts are removed, by grasping the inboard side of the caliper and pulling outward working with the guide pins, thus retracting the piston. Never push on the piston directly as it may get damaged.

3. Remove the disc brake caliper (2) lower guide pin bolt (1).

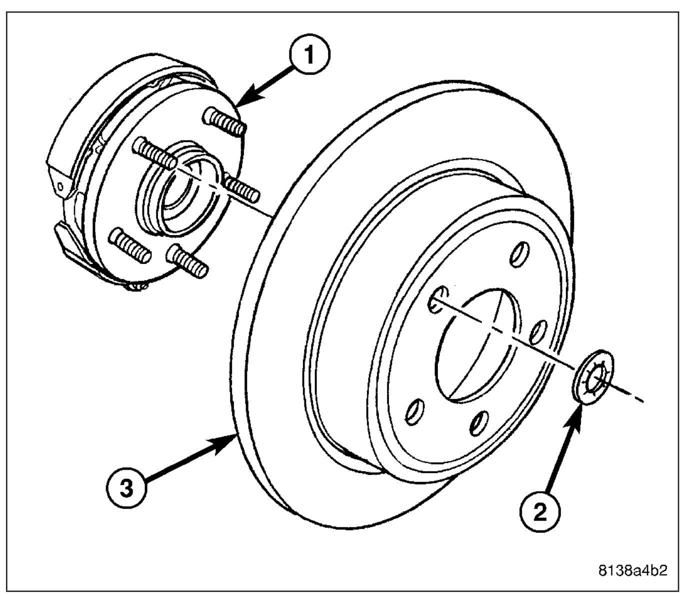


CAUTION: When moving rear brake caliper upward, use extreme care not to damage or over-extend the flex hose. Damage may occur.

4. Rotate the caliper upward hinging off the upper guide pin bolt. Rotate the caliper upward just enough to allow brake rotor removal. Hang the caliper assembly in this position using wire or a bungee cord.



5. Remove any clips (2) retaining the brake rotor (3) to the wheel studs.
6. Slide the brake rotor (3) off the hub and bearing (1) and remove.

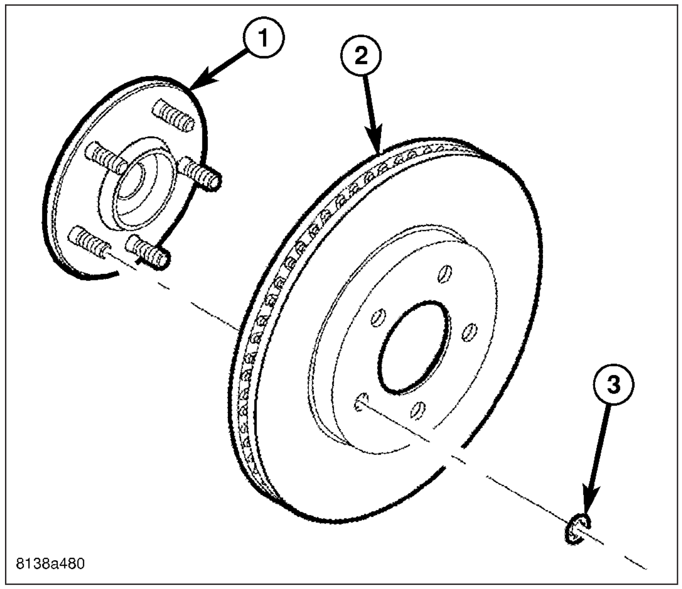


INSTALLATION

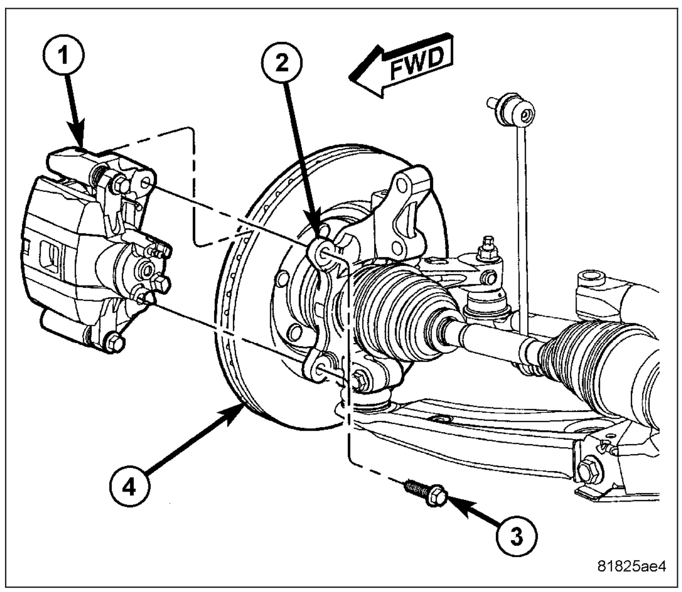
FRONT BRAKE ROTOR

NOTE: Inspect disc brake pads before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

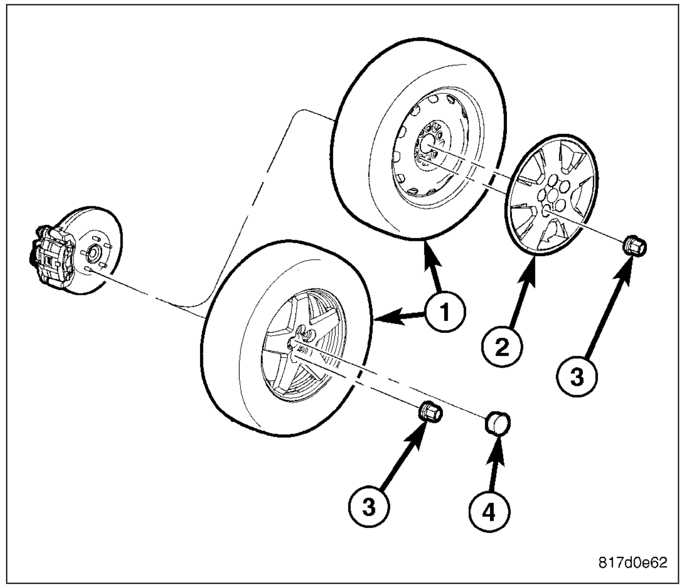
1. Clean the hub face (1) to remove any dirt or corrosion where the rotor mounts.
2. Install the brake rotor (2) over the studs on the hub and bearing.



3. Install the disc brake caliper and adapter bracket assembly (1) over the brake rotor (4) and knuckle (2).
4. Install the mounting bolts (3) securing the caliper adapter bracket to the knuckle (2). Tighten the bolts to 108 N·m (80 ft. lbs.).



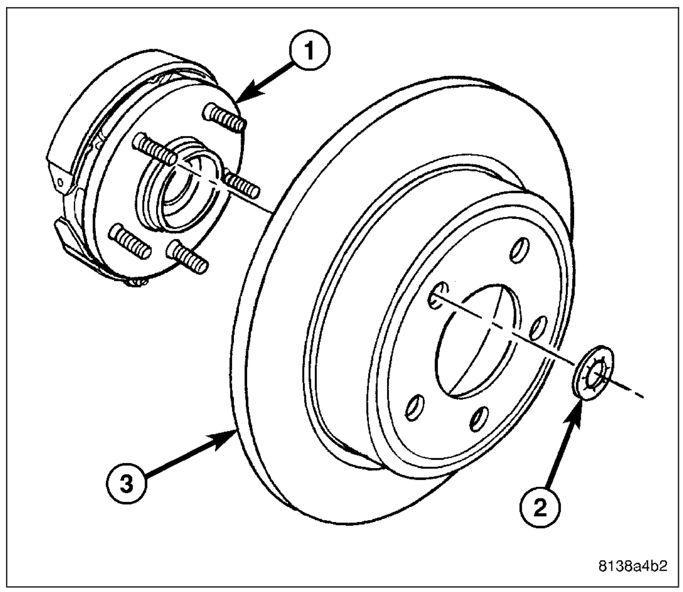
5. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.
7. Pump the brake pedal several times before moving the vehicle to set the pads to the brake rotor.
8. Check and adjust the brake fluid level in the reservoir as necessary.
9. Road test the vehicle and make several stops to seat the brake pads to the rotor.



REAR BRAKE ROTOR

NOTE: Inspect disc brake pads and parking brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

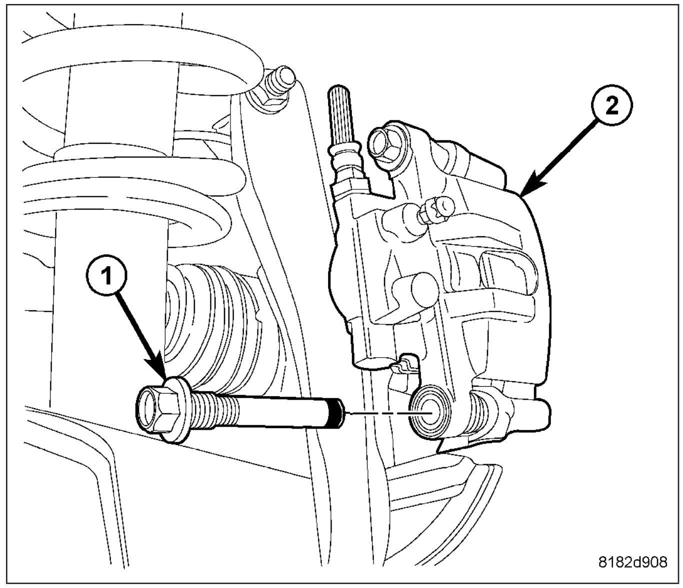
1. Clean the hub face (1) to remove any dirt or corrosion where the rotor mounts.
2. Install the brake rotor (3) over the studs on the hub and bearing (1).



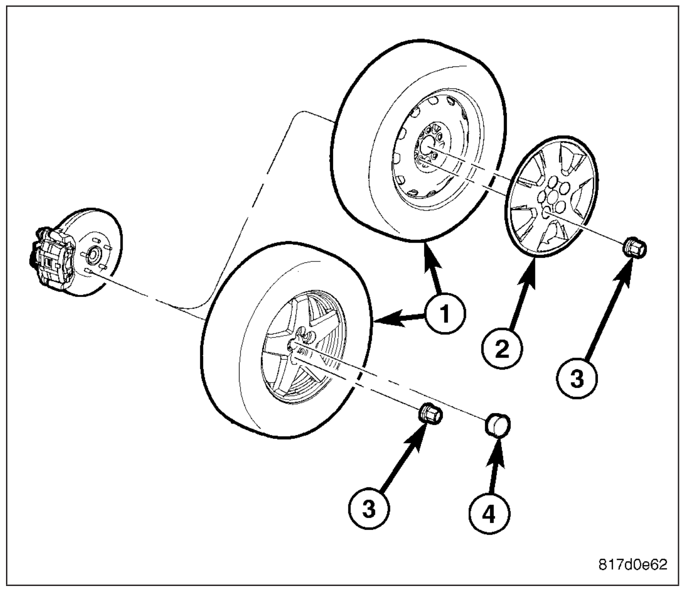
CAUTION: Use care when installing the caliper onto the adapter bracket to avoid damaging the guide pin boot.

NOTE: The lubricant used on the guide pin portion of the guide pin bolt is Niglube RM. Use the appropriate lubricant when necessary.

3. Rotate the disc brake caliper downward over the brake rotor and lower part of caliper adapter.
4. Install the disc brake caliper (2) lower guide pin bolt (1). Tighten the guide pin bolt to 43 N·m (32 ft. lbs.).



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.
7. Pump the brake pedal several times before moving the vehicle to set the pads to the brake rotor.
8. Check and adjust the brake fluid level in the reservoir as necessary.
9. Road test the vehicle and make several stops to seat the brake pads to the rotor.



SPECIFICATIONS

BRAKE ROTOR LIMITS/SPECIFICATIONS

NOTE: When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits MUST BE MAINTAINED.

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout*
Front Rotor (15-inch)**	25.90–26.10 mm 1.020–1.028 in.	24.40 mm 0.961 in.	0.005 mm 0.0002 in.	0.05 mm 0.002 in.
Front Rotor (16-inch*)**	25.90–26.10 mm 1.020–1.028 in.	24.40 mm 0.961 in.	0.005 mm 0.0002 in.	0.05 mm 0.002 in.
Rear Rotor	9.80–10.20 mm 0.386–0.402 in.	8.40 mm 0.331 in.	0.015 mm 0.0006 in.	0.06 mm 0.0024 in.

* TIR Total Indicator Reading (Measured On Vehicle)
** Referred to as “15-inch” because they are designed to fit inside 15-inch or larger wheels. Actual rotor diameter is 10.8 in. (276 mm).
*** Referred to as “16-inch” because they are designed to fit inside 16-inch or larger wheels. Actual rotor diameter is 11.5 in. (294 mm).

TUBES/HOSES

DESCRIPTION

The brake tubes are steel with a corrosion-resistant nylon coating applied to the external surfaces.

The flex hoses used at each wheel brake are made of reinforced rubber with fittings at each end. The fitting at each front brake caliper is the banjo-type and requires a special banjo bolt and copper washers. The fitting at each rear brake caliper is a screw-in type fitting. Rear drum brake vehicles use a standard tube nut fitting at each wheel cylinder.

INSPECTION

Brake tubing should be inspected periodically for evidence of physical damage or contact with moving or hot components.

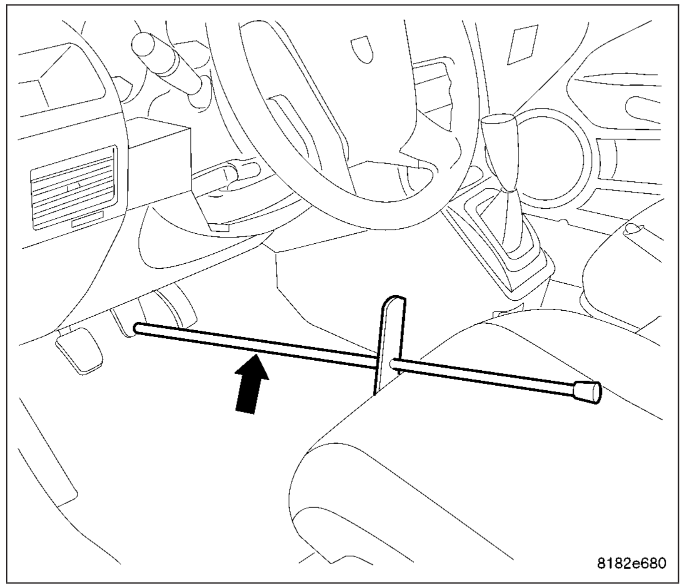
Flexible rubber hose is used at both the front and rear wheel brakes. Inspection of the flexible brake hoses should be performed whenever the brake system is serviced and every 7,500 miles or 12 months, whichever comes first. Inspect hydraulic brake hoses for surface cracking, scuffing, or worn spots. If the fabric casing of the hose becomes exposed due to cracks or abrasions in the hose cover, the hose should be replaced immediately. Eventual deterioration of the hose can take place with possible burst failure. Faulty installation can cause twisting, resulting in wheel, tire, or chassis interference.

PLATE-SUPPORT, BRAKE BACKING

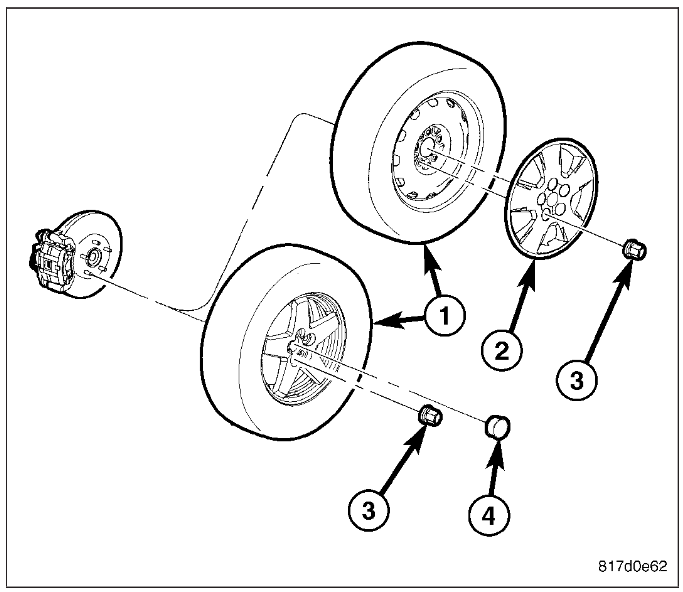
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

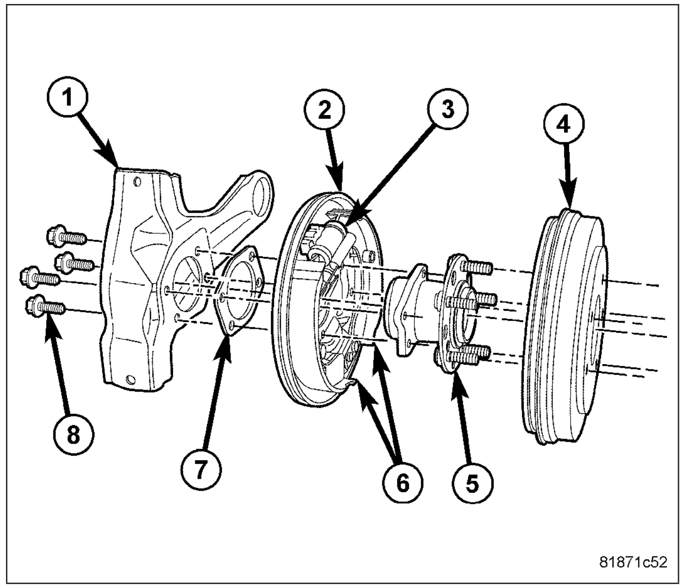
1. Using a brake pedal holding tool as shown, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



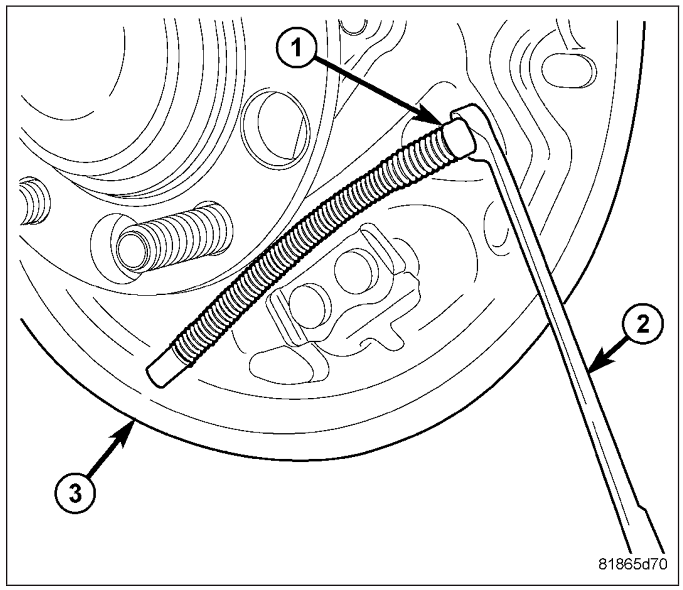
3. Remove the wheel mounting nuts (3), then the tire and wheel assembly.



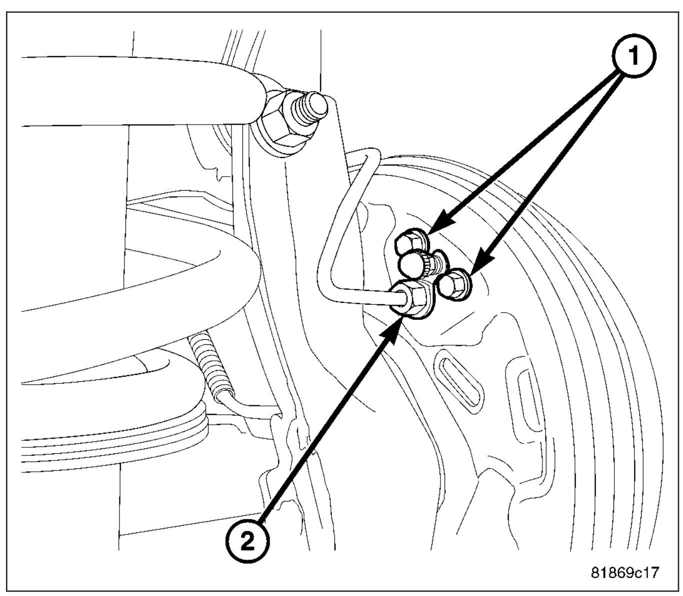
4. Access and remove the drum brake shoes (6) from the support plate (2). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL)



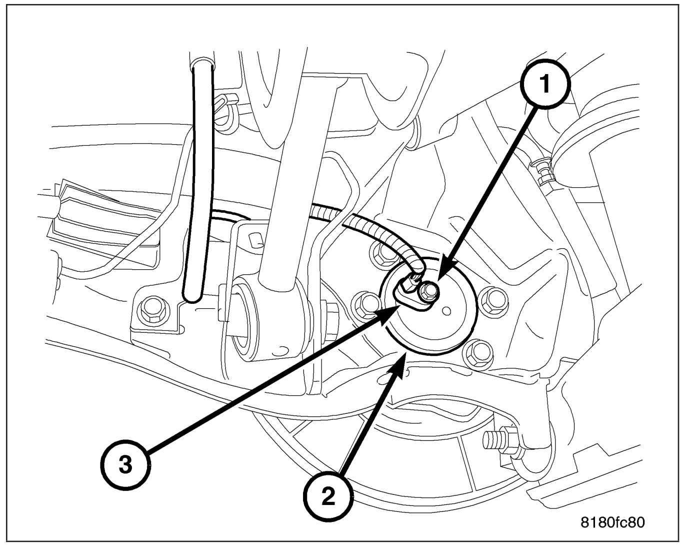
5. Position a 10 mm box wrench (2) over the retainer fingers on the end of the parking brake cable housing (1). Compress the cable housing retaining fingers with the wrench, then pull the cable housing out of the support plate.



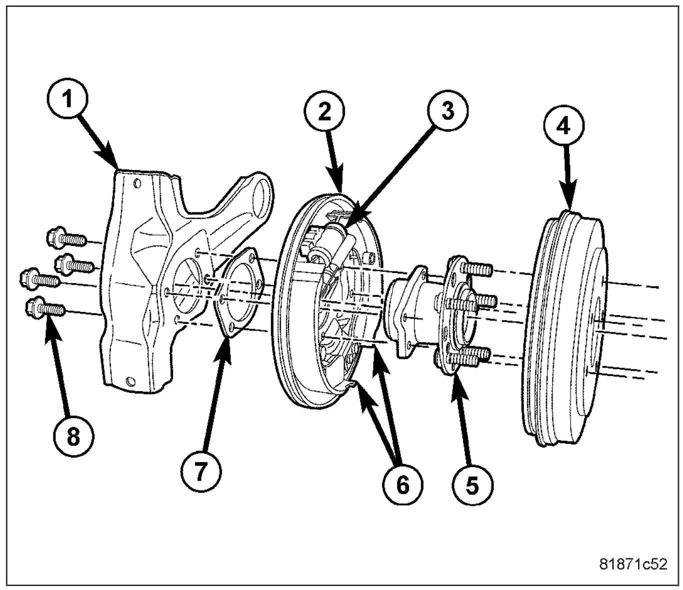
6. Disconnect the brake tube (2) at the wheel cylinder.
7. Remove the wheel cylinder attaching screws (1).
8. Remove the wheel cylinder from the support plate.



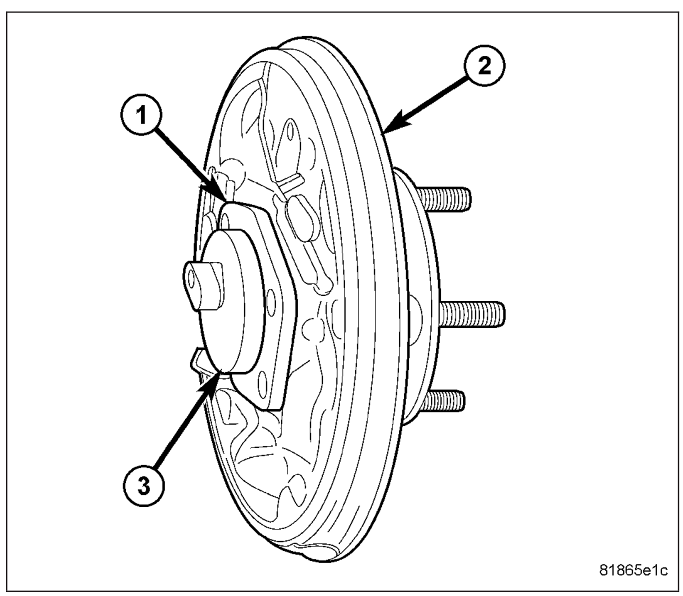
9. If equipped with a wheel speed sensor, remove the screw (1) fastening the wheel speed sensor head (3) in the rear of the hub and bearing (2). Remove the sensor head from the hub and bearing.



10. Remove the four bolts (8) securing the hub and bearing (5), support plate (2), and spacer (7) to the trailing link (1).

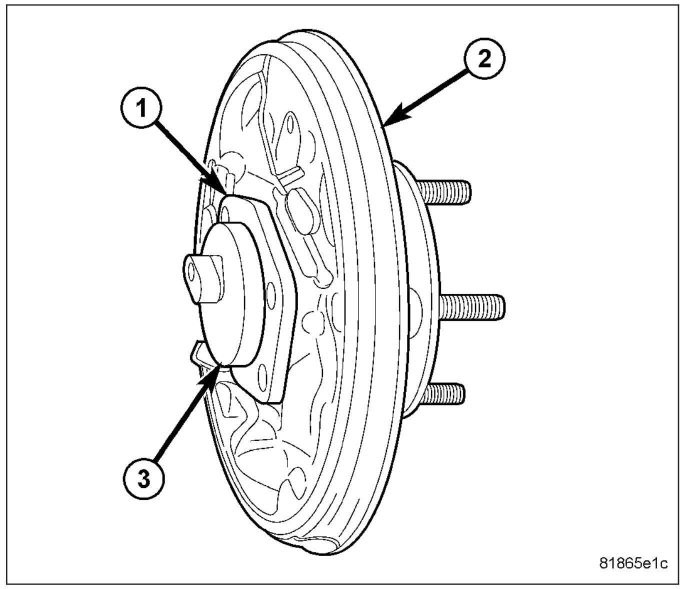


11. Remove the hub and bearing (3), support plate (2), and spacer (1) as an assembly from the trailing link (1). Separate the spacer and hub and bearing from the support plate once removed.



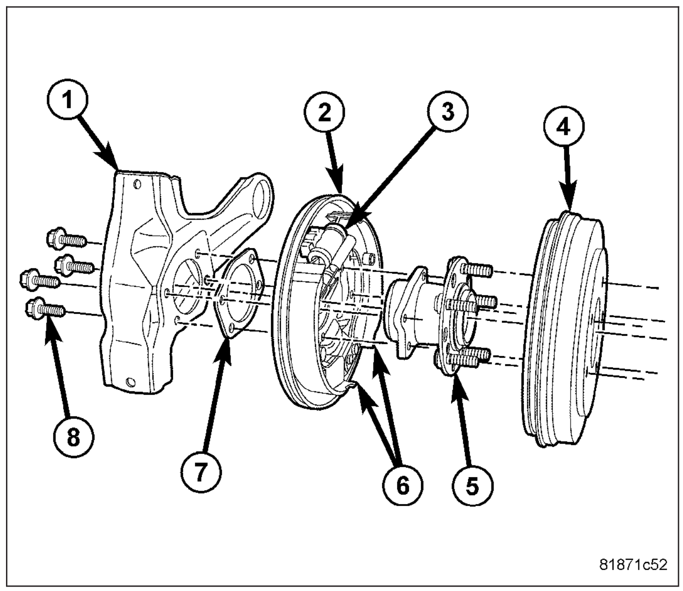
INSTALLATION

1. Assemble the hub and bearing (3) through the support plate (2) and install the spacer (1) on the rear of the assembly.
2. Install the hub and bearing (3), support plate (2), and spacer (1) as an assembly on the trailing link.



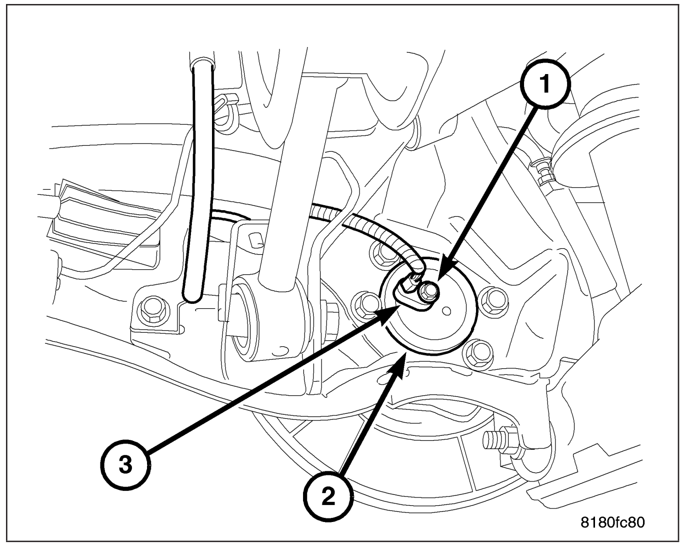
NOTE: When performing the following step, use NEW mounting bolts or clean and apply Mopar® Stud & Bearing Mount Adhesive or equivalent to the original mounting bolt threads before reuse.

3. Install the four bolts (8) securing the hub and bearing (5), support plate (2), and spacer (7) to the trailing link (1). Tighten the mounting bolts to 105 N·m (77 ft. lbs.).

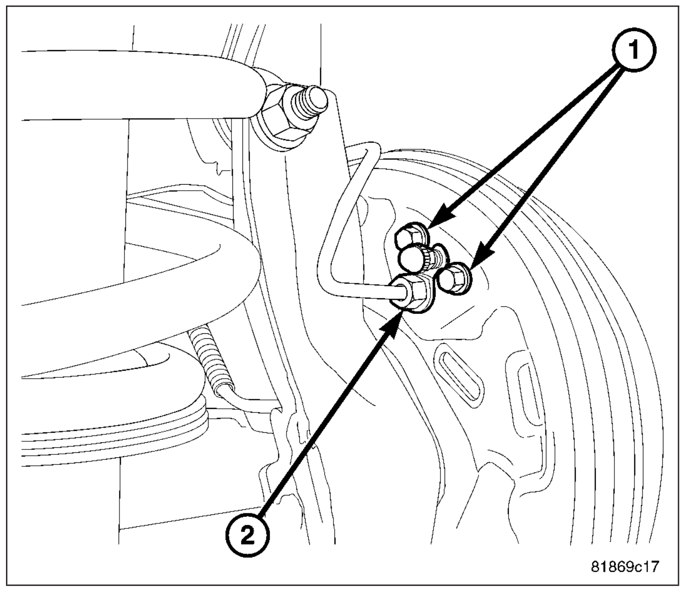


4. Insert the parking brake cable into its mounting hole in the brake support plate. Push the cable housing in until the retainer's fingers lock into place.

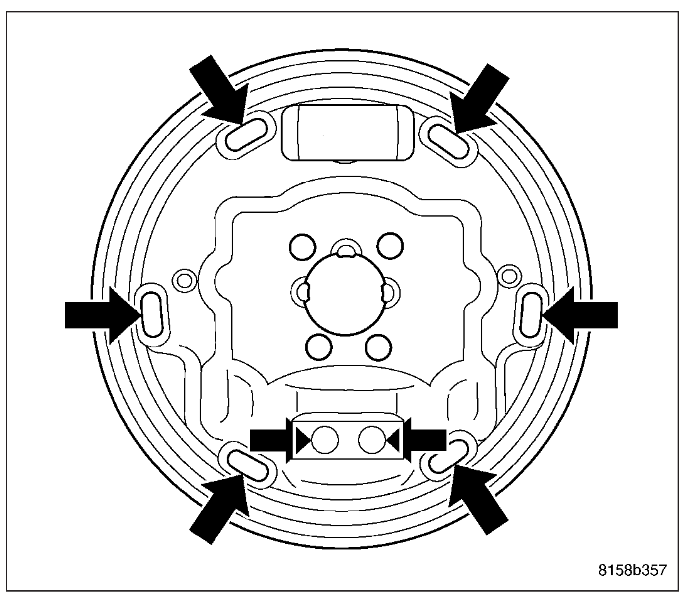
5. If equipped with a wheel speed sensor, Install the wheel speed sensor head (3) into the rear of the hub and bearing (2). Install the wheel speed sensor head mounting screw (1). Tighten the screw to 10 N·m (89 in. lbs.).



6. Install the wheel cylinder onto the brake support plate. Install and tighten the mounting screws (1) to 13 N·m (115 in. lbs.).
7. Connect the brake tube (2) to the wheel cylinder (1). Tighten the tube nut to 17 N·m (150 in. lbs.).

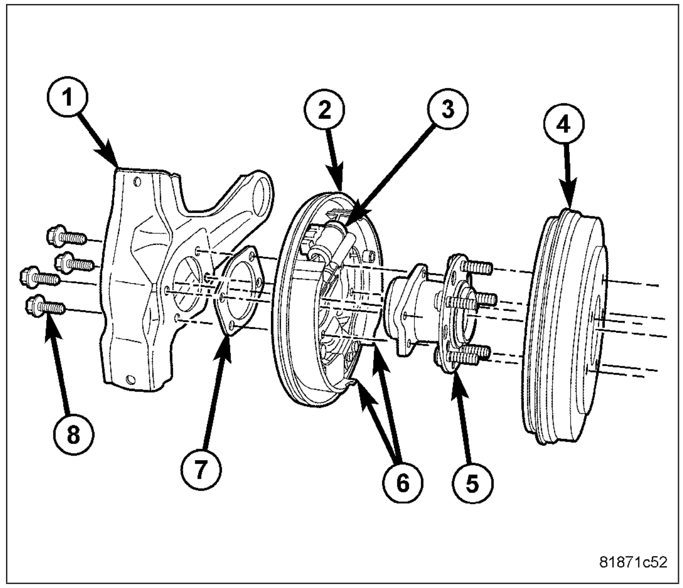


8. Lubricate shoe contact areas on support plate and anchor using Mopar® Brake Lubricant or equivalent.

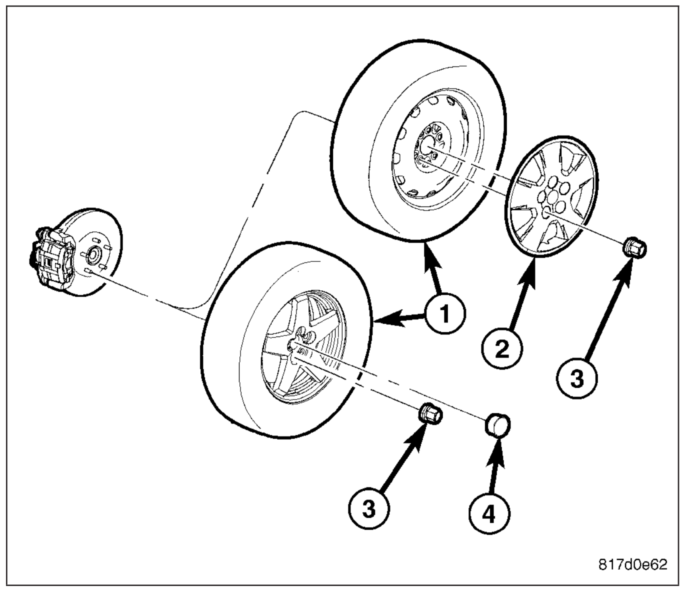


NOTE: Inspect the brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ BRAKE PADS/SHOES - INSPECTION)

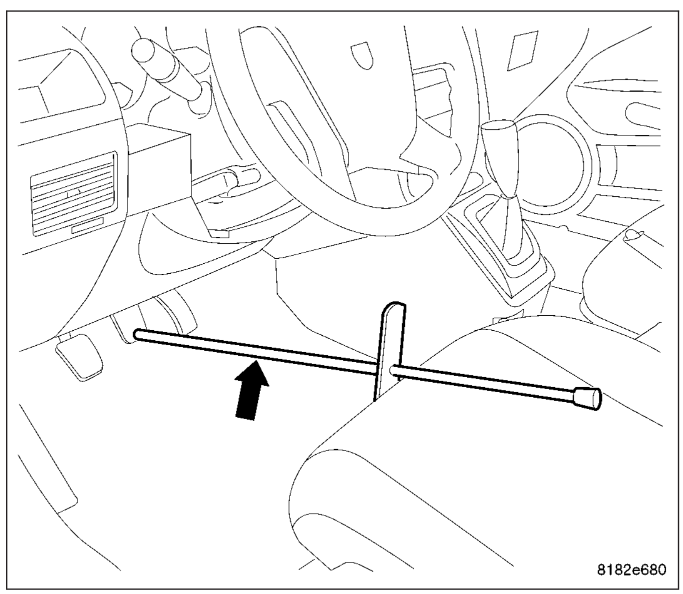
9. Install the drum brake shoes (6) and drum (4). Adjust shoes as necessary. (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION)



10. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
11. Slowly rotate the rear wheel and verify that the brake drum **lightly** drags on the shoes.
12. Lower the vehicle.



13. Remove the brake pedal holding tool.
14. Bleed the affected wheel cylinder as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
15. Road test the vehicle to ensure proper brake operation.

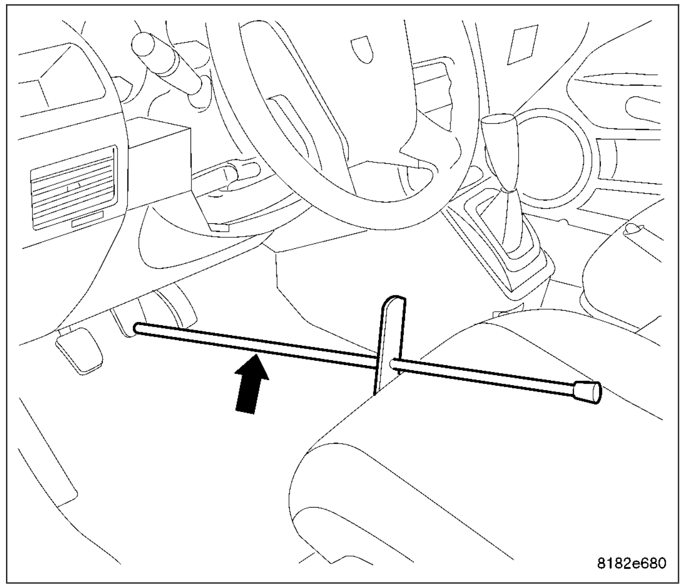


WHEEL CYLINDER - DRUM BRAKE

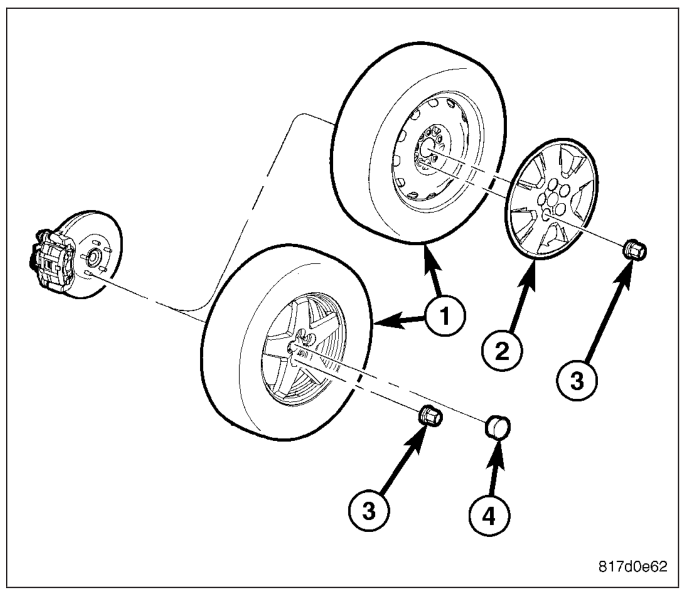
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

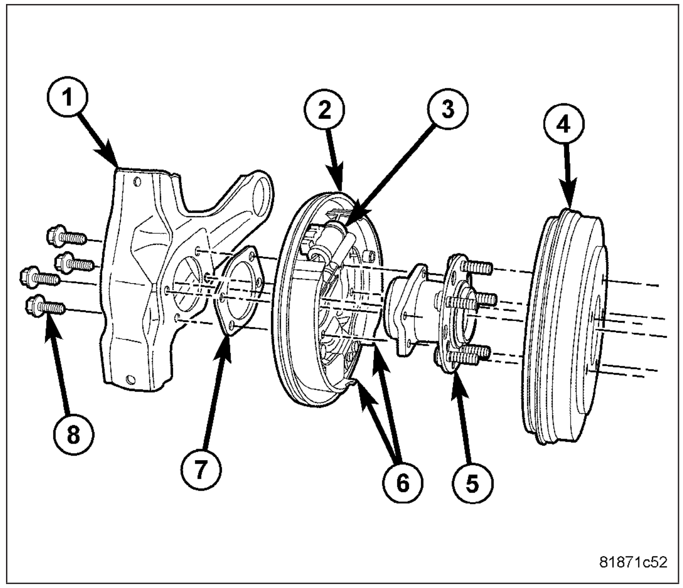
1. Using a brake pedal holder, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



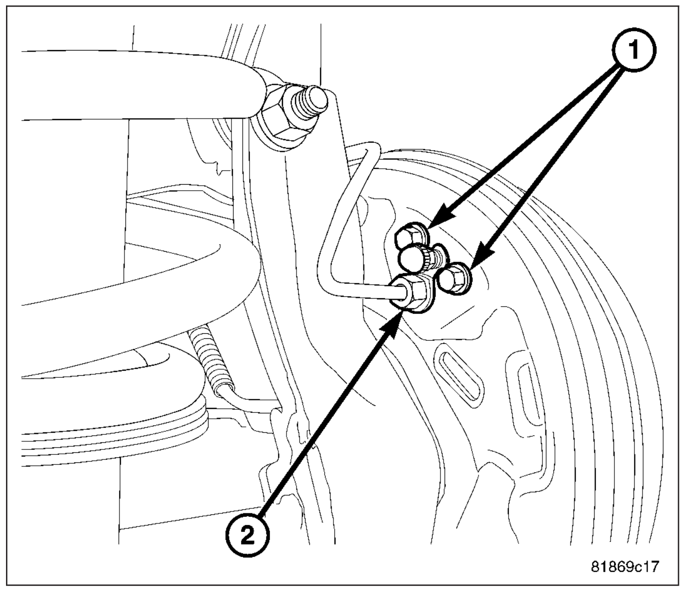
3. Remove the wheel mounting nuts (3), then the tire and wheel assembly.



4. Access and remove the drum brake shoes (6) from the support plate (2). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - REMOVAL)



5. Disconnect the brake tube (2) at the wheel cylinder.
6. Remove the wheel cylinder attaching screws (1).
7. Remove the wheel cylinder from the support plate.



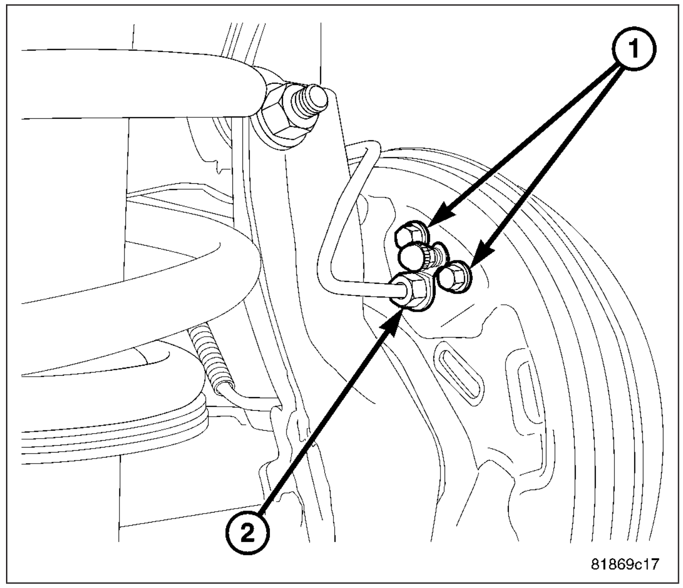
INSPECTION

With the brake drum removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks. If any of these conditions exist, the wheel cylinders must be replaced.

If a wheel cylinder is leaking and the brake lining material is saturated with brake fluid, the brake shoes must be replaced.

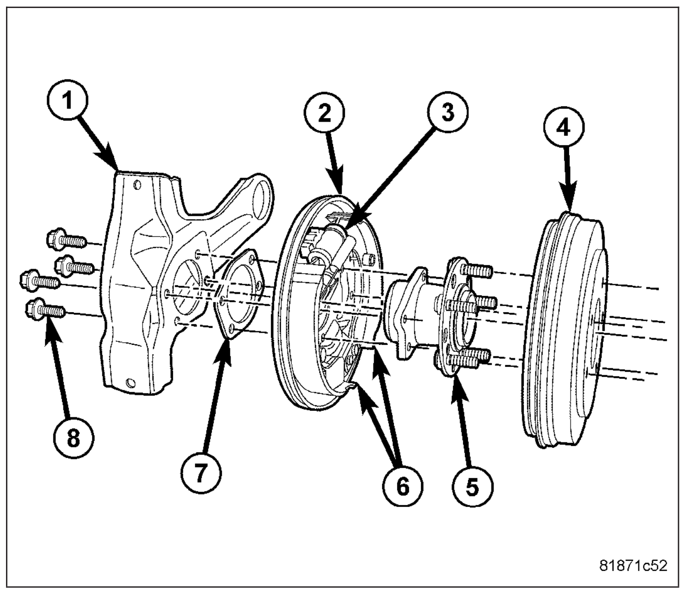
INSTALLATION

1. Install the wheel cylinder onto the brake support plate. Install and tighten the mounting screws (1) to 13 N·m (115 in. lbs.).
2. Hand start the brake tube nut (2) into the wheel cylinder (1). Tighten the tube nut to 17 N·m (150 in. lbs.).

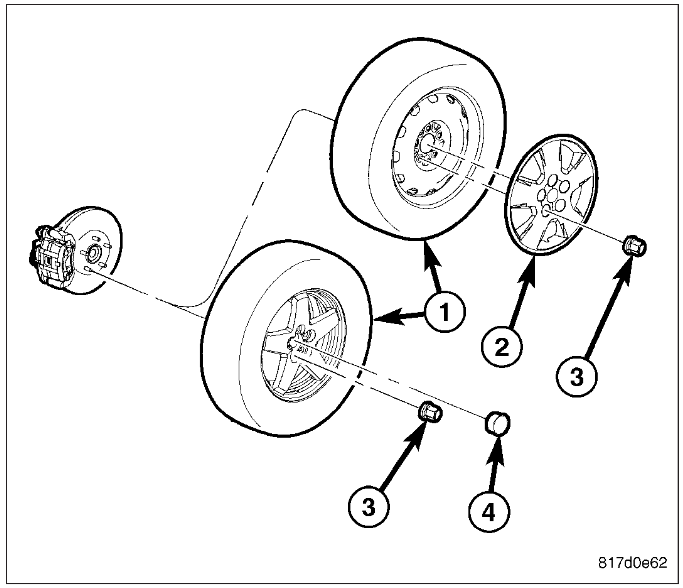


NOTE: Inspect the brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ BRAKE PADS/SHOES - INSPECTION)

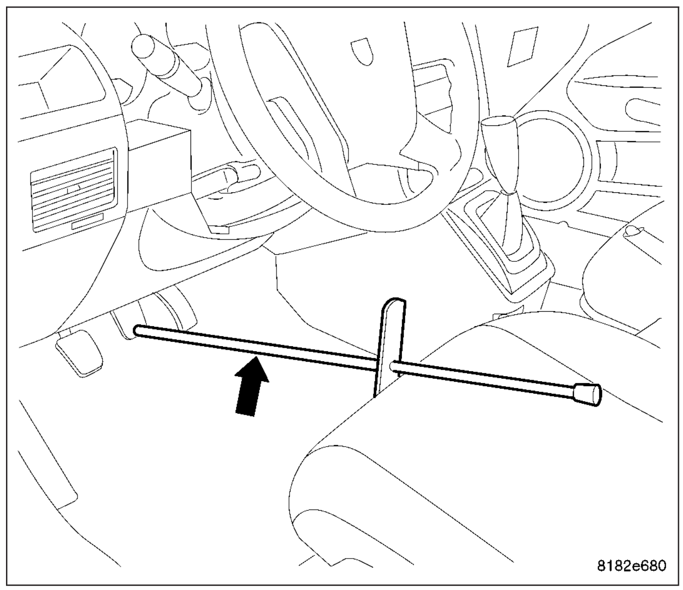
3. Install the drum brake shoes (6) and drum. Adjust shoes as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION)



4. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
5. Slowly rotate the rear wheel and verify that the brake drum **lightly** drags on the shoes.
6. Lower the vehicle.



7. Remove the brake pedal holder.
8. Bleed the wheel cylinder as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
9. Road test the vehicle to make sure the brakes operate correctly.

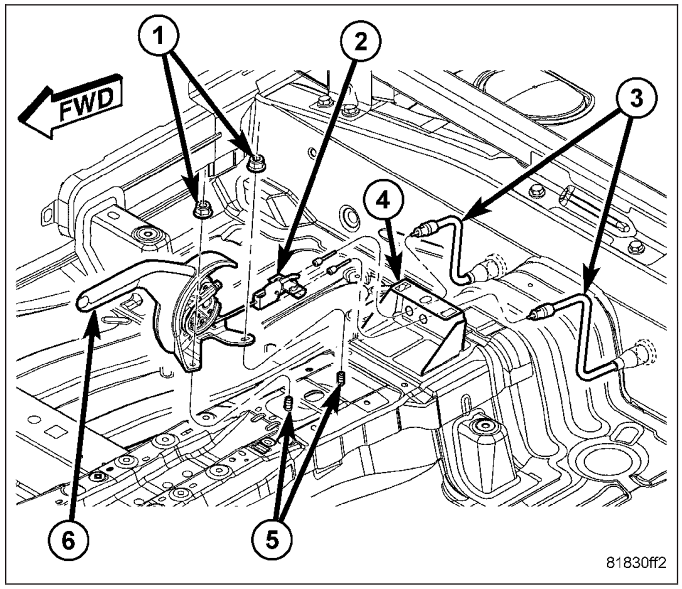


PARKING BRAKE

DESCRIPTION

The parking brakes consist of the following components:

- Hand-operated park brake lever (6)
- Parking brake cables (one each side) (3)
- Actuation levers and struts
- Duo-servo parking brake assembly (rear disc only)



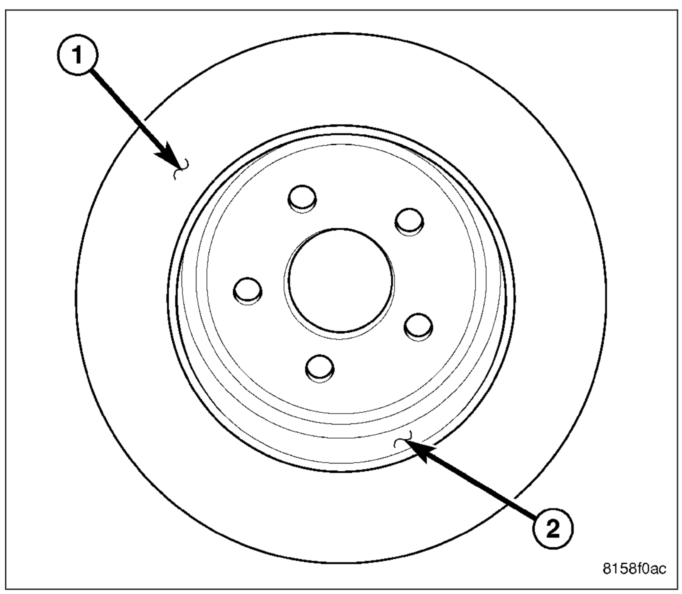
All vehicles are equipped with a center-mounted, hand-operated parking brake lever mounted between the front seats. A bent nail tensioner is built into the equalizer mounted on the end of the lever's output cable.

There is an individual parking brake cable for each rear wheel that joins a parking brake cable equalizer, attached to the parking brake lever, to the rear parking brakes. The parking brake cables are made of flexible steel cable. Both drum rear brakes and disc rear brakes use the same parking brake cable configuration, but the cables are different.

On vehicles equipped with rear drum brakes, the rear wheel service brakes also act as the vehicle's parking brakes. The rear drum brake shoes, when acting as parking brakes, are mechanically operated using an internal actuating lever and strut connected to the flexible steel parking brake cable.

The parking brakes on vehicles equipped with rear disc brakes consist of a small duo-servo brake assembly mounted to the disc brake caliper adapter including two shoes, an actuating lever and strut, as well as the attaching springs and clips. This parking brake application uses the same operating cable configuration as the drum brake equipped vehicles, but uses different cables.

The hat (center) section (2) of each rear disc brake rotor (1) serves as the braking surface (drum) for the parking brakes.



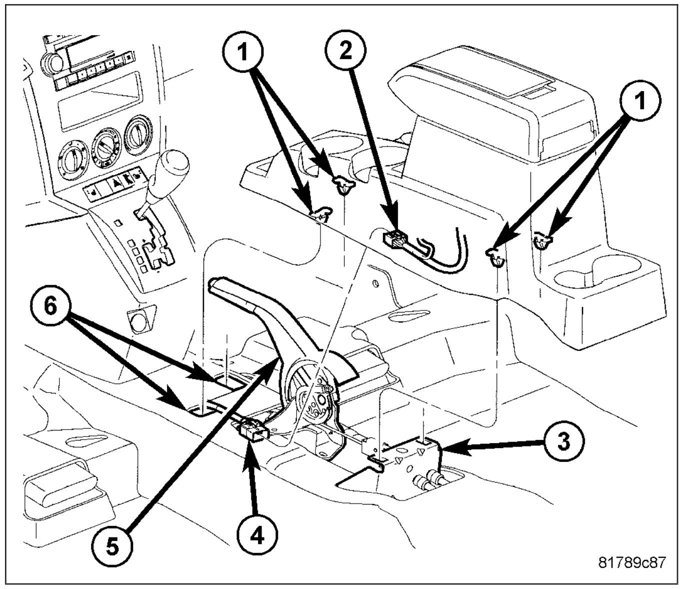
CABLE-PARKING BRAKE

REMOVAL

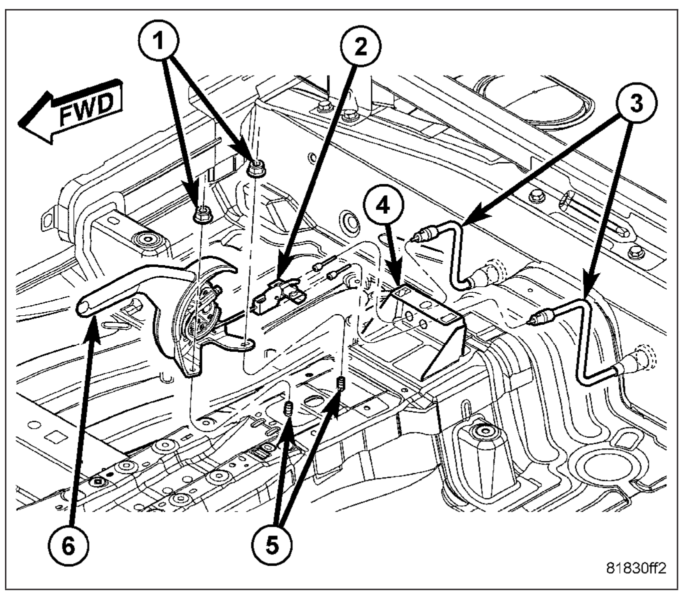
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

NOTE: The procedure below applies to either of the two rear parking brake cables.

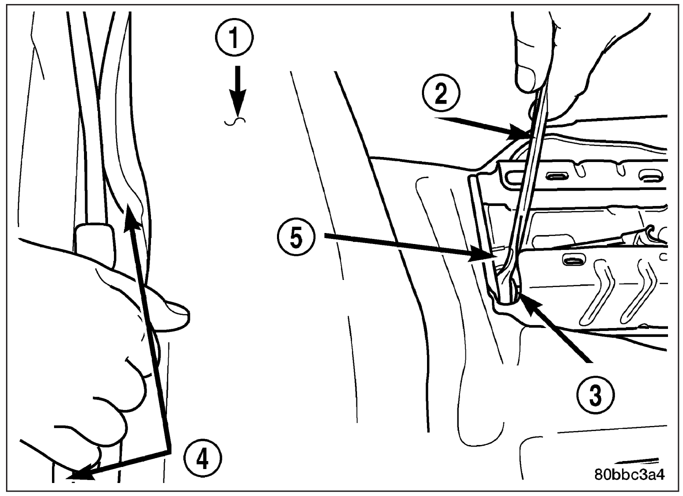
1. Disconnect and isolate the battery negative cable from its post on the battery.
2. Block the tire and wheel assemblies so the vehicle does not move once the vehicle parking brake lever is released.
3. Remove the center console. (Refer to 23 - BODY/ INTERIOR/CENTER CONSOLE - REMOVAL)
4. Release and lower the parking brake lever (5).



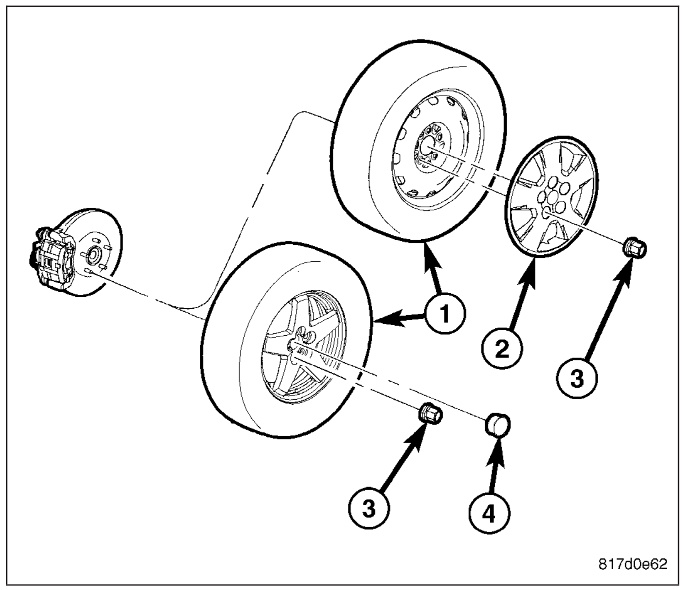
5. Loosen the adjusting nut on the lever's output cable taking tension off parking brake cables.
6. Remove the parking brake cables (3) from the parking brake cable equalizer (2).
7. Remove the rear seat cushion.



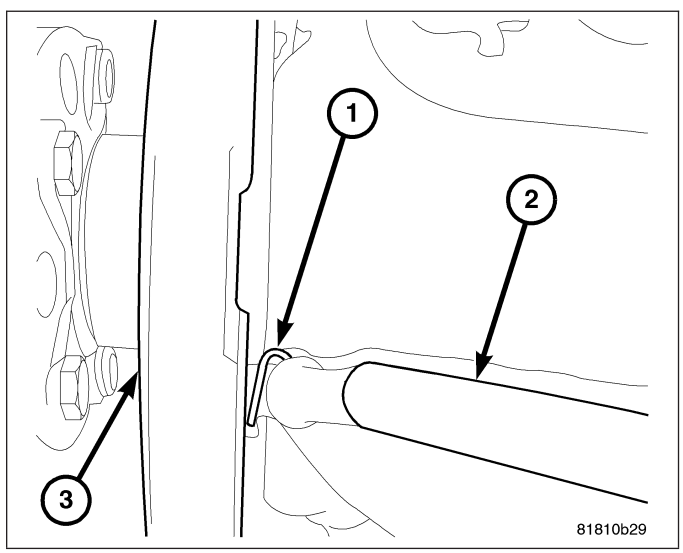
8. Fold the rear carpeting forward (1) to expose the parking brake cables (4) at the end of the rear floor.
9. Install the box end of a ½ inch (13 mm) wrench (2) over the retainer for either the right (3) or left (5) parking brake cable. Push the wrench onto the retainer until the retainer fingers are collapsed. From under the carpeting, grasp the parking brake cable housing and pull the cable straight out of the bracket attached to the floor.

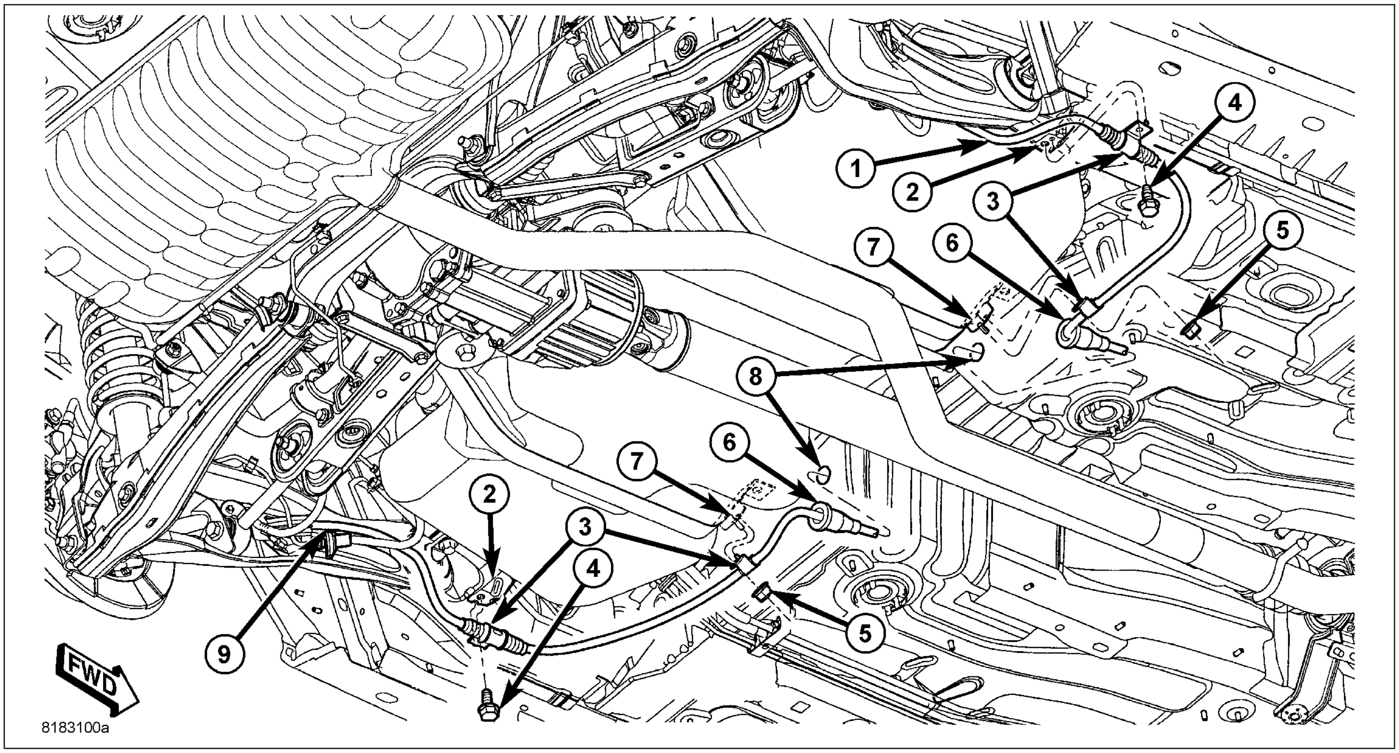


10. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
11. Remove the wheel mounting nuts (3), then the rear tire and wheel assembly (1).
12. Access and remove the parking brake shoes. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL)



13. Remove the hair pin (1) securing the parking brake cable (2) to the brake support plate (3).
14. Pull the parking brake cable from the support plate and hole in trailing link.

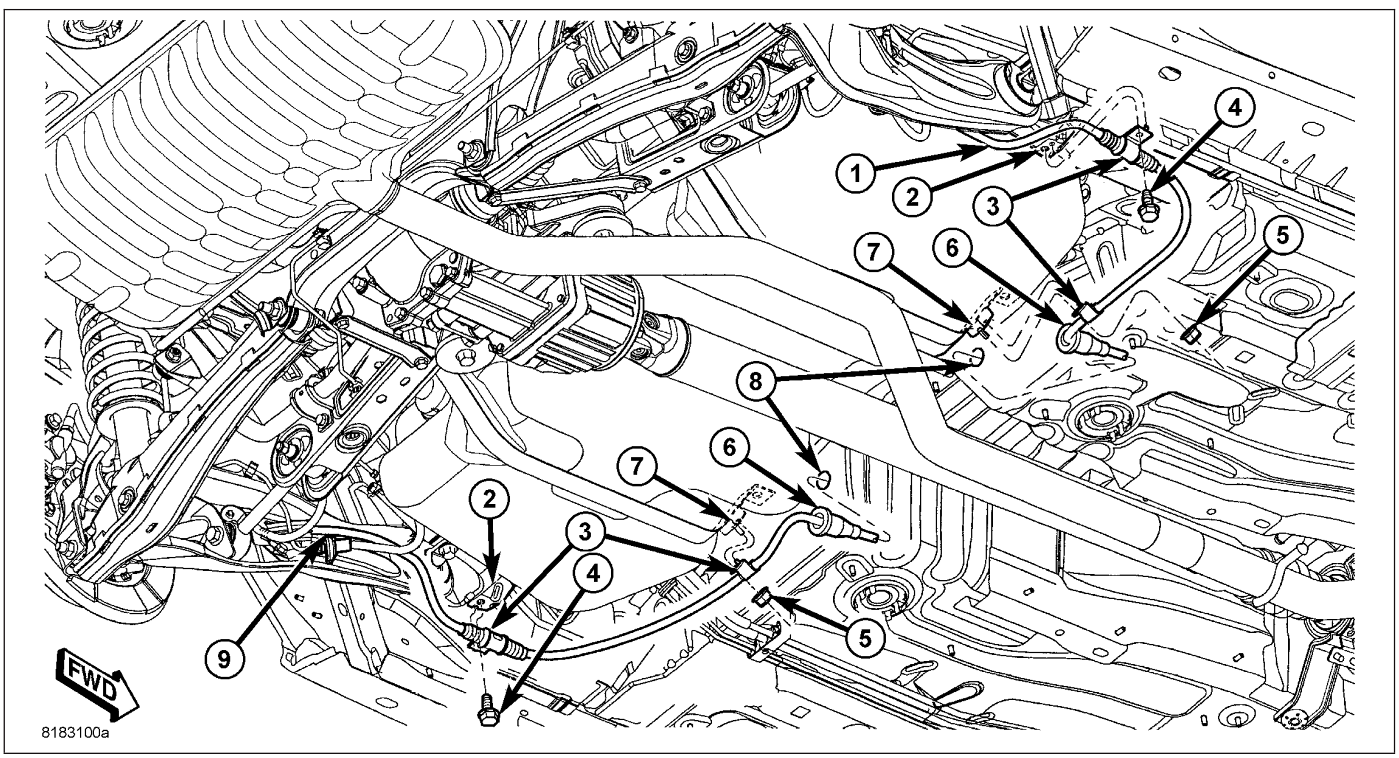




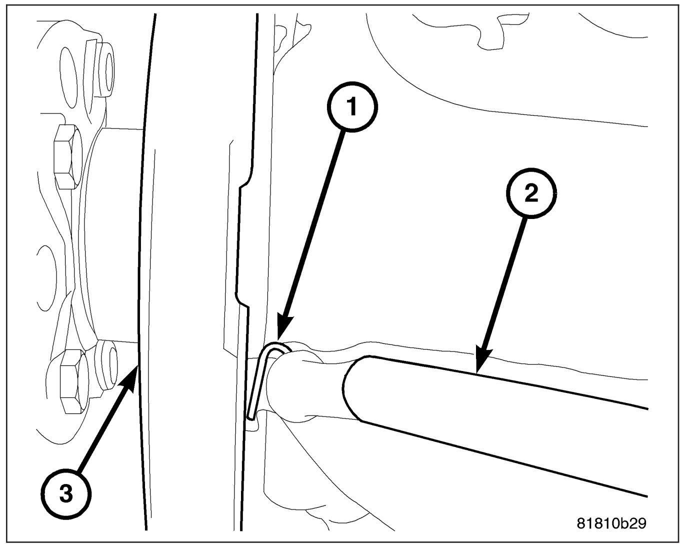
15. Remove the screw (4) securing the cable routing clamp (3) to the body (2).
16. Remove the nut (5) securing the cable routing clamp (3) to the fuel tank strap (7).
17. Remove the parking brake cable (1 - right cable, 9 - left cable) with sealing grommet (6) through the hole (8) in the floor pan of the vehicle.

INSTALLATION

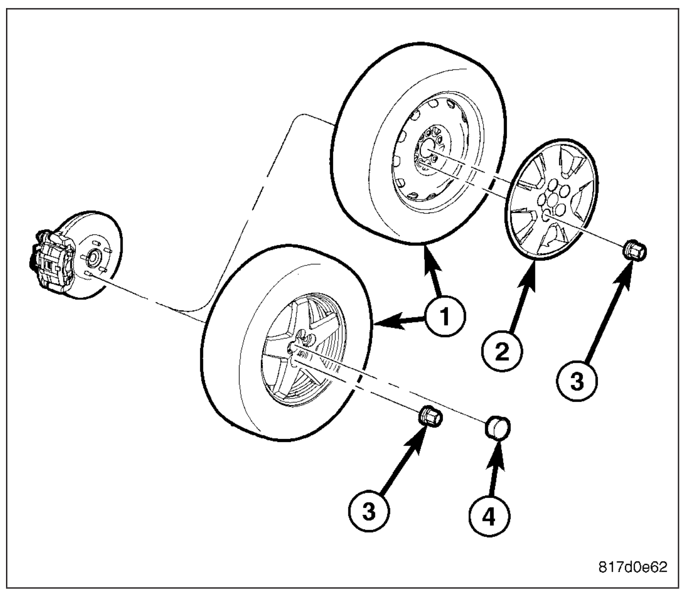
NOTE: The following procedure applies to either of the two rear parking brake cables.



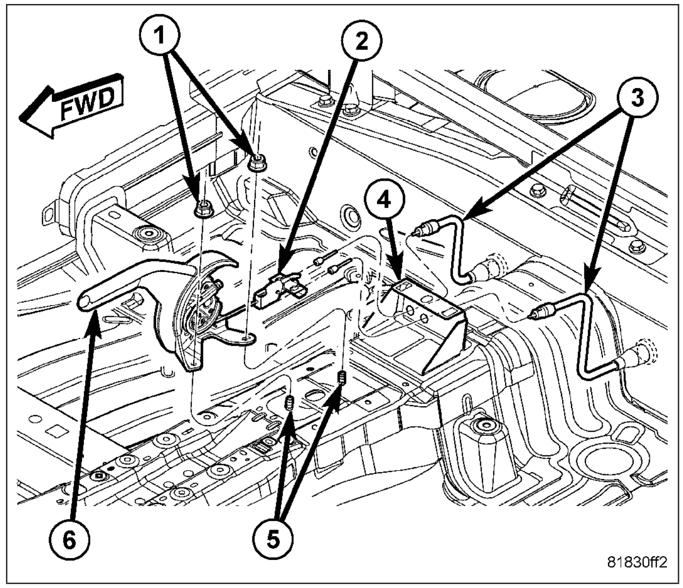
1. From underneath, push the parking brake cable through the hole (8) in the floor pan of the vehicle making sure the cable sealing grommet (6) is installed in the floor pan as far as possible (without going all the way through) to ensure a good seal.
2. Position the cable routing clamp (3) over the stud on the fuel tank strap (7) and install the nut (5).
3. Position the cable routing clamp (3) and install the screw (4) securing the cable (1 - right cable, 9 - left cable) to the body (2).
4. Insert the parking brake cable through the hole in the trailing link and the support plate (3).
5. Install the hair pin (1) securing the parking brake cable (2) to the brake support plate (3).



6. Install the parking brake shoes (and check adjustment) and components removed to access them. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION)
7. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
8. Lower the vehicle.
9. Block the tire and wheel assemblies so the vehicle does not move with the vehicle parking brake lever released.

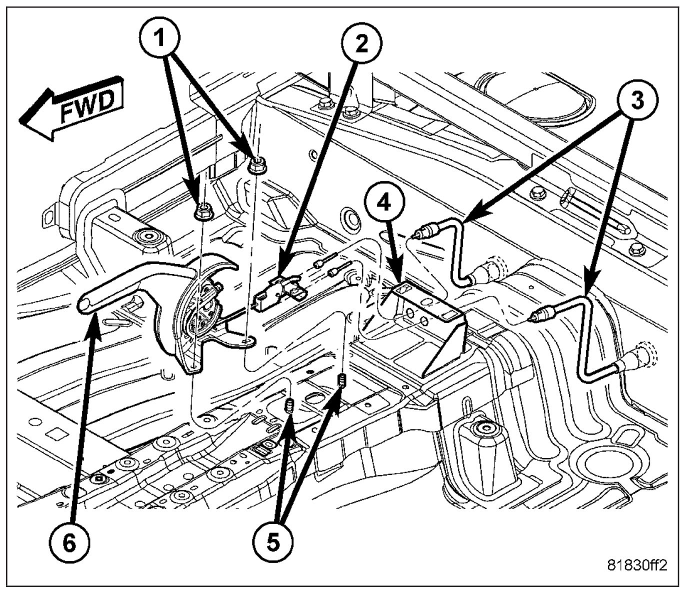


10. Ensure that the seal grommet on the cable installed from underneath is fully seated into the floor pan.
11. Route the parking brake cable under the carpeting, up to the parking brake cable retaining bracket (4) on the floor pan. Insert the parking brake cable (3) through the retaining bracket. Push the cable in until the locking fingers on the cable retainer lock the cable into place.



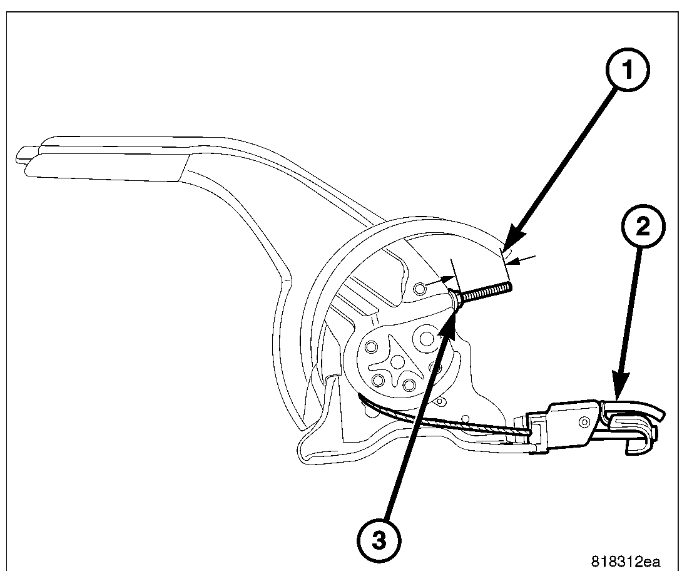
CAUTION: A NEW parking brake cable equalizer (2) must be installed when servicing the parking brake cables or lever. The equalizer has an integrated bent nail tensioner that needs to be stretched upon installation placing the correct tension on the cables.

12. Remove and install a NEW parking brake cable equalizer (2) on the parking brake lever output cable.
13. Install the rear parking brake cables (3) into the equalizer (2) on the parking brake lever output cable.
14. Ensure that the parking brake cables are correctly installed on the equalizer and aligned with the cable track on the parking brake lever.

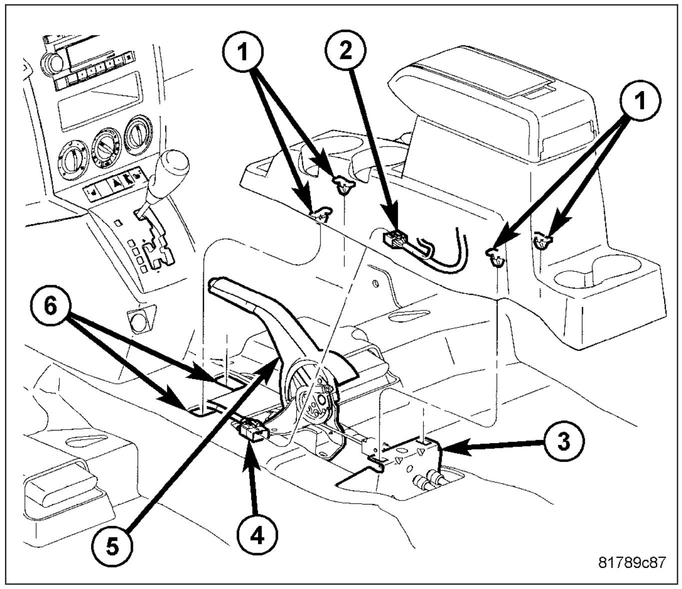


NOTE: Actuating the parking brake lever to its fully applied position one time after tightening the adjustment nut will yield (stretch) the bent nail portion of the equalizer approximately 1/4 inch. This process will correctly set the parking brake cable tension.

15. Adjust parking brake cable tension using the following steps:
    a. Place the parking brake lever in the fully released (down) position.
    b. Tighten the adjusting nut (3) on the parking brake lever output cable until 31 millimeters of thread is out past the end of the adjustment nut (1).
    c. Actuate the parking brake lever to its fully applied position one time, then reposition it to its fully released (down) position.



16. Raise the vehicle to a point where the rear wheels just clear the floor.
17. Check the rear wheels of the vehicle; they should rotate freely without dragging.
18. Apply the parking brake. Check the rear wheels of the vehicle. They should not rotate.
19. Return the parking brake lever to its fully released (down) position and check the rear wheels. They should rotate freely without dragging.
20. Apply the parking brake.
21. Lower the vehicle.
22. Install the center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
23. Remove the blocks from the tires and wheel assemblies.
24. Connect the battery negative cable to its post on the battery.



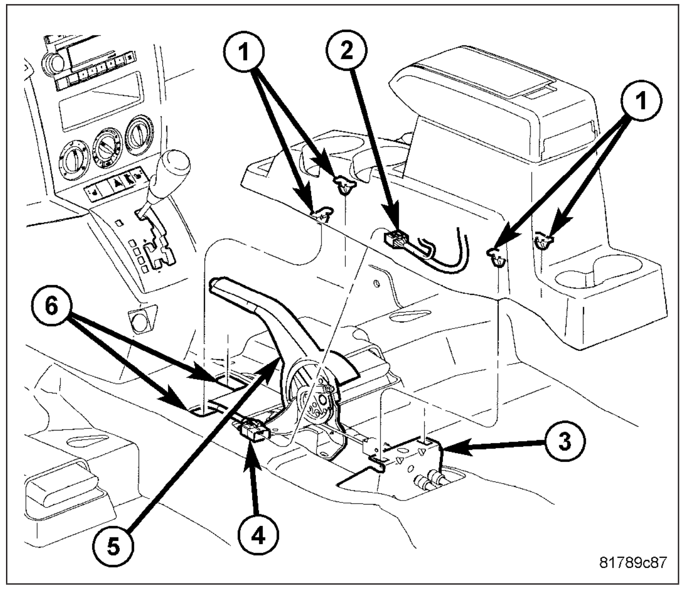
LEVER-PARKING BRAKE

REMOVAL

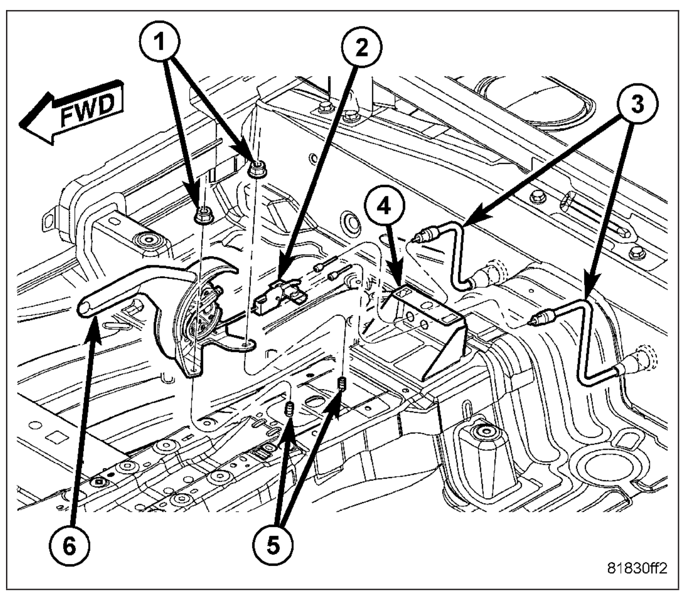
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

NOTE: The procedure below applies to either of the two rear parking brake cables.

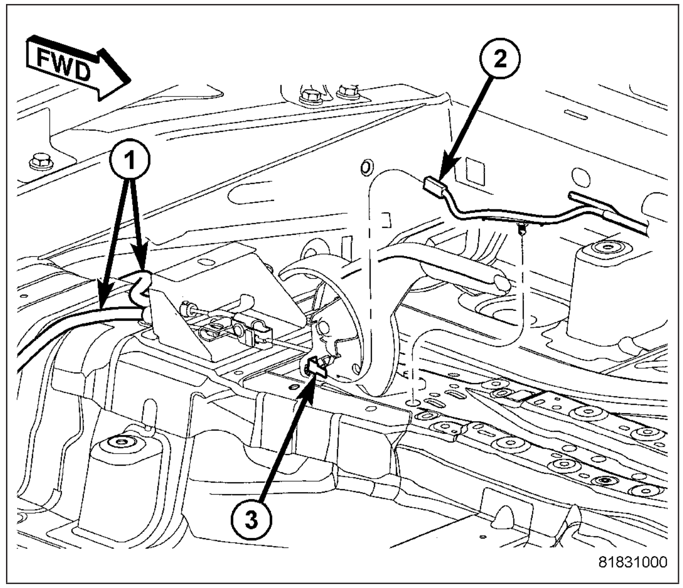
1. Disconnect and isolate the battery negative cable from its post on the battery.
2. Block the tire and wheel assemblies so the vehicle does not move once the vehicle parking brake lever is released.
3. Remove the center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
4. Release and lower the parking brake lever (5).



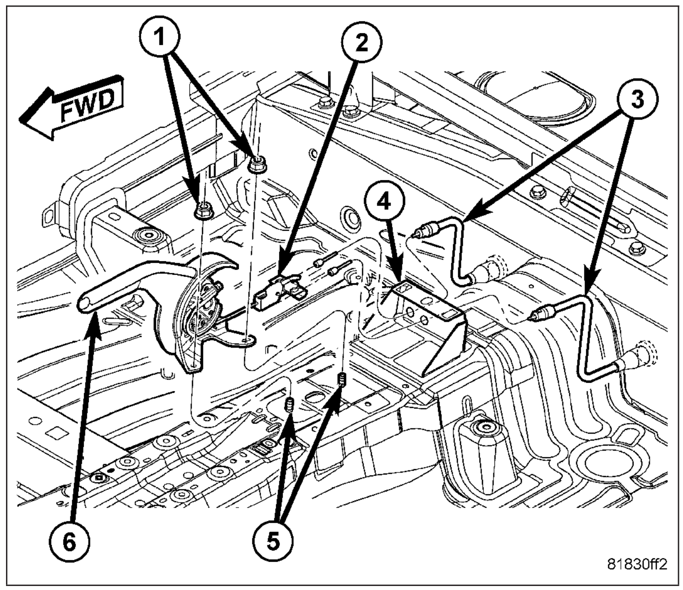
5. Loosen the adjusting nut on the lever's output cable taking tension off parking brake cables. Back the nut off until it is flush with the end of the output cable.
6. Remove the parking brake cables (3) from the parking brake cable equalizer (2).



7. Disconnect the wiring harness connector (2) from the parking brake switch (3).

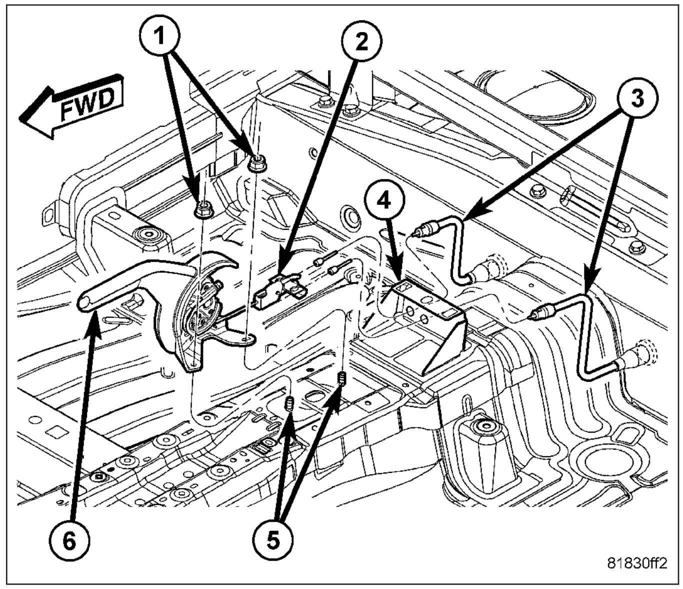


8. Remove the nuts (1) attaching the parking brake lever (6) to the vehicle.
9. Remove the parking brake lever (6).

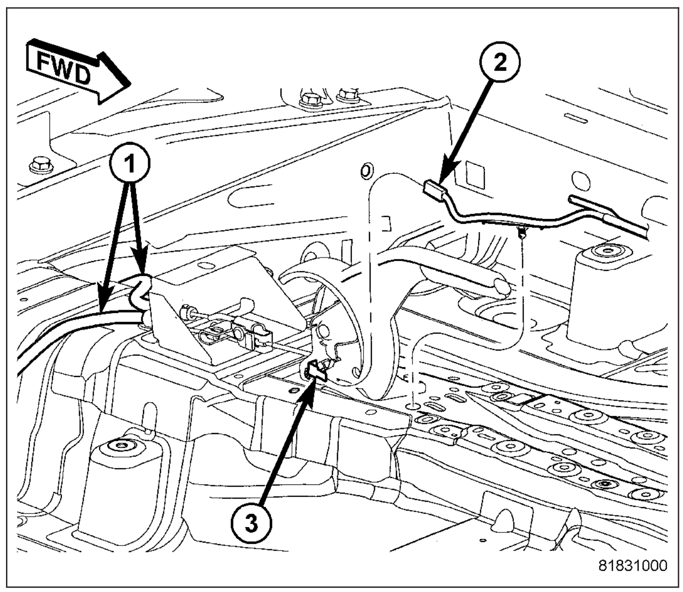


INSTALLATION

1. Place the parking brake lever (6) on the mounting studs (5) affixed to the vehicle floor pan. Install and tighten the nuts to 28 N·m (250 in. lbs.).

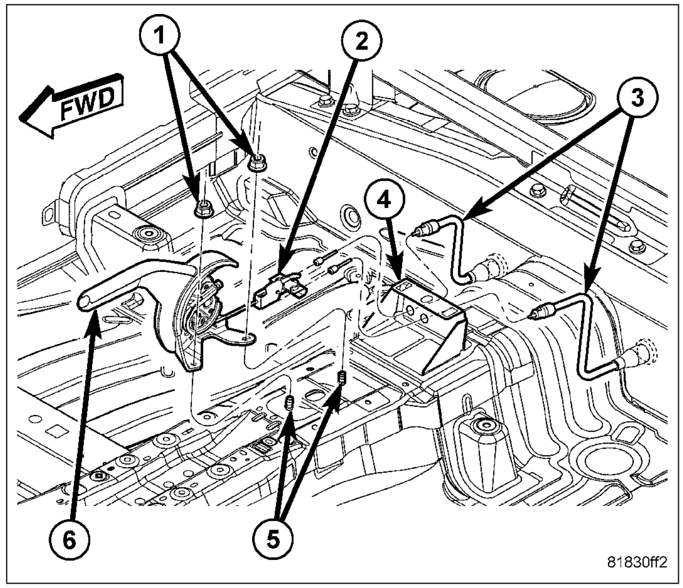


2. Connect the wiring harness connector (2) to the parking brake switch (3).



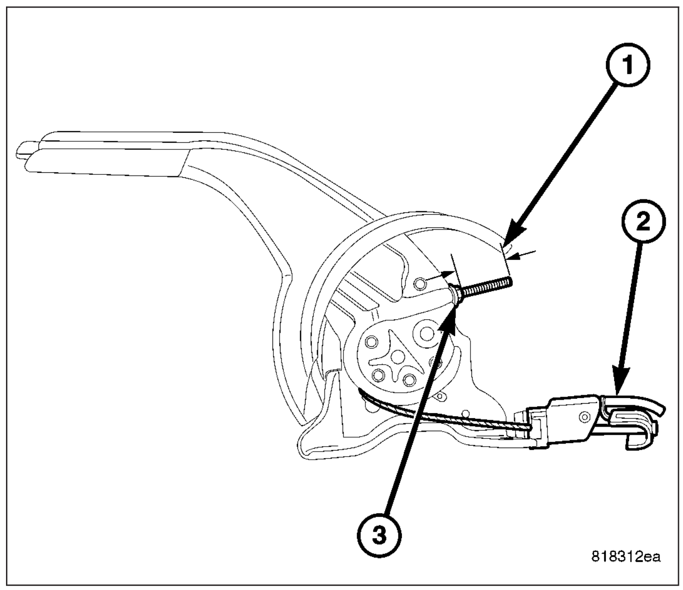
CAUTION: A NEW parking brake cable equalizer (2) must be installed when servicing the parking brake cables or lever. The equalizer has an integrated bent nail tensioner that needs to be stretched upon installation placing the correct tension on the cables.

3. Remove and install a NEW parking brake cable equalizer (2) on the parking brake lever output cable.
4. Install the rear parking brake cables (3) into the equalizer (2) on the parking brake lever output cable.
5. Ensure that the parking brake cables are correctly installed on the equalizer and aligned with the cable track on the parking brake lever.



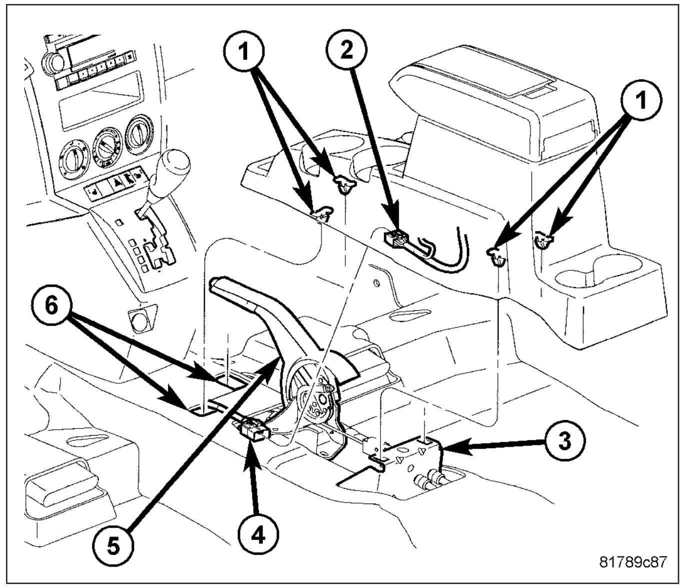
NOTE: Actuating the parking brake lever to its fully applied position one time after tightening the adjustment nut will yield (stretch) the bent nail portion of the equalizer approximately 1/4 inch. This process will correctly set the parking brake cable tension.

6. Adjust parking brake cable tension using the following steps:
   a. Place the parking brake lever in the fully released (down) position.
   b. Tighten the adjusting nut (3) on the parking brake lever output cable until 31 millimeters of thread is out past the end of the adjustment nut (1).
   c. Actuate the parking brake lever to its fully applied position one time, then reposition it to its fully released (down) position.



7. Raise the vehicle to a point where the rear wheels just clear the floor.
8. Check the rear wheels of the vehicle; they should rotate freely without dragging.
9. Apply the parking brake. Check the rear wheels of the vehicle. They should not rotate.
10. Return the parking brake lever to its fully released (down) position and check the rear wheels. They should rotate freely without dragging.
11. Apply the parking brake.
12. Lower the vehicle.

13. Install the center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
14. Remove the blocks from the tires and wheel assemblies.
15. Connect the battery negative cable to its post on the battery.



SHOE AND LININGS-PARKING BRAKE

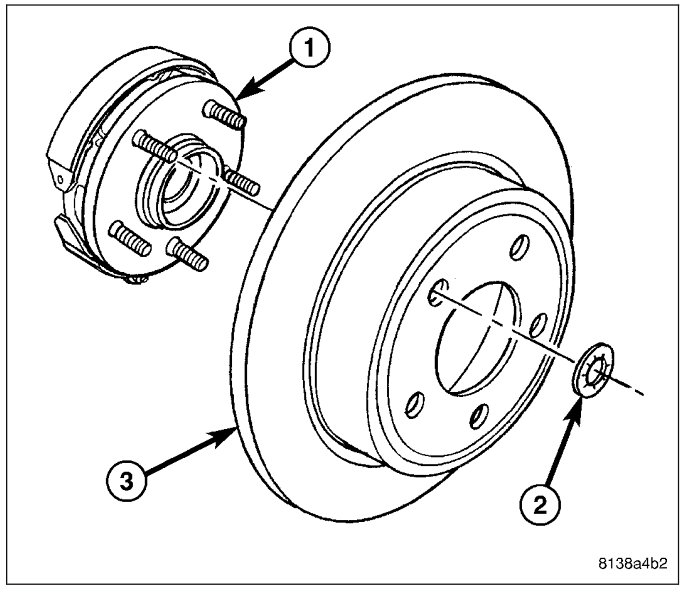
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

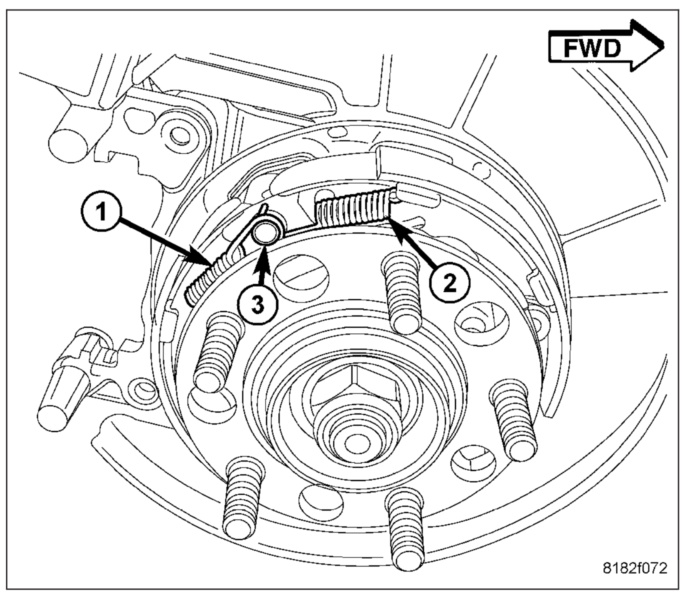
1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

NOTE: If removing parking brake shoes on both sides of vehicle, perform remaining steps on each side of the vehicle.

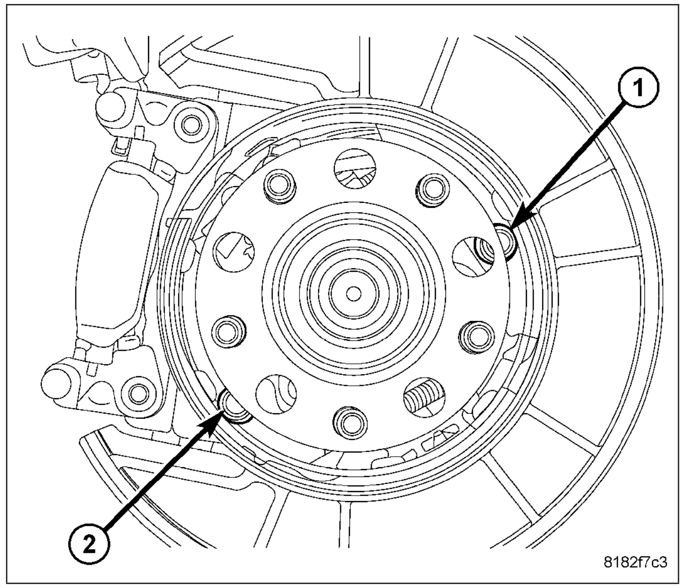
2. Access and remove the rear brake rotor (3). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL)
3. Turn the brake shoe adjuster wheel until the adjuster is at shortest length.



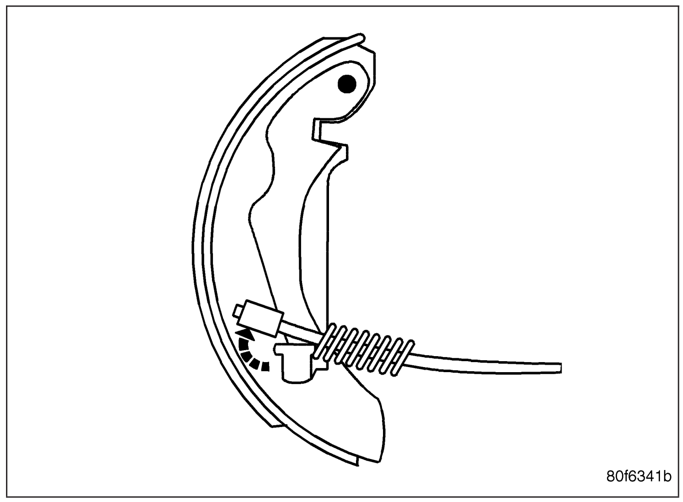
4. Remove the upper return spring (1) from the anchor pin (3) and the rear brake shoe.
5. Remove the upper return spring (2) from the anchor pin (3) and the front brake shoe.



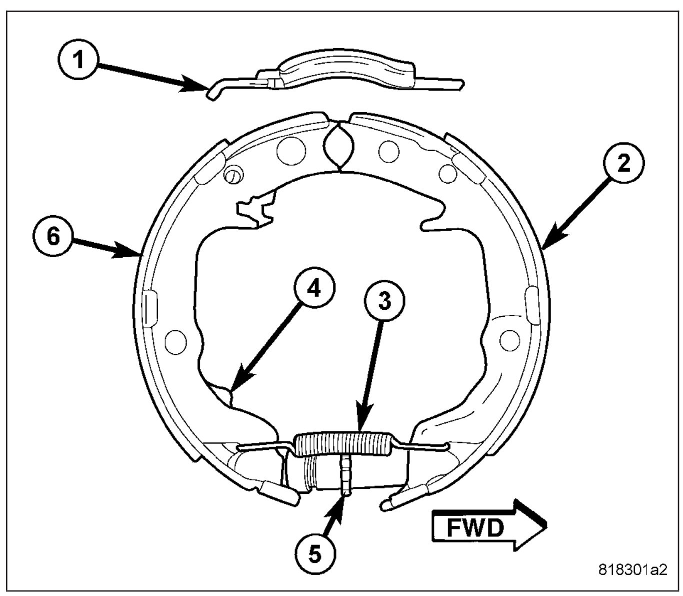
6. Remove the brake shoe hold-down springs and pins (1, 2). Rotate the pins 90° to disengage.



7. Remove the parking brake cable from the lever on the rear parking brake shoe.



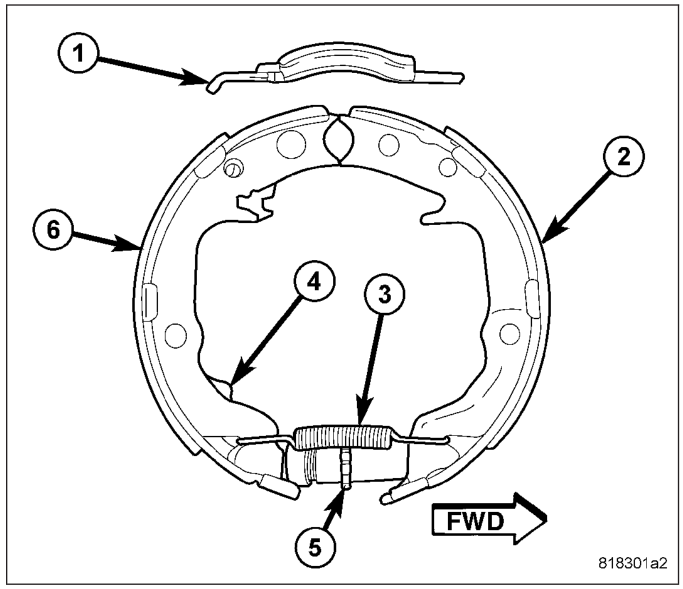
8. Remove the brake shoes (2, 6), adjuster (5) and lower return spring (3) as an assembly from the support plate.
9. If necessary, remove the strut (1).
10. Remove the lower return spring (3) and adjuster (5) from the shoes (2, 6).



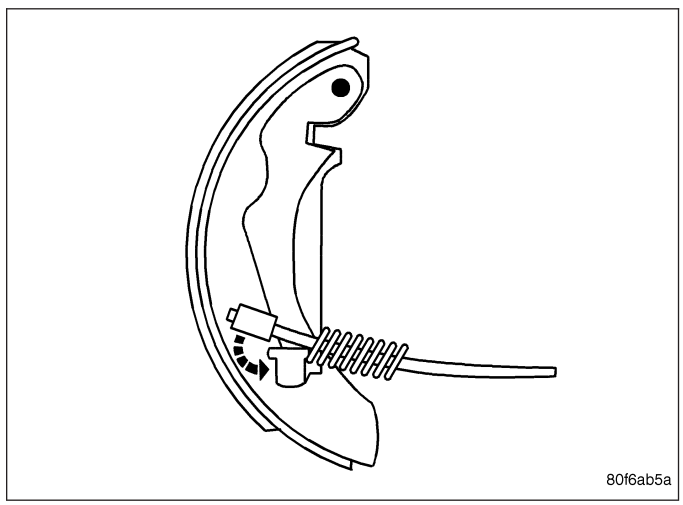
INSTALLATION

NOTE: If replacing parking brake shoes on both sides of vehicle, perform Step 1 through Step 15 on each side of the vehicle to complete shoe set installation, then proceed to Step 16.

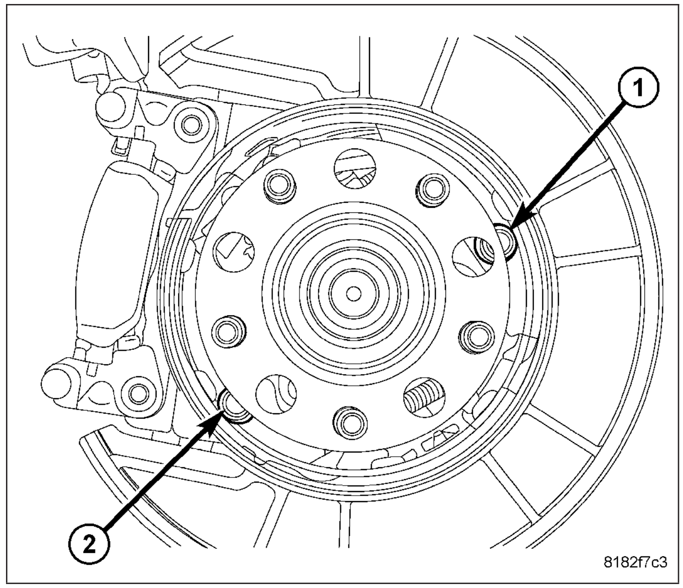
NOTE: Left side shoes are shown in the figure. Right side shoes are a mirror image of the left except for the adjuster. The threaded portion of the adjuster should always be positioned to the left side in order to maintain consistent side-to-side rotational direction for adjustment purposes.



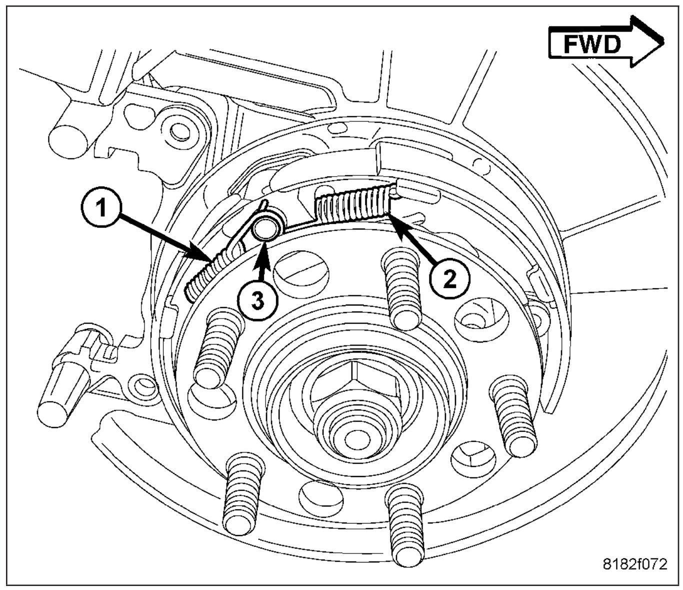
1. Install the lower return spring (3) and adjuster (5) between the parking brake shoes (2, 6). The rear shoe will have the lever mounted on the inside. Make sure the threaded portion of the adjuster is mounted to the left on both right and left side parking brake assemblies (see preceding note).
2. If necessary, place the strut (1) above the hub and bearing on the vehicle. Note the curved end of the strut (1) is positioned to the rear.
3. Install the assembled brake shoes (2, 6), adjuster (5) and lower return spring (3) over the hub and bearing and onto the support plate and anchor. Be sure to install the strut between the front shoe and the lever on the rear shoe.
4. Install the parking brake cable onto the lever on the parking brake shoe.



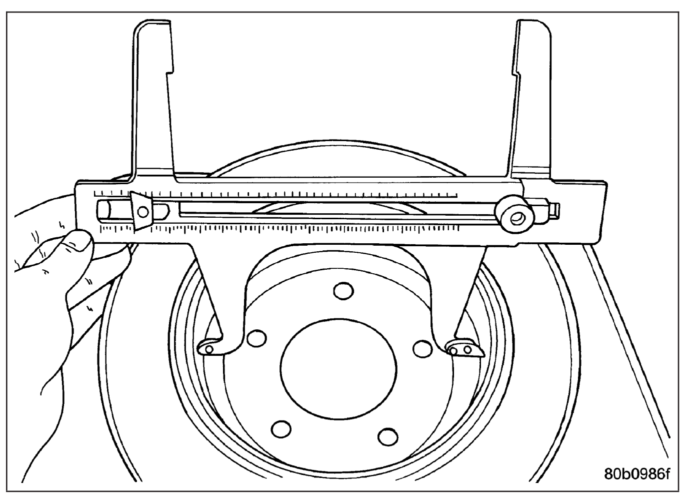
5. Install the brake shoe hold-down springs and pins (1, 2). Rotate the pins 90° to engage.



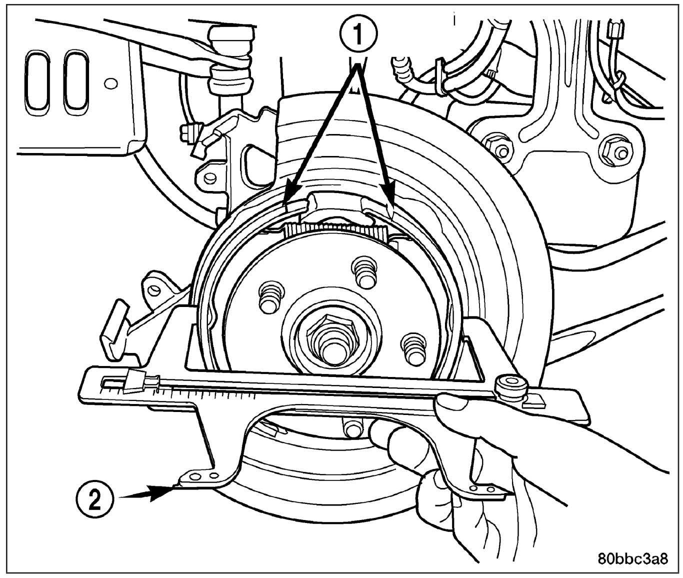
6. Install the front upper return spring (2) holding the front brake shoe and anchor pin (3).
7. Install the rear upper return spring (2) holding the rear brake shoe and anchor pin (3).



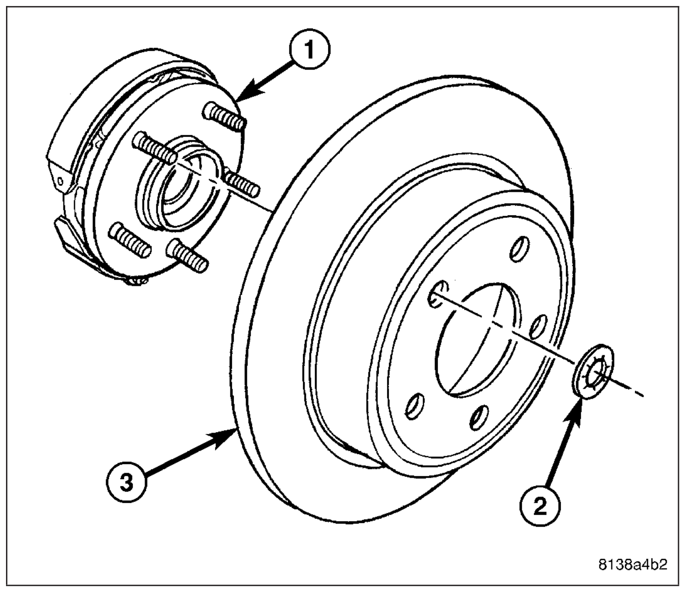
8. Using Brake Shoe Gauge, Special Tool C-3919, or equivalent, measure the inside diameter of parking brake drum portion of rotor. Set the Gauge.



9. Place Gauge (2) over the parking brake shoes (1) at their widest point.
10. Using the adjuster wheel, adjust the parking brake shoes until the linings on both parking brake shoes just touch the jaws on the Gauge.



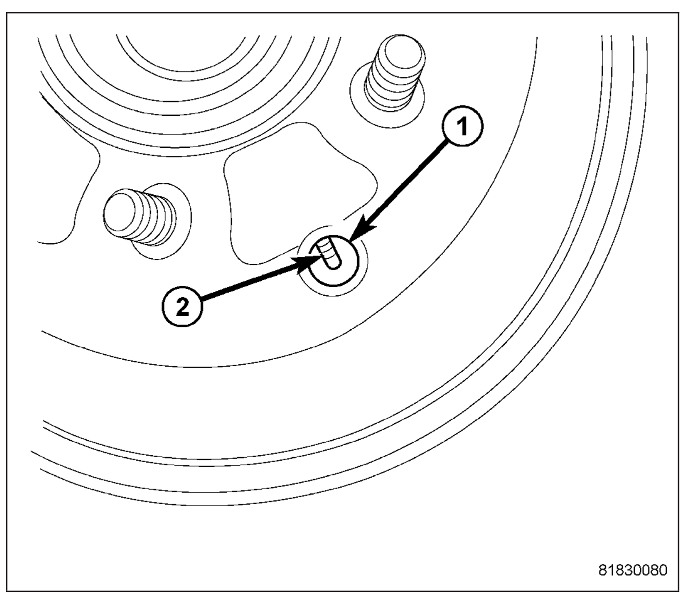
11. Install the rear brake rotor (3) and install a couple wheel mounting nuts to hold it in place while a final adjustment is made.



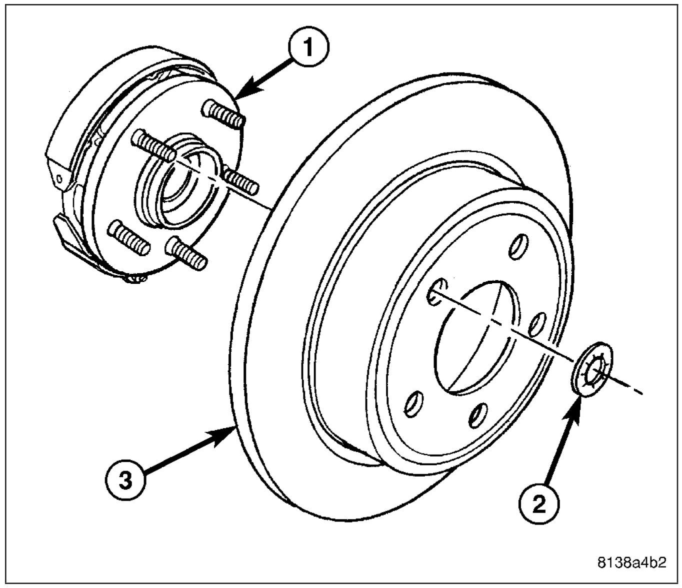
NOTE: To find the adjuster wheel with the drum on position the hole (1) in the front of the rotor drum as follows:
- **Left side – 7 o'clock.**
- **Right side – 5 o'clock.**

NOTE: When adjusting the parking brake shoes with the drum-in hat rotor installed, rotating the adjuster wheel (2) upward will loosen the adjustment. Rotating the adjuster wheel (2) downward will tighten the adjustment.

12. Remove the rubber plug from the hole (1) in the front of the rotor.
13. Utilizing the hole (1) in the front of the rotor, make a final adjustment of the shoes if necessary.
14. Reinstall the rubber plug.



15. Remove the wheel mounting nuts and finish installing the brake rotor (3) as well as all components removed to access it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION)
16. Lower the vehicle.
17. Cycle the parking brake lever once, verifying proper operation of the parking brake.



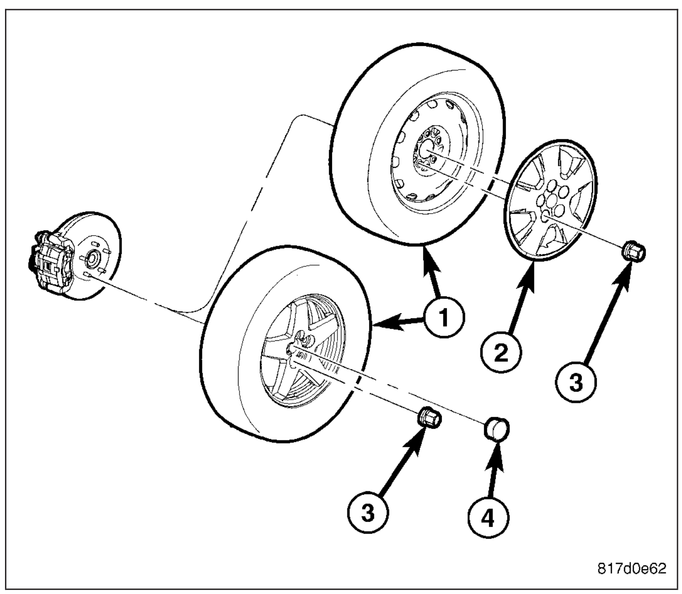
ADJUSTMENTS

PARKING BRAKE SHOE ADJUSTMENT

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

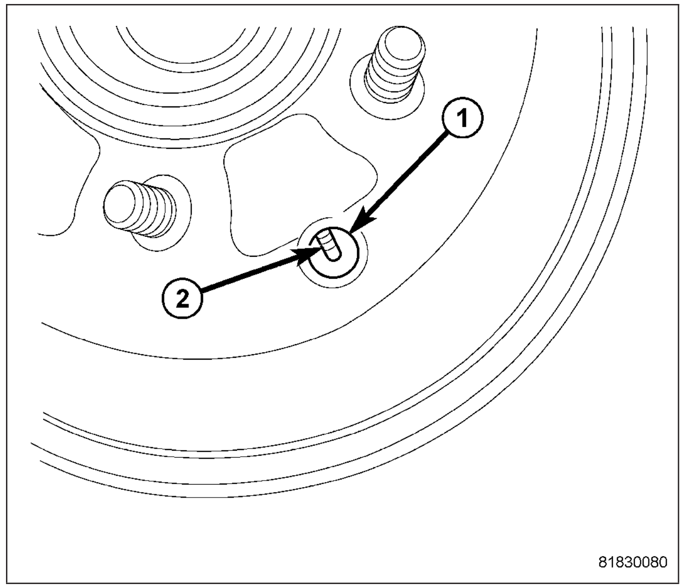
NOTE: The parking brake shoes used in the drum-in-hat park brake system do not automatically adjust to compensate for brake shoe lining wear. Therefore, it is necessary to manually adjust the parking brake shoes.

1. Verify the parking brake lever is in the released (down) position.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
3. Remove the wheel mounting nuts (3), then the tire and wheel assembly.
4. Install a couple wheel mounting nuts to hold the brake rotor in place while adjustment of the brake shoes is made.

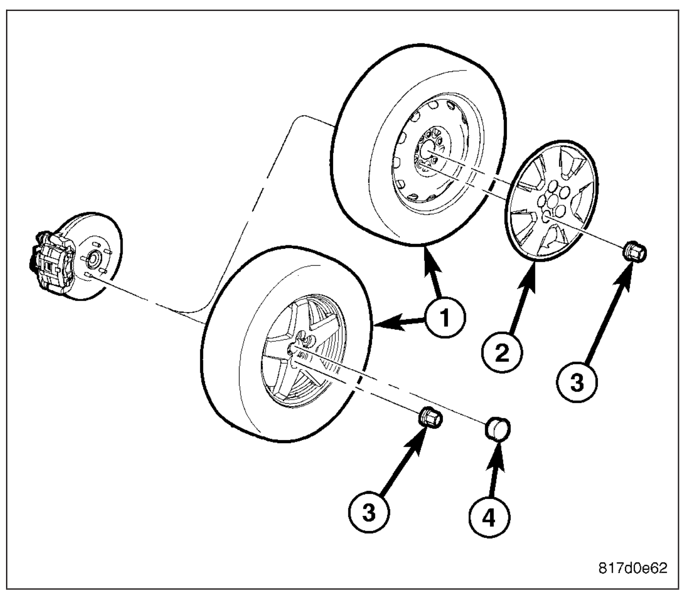


NOTE: To find the adjuster wheel with the drum on position the hole (1) in the front of the rotor drum as follows:
- **Left side – 7 o'clock.**
- **Right side – 5 o'clock.**

NOTE: When adjusting the parking brake shoes with the drum-in hat rotor installed, rotating the adjuster wheel (2) upward will loosen the adjustment. Rotating the adjuster wheel (2) downward will tighten the adjustment.



5. Remove the rubber plug from the hole (1) in the front of the rotor.
6. Utilizing the hole (1) in the front of the rotor, make a fine adjustment of the shoes.
7. Reinstall the rubber plug.
8. Lower the vehicle far enough to access the interior of the vehicle.
9. Reach inside the vehicle and cycle (fully apply and release) the park brakes.
10. With the parking brake lever in the fully applied (up) position, attempt to hand rotate each rear brake rotor to ensure that the parking brake shoes are working properly.
11. With the parking brake lever in the released (down) position, hand rotate each rear brake rotor to ensure that the parking brake shoes are not dragging.
12. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
13. Remove the wheel mounting nuts and install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten the wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
14. Lower the vehicle.



BRAKES - ABS ELECTRICAL DIAGNOSTICS

TABLE OF CONTENTS

BRAKES - ABS ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

ABS-INTERMITTENT CONDITION

For a complete wiring diagram **Refer to Section 8W**.

POSSIBLE CAUSES
INTERMITTENT CONDITION

1. INTERMITTENT CONDITION

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Review the scan tool Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set.

Turn the ignition off.

Visually inspect the related wire harness. Wiggle the related wire harness and look for an interrupted signal on the affected circuit. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected component and the Anti-Lock Brake Module.

Inspect and clean all PCM, ABS, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits

For any Relay DTCs, actuate the Relay with the scan tool and wiggle the related wire harness to try to interrupt the actuation.

Use the scan tool to perform a System Test if one applies to failing component.

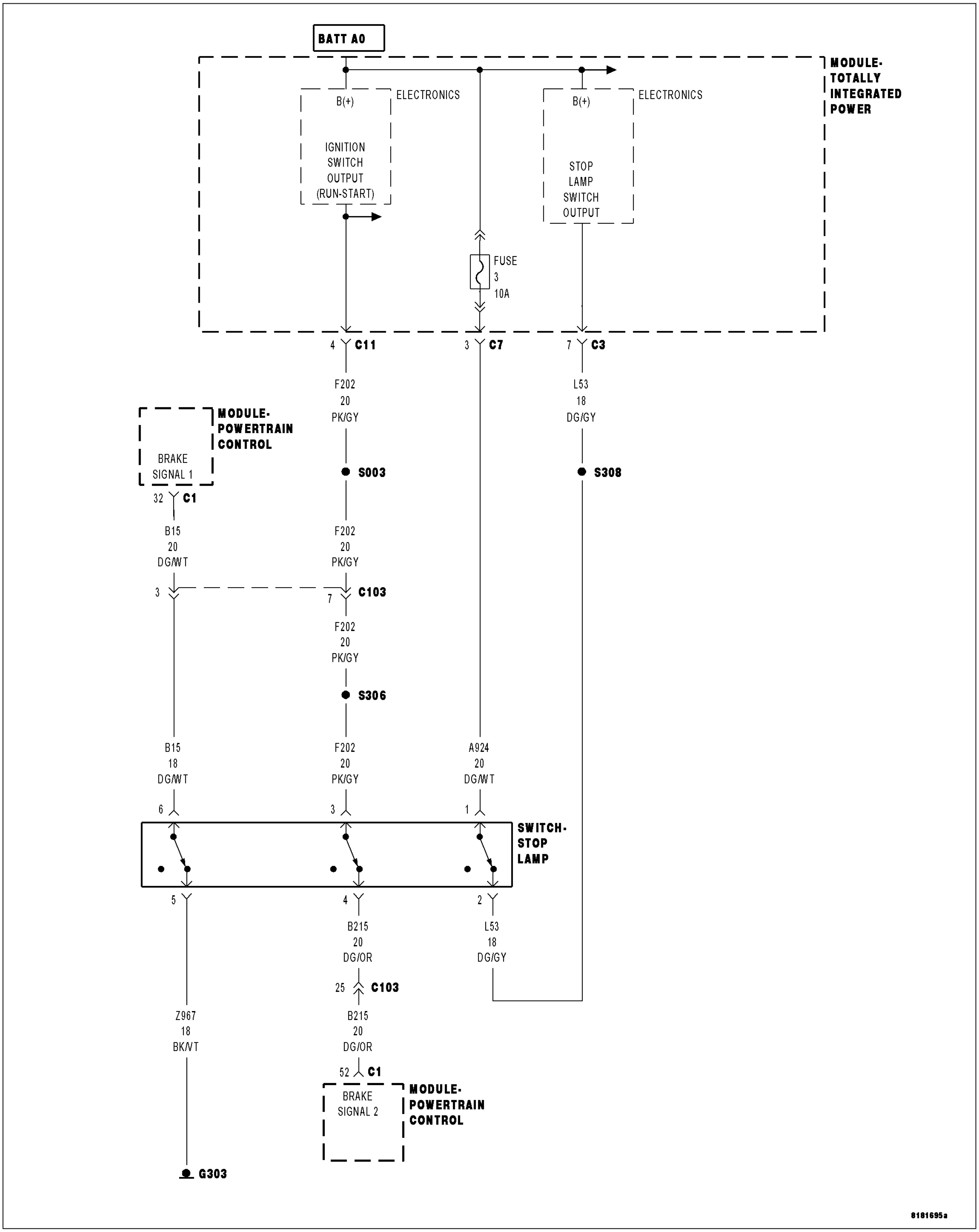
A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

Were any problems found during the above inspections?

Yes >> Perform the necessary repairs.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1002-BRAKE PEDAL SWITCH 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **Theory of Operation**
  The TIPM monitors the (L53) Primary Brake Switch Signal Circuit (L53] Brake Lamp Switch Output Circuit) for three minutes once the set conditions have been met.
- **When Monitored:**
  Ignition Switch OFF.
  All Doors Closed.
  CAN B and C are Ready to go to sleep. **When Set:**
  The TIPM monitors the L53 Brake Switch Signal Circuit once the set conditions have been met and the brake switch input has been active for more than 3 consecutive minutes.

Possible Causes
(L53) PRIMARY BRAKE SWITCH SIGNAL CIRCUIT OR (L53) BRAKE LAMP SWITCH OUTPUT SHORTED TO VOLTAGE
BRAKE LAMP SWITCH
TIPM

Diagnostic Test

1. CHECK FOR DTC C1002-BRAKE PEDAL SWITCH 1 CIRCUIT HIGH

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

Does the scan tool display: C1002-BRAKE PEDAL SWITCH 1 CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK (L53) PRIMARY BRAKE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE

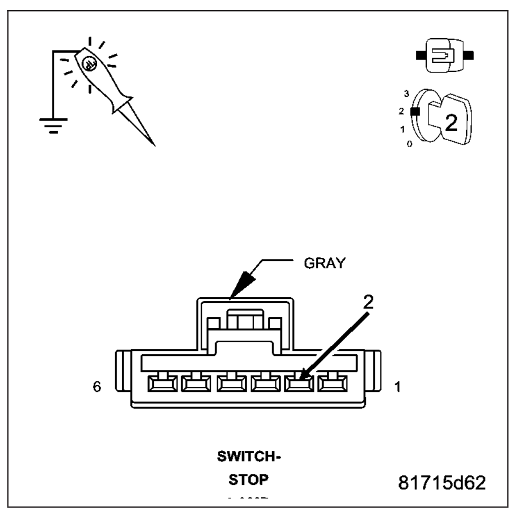
Turn the ignition on.

Using a 12-volt test light connected to ground, back probe the (L53) Primary Brake Switch Circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)



3. STOP LAMP BRAKE PEDAL SWITCH SHORTED

Turn the ignition off.

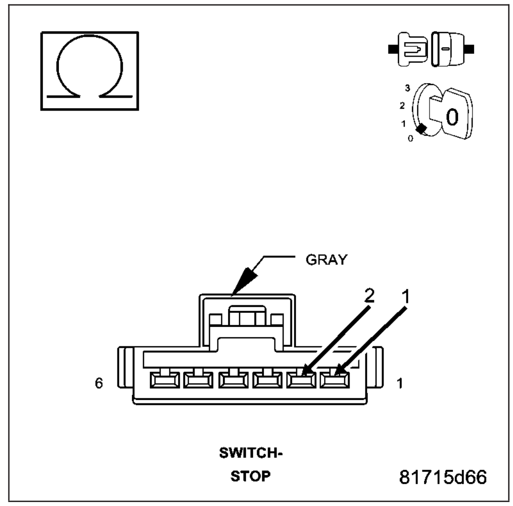
Disconnect the Stop Lamp Switch harness connector.

Measure the resistance of the Stop Lamp Switch between (L53) Pin 2 and (A924) Pin 1.

Is there continuity?

Yes >> Replace the Stop Lamp Switch and then Go To 4

No >> Go To 5



4. CHECK (L53) PRIMARY BRAKE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE

Reconnect the Stop Lamp Switch connector.

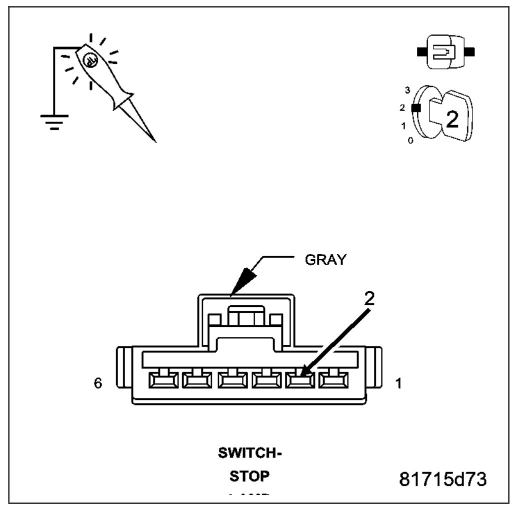
Turn the ignition on.

Using a 12-volt test light connected to ground, back probe the (L53) Primary Brake Switch Circuit.

Does the test light illuminate?

YES >> Go To 5

NO >> Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



5. CHECK TIPM BACK FEEDING VOLTAGE TO (L53) PRIMARY BRAKE SWITCH SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, test the (L53) Primary Brake Switch Circuit.

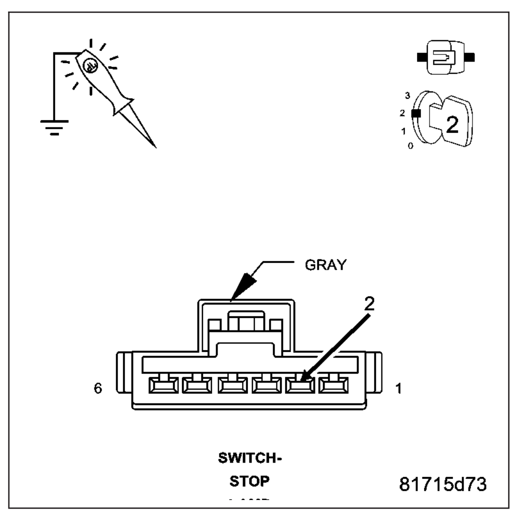
Does the test light illuminate?

YES >> Repair the short to voltage in the (L53) Primary Brake Switch Signal circuit.

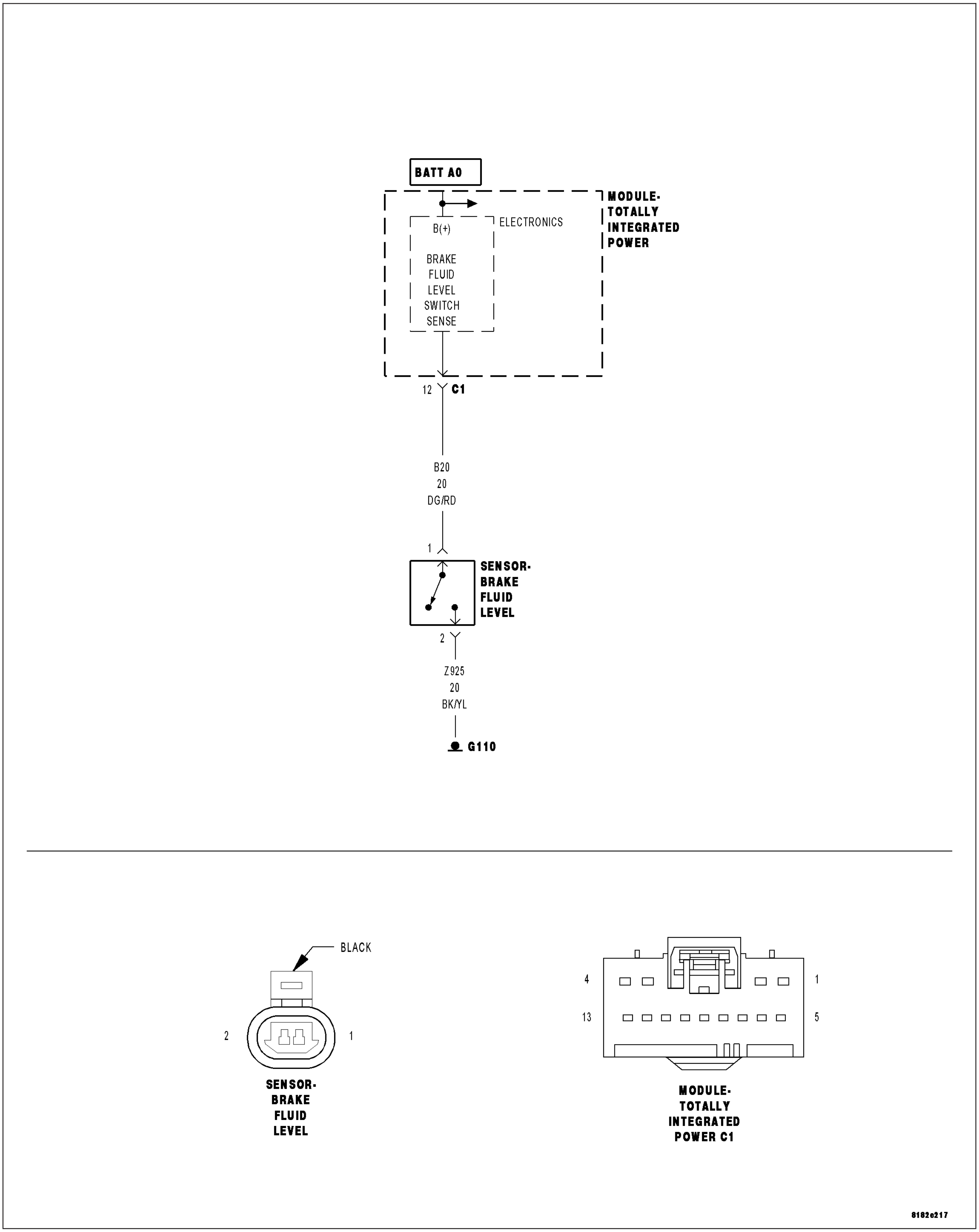
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace and program the Totally Integrated Power Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



C1007-BRAKE FLUID LEVEL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Totally Integrated Power Module indicates that the Brake Fluid Level Circuit is less then 0.10 volt.

Possible Causes
BRAKE FLUID LEVEL LOW
(B20) BRAKE FLUID LEVEL SWITCH SIGNAL CIRCUIT IS SHORTED TO GROUND
BRAKE FLUID LEVEL SWITCH INTERNAL FAILURE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. BRAKE FLUID LEVEL SENSOR SIGNAL VOLTAGE BELOW 0.10 VOLTS

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.
With the scan tool, read Brake Fluid Level Sensor Signal voltage.

Is the voltage below 0.10 volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

2. CHECK BRAKE FLUID LEVEL

NOTE: Visually inspect for worn brake linings or undersized rotors.

Was low brake fluid level found?

Yes >> Repair as needed.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. BRAKE FLUID LEVEL SENSOR INTERNAL FAILURE

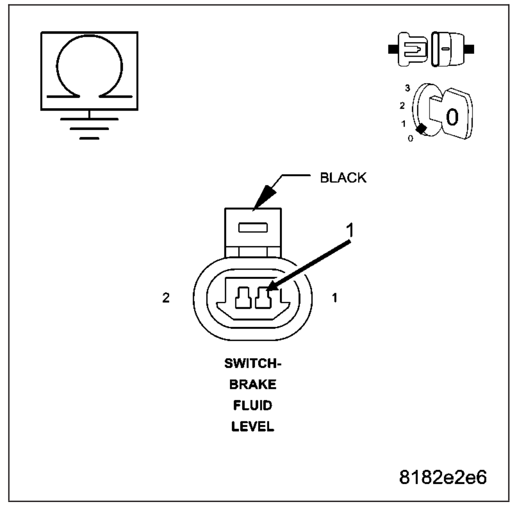
Turn the ignition off.
Disconnect the Brake Fluid Level Sensor harness connector
Turn the ignition on.
With the scan tool, read the Brake Fluid Level Sensor voltage

Is the voltage approximately 5 volts?

Yes >> Replace the Brake Fluid Level Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK THE (B20) BRAKE FLUID LEVEL SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND



Turn the ignition off.

Disconnect the Totally Integrated Power Module harness connector.

Disconnect the Brake Fluid Level Sensor harness connector.

Measure the resistance of the (B20) Brake Fluid Level circuit in the Brake Fluid Level Sensor harness connector to ground.

Is the resistance below 100 ohms?

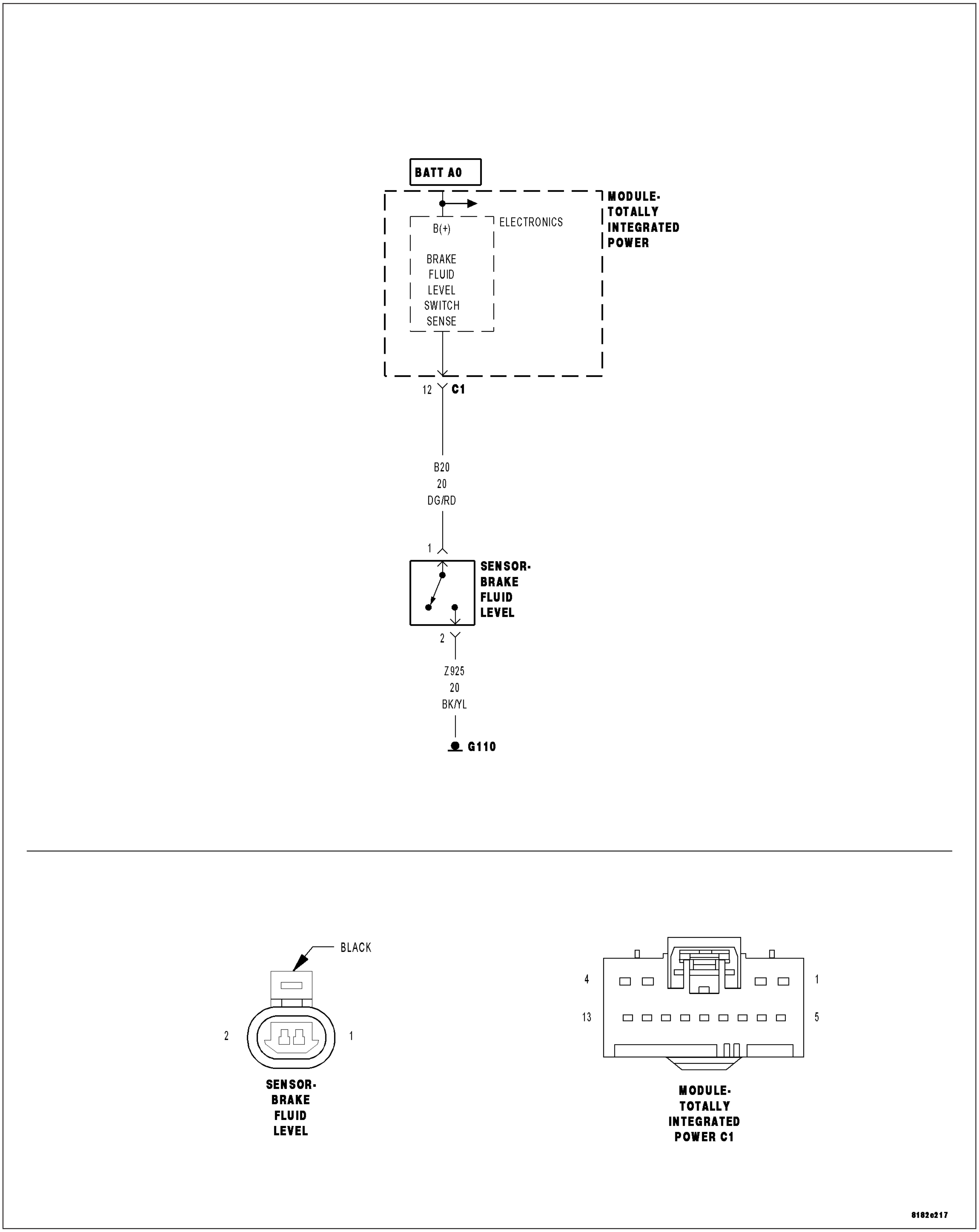
Yes >> Repair the (B20) Brake Fluid Level circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace and program the Totally Integrated Power Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1008-BRAKE FLUID LEVEL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Totally Integrated Power Module indicates that the Brake Fluid Level Circuit is greater than 4.9 volts for more then 5 seconds.

Possible Causes
(B20) BRAKE FLUID LEVEL SWITCH SIGNAL CIRCUIT OPEN
(B20) BRAKE FLUID LEVEL SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
BRAKE FLUID LEVEL SWITCH INTERNAL FAILURE
(Z925) SENSOR GROUND CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. BRAKE FLUID LEVEL SWITCH SIGNAL VOLTAGE ABOVE 4.9 VOLTS

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.
With the scan tool, read Fuel Level Switch Signal voltage.

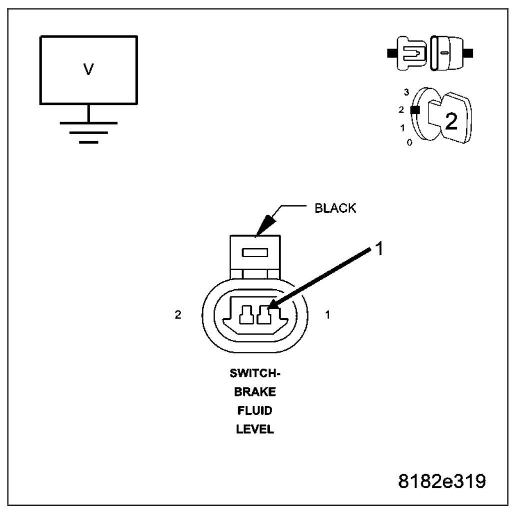
Is the voltage above 4.9 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. (B20) BRAKE FLUID LEVEL SWITCH SIGNAL CIRCUIT FOR SHORT TO BATTERY VOLTAGE

Turn the ignition off.
Disconnect the Brake Fluid Level Switch harness connector.
Turn the ignition on.
Measure the voltage of the (B20) Brake Fluid Level signal circuit in the Brake Fluid Level Switch harness connector to ground.



Is the voltage above 5.2 volts?

Yes >> Repair the (B20) Brake Fluid Level signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

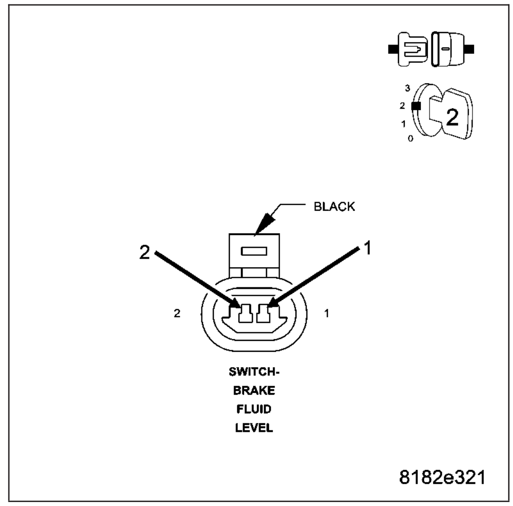
3. BRAKE FLUID LEVEL SWITCH INTERNAL FAILURE

Turn the ignition off.

Connect a jumper wire between the (B20) Brake Fluid Level signal circuit and the (Z925) Brake Fluid Level ground circuit in the Brake Fluid Level Switch harness connector

Turn the ignition on.

With the scan tool, read the Brake Fluid Level Switch voltage



Is the voltage below 1.0 volt?

Yes >> Replace the Brake Fluid Level Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

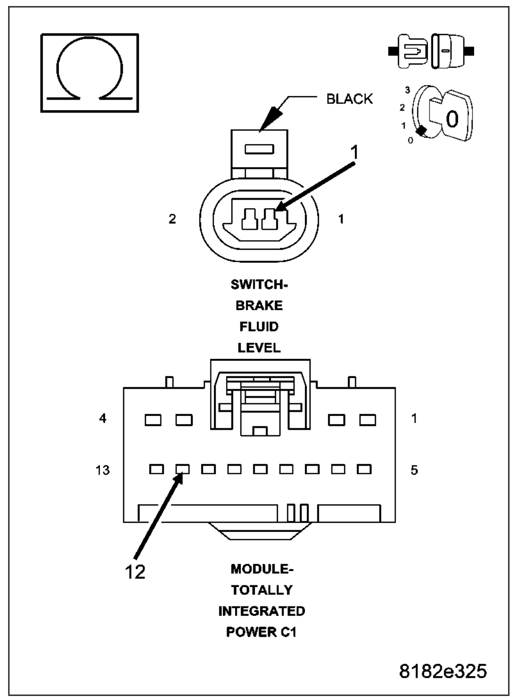
4. (B20) BRAKE FLUID LEVEL SWITCH CIRCUIT OPEN

Turn the ignition off.

Disconnect the Brake Fluid Level Switch.

Disconnect the TIPM harness connector.

Measure the resistance of the (B20) Brake Fluid Level signal circuit between the Brake Fluid Level Switch harness connector and the TIPM harness connector.



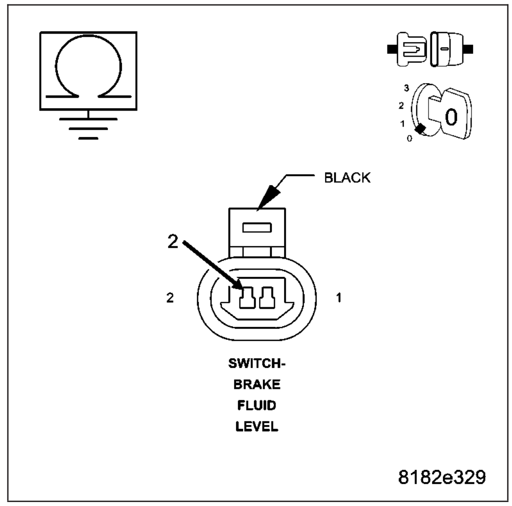
Is the resistance below 5 ohms?

Yes >> Go To 5

No >> Repair the open in the (B20) Brake Fluid Level Switch signal circuit.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. (Z925) SENSOR GROUND CIRCUIT OPEN



Turn the ignition off.

Disconnect the Brake Fluid Level Switch harness connector.

Reconnect the TIPM harness connector.

Measure the resistance of the (Z925) Brake Fluid Level Switch ground circuit between the Brake Fluid Level Switch harness connector and ground.

Is the resistance below 5.0 ohms?

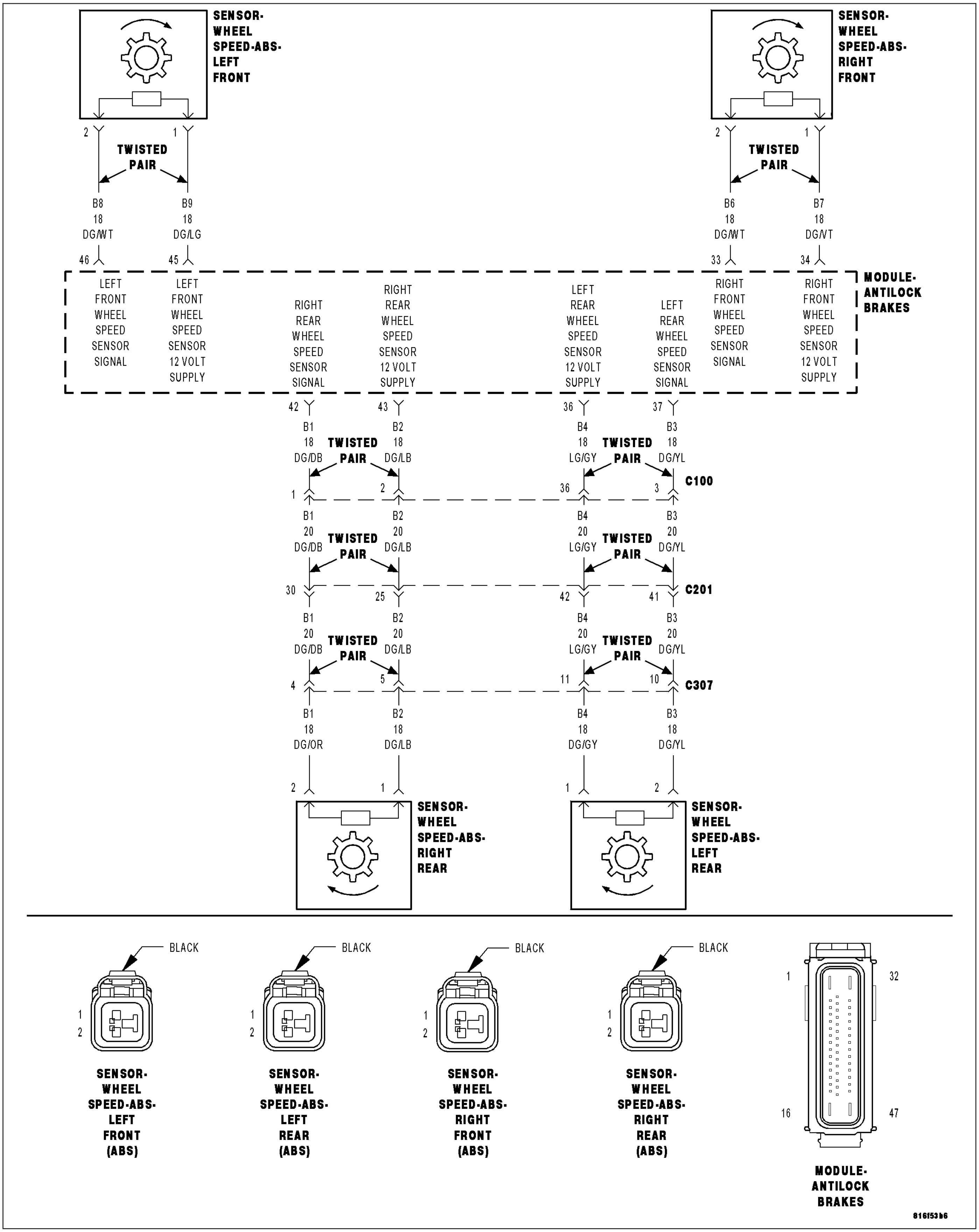
Yes >> Replace and program the Totally Integrated Power Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the open in the (Z925) Sensor ground circuit.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND OR OPEN
(B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER
LEFT FRONT WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector.

Is the Left Front WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT VOLTAGE

Disconnect the Left Front WSS harness connector.

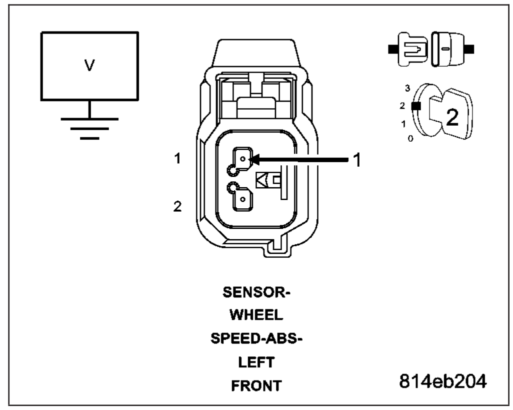
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



4. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORT TO GROUND

Disconnect the Anti-Lock Brake Module harness connector.

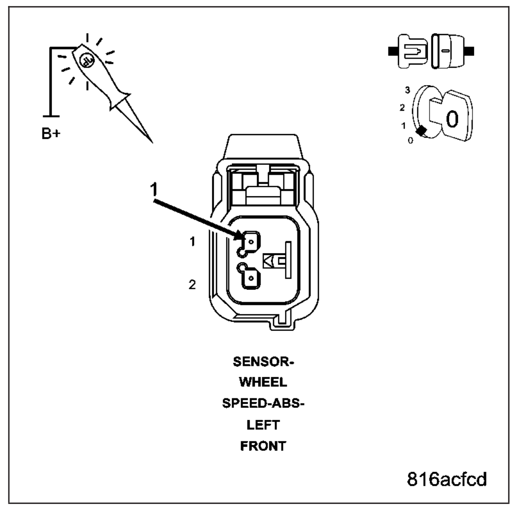
Using a 12-volt test light connected to 12-volts, probe the (B9) Left Front WSS Supply circuit.

Does the test light illuminate brightly?

Yes >> Repair the (B9) Left Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5



5. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT OPEN

Connect a jumper wire between ground and the (B9) Left Front WSS Supply circuit in the Anti-Lock Brakes Module harness connector.

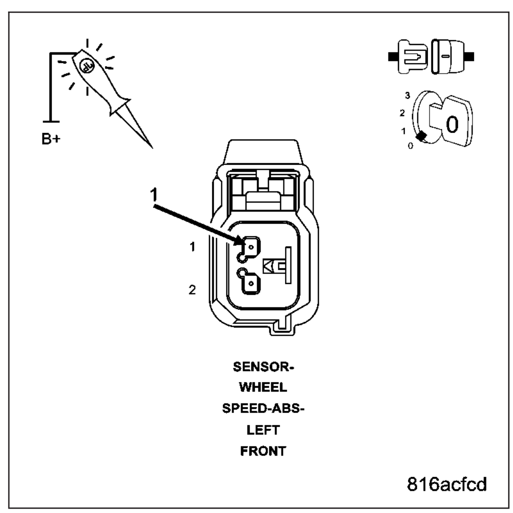
Using a 12-volt test light connected to 12-volts, probe the (B9) Left Front WSS Supply circuit.

Does the test light illuminate brightly

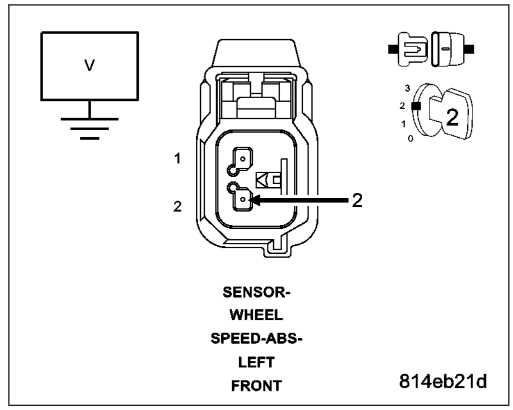
Yes >> Go To 6

No >> Repair the (B9) Left Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



6. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO VOLTAGE



Turn the ignition on.

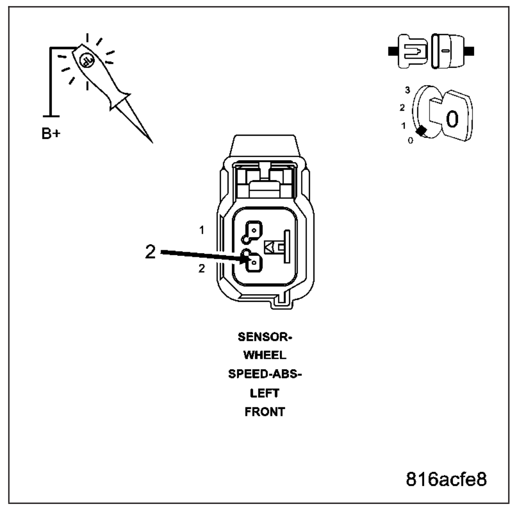
Measure the voltage between the (B8) Left Front WSS Signal circuit and ground.

Is the voltage above one volt?

Yes >> Repair the (B8) Left Front WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO GROUND



Turn the ignition off.

If not done previously, disconnect the Anti-Lock Brake Module harness connector.

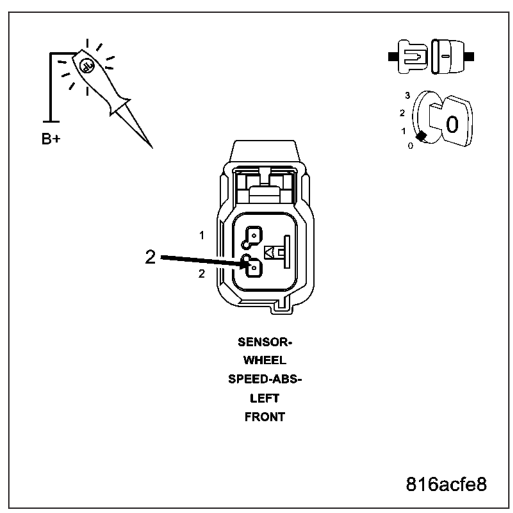
Using a 12-volt test light connected to 12-volts, probe the (B8) Left Front WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8

8. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT OPEN



Connect a jumper wire between ground and the (B8) Left Front WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B8) Left Front WSS Signal circuit.

Does the test light illuminate brightly?

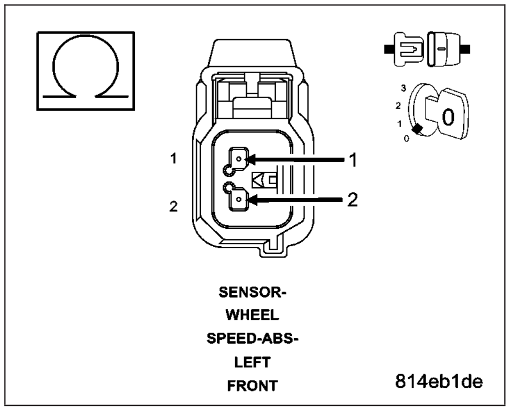
Yes >> Go To 9

No >> Repair the (B8) Left Front WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

9. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORT TOGETHER

Remove all jumper wires.

Measure the resistance between the (B8) Left Front WSS Signal circuit and the (B9) Left Front WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B8) Left Front WSS Signal circuit and the (B9) Left Front WSS Supply circuit for a short together.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

10. LEFT FRONT WHEEL SPEED SENSOR

Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front WSS Signal is intermittently missing a vehicle speed above 40 kph (25 mph) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
LEFT FRONT WSS LOOSE — B8, B9 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
LEFT FRONT TONE WHEEL DAMAGE
LEFT FRONT WHEEL BEARING DAMAGE
IMPROPER LEFT FRONT TIRE PRESSURE/MISMATCHED TIRES
LEFT FRONT WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

NOTE: If DTC C100A Left Front Wheel Speed Sensor Circuit is present it must be repaired before continuing.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. CHECK FOR IMPROPER LEFT FRONT TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Left Front Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Left Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK LEFT FRONT WSS LOOSENESS, INSPECT B8, B9 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector

Inspect the Left Front WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B8) Left Front WSS Signal and (B9) Left Front WSS Supply circuits between the Left Front WSS and Anti-Lock Brake Module for damage.

Is the Left Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK LEFT FRONT TONE WHEEL FOR DAMAGE

Inspect the Left Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Front Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK LEFT FRONT WHEEL BEARING FOR DAMAGE

Inspect the Left Front wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Front Wheel Bearing Damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. LEFT FRONT WHEEL SPEED SENSOR

Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front WSS reading is different from the readings received from the other WSS's at a vehicle speed above 40 kph (25 mph). The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
LEFT FRONT WSS LOOSE — B8, B9 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER LEFT FRONT TIRE PRESSURE/MISMATCHED TIRES
LEFT FRONT TONE WHEEL/BEARING DAMAGE
LEFT FRONT WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE?

Yes >> Go To 3

No >> Go To 2

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.
Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

3. CHECK FOR IMPROPER LEFT FRONT TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Left Front Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Left Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK LEFT FRONT WSS LOOSENESS, INSPECT B8, B9 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector

Inspect the Left Front WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B8) Left Front WSS Signal and (B9) Left Front WSS Supply circuits between the Left Front WSS and Anti-Lock Brake Module for damage.

Is the Left Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK LEFT FRONT TONE WHEEL FOR DAMAGE

Inspect the Left Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Front Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. LEFT FRONT WHEEL SPEED SENSOR

Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

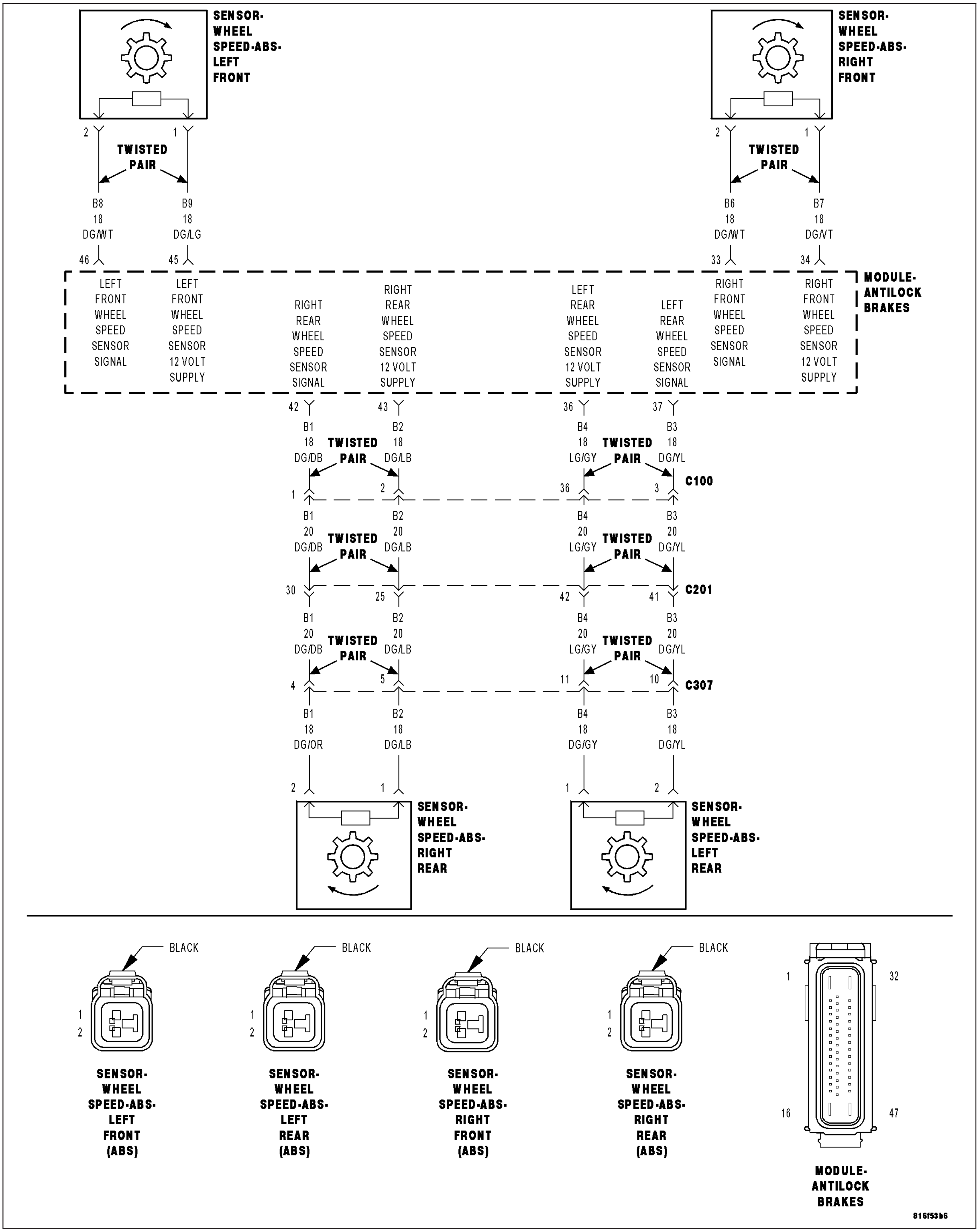
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Right Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO (B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT
RIGHT FRONT WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR DTC C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector.

Is the Right Front WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

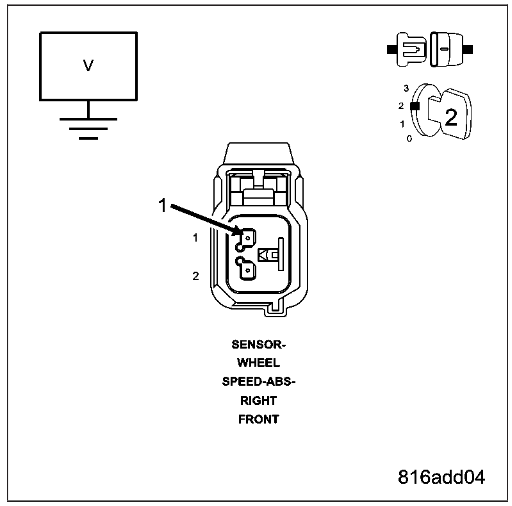
No >> Go To 3

3. CHECK (B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT VOLTAGE

Disconnect the Right Front WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS 12 Volt Supply circuit.



Is the voltage above 10.0 volts?

Yes >> Go To 6

No >> Go To 4

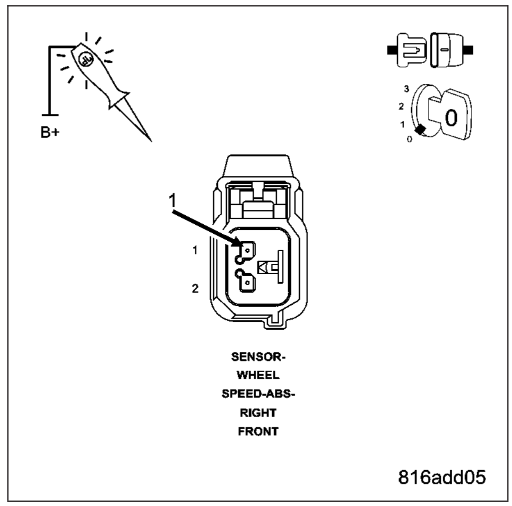
4. CHECK (B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B7) Right Front WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.

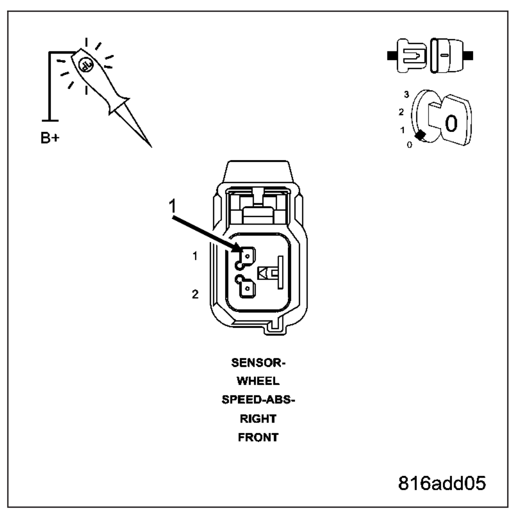
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK (B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B7) Right Front WSS Supply circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B7) Right Front WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

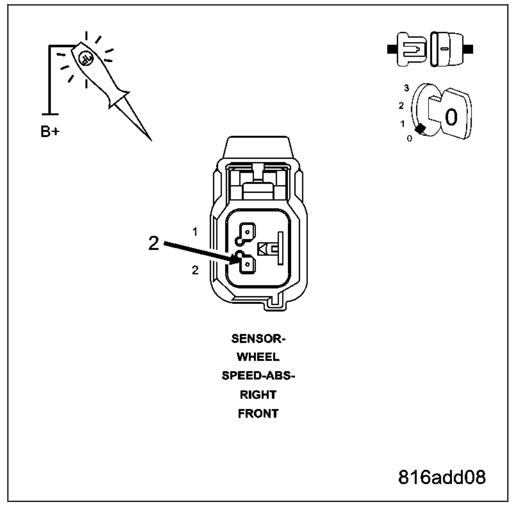
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (B7) Right Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORT TO GROUND

Using a 12-volt test light connected to 12-volts, probe the (B6) Right Front WSS Signal circuit.



Does the test light illuminate brightly?

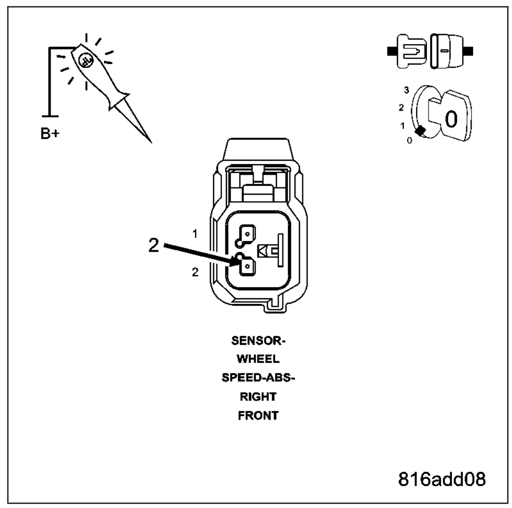
Yes >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT OPEN

Connect a jumper wire between ground and the (B6) Right Front WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B6) Right Front WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 8

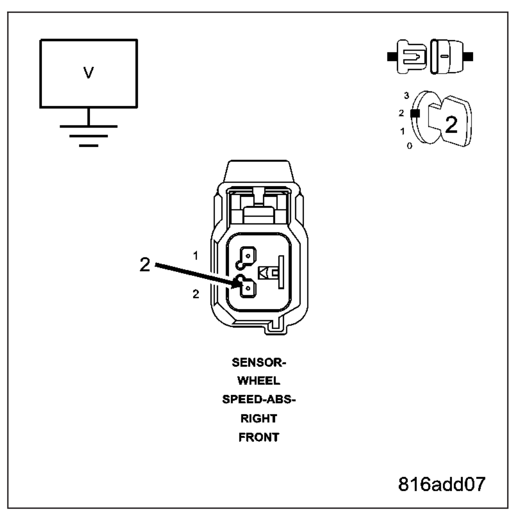
No >> Repair the (B6) Right Front WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR AN SHORT TO VOLTAGE

Turn the ignition on.

Remove all jumper wires.

Measure the voltage between the (B6) Right Front WSS Signal circuit and ground.

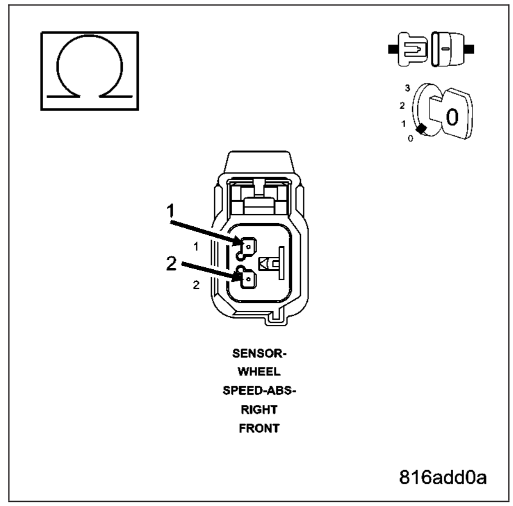


Is the voltage above one volt?

Yes >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 9

9. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS 12 VOLT SUPPLY CIRCUIT SHORTED TOGETHER



Turn the ignition off.

Measure the resistance between the (B6) Right Front WSS Signal circuit and the (B7) Right Front WSS Supply circuit.

Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B6) Right Front WSS Signal circuit and the (B7) Right Front WSS Supply circuit for a short together.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

10. RIGHT FRONT WHEEL SPEED SENSOR

Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Front WSS Signal is intermittently missing a vehicle speed above 25mph (40 kph) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
RIGHT FRONT WSS LOOSE — B6, B7 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
RIGHT FRONT TONE WHEEL DAMAGE
RIGHT FRONT WHEEL BEARING DAMAGE
IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES
RIGHT FRONT WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

NOTE: If DTC C1015–Right Front Wheel Speed Sensor Circuit is present it must be repaired before continuing.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. CHECK FOR IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Right Front Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Right Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK RIGHT FRONT WSS LOOSENESS, INSPECT B6, B7 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector

Inspect the Right Front WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B6) Right Front WSS Signal and (B7) Right Front WSS Supply circuits between the Right Front WSS and Anti-Lock Brake Module for damage.

Is the Right Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK RIGHT FRONT TONE WHEEL FOR DAMAGE

Inspect the Right Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Front Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK RIGHT FRONT WHEEL BEARING FOR DAMAGE

Inspect the Right Front wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Front Wheel Bearing Damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. RIGHT FRONT WHEEL SPEED SENSOR

Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Front WSS reading is different from the readings received from the other WSS's at a vehicle speed above 40 kph (25 mph). The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
RIGHT FRONT WSS LOOSE — B6, B7 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES
RIGHT FRONT TONE WHEEL/BEARING DAMAGE
RIGHT FRONT WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE?

Yes >> Go To 3

No >> Go To 2

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.
Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

3. CHECK FOR IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Right Front Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Right Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK RIGHT FRONT WSS LOOSENESS, INSPECT B6, B7 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector

Inspect the Right Front WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B6) Right Front WSS Signal and (B7) Right Front WSS Supply circuits between the Right Front WSS and Anti-Lock Brake Module for damage.

Is the Right Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK RIGHT FRONT TONE WHEEL FOR DAMAGE

Inspect the Right Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Front Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. RIGHT FRONT WHEEL SPEED SENSOR

Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

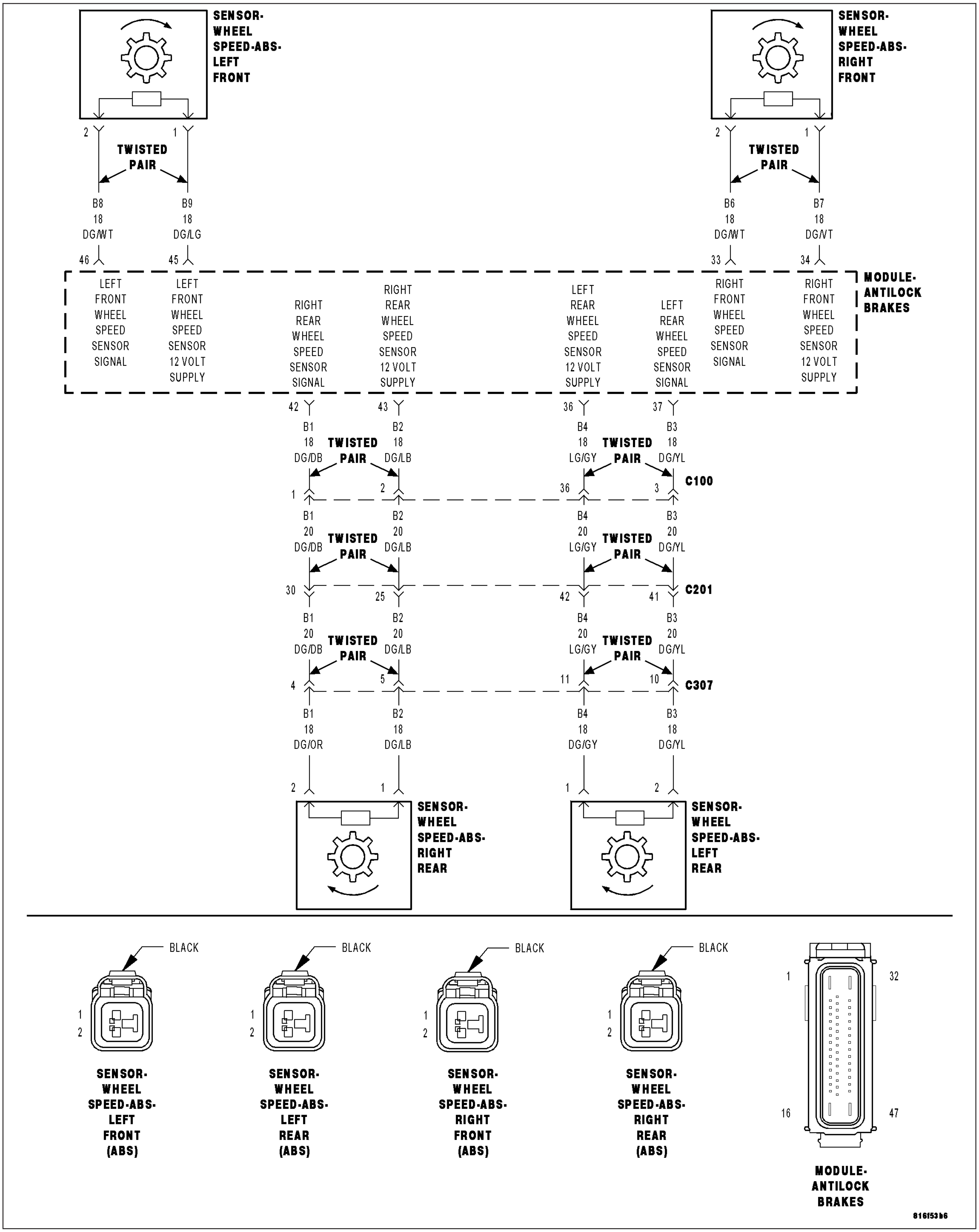
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Left Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B3) LEFT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B3) LEFT REAR WSS SIGNAL CIRCUIT SHORTED TO (B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT
LEFT REAR WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR DTC C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector.

Is the Left Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

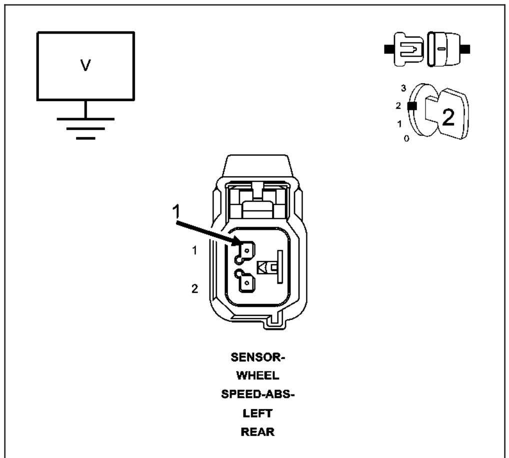
No >> Go To 3

3. CHECK (B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT VOLTAGE

Disconnect the Left Rear WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B4) Left Rear WSS 12 Volt Supply circuit.



816add50

Is the voltage above 10.0 volts?

Yes >> Go To 6

No >> Go To 4

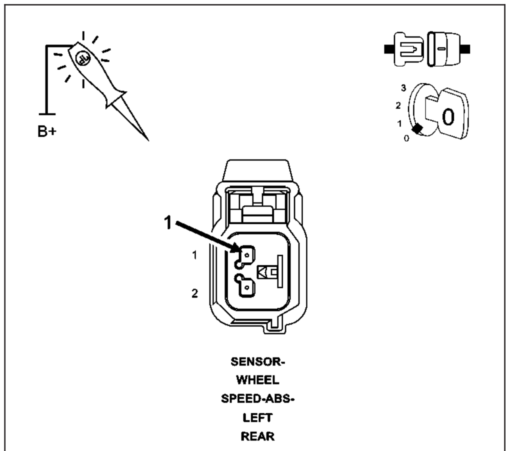
4. CHECK (B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B4) Left Rear WSS Supply circuit.



816add52

Does the test light illuminate brightly?

Yes >> Repair the (B4) Left Rear WSS Supply circuit for a short to ground.

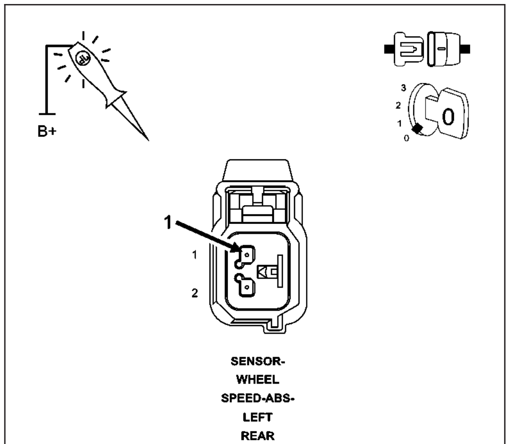
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK (B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B4) Left Rear WSS Supply circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B4) Left Rear WSS Supply circuit.



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Does the test light illuminate brightly?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

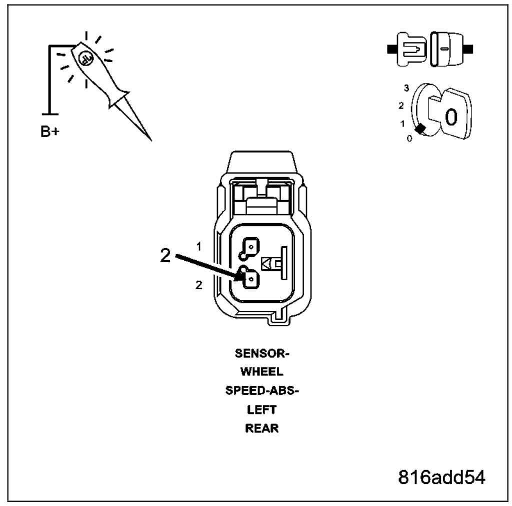
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (B4) Left Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND

Using a 12-volt test light connected to 12-volts, probe the (B3) Left Rear WSS Signal circuit.



Does the test light illuminate brightly?

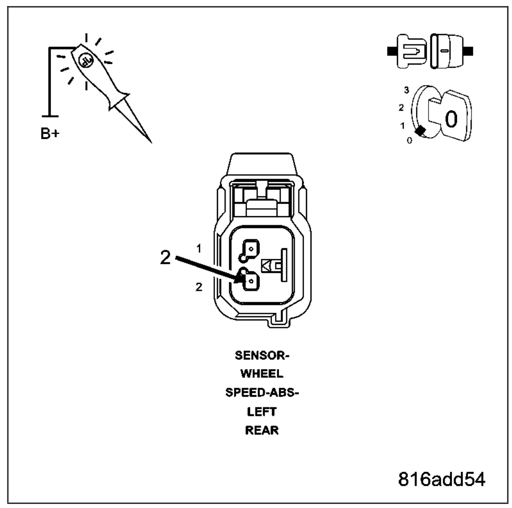
Yes >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B3) Left Rear WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B3) Left Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 8

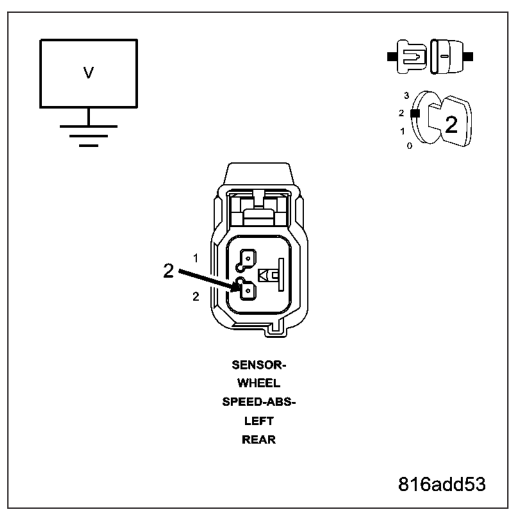
No >> Repair the (B3) Left Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Remove all jumper wires.

Measure the voltage between the (B3) Left Rear WSS Signal circuit and ground.



Is the voltage above one volt?

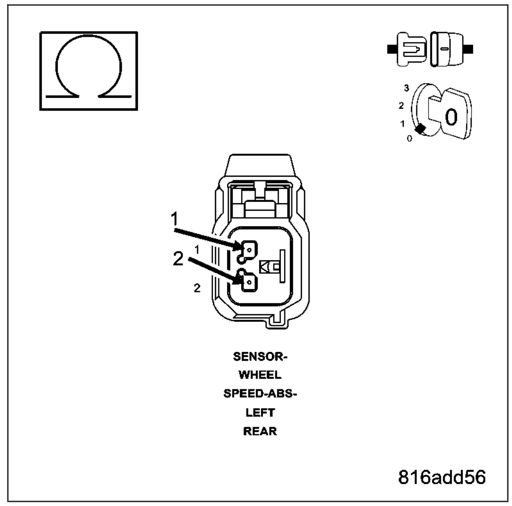
Yes >> Repair the (B3) Left Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 9

9. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT AND (B4) LEFT REAR WSS 12 VOLT SUPPLY CIRCUIT SHORTED TOGETHER

Turn the ignition off.

Measure the resistance between the (B3) Left Rear WSS Signal circuit and the (B4) Left Rear WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B3) Left Rear WSS Signal circuit and the (B4) Left Rear WSS Supply circuit for a short together.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

10. LEFT REAR WHEEL SPEED SENSOR

Replace the Left Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Rear WSS Signal is intermittently missing a vehicle speed above 25mph (40 kph) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
LEFT REAR WSS AIR GAP FAULT
LEFT REAR WSS LOOSE — B3, B4 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
LEFT REAR TONE WHEEL DAMAGE
LEFT REAR WHEEL BEARING DAMAGE
IMPROPER LEFT REAR TIRE PRESSURE/MISMATCHED TIRES
LEFT REAR WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK LEFT REAR WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Left Rear WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Rear WSS air gap within specifications?

Yes >> Go To 3

No >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 4

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

4. CHECK FOR IMPROPER LEFT REAR TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Left Rear Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Left Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK LEFT REAR WSS LOOSENESS, INSPECT B4, B5 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector

Inspect the Left Rear WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B3) Left Rear WSS Signal and (B4) Left Rear WSS Supply circuits between the Left Rear WSS and Anti-Lock Brake Module for damage.

Is the Left Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK LEFT REAR TONE WHEEL FOR DAMAGE

Inspect the Left Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Rear Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK LEFT REAR WHEEL BEARING FOR DAMAGE

Inspect the Left Rear wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Rear Wheel Bearing Damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8

8. LEFT REAR WHEEL SPEED SENSOR

Replace the Left Rear Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).
Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Rear WSS reading is different from the readings received from the other WSS's at a vehicle speed above 40 kph (25 mph). The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
LEFT REAR WSS LOOSE — B3, B4 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER LEFT REAR TIRE PRESSURE/MISMATCHED TIRES
LEFT REAR TONE WHEEL DAMAGE
LEFT REAR WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE?

Yes >> Go To 3

No >> Go To 2

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.
Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

3. CHECK FOR IMPROPER LEFT REAR TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Left Rear Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Left Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK LEFT REAR WSS LOOSENESS, INSPECT B3, B4 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector

Inspect the Left Rear WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B3) Left Rear WSS Signal and (B4) Left Rear WSS Supply circuits between the Left Rear WSS and Anti-Lock Brake Module for damage.

Is the Left Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK LEFT REAR TONE WHEEL FOR DAMAGE

Inspect the Left Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Rear Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. LEFT REAR WHEEL SPEED SENSOR

Replace the Left Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

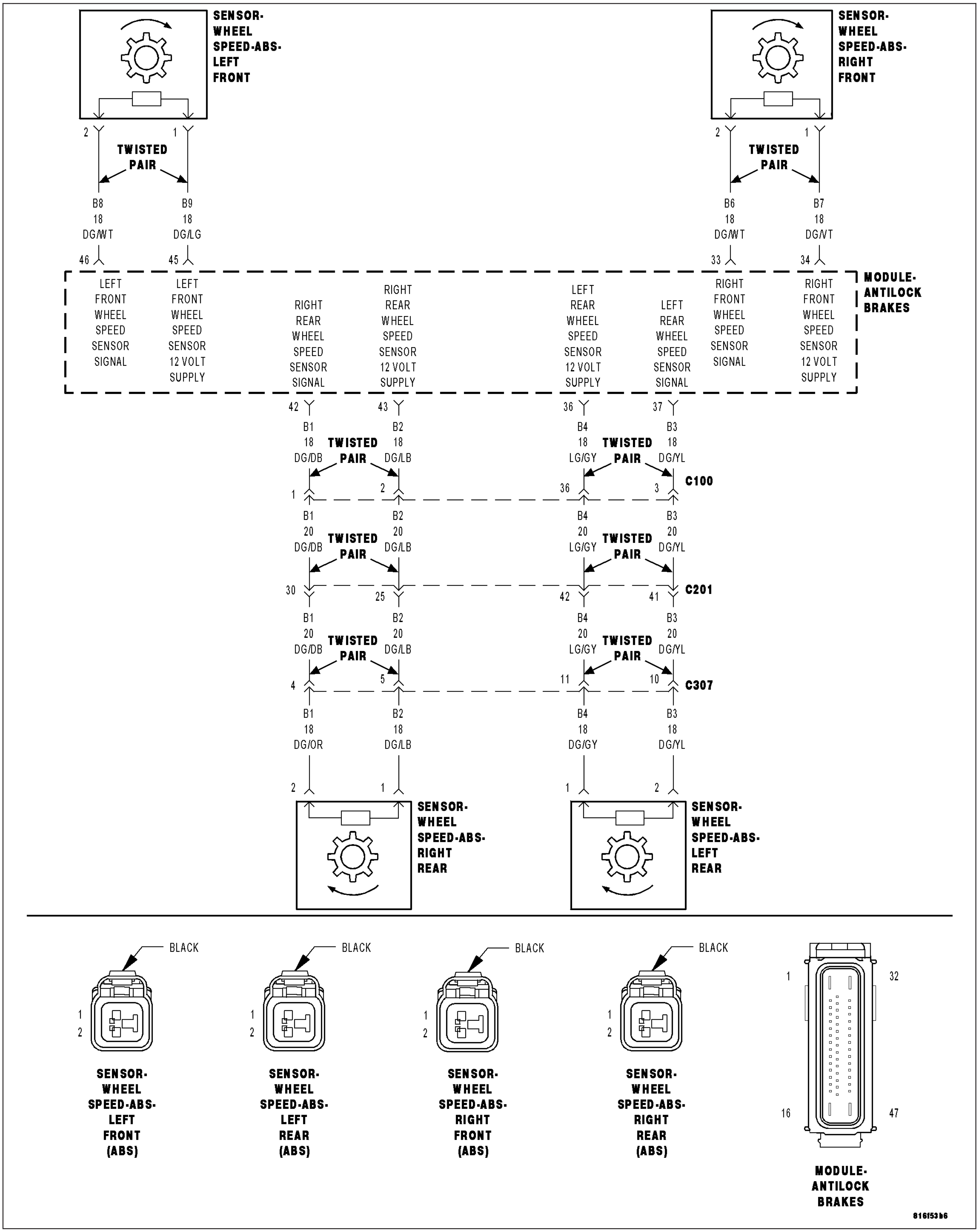
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT
RIGHT REAR WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR DTC C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector.

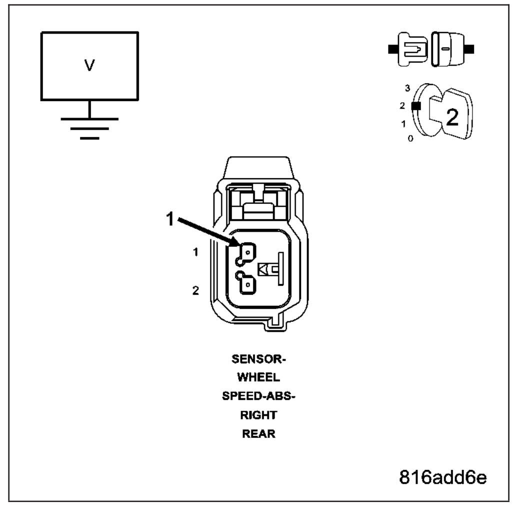
Is the Right Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT VOLTAGE



Disconnect the Right Rear WSS harness connector.

Turn the ignition on.

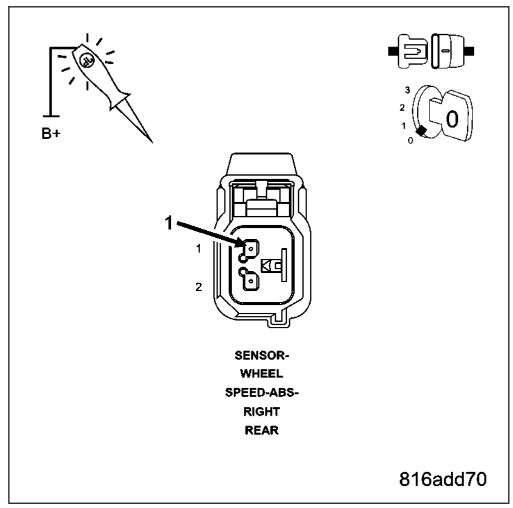
Measure the voltage of the (B2) Right Rear WSS 12 Volt Supply circuit.

Is the voltage above 10.0 volts?

Yes >> Go To 6

No >> Go To 4

4. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND



Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.

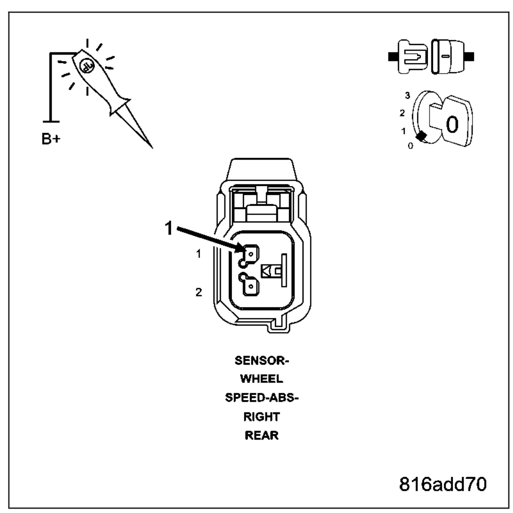
Does the test light illuminate brightly?

Yes >> Repair the (B2) Right Rear WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR AN OPEN



Connect a jumper wire between ground and the (B2) Right Rear WSS Supply circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.

Does the test light illuminate brightly?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

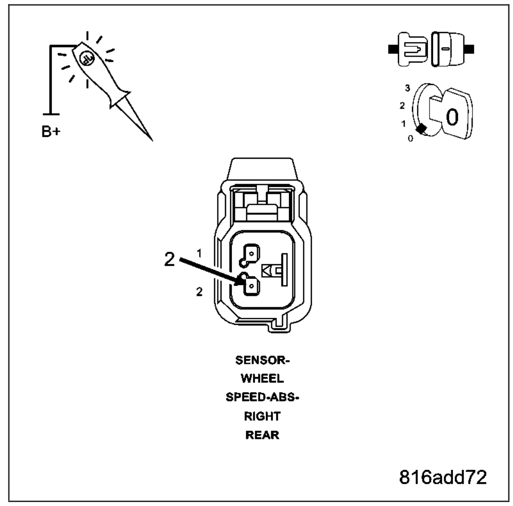
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (B2) Right Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

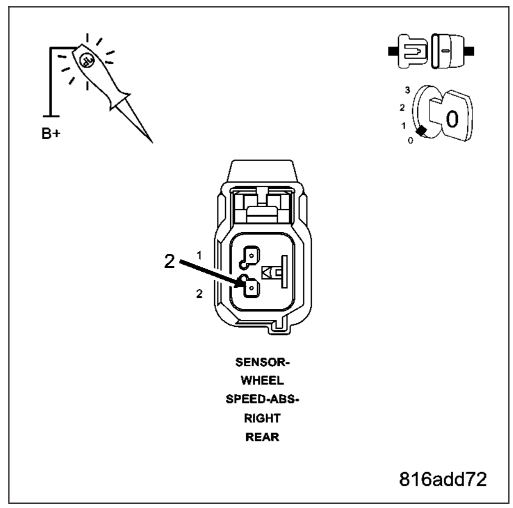
Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B1) Right Rear WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 8

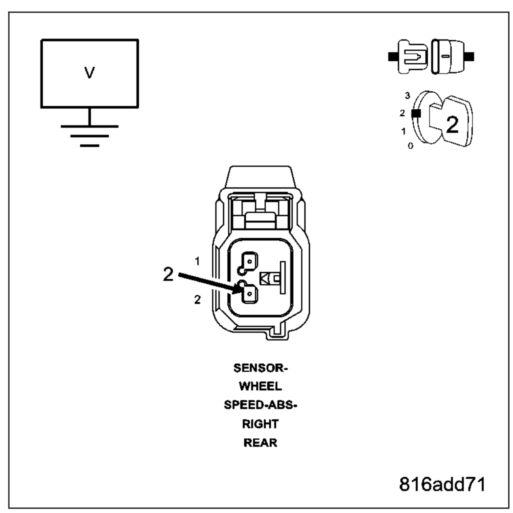
No >> Repair the (B1) Right Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Remove all jumper wires.

Measure the voltage between the (B1) Right Rear WSS Signal circuit and ground.



Is the voltage above one volt?

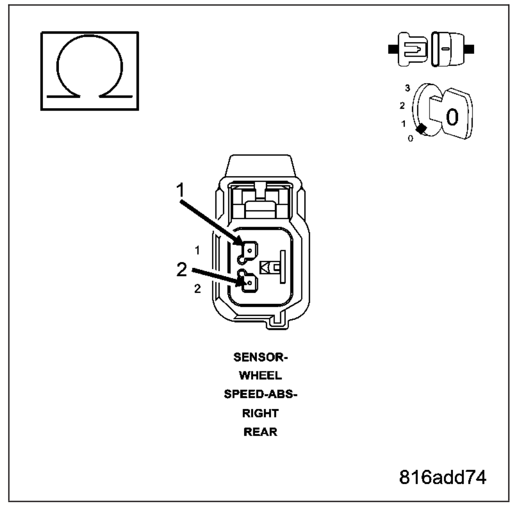
Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 9

9. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT

Turn the ignition off.

Measure the resistance between the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit for a short together.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

10. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear WSS Signal is intermittently missing a vehicle speed above 25mph (40 kph) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
RIGHT REAR WSS AIR GAP FAULT
RIGHT REAR WSS LOOSE — B1, B2 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
RIGHT REAR TONE WHEEL DAMAGE
RIGHT REAR WHEEL BEARING DAMAGE
IMPROPER RIGHT REAR TIRE PRESSURE/MISMATCHED TIRES
RIGHT REAR WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK RIGHT REAR WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Right Rear WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Rear WSS air gap within specifications?

Yes >> Go To 3

No >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 4

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

4. CHECK FOR IMPROPER RIGHT REAR TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Right Rear Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Right Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK RIGHT REAR WSS LOOSENESS, INSPECT B1, B2 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector

Inspect the Right Rear WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B1) Right Rear WSS Signal and (B2) Right Rear WSS Supply circuits between the Right Rear WSS and Anti-Lock Brake Module for damage.

Is the Right Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK RIGHT REAR TONE WHEEL FOR DAMAGE

Inspect the Right Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Rear Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK RIGHT REAR WHEEL BEARING FOR DAMAGE

Inspect the Right Rear wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Rear Wheel Bearing Damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8

8. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear WSS reading is different from the readings received from the other WSS's at a vehicle speed above 40 kph (25 mph). The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
RIGHT REAR WSS LOOSE — B1, B2 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER RIGHT REAR TIRE PRESSURE/MISMATCHED TIRES
RIGHT REAR TONE WHEEL DAMAGE
RIGHT REAR WSS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE?

Yes >> Go To 3

No >> Go To 2

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If graph shows periodic dropouts pay close attention to the tone wheel.
Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

3. CHECK FOR IMPROPER RIGHT REAR TIRE PRESSURE/MISMATCHED TIRES

Turn the ignition off.

Check and adjust the Right Rear Tire pressure.

Check and adjust all other tire pressures.

Inspect for mismatched tires on vehicle.

Is the Right Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK RIGHT REAR WSS LOOSENESS, INSPECT B1, B2 CIRCUITS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector

Inspect the Right Rear WSS for looseness, excessive corrosion and not properly fastened.

Inspect the (B1) Right Rear WSS Signal and (B2) Right Rear WSS Supply circuits between the Right Rear WSS and Anti-Lock Brake Module for damage.

Is the Right Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK RIGHT REAR TONE WHEEL FOR DAMAGE

Inspect the Right Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Rear Tone Wheel damaged?

Yes >> Repair as necessary
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1038–REAR WHEEL SPEED SENSOR CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT SHORTED TO GROUND, OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO GROUND, OR OPEN
RIGHT REAR WSS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR DTC C1038–REAR WHEEL SPEED SENSOR CIRCUIT LOW

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

Does the scan tool display: C1038–REAR WHEEL SPEED SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.
Turn the ignition off.

Inspect the TIPM harness connector, Right Rear WSS, and Right Rear WSS harness connector.

Is the Right Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

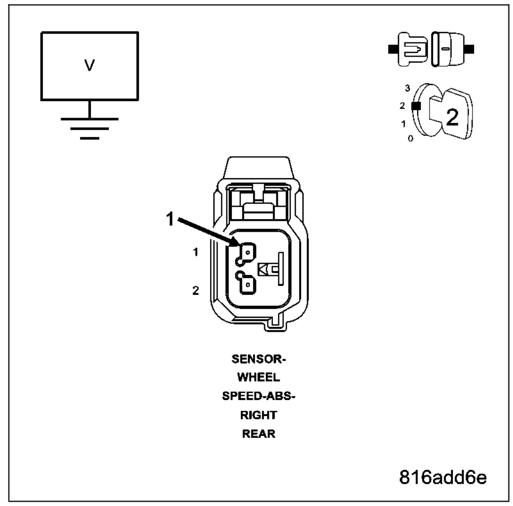
No >> Go To 3

3. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT VOLTAGE

Disconnect the Right Rear WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B2) Right Rear WSS 12 Volt Supply circuit.



Is the voltage above 10.0 volts?

Yes >> Go To 6

No >> Go To 4

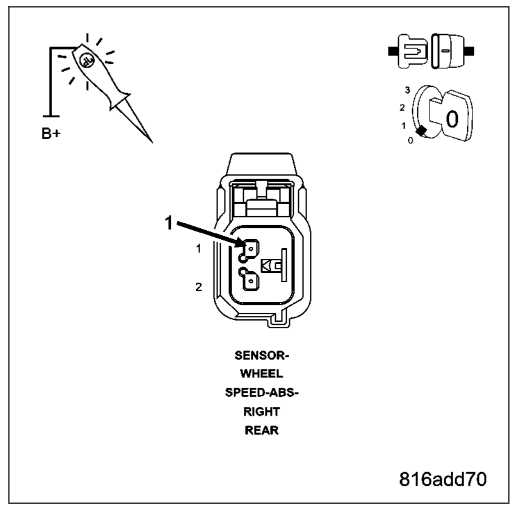
4. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

Disconnect the TIPM harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B2) Right Rear WSS Supply circuit for a short to ground.

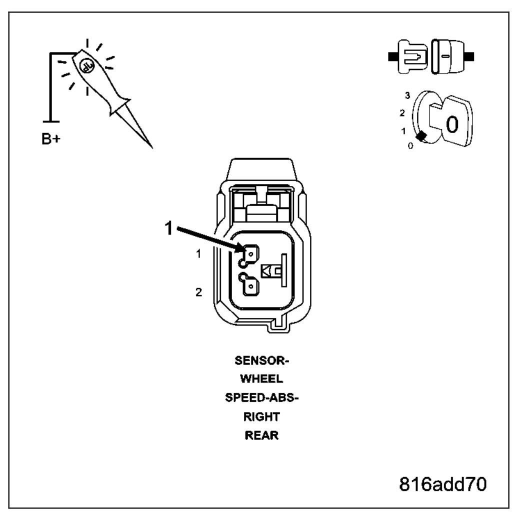
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B2) Right Rear WSS Supply circuit in the TIPM harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Replace the TIPM in accordance with the Service Information.

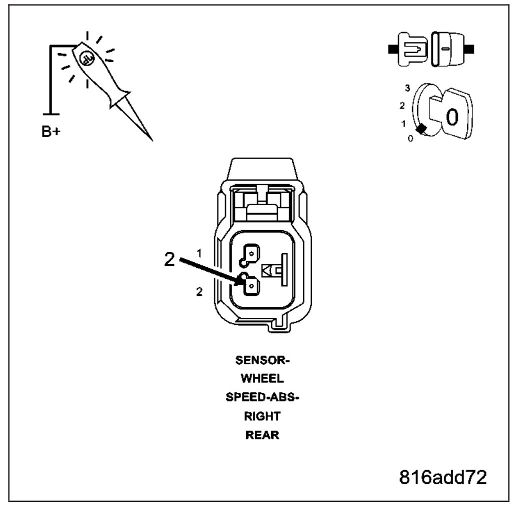
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (B2) Right Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

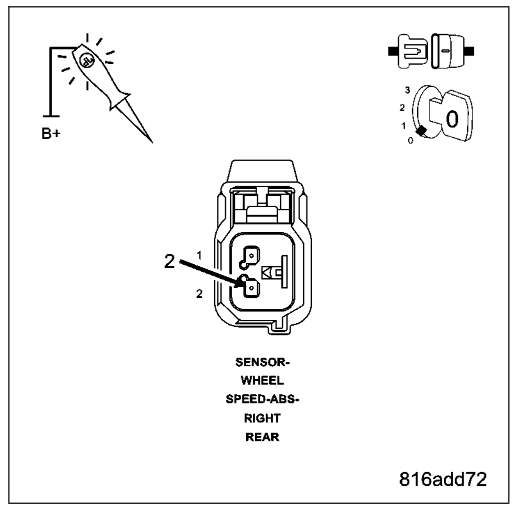
Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B1) Right Rear WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 8

No >> Repair the (B1) Right Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
With the scan tool, read TIPM DTCs.

Did DTC C1038–REAR WHEEL SPEED SENSOR CIRCUIT LOW reset?

Yes >> Replace the TIPM in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1039–REAR WHEEL SPEED SENSOR CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE,OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT
RIGHT REAR WSS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR DTC C1039–REAR WHEEL SPEED SENSOR CIRCUIT HIGH

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

Does the scan tool display: C1039–REAR WHEEL SPEED SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the TIPM harness connector, Right Rear WSS, and Right Rear WSS harness connector.

Is the Right Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT VOLTAGE

Disconnect the Right Rear WSS harness connector.

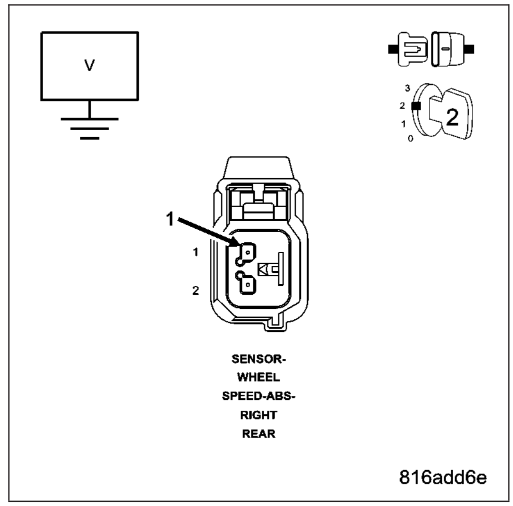
Turn the ignition on.

Measure the voltage of the (B2) Right Rear WSS 12 Volt Supply circuit.

Is the voltage above 10.0 volts?

Yes >> Go To 5

No >> Go To 4



4. CHECK (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B2) Right Rear WSS Supply circuit in the TIPM harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.

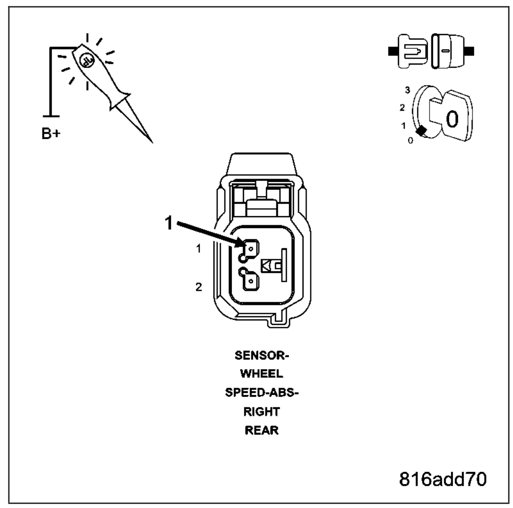
Does the test light illuminate brightly?

Yes >> Replace the TIPM in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (B2) Right Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



5. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR AN OPEN

Connect a jumper wire between ground and the (B1) Right Rear WSS Signal circuit in the Anti-Lock Brakes Module harness connector.

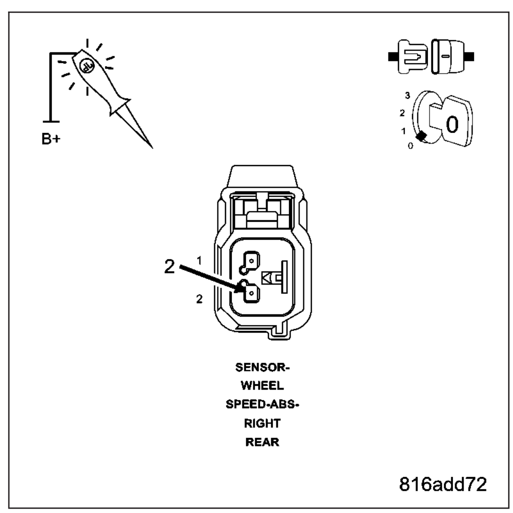
Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (B1) Right Rear WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

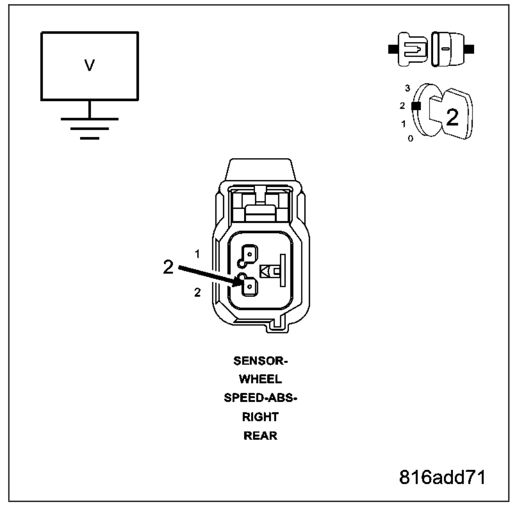


6. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Remove all jumper wires.

Measure the voltage between the (B1) Right Rear WSS Signal circuit and ground.



Is the voltage above one volt?

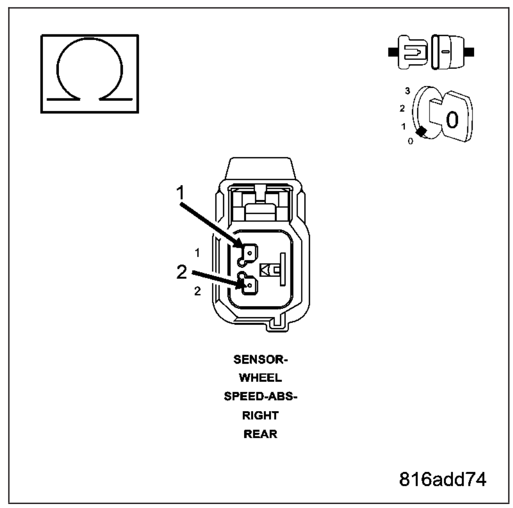
Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO (B2) RIGHT REAR WSS 12 VOLT SUPPLY CIRCUIT

Turn the ignition off.

Measure the resistance between the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
With the scan tool, read TIPM DTCs.

Did DTC C1039–REAR WHEEL SPEED SENSOR CIRCUIT HIGH reset?

Yes >> Replace the TIPM in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1041-LEFT FRONT TONE WHEEL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
LEFT FRONT TONE WHEEL/BEARING DAMAGE
DIRTY TONE WHEEL/SENSOR

Diagnostic Test

1. CHECK FOR A DTC C1041-LEFT FRONT TONE WHEEL PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read DTCs.

Record DTC and Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch off then on.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Test drive the vehicle in a straight line to 40 Km/h (25 mph).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

Does the scan tool display: C1041-LEFT FRONT TONE WHEEL PERFORMANCE?

Yes >> Replace the Left Front Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C1042-RIGHT FRONT TONE WHEEL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
RIGHT FRONT TONE WHEEL/BEARING DAMAGE
DIRTY TONE WHEEL/SENSOR

Diagnostic Test

1. CHECK FOR A DTC C1042-RIGHT FRONT TONE WHEEL PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, read DTCs.

Record DTC and Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch off then on.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle in a straight line to 40 km/h (25 mph).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

Does the scan tool display: C1042-RIGHT FRONT TONE WHEEL PERFORMANCE?

Yes >> Replace the Right Front Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C1043-LEFT REAR TONE WHEEL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
LEFT REAR TONE WHEEL/BEARING DAMAGE
DIRTY TONE WHEEL/SENSOR

Diagnostic Test

1. CHECK FOR A DTC C1043-LEFT REAR TONE WHEEL PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, read DTCs.

Record DTC and Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch off then on.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle in a straight line to 40 km/h (25 mph).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

Does the scan tool display: C1043-LEFT REAR TONE WHEEL PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE LEFT REAR TONE WHEEL FOR DAMAGE

NOTE: Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.
Check the Left Rear Tone Wheel for damage.

Check the Left Rear Tone Wheel for dirt.

Was the tone wheel dirty?

Yes >> Clean tone wheel and sensor. Clear codes and retest.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Left Rear Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1044-RIGHT REAR TONE WHEEL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
RIGHT REAR TONE WHEEL/BEARING DAMAGE
DIRTY TONE WHEEL/SENSOR

Diagnostic Test

1. CHECK FOR A DTC C1044-RIGHT REAR TONE WHEEL PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, read DTCs.

Record DTC and Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch off then on.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle in a straight line to 40 Km/h (25 mph).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.
With the scan tool, read DTCs.

Does the scan tool display: C1044-RIGHT REAR TONE WHEEL PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE RIGHT REAR TONE WHEEL FOR DAMAGE

NOTE: Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.
Check the Right Rear Tone Wheel for damage.

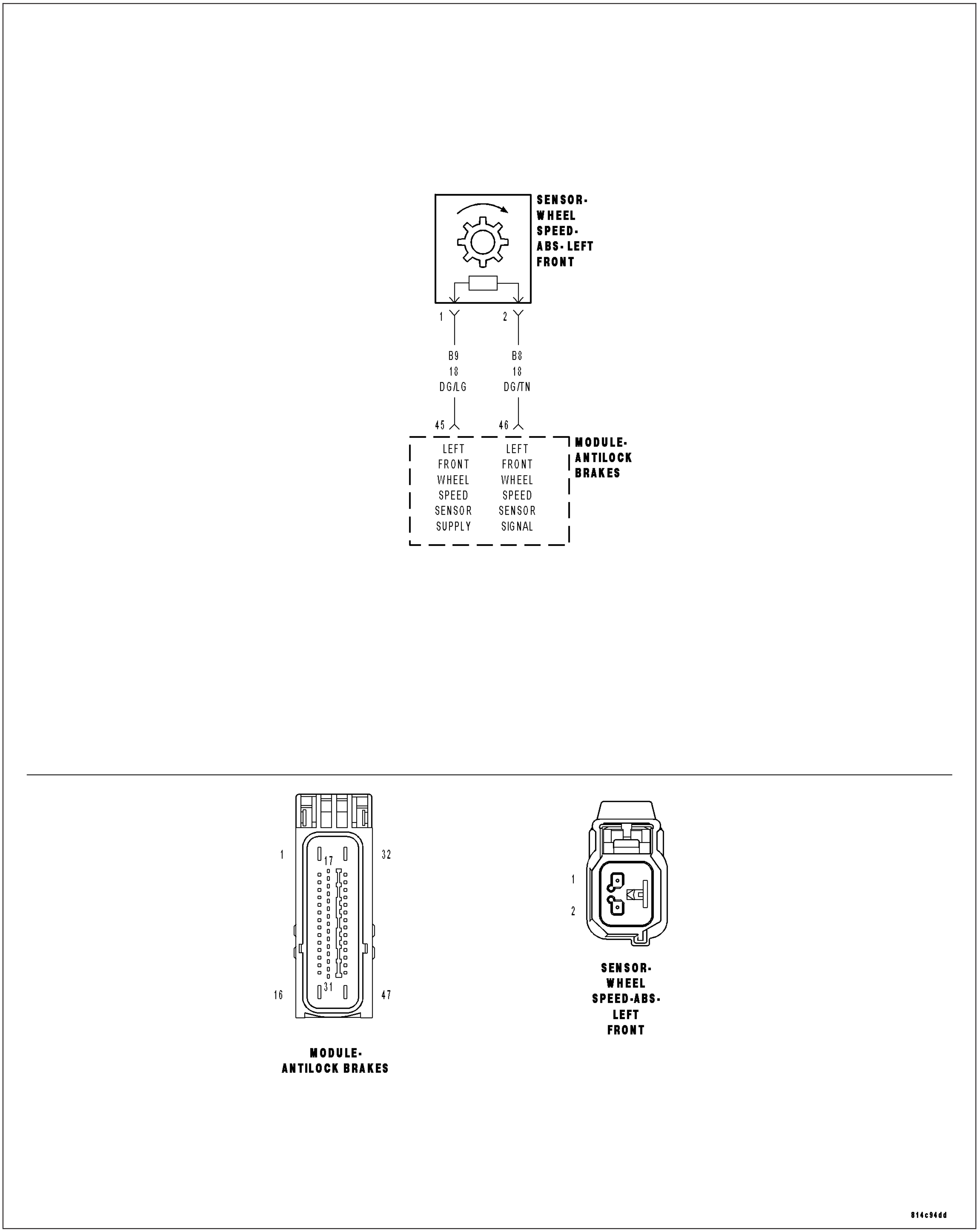
Check the Right Rear Tone Wheel for dirt.

Was the tone wheel dirty?

Yes >> Clean tone wheel and sensor. Clear codes and retest.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Right Rear Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1046–LEFT FRONT WHEEL PRESSURE PHASE MONITORING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During active ABS control.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
LEFT FRONT TONE WHEEL/BEARING DAMAGED
WHEEL SPEED SIGNALS SWAPPED
LEFT FRONT WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. COMPARE WHEEL SPEED SENSOR SIGNALS

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Does the Left Front WSS speed differ from the other WSS speeds by 8 Km/h (5 m.p.h.) or show NO speed?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT TONE WHEEL/BEARING

Turn the ignition off.

Visually inspect the tone wheel and bearing for damage.

- Check the tone wheel teeth for missing teeth, cracks, and looseness. The teeth must be perfectly square, not bent, or nicked. Check the wheel bearing for worn/looseness.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK WHEEL SPEED SENSOR WIRING

Check the Anti-Lock Brakes Module and Wheel Speed Sensors harness connectors for incorrectly wired connectors.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. LEFT FRONT WHEEL SPEED SENSOR

Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

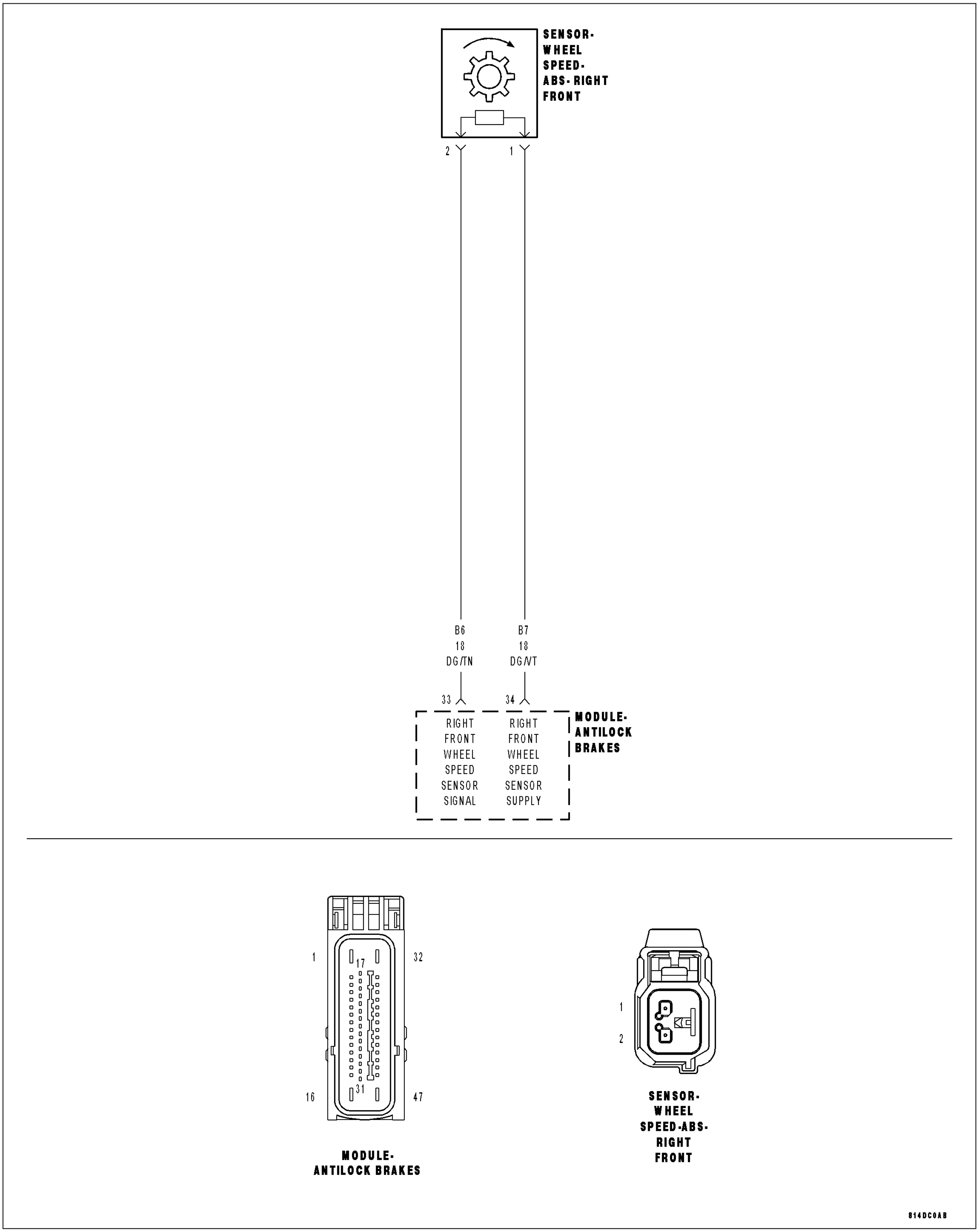
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1046–LEFT FRONT WHEEL PRESSURE PHASE MONITORING reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1047–RIGHT FRONT WHEEL PRESSURE PHASE MONITORING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During active ABS control.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
RIGHT FRONT TONE WHEEL DAMAGED
WHEEL SPEED SIGNALS SWAPPED
RIGHT FRONT WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. COMPARE WHEEL SPEED SENSOR SIGNALS

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Does the Right Front WSS speed differ from the other WSS speeds by 8 Km/h (5 m.p.h.) or show NO speed?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT TONE WHEEL/BEARING

Turn the ignition off.

Visually inspect the tone wheel and bearing for damage.

Check the tone wheel teeth for missing teeth, cracks, and looseness. The teeth must be perfectly square, not bent, or nicked. Check the wheel bearing for worn/looseness.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK WHEEL SPEED SENSOR WIRING

Check the Anti-Lock Brakes Module and Wheel Speed Sensors harness connectors for incorrectly wired connectors.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. RIGHT FRONT WHEEL SPEED SENSOR

Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

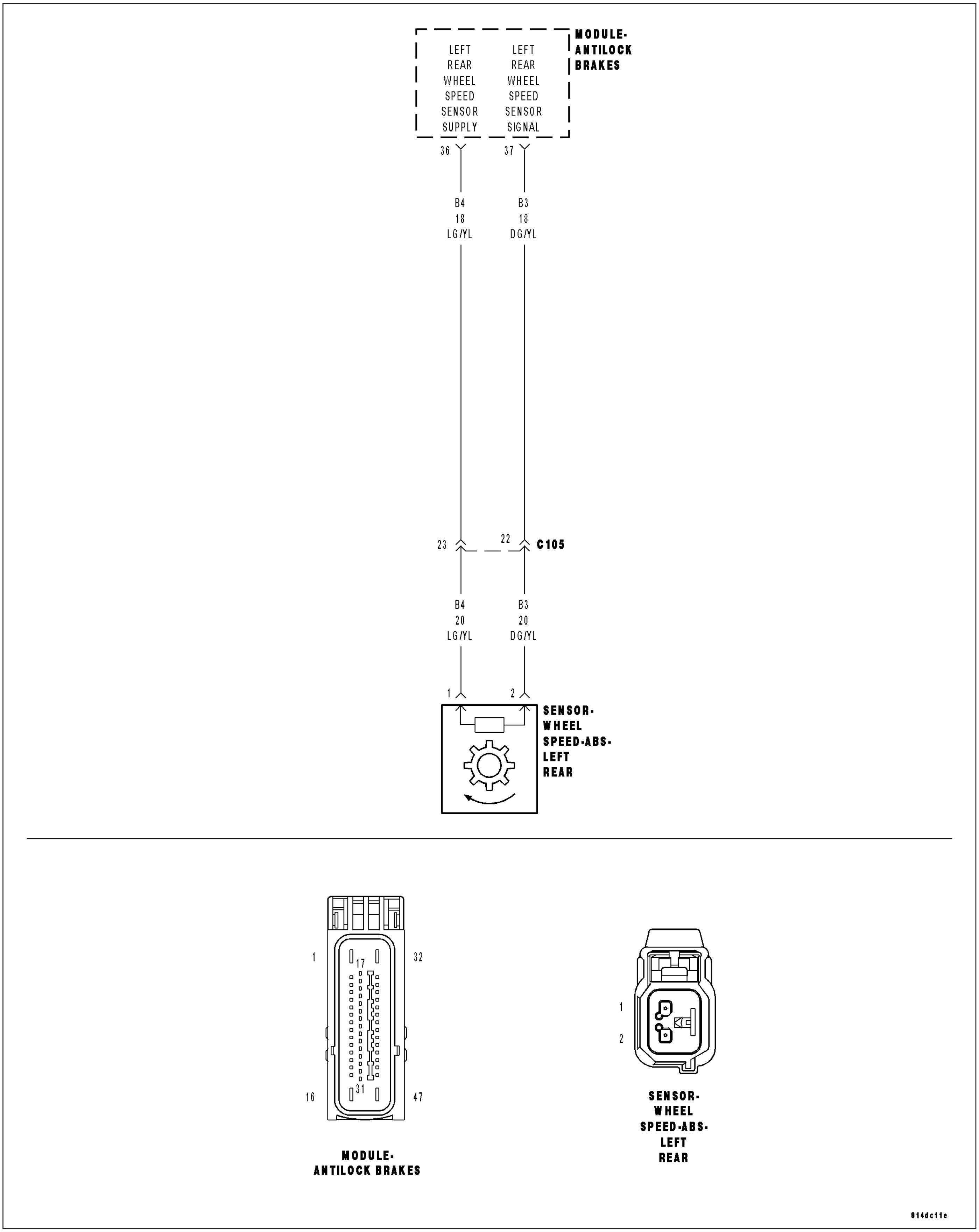
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1047–RIGHT FRONT WHEEL PRESSURE PHASE MONITORING reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1048–LEFT REAR WHEEL PRESSURE PHASE MONITORING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During active ABS control.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
LEFT REAR TONE WHEEL/WHEEL BEARING
WHEEL SPEED SIGNALS SWAPPED
LEFT REAR WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. COMPARE WHEEL SPEED SENSOR SIGNALS

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
With the scan tool, monitor ALL the WSS speeds while driving the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Does the Left Rear WSS speed differ from the other WSS speeds by 8 Km/h (5 m.p.h.) or show NO speed?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT TONE WHEEL/BEARING

Turn the ignition off.

Visually inspect the tone wheel and bearing for damage.

Check the tone wheel teeth for missing teeth, cracks, and looseness. The teeth must be perfectly square, not bent, or nicked. Check the wheel bearing for worn/looseness.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK WHEEL SPEED SENSOR WIRING

Check the Anti-Lock Brakes Module and Wheel Speed Sensors harness connectors for incorrectly wired connectors.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. LEFT REAR WHEEL SPEED SENSOR

Replace the Left Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

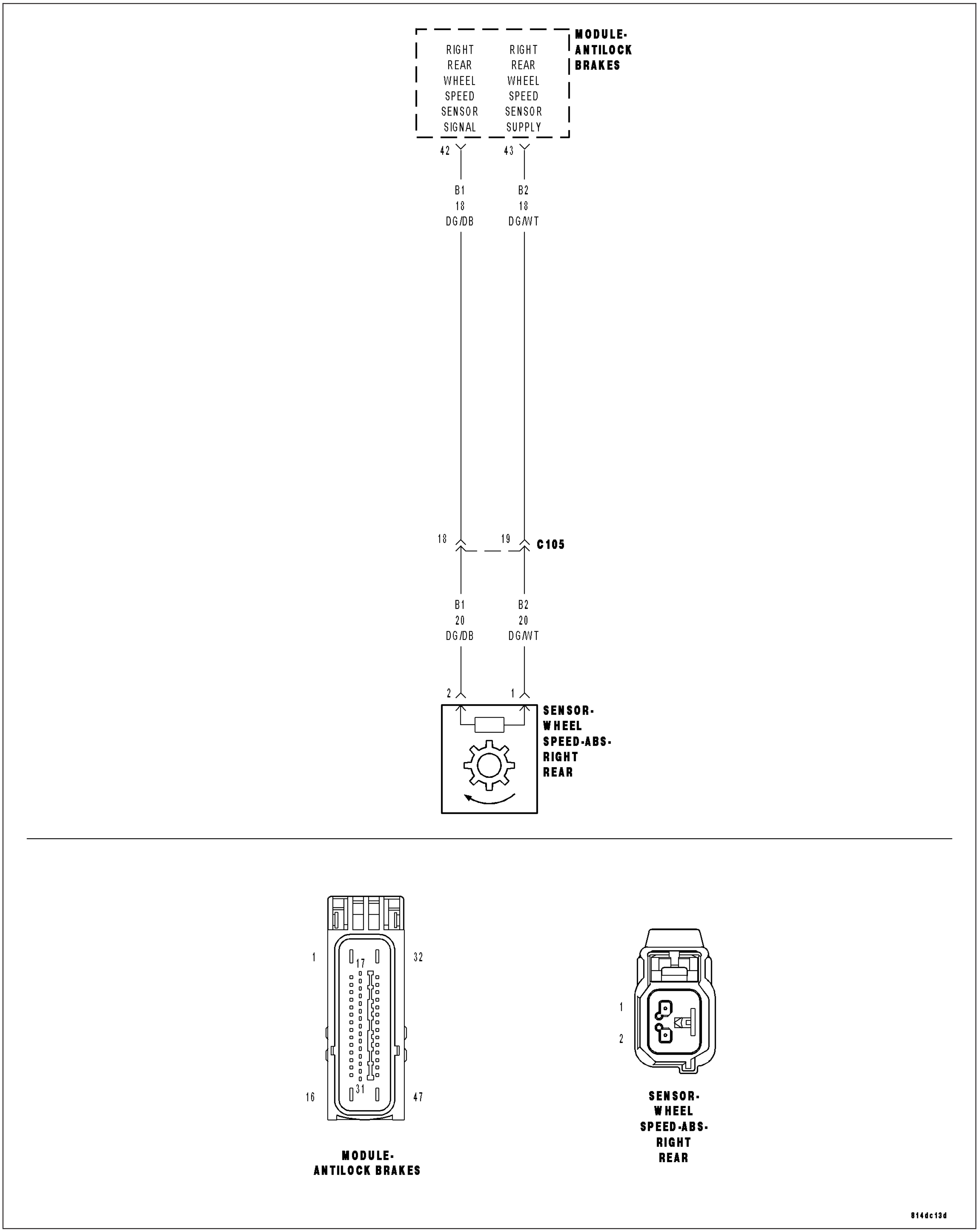
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1048–LEFT REAR WHEEL PRESSURE PHASE MONITORING reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1049–RIGHT REAR WHEEL PRESSURE PHASE MONITORING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During active ABS control.
- **Set Condition:**
  When the Anti-Lock Brakes Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
RIGHT REAR TONE WHEEL DAMAGED
WHEEL SPEED SIGNALS SWAPPED
RIGHT REAR WSS
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. COMPARE WHEEL SPEED SENSOR SIGNALS

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Does the Right Rear WSS speed from the other WSS speeds by 8 Km/h (5 m.p.h.) or show NO speed?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT TONE WHEEL/BEARING

Turn the ignition off.

Visually inspect the tone wheel and bearing for damage.

Check the tone wheel teeth for missing teeth, cracks, and looseness. The teeth must be perfectly square, not bent, or nicked. Check the wheel bearing for worn/looseness.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK WHEEL SPEED SENSOR WIRING

Check the Anti-Lock Brakes Module and Wheel Speed Sensors harness connectors for incorrectly wired connectors.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. RIGHT REAR WHEEL SPEED SENSOR

Replace the Right Rear Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read ABS DTCs.

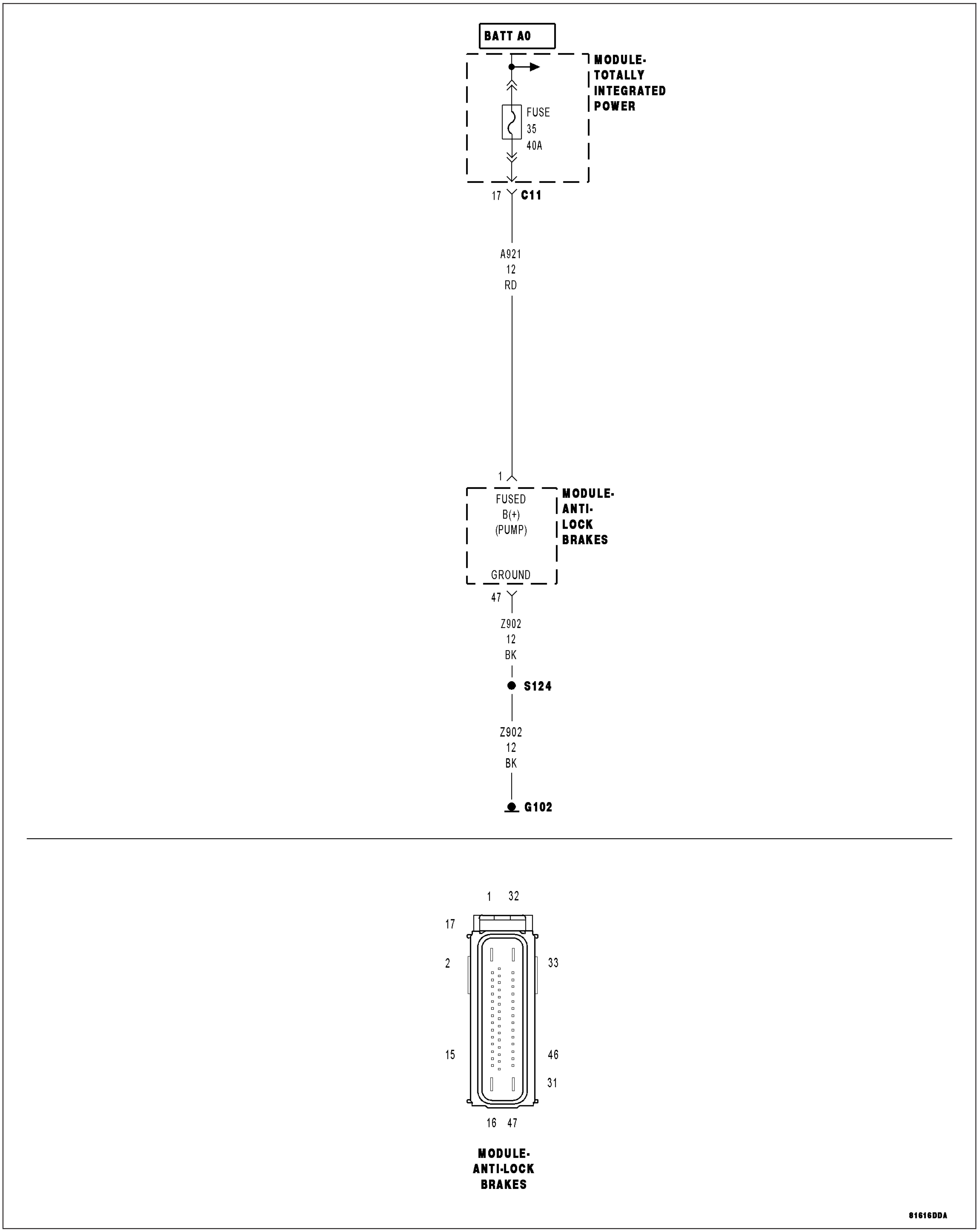
NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Did DTC C1049–RIGHT REAR WHEEL PRESSURE PHASE MONITORING reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C1073-ABS PUMP MOTOR CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The ABM detects low pump motor feedback voltage with actuation of the pump motor relay.

Possible Causes
BLOWN PUMP FUSE
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(A921) HIGH RESISTANCE IN B+ CIRCUITS
(Z902) HIGH RESISTANCE IN GROUND CIRCUITS
INTEGRATED CONTROL UNIT

Diagnostic Test

1. CHECK FOR A DTC C1073-ABS PUMP MOTOR CONTROL CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1073-ABS PUMP MOTOR CONTROL CIRCUIT?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING).

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK THE ABS PUMP MOTOR FUSED B+ FOR AN OPEN

Turn the ignition off.

Remove and visually inspect the ABS Pump Motor B+ fuse.

Is the ABS Pump Motor B+ fuse open?

Yes >> Go To 4

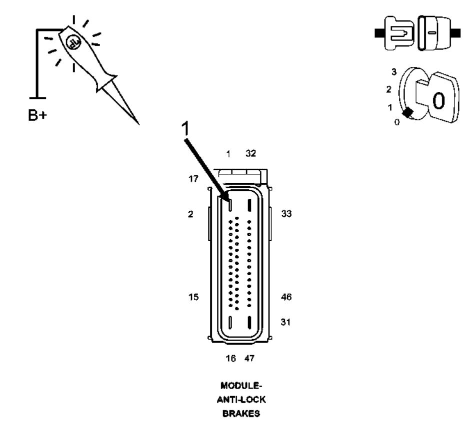
No >> Go To 6

4. CHECK THE (A921) FUSED B(+) FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Using a 12–volt test light connected to 12–volts, probe the (A921) Fused B+ circuit.



81821a9e

Does the test light illuminate brightly?

Yes >> Repair the (A921) Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK THE (A921) FUSED B(+) CIRCUIT

Turn the ignition off.

Visually inspect the (A921) Fused B(+) circuit in the wiring harness.

Look for any signs of intermittent short to ground.

Is the wiring harness OK?

Yes >> Go To 6

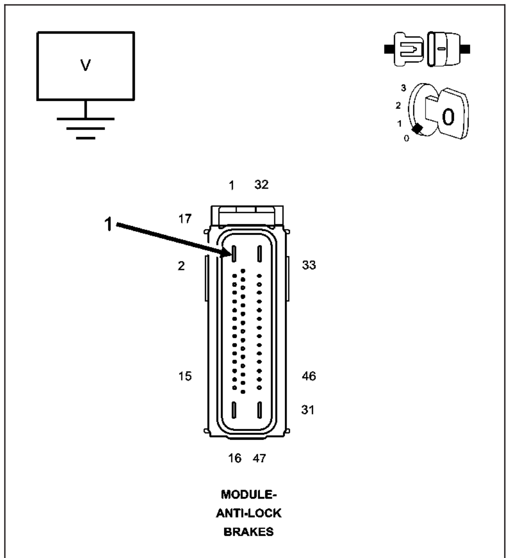
No >> Repair the (A921) Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK THE VOLTAGE ON THE (A921) FUSED B(+) CIRCUIT

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Measure the voltage of the (A921) Fused B(+) circuit in the Anti-Lock Brake Module harness connector.



81616ddd

Is the voltage above 10 volts?

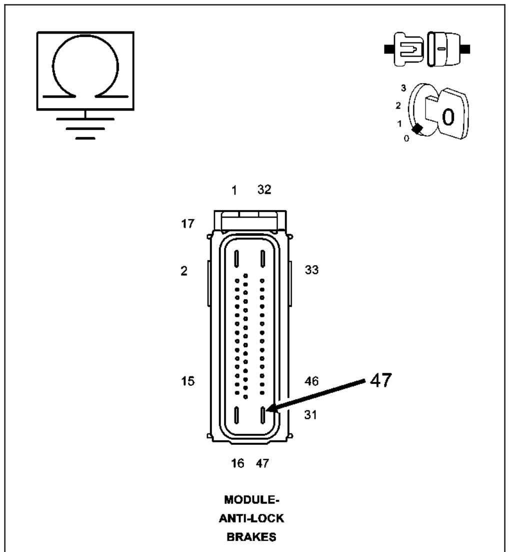
Yes >> Go To 7

No >> Repair the (A921) Fused B(+) circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

7. CHECK THE (Z902) GROUND CIRCUITS FOR AN OPEN

Measure the resistance of the (Z902) Ground circuits between the Anti-Lock Brake Module harness connector and ground



81616dde

Is the resistance below 5.0 ohms?

Yes >> Replace the ICU per service information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the high resistance in the affected circuit.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1078-TIRE REVOLUTIONS RANGE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous.
- **Set Condition:**
  Programmed value for tire size is not within acceptable range.

Possible Causes
INCORRECT VALUE PROGRAMMED INTO TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INCORRECT VALUE PROGRAMMED INTO TIPM

TIRE SIZE	BODY STYLE	ENGINE SIZE	SALES CODE	TIRE CIRCUMFERENCE (MM PER REV)
P205/70R 15 Dunlop SP50	PM	ALL	TPB	2112
P215/60R 17 BSW AS Touring Firestone Affinity 3	PM	ALL	TTU	2087
P215/55R 18 AS Performance Firestone Firehawk GTA 03	PM	ALL	TT1	2115
P215/60R 17 BSW Summer Performance Continental Premium Contact 2	PM	ALL	TMQ	2115
P215/55R 18BSW Summer Performance Continental Premium Contact 2	PM	ALL	TMZ	2117

Verify the correct tire/wheel information is programmed in the TIPM.

Is the correct value programmed in the TIPM according to the chart?

Yes >> Test complete.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Program the correct Tire/Wheel information in the TIPM.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C107C–BRAKE PEDAL SWITCH 1/2 STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, but not during first run.
  Or, with low supply voltage.
  Or, if a Pressure Sensor fault is active.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects a mismatch between the Brake Test Signal (BTS) from the Pressure Sensor and the (B15) Brake Switch No. 1 Signal circuit.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
STOP LAMP RELATED DTC OR SYMPTOMS PRESENT
ENGINE BRAKE SWITCH DTC PRESENT
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Diagnose and repair all Pressure Sensor and Voltage related DTCs and all Stop Lamp related DTCs and symptoms before diagnosing this DTC.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

Press and release the brake pedal several times.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK FOR ENGINE BRAKE SWITCH DTCS

With the scan tool, check for engine brake switch DTCs.

Are there any engine brake switch DTCs present?

Yes >> Refer to the engine Diagnosis and Testing category and perform the appropriate symptom.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK OTHER CONTROLLERS FOR BRAKE SWITCH DTCS

With the scan tool check other controllers for Brake Switch DTCs.

Do any other controllers report a Brake Switch DTC?

Yes >> Refer to the Engine Diagnosis and Testing category and perform diagnostics for P0571 as though the DTC is active.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C107D–BRAKE PEDAL SWITCH 1/2 CORRELATION

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the vehicle is driven.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects an implausible signal from the Stop Lamp Switch.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
STOP LAMP RELATED DTC OR SYMPTOMS PRESENT
ENGINE BRAKE SWITCH DTC PRESENT
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Diagnose and repair all Pressure Sensor and Voltage related DTCs and all Stop Lamp related DTCs and symptoms before diagnosing this DTC.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

Press and release the brake pedal several times.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK FOR ENGINE BRAKE SWITCH DTCS

With the scan tool, check for engine brake switch DTCs.

Are there any engine brake switch DTCs present?

Yes >> Refer to the engine Diagnosis and Testing category and perform the appropriate symptom.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK OTHER CONTROLLERS FOR BRAKE SWITCH DTCS

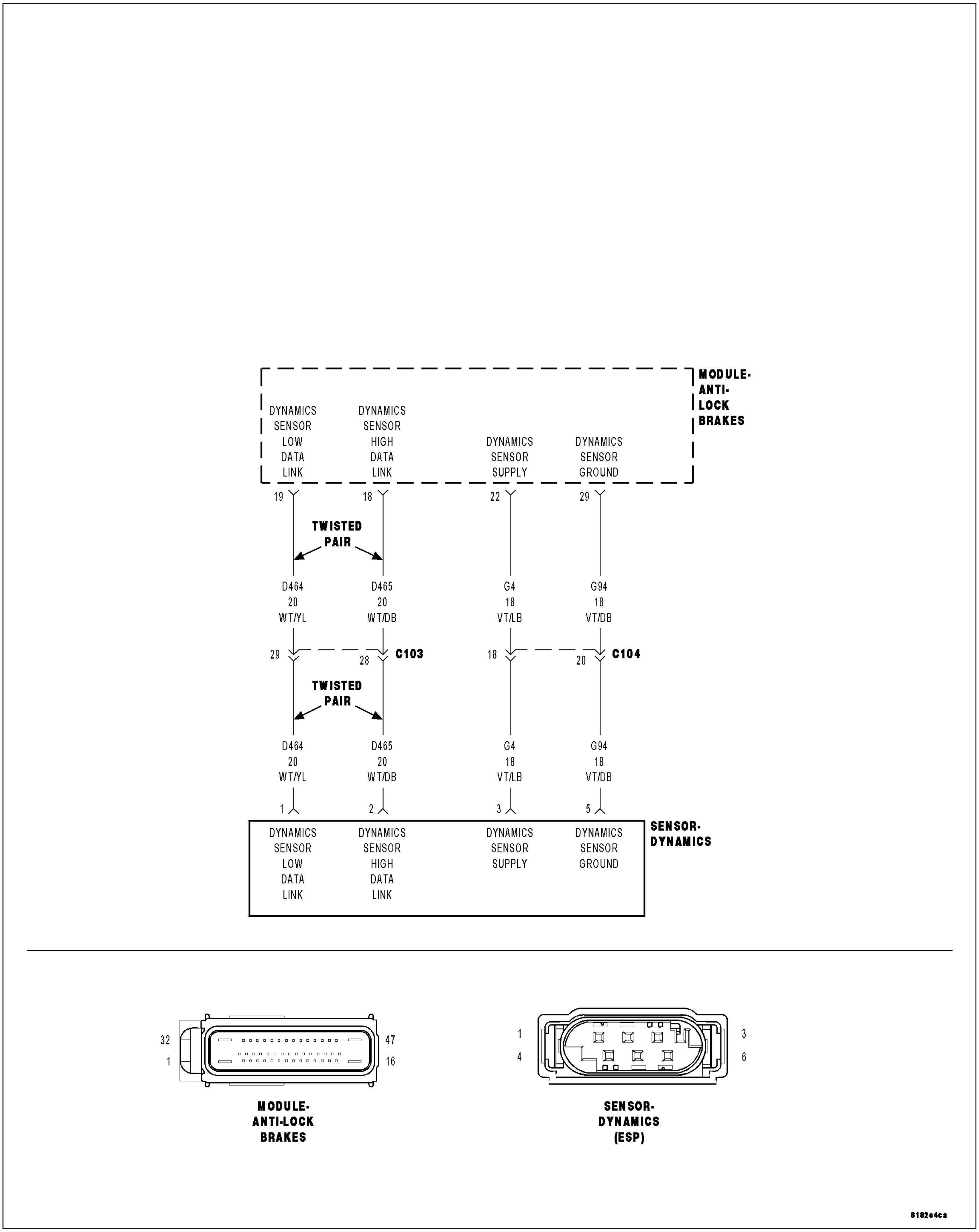
With the scan tool check other controllers for Brake Switch DTCs.

Do any other controllers report a Brake Switch DTC?

Yes >> Refer to the Engine Diagnosis and Testing category and perform diagnostics for P0571 as though the DTC is active.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1210–G SENSOR INPUT CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Once per loop, but not during active test function of acceleration sensor if the sensor voltage is out of range.
- **Set Condition:**
  Longitudinal acceleration sensor signal is out of range.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(G4) DYNAMICS SENSOR SUPPLY HIGH RESISTANCE
(G94) GROUND CIRCUIT HIGH RESISTANCE
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR A DTC C1210–G SENSOR INPUT CIRCUIT PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read and record DTCs.

Does the scan tool display: C1210–G SENSOR INPUT CIRCUIT PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE

Check the Steering Angle Sensor installation.

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

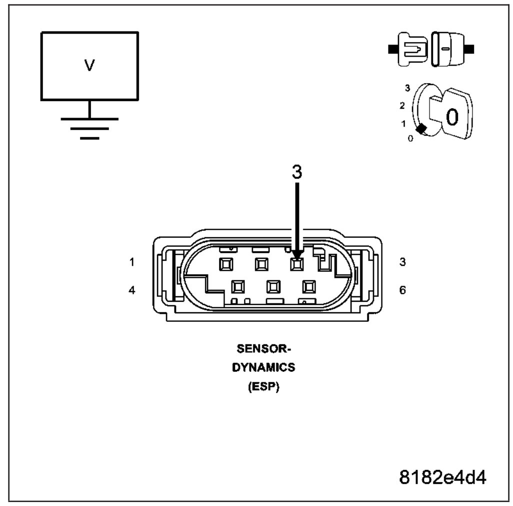
3. (G4) DYNAMICS SENSOR SUPPLY HIGH RESISTANCE

Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (G4) Dynamics Sensor Supply circuit at the Dynamics Sensor harness connector.



Is the voltage above 10 volts?

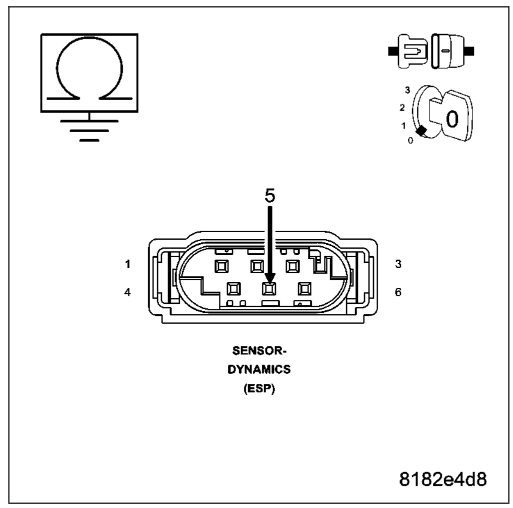
Yes >> Go To 4

No >> Repair the (G4) Dynamics Sensor Supply circuit for high resistance.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

4. (G94) GROUND CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Measure the resistance between the (G94) Ground circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (G94) Ground circuit for high resistance.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.

Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

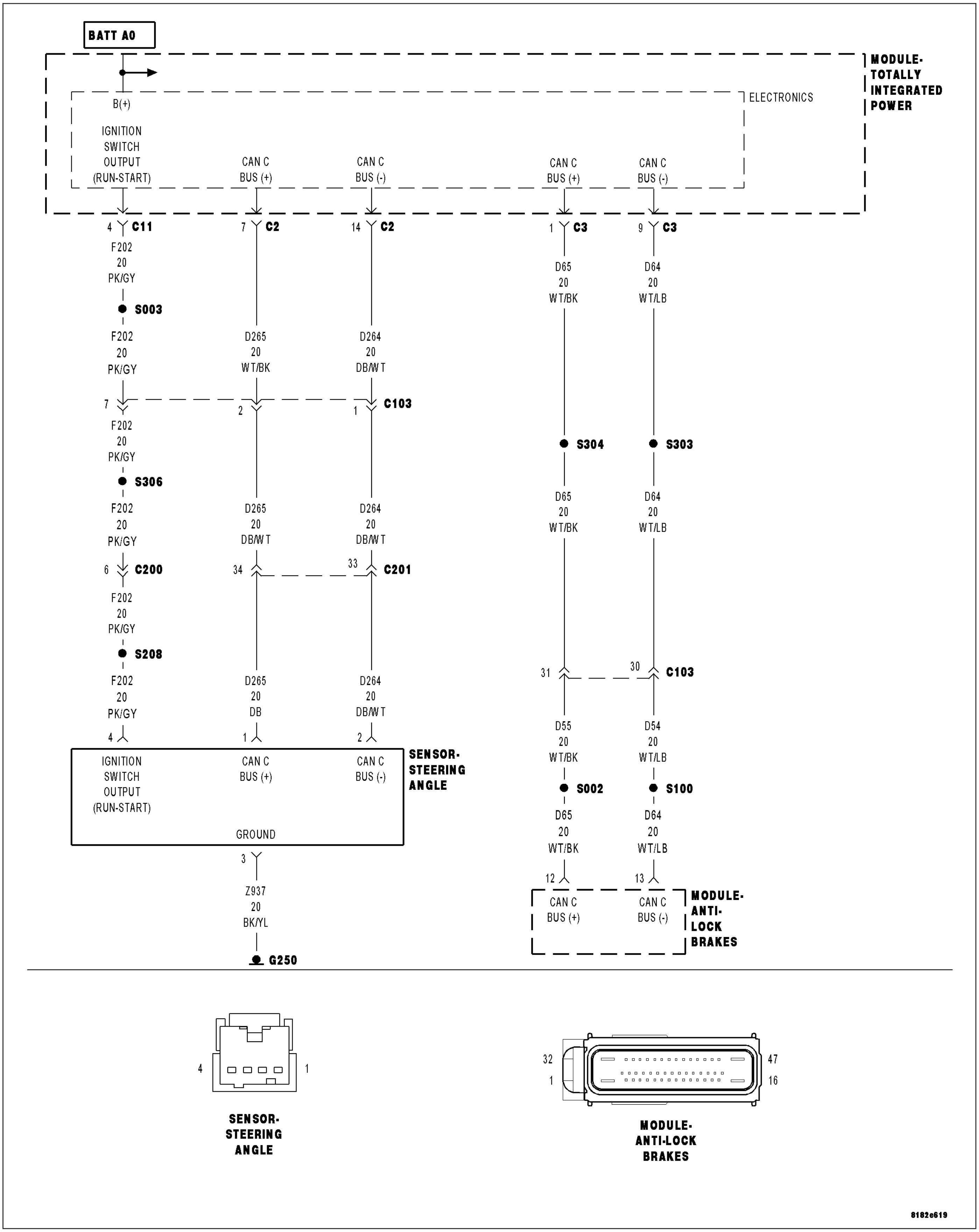
Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Dynamics Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1219–STEERING ANGLE SENSOR ERRATIC PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brake Module detects that the calculated steering wheel angle exceeds what is physically possible.

Possible Causes
VEHICLE DAMAGE
STEERING COLUMN / INTERMEDIATE SHAFT DAMAGE
STEERING ANGLE SENSOR LOOSE
STEERING ANGLE SENSOR IMPROPERLY INSTALLED (WRONG MOUNTING POSITION)
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-ACC) CIRCUIT HIGH RESISTANCE
(Z937) GROUND CIRCUIT HIGH RESISTANCE
STEERING ANGLE SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. PERFORM TEST DRIVE & VERIFY DTC IS STILL ACTIVE

Turn the ignition on.

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK STEERING ANGLE SENSOR OUTPUT

Start the engine.

Center the steering wheel.

With the scan tool, read the Steering Angle Sensor Position.

Is the Steering Angle Sensor Position within ±15°?

Yes >> Go To 3

No >> Go To 8

3. INSPECT VEHICLE, STEERING COLUMN, & INTERMEDIATE SHAFT FOR DAMAGE

NOTE: If possible, check vehicle repair history for collision damage.

Turn the ignition off.

Inspect the vehicle for damage causing tracking problems.

Inspect the steering column and intermediate shaft for damage.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK STEERING ANGLE SENSOR INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Proper Steering Angle Sensor installation is crucial for proper operation.

Verify that the Steering Angle Sensor are properly installed.

Is the Steering Angle Sensor properly installed?

Yes >> Go To 5

No >> Repair as necessary and clear offsets by initializing ECU with wheels pointing straight ahead.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: A low voltage condition at the Steering Angle Sensor will cause this DTC to set.

Check all related wiring for pinched, chafed, pierced, and partially broken wires.

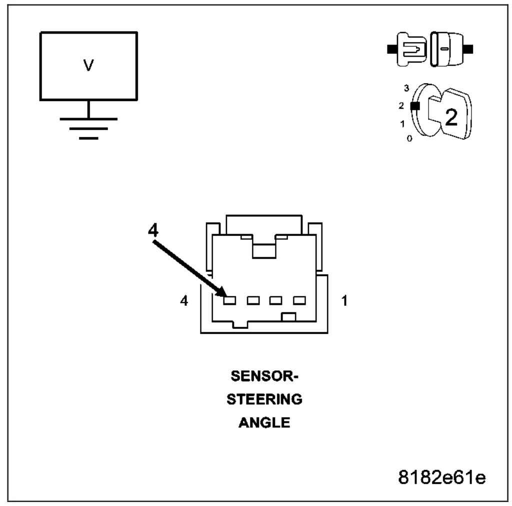
Check all related connectors for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK (F202) FUSED IGNITION SWITCH OUTPUT (RUN-ACC) CIRCUIT FOR HIGH RESISTANCE



Disconnect the Steering Angle Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F202) Fused Ignition Switch Output (Run-ACC) circuit.

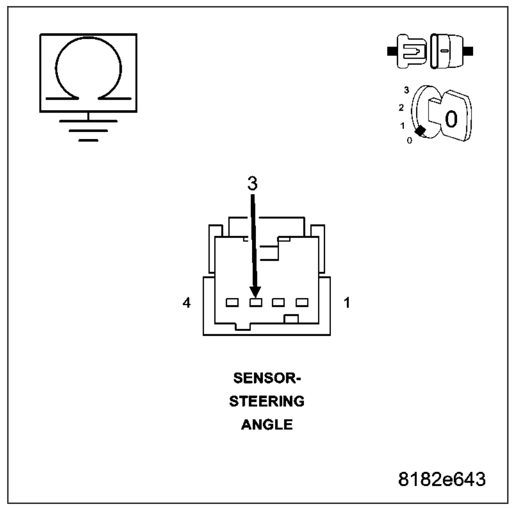
Is the voltage above 11.0 volts?

Yes >> Go To 7

No >> Repair the (F202) Fused Ignition Switch Output (Run-ACC) circuit for high resistance.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

7. CHECK (Z937) GROUND CIRCUIT FOR HIGH RESISTANCE



Turn the ignition off.

Measure the resistance of the (Z937) Ground circuit between ground and the Steering Angle Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Steering Angle Sensor in accordance with the Service Information and clear offsets by initializing ECU with wheels pointing straight ahead. Refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (Z937) Ground circuit for high resistance.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

8. CHECK STEERING ANGLE SENSOR OUTPUT WHILE ROTATING THE STEERING WHEEL

With the scan tool, read the Steering Angle Sensor Position while rotating the steering wheel to the right and then to the left. The Steering Angle Sensor Position should decrease when rotating the steering wheel to the right and increase when rotating the steering wheel to the left.

Did the steering angle change accordingly?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Steering Angle Sensor in accordance with the Service Information and clear offsets by initializing ECU with wheels pointing straight ahead.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C121A–STEERING ANGLE SENSOR NOT INITIALIZED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the Drive Test.
- **Set Condition:**
  This DTC may set with DTC C1231–DRIVE TEST: STEERING ANGLE SENSOR due to cycling of ignition several times or entering and exiting diagnostics several times.

Refer to **C1231–DRIVE TEST: STEERING ANGLE SENSOR** in this Section for the diagnostic test procedure.

C121C-TORQUE REQUEST SIGNAL DENIED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Powertrain Control Module indicates, for an extended period of time, that engine management relevant for Automatic Yaw Control/Traction Control System control can not be accomplished.

Possible Causes
ANTI-LOCK BRAKE MODULE
POWERTRAIN CONTROL MODULE

Diagnostic Test

1. CHECK FOR A DTC C121C-TORQUE REQUEST SIGNAL DENIED

NOTE: This DTC must be active for the results of this test to be valid and this DTC may set while driving under severe load conditions.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Cycle the ignition switch from off to on.

Start Engine.

With the scan tool, read and record DTCs.

Does the scan tool display: C121C-TORQUE REQUEST SIGNAL DENIED?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE POWERTRAIN DTCS

With the scan tool, read and record Powertrain DTCs.

Were any Powertrain related DTCs found?

Yes >> Repair the Powertrain System in accordance with the Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. ESP TORQUE REQUEST SIGNAL

Engine started.

With the scan tool, read the Allow ESP Torque Request status bit.

Was the Allow ESP Torque Request showing NOT set?

Yes >> Replace the Powertrain Module in accordance with the Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C121D–BRAKE PRESSURE SENSOR CIRCUIT

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is out of range.

Possible Causes
ANTI-LOCK BRAKE MODULE
INTEGRATED CONTROL MODULE

Diagnostic Test

1. CHECK FOR A DTC C121D-BRAKE PRESSURE SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Start the engine.

Depress and release the brake pedal.

With the scan tool, read and record DTCs.

Does the scan tool display: C121D-BRAKE PRESSURE SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. RECHECK FOR A DTC C121D-BRAKE PRESSURE SENSOR CIRCUIT

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Start the engine.

Depress and release the brake pedal.

With the scan tool, read and record DTCs.

Does the scan tool display: C121D-BRAKE PRESSURE SENSOR CIRCUIT?

Yes >> Replace the ICU in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test complete

C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is out of range.

Possible Causes
ANTI-LOCK BRAKE MODULE
INTEGRATED CONTROL MODULE

Diagnostic Test

1. CHECK FOR A DTC C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Start the engine.

Depress and release the brake pedal.

With the scan tool, read and record DTCs.

Does the scan tool display: C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. RECHECK FOR A DTC C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Start the engine.

Depress and release the brake pedal.

With the scan tool, read and record DTCs.

Does the scan tool display: C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE?

Yes >> Replace the ICU in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test complete

C1221-BRAKE PRESSURE SENSOR/ACCEL PEDAL POSITION SENSOR CORRELATION

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor output signal is not plausible.

Possible Causes
AIR IN BRAKE SYSTEM / WORN MECHANICAL COMPONENTS
BRAKE SWITCH SIGNAL OPEN
BRAKE PRESSURE SENSOR
INTEGRATED CONTROL MODULE

Diagnostic Test

1. CHECK FOR A DTC C1221-BRAKE PRESSURE SENSOR/ACCEL PEDAL POSITION SENSOR CORRELATION

Turn the ignition on.
With the scan tool, read and record DTCs.
With the scan tool, read and record Freeze Frame information.
With the scan tool, erase DTCs.
Start the engine.
Depress and release the brake pedal.
With the scan tool, read and record DTCs.

Does the scan tool display: C1221-BRAKE PRESSURE SENSOR/ACCEL PEDAL POSITION SENSOR CORRELATION?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

2. CHECK BRAKE SWITCH

With the scan tool look at the Brake Switch Signal.
Apply the brakes on and off while checking for a Brake Switch Signal change.

Did the Brake Switch Signal change?

Yes >> Go To 3

No >> Repair as needed.

3. CHECK BRAKE PRESSURE SENSOR

With the scan tool look at Pressure Sensor Signal and the Brake Switch Signal.
With the brakes not applied the Pressure Sensor should read ± 15 bar.
Apply the brakes the Pressure Sensor should read above 15 bar.

Did Brake Pressure Sensor increase above 15 bar?

Yes >> Replace the Integrated Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK FOR AIR IN BRAKE SYSTEM

NOTE: Before continuing the brake system must be bled to verify there is no air in the brake system.

Turn ignition off.

Bleed brake system.

Check worn mechanical components.

Was there any air in the brake system or worn mechanical components?

Yes >> Repair as needed.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Integrated Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1231–DRIVE TEST: STEERING ANGLE SENSOR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the Drive Test.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects implausible Steering Angle Sensor data.

Possible Causes
STEERING ANGLE SENSOR INSTALLATION
STEERING ANGLE SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR A DTC C1231–DRIVE TEST: STEERING ANGLE SENSOR

NOTE: This DTC must be active for the results of this test to be valid.

NOTE: If any of the following DTCs are present they must be repaired before continuing.

DTC C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE

DTC C121A-STEERING ANGLE SENSOR NOT INITIALIZED

DTC C123F-STEERING ANGLE SENSOR COMPARATIVE PERFORMANCE

DTC C1240-STEERING ANGLE SENSOR ANGLE OVERTRAVEL PERFORMANCE

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

Perform ECU initialization with drive test. Refer to Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Start the engine.

With the scan tool, read and record DTCs.

Does the scan tool display: C1231–DRIVE TEST: STEERING ANGLE SENSOR?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. VERIFY THAT THE STEERING ANGLE SENSOR IS ACTIVE ON THE BUS

With the scan tool, select ECU View.

Verify that the Steering Angle Sensor is active on the bus.

Is the Steering Angle Sensor active on the bus?

Yes >> Go To 3

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response related diagnostic procedures.

3. CHECK STEERING ANGLE

Turn steering wheel so wheels point in a straight ahead position.

With scan tool check steering angle.

Is the Steering Angle reading within ±15 degrees?

Yes >> Go To 4

No >> Go To 5

4. CHECK STEERING ANGLE CHANGE

Turn steering wheel so wheels point in a straight ahead position.

With scan tool check steering angle.

Rotate steering wheel to the right and the degrees will decrease and rotating steering wheel to the left the degrees will increase.

Did the steering angle change accordingly?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Steering Angle Sensor in accordance with the Service Information and clear offsets by initializing ECU with wheels pointing straight ahead.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. CHECK STEERING ANGLE SENSOR INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Proper Steering Angle Sensor installation is crucial for proper operation.

Turn the ignition off.

Verify that the Steering Angle Sensor is properly installed. Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION.

Is the Steering Angle Sensor properly installed?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair as necessary and clear offsets by initializing ECU with wheels pointing straight ahead.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1232–DRIVE TEST: PRESSURE SENSOR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the Drive Test.
- **Set Condition:**
  If the Pressure Sensor fails to activate.

Possible Causes
HYDRAULIC / BRAKE SYSTEM COMPONENT INSTALLATION
INTEGRATED CONTROL UNIT
PRESSURE SENSOR (HYDRAULIC CONTROL UNIT)

Diagnostic Test

1. CHECK FOR A DTC C1232–DRIVE TEST: PRESSURE SENSOR

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

Perform ECU initialization with drive test. Refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Start the engine.

With the scan tool, read and record DTCs.

Does the scan tool display: C1232–DRIVE TEST: PRESSURE SENSOR?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK HYDRAULIC SYSTEM & BRAKE SYSTEM COMPONENT INSTALLATION & FUNCTION

Verify that the Anti-Lock Brakes Module and Hydraulic Control Unit are properly installed.

Verify that the hydraulic system is properly filled and bled.

Verify that the brake system components are installed and functioning properly.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Clean contacts in HCU first if problem reoccurs replace the Integrated Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1234–DRIVE TEST: SENSOR CLUSTER INSTALLATION

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the Drive Test.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects implausible Dynamics Sensor data.

Possible Causes
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR A DTC C1234–DRIVE TEST: SENSOR CLUSTER INSTALLATION

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

Perform ECU initialization with drive test. Refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Start the engine.

With the scan tool, read and record DTCs.

Does the scan tool display: C1234–DRIVE TEST: SENSOR CLUSTER INSTALLATION?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.

Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Dynamics Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1238-DRIVE TEST: UNSUCCESSFUL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the Drive Test.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects a fault with the Steering Angle Sensor, the Pressure Sensor, or the Dynamics Sensor.

Possible Causes
STEERING ANGLE SENSOR
PRESSURE SENSOR
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. DIAGNOSE & REPAIR ALL DTCs

Repair

Diagnose and repair all DTCs.

C123A–ESP SYSTEM SENSORS CALIBRATION

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Once per ignition cycle.
- **Set Condition:**
  If the calculated checksum does not match the stored checksum.

Possible Causes
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. INITIALIZE ANTI-LOCK BRAKES MODULE

Initialize ECU refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Does this DTC reset?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test complete.

C123B–ESP SYSTEM CONTROL TOO LONG

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module indicates ESP control lasting longer the 15 seconds.

Possible Causes
HYDRAULIC/BRAKE ISSUE
DYNAMICS SENSOR
INTEGRATED CONTROL MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: If other DTC's are set they must be repaired before continuing. This DTC must be active for the results of this test to be valid and this DTC may set while driving under excessive driving conditions.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 20 km/hr (6 and 12 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK HYDRAULIC SYSTEM & BRAKE SYSTEM COMPONENT INSTALLATION & FUNCTION

Verify that the Anti-Lock Brakes Module and Hydraulic Control Unit are properly installed.

Verify that the hydraulic system is properly filled and bled.

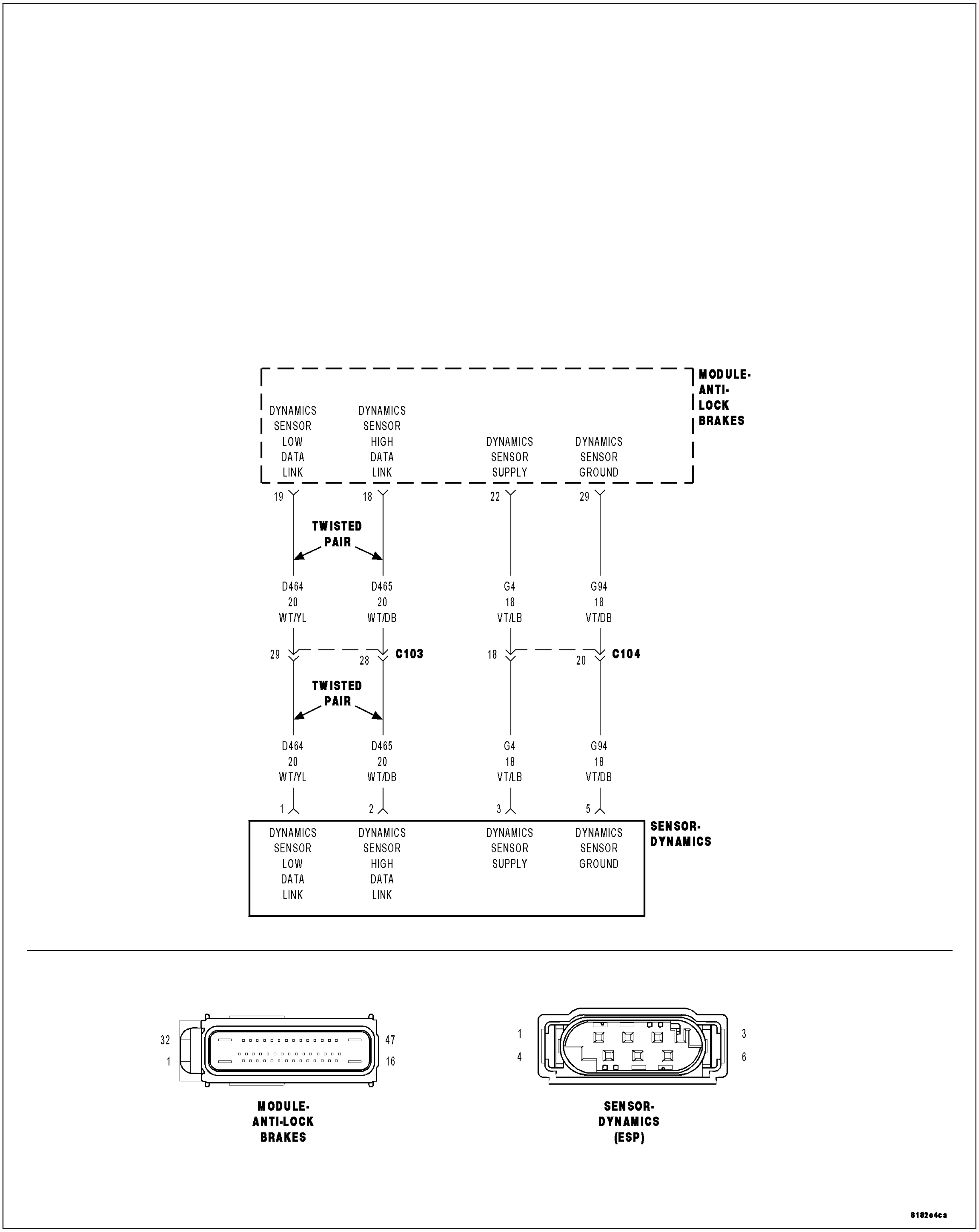
Verify that the brake system components are installed and functioning properly.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Dynamics Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C123C–DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With vehicle speed above 11 km/h (7 m.p.h.), but not if the sensor signal is invalid.
  Or, during skidding.
  Or, when driving in reverse.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects implausible Dynamics Sensor values.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: If present, diagnose and repair DTC C2114–DYNAMICS SENSOR SUPPLY VOLTAGE LOW or DTC C2115–DYNAMICS SENSOR SUPPLY VOLTAGE HIGH before diagnosing this DTC.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 20 km/hr (6 and 12 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.

Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Dynamics Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C123F–STEERING ANGLE SENSOR COMPARATIVE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With ignition on, but not if a checksum failure of the stored offset values is detected.
  Or, a CAN time-out failure is detected.
  Or, a failure is detected by the Steering Angle Sensor.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that either the calculated steering wheel angle offset or the steering wheel angle signal measured output is out of range.

Possible Causes
VEHICLE DAMAGE
STEERING COLUMN / INTERMEDIATE SHAFT DAMAGE
STEERING WHEEL ALIGNMENT
STEERING ANGLE SENSOR LOOSE
STEERING ANGLE SENSOR IMPROPERLY INSTALLED (WRONG MOUNTING POSITION)
STEERING ANGLE SENSOR
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. PERFORM TEST DRIVE & VERIFY DTC IS STILL ACTIVE

NOTE: If present, diagnose and repair DTC C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE, C121A-STEERING ANGLE SENSOR NOT INITIALIZED, or C1240-STEERING ANGLE SENSOR OVERTRAVEL PERFORMANCE before diagnosing this DTC.

Turn the ignition on.

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT VEHICLE, STEERING COLUMN, & INTERMEDIATE SHAFT FOR DAMAGE

NOTE: If possible, check vehicle repair history for collision damage.

Turn the ignition off.

Inspect the vehicle for damage causing tracking problems or steering wheel misalignment.

Inspect the steering column and intermediate shaft for damage.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK STEERING ANGLE SENSOR OUTPUT

Start the engine.

Turn the steering wheel so wheels point in a straight ahead position.

With the scan tool, read the Steering Angle Sensor position.

Is the Steering Angle Sensor Position within ± 15° degrees?

Yes >> Go To 5

No >> Go To 4

4. CHECK STEERING ANGLE SENSOR INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Proper Steering Angle Sensor installation is crucial for proper operation.
Verify that the Steering Angle Sensor are properly installed.

Is the Steering Angle Sensor properly installed?

Yes >> Go To 5

No >> Repair as necessary and clear offsets by initializing ECU with wheels pointing straight ahead.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. RE-INITIALIZE THE ESP MODULE

Perform ECU initialization with drive test to clear offsets. Refer to Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Is DTC C123F–STEERING ANGLE SENSOR COMPARATIVE PERFORMANCE still active?

Yes >> Go To 6

No >> Sensor was probably loose or calibrated with wheels not centered to vehicle. Test complete.
Perform the ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK STEERING ANGLE SENSOR OUTPUT WHILE ROTATING THE STEERING WHEEL

With the scan tool, read the Steering Angle Sensor position while rotating the steering wheel to the right and then to the left. The Steering Angle Sensor position should decrease when rotating the steering wheel to the right and increase when rotating the steering wheel to the left.

Did the steering angle change accordingly?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Steering Angle Sensor in accordance with the Service Information and clear offsets by initializing ECU with wheels pointing straight ahead.
Perform the ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1240–STEERING ANGLE SENSOR OVERTRAVEL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With ignition on, but not if a CAN time out failure is detected.
  Or, if a fault is detected by the Steering Angle Sensor.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that the absolute value of the measured steering wheel angle is greater than 720 degrees.

Possible Causes
VEHICLE DAMAGE
STEERING COLUMN / INTERMEDIATE SHAFT DAMAGE
STEERING WHEEL ALIGNMENT
STEERING ANGLE SENSOR LOOSE
STEERING ANGLE SENSOR IMPROPERLY INSTALLED (WRONG MOUNTING POSITION)
STEERING ANGLE SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. PERFORM TEST DRIVE & VERIFY DTC IS STILL ACTIVE

Turn the ignition on.

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT VEHICLE, STEERING COLUMN, & INTERMEDIATE SHAFT FOR DAMAGE

NOTE: If possible, check vehicle repair history for collision damage.

Turn the ignition off.

Inspect the vehicle for damage causing tracking problems or steering wheel misalignment.

Inspect the steering column and intermediate shaft for damage.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK STEERING ANGLE CHANGE

Turn steering wheel so wheels point in a straight ahead position.

With scan tool check steering angle if reading travels to 720 degrees whiling rotating wheel from lock to lock.

NOTE: Sensor damage can occur if wheel is turned over 720 degrees.

Rotate steering wheel to the right and the degrees will decrease and rotating steering wheel to the left the degrees will increase.

Did the steering angle change accordingly and display less the 720 degrees from lock to lock?

Yes >> Go To 4

No >> Replace the Steering Angle Sensor in accordance with the Service Information and clear offsets by initializing ECU with wheels pointing straight ahead.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

4. CHECK STEERING ANGLE SENSOR INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Proper Steering Angle Sensor installation is crucial for proper operation.

Verify that the Steering Angle Sensor are properly installed. Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION.

Is the Steering Angle Sensor properly installed?

Yes >> Replace the Steering Angle Sensor and clear offsets by initializing ECU with wheels pointing straight ahead, in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair as necessary and clear offsets by initializing ECU with wheels pointing straight ahead.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1242–G SENSOR INPUT SIGNAL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously, with ignition on, until vehicle speed exceeds 20 km/h (12.4 m.p.h.) for the first time, but not if the sensor voltage is out of range,
  Or, during diagnostic mode.
  Or, if the monitoring was inhibited by a corresponding diagnostics command.
  Or, if the vehicle speed has exceeded 20 km/h (12.4 m.p.h.) during the actual ignition cycle.
  Or, if at least one over spinning wheel is detected.
  Or, if one of the control functions is active.
- **Set Condition:**
  If the measured acceleration signal is higher than 0.8 g and longer than the specified detection time.

Possible Causes
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR OR ANTI-LOCK BRAKE MODULE
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 20 km/hr (6 and 12 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.
Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >>

NOTE: Vehicles without a Dynamics Sensor replace Anti-Lock Brake Module.
Replace the Dynamics Sensor or Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C1243–G SENSOR NOT INITIALIZED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Once after ignition on.
- **Set Condition:**
  If the stored zero point calibration value of the longitudinal acceleration sensor is invalid.

Possible Causes
DYNAMICS SENSOR NOT CALIBRATED
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. PERFORM ECU INITIALIZATION

Turn the ignition on.

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Perform ECU initialization with drive test refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

NOTE: The ECU Initialization process must include driving the vehicle into a 90° turn.
Park the vehicle.

>> Go To 2

2. VERIFY IF DTC IS STILL ACTIVE

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >>

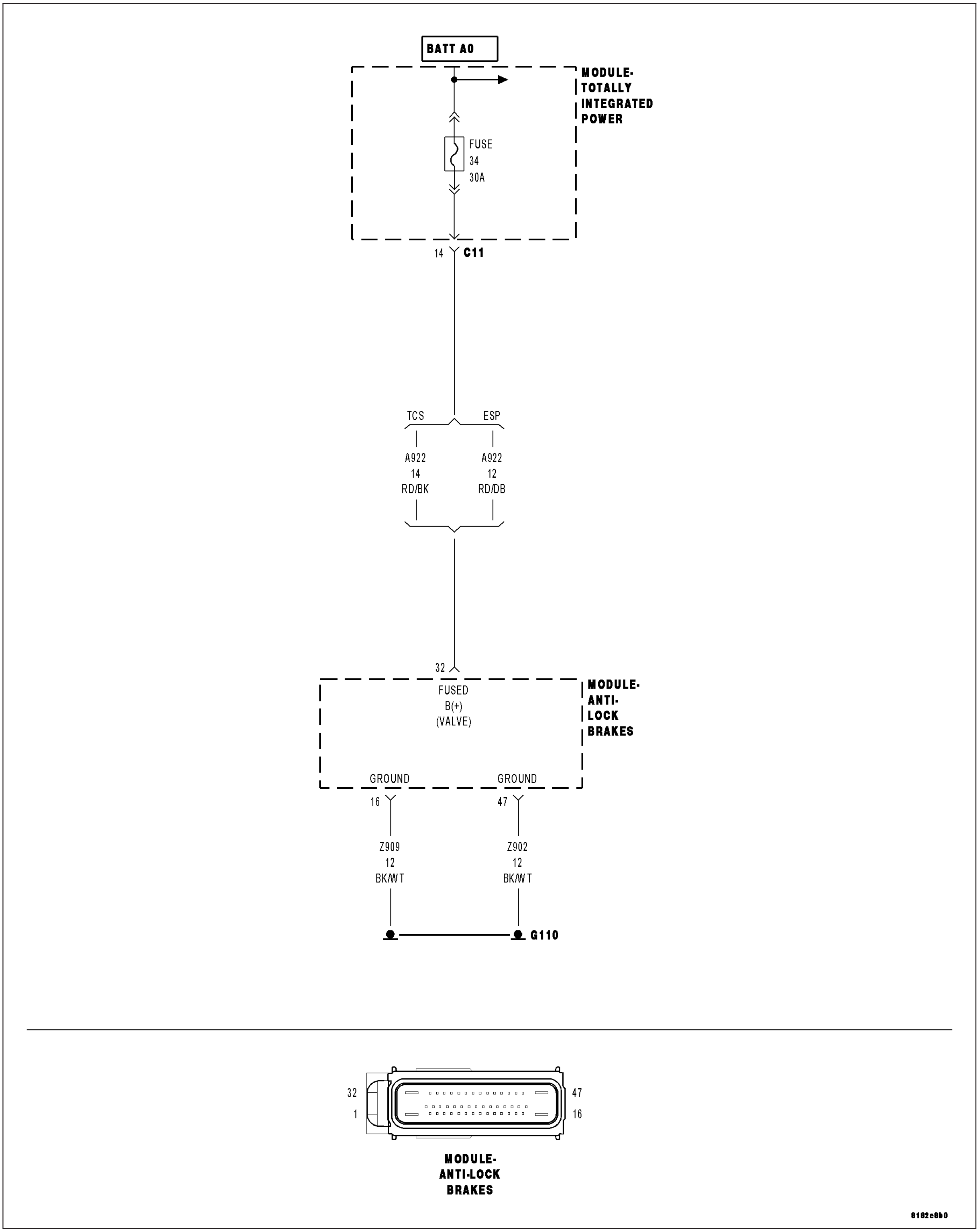
NOTE: Vehicles without a Dynamics Sensor replace Anti-Lock Brake Module.
Replace the Dynamics Sensor or Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C2100–BATTERY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects system voltage is below 7.5 volts.

Possible Causes
ECM OR PCM DTCs PRESENT
VEHICLE BATTERY / CHARGING SYSTEM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. DTC'S IN THE PCM

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTCs from the PCM.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read and record DTCs.

With the scan tool read DTCs from the PCM.

Are any charging system codes present?

Yes >> Repair the charging system DTC in the PCM.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 2

2. CHARGING SYSTEM FAILURE

Start the engine.

Connect voltmeter to vehicle battery.

Is the vehicle battery voltage under 8.2 volts?

No >> Go To 3

Yes >> Repair the charging system per service information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. CHARGING POWER SUPPLY VOLTAGE

With a scan tool read Power Supply Voltage.

Is Power Supply Voltage under 8.2 volts?

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C2111–SENSOR SUPPLY 1 VOLTAGE CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that the supply voltage for external analog sensors is out of range.

Possible Causes
ANTI-LOCK BRAKES MODULE
PRESSURE SENSOR (HYDRAULIC CONTROL UNIT)

Diagnostic Test

1. REPLACE ANTI-LOCK BRAKES MODULE & VERIFY IF DTC IS STILL ACTIVE

Turn the ignition off.

Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Replace the Hydraulic Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C2112–SENSOR SUPPLY 1 VOLTAGE CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that the supply voltage for external analog sensors is out of range.

Possible Causes
ANTI-LOCK BRAKES MODULE
PRESSURE SENSOR (HYDRAULIC CONTROL UNIT)

Diagnostic Test

1. REPLACE ANTI-LOCK BRAKES MODULE & VERIFY IF DTC IS STILL ACTIVE

Turn the ignition off.

Replace the Anti-Lock Brakes Module in accordance with the Service Information. Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Turn the ignition on.

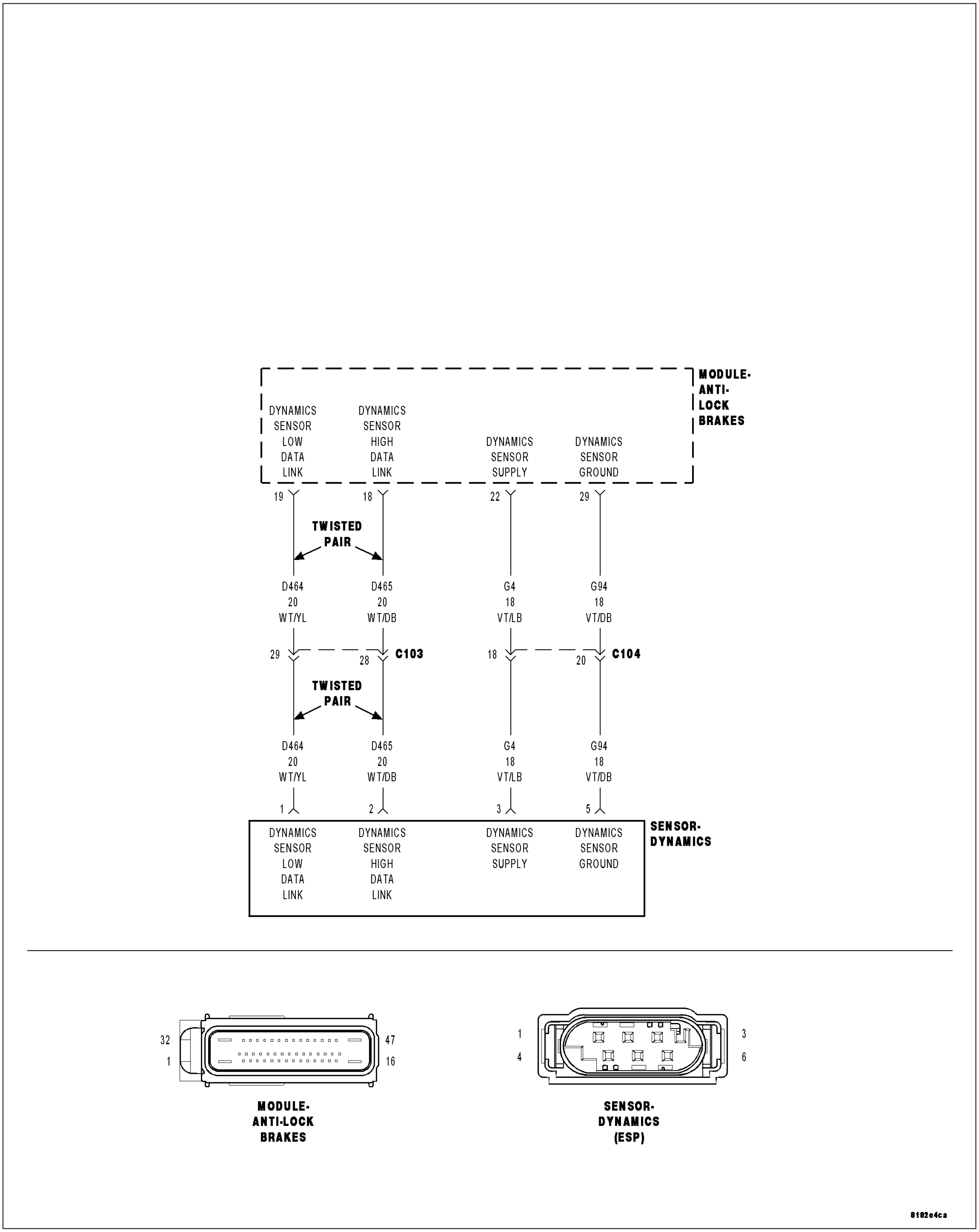
With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Replace the Hydraulic Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C2114–DYNAMICS SENSOR SUPPLY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Dynamics Sensor status changes from initialized to not initialized due to low voltage on the (G4) Dynamics Sensor Supply circuit.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(G4) DYNAMICS SENSOR SUPPLY CIRCUIT HIGH RESISTANCE
(G94) DYNAMICS SENSOR GROUND CIRCUIT HIGH RESISTANCE
(G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORTED TO OTHER ABS CIRCUITS
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.

Check all related wiring for pinched, chafed, pierced, and partially broken wires.

Check all related connectors for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

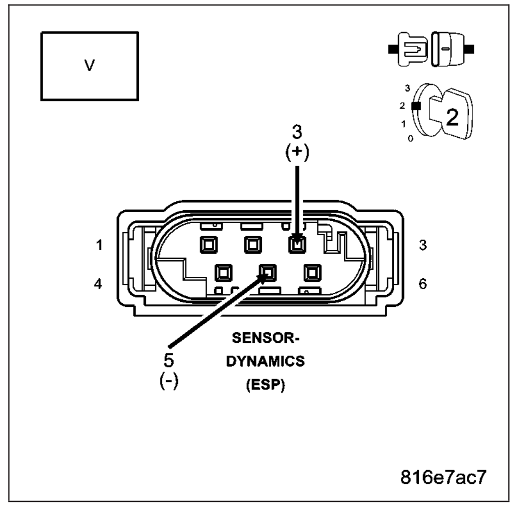
No >> Go To 3

3. CHECK (G4) DYNAMICS SENSOR SUPPLY CIRCUIT & (G94) DYNAMICS SENSOR GROUND CIRCUIT FUNCTION

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Measure the voltage between the (G4) Dynamics Sensor Supply Circuit and the (G94) Dynamics Sensor Ground Circuit.



Is the voltage above 4.5 volts?

Yes >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

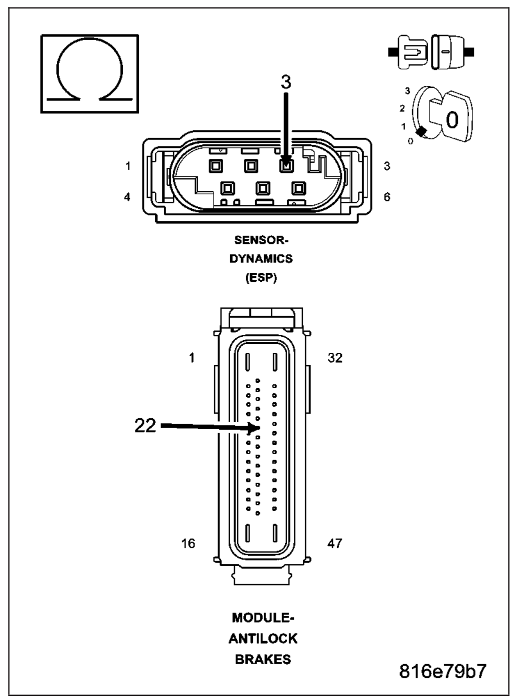
No >> Go To 4

4. CHECK (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Anti-Lock Brakes Module harness connector.

Measure the resistance of the (G4) Dynamics Sensor Supply circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

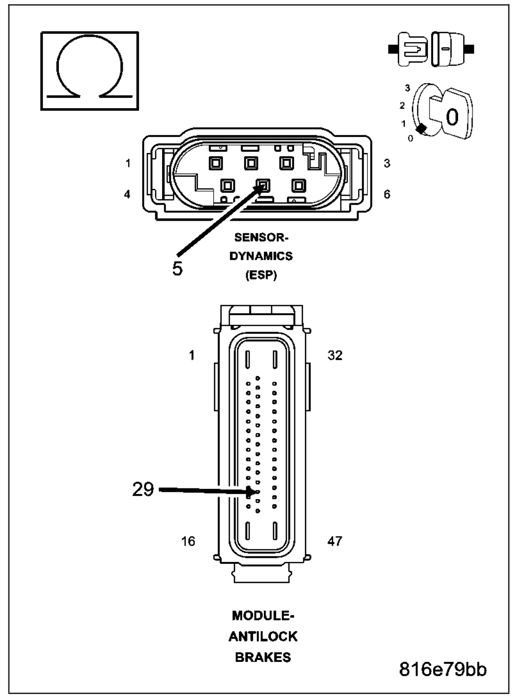
Yes >> Go To 5

No >> Repair the (G4) Dynamics Sensor Supply circuit for high resistance.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

5. CHECK (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR HIGH RESISTANCE

Measure the resistance of the (G94) Dynamics Sensor Ground circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

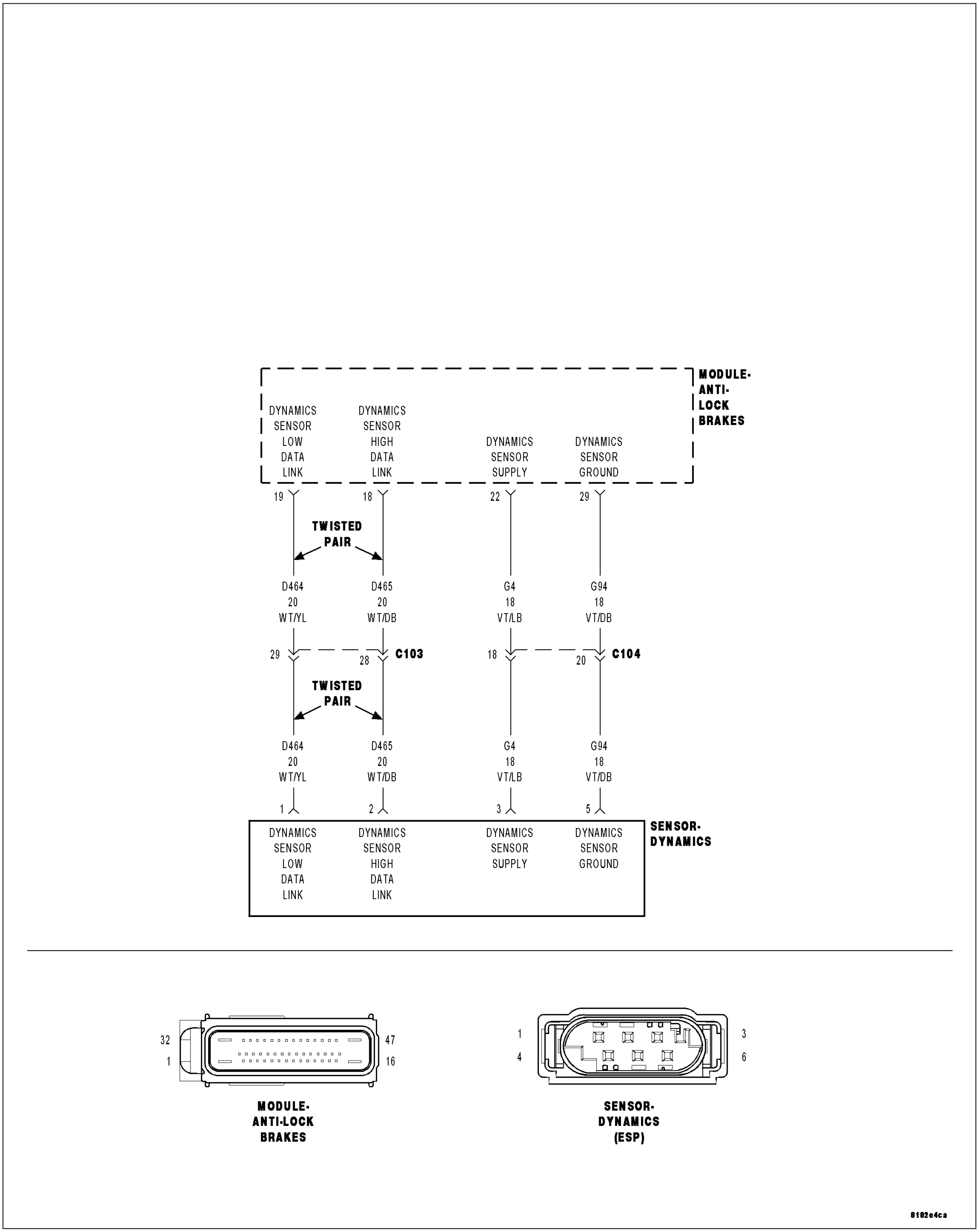
Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (G94) Dynamics Sensor Ground circuit for high resistance.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C2115–DYNAMICS SENSOR SUPPLY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Upon ignition on, prior to switching the (G4) Dynamics Sensor Supply circuit power on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects voltage on the (G4) Dynamics Sensor Supply circuit when the circuit's power is turned off.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE
ANTI-LOCK BRAKES MODULE

1. VERIFY DTC IS ACTIVE

Turn the ignition on.
With the scan tool, read and record ABS DTCs.
With the scan tool, read and record Environmental Data (EV Data).
With the scan tool, erase ABS DTCs.
Cycle the ignition switch.
With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.
Check all related wiring for pinched, chafed, pierced, and partially broken wires.
Check all related connectors for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

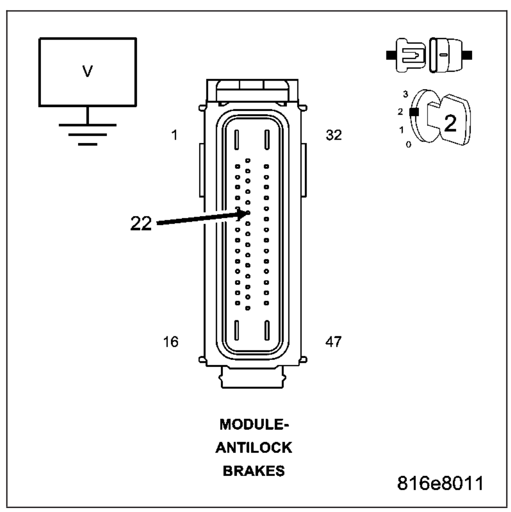
3. CHECK (G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORT FOR A SHORT TO VOLTAGE

Disconnect the Anti-Lock Brakes Module harness connector.
Turn the ignition on.
Measure the voltage of the (G4) Dynamics Sensor Supply Circuit.

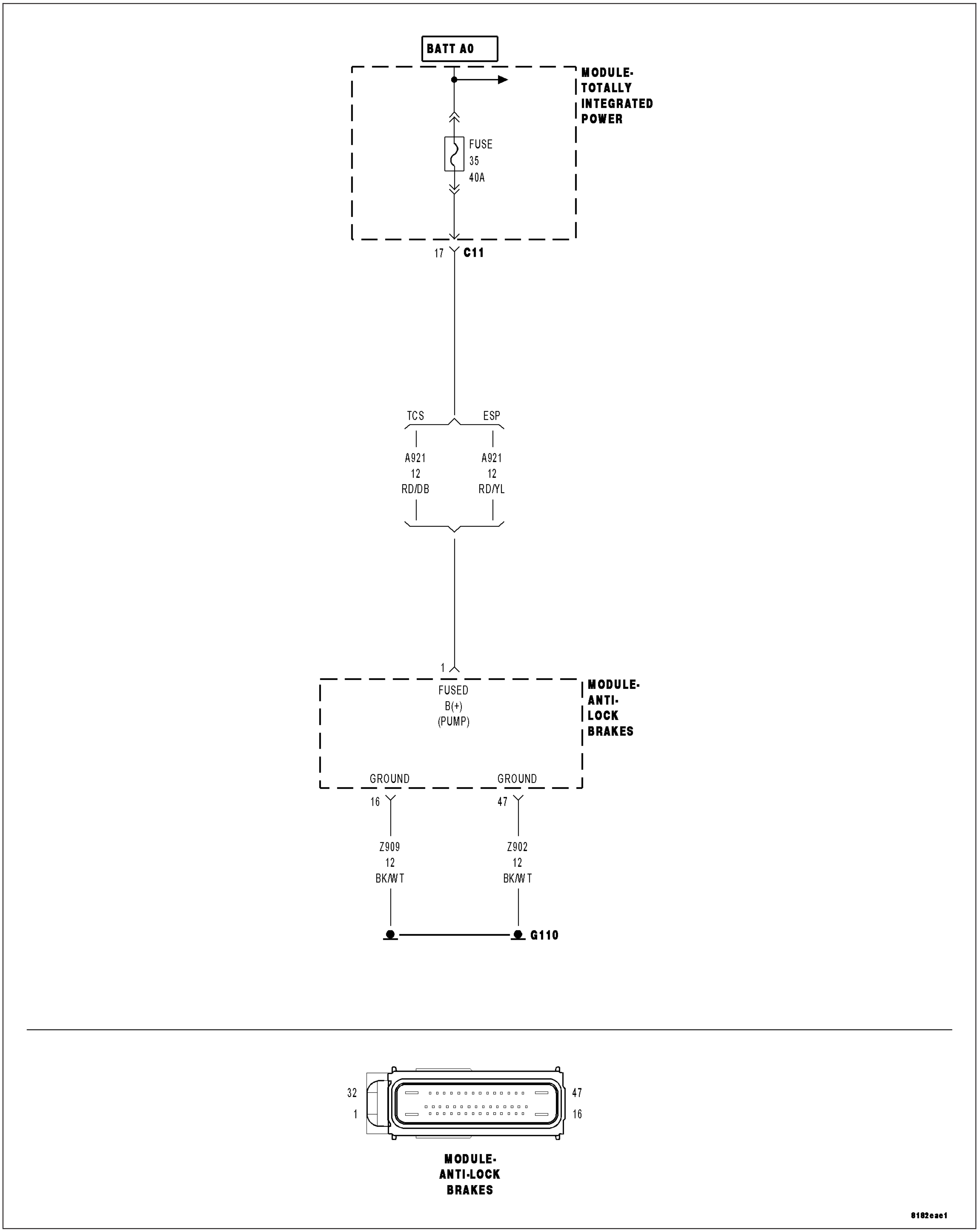
Is the voltage above 0.2 volts?

Yes >> Repair the (G4) Dynamics Sensor Supply Circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



C2116–ABS PUMP MOTOR SUPPLY LOW VOLTAGE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the ABS Pump Motor deactivated, but not if supply voltage faults are detected. Or, if the control is switched off.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects either a low voltage condition when the ABS Pump Motor is activated or deactivated or a high voltage condition when the ABS Pump Motor is deactivated.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
ABS PUMP MOTOR FUSE OPEN
(A921) FUSED B(+) CIRCUIT SHORTED TO GROUND, OPEN, OR HIGH RESISTANCE
(Z909) and (Z902) GROUND CIRCUIT OPEN, OR HIGH RESISTANCE
ANTI-LOCK BRAKES MODULE
PUMP MOTOR (HYDRAULIC CONTROL UNIT)

Diagnostic Test

1. CHECK FOR A DTC C2116–ABS PUMP MOTOR SUPPLY LOW VOLTAGE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

Road test the vehicle over 40 km/h (25 m.p.h.).

NOTE: Vehicle must be driven above 40 km/h (25 m.p.h.) for set conditions to be meet.

With the scan tool, read DTCs.

Does the scan tool display: C2116–ABS PUMP MOTOR SUPPLY LOW VOLTAGE?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) Diagnostic Test

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Turn the ignition off.

Visually inspect the Anti-Lock Brakes Module harness connector and wiring harness for damage.

Check all related wiring for pinched, chafed, pierced, and partially broken wires.

Check all related connectors for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK ABS PUMP MOTOR FUSE

Remove and visually inspect the ABS Pump Motor fuse.

Is the fuse open?

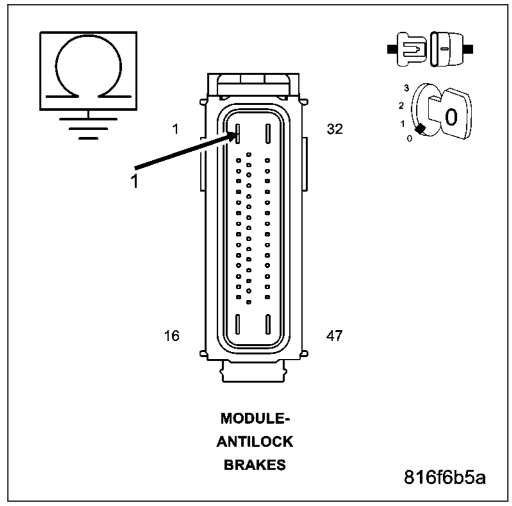
Yes >> Go To 4

No >> Go To 5

4. CHECK (A921) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Anti-Lock Brakes Module harness connector.

Measure the resistance of the (A921) Fused B(+) circuit between ground and the Anti-Lock Brakes Module harness connector.



Is the resistance below 10k ohms?

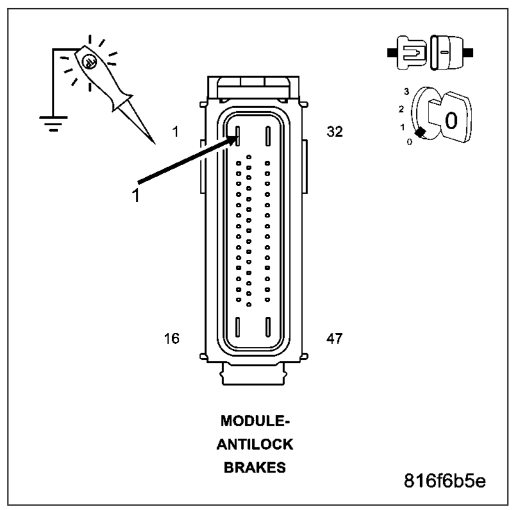
Yes >> Repair the (A921) Fused B(+) circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK (A921) FUSED B(+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Replace the ABS Pump Motor fuse.

Using a 12-volt test light connected to ground, probe the (A921) Fused B(+) circuit.



NOTE: The test light should illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

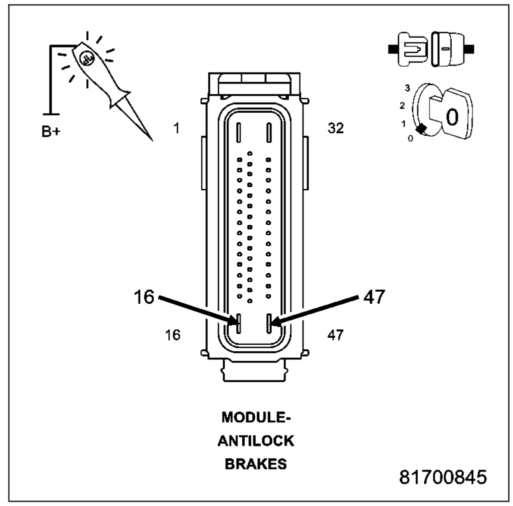
Yes >> Go To 6

No >> Repair the (A921) Fused B(+) circuit for an open or high resistance.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK (Z909) AND (Z902) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to 12 volts, probe the (Z909) and (Z902) Ground circuit.

NOTE: The test light should illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly on both circuits?

Yes >> Go To 7

No >> Repair (Z909) and (Z902) circuit for an open or high resistance.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

7. REPLACE ANTI-LOCK BRAKES MODULE & VERIFY IF DTC IS STILL ACTIVE

Replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Turn the ignition on.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Replace the Hydraulic Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C2200–ANTI-LOCK BRAKE MODULE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. The Anti-Lock Brake Module monitors its internal microprocessors for correct operation.
- **Set Condition:**
  If the Anti-lock brake module detects an internal fault, the DTC is set.

Possible Causes
ABM - INTERNAL FAULT

Diagnostic Test

1. ABM INTERNAL FAILURE DTC PRESENT

Turn the ignition on.

With the scan tool, read DTCs.

With the scan tool, erase DTCs.

Turn the ignition off.

Turn the ignition on.

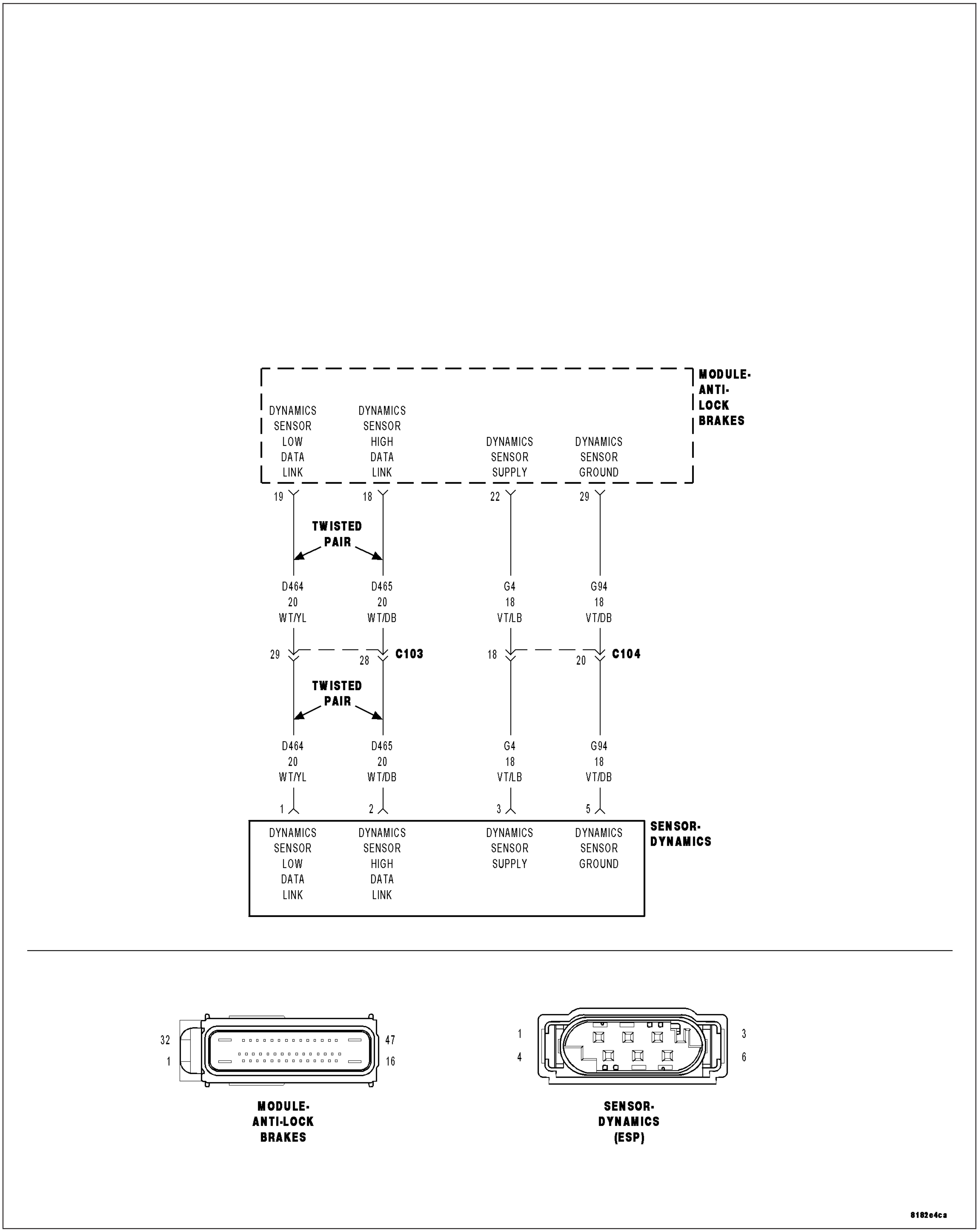
With the scan tool, read DTCs.

Does the scan tool display ANTI-LOCK BRAKE MODULE INTERNAL FAILURE?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

C2204–DYNAMICS SENSOR INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously, with ignition on, until vehicle speed exceeds 20 km/h (12.4 m.p.h.) for the first time, but not if the sensor voltage is out of range.
  Or, during diagnostic mode.
  Or, if the monitoring was inhibited by a corresponding diagnostics command.
  Or, if the vehicle speed has exceeded 20 km/h (12.4 m.p.h.) during the actual ignition cycle.
  Or, if at least one over spinning wheel is detected.
  Or, if one of the control functions is active.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that the Lateral Sensor signal is out of range.

Possible Causes
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 20 km/hr (6 and 12 m.p.h.).

Park the vehicle.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.
Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK DYNAMICS SENSOR OUTPUT

CAUTION: All previously removed connectors must be connected before test driving the vehicle, to avoid personal injury or death,

Connect all previously disconnected components and connectors.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

Monitor Dynamics Sensor operation while an assistant drives the vehicle.

Is Lateral Sensor output between 0.02 G to 0.16 G and Yaw Sensor output between 1.30° to 5.70°

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Dynamics Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

C2205–STEERING ANGLE SENSOR INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With ignition on, but not if supply voltage faults are detected.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects that the Steering Angle Sensor is either not calibrated, or not initialized, or its status changes from initialized to not initialized, or if the sensor sends an internal failure message.

Possible Causes
STEERING ANGLE SENSOR NOT INITIALIZED
STEERING ANGLE SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. CHECK FOR A DTC C2205-STEERING ANGLE SENSOR INTERNAL

NOTE: This DTC must be active for the results of this test to be valid.
Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

With the scan tool, read and record DTCs.

Does the scan tool display: C2205-STEERING ANGLE SENSOR INTERNAL?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. STEERING ANGLE SENSOR

Replace the Steering Angle Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

WARNING: To avoid personal injury or death, check brake capability is available before road testing.
Road test the vehicle over 25 km/h (6 and 15 m.p.h).

NOTE: Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.). for set conditions to be meet.
With the scan tool, read ABS DTCs.

Did DTC C2205-STEERING ANGLE SENSOR INTERNAL reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Test Complete.

C2206–VEHICLE CONFIGURATION MISMATCH

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects the signal from the gateway module relevant for vehicle characteristic is missing or does not match for a period greater than the specified fault duration.

Possible Causes
TIPM / PCM NOT CONFIGURED CORRECTLY
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR A DTC C2206-VEHICLE CONFIGURATION MISMATCH

NOTE: This DTC must be active for the results of this test to be valid.

NOTE: This DTC will be active when a new module is installed until initialization is performed.

Turn the ignition on.

With the scan tool, read and record DTCs.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTCs.

Perform ECU initialization with drive test on ABM. Refer to ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Cycle the ignition switch from off to on.

With the scan tool, read and record DTCs.

Does the scan tool display: C2206-VEHICLE CONFIGURATION MISMATCH?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. VERIFY THAT THE TIPM/PCM IS CONFIGURED CORRECTLY

Turn the ignition on.

Check the following data to verify the TIPM/PCM is configured correctly. Engine Displacement (PCM), XWD 4x2, 4x4, all Wheel Drive, (TIPM), Axle ratio (TIPM), Vehicle Line (TIPM), Brake type 0= ABS 1=ESP (TIPM).

NOTE: The DTC will be active when a new controller is installed until initialization is performed.

Was the TIPM/PCM configured correctly?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Reprogram the appropriate module.
Perform ABS or PCM VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U0002–CAN C BUS OFF PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND
(D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND
(D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT
ANTI-LOCK BRAKE MODULE
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE
STEERING CONTROL MODULE
TOTALLY INTEGRATED CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase ABM DTCs.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active ABM DTCs.

Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.
Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. ANTILOCK BRAKE MODULE — INTERNAL SHORT

Turn the ignition off.
Disconnect the Anti-Lock Brake Module harness connector.
Turn the ignition on.
With the scan tool, record and erase TIPM DTCs.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active TIPM DTCs.

Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTCs.

Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?

Yes >> Go To 4

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.

Perform POWERTRAIN VERIFICATION TEST.

4. TRANSMISSION CONTROL MODULE-INTERNAL SHORT

Turn the ignition off.

Disconnect the Transmission Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTCs.

Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?

Yes >> Go To 5

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Transmission Control Module in accordance with the service information.

Perform TRANSMISSION VERIFICATION TEST.

5. STEERING CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTCs.

Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?

Yes >> Go To 6

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

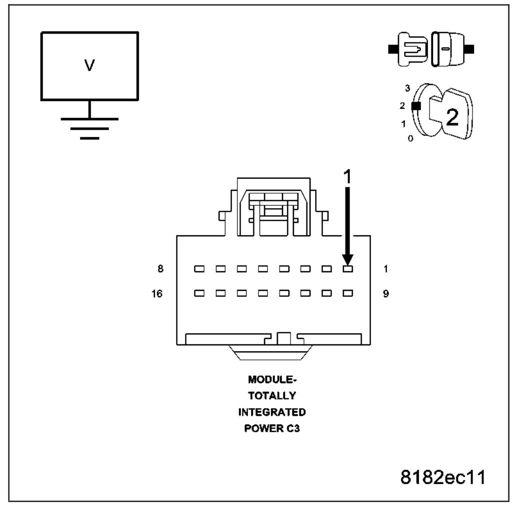
6. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Turn the ignition on.

Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.



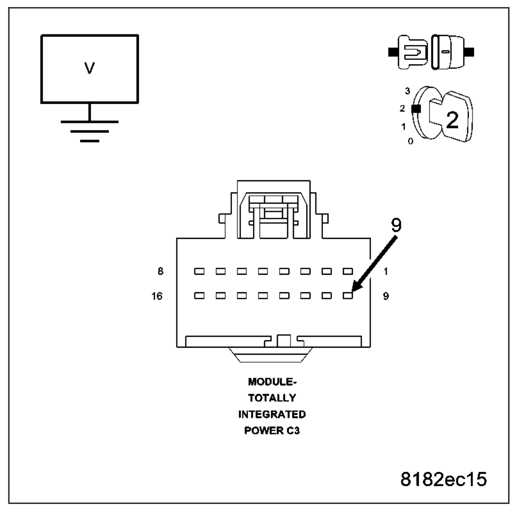
Is there any voltage present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 7

7. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.



Is there any voltage present?

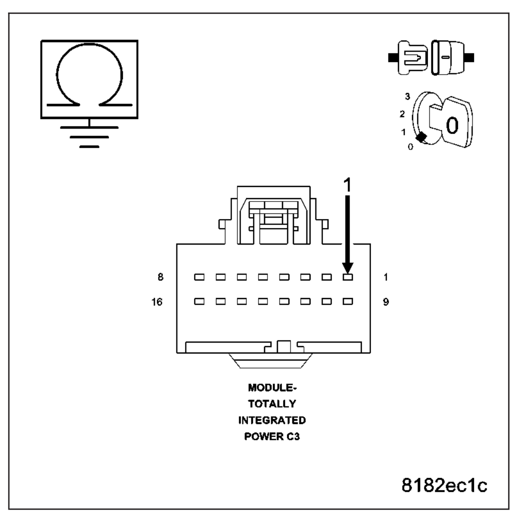
Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 8

8. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.



Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 9

9. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND

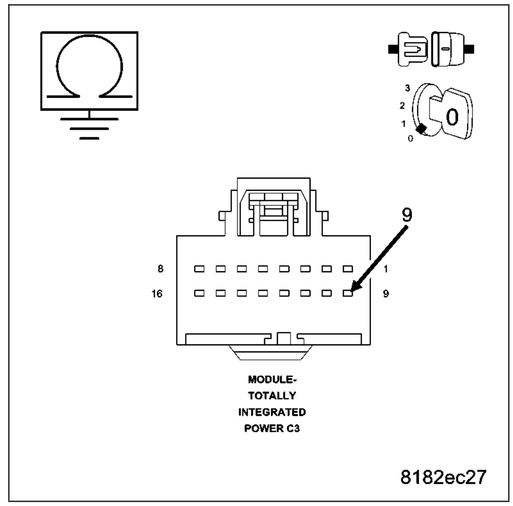
Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

Is any resistance present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)..

No >> Go To 10



10. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

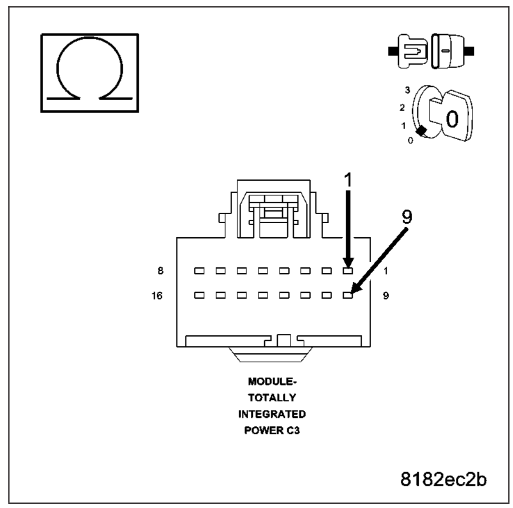
Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



U0100–LOST COMMUNICATION WITH ECM/PCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the Anti-Lock Brakes Module fails to receive bus messages from the ECM or PCM for approximately 500 ms.

Possible Causes
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
ECM OR PCM POWER AND GROUND
ECM OR PCM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Verify the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. VERIFY THAT THE ECM OR PCM IS ACTIVE ON THE BUS

With the scan tool, select ECU View.

Verify that the ECM or PCM is active on the bus.

Is the ECM or PCM active on the bus?

Yes >> Go To 4

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the ECM or PCM?

Yes >> Replace/update the ECM or PCM in accordance with the service information.
Perform POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)..
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Anti-Lock Brakes Module in accordance with the service information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U0101–LOST COMMUNICATION WITH TCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the Anti-Lock Brakes Module fails to receive bus messages from the TCM for approximately 500 ms.

Possible Causes
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
TCM POWER AND GROUND
PCM DTCs PRESENT
TCM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Verify the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

NOTE: If present, diagnose and repair DTC U0002–CAN C BUS OFF PERFORMANCE, DTC U0146–LOST COMMUNICATION WITH CENTRAL GATEWAY, or DTC U1502–IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM FCM / BCM before diagnosing this DTC.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. Refer to the table of contents in this section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. VERIFY THAT THE TCM IS ACTIVE ON THE BUS

With the scan tool, select ECU View.

Verify that the TCM is active on the bus.

Is the TCM active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs "Logged Against" the TCM?

Yes >> Replace/update the TCM in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Anti-Lock Brakes Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0114-LOST COMMUNICATION WITH FINAL DRIVE MODULE (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - TIPM is configured correctly
- **Set Condition:**
  Bus messages not received from the Totally Integrated Power Module (TIPM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
TOTALLY INTEGRATED CONTROL MODULE
TOTALLY INTEGRATED CONTROL MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Verify the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

3. VERIFY THAT THE TIPM IS ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select Network Diagnostics.
Verify that the TIPM is active on the bus.

Is the TIPM active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform BODY VERIFICATION TEST – VER 1.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

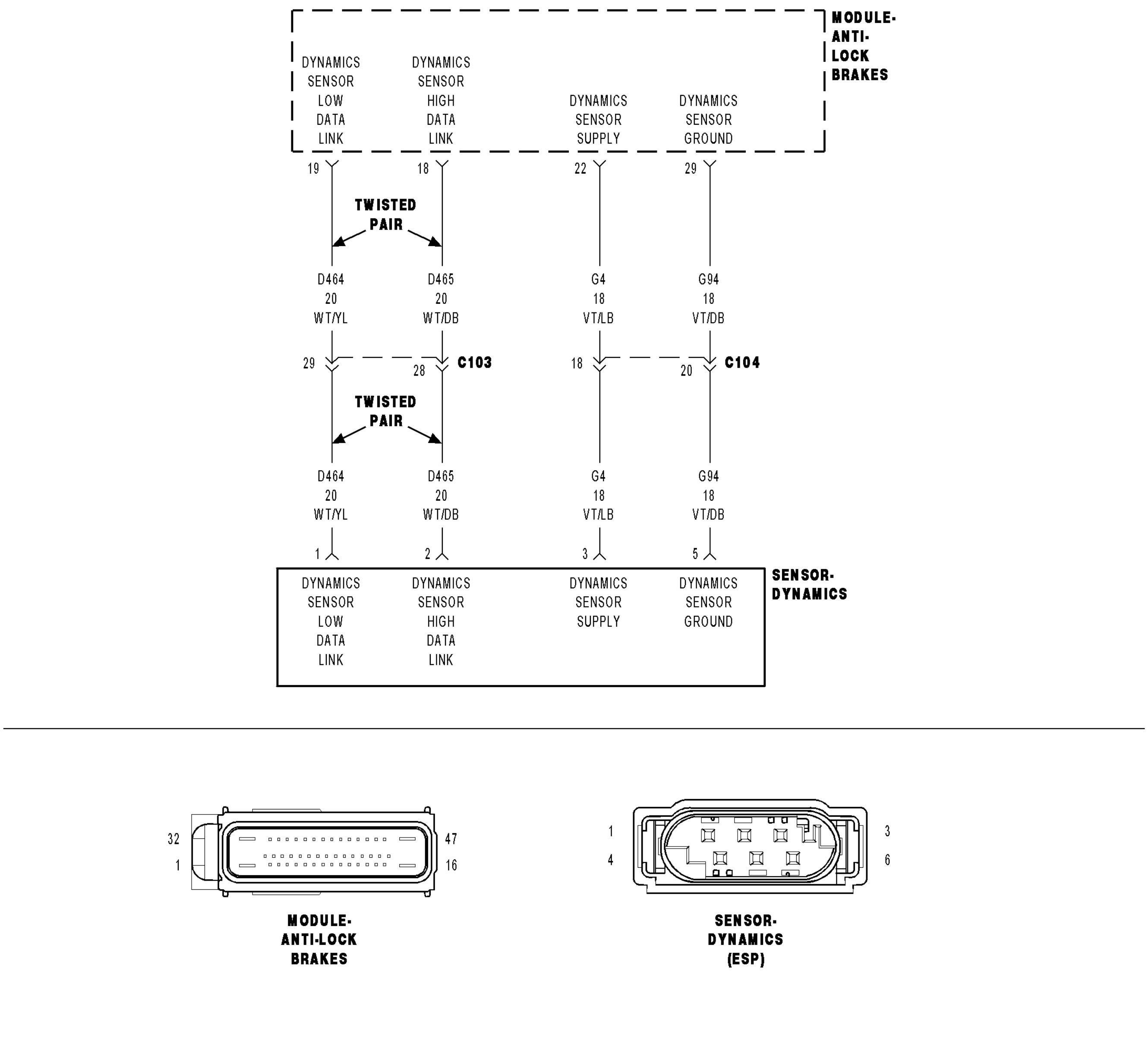
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the TIPM?

Yes >> Replace/update the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0125–LOST COMMUNICATION WITH DYNAMICS SENSOR



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module fails to receive bus messages from the Dynamics Sensor.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT SHORTED TO GROUND, SHORTED TO VOLTAGE, OR OPEN
(D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT SHORTED TO GROUND, SHORTED TO VOLTAGE, OR OPEN
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: If present, diagnose and repair DTC C2114–DYNAMICS SENSOR SUPPLY VOLTAGE LOW or DTC C2115–DYNAMICS SENSOR SUPPLY VOLTAGE HIGH before proceeding.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

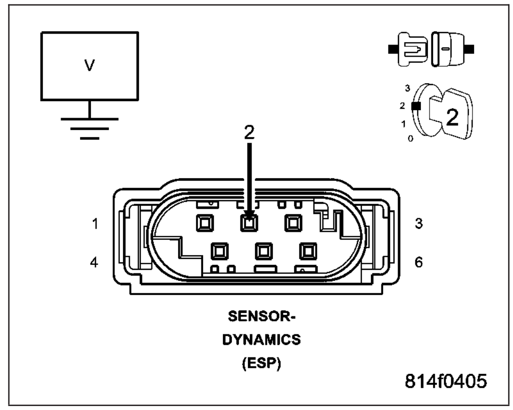
3. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the Anti-Lock Brakes Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (D465) Dynamics Sensor High Data Link circuit.



Is there any voltage present?

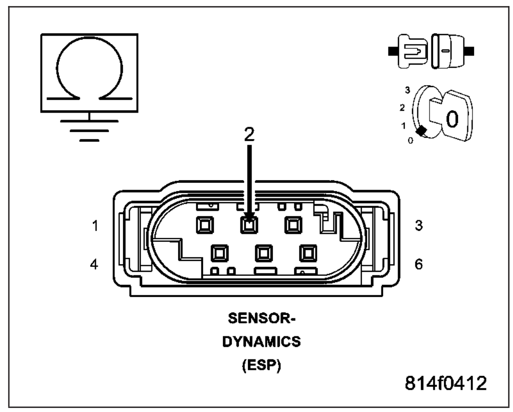
Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between ground and the Dynamics Sensor harness connector.



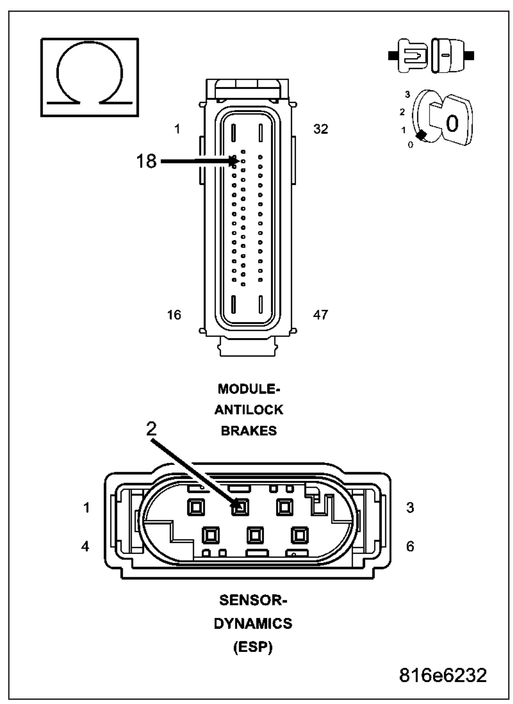
Is the resistance below 5.0 ohms?

Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR AN OPEN

Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

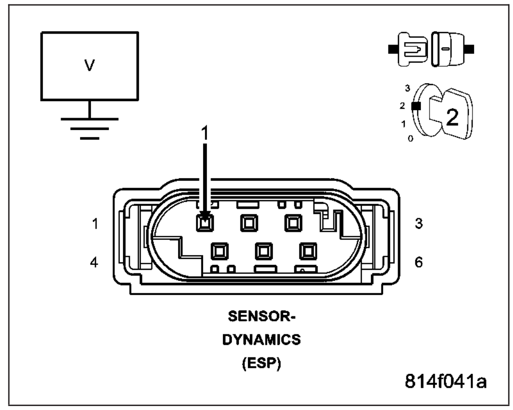
Yes >> Go To 6

No >> Repair the (D465) Dynamics Sensor High Data Link circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (D464) Dynamics Sensor Low Data Link circuit.



Is there any voltage present?

Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to voltage.

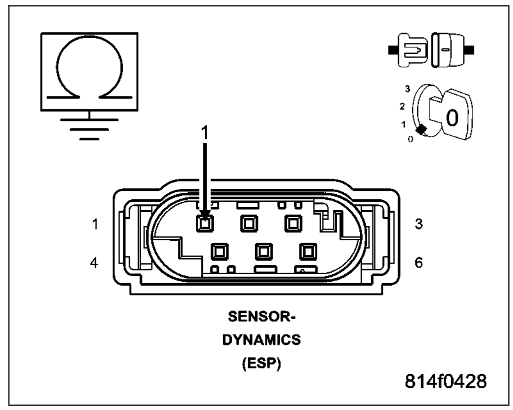
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between ground and the Dynamics Sensor harness connector.



Is the resistance below 5.0 ohms?

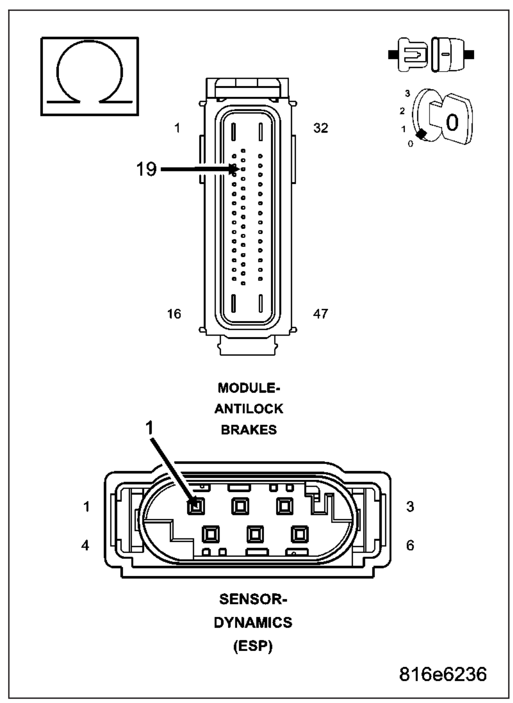
Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8

8. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR AN OPEN

Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (D464) Dynamics Sensor Low Data Link circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - TIPM is configured correctly
- **Set Condition:**
  Bus messages not received from the TIPM for approximately 2 to 5 seconds.

Possible Causes
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
TOTALLY INTEGRATED POWER MODULE
TOTALLY INTEGRATED POWER MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Verify the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE TIPM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the TIPM is active on the bus.

Is the TIPM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the TIPM?

Yes >> Replace/update the Totally Integrated Power Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0146–LOST COMMUNICATION WITH CENTRAL GATEWAY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the Anti-Lock Brakes Module either fails to receive bus messages from the Totally Integrated Control Module (TIPM) for approximately 500 ms, or it receives invalid messages from the TIPM, or it detects messages from the TIPM are of improper data length.

Possible Causes
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
TIPM POWER AND GROUND
TIPM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Verify the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. VERIFY THAT THE TIPM IS ACTIVE ON THE BUS

With the scan tool, select ECU View.

Verify that the TIPM is active on the bus.

Is the TIPM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response related diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs "Logged Against" the TIPM?

Yes >> Replace/update the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Anti-Lock Brakes Module in accordance with the service information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U0401–IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, one valid CAN message received at least once, and no U0002-CAN C Bus Off Performance DTC present.
- **Set Condition:**
  When the Anti-Lock Brake Module detects an incorrect CAN message from the Engine Module.

Possible Causes
ABM CAN BUS DTCS
ENGINE DTCS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR DTC U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition switch from off to on.

With the scan tool, read DTCs.

Does the scan tool display: U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM?

Yes >> Go To 2

No >> Perform the ABS Intermittent Condition diagnostic procedure in this Section.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) . Diagnostic Test

2. CHECK IF TIPM CAN BUS DTCs ARE PRESENT

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTCs present?

Yes >> Refer to the appropriate diagnostic. (Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK IF ENGINE DTCs ARE PRESENT

With the scan tool, read Engine DTCs.

Are there any Engine DTCs present?

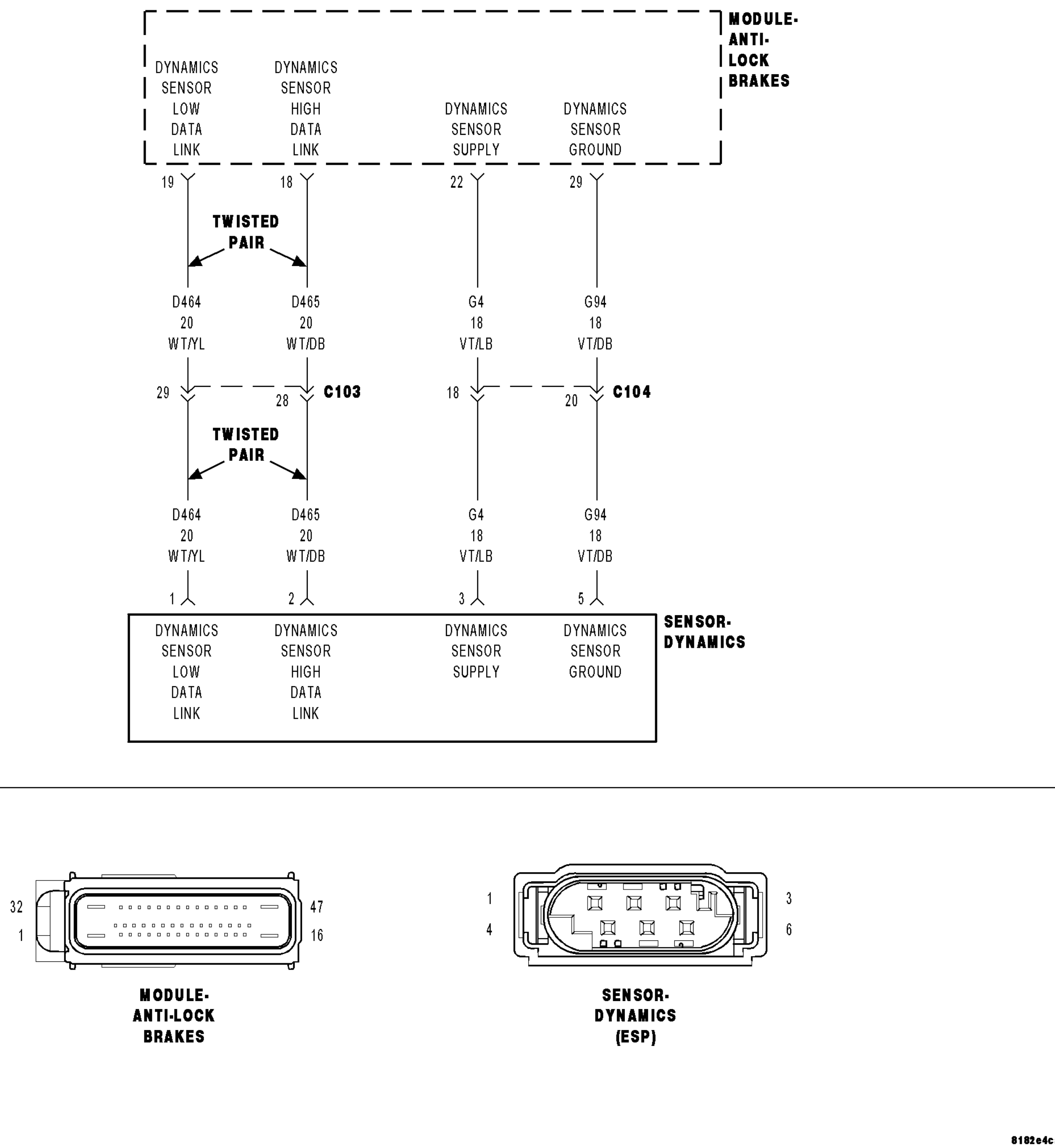
Yes >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U1003–ESP CAN C BUS PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects too many CAN Bus off events on the Dynamics Sensor Data Link circuits.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN
(D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN
DYNAMICS SENSOR
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING).

2. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

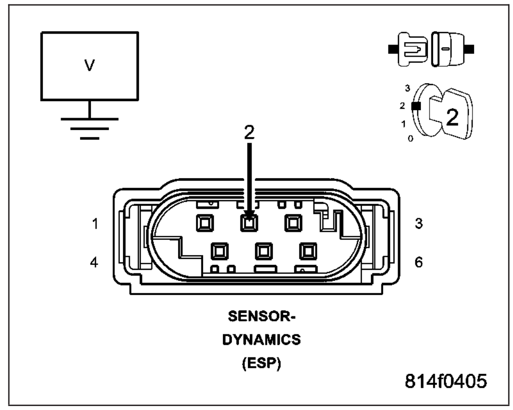
3. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the Anti-Lock Brakes Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (D465) Dynamics Sensor High Data Link circuit.



Is there any voltage present?

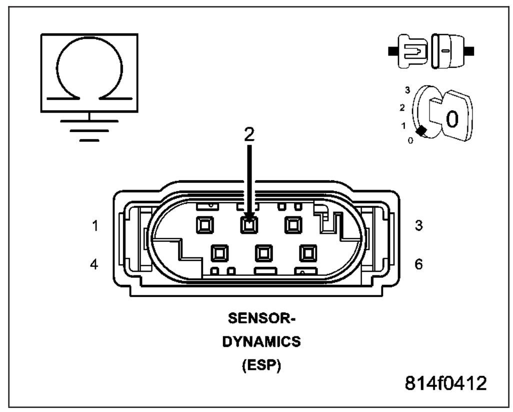
Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to voltage.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between ground and the Dynamics Sensor harness connector.



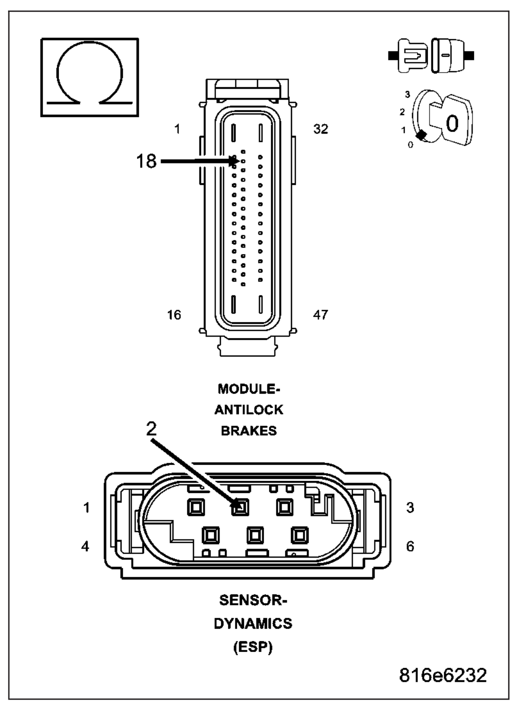
Is the resistance below 5.0 ohms?

Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to ground.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR AN OPEN

Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

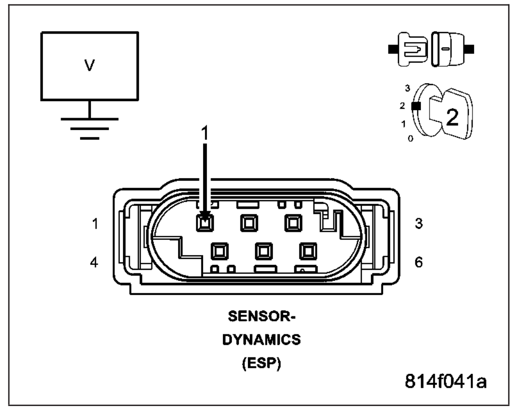
Yes >> Go To 6

No >> Repair the (D465) Dynamics Sensor High Data Link circuit for an open.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

6. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (D464) Dynamics Sensor Low Data Link circuit.



Is there any voltage present?

Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to voltage.

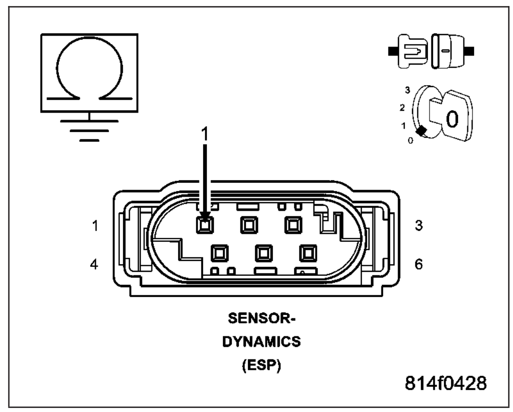
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 7

7. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between ground and the Dynamics Sensor harness connector.



Is the resistance below 5.0 ohms?

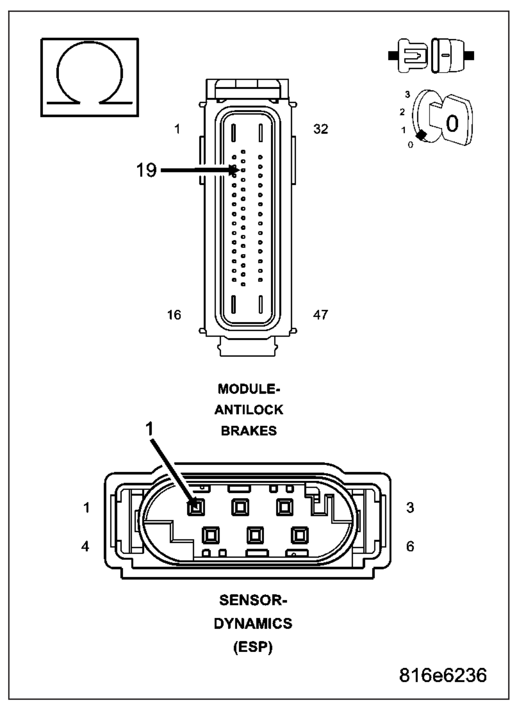
Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8

8. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR AN OPEN

Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the (D464) Dynamics Sensor Low Data Link circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

9. REPLACE DYNAMICS SENSOR & VERIFY IF DTC IS STILL ACTIVE

Replace the Dynamics Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

Turn the ignition on.

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

WARNING: Ensure brake capability is available before road testing.

Test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

Park the vehicle.

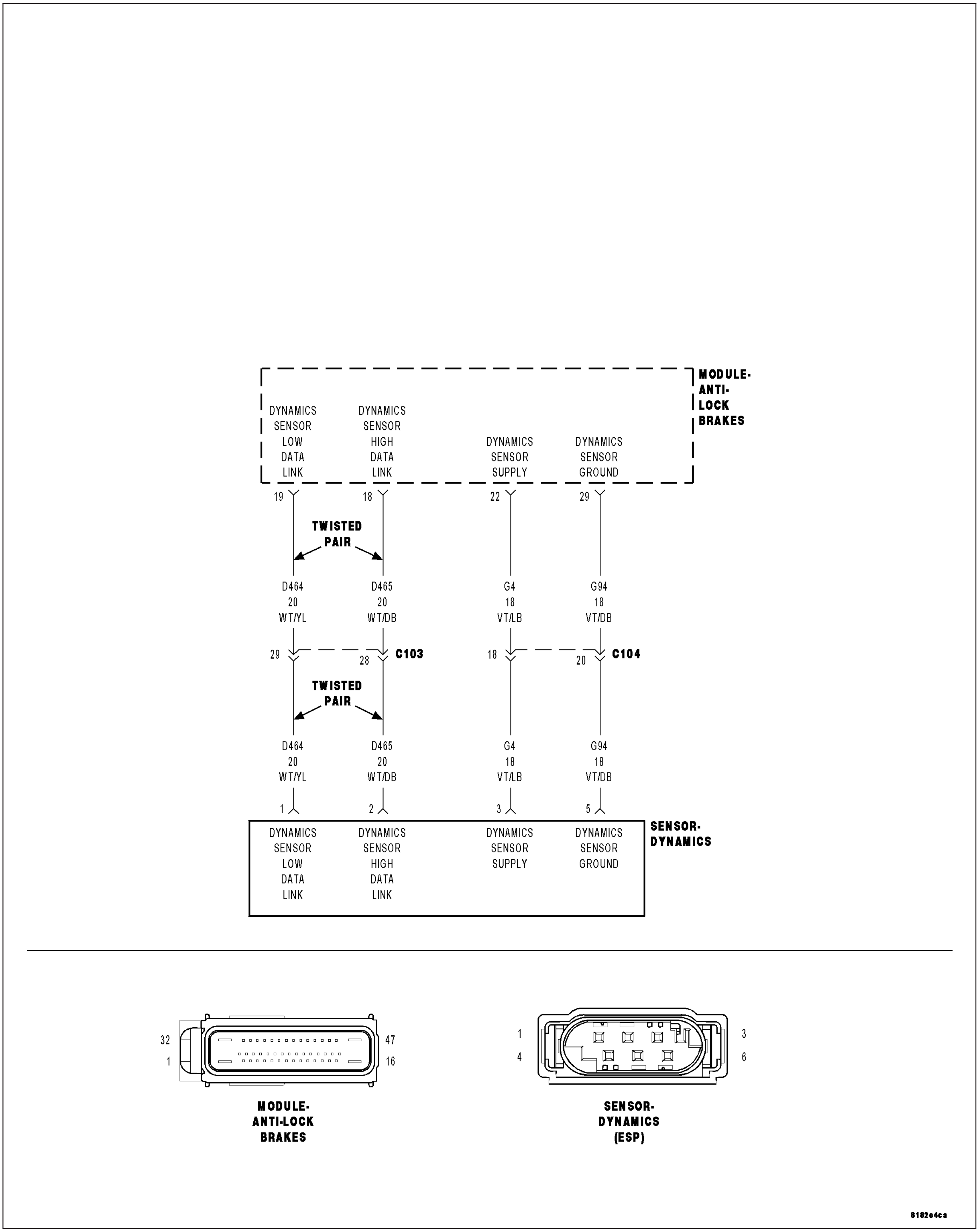
With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U1104–CAN C BUS CRC PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects an invalid CAN message from the Dynamics Sensor.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
(D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN
(D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN
DYNAMICS SENSOR INSTALLATION
DYNAMICS SENSOR

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING).

2. CHECK THE DYNAMICS SENSOR INSTALLATION

NOTE: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.

Turn the ignition off.

Check the Dynamics Sensor for damaged, modified, and bent mounting brackets.

Check the Dynamics Sensor mounting bolts for a loose or over tightened condition.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 3

3. INSPECT RELATED WIRING HARNESS, TERMINALS, & CONNECTORS

Visually inspect the related wiring harness. Look for any pinched, chafed, pierced, and partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, and corroded terminals.

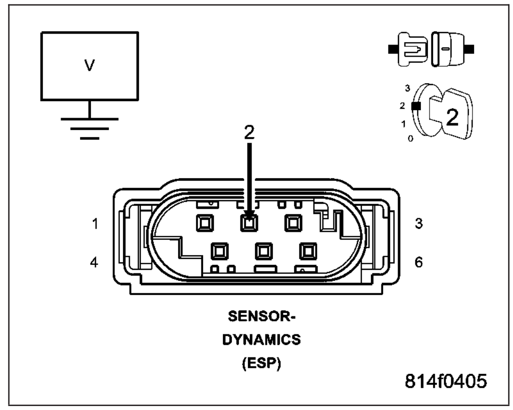
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE



Disconnect the Anti-Lock Brakes Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (D465) Dynamics Sensor High Data Link circuit.

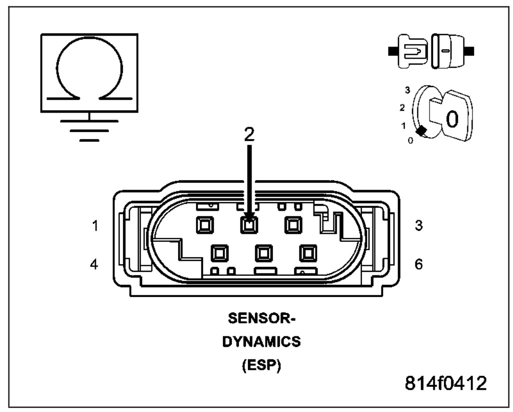
Is there any voltage present?

Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to voltage.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR A SHORT TO GROUND



Turn the ignition off.

Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between ground and the Dynamics Sensor harness connector.

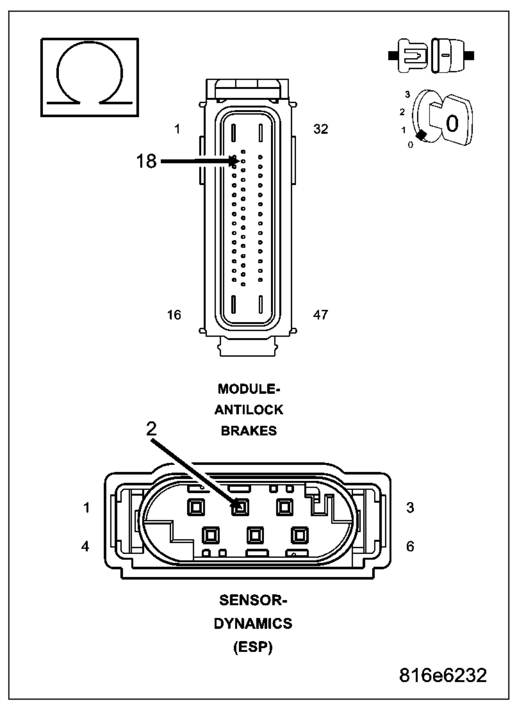
Is the resistance below 5.0 ohms?

Yes >> Repair the (D465) Dynamics Sensor High Data Link circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK THE (D465) DYNAMICS SENSOR HIGH DATA LINK CIRCUIT FOR AN OPEN



Measure the resistance of the (D465) Dynamics Sensor High Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the (D465) Dynamics Sensor High Data Link circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

7. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition on.

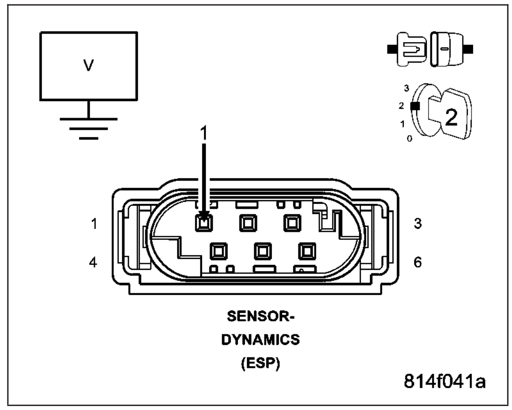
Measure the voltage of the (D464) Dynamics Sensor Low Data Link circuit.

Is there any voltage present?

Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to voltage.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 8



8. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

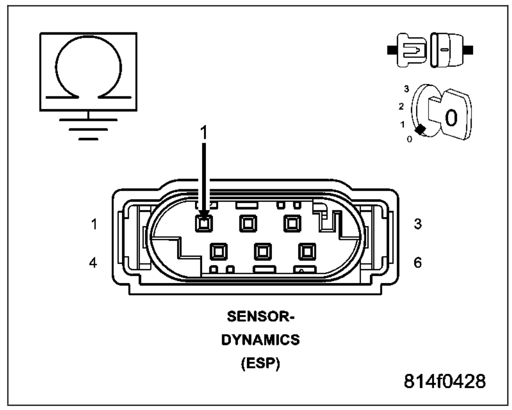
Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between ground and the Dynamics Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the (D464) Dynamics Sensor Low Data Link circuit for a short to ground.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 9



9. CHECK THE (D464) DYNAMICS SENSOR LOW DATA LINK CIRCUIT FOR AN OPEN

Measure the resistance of the (D464) Dynamics Sensor Low Data Link circuit between the Dynamics Sensor harness connector and the Anti-Lock Brakes Module harness connector.

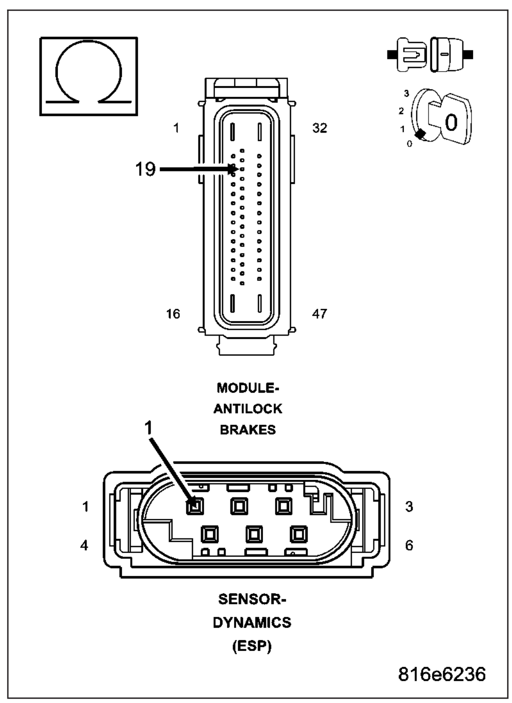
Is the resistance below 5.0 ohms?

Yes >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Repair the (D464) Dynamics Sensor Low Data Link circuit for an open.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



U140E–IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Once per ignition cycle, but not during cranking.
  Or, if low supply voltage faults are detected.
- **Set Condition:**
  If the Anti-Lock Brakes Module either fails to receive vehicle configuration data from the Engine Control Module (ECM) or Powertrain Control Module (PCM) or the configuration data it receives from the ECM or PCM is different than that received during the previous ignition cycle.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
ECM OR PCM DTCs PRESENT
ECM OR PCM NOT PROGRAMMED OR PROGRAMMED WITH INCORRECT VIN
ECM OR PCM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. CHECK IF ECM OR PCM DTCs ARE PRESENT

With the scan tool, read ECM or PCM DTCs.

Are any DTCs present?

Yes >> Diagnose and repair the DTC(s). Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. VERIFY CORRECT ECM OR PCM IS INSTALLED IN THE VEHICLE

With the scan tool, verify that the ECM or PCM part number is correct for the vehicle.

Is the correct ECM or PCM installed in the vehicle?

Yes >> Replace and program the ECM or PCM in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 5

5. VERIFY ECM OR PCM IS PROGRAMMED WITH CORRECT VIN

With the scan tool, verify that the ECM or PCM is programmed with the correct VIN.

Is the ECM or PCM programmed with the correct VIN?

Yes >> Using the scan tool, perform PCM Replaced to update the VIN in the PCM.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 6

6. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs "Logged Against" the ECM or PCM?

Yes >> Replace/update the ECM or PCM in accordance with the service information.
Perform POWERTRAIN VERIFICATION TEST. Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the Anti-Lock Brakes Module pins, terminals, and connectors for corrosion, damage, and terminal push out. Pay particular attention to all Communication circuits. If no problems are found, replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U1501–IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM ECM/PCM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously, with ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects bus messages from the Engine Control Module (ECM) or Powertrain Control Module (PCM) are of improper data length.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
ECM OR PCM DTCs PRESENT
ECM OR PCM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. CHECK IF ECM OR PCM DTCs ARE PRESENT

With the scan tool, read ECM or PCM DTCs.

Are any DTCs present?

Yes >> Diagnose and repair the DTC(s). Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the ECM or PCM?

Yes >> Replace/update the ECM or PCM in accordance with the service information.
Perform POWERTRAIN VERIFICATION TEST. Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the Anti-Lock Brakes Module pins, terminals, and connectors for corrosion, damage, and terminal push out. Pay particular attention to all Communication circuits. If no problems are found, replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U1502–IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM TCM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously, with ignition on.
- **Set Condition:**
  If the Anti-Lock Brakes Module detects bus messages from the Transmission Control Module (TCM) are of improper data length.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DTCs RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CAN C BUS CIRCUITS OPEN OR SHORTED
TCM DTCs PRESENT
TCM
ANTI-LOCK BRAKES MODULE

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, read and record ABS DTCs.

With the scan tool, read and record Environmental Data (EV Data).

With the scan tool, erase ABS DTCs.

Cycle the ignition switch.

With the scan tool, read ABS DTCs.

Does this DTC reset?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Refer to the ABS-INTERMITTENT CONDITION TEST. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs

With the scan tool, read all active DTCs from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs related to the conditions listed above?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in the applicable Section.

No >> Go To 3

3. CHECK IF TCM DTCs ARE PRESENT

With the scan tool, read TCM DTCs.

Are any TCM DTCs present?

Yes >> Diagnose and repair the DTC(s).

Perform TRANSMISSION VERIFICATION TEST - VER 1.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Using the schematics as a guide, check the Anti-Lock Brakes Module pins, terminals, and connectors for corrosion, damage, and terminal push out. Pay particular attention to all Communication circuits. If no problems are found, replace the Anti-Lock Brakes Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

U1503–IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM TIPM (TIPM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  When the Anti-Lock Brake Module detects an incorrect CAN message from the Totally Integrated Control Module (TIPM).

Possible Causes
TIPM CAN BUS DTCS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK IF TIPM CAN BUS DTCs ARE PRESENT

With the scan tool, read TIPM DTCs.

Are there any TIPM CAN BUS DTCs present?

Yes >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

No >> Replace the Anti-Lock Brakes Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

STANDARD PROCEDURE

ABS VERIFICATION TEST

1. ABS VERIFICATION TEST

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

NOTE: If the ABM (Anti-Lock Brake Module), SAS (Steering Angle Sensor), Dynamics Sensor was replaced, it must be initialized using the scan tool. If not initialized, the ABS indicator will flash continuously with no DTCs. To initialize the ABM and clear offsets have wheels pointing straight ahead and follow the directions on the scan tool. The drive test requires a 90° turn. If the Dynamics Sensor was replaced, test drive the vehicle by turning the vehicle left or right in a curving manner at a velocity between 10 and 25 km/hr (6 and 15 m.p.h.).

1. Turn the ignition off.
2. Connect all previously disconnected components and connectors.
3. Verify all accessories are turned off and the battery is fully charged.
4. Verify that the ignition is on, with the scan tool, erase all Diagnostic Trouble Codes from All modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was indicating the failure.
5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the scan tool, read DTCs from all modules.
6. If any Diagnostic Trouble Codes are present, return to symptom list and trouble shoot new or recurring symptom.

NOTE: For Sensor Signal and Pump Motor faults, the ABM must sense all 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicator.

7. If there are no DTCs present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several anti-lock braking stops.
8. Again, with the scan tool read DTCs. If any DTCs are present, refer to the Table of Contents in the applicable Section for the diagnostic test procedure and troubleshoot the new or recurring symptom.
9. If there are no Diagnostic Trouble Codes (DTCs) present, and the customer's concern can no longer be duplicated, the repair is complete.

Are any DTCs present or is the original concern still present?

Yes >> Repair is not complete, refer to appropriate symptom.

No >> Repair is complete.

BRAKES - ABS SERVICE INFORMATION

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BRAKES - ABS SERVICE INFORMATION

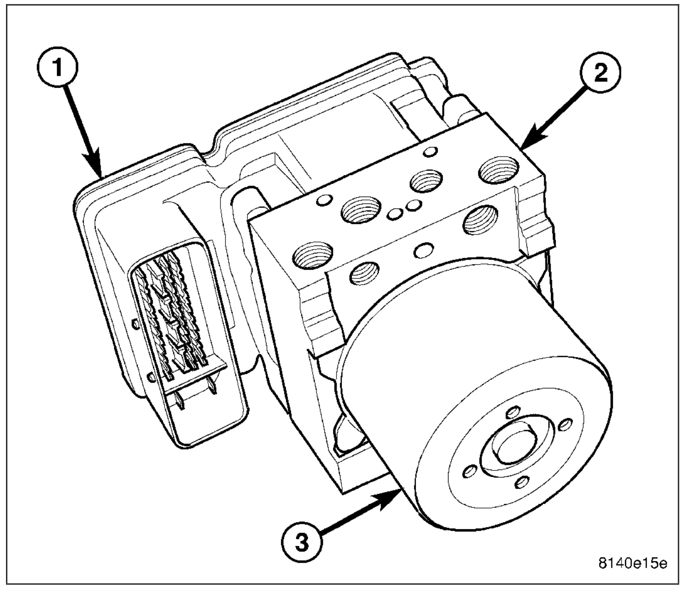
DESCRIPTION

ANTILOCK BRAKE SYSTEM

This vehicle uses an antilock brake system designated MK25e. For this vehicle, MK25e is available with Electronic Stability Program (ESP) and All-Speed Traction Control or without.

This antilock brake system uses components of the base brake system, but also features the following components:

- Integrated Control Unit (ICU) - Hydraulic Control Unit (HCU) (2) and Antilock Brake Module (ABM) (1)
- Wheel Speed Sensors (WSS) - Four sensors (one at each wheel)



The MK25e ICU is made up of the Hydraulic Control Unit (HCU) and the Antilock Brake Module (ABM). For additional information on these components, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - DESCRIPTION) (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ANTILOCK BRAKE MODULE - DESCRIPTION).

ABS

The purpose of the antilock brake system (ABS) is to prevent wheel lockup under braking conditions on virtually any type of road surface. Antilock braking is desirable because a vehicle that is stopped without locking the wheels retains directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

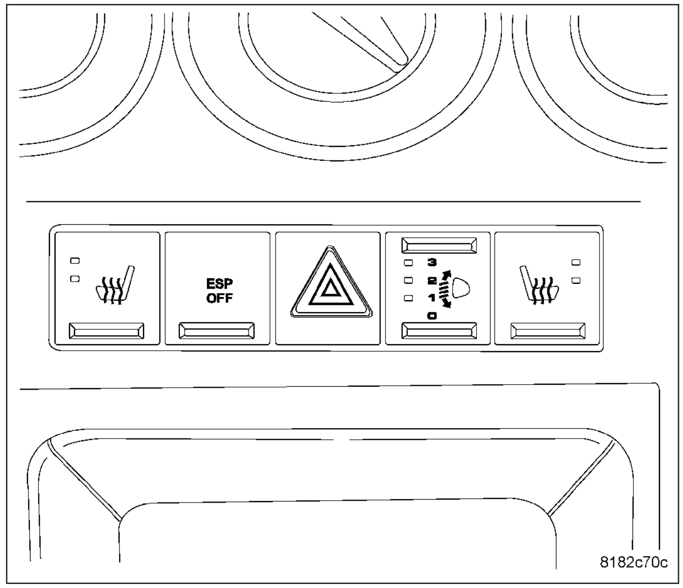
All vehicles equipped with ABS use Electronic Variable Brake Proportioning (EVBP) to balance front-to-rear braking when the brakes are applied in the partial braking range. For more information on electronic brake distribution, (Refer to 5 - BRAKES - ABS - DESCRIPTION).

ALL-SPEED TRACTION CONTROL

The traction control system that is part of the Electronic Stability Program (ESP), is an all-speed traction control. All-Speed Traction Control enhances mobility and prevents wheel slip when accelerating on slippery surfaces. It also provides a measure of directional stability control. Using the wheel-speed sensors, it can detect excessive yaw and help keep the car on the intended course, as for instance, when accelerating around a curve.

All-Speed Traction Control is effective up to 85 mph (137 km/h).

The traction control system may be turned off or on by depressing the ESP Off switch button located on the instrument panel.



ELECTRONIC VARIABLE BRAKE PROPORTIONING

Vehicles equipped with ABS use Electronic Variable Brake Proportioning (EVBP) to balance front-to-rear braking. The EVBP is used in place of a rear proportioning valve. The EVBP system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the Integrated Control Unit (ICU).

EVBP activation is invisible to the customer since there is no pump motor noise or brake pedal feedback.

OPERATION

ANTILOCK BRAKE SYSTEM

The following information applies to both antilock brakes (ABS) without Electronic Stability Program (ESP) and traction control and ABS with ESP and traction control.

ABS

There are a few performance characteristics of the Antilock Brake System (ABS) that may at first seem abnormal, but in fact are normal. These characteristics are described below.

NORMAL BRAKING

Under normal braking conditions, the ABS functions the same as a standard base brake system with a diagonally split master cylinder and conventional vacuum assist.

ABS BRAKING

ABS operation is available at all vehicle speeds above 3–5 mph (5–8 km/h) If a wheel locking tendency is detected during a brake application, the brake system enters the ABS mode. During ABS braking, hydraulic pressure in the four wheel circuits is modulated to prevent any wheel from locking. Each wheel circuit is designed with a set of electric solenoids to allow modulation, although for vehicle stability, both rear wheel solenoids receive the same electrical signal. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

During an ABS event, the Integrated Control Unit (ICU) regulates hydraulic pressure at all four of the vehicle's wheels.

The hydraulic pressure at each front wheel is controlled independently (relative to the amount of slip at each wheel) in order to maximize the braking force generated by the front brakes. The rear wheels are controlled such that the

hydraulic pressure at either rear wheel does not exceed that of the highest slip rear wheel in order to maintain vehicle stability.

The system can build and release pressure at each wheel, depending on signals generated by the Wheel Speed Sensors (WSS) at each wheel and received at the Antilock Brake Module (ABM).

NOISE AND BRAKE PEDAL FEEL

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping, or groaning noises heard by the driver. This is normal and is due to pressurized fluid being transferred between the master cylinder and the brakes. If ABS operation occurs during hard braking, some pulsation may be felt in the vehicle body due to fore and aft movement of the suspension as brake pressures are modulated.

At the end of an ABS stop, ABS is turned off when the vehicle is slowed to a speed of 3–4 mph (5–6 km/h). There may be a slight brake pedal drop anytime that the ABS is deactivated, such as at the end of the stop when the vehicle speed is less than 3 mph (5 km/h) or during an ABS stop where ABS is no longer required. These conditions exist when a vehicle is being stopped on a road surface with patches of ice, loose gravel, or sand on it. Also, stopping a vehicle on a bumpy road surface activates ABS because of the wheel hop caused by the bumps.

TIRE NOISE AND MARKS

Although the ABS system prevents complete wheel lockup, some wheel slip is desired in order to achieve optimum braking performance. Wheel slip is defined as follows: 0 percent slip means the wheel is rolling freely and 100 percent slip means the wheel is fully locked. During brake pressure modulation, wheel slip is allowed to reach up to 25–30 percent. This means that the wheel rolling velocity is 25–30 percent less than that of a free rolling wheel at a given vehicle speed. This slip may result in some tire chirping, depending on the road surface. This sound should not be interpreted as total wheel lockup.

Complete wheel lockup normally leaves black tire marks on dry pavement. The ABS will not leave dark black tire marks since the wheel never reaches a fully locked condition. However, tire marks may be noticeable as light patched marks.

START-UP AND DRIVE-OFF CYCLES

When the ignition is turned on, a popping sound and a slight brake pedal movement may be noticed. The ABS warning lamp will also be on for up to 5 seconds after the ignition is turned on.

When the vehicle is first driven off, a humming may be heard or felt by the driver at approximately 12–25 mph (20–40 km/h). All of these conditions are a normal function of ABS as the system is performing a diagnosis check.

PREMATURE ABS CYCLING

Symptoms of premature ABS cycling include: clicking sounds from the solenoid valves; pump/motor running; and pulsations in the brake pedal. Premature ABS cycling can occur at any braking rate of the vehicle and on any type of road surface. Neither the red BRAKE indicator lamp, nor the amber ABS indicator lamp, illuminate and no faults are stored in the ABM.

Premature ABS cycling is a condition that needs to be correctly assessed when diagnosing problems with the antilock brake system. It may be necessary to use a scan tool to detect and verify premature ABS cycling.

Check the following common causes when diagnosing premature ABS cycling: damaged wheel bearings (causing tone wheel issues); damaged wheel speed sensor mounting bosses; and loose wheel speed sensor mounting screws.

After diagnosing the defective component, repair or replace it as required. When the component repair or replacement is completed, test drive the vehicle to verify that premature ABS cycling has been corrected.

ALL-SPEED TRACTION CONTROL

Traction control systems sense impending wheel spin based on a model of the rate of change of wheel speed under normal traction conditions. The All-Speed Traction Control uses signals from the same wheel speed sensors as ABS to determine when to apply the brakes to one or more wheels and when to reduce engine torque output using the electronic throttle control (ETC) to prevent wheel slip during acceleration. Throttle control makes the vehicle less reliant on brake application alone to maintain traction, increasing the operating speed range and more closely modulates speed, resulting in smoother operation. With All-Speed Traction Control reducing engine torque as well as applying the brakes, it is possible to achieve almost seamless torque application at the wheels.

If the wheel slip is severe enough to require throttle intervention, All-Speed Traction Control will reduce engine torque and sometimes upshift the transmission to avoid the condition. In milliseconds, All-Speed Traction Control interrogates the engine control system to determine the current torque output, determines how much the torque output the current conditions will allow, and signals this requirement to the engine control system, which reduces the torque by partially closing the throttle. With execution of the torque reduction, the brake system reduces brake pressure to make the transition smooth, while maintaining forward progress. By reducing engine power, braking effectiveness is maintained and the system can operate throughout the normal vehicle speed range. That is why the system is identified as providing “all-speed” traction control.

The traction control system is enabled at each ignition cycle. It may be turned off by depressing the traction control switch button. The ESP/TCS function indicator lamp illuminates immediately upon depressing the button. Pressing this button again or turning off and restarting the vehicle will enable the traction control system.

ELECTRONIC VARIABLE BRAKE PROPORTIONING

Upon entry into EVBP, the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure, the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the Low Pressure Accumulator (LPA) in the Hydraulic Control Unit (HCU) resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure, the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This back-and-forth process will continue until the required slip difference is obtained. At the end of EVBP braking (brakes released) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EVBP will remain functional during many ABS fault modes. If both the red BRAKE and amber ABS warning indicators are illuminated, the EVBP may not be functioning.

CAUTION

The antilock brake system uses an electronic control module known as the Antilock Brake Module (ABM). This module is designed to withstand normal current draws associated with vehicle operation. Care must be taken to avoid overloading the circuits.

CAUTION: In testing for open or short circuits, do not ground or apply voltage to any of the circuits unless instructed to do so for a diagnostic procedure.

CAUTION: These circuits should only be tested using a high impedance multi-meter or the designated scan tool as described in this section. Power should never be removed or applied to any control module with the ignition in the ON position. Before removing or connecting battery cables, fuses, or connectors, always turn the ignition to the OFF position.

CAUTION: The ABM 47-way connector should never be connected or disconnected with the ignition switch in the ON position.

CAUTION: This vehicle utilizes active wheel speed sensors. Do not apply voltage to wheel speed sensors at any time.

CAUTION: Use only factory wiring harnesses. Do not cut or splice wiring to the brake circuits. The addition of aftermarket electrical equipment (car phone, radar detector, citizen band radio, trailer lighting, trailer brakes, etc.) on a vehicle equipped with antilock brakes may affect the function of the antilock brake system.

CAUTION: When performing any service procedure on a vehicle equipped with ABS, do not apply a 12-volt power source to the ground circuit of the pump motor in the HCU. Doing this will damage the pump motor and will require replacement of the entire HCU.

CAUTION: An attempt to remove or disconnect certain system components may result in improper system operation. Only those components with approved removal and installation procedures in this manual should be serviced.

CAUTION: If welding work is to be performed on the vehicle using an electric arc welder, the ABM connector should be disconnected during the welding operation.

CAUTION: Many components of the ABS are not serviceable and must be replaced as an assembly. Do not disassemble any component which is not designed to be serviced.

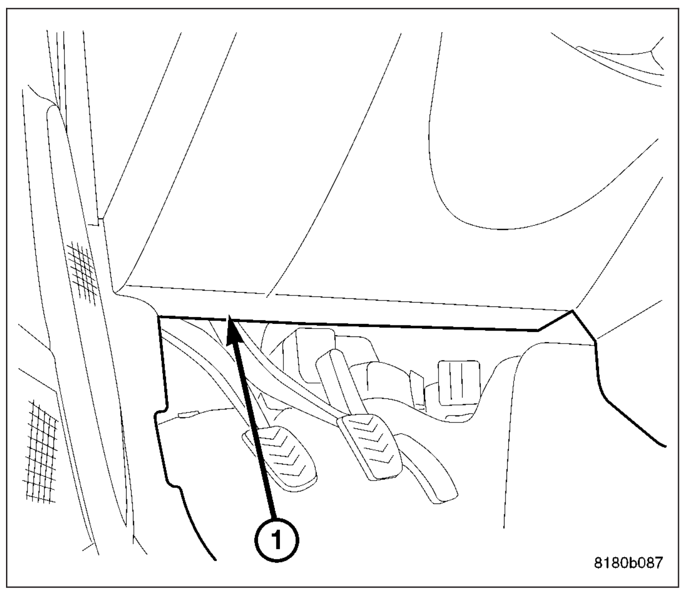
CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surface, wash off with water immediately.

CAUTION: Only the recommended jacking or hoisting positions for this vehicle are to be used whenever it is necessary to lift a vehicle.

DIAGNOSIS AND TESTING

INSPECTION AND ROAD TEST

1. Visually inspect the ABS for damaged or disconnected components and connectors.
2. Verify the brake lamps are operational. If they are not, repair them prior to continuing.
3. Connect a scan tool to the Data Link Connector located under the instrument panel to the left of the steering column (1). If the scan tool does not power-up, check the power and ground supplies to the connector.
4. Turn the ignition key to the ON position.
5. Using the scan tool, read and record any Diagnostic Trouble Codes (DTCs). If any DTCs are present, refer to the appropriate diagnostic information.



If no problems are observed, it will be necessary to road test the vehicle.

Many ABS conditions judged to be a problem by the driver may be normal operating conditions. To become familiarized with the normal operating characteristics of this antilock brake system, (Refer to 5 - BRAKES - ABS OPERATION).

WARNING: Conditions that result in turning on the red brake warning indicator lamp may indicate reduced braking ability.

Before road testing a brake complaint vehicle, note whether the red BRAKE warning indicator lamp, amber ABS warning indicator lamp, or both are turned on. If it is the red BRAKE warning indicator, there is a brake hydraulic problem that must be corrected before driving the vehicle (Refer to 5 - BRAKES - BASE - DIAGNOSIS AND TESTING).

If the amber ABS warning indicator is on, road test the vehicle as described below. While only the amber ABS warning indicator is on, the ABS is not functional. The ability to stop the car using the base brake system should not be affected.

6. Turn the key to the OFF position and then back to the ON position. Note whether the amber ABS warning indicator lamp continues to stay on.
7. If the amber ABS warning indicator lamp stays on, shift into gear and drive the car to a speed of approximately 15 mph (25 km/h) to complete the ABS Start-Up and Drive-Off Cycles (Refer to 5 - BRAKES - ABS - OPERATION). If at this time the amber ABS warning indicator lamp stays on, refer to the appropriate diagnostic information.
8. If the amber ABS warning indicator lamp goes out at any time, drive the vehicle a short distance. Accelerate the vehicle to a speed of at least 64 km/h (40 mph). Bring the vehicle to a complete stop, braking hard enough to cause the ABS to cycle. Repeat this action several times. Using the scan tool, read and record any Diagnostic Trouble Codes (DTCs). If any DTCs are present, refer to the appropriate diagnostic information.

STANDARD PROCEDURE

ANTILOCK BRAKE SYSTEM BLEEDING

The base brake's hydraulic system must be bled anytime air enters the hydraulic system. The ABS must always be bled anytime it is suspected that the HCU has ingested air.

Brake systems with ABS must be bled as two independent braking systems. The non-ABS portion of the brake system with ABS is to be bled the same as any non-ABS system.

The ABS portion of the brake system must be bled separately. Use the following procedure to properly bleed the brake hydraulic system including the ABS.

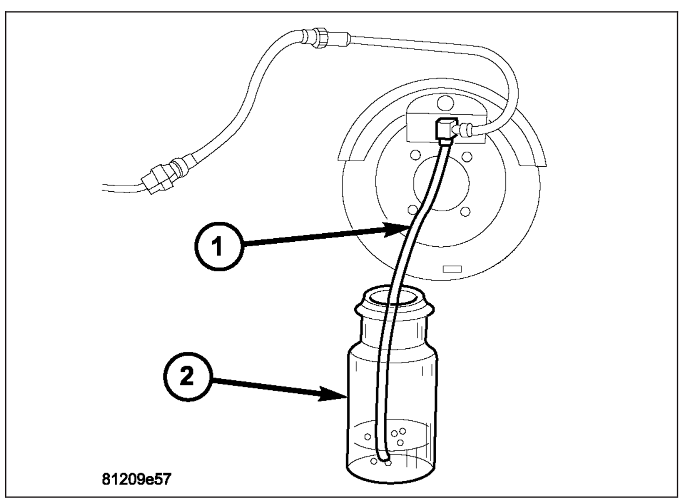
NOTE: During the brake bleeding procedure, be sure the brake fluid level remains close to the FULL level in the master cylinder fluid reservoir. Check the fluid level periodically during the bleeding procedure and add Mopar® DOT 3 brake fluid as required.

BLEEDING

When bleeding the ABS system, the following bleeding sequence must be followed to insure complete and adequate bleeding.

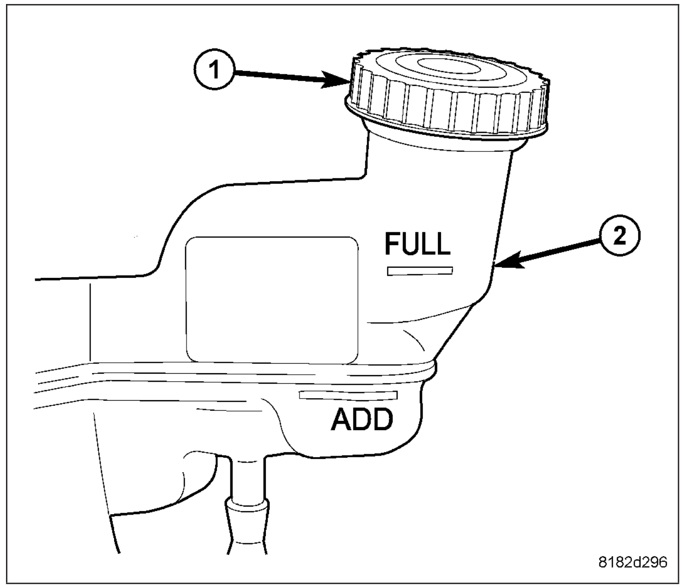
1. Make sure all hydraulic fluid lines are installed and properly torqued.
2. Connect the scan tool to the diagnostics connector. The diagnostic connector is located under the lower steering column cover to the left of the steering column.
3. Using the scan tool, check to make sure the ABM does not have any fault codes stored. If it does, clear them.

WARNING: When bleeding the brake system wear safety glasses. A clear bleed tube (1) must be attached to the bleeder screws and submerged in a clear container filled part way with clean brake fluid (2). Direct the flow of brake fluid away from yourself and the painted surfaces of the vehicle. Brake fluid at high pressure may come out of the bleeder screws when opened.



NOTE: Pressure bleeding is recommended to bleed the base brake system to ensure all air is removed from system. Manual bleeding may also be used, but additional time is needed to remove all air from system.

4. Bleed the base brake system. (Refer to 5 - BRAKES - BASE - STANDARD PROCEDURE)
5. Using the scan tool, select ECU VIEW, followed by ABS MISCELLANEOUS FUNCTIONS to access bleeding. Follow the instructions displayed. When finished, disconnect the scan tool and proceed.
6. Bleed the base brake system a second time. Check brake fluid level in the reservoir periodically to prevent emptying, causing air to enter the hydraulic system.
7. Fill the master cylinder fluid reservoir (1) to the FULL level.
8. Test drive the vehicle to be sure the brakes are operating correctly and that the brake pedal does not feel spongy.



SPECIFICATIONS

ABS FASTENER TORQUE

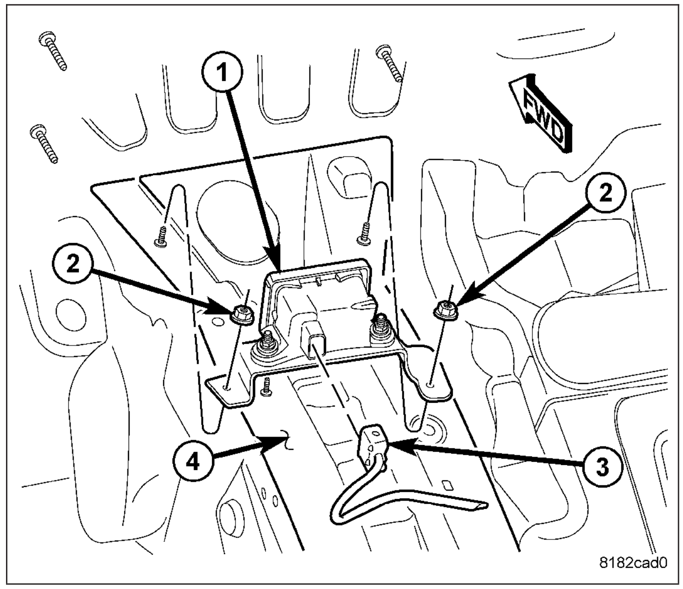
(Refer to 5 - BRAKES - BASE - SPECIFICATIONS - BRAKE FASTENER TORQUE)

SENSOR-DYNAMICS (ESP)

DESCRIPTION

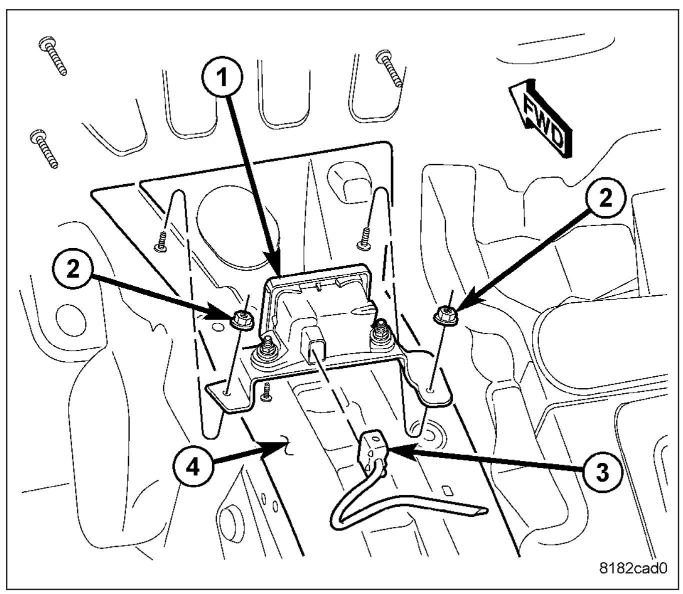
The Yaw Rate and Lateral Acceleration Sensors are housed into one unit known as the Dynamics Sensor (1). The sensor is used to measure side-to-side (Lateral) motion and vehicle rotational sensing (how fast the vehicle is turning - Yaw).

Yaw and Lateral Acceleration Sensors cannot be serviced separately. The entire Dynamics Sensor must be replaced when necessary.



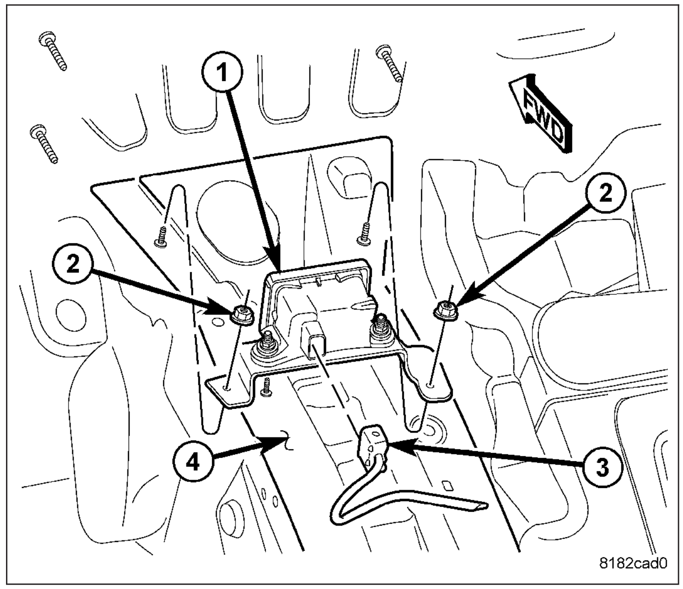
REMOVAL

1. Disconnect and isolate the battery negative cable from the battery post.
2. Remove the shifter housing center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
3. Disconnect the wiring harness connector (3) at the dynamics sensor (1).
4. Remove the nuts (2) mounting the dynamics sensor to the floor pan tunnel (4).
5. Remove the dynamics sensor (1).



INSTALLATION

1. Install the dynamics sensor (1) over the studs mounted to the floor pan tunnel (4).
2. Install the two mounting nuts (2). Tighten the nuts to 9 N·m (80 in. lbs.).
3. Connect the wiring harness connector (3) to the dynamics sensor (1).
4. Install the shifter housing center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
5. Connect the battery negative cable to the battery post. It is important that this be performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
6. Perform the Verification Test and clear any faults. (Refer to 5 - BRAKES - STANDARD PROCEDURE)



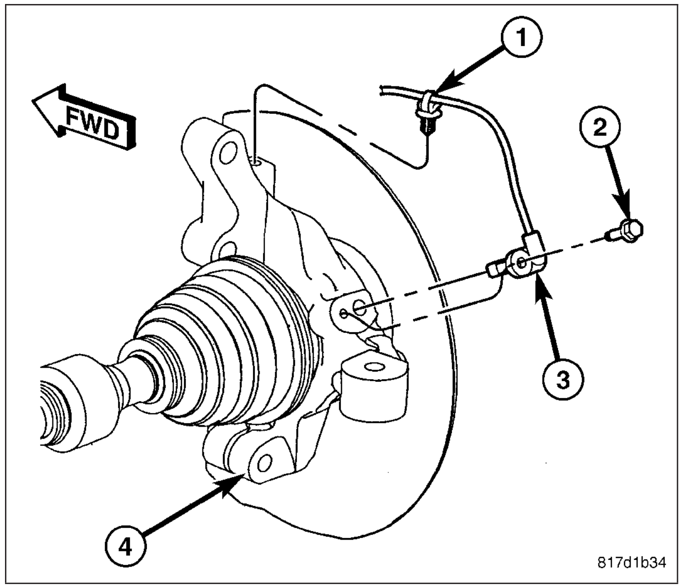
SENSOR-FRONT WHEEL SPEED

DESCRIPTION

The antilock brake system uses two-wire wheel speed sensors, known as active wheel speed sensors. The sensors use an electronic principle known as magnetoresistive to help increase performance and durability. The sensors convert wheel speed into a small digital signal. A Wheel Speed Sensor (WSS) is used at each wheel. A magnetic pole encoder serves as the trigger mechanism for each sensor. At each wheel of the vehicle there is one wheel speed sensor and one encoder.

A front wheel speed sensor (3) is attached to a mounting boss on each front knuckle (4). The encoder is an integral part of the hub and bearing.

WSS air gaps are not adjustable.



OPERATION

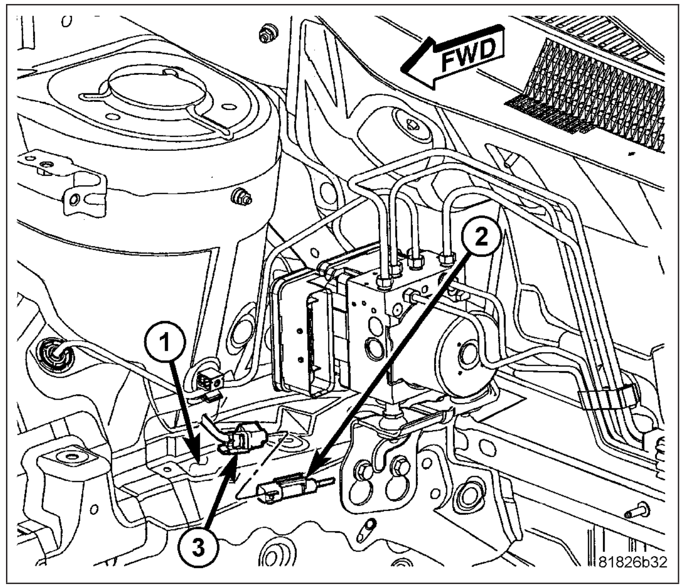
The ABM sends 12 volts to power an Integrated Circuit (IC) in the sensor. The IC supplies a constant 7 mA power supply to the ABM. The relationship of the magnetic pole encoder to the permanent magnet in the sensor, signals the IC to enable a second 7 mA power supply. The output of the sensor, sent to the ABM, is a DC voltage signal with changing voltage and current levels. The ground for the IC and the current sense circuit is provided by the ABM.

When a pole is properly aligned with the sensor, the voltage signal is approximately 0.8 volts and a constant 7 mA current is sent to the ABM. As the magnetic pole encoder rotates, the encoder shifts the magnetic field and the IC enables a second 7 mA current source. The ABM senses a voltage signal of approximately 1.6 volts and 14 mA. The ABM measures the amperage of the digital signal for each wheel. The resulting signal is interpreted by the ABM as the wheel speed.

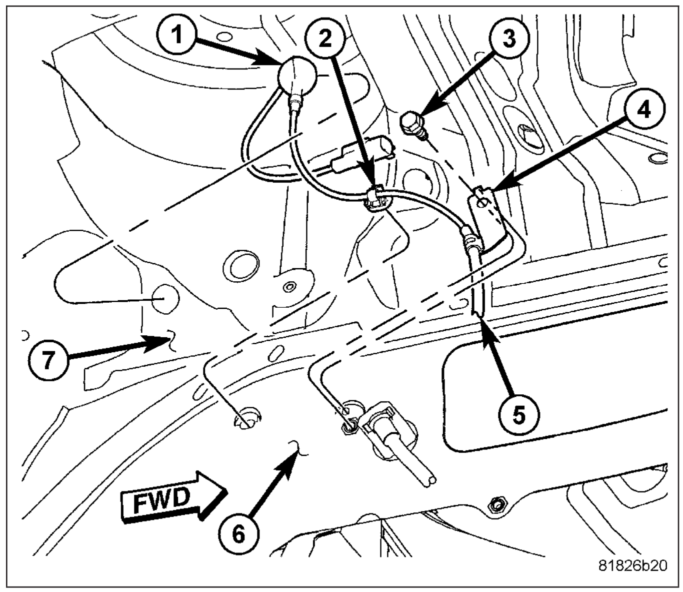
REMOVAL

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

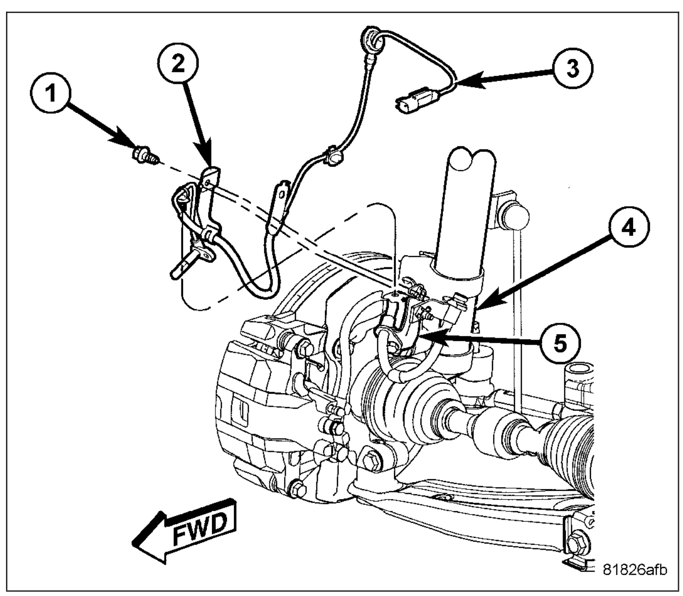
1. Open the hood.
2. Disconnect the wheel speed sensor cable connector (2) from the wiring harness connector (3) on top of the frame rail (1) to the inside of the strut tower.
3. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



4. Remove the grommet (1) from the hole in the body (7) and pull the wheel speed sensor cable out of the hole.
5. Remove the speed sensor cable routing clip (2) from the outside frame rail (6).
6. Remove the screw fastening the cable routing clamp (3) to the outside frame rail (6).



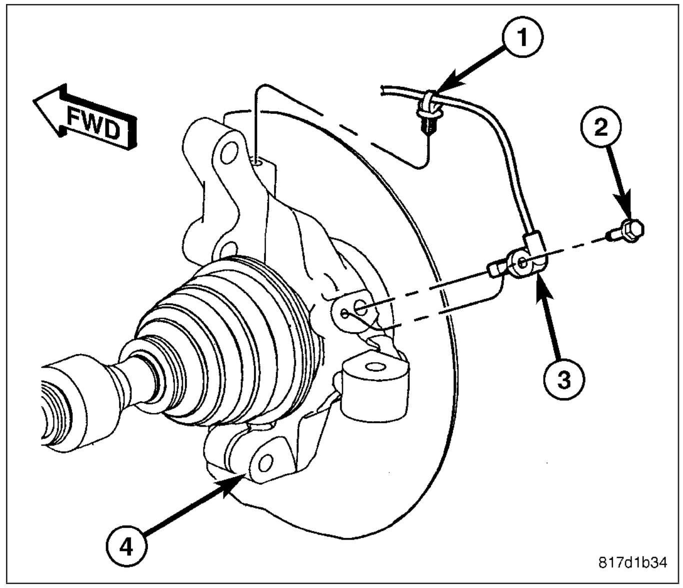
7. Remove the screw (1) securing the wheel speed sensor routing bracket (2) to the brake flex hose bracket (5).



8. Remove the mounting screw (2) fastening the wheel speed sensor head (3) to the knuckle (4). Pull the sensor head out of the knuckle.

NOTE: In the following step, the routing clip can be easily removed without damaging it by rotating it (with entire sensor) counterclockwise.

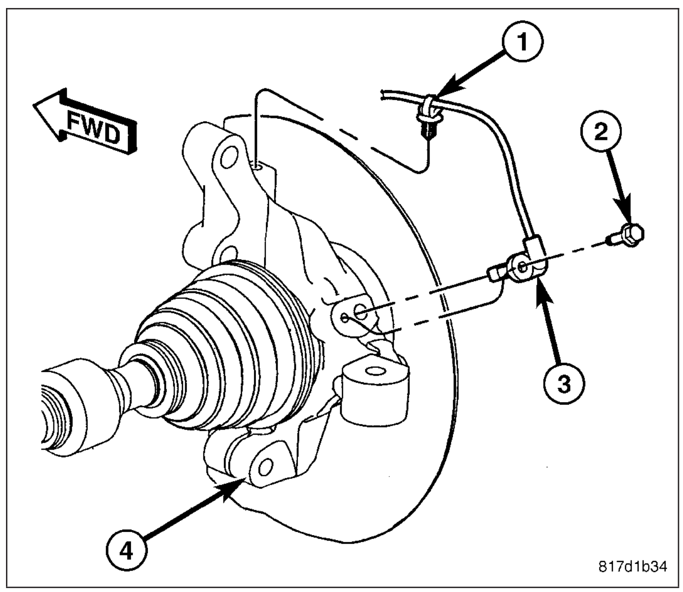
9. Remove the routing clip (1) securing wheel speed sensor cable to the knuckle (4). Remove the sensor from the vehicle.



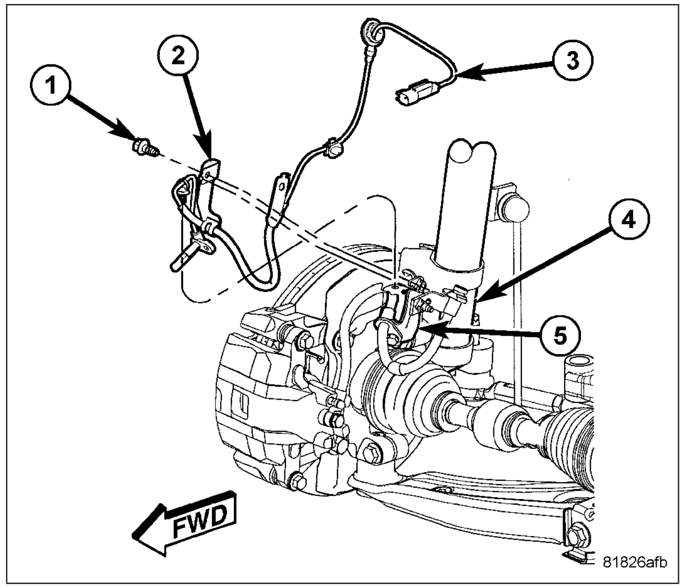
INSTALLATION

CAUTION: Failure to install speed sensor cables properly may result in contact with moving parts or an over extension of cables causing an open circuit. Be sure that cables are installed, routed, and clipped properly.

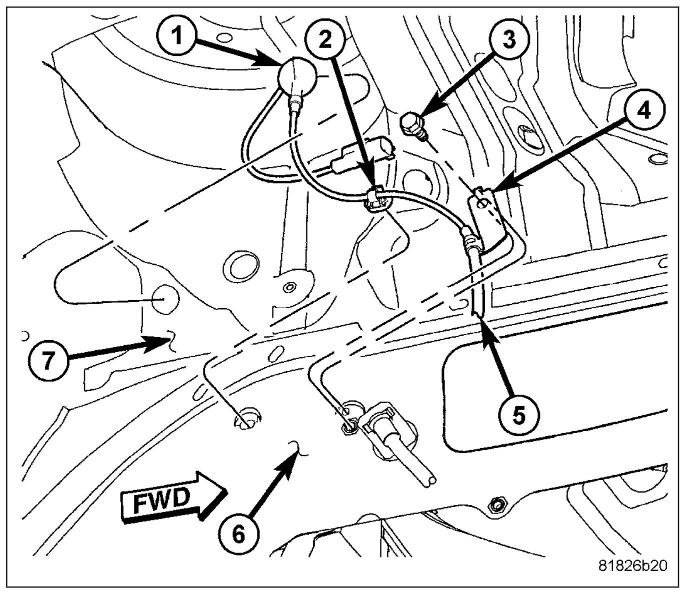
1. Install the wheel speed sensor head (3) into the knuckle (4). Install the mounting screw (2) and tighten it to 12 N·m (106 in. lbs.).
2. Install the routing clip (1) securing the wheel speed sensor cable to the knuckle (4).



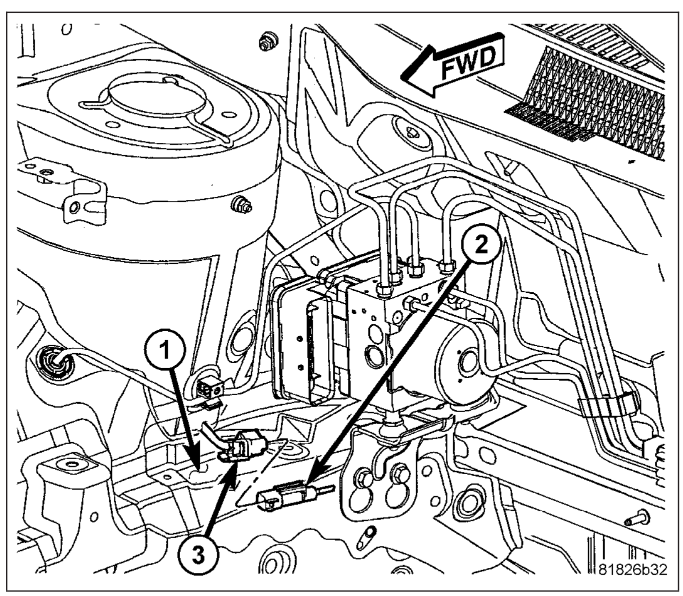
3. Position the wheel speed sensor routing bracket (2) on the brake flex hose bracket (5) and install the mounting screw (1). Tighten the mounting screw to 18 N·m (13 ft. lbs.).



4. Position the wheel speed sensor cable routing clamp (4) on the outside frame rail (6) and install the mounting screw (3). Tighten the mounting screw to 18 N·m (13 ft. lbs.).
5. Install the speed sensor cable routing clip (2) on the outside frame rail (6).
6. Insert the wheel speed sensor cable through the hole in the body (7) and install the grommet (1) in the hole.



7. Lower the vehicle.
8. Connect the wheel speed sensor cable connector (2) to the wiring harness connector (3) on top of the frame rail (1).
9. Perform the Diagnostic Verification Test and clear any faults. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

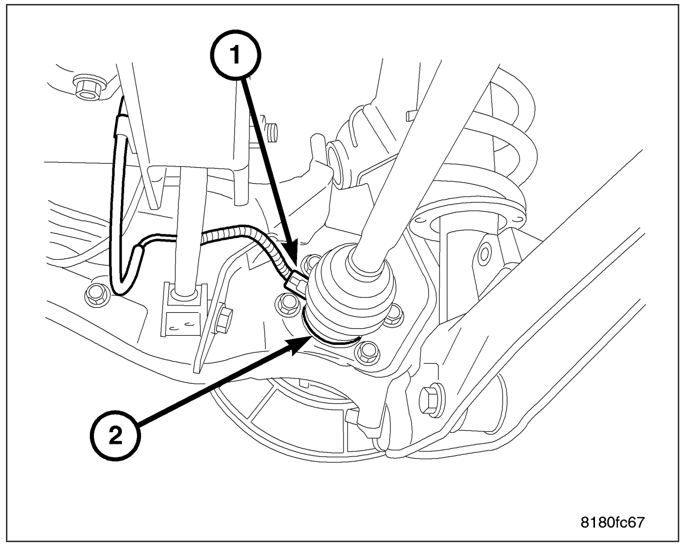


SENSOR-REAR WHEEL SPEED

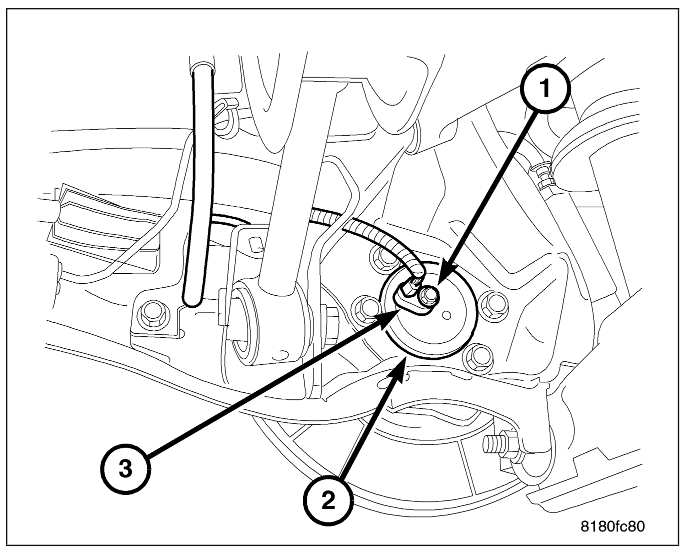
DESCRIPTION

The antilock brake system uses two-wire wheel speed sensors, known as active wheel speed sensors. The sensors use an electronic principle known as magnetoresistive to help increase performance and durability. The sensors convert wheel speed into a small digital signal. A Wheel Speed Sensor (WSS) is used at each wheel. A magnetic pole encoder serves as the trigger mechanism for each sensor. At each wheel of the vehicle there is one wheel speed sensor and one encoder.

On all-wheel-drive vehicles, the rear wheel speed sensor head (1) is secured to the rear hub and bearing (2) by a spring-loaded clip on the rear of the assembly. The encoder is integral to the hub and bearing assembly. The encoder is serviced as part of the rear hub and bearing.



On front-wheel-drive vehicles, the rear wheel speed sensor head (3) is mounted to the rear of the hub and bearing by a screw. The encoder is integral to the hub and bearing assembly. The encoder is are serviced as part of the rear hub and bearing.



The WSS air gaps are not adjustable.

OPERATION

The ABM sends 12 volts to power an Integrated Circuit (IC) in the sensor. The IC supplies a constant 7 mA power supply to the ABM. The relationship of the magnetic pole encoder to the permanent magnet in the sensor, signals the IC to enable a second 7 mA power supply. The output of the sensor, sent to the ABM, is a DC voltage signal with changing voltage and current levels. The ground for the IC and the current sense circuit is provided by the ABM.

When a pole is properly aligned with the sensor, the voltage signal is approximately 0.8 volts and a constant 7 mA current is sent to the ABM. As the magnetic pole encoder rotates, the encoder shifts the magnetic field and the IC enables a second 7 mA current source. The ABM senses a voltage signal of approximately 1.6 volts and 14 mA.

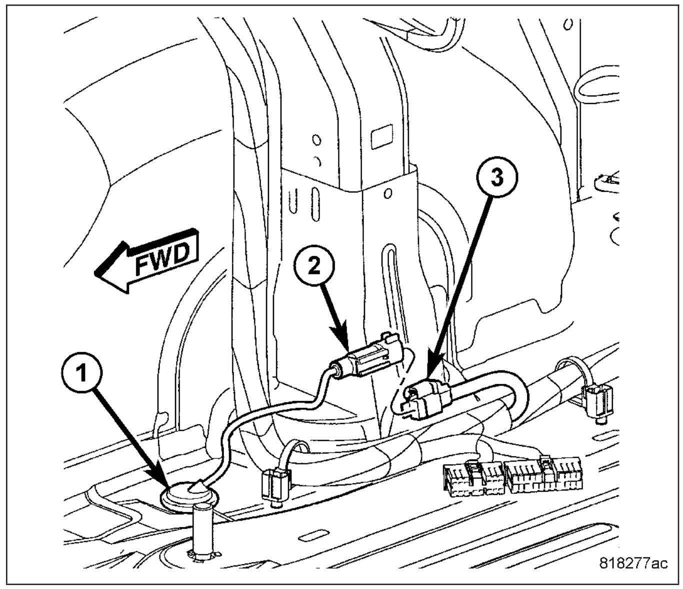
The ABM measures the amperage of the digital signal for each wheel. The resulting signal is interpreted by the ABM as the wheel speed.

REMOVAL

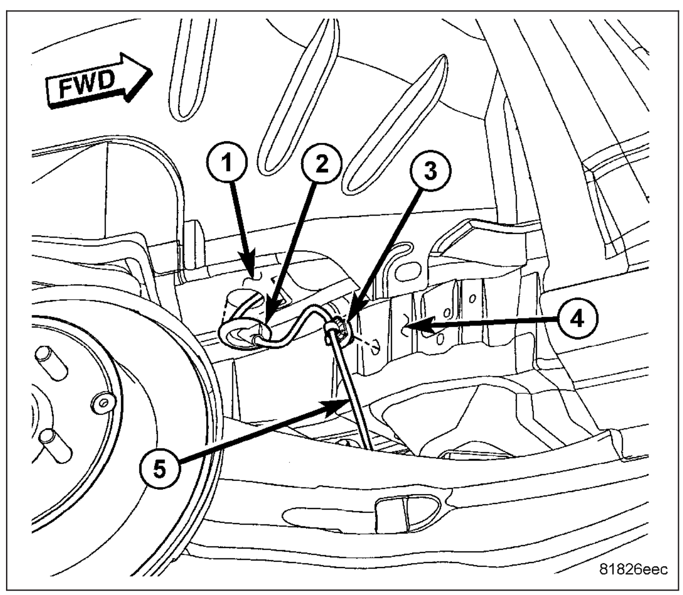
ALL-WHEEL-DRIVE

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

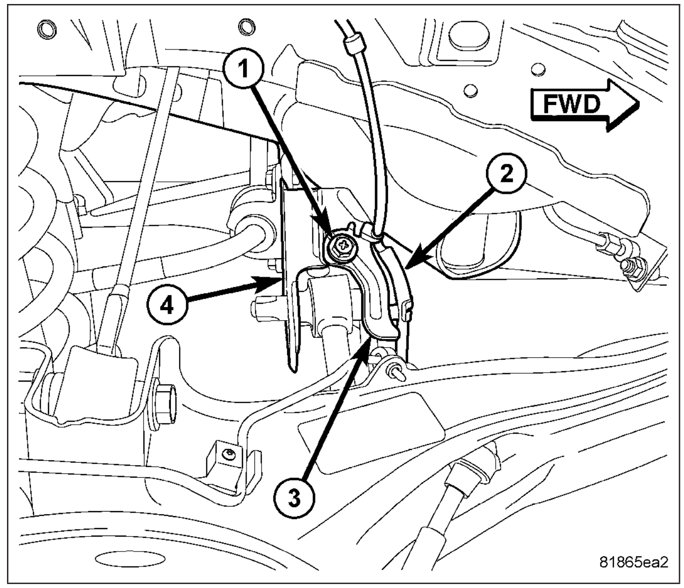
1. Remove the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)
2. Disconnect the wheel speed sensor cable connector (2) at the body wiring harness connector (3).



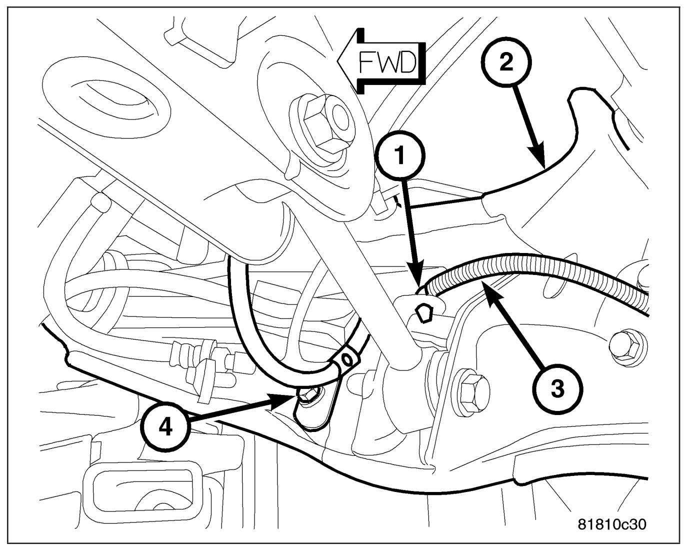
3. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
4. Remove the grommet (2) from the hole in the body (1) and pull the wheel speed sensor cable out through the hole.
5. Remove the speed sensor cable routing clip (3) from the outside frame rail (4).



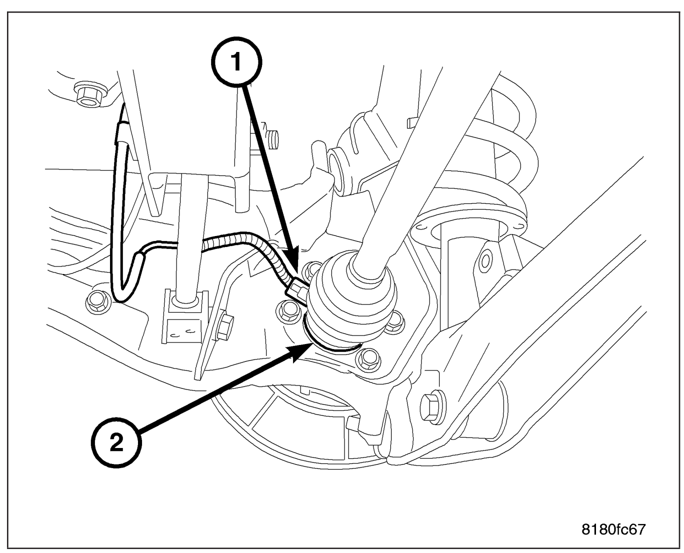
6. Remove the screw (1) fastening the cable routing clamp (3) to the rear suspension crossmember (4).



7. Remove the speed sensor cable routing clip (1) from the trailing link (2).
8. Remove the screw (4) fastening the cable routing clamp to the trailing link.



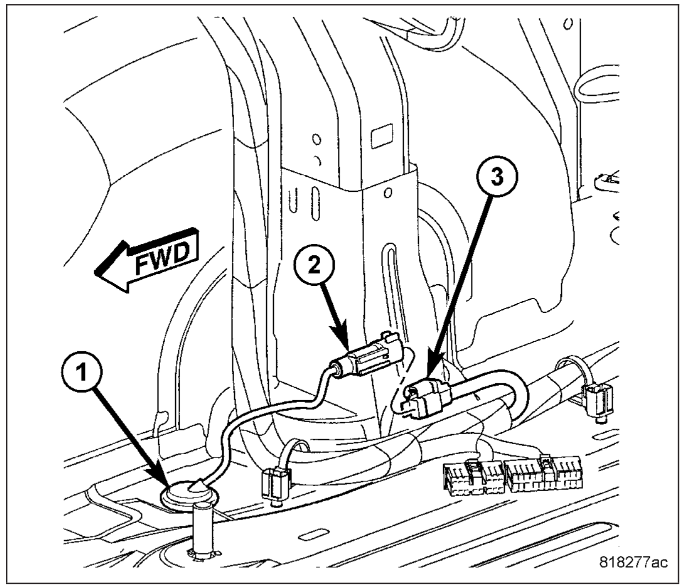
9. Unclip the wheel speed sensor head (1) from the spring-loaded retainer on the rear of the hub and bearing (2). Remove the sensor from the vehicle.



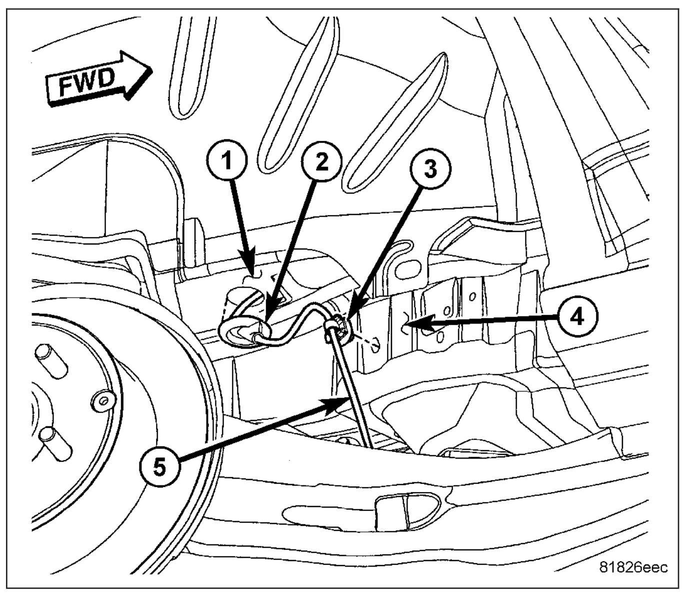
FRONT-WHEEL-DRIVE

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

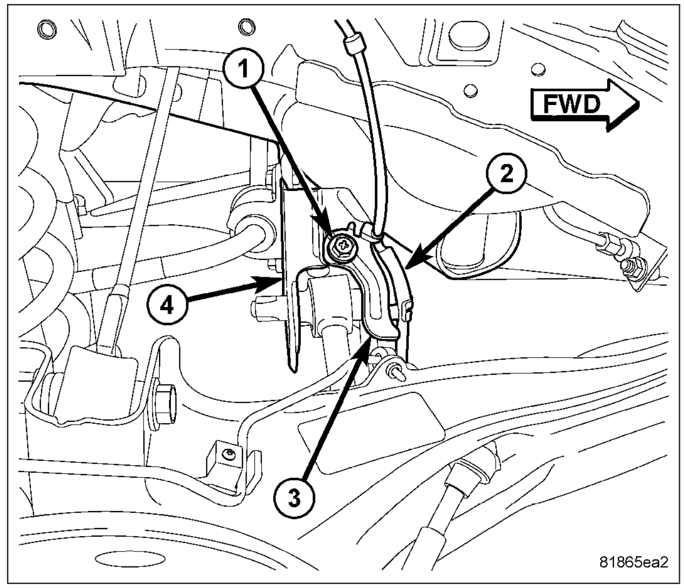
1. Remove the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)
2. Disconnect the wheel speed sensor cable connector (2) at the body wiring harness connector (3).



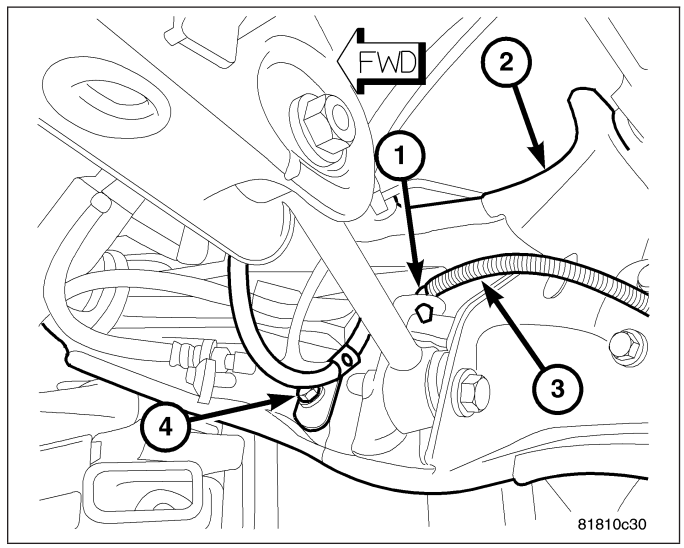
3. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
4. Remove the grommet (2) from the hole in the body (1) and pull the wheel speed sensor cable out through the hole.
5. Remove the speed sensor cable routing clip (3) from the outside frame rail (4).



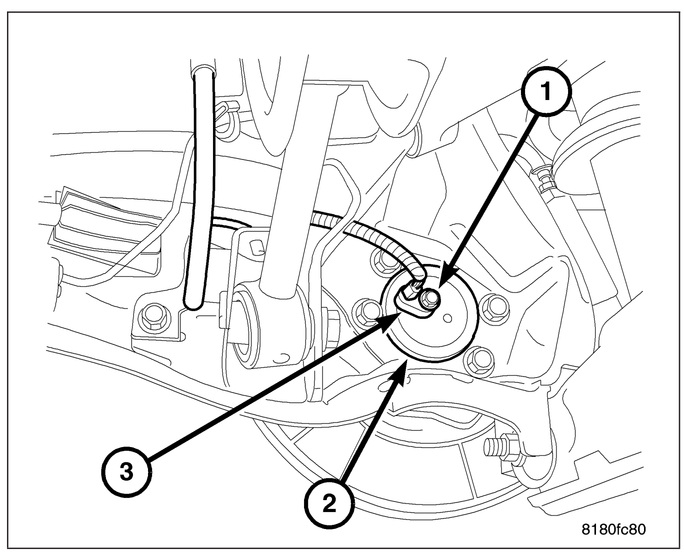
6. Remove the screw (1) fastening the cable routing clamp (3) to the rear suspension crossmember (4).



7. Remove the speed sensor cable routing clip (1) from the trailing link (2).
8. Remove the screw (4) fastening the cable routing clamp to the trailing link.



9. Remove the screw (1) fastening the wheel speed sensor head (3) in the rear of the hub and bearing (2). Remove the sensor from the vehicle.



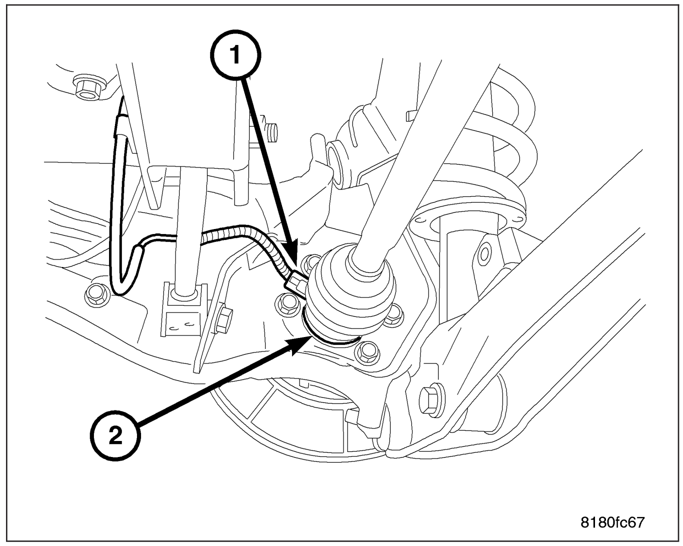
INSTALLATION

ALL-WHEEL-DRIVE

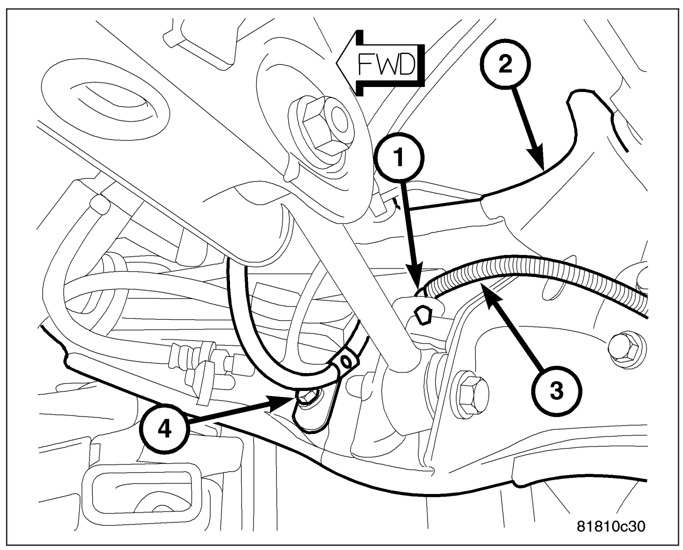
CAUTION: Failure to install speed sensor cables properly may result in contact with moving parts or an over extension of cables causing an open circuit. Be sure that cables are installed, routed, and clipped properly.

NOTE: When installing the sensor head to the spring-loaded retainer on the hub and bearing, make sure the head is held snug in the retainer. If there is any play, the clip is deformed and the hub and bearing must be replaced. The retainer is not serviced separately.

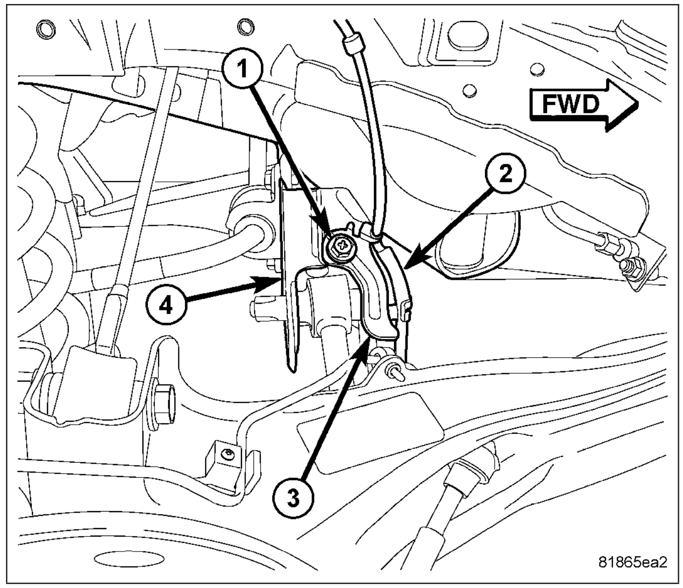
1. Clip the wheel speed sensor head (1) (flat side to bearing rear face) into the spring-loaded retainer on the rear of the hub and bearing (2).



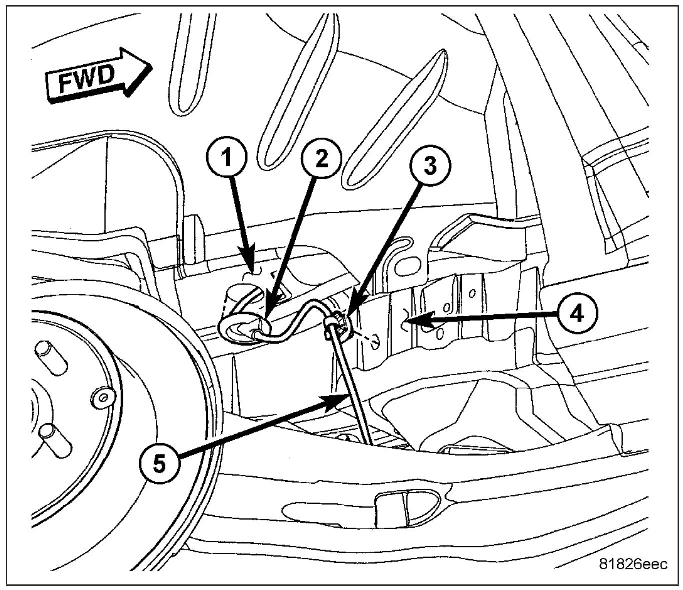
2. Position the wheel speed sensor (3) on the trailing link (2) and install the screw (4) securing it in place. Tighten the mounting screw to 18 N·m (13 ft. lbs.).
3. Position the wheel speed sensor (3) and install the routing clip (1) fastening the sensor to the trailing link (2).



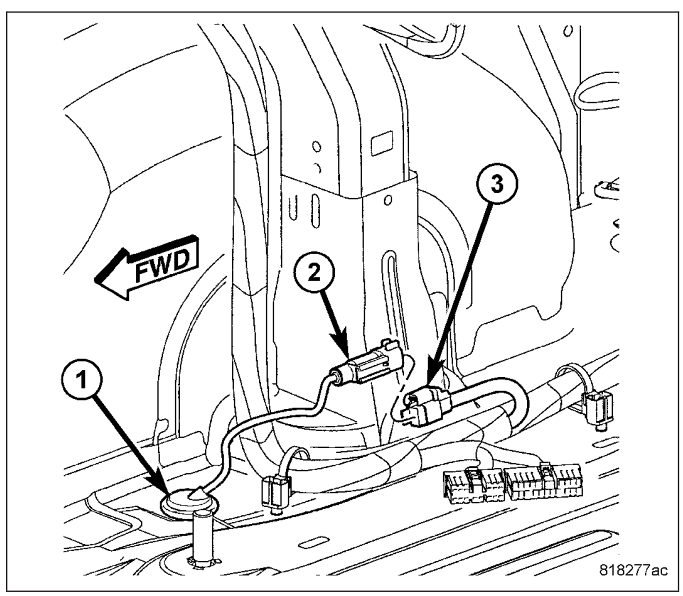
4. Position the wheel speed sensor cable routing clamp (3) on the rear suspension crossmember (4) and install the mounting screw (1). Tighten the mounting screw to 18 N·m (13 ft. lbs.).



5. Install the speed sensor cable routing clip (3) on the outside frame rail (4).
6. Insert the wheel speed sensor cable (5) through the hole in the body (1) and install the grommet (2) in the hole.
7. Lower the vehicle.

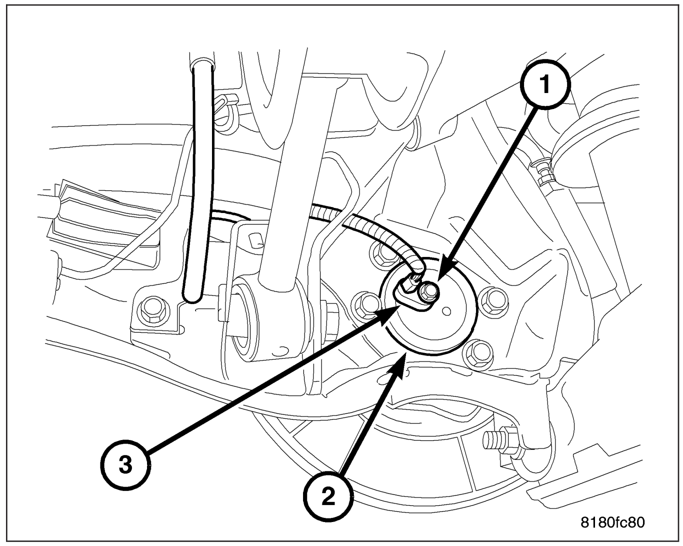


8. Connect the wheel speed sensor cable connector (2) at the body wiring harness connector (3).
9. Install the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
10. Perform the Diagnostic Verification Test and clear any faults. (Refer to 5 - BRAKES - STANDARD PROCEDURE)

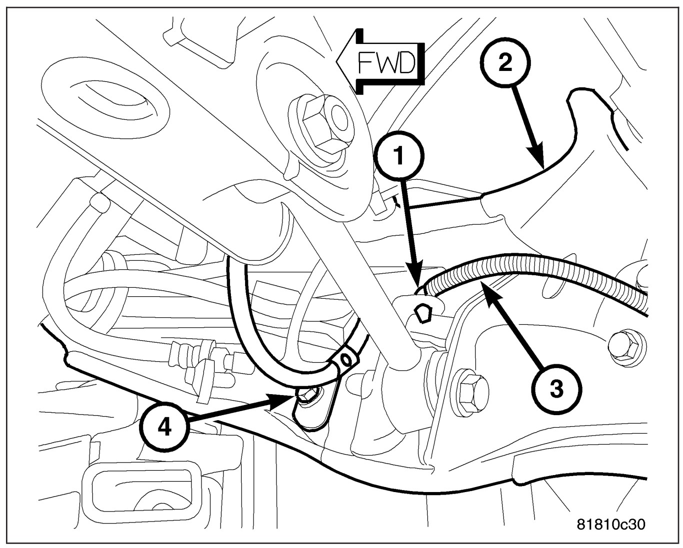


FRONT-WHEEL-DRIVE

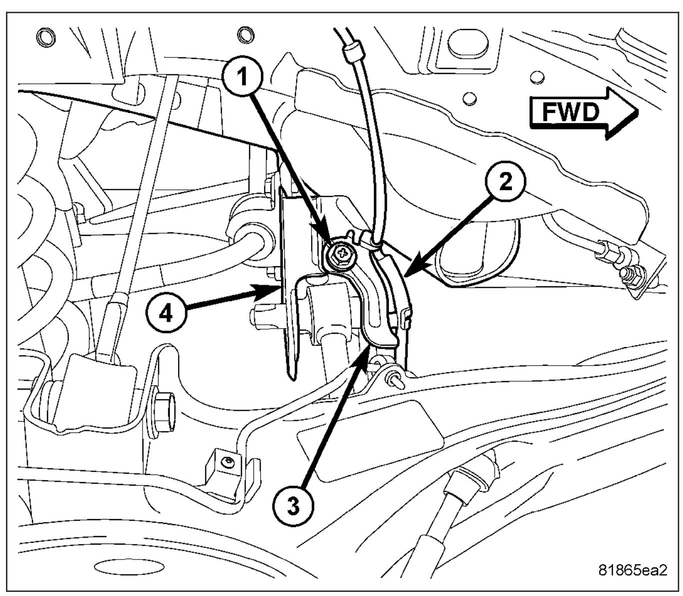
1. Install the wheel speed sensor head (3) into the rear of the hub and bearing (2).
2. Install the wheel speed sensor head mounting screw (1). Tighten the screw to 10 N·m (89 in. lbs.).



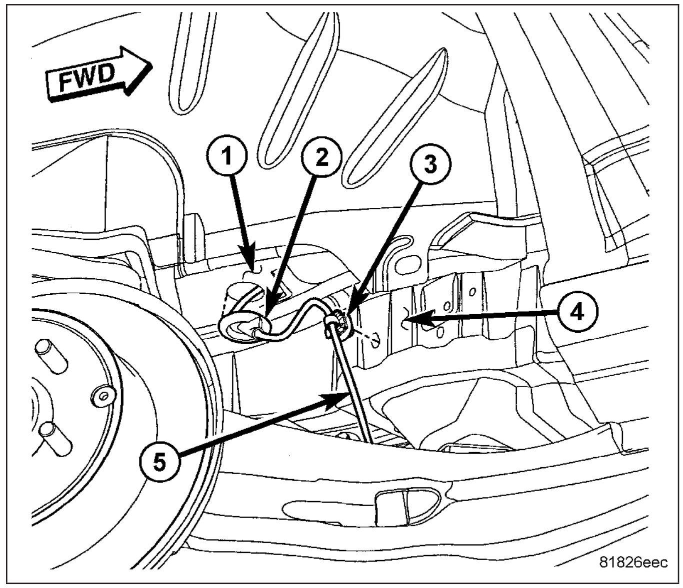
3. Position the wheel speed sensor (3) on the trailing link (2) and install the screw (4) securing it in place. Tighten the mounting screw to 18 N·m (13 ft. lbs.).
4. Position the wheel speed sensor (3) and install the routing clip (1) fastening the sensor to the trailing link (2).



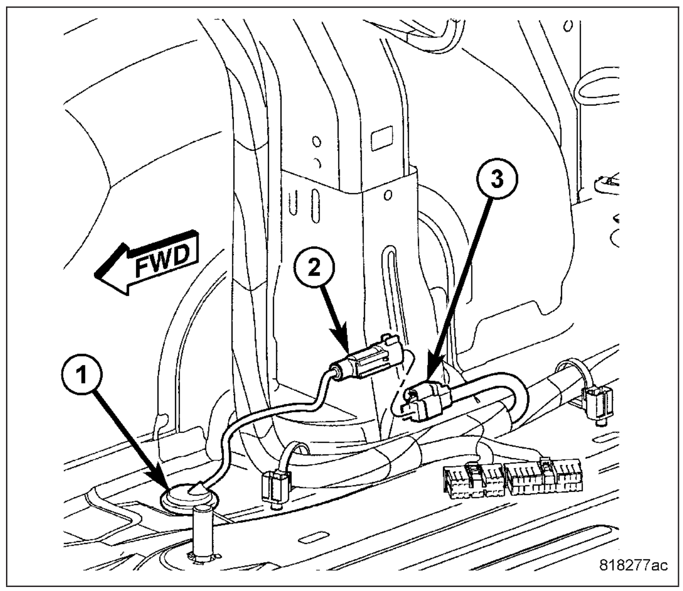
5. Position the wheel speed sensor cable routing clamp (3) on the rear suspension crossmember (4) and install the mounting screw (1). Tighten the mounting screw to 18 N·m (13 ft. lbs.).



6. Install the speed sensor cable routing clip (3) on the outside frame rail (4).
7. Insert the wheel speed sensor cable (5) through the hole in the body (1) and install the grommet (2) in the hole.
8. Lower the vehicle.



9. Connect the wheel speed sensor cable connector (2) at the body wiring harness connector (3).
10. Install the interior rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
11. Perform the Diagnostic Verification Test and clear any faults. (Refer to 5 - BRAKES - STANDARD PROCEDURE)



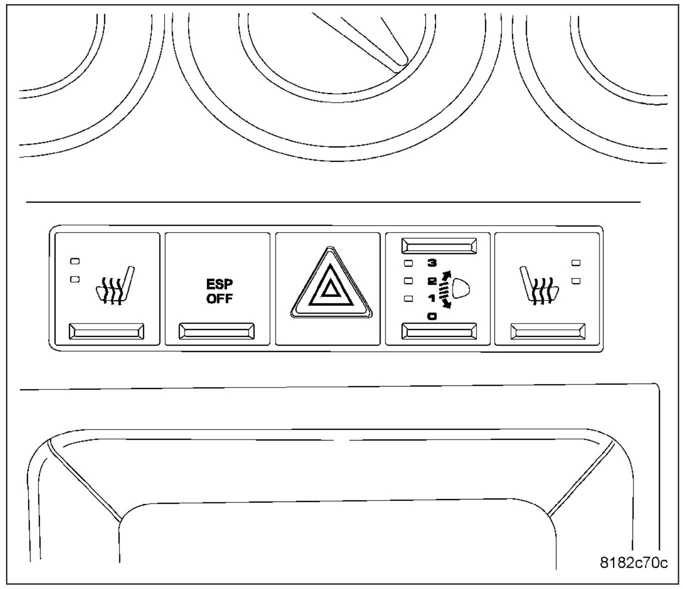
SWITCH-ESP

DESCRIPTION

The ESP Off Switch is part of the accessory switch bank module located in the center bezel on the instrument panel above the transmission gear shifter. The ESP Off switch turns the Electronic Stability Program off whenever the switch is depressed. Depressing the switch a second time turns the ESP back on. The switch resets itself each time the ignition is cycled.

When the ESP Off switch is depressed and released, turning ESP off, it does not completely turn the system off. The ESP system reduces torque management to a lesser amount, but ESP function can still occur if the system perceives the need.

The ESP Off switch is serviced as part of the accessory switch bank. There are different accessory switch banks available based on the option content of the vehicle. Ensure the accessory switch bank being installed matches the vehicle options.



REMOVAL

NOTE: The ESP Off switch is integral to the accessory switch bank and cannot be serviced separately.

1. Disconnect and isolate the negative battery cable.
2. Remove the center bezel from the instrument panel and place it on a work bench (Refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).
3. Remove the screws that secure the accessory switch bank to the back of the center bezel and remove the accessory switch bank.

INSTALLATION

NOTE: The ESP Off switch is serviced as part of the accessory switch bank.

NOTE: There are different instrument panel accessory switch banks available based on the option content of the vehicle. Ensure the accessory switch bank being installed matches the vehicle options.

1. Position the accessory switch bank onto the back of the instrument panel center bezel.
2. Install the screws that secure the accessory switch bank to the center bezel. Tighten the screws to 2 N·m (17 in. lbs.).
3. Install the center bezel onto the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - INSTALLATION).
4. Reconnect the negative battery cable.
5. Perform the ABS Verification Test and make sure the ESP Off switch operates properly. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
6. Verify proper operation of all components controlled by the switch bank.

HYDRAULIC CONTROL UNIT (HCU)

DESCRIPTION

The Hydraulic Control Unit (HCU) is mounted to the Antilock Brake Module (ABM) as part of the Integrated Control Unit (ICU). The HCU controls the flow of brake fluid to the brakes using a series of valves and accumulators. A pump/motor is mounted on the HCU to supply build pressure to the brakes during an ABS stop.

VALVES AND SOLENOIDS

The valve block contains four inlet valves and four outlet solenoid valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring-loaded in the closed position during normal braking. The fluid is allowed to flow from the master cylinder to the wheel brakes.

During an ABS stop, these valves cycle to maintain the proper slip ratio for each wheel. The inlet valve closes preventing further pressure increase and the outlet valve opens to provide a path from the wheel brake to the HCU accumulators and pump/motor. This releases (decays) pressure from the wheel brake, thus releasing the wheel from excessive slippage. Once the wheel is no longer slipping, the outlet valve is closed and the inlet valve is opened to reapply (build) pressure.

If the ABS includes the traction control feature, there are four other valves in the HCU. Two traction control (TC) valves, mounted in the HCU valve block, are normally in the open position and close only when the traction control is applied. There are also two shuttle valves which control pressure return to the master cylinder under ABS and traction control conditions.

These TC valves are used to isolate the rear (non-driving) wheels of the vehicle from the hydraulic pressure that the HCU pump/motor is sending to the front (driving) wheels when traction control is being applied. The rear brakes need to be isolated from the master cylinder when traction control is being applied so the rear wheels do not drag.

BRAKE FLUID ACCUMULATORS

There are two fluid accumulators in the HCU: one for the primary hydraulic circuit, and one for the secondary hydraulic circuit. Each hydraulic circuit uses a 3 cc accumulator.

The fluid accumulators temporarily store brake fluid that is removed from the wheel brakes during an ABS cycle. This stored fluid is used by the pump/motor to provide build pressure for the brake hydraulic system. When the antilock stop is complete, the accumulators are drained by the pump/motor.

There are two noise dampening chambers in the HCU on this vehicle equipped with traction control.

PUMP/MOTOR

There are two pump assemblies in the HCU: one for the primary hydraulic circuit, and one for the secondary hydraulic circuit. Both pumps are driven by a common electric motor. This DC-type motor is integral to the HCU and is controlled by the ABM.

The pump/motor provides the extra amount of brake fluid needed during antilock braking. Brake fluid is released to the accumulators when the outlet valve is opened during an antilock stop. The pump mechanism consists of two opposing pistons operated by an eccentric camshaft. In operation, these pistons are used to purge fluid from the accumulators back into the master cylinder circuits. When the antilock stop is complete, the pump/motor drains the accumulators.

The pump motor is also used to build pressure when the system goes into Electronic Stability Program (ESP) and traction control mode.

The ABM may turn on the pump/motor when an antilock stop is detected. The pump/motor continues to run during the antilock stop and is turned off after the stop is complete. Under some conditions, the pump/motor runs to drain the accumulators during the next drive-off.

The pump/motor is not a serviceable item; if it requires replacement, the HCU must be replaced.

For more information, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - OPERATION - HYDRAULIC CIRCUITS AND VALVES).

REMOVAL

To remove the HCU, the ICU must be removed and disassembled. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - REMOVAL) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DISASSEMBLY)

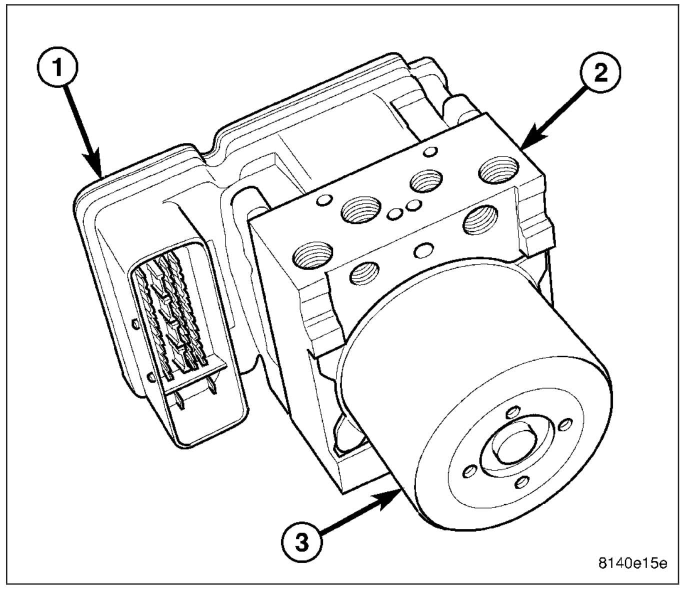
INSTALLATION

To install the HCU, assemble and install the ICU. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - ASSEMBLY) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION)

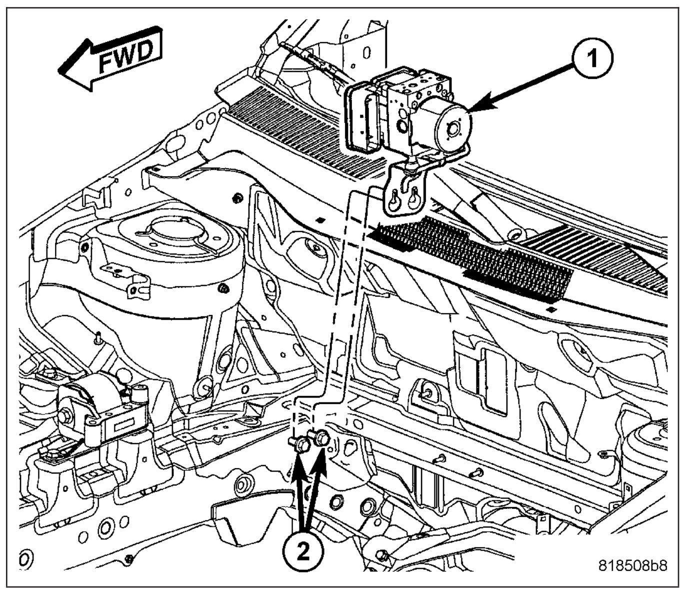
INTEGRATED CONTROL UNIT (ICU)

DESCRIPTION

The Hydraulic Control Unit (HCU) (2) and the Antilock Brake Module (ABM) (1) used with this antilock brake system are combined (integrated) into one unit, which is called the Integrated Control Unit (ICU).



The ICU (1) is located in the engine compartment, mounted to the right side body frame rail near the strut tower.



Two different ICU's are used on this vehicle depending on whether or not the vehicle is equipped with traction control and Electronic Stability Program (ESP). The HCU on a vehicle equipped with traction control or ESP has a valve block that is approximately one inch longer than a HCU on a vehicle that is equipped with ABS only.

The ABS-only ICU consists of the following components: the ABM, eight (build/decay) solenoid valves (four inlet valves and four outlet valves), valve block, fluid accumulators, a pump, and an electric motor.

The ABS with ESP and All-Speed Traction Control ICU consists of the following components: the ABM, 12 (build/decay) solenoid valves, two traction control solenoid valves, two hydraulic shuttle valves, valve block, fluid accumulators, a pump, and an electric pump/motor.

The replaceable components of the ICU are the HCU and the ABM. No attempt should be made to service any components of the HCU or ABM.

For additional information on the ABM, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ANTILOCK BRAKE MODULE - DESCRIPTION). For additional information on the HCU, (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - DESCRIPTION).

OPERATION

For information of the ICU, refer to these individual components of the ICU:

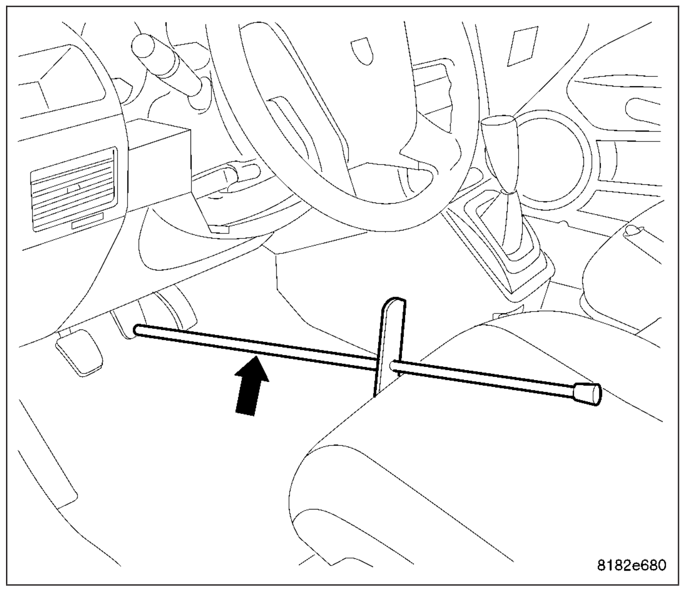
- ANTILOCK BRAKE MODULE (ABM) (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ANTILOCK BRAKE MODULE - DESCRIPTION)
- HYDRAULIC CONTROL UNIT (HCU) (Refer to 5 - BRAKES - ABS/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - OPERATION)

REMOVAL

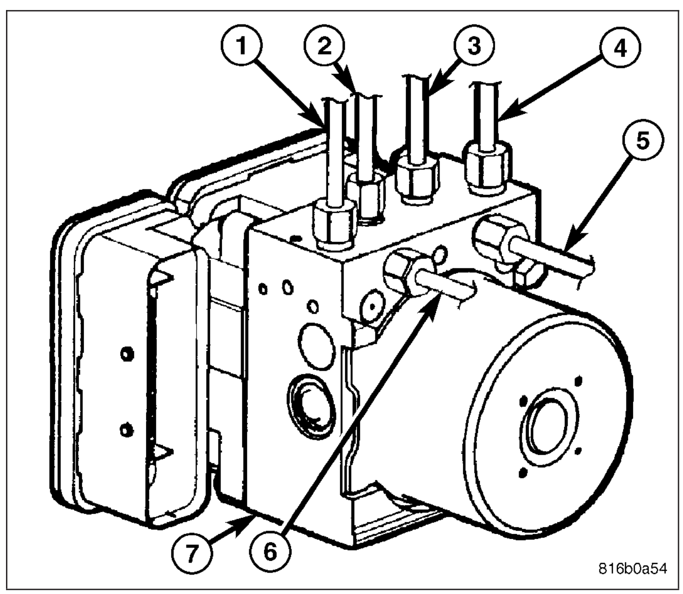
GAS ENGINE

NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

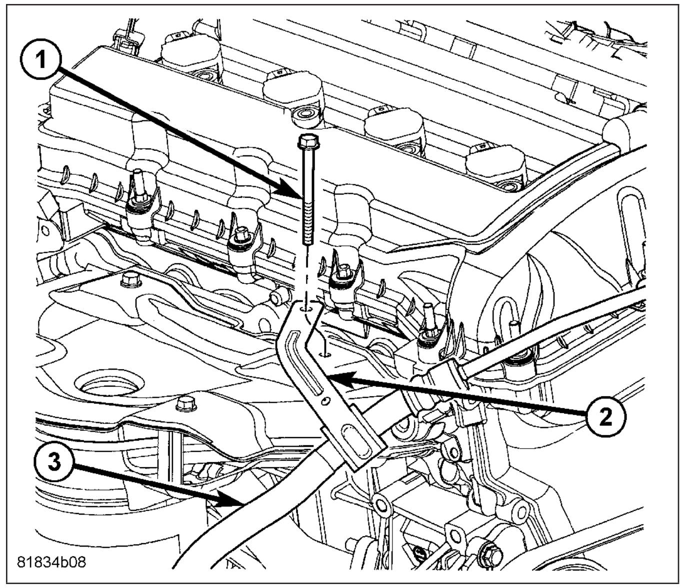
1. Disconnect and isolate battery negative cable from battery post.
2. Using a brake pedal holding tool as shown, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.
3. Remove the engine appearance cover.
4. Loosen lower and upper mounting nuts, then remove the exhaust heat shield from the dash panel.
5. Pull the brake tube bundle routing clips (with tubes) loose from studs on the dash panel.



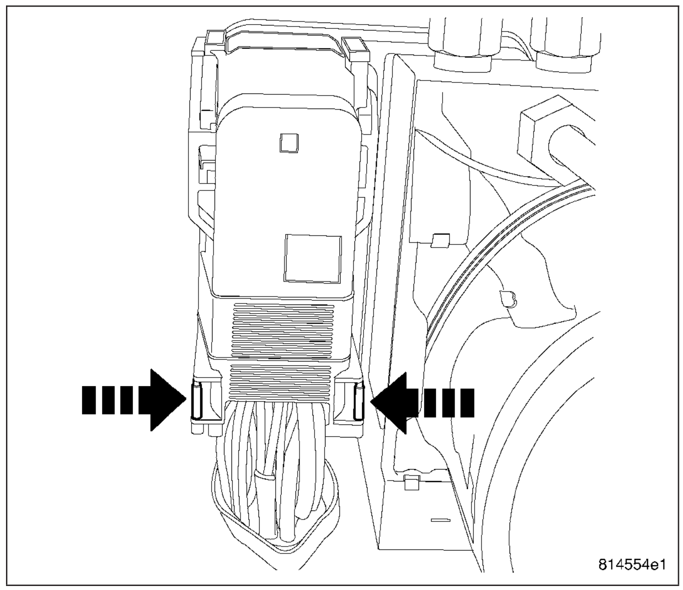
6. Remove the primary (4) and secondary (1) brake tubes (from master cylinder) at the hydraulic control unit (7).
7. Remove the remaining brake tubes (2, 3, 5, 6) at the hydraulic control unit (7).



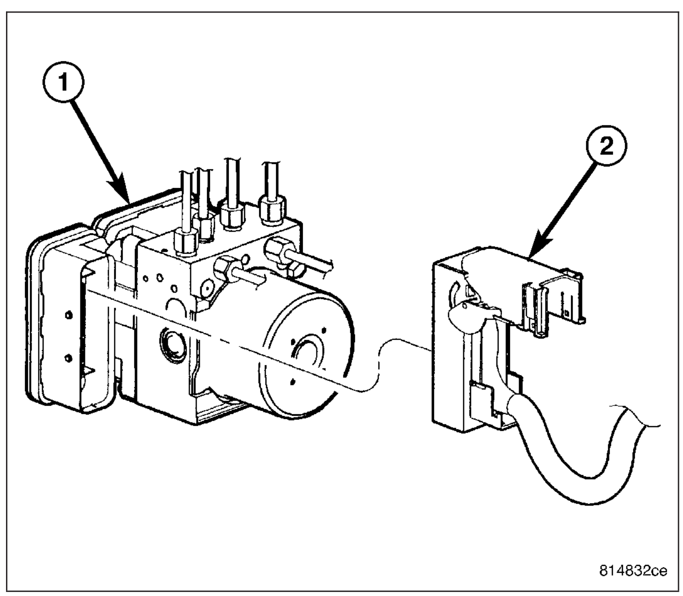
8. Remove the screw (1) fastening the power steering pressure hose routing clamp (2) to the exhaust manifold.



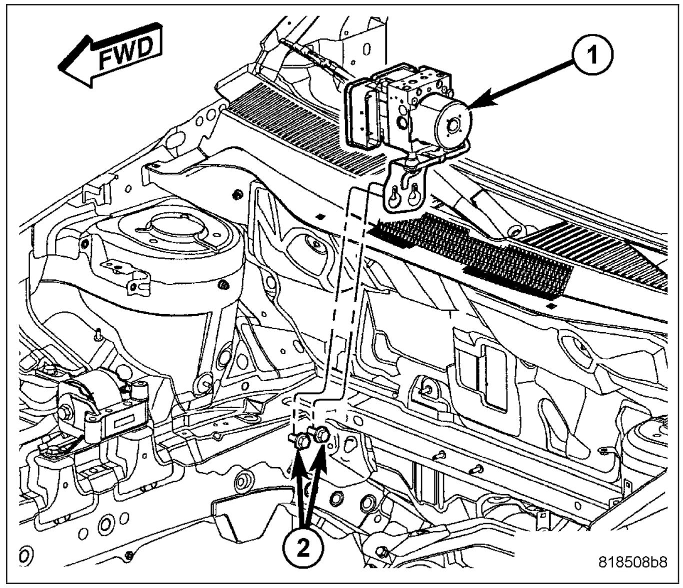
NOTE: Use this figure in the following step to release the ABM harness connector cover. It shows the location of the release tabs.



9. Disconnect the ABM harness connector from the Antilock Brake Module (ABM). To do so:
   a. Depress the tabs on each side of the connector cover, then
   b. Pull outward and upward on the lower half of the cover until it locks into position pointing straight outward (2). The connector can then be pulled straight outward off the ABM (1).



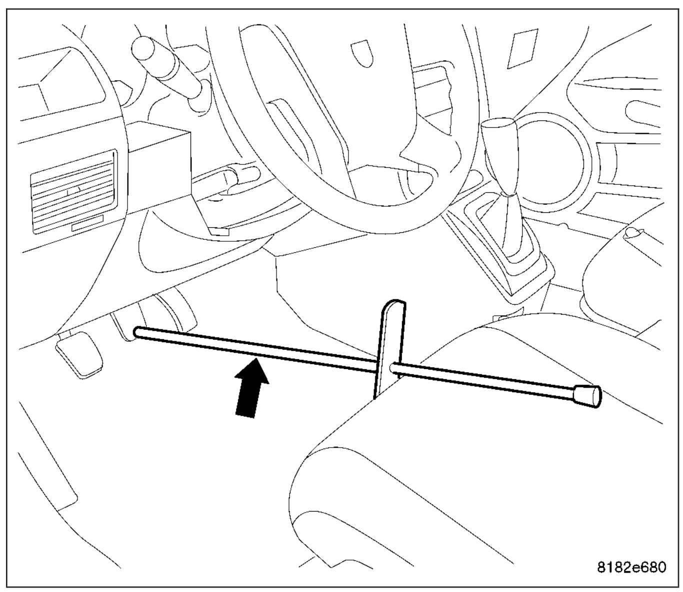
10. Loosen, but do not remove, the two mounting screws (2) attaching the ICU (1) mounting bracket to the body.
11. Lift the ICU and mounting bracket (1) off the mounting screws (2).
12. Move the brake tubes around as necessary without bending them and remove the ICU with bracket through the opening between the A/C lines and the exhaust manifold.
13. To separate the ABM from the HCU, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DISASSEMBLY).



DIESEL ENGINE

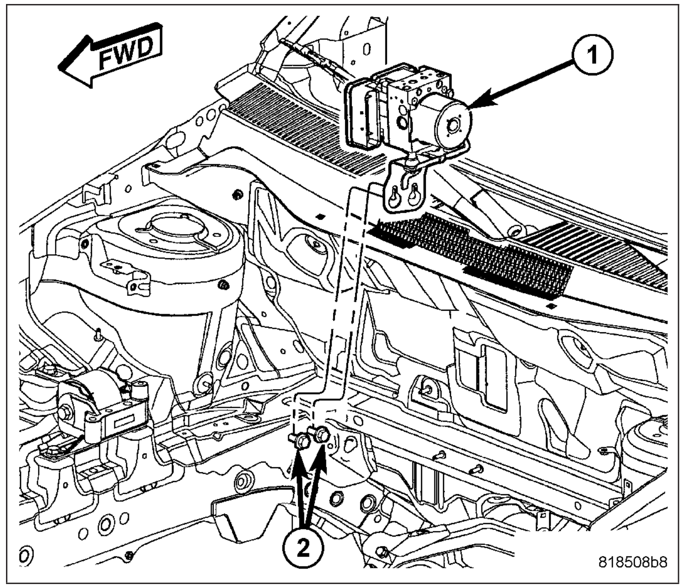
NOTE: Before proceeding, (Refer to 5 - BRAKES - WARNING) (Refer to 5 - BRAKES - CAUTION).

1. Disconnect and isolate battery negative cable from battery post.
2. Using a brake pedal holding tool as shown, depress the brake pedal past its first one inch of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.

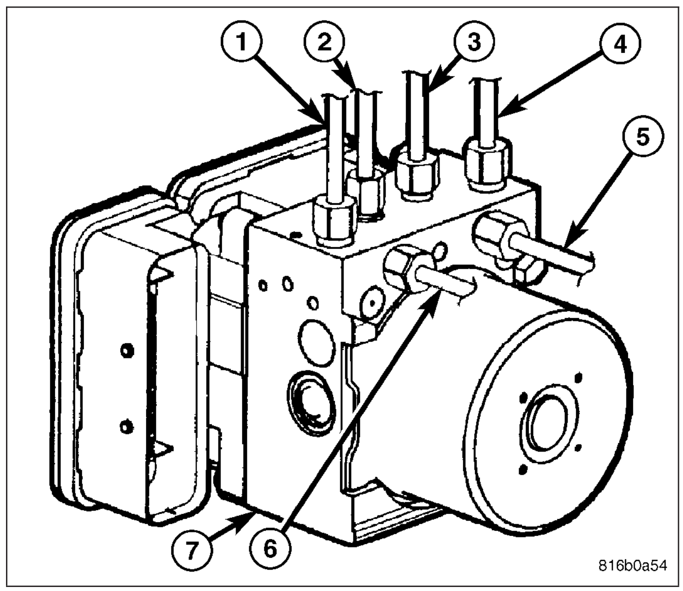


3. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

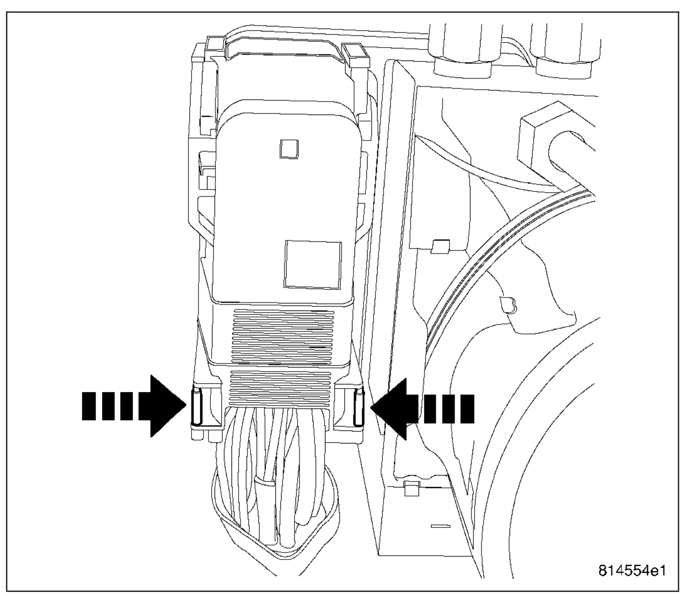
4. Loosen, but do not remove, the two mounting screws (2) attaching the ICU (1) mounting bracket to the body.
5. Loosen the air inlet tube at the turbocharger.
6. Lower the vehicle.
7. Remove the engine appearance cover.
8. Loosen the air inlet tube at the air cleaner and engine cylinder head cover, then remove the tube.
9. Loosen lower and upper mounting nuts, then remove the heat shield from the dash panel.
10. Pull the brake tube bundle routing clips (with tubes) loose from studs on the dash panel.



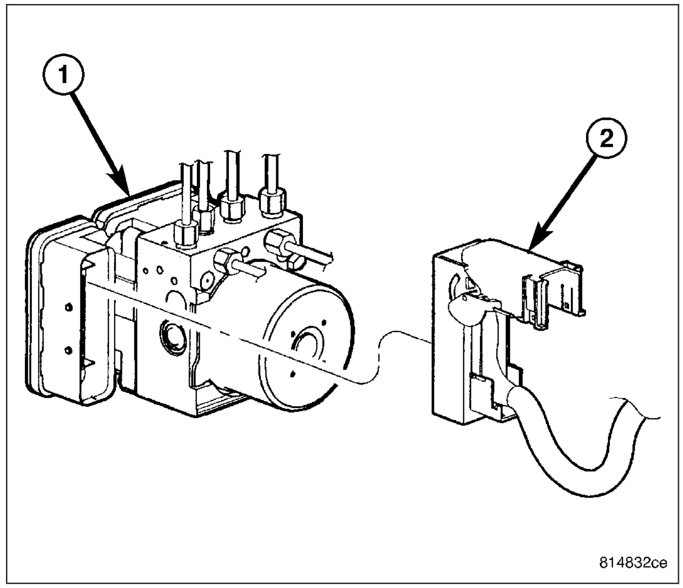
11. Remove primary (4) and secondary (1) brake tubes (from master cylinder) at hydraulic control unit (7).
12. Remove remaining brake tubes (2, 3, 5, 6) at hydraulic control unit (7).



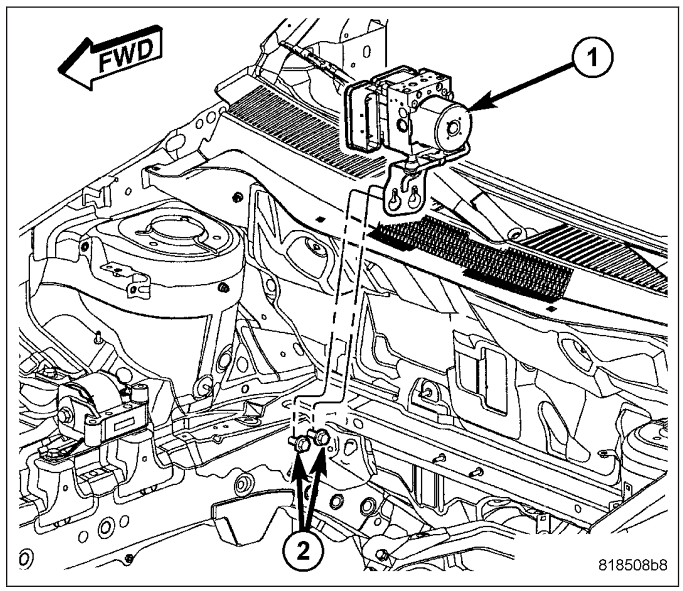
NOTE: Use this figure in the following step to release the ABM harness connector cover. It shows the location of the release tabs.



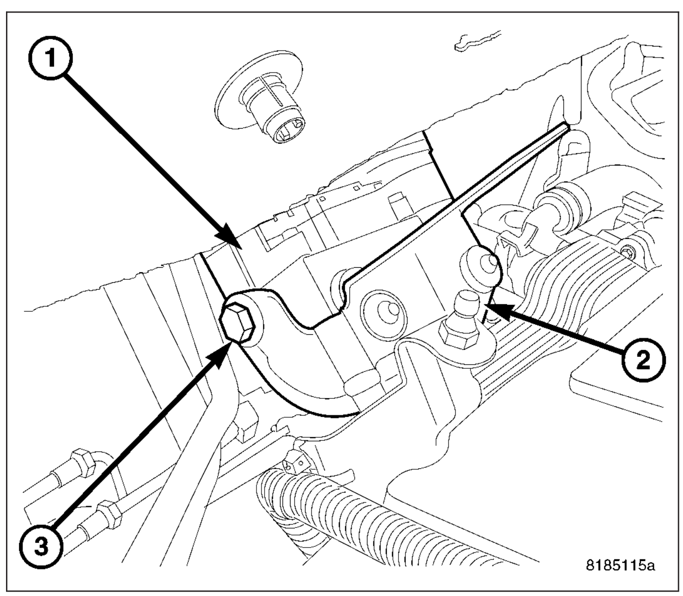
13. Disconnect the ABM harness connector from the Antilock Brake Module (ABM). To do so:
    a. Depress the tabs on each side of the connector cover, then
    b. Pull outward and upward on the lower half of the cover until it locks into position pointing straight outward (2). The connector can then be pulled straight outward off the ABM (1).



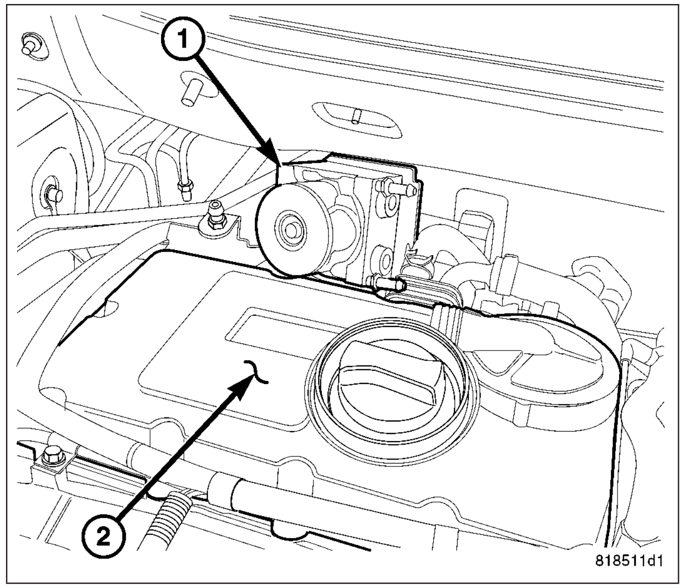
14. Lift the ICU and mounting bracket (1) off the mounting screws (2).



15. Rotate the ICU (1) around behind the engine until the bracket mounting screw (3) can be accessed.
16. Remove the ICU bracket mounting screw (3), then remove the bracket (2) from the ICU (1). The ICU has mounting pins that are inserted into grommets in the bracket that must be overcome to remove bracket.

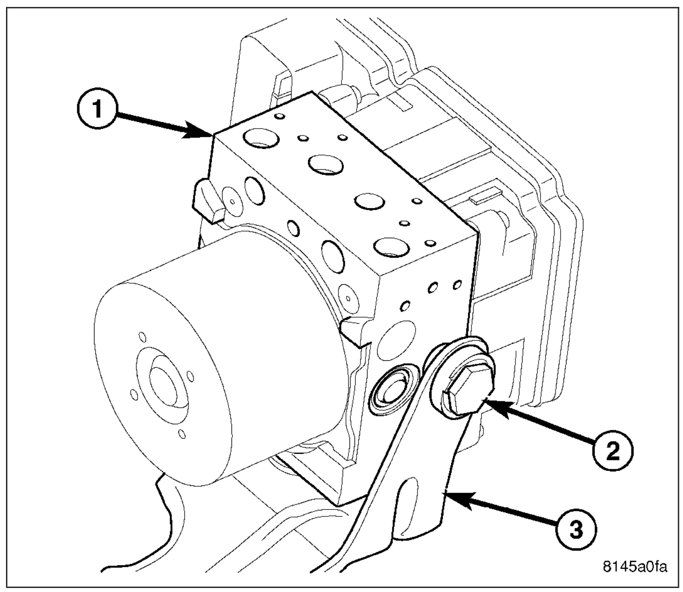


17. Remove the ICU (1) from the engine compartment out over the engine cylinder head cover (2).
18. To separate the ABM from the HCU, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DISASSEMBLY).

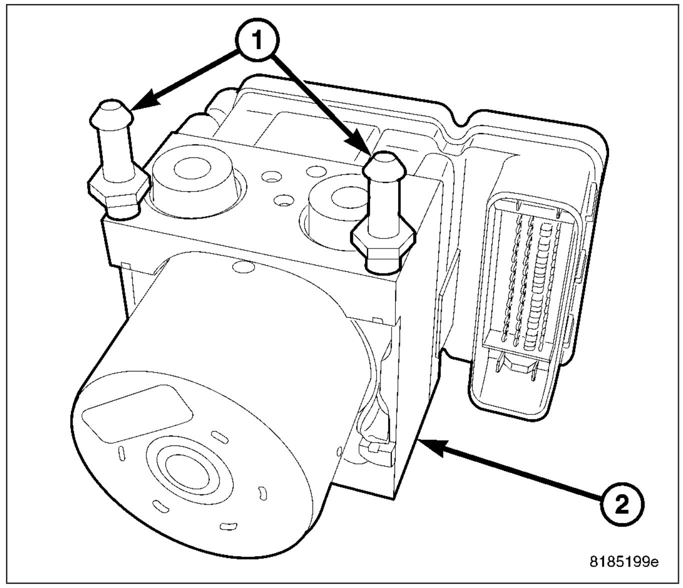


DISASSEMBLY

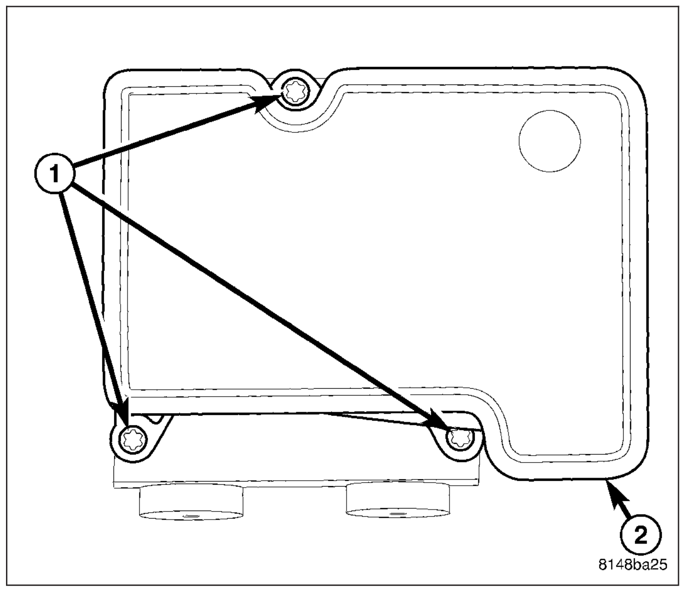
1. If the mounting bracket (3) needs to be removed from the ICU, remove the single mounting bolt (2), then slide the ICU's mounting pins out of the grommets in the bracket and remove the bracket.



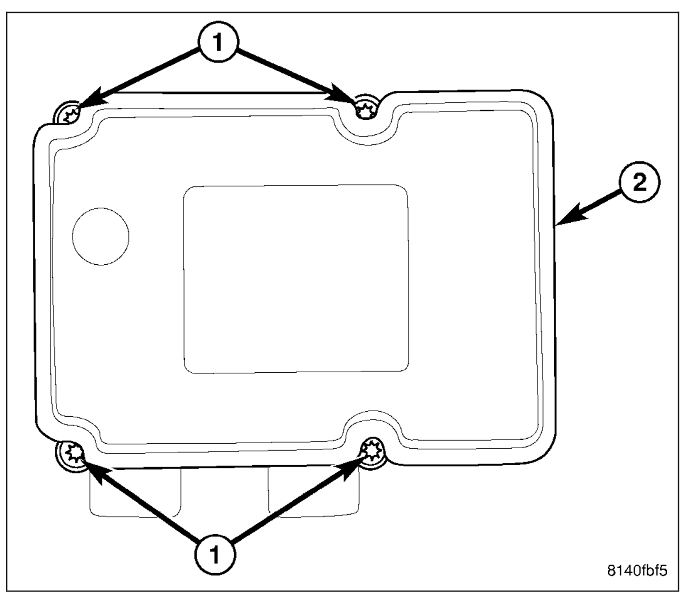
2. Remove the mounting pins from the ICU.



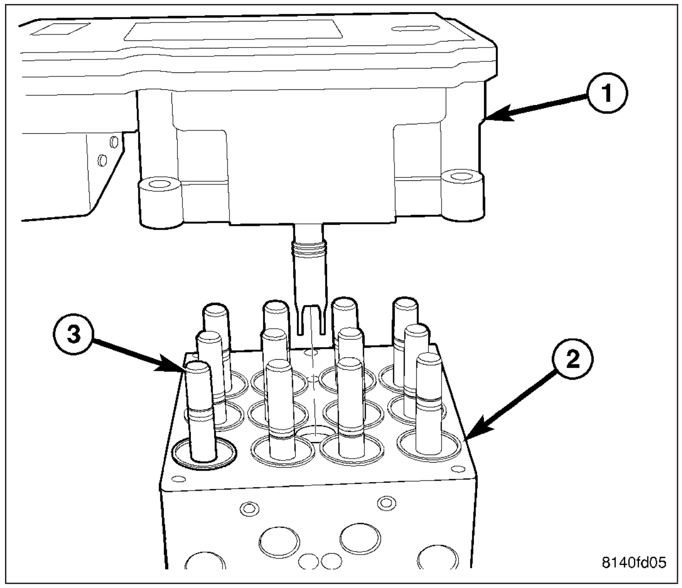
3. If not equipped with traction control, remove the three screws (1) attaching the ABM (2) to the HCU.



4. If equipped with traction control or ESP, remove the four screws (1) attaching the ABM (2) to the HCU.



5. Separate the ABM (1) from the HCU (2).

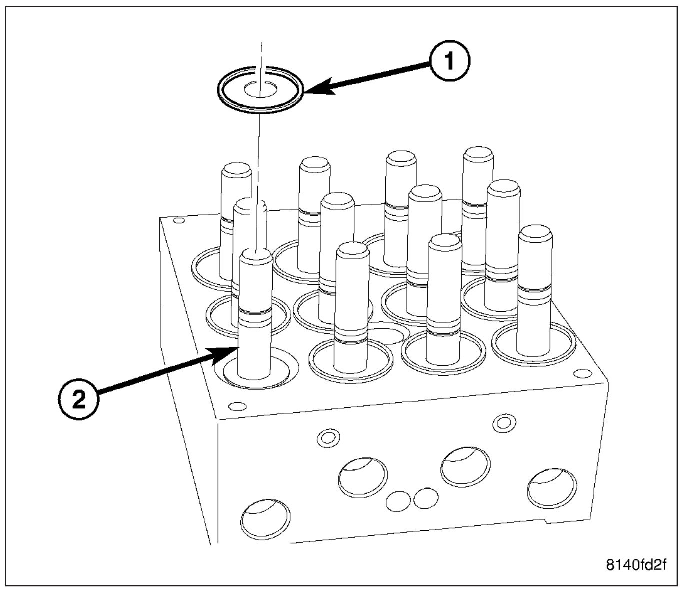


ASSEMBLY

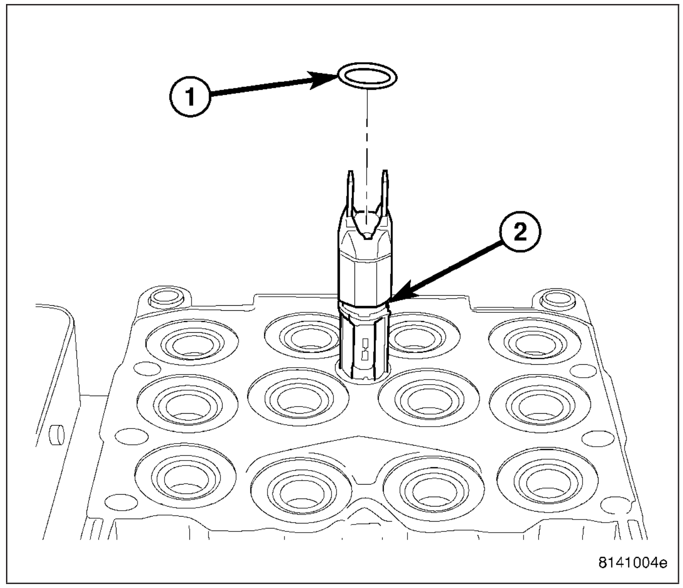
1. Clean any debris off the mating surfaces of the HCU and ABM.

CAUTION: When installing new O-rings or solenoid valve stem seals, do not use any type of lubricant.

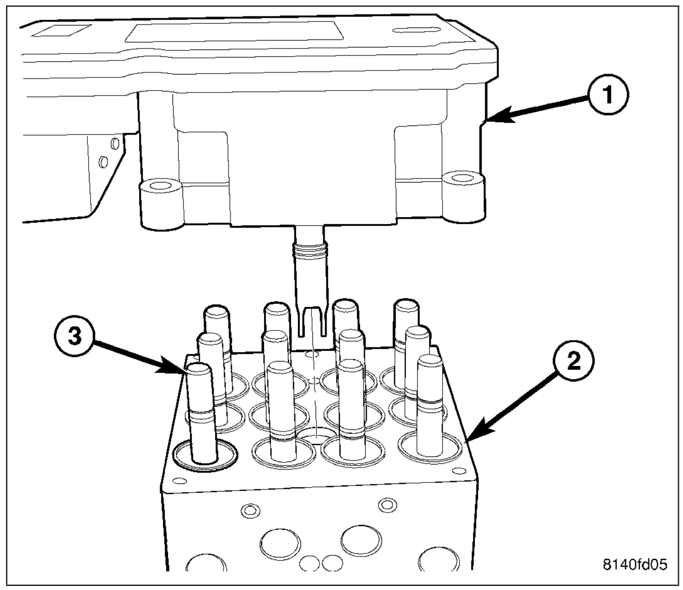
2. If the seals (1) on the solenoid valve stems (2) are not new, replace them all. Each of the solenoid valve stem seals must be new to keep out moisture and debris; **do not reuse solenoid valve stem seals.**



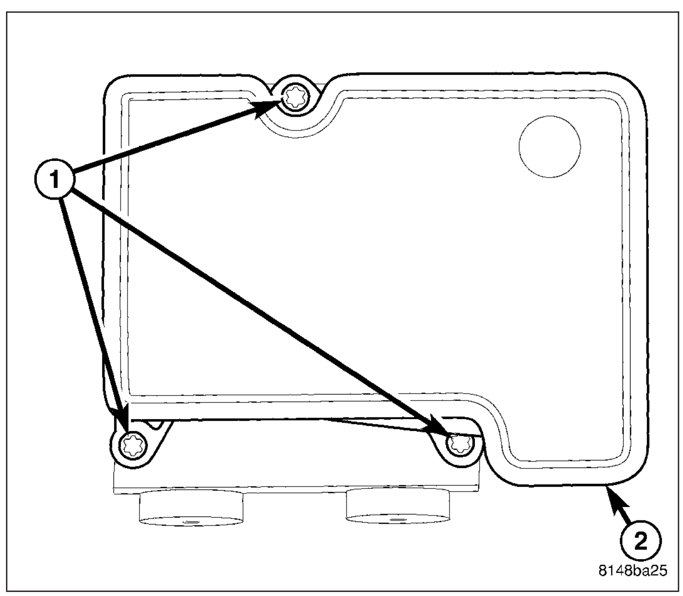
3. Replace the pump/motor connector O-ring (1) if it is not new. Be sure the O-ring is properly seated in the mounting groove (2).



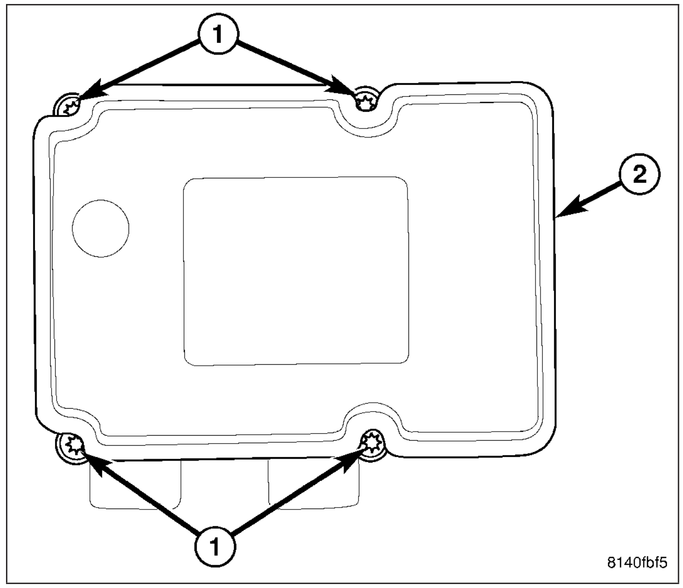
4. Align components and install the ABM (1) on the HCU (2).



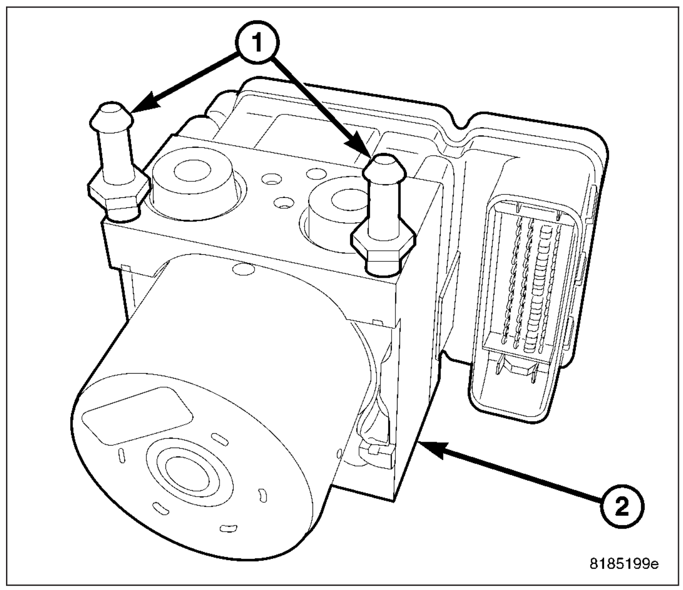
5. If not equipped with traction control, install the three screws (1) attaching the ABM (2) to the HCU. Tighten the mounting screws to 2 N·m (17 in. lbs.).



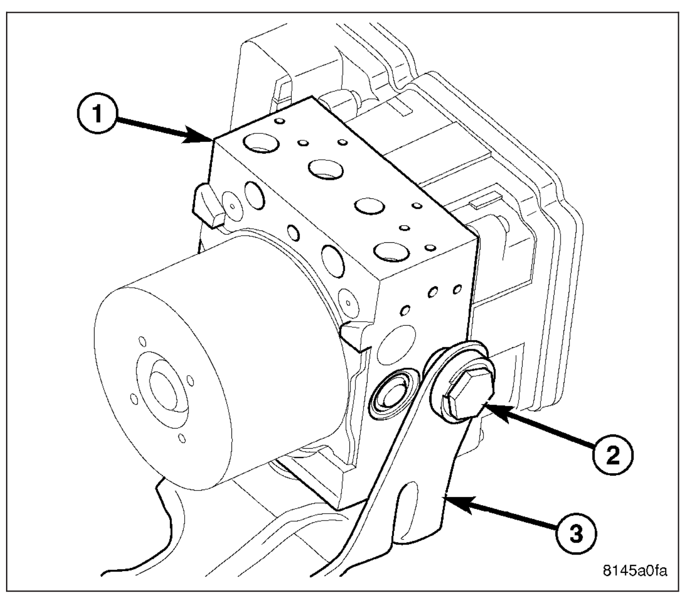
6. If equipped with traction control, install the four screws (1) attaching the ABM (2) to the HCU. Tighten the mounting screws to 2 N·m (17 in. lbs.).



7. If necessary, install the mounting pins (1) in the ICU (2) and tighten to 11 N·m (97 in. lbs.).



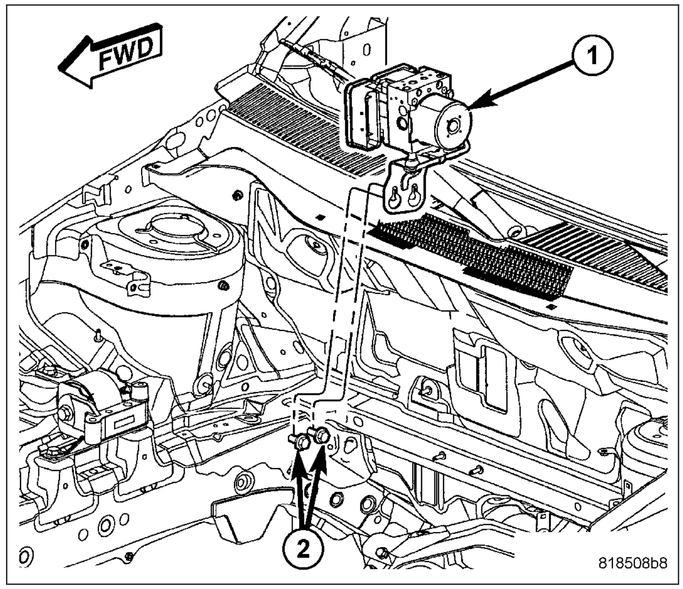
8. If the mounting bracket (3) needs to be installed on the ICU (1), install the mounting pins in the ICU as necessary and tighten to 11 N·m (97 in. lbs.). Insert the mounting pins into the grommets mounted in the bracket, then install the single mounting bolt (2). Tighten the mounting bolt to 11 N·m (97 in. lbs.).
9. Install the ICU in the vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION)



INSTALLATION

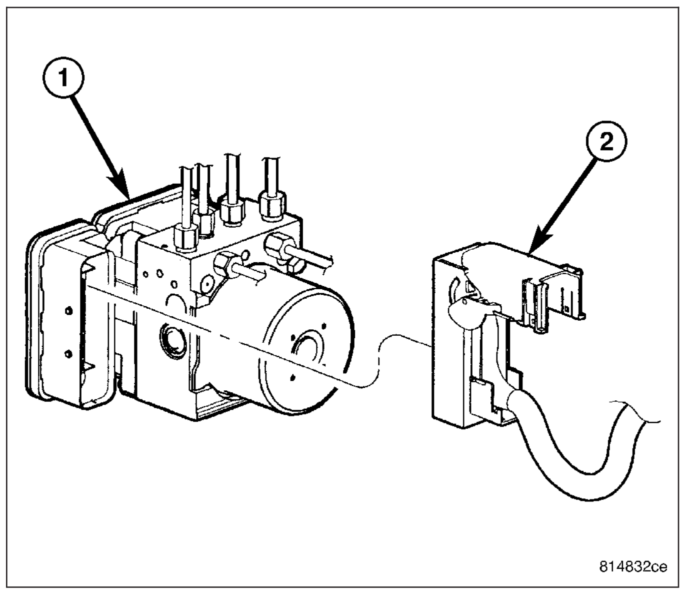
GAS ENGINE

1. Install the ICU with bracket (1) through the opening between the A/C lines and the exhaust manifold using the opposite of how it was removed.
2. Place the mounting bracket for the ICU (1) over the mounting screws (2) and hang the assembly in place. Tighten the two mounting screws (2) to 23 N·m (17 ft. lbs.).

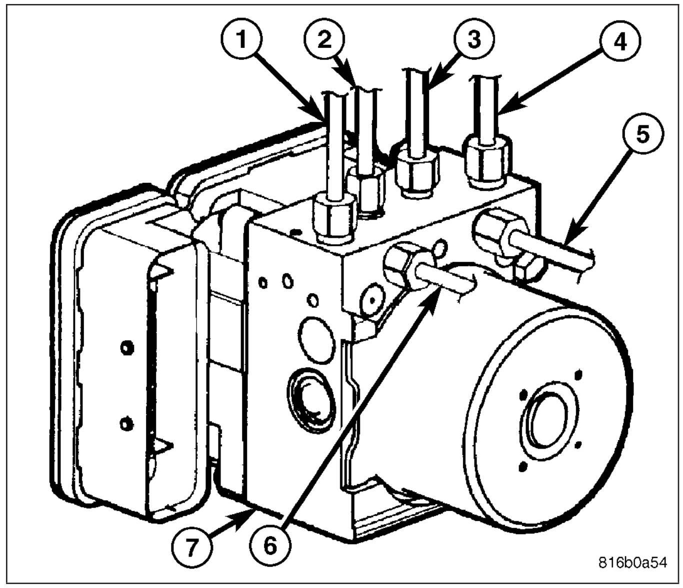


CAUTION: Before installing the ABM harness connector on the ABM, be sure the seal is properly installed in the connector.

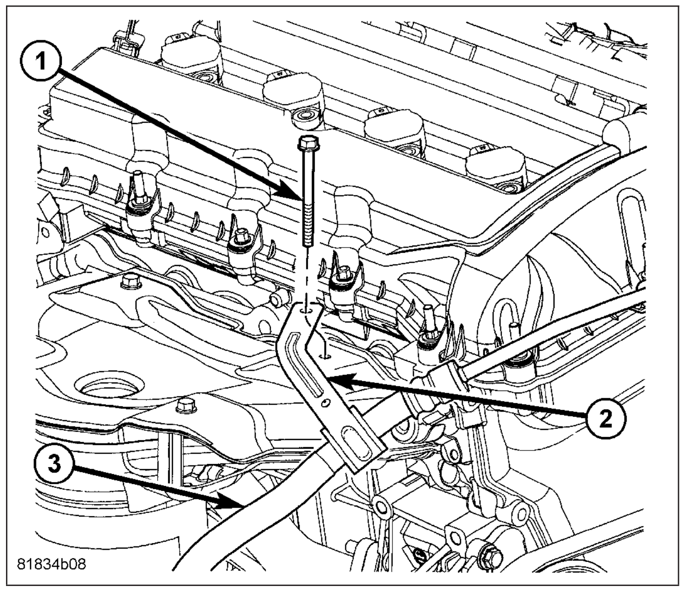
3. Insert the ABM wiring harness connector (2) into the socket of the ABM (1) and close the cover, locking the connector in place.



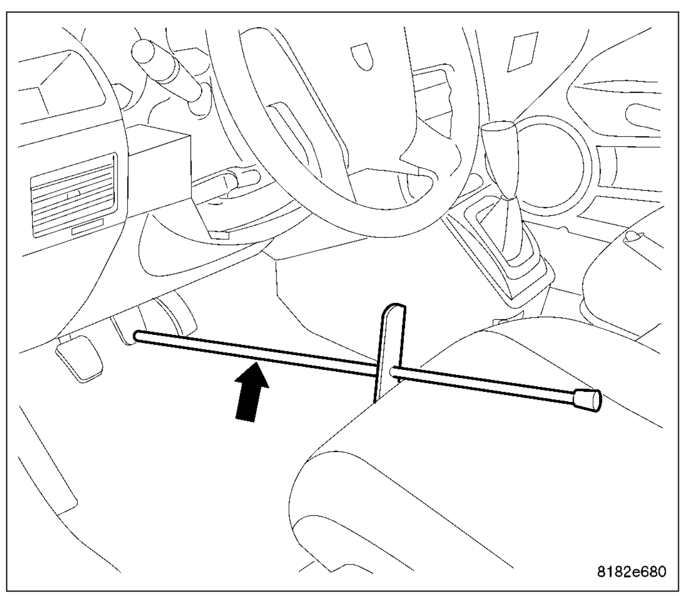
4. Install the four chassis brake tubes (2, 3, 5, 6) brake tubes at the ICU hydraulic control unit (7). Tighten the tube nuts to 17 N·m (150 in. lbs.).
5. Install the primary (4) and secondary (1) brake tubes at the ICU hydraulic control unit (7). Tighten the tube nuts to 17 N·m (150 in. lbs.).



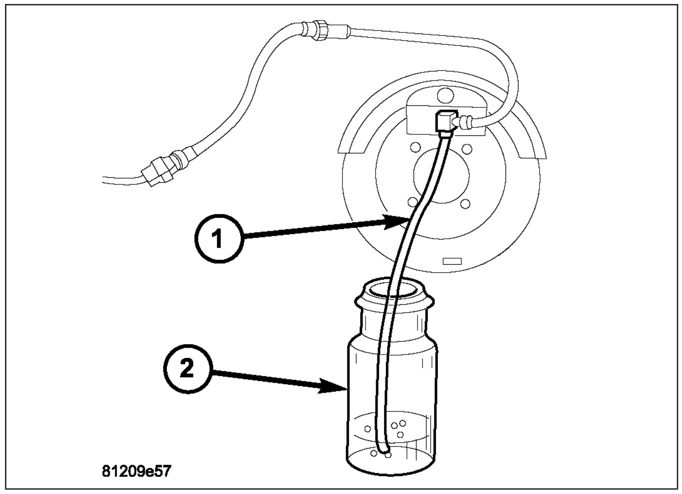
6. Position the power steering pressure hose routing clamp (2) on the exhaust manifold and install the mounting screw (1). Tighten the mounting screw to 9 N·m (80 in. lbs.).
7. Push the brake tube bundle routing clips (with tubes) onto the studs on the dash panel.
8. Install the heat shield on the dash panel and tighten the lower and upper mounting nuts.



9. Remove the brake pedal holding tool.
10. Install the engine appearance cover.
11. Connect the battery negative cable to the battery post. It is important that this be performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



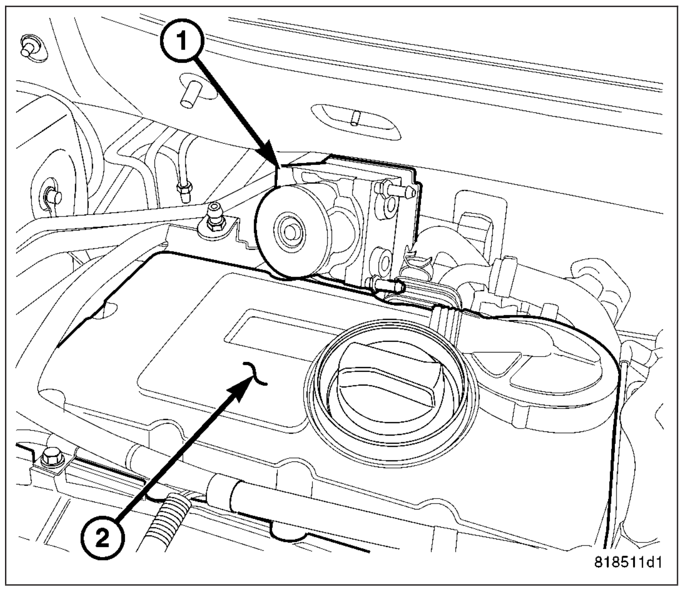
12. Hook up the scan tool to initialize the ABM and perform the following:
    a. Clear any faults.
    b. Fill the master cylinder to the proper fill level and bleed the base and ABS hydraulic systems. (Refer to 5 - BRAKES - ABS - STANDARD PROCEDURE)
    c. Check for leaks.
    d. Perform the ABS Verification Test and road test the vehicle.



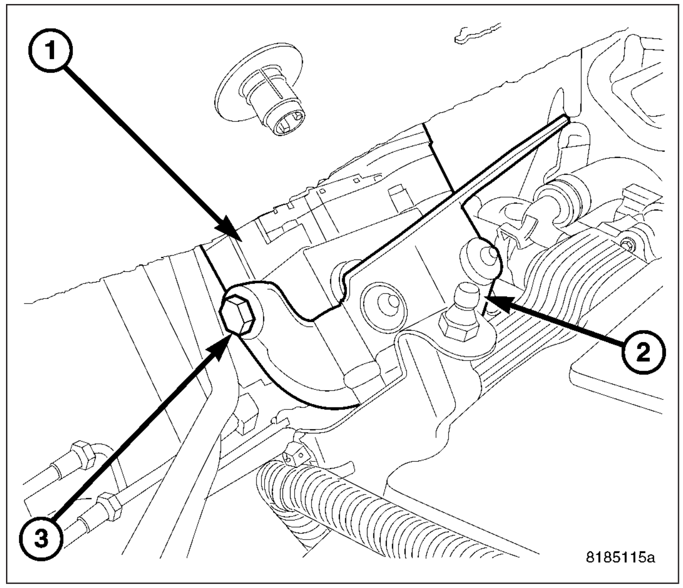
DIESEL ENGINE

NOTE: Before installation, be sure the mounting pins are installed in the ICU block, but do not install the mounting bracket.

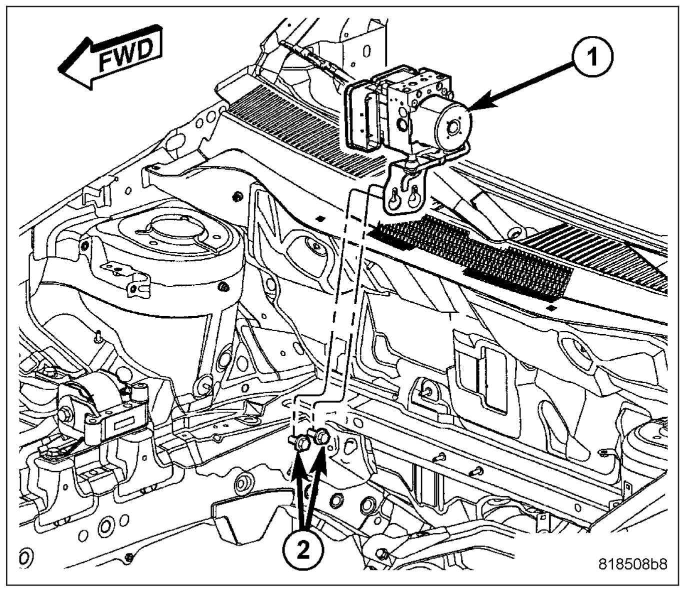
1. Install the ICU (1) into the engine compartment over the top of the engine cylinder head cover (2) as shown.



2. Rotate the ICU (1) around behind the engine until the mounting bracket (2) can be installed.
3. Install the mounting bracket (2) onto the ICU (1). Push the bracket mounting grommets onto the mounting pins of the ICU. Install the single mounting bolt (3). Tighten the mounting bolt to 11 N·m (97 in. lbs.).

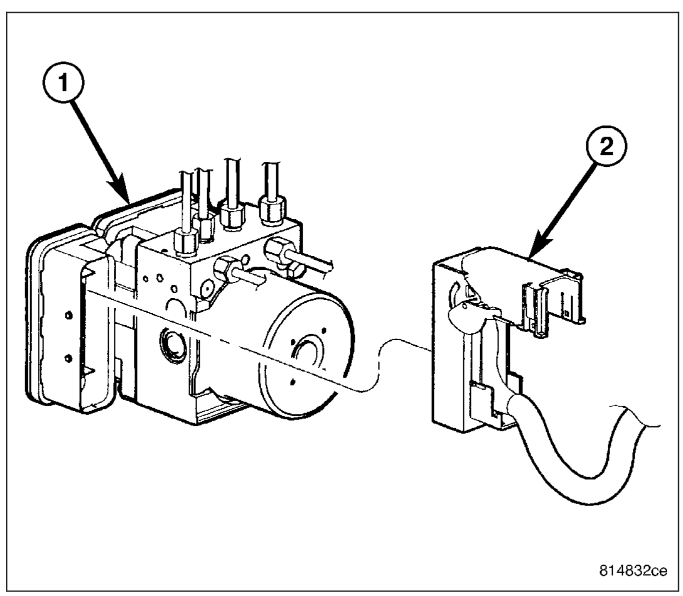


4. Place mounting bracket for the ICU (1) over the mounting screws (2) and hang the assembly in place.

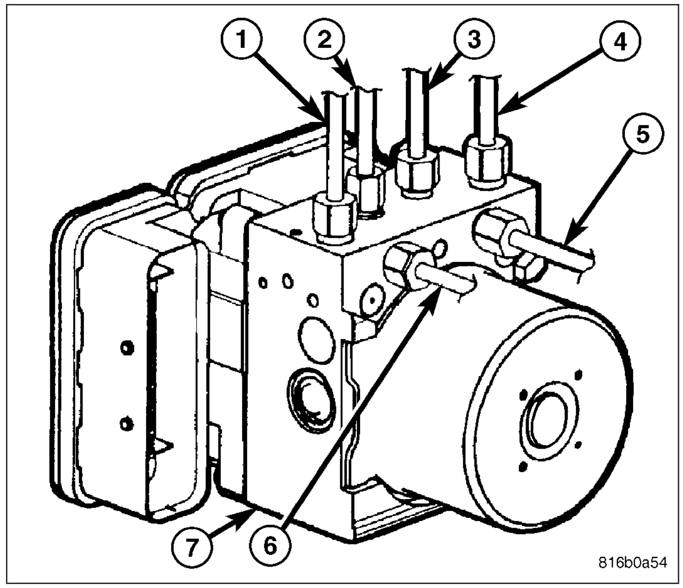


CAUTION: Before installing the ABM harness connector on the ABM, be sure the seal is properly installed in the connector.

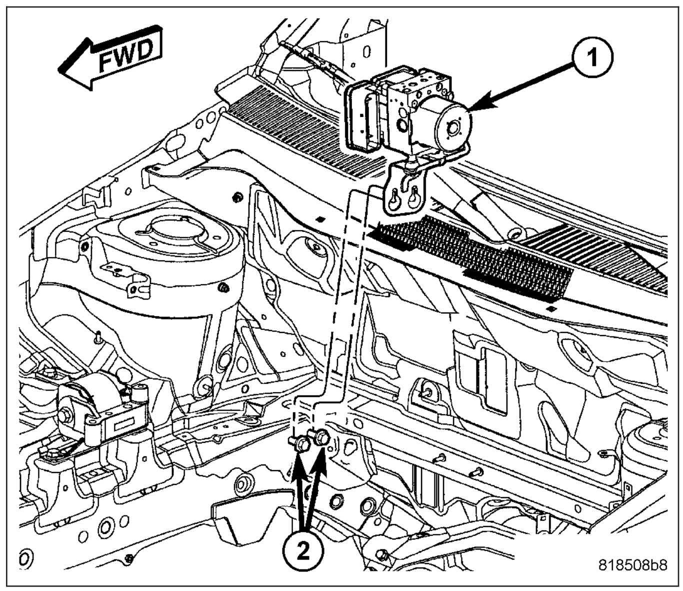
5. Insert the ABM wiring harness connector (2) into the socket of the ABM (1) and close the cover, locking the connector in place.



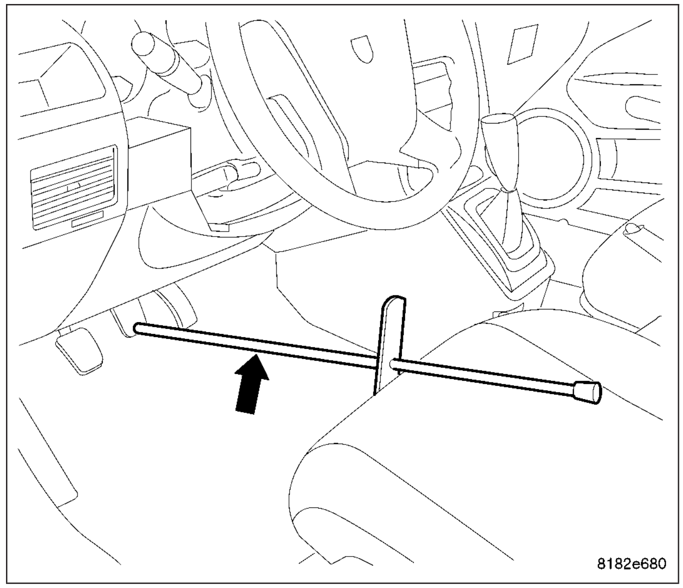
6. Install the four chassis brake tubes (2, 3, 5, 6) brake tubes at the ICU hydraulic control unit (7). Tighten the tube nuts to 17 N·m (150 in. lbs.).
7. Install the primary (4) and secondary (1) brake tubes at the ICU hydraulic control unit (7). Tighten the tube nuts to 17 N·m (150 in. lbs.).
8. Push the brake tube bundle routing clips (with tubes) onto the studs on the dash panel.
9. Install the heat shield on the dash panel and tighten the lower and upper mounting nuts.
10. Install the air inlet tube at the air cleaner and engine cylinder head cover.



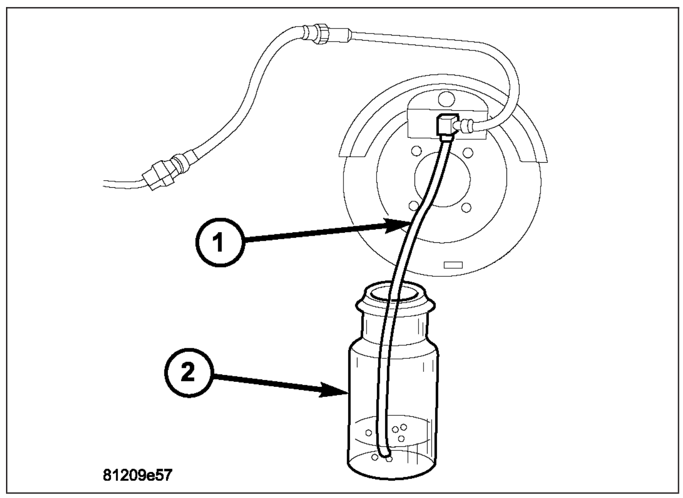
11. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
12. Tighten the two mounting screws (2) attaching the ICU (1) mounting bracket to the body. Tighten the mounting screws to 23 N·m (17 ft. lbs.).
13. Tighten the air inlet tube at the turbocharger.
14. Lower the vehicle.



15. Remove brake pedal holding tool.



16. Install the engine appearance cover.
17. Connect the battery negative cable to the battery post. It is important that this be performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
18. Hook up the scan tool to initialize the ABM and perform the following:
    a. Clear any faults.
    b. Fill the master cylinder to the proper fill level and bleed the base and ABS hydraulic systems. (Refer to 5 - BRAKES - ABS - STANDARD PROCEDURE)
    c. Perform the ABS Verification Test and road test the vehicle.



CLUTCH

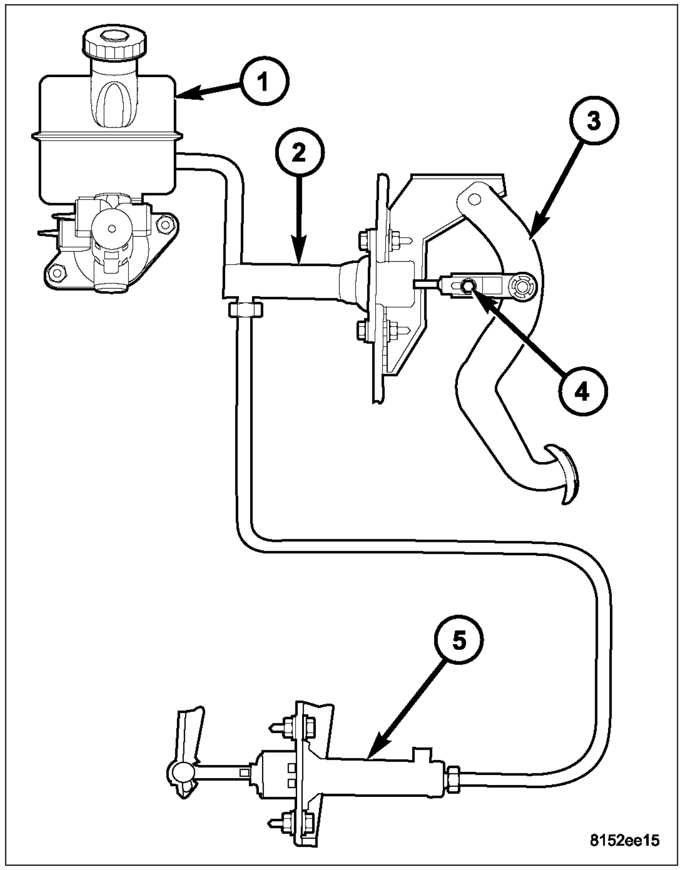
TABLE OF CONTENTS

CLUTCH

DESCRIPTION

The typical clutch hydraulic system consists of a clutch master cylinder (2), slave cylinder (5), and an interconnecting fluid line. Clutch hydraulic fluid is supplied by the brake system via the brake master cylinder reservoir (1). The clutch pedal pushrod (4) is adjustable.

On some models, the slave cylinder is integrated with the clutch release bearing.



FLUID

CAUTION: Never use any type of petroleum-based fluid (engine oil, transmission oil, power steering fluid, etc.) in the clutch hydraulic system. Use of such fluids will result in master/slave cylinder seal damage, and cause a failure of the hydraulic clutch release system.

NOTE: Under normal operating conditions, the clutch hydraulic system does not require additional fluid for the life of the vehicle. Since the clutch shares the brake reservoir, the fluid level will be maintained whenever the brake system is checked.

The fluid required for use in the clutch hydraulic system is brake fluid conforming to DOT 3 specifications and J1703 standards. No other type of fluid is recommended or approved for use in the clutch hydraulic system. Use only MOPAR® brake fluid or equivalent from a tightly sealed container.

OPERATION

The clutch hydraulic system is responsible for engaging and disengaging the clutch. Depressing the clutch pedal develops fluid pressure in the clutch master cylinder. This pressure is transmitted to the slave cylinder through a connecting line.

Slave cylinder force transmits through the integral release bearing, which is in contact with the pressure plate diaphragm spring. As additional force is applied, the bearing depresses the diaphragm spring fingers inward on the fulcrums. The action moves the pressure plate rearward, relieving clamping force on the clutch disc.

DIAGNOSIS AND TESTING

CLUTCH SYSTEM

Clutch problem diagnosis will generally require a road test to determine the type of fault. Component inspection will then determine the problem after road testing.

Drive the vehicle at normal speeds during road test. Shift the transaxle through all gear ranges and observe clutch action. If chatter, grab, slip, or improper release is experienced, remove and inspect the clutch components. If the problem is noise or hard shifting, further diagnosis may be needed. The transaxle or other driveline components may actually be at fault.

CLUTCH GRAB/CHATTER

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC FACING COVERED WITH OIL OR GREASE	Oil leak at engine rear main or transaxle input shaft seal.	T355 equipped- Correct leak and replace modular clutch assembly. BG6 equipped - Clean pressure plate, flywheel, and replace clutch disc.
	Too much grease applied to splines of disc and input shaft.	Apply lighter coating of grease to splines.
NO FAULT FOUND WITH CLUTCH COMPONENTS	Problem actually related to suspension or driveline component.	Further diagnosis required. Check engine/transmission mounts, suspension attaching parts and other driveline components as needed.
	Engine related problems.	Check EFI and ignition systems.
PARTIAL ENGAGEMENT OF CLUTCH DISC	Clutch cover, spring, or release fingers bent, distorted (rough handling, improper assembly).	Replace clutch assembly.
	Clutch disc damaged or distorted.	Replace clutch assembly.
	Clutch misalignment.	T355 equipped - Verify modular clutch pilot plate alignment to crankshaft. Replace the modular clutch assembly if the pilot plate is loose or bent. BG6 equipped - Check alignment and runout of flywheel, disc, or cover. Check clutch housing to engine dowels and dowel holes for damage. Correct as necessary.

CLUTCH SLIPS

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC FACING WORN OUT	Normal wear.	Replace clutch assembly.
	Driver frequently rides (slips) clutch, results in rapid wear, overheating.	Replace clutch assembly.
	Insufficient clutch cover diaphragm spring tension	Replace clutch assembly.
CLUTCH DISC FACING CONTAMINATED WITH OIL OR GREASE	Leak at rear main oil seal or transaxle input shaft seal	T355 equipped - Replace leaking seals. Replace clutch assembly. BG6 equipped - Replace leaking seals. Clean the pressure plate and flywheel surface and replace clutch disc.

CONDITION	POSSIBLE CAUSES	CORRECTION
	Excessive amount of grease applied to input shaft splines	T355 equipped - Apply less grease to input shaft. Replace clutch assembly. BG6 equipped - Apply less grease to input shaft. Clean the pressure plate and flywheel surface and replace clutch disc.
	Road splash, water entering housing	Seal housing. Inspect clutch assembly.
	Concentric Slave Cylinder leaking hydraulic fluid	Replace Concentric Slave Cylinder (CSC)
CLUTCH IS RUNNING PARTIALLY DISENGAGED	Release bearing sticking or binding, does not return to normal running position.	Verify that bearing is actually binding. Then, replace bearing and transmission front bearing retainer if sleeve surface is damaged.
	Clutch master cylinder pushrod not adjusted properly (LHD Models), causing high preload.	Verify that pushrod adjustment is correct (LHD Models).
	Slave cylinder binding	Replace slave cylinder
CLUTCH DISC FACINGS HAVE FRACTURED INTO SMALL PIECES	Driver performs a 5-1 downshift at vehicle speed in excess of 60 miles per hour	Alert driver to problem cause. Replace clutch assembly. Inspect slave cylinder, fork, and bearing for damage.
	Leak at rear main or transaxle input shaft seal	T355 equipped - Replace seal. Replace clutch assembly. BG6 equipped - Replace seal. Clean the pressure plate and flywheel surface and replace clutch disc.
	Excessive heat from slippage	Replace Clutch Assembly

IMPROPER CLUTCH RELEASE

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC BINDS ON INPUT SHAFT SPLINES	Clutch disc hub splines damaged during installation	Clean, smooth, and lubricate disc and shaft splines. Replace modular clutch assembly, or clutch disc, and/or input shaft if splines are severely damaged.
	Input shaft splines rough, damaged.	Clean input shaft splines. Then lube.
	Corrosion or rust formations on splines of input shaft and disc	Clean input shaft splines and disc splines, then lube
CLUTCH DISC RUSTED TO FLYWHEEL AND/OR PRESSURE PLATE	Occurs in vehicles stored or not driven for extended period of time. Also occurs after steam cleaning if vehicle is not used for extended period.	Replace clutch assembly.
CLUTCH WILL NOT DISENGAGE PROPERLY	Disc bent, distorted during transaxle installation	Replace clutch assembly.
	Clutch cover diaphragm spring damaged during transaxle installation	Replace clutch assembly.
	Release lever bent, loose, or damaged	Replace release lever if worn or damaged
	Air in clutch hydraulic system.	Bleed clutch hydraulic system to purge air.
	Clutch master cylinder or slave cylinder leaking	Check and replace master and/or slave cylinder

CONDITION	POSSIBLE CAUSES	CORRECTION
	Master cylinder adjustable pushrod loose or damaged	Inspect. Tighten adjustment fastener or replace master cylinder.
	Pushrod not retained to clutch pedal pin.	Inspect pushrod & bushing. Replace as necessary.

CLUTCH PEDAL NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH PEDAL SQUEAKS WHEN DEPRESSED TO FLOOR	Pedal bushings worn out or inadequate lubrication	Replace or lubricate bushings
	Clutch pedal return spring worn out	Lubricate or replace return spring

CLUTCH CHATTER COMPLAINTS

For all clutch chatter complaints, perform the following:

1. Check for loose, misaligned, or broken engine and transmission mounts. If present, they should be corrected at this time. Test vehicle for chatter. If chatter is gone, there is no need to go any further.
2. If chatter persists, check hydraulic clutch release system is functioning properly.
3. Check for loose connections in drivetrain. Correct any problems and determine if clutch chatter complaints have been satisfied. If not:
   a. Remove transaxle.
   b. Check to see if the release bearing is sticky or binding. Replace bearing, if needed.
   c. Check clutch assembly for contamination (dirt, oil). Replace clutch assembly, if required.
   d. Check to see if the clutch disc hub splines are damaged. Replace with new clutch assembly, if necessary.
   e. Check input shaft splines for damage. Replace, if necessary.
   f. Check for uneven wear on clutch fingers.
   g. Check for broken clutch cover diaphragm spring fingers. Replace with new clutch assembly, if necessary.

DRIVE PLATE MISALIGNMENT

Common causes of misalignment are:

- Heat warping
- Mounting drive plate on a dirty crankshaft flange
- Incorrect bolt tightening
- Improper seating on the crankshaft shoulder
- Loose crankshaft bolts

Clean the crankshaft flange before mounting the drive plate. Dirt and grease on the flange surface may misalignment the flywheel, causing excessive runout. Use new bolts when mounting drive plate to crankshaft. Tighten drive plate bolts to specified torque only. Over-tightening can distort the drive plate hub causing excessive runout.

CLASH-INTO-REVERSE COMPLAINTS

All T355 manual transaxles are equipped with a reverse brake. It prevents clash when shifting into reverse, but only if the vehicle is not moving.

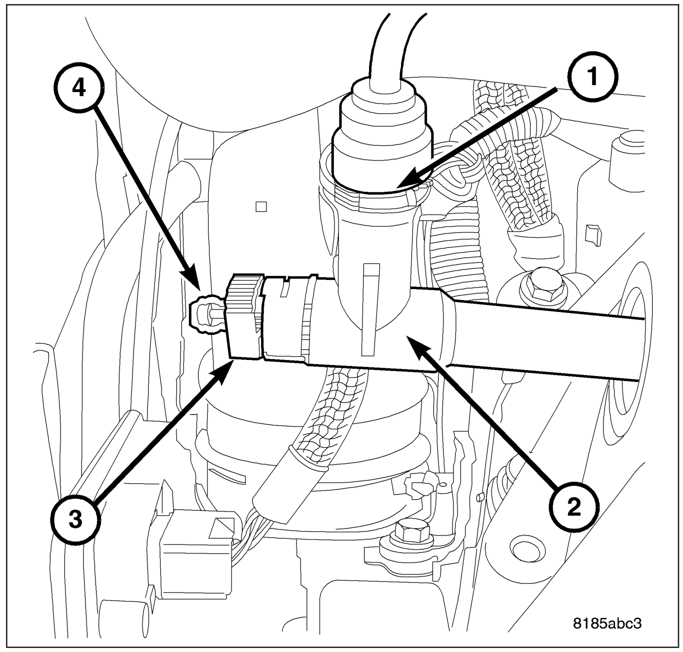
1. Depress clutch pedal to floor and hold. After three seconds, shift to reverse. If clash is present, clutch has excessive spin time, and the reverse brake may not be functioning.
2. Remove transaxle.
3. Check the input shaft spline, clutch disc splines, and release bearing for dry rust. If present, clean rust off and apply a light coat of bearing grease to the input shaft splines. Apply grease on the input shaft splines only where the clutch disc slides. Verify that the clutch disc slides freely along the input shaft spline.

4. Check to see if the clutch disc hub splines are damaged, and replace with new clutch assembly if required.
5. Check the input shaft for damaged splines. Replace as necessary.
6. Check for broken clutch cover diaphragm spring fingers.
7. Install clutch assembly and transaxle.

STANDARD PROCEDURE

GRAVITY BLEEDING CLUTCH HYDRAULIC CIRCUIT

1. Verify fluid level in brake master cylinder. Top off with DOT 3 brake fluid as necessary. Leave cap off.
2. Raise vehicle on hoist.
3. Remove bleed port protective cap and install suitable size and length of clear hose (4) to monitor and divert fluid into suitable container.
4. Open up the bleed circuit by turning the thumb screw (3) counter clockwise this will start the air purge and fluid fill process.
5. Lower vehicle, but only enough to gain access to and fill the brake master cylinder.



NOTE: Do not allow clutch master cylinder to run dry while fluid exits bleed port. If master cylinder runs dry, it is necessary to remove clutch master cylinder, position vertically (with push rod down) for 10 seconds, and reinstall.

6. Top off brake master cylinder fluid level while air is purged and fluid drains from bleed port. Continue this until no air bubbles are seen and a solid column of fluid exists.
7. Close hydraulic bleed circuit, remove drain hose and replace dust cap on bleed port.
8. From driver's seat, actuate clutch pedal 60-100 times.
9. **Apply parking brake.** Start engine and verify clutch operation and pedal feel. If pedal feels fine and clutch operates as designed, stop here. If pedal still feels spongy or clutch does not fully disengage, excessive air is still trapped within the system, most likely at the master cylinder.
10. Top off brake master cylinder fluid level with DOT 3 brake fluid as necessary.

POWER BLEEDING CLUTCH HYDRAULIC CIRCUIT

1. Remove reservoir cap and connect bleeder cap to reservoir.

NOTE: Use Bleeder Cap/Modified reservoir cap adapter Snap-on #901-059 or equivalent

2. Connect service filling machine to bleeder cap.

NOTE: Use Service Filling Machine/Brake power bleeder Brake power bleeder or equivalent

3. Service filling machine should be pressurized to at least 2.5 bar (36 PSI).
4. Remove dust cap from bleeder valve and connect the transparent bleeder hose to bleeder valve.
5. Place the other end of hose in the bleeder container to capture the used fluid. The end of the hose MUST be submerged in the DOT 3 brake fluid.

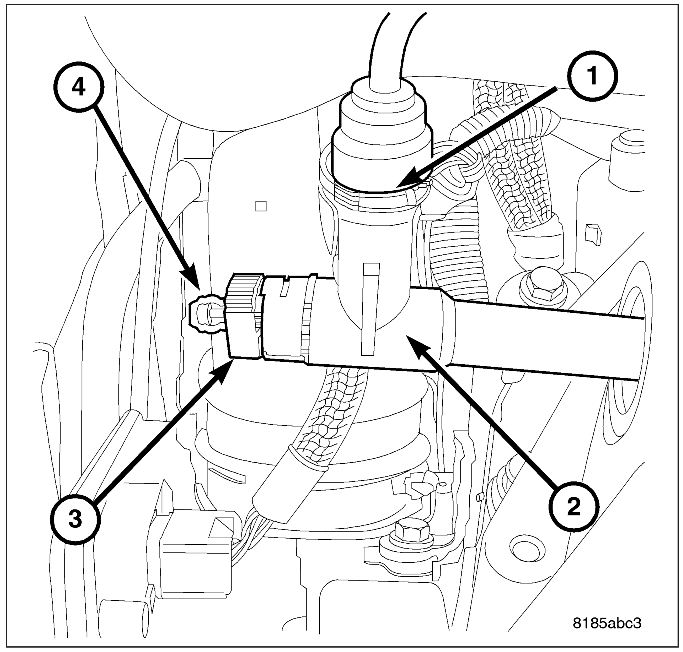
NOTE: Use Bleeder Container To capture hydraulic fluid and Transparent Bleeder Hose To route fluid to container

6. Turn on the service filling machine.

7. Crack open the bleeder valve (3).
8. Allow fluid to flow out of bleed port until no more air bubbles can be seen in the transparent bleeder hose.
9. Once fluid is free of air bubbles; make 15 quick actuations between clutch pedal stop positions.
10. Close the bleeder valve and disconnect the service filling machine.
11. To remove remaining air, actuate pedal 10 times slowly between pedal stop positions.

NOTE: Pedal load should be approximately 25 lbs. For gas vehicles, reserve should not be below 30 mm.For diesel vehicles, reserve should not be below 40 mm.

12. Check clutch pedal to see if vehicle is properly bled.
13. If vehicle is not properly bled, repeat procedure.
14. Remove bleeder cap from reservoir and replace reservoir cap.
15. Disconnect transparent bleeder hose from bleeder valve and replace dust cap.



SPECIFICATIONS

CLUTCH/HYDRAULICS/PEDALS

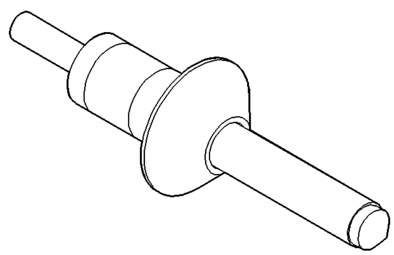
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake/Clutch Pedal & Booster-to-Dash Nuts	34	-	300
Brake/Clutch Pedal Assembly-to-Instrument Panel	34	-	300
Pressure Plate-to-Flywheel Bolts	28	23	250
Clutch Pedal Pivot Shaft Nut	42	31	-
Damper-to-Transaxle Nuts	24	-	215
Driveplate-to-Crankshaft Bolts	95	70	-
Flywheel-to-Crankshaft Bolts Gas	95	70	-
Flywheel-to-Crankshaft Bolts Diesel	45	33	-
Master Cylinder Pushrod Adj. Screw (LHD Models)	6	-	55
Modular Clutch-to-Drive Plate Bolts	88	65	-
Master Cylinder Mounting Nuts (LHD)	15	-	130

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Master Cylinder Reservoir Mounting bolts (LHD)	11	-	115
Master Cylinder Reservoir Mounting Screw (RHD)	3	-	24
Slave Cylinder-to-Transaxle (2.0/2.4L Models)	12	-	105
Slave Cylinder-to-Transaxle (2.0/2.4L Models)	19	-	168
Transaxle-to-Engine Mounting Bolts	95	70	-

SPECIAL TOOLS

HYDRAULIC CLUTCH



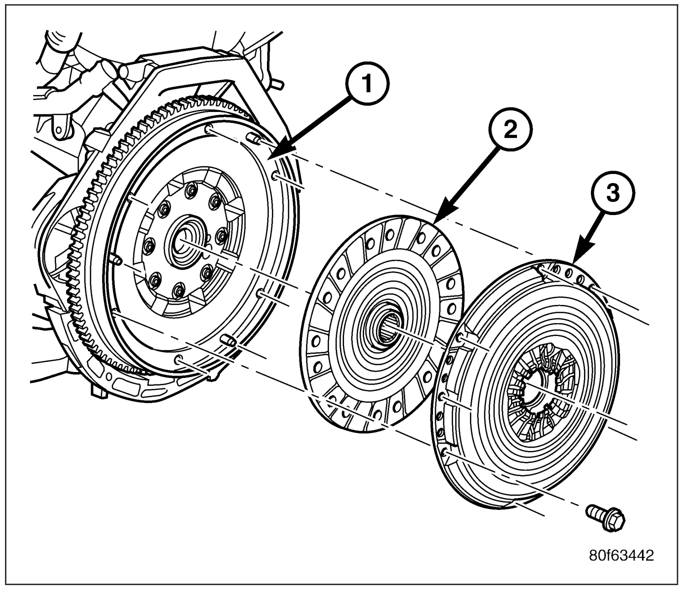
Clutch Disc Alignment Tool - 6724

PLATE-CLUTCH DISC AND PRESSURE

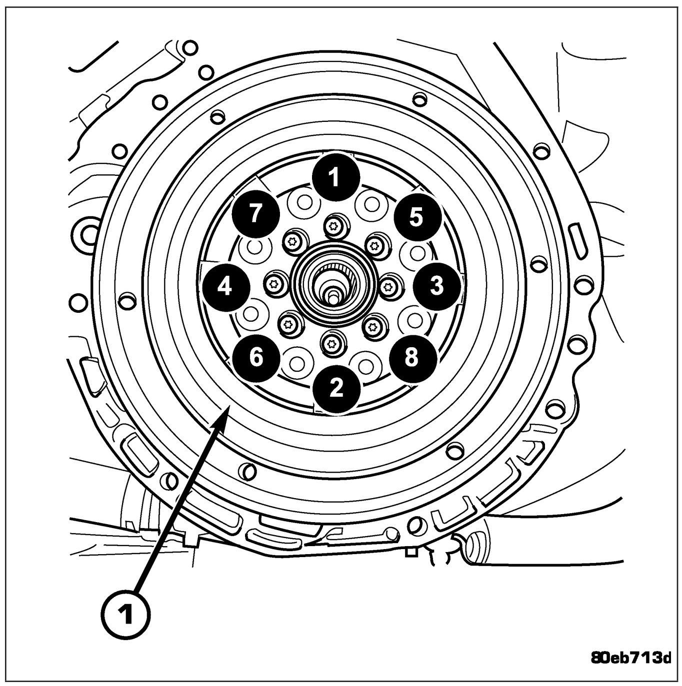
REMOVAL

DIESEL

1. Remove transaxle assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL).
2. Mark position of pressure plate (3) on flywheel (1) with paint or scribe for assembly reference.
3. Loosen and remove six pressure plate-to-flywheel bolts. Remove pressure plate (3) and clutch disc (2).

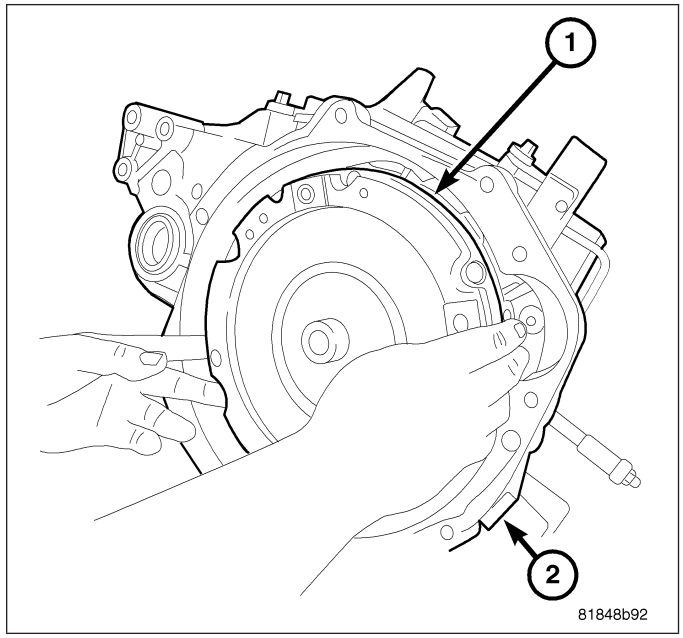


4. Remove eight flywheel-to-crankshaft bolts and remove flywheel assembly (1).



GAS

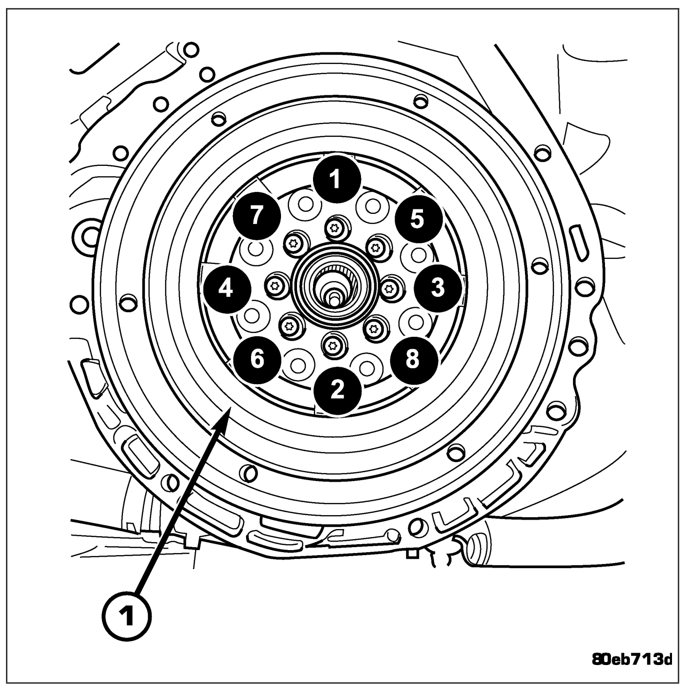
1. Remove transaxle assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL).
2. Remove the modular clutch assembly (1).



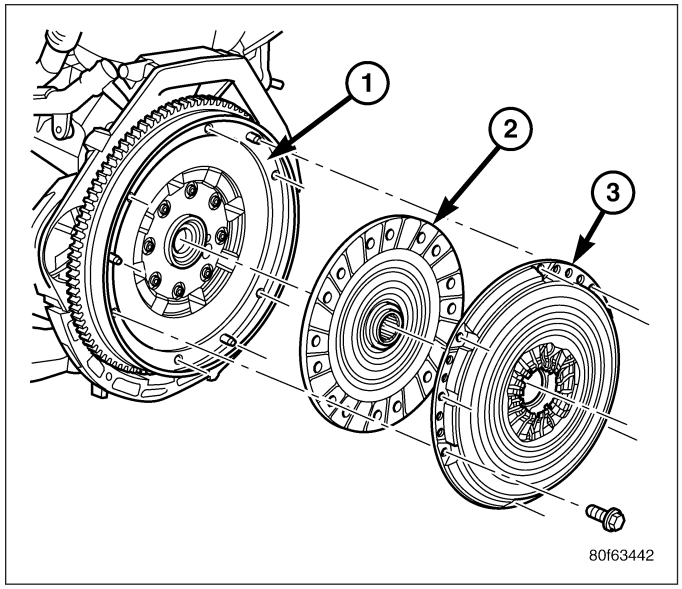
INSTALLATION

DIESEL

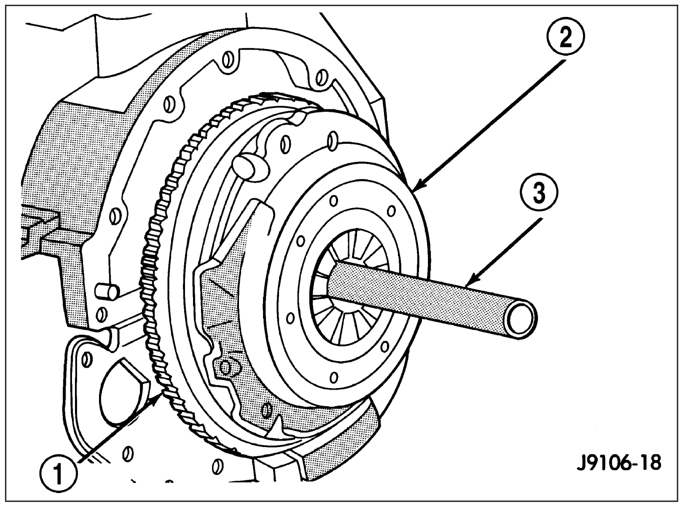
1. Inspect clutch release bearing and lever for excessive wear and replace as necessary. The release bearing is integral to the Concentric Slave Cylinder (CSC).
2. Clean the surfaces of the flywheel (1) and pressure plate to make certain that all oil, grease, and rust have been removed.
3. Verify the crankshaft mounting flange is free of debris, oil, grease, etc. Position the flywheel (1) onto the engine crankshaft.
4. Install flywheel to crankshaft. Install eight (8) flywheel-to-crankshaft bolts and torque to 45 N·m (33 ft. lbs.) plus an additional ¼ turn (90°).



5. Apply a very light coating of grease to the splines in the clutch disc hub.
6. Position the clutch disc (2) to the flywheel (1). Make sure the side marked “FLYWHEEL SIDE” faces the flywheel (1).
7. Install the clutch pressure plate (1) to the flywheel and clutch disc. Finger tighten the six pressure plate-to-flywheel bolts.



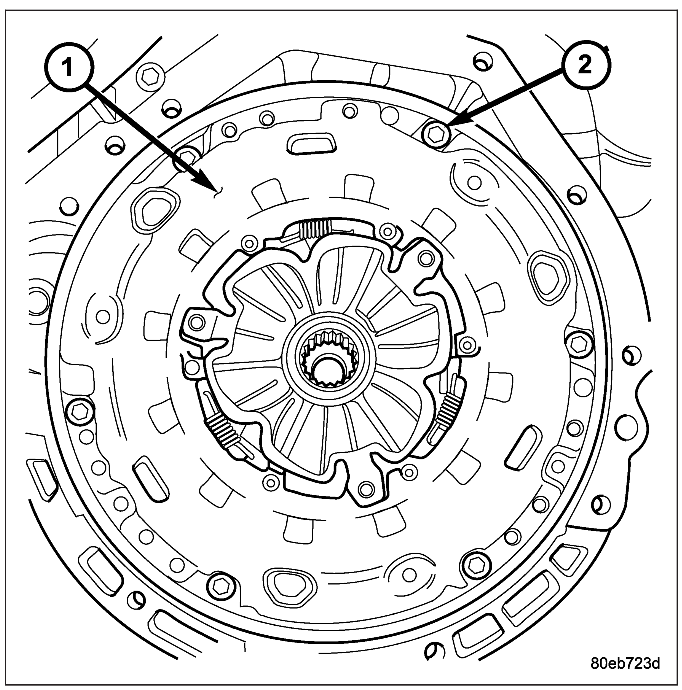
8. Use Clutch Alignment Tool 6724 (3) to position the clutch disc (2) to the center of the flywheel (1).



9. Tighten pressure plate bolts (2) evenly and in rotation a few threads at a time **The bolts must be tightened evenly and to specified torque to avoid distorting the pressure plate.**
10. Using a “criss-cross” pattern, torque pressure plate bolts (2) to 31 N·m (23 ft. lbs.). Remove the clutch disc alignment tool.
11. Apply light coat of MOPAR® High Temperature Bearing Grease or equivalent to clutch disc hub and splines of transmission input shaft.

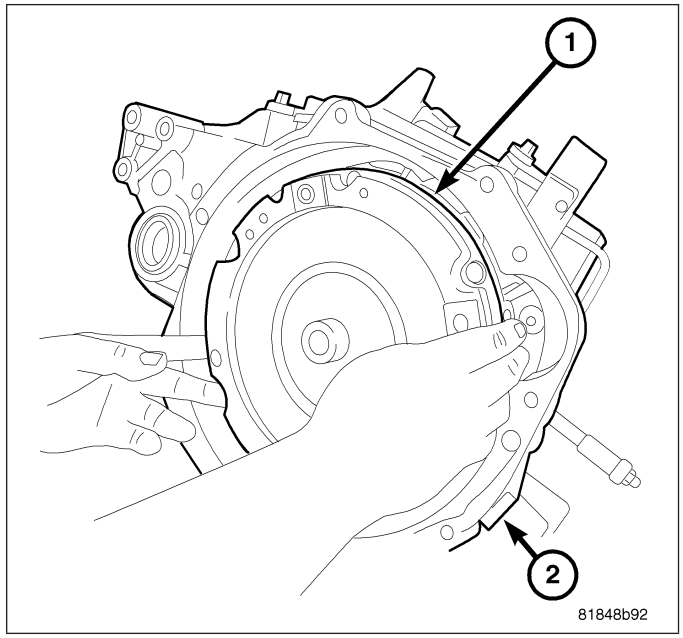
CAUTION: Do not over lubricate shaft splines. This will result in grease contamination of disc.

12. Install transaxle (Refer to 21 - TRANSMISSION/ TRANSAXLE/MANUAL - INSTALLATION).



GAS

1. Install new modular clutch assembly onto input shaft of transmission.
2. Install the transmission (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - INSTALLATION)



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FLYWHEEL

OPERATION

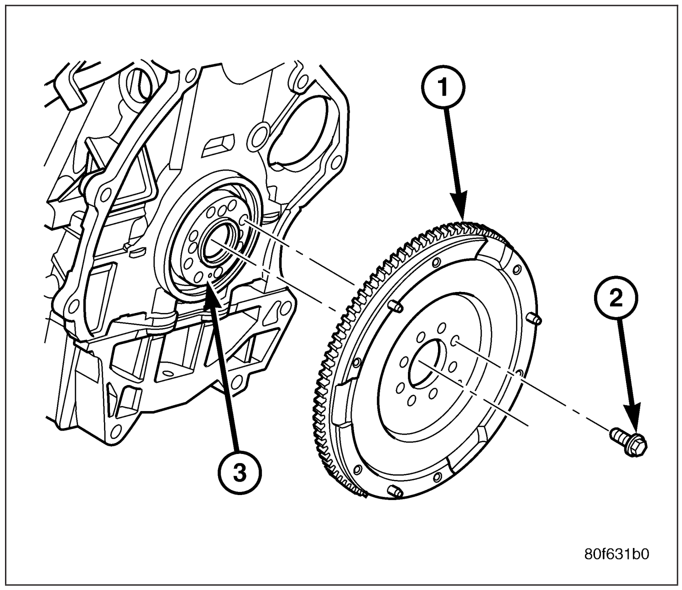
The flywheel serves to dampen the engine firing pulses. The heavy weight of the flywheel relative to the rotating mass of the engine components serves to stabilize the flow of power to the remainder of the drivetrain. The crankshaft has the tendency to attempt to speed up and slow down in response to the cylinder firing pulses. The flywheel dampens these impulses by absorbing energy when the crankshaft speeds and releasing the energy back into the system when the crankshaft slows down.

On a Dual Mass Flywheel, the additional secondary mass coupled to the transmission lowers the natural frequency of the transmission rotating elements. This decreases the transmission gear rattle. The damper springs between the two flywheel masses replace the clutch disc damper springs and assist in a smooth transfer of torque to the transmission.

CAUTION: The Dual Mass Flywheel is serviced as an assembly only and should never be disassembled.

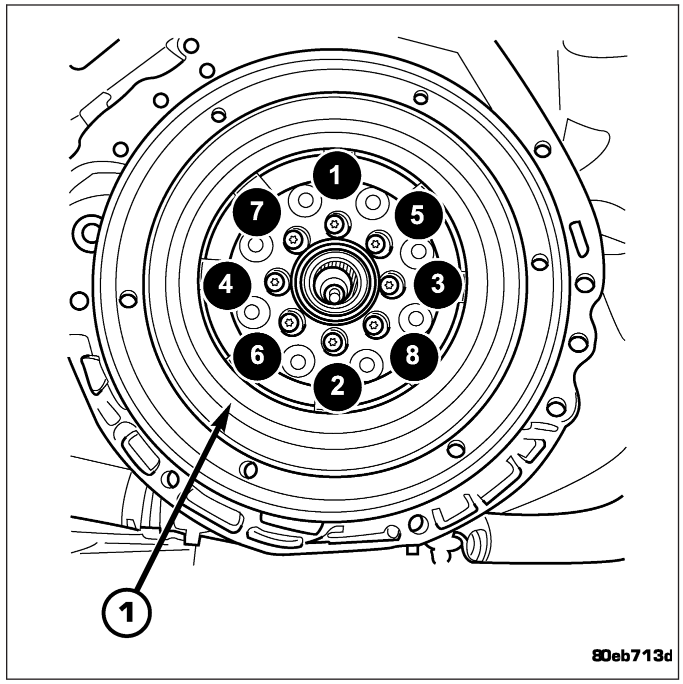
REMOVAL

1. Remove transaxle (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL).
2. Remove clutch pressure plate and disc (Refer to 6 - CLUTCH/CLUTCH DISC - REMOVAL).
3. Remove eight (8) flywheel-to-crankshaft bolts (2) and remove flywheel assembly (1).



INSTALLATION

1. Clean the surfaces of the flywheel and pressure plate to make certain that all oil, grease, and rust have been removed.
2. Install and torque the flywheel-to-crankshaft bolts to 95 N·m (70 ft.lbs.).
3. Install clutch pressure plate and disc (Refer to 6 - CLUTCH/CLUTCH DISC - INSTALLATION).
4. Install transaxle assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - INSTALLATION).

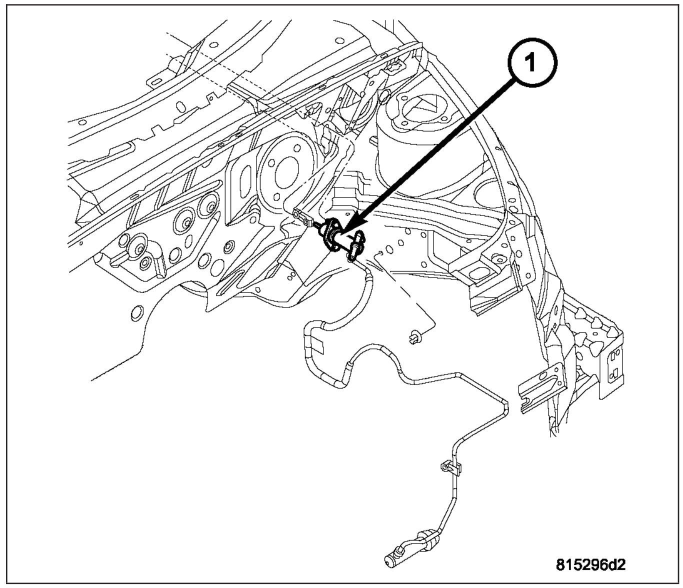


CYLINDER-MASTER-LHD

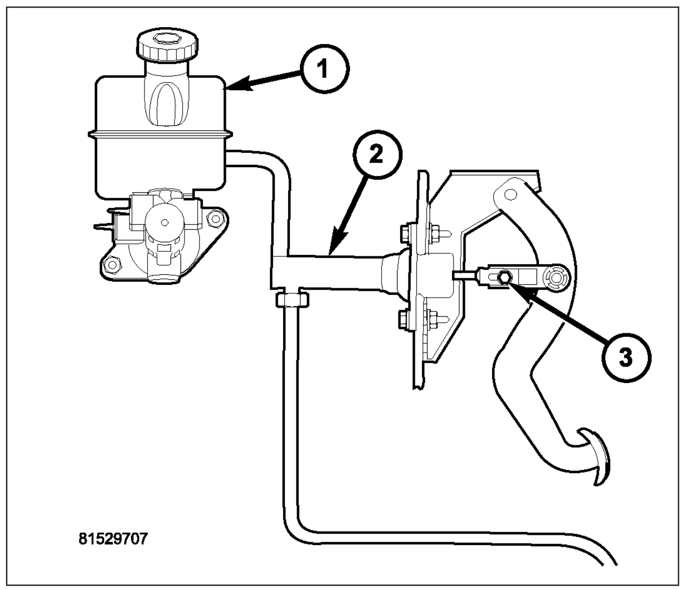
DESCRIPTION

CAUTION: The clutch master cylinder (1) pushrod adjustment must not be used to change pedal freeplay or pedal height. Using the adjustable pushrod for these reasons will result in premature clutch wear or system over/undertravel.

NOTE: The clutch master cylinder/hydraulic release system does not have its own reservoir. This system is supplied fluid from the brake master cylinder reservoir.



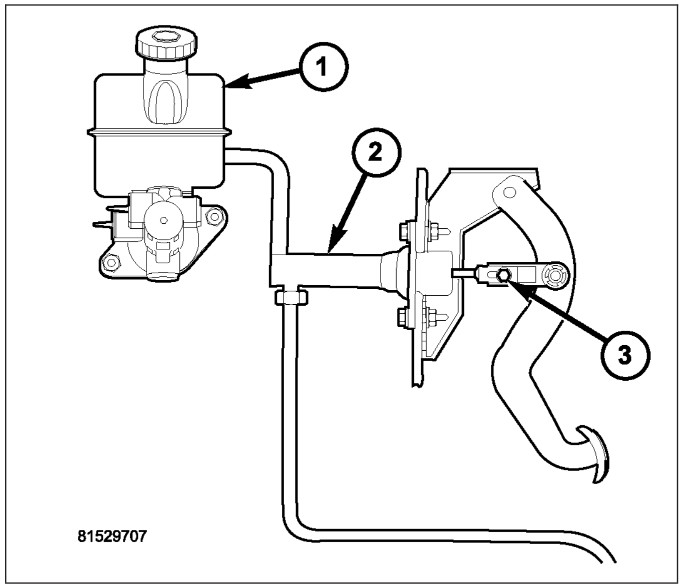
The clutch master cylinder (1) mounts to the dash panel and consists of a push rod (adjustable (3) on LHD models), a piston and cylinder housing, an interconnecting hydraulic tube and a supply hose which connects to the brake master cylinder reservoir (1) for fluid supply.



OPERATION

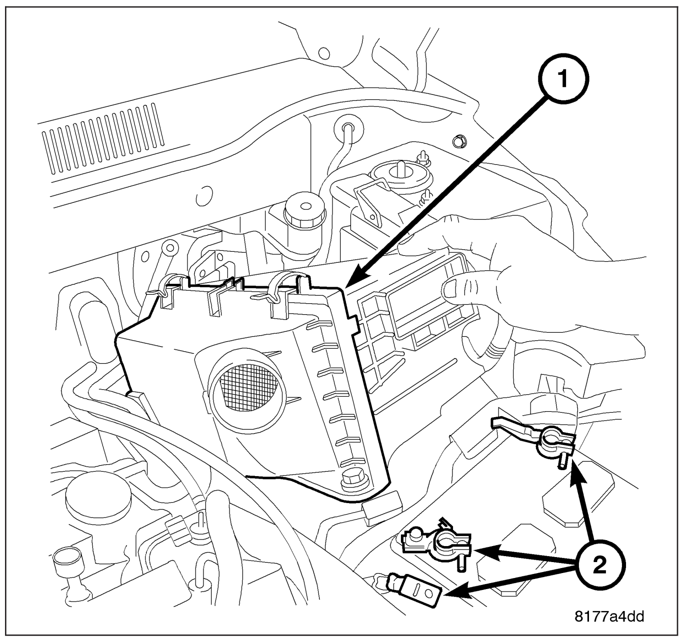
When the clutch pedal is depressed, the push rod moves the piston in the master cylinder (2), displacing fluid through the hydraulic line and into the slave cylinder. As the slave cylinder extends, the release bearing is forced into the fingers of the clutch diaphragm springs. As the fingers move, they release the clamping pressure on the clutch disc between the clutch pressure plate and the flywheel. The clutch becomes disengaged as this pressure is released.

When the clutch pedal is released, the system hydraulic pressure is released. This allows the force of the clutch diaphragm springs to return to their original position, re-clamping the clutch disc between the flywheel and the clutch pressure plate. Also, the release bearing and lever are forced to return, which reverses the movement of the hydraulic system and returns the pedal to its original position against the up-stop.

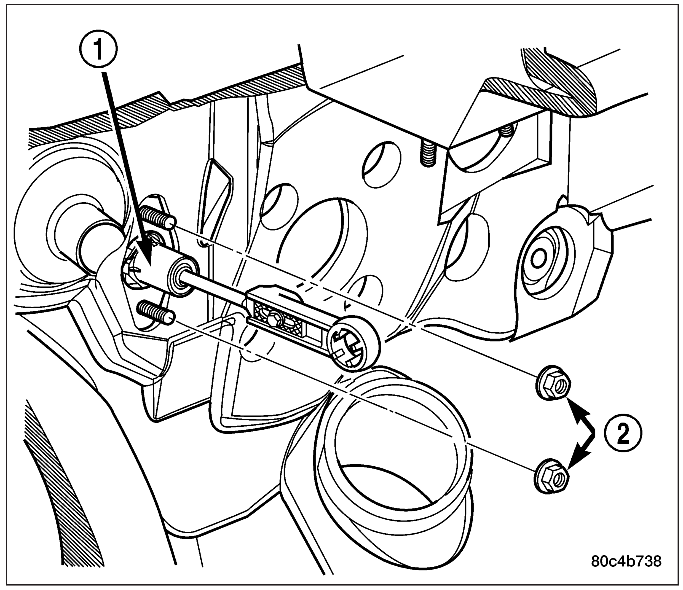


REMOVAL

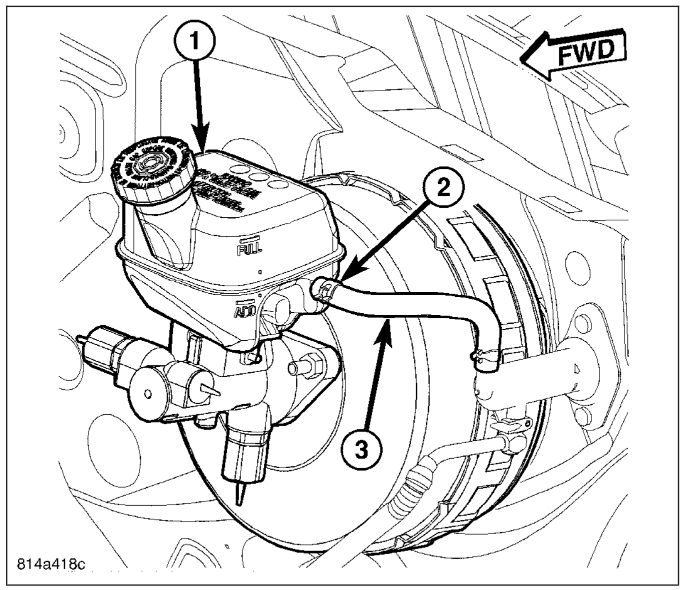
1. Remove the engine cover.
2. Remove air cleaner assembly (1).
3. Disconnect battery negative cable (2).
4. Remove lower instrument panel bezel.



5. Remove two clutch master cylinder retaining nuts (2).
6. Disconnect hydraulic supply tube at clutch slave cylinder. To completely drain clutch master cylinder and tubing, remove brake master cylinder cap.
   a. Disconnect tube and drain fluid into suitable container.
   b. Lower vehicle.



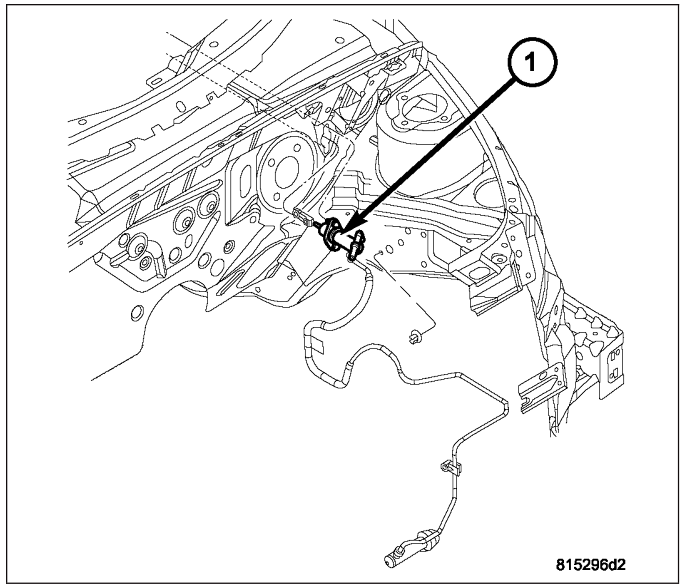
7. Disconnect clutch master cylinder supply line from brake master cylinder reservoir (1). Cap off or collect fluid spillage from reservoir port.



CAUTION: Use care when removing clutch master cylinder from engine compartment. Aggressive handling can result in a damaged hydraulic tube and improper clutch release operation upon reassembly.

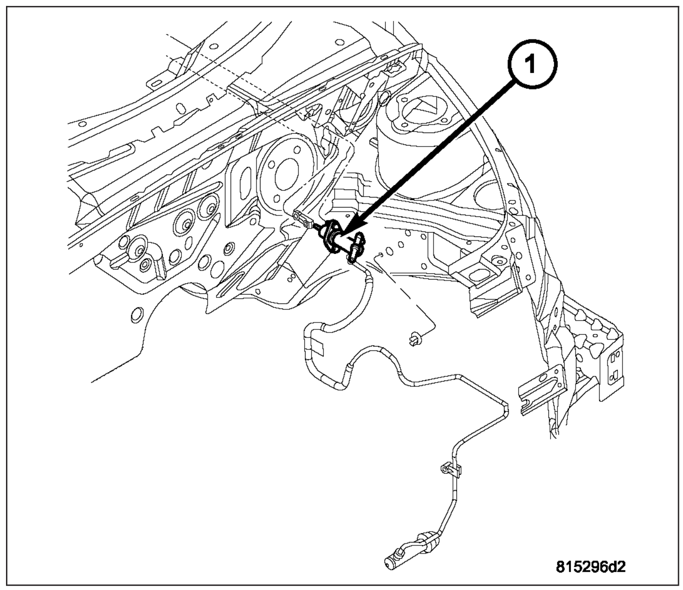
CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.

8. Remove master cylinder assembly (1) from mounting position and carefully work hydraulic pipe from out of left rail retainer and engine compartment.

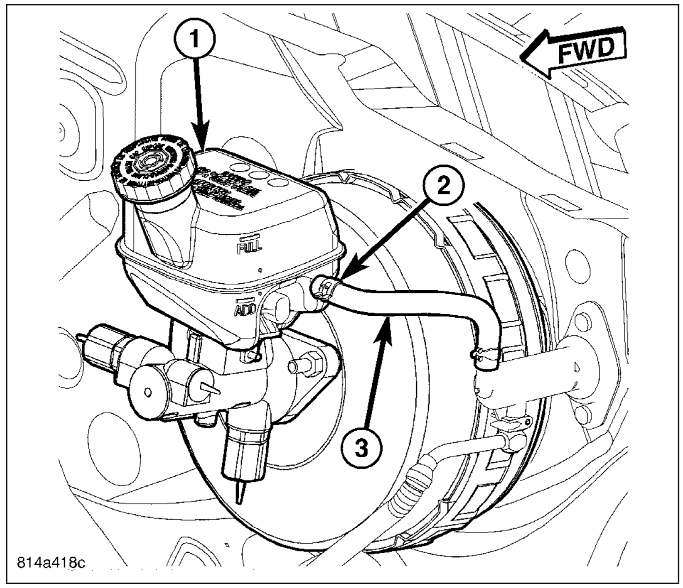


INSTALLATION

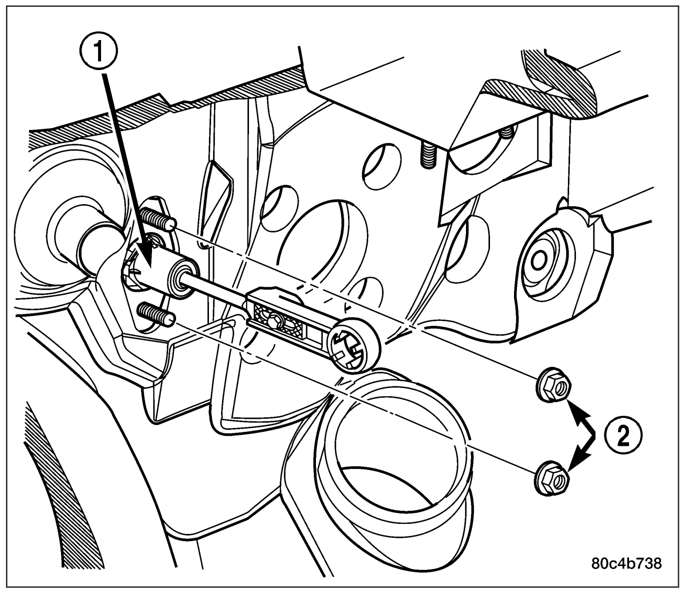
1. Install clutch master cylinder (1)
2. Insert tube into slave cylinder port and verify connection by pulling outward.



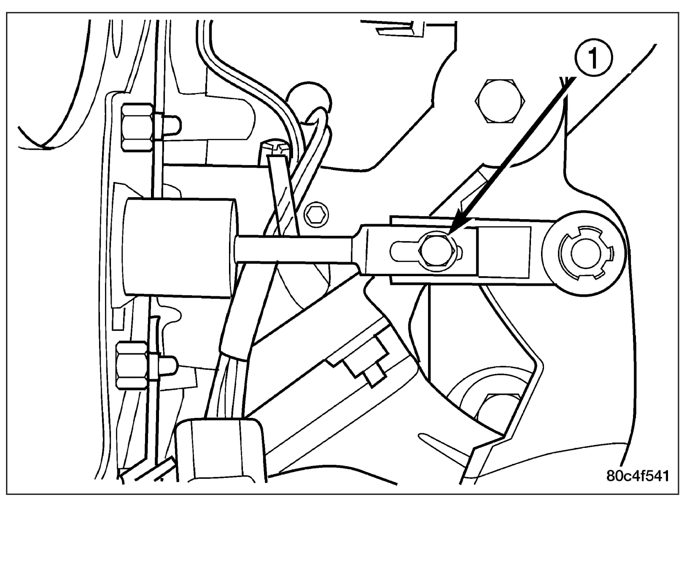
3. Connect clutch master cylinder supply hose to brake master cylinder reservoir.



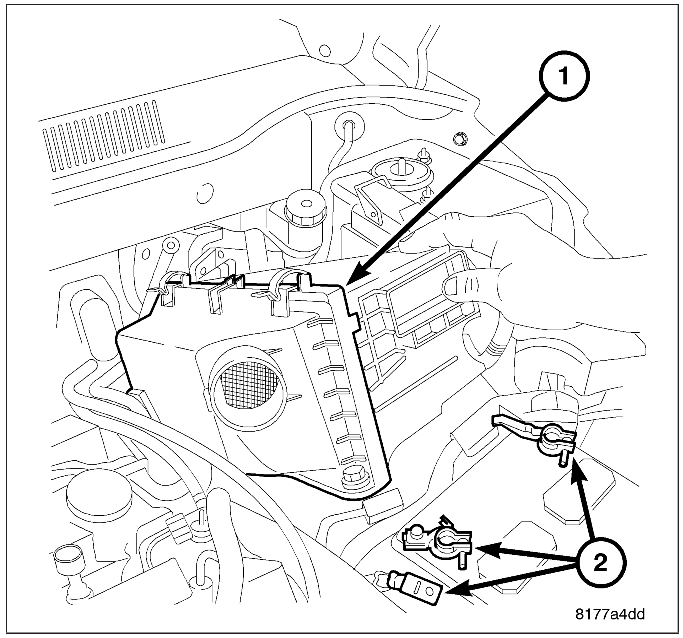
CAUTION: Due to clutch master cylinder design and placement, the master cylinder body traps a significant amount of air which does not purge by means of normal methods. It is necessary to position master cylinder body vertical, with pushrod pointing down, for about ten seconds to purge air trapped from end of cylinder. Failure to perform this step upon assembly will result in inadequate system bleeding and poor release system functionality.



4. Verify that brake master cylinder reservoir is full and cap is off.
5. Position clutch master cylinder body vertically, with pushrod pointing down, for about ten seconds to purge air trapped from end of cylinder.
6. Install clutch master cylinder body to dash panel. From inside vehicle, install and torque two clutch master cylinder-to-dash panel retaining nuts (2) to 15 N·m (130 in. lbs.) torque.
7. Loosen master cylinder pushrod adjustment screw (1).
8. Connect clutch master cylinder rod to clutch pedal pin. An audible “click” should be heard. If damaged, replace nylon retainer.
9. Adjust clutch pedal position. Gently lift upward on clutch pedal. Tighten adjustment screw to 6 N·m (55 in. lbs.) torque.
10. Install lower instrument panel bezel (2).



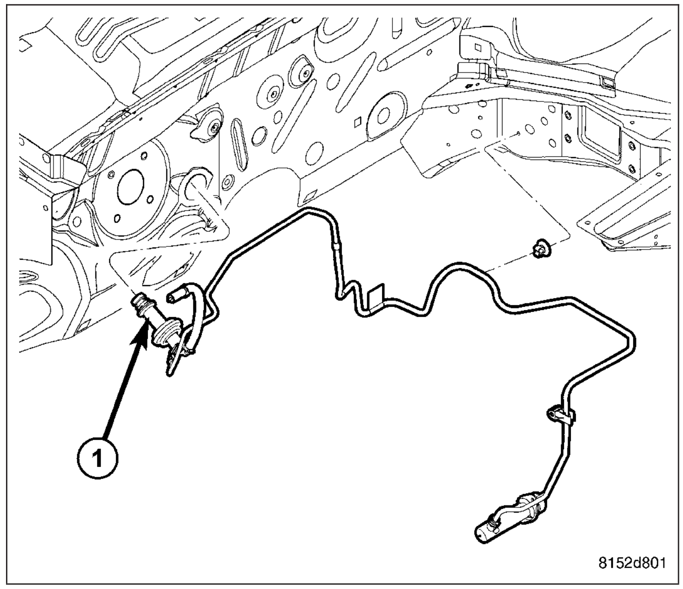
11. Connect battery negative cable.
12. Install air cleaner assembly (1).
13. Verify that brake master cylinder reservoir is full. Top off with DOT 3 brake fluid if necessary.
14. Bleed clutch system (Refer to 6 - CLUTCH - STANDARD PROCEDURE).
15. Actuate clutch pedal a minimum of fifty times to allow any air ingested into the system to vent to the master cylinder reservoir. If residual air becomes trapped in the system, it is necessary to bleed the clutch hydraulic system.
16. Verify proper clutch release system operation.



CYLINDER-MASTER-RHD

DESCRIPTION

The clutch master cylinder (1) mounts to the dash panel and consists of a piston and cylinder housing, an actuating push rod, and an interconnecting hydraulic tube. Fluid is supplied to the clutch master cylinder via the brake master cylinder reservoir.



OPERATION

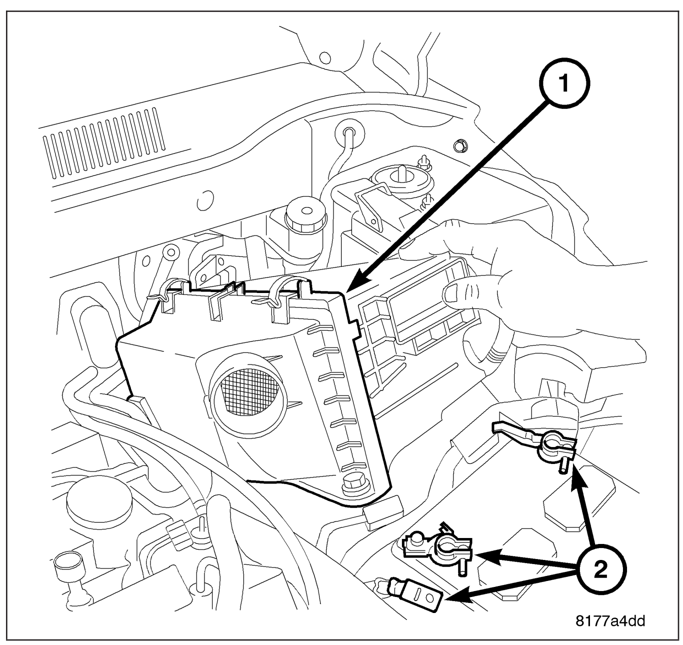
When the clutch pedal is depressed, the push rod moves the piston in the master cylinder, displacing fluid through the hydraulic line and into the slave cylinder. As the slave cylinder extends, actuating the clutch release lever, the release bearing is forced into the fingers of the clutch diaphragm springs. As the fingers move, they release the clamping pressure on the clutch disc between the clutch pressure plate and the flywheel. The clutch becomes disengaged as this pressure is released.

When the clutch pedal is released, the system hydraulic pressure is released. This allows the force of the clutch diaphragm springs to return themselves to their original position, re-clamping the clutch disc between the flywheel and the clutch pressure plate. Also, the release bearing and lever are forced to return, which reverses the movement of the hydraulic system and returns the pedal to its original position against the upstop.

REMOVAL

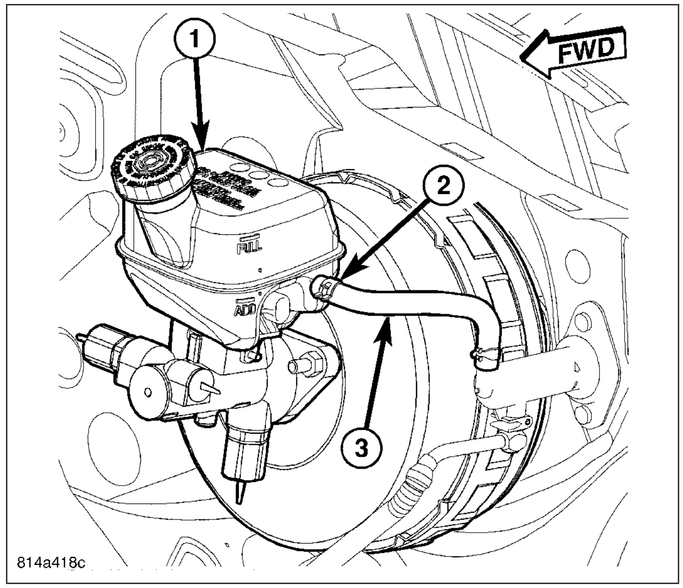
1. Remove the engine cover.
2. Remove air cleaner assembly (1).
3. Disconnect battery negative cable.

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.



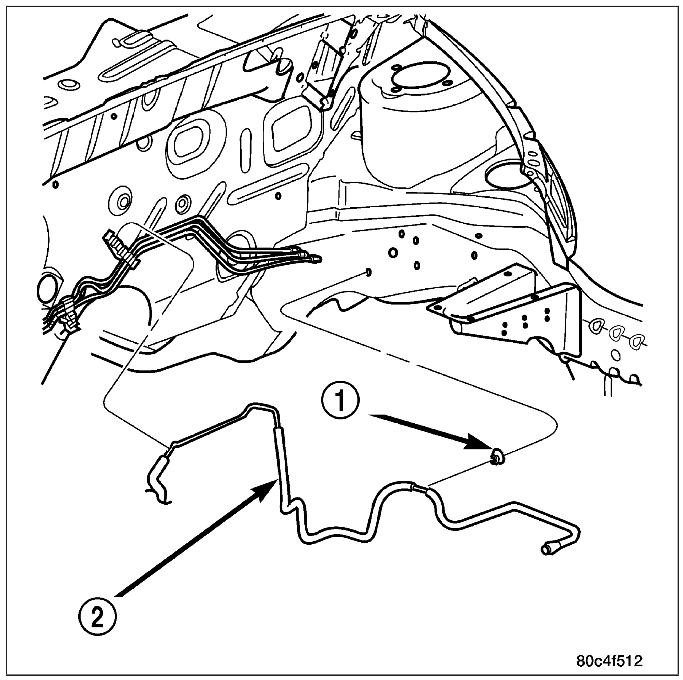
4. Disconnect hydraulic supply tube at clutch slave cylinder. To completely drain clutch master cylinder and tubing, remove brake master cylinder cap.
5. Disconnect hydraulic tube and drain fluid into suitable container. Lower vehicle.
6. Remove instrument panel bezel.
7. Disconnect clutch master cylinder pushrod from clutch pedal. **Inspect retainer bushing and replace if damaged in any way.**

8. Disconnect clutch master cylinder supply line from brake master cylinder reservoir, Cap off or collect reservoir fluid spillage.



9. Remove hydraulic tube from left rail retainer.

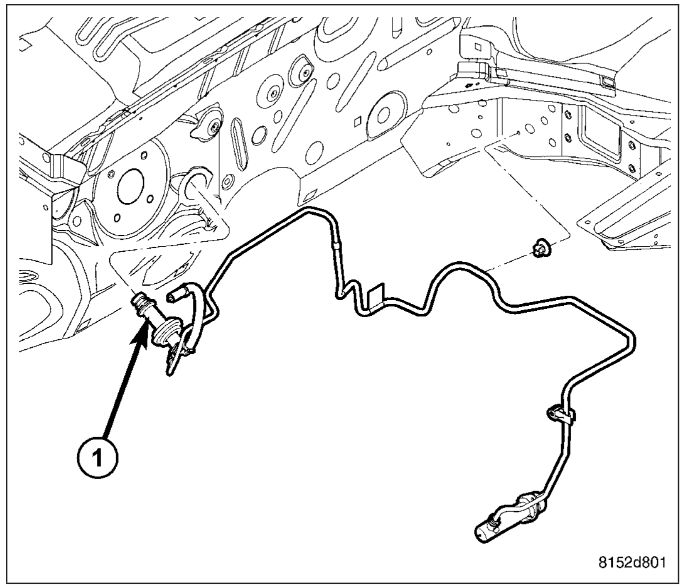
CAUTION: Use care when removing clutch master cylinder from engine compartment. Aggressive handling can result in a damaged hydraulic tube and improper clutch release operation upon reassembly.



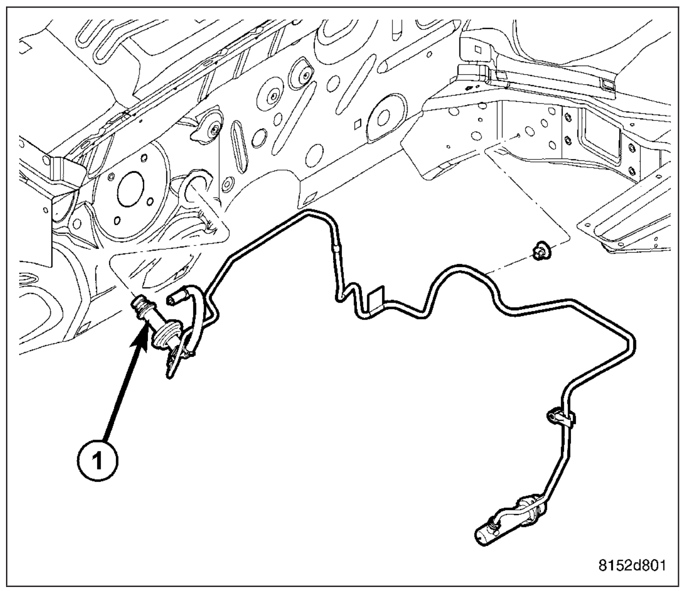
10. Disengage master cylinder grommet and slide back.
11. Release master cylinder by rotating to disengage from pedal bracket assembly.

CAUTION: Use care when removing clutch master cylinder from engine compartment. Aggressive handling can result in a damaged hydraulic tube and improper clutch release operation upon reassembly.

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.

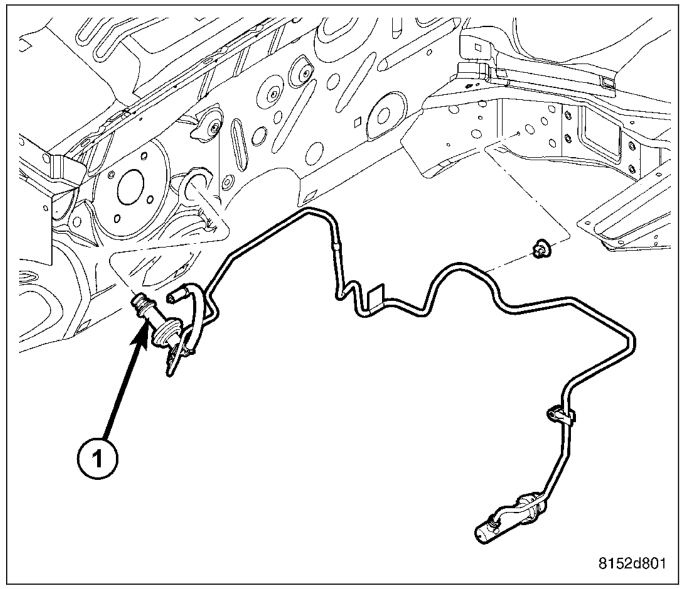


12. Remove master cylinder assembly from mounting position and carefully work hydraulic pipe from out of engine compartment.

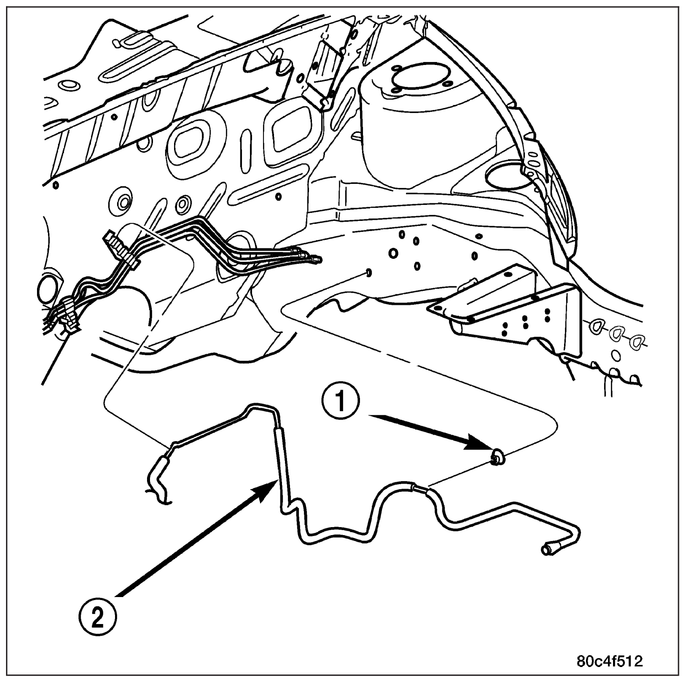


INSTALLATION

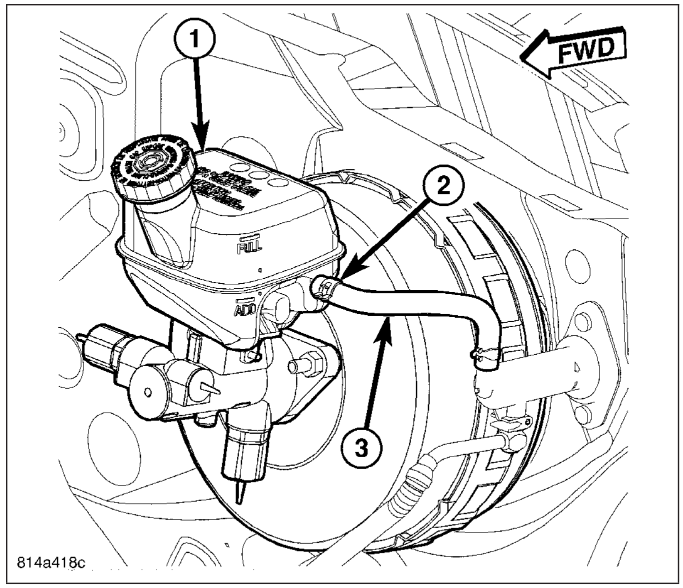
1. Install clutch master cylinder (1) into position **but do not fasten to brake pedal bracket at this time.** Carefully route hydraulic pipe into position as removed.



2. Fasten hydraulic supply tube to retainer (1) at left rail.
3. Connect hydraulic supply tube to clutch slave cylinder:
4. Raise vehicle on hoist. Insert tube into slave cylinder port.
5. Lower vehicle.

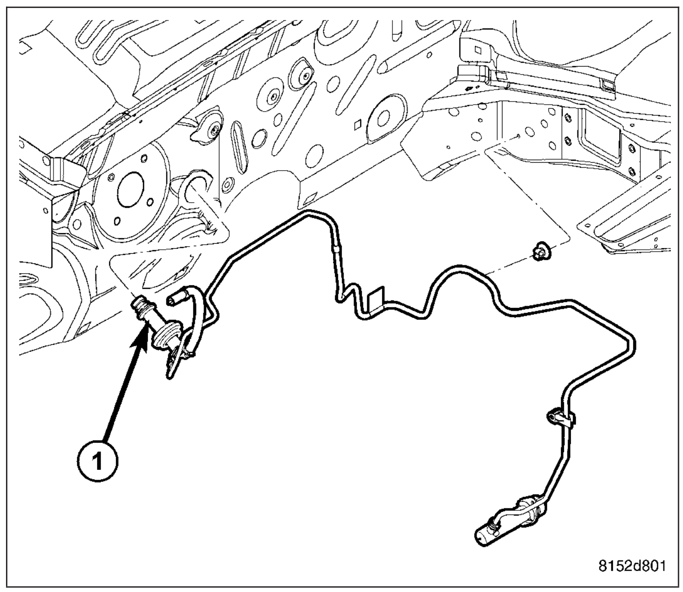


6. Connect clutch master cylinder supply hose (3) to brake master cylinder reservoir (1) and secure with clamp (2).
7. Fill brake master cylinder to the top with suitable DOT 3 fluid. Leave cap off. Raise vehicle on hoist.
8. Remove bleed port protective cap, and install suitable size and length of clear hose to monitor and divert fluid into suitable container.

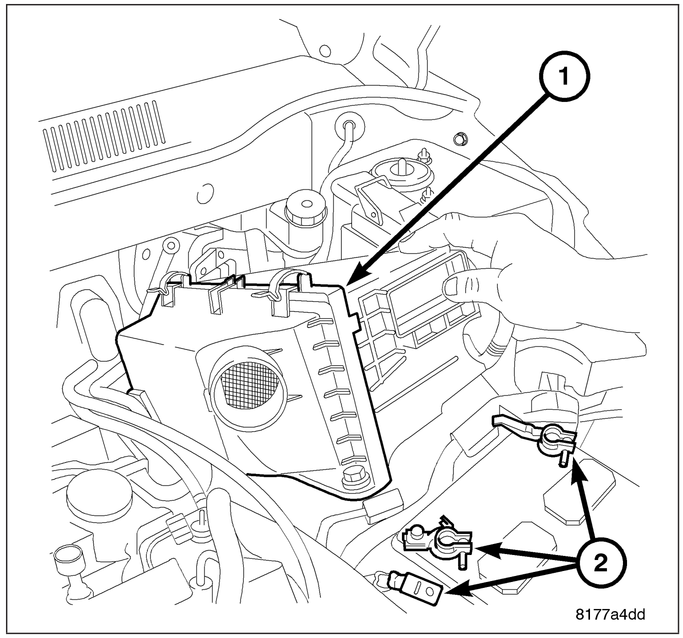


CAUTION: Due to clutch master cylinder design and placement, the master cylinder body traps a significant amount of air which does not purge by means of normal methods. It is necessary to position master cylinder body vertical, with pushrod pointing down, for about ten seconds to purge air trapped from end of cylinder. Failure to perform this step upon assembly will result in inadequate system bleeding and poor release system functionality.

9. Verify that brake master cylinder reservoir is full and cap is off.
10. Remove clutch master cylinder body from dash panel. Position master cylinder body vertically, with pushrod pointing down, for about ten seconds to purge air trapped from end of cylinder. Install brake master cylinder cap.
11. Install clutch master cylinder body.
12. From inside vehicle, connect clutch master cylinder rod to clutch pedal pin. An audible “click” should be heard. If damaged, replace nylon retainer.
13. Install and torque clutch master cylinder-to-dash panel nuts to 34 N·m (300 in.lbs.). Install push rod retaining clip (1).
14. Install lower instrument panel bezel.
15. Install PDC bracket into position.
16. Raise vehicle on hoist.
17. Connect battery negative cable.



18. Install air cleaner assembly (1).
19. Verify that brake master cylinder reservoir is full. Top off with DOT 3 brake fluid if necessary.
20. Actuate clutch pedal a minimum of fifty times to allow any air ingested into the system to vent to the master cylinder reservoir. If residual air becomes trapped in the system, it is necessary to bleed the clutch hydraulic system (Refer to 6 - CLUTCH - STANDARD PROCEDURE).
21. Verify proper clutch release system operation.

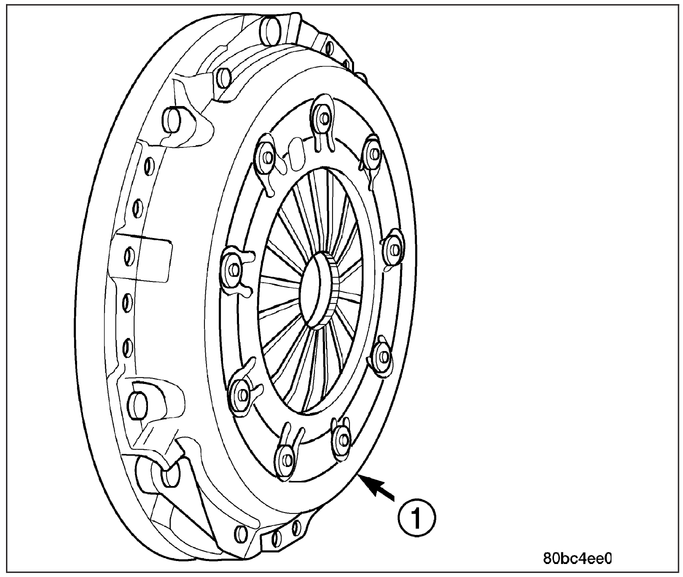


CLUTCH-MODULAR

DESCRIPTION

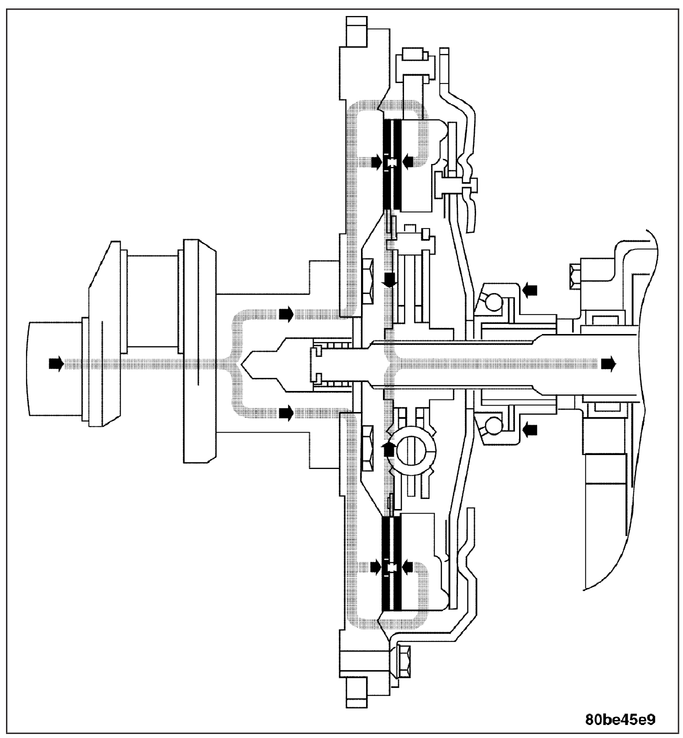
The modular clutch assembly (1) is located between the engine and manual transaxle in the transaxle bell-housing, and is responsible for transmitting engine power to the transaxle. The modular clutch is an assembly which incorporates a self-adjusting design and consists of the following components:

- Flywheel
- Clutch Disc
- Pressure Plate
- Diaphragm Spring
- Adjusting Ring
- Sensor
- Cover

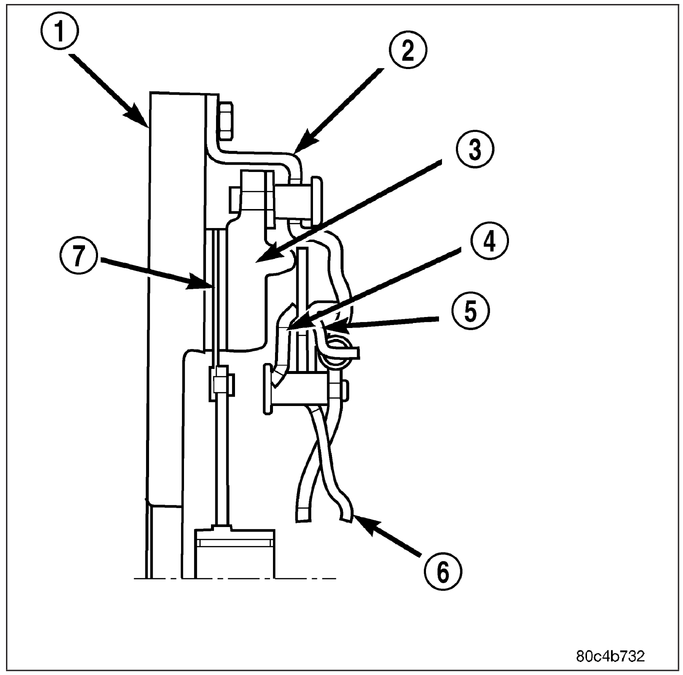


OPERATION

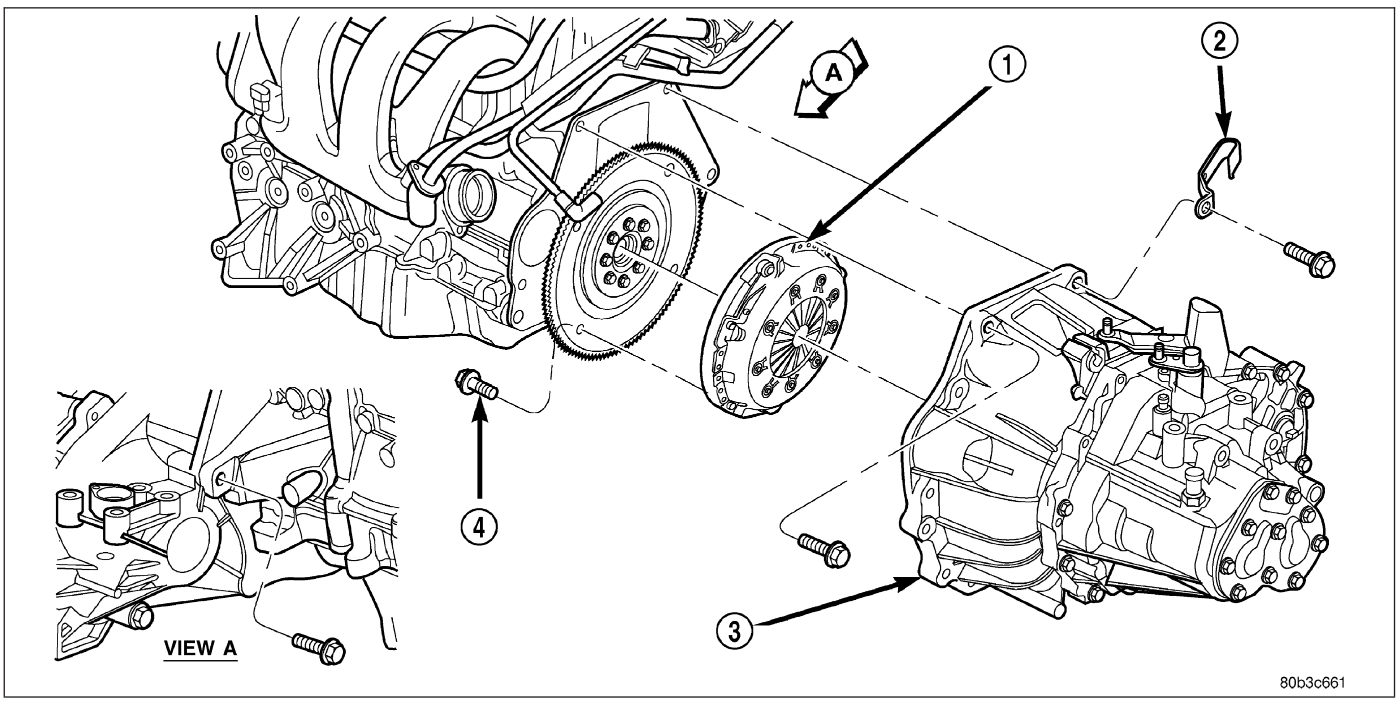
The modular clutch assembly is designed to transmit power from the engine to the manual transaxle. This is accomplished by the friction and clamping force generated when the spring loaded pressure plate locks the clutch disc to the flywheel. The clutch disc, which is splined to the transaxle input shaft, transmits power until the center of the diaphragm spring is depressed, and the clamp force is removed from the disc.



The self-adjusting feature of this clutch assembly relies on the sensor ring (4) and the adjuster ring (5), which works its way around a ramped clutch cover (2), taking up clearance as the clutch disc wears and maintaining diaphragm spring force throughout the life of the clutch. The primary benefits of this design are reduced pedal effort, constant release load over clutch life, and extended clutch life.

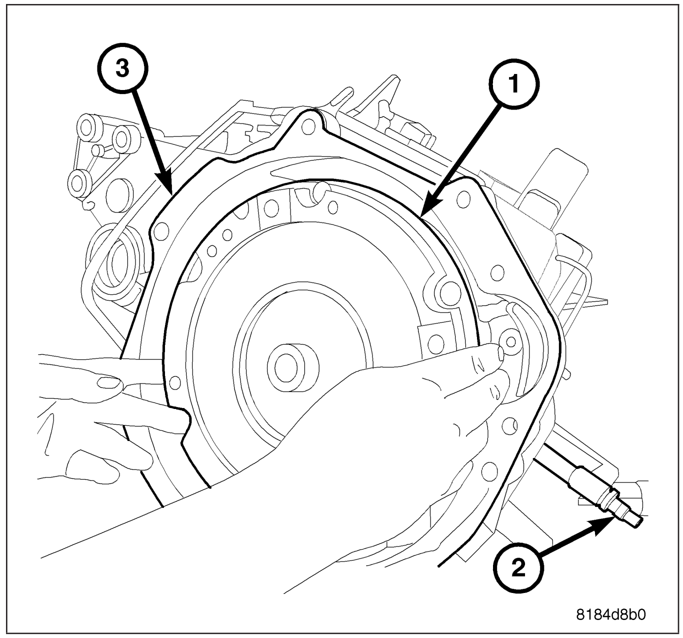


REMOVAL

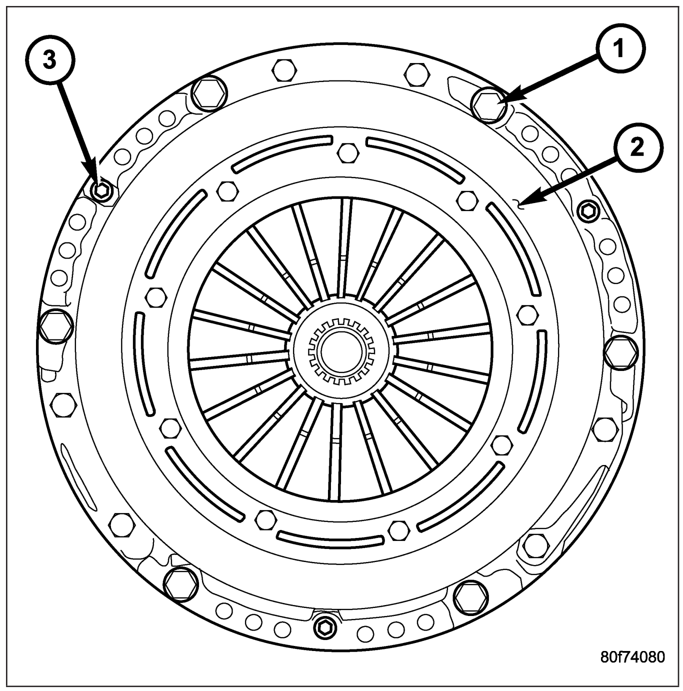


1. Remove transaxle (3) from vehicle (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL).

2. Remove modular clutch assembly (1) from transaxle input shaft.



3. Disassemble modular clutch assembly (If individual parts are available). Remove six pressure plate-to-flywheel bolts (1).Remove pressure plate (2) and disc from flywheel.



INSPECTION

Fluid contamination is a frequent cause of clutch malfunctions. Oil, grease, water, or other fluids on the clutch contact surfaces will cause faulty operation.

During inspection, note if any components are contaminated. Look for evidence of oil, grease, or water/road splash on clutch components.

OIL CONTAMINATION

Oil contamination indicates a leak at the rear main seal and/or transaxle input shaft. Oil leaks produce a residue of oil on the transaxle housing interior, clutch cover and flywheel. Heat buildup caused by slippage can bake the oil residue onto the components. This glaze-like residue ranges in color from amber to black.

GREASE CONTAMINATION

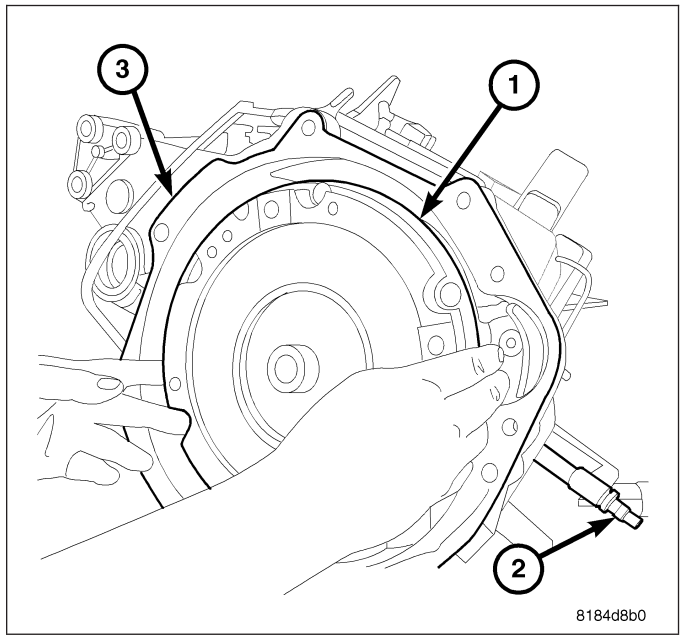
Grease contamination is usually a product of over-lubrication. During clutch service, apply only a small amount of grease to the input shaft splines. Excess grease may be thrown off during operation, contaminating the disc.

ROAD SPLASH/WATER CONTAMINATION

Road splash contamination is usually caused by driving the vehicle through deep water puddles. Water can be forced into the clutch housing, causing clutch components to become contaminated. Facing of disc will absorb moisture and bond to the flywheel and/or, pressure plate, if vehicle is allowed to stand for some time before use. If this condition occurs, replacement of clutch assembly may be required. Drive the vehicle until normal clutch operating temperature has been obtained. This will dry off disc assembly, pressure plate, and flywheel.

INSTALLATION

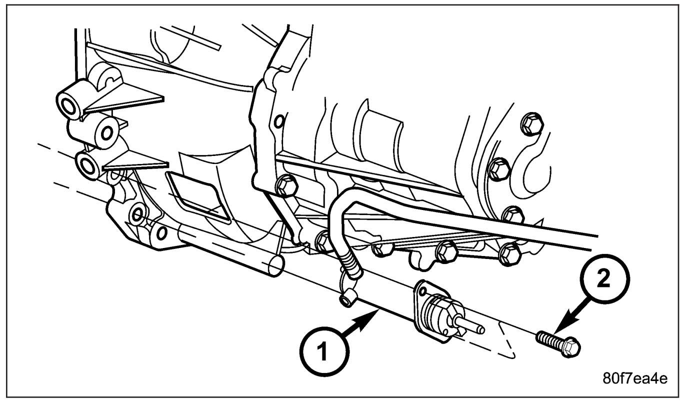
1. Install clutch module onto input shaft.
2. Install transaxle into vehicle (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - INSTALLATION).



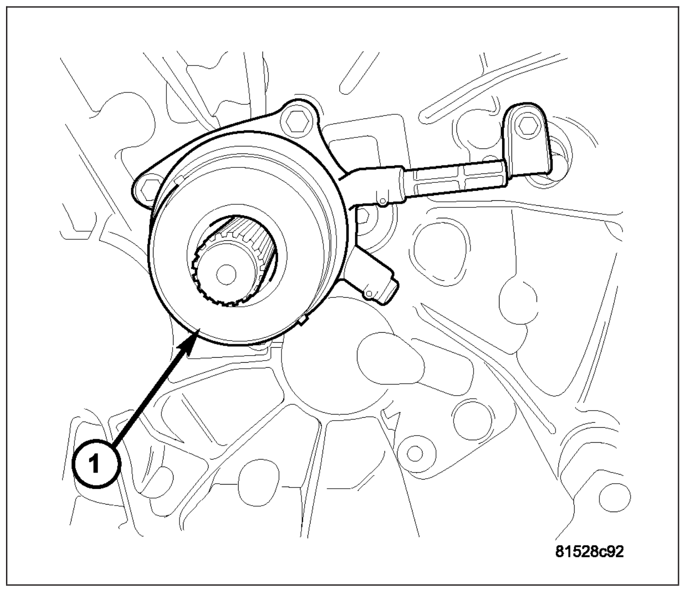
CYLINDER-SLAVE

DESCRIPTION

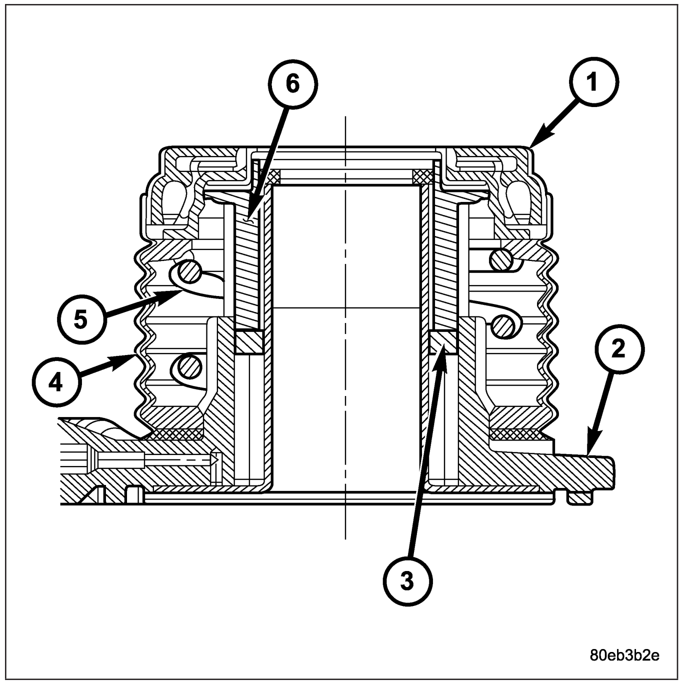
The clutch slave cylinder (1) consists of a hydraulic piston and cylinder, seal and return spring. It is fastened to the transaxle bellhousing. The slave cylinder is connected to the clutch master cylinder hydraulic pipe, which is retained to the cylinder by a pair of retainer clips, and has a bleed port to facilitate the removal of air from the system.



The clutch release system (1) utilizes a slave cylinder of a concentric design, having all components fixed about the same axis. The concentric slave cylinder (CSC) is mounted to the inside of the clutch bellhousing and is serviced only as an assembly.



The concentric design permits high efficiency, resulting in low and consistent pedal effort, as well as automatic adjustment to compensate for clutch disc wear. The CSC is a self-contained unit, consisting of a main body (2) and piston (6), spring (5), integrated release bearing (1), and a rubber boot (4).

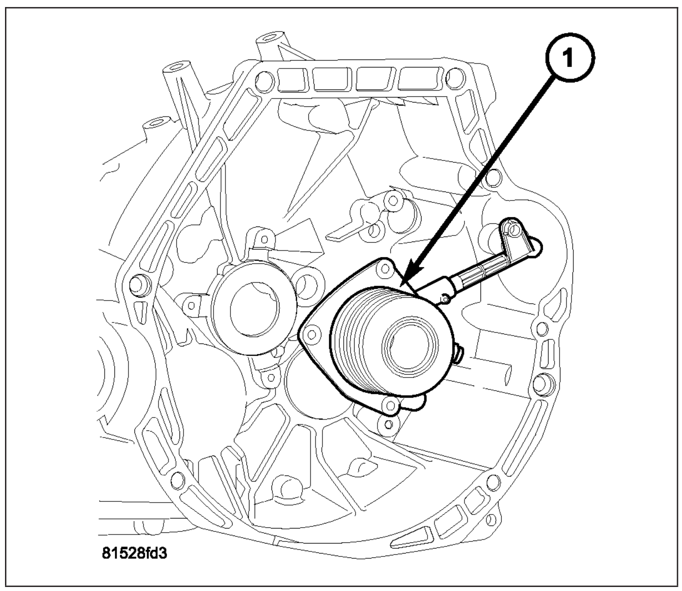


REMOVAL

Removal

NOTE: To prevent drainage of clutch master cylinder assembly upon slave cylinder removal, it is necessary to make sure brake master cylinder fluid level is full and reservoir cap is installed tight.

1. Remove transaxle from vehicle (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL - REMOVAL).
2. Remove bolts to slave cylinder-to-clutch bellhousing bolts and remove slave cylinder (1) from transaxle.

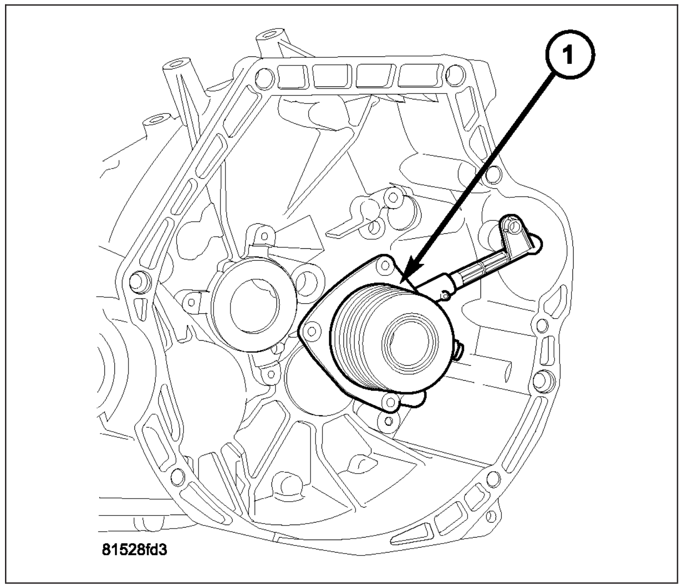


INSTALLATION

1. Install slave cylinder (1) to transaxle using new bolts.

NOTE: Torque three CSC body screws first, then torque the fluid tube attachment.

2. Torque slave cylinder-to-case bolts in three steps:
   1. 2 N·m (18 in. lbs.)
   2. 5 N·m (44 in. lbs.)
   3. 8.4 N·m (74 in. lbs.)
3. Install transaxle (Refer to 21 - TRANSMISSION/ TRANSAXLE/MANUAL - INSTALLATION).
4. Bleed clutch hydraulic system. (Refer to 6 - CLUTCH - STANDARD PROCEDURE)

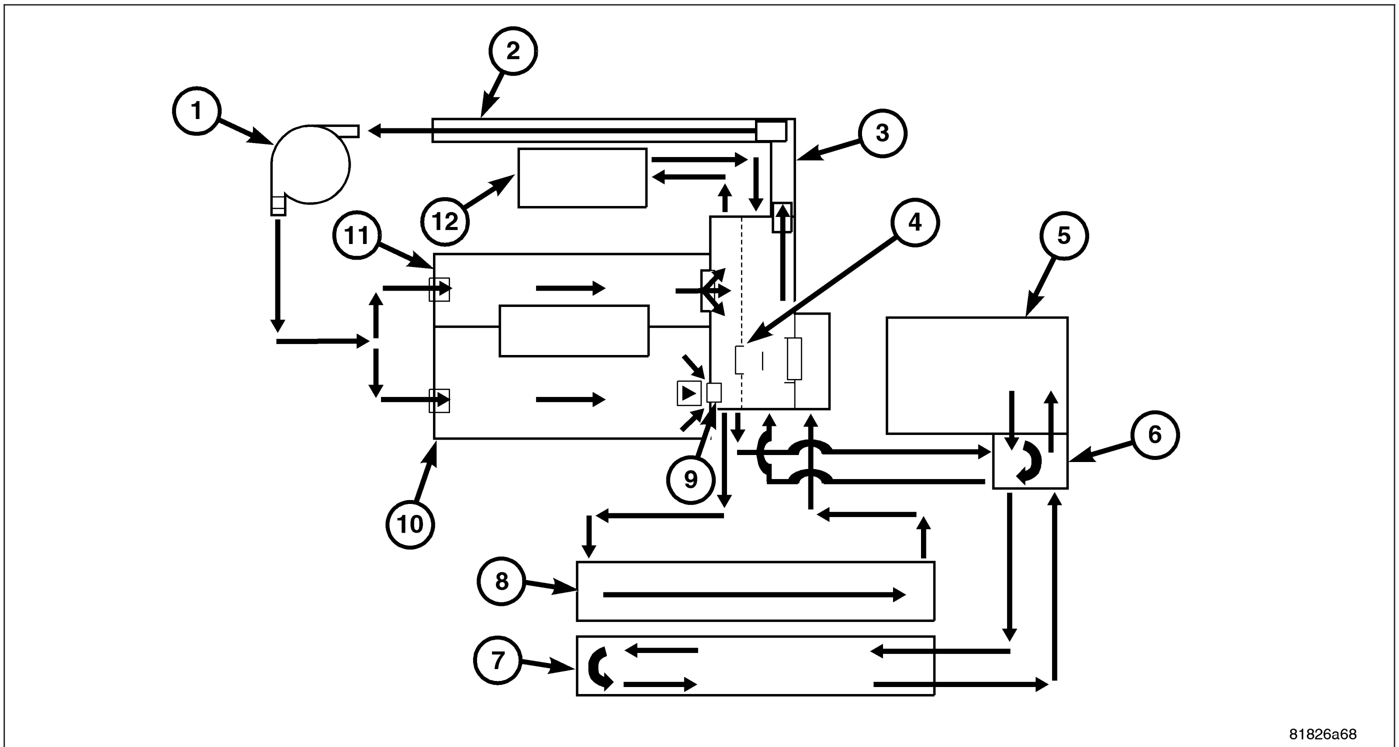


COOLING

TABLE OF CONTENTS

COOLING

DESCRIPTION



1 - WATER PUMP
2 - RETURN TUBE
3 - WATER PLENUM
4 - PRIMARY THERMOSTAT
5 - TRANSMISSION
6 - INTERNAL TRANSMISSION COOLER
7 - COMBINATION COOLER
8 - RADIATOR
9 - SECONDARY THERMOSTAT
10 - CYLINDER BLOCK
11 - CYLINDER HEAD
12 - HEATER CORE

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible, maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment. The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system. Gas engines use a separate and remotely mounted, ambient pressure coolant recovery bottle using a pressure/vent cap. Diesel engine use a separate and remotely mounted, pressurized coolant tank using a pressure/vent cap.

The cooling system consists:

- Radiator
- Coolant
- Electric Cooling Fans
- Water pump
- Dual Thermostats (Gas Engines)

- Charge air cooler (Turbocharged vehicles only)
- Hoses and clamps
- Transmission oil cooler
- Coolant pressure bottle/overflow system

OPERATION

The primary purpose of a cooling system is to maintain engine temperature in a range that will provide satisfactory engine performance and emission levels under all expected driving conditions. It also provides hot water (coolant) for heater performance and cooling for automatic transmission oil. It does this by transferring heat from engine metal to coolant, moving this heated coolant to the radiator, and then transferring this heat to the ambient air.

- When the Engine is cold and both the primary and secondary thermostats are closed. The coolant will circulate through the engine, heater system, which also serves as the bypass, and the internal automatic transmission oil cooler. The cooling system has no flow through the radiator
- As the engine warms up, the primary thermostat will start to open at 82 °C (179 °F). Coolant will start to flow through the radiator. The primary thermostat will fully open at 95 °C (203 °F).
- The secondary thermostat will start to open at 95 °C (203 °F). This will increase the coolant flow through the cylinder block and cylinder head and the radiator. The secondary thermostat will fully open at 110 °C (230 °F).

WARNING

COOLING SYSTEM WARNINGS

WARNING: Antifreeze is an ethylene glycol based coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area, seek medical attention immediately. Do not store in opened or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene glycol. Keep out of reach of children and pets. Dispose of glycol based coolant properly, contact your dealer or government agency for location of collection center in your area. Do not open a cooling system when the engine is at operating temperature or hot under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - COOLING SYSTEM AERATION

If coolant level drops below a certain point, aeration will occur drawing air into the water pump resulting in the following:

- High reading shown on the temperature gauge.
- Loss of coolant flow through the heater core.
- Corrosion in the cooling system.
- Transmission oil will become hotter (automatic transmission equipped vehicles).
- Water pump seal may run dry, increasing the risk of premature seal failure.
- Combustion gas leaks into the coolant can also cause the above problems.

DIAGNOSIS AND TESTING - COOLING SYSTEM DEAERATION

As air is removed from the cooling system, it gathers in the coolant recovery container. This pressure is released into the atmosphere through the pressure valve located in the radiator pressure cap when pressure reaches 96 - 124 kPa (14 - 18 psi). This air is replaced with coolant from the coolant recovery container.

NOTE: Deaeration does not occur at engine idle, higher engine speeds are required. Normal driving will deaerate cooling system.

To effectively deaerate the system, multiple thermal cycles of the system may be required.

DIAGNOSIS AND TESTING - COOLING SYSTEM FLOW CHECK

WARNING: Do not remove the cooling system pressure cap with the system hot and under pressure because serious burns from coolant can occur.

To determine whether coolant is flowing through the cooling system, use one of the following procedures:

- If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If it is hot, coolant is circulating.
- Remove pressure cap when engine is cold, remove small amount of coolant. Idle engine until thermostat opens, you should observe coolant flow while looking down the filler neck. Once flow is detected install the pressure cap.

COOLING SYSTEM LEAK TESTING

WARNING: If vehicle has been run recently, wait 15 minutes before removing pressure cap. Place a shop towel over the cap, and without pushing down, rotate it counterclockwise to the first stop. Allow fluids to escape through the overflow tube. When the system stops pushing coolant and steam into the coolant recovery container and pressure drops, push down on the cap and remove it completely. Squeezing the radiator inlet hose with a shop towel (to check pressure) before and after turning to the first stop is recommended.

With engine not running, wipe the coolant filler neck sealing seat clean. The radiator should be full.

Attach Tool 7700 or equivalent cooling system pressure tester to the coolant filler neck. Apply 104 kPa (15 psi) pressure. If the pressure drops more than 13 kPa (2 psi) in 2 minutes inspect all points for external leaks.

All hoses, radiator and heater, should be moved while at 104 kPa (15 psi) since some leaks occur while driving due to engine movement, etc.

If there are no external leaks after the gauge dial shows a drop in pressure, detach the tester. Start engine and run the engine to normal operating temperature in order to open the thermostat and allow the coolant to expand. Reattach the tester. If the needle on the dial fluctuates, it indicates a combustion leak and is usually a head gasket leak.

WARNING: WITH TOOL IN PLACE PRESSURE BUILDS UP FAST. ANY EXCESSIVE AMOUNT OF PRESSURE BUILT UP BY CONTINUOUS ENGINE OPERATION MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

If the needle on the dial does not fluctuate, race the engine a few times. If an abnormal amount of coolant or steam is emitted from the tailpipe, it may indicate a damaged head gasket, cracked engine block or cylinder head.

There may be internal leaks which can be determined by removing the oil dipstick. If water globules appear intermixed with the oil, it will indicate an internal leak in the engine. If there is an internal leak, the engine must be disassembled for repair.

COOLING SYSTEM

CONDITION	POSSIBLE CAUSE	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Diagnostic Trouble Code (DTC) has been set indicating a stuck open engine thermostat.	1. Replace thermostat, if necessary. If a (DTC) has not been set, the problem may be with the temperature gauge.
	2. Engine Coolant Temperature Sensor.	2. Check connector at Engine Coolant Temperature Sensor. Repair as necessary.
	3. Inoperative temperature gauge.	3. Check gauge operation (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

CONDITION	POSSIBLE CAUSE	CORRECTION
	4. Coolant level low during cold ambient temperature, accompanied by poor heater performance.	4. Check coolant level in the coolant recovery/reserve container and the radiator. Inspect the system for leaks. Repair as necessary. Refer to WARNINGS in this section before removing pressure cap.
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST FROM SYSTEM.	1. Trailer being towed, a steep hill being climbed, vehicle being operated in slow moving traffic, or engine idling during high ambient (outside) temperatures with air conditioning on. High altitudes could also cause these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause of the overheating and repair. Refer to POSSIBLE CAUSES in this section.
	2. Inoperative temperature gauge.	2. Check gauge operation (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).
	3. Is temperature warning lamp (if equipped) illuminating unnecessarily?	3. Check warning lamp operation (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).
	4. Coolant low in recovery/reserve bottle and radiator?	4. Check for coolant leaks and repair as necessary.
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following step 6.	5. Tighten cap.
	6. Poor seals at pressure cap.	6. (a) Check condition of cap and cap seals (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap if necessary. (b) Check condition of filler neck. If neck is warped or damaged, replace neck.
	7. Coolant level low in radiator, but not in coolant recovery/reserve bottle. This indicates the radiator is not drawing coolant from the coolant recovery/reserve bottle as the engine cools. As the engine cools, a vacuum is formed inside the cooling system. If the pressure cap seals are defective, or the cooling system has a leak, a vacuum cannot be formed.	7. (a) Check condition of pressure cap and cap seals. Replace cap if necessary. (b) Check condition of filler neck. Replace if damaged. (c) Check condition of hose from filler neck to coolant container. It should be tight at both ends without any kinks or tears. Replace hose as necessary. (d) Check coolant recovery/reserve bottle and hose for blockage. Repair as necessary.

CONDITION	POSSIBLE CAUSE	CORRECTION
	8. Freeze point of coolant not correct. Mixture ratio may be too rich.	8. Check coolant concentration (Refer to 7 - COOLING/ENGINE/ COOLANT - DIAGNOSIS AND TESTING). Adjust glycol-to-water ratio as required.
	9. Coolant not flowing through system.	9. Check for coolant flow at filler neck with some coolant removed, engine warm, and thermostat open. Coolant should be observed flowing through filler neck. If flow is not observed, determine reason for lack of flow and repair as necessary.
	10. Radiator air seals missing or improperly installed.	10. Inspect air seals. Correct as necessary.
	11. Radiator or A/C condenser fins are dirty or clogged.	11. Clean obstruction from fins.
	12. Radiator core is plugged or corroded.	12. Replace or clean radiator.
	13. Fuel or ignition system problems.	13. Refer to the appropriate Powertrain Diagnostic Procedure manual.
	14. Dragging Brakes.	14. Inspect brake system and repair as necessary (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING).
	15. Bug screen or other aftermarket accessory is being used causing reduced air flow.	15. Remove bug screen or accessory.
	16. Thermostat partially or completely closed.	16. Check thermostat operation and replace as necessary (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - DIAGNOSIS AND TESTING).
	17. Cooling fan not operating properly.	17. Check electric fan operation and repair as necessary.
	18. Cylinder head gasket leaking.	18. Check cylinder head gasket for leaks (Refer to 7 - COOLING/ ENGINE - DIAGNOSIS AND TESTING - COOLING SYSTEM LEAK TESTING).
	19. Heater core leaking.	19. Check heater core for leaks.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. The gauge may cycle up and down. This is due to the cycling of the electric radiator fan.	1. A normal condition. No correction is necessary. If gauge cycling is the hot zone, check electric fan operation and repair as necessary.
	2. During cold weather operation with the heater blower in the high position, the gauge reading may drop slightly.	2. A normal condition. No correction is necessary.
	3. Temperature gauge or Engine Coolant Temperature Sensor is defective or shorted.	3. Check gauge operation (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

CONDITION	POSSIBLE CAUSE	CORRECTION
	4. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running).	4. A normal condition. No correction is necessary. The gauge should return to normal range after vehicle is driven.
	5. Gauge reading high after restarting a warmed-up (hot) engine.	5. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.
	6. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late).	6. Check and correct coolant leaks.
	7. Cylinder head gasket leaking allowing exhaust gas to enter cooling system. This will cause thermostat to open late.	7. (a) Check for cylinder head gasket leaks using Tool C-3685-A Block Leak Tester or the equivalent. Repair as necessary.
		(b) Check for coolant in the engine oil. Inspect for white steam emitting from exhaust system. Repair as necessary.
	8. Water pump impeller loose on shaft.	8. Check water pump and replace as necessary.
	9. Air leak on the suction side of water pump allows air to build up in cooling system. This will cause the thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT FLOWING INTO RECOVERY BOTTLE. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL, BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN RECOVERY BOTTLE.	1. Pressure relief valve in pressure cap is defective.	1. Check condition of pressure cap and seals (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE IS READING HIGH OR HOT.	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test cooling system and repair as necessary.
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH.	1. Engine overheating.	1. Check reason for overheating and repair as necessary.
	2. Freeze point of coolant not correct.	2. Check the freeze point of the coolant (Refer to 7 - COOLING/ ENGINE/COOLANT - DIAGNOSIS AND TESTING). Adjust glycol-to-water ratio as required.

CONDITION	POSSIBLE CAUSE	CORRECTION
HOSE OR HOSES COLLAPSE WHEN ENGINE IS COOLING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant recovery/reserve system.	1. (a) Pressure cap relief valve stuck (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace as necessary. (b) Hose between coolant recovery/reserve bottle and outlet connector is kinked. Repair as necessary. (c) Vent at coolant recovery/reserve bottle is plugged. Clean vent and repair as necessary. (d) Recovery/reserve bottle is internally blocked or plugged. Check for blockage and repair as necessary.
RADIATOR FAN OPERATES ALL THE TIME	1. Malfunctioning electrical component or circuit.	1. Refer to appropriate Powertrain Diagnostic Procedures. Repair as necessary.
	2. Check for low coolant level.	2. Repair as necessary.
RADIATOR FAN WILL NOT OPERATE, GAUGE READING HIGH OR HOT	1. Fan motor defective.	1. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB III® scan tool. Repair as necessary.
	2. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective.	2. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB III® scan tool. Repair as necessary.
	3. Blown fuse in power distribution center (PDC).	3. Determine cause for blown fuse and repair as necessary.
NOISY FAN	1. Fan blade loose.	1. Replace radiator fan assembly.
	2. Fan blade striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or A/C condenser.	3. Remove obstructions and/or clean debris from radiator and/or A/C condenser.
	4. Electric fan motor defective.	4. Replace radiator fan assembly.

CONDITION	POSSIBLE CAUSE	CORRECTION
INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)	1. Electric radiator fan not operating when A/C is on.	1. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB III® scan tool. Repair as necessary.
	2. Radiator and/or air conditioning condenser is restricted, obstructed or dirty.	2. Remove restriction and/or clean as necessary.
	3. Radiator air seals missing or improperly installed.	3. Inspect air seals. Repair as necessary.
	4. Engine is overheating (heat may be transferred from radiator to A/C condenser). High underhood temperature due to engine overheating may also transfer heat to A/C components.	4. Correct overheating condition. Refer to this section.
INADEQUATE HEATER PERFORMANCE	1. Has a diagnostic trouble code (DTC) been set?	1. Refer to Powertrain Diagnostic Procedures.
	2. Coolant level low.	2. Check cooling system for leaks. Repair as necessary.
	3. Obstructions in heater hose fittings at engine.	3. Remove heater hoses at both ends and check for obstructions. Repair as necessary.
	4. Heater hose kinked.	4. Locate kinked area and repair as necessary.
	5. Water pump is not pumping coolant to heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch.	5. (Refer to 7 - COOLING/ENGINE/ WATER PUMP - DIAGNOSIS AND TESTING). Repair as necessary.
HEAT ODOR	1. Various heat shields are used at certain components. One or more of these shields may be missing.	1. Locate missing shields and replace or repair as necessary.
	2. Is temperature gauge reading above the normal range?	2. Refer to the previous Temperature Gauge Reads High in these Diagnostic Charts. Repair as necessary.
	3. Is cooling fan operating correctly?	3. Repair as necessary.
	4. Has undercoating been applied to any unnecessary component.	4. Clean undercoating as necessary.
	5. Engine may be running rich causing the catalytic converter to overheat.	5. Refer to appropriate Powertrain Diagnostic Procedures manual for operation of the DRB III® scan tool. Repair as necessary.
POOR DRIVEABILITY (THERMOSTAT POSSIBLY STUCK OPEN). GAUGE MAY BE READING LOW	1. Has a diagnostic trouble code (DTC) been set?	1. Refer to the Powertrain Diagnostic Procedure manual for checking a DTC related to the thermostat.

CONDITION	POSSIBLE CAUSE	CORRECTION
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILLE AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP, RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE.	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. Check the freeze point of the coolant (Refer to 7 - COOLING/ ENGINE/COOLANT - DIAGNOSIS AND TESTING). Adjust the glycol-to-water ratio as required.
COOLANT LEVEL CHANGES IN COOLANT RECOVERY/RESERVE BOTTLE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the bottle was between the FULL HOT and ADD marks at normal engine operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.

STANDARD PROCEDURE

ROUTINE COOLANT LEVEL CHECK

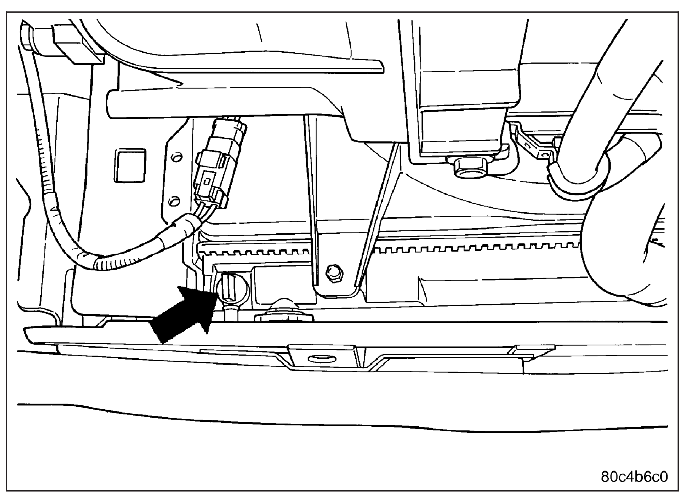
NOTE: Do not remove pressure cap for routine coolant level inspections.

The coolant recovery/reserve system provides a quick visual method for determining the coolant level without removing the radiator cap. Simply observe, with the engine idling and warmed up to normal operating temperature, that the level of the coolant in the recovery/reserve container is between the FULL HOT and ADD marks.

DRAINING COOLING SYSTEM

WARNING: DO NOT OPEN THE RADIATOR DRAIN-COCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

NOTE: Drain, flush, and fill the cooling system at the mileage or time intervals specified in the MAINTENANCE SCHEDULE (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). If the solution is dirty, rusty, or contains a considerable amount of sediment; clean and flush with a reliable cooling system cleaner. Care should be taken in disposing of the used engine coolant from your vehicle. Check governmental regulations for disposal of used engine coolant.



1. Position a clean collecting container under draincock location.
2. Without removing the pressure cap and with system not under pressure, turn draincock counterclockwise to open.
3. The coolant reserve bottle should empty first, then remove the pressure cap.
4. If coolant reserve bottle does not empty first:
    a. Check condition of the pressure cap and cap seals.
    b. Check for kinked/torn overflow hose from filler neck to reserve bottle.
5. Allow cooling system to drain completely.

FILLING COOLING SYSTEM

WARNING: MAKE SURE ENGINE COOLING SYSTEM IS COOL BEFORE REMOVING PRESSURE CAP OR ANY HOSE. THE COOLING SYSTEM IS PRESSURIZED WHEN HOT. SEVERE PERSONAL INJURY MAY RESULT FROM ESCAPING HOT COOLANT.

CAUTION: Do not use well water, or suspect water supply in cooling system. A 50/50 mixture of the recommended ethylene glycol and distilled water is recommended. For recommended coolant usage, (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).

NOTE: For cooling system capacity (Refer to LUBRICATION & MAINTENANCE/SPECIFICATIONS - FLUID CAPACITIES).

1. Close radiator draincock. **Hand tighten only.**
2. Remove cooling system pressure cap. Install
3. Use the supplied clip to pinch overflow hose that connects between the radiator and the coolant recovery container.

NOTE: While filling the cooling system, pour coolant into the larger section of the Filling Aid Funnel, Tool 8195.

4. Remove clip from overflow hose and remove Filling Aid Funnel, Tool 8195.
5. Install cooling system pressure cap.
6. Slowly fill the coolant recovery container to the FULL HOT mark with the recommended coolant. It may be necessary to add coolant to the recovery container after one warm-up/cool down cycle in order to maintain the coolant level between the FULL HOT and ADD marks. This is due to the removal of trapped air from the system.

COOLING SYSTEM CLEANING/REVERSE FLUSHING

CLEANING

Drain the cooling system and refill with water. Run the engine with the radiator cap installed until the upper radiator hose is hot. Stop the engine and drain the water from system. If the water is dirty, fill the system with water, run the engine and drain the system. Repeat this procedure until the water drains clean.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator inlet and outlet. Attach a section of the radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: Internal radiator pressure must not exceed 138 kPa (20 psi) as damage to radiator may result.

Allow the radiator to fill with water. When the radiator is filled, apply air in short blasts. Allow the radiator to refill between blasts. Continue this reverse flushing until clean water flows out through the rear of the radiator cooling tube passages.

REVERSE FLUSHING ENGINE

Drain the cooling system. Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump and attach a lead-away hose to the water pump inlet fitting.

CAUTION: On vehicles equipped with a heater water control valve, be sure the heater control valve is closed (heat off). This will prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing and install the thermostat. Install the thermostat housing with a replacement gasket. Refer to Thermostat Replacement. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION). Refer to Refilling the Cooling System.

CHEMICAL CLEANING

In some instances, use a radiator cleaner (Mopar® Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid flushing operation.

CAUTION: Follow manufacturers instructions when using these products.

INSPECTION

After performing a cleaning/flush procedure, inspect all hoses, clamps and connections for deterioration and leaks. Inspect radiator and heater core for leaks.

SPECIFICATIONS

TORQUE

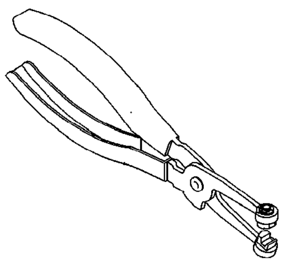
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolts, A/C Condenser to Radiator	5.1	–	45
Bolt, Automatic Belt Tensioner Pulley	27	20	–
Bolt Automatic Belt Tension Assembly	54	40	–
Bolts, Charge Air Cooler to Radiator (Turbo Equipped)	5.1	–	45
Bolt, Coolant Recovery Bottle	4	–	35
Bolts, Coolant Adapter	12.5	–	110
Bolts, Inlet housing to coolant adapter	7	-	65
Screw, bypass valve to radiator	5.1	-	45
Screw, transmission coller to radiator	5.1	-	45
Engine Coolant Temperature Sensor -	19	–	168
Pivot Bolt, Generator Mounting	54	40	–
Locking Nut, Generator Mounting	54	40	–
Screws, Radiator Fan Shroud to Radiator	6	–	55
Screws, Transmission Cooler to Radiator	8	–	70
Bolts, Water Pump to Engine Block	12	–	105
Bolts, Water Pump Inlet Tube to water pump housing	24	–	212

SPECIAL TOOLS

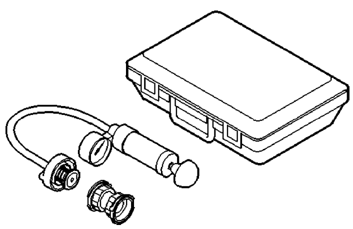
COOLING SYSTEM



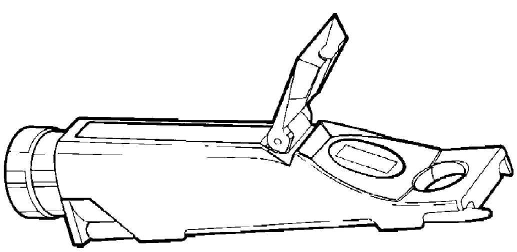
Filling Aid Funnel 8195



Hose Clamp Pliers 8495



Cooling System Tester 7700



Coolant Refractometer 8286

BELT ACCESSORY DRIVE

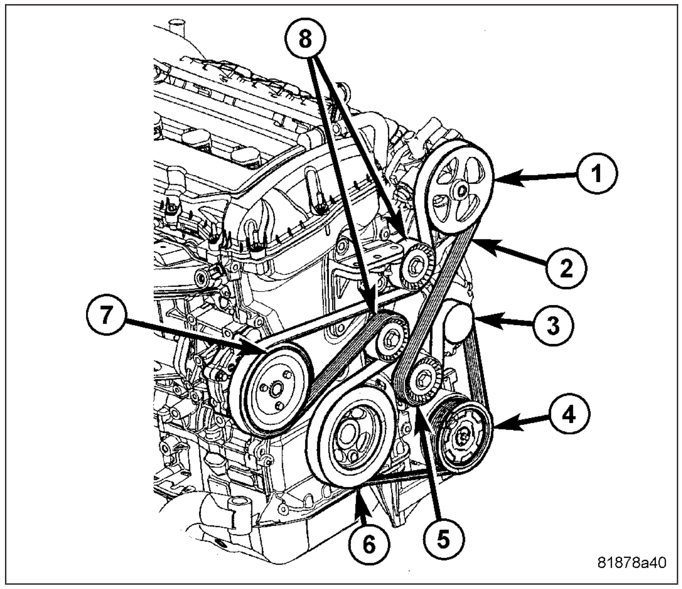
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ACCESSORY DRIVE BELT

DESCRIPTION

The accessory drive belt is a serpentine type belt that is driven by the crankshaft.

The belt drives the A/C compressor, power steering pump and water pump. Belt tension is maintained by an automatic belt tensioner.



DIAGNOSIS AND TESTING

ACCESSORY DRIVE BELT

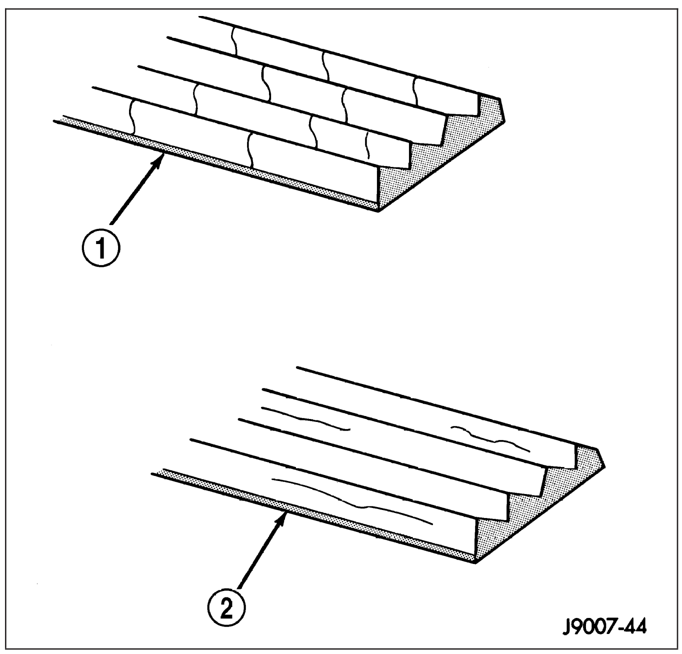
VISUAL DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib, are considered normal. These are not a reason to replace the belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced. Also replace the belt if it has excessive wear, frayed cords or severe glazing.

Refer to ACCESSORY DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

NOISE DIAGNOSIS

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for contamination, alignment, glazing, or excessive end play.



ACCESSORY DRIVE BELT DIAGNOSIS CHART

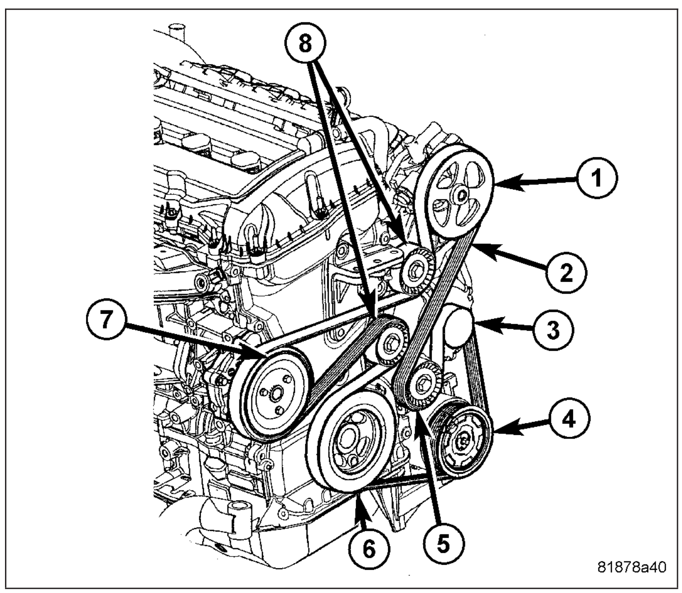
CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	1. Foreign objects imbedded in pulley grooves. 2. Installation damage	1. Remove foreign objects from pulley grooves. Replace belt. 2. Replace belt
RIB OR BELT WEAR	1. Pulley misaligned 2. Abrasive environment 3. Rusted pulley(s) 4. Sharp or jagged pulley groove tips 5. Belt rubber deteriorated	1. Align pulley(s) 2. Clean pulley(s). Replace belt if necessary 3. Clean rust from pulley(s) 4. Replace pulley. Inspect belt. 5. Replace belt
BELT SLIPS	1. Belt slipping because of insufficient tension 2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol) 3. Driven component bearing failure (seizure) 4. Belt glazed or hardened from heat and excessive slippage	1. Inspect/Replace tensioner if necessary 2. Replace belt and clean pulleys 3. Replace component or bearing 4. Replace belt.
LONGITUDAL BELT CRACKING	1. Belt has mistracked from pulley groove 2. Pulley groove tip has worn away rubber to tensile member	1. Replace belt 2. Replace belt
GROOVE JUMPING (Belt does not maintain correct position on pulley)	1. Incorrect belt tension 2. Pulley(s) not within design tolerance 3. Foreign object(s) in grooves 4. Pulley misalignment 5. Belt cordline is broken	1. Inspect/Replace tensioner if necessary 2. Replace pulley(s) 3. Remove foreign objects from grooves 4. Align component 5. Replace belt
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	1. Incorrect belt tension 2. Tensile member damaged during belt installation 3. Severe misalignment 4. Bracket, pulley, or bearing failure	1. Replace Inspect/Replace tensioner if necessary 2. Replace belt 3. Align pulley(s) 4. Replace defective component and belt

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISE (Objectional squeal, squeek, or rumble is heard or felt while drive belt is in operation)	1. Incorrect belt tension	1. Inspect/Replace tensioner if necessary
	2. Bearing noise	2. Locate and repair
	3. Belt misalignment	3. Align belt/pulley(s)
	4. Belt to pulley mismatch	4. Install correct belt
	5. Driven component induced vibration	5. Locate defective driven component and repair
	6. System resonent frequency induced vibration	6. Vary belt tension within specifications
TENSION SHEETING FABRIC FAILURE (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object	1. Correct rubbing condition
	2. Excessive heat causing woven fabric to age	2. Replace belt
	3. Tension sheeting splice has fractured	3. Replace belt
CORD EDGE FAILURE (Tensile member exposed at edges of belt or separated from belt body)	1. Incorrect belt tension	1. Inspect/Replace tensioner if necessary
	2. Belt contacting stationary object	2. Replace belt
	3. Pulley(s) out of tolerance	3. Replace pulley
	4. Insufficient adhesion between tensile member and rubber matrix	4. Replace belt

REMOVAL

WORLD ENGINE

1. Insert a 1/2 in.drive breaker bar into the square opening of the accessory drive belt tensioner (5).
2. Rotate accessory drive belt tensioner (5) counter-clockwise until accessory drive belt (2) can be removed from pulleys. Remove accessory drive belt (2).



CLEANING

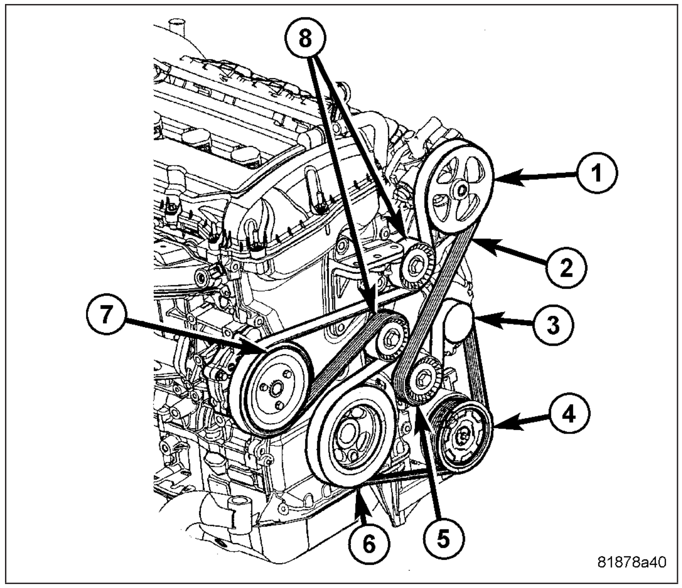
Clean all foreign debris from belt pulley grooves. The belt pulleys must be free of oil, grease, and coolants before installing the drive belt.

INSTALLATION

WORLD ENGINE

NOTE: When installing drive belt on the pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulley grooves.

1. Install the accessory drive belt (2) around all the pulleys except for the generator pulley (3).
2. Using a 1/2 in. breaker bar, rotate accessory drive belt tensioner (5) counterclockwise until accessory drive belt (2) can be installed on the generator pulley (3). Release spring tension onto belt.
3. Remove breaker bar from accessory drive belt tensioner (5).



ACCESSORY DRIVE BELT TENSIONER

DESCRIPTION

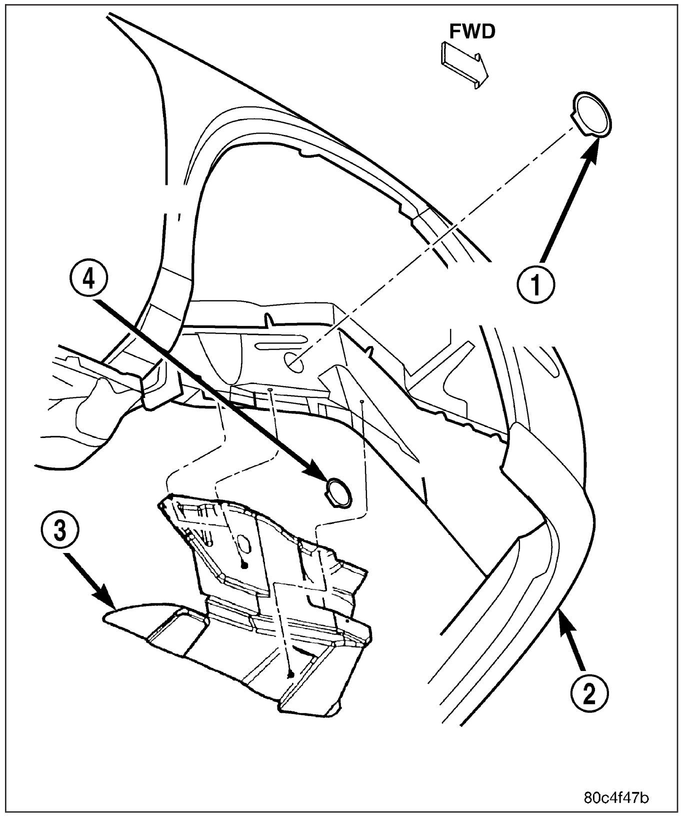
The automatic belt tensioner maintains proper tension on the power steering and air conditioning belt. The tensioner pulley can be serviced separately.

NOTE: Tensioner arm should move freely and maintain 14.9 – 20.8 kg. (33 - 46 lb). tension on belt.

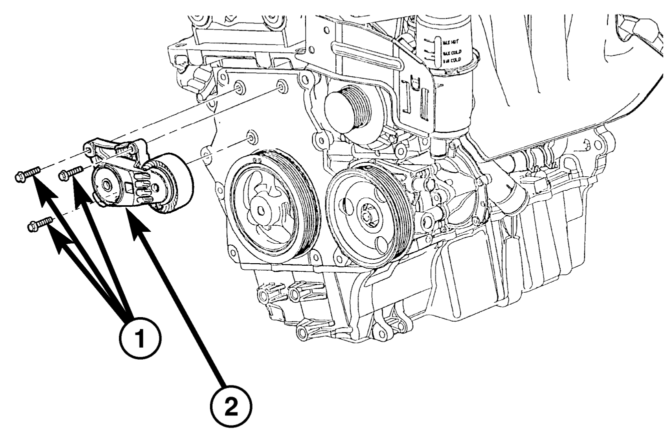
REMOVAL

WORLD ENGINE

1. Raise vehicle on hoist.
2. Remove belt splash shield.



3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove accessory drive belt tensioner mounting bolt. Remove accessory drive belt tensioner.

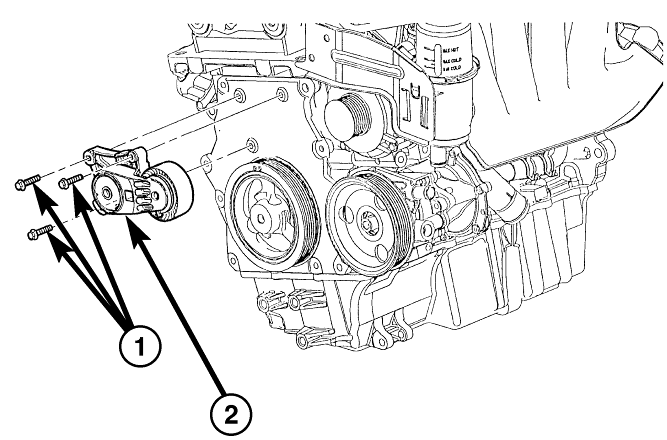


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INSTALLATION

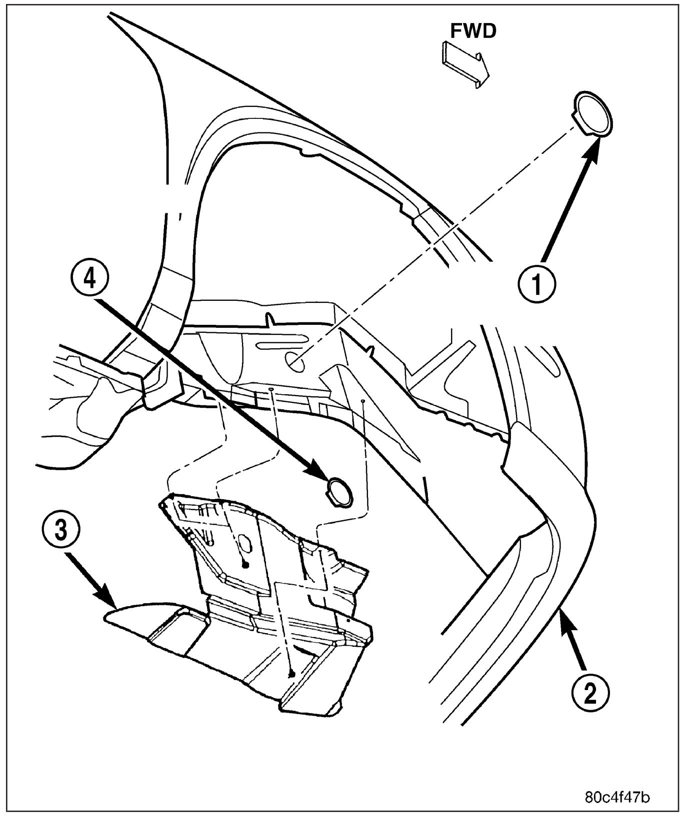
WORLD ENGINE

1. Position accessory drive belt tensioner and install mounting bolt. Tighten bolt to 12 N·m (105 in. lbs.).
2. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



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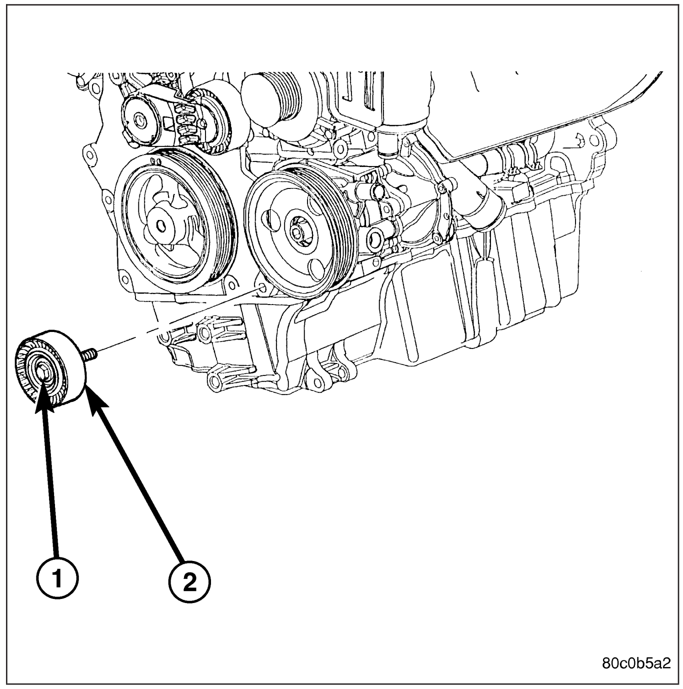
3. Install belt splash shield.
4. Lower vehicle.



IDLER PULLEY

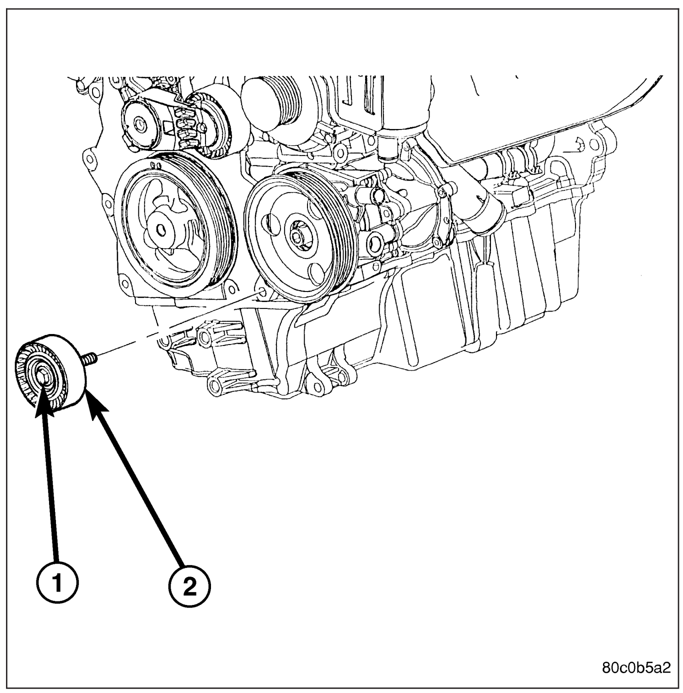
REMOVAL

1. Raise vehicle on hoist.
2. Remove belt splash shield.
3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove idler pulley mounting bolt. Remove idler pulley.



INSTALLATION

1. Position pulley in mounting position. Install idler pulley mounting bolt. Tighten bolt to 28 N·m (250 in. lbs.).
2. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
3. Install belt splash shield.
4. Lower vehicle.



ENGINE

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COOLANT

DESCRIPTION

ENGINE COOLANT

WARNING: Antifreeze is an ethylene glycol base coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area, seek medical attention immediately. Do not store in open or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene glycol. Keep out of reach of children. Dispose of glycol base coolant properly, contact your dealer or government agency for location of collection center in your area. Do not open a cooling system when the engine is at operating temperature or hot under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

ETHYLENE-GLYCOL MIXTURES

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 year/100,000 Mile Formula (ethylene-glycol base coolant with corrosion inhibitors called HOAT, (Hybrid Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain a freeze point of -37°C (-35°F).

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68% antifreeze concentration, which prevents freezing down to -67.7° C (-90° F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22°C (-8°F).

PROPYLENE-GLYCOL MIXTURES

It’s overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32°C (-26°F). 5°C higher than ethylene-glycol’s freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125°C (257°F) at 96.5 kPa (14 psi), compared to 128°C (263°F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

HOAT COOLANT

WARNING: Antifreeze is an ethylene-glycol base coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area. Seek medical attention immediately. Do not store in open or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene-glycol. Keep out of reach of children. Dispose of glycol base coolant properly, contact your dealer or government agency for location of collection center in your area. Do not open a cooling system when the engine is at operating temperature or hot under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

CAUTION: Use of Propylene-Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene-glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% ethylene-glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water- Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol - The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water - Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

OPERATION

Coolant flows through the engine block absorbing the heat from the engine, then flows to the radiator where the cooling fins in the radiator transfers the heat from the coolant to the atmosphere. During cold weather the ethylene-glycol or propylene-glycol coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.

DIAGNOSIS AND TESTING

COOLANT CONCENTRATION TESTING

Coolant concentration should be checked when any additional coolant was added to system or after a coolant drain, flush and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of -37°C (-34°F) to -46°C (-50°F). The use of a hydrometer or a refractometer can be used to test coolant concentration.

A hydrometer will test the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene glycol, the larger the number of balls that will float, and higher the freeze protection (up to a maximum of 60% by volume glycol).

A refractometer Tool 8286 (Refer to 7 - COOLING - SPECIAL TOOLS) will test the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

Some coolant manufactures use other types of glycols into their coolant formulations. Propylene glycol is the most common new coolant. However, propylene glycol based coolants do not provide the same freezing protection and corrosion protection and is not recommended.

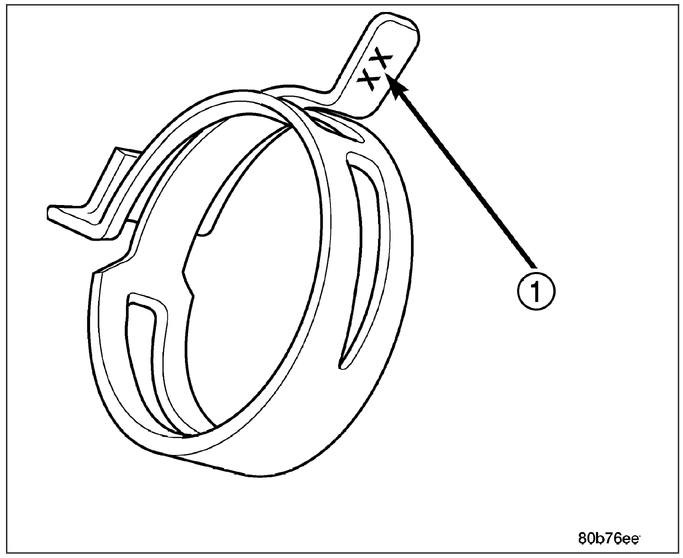
CAUTION: Do not mix types of coolant corrosion protection will be severely reduced.

CLAMPS HOSE

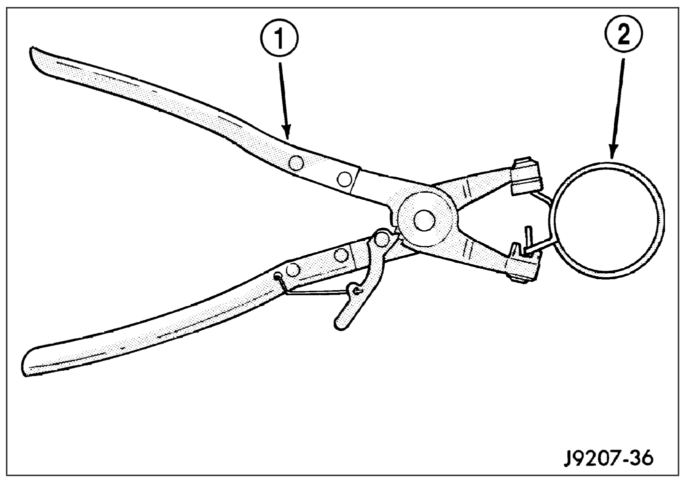
DESCRIPTION

The cooling system uses spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only an original equipment clamp with matching number or letter.



The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, use Hose clamp Tool 6094 or 8495 (or equivalent), to compress the hose clamp.



CONTAINER COOLANT RECOVERY

DESCRIPTION

WORLD ENGINE

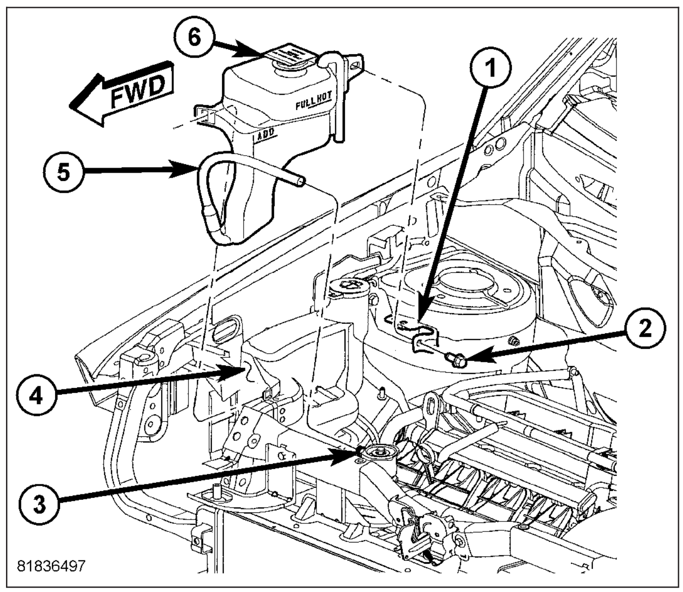
The coolant recovery system consists of a coolant recovery container mounted to the dash panel, a vent hose for the coolant recovery container, a hose connecting the container to the radiator neck, and a pressure cap.

OPERATION - WORLD ENGINE

The system works in conjunction with the cooling system pressure cap to utilize thermal expansion and contraction of the coolant to keep the coolant free of trapped air. The system provides space for expansion and contraction. Also, the system provides a convenient and safe method for checking and adjusting the coolant level at atmospheric pressure without removing the pressure cap. It also provides some reserve coolant to compensate for minor leaks and evaporation or boiling losses.

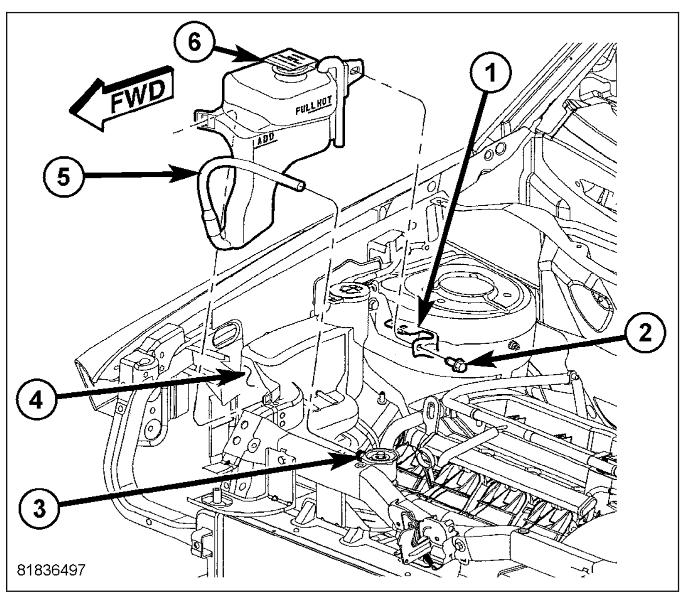
REMOVAL - WORLD ENGINE

1. Siphon coolant from coolant recovery container.
2. Remove return hose (5) from upper radiator hose tee (3).
3. Remove coolant recovery bottle mount bolt (2).
4. Disengage coolant recovery container (6) from washer reservoir bottle (4).
5. Remove coolant recovery container and drain.



INSTALLATION - WORLD ENGINE

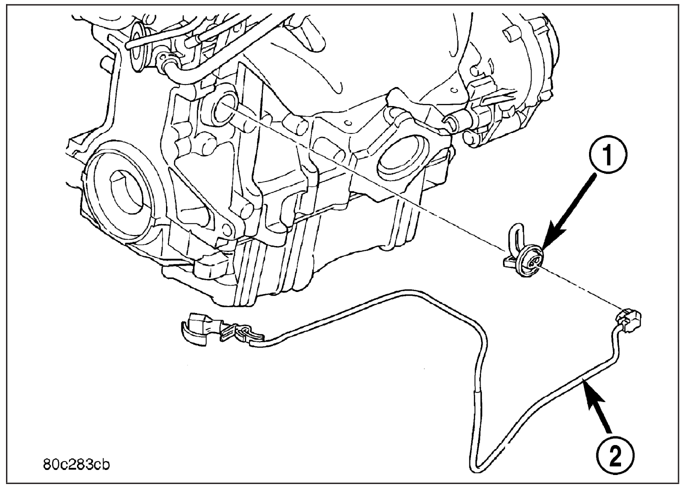
1. Engage coolant recovery container (6) into washer fluid reservoir (4).
2. Install coolant recovery container mounting bolt (2) and tighten to 4 N·m (35 in. lbs.).
3. Connect hose (5) at upper radiator Tee (3).
4. Fill coolant recovery container to proper level.



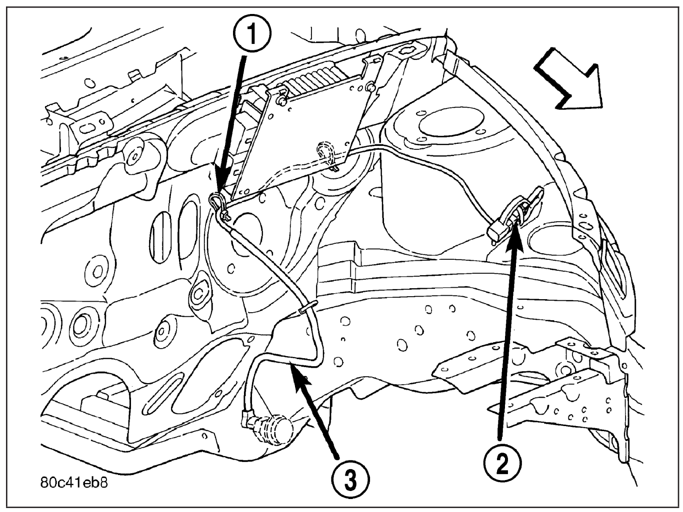
HEATER ENGINE BLOCK

DESCRIPTION

The heater is mounted in a core hole (in place of a core hole plug) in the engine block, with the heating element immersed in coolant.



The engine block heater is available as an optional accessory. The heater is powered by ordinary house current (110 Volt AC) through a power cord and connector.



OPERATION

The block heater element is submerged in the cooling system's coolant. When electrical power (110 volt A.C.) is applied to the element, it creates heat. This heat is transferred to the engine coolant. This provides easier engine starting and faster warm-up when vehicle is operated in areas having extremely low temperatures.

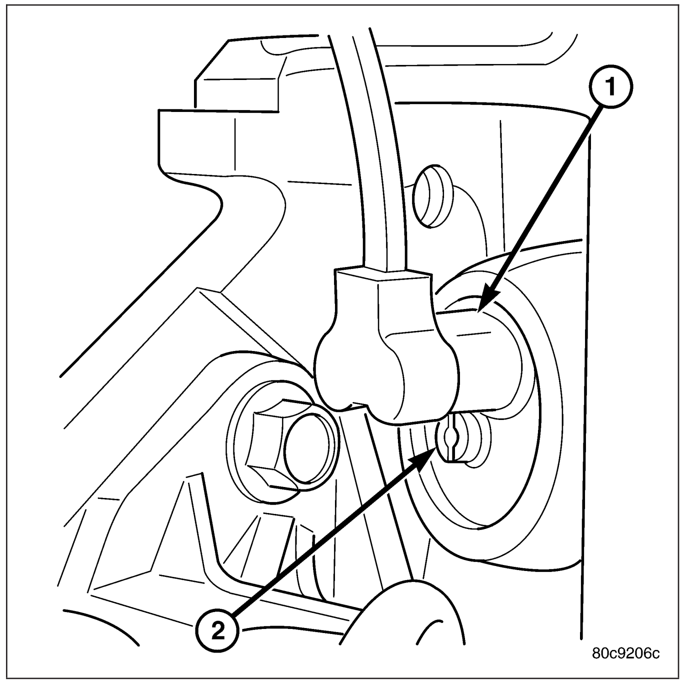
DIAGNOSIS AND TESTING

ENGINE BLOCK HEATER TESTING

If unit does not operate, trouble can be in either the power cord or the heater element. Test power cord for continuity with a 110-volt voltmeter or 110-volt test light; test heater element continuity with an ohmmeter or 12-volt test light.

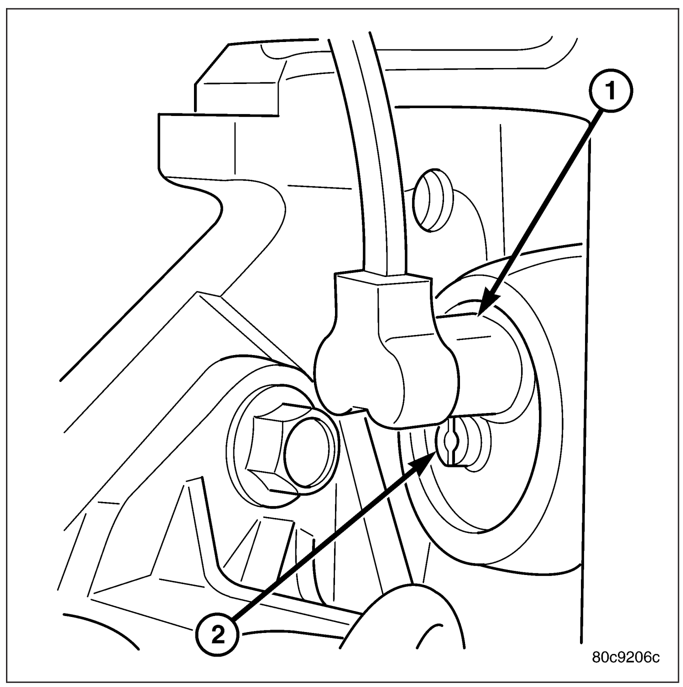
REMOVAL

1. Drain the cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).
2. Raise vehicle on hoist.
3. Detach power cord plug from heater (1).
4. Loosen screw (2) in center of heater. Remove heater assembly (1).



INSTALLATION

1. Thoroughly clean core hole and heater seat.
2. Insert heater (1) assembly with element loop positioned **upward**.
3. With heater (1) seated, tighten center screw (2) securely to assure a positive seal.
4. Connect power cord to block heater.
5. Lower vehicle.
6. Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

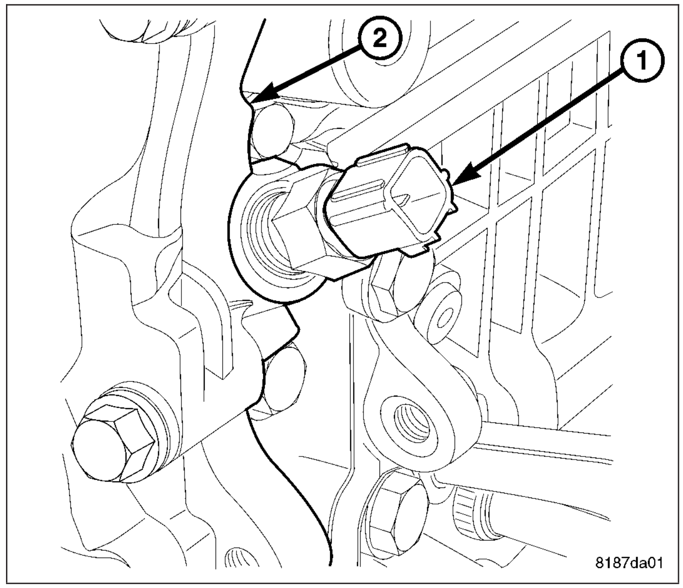


SENSOR ENGINE COOLANT TEMP

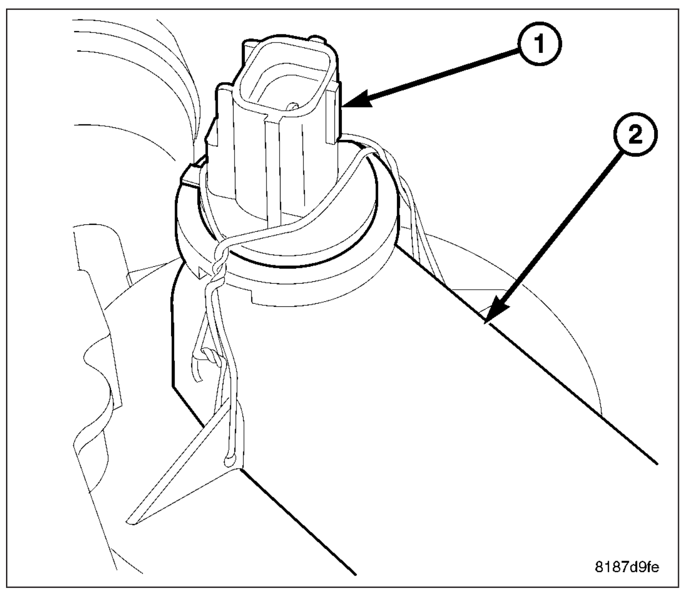
DESCRIPTION

WORLD ENGINE

There are two engine coolant sensors (ETC). One ETC is located in the coolant adapter and one is (ECT) sensor (1) threads into the cylinder head (1). New sensors have sealant applied to the threads.



The ECT Sensor is a Negative Thermal Coefficient (NTC) Sensor. The resistance of the ECT Sensor changes as coolant temperature changes. This results in different input voltages to the PCM. The PCM also uses the ECT Sensor input to operate the radiator cooling fan(s), and send a message over the PCI bus to the instrument cluster for temperature gauge operation.



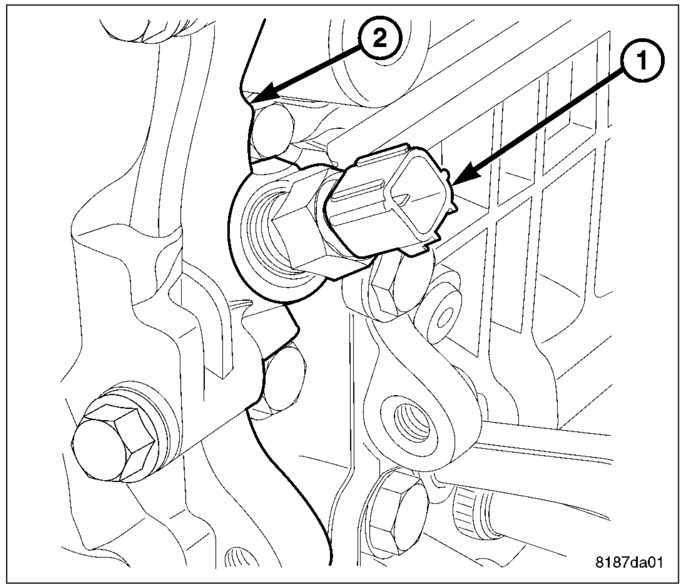
OPERATION

The ECT sensor provides an input to the PCM. As temperature increases, resistance of the sensor decreases. As coolant temperature varies, the ECT sensor resistance changes resulting in a different voltage value at the PCM ECT sensor signal circuit. The ECT sensor provides input for various PCM operations. The PCM uses the input to control air-fuel mixture, timing, and radiator fan on/off times. The ECT sensor input is also used for temperature gauge operation.

REMOVAL

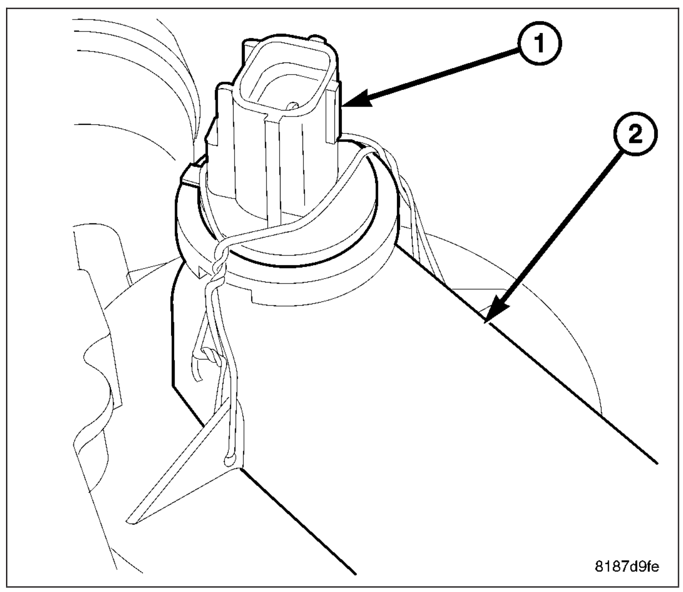
CYLINDER HEAD MOUNTED

1. Disconnect negative battery cable.
2. Partially drain cooling system below level of ECT Sensor (1).
3. Disconnect ECT Sensor electrical connector.
4. Remove ECT Sensor (1).



COOLANT ADAPTER MOUNTED

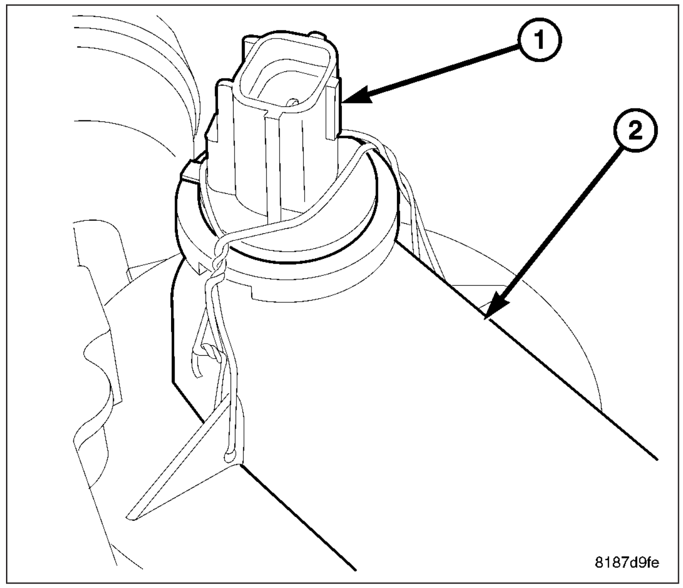
1. Disconnect negative battery cable.
2. Partially drain cooling system below level of ECT Sensor (1).
3. Disconnect ECT Sensor electrical connector.
4. Remove ECT Sensor (1).



INSTALLATION

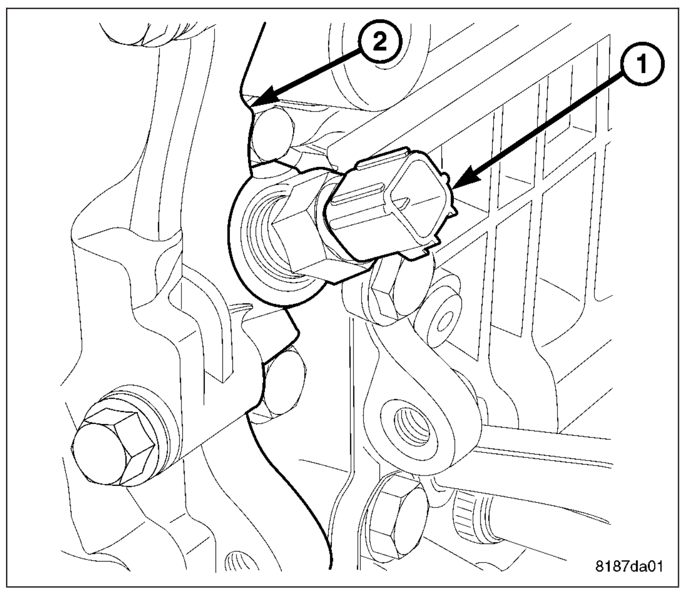
COOLANT ADAPTER MOUNTED

1. Install ECT Sensor (1). Make sure coolant sensor is locked in place
2. Reconnect ECT Sensor electrical connector.
3. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
4. Connect negative battery cable.



CYLINDER HEAD MOUNTED

1. Install ECT Sensor (1). Tighten sensor to 19 N·m (168 in. lbs.).
2. Reconnect ECT Sensor electrical connector.
3. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
4. Connect negative battery cable.

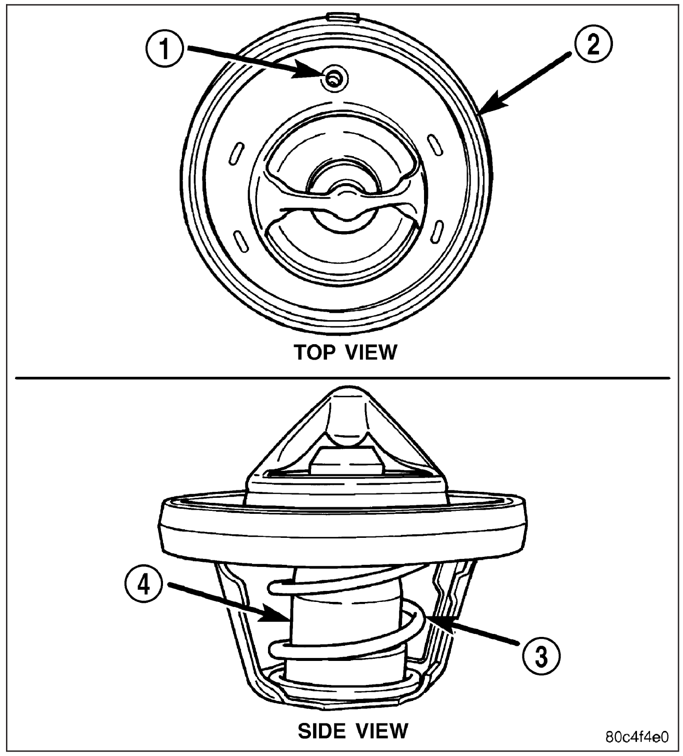


THERMOSTAT ENGINE COOLANT

DESCRIPTION

The primary thermostat is located on the front of the water plenum in the thermostat housing/coolant inlet. The thermostat has an air bleed vent located on its flange. The air bleed vent (1) and the locator dimple on thermostat seal provide for proper positioning of thermostat in inlet housing.

The secondary thermostat is located in the cylinder head under the water plenum.



OPERATION

The engine cooling thermostat is a wax pellet driven, reverse poppet choke type. The thermostat is designed to provide the fastest warm up possible by preventing leakage through it and to guarantee a minimum engine operating temperature of 88 to 93°C (192 to 199°F).

The primary thermostat starts to open at 77° C (171° F) and is fully open at 89° C (193° F). The secondary thermostat starts to open at 95° C (203°F) and is fully open at 108° C (226° F).

The thermostat is operated by a wax filled chamber (pellet) which is sealed. When coolant reaches a predetermined temperature, the wax expands enough to overcome the closing spring and water pump pressure, which forces the thermostat to open. Coolant leakage into the wax pellet will cause a thermostat to fail in the open position. Do not attempt to free-up a stuck open thermostat.

If the thermostat is stuck open or allows coolant leakage through it, the engine will not operate at the proper temperature for obtaining engine fuel efficiency, performance and emissions levels. If this condition occurs, a diagnostic trouble code will be set and a MIL light will be turned on. Refer to the Powertrain Diagnostic Procedures manual for further information and diagnostics provided.

DIAGNOSIS AND TESTING - ENGINE COOLANT THERMOSTAT

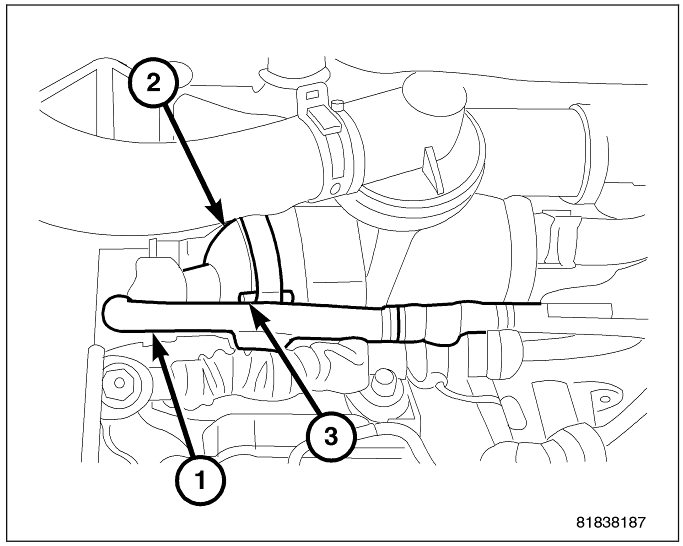
The thermostat is operated by a wax filled chamber (pellet) which is sealed. When heated coolant reaches a predetermined temperature the wax pellet expands enough to overcome the closing spring and water pump pressure, which forces the valve to open. Coolant leakage into the pellet will cause a thermostat to fail open. Do not attempt to free up a thermostat with a screwdriver.

Thermostat diagnostics is included in powertrain control module’s (PCM) programing for on-board diagnosis. The malfunction indicator light (MIL) will illuminate and a diagnostic trouble code (DTC) will be set when an “open too soon” condition occurs. Do not change a thermostat for lack of heater performance or temperature gauge position, unless a DTC is present. For other probable causes, (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING). Thermostat failing shut is the normal long term mode of failure, and normally, only on high mileage vehicles. The temperature gauge will indicate this (Refer to 7 - COOLING/ENGINE - DIAGNOSIS AND TESTING).

REMOVAL

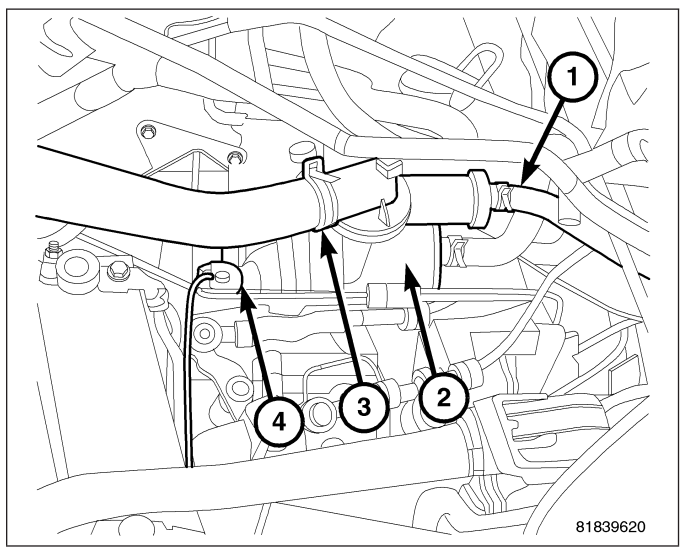
PRIMARY THERMOSTAT

1. Partially drain cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove air filter housing.
3. Disconnect coolant hose (1) from inlet housing (2).
4. Remove inlet housing bolts (3).
5. Remove thermostat assembly, and clean sealing surfaces.



SECONDARY THERMOSTAT

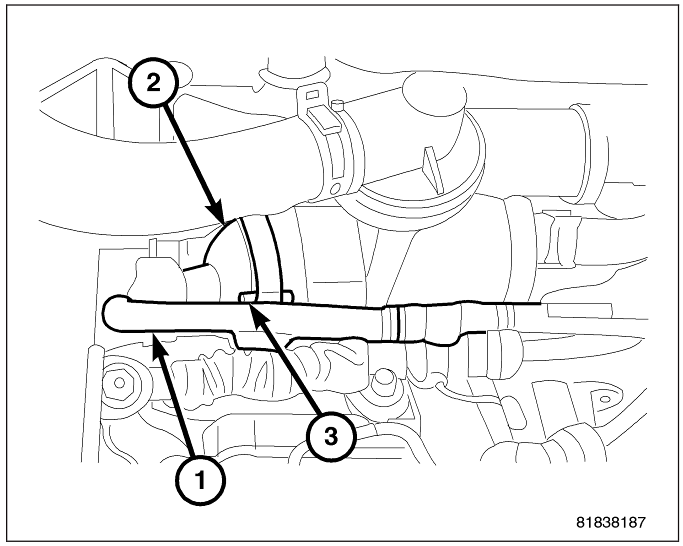
1. Partially drain cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove air filter housing.
3. Disconnect coolant hoses (1) from rear of coolant adapter (2).
4. Remove radiator hose (3).
5. Remove coolant hose (4) from front of coolant adapter (2).
6. Remove coolant adapter mounting bolts.
7. Carefully slide coolant adapter off water pump inlet tube and remove coolant adapter (2) and secondary thermostat.



INSTALLATION

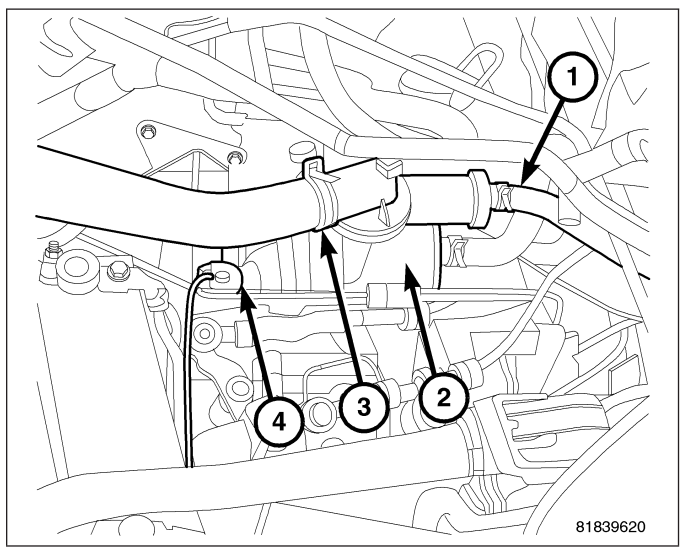
PRIMARY THERMOSTAT

1. Position thermostat into the water plenum, aligning air bleed with the location notch on inlet housing (2).
2. Install inlet housing (2) onto coolant adapter. Tighten bolts to 12.5 N·m (110 in. lbs.).
3. Connect coolant hose (1).
4. Install air filter housing.
5. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



SECONDARY THERMOSTAT

1. Position thermostat into the cylinder head.
2. Inspect the water pump inlet tube O-rings for damage before installing the tube in the coolant adapter. Replace O-ring as necessary.
3. Lubricate O-rings with soapy water.
4. Position coolant adapter on water pump inlet tube and cylinder head.
5. Install coolant adapter mounting bolts. Tighten bolts to 12.5 N·m (110 in. lbs.).
6. Connect front coolant hose (1).
7. Connect two rear coolant hoses (1).
8. Connect radiator hose (3).
9. Install air filter housing.
10. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



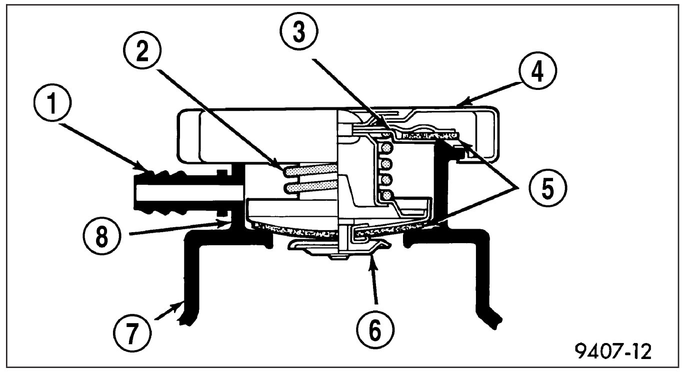
CAP RADIATOR PRESSURE

DESCRIPTION

GAS ENGINES

The cooling system is equipped with a pressure cap that releases built up pressure, maintaining a range of 97-124 kPa (14-18 psi).

There is also a vent valve (6) in the center of the cap. This valve also opens when coolant is cooling and contracting, allowing coolant to return to radiator from coolant recovery container by vacuum through connecting hose. **If valve is stuck shut, the radiator hoses will be collapsed on cool down. Clean the vent valve to ensure proper sealing when boiling point is reached.**



OPERATION

GAS ENGINES

The pressure cap allows the cooling system to operate at higher than atmospheric pressure. The higher pressure raises the coolant boiling point; this allows increased radiator cooling capacity.

The secondary gasket in the cap seals the filler neck and the primary gasket seals the cooling system so that vacuum can be maintained, allowing coolant to be drawn back into the radiator from the reserve container.

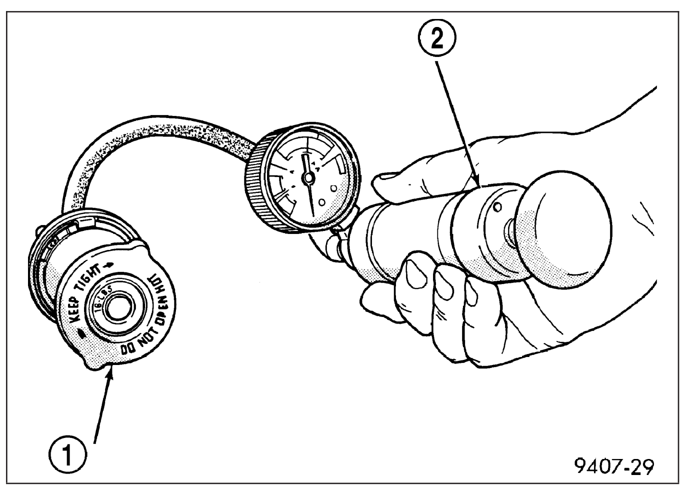
A vent valve in the center of the cap will remain shut as long as the cooling system is pressurized. As the coolant cools, it contracts and creates a vacuum in cooling system. This causes the vacuum valve to open and coolant in reserve/overflow tank to be drawn through connecting hose into radiator. If the vacuum valve is stuck shut, or overflow hose is kinked, radiator hoses will collapse on cool-down.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - COOLING SYSTEM PRESSURE CAP TESTING

Dip the pressure cap in water. Clean any deposits off the vent valve or its seat and apply cap to end of the Pressure Cap Test Adaptor that is included with the Cooling System Tester 7700. Working the plunger, bring the pressure to 104 kPa (15 psi) on the gauge. If the pressure cap fails to hold pressure of at least 97 kPa (14 psi), replace the pressure cap.

CAUTION: The Cooling System Tester Tool is very sensitive to small air leaks that will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to the tool. Turn tool upside down and recheck pressure cap to confirm that cap is bad.



If the pressure cap tests properly while positioned on Cooling System Tester 7700, but will not hold pressure or vacuum when positioned on the filler neck. Inspect the filler neck and cap top gasket for irregularities that may prevent the cap from sealing properly.

DIAGNOSIS AND TESTING - COOLING SYSTEM PRESSURE RELIEF TESTING

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT 15 MINUTES BEFORE REMOVING CAP. PLACE A SHOP TOWEL OVER THE CAP, AND WITHOUT PUSHING DOWN, ROTATE IT COUNTERCLOCKWISE TO THE FIRST STOP. ALLOW FLUIDS TO ESCAPE THROUGH THE OVERFLOW TUBE. WHEN THE SYSTEM STOPS PUSHING COOLANT AND STEAM INTO THE COOLANT RECOVERY CONTAINER AND PRESSURE DROPS, PUSH DOWN ON THE CAP AND REMOVE IT COMPLETELY. SQUEEZING THE RADIATOR INLET HOSE WITH A SHOP TOWEL (TO CHECK PRESSURE) BEFORE AND AFTER TURNING TO THE FIRST STOP IS RECOMMENDED.

WARNING: THE WARNING WORDS "DO NOT OPEN HOT" ON THE PRESSURE CAP IS A SAFETY PRECAUTION. WHEN HOT, THE COOLING SYSTEM BUILDS UP PRESSURE. TO PREVENT SCALDING OR OTHER INJURY, THE PRESSURE CAP SHOULD NOT BE REMOVED WHILE THE SYSTEM IS HOT AND/OR UNDER PRESSURE.

The pressure cap upper gasket to filler neck seal can be checked by removing the overflow hose at the radiator filler neck overflow nipple. Attach the radiator pressure tester to the **filler neck overflow nipple,** and pump air into the system. The pressure cap upper gasket should relieve pressure at 69-124 kPa (10-18 psi), and hold pressure at 55 kPa (8 psi) minimum.

There is no need to remove the pressure cap at any time **except** for the following purposes:

- Check and adjust coolant freeze point
- Refill system with new coolant
- Conducting service procedures
- Checking for leaks

CLEANING

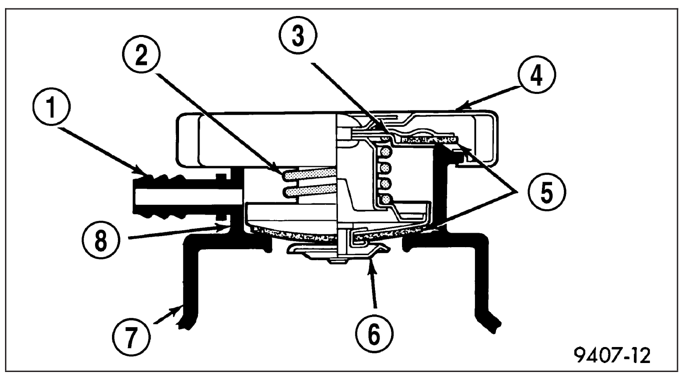
Use only a mild soap to clean the pressure cap.

INSPECTION

Hold the cap in your hand, **top side up**.. The vent valve (6) at the bottom of the cap should open. If the rubber seal (5) has swollen, preventing the valve from opening, replace the cap.

Hold the cleaned cap in your hand, **upside down.** If any light can be seen between vent valve (6) and the rubber seal (5), replace the cap. **Do not use a replacement cap that has a spring to hold the vent shut.**

A replacement cap must be of the type designed for a full pressure coolant systems. This design ensures coolant return to the radiator.



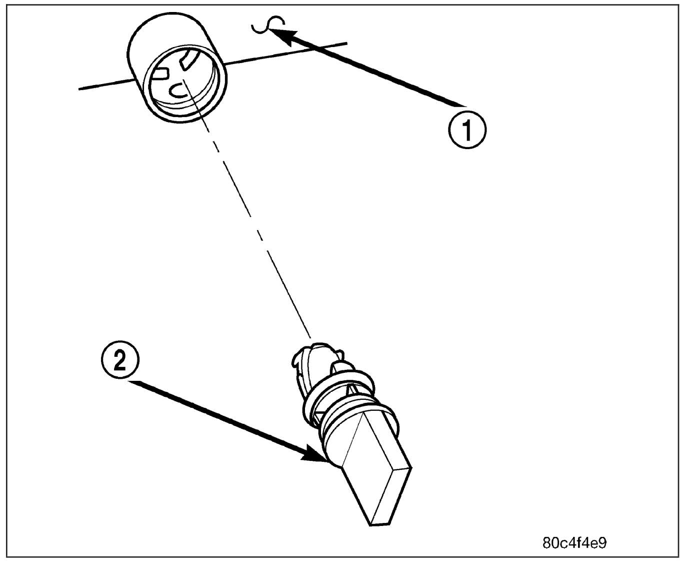
DRAINCOCK RADIATOR

REMOVAL

CAUTION: Use of pliers on draincock is not recommended. Damage may occur to radiator or draincock.

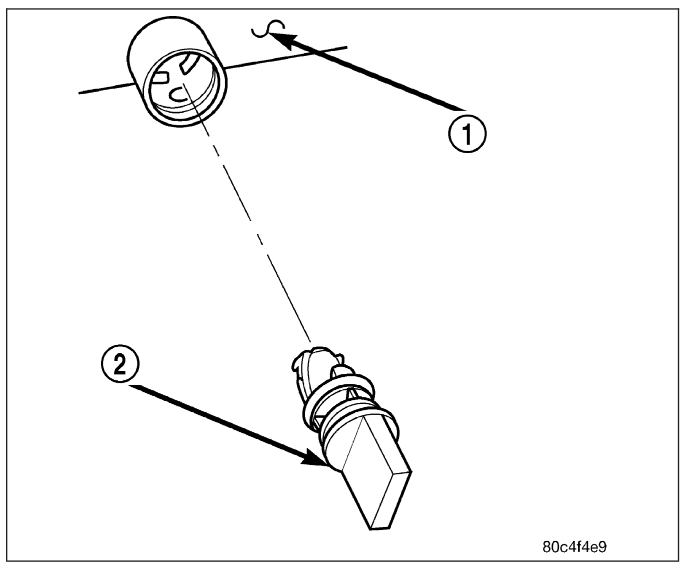
NOTE: It is not necessary to remove draincock during a routine coolant drain.

1. Drain the cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).
2. Open the draincock (2) by turning it counterclockwise until it stops.
3. Turn the draincock (2) back (clockwise) 1/8 turn.
4. Pull the draincock (2) from the radiator tank (1).



INSTALLATION

1. Align draincock stem to radiator tank opening.
2. Push draincock (2) into the radiator tank opening.
3. Tighten the draincock (2) by turning clockwise until it stops.
4. Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



FAN-RADIATOR

DESCRIPTION

The radiator cooling fans are dual-speed electric motor driven fans. The radiator fan assembly includes two electric motors, two five blade fans, and a support shroud that is attached to the radiator. The radiator fans are serviced as an assembly.

OPERATION

Radiator fan operation is controled by the Totally Integrated Power Module (TIPM), with inputs from the temperature of the coolant, which is sensed by the coolant temperature sensor, and vehicle speed which is measured by the vehicle speed sensor. The (TIPM) turns on the fan through either the high or low speed fan relay. The PCM provides a ground to the relay's control circuit. The fan relays are located in the (TIPM). Refer to the label beneath the(TIPM) cover for location of fan relays.

Refer to **Radiator Fan Operation Chart** for fan operation specifications. For fan circuit wiring diagrams, refer to WIRING DIAGRAMS.

If the cooling fan is inoperative or a Diagnostic Trouble Code (DTC) related to fan control has been set, refer to the appropriate Powertrain Diagnostic Information for diagnostic procedures.

RADIATOR FAN OPERATION CHART

Radiator Fan Control		
	Low Speed	**High Speed**
A/C Off –vehicle speed < 70.8 km/h (44 mph)		
Fan On:	96.6° C (206° F)	103° C (219° F)
Fan Off:	92.7° C (199° F)	98.8° C (210° F)
A/C Off –vehicle speed > 70.8 km/h (44 mph) (until vehicle speed drops below 58 km/h (36 mph)		
Fan On:	Off	103° C (219° F)
Fan Off:		98.8° C (210° F)
A/C On –any vehicle speed		
Fan On:	Off	82.2° C (180° F)
Fan Off:		80° C (176° F)

DIAGNOSIS AND TESTING

RADIATOR FAN

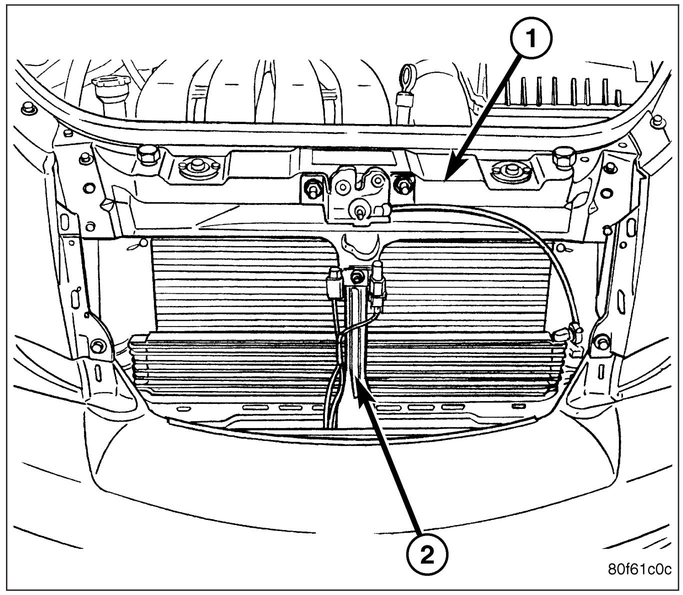
(Refer to Appropriate Diagnostic Information)

REMOVAL - WORLD ENGINE

NOTE: The fan motor, fan, and the shroud are serviced as an assembly.

WARNING: DO NOT OPEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

1. Disconnect negative cable from battery.
2. Drain cooling system below upper radiator hose level (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
3. Remove grille (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).
4. Disconnect upper radiator hose from radiator.
5. Hoist vehicle.
6. Disconnect radiator fan electrical connector.
7. Remove the two lower and left side radiator fan screws.



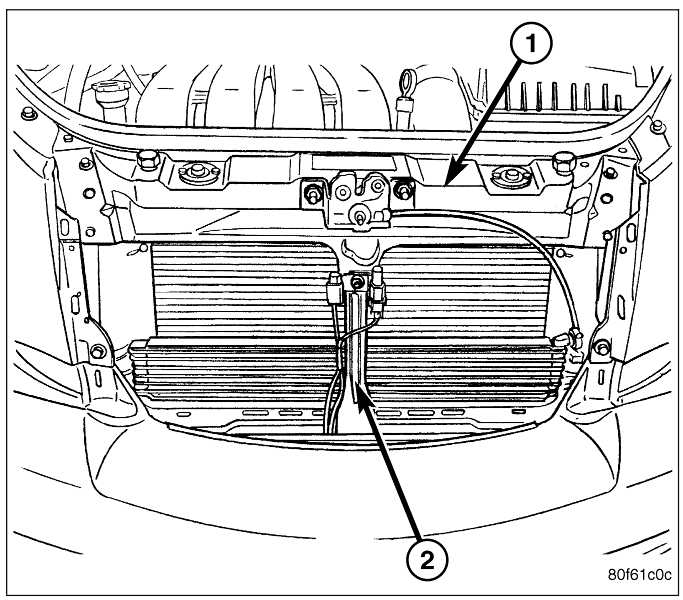
8. Lower vehicle and remove the remaining radiator fan attaching screws.

CAUTION: Care should be taken not to damage the radiator cooling fins and tubes during fan removal.

9. Remove radiator fan by lifting up from the engine compartment.

INSTALLATION - WORLD ENGINE

1. Install the radiator fan into position on the radiator.
2. Hand start all radiator fan fasteners.
3. Tighten all radiator fan retaining screws to 6 N·m (55 in. lbs.).
4. Connect radiator fan electrical connector.
5. Lower vehicle.
6. Connect the upper radiator hose to radiator. Align hose and position clamp so it will not interfere with the engine or the hood.
7. Install upper radiator closure panel and center brace (Refer to 23 - BODY/EXTERIOR/RADIATOR CLOSURE PANEL - INSTALLATION).
8. Install grille (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).
9. Install battery tray and battery.
10. Connect cables to battery.
11. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



RADIATOR

DESCRIPTION

The radiator is a down-flow type (vertical tubes) with design features that provide greater strength, as well as sufficient heat transfer capabilities to keep the engine coolant within operating temperatures.

The radiator has an aluminum core with plastic tanks. Although stronger than brass, plastic tanks are subject to damage by impact. Always handle radiator with care.

OPERATION

The radiator functions as a heat exchanger, using air flow across the exterior of the radiator tubes. This heat is then transferred from the coolant and into the passing air.

REMOVAL

WARNING: DO NOT OPEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

1. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
2. Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
3. Disconnect lower radiator hose.
4. Remove fasteners attaching AC condenser to radiator. Reposition AC condenser.
5. Remove radiator assembly by lifting it up from the engine compartment. **Care should be taken not to damage the cooling fins and tubes during removal.**

CLEANING

Clean radiator fins are necessary for good heat transfer. The radiator and air conditioning fins should be cleaned when an accumulation of debris has occurred. With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

Inspect the radiator tanks for cracks, broken or missing fittings also inspect the joint where the tanks seam up to the radiator core for signs of leakage and/or deteriorating seals.

Inspect radiator core for corroded, bent or missing cooling fins. Inspect the core for bent or damaged cooling tubes.

INSTALLATION

1. Install the lower air seal to radiator.

NOTE: Turbocharger Equipped Vehicles: When lowering radiator, make sure lower radiator pins engage properly through Charge Air Cooler locating tabs.

2. Position radiator into mounting position.
3. Position A/C condenser against radiator. Hand start fasteners.
4. Install fasteners attaching Charge Air Cooler to radiator. Tighten fasteners to 8 N·m (70 in. lbs.)
5. Install radiator fan/shroud assembly. Hand start fasteners.
6. Tighten all condenser fasteners to 8 N·m (70 in. lbs.).
7. Tighten all radiator fan fasteners to 6 N·m (55 in. lbs.).
8. Install fasteners attaching transmission oil cooler to radiator. Tighten fasteners to 8 N·m (70 in. lbs.).
9. Raise vehicle on hoist.
10. Connect the lower air seal to the side air seals.
11. Connect lower radiator hose. Align the hose and position the clamp so it will not interfere with engine components.
12. Connect the radiator fan electrical connector.

13. Connect the power steering hoses.
14. Close radiator draincock.
15. Lower vehicle.
16. **Turbocharger equipped vehicles:** Inspect radiator inlet neck o-ring. Replace if necessary. Install radiator inlet neck. Tighten fasteners to 6 N·m (55 in. lbs.).
17. Connect upper radiator hose. Align the hose and position the clamp to prevent interference with the engine or hood.
18. Install upper radiator closure panel and center brace (Refer to 23 - BODY/EXTERIOR/RADIATOR CLOSURE PANEL - INSTALLATION).
19. Install grille (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).
20. Install battery tray and battery.
21. Connect positive battery cable. Connect negative battery cable.
22. Install air cleaner housing assembly.
23. Fill cooling system with coolant (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
24. Operate engine until it reaches normal operating temperature. Check cooling system for correct fluid level.

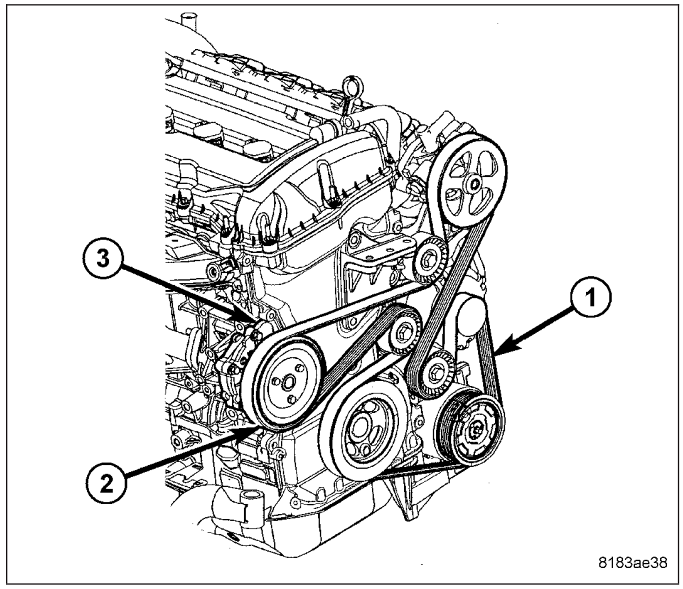
PUMP-WATER

DESCRIPTION

WORLD ENGINE

The water pump (3) on the world engine is attached to the water pump adapter on the front of the cylinder block.

The water pump is driven by the accessory drive belt. The water pump is connected to the water plenum by the return tube.



DIAGNOSIS AND TESTING

WATER PUMP

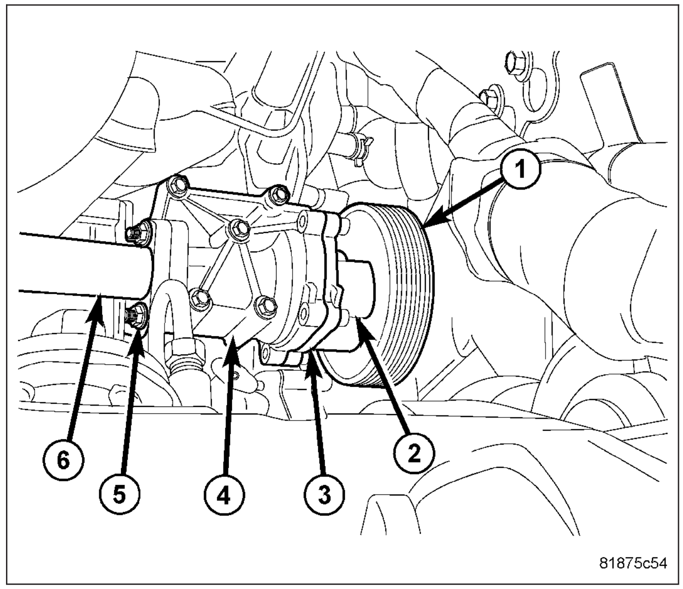
A quick flow test to determine if the water pump is working effectively is to check heater system for proper operation. A defective pump will not provide an adequate flow of heated coolant through the system.

WARNING: DO NOT REMOVE THE COOLING SYSTEM PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Another flow test to help determine water pump operation is as follows:

1. Remove cooling system pressure cap.
2. Remove a small amount of coolant from the system.
3. Start the engine and warm up until thermostat opens.
4. With the thermostat open and coolant level low, visually inspect for coolant flow. If flow is present, the water pump is pumping coolant through the system.

REMOVAL - WORLD ENGINE



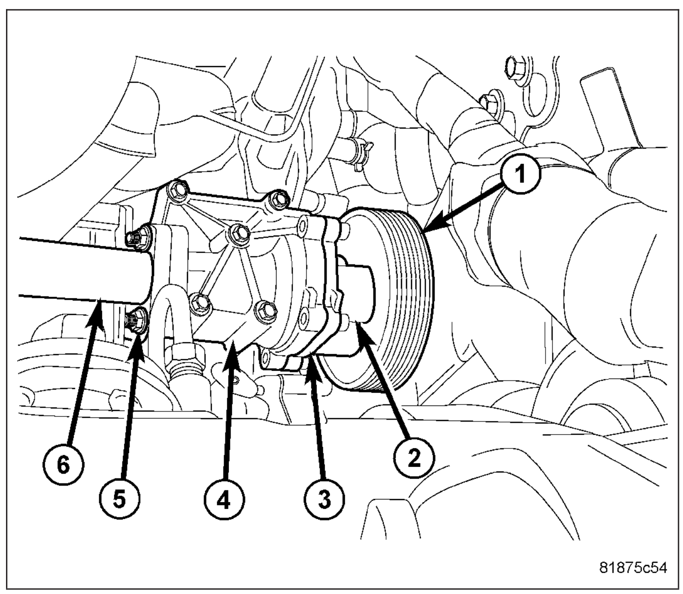
1. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELT - REMOVAL).
2. Drain engine coolant (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE - DRAIN COOLING SYSTEM).
3. Raise vehicle (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
4. Remove accessory drive belt splash shield.
5. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
6. Remove screws attaching water pump pulley (1). Remove pulley (1).
7. Remove water pump mounting bolts (2).
8. Remove water pump (3).

INSPECTION

Replace water pump body assembly if it has any of these defects:

- Cracks or damage on the body.
- Coolant leaks from the shaft seal, evident by wet coolant traces on the pump body.
- Loose or rough turning bearing.
- Impeller rubs either the pump body or the engine block.
- Impeller loose or damaged.
- Sprocket or sprocket flange loose or damaged.

INSTALLATION - WORLD ENGINE



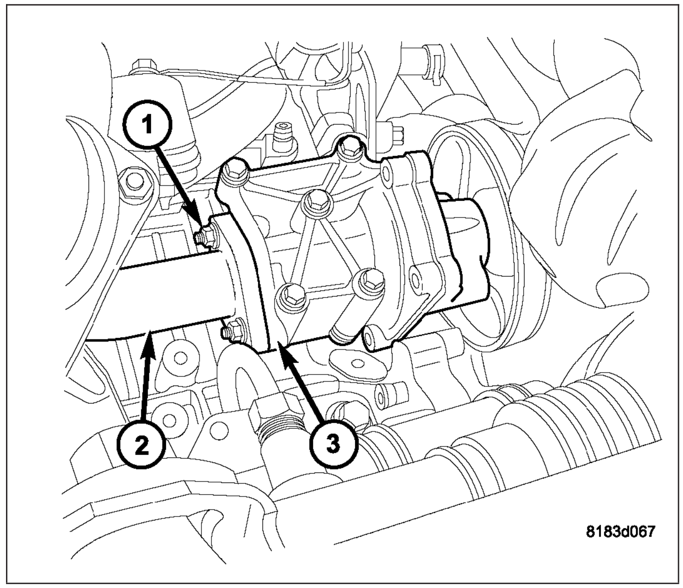
1. Position water pump assembly (3) into water pump housing (4).
2. Install mounting bolts (2). Tighten bolts to 12 N·m (105 in. lbs.).
3. Install water pump pulley (1). Tighten bolts to 28 N·m (21 ft. lbs.).
4. Install drive belt splash shield.
5. Lower vehicle.
6. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELT - INSTALLATION).
7. Connect battery negative terminal.
8. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - FILLING COOLING SYSTEM).

INLET TUBEWATER PUMP-WORLD ENGINE

REMOVAL

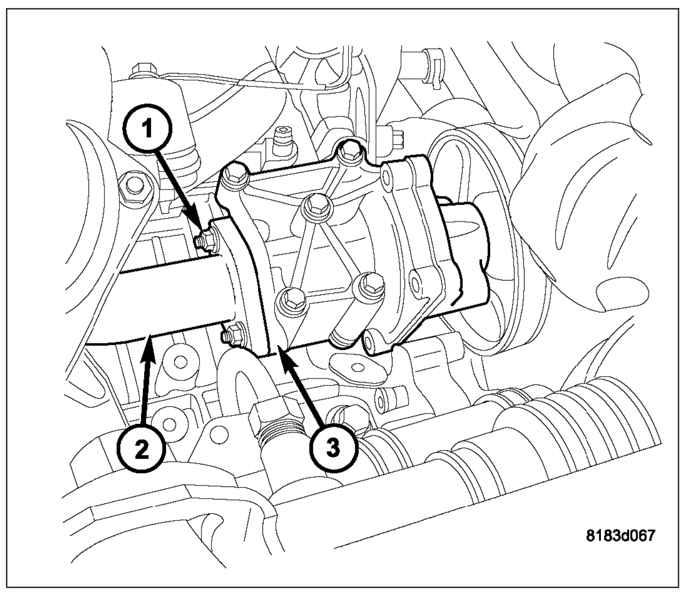
The water pump inlet tube (3) connects the water pump to the coolant adapter. This tube is sealed by an O-ring and held in place by fasteners to the water pump housing.

1. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
2. Remove the coolant adapter and secondary thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).
3. Raise and support vehicle.
4. Remove inlet tube mounting nuts (1).
5. Remove inlet tube (3).



INSTALLATION

1. Inspect the O-ring for damage before installing the tube. Replace O-ring as necessary.
2. Lubricate O-rings with soapy water.
3. Install new water inlet gasket between tube and water pump housing (2).
4. Position water pump inlet tube (3) on water pump housing (2). Hand tighten nuts to aide in tube alignment.
5. Install secondary thermostat and coolant adapter (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION).
6. Tighten coolant tube nuts (1) to 24 N·m (212 in. lbs.).
7. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



TRANSMISSION

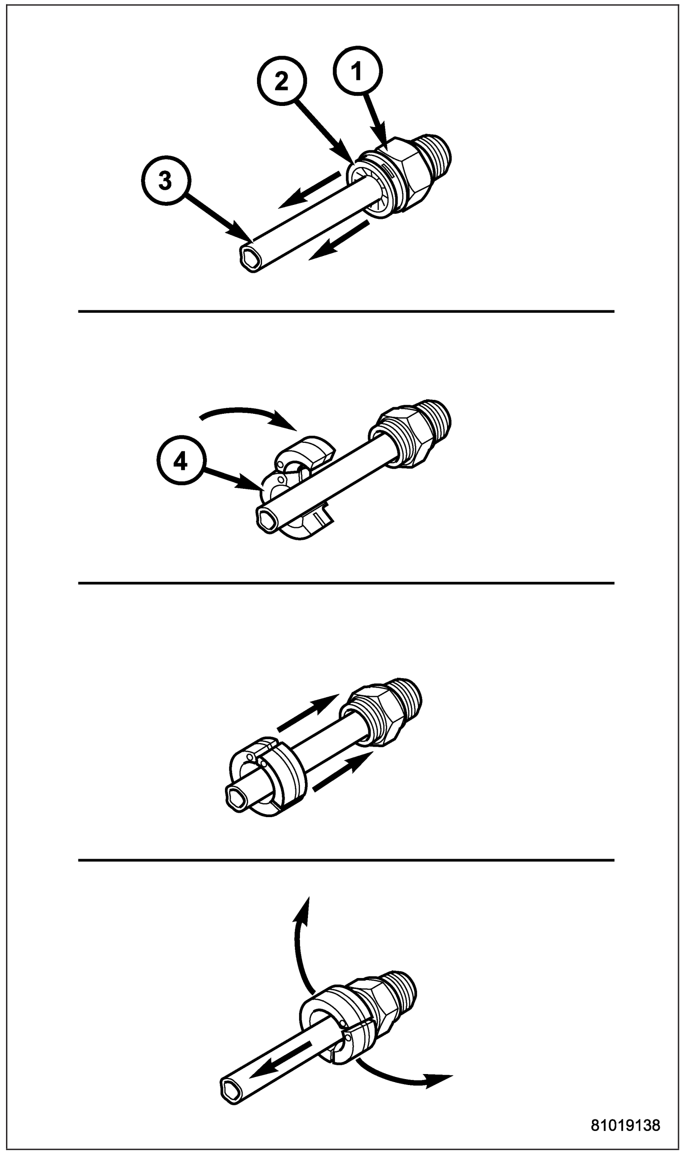
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TRANSMISSION

STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING DISASSEMBLY/ASSEMBLY

DISCONNECT

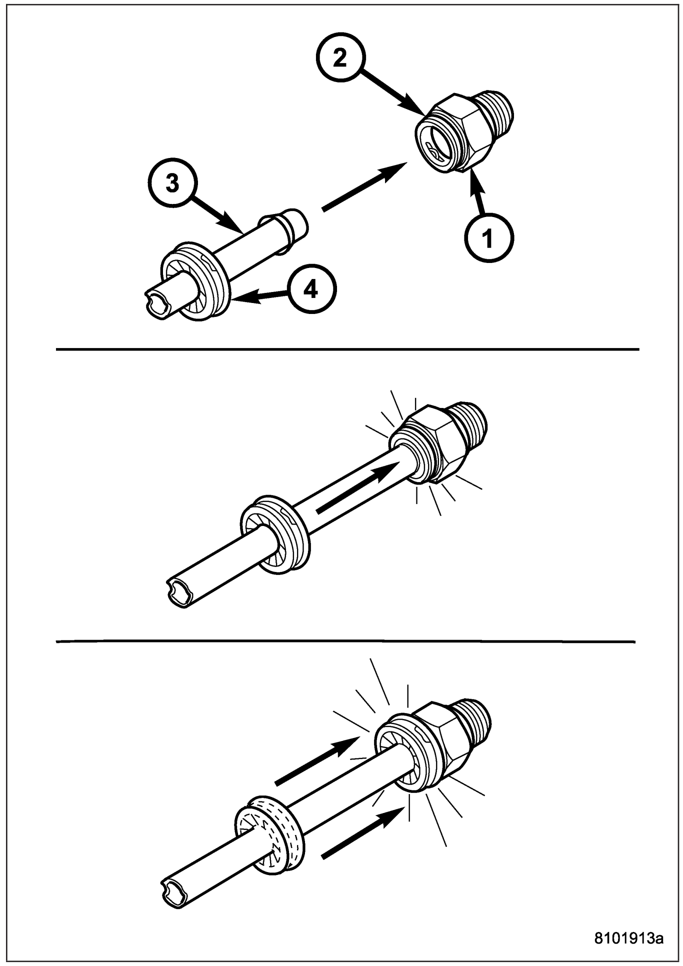
1. Remove dust cap by pulling it straight back off of quick connect fitting (1).
2. Place disconnect tool Release Tool 8875A (4) onto transmission cooler line with the fingers of the tool facing the quick connect fitting.
3. Slide disconnect tool down the transmission line and engage the fingers of the tool into the retaining clip. When properly engaged in the clip, the tool will fit flush against the quick connect fitting.
4. Rotate the disconnect tool 60° to expand the retaining clip.
5. While holding the disconnect tool against the quick connect fitting, pull back on the transmission cooler line to remove.



CONNECT

1. Align transmission cooler line (3) with quick connect fitting while pushing straight into the fitting.
2. Push in on transmission cooler line until a “click” is heard or felt.
3. Slide dust cap (4) down the transmission cooler line and snap it over the quick connect fitting until it is fully seated and rotates freely. Dust cap will only snap over quick connect fitting when the transmission cooler line is properly installed.

NOTE: If dust cap will not snap into place, repeat assembly step #2.

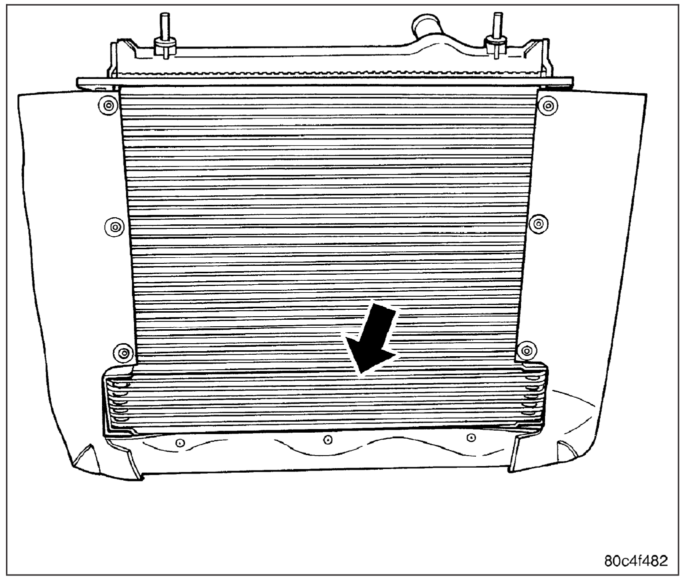


COOLER AUTOMATIC TRANSMISSION

DESCRIPTION

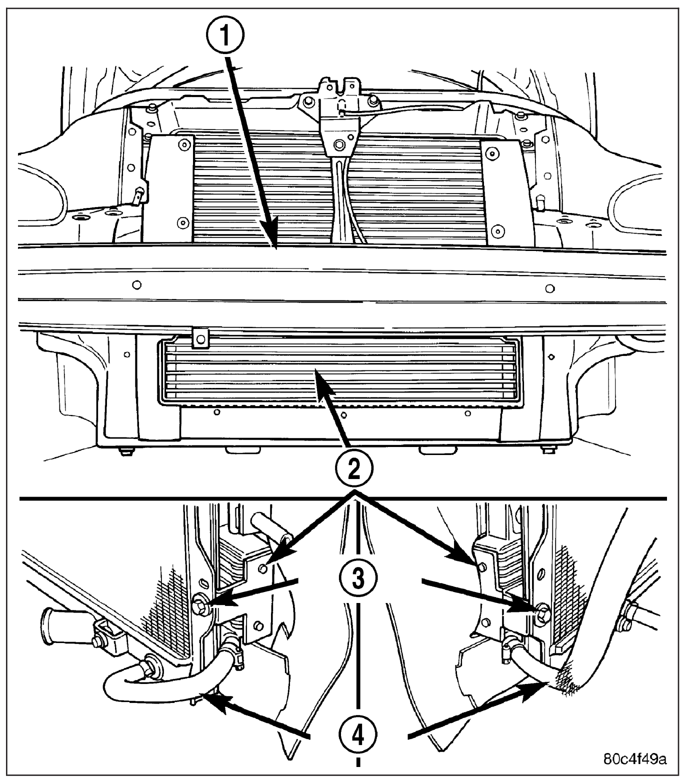
The automatic transmission cooler is located in the front of the radiator and behind the front fascia and is combined with the A/C condenser. The transmission cooler is a heat exchanger that allows heat in the transmission fluid to be transferred to the air passing over the cooler fins.

The Transmission oil cooler/A/C condenser assembly is equipped with quick connect fitting for the transmission oil cooler lines.



REMOVAL

1. Remove front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
2. Recover refrigerant (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
3. Disconnect A/C lines.
4. Using Tool 9586 disconnect cooler line from the combination cooler (Refer to 7 - COOLING/ TRANSMISSION - STANDARD PROCEDURE).
5. Remove combination cooler mounting bolts.
6. Remove combination cooler (2).



CLEANING

Check the external cooler for debris on the cooling fin surfaces. Clean as necessary.

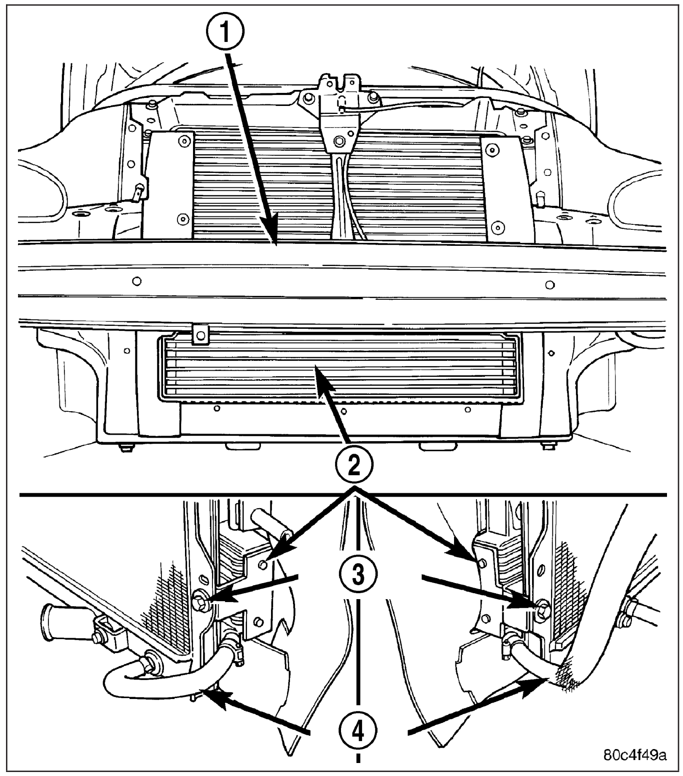
INSPECTION

Inspect all hoses, tubes, clamps and connections for leaks, cracks, or damage. Replace as necessary. Use only approved transmission oil cooler hoses that are molded to fit the space available.

Inspect external coolers for leaks, loose mounts, or damage. Replace as necessary.

INSTALLATION

1. Replace automatic transmission cooler hoses and clamps.
2. Connect hoses to combination cooler (2) (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE).
3. Install combination cooler (2). Tighten screws to 8 N·m (70 in. lbs.).
4. Install radiator closure panel center brace.
5. Install upper radiator closure panel (Refer to 23 - BODY/EXTERIOR/RADIATOR CROSSMEMBER - INSTALLATION).
6. Install grille (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).
7. Start engine and check transmission fluid level. Adjust level as necessary.



AUDIO/VIDEO

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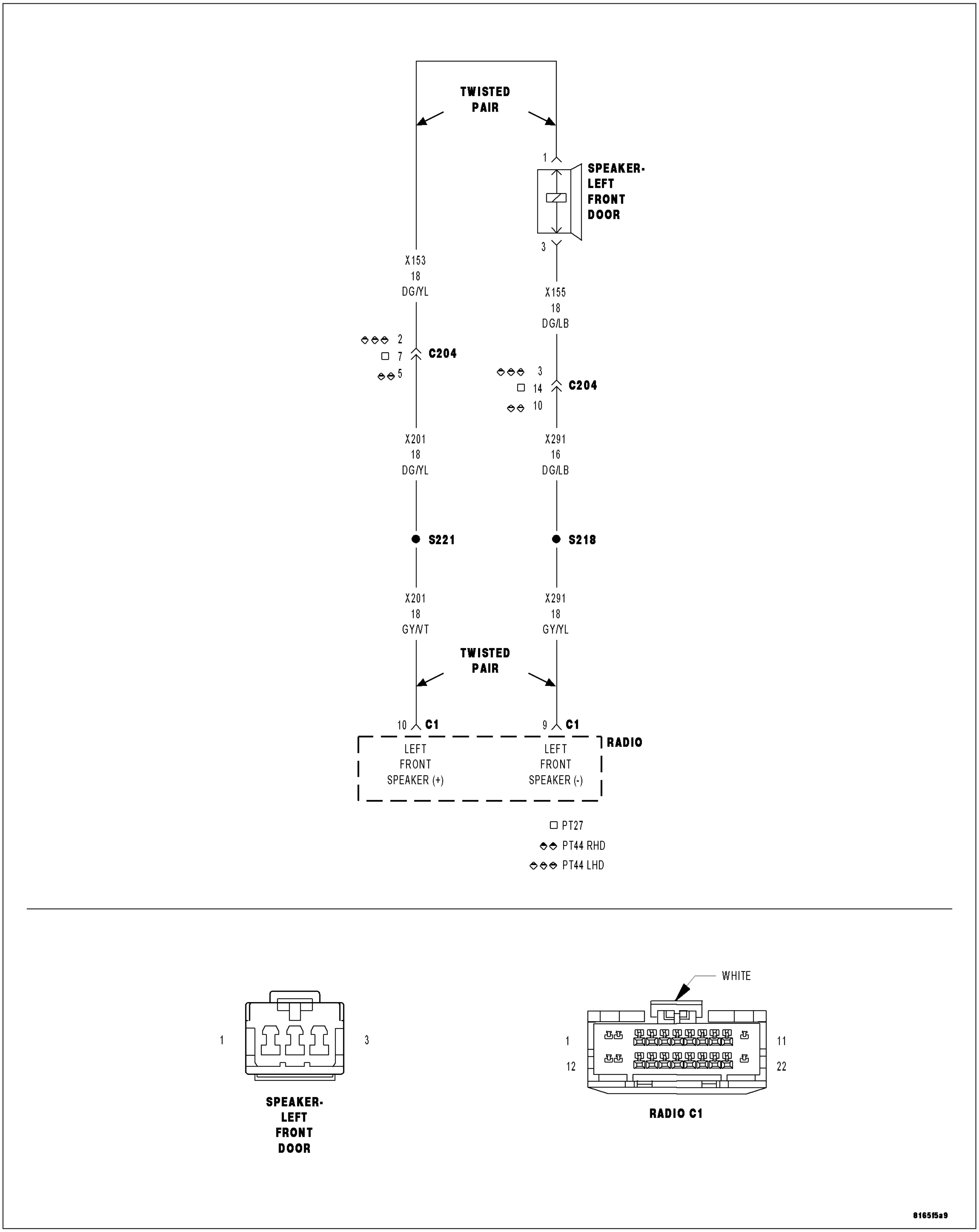
AUDIO/VIDEO SYSTEMS- ELECTRICAL DIAGNOSIS

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AUDIO/VIDEO SYSTEMS- ELECTRICAL DIAGNOSIS

DIAGNOSIS AND TESTING

B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than three seconds.

Possible Causes
SPEAKER
(X201) (X291) LEFT FRONT SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, clear all Audio DTC's.
Turn the radio on.
With the scan tool, read the DTC information.

Does the scan tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

2. (X201) (X291) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Left Audio Speaker connector.
Measure the resistance between ground and each speaker (X201)(+) and (X291)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable speaker (+) or (-) output circuit for a short to ground condition.

No >> Go To 3

3. SPEAKER

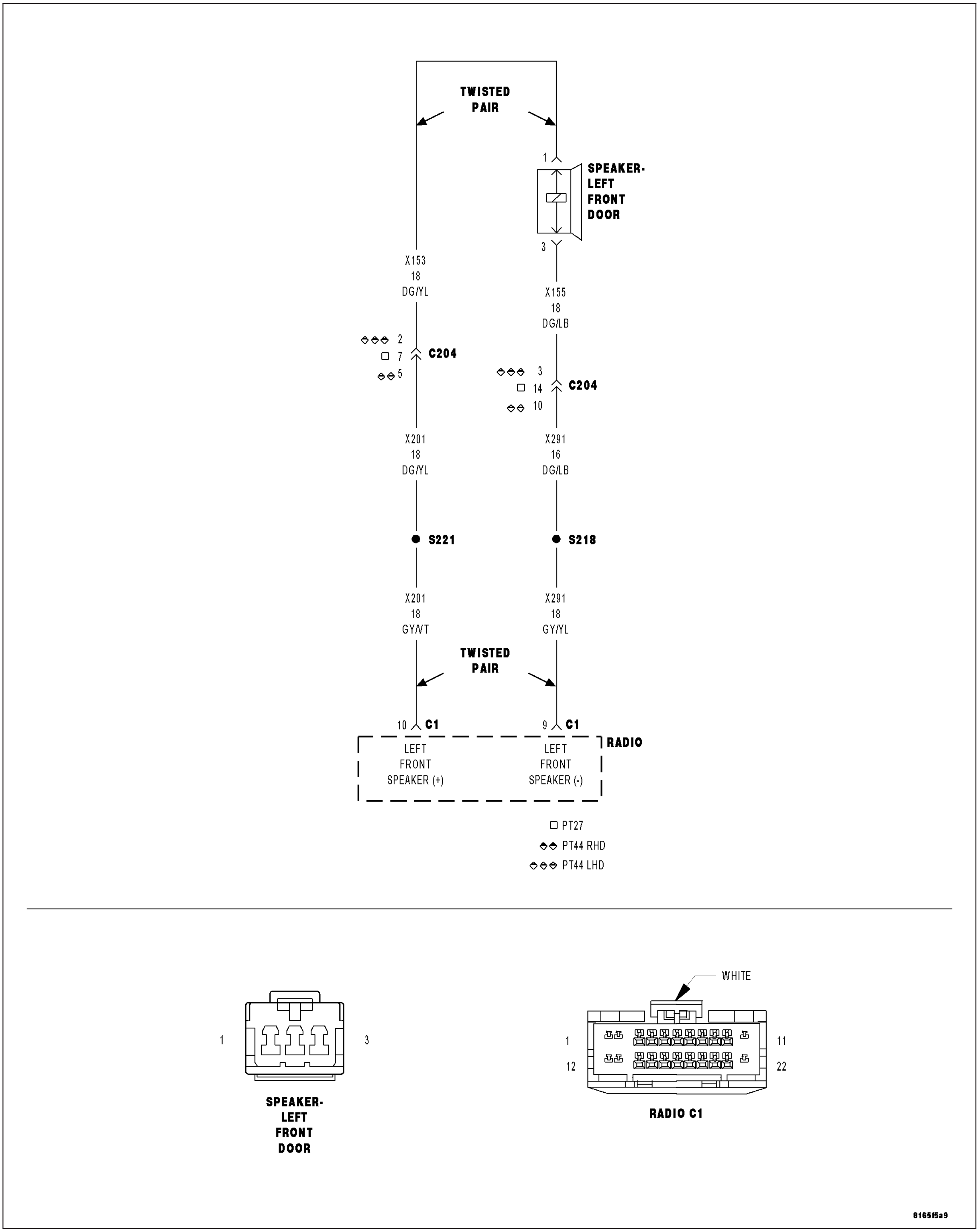
Turn the ignition off.
Disconnect the Front Left Audio Speaker.
Turn the ignition on.
Turn the radio on.
With the scan tool, clear all Audio DTC's.
With the scan tool, read the DTC information.

Does the scan tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
SPEAKER
(X201) SPEAKER OUTPUT CIRCUIT (+)
(X291) SPEAKER OUTPUT CIRCUIT (-)

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

Does the scan tool display active: B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

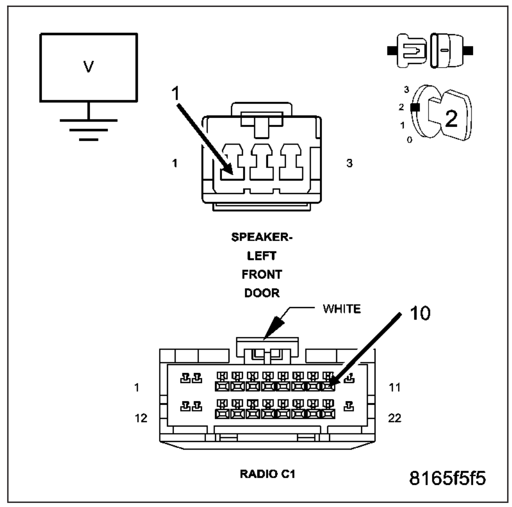
2. CHECK FOR VOLTAGE ON THE (X201) SPEAKER (+) CIRCUIT

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Left Front Speaker harness connector.

Measure for voltage on the (X201) Speaker (+) circuit.



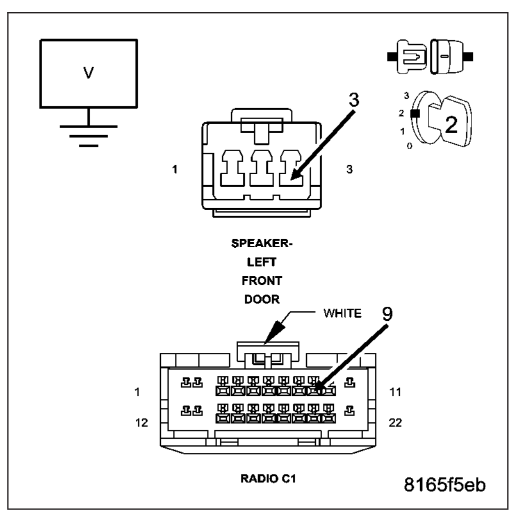
Is the voltage above 10.0 volts?

Yes >> Repair the (X201) Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X291) SPEAKER (-) CIRCUIT

Measure for voltage on the (X291) Speaker (-) circuit.

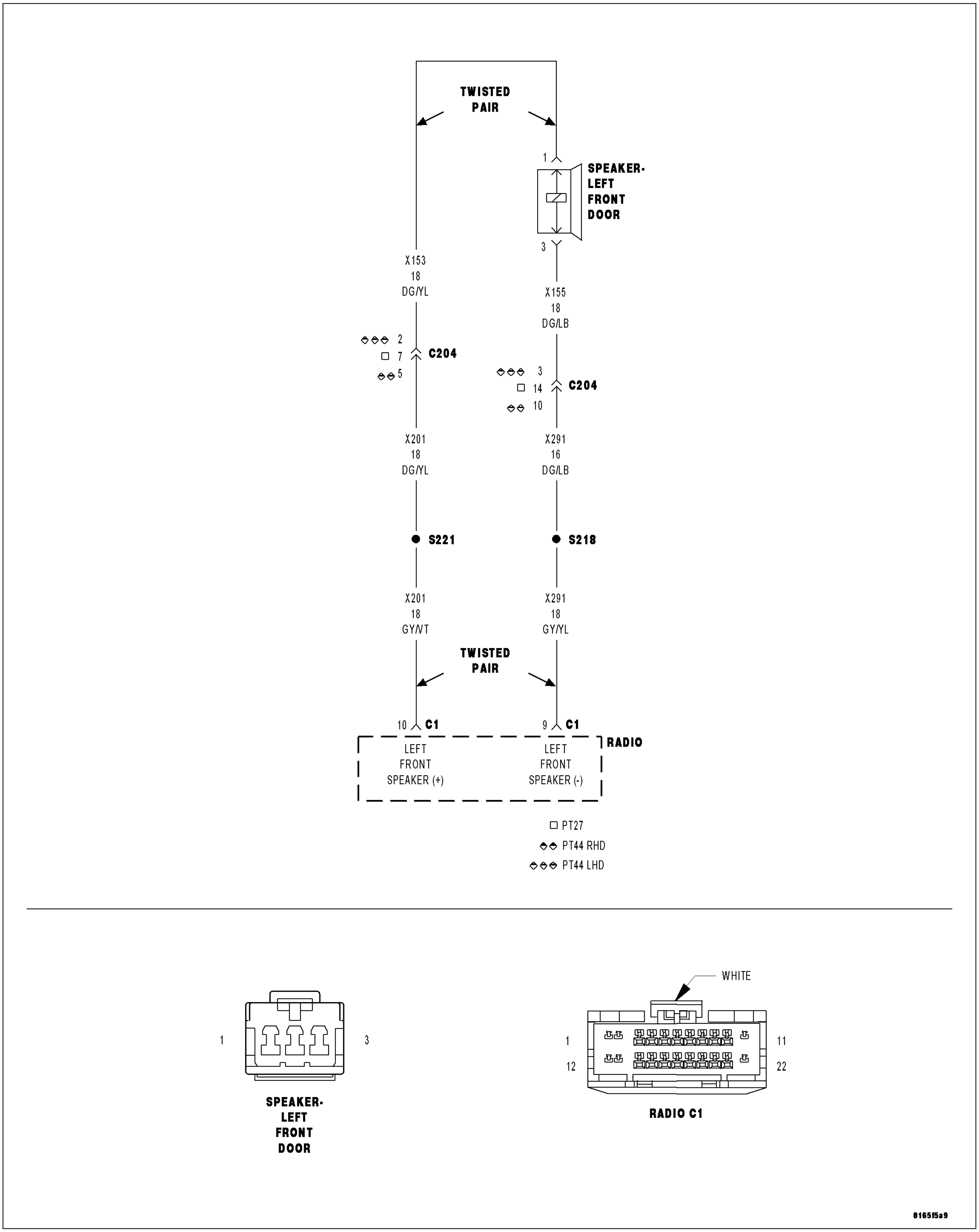


Is the voltage above 10.0 volts?

Yes >> Repair the (X291) Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is open for more than three seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER
(X201) (X291) LEFT FRONT SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, clear all Audio DTC's.
Turn the radio on.
With the scan tool, read the DTC information.

Does the scan tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

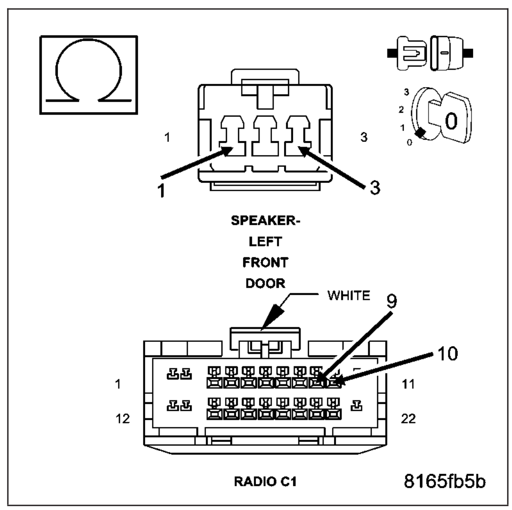
No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

2. (X201) (X291) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Left Audio Speaker connector.
Measure the resistance of each speaker (X201)(+) and (X291)(-) circuit between the radio and the speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3



No >> Repair the applicable output speaker circuit for an open condition.
Perform the BODY VERIFICATION TEST VER 1.

3. SPEAKER

Turn the ignition off.

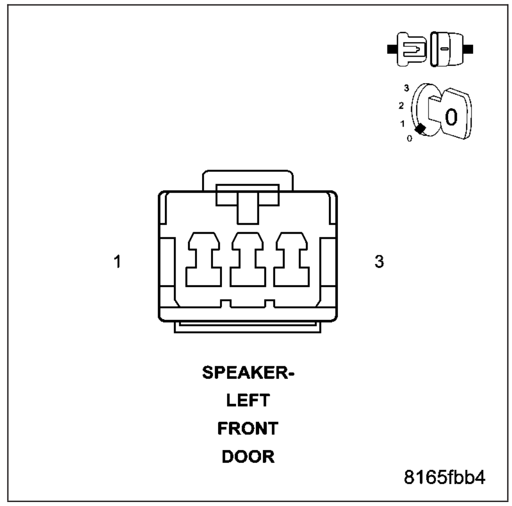
Disconnect the Front Left Audio Speaker.

Turn the ignition on.

Turn the radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



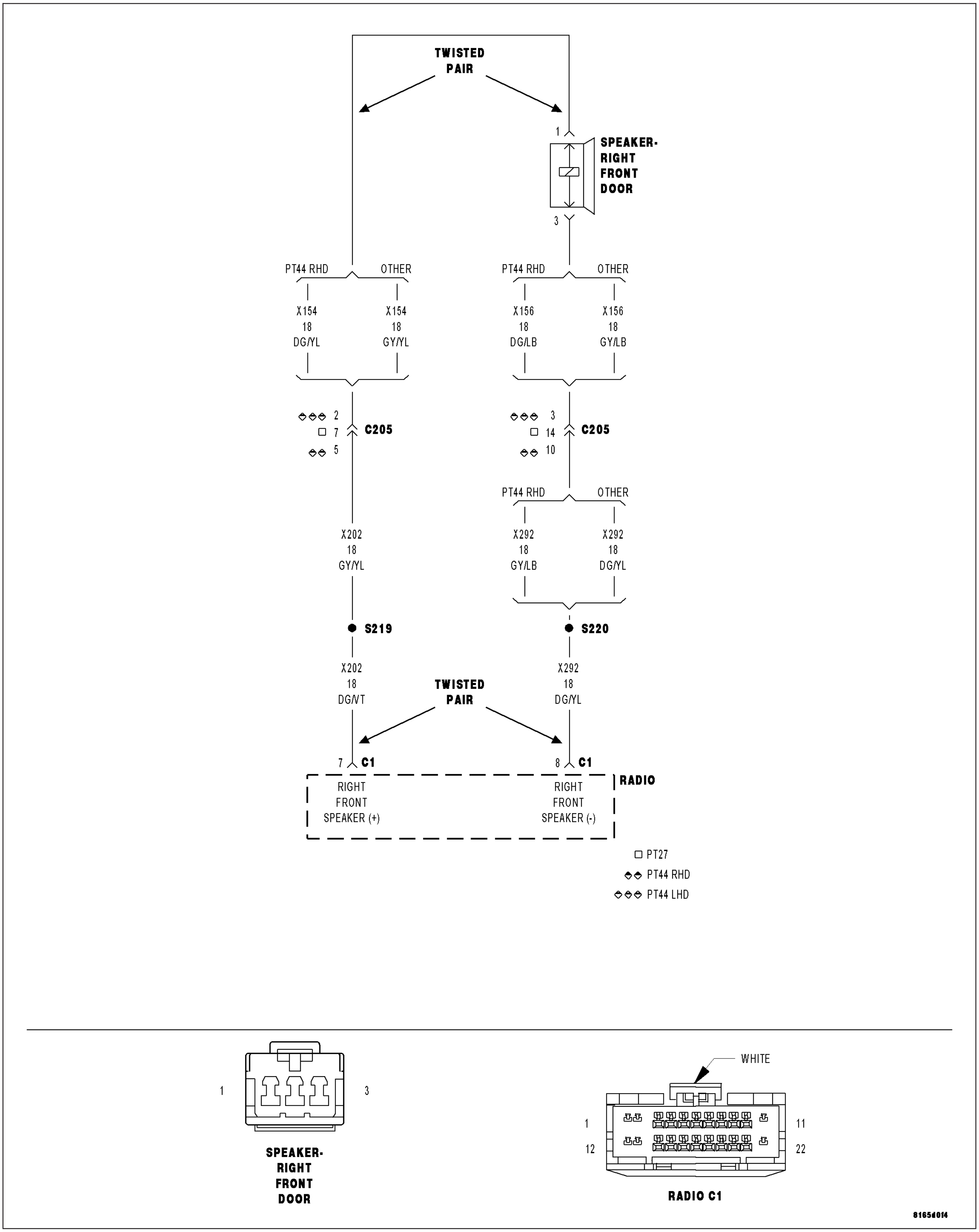
Does the scan tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is LOW for more than three seconds.

Possible Causes
SPEAKER
(X202) (X292) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, clear all Audio DTC's.
Turn the radio on.
With the scan tool, read the DTC information.

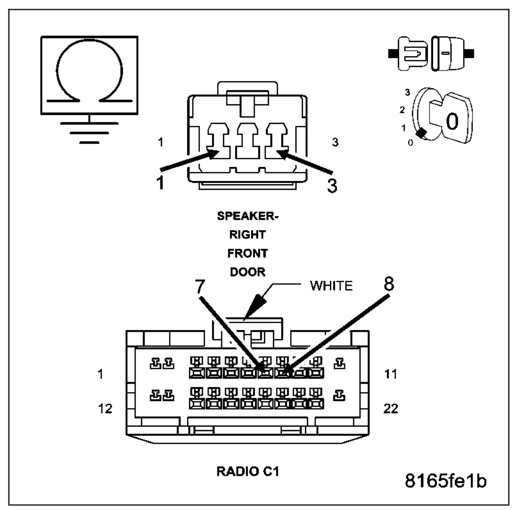
Does the scan tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

2. (X202) (X292) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Right Audio Speaker connector.
Measure the resistance between ground and each speaker (X202)(+) and (X292)(-) circuit.



Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable speaker (+) or (-) output circuit for a short to ground condition.

No >> Go To 3

3. SPEAKER

Turn the ignition off.

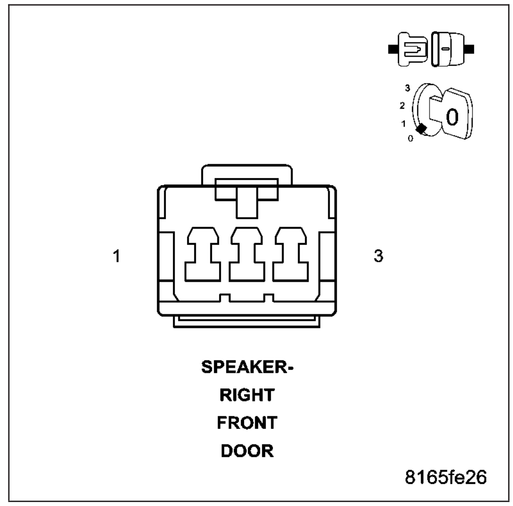
Disconnect the Front Right Audio Speaker.

Turn the ignition on.

Turn the radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



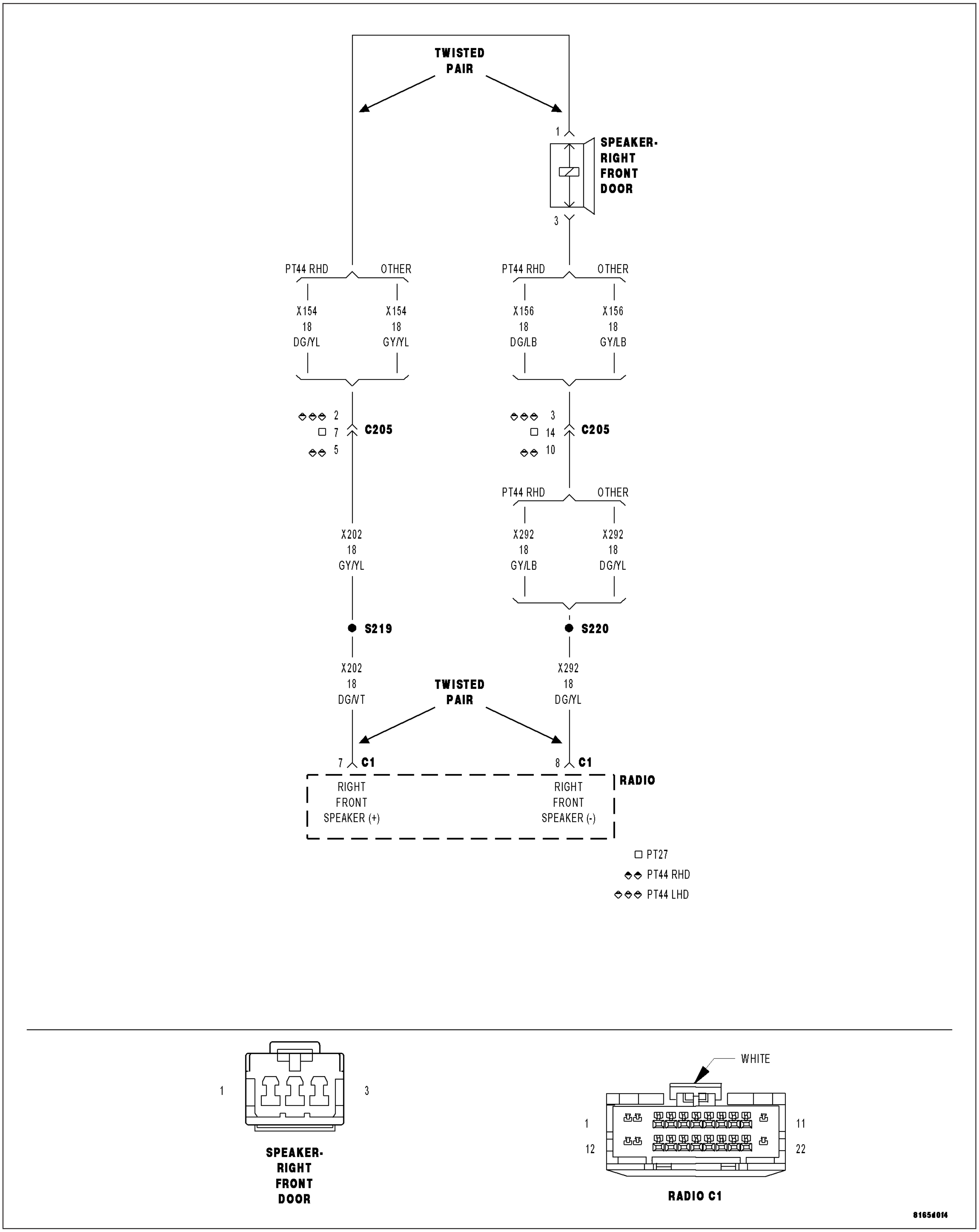
Does the scan tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
SPEAKER
(X202) SPEAKER OUTPUT CIRCUIT (+)
(X292) SPEAKER OUTPUT CIRCUIT (-)

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

Does the scan tool display active: B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X202) SPEAKER (+) CIRCUIT

Turn the ignition off.

Disconnect the Radio C1 harness connector.

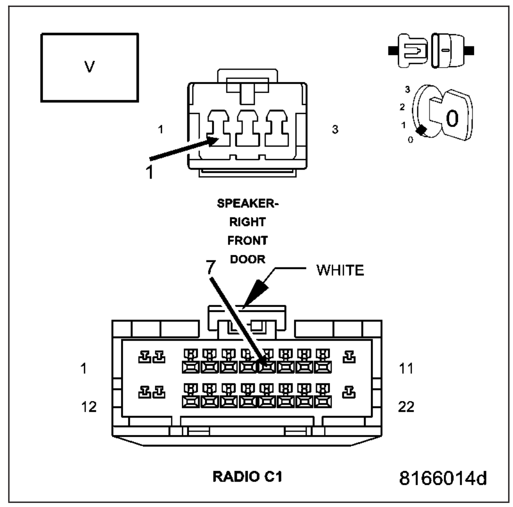
Disconnect the Right Rear Speaker harness connector.

Measure for voltage on the (X202) Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X202) Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



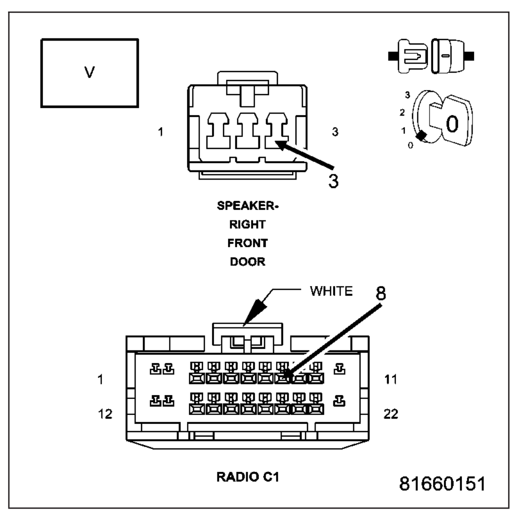
3. CHECK FOR VOLTAGE ON THE (X292) SPEAKER (-) CIRCUIT

Measure for voltage on the (X292) Speaker (-) circuit.

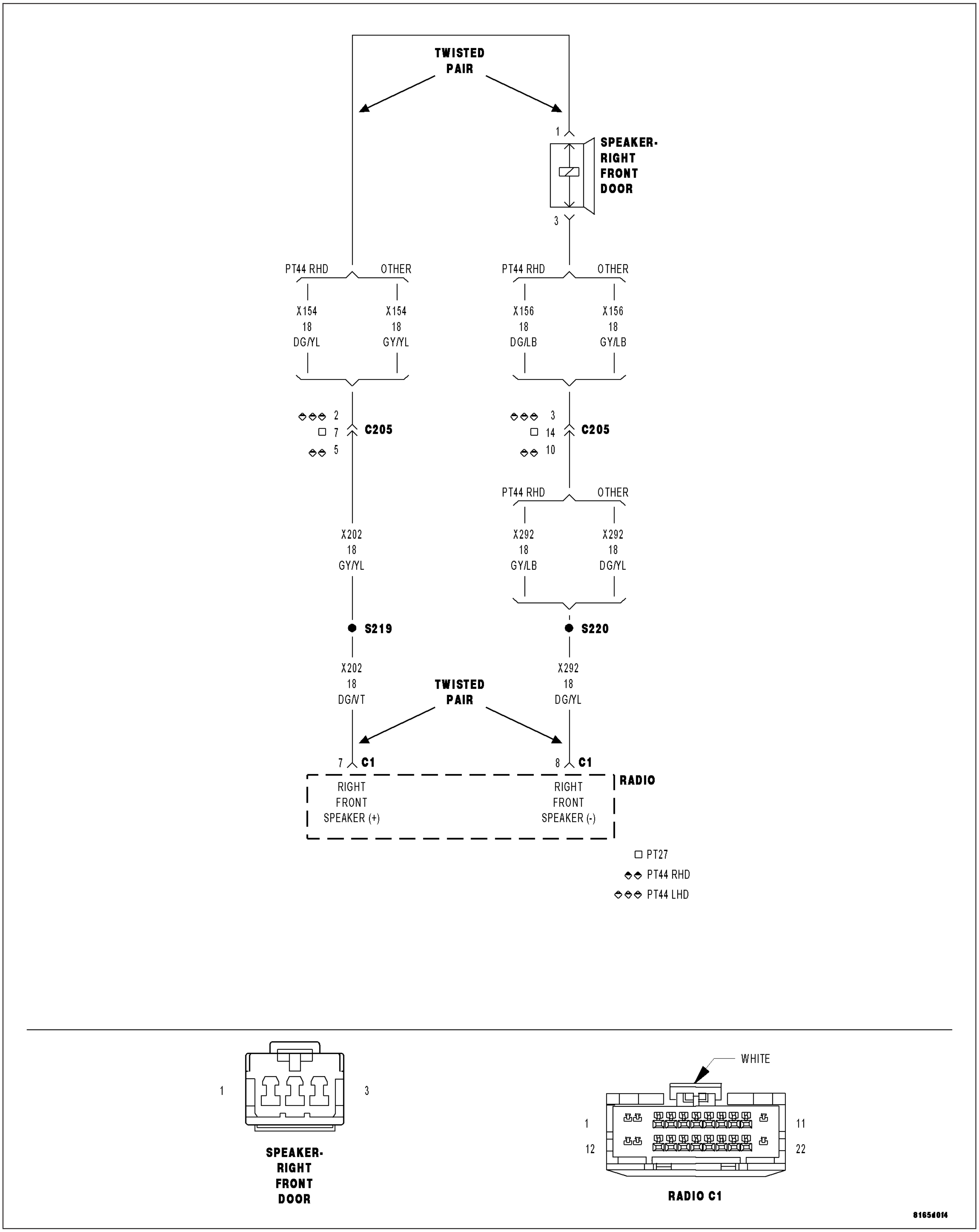
Is the voltage above 10.0 volts?

Yes >> Repair the (X292) Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is open for more than three seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER
(X202) (X292) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, clear all Audio DTC's.

Turn the radio on.

With the scan tool, read the DTC information.

Does the scan tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

2. (X202) (X292) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.

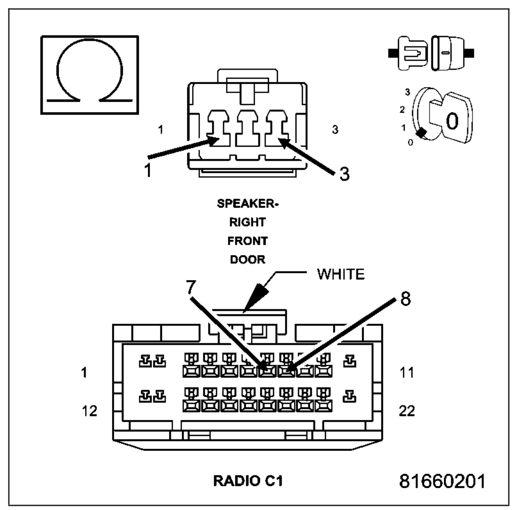
Disconnect the Radio C1 harness connector.

Disconnect the Front Right Audio Speaker connector.

Measure the resistance of each speaker (X202)(+) and (X292)(-) circuit between the Radio and the Speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3



No >> Repair the applicable Output Speaker circuit for an open condition.

Perform the BODY VERIFICATION TEST VER 1.

3. SPEAKER

Turn the ignition off.

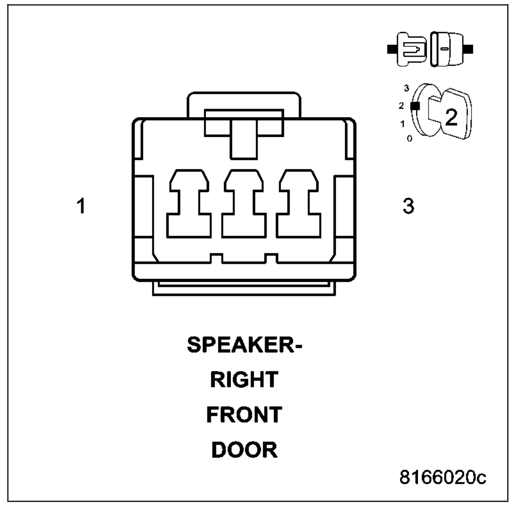
Disconnect the Front Right Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



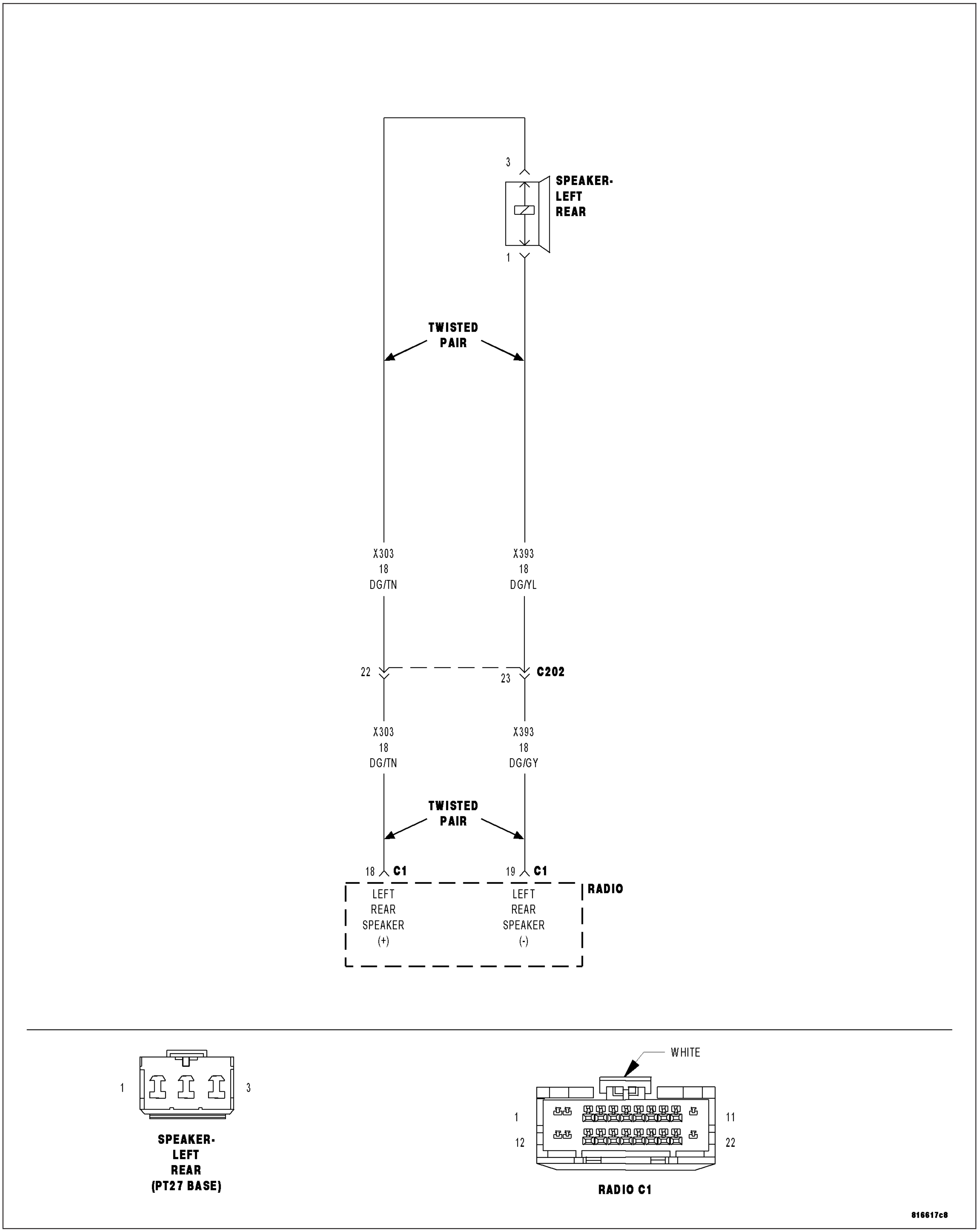
Does the scan tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the Speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is LOW for more than three seconds.

Possible Causes
SPEAKER
(X303) (X393) LEFT REAR SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, clear all Audio DTC's.

Turn the radio on.

With the scan tool, read the DTC information.

Does the scan tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

2. (X303) (X393) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.

Disconnect the Radio C1 harness connector.

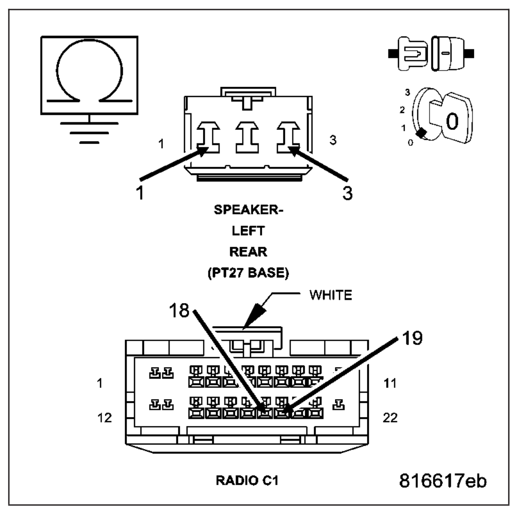
Disconnect the Rear Left Audio Speaker connector.

Measure the resistance between ground and each speaker (X303)(+) and (X393)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable speaker (+) or (-) output circuit for a short to ground condition.

No >> Go To 3



3. SPEAKER

Turn the ignition off.

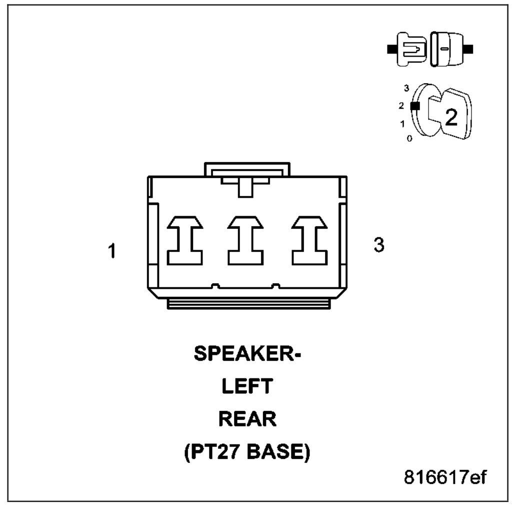
Disconnect the Rear Left Audio Speaker.

Turn the ignition on.

Turn the radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



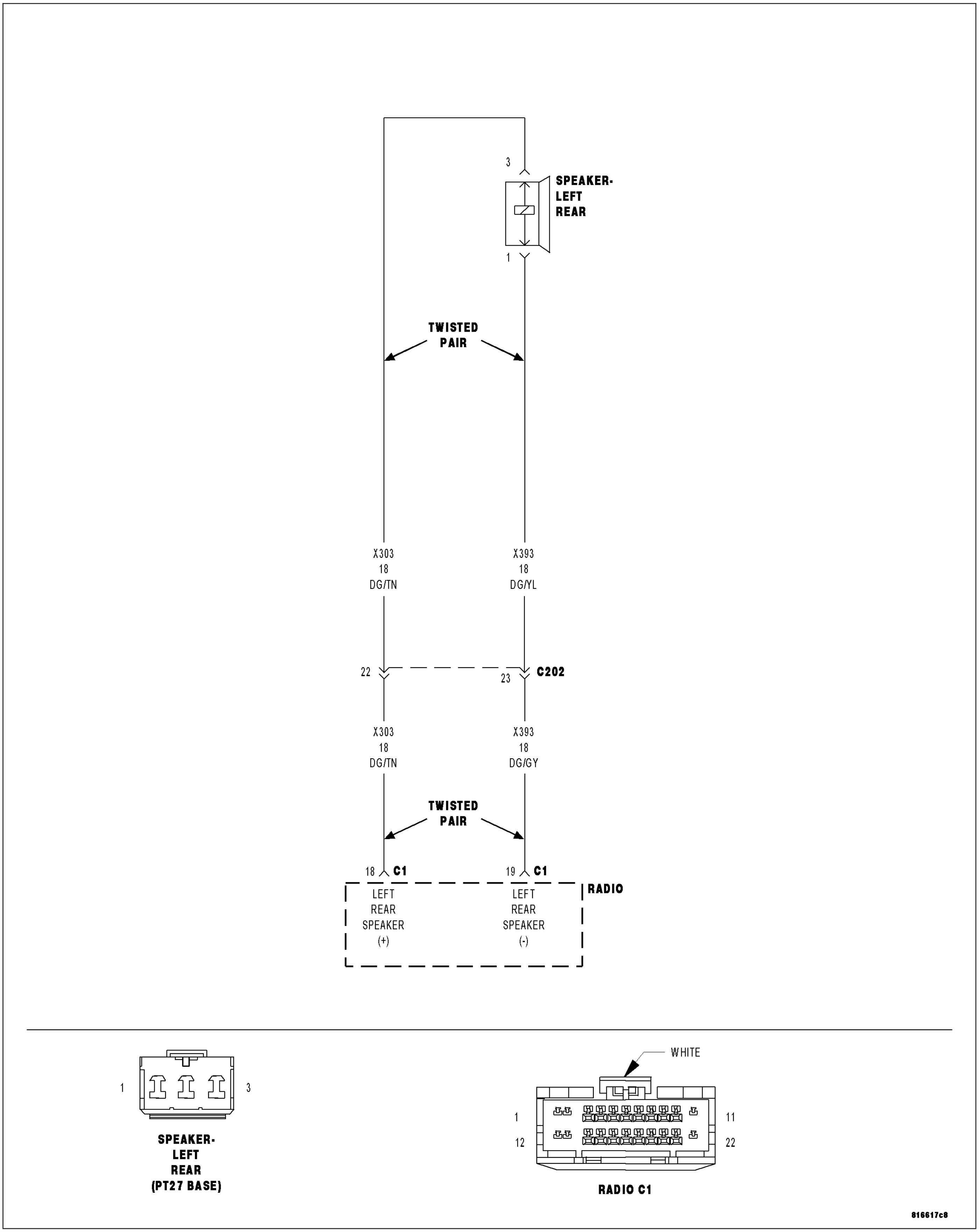
Does the scan tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
SPEAKER
(X303) SPEAKER OUTPUT CIRCUIT (+)
(X393) SPEAKER OUTPUT CIRCUIT (-)

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

Does the scan tool display active: B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

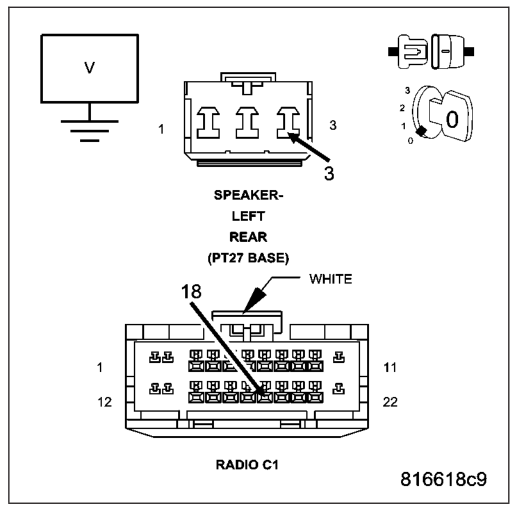
2. CHECK FOR VOLTAGE ON THE (X303) SPEAKER (+) CIRCUIT

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Left Rear Speaker harness connector.

Measure for voltage on the (X303) Speaker (+) circuit.



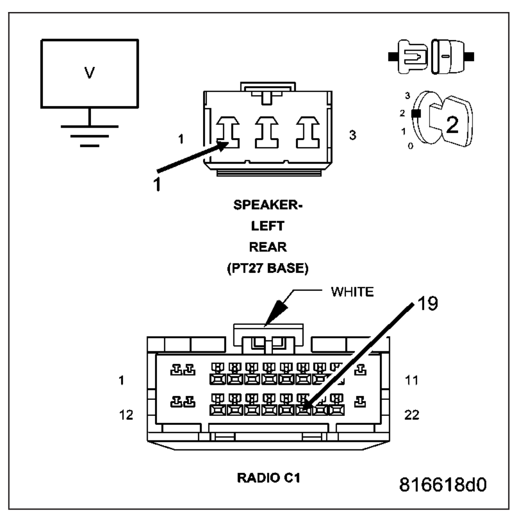
Is the voltage above 10.0 volts?

Yes >> Repair the (X303) Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X393) SPEAKER (-) CIRCUIT

Measure for voltage on the (X393) Speaker (-) circuit.

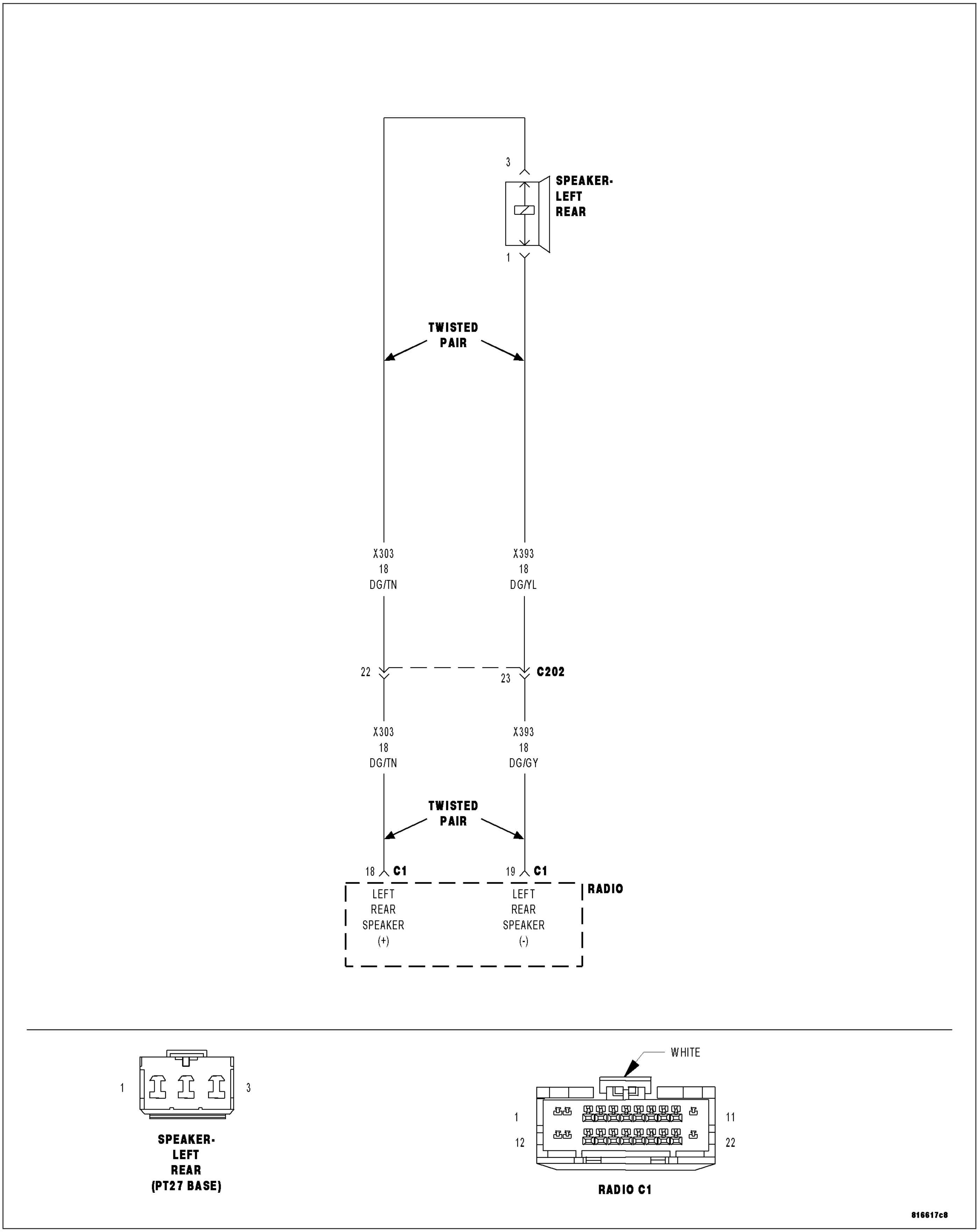


Is the voltage above 10.0 volts?

Yes >> Repair the (X393) Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is open for more than three seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER
(X303) (X393) LEFT REAR SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, clear all Audio DTC's.

Turn the radio on.

With the scan tool, read the DTC information.

Does the scan tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

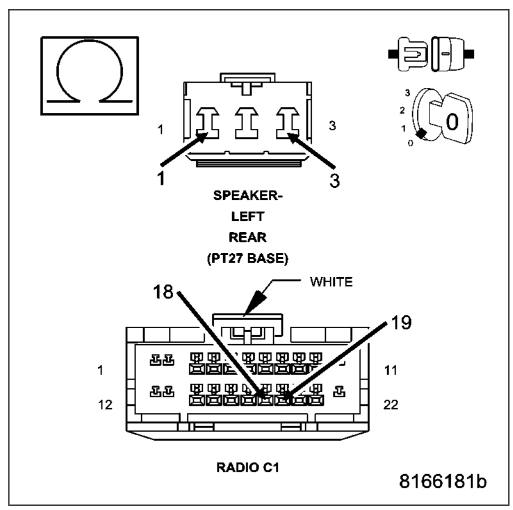
2. (X303) (X393) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Left Audio Speaker connector.

Measure the resistance of each speaker (X303)(+) and (X393)(-) circuit between the radio and the speaker.



Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable output speaker circuit for an open condition.

Perform the BODY VERIFICATION TEST VER 1.

3. Speaker

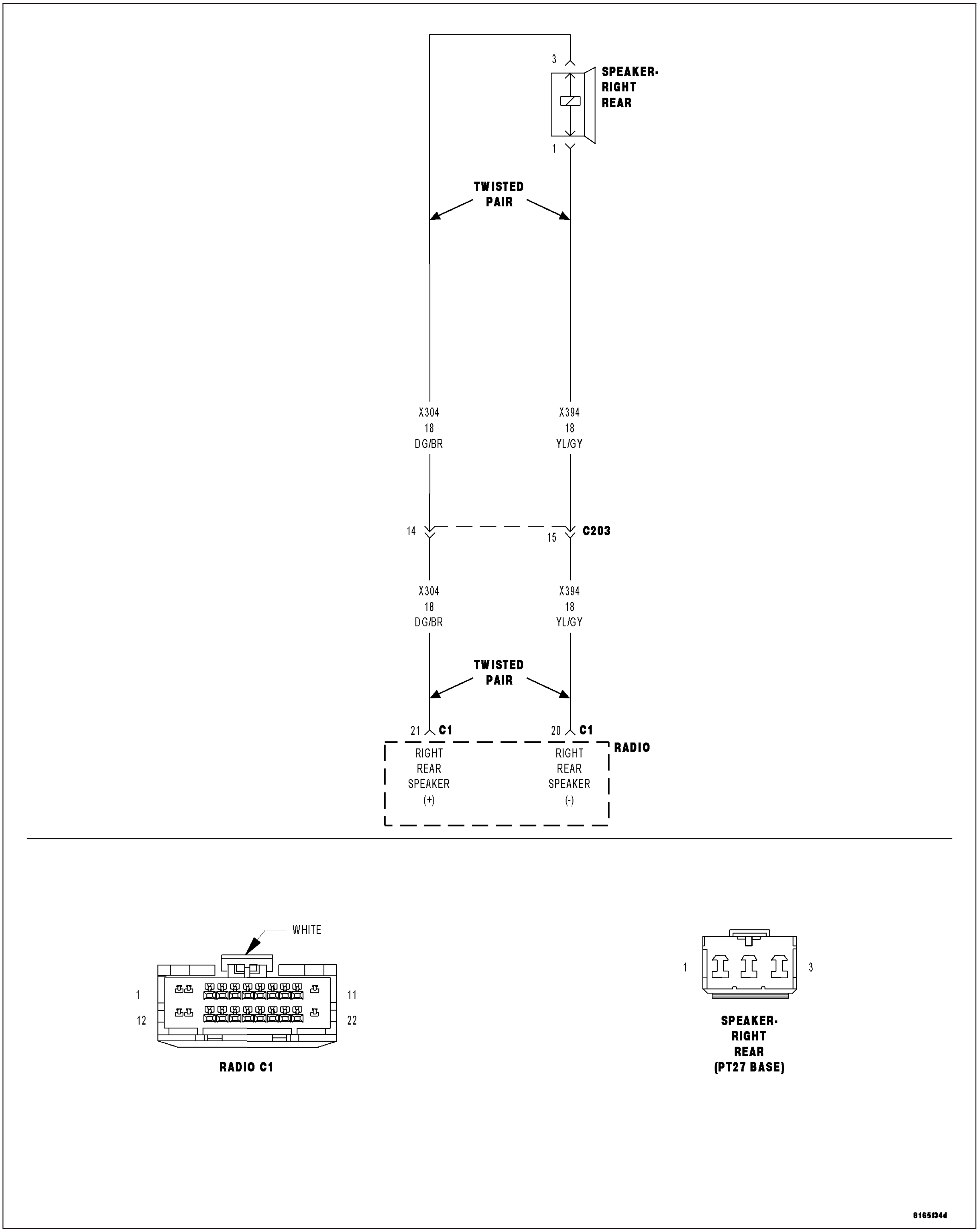
Turn the ignition off.
Disconnect the Rear Left Audio Speaker.
Turn the ignition on.
Turn the radio on.
With the scan tool, clear all Audio DTC's.
With the scan tool, read the DTC information.

Does the scan tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is LOW for more than three seconds.

Possible Causes
SPEAKER
(X304) (X394) RIGHT REAR SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, clear all Audio DTC’s.

Turn the radio on.

With the scan tool, read the DTC information.

Does the scan tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

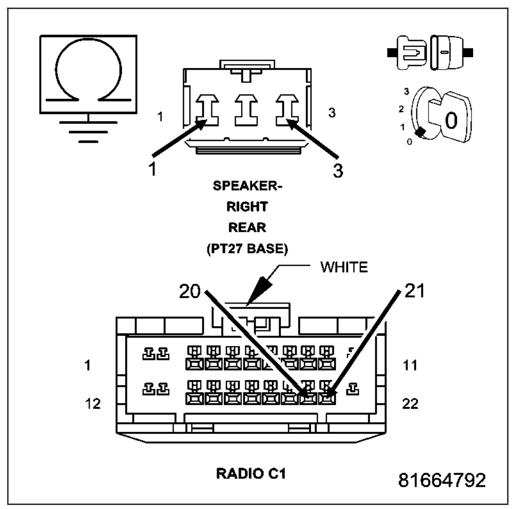
2. (X304) (X394) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Right Audio Speaker connector.

Measure the resistance between ground and each speaker (X304)(+) and (X394)(-) circuit.



Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable speaker (+) or (-) output circuit for a short to ground condition.

No >> Go To 3

3. SPEAKER

Turn the ignition off.

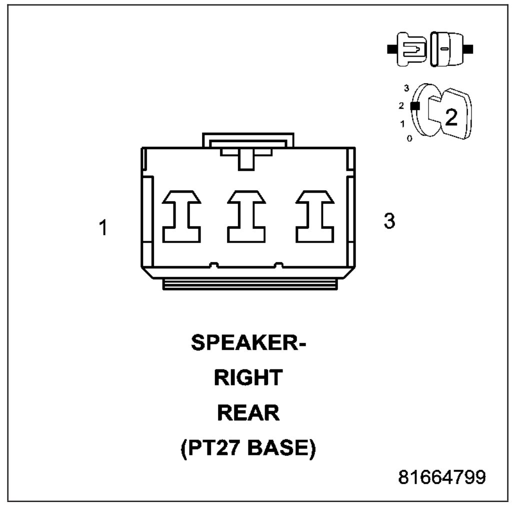
Disconnect the Rear Right Audio Speaker.

Turn the ignition on.

Turn the radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



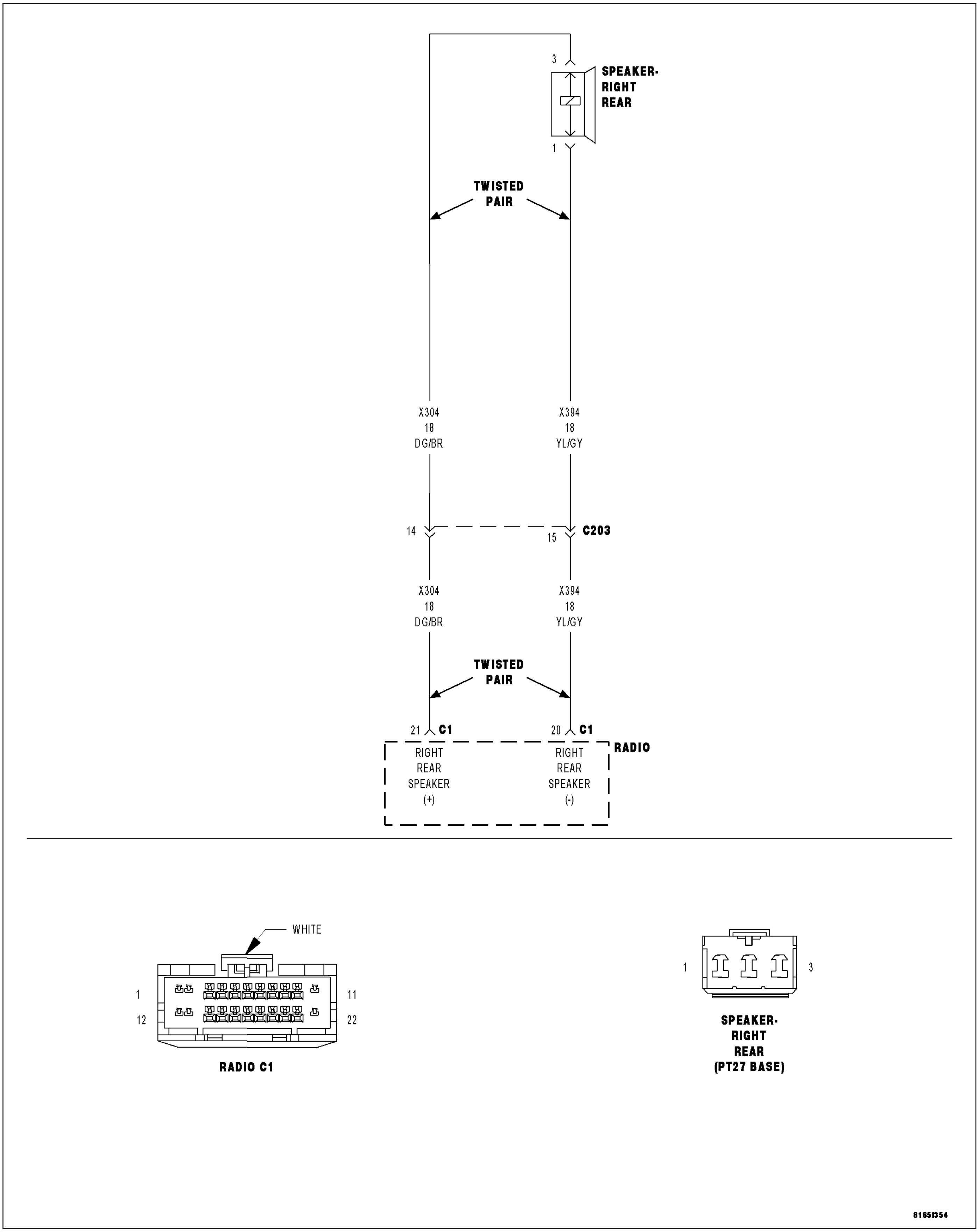
Does the scan tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
SPEAKER
(X304) SPEAKER OUTPUT CIRCUIT (+)
(X394) SPEAKER OUTPUT CIRCUIT (-)

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Radio DTCs.

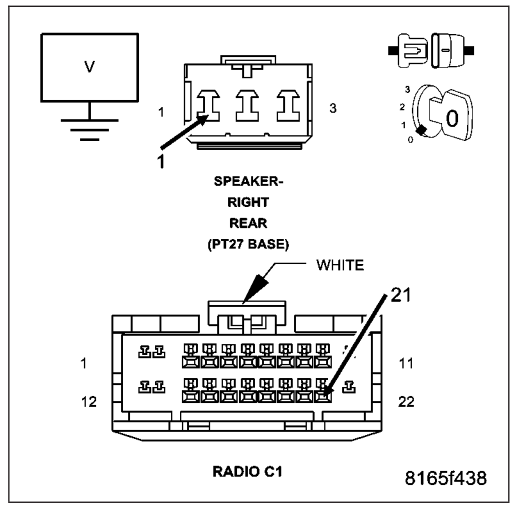
Does the scan tool display active: B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X304) SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Right Rear Speaker harness connector.
Measure for voltage on the (X304) Speaker (+) circuit.



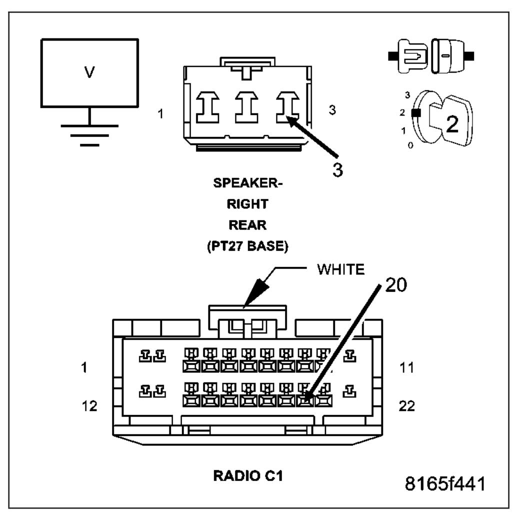
Is the voltage above 10.0 volts?

Yes >> Repair the (X304) Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X394) SPEAKER (-) CIRCUIT

Measure for voltage on the (X394) Speaker (-) circuit.

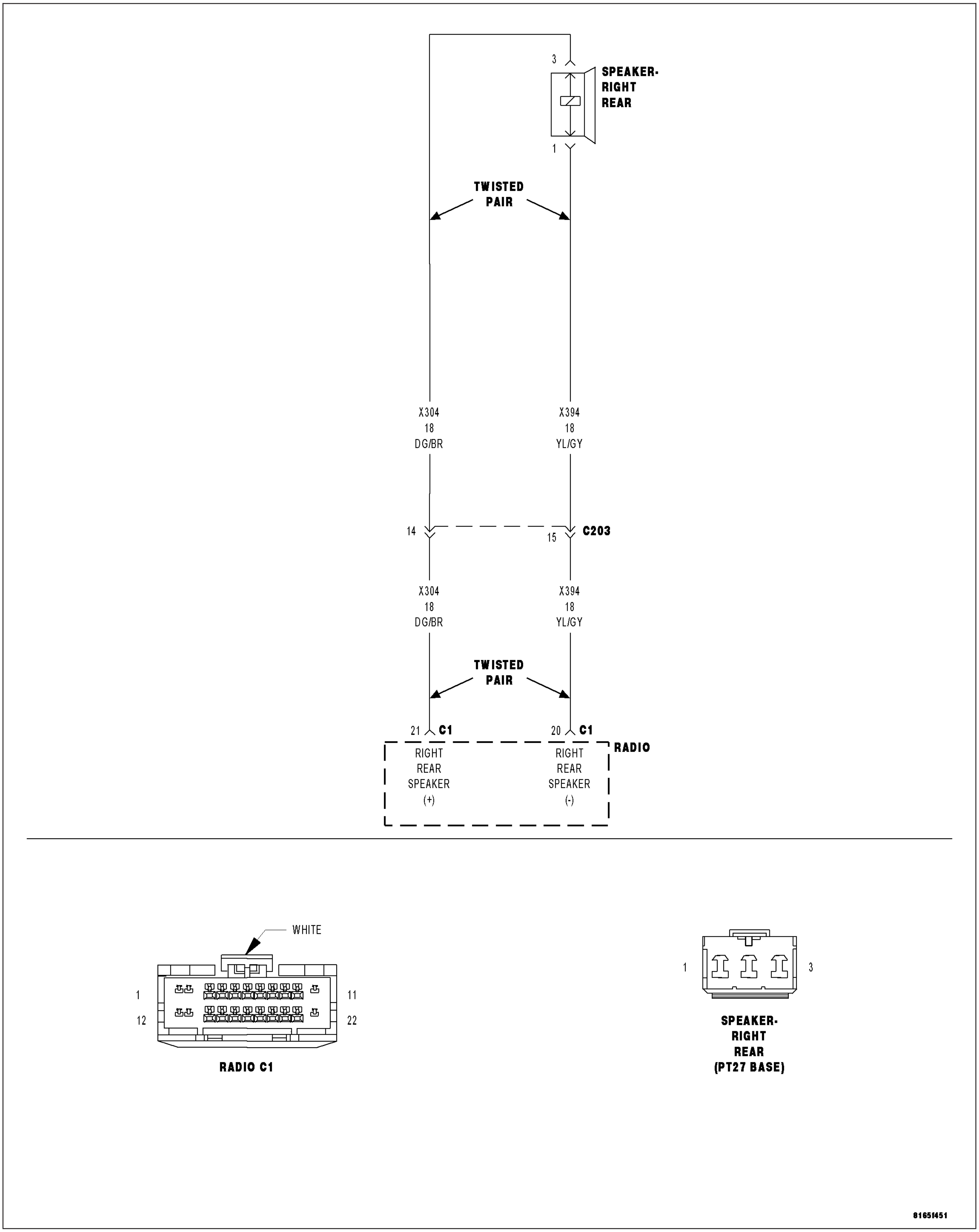


Is the voltage above 10.0 volts?

Yes >> Repair the (X394) Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the radio on.
- **Set Condition:**
- When the output circuit is open for more than three seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER
(X304) (X394) RIGHT REAR SPEAKER OUTPUT CIRCUIT

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, clear all Audio DTC's.

Turn the radio on.

With the scan tool, read the DTC information.

Does the Scan Tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

2. (X304) (X394) SPEAKER OUTPUT CIRCUITS

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Right Audio Speaker connector.

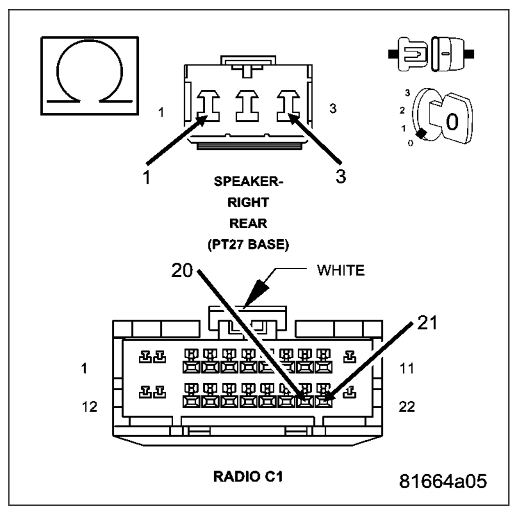
Measure the resistance of each speaker (X304)(+) and (X394)(-) circuit between the radio and the speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable Output Speaker circuit for an open condition.

Perform the BODY VERIFICATION TEST VER 1.



3. SPEAKER

Turn the ignition off.

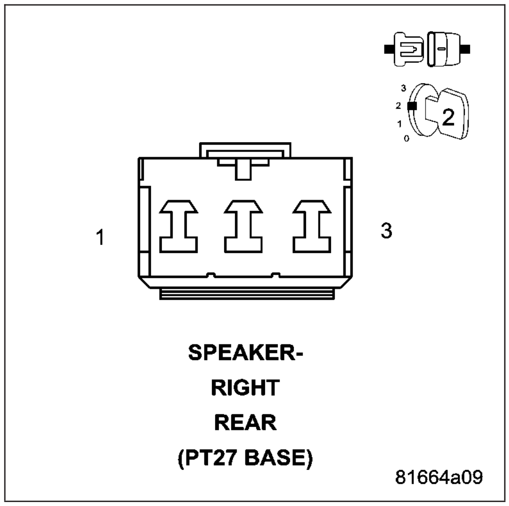
Disconnect the Rear Right Audio Speaker.

Turn the ignition on.

Turn the radio on.

With the scan tool, clear all Audio DTC's.

With the scan tool, read the DTC information.



Does the scan tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the speaker in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B1421-AUDIO CD READ ERROR/INOPERABLE DISC

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously with the ignition on and the radio CD player turned on.
- **Set Condition:**
- The code will set if a CD that is not formatted as a music CD is installed in the radio CD player.

Possible Causes
CD READ FAILURE

Diagnostic Test

1. RADIO

Replace the problem CD with a good, clean, unscratched, music CD.
Turn the radio CD player on.
With the scan tool, read DTC's.

Does the tcan tool display: B1421 AUDIO CD READ ERROR/INOPERABLE DISC?

Yes >> Eject the inoperative CD and replace the CD in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Test Complete.

B142F-SATELLITE RADIO ANTENNA NOT CONNECTED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on and the Satellite Radio in seek mode.
- **Set Condition:**
- With the radio in seek mode for two loops around the band. The radio does not detect an antenna connection or does not receive a radio satellite signal.

Possible Causes
BAD ANTENNA CONNECTION
SATELLITE RADIO RECEIVER

Diagnostic Test

1. TEST ANTENNA

Turn the ignition off.

Disconnect the Satellite Radio Antenna connector.

Inspect the Satellite Radio Antenna connection.

Was the Antenna connection clean and secure?

Yes >> Go To 2

No >> Repair the Antenna connection as needed.
Perform the BODY VERIFICATION TEST — VER1.

2. SATELLITE RADIO ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

Is the Antenna ok?

Yes >> Go To 3

No >> Repair or replace the Antenna assembly as necessary.
Perform the BODY VERIFICATION TEST — VER1.

3. SATELLITE RADIO RECEIVER

NOTE: Reconnect all previously disconnected components.

NOTE: Move vehicle outside approximately 30ft (9.144m) from any structure.

Turn the ignition and radio on.

With the scan tool, erase the audio DTC's, put the satellite radio in seek up and down mode for 2 loops around the band cycle before proceeding.

With the scan tool, read the audio DTC's.

Did this DTC reset?

Yes >> Replace the Satellite Radio Receiver in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Test Complete.

B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

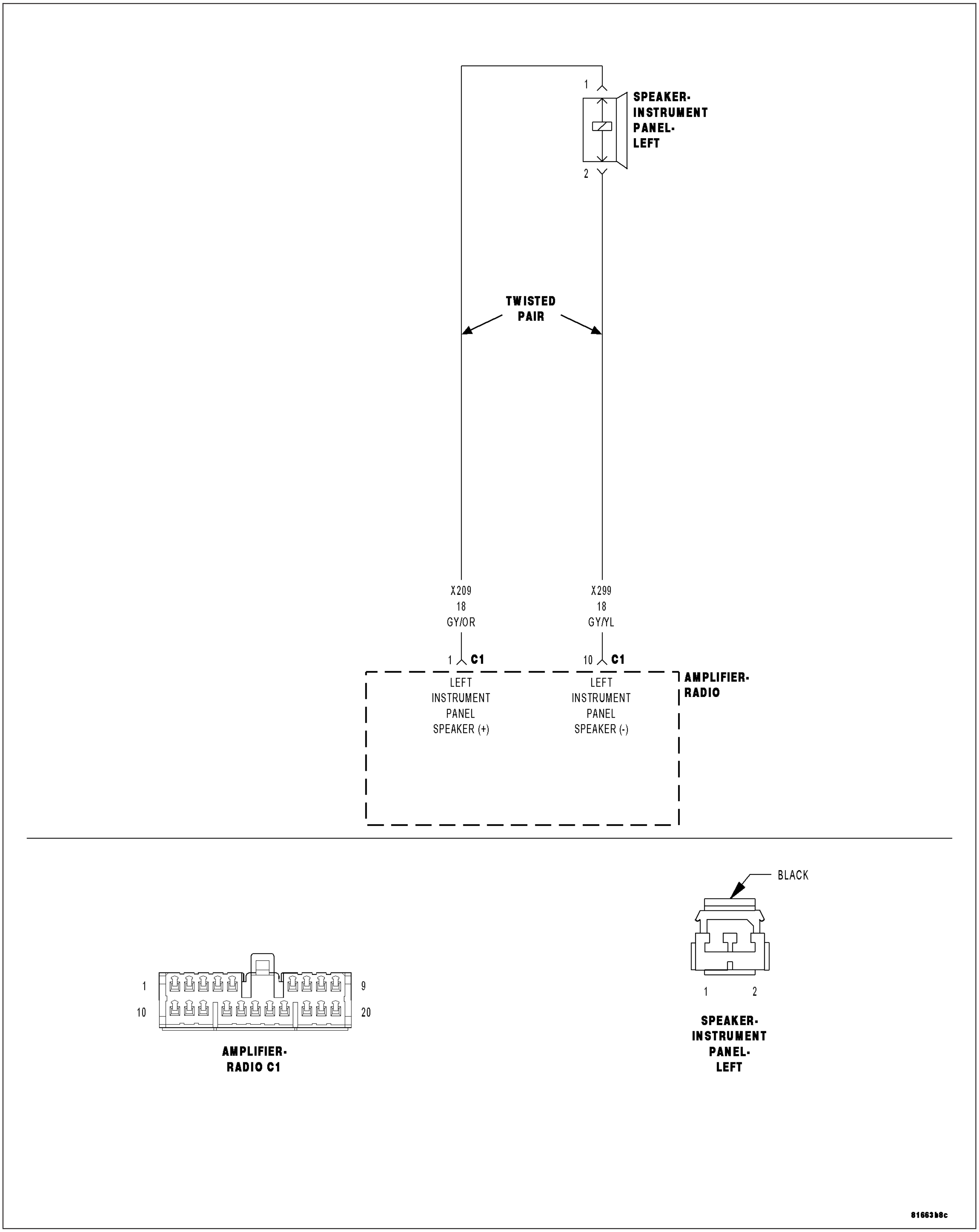
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

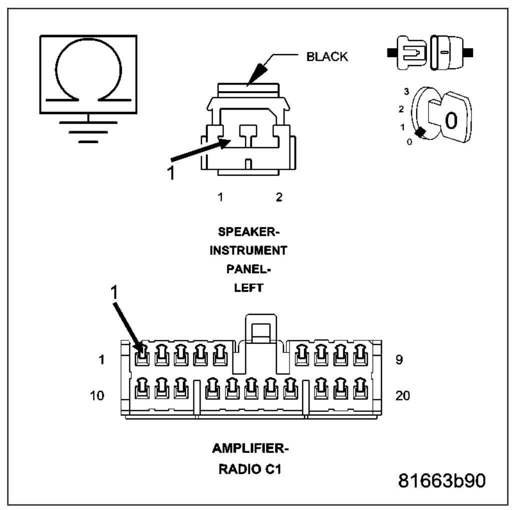
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.

Disconnect the Left I/P Speaker harness connector.

Measure the resistance between ground and the (X209) Amplified Left Front I/P Speaker (+) circuit.



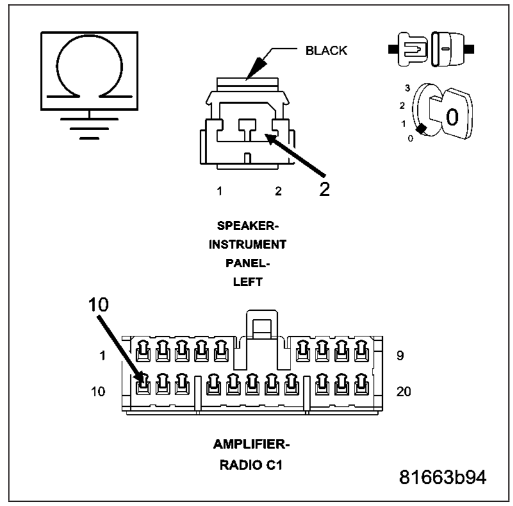
Is the resistance below 10K ohms?

Yes >> Repair the (X209) Amplified Left Front I/P Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X299) Amplified Left Front I/P Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X299) Amplified Left Front I/P Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

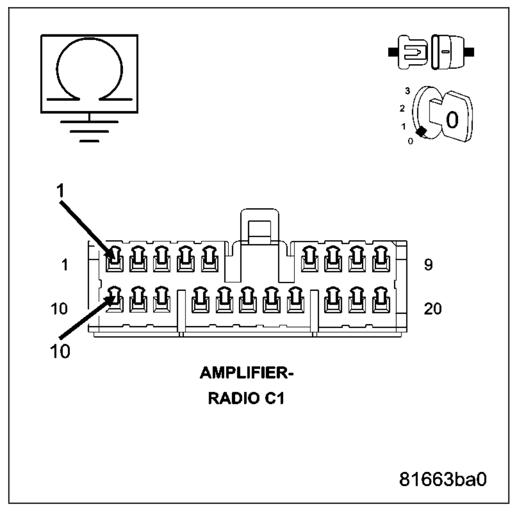
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT I/P SPEAKER

Turn the ignition off.

Reconnect and reinstall the Left Front I/P Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground.

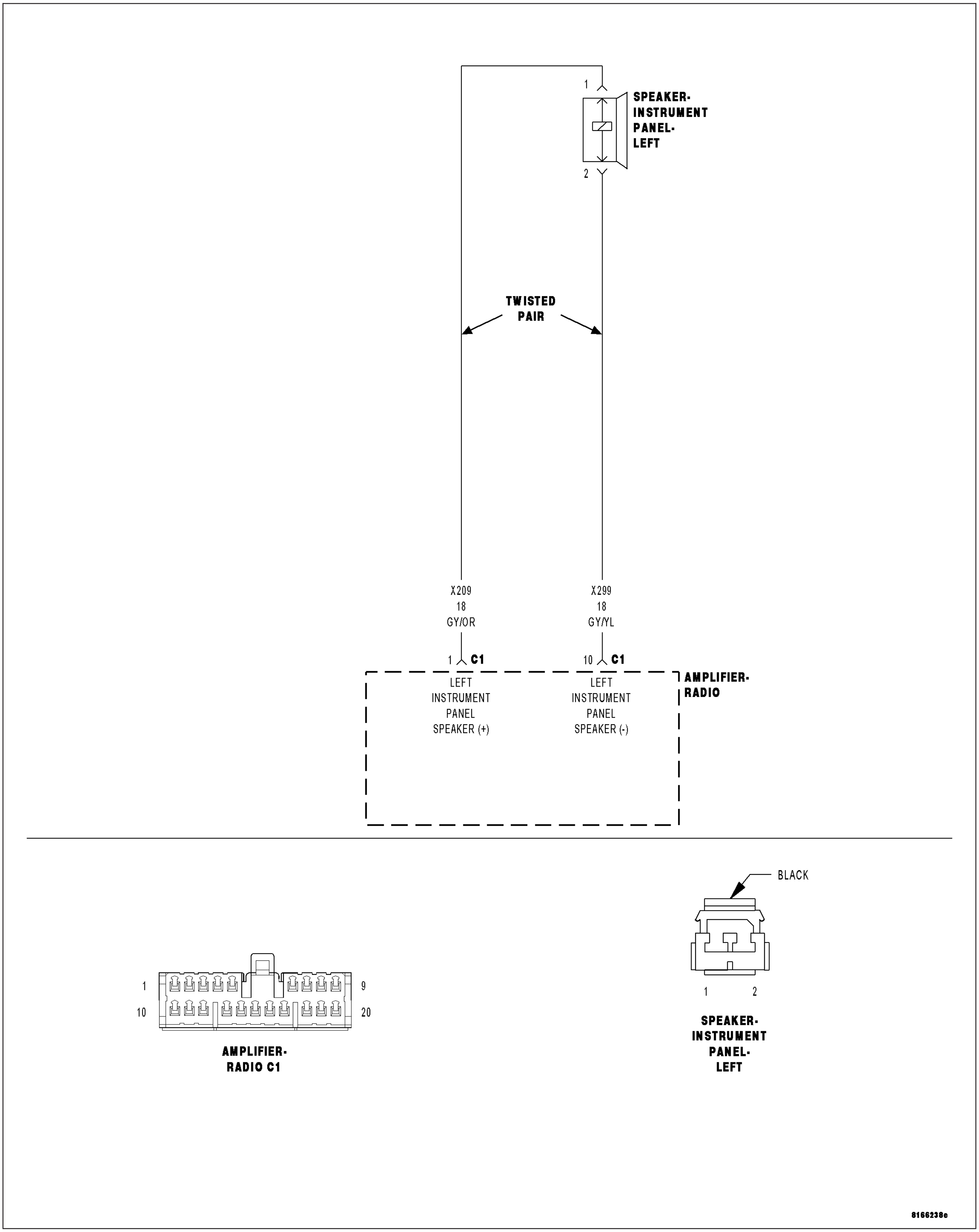


Is the resistance below 10K ohms?

Yes >> Replace the Left Front I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT

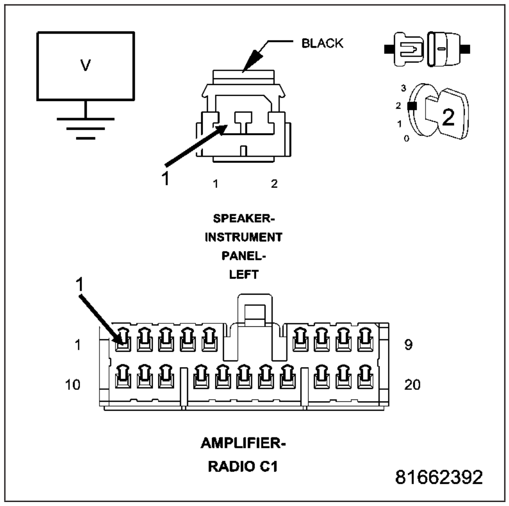
Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Left I/P Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X209) Amplified Left I/P Speaker (+) circuit.



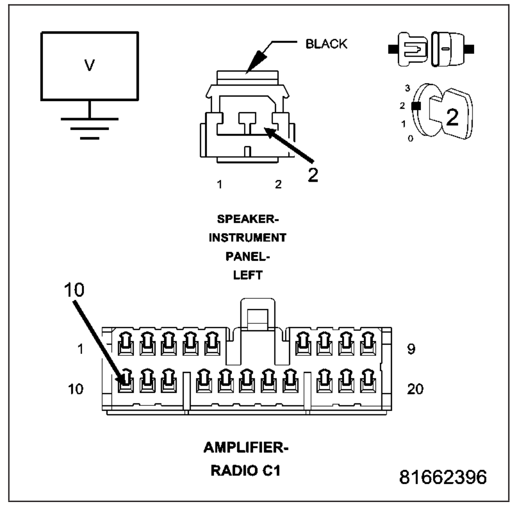
Is the voltage above 10.0 volts?

Yes >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT

Measure for voltage on the (X299) Amplified Left I/P Speaker (-) circuit.

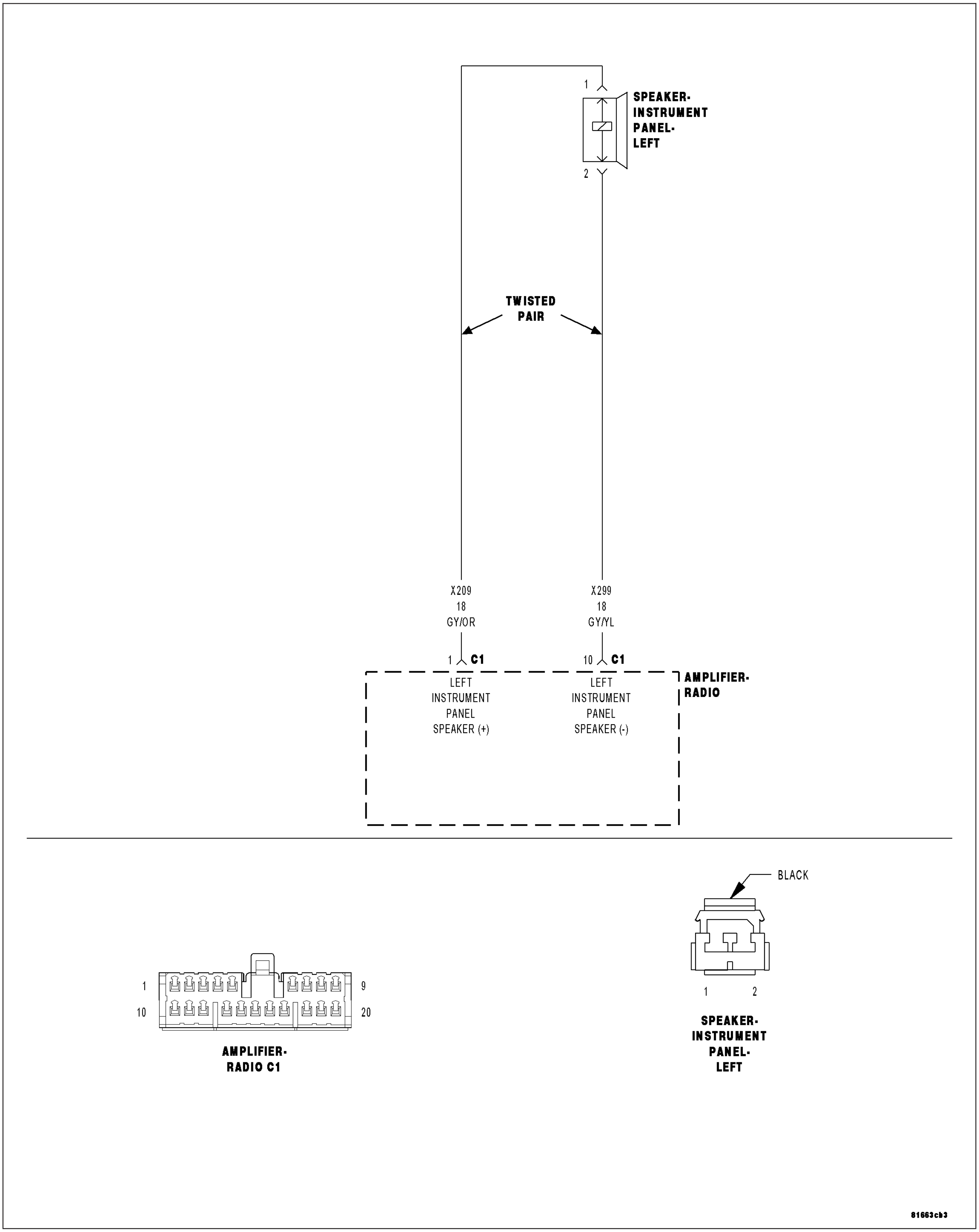


Is the voltage above 10.0 volts?

Yes >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT OPEN
(X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT OPEN
LEFT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

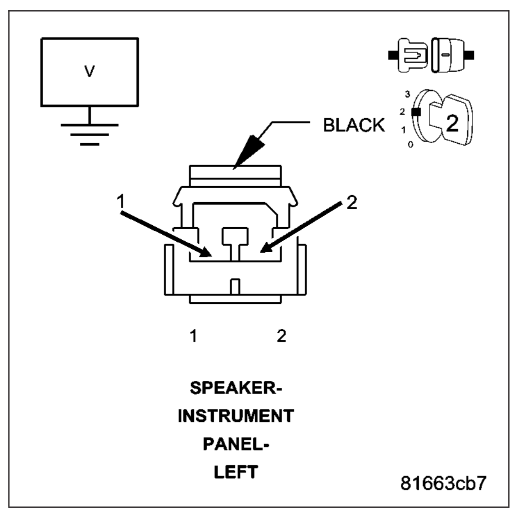
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE LEFT FRONT I/P SPEAKER

Disconnect the Left I/P Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left I/P Speaker circuits in the Amplified Left I/P Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left I/P Speaker in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

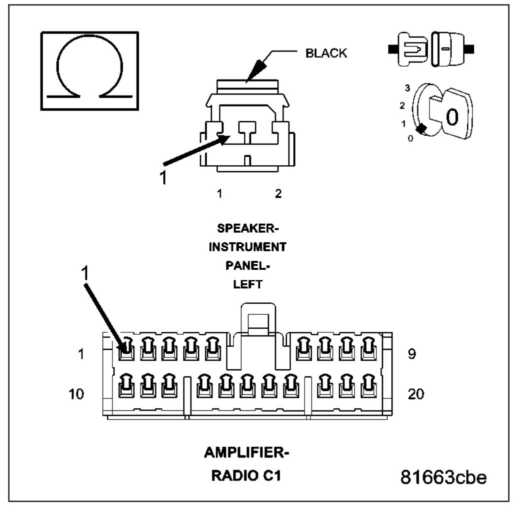
No >> Go To 3

3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X209) Amplified Left I/P Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Left I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for an open.

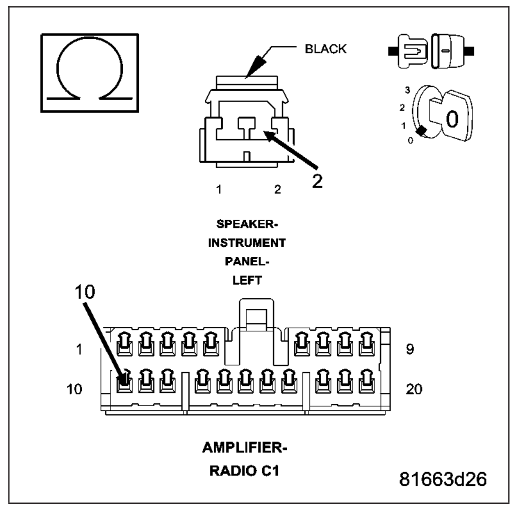
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X299) amplified Left I/P Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Left I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

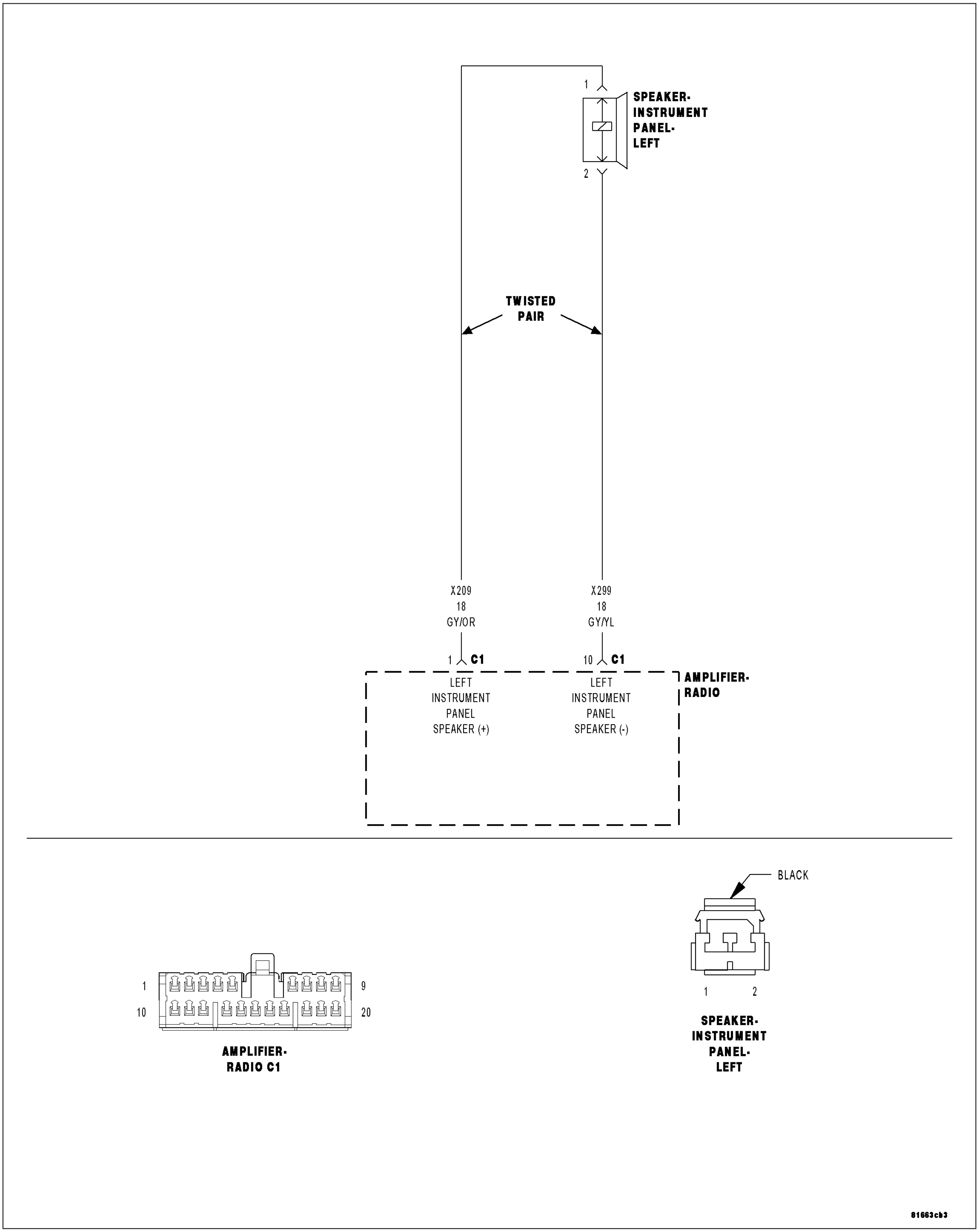
Yes >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.

B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT
AMPLIFIED LEFT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT I/P SPEAKER

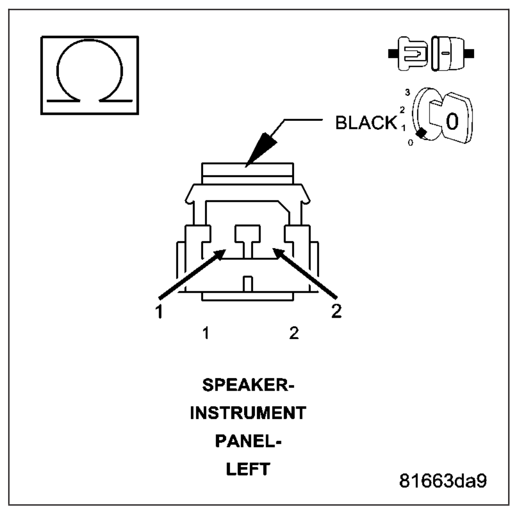
Disconnect the Amplified Left I/P Speaker.

Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

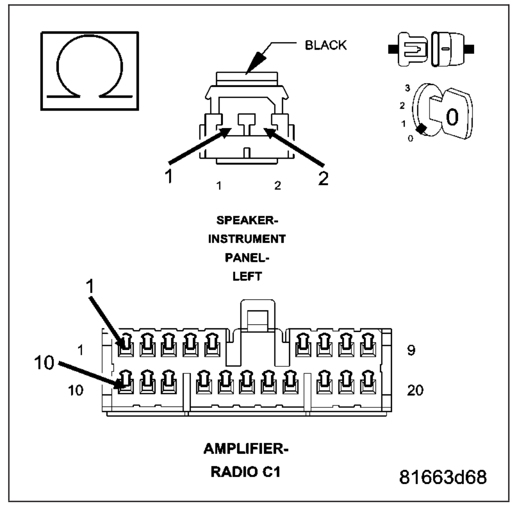


3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT, AND THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read amplifier DTCs.

Does the scan tool display active: B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

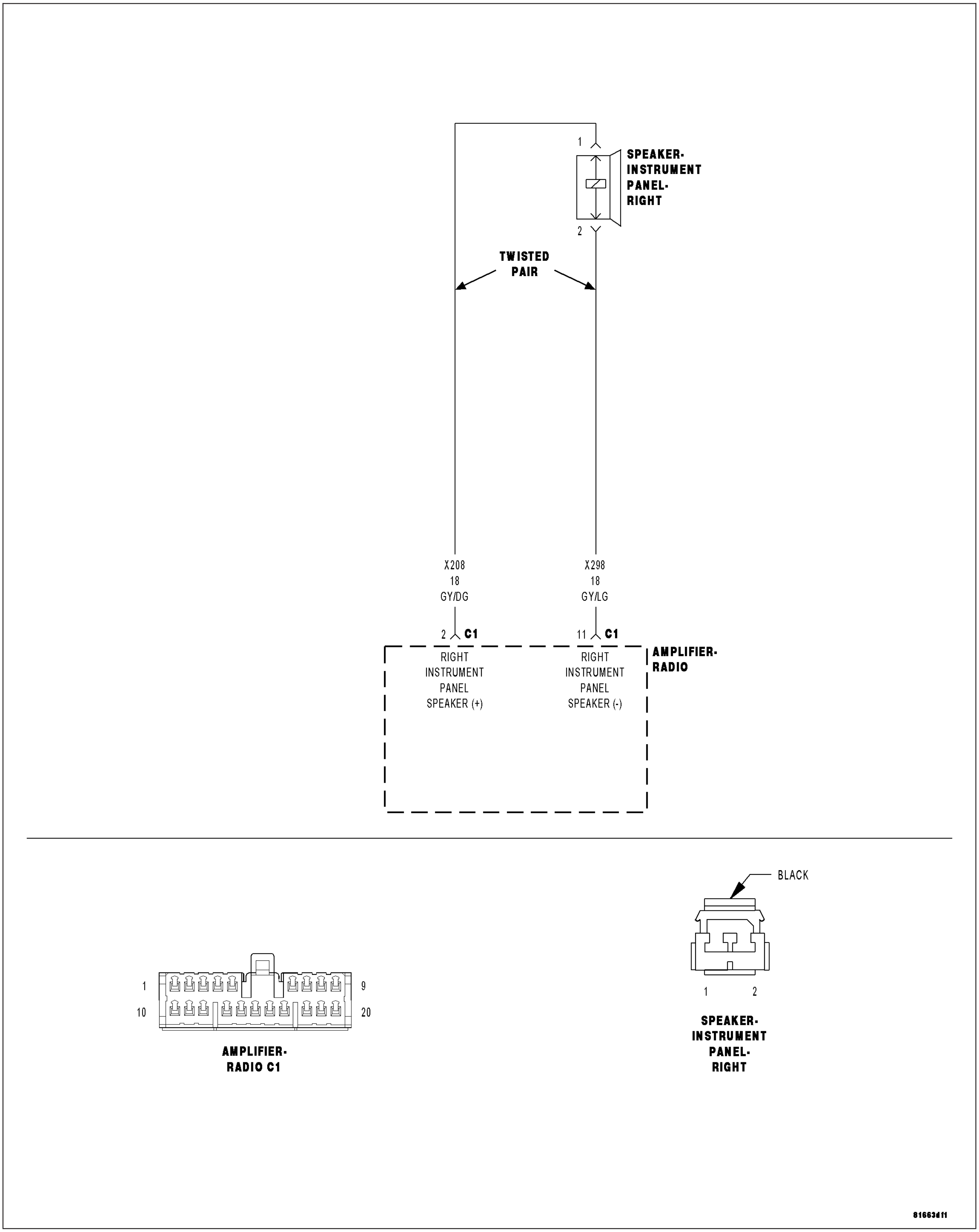
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.

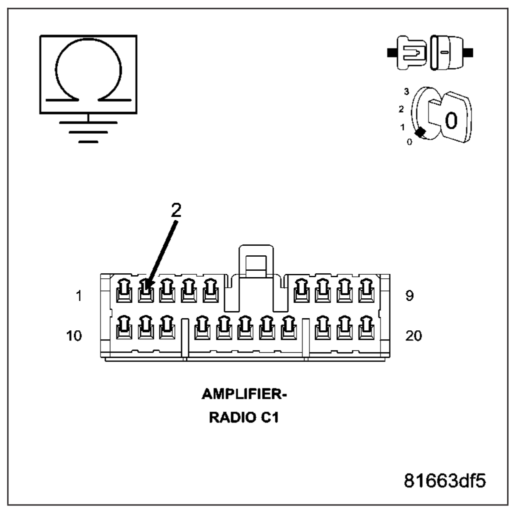
Disconnect the Right Front I/P Speaker harness connector.

Measure the resistance between ground and the (X208) Amplified Right Front I/P Speaker (+) circuit.

Is the resistance below 10K ohms?

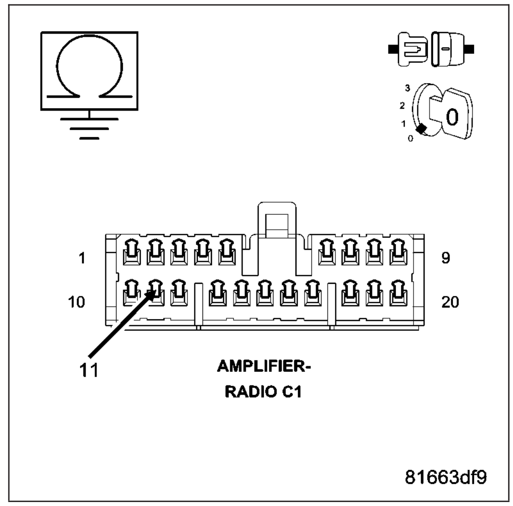
Yes >> Repair the (X208) Amplified Right Front I/P Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



3. CHECK THE (X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X298) Amplified Right Front I/P Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X298) Amplified Right Front I/P Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

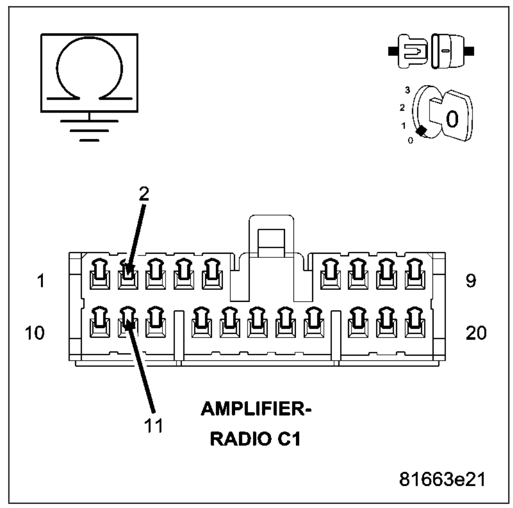
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT I/P SPEAKER

Turn the ignition off.

Reconnect and reinstall the Right Front I/P Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground.

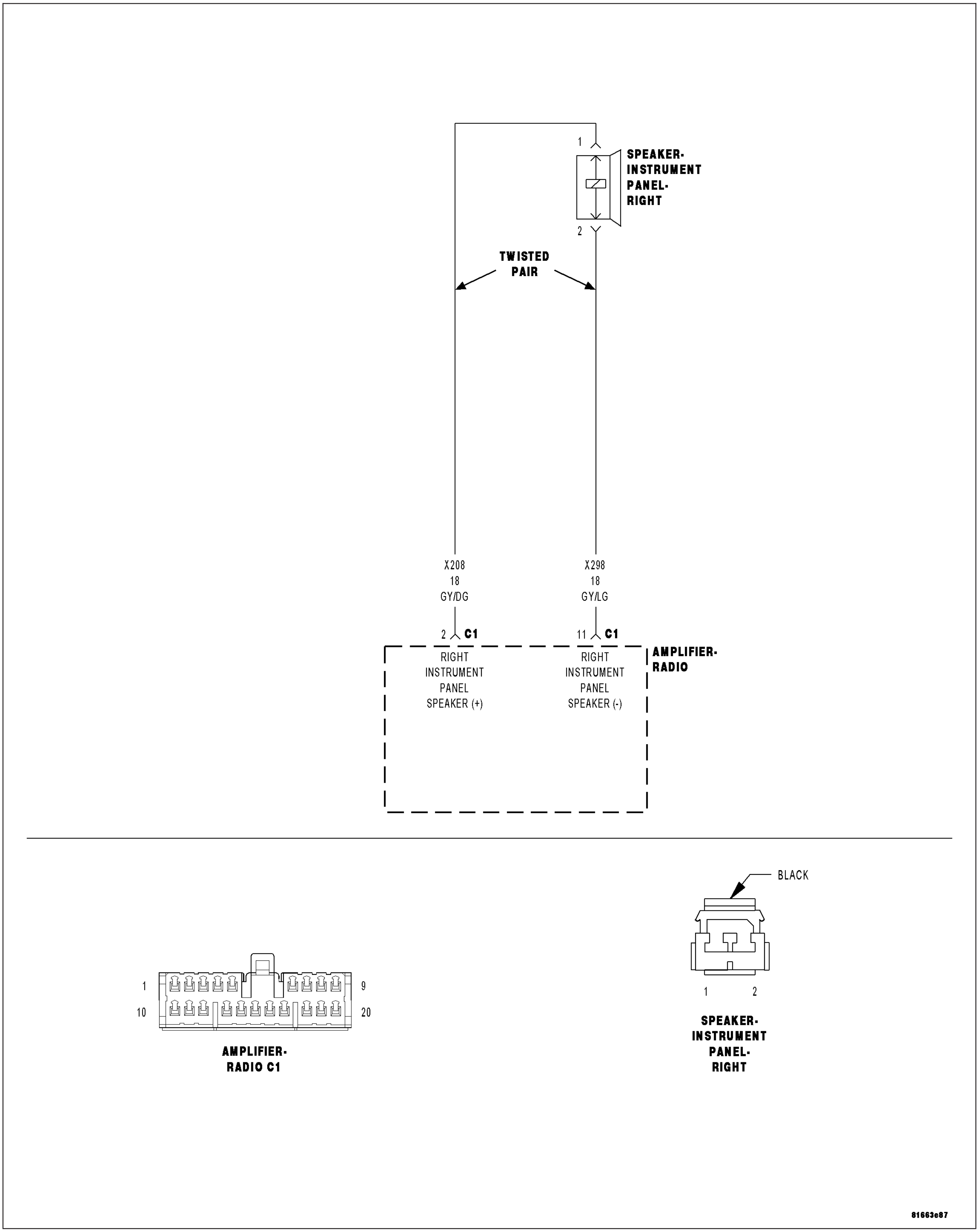


Is the resistance below 10K ohms?

Yes >> Replace the Right Front I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT

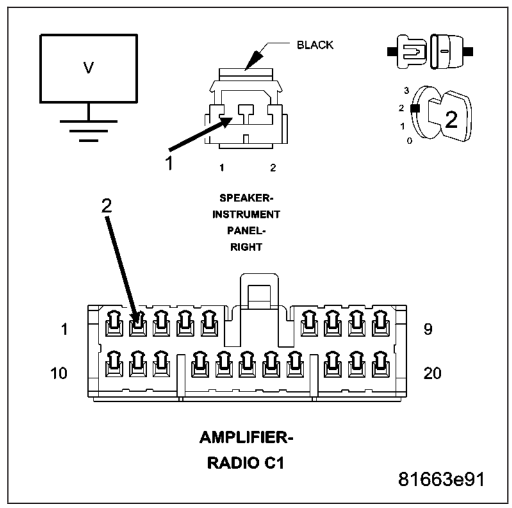
Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Right I/P Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X208) Amplified Right I/P Speaker (+) circuit.



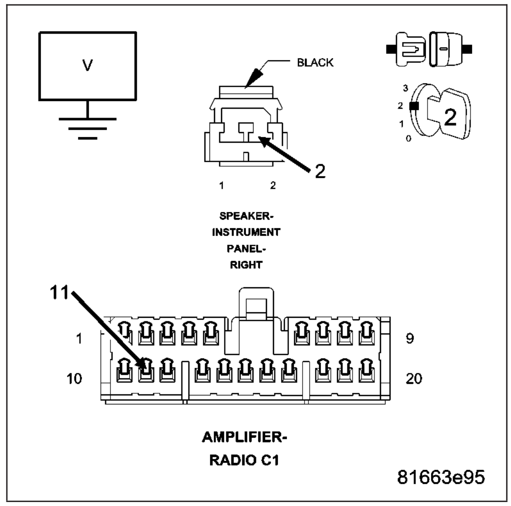
Is the voltage above 10.0 volts?

Yes >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT

Measure for voltage on the (X298) Amplified Right I/P Speaker (-) circuit.

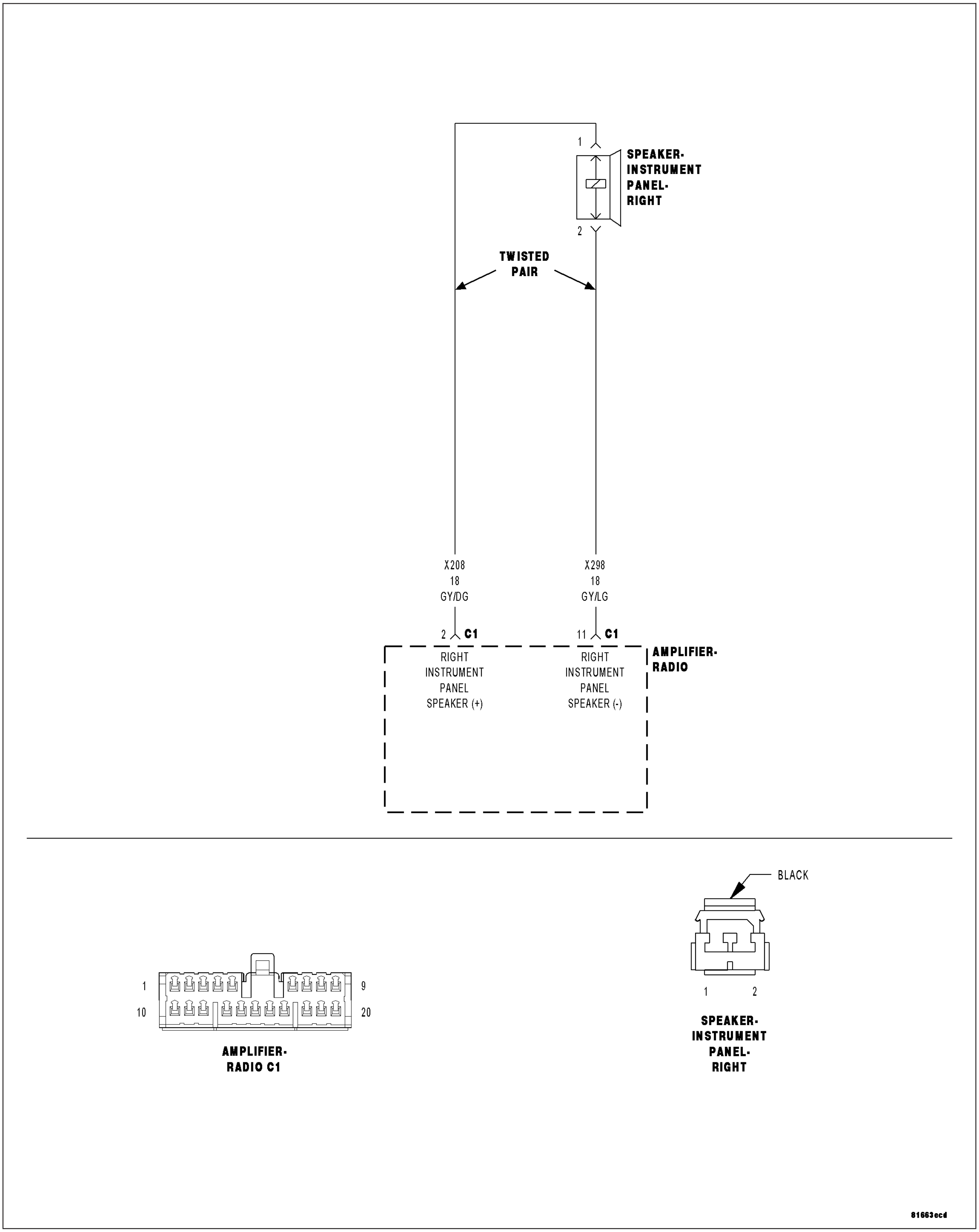


Is the voltage above 10.0 volts?

Yes >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT OPEN
(X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT OPEN
RIGHT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.

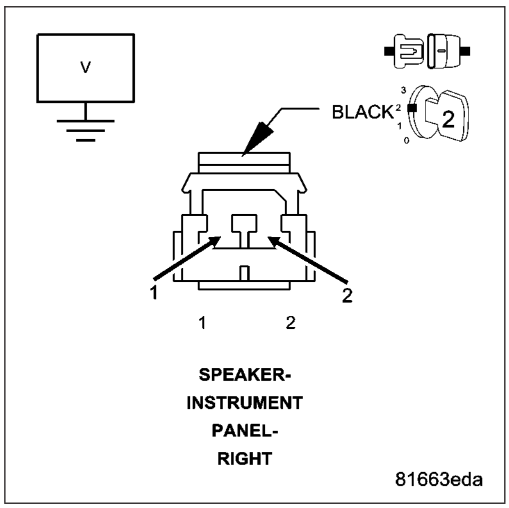
Does the scan tool display active: B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT FRONT I/P SPEAKER

Disconnect the Right I/P Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right I/P Speaker circuits in the Amplified Right I/P Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

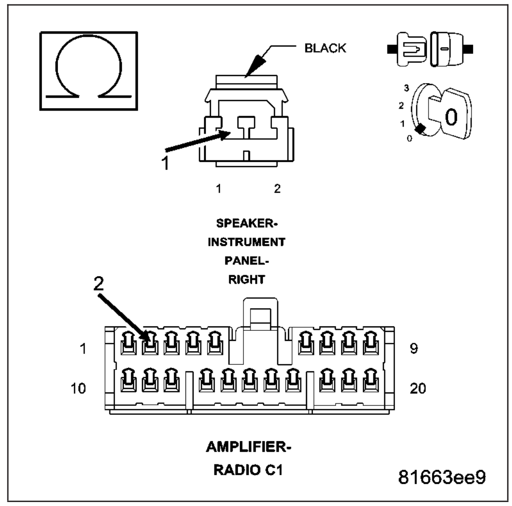
No >> Go To 3

3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X208) Amplified Right I/P Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Right I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for an open.

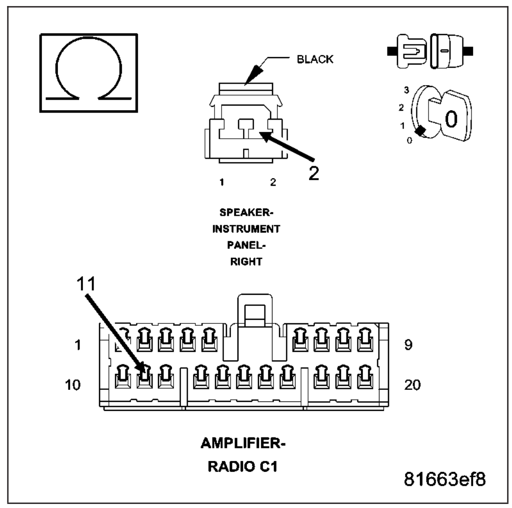
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X298) Amplified Right I/P Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Right I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

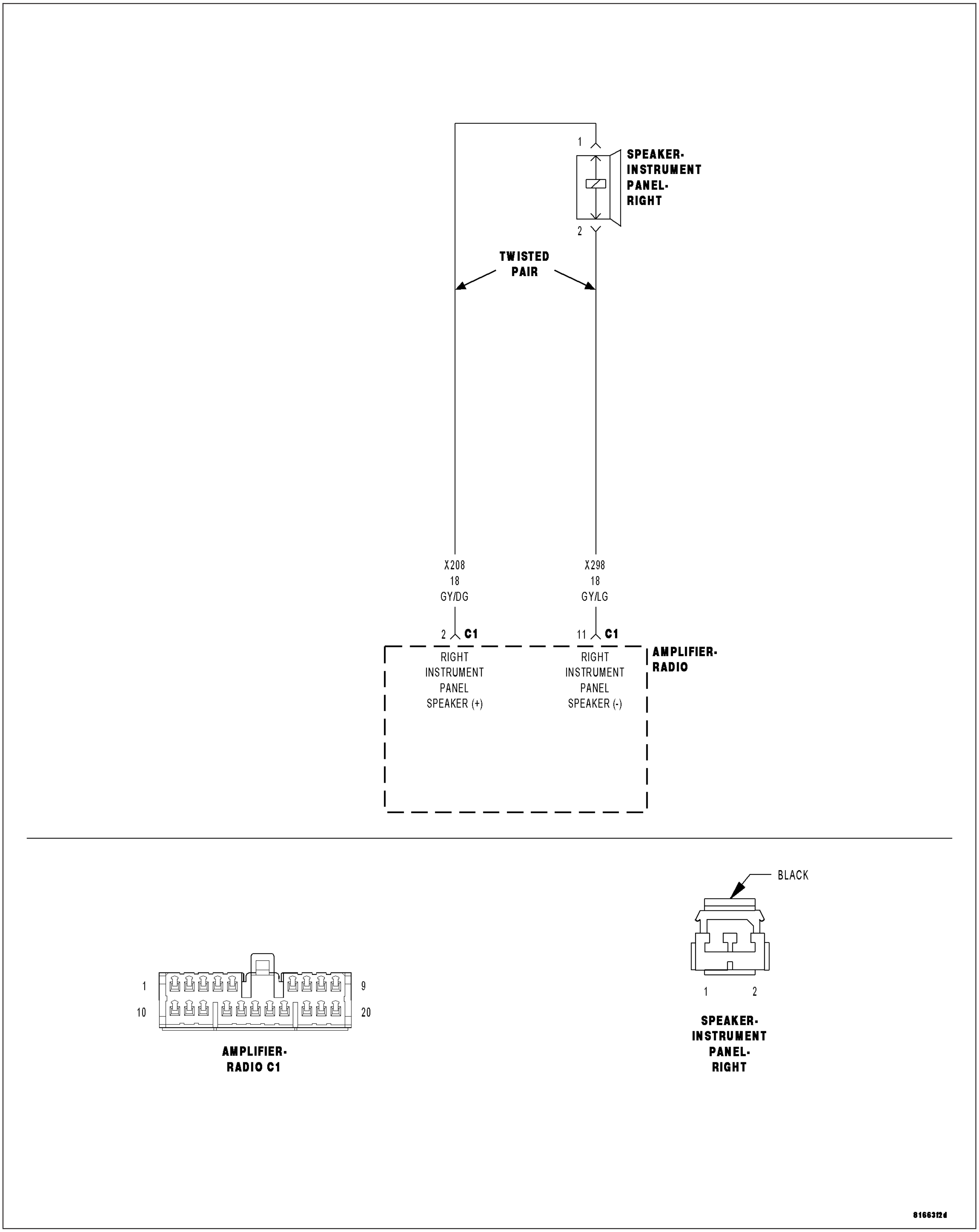
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.

B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

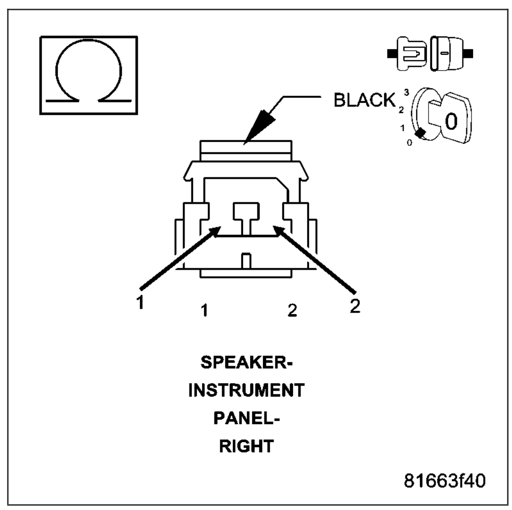
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT I/P SPEAKER

Disconnect the Amplified Right I/P Speaker.

Measure the resistance of the speaker between the two terminals.



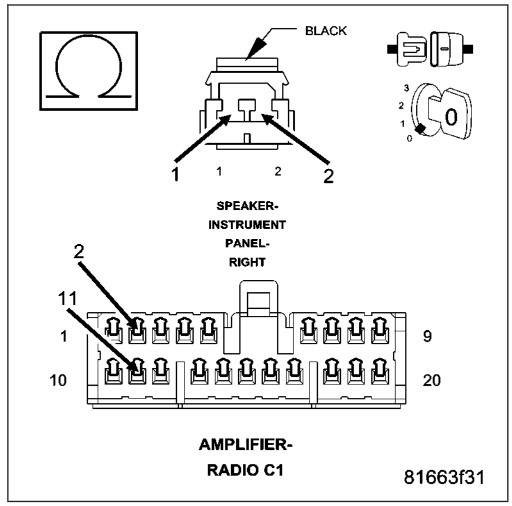
Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right I/P Speaker in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT, AND THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER



Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

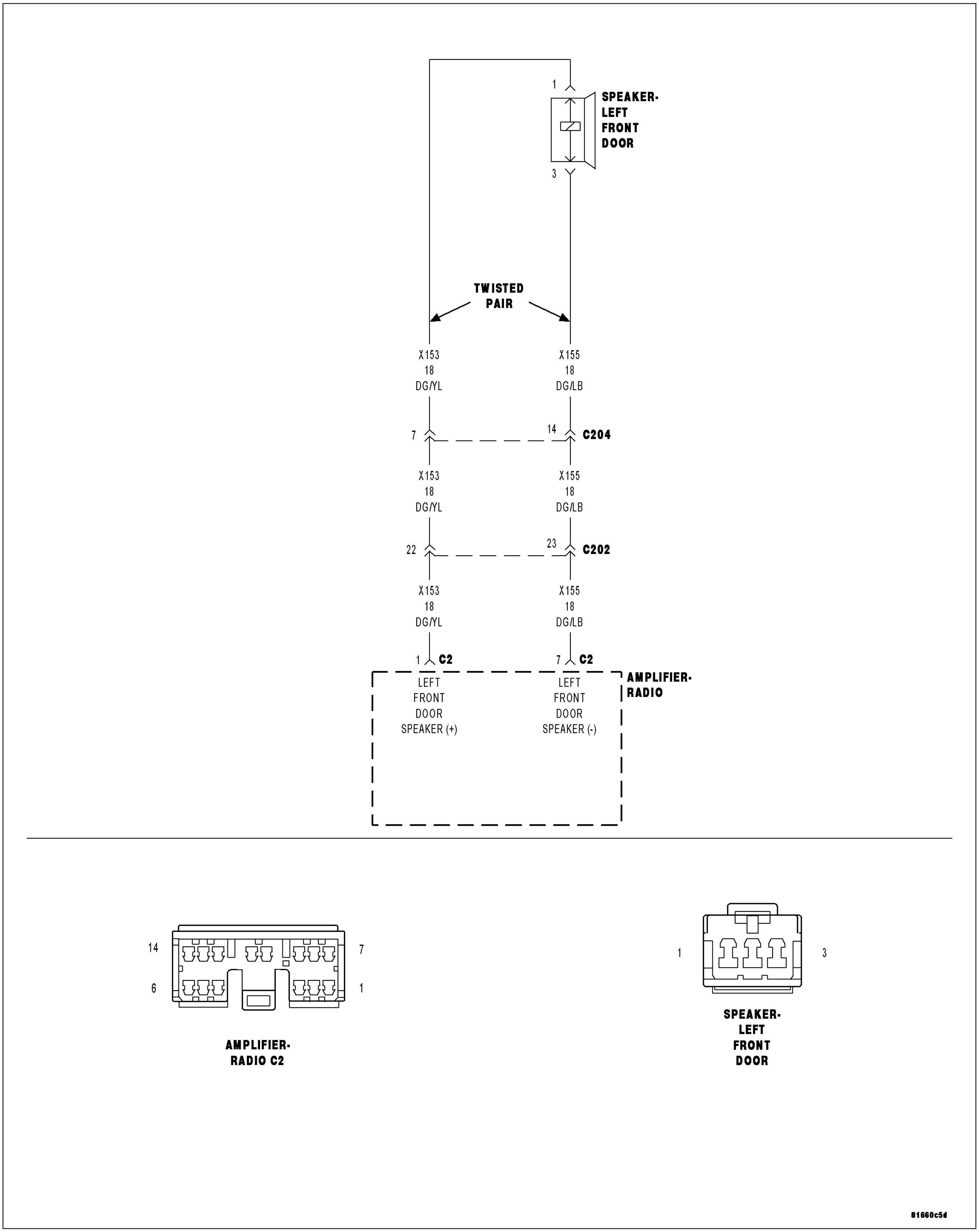
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

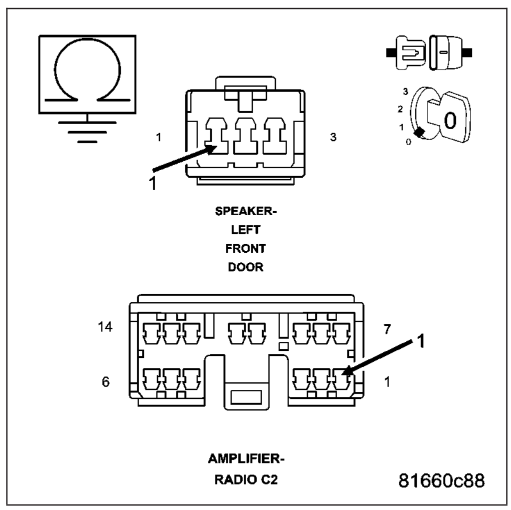
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X201) Amplified Left Front Door Speaker (+) circuit.



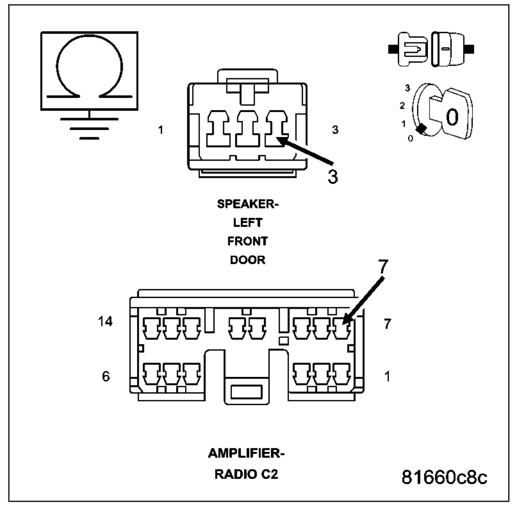
Is the resistance below 10K ohms?

Yes >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND



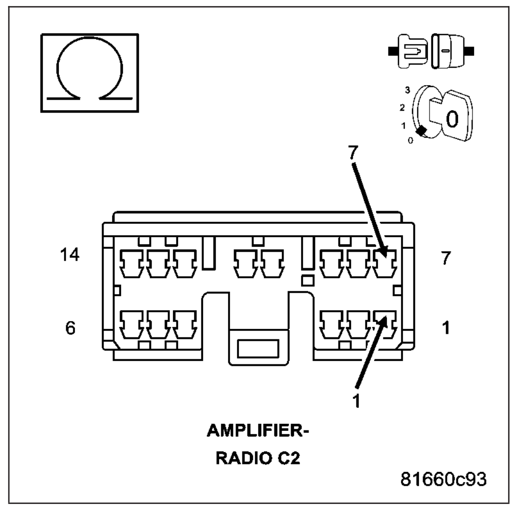
Measure the resistance between ground and the (X291) Amplified Left Front Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X291) Amplified Left Front Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER



Turn the ignition off.

Reconnect and reinstall the Left Front Door Speaker.

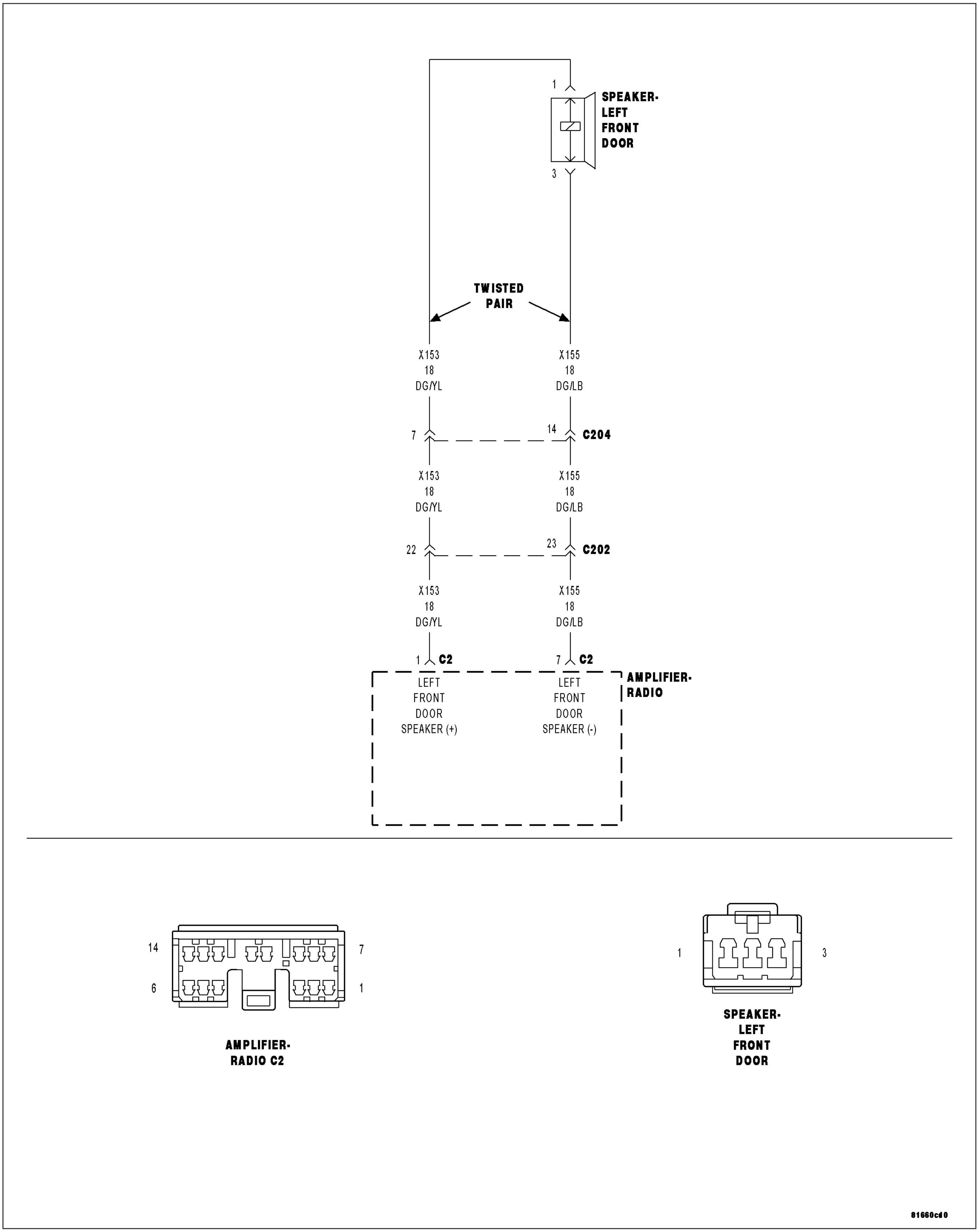
Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground..

Is the resistance below 10K ohms?

Yes >> Replace the Left Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X153) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X155) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X153) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT

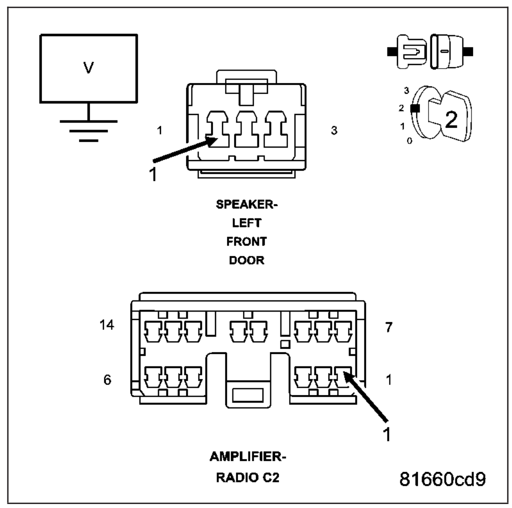
Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Left Front Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X153) Amplified Left Front Door Speaker (+) circuit.



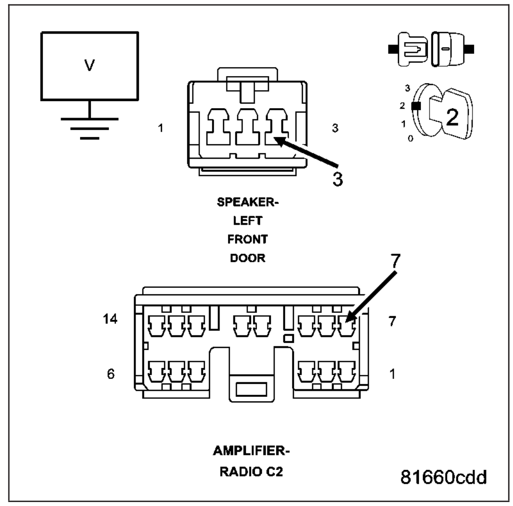
Is the voltage above 10.0 volts?

Yes >> Repair the (X153) Amplified Left Front Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X155) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT

Measure for voltage on the (X155) Amplified Left Front Door Speaker (-) circuit.

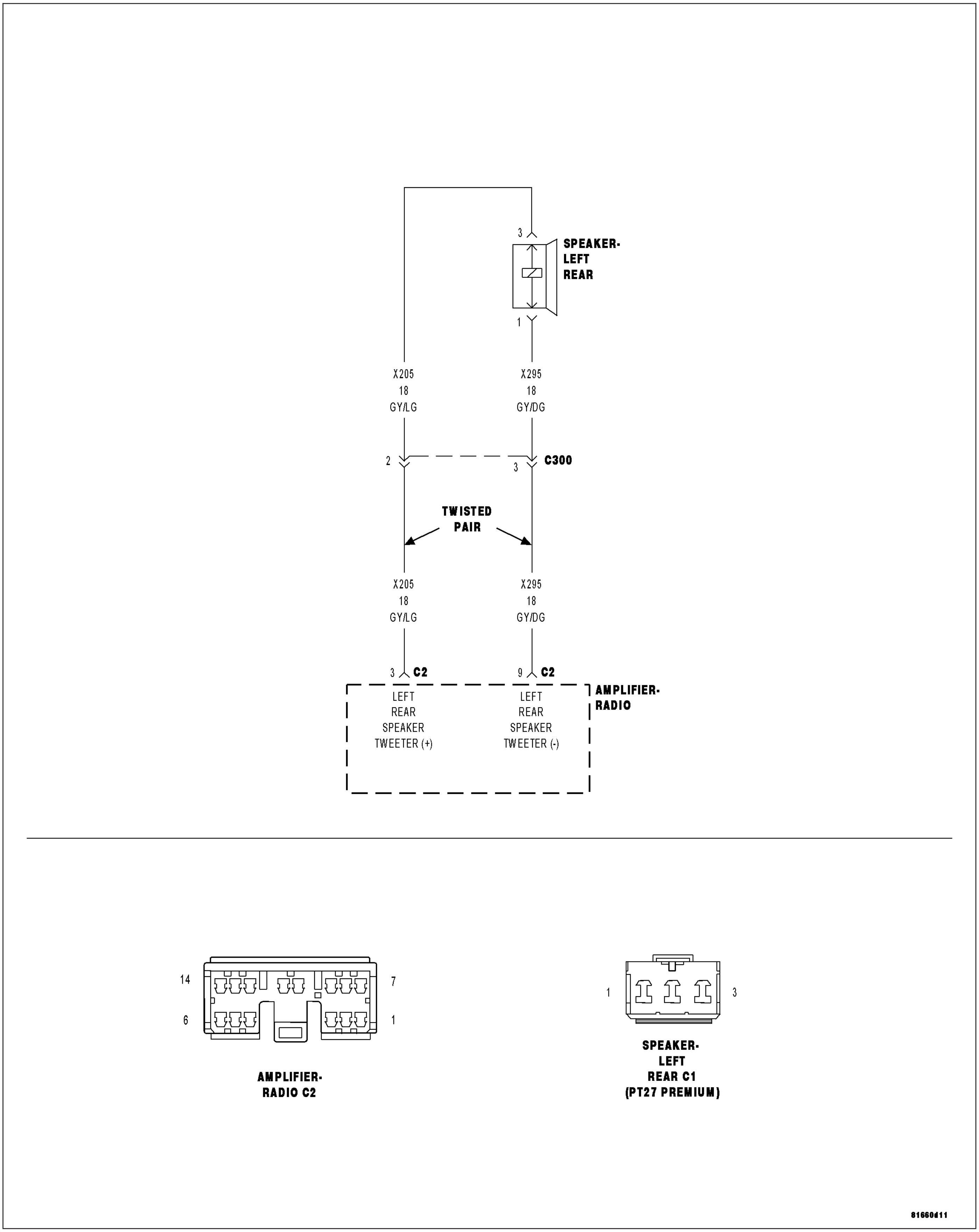


Is the voltage above 10.0 volts?

Yes >> Repair the (X155) Amplified Left Front Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT OPEN
(X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT OPEN
LEFT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

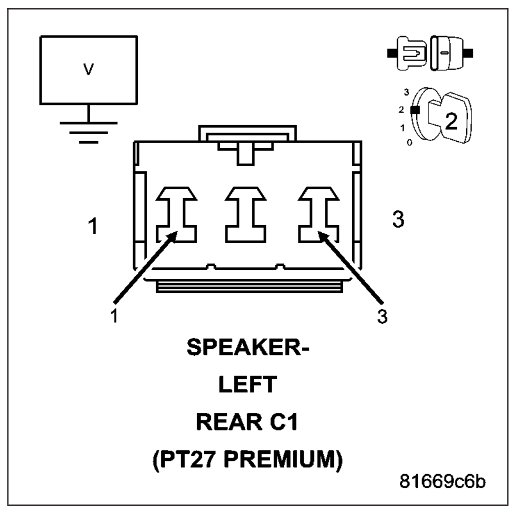
2. CHECK THE OPERATION OF THE LEFT REAR SHELF SPEAKER

Disconnect the Left Rear Shelf Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Shelf Speaker circuits in the Amplified Left Rear Shelf Speaker harness connector.

Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

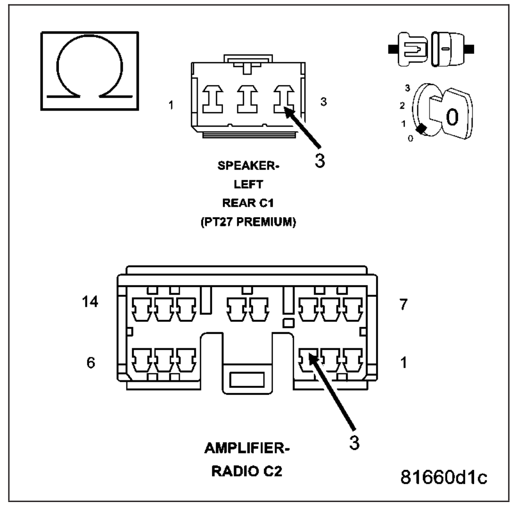


3. CHECK THE (X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X205) Amplified Left Rear Shelf Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Left Rear Shelf Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

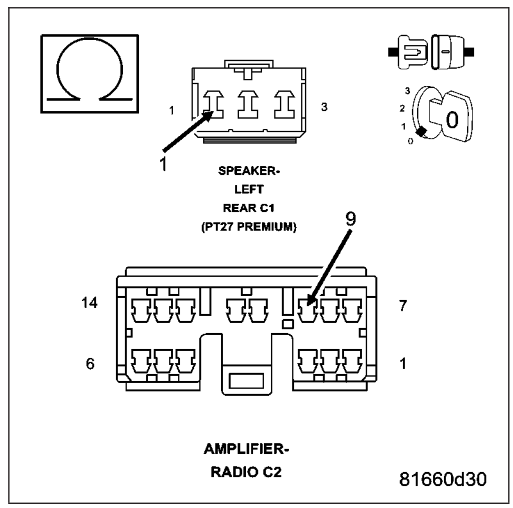
No >> Repair the (X205) Amplified Left Rear Shelf Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X295) Amplified Left Rear Shelf Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Left Rear Shelf Speaker harness connector.

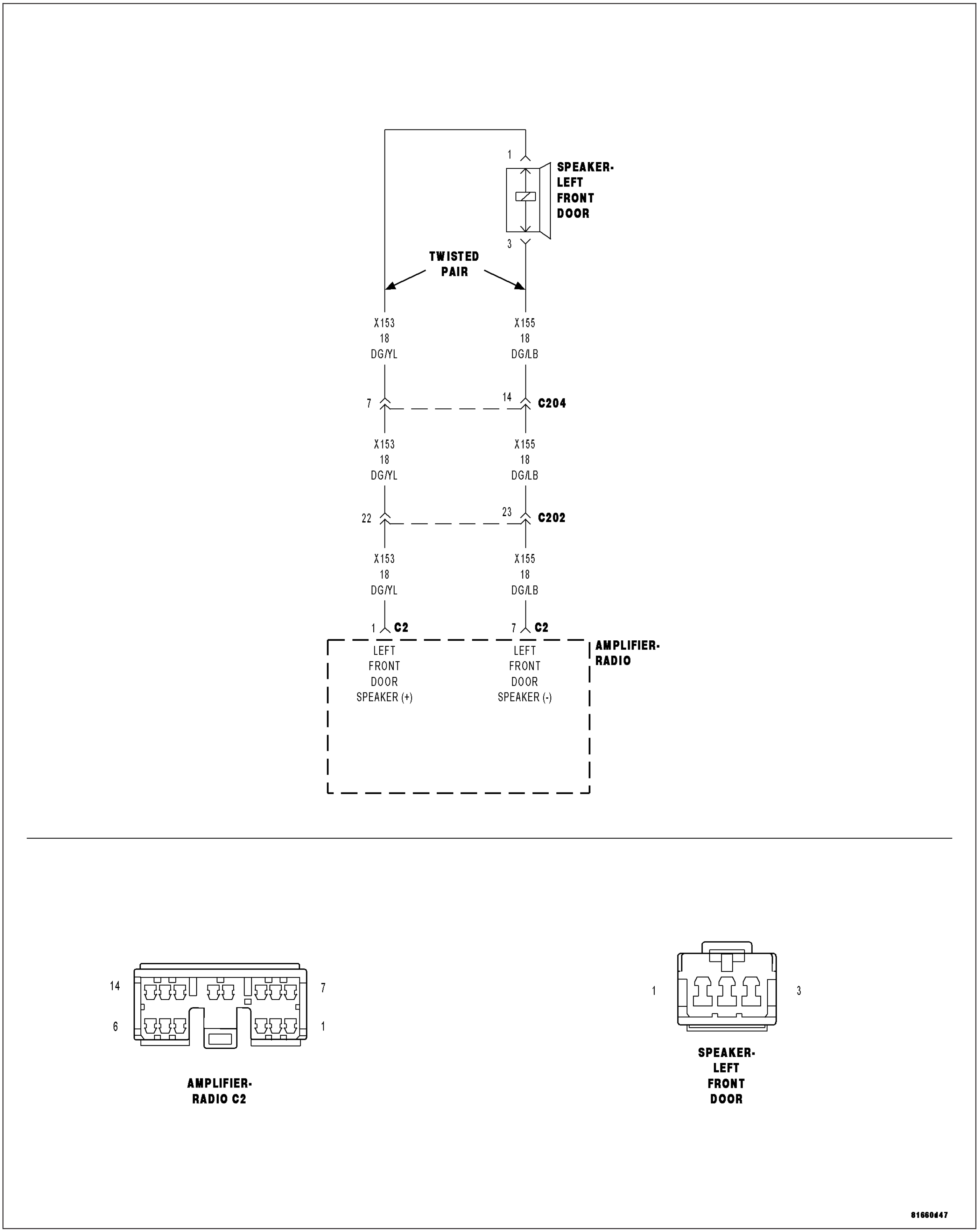


Is the resistance below 5.0 ohms?

Yes >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X291) Amplified Left Rear Shelf Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X153) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X155) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT
AMPLIFIED LEFT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

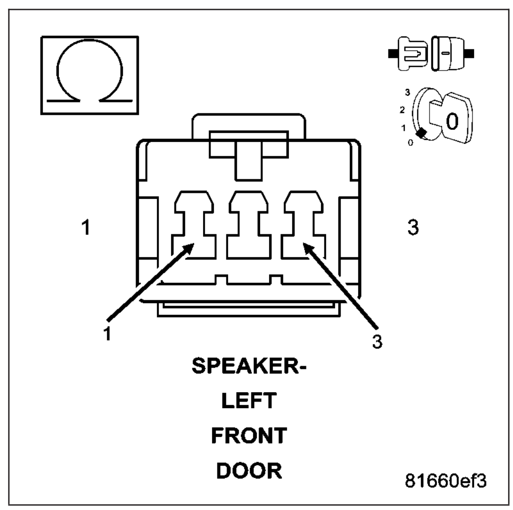
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER

Disconnect the Amplified Left Front Door Speaker.

Measure the resistance of the speaker between the two terminals.



Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

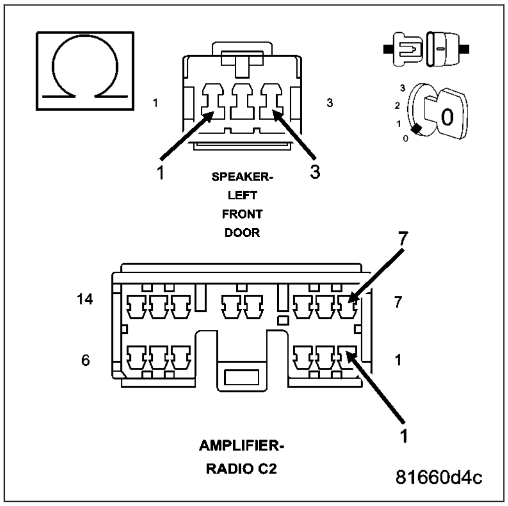
No >> Go To 3

3. CHECK THE (X153) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X155) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X153) Amplified Left Front Door Speaker (+) circuit, and the (X155) Amplified Left Front Door Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X153) Amplified Left Front Door Speaker (+) circuit, and the (X155) Amplified Left Front Door Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read amplifier DTCs.

Does the scan tool display active: B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

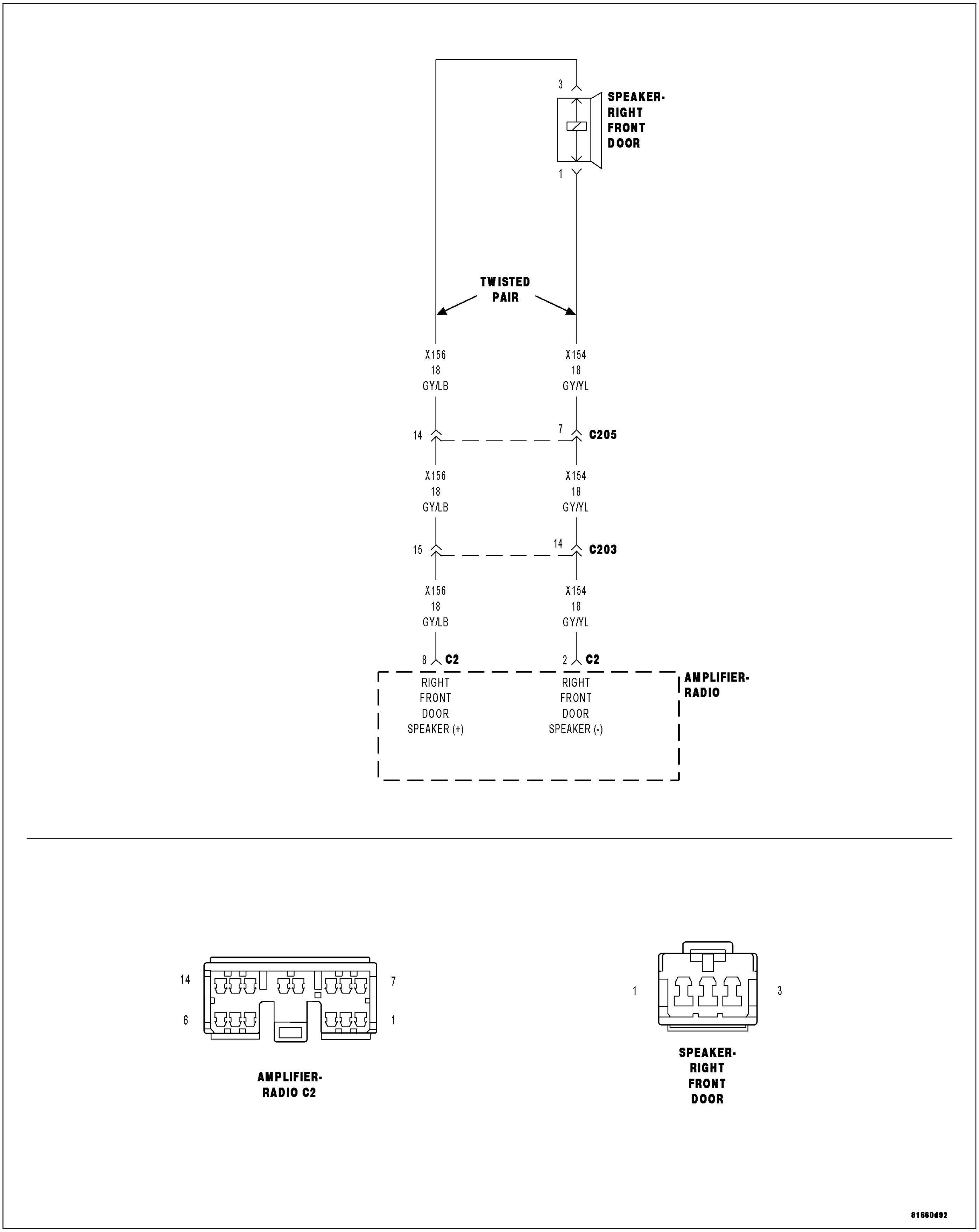
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

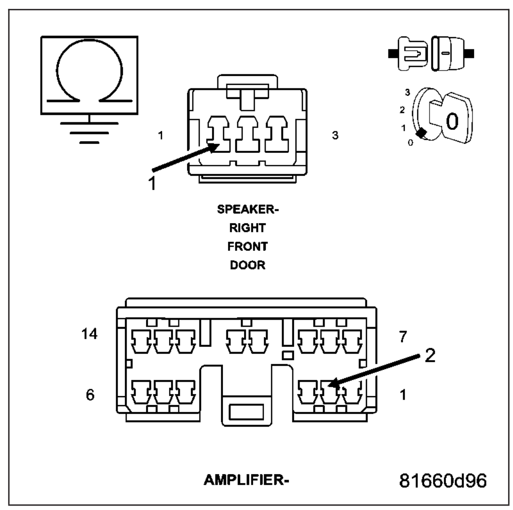
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C2 harness connector.

Disconnect the Right Front Door Speaker harness connector.

Measure the resistance between ground and the (X154) Amplified Right Front Door Speaker (+) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X154) Amplified Left Front Door Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

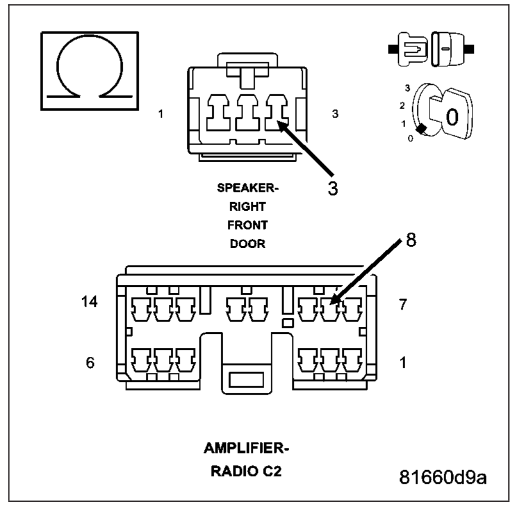
3. CHECK THE (X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X156) Amplified Right Front Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X156) Amplified Right Front Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4



4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER

Turn the ignition off.

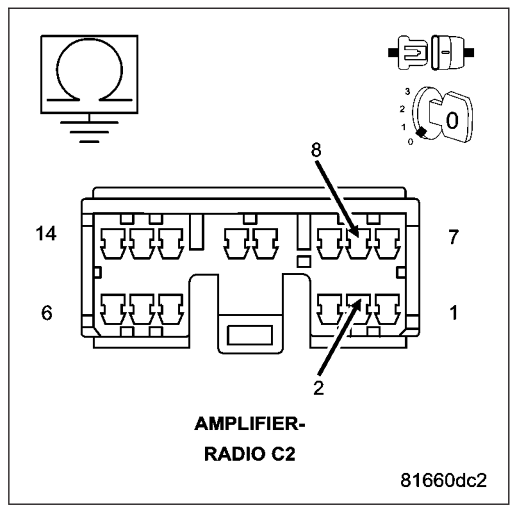
Reconnect and reinstall the Right Front Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground.

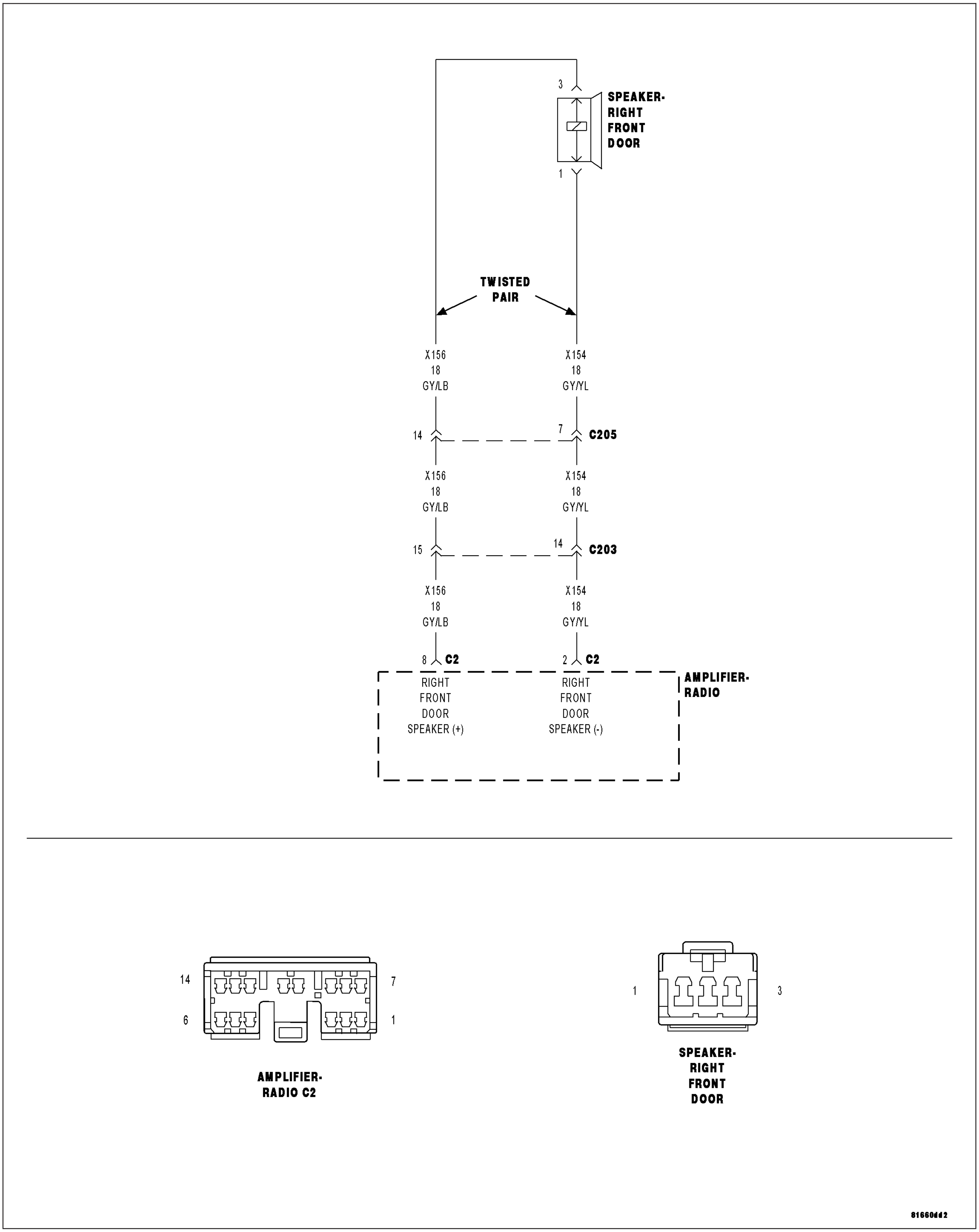
Is the resistance below 10K ohms?

Yes >> Replace the Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT

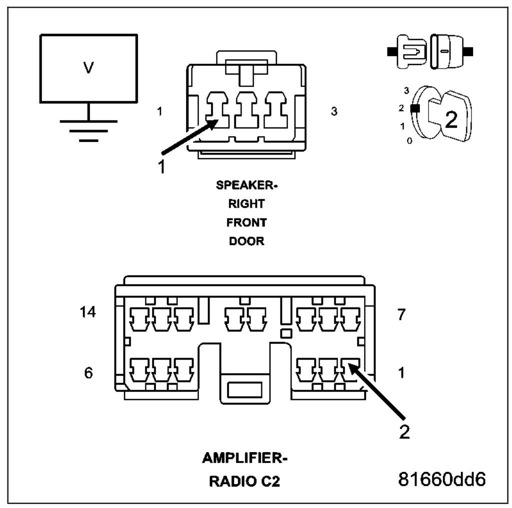
Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Right Front Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X154) Amplified Right Front Door Speaker (+) circuit.



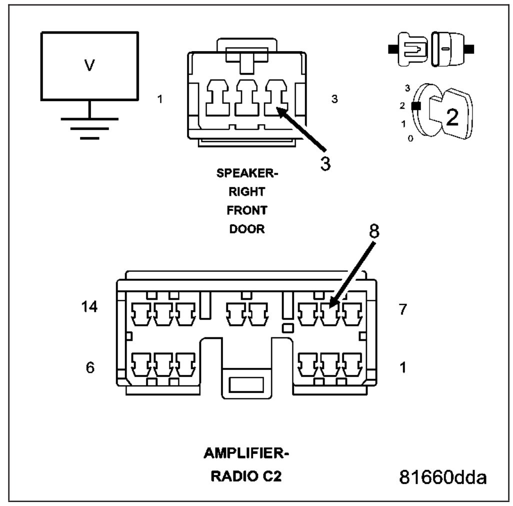
Is the voltage above 10.0 volts?

Yes >> Repair the (X154) Amplified Right Front Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT

Measure for voltage on the (X156) Amplified Right Front Door Speaker (-) circuit.

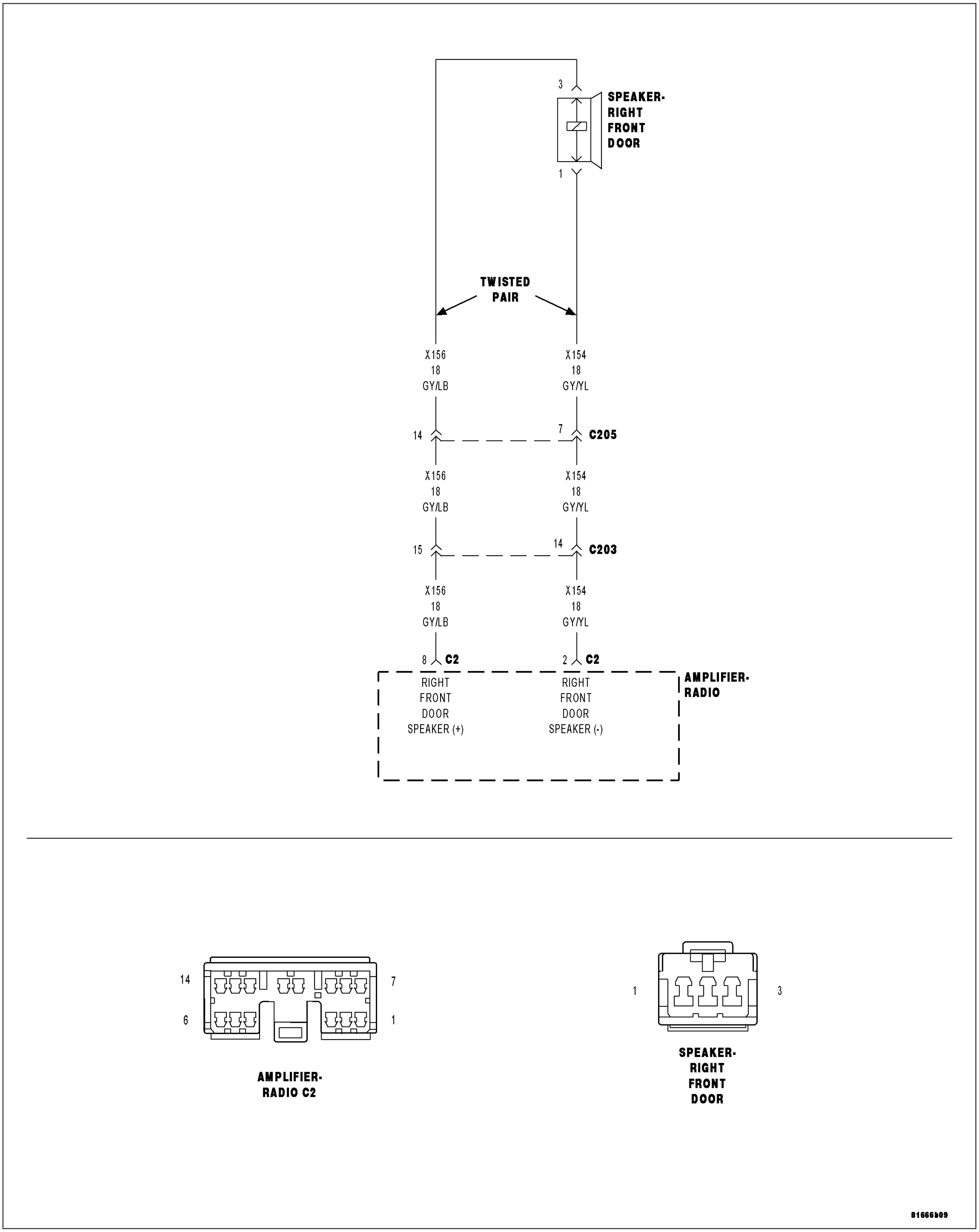


Is the voltage above 10.0 volts?

Yes >> Repair the (X156) Amplified Right Front Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT OPEN
(X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT OPEN
RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

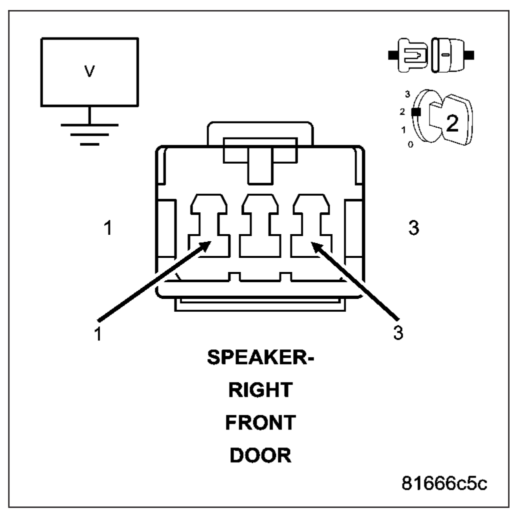
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT FRONT DOOR SPEAKER

Disconnect the Right Front Door Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Front Door Speaker circuits in the Amplified Right Front Door Speaker harness connector.

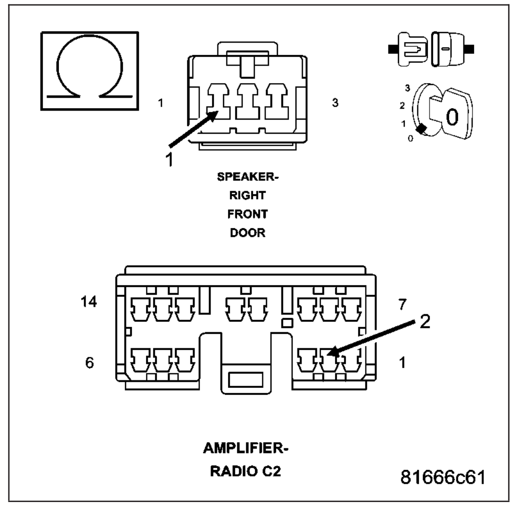


Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR AN OPEN



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

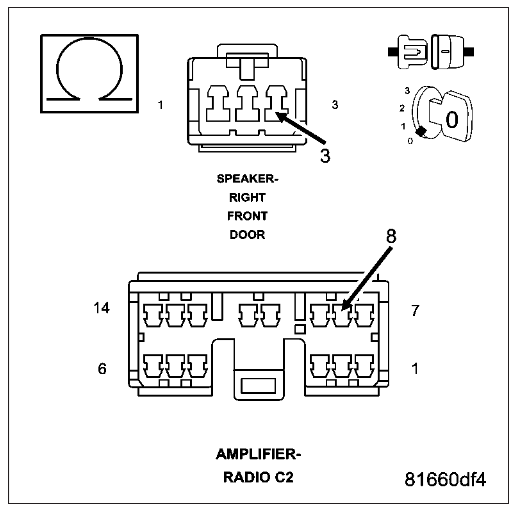
Measure the resistance of the (X154) Amplified Right Front Door Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Right Front Door Speaker harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X154) Amplified Right Front Door Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR AN OPEN



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

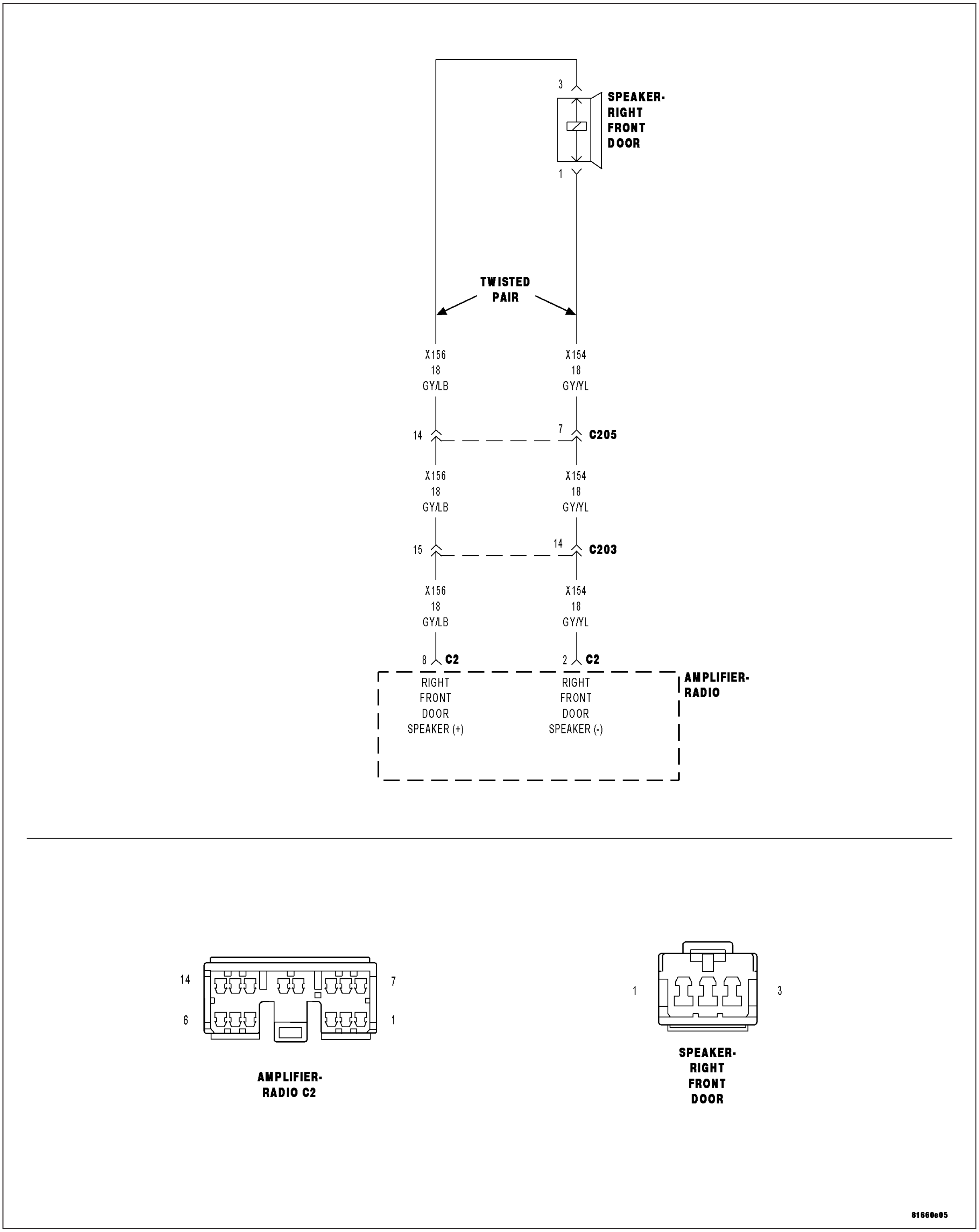
Measure the resistance of the (X156) Amplified Right Front Door Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Right Front Door Speaker harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X156) Amplified Right Front Door Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

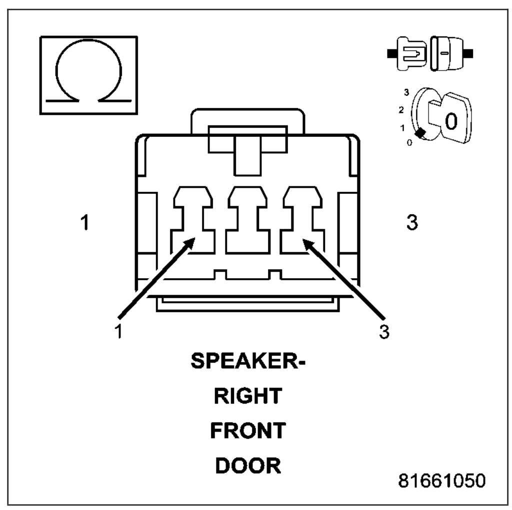
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER

Disconnect the Amplified Right Front Door Speaker.

Measure the resistance of the speaker between the two terminals.

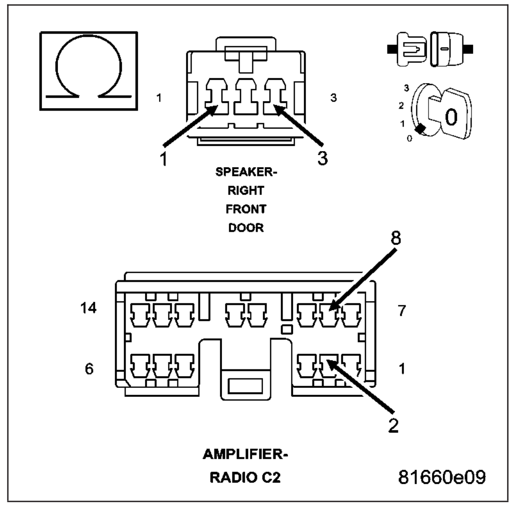


Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X154) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X156) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X154) Amplified Right Front Door Speaker (+) circuit, and the (X156) Amplified Right Front Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X154) Amplified Right Front Door Speaker (+) circuit, and the (X156) Amplified Right Front Door Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

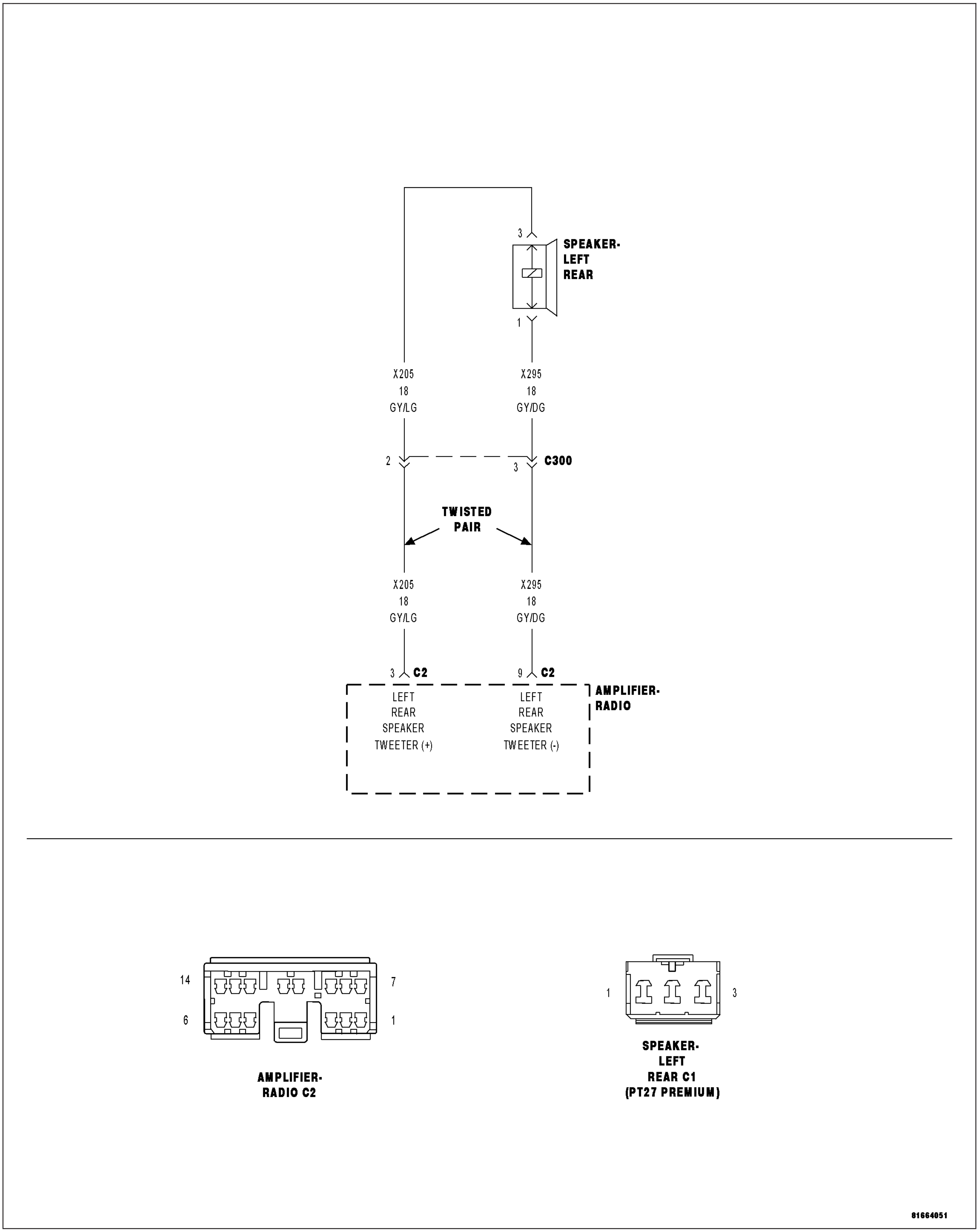
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

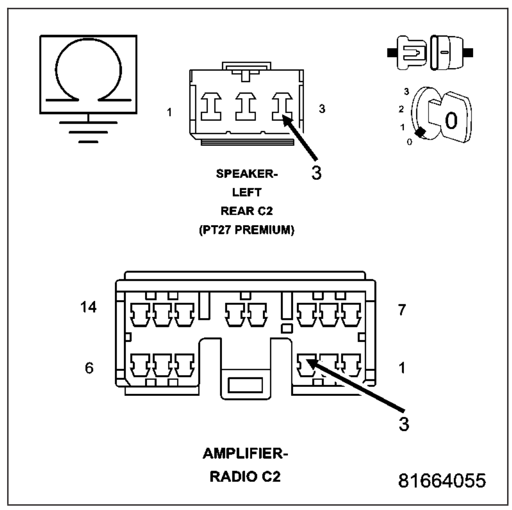
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C2 harness connector.

Disconnect the Left Rear Shelf Speaker harness connector.

Measure the resistance between ground and the (X205) Amplified Left Rear Shelf Speaker (+) circuit.



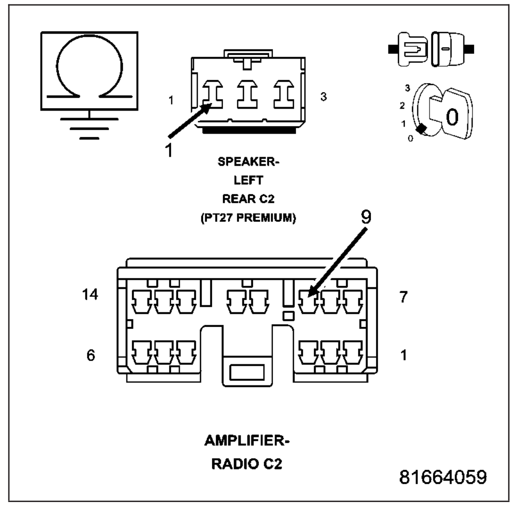
Is the resistance below 10K ohms?

Yes >> Repair the (X205) Amplified Left Rear Shelf Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X295) Amplified Left Rear Shelf Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X295) Amplified Left Rear Shelf Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

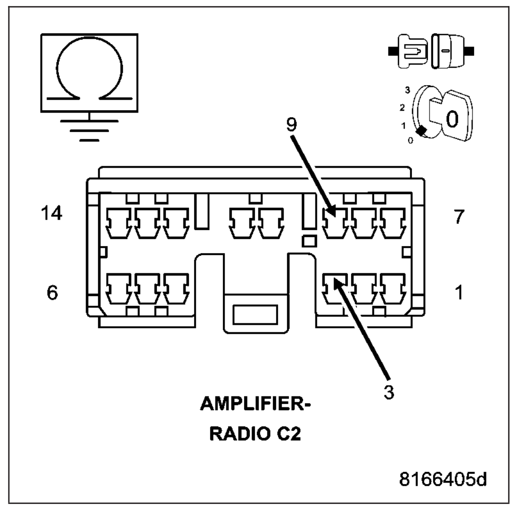
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED LEFT REAR SHELF SPEAKER

Turn the ignition off.

Reconnect and reinstall the Left Rear Shelf Speaker.

Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground..

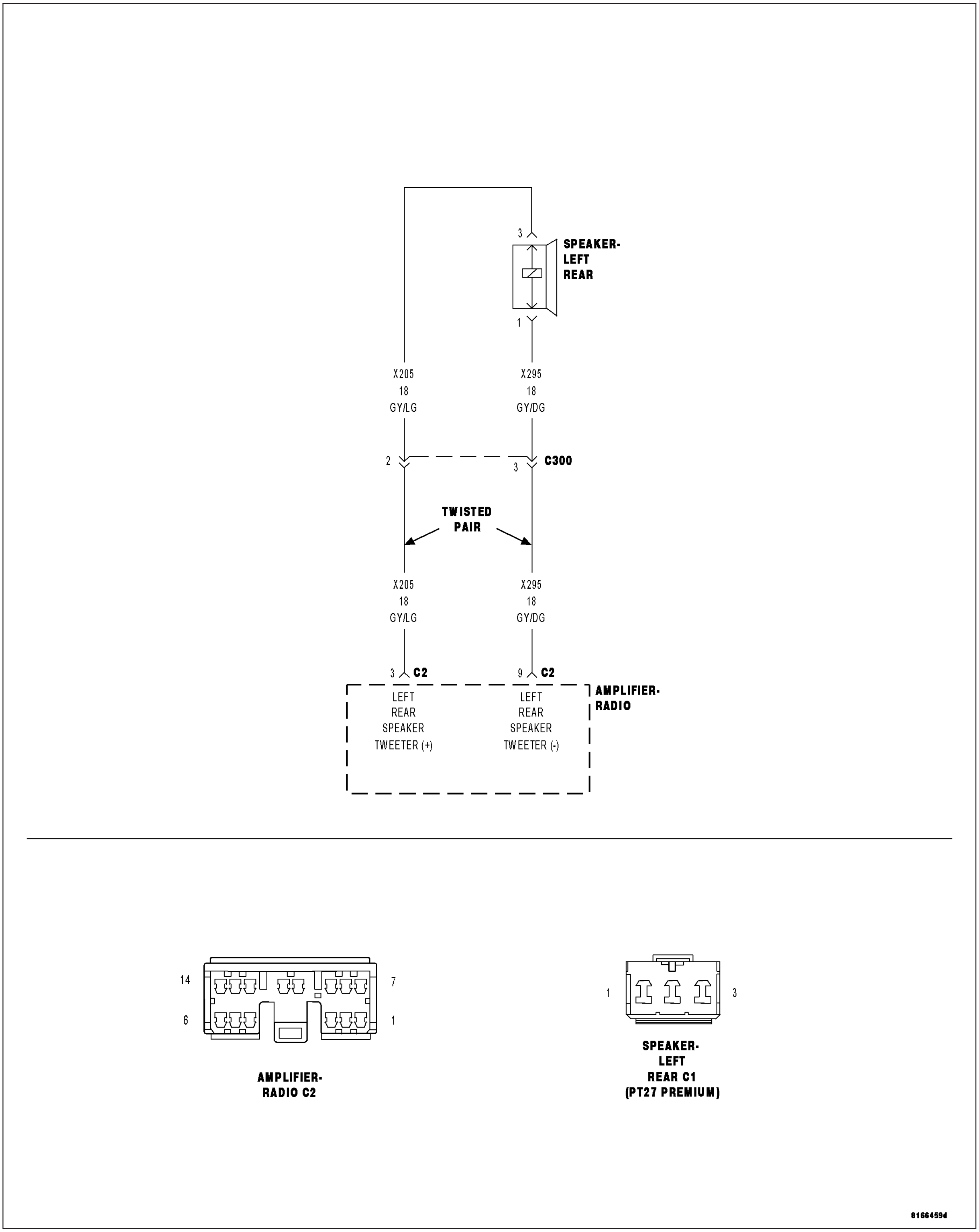


Is the resistance below 10K ohms?

Yes >> Replace the Left Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT

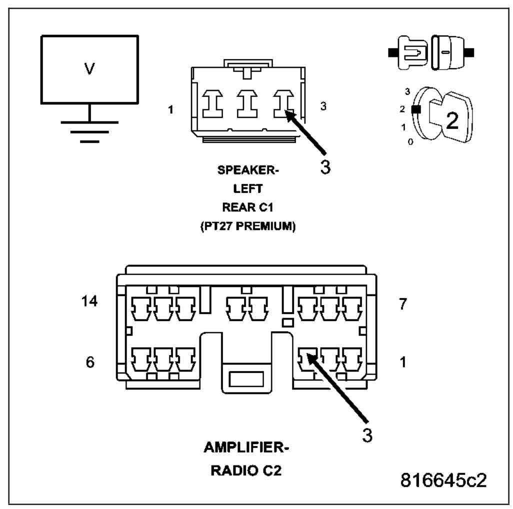
Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Left Rear Shelf Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X205) Amplified Left Rear Shelf Speaker (+) circuit.



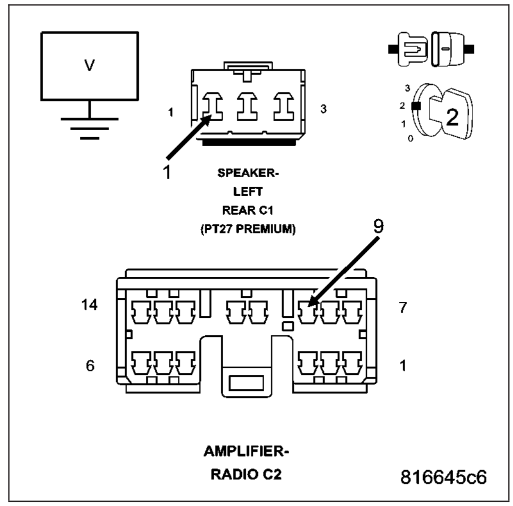
Is the voltage above 10.0 volts?

Yes >> Repair the (X205) Amplified Left Rear Shelf Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT

Measure for voltage on the (X295) Amplified Left Rear Shelf Speaker (-) circuit.

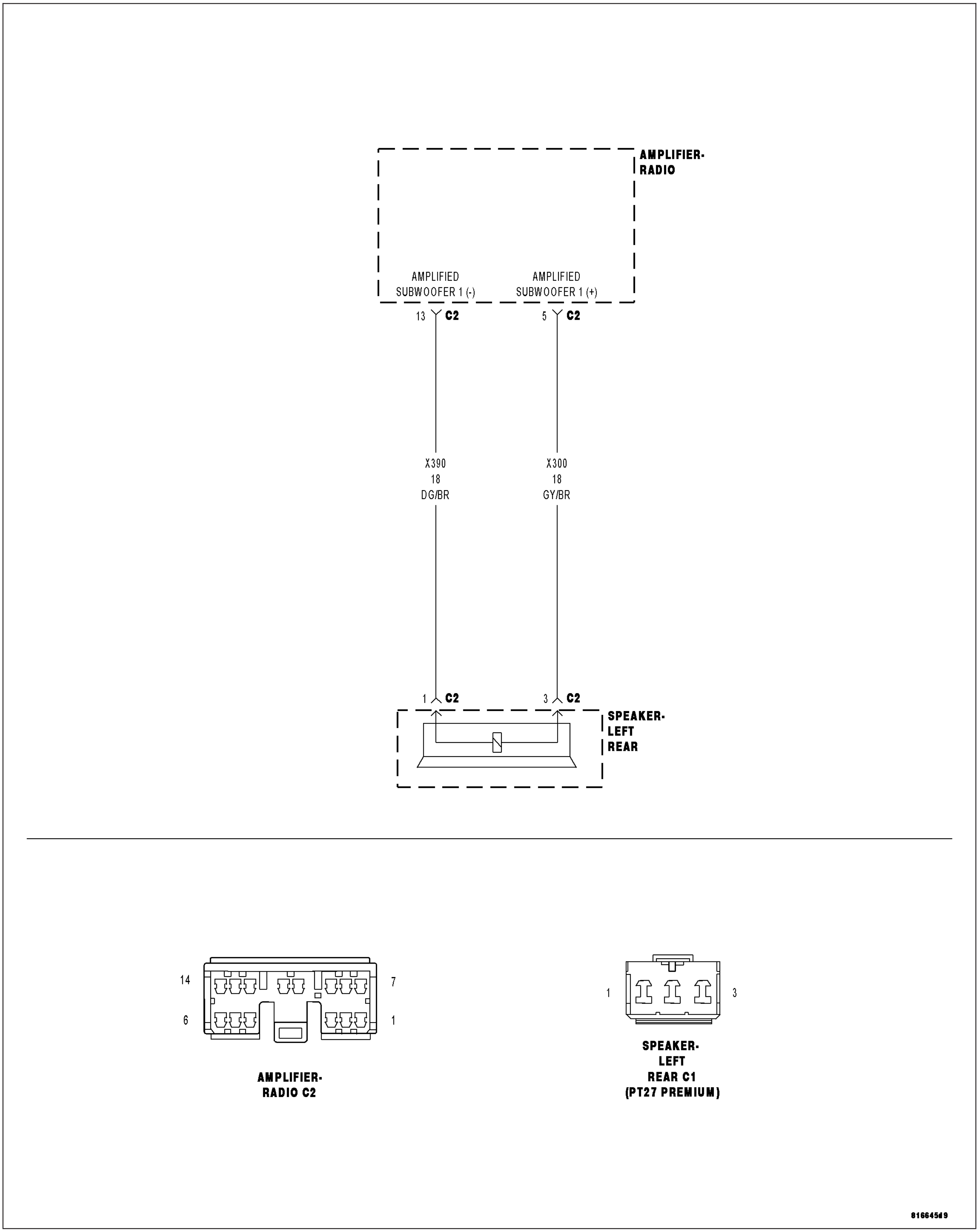


Is the voltage above 10.0 volts?

Yes >> Repair the (X295) Amplified Left Rear Shelf Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT OPEN
(X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT OPEN
LEFT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.

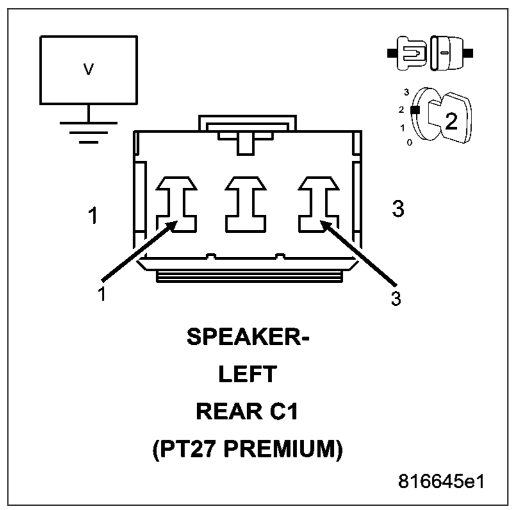
Does the scan tool display active: B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE LEFT REAR SHELF SPEAKER

Disconnect the Left Rear Shelf Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Shelf Speaker circuits in the Amplified Left Rear Shelf Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

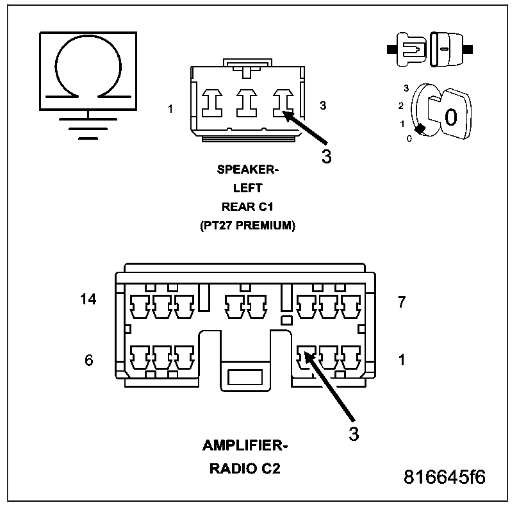
No >> Go To 3

3. CHECK THE (X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X205) Amplified Left Rear Shelf Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Left Rear Shelf Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X205) Amplified Left Rear Shelf Speaker (+) circuit for an open.

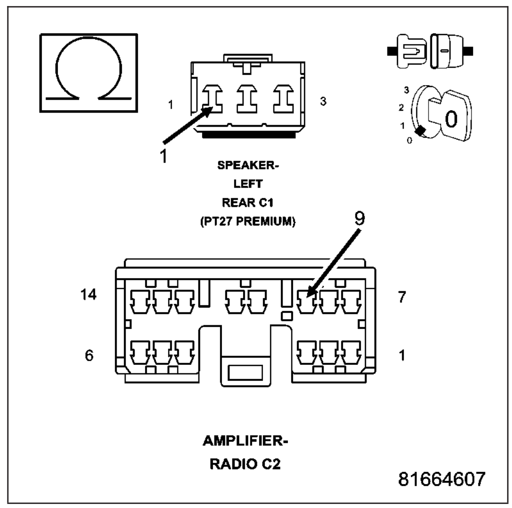
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X295) Amplified Left Rear Shelf Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Left Rear Shelf Speaker harness connector.



Is the resistance below 5.0 ohms?

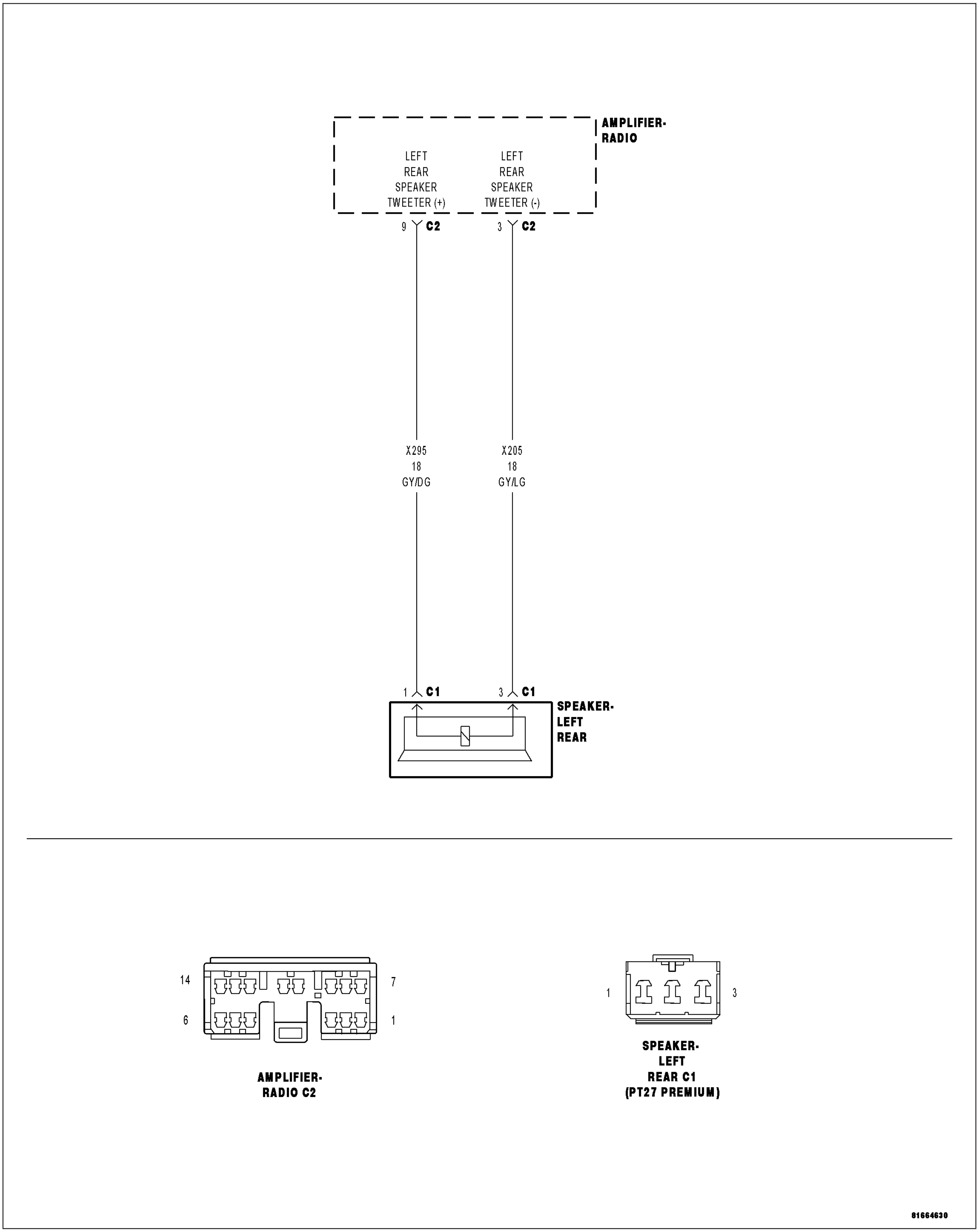
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X295) Amplified Left Rear Shelf Speaker (-) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.

B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT SHORTED TO THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUIT
AMPLIFIED LEFT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

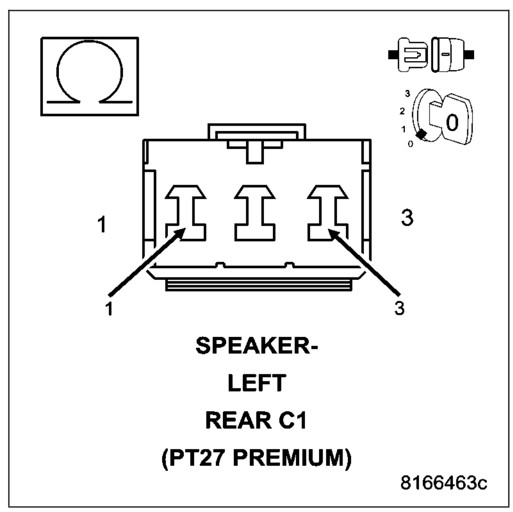
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT REAR SHELF SPEAKER

Disconnect the Amplified Left Rear Shelf Speaker.

Measure the resistance of the speaker between the two terminals.



Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

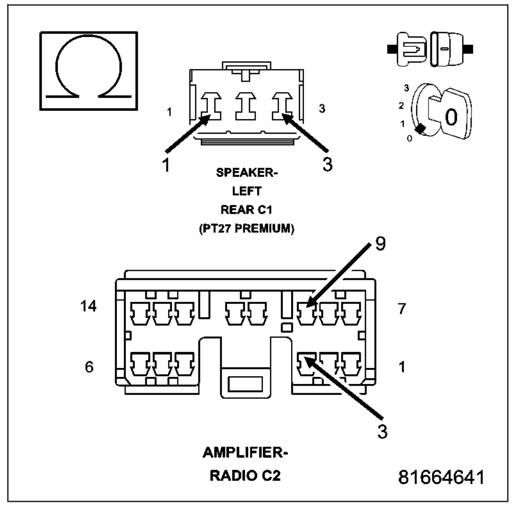
No >> Go To 3

3. CHECK THE (X205) AMPLIFIED LEFT REAR SHELF SPEAKER (+) CIRCUIT, AND THE (X295) AMPLIFIED LEFT REAR SHELF SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X205) Amplified Left Rear Shelf Speaker (+) circuit, and the (X295) Amplified Left Rear Shelf Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X205) Amplified Left Rear Shelf Speaker (+) circuit, and the (X295) Amplified Left Rear Shelf Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

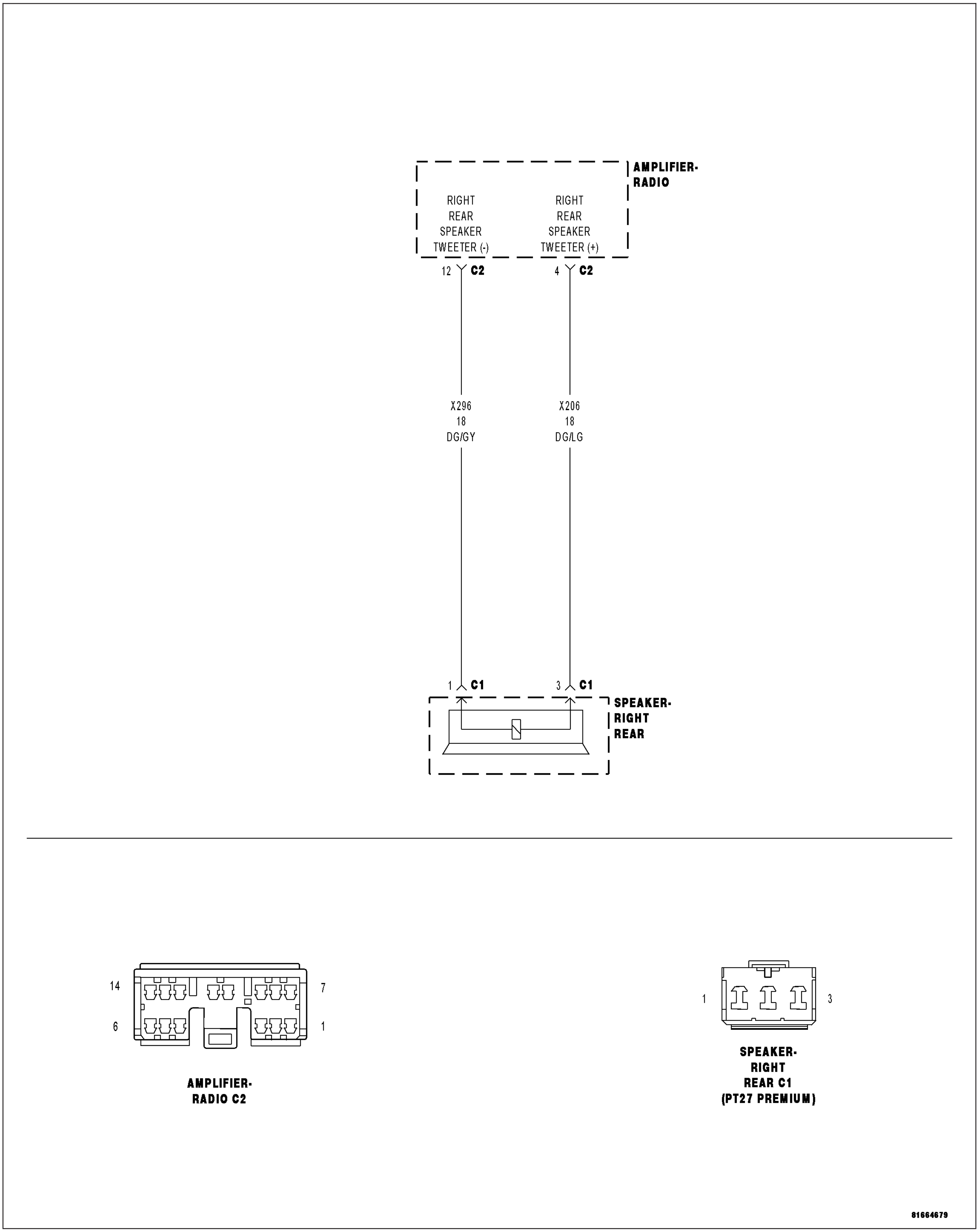
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

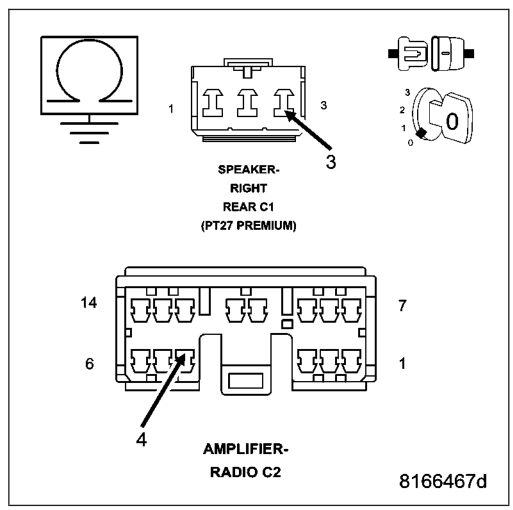
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE (X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C2 harness connector.

Disconnect the Right Rear Shelf Speaker harness connector.

Measure the resistance between ground and the (X206) Amplified Right Rear Shelf Speaker (+) circuit.



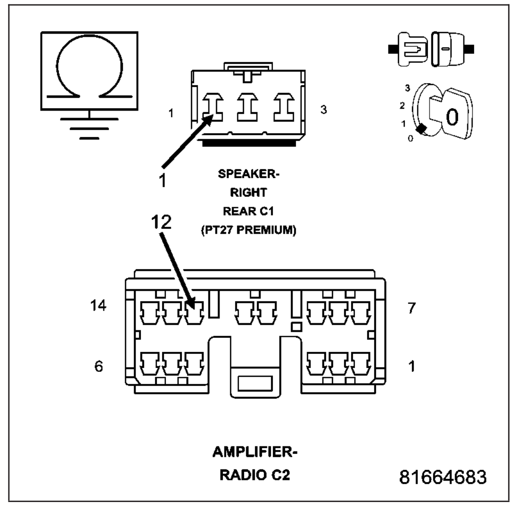
Is the resistance below 10K ohms?

Yes >> Repair the (X206) Amplified Right Rear Shelf Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X296) Amplified Right Rear Shelf Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X296) Amplified Right Rear Shelf Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

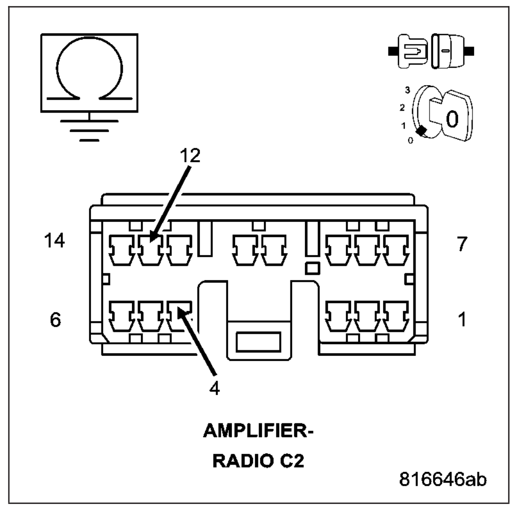
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED RIGHT REAR SHELF SPEAKER

Turn the ignition off.

Reconnect and reinstall the Right Rear Shelf Speaker.

Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground..

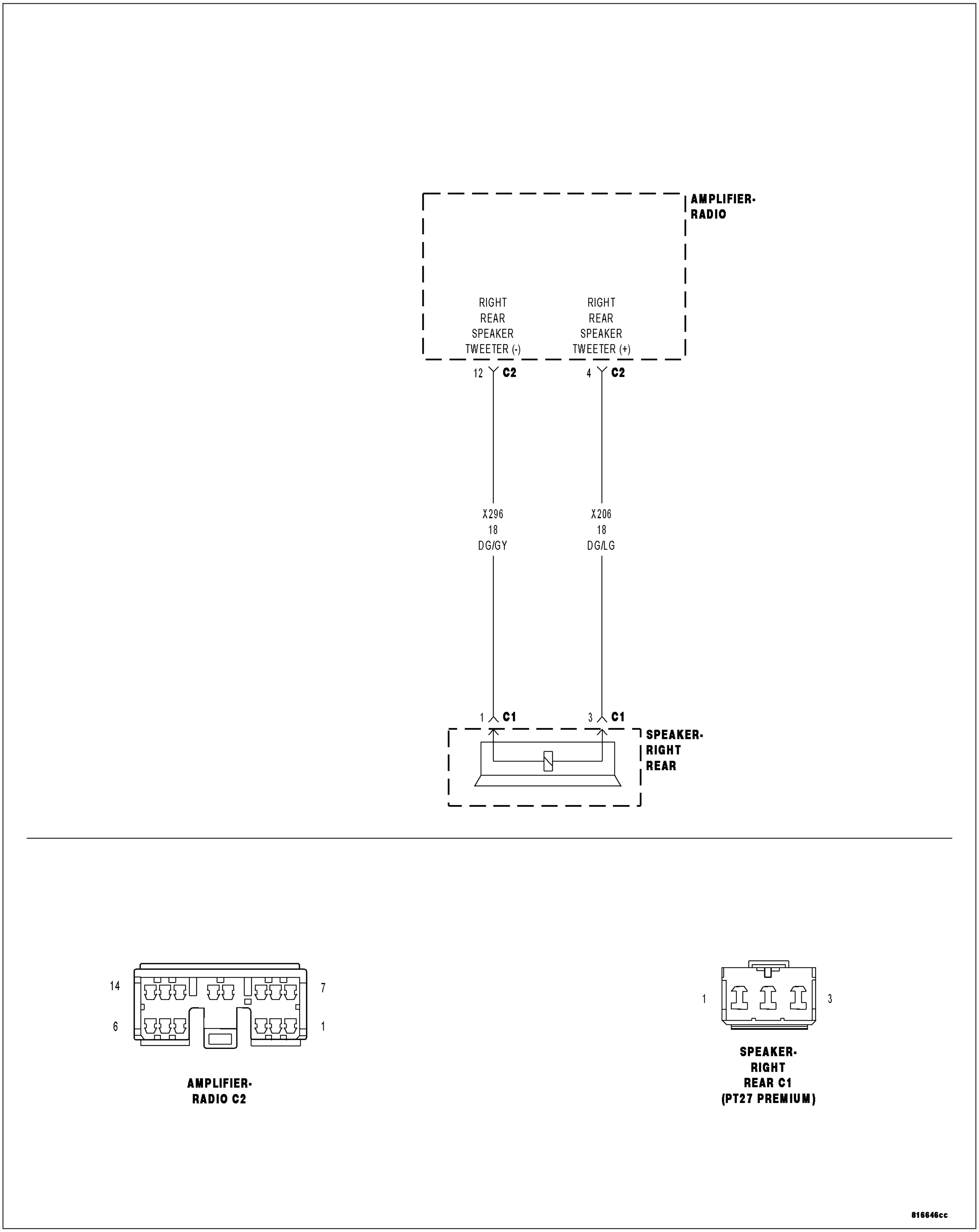


Is the resistance below 10K ohms?

Yes >> Replace the Right Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK FOR VOLTAGE ON THE (X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT

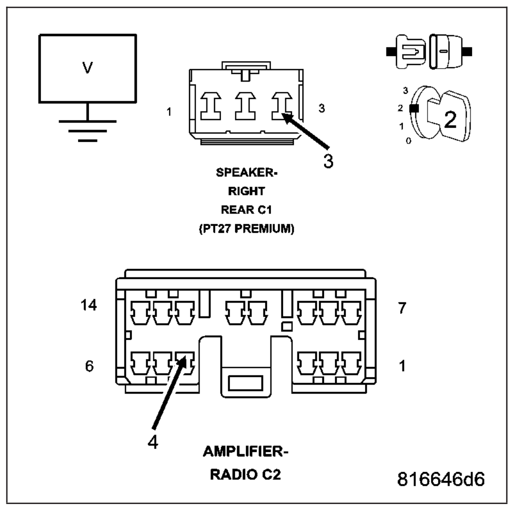
Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Right Rear Shelf Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X206) Amplified Right Rear Shelf Speaker (+) circuit.



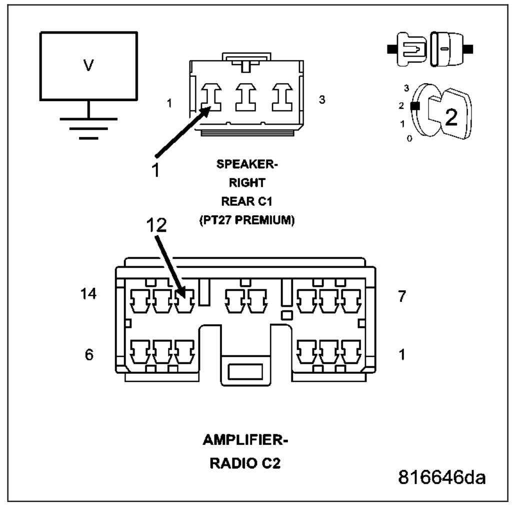
Is the voltage above 10.0 volts?

Yes >> Repair the (X206) Amplified Right Rear Shelf Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK FOR VOLTAGE ON THE (X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT

Measure for voltage on the (X296) Amplified Right Rear Shelf Speaker (-) circuit.

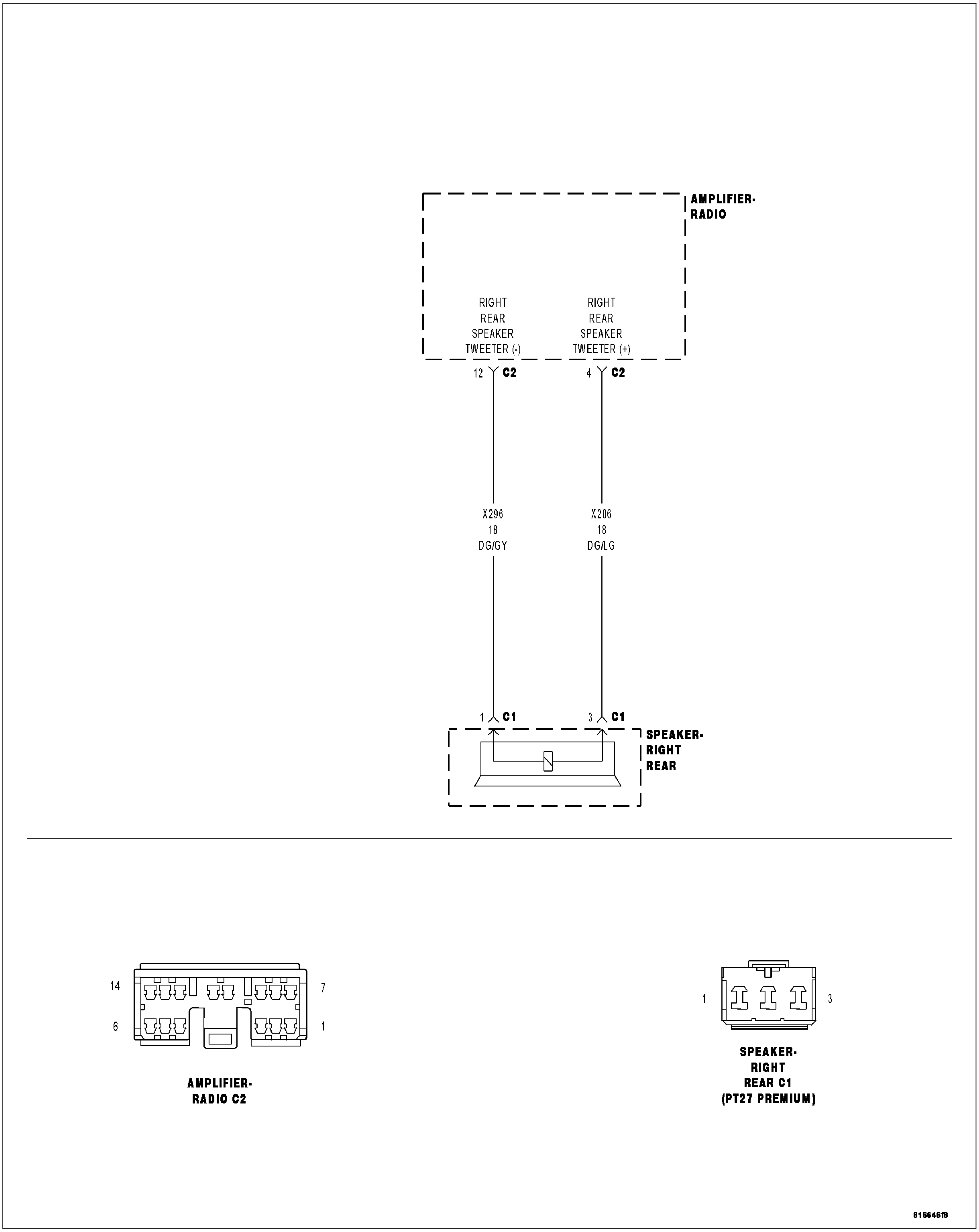


Is the voltage above 10.0 volts?

Yes >> Repair the (X296) Amplified Right Rear Shelf Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Amplifier BUS wake-up. Amplifier reset with scan tool.
- **Set Condition:**
- The amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT OPEN
(X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT OPEN
RIGHT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

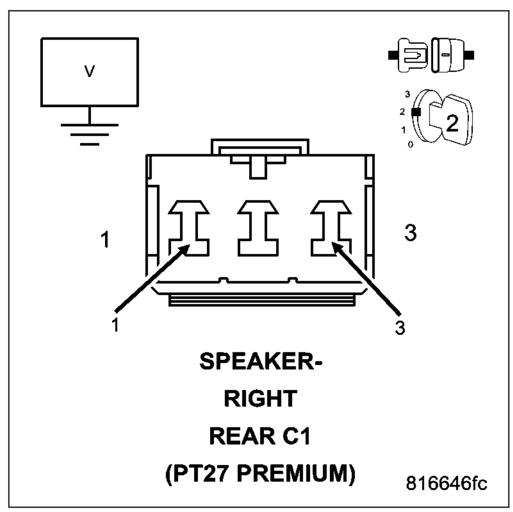
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT REAR SHELF SPEAKER

Disconnect the Right Rear Shelf Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Rear Shelf Speaker circuits in the Amplified Right Rear Shelf Speaker harness connector.

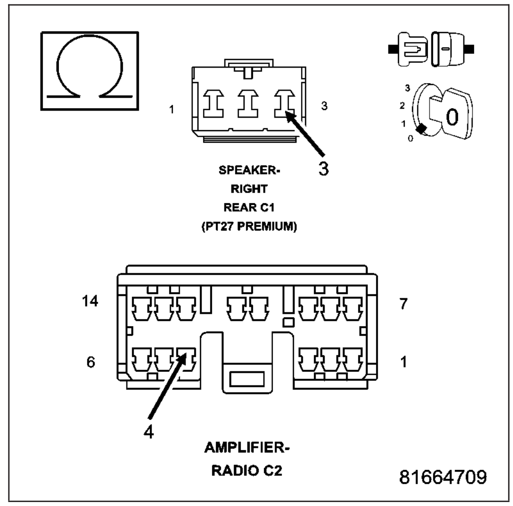


Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT FOR AN OPEN



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X206) Amplified Right Rear Shelf Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Right Rear Shelf Speaker harness connector.

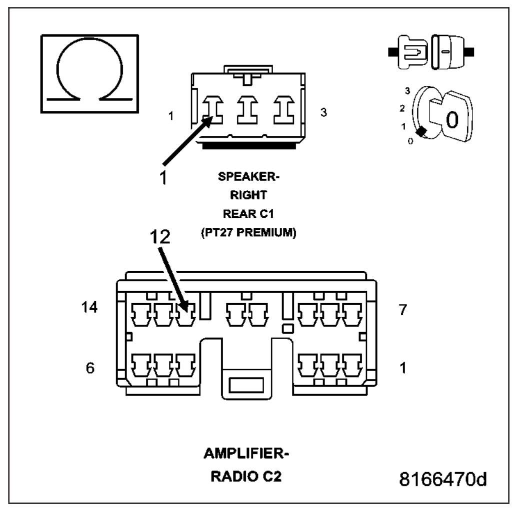
Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X206) Amplified Right Rear Shelf Speaker (+) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT FOR AN OPEN



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X296) Amplified Right Rear Shelf Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Right Rear Shelf Speaker harness connector.

Is the resistance below 5.0 ohms?

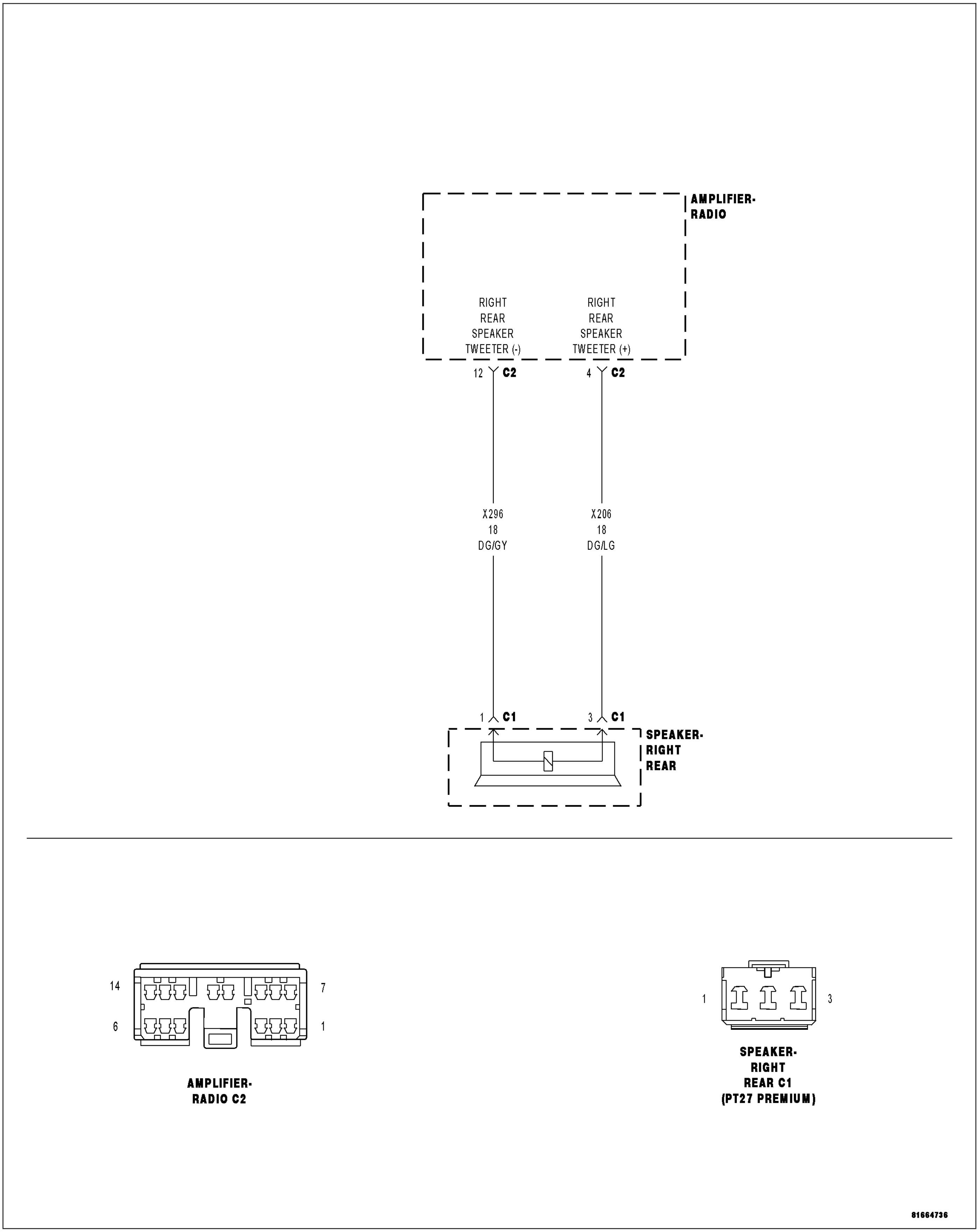
Yes >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X296) Amplified Right Rear Shelf Speaker (-) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.

B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
- The amplifier detects that the output circuits are shorted together.

Possible Causes
(X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT SHORTED TO THE (X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT REAR SHELF SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

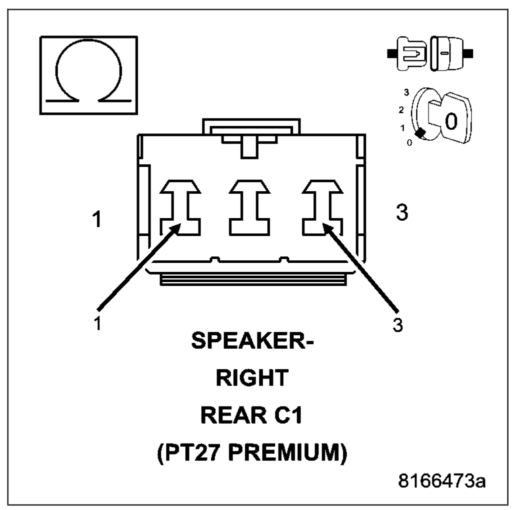
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT REAR SHELF SPEAKER

Disconnect the Amplified Right Rear Shelf Speaker.

Measure the resistance of the speaker between the two terminals.

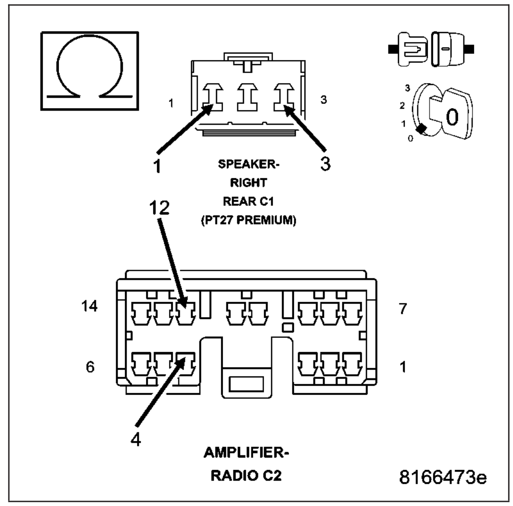


Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right Rear Shelf Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

3. CHECK THE (X206) AMPLIFIED RIGHT REAR SHELF SPEAKER (+) CIRCUIT, AND THE (X296) AMPLIFIED RIGHT REAR SHELF SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER



Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X206) Amplified Right Rear Shelf Speaker (+) circuit, and the (X296) Amplified Right Rear Shelf Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X206) Amplified Right Rear Shelf Speaker (+) circuit, and the (X296) Amplified Right Rear Shelf Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

No >> Replace the amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

B2222-SATELLITE RADIO RECEIVER INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The Satellite Radio Receiver detects a software checksum test failure.

Possible Causes
SATELLITE RADIO RECEIVER

Diagnostic Test

1. REPLACE THE SATELLITE RADIO RECEIVER

When this code is set, the Satellite Radio must be replaced.

Repair

Replace the Satellite Radio Receiver in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

U0019–CAN B BUS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously.
- **Set Condition:**
- Whenever the CAN B BUS (+) or B BUS (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN THE TOTALLY INTEGRATED POWER MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
AMPLIFIER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display: U0019–CAN B BUS CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.

2. CHECK TOTALLY INTEGRATED POWER MODULE DTCs

With the scan tool, read Totally Integrated Power Module DTCs

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

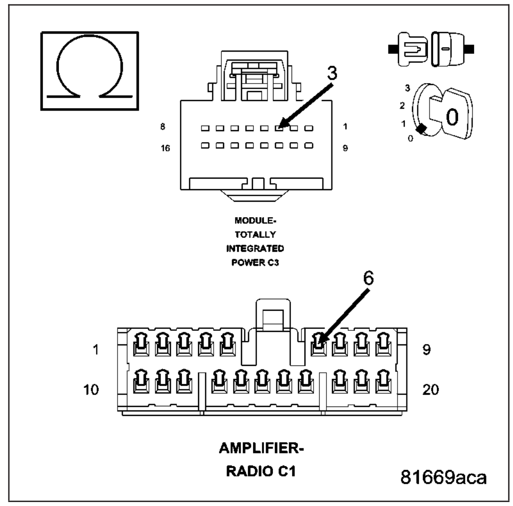
3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Totally Integrated Power Module C3 harness connector.

Measure the resistance of the (D55) CAN B BUS (+) circuit between the Totally Integrated Power Module C3 harness connector and the Amplifier C1 harness connector.



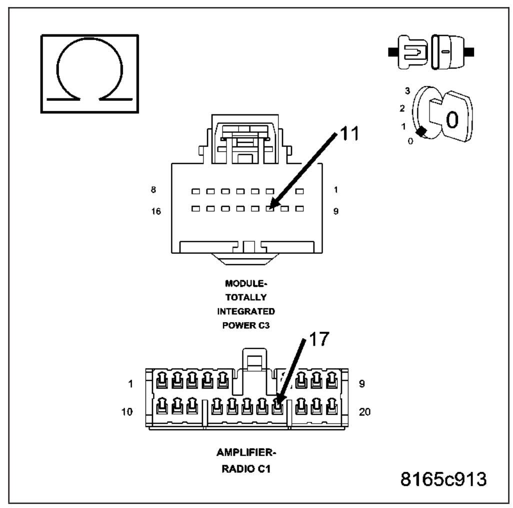
Is the resistance below 2.0 ohms?

Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the CAN B BUS (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B BUS (–) circuit between the Totally Integrated Power Module C3 harness connector and the Amplifier C1 harness connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the CAN B BUS (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0020-CAN B BUS OFF PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously.
- **Set Condition:**
- Whenever the CAN B BUS (+) or B BUS (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN THE TOTALLY INTEGRATED POWER MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
AMPLIFIER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display: U0020-CAN B BUS OFF PERFORMANCE?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

2. CHECK FRONT CONTROL MODULE DTCs

With the scan tool, read Totally Integrated Power Module DTCs.

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

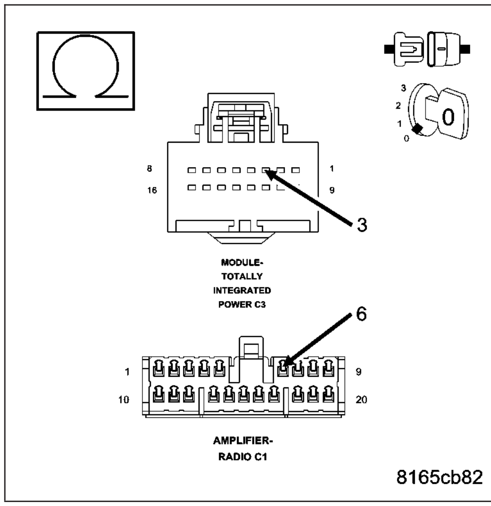
Disconnect the Totally Integrated Power Module C3 harness connector.

Measure the resistance of the (D55) CAN B BUS (+) circuit between the Totally Integrated Power module C3 harness connector and the Amplifier C1 harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the CAN B BUS (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



8165cb82

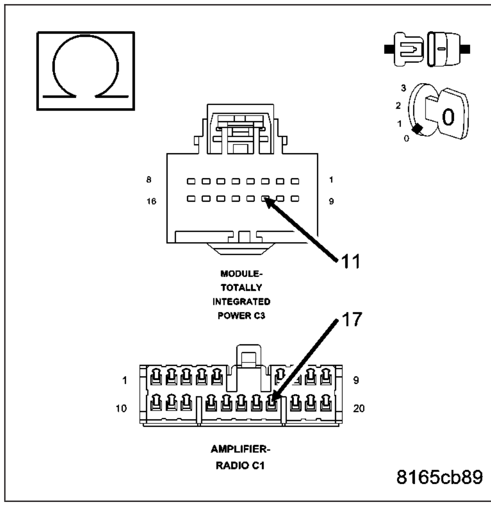
4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B BUS (–) circuit between the Totally Integrated Power Module C3 harness connector and the Amplifier C1 harness connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the CAN B BUS (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



8165cb89

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDAR

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMINICATION WITH HANDS FREE MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMINICATION WITH DRIVERS DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMINICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMINICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMINICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

AUDIO

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AUDIO

DESCRIPTION

Several combinations of radio receivers are offered. The audio system uses an ignition switched source of battery current so that the system will only operate when the ignition switch is in the RUN or ACCESSORY positions.

An optional navigation radio (REC) is available on this vehicle. With this system, the operator has the option of choosing a street address, point of interest, trip itinerary and other features outlined in the operator's manual.

The audio system includes the following components:

- Amplifier (if equipped)
- Antenna
- Antenna - satellite radio and navigation (if equipped)
- Radio noise suppression components
- Radio receiver
- Satellite receiver module (if equipped)
- Speakers

Certain functions and features of the audio system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communication Interface (PCI) bus network. The data bus network allows the sharing of sensor information. For diagnosis of these electronic modules or of the data bus network, the use of a scan tool and the proper Diagnostic Procedures manual are recommended.

OPERATION

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signals in both the Amplitude Modulating (AM) and Frequency Modulating (FM) commercial frequency ranges.

The available satellite radio system is a subscription based service. Information sent by satellite is transmitted to the roof mounted antenna, then to the satellite receiver module. The operator then has the choice of multiple music/ information channels.

The available navigation radio system receives GPS signals from up to eight satellites to display the position and direction of the vehicle. Map information is supplied through a DVD-ROM. An electronic gyro-sensor and the vehicle's speed sensor enable the system to display the present vehicle position even in locations where GPS signals may be blocked, however system performance will be degraded.

When a destination is selected, the navigation system uses information from the map to quickly calculate a route. As the vehicle is driven along the chosen route, the operator is guided with pictorial displays and voice prompts. The navigation system will also reroute the user if a turn is missed. For complete operating instructions, refer to the manual included with the vehicle.

The audio system components operate on battery current received through a fuse in the Junction Block (JB) on a fused ignition switch output (RUN-ACC) circuit so that the system will only operate when the ignition switch is in the ON or ACCESSORY positions.

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with the use of the scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: Disable the airbag system before attempting any steering wheel, steering column, seat belt tensioner, side airbag, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

AUDIO SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for shorted or open wires. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service information.
	6. Speakers inoperative.	6. Replace speaker as necessary.
NO SATELLITE RADIO AUDIO (PERFORM ALL DIAGNOSIS OUTDOORS)	1. Subscription service has expired (with subscription expired, one channel is still available)	1. Contact satellite radio provider.
	2. Items on roof blocking satellite antenna.	2. Remove or reposition items to allow clear space around antenna.
	3. Damaged satellite antenna cable.	3. Replace satellite antenna cable.
	4. Damaged satellite antenna.	4. Replace satellite antenna.
NO RADIO DISPLAY	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Junction Block (JB). Replace fuses, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service information.
CLOCK WILL NOT KEEP SET TIME	1. Fuse inoperative.	1. Check Ignition-Off Draw (IOD) fuse in the Junction Block (JB). Replace fuse, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service information.

CONDITION	POSSIBLE CAUSES	CORRECTION
SOUND DISTORTION (VIBRATION FROM SPEAKER AREA, BUZZING - HUMMING)	1. Door trim panel loose or missing fasteners.	1. Inspect door trim panel and correct as necessary. Replace any missing fasteners.
	2. Water shield loose or misaligned.	2. Inspect water shield and adjust as required.
	3. Items placed in door trim panel map pockets vibrating or moving from side to side.	3. Remove items from door trim panel. Ensure that vibration is no longer present.
POOR RADIO RECEPTION	1. Antenna damaged or inoperative.	1. Diagnose and replace antenna if necessary.
	2. Radio ground damaged.	2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	3. Radio noise suppression inoperative.	3. Repair or replace ground strap as necessary.
	4. Radio inoperative.	4. Refer to appropriate Diagnostic Service information.
NO/POOR TAPE OPERATION	1. Damaged tape.	1. Insert known good tape and test operation.
	2. Foreign objects behind tape door.	2. Remove foreign objects and test operation.
	3. Dirty cassette tape head.	3. Clean head with Mopar Cassette Head Cleaner.
	4. Inoperative radio.	4. Exchange or replace radio, if required.
NO COMPACT DISC OPERATION	1. Damaged CD.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. Inoperative radio.	4. Refer to appropriate Diagnostic Service information.

AMPLIFIER

DESCRIPTION

The optional premium speaker system includes a separate audio power amplifier. The amplifier is located on the floor behind the spare tire in the trunk.

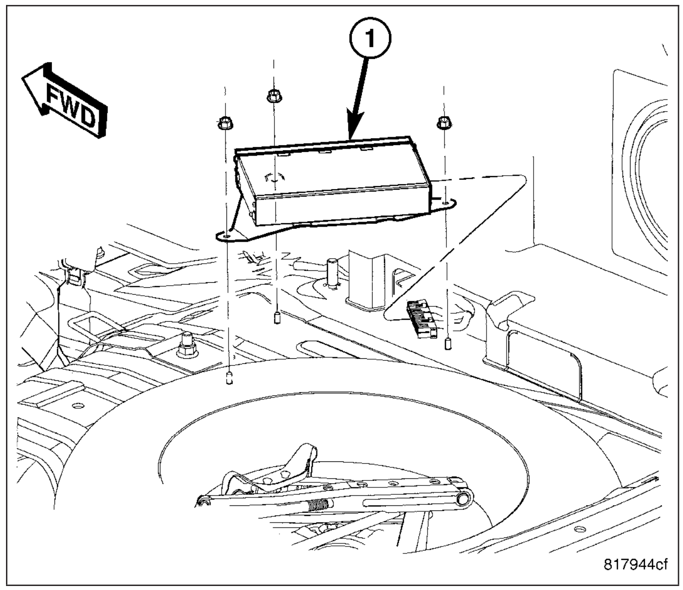
OPERATION

The power amplifier electronically increases the frequency response of the normal audio signal output from the radio amplifier in order to improve the acoustic performance of the speakers. On vehicles equipped with an amplifier, the amplifier section of the radio becomes a pre-amplifier.

The amplifier receives audio signal inputs for speaker channels from the radio, then sends amplified audio outputs with dedicated feed and return circuits to the individual speakers.

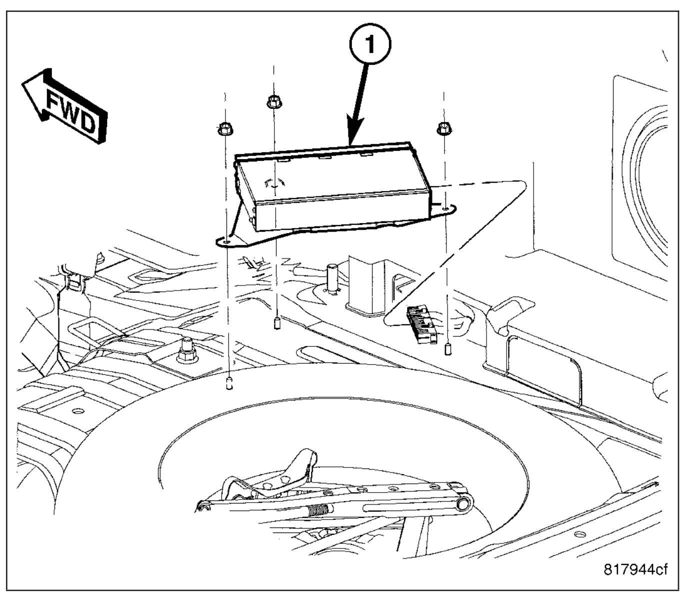
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the retaining fasteners.
3. Disconnect the wire harness connector.
4. Remove the amplifier (1).



INSTALLATION

1. Install amplifier (1).
2. Install the mounting fasteners.
3. Connect wire harness connector to amplifier.
4. Connect battery negative cable.



ANTENNA BODY AND CABLE

DESCRIPTION – Fixed Mast Antenna

The antenna body and cable are secured below the fender panel by the antenna cap nut through a mounting hole in the side of the right front fender. The primary coaxial antenna cable is then routed beneath the fender sheet metal and through an entry hole in the right cowl side panel into the interior of the vehicle. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right end of the instrument panel. The secondary coaxial cable is then routed behind the instrument panel to the back of the radio.

DESCRIPTION – Roof Mounted Antenna

The roof mounted antenna is a combination antenna that is used for the reception of Amplitude Modulation (AM) frequencies, Frequency Modulated (FM) frequencies and Satellite signals for the Digital Satellite Radio. The primary coaxial antenna cable is then routed through an entry hole in the roof panel into the interior of the vehicle. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right end of the instrument panel. The secondary coaxial cable is then routed behind the instrument panel to the back of the radio.

OPERATION

The antenna body and cable connects the antenna mast to the radio. The radio antenna is an electromagnetic circuit component used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast. The antenna body transfers the weak electromagnetic radio waves induced into the rigid antenna mast into the center conductor of the flexible primary antenna coaxial cable. The braided outer shield of the antenna coaxial cable is grounded through both the antenna body and the radio chassis, effectively shielding the radio waves as they are conducted to the radio. The radio then tunes and amplifies the weak radio signals into stronger electrical signals in order to operate the audio system speakers. For more information on the satellite radio operation of the roof mounted antenna, Refer to (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA MAST - OPERATION)

DIAGNOSIS AND TESTING - ANTENNA BODY AND CABLE

The following four tests are used to diagnose the antenna with an ohmmeter:

- **TEST 1** - Mast to ground test
- **TEST 2** - Tip-of-mast to tip-of-conductor test
- **TEST 3** - Body ground to battery ground test
- **TEST 4** - Body ground to antenna coaxial cable shield test.

WARNING: Disable the airbag system before attempting any steering wheel, steering column, seat belt tensioner, side airbag, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

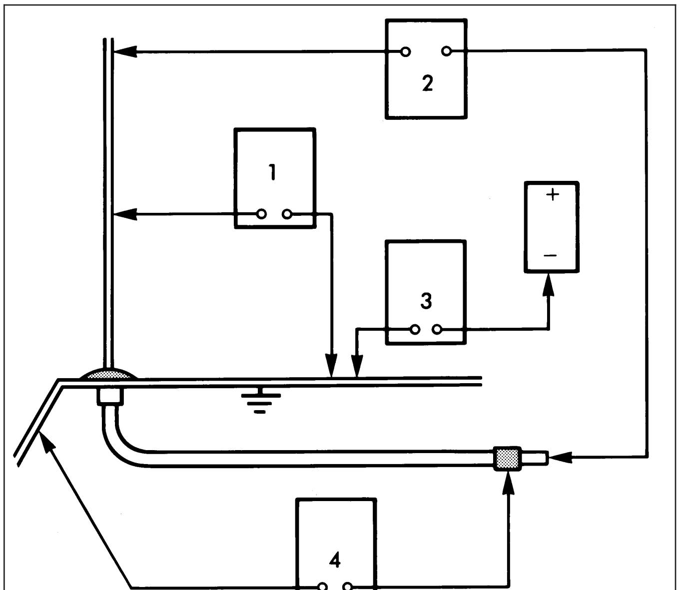
The ohmmeter test lead connections for each test are shown in the illustration.

NOTE: This model has a two-piece antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate an antenna cable problem. First, test the primary antenna cable (integral to the antenna body and cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the antenna body. Then, test the secondary antenna cable (instrument panel antenna cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the coaxial cable connector at the radio.

TEST 1

Test 1 determines if the antenna mast is insulated from ground. Proceed as follows:

1. Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.
2. Touch one ohmmeter test lead to the tip of the antenna mast (below tip if ball tip is plastic). Touch the other test lead to the antenna cap nut. Check the ohmmeter reading for continuity.
3. There should be no continuity. If OK, go to Test 2. If not OK, replace the faulty antenna body and cable.



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TEST 2

Test 2 checks the antenna conductor components for an open circuit. This test should be performed first on the entire antenna circuit, from the antenna mast to the center conductor of the coaxial cable connector at the radio. If an open circuit is detected, each of the three antenna conductor components (antenna mast, antenna body and primary cable unit, instrument panel antenna secondary cable) should be isolated and tested individually to locate the exact component that is the source of the open circuit. To begin this test, proceed as follows:

1. Disconnect the instrument panel (secondary) antenna cable coaxial connector from the back of the radio.
2. Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the center conductor pin of the instrument panel antenna cable coaxial connector for the radio. Check the ohmmeter reading for continuity.
3. There should be continuity. The ohmmeter should register only a fraction of an ohm resistance. High or infinite resistance indicates a damaged or open antenna conductor. If OK, go to Test 3. If not OK, isolate and test each of the individual antenna conductor components. Replace only the faulty antenna conductor component.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. To begin this test, proceed as follows:

1. This test must be performed with the battery positive cable disconnected from the battery. Disconnect and isolate both battery cables, negative cable first.
2. Reconnect the battery negative cable.
3. Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the battery negative terminal post. Check the ohmmeter reading for continuity.
4. There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the battery negative terminal and the vehicle body. If OK, go to Test 4. If not OK, check the battery negative cable connection to the vehicle body and the radio noise suppression ground strap connections to the engine and the vehicle body for being loose or corroded. Clean or tighten these connections as required.

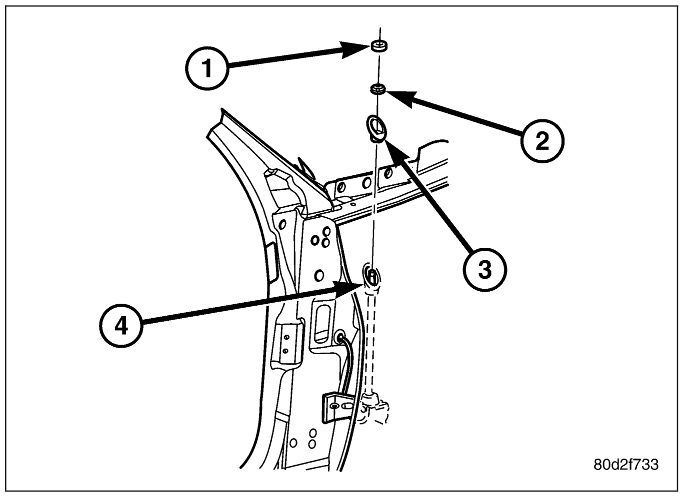
TEST 4

Test 4 checks the condition of the connection between the antenna coaxial cable shield and the vehicle body ground as follows:

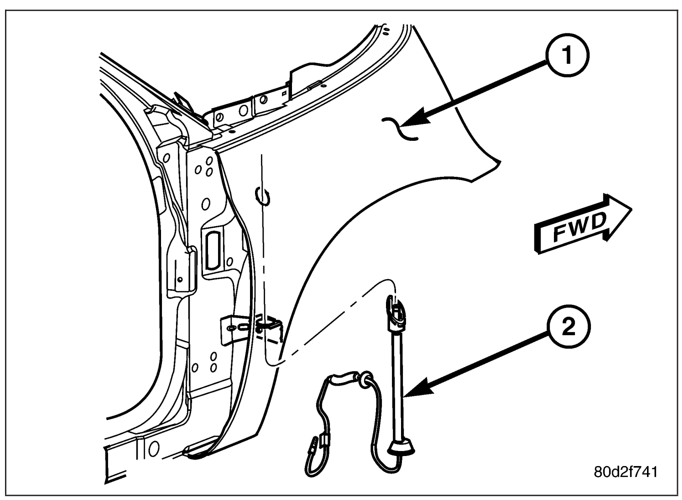
1. Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.
2. Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the outer crimp on the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel. Check the ohmmeter reading for continuity.
3. There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the antenna body and the vehicle body or between the antenna body and the antenna coaxial cable shield. If not OK, clean the antenna body to fender mating surfaces and tighten the antenna cap nut to specifications.
4. Check the resistance again with an ohmmeter. If the resistance is still more then one ohm, replace the faulty antenna body and cable.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove antenna mast by unscrewing mast from antenna body. On vehicles equipped with manual retractable antenna, lower antenna fully.
3. Remove shroud (1), if equipped.
4. Remove antenna nut (2) and adapter (3)

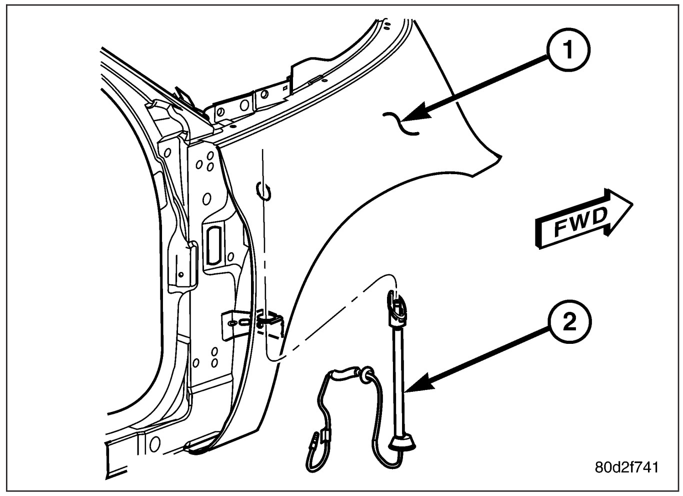


5. Disconnect antenna body cable from instrument panel antenna cable.
6. Remove inner fender shield as necessary to gain access to mounting fasteners.
7. Remove antenna body and cable (2) assembly from fender (1)

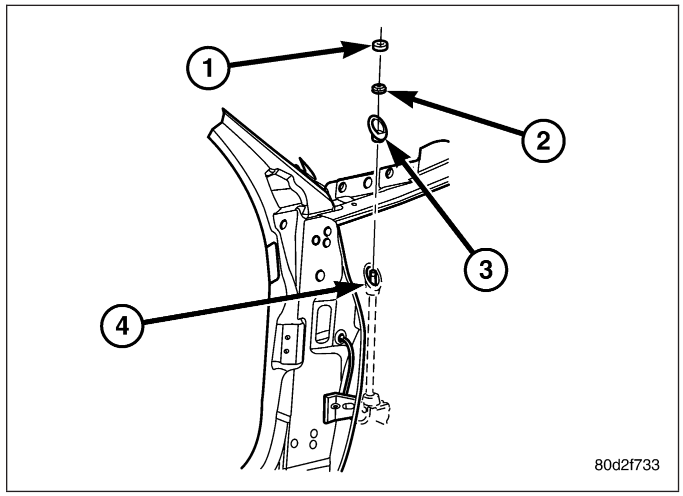


INSTALLATION

1. Position antenna body and cable assembly (2) into fender (1).
2. Insert antenna cable through the opening in fender.



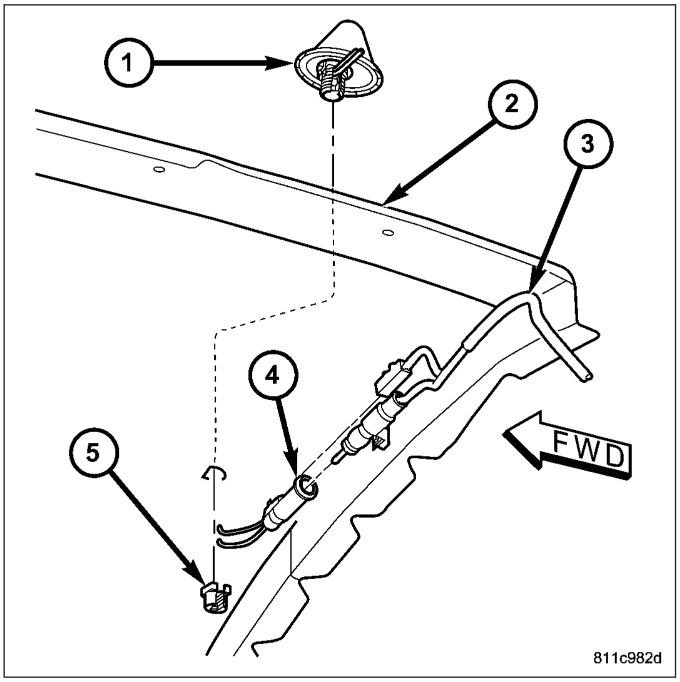
3. Seat the grommet in the side panel and connect the cable to the instrument panel harness connector.
4. Install antenna nut (2) and adapter (3).
5. Install shroud (1), if equipped.
6. Install the inner fender shield.
7. Install antenna mast. Tighten to 5 N·m (46 in. lbs.). **Ensure that the antenna mast is fully seated on antenna base and that there is no gap between the mast and base.**
8. Connect the antenna cable to the instrument panel antenna cable.
9. Install the right side cowl trim panel.
10. Connect the battery negative cable.



ANTENNA - EXPORT

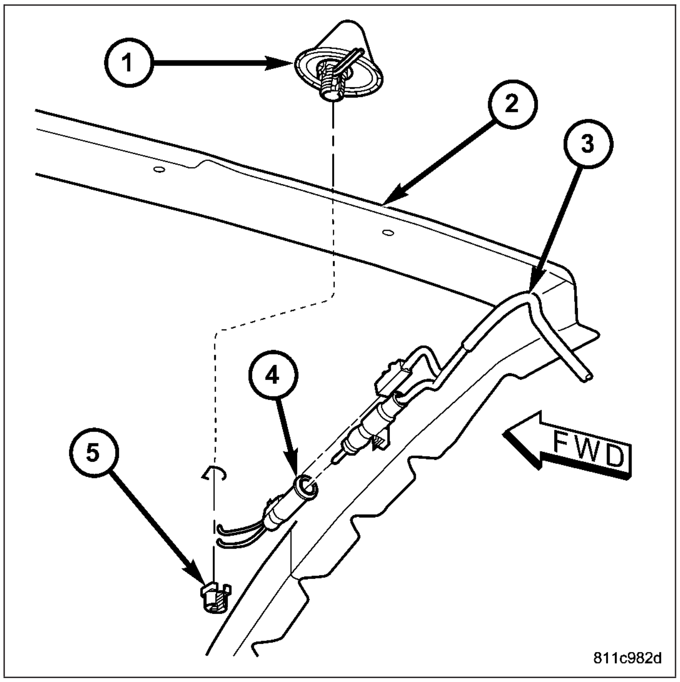
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Lower the headliner as necessary to access antenna mounting fastener (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Disconnect antenna cable and electrical harness connector (4).
4. Remove the mounting fastener.
5. Remove antenna from roof panel.



INSTALLATION

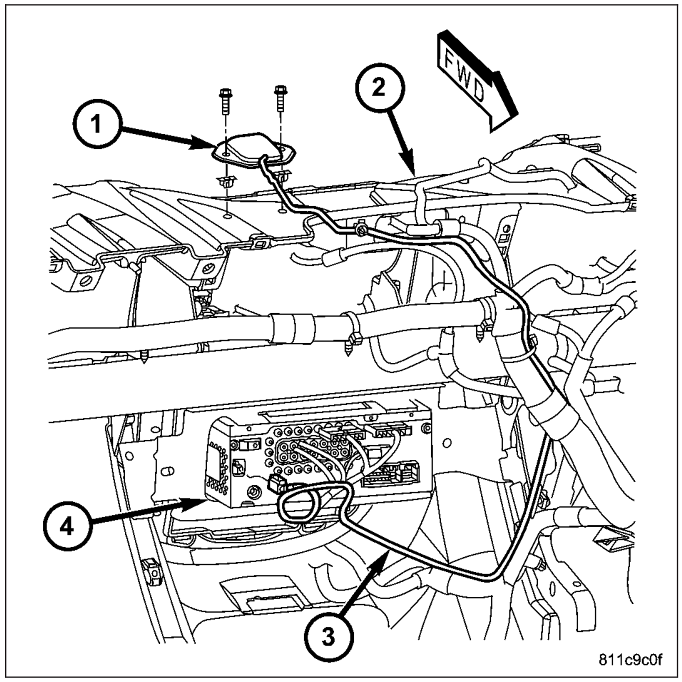
1. Position antenna to roof panel.
2. Install and tighten mounting fastener.
3. Connect antenna cable and electrical harness connector.
4. Raise headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
5. Connect battery negative cable.



ANTENNA - NAVIGATION

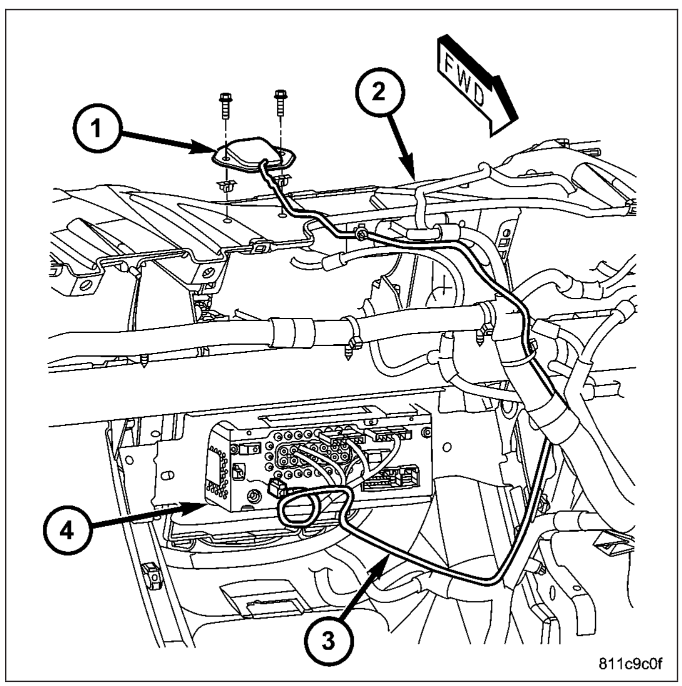
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
3. Remove the radio (4) (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
4. Remove the antenna (1) mounting fasteners
5. Remove antenna cable (3) from wire harness.



INSTALLATION

1. Position antenna cable (3) to wire harness. Secure into place.
2. Install antenna (1) mounting fasteners.
3. Install radio (4) (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
4. Install instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).
5. Connect battery negative cable.



ANTENNA-SATELLITE

DESCRIPTION

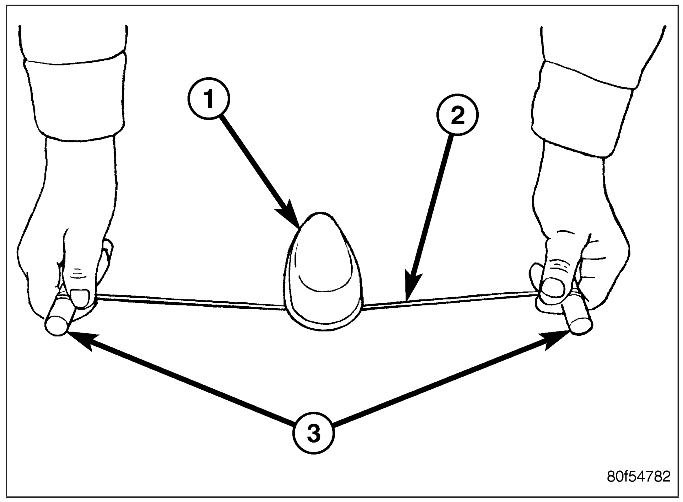
The satellite radio antenna is secured by adhesive foam and retainers which protrude through a hole in the roof panel. Two wires from the antenna are connected to the body harness above the headliner.

OPERATION

The satellite radio antenna receives signals from orbiting satellites and sends these signals to the satellite receiver module. The satellite radio antenna must have open space in which to operate. Items carried on the roof, parking inside etc. can have an effect on the antenna's ability to receive signals.

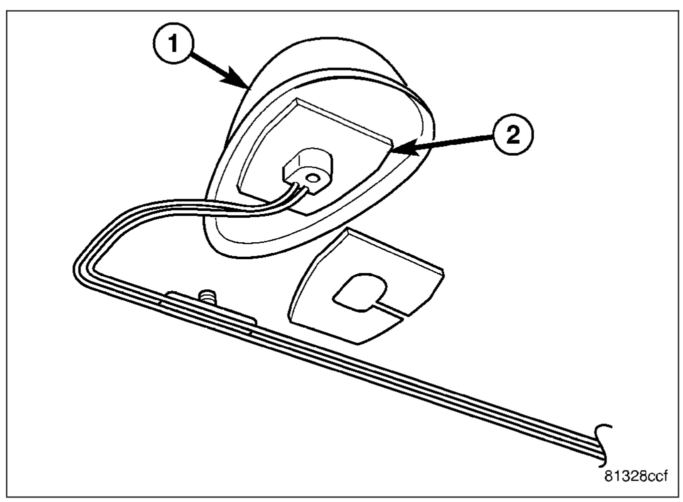
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Lower the rear portion of the headliner as necessary to access underside of antenna (1) (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. An adhesive removal tool can be created by using an 18 to 24 inch piece of nylon cord (2) wrapped around two handles (3). Using the removal tool, guide the nylon cord under the dust seal on the forward side of the antenna. Grab the handles and work the cord through the adhesive. Continue this for 360° around the antenna.
4. Disconnect the wire harness connectors from the antenna.
5. From inside the vehicle, and using a flat bladed tool, depress one of the retaining tabs on the antenna. Push up the one side of the antenna connector through the roof panel. Depress the other side of the connector and remove the antenna.
6. Remove any remaining adhesive from roof panel with isopropyl alcohol and a lint free cloth. If original antenna is being reinstalled, remove adhesive from antenna mounting surface.



INSTALLATION

1. If original antenna is being reinstalled, remove backing from patch adhesive (2) and apply to antenna base (1).
2. Remove backing from the adhesive on the antenna.
3. Insert wire harness through hole in roof panel. Press antenna into position until both retainers snap into place.
4. Connect wire harness connectors to antenna.
5. Install headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
6. Connect battery negative cable.



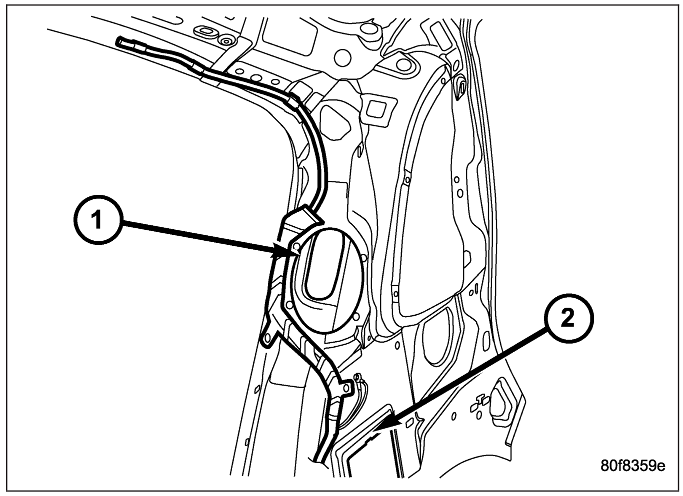
ANTENNA CABLE - SATELLITE RADIO

DESCRIPTION

The satellite radio antenna cable connects the roof mounted antenna to the satellite receiver module. It has two connectors at each end and is routed above the headliner, then behind the left quarter panel trim.

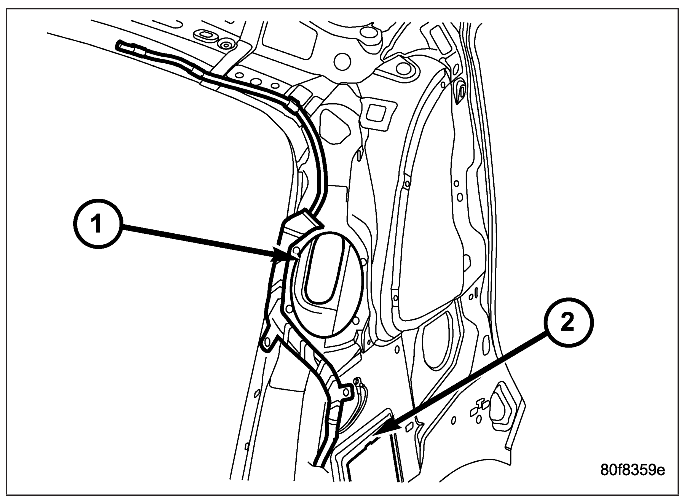
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)
3. Lower the rear portion of the headliner as necessary to access the underside of the satellite antenna (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
4. Detach the antenna cable (1) from the body harness. Disconnect wire harness connectors at each end of the cable.



INSTALLATION

1. Secure the antenna cable (1) to the body harness. Connect the wire harness connectors at each end of the antenna.
2. Install the headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
3. Install the rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
4. Connect the battery negative cable.



RADIO

DESCRIPTION

Available radios for this vehicle include:

- AM/FM/cassette/6CD/MP3 (RAK sales code)
- AM/FM/6CD/MP3 (RAQ sales code)
- AM/FM/6CD (RAR sales code) - export only
- AM/FM/CD (REF sales code)
- AM/FM/6CD/MAP/DVD/GPS Navigation (REC sales code) - export only

All factory-installed radios can communicate on the Programmable Communications Interface (PCI) data bus network.

COUNTRY CODE AND CABIN EQ SETTING - RAR/REC RADIO ONLY

The RAR and REC radio may require the country code and cabin EQ setting to be set if not programmed correctly.

If battery power is lost to radio, the anti-theft code must be entered before radio will operate.

If the region the vehicle will be driven in uses 10 kHz spacing on the AM band (i.e. 950, 960 etc.), set the Country Code to “USA”. If the region uses 9 kHz spacing, has LW and MW Bands, and uses RDS (i.e. AF, PTY, TA, etc.), set the radio for “EUR”. If neither of the previous settings apply, and the vehicle is not being driven in Japan, set the radio to “ROW”. Vehicles driven in Japan should have the radio set to “JPN”. The following chart list selected country codes and radio broadcast standards.

To enter the country code and EQ setting, use a scan tool.

COUNTRY CODE SELECTION CHART

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
AFGHANISTAN (8AA)	ROW
ALBANIA (8BA)	ROW
ALGERIA (8AC)	EUR
AMERICAN SAMOA (8AD)	ROW
ANDORRA (8AE)	ROW
ANGOLA (8AF)	ROW
ANGUILLA (8HA)	USA
ANTARCTICA (8HB)	ROW
ANTIGUA (8AG)	USA
ARGENTINA (8AJ)	USA
ARMENIA (8HC)	EUR
ARUBA (8AK)	USA
AUSTRALIA (8AL)	ROW
AUSTRIA (8AM)	EUR
AZERBAIJAN (8HD)	ROW
AZORES (8AN)	USA
BAHAMAS (8AP)	USA
BAHRAIN (8AR)	ROW
BANGLADESH (8AS)	ROW
BARBADOS & ISLANDS (8AT)	ROW
BELARUS (8G5)	EUR

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
BELGIUM & LUXEMBOURG (8AU)	EUR
BELIZE (8AV)	USA
BENIN (8WA)	ROW
BERMUDA (8AX)	USA
BOLIVIA (8AY)	USA
BOSNIA-HERZEGOVINA (8HE)	ROW
BOTSWANA (8AZ)	ROW
BRAZIL (8A1)	USA
BRITISH INDIA OCEAN (8A2)	ROW
BRITISH VIRGIN ISLANDS (8A3)	USA
BRUNEI (8A4)	ROW
BULGARIA (8A5)	EUR
BURKINA FASO (8GM)	ROW
CAMBODIA/ KAMPUCHEA (8DG)	ROW
CAMEROON (8A9)	ROW
CANARY ISLANDS (8BB)	ROW
CAPE VERDE (8BD)	ROW
CAYMAN ISLANDS (8BF)	USA
CENTRAL AFRICAN REPUBLIC (8BG)	ROW
CHAD (8BJ)	ROW
CHILE (8BK)	USA
CHINA MAINLAND (8BL)	ROW
COLOMBIA (8BM)	USA
COMOROS (8BN)	ROW
CONGO (8BP)	ROW
COSTA RICA (8BS)	USA
CROATIA (8G7)	EUR
CUBA (8BT)	USA
CYPRUS (8BB)	EUR
CZECH. REPUBLIC (8BW)	EUR
DENMARK (8BX)	EUR
DJIBOUTI (8BU)	ROW
DOMINICA (8BZ)	USA
DOMINICAN REPUBLIC (8B1)	USA
ECUADOR (8B2)	USA
EGYPT (8B3)	ROW
EL SALVADOR (8B4)	USA

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
EQUATORIAL GUINEA (8B5)	ROW
ERITREA (8BU)	ROW
ESTONIA (8B6)	EUR
ETHIOPIA (8B7)	ROW
FAEROE ISLANDS (8HG)	ROW
FAUKLAND ISLANDS (8B8)	ROW
FIJI (8B9)	EUR
FINLAND (8CA)	EUR
FRANCE (8CD)	EUR
FRENCH GUIANA (8CC)	ROW
FRENCH POLYNESIA / TAHITI (8F9)	ROW
GABON (8CF)	ROW
GAMBIA (8CG)	ROW
GEORGIA (8HH)	EUR
GERMANY (8CJ)	EUR
GHANA (8CK)	ROW
GIBRALTAR (8CL)	ROW
GREECE (8CP)	EUR
GREENLAND (8CR)	EUR
GRENADA (8CS)	USA
GUADELOUPE (8CT)	ROW
GUAM (8CU)	ROW
GUATEMALA (8CV)	USA
GUINEA (8CW)	ROW
GUINEA - BISSAU (8CX)	ROW
GUYANA (8CY)	USA
HAITI (8CZ)	USA
HONDURAS (8C1)	USA
HONG KONG (8C2)	ROW
HUNGARY (8C3)	EUR
ICELAND (8C4)	EUR
INDIA (8C5)	ROW
INDONESIA (8C6)	ROW
IRAN (8C7)	ROW
IRAQ (8C8)	ROW
IRELAND (8C9)	EUR
ISRAEL (8DA)	ROW
ITALY (8DB)	EUR
IVORY COAST (8DC)	ROW
JAMAICA (8DD)	USA

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
JAPAN (8DE)	JAN
JORDAN (8DF)	ROW
KAZAKSTAN (8G6)	EUR
KENYA (8DH)	ROW
KIRIBATI/GILBERT (8HJ)	ROW
KUWAIT (8DK)	ROW
KYRGYZSTAN (8HK)	EUROPEAN
LAOS (8DM)	ROW
LATVIA (8G2)	EUR
LEBANON (8DN)	ROW
LESOTHO (8DP)	ROW
LIBERIA (8DR)	ROW
LITHUANIA (8G3)	EUR
LIBYA (8DT)	ROW
MACAO (8DU)	ROW
MALAGASY/ MADAGASCAR (8DW)	ROW
MALAWI (8DX)	ROW
MALAYSIA (8DY)	ROW
MALDIVES (8DZ)	ROW
MALI (8D1)	ROW
MALTA & GOZO (8D2)	ROW
MARSHALL ISLANDS (8D4)	ROW
MARTINIQUE (8D5)	ROW
MAURITANIA (8D6)	ROW
MAURITIUS (8D7)	ROW
MAYOTTE (8HL)	ROW
MEXICO (8D9)	USA
MICRONESIA (8BE)	ROW
MOLDOVA (8HM)	EUR
MONACO (8EF)	EUR
MONGOLIA (8EE)	ROW
MOROCCO (8EG)	EUR
MOZAMBIQUE (8PH)	ROW
NAMIBIA (8EJ)	ROW
NEPAL (8EL)	ROW
NETHERLANDS (8EM)	EUR
NETHERLANDS ANTILLES/CURACAO (8HN)	USA
NEW CALEDONIA (8EN)	ROW
NEW ZEALAND (8EP)	ROW
NICARAGUA (8ER)	USA

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
NIGER (8ES)	ROW
NIGERIA (8ET)	ROW
NORTH KOREA (8EV)	ROW
NORWAY (8EW)	EUR
OMAN (8EX)	ROW
PAKISTAN (8EY)	ROW
PANAMA (8EZ)	USA
PAPUA NEW GUINEA (8E1)	ROW
PARAGUAY (8E2)	USA
PERU (8E4)	USA
PHILIPPINES (8E5)	ROW
POLAND (8E7)	EUR
PORTUGAL (8E8)	EUR
PUERTO RICO (8E9)	USA
QATAR (8FA)	ROW
ROMANIA (8FB)	EUR
RUSSIA (8FE)	EUR
RWANDA (8FD)	ROW
SAO TOME (8FG)	ROW
SAUDI ARABIA (8FH)	ROW
SENEGAL (8FJ)	ROW
SERBIA (8HS)	EUR
SEYCHELLES (8FK)	ROW
SIERRA LEONE (8FL)	ROW
SINGAPORE (8FM)	ROW
SLOVAKIA (8CE)	EUR
SLOVENIA (8GX)	EUR
SOLOMON ISLANDS (8FN)	ROW
SOMALIA (8FP)	ROW
SOUTH AFRICA (8FR)	ROW
SOUTH KOREA (8DJ)	ROW
SPAIN (8FS)	EUR
SRI LANKA (8FT)	EUR
ST. KITTS AND NEVIS (8FU)	USA
ST. LUCIA (8FX)	USA
ST. PIERRE & MIQUELON (8FZ)	USA
ST. THOMAS & U.S. VIRGIN ISLANDS (8F1)	USA
ST. VINCENT (8F2)	USA
SUDAN (8F3)	ROW
SURINAME (8F4)	ROW

INTERNATIONAL COUNTRY CODE	RADIO BROADCAST STD.
SWAZILAND (8F5)	EUR
SWEDEN (8F6)	EUR
SWITZERLAND (8F7)	EUR
SYRIA (8F8)	ROW
TAIWAN (8GA)	ROW
TAJIKISTAN (8HT)	EUR
TANZANIA (8GB)	ROW
THAILAND (8GC)	ROW
TOGO (8GD)	ROW
TONGA (8GE)	ROW
TRINIDAD & TOBAGO (8GF)	USA
TUNISIA (8GG)	EUR
TURKEY (8GH)	ROW
TURKMENISTAN (8HV)	EUR
TURKS & CAICOS ISLAND (8GJ)	USA
TUVALU (8CM)	ROW
UGANDA (8GK)	ROW
UKRAINE (8FC)	EUR
UNITED ARAB EMIRATES (8GL)	ROW
UNITED KINGDOM (8CN)	EUR
URUGUAY (8GN)	USA
UZBEKISTAN (8HW)	EUR
VANUATU (8GP)	ROW
VATICAN CITY (8GR)	EUR
VENEZUELA (8GS)	USA
VIETNAM (8GT)	ROW
WALLIS & FUTUNA (8GV)	ROW
WESTERN SAMOA (8GW)	ROW
YEMEN (8AH)	ROW
YUGOSLAVIA (8HR)	EUR
ZAIRE (8GY)	ROW
ZAMBIA (8GZ)	ROW
ZIMBABWE (8G1)	ROW

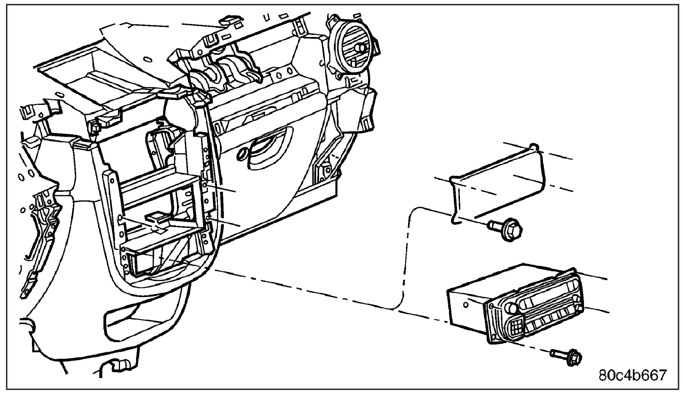
OPERATION

The radio receiver operates on ignition switched battery current that is available only when the ignition switch is in the ON or ACCESSORY positions. The electronic digital clock function of the radio operates on fused battery current supplied through the IOD fuse, regardless of the ignition switch position.

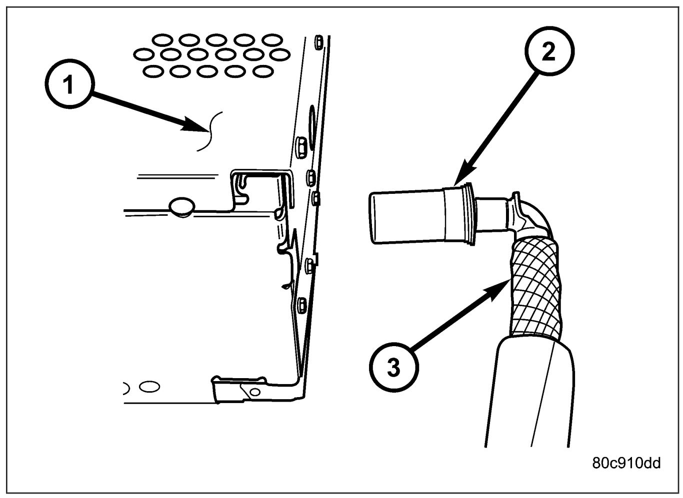
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove instrument panel center bezel.
3. Remove mounting fasteners and remove radio from instrument panel.
4. Disconnect wire harness connectors from radio.

CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

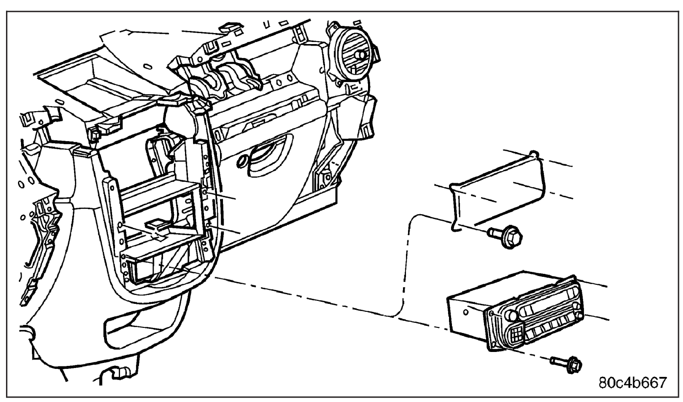


5. Disconnect the antenna cable (3) by pulling the locking antenna connector (2) away from the radio (1).



INSTALLATION

1. Connect the wire harness connectors and antenna cable to radio.
2. Insert radio into instrument panel.
3. Install mounting fasteners. Tighten to 2 N·m (20 in. lbs.).
4. Install instrument panel center bezel.
5. Connect battery negative cable.



RADIO NOISE SUPPRESSION COMPONENTS

DESCRIPTION

Radio noise suppression devices are factory-installed standard equipment on this vehicle. Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) can be produced by any on-board or external source of electromagnetic energy. These electromagnetic energy sources can radiate electromagnetic signals through the air, or conduct them through the vehicle electrical system.

When the audio system converts RFI or EMI to an audible acoustic wave form, it is referred to as radio noise. This undesirable radio noise is generally manifested in the form of “buzzing,” “hissing,” “popping,” “clicking,” “crackling,” and/or “whirring” sounds. In most cases, RFI and EMI radio noise can be suppressed using a combination of vehicle and component grounding, filtering and shielding techniques. This vehicle is equipped with factory-installed radio noise suppression devices that were designed to minimize exposure to typical sources of RFI and EMI; thereby, minimizing radio noise complaints.

Radio noise suppression is accomplished primarily through circuitry or devices that are integral to the radios, audio power amplifiers and other on-board electrical components such as generators, wiper motors, blower motors, and fuel pumps that have been found to be potential sources of RFI or EMI. External radio noise suppression devices that are used on this vehicle to control RFI or EMI, and can be serviced, include the following:

- **Ground straps** - This length of braided ground strap has an eyelet terminal connector crimped to each end. They are located in various locations on the vehicle.
- **Radio Noise Suppression Capacitor** - This component is attached near the exhaust manifold.
- **Resistor-type spark plugs** - This type of spark plug has an internal resistor connected in series between the spark plug terminal and the center electrode to help reduce the production of electromagnetic radiation that can result in radio noise.

OPERATION

There are two common strategies that can be used to suppress Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) radio noise. The first suppression strategy involves preventing the production of RFI and EMI electromagnetic signals at their sources. The second suppression strategy involves preventing the reception of RFI and EMI electromagnetic signals by the audio system components.

The use of braided ground straps in key locations is part of the RFI and EMI prevention strategy. These ground straps ensure adequate ground paths, particularly for high current components such as many of those found in the starting, charging, ignition, engine control and transmission control systems. An insufficient ground path for any of these high current components may result in radio noise caused by induced voltages created as the high current seeks alternative ground paths through components or circuits intended for use by, or in close proximity to the audio system components or circuits.

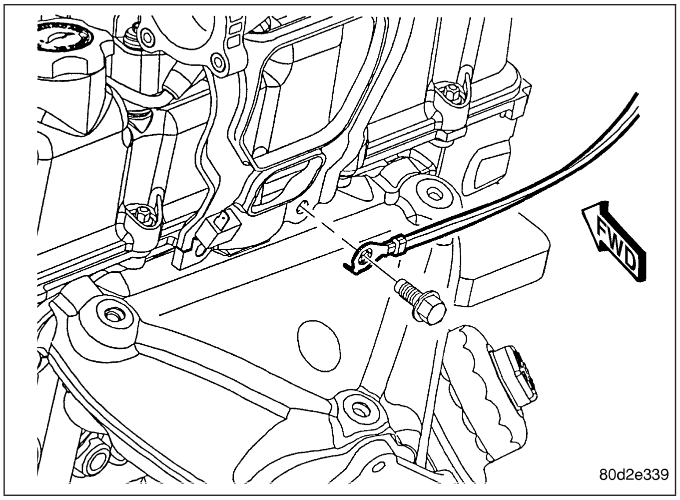
Preventing the reception of RFI and EMI is accomplished by ensuring that the audio system components are correctly installed in the vehicle. Loose, corroded or improperly soldered wire harness connections, improperly routed wiring and inadequate audio system component grounding can all contribute to the reception of RFI and EMI. A properly grounded antenna body and radio chassis, as well as a shielded antenna coaxial cable with clean and tight connections will each help reduce the potential for reception of RFI and EMI.

REMOVAL

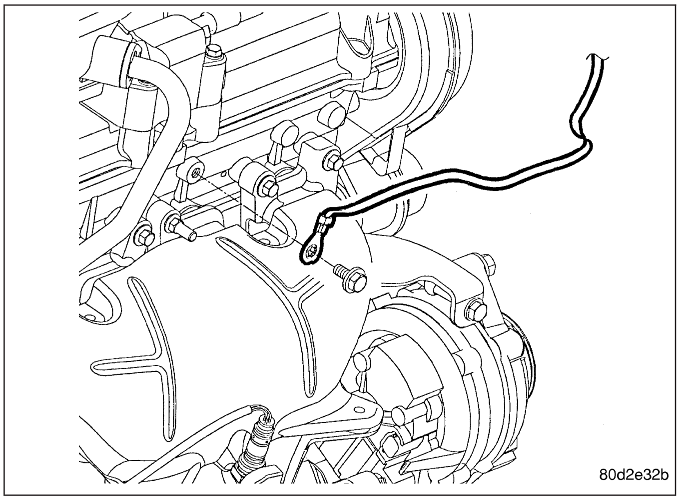
ENGINE GROUND STRAP

1. Disconnect and isolate the battery negative cable.

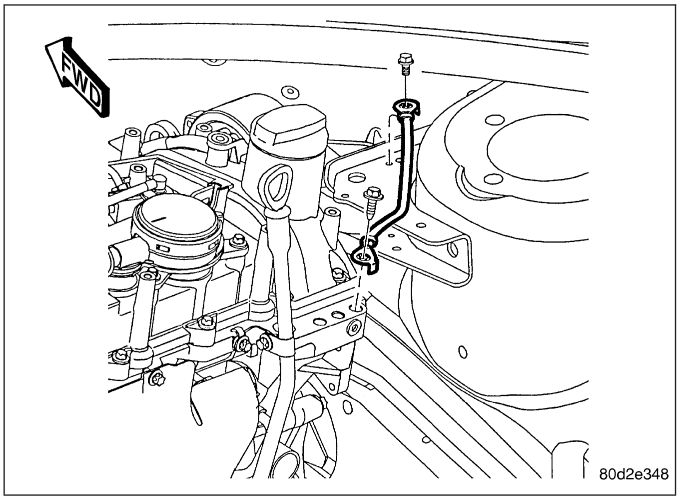
2. For the 1.6L Engine, remove bolt from engine cylinder head.



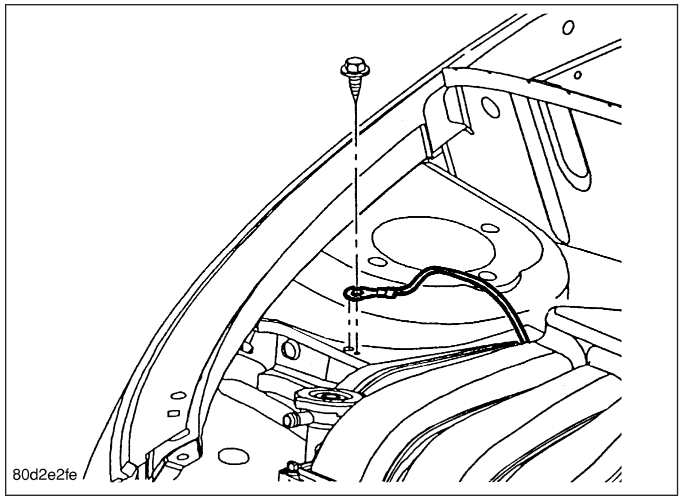
3. For the 2.0/2.4L Engine, remove bolt from engine cylinder head.



4. For the 2.2L Engine, remove bolt from engine cylinder head.

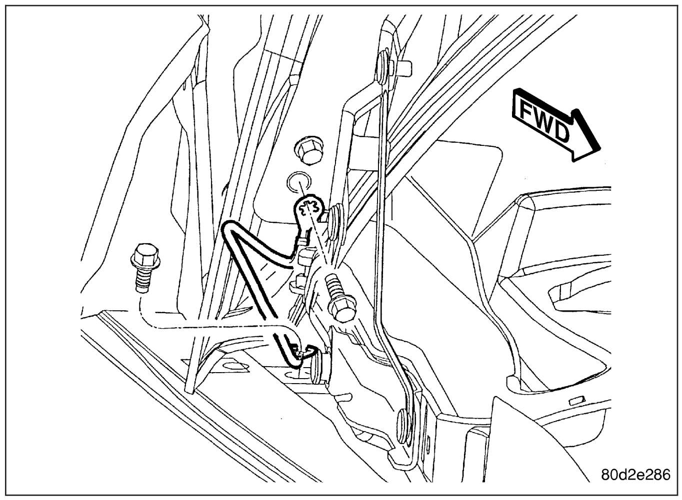


5. Remove bolt from strut tower and remove strap.


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HOOD HINGE GROUND STRAP

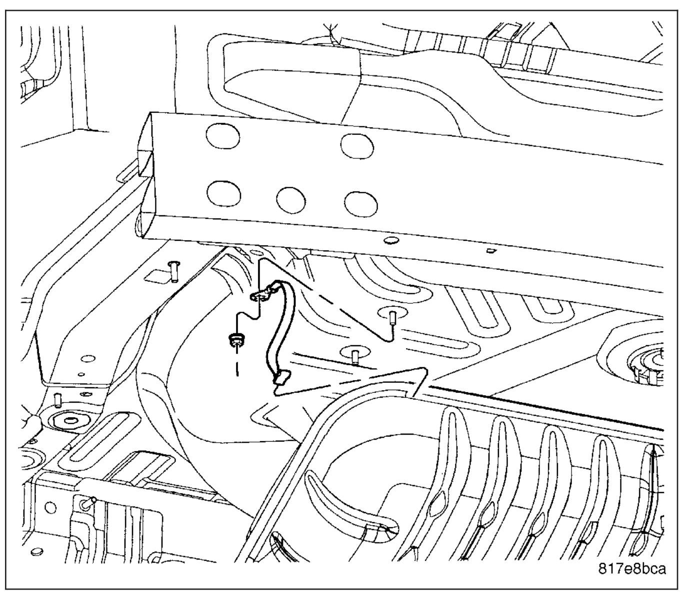
1. Disconnect and isolate the battery negative cable.
2. Remove bolt from fender.
3. Remove bolt from hood and remove strap.



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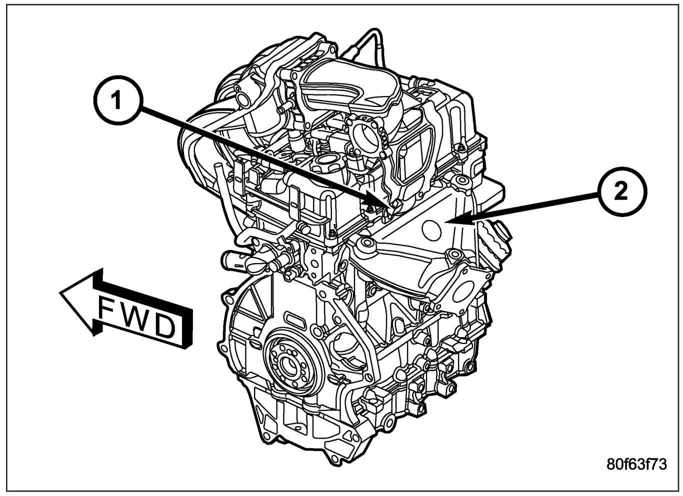
MUFFLER GROUND STRAP

1. Disconnect and isolate the battery negative cable.
2. Remove bolt from rear floor pan.
3. Remove bolt from muffler and remove strap.


817e8bca

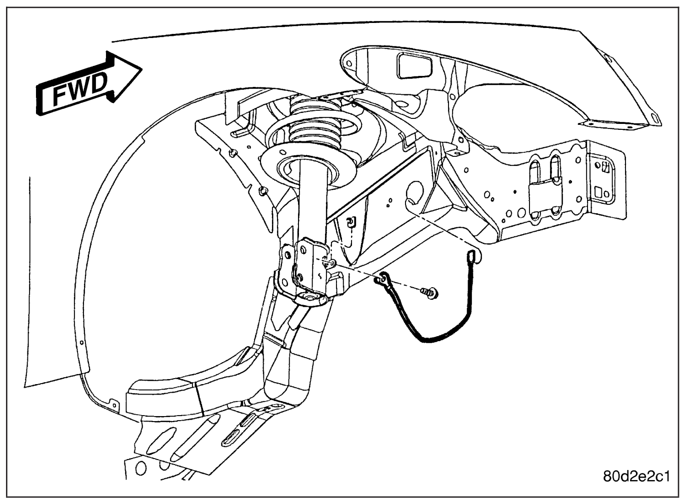
RADIO NOISE SUPPRESSION CAPACITOR

1. Disconnect and isolate the battery negative cable.
2. Disconnect electrical harness connector from capacitor (1).
3. Remove bolt from capacitor and remove capacitor.



STRUT BRACKET TO BODY GROUND STRAP

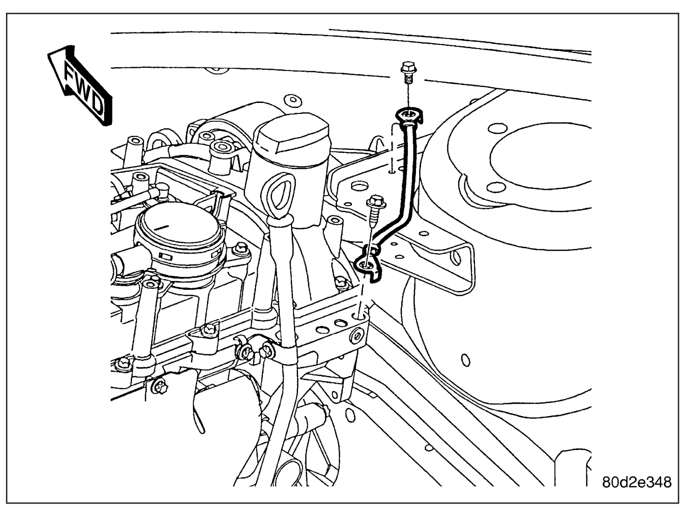
1. Disconnect and isolate the battery negative cable.
2. Remove bolt from strut.
3. Remove strap from frame rail.



INSTALLATION

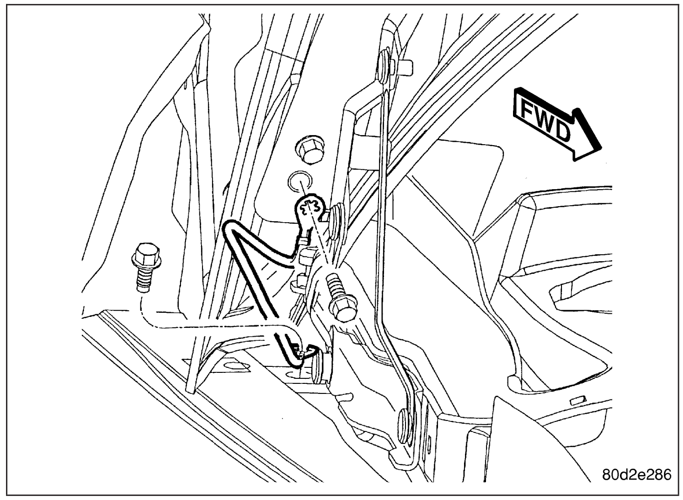
ENGINE GROUND STRAP

1. Install strap and bolt to strut tower. Tighten bolt to 12 N·m (105 in. lbs.).
2. Install strap and bolt to engine cylinder head. Tighten bolt to 28 N·m (21 ft. lbs.).
3. Connect battery negative cable.



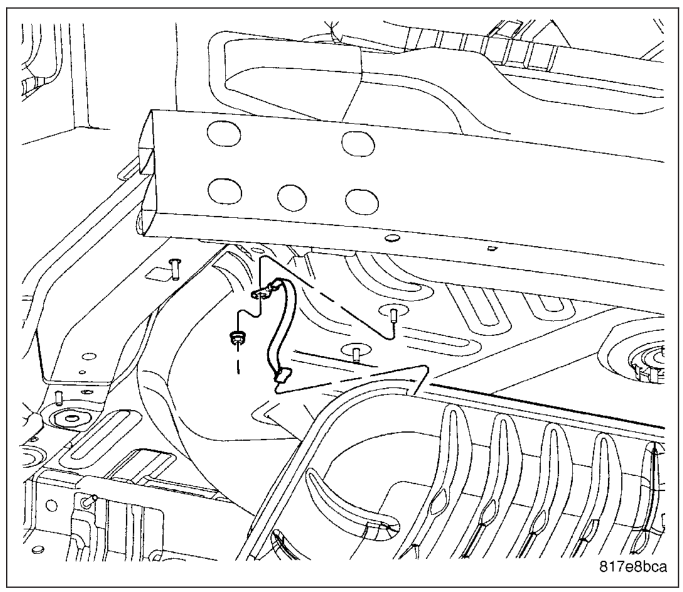
HOOD HINGE GROUND STRAP

1. Install strap and bolt to fender. Tighten bolt to 4 N·m (35 in. lbs.).
2. Install strap and bolt to hood. Tighten bolt to 4 N·m (35 in. lbs.).
3. Connect battery negative cable.



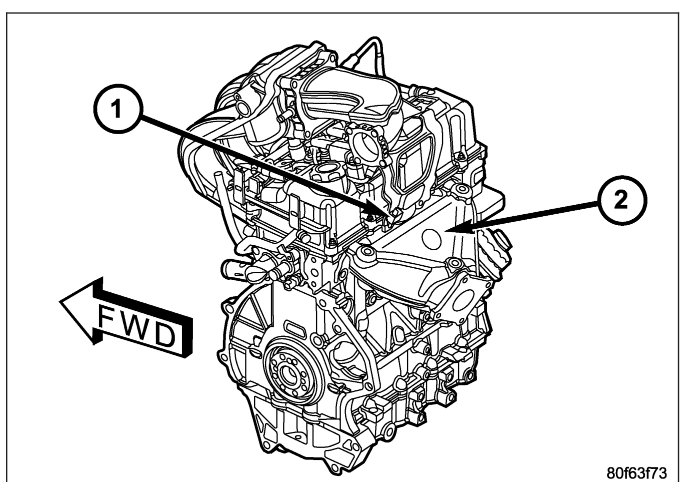
MUFFLER GROUND STRAP

1. Install strap and bolt to rear floor pan. Tighten bolt to 8 N·m (75 in. lbs.).
2. Install strap and bolt to muffler. Tighten bolt to 8 N·m (75 in. lbs.).
3. Connect battery negative cable.



RADIO NOISE SUPPRESSION CAPACITOR

1. Install capacitor and bolt.
2. Connect electrical harness connector to capacitor.
3. Connect battery negative cable.

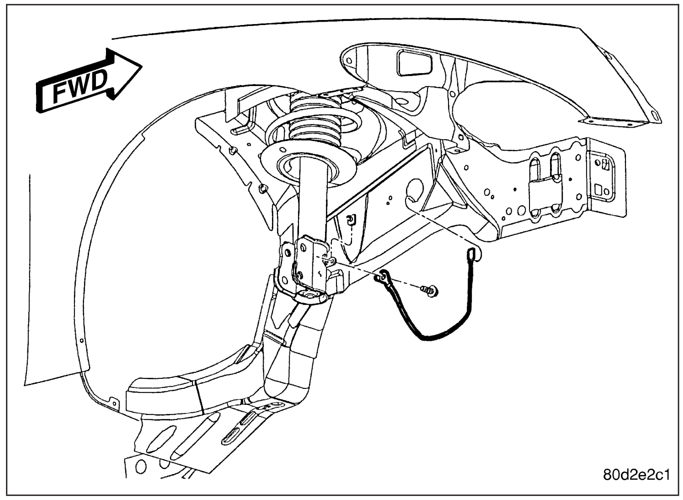


STRUT BRACKET TO BODY GROUND STRAP

1. Install strap to frame rail.

CAUTION: Ensure that ground strap does not come in contact with brake hose. Damage to brake hose can result.

2. Install strap and bolt to strut. Tighten bolt to 12 N·m (105 in. lbs.).
3. Connect battery negative cable.



RECEIVER-SATELLITE

DESCRIPTION

The satellite receiver module is located behind the spare tire. It is mounted to a bracket which is fastened to the trunk floor sheet metal.

OPERATION

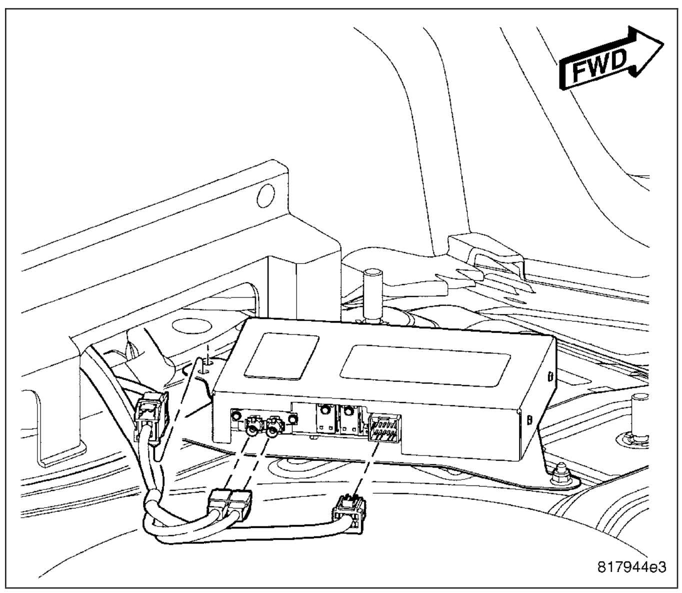
The satellite receiver module receives signals from the roof mounted antenna and processes this information before it is sent to the radio. The module operates on both battery and accessory feed circuits and will operate with the ignition key in the RUN or ACCESSORY position only.

REMOVAL

NOTE:
If the owner's satellite service was active before the satellite receiver module was replaced the new satellite receiver module will have to be activated. The existing satellite receiver module will have to be deactivated before the replacement satellite receiver module can be activated.
To activate Sirius satellite radio service, call Sirius at their toll-free number. Please have the following information available when activating a system:

- **Electronic Serial Number / Sirius Identification Number (ESN/SID) of the unit to be replaced**
- **ESN/SID of the replacement receiver**
- **Vehicle Owner's name and address**
- **VIN**
  The ESN/SID number can be obtained through the radio display by following the steps in the satellite radio owners manual.
  The vehicle must be outside with the audio system powered on, in the satellite radio mode, to receive the activation signal.

1. Disconnect and isolate the battery negative cable.
2. Remove the left rear quarter trim panel (Refer to 23 - BODY/INTERIOR/LEFT QUARTER TRIM PANEL - REMOVAL).
3. Remove the mounting bracket fasteners.
4. Disconnect the wire harness connectors.
5. Remove the module from the mounting bracket.



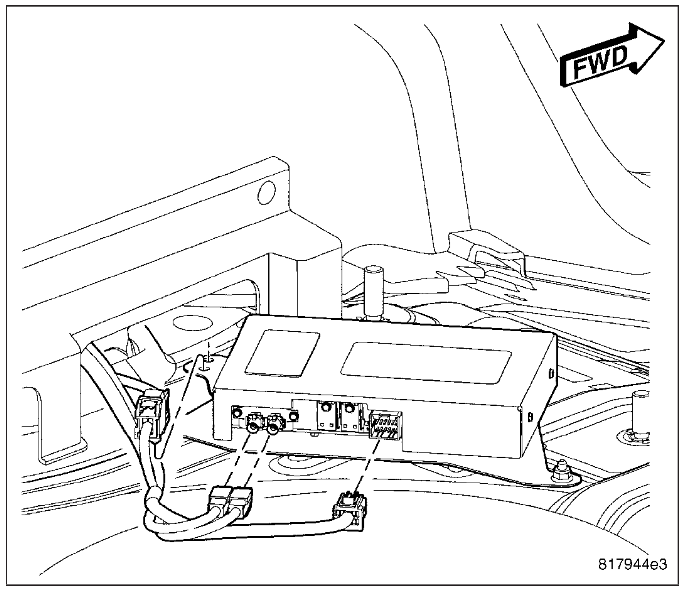
INSTALLATION

NOTE:
If the owner's satellite service was active before the satellite receiver module was replaced the new satellite receiver module will have to be activated. The existing satellite receiver module will have to be deactivated before the replacement satellite receiver module can be activated.
To activate Sirius satellite radio service, call Sirius at their toll-free number. Please have the following information available when activating a system:

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- **Vehicle Owner's name and address**
- **VIN**

The ESN/SID number can be obtained through the radio display by following the steps in the satellite radio owners manual.
The vehicle must be outside with the audio system powered on, in the satellite radio mode, to receive the activation signal.

1. Position the module to the mounting bracket.
2. Connect wire harness connectors.
3. Install mounting bracket and fasteners.
4. Install the left rear quarter trim panel (Refer to 23 - BODY/INTERIOR/LEFT QUARTER TRIM PANEL - INSTALLATION).
5. Connect the battery negative cable.



REMOTE SWITCHES

DESCRIPTION

Two rocker-type switches (if equipped) are mounted on the back (instrument panel side) of the steering wheel spokes. The switch on the left spoke is the seek switch and has seek up, seek down, and preset station advance functions. The switch on the right spoke is the volume control switch and has volume up, and volume down functions. The switch on the right spoke also includes a “mode” control that allows the driver to sequentially select AM radio, FM radio, cassette player, CD player or CD changer (if equipped).

OPERATION

These switches are resistor multiplexed units that are hard-wired to the Body Control Module (BCM) through the clockspring. The BCM sends the proper messages on the Programmable Communications Interface (PCI) data bus network to the radio receiver. For diagnosis of the BCM or the PCI data bus, the use of a scan tool and the proper Diagnostic Procedures manual are recommended. For more information on the operation of the remote radio switch controls, refer to the owner’s manual in the vehicle glove box.

DIAGNOSIS AND TESTING - REMOTE SWITCHES

WARNING: On vehicles equipped with airbags, refer to electrical, restraints before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

For complete circuit diagrams, refer to the appropriate wiring information.

1. Disconnect and isolate the battery negative cable.
2. Remove the remote radio switch(es) from the steering wheel. (Refer to 8 - ELECTRICAL/AUDIO/REMOTE SWITCHES - REMOVAL).
3. Use an ohmmeter to check the switch resistance as shown in the Remote Radio Switch Test table

REMOTE RADIO SWITCH TEST

Switch	Switch Position	Resistance
Right (White)	Volume Up	1.210 Kilohms
Right (White)	Volume Down	3.010 Kilohms
Right (White)	Mode Advance	0.0511 Kilohms
Left (Black)	Seek Up	0.261 Kilohms
Left (Black)	Seek Down	0.681 Kilohms
Left (Black)	Pre-Set Station Advance	0.162 Kilohms

NOTE: The right remote radio switch back is white in color. The left switch back is black in color. The right/left remote radio switch orientation is with the steering wheel installed, and driver in driver’s seat.

4. If the switch resistance checks OK, go to Step 5. If not OK, replace the faulty switch.
5. Check for continuity between the ground circuit cavity of the switch wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open circuit as required.

6. Unplug the 24-way white wire harness connector from the Body Control Module (BCM). Check for continuity between the radio control circuit cavity of the remote radio switch wire harness connector and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the short circuit as required.
7. Check for continuity between the radio control circuit cavities of the remote radio switch wire harness connector and the BCM wire harness connector. There should be continuity. If OK, refer to the proper Diagnostic Procedures manual to test the BCM and the PCI data bus. If not OK, repair the open circuit as required.

REMOVAL

WARNING: On vehicles equipped with airbags, refer to electrical, restraints before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

1. Disconnect and isolate the battery negative cable.
2. Remove the driver side airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Remove the steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).
4. Unplug the wire harness connector from the remote radio switch.
5. Remove steering wheel rear cover.
6. Remove the remote radio switch from the steering wheel by depressing tabs on each side of each switch.

NOTE: The right remote radio switch back is white in color. The left switch back is black in color. The right/left remote radio switch orientation is with the steering wheel installed, and driver in driver's seat.

INSTALLATION

WARNING: On vehicles equipped with airbags, refer to electrical, restraints before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

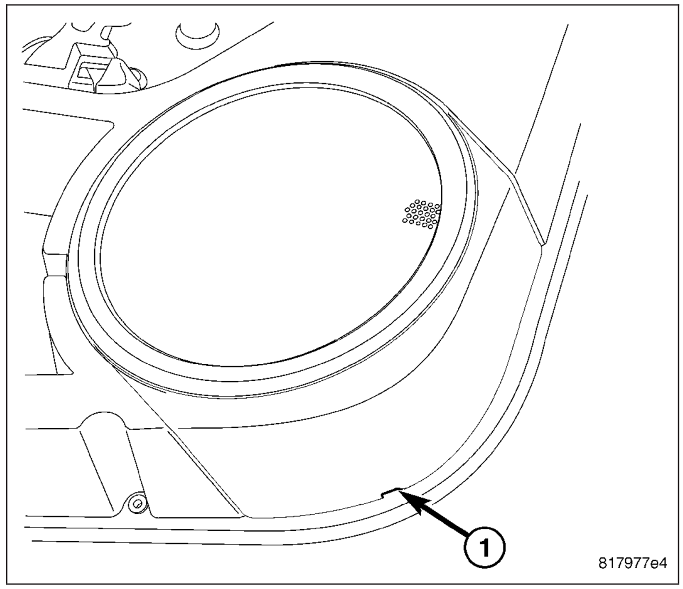
1. Install remote radio switch to the steering wheel.
2. Install steering wheel rear cover.
3. Connect the wire harness to the remote radio switch.
4. Install the steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).
5. Install the driver side airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
6. Connect the battery negative cable.

SPEAKER

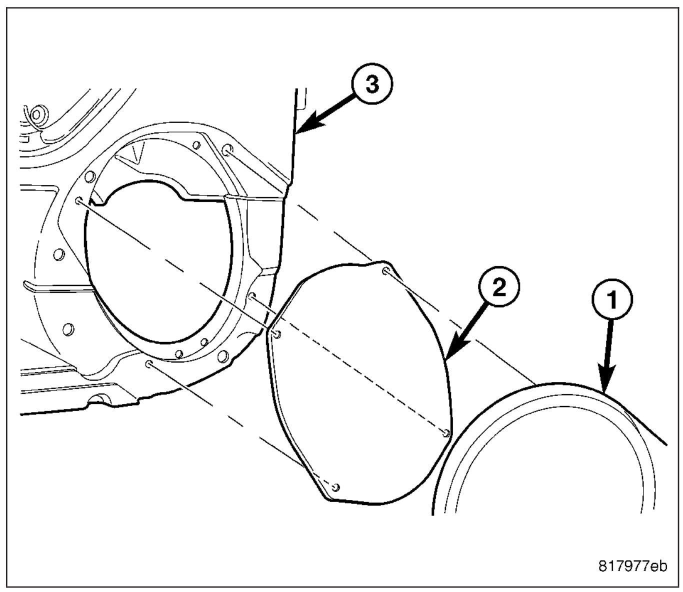
REMOVAL

DOOR SPEAKERS

1. Using an approved flat blade tool find the service notch located at the bottom of speaker grille and pry up speaker grille.

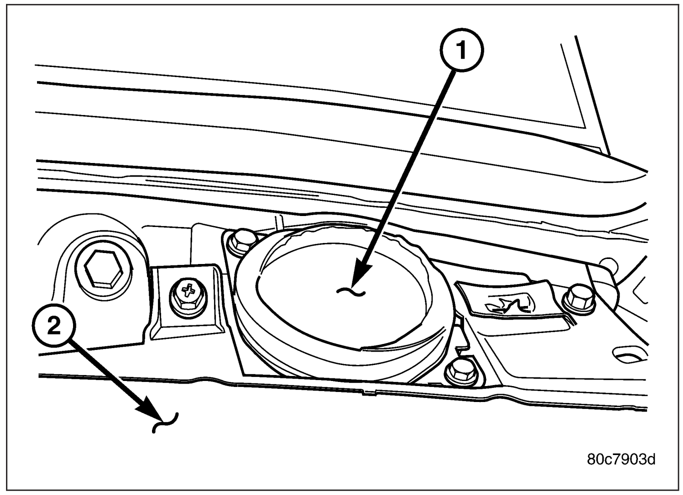


2. Remove the four screws attaching the speaker (2) to door panel (3).
3. Disconnect the electrical connector and remove the speaker.



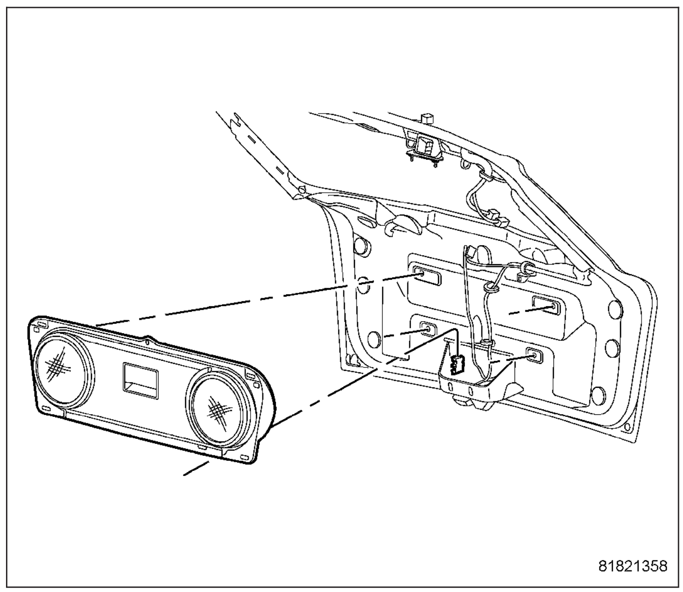
INSTRUMENT PANEL SPEAKER

1. Disconnect and isolate the battery negative cable.
2. Remove instrument panel (2) top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
3. Remove speaker retaining screws.
4. Remove speaker (1) and disconnect wire harness connector.



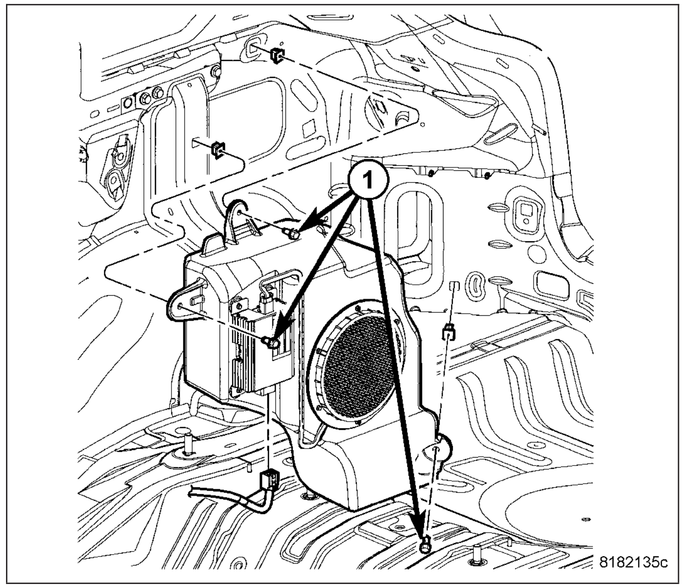
REAR SPEAKER - LIFTGATE

1. Disconnect and isolate the battery negative cable.
2. Remove the speaker enclosure fasteners.
3. Remove speaker and disconnect the electrical harness connector.



REAR SUBWOOFER

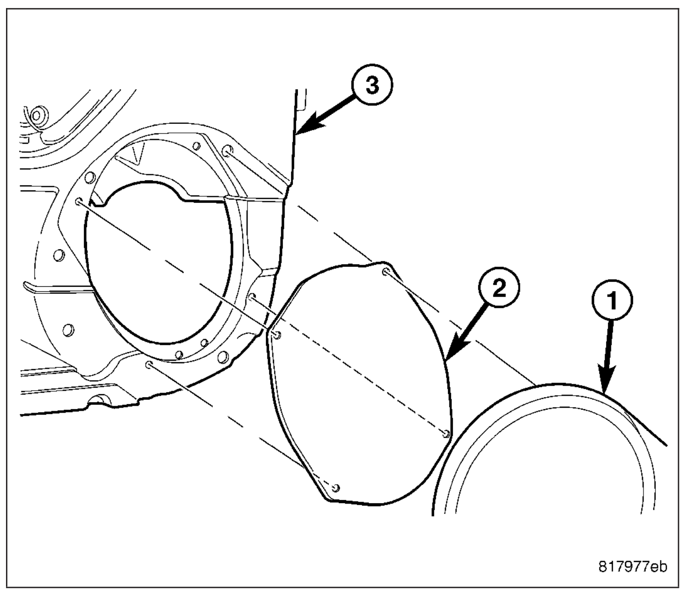
1. Disconnect and isolate the battery negative cable.
2. Remove the right quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Remove the subwoofer mounting fasteners.
4. Disconnect the electrical harness connector.
5. Remove the speaker.



INSTALLATION

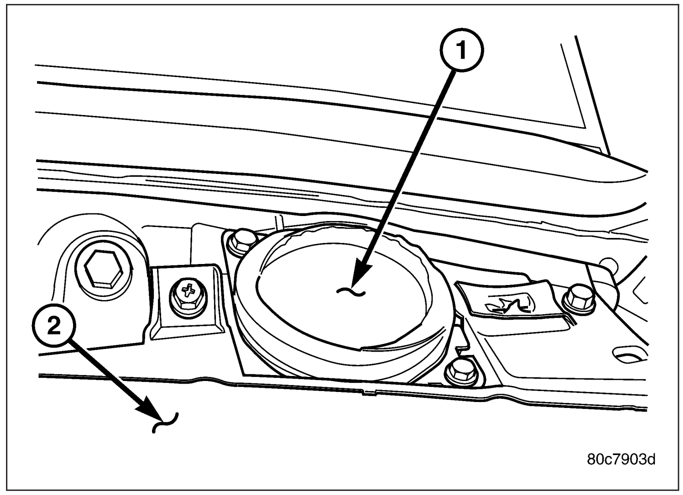
DOOR SPEAKERS

1. Connect wire connector.
2. Install speaker (2) into the door panel (3) opening and install the four screws into door panel.
3. Install speaker grille (1) onto trim panel.



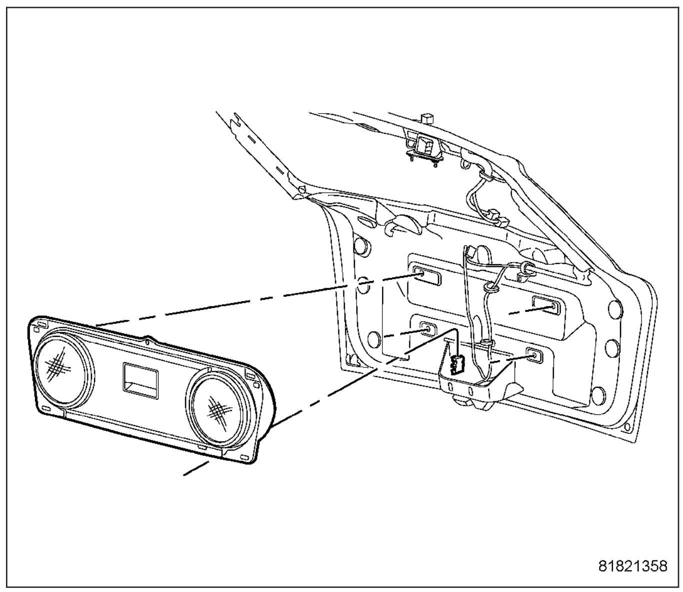
INSTRUMENT PANEL SPEAKER

1. Connect wire harness connector to speaker (1).
2. Install speaker screws.
3. Install instrument panel (2) top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).
4. Connect the battery negative cable.



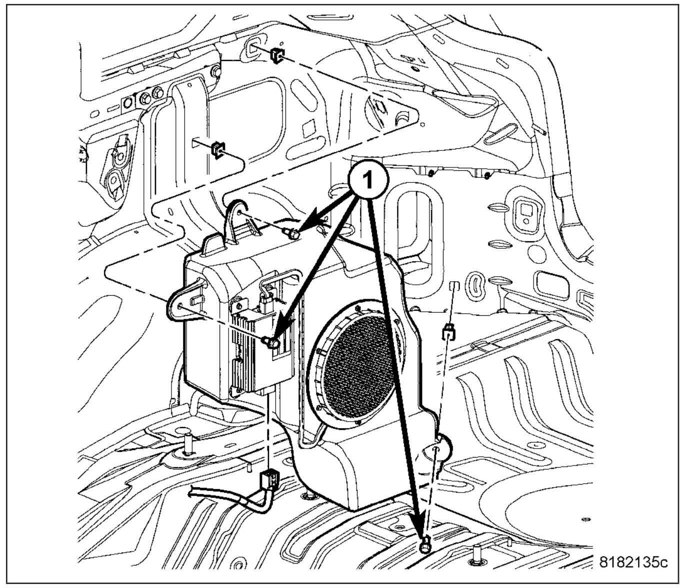
REAR SPEAKER - TAILGATE

1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Connect battery negative cable.



REAR SUBWOOFER

1. Position the speaker and connect the electrical harness connector.
2. Install the subwoofer mounting fasteners.
3. Install the right rear quarter trim panel. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
4. Connect the battery negative cable.



CHIME/BUZZER

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CHIME/BUZZER - SERVICE INFORMATION

DESCRIPTION

The chime software is located within, and serviced with the instrument cluster. The chime warning system uses an electromechanical transducer and an electromechanical relay that are soldered onto the electronic circuit board inside of the ElectroMechanical Instrument Cluster (EMIC) to provide audible indications of various vehicle conditions that may require the attention of the vehicle operator or occupants. The EMIC also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.

The electromechanical transducer generates beep tones and chime tones, while the electromechanical relay generates click tones to emulate the sounds associated with conventional turn signal and hazard warning flasher operation. The microprocessor-based EMIC utilizes electronic chime request messages received from other modules in the vehicle over the Controller Area Network (CAN) data bus along with hard wired inputs to monitor many sensors and switches throughout the vehicle. In response to those inputs, the circuitry and programming of the EMIC allow it to control the audible outputs that are produced through its on-board transducer and relay.

OPERATION

CHIME WARNING SYSTEM

The chime warning system operates on battery voltage received through a fuse in the Junction Block (JB) on a non-switched fused B(+) circuit so that the system may operate regardless of the ignition switch position. The chime warning system also monitors the ignition switch position so that some chime features are functional only with the ignition switch in the On position, while others are functional regardless of the ignition switch position.

The chime warning system provides an audible indication to the vehicle operator or occupants under the following conditions:

- **Airbag Indicator Warning** - The Cab Compartment Node (CCN) will generate one short chime when the ignition switch is in the On position, and an electronic message is received over the Controller Area Network (CAN) data bus from the Occupant Restraint Controller (ORC) requesting “Airbag” indicator illumination. This warning will only occur following completion of the “Airbag” indicator bulb test, and will only occur once during any ignition cycle.
- **Door Ajar Indicator Warning** - The CCN will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of any door ajar switch has changed, and an electronic message is received over the CAN data bus indicating that the vehicle is moving. Door ajar chime occurs only if the door ajar status is true.
  - Door opened and
  - Ignition in RUN position and
  - Vehicle speed is present
- **Fasten Seat Belt Indicator Warning** - The CCN will generate repetitive chimes at a slow rate to announce that a hard wired input from the seat belt switch indicates that the driver side front seat belt is not fastened with the ignition switch in the On position. The chime warning system also supports the enhanced seat belt reminder (beltminder) when this feature is enabled.

NOTE: If the vehicle is equipped with the Occupant Classification System (OCS), this will apply to the front passenger seatbelt as well.

There are two different Fasten Seatbelt Reminder announcements incorporated into the cluster’s logic, a Non-enhanced announcement and an Enhanced announcement.

When the Enhanced announcement is DISABLED:

- The cluster will chime five times (not greater than six seconds) and illuminate the Seatbelt Lamp after turning the ignition to the run/start position if the driver/passenger seatbelt is unbuckled.

When the Enhanced announcement is ENABLED;

- The cluster will chime continuously at a slow rate for a period of 6 seconds and illuminate the Seatbelt Lamp after turning the ignition to the run/start position if the driver/passenger seatbelt is unbuckled. After 6 seconds the chime will stop, but the Seatbelt Lamp will stay illuminated. If the ignition is in the run position for a period greater than 60 seconds, and the driver/passenger seatbelt is unbuckled, and the vehicle’s speed is greater

than 5 mph (8 km/h) in a forward gear, the Enhanced Fasten Seatbelt Reminder will activate. This will cause the Seatbelt Lamp to blink and a slow continuous chime to sound for 5 seconds. After 5 seconds, the chime will stop, but the lamp will remain illuminated for an additional 3 seconds. The Enhanced Seatbelt Reminder cycles for a total of 12 times (96 seconds). After the 12th time, the Seatbelt Lamp will remain on without any chime. Buckling the driver/passenger seatbelt at anytime will cancel the Fasten Seatbelt Reminder announcement.

The seatbelt indicator includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This beltminder feature can be disabled and enabled by the customer using a specific programming event sequence, or by the dealer using a diagnostic scan tool.

- **Gate Ajar Indicator Warning** - The CCN will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of the liftgate ajar switch has changed (switch position has to change to true), and an electronic message is received over the CAN data bus indicating that the vehicle is moving.
- **Head/Park Lamps-On Warning** - The CCN will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the headlamp switch, and the ignition switch indicate that the exterior lamps are turned On with the driver side front door opened and the ignition switch in the Off position. The chimes will continue to sound until the exterior lamps are turned Off, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Key-In-Ignition Warning** - The CCN will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the ignition switch, and the key-in ignition switch circuitry of the ignition switch indicate that the key is in the ignition in the lock position with the driver side front door open and the ignition switch in the Off position. The chimes will continue to sound until the key is removed from the ignition lock cylinder, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Low Fuel Indicator Warning** - The CCN will generate one short chime when the low fuel indicator is illuminated by the instrument cluster circuitry. This chime will only occur once during any ignition cycle.
- **Park Brake Reminder -** The CCN will generate one short chime to announce that the hard wired input from the park brake switch and a vehicle speed message input received over the CAN data bus indicate that the park brake is applied and the vehicle is moving. This chime will repeat each time the input conditions are met.
- **Sentry Key “Customer Learn” Mode Announcement** - The CCN will generate one short chime to confirm that an electronic “Customer Learn” mode message has been received over the CAN data bus to indicate that the Sentry Key Remote Entry Module (SKREEM) is prepared for programming additional sentry key transponders. This chime feature is only active on vehicles equipped with the optional Sentry Key system, and sold in a market where “Customer Learn” programming is an allowed feature.
- **Turn Signal/Hazard Warning Flasher Emulation** - The CCN relay will generate repetitive clicks at a slow rate to emulate an electromechanical flasher when the turn signal or hazard warning system are operating. The CCN relay will generate repetitive clicks at a fast rate to indicate that the right or left turn signal are operating with one or more bulbs inoperative. In either case, the clicks will continue until the turn signal and hazard warning systems are turned off.
- **Turn Signal On Warning** - The CCN will generate repetitive chimes at a slow rate to indicate that a turn signal has been active continuously for 1.6 kilometers (1 mile) with the vehicle speed greater than 22 kilometers-per-hour (15 miles-per hour). Vehicles built for markets other than the United States and Canada have a revised distance threshold of 4 kilometers for this feature. The chime will continue until the turn signal input becomes inactive or until the vehicle speed message indicates that the speed is less than 22 kilometers-per-hour (15 miles-per-hour), whichever occurs first. The hazard warning flashers will not activate this chime feature.
- **Warning Indicator Announcement** - The CCN will generate one short chime each time the Malfunction Indicator or MIL lamp is illuminated by the instrument cluster circuitry. The check gauges indicator may be illuminated when any critical engine or transmission systems are operating outside of their normal parameters. The instrument cluster monitors electronic messages received over the CAN data bus to determine when to illuminate the check gauges indicator.

The CCN provides chime service for all available features in the chime warning system. The CCN relies upon its internal programming, numerous hard wired inputs, and electronic message inputs received from other modules over the CAN data bus network to provide the chime warning system features. The internal programming of the CCN determines the priority of each chime request input that is received, as well as the rate and duration of each chime that is to be generated.

The hard wired chime warning system inputs to the CCN may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the CCN, the CAN data bus, or the electronic messages received by the CCN from other modules. The most reliable, efficient and accurate means to diagnose the CCN, the CAN/LIN data bus, or the electronic message inputs used for the chime warning system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

BRAKE/PARK BRAKE INDICATOR

The brake/park brake indicator illuminates when the parking brake is applied with the ignition switch turned to the ON position (Refer to the PARK BRAKE SWITCH TEST table. The same lamp will also illuminate if one of the two (hydraulic or ABS) service brake systems fail when the brake pedal is applied.

PARK BRAKE SWITCH TEST

PROCEDURE	EXPECTED RESULTS
1. Turn key to run wait till bulb check is complete	
2. Apply park brakes.	Verify that the brake indicator lamp comes ON.
3. Disengage the park brakes.	Verify Brake indicator lamp turns OFF.
4. Repeat steps 2 and 3 with key in OFF/ACC and LOCK positions.	Brake indicator lamp should not come ON.
5. In an Automatic Transmission vehicle apply park brakes, start the vehicle, press brake pedal and shift into reverse or drive.	The brake indicator lamp should flash. (Move on to Step 7)
6. In a Manual Transmission vehicle, start the vehicle with park brakes applied.	The brake indicator lamp should start flashing. (Move on to Step 7)
7. Drive the vehicle over 8 km/h (5 mph) with the park brake engaged.	The park brake lamp should flash accompanied with a chime.

TO TEST THE SYSTEM:

- As the ignition switch is turned to the START position, the lamp should light.
- Turn ignition switch to the ON position and apply the parking brake. The lamp should light.

IF LAMPS FAILS TO LIGHT, INSPECT FOR:

- A broken or disconnected wire at the switch
- Defective switch
- A burned out Light Emitting Diode (LED)
- A damaged circuit board

To test the service brake warning system, refer to Brakes, Diagnosis and Testing, Base Brake System Diagnosis Charts, Red Brake Warning Lamp.

CHIME/BUZZER SYSTEM

The hard wired chime warning system inputs to the ElectroMechanical Instrument Cluster (EMIC), as well as other hard wired circuits for this system may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the Controller Area Network (CAN) data bus, or the electronic message inputs used by the EMIC to provide chime warning system service. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAN data bus, and the elec-

tronic message inputs for the chime warning system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO KEY-IN IGNITION WARNING CHIME, BUT OTHER CHIME FEATURES OK	1. Driver door ajar switch sense circuit open.	1. Check for continuity between the driver door ajar switch sense circuit connector and the instrument cluster connector. Repair the open driver door ajar switch sense circuit, if required.
	2. Key-in ignition switch sense circuit open.	2. Check for continuity between the key-in ignition switch sense circuit connector and instrument cluster connector. Repair the open key-in ignition switch sense circuit, if required.
	3. Key-in ignition switch ground circuit open.	3. Check for continuity between the ground circuit cavity of the ignition switch connector and a good ground. Repair the open ground circuit, if required.
	4. Faulty ignition switch.	4. Check for continuity between the ground circuit terminal and the key-in ignition switch sense circuit terminal in the ignition switch connector. There should be continuity with a key in the ignition lock cylinder. Replace the faulty ignition switch, if required.
NO EXTERIOR LAMPS-ON WARNING CHIME, BUT OTHER CHIME FEATURES OK	1. Driver door ajar switch sense circuit open.	1. Check for continuity between the driver door ajar switch sense circuit connector and the instrument cluster connector. Repair the open driver door ajar switch sense circuit, if required.
	2. Headlamp switch signal circuit open.	2. Check for continuity between the headlamp switch output circuit connector and the instrument cluster connector. Repair the open headlamp switch signal circuit, if required.
NO CHIMES AND OTHER INSTRUMENT CLUSTER FEATURES ERRATIC OR DISABLED	1. Instrument cluster ground circuit(s) open.	1. Check for continuity between the ground circuits of the instrument cluster connector and a good ground. Repair the open ground circuits(s), if required.
	2. Instrument cluster fused B(+) circuit(s) open.	2. Check for battery voltage at the B(+) circuits of the instrument cluster connector. Repair the open fused B(+) circuit(s), if required.
	3. Instrument cluster fused ignition switch output (run-start) circuit open.	3. With the ignition switch in the On position, check for battery voltage at the fused ignition switch output (run-start) circuit of the instrument cluster connector. Repair the open fused ignition switch output (run-start) circuit, if required.
	4. Faulty instrument cluster.	4. Replace the faulty instrument cluster, if required.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO CHIMES, BUT ALL OTHER INSTRUMENT CLUSTER FEATURES OK	1. Faulty instrument cluster.	1. Replace the faulty instrument cluster, if required.

FASTEN SEAT BELTS

To test the fasten seat belts function, turn the ignition switch to the ON position with the driver's seat belt unbuckled and fully retracted. The seat belt warning lamp should light for four to eight seconds and the tone should sound three to five times.

If the lamp does not light, check the connection at the seat belt retractor. Replace as necessary.

ELECTRONIC CONTROL MODULES

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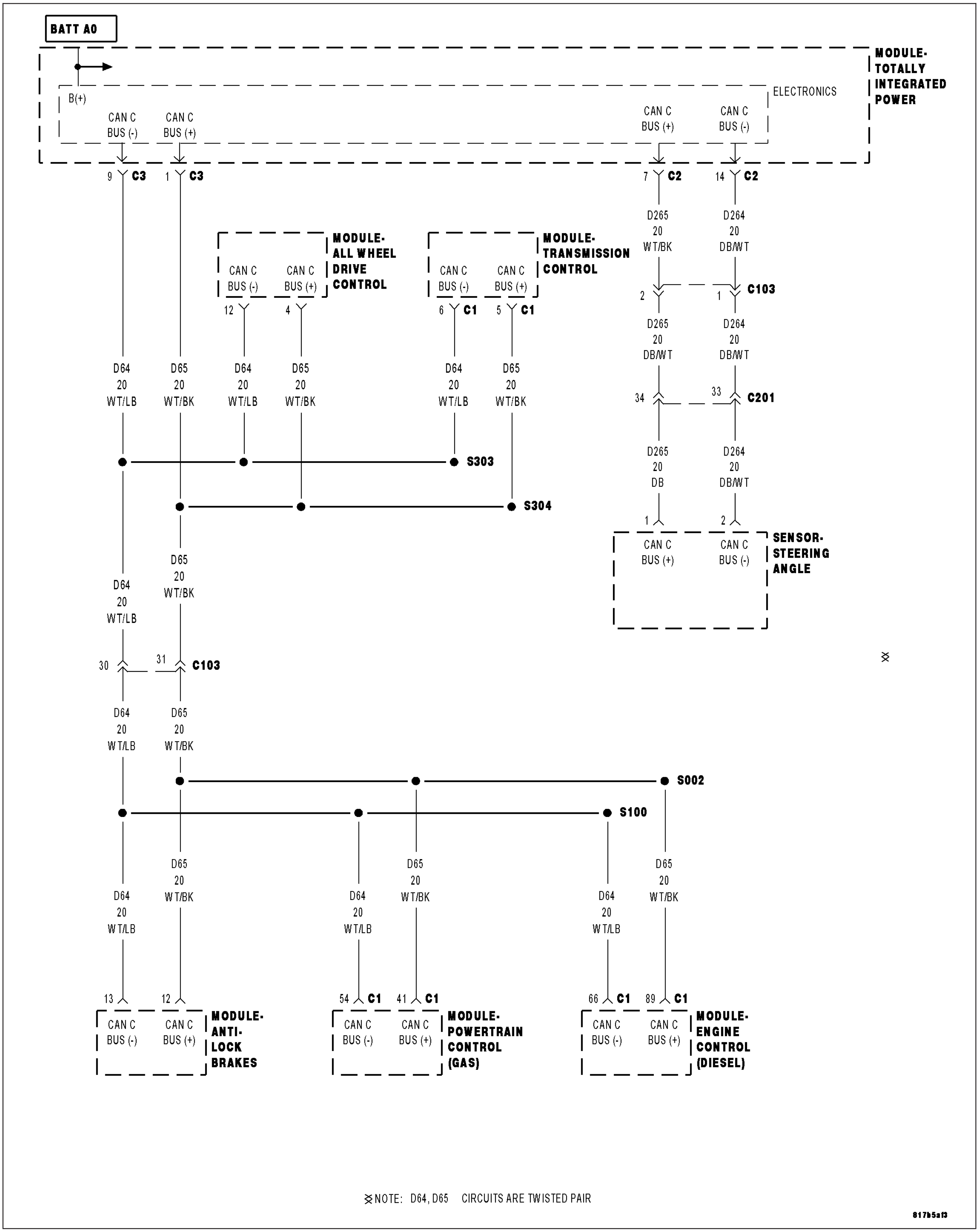
ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS

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ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

U0001-CAN C BUS CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND
(D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND
(D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT
ANTILOCK BRAKE MODULE
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE (CVT)
ENGINE CONTROL MODULE (DIESEL ONLY)
STEERING ANGLE SENSOR
ALL WHEEL DRIVE CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. ANTILOCK BRAKE MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.

Perform ABS VERIFICATION TEST — VER 1.

3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.

NOTE: If vehicle is not equipped with this module, answer yes to the question.

Disconnect the Powertrain Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 4

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

4. TRANSMISSION CONTROL MODULE (CVT) — INTERNAL SHORT

Turn the ignition off.

NOTE: If vehicle is not equipped with this module, answer yes to the question.

Disconnect the Transmission Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 5

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Transmission Control Module in accordance with the service information.

Perform the appropriate VERIFICATION TEST VER 1.

5. ENGINE CONTROL MODULE (DIESEL ONLY) — INTERNAL SHORT

Turn the ignition off.

NOTE: If vehicle is not equipped with this module, answer yes to the question.

Disconnect the Engine Control Module C1 harness connectors.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 6

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Engine Control Module in accordance with the service information.

Perform the ECM VERIFICATION TEST.

6. STEERING ANGLE SENSOR— INTERNAL SHORT

Turn the ignition off.

NOTE: If vehicle is not equipped with this sensor, answer yes to the question.

Disconnect the Steering Angle Sensor harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 7

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Angle Sensor in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

7. ALL WHEEL DRIVE CONTROL (AWD) MODULE — INTERNAL SHORT

Turn the ignition off.

NOTE: If vehicle is not equipped with this module, answer yes to the question.

Disconnect the AWD Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 8

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the All Wheel Drive Control (AWD) Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

8. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Totally Integrated Power Module C2 and C3 harness connectors.

Turn the ignition on.

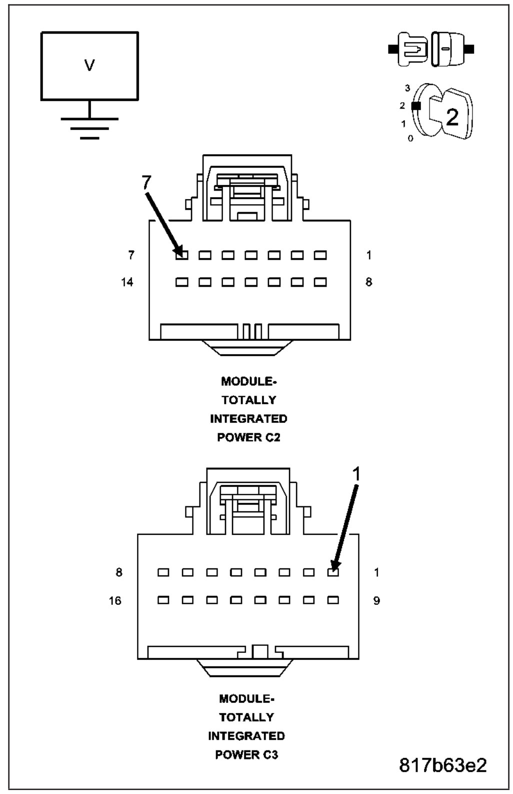
Measure the voltage between the (D65) CAN C Bus (+) circuit and ground on both connectors.

Is there any voltage present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 9



9. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE

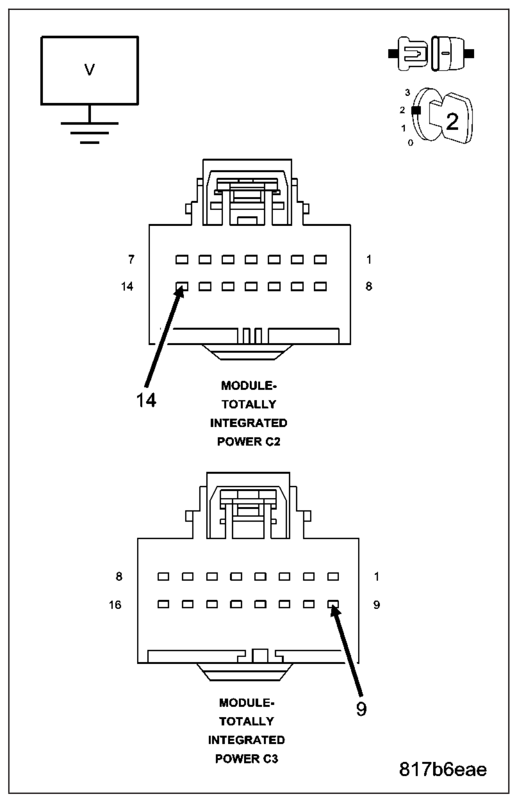
Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.

Is there any voltage present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 10



10. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

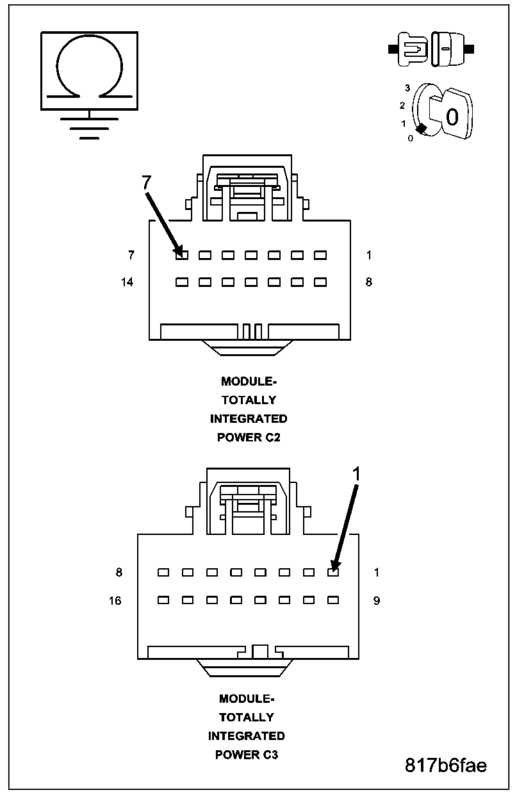
Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.

Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 11



11. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND

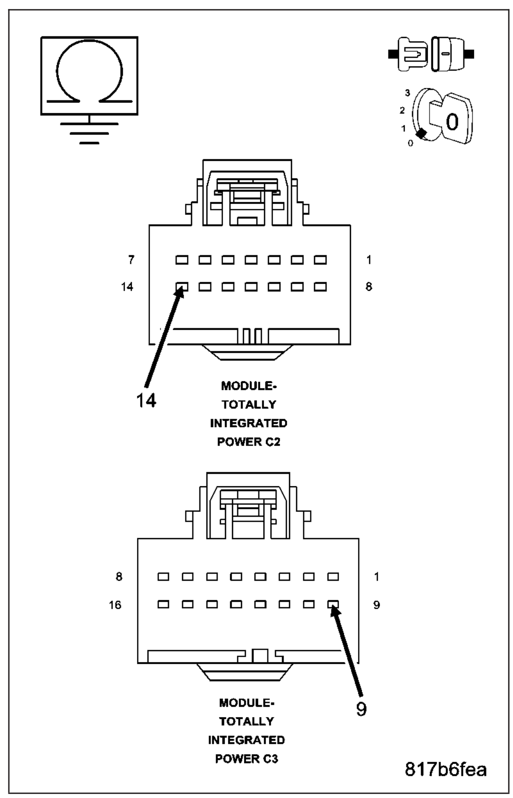
Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

Is any resistance present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.

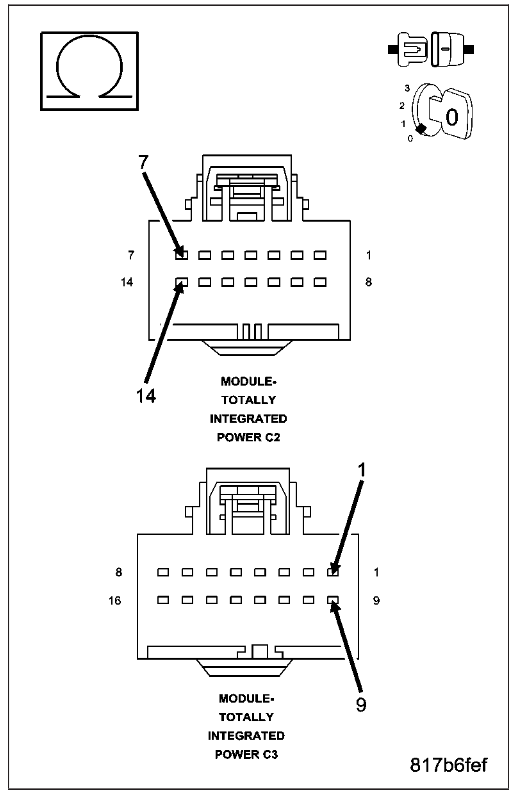
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 12



12. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.



Is any resistance present?

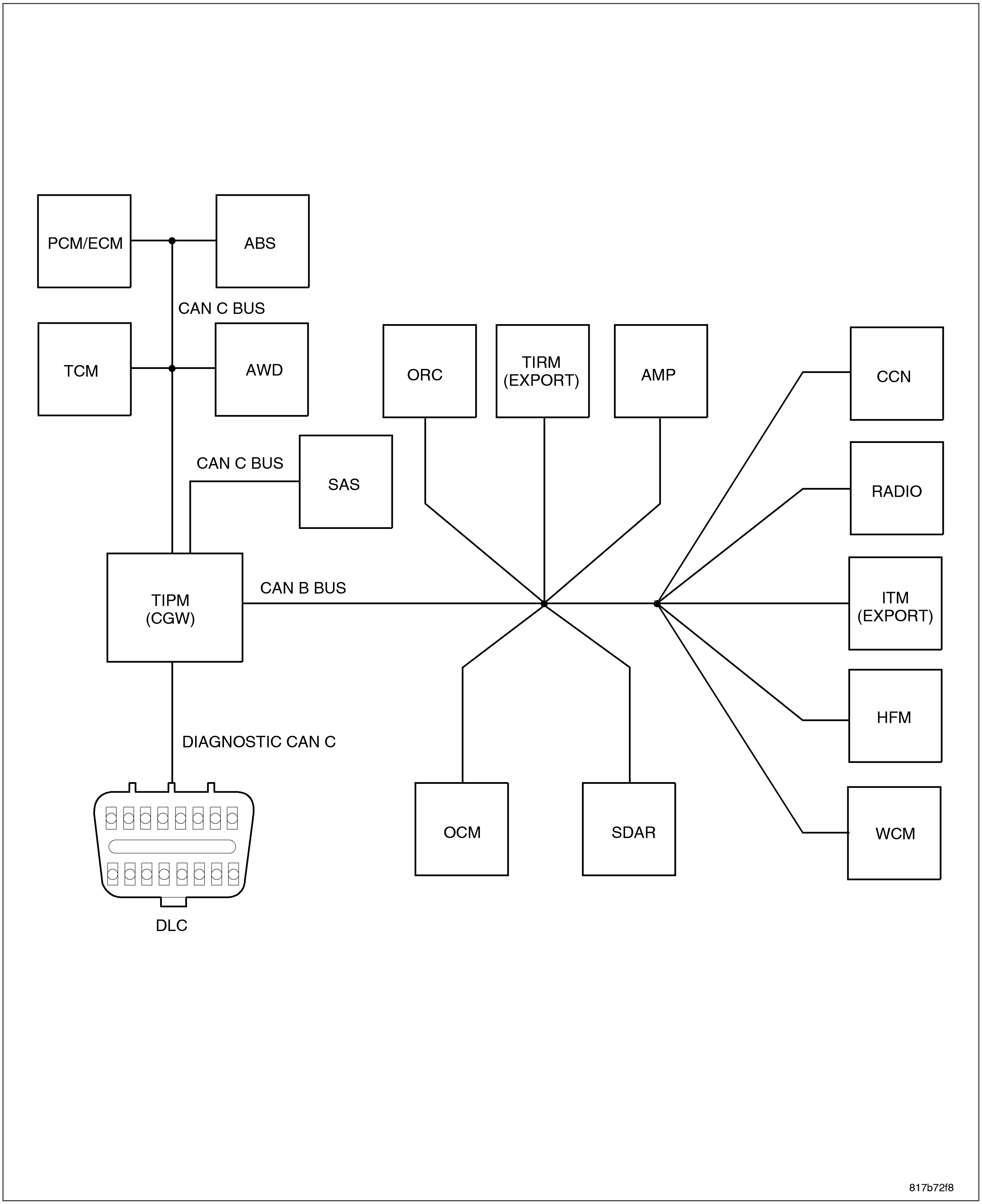
Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Totally Integrated Power Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0019-CAN B BUS



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects an open, a short high, a short low or a short together in either of the CAN B Bus circuits.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND
(D55) CAN B BUS (+) CIRCUIT SHORTED TO (D54) CAN B BUS (-) CIRCUIT
ANY CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase TIPM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. MEASURE VOLTAGE AT TIPM

Gain access to the Totally Integrated Power Module C3 harness connector, but do not disconnect.
Backprobe and measure the voltage on both the (D55) CAN B Bus (+) and the (D54) CAN B (-) circuits.

Does the voltage read approximately 4.65 - 4.98 volts on the (D54) CAN B Bus (-) and 0.39 - 0.46 volts on the (D55) CAN B (+) circuits?

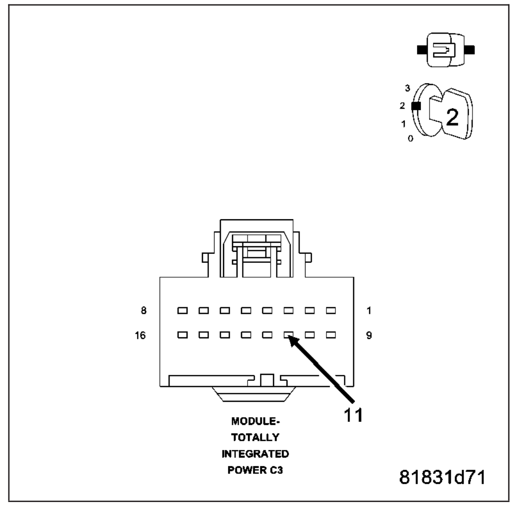
Yes >> Go To 3

No - Voltage Between 0.3 - 0.7 Volts on Both Circuits
Go To 9

No - Voltage Reads 0 Volts on Either Circuit
Go To 7

No - Voltage Above 10 Volts on Either Circuit
Go To 5

3. (D55) CAN B BUS (+) CIRCUIT OPEN



Turn the ignition on.

With the scan tool select ECU View.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the (D54) CAN B Bus (-) circuit at the TIPM C3 harness connector.

NOTE: A red “X” will appear next to modules that can no longer communicate on the Bus.

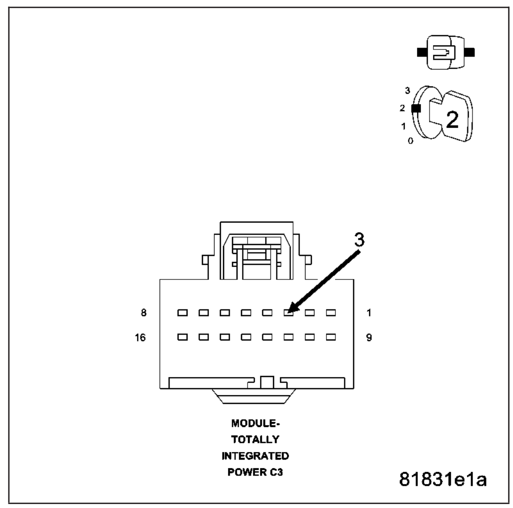
Did a red “X” appear next to any modules on the scan tool?

Yes >> Using the Wiring Diagrams to further isolate the open in the circuit, repair the (D55) CAN B Bus (+) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (D54) CAN B BUS (-) CIRCUIT OPEN



With the scan tool select ECU View.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the (D55) CAN B Bus (+) circuit at the TIPM C3 harness connector.

NOTE: A red “X” will appear next to modules that can no longer communicate on the Bus.

Did a red “X” appear next to any modules on the scan tool?

Yes >> Using the Wiring Diagrams to further isolate the open in the circuit, repair the (D54) CAN B Bus (-) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage. If ok, replace and program the Totally Integrated Power Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

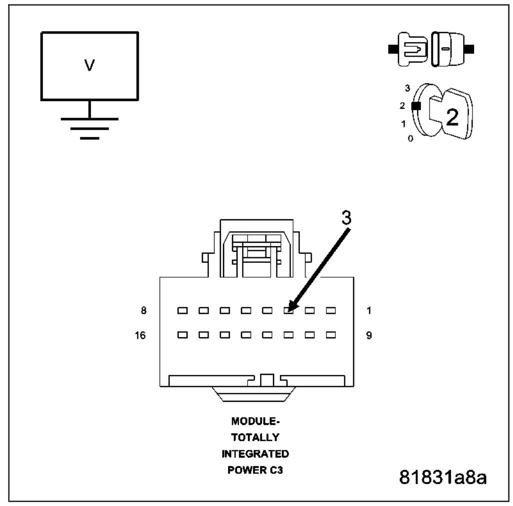
5. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Turn the ignition on.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is the voltage above 10.0 volts?

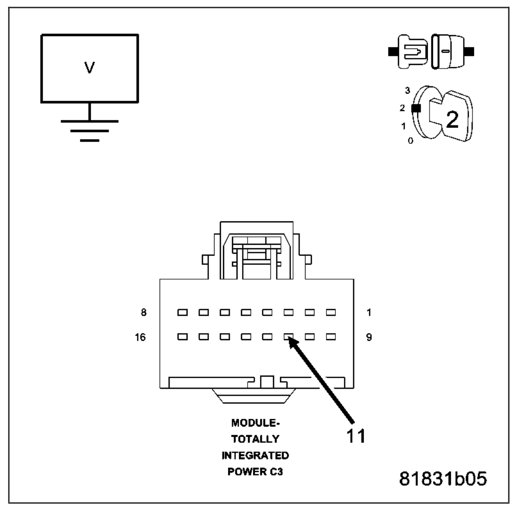
Yes >> Disconnect each CAN B Bus module one at a time while observing the voltage to determine if the short is caused by an internal short within a module. Replace the module, in accordance with the service information, that when disconnected eliminates the short to voltage. If the short condition is still present with all CAN B Bus modules disconnected use the Wiring Diagrams to help isolate and repair the (D55) CAN B Bus (+) circuit for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 6

6. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



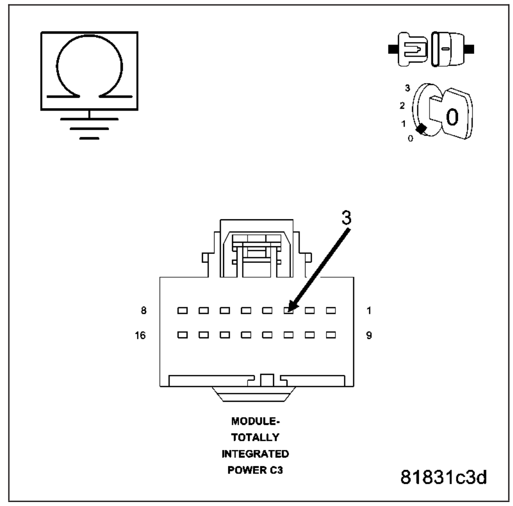
Is the voltage above 10.0 volts?

Yes >> Disconnect each CAN B Bus module one at a time while observing the voltage to determine if the short is caused by an internal short within a module. Replace the module, in accordance with the service information, that when disconnected eliminates the short to voltage. If the short condition is still present with all CAN B Bus modules disconnected use the Wiring Diagrams to help isolate and repair the (D54) CAN B Bus (-) circuit for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage. If ok, replace and program the Totally Integrated Power Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

7. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND



Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

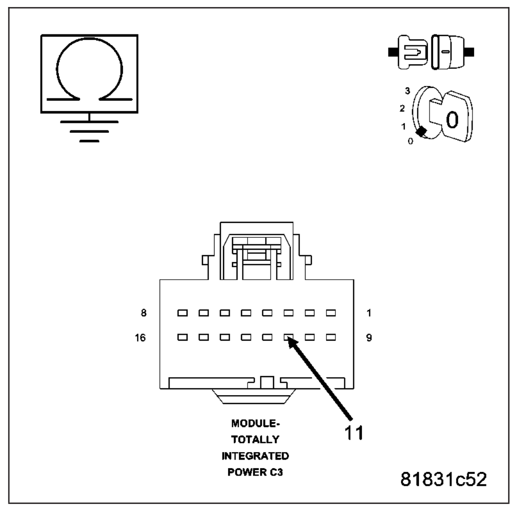
Is the resistance above 1000.0 ohms?

Yes >> Go To 8

No >> Disconnect each CAN B Bus module one at a time while observing the resistance to determine if the short is caused by an internal short within a module. Replace the module, in accordance with the service information, that when disconnected eliminates the short to ground. If the short condition is still present with all CAN B Bus modules disconnected use the Wiring Diagrams to help isolate and repair the (D55) CAN B Bus (+) circuit for a short to ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

8. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND



Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.

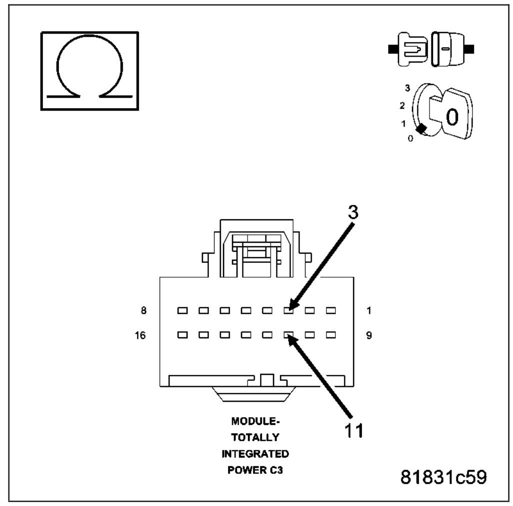
Is the resistance above 1000.0 ohms?

Yes >> Inspect the wiring and connectors for damage. If ok, replace and program the Totally Integrated Power Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Disconnect each CAN B Bus module one at a time while observing the resistance to determine if the short is caused by an internal short within a module. Replace the module, in accordance with the service information, that when disconnected eliminates the short to ground. If the short condition is still present with all CAN B Bus modules disconnected use the Wiring Diagrams to help isolate and repair the (D54) CAN B Bus (-) circuit for a short to ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

9. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT



Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

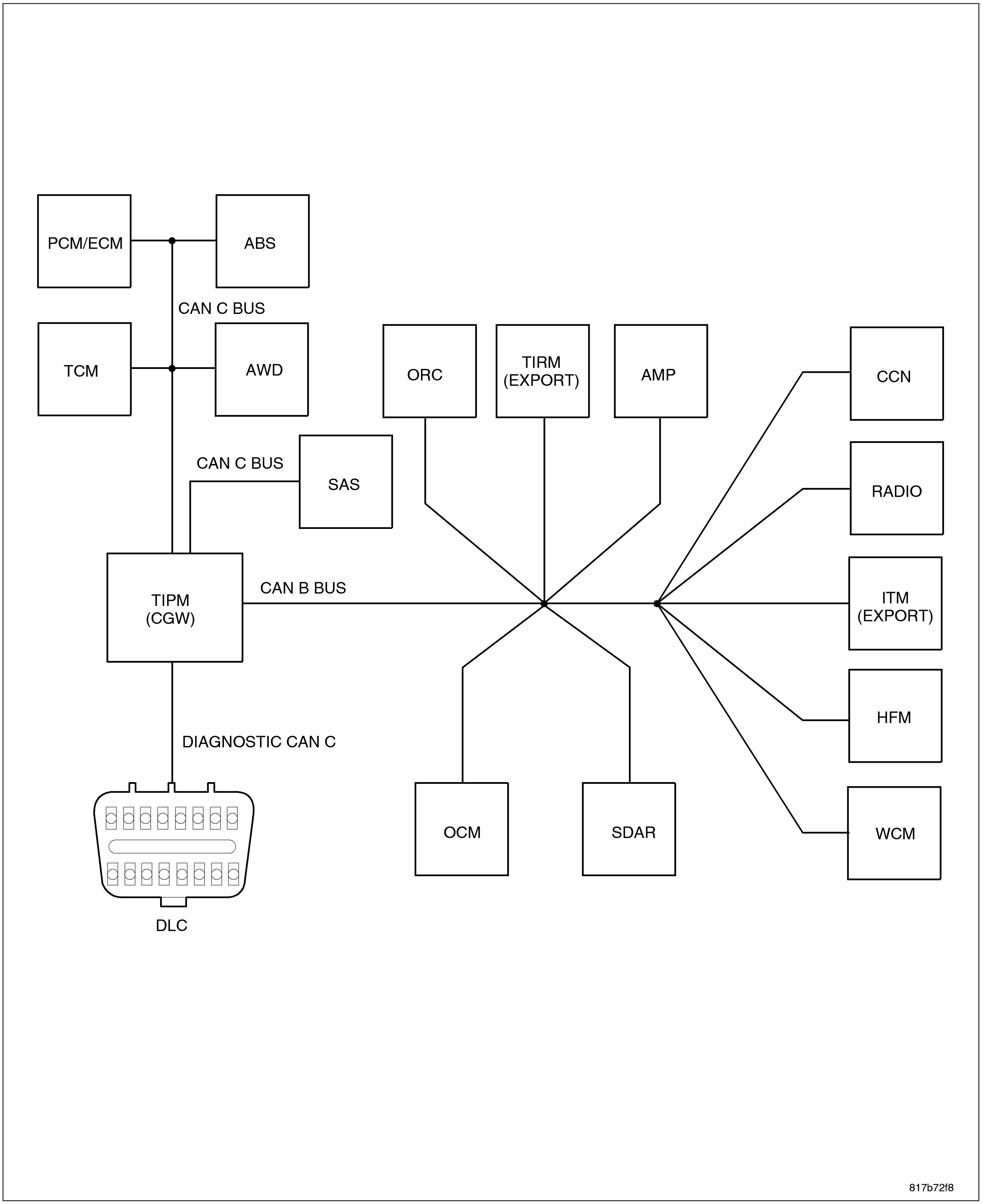
Is any resistance present?

Yes >> Disconnect each CAN B Bus module one at a time while observing the resistance to determine if the short is caused by an internal short within a module. Replace the module, in accordance with the service information, that when disconnected eliminates the short between the two circuits. If the short condition is still present with all CAN B Bus modules disconnected use the Wiring Diagrams to help isolate and repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage. If ok, replace and program the Totally Integrated Power Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0021-CAN B BUS (+) CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage between 10 and 16 volts.
- **Set Condition:**
  The TIPM detects the (D55) CAN B Bus (+) circuit is open.

Possible Causes
CAN B BUS TERMINAL PUSH OUT
SPREAD CAN B BUS TERMINAL
(D55) CAN B BUS (+) CIRCUIT OPEN
INTERNAL OPEN IN A CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC’s.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC’s.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. ATTEMPT TO ISOLATE THE OPEN CONDITION

Turn the ignition on.

With the scan tool select ECU View.

Verify that all CAN B Bus modules are communicating with the scan tool.

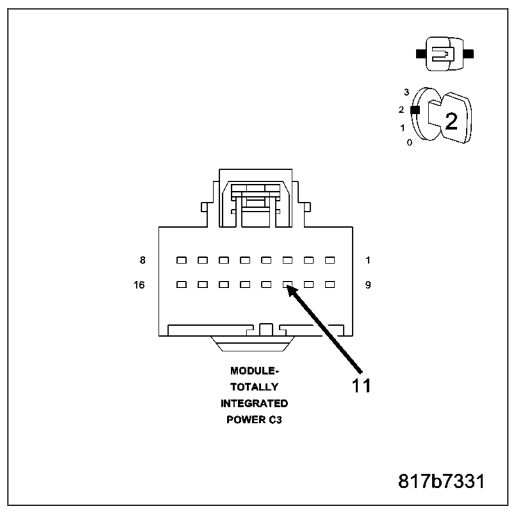
NOTE: A red X will be next to a module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: If any module is not communicating, perform the appropriate no response test procedure before proceeding.

Turn the ignition off.

Gain access to the Totally Integrated Power Module C3 harness connector, but do not disconnect.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the CAN B Bus (-) circuit at the TIPM C3 harness connector.



Turn the ignition on.

With the scan tool monitor the ECU View screen and document all modules that display a red X.

Are there any red X’s displayed next to any CAN B Bus modules?

Yes >> Go To 3

No >> Check backprobe connection to ground, make sure it is proper. The CAN B Bus open DTC may no longer be active, it may be stored. Check all module connections.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. ATTEMPT TO ISOLATE THE OPEN CONDITION — MULTIPLE RED X'S

With the scan tool continue monitoring the ECU View screen.

Are there multiple red X's displayed next to CAN B Bus modules?

Yes >> The most likely cause of this condition is an open CAN B Bus (+) circuit between a common CAN B Bus splice and the modules that display the red X next to them. Use the wiring diagrams to help you determine where the open condition exists.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (D55) CAN B BUS (+) CIRCUIT OPEN — SINGLE RED X

Turn the ignition off.

Disconnect the module that has the red X displayed next to it.

Turn the ignition on.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present?

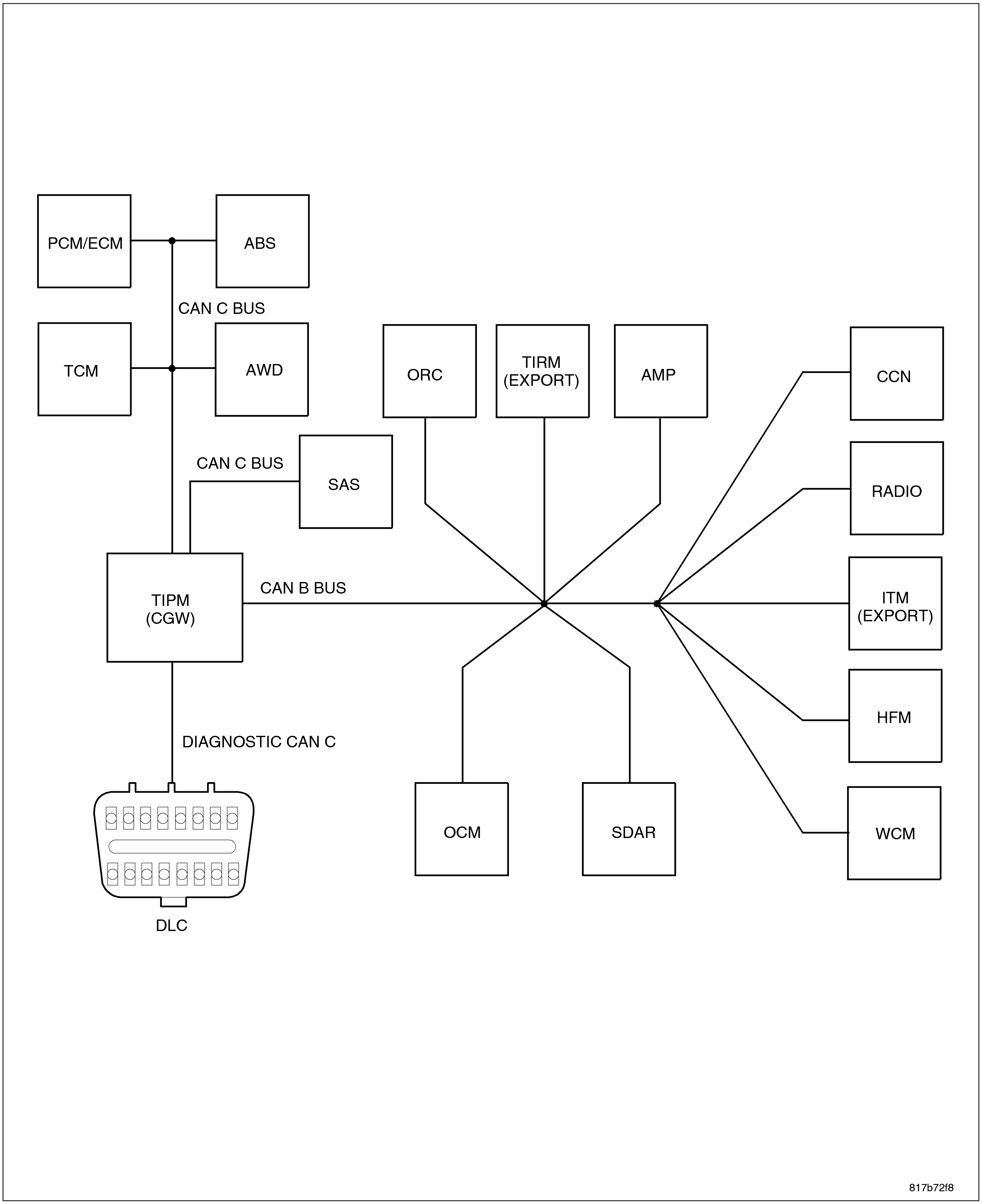
Yes >> Inspect the connector and terminal for damage, inspect for spread terminals, or pushed out terminals. If ok, replace the module that displayed the red X next to it in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) CAN B Bus (+) circuit for an open between the next common splice and the module that has the red X displayed next to it. Use the wiring diagrams to help you determine where the open condition exists.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0022-CAN B BUS (+) CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The TIPM detects the (D55) CAN B Bus (+) circuit is shorted to ground.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
ANY CAN B BUS MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module C3 harness connector.

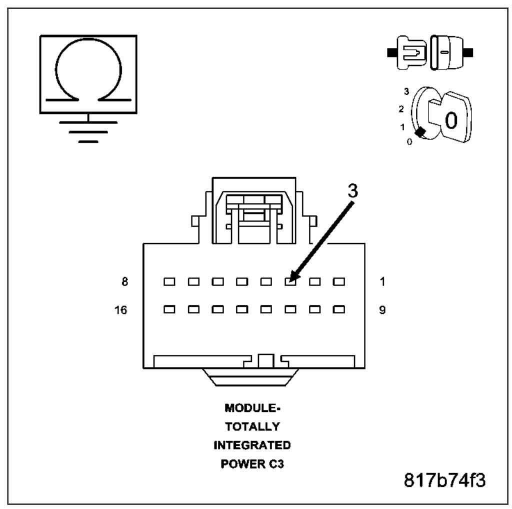
Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

Is resistance below 1000.0 ohms?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



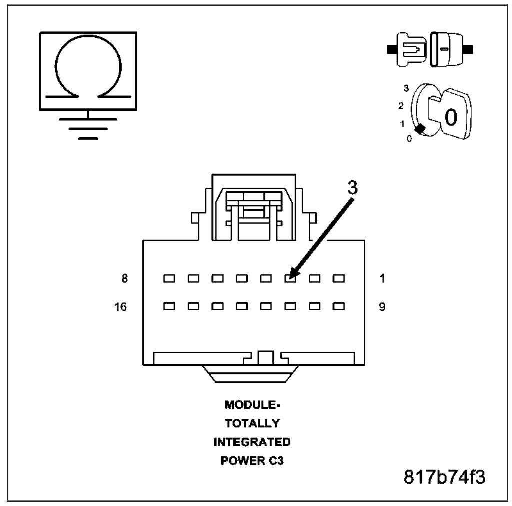
3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the circuit is shorted to ground internally within a module or if the circuit is shorted in the harness.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.



Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

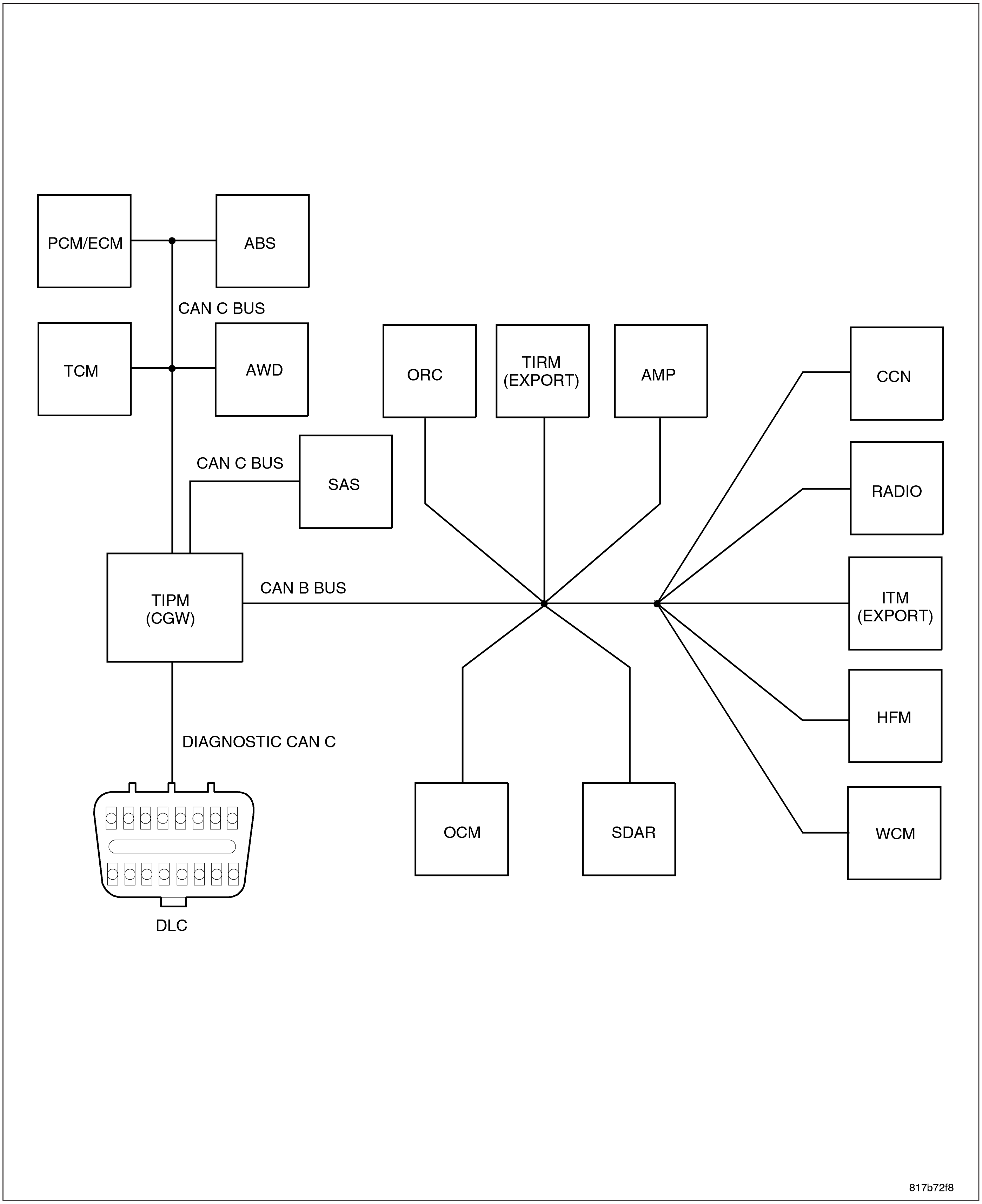
Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module that when disconnected eliminated the short to ground in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0023-CAN B BUS (+) CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The TIPM detects the (D55) CAN B Bus (+) circuit is shorted to voltage.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
ANY CAN B BUS MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Totally Integrated Power Module C3 harness connector.

Turn the ignition on.

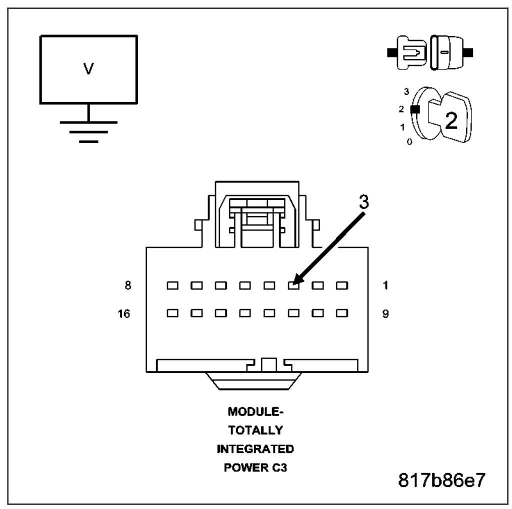
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is voltage above 10.0 volts?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE

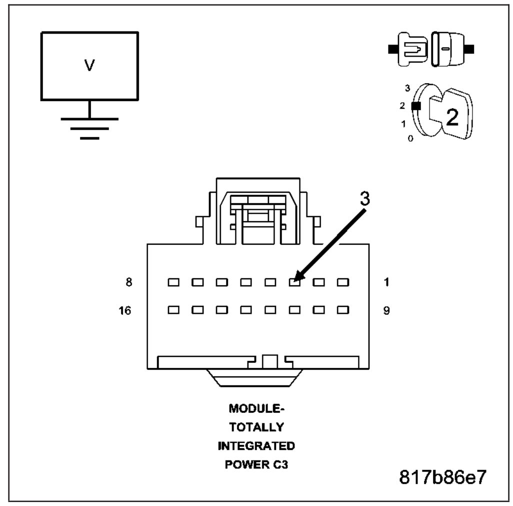
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

While monitoring the voltmeter, disconnect each CAN B Bus module one at a time.

NOTE: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.

NOTE: This is to determine if the circuit is shorted to voltage internally within a module or if the circuit is shorted to voltage in the harness.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.



Is the voltage above 10.0 volts with all the CAN B Bus modules disconnected?

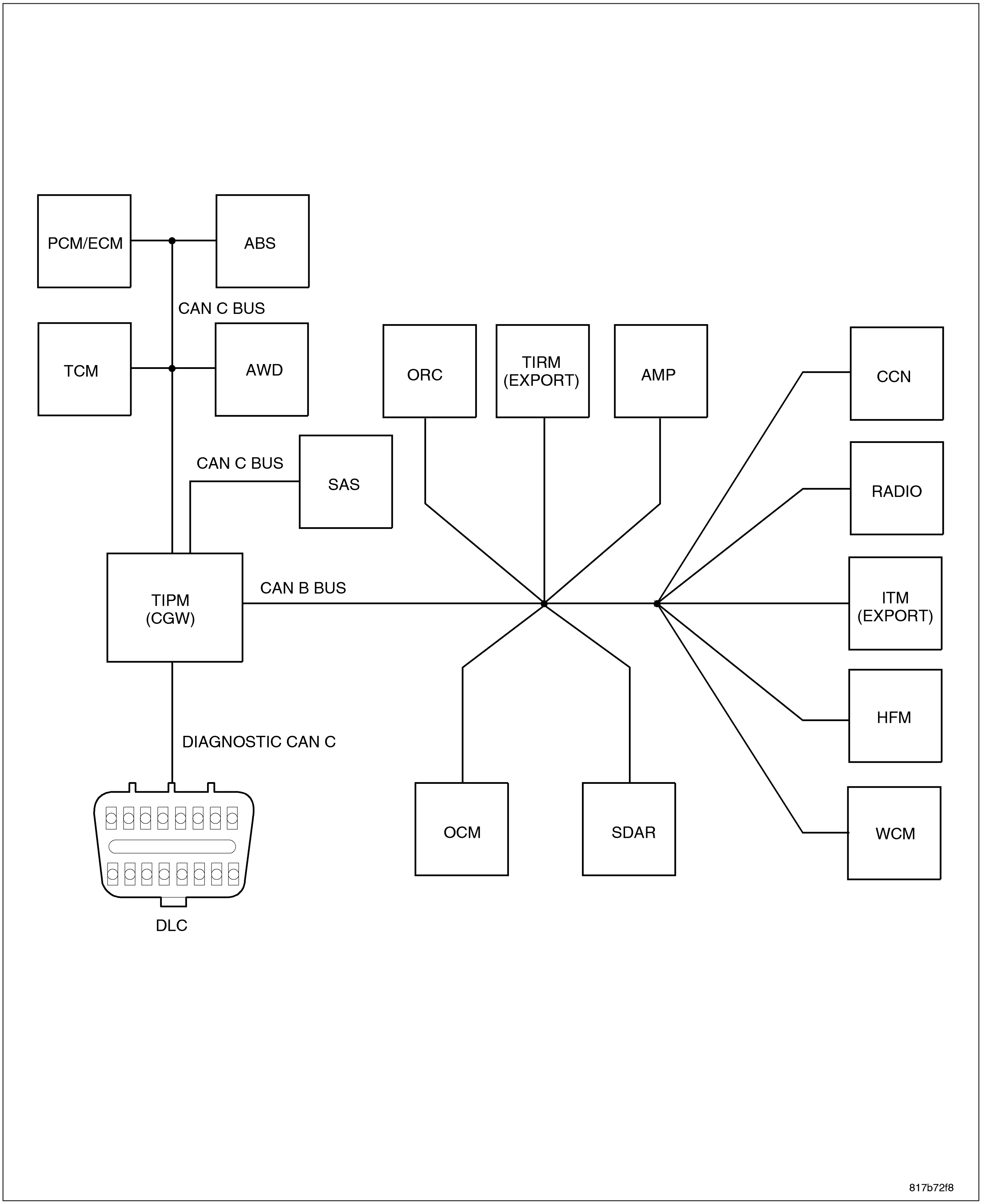
Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module that when disconnected eliminated the short to voltage in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0024-CAN B BUS (-) CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage between 10 and 16 volts.
- **Set Condition:**
  The TIPM detects the (D54) CAN B Bus (-) circuit is open.

Possible Causes
CAN B BUS TERMINAL PUSH OUT
SPREAD CAN B BUS TERMINAL
(D54) CAN B BUS (-) CIRCUIT OPEN
INTERNAL OPEN IN A CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. ATTEMPT TO ISOLATE THE OPEN CONDITION

Turn the ignition on.

With the scan tool select ECU View.

Verify that all CAN B Bus modules are communicating with the scan tool.

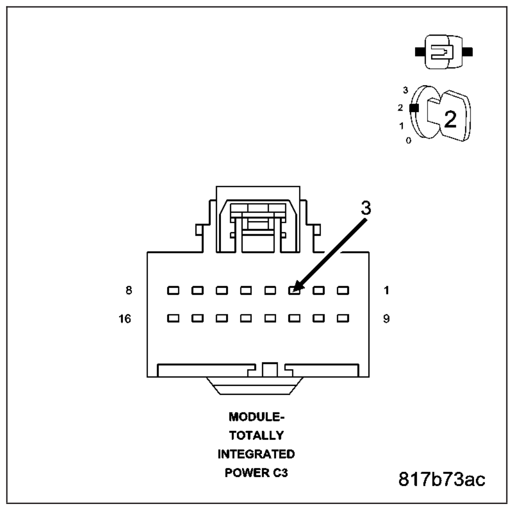
NOTE: A red X will be next to a module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: If any module is not communicating, perform the appropriate no response test procedure before proceeding.

Turn the ignition off.

Gain access to the Totally Integrated Power Module C3 harness connector, but do not disconnect.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the CAN B Bus (+) circuit at the TIPM C3 harness connector.



Turn the ignition on.

With the scan tool monitor the ECU View screen and document all modules that display a red X.

Are there any red X's displayed next to any CAN B Bus modules?

Yes >> Go To 3

No >> Check backprobe connection to ground, make sure it is proper. The CAN B Bus open DTC may no longer be active, it may be stored. Check all module connections.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. ATTEMPT TO ISOLATE THE OPEN CONDITION — MULTIPLE RED X'S

With the scan tool continue monitoring the ECU View screen.

Are there multiple red X's displayed next to CAN B Bus modules?

Yes >> The most likely cause of this condition is an open CAN B Bus (-) circuit between a common CAN B Bus splice and the modules that display the red X next to them. Use the wiring diagrams to help you determine where the open condition exists.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (D54) CAN B BUS (-) CIRCUIT OPEN — SINGLE RED X

Turn the ignition off.

Disconnect the module that has the red X displayed next to it.

Turn the ignition on.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Is there any voltage present?

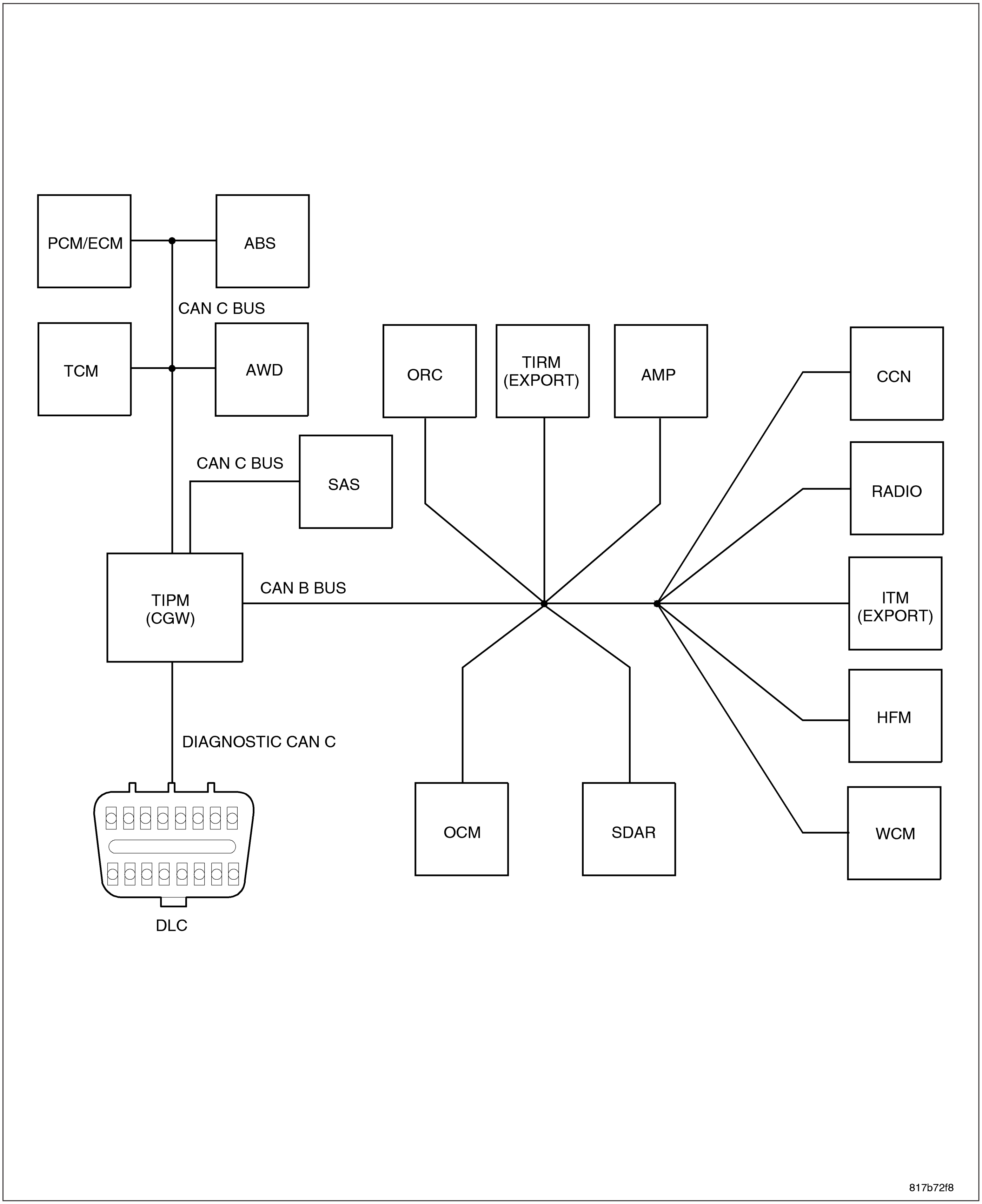
Yes >> Inspect the connector and terminal for damage, inspect for spread terminals, or pushed out terminals. If ok, replace the module that displayed the red X next to it in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D54) CAN B Bus (-) circuit for an open between the next common splice and the module that has the red X displayed next to it. Use the wiring diagrams to help you determine where the open condition exists.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0025-CAN B BUS (-) CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The TIPM detects the (D54) CAN B Bus (-) circuit is shorted to ground.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND OR TO (D55) CAN B BUS (+) CIRCUIT
ANY CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

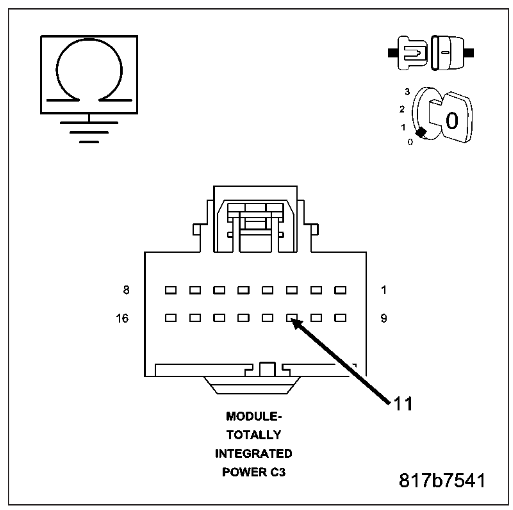
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECK THE (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module C3 harness connector.

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.



Is resistance below 1000.0 ohms?

Yes >> Go To 3

No >> Go To 4

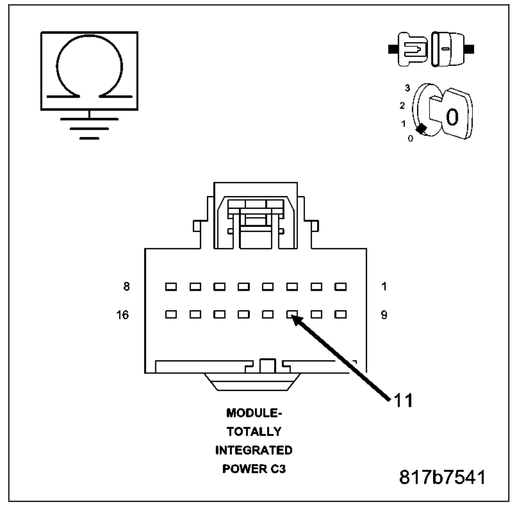
3. (D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the circuit is shorted to ground internally within a module or if the circuit is shorted to ground in the harness.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.



Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

Yes >> Repair the (D54) CAN B Bus (-) circuit for a short to ground.

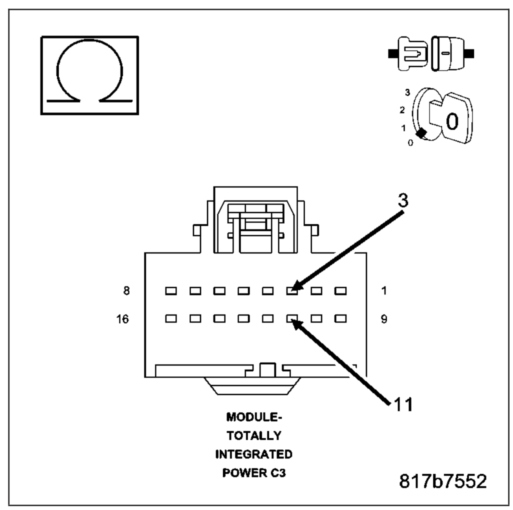
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module that when disconnected eliminated the short to ground in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO THE (D54) CAN B BUS (-) CIRCUIT

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.



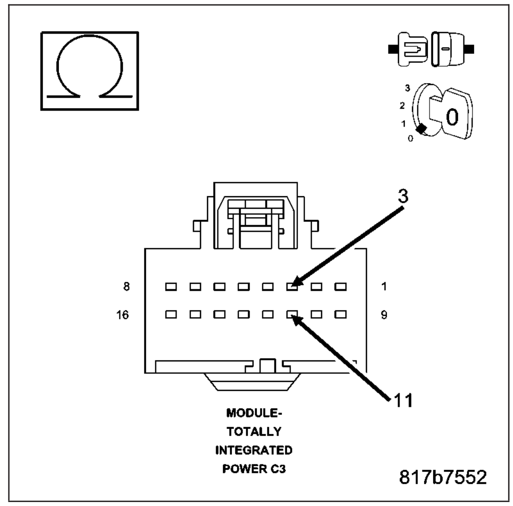
Is resistance below 1000.0 ohms?

Yes >> Go To 5

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

5. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT



Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the short together is internal within a module or if the circuits are shorted together.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.

Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

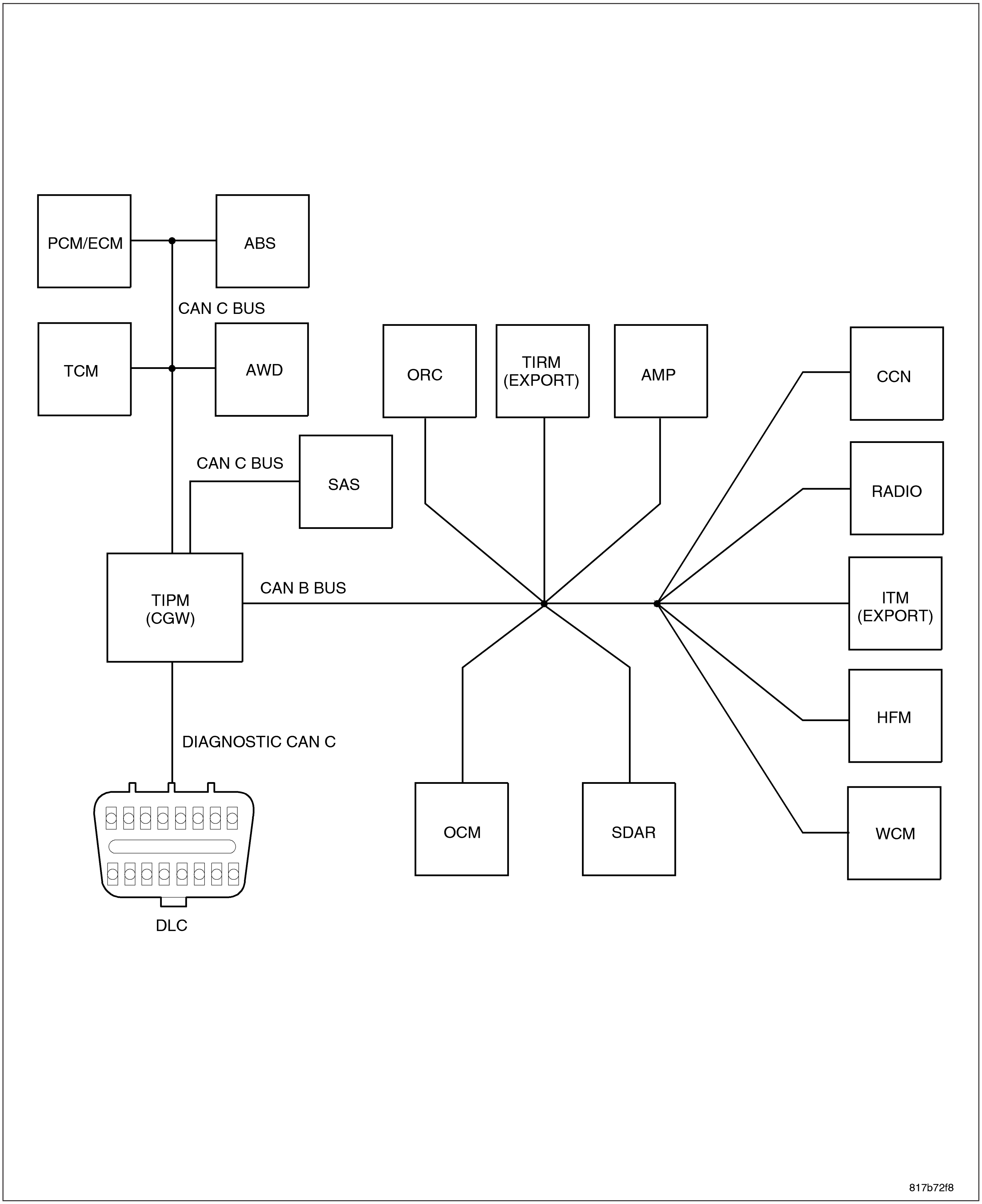
Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module that when disconnected the short together was eliminated, in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0026-CAN B BUS (-) CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The TIPM detects the (D54) CAN B Bus (-) circuit is shorted to voltage.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
ANY CAN B BUS MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

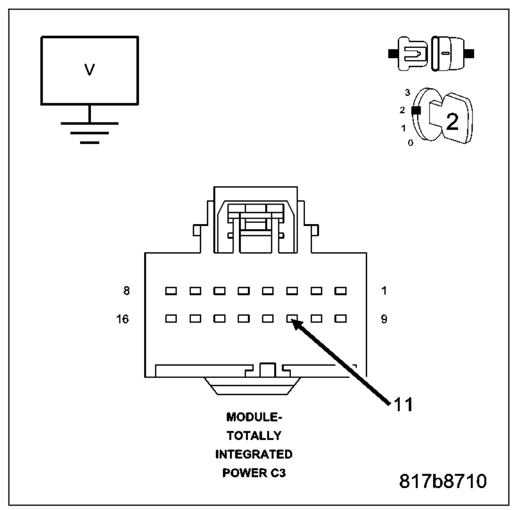
2. CHECK THE (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Totally Integrated Power Module C3 harness connector.

Turn the ignition on.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



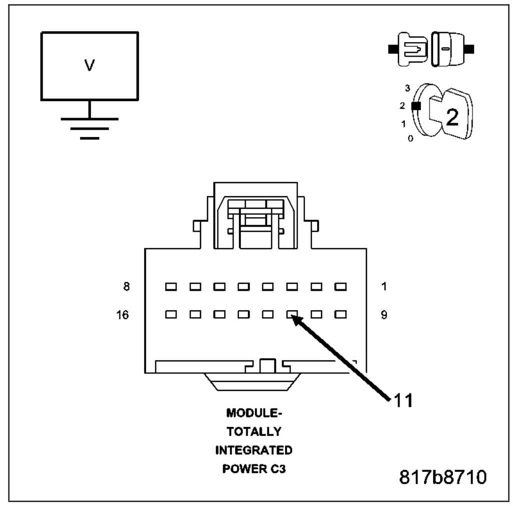
Is voltage above 10.0 volts?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE



Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

While monitoring the voltmeter, disconnect each CAN B Bus module one at a time.

NOTE: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.

NOTE: This is to determine if the circuit is shorted to voltage internally within a module or if the circuit is shorted to voltage in the harness.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.

Is the voltage above 10.0 volts with all the CAN B Bus modules disconnected?

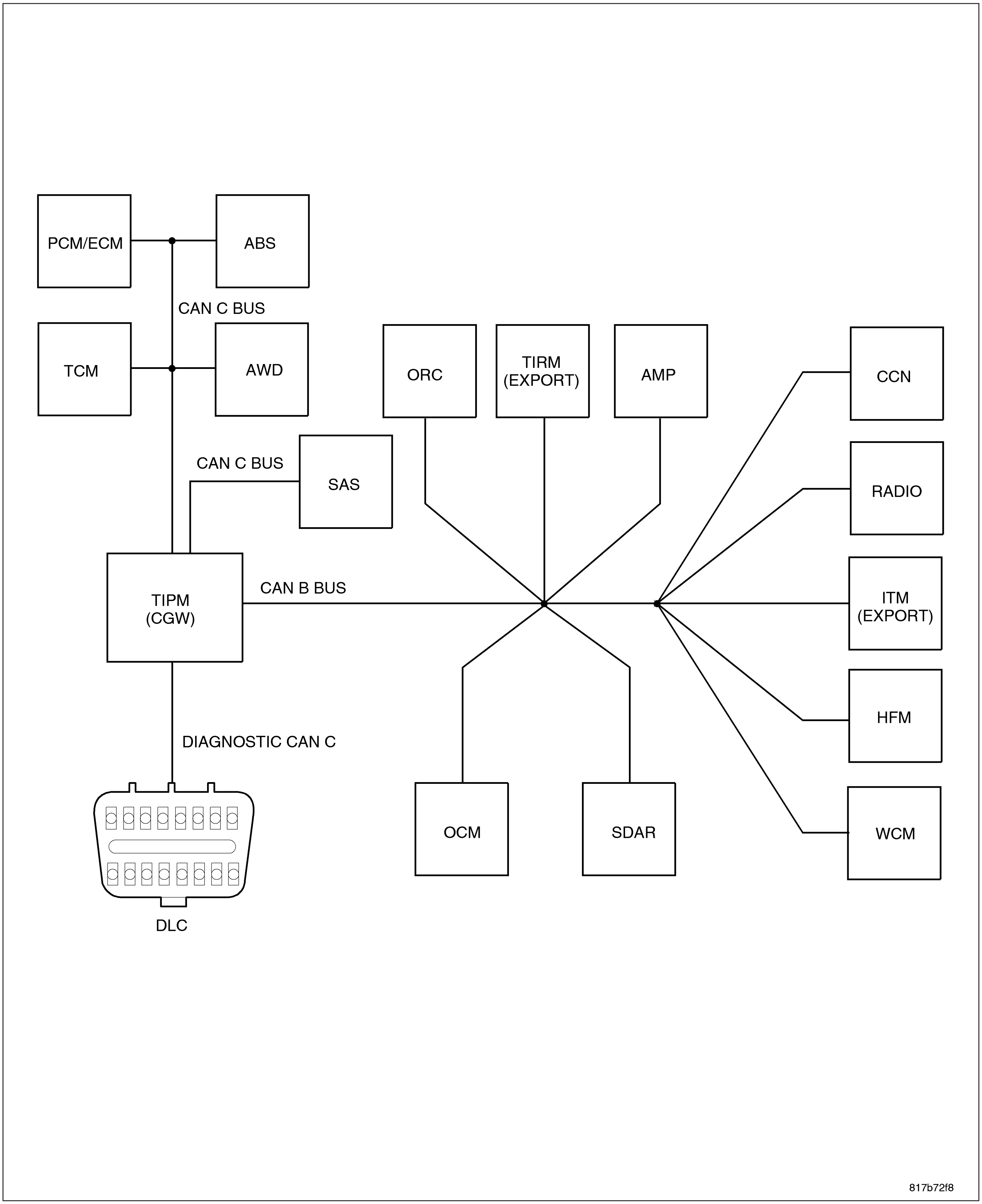
Yes >> Repair the (D54) CAN B Bus (-) circuit for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module, in accordance with the service information, that when disconnected eliminated the short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0027-CAN B BUS (-) SHORTED TO BUS (+)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The TIPM detects the (D55) CAN B Bus (+) circuit is shorted to the (D54) CAN B Bus (-) circuit.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT
ANY CAN B BUS MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

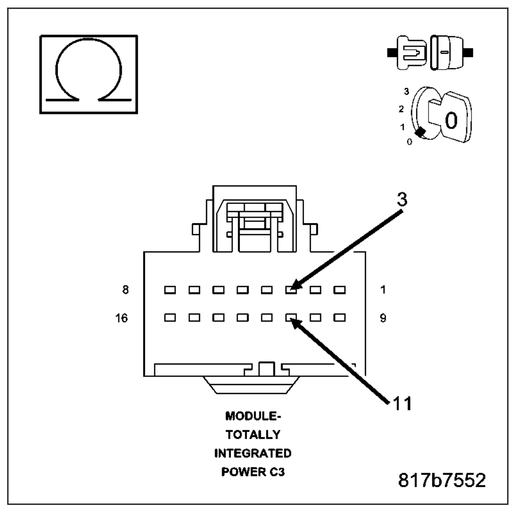
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO THE (D54) CAN B BUS (-) CIRCUIT

Turn the ignition off.

Disconnect the Totally Integrated Power Module C3 harness connector.

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.



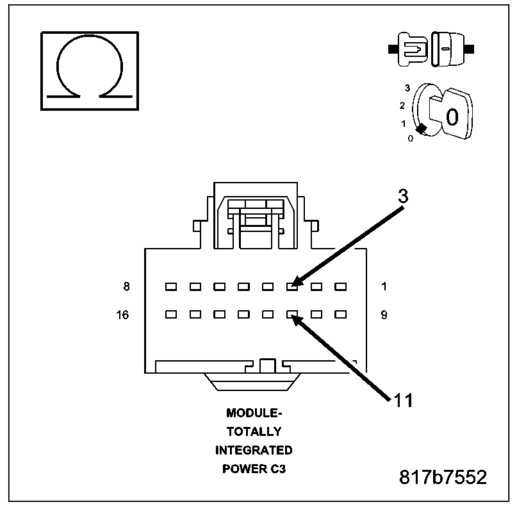
Is resistance below 1000.0 ohms?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT



Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the circuits are shorted together internally within a module or if the circuits are shorted together in the harness.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wring diagrams to assist in diagnosis.

Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

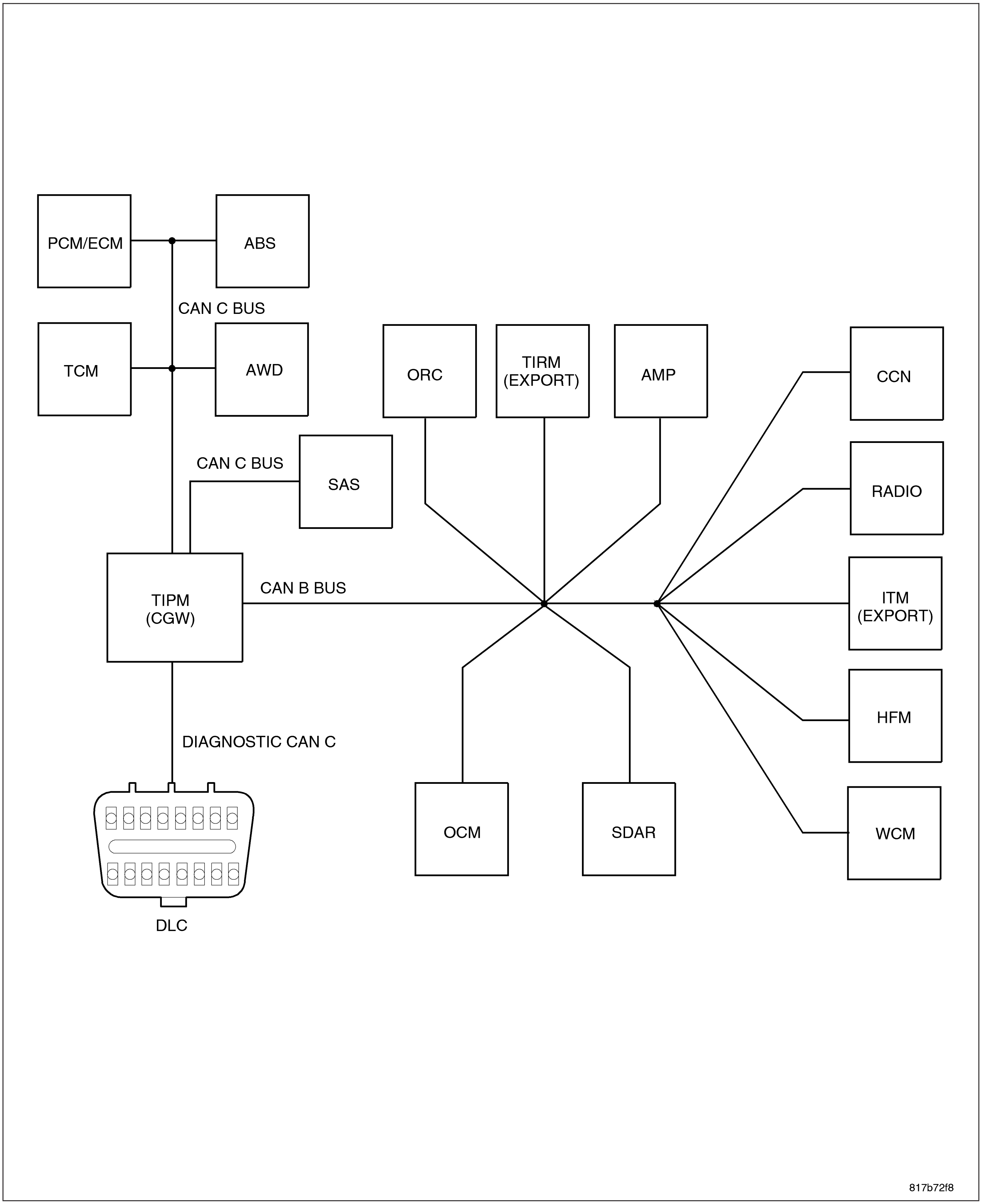
Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the module, in accordance with the service information, that when disconnected eliminated the shorted together circuits.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0100-LOST COMMUNICATION WITH ECM/PCM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
- **Set Condition:**
  Bus messages not received from the PCM/ECM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
ECM/PCM
ECM/PCM POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the ECM/PCM is active on the bus.

Is the ECM/PCM active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the ECM/PCM?

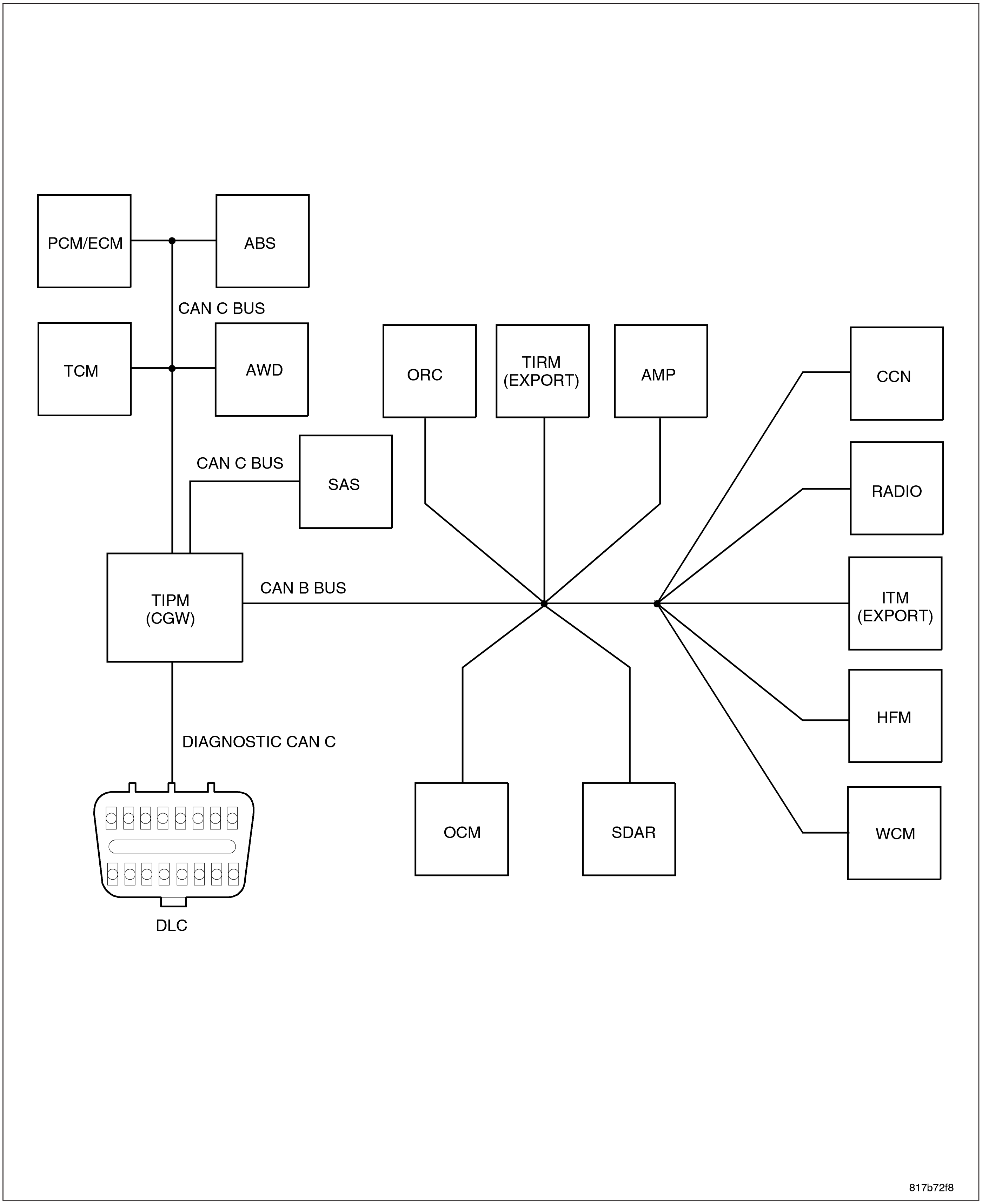
Yes >> Replace/update the ECM/PCM in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0101-LOST COMMUNICATION WITH TCM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the TCM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
TCM
TCM POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE TCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the TCM is active on the bus.

Is the TCM active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the TCM?

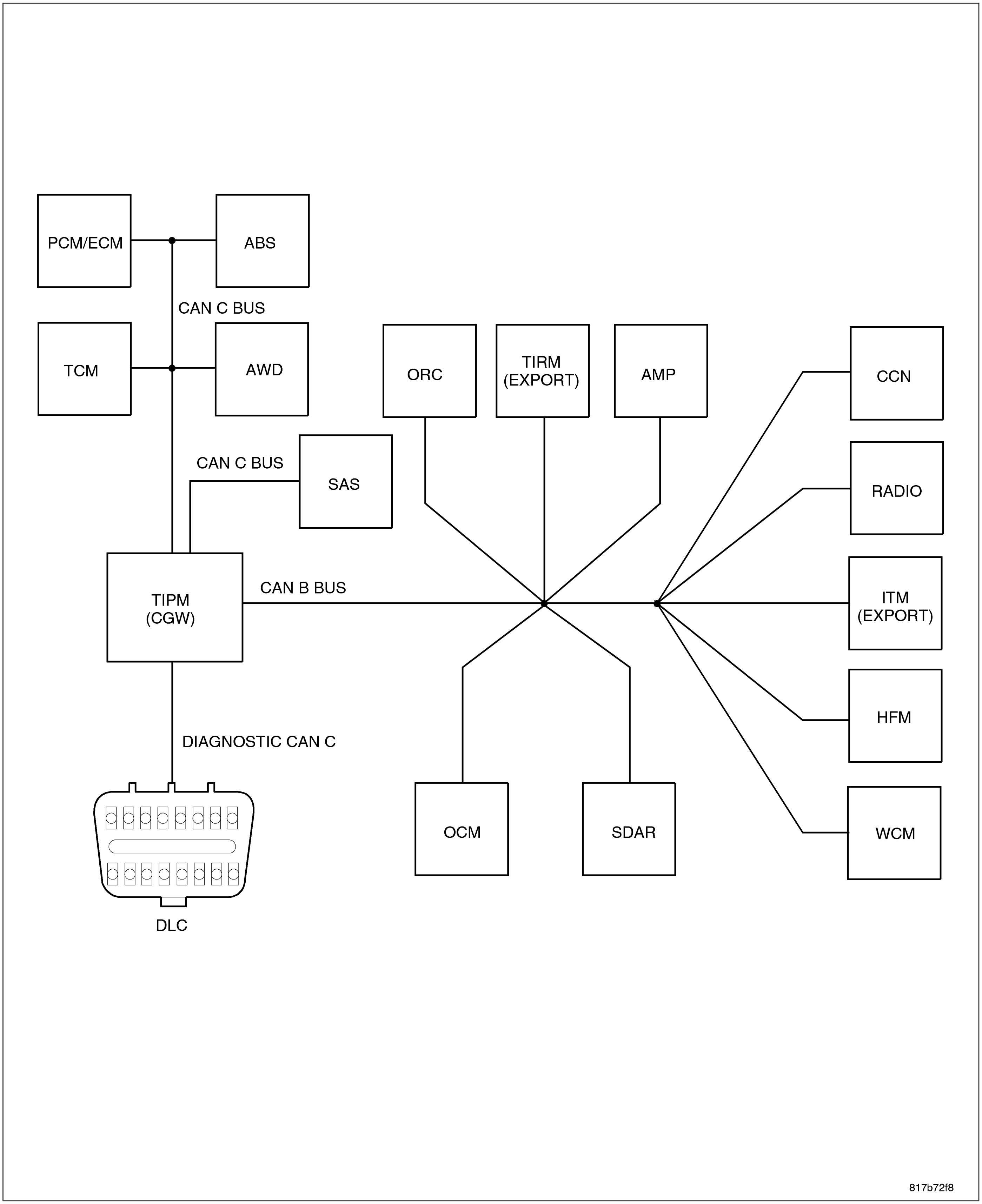
Yes >> Replace/update the TCM in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0114-LOST COMMUNICATION WITH FINAL DRIVE CONTROL MODULE (ALL WHEEL DRIVE CONTROL MODULE) (AWD)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the All Wheel Drive Control (AWD) Module for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
ALL WHEEL DRIVE CONTROL (AWD) MODULE POWER AND GROUND
ALL WHEEL DRIVE CONTROL (AWD) MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE AWD IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the AWD is active on the bus.

Is the AWD active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

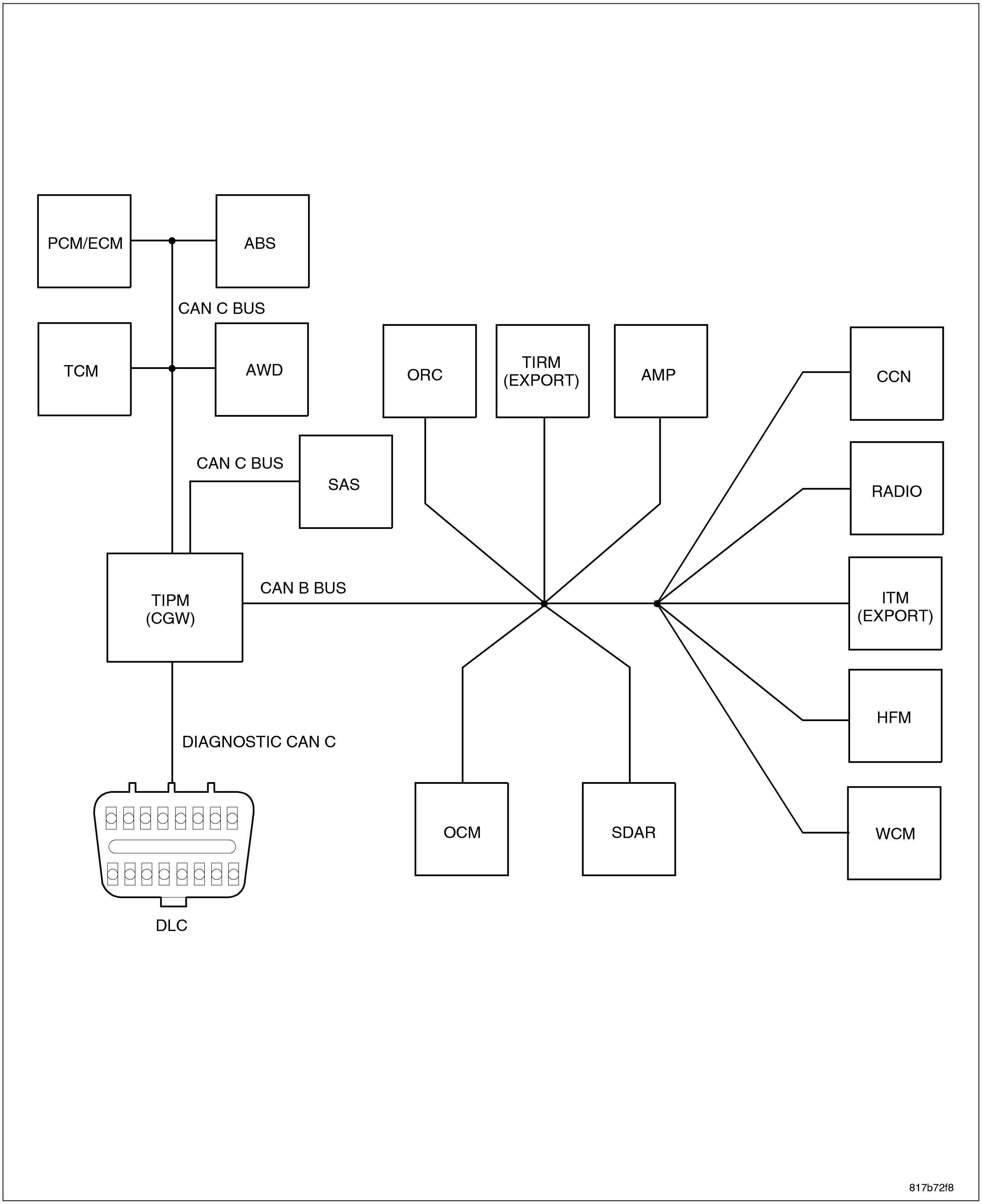
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the AWD?

Yes >> Replace/update the All Wheel Drive Control (AWD) Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0121-LOST COMMUNICATION WITH ANTILOCK BRAKE MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Antilock Brake Module for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
ANTILOCK BRAKE MODULE POWER AND GROUND
ANTILOCK BRAKE MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE ABS IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the ABS is active on the bus.

Is the ABS active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

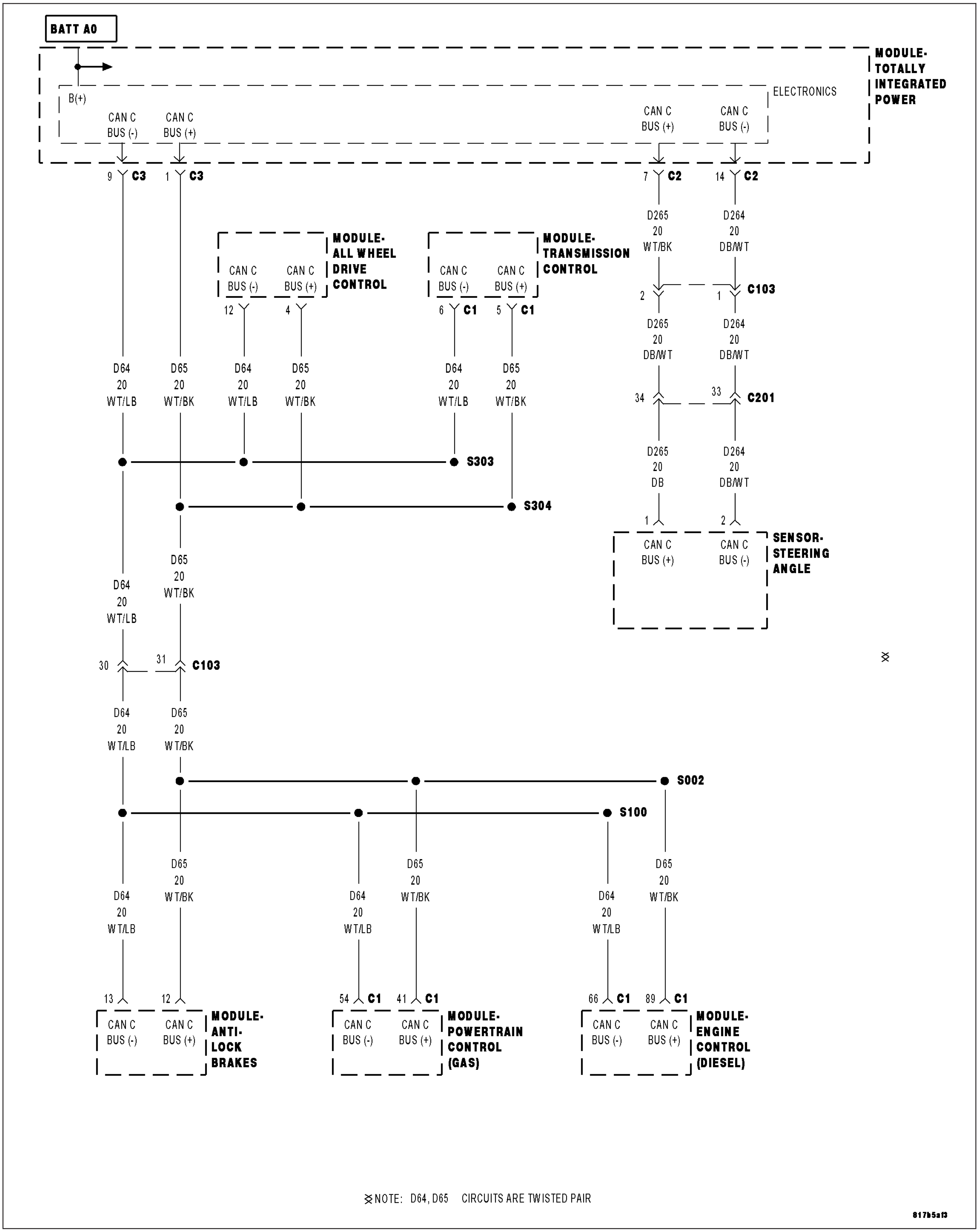
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the ABS?

Yes >> Replace/update the Antilock Brake Module in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0126-LOST COMMUNICATION WITH STEERING ANGLE SENSOR (SAS)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM configured correctly.
- **Set Condition:**
  Bus messages not received from the SAS (steering angle sensor) for approximately 500ms.

Possible Causes
CAN C BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
STEERING ANGLE SENSOR
STEERING ANGLE SENSOR POWER AND GROUND
TIPM NOT CONFIGURED CORRECTLY
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
Turn the ignition on.

With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all CAN C Bus modules.

NOTE: Check for CAN C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE SAS IS ACTIVE ON THE BUS

With the scan tool, select ECU View.

Verify that the SAS is active on the bus.

Is the SAS active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the SAS?

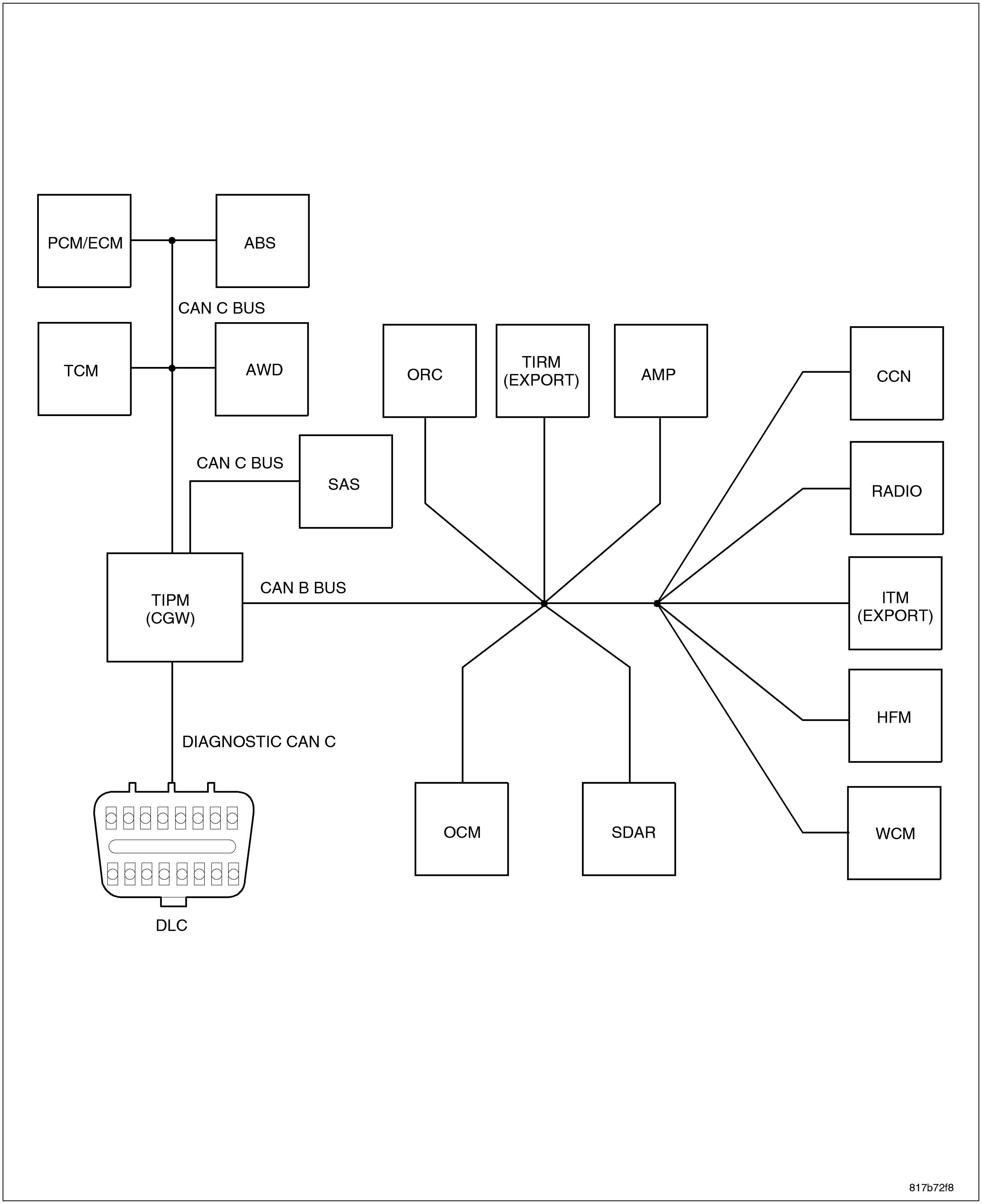
Yes >> Replace/update the Steering Angle Sensor (internal to the clockspring) in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE (TIPM - TOTALLY INTEGRATED POWER MODULE)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Front Control Module (on this vehicle, it is the Totally Integrated Power Module or TIPM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
TOTALLY INTEGRATED POWER MODULE POWER AND GROUND
TOTALLY INTEGRATED POWER MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE TIPM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the TIPM is active on the bus.

Is the TIPM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

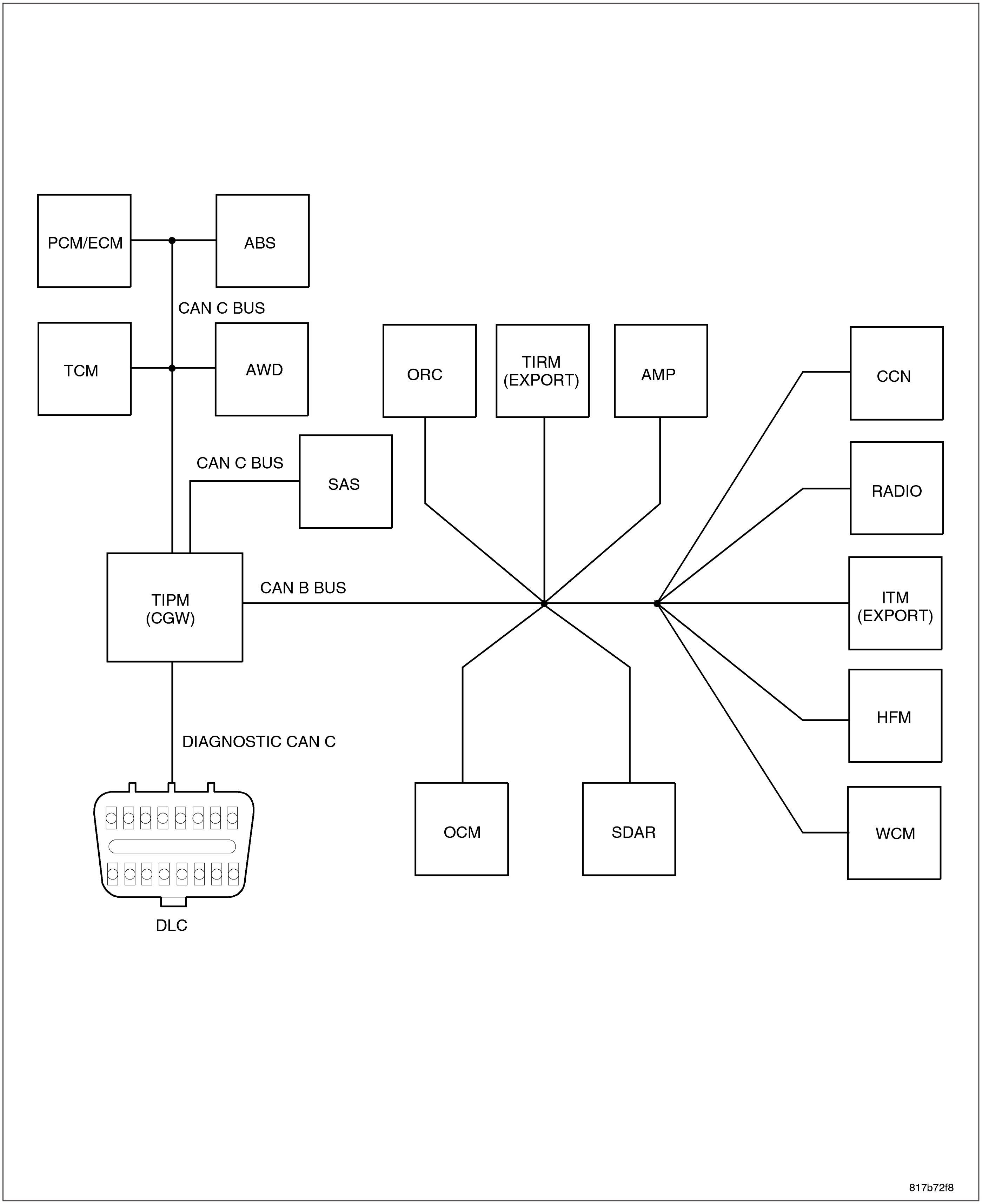
With the scan tool, select Network Diagnostics and select Advanced.

Is there more than one module with active DTC's "Logged Against" the TIPM?

Yes >> Replace/update the Totally Integrated Power Module (TIPM) in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information Perform the appropriate VERIFICATION TEST.

U0151–LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  Airbag fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Occupant Restraint Controller for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
AIRBAG FUSE NOT INSTALLED
OCCUPANT RESTRAINT CONTROLLER POWER AND GROUND
OCCUPANT RESTRAINT CONTROLLER
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read all active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE ORC IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the ORC is active on the bus.

Is the ORC active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

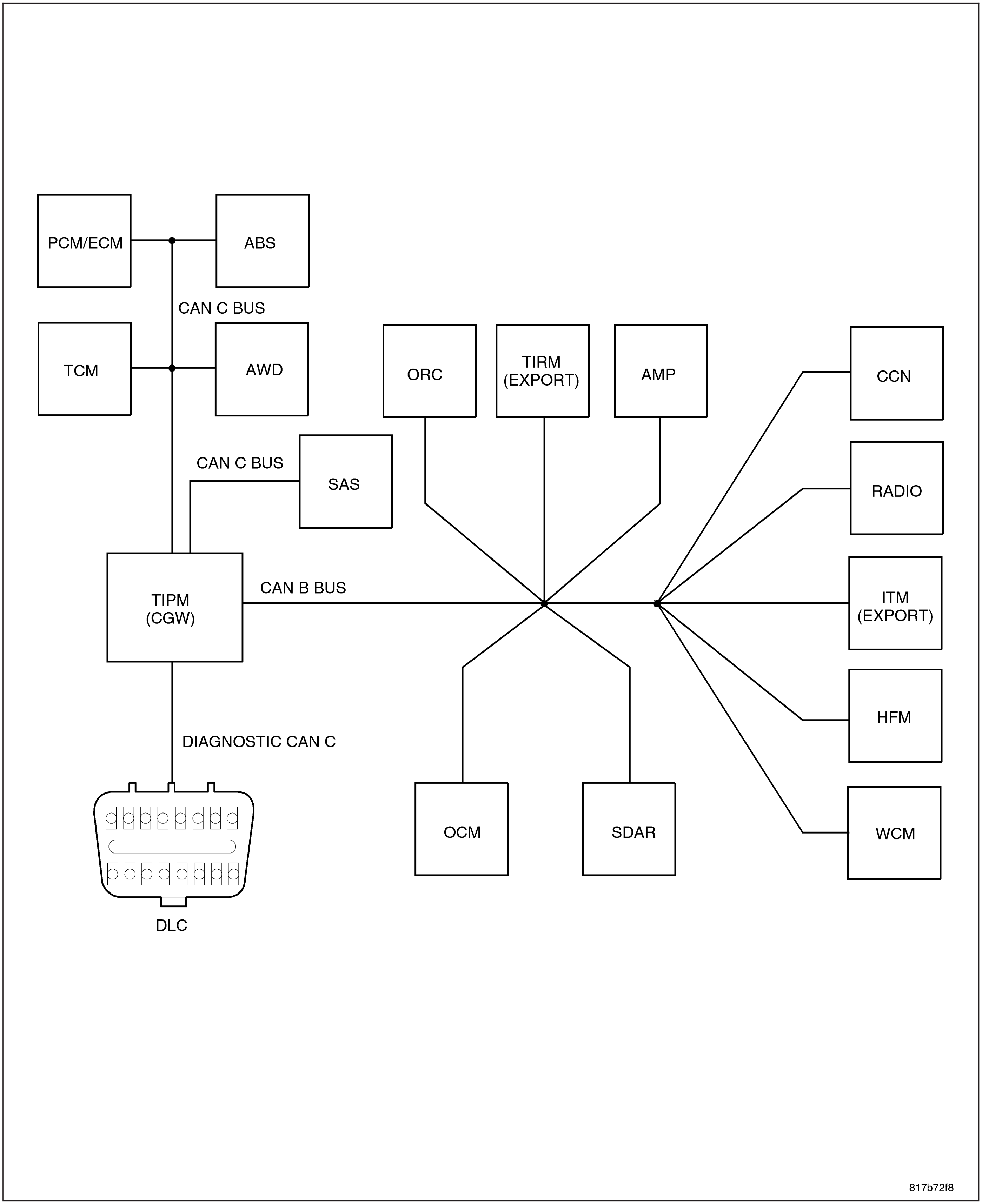
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the ORC?

Yes >> Replace/update the Occupant Restraint Controller in accordance with the service information. Perform the AIRBAG VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information Perform the appropriate VERIFICATION TEST.

U0154–LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (OCM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  Airbag fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Occupant Classification Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
AIRBAG FUSE NOT INSTALLED
OCCUPANT CLASSIFICATION MODULE POWER AND GROUND
OCCUPANT CLASSIFICATION MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE OCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the OCM is active on the bus.

Is the OCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

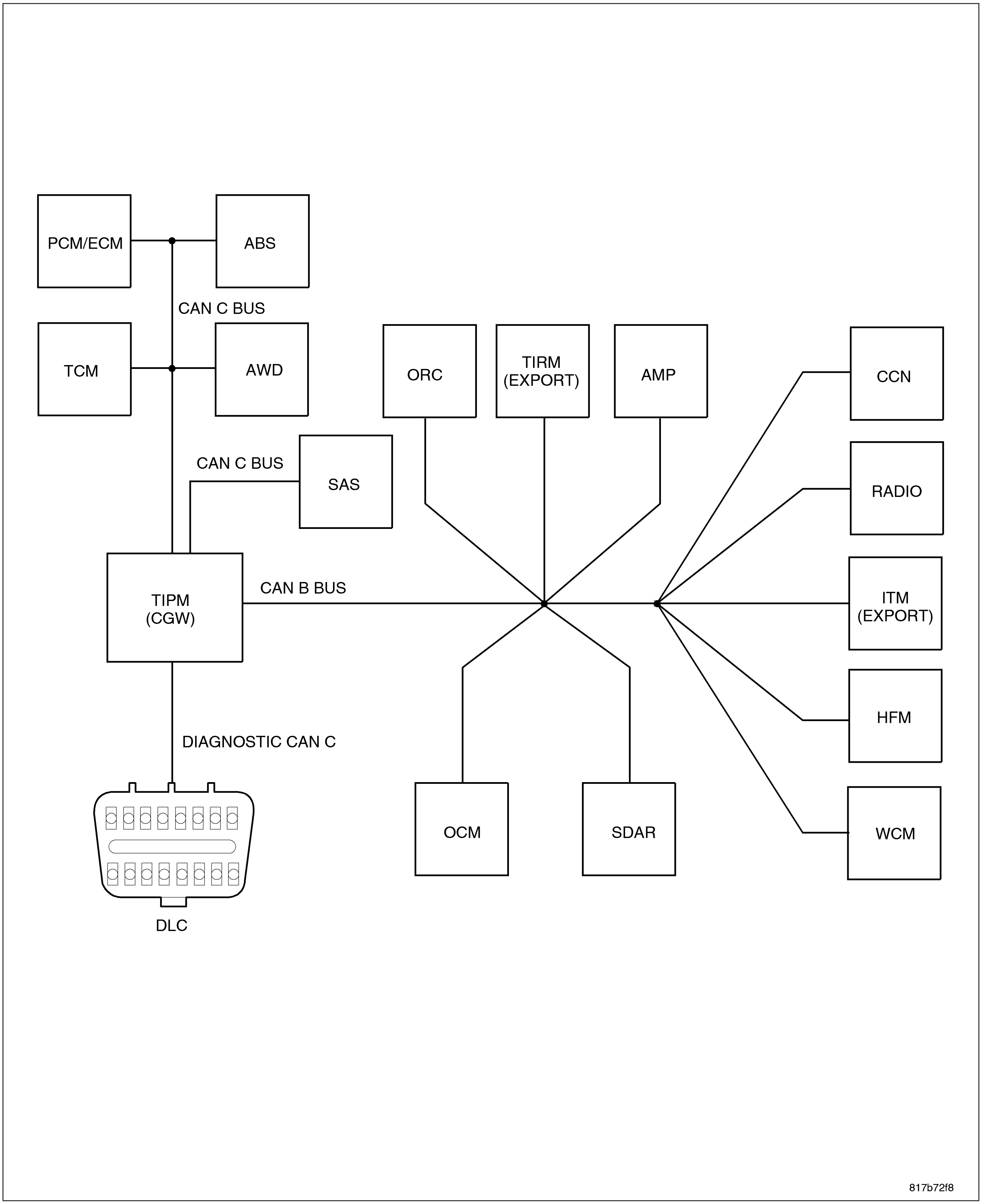
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the OCM?

Yes >> Replace/update the Occupant Classification Module in accordance with the service information. Perform the AIRBAG VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information Perform the appropriate VERIFICATION TEST.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
- **Set Condition:**
  Bus messages not received from the Cluster/CCN for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
CLUSTER/CCN
CLUSTER/CCN POWER AND GROUND
MODULE THAT SET THE DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. VERIFY THAT THE CCN IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the CCN is active on the bus.

Is the CCN active on the bus?

Yes >> Go To 4

No >> Refer to the Table of Contents located in this section for a no response test procedure.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the CCN?

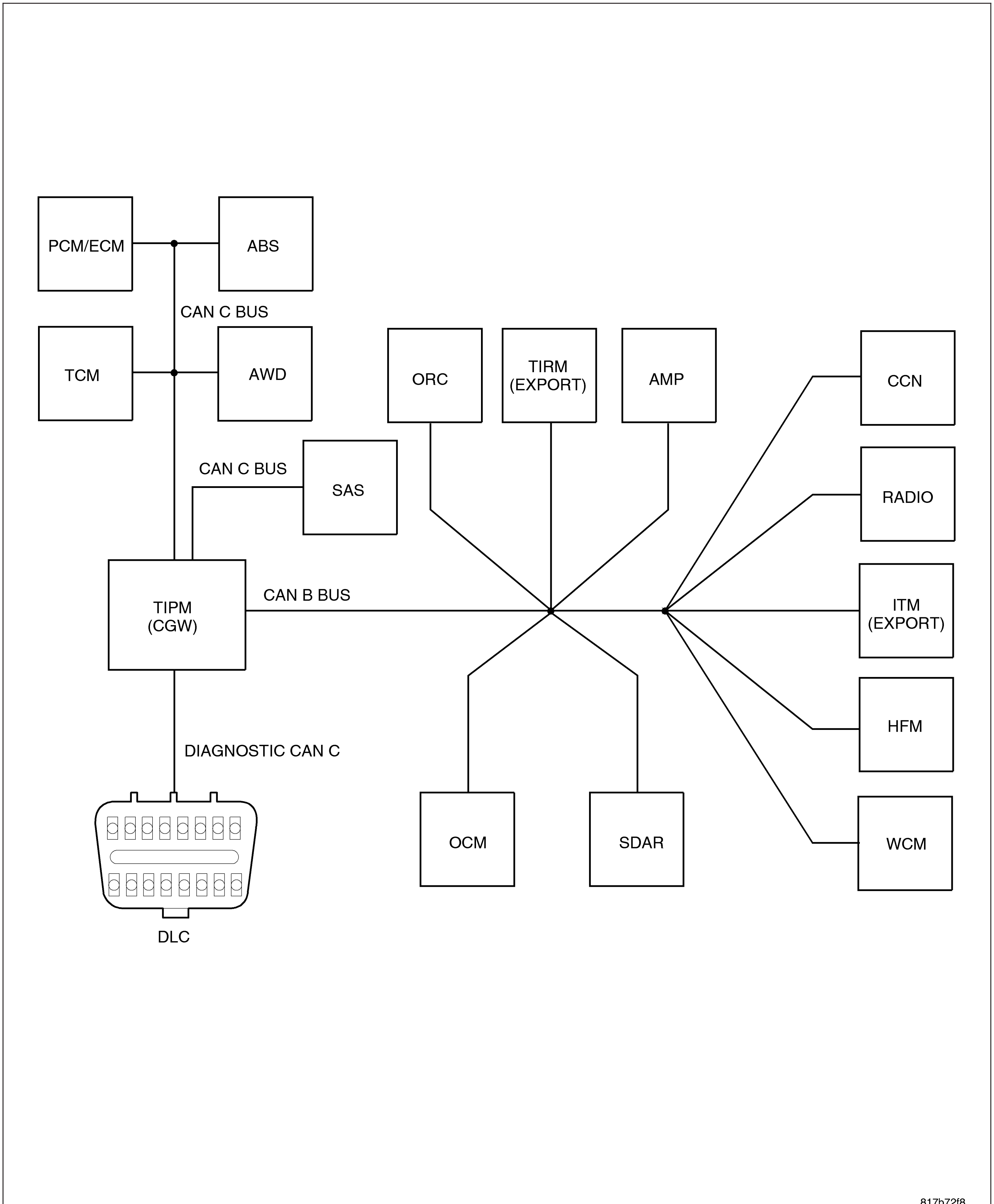
Yes >> Replace/update the Cluster (CCN) in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE (ITM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Intrusion Transceiver Control Module (ITM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
IOD FUSE NOT INSTALLED
INTRUSION TRANSCEIVER CONTROL MODULE POWER AND GROUND
INTRUSION TRANSCEIVER CONTROL MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE ITM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the ITM is active on the bus.

Is the ITM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

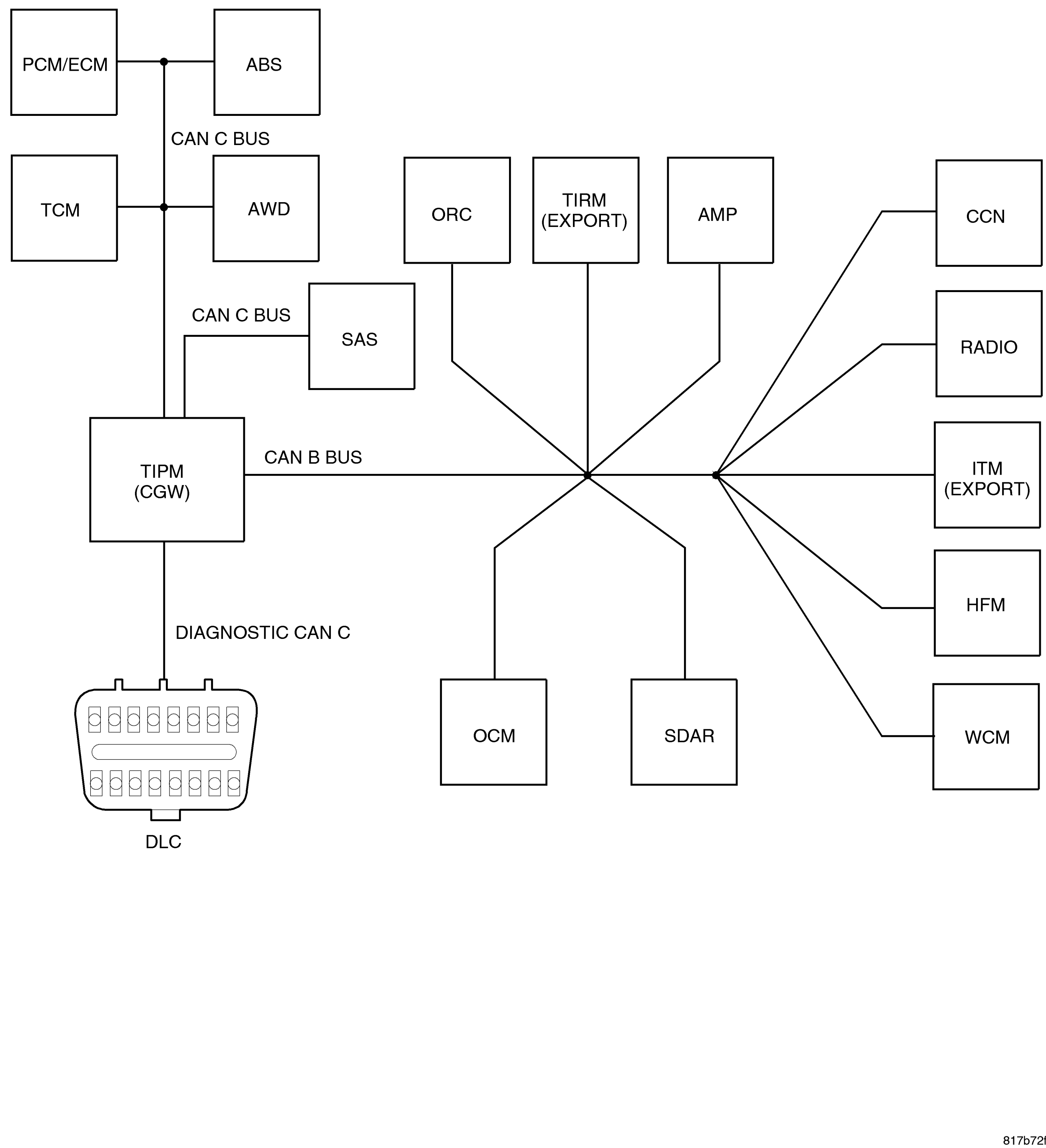
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the ITM?

Yes >> Replace/update the Intrusion Transceiver Control Module in accordance with the service information. Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set the DTC in accordance with the service information Perform the appropriate VERIFICATION TEST.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
- **Set Condition:**
  Bus messages not received from the Sentry Key Remote Entry Module (WCM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
SENTRY KEY REMOTE ENTRY MODULE POWER AND GROUND
SENTRY KEY REMOTE ENTRY MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE WCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the WCM is active on the bus.

Is the WCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

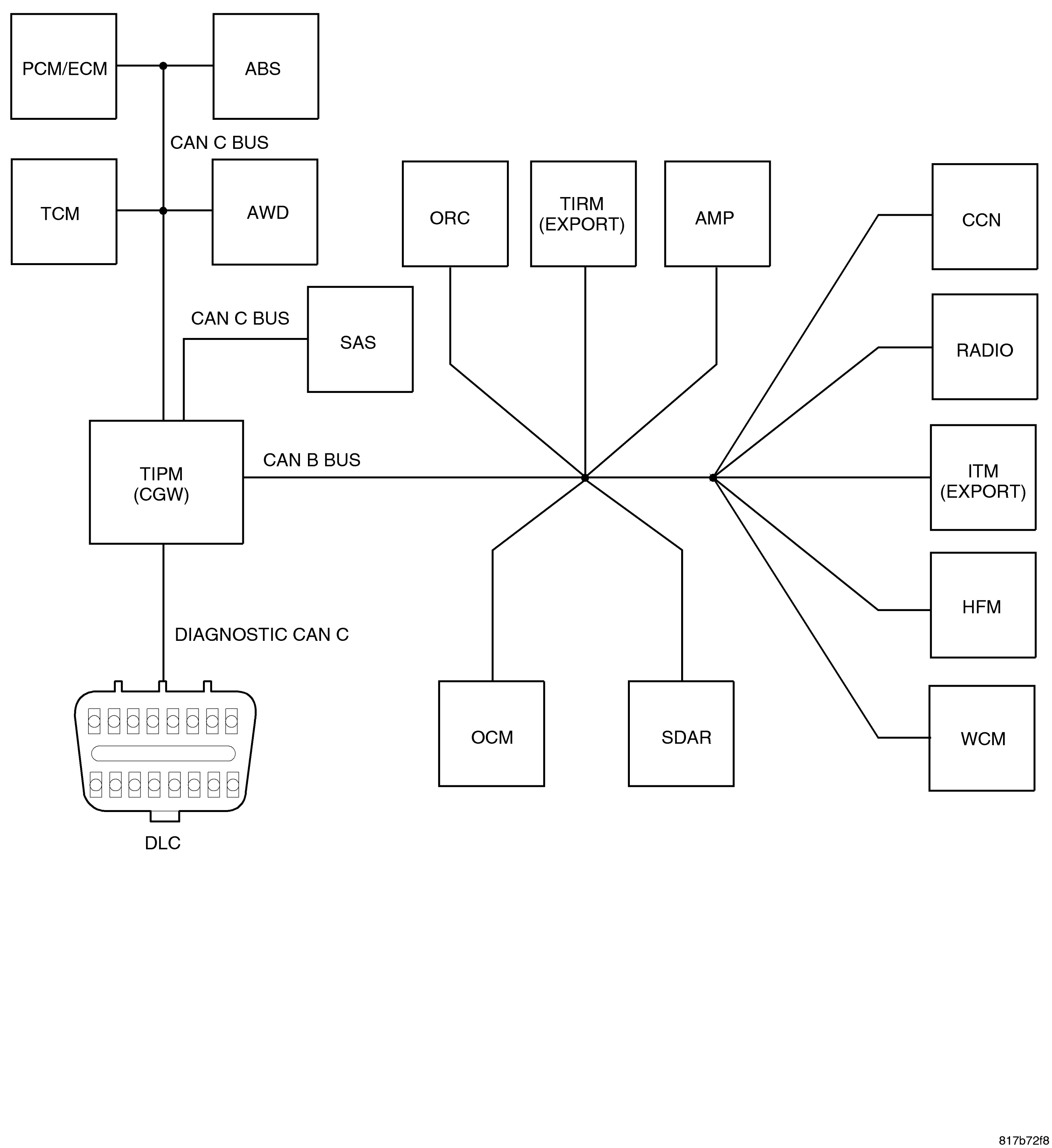
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the WCM?

Yes >> Replace/update the Sentry Key Remote Entry Module in accordance with the service information. Perform SKREEM VERIFICATION TEST

No >> Replace/update the module that set this DTC in accordance with the service information. Perform the appropriate VERIFICATION TEST.

U0184-LOST COMMUNICATION WITH RADIO



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Radio for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
RADIO POWER AND GROUND
RADIO
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE RADIO IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the Radio is active on the bus.

Is the Radio active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the Radio?

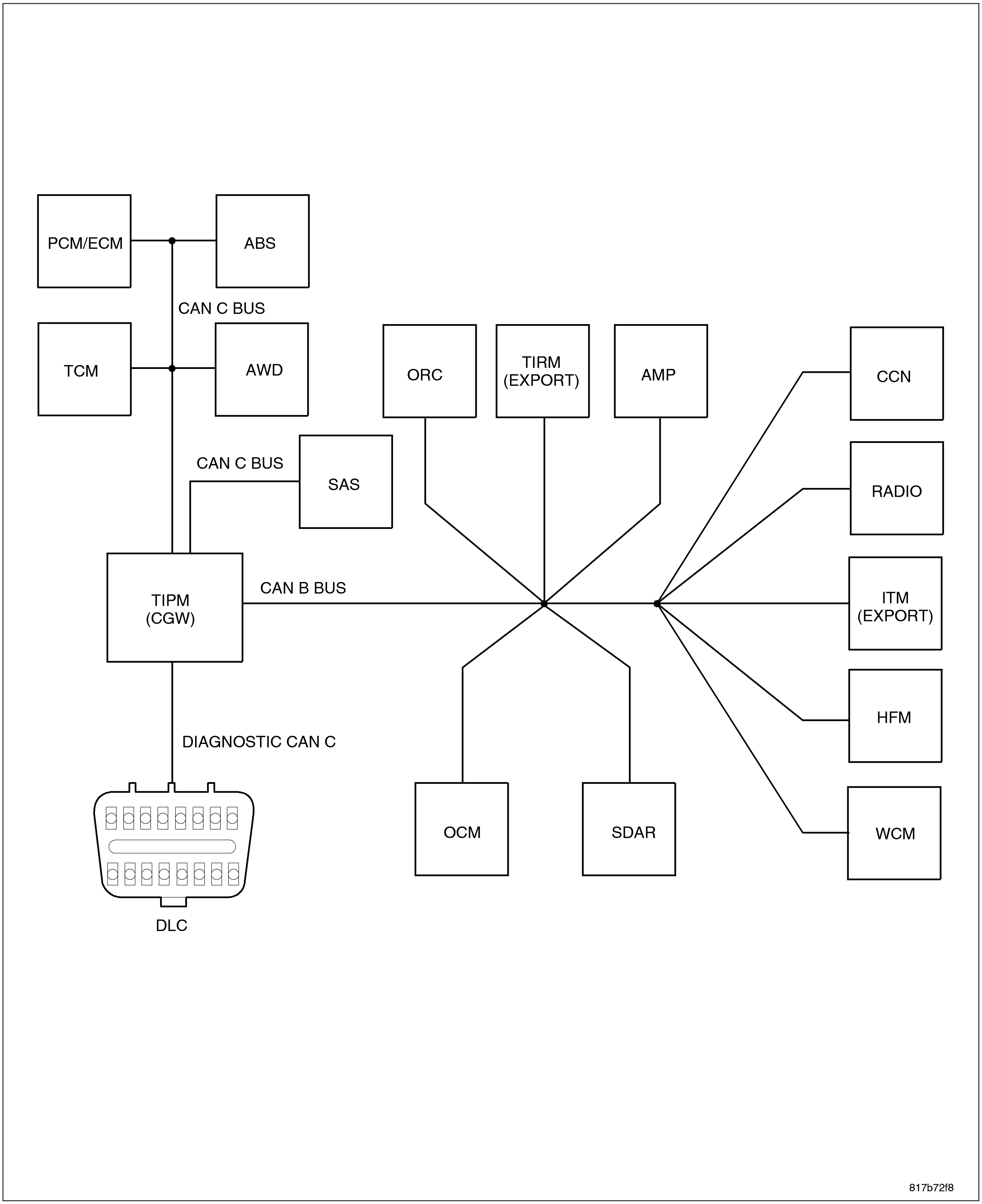
Yes >> Replace/update the Radio in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.

Perform the appropriate VERIFICATION TEST.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER (AMP)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Amplifier for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
AMPLIFIER POWER AND GROUND
AMPLIFIER
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE AMPLIFIER IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the Amplifier is active on the bus.

Is the Amplifier active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

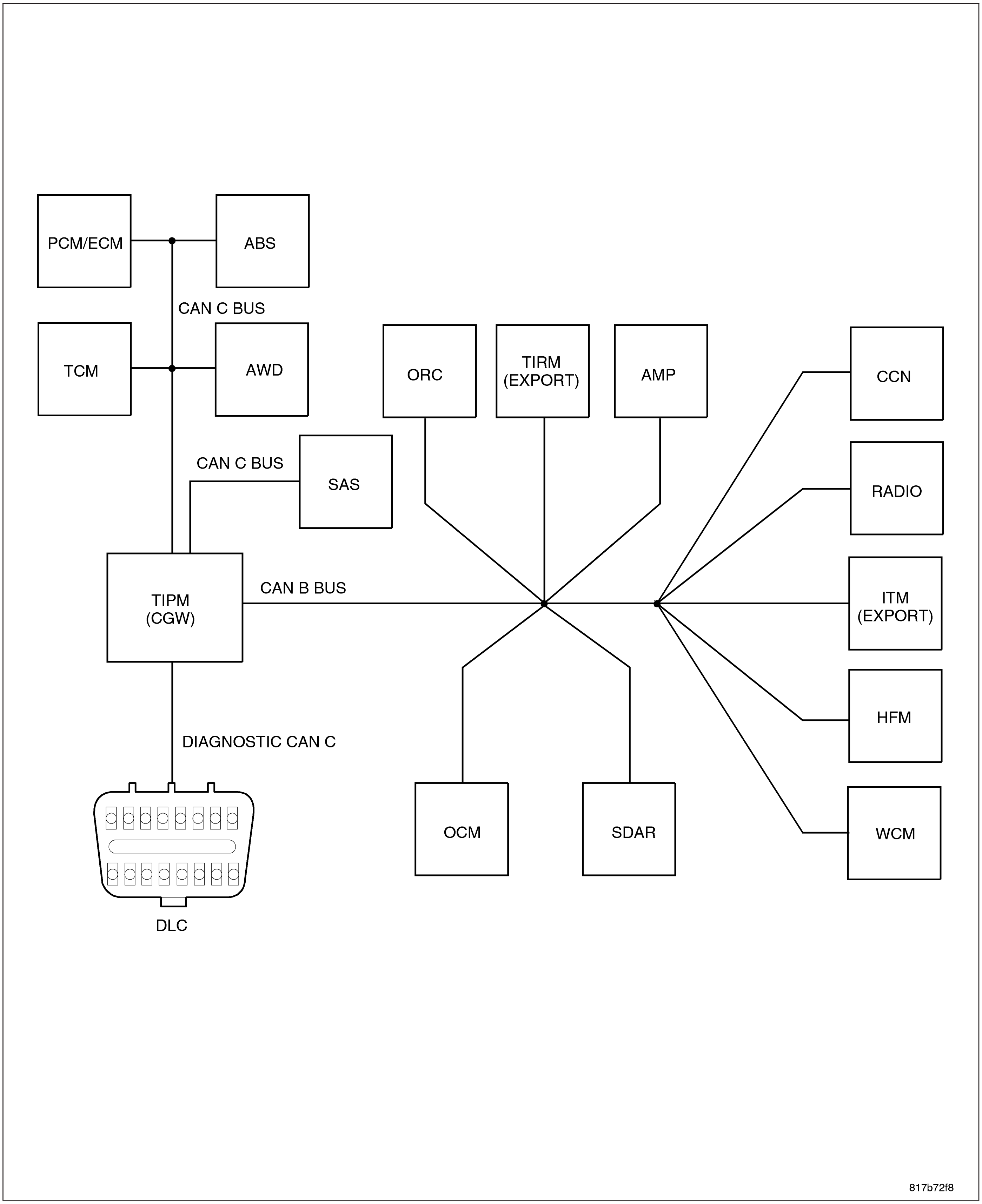
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the Amplifier?

Yes >> Replace/update the Amplifier in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

U0195-LOST COMMUNICATION WITH SDARS (SATELLITE RECEIVER)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the Satellite Receiver (SDAR) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
SATELLITE RECEIVER POWER AND GROUND
SATELLITE RECEIVER
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE SATELLITE RECEIVER IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the SDARS is active on the bus.

Is the SDARS active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

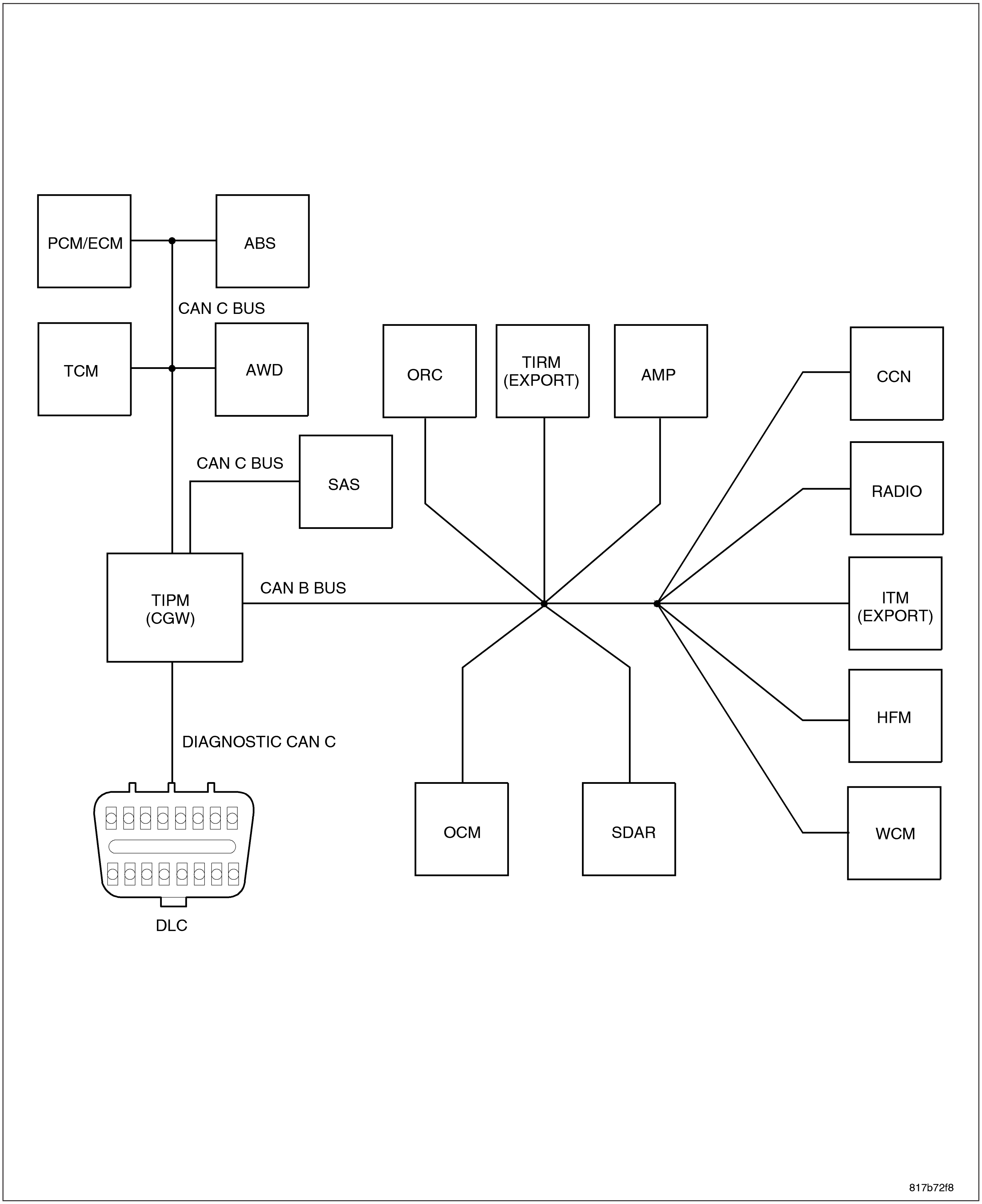
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the SDARS?

Yes >> Replace/update the Satellite Receiver in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set the DTC in accordance with the service information
Perform the appropriate VERIFICATION TEST.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (HFM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received from the HFM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTC'S RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
HANDS FREE MODULE POWER AND GROUND
HANDS FREE MODULE
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTC's.

Is this DTC active?

Yes >> Go To 2

No >> Perform the Stored Lost Communication test procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTC'S

With the scan tool, read active DTC's from all modules.

NOTE: Check for TIPM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTC's.

Does the scan tool display any active DTC's to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.

No >> Go To 3

3. VERIFY THAT THE HFM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select ECU View.

Verify that the HFM is active on the bus.

Is the HFM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTC'S

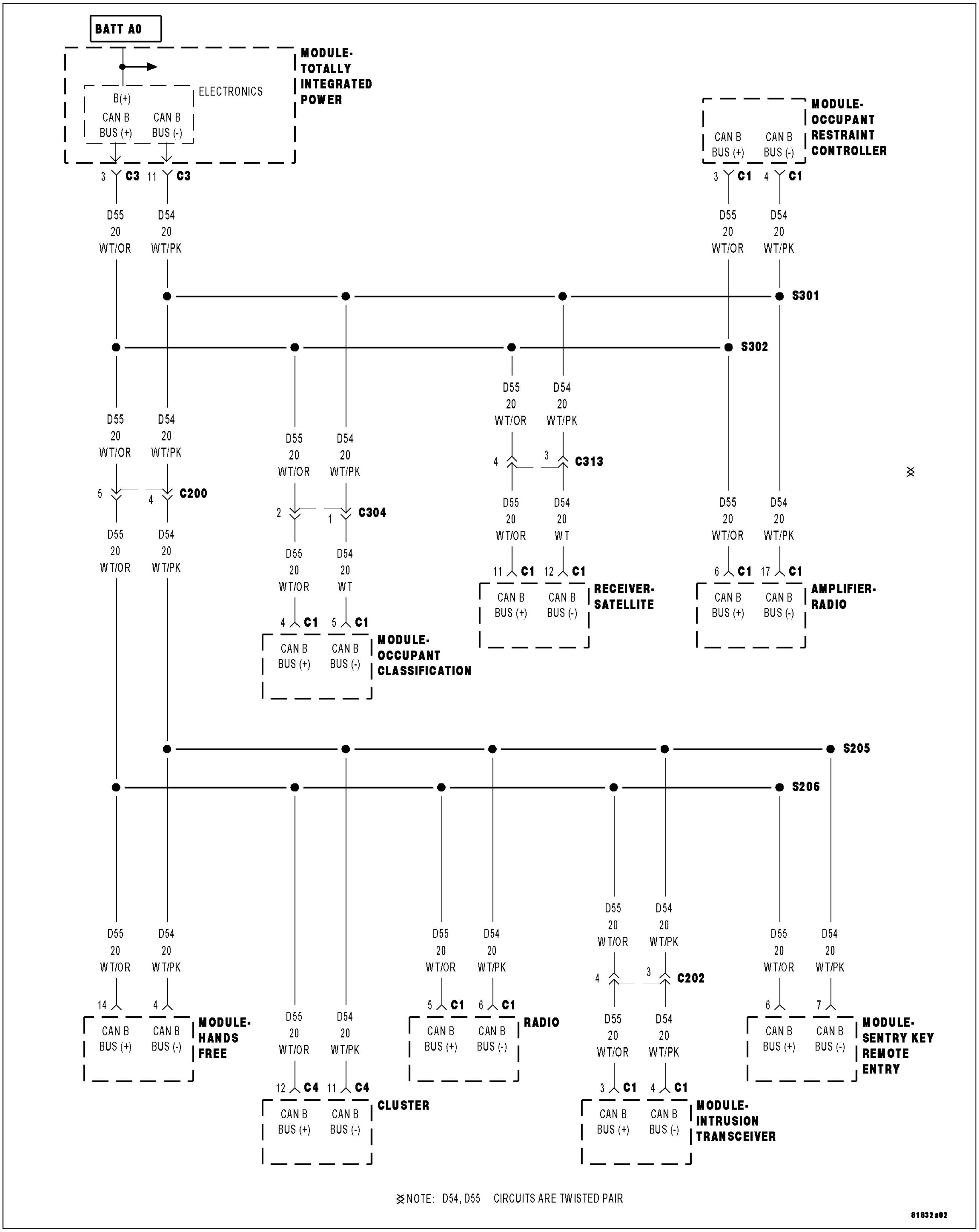
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTC's "Logged Against" the HFM?

Yes >> Replace/update the Hands Free Module in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

U1105-CAN B SIGNAL MISSING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the CAN B Bus messages are not received within 2 seconds.

Possible Causes
OTHER CAN B BUS DTC's SET IN TIPM
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK TIPM FOR U0019 DTC

With the scan tool, read TIPM active DTC's

Does the scan tool display U0019 CAN B BUS – ACTIVE?

Yes >> Refer to the table of contents in this section and perform the U0019 diagnostic procedure.

No >> Go To 3

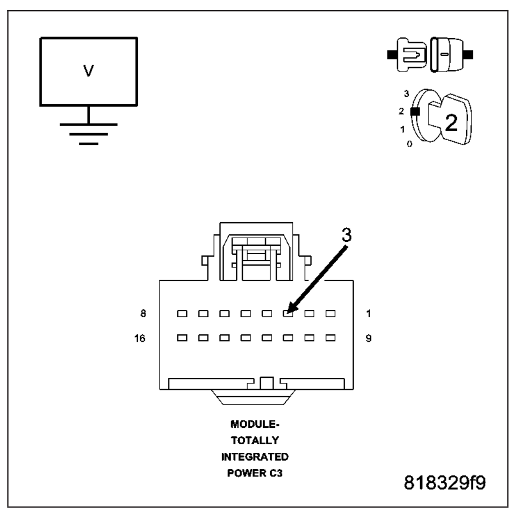
3. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Turn the ignition on.

Measure the voltage of the (D55) CAN B Bus (+) circuit.



Is any voltage present on this circuit?

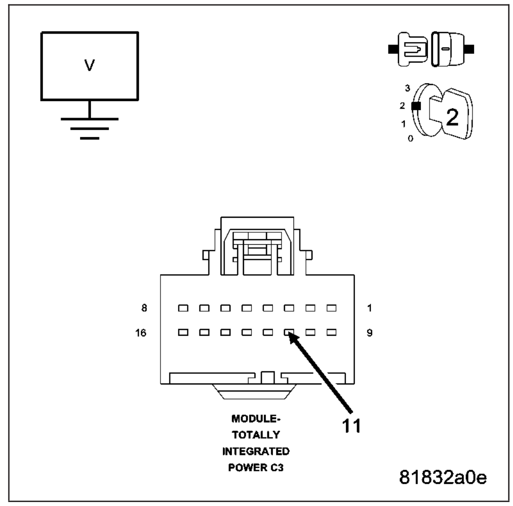
Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the voltage of the (D54) CAN B Bus (-) circuit.



Is any voltage present on this circuit?

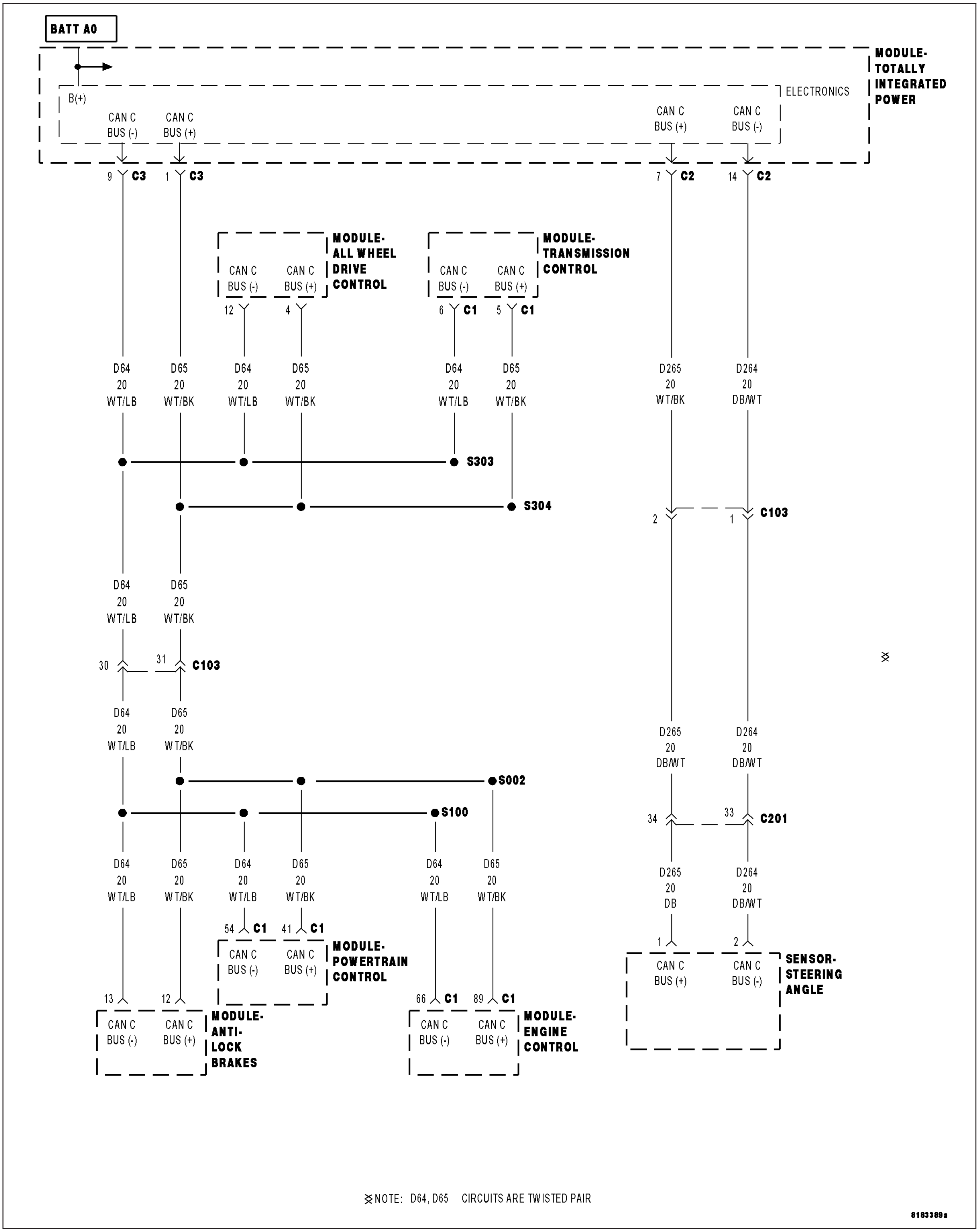
Yes >> Replace the TIPM in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D54) CAN B Bus (–) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U1106-CAN C SIGNAL MISSING



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND
(D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND
(D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT
ANTILOCK BRAKE MODULE
POWERTRAIN or ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE
ALL WHEEL DRIVE CONTROL MODULE
STEERING CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U1106–CAN C SIGNAL MISSING as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. ANTILOCK BRAKE MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U1106–CAN C SIGNAL MISSING as active?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.

Perform ABS VERIFICATION TEST — VER 1.

3. POWERTRAIN OR ENGINE CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Powertrain or Engine Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U1106–CAN C SIGNAL MISSING as active?

Yes >> Go To 4

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain or Engine Control Module in accordance with the service information.
Perform appropriate POWERTRAIN VERIFICATION TEST.

4. TRANSMISSION CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the Transmission Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U1106–CAN C SIGNAL MISSING as active?

Yes >> Go To 5

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Transmission Control Module in accordance with the service information.
Perform the appropriate TRANSMISSION VERIFICATION TEST.

5. ALL WHEEL DRIVE CONTROL (AWD) MODULE — INTERNAL SHORT

Turn the ignition off.

Disconnect the AWD Module harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U0001–CAN C BUS as active?

Yes >> Go To 6

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the All Wheel Drive Control (AWD) Module in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

6. STEERING CONTROL MODULE (SAS) — INTERNAL SHORT

Turn the ignition off.

Disconnect the Steering Control Module (SAS) harness connector.

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display U1106–CAN C SIGNAL MISSING as active?

Yes >> Go To 7

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Control Module (SAS) in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

7. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Turn the ignition on.

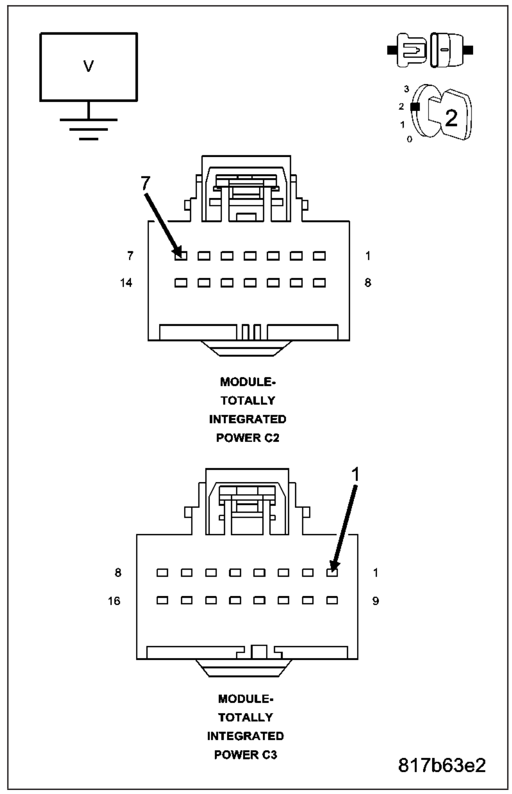
Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.

Is there any voltage present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.

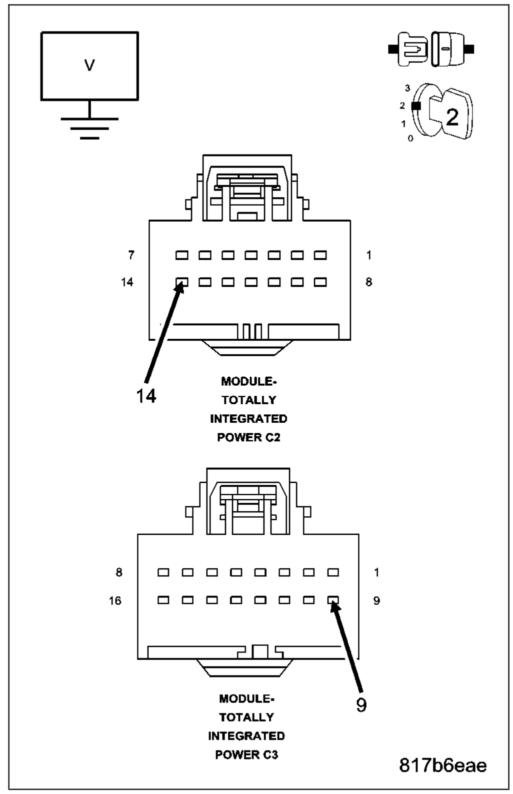
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 8



8. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.



Is there any voltage present?

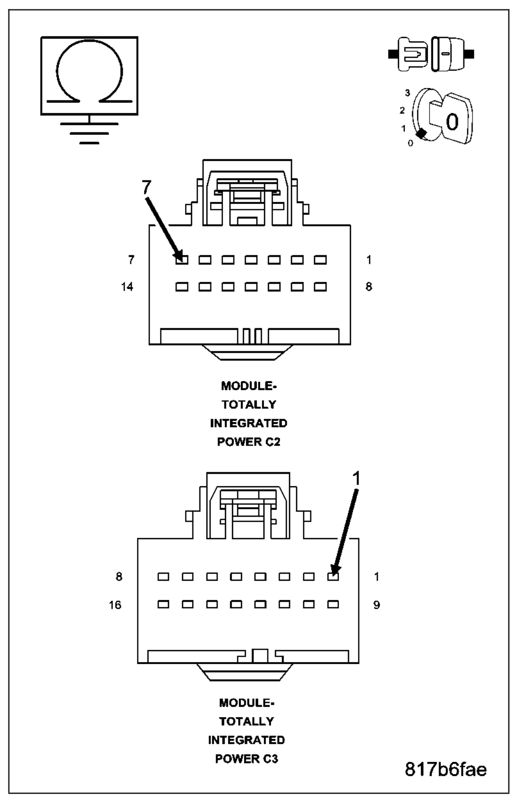
Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 9

9. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.



Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 10

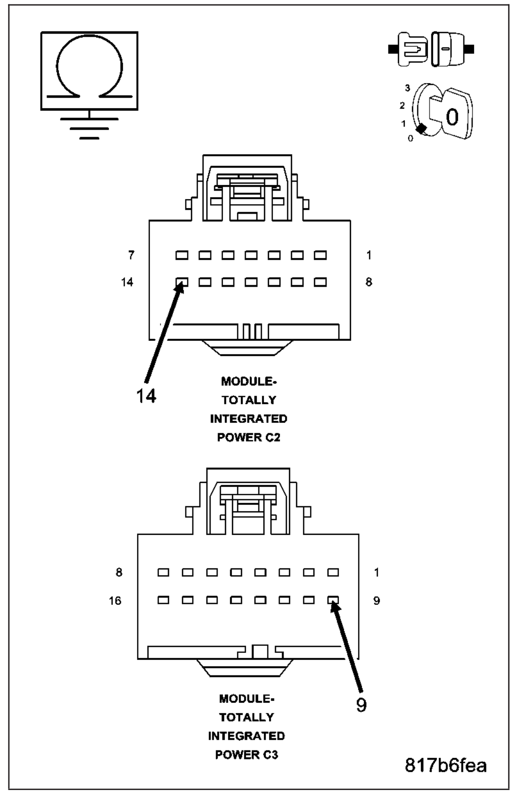
10. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

Is any resistance present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 11



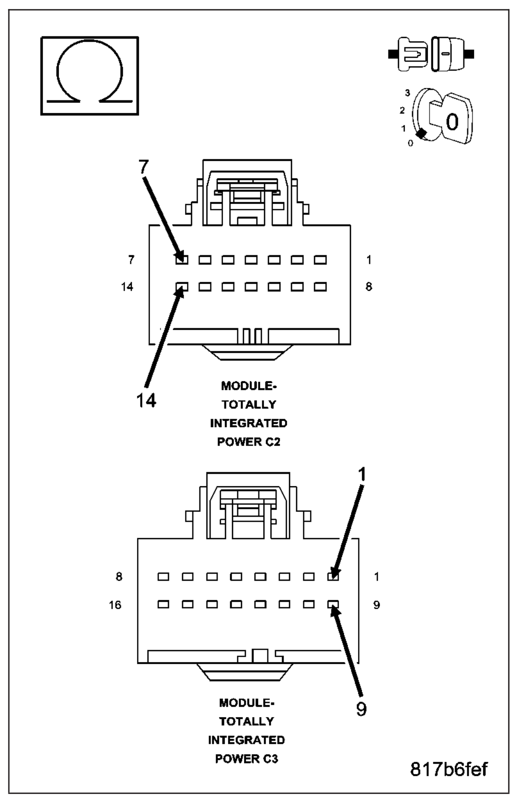
11. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

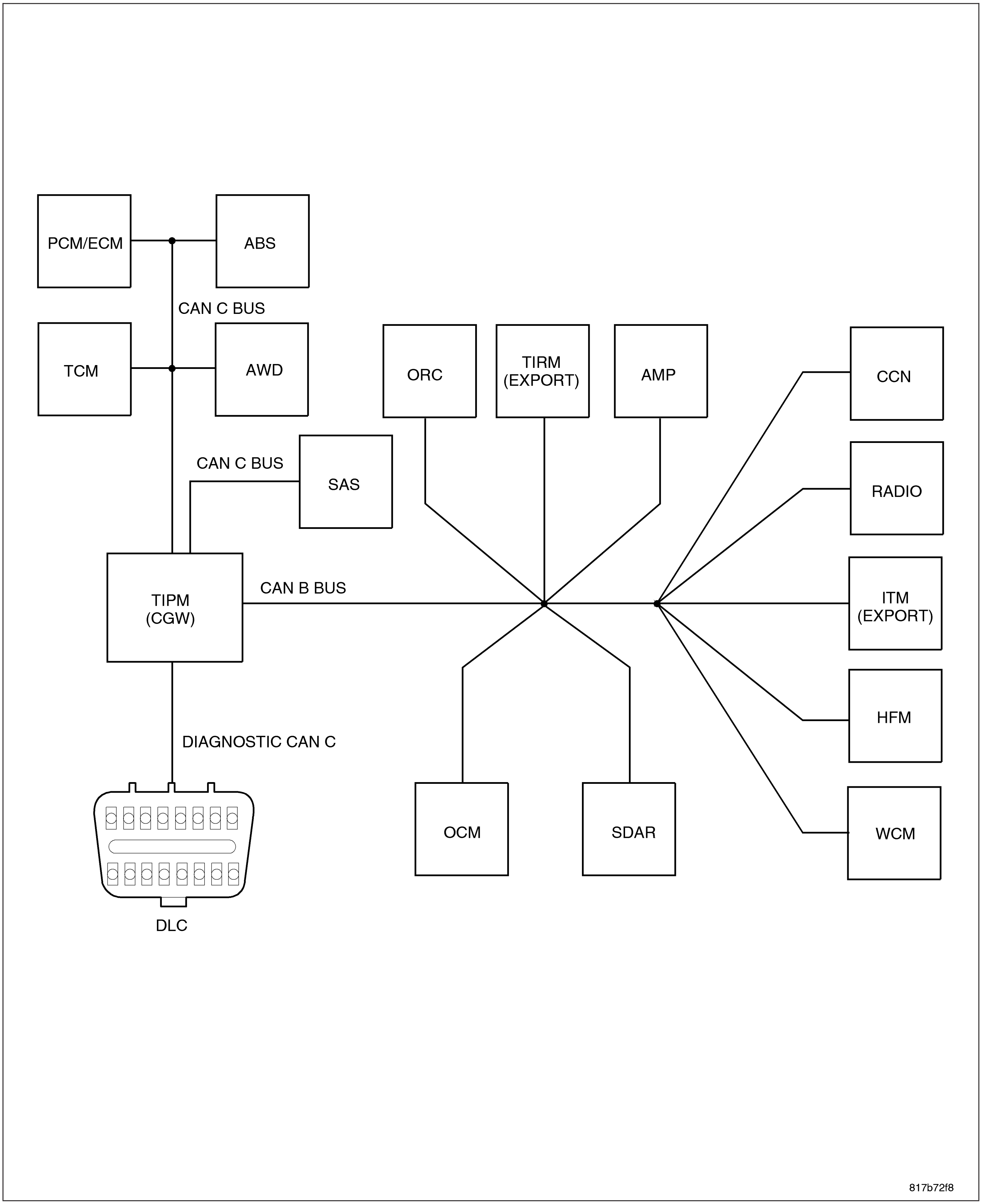
Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the TIPM in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



U1107-ECU IN SINGLE-WIRE MODE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects an open, a short high, a short low or a short together in either of the CAN B Bus circuits.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D55) CAN B BUS (+) CIRCUIT SHORTED TO (D54) CAN B BUS (-) CIRCUIT
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
ANY CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase TIPM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active TIPM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. ANY CAN B BUS MODULE— INTERNAL FAULT

Turn the ignition off.

With the scan tool, monitor the active TIPM DTC's.

While monitoring the scan tool, disconnect each CAN B Bus module one at a time.

NOTE: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on.

NOTE: This is to determine if the fault is internal within a module.

Check for this DTC to become active after disconnecting each CAN B Bus module the vehicle is equipped with.

NOTE: If the DTC becomes stored when a particular CAN B Bus module is disconnected, that module is causing the DTC to set.

With all the CAN B Bus modules disconnected did the TIPM still set this DTC as active?

Yes >> Go To 3

No >> Replace the module that when disconnected the DTC became stored.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE

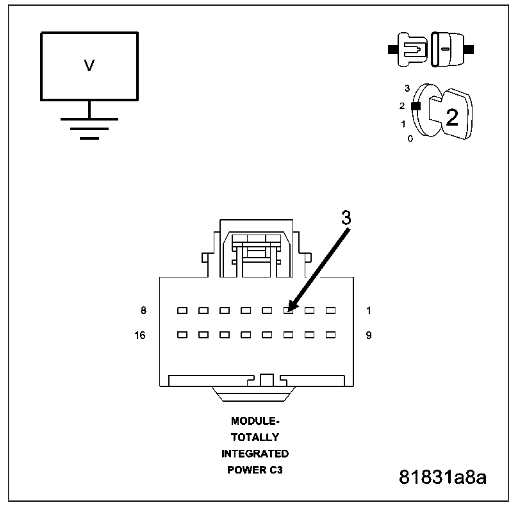
Turn the ignition off.

Disconnect the TIPM C3 harness connector.

NOTE: Ensure each CAN B Bus module is disconnected at this time.

Turn the ignition on.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is the voltage above 10.0 volts?

Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to voltage.

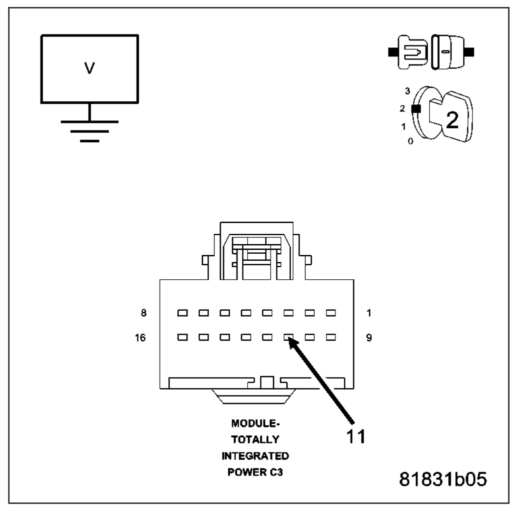
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE

NOTE: Ensure each CAN B Bus module is disconnected at this time.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



Is the voltage above 10.0 volts?

Yes >> Repair the (D54) CAN B Bus (-) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

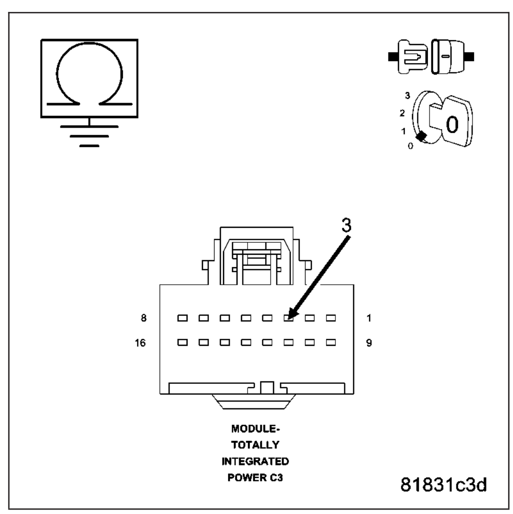
No >> Go To 5

5. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

NOTE: Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.



Is the resistance above 1000.0 ohms?

Yes >> Go To 6

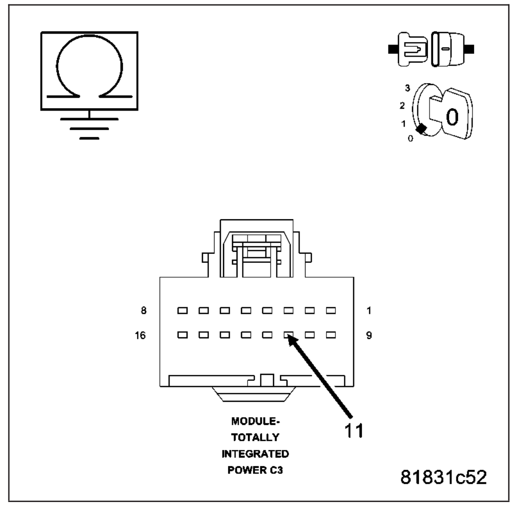
No >> Repair the (D55) CAN B Bus (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

6. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND

NOTE: Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.



Is the resistance above 1000.0 ohms?

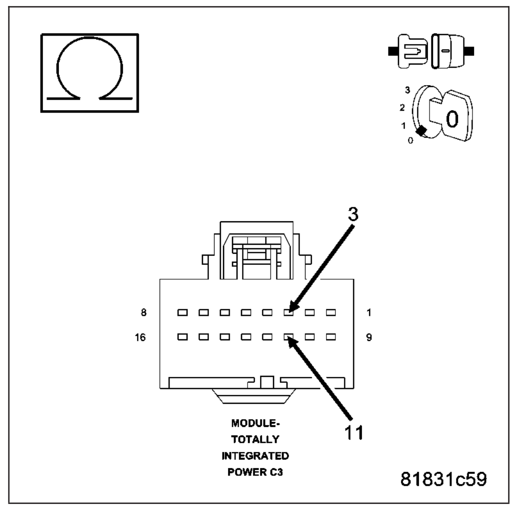
Yes >> Go To 7

No >> Repair the (D54) CAN B Bus (-) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

7. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.



NOTE: Ensure each CAN B Bus module is disconnected at this time.

Is any resistance present?

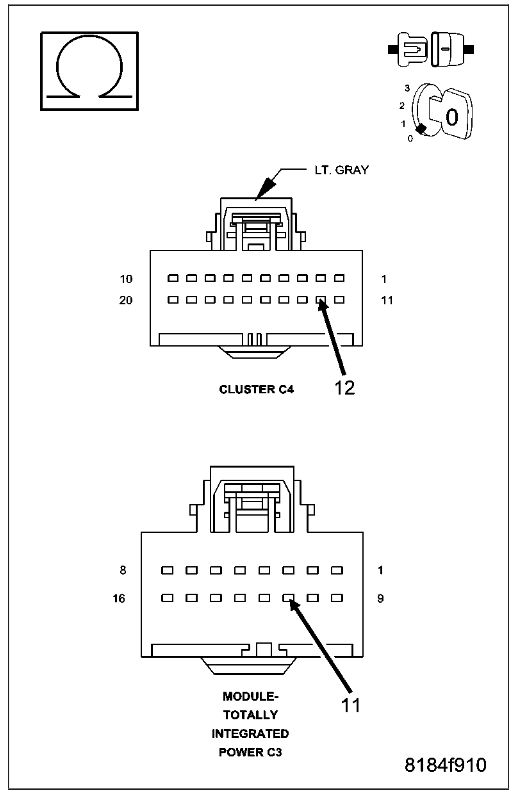
Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 8

8. (D55) CAN B BUS (+) CIRCUIT OPEN

Measure the resistance of the (D55) CAN B Bus (+) circuit between the TIPM C3 harness connector and the Cluster C4 harness connector.



Is the resistance above 10.0 ohms?

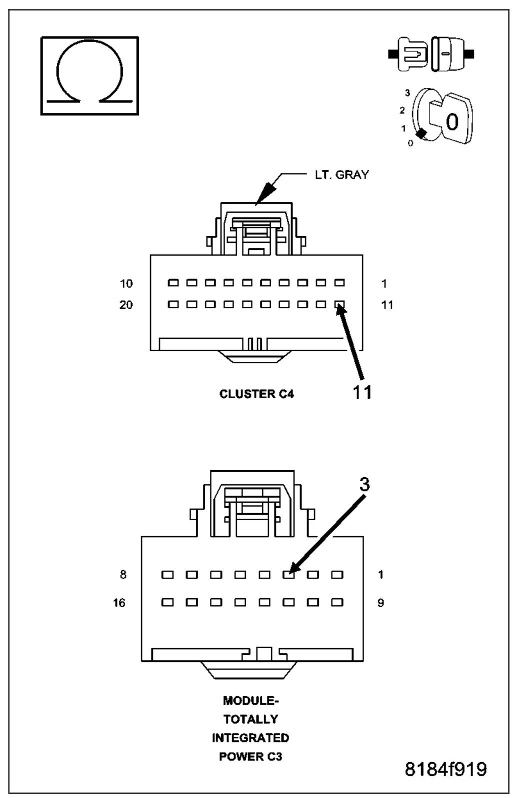
Yes >> Repair the (D55) CAN B Bus (+) circuit for an open or high resistance.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 9

9. (D54) CAN B BUS (-) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (-) circuit between the TIPM C3 harness connector and the Cluster C4 harness connector.



Is the resistance above 10.0 ohms?

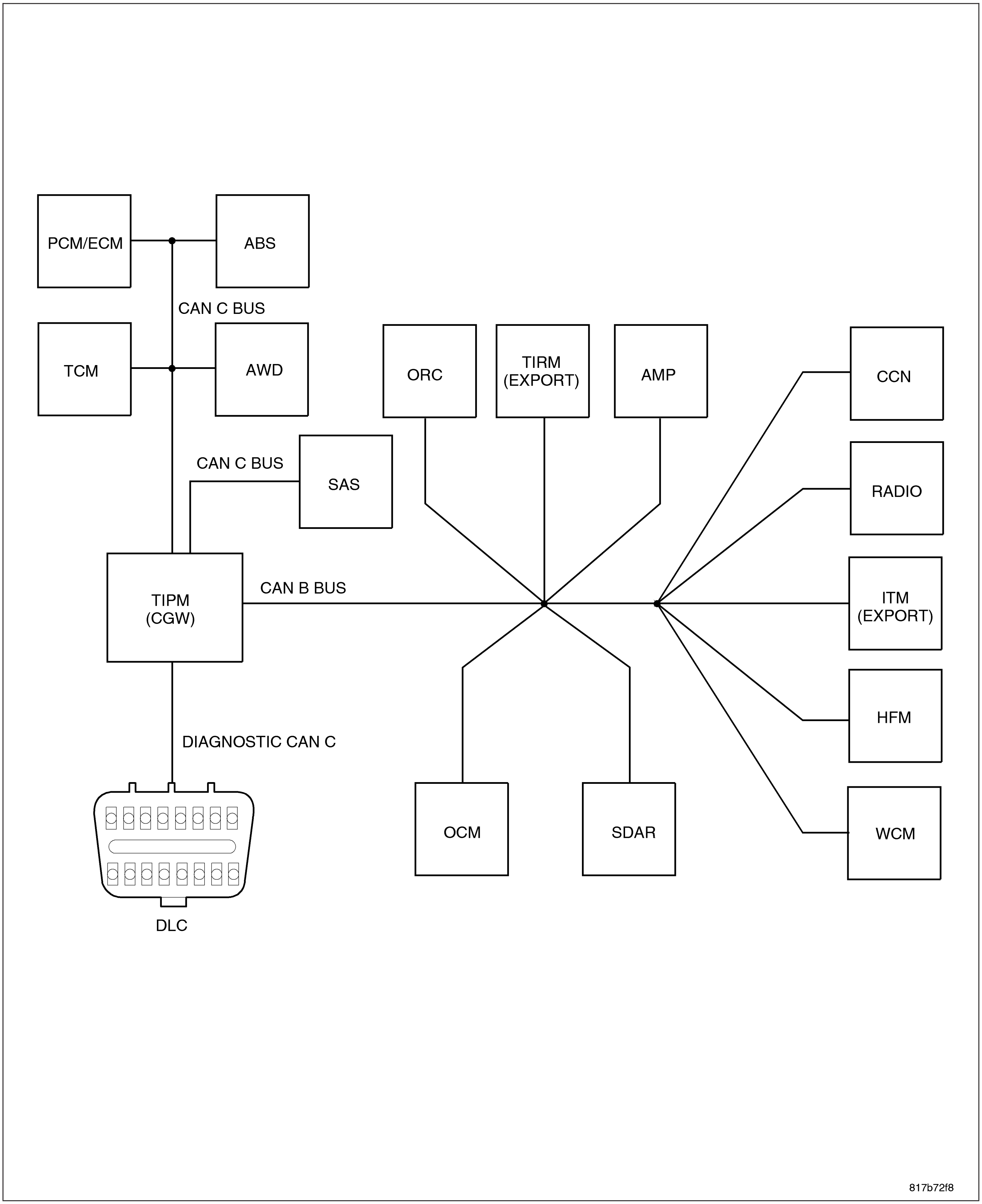
Yes >> Repair the (D54) CAN B Bus (-) circuit for an open or high resistance.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace and program the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U1108-ADDITIONAL CAN B ECU DETECTED



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Totally Integrated Power Module (TIPM) detects an additional CAN B module and requires a reconfiguration.

Possible Causes
ADDITIONAL MODULE ADDED/REMOVED FROM THE CAN B BUS NETWORK

Diagnostic Test

1. RECONFIGURE THE TOTALLY INTEGRATED POWER MODULE

Turn the ignition on.

With the scan tool, select network view and press the gateway button. This will list the CAN modules on the vehicle. Read and record the listed modules.

With the scan tool, select TIPM, miscellaneous functions then add/remove ECUs.

With the scan tool, add or remove the module that was not configured in the TIPM.

With the scan tool, erase DTC's.

Cycle the ignition from on to off 3 times and read the active TIPM DTC's.

Does the scan tool display this DTC as active?

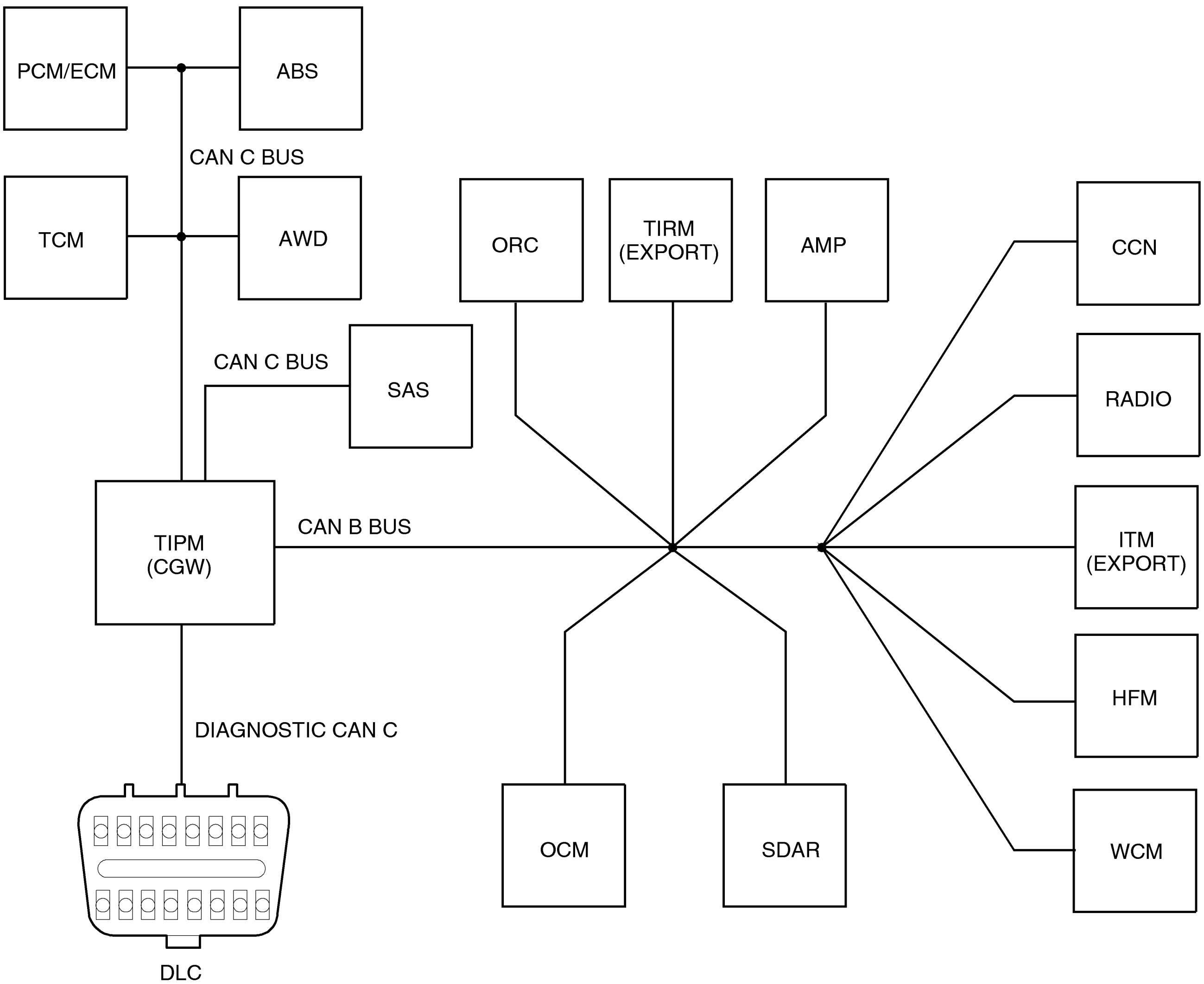
Yes >> Retest system and attempt to reconfigure the TIPM.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*STORED LOST COMMUNICATION DTC'S



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
POWER OR GROUND FROM THE REPORTING MODULE
MODULE THAT SET THIS DTC
PREVIOUS SERVICE PERFORMED WITHIN THE LAST 100 KEY CYCLES (FUSE/RELAYS REMOVED, WIRING SERVICE, BATTERY DISCONNECT)
LOW BATTERY/JUMP START CONDITION
IOD FUSE WAS REMOVED DURING SHIPPING
CHECK FOR RELATED TSB'S

Diagnostic Test

1. VERIFY DTC IS STORED

NOTE: Stored faults may indicate a customer perceived intermittent condition.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read stored DTC's.

Is this DTC stored?

Yes >> Go To 2

No >> Diagnose the active DTC. Refer to the Table of Contents for a list of the symptoms.

2. CHECK THE ENVIRONMENTAL DATA

With the scan tool, read the loss of communication environmental data.

Does the loss of communication environmental odometer data match up to any of the previous service procedures listed in the possible causes or are their any stored CAN B or C hardware electrical, battery, ignition voltage, VIN missing/mismatch, TIPM configuration DTC's present with matching environmental data?

Yes >> These DTC's may have been the result of other service procedures performed. Clear DTC's.

No >> Go To 3

3. VERIFY INTERMITTENT LOST COMMUNICATION DTC – WIRING CONCERNS

Turn the ignition on.

With the scan tool, select Network View and select Advanced.

Is there more than one ECU with stored DTC's "Logged Against" the module and one or more lost communication DTC's stored in the offending module?

Yes >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

No >> Go To 4

4. VERIFY INTERMITTENT LOST COMMUNICATION DTC – OFFENDING MODULE

Turn the ignition on.

With the scan tool, select Network View and select Advanced.

Is there more than one ECU with stored DTC's "Logged Against" the module and NO lost communication DTC's stored in the offending module?

Yes >> Check for TSB related to this offending module.

No >> Go To 5

5. VERIFY INTERMITTENT LOST COMMUNICATION DTC – REPORTING MODULE

Turn the ignition on.

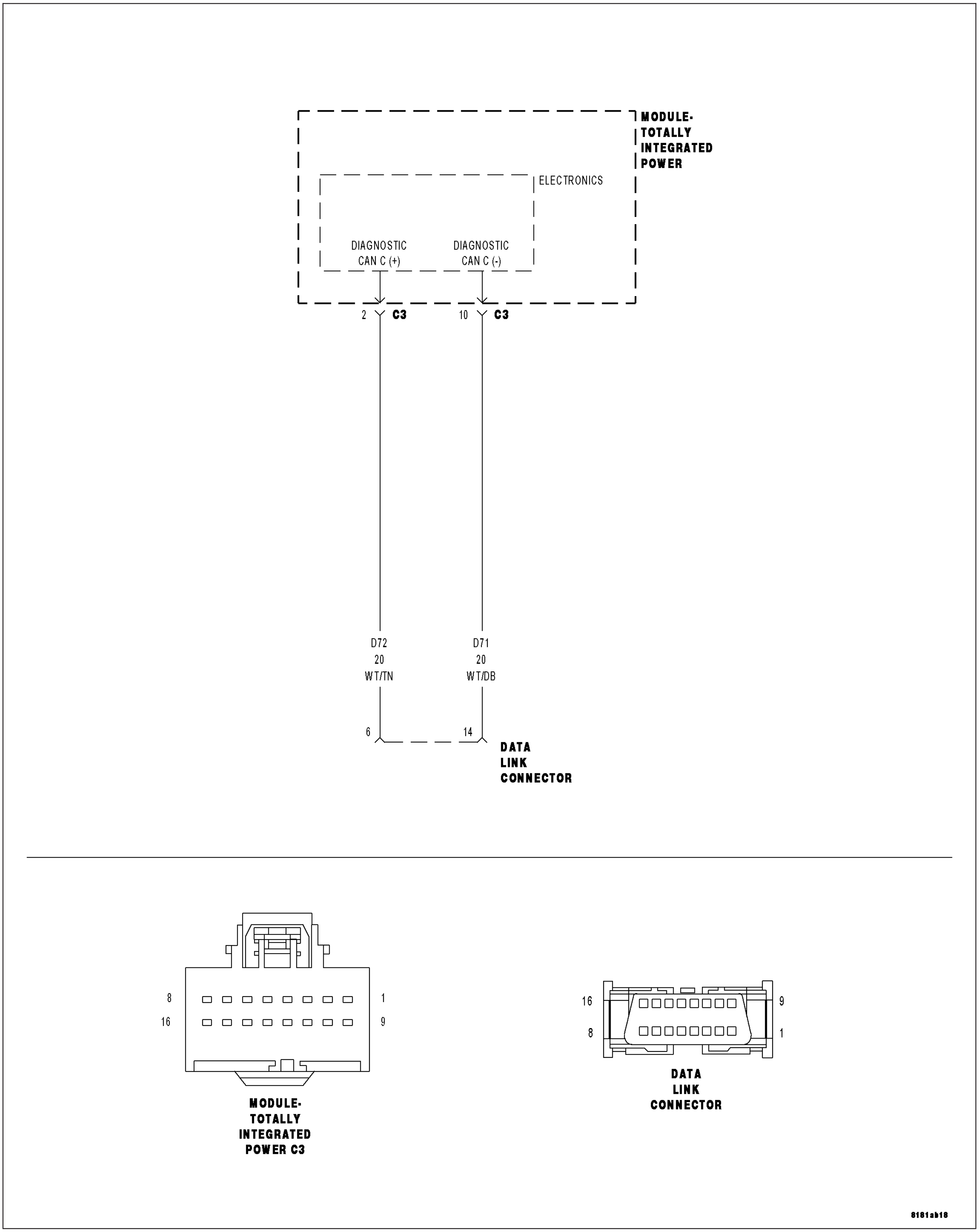
With the scan tool, select Network View and select Advanced.

Is there ONLY ONE ECU with stored DTC's "Logged Against" the module?

Yes >> Check for TSB related to the module that set this DTC.

No >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

*DIAGNOSTIC CAN C (+) AND/OR DIAGNOSTIC CAN C (-) CIRCUITS HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected a shorted high condition on either or both Diagnostic CAN C circuits.

Possible Causes
(D72) DIAGNOSTIC CAN C (+) CIRCUIT SHORTED TO VOLTAGE
(D71) DIAGNOSTIC CAN C (-) CIRCUIT SHORTED TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. DIAGNOSTIC CAN C CIRCUITS SHORTED TO VOLTAGE

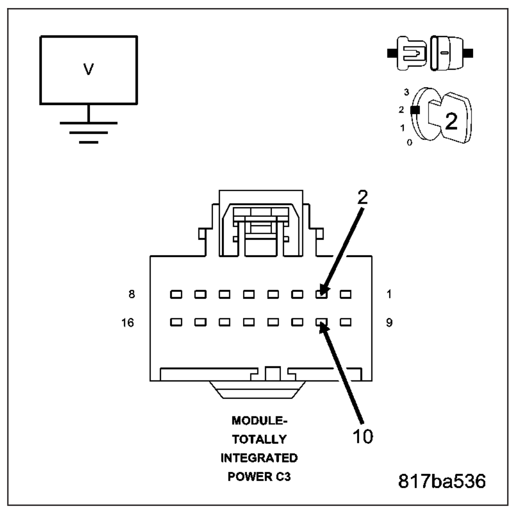
Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) C3 harness connector.

Disconnect the scan tool from the DLC.

Turn the ignition on.

Measure the voltage of the Diagnostic CAN C circuits at the TIPM C3 harness connector.



Is the voltage above 6.0 volts on either circuit?

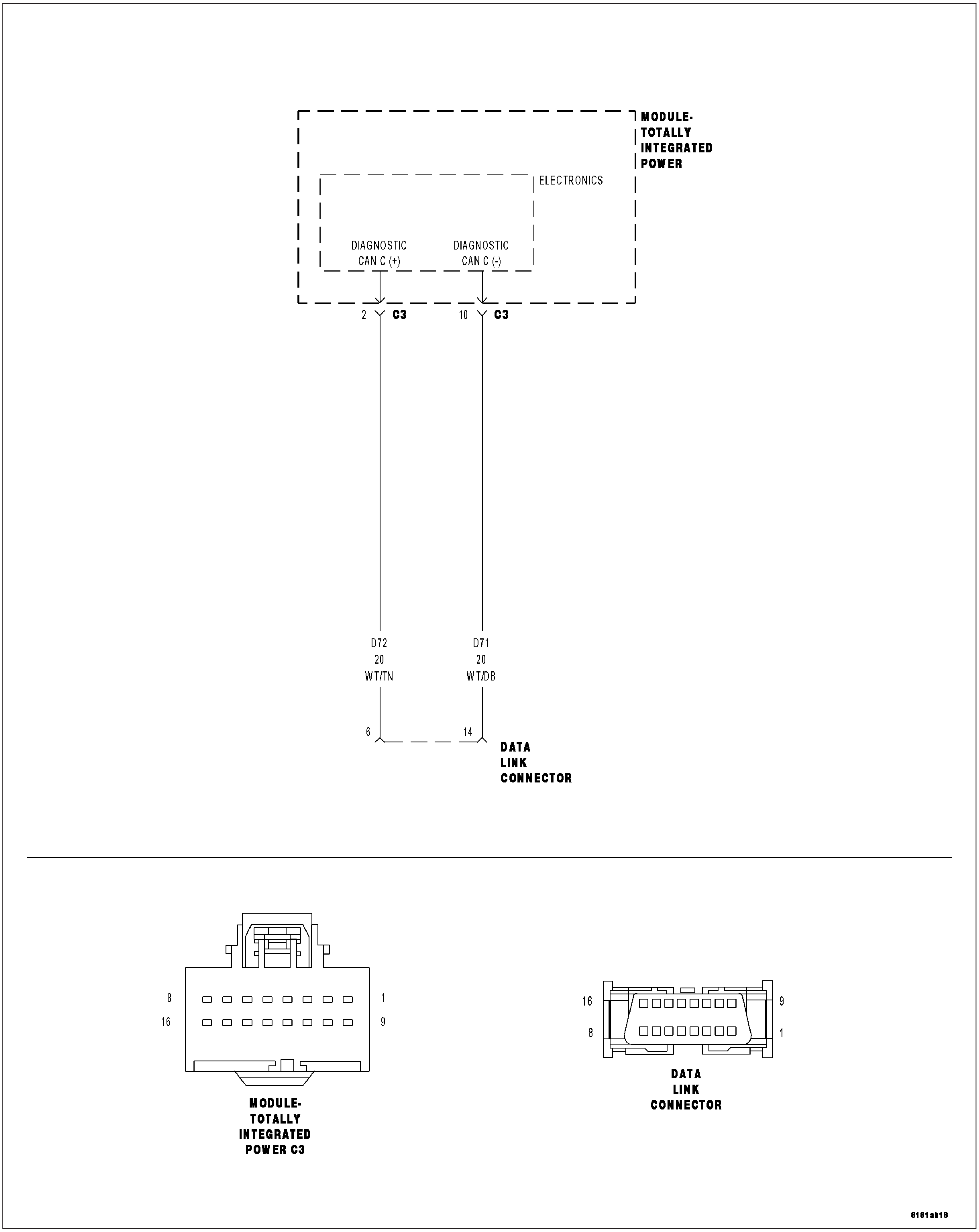
Yes >> Repair the Diagnostic CAN C circuits for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*DIAGNOSTIC CAN C (+) SHORTED TO DIAGNOSTIC CAN C (-)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected a shorted together condition on the Diagnostic CAN C circuits.

Possible Causes
(D72) DIAGNOSTIC CAN C (+) CIRCUIT SHORTED TO (D71) DIAGNOSTIC CAN C (-) CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

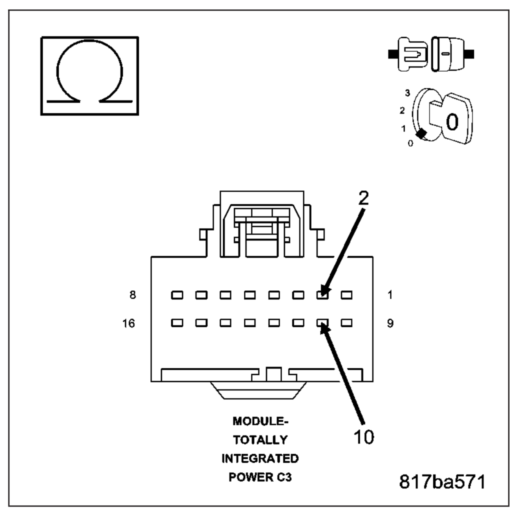
2. (D72) DIAGNOSTIC CAN C (+) CIRCUIT SHORTED TO (D71) DIAGNOSTIC CAN C (-) CIRCUIT

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) C3 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between the (D72) Diagnostic CAN C (+) circuit and the (D71) Diagnostic CAN C (-) circuit at the TIPM C3 harness connector.



Is the resistance below 100.0 ohms?

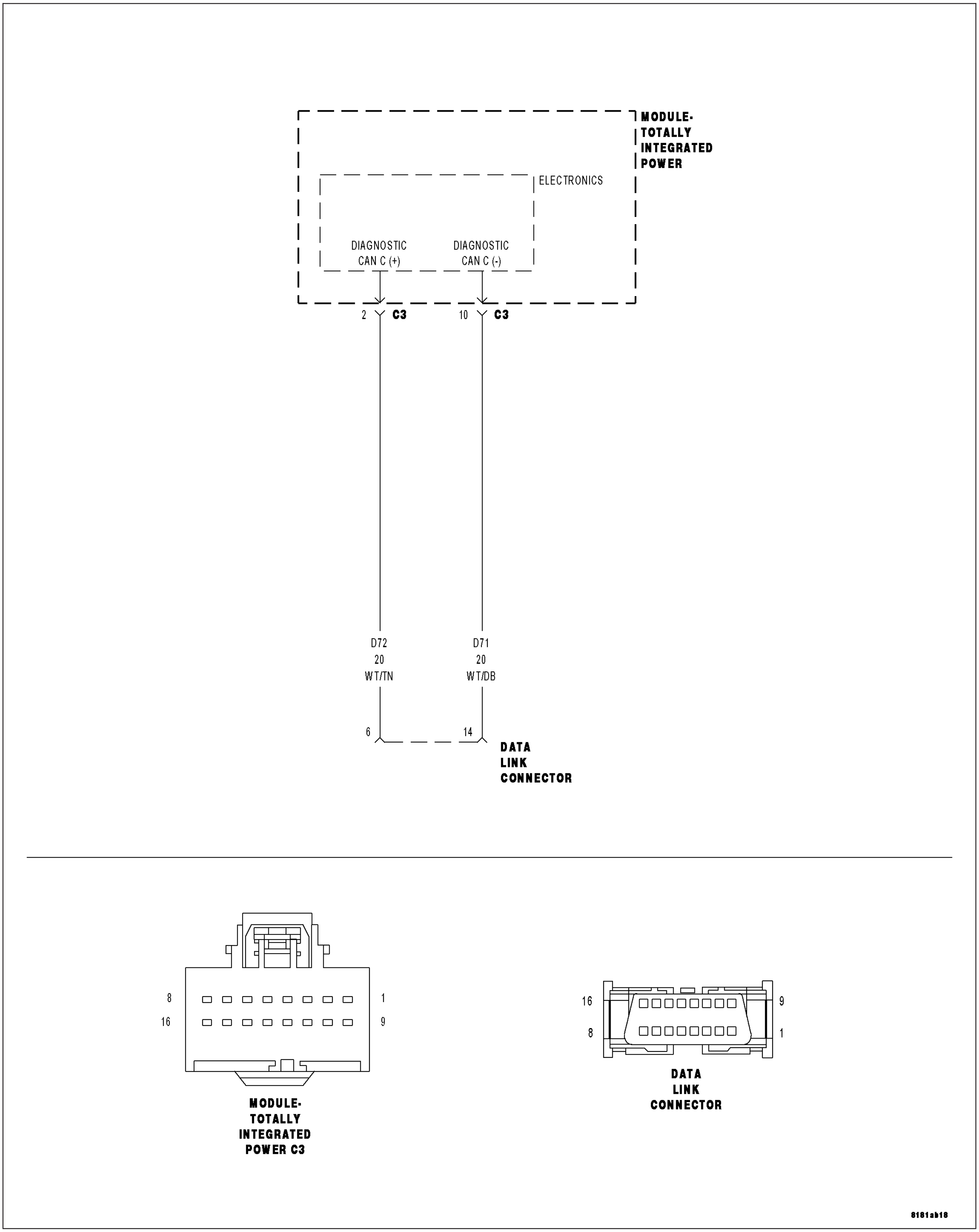
Yes >> Repair the (D72) Diagnostic CAN C (+) circuit for a short to the (D71) Diagnostic CAN C (-) circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*DIAGNOSTIC CAN C (+) CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected a shorted low condition on the (D72) Diagnostic CAN C (+) circuit.

Possible Causes
(D72) DIAGNOSTIC CAN C (+) CIRCUIT SHORTED TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

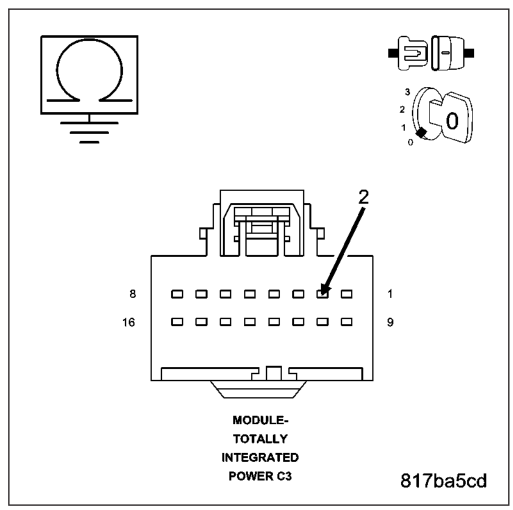
2. (D72) DIAGNOSTIC CAN C (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) C3 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between ground and the (D72) Diagnostic CAN C (+) circuit at the TIPM C3 harness connector.

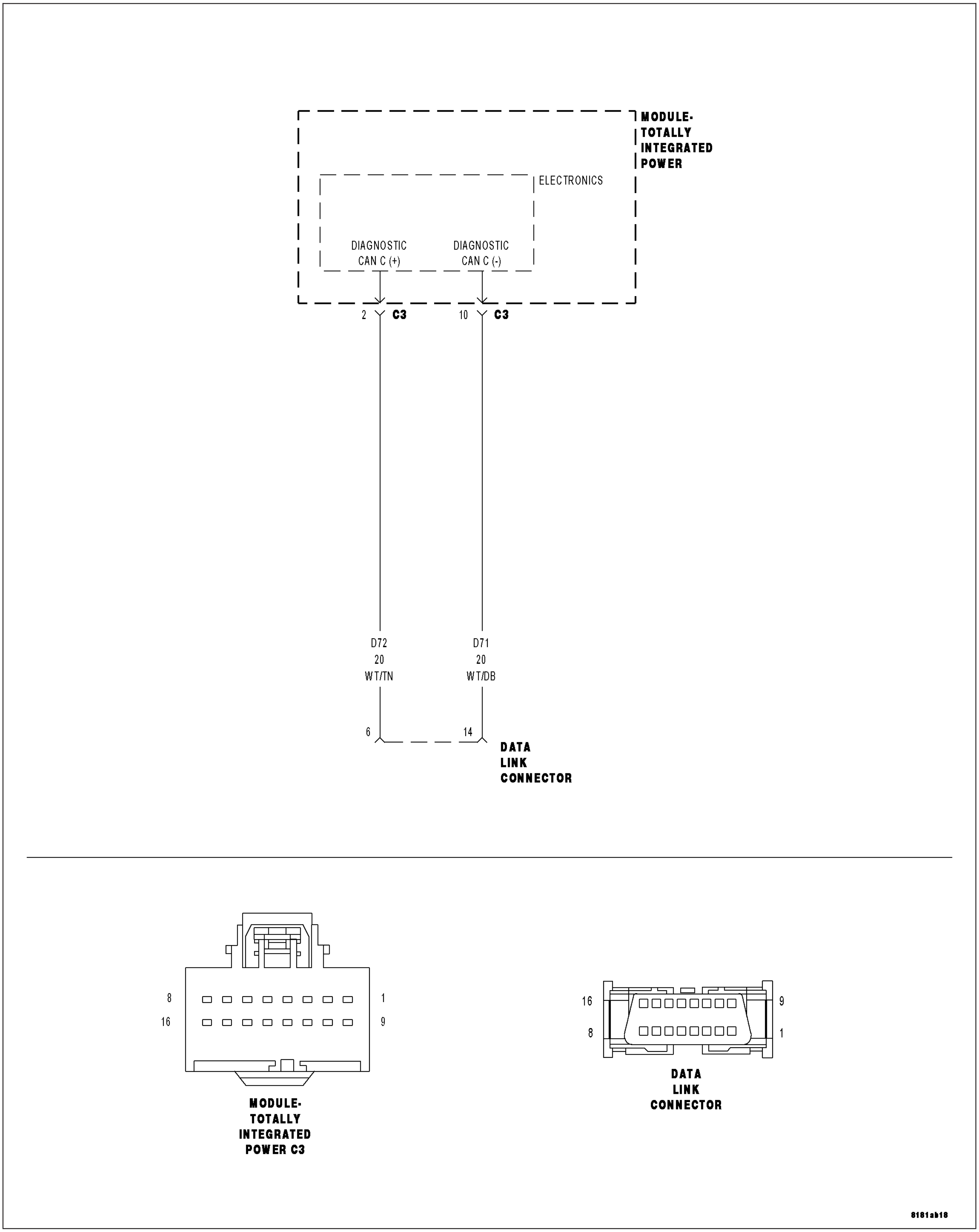


Is the resistance below 100.0 ohms?

Yes >> Repair the (D72) Diagnostic CAN C (+) circuit for a short to ground.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*DIAGNOSTIC CAN C (-) CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected a shorted low condition on the (D71) Diagnostic CAN C (-) circuit.

Possible Causes
(D71) DIAGNOSTIC CAN C (-) CIRCUIT SHORTED TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

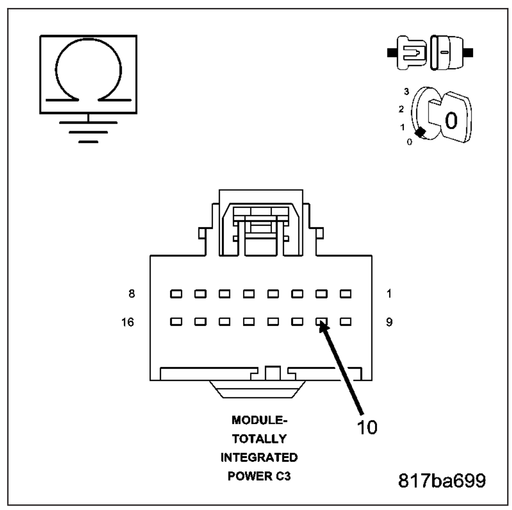
2. (D71) DIAGNOSTIC CAN C (-) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) C3 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between ground and the (D71) Diagnostic CAN C (-) circuit at the TIPM C3 harness connector.

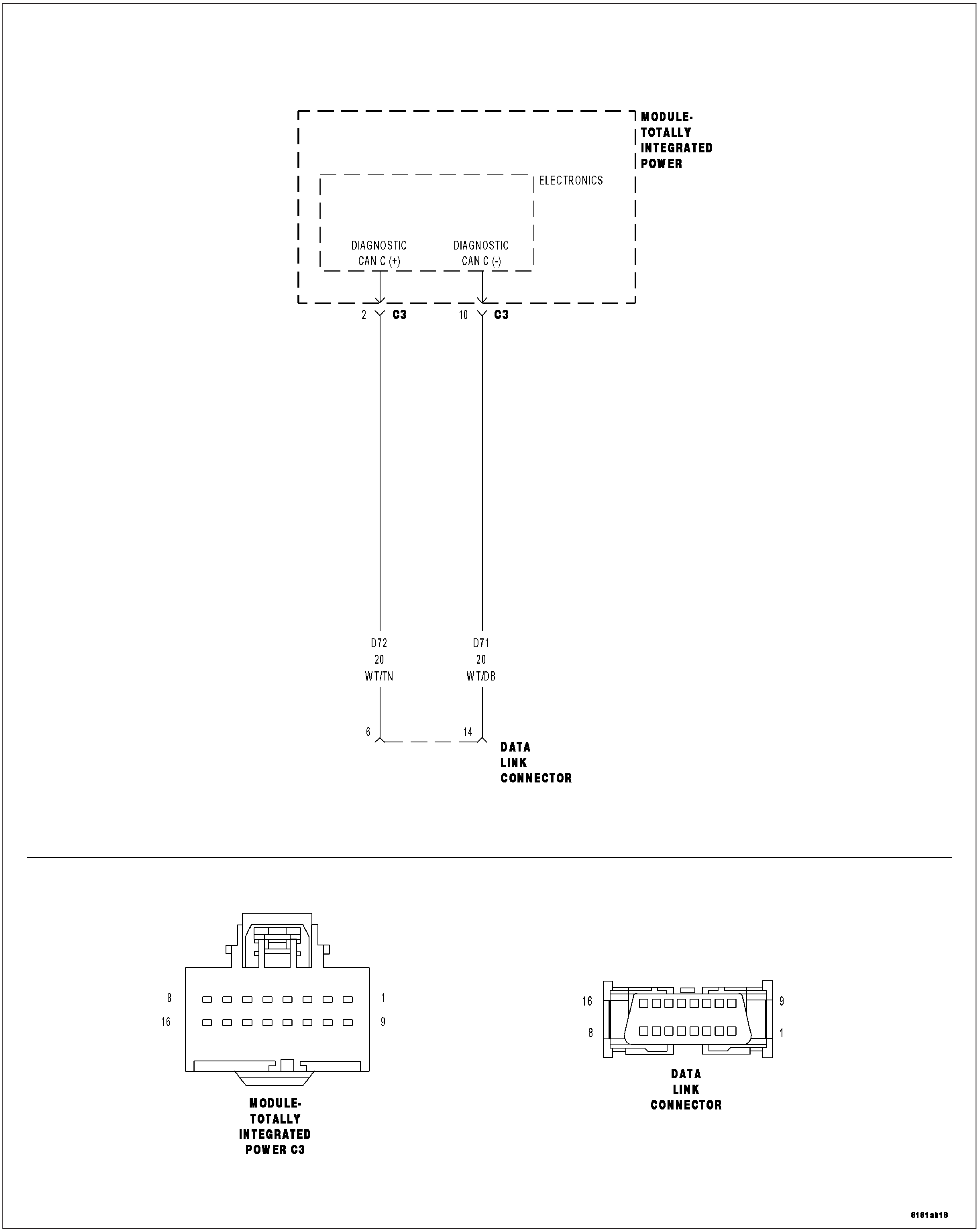


Is the resistance below 100.0 ohms?

Yes >> Repair the (D71) Diagnostic CAN C (-) circuit for a short to ground.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*DIAGNOSTIC CAN C (+) CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected an open condition on the (D72) Diagnostic CAN C (+) circuit.

Possible Causes
(D72) DIAGNOSTIC CAN C (+) CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. (D72) DIAGNOSTIC CAN C (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) C3 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance of the (D72) Diagnostic CAN C (+) circuit between the TIPM C3 harness connector and the DLC.

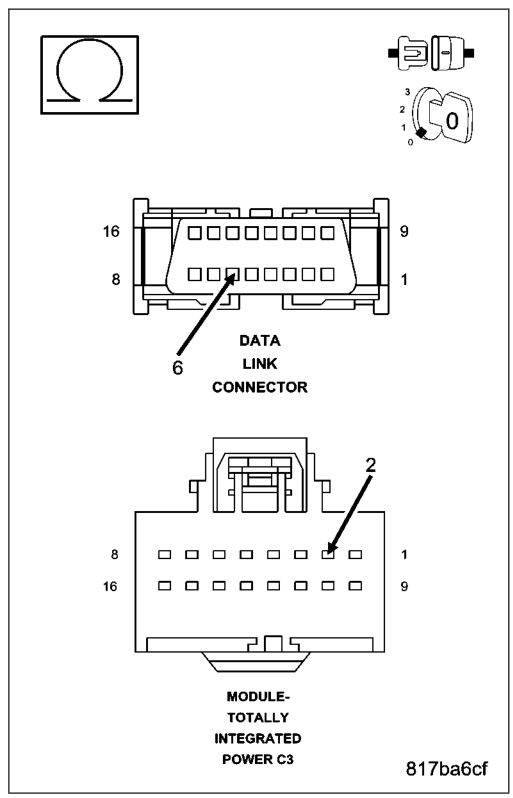
Is the resistance below 5.0 ohms?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

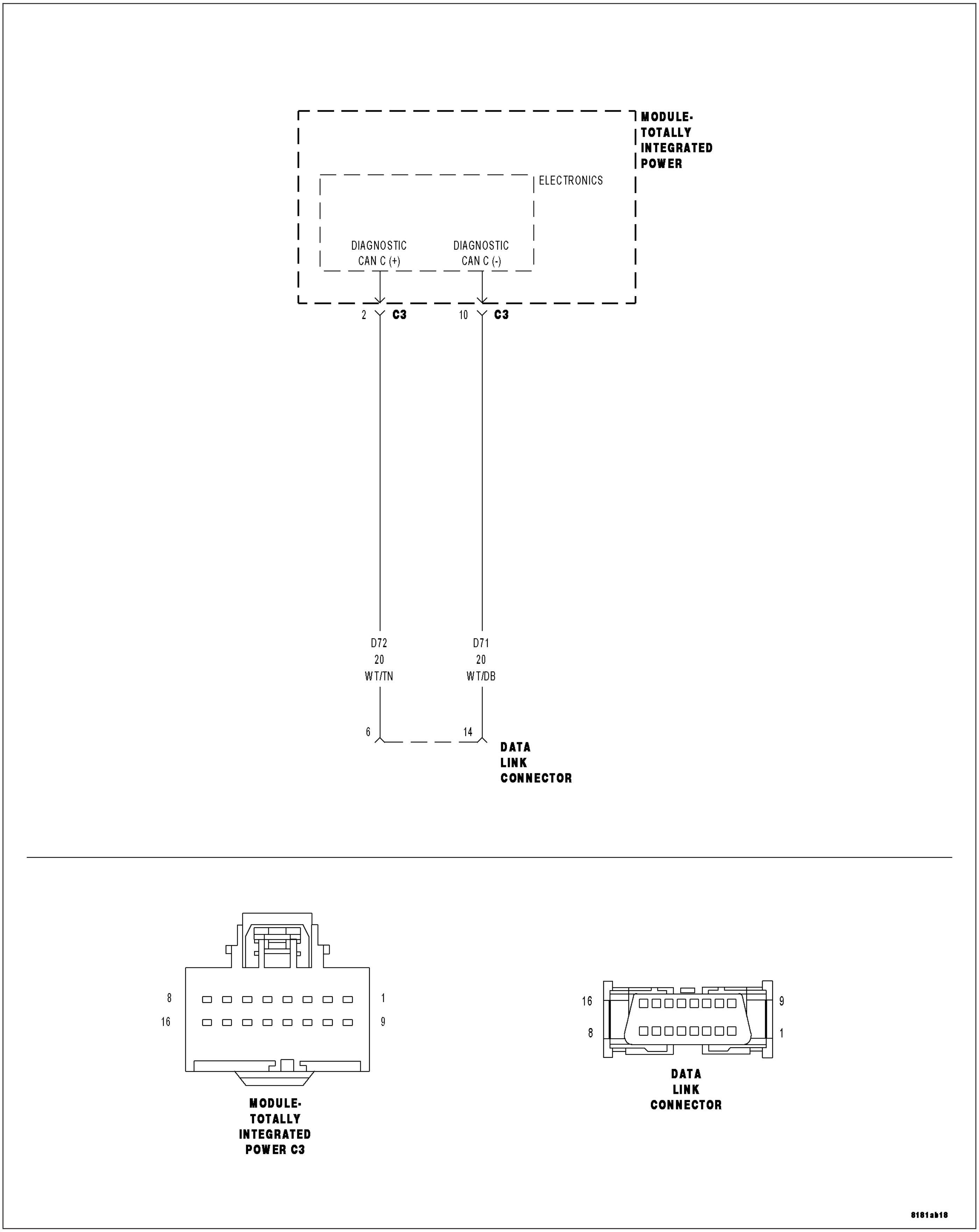
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D72) Diagnostic CAN C (+) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



*DIAGNOSTIC CAN C (-) CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected an open condition on the (D71) Diagnostic CAN C (-) circuit.

Possible Causes
(D71) DIAGNOSTIC CAN C (-) CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

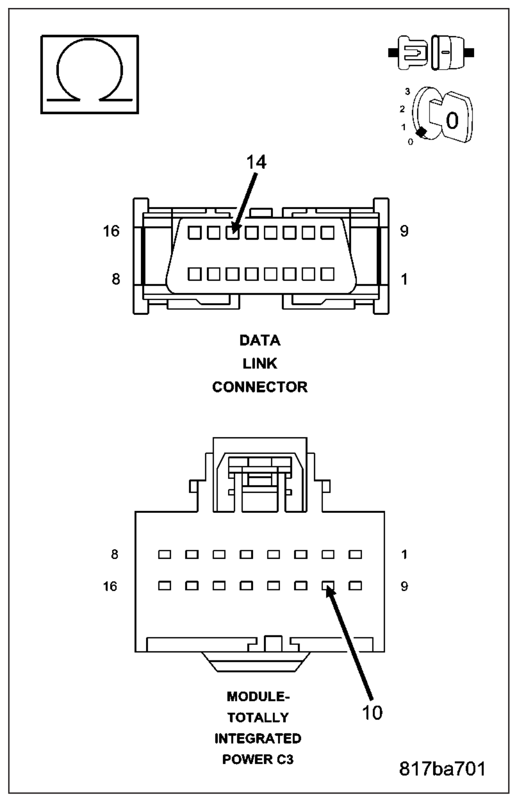
2. (D71) DIAGNOSTIC CAN C (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance of the (D71) Diagnostic CAN C (-) circuit between the TIPM C3 harness connector and the DLC.



Is the resistance below 5.0 ohms?

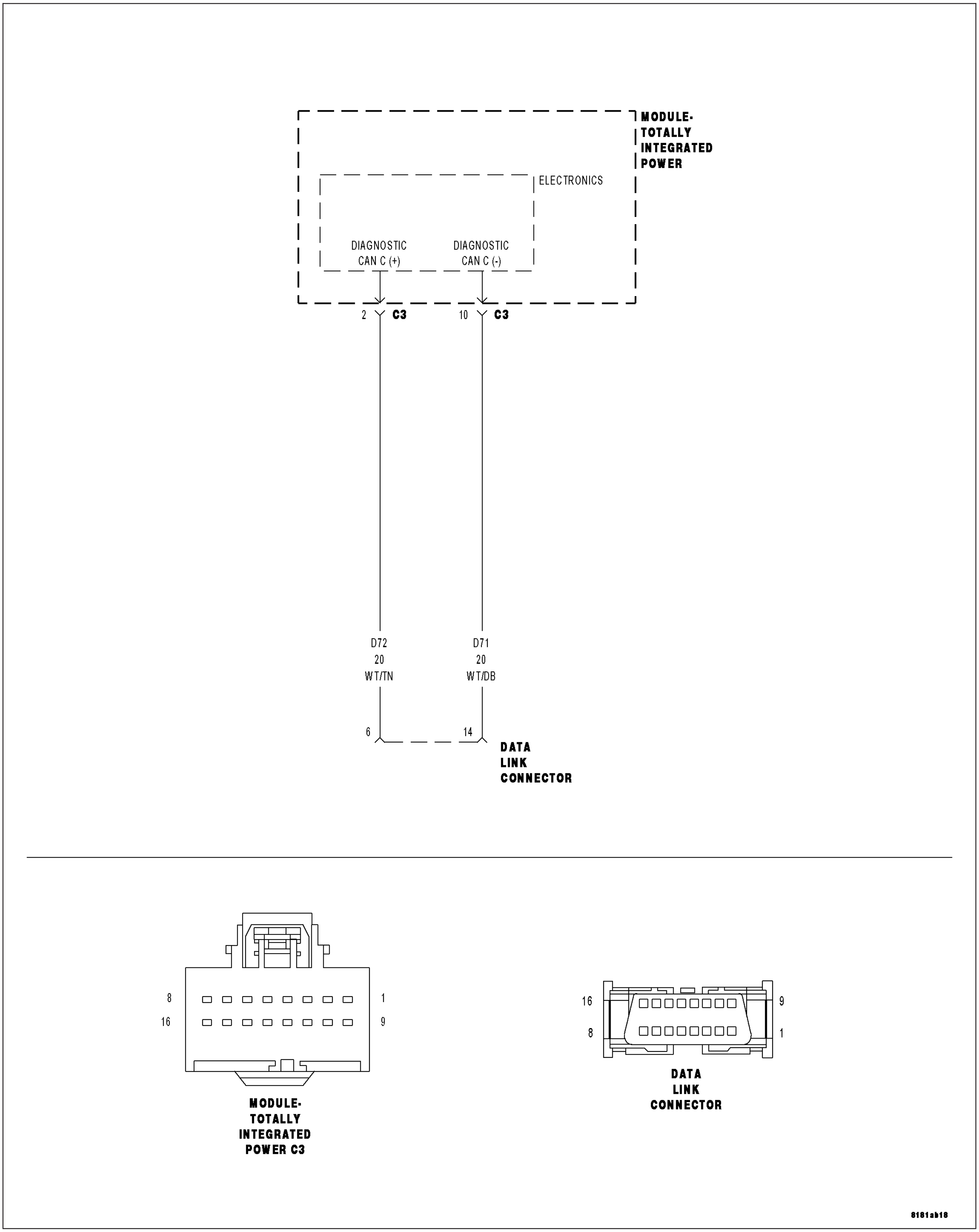
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D71) Diagnostic CAN C (-) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*BOTH DIAGNOSTIC CAN C (+) AND DIAGNOSTIC CAN C (-) CIRCUITS OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the TIPM.
- **Set Condition:**
  The scan tool has detected an open condition on both Diagnostic CAN C circuits.

Possible Causes
(D72) DIAGNOSTIC CAN C (+) CIRCUIT OPEN
(D71) DIAGNOSTIC CAN C (-) CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. (D72) CAN C DIAGNOSTIC (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the scan tool from the DLC.

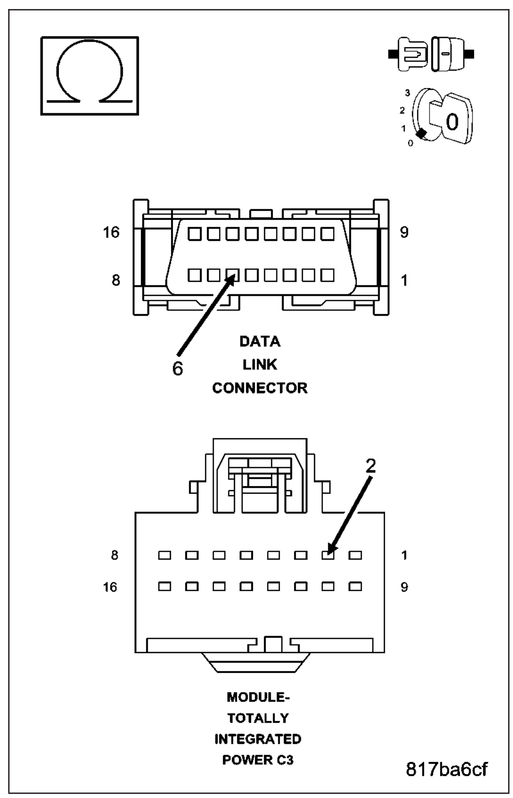
NOTE: Check the connectors at both the DLC and the TIPM.

Measure the resistance of the (D72) Diagnostic CAN C (+) circuit between the TIPM connector and the DLC.

Is the resistance below 5.0 ohms?

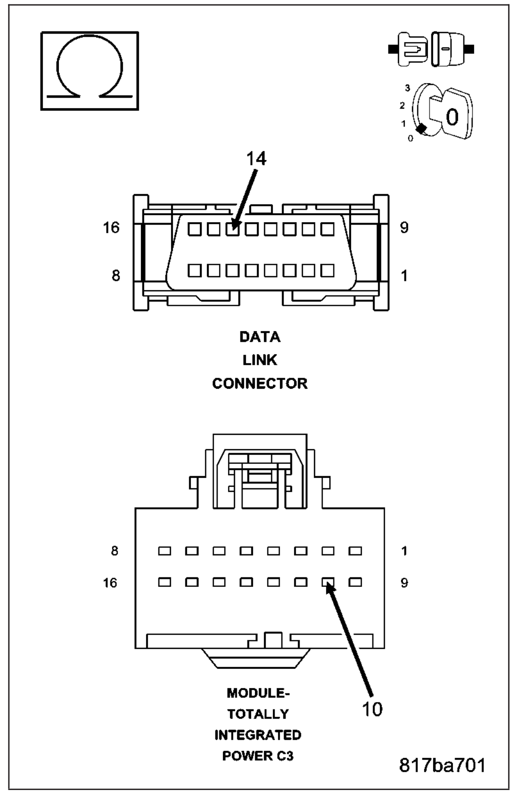
Yes >> Go To 3

No >> Repair the (D72) Diagnostic CAN C (+) circuit for an open.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



3. (D71) DIAGNOSTIC CAN C (-) CIRCUIT OPEN

Measure the resistance of the (D71) Diagnostic CAN C (-) circuit between the TIPM C3 harness connector and the DLC.



Is the resistance below 5.0 ohms?

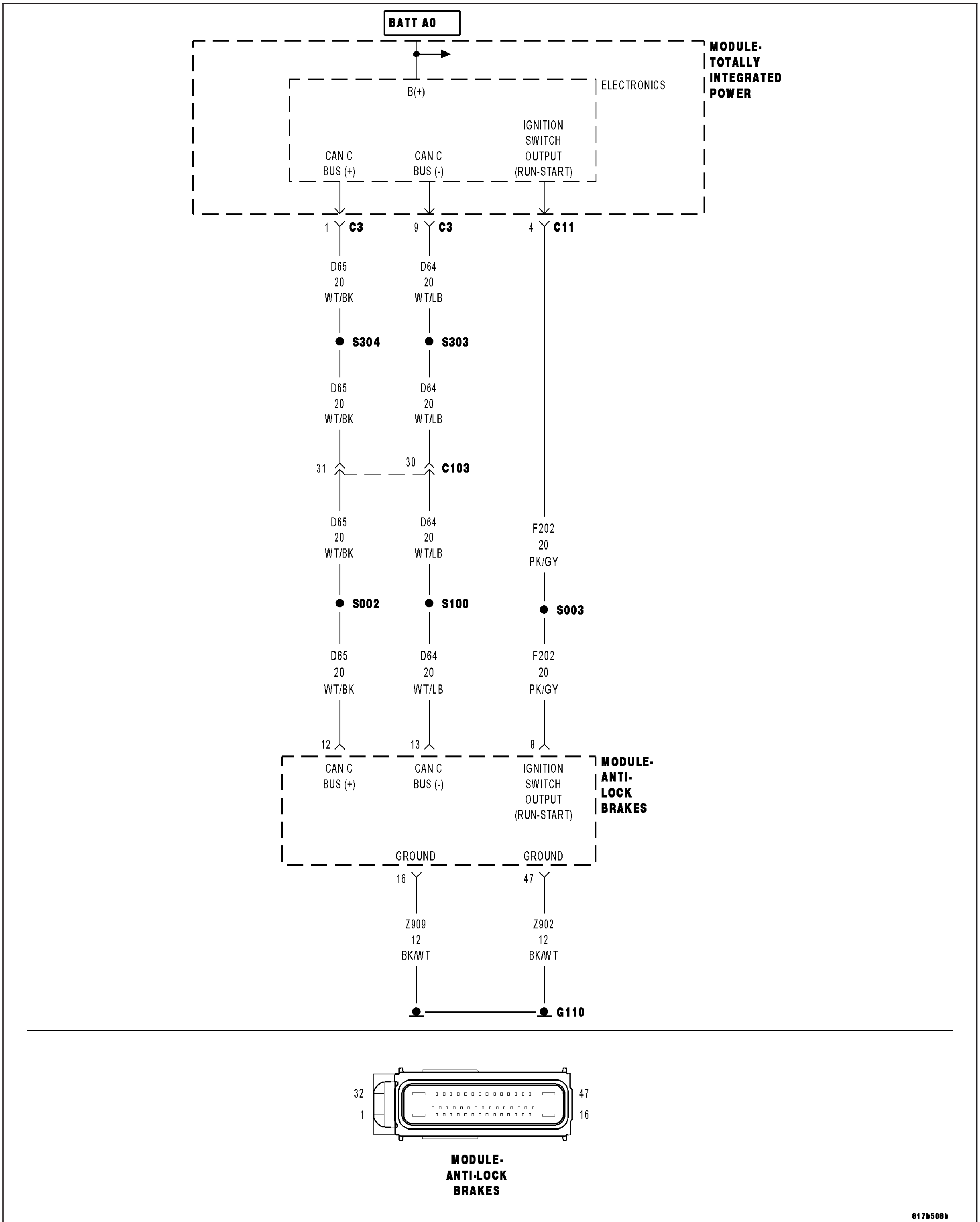
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D71) Diagnostic CAN C (-) circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM ABS (ANTILOCK BRAKE MODULE)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(Z902) (Z909) GROUND CIRCUITS OPEN
(F202) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
ANTILOCK BRAKE MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the TIPM for any active CAN C hardware DTCs, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

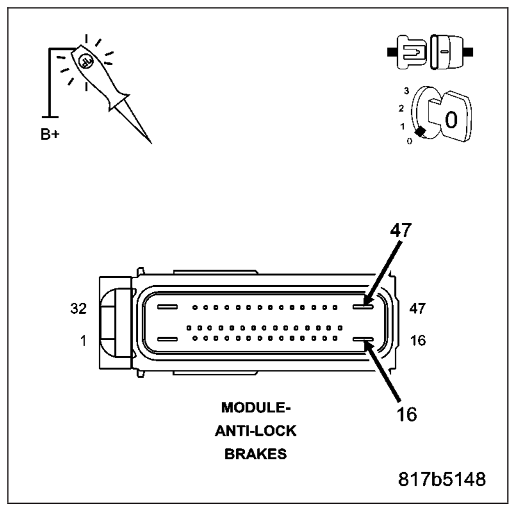
2. (Z902) (Z909) GROUND CIRCUITS OPEN

Using a 12-volt test light connected to 12-volts, check each (Z902) and (Z909) ground circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 3

No >> Repair the (Z902) or (Z909) ground circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



3. (F202) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR SHORTED

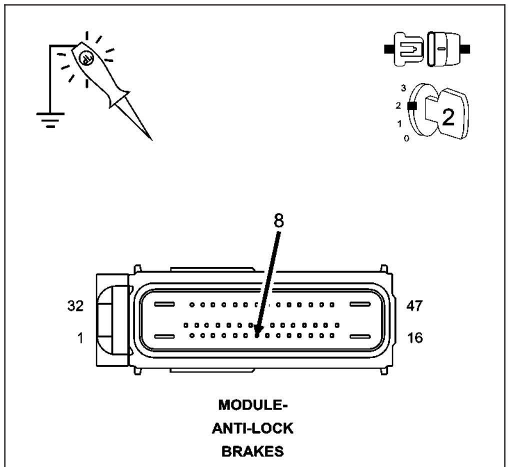
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output (Run-Start) circuit.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (F202) Ignition Switch Output (Run-Start) circuit for an open or short.
Perform ABS VERIFICATION TEST - VER 1.



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4. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

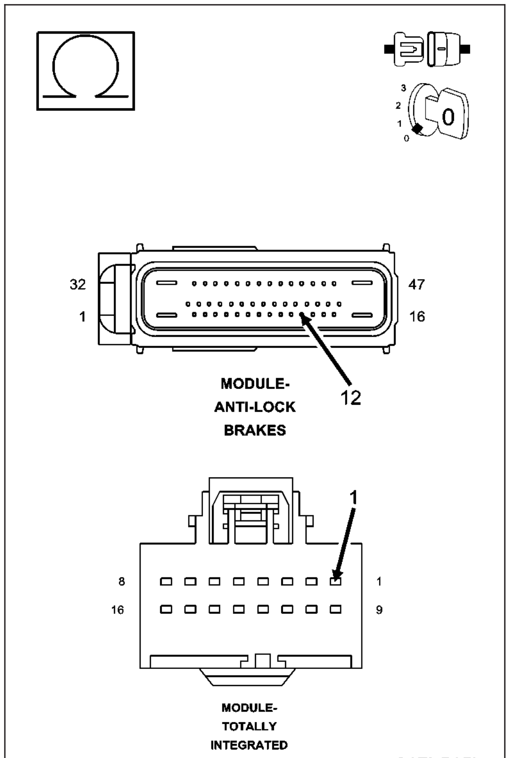
Disconnect the TIPM C3 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM connector and the Antilock Brake Module connector.

Is resistance below 5.0 ohms?

Yes >> Go To 5

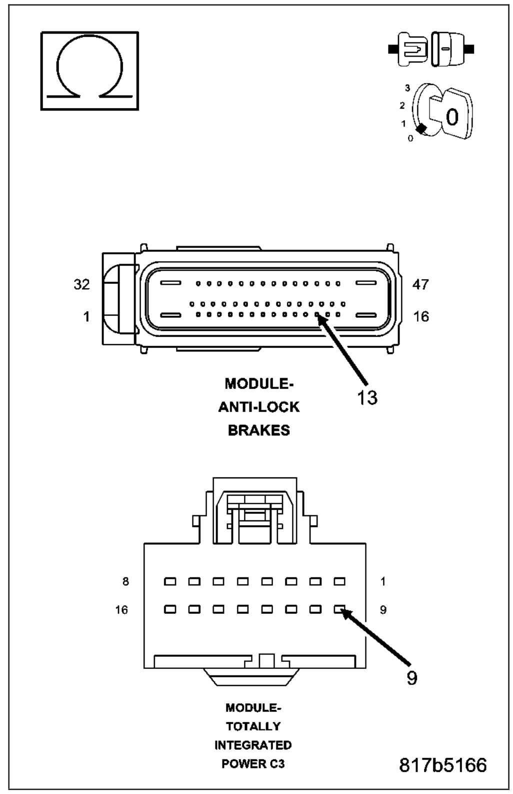
No >> Repair the (D65) CAN C Bus (+) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



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5. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM connector and the Antilock Brake Module connector.

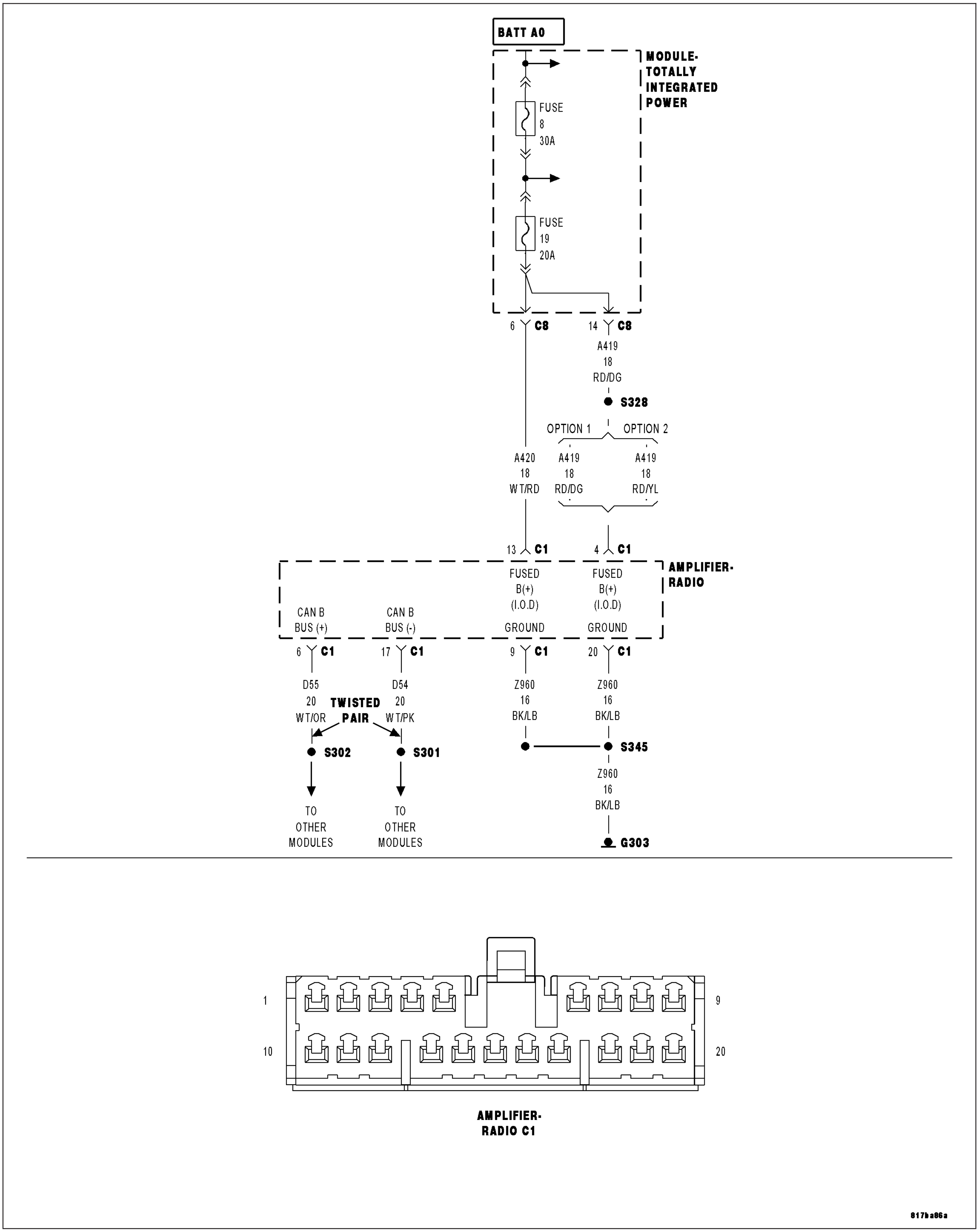


Is resistance below 5.0 ohms?

Yes >> Replace the Antilock Brake Module in accordance with the service information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Repair the (D64) CAN C Bus (-) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

*NO RESPONSE FROM AMP (AMPLIFIER)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A419) (A420) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z960) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
AMPLIFIER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A419) (A420) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Radio Amplifier C1 harness connector.

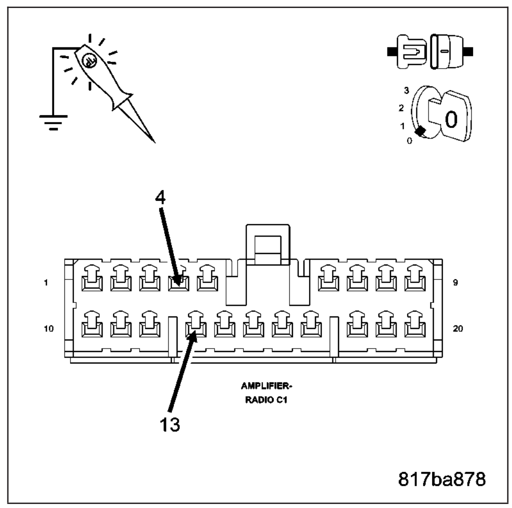
Using a 12-volt test light connected to ground, check each (A419) and (A420) Fused B(+) circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 3

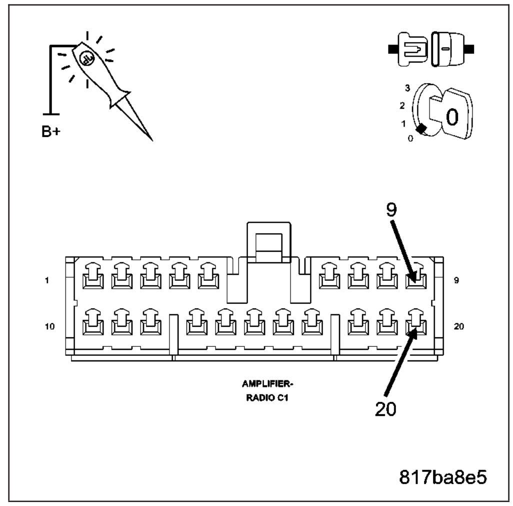
No >> Repair the (A419) or (A420) Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



3. (Z960) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check each (Z960) ground circuit.



Does the test light illuminate brightly for each circuit?

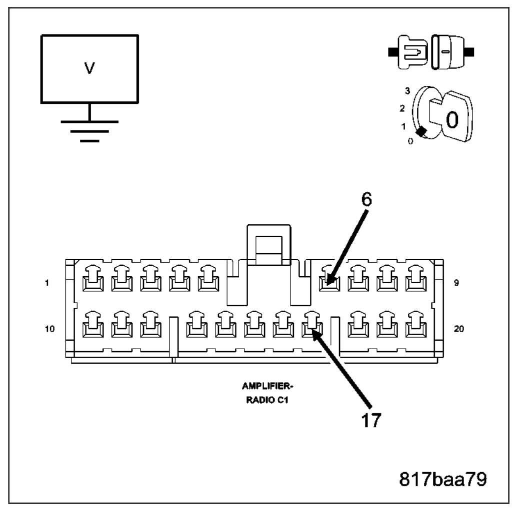
Yes >> Go To 4

No >> Repair the (Z960) ground circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

Turn the ignition on.



NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present on either circuit?

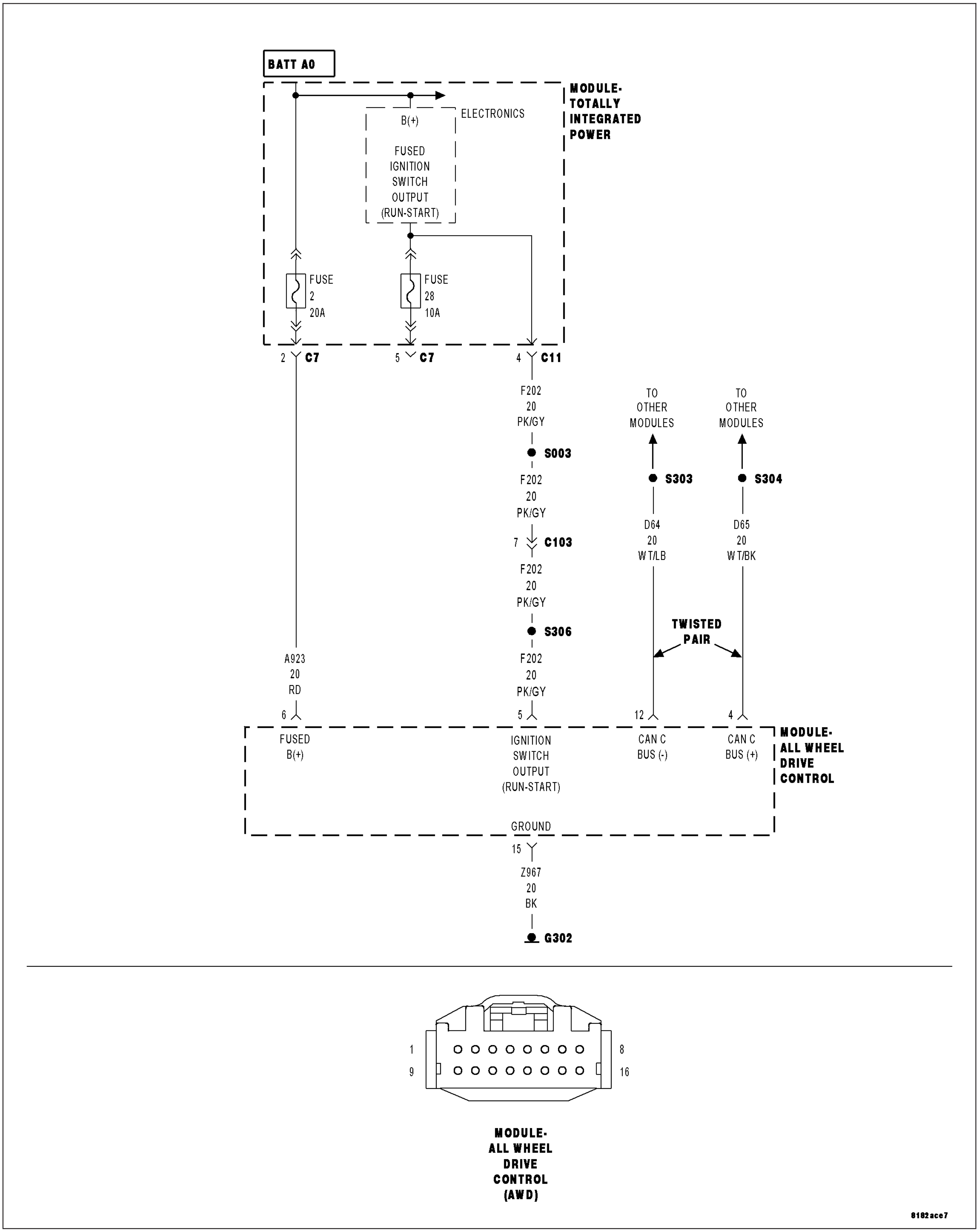
Yes >> Replace the Radio Amplifier in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM ALL WHEEL DRIVE CONTROL (AWD) MODULE



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(F202) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR SHORTED
(A923) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z967) GROUND CIRCUIT OPEN
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
ALL WHEEL DRIVE CONTROL (AWD) MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the TIPM for any active CAN C hardware DTC's, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

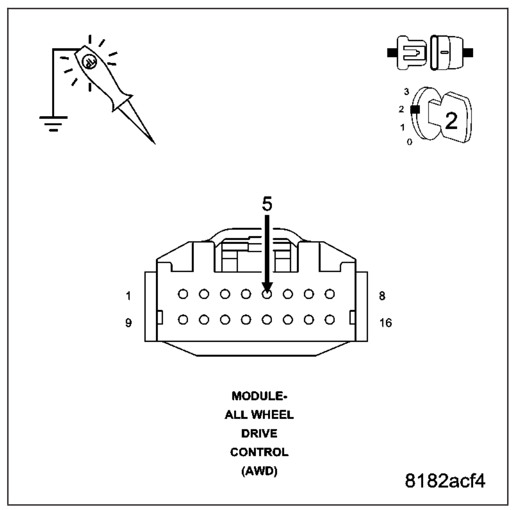
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (F202) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR SHORTED

Turn the ignition on.

Disconnect the AWD harness connector.

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output (Run-Start) circuit.



Does the test light illuminate brightly?

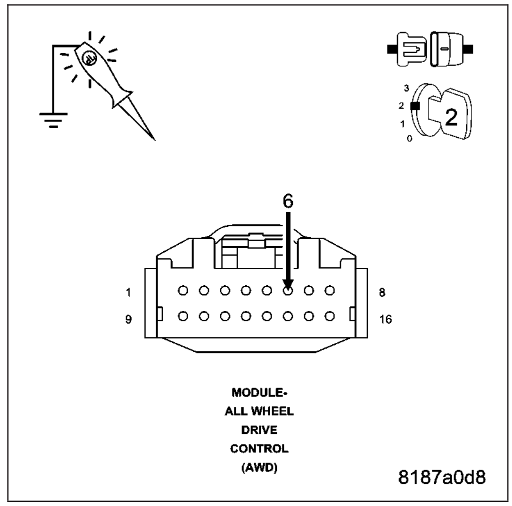
Yes >> Go To 3

No >> Repair the (F202) Ignition Switch Output (Run-Start) circuit for an open or short.

Perform the appropriate VERIFICATION TEST.

3. (A923) FUSED B(+) CIRCUIT OPEN OR SHORTED

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output (Run-Start) circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

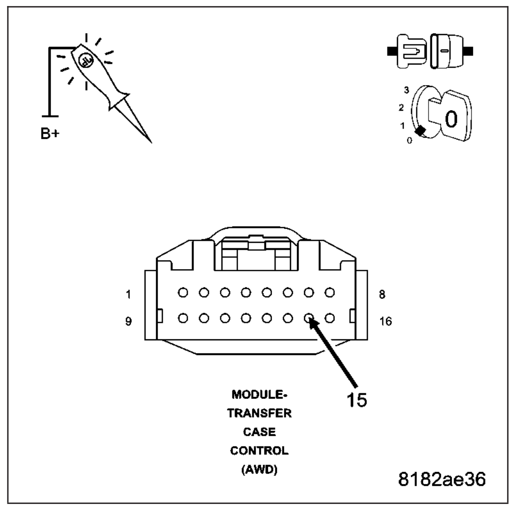
No >> Repair the (F202) Ignition Switch Output (Run-Start) circuit for an open or short.

Perform the appropriate VERIFICATION TEST.

4. (Z967) GROUND CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z967) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (Z967) ground circuit for an open.

Perform the appropriate VERIFICATION TEST.

5. (D65) CAN C BUS (+) CIRCUIT OPEN

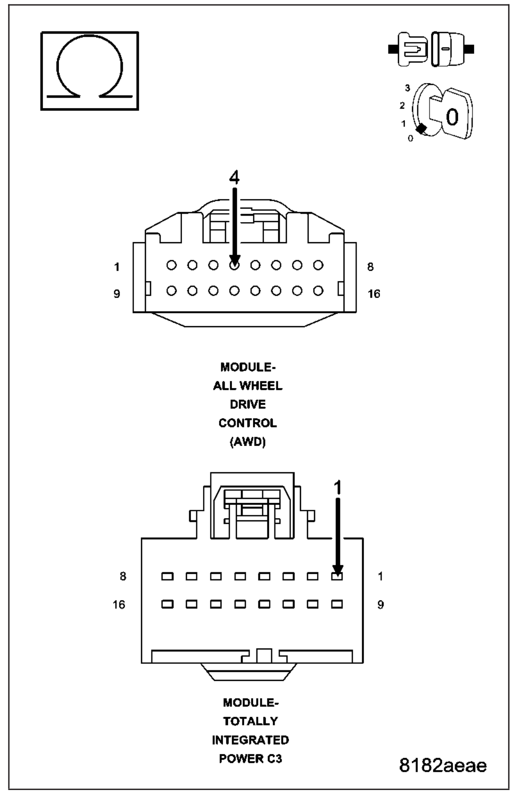
Disconnect the TIPM C3 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM C3 harness connector and the AWD harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (D65) CAN C Bus (+) circuit for an open. Perform the appropriate VERIFICATION TEST.



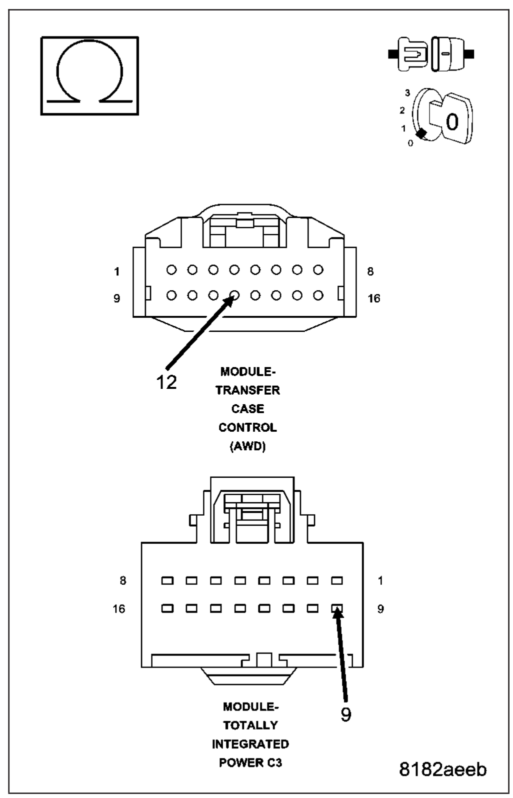
6. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM C3 harness connector and the AWD harness connector.

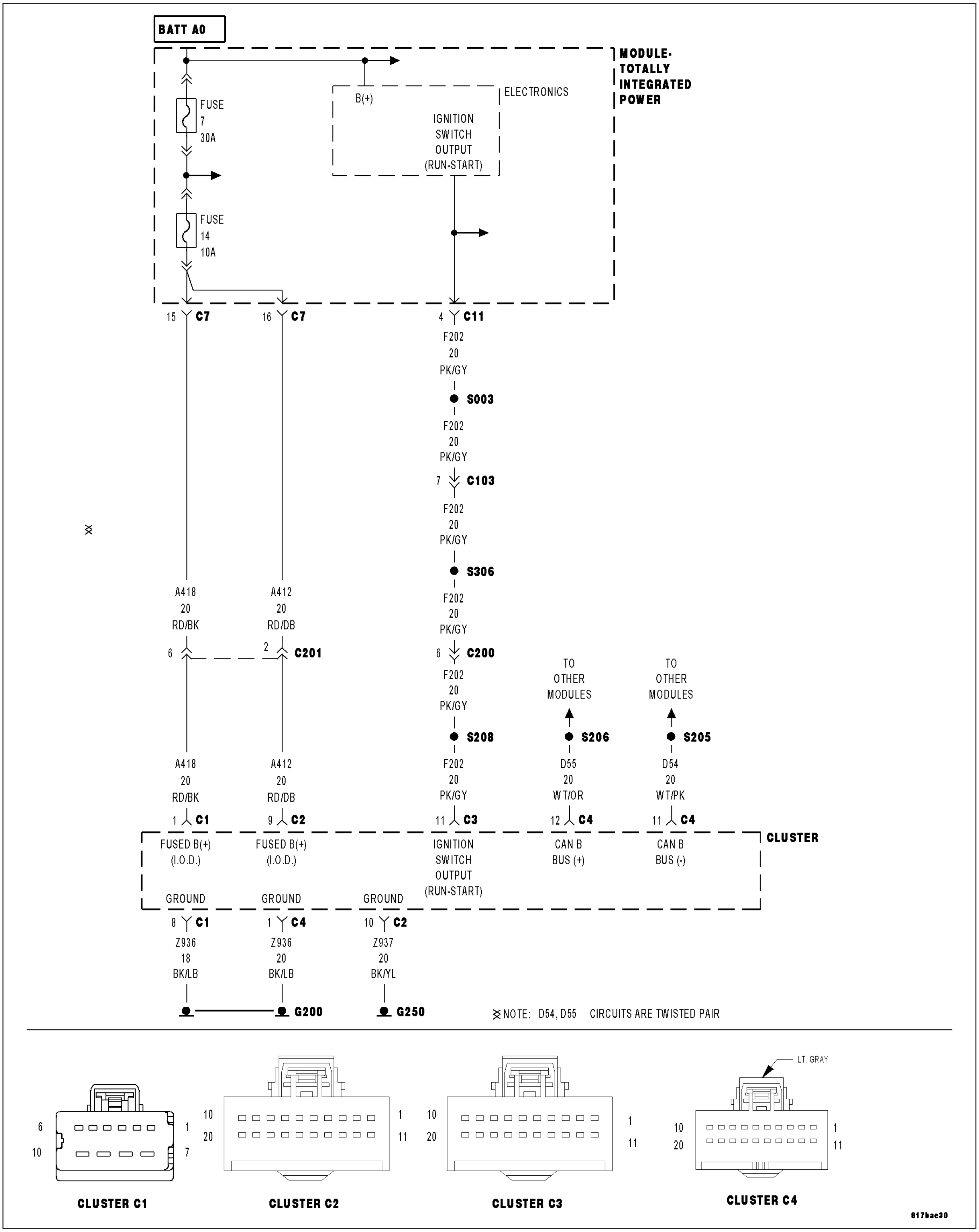
Is the resistance below 5.0 ohms?

Yes >> Replace and program the All Wheel Drive Control (AWD) Module in accordance with the service information. Perform the appropriate VERIFICATION TEST.

No >> Repair the (D64) CAN C Bus (-) circuit for an open. Perform the appropriate VERIFICATION TEST.



*NO RESPONSE FROM CCN (CLUSTER)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A418) (A412) FUSED B(+) CIRCUITS OPEN OR SHORTED
(Z936) (Z937) GROUND CIRCUITS OPEN
(F202) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
CLUSTER (CCN)

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

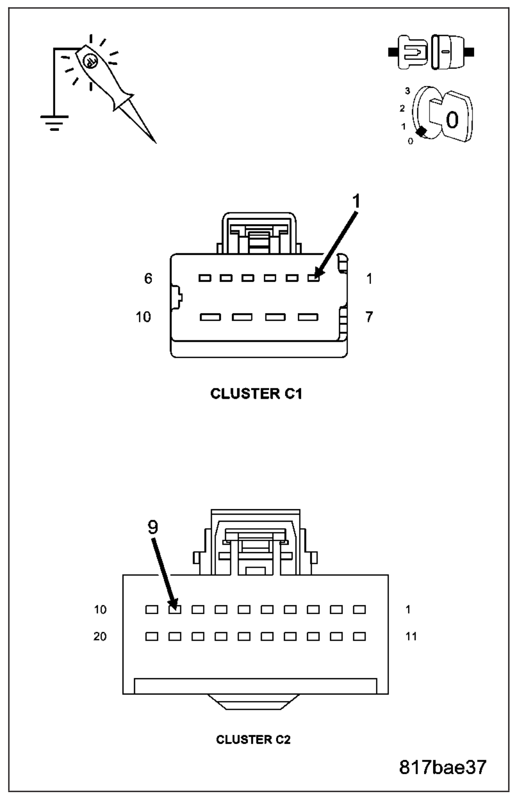
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A418) (A412) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Cluster C1 and C2 harness connectors.

Using a 12-volt test light connected to ground, check each (A418) and (A412) Fused B(+) circuit.



Does the test light illuminate brightly for each circuit?

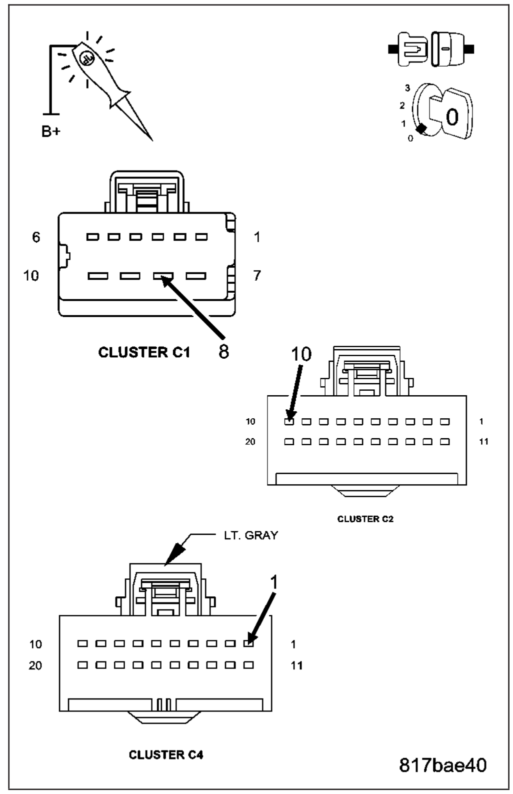
Yes >> Go To 3

No >> Repair the Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (Z936) (Z937) GROUND CIRCUITS OPEN

Using a 12-volt test light connected to 12-volts, check each (Z936) and (Z937) ground circuit.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

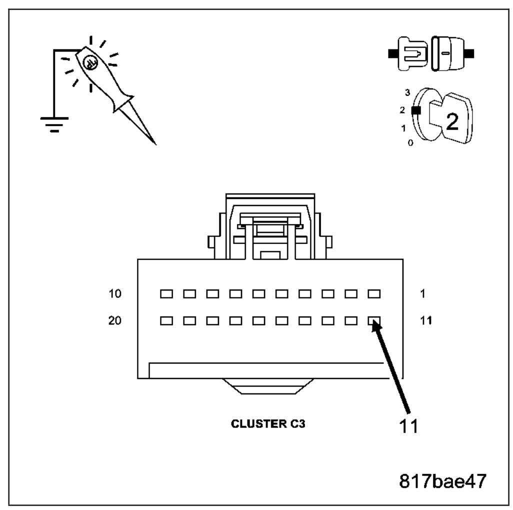
No >> Repair the (Z936) or (Z937) ground circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (F202) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F202) Ignition Switch Output circuit for an open or short.

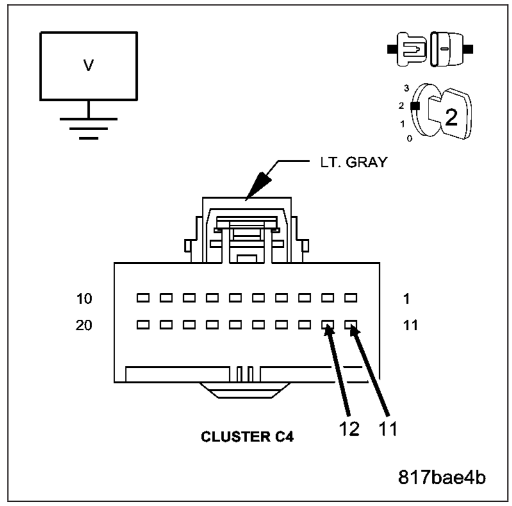
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present on either circuit?

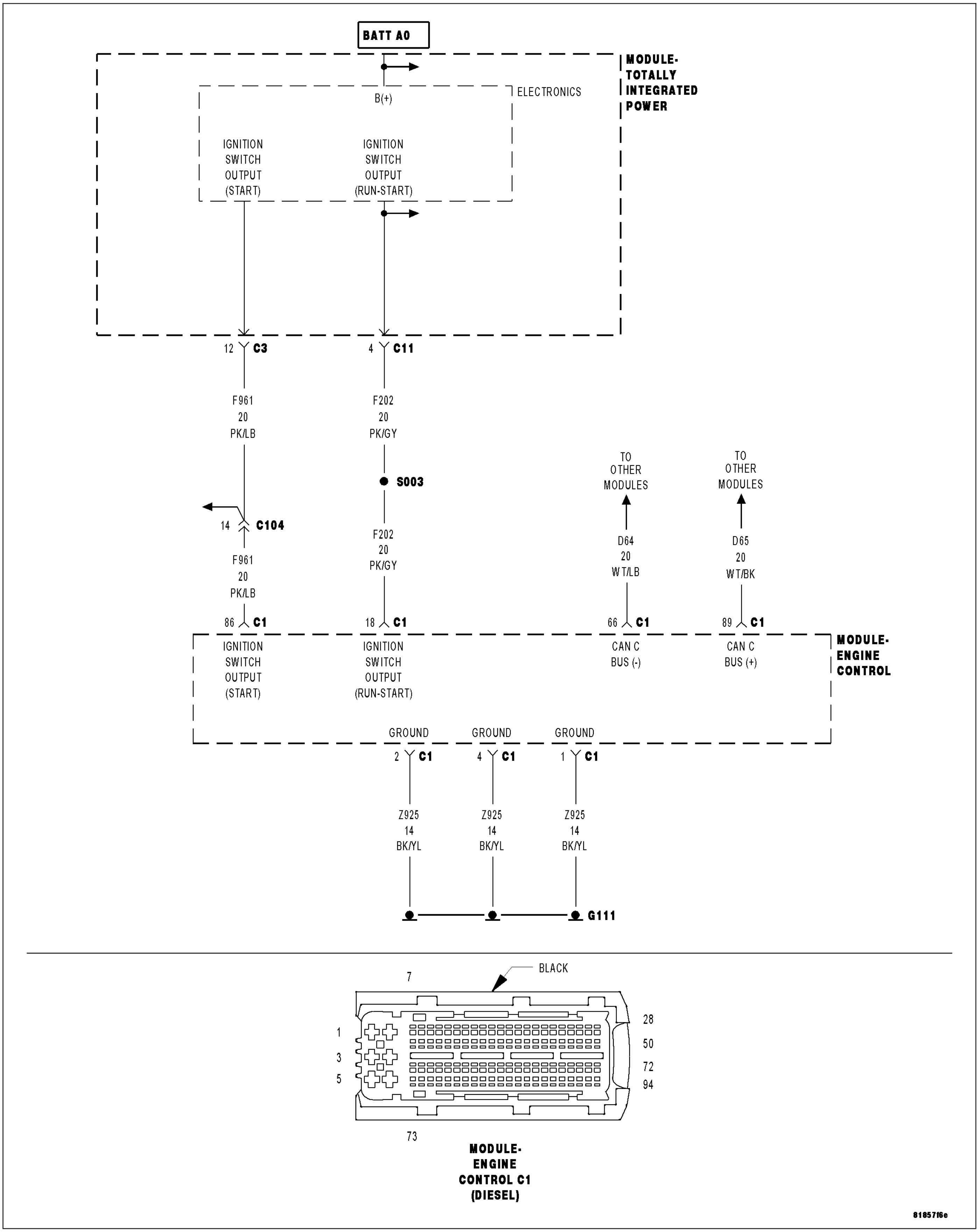
Yes >> Replace the Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM ECM (ENGINE CONTROL MODULE) - DIESEL



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
ENGINE CONTROL MODULE POWER AND GROUND
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
ENGINE CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the TIPM for any active CAN C hardware and any ignition related DTC's, perform DTC's before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. CHECK ECM POWER AND GROUND

Check the ECM power and ground circuits. Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS - DIESEL for the diagnostic test procedure.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM VERIFICATION TEST.

No >> Go To 3

3. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

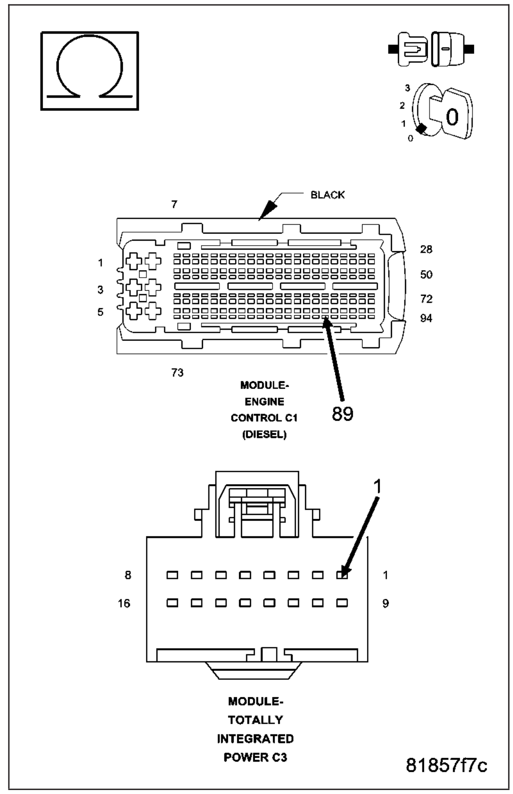
Disconnect the ECM C2 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM connector and the ECM connector.

Is resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (D65) CAN C Bus (+) circuit for an open.
Perform the ECM VERIFICATION TEST.



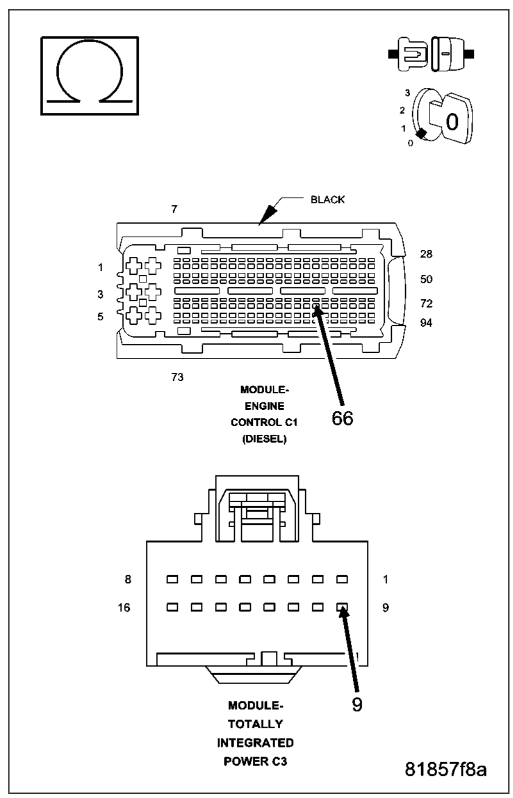
4. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM connector and the ECM connector.

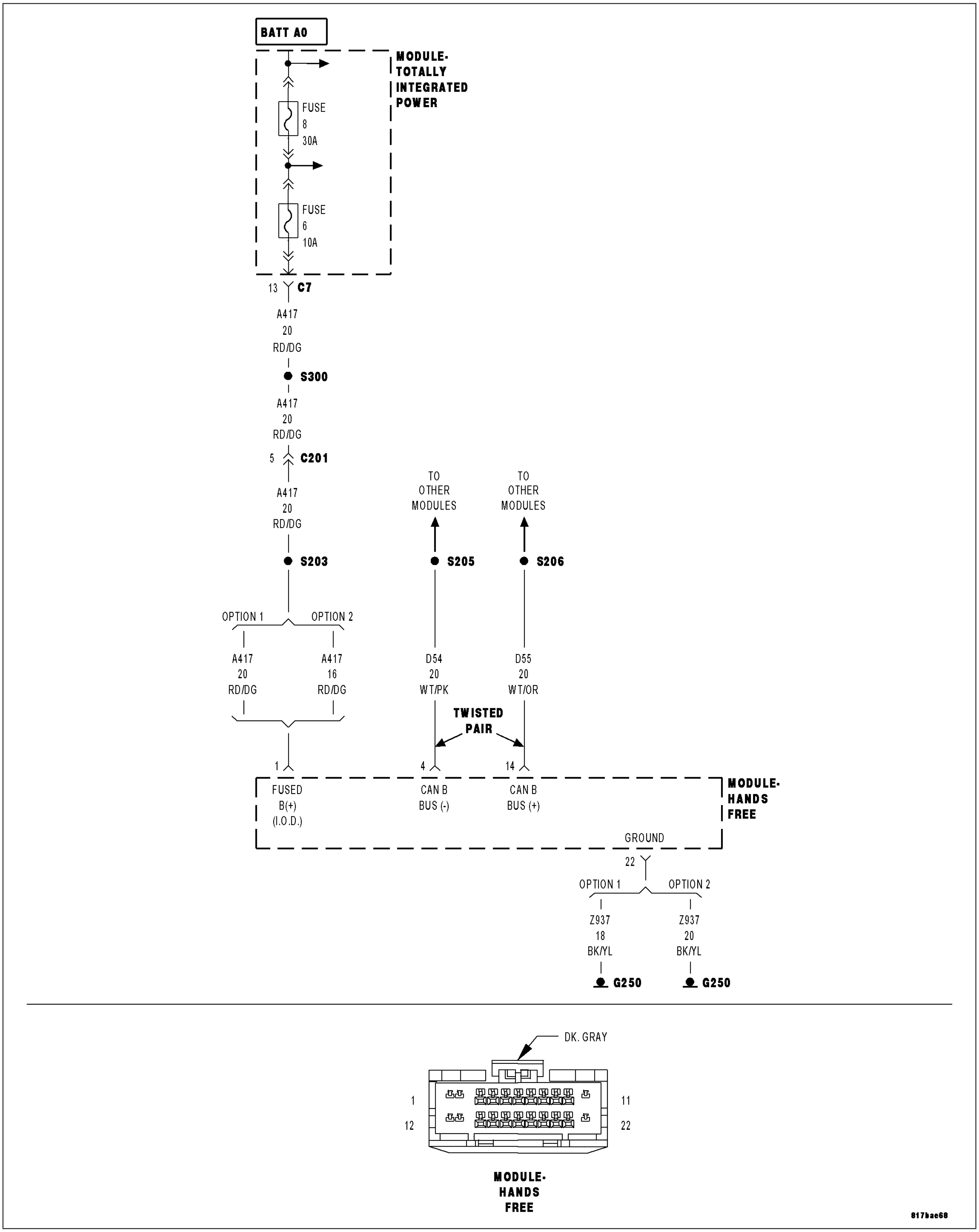
Is resistance below 5.0 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the service information.
Perform the ECM VERIFICATION TEST.

No >> Repair the (D64) CAN C Bus (-) circuit for an open.
Perform the ECM VERIFICATION TEST.



*NO RESPONSE FROM HFM (HANDS FREE MODULE)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A417) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z937) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
HANDS FREE MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

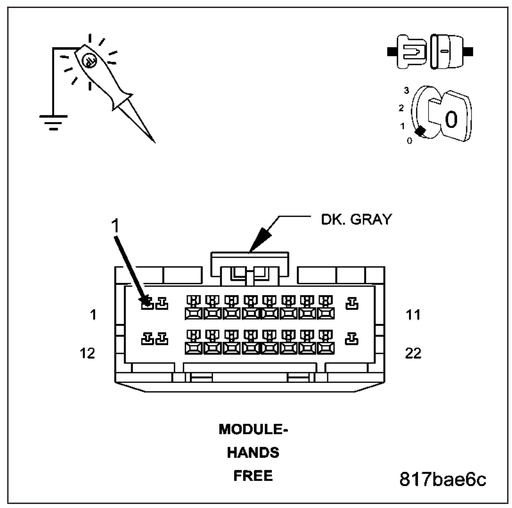
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A417) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Using a 12-volt test light connected to ground, check the (A417) Fused B(+) circuit.



Does the test light illuminate brightly?

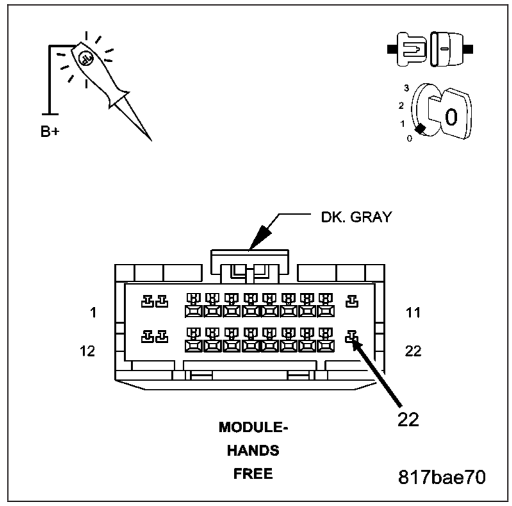
Yes >> Go To 3

No >> Repair the (A417) Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (Z937) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z937) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z937) ground circuit for an open.

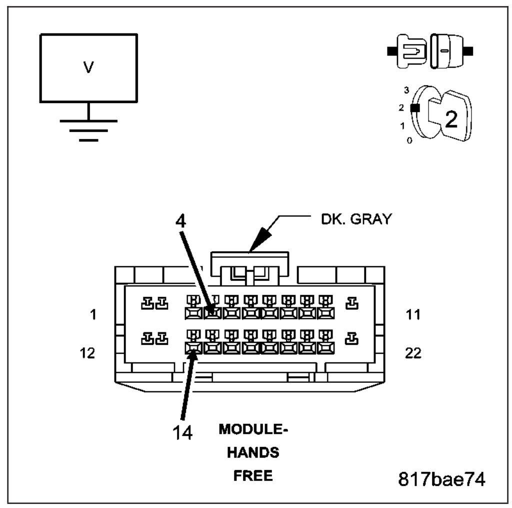
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present on either circuit?

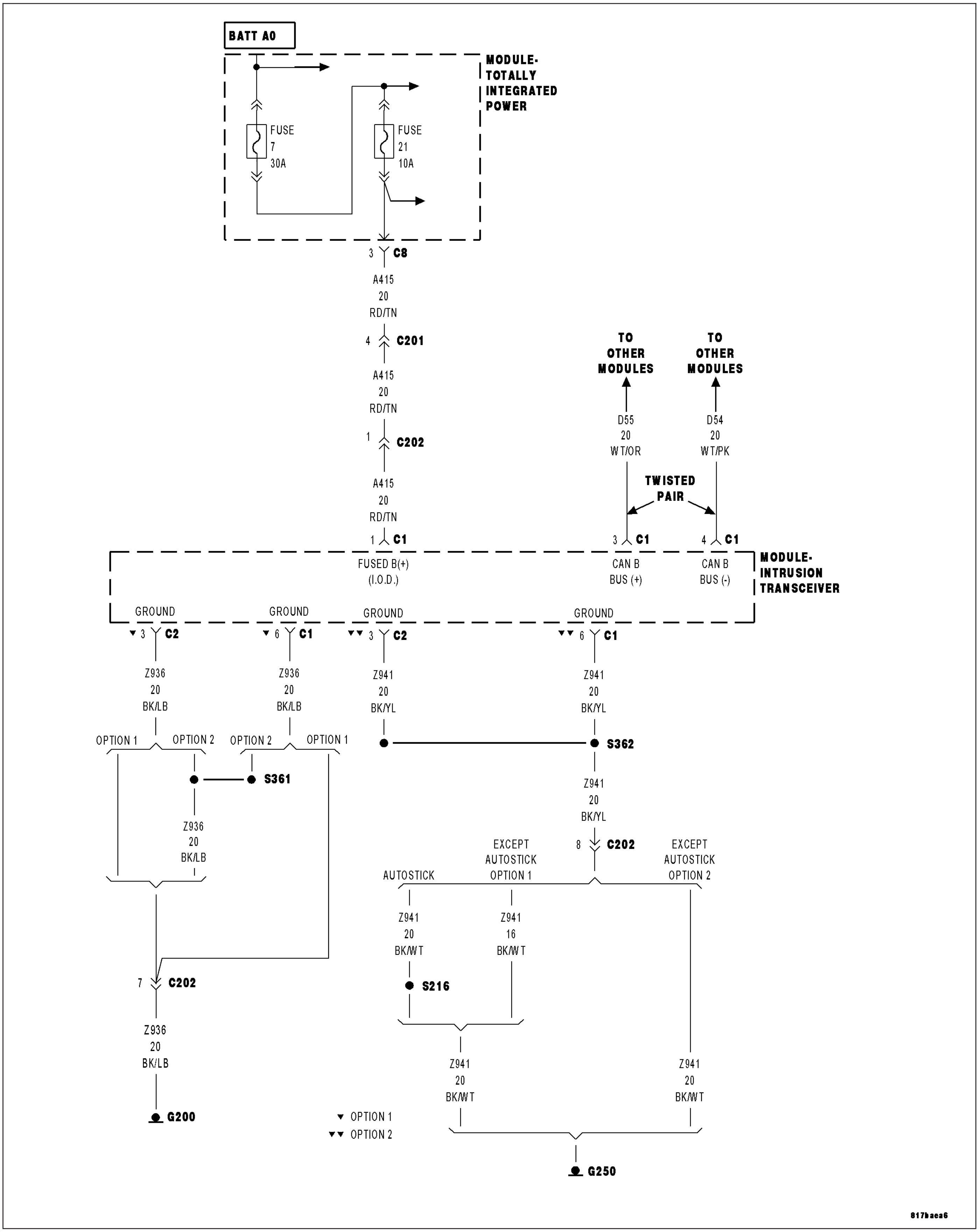
Yes >> Replace the Hands Free Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM ITM (INTRUSION TRANSCEIVER MODULE)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A415) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z936) (Z941) GROUND CIRCUITS OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
INTRUSION TRANSCEIVER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

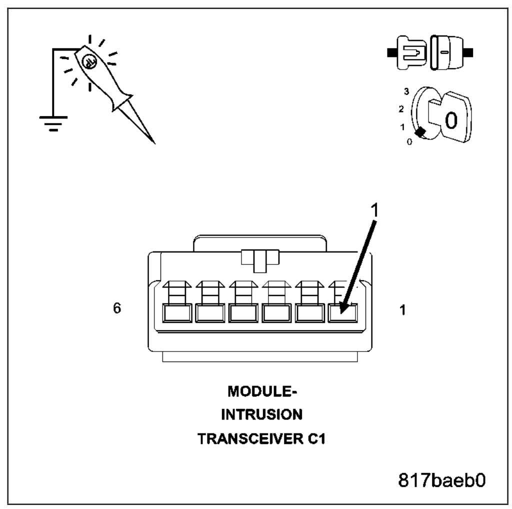
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A415) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Intrusion Transceiver Module C1 and C2 harness connectors.

Using a 12-volt test light connected to ground, check the (A415) Fused B(+) circuit.



Does the test light illuminate brightly?

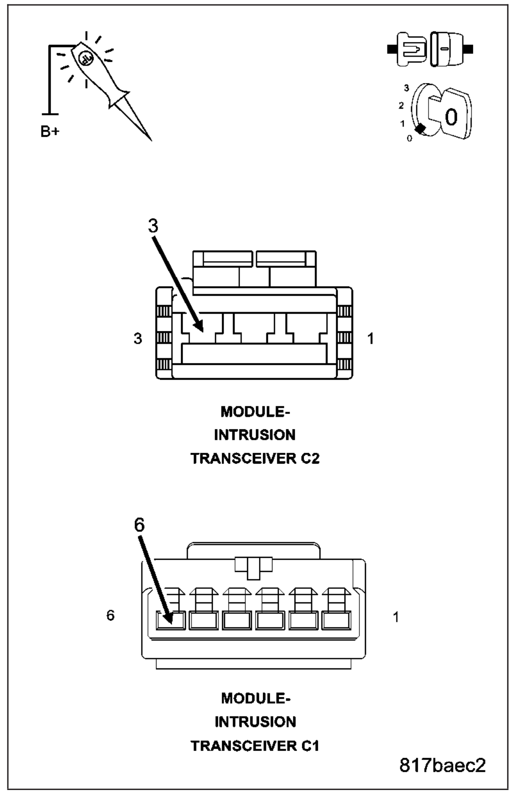
Yes >> Go To 3

No >> Repair the (A415) Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (Z936) (Z937) GROUND CIRCUITS OPEN

Using a 12-volt test light connected to 12-volts, check the (Z936) and (Z941) ground circuits.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the (Z936) or (Z941) ground circuit for an open.

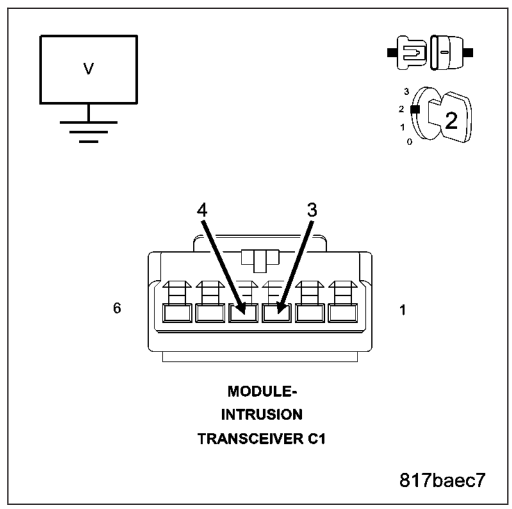
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present on either circuit?

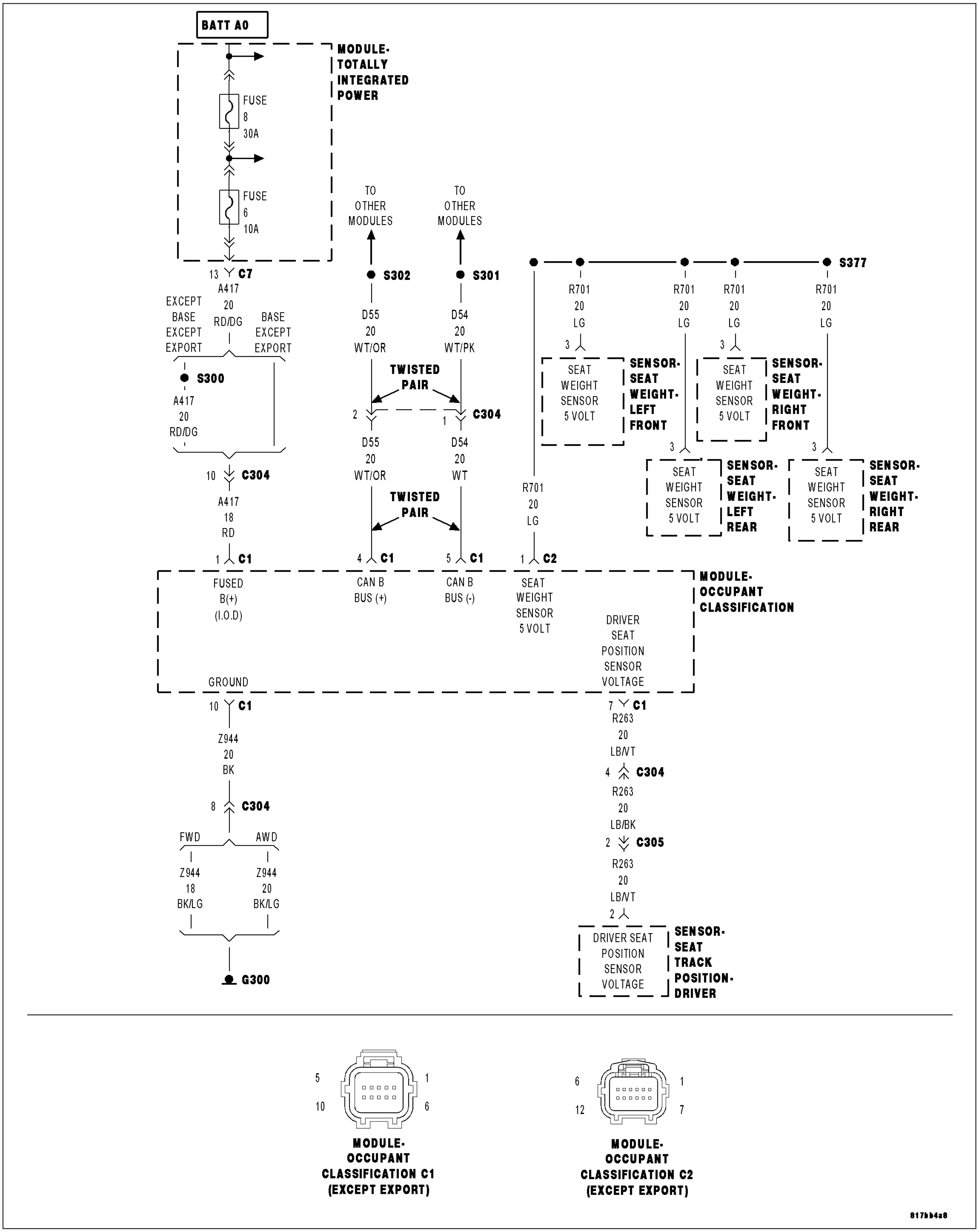
Yes >> Replace the Intrusion Transceiver Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM OCM (OCCUPANT CLASSIFICATION MODULE)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A417) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z944) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
(R263) DRIVER SEAT POSITION SENSOR VOLTAGE CIRCUIT FOR A SHORT TO GROUND
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR A SHORT TO GROUND
OCCUPANT CLASSIFICATION MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A417) FUSED B(+) CIRCUIT OPEN OR SHORTED

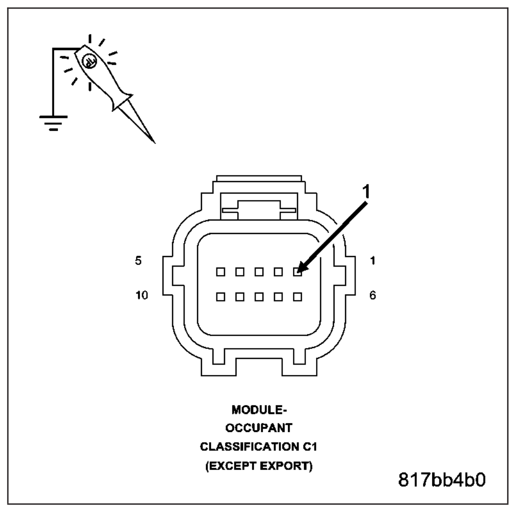
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Occupant Classification Module C1 harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Using a 12-volt test light connected to ground, check the (A417) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

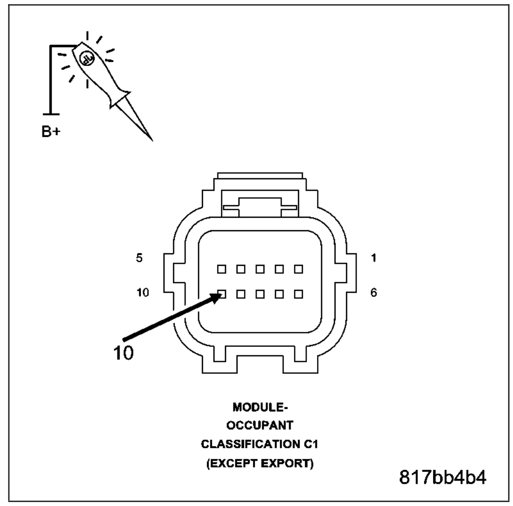
No >> Repair the (A417) Fused B(+) circuit for an open or short.
Perform the OCS VERIFICATION TEST-VER 1.



3. (Z944) GROUND CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z944) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z944) ground circuit for an open.
Perform the OCS VERIFICATION TEST-VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

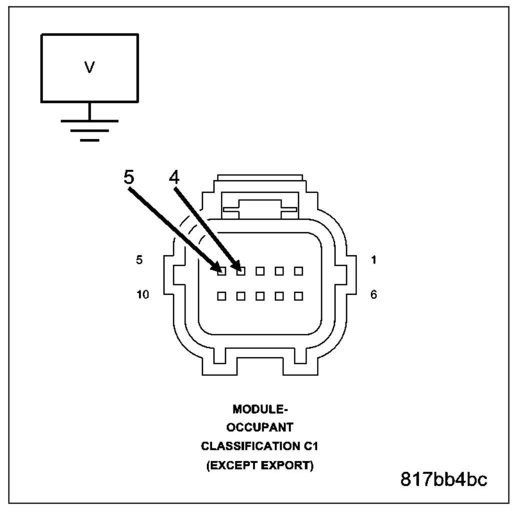
WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

NOTE: One open circuit will not cause this condition.

Turn the ignition on.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present on either circuit?

Yes >> Go To 5

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open.
Inspect the connector for damage.
Perform the OCS VERIFICATION TEST-VER 1.

5. CHECK (R263) DRIVER SEAT POSITION SENSOR VOLTAGE CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (R263) Driver Seat Position Sensor Voltage-Driver circuit.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the OCM and Driver Seat Position Sensor Harness in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.

No >> Go To 6

6. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR A SHORT TO GROUND

Disconnect the Occupant Classification Module C2 harness connector.
Measure the resistance between ground and the (R701) Seat Weight Sensor 5 volt circuit.

Is the resistance below 10k ohms?

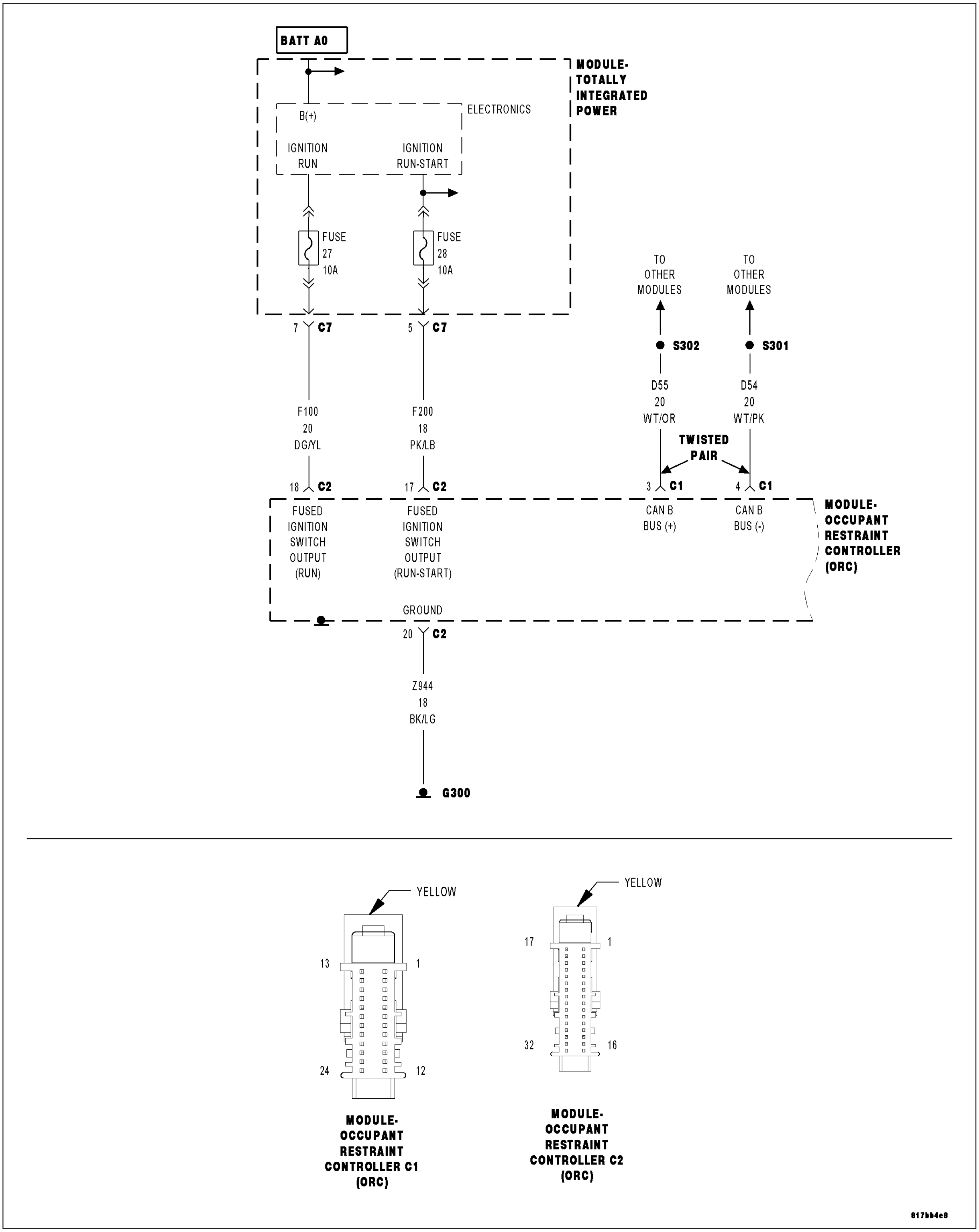
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition is present.

Replace the OCM and Driver Seat Position Sensor Harness in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.

No >> Replace the Occupant Classification Module in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.

*NO RESPONSE FROM ORC (OCCUPANT RESTRAINT CONTROLLER)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(Z944) GROUND CIRCUIT OPEN
(F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED
(F200) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
OCCUPANT RESTRAINT CONTROLLER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

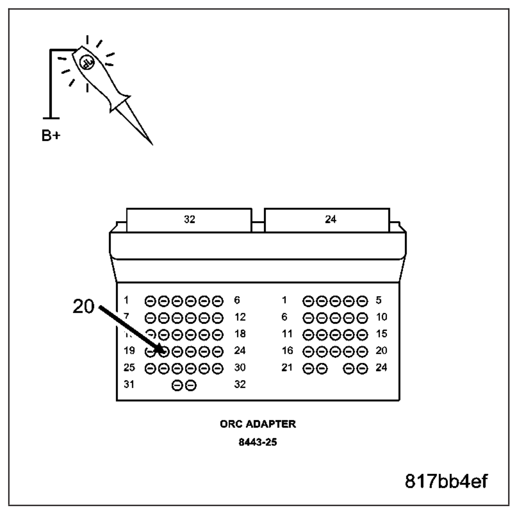
2. (Z944) GROUND CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Occupant Restraint Controller Module C1 and C2 harness connectors.

Connect the appropriate Load Tool ACM Adaptor to the ORC connectors.

Using a 12-volt test light connected to 12-volts, check the (Z944) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 3

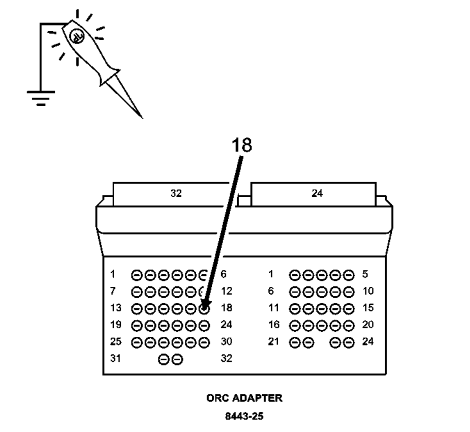
No >> Repair the (Z944) ground circuit for an open.
Perform the AIRBAG VERIFICATION TEST - VER 1.

3. (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED

NOTE: Check the TIPM for any ignition related DTCs before proceeding. If set (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Using a 12-volt test light connected to ground, check the (F100) Fused Ignition Switch Output (RUN) circuit.



817bb4f7

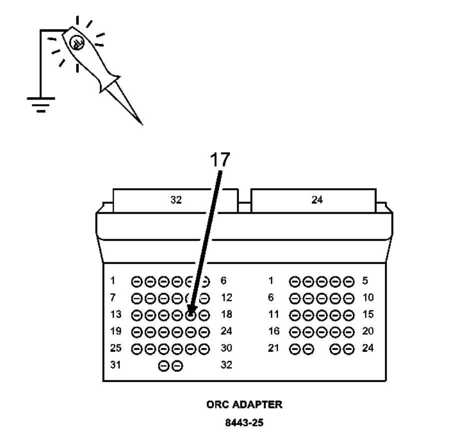
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (F100) Fused Ignition Switch Output (RUN) circuit for an open or short.
Perform the AIRBAG VERIFICATION TEST - VER 1.

4. (F200) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED

Using a 12-volt test light connected to ground, check the (F200) Fused Ignition Switch Output (RUN/START) circuit.



817bb50d

Does the test light illuminate brightly?

Yes >> Go To 5

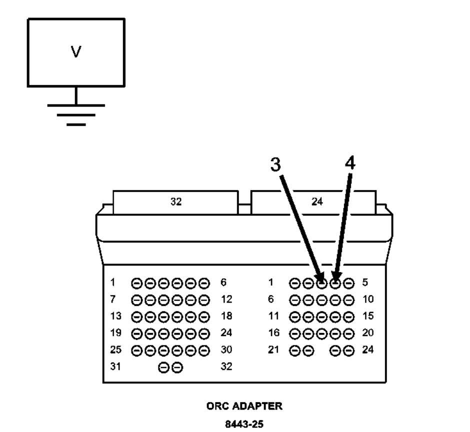
No >> Repair the (F200) Fused Ignition Switch Output (RUN/START) circuit for an open or short.
Perform the AIRBAG VERIFICATION TEST - VER 1.

5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



817bb518

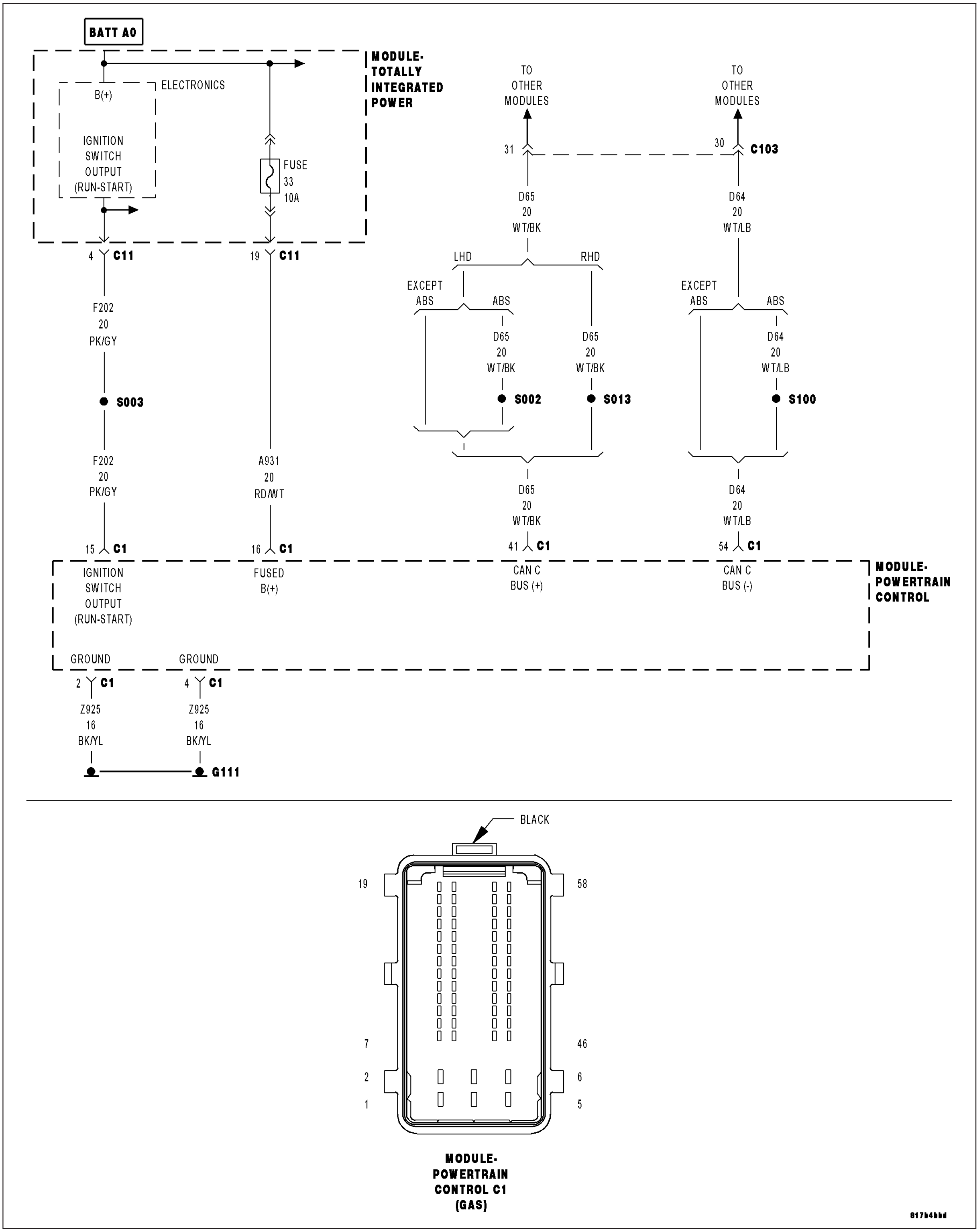
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present on either circuit?

Yes >> Replace the Occupant Restraint Controller Module in accordance with the service information. Perform the AIRBAG VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage. Perform the AIRBAG VERIFICATION TEST - VER 1.

*NO RESPONSE FROM PCM (POWERTRAIN CONTROL MODULE) (GPEC)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A931) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z925) GROUND CIRCUIT OPEN
(F202) IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the TIPM for any active CAN C hardware DTC's, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

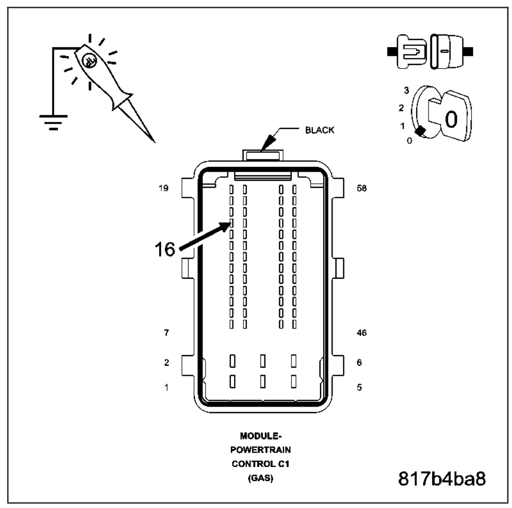
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A931) B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the PCM C1 harness connector.

Using a 12-volt test light connected to ground, check the (A931) B(+) circuit.



Does the test light illuminate brightly?

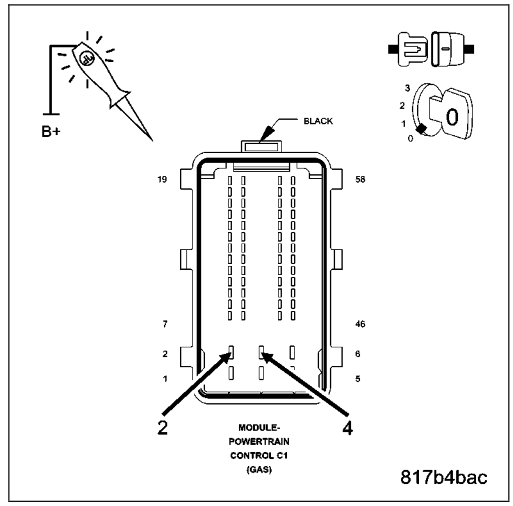
Yes >> Go To 3

No >> Repair the (A931) B(+) circuit for an open or short.

Perform the appropriate POWERTRAIN VERIFICATION TEST.

3. (Z925) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z925) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

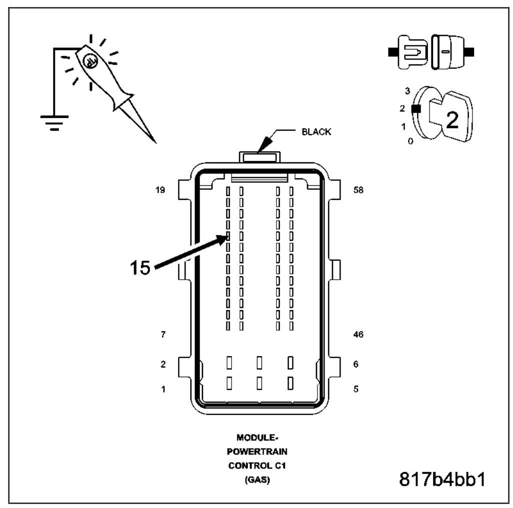
No >> Repair the ground circuit for an open.

Perform the appropriate POWERTRAIN VERIFICATION TEST.

4. (F202) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F202) Ignition Switch Output circuit for an open or short.

Perform the appropriate POWERTRAIN VERIFICATION TEST.

5. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

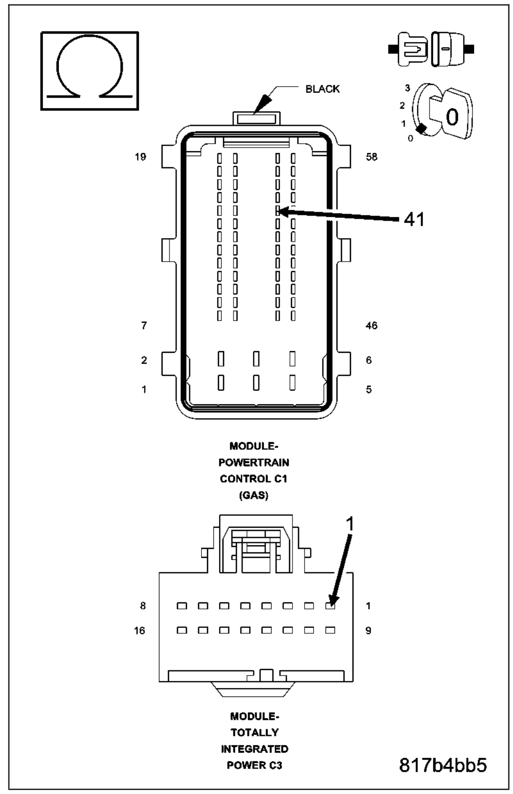
Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM C3 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (D65) CAN C Bus (+) circuit for an open.

Perform the appropriate POWERTRAIN VERIFICATION TEST.



6. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM C3 harness connector and the PCM C1 harness connector.

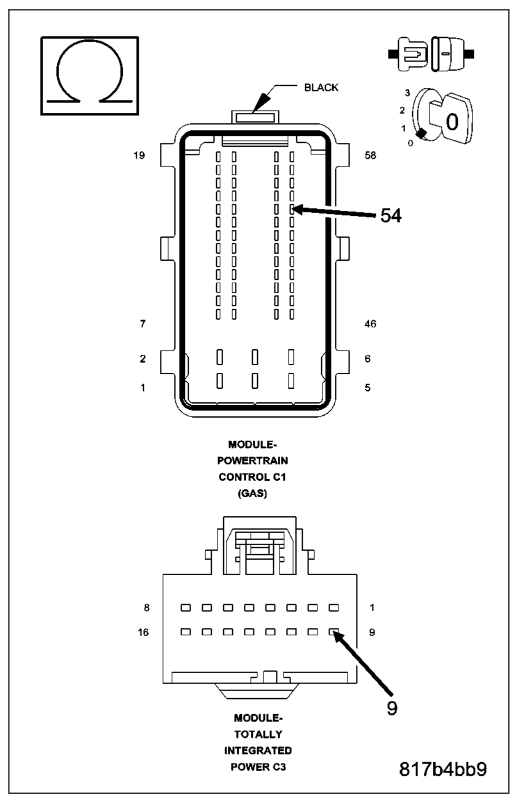
Is the resistance below 5.0 ohms?

Yes >> Replace and program the Powertrain Control Module in accordance with the service information.

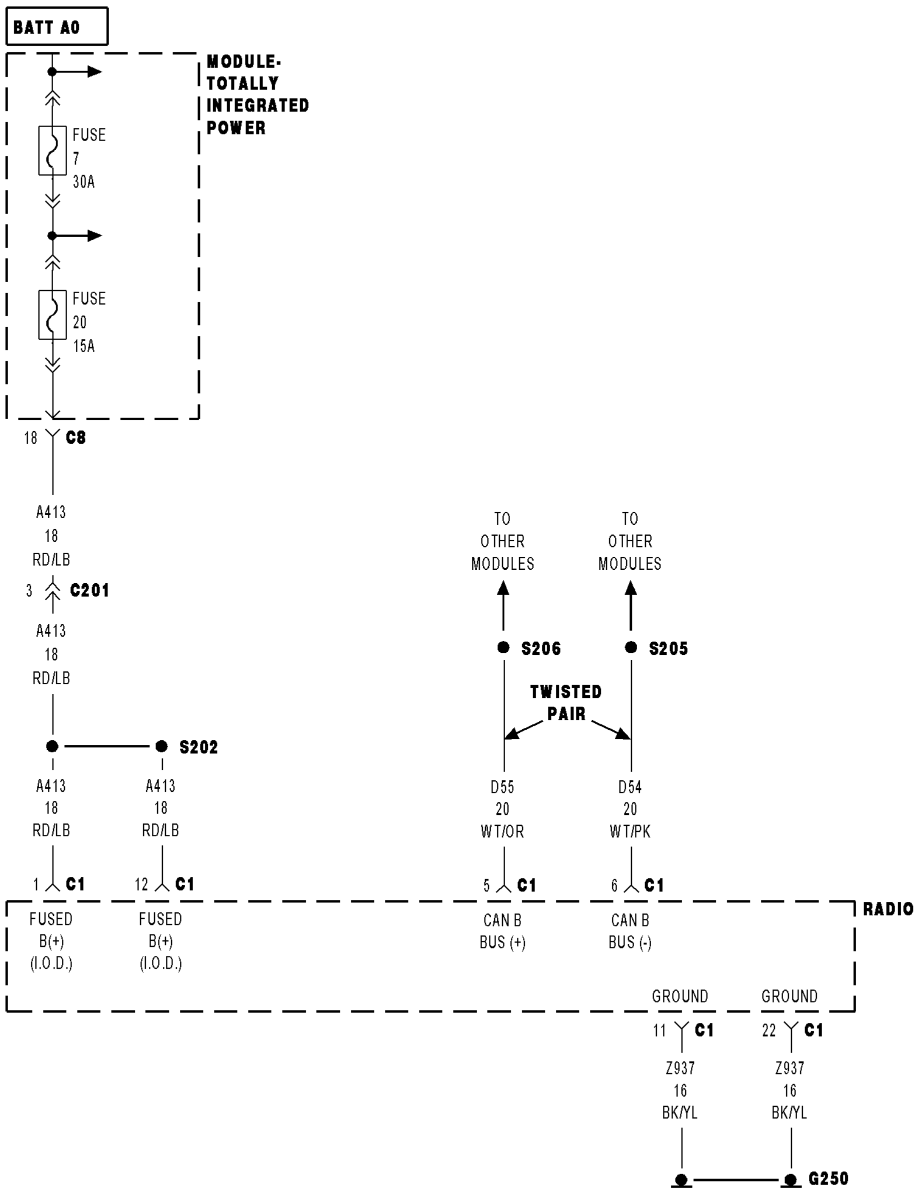
Perform the appropriate POWERTRAIN VERIFICATION TEST.

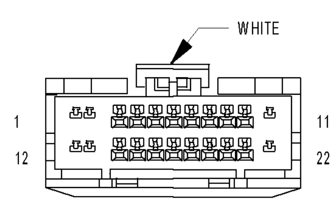
No >> Repair the (D64) CAN C Bus (-) circuit for an open.

Perform the appropriate POWERTRAIN VERIFICATION TEST.



*NO RESPONSE FROM RADIO





RADIO C1

817bb795

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A413) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z937) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
RADIO

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

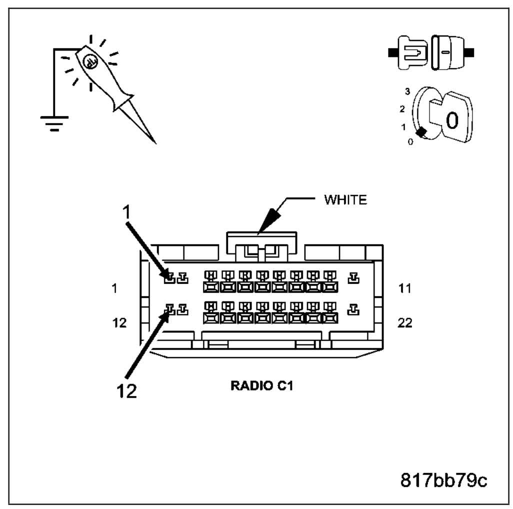
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A413) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Using a 12-volt test light connected to ground, check each (A413) Fused B(+) circuit.



Does the test light illuminate brightly for each circuit?

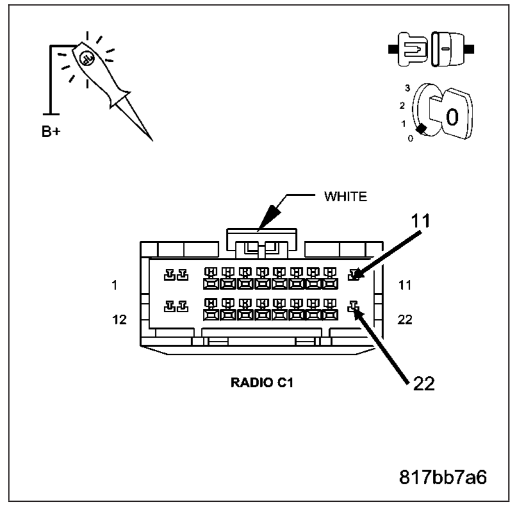
Yes >> Go To 3

No >> Repair the (A413) Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (Z937) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check each (Z937) ground circuit.



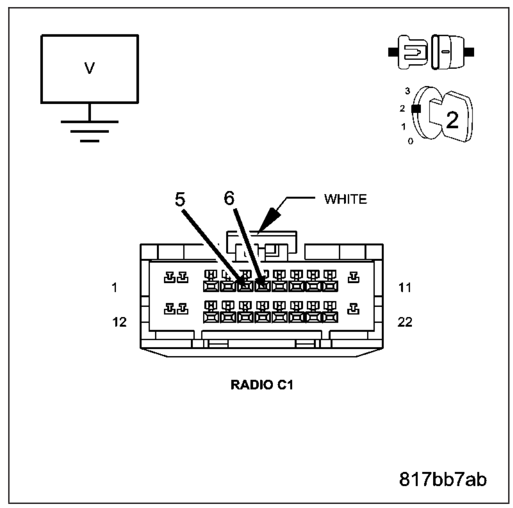
Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the (Z937) ground circuit for an open.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

Turn the ignition on.



NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

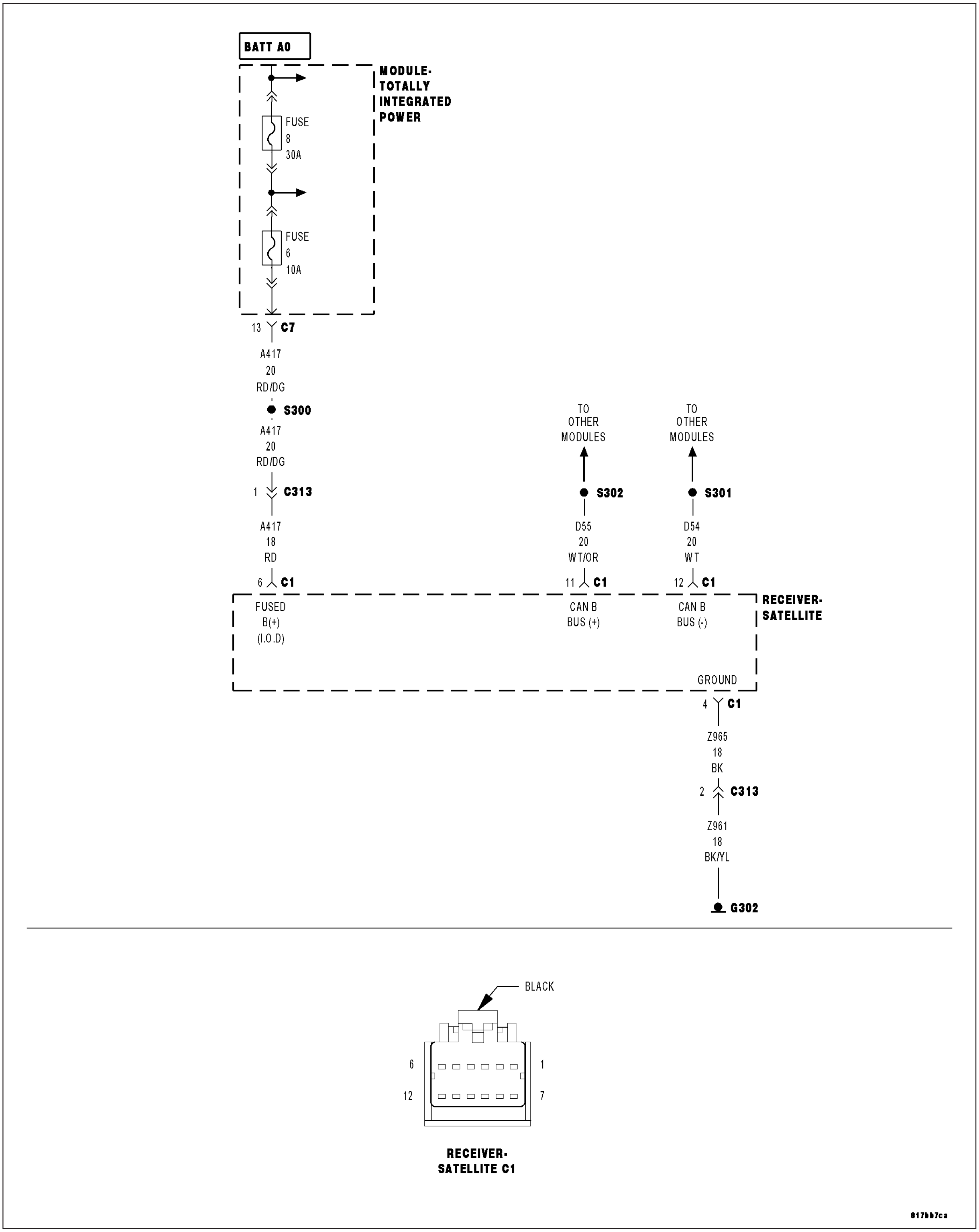
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present on either circuit?

Yes >> Replace the Radio in accordance with the service information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM SDAR (SATELLITE RECEIVER)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A417) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z965) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
SATELLITE RECEIVER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

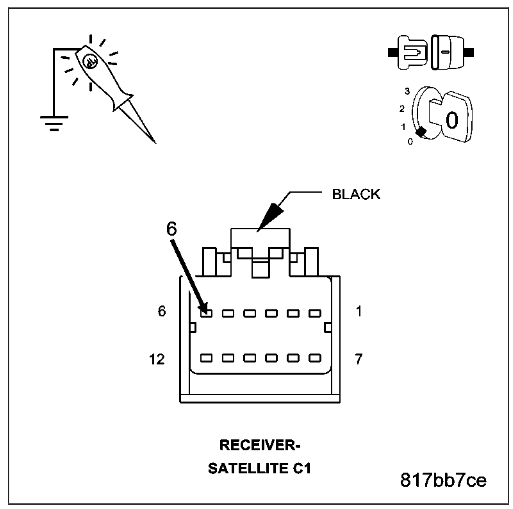
No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A417) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Satellite Receiver harness connector.

Using a 12-volt test light connected to ground, check the (A417) Fused B(+) circuit.



Does the test light illuminate brightly?

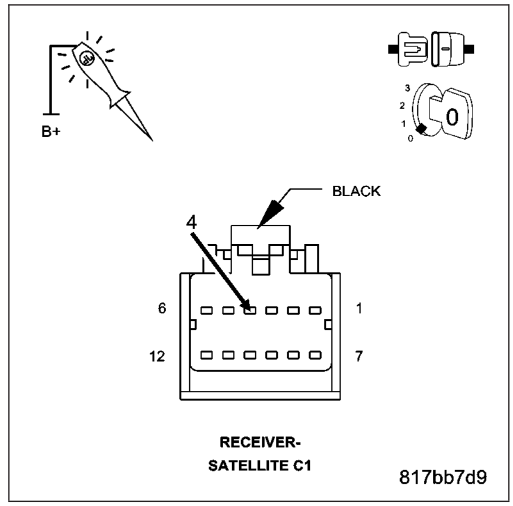
Yes >> Go To 3

No >> Repair the (A417) Fused B(+) circuit for an open or short.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (Z965) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z965) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z965) ground circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

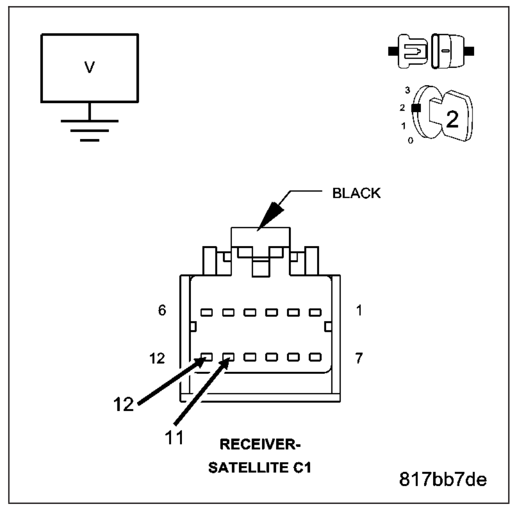
4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

Turn the ignition on.

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present on either circuit?

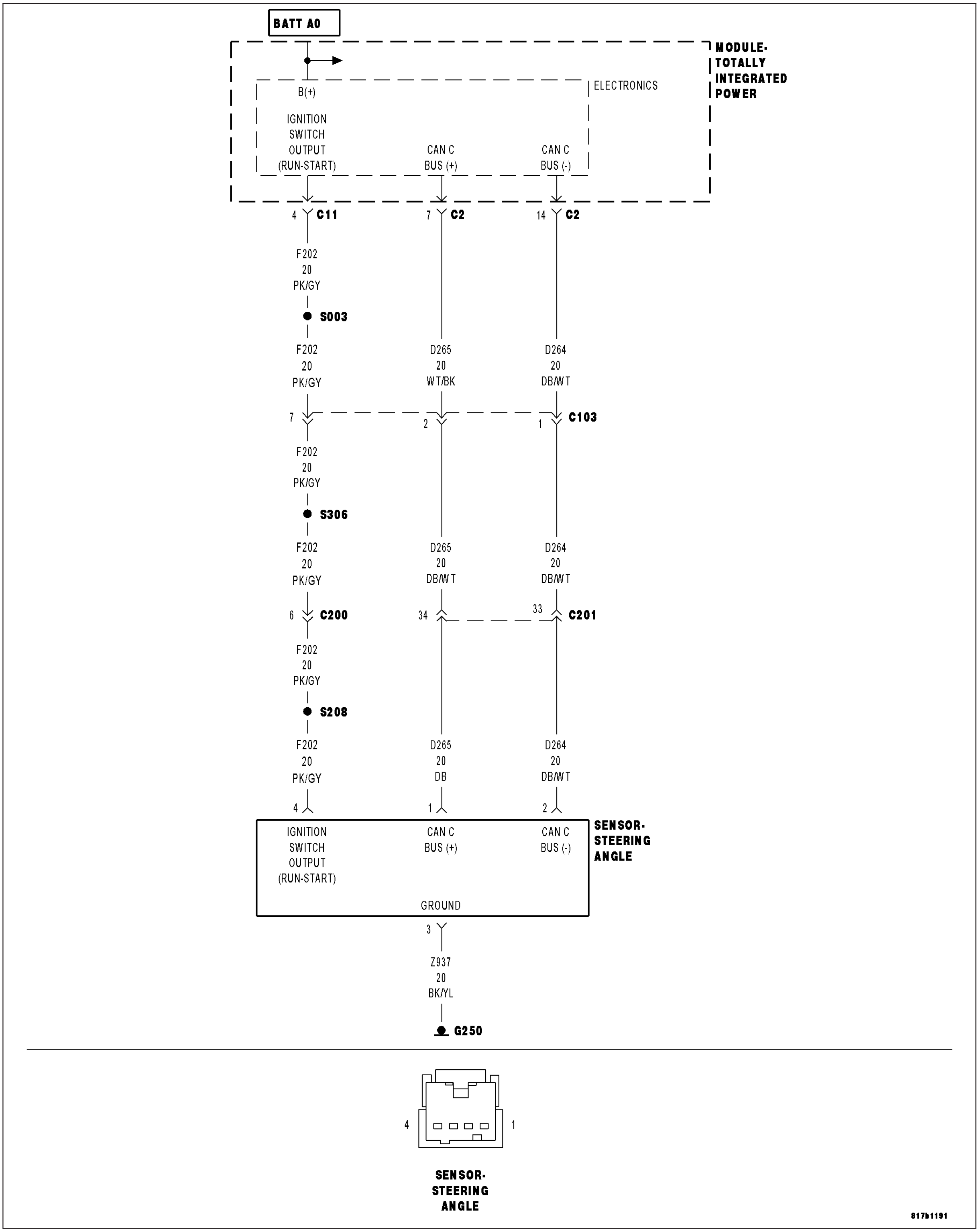
Yes >> Replace the Satellite Receiver in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM THE STEERING ANGLE SENSOR (SAS)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(F202) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(Z937) GROUND CIRCUIT OPEN
(D265) CAN C BUS (+) CIRCUIT OPEN
(D264) CAN C BUS (-) CIRCUIT OPEN
STEERING ANGLE SENSOR

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the sensor?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

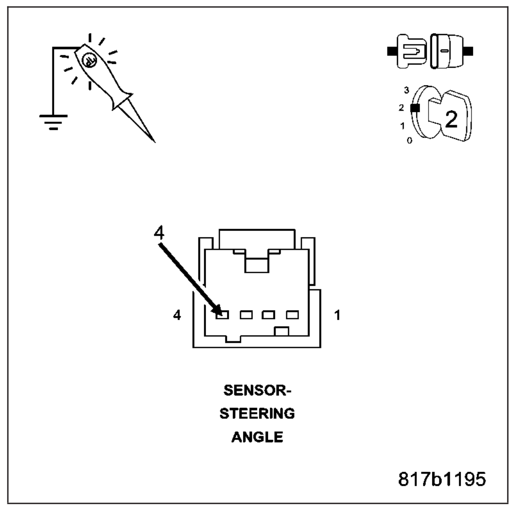
2. (F202) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Steering Angle Sensor harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Ignition Switch Output circuit.



Does the test light illuminate brightly?

Yes >> Go To 3

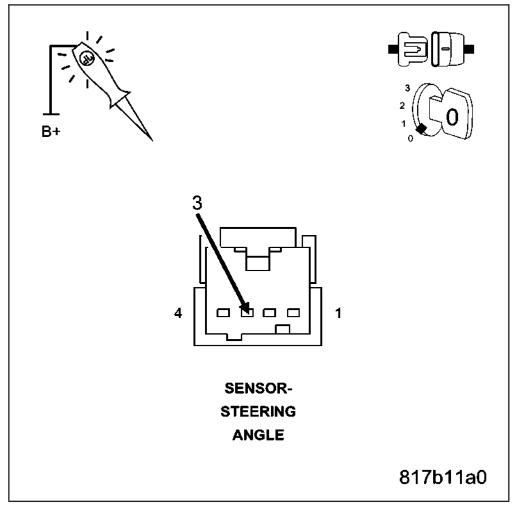
No >> Repair the (F202) Ignition Switch Output circuit for an open or short.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (Z937) GROUND CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z937) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

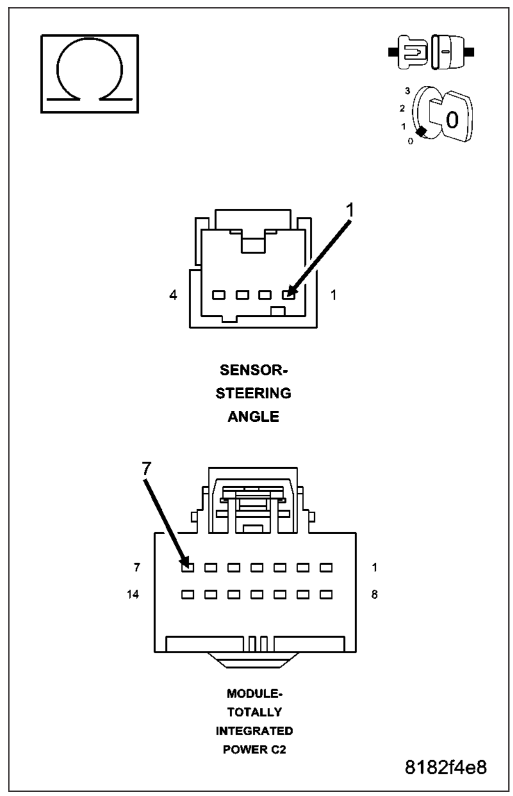
No >> Repair the (Z937) ground circuit for an open.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (D265) CAN C BUS (+) CIRCUIT OPEN

Disconnect the TIPM C2 harness connector.

Measure the resistance of the (D265) CAN C Bus (+) circuit between the TIPM C2 harness connector and the Steering Angle Sensor connector.



Is resistance below 5.0 ohms?

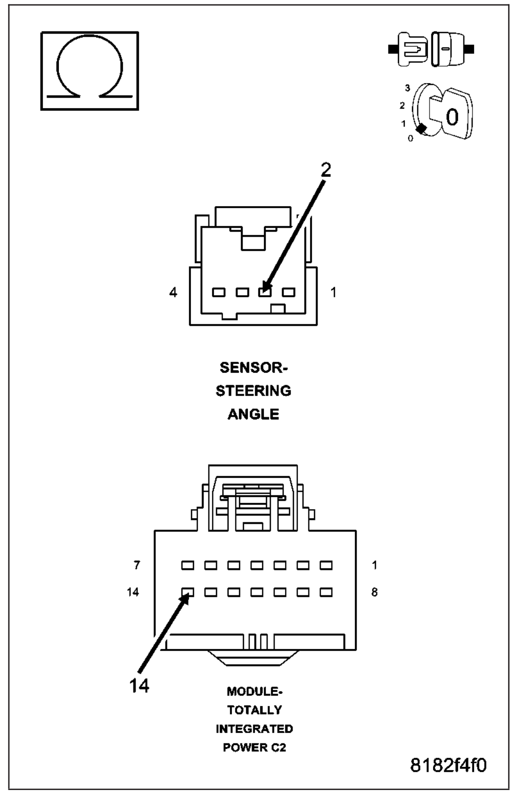
Yes >> Go To 5

No >> Repair the (D265) CAN C Bus (+) circuit for an open.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. (D264) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D264) CAN C Bus (-) circuit between the TIPM C2 harness connector and the Steering Angle Sensor connector.



Is resistance below 5.0 ohms?

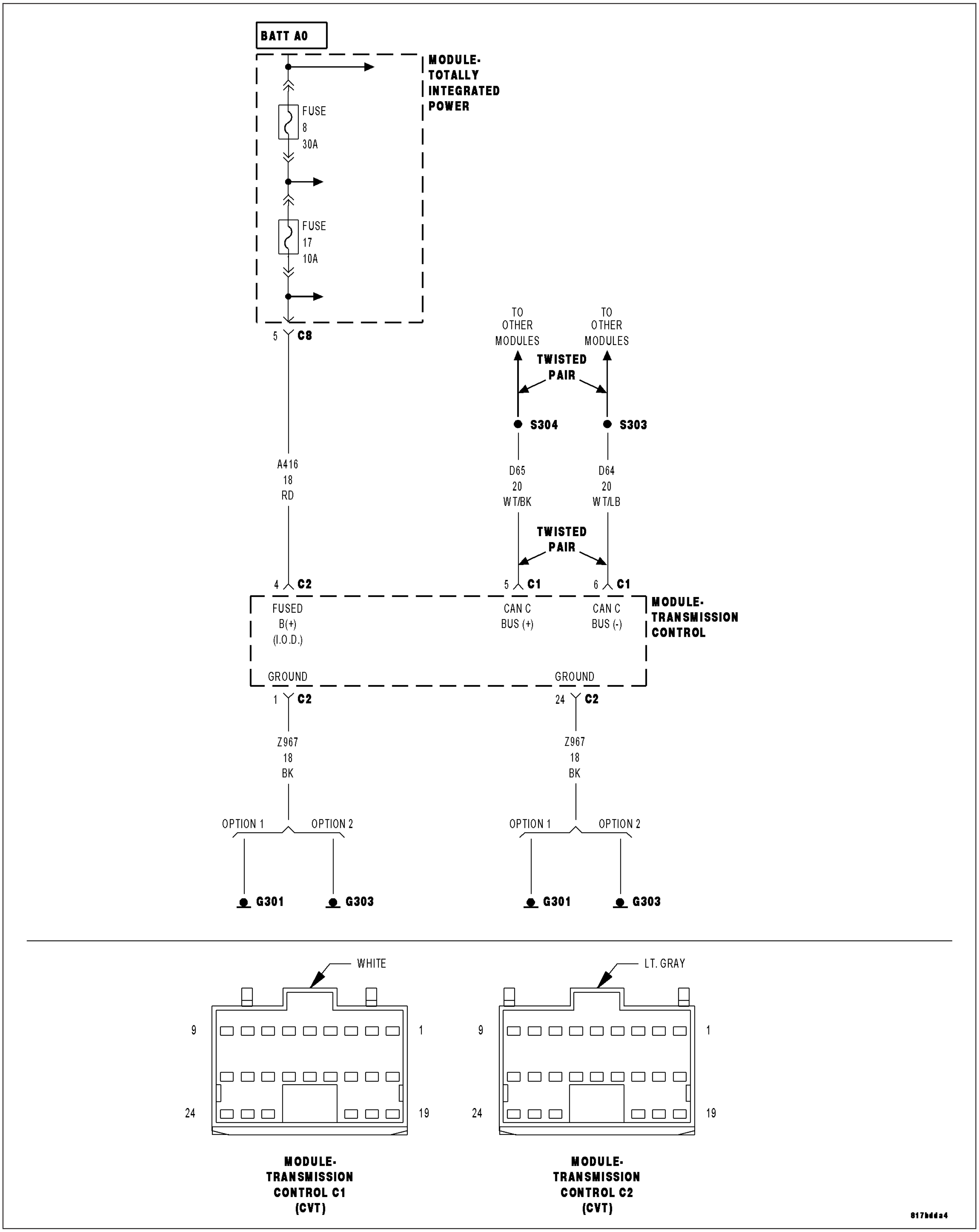
Yes >> Replace the Steering Angle Sensor in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (D264) CAN C Bus (-) circuit for an open.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

*NO RESPONSE FROM TCM (TRANSMISSION CONTROL MODULE) (CVT)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A416) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z967) GROUND CIRCUIT OPEN
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
TRANSMISSION CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the TIPM for any active CAN C hardware DTC's, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A416) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

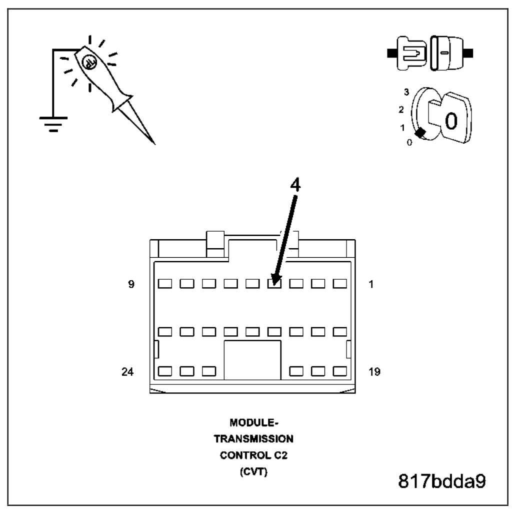
Disconnect the TCM C2 harness connector.

Using a 12-volt test light connected to ground, check the (A416) Fused B(+) circuit.

Does the test light illuminate brightly?

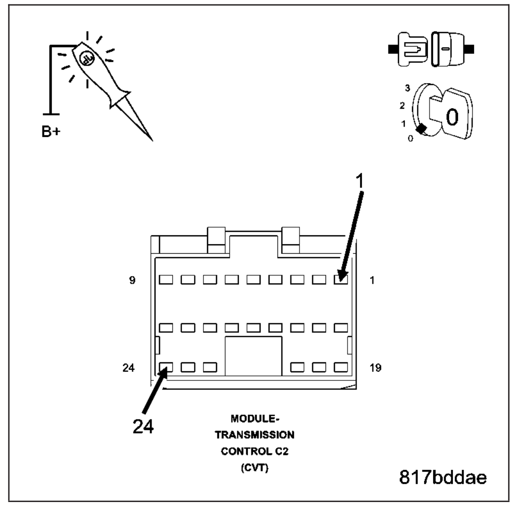
Yes >> Go To 3

No >> Repair the (A416) Fused B(+) circuit for an open or short. Perform the CVT VERIFICATION TEST.



3. (Z967) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z967) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z967) ground circuit for an open. Perform the CVT VERIFICATION TEST.

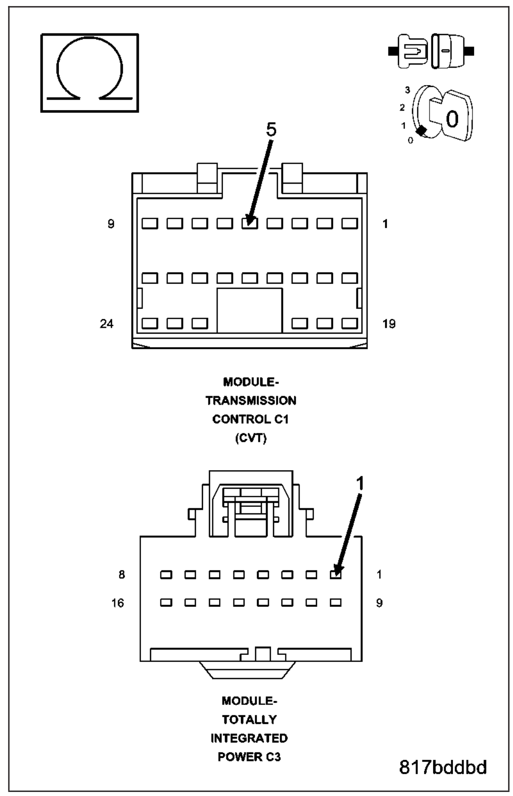
4. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the TCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM C3 harness connector and the TCM C1 harness connector.



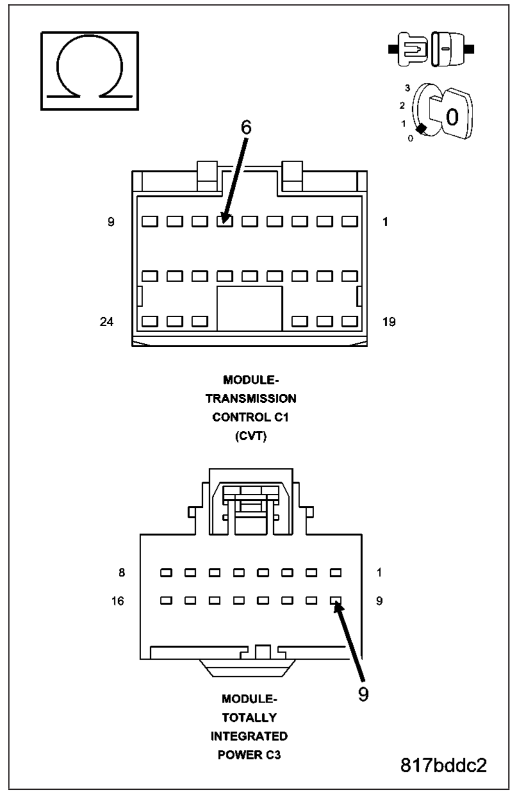
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (D65) CAN C Bus (+) circuit for an open. Perform the CVT VERIFICATION TEST.

5. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM C3 harness connector and the TCM C1 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace and program the Transmission Control Module in accordance with the service information.
Perform the appropriate VERIFICATION TEST.

No >> Repair the (D64) CAN C Bus (-) circuit for an open.
Perform the CVT VERIFICATION TEST.

*NO RESPONSE FROM TIPM (TOTALLY INTEGRATED POWER MODULE)

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
DIRECT BATTERY FEED CIRCUIT OPEN
GROUND CIRCUITS OPEN
DIAGNOSTIC CAN C CIRCUITS OPEN
DIAGNOSTIC CAN C CIRCUITS SHORTED TO GROUND
DIAGNOSTIC CAN C CIRCUITS SHORTED TOGETHER
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

NOTE: Ensure the scan tool is updated to the latest software.

NOTE: If the scan tool displays any error messages involving the Diagnostic CAN C circuits, diagnose and repair the errors before proceeding. Refer to the Table of Contents.

NOTE: A loss of communication with the TIPM can cause the ECU View button on the scan tool to be inoperative (not highlighted).

With the scan tool, attempt to select ECU View.

Can the scan tool communicate with the TIPM?

Yes >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

No >> Go To 2

2. DIRECT BATTERY FEED CIRCUIT OPEN AT TIPM

Disconnect the scan tool from the DLC.

Using a 12-volt test light connected to ground, and using the wiring diagram as a guide, check the direct battery feed circuit at the TIPM.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the direct battery feed circuit for an open.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. GROUND CIRCUITS OPEN AT TIPM

Turn the ignition off.

Using a 12-volt test light connected to 12-volts, and using the wiring diagram as a guide, check all ground circuits at the TIPM.

Does the test light illuminate brightly on each circuit?

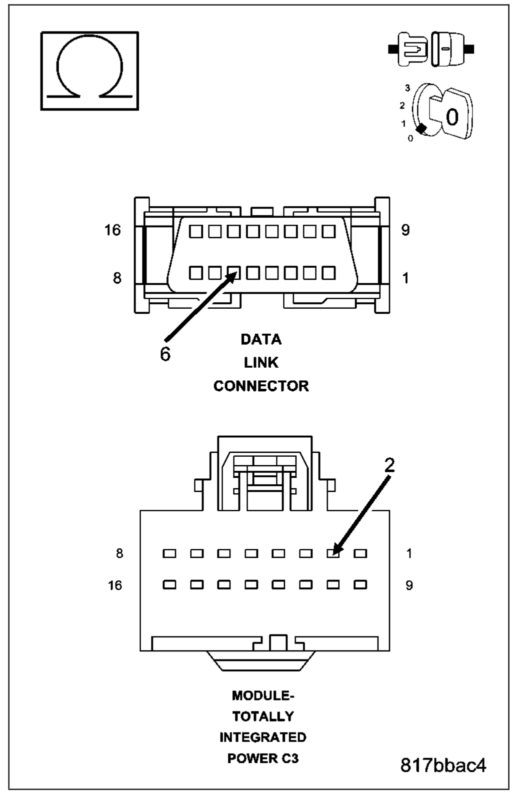
Yes >> Go To 4

No >> Repair the ground circuit that did not light the test light for an open.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. CHECK FOR (D72) DIAGNOSTIC CAN C (+) CIRCUIT OPEN AT DLC

Disconnect the TIPM C3 harness connector.

Measure the resistance on the (D72) Diagnostic CAN C (+) circuit between the TIPM C3 harness connector and the DLC.



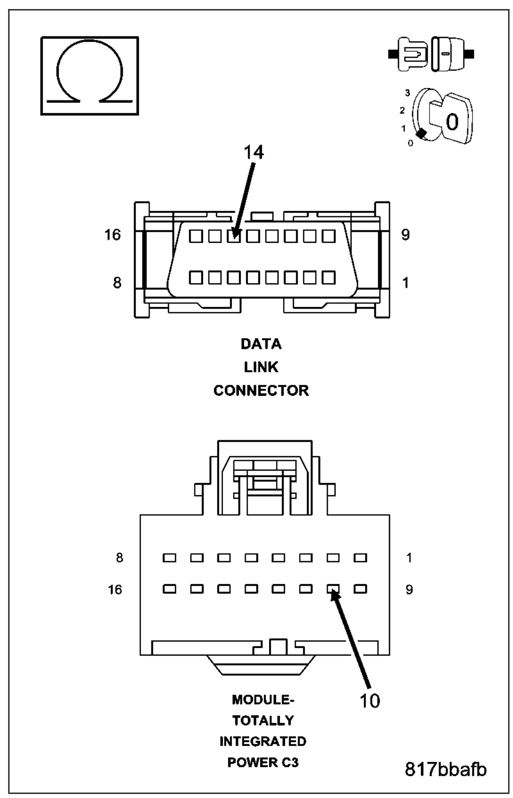
Is the resistance above 10.0 ohms?

Yes >> Repair the (D72) Diagnostic CAN C (+) circuit for an open. Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK FOR (D71) DIAGNOSTIC CAN C (-) CIRCUIT OPEN AT DLC

Measure the resistance on the (D71) Diagnostic CAN C (-) circuit between the TIPM C3 harness connector and the DLC.



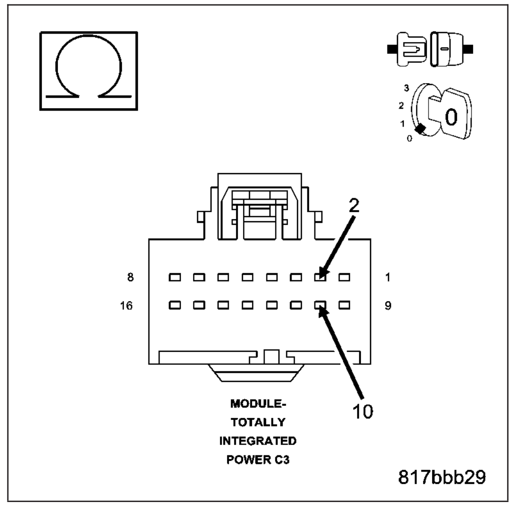
Is the resistance above 10.0 ohms?

Yes >> Repair the (D71) Diagnostic CAN C (-) circuit for an open. Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 6

6. CHECK FOR DIAGNOSTIC CAN C CIRCUITS SHORTED TOGETHER

Measure the resistance between the (D72) Diagnostic CAN C (+) circuit and the (D71) Diagnostic CAN C (-) circuit at the TIPM C3 harness connector.



Is the resistance below 100.0 ohms?

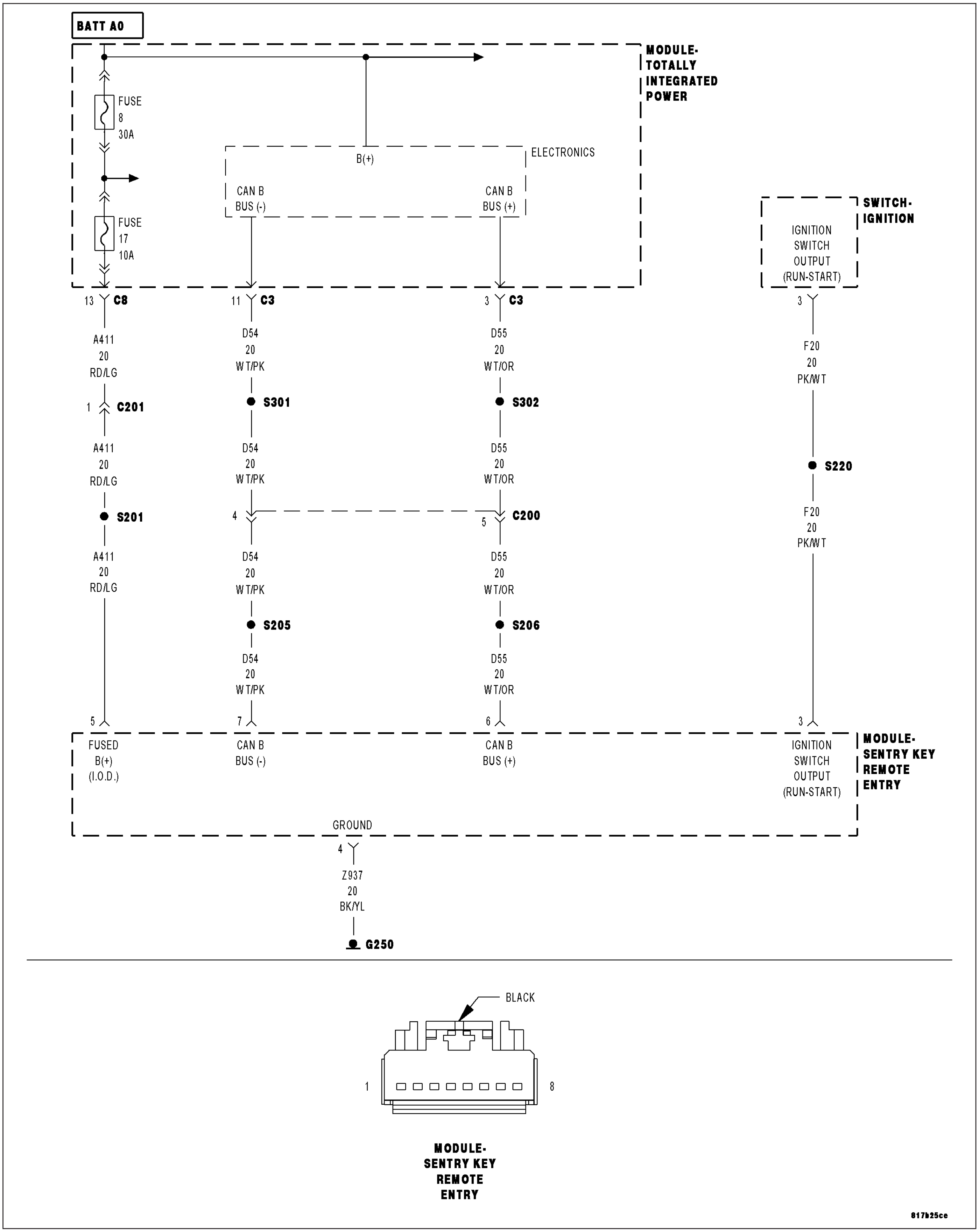
Yes >> Repair the (D72) Diagnostic CAN C (+) circuit for a short to the (D71) Diagnostic CAN C (-) circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

*NO RESPONSE FROM WCM (SENTRY KEY REMOTE ENTRY MODULE)



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A411) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z937) GROUND CIRCUIT OPEN
(F20) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
SENTRY KEY REMOTE ENTRY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU View.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

2. (A411) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

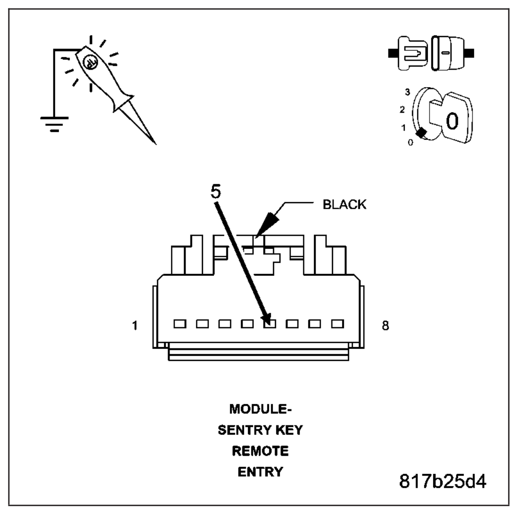
Disconnect the Sentry Key Remote Entry Module harness connector.

Using a 12-volt test light connected to ground, check the (A411) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A411) Fused B(+) circuit for an open or short. Perform SKREEM VERIFICATION TEST.



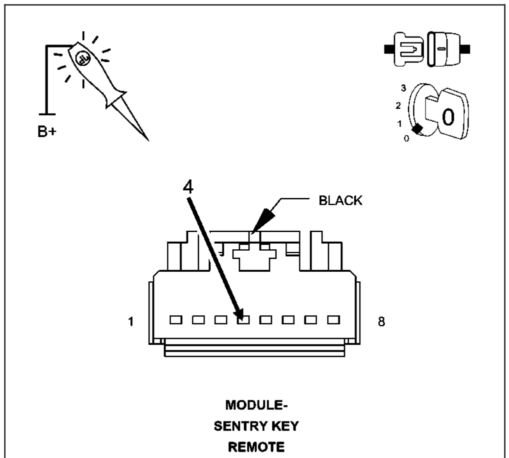
3. (Z937) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z937) ground circuit.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z937) ground circuit for an open.
Perform SKREEM VERIFICATION TEST.



817b25d9

4. (F20) IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

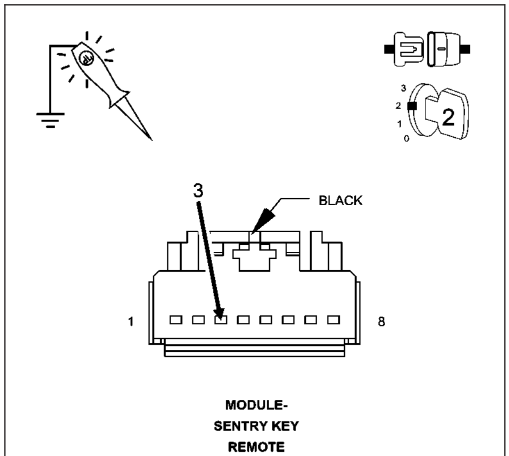
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F20) Ignition Switch Output circuit.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F20) Ignition Switch Output circuit for an open or short.
Perform SKREEM VERIFICATION TEST.



817b25e3

5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

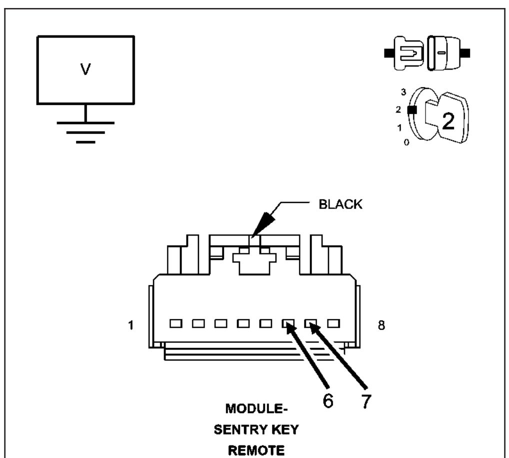
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present on either circuit?

Yes >> Replace the Sentry Key Remote Entry Module in accordance with the service information.
Perform SKREEM VERIFICATION TEST.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform SKREEM VERIFICATION TEST.



817b25e7

STANDARD PROCEDURE

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

NOTE: If the SKREEM or PCM/ECM was replaced, refer to the service information for proper programming procedures.

1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
2. Ensure that all accessories are turned off.
3. Ensure that the battery is fully charged.
4. Turn the ignition on.
5. With the scan tool, record and erase DTC's from all modules.
6. If an electronic control module was replaced, select the applicable module from the scan tool menu and press "Misc. Functions". If the module has programmable features, program as necessary.
7. (Export only) If the Intrusion Transceiver Module (ITM) and/or Siren was replaced, select ITM from the scan tool ECU View menu then "Misc. Functions" and perform the applicable replacement procedure.
8. Turn the ignition off, wait 10 seconds, and then turn the ignition on.
9. Operate all functions of the system that caused the original concern.
10. With the scan tool, select ECU View and check for DTC's in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

ELECTRONIC CONTROL MODULES - SERVICE INFORMATION

TABLE OF CONTENTS

ELECTRONIC CONTROL MODULES - SERVICE INFORMATION

STANDARD PROCEDURE

PCM/ECM/SKREEM PROGRAMMING

NOTE: Before replacing the Powertrain Control Module (PCM) or Engine Control Module (ECM), be certain to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM/ECM driver/control circuit failures are caused by internal component failures (i.e. relays and solenoids) and shorted circuits (i.e. pull-ups, drivers, and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has been set.

When a PCM, or ECM, and the Sentry Key REmote Entry Module (SKREEM) on vehicles equipped with the Sentry Key Immobilizer System (SKIS) are replaced at the same time, perform the following steps in order:

1. Program the new PCM or ECM.
2. Program the new SKREEM (also sometimes referred to as the Wireless Control Module or WCM).
3. Replace all ignition keys and program them into the new SKREEM/WCM.

PROGRAMMING THE SKREEM

The SKIS Secret Key is an ID code that is unique to each SKREEM/WCM. This code is programmed and stored in the SKREEM/WCM, the PCM/ECM, and each ignition key transponder chip. When the PCM or SKREEM/WCM is replaced, it is necessary to program the Secret Key into the new module using a diagnostic scan tool. Follow the programming steps outlined in the diagnostic scan tool for “PCM Replaced” or “WCM Replaced” under “Miscellaneous Functions” for the “WCM/Wireless Control Module” menu item as appropriate.

NOTE: If the PCM/ECM and the SKREEM/WCM are replaced at the same time, all vehicle ignition keys will need to be replaced and new keys programmed into the new SKREEM/WCM.

NOTE: Programming the PCM/ECM or SKREEM is done using a diagnostic scan tool and a PIN to enter secure access mode. If eight attempts are made to enter secure access mode using an incorrect PIN, secure access mode will be locked out for one hour. To exit this lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned OFF. Also monitor the battery state and connect a battery charger if necessary).

PROGRAMMING IGNITION KEYS TO THE SKREEM

Each ignition key transponder also has a unique ID code that is assigned at the time the key is manufactured. When a key is programmed into the SKREEM/WCM, the transponder ID code is learned by the module and the transponder acquires the unique Secret Key ID code from the SKREEM/WCM. To program ignition keys into the SKREEM/WCM, follow the programming steps outlined in the diagnostic scan tool for **PROGRAM IGNITION KEYS OR KEY FOBS** under **MISCELLANEOUS FUNCTIONS** for the **WCM/WIRELESS CONTROL MODULE** menu item.

NOTE: A maximum of eight keys can be learned to each SKREEM. Once a key is learned to a SKREEM, that key has acquired the Secret Key for that SKREEM and cannot be transferred to any other SKREEM or vehicle.

If ignition key programming is unsuccessful, the scan tool will display one of the following error messages:

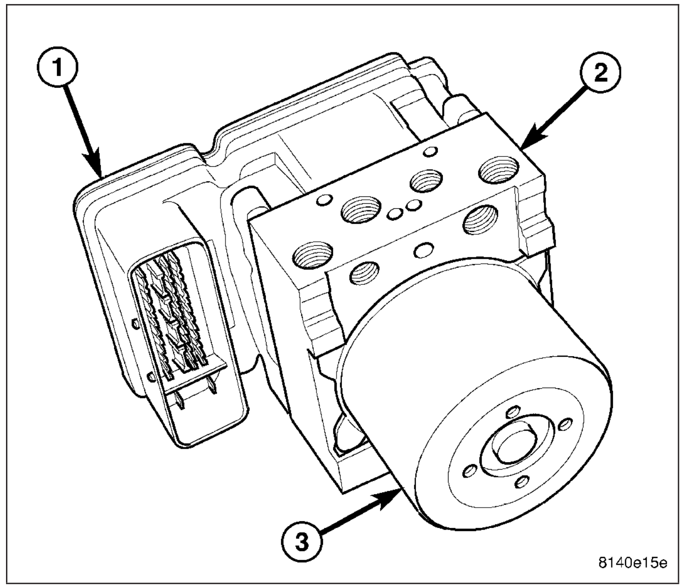
- **Programming Not Attempted** - The scan tool attempts to read the programmed key status and there are no keys programmed into SKREEM memory.
- **Programming Key Failed (Possible Used Key From Wrong Vehicle)** - SKREEM is unable to program an ignition key transponder due to one of the following:
  - The ignition key transponder is faulty.
  - The ignition key transponder is or has been already programmed to another vehicle.
- **8 Keys Already Learned, Programming Not Done** - The SKREEM transponder ID memory is full.
- **Learned Key In Ignition** - The ID for the ignition key transponder currently in the ignition lock cylinder is already programmed into SKREEM memory.

MODULE-ANTILOCK BRAKE

DESCRIPTION

The Antilock Brake Module (ABM) is a microprocessor-based device which monitors the antilock brake system (ABS) during normal braking and controls it when the vehicle is in an ABS stop or when in a traction control situation. The ABM utilizes a 47-way electrical connector on the vehicle wiring harness. The power source for the ABM is through the ignition switch in the RUN or ON position.

The ABM (1) is mounted to the HCU (2) as part of the Integrated Control Unit (ICU). The ICU is located in the engine compartment on the inboard side of the right body frame rail behind the strut tower. For information on the ICU, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DESCRIPTION).



OPERATION

The primary functions of the Antilock Brake Module (ABM) are to:

- Monitor the Antilock Brake System (ABS) and Electronic Stability Program (ESP) for proper operation.
- Detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- Control fluid modulation to the wheel brakes while the system is in ABS or traction control mode.
- Modulates fluid pressure to the wheel brakes to control vehicle yaw rate in ESP mode.
- Store diagnostic information.
- Provide communication to the scan tool while in diagnostic mode.
- Illuminate the amber ABS indicator in the instrument cluster.
- Illuminate the yellow ESP/BAS indicator in the instrument cluster (if equipped).

The ABM constantly monitors the ABS and ESP (if equipped) for proper operation. If the ABM detects a fault, it will turn on the amber ABS and yellow ESP/BAS indicators and disable the ABS or ESP if so equipped. The normal base braking system will remain operational at that time.

The ABM continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the ABM commands the ABM solenoid coils to actuate. The coils then open and close the valves in the HCU that modulate brake fluid pressure in some or all of the hydraulic circuits. The ABM continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

REMOVAL

Due to packaging and limited space it is necessary to remove and disassemble the Integrated Control Unit (ICU) to service the Antilock Brake Module (ABM) on this vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - REMOVAL)

INSTALLATION

Due to packaging and limited space it is necessary to install the Antilock Brake Module (ABM) on the Hydraulic Control Unit (HCU), then install the Integrated Control Unit (ICU) on the vehicle as an assembly. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - ASSEMBLY)

COMMUNICATION

DESCRIPTION

The primary on-board communication network between microprocessor-based electronic control modules in this vehicle is the Controller Area Network (CAN) data bus system. A data bus network minimizes redundant wiring connections; and, at the same time, reduces wire harness complexity, sensor current loads and controller hardware by allowing each sensing device to be connected to only one module (also referred to as a node). Each node reads, then broadcasts its sensor data over the bus for use by all other nodes requiring that data. Each node ignores the messages on the bus that it cannot use.

The CAN bus is a two-wire multiplex system. Multiplexing is any system that enables the transmission of multiple messages over a single channel or circuit. The CAN bus is used for communication between most vehicle nodes. However, in addition to the CAN bus network, certain nodes may also be equipped with a Local Interface Network (LIN) data bus. The LIN data bus is a single wire low-speed system used to provide direct communication between a master module and certain switch or sensor inputs.

There are actually three separate CAN bus systems used in the vehicle. They are designated: the CAN-B, the CAN-C and the Diagnostic CAN-C. The CAN-B and CAN-C systems provide on-board communication between all nodes in the vehicle. The CAN-C is the faster of the two systems providing near real-time communication (500 Kbps), but is less fault tolerant than the CAN-B system. The CAN-C is used exclusively for communications between critical powertrain and chassis nodes. The slower (83.3 Kbps), but more fault tolerant CAN-B system is used for communications between body and interior nodes. The CAN-B fault tolerance comes from its ability to revert to a single wire communication mode if there is a fault in the bus wiring.

The added speed of the CAN data bus is many times faster than previous data bus systems. This added speed facilitates the addition of more electronic control modules or nodes and the incorporation of many new electrical and electronic features in the vehicle. The Diagnostic CAN-C bus is also capable of 500 Kbps communication, and is sometimes informally referred to as the CAN-D system to differentiate it from the other high speed CAN-C bus. The Diagnostic CAN-C is used exclusively for the transmission of diagnostic information between the Totally Integrated Power Module/Central GateWay (TIPM or TIPMCGW) and a diagnostic scan tool connected to the industry-standard 16-way Data Link Connector (DLC) located beneath the instrument panel on the driver side of the vehicle.

The TIPM is located in the engine compartment near the battery. The central CAN gateway or hub module integral to the TIPM is connected to all three CAN buses. This gateway physically and electrically isolates the CAN buses from each other and coordinates the bi-directional transfer of messages between them.

OPERATION

The Controller Area Network (CAN) data bus allows all electronic modules or nodes connected to the bus to share information with each other. Regardless of whether a message originates from a module on the low speed CAN-B bus or on the high speed CAN-C or CAN-D bus, the message structure and layout is similar, which allows the Totally Integrated Power Module/Central GateWay (TIPM or TIPMCGW) to process and transfer messages between the CAN buses. The TIPM also stores a Diagnostic Trouble Code (DTC) for certain bus network faults.

All modules (also referred to as nodes) transmit and receive messages over one of these buses. Data exchange between nodes is achieved by serial transmission of encoded data messages. Each node can both send and receive serial data simultaneously. Bus messages are carried over the data bus in the form of Variable Pulse Width Modulated (VPWM) signals which, when the high and low voltage pulses are strung together, form a message. Each node uses arbitration to sort the message priority if two competing messages are attempting to be broadcast at the same time.

The ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) is the Local Interface Network (LIN) master module in this vehicle and it gathers information from the compass module, the instrument panel switch bank, the Steering Control Module (SCM), and the Heated Seat Module (HSM) through the LIN data bus. There is also LIN data bus communication between the individual Tire Pressure Monitor (TPM) transponders and the Sentry Key REmote Entry Module (SKREEM) (also known as the Wireless Control Module/WCM). Both the EMIC and the SKREEM either act directly upon the information received through the LIN data bus or relay the information to other nodes in the vehicle using electronic messages placed on the CAN-B bus.

The voltage network used to transmit messages requires biasing and termination. Each module on the CAN bus network provides its own biasing and termination. Each node terminates the bus through a terminating resistor and a terminating capacitor. There are two types of nodes on the bus. The dominant node terminates the bus through a 1 KW resistor and a 3300 pF capacitor, typically resulting in about a 3300 ohm termination resistance. However, this

resistance value may vary somewhat by application. The TIPM (or TIPMCGW) is the only dominant node in this network. A non-dominant (or recessive) node terminates the bus through an 11 KW resistor and a 330 pF capacitor, typically resulting in about a 10800 ohm termination resistance.

The communication protocol being used for the CAN data bus is a non-proprietary, open standard adopted from the Bosch CAN Specification 2.0b. The CAN-C is the faster of the two primary buses in the CAN bus system, providing near real-time communication (500 Kbps).

The CAN bus nodes are connected in parallel to the two-wire bus using a twisted pair, where the wires are wrapped around each other to provide shielding from unwanted electromagnetic induction, thus preventing interference with the relatively low voltage signals being carried through them. The twisted pairs have between 33 and 50 twists per meter. While the CAN bus is operating (active), one of the bus wires will carry a higher voltage and is referred to as the CAN High or CAN bus (+) wire, while the other bus wire will carry a lower voltage and is referred to as the CAN Low or CAN bus (–) wire. Refer to the CAN Bus Voltages table.

CAN Bus Voltages (Normal Operation)								
CAN-C Bus Circuits	**Sleep**	**Recessive (Bus Idle)**	**Dominant (Bus Active)**	**CAN-L Short to Ground**	**CAN-H Short to Ground**	**CAN-L Short to Battery**	**CAN-H Short to Battery**	**CAN-H Short to CAN-L**
CAN-L (–)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
CAN-B Bus Circuits	**Key-Off (Bus Asleep)**		**Key-On (Bus Active)**	**CAN-L Short to Ground**	**CAN-H Short to Ground**	**CAN-L Short to Battery**	**CAN-H Short to Battery**	**CAN-H Short to CAN-L**
CAN-L (–)	10.99 V		4.65 - 4.98 V	0 V	4.5 - 4.7 V	Battery Voltage	4.5 - 4.7 V	0.3 - 0.7 V
CAN-H (+)	0.0 V		0.39 - 0.46 V	0.3 - 0.7 V	0 V	0.3 - 0.7 V	Battery Voltage	0.3 - 0.7 V
Notes								
All measurements taken between node ground and CAN terminal with a standard DVOM. DVOM will display average network voltage. Total resistance of CAN-C network can also be measured (60 ohms). Cannot measure total resistance of CAN-B network.								

In order to minimize the potential effects of Ignition-Off Draw (IOD), the CAN-B network employs a sleep strategy. However, a network sleep strategy should not be confused with the sleep strategy of the individual nodes on that network, as they may differ. For example: The CAN-C bus network is awake only when the ignition switch is in the ON or START positions; however, the TIPM, which is on the CAN-C bus, may still be awake with the ignition switch in the ACCESSORY or UNLOCK positions. The integrated circuitry of an individual node may be capable of processing certain sensor inputs and outputs without the need to utilize network resources.

The CAN-B bus network remains active until all nodes on that network are ready for sleep. This is determined by the network using tokens in a manner similar to polling. When the last node that is active on the network is ready for sleep, and it has already received a token indicating that all other nodes on the bus are ready for sleep, it broadcasts a **bus sleep acknowledgment** message that causes the network to sleep. Once the CAN-B bus network is asleep, any node on the bus can awaken it by transmitting a message on the network. The TIPM will keep either the CAN-B or the CAN-C bus awake for a timed interval after it receives a diagnostic message for that bus over the Diagnostic CAN-C bus.

In the CAN system, available options are configured into the TIPM at the assembly plant, but additional options can be added in the field using the diagnostic scan tool. The configuration settings are stored in non-volatile memory. The TIPM also has two 64-bit registers, which track each of the **as-built** and **currently responding** nodes on the CAN-B and CAN-C buses. The TIPM stores a Diagnostic Trouble Code (DTC) in one of two caches for any detected

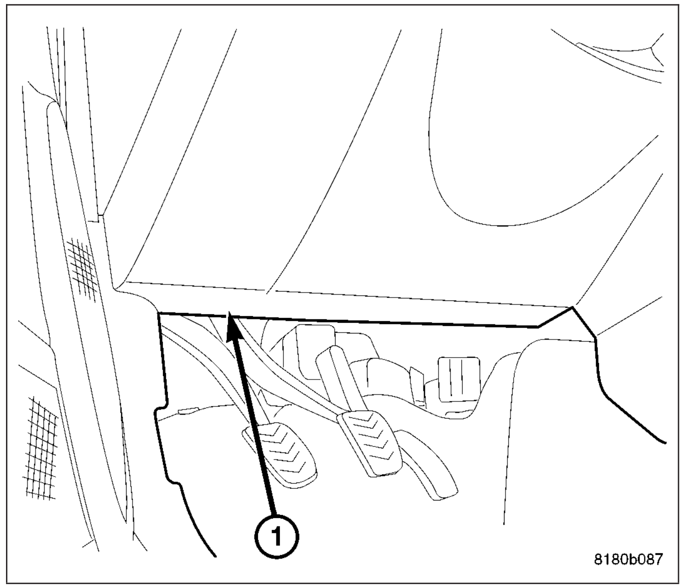
active or stored faults in the order in which they occur. One cache stores powertrain (P-Code), chassis (C-Code) and body (B-Code) DTCs, while the second cache is dedicated to storing network (U-Code) DTCs.

If there are intermittent or active faults in the CAN network, a diagnostic scan tool connected to the Diagnostic CAN-C bus through the 16-way Data Link Connector (DLC) may only be able to communicate with the TIPM. To aid in CAN network diagnosis, the TIPM will provide CAN-B and CAN-C network status information to the scan tool using certain diagnostic signals. In addition, the transceiver in each node on the CAN-C bus will identify a **bus off hardware failure**, while the transceiver in each node on the CAN-B bus will identify a **general bus hardware failure**. The transceivers for some CAN-B nodes will also identify certain failures for both CAN-B bus signal wires.

DATA LINK CONNECTOR

DESCRIPTION

The Data Link Connector (DLC) (1) is a 16-way molded plastic connector that is part of the instrument panel wire harness. This connector is located at the lower edge of the instrument panel, outboard of the steering column. The connector insulator is retained by integral snap features within a rectangular cutout in a mounting bracket integral to the lower instrument panel and inboard of the inside hood release on the inner cowl side trim.



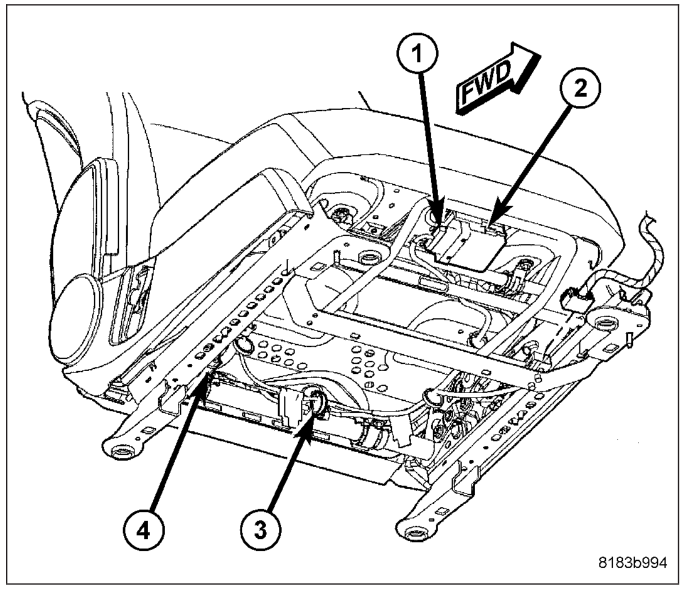
OPERATION

The Data Link Connector (DLC) is an industry-standard 16-way connector that permits the connection of a diagnostic scan tool to the Controller Area Network (CAN) data bus for interfacing with, configuring, and retrieving Diagnostic Trouble Code (DTC) data from the electronic modules that reside on the data bus network of the vehicle.

HEATED SEAT MODULE

DESCRIPTION

The heated seat module (2) is located under the left front seat. It has a single electrical connector (1) and a push pin style retainer that secures it to the seat pan. The module can be accessed from under the front left seat with the seat in the full back position.



The heated seat module is a microprocessor designed to use the Local Interface Network (LIN) data bus messages from the instrument cluster also known as the Cabin Compartment Node (CCN). The CCN receives inputs from the heated seat switches and in turn signals the heated seat module to operate the heated seat elements for both front seats.

OPERATION

The heated seat module operates on fused battery current received from the ignition switch. The module is grounded to the body at all times through the electrical connector. Inputs to the module include Local Interface Network (LIN) data bus messages and standard hardwired 12 volt power and ground. In response to the LIN inputs the heated seat module will control the battery current to the appropriate heated seat elements.

When a heated seat switch LIN data bus signal is received by the heated seat module, the module energizes the selected heated seat element. The Low heat set point is about 38°C (100.4°F), and the High heat set point is about 42°C (107.6°F).

In addition to operating the heated seat elements, the heated seat module sends LED illumination messages to the CNN via the LIN data bus. The CNN then sends the LED illumination message to the accessory switch bank so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

If the heated seat module detects a heated seat element OPEN or SHORT circuit, it will record and store the appropriate diagnostic trouble code (DTC).

DIAGNOSIS AND TESTING

HEATED SEAT MODULE

In order to obtain conclusive testing, the heated seat system and the Local Interface Network (LIN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

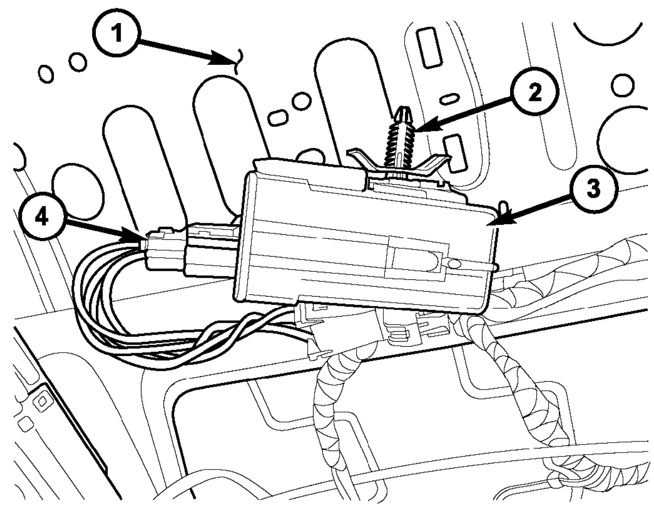
NOTE: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.7v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the heated seat system is attempted, the battery should be fully-charged.

REMOVAL

CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.

1. Position the right front seat to the full rearward position.
2. Disconnect and isolate the battery negative cable.
3. Disconnect the wire harness connector (4) from the heated seat module (3).
4. Unsnap the heated seat module retaining tab (2) from the seat pan (1).
5. Remove the heated seat module (3) from the vehicle.

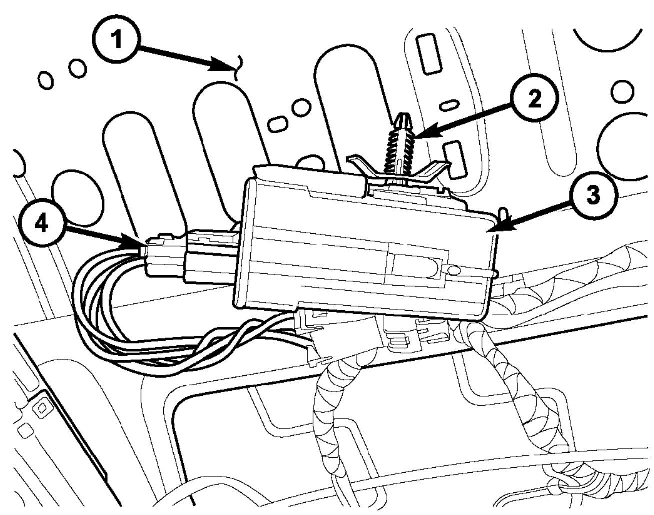


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INSTALLATION

CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.

1. Install the heated seat module (3) into the vehicle.
2. Position the retaining tab (2) with the mounting hole in the seat pan (1). Firmly apply even pressure to the module (3) until the mounting tab is fully seated.
3. Connect the wire harness connector (4) to the heated seat module (3).
4. Connect the battery negative cable.
5. Check for proper heated seat system operation.



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MODULE-POWERTRAIN CONTROL

DESCRIPTION

PCM GROUND

Ground is provided through multiple pins of the PCM connector. Depending on the vehicle there may be as many as two different ground pins. There are power grounds and sensor grounds.

The power grounds are used to control the ground side relays, solenoids, ignition coil or injectors. The signal ground is used for any input that uses sensor return for ground, and the ground side of any internal processing component.

The PCM case is shielded to prevent RFI and EMI. The PCM case is grounded and must be firmly attached to a good, clean body ground.

Internally all grounds are connected together, however there is noise suppression on the sensor ground. For EMI and RFI protection the housing and cover are also grounded separately from the ground pins.

SENSOR RETURN - PCM INPUT

The sensor return circuit provides a low electrical noise ground reference for all of the systems sensors. The sensor return circuit connects to internal ground circuits within the Powertrain Control Module (PCM).

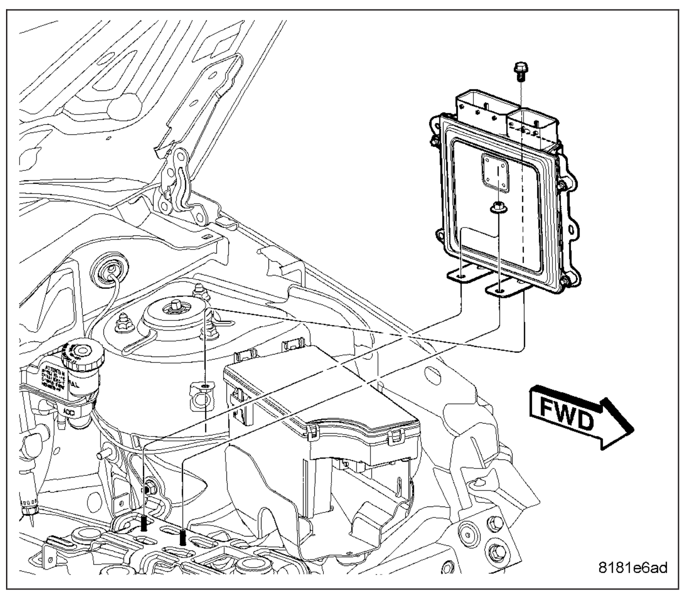
IGNITION SENSE - PCM INPUT

The ignition sense input informs the Powertrain Control Module (PCM) that the ignition switch is in the crank or run position.

OPERATION

POWERTRAIN CONTROL MODULE

The PCM receives input signals from various switches and sensors that are referred to as PCM Inputs. Based on these inputs, the PCM adjusts various engine and vehicle operations through devices that are referred to as PCM Outputs.



NOTE: PCM Inputs:

- Air Conditioning Controls
- Battery Voltage
- Brake Switch
- Camshaft Position Sensor
- Clutch Upstop Switch
- Clutch Interlock
- Crankshaft Position Sensor

- Engine Coolant Temperature Sensor
- Fuel Level Sensor (Bus message)
- Ignition Switch
- Intake Air Temperature Sensor
- Knock Sensor
- Evaporative System Integrity Monitor
- Manifold Absolute Pressure (MAP) Sensor
- Oil Pressure Switch
- Oxygen Sensors
- Power Steering Pressure Switch
- Speed Control Switches
- Vehicle Speed Sensor (MTX-equipped models)

NOTE: PCM Outputs:

- Air Conditioning Clutch Relay
- Charging Indicator Lamp (Bus Message)
- Proportional Purge Solenoid
- Fuel Injectors
- Generator Field
- Ignition Coils
- Malfunction Indicator (Check Engine) Lamp (Bus Message)
- Manifold Flow Valve
- Oxygen Sensors Heater Controls
- Variable Valve Timing
- Vehicle Speed (Manual Transmission)

Based on inputs it receives, the PCM adjusts fuel injector pulse width, idle speed, ignition spark advance, ignition coil dwell and EVAP canister purge operation. The PCM also determines the appropriate transmission shift schedule and shift points, depending on the present operating conditions and driver demand. The PCM regulates the cooling fan, air conditioning and speed control systems. The PCM changes generator charge rate by adjusting the generator field. The PCM also performs diagnostics.

The PCM adjusts injector pulse width (air-fuel ratio) based on the following inputs.

- Battery voltage
- Coolant temperature
- Exhaust gas content (oxygen sensor)
- Engine speed (crankshaft position sensor)
- Intake air temperature
- Manifold absolute pressure
- Throttle position

The PCM adjusts ignition timing based on the following inputs.

- Coolant temperature
- Engine speed (crankshaft position sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position
- Transmission gear selection (park/neutral switch)
- Intake air temperature

The PCM also adjusts engine idle speed through the idle air control motor based on the following inputs.

- Air conditioning sense
- Battery voltage
- Brake switch

- Coolant temperature
- Engine speed (crankshaft position sensor)
- Engine run time
- Manifold absolute pressure
- Power steering pressure switch
- Throttle position
- Transmission gear selection (park/neutral switch)
- Vehicle distance (speed)

The camshaft position sensor and crankshaft position sensor signals are sent to the PCM. If the PCM does not receive the signal within approximately 1 second of engine cranking, it deactivates the fuel pump. When these are deactivated, power is shut off to the fuel injectors, ignition coils, oxygen sensor heating elements and fuel pump.

The PCM contains a voltage converter that changes battery voltage to a regulated 5 volts direct current to power the camshaft position sensor, crankshaft position sensor, manifold absolute pressure sensor, throttle position sensor, A/C pressure switch, A/C pressure transducer, and vehicle speed sensor.

5 VOLT SUPPLY - PCM OUTPUT

The PCM supplies 5 volts to the following sensors:

- A/C pressure transducer
- Ambient Temperature sensor
- Battery temperature
- Camshaft Position Sensor (NGC)
- Crankshaft Position Sensor (NGC)
- Engine coolant temperature sensor
- Inlet Air Temperature Sensor
- Knock sensor
- Linear EGR solenoid (if equipped)
- Manifold absolute pressure sensor
- Oil Pressure Switch
- Throttle position sensor

STANDARD PROCEDURE

OBTAINING DIAGNOSTIC TROUBLE CODES

BULB CHECK

Key on: Bulb illuminated until vehicle starts, as long as all once per trip (readiness) monitors completed. If monitors have **not** been completed, then: Key on: bulb check for about 5 to 8 seconds, lamp then flashes if once per trip (readiness) monitors have **not** been completed until vehicle is started, then MIL is extinguished.

OBTAINING DTC’S USING SCAN TOOL

1. Connect the scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.
2. Turn the ignition switch on and access the “Read Fault” screen.
3. Record all the DTC’s and “freeze frame” information shown on the scan tool.
4. To erase DTC’s, use the “Erase Trouble Code” data screen on the scan tool. **Do not erase any DTC’s until problems have been investigated and repairs have been performed.**

PINION FACTOR SETTING

NOTE: This procedure must be performed if the PCM has been replaced with a NEW or replacement unit. Failure to perform this procedure will result in an inoperative or improperly calibrated speedometer.

The vehicle speed readings for the speedometer are taken from the output speed sensor. The PCM must be calibrated to the different combinations of equipment (final drive and tires) available. Pinion Factor allows the technician to set the Powertrain Control Module initial setting so that the speedometer readings will be correct. To properly read and/or reset the Pinion Factor, it is necessary to use a scan tool.

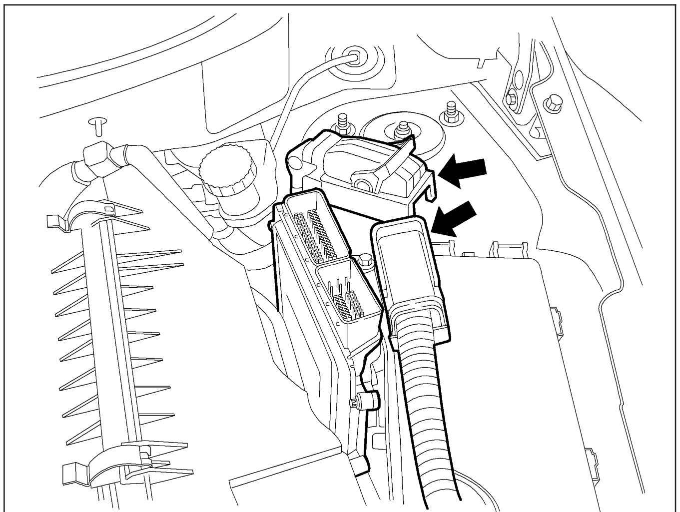
1. Plug the scan tool into the diagnostic connector located under the instrument panel.
2. Select the Transmission menu.
3. Select the Miscellaneous menu.
4. Select Pinion Factor. Then follow the instructions on the scan tool screen.

REMOVAL

USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

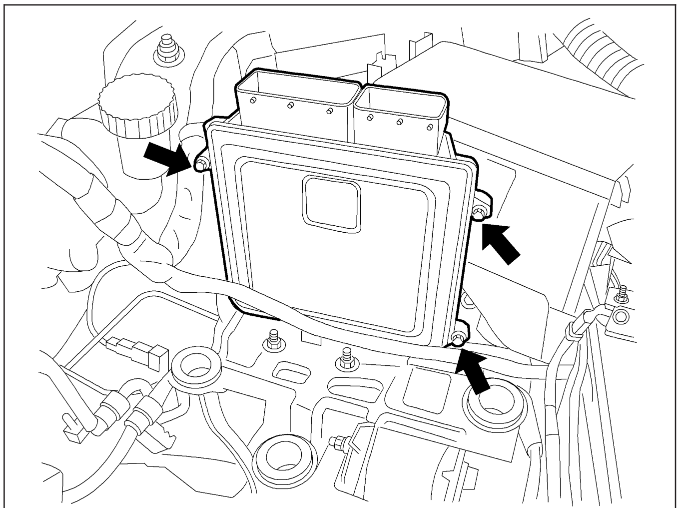
To avoid possible voltage spike damage to PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

1. Disconnect negative battery cable.
2. Unlock and disconnect the electrical connectors from PCM.



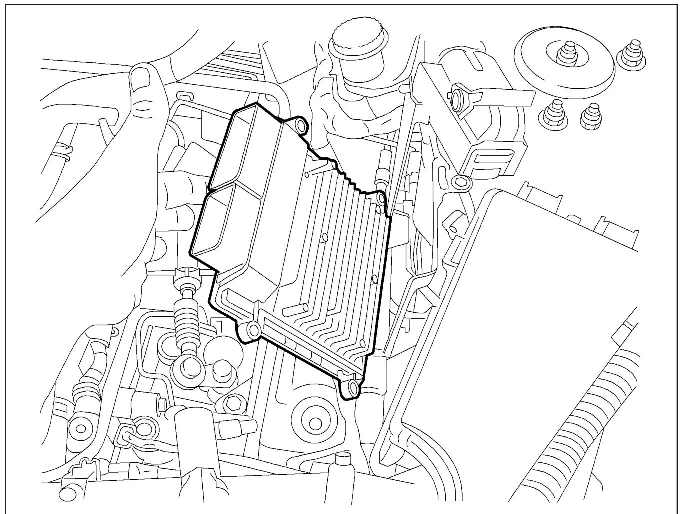
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3. Remove the air cleaner box.
4. Remove the three mounting bolts.



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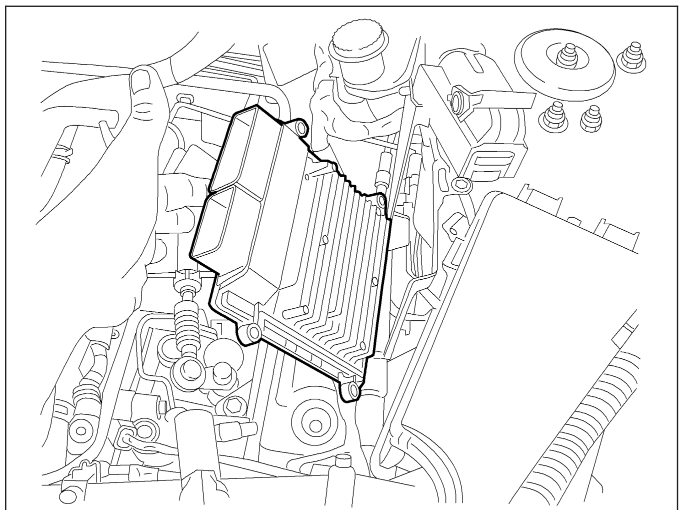
5. Tip module out and remove from bracket.


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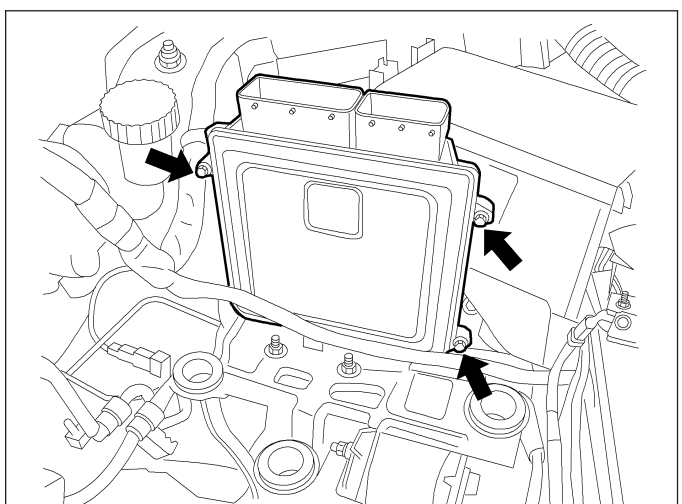
INSTALLATION

USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

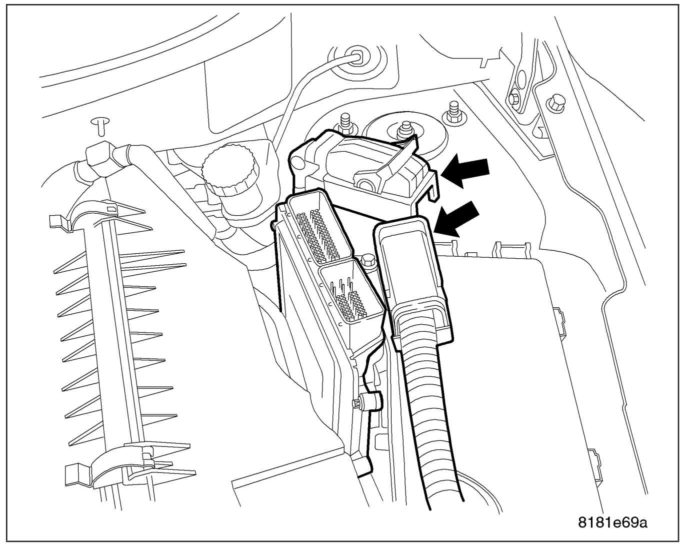
1. Tip module into bracket.


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2. Install three mounting bolts and tighten to 9 N·m (80 in. lbs.) torque.

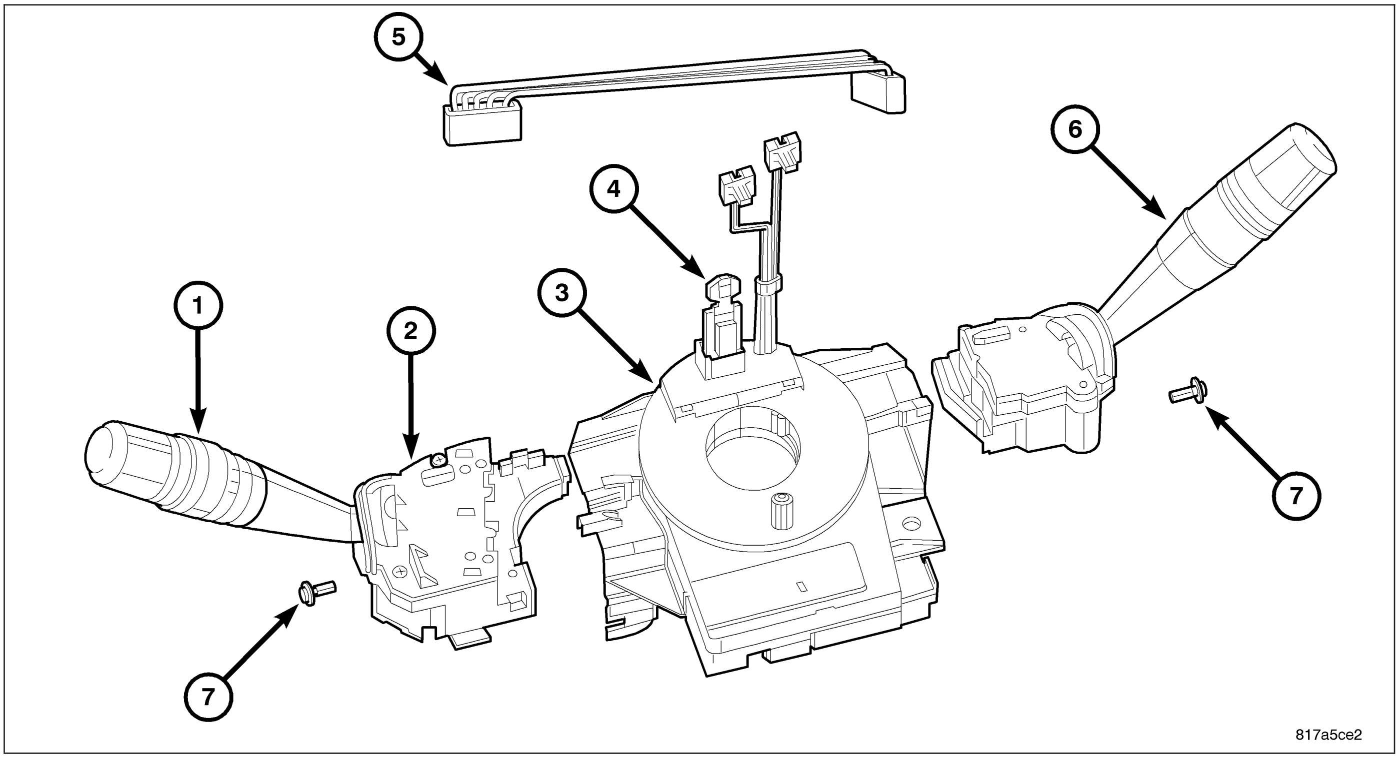

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3. Check pins in electrical connectors for damage. Repair as necessary.
4. Connect electrical connectors and lock.
5. Install air cleaner box.
6. Connect negative battery cable.
7. Use the scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.



MODULE-STEERING CONTROL

DESCRIPTION



This vehicle is equipped with a Steering Column Control Module (SCCM) The SCCM is secured near the top of the steering column below the steering wheel and is completely concealed beneath the steering column shrouds. It is installed as a modular unit that supports the left (lighting) multi-function switch (1) and right (wiper) multi-function switch (6). The controls for each of these switches extend through appropriate clearance holes provided in the steering column shrouds.

The microprocessor-based Steering Control Module (SCM) (2) utilizes integrated circuitry and information carried on the Controller Area Network (CAN) data bus along with several hard wired analog and multiplexed inputs to monitor both the right and left multi-function switches. The SCCM uses a Local Interconnect Network (LIN) data bus for exterior lighting and wiper functions. The LIN data is sent to the Cab Compartment Node (CCN) and the CCN then sends it out on the CAN data bus (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - CAN BUS). The SCCM is available for service replacement as a unit or each individual component:

- Clockspring (with integral Steering Angle Sensor if equipped)
- Left Multi-Function Switch
- Right Multi-Function Switch

OPERATION

The Steering Control Module (SCM) communicates over the Local Interconnect Network (LIN) data bus with other electronic modules in the vehicle and/or a diagnostic scan tool. The horn switch circuits pass through the clockspring to the Cab Compartment Node (CCN) and the CCN sends a CAN message to the Totally Integrated Power Module (TIPM) to control the horn. The CCN stores Diagnostic Trouble Codes (DTC's) for the SCM. The right (wiper) multi-function switch has several inputs to the CCN.

The SCM is connected to a fused B(+) circuit and receives a path to ground at all times. These connections allow it to remain functional regardless of the ignition switch position. The driver airbag squib circuits of the clockspring, the horn, and the speed control switch circuits pass through the SCM, but the SCM does not monitor, and has no control outputs related to these circuits. Any other input to the SCM that would cause a vehicle system to function but does not require that the ignition switch be in the On position, such as turning on the lights or sounding the horn, prompts the SCM to wake up and transmit on the CAN data bus.

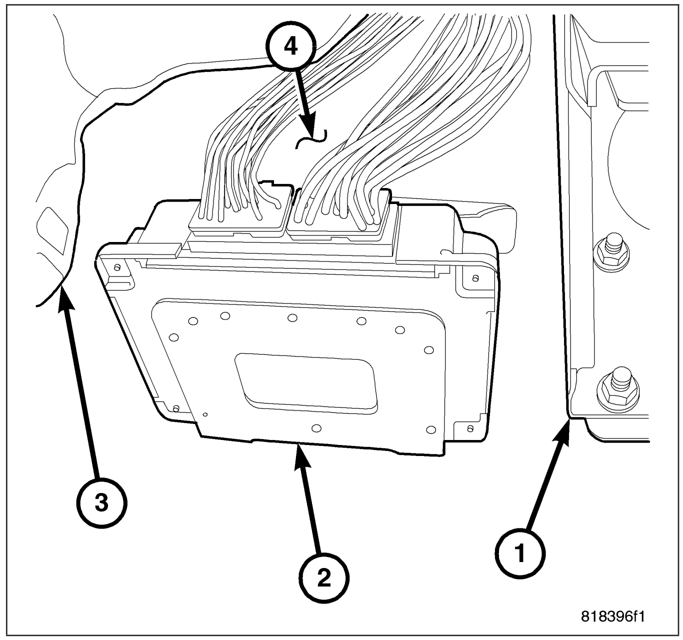
The most reliable, efficient, and accurate means to diagnose the SCM, the CAN data bus, the hard wired inputs or the electronic communication related to SCM operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

The integral SCM is not available for separate service replacement. If found inoperative or defective, the entire left (lighting) multi-function switch must be replaced (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LEFT MULTI-FUNCTION SWITCH - REMOVAL).

MODULE-TRANSMISSION CONTROL

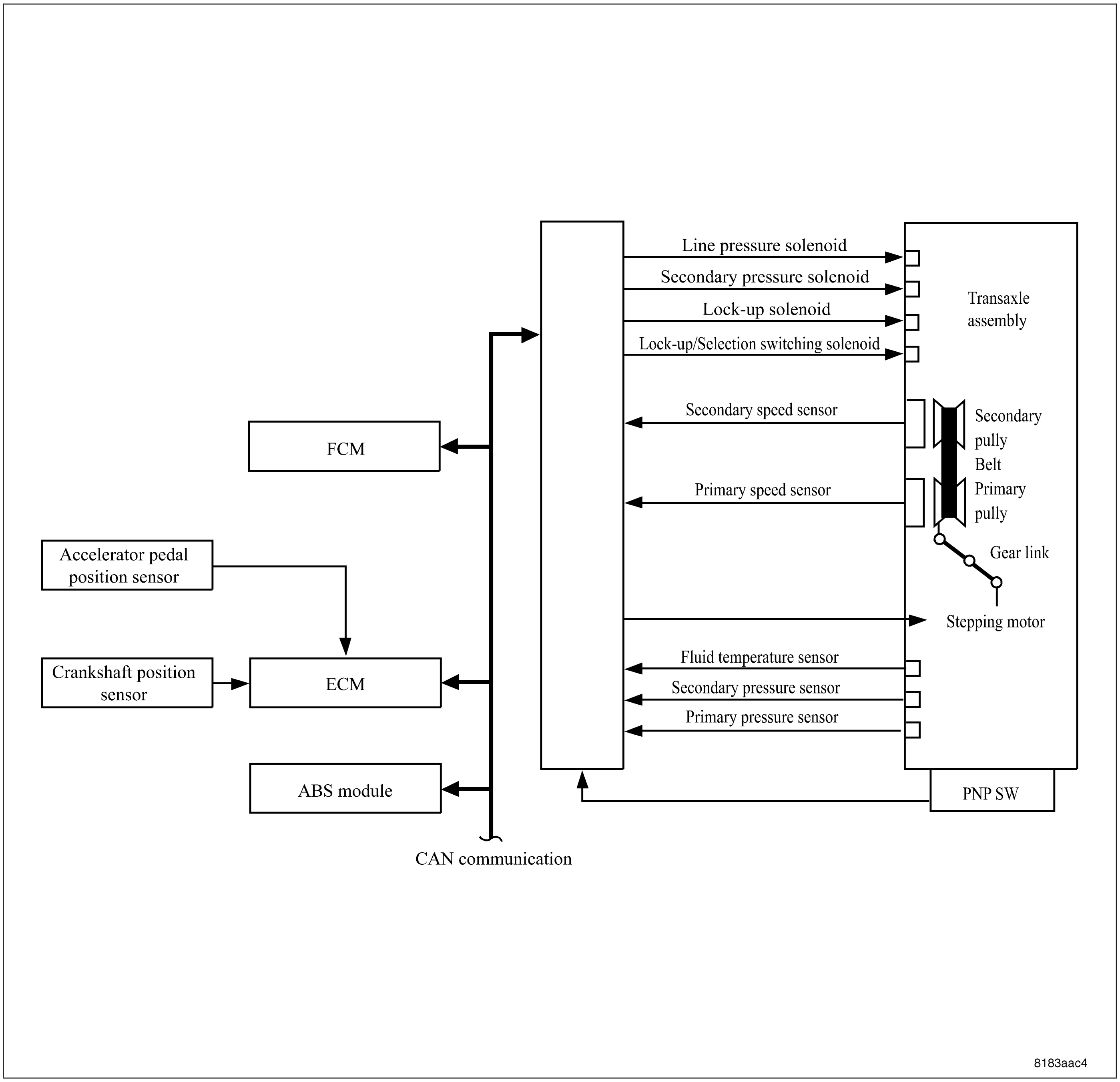
DESCRIPTION

The transmission control module (TCM) is inside the car, behind the instrument panel where the clutch pedal would be located. New controllers are shipped with generic software but need to be initialized for the vehicle into which it is installed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

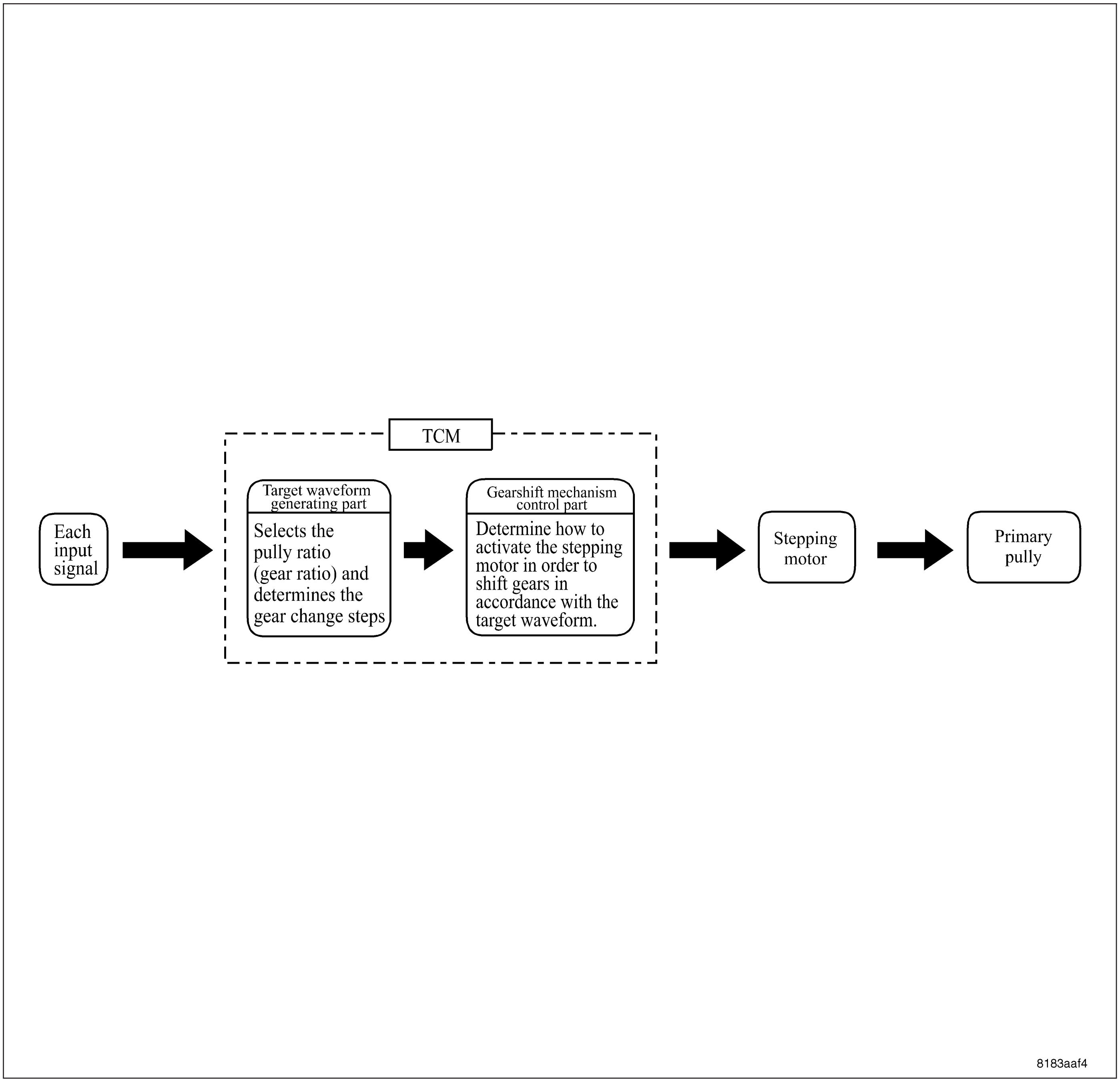


OPERATION

Shift Control



In order to select the gear ratio which can obtain the driving force in accordance with driver's intention and the vehicle condition, TCM monitors the driving conditions, such as the vehicle speed and the throttle position and selects the optimum gear ratio, and determines the gear change steps to the gear ratio. Then it sends the command to the stepping motor, and controls the flow-in/flow-out of line pressure to/from the primary pulley to determine the position of the moving-pulley and control the gear ratio.



Selection of the gear ratio is set for every position separately.

“Drive” Position

Shifting is available over all the ranges of gear ratios from the lowest to the highest.

When using the Manual Mode (Vehicles with the manual mode)

When the manual mode switch is turned ON, the fixed changing gear line is set. By moving the switch to + side or – side, shift change is like a M/T and selects from a range of 6 pre-programmed gear ranges.

By limiting the shift to the area nearest the low side of the gear ratio, a larger driving force and engine brake are secured.

Downhill Engine Brake Control

When a downhill condition is detected while the accelerator pedal is released, the engine brake will be increased by downshifting so as to limit acceleration of the vehicle. Also, if uphill is detected, acceleration performance is improved by limiting the shift area on the highest side of the gear ratio.

Acceleration Control

According to vehicle speed and a increase of accelerator pedal angle, driver's request for acceleration as well as driving conditions are measured. At the time of starting or acceleration while moving, this function improves in acceleration feeling by making the engine speed proportionate to the vehicle speed. Even at the time of slower acceleration, a shift map which can gain a larger driving force is chosen for compatibility of mileage with drivability.

Line Pressure and Secondary Pressure Control

Control of line pressure and secondary pressure with a high degree of accuracy has reduced friction and improved fuel economy.

Normal Fluid Pressure Control

The line pressure and the secondary pressure are optimized depending on driving conditions, on the basis of the throttle position, the engine speed, the primary pulley (input) revolution speed, the secondary pulley (output) revolution speed, the stop lamp SW signal, the PNP switch signal, the lock-up signal, the voltage, the target gear ratio, the fluid temperature, and the fluid pressure.

Secondary Pressure Feedback Control

When controlling the normal fluid pressure or the fluid pressure at the time of selection, the secondary pressure can be set more accurately by using the fluid pressure sensor to detect the secondary pressure and performing the feedback control.

Lock-up Control

The lock-up applied gear range has been expanded by locking up the torque converter at a lower vehicle speed than conventional A/T models.

Selection Control

When selecting between N (P) and D(R) position, the optimum operating pressure is set on the basis of the throttle position, the engine speed, and the secondary pulley (output) revolution speed to lessen the select shock.

CAN Communication

Real-time communications (signal exchanges) are maintained among the control units such as the CVT, C/U, ECM, combination meter etc. Each unit is controlled optimally depending on vehicle driving conditions while sharing information and in cooperating with the other control units.

In CAN (Controller Area Network) communication, control units are connected with two communication lines (CAN-H line, CAN-L line) allowing a high rate of information to be transmitted by fewer wirings. Each control unit transmits/receives data but selectively reads required data only.

Inputs and Outputs

Item		Shift Control	Line Pressure Control	Selection Control	Lock-up Control	CAN Communication Control	Fail-safe Function (Note 1)
Input	Engine speed signal		X	X	X	X	X
	Accelerator pedal position signal	X	X	X	X	X	X
	Closed throttle position signal	X			X	X	
	Stop lamp SW signal	X	X		X	X	X
	Primary pressure sensor		X				
	Secondary pressure sensor		X	X			X
	Fluid temperature sensor	X	X	X	X		X
	Primary speed sensor	X	X		X		X
	Secondary speed sensor	X	X	x	X		X
	PNP switch	X	X	X	X		X
Output	Line pressure solenoid value		X	x			X
	Secondary pressure solenoid value		X	X			X
	Lock-up solenoid value			X	X		X
	Lock-up/ Selection switching solenoid value			X	X		X
	Stepping motor	X					X

Engine/CVT Integration Control (CAN Communication Control)

In order to improve gearshift feeling and to perform controls such as prevention of engine slowdown, engine power control signals are intercommunicated between the engine ECM and the TCM, and real-time cooperative controls depending on vehicle driving conditions are performed.

TCM sends information such as fast slowdown signals, lock-up signals, torque down request signals to ECM, while receiving information such as torque down permission/prohibition signals, lock-up permission/prohibition signals, throttle position from ECM.

Fail-safe Function

If an unexpected signal is sent from any sensor, switch, solenoid etc., this function controls the CVT to make driving as smooth as possible.

Secondary Speed Sensor

The shift pattern is changed in accordance with throttle position when an unexpected signal is sent from the output speed sensor (secondary speed sensor) to the TCM. The manual mode position or the sports mode position is inhibited, and the transaxle is put in “D”.

Primary Speed Sensor

The shift pattern is changed in accordance with throttle position and secondary speed (vehicle speed) when an unexpected signal is sent from the primary speed sensor to the TCM. The manual mode function or the sports mode function is inhibited, and the transaxle is put in “D”.

PNP Switch

If an unexpected signal is sent from the PNP switch to the TCM, the transaxle is put in “D”.

Fluid Temperature Sensor

If an unexpected signal is sent from the fluid temperature sensor to the TCM, the gear ratio obtained immediately before receiving the unexpected signal is maintained and the gear ratio is controlled to keep engine speed under 5,000 rpm (approximately), depending on driving conditions.

Secondary Pressure Sensor

If an unexpected signal is sent from the secondary pressure sensor to the TCM, the secondary pressure feedback control is stopped and the offset value obtained immediately before the non-standard condition occurs is used to control line pressure.

Line Pressure Solenoid

If an unexpected condition of the solenoid is detected by the TCM, the line pressure solenoid is turned OFF to achieve the maximum fluid pressure.

Secondary Pressure Solenoid

If an unexpected condition of the secondary solenoid is detected by the TCM, the secondary pressure solenoid is turned OFF to achieve the maximum fluid pressure.

Lock-up solenoid

If an unexpected condition of the lock-up solenoid is detected by the TCM, the lock-up solenoid is turned OFF to cancel the lock-up.

Stepping Motor

If an unexpected condition of the stepping motor is detected by the TCM, the stepping motor coil phases “A” through “D” are all turned OFF to hold the gear ratio used immediately before the unexpected condition occurred.

Lock-up/Selection Switching Solenoid

If an unexpected condition of the solenoid is detected by the TCM, the lock-up/selection switching solenoid is turned OFF to cancel the lock-up.

Backup Power Supply

Transaxle assembly is protected by limiting the engine torque when the memory back-up power supply for controlling from the battery is not supplied to the TCM. Normal status is restored when turning the ignition switch OFF to ON after power is normally supplied

TCM

- 1. Shift control
- 2. Line pressure control
- 3. Selection control
- 4. Lock-up control
- 5. Engine/CVT integration control [CAN communication control]
- 6. Self-diagnosis function
- 7. Fail-safe function

Primary Speed Sensor, Secondary Speed Sensor

Primary Speed Sensor It is installed near the CVT fluid cooler in the transaxle case. It sends rotating speed of the primary pulley (input shaft) to the TCM as a pulse signal.

Secondary Speed Sensor It is installed near the output gear part in the transaxle case. It sends rotating speed of the secondary pulley (output shaft) to the TCM as a pulse signal. TCM converts the pulse signal to vehicle speed.

STANDARD PROCEDURE - TRANSMISSION CONTROL MODULE INITIALIZATION

INITIAL LEARN (BRAND-NEW MODULE, MEMORY ALREADY CLEAR

) Battery must be connected. If TIPM is to be configured, do this, then Turn ignition key to OFF/LOCKED briefly, then back to RUN. Shifter must be in PARK or NEUTRAL, engine not running.

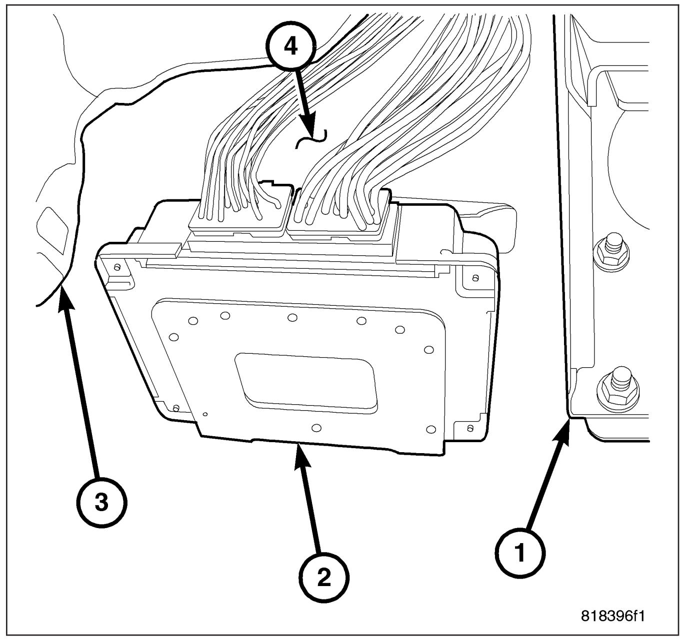
1. Turn Ignition key to RUN for 4 seconds to allow reading of new values.
2. Clear fault codes.
3. Turn ignition key to OFF/LOCKED for 2 seconds to allow storing new values in EEROM.
4. Turn ignition key to RUN.
5. At least 7 seconds, Read fault codes.

RELEARN, AFTER REPLACING A TRANSAXLE

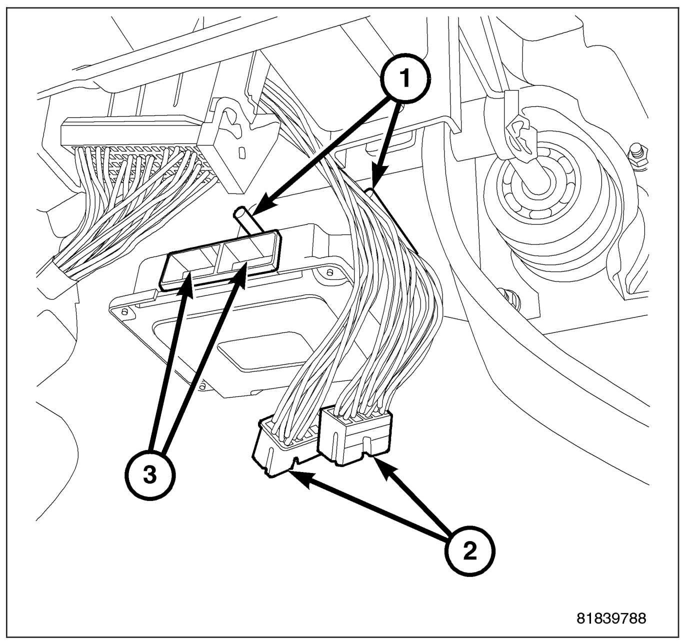
1. Clear learning memory using the scan tool.
2. Turn ignition key to OFF/LOCKED for 2 seconds to allow clearing of values in EEROM.
3. Turn Ignition key to RUN for 4 seconds to allow reading of new values.
4. Clear fault codes.
5. Turn ignition key to OFF/LOCKED for 2 seconds to allow storing new values in EEROM.
6. Turn ignition key to RUN.
7. At least 7 seconds later, Read fault codes.

REMOVAL

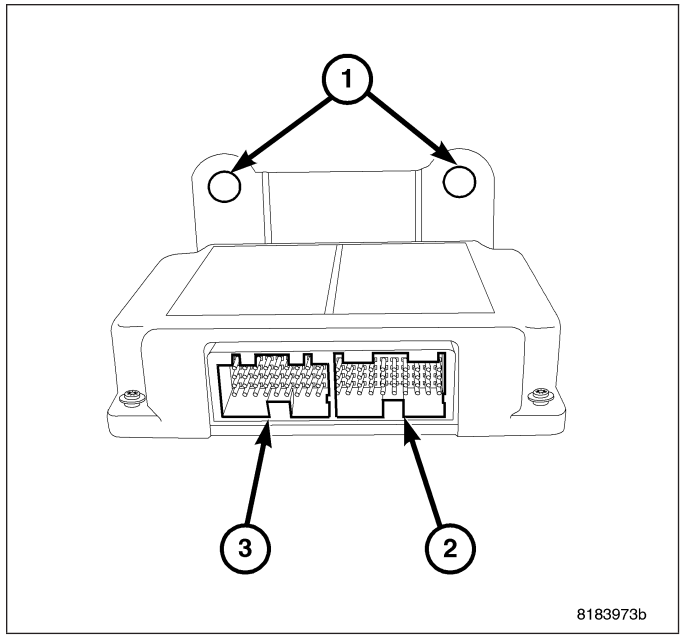
1. The TCM (2) is located between the brake pedal bracket (1) and the left kick panel (3).



2. Unplug the two electrical connectors (2) at the TCM.
3. Remove the two nuts (1) that hold the TCM to the bulkhead.

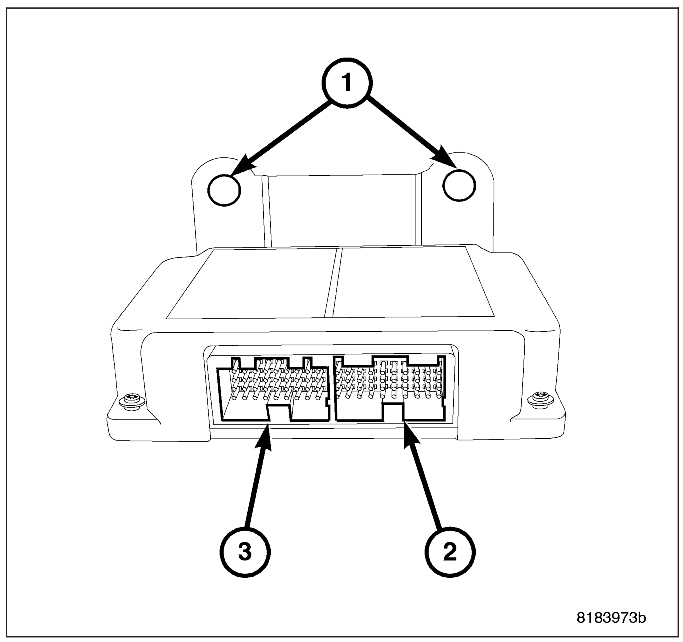


4. Remove the TCM.



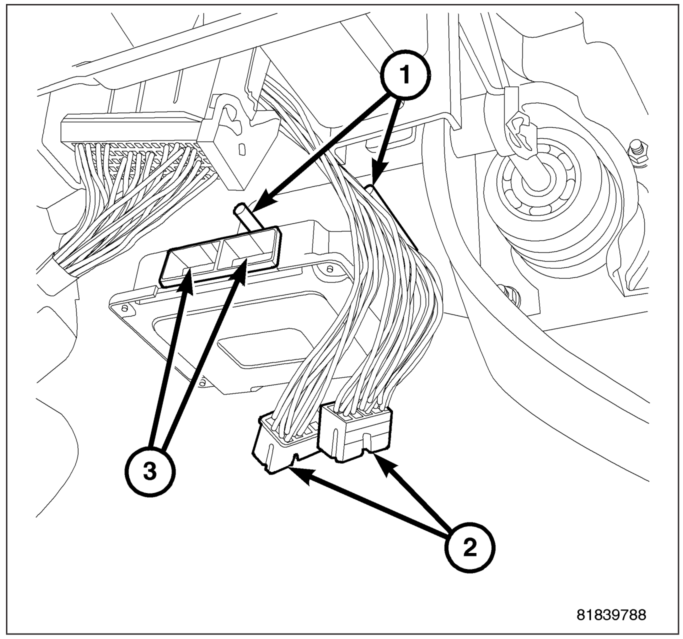
INSTALLATION

1. Install TCM mounting bracket holes (1) over the two studs on the bulkhead.



2. Install the two nuts to mounting studs (1) on the bulkhead and torque to 15 N·m (130 in. lbs.).
3. Plug in electrical connectors (2) to TCM (3).

NOTE: If a new TCM is installed a learn procedure must be performed.



MODULE - FINAL DRIVE CONTROL

DESCRIPTION

The ECC is controlled by it's own controller that is located in the left kick panel area. It gets signals over the CAN bus from the ABS Wheel speed sensors and TPS signal.

OPERATION

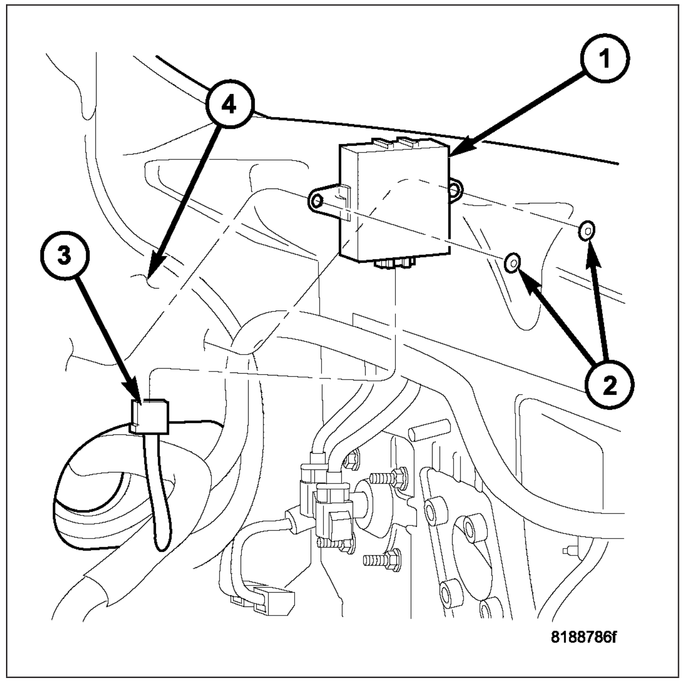
The all-wheel-drive system requires no driver input or control. Under most driving conditions, it is passive and power is transmitted to the front wheels alone. Unlike all-wheel drive systems that rely on pumps or viscous fluids to transfer torque, this system requires no front-to-rear slippage for activation. This allows the system to transfer torque solely in response to accelerator pedal position. If the driver is asking for a lot of power, the system immediately starts clamping the electronically controlled coupling (ECC), transferring a high percentage of power to the rear wheels. This avoids front wheel slippage, as power to propel the car is transmitted through all four tires. This mode of operation is called open-loop operation in that there is no feedback to affect the torque transfer.

A second, closed loop, operating mode uses feedback from the wheel-speed sensors to determine the appropriate torque transfer. When the front wheels slip, the allwheel- drive electronic control module tells the ECC to start clamping, sending power to the rear wheels. Attempting the same aggressive launch described above with the front wheels on ice and the rear wheels on dry pavement, the ECC sends even more torque to the rear wheels to minimize slippage and launch the vehicle. Both modes are always active with the closed loop mode layered on top of open loop mode to increase torque to the rear wheels when needed to maintain traction in extreme cases.

Power to the rear wheels is modulated under the following conditions: • Slipping on ice while backing up will send a lot of power to the rear axle • Loss of traction while traveling at freeway speeds, for example hydroplaning on a puddle of water, will send very little power to the rear wheels because the controller knows at those speeds a lot of power is not needed at the rear wheels A third condition, which is independent of the others, uses wheel speed differences to determine when the vehicle is turning in a tight circle. This condition, which is indicated by a large discrepancy in side-to-side wheel speeds, causes the electronic control module to reduce torque to the rear wheels to prevent binding in the driveline. The electronic control module is always checking for this condition as well. A fourth condition that is unique to the Caliber system is to influence vehicle dynamics. Other manufacturers limit AWD to aiding traction or providing off-road capability. They concentrate on launching the vehicle or going off road at speeds up to about 25 mph (40 km/hr). Above that speed range, they use it to limit wheel slip for traction. On this system, additional ECM calibration controls torque to the rear wheels for improved handling in the 25-65 mph (40-105 km/hr) range. In this speed range, the system increases torque to the rear wheels during cornering with the throttle open to make the car turn more easily – make the handling more neutral. This is more readily accomplished with an electronically controlled system, than with viscous-coupling or gerotor systems that require some degree of front-to-rear slip to transfer torque to the rear wheels. Above 70 mph (113 km/hr), the control strategy provides minimal torque to the rear wheels under normal driving conditions to aid fuel economy. The ECC system is easier to calibrate, more flexible and more precise than viscouscoupling, Torsen®, or gerotor system, but less costly. It is also less costly than the systems used in luxury cars from other manufacturers while providing similar functionality. The electronic control module also interfaces with the ESP and traction control systems. The interface allows the ESP system to use the ECC to help gain control of the vehicle. For this purpose, torque transmitted to the rear wheels by the ECC can be reduced. The Caliber AWD system is not traction control. It only works on situations where front-to-rear traction varies, for instance, front wheels on ice, rear wheels on dry pavement or climbing steep grades. AWD does not aid side-to-side traction. ESP does that through brake intervention on this system.

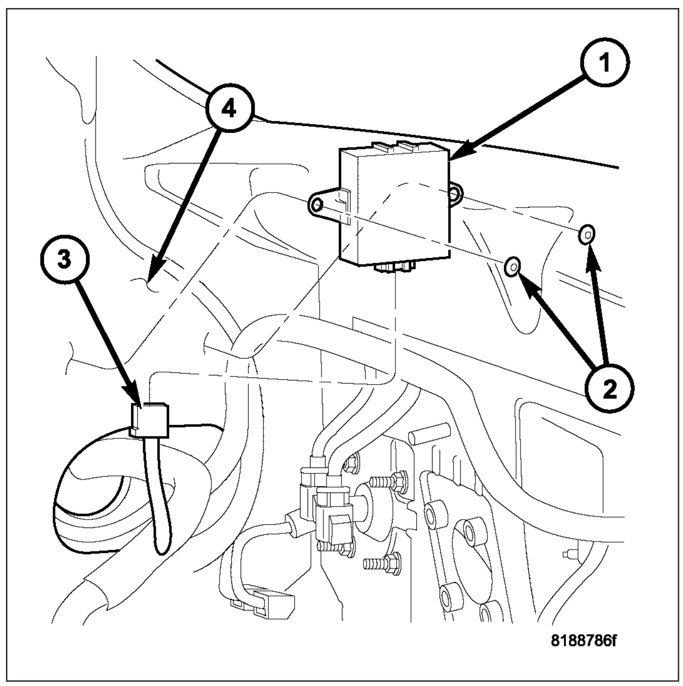
REMOVAL

1. Remove the left front kick panel (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL).
2. Remove module retaining bolts (2).
3. Remove electrical connector (3).
4. Remove ECC module (1).



INSTALLATION

1. Plug ECC module in (3).
2. Move into place, install bolts (2) and torque to 11 N·m (97 in. lbs.).
3. Install the left front kick panel (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION).



ENGINE SYSTEMS

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BATTERY SYSTEM

TABLE OF CONTENTS

BATTERY SYSTEM

DESCRIPTION

This vehicle is equipped with a single 12-volt battery. All of the components of the battery system are located within the engine compartment of the vehicle. The battery system for this vehicle contains the following components:

- **Battery** - The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables** - The battery cables connect the positive and negative charged battery terminal posts to the vehicle electrical system.
- **Battery Holddown** - The battery holddown hardware secures the battery in the battery tray.
- **Battery Thermal Guard** - The battery thermal guard insulates the battery to protect it from engine compartment temperature extremes.
- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery holddown hardware.

For battery system maintenance schedules, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). For the proper jump starting procedures, (Refer to LUBRICATION & MAINTENANCE/JUMP STARTING - STANDARD PROCEDURE).

OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

DIAGNOSIS AND TESTING

BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting, and charging systems include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for the proper charging system on-board diagnostic test procedures.

MICRO 420 BATTERY TESTER (GASOLINE ENGINES)

The Micro 420 automotive battery tester is designed to help diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER) which includes the directions for using the Micro 420 battery tester.

OTC ONE STEP BATTERY ANALYZER AND CHARGER (DIESEL ENGINES)

The OTC One Step Battery Analyzer and Charger is designed to help diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle.

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - IGNITION-OFF DRAW TEST) for the appropriate test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is inoperative.	2. Determine if the charging system is performing to specifications. (Refer to 8 - ELECTRICAL/ CHARGING - DIAGNOSIS AND TESTING) for the appropriate charging system diagnosis and testing procedures. Repair the inoperative charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the appropriate battery tester. Charge the inoperative battery, as required.
	4. The battery terminal connections are loose or corroded.	4. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - DIAGNOSIS AND TESTING) for the appropriate battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the proper battery size and rating. Replace an incorrect battery, as required.
	6. The battery is inoperative.	6. Test the battery using the appropriate battery tester. Replace the inoperative battery, as required.
	7. The starting system is inoperative.	7. Determine if the starting system is performing to specifications. (Refer to 8 - ELECTRICAL/ STARTING - DIAGNOSIS AND TESTING) for the appropriate starting system diagnosis and testing procedures. Repair the inoperative starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	1. The battery has an incorrect size or rating for this vehicle.	1. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the proper battery size and rating. Replace an incorrect battery, as required.
	2. The battery terminal connections are loose or corroded.	2. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - DIAGNOSIS AND TESTING) for the appropriate battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	3. The electrical system ignition-off draw is excessive.	3. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - IGNITION-OFF DRAW TEST) for the appropriate test procedures. Repair the excessive ignition-off draw, as required.
	4. The battery is inoperative.	4. Test the battery using the appropriate battery tester. Replace the inoperative battery, as required.
	5. The starting system is inoperative.	5. Determine if the starting system is performing to specifications. (Refer to 8 - ELECTRICAL/ STARTING - DIAGNOSIS AND TESTING) for the appropriate starting system diagnosis and testing procedures. Repair the inoperative starting system, as required.
	6. The charging system is inoperative.	6. Determine if the charging system is performing to specifications. (Refer to 8 - ELECTRICAL/ CHARGING - DIAGNOSIS AND TESTING) for the appropriate charging system diagnosis and testing procedures. Repair the inoperative charging system, as required.
	7. Electrical loads exceed the output of the charging system.	7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.
	8. Slow driving or prolonged idling with high-amperage draw loads in use.	8. Advise the vehicle operator, as required.
THE BATTERY WILL NOT ACCEPT A CHARGE.	1. The battery is inoperative.	1. Test the battery using the appropriate battery tester. Replace the inoperative battery, as required.

STANDARD PROCEDURE

BATTERY RECONNECTION

NOTE: This reconnection procedure is to be performed anytime the battery has been disconnected.

1. Connect the battery negative cable to the battery post and tighten the clamp nut.
2. Install the rear compartment floor trim panel.

CAUTION: Once the battery has been connected, review and perform the following information as applica-ble.

ELECTRONIC STABILITY PROGRAM (ESP)

If the vehicle is equipped with ESP, once the battery is reconnected, the Steering Angle Sensor (SAS) in the clock-spring needs to be calibrated. The SAS requires calibration anytime the battery or an ABS (ESP) component has been disconnected for any length of time. **If the SAS is not calibrated following battery reconnection, the ESP/ BAS indicator lamp is illuminated following five ignition cycles indicating the need for calibration.**

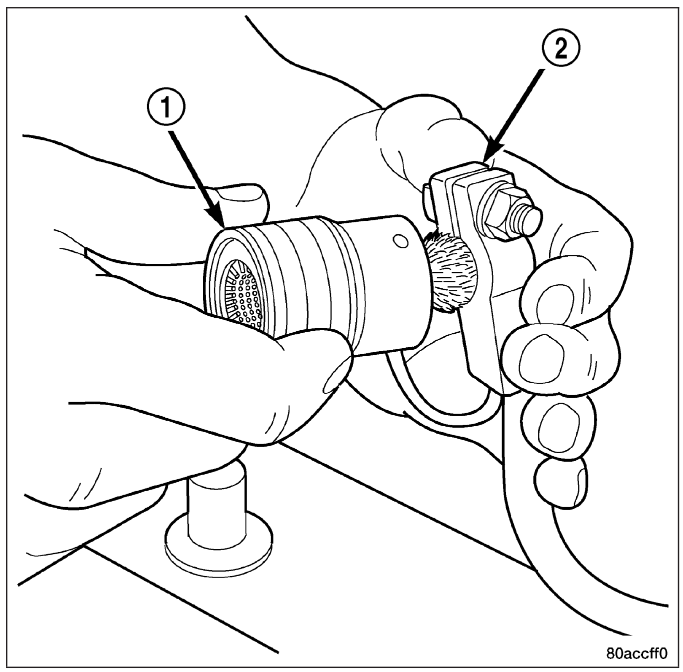
To calibrate, perform the following:

1. Start the engine.
2. Center the steering wheel.
3. Turn the steering wheel all the way to the left until the internal stop in the steering gear is met, then turn the wheel all the way to the right until the opposite internal stop in the steering gear is met.
4. Center the steering wheel.
5. Stop the engine.

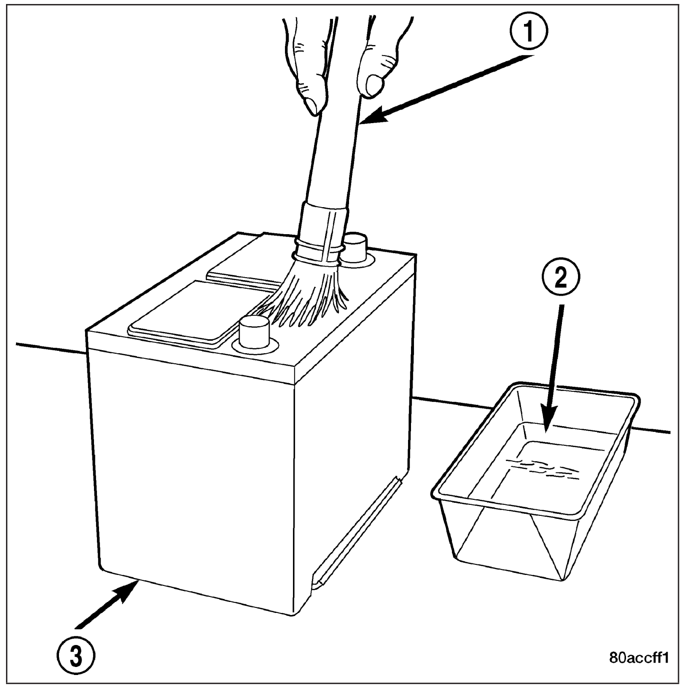
CLEANING

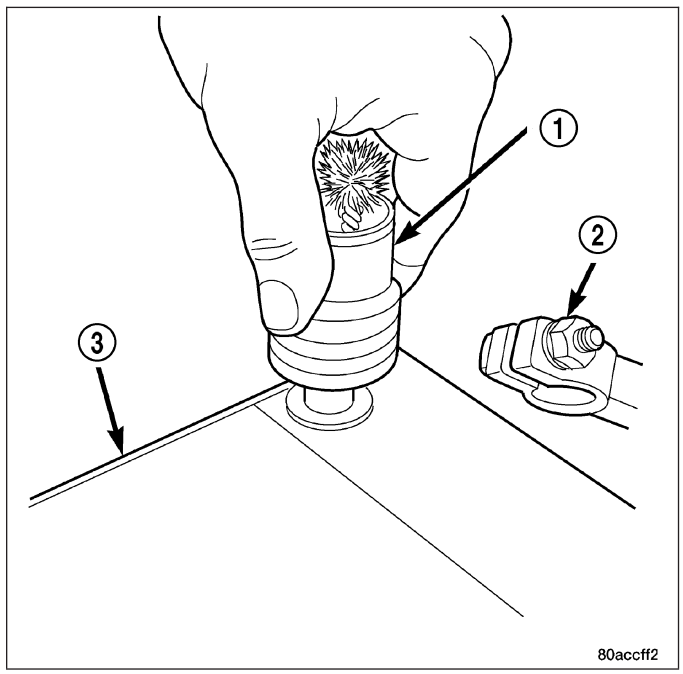
The following information details the recommended cleaning procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the Owner's Manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

1. Clean the battery cable terminal clamps of all corrosion. Remove any corrosion using a wire brush or a post and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution.



2. Clean the battery tray and battery holddown hardware of all corrosion. Remove any corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal.
3. If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film. Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the factory-installed battery specifications. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.
4. Clean the battery thermal guard with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film.
5. Clean any corrosion from the battery terminal posts with a wire brush or a post and terminal cleaner, and a sodium bicarbonate (baking soda) and warm water cleaning solution.





INSPECTION

The following information details the recommended inspection procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner’s manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

1. Inspect the battery cable terminal clamps for damage. Replace any battery cable that has a damaged or deformed terminal clamp.
2. Inspect the battery tray and battery holddown hardware for damage. Replace any damaged parts.
3. Slide the thermal guard off of the battery case (if equipped). Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose terminal posts must be replaced.
4. Inspect the battery thermal guard for tears, cracks, deformation or other damage (if equipped). Replace any battery thermal guard that has been damaged.

5. Inspect the battery built-in test indicator sight glass (if equipped) for an indication of the battery condition. If the battery is discharged, charge as required. Refer to Standard Procedures for detailed instructions.

SPECIFICATIONS

BATTERY

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

NOTE: Vehicles equipped with a diesel engine utilize a unique battery. The specifications for this battery may differ from the standards shown here. Refer to the battery manufacturer for detailed specifications.

- **Group Size** - The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.
- **Cold Cranking Amperage** - The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18° C (0° F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.
- **Reserve Capacity** - The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7° C (80° F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.
- **Ampere-Hours** - The Ampere-Hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for twenty hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the twenty-hour discharge rating.
- **Load Test Amperage** - The Load Test Amperage rating specifies the current (in amperes) that a battery should be tested at with the battery load test equipment. This value should always be 50 percent of the CCA. For example: if the CCA for this battery is 700 amps, the Load Test Amperage is 50 percent of that or 350 amps.

BATTERY CLASSIFICATIONS & RATINGS					
Part Number	BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Ampere - Hours	Load Test Amperage
04868999AC	34	700	95 Minutes	48	350
05082380AA	86	525	92 Minutes	50	255

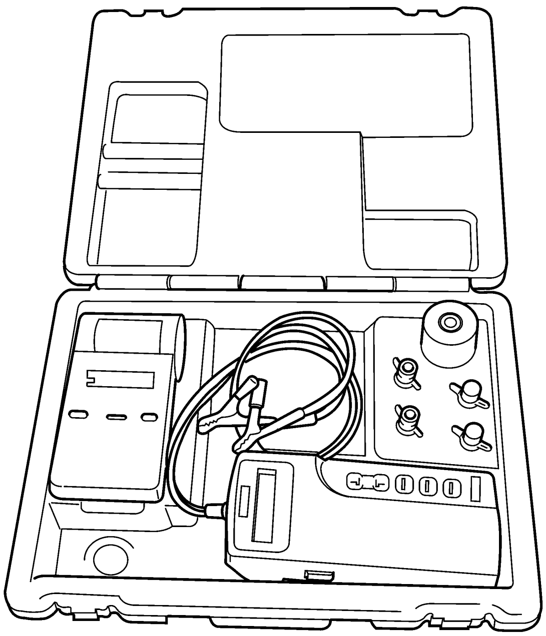
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Battery Terminal Clamp Pinch-Bolt Hex Nut	5	-	45
Battery Hold Down Bolt	7	-	62
Starter Solenoid B(+) Terminal Stud Nut	13	-	115
Battery Negative Cable Ground Eyelet Terminal To Engine Block Bolt	16.5	-	145
Generator Output Terminal Stud Nut	14	-	125

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Totally Integrated Power Module B(+) Terminal Stud Nut	10	-	90
Battery Negative Cable Eyelet Terminal To The Inner Fender Bolt	12	9	-
Lower Battery Tray Bolts	10.5	-	93
Upper Battery Tray Bolts	10.5	-	93
Battery Tray Nut	10.5	-	93

SPECIAL TOOLS

BATTERY SYSTEM SPECIAL TOOLS



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BATTERY

DESCRIPTION

There are two different batteries available for this vehicle. Vehicles equipped with a diesel engine utilize a spiral cell battery with recombination technology. This is a maintenance-free battery that is capable of delivering more power than a conventional battery. This additional power is required by a diesel engine during cold cranking. Vehicles equipped with a gasoline engine utilize a conventional battery. Refer to the following information for detailed differences and descriptions of these two batteries.

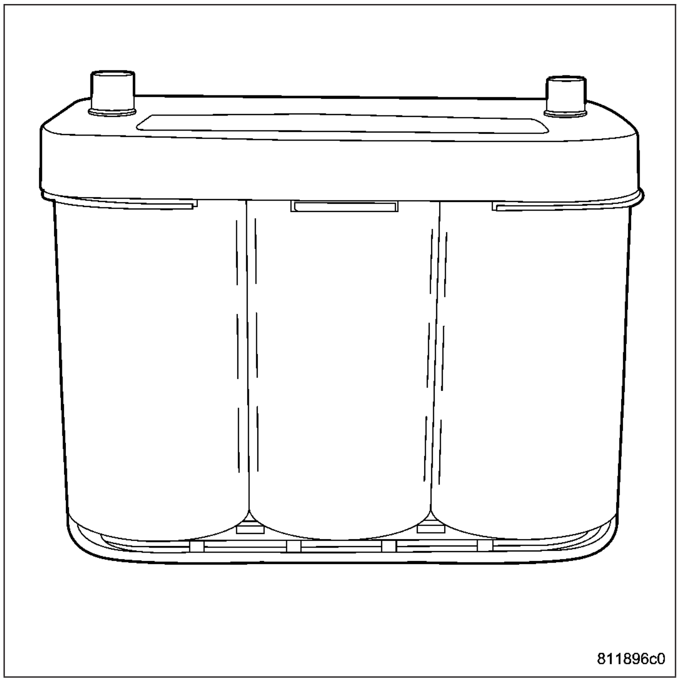
SPIRAL CELL BATTERY - DIESEL ENGINE

WARNING: Never exceed 14.4 volts when charging a spiral cell battery. Personal injury and/or battery damage may result.

By tightly winding layers of spiral grids and acid-permeated vitreous separators into cells, the battery has more power and service life than conventional batteries of the same size. The spiral cell battery is completely, permanently sealed. Through gas recombination, hydrogen and oxygen within the battery are captured during normal charging and reunited to form the water within the electrolyte, eliminating the need to add distilled water. Therefore, these batteries have non-removable battery vent caps.

The acid inside a spiral cell battery is bound within the vitreous separators, ending the threat of acid leaks. This feature allows the battery to be installed in any position anywhere in the vehicle.

Spiral cell technology is the process by which the cells holding the active material in the battery are wound tightly in coils instead of hanging flat, like conventional batteries. This design has a lower internal resistance and also increases the active material surface area.



Due to the maintanance-free design, distilled water cannot be added to this battery. Therefore, if more than 14.4 volts are used during the spiral cell battery charging process, water vapor can be exhausted through the pressure-sensitive battery vents and lost for good. This can permanently damage the spiral cell battery.

CONVENTIONAL BATTERY - GASOLINE ENGINE

Low-maintenance conventional batteries are used on vehicles equipped with a gasoline engine, these batteries have non-removable battery cell caps. Under normal service, the composition of this battery reduces gassing and water loss at normal charge rates.

Conventional batteries are made up of six individual cells that are connected in series. Each cell contains positive charged cell groups made of lead oxide, and negatively charged cell groups made of sponge lead. The cells are submerged in a sulfuric acid and water solution called electrolyte.

The battery is used to store electrical energy potential in a chemical form. When an electrical load is applied to the battery terminals, an electrochemical reaction occurs within the battery. This reaction causes the battery to discharge electrical current.

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING

BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING) for the proper battery cleaning procedures. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - INSPECTION) for the proper battery inspection procedures. Refer to Standard Procedures for the proper battery charging procedures.

MICRO 420 BATTERY TESTER (GASOLINE ENGINES)

The Micro 420 automotive battery tester is designed to help diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro 420 battery tester.

OTC ONE STEP BATTERY ANALYZER AND CHARGER (DIESEL ENGINES)

The OTC One Step Battery Analyzer and Charger is designed to help diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle.

WARNING: If the battery shows signs of freezing, leaking or loose posts, do not test, assist-boost, or charge. The battery may arc internally and explode. Personal injury and/or vehicle damage may result.

WARNING: Explosive hydrogen gas forms in and around the battery. Do not smoke, use flame, or create sparks near the battery. Personal injury and/or vehicle damage may result.

WARNING: The battery contains sulfuric acid, which is poisonous and caustic. Avoid contact with the skin, eyes, or clothing. In the event of contact, flush with water and call a physician immediately. Keep out of the reach of children.

WARNING: Never exceed 14.4 volts when charging a spiral cell battery. Personal injury and/or battery damage may result.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be tested to determine its cranking capacity. A battery that is fully-charged, but fails the OTC One Step Battery Analyzer and Charger or other load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

STANDARD PROCEDURE

SPIRAL CELL BATTERY CHARGING

WARNING: Never exceed 14.4 volts when charging a spiral cell battery. Personal injury and/or battery damage may result.

Vehicles equipped with a diesel engine utilize a unique spiral cell battery. This battery has a maximum charging voltage that must not be exceeded in order to restore the battery to its full potential, failure to use the following spiral cell battery charging procedure could result in damage to the battery or personal injury.

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- OTC One Step Battery Analyzer and Charger special tool number OT-3641 or equivalent tester indicates battery is OK.
- Open-circuit voltage of the battery is 12.65 volts or above.
- Battery passes Load Test multiple times.

WARNING: If the battery shows signs of freezing, leaking, loose posts or low electrolyte level, do not test, assist-boost, or charge. The battery may arc internally and explode. Personal injury and/or vehicle damage may result.

WARNING: Explosive hydrogen gas forms in and around the battery. Do not smoke, use flame, or create sparks near the battery. Personal injury and/or vehicle damage may result.

WARNING: The battery contains sulfuric acid, which is poisonous and caustic. Avoid contact with the skin, eyes, or clothing. In the event of contact, flush with water and call a physician immediately. Keep out of the reach of children.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Charge the battery directly at the battery terminals. Do not exceed 14.4 volts while charging a battery.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

After the battery has been charged to 12.6 volts or greater, perform a load test to determine the battery cranking capacity. If the battery passes a load test, return the battery to service. If the battery fails a load test, it is faulty and must be replaced.

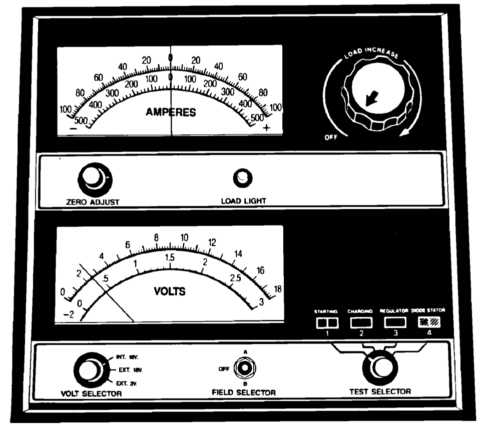
Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING) for the proper battery system cleaning procedures. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - INSPECTION) for the proper battery system inspection procedures.

CHARGING A COMPLETELY DISCHARGED BATTERY – SPIRAL CELL BATTERY

WARNING: Never exceed 14.4 volts when charging a spiral cell battery. Personal injury and/or battery damage may result.

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt. Refer to Battery Removal and Installation for access instructions. If the reading is below ten volts, the battery charging current will be low. It could take several hours before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.
2. Disconnect and isolate the battery negative cable. Connect the OTC One Step Battery Analyzer and Charger special tool number OT-3641 or equivalent.



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NOTE: Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

3. Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

SPIRAL-PLATE BATTERY CHARGE RATE TABLE

Voltage	Minutes
14.4 volts maximum	up to 10 minutes
13.0 to 14 volts	up to 20 minutes
12.9 volts or less	up to 30 minutes

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies eight amperes will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

SPIRAL-PLATE BATTERY CHARGING TIME TABLE

Charging Amperage	5 Amps	8 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)	
12.25 to 12.49	6 hours	3 hours
12.00 to 12.24	10 hours	5 hours
10.00 to 11.99	14 hours	7 hours
Below 10.00	18 hours	9 hours

STANDARD PROCEDURE - CONVENTIONAL BATTERY CHARGING

CAUTION: Vehicles equipped with a diesel engine utilize a unique spiral cell battery. This battery has a maximum charging voltage that must be used in order to restore the battery to its full potential, failure to use the spiral cell battery charging procedure could result in damage to the battery or personal injury. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - SPIRAL CELL BATTERY CHARGING) for the appropriate procedure.

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Micro 420 battery tester indicates battery is OK.
- Open-circuit voltage of the battery is 12.65 volts or above.
- Battery passes Load Test multiple times.

WARNING: If the battery shows signs of freezing, leaking, loose posts, do not test, assist-boost, or charge. The battery may arc internally and explode. Personal injury and/or vehicle damage may result.

WARNING: Explosive hydrogen gas forms in and around the battery. Do not smoke, use flame, or create sparks near the battery. Personal injury and/or vehicle damage may result.

WARNING: The battery contains sulfuric acid, which is poisonous and caustic. Avoid contact with the skin, eyes, or clothing. In the event of contact, flush with water and call a physician immediately. Keep out of the reach of children.

WARNING: If the battery is equipped with removable cell caps, be certain that each of the cell caps is in place and tight before the battery is returned to service. Personal injury and/or vehicle damage may result from loose or missing cell caps.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.

CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

After the battery has been charged to an open-circuit voltage reading of 12.4 volts or greater, retest the battery with the Micro 420 tester or perform a load test to determine the battery cranking capacity. (Refer to 8 - ELECTRICAL/

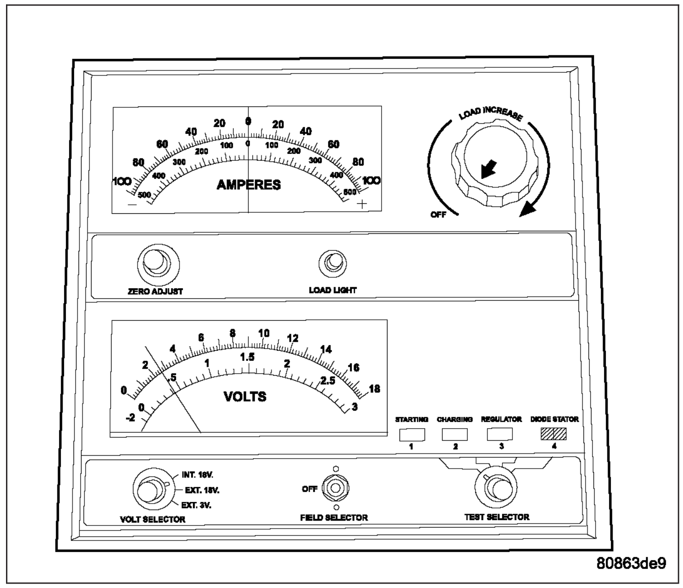
BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER) for the proper battery test procedures. If the battery passes a load test, return the battery to service. If the battery fails a load test, it is faulty and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING) for the proper battery system cleaning procedures. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - INSPECTION) for the proper battery system inspection procedures.

CHARGING A COMPLETELY DISCHARGED CONVENTIONAL BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt. If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.
2. Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.



3. Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CONVENTIONAL BATTERY CHARGE RATE TABLE

Voltage	Minutes
16.0 volts maximum	up to 10 min.
14.0 to 15.9 volts	up to 20 min.
13.9 volts or less	up to 30 min.

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Conventional Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

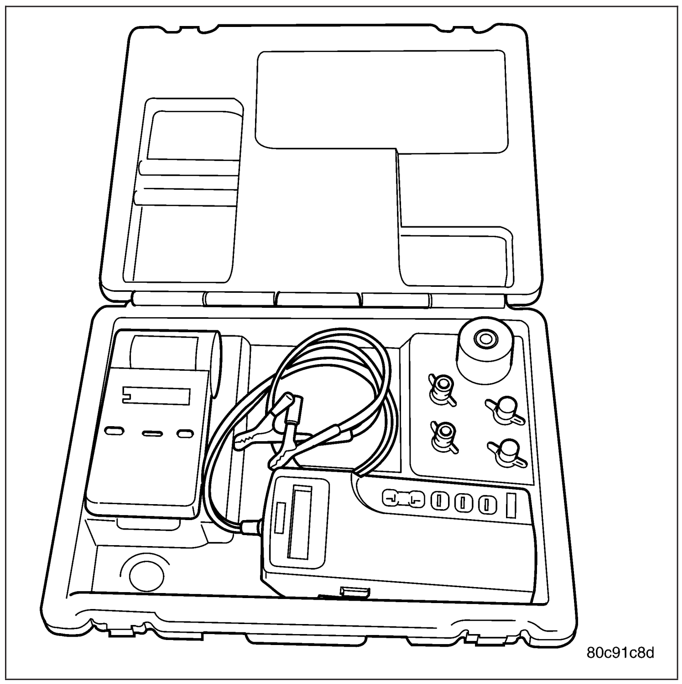
CONVENTIONAL BATTERY CHARGING TIME TABLE

Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

USING MICRO 420 BATTERY TESTER (GASOLINE ENGINES)

NOTE: The Micro 420 Battery Tester should only be used to test vehicles equipped with gasoline engines. If the vehicle being tested has a diesel engine the OTC One Step Battery Analyzer and Charger special tool number OT-3641 or equivalent should be used to test the battery.

Always use the Micro 420 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:



WARNING: Always wear appropriate eye protection and use extreme caution when working with batteries.

BATTERY TESTING

1. If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing. If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.
2. If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition.
3. Connect the tester to the battery, the red clamp to the positive (+) terminal and the black clamp to the negative (–) terminal.

NOTE: Multiple batteries connected in parallel must have the ground cable disconnected to perform a battery test. Failure to disconnect may result in false battery test readings.

4. Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.
5. If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the BATTERY TEST RESULTS TABLE.

CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.

6. While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

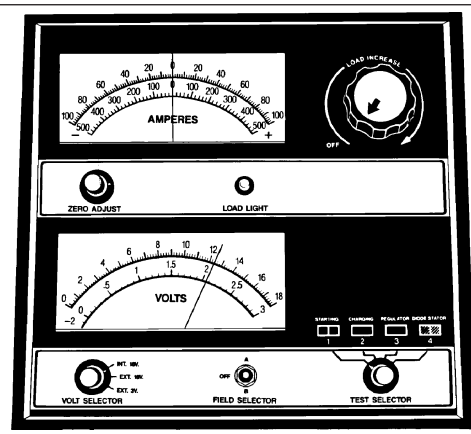
NOTE: The SERVICE CODE is required on every warranty claim submitted for battery replacement.

STANDARD PROCEDURE - OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery.

Before proceeding with this test, completely charge the battery, refer to the appropriate battery charging procedure.

1. Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.
2. Disconnect and isolate both battery cables, negative cable first.
3. Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage.



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See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity.

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Totally Integrated Power Module (TIPM). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Faulty or improperly adjusted switches.
- Faulty or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

1. Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes.
2. Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.
3. Disconnect the battery negative cable.
4. Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to three minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.
5. After about three minutes, the high-amperage IOD reading on the multi-meter should become very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Totally Integrated Power Module (TIPM), one at a time until the amperage reading becomes very low, or nonexistent. **Refer to the appropriate wiring information for complete TIPM fuse, circuit breaker, and circuit identification.** This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for the proper charging system diagnosis and testing procedures. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multi-meter to check the low-amperage IOD.

CAUTION: Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multi-meter may be damaged.

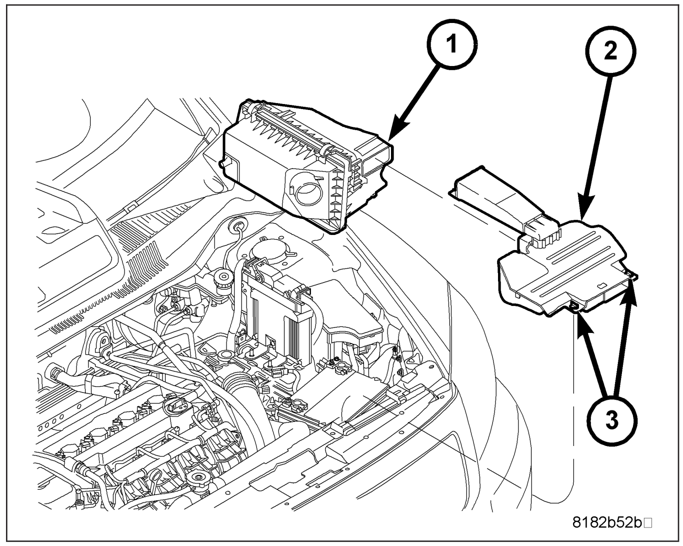
6. Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or a component failure is at fault.

REMOVAL

WARNING:
To protect the hands from battery acid, a suitable pair of heavy duty rubber gloves should be worn when removing or servicing a battery. Safety glasses also should be worn.

WARNING: Remove metallic jewelry to avoid injury by accidental arcing of battery current.

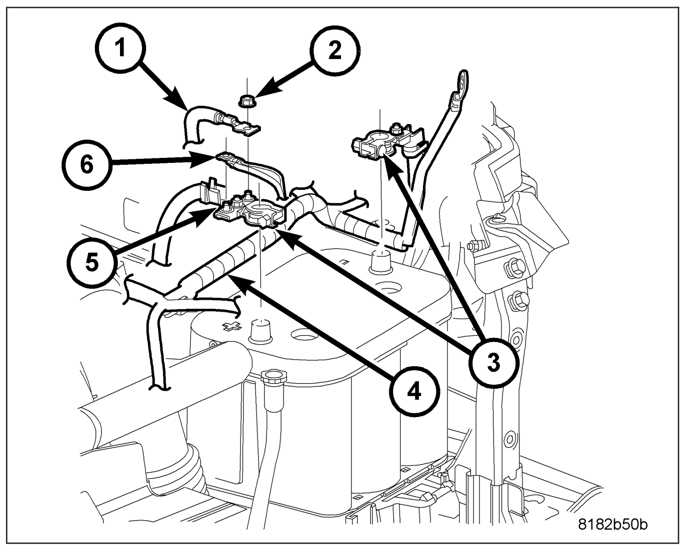
1. Rotate the two retaining clips (3) and remove the air cleaner fresh air duct (2).



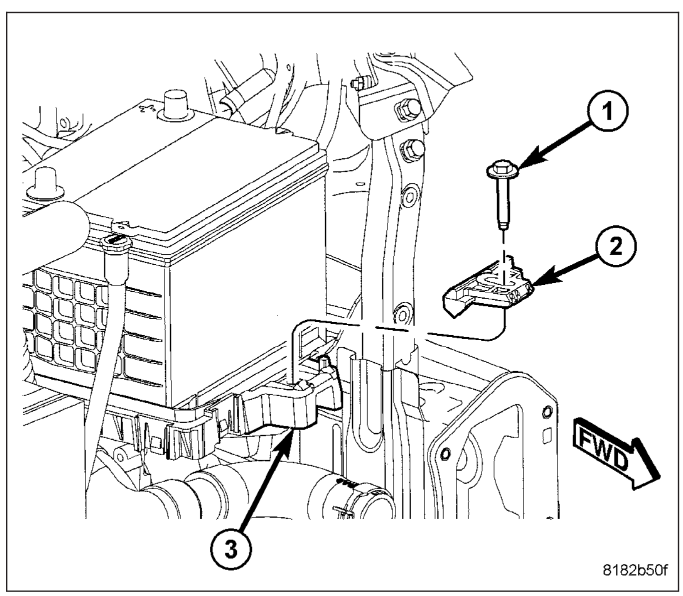
WARNING: The battery negative and positive cable polarity are different from the gasoline engine equipped vehicles to the diesel engine equipped vehicles. Please note the location of the positive and negative cables prior to service of the battery or related components.

NOTE: Diesel battery shown, gasoline battery similar.

2. Disconnect and isolate the battery negative cable then the positive cable (3).

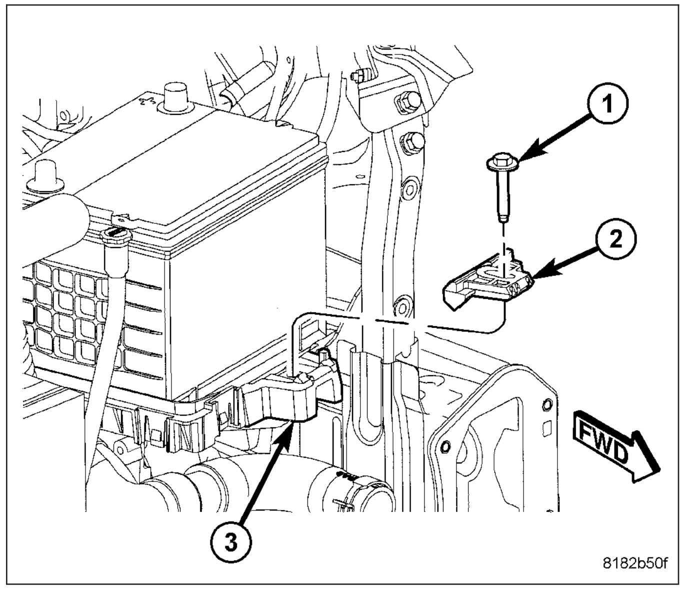


3. Loosen bolt (1) and retainer (2) that holds the battery down to the tray (3).
4. Lift battery out of battery tray and remove from vehicle.
5. Remove thermal guard (if equipped) from battery.



INSTALLATION

WARNING:
To protect the hands from battery acid, a suitable pair of heavy duty rubber gloves should be worn when removing or servicing a battery. Safety glasses also should be worn.

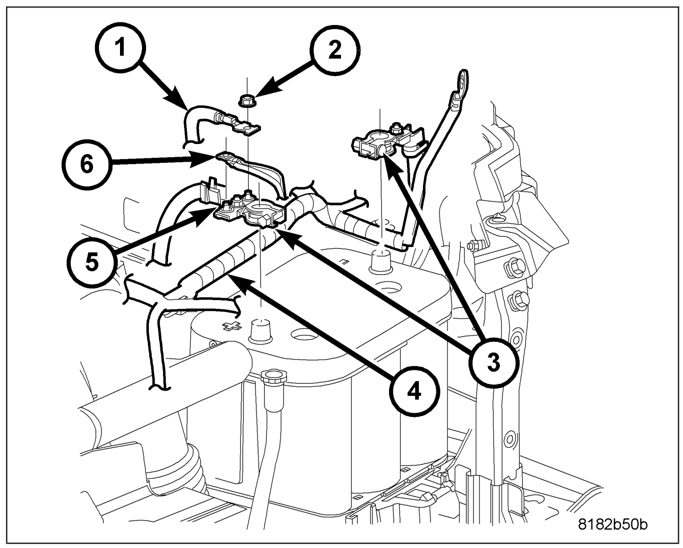


WARNING: Remove metallic jewelry to avoid injury by accidental arcing of battery current.

NOTE: When replacing battery, the thermal guard MUST be transferred to the new battery (if equipped).

1. Install battery in vehicle making sure that the thermal guard (if equipped) is present and battery is properly positioned on battery tray (3).
2. Install the battery hold down retainer (2) and bolt (1) making sure that it is properly positioned on battery. Torque the hold down bolt to 7 N·m (62 in. lbs.)

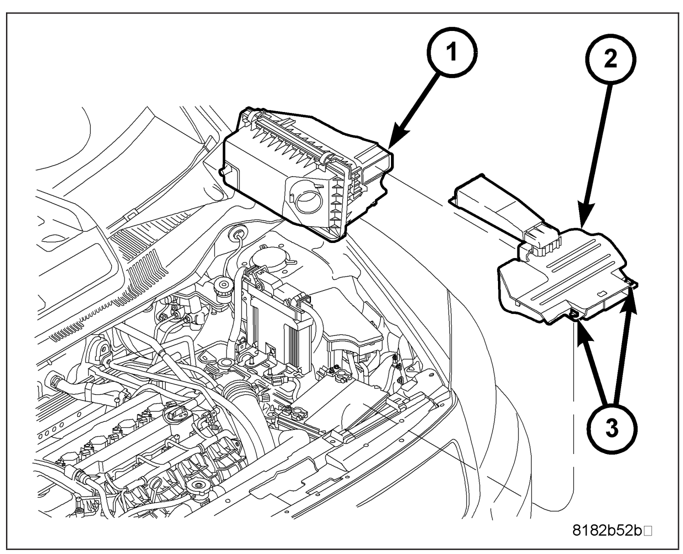
WARNING: The battery negative and positive cable polarity are different from the gasoline engine equipped vehicles to the diesel engine equipped vehicles. Please note the location of the positive and negative cables prior to service of the battery or related components.



NOTE: Diesel battery shown, gasoline battery similar.

3. Connect the battery positive cable then the negative cable (3).
4. Torque the cable clamp nuts to 5 N·m (45 in. lbs.).

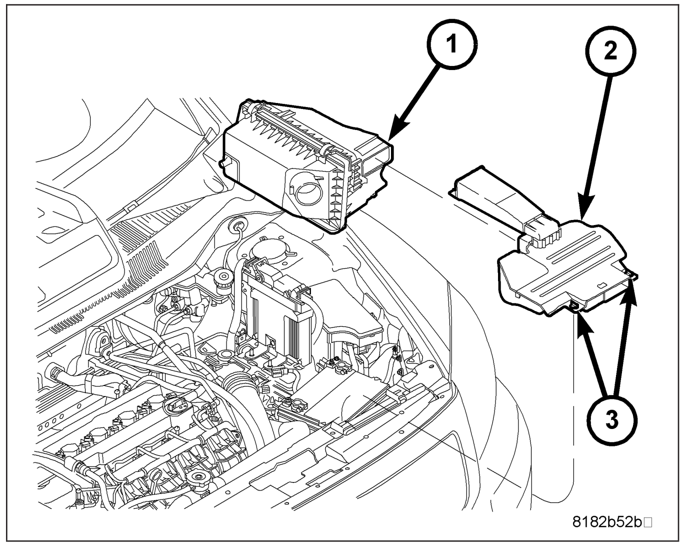
5. Install the air cleaner fresh air duct (2) and secure in place by rotating the two retaining clips (3).
6. Verify proper vehicle operation.



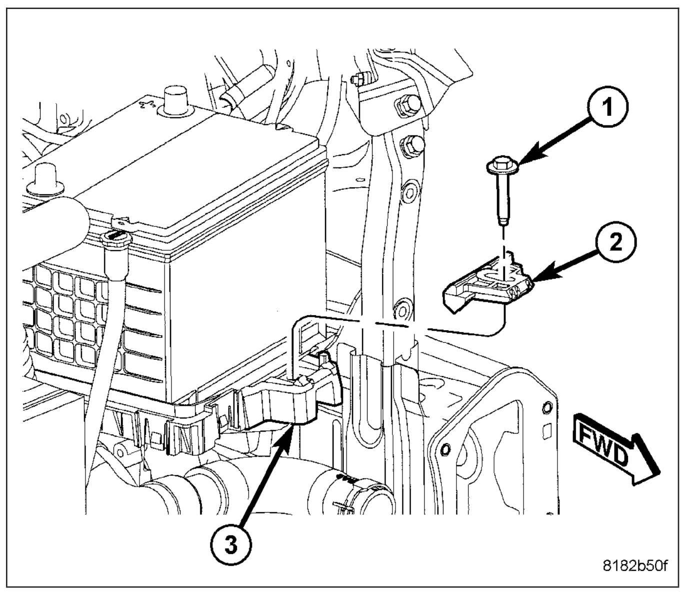
BATTERY HOLDDOWN

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Rotate the two retaining clips (3) and remove the air cleaner fresh air duct (2).

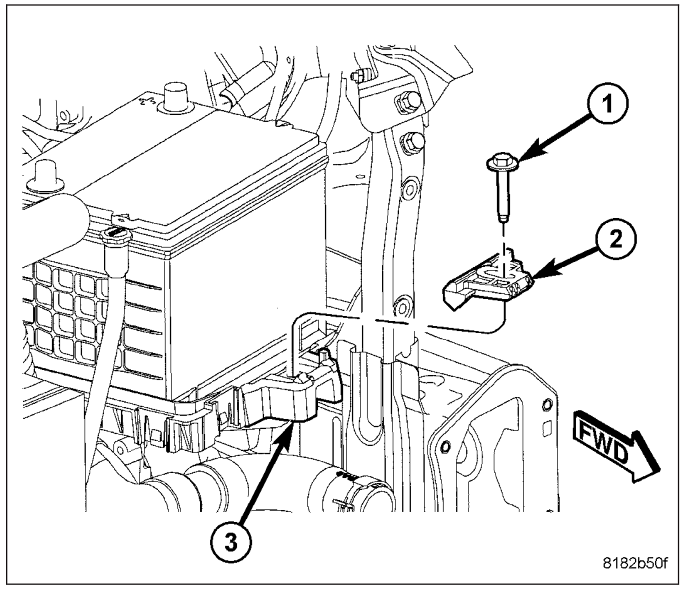


3. Remove the battery hold down retaining bolt (1).
4. Remove the battery hold down (2) from the vehicle.

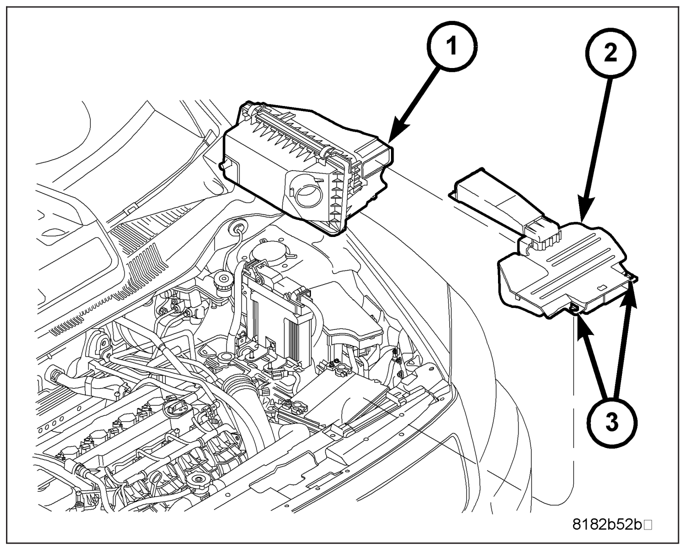


INSTALLATION

1. Install the battery hold down (2) into the vehicle.
2. Install the battery hold down retaining bolt (1). Tighten the bolt to 7 N·m (62 in. lbs.).



3. Install the air cleaner fresh air duct (2) and secure in place by rotating the two retaining clips (3).
4. Connect the battery negative cable.



BATTERY CABLES

DESCRIPTION

The battery cables are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. The battery cables feature a clamping type female battery terminal made of stamped sheet metal that is die cast onto one end of the battery cable wire. A pinch-bolt and nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then soldered. The battery positive cable wires feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a smaller female battery terminal clamp.

Both the battery positive and negative cables are available for service replacement only as a unit with the battery wire harness, which may include portions of the wiring circuits for the generator and other components on some vehicles.

OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

One wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the Totally Integrated Power Module (TIPM), and the other wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the engine starter motor solenoid. The battery negative cable terminal clamp has one wire as an eyelet terminal that connects the battery negative cable to the vehicle powertrain through a ground connection, typically on the engine cylinder block.

DIAGNOSIS AND TESTING

BATTERY CABLES

A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cable. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

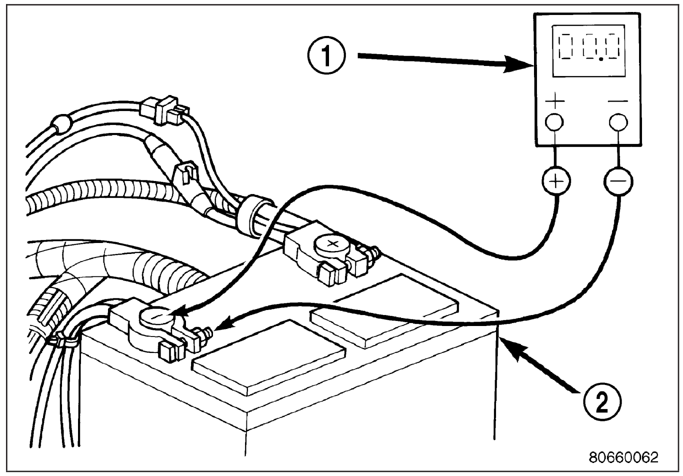
VOLTAGE DROP TEST

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

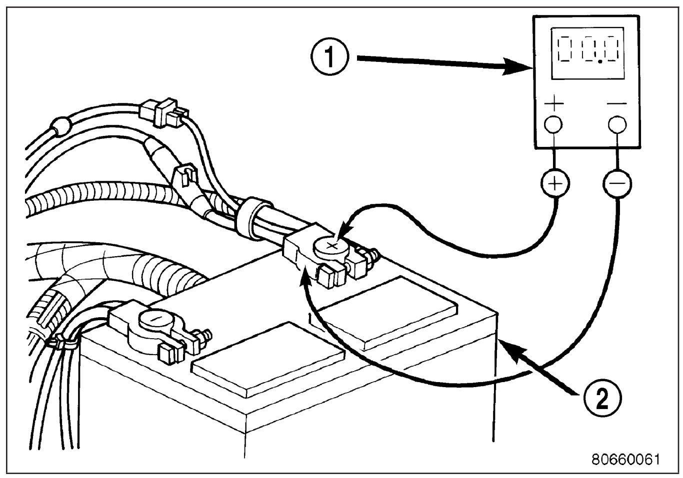
- The battery is fully-charged and load tested. Refer to Standard Procedures for the proper battery charging and load test procedures.
- Fully engage the parking brake.
- If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
- Verify that all lamps and accessories are turned off.

- To prevent the engine from starting, remove the Automatic Shut Down (ASD) relay. The ASD relay is located in the Totally Integrated Power Module (TIPM), in the engine compartment. See the fuse and relay layout label affixed to the underside of the TIPM cover for ASD relay identification and location.

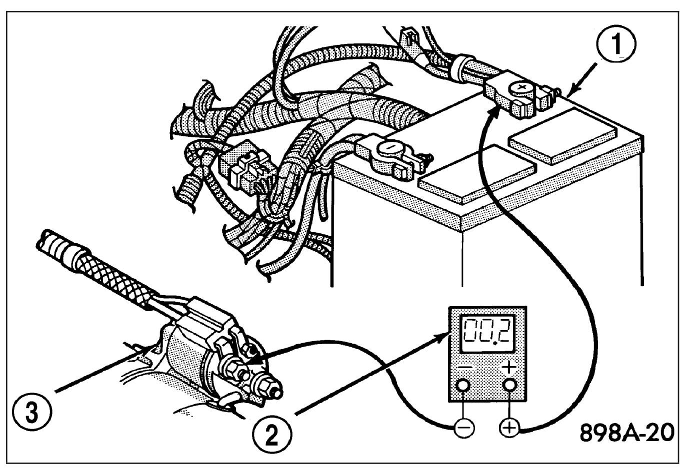
1. Connect the positive lead of the voltmeter (1) to the battery (2) negative terminal post. Connect the negative lead of the voltmeter (1) to the battery (2) negative cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.



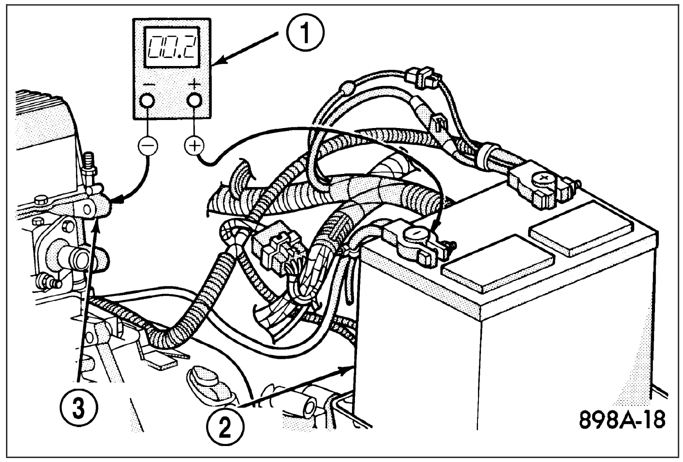
2. Connect the positive lead of the voltmeter (1) to the battery (2) positive terminal post. Connect the negative lead of the voltmeter (1) to the battery (2) positive cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.



3. Connect the voltmeter (2) to measure between the battery positive cable terminal clamp (1) and the starter solenoid B(+) terminal stud (3). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

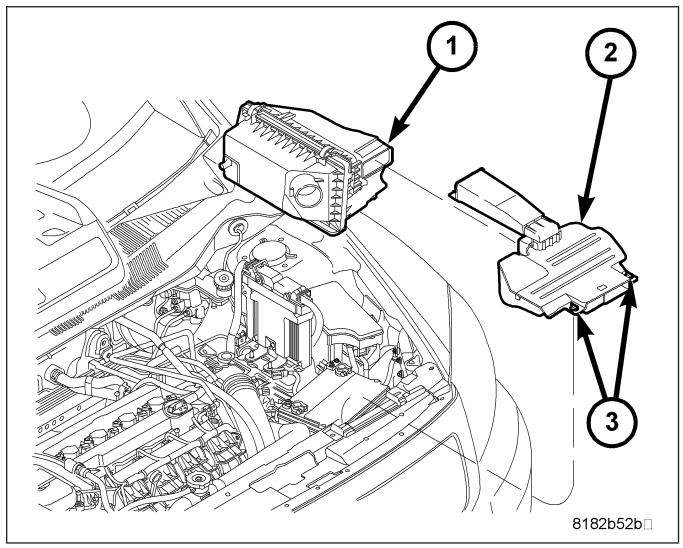


4. Connect the voltmeter (1) to measure between the battery (2) negative cable terminal clamp and a good clean ground on the engine block (3). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection to the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.



REMOVAL

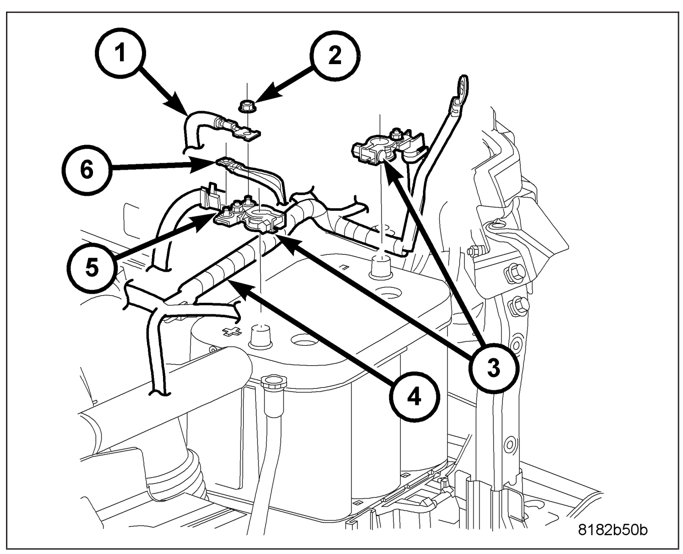
1. Disconnect and isolate the battery negative cable.
2. Rotate the two retaining clips (3) and remove the air cleaner fresh air duct (2).



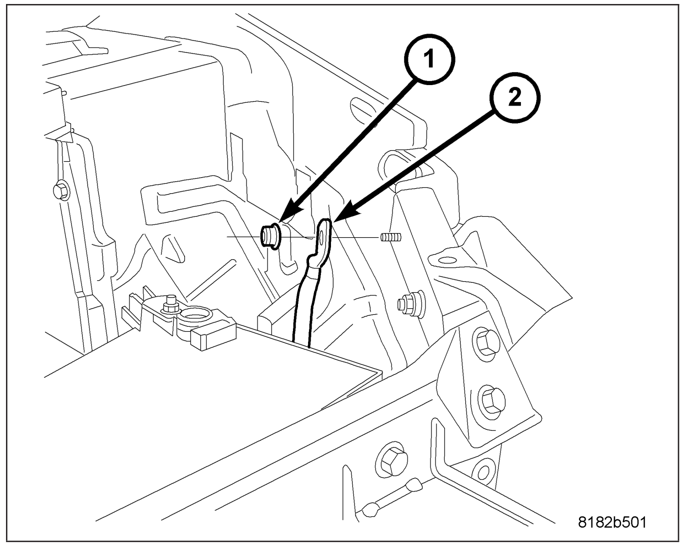
WARNING: The battery negative and positive cable polarity are different from the gasoline engine equipped vehicles to the diesel engine equipped vehicles. Please note the location of the positive and negative cables prior to service of the battery or related components.

NOTE: Diesel battery shown, gasoline battery similar.

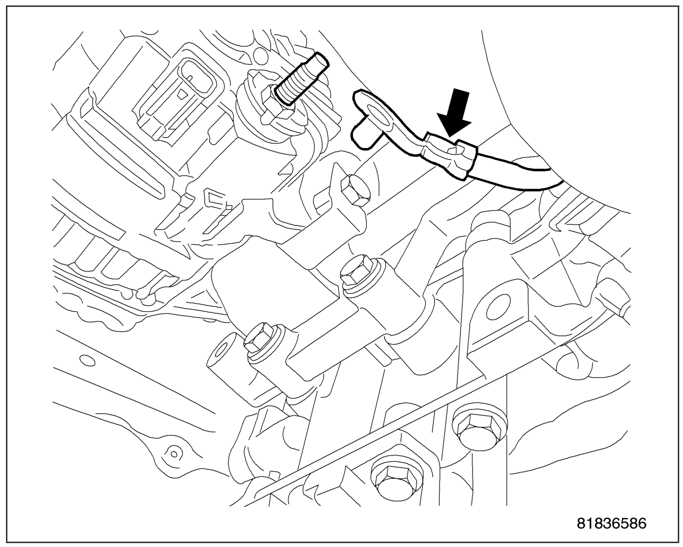
3. Remove the nut (2) securing the Totally Integrated Power Module (TIPM) cable (1) to the battery clamp stud (5).
4. Disconnect and isolate the battery negative cable then the positive cable (3).



5. Remove the nut (1) securing the negative cable (2) to the body ground stud.

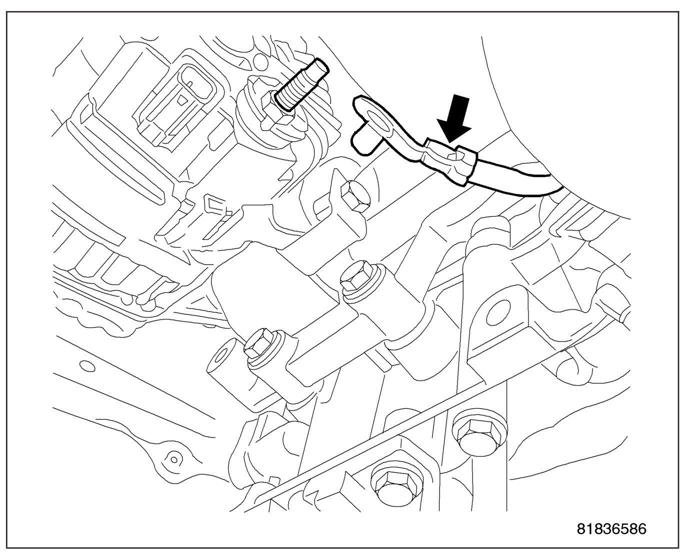


6. Remove the battery cable from the B+ terminal of the generator.
7. Remove the battery cable from the B+ terminal of the starter motor.
8. One at a time, trace the battery cable retaining pushpins, fasteners and routing clips until the cables are free from the vehicle.
9. Remove the battery cables from the engine compartment.

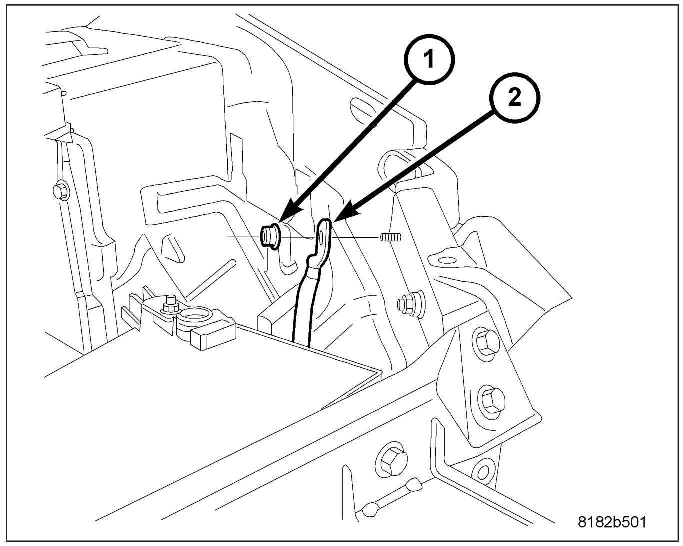


INSTALLATION

1. Position the battery cables in the engine compartment.
2. One at a time, install the battery cable retaining pushpins, fasteners and routing clips until the cables are installed exactly where they were in the vehicle.
3. Connect the battery cable to the B+ terminal of the starter motor. Torque the cable nut to 13 N·m (115 in. lbs.).
4. Connect the battery cable to the B+ terminal of the generator. Torque the cable nut to 14 N·m (125 in. lbs.).

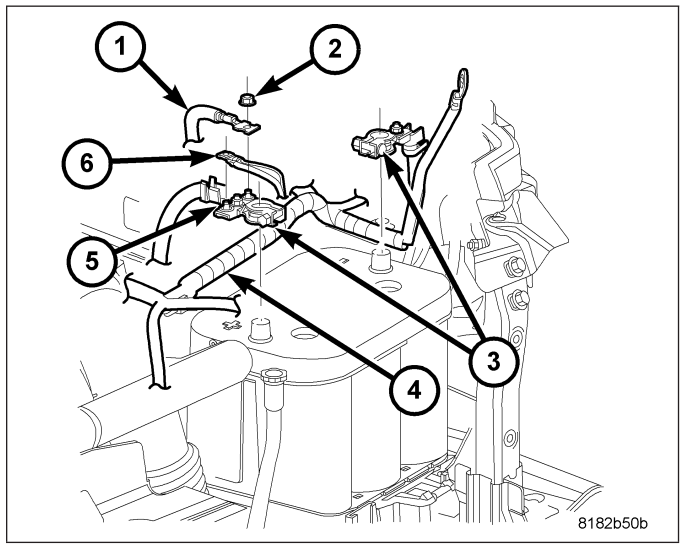


5. Install the nut (1) securing the negative cable (2) to the body ground stud. Torque the cable nut to 12 N·m (9 ft. lbs.).

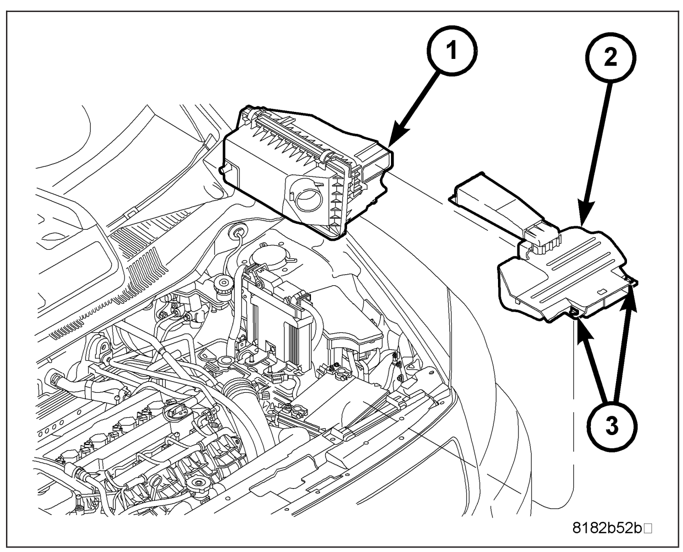


WARNING: The battery negative and positive cable polarity are different from the gasoline engine equipped vehicles to the diesel engine equipped vehicles. Please note the location of the positive and negative cables prior to service of the battery or related components.

NOTE: Diesel battery shown, gasoline battery similar.



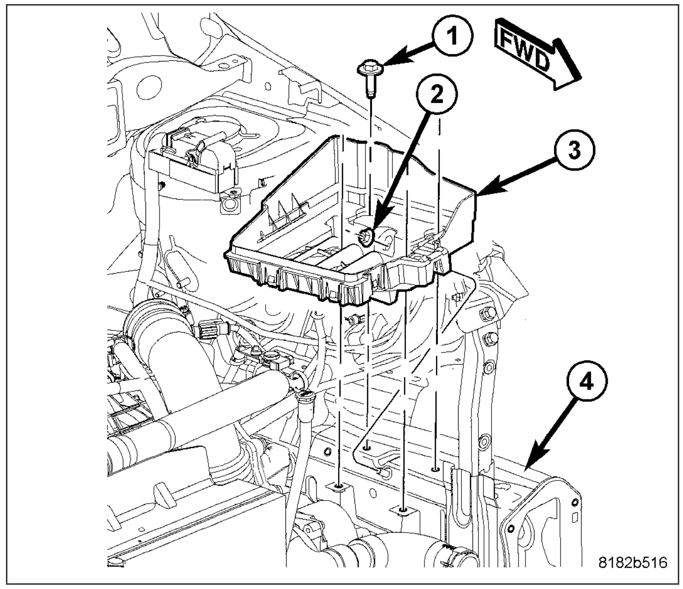
6. Connect the battery positive cable then the negative cable (3).
7. Torque the cable clamp nuts to 5 N·m (45 in. lbs.).
8. Install the nut (2) securing the Totally Integrated Power Module (TIPM) cable (1) to the battery clamp stud (5).
9. Install the air cleaner fresh air duct (2) and secure in place by rotating the two retaining clips (3).



BATTERY TRAY

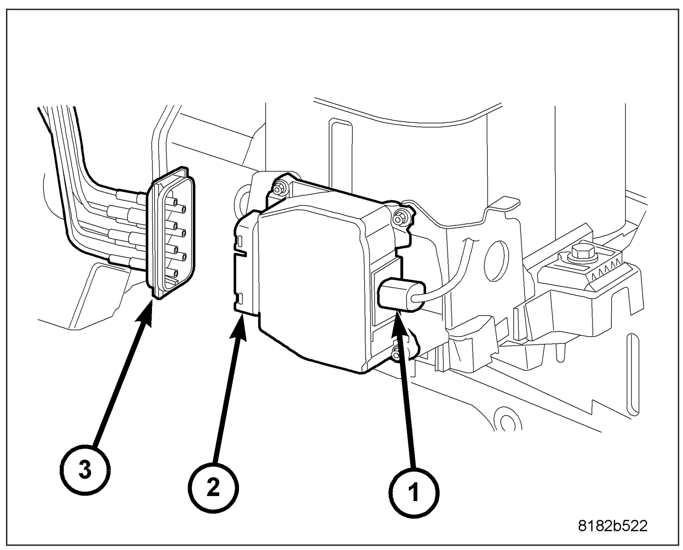
DESCRIPTION

The battery is placed and secured in a plastic battery tray (3). The battery tray is located in the left front side of the vehicle and is secured in place by one nut (2) and four bolts (1).

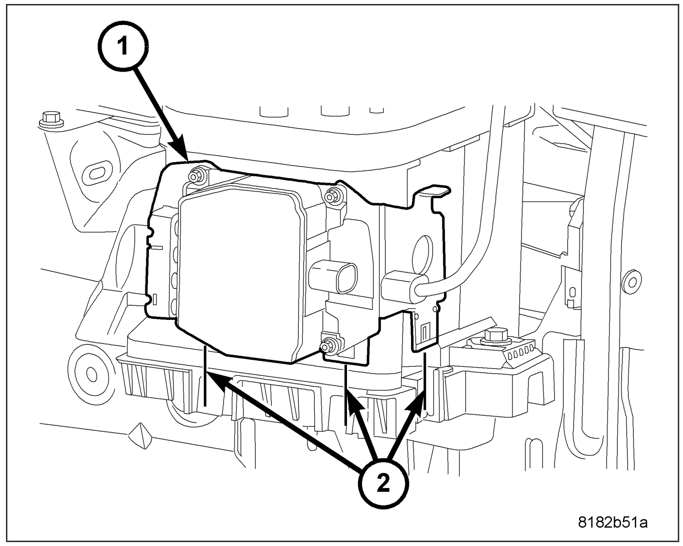


REMOVAL

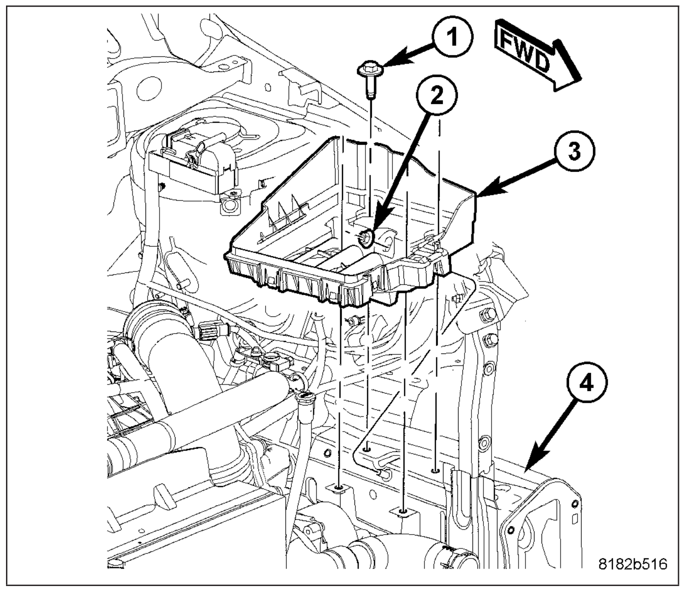
1. Disconnect and isolate the battery negative cable.
2. On diesel engine equipped vehicles disconnect the vacuum connector (3) and electrical connector (1) from the diesel vacuum valve (2).



3. On diesel engine equipped vehicles lift the diesel vacuum valve bracket (1) up disengaging the mounting tabs from the receptacles (2) in the battery tray.

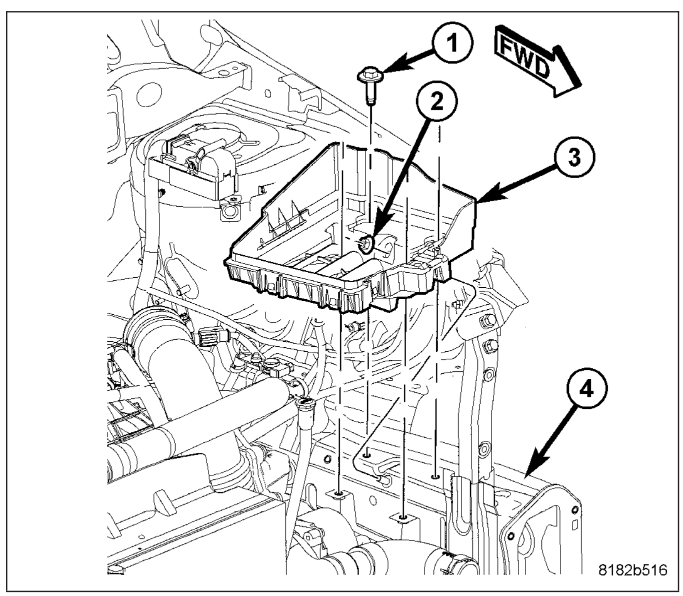


4. Remove the battery (Refer to 8 - ELECTRICAL/ BATTERY SYSTEM/BATTERY - REMOVAL).
5. Remove the four bolts (1) and one nut (2) securing the battery tray (3) to the left frame rail (4).
6. Lift the battery tray out of the engine compartment and remove from the vehicle.

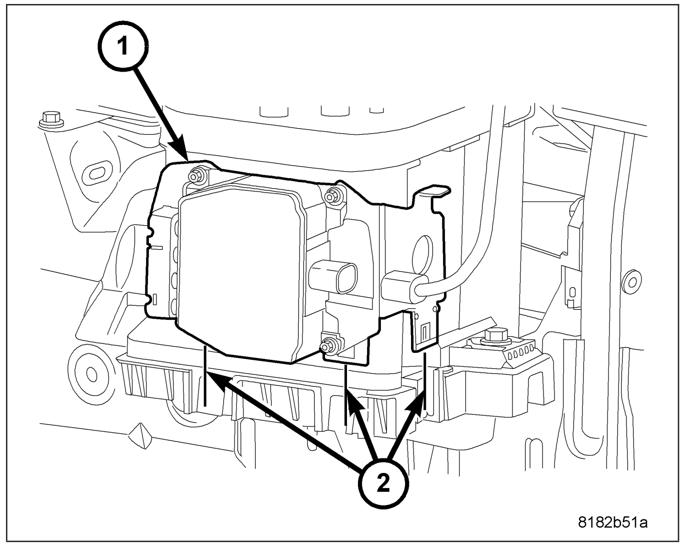


INSTALLATION

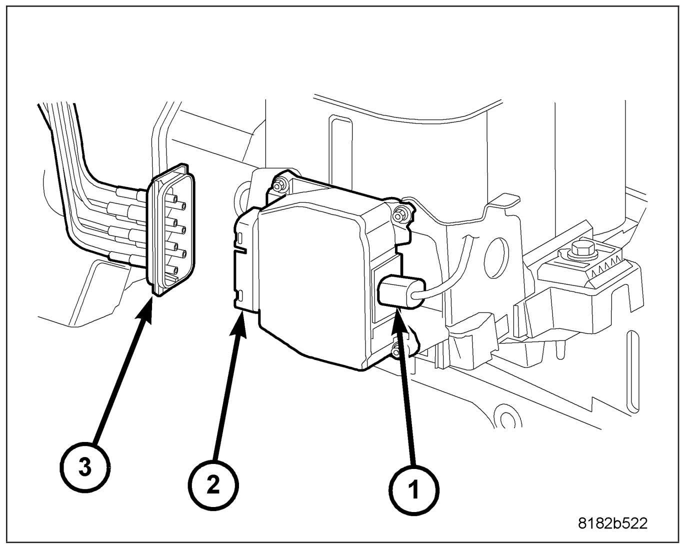
1. Place the battery tray (3) into the engine compartment over the left frame rail (4).
2. Install the one nut (2) and four bolts (1) securing the battery tray (3) to the frame rail (4).
3. Tighten the nut to 10.5 N·m (93 in. lbs.).
4. Tighten the bolts to 1.5 N·m (93 in. lbs.).
5. Install the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).



6. On diesel engine equipped vehicles install the diesel vacuum valve. Push the bracket (1) down until the mounting tabs are completely seated into the receptacles (2) in the battery tray.



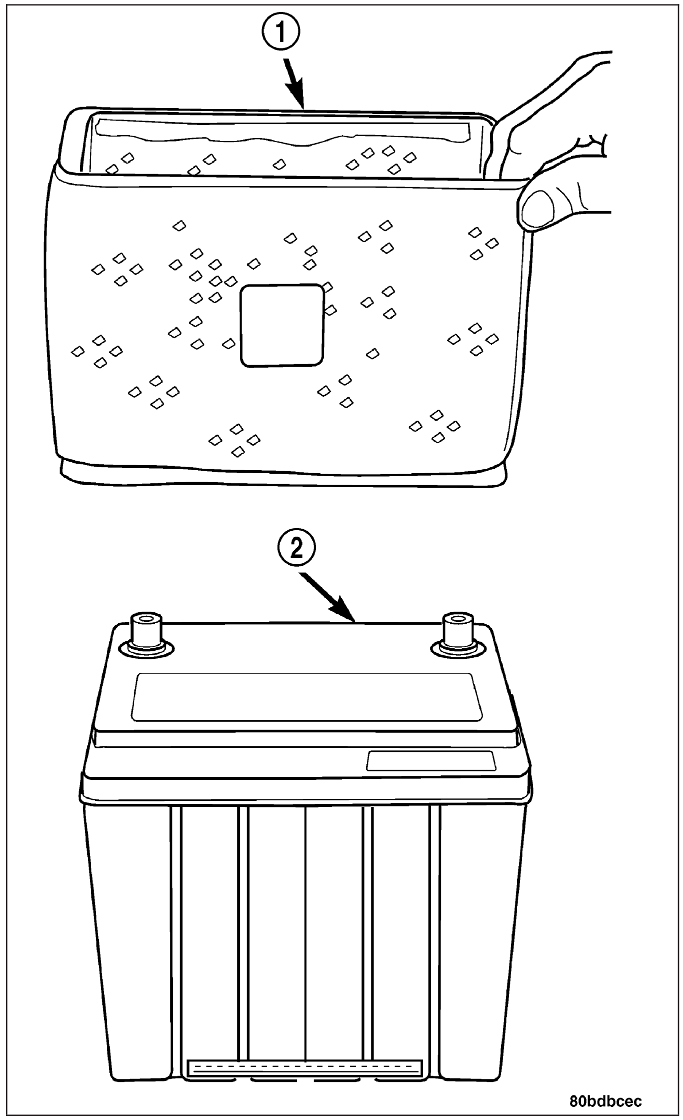
7. On diesel engine equipped vehicles connect the vacuum connector (3) and electrical connector (1) to the diesel vacuum valve (2).
8. Connect the battery negative cable.



THERMAL GUARD

DESCRIPTION

On gasoline engine equipped vehicles, a flexible thermal guard wraps around the battery case (2) to enclose the sides of the battery. The thermal guard (1) consists of a plastic cloth outer skin with a polyester based insulator fiber.



REMOVAL

WARNING:
To protect the hands from battery acid, a suitable pair of heavy duty rubber gloves, not the household type, should be worn when removing or servicing a battery. Safety glasses also should be worn.

1. Disconnect and isolate the battery negative cable.
2. Remove the battery, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).
3. Carefully lift the thermal guard off over the battery taking care not to tear it.
4. Remove the thermal guard from battery.

INSTALLATION

NOTE: When replacing battery, the thermal guard MUST be transferred to the new battery.

1. Slip the battery thermal guard over the battery being careful not to tear it.
2. Install the battery into the vehicle, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).
3. Connect the battery negative cable.

CHARGING

TABLE OF CONTENTS

CHARGING

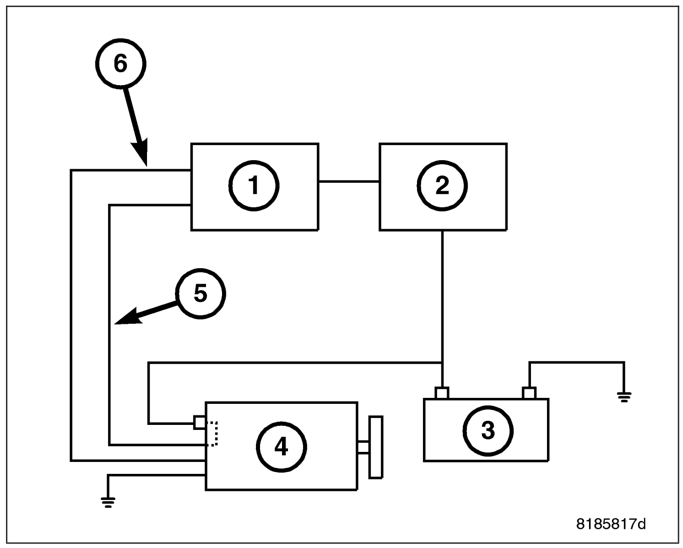
DESCRIPTION - CHARGING SYSTEM

The charging system consists of:

- Generator
- Decoupler Pulley (If equipped)
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to the Ignition System section for information)
- Battery (refer to the Battery section for information)
- Inlet Air Temperature
- Voltmeter (refer to the Instrument Cluster section for information if equipped)
- Wiring harness and connections (refer to the Wiring section for information)
- Accessory drive belt (refer to the Cooling section for more information)

OPERATION - CHARGING SYSTEM

The charging system is turned on and off with the ignition switch. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator. The alternator is internally grounded. The generator regulates the field using Pin 1 of the field connector (High side driver).



The generator is driven by the engine through a serpentine belt and pulley or decoupler pulley arrangement.

The PCM receives a voltage input from the alternator and also a battery voltage input from the TIPM, it then compares the voltages and if there is a difference it send a signal to the alternator EVR circuit to increase or decrease output. It uses a pulse width modulation (PWM) to send signals to the alternator circuitry to control the amount of output from the alternator. The amount of DC current produced by the generator is controlled by the EVR (electronic voltage regulator) circuitry contained within the alternator.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (electronic voltage regulator) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The lamp is located on the instrument panel. Refer to the Instrument Cluster section for additional information.

Voltage is monitored at B+ stud to insure the cable is connected. If cable is loose PCM will shut down generator field. Because of this new feature, pin 2 of the field connector is internally connected to the B+.

DIAGNOSIS AND TESTING

ON-BOARD DIAGNOSTIC SYSTEM

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the OBD system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 40 good trip if the problem does not occur again.

DIAGNOSTIC TROUBLE CODES

A DTC description can be read using the scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

ERASING DIAGNOSTIC TROUBLE CODES

The scan tool must be used to erase a DTC.

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp or battery lamp is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to Ignition-Off Draw Test (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE)
- loose generator belt.

INSPECTION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Diagnostic manual for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the scan tool. Perform the following inspections before attaching the scan tool.

1. Inspect the battery condition. Refer to the Battery section (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING) for procedures.
2. Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.
3. Inspect all fuses in the fuseblock for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.
4. Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications (Refer to 8 - ELECTRICAL/CHARGING - SPECIFICATIONS).
5. Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications (Refer to 7 - COOLING/ACCESSORY DRIVE - SPECIFICATIONS).
6. Inspect decoupler pulley (if equipped). Ensure decoupler pulley is driving the alternator rotor.
7. Inspect automatic belt tensioner (if equipped). Refer to the Cooling System for more information.
8. Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Generator B+ nut GAS	11.3	-	100
Generator B+ nut DIESEL	10	-	88.5
Battery Terminal Nut	9	6.6	75
Battery Hold Down Clamp Bolt	9	6.6	75
Generator Mounting Bolt - GAS	61	45	-
Generator Mounting Bolt - DIESEL	28	38	-

GENERATOR RATINGS

TYPE	RATED SAE AMPS	ENGINES	MINIMUM TEST AMPS
MELCO	120 AMPS	1.8/2.0/2.4L	

GENERATOR

DESCRIPTION

The generator is belt-driven by the engine. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced. The generator produces DC voltage.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil.

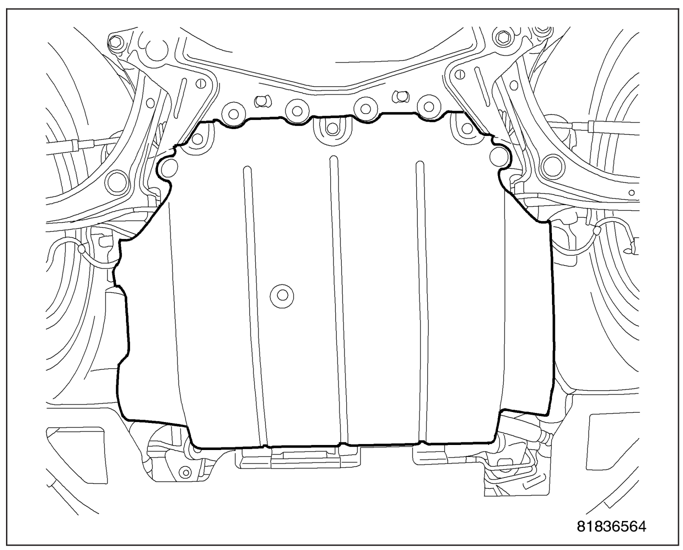
The Y type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicles electrical system through the generator, battery, and ground terminals.

Noise emitting from the generator may be caused by:

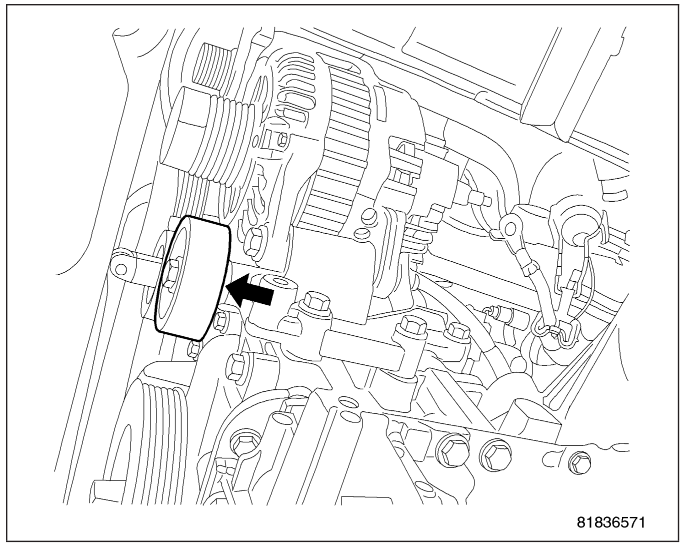
- Worn, loose or defective bearings
- Loose or defective drive pulley
- Incorrect, worn, damaged or misadjusted drive belt
- Loose mounting bolts
- Misaligned drive pulley
- Defective stator or diode
- Damaged internal fins

REMOVAL

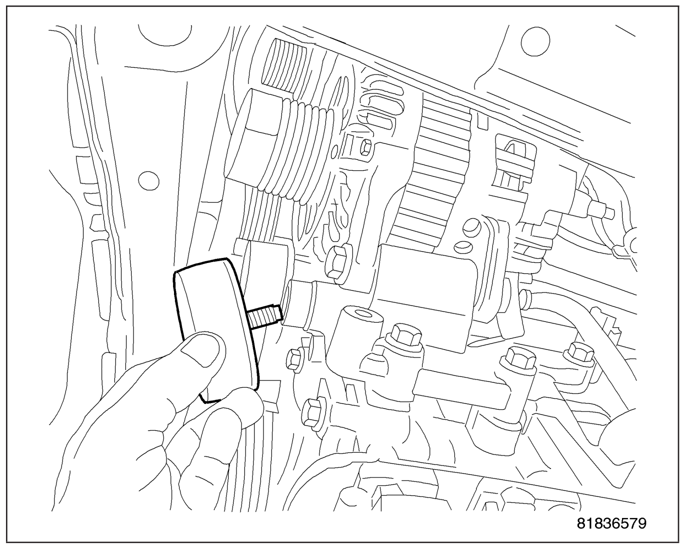
1. Disconnect the negative battery cable.
2. Raise and support vehicle.
3. Remove the right front wheel.
4. Remove the underbody air dam.



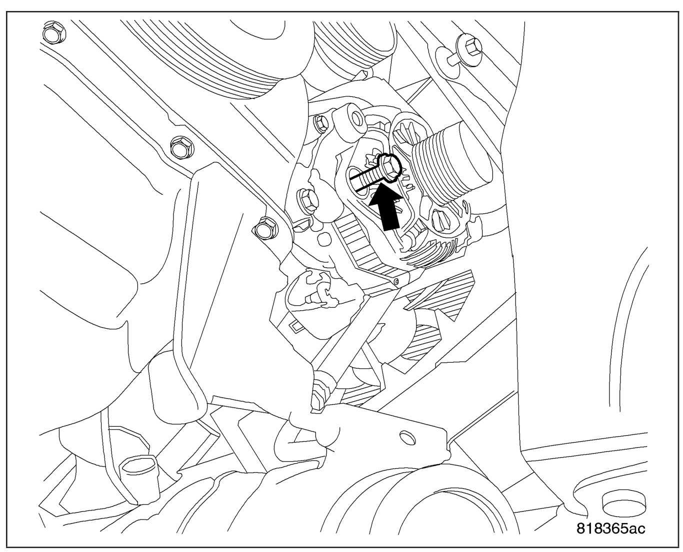
5. Remove the accessory drive splash shield.



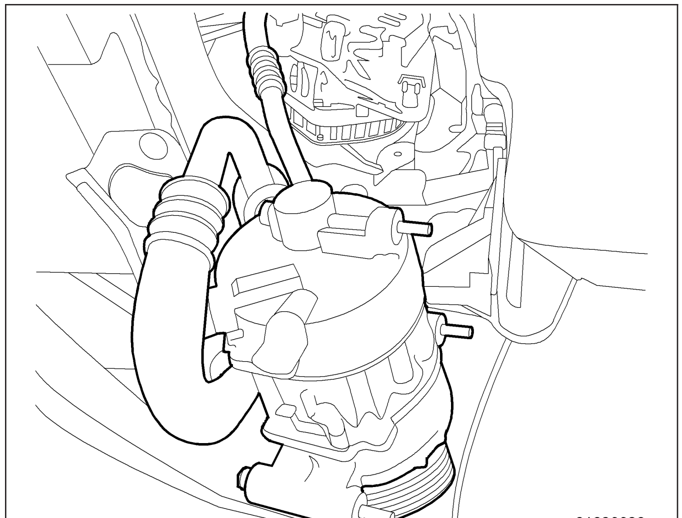
6. Remove the accessory drive idler pulley



7. Loosen the lower mounting bolt.

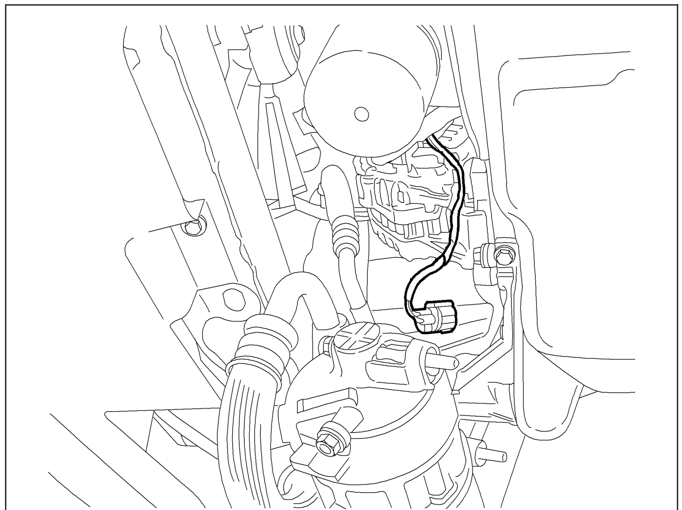


8. Loosen the A/C compressor and relocate, pull down and to outboard side of vehicle to make room to remove generator.



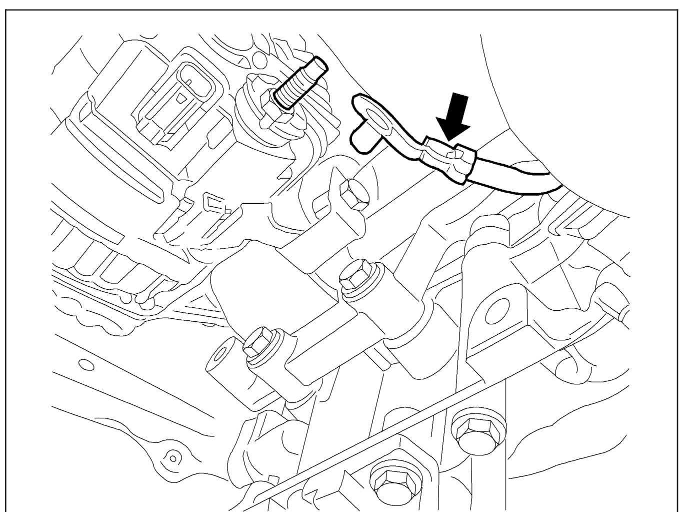
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9. Unplug field circuit from generator.



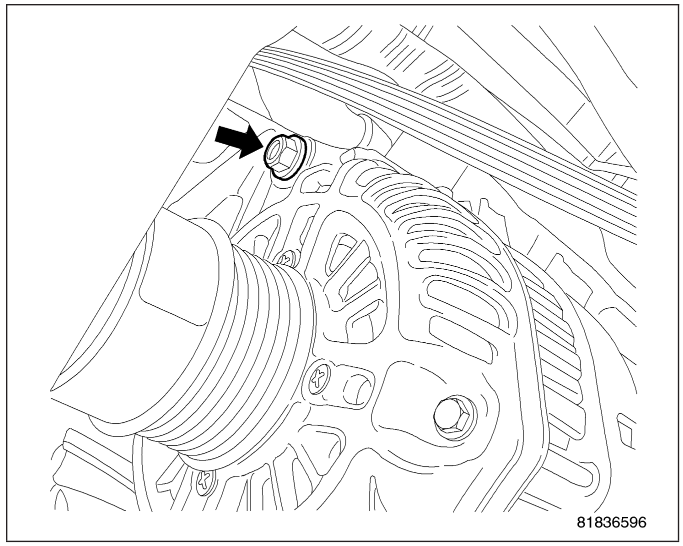
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10. Remove the B+ terminal nut and wire.

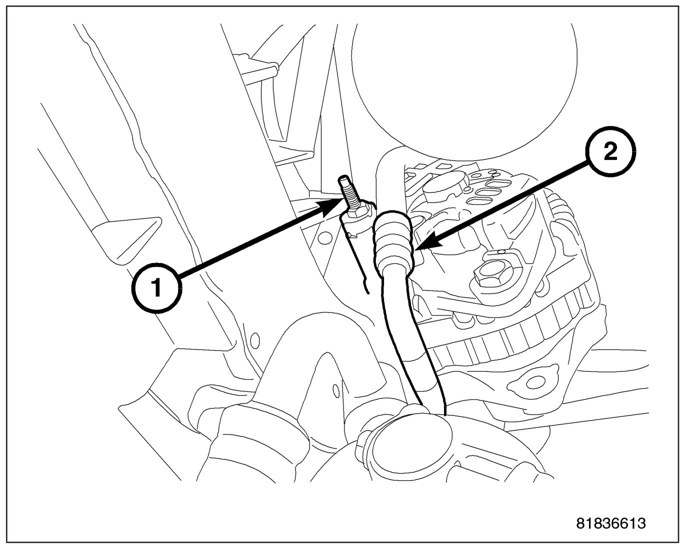


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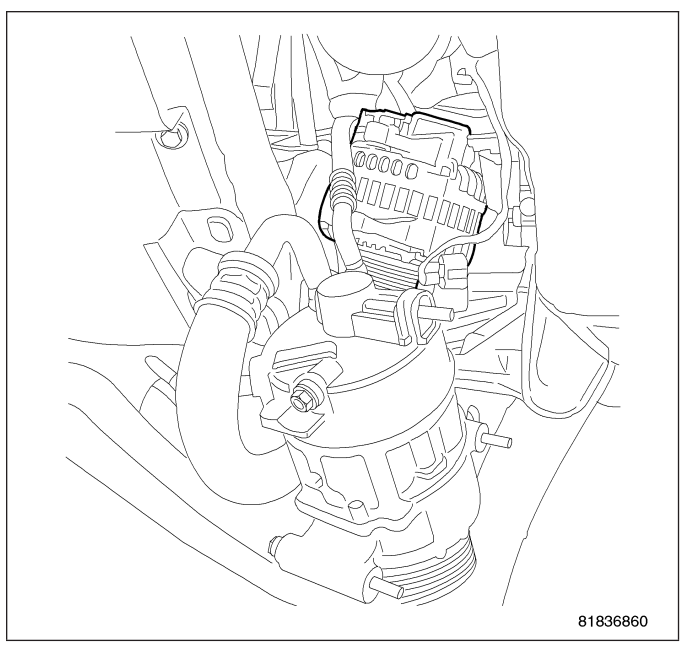
11. Remove the upper mounting bolt.
12. Remove the generator lower mounting bolt.



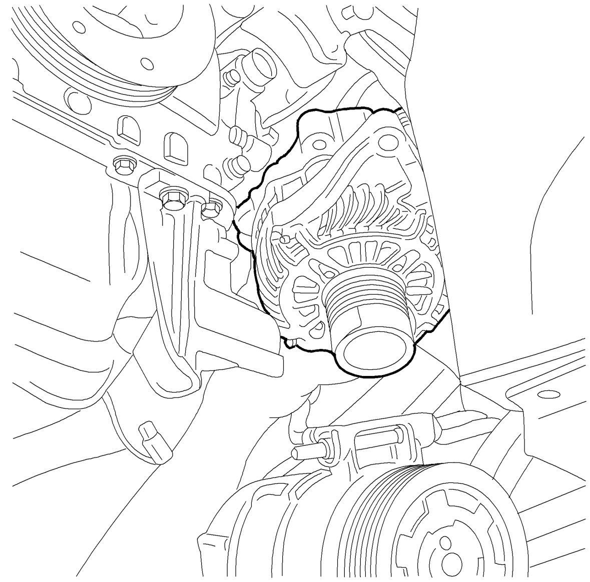
13. Relocate the battery stud (1) to the other side of the A/C line (2) for removal of the generator.



14. Rotate generator pulley down.



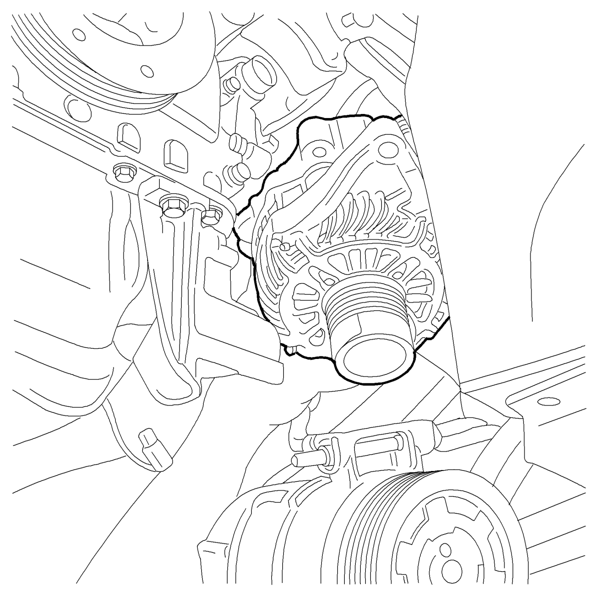
15. Slide generator down and out of vehicle.



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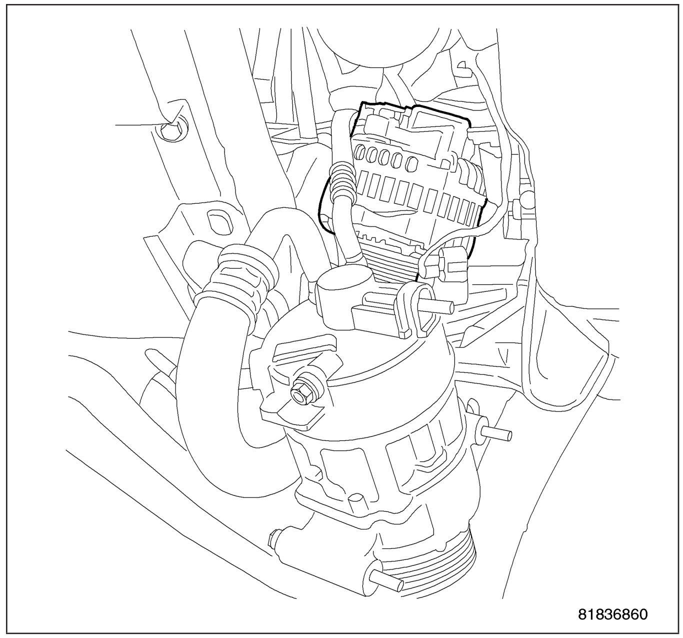
INSTALLATION

1. Move A/C compressor to the side to install generator.

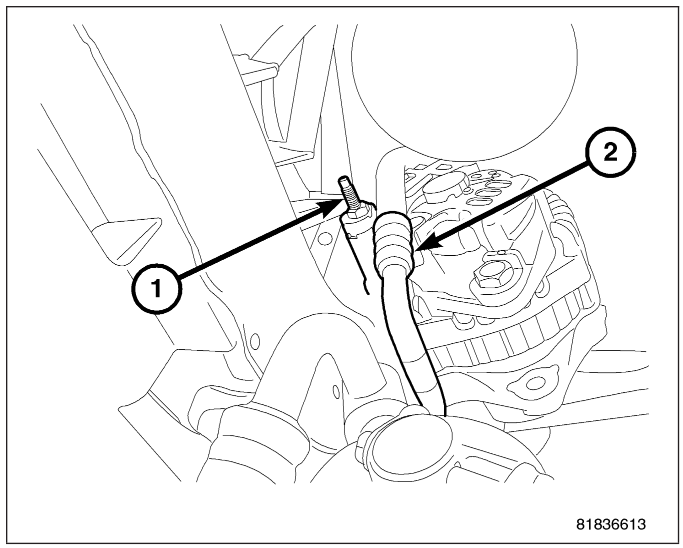


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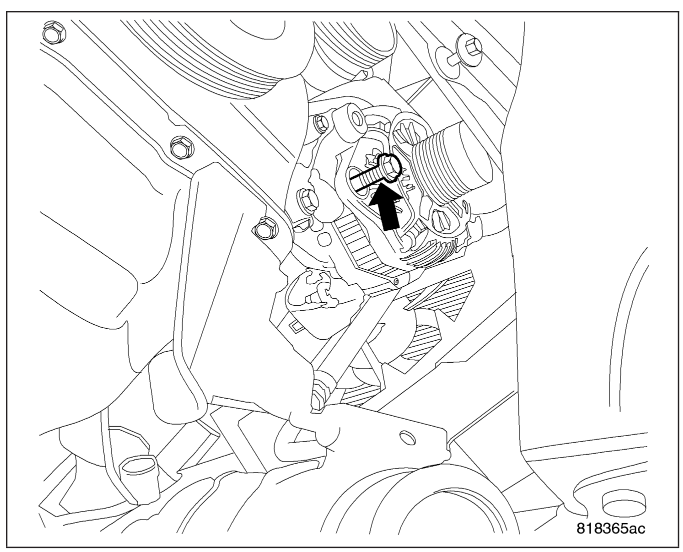
2. Rotate generator and set in place.



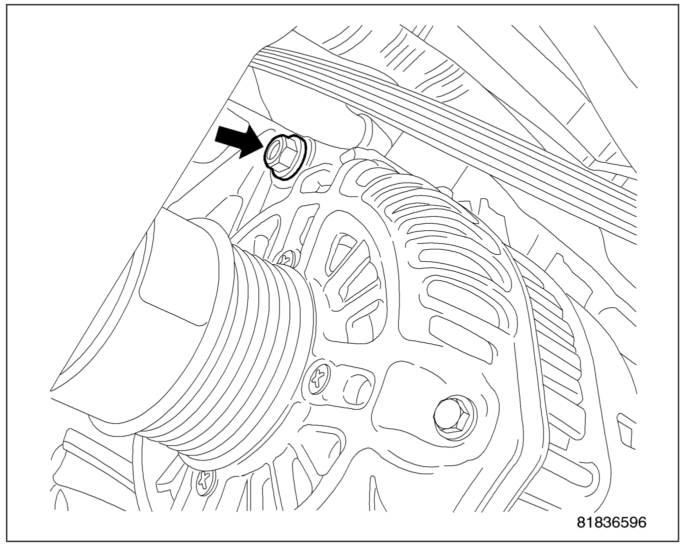
Make sure battery terminal (1) is in front of A/C line (2).



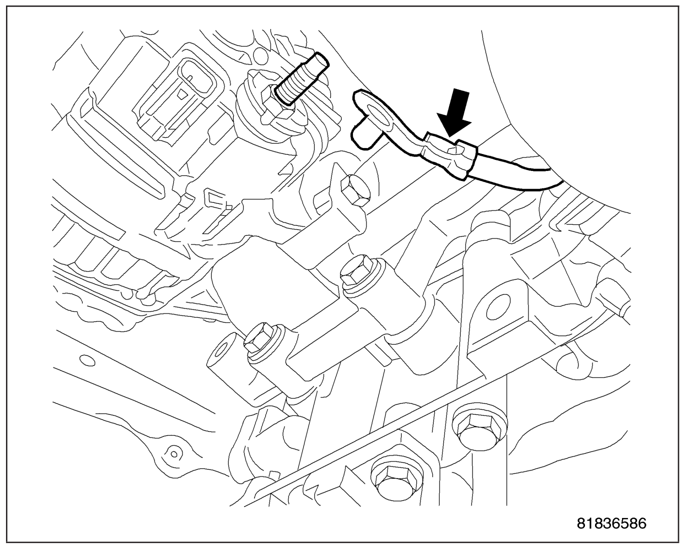
3. Loose install lower mounting bolt.



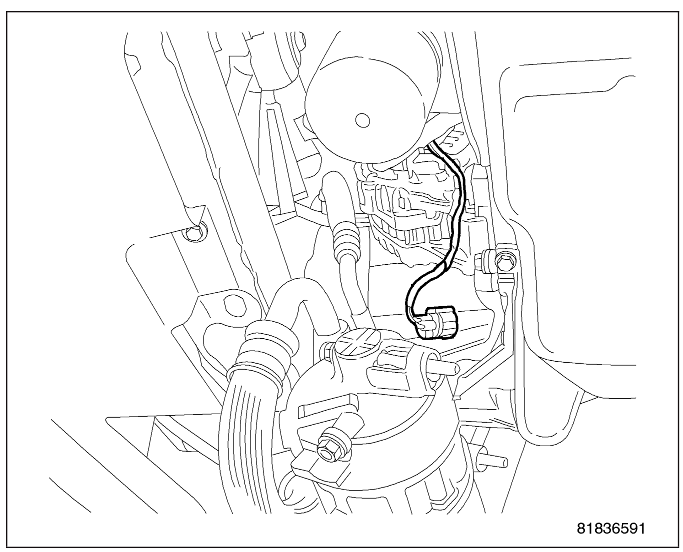
4. Loose install upper mounting bolt.
5. Tighten bolts to 61 N·m (45 ft. lbs.).



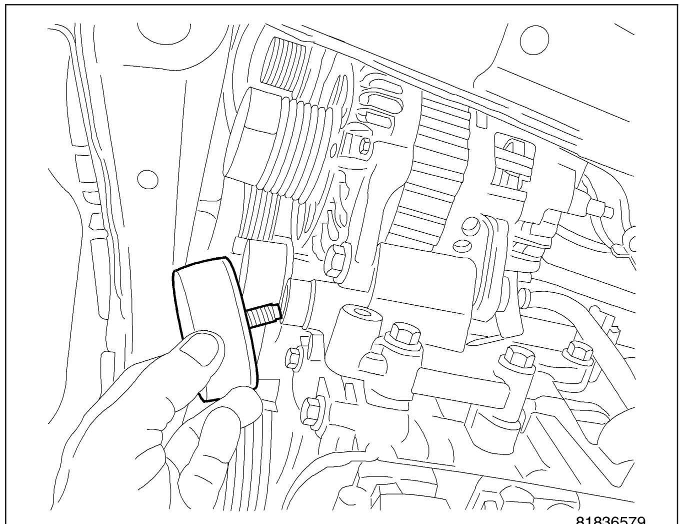
6. Install the B+ terminal nut and wire and tighten to 11.3 N·m (100 ins. lbs.).



7. Plug in the field circuit to the generator.

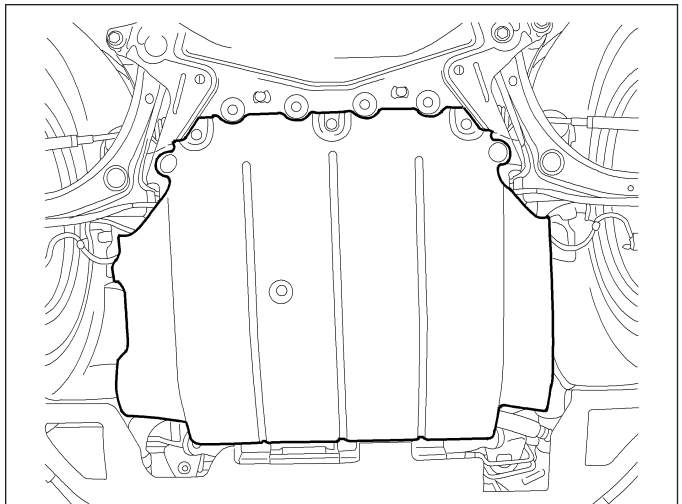


8. Install idler pulley and tighten bolt.
9. Install the accessory drive belt.
10. Install splash shield.



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11. Install lower air dam.
12. Lower vehicle.
13. Connect the negative battery cable.



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STARTING

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STARTING

DESCRIPTION

The starting system consists of:

- Starter motor (including an integral starter solenoid)

Other components to be considered as part of starting system are:

- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Clutch pedal position switch (manual transmission)
- Park/neutral position switch (automatic transmission)
- Wire harnesses and connections.

The Battery, Starting, and Charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in each of these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

OPERATION

These components form two separate circuits. A high amperage circuit that feeds the starter motor up to 300+ amps, and a control circuit that operates on less than 20 amps.

The PCM controls a double start over-ride safety that does not allow the starter to be engaged if the engine is already running.

SPECIFICATIONS

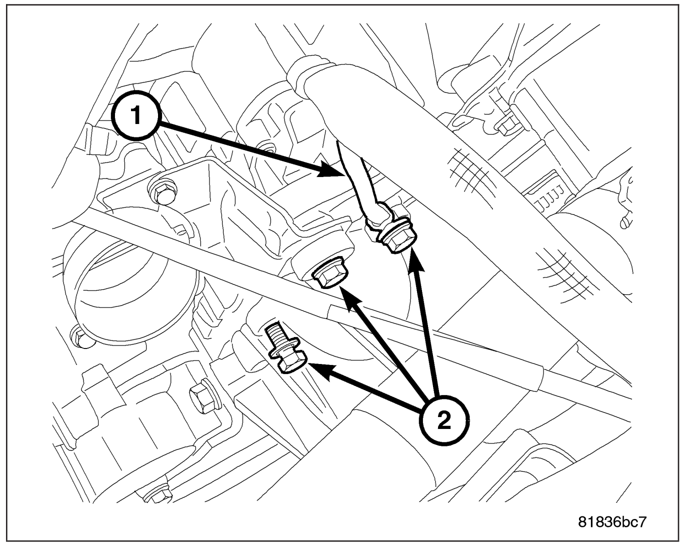
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Starter Mounting Bolts	54	40	-
Starter Solenoid Battery Nut	10	-	90
Power Steering Lines	61	45	-

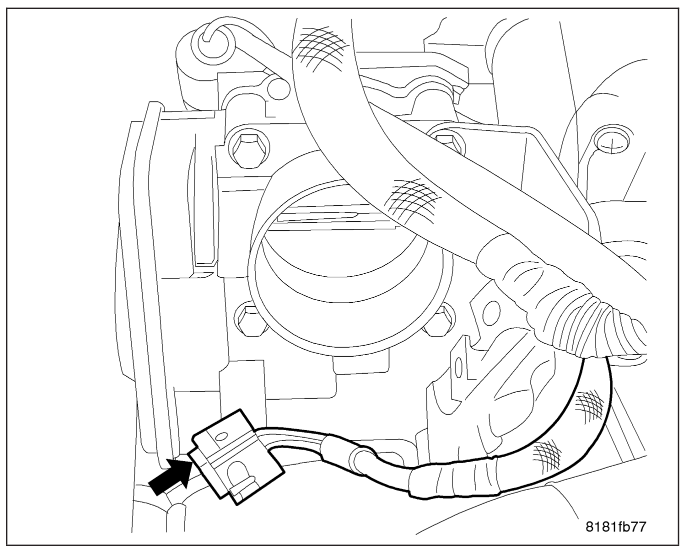
STARTER MOTOR

REMOVAL

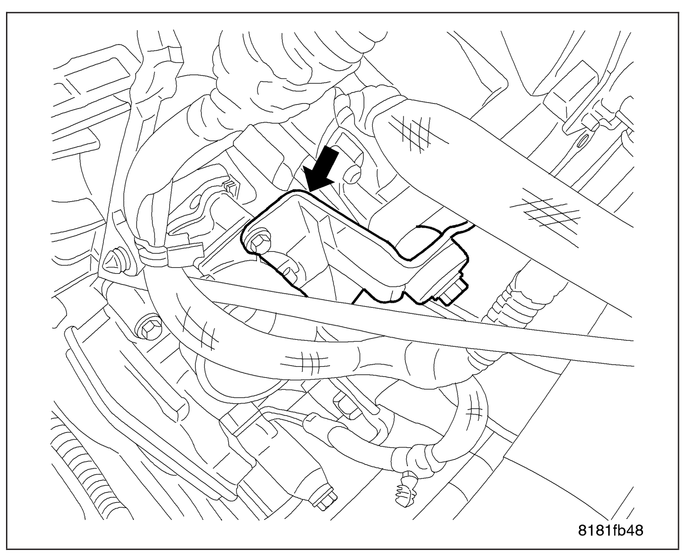
1. Open hood.
2. Remove air cleaner box and air tube.
3. Disconnect and isolate the battery negative cable
4. Remove starter motor mounting bolt.



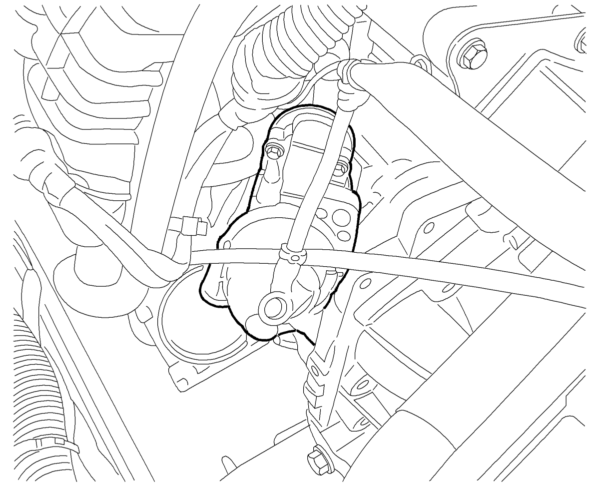
5. Disconnect the electrical connector at throttle body.



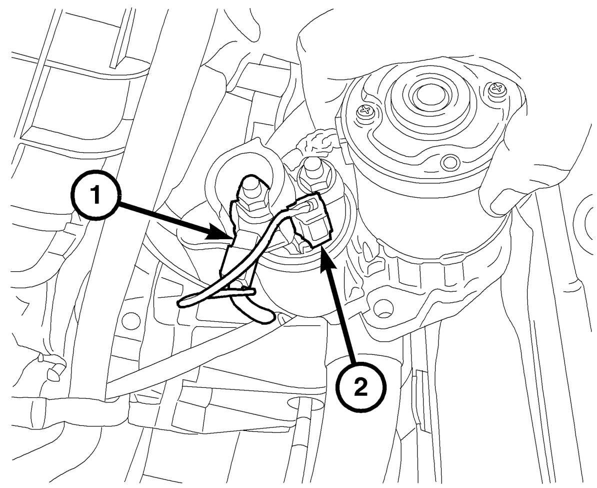
6. Remove Throttle body bolts and remove throttle body.



7. Push starter under intake manifold.
8. Tip starter nose toward cooling module.
9. Pull starter up and out.


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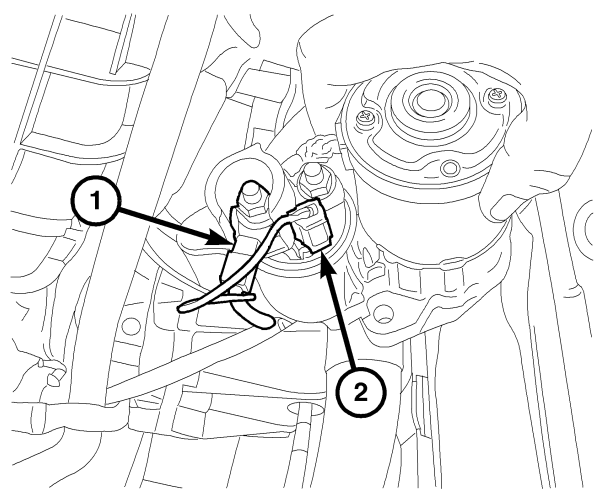
10. Disconnect starter motor wiring.
11. Remove starter motor from vehicle.



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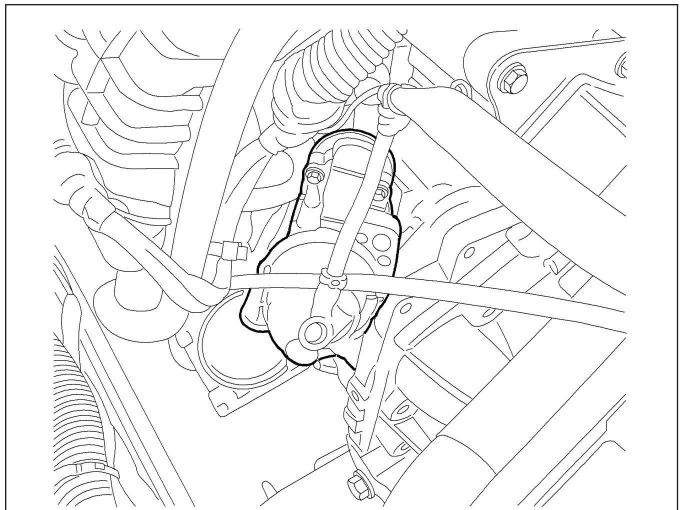
INSTALLATION

1. Connect starter motor wiring. Torque battery cable nut to 10 N·m (90 in. lbs.).



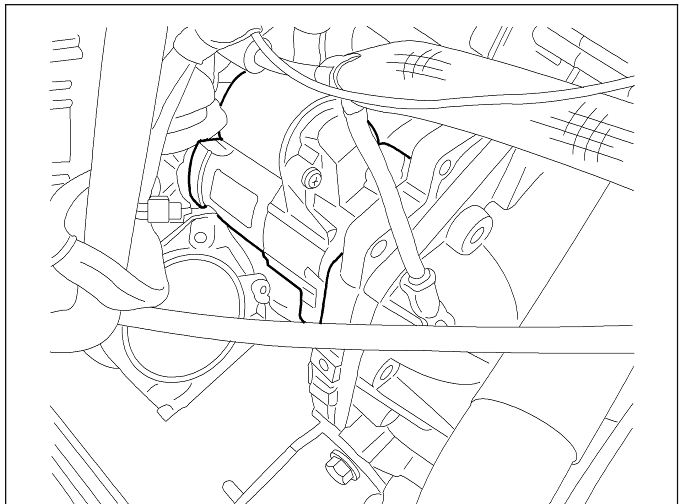
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2. Reinstall starter motor into vehicle lower engine compartment.



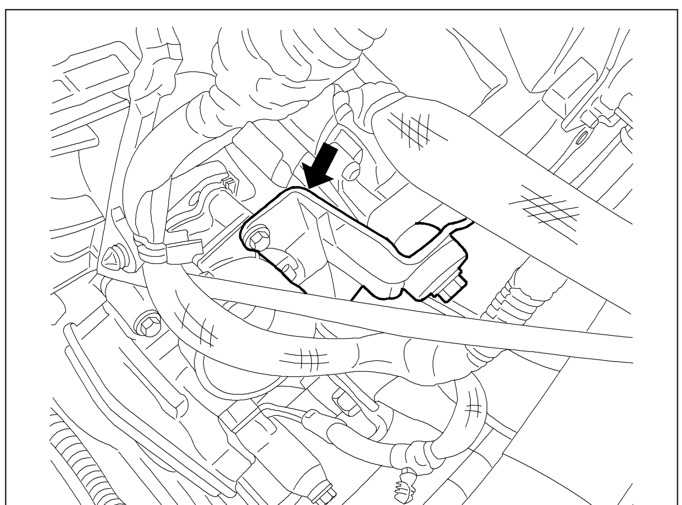
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3. Loose install starter into position.



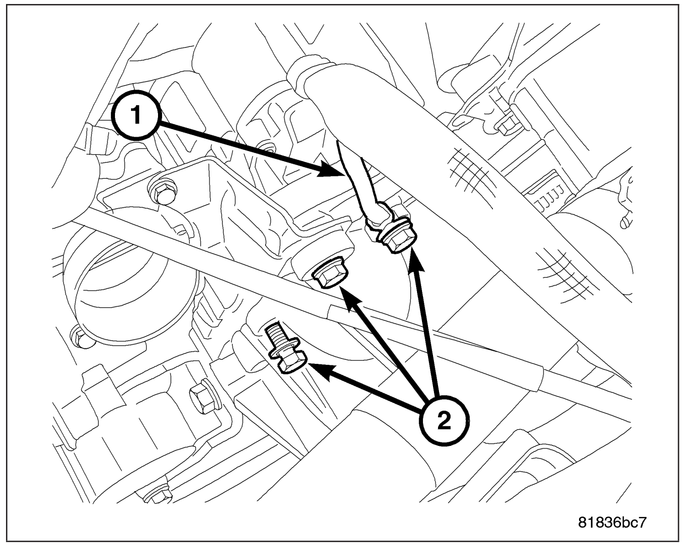
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4. Install throttle body
5. Install throttle body bracket.

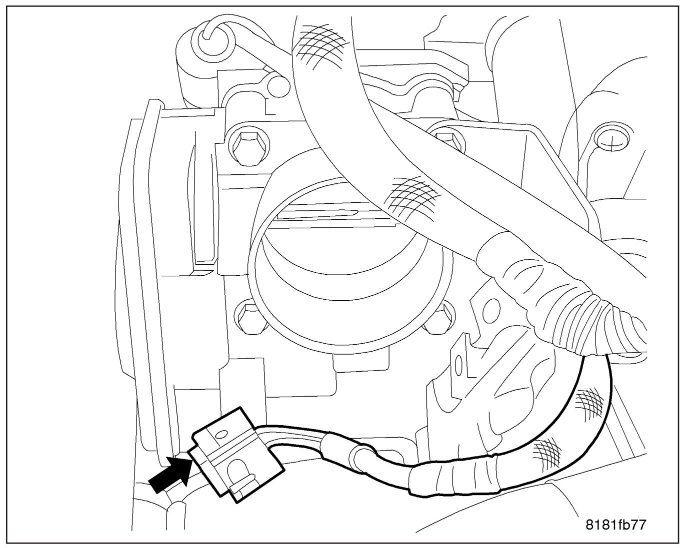


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6. Install starter motor mounting bolts and torque to 54 N·m (40 ft. lbs.).



7. Connect throttle body electrical connector.
8. Install air cleaner box and inlet tube.
9. Lower vehicle.
10. Connect battery negative cable.



HEATED SYSTEMS

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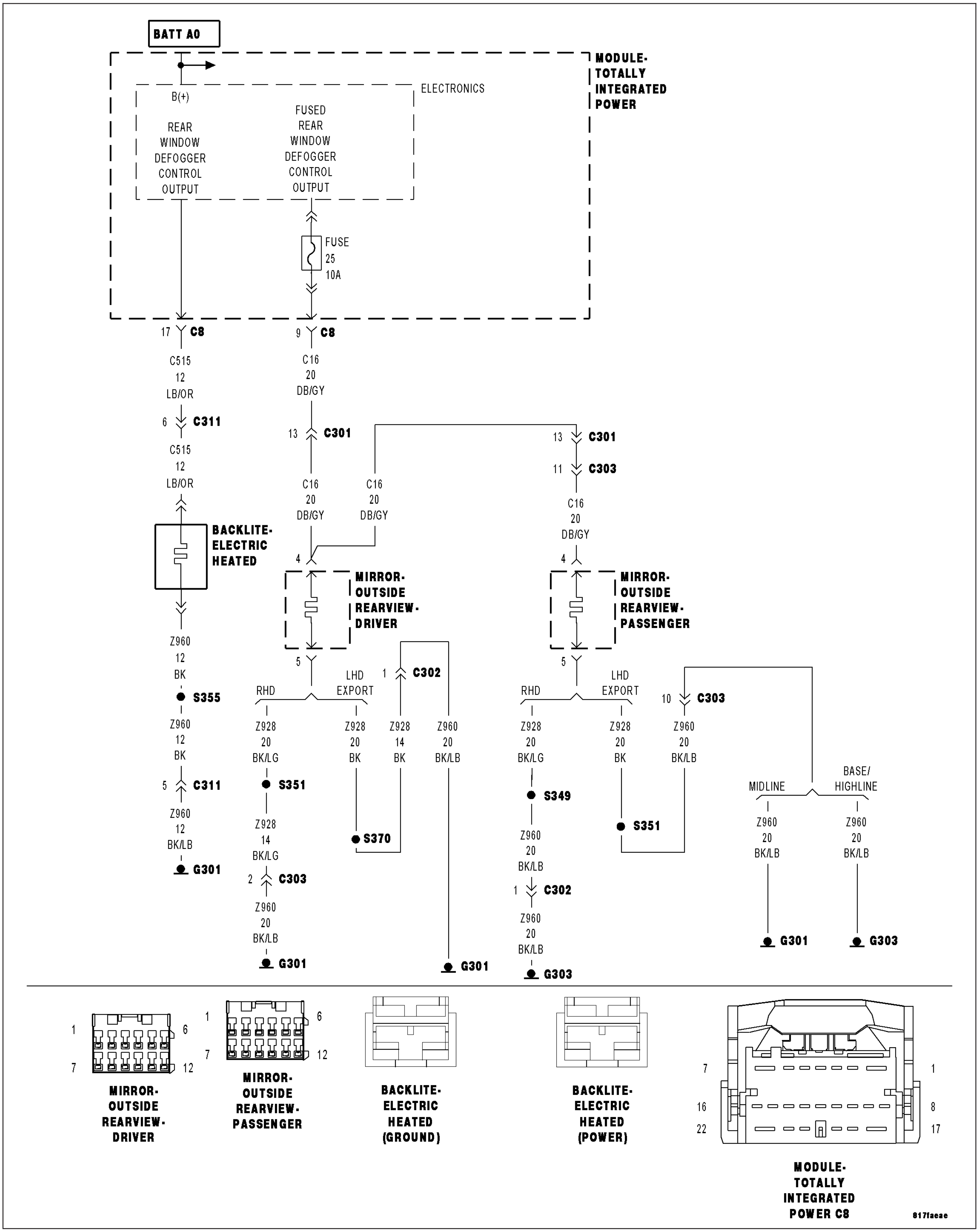
HEATED GLASS - ELECTRICAL DIAGNOSTICS

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HEATED GLASS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B106B–REAR DEFROST CONTROL CIRCUIT LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  A shorted low condition on the (C515) Rear Defogger Control Output or (C16) Fused Rear Defogger Control Output circuit.

Possible Causes
(C515) REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
(C16) FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT PARTIAL SHORT TO GROUND (IF EQUIPPED WITH HEATED MIRRORS)
HEATED MIRRORS (IF EQUIPPED)
TIPM

Diagnostic Test

1. VERIFY DTC B106B–REAR DEFROST CONTROL CIRCUIT LOW IS ACTIVE

Ensure the Rear Defogger is switched off.

With the scan tool, erase TIPM DTCs.

Operate the Rear Defogger Switch several times.

With the scan tool, read TIPM DTCs.

Does the scan tool display active DTC B106B-REAR DEFROST CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. INSPECT (C515) REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT AT REAR WINDOW GRID

Inspect (C515) Rear Window Defogger Control Output wiring at rear window grid. If necessary remove trim around rear window.

Check for a chafed, pierced or pinched wire. Also look for a metal object that may cause a short to ground condition at the grid.

Were there any problems found?

Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. VEHICLE EQUIPPED WITH HEATED MIRRORS

Is this vehicle equipped with heated mirrors?

Yes >> Go To 4

No >> Go To 6

4. DISCONNECT MIRROR AND RE-CHECK DTC

NOTE: For this step disconnect each outside rearview mirror one at a time and re–check DTC's.

With the scan tool, erase TIPM DTCs.

Operate the Rear Defogger Switch several times.

With the scan tool, read TIPM DTCs.

Does the scan tool display active DTC B106B-REAR DEFROST CONTROL CIRCUIT LOW?

Yes >> Go To 5

No >> Inspect mirror pigtail wiring, if the wiring is OK replace mirror as necessary. Perform the BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

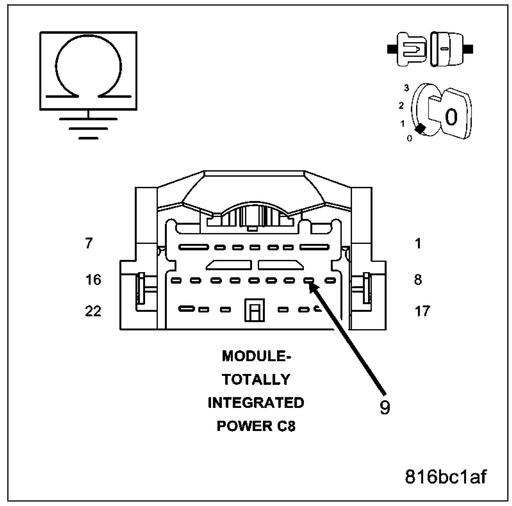
5. (C16) FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Both outside review mirrors should be disconnected at this time.

Disconnect the TIPM C8 harness connector.

Measure the resistance between ground and the (C16) Fused Rear Window Defogger Control Output circuit at the TIPM C8 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (C16) Fused Rear Window Defogger Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 6

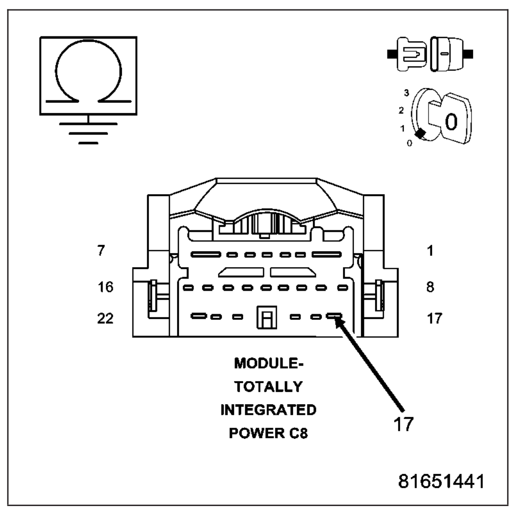
6. (C515) REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Electric Heated Backlite (Power) 1-way connector.

Disconnect the TIPM C8 harness connector.

Measure the resistance between ground and the (C515) Rear Window Defogger Control Output circuit at the TIPM C8 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (C515) Rear Window Defogger Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 7

7. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

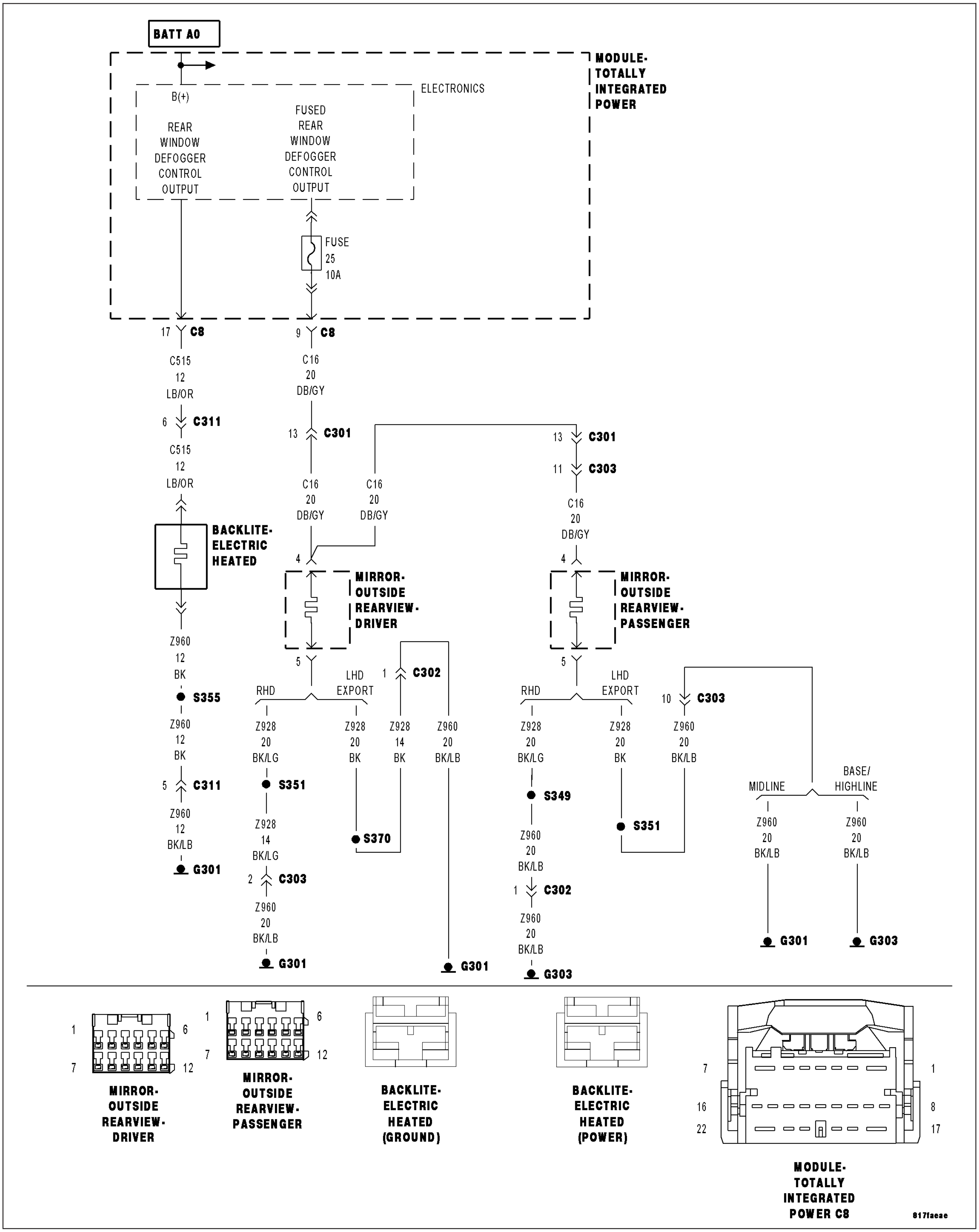
Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B106C–REAR DEFROST CONTROL CIRCUIT HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  A shorted high condition in the (C515) Rear Defogger Control Output circuit or (C16) Fused Rear Defogger Control Output circuit.

Possible Causes
(C515) REAR DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
EXCESSIVE RESISTANCE IN THE DEFOGGER GRID OR (Z908) GROUND CIRCUIT FOR THE GRID
(C16) FUSED REAR DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE (IF EQUIPPED WITH HEATED MIRRORS)
(Z928)/(Z960) GROUND CIRCUIT (IF EQUIPPED WITH HEATED MIRRORS)
HEATED MIRRORS (IF EQUIPPED)
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B106C – REAR DEFROST CONTROL CIRCUIT HIGH IN THE TIPM

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Rear Defogger Switch several times.

With the scan tool, read DTC's.

Does the scan tool display active DTC B106C– REAR DEFROST CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECKING THE WINDOW GRID AND (Z908) GROUND CIRCUIT

Turn the ignition off.

Disconnect the Electric Heated Backlite (Power) 1-way connector.

Using a 12-volt test light connected to 12-volts, probe the power terminal at the grid.

Does the test light illuminate? Compare with a known good vehicle, if necessary.

Yes >> Go To 4

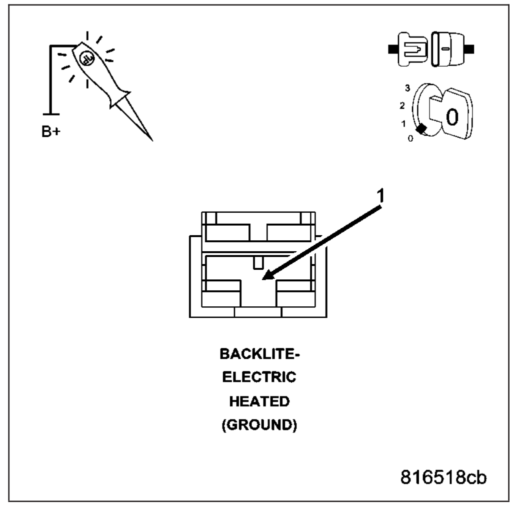
No >> Go To 3

3. (Z908) GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the Electric Heated Backlite (Ground) 1-way connector.

Using a 12-volt test light connected to 12-volts, probe the (Z908) ground circuit at the 1-way connector.



Does the test light illuminate brightly?

Yes >> Repair the open or excessive resistance in the Rear Window Defogger Grid.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or excessive resistance in the (Z908) Ground circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. VEHICLE EQUIPPED WITH HEATED MIRRORS

Is vehicle equipped with heated mirrors?

Yes >> Go To 5

No >> Go To 7

5. DISCONNECT MIRROR AND RE–CHECK DTC

NOTE: For this step disconnect each outside rearview mirror one at a time and re–check DTC's.

With the scan tool, erase TIPM DTCs.

Operate the Rear Defogger Switch several times.

With the scan tool, read TIPM DTCs.

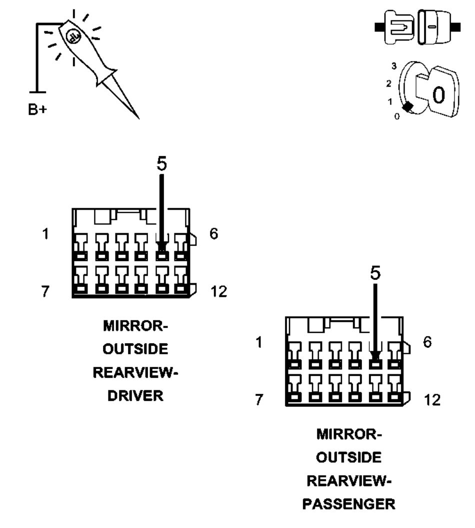
Does the scan tool display active DTC B106C-REAR DEFROST CONTROL CIRCUIT HIGH?

Yes >> Go To 7

No >> Go To 6

6. MIRROR GROUND CIRCUIT

Using a 12-volt test light connected to 12-volts, probe the (Z928) or (Z960) ground circuit at the mirror connector.



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Does the test light illuminate brightly?

Yes >> Inspect mirror pigtail wiring and repair or replace mirror as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the excessive resistance in the (Z928) or (Z960) Ground circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

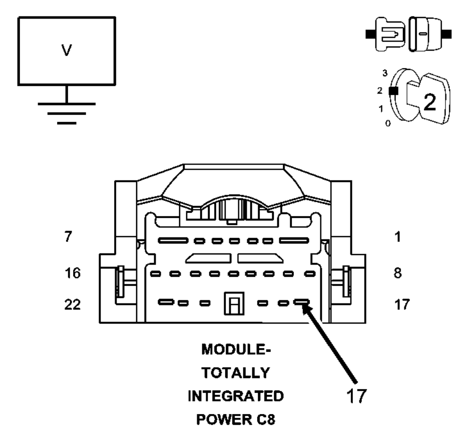
7. (C515) REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Ignition on, engine not running.

Measure the voltage between (C515) Rear Window Defogger Control Output circuit and ground at the TIPM C8 harness connector.



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Is there any voltage present?

Yes >> Repair the short to battery voltage in the (C515) Rear Window Defogger Control Output circuit.

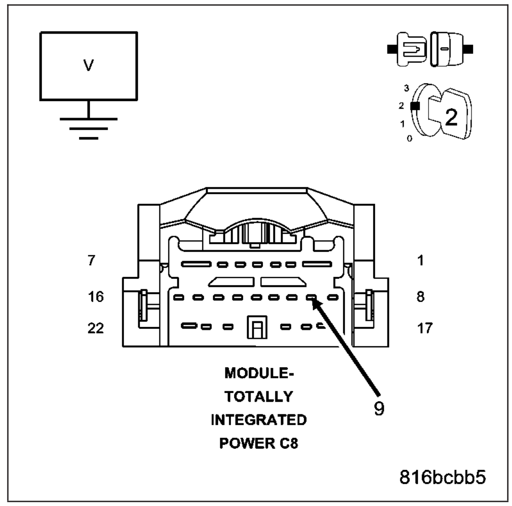
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 8

8. (C16) FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Ignition on, engine not running.

Measure the voltage between (C16) Fused Rear Window Defogger Control Output circuit and ground at the TIPM C8 harness connector.



Is there any voltage present?

Yes >> Repair the short to battery voltage in the (C16) Fused Rear Window Defogger Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 9

9. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

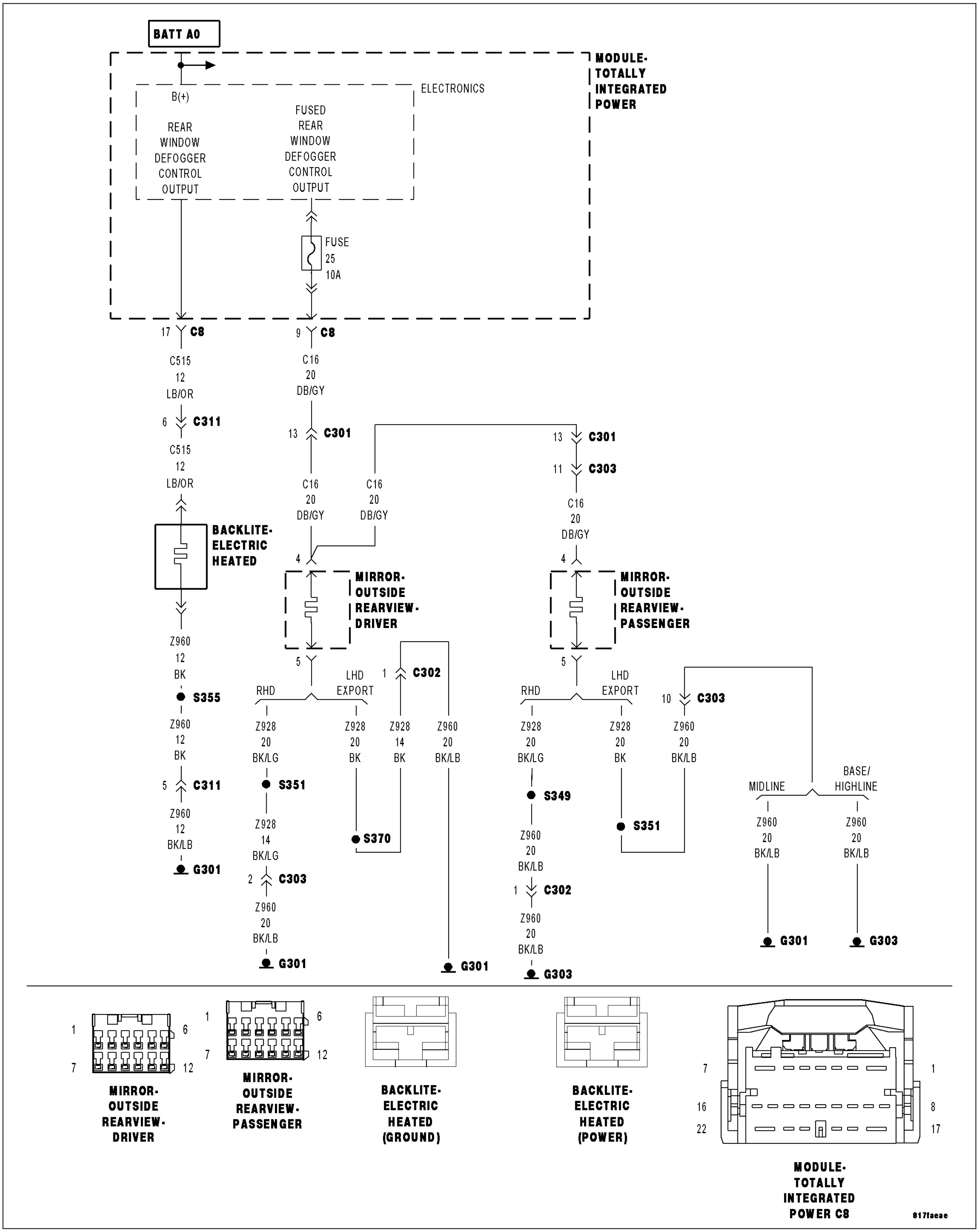
Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B106D–REAR DEFROST CONTROL CIRCUIT OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  An open condition on the (C515) Rear Defogger Control Output circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
(C515) REAR DEFOGGER CONTROL OUTPUT CIRCUIT OPEN
DEFOGGER GRID OR (Z908) GROUND CIRCUIT FOR THE GRID OPEN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B106D–REAR DEFROST CONTROL CIRCUIT OPEN

Turn the ignition on.

With the scan tool, record and erase DTC's.

Operate the Rear Defogger Switch several times.

With the scan tool, read DTC's.

Does the scan tool display active DTC B106D–REAR DEFROST CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

Turn the ignition off.

Inspect the following connector terminal condition. Check for signs of corrosion build up or damage that would compromise the terminal to controller pin connector.

NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.

Disconnect the rear window defogger grid connectors.

Disconnect the C8 TIPM harness connector.

Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

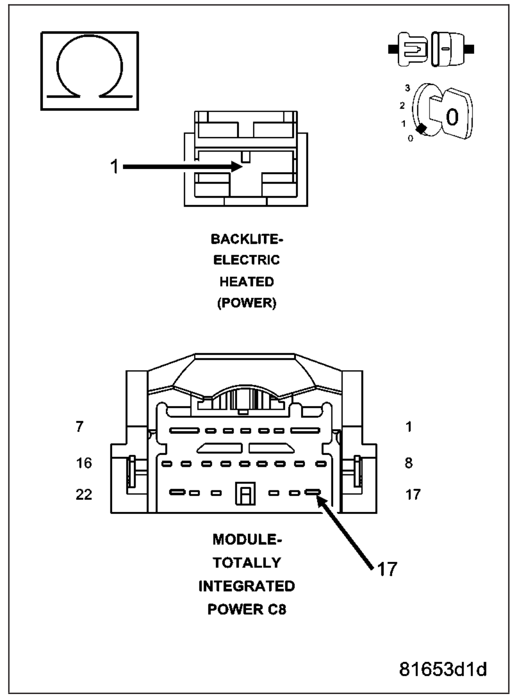
Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. (C515) REAR DEFOGGER CONTROL OUTPUT CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (C515) Rear Defogger Control Output circuit at the between the C8 TIPM harness connector and the 1-way connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (C515) Rear Defogger Control Output circuit for an open.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

4. CHECKING THE WINDOW GRID AND (Z908) GROUND CIRCUIT

Turn the ignition off.

Disconnect the Electric Heated Backlite (Power) 1-way connector.

Using a 12-volt test light connected to 12-volts, probe the power terminal at the grid.

Does the test light illuminate?

Yes >> Go To 6

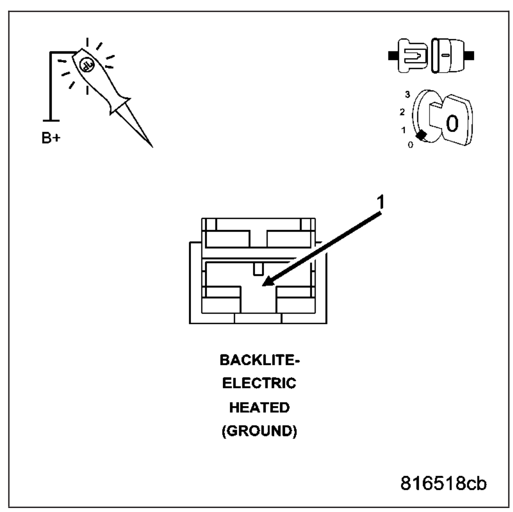
No >> Go To 5

5. (Z908) GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the Electric Heated Backlite (Ground) 1-way connector.

Using a 12-volt test light connected to 12-volts, probe the (Z908) ground circuit at the 1-way connector.



Does the test light illuminate brightly?

Yes >> Repair the open Rear Window Defogger Grid.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z908) Ground circuit for an open.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B10C2 – REAR DEFROST SWITCH STUCK – (CCN)

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The switch input changes when the switch is pushed down. A stored DTC B10C2 indicates that the Electronic Back Light (EBL) mode switch was stuck in a pushed position for more than 10 seconds, but has since returned to its normal state. An active DTC B10C2 indicates that the EBL mode switch is stuck in a pushed position. An active DTC B10C2 will prevent proper EBL mode switch and status indicator function.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the EBL mode switch stays in a pushed position for more than 10 seconds.

Possible Causes
OBJECT HOLDING ELECTRONIC BACK LIGHT (EBL) MODE SWITCH IN A PUSHED POSITION
SUBSTANCE CAUSING EBL MODE SWITCH TO GET STUCK IN A PUSHED POSITION
A/C HEATER CONTROL

Diagnostic Test

1. INSPECT THE A/C HEATER CONTROL FOR DAMAGE

Inspect the A/C Heater Control for damage.

Is the A/C Heater Control damaged?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. INSPECT FOR OBJECT OR SUBSTANCE CAUSING THE EBL MODE SWITCH TO STAY OR STICK IN A PUSHED POSITION

Inspect the A/C Heater Control for anything that would cause the EBL mode switch to stay or stick in a pushed position.

Is anything present that would cause the EBL mode switch to stay or stick in a pushed position?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECK FOR NORMAL EBL MODE SWITCH AND STATUS INDICATOR FUNCTION

Turn the ignition on.

Press the EBL mode switch on and off several times while observing the EBL status indicator.

Does the EBL status indicator turn on and off?

Yes >> Go To 4

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

4. VERIFY THAT DTC B10C2 – REAR DEFROST SWITCH STUCK IS STILL ACTIVE

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on. Wait 1 minute before proceeding.

With the scan tool, read DTCs.

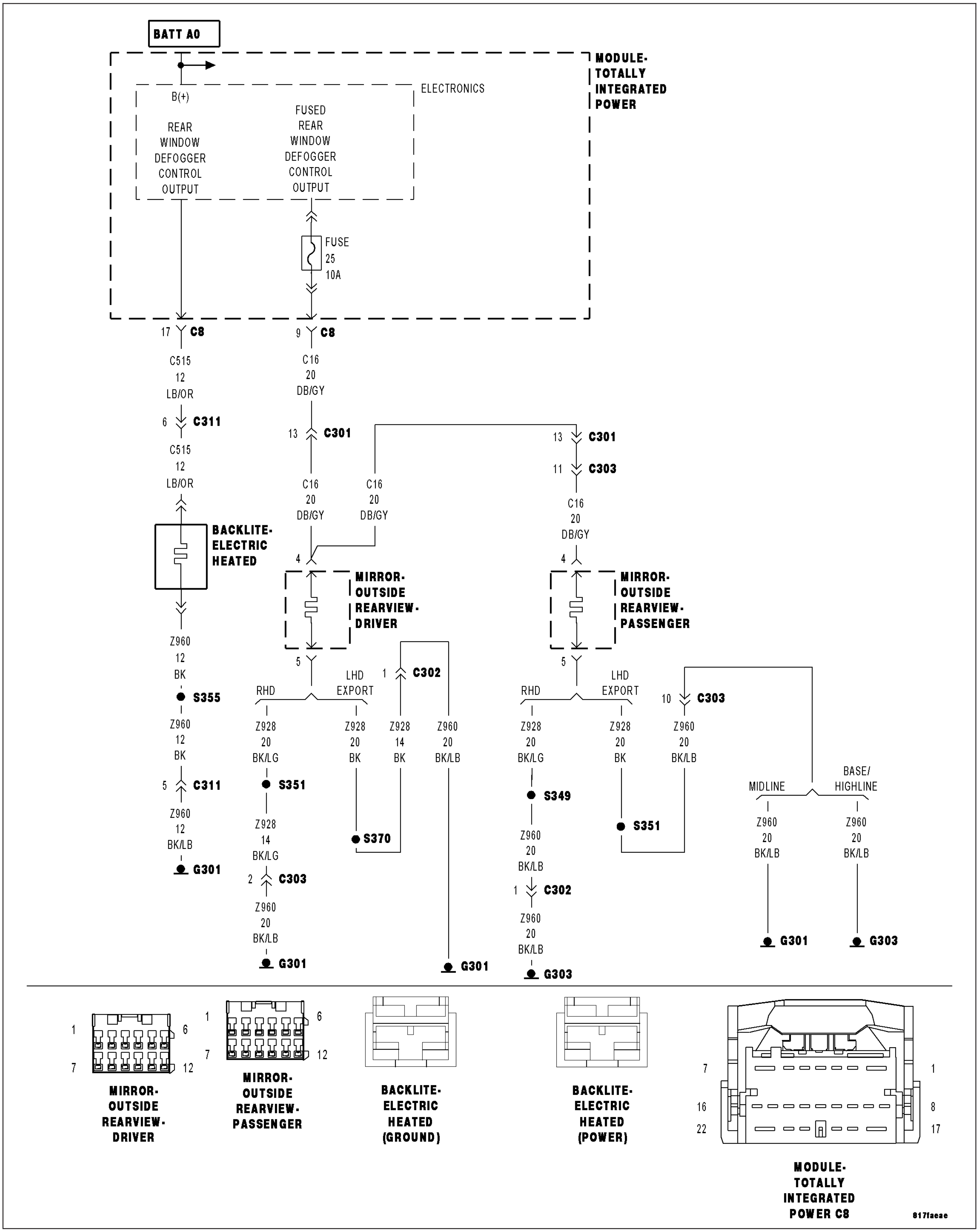
Does the scan tool display active: B10C2 – REAR DEFROST SWITCH STUCK?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10ED–REAR DEFROST CONTROL CIRCUIT OVERCURRENT (TIPM)



For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  An overcurrent condition on the (C515) Rear Defogger Control Output circuit or the (C16) Fused Rear Defogger Control Output circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
EXCESSIVE RESISTANCE IN THE DEFOGGER GRID OR (Z908) GROUND CIRCUIT FOR THE GRID
(C515) REAR DEFOGGER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
(C16) FUSED REAR DEFOGGER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE (IF EQUIPPED WITH HEATED MIRRORS)
(Z928)/(Z960) GROUND CIRCUIT (IF EQUIPPED WITH HEATED MIRRORS)
HEATED MIRRORS (IF EQUIPPED)
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B10ED–REAR DEFROST CONTROL CIRCUIT OVERCURRENT

Turn the ignition on.

With the scan tool, record and erase DTC’s.

Operate the Rear Defogger Switch several times.

With the scan tool, read DTC’s.

Does the scan tool display active DTC B10ED-REAR DEFROST CONTROL CIRCUIT OVERCURRENT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

Turn the ignition off.

Inspect the following connector terminal condition. Check for signs of corrosion build up or damage that would compromise the terminal to controller pin connector.

NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.

Disconnect the TIPM C8 harness connector.

Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair or replace as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. VEHICLE EQUIPPED WITH HEATED MIRRORS

Is vehicle equipped with heated mirrors?

Yes >> Go To 4

No >> Go To 7

4. (C16) FUSED REAR DEFOGGER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE

Disconnect both mirror connectors.

With a jumper wire, connect one end to the (C16) Fused Rear Defogger Control Output circuit at one mirror connector and the other to a clean chassis ground.

Using a 12-volt test light to battery voltage, probe the (C16) Rear Defogger Control Output circuit in the TIPM C8 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

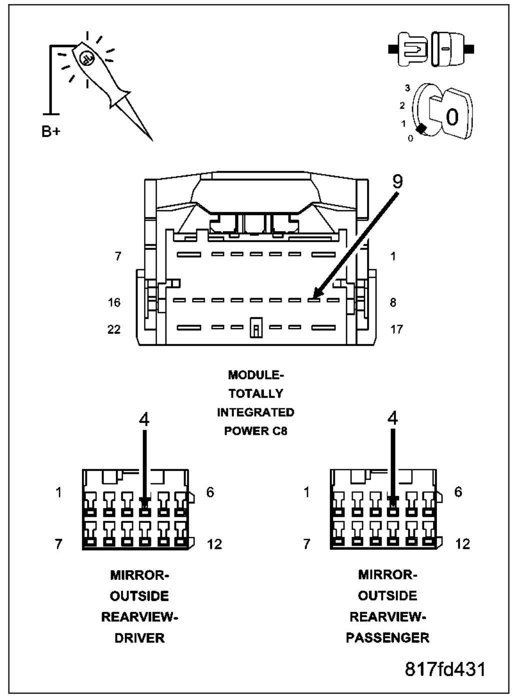
NOTE: Repeat this test for each outside mirror.

Does the test light illuminate brightly for each mirror circuit?

Yes >> Go To 5

No >> Repair the excessive resistance in the (C16) Fused Rear Defogger Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



5. DISCONNECT ONE MIRROR AND RE–CHECK DTC

NOTE: For this step have only one outside rearview mirror disconnected at a time and re–check DTC's.

Reconnect the TIPM and one outside rearview mirror.

With the scan tool, erase TIPM DTCs.

Operate the Rear Defogger Switch several times.

With the scan tool, read TIPM DTCs.

Does the scan tool continue to display active DTC B10ED-REAR DEFROST CONTROL CIRCUIT OVER-CURRENT for each mirror?

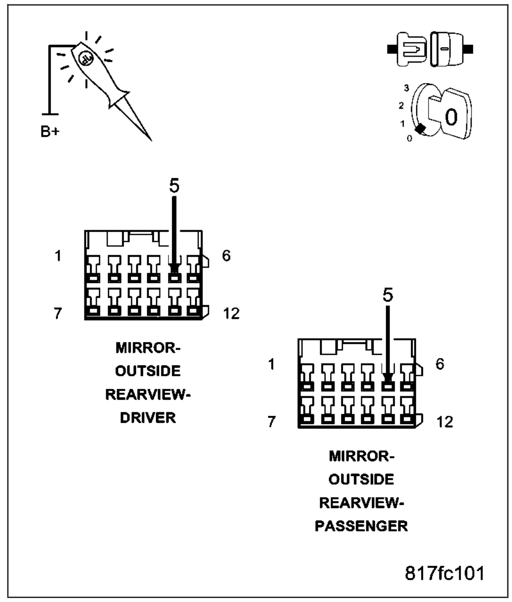
Yes >> Go To 7

No >> Go To 6

6. (Z928)/(Z960) GROUND CIRCUIT

NOTE: Perform this test on the mirror that caused the code to set.

Using a 12-volt test light connected to 12-volts, probe the (Z928) or (Z960) ground circuit at the mirror connector.



Does the test light illuminate brightly?

Yes >> Inspect mirror pigtail wiring and repair or replace mirror as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the excessive resistance in the (Z928) or (Z960) Ground circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

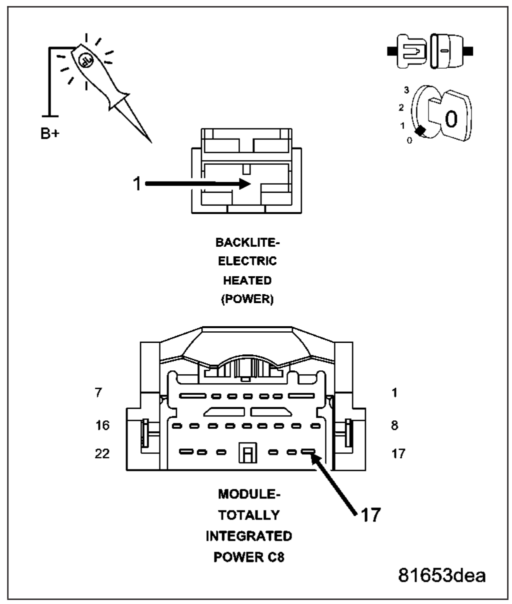
7. (C515) REAR DEFOGGER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE

Disconnect the TIPM C8 if not disconnected.

Disconnect the Electric Heated Backlite (Power) 1-way connector.

With a jumper wire, connect one end to the (C515) Rear Defogger Control Output circuit at the 1-way connector and the other to a clean chassis ground.

Using a 12-volt test light to battery voltage, probe the (C515) Rear Defogger Control Output circuit in the TIPM C8 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 8

No >> Repair the excessive resistance in the (C515) Rear Defogger Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

8. CHECKING THE WINDOW GRID AND (Z908) GROUND CIRCUIT

Turn the ignition off.

Disconnect the Electric Heated Backlite (Power) 1-way connector.

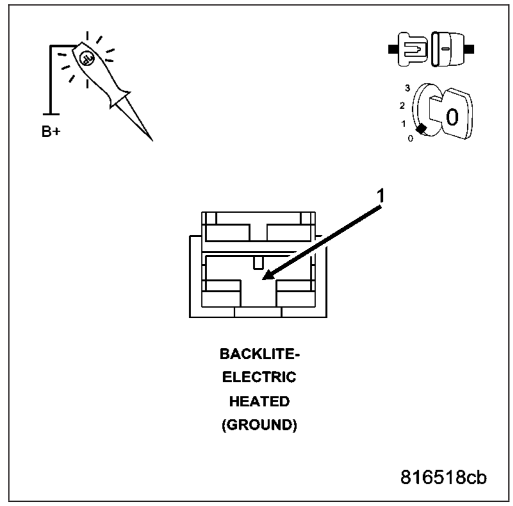
Using a 12-volt test light connected to 12-volts, probe the power terminal at the grid.

Does the test light illuminate? Compare with a known good vehicle, if necessary.

Yes >> Go To 10

No >> Go To 9

9. (Z908) GROUND CIRCUIT OPEN



Turn the ignition off.

Disconnect the Electric Heated Backlite (Ground) 1-way connector.

Using a 12-volt test light connected to 12-volts, probe the (Z908) ground circuit at the 1-way connector.

Does the test light illuminate brightly?

Yes >> Repair the open or excessive resistance in the Rear Window Defogger Grid.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or excessive resistance in the (Z908) Ground circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

10. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

HEATED GLASS - SERVICE INFORMATION

TABLE OF CONTENTS

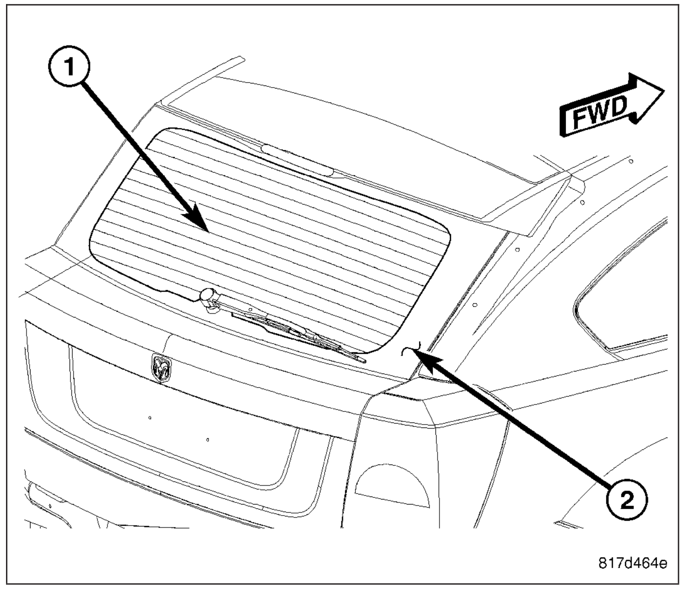
HEATED GLASS - SERVICE INFORMATION

DESCRIPTION

CAUTION: Grid lines can be damaged or scraped off with sharp instruments. Care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

The rear window defogger system, also known as electric backlight (EBL), consists of two vertical bus bars and a series of grid lines (1) fired onto the inside surface of the rear window (2).

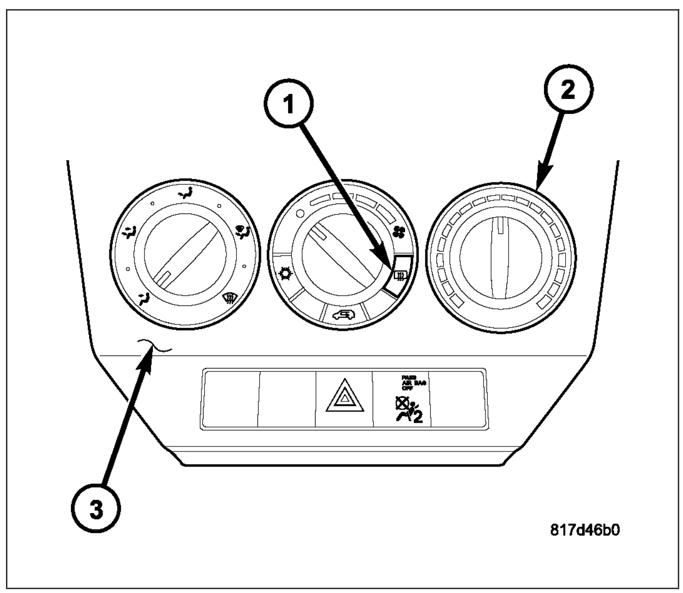
The EBL system is turned on or off by a push-button switch located in the A/C-heater control (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CONTROL-A/C HEATER - DESCRIPTION).



OPERATION

The electric backlight (EBL) system is controlled by a momentary push-button switch (1) located on the A/C-heater control (2) in the instrument panel center bezel (3). When the rear window defogger switch is pressed to the On position with the ignition switch in the Run position, the switch sends a request signal to the cabin compartment node (CCN), which sends a message on the CAN-B Bus to the totally integrated power module (TIPM) to energize the internal EBL high side driver. When energized, the EBL high side driver provides battery current to the rear window defogger grid lines and the heated side view mirrors (when equipped). The grid lines heat the glass to help clear the rear window and side mirror surfaces of fog or frost.

An amber indicator in the rear window defogger switch will illuminate to indicate when the EBL system is turned on.



NOTE: The EBL system turns off automatically after 10 minutes of initial operation. Each following activation cycle of the EBL system will last 5 minutes.

The EBL system will be automatically turned off after an initial programmed time interval of about 10 minutes as long as the ignition switch is the Run position. After the initial time interval has expired, if the rear window defogger switch is turned on again during the same ignition cycle, the EBL system will automatically turn off after about 5 minutes. The EBL system will also turn off if the ignition switch is turned to any position other than Run or by manually pressing the rear window defogger switch a second time.

Repair of the rear window defogger grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent (refer to 8 - ELECTRICAL/HEATED GLASS/GRID-REAR WINDOW DEFOGGER - STANDARD PROCEDURE - GRID LINE AND TERMINAL REPAIR).

The EBL control system is diagnosed using a scan tool (refer to 8G - Heated Glass Electrical Diagnostics for more information).

DIAGNOSIS AND TESTING

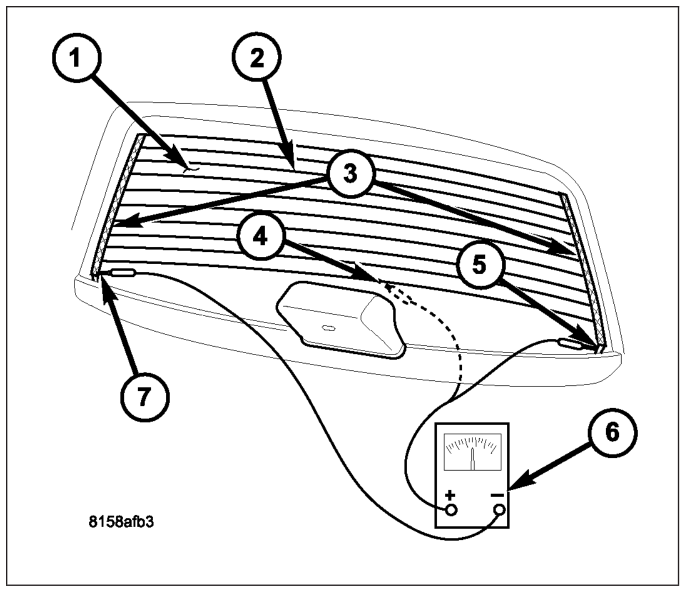
ELECTRIC BACKLIGHT (EBL) SYSTEM

NOTE: Illumination of the defogger switch indicator lamp does not necessarily mean that electrical current is reaching the rear window glass and/or the outside rear view mirror heating grids (when equipped).

NOTE: For circuit descriptions and diagrams of the rear window defogger (EBL) and heated mirror systems, refer to 8W - WIRING DIAGRAM INFORMATION.

Operation of the electrical backlight (EBL) system can be confirmed by the following:

NOTE: Typical heated rear window glass shown in illustration.



1. Use a scan tool and check for diagnostic trouble codes (DTCs) related to the rear window defogger switch, cabin compartment node (CCN) and the totally integrated power module (TIPM). If no DTCs are found, go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Turn the ignition switch to the Run position. Set the rear window defogger switch in the On position. Rear window defogger operation can be checked by feeling the rear window glass (1), or the heated outside rear view mirror glass when equipped with heated mirrors. A distinct difference in temperature between the grid lines (2) and the adjacent clear glass or the heated mirror glass should be detected within 3 to 4 minutes of operation.
3. If a temperature difference is not detected, use a 12-volt DC voltmeter (6) and contact the rear glass heating grid terminal A (5) with the positive lead, and terminal B (7) with the negative lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:
   - Confirm the ignition switch is in the Run position.
   - Confirm the rear window defogger switch is in the On position.
   - Confirm the EBL feed wire is connected to the heating grid positive terminal and that there is continuity between the TIPM and the heating grid.
   - Confirm the EBL ground wire is connected to the heating grid negative terminal and that there is continuity to ground.
   - When diagnosing a heated mirror concern, check the heated mirror circuit fuse located in the TIPM. The fuse must be in the receptacle and all electrical connections must be secure.
4. If broken defogger grid lines or bus bars (3) are suspected, use a 12-volt DC voltmeter and contact terminal B with the negative lead and each rear glass heating grid line at its mid-point C (4) with the positive lead. The voltmeter should read approximately 6 volts at each grid line mid-point. If the voltmeter does not read approximately 6 volts, repair the open grid line(s) or bus bar(s) (refer to 8 - ELECTRICAL/HEATED GLASS/GRID-REAR WINDOW DEFOGGER - STANDARD PROCEDURE).
5. If EBL system operation has been verified but rear window defogger indicator does not illuminate, replace the A/C-heater control (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CONTROL-A/C HEATER - REMOVAL).

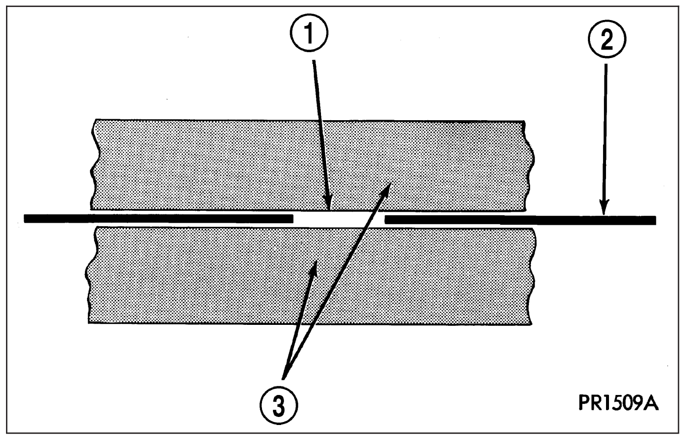
GRID-REAR WINDOW DEFOGGER

STANDARD PROCEDURE

GRID LINE AND TERMINAL REPAIR

WARNING: Materials contained in the Repair Kit (Part Number 04549275) may cause skin or eye irritation. The kit contains epoxy resin and amine type hardener, which are harmful if swallowed. Avoid contact with the skin and eyes. For skin contact, wash the affected areas with soap and water. For contact with the eyes, flush with plenty of water. Do not take internally. If taken internally, induce vomiting and call a physician immediately. Use with adequate ventilation. Do not use near fire or flame. Contains flammable solvents. Keep out of the reach of children. Failure to follow the warnings could result in possible personal injury or death.

Repair of the rear glass heating grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent.



1. Mask the repair area with masking tape (3) so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line (2) or the bus bar on each side of the break (1).
2. Follow the instructions in the repair kit for preparing the damaged area.
3. Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.
4. For grid line repairs, mask the area to be repaired with masking tape or use a template.
5. Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).
6. For a terminal or pigtail wire replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar. Apply a thin layer of epoxy to the area where the terminal or pigtail wire was fastened and onto the adjacent grid line.
7. Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place it in the proper location on the bus bar. To prevent the terminal or pigtail wire from moving while the epoxy is curing, it must be wedged or clamped.
8. Carefully remove the masking tape or template.

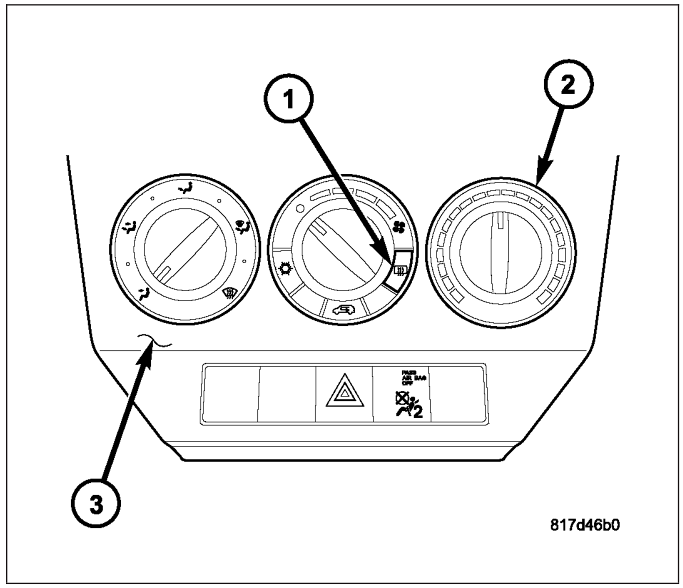
CAUTION: Do not allow the glass surface to exceed 204° C (400° F) when using a heat gun, or the glass may fracture.

9. Allow the epoxy to cure 24 hours at room temperature, or carefully use a heat gun for 15 minutes. When using a heat gun, hold it approximately 25.4 centimeters (10 inches) from the repair and do not allow the glass surface to exceed 204° C (400° F).
10. After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire.
11. Connect the wire harness leads to the grid terminals or pigtail wires and verify EBL operation.

SWITCH-REAR WINDOW DEFOGGER

DESCRIPTION

The switch for the rear window defogger (EBL) system (1) is located in the A/C-heater control (2) in the instrument panel center bezel (3). When the rear window defogger switch is pressed to the On position a request signal is sent to the cabin compartment node (CCN), which sends a message to the totally integrated power module (TIPM) to operate the EBL system.



When the high side driver in the TIPM is energized, current is directed to the rear defogger grid lines and to the heated side view mirrors (when equipped). The grid lines heat the glass to help clear the surface of fog or frost.

OPERATION

An amber indicator will illuminate when the rear window defogger switch is activated. When activated, the switch sends a request signal to the cabin compartment node (CCN), which sends a message to the totally integrated power module (TIPM) to energize the internal EBL high side driver to provide battery current to the rear window defogger grid lines and, when equipped, to the heated side view mirrors.

NOTE: The EBL system turns off automatically after 10 minutes of initial operation. Each following activation cycle of the EBL system will last 5 minutes.

The EBL system will be automatically turned off after an initial programmed time interval of about 10 minutes as long as the ignition switch is the Run position. After the initial time interval has expired, if the rear window defogger switch is turned on again during the same ignition cycle, the EBL system will automatically turn off after about 5 minutes. The EBL system will automatically shut off if the ignition switch is turned to any position other than Run, or it can be turned off manually by pressing the rear window defogger switch a second time.

The rear window defogger switch is diagnosed using a scan tool (refer to 8G - Heated Glass Electrical Diagnostics for more information).

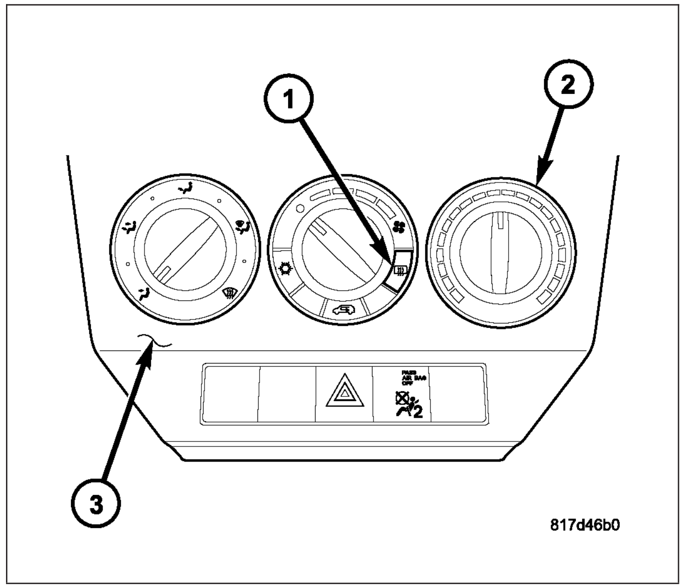
The rear window defogger switch and the rear window defogger indicator cannot be repaired and, if faulty or damaged, the A/C-heater control must be replaced (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CONTROL-A/C HEATER - REMOVAL).

HEATED MIRRORS - SERVICE INFORMATION

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HEATED MIRRORS - SERVICE INFORMATION

DESCRIPTION



When equipped, the heated mirror system operates in concert with the rear window defogger (EBL) system and is controlled by the rear window defogger switch (1) located in the A/C-heater control (2) in the instrument panel center bezel (3). An amber indicator lamp in the rear window defogger switch will illuminate to indicate when the heated mirror system is turned on.

The heated mirror system will be automatically turned off after an initial programmed time interval of about 10 minutes as long as the ignition switch is the Run position. After the initial time interval has expired, if the rear window defogger switch is turned on again during the same ignition cycle, the heated mirror system will automatically turn off after about 5 minutes. The heated mirror system will also turn off if the ignition switch is turned to any position other than Run or by manually pressing the rear window defogger switch a second time.

Circuit protection for the heated mirror system is provided by a fuse located in the totally integrated power module (TIPM).

OPERATION

When equipped, the heated mirror system is activated when the rear window defogger (EBL) system is turned on (refer to 8 - ELECTRICAL/HEATED GLASS - OPERATION). When the heated mirror system is activated, an electric heater grid located behind the glass of each of the outside rear view mirror becomes energized and produces heat to help clear the mirror of ice, snow, or fog.

If the outside mirror heating grids are both inoperative, (refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING) in this group. If only one of the outside mirror heating grid is inoperative, (refer to 8 - ELECTRICAL/POWER MIRRORS - DIAGNOSIS AND TESTING).

The heating grid behind each outside mirror glass cannot be repaired and if faulty or damaged the mirror must be replaced (refer to 23 - BODY/EXTERIOR/SIDE VIEW MIRROR - REMOVAL.

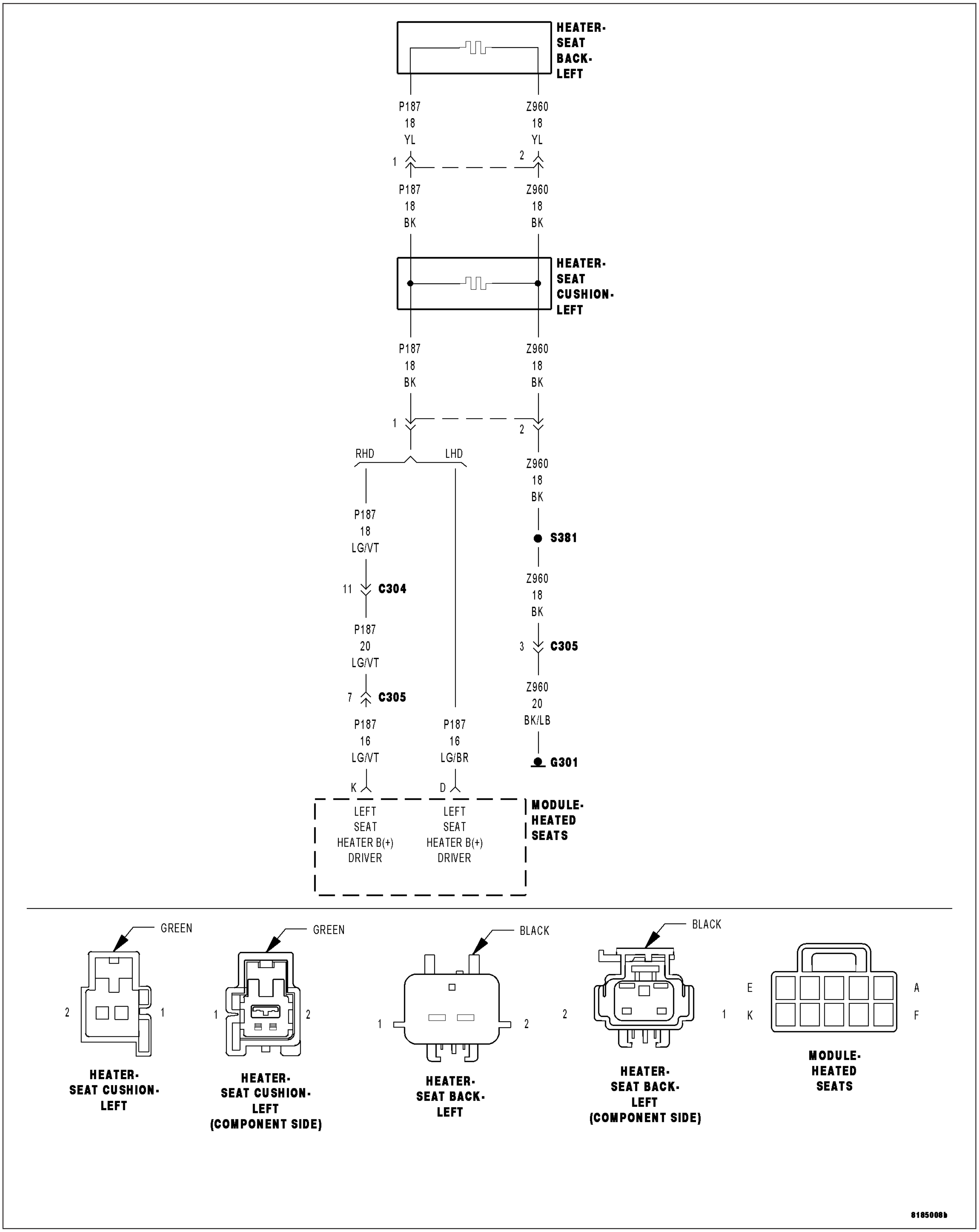
HEATED SEATS - ELECTRICAL DIAGNOSTICS

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HEATED SEATS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, during the heated seat operation.
- **Set Condition:**
  This code is set immediately after the Heated Seat Module (HSM) detects the control circuit shorted to ground.

Possible Causes
(P187) LEFT SEAT HEATER B(+) DRIVER SHORTED TO GROUND
SEAT CUSHION HEATER ELEMENT SHORTED
SEAT BACK HEATER ELEMENT SHORTED
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's.
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1092 – FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW reset?

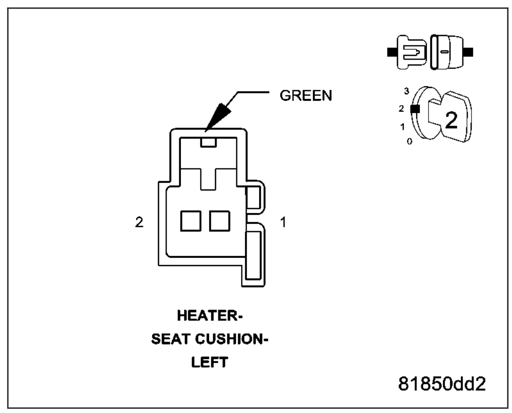
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

2. DISCONNECT LEFT SEAT CUSHION HEATER 2-WAY CONNECTOR AND READ DTC'S

Disconnect the Left Seat Cushion Heater 2–way connector.

NOTE: Check connectors - Clean and repair as necessary.
With the scan tool, erase HSM DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



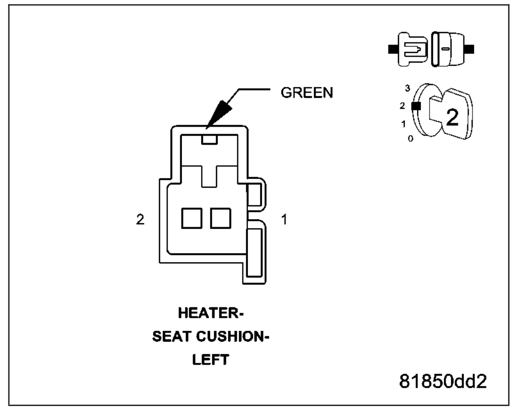
Does the scan tool display the same DTC?

Yes >> Go To 5

No >> Go To 3

3. CHECK THE (P187) LEFT SEAT HEATER B(+) DRIVER FOR A SHORT TO GROUND AT THE SEAT

Measure between the (P187) Left Seat Heater B(+) Driver circuit at the Left Seat Heater connector (component side) and the seat frame for a short to ground.



Is the resistance below 1000 ohms?

No >> Go To 4

Yes >> Repair/replace the pigtail/heating element as necessary for a short to ground condition.

Perform BODY VERIFICATION TEST – VER 1 (Refer to BODY VERIFICATION TEST – VER 1).

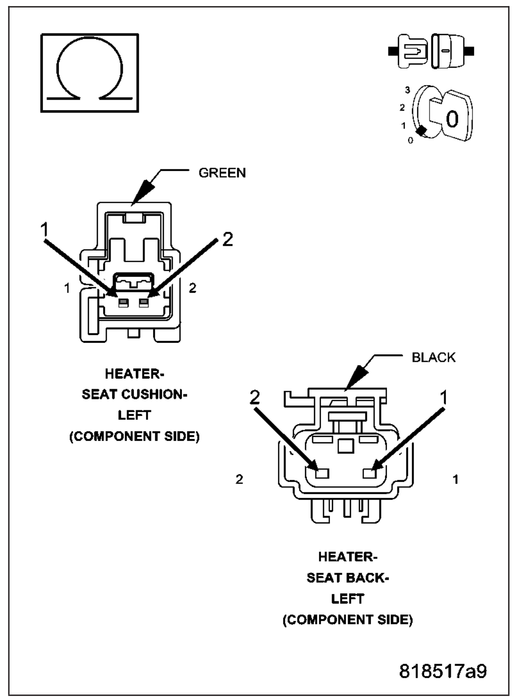
4. CHECK THE LEFT HEATER ELEMENT SEAT CUSHION AND SEAT BACK RESISTANCE

Gain access to the seat cushion and seat back heater connectors.

Check the resistance of each of the heater elements by measuring between the (P187) Left Seat Heater B(+) Driver and the Ground circuit at the seat cushion and seat back heater connectors.

For the seat cushion element, the resistance value is 3 to 5.5 ohms.

For the seat back element, the resistance value is 4 to 6 ohms.



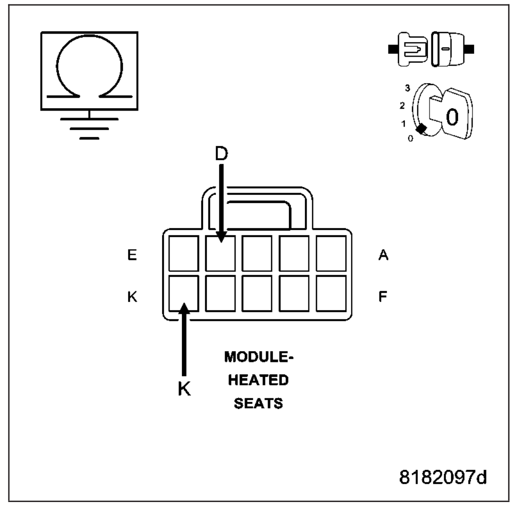
Is the resistance correct for each heater element?

Yes >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.

No >> Replace the heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

5. CHECK THE (P187) LEFT SEAT HEATER B(+) DRIVER CIRCUIT FOR A SHORT TO GROUND



Ensure the Left Seat Cushion Heater 2–way connector is still disconnected.

Disconnect the Heated Seat Module connector.

NOTE: Check connectors - Clean and repair as necessary.

Measure the (P187) Left Seat Heater B(+) Driver circuit cavity D for (LHD) or K for (RHD) at the HSM connector to ground.

Is the resistance below 5.0 ohms?

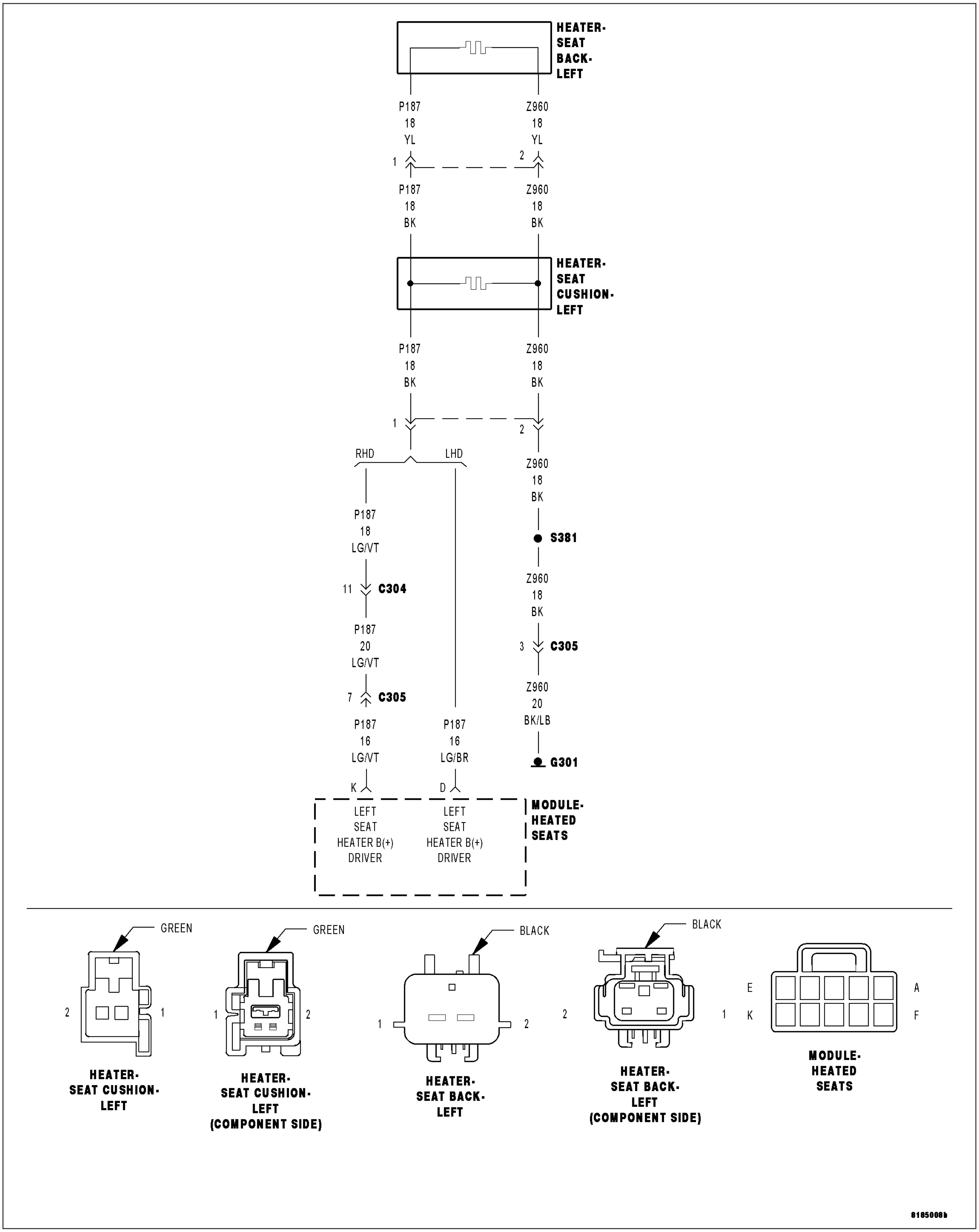
Yes >> Repair the (P187) Left Seat Heater B(+) Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, during the heated seat operation.
- **Set Condition:**
  This code is set immediately after the Heated Seat Module detects an open in the seat heater B(+) driver circuit.

Possible Causes
(P187) LEFT SEAT HEATER B(+) DRIVER WIRE OPEN
(Z960) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE

With the scan tool, record and erase DTC's.

Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

Does the DTC B1094 FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

2. CHECK FOR AN OPEN SEAT HEATER ELEMENT CIRCUIT

Disconnect the Left Seat Cushion Heater 2–way connector.

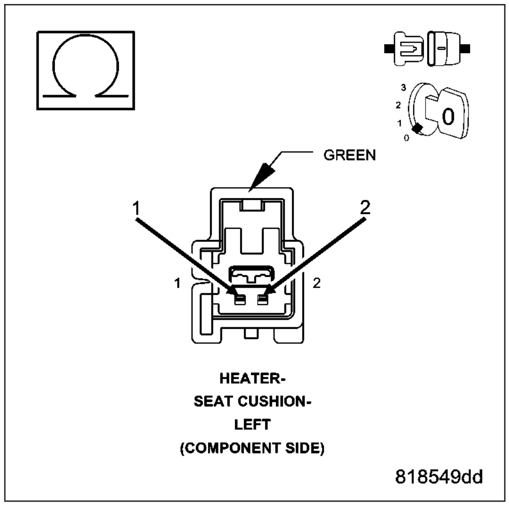
NOTE: Check connectors - Clean and repair as necessary.

Measure the total resistance of the cushion and seat back heater elements at the Left Seat Cushion 2–way connector (component side).

Is the total resistance 2.5 to 3.5 ohms + or – .5 ohms?

Yes >> Go To 4

No >> Go To 3



3. CHECK THE LEFT SEAT HEATER ELEMENT RESISTANCE

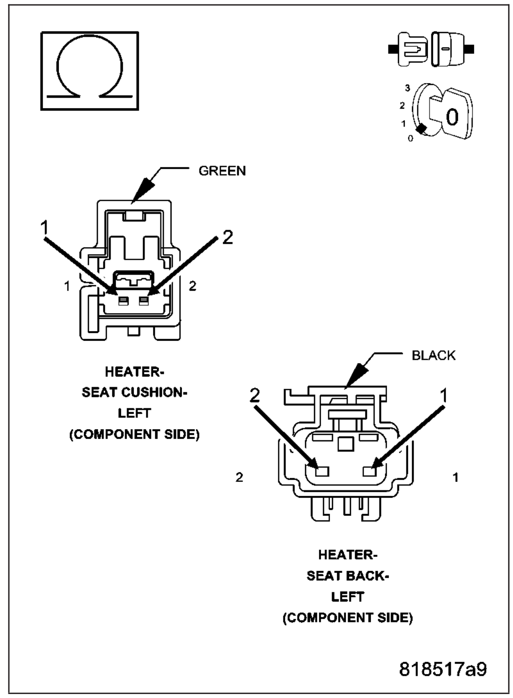
Gain access to and disconnect the seat cushion and seat back heater connectors.

NOTE: Check connectors - Clean and repair as necessary.

Measure each of the heater elements by measuring between the (P187) Left Seat Heater B(+) Driver and the Ground circuit at the seat cushion and seat back heater connectors.

For the seat cushion element, the resistance value is 3 to 5.5 ohms.

For the seat back element, the resistance value is 4 to 6 ohms.



Is the resistance correct for each heater element?

Yes >> Check for an open in the pigtail harness and repair as necessary.

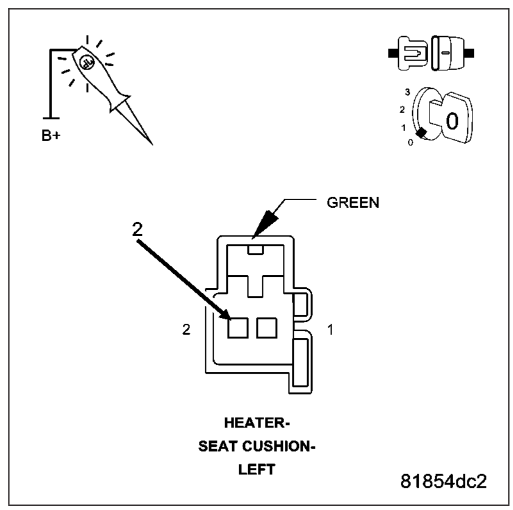
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Replace the heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

4. CHECK THE LEFT SEAT HEATER GROUND CIRCUIT

Using a 12-volt test light connected to 12-volts, check the (Z960) Ground circuit at the Left Seat Cushion Heater 2–way connector (harness side).



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (Z960) Ground circuit for an open.

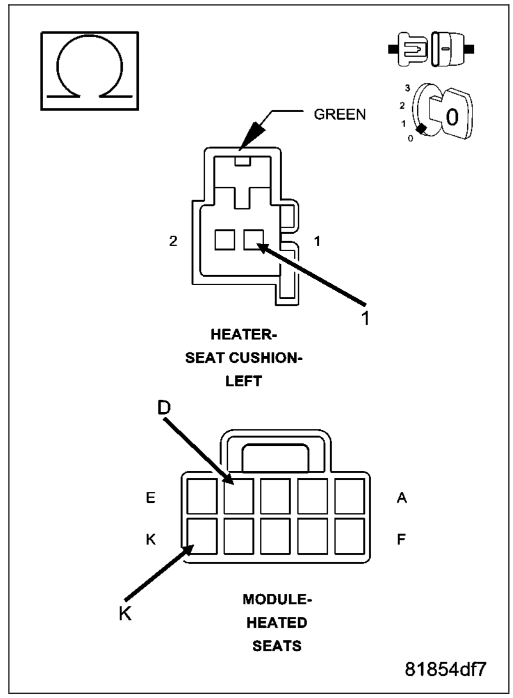
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

5. CHECK THE (P187) LEFT SEAT HEATER B(+) DRIVER CIRCUIT FOR AN OPEN.

Disconnect the Heated Seat Module connector.

NOTE: Check connectors - Clean and repair as necessary.

Measure the (P187) Left Seat Heater B(+) Driver circuit cavity D for (LHD) or K for (RHD) from the HSM connector to the Left Seat Cushion Heater 2–way connector (harness side).



Is the resistance below 5.0 ohms?

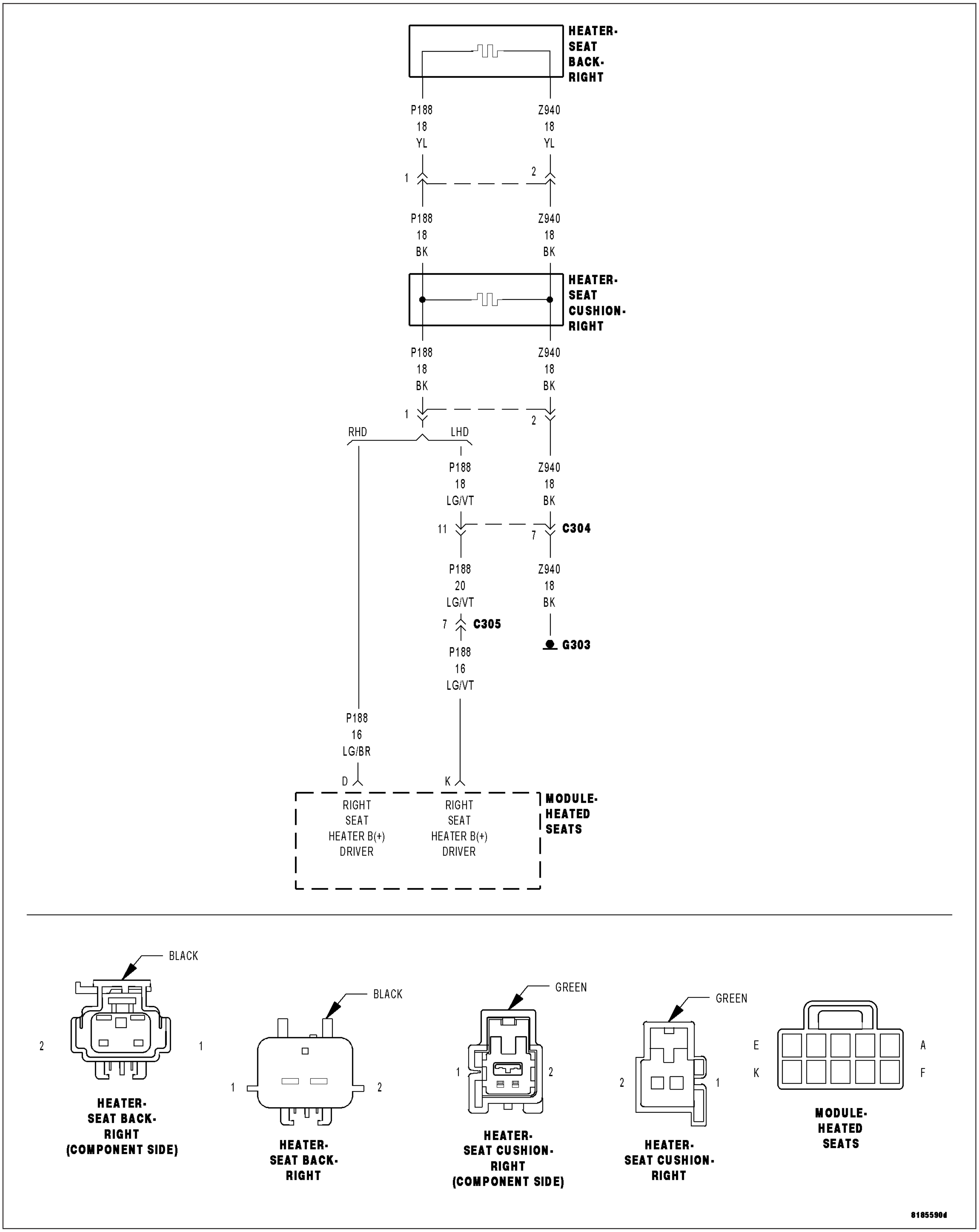
Yes >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Repair the (P187) Left Seat Heater B(+) Driver circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, during the heated seat operation.
- **Set Condition:**
  This code is set immediately after the Heated Seat Module detects the control circuit shorted to ground.

Possible Causes
(P188) RIGHT SEAT HEATER B(+) DRIVER SHORTED TO GROUND
SEAT CUSHION HEATER ELEMENT SHORTED
SEAT BACK HEATER ELEMENT SHORTED
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's.

Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

Does the DTC B1096 – FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

2. DISCONNECT RIGHT CUSHION HEATER 2-WAY CONNECTOR AND READ DTC'S

Disconnect the Left Seat Cushion Heater 2–way connector.

NOTE: Check connectors - Clean and repair as necessary.
With the scan tool, erase HSM DTC's.

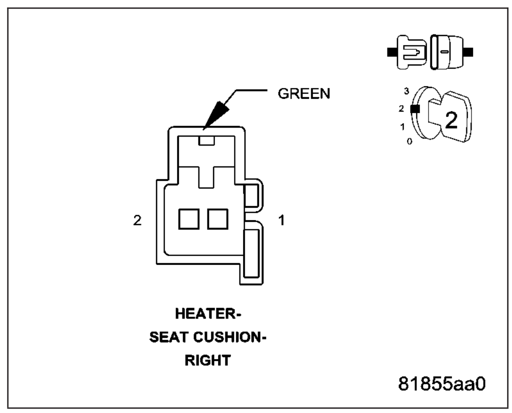
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

Does the scan tool display the same DTC?

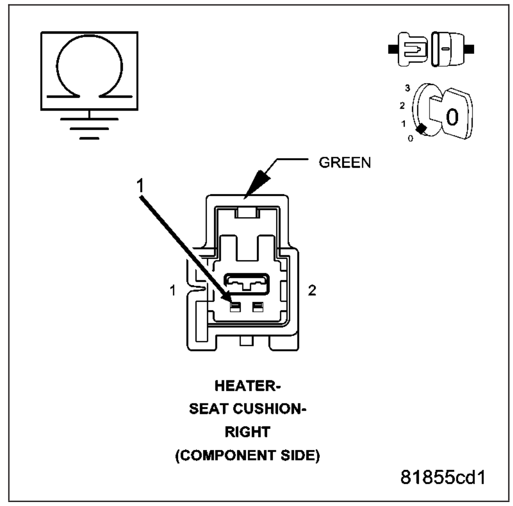
Yes >> Go To 5

No >> Go To 3



3. CHECK THE (P188) RIGHT SEAT HEATER B(+) DRIVER FOR A SHORT TO GROUND AT THE SEAT

Measure between the (P188) Right Seat Heater B(+) Driver circuit at the Right Seat Heater connector (component side) and the seat frame for a short to ground.



Is the resistance below 1000 ohms?

No >> Go To 4

Yes >> Repair/replace the pigtail/heating element as necessary for a short to ground condition.

Perform BODY VERIFICATION TEST – VER 1 (Refer to BODY VERIFICATION TEST – VER 1).

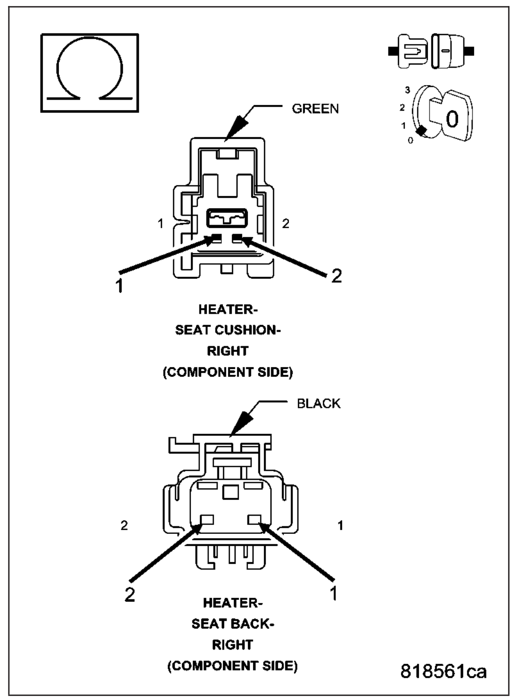
4. CHECK THE RIGHT HEATER ELEMENT SEAT CUSHION AND SEAT BACK RESISTANCE

Gain access to the seat cushion and seat back heater connectors.

Check the resistance of each of the heater elements by measuring between the (P188) Right Seat Heater B(+) Driver and the Ground circuit at the seat cushion and seat back heater connectors.

For the seat cushion element, the resistance value is 3 to 5.5 ohms.

For the seat back element, the resistance value is 4 to 6 ohms.



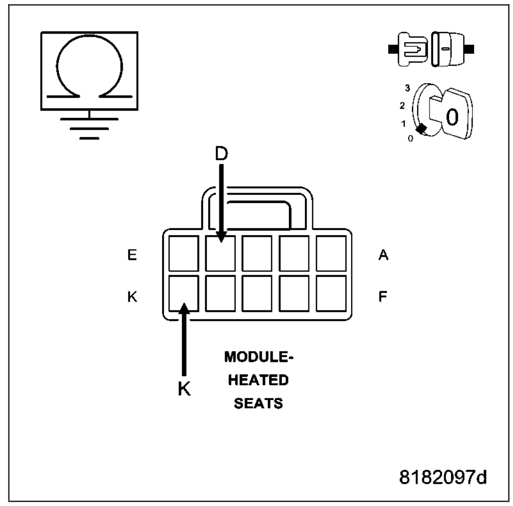
Is the resistance correct for each heater element?

Yes >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.

No >> Replace the heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

5. CHECK THE (P188) RIGHT SEAT HEATER B(+) DRIVER CIRCUIT FOR A SHORT TO GROUND



Ensure the Right Seat Cushion Heater 2–way connector is still disconnected.

Disconnect the Heated Seat Module connector.

NOTE: Check connectors - Clean and repair as necessary.

Measure the (P188) Right Seat Heater B(+) Driver circuit cavity K for (LHD) or D for (RHD) at the HSM connector to ground.

Is the resistance below 5.0 ohms?

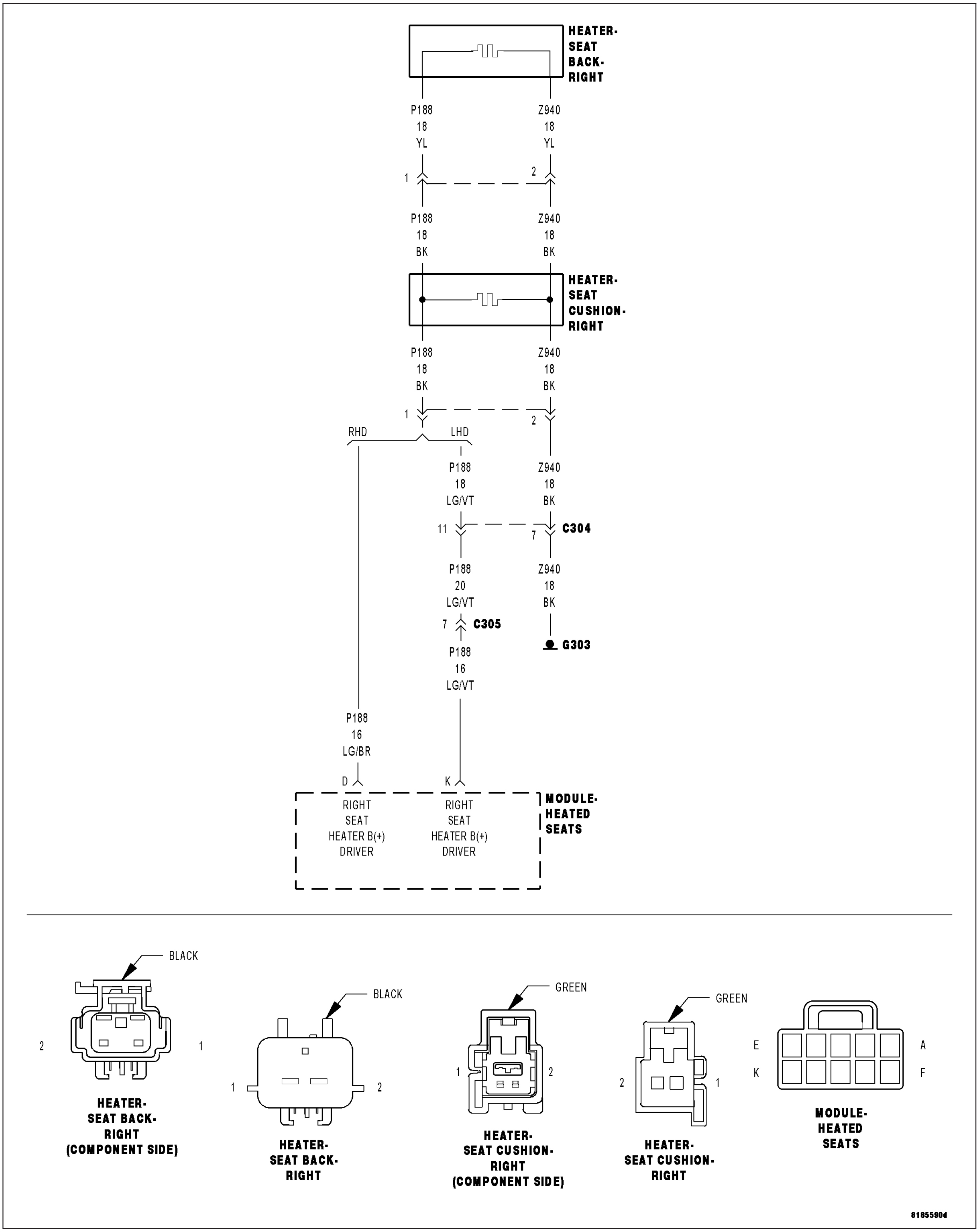
Yes >> Repair the (P188) Right Seat Heater B(+) Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, during the heated seat operation.
- **Set Condition:**
  This code is set immediately after the Heated Seat Module detects an open in the seat heater B(+) driver circuit.

Possible Causes
(P188) RIGHT SEAT HEATER B(+) DRIVER WIRE OPEN
(Z940) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE

With the scan tool, record and erase DTC's.

Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

Does the DTC B1098 FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN reset?

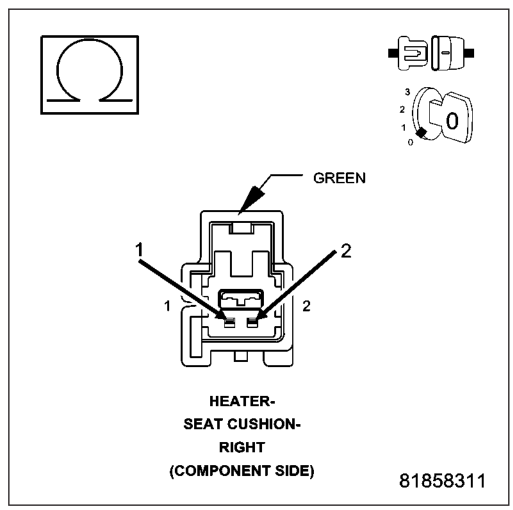
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

2. CHECK FOR AN OPEN SEAT HEATER ELEMENT

Disconnect the Right Seat Cushion Heater 2–way connector.

NOTE: Check connectors - Clean and repair as necessary.
Measure the total resistance of the cushion and seat back heater elements at the Right Seat Cushion 2–way connector (component side).

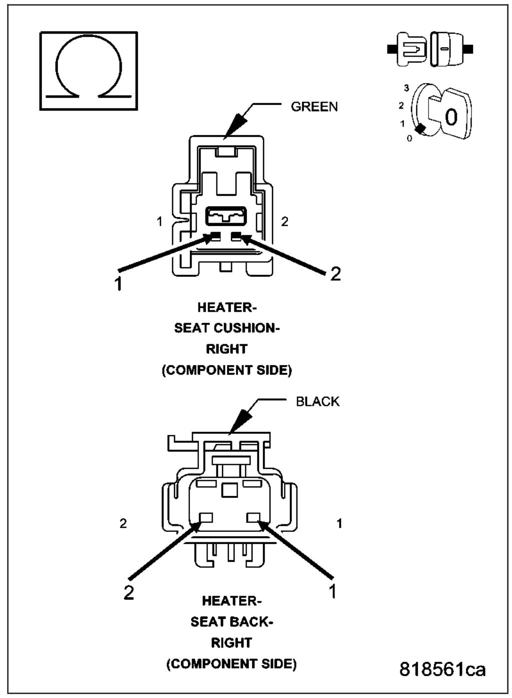


Is the total resistance 2.5 to 3.5 ohms + or – .5 ohms?

Yes >> Go To 4

No >> Go To 3

3. CHECK THE RIGHT SEAT HEATER ELEMENT RESISTANCE



Gain access to and disconnect the seat cushion and seat back heater connectors.

NOTE: Check connectors - Clean and repair as necessary.

Measure each of the heater elements by measuring between the (P188) Right Seat Heater B(+) Driver and the Ground circuit at the seat cushion and seat back heater connectors.

For the seat cushion element, the resistance value is 3 to 5.5 ohms.

For the seat back element, the resistance value is 4 to 6 ohms.

Is the resistance correct for each heater element?

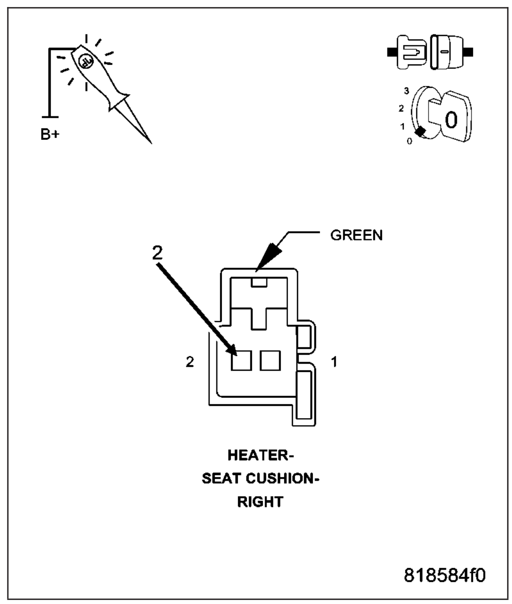
Yes >> Check for an open in the pigtail harness and repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Replace the heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

4. CHECK THE SEAT HEATER GROUND CIRCUIT



Using a 12-volt test light connected to 12-volts, check the (Z940) Ground circuit at the Right Seat Cushion Heater 2–way connector (harness side).

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (Z940) Ground circuit for an open.

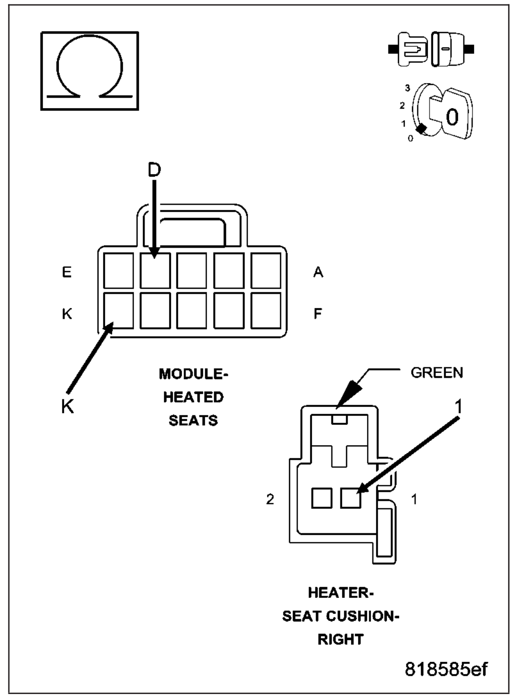
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

5. CHECK THE (P188) RIGHT SEAT HEATER B(+) DRIVER CIRCUIT FOR AN OPEN.

Disconnect the Heated Seat Module connector.

NOTE: Check connectors - Clean and repair as necessary.

Measure the (P188) Right Seat Heater B(+) Driver circuit cavity K for (LHD) or D for (RHD) from the HSM connector to the Right Seat Cushion Heater 2–way connector (harness side).



Is the resistance below 5.0 ohms?

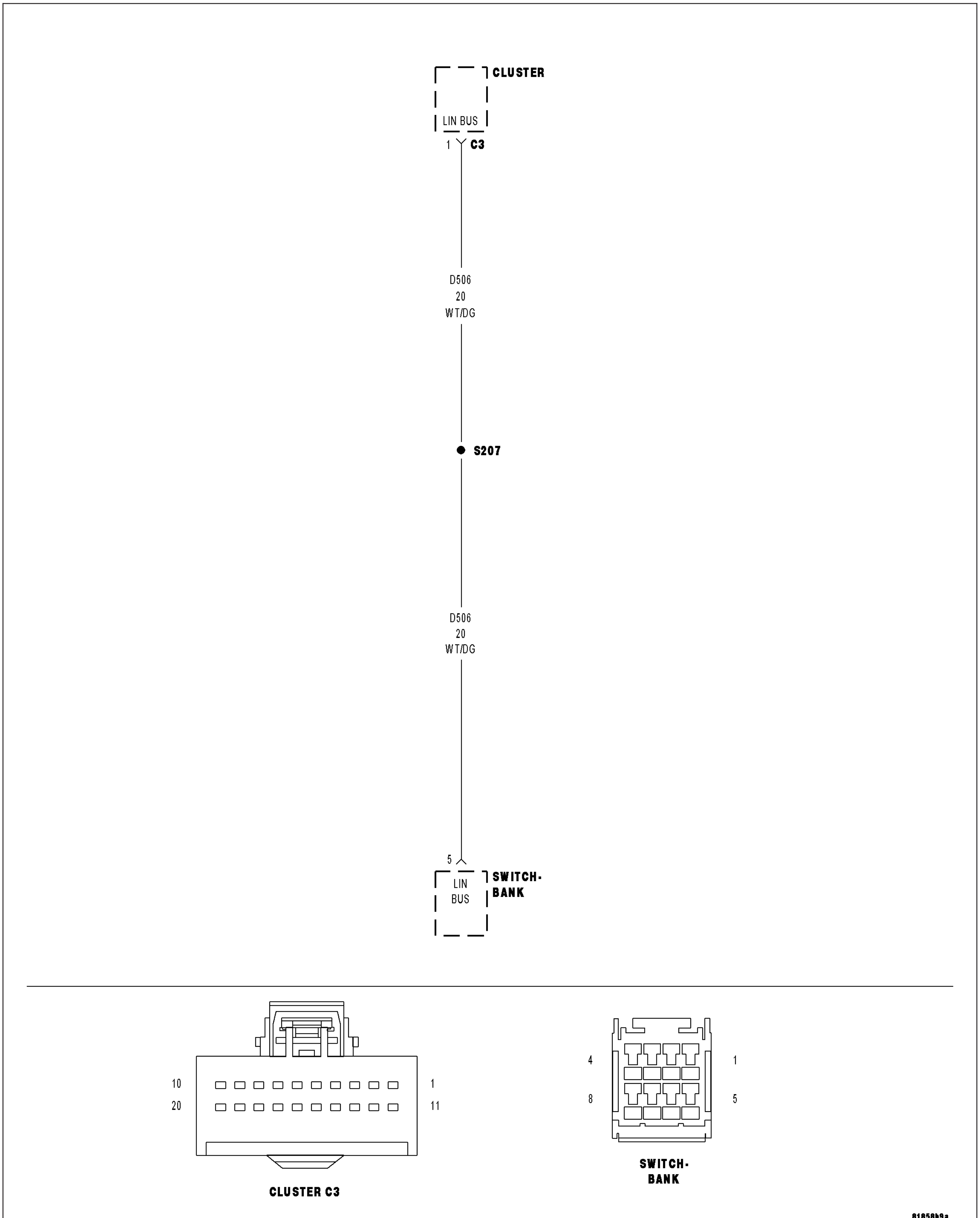
Yes >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Repair the (P188) Right Seat Heater B(+) Driver circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B10BB – LEFT HEATED SEAT SWITCH INPUT CIRCUIT STUCK – CLUSTER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Heated Seat Switch in the Switch Bank is held in the On position for over 10 seconds, this code will set.

Possible Causes
(D506) LIN BUS CIRCUIT PARTIAL SHORT TO GROUND
SWITCH BANK STUCK
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's.

Operate the Heated Seat Switch several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display B10BB LEFT HEATED SEAT SWITCH INPUT CIRCUIT STUCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. SWITCH SHORTED

With the scan tool, erase DTC's.

Disconnect the Switch Bank connector.

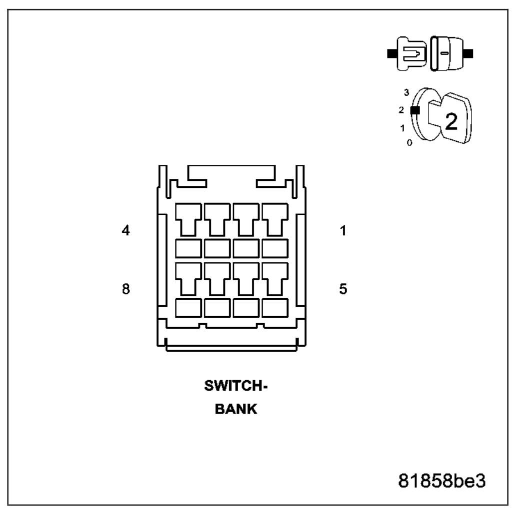
With the scan tool, read DTC's.

Does the scan tool display B10BB – LEFT HEATED SEAT SWITCH INPUT CIRCUIT STUCK?

No >> Replace the Switch Bank.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

Yes >> Go To 3

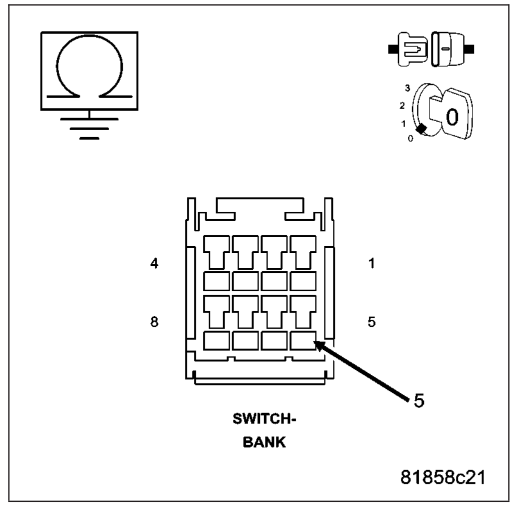


3. (D506) LIN BUS CIRCUIT PARTIAL SHORT TO GROUND

Turn the ignition off.

Disconnect the Cluster C3 connector.

Measure the resistance between ground and the (D506) LIN Bus circuit.



Is the resistance below 10000.0 ohms?

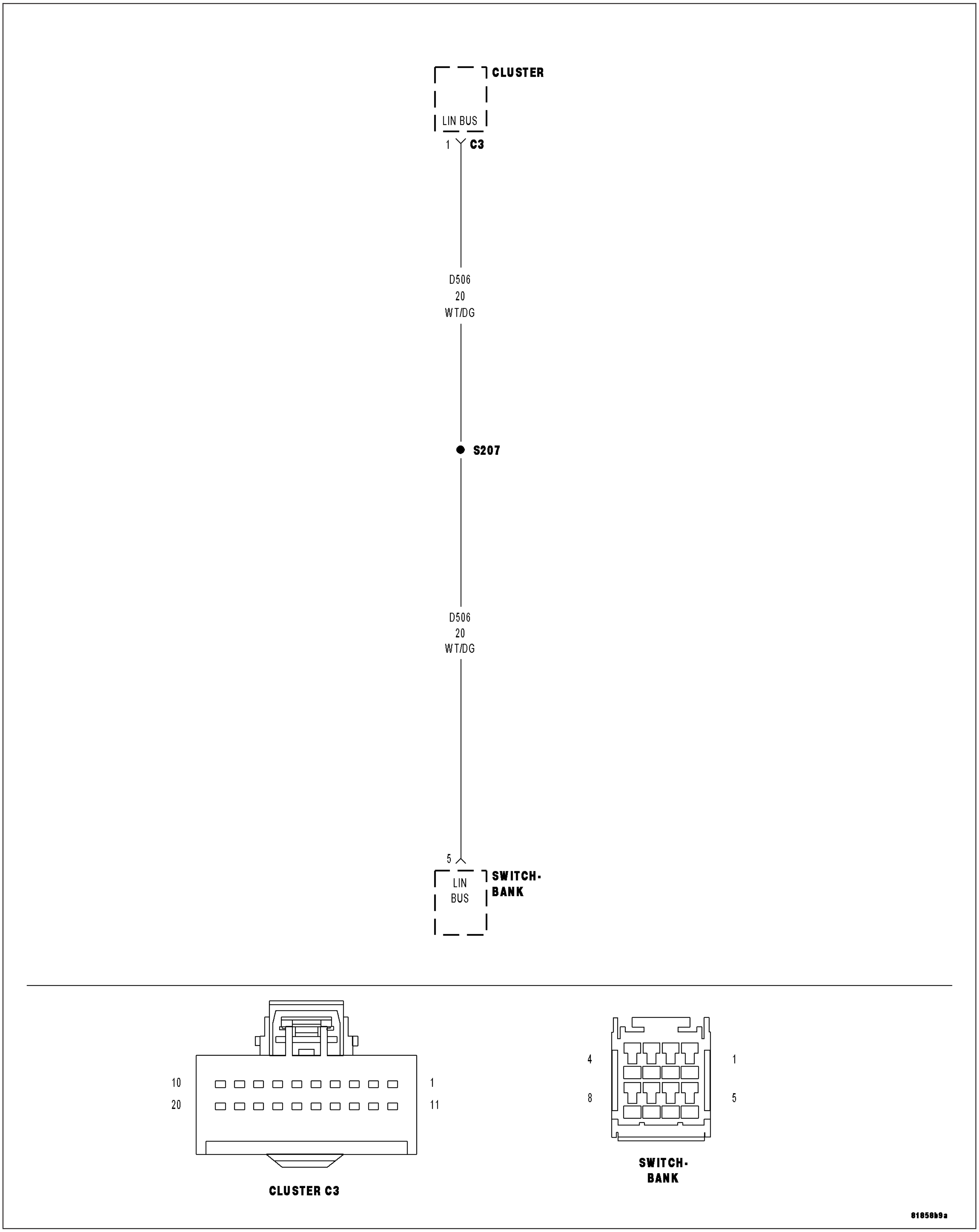
Yes >> Repair the (D506) LIN Bus circuit for a partial short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B10BC – RIGHT HEATED SEAT SWITCH INPUT CIRCUIT STUCK – CLUSTER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Heated Seat Switch in the Switch Bank is held in the On position for over 10 seconds, this code will set.

Possible Causes
(D506) LIN BUS CIRCUIT PARTIAL SHORT TO GROUND
SWITCH BANK STUCK
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC’s.

Operate the Heated Seat Switch several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC’s.

Does the scan tool display B10BC RIGHT HEATED SEAT SWITCH INPUT CIRCUIT STUCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. SWITCH SHORTED

With the scan tool, erase DTC’s.

Disconnect the Switch Bank connector.

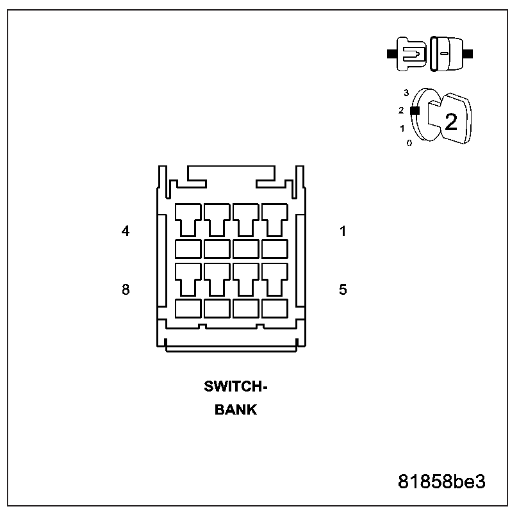
With the scan tool, read DTC’s.

Does the scan tool display B10BC – RIGHT HEATED SEAT SWITCH INPUT CIRCUIT STUCK?

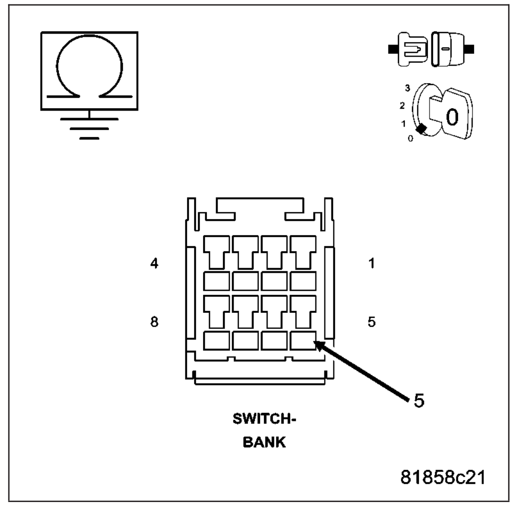
No >> Replace the Switch Bank.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

Yes >> Go To 3



3. (D506) LIN BUS CIRCUIT PARTIAL SHORT TO GROUND



Turn the ignition off.

Disconnect the Cluster C3 connector.

Measure the resistance between ground and the (D506) LIN Bus circuit.

Is the resistance below 10000.0 ohms?

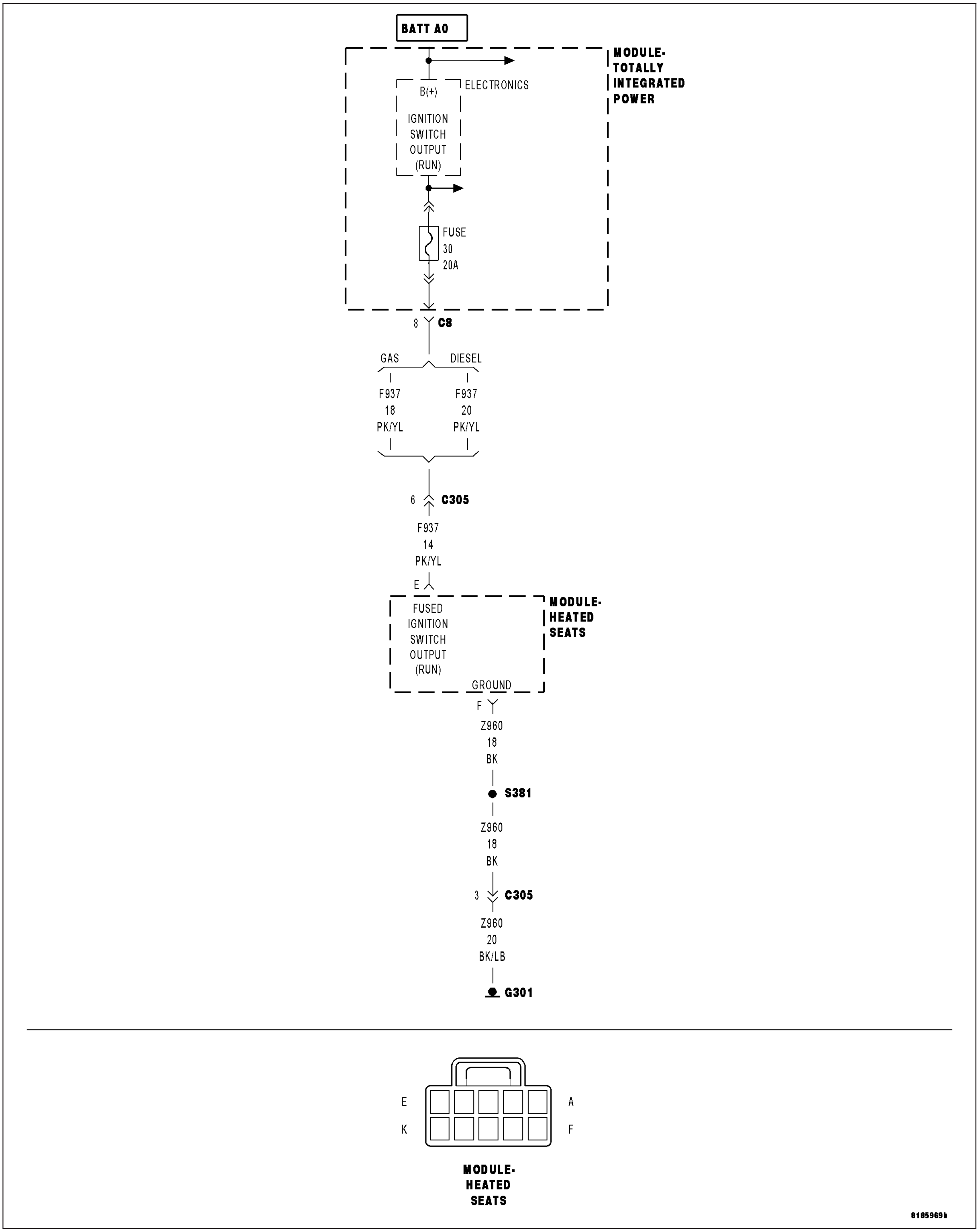
Yes >> Repair the (D506) LIN Bus circuit for a partial short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2181- HEATED SEAT MODULE POWER SUPPLY LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During heated seat operation.
- **Set Condition:**
  This code is set immediately if the Heated Seat Module detects voltage under 10 volts on the (F937) Fused Ignition Switch Output (Run) circuit.

Possible Causes
(F937) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT HIGH RESISTANCE
HEATED SEAT MODULE

Diagnostic Test

1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

No >> Go To 2
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

2. VERIFY THAT DTC B2181 - HEATED SEAT MODULE POWER SUPPLY LOW IS ACTIVE

With the scan tool, record and erase DTC's.

Turn the ignition switch to the Off position then start the engine and operate the heated seats for one minute.

With the scan tool, read DTC's.

Does the DTC B2181 - HEATED SEAT MODULE POWER SUPPLY LOW reset?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

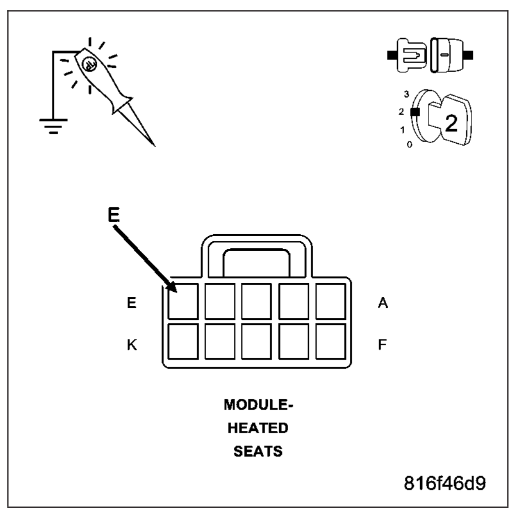
3. (F937) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT HIGH RESISTANCE

Disconnect the Heated Seat Module connector.

NOTE: Check connectors - Clean and repair as necessary.
Start the engine and let idle.

Using a 12-volt test light connected to ground, check the (F937) Fused Ignition Switch Output (Run) circuit at the HSM connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly?

Yes >> Replace the Heated Seat Module in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Repair the (F937) Fused Ignition Switch Output (Run) circuit as necessary.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B2182- HEATED SEAT MODULE POWER SUPPLY HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During heated seat operation.
- **Set Condition:**
  This code is set immediately if the Heated Seat Module detects voltage over 16.0 volts on the (F937) Fused Ignition Switch Output (Run) circuit.

Possible Causes
TROUBLE CODE PRESENT
CHARGING SYSTEM HIGH

Diagnostic Test

1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, record and erase DTC's.

Cycle the ignition switch from On to Off.

Start the engine.

Run the engine at approximately 1500 RPM for 1 minute.

With the scan tool, read DTCs.

With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using Service Information, check the charging system.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B221A-HEATED SEAT MODULE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  This code is set immediately if the Heated Seat Module internal self test fails.

Possible Causes
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B221A-HEATED SEAT MODULE INTERNAL IS ACTIVE

With the scan tool, record and erase DTC's.

Cycle the ignition switch off then back on.

With the scan tool, read DTC's.

Does the DTC B221A-HEATED SEAT MODULE INTERNAL reset?

Yes >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

HEATED SEATS - SERVICE INFORMATION

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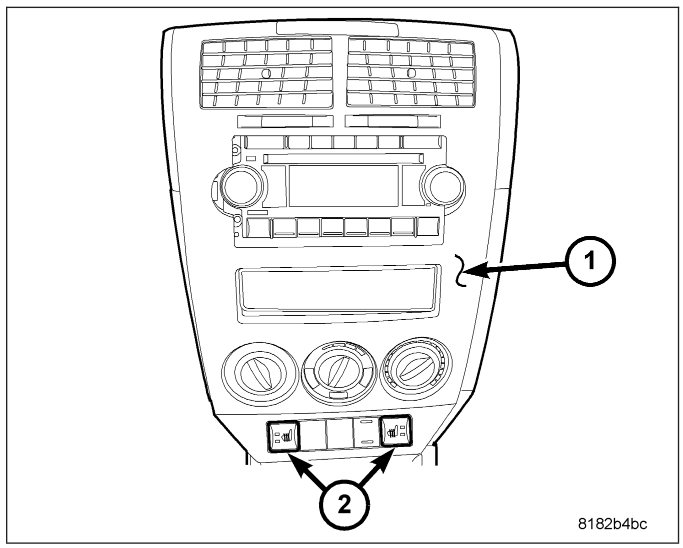
HEATED SEATS - SERVICE INFORMATION

DESCRIPTION

WARNING: The front passenger seat assembly contains critical components that affect the front passenger airbag deployment. Correctly functioning front passenger seat components are critical for the Occupant Classification System (OCS) to properly classify the front passenger and calculate the proper airbag deployment. Unapproved modifications or service procedures to the front passenger seat assembly, its related components, or trim cover may inadvertently change the airbag deployment in case of a frontal crash. This could result in death or serious injury to the front seat passenger if the vehicle is involved in an accident. The following requirements must be strictly adhered to:

- **Do not modify the front passenger seat assembly or components in any way.**
- **Do not modify the front seat center console or center position seat in any way.**
- **Do not use prior or future model year seat trim covers not designated for the specific model being repaired. Always use the correct seat trim cover specified for the vehicle.**
- **Do not replace the seat trim cover with an aftermarket trim cover.**
- **Do not add a secondary trim cover other than those approved by DaimlerChrysler/Mopar.**
- **At no time should any Supplemental Restraint System (SRS) component or SRS related component or fastener be modified or replaced with any part except those which are approved by DaimlerChrysler/Mopar.**

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the center stack (1) of the instrument panel. The switches are located on the outer edges of the accessory switch bank (2). The heated seat system allows the driver and front seat passenger to select from two different levels of electrical seat heating (HI/LO). The heated seat system for this vehicle includes the following major components, which are described in further detail later in this section:



- **Heated Seat Elements** - Four heated seat elements are used per vehicle. Two heated seat elements are integral to each seat, one in the seat back and the other in the seat cushion.
- **Heated Seat Module** - One heated seat module is used per vehicle. The Heated Seat Module is mounted under the left front seat. This module contains the control logic and software for the front heated seat system. The module communicates on the Local Interface Network (LIN) data bus.
- **Heated Seat Switches** - Two heated seat switches are used per vehicle, one for each heated seat. Both switches are mounted in the instrument panel center stack.
- **Instrument Cluster (CCN)** - A Cab Compartment Node (CCN) is part of the instrument cluster on this vehicle. The CCN utilizes integrated software and information carried on the LIN data bus. The CCN serves as the link between the heated seat switches and the heated seat module.

OPERATION

The heated seat system operates on battery current received through a fuse in the Totally Integrated Power Module (TIPM). Fused ignition switch output (Run) circuits are used, so that the heated seat system will only operate when the ignition switch is in the On position. The heated seat system will turn Off automatically whenever the ignition switch is turned to any position except On.

A Heated Seat Module is used to control the heated seat system. The module responds to heated seat switch messages and ignition switch status inputs by controlling the 12v output to the front seat heating elements through integral solid-state relays.

When either of the heated seat switches are depressed a switch status message is sent to the Cab Compartment Node (CCN) or instrument cluster via the Local Interface Network (LIN) data bus. The CCN then sends a message via the LIN data bus to the heated seat module, signaling the module to energize the heating element for the

selected seat. Amber Light Emitting Diodes (LEDs) in the top portion of each switch indicate the level of heat in use: Two LEDs are illuminated for high, one for low, and none for off. The heated seat module sends the LED illumination message to the CNN via the LIN data bus. The CNN then sends the LED illumination message to the accessory switch bank so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

The heated seat module energizes an integral solid-state relay, which supplies battery current to the heating elements. When high-temperature heating is selected, the heaters provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal high-temperature level. If high-level heating is selected, the control system will automatically switch to the low level after two hours of continuous operation. At that time, the number of illuminated LEDs changes from two to one, indicating the change. Operation on the low setting also turns off automatically after two hours.

The module will automatically turn off the heating elements if it detects an OPEN or LOW short in the heating element circuit.

DIAGNOSIS AND TESTING

HEATED SEAT SYSTEM

In order to obtain conclusive testing, the heated seat system and the Local Interface Network (LIN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

NOTE: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.7v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the heated seat system is attempted, the battery should be fully-charged.

HEATER-CUSHION PAD

DESCRIPTION

Vehicles equipped with the optional heated seat system have two, carbon fiber heated seat elements, located in each front seat. One heating element is used for each seat cushion and another for each seat back.

Each of the heated seat element consists of multiple heating circuits operating in parallel throughout the carbon fiber element. The heated seat elements are captured between the leather trim cover and the seat cushion assembly. If a malfunction occurs in one or more of the individual carbon fiber circuits, the others will continue to provide heat.

The heated seat elements cannot be repaired. If found to be damaged or inoperative, a new heating element assembly must be installed.

OPERATION

One end of the heated seat element is connected to ground at all times through a splice under the seat. Battery current is directed to the other end of the heated seat element by the heated seat module. The heated seat module will energize the heated seat element when the heated seat switch is depressed in the Low or High position.

As electrical current passes through the heated seat element, the resistance of the wire used in the element disperses some of the electrical current in the form of heat. The heat produced by the heated seat element then radiates through the underside of the seat cushion and seat back trim covers, warming the seat cover and its occupant.

DIAGNOSIS AND TESTING

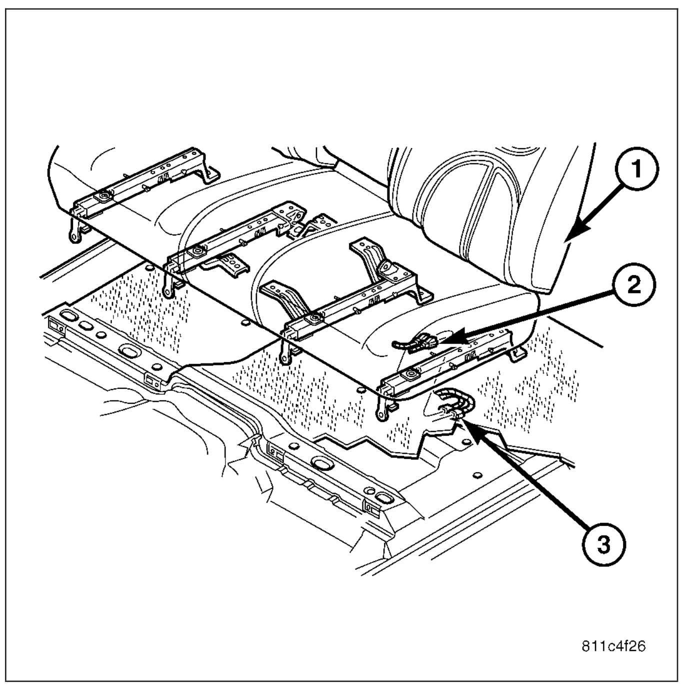
HEATED SEAT ELEMENT

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

The wire harness connectors (2&3) for the heating elements are located under the seat (1).

NOTE: When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as sitting in the seat will eliminate the possibility of an intermittent open in the element which would only be evident if the element was in a certain position. Failure to check the element in various positions could result in an incomplete test.

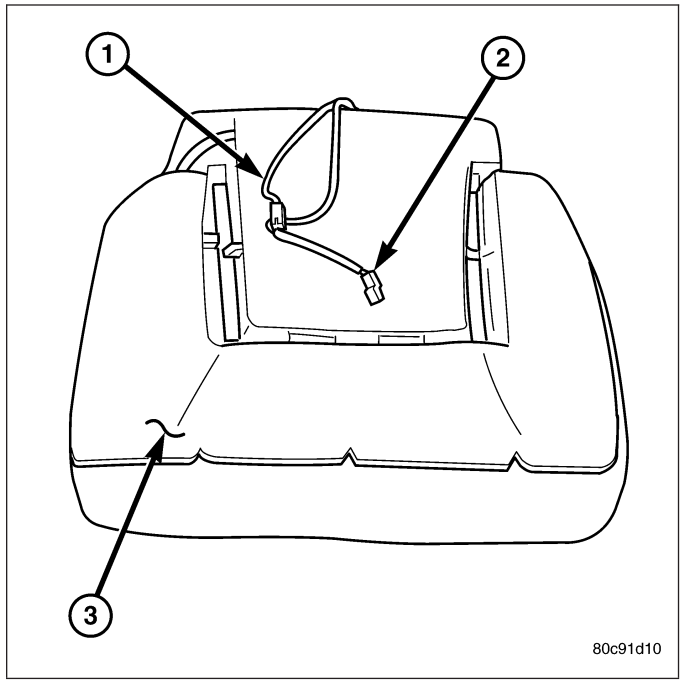
1. Locate and disconnect the seat electrical connector.
2. Check the resistance between the circuit leading in and out of the suspect heated seat element. The resistance should be between 3.0 - 5.5 ohms for a seat cushion element and 4.0 - 6.0 ohms for a seat back element. If OK, (Refer to 8 - ELECTRICAL/ HEATED SEATS - DIAGNOSIS AND TESTING). If not OK, replace the inoperative heated seat element.



REMOVAL

NOTE: Do not remove the factory installed heating elements (3) from the seat or seat back cushions. The original element is permanently attached and cannot be removed without permanent damage. The replacement heating element is designed to be applied directly on top of the inoperative factory installed heating element.

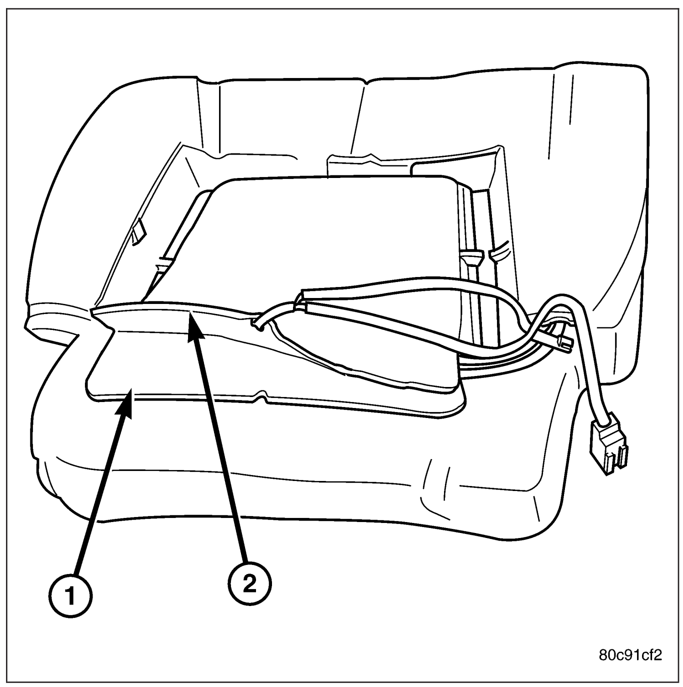
1. Disconnect and isolate the battery negative cable.
2. Remove the appropriate seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL) or seat back trim cover, (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - REMOVAL).
3. Disconnect the inoperative heated seat cushion or seat back element electrical connectors (2).
4. Locate the wires leading from the inoperative heating element and cut them off flush with the edge of the original heating element.



INSTALLATION

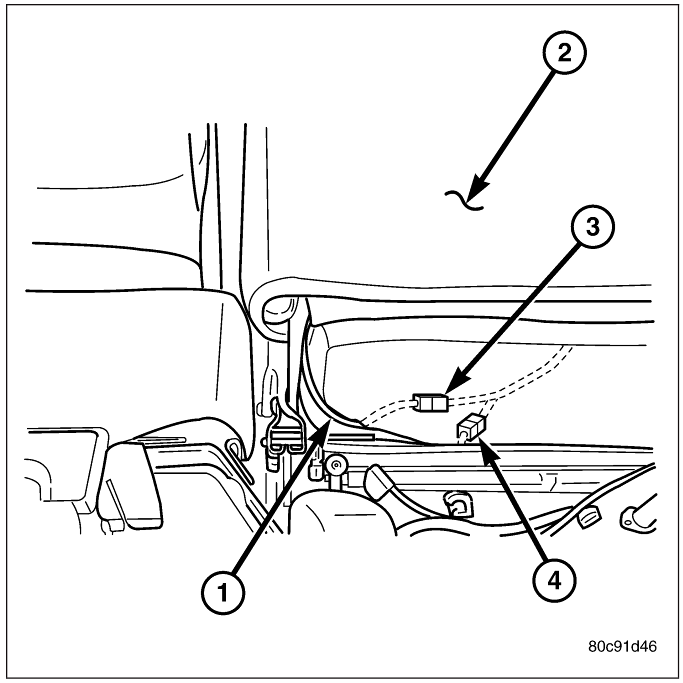
1. Peel off the adhesive backing on the back of the replacement heating element (2) and stick directly on top of the factory installed heating element (1).

CAUTION: During the installation of the replacement heating element, be careful not to fold or crease the element assembly. Folds or creases will cause premature failure.



2. Connect the new heating element electrical connectors (3&4).
3. Connect the battery negative cable.
4. Verify heated seat system operation.
5. Install the appropriate seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION) or seat back trim cover, (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - INSTALLATION).

NOTE: Make certain the seat wire harness is correctly routed through the seat and seat back. The excess wire between the cushion and back elements should be securely tucked between the rear of the cushion foam and the rear carpet flap of the trim cover.

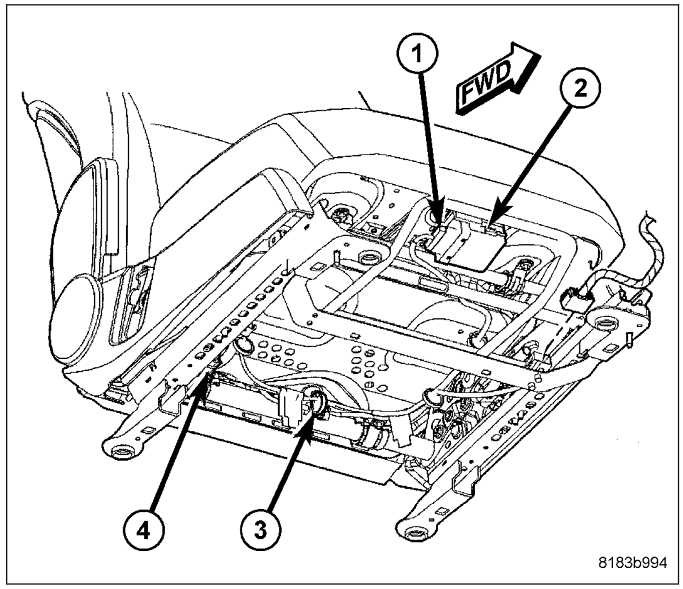


MODULE-HEATED SEATS

DESCRIPTION

The heated seat module (2) is located under the left front seat. It has a single electrical connector (1) and a push pin style retainer that secures it to the seat pan. The module can be accessed from under the front left seat with the seat in the full back position.

The heated seat module is a microprocessor designed to use the Local Interface Network (LIN) data bus messages from the instrument cluster also known as the Cabin Compartment Node (CCN). The CCN receives inputs from the heated seat switches and in turn signals the heated seat module to operate the heated seat elements for both front seats.



OPERATION

The heated seat module operates on fused battery current received from the ignition switch. The module is grounded to the body at all times through the electrical connector. Inputs to the module include Local Interface Network (LIN) data bus messages and standard hardwired 12 volt power and ground. In response to the LIN inputs the heated seat module will control the battery current to the appropriate heated seat elements.

When a heated seat switch LIN data bus signal is received by the heated seat module, the module energizes the selected heated seat element. The Low heat set point is about 38°C (100.4°F), and the High heat set point is about 42°C (107.6°F).

In addition to operating the heated seat elements, the heated seat module sends LED illumination messages to the CNN via the LIN data bus. The CNN then sends the LED illumination message to the accessory switch bank so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

If the heated seat module detects a heated seat element OPEN or SHORT circuit, it will record and store the appropriate diagnostic trouble code (DTC).

DIAGNOSIS AND TESTING

HEATED SEAT MODULE

In order to obtain conclusive testing, the heated seat system and the Local Interface Network (LIN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

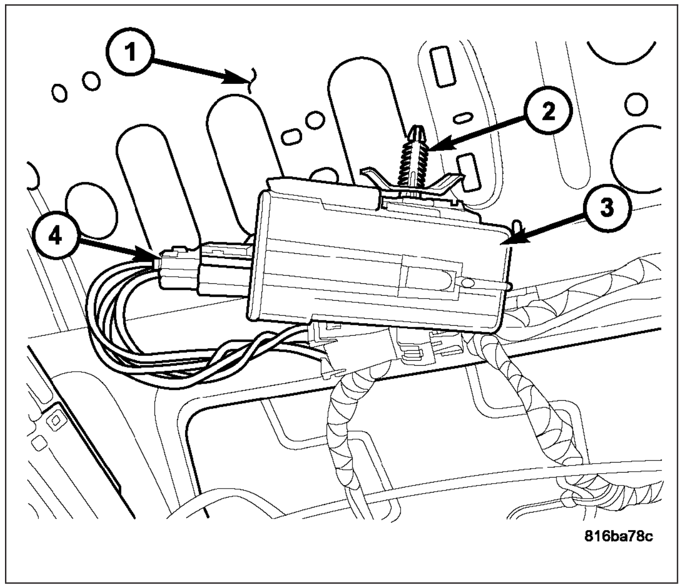
Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

NOTE: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.7v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the heated seat system is attempted, the battery should be fully-charged.

REMOVAL

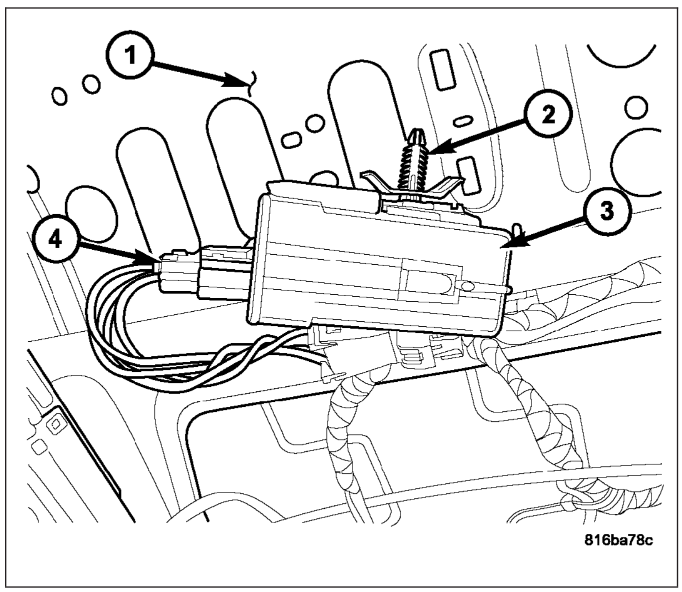
CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.



1. Position the right front seat to the full rearward position.
2. Disconnect and isolate the battery negative cable.
3. Disconnect the wire harness connector (4) from the heated seat module (3).
4. Unsnap the heated seat module retaining tab (2) from the seat pan (1).
5. Remove the heated seat module (3) from the vehicle.

INSTALLATION

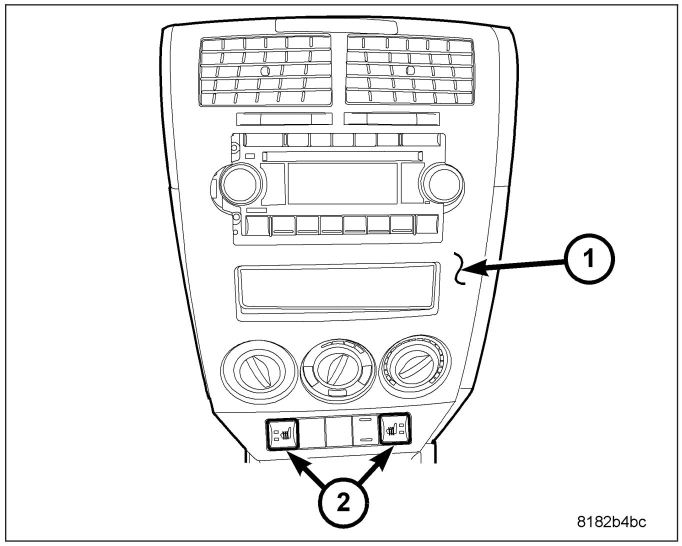
CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.



1. Install the heated seat module (3) into the vehicle.
2. Position the retaining tab (2) with the mounting hole in the seat pan (1). Firmly apply even pressure to the module (3) until the mounting tab is fully seated.
3. Connect the wire harness connector (4) to the heated seat module (3).
4. Connect the battery negative cable.
5. Check for proper heated seat system operation.

SWITCH-HEATED SEAT

DESCRIPTION



The heated seat switches are located in the center stack (1) of the instrument panel. The switches are located on the outer edges of the accessory switch bank (2). If either of the switches is damaged or inoperative the complete accessory switch bank assembly must be replaced.

When either of the heated seat switches are depressed a switch status message is sent to the Cab Compartment Node (CCN) or instrument cluster via the Local Interface Network (LIN) data bus. The CCN then sends a message via the LIN data bus to the heated seat module, signaling the module to energize the heating element for the selected seat. Amber Light Emitting Diodes (LEDs) in the top portion of each switch indicate the level of heat in use: Two LEDs are illuminated for high, one for low, and none for off. The heated seat module sends the LED illumination message to the CNN via the LIN data bus. The CNN then sends the LED illumination message to the accessory switch bank so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

The LED indicator lamps in each heated seat switch cannot be repaired. If the LED lamps are inoperative or damaged, or the switch is inoperative or damaged the complete accessory switch bank assembly must be replaced.

OPERATION

The heated seat switches are active any time the Local Interface Network (LIN) data bus is active. Depressing the heated seat switch provides a switch status message to the Cabin Compartment Node (CCN) via the LIN data bus. The CCN is responsible for supplying the LIN data bus message to the heated seat module, signaling the module to power the heated seat element of the selected seat and maintain the temperature setting. If the heated seat switch is depressed to a different position (Low or High) than the currently selected state, the CCN will go through the process again to change the temperature setting.

DIAGNOSIS AND TESTING

HEATED SEAT SWITCH

In order to obtain conclusive testing, the heated seat system and the Local Interface Network (LIN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

NOTE: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.0v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

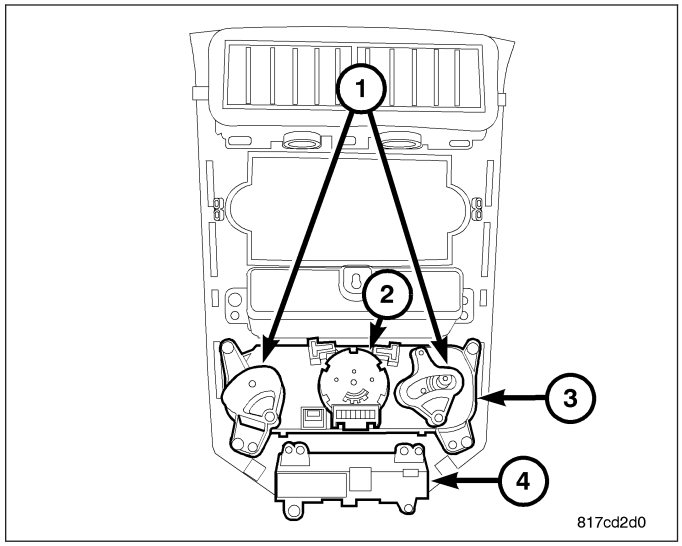
Before any testing of the heated seat system is attempted, the battery should be fully-charged.

REMOVAL

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: The heated seat switches are integral to the accessory switch bezel and cannot be serviced separately.

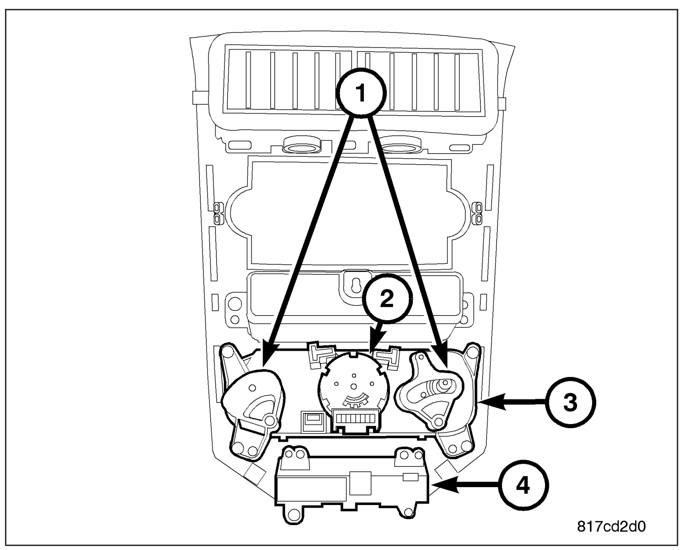
1. Disconnect and isolate the negative battery cable.
2. Remove the center bezel from the instrument panel and place it on a work bench (Refer to 23 - BODY/ INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).
3. Remove the screws that secure the accessory switch bank (4) to the back of the center bezel and remove the accessory switch bank.



INSTALLATION

NOTE: There are different instrument panel accessory switch banks available based on the option content of the vehicle. Ensure the accessory switch bank being installed matches the vehicle options.

1. Position the accessory switch bank (4) onto the back of the instrument panel center bezel.
2. Install the screws that secure the accessory switch bank to the center bezel. Tighten the screws to 1N·m (8 in. lbs.).
3. Install the center bezel onto the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - INSTALLATION).
4. Reconnect the negative battery cable.
5. Verify heated seat system operation.



HORN

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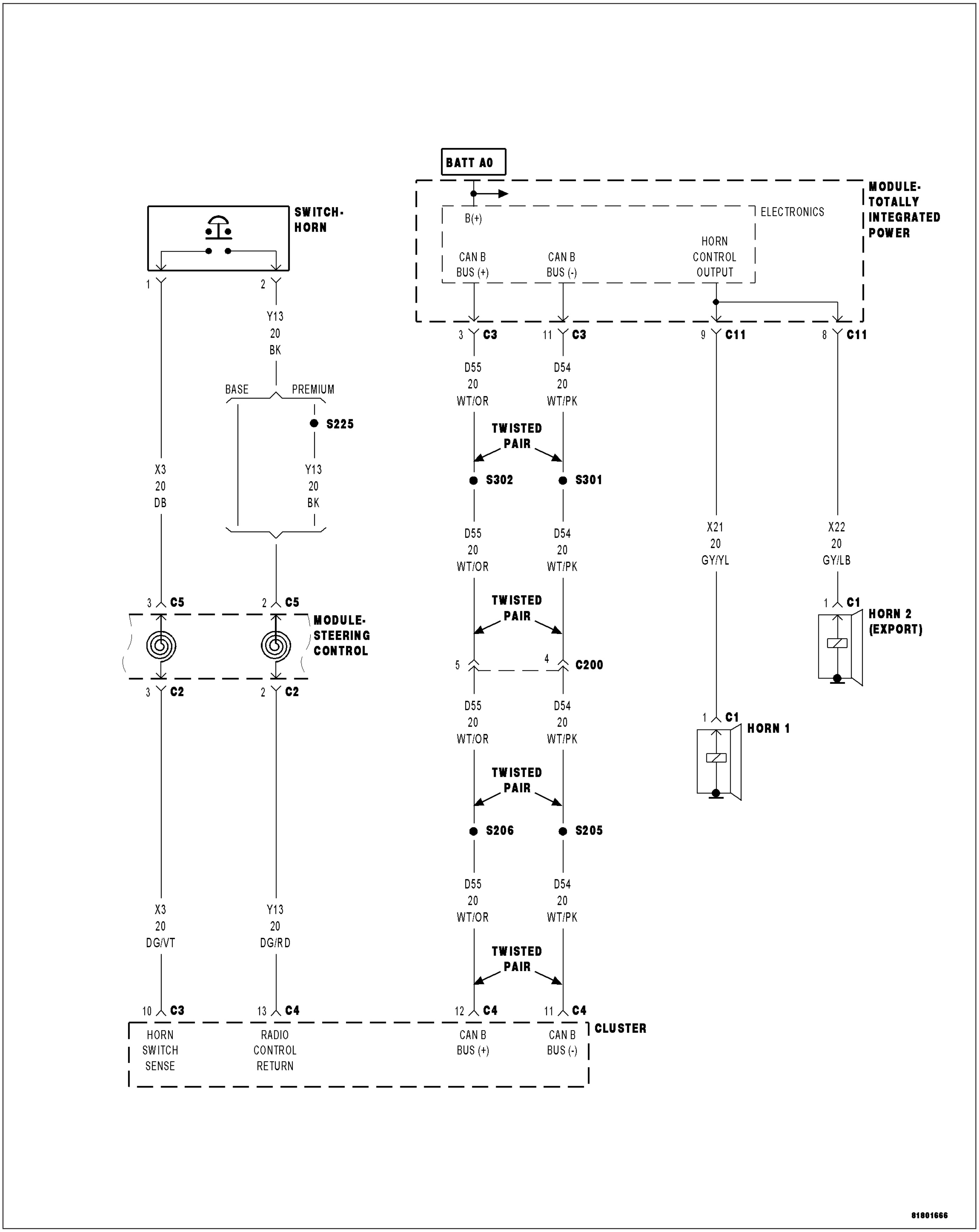
HORN SYSTEM - ELECTRICAL DIAGNOSTICS

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HORN SYSTEM - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B2336–HORN CONTROL CIRCUIT LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  A shorted low condition on the (X21)/(X22) Horn Control Output circuit.

Possible Causes
(X21) HORN CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
(X22) HORN CONTROL OUTPUT CIRCUIT SHORTED TO GROUND (EXPORT)
TIPM

Diagnostic Test

1. VERIFY DTC B2336–HORN CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, erase TIPM DTCs.

Operate the Horn Switch several times.

With the scan tool, read TIPM DTCs.

Does the scan tool display active DTC B2336-HORN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

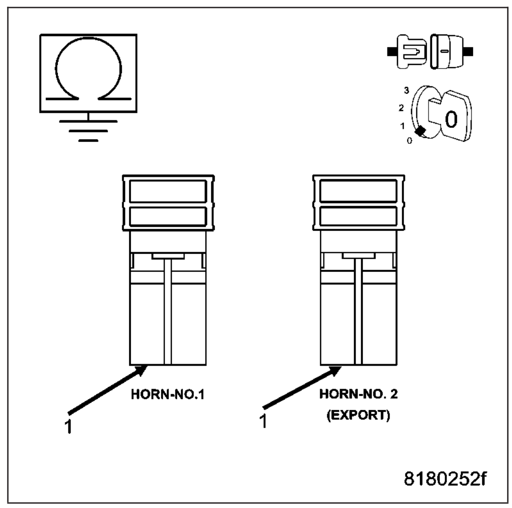
2. (X21)/(X22) HORN CONTROL OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition off

Disconnect the horn connector(s).

Disconnect the C11 TIPM harness connector.

Measure the resistance between ground and the Horn Control Output circuit(s) at the horn connector(s).



Is the resistance below 100 ohms?

Yes >> Repair the (X21)/(X22) Horn Control Output circuit for a short to ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

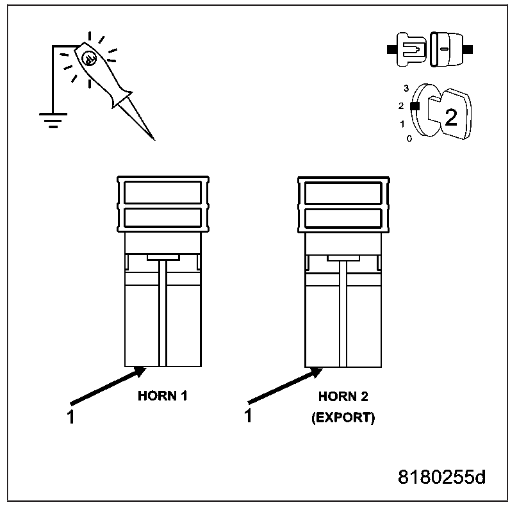
3. HORN

Connect the C11 TIPM harness connector.

Turn the ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate the Horn.

With a 12-volt test light connected to ground, probe the Horn Control Output circuit at the Horn connector(s).



Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Horn(s) as necessary per Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

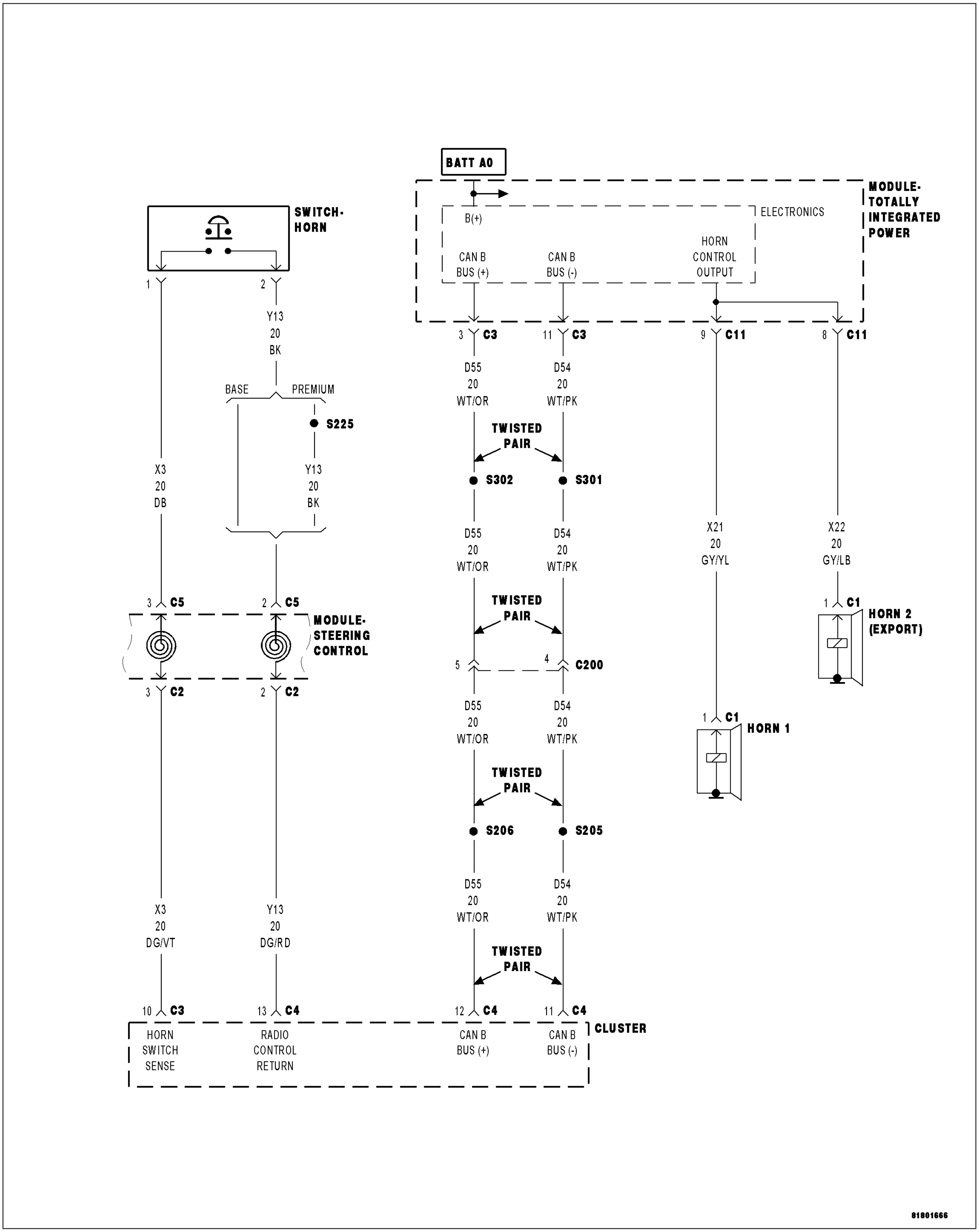
Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2337–HORN CONTROL CIRCUIT HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  A shorted high condition in the (X21)/(X22) Horn Control Output circuit.

Possible Causes
(X21) HORN CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
(X22) HORN CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE (EXPORT)
EXCESSIVE RESISTANCE IN THE HORN OR CASE GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B2337 – HORN CONTROL CIRCUIT HIGH IN THE TIPM

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Horn Switch several times.

With the scan tool, read DTC's.

Does the scan tool display active DTC B2337– HORN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. CHECKING THE HORN(S)

Turn the ignition off.

Disconnect the Horn(s) connector(s).

Momentarily jumper 12-volts to the horn(s).

Did the horn(s) operate properly?

Yes >> Go To 4

No >> Go To 3

3. CASE GROUND CIRCUIT OPEN

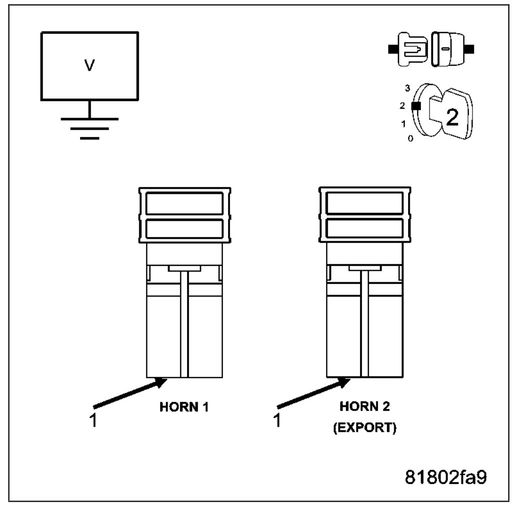
Using a 12-volt test light connected to 12-volts, check for a good case ground at the horn(s) case.

Does the test light illuminate brightly?

Yes >> Replace the Horn(s) as necessary.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or excessive resistance at the horn(s) case ground.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (X21)/(X22) HORN CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE



Turn the ignition off

Disconnect the C11 TIPM harness connector.

Ignition on, engine not running.

Measure the voltage between (X21)/(X22) Horn Control Output circuit(s) and ground at the horn connector(s).

Is there any voltage present?

Yes >> Repair the short to battery voltage in the (X21)/(X22) Horn Control Output circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

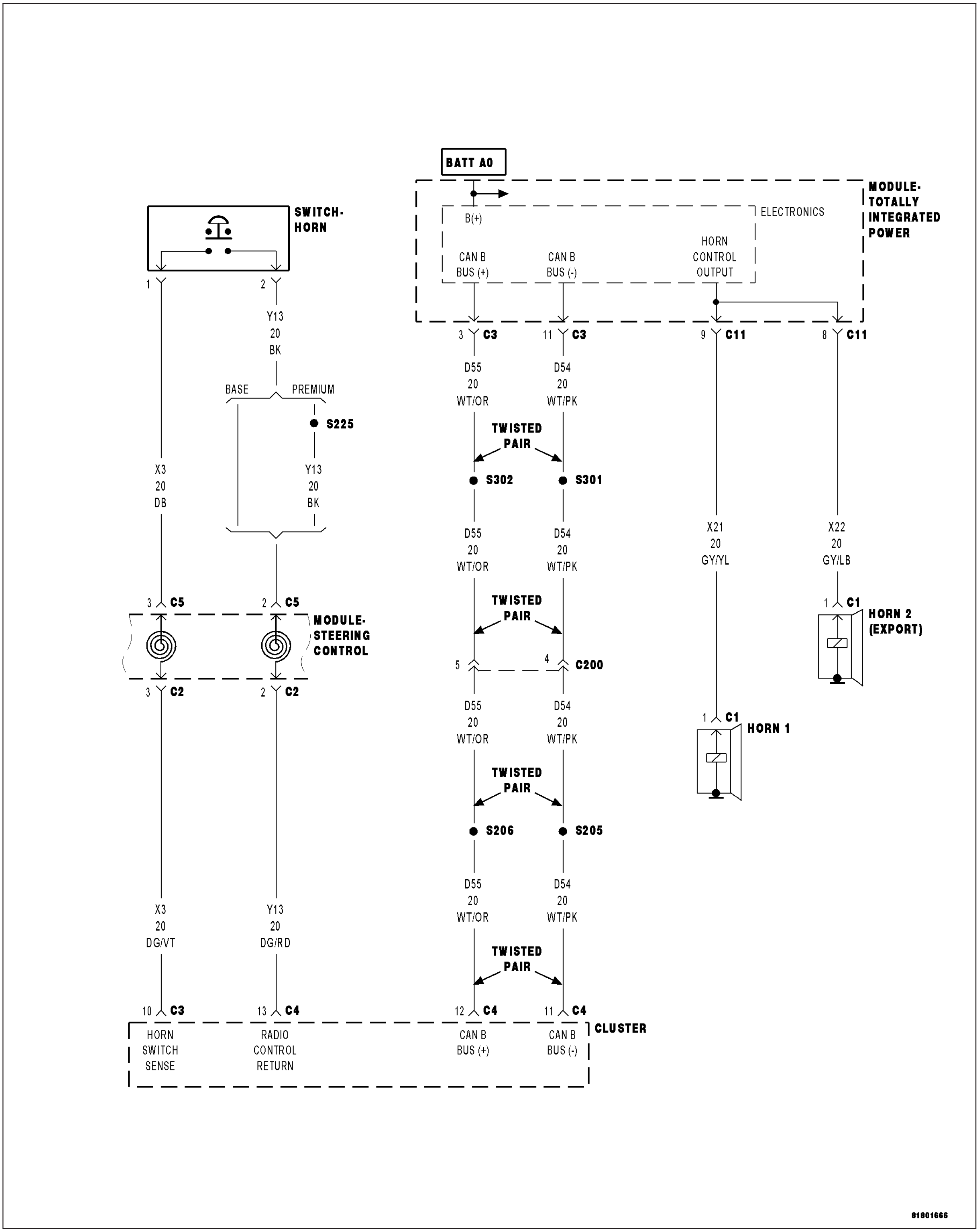
Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2338–HORN CONTROL CIRCUIT OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  An open condition on the (X21)/(X22) Horn Control Output circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
(X21) HORN CONTROL OUTPUT CIRCUIT OPEN
(X22) HORN CONTROL OUTPUT CIRCUIT OPEN (EXPORT)
HORN CASE GROUND
HORN
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B2338–HORN CONTROL CIRCUIT OPEN

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the horn switch several times.

With the scan tool, read DTC's.

Does the scan tool display active DTC B2338–HORN CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

Turn the ignition off.

Inspect the following connector terminal condition. Check for signs of corrosion build up or damage that would compromise the terminal to controller pin connector.

NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.

Disconnect the horn connectors.

Disconnect the C11 TIPM harness connector.

Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

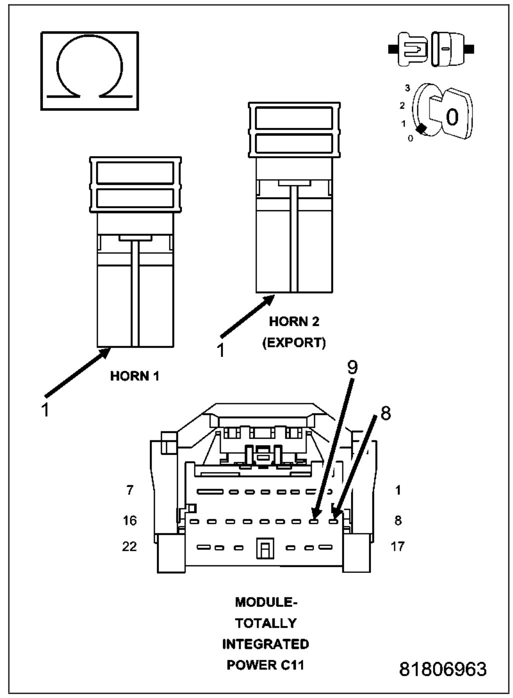
No >> Go To 3

3. (X21)/(X22) HORN CONTROL OUTPUT CIRCUIT OPEN

NOTE: Cavity 8 at the C11 TIPM harness connector is for export vehicles only.

Turn the ignition off

Measure the resistance of the (X21)/(X22) Horn Control Output circuit between the C11 TIPM harness connector and the Horn connector(s).



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X21)/(X22) Horn Control Output circuit for an open.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

4. CHECKING HORN OPERATION

Turn the ignition off.

Disconnect the horn(s) connector(s) if not disconnected.

Momentarily jumper 12-volts to the horn(s).

Did the horn(s) operate properly?

Yes >> Go To 6

No >> Go To 5

5. CASE GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check for a good case ground at the horn(s) case.

Does the test light illuminate brightly?

Yes >> Replace the Horn(s) as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or excessive resistance at the horn(s) case ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

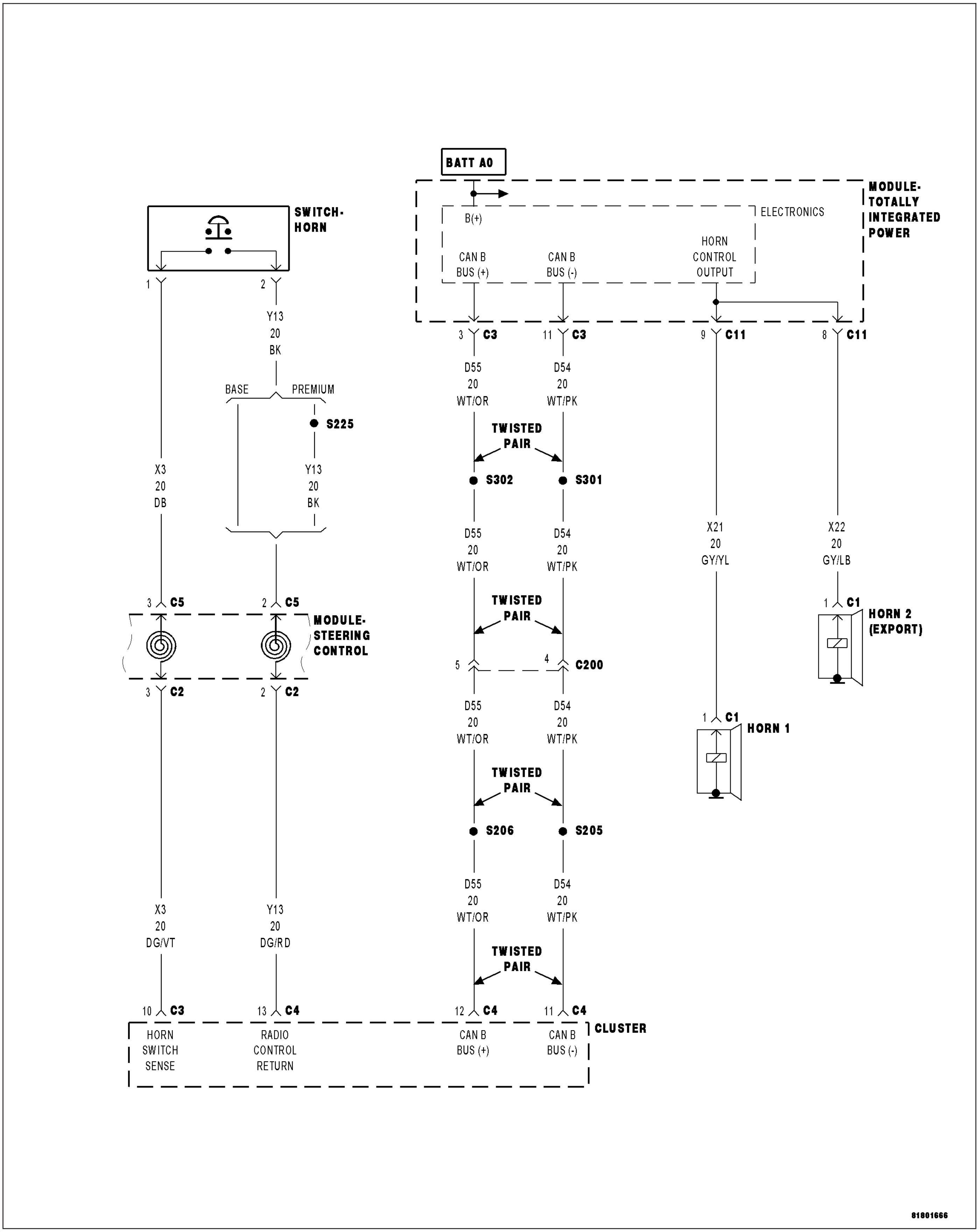
Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2339 - HORN SWITCH STUCK – CCN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Cluster senses that the Horn switch is in the Set position for greater than 50 seconds.

Possible Causes
HORN SWITCH
CLOCKSPRING
(X3) HORN SWITCH SENSE CIRCUIT SHORTED TO GROUND
CLUSTER

Diagnostic Test

1. VERIFY DTC B2339 – HORN SWITCH STUCK IS ACTIVE

With the scan tool, erase CCN DTCs.

Operate the Horn Switch several times.

Wait 1 minute.

With the scan tool, read CCN DTCs.

Does the scan tool display active DTC B2339 - HORN SWITCH STUCK?

Yes >> Go To 2

No >> Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. HORN SWITCH

WARNING: Turn the ignition off, disconnect the battery and wait two minutes before proceeding.

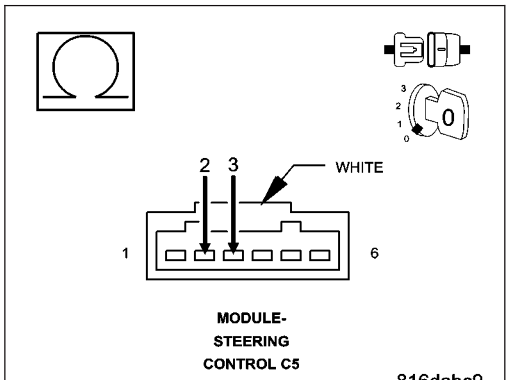
WARNING: Do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed, and could results in serious or fatal injury.

Remove the Driver Airbag in accordance with the Service information.

Disconnect the Steering Control Module C5 connector.

NOTE: Before proceeding, thoroughly inspect the wiring harness and connectors between the Horn Switch for a short to ground or to any other circuit.

Measure the resistance between the (X3) Horn Switch Sense circuit at the C5 connector to the Radio Control Return.



816dabc9

Is the resistance below 5.0 ohms?

Yes >> Replace the Horn Switch in accordance with the Service Information.

No >> Go to 3

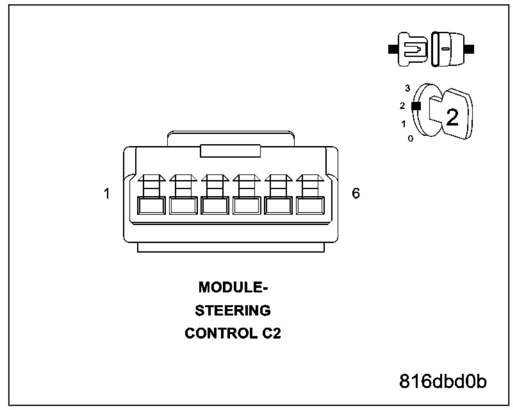
3. CLOCKSPRING

Disconnect the Steering Control Module C2 connector.

With the scan tool, erase CCN DTCs.

Wait 1 minute.

With the scan tool, read CCN DTCs.



Does the scan tool display active DTC B2339 - HORN SWITCH STUCK?

Yes >> Go To 4

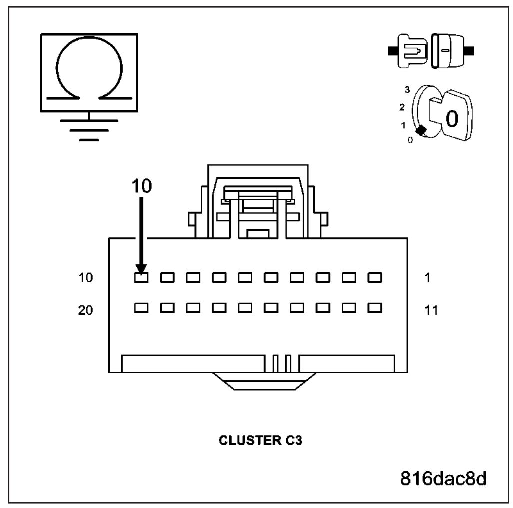
No >> Replace the Steering Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (X3) HORN SWITCH SIGNAL CIRCUIT SHORT TO GROUND

Disconnect the Cluster C3 connector.

Measure the resistance between ground and the (X3) Horn Switch circuit.



Is the resistance below 5.0 ohms?

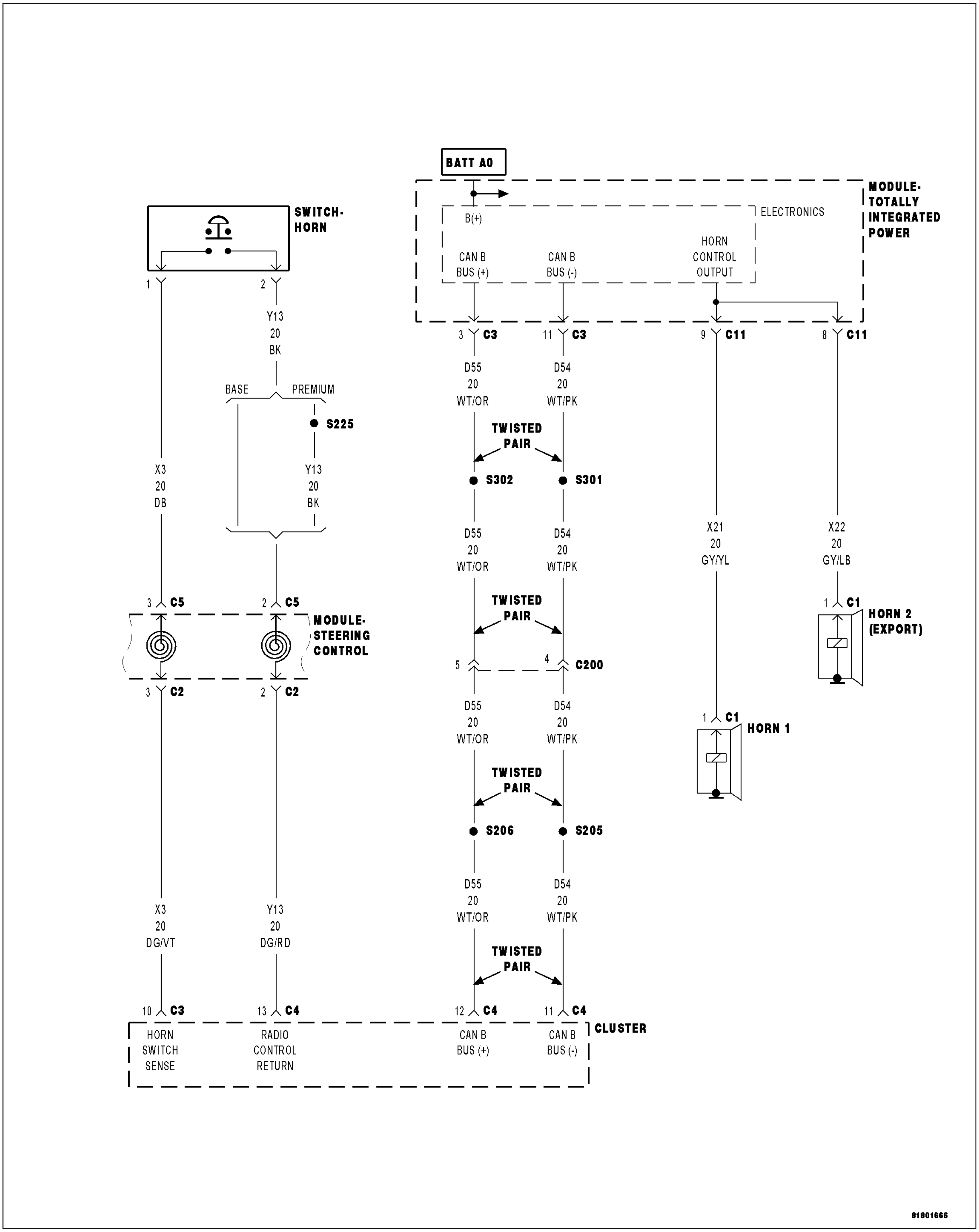
Yes >> Repair the (X3) Horn Switch circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2371–HORN CONTROL CIRCUIT OVERCURRENT (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  An overcurrent condition in the (X21)/(X22) Horn Control Output circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
(X21) HORN CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
(X22) HORN CONTROL OUTPUT CIRCUIT HIGH RESISTANCE (EXPORT)
HORN CASE GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC B2371 HORN CONTROL CIRCUIT OVERCURRENT

Turn the ignition on.

With the scan tool, record and erase DTC's.

Operate the Horn Switch several times.

With the scan tool, read DTC's.

Does the scan tool display active DTC B2371-HORN CONTROL CIRCUIT OVERCURRENT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

Turn the ignition off.

Inspect the following connector terminal condition. Check for signs of corrosion build up or damage that would compromise the terminal to controller pin connector.

NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.

Disconnect the Horn connectors.

Disconnect the C11 TIPM harness connector.

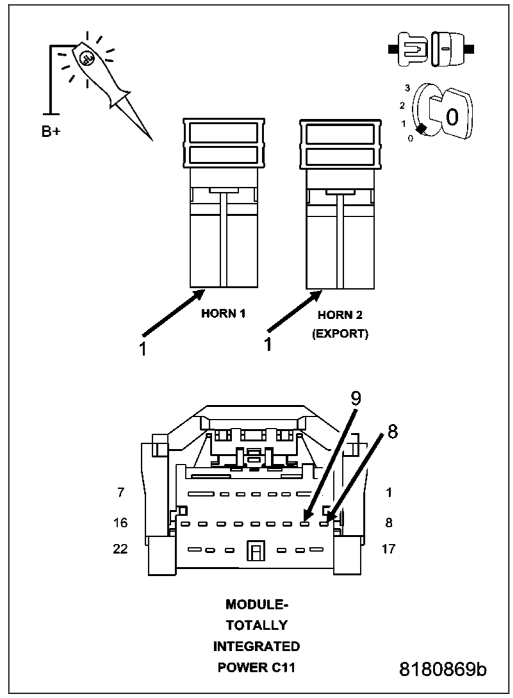
Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. (X21)/(X22) HORN CONTROL OUTPUT CIRCUIT HIGH RESISTANCE



With a jumper wire, connect one end to the (X21) Horn Control Output circuit at the Horn connector and the other to a clean chassis ground.

Using a 12-volt test light to battery voltage, probe the (X21) Control Output circuit in the C11 TIPM harness connector.

NOTE: Cavity 8 at the C11 TIPM harness connector is for export vehicles only.

NOTE: If this is an export vehicle, follow the previous steps for the (X22) Horn Control Circuit also.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance in the Horn Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

4. CHECKING HORN OPERATION

Turn the ignition off.

Disconnect the horn(s) connector(s) if not disconnected.

Momentarily jumper 12-volts to the horn(s).

Did the horn(s) operate properly?

Yes >> Go To 6

No >> Go To 5

5. CASE GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check for a good case ground at the horn(s) case.

Does the test light illuminate brightly?

Yes >> Replace the Horn(s) as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or excessive resistance at the horn(s) case ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

6. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

HORN SYSTEM - SERVICE INFORMATION

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HORN SYSTEM - SERVICE INFORMATION

DESCRIPTION

A single note (domestic) or dual note (export) electric horn system is installed on this vehicle.

The horn system features electromagnetic horn(s). The horn system includes the following major components:

- **Horn** - The horn(s) are located on the left and right side frame rail.
- **Horn Relay** - The horn relay is located in the Junction Block (JB).
- **Horn Switch** - The horn switch is located under the driver airbag.

OPERATION

The horn system operates on battery current received through a fuse in the Totally Integrated Power Module (TIPM). The horn system circuit is designed so that the system will remain operational, regardless of the ignition switch position.

DIAGNOSIS AND TESTING - HORN SYSTEM

HORN SYSTEM TEST TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
HORN SOUNDS CONTINUOUSLY. NOTE: IMMEDIATELY UNPLUG HORN AND RELAY IN THE JUNCTION BLOCK	1. INOPERATIVE HORN RELAY.	1. REPLACE RELAY, IF INOPERATIVE
	2. HORN CONTROL CIRCUIT TO RELAY SHORTED TO GROUND.	2. CHECK TERMINAL 65 IN TIPM FOR CONTINUITY TO GROUND INDICATES: A. WIRING HARNESS SHORTED TO GROUND. B. FIND THE SHORT AND REPAIR AS NECESSARY.
	4. PINCHED HORN SWITCH WIRE UNDER DRIVER AIRBAG MODULE.	4. REPLACE DRIVER AIRBAG.
	5. INOPERATIVE HORN SWITCH	5. REPLACE DRIVER AIRBAG.
HORN SOUNDS INTERMITTENTLY AS THE STEERING WHEEL IS TURNED.	1. HORN RELAY CONTROL CIRCUIT X3 IS SHORTED TO GROUND INSIDE STEERING WHEEL.	1. REMOVE DRIVER AIRBAG AND CHECK FOR RUBBING OR LOOSE WIRE/CONNECTOR, REPAIR AS NECESSARY.
	2. PINCHED HORN SWITCH WIRE UNDER DRIVER AIRBAG.	2. REPLACE DRIVER AIRBAG.
	3. INOPERATIVE HORN SWITCH.	3. REPLACE DRIVER AIRBAG.
HORN DOES NOT SOUND	1. CHECK FUSE 23 IN THE TIPM.	1. REPLACE FUSE IF INOPERATIVE.
	2. NO VOLTAGE AT HORN RELAY TERMINALS 62 & 66 AND FUSE IS OK.	2. NO VOLTAGE, REPAIR TIPM AS NECESSARY.
	3. OPEN CIRCUIT FROM TERMINAL 65 OF THE RELAY TO HORN SWITCH X3 CIRCUIT.	3. REPAIR CIRCUIT AS NECESSARY.

CONDITION	POSSIBLE CAUSE	CORRECTION
	4. INOPERATIVE OR DAMAGED HORN.	4. VOLTAGE AT HORN WHEN HORN SWITCH IS PRESSED, REPLACE HORN.
	5. INOPERATIVE HORN SWITCH	5. REPLACE DRIVER AIRBAG.
FUSE BLOWS WHEN HORN IS BLOWN	1. SHORT CIRCUIT IN HORN OR HORN WIRING	1. REMOVE HORN RELAY, CHECK FOR SHORTED HORN OR HORN WIRING. DISCONNECT HORN WIRE HARNESS TO ISOLATE SHORT AND REPAIR AS NECESSARY.
FUSE BLOWS WITHOUT BLOWING HORN NOTE: FOR WIRING REPAIRS REFER TO GROUP 8W, WIRE DIAGRAMS.	1. SHORT CIRCUIT	1. REMOVE RELAY, INSTALL NEW FUSE, IF FUSE DOES NOT BLOW REPLACE HORN RELAY. IF FUSE BLOWS WITH RELAY REMOVED, CHECK FOR SHORT TO GROUND WITH OHMMETER BETWEEN TERMINALS 62 & 66 AND THE FUSE TERMINAL. REPAIR AS NECESSARY.

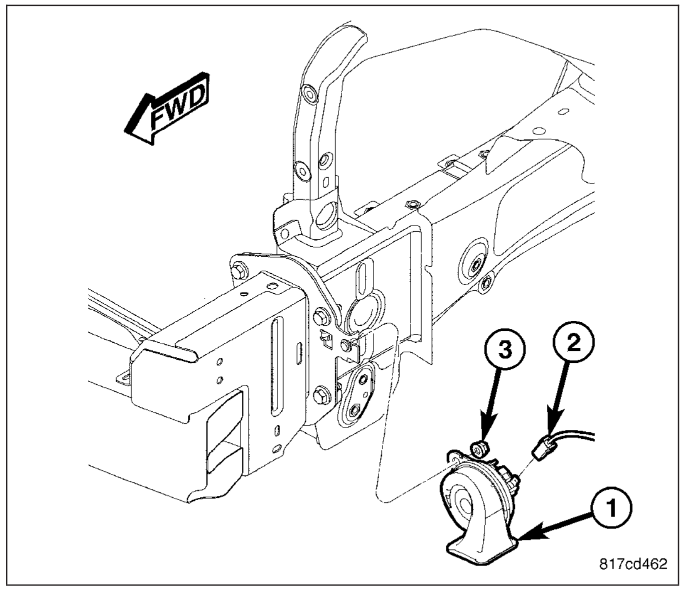
HORN

DIAGNOSIS AND TESTING - HORN

1. Disconnect wire connector at horn.
2. Using a voltmeter, connect one lead to ground terminal and the other lead to the positive wire terminal.
3. Depress the horn switch, battery voltage should be present.
4. If no voltage, (Refer to 8 - ELECTRICAL/HORN - DIAGNOSIS AND TESTING). If voltage is OK, go to Step 5.
5. Using ohmmeter, test ground wire for continuity to ground.
6. If no ground repair as necessary.
7. If wires test OK and horn does not sound, replace horn.

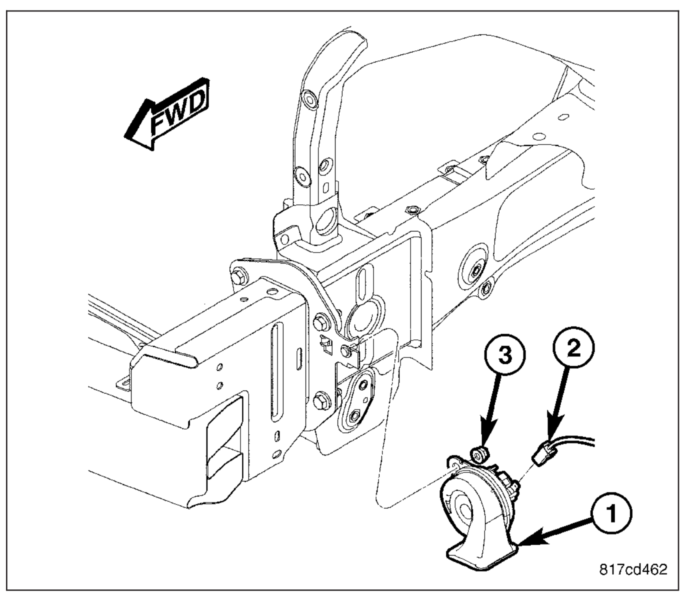
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the left or right front wheelhouse splash shield.
3. Disconnect the harness connector.
4. Remove the fastener securing the horn the vehicle.



INSTALLATION

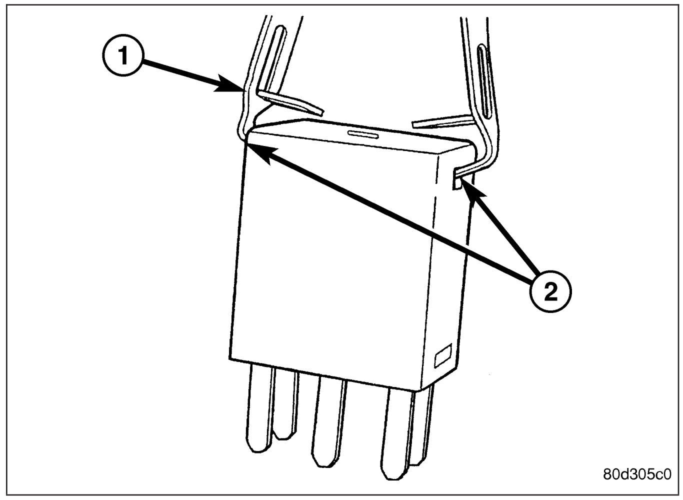
1. Install the fastener securing the horn to the vehicle.
2. Connect the harness connector.
3. Install the left or right front wheelhouse splash shield.
4. Connect the battery negative cable.



HORN RELAY

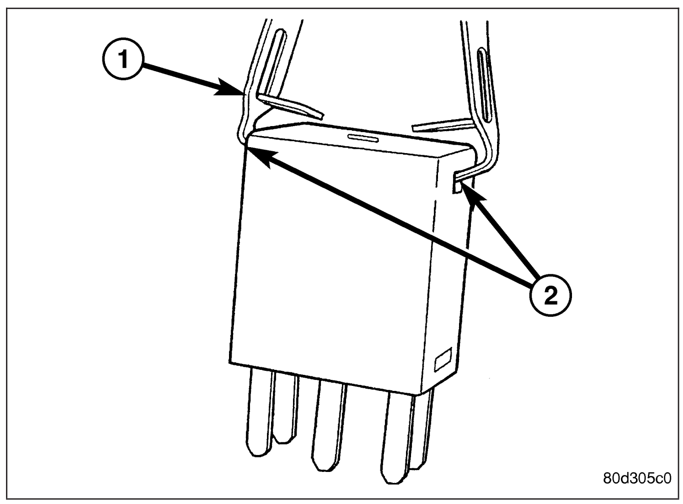
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove cover from Totally Integrated Power Module (TIPM).
3. Using special tool C-4817 (1), grip the relay (2) by the sides and pull upward with an even effort.



INSTALLATION

1. Align relay (2) with Totally Integrated Power Module (TIPM) and press into position.
2. Install cover to TIPM.
3. Connect battery negative cable.



HORN SWITCH

DESCRIPTION

WARNING:
On vehicles equipped with an airbag, refer to restraint systems for warnings and cautions before servicing the horn switch.

The horn switch is mounted inside the driver airbag. The horn switch has three contacts that are grounded when the driver airbag is depressed.

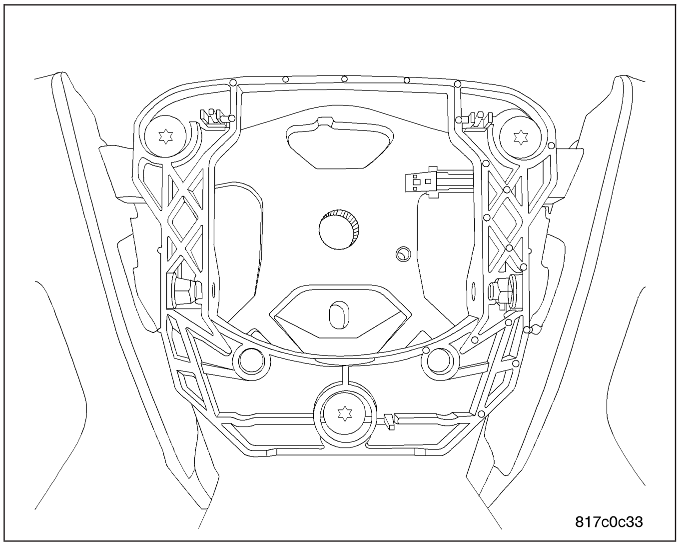
OPERATION

When the Driver Airbag Cover is pressed, the horn switch makes contact to ground. The ground signal is carried to the horn relay and the horn sounds. The horn switch grounds to the airbag housing.

REMOVAL

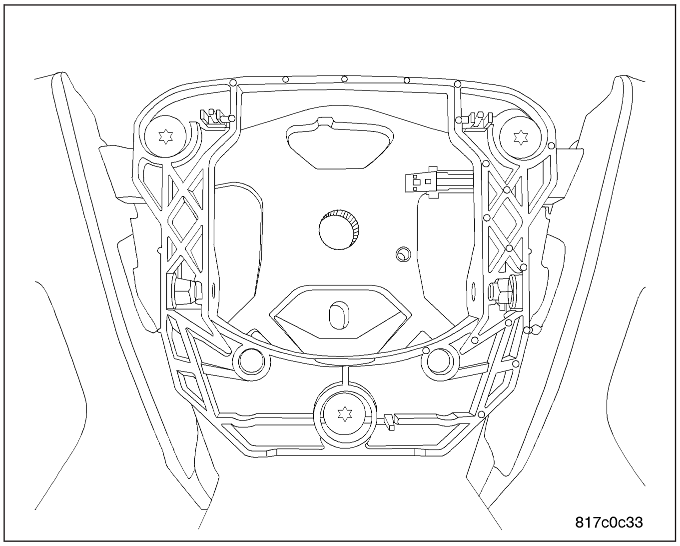
WARNING:
On vehicles equipped with an airbag, refer to restraint systems for warnings and cautions before servicing the horn switch.

1. Disconnect and isolate the battery negative cable.
2. Remove the driver airbag. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Disconnect the connector from the clockspring.
4. Remove the three mounting fasteners.
5. Remove the horn switch.



INSTALLATION

1. Install the horn switch.
2. Install the three mounting fasteners.
3. Connect the electrical connector to the clockspring.
4. Install the driver airbag. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION)
5. Connect the battery negative cable.



IGNITION CONTROL

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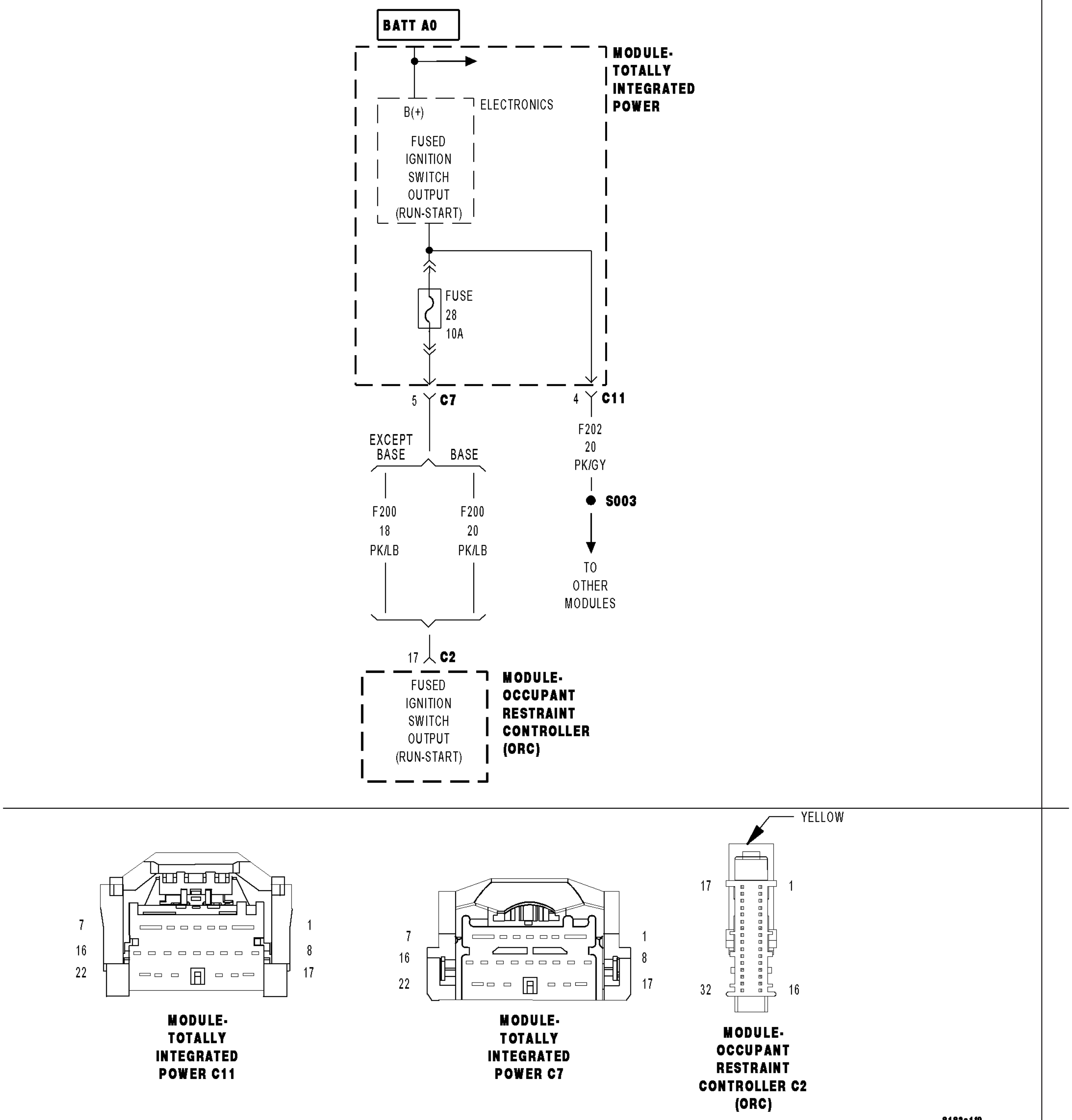
IGNITION SYSTEM - ELECTRICAL DIAGNOSTICS

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IGNITION SYSTEM - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B2104-IGNITION RUN/START CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F200) Fused Ignition Switch Output (Run-Start) circuit low.

Possible Causes
(F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO GROUND
ORC INTERNAL SHORT
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition off for a minimum of 30 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. ORC INTERNAL SHORT

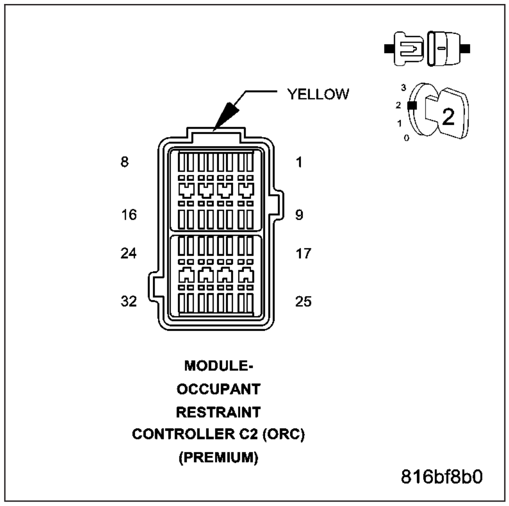
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C2 harness connector.

Turn the ignition on.

Reconnect the battery.

With the scan tool, read DTCs.



Does the scan tool display B2104-IGNITION RUN/START CONTROL CIRCUIT LOW?

Yes >> Go To 3

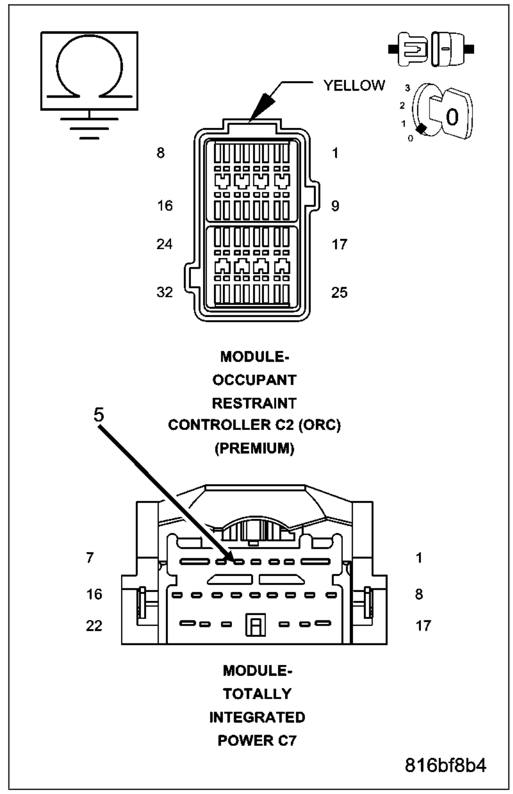
No >> Replace the ORC in accordance with the service information.
Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C7 harness connector.

Measure the resistance between ground and the (F200) Fused Ignition Switch Output (Run-Start) circuit.



Is the resistance below 10K ohms?

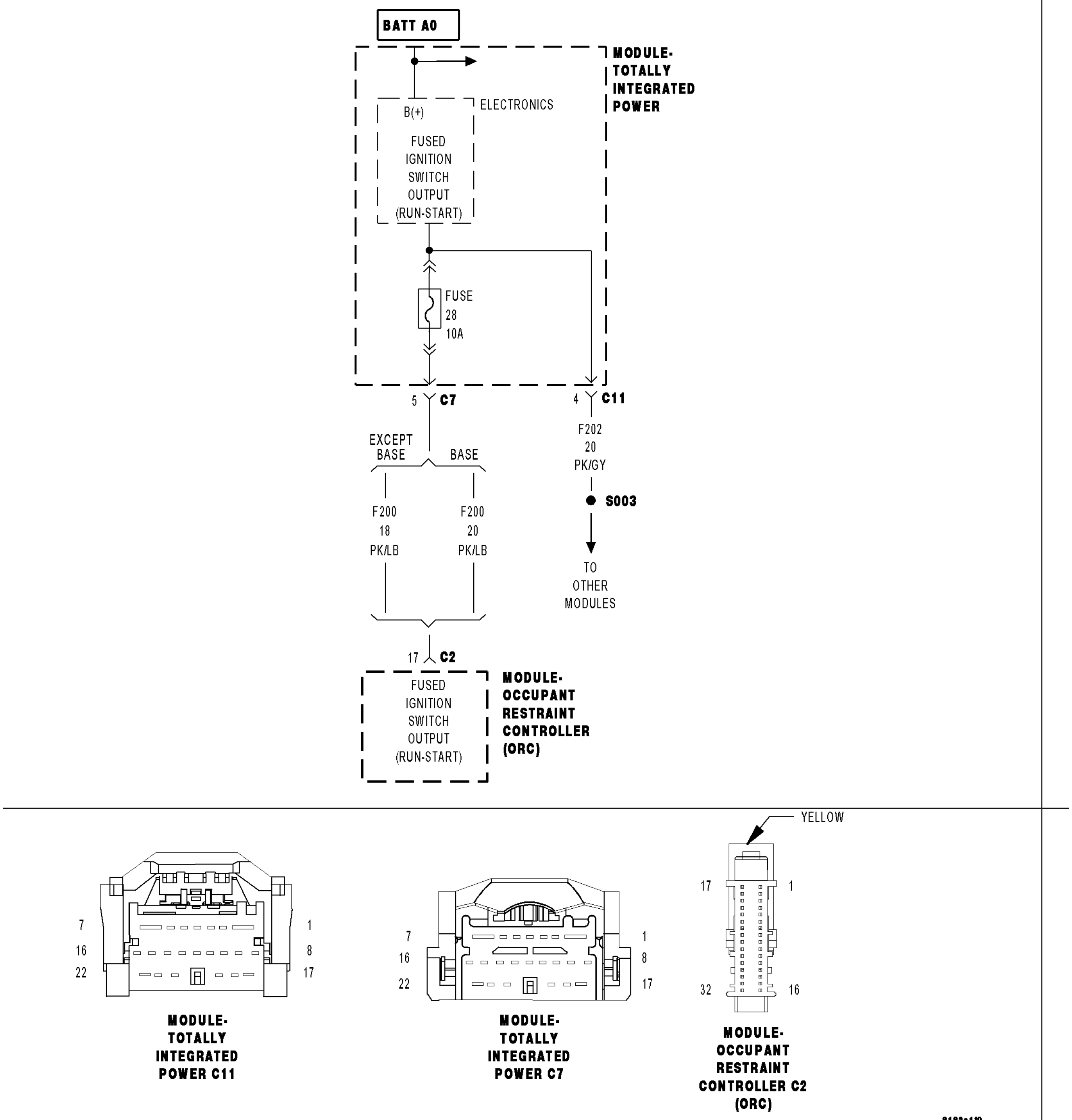
Yes >> Repair the (F200) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2105-IGNITION RUN/START CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F200) Fused Ignition Switch Output (Run-Start) circuit high.

Possible Causes
(F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO VOLTAGE
ORC
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition off for a minimum of 30 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. ORC INTERNAL SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C2 harness connector.

Turn the ignition on.

Reconnect the battery.

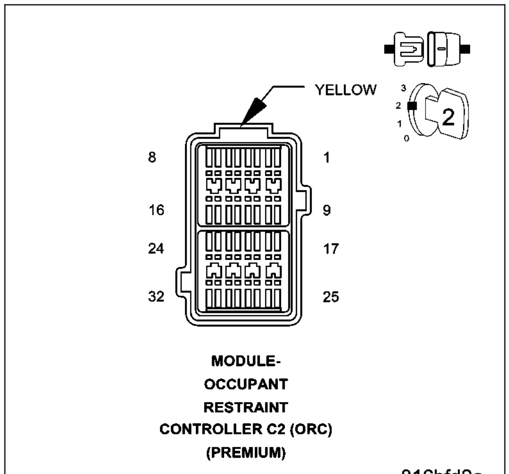
With the scan tool, read DTCs.

Does the scan tool display B2105-IGNITION RUN/START CONTROL CIRCUIT HIGH?

Yes >> Go To 3

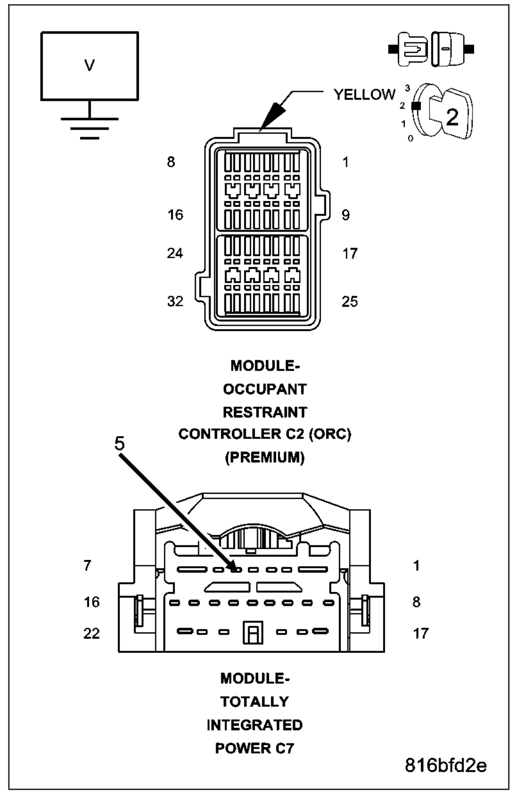
No >> Replace the ORC in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



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3. (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C7 harness connector.

Turn the ignition on.

Measure the voltage of the (F200) Fused Ignition Switch Output (Run-Start) circuit.

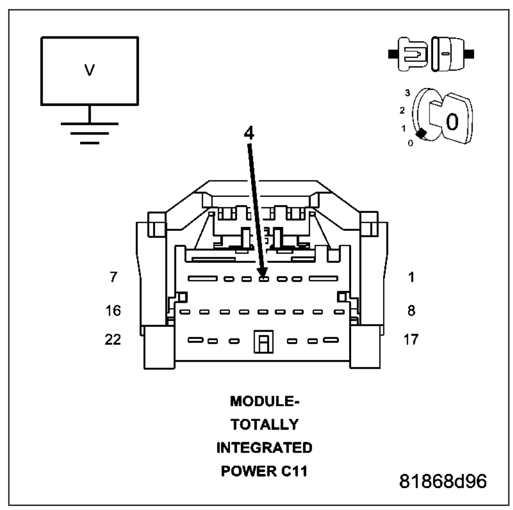
Is the voltage above 10 volts ?

Yes >> Repair the (F200) Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORT TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C11 harness connector.

Turn the ignition on.

Measure the voltage of the (F202) Fused Ignition Switch Output (Run-Start) circuit.

Is the voltage above 10 volts ?

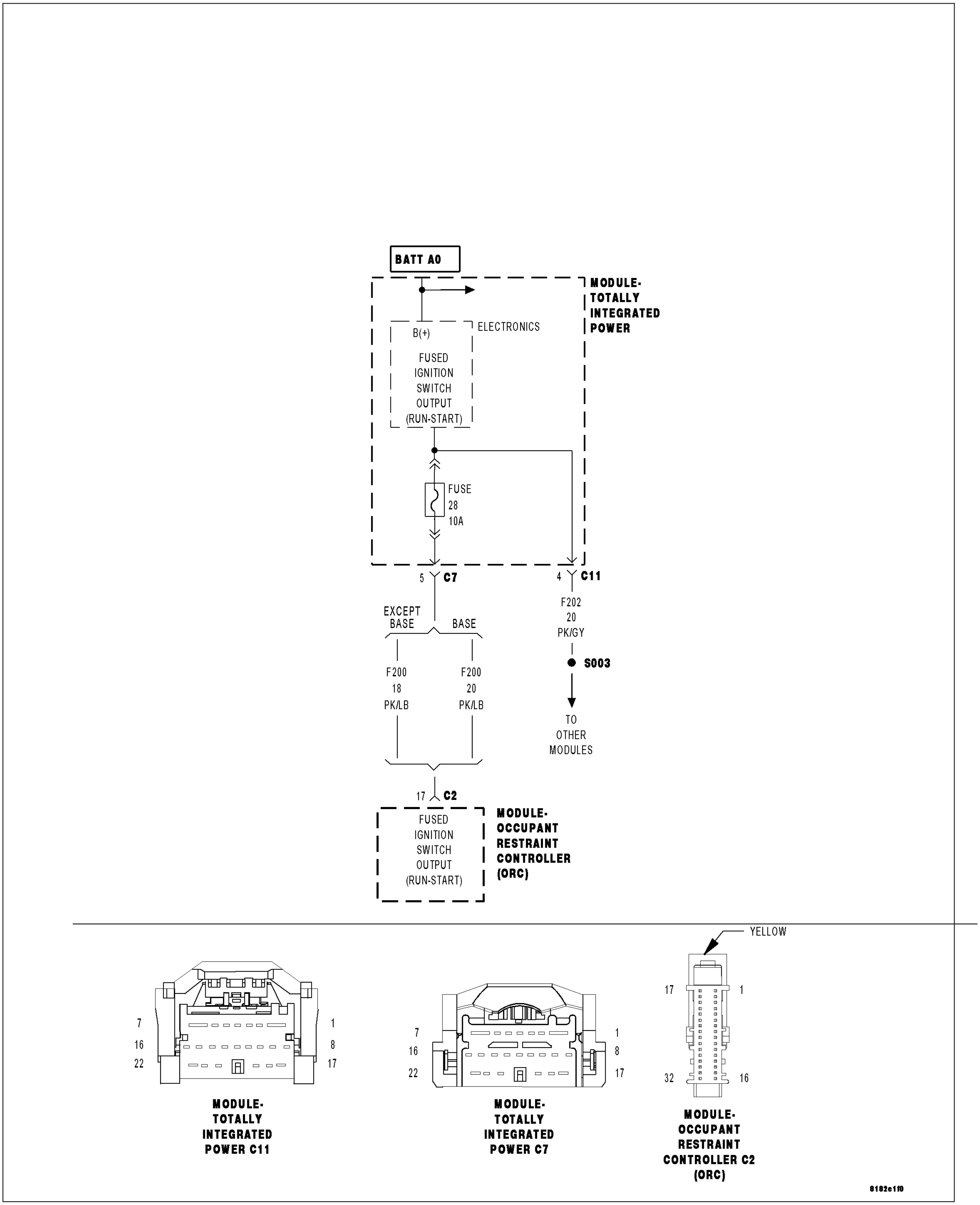
Yes >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2106-IGNITION RUN/START CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F200) Fused Ignition Switch Output (Run-Start) circuit open.

Possible Causes
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Check all fuses.

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

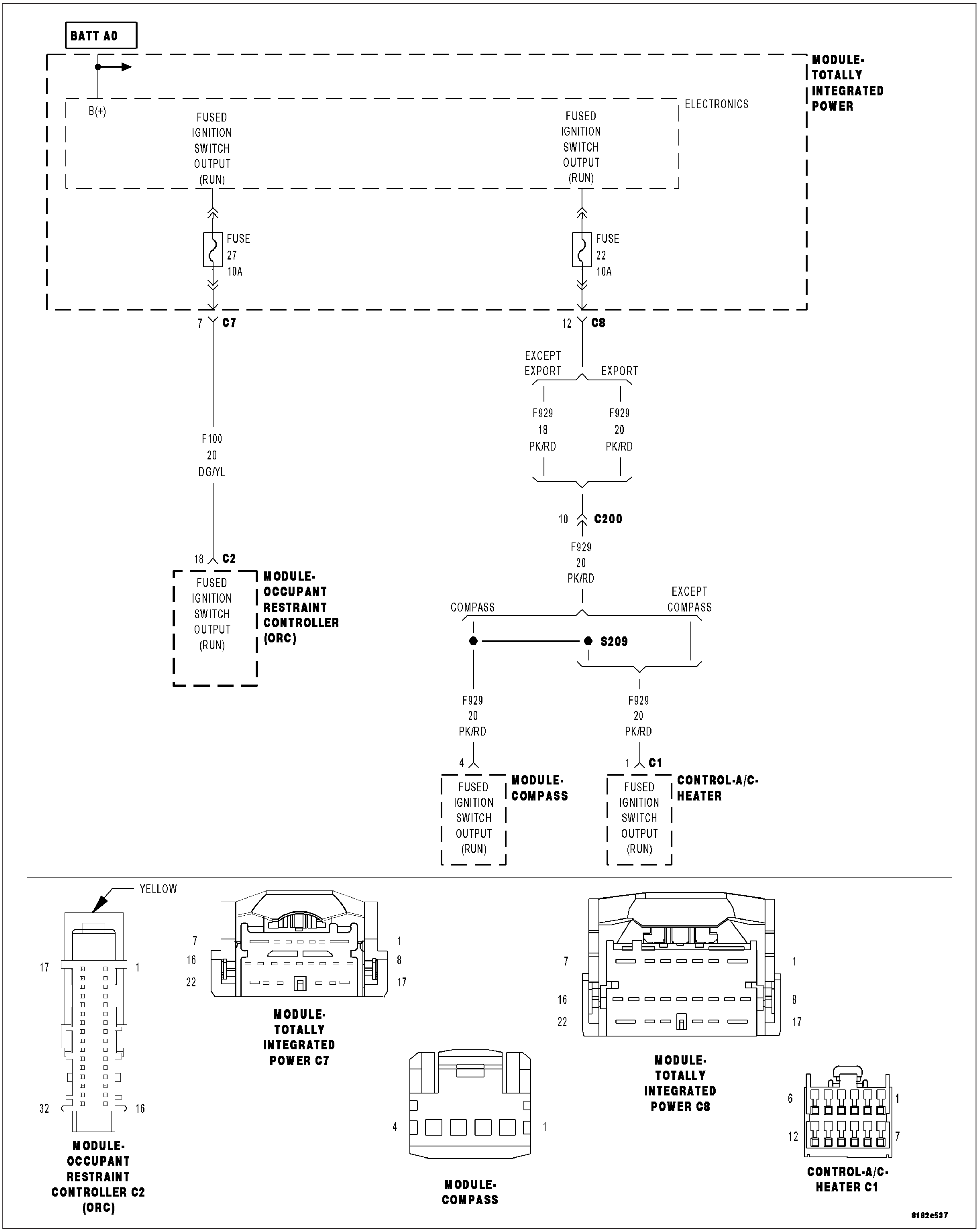
Does the scan tool display this DTC as active?

Yes >> This is an internal TIPM DTC. If this DTC is active, replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2122-IGNITION RUN CONTROL 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Low voltage on the Fused Ignition Switch Output (RUN).

Possible Causes
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Check all fuses. If any fuses are open, diagnose the appropriate circuit.

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

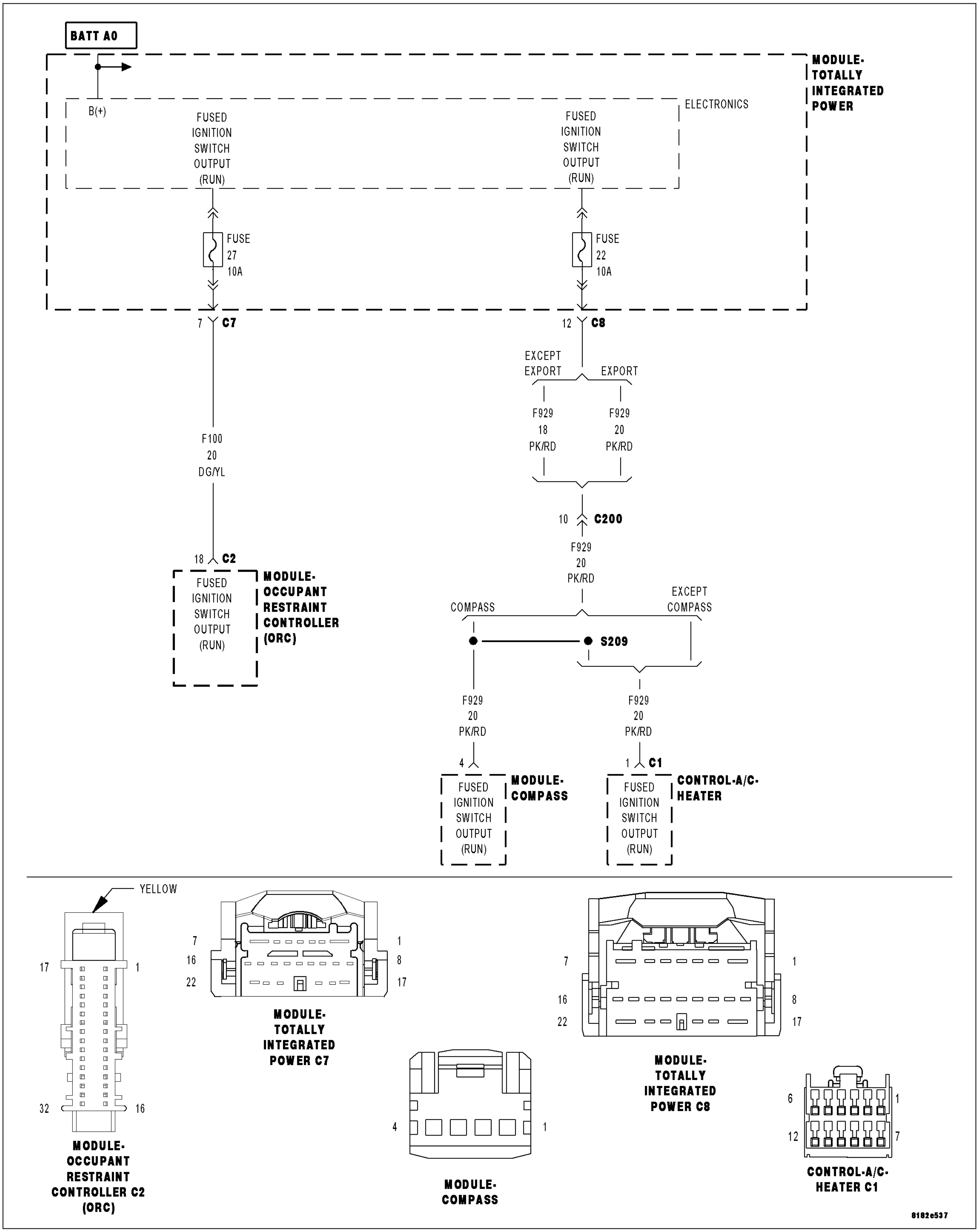
Does the scan tool display this DTC as active?

Yes >> This is an internal TIPM DTC. If this DTC is active, replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F100), (F929) Fused Ignition Switch Output (Run) circuits High.

Possible Causes
CHECK THE (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE
CHECK THE (F929) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE
ORC
COMPASS MODULE
A/C HEATER CONTROL
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK FOR ACTIVE DTC B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH WITH THE OCCUPANT RESTRAINT CONTROLLER MODULE DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Turn the ignition off.

Disconnect the ORC C2 harness connector.

Turn the ignition on.

Reconnect the battery.

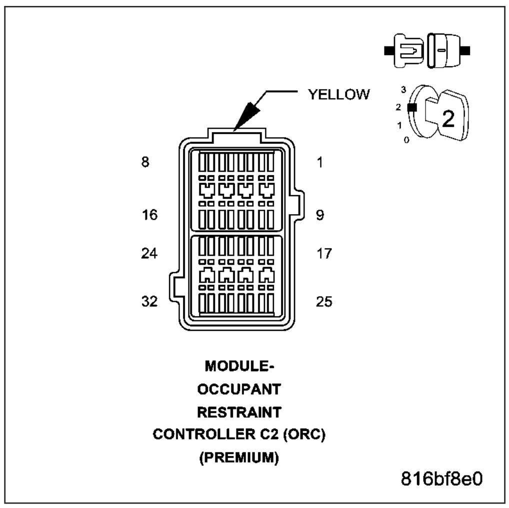
With the scan tool, read DTCs.

Does the scan tool display active: B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH?

Yes >> Go to 3

No >> Replace the Occupant Restraint Controller Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



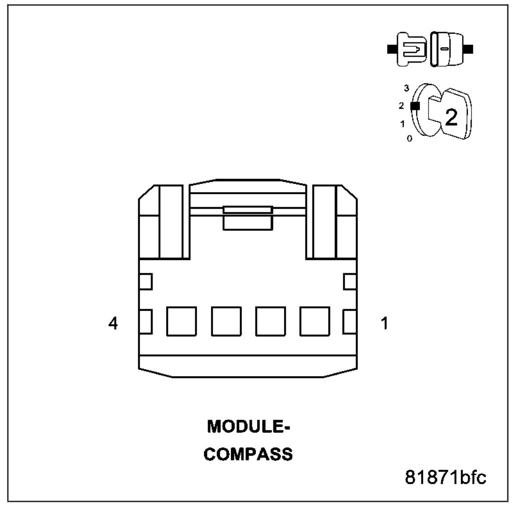
3. CHECK FOR ACTIVE DTC B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH WITH THE COMPASS MODULE DISCONNECTED

Turn the ignition off.

Disconnect the Compass Module harness connector.

Turn the ignition on.

With the scan tool, read DTCs.



Does the scan tool display active: B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH?

Yes >> Go to 4

No >> Replace the Compass Module in accordance with the service information.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

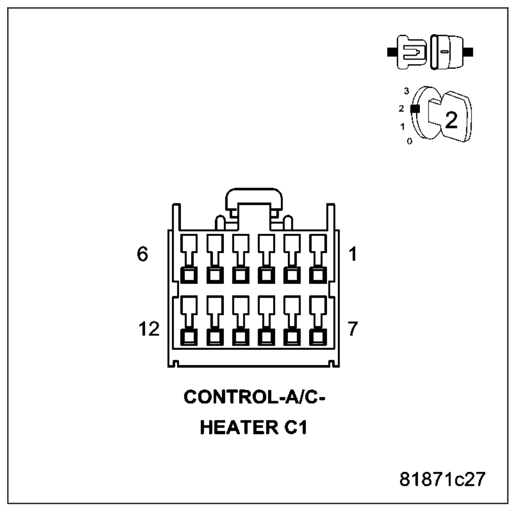
4. CHECK FOR ACTIVE DTC B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH WITH THE A/C HEATER CONTROL DISCONNECTED

Turn the ignition off.

Disconnect the A/C heater control harness connector.

Turn the ignition on.

With the scan tool, read DTCs.



Does the scan tool display active: B2123-IGNITION RUN CONTROL 1 CIRCUIT HIGH?

Yes >> Go to 5

No >> Replace the A/C Heater Control in accordance with the service information.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

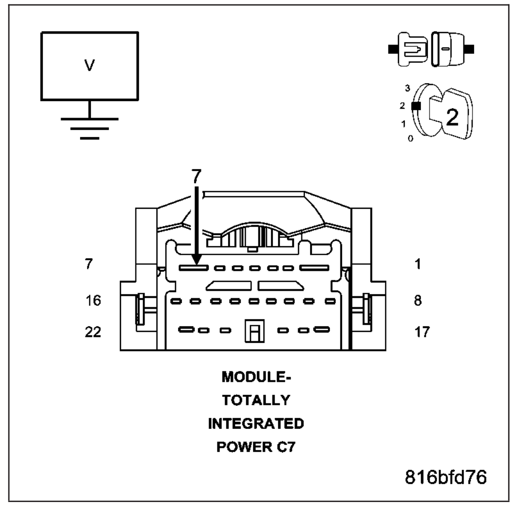
5. CHECK THE (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C7 harness connector.

Turn the ignition on.

Measure the voltage of the (F100) Fused Ignition Switch Output (RUN) circuit.



Is the voltage above 10 volts?

Yes >> Repair the (F100) Fused Ignition Switch Output (RUN) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 6

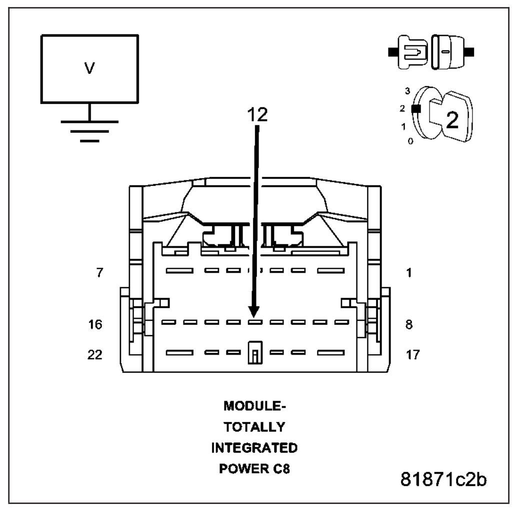
6. CHECK THE (F929) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Turn the ignition on.

Measure the voltage of the (F929) Fused Ignition Switch Output (RUN) circuit.



Is the voltage above 10 volts?

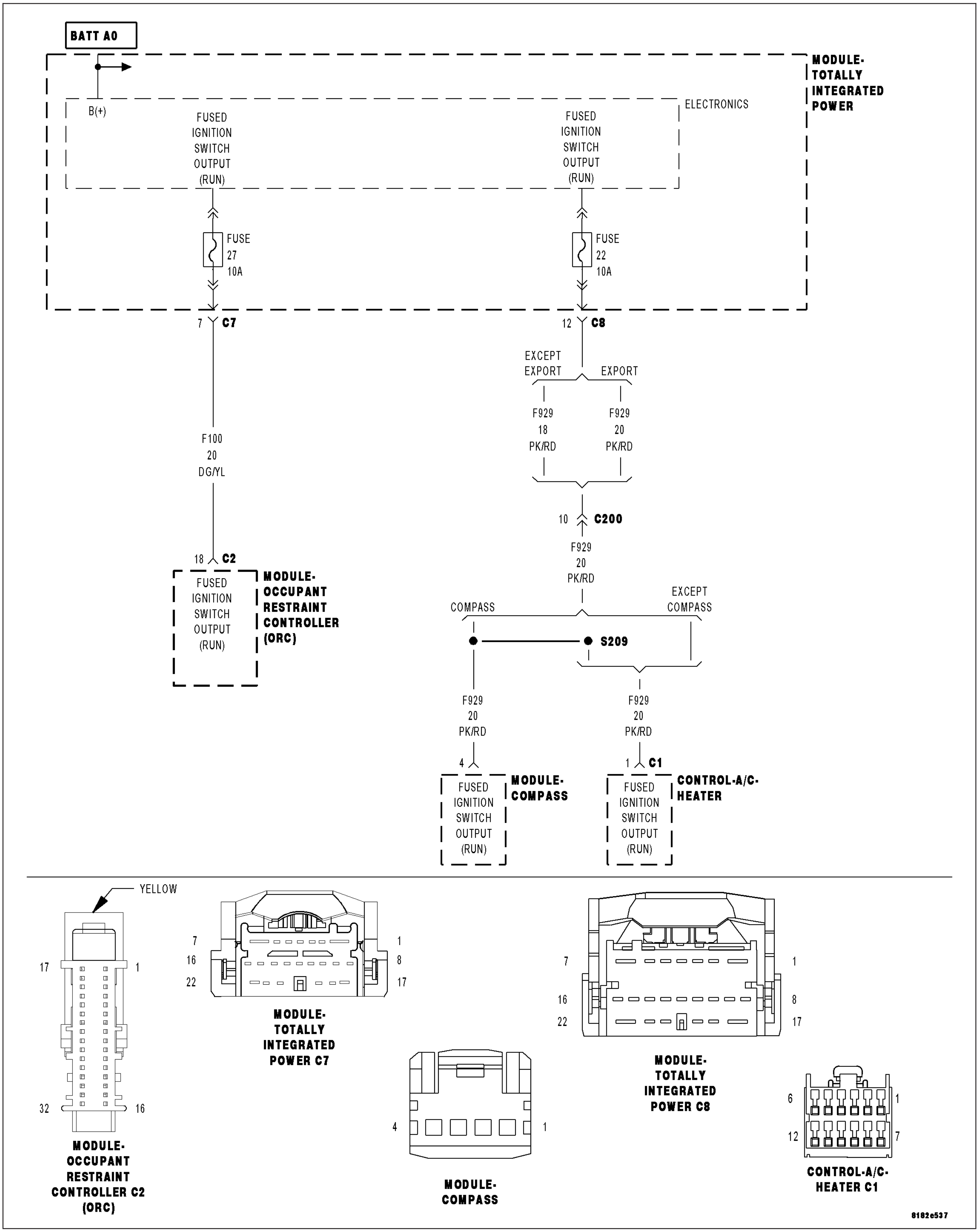
Yes >> Repair the (F929) Fused Ignition Switch Output (RUN) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2124-IGNITION RUN CONTROL 1 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F100), (F929) Fused Ignition Switch Output (Run) circuits Open.

Possible Causes
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Check all fuses. If any fuses are open, diagnose the appropriate circuit.

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

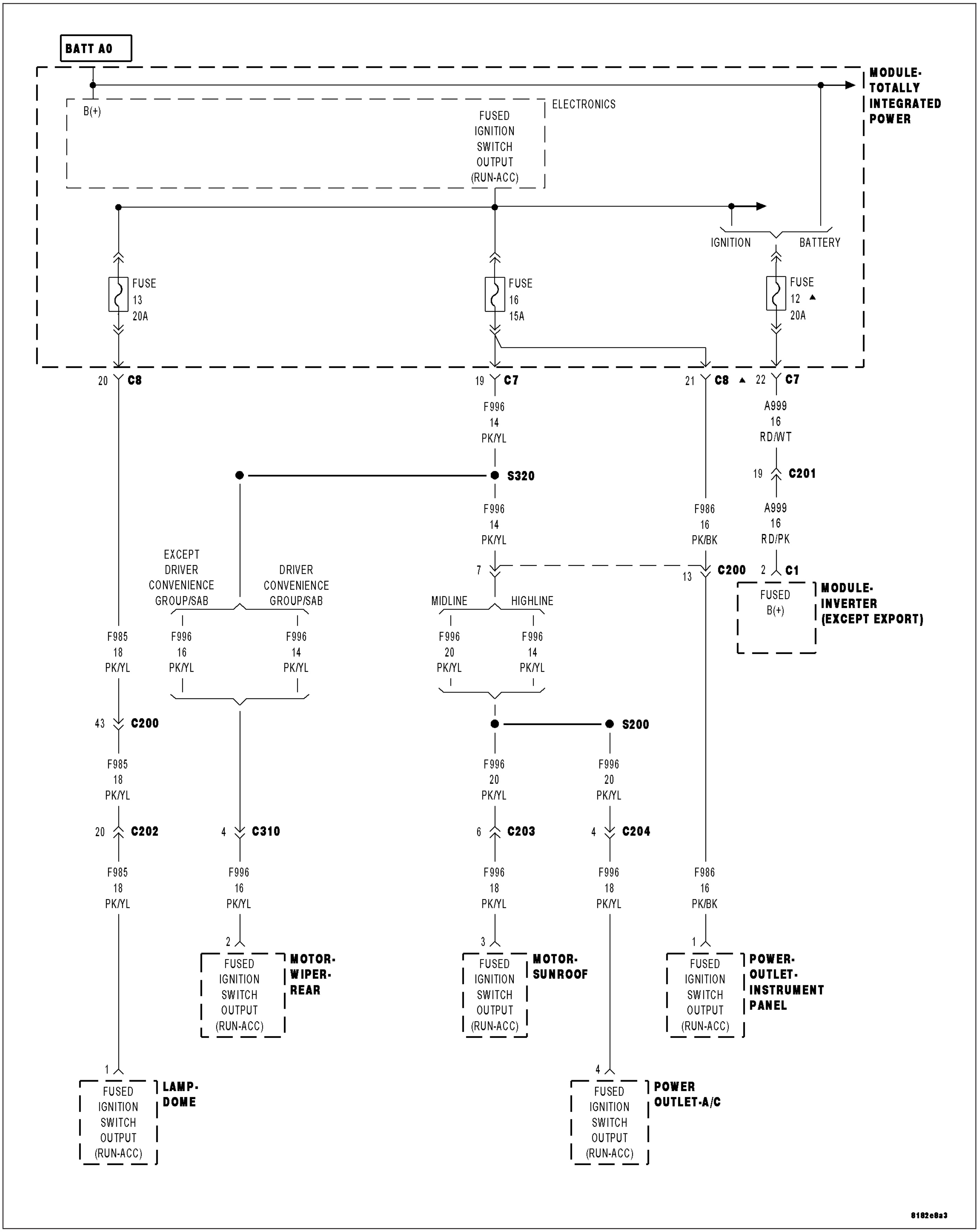
Does the scan tool display this DTC as active?

Yes >> This is an internal TIPM DTC. If this DTC is active, replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B212F-IGNITION RUN/ACC CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Internal TIPM failure.

Possible Causes
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Check all fuses.

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

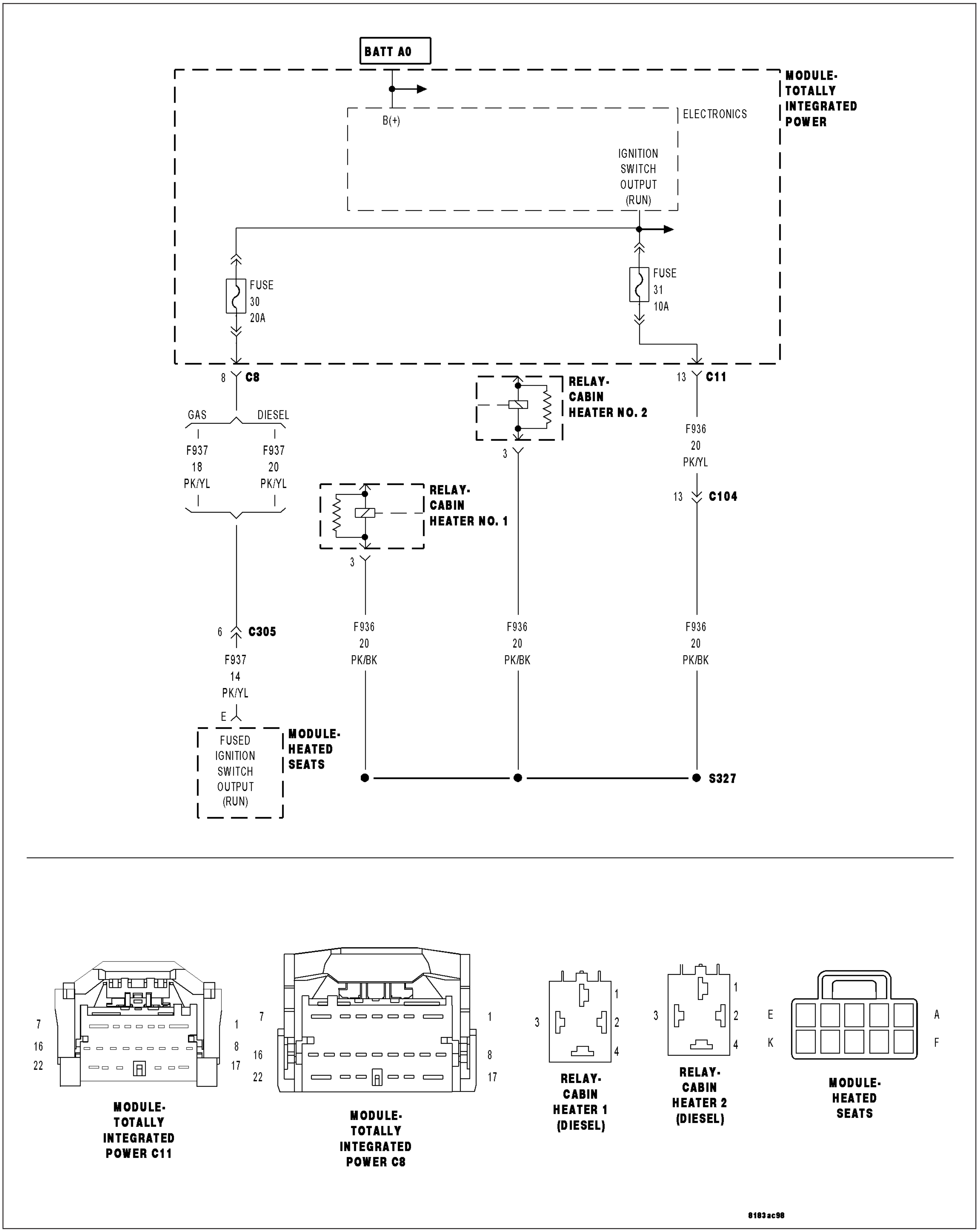
Does the scan tool display this DTC as active?

Yes >> This is an internal TIPM DTC. If this DTC is active, replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2148-IGNITION RUN CONTROL 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Check all fuses. If any fuses are open, diagnose the appropriate circuit.
With the scan tool, read the active DTC's.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.
With the scan tool, read the active DTC's.

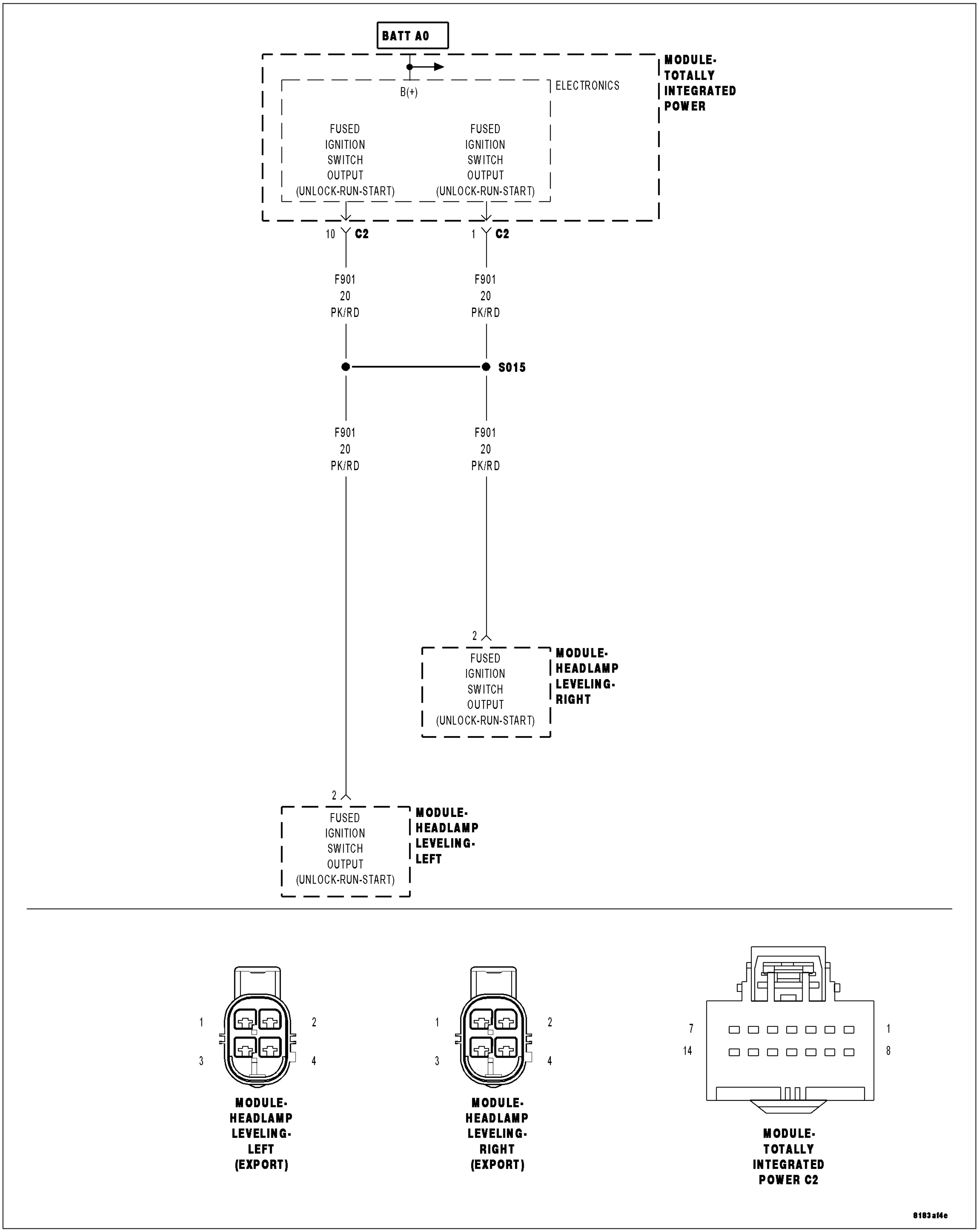
Does the scan tool display this DTC as active?

Yes >> This is an internal TIPM DTC. If this DTC is active, replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2184-IGNITION UNLOCK RUN/START CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit low.

Possible Causes
(F901) FUSED IGNITION SWITCH OUTPUT (UNLOCK-RUN-START) CIRCUIT SHORT TO GROUND
LEFT HEADLAMP LEVELING MODULE
RIGHT HEADLAMP LEVELING MODULE
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

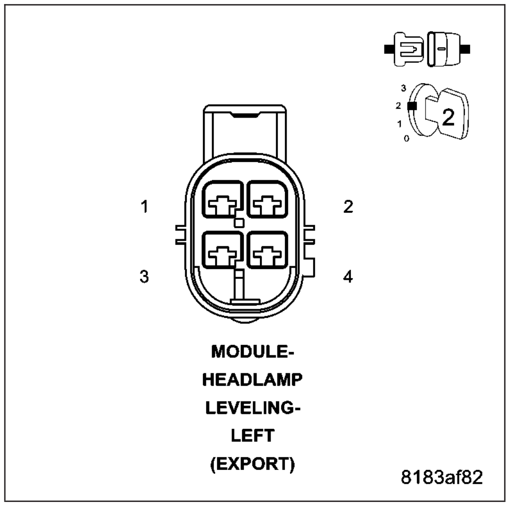
2. LEFT HEADLAMP LEVELING MODULE INTERNAL SHORT

Turn the ignition off.

Disconnect the Left Headlamp Leveling Module harness connector.

Turn the ignition on.

With the scan tool, read DTCs.



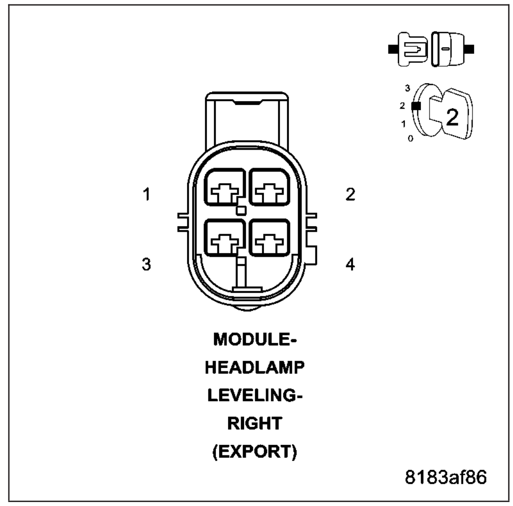
Does the scan tool display B2184-IGNITION UNLOCK RUN/ START CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Left Headlamp Leveling Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. RIGHT HEADLAMP LEVELING MODULE INTERNAL SHORT



Turn the ignition off.

Disconnect the Right Headlamp Leveling Module harness connector.

Turn the ignition on.

With the scan tool, read DTCs.

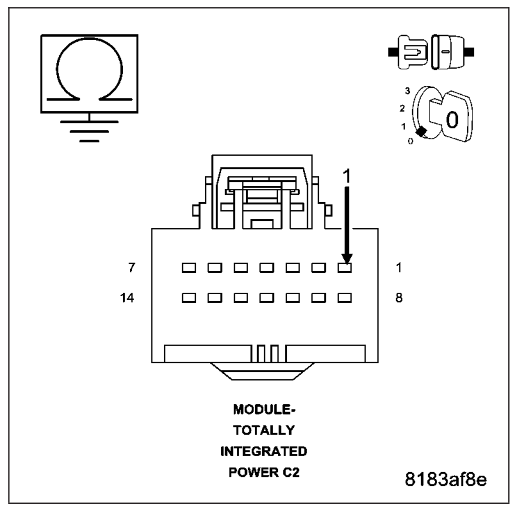
Does the scan tool display B2184-IGNITION UNLOCK RUN/ START CONTROL CIRCUIT LOW?

Yes >> Go To 4

No >> Replace the Right Headlamp Leveling Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (F901) FUSED IGNITION SWITCH OUTPUT (UNLOCK-RUN-START) CIRCUIT SHORT TO GROUND



Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Measure the resistance between ground and the (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit.

Is the resistance below 10K ohms?

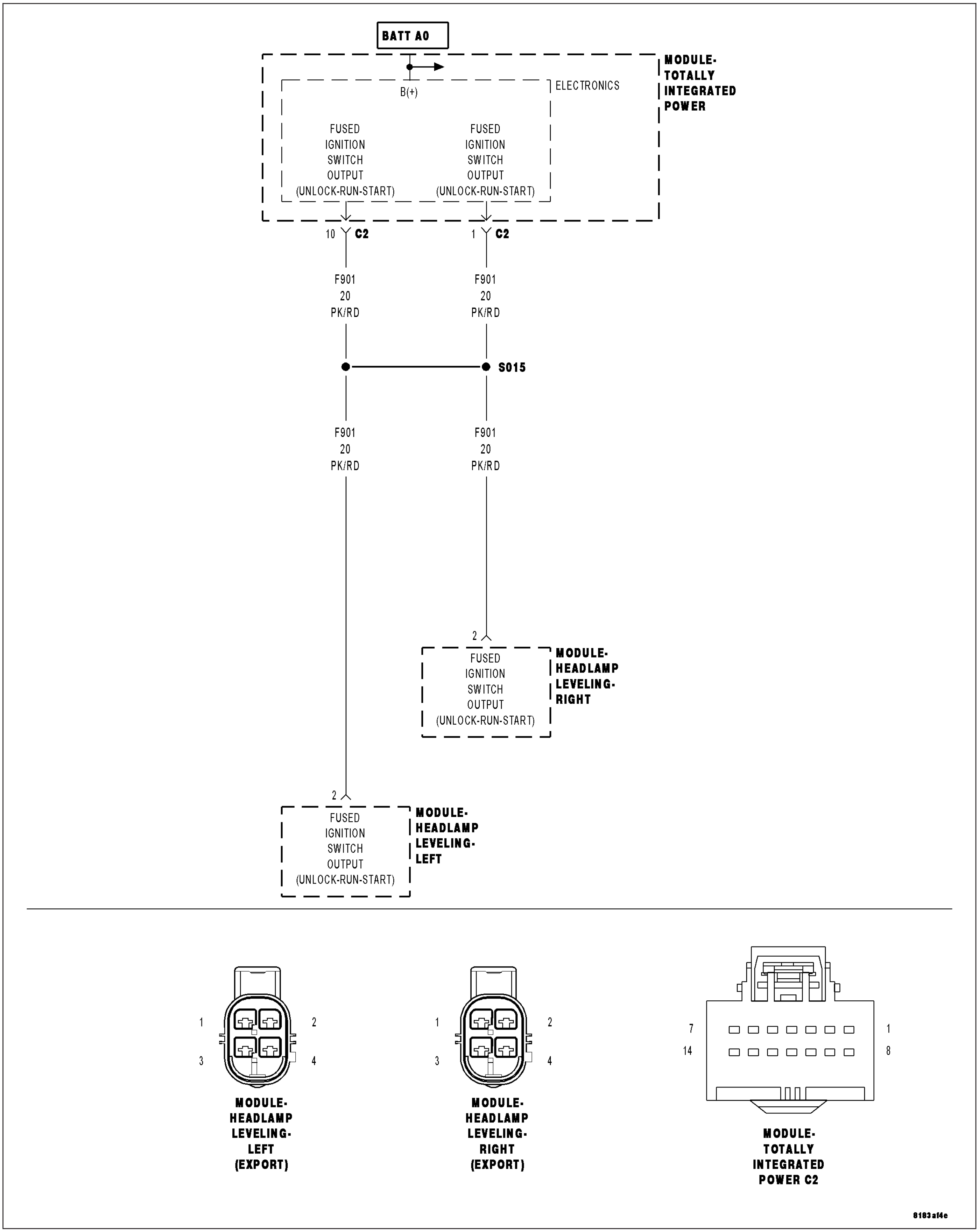
Yes >> Repair the (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit for a short to ground.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2185-IGNITION UNLOCK RUN/START CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit high.

Possible Causes
(F901) FUSED IGNITION SWITCH OUTPUT (UNLOCK-RUN-START) CIRCUIT SHORT TO VOLTAGE
LEFT HEADLAMP LEVELING MODULE
RIGHT HEADLAMP LEVELING MODULE
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. LEFT HEADLAMP LEVELING MODULE INTERNAL SHORT

Turn the ignition off.

Disconnect the Left Headlamp Leveling Module harness connector.

Turn the ignition on.

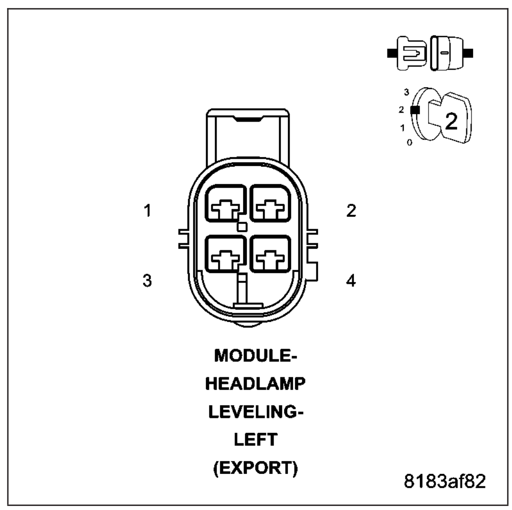
With the scan tool, read DTCs.

Does the scan tool display B2185-IGNITION UNLOCK RUN/ START CONTROL CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Left Headlamp Leveling Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



3. RIGHT HEADLAMP LEVELING MODULE INTERNAL SHORT

Turn the ignition off.

Disconnect the Right Headlamp Leveling Module harness connector.

Turn the ignition on.

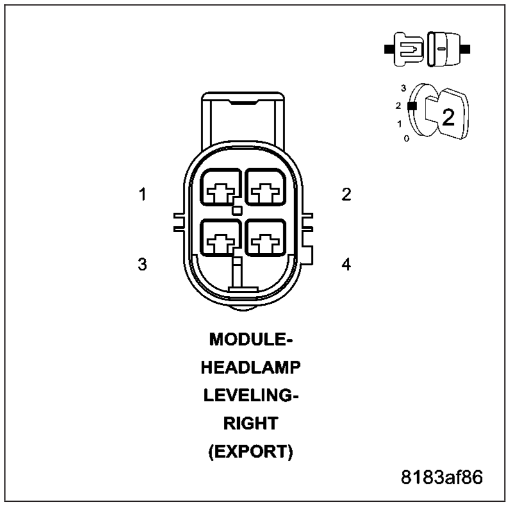
With the scan tool, read DTCs.

Does the scan tool display B2185-IGNITION UNLOCK RUN/ START CONTROL CIRCUIT HIGH?

Yes >> Go To 4

No >> Replace the Right Headlamp Leveling Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



4. (F901) FUSED IGNITION SWITCH OUTPUT (UNLOCK-RUN-START) CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Turn the ignition on.

Measure the voltage of the (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit.

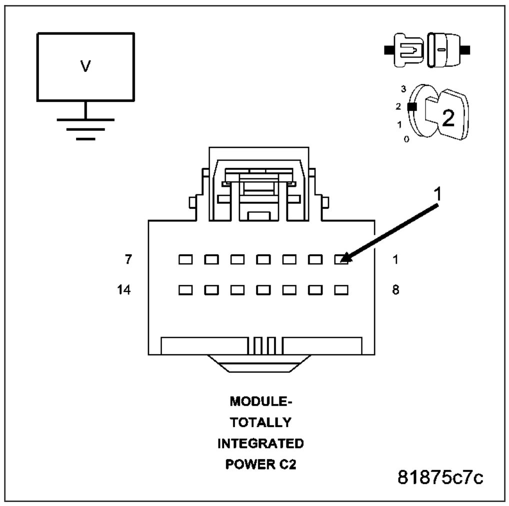
Is the resistance below 10K ohms?

Yes >> Repair the (F901) Fused Ignition Switch Output (Unlock-Run-Start) circuit for a short to voltage.

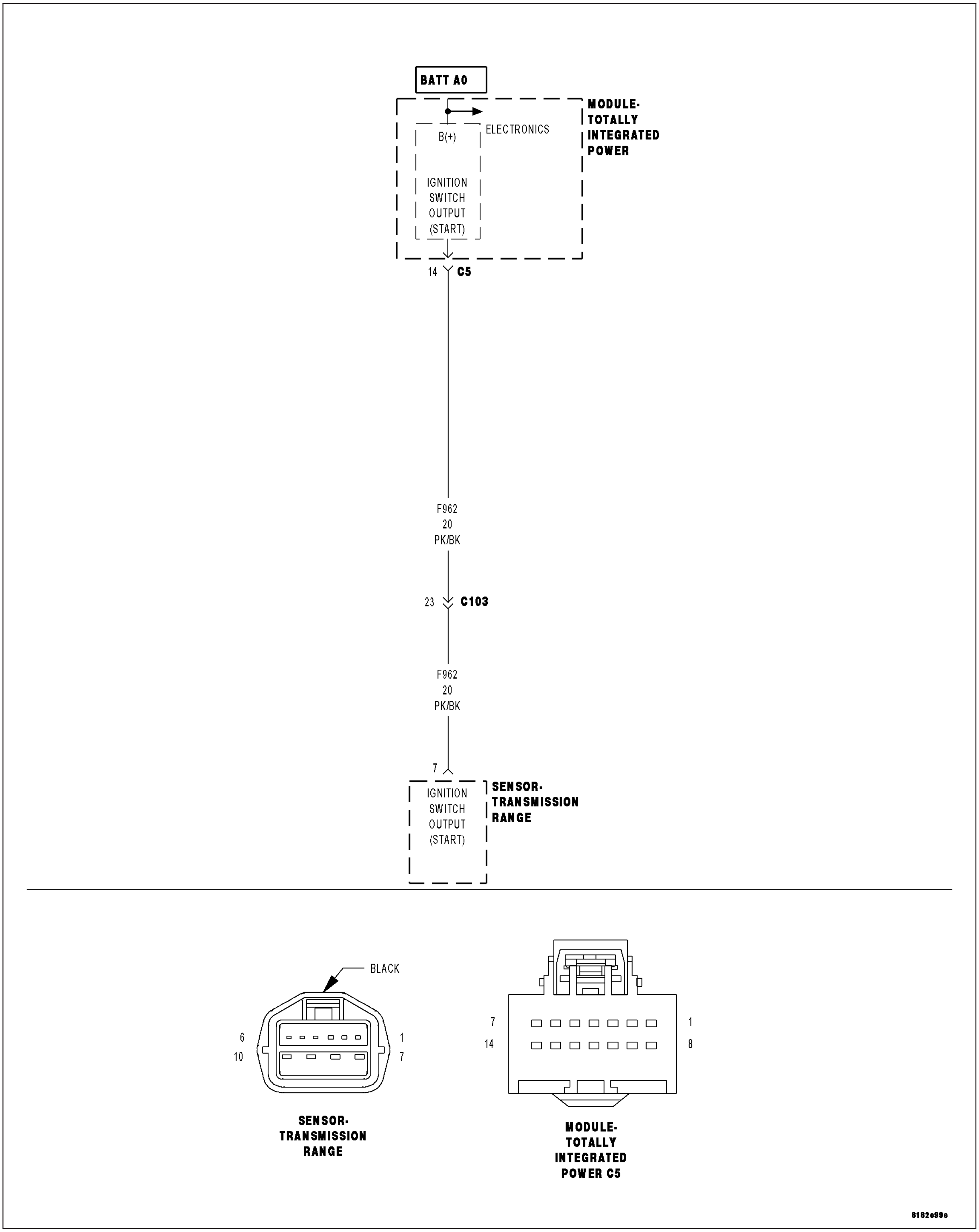
Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



B2188-IGNITION START CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Start position.
- **Set Condition:**
  The TIPM detects a short to ground condition in the (F962) Fused Ignition Switch Output (Start) circuit.

Possible Causes
(F962) FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT SHORT TO GROUND
TRANSMISSION RANGE SENSOR
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. TRANSMISSION RANGE SENSOR

Turn the ignition off.

Disconnect the Transmission Range Sensor harness connector.

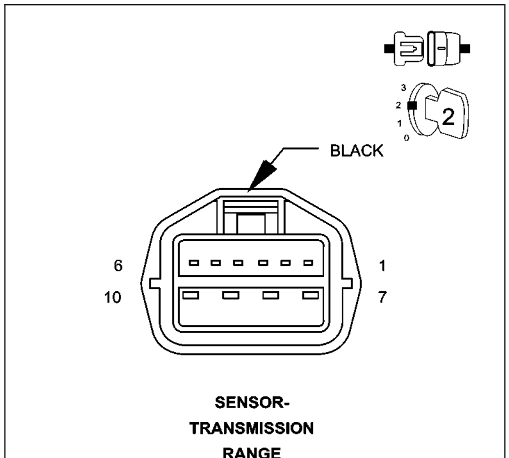
Turn the ignition on, wait 30 seconds.

With the scan tool, read TIPM DTCs.

Did DTC B2188-IGNITION START CONTROL CIRCUIT LOW change from active to stored?

Yes >> Replace the Transmission Range Sensor in accordance with the service information.
Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3



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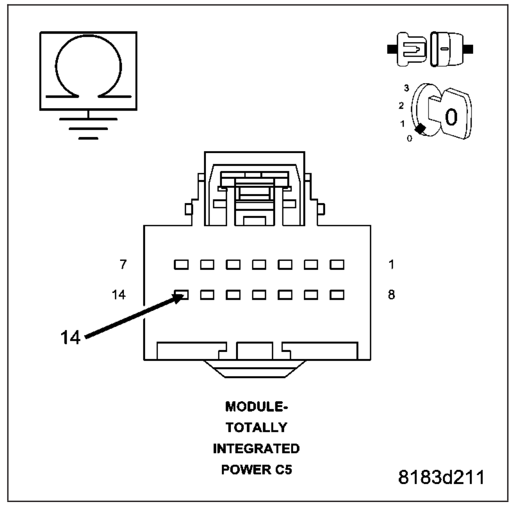
3. (F962) FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C5 connector.

Measure the resistance between the (F962) Fused Ignition Switch Output (START) circuit and ground.

Is the resistance below 10K ohms?



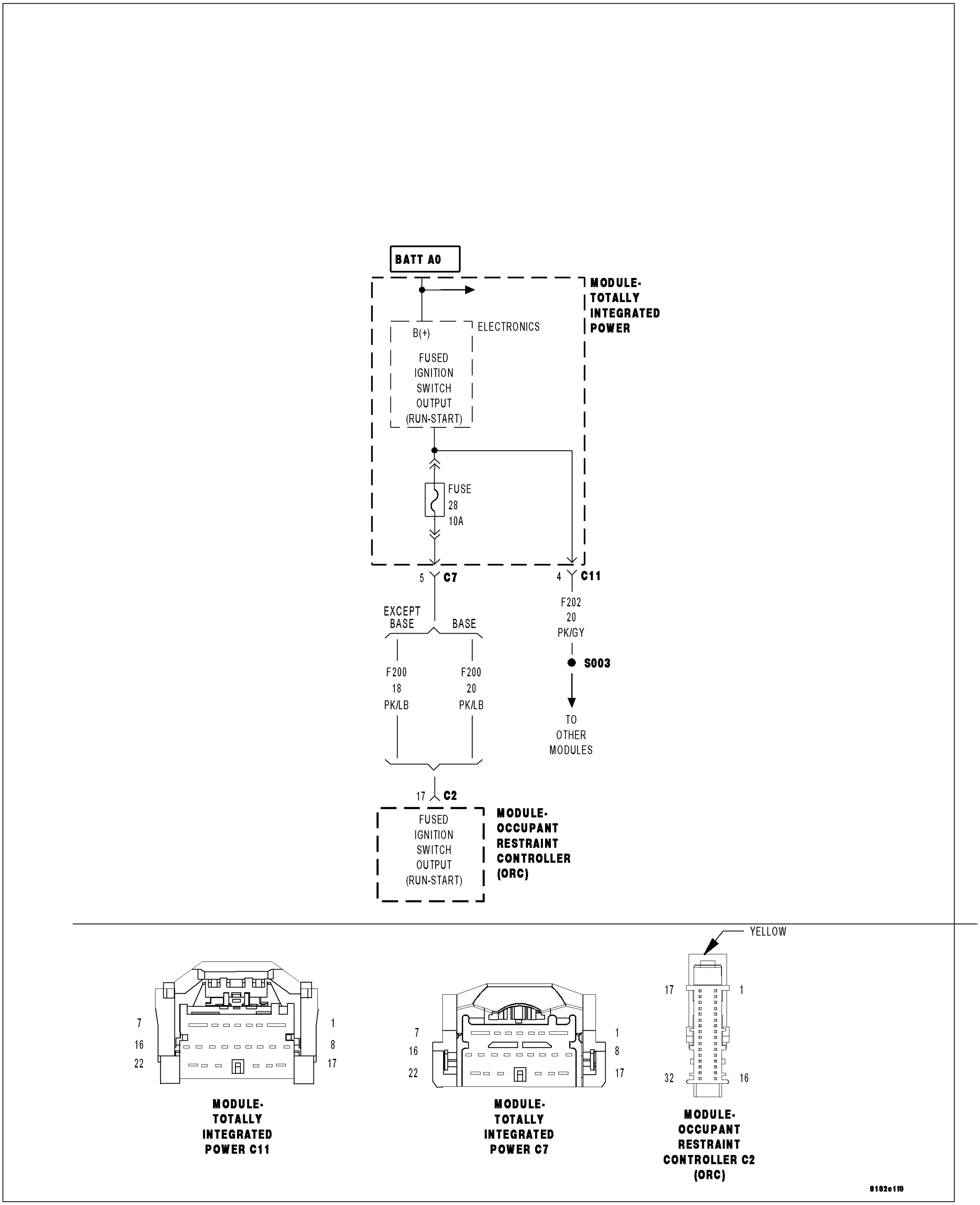
Yes >> Repair the (F962) Fused Ignition Switch Output (START) circuit for a short to ground.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B218B-IGNITION RUN/START 1 CONTROL CIRCUIT OVERCURRENT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Over current condition detected on the Fused Ignition Switch Output (Run-Start) circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
HIGH RESISTANCE ON THE (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
OCCUPANT RESTRAINT CONTROLLER (ORC)
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

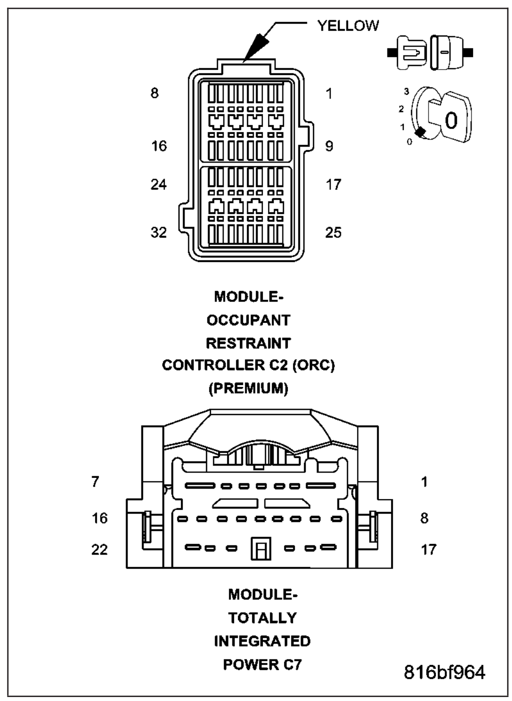
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. INSPECT THE TIPM AND ORC TERMINALS AND WIRE HARNESS FOR A CONDITION CAUSING HIGH CIRCUIT RESISTANCE



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the TIPM C7 harness connector.

Disconnect the ORC harness connector.

Inspect the connector terminal for signs of corrosion build up and damage.

Visually inspect the wiring harness for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. INSPECT THE (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR A CONDITION CAUSING HIGH CIRCUIT RESISTANCE

Disconnect the TIPM C11 harness connector.

Inspect the connector terminal for signs of corrosion build up and damage.

Using the wiring diagrams, visually inspect the associated wiring harnesses and connectors for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

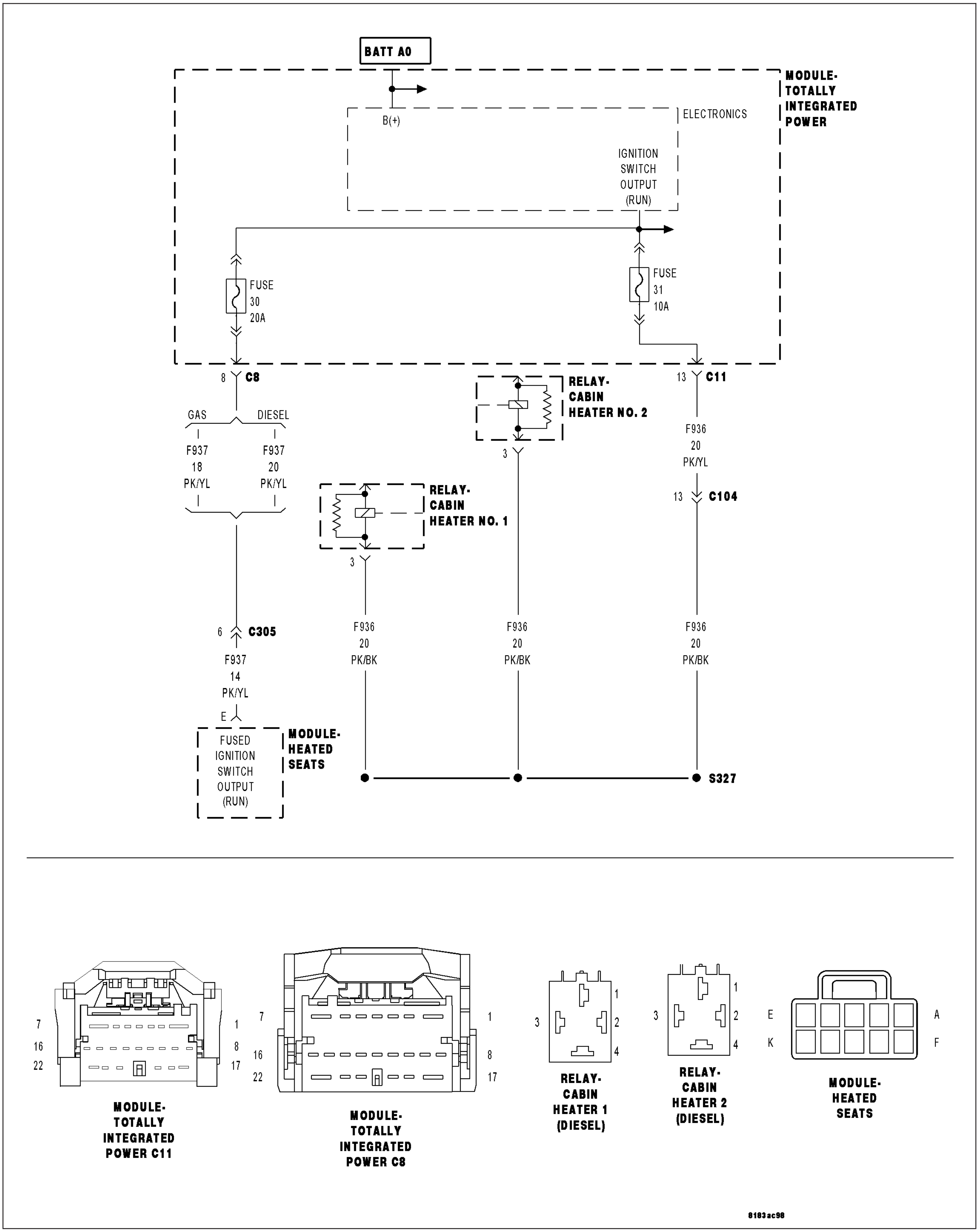
Yes >> Repair as necessary.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B218C-IGNITION RUN CONTROL 2 CIRCUIT OVERCURRENT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Over current condition detected on the (F937) Fused Ignition Switch Output (Run) circuit.

Possible Causes
TERMINAL DAMAGE OR CORROSION
HIGH RESISTANCE ON THE (F937) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT
HIGH RESISTANCE ON THE (F936) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT
HEATED SEAT MODULE
CABIN HEATER RELAYS 1 AND 2
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on, leaving the ignition off for a minimum of 30 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. INSPECT THE TIPM AND HEATED SEAT MODULE TERMINALS AND WIRE HARNESS FOR A CONDITION CAUSING HIGH CIRCUIT RESISTANCE

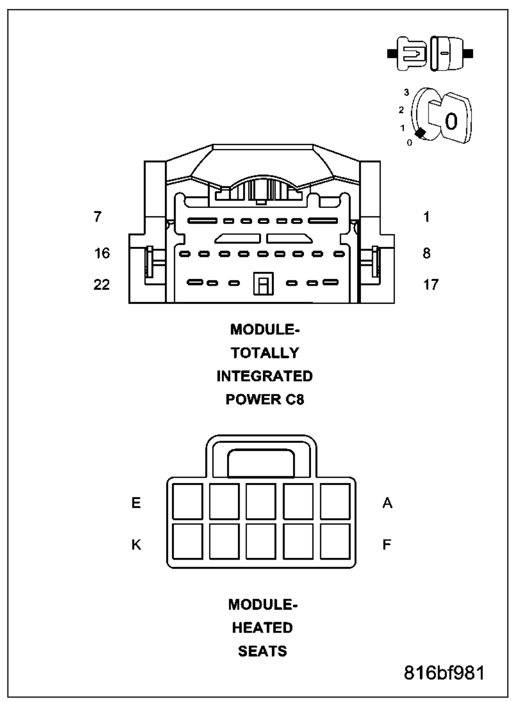
Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Disconnect the Heated Seat Module harness connector.

Inspect the connector terminal for signs of corrosion build up and damage.

Visually inspect the wiring harness for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.



Were any of the above conditions found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

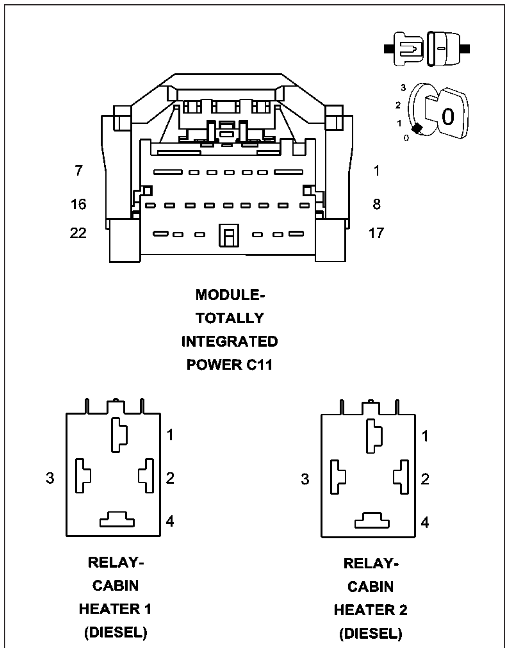
3. INSPECT THE CABIN HEATER RELAY TERMINALS AND WIRE HARNESS FOR A CONDITION CAUSING HIGH CIRCUIT RESISTANCE

Disconnect the Cabin Heater Relays.

Disconnect the TIPM C11 harness connector.

Inspect the connector terminal for signs of corrosion build up and damage.

Visually inspect the wiring harness for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.



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Were any of the above conditions found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

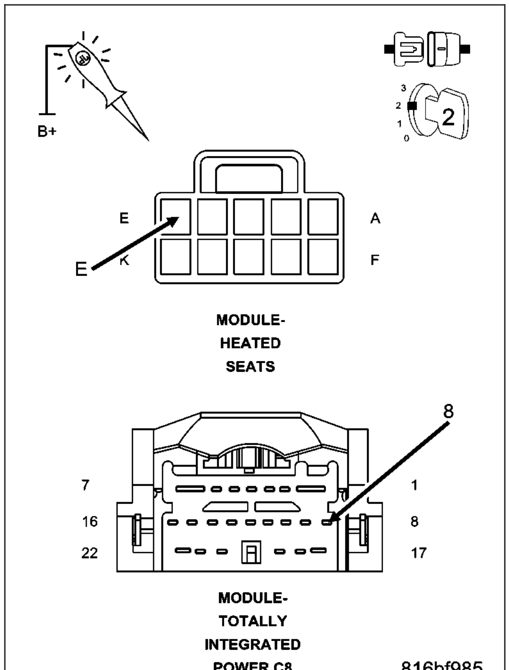
No >> Go To 4

4. CHECK THE (F937) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FUNCTION

Connect one end of a jumper wire to the (F937) Fused Ignition Switch Output (RUN) circuit at the Heated Seat Module harness connector, and connect the other end to a clean chassis ground.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to battery.

Using a 12 volt test light connected to 12 volts, probe the (F937) Fused Ignition Switch Output (RUN) circuit in the TIPM C8 harness connector.



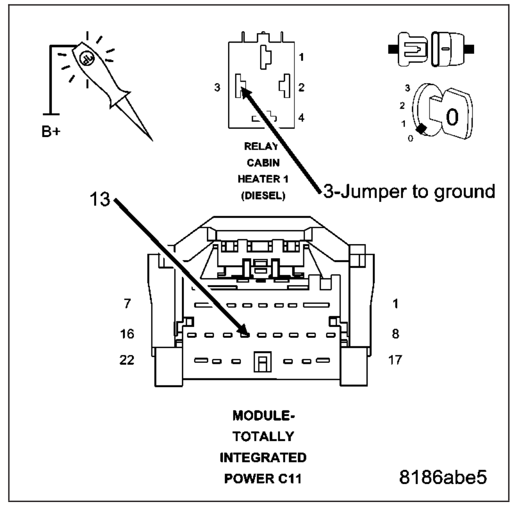
816bf985

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F937) Fused Ignition Switch Output (RUN) circuit for high resistance.
Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. CHECK THE (F936) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FUNCTION



Connect one end of a jumper wire to the (F936) Fused Ignition Switch Output (RUN) circuit at the number 1 Cabin Heater Relay harness connector, and connect the other end to a clean chassis ground.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to battery.

Using a 12 volt test light connected to 12 volts, probe the (F936) Fused Ignition Switch Output (RUN) circuit in the TIPM C11 harness connector.

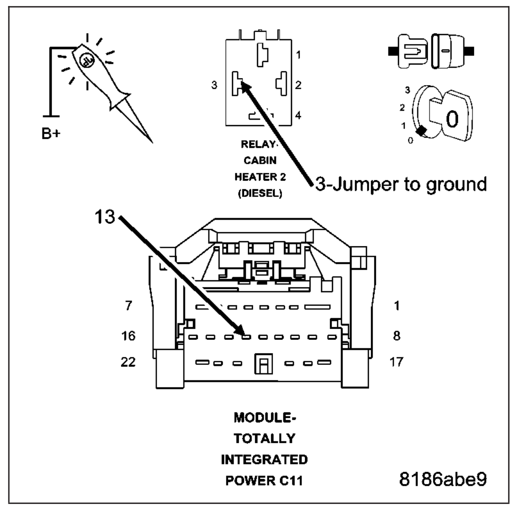
Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (F936) Fused Ignition Switch Output (RUN) circuit for high resistance.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

6. CHECK THE (F936) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FUNCTION



Connect one end of a jumper wire to the (F936) Fused Ignition Switch Output (RUN) circuit at the number 2 Cabin Heater Relay harness connector, and connect the other end to a clean chassis ground.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to battery.

Using a 12 volt test light connected to 12 volts, probe the (F936) Fused Ignition Switch Output (RUN) circuit in the TIPM C11 harness connector.

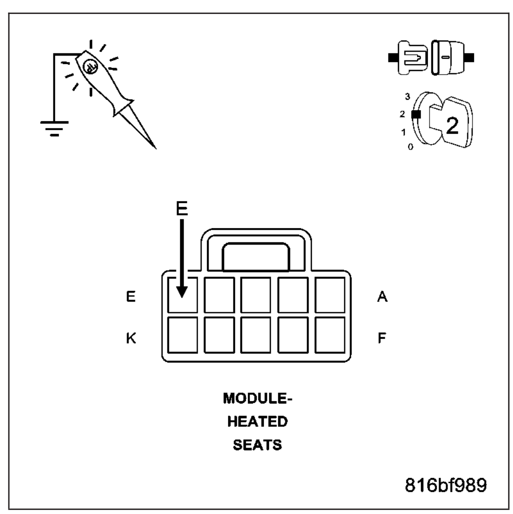
Does the test light illuminate brightly?

Yes >> Go To 7

No >> Repair the (F936) Fused Ignition Switch Output (RUN) circuit for high resistance.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

7. CHECK THE OUTPUT FROM THE TIPM ON THE (F937) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT



Reconnect the TIPM C8 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the (F937) Fused Ignition Switch Output (RUN) circuit in the Heated Seat Module harness connector.

Does the test light illuminate brightly?

Yes >> Replace the Heated Seat Module in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

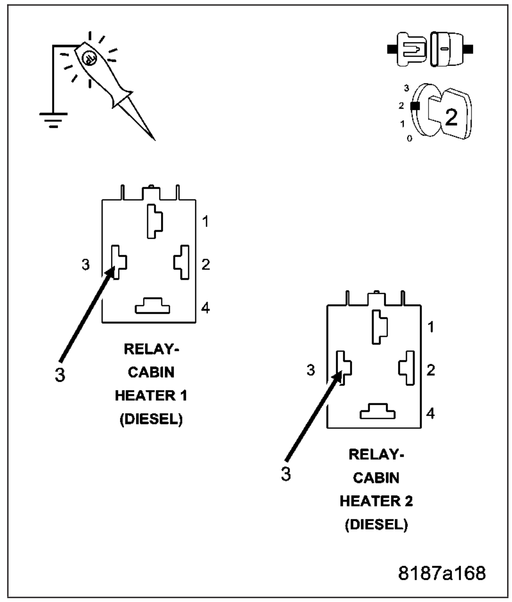
No >> Go To 8

8. CHECK THE OUTPUT FROM THE TIPM ON THE (F936) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Reconnect the TIPM C11 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the (F936) Fused Ignition Switch Output (RUN) circuit in the Cabin Heater Relay 1 and 2 harness connectors.



Does the test light illuminate brightly?

Yes >> Replace the appropriate Cabin Heater Relay in accordance with the service information.

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the service information

Perform BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

IGNITION CONTROL- SERVICE INFORMATION

TABLE OF CONTENTS

IGNITION CONTROL- SERVICE INFORMATION

DESCRIPTION - IGNITION SYSTEM

NOTE: All engines use a fixed ignition timing system. Basic ignition timing is not adjustable. All spark advance is determined by the Powertrain Control Module (PCM).

The ignition system used on these engines is referred to as the Direct Ignition System (DIS). The system's four main components are the coils, crankshaft position sensor, spark plugs, and camshaft position sensor. If equipped with the coil on plug ignition system it utilizes an ignition coil for every cylinder and is mounted directly over the each spark plug.

OPERATION - IGNITION SYSTEM

The crankshaft position sensor and camshaft position sensor are hall effect devices. The camshaft position sensor and crankshaft position sensor generate pulses that are inputs to the PCM. The PCM determines engine position from these sensors. The PCM calculates injector sequence and ignition timing from crankshaft & camshaft position. For a description of both sensors, refer to Camshaft Position Sensor and Crankshaft Position Sensor.

SPECIFICATIONS

TORQUE

Description	N·m	ft. lbs.	in. lbs.
Camshaft Position Sensor Screw	9		79.5
Crankshaft Position Sensor Screw	9	-	79.5
Coolant Temp. Sensor	18.6	-	165
Ignition Coil to Cyl. Head	8	-	71
Knock Sensor Bolt	22	-	195
Spark Plugs *	27	20	-
Coil Capacitor	12	-	105
Variable valve timing solenoid	12	9	-
Lock Cylinder to Column	12	-	110
Ignition Switch Mounting Screws	2	-	18
SKREEM/WCM Ring	2.5	-	22
* Tapered seat plugs. Imperative that torque is NOT EXCEEDED.			

SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
2.0/2.4L	Refer to the Vehicle Emission Control Information label in the engine compartment.	1.24 to 1.37 mm (0.048 to 0.053 in.)

SENSOR-CAMSHAFT POSITION

DESCRIPTION

The camshaft position sensors are mounted to the front and rear of the cylinder head.

OPERATION

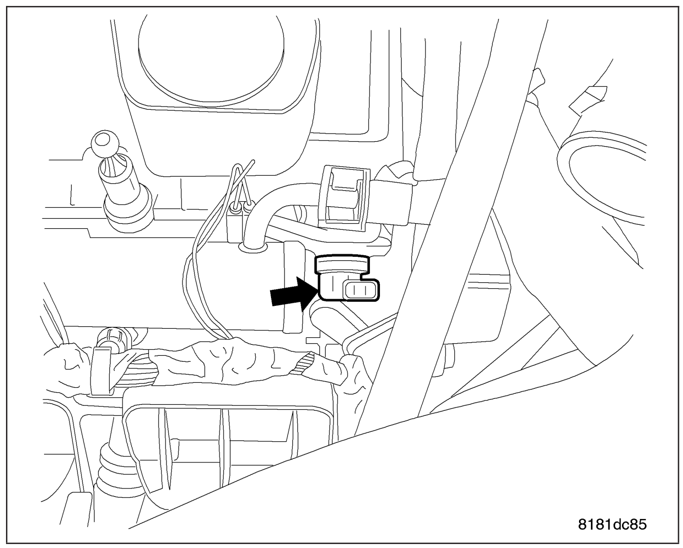
The PCM sends approximately 5 volts to the Hall-effect sensor. This voltage is required to operate the Hall-effect chip and the electronics inside the sensor. The input to the PCM occurs on a 5 volt output reference circuit. A ground for the sensor is provided through the sensor return circuit. The PCM identifies camshaft position by registering the change from 5 to 0 volts, as signaled from the camshaft position sensor.

The PCM determines fuel injection synchronization and cylinder identification from inputs provided by the camshaft position sensor and crankshaft position sensor. From the two inputs, the PCM determines crankshaft position.

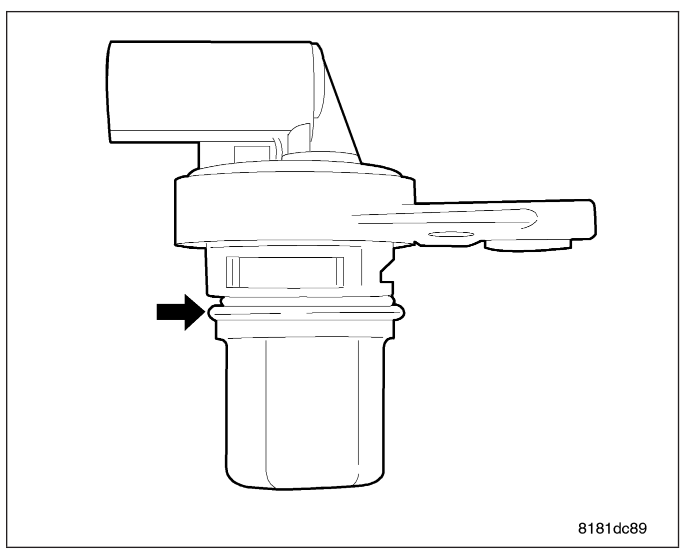
REMOVAL

FRONT CAMSHAFT POSITION SENSOR

1. Remove the air cleaner hose to throttle body, disconnect the inlet air temperature sensor electrical connector.
2. Disconnect negative battery cable.
3. Disconnect electrical connector from camshaft position sensor.
4. Remove camshaft position sensor mounting screws.

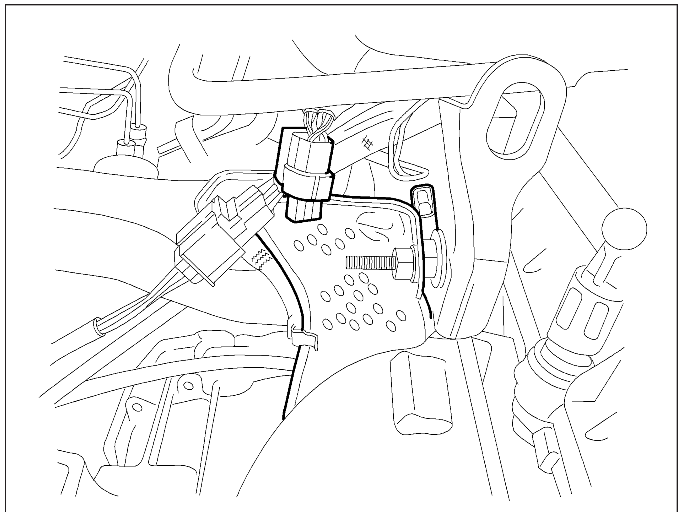


5. Remove sensor.



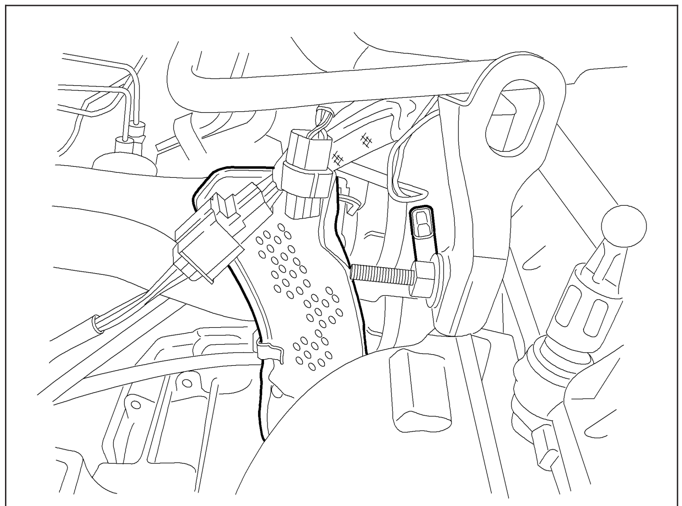
REAR CAMSHAFT POSITION SENSOR

1. Disconnect negative battery cable.
2. Disconnect electrical connector at sensor.
3. Remove nut retaining heat shield.



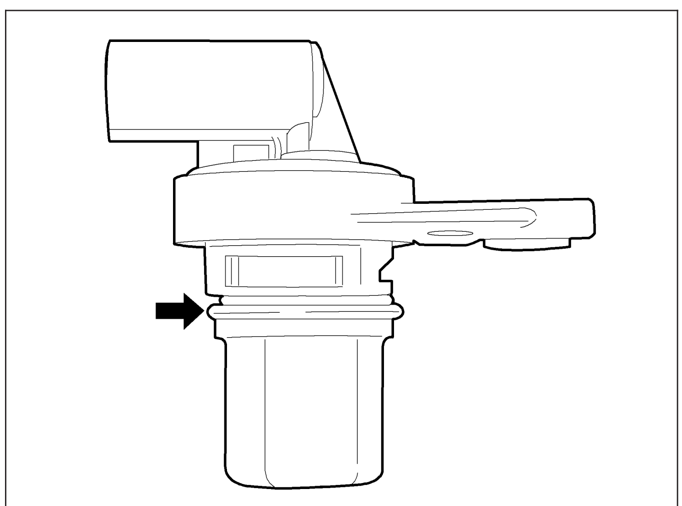
8181dd35

4. Pull heat shield out to uncover sensor.
5. Remove mounting bolt.



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6. Remove sensor.

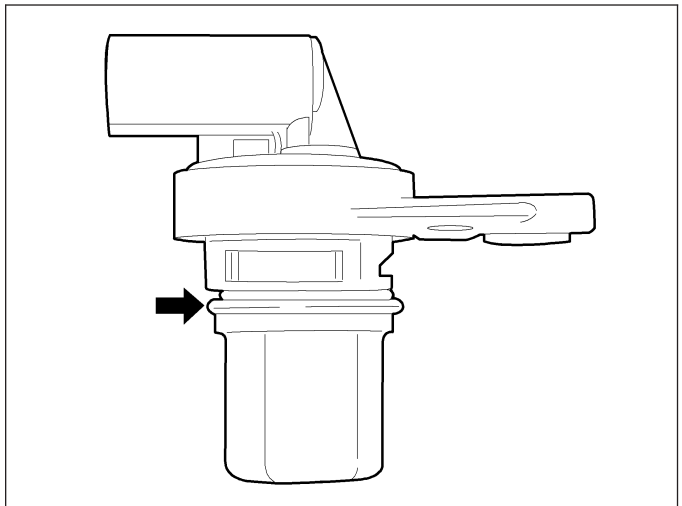


8181dc89

INSTALLATION

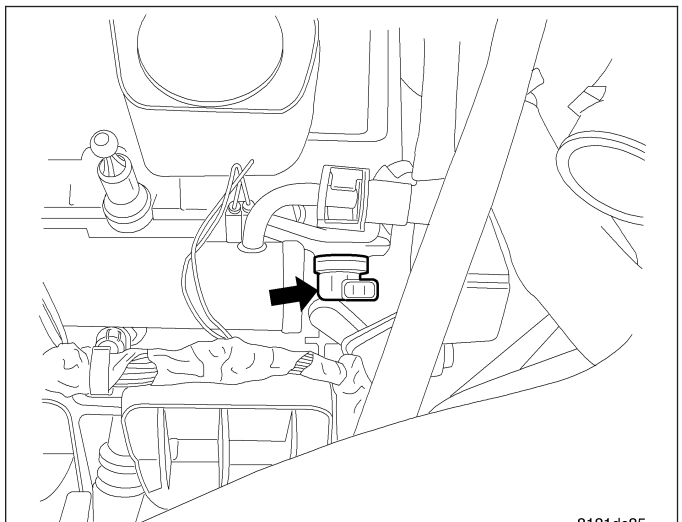
FRONT CAMSHAFT POSITION SENSOR

1. Lubricate sensor o-ring.



8181dc89

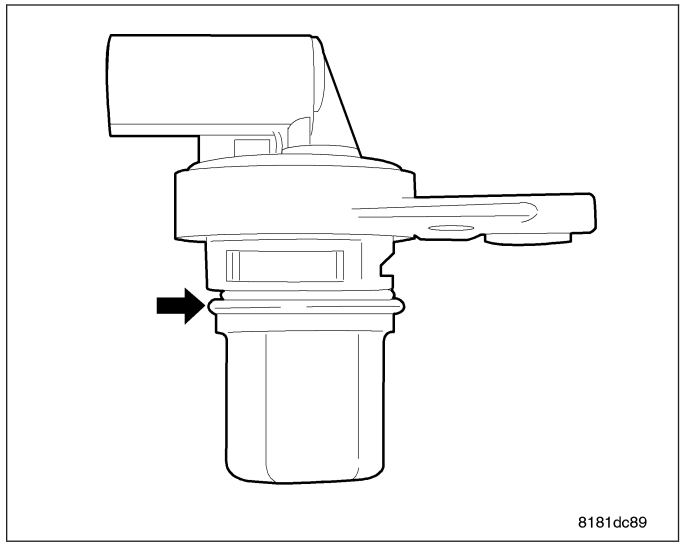
2. Install camshaft position sensor. Tighten sensor mounting screws to 9 N·m (79.5 in. lbs.) torque.
3. Carefully attach electrical connector to camshaft position sensor. Installation at an angle may damage the sensor pins.
4. Install the negative battery cable.
5. Install the air cleaner to throttle body hose, connect the inlet air temperature sensor electrical connector.



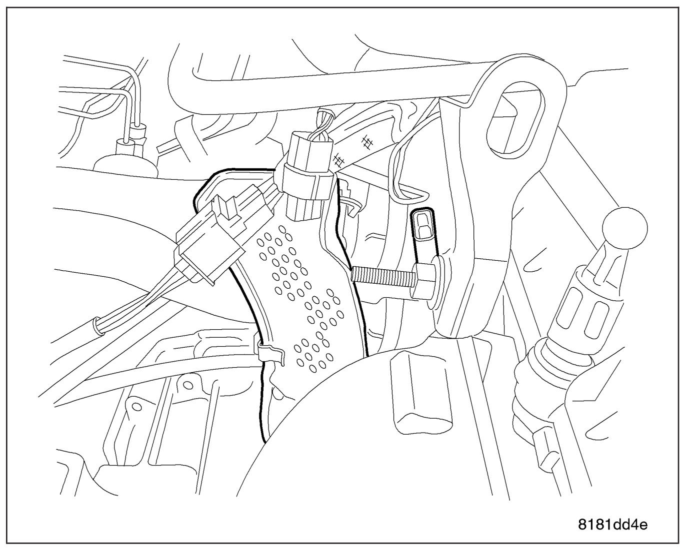
8181dc85

REAR CAMSHAFT POSITION SENSOR

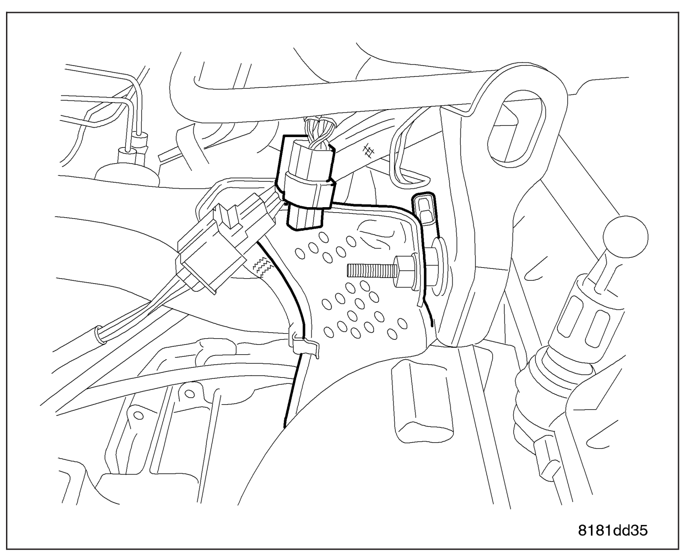
1. Lubricate sensor o-ring.
2. Install sensor.
3. Install mounting bolt and tighten to 9 N·m (79.5 in. lbs.) torque.



4. Install heat shield onto mounting stud.
5. Install heat shield retaining nut and tighten.



6. Connect the electrical connector.
7. Connect negative battery cable.

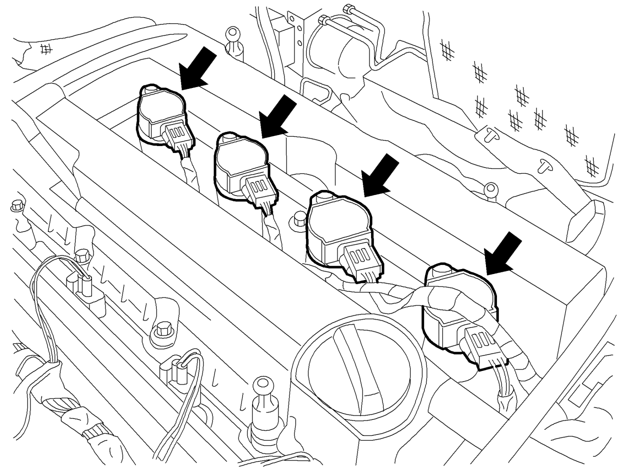


COIL-IGNITION

DESCRIPTION

WARNING: The direct ignition system generates approximately 40,000 volts. Personal injury could result from contact with this system.

The ignition coil is mounted on the valve cover.

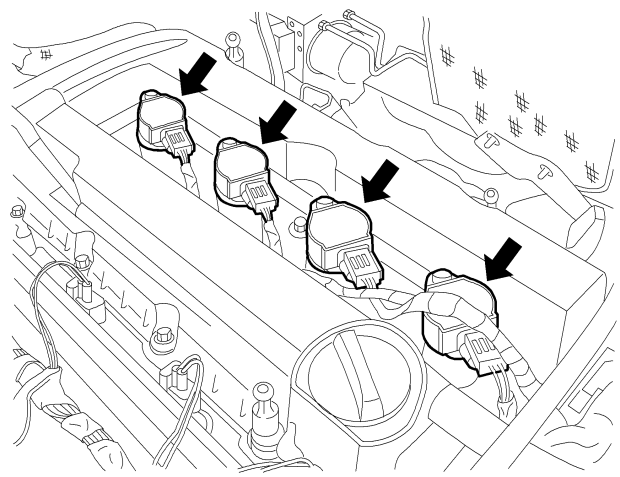


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REMOVAL

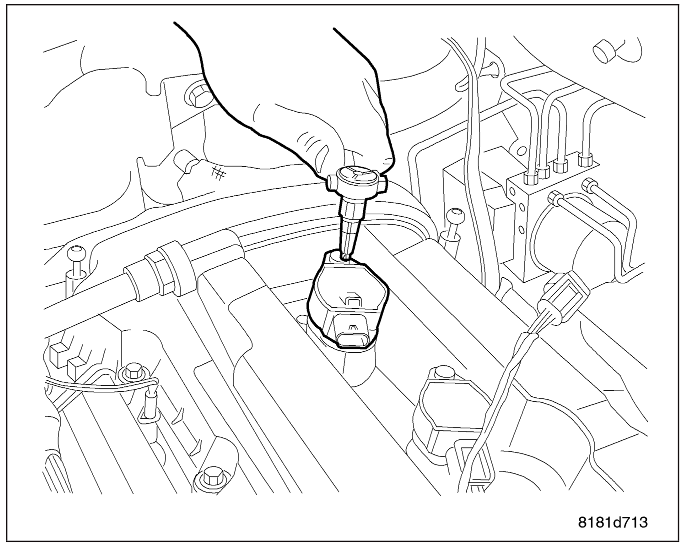
The electronic ignition coil attaches directly to the valve cover.

1. Remove the negative battery cable.
2. Disconnect electrical connector from ignition coil.

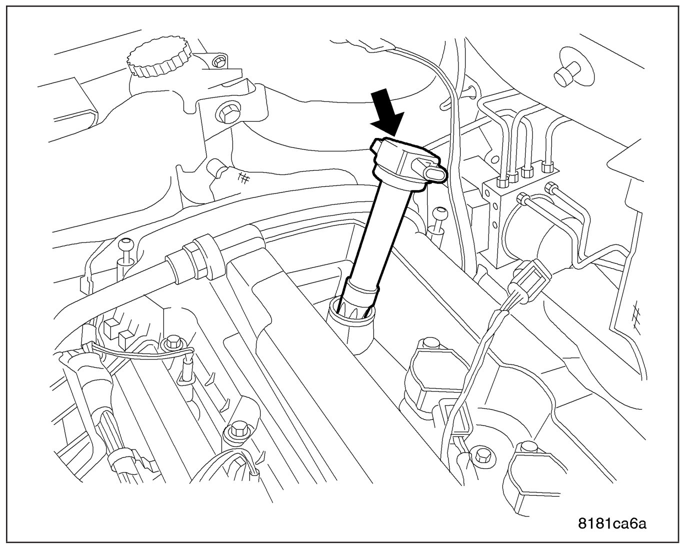


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3. Remove ignition coil mounting bolts.

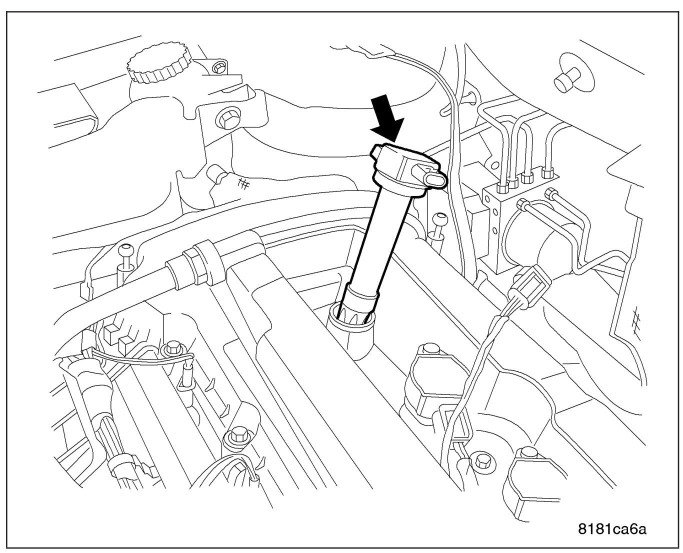


4. Remove ignition coil.

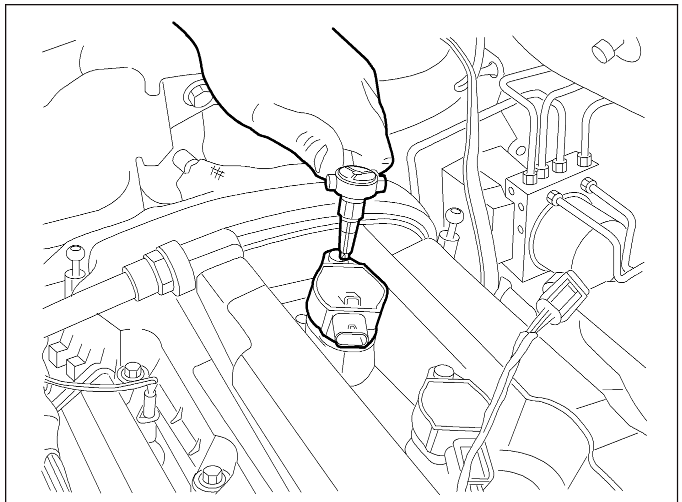


INSTALLATION

1. Install ignition coil.



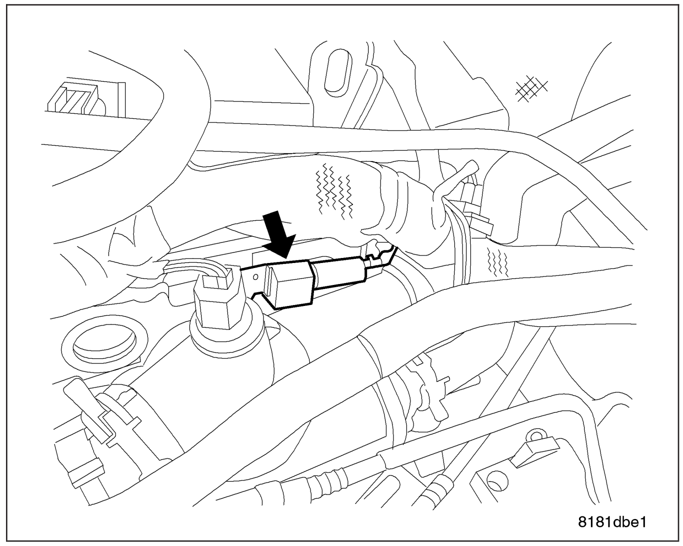
2. Tighten bolt to 8 N·m (71 ins. lbs.).
3. Connect electrical connectors and lock.
4. Install the negative battery cable.


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CAPACITOR-IGNITION COIL

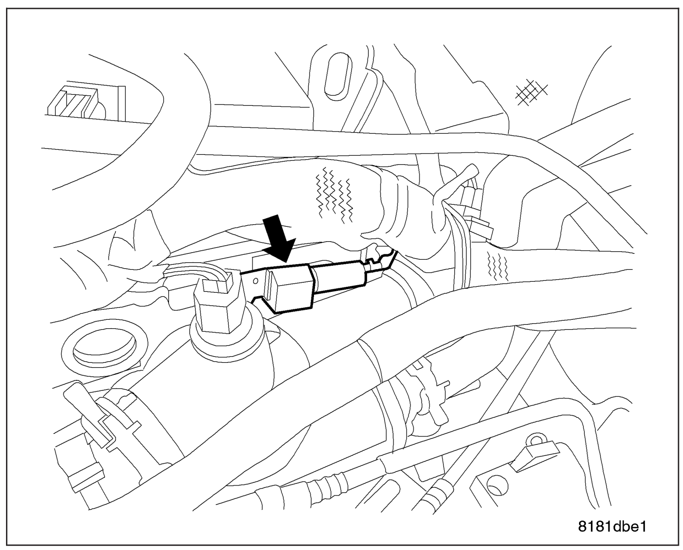
REMOVAL

1. Disconnect the negative battery cable.
2. Remove the electrical connector from the ignition coil capacitor.
3. Remove mounting bolt and remove capacitor.



INSTALLATION

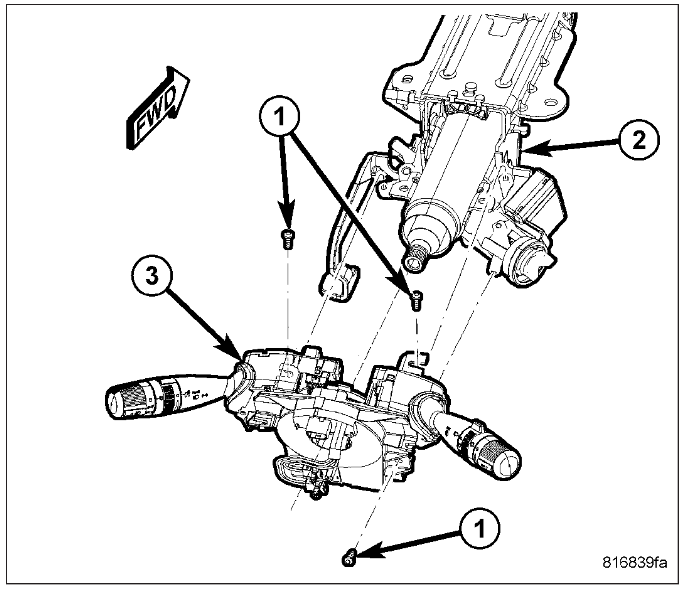
1. Install coil capacitor and mounting bolt and tighten to 12 N·m (105 in. lbs.).
2. Connect the electrical connector.
3. Connect the negative battery cable.



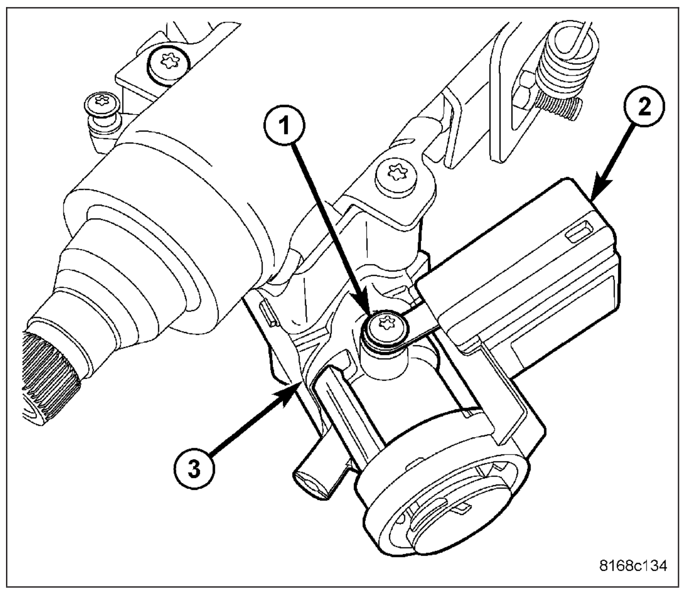
IGNITION SWITCH

REMOVAL

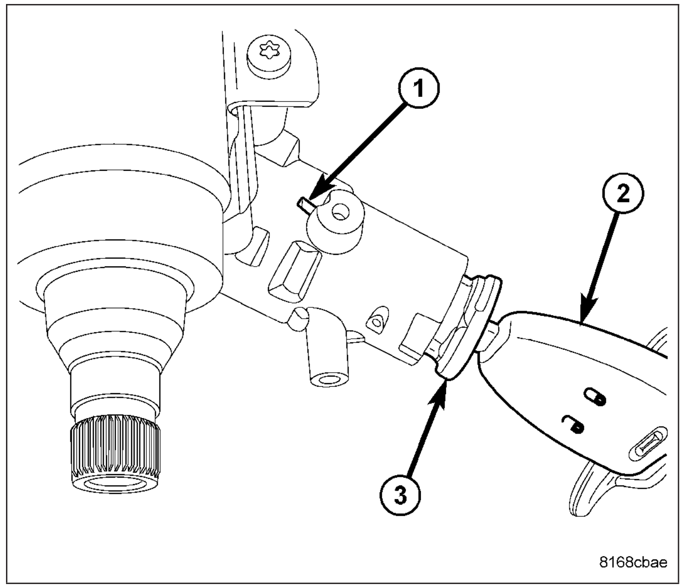
1. Access and remove the Steering Column Control Module (SCCM) (3) from the steering column (2). (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - REMOVAL)



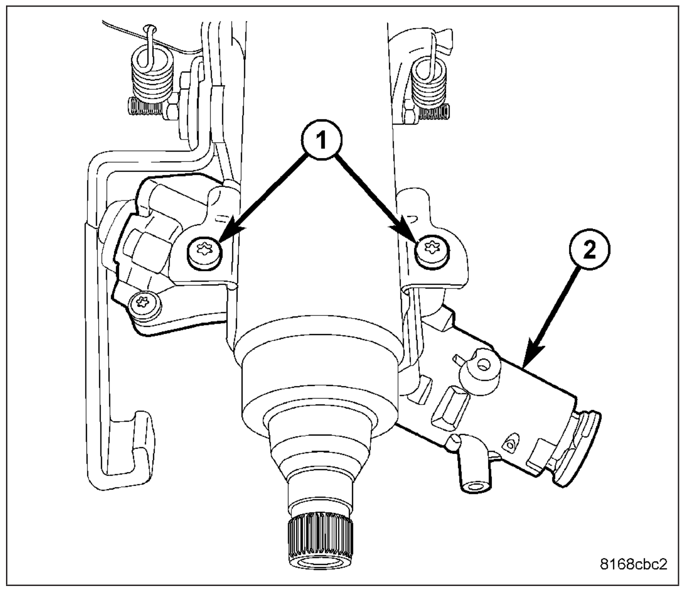
2. Remove the screw (1) fastening the SKREEM/ WCM (2) to the lock cylinder housing (3).
3. Unhook the SKREEM/WCM (2) retainer fingers from the lock cylinder housing (3) and remove it.



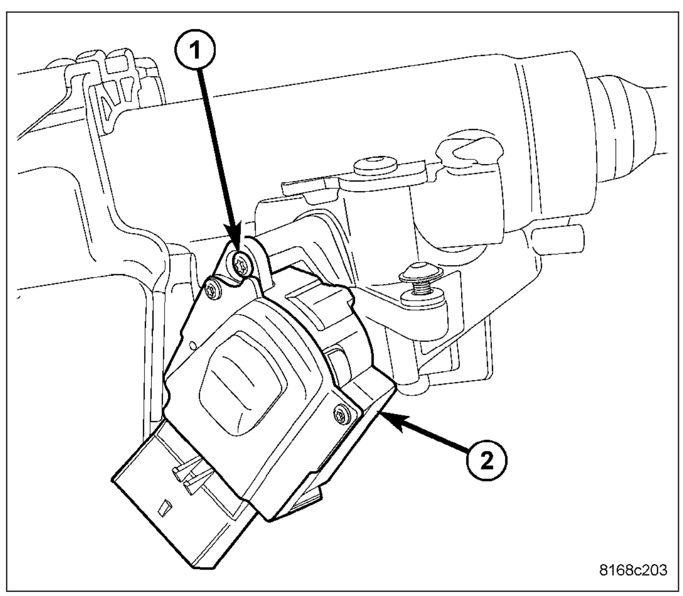
4. Insert the key (2) and turn the key cylinder (3) to the RUN position.
5. Insert an appropriate tool into the slot (1) formed into the lock cylinder housing depressing the key cylinder retaining tab.
6. Pull the key cylinder and key straight out of the lock cylinder housing as one unit.



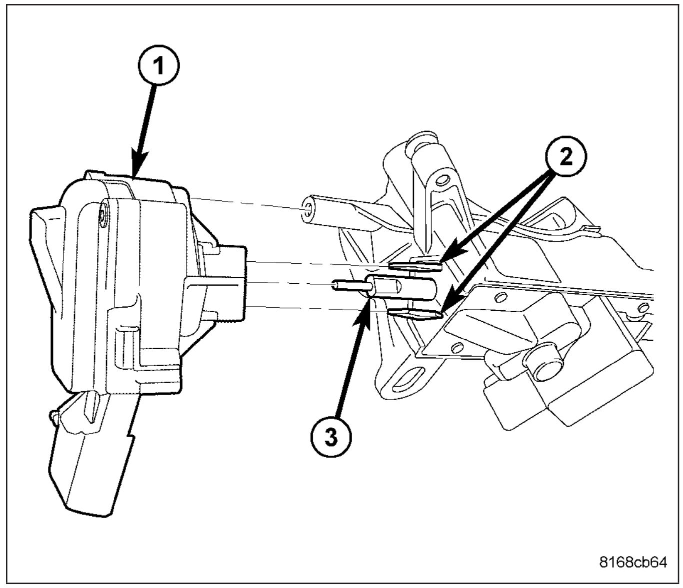
7. Using a Tamper-Proof Torx® Plus (five point) 30 bit, remove the two screws (1) fastening the lock cylinder housing (2) to the column.
8. Remove the lock cylinder housing from the steering column.



9. Remove the ignition switch (2) mounting screw (1).



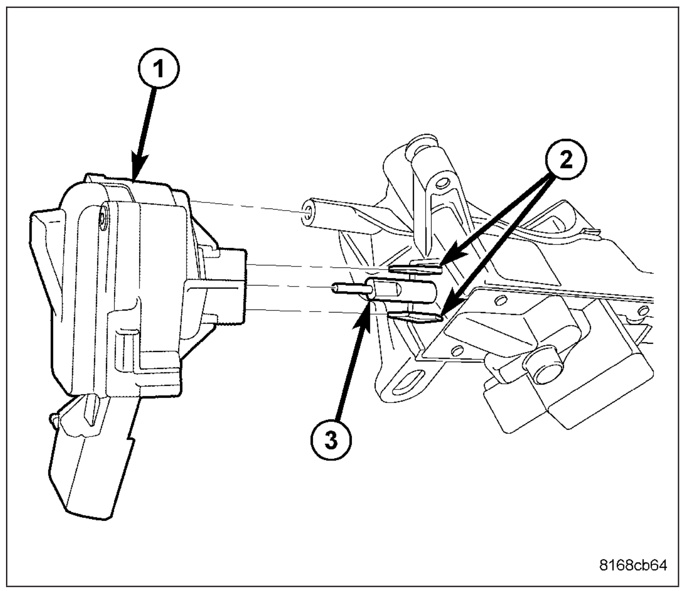
10. Pull the switch (1) straight out and off the retaining tabs (2) located on the lock cylinder housing.



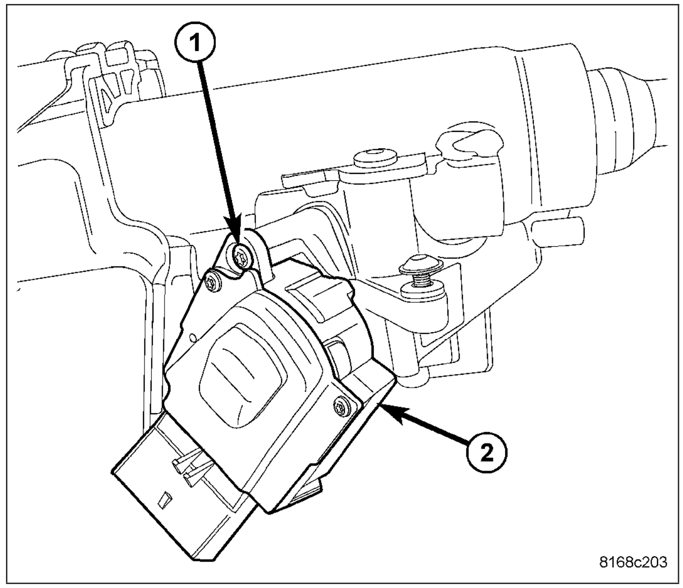
INSTALLATION

NOTE: Ignition switch must be installed prior to lock housing installation on column. Otherwise, the tilt lever will obstruct installation of ignition switch.

1. Ensure the ignition switch is in the RUN position and the actuator shaft in the lock housing is in the RUN position.
2. Align the ignition switch with the pin (3), actuator shaft and retaining tabs (2) located on the lock cylinder housing. Carefully install the switch, snapping it into place over the retaining tabs.

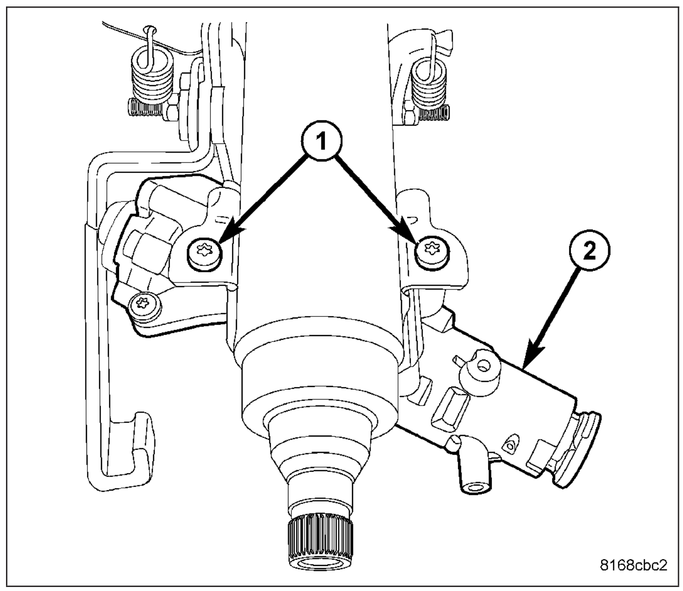


3. Install the ignition switch (2) mounting screw (1). Tighten the screw to 2 N·m (18 in. lbs.).

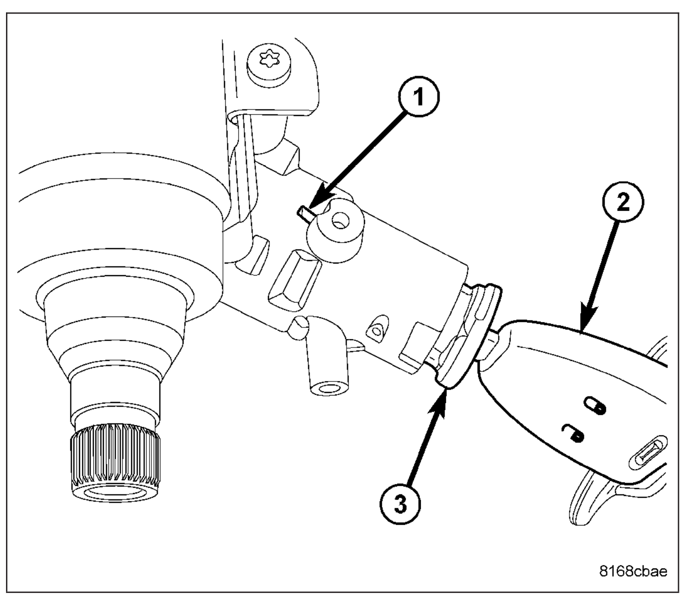


NOTE: Ignition switch needs to be installed on lock cylinder housing before housing installation to clear tilt lever.

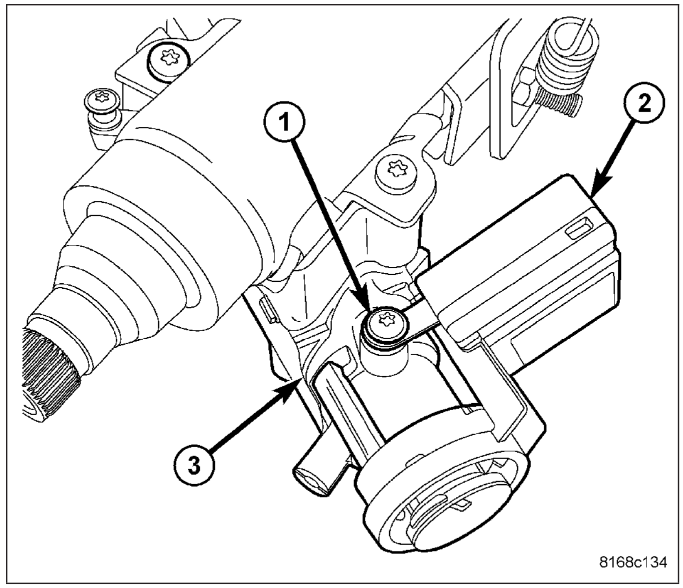
4. Position the lock cylinder housing in the RUN position.
5. Align the lock cylinder housing (2) with the steering column.
6. Install the two screws (1) fastening the lock cylinder housing (2) to the column. Tighten the screws to 12 N·m (110 in. lbs.).



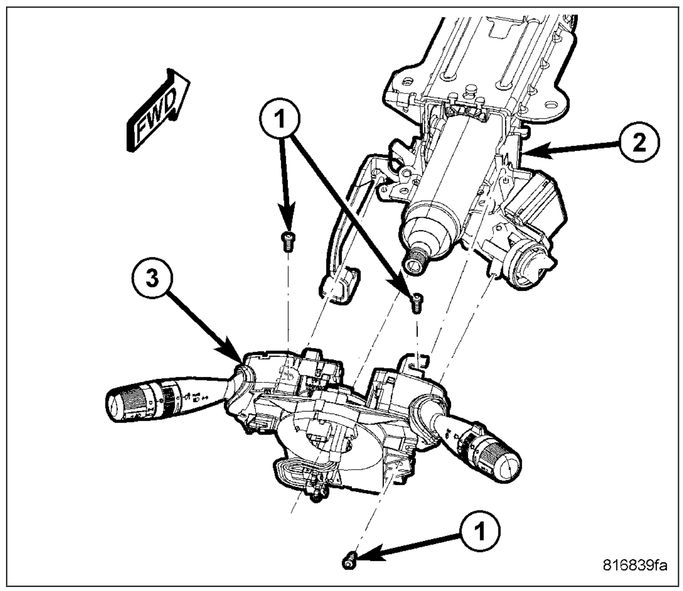
7. Place the actuator in the lock cylinder housing to the RUN position (if not already there).
8. Insert the key into the key cylinder and turn the key cylinder to the RUN position.
9. Align the retaining tab on the key cylinder with the slot in the top of the lock cylinder housing.
10. Slide the key cylinder into the lock cylinder housing until the key cylinder retaining tab locks the cylinder into place.
11. Rotate the key back and forth (OFF to START), then remove and reinstall it, making sure the key cylinder and lock cylinder housing operate properly.



12. Slide the ring of the SKREEM/WCM (2) over the lock cylinder housing (3) and engage the retainer fingers in the recesses formed on the lock cylinder housing.
13. Install the screw (1) fastening the SKREEM/WCM (2) to the lock cylinder housing (3). Tighten the screw to 2.5 N·m (22 in. lbs.).



14. Install the Steering Column Control Module (SCCM) (3) and all components removed to access it. (Refer to 19 - STEERING/COLUMN/ STEERING COLUMN CONTROL MODULE - INSTALLATION)
15. Check operation of all steering column mounted components.



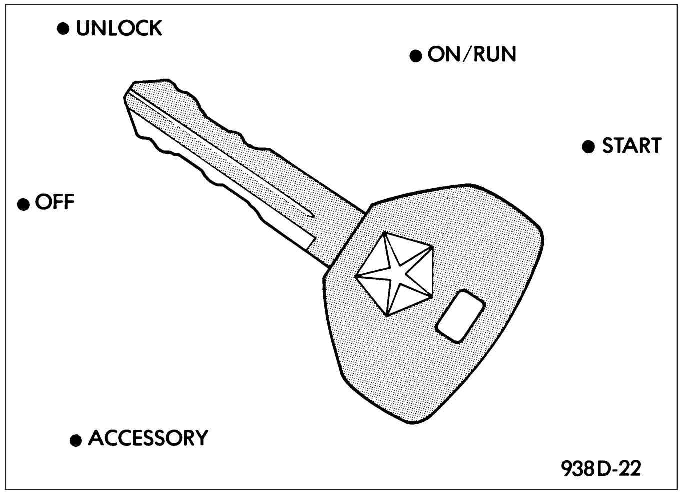
KEY/LOCK CYLINDER

REMOVAL

The lock cylinder is inserted in the end of the housing opposite the ignition switch. The ignition key rotates the cylinder to 5 different detentes:

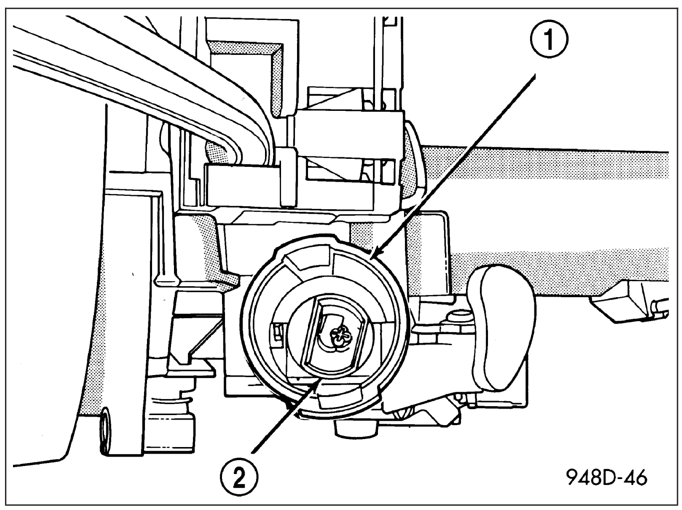
- Accessory
- Off (lock)
- Unlock
- On/Run
- Start

1. Disconnect negative cable from battery.
2. Place key cylinder in RUN position. Through the hole in the lower shroud, depress lock cylinder retaining tab and remove key cylinder.



INSTALLATION

1. Install key in lock cylinder. Turn key to RUN position (retaining tab on lock cylinder can be depressed).
2. The shaft at the end of the lock cylinder aligns with the socket in the end of the housing. To align the socket with the lock cylinder, ensure the socket is in the Run position.
3. Align the lock cylinder with the grooves in the housing. Slide the lock cylinder into the housing until the tab sticks through the opening in the housing.
4. Turn the key to the Off position. Remove the key.
5. Connect negative cable to battery.



SENSOR-KNOCK

DESCRIPTION

The knock sensor is bolted to the cylinder block. The knock sensor is designed to detect engine vibration that is caused by detonation or preignition.

OPERATION

When the knock sensor detects a knock in one of the cylinders, it sends an input signal to the PCM. In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the PCM while the engine operates. As the intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

The voltage signal produced by the knock sensor increases with the amplitude of vibration. The PCM receives as an input the knock sensor voltage signal. If the signal rises above a predetermined level, the PCM will store that value in memory and retard ignition timing to reduce engine knock. If the knock sensor voltage exceeds a preset value, the PCM retards ignition timing for all cylinders. It is not a selective cylinder retard.

The PCM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Knock retard uses its own short term and long term memory program.

Long term memory stores previous detonation information in its battery-backed RAM. The maximum authority that long term memory has over timing retard can be calibrated.

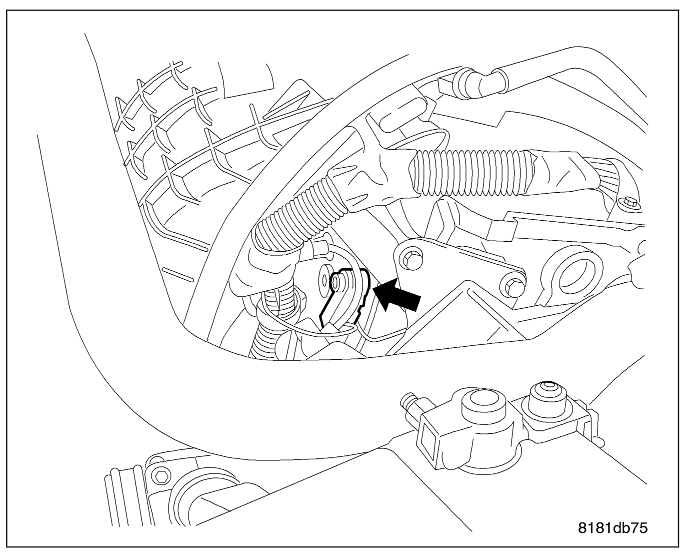
Short term memory is allowed to retard timing up to a preset amount under all operating conditions (as long as rpm is above the minimum rpm) except WOT. The PCM, using short term memory, can respond quickly to retard timing when engine knock is detected. Short term memory is lost any time the ignition key is turned off.

NOTE: Over or under tightening affects knock sensor performance, possibly causing improper spark control.

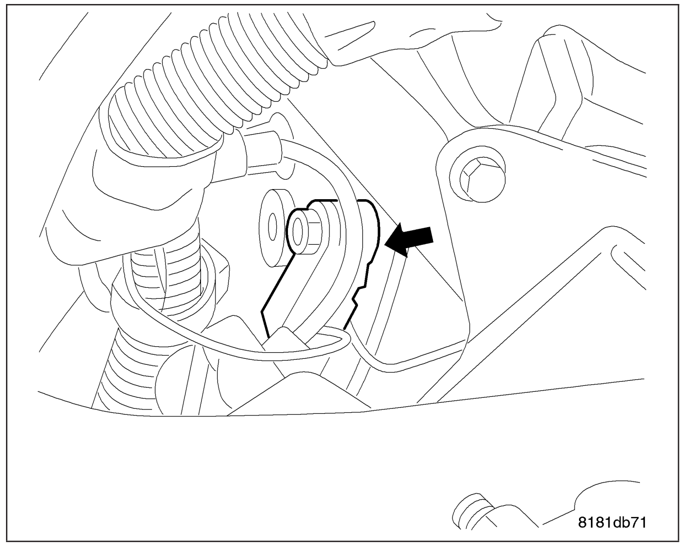
REMOVAL

The knock sensor bolts into the side of the cylinder block in front of the starter under the intake manifold.

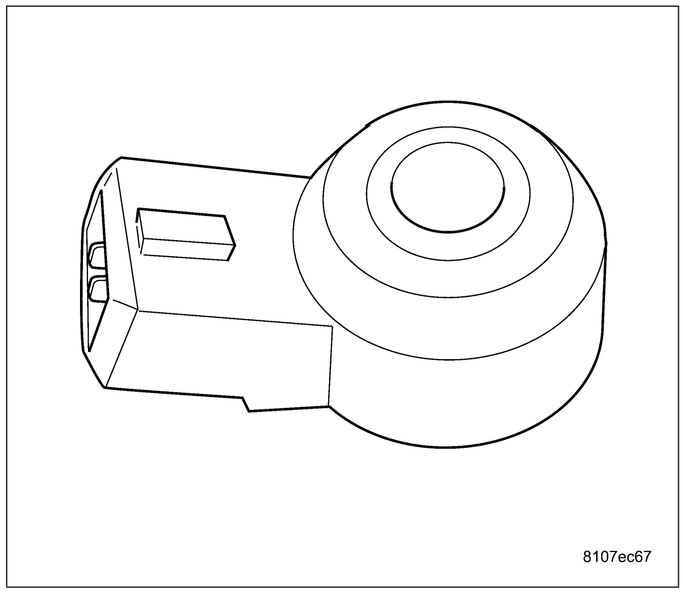
1. Disconnect the negative battery cable.



2. Remove the bolt holding the knock sensor.
3. Remove sensor with electrical connector attached.
4. Disconnect electrical connector from knock sensor.

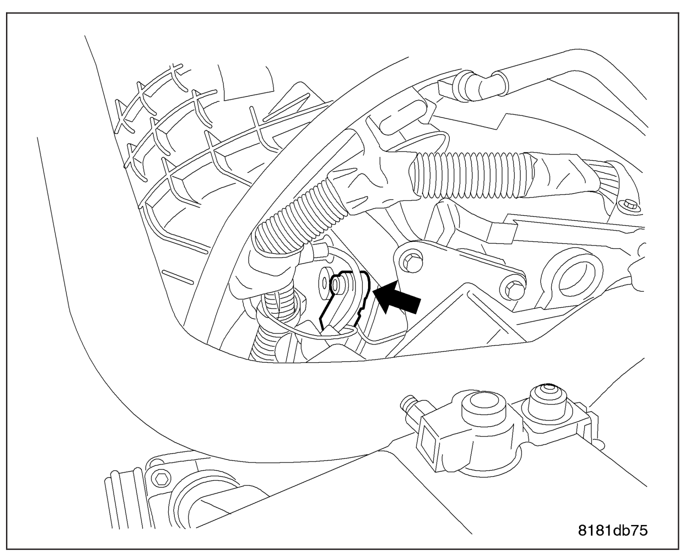


5. Remove the knock sensor.

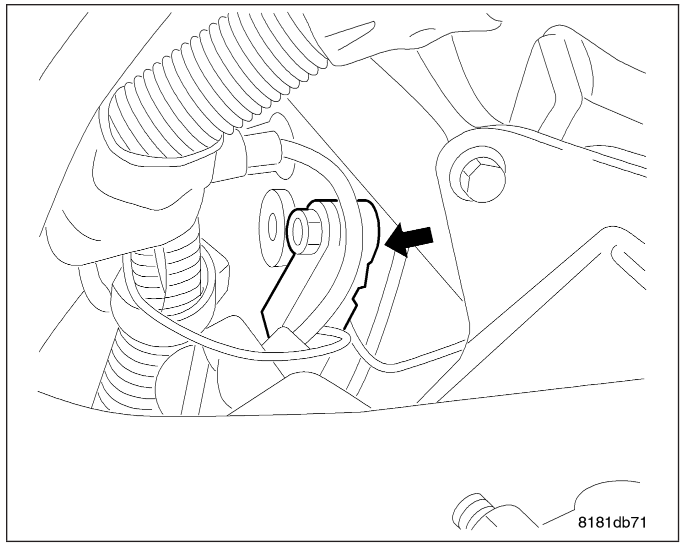


INSTALLATION

The knock sensor bolts into the side of the cylinder block in front of the starter under the intake manifold.



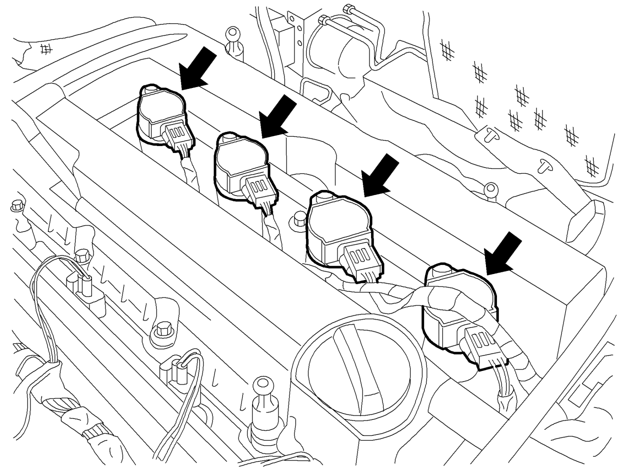
1. Attach electrical connector to knock sensor.
2. Install knock sensor. Tighten knock sensor bolt to 22 N·m (195 in. lbs.) torque. **Over or under tightening effects knock sensor performance, possibly causing improper spark control.**
3. Connect the negative battery cable.



SPARK PLUG

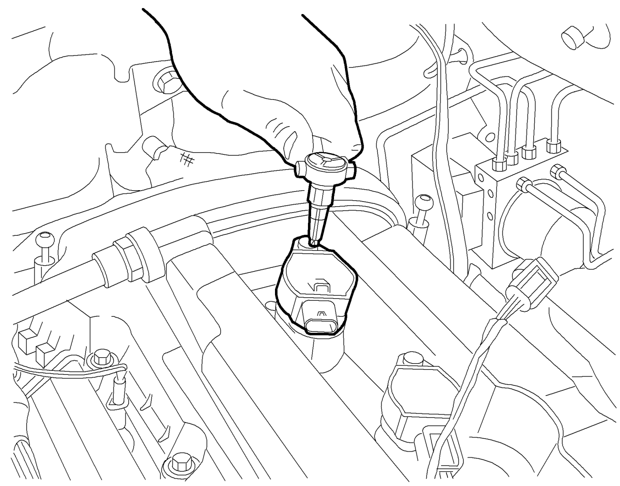
REMOVAL

1. Disconnect the negative battery cable.
2. Disconnect the electrical connectors from ignition coils.



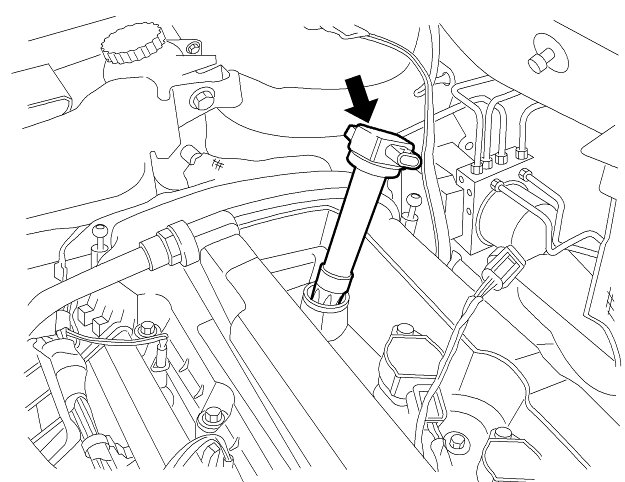
8181ca59

3. Remove the ignition coil mounting bolt.



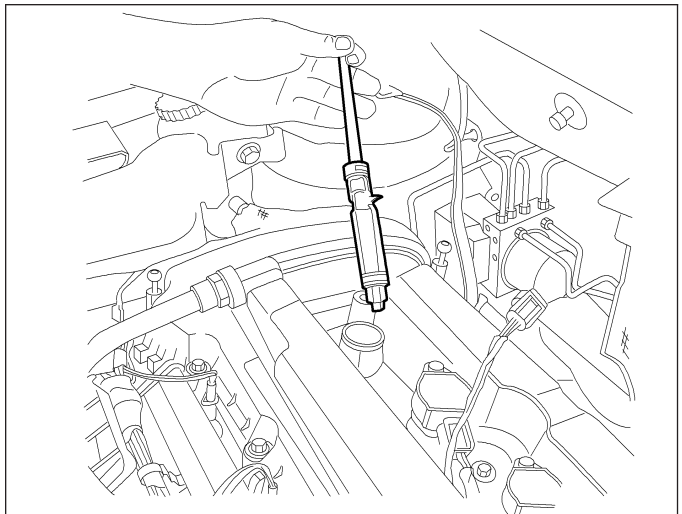
8181d713

4. Twist the ignition coil then pull straight up.



8181ca6a

5. Remove the spark plug using a quality socket with a rubber or foam insert.
6. Inspect the spark plug condition.



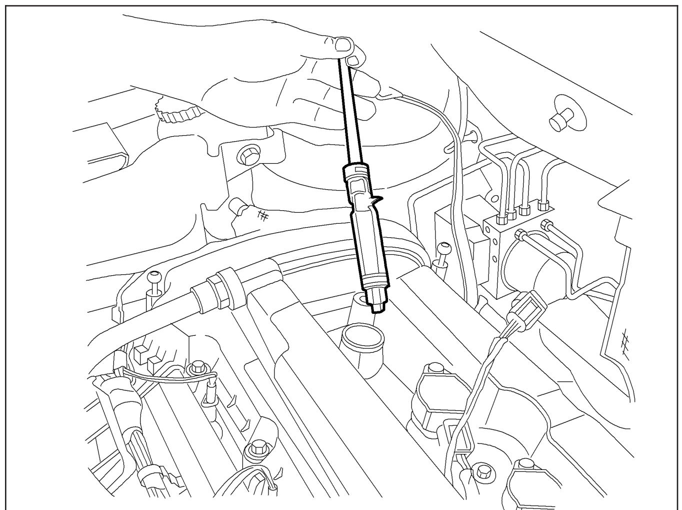
8181d0d7

INSTALLATION

Special care should be used when installing spark plugs in the cylinder head spark plug wells. Be sure the plugs do not drop into the wells, damage to the electrodes can occur.

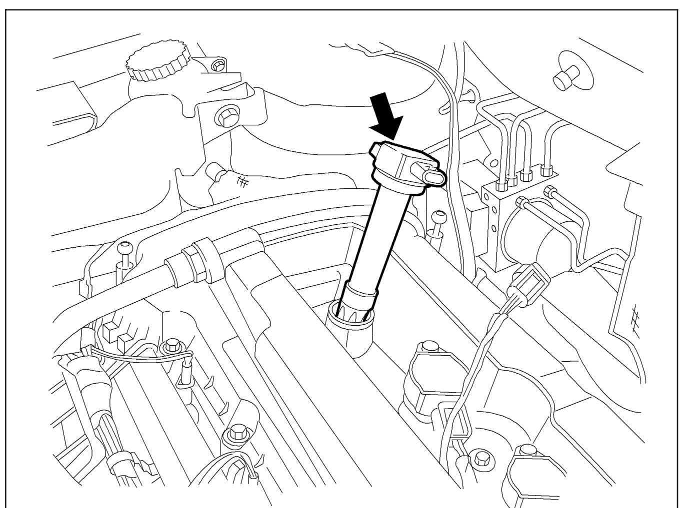
Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap. Overtightening can also damage the cylinder head.

1. To avoid cross threading, start the spark plug into the cylinder head by hand.
2. Tighten spark plugs to 27 N·m (20 ft. lbs.) torque.



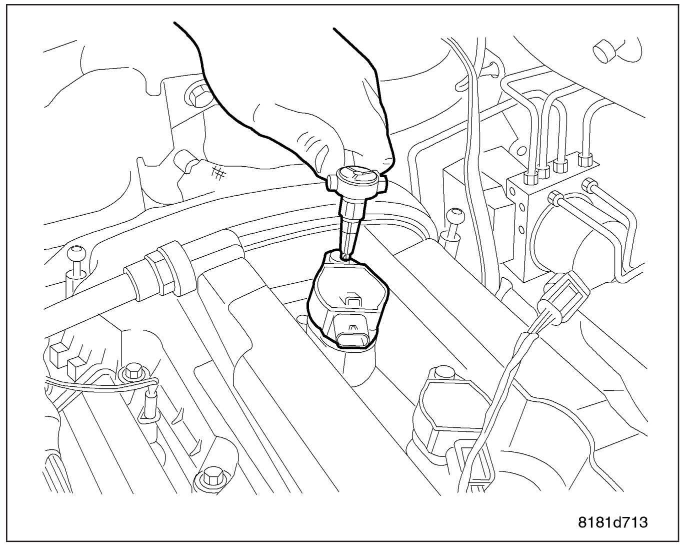
8181d0d7

3. Install ignition coil on to spark plug.



8181ca6a

4. Tighten coil mounting bolt. Tighten to N·m (ft. lbs.) torque.
5. Connect electrical connectors and lock.
6. Connect the negative battery cable.



SOLENOID-VARIABLE VALVE TIMING

DESCRIPTION

Variable valve timing solenoid assembly.

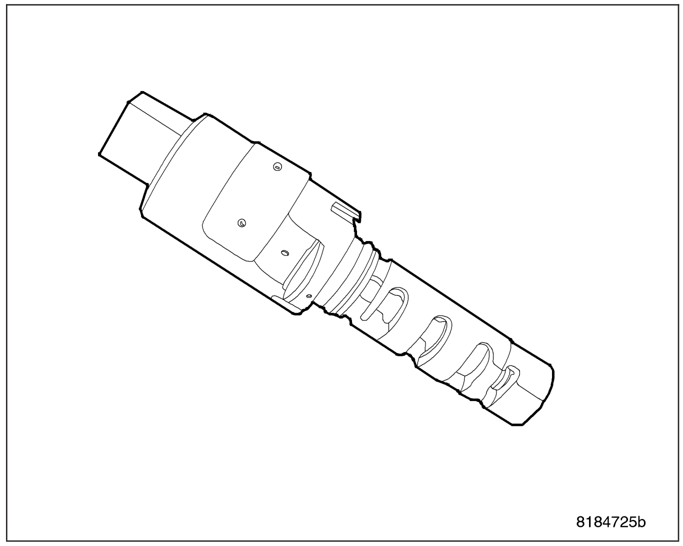
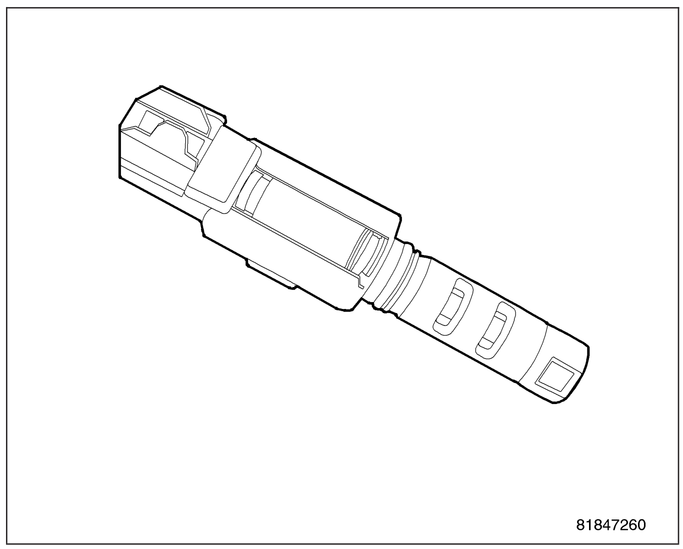


Fig. 1 SOLENOID ASSEMBLY



OPERATION

There is both an Intake and an exhaust camshaft sensor on vehicles equipped with a World Engine. The variable valve timing system used on World Engines requires the exact position of both the intake and exhaust camshaft. The GPEC1 uses camshaft sensor data along with crankshaft data to determine the actual position of the camshafts. Intake and exhaust phaser oil control valves are required on World Engine vehicles using variable valve timing. The oil valves direct oil to the Intake and exhaust phasers. Oil pressure in the phasers moves the camshafts to an advanced or retarded position.

To resolve this inherent conflict between optimum high and low speed valve timing, the GPEC1 controlled engine uses a variable valve timing system. The variable valve timing system advances and retards valve timing by rotating the position of both the intake and exhaust camshafts. With this system, the intake valve opening can range from 80 to 120 crankshaft degrees after Top Dead Center. Likewise, the exhaust valve opening can range from 85 to 120 crankshaft degrees before Top Dead Center. This degree of flexibility provides many benefits, including: Improved Engine Performance, Increased Fuel Economy, Improved Idle Stability and Decreased Engine Emissions.

The variable valve timing system is electronically controlled and hydraulically operated. The GPEC1 receives information from many sensors to determine the optimum valve timing. It then pulse-width modulates oil control valves which direct oil to the cam phasers. The cam phasers use oil pressure to rotate the intake and exhaust camshafts.

The rotation of the camshafts is referred to as cam phasing. Before the GPEC1 can begin commanding the camshaft phasing, several enabling conditions must be met:

- The engine oil temperature must be at least 20°F (-6.6°)
- The oil control valve coil temperature must be less than 280°F (138° C)
- Engine speed must be at least 600 to 1000 rpm
- Battery voltage must be at least 10 volts
- And there must be no camshaft or crankshaft sensor faults, engine timing faults, or oil control valve faults

First we will examine variable valve timing enabling conditions, and then we will take a closer look at the inputs and outputs of the system:

- Accelerator pedal position sensor
- Oil temperature sensor
- Map sensor
- Intake cam sensor
- Exhaust cam sensor
- Crankshaft sensor
- GPEC1
- Exhaust phaser oil control valve
- Intake phaser oil control valve
- Inputs
- Engine control module
- Outputs
- Sensed battery voltage

A minimum oil temperature is required to enable variable valve timing operation. Oil temperature and viscosity also have an impact on the operation of variable valve timing after start-up. Oil is used to control the movement of the camshafts. An incorrect oil viscosity could adversely affect the operation of the system or even render the system inoperative. It may even set a fault code.

The accelerator pedal position sensor indicates how far the driver wants to open the throttle plate. The GPEC1 calculates an initial camshaft set point based on whether the accelerator pedal is at part throttle or wide open throttle.

The MAP sensor provides information regarding engine load.

Sensed battery voltage provides information regarding current system voltage. Sensed battery voltage must be at least 10 volts in order for the oil control valves to function properly

This information allows the GPEC1 to adjust camshaft timing to achieve the best fuel economy, the best engine performance or a combination of both. The hall-effect crankshaft sensor provides RPM information and determines when the number one piston is approaching Top Dead Center. The sensor generates a signal as the tone wheel, attached to the crankshaft, rotates. The tone wheel has 60 teeth minus two. When the gap, created by the missing teeth passes by the sensor, a signal is produced that indicates the number one piston is at Top Dead Center. The GPEC1 uses crankshaft sensor data along with camshaft data to determine the actual position of the camshaft. There are two hall-effect camshaft sensors on engines equipped with variable valve timing. The GPEC1 uses camshaft sensor data along with crankshaft data to determine the actual position of the camshaft.

The GPEC1 individually controls each valve. It sends a pulse width modulated signal to move a spool within the outer casing of the valve. Depending upon spool movement, oil is directed through the passages to advance or retard cam timing. The oil control valve also has a special cleaning strategy at key-on. The cleaning strategy is known as ″debris crush mode″. At key-on the GPEC1 cycles the oil control valve on and off several times to crush any debris in the oil control valve and prevent the spool valve from sticking.

There are two oil control valves. One valve directs oil to the intake cam phaser, the other valve directs oil to the exhaust cam phaser. The valves are designed and function in the same manner. The outer casing of each oil valve has five oil passages. A passage for pressurized supply oil. A passage to the advance chamber of the cam phaser. A passage to the retard chamber of the cam phaser. A passage for oil return from the advance chamber of the cam phaser. A passage for oil return from the retard chamber of the cam phaser. Oil flows through the passages and applies pressure to the cam phasers to change cam timing.

There are two cam phasers. One phaser controls the position of the intake camshaft. The other phaser controls the position of the exhaust camshaft. The phasers consist of a sprocket, a rotor vane, and a housing or stator. The

exhaust cam phaser also consists of a front bushing and spring. We will discuss the purpose and function of the bushing and spring later. The housing is bolted and permanently fixed to the camshaft sprocket, while the rotor vane is bolted and permanently fixed to the camshaft. With this design, any movement of the rotor vane in relation to the housing will also move the camshaft. The phaser and sprocket are serviced as an assembly.

Camshaft and crankshaft sensors provide feedback to the GPEC1 regarding the actual position of the camshafts. The GPEC1 then compares the actual camshaft positioning with desired positioning. If the desired positioning is not achieved within a specified time, during the second key cycle a trouble code is set.

There are six new diagnostic trouble codes available to help you determine if the control circuit from the GPEC1 to the oil control valve is intact and operating properly. The codes identify whether the control circuit is open, shorted to ground, or shorted to power. Three trouble codes are related to intake camshaft positioning, the other three codes are specific to exhaust camshaft positioning.

The oil control valve contains both electrical and mechanical components. It is electrically controlled by the GPEC1. The electrical current that energizes the coil results in mechanical motion of the spool valve. It is possible to verify both the electrical and mechanical operation of the valve. The oil control valve consists of a coil that is energized to move a spool within an outer casing. The condition of the coil can be tested with a Digital Volt Ohmmeter or DVOM. With the DVOM set to measure resistance, check the coil for an open, a short to ground, or excessive resistance. The correct resistance value of the coil is between 6 and 8 ohms. The mechanical operation of the oil control valve can be tested using actuator commands on the scan tool. Remove the oil control valve, then navigate to the actuator menu and select the oil control valve. Use commands to activate the valve and watch as the spool valve moves back and forth inside the casing.

Because the cam phasers are hydraulically operated by engine oil, the condition of the oil is very important. The oil must be of the correct viscosity, not obstructed by debris, and of the correct pressure. Maintaining the correct oil viscosity is critical to the operation of the variable valve timing system. The wrong oil viscosity may cause the variable valve timing to malfunction and trouble codes to set. The correct oil viscosity for this system is 5W20. Oil must be clean, unobstructed and free to flow through the variable valve timing system. Oil could become obstructed in oil passages located in the cylinder head, cylinder block, or even in the oil screen. In the event oil flow is obstructed, further diagnosis or disassembly may be required to pin point the source of the obstruction. The variable valve timing system relies on oil pressure to advance or retard the position of the camshaft. Insufficient oil pressure will adversely affect the operation of variable valve timing. The minimum oil pressure for this system is 15 psi at normal operating temperature.

Though not directly used to change camshaft positioning, the oil screen is an important component of the variable valve timing system. It helps to remove debris going to the variable valve timing components. The oil screen is located in the cylinder block, immediately below the cylinder head. Oil must pass through the oil screen before entering the oil control valve. The cylinder head must be removed to service the oil screen.

How the cam phaser works. The cam phaser assembly has eight separate chambers; four advance chambers and four retard chambers. When camshaft advance is requested, oil enters all four advance chambers and exerts force on the rotor vane. Because the rotor vane is bolted to the camshaft, the entire camshaft profile moves along with the rotor vane. At the same time, oil is forced out of the retard chambers. When camshaft retard is requested oil enters the retard chambers to move the camshaft in the opposite direction. There is a lock pin on one side of the rotor vane that fits inside a recessed area in the housing. The lock pin ensures that the default position of the intake cam phaser is 120 crankshaft degrees full retard and the default position of the exhaust cam phaser is 120 crankshaft degrees full advance. When the engine is turned off, rotational force and inertia move the intake camshaft and rotor vane toward the retard position. The exhaust cam phaser includes a spring and bushing to work against the rotational force of the engine, allowing the exhaust cam phaser to lock in the fully advanced position. Under most conditions the cam phasers are returned to lock pin position when the engine is turned off. In the unique condition of an engine stall, which abruptly shuts off the engine, the cam phasers may not return to the lock pin position. In this case, the phasers will return to the lock pin position at the next start-up. Lock pin position is the most ideal cam timing for idle stability. When engine rpm exceeds approximately 600 to 1000 rpm, oil pressure unlocks the pins and variable valve timing resumes. Once enabling conditions are met, the GPEC1 uses input from sensors to calculate optimum valve timing.

There are four preprogrammed modes from which the GPEC1 bases initial valve timing.

- Starting
- Idle or Part throttle
- Wide open throttle
- Limp-in or Default

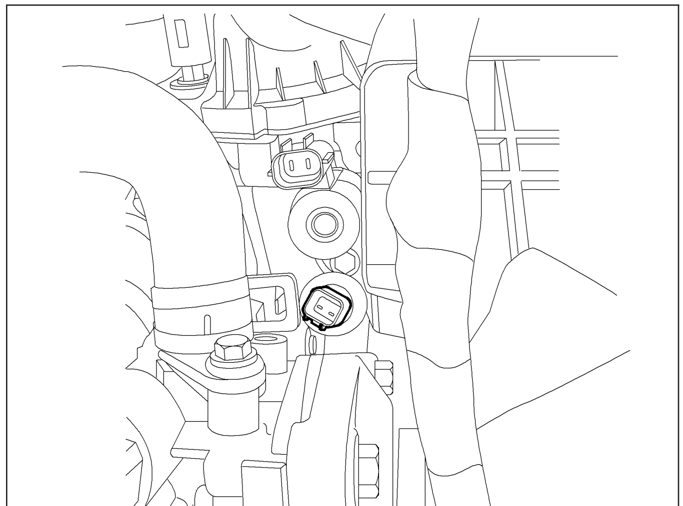
From each preprogrammed mode, the GPEC1 adjusts valve timing based on operating conditions.

GPEC1 has calculated optimum intake valve timing of 112° after Top Dead Center and optimum exhaust valve timing of 97° before Top Dead Center. The GPEC1 pulse width modulates the oil control valves to advance or retard the camshaft to their desired location. The spool valve inside the intake oil control valve is energized and moves to allow pressurized oil into the advance chambers of the intake cam phaser. At the same time, the spool valve inside the exhaust oil control valve is energized and moves to allow pressurized oil into the retard chambers of the exhaust cam phaser. Oil enters the advance chambers of the intake phaser and the retard chambers of the exhaust phaser. Oil pressure releases the lock pin from its locked position and pushes against the rotor vane. Both the rotor vanes are moved, advancing the intake camshaft and retarding the exhaust camshaft.

REMOVAL

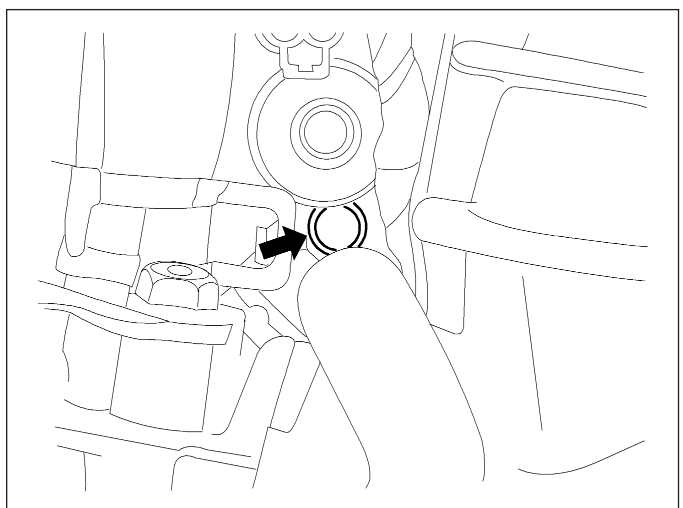
FRONT SOLENOID 1/1

1. Disconnect negative battery cable.
2. Remove engine cover.
3. Rotate hose clamp out of way.
4. Disconnect oil pressure sensor electrical connector.
5. Remove oil pressure sensor.
6. Disconnect variable valve timing solenoid electrical connector.



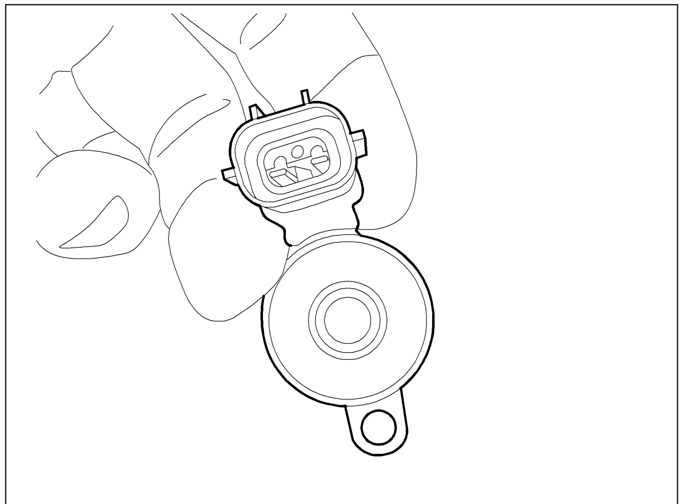
81847278

7. Remove variable valve timing solenoid mounting bolt.



81847274

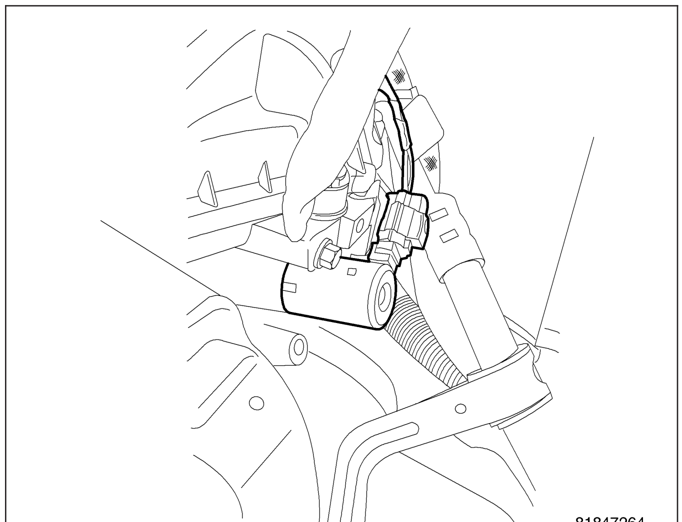
8. Pull solenoid straight out of cylinder head.



8184726c

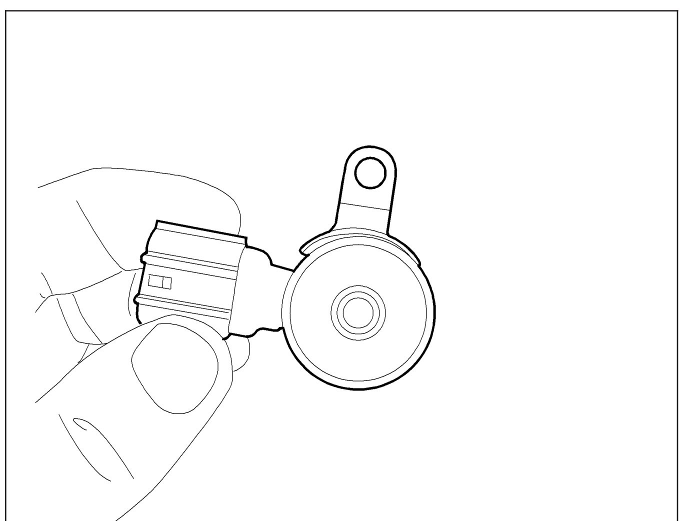
REAR SOLENOID 1/2

1. Disconnect negative battery cable.
2. Remove engine cover.
3. Disconnect variable valve timing solenoid electrical connector.
4. Remove variable valve timing solenoid mounting bolt.



81847264

5. Pull solenoid straight out of cylinder head.

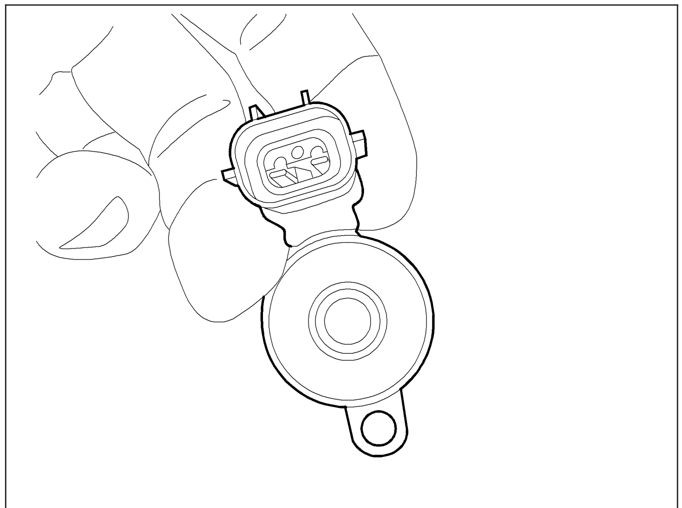


81847268

INSTALLATION

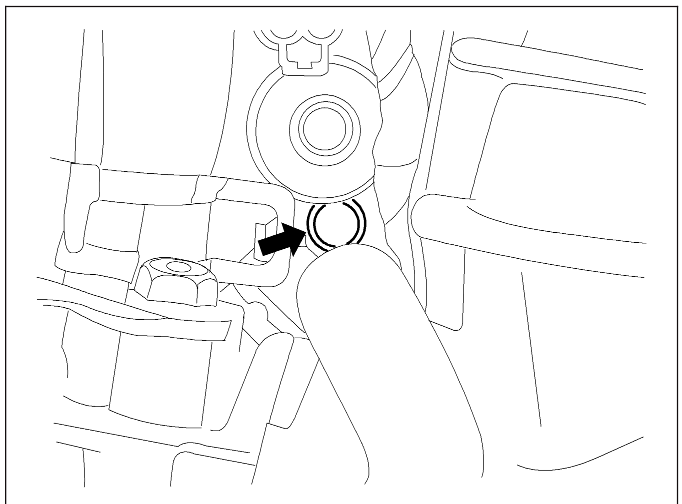
FRONT SOLENOID 1/1

1. Solenoid for front location 1/1.



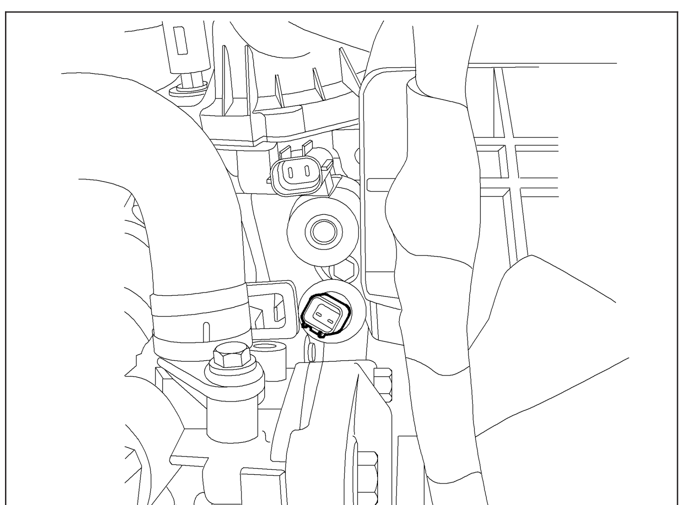
8184726c

2. Install solenoid into cylinder head.
3. Install mounting bolt and tighten to 12 N·m (9 ft. lbs.).



81847274

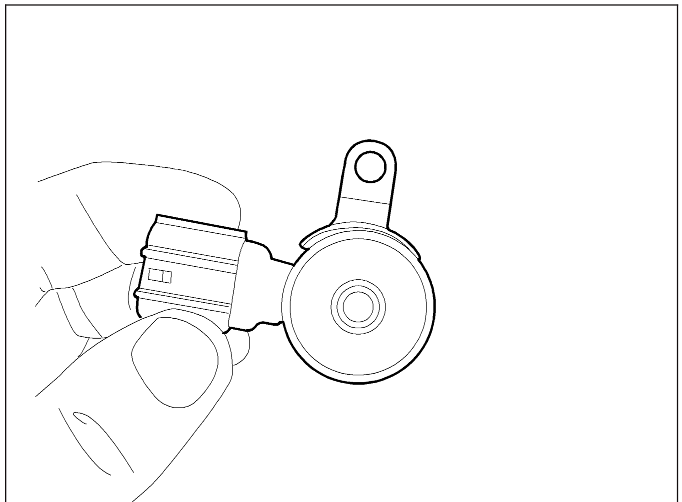
4. Install oil pressure sensor.
5. Connect electrical connector to oil pressure sensor.
6. Connect electrical connector to Variable valve timing solenoid.
7. Connect negative battery cable.
8. Install engine cover.



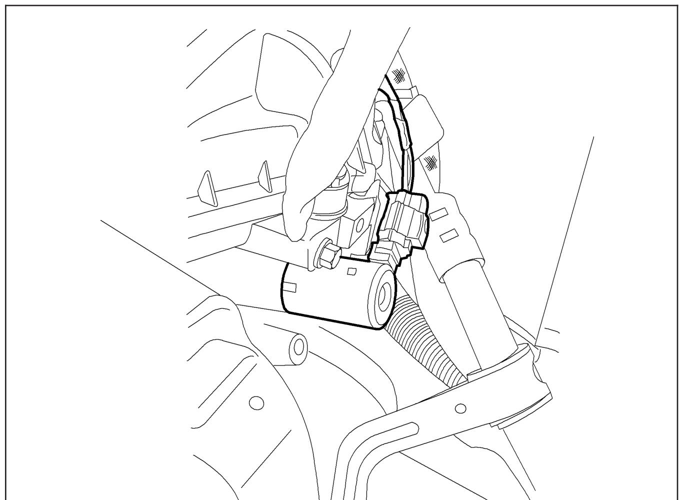
81847278

REAR SOLENOID 1/2

1. Rear variable valve timing solenoid.
2. Install solenoid into cylinder head.
3. Install mounting bolt and tighten to 12 N·m (9 ft. lbs.).
4. Connect electrical connector to Variable valve timing solenoid.


81847268

5. Connect negative battery cable.
6. Install engine cover.


81847264

INSTRUMENT CLUSTER

TABLE OF CONTENTS

INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

TABLE OF CONTENTS

INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B123F-MENU SWITCH STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects the Menu Switch active for greater than 20 seconds.

Possible Causes
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Press the MENU switch three times.

With the scan tool, read DTCs.

Does the scan tool display: B123F-MENU SWITCH STUCK?

Yes >> Replace the Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Test complete

B1265–TRIP/TOGGLE SWITCH STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects the TRIP/TOGGLE Switch active for greater than 20 seconds.

Possible Causes
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Press the TRIP/TOGGLE switch three times.

With the scan tool, read DTCs.

Does the scan tool display: B1265–TRIP/TOGGLE SWITCH STUCK?

Yes >> Replace the Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Test complete

B1609-PANEL DIMMER INPUT CIRCUIT/PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Headlamps activated.
- **Set Condition:**
  Panel Dimmer Input circuit incorrect performance.

Possible Causes
STEERING CONTROL MODULE

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B1609-PANEL DIMMER INPUT CIRCUIT/PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. STEERING CONTROL MODULE

The Panel Dimmer Signal is a LIN Bus message from the SCM.

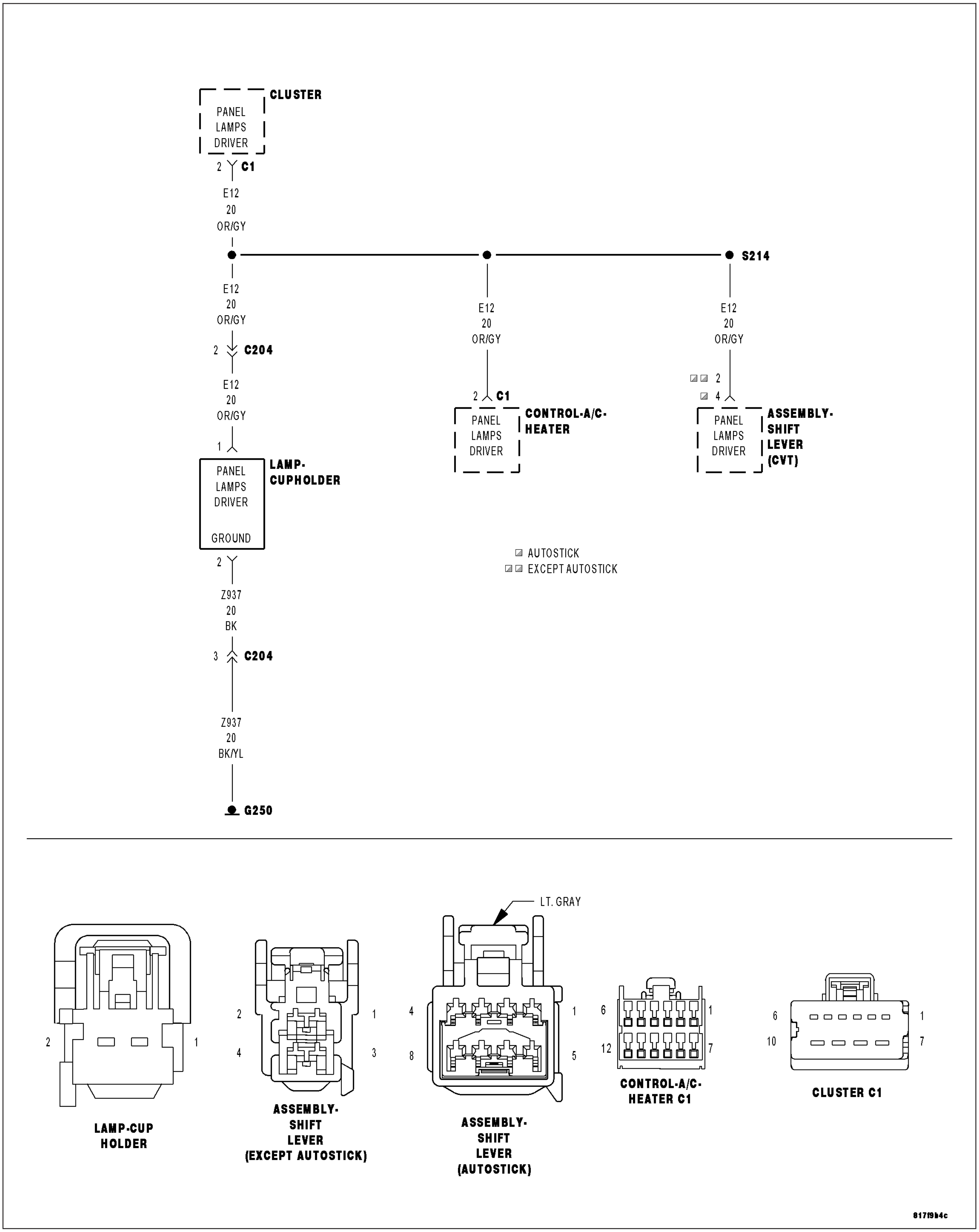
If this DTC is set, view repair.

Continue

Replace the SCM in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1612-PANEL ILLUMINATION CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the Panel Illumination active.
- **Set Condition:**
  Panel Illumination circuit performance.

Possible Causes
(E12) PANEL LAMPS DRIVER CIRCUIT SHORTED TO GROUND
(E12) PANEL LAMPS DRIVER CIRCUIT SHORTED TO VOLTAGE
(E12) PANEL LAMPS DRIVER CIRCUIT OPEN
A/C HEATER CONTROL SHORTED TO GROUND
SHIFT LEVER ASSEMBLY SHORTED TO GROUND
CUP HOLDER LAMP SHORTED TO GROUND
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Panel Illumination.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. CHECK THE A/C HEATER CONTROL FOR A SHORT TO GROUND

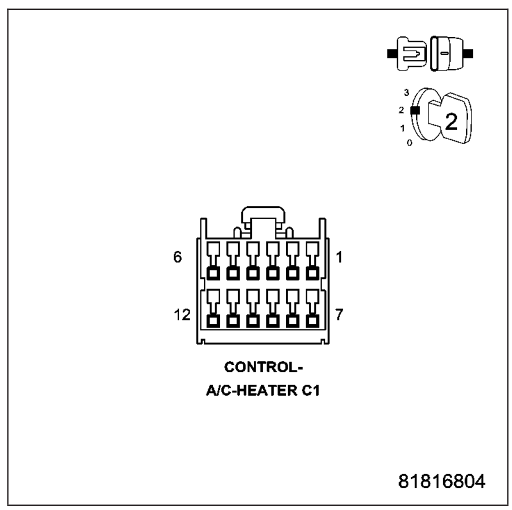
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



Does the scan tool display: B1612-PANEL ILLUMINATION CONTROL CIRCUIT?

Yes >> Go To 3

No >> Replace the A/C Control Head in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. CHECK THE SHIFT LEVER ASSEMBLY FOR A SHORT TO GROUND

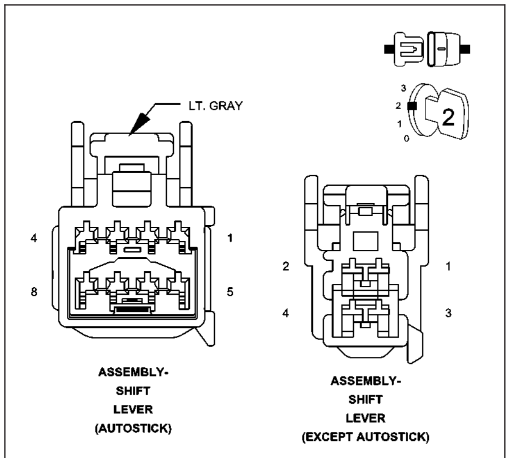
Turn the ignition off.

Disconnect the Shift Lever Assembly harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



8181680b

Does the scan tool display: B1612-PANEL ILLUMINATION CONTROL CIRCUIT?

Yes >> Go To 4

No >> Replace the Shift Lever Assembly in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. CHECK THE CUP HOLDER LAMP FOR A SHORT TO GROUND

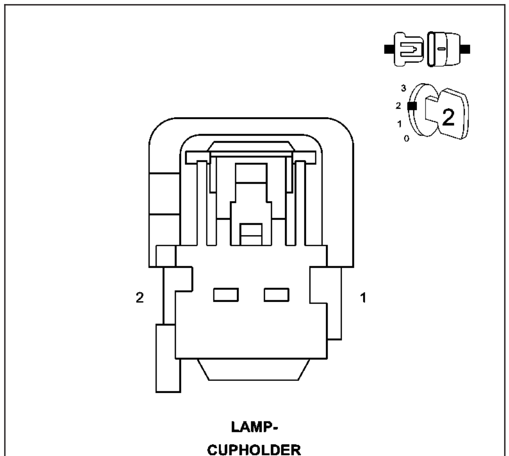
Turn the ignition off.

Disconnect the Cup Holder Lamp harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



81816812

Does the scan tool display: B1612-PANEL ILLUMINATION CONTROL CIRCUIT?

Yes >> Go To 5

No >> Replace the Cup Holder Lamp in accordance with the service information.

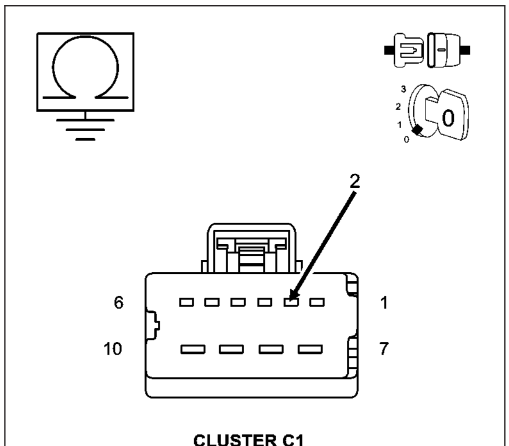
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 harness connector.

With all the above components disconnected, measure the resistance to ground of the (E12) Panel Lamps Driver Circuit from the Instrument Cluster C1 harness connector.



8184e50d

Is the resistance less than 10K ohms?

Yes >> Repair the (E12) Panel Lamps Driver circuit for a short to ground.

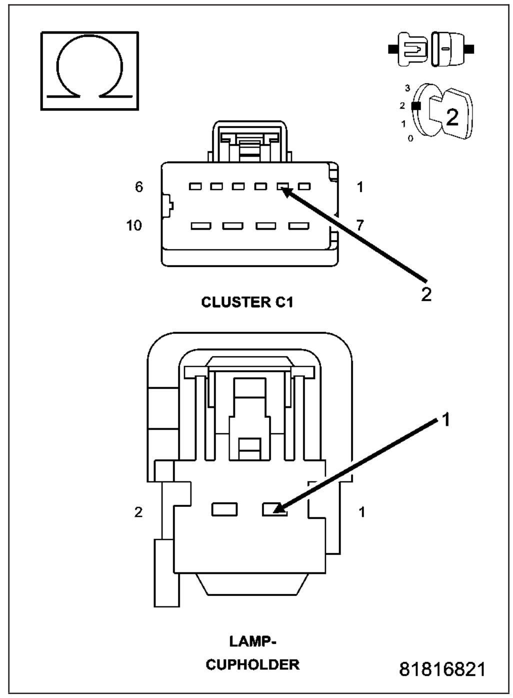
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 6

6. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR AN OPEN

Turn the ignition off.

Measure the resistance of the (E12) Panel Lamps Driver Circuit between the Instrument Cluster C1 harness connector and the Cup Holder harness connector.



Is the resistance greater than 10K ohms?

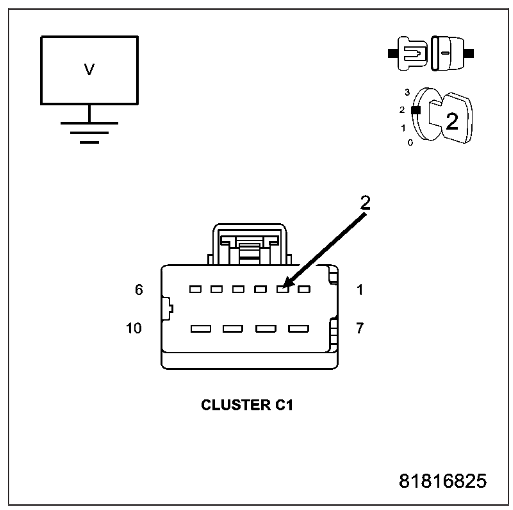
Yes >> Repair the (E12) Panel Lamps Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 7

7. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (E12) Panel Lamps Driver Circuit from the Instrument Cluster C1 harness connector.

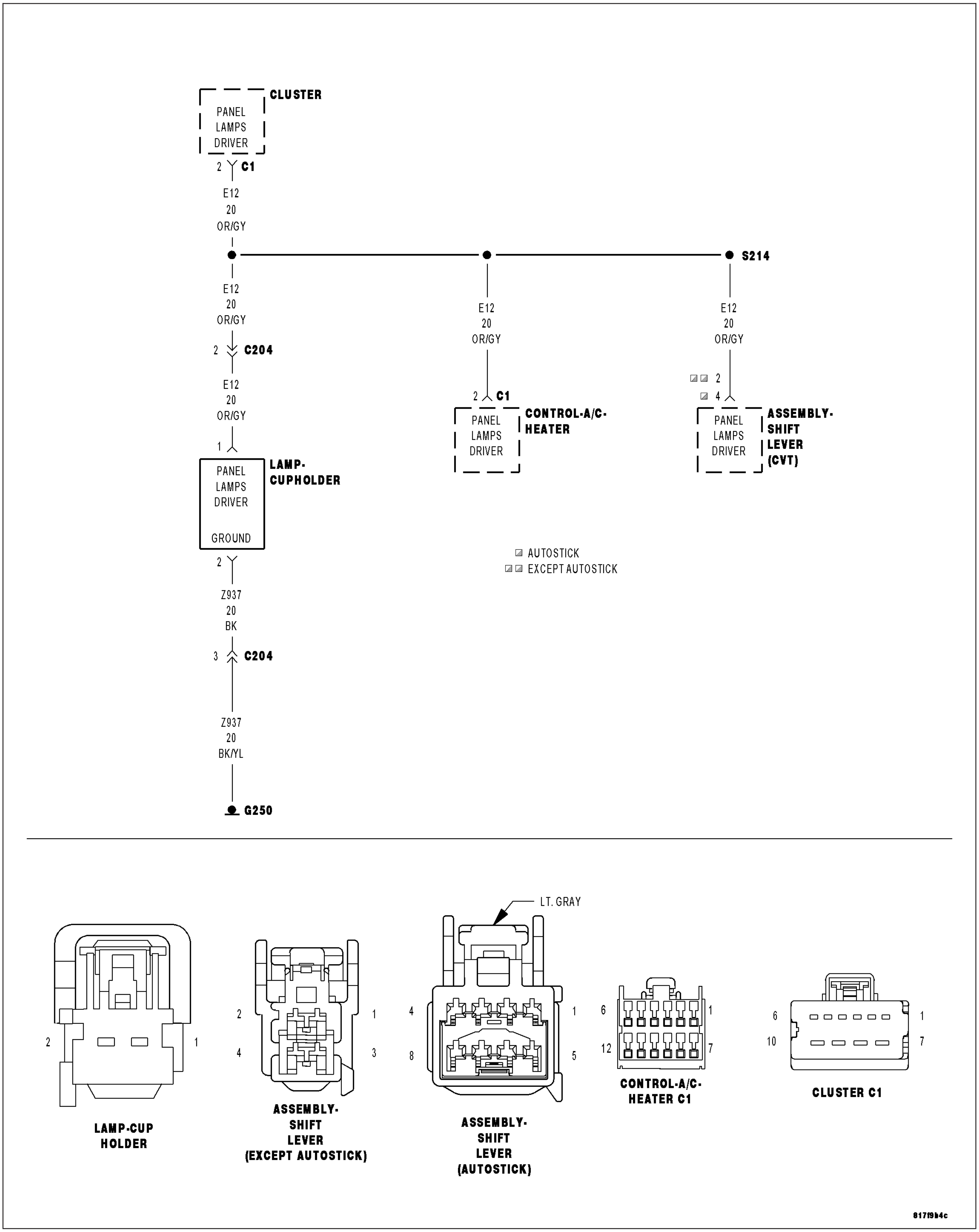


Is the voltage above 5.0 volts?

Yes >> Repair the (E12) Panel Lamps Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the Panel Illumination active.
- **Set Condition:**
  Panel Illumination Status LOW.

Possible Causes
(E12) PANEL LAMPS DRIVER CIRCUIT SHORTED TO GROUND
A/C HEATER CONTROL SHORTED TO GROUND
SHIFT LEVER ASSEMBLY SHORTED TO GROUND
CUP HOLDER LAMP SHORTED TO GROUND
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Panel Illumination.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. CHECK THE A/C HEATER CONTROL FOR A SHORT TO GROUND

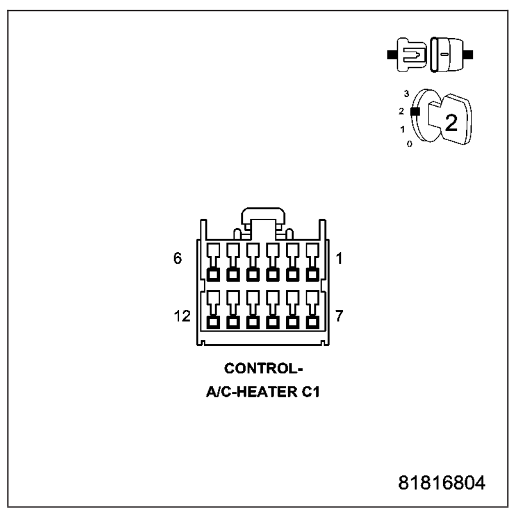
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the A/C Control Head in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. CHECK THE SHIFT LEVER ASSEMBLY FOR A SHORT TO GROUND

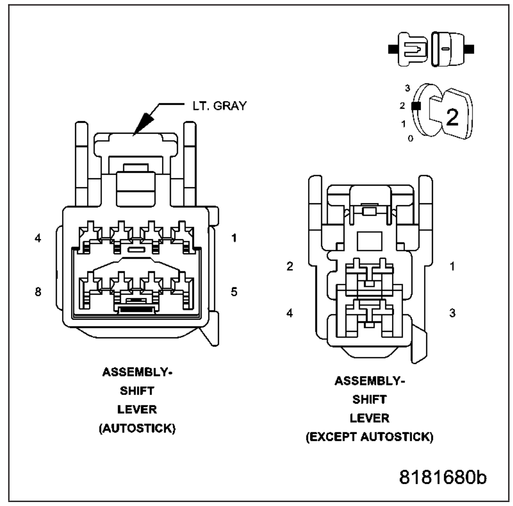
Turn the ignition off.

Disconnect the Shift Lever Assembly harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 4

No >> Replace the Shift Lever Assembly in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. CHECK THE CUP HOLDER LAMP FOR A SHORT TO GROUND

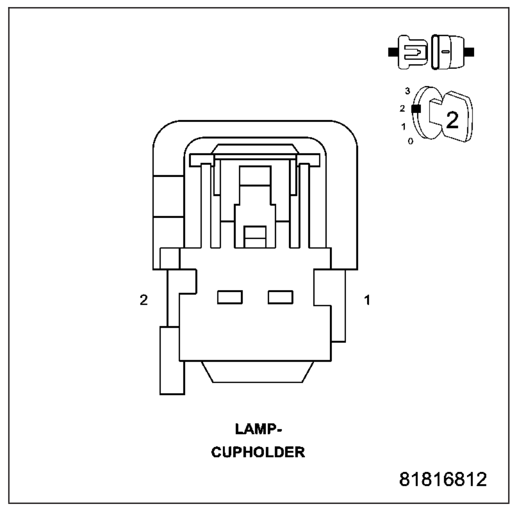
Turn the ignition off.

Disconnect the Cup Holder Lamp harness connector.

Turn the ignition on.

Activate the Panel Illumination.

With the scan tool, read DTCs.



Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 5

No >> Replace the Cup Holder Lamp in accordance with the service information.

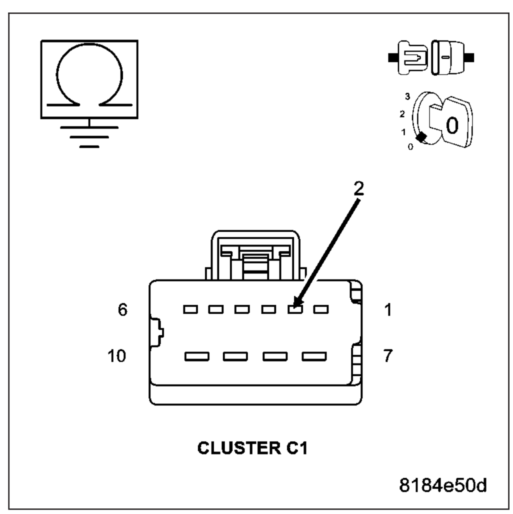
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 harness connector.

With all the above components disconnected, measure the resistance to ground of the (E12) Panel Lamps Driver Circuit from the Instrument Cluster C1 harness connector.



Is the resistance less than 10K ohms?

Yes >> Repair the (E12) Panel Lamps Driver circuit for a short to ground.

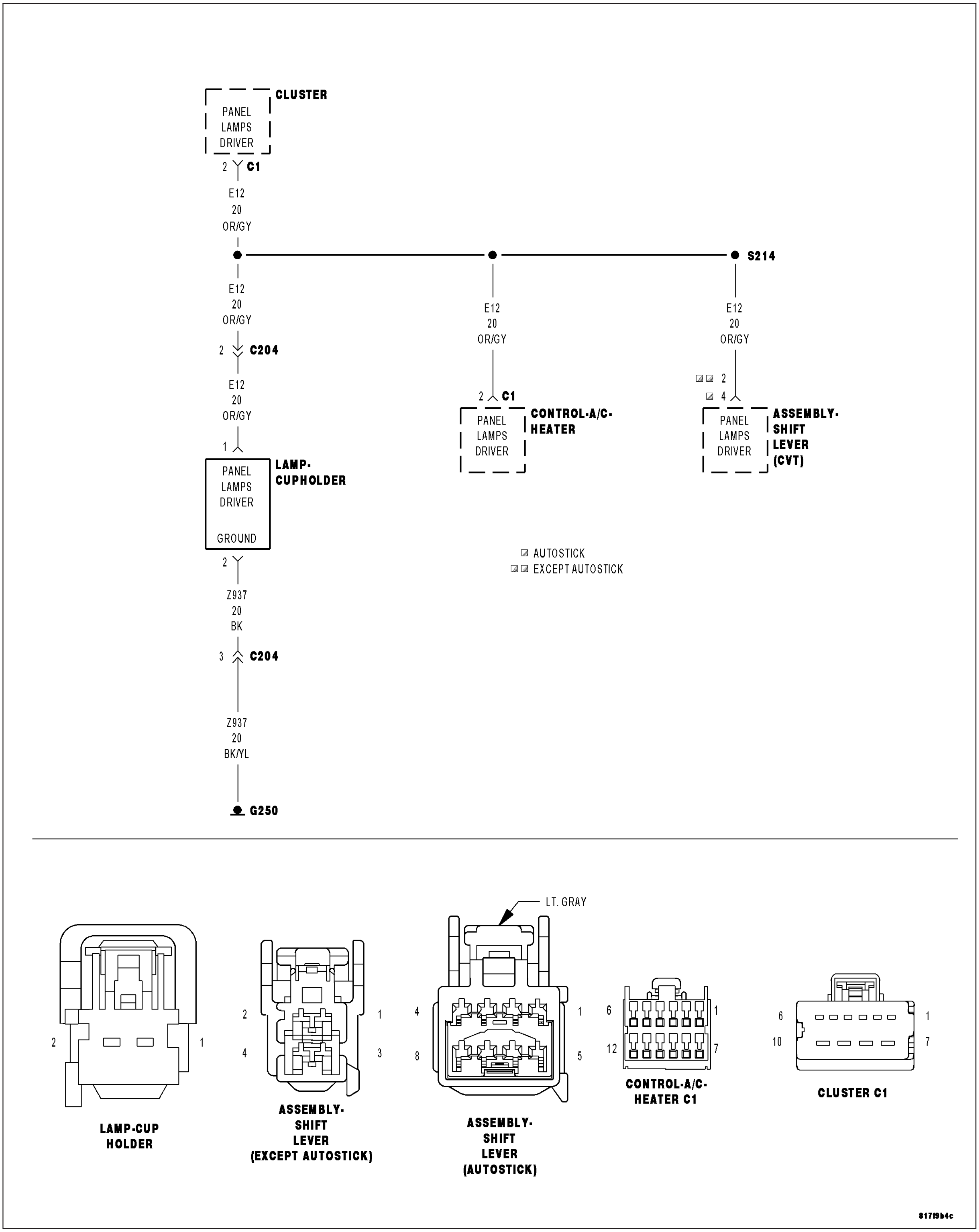
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES -

STANDARD PROCEDURE)

B1615-PANEL ILLUMINATION CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the Panel Illumination active.
- **Set Condition:**
  Panel Illumination Status open.

Possible Causes
(E12) PANEL LAMPS DRIVER CIRCUIT SHORTED TO VOLTAGE
(E12) PANEL LAMPS DRIVER CIRCUIT OPEN
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Panel Illumination.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B1615-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

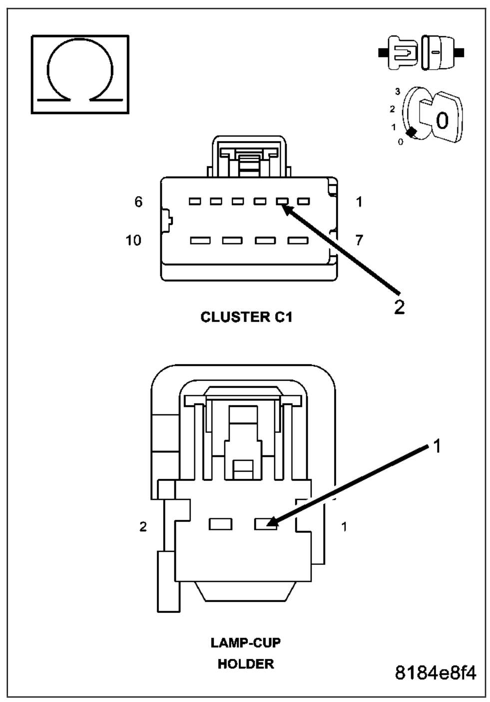
2. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Cluster C1 harness connector.

Disconnect the Cup Holder Lamp harness connector.

Measure the resistance of the (E12) Panel Lamps Driver Circuit between the Instrument Cluster C1 harness connector and the Cup Holder harness connector.



Is the resistance greater than 10K ohms?

Yes >> Repair the (E12) Panel Lamps Driver circuit for an open.

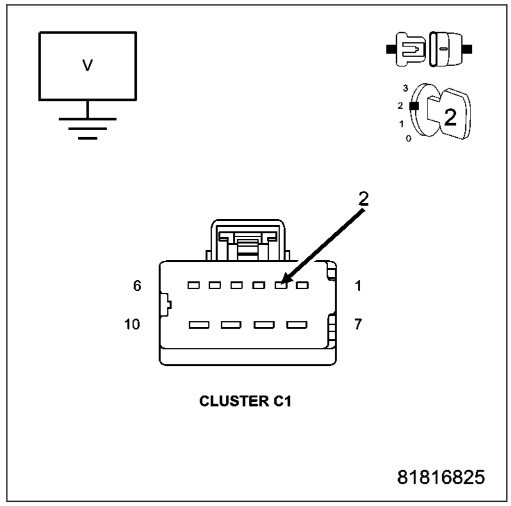
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (E12) Panel Lamps Driver Circuit from the Instrument Cluster C1 harness connector.



Is the voltage above 5.0 volts?

Yes >> Repair the (E12) Panel Lamps Driver circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B210D-BATTERY VOLTAGE LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects a battery voltage of 9.0 volts or less for 5 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
CLUSTER

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B210D-BATTERY VOLTAGE LOW

Turn the ignition on.

With the scan tool, record and erase Instrument Cluster DTCs.

Wait 30 seconds.

With the scan tool, read Instrument Cluster DTCs.

Does the scan tool display: B210D-BATTERY VOLTAGE LOW?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Ensure the battery is fully charged.

Are any charging system DTCs present?

Yes >> Refer to appropriate DTC diagnostic information.

No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B210E-BATTERY VOLTAGE HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects a battery voltage of 16.0 volts or greater for 5 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
CLUSTER

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B210E-BATTERY VOLTAGE HIGH

Turn the ignition on.

With the scan tool, record and erase Instrument Cluster DTCs.

Wait 30 seconds.

With the scan tool, read Instrument Cluster DTCs.

Does the scan tool display: B210E-BATTERY VOLTAGE HIGH?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Ensure the battery is fully charged.

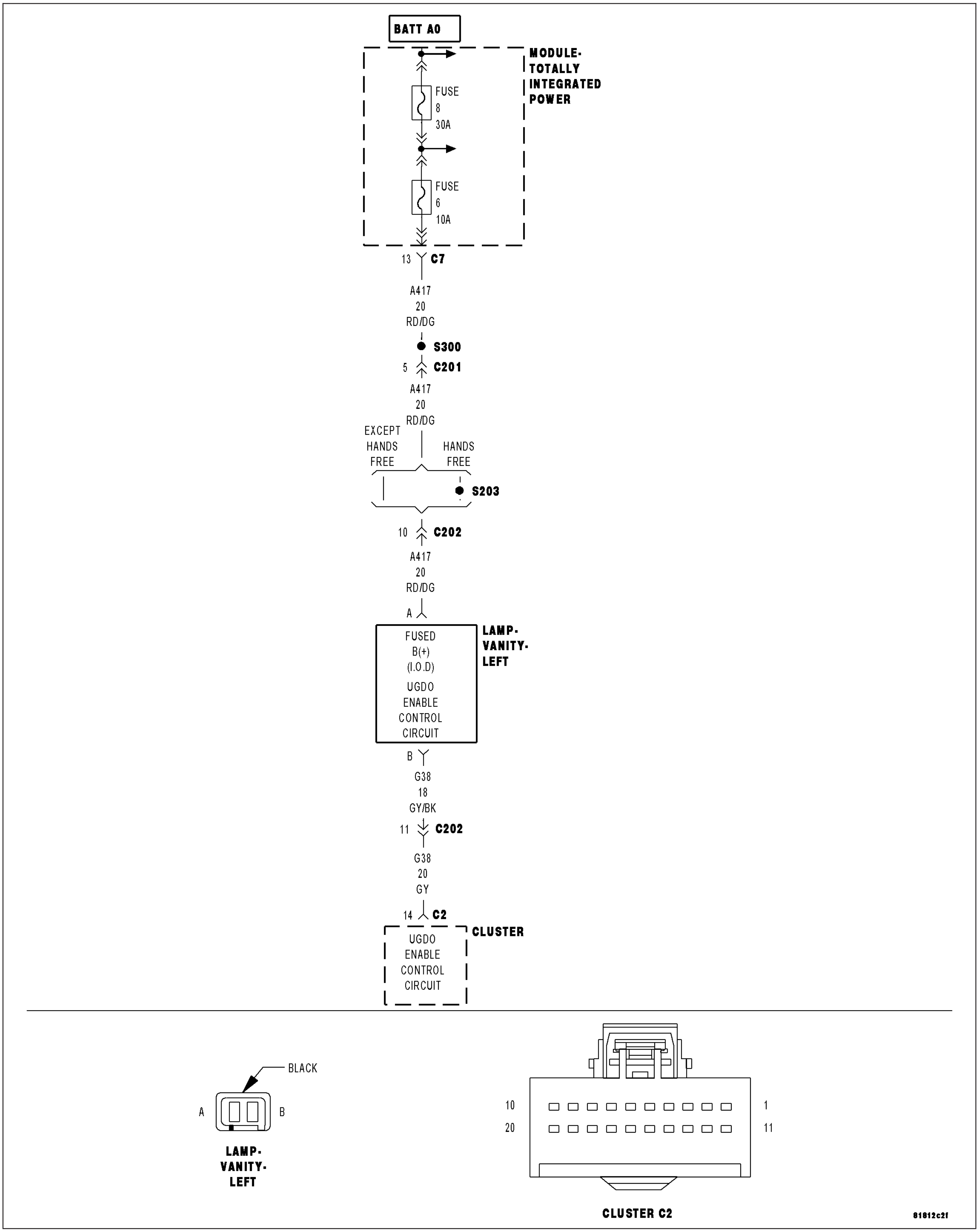
Are any charging system DTCs present?

Yes >> Refer to appropriate DTC diagnostic information.

No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2143-UGDO ENABLE CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster detects a fault on the (G38) UGDO Enable Control Circuit.

Possible Causes
(G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO VOLTAGE
(G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO GROUND
(G38) UGDO ENABLE CONTROL CIRCUIT OPEN
UGDO MODULE
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B2143-UGDO ENABLE CONTROL CIRCUIT?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO VOLTAGE

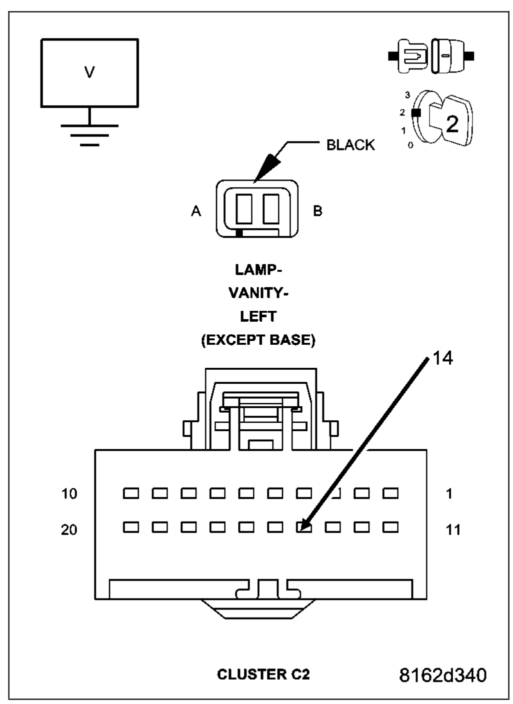
Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Disconnect the Left Vanity Lamp Harness connector.

Turn the ignition on.

Measure the voltage of the (G38) UGDO Enable Control Circuit.



Is voltage present?

Yes >> Repair the (G38) UGDO Enable Control Circuit for a short to voltage.

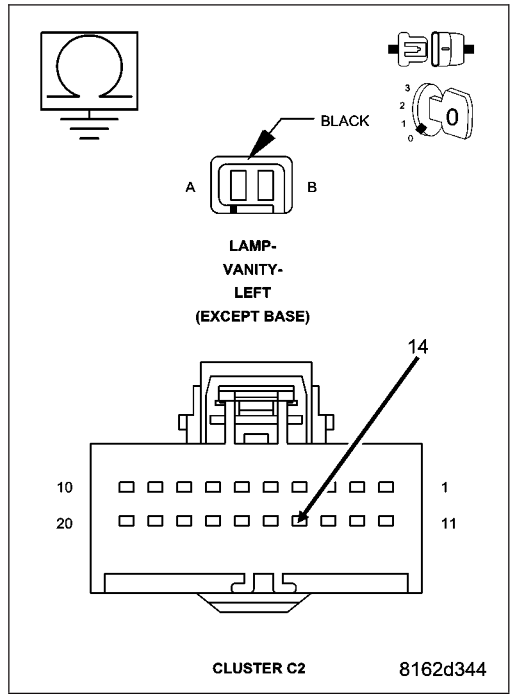
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (G38) UGDO Enable Control Circuit.



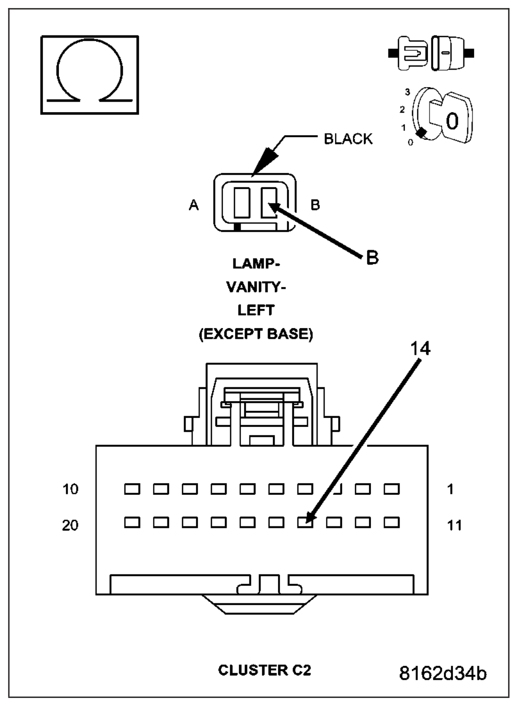
Is the resistance below 10K ohms?

Yes >> Repair the (G38) UGDO Enable Control Circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (G38) UGDO ENABLE CONTROL CIRCUIT OPEN

Measure the resistance of the (G38) UGDO Enable Control Circuit.

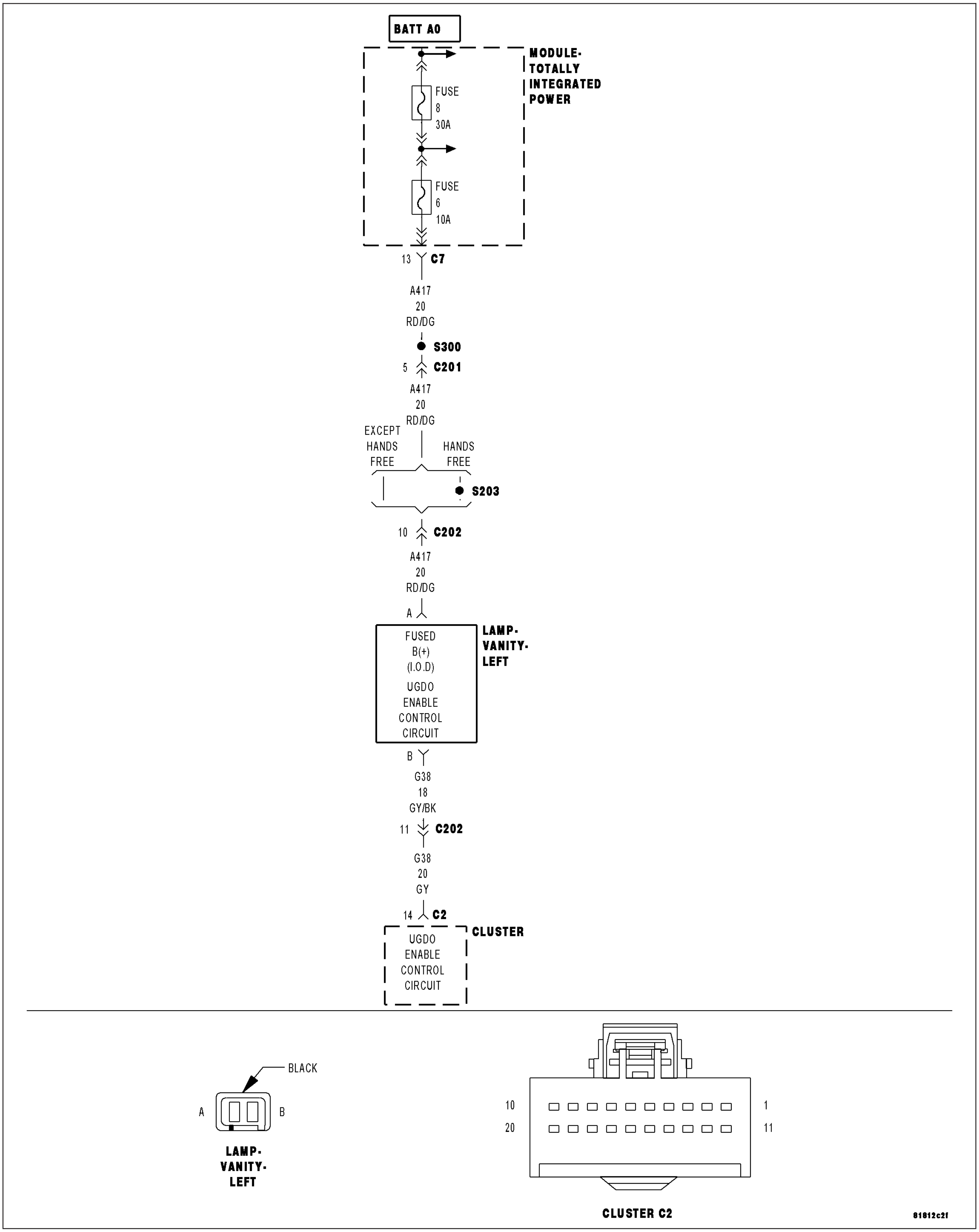


Is the resistance above 10K ohms?

Yes >> Repair the (G38) UGDO Enable Control Circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster inaccordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2144-UGDO ENABLE CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster detects a fault on the (G38) UGDO Enable Control Circuit.

Possible Causes
(G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO GROUND
UGDO MODULE
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B2143-UGDO ENABLE CONTROL CIRCUIT?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. UGDO SHORTED TO GROUND

Disconnect the Left Vanity Lamp harness connector.

With the scan tool, read DTCs.

Does the scan tool display B2144-UGDO ENABLE CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the UGDO Module in accordance with the service information.

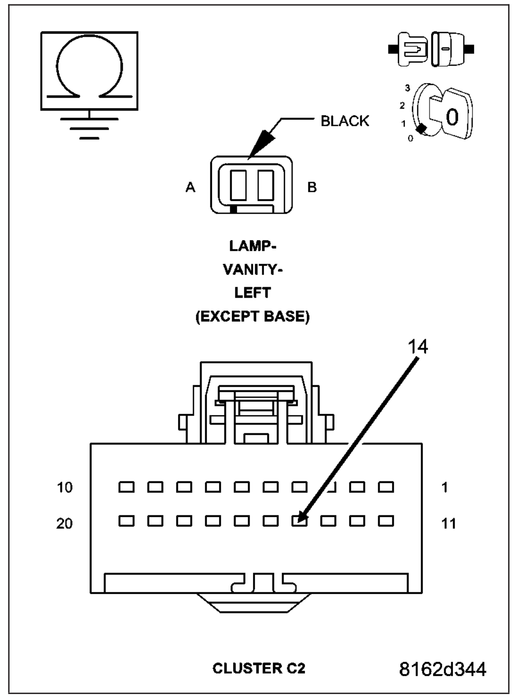
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Cluster C2 harness connector.

Measure the resistance between ground and the (G38) UGDO Enable Control Circuit.



Is the resistance below 10K ohms?

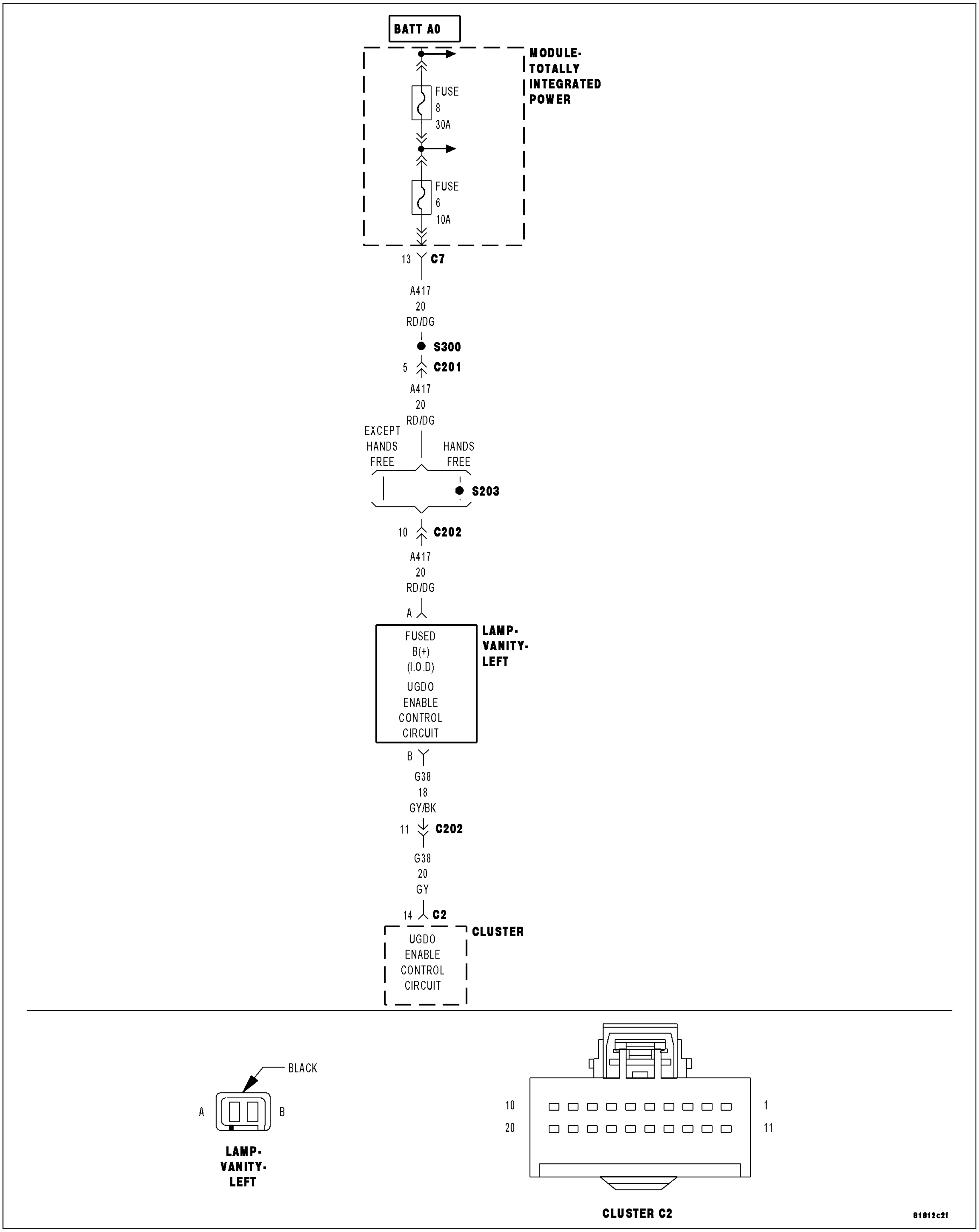
Yes >> Repair the (G38) UGDO Enable Control Circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2145-UGDO ENABLE CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster detects a fault on the (G38) UGDO Enable Control Circuit.

Possible Causes
(G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO VOLTAGE
UGOD MODULE
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B2145-UGDO ENABLE CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. UGDO SHORTED TO VOLTAGE

Disconnect the Left Vanity Lamp harness connector.

With the scan tool, read DTCs.

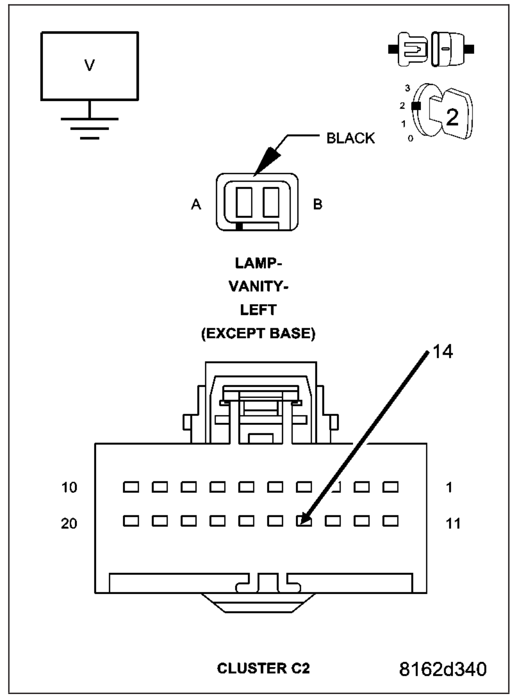
Does the scan tool display: B2144-UGDO ENABLE CONTROL CIRCUIT OPEN?

Yes >> Replace the UGDO Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (G38) UGDO ENABLE CONTROL CIRCUIT SHORT TO VOLTAGE



Turn the ignition off.

Disconnect the Cluster C2 harness connector.

Turn the ignition on.

Measure the voltage of the (G38) UGDO Enable Control Circuit.

Is voltage present?

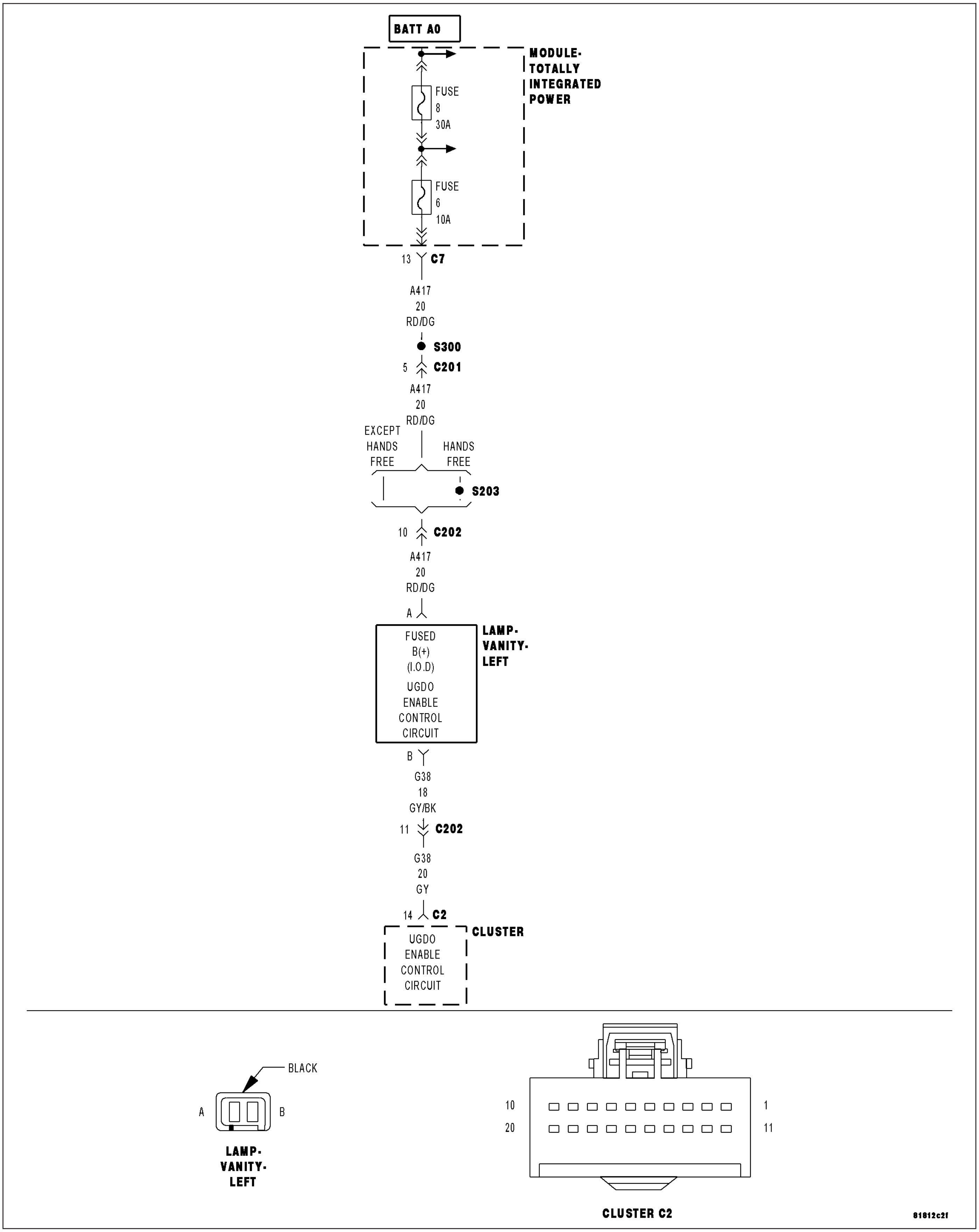
Yes >> Repair the (G38) UGDO Enable Control Circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2146-UGDO ENABLE CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster detects a fault on the (G38) UGDO Enable Control Circuit.

Possible Causes
(G38) UGDO ENABLE CONTROL CIRCUIT OPEN
UGDO MODULE
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: B2146-UGDO ENABLE CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. UGDO OPEN

Disconnect the Left Vanity Lamp harness connector.

Connect a jumper wire between ground and the (G38) UGDO Enable Control Circuit.

With the scan tool, read DTCs.

Does the scan tool display: B2144-UGDO ENABLE CONTROL CIRCUIT LOW?

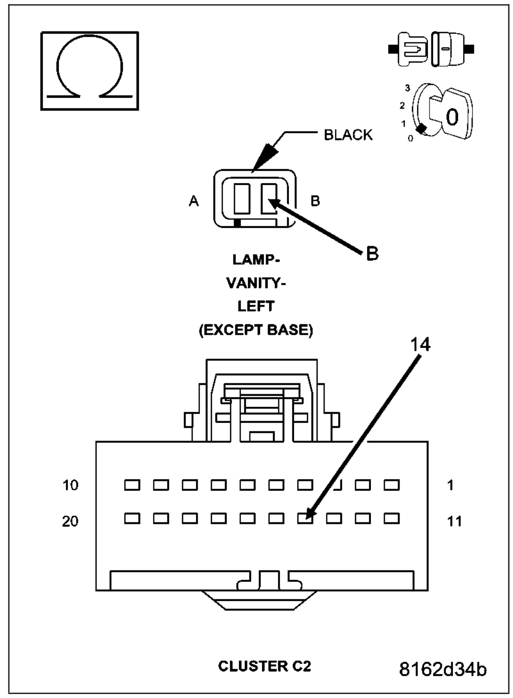
Yes >> Replace the UGDO Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. **(G38) UGDO ENABLE CONTROL CIRCUIT OPEN**

Measure the resistance of the (G38) UGDO Enable Control Circuit.



Is the resistance above 10K ohms?

Yes >> Repair the (G38) UGDO Enable Control Circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster inaccordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

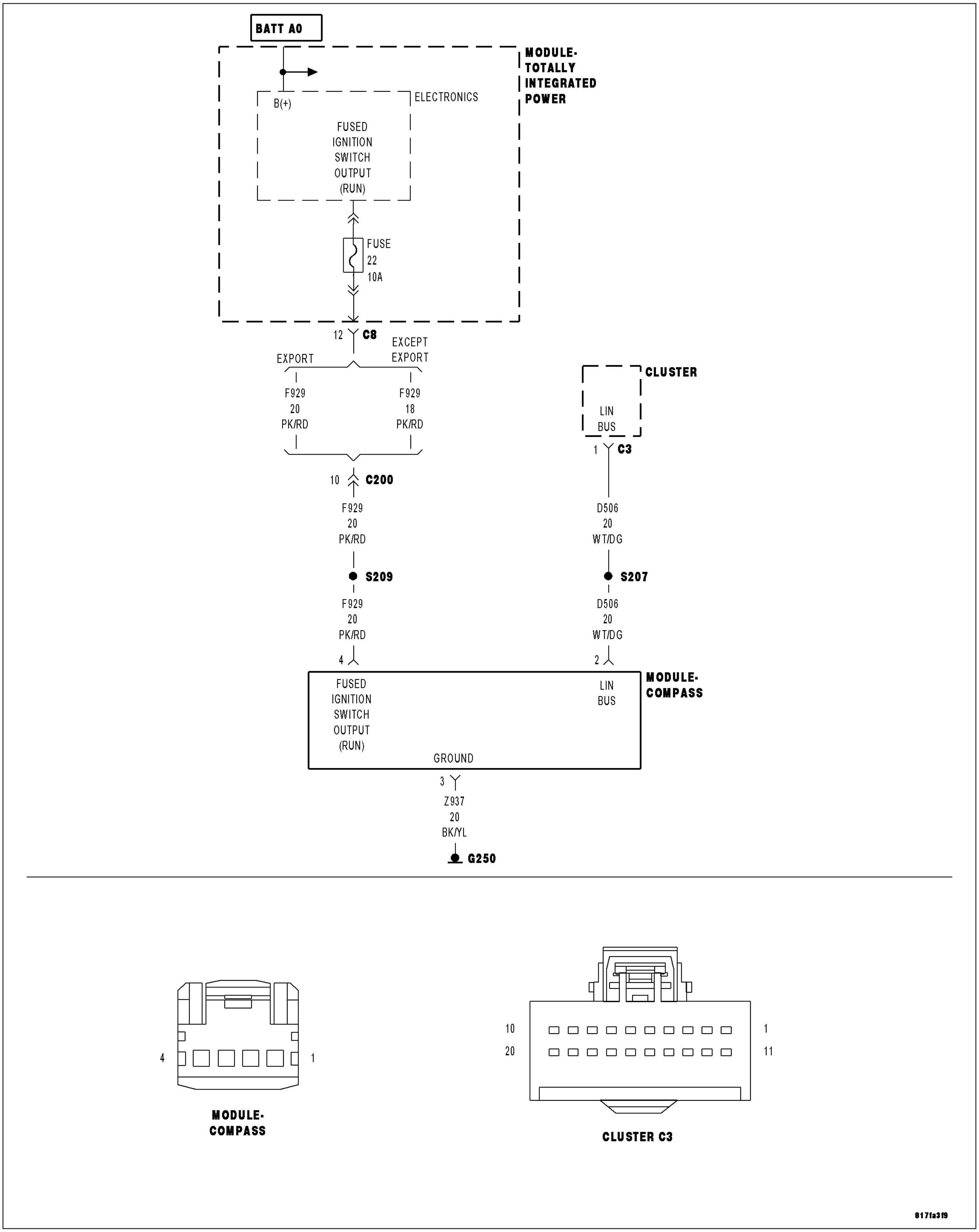
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0161-LOST COMMUNICATION WITH COMPASS MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster does not receive information from the Compass Module.

Possible Causes
(D506) LIN BUS CIRCUIT OPEN
(F929) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
(Z937) GROUND CIRCUIT OPEN
COMPASS MODULE

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: U0161-LOST COMMUNICATION WITH COMPASS MODULE?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (D506) LIN BUS CIRCUIT OPEN

Turn the ignition off.

Disconnect the Compass Module harness connector.

Turn the ignition on.

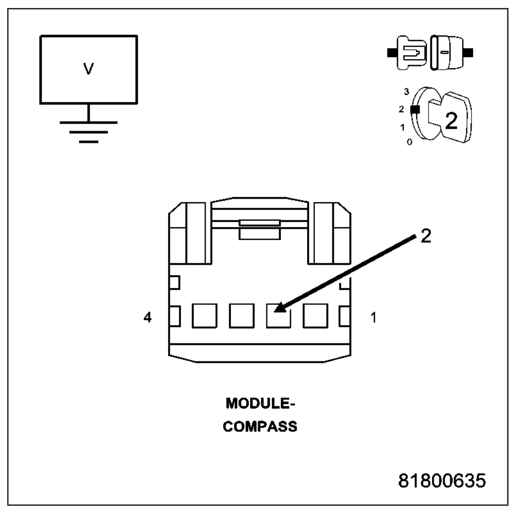
Measure the voltage of the (D506) LIN BUS circuit.

Is the voltage above 5 volts?

Yes >> Go To 3

No >> Repair the (D506) LIN BUS circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



3. (F929) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN

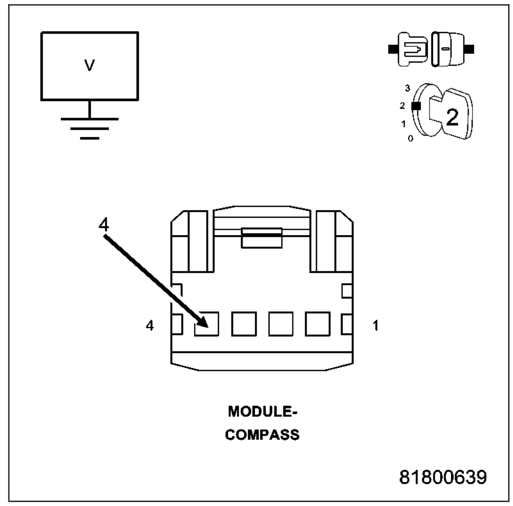
Measure the voltage of the (F929) Fused Ignition Switch Output (RUN) circuit.

Is the voltage above 10 volts?

Yes >> Go To 4

No >> Repair the (F929) Fused Ignition Switch Output (RUN) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



4. (Z937) GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z937) Ground circuit.

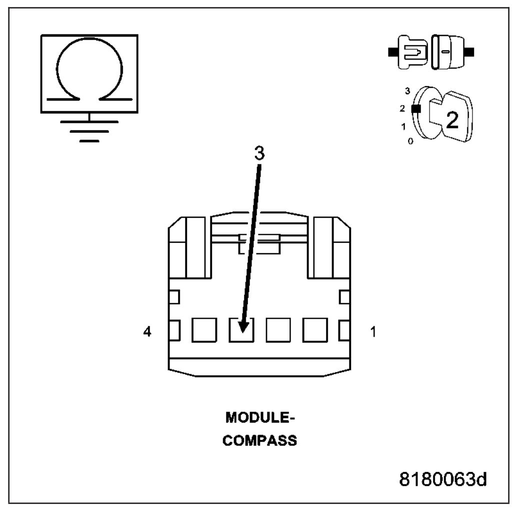
Is the resistance below 10K ohms?

Yes >> Replace the Compass Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z937) ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

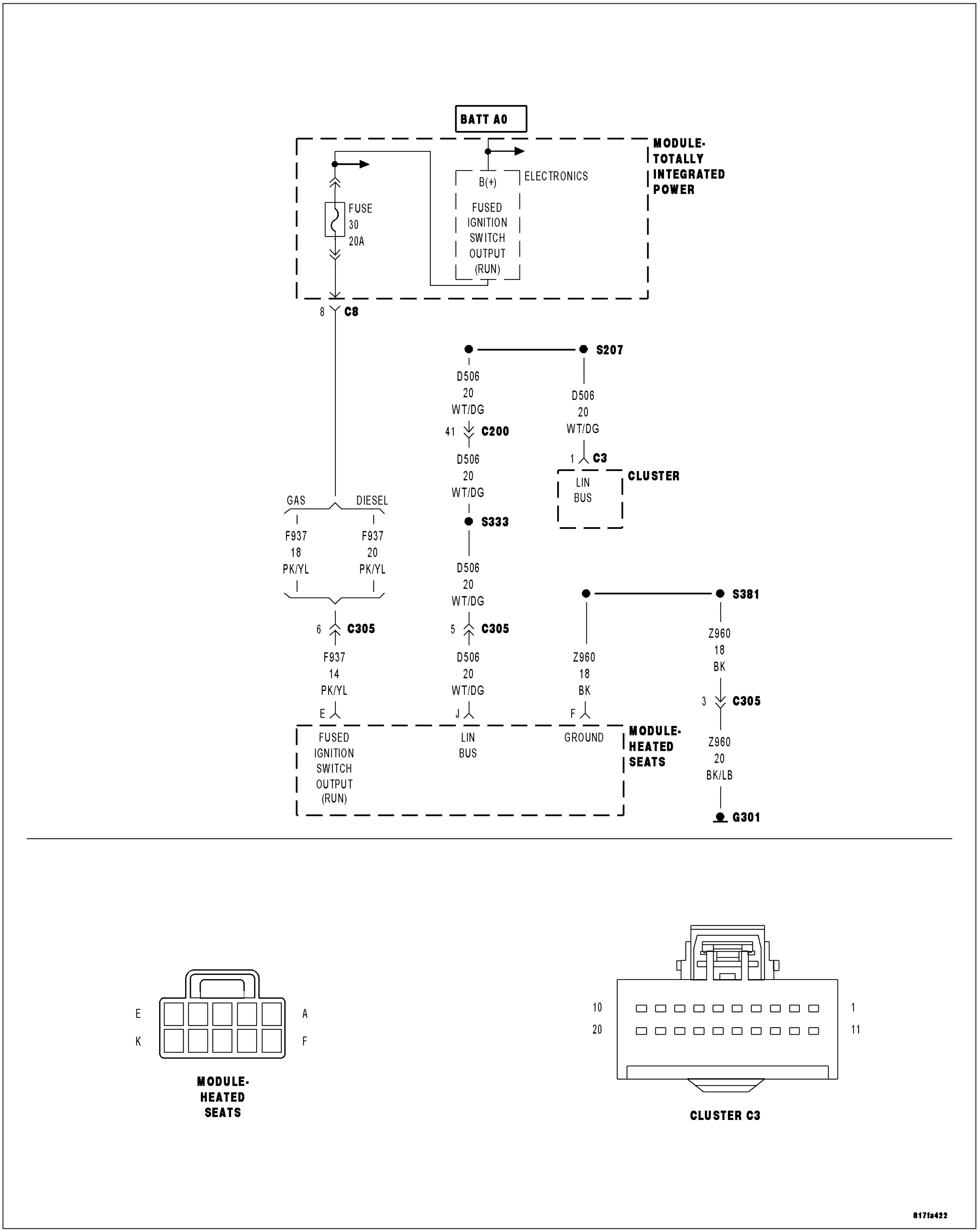
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEATS CONTROL MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster does not receive information from the Heated Seats Control Module.

Possible Causes
(D506) LIN BUS CIRCUIT OPEN
(F937) FUSED IGNITION SWITCH OUTPUT (RUN) OPEN
(Z908) GROUND CIRCUIT OPEN
HEATED SEATS MODULE

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: U0208-LOST COMMUNICATION WITH HEATED SEATS CONTROL MODULE?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

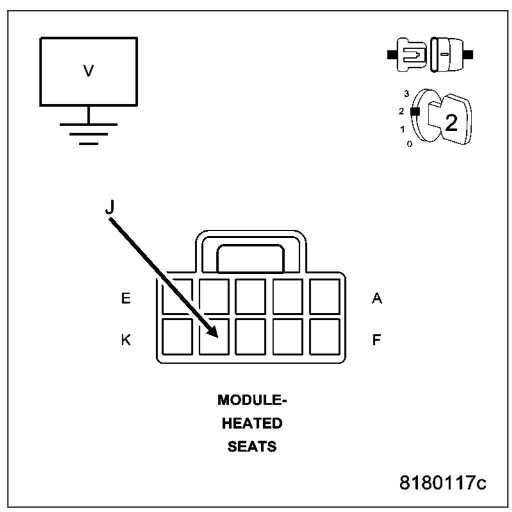
2. (D506) LIN BUS CIRCUIT OPEN

Turn the ignition off.

Disconnect the Heated Seats Module harness connector.

Turn the ignition on.

Measure the voltage of the (D506) LIN BUS circuit.



Is the voltage above 5 volts?

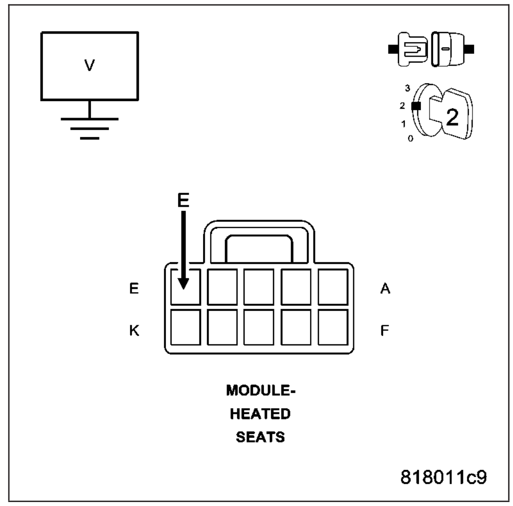
Yes >> Go To 3

No >> Repair the (D506) LIN BUS circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (F937) FUSED IGNITION SWITCH OUTPUT (RUN) OPEN

Measure the voltage of the (F937) Fused Ignition Switch Output (RUN) circuit.



Is the voltage above 10 volts?

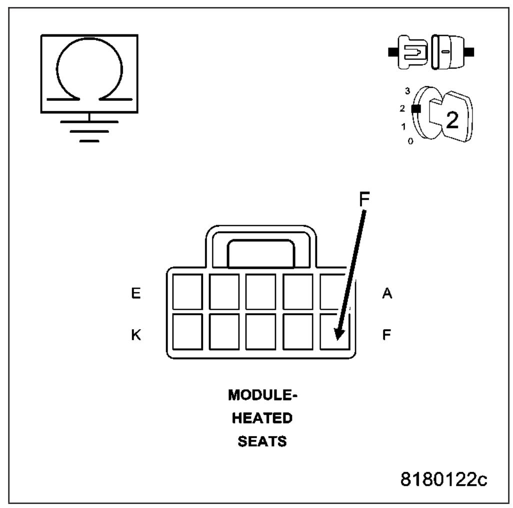
Yes >> Go To 4

No >> Repair the (F937) Fused Ignition Switch Output (RUN) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (Z908) GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z908) Ground circuit.



Is the resistance below 10K ohms?

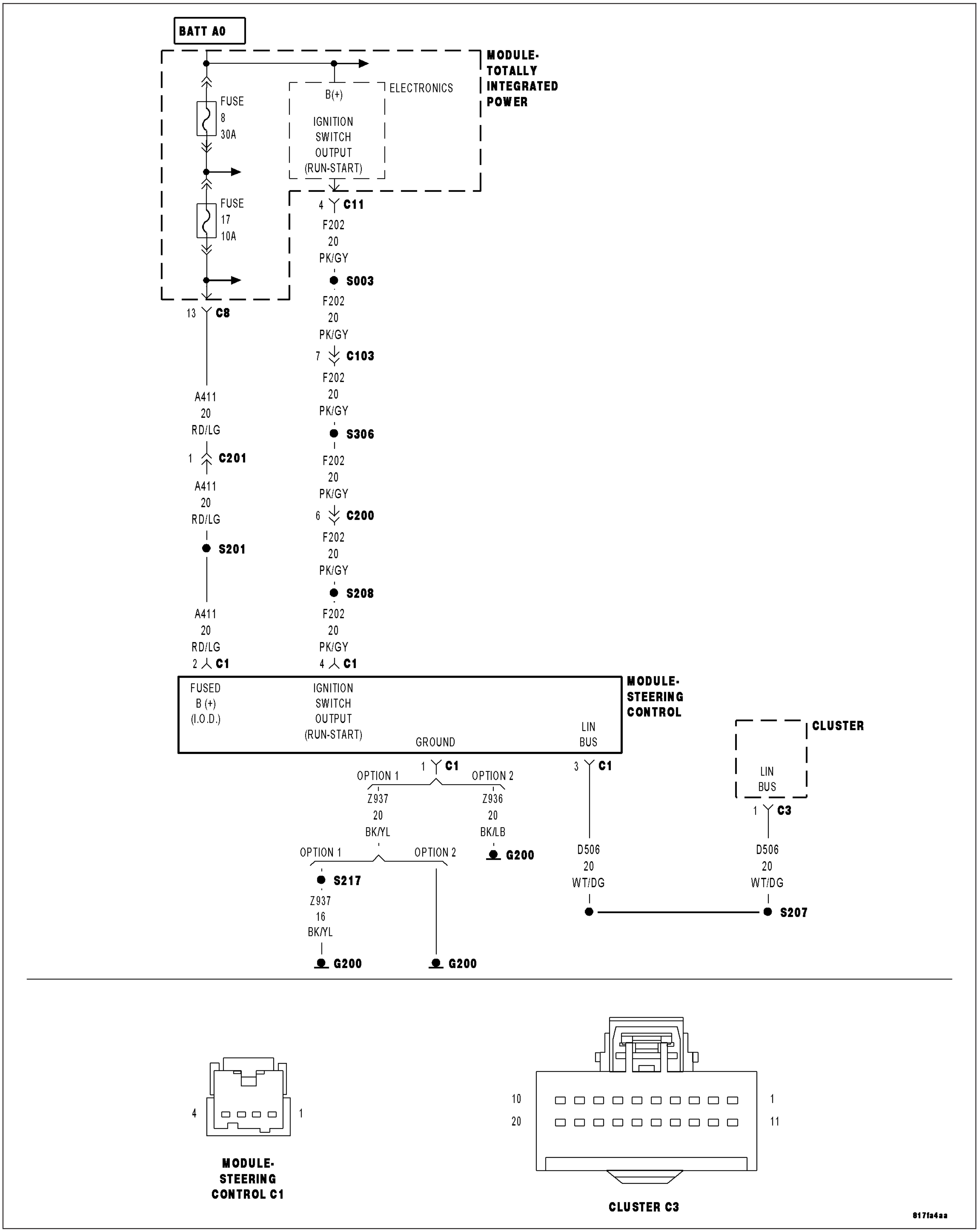
Yes >> Replace the Heated Seats Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z908) ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U0212-LOST COMMUNICATION WITH SCM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster does not receive any LIN Bus messages from the SCM.

Possible Causes
(D506) LIN BUS CIRCUIT OPEN
(F20) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
(A411) FUSED B+ (I.O.D.) CIRCUIT OPEN
(Z936/Z937) GROUND CIRCUIT OPEN
SCM

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: U0212-LOST COMMUNICATION WITH SCM?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

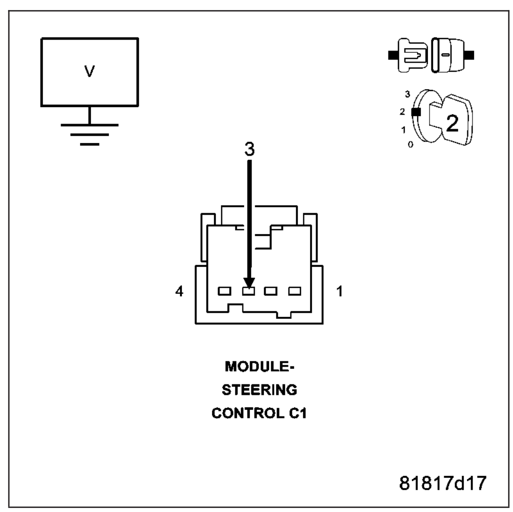
2. (D506) LIN BUS CIRCUIT OPEN

Turn the ignition off.

Disconnect the Steering Column Module C1 harness connector.

Turn the ignition on.

Measure the voltage of the (D506) LIN BUS circuit.



Is the voltage above 5 volts?

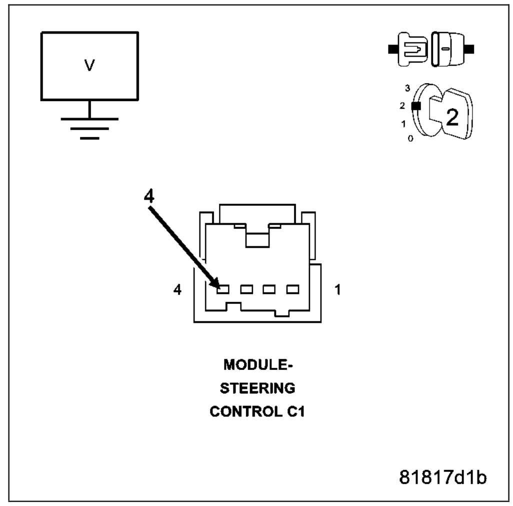
Yes >> Go To 3

No >> Repair the (D506) LIN BUS circuit for an open

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (F202) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN

Measure the voltage of the (F202) Fused Ignition Switch Output (RUN/START) circuit.



Is the voltage above 10 volts?

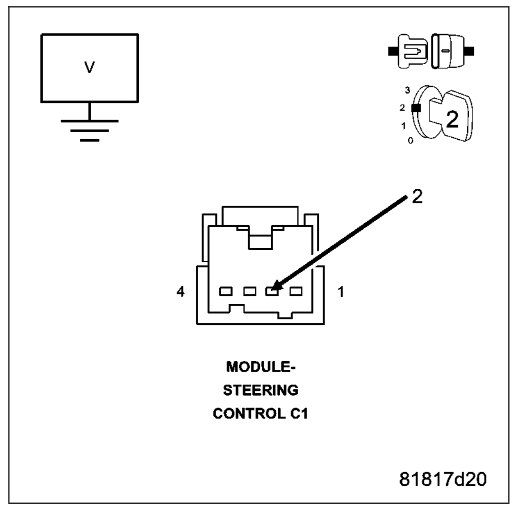
Yes >> Go To 4

No >> Repair the (F202) Fused Ignition Switch Output (RUN/START) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (A411) FUSED B+ (I.O.D.) CIRCUIT OPEN

Measure the voltage of the (A411) Fused B+ (I.O.D.) circuit.



Is the voltage above 10 volts?

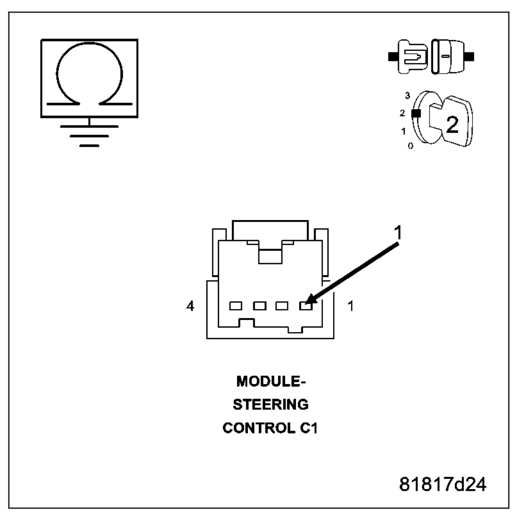
Yes >> Go To 5

No >> Repair the (A411) Fused B+ (I.O.D.) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. (Z936/Z937) GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z936–MTX)/(Z937–ATX) Ground circuit.



Is the resistance below 10K ohms?

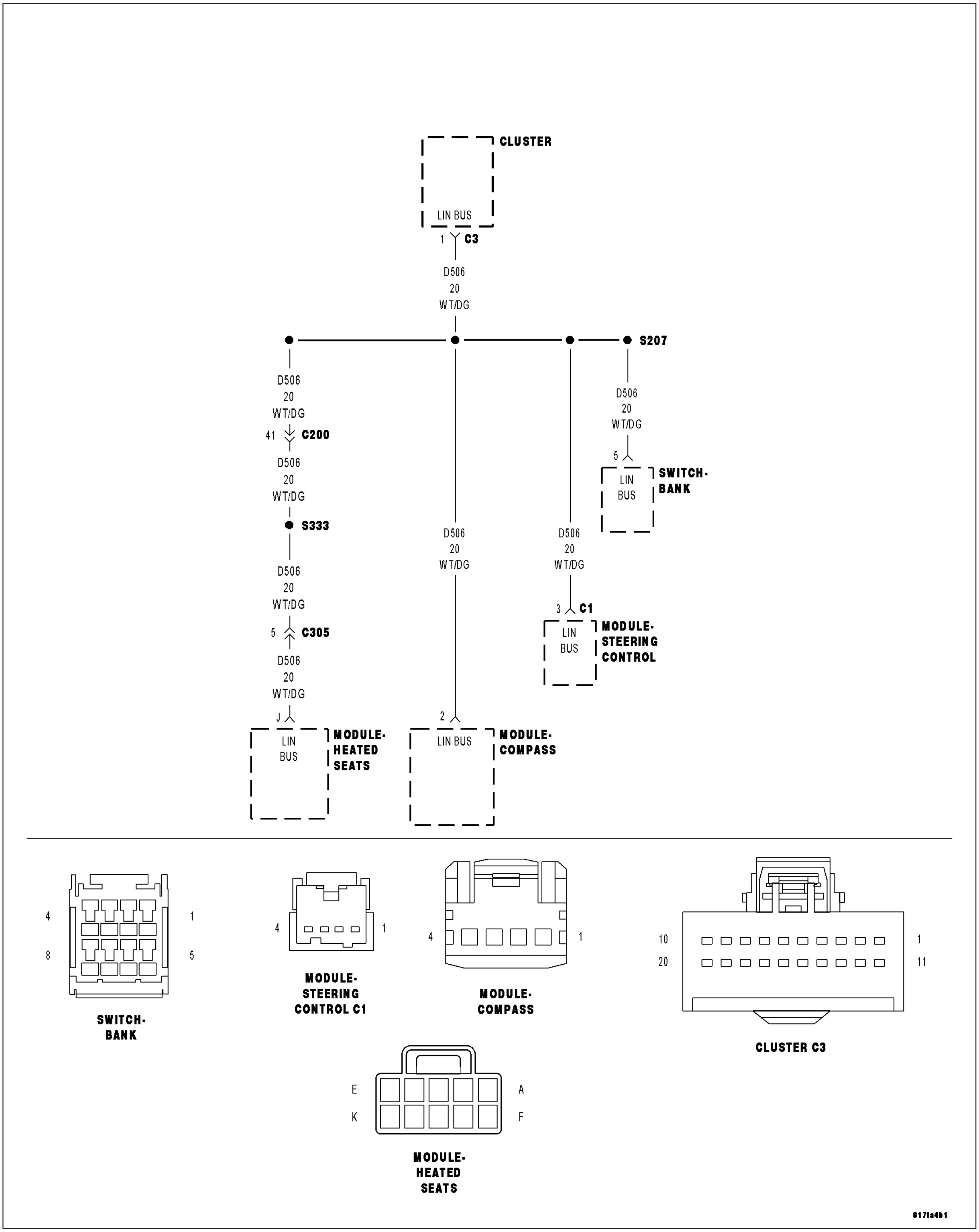
Yes >> Replace the SCM in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z936–MTX)/(Z937–ATX) ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U1008–LIN 1 BUS



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  LIN 1 Bus Performance.

Possible Causes
(D506) LIN BUS CIRCUIT OPEN
(D506) LIN BUS CIRCUIT SHORT TO GROUND
CLUSTER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: U1008–LIN 1 BUS?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. SHORTED COMPONENT

NOTE: After disconnecting each component, check DTCs with the scan tool.

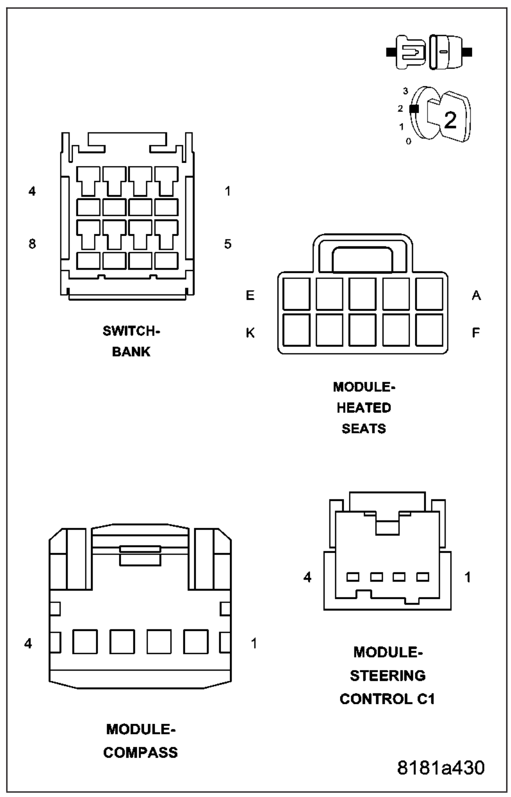
Turn the ignition on.

Disconnect the Switch Bank Module harness connector.

Disconnect the Remote Compass Module harness connector.

Disconnect the Heated Seat Module harness connector.

Disconnect the Steering Control Module C1 harness connector.



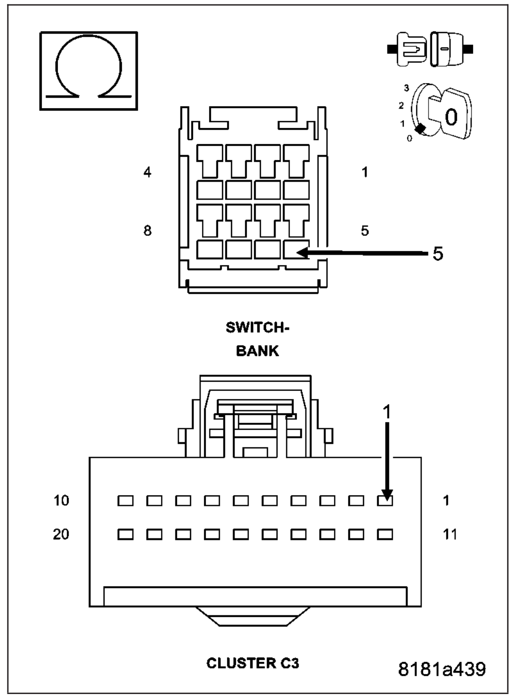
With each component disconnected, did the DTC U1008–LIN 1 BUS change from active to stored?

Yes >> Replace the component that caused the DTC U1008–LIN 1 BUS change from active to stored.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (D506) LIN BUS CIRCUIT OPEN



Turn the ignition off.

Disconnect the Cluster C3 harness connector.

Disconnect the Switch Bank harness connector.

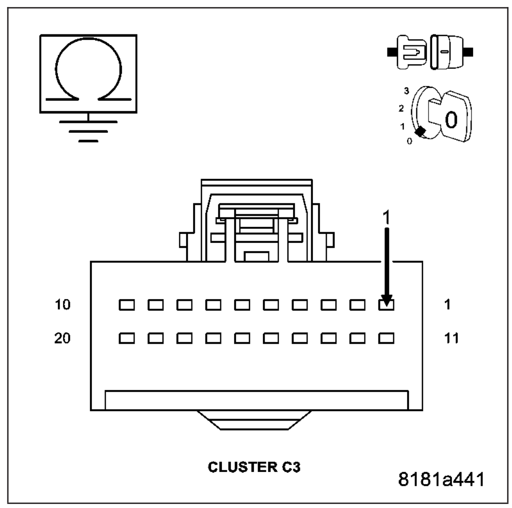
Measure the resistance of the (D506) LIN Bus circuit.

Is the resistance above 10K ohms?

Yes >> Repair the (D506) LIN Bus circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (D506) LIN BUS CIRCUIT SHORT TO GROUND



Turn the ignition off.

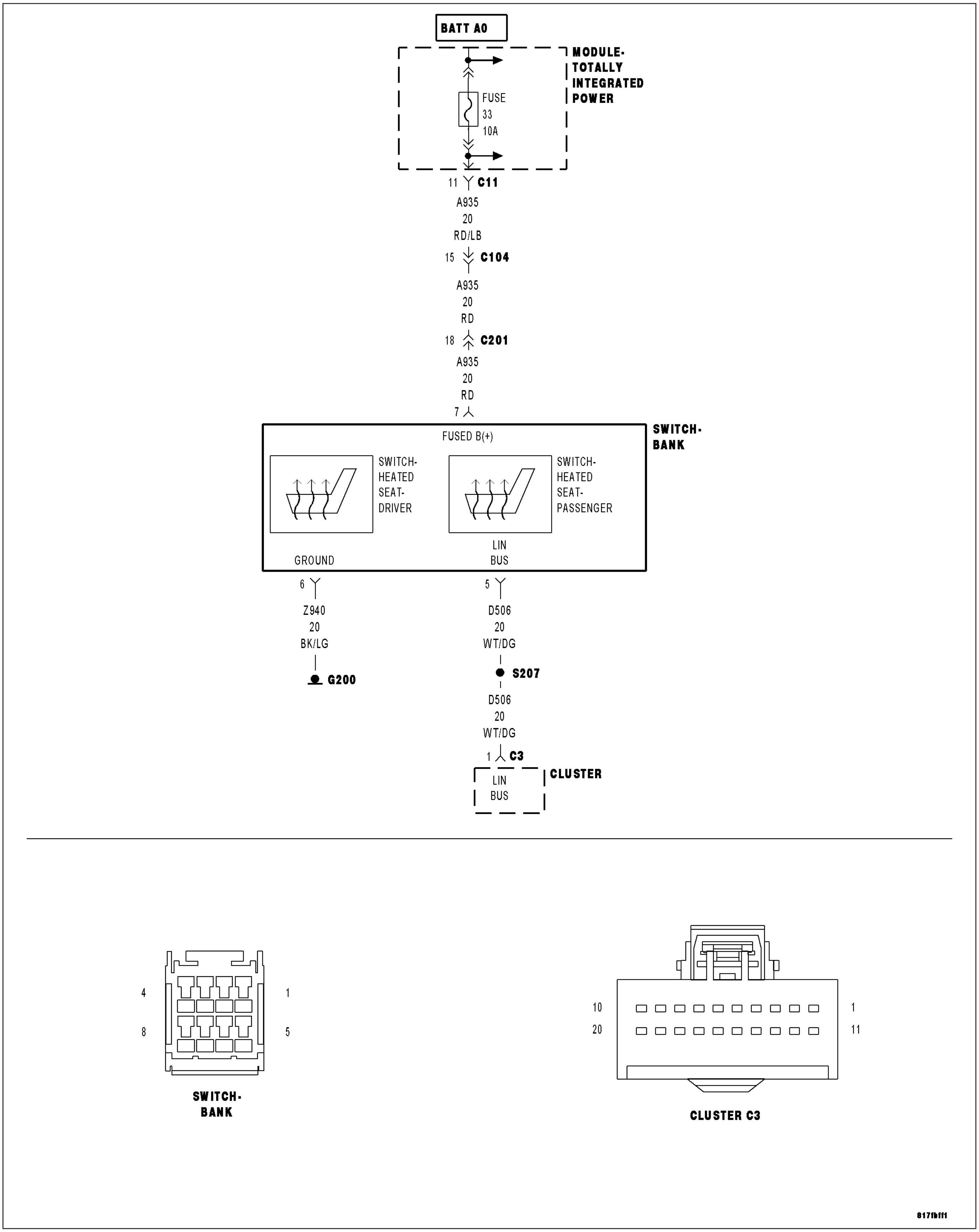
Measure the resistance to ground on the (D506) LIN Bus circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (D506) LIN Bus circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U113B-LOST COMMUNICATION WITH SWITCH BANK MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster does not receive information from the Switch Bank Module.

Possible Causes
(D506) LIN BUS CIRCUIT OPEN
(A935) FUSED B+ CIRCUIT OPEN
(Z940) GROUND CIRCUIT OPEN
SWITCH BANK

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

Does the scan tool display: U113B-LOST COMMUNICATION WITH SWITCH BANK MODULE?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

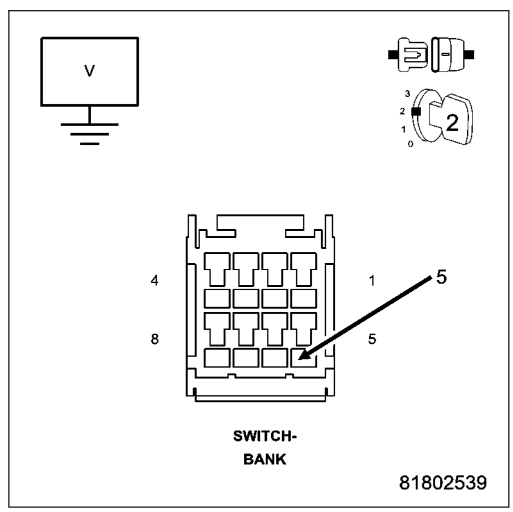
2. (D506) LIN BUS CIRCUIT OPEN

Turn the ignition off.

Disconnect the Switch Bank harness connector.

Turn the ignition on.

Measure the voltage of the (D506) LIN BUS circuit.



Is the voltage above 5 volts?

Yes >> Go To 3

No >> Repair the (D506) LIN BUS circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (A935) FUSED B+ CIRCUIT OPEN

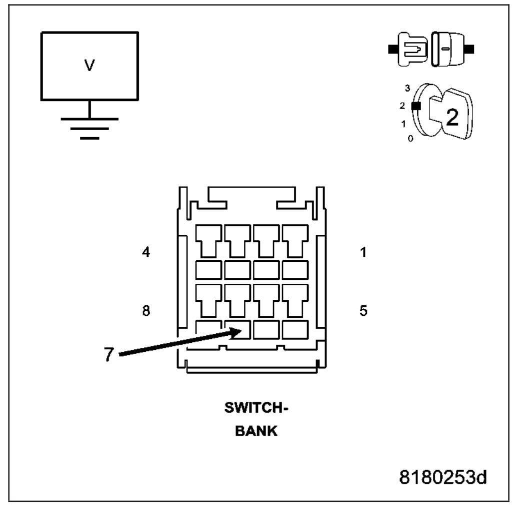
Measure the voltage of the (A935) Fused B+ circuit.

Is the voltage above 10 volts?

Yes >> Go To 4

No >> Repair the (A935) Fused B+ circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



4. (Z940) GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z940) Ground circuit.

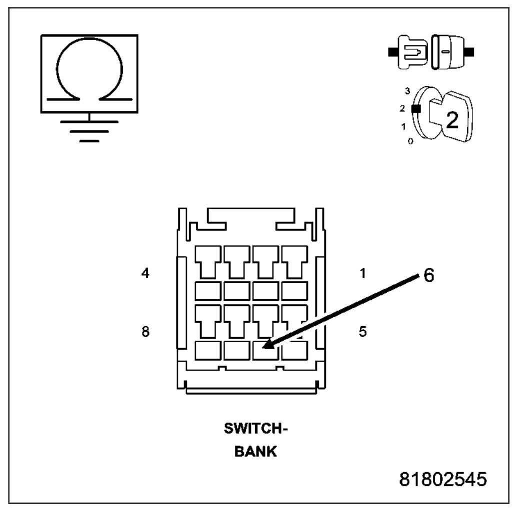
Is the resistance below 10K ohms?

Yes >> Replace the Switch Bank in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z940) ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

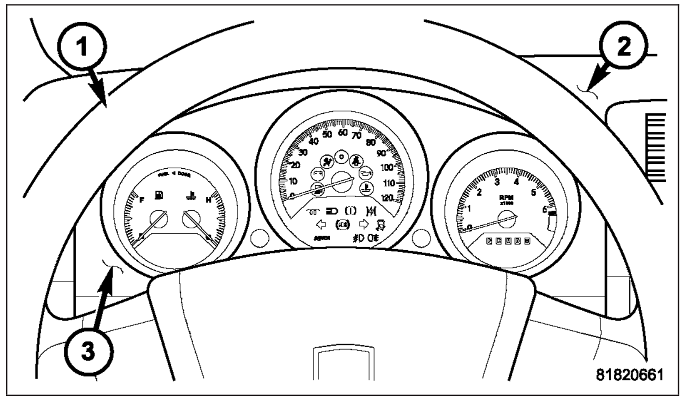


INSTRUMENT CLUSTER - SERVICE INFORMATION

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INSTRUMENT CLUSTER - SERVICE INFORMATION

DESCRIPTION



The instrument cluster is an ElectroMechanical Instrument Cluster (EMIC) (3) that is located in the instrument panel (2) above the steering column opening, behind the steering wheel (1), directly in front of the driver. The instrument cluster includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node (CCN). The remainder of the CCN, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel. Besides analog gauges and indicators, the CCN incorporates two digital Vacuum Fluorescent Display (VFD) units for displaying odometer/trip odometer information, engine hours, automatic transmission gear selector position (PRNDL), several warning or reminder indications and certain diagnostic information, and the display for the Electronic Vehicle Information Center (EVIC).

Sandwiched between the rear cover and the lens is the cluster housing. The molded plastic cluster housing serves as the carrier for the cluster circuit board and circuitry, the cluster connectors, the gauges, a Light Emitting Diode (LED) for each cluster indicator, the VFD units, an audible tone transducer, the cluster overlay, the gauge pointers, the odometer/trip odometer switch and the Electronic Vehicle Information Center Display (EVIC) switch button.

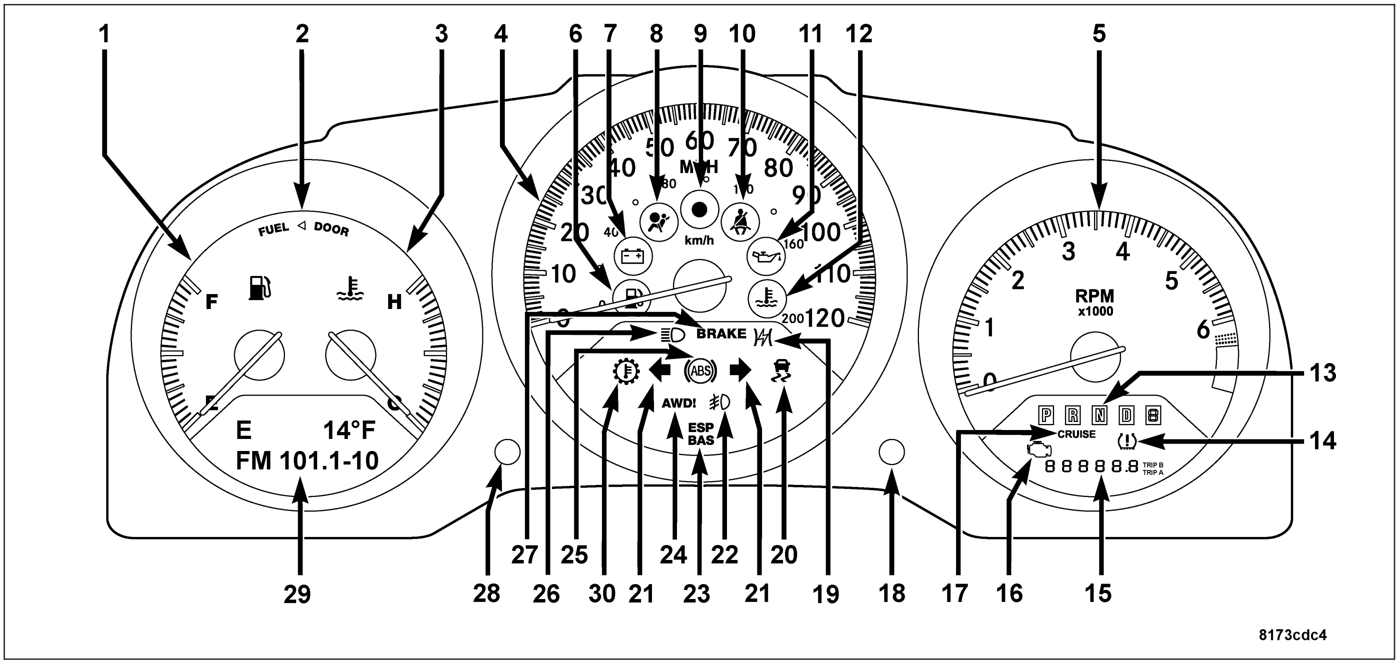
Several versions of the CCN are offered. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle will be offered. The microprocessor-based CCN utilizes integrated circuitry and information carried on the Controller Area Network (CAN) data bus along with several hard wired analog and multiplexed inputs to monitor sensors and switches throughout the vehicle. In response to those inputs, the internal circuitry and programming of the CCN allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the CAN/LIN data bus (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION).

The CCN houses four analog gauges and has provisions for up to twenty-five indicators. All of the CCN indicators are automatically configured when the CCN is connected to the vehicle electrical system for compatibility with certain optional equipment or equipment required for regulatory purposes in certain markets. While each CCN may have provisions for indicators to support every available option, the configurable indicators will not be functional in a vehicle that does not have the equipment that an indicator supports.

Each indicator in the CCN, except those located within the VFD units, is illuminated by a dedicated LED that is soldered onto the CCN electronic circuit board. Cluster illumination is accomplished by dimmable LED back lighting, which illuminates each of the gauges for visibility when the exterior lighting is turned on. The LED units are not available for service replacement and, if damaged or faulty, the entire CCN must be replaced.

The CCN is serviced only as a complete unit. The CCN cannot be adjusted or repaired. If a gauge, an LED indicator, a VFD unit, the electronic circuit board, the circuit board hardware, the cluster overlay, or the CCN housing are damaged or faulty, the entire CCN must be replaced. The cluster lens, hood and mask unit are available for separate service replacement.

DOMESTIC CLUSTER/CCN



The Domestic CCN includes the following analog gauges:

- **Engine Temperature Gauge (3)**
- **Fuel Gauge (1)**
- **Speedometer (4)**
- **Tachometer (5)**

The CCN includes the following VFD units:

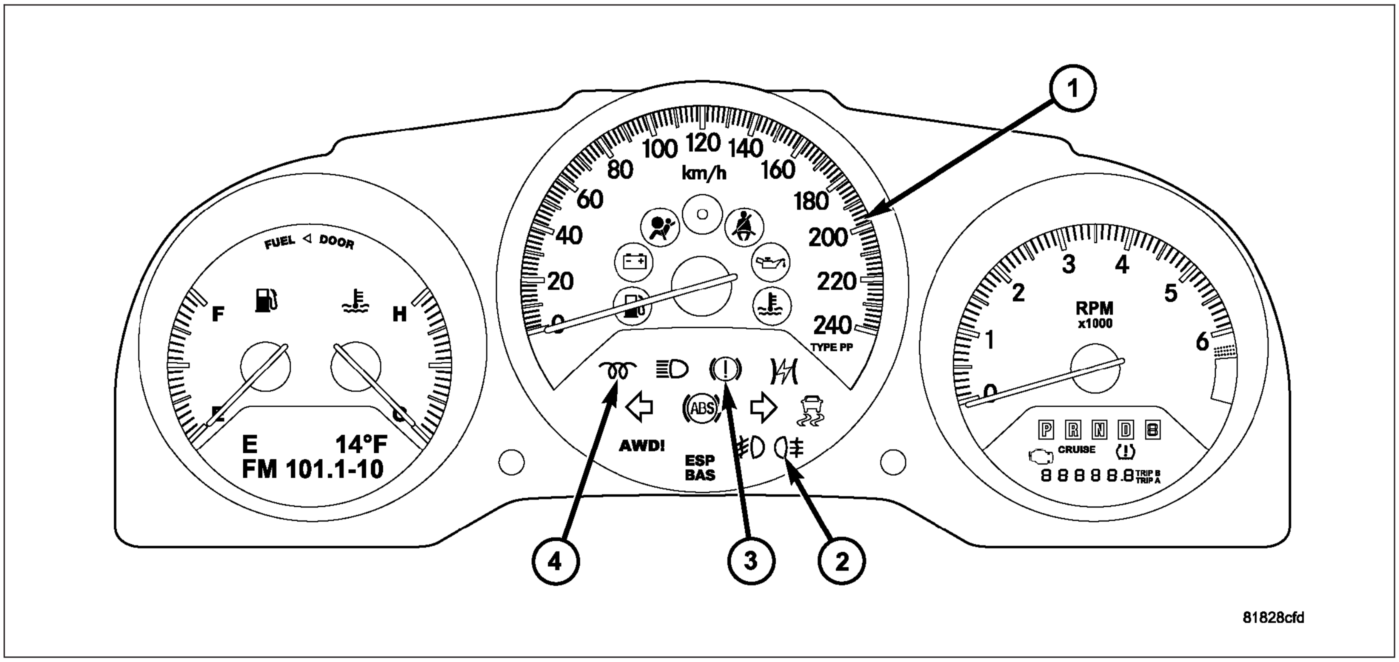
- **Gear Selector/Odometer/Trip Odometer (13 and 15)**
- **Electronic Vehicle Information Center (EVIC) Display**

The CCN includes provisions for the following indicators:

- **Airbag Warning Indicator (8)**
- **All Wheel Drive Indicator (24)**
- **Antilock Brake System (ABS) Warning Indicator (25)**
- **Park Brake/Brake Indicator (27)**
- **Charging System Warning Indicator (7)**
- **Cruise Indicator (17)**
- **Electronic Stability Program Indicator (23)**
- **Electronic Throttle Control Indicator (19)**
- **Electronic Vehicle Information Center (EVIC) Display Step Button**
- **Fog Lamp Indicator (22)**
- **Fuel Door Location (2)**
- **High Beam Indicator (26)**
- **High Engine Temperature Warning Indicator (12)**
- **Low Fuel Indicator (6)**
- **Malfunction Indicator Lamp (MIL) (16)**
- **Odometer/Trip Odometer A/B Select Button (18)**
- **Oil Pressure Warning Indicator (11)**
- **Seatbelt Indicator (10)**
- **Security Indicator (9)**
- **Tire Pressure Monitor System Indicator (14)**

- **Traction Control Indicator (20)**
- **Transmission Over Temperature Indicator (CVT transmission only) (30)**
- **Turn Signal (Right and Left) Indicators (21)**

BUX CLUSTER/CCN



The BUX CCN is relatively the same as domestic for the exception of:

- **Brake Fail/Park Brake Indicator (3)**
- **Rear Fog lamps Indicator (2)**
- **Speedometer - Kilometers per hour (km/h) (1)**
- **Wait to Start Indicator (diesel only) (4)**

OPERATION

The ElectroMechanical Instrument Cluster (EMIC) in this model also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN. The following information deals primarily with the instrument cluster functions of this unit. Additional details of the electronic body control functions of this unit may be found within the service information for the system or component that the CCN controls. For example: Additional details of the audible warning functions of the CCN are found within the Chime/Buzzer service information.

The CCN is designed to allow the vehicle operator to monitor the conditions of many of the vehicle components and operating systems. The gauges and indicators in the CCN provide valuable information about the various standard and optional powertrains, fuel and emissions systems, cooling systems, lighting systems, safety systems and many other convenience items. The CCN is installed in the instrument panel so that all of these monitors can be easily viewed by the vehicle operator when driving, while still allowing relative ease of access for service.

The microprocessor-based CCN hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Controller Area Network (CAN) data bus and the Local Interconnect Network (LIN) data bus. The CCN is the master of the LIN bus and there are four modules that talk to the CCN: The Heated Seat Module (HSM), Remote Compass Module (RCM), Steering Control Module (SCM), and the Accessory Switch Bank Module (ASBM) (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The CCN microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during normal operation that are consistent with customer expectations. However, when abnormal conditions exist such as high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor

can sound a chime through the on-board audible tone transducer to provide distinct visual and audible indications of a problem to the vehicle operator. The CCN may also produce audible warnings for other electronic modules in the vehicle based upon electronic tone request messages received over the CAN/LIN data bus. Each audible warning is intended to provide the vehicle operator with an audible alert to supplement a visual indication.

The CCN circuitry operates on battery current received through a fused B(+) fuse on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse on a fused ignition switch output (run-start) circuit. This arrangement allows the/CCN to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The CCN circuitry is grounded through a ground circuit of the instrument panel wire harness.

The CCN also has a self-diagnostic actuator test capability which will test each of the CAN bus message-controlled functions of the cluster by lighting the appropriate indicators, positioning the gauge needles at several predetermined calibration points across the gauge faces, and illuminating all segments of the odometer/trip odometer/gear selector indicator Vacuum-Fluorescent Display (VFD) unit and Electronic Vehicle Information Center (EVIC). The EVIC will display the hardware/software version, and the CAN and LIN Vehicle Maintenance Monitor (VMM) used in the CCN. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

The CCN collects data and provides control signals for the following electrical equipment via the CAN data bus:

- Gauges
- Interior lighting controls
- Variable-intensity cluster lighting and illumination of instrument panel mounted equipment
- Vehicle Theft Alarm and Sentry Key Theft Deterrent System
- Power door lock system controls (automatic locking, and Remote Keyless Entry locking and unlocking)
- Headlamp switch actuation signal
- Steering wheel radio actuation signals
- Accessory power delay relay control
- Wiper control
- Turn signal flasher audible click
- Heated seat actuation signal (if equipped)
- UConnect® Hands-Free, Voice-Actuated Communication system actuation signal (if equipped)
- Display of the outputs for the HomeLink® universal home security system and compass (if equipped)
- Illuminated entry system
- Key-in-ignition warning chime
- Seat belt warning chime and lamp (Including BeltAlert®)
- Low washer fluid warning indicator
- Door ajar warning indicator
- Liftgate/trunk ajar warning indicator
- LIN master module

The CCN also provides the following enhancements to the above features:

- Time-out for interior lamps left on inadvertently
- Driver programmability of vehicle speed-sensitive automatic locking
- Driver programmability of the power locks to unlock only the driver's door or all doors with the first actuation of the RKE unlock button
- Ability to program vehicle response to lock and unlock commands from the RKE transmitter
- The improved BeltAlert® seatbelt warning indication
- Filtering of input signals to the fuel gauge, temperature gauge, and speedometer to avoid sudden, unexpected pointer movements
- Headlamp control for turning the headlamps on if the windshield wipers are operated in daylight as required by law in some states

GAUGES

All gauges receive battery current through the CCN circuitry only when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the CCN circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

All of the CCN gauges are stepper motors. The gauges are diagnosed using the CCN self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the CCN that control each gauge require the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for each gauge may be found elsewhere in this service information.

VACUUM-FLUORESCENT DISPLAYS

ODOMETER/TRIP ODOMETER - The odometer and trip odometer give an indication to the vehicle operator of the distance the vehicle has traveled. The engine hours give an indication of the cumulative engine-ON time. This indicator is controlled by the instrument cluster circuitry based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) or Engine Control Module (ECM) over the Controller Area Network (CAN) data bus.

The odometer/trip odometer will display some warning messages such as “d00R” and “gATE” ajar. If equipped with the optional Electronic Vehicle Information Center (EVIC), the EVIC will display all messages except GASCAP.

The odometer, trip odometer and engine hours information are displayed by the instrument cluster Vacuum Fluorescent Display (VFD). The VFD will display the odometer information whenever the driver side front door is opened with the ignition switch in the OFF or ACCESSORY positions, and will display the last previously selected odometer or trip odometer information when the ignition switch is turned to the ON or START positions. The instrument cluster circuitry controls the VFD and provides the following features:

- **Odometer/Trip Odometer Display Toggling** - Actuating the trip odometer reset switch button momentarily with the VFD illuminated will toggle the display between the odometer and trip odometer information. Each time the VFD is illuminated with the ignition switch in the ON or START positions, the display will automatically return to the last mode previously selected (odometer or trip odometer).
- **Engine Hours Display Toggling** - When the trip odometer reset switch button is pressed and held for longer than about six seconds with the ignition switch in the ON position and the engine speed message from the PCM is zero, the trip odometer information will be momentarily displayed, then the engine hours information will be displayed. The VFD must be displaying the odometer information when the trip odometer reset switch button is pressed in order to toggle to the engine hours display. The engine hours will remain displayed for about 30 seconds, until the engine speed message is greater than zero, or until the ignition switch is turned to the OFF position, whichever occurs first.
- **Trip Odometer Reset** - When the trip odometer reset switch button is pressed and held for longer than about two seconds with the ignition switch in the ON or START position, the trip odometer will be reset to **0.0** kilometers (miles). The VFD must be displaying the trip odometer information in order for the trip odometer information to be reset.
- **GASCAP Message Display** - On vehicles manufactured with a United States country code, each time the cluster receives an electronic message from the PCM indicating a monitored leak in the evaporative emissions system, the cluster replaces the displayed odometer/trip odometer value with the textual message, **GASCAP**. This message serves as a reminder to the vehicle operator to check that the gas cap is properly installed and tightened, but could also indicate another source of air leakage in the on-board evaporative and vapor recovery emissions systems. Unless the leak is corrected, this message will latch and remain displayed during the current and each subsequent ignition cycle until the trip odometer reset button is pressed and released momentarily, which will revert the display to the odometer/trip odometer information that was last displayed for the remainder of that ignition cycle. Once the source of a leak has been corrected, either momentarily pressing the trip odometer reset button or cycling the ignition switch will unlatch the message and return the odometer/trip odometer to normal operation.
- **Communication Error** - If the cluster fails to receive an electronic **distance** message during normal operation, it will hold and display the last data received until the ignition switch is turned to the OFF position. If the cluster does not receive a **distance** message within one second after the ignition switch is turned to the ON position, it will display the last distance value stored in the cluster memory. If the cluster is unable to display distance information due to an error internal to the cluster, the VFD will display **Error**.
- **Actuator Test** - Each time the cluster is put through the actuator test, the odometer VFD will display all of its segments simultaneously, then step through each character segment individually during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors the vehicle speed pulse information received from the Vehicle Speed Sensor (VSS) or the Controller Anti-lock Brake (CAB) and engine speed pulse information received from the crankshaft position sensor, then sends the proper messages to the ElectroMechanical Instrument Cluster (EMIC). For further diagnosis

of the odometer/trip odometer or the instrument cluster circuitry that controls these functions, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the VSS, the crankshaft position sensor, the CAB, the PCM, the EMIC, the CAN data bus or the electronic communication related to odometer/trip odometer operation a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ELECTRONIC VEHICLE INFORMATION CENTER DISPLAY - The Electronic Vehicle Information Center (EVIC) features a driver-interactive display. The display is located in the lower left part of the instrument cluster below the fuel and engine temperature gauges. This system conveniently allows the driver to select a variety of useful information by pressing the **STEP** button to the right of the EVIC display. The EVIC displays information related to the following:

- **Audio mode display**
- **Compass display**
- **Navigation system screens (if equipped)**
- **Outside temperature display**
- **Personal Settings (customer programmable features)**
- **System Status**
- **Trip computer functions**
- **UConnect™ hands-free communication system displays (if equipped)**
- **Vehicle information warning message displays**

The Vacuum-Fluorescent Display (VFD) units are soldered to the CCN electronic circuit board. With the ignition switch in the Off or Accessory positions, the left and right VFD displays are activated when the driver door is opened and is deactivated when the driver door is closed. Otherwise, the display units are active when the ignition switch is in the On or Start positions, and inactive when the ignition switch is in the Off or Accessory positions.

The illumination intensity of the VFD units are controlled by the CCN circuitry based upon an input from the headlamp switch and a dimming level input received from the panel dimmer switch. The CCN synchronizes the illumination intensity of other VFD units with that of the unit in the CCN by sending electronic dimming level messages to other electronic modules in the vehicle over the CAN/LIN data bus.

The CCN VFD units have several display capabilities. The right VFD unit displays odometer, trip odometer, engine hours, gear selector indication (PRNDL) for models with an automatic transmission, several warning or reminder indications, and various diagnostic information when certain fault conditions exist. An odometer/trip odometer switch on the CCN circuit board is used to control some of the display modes of the right VFD. This switch is actuated manually by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the tachometer. Actuating this switch momentarily with the ignition switch in the On position will toggle the VFD between the odometer and trip odometer modes. Depressing the switch button for about two seconds while the VFD is in the trip odometer mode will reset the trip odometer value to zero. The left VFD unit displays the Electronic Vehicle Information Center (EVIC) and Compass/Temperature information. The left switch button is used as a STEP button for the EVIC display and customer programmable features (Refer to 8 - ELECTRICAL/MESSAGE CENTER/ELECT VEHICLE INFORMATION CENTER - OPERATION).

NOTE: If the vehicles OnBoard Diagnostic (OBD) system determines that the fuel filler cap is loose, improperly installed, or damaged, a “GASCAP” message will be displayed in the Odometer/Trip Odometer. In this instance, tighten the fuel filler cap and press the odometer/trip odometer reset button once to turn the message OFF. The key must be in the Run/Start position during the reset, or you may just cycle the key. If left loose for three trips, or key cycles, a DTC will set and the MIL lamp will illuminate.

Holding the right switch depressed while turning the ignition switch from the Off position to the On position will initiate the CCN self-diagnostic actuator test. Refer to the instrument cluster diagnosis and testing service information for additional details on this cluster function. The CCN microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the VFD display to that mode when the ignition switch is turned On again.

The VFD unit is diagnosed using the CCN self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the CCN that control some of the VFD functions requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for the odometer, the trip odometer, the gear selector indicator and the various warning and reminder indicator functions of the VFD unit may be found elsewhere in this service information. Refer to the vehicle owners manual for further information on various readout messages.

INDICATORS

Indicators are located in various positions within the CCN and are all connected to the CCN electronic circuit board. The door ajar indicator, cargo lamp indicator, high beam indicator, and turn signal indicators operate based upon hard wired inputs to the CCN. The brake indicator is controlled by CAN data bus messages from the Controller Antilock Brake (CAB) as well as by hard wired park brake switch inputs to the CCN. The seatbelt indicator is controlled by the CCN programming, CAN data bus messages from the Occupant Restraint Controller (ORC), and a hard wired seat belt switch input to the CCN. The Malfunction Indicator Lamp (MIL) is normally controlled by CAN data bus messages from the Powertrain Control Module (PCM); however, if the CCN loses CAN data bus communication, the CCN circuitry will automatically turn the MIL on until CAN data bus communication is restored. The CCN uses CAN data bus messages from the Totally Integrated Power Module (TIPM), the ORC, the CAB, and the Sentry Key REmote Entry Module (SKREEM) to control all of the remaining indicators.

The various CCN indicators are controlled by different strategies; some receive fused ignition switch output from the CCN circuitry and have a switched ground, while others are grounded through the CCN circuitry and have a switched battery feed. However, all indicators are completely controlled by the CCN microprocessor based upon various hard wired and electronic message inputs. The cruise indicator located within the VFD unit is dimmable. All other indicators are illuminated at a fixed intensity, which is not affected by the selected illumination intensity of the CCN general illumination LED's. The illumination intensity of the dimmable indicators is synchronized with that of the CCN general illumination LED's.

In addition, certain indicators in this instrument cluster are automatically configured or self-configured. This feature allows the configurable indicators to be enabled by the CCN circuitry for compatibility with certain optional equipment. The CCN defaults for the ABS indicator and airbag indicator are enabled, and these configuration settings must be programmatically disabled in the CCN using a diagnostic scan tool for vehicles that do not have this equipment. The automatically configured or self-configured indicators remain latent in each CCN at all times and will be active only when the CCN receives the appropriate CAN message inputs for that optional system or equipment.

The hard wired indicator inputs may be diagnosed using conventional diagnostic methods. However, the CCN circuitry and CAN/LIN bus message controlled indicators are diagnosed using the CCN self-diagnostic actuator test. Some indicators are requested to be turned on via the LIN bus. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN/LIN data bus and the electronic message inputs to the CCN that control an indicator requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific details of the operation for each indicator may be found elsewhere in this service information.

CLUSTER ILLUMINATION

The CCN has several illumination lamps that are illuminated whenever the exterior lighting is turned On. The illumination intensity of these lamps is adjusted when the interior lighting thumbwheel on the headlamp switch is rotated (down to dim, up to brighten) to one of six available minor detent positions. The CCN monitors a resistor multiplexed input from the headlamp switch on a dimmer input circuit. In response to that input, the CCN electronic circuitry converts a fused 12-volt input it receives on a hard wired panel lamps dimmer switch signal circuit into a 12-volt Pulse Width Modulated (PWM) output.

The CCN uses this PWM output to control the illumination intensity of the cluster, the instrument panel center stack illumination, and the VFD unit on the CCN circuit board. The CCN also transmits electronic dimming level messages over the LIN data bus to other electronic modules (such as the ASBM, HVAC control head, the radio, and the clock) in the vehicle to control and synchronize their illumination intensity.

In addition, the thumbwheel on the headlamp switch has a Parade Mode position to provide a parade or funeral mode. The CCN monitors the request for this mode from the headlamp switch, then transmits an electronic dimming level message to illuminate all VFD units in the vehicle at full (daytime) intensity for easier visibility when driving in daylight with the exterior lighting turned on.

The hard wired headlamp switch and panel lamps dimmer inputs to and outputs from the CCN may be diagnosed using conventional diagnostic methods. However, proper testing of the PWM processing of the CCN and the electronic dimming level messages sent by the CCN over the CAN data bus requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

INSTRUMENT CLUSTER

If all of the instrument cluster gauges and indicators are inoperative, be certain to check the instrument cluster fused B(+) fuse and the instrument cluster fused B(+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

If an individual hard wired gauge or indicator is inoperative, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual Controller Area Network (CAN) or Local Interconnect Network (LIN) data bus message-controlled gauge or indicator is inoperative, perform the Actuator Test as follows:

CAUTION: Instrument clusters used in this model automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which they are initially installed. The instrument cluster is programmed to do this by embedding the Vehicle Identification Number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the Controller Area Network (CAN) data bus, and through certain hard wired inputs received when the cluster is connected to the vehicle electrically. Once configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN, and the certified odometer and engine hours values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

ACTUATOR TEST

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, and the indicators are capable of operating as designed. During the actuator test the instrument cluster circuitry will position each of the gauge needles at various calibration points, illuminate all of the segments in the Vacuum Fluorescent Display (VFD) unit, and turn all of the indicators on and off again.

Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the CAN/LIN data bus, the Powertrain Control Module (PCM), the Engine Control Module (ECM), the Totally Integrated Power Module (TIPM), the Transmission Control Module (TCM), the Occupant Restraint Controller (ORC), the Controller Anti-lock Brake (CAB), the Sentry Key REmote Entry Module (SKREEM) or the hard wired inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the Off position.
2. Depress the odometer/trip odometer switch button.
3. While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.
4. Release the odometer/trip odometer switch button.
5. The instrument cluster will simultaneously begin to illuminate all of the operational segments in the VFD unit and perform a bulb check of each operational LED indicator. The VFD segments and LED indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a VFD segment or an LED indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the instrument cluster must be replaced.
6. The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test. The actuator test will be aborted if the ignition switch is turned to the Off position, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the CAN data bus during the test.

7. Go back to Step 1 to repeat the test, if necessary.

STANDARD PROCEDURE

ENHANCED SEATBELT REMINDER PROGRAMMING

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This beltminder feature provides extended and modified visual seatbelt indicator and audible chime warning responses to an unbuckled driver side or both driver and passenger front seat belts. The beltminder feature may be disabled or enabled by the customer using the programming sequence that follows, or by the dealer using a diagnostic scan tool.

CUSTOMER PROGRAMMING SEQUENCE

NOTE: The following sequence of events must occur within sixty (60) seconds of the ignition switch being placed in the On position in order for the programming to be completed successfully. Even if the vehicle is equipped with both driver and passenger side front seat belt switches, this programming sequence MUST be performed using the driver side front seat belt. The passenger side front seat belt switch has no programming functionality.

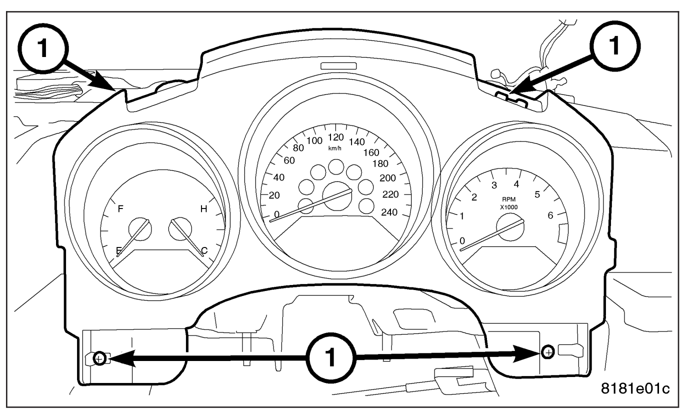
1. With all doors closed and the ignition switch in any position except On or Start, buckle the driver side front seat belt.
2. Turn the ignition switch to the On position and wait for the seatbelt indicator reminder function to conclude (about six seconds).
3. Unbuckle and buckle the driver side front seat belt three or more times, ending with the belt buckled.

NOTE: The occupant must be sure to fully retract the seatbelt each time during this cycle because the actual switch is located in the seatbelt retractor and not the buckle. Each time the seatbelt is buckled or unbuckled, and fully retracted, the seatbelt indicator will illuminate or turn OFF, depending on switch state.

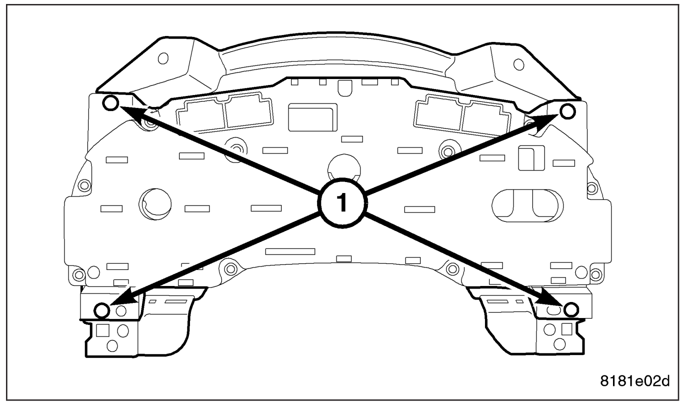
4. Turn the ignition switch to any position except On or Start to toggle the beltminder feature from its current setting (from active to inactive, or from inactive to active). A single chime tone will provide an audible confirmation that the programming sequence has been successfully completed.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel upper panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL UPPER PANEL - REMOVAL).
3. Remove the four retaining screws (1) to the instrument cluster bezel.

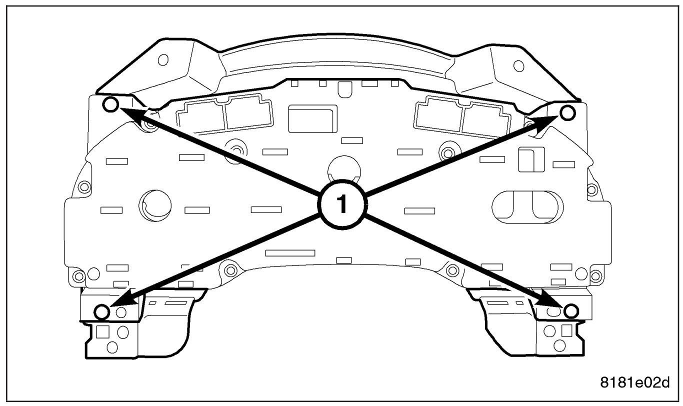


4. Pull instrument cluster rearward to expose the four electrical connectors.
5. Disconnect the electrical connectors and remove cluster from instrument panel.
6. Separate cluster bezel from cluster by removing the four retaining screws (1).

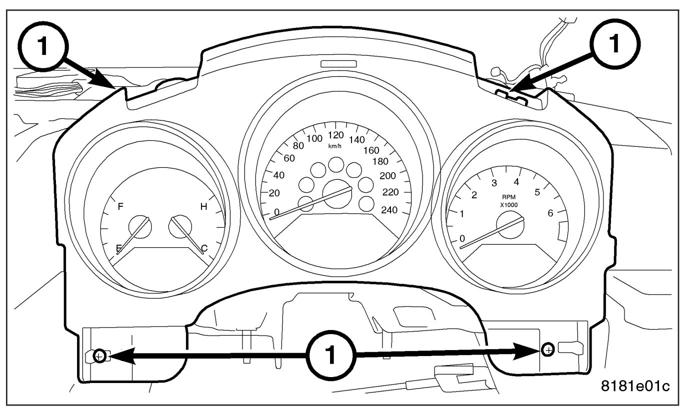


INSTALLATION

1. Install the cluster bezel onto the cluster by installing the four retaining screws (1).
2. Position the cluster in the instrument panel opening.
3. Connect the four electrical connectors.
4. Push instrument cluster forward.



5. Install the four retaining screws (1) to the instrument cluster bezel.
6. Install the instrument panel upper panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL UPPER PANEL - INSTALLATION).
7. Connect the battery negative cable.

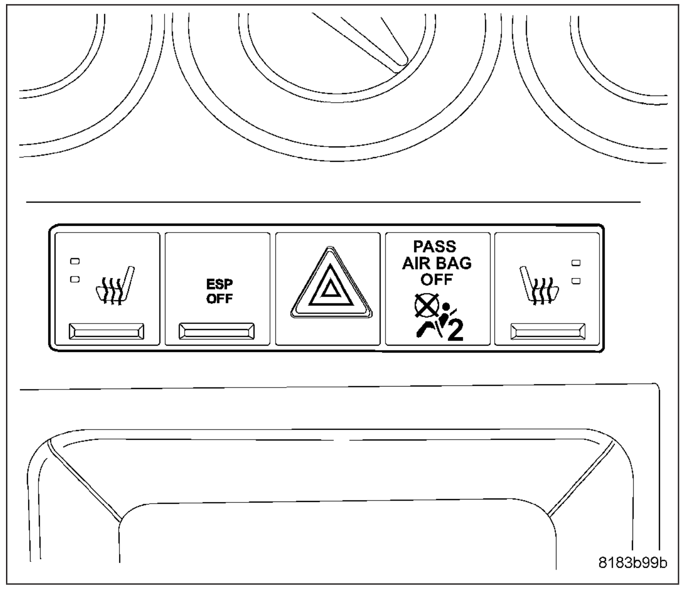


ACCESSORY SWITCH BANK MODULE

DESCRIPTION

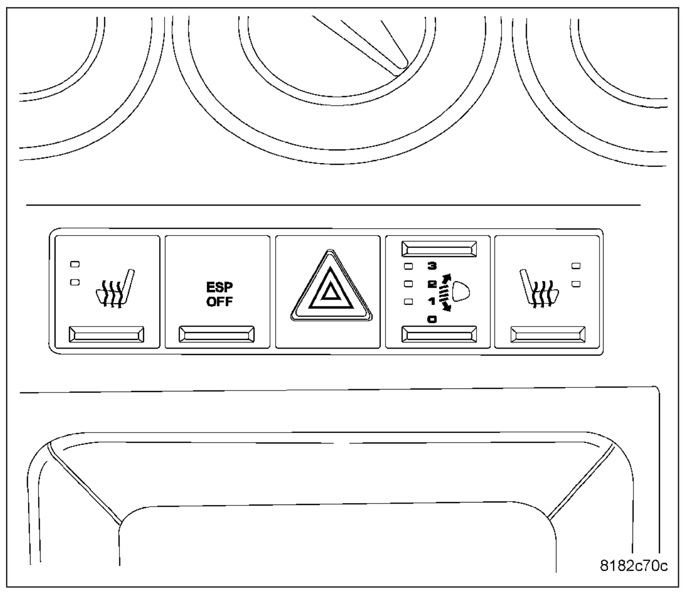
There is an Accessory Switch Bank Module (ASBM) located in the instrument panel center stack just below the heater a/c control. Included in this switch bank are:

- Electronic Stability Program (ESP)/Traction Control Switch (TCS) Off (if equipped) - (Refer to 5 - BRAKES/ELECTRICAL/ESP SWITCH - DESCRIPTION)
- Hazard Switch (all models) - (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HAZARD SWITCH - DESCRIPTION)
- Heated Seat Switch (if equipped) - (Refer to 8 - ELECTRICAL/HEATED SEATS/SEAT SWITCH - DESCRIPTION)
- Passenger Airbag Disabled Lamp (PADL) Indicator (if equipped with OCS) - (Refer to 8 - ELECTRICAL/RESTRAINTS - DESCRIPTION).



The BUX version of the ASBM will vary from the domestic a bit. Following are the various BUX switches:

- Anti-Skid Control (ASC) (if equipped) - This is the same as the ESP/TCS off switch in the domestic version.
- Hazard Switch (all models)
- Heated Seat Switch (if equipped)
- Headlamp Leveling Switch (if equipped) - (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP LEVELING SWITCH - DESCRIPTION)



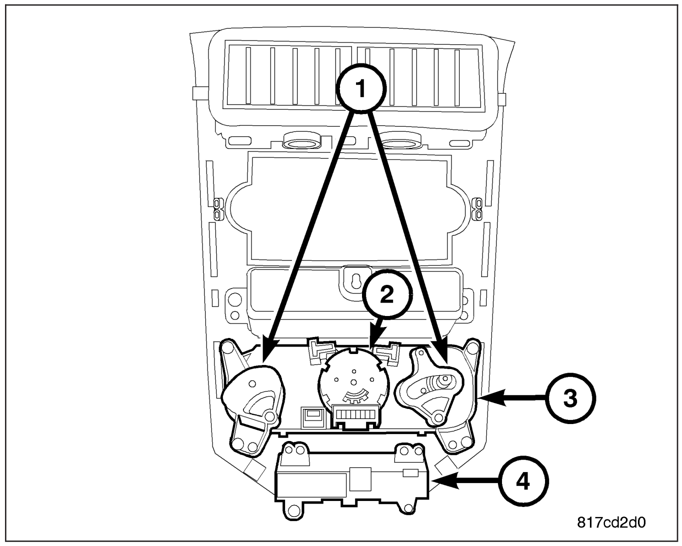
Each individual switch is not available for service replacement. If one or more switches are inoperative, the entire ASBM must be replaced (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/ACCESSORY SWITCH BANK MODULE - REMOVAL). To diagnose the ASBM switches, use a scan tool and the appropriate diagnostic information.

OPERATION

For more information on the individual switches refer to the owners manual in the vehicles glove box.

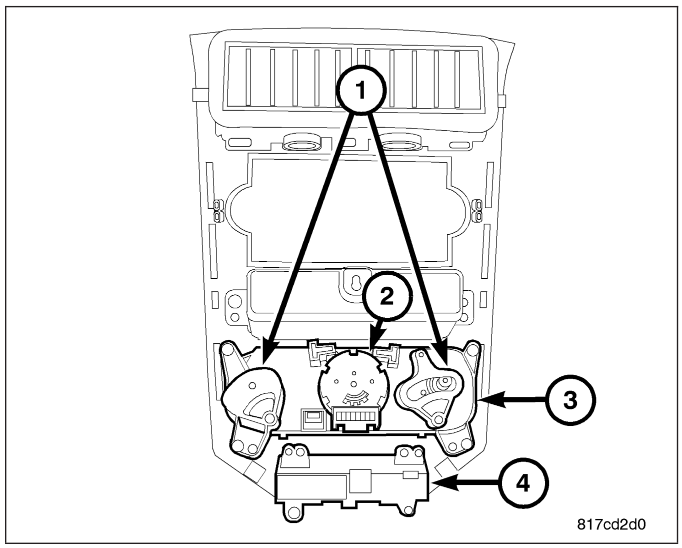
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
3. Remove the screws to the Accessory Switch Bank Module (ASBM) (4).



INSTALLATION

1. Position the Accessory Switch Bank Module (ASBM) (4) in the center bezel.
2. Install the screws to the ASBM.
3. Install the instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
4. Connect the battery negative cable.



CLUSTER MASK/LENS

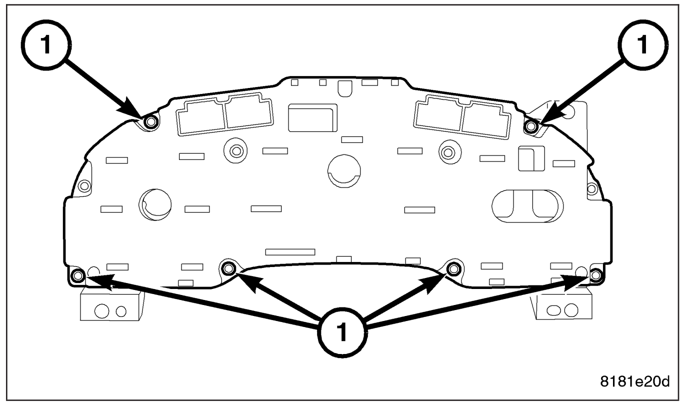
REMOVAL

The mask and lens are serviced together as a unit. If replacement is required for either of these components, they both will be replaced as a unit.

1. Remove instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

NOTE: You must separate the cluster bezel from the cluster to remove the mask/lens.

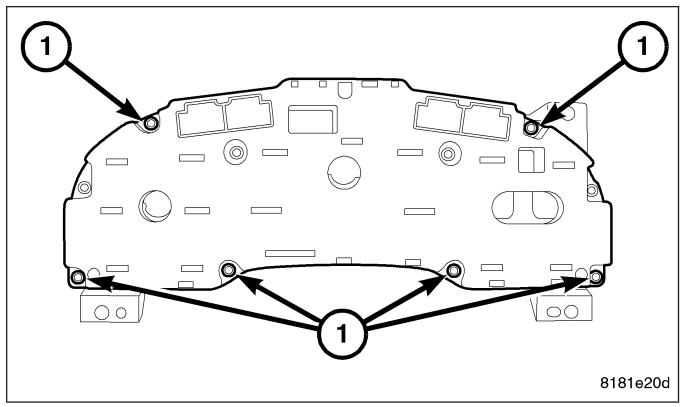
2. To separate the mask/lens from the cluster housing, remove the four screws (1) along the bottom back of the cluster and the two top screws (1).



INSTALLATION

The mask and lens are serviced together as a unit. If replacement is required for either of these components, they both will be replaced as a unit.

1. Position the mask/lens on the cluster housing, install the four screws (1) along the bottom back of the cluster and the two top screws (1).
2. Install the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).



LAMPS

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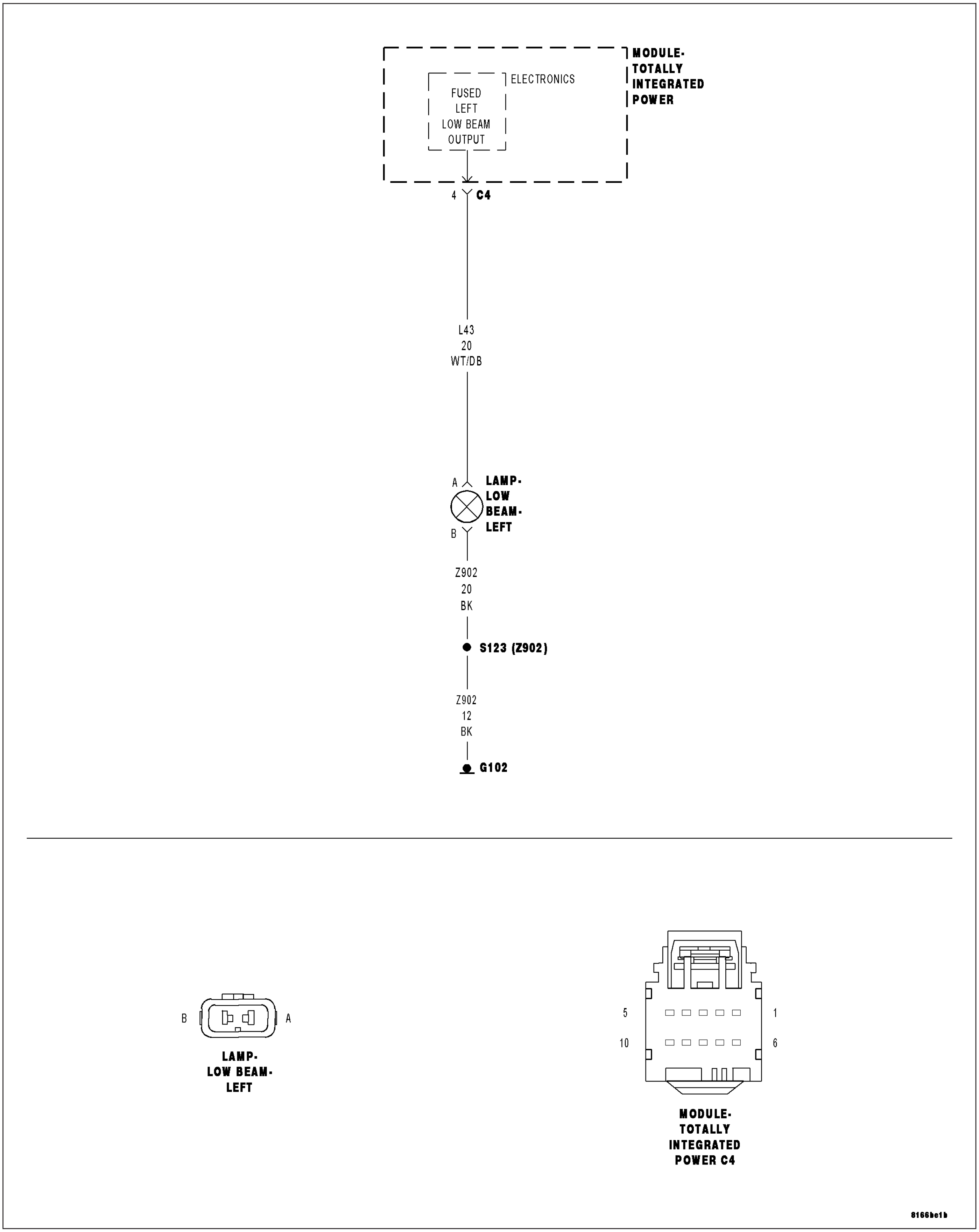
LAMPS/LIGHTING - EXTERIOR - ELECTRICAL DIAGNOSTICS

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LAMPS/LIGHTING - EXTERIOR - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L43) LEFT LOW BEAM CONTROL CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Headlamps on.
With the Scan Tool read the DTC information.

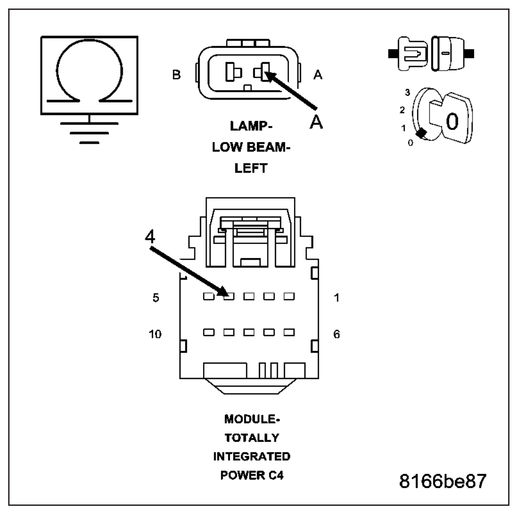
Does the Scan Tool read: B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (L43) LEFT LOW BEAM CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.
Disconnect the TIPM C4 harness connector.
Disconnect the Left Headlamp harness connector.
Measure the resistance between ground and the (L43) Left Low Beam Control circuit.

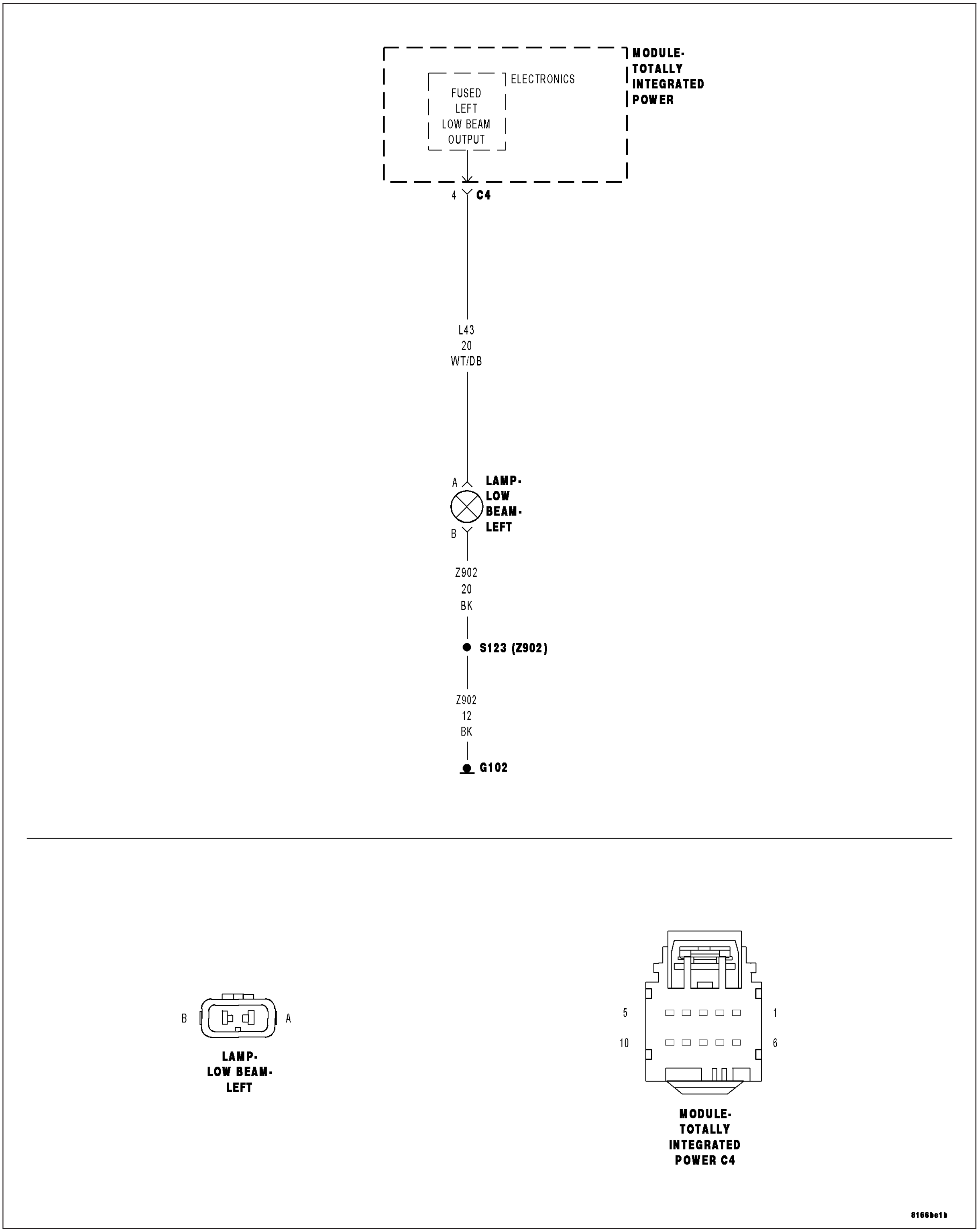


Is the resistance below 5.0 ohms?

Yes >> Repair the (L43) Left Low Beam Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B162C-LEFT LOW BEAM CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L43) LEFT LOW BEAM CONTROL CIRCUIT OPEN
(L43) LEFT LOW BEAM CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT LOW BEAM BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B162C-LEFT LOW BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. LEFT LOW BEAM BULB

Turn the ignition off.

Inspect the Left Low Beam Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

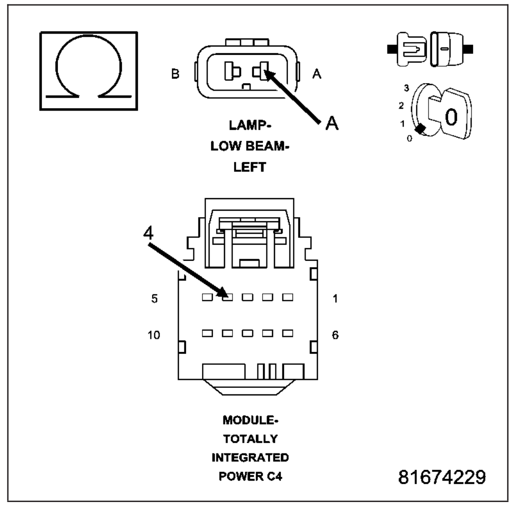
3. (L43) LEFT LOW BEAM CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Left Low Beam Lamp harness connector.

Measure the resistance of the (L43) Left Low Beam Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L43) Left Low Beam Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (L43) LEFT LOW BEAM CONTROL CIRCUIT SHORTED TO VOLTAGE

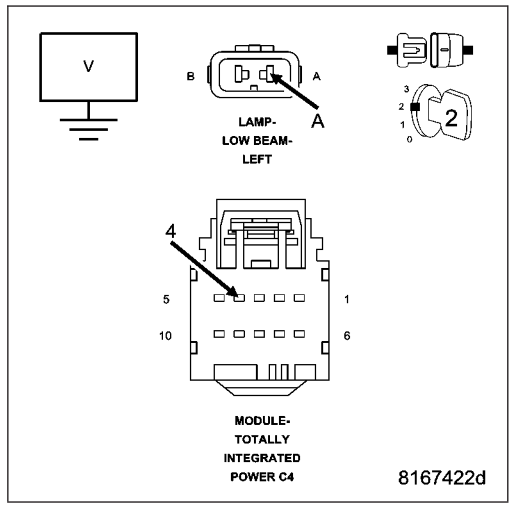
Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Left Low Beam Lamp harness connector.

Turn the ignition on.

Measure for voltage on the (L43) Left Low Beam Control circuit.



Is the voltage above 10.0 volts?

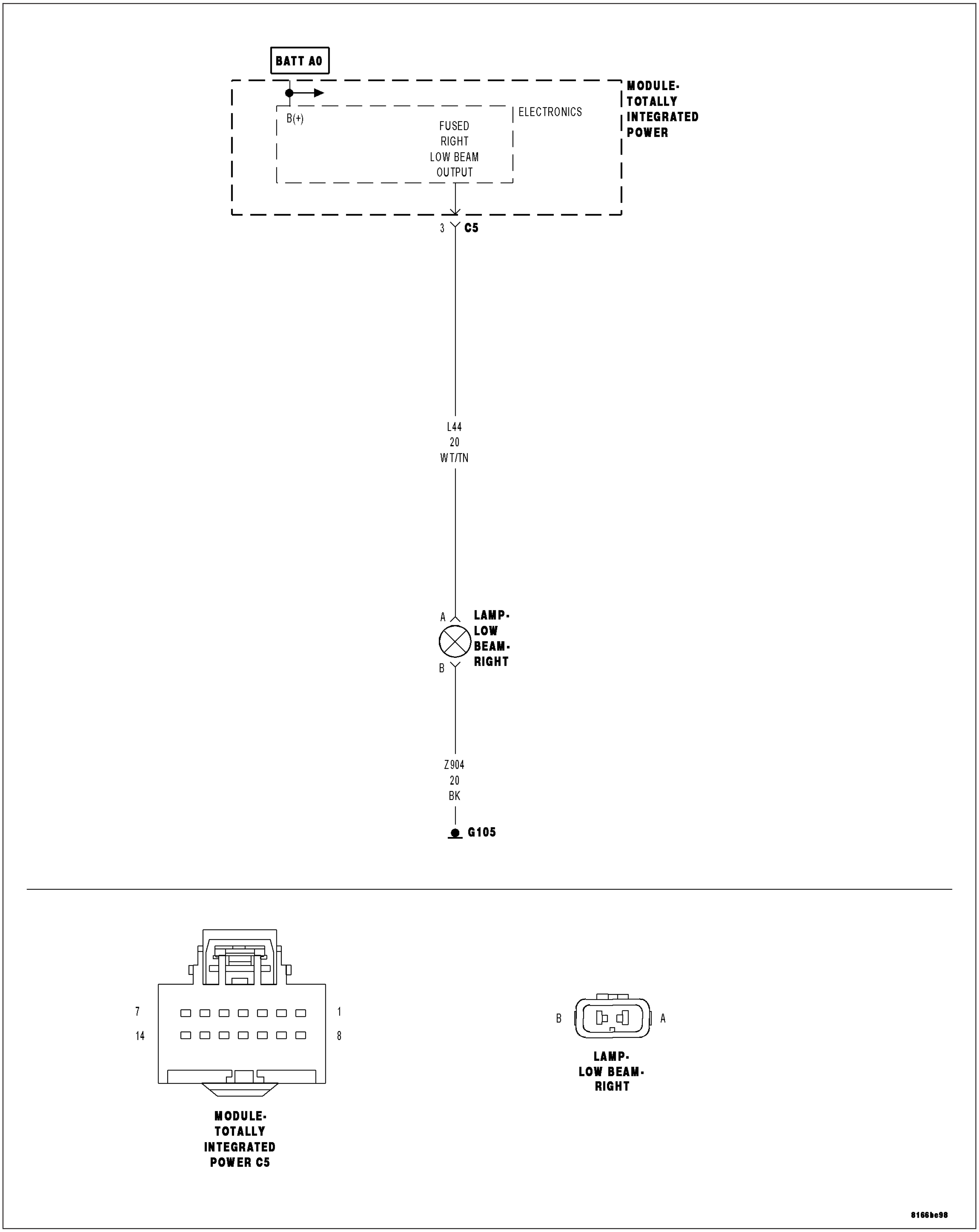
Yes >> Repair the (L43) Left Low Beam Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

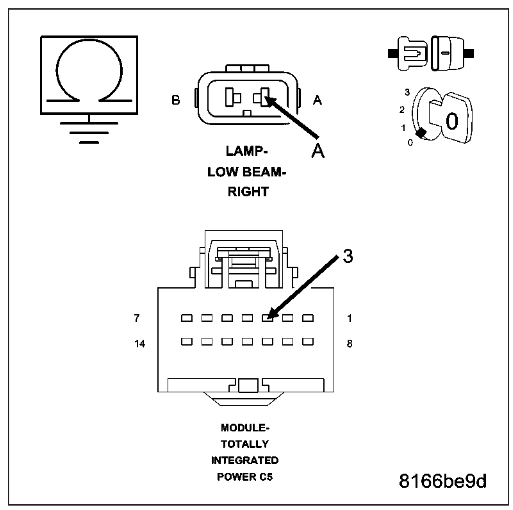
2. (L44) RIGHT LOW BEAM CONTROL CIRCUIT

Turn the ignition off.

Disconnect the TIPM C5 harness connector.

Disconnect the Right Headlamp harness connector.

Measure the resistance between ground and the (L44) Right Low Beam Control circuit.



Is the resistance below 5.0 ohms?

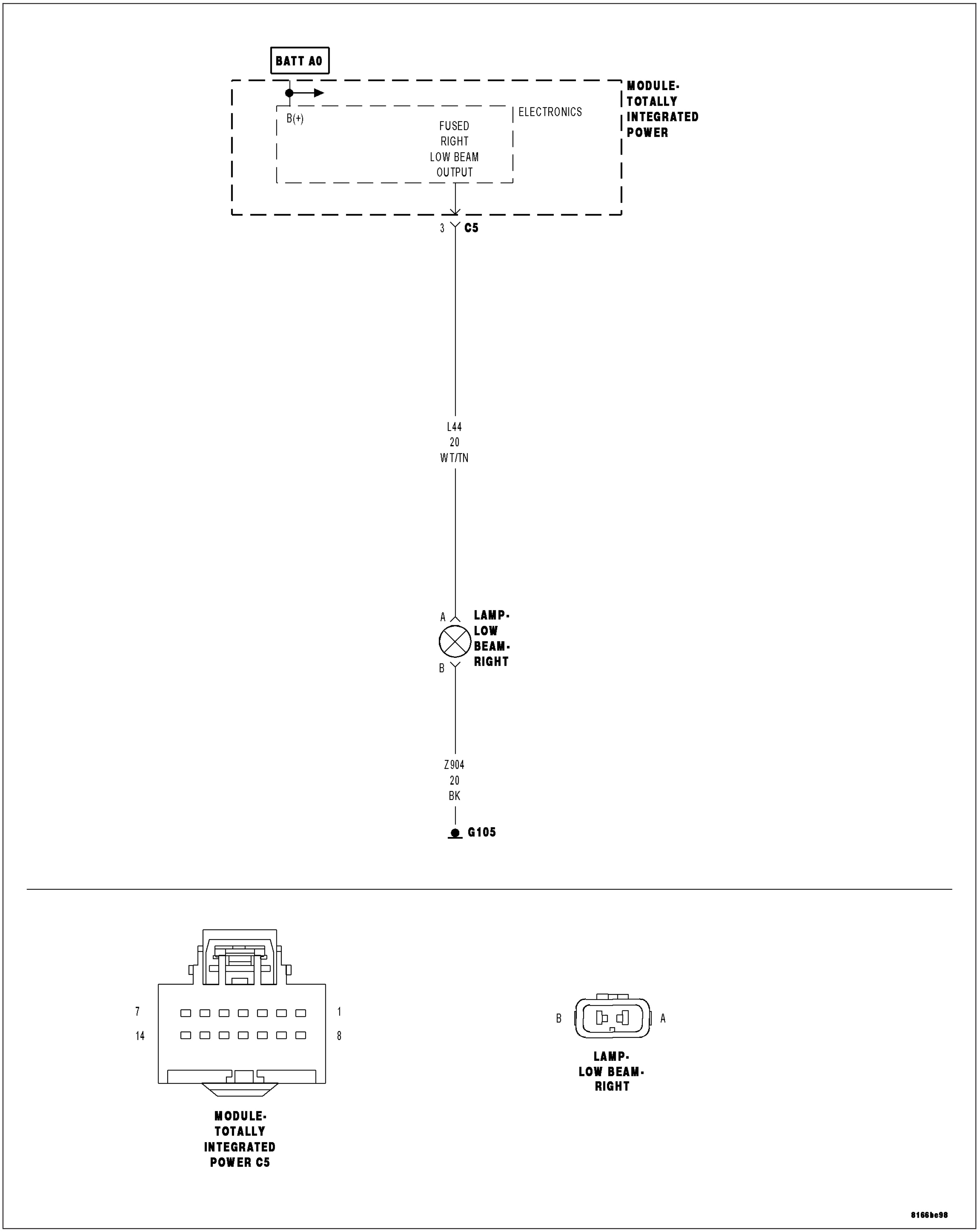
Yes >> Repair the (L44) Right Low Beam Control circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT OPEN
(L44) RIGHT LOW BEAM CONTROL CIRCUIT SHORTED TO VOLTAGE
RIGHT LOW BEAM BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. RIGHT LOW BEAM BULB

Turn the ignition off.

Inspect the Right Low Beam Bulb Assembly.

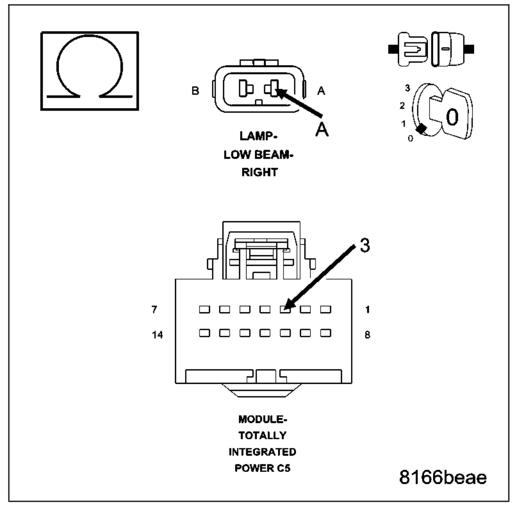
Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L44) RIGHT LOW BEAM CONTROL CIRCUIT OPEN



Turn the ignition off.

Disconnect the TIPM C5 harness connector.

Disconnect the Right Low Beam Lamp harness connector.

Measure the resistance of the (L44) Right Low Beam Control circuit.

Is the resistance above 5.0 ohms?

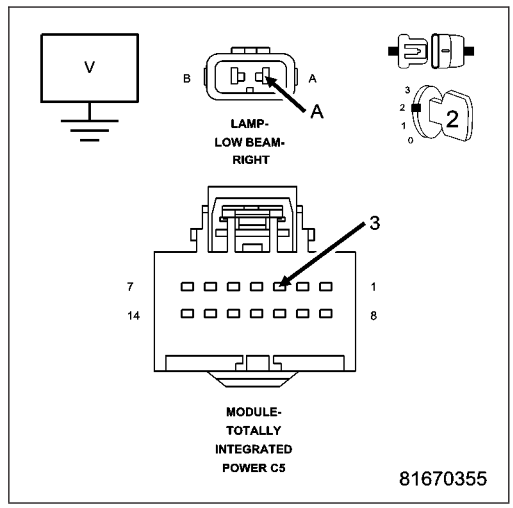
Yes >> Repair the (L44) Right Low Beam Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (L44) RIGHT LOW BEAM CONTROL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C5 harness connector.

Disconnect the Right Low Beam Lamp harness connector.

Turn the ignition on.

Measure for voltage on the (L44) Right Low Beam Control circuit.

Is the voltage above 10.0 volts?

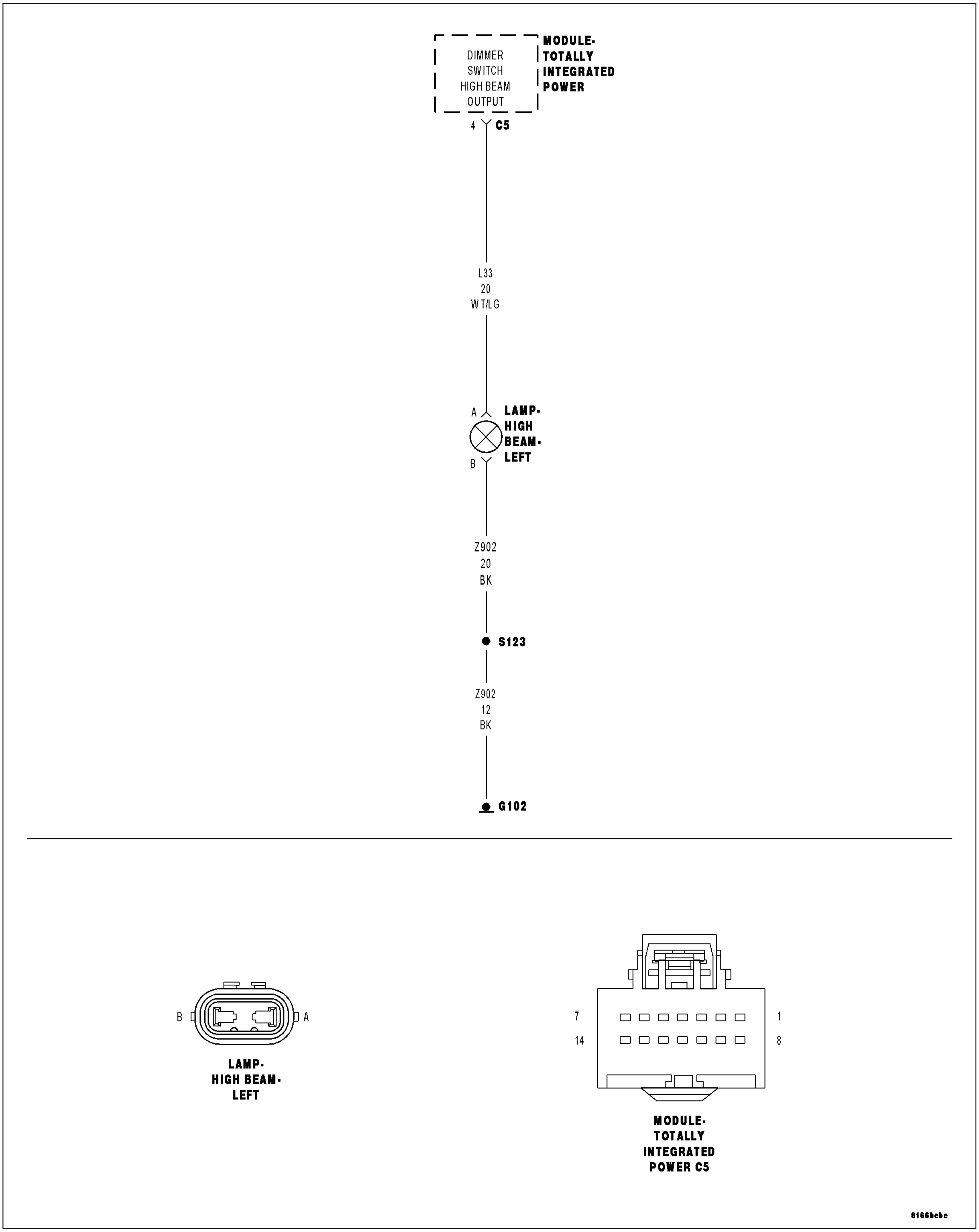
Yes >> Repair the (L44) Right Low Beam Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1633-LEFT HI BEAM CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L33) LEFT HIGHBEAM OUTPUT CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Highbeam Headlamps on.
With the Scan Tool read the DTC information.

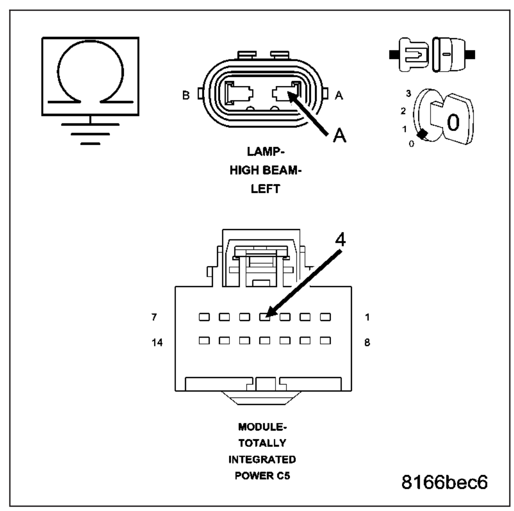
Does the Scan Tool read: B1633-LEFT HI BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (L33) LEFT HIGHBEAM OUTPUT CIRCUIT

Turn the ignition off.
Disconnect the TIPM C5 harness connector.
Disconnect the Left Headlamp harness connector.
Measure the resistance between ground and the Left Highbeam Output circuit.

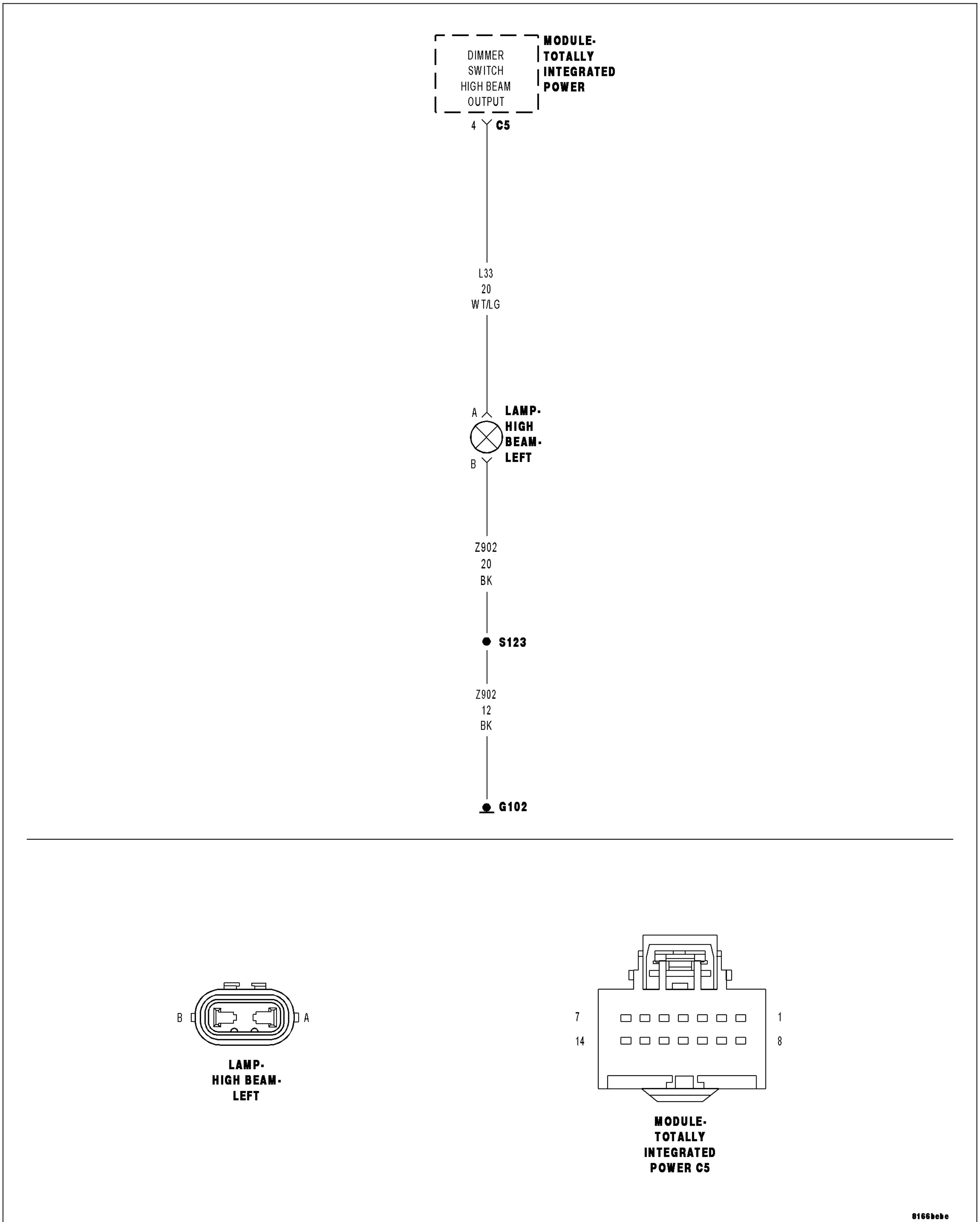


Is the resistance below 5.0 ohms?

Yes >> Repair the (L33) Left Highbeam Output circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L33) HIGH BEAM CONTROL CIRCUIT OPEN
(L33) HIGH BEAM CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT HIGH BEAM BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1.

2. LEFT HIGH BEAM BULB

Turn the ignition off.

Inspect the Left High Beam Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

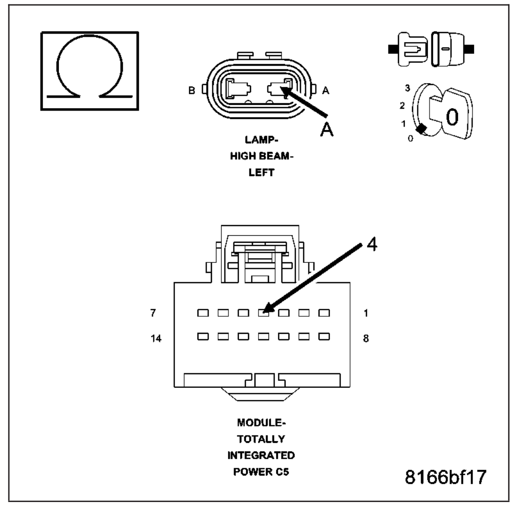
3. (L33) HIGH BEAM CONTROL CIRCUIT

Turn the ignition off.

Disconnect the TIPM C5 harness connector.

Disconnect the Left High Beam Lamp harness connector.

Measure the resistance of the (L33) High Beam Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L33) High Beam Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L33) HIGH BEAM CONTROL CIRCUIT SHORT TO VOLTAGE

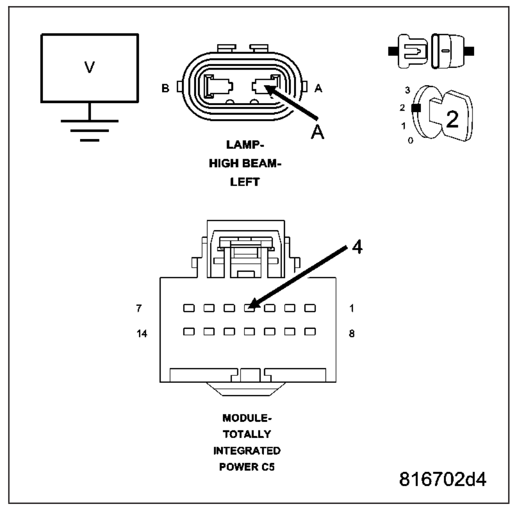
Turn the ignition off.

Disconnect the TIPM C5 harness connector.

Disconnect the Left High Beam Lamp harness connector.

Turn the ignition on.

Measure for voltage on the (L33) High Beam Control circuit.



Is the voltage above 10.0 volts?

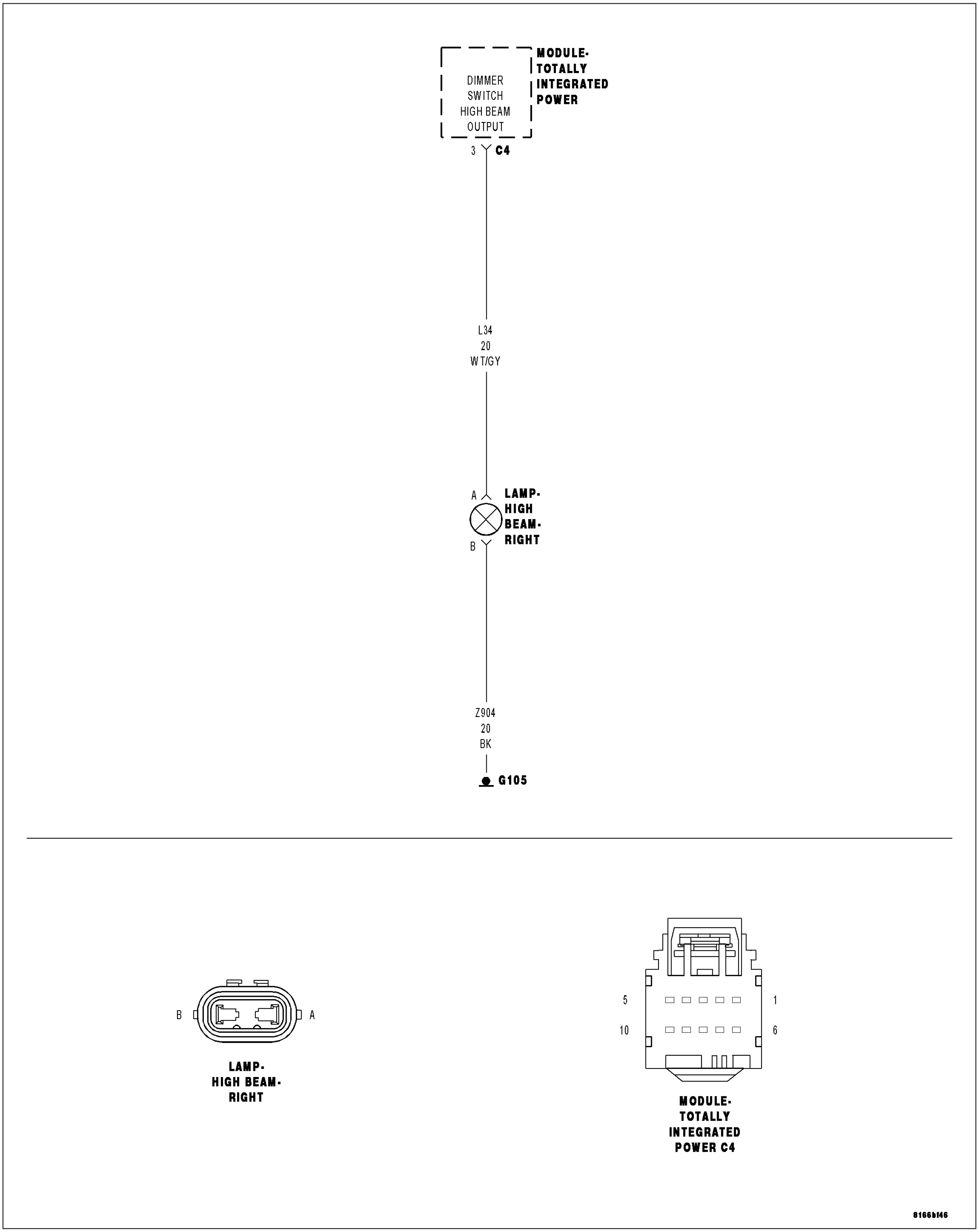
Yes >> Repair the (L33) High Beam Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1637-RIGHT HIGH BEAM CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the High Beam Headlamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L34) RIGHT HIGHBEAM OUTPUT CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Highbeam Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

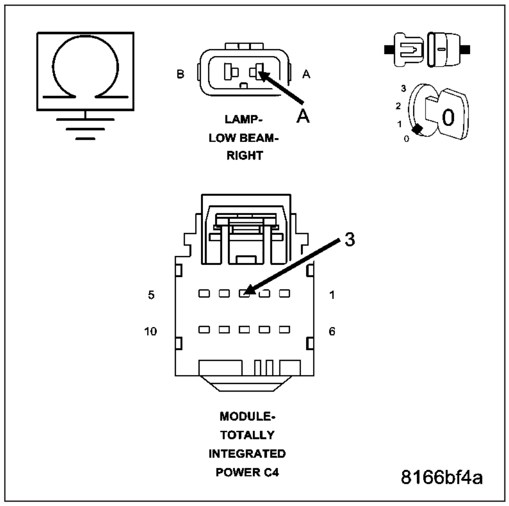
2. (L34) RIGHT HIGHBEAM OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Right Highbeam Lamp harness connector.

Measure the resistance between ground and the Right Highbeam Output circuit.



Is the resistance below 5.0 ohms?

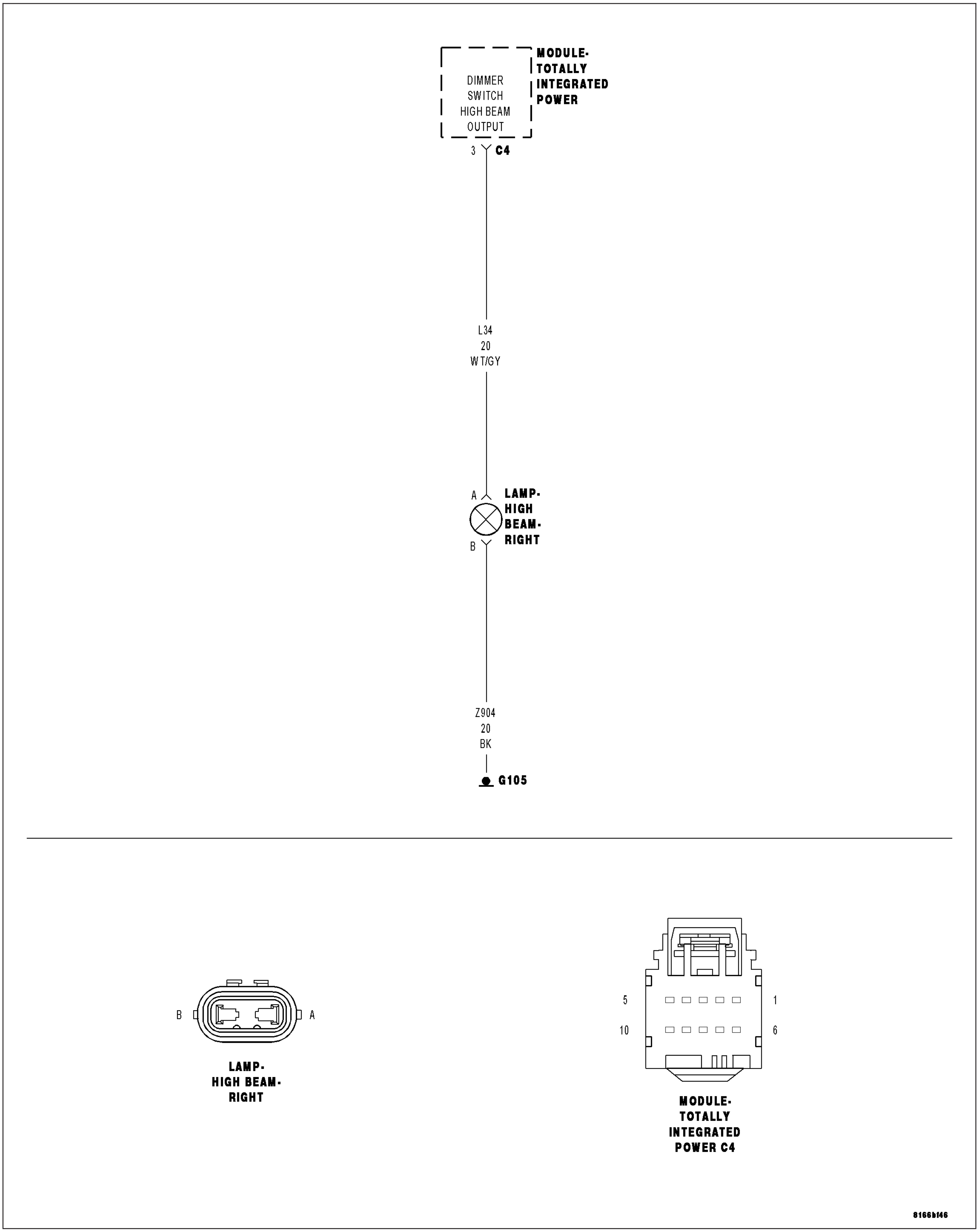
Yes >> Repair the (L34) Right Highbeam Output circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L34) HIGH BEAM CONTROL CIRCUIT OPEN
(L34) HIGH BEAM CONTROL SHORT TO VOLTAGE
RIGHT HIGH BEAM BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. RIGHT LOW BEAM BULB

Turn the ignition off.

Inspect the Right High Beam Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

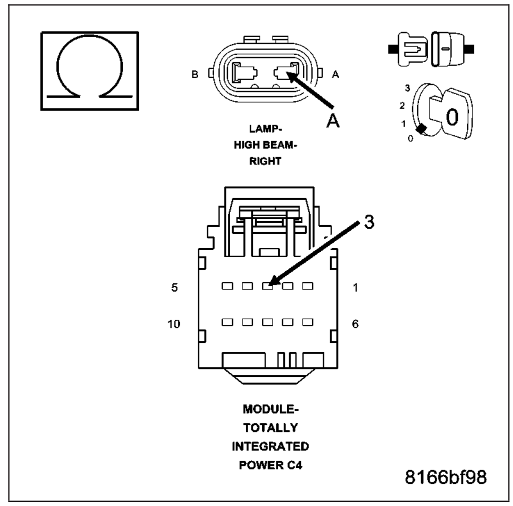
3. (L34) HIGH BEAM CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Right Highbeam Lamp harness connector.

Measure the resistance of the (L34) High Beam Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L34) High Beam Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L34) HIGH BEAM CONTROL CIRCUIT SHORT TO VOLTAGE

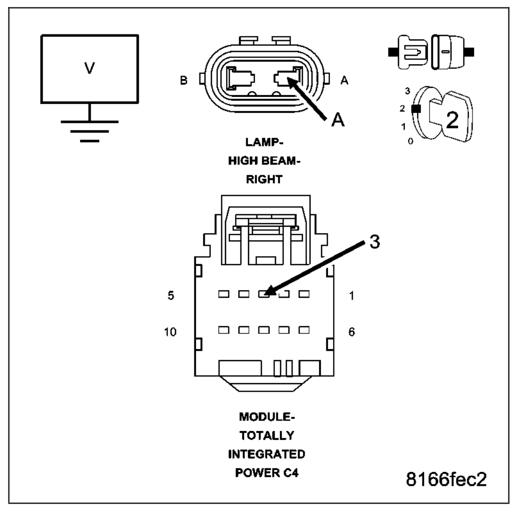
Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Right Highbeam Lamp harness connector.

Turn the ignition on.

Measure for voltage on the (L34) High Beam Control circuit.



Is the voltage above 10.0 volts?

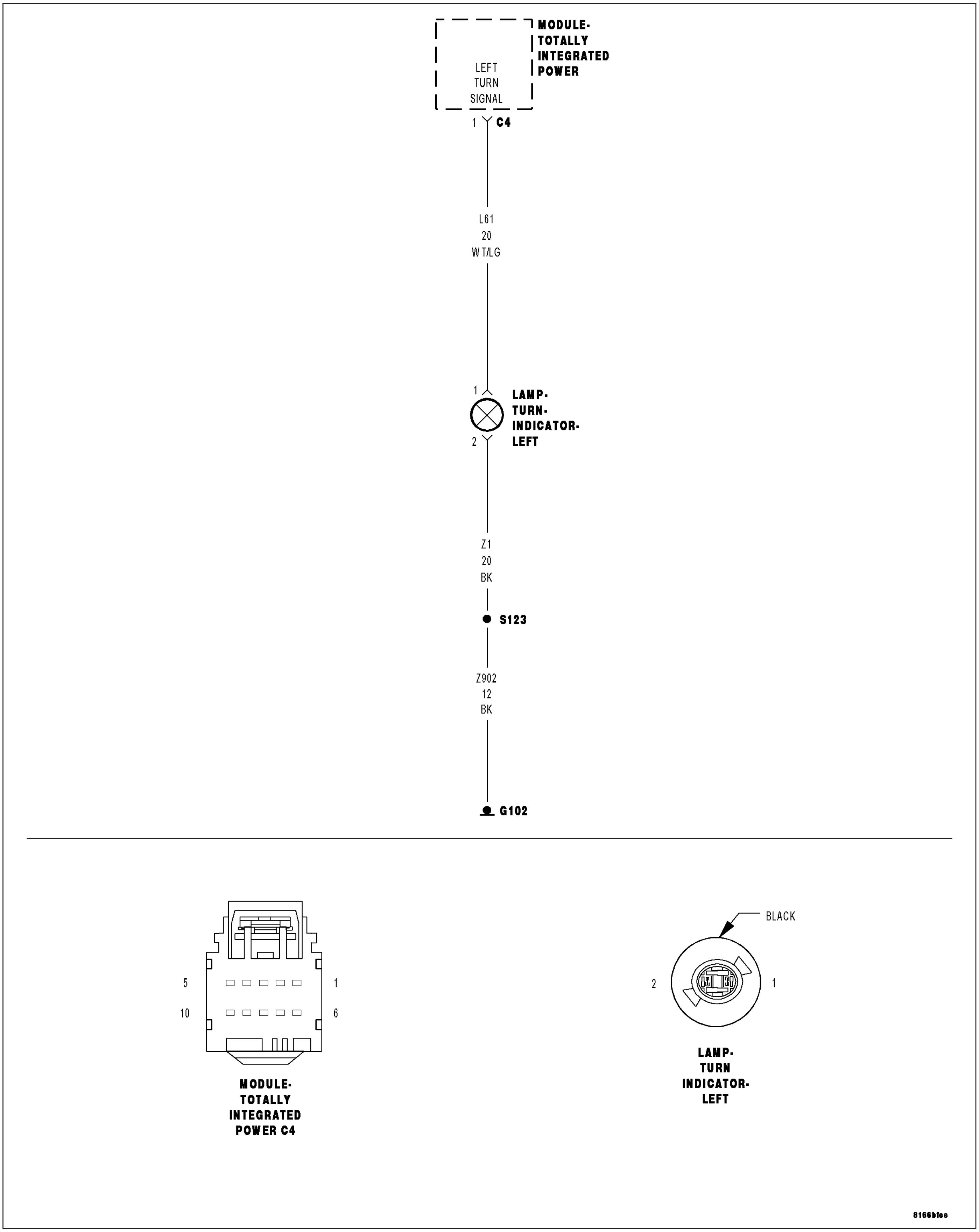
Yes >> Repair the (L34) High Beam Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L61) FRONT LEFT TURN SIGNAL CONTROL CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Left Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

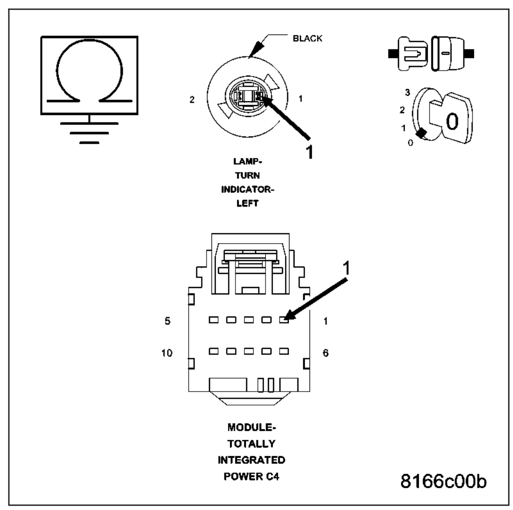
2. (L61) FRONT LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the TIPM C2 connector.

Disconnect the Left Turn Signal Lamp harness connector.

Measure the resistance between ground and the (L61) Front Left Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

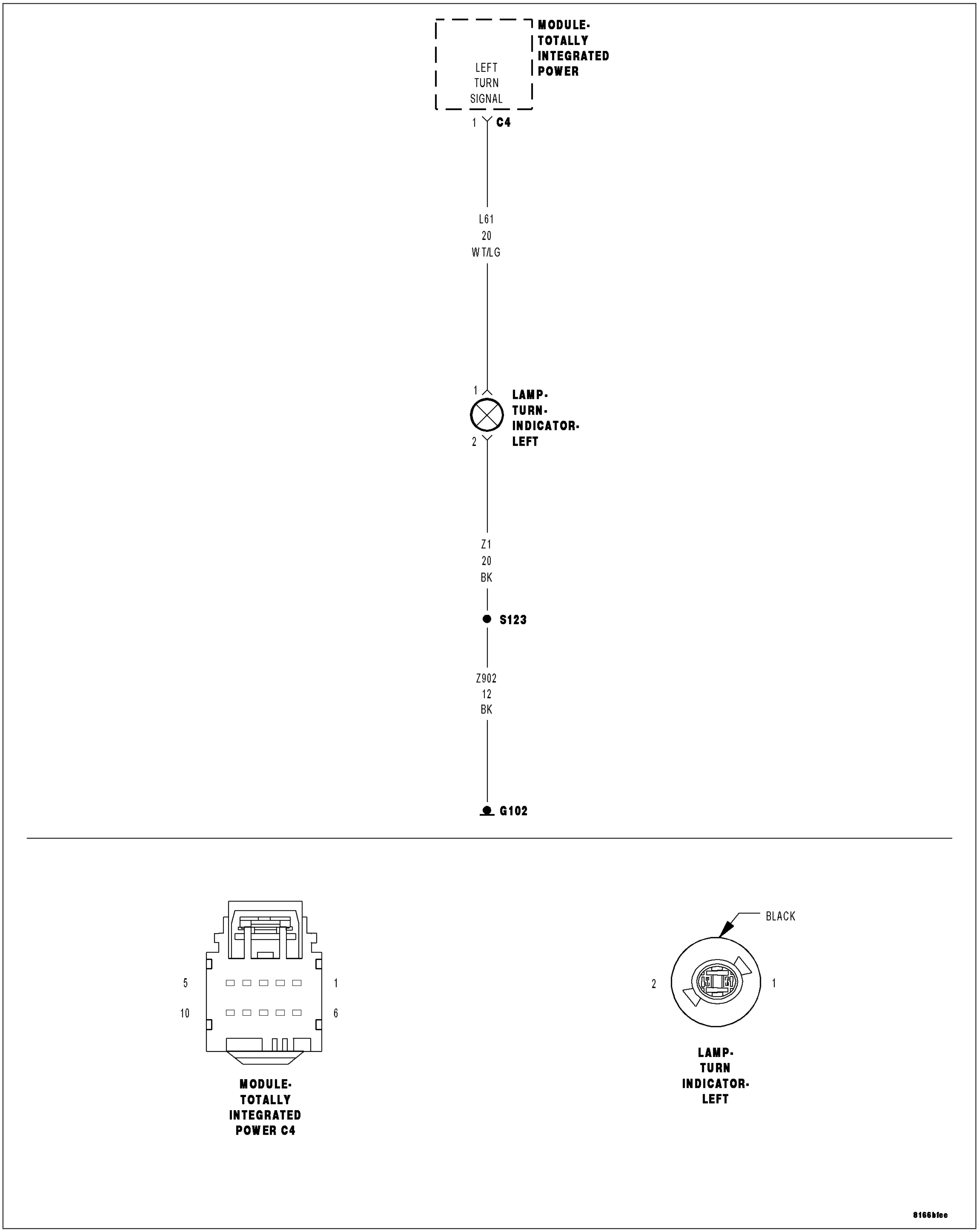
Yes >> Repair the (L61) Front Left Turn Signal Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Totally Integrated Power Module detects a short to battery on the Control circuit.

Possible Causes
(L61) TURN SIGNAL CONTROL CIRCUIT OPEN
(L61) TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE
FRONT LEFT TURN SIGNAL BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all TIPM DTC's

Turn the Left Turn Signal on.

With the scan tool, read DTC's.

Does the scan tool read: B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. FRONT LEFT TURN SIGNAL BULB

Turn the ignition off.

Inspect the Front Left Turn Signal Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

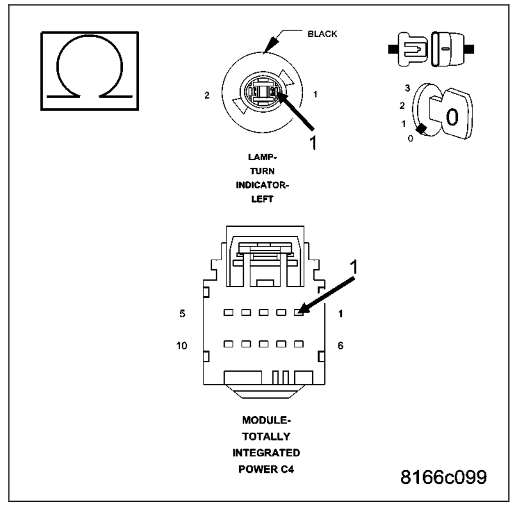
3. (L61) LEFT TURN SIGNAL CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C4 connector.

Disconnect the Front Left Turn Signal Lamp harness connector.

Measure the resistance of the (L61) Front Left Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L61) Turn Signal Control circuit for an open.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

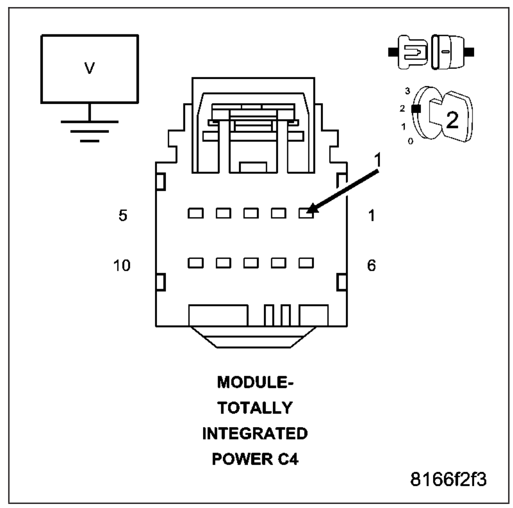
4. L61 LEFT TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C4 connector.

Turn the ignition on.

Check for voltage on the (L61) Front Left Turn Signal Control circuit.



Is the voltage above 10.0 volts?

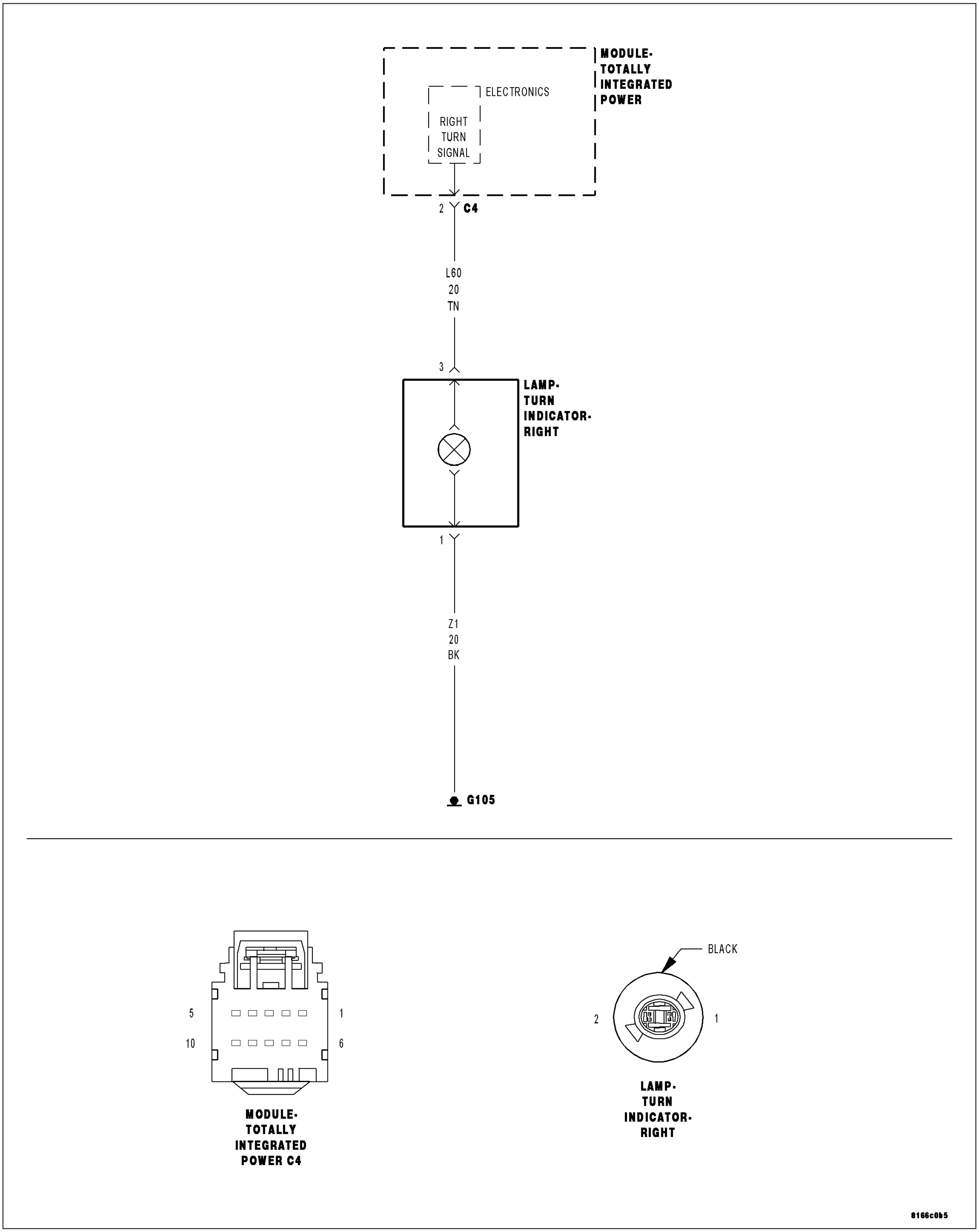
Yes >> Repair the (L61) Turn Signal Control circuit for a short to voltage.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Turn Signal activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L60) FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

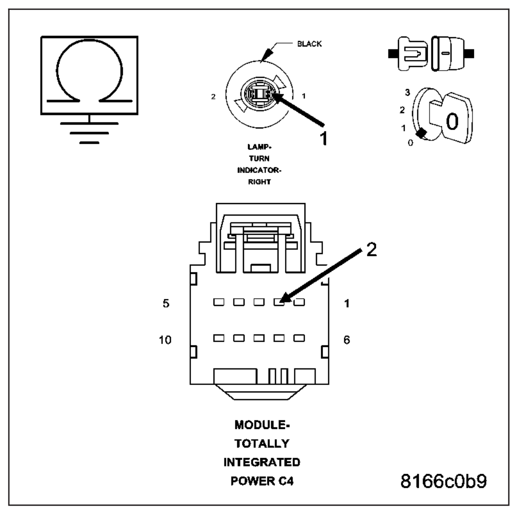
2. (L60) FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the TIPM C4 harness connector.

Disconnect the Right Front Headlamp harness connector.

Measure the resistance between ground and the (L60) Front Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

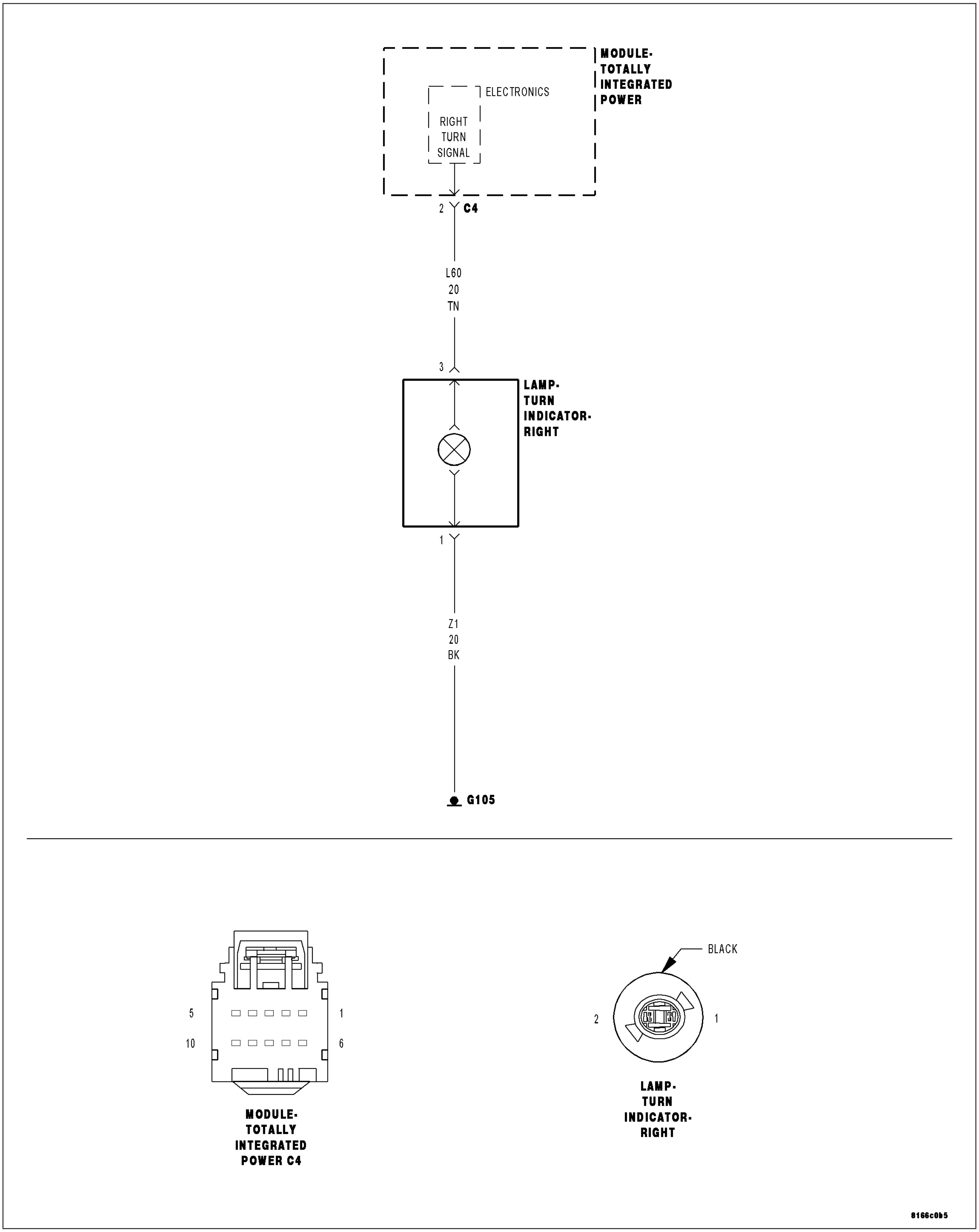
Yes >> Repair the (L60) Front Right Turn Signal Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Totally Integrated Power Module detects a short to battery on the Control circuit.

Possible Causes
(L60) TURN SIGNAL CONTROL CIRCUIT OPEN
(L60) TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE
FRONT RIGHT TURN SIGNAL BULB
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all TIPM DTC's

Turn the Right Turn Signal on.

With the scan tool, read DTC's.

Does the scan tool read: B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. FRONT RIGHT TURN SIGNAL BULB

Turn the ignition off.

Inspect the Front Right Turn Signal Bulb Assembly.

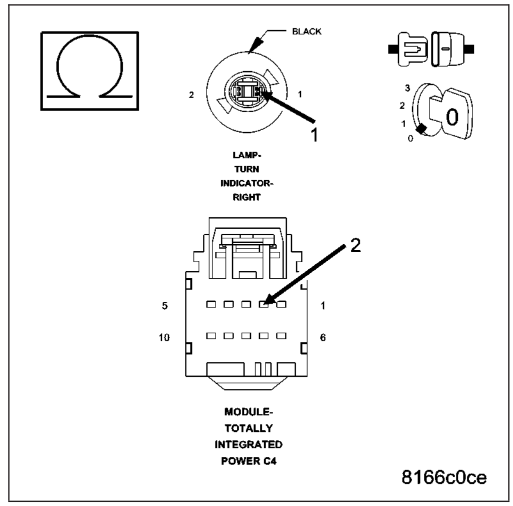
Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L60) RIGHT TURN SIGNAL CONTROL CIRCUIT OPEN



Turn the ignition off.

Disconnect the TIPM C4 connector.

Disconnect the Front Right Turn Signal harness connector.

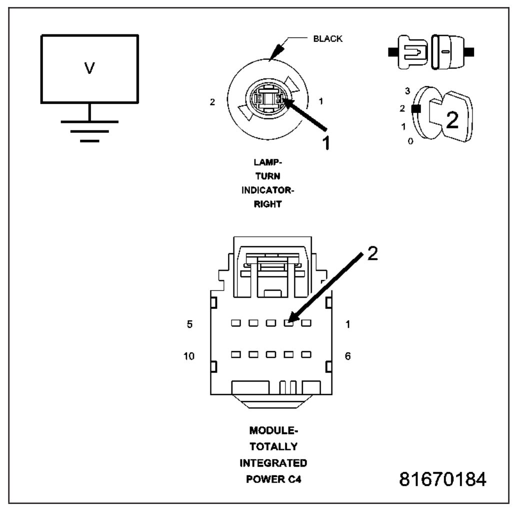
Measure the resistance of the (L60) Front Right Turn Signal Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (L60) Turn Signal Control circuit for an open.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L60) RIGHT TURN SIGNAL CONTROL CIRCUIT SHORT TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C4 connector.

Disconnect the Front Right Turn Signal harness connector.

Turn the ignition on.

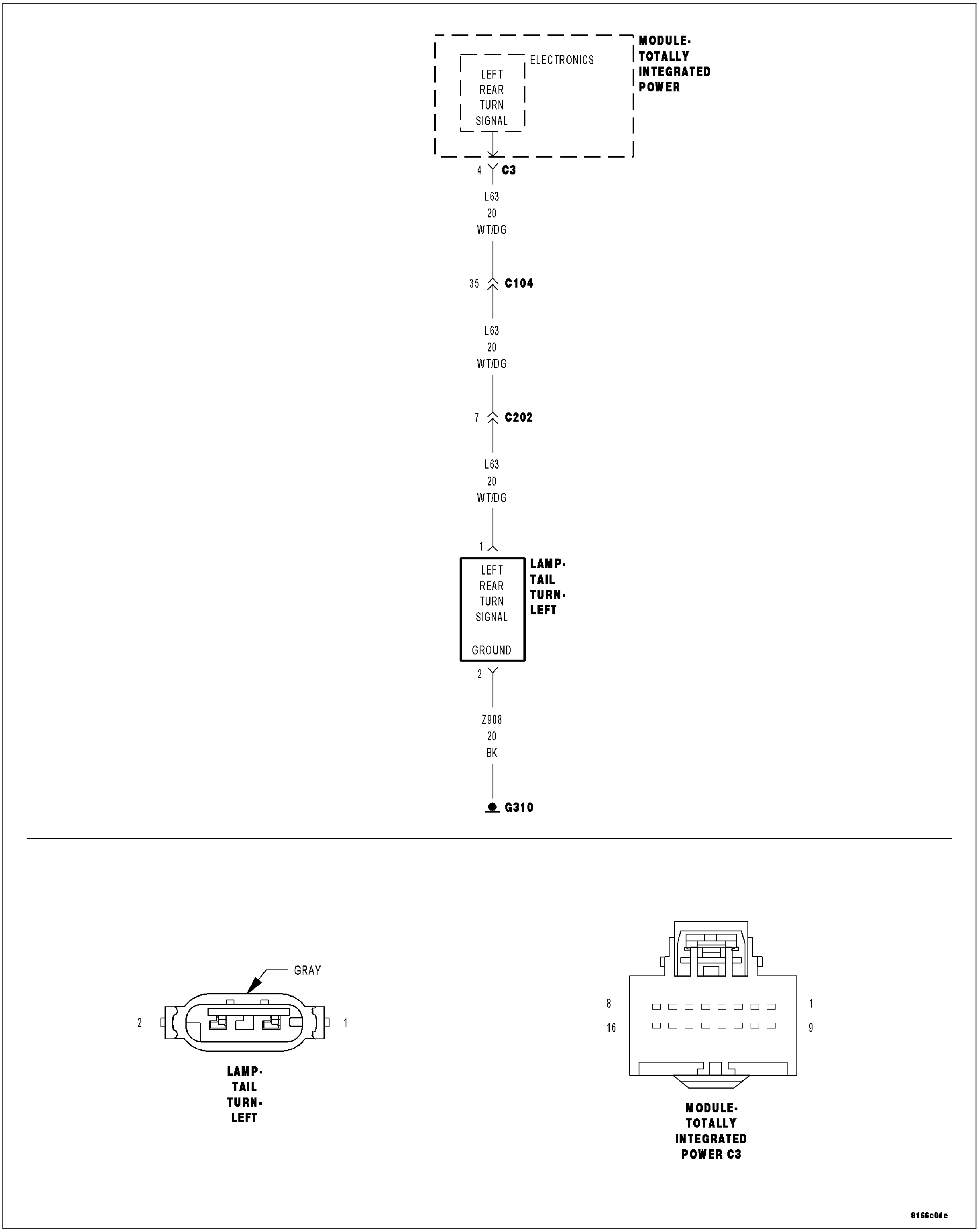
Measure for voltage on the (L60) Front Right Turn Signal Control circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (L60) Turn Signal Control circuit for a short to voltage.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1643-REAR LEFT TURN CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Turn Signal activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L63) REAR LEFT TURN SIGNAL CONTROL CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Left Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1643-REAR LEFT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

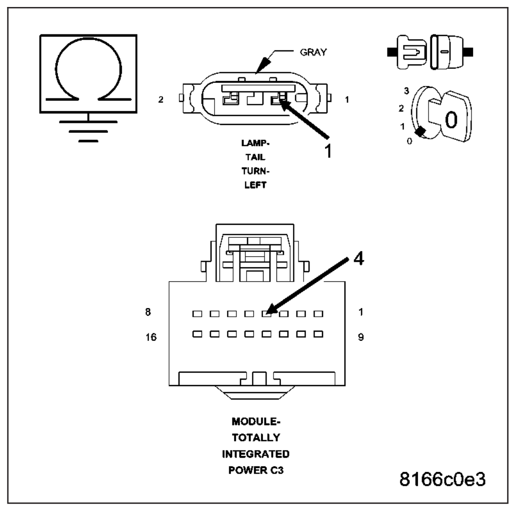
2. (L63) LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the TIPM C3 connector.

Disconnect the Left Rear Tail Lamp connector.

Measure the resistance between ground and the (L63) Rear Left Rear Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

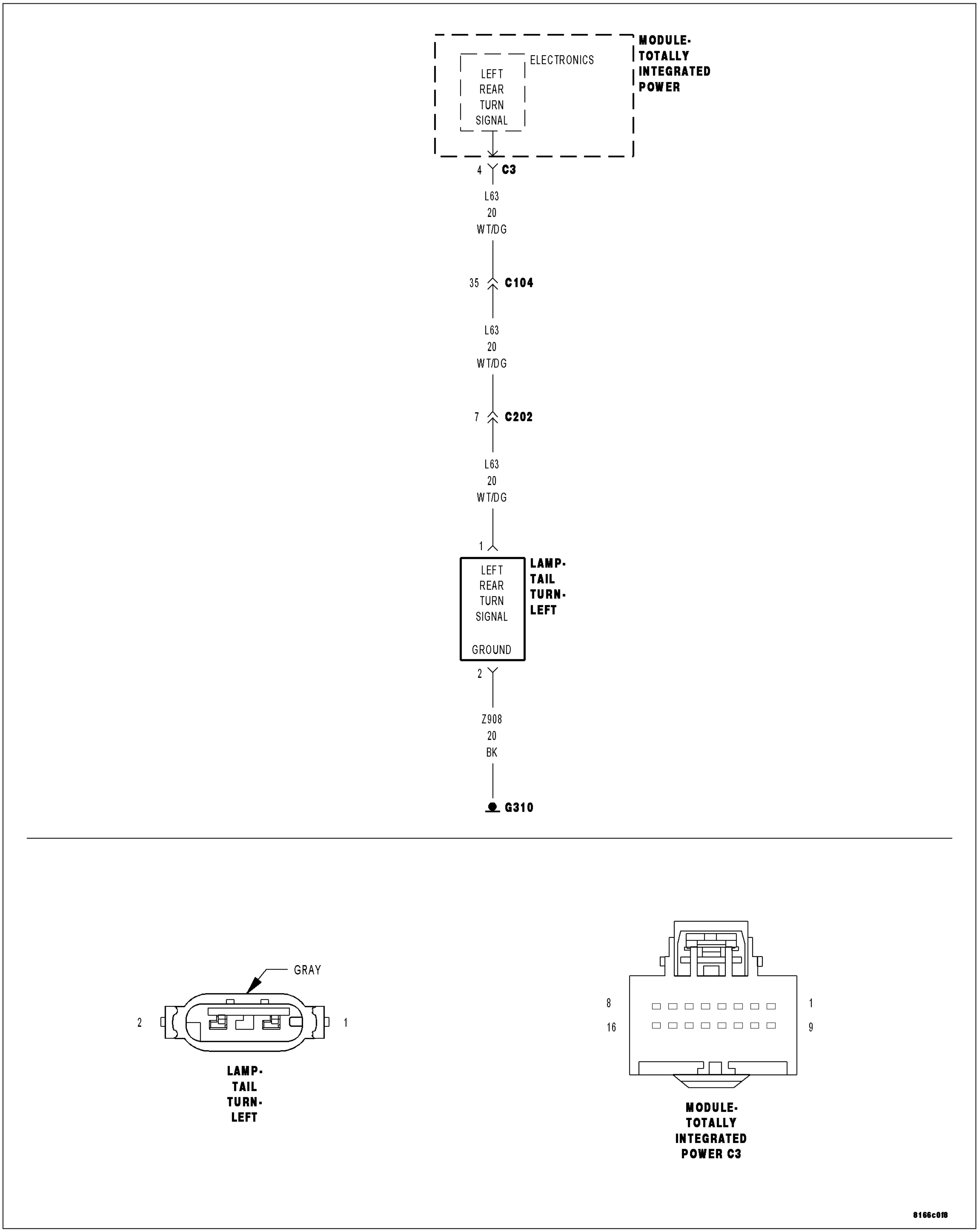
Yes >> Repair the (L63) Rear Left Turn Signal Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Totally Integrated Power Module detects a short to battery on the Left Rear Turn Signal Control circuit.

Possible Causes
(L63) LEFT REAR TURN SIGNAL CONTROL CIRCUIT OPEN
(L63) LEFT REAR TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all TIPM DTC's

Turn the Left Turn Signal on.

With the scan tool, read DTC's.

Does the scan tool read: B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. LEFT REAR TURN SIGNAL BULB

Turn the ignition off.

Inspect the Left Rear Turn Signal Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

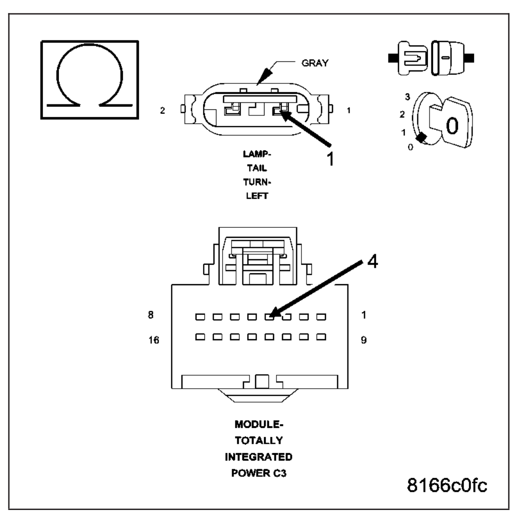
3. (L63) LEFT REAR TURN SIGNAL CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left Rear Tail Lamp harness connector.

Measure the resistance of the (L63) Left Rear Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L63) Turn Signal Control circuit for an open.

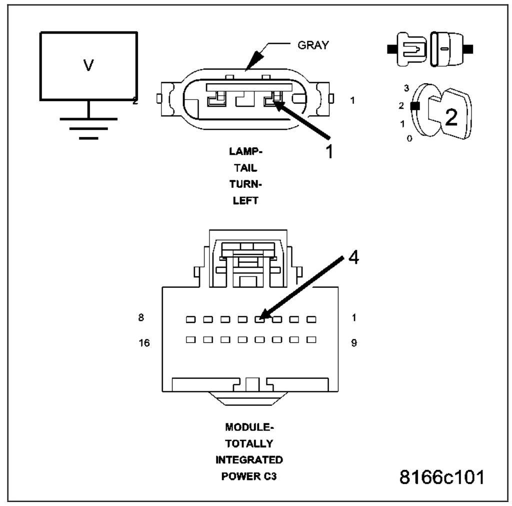
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L63) LEFT REAR TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure for voltage on the (L63) Left Rear Turn Signal Control circuit.



Is there any voltage present?

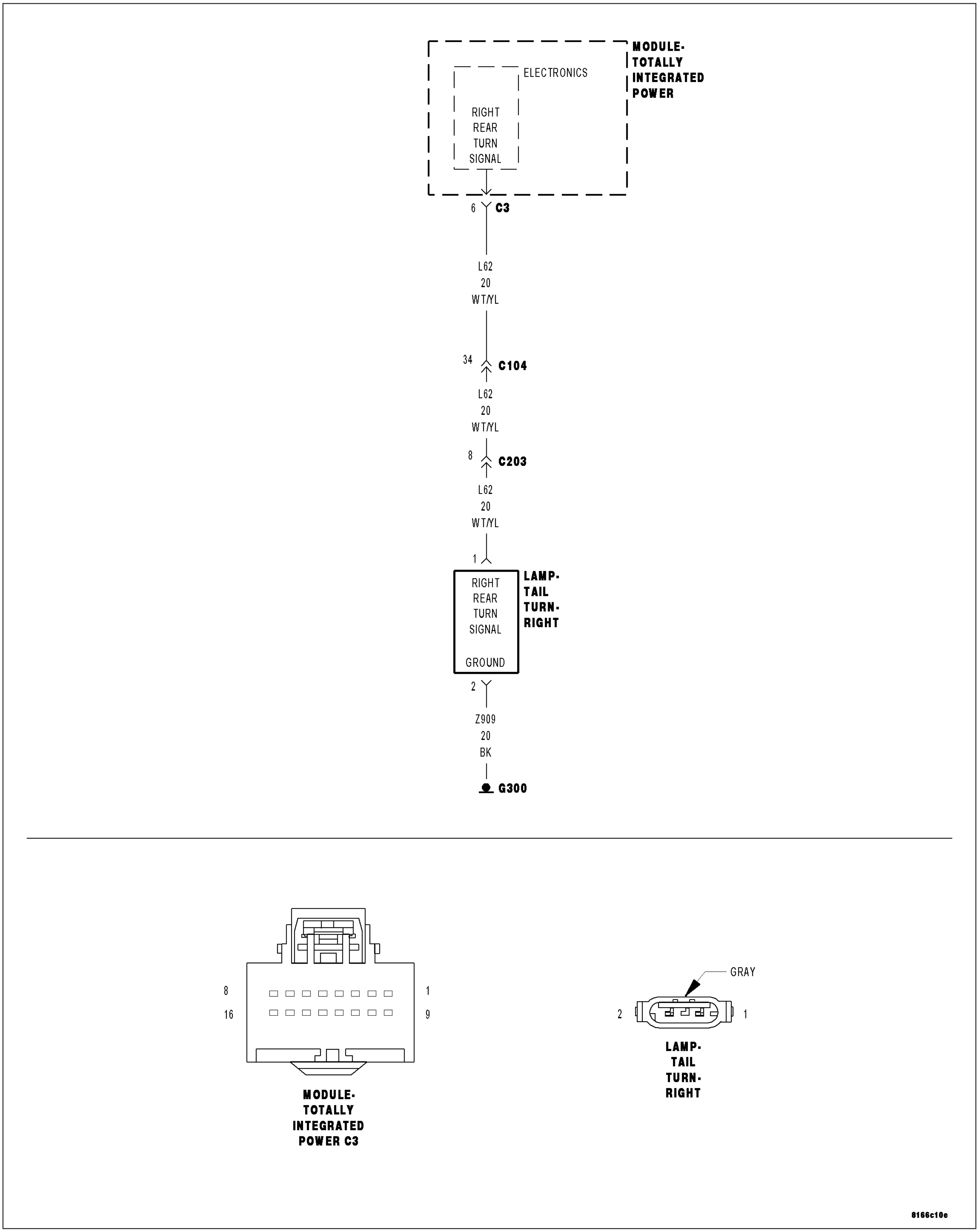
Yes >> Repair short to voltage on the (L63) Left Rear Turn Signal Control circuit

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Turn Signal activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L62) REAR RIGHT TURN SIGNAL CONTROL CIRCUIT
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

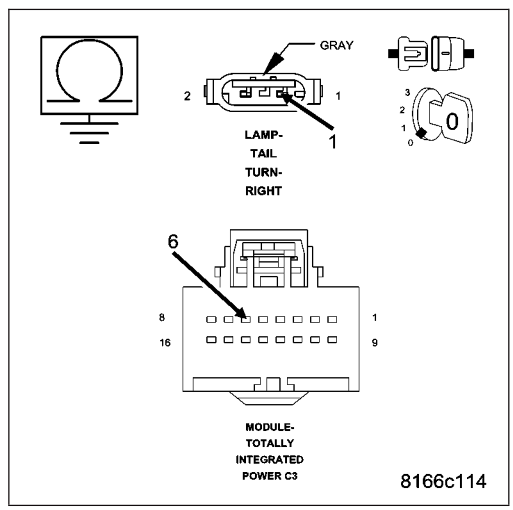
2. (L62) RIGHT REAR TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect theTIPM C3 connector.

Disconnect the Right Rear Tail Lamp harness connector.

Measure the resistance between ground and the (L62) Right Rear Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

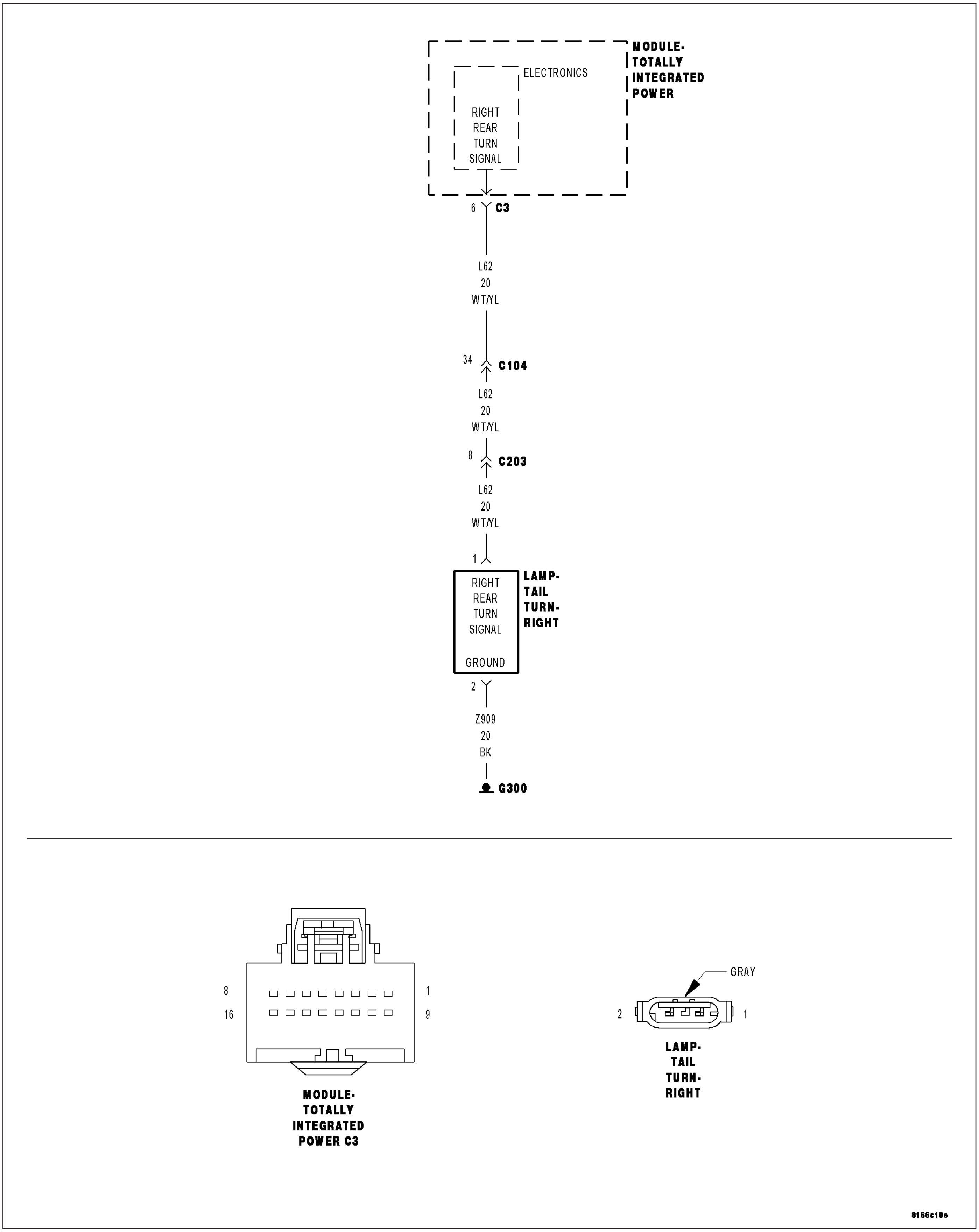
Yes >> Repair the (L62) Right Rear Turn Signal Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Totally Integrated Power Module detects a short to battery on the Control circuit.

Possible Causes
(L62) RIGHT REAR TURN SIGNAL CONTROL CIRCUIT OPEN
(L62) RIGHT REAR TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all TIPM DTC's

Turn the Right Turn Signal on.

With the scan tool, read DTC's.

Does the scan tool read: B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. RIGHT REAR TURN SIGNAL BULB

Turn the ignition off.

Inspect the Right Rear Turn Signal Bulb Assembly.

Is the inoperative bulb OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

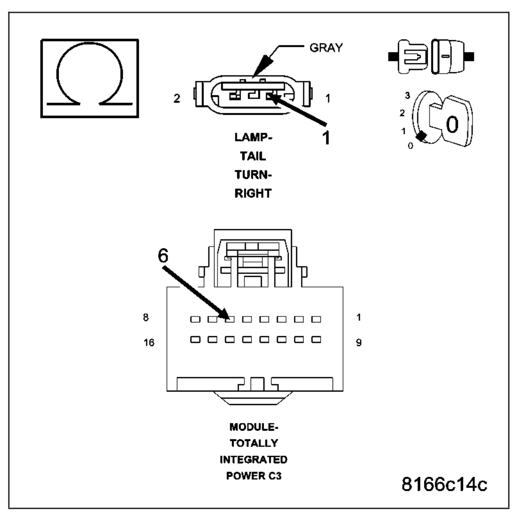
3. (L62) RIGHT REAR TURN SIGNAL CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Right Rear Tail Lamp harness connector.

Measure the resistance of the (L62) Right Rear Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L62) Right Rear Turn Signal Control circuit for an open.

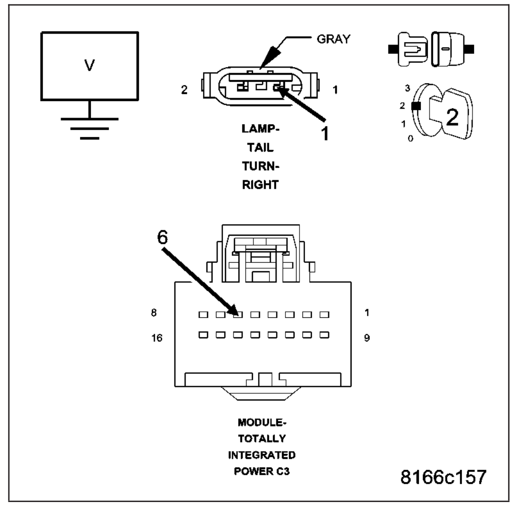
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L62) RIGHT REAR TURN SIGNAL CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the (L62) Right Rear Turn Signal Control circuit for short to voltage.



Is there any voltage present?

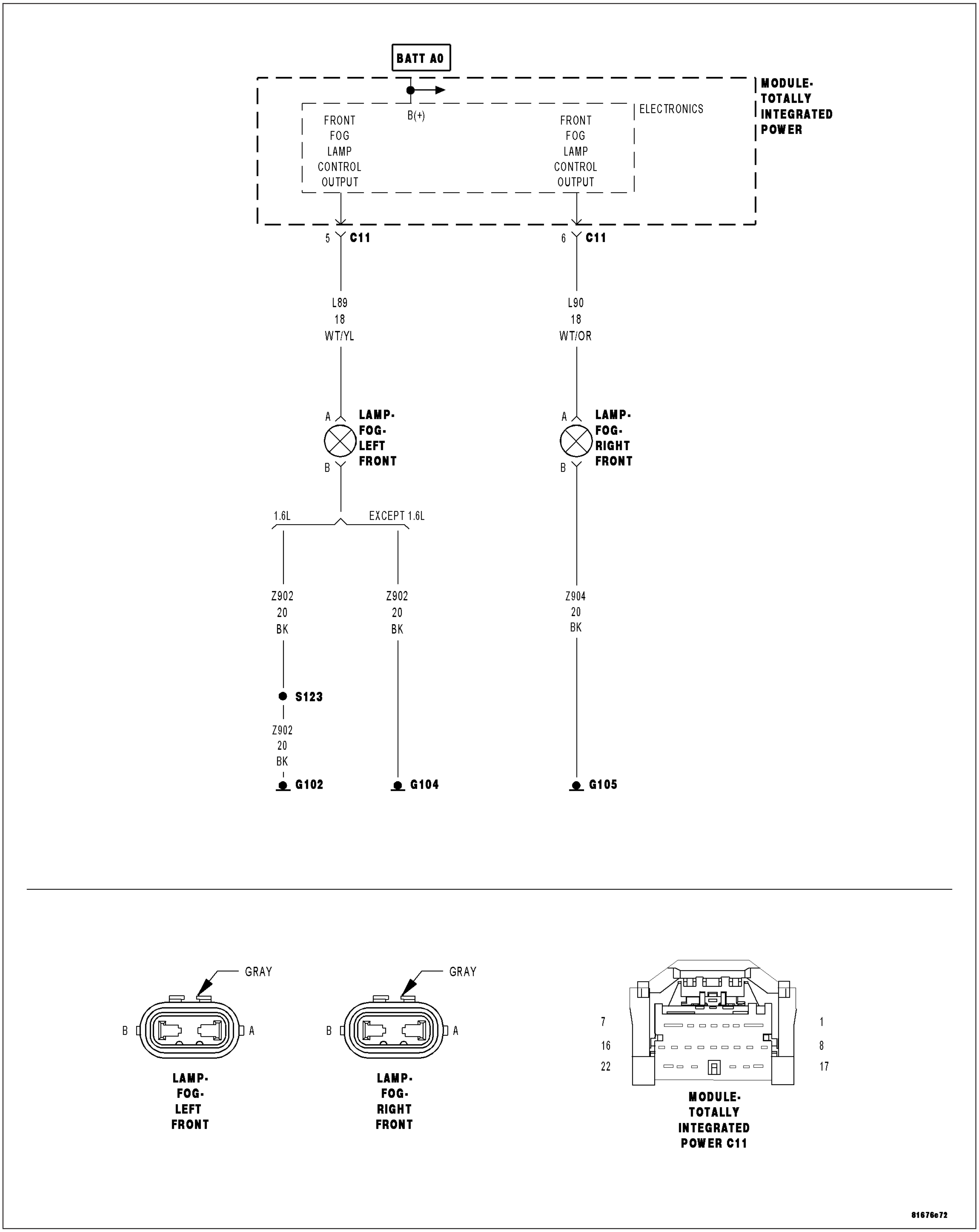
Yes >> Repair short to voltage on the (L62) Right Rear Turn Signal Control circuit.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Front Fog Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

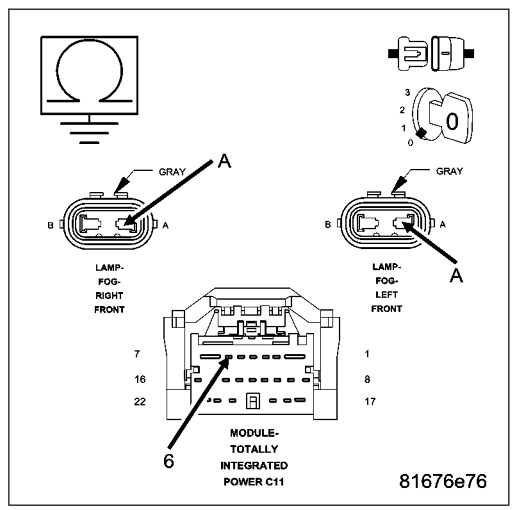
2. (L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C11 harness connector.

Disconnect the Front Fog Lamp harness connector.

Measure the resistance between ground and the (L89)(L90) Front Fog Lamp Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (L89)(L90) Front Fog Lamp Control circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B165C-PARK LAMP CONTROL CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Parklamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L217) PARK LAMP CONTROL CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Park Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B165C-PARK LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (L217) PARK LAMP CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left and Right Park Lamp harness connectors.

Measure the resistance between ground and the (L217) Park Lamp Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (L217) Park Lamp Control circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B165D-LEFT PARK LAMP CONTROL CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Park Lamps are activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L217) PARK LAMP CONTROL CIRCUIT OPEN
(L217) PARK LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT AND/OR RIGHT PARK LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Park Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B165D-PARK LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. LEFT AND RIGHT PARK LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Park Lamp Bulb Assemblies.

Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb(s) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L217) PARK LAMP CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left and Right Park Lamp harness connectors.

Measure the resistance of the (L217) Park Lamp Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (L217) Park Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B165E-PARK LAMP CONTROL CIRCUIT OPEN

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Park Lamps Activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L217) PARK LAMP CONTROL CIRCUIT OPEN
LEFT AND/OR RIGHT PARK LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Stop Lamps on.
With the Scan Tool read the DTC information.

Does the Scan Tool read: B165E-PARK LAMP CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. PARK LAMP BULBS

Turn the ignition off.
Inspect the Left and Right Park Lamp Bulb Assemblies.

Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb or bulbs in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L217) PARK LAMP CONTROL CIRCUIT OPEN

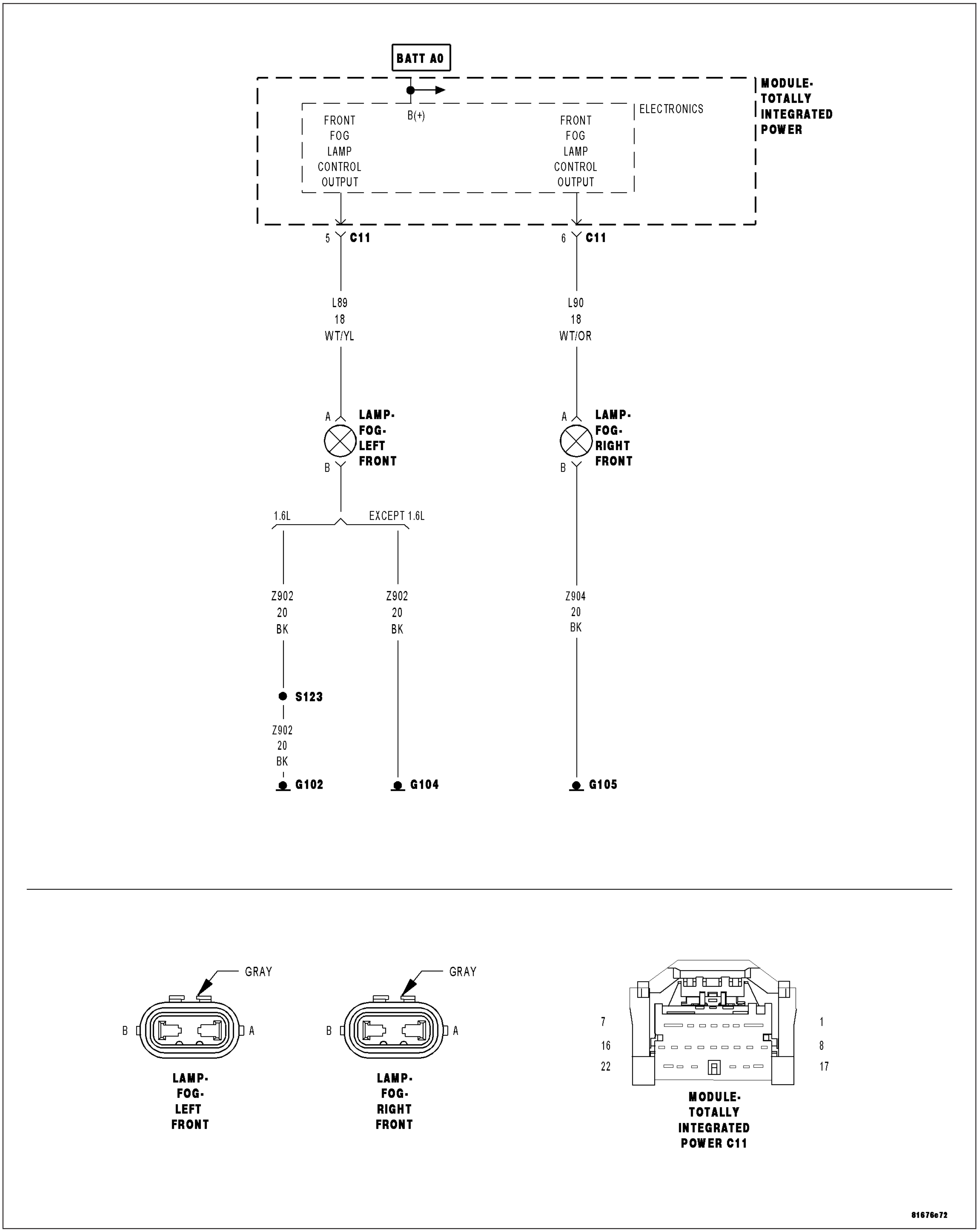
Turn the ignition off.
Disconnect the TIPM C3 harness connector.
Disconnect the Left and Right Park Lamp harness connectors.
Measure the resistance of the (L217) Park Lamp Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (L217) Park Lamp Control circuit for an open condition.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT OPEN
(L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT AND/OR RIGHT FRONT FOG LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Front Fog Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. FRONT FOG LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Front Fog Lamp Bulb Assemblies.

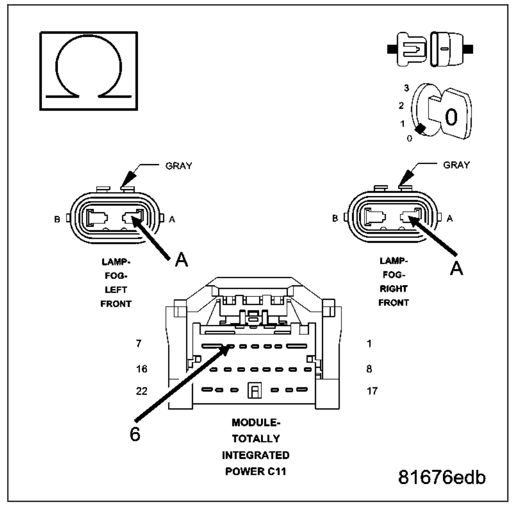
Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb(s) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT OPEN



Turn the ignition off.

Disconnect the TIPM C11 harness connector.

Disconnect the Left and Right Front Fog Lamp harness connectors.

Measure the resistance of the (L89)(L90) Front Fog Lamp Control circuit.

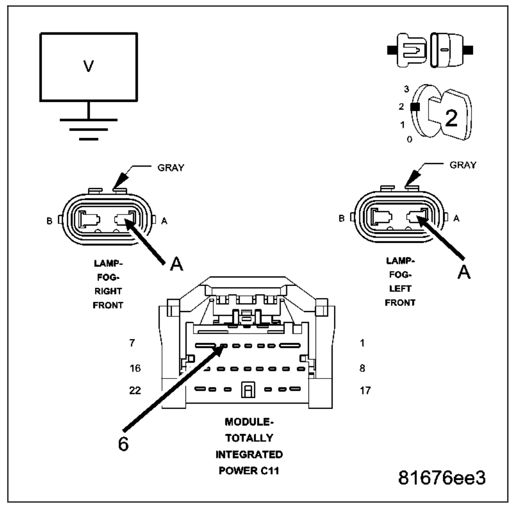
Is the resistance above 5.0 ohms?

Yes >> Repair the (L89)(L90) Front Fog Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C11 harness connector.

Disconnect the Left and Right Front Fog Lamp harness connectors.

Turn the ignition on.

Measure for voltage on the (L89)(L90) Front Fog Lamp Control circuit.

Is the voltage above 10.0 volts?

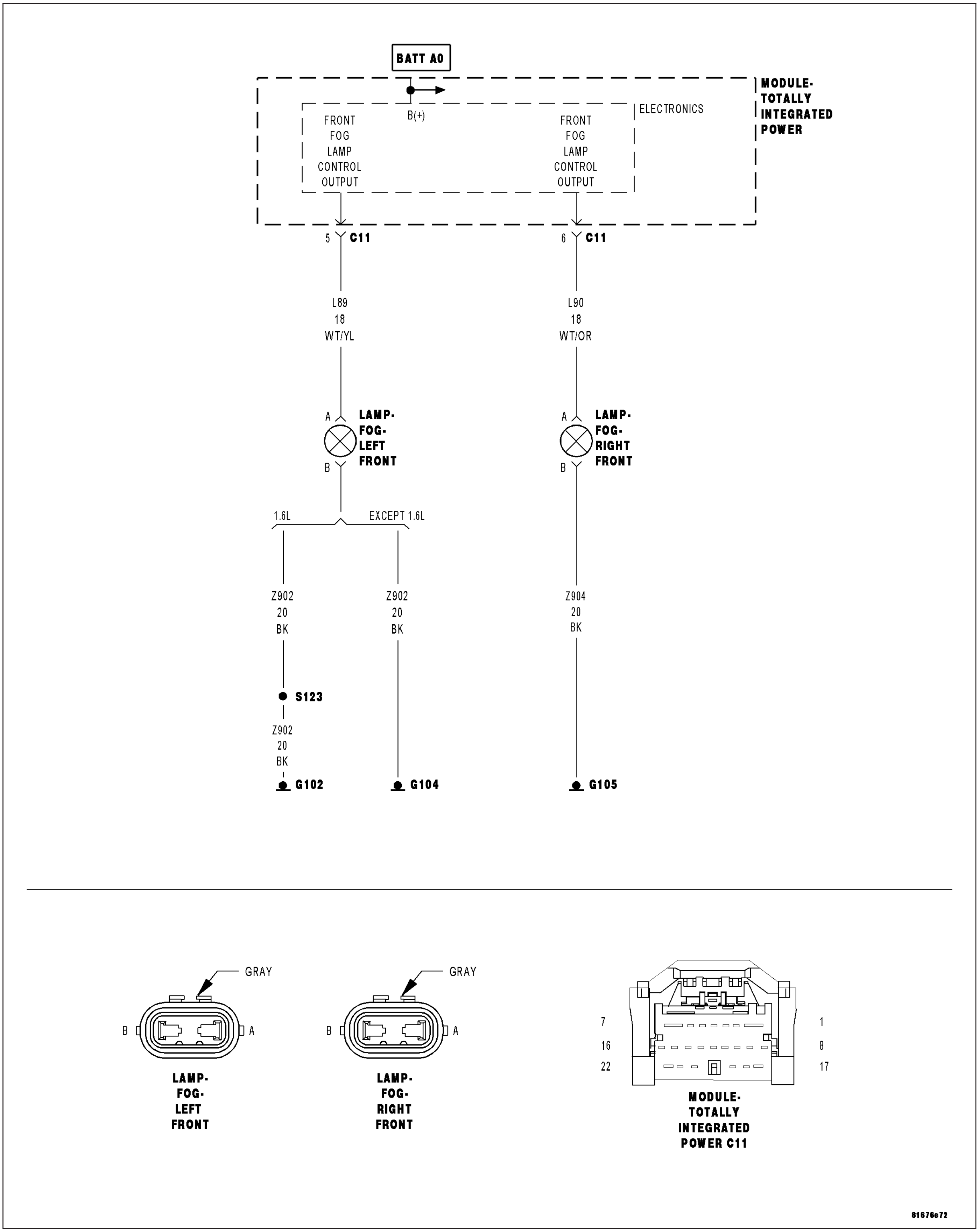
Yes >> Repair the (L89)(L90) Front Fog Lamp Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1661-FRONT FOG LAMP CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Front fog Lamps Activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT OPEN
LEFT AND/OR RIGHT FRONT FOG LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Front Fog Lamps on.
With the Scan Tool read the DTC information.

Does the Scan Tool read: B1661-FRONT FOG LAMP CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. FRONT FOG LAMP BULBS

Turn the ignition off.
Inspect the Left and Right Front Fog Lamp Bulb Assemblies.

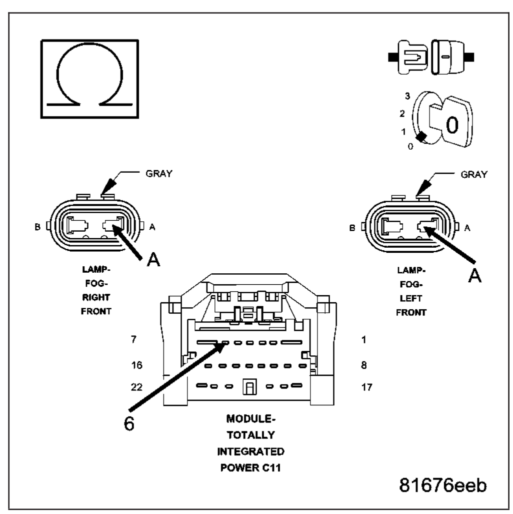
Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb(s) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L89)(L90) FRONT FOG LAMP CONTROL CIRCUIT OPEN

Turn the ignition off.
Disconnect the TIPM C11 harness connector.
Disconnect the Left and Right Front Fog Lamp harness connectors.
Measure the resistance of the (L89)(L90) Front Fog Lamp Control circuit.

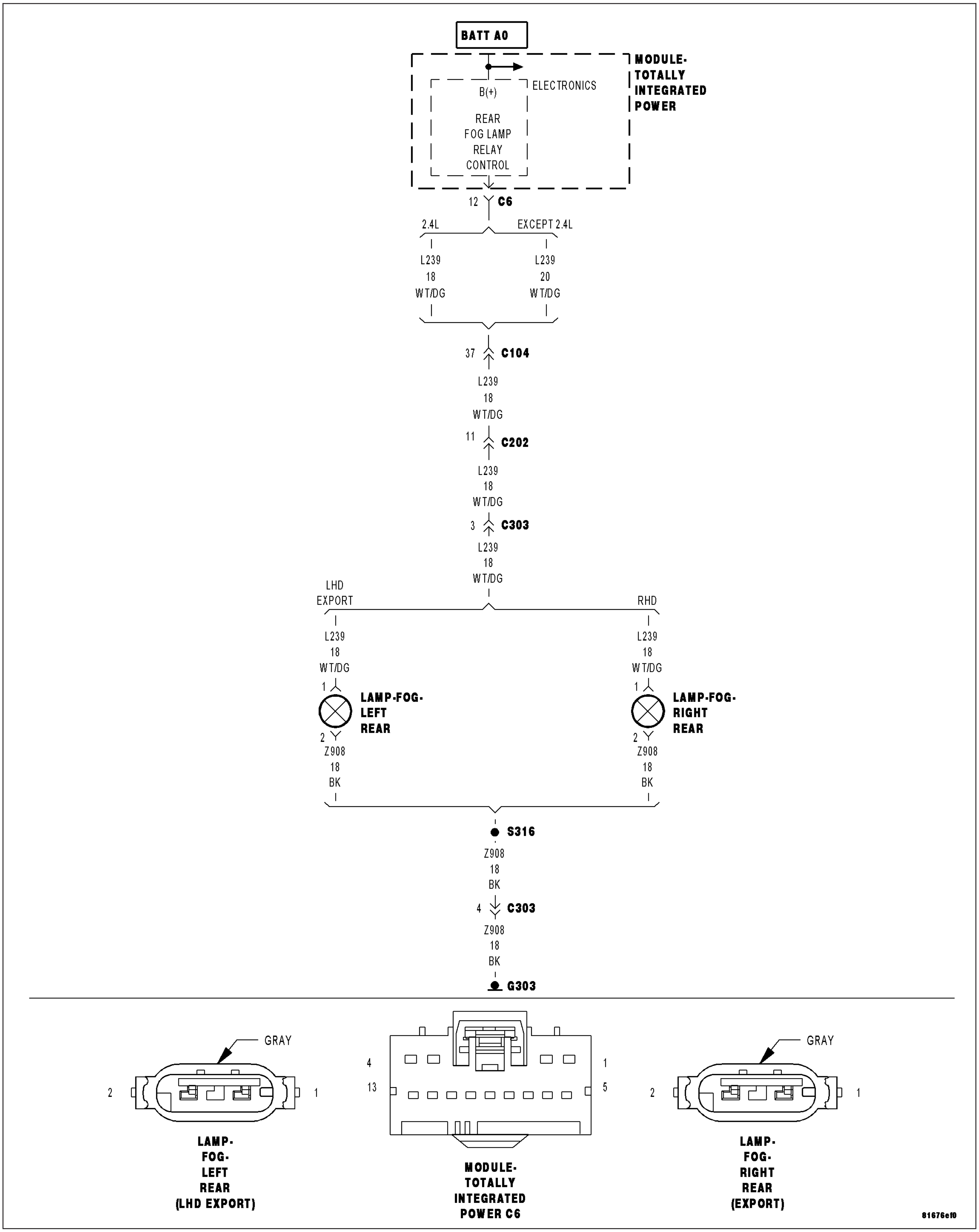


Is the resistance above 5.0 ohms?

Yes >> Repair the (L89)(L90) Front Fog Lamp Control circuit for an open condition.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1663-REAR FOG LAMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Rear Fog Lamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L239) REAR FOG LAMP CONTROL CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Rear Fog Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1663-REAR FOG LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

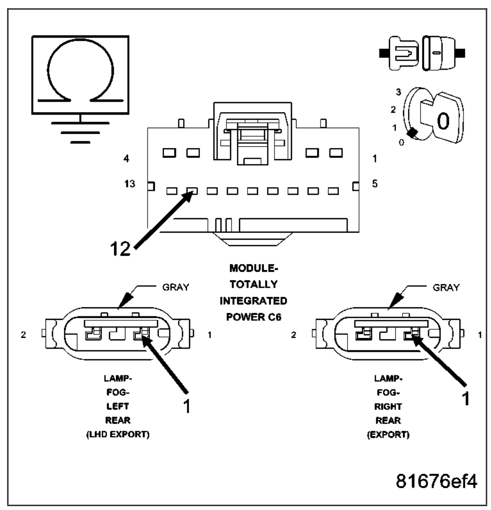
2. (L239) REAR FOG LAMP CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C6 harness connector.

Disconnect the Left and Right Fog Lamp harness connectors.

Measure the resistance between ground and the (L239) Right Low Beam Control circuit.



Is the resistance below 5.0 ohms?

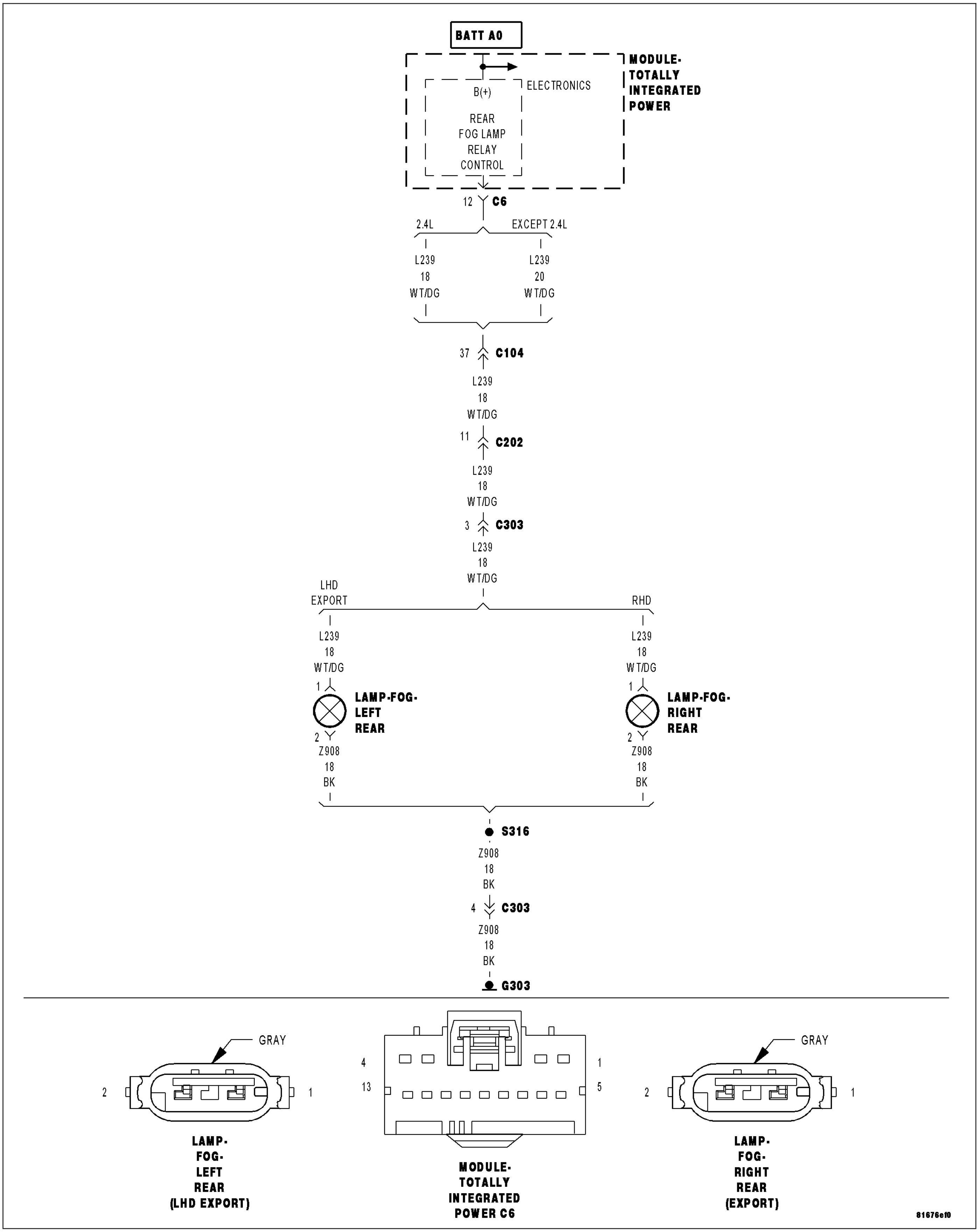
Yes >> Repair the (L39) Rear Fog Lamp Control circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1664-REAR FOG LAMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Rear Fog Lamps activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L239) REAR FOG LAMP CONTROL CIRCUIT OPEN
(L239) REAR FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT AND/OR RIGHT REAR FOG LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Rear Fog Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1664-REAR FOG LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. LEFT AND RIGHT REAR FOG LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Fog Lamp Bulb Assemblies.

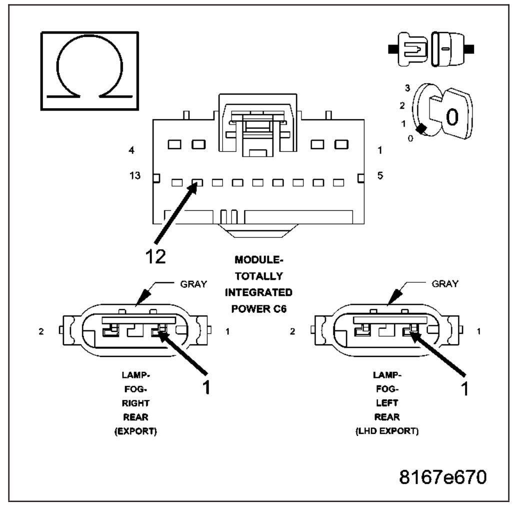
Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb(s) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L239) REAR FOG LAMP CONTROL CIRCUIT OPEN



Turn the ignition off.

Disconnect the TIPM C6 harness connector.

Disconnect the Left and Right Rear Fog Lamp harness connectors.

Measure the resistance of the (L239) Rear Fog Lamp Control circuit.

Is the resistance above 5.0 ohms?

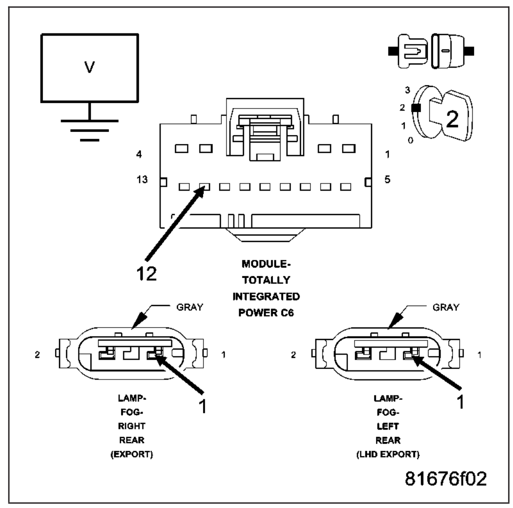
Yes >> Repair the (L239) Rear Fog Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (L239) REAR FOG LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the TIPM C6 harness connector.

Disconnect the Left and Right Rear Fog Lamp harness connectors.

Turn the ignition on.

Measure for voltage on the (L239) Rear Fog Lamp Control circuit.

Is the voltage above 10.0 volts?

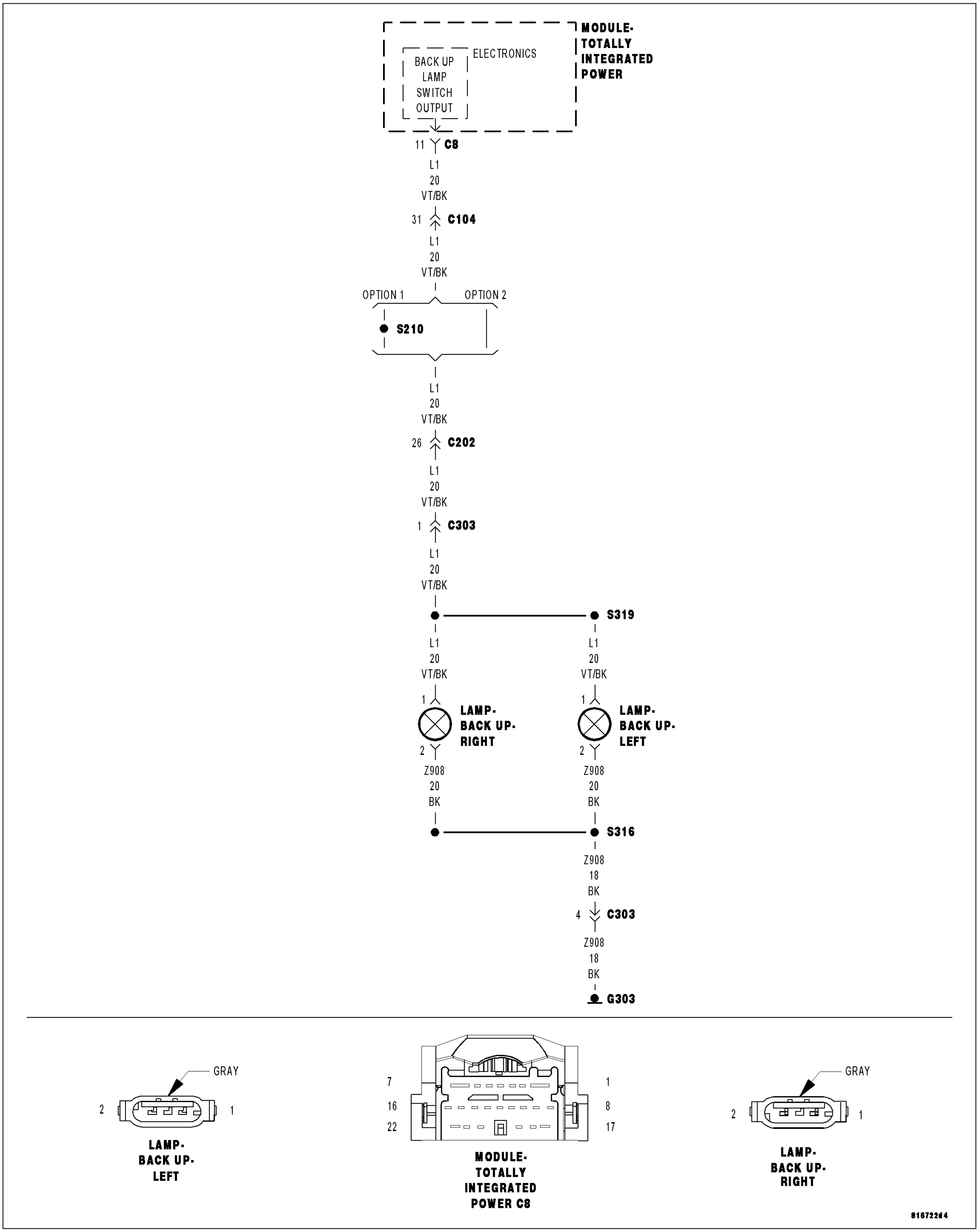
Yes >> Repair the (L239) Rear Fog Lamp Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1667-REVERSE LAMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM Detects a Short to ground condition.

Possible Causes
(L1) BACK-UP LAMP FEED CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Shift the transmission into reverse.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1667-REVERSE LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

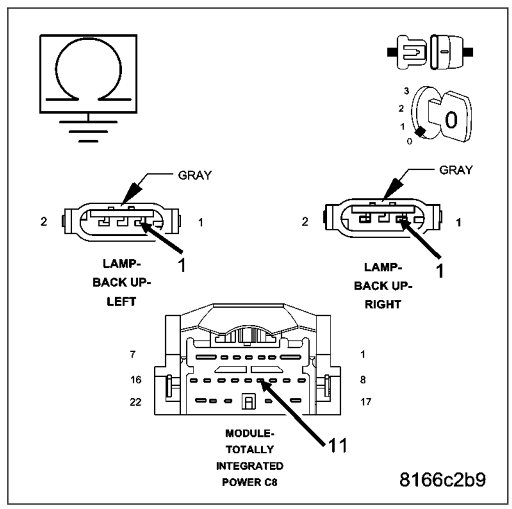
Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (L1) BACK-UP LAMP FEED CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C8 connector.

Measure the resistance between ground and the (L1) Back-up Lamp circuit.



Is the resistance below 5.0 ohms?

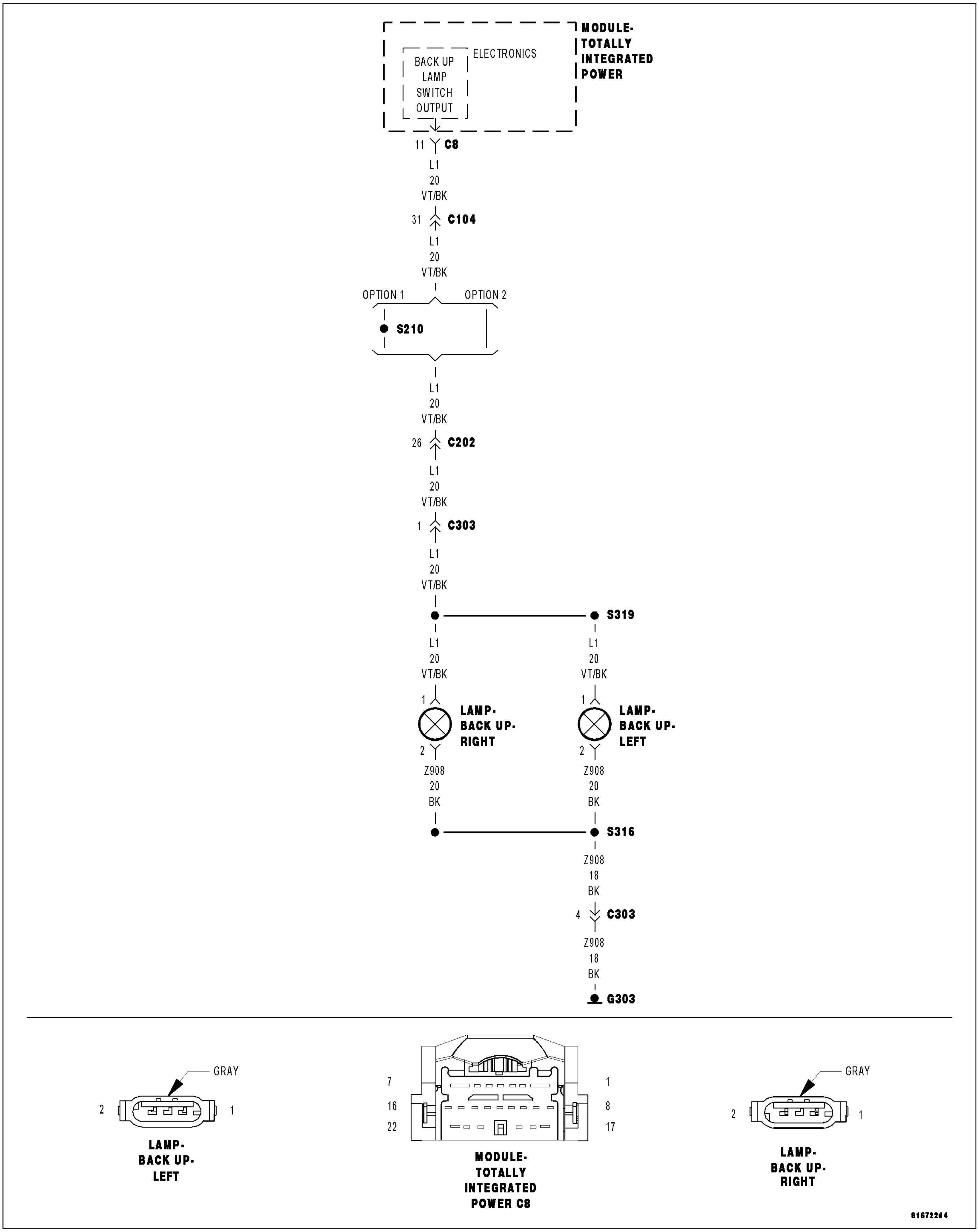
Yes >> Repair the (L1) Back-up Lamp circuit for a short to ground.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1668-REVERSE LAMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects an open condition.

Possible Causes
(L1) BACK-UP LAMP FEED CIRCUIT SHORT TO VOLTAGE
TIPM

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all TIPM DTC's

Shift the transmission into reverse.

With the scan tool, read DTC's.

Does the scan tool read: B1668-REVERSE LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

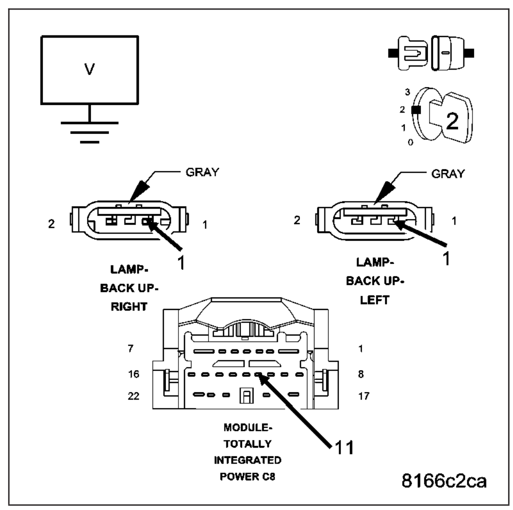
2. (L1) BACK-UP LAMP FEED CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Turn the ignition on.

Measure the voltage on the (L1) Back-up Lamp Feed circuit.



Is the voltage greater than 10.0 volts?

Yes >> Repair the (L1) Back-up Lamp Feed circuit for a short to voltage.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1669-REVERSE LAMP CONTROL CIRCUIT OPEN

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Reverse Lamps Activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L1) REVERSE LAMP CONTROL CIRCUIT OPEN
LEFT AND/OR RIGHT REVERSE LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Reverse Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1669-REVERSE LAMP CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. REVERSE LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Reverse Lamp Bulb Assemblies.

Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb or bulbs in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L1) REVERSE LAMP CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Disconnect the Left and Right Reverse Lamp harness connectors.

Measure the resistance of the (L1) Reverse Lamp Control circuit.

Is the resistance above 5.0 ohms?

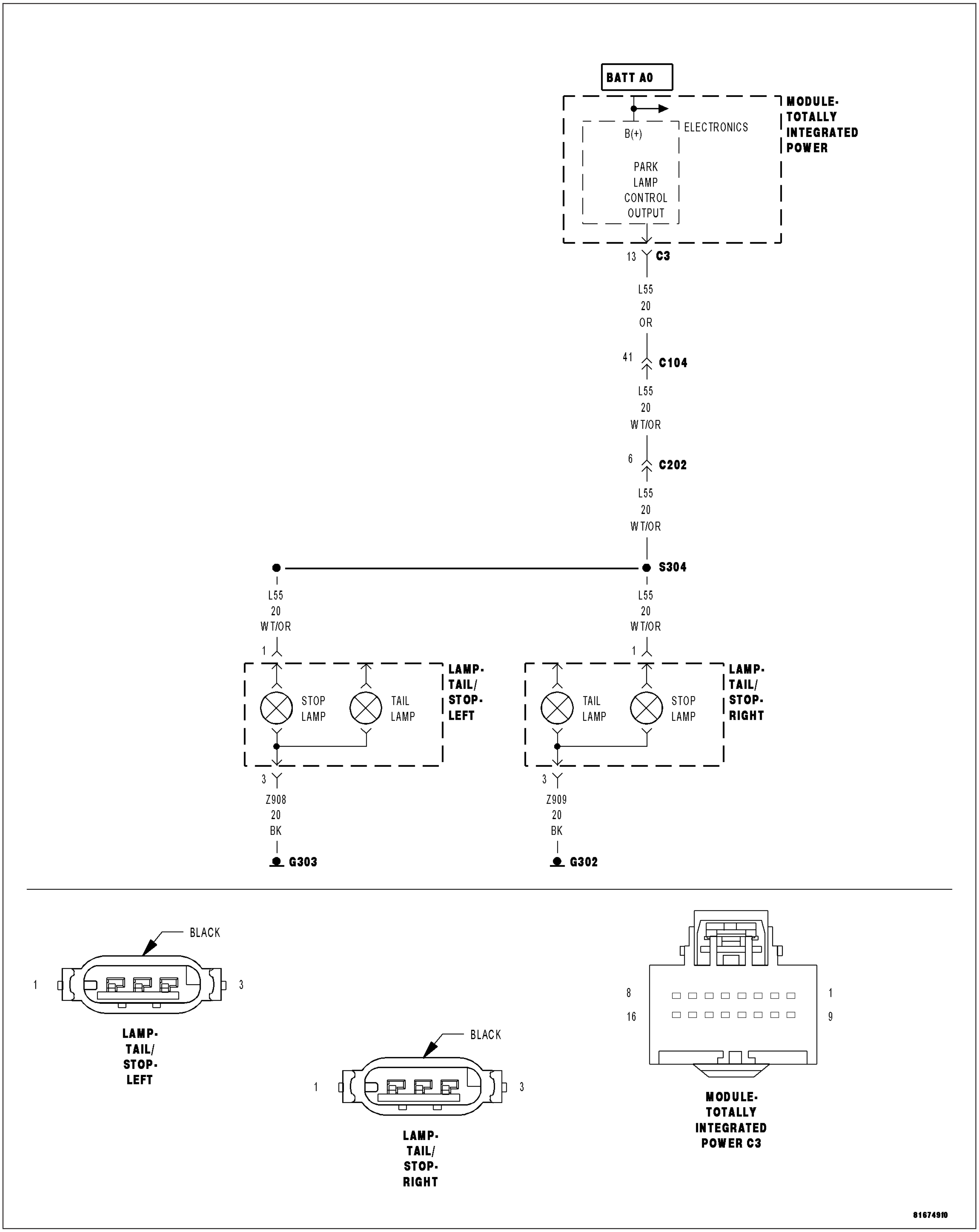
Yes >> Repair the (L1) Reverse Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1784-STOP LAMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Stop Lamps activated.
- **Set Condition:**
- When the TIPM detects a LOW condition.

Possible Causes
(L55) STOP LAMP CONTROL CIRCUIT SHORTED TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Stop Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1784-STOP LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

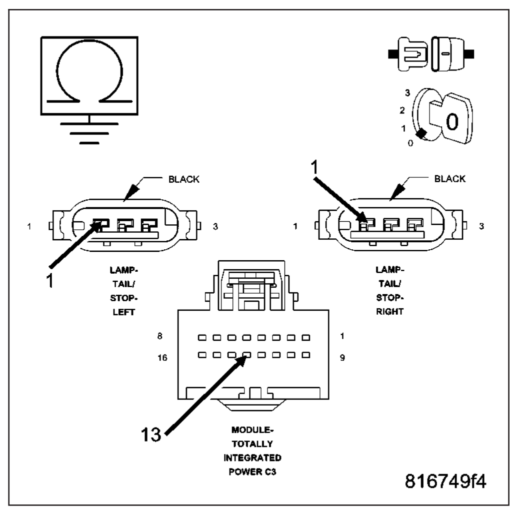
2. (L55) STOP LAMP CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM C3 connector.

Disconnect the Left and Right Rear Tail Lamp harness connectors.

Measure the resistance between ground and the (L55) Stop Lamp Control circuit.



Is the resistance below 5.0 ohms?

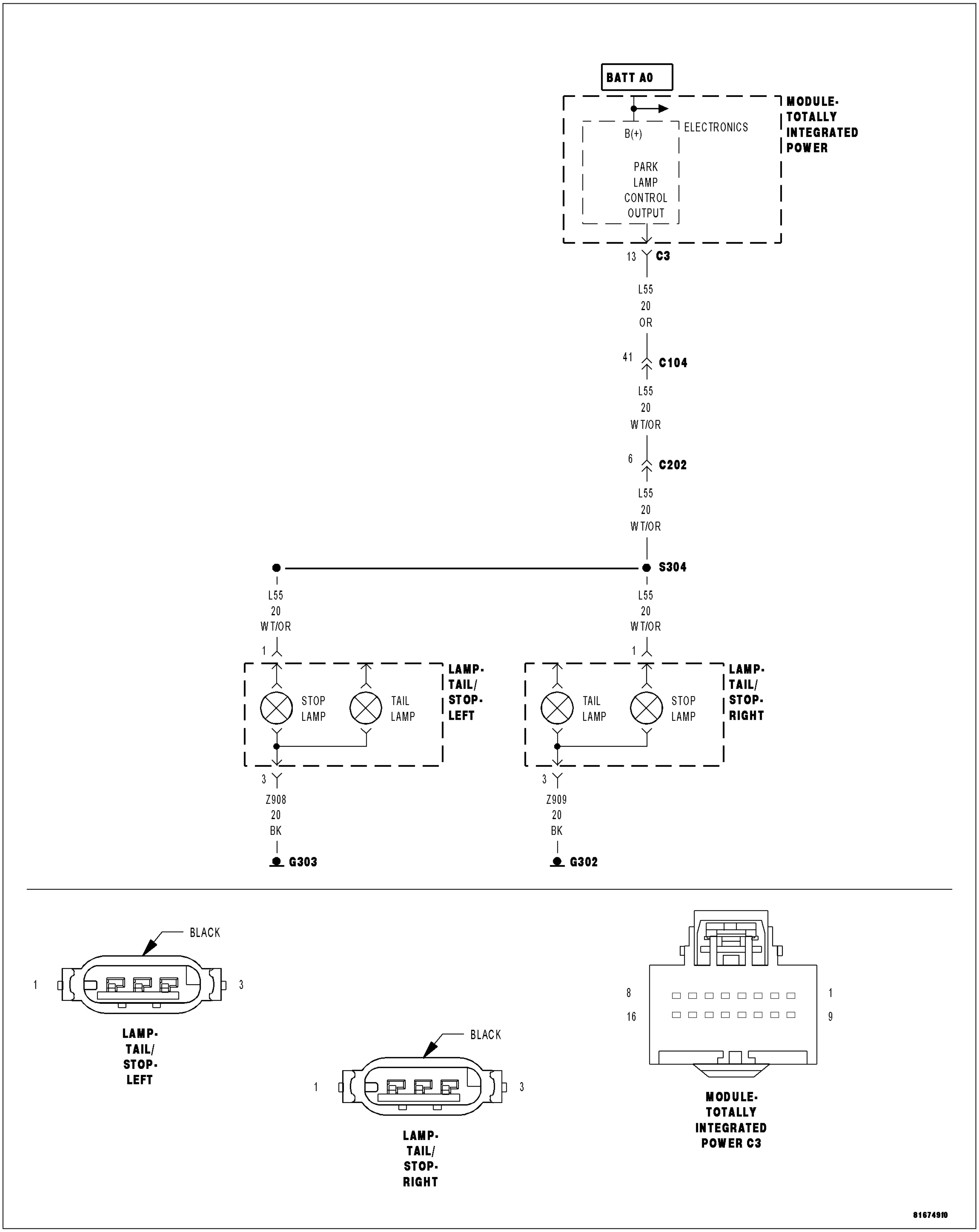
Yes >> Repair the (L55) Stop Lamp Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1785-STOP LAMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Stop Lamps Activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L55) STOP LAMP CONTROL CIRCUIT OPEN
(L55) STOP LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE
LEFT AND/OR RIGHT STOP LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Stop Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1785-STOP LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. STOP LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Stop Lamp Bulb Assemblies.

Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb or bulbs in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

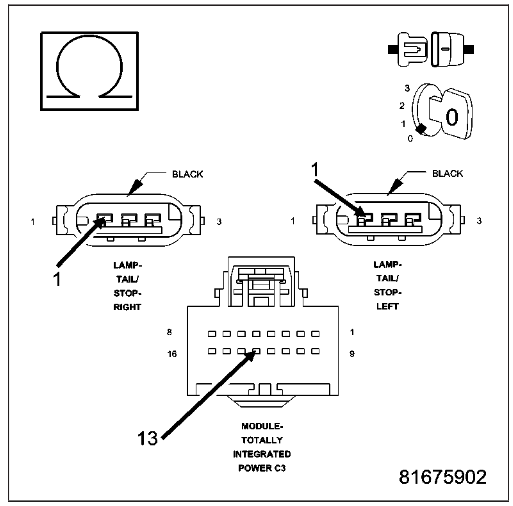
3. (L55) STOP LAMP CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left and Right Stop Lamp harness connectors.

Measure the resistance of the (L55) Stop Lamp Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (L55) Stop Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (L55) STOP LAMP CONTROL CIRCUIT SHORTED TO VOLTAGE

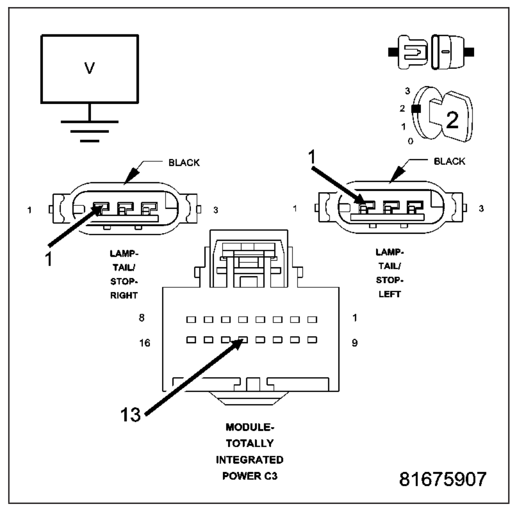
Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left and Right Stop Lamp harness connectors.

Turn the ignition on.

Measure for voltage on the (L55) Stop Lamp Control circuit.



Is the voltage above 10.0 volts?

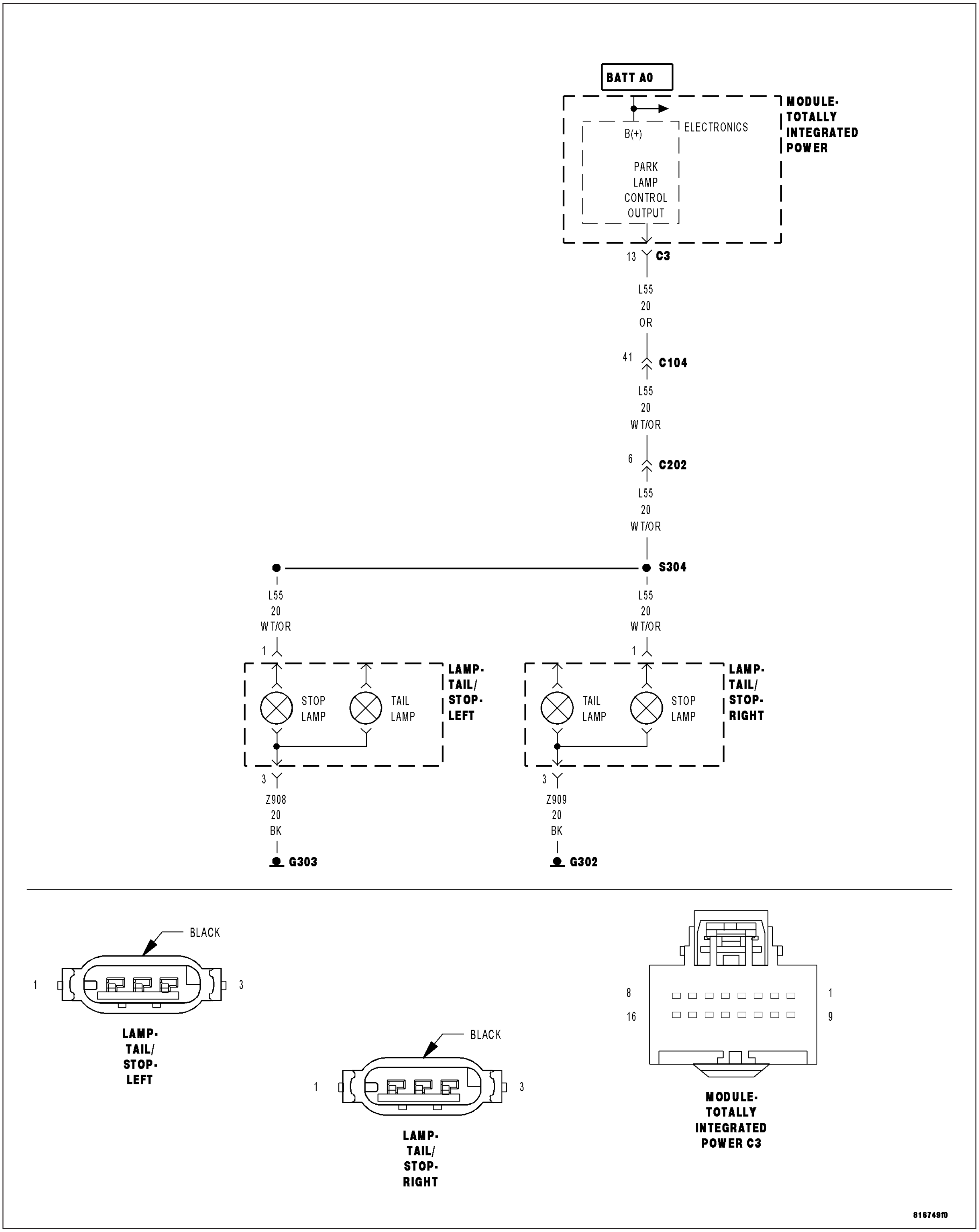
Yes >> Repair the (L55) Stop Lamp Control circuit for a short to voltage condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1786-STOP LAMP CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Stop Lamps Activated.
- **Set Condition:**
- When the TIPM detects a HIGH condition.

Possible Causes
(L55) STOP LAMP CONTROL CIRCUIT OPEN
LEFT AND/OR RIGHT STOP LAMP BULBS
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Stop Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1786-STOP LAMP CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. STOP LAMP BULBS

Turn the ignition off.

Inspect the Left and Right Stop Lamp Bulb Assemblies.

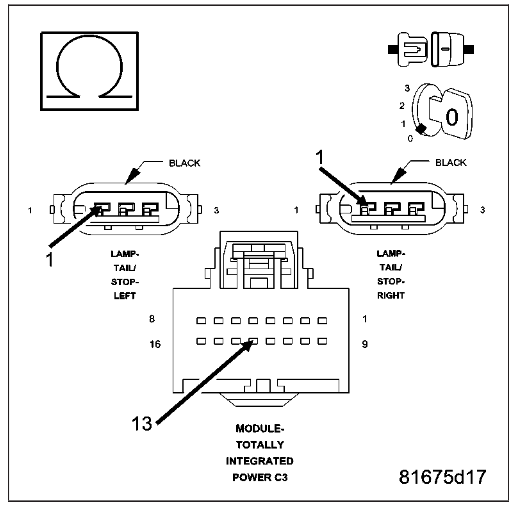
Are the inoperative bulbs OK?

Yes >> Go To 3

No >> Replace the Inoperative bulb or bulbs in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (L55) STOP LAMP CONTROL CIRCUIT OPEN



Turn the ignition off.

Disconnect the TIPM C3 harness connector.

Disconnect the Left and Right Stop Lamp harness connectors.

Measure the resistance of the (L55) Stop Lamp Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (L55) Stop Lamp Control circuit for an open condition.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

TABLE OF CONTENTS

LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

DIAGNOSIS AND TESTING

LAMPS/LIGHTING - EXTERIOR

BACKUP LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BACKUP LAMP DOES NOT ILLUMINATE	1. Ineffective or missing bulb.	1. Test and replace backup lamp bulb as required.
	2. Ineffective ground circuit.	2. Test and repair backup lamp ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open back-up lamp feed circuit as required.
	4. Ineffective switch.	4. Test and replace backup lamp switch (manual transmission) or transmission range sensor (automatic transmission) as required.
	5. Ineffective TIPM inputs or outputs.	5. Use a diagnostic scan tool to test the TIPM inputs and outputs. Refer to the appropriate diagnostic information. Check TIPM for DTC's.
BACKUP LAMP DOES NOT EXTINGUISH	1. Ineffective feed circuit.	1. Test and repair shorted back-up lamp feed circuit as required.
	2. Ineffective switch.	2. Test and replace backup lamp switch (manual transmission) or transmission range sensor (automatic transmission) as required.
	3. Ineffective TIPM inputs or outputs.	3. Use a diagnostic scan tool to test the TIPM inputs and outputs. Refer to the appropriate diagnostic information.

BRAKE LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKE LAMP DOES NOT ILLUMINATE	1. Ineffective or missing fuse.	1. Test and replace brake lamp fuse as required.
	2. Ineffective or missing bulb.	2. Test and replace brake lamp bulb as required.
	3. Ineffective ground circuit.	3. Test and repair brake lamp ground circuit as required.
	4. Ineffective feed circuit.	4. Test and repair open brake lamp switch output circuit as required.
	5. Ineffective switch.	5. Test and replace brake lamp switch as required.
	6. Ineffective TIPM inputs or outputs.	6. Use a diagnostic scan tool to test the TIPM inputs and outputs. Refer to the appropriate diagnostic information. Check TIPM for DTC's.

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKE LAMP DOES NOT EXTINGUISH	1. Ineffective feed circuit.	1. Test and repair shorted brake lamp switch output circuit as required.
	2. Ineffective switch.	2. Test and replace brake lamp switch as required.

DAYTIME RUNNING LAMPS

NOTE: Before performing the following tests, determine whether the headlamp low and high beams operate. If the headlamp low and high beams are also inoperative, diagnose and repair that problem before attempting to repair the Daytime Running Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
DAYTIME RUNNING LAMPS WILL NOT ILLUMINATE	1. Incorrect TIPM programming.	1. Use a diagnostic scan tool to check and configure TIPM as required.
	2. Ineffective TIPM inputs or outputs.	2. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.

FRONT FOG LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT FOG LAMP DOES NOT ILLUMINATE	1. Ineffective or missing bulb.	1. Test and replace front fog lamp bulb as required.
	2. Ineffective ground circuit.	2. Test and repair front fog lamp ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open front fog lamp feed circuit as required.
	4. Ineffective switch.	4. Test and replace headlamp switch as required. Check TIPM for DTC's.
	5. Ineffective instrument cluster inputs or outputs.	5. Use a diagnostic scan tool to test the instrument cluster inputs and outputs as required. Refer to the appropriate diagnostic information.
	6. Ineffective TIPM inputs or outputs.	6. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information. Check TIPM for DTC's.
	7. Ineffective CCN inputs or outputs.	7. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information. Check TIPM for DTC's
	7. Ineffective SCCM outputs.	Use diagnostic scan tool to diagnose LIN data bus. Refer to the appropriate diagnostic information. Check CCN for DTC's.

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT FOG LAMP DOES NOT EXTINGUISH	1. Ineffective feed circuit.	1. Test and repair shorted front fog lamp feed circuit as required.
	2. Ineffective switch.	2. Test and replace headlamp switch as required.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the instrument cluster inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	5. Ineffective SCCM outputs.	5. Use diagnostic scan tool to diagnose LIN data bus. Refer to the appropriate diagnostic information. Check CCN for DTC's.

HAZARD WARNING LAMPS

NOTE: Before performing the following tests, confirm whether the left and right turn signals operate satisfactorily. If the turn signals are inoperative or operate improperly, diagnose and repair that problem before attempting to repair the Hazard Warning Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
HAZARD WARNING LAMPS DO NOT FLASH	1. Ineffective switch.	1. Test and replace Accessory Switch Bank Module (ASBM) as required.
	2. LIN bus down.	2. Use a diagnostic scan tool to test the ASBM inputs and outputs as required. Refer to the appropriate diagnostic information.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
HAZARD WARNING LAMPS DO NOT STOP FLASHING	1. Ineffective switch.	1. Test and replace ASBM as required.
	2. Ineffective CCN inputs or outputs.	2. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	3. Ineffective TIPM inputs or outputs.	3. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.

HEADLAMPS

NOTE: As part of the exterior lighting failsafe feature, upon ignition On all exterior park lamps and the headlamp low beams will illuminate regardless of the headlamp switch position if the CCN cannot detect an input from the headlamp switch, or if there is a loss of data bus communication.

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMP DOES NOT ILLUMINATE	1. Ineffective or missing bulb.	1. Test and replace headlamp bulb as required.
	2. Ineffective ground circuit.	2. Test and repair open headlamp ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open headlamp low beam or high beam feed circuit as required.
	4. Ineffective switch.	4. Test and replace left multi-function switch as required.
	5. Ineffective TIPM inputs or outputs.	5. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information. Check for TIPM DTC's.
HEADLAMP DOES NOT EXTINGUISH	1. Ineffective feed circuit.	1. Test and repair shorted headlamp low beam or high beam feed circuit as required.
	2 Ineffective switch.	2. Test and replace left multi-function switch as required.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
HEADLAMPS ILLUMINATE WITH IGNITION ON AND HEADLAMP SWITCH OFF (FAIL-SAFE OPERATION)	1. Ineffective circuits between headlamp switch and instrument cluster.	1. Test and repair left multi-function switch mux and return circuits as required.
	2. Loss of data bus communication.	2. Use a diagnostic scan tool to test the data bus. Refer to the appropriate diagnostic information.
	3. Ineffective switch.	3. Test and replace the left multi-function switch as required.
	4. Ineffective CCN inputs or outputs.	4. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
HEADLAMPS WILL NOT SWITCH FROM HIGH TO LOW BEAMS, OR FROM LOW TO HIGH BEAMS	1. Ineffective circuits between left multi-function switch and CCN.	1. Test and repair wash/beam select mux and multi-function switch return circuits as required.
	2. Ineffective switch.	2. Test and replace the left multi-function switch as required.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.

PARK LAMPS

NOTE: As part of the exterior lighting failsafe feature, upon ignition On all exterior park lamps and the headlamp low beams will illuminate regardless of the headlamp switch position if the instrument cluster cannot detect an input from the headlamp switch, or if there is a loss of data bus communication.

CONDITION	POSSIBLE CAUSES	CORRECTION
PARK LAMP DOES NOT ILLUMINATE	1. Ineffective or missing bulb.	1. Test and replace park lamp bulb as required.
	2. Ineffective ground circuit.	2. Test and repair open park lamp ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open park lamp feed circuit as required.
	4. Ineffective switch.	4. Test and replace left multi-function switch as required.
	5. Ineffective CCN inputs or outputs.	5. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	6. Ineffective TIPM inputs or outputs.	6. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	7. Ineffective SCCM inputs or outputs.	7. Use diagnostic scan tool to diagnose LIN data bus. Refer to the appropriate diagnostic information. Check CCN for DTC’s.
PARK LAMP DOES NOT EXTINGUISH	1. Ineffective feed circuit.	1. Test and repair shorted park lamp feed circuit as required.
	2. Ineffective switch.	2. Test and replace left multi-function switch as required.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	5. Ineffective SCCM inputs or outputs.	5. Use diagnostic scan tool to diagnose LIN data bus. Refer to the appropriate diagnostic information. Check CCN for DTC’s.

TURN SIGNAL LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
ONE TURN SIGNAL LAMP DOES NOT ILLUMINATE	1. Ineffective or missing bulb.	1. Test and replace turn signal bulb as required.
	2. Ineffective ground circuit.	2. Test and repair open ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open right or left turn signal feed circuit as required.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	5. Ineffective CCN inputs or outputs.	5. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
	6. Ineffective SCCM inputs or outputs.	6. Use diagnostic scan tool to diagnose LIN data bus. Refer to the appropriate diagnostic information. Check CCN for DTC's.
ALL RIGHT SIDE AND/OR ALL LEFT SIDE TURN SIGNAL LAMPS DO NOT FLASH	1. Ineffective switch.	1. Test and replace left multi-function switch or SCCM as required.
	2. Ineffective feed circuit.	2. Test and repair open right or left turn signal feed circuit as required.
	3. Ineffective CCN inputs or outputs.	3. Use a diagnostic scan tool to test the CCN inputs and outputs as required. Refer to the appropriate diagnostic information.
	4. Ineffective TIPM inputs or outputs.	4. Use a diagnostic scan tool to test the TIPM inputs and outputs as required. Refer to the appropriate diagnostic information.
ALL RIGHT SIDE OR ALL LEFT SIDE TURN SIGNALS FLASH TOO RAPIDLY (MORE THAN 100 FLASHES PER MINUTE)	1. Ineffective or missing bulb.	1. Test and replace faulty bulb as required.
	2. Ineffective ground circuit.	2. Test and repair open ground circuit as required.
	3. Ineffective feed circuit.	3. Test and repair open right or left turn signal feed circuit as required.

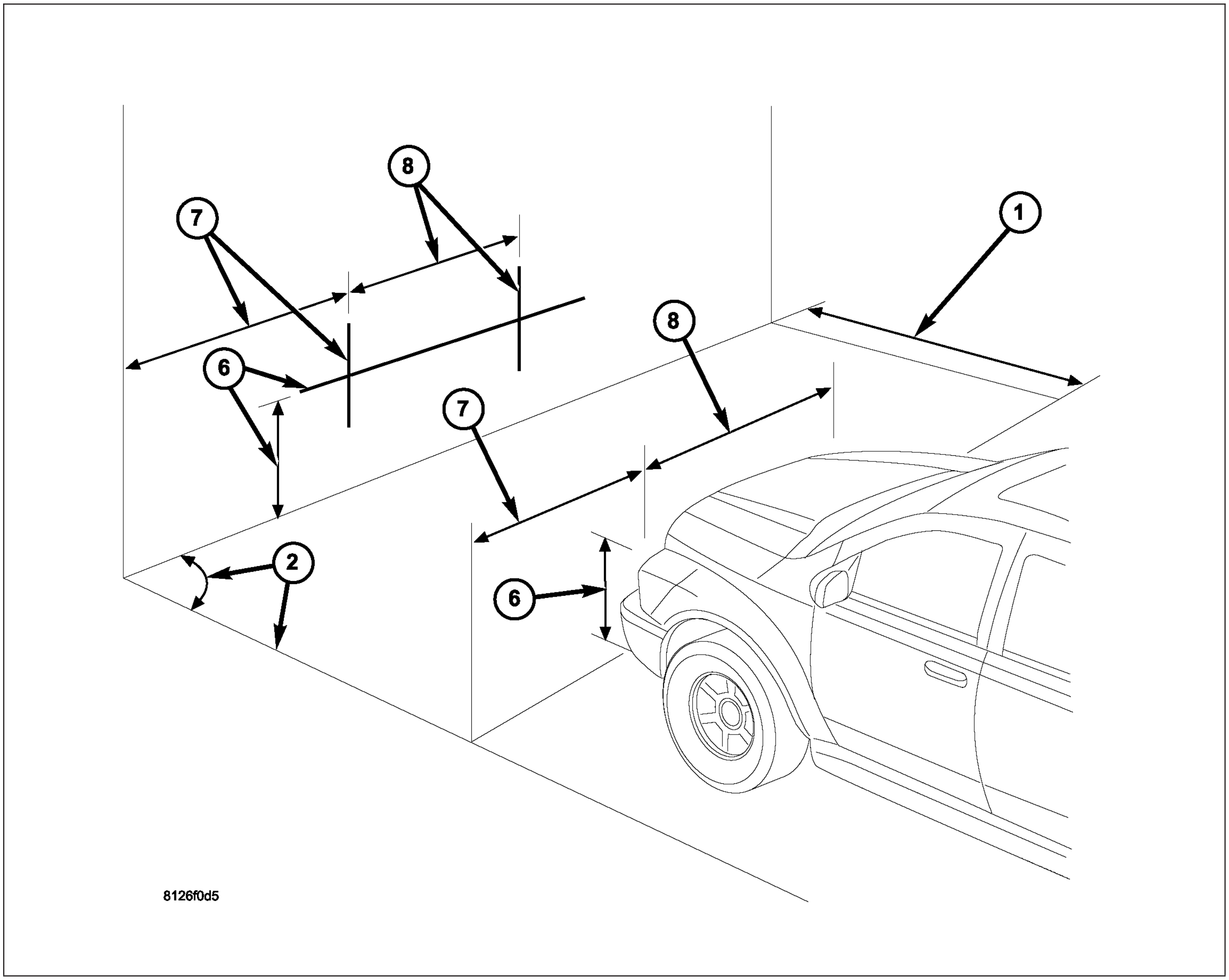
STANDARD PROCEDURE

FRONT LAMP AIMING

VEHICLE PREPARATION FOR LAMP ALIGNMENT

1. Check for and correct any burnt out bulbs.
2. Repair or replace any ineffective, worn or damaged body or suspension components that could hinder proper lamp alignment.
3. Verify proper tire inflation pressures.
4. Remove any accumulations of mud, snow or ice from the vehicle underbody and clean the front lamp lenses.
5. Verify that there is no load in the vehicle (cargo or passengers), except for the driver.
6. The fuel tank should be FULL. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.
7. Verify correct vehicle suspension height.

ALIGNMENT SCREEN PREPARATION

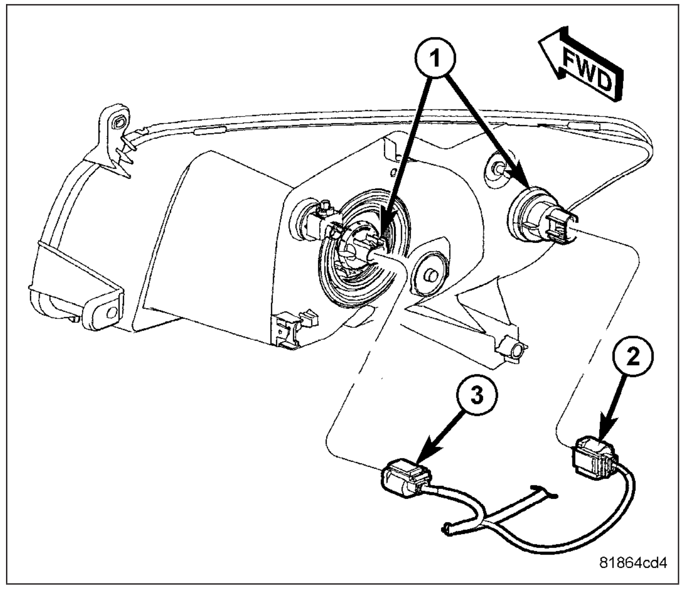


1. Tape a line on a level floor 7.62 meters (25 feet) away from and parallel to the flat wall that will be used as the lamp alignment screen. The level floor will be used as the horizontal zero reference.
2. An adjacent wall or floor member that is perpendicular to the alignment screen can be used as the vertical zero reference. If there is no adjacent wall or floor member that is perpendicular to the screen, tape a second line on the floor perpendicular to both the alignment screen and the first line, and outboard of either side of where the vehicle will be positioned. This will be used as the vertical zero reference.
3. Position the vehicle so that the side of the vehicle is parallel to the vertical zero reference, and so that the front of the lamp lenses are in the vertical plane of the parallel line taped on the floor 7.62 meters (25 feet) away from the screen.
4. Rock the vehicle side-to-side three times to allow the suspension to stabilize.
5. Jounce the front suspension three times by pushing downward on the front bumper and releasing.
6. Measure the distance between the optical center of one of the lamps being aimed (head or fog) and the floor (horizontal zero reference). Transfer this measurement to the alignment screen with a piece of tape placed horizontally to the floor. This line will be used as the lamp horizontal reference.
7. Measure the distance between the vertical zero reference and the optical center of the nearest lamp being aimed (head or fog). Transfer this measurement to the alignment screen with a piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the first lamp.

8. Measure the distance on center between the first and the second lamp being aimed. Transfer this measurement to the alignment screen with a second piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the second lamp.

HEADLAMP ALIGNMENT

NOTE: Due to the linear nature of the headlamp cutoff, a properly aimed low beam headlamp will project the top edge of the high intensity pattern on the alignment screen from the horizontal line to 50 millimeters (2 inches) below the horizontal line. No horizontal (right/left) adjustment is required for this headlamp beam pattern. The high beam pattern will be correct when the low beams are properly aimed.

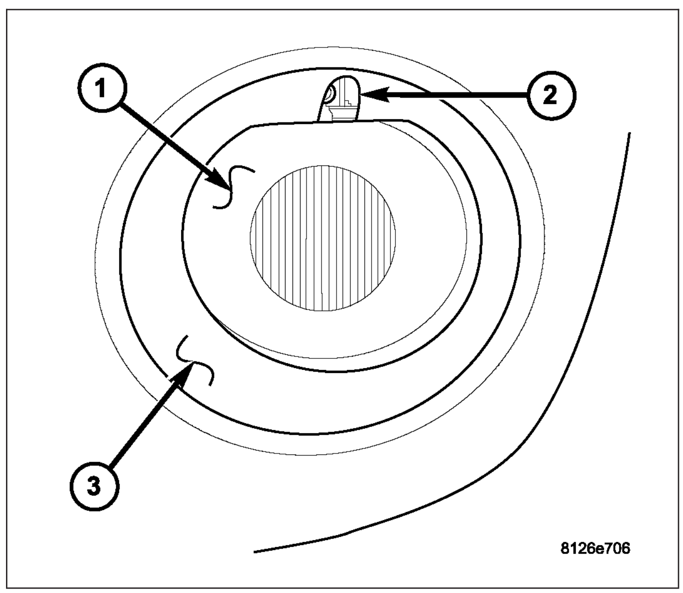


1. Turn the headlamps ON and select the LOW beams.
2. Rotate the headlamp vertical adjustment screw which is located just inboard of the headlamp bulb (1) to adjust each lamp beam height as required.

FOG LAMP ALIGNMENT

NOTE: A properly aimed front fog lamp will project a pattern on the alignment screen 100 millimeters (4 inches) below the fog lamp centerline and straight ahead of the lamp.

1. Turn the fog lamps ON.
2. Rotate the fog lamp vertical adjustment screw (2) on each lamp to adjust the beam height as required.



FRONT LAMP AIMING - EXPORT

VEHICLE PREPARATION FOR FRONT LAMP UNIT ALIGNMENT

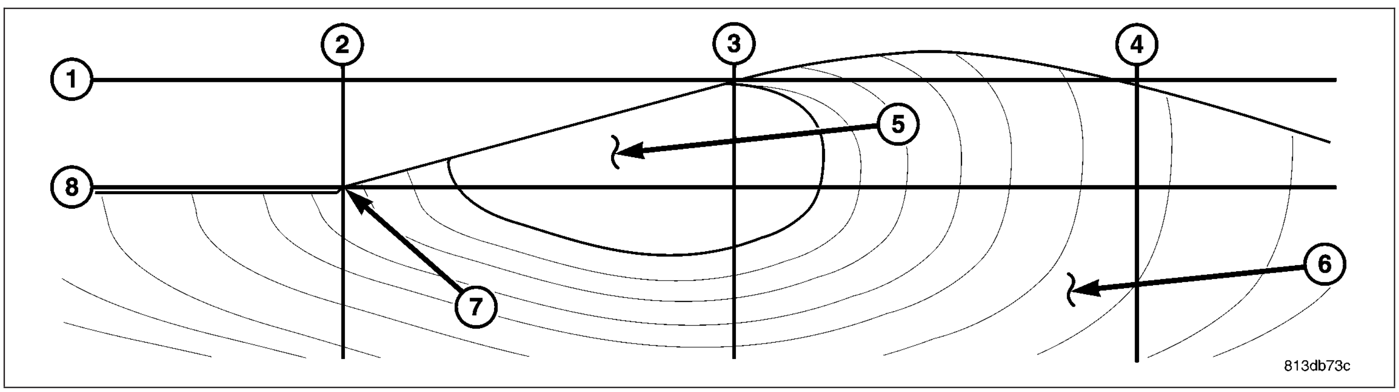
1. Verify headlamp dimmer switch and high beam indicator operation.
2. Verify that the headlamp leveling switch is in the “0” position.
3. Inspect and correct damaged or defective components that could interfere with proper headlamp alignment.
4. Verify proper tire inflation.

5. Clean headlamp lenses.
6. Verify that luggage area is loaded as the vehicle is routinely used.
7. Fuel tank should be FULL. Add 2.94 kg (6.5 lbs.) of weight over the fuel tank for each estimated gallon of missing fuel.

ALIGNMENT SCREEN PREPARATION

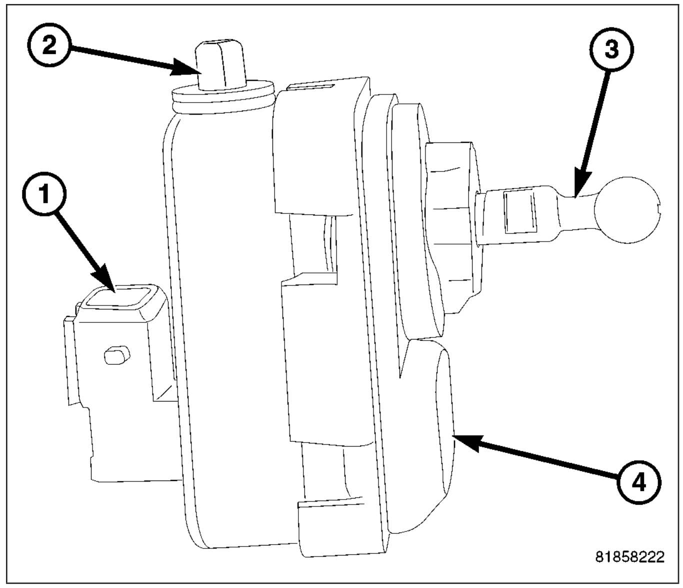
1. Position vehicle on a level surface perpendicular to a flat wall 10 meters (32.8 ft.) away from front of headlamp lens.
2. Place 75 kg in the driver's seat to simulate the ride height of the vehicle when driven.
3. If necessary, tape a line on the floor 10 meters (32.8 ft.) away from and parallel to the wall.
4. From the floor up 1.27 meters (5 ft.), tape a vertical line on the wall at the centerline of the vehicle. Sight along the centerline of the vehicle (from rear of vehicle forward) to verify accuracy of the line placement.
5. Rock vehicle side-to-side three times and allow suspension to stabilize.
6. Jounce front suspension three times by pushing downward on front bumper and releasing.
7. Measure the distance from the center of headlamp low beam dot on the lens to the floor. Transfer measurement to the alignment screen (with tape). Use this line for up/down adjustment reference.
8. Place a tape line 100 mm (4 inches) below and parallel to the center of headlamp line.
9. Measure distance from the centerline of the vehicle to the center of each headlamp being aligned. Transfer measurements to screen (with tape) to each side of vehicle centerline. Use these lines for left/right adjustment reference.

FRONT LAMP UNIT ALIGNMENT

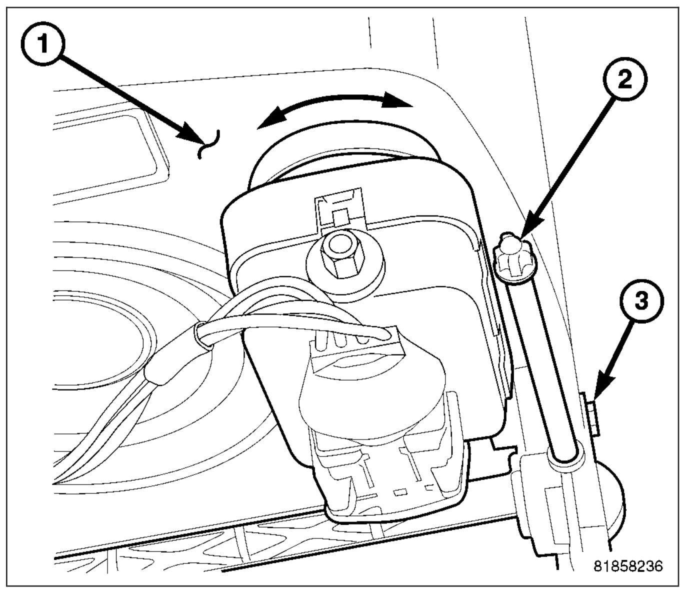


With the horizontal centerline of the headlamp (1) transferred on the wall, measure down 76 mm (3 in). This line (6) will be the vertical aiming mark. Using the intersecting point (5) of the horizontal centerline (6) and the vertical centerline (2) for the left headlamp, adjust the headlamp unit horizontally and vertically so (5) is the intersecting point at lines (6 and 2). For the right headlamp unit, cover up the left headlamp and follow the same procedure but intersecting at (6 and 4).

1. Turn the headlamps On and select the Low beams.
2. The vertical alignment screw (2) is located on the top of the headlamp leveling motor (4).



3. The horizontal alignment screw (2) is located next to and inboard of the headlamp leveling motor.



A properly aimed low beam headlamp will project a high intensity light pattern on the screen with the horizontal cut-off line aligned with the tape line 100 mm (3.94 in.) below the headlamp centerline. The intersection of the horizontal and 15 degree cut-off lines in the projected pattern should align to the intersection of the headlamp centerline vertical tape line and the tape line 100 mm (3.94 in.) below the headlamp horizontal centerline. The high beams on a vehicle with aero headlamps cannot be aligned. The high beam pattern should be correct when the low beams are aligned properly.

SPECIFICATIONS

EXTERIOR LAMPS

CAUTION: Do not use bulbs that have a higher candle power than the bulb listed in the chart below. Damage to lamp can result. Do not touch halogen bulbs with fingers or other oily surfaces. Bulb life will be reduced.

BULB APPLICATION TABLE

LAMP	BULB
Back-Up Lamp	921 W16W
Front Fog Lamp	9145
Front Park/Turn Signal/Side Marker Lamp	3157AK
Headlamp Low Beam/High Beam	H13
License Lamp	W5W
Rear Tail/Stop Lamp	3157
Rear Turn Signal	3757AK

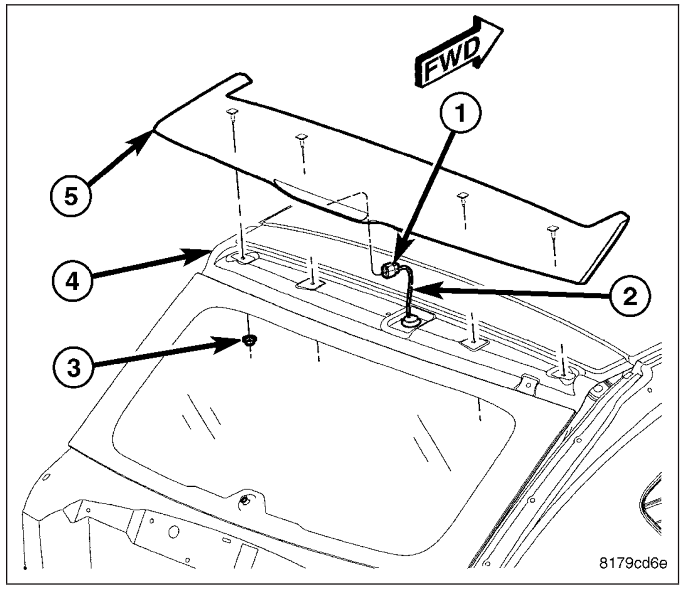
BULB APPLICATION TABLE - EXPORT

LAMP	BULB
Front Position Lamp	W5W
Headlamp Low Beam/High Beam	H4
Rear Fog Lamp	3157

CENTER HIGH MOUNTED STOP LAMP

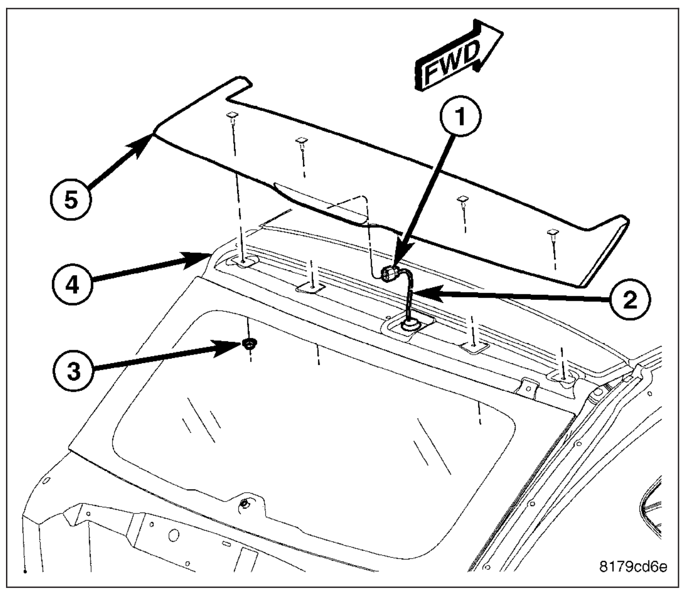
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the rear spoiler (Refer to 23 - BODY/LIFT-GATE - SPOILER - REMOVAL)
3. With spoiler on bench, remove the two screws to the CHMSL.
4. Remove CHMSL from spoiler.



INSTALLATION

1. Place CHMSL onto rear spoiler.
2. Install the two mounting screws to the CHMSL.
3. Install the rear spoiler (Refer to 23 - BODY/LIFT-GATE - SPOILER - INSTALLATION).
4. Connect the battery negative cable.



DAYTIME RUNNING LAMPS

DESCRIPTION

Vehicles built for use in Canada, and also available as an option on vehicles for sale in the U.S., are equipped with a Daytime Running Lamp (DRL) system. All the exterior lighting messages come from Steering Control Module (SCM) or left multi-function switch on Local Interconnect Network (LIN) data bus and goes to the Cab Compartment Node (CCN), then the CCN sends out a Controller Area Network (CAN) data bus message to the Totally Integrated Power Module (TIPM) for each lighting function according to the request from left multi-function switch. Then the TIPM will turn ON/OFF the requested output. The DRL function is controlled by TIPM. Daytime running lamps are High beam lamps at lower intensity.

OPERATION

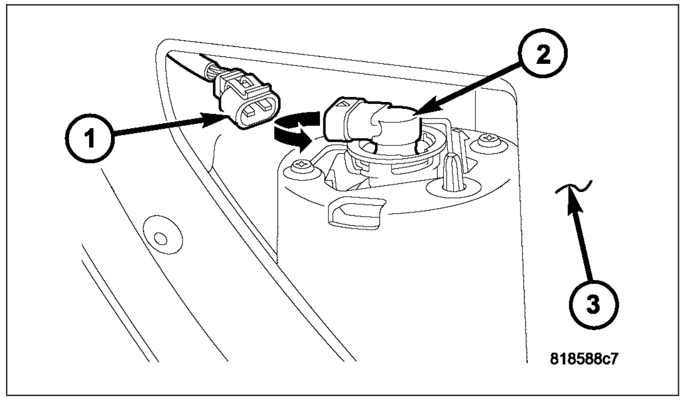
The Canadian cluster provides steady illumination of the front turn signal when the ignition switch is in the ON position. The Daytime Running Lamp (DRL) function may be inhibited by activating the turn signals, the hazard flashers, the headlamp switch, or park brake.

FOG LAMP

REMOVAL

BULB

1. Disconnect and isolate the battery negative cable.
2. Reach up through the lower fascia (3) cutout.
3. Disconnect the fog lamp connector (1).
4. Twist the bulb (2) counterclockwise to remove from lamp unit.

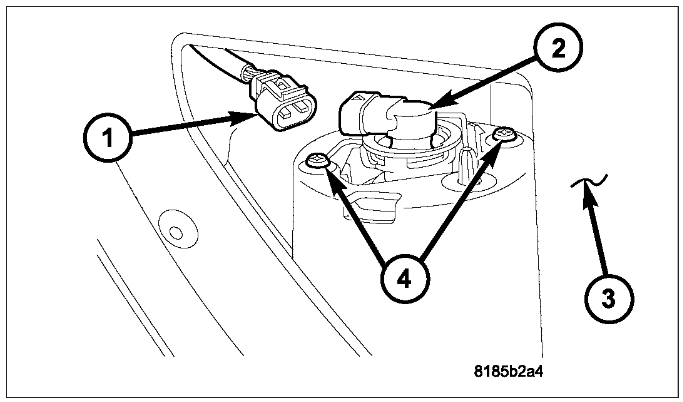


UNIT

1. Disconnect and isolate the battery negative cable.
2. Reach up through the lower fascia (3) cutout.
3. Disconnect electrical connector from fog lamp (1).

NOTE: It may be necessary to twist out the fog lamp bulb (2) to release fog lamp unit from fascia.

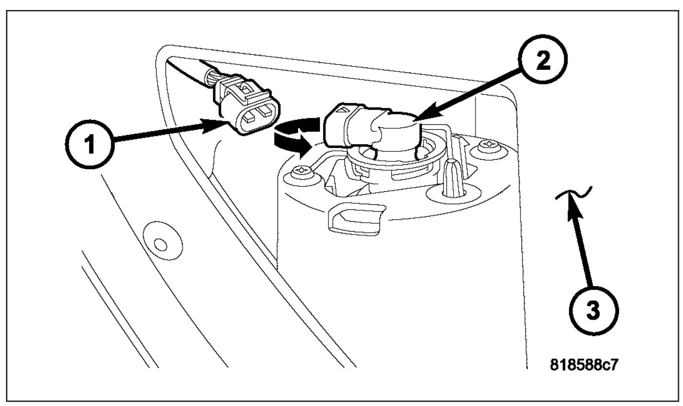
4. Remove screws attaching fog lamp to fascia (4).
5. Push fog lamp forward to remove from fascia.



INSTALLATION

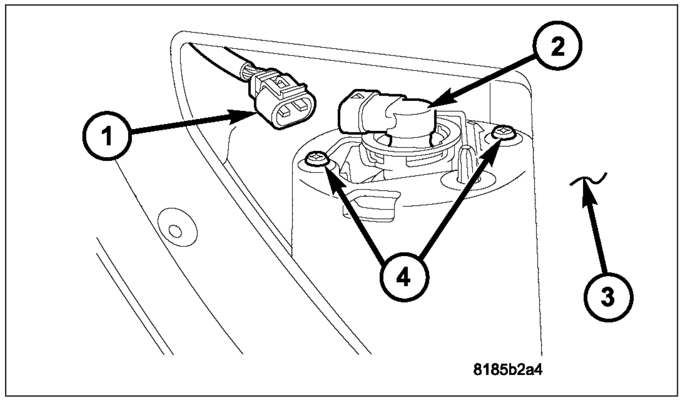
BULB

1. Reach up through the lower fascia (3) cutout.
2. Place bulb (2) into lamp unit and twist clockwise until stops, approximately 90 degrees.
3. Connect the fog lamp bulb electrical connector (1).
4. Connect the battery negative cable.



UNIT

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.



1. Place fog lamp into fascia opening and push rearward to position into fascia.
2. Reach up through the lower fascia (3) cutout.
3. Install two screws attaching fog lamp to fascia (4).

NOTE: It may be necessary to install the fog lamp bulb (2) if it was removed to access the fog lamp unit.

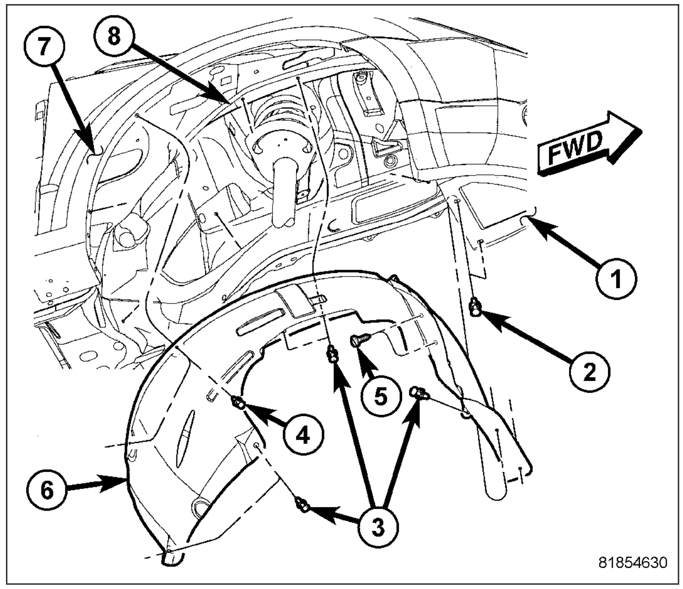
4. Connect electrical connector to fog lamp (1).
5. Connect the battery negative cable.

FRONT LAMP UNIT

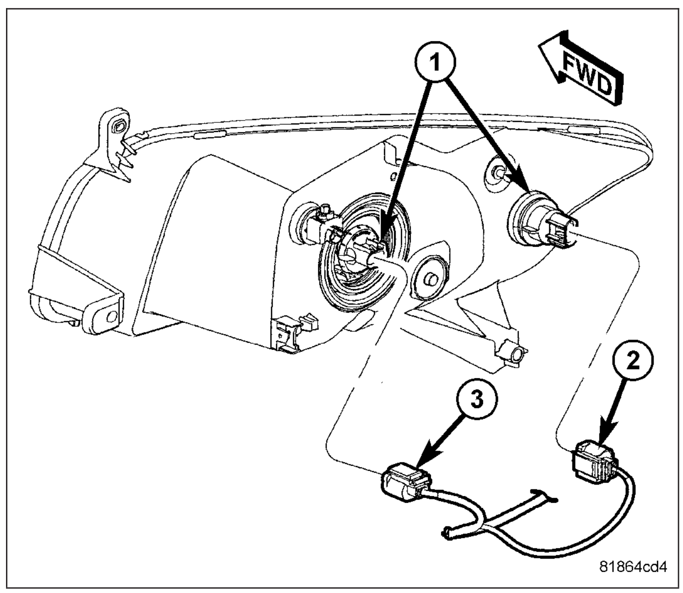
REMOVAL

BULBS

1. Disconnect and isolate the battery negative cable.
2. Hoist vehicle.
3. Working in the appropriate wheel well, loosen up the front of the splash shield, but don't fully remove it.



4. Looking up through the front wheel well, locate the bulb (1) in which needs replacing. The headlamp bulb is the inboard bulb and the park/turn signal bulb is the outboard bulb.
5. Disconnect the bulb electrical connector (2 or 3).



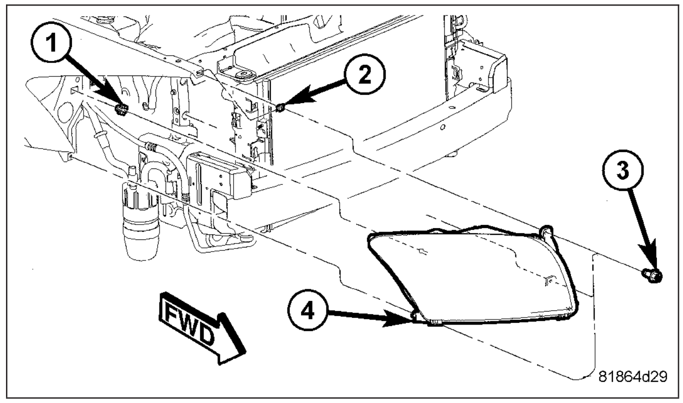
NOTE: EXPORT ONLY - If removing/replacing the headlamp bulb on export vehicles there is a rubber cover over the rear of the lamp housing that must be removed to access the bulb. Then a spring clip must be removed and the bulb pulled straight rearward.

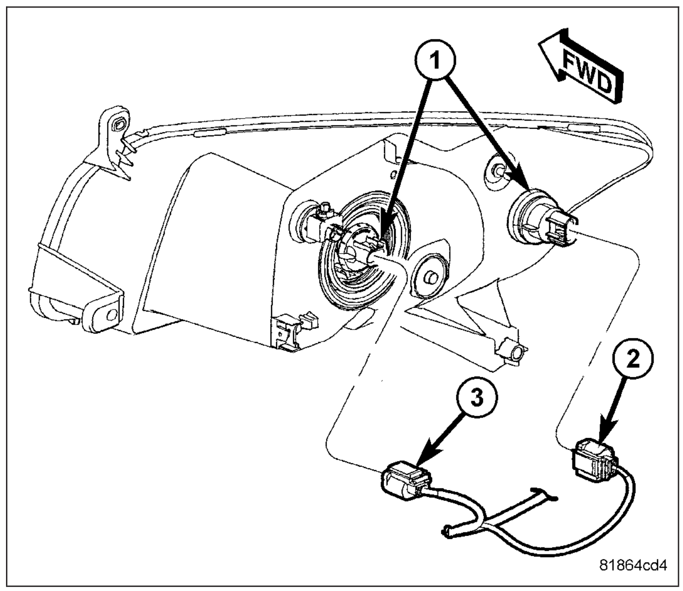
6. Grasp the bulb (1), twist 1/4 turn counterclockwise and pull straight out of front lamp unit.

UNIT

DOMESTIC

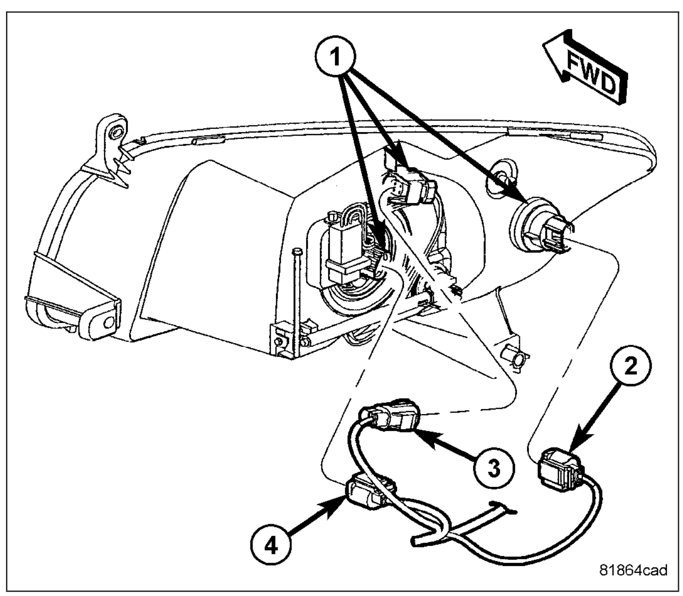
1. Open hood.
2. Disconnect and isolate the battery negative cable.
3. Loosen the fascia on the side you're taking the front lamp unit out on (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL). The fasteners along the radiator closure panel, the splash shield to fascia screws, and the bolt holding the fascia to the fender at the wheel well opening.
4. Remove the three screws (3) to the front lamp unit (4) to body.
5. Pull the front lamp unit (4) straight back to unsnap the ball and socket pivots from the retainer (1).
6. Maneuver the front lamp unit out of its mounting pocket, enough to expose the individual lamp (1) electrical connectors (2 and 3).
7. Disconnect the two electrical connectors (2 and 3).





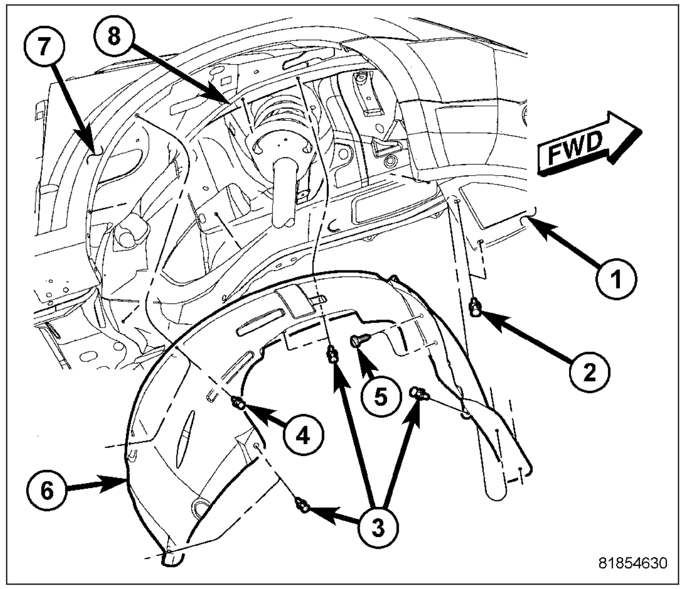
EXPORT

1. Use the Domestic Removal procedure to remove the BUX front lamp unit. Refer to Step 1.
2. For BUX markets, there are three electrical connectors (2, 3, and 4) to disconnect.

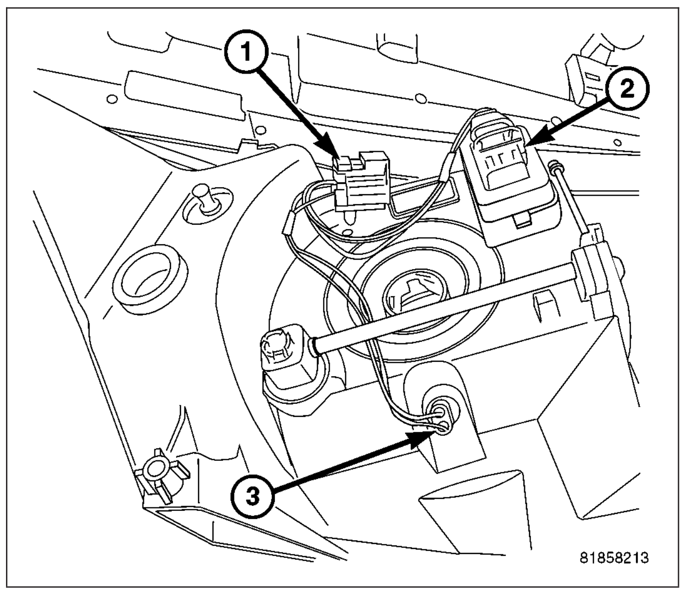


FRONT POSITION LAMP - EXPORT

1. Disconnect and isolate the battery negative cable.
2. Hoist vehicle.
3. Working in the appropriate wheel well, loosen up the front of the splash shield, but don't fully remove it (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).



4. Looking up through the front wheel well, locate the front position lamp (3).
5. Grasp the front position lamp (3) twist 1/4 turn counterclockwise, and pull straight out of front lamp unit.
6. Pull bulb straight from its socket.



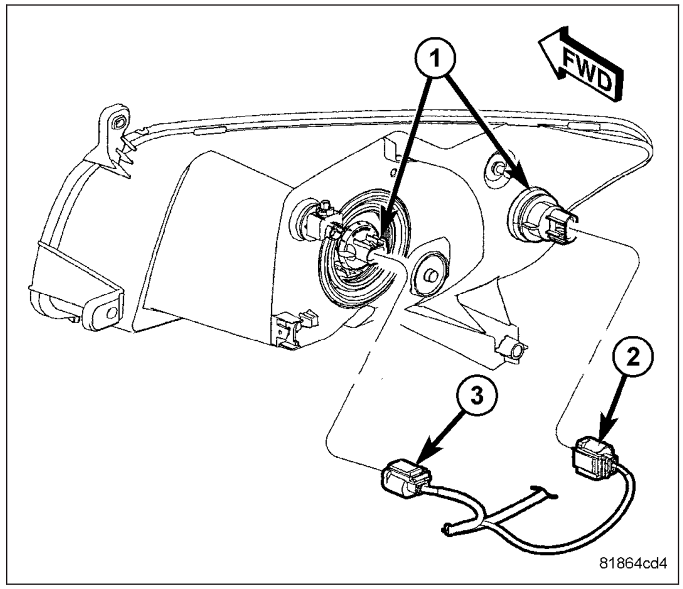
INSTALLATION

BULBS

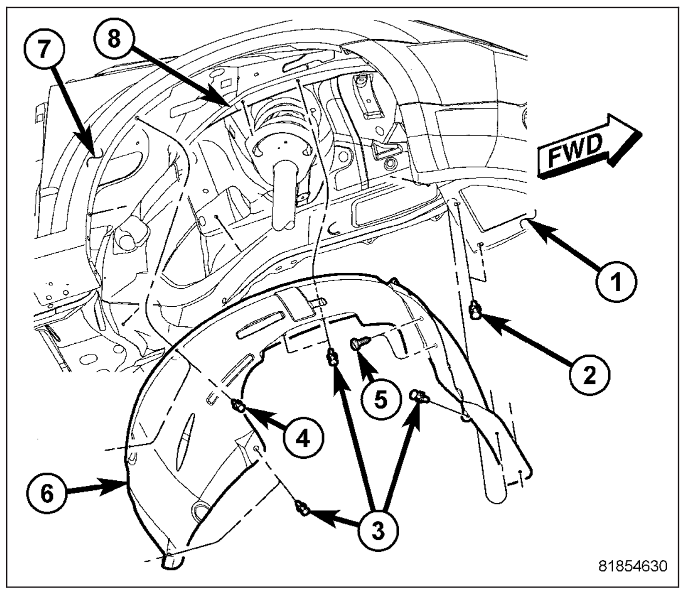
1. Reaching up through wheel well, install the headlamp or park/turn signal bulb (1) in the front lamp unit, locking it into place by twisting a 1/4 turn clockwise.

NOTE: EXPORT ONLY - If installing/replacing the headlamp bulb on export vehicles push the bulb straight in unit and then install the spring clip. Install the rubber cover over the rear of the lamp housing, over the headlamp bulb.

2. Connect the bulb electrical connector (2 or 3).



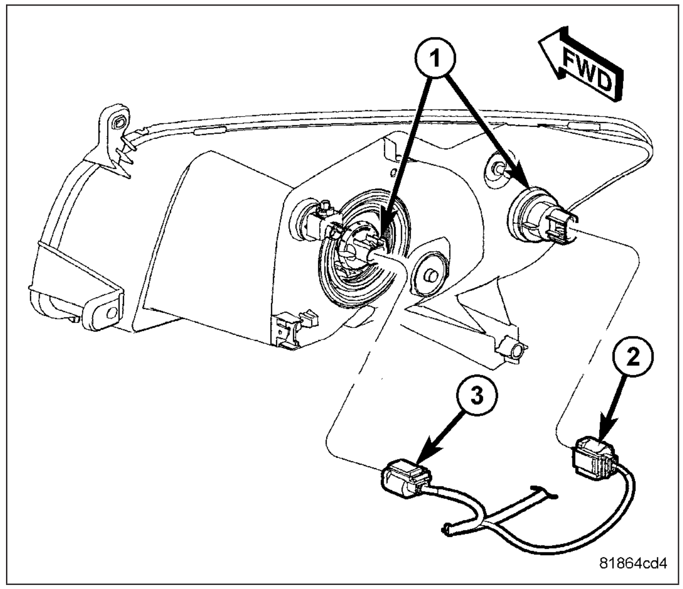
3. Install the front of the splash shield (6) removed to gain access to the front lamp unit bulbs (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Lower vehicle from hoist.
5. Connect the battery negative cable.



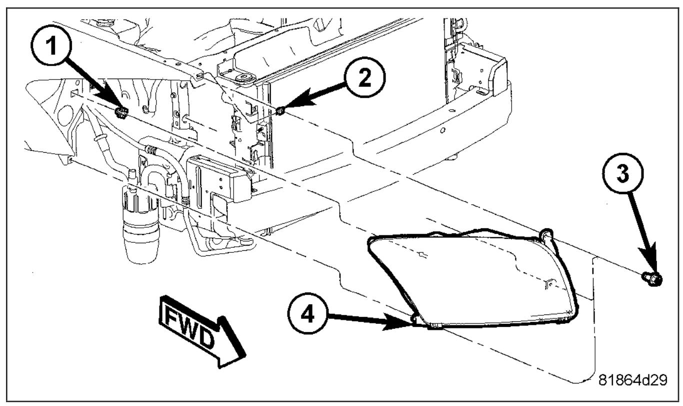
UNIT

DOMESTIC

1. Position the front lamp unit in its mounting location.
2. Connect the two front lamp unit electrical connectors (2 and 3).

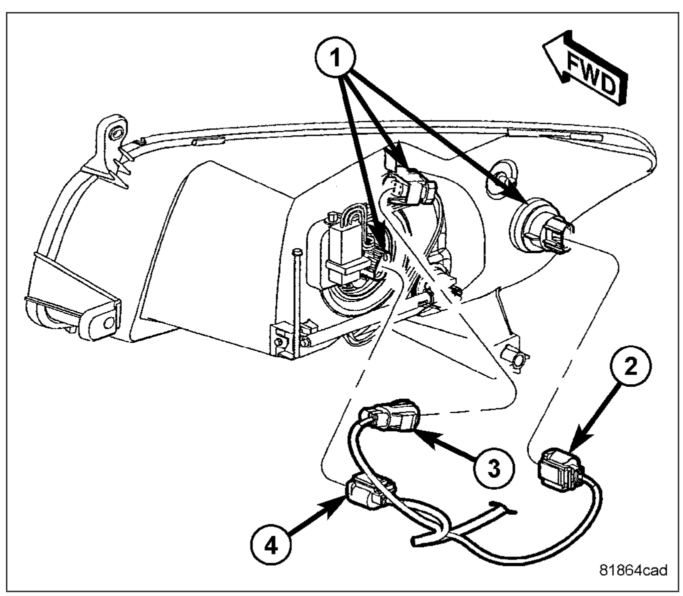


3. Align the ball and socket (1) up and then with a firm push, snap the front lamp unit into place.
4. Install the three screws (3) to the front lamp unit.
5. Install the fascia that was loosened on the repair side. One bolt holding the fascia to the fender at the wheel well opening, the splash shield to fascia screws, and the fasteners along the radiator closure panel (Refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - INSTALLATION).
6. Connect battery negative cable.



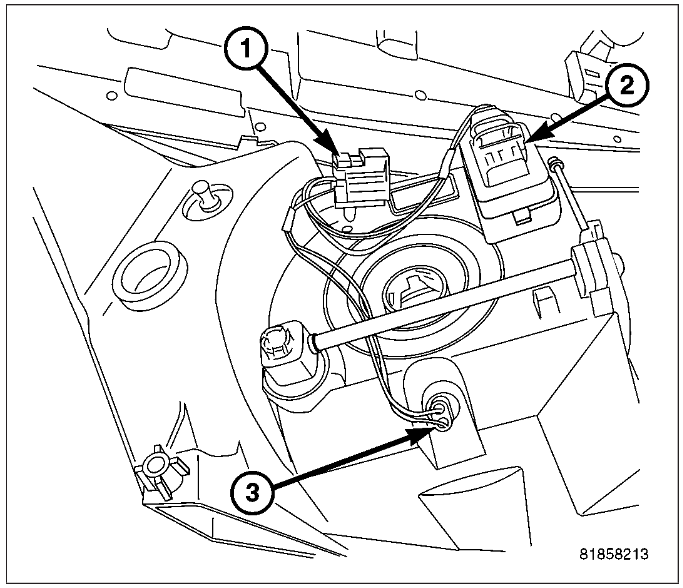
EXPORT

1. On BUX models, there are three electrical connectors (2, 3, and 4) to be connected.
2. Install the export front lamp unit the same way as the domestic unit Step 1.

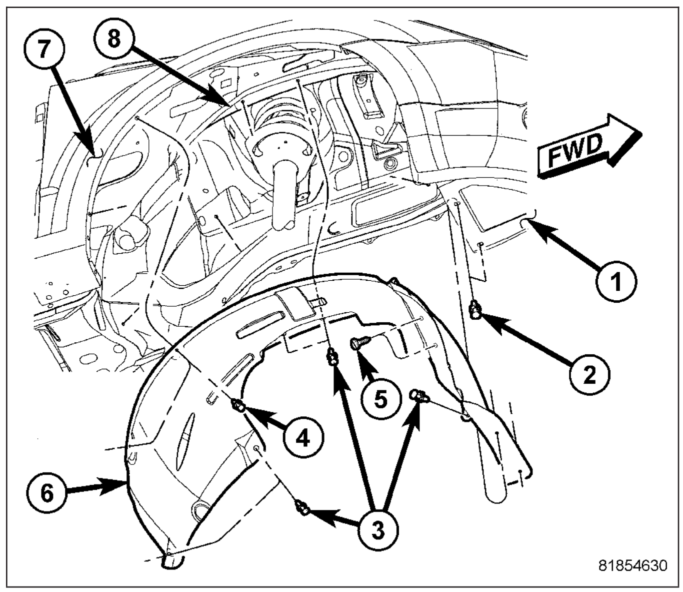


FRONT POSITION LAMP - EXPORT

1. Install the bulb in its socket (3).
2. Reaching up through wheel well, install front position lamp (3) in the front lamp unit, locking it into place by twisting a 1/4 turn.



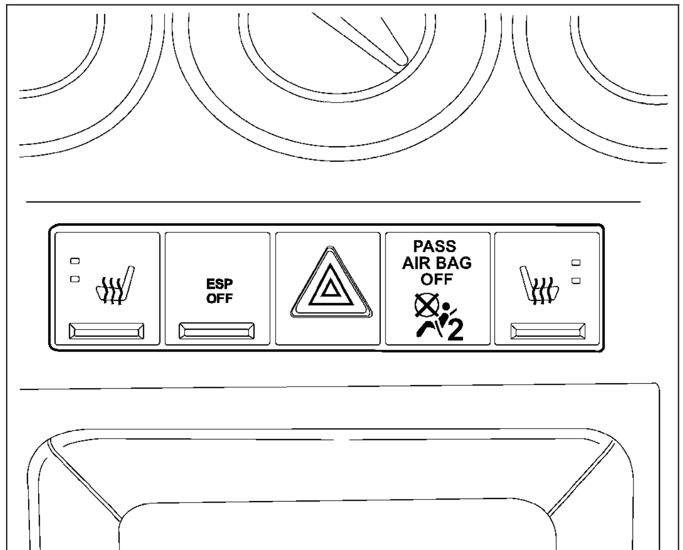
3. Install the front of the splash shield removed to gain access to the front position lamp (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Connect the battery negative cable.



HAZARD SWITCH

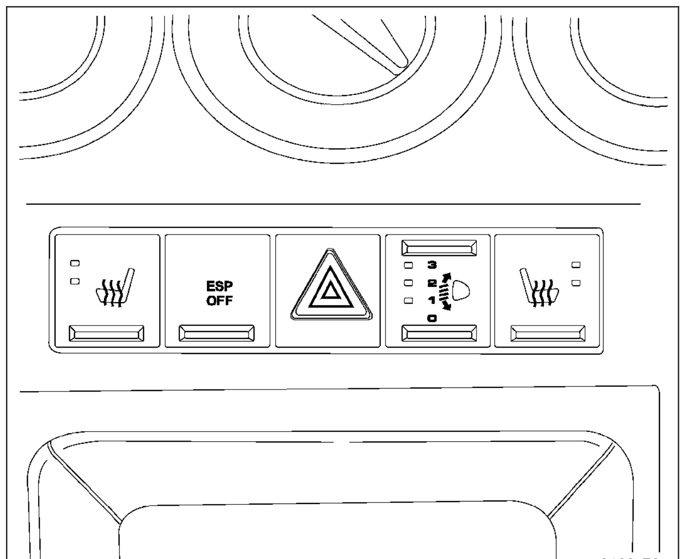
DESCRIPTION

The hazard switch is located in the Accessory Switch Bank Module (ASBM) just below the heater a/c controls, in the instrument panel center stack. This switch is the control for the hazard warning lighting. The only visible component of the switch is the control push button that is located just to the left of the Passenger Airbag Disabled Light (PADL) indicator.



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On BUX models, the hazard switch is located to the left of the Headlamp Leveling Switch, in the ASBM. The hazard switch cannot be adjusted or repaired. If the switch is ineffective or damaged, the entire ASBM must be replaced (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/ACCESSORY SWITCH BANK MODULE - REMOVAL).



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OPERATION

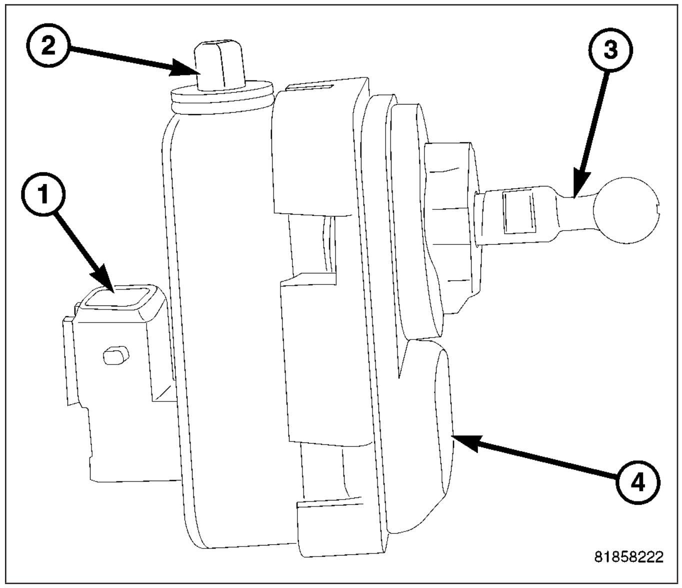
The hazard switch features a push-push type latching push button. When the push button is in its latched (lowered) position the switch contacts are open, and when the push button is in its unlatched (raised) position the switch contacts are closed.

The hazard switch receives a ground on one terminal and provides a ground signal output to the Totally Integrated Power Module (TIPM)) whenever the switch contacts are closed. The TIPM responds to this input by controlling a battery voltage output and the flash rate for each of the right and left turn signal lamps, then sends an electronic hazard switch status message over the Controller Area Network (CAN) data bus to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional hazard warning flasher.

The hazard switch as well as the hard wired inputs and outputs of the switch may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information.

HEADLAMP LEVELING MOTOR - EXPORT

DESCRIPTION



The headlamp leveling motor (4) is located on the rear upper surface of each front lamp unit on vehicles equipped with the headlamp leveling system, which is available only in certain markets where it is required equipment. There is a plunger (3) that moves the headlamp, an adjustment screw (2) that allows for baseline adjustment, and a connector (1) for connection to the vehicles electrical system.

Within the motor housing is a 12-volt Direct Current (DC) servo motor, an electronic controller board that includes the motor logic circuits, and an integral screw-drive transmission. The motor cannot be repaired and, if ineffective or damaged, the entire motor unit must be replaced.

The Headlamp Leveling System allows the driver to adjust the headlamp beam pattern from the interior of the vehicle to compensate for passenger or cargo load. Only the vertical axis of the headlamp beam can be adjusted.

A headlamp leveling switch is located on the instrument panel Accessory Switch Bank Module (ASBM), and controls the headlamp leveling motors found on the headlamp unit. The headlamp leveling switch has four settings 0-3, 0 being the highest, 3 being the lowest headlight beam vertical setting.

When performing a headlamp beam pattern alignment on a vehicle equipped with headlamp leveling, be certain the headlamp leveling switch is in the “0” position before starting. Failure to do so will result in an incorrect headlamp unit alignment.

OPERATION

With the push button of the headlamp leveling switch control, voltage is adjusted at the headlamp leveling switch (rheostat). This signals the headlamp leveling motors to adjust the vertical headlamp beam pattern accordingly. Headlamps must be ON, and ignition in the ON or RUN position, in order for the leveling system to function.

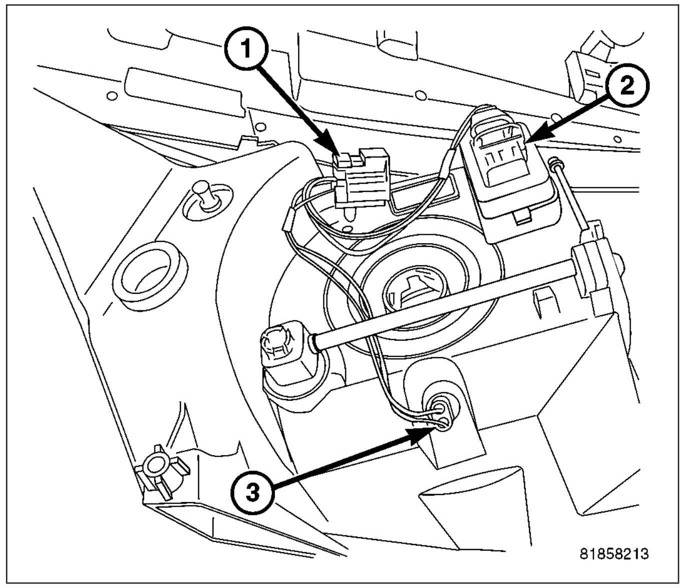
The controller board and logic circuitry of the headlamp leveling motor control motor operation based upon a voltage signal input received from the resistor multiplexed headlamp leveling switch in the Accessory Switch Bank Module (ASBM) on the instrument panel center stack. When the motor is energized it will extend or retract the motor push-rod through the integral screw-drive transmission. The ball on the end of the push-rod is snapped into a socket on the back of the reflector within the front lamp unit housing, which will cause the reflector to move as the push-rod is extended or retracted, changing the angle at which the light is projected from the headlamp low and high beam bulbs.

The headlamp leveling motors and switch have a path to ground at all times. The headlamp leveling components operate on battery voltage, but the system will only operate when the exterior lighting is turned ON.

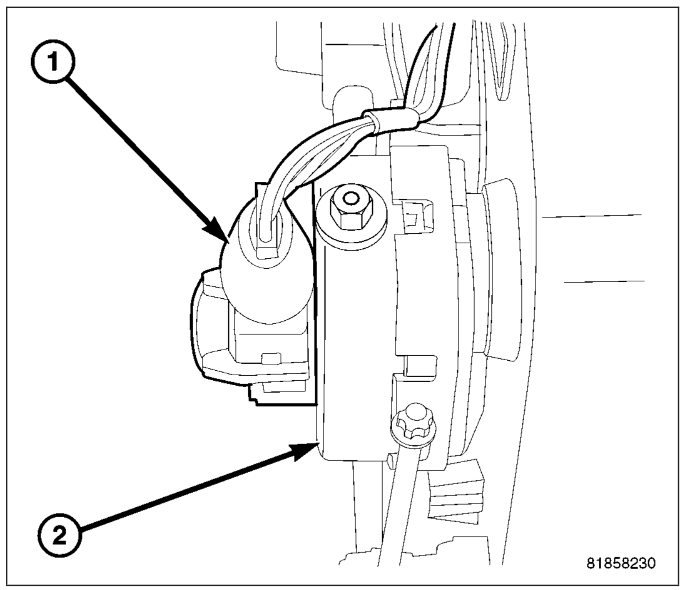
Because of active electronic elements within the headlamp leveling motor, it cannot be tested using conventional diagnostic tools and procedures. If the headlamp leveling motor is believed to be ineffective, the hard wired headlamp leveling motor circuits and the leveling switch must be tested before considering motor replacement. Use a scan tool and the proper diagnostic information.

REMOVAL

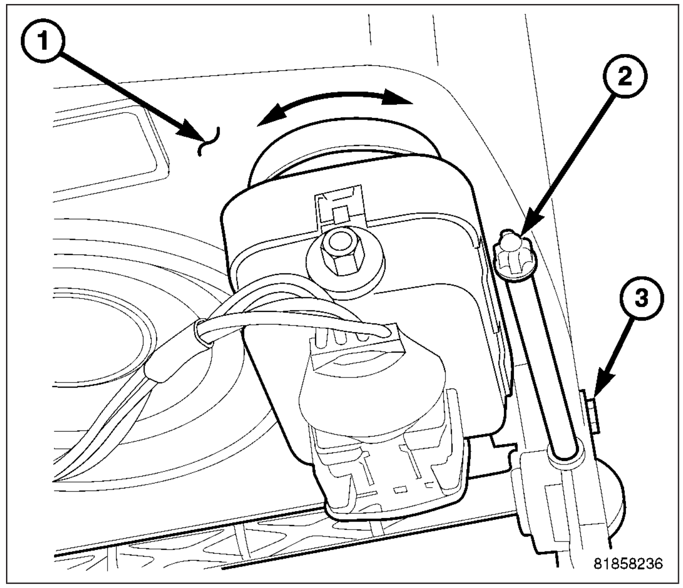
1. Remove Front Lamp Unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL).



2. Disconnect the headlamp leveling motor (2) electrical connector (1).



3. Remove the one screw (3) retaining the horizontal adjustment assembly (2) to allow the motor to swing far enough to remove.
4. Rotate leveling motor 1/4 turn counter-clockwise. This will free leveling motor housing from the headlamp unit (1).
5. Pull leveling motor straight from headlamp unit (1). Significant force will be required to unsnap motor control arm from lens reflector.

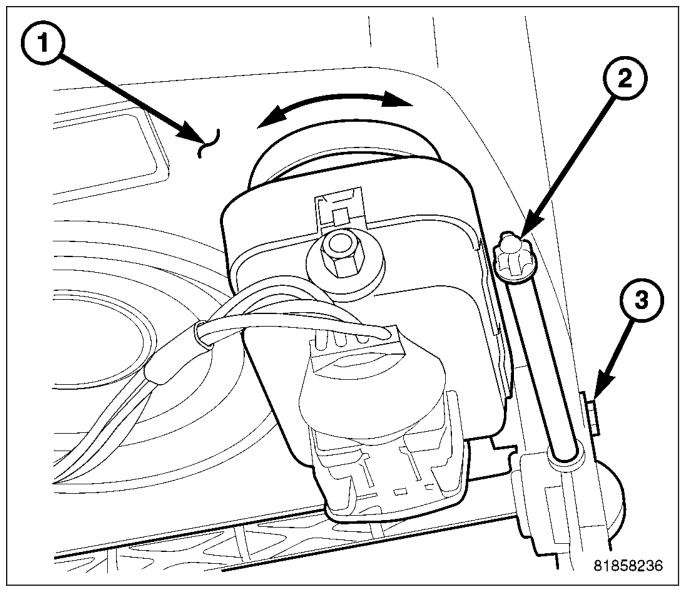


NOTE: The headlamp leveling motor control arm is snapped into the lens reflector mechanism very securely. Use a firm, steady pull to disengage motor arm from reflector.

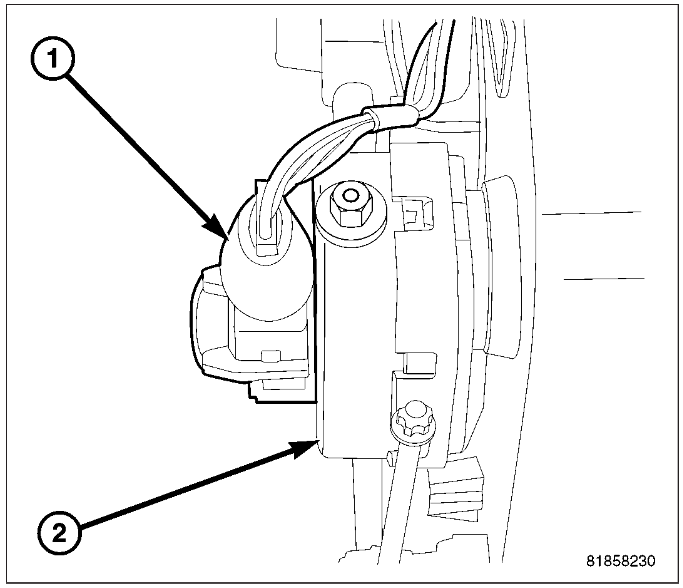
6. Remove leveling motor from front lamp unit.

INSTALLATION

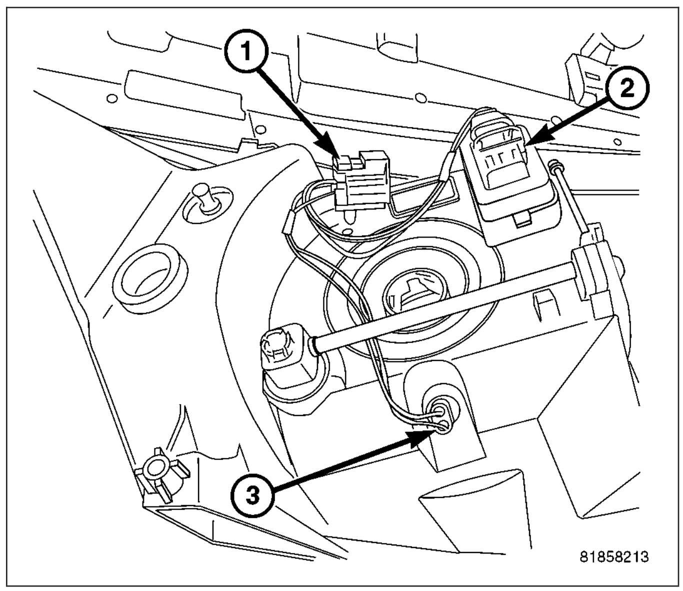
1. While holding headlamp reflector assembly still, push leveling motor until control arm is fully seated into reflector mechanism. An audible “snap” will be heard.
2. Push and rotate leveling motor 1/4 turn clockwise to lock motor to the front lamp unit (1).



3. Connect headlamp leveling motor (2) electrical connector (1).



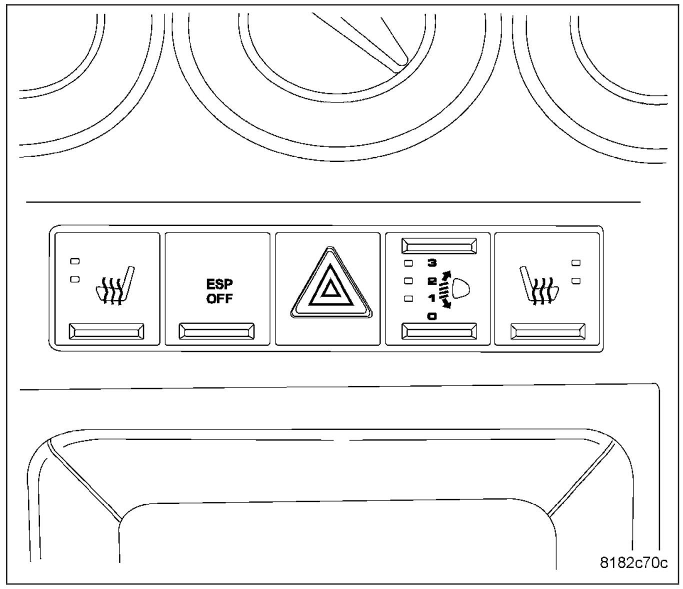
4. Install the front lamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION).



HEADLAMP LEVELING SWITCH - EXPORT

DESCRIPTION

The headlamp leveling switch is used only on vehicles manufactured for certain markets where the headlamp leveling system is required. The headlamp leveling switch is integral to the Accessory Switch Bank Module (ASBM) on the instrument panel center stack, just below the heater a/c controls and next to the hazard switch. The switch is marked with the numbers **0**, **1**, **2**, and **3**, which indicates each of the four switch detent positions. Each higher number represents a lower aiming position of the headlamp beam relative to the road surface.



The molded plastic ASBM housing encloses the switch mechanism and the leveling switch circuitry including the switch contacts and a series resistor configuration. The switch is connected to the vehicle electrical system through the instrument panel wire harness.

The headlamp leveling switch cannot be adjusted or repaired and, if ineffective or damaged, the entire ASBM unit must be replaced (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/ACCESSORY SWITCH BANK MODULE - REMOVAL).

OPERATION

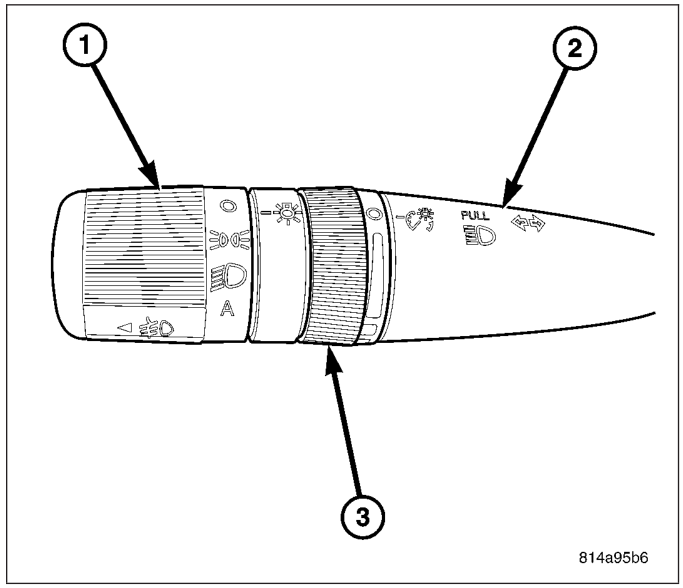
The headlamp leveling switch receives battery voltage whenever the park lamp lamps are turned ON. The switch receives a path to ground at all times through the instrument panel wire harness. The only output from the switch is a voltage signal that it provides to the headlamp leveling motors on a headlamp adjust signal circuit. Each switch position selects a different tap on a series resistor within the switch to provide a different voltage signal to the leveling motors. The higher the switch position number, the higher the output voltage level.

The headlamp leveling switch as well as the hard wired inputs and outputs of the switch may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information.

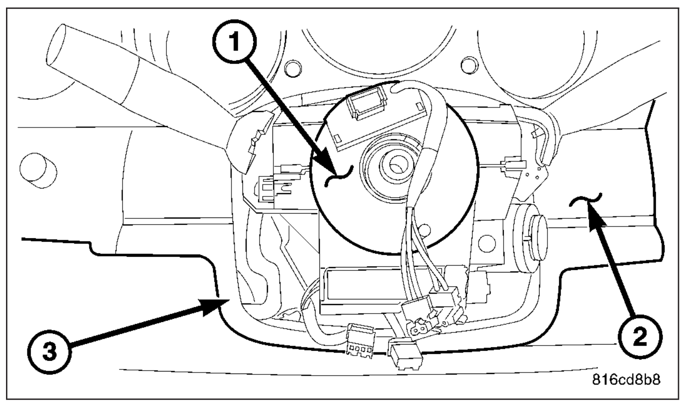
LEFT MULTI-FUNCTION SWITCH

DESCRIPTION

The left (lighting) multi-function switch is located on the left side of the steering column, just below the steering wheel. This switch is the primary control for the interior and exterior lighting systems. The only visible components of the switch are the control stalk (2), control knob (1) and control sleeve (3) that extend through the steering column shrouds on the left side of the column. The remainder of the switch including its mounting provisions, its electrical connection, and the turn signal cancel actuator are concealed beneath the shrouds.



The switch housing and controls are attached to the Steering Column Control Module (SCCM) (1) by one retaining screw. Each of the switch controls has white International Control and Display Symbol graphics applied to it, which clearly identify its many functions. A single integral interface connector connects the left multi-function switch directly to the SCCM (1).



The left multi-function switch provides the vehicle operator with a control interface for the following exterior lighting functions:

- **Front Fog Lamps** - For vehicles so equipped, the left multi-function switch control knob provides detent switching for the optional front fog lamps.
- **Headlamps** - The left multi-function switch control knob provides detent switching for the headlamps.
- **Headlamp Beam Selection** - The left multi-function switch control stalk provides detent switching for selection of the headlamp high or low beams.
- **Headlamp Optical Horn** - The left multi-function switch control stalk includes momentary switching of the headlamp high beam circuits to provide an optical horn feature (sometimes referred to as flash-to-pass), which allows the vehicle operator to momentarily flash the headlamp high beams as an optical signalling device.
- **Park Lamps** - The left multi-function switch control knob provides detent switching for the park lamps.
- **Rear Fog Lamps** - For vehicles so equipped, the left multi-function switch control knob provides detent switching for the optional rear fog lamps. Rear fog lamps are optional only for vehicles manufactured for certain markets, where they are required.
- **Turn Signal Control** - The left multi-function switch control stalk provides both momentary non-detent switching and detent switching with automatic cancellation for both the left and right turn signal lamps.

The left multi-function switch also provides the vehicle operator with a control interface for the following interior lighting functions:

- **Interior Lamps Defeat** - The left multi-function switch control ring provides detent switching to defeat the illumination of all interior courtesy lamps when a door, the rear flip-up glass, or the liftgate are opened.

- **Interior Lamps On** - The left multi-function switch control ring provides detent switching to simultaneously illuminate all interior courtesy lamps.
- **Panel Lamps Dimming** - The left multi-function switch control ring provides simultaneous adjustable control of the illumination intensity of all instrument panel lighting at one of six available illumination intensity levels.
- **Parade Mode** - The left multi-function switch control ring provides detent switching for a parade mode that maximizes the illumination intensity of all instrument panel lighting for visibility when driving in daylight with the exterior lamps turned on.

The left multi-function switch cannot be adjusted or repaired. If any function of the switch is damaged or inoperative, the entire switch unit must be replaced.

OPERATION

The left (lighting) multi-function switch uses resistor multiplexing to control the many functions and features it provides using a minimal number of hard wired circuits. The switch then sends electronic switch status messages over the Local Interconnect Network (LIN) to the Cab Compartment Node (CCN) and then the CCN sends messages over the Controller Area Network (CAN) data bus to the Totally Integrated Power Module (TIPM) other electronic modules in the vehicle.

For lighting and wiper function it sends the messages over the LIN bus to the CCN and the CCN puts them out on the CAN bus to the other modules. The left switch has the microprocessor for all communication to the TIPM. The SCCM is composed of a clockspring and left lighting switch and a right wiper switch. The TIPM, controls the lighting and wiper functions.

The left multi-function switch can be diagnosed using LIN based diagnostic tools and methods. However, the most reliable, efficient and accurate means to diagnose this component requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

EXTERIOR LIGHTING

Following are descriptions of how the left multi-function switch is operated to control the many exterior lighting functions and features it provides:

- **Front Fog Lamps** - The optional front fog lamps are requested when the left multi-function switch control knob is pulled outward to the front fog lamps detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle. The switch control knob incorporates an internal cam mechanism that will only allow the front fog lamps to be selected while the headlamp On position is also selected, and will automatically move the control knob to the front fog lamps Off position when the control knob is rotated to deselect the headlamps.
- **Headlamps** - The headlamps are requested when the left multi-function switch control knob is rotated to the headlamps on detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Headlamp Beam Selection** - The headlamp beams are selected when the left multi-function switch control stalk is pushed forward. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle. Each time the control stalk is actuated in this manner, the headlamp beams are toggled from the current selection to the opposite selection.
- **Headlamp Optical Horn** - The headlamp optical horn is selected each time the left multi-function switch control stalk is pulled rearward to a momentary position just short of the beam selection detent position. The headlamp high beams will remain illuminated for as long as the control stalk is held in this momentary position and the previously selected beams will be restored when the control stalk is released. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Park Lamps** - The headlamps are requested when the left multi-function switch control knob is rotated to the park lamps on detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Rear Fog Lamps** - The optional rear fog lamps are requested when the left multi-function switch control knob is pulled outward to the front fog lamps detent position and then rotated to the rear fog lamps detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle. The switch control knob incorporates an internal cam mechanism that will only allow the rear fog lamps to be selected while the front fog lamps On

position is also selected, and will automatically move the control knob to the rear fog lamp Off position when the control knob is pushed in to deselect the front fog lamps.

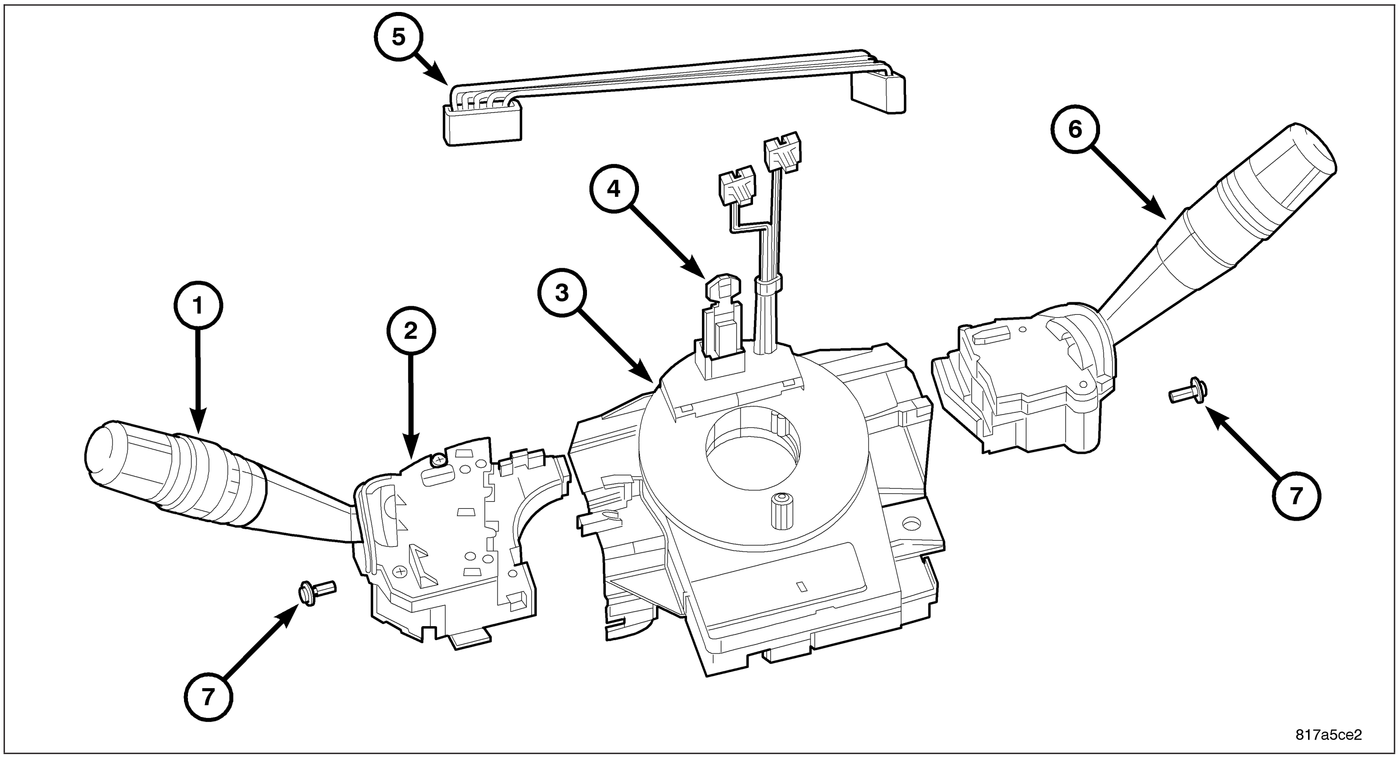
- **Turn Signal Control** - The turn signals are requested when the left multi-function switch control stalk is moved downward (left signal) or upward (right signal). The control stalk has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary “lane change” position in each direction that provides turn signals only until the control stalk is released. When the control stalk is moved to a detent turn signal switch position, a cancel actuator extends toward the center of the steering column. A turn signal cancel cam that is integral to the clockspring, rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the left multi-function switch. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. If the left turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral Off position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.

INTERIOR LIGHTING

Following are descriptions of the how the left multi-function switch is operated to control the many interior lighting functions and features it provides:

- **Interior Lamps Defeat** - The interior lamps defeat feature is requested when the left multi-function switch control sleeve is rotated to the interior lamps defeat detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Interior Lamps On** - The interior lamps on feature is requested when the left multi-function switch control sleeve is rotated to the interior lamps On detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Panel Lamps Dimming** - The panel lamps dimming function is active only when the left multi-function switch control knob is in any exterior lighting On position. With the exterior lighting On, the panel lamps dimming level is requested when the left multi-function switch control sleeve is rotated to any one of five minor detent positions. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.
- **Parade Mode** - The parade or funeral mode is active only when the left multi-function switch control knob is in any exterior lighting On position. With the exterior lighting On, the parade mode is requested when the left multi-function switch control sleeve is rotated to the parade mode detent position. The left multi-function switch sends an electronic switch status message over the LIN bus to the CCN, then over the CAN data bus to the other electronic modules in the vehicle.

REMOVAL

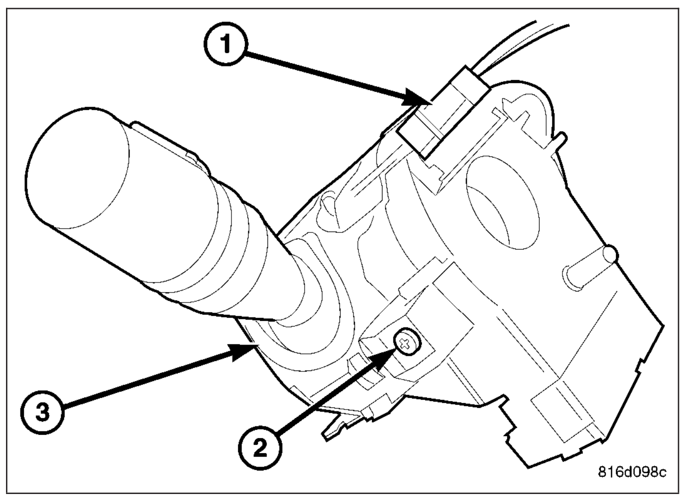


NOTE: It is not necessary to remove the Steering Column Control Module (SCCM) from the steering column to replace the left multi-function switch (2).

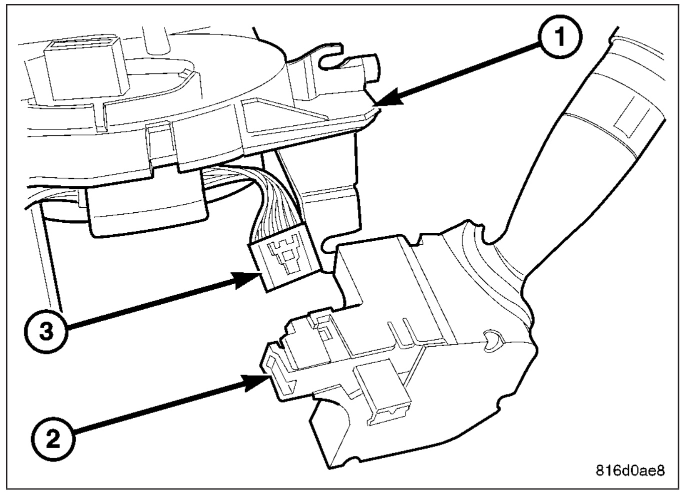
1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag or steering column components.

2. Remove both the upper and lower shrouds from the steering column. (Refer to 19 - STEERING/ COLUMN/SHROUD - REMOVAL).
3. Remove the one screw (2) that secures the left multi-function switch (3) on the right side of the clockspring (1).

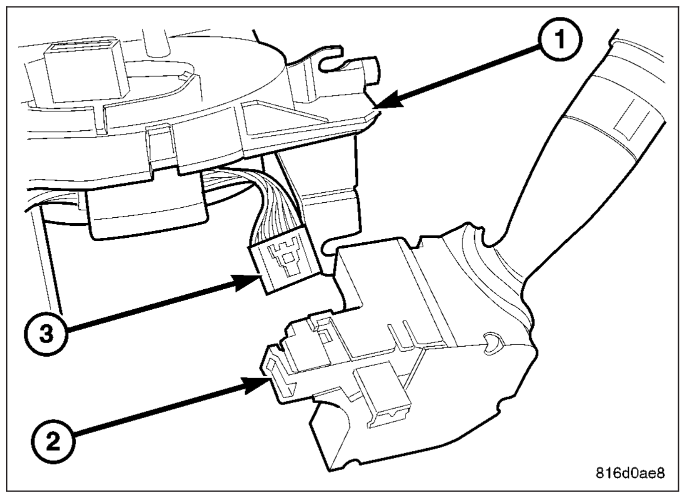


4. Pull the switch (2) straight away from the clockspring (1) far enough to access the electrical connector (3) to disconnect it.
5. Disconnect the instrument panel wiring harness from the back of the left multi-function switch.
6. Remove the switch (2) from the clockspring (1).

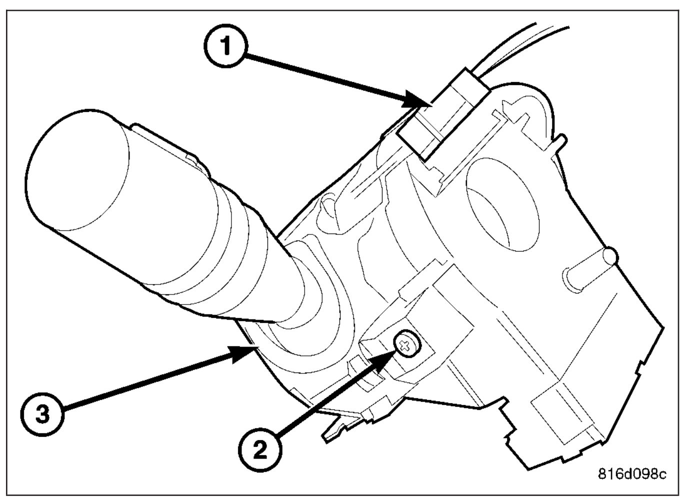


INSTALLATION

1. Position the left multi-function switch in the slot in the back of the clockspring (1) and connect the switch connector (3).
2. Connect the instrument panel wiring harness connector to the back of the left multi-function switch.



3. Align switch (3) with the clockspring (1) and slide toward steering column.
4. Install the screw (2) that secures the switch (3) to the clockspring (1).
5. Install the upper and lower shrouds onto the steering column. (Refer to 19 - STEERING/COLUMN/SHROUD - INSTALLATION).
6. Connect the battery negative cable.

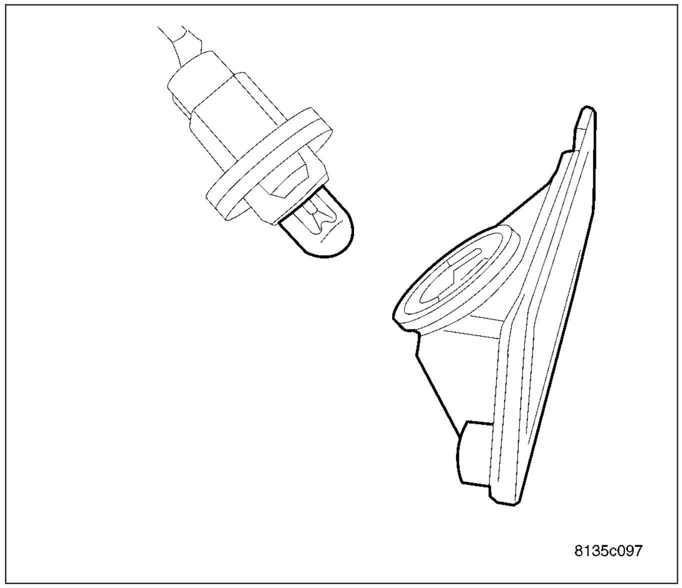


LICENSE PLATE LAMP

REMOVAL

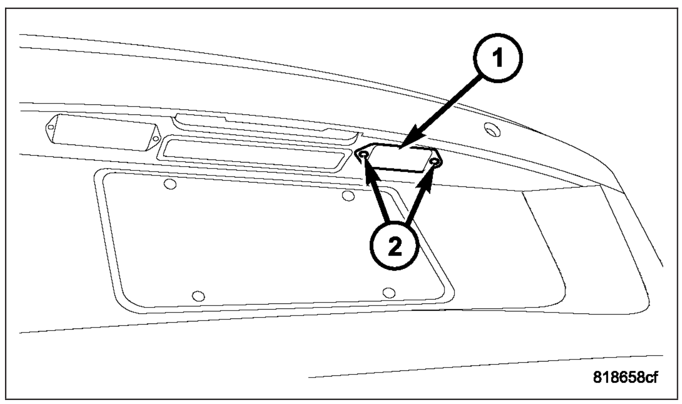
BULB

1. Remove the license plate lamp unit from the liftgate (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP - REMOVAL).
2. Pull bulb from socket.

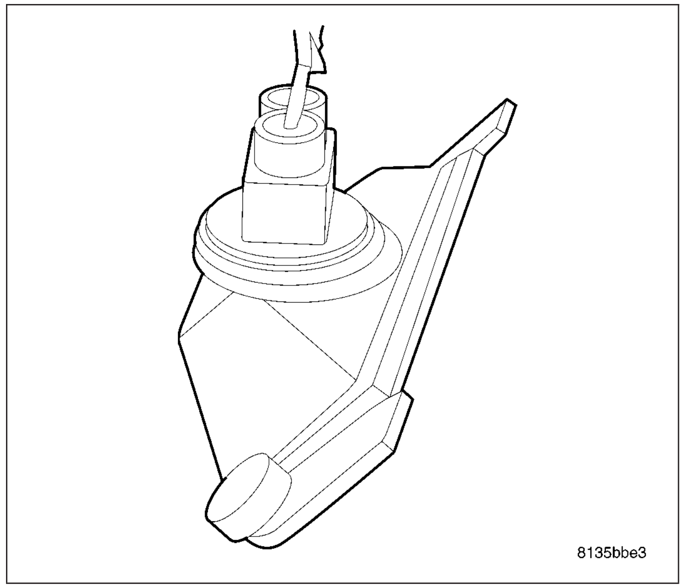


UNIT

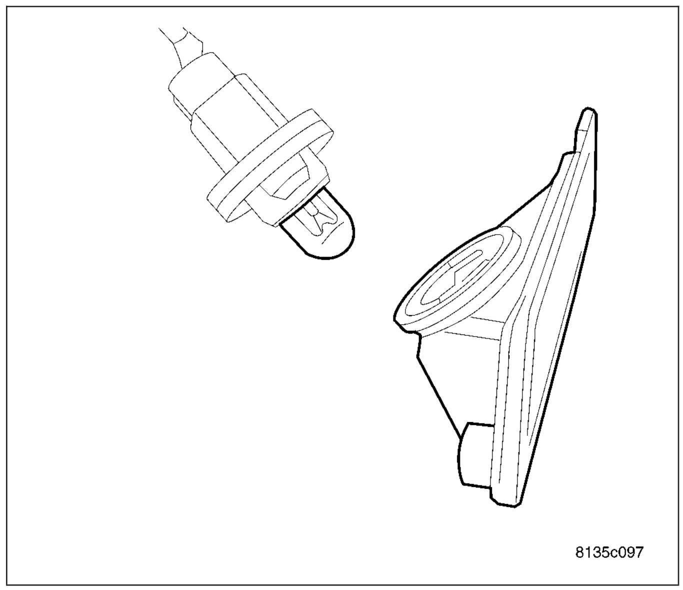
1. Using a trim stick or equivalent, gently pry on the side (2) of the license plate lamp unit (1) to release it from the liftgate.



2. Remove lamp (1) from liftgate.



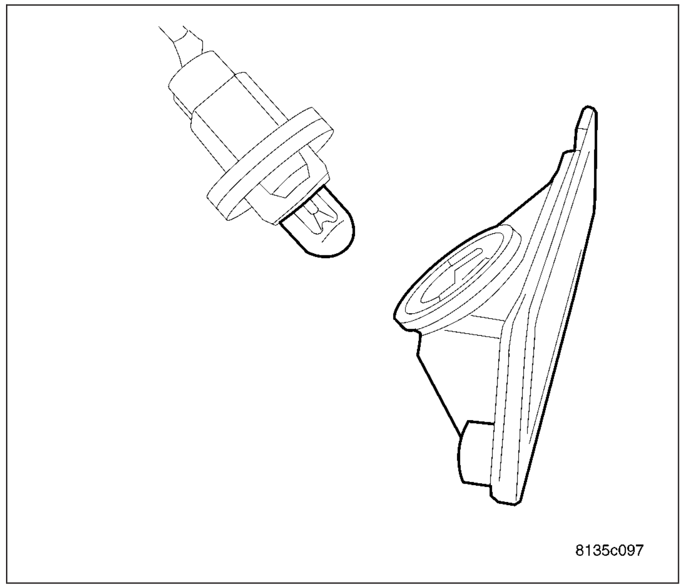
3. Twist the bulb socket 1/4 turn counter-clockwise and remove from license lamp unit.



INSTALLATION

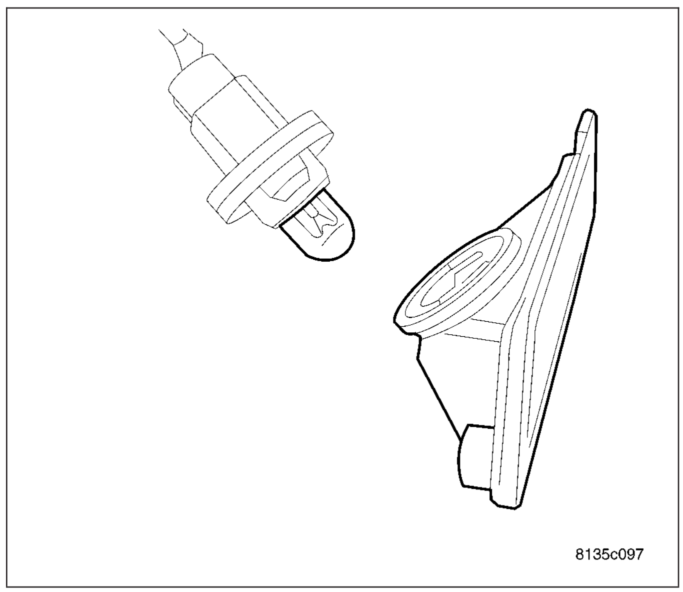
BULB

1. Install bulb into socket.
2. Install the license plate lamp unit into the liftgate (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP - INSTALLATION).

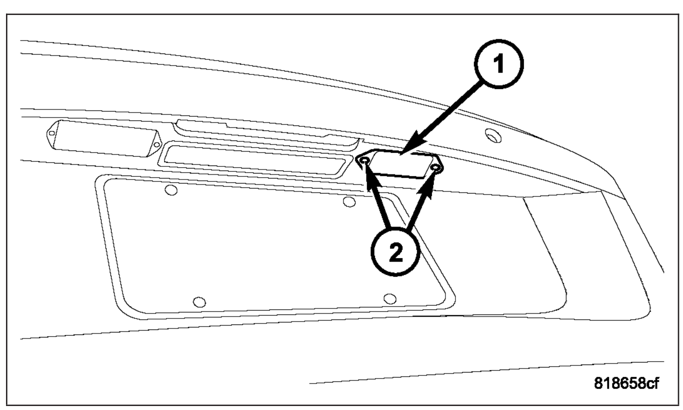


UNIT

1. Place bulb socket into license plate lamp unit.



2. Position lamp unit (1) into the liftgate opening and firmly push up and snap into place. Make sure both sides (2) are fully engaged.



SIDE REPEATER LAMP - EXPORT

DIAGNOSIS AND TESTING

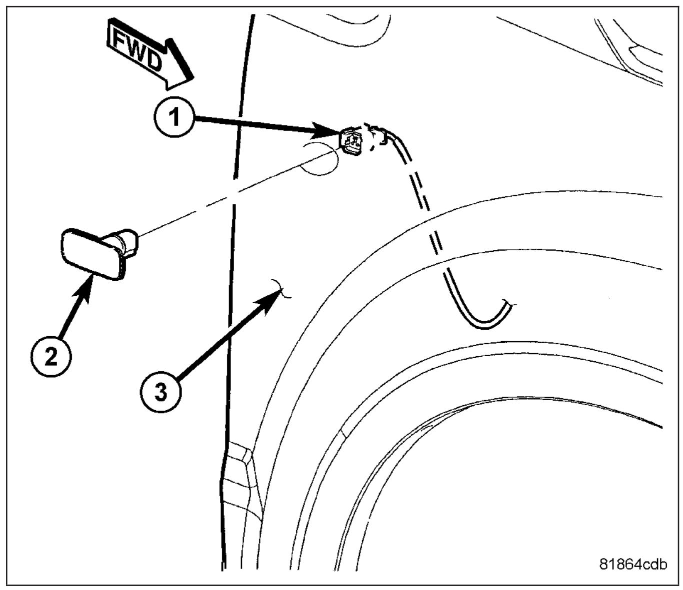
SIDE REPEATER LAMP

NOTE: The battery must be completely charged (12v) prior to testing. It may also be necessary to install a battery charger on the vehicles electrical system when performing this test.

1. Remove the side repeater lamp and check for a burned out condition. Replace lamp if necessary.
2. If lamp appears OK, reinstall the bulb in its socket and rotate the ignition switch to the ON position. Turn the appropriate turn signal lamp ON and check for lamp operation. If lamp is still inoperative proceed to Step 3.
3. Remove lamp and check for power (12v) and ground connections in lamp socket. If power and/or ground connections are not present, trace wire until open or short is found. Refer to Wiring Diagrams for a complete system schematic.

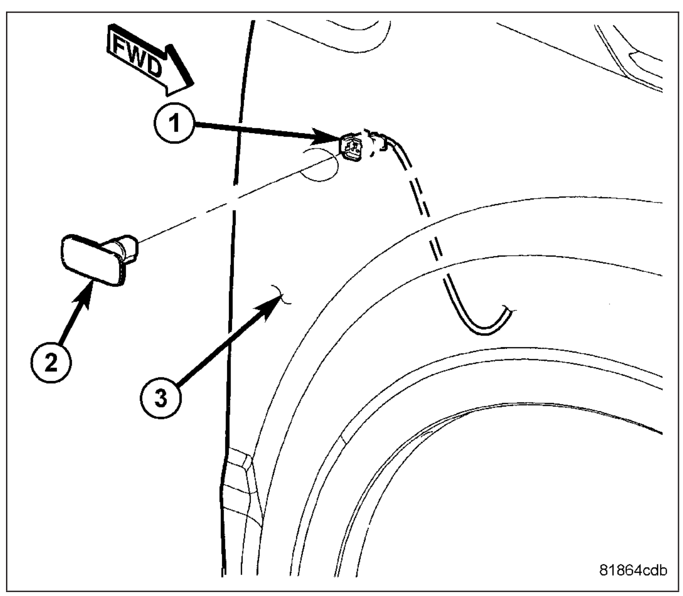
REMOVAL

1. Grasp the repeater lamp (2) from the side with a finger and pull towards the opposite end of the lamp. There is a spring clip that will allow the lamp to be released.
2. Disconnect the electrical connector (1).



INSTALLATION

1. Connect the repeater lamp electrical connector (1).
2. Position side repeater lamp (2) near hole in fender (3) and there is a large cut-out and a small cut-out in the fender. Place the large side in first, matching the tab on the lamp and then slide it that direction and release. This will lock the lamp into the fender.

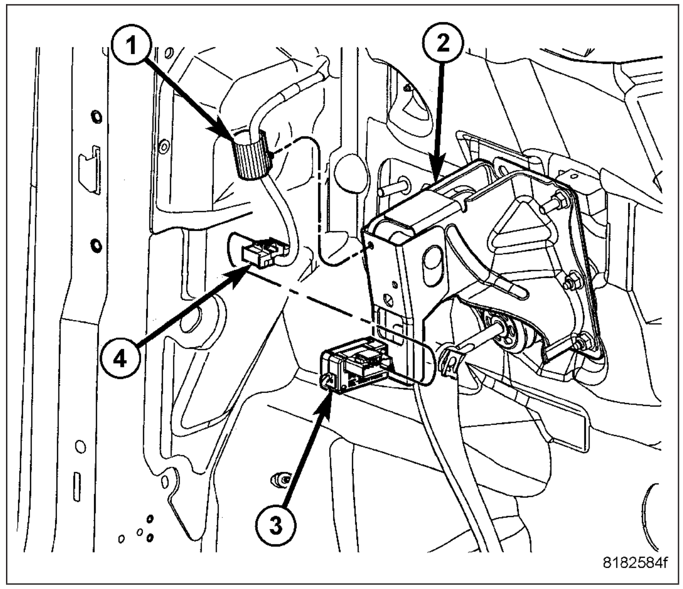


SWITCH-STOP LAMP

DESCRIPTION

The stop lamp switch (3) is located under the instrument panel, at the brake pedal (2). It has three internal switches controlling various functions of the vehicle. It's main function is to control operation of the vehicle's brake lamps. Other functions include speed control deactivation, brake sense for the antilock brake system and brake sense for the brake transmission shift interlock.

CAUTION: The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.



OPERATION

When the brake pedal is pressed, the plunger on the outside of the stop lamp switch extends outward. This action opens or closes the contacts of the three switches inside the stop lamp switch.

With the brake pedal pressed down (plunger extended), the switch for terminals 1 and 2 is closed completing the circuit. The switch for terminals 3 and 4 is open and so is the switch for 5 and 6.

When the brake pedal is released (plunger pushed in), the three switches assume the opposite positions. The switch for terminals 1 and 2 is now open while the other two switches are now closed, completing their circuits.

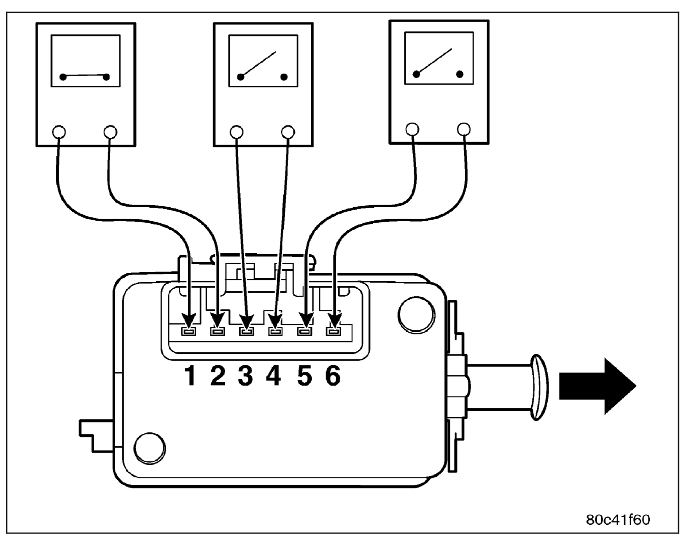
DIAGNOSIS AND TESTING

STOP LAMP SWITCH

NOTE: Before proceeding with this diagnostic test, verify the adjustment lever on the back of the switch is in the adjusted position. If the lever is in the non-adjusted (diagonal) position it may have never been adjusted. For adjustment, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION).

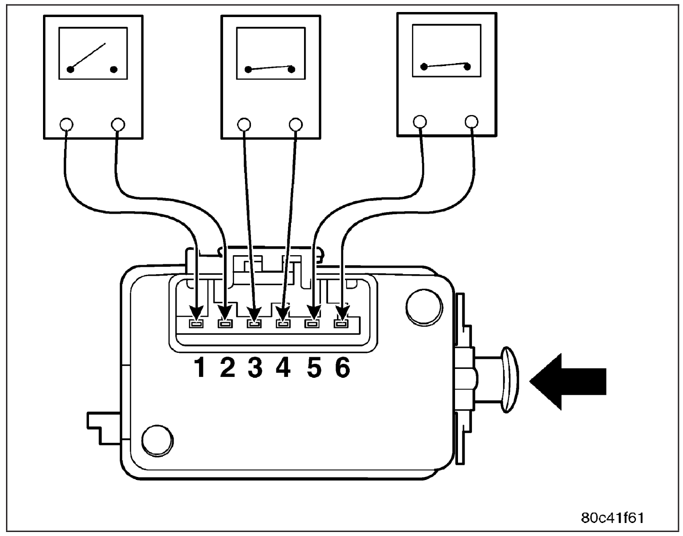
If the electrical circuit has been tested and the stop lamp switch is suspected of being damaged or inoperative, it can be tested using the following method.

1. Remove the switch from the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ STOP LAMP SWITCH - REMOVAL).
2. With the switch in the released position (plunger extended), use an ohmmeter to test each of the



three internal switches as shown. You should achieve the results as listed in the figure.

3. Gently push the plunger on the stop lamp switch in until it stops.
4. With the switch in this depressed position (plunger pushed in), use an ohmmeter to test each of the three internal switches as shown. You should achieve the results as listed in the figure.



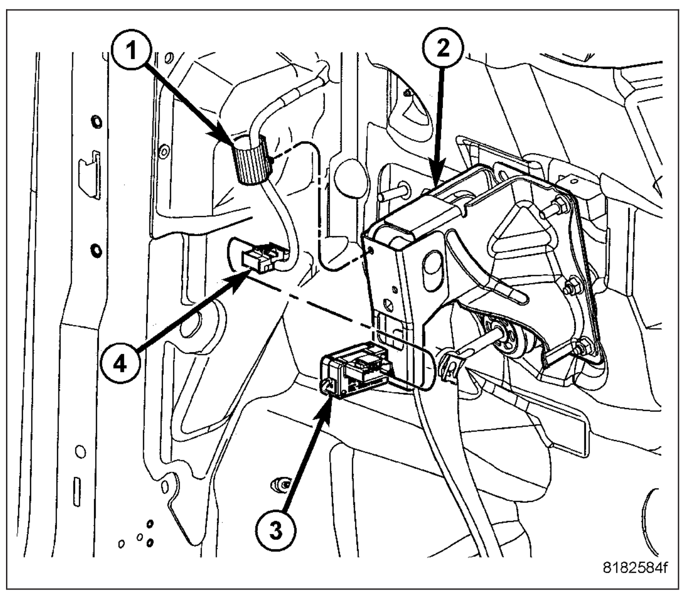
If you do not achieve the results as listed in both figures, the switch must be replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION)

If the switch is found to be operating properly, it may be misadjusted. Do not reinstall the switch, replace it. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION)

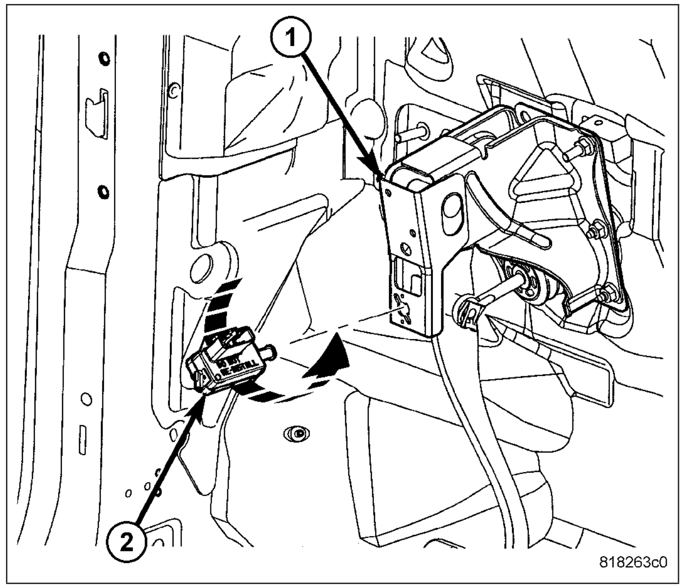
CAUTION: The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for any reason, a new switch must be installed and adjusted.

REMOVAL

1. Disconnect and isolate the battery negative cable from its post on the battery.
2. If equipped, remove the silencer pad below the steering column.
3. Disconnect the wiring harness connector (4) at the switch (3).



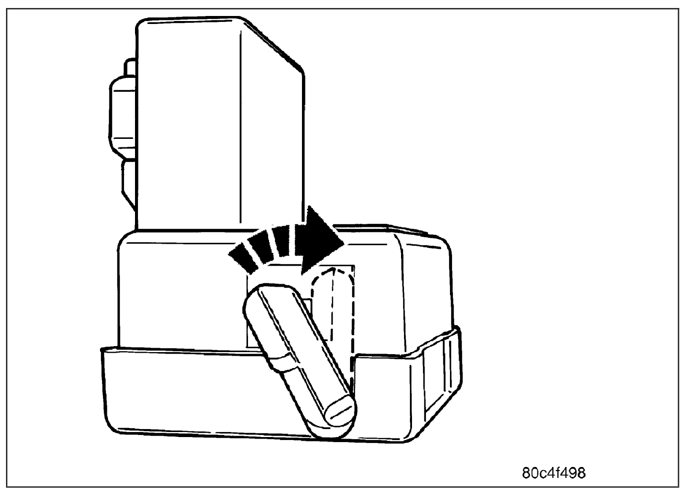
4. Remove the stop lamp switch (2) from the brake pedal bracket (1) by rotating the switch in a counterclockwise direction approximately 30 degrees, then pulling the switch rearward.
5. Discard the stop lamp switch. **It must not be reused.**



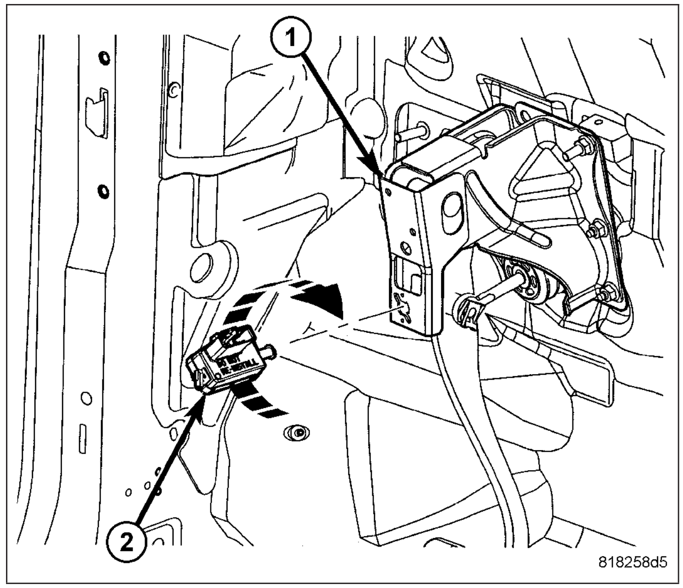
INSTALLATION

CAUTION: Do not reuse the original stop lamp switch. The switch can only be adjusted once. That is during initial installation of the switch. If the switch is not adjusted properly or has been removed for some service, a new switch must be installed and adjusted.

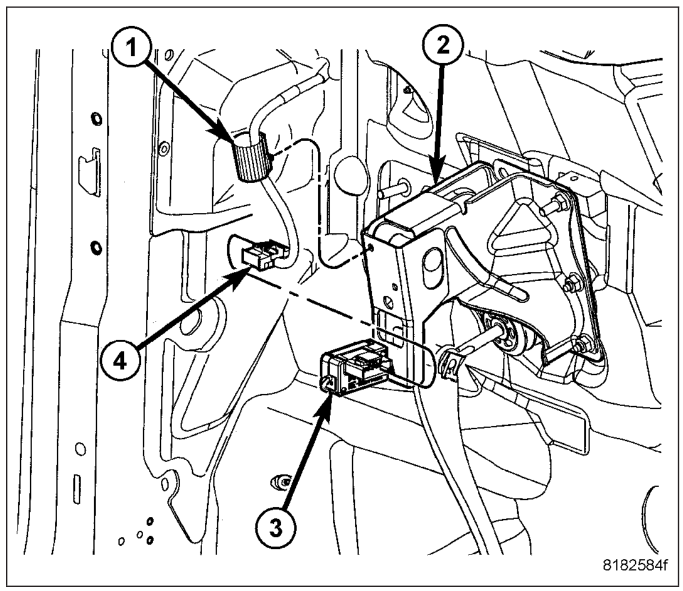
1. Obtain a NEW stop lamp switch. The adjustment lever on the NEW switch should be at a 45° angle from the wiring connector. **If the adjustment lever is parallel with the wiring connector, the switch has been pre-set and must be scrapped. DO NOT ATTEMPT TO RESET (OR RE-ADJUST) THE STOP LAMP SWITCH.**



2. Mount and adjust the NEW brake lamp switch (2) using the following steps:
   a. Install the switch in its bracket by aligning the index tab on the switch with the notch in the brake pedal bracket (1).
   b. When the switch body is fully seated in its bracket, rotate the switch clockwise approximately 30° to lock the switch into place.
   c. With the brake pedal in the fully released position, move the adjustment lever on the brake lamp switch from the 45° angled non-adjusted position, clockwise as shown, until it is parallel with the wiring connector. The brake lamp switch is now properly adjusted to the vehicle.



3. Connect the wiring harness connector (4) to the switch (3).
4. If equipped, install the silencer pad below the steering column.
5. Reconnect the battery negative terminal.
6. Check the stop lamps to verify they are operating properly and not staying on when the pedal is in the released position.
7. Road test the vehicle to ensure proper operation of the brakes (including ABS) and speed control (if equipped).



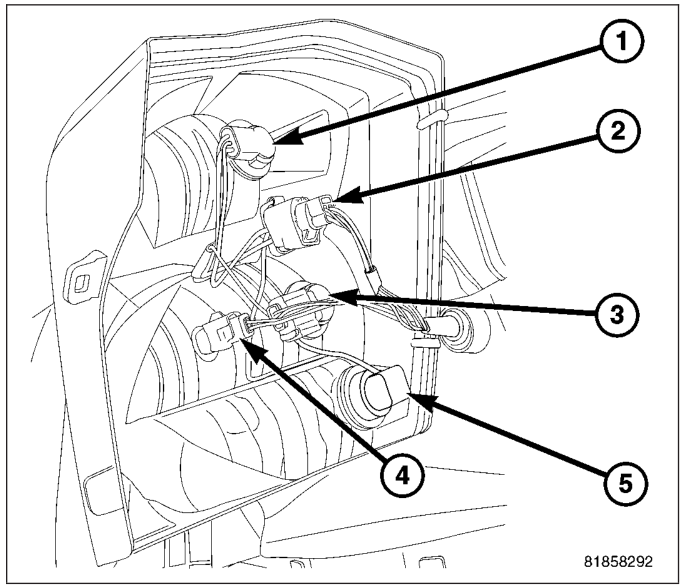
TAIL LAMP

REMOVAL

BULBS

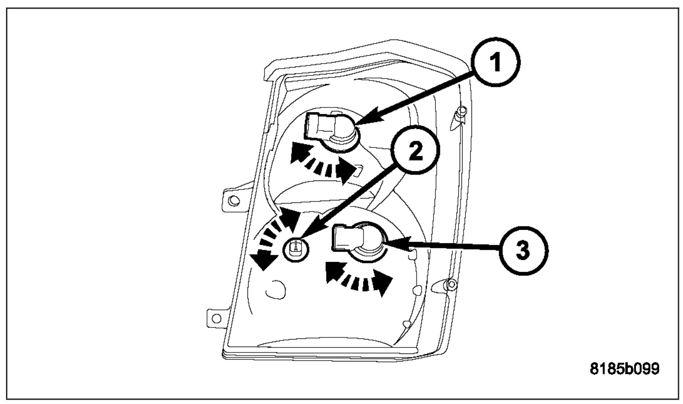
There are a total of four possible bulbs in the tail lamp unit:

- Back-Up Lamp (4)
- Park/Brake Lamp (1)
- Rear Fog Lamp (5) - Export Only
- Turn Signal (3)



1. Remove the tail lamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP UNIT - REMOVAL).

NOTE: It is not necessary to completely remove the tail lamp unit. Once loosened from quarter panel, there should be enough room to service any of the bulbs.

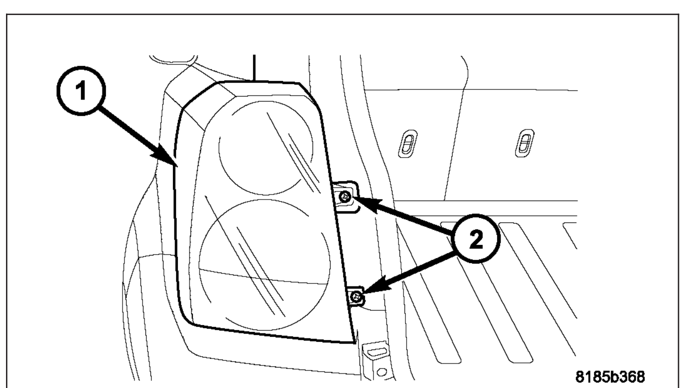


2. Disconnect the electrical connector.
3. Remove bulb socket from tail lamp unit by twisting a quarter turn counterclockwise.
4. Pull socket straight out of tail lamp unit.
5. Pull bulb from socket.

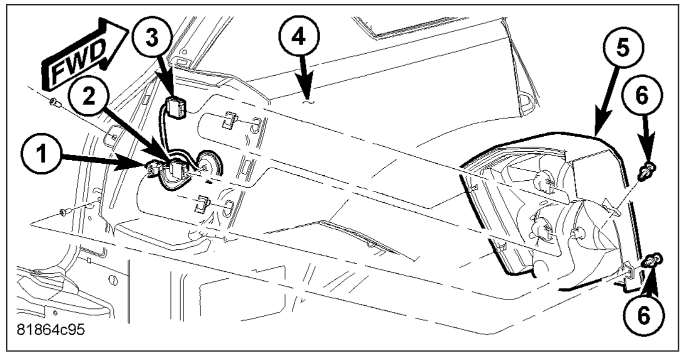
UNIT

DOMESTIC

1. Disconnect and isolate the battery negative cable.
2. Using a trim stick or equivalent, pry out the two push pins (2) retaining the tail lamp unit (1).

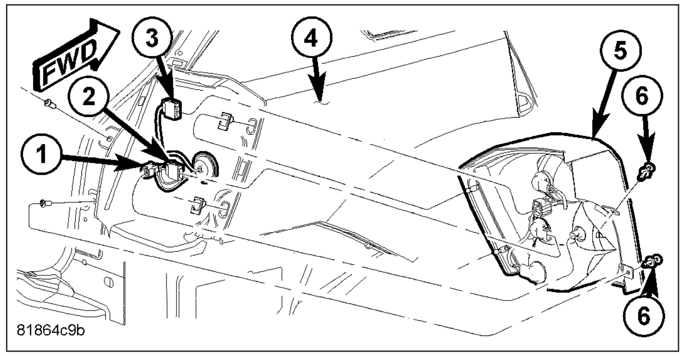


3. Pull straight back on the tail lamp unit (5) to release it from the quarter panel (4).
4. Disconnect the three electrical connectors (1, 2, and 3) to the tail lamp unit (5).
5. Remove the tail lamp unit (5) from the vehicle.
6. Remove the bulb sockets from the lamp unit by rotating the sockets counterclockwise, and then pull straight out of the unit.



EXPORT

The BUX tail lamp unit comes out the same way as the domestic, with the difference being the location of the electrical connectors (1, 2, and 3). They incorporate a rear fog lamp in the tail lamp assembly.

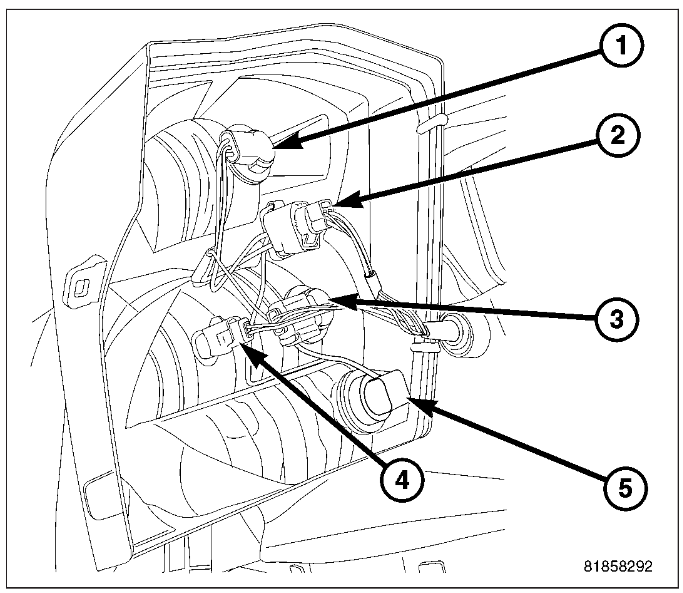


INSTALLATION

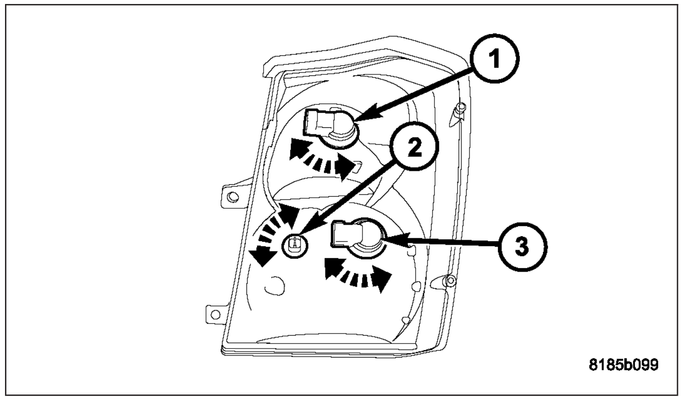
BULBS

There are a total of four possible bulbs in the tail lamp unit:

- Back-Up Lamp (4)
- Park/Brake Lamp (1)
- Rear Fog Lamp (5) - Export Only
- Turn Signal (3)



1. Push bulb into the bulb socket.
2. Install bulb socket into tail lamp assembly. Rotate the socket clockwise until fully seated.
3. Install the tail lamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP - INSTALLATION).

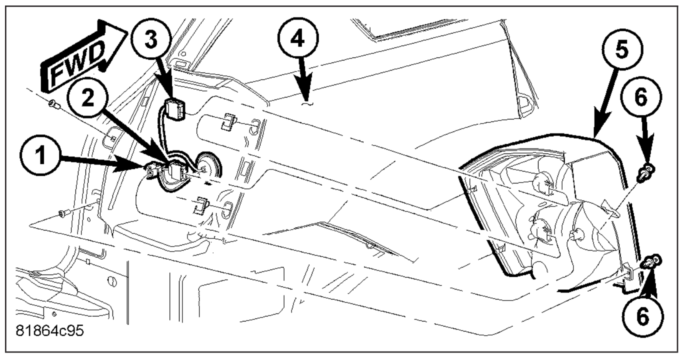


UNIT

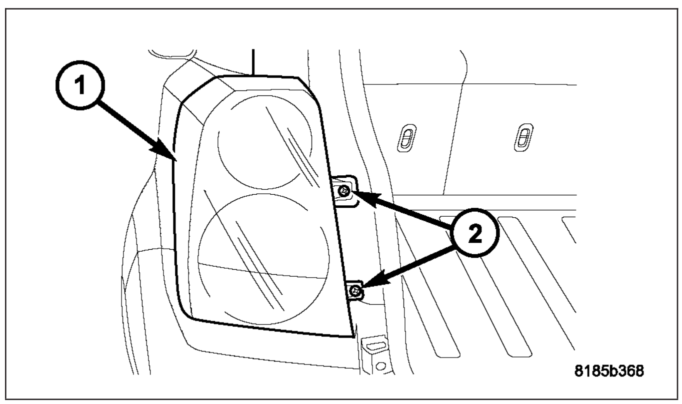
DOMESTIC

If replacing the tail lamp unit (5) with a new one, transfer the bulb sockets to the new unit (5).

1. Position the tail lamp unit (5) near the quarter panel (4),
2. Connect the three electrical connectors (1, 2, and 3).
3. Align the ball and socket retainers in the quarter panel (4) and firmly push forward until the tail lamp (5) snaps into place.



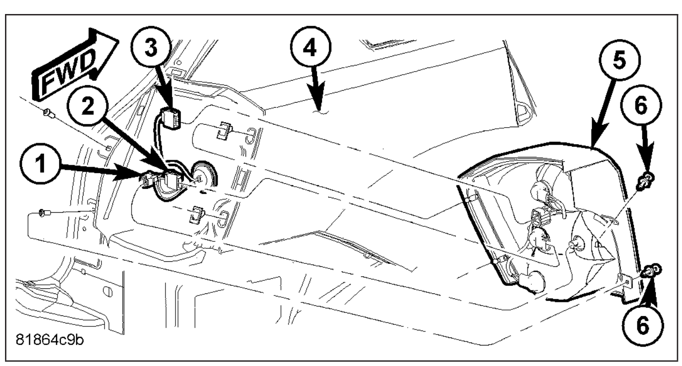
4. Install the push pin retainers (2) to the tail lamp unit (1).
5. Connect the battery negative cable.



EXPORT

If replacing the tail lamp unit (5) with a new one, transfer the bulb sockets to the new unit (5). Remember that there is a rear fog lamp bulb in the BUX tail lamp unit.

1. Install the tail lamp unit (5). Follow the same procedure as the domestic Step 1.



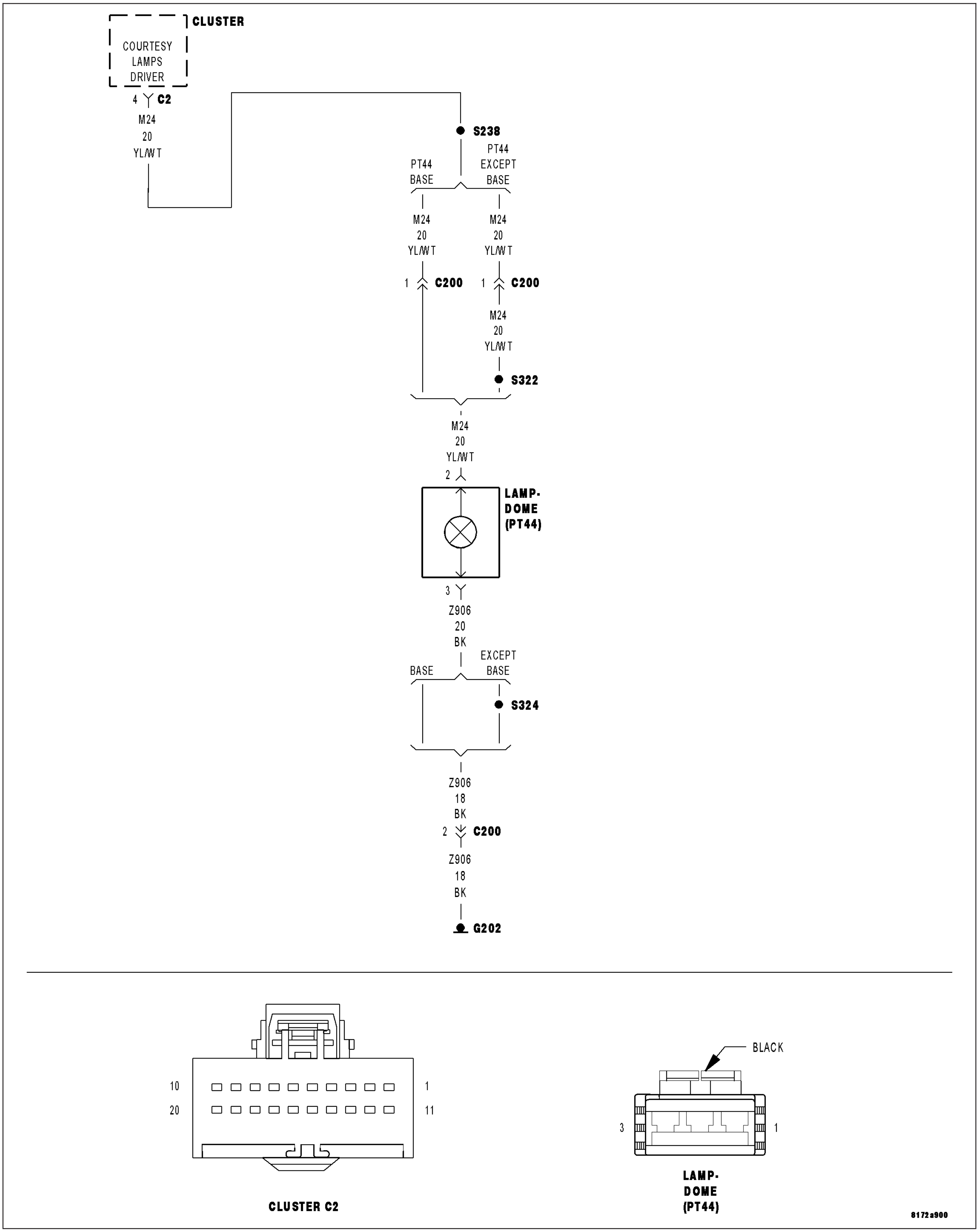
LAMPS/LIGHTING - INTERIOR

TABLE OF CONTENTS

LAMPS/LIGHTING - INTERIOR

DIAGNOSIS AND TESTING

B161A-COURTESY/DOME LAMP CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously
- **Set Condition:**
- When the Instrument Cluster detects a short to battery on the Control circuit.

Possible Causes
(M24) COURTESY LAMPS DRIVER CIRCUIT SHORT TO GROUND
(M24) COURTESY LAMPS DRIVER CIRCUIT OPEN
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
Clear all Instrument Cluster DTC's
Turn the Courtesy Lamps on.
With the scan tool, read DTC's.

Does the scan tool read: B161A-COURTESY/DOME LAMP CONTROL CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

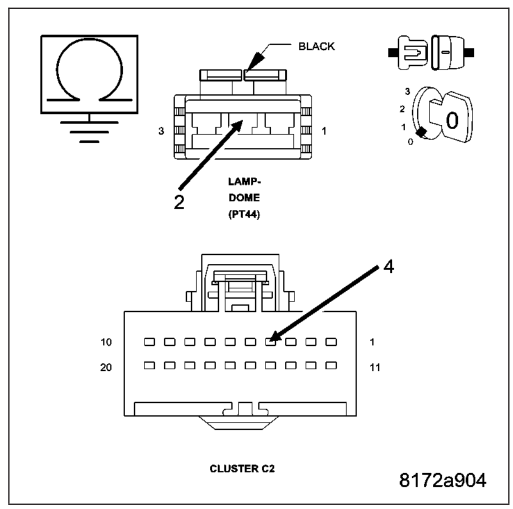
2. CHECK THE (M24) COURTESY LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the Instrument Cluster C2 harness connector.
Measure the resistance between the (M24) Courtesy Lamp Driver circuit and ground.

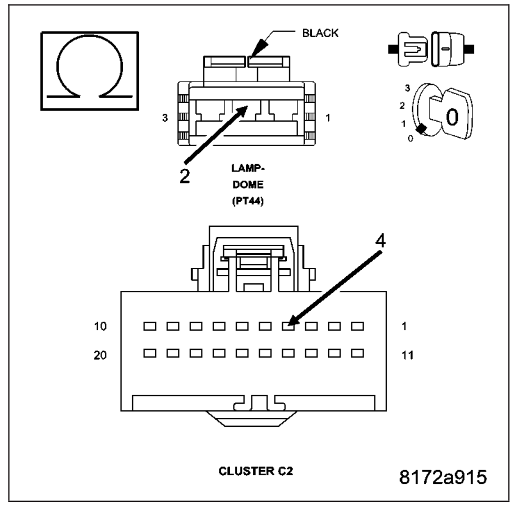
Is the resistance below 5.0 ohms?

Yes >> Repair the (M24) Courtesy Lamp Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3



3. CHECK THE (M24) COURTESY LAMPS DRIVER CIRCUIT FOR AN OPEN



Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Turn the ignition on.

Measure the voltage of the (M24) Courtesy Lamp Driver circuit.

Is the voltage below 10.0 volts?

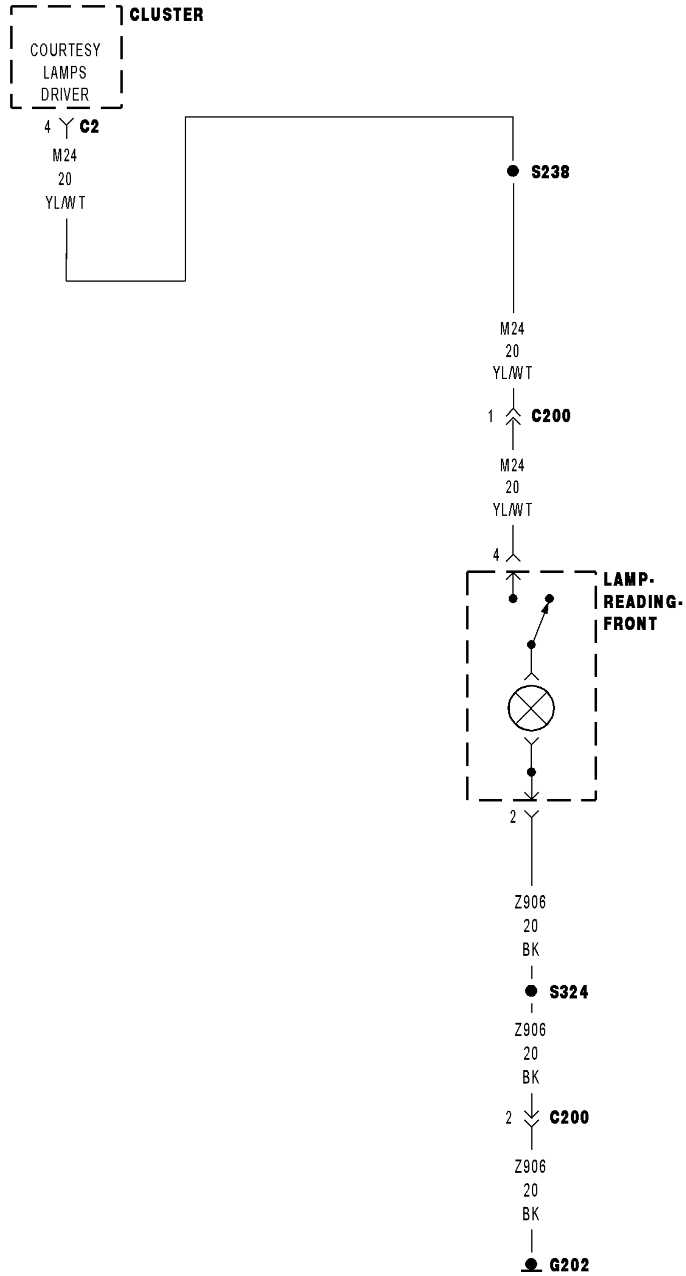
Yes >> Repair the (M24) Courtesy Lamp Driver circuit for an open.

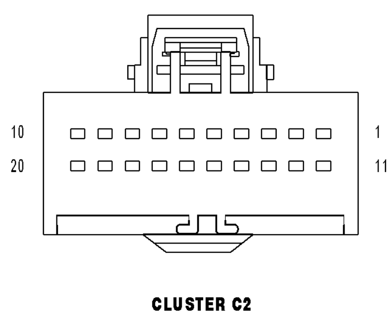
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

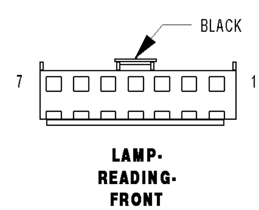
No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B161E-READING LAMP CONTROL CIRCUIT







For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously
- **Set Condition:**
- When the Instrument Cluster detects a short to battery on the Control circuit.

Possible Causes
(M28) GLOVE BOX LAMP DRIVER CIRCUIT SHORT TO GROUND
(M28) GLOVE BOX LAMP DRIVER CIRCUIT OPEN
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

Clear all Instrument Cluster DTC's

Turn the Courtesy Lamps on.

With the scan tool, read DTC's.

Does the scan tool read: B161E-READING LAMP CONTROL CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

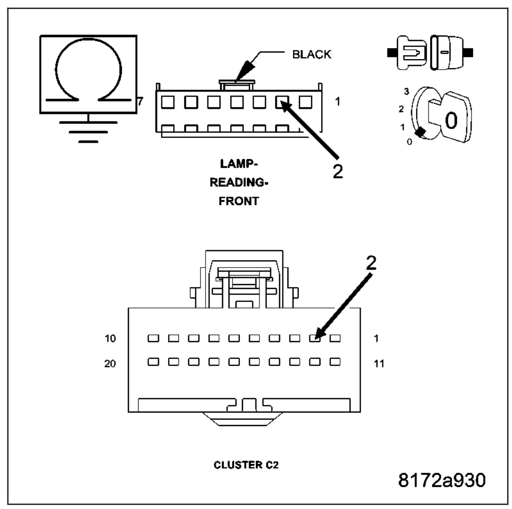
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. CHECK THE (M28) GLOVE BOX LAMP DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance between the (M28) Glove Box Lamp Driver circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Repair the (M28) Glove Box Lamp Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (M28) GLOVE BOX LAMP DRIVER CIRCUIT FOR AN OPEN

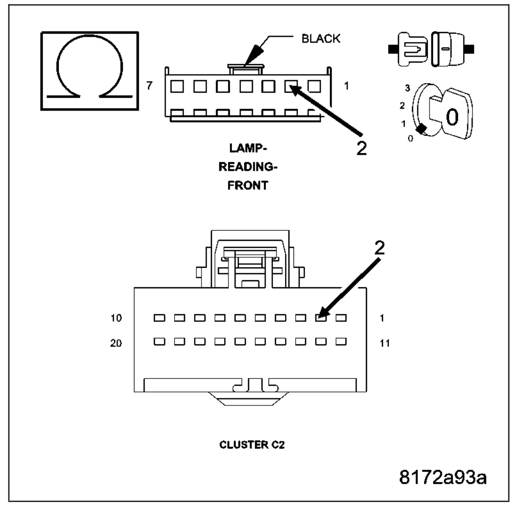
Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Activate the left and right vanity lamps (if equipped), the glove box lamp, and the left and right door handle lamps.

Turn the ignition on.

Measure the voltage of the (M28) Glove Box Lamp Driver circuit.



Is the voltage below 10.0 volts?

Yes >> Repair the (M28) Glove Box Lamp Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

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LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

SPECIFICATIONS

INTERIOR LAMPS

CAUTION: Do not use bulbs that have a higher candle power than the bulb listed in the chart below. Damage to the lamp unit can result.

BULB APPLICATION TABLE

BULB	LAMP
Courtesy/Reading Lamp	T578
Dome Lamp	T578
Rear Cargo Lamp	8-A35LF

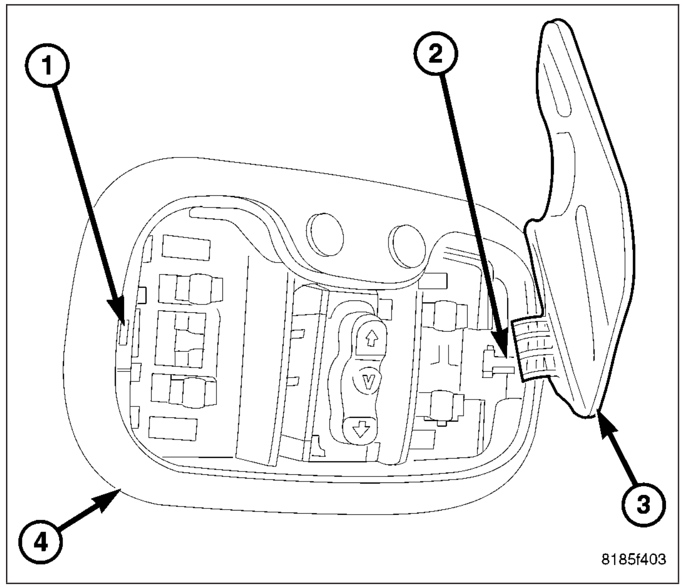
All the interior bulbs utilize a brass or glass wedge base. Bulbs with aluminum bases are not approved and should not be used.

COURTESY/READING LAMP

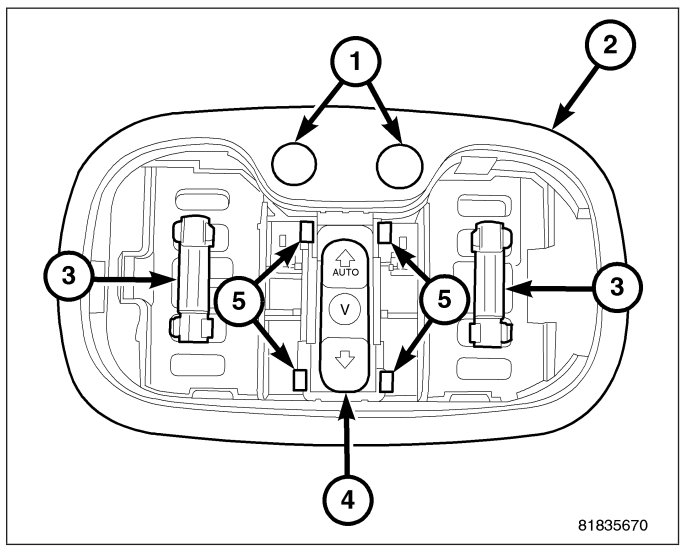
REMOVAL

BULB

1. Insert a trim stick between the lamp bezel (4) and courtesy/reading lamp lens (3) on the left side of the courtesy/reading lamp at (1).
2. Carefully swing lamp lens (3) toward the right side of the vehicle so that the tab (2) on the lens can come out of the lamp unit (4).

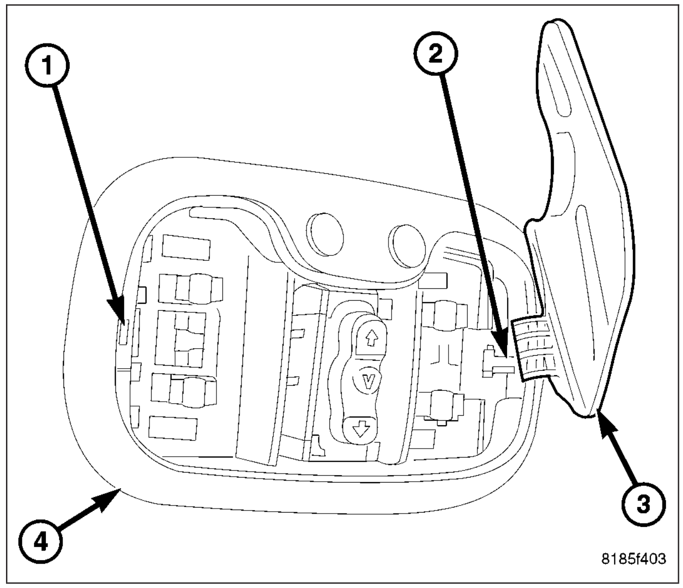


3. Remove bulb (3) from lamp unit (2).

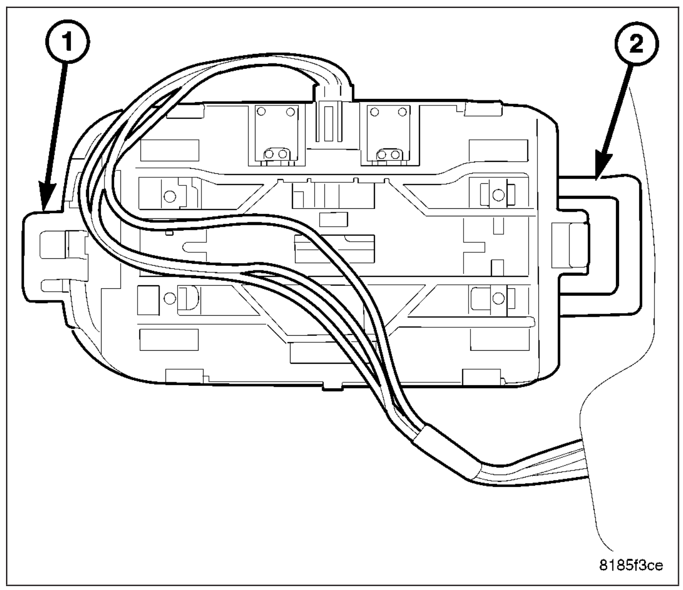


UNIT

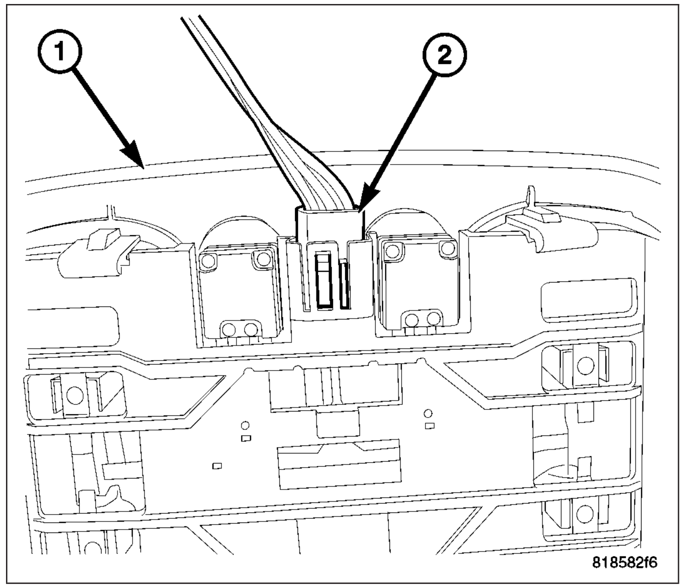
1. Insert a trim stick between the lamp bezel (4) and courtesy/reading lamp lens (3) on the left side of the courtesy/reading lamp at (1).
2. Carefully swing lamp lens (3) toward the right side of the vehicle so that the tab (2) on the lens can come out of the lamp unit (4).



3. As shown from the backside, once the tab (1) from the lens is out of the way, the right side will pull down from the headliner and then pull to the right to release the unit retaining tab (2).



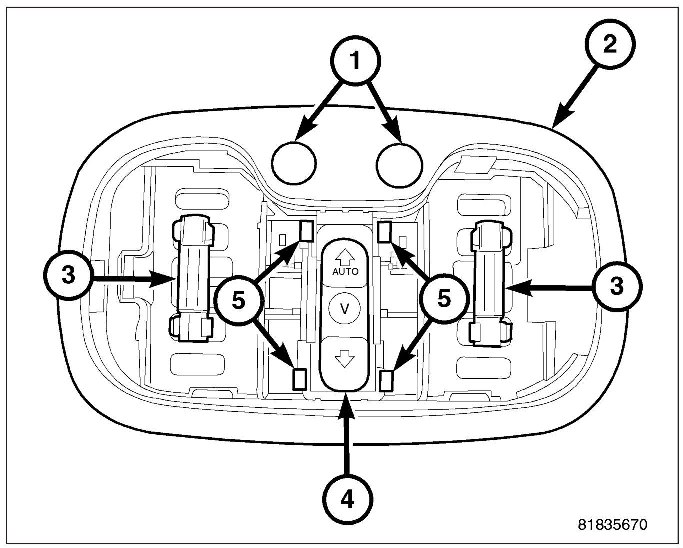
4. Disconnect the courtesy/reading lamp unit (1) electrical connector (2).



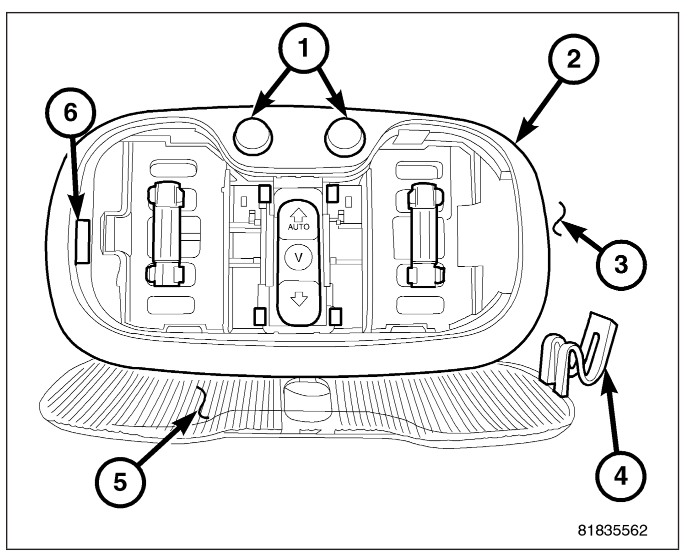
INSTALLATION

BULB

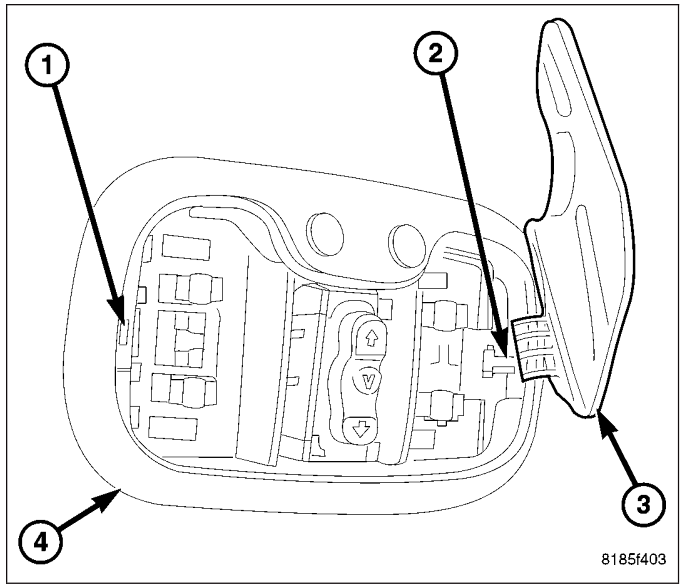
1. Position bulb (3) in holder and firmly press into place.



NOTE: When installing the lens (5), make sure that the tab on the lens (4) is inserted on the right side of the courtesy/reading lamp unit first.

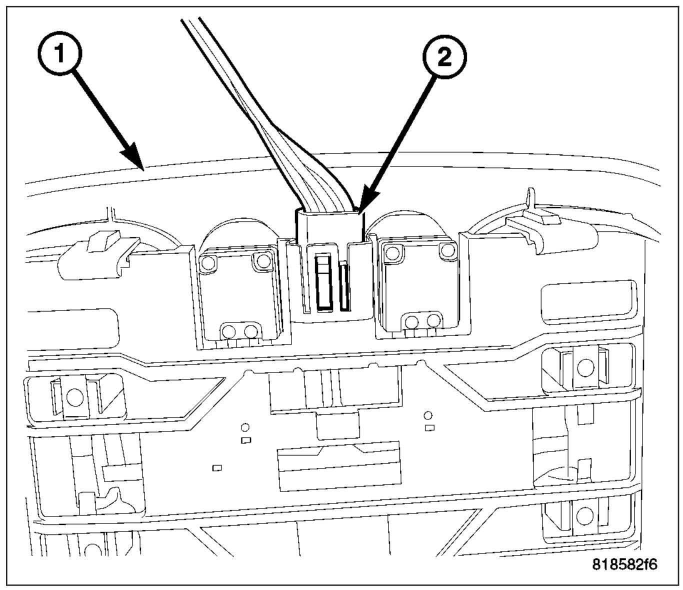


2. Once the right side tab (2) is in the headliner, roll up the left side of the lens (3) until it snaps into place at (1).

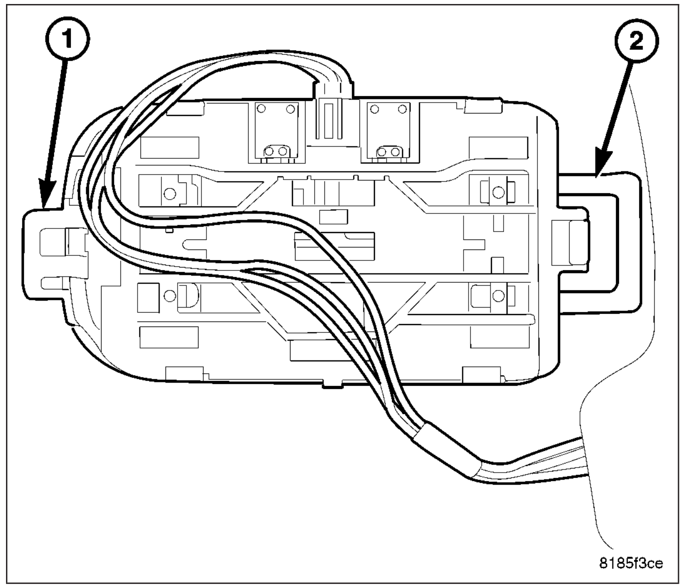


UNIT

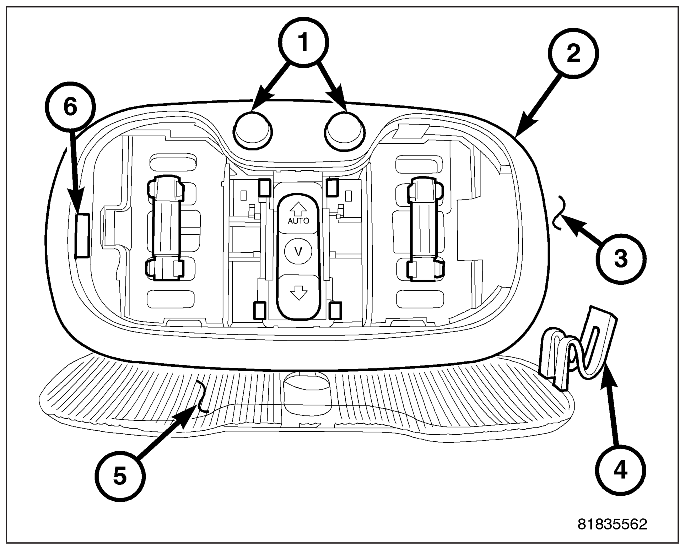
1. Connect the courtesy/reading lamp (1) electrical connector (2).



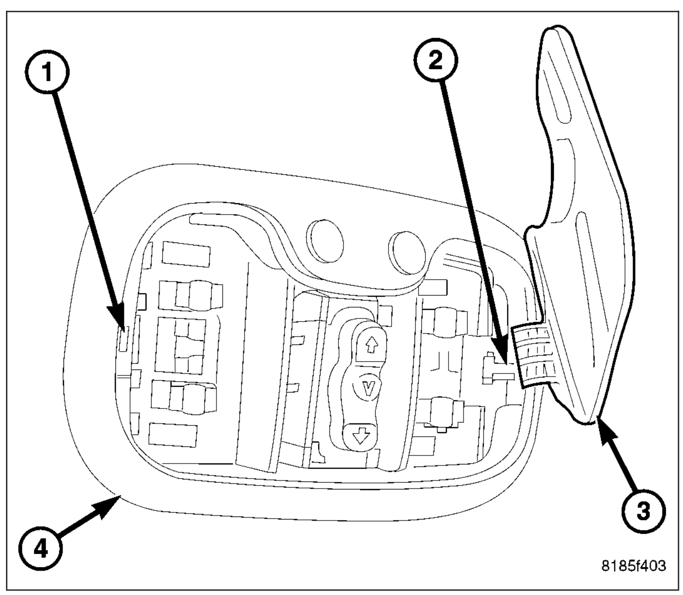
2. As shown from the backside, insert the unit tab (2) up into the headliner to the left first of all. Then push up the right side up into the headliner. The lens tab (1) will hold up the right side of the courtesy/reading lamp unit.



NOTE: When installing the lens (5), make sure that the tab on the lens (4) is inserted on the right side of the courtesy/reading lamp unit first.



3. Once the right side tab (2) is in the headliner, roll up the left side of the lens (3) until it snaps into place at (1).

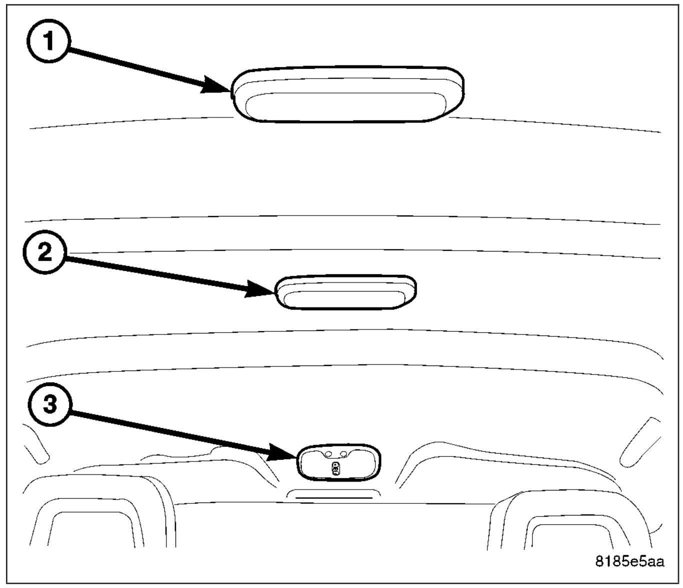


DOME LAMP

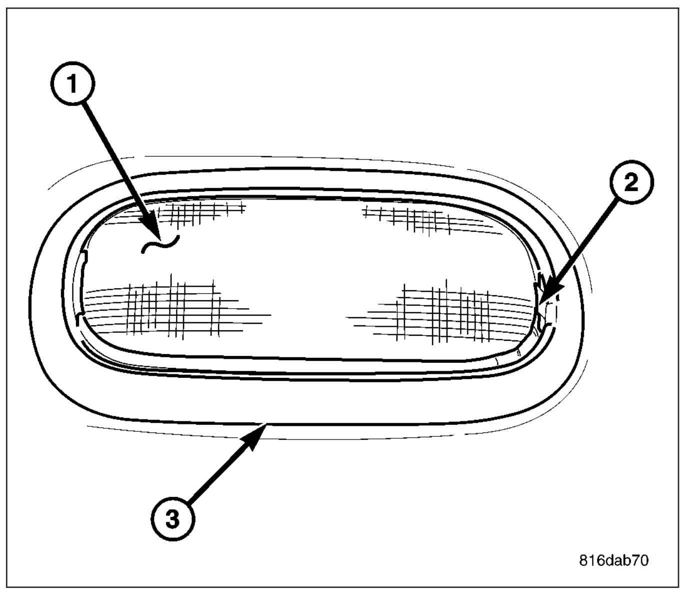
REMOVAL

BULB

1. On lower line vehicles, there will be two overhead lamps located at (1 and 2). (1) is the Cargo Lamp, and (2) is the Dome Lamp.

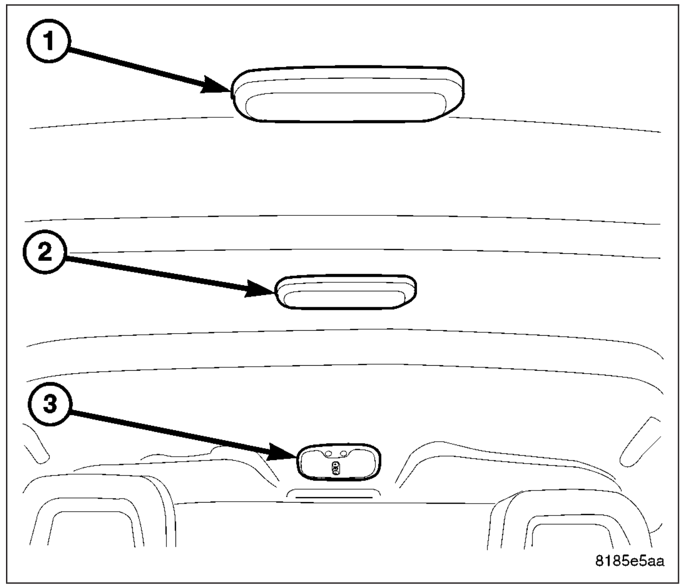


2. Insert a trim stick or equivalent between the lamp unit (3) and the lens (1) at this position (2).
3. Carefully remove the lamp lens (1).
4. Remove lamp from lamp unit.

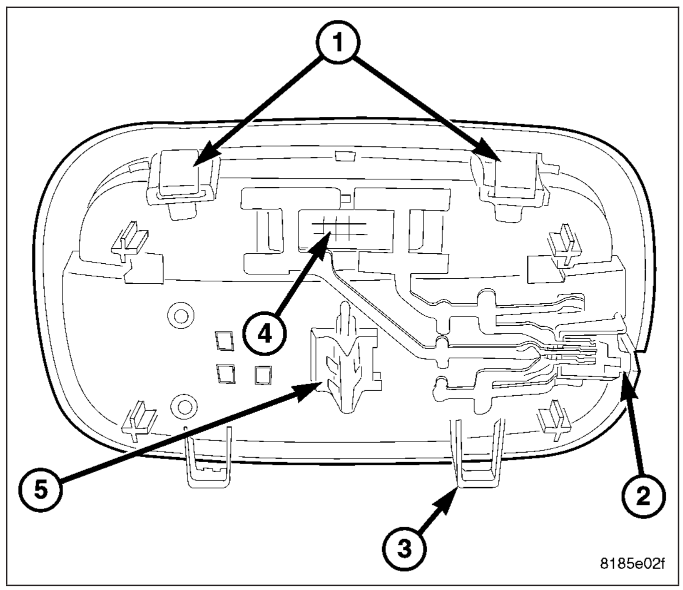


UNIT

1. On lower line vehicles, there will be two overhead lamps located at (1 and 2). (1) is the Cargo Lamp, and (2) is the Dome Lamp.



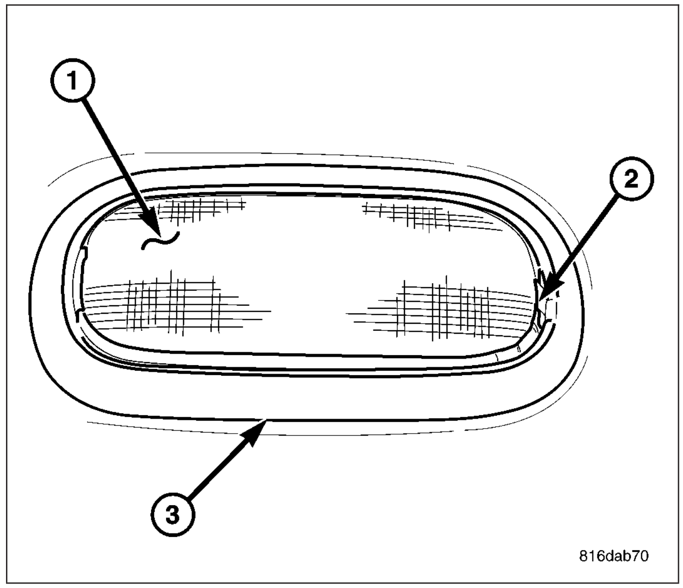
2. From the front of the dome lamp, insert a trim stick between the dome lamp unit bezel (3) and the headliner and gently pry down to release the clip (5) holding the unit to the roof panel , and the two clips (1) holding it to the headliner.
3. Pull the dome lamp forward to release the two tabs (3) from the headliner.
4. Disconnect the wire connector (2).
5. Remove the dome lamp unit from vehicle.



INSTALLATION

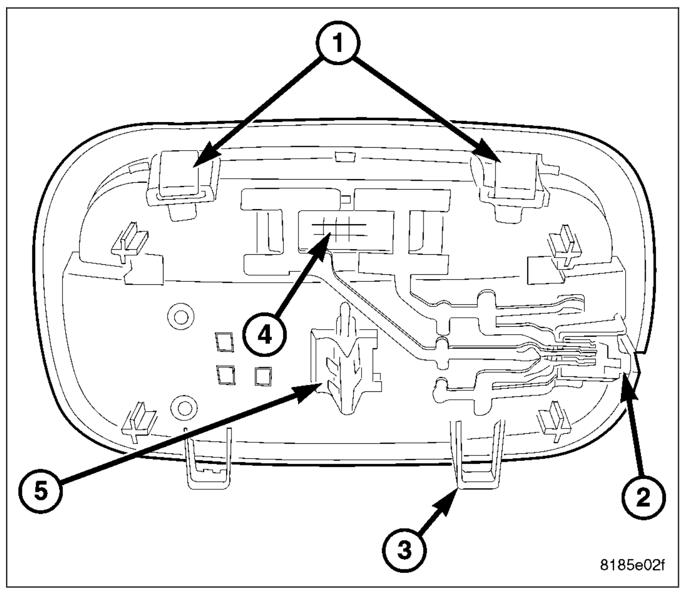
BULB

1. Push lamp in lamp unit (3) and snap into place.
2. Position lens (1) on lamp unit (3) and snap into place.



UNIT

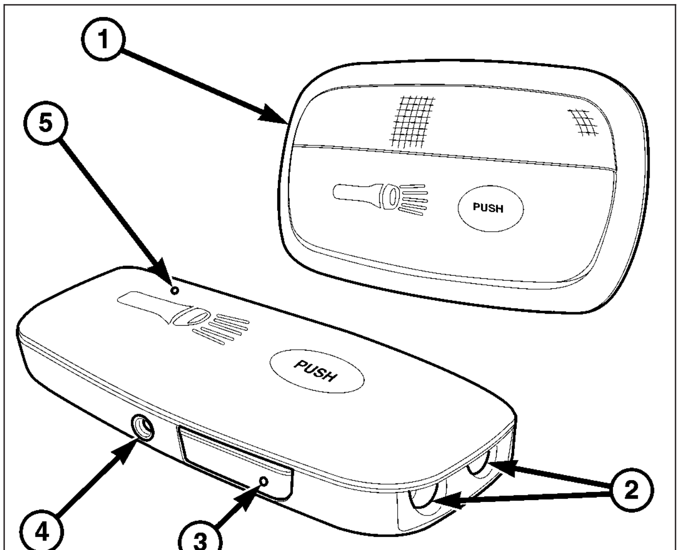
1. Connect electrical connector (2).
2. Place lamp into position, insert the unit into headliner opening, place the two tabs (3) towards the rear of the vehicle.
3. Push up on the front of the dome lamp until the three clips are fully engaged. The two front clips (1) to the headliner and the one clip (5) to the roof panel.



REAR CARGO LAMP

DESCRIPTION

An optional dual-purpose cargo lamp (1) is removable and rechargeable on some models. If equipped with this option, there is flashlight (5) that can be removed. When the flashlight is snapped out of its bezel, it can be used in emergencies or other situations. The recharge indicator (4) reminds you that the flashlight batteries are getting low and need to be recharged by reinstalling the flashlight into the cargo lamp. The flashlight uses two Light Emitting Diodes (LED's) (2) for illumination and is powered by rechargeable lithium batteries integral to the flashlight unit. The cargo lamp is still functional with or without the flashlight installed

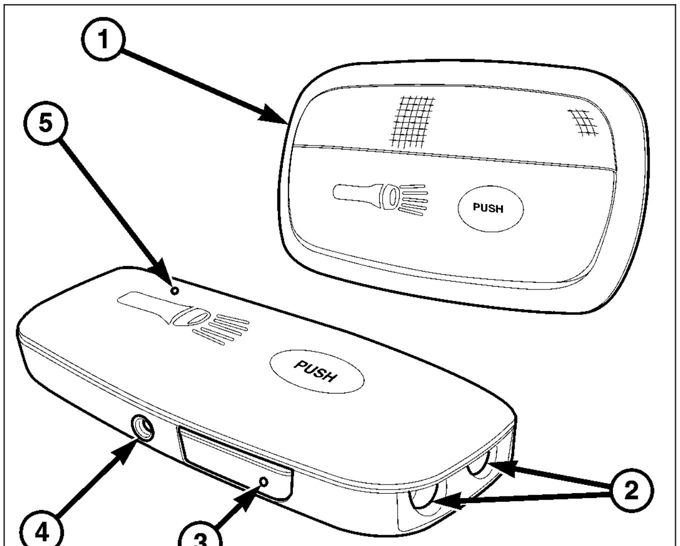


8185e221

OPERATION

Some models will be equipped with the optional Removable/Rechargeable Cargo Lamp (1). This is a flashlight (5) that is removed from the rear cargo lamp with the simple push on the flashlight on the left side, and then is pulled down to release it from the cargo lamp. The flashlight is turned on by the momentary contact switch (3). The flashlight uses Light Emitting Diodes (LED's) (2) that are not serviceable and if inoperative, must be replaced with a new flashlight.

The rear cargo lamp has B+ battery power to it when any of the doors or liftgate is opened, assuming that the thumbwheel on the left switch stalk is in the on position. The flashlight has two contacts that apply B+ battery power and ground when the ignition switch is in the Run/Start position, regardless of the position of the interior lamp thumbwheel.

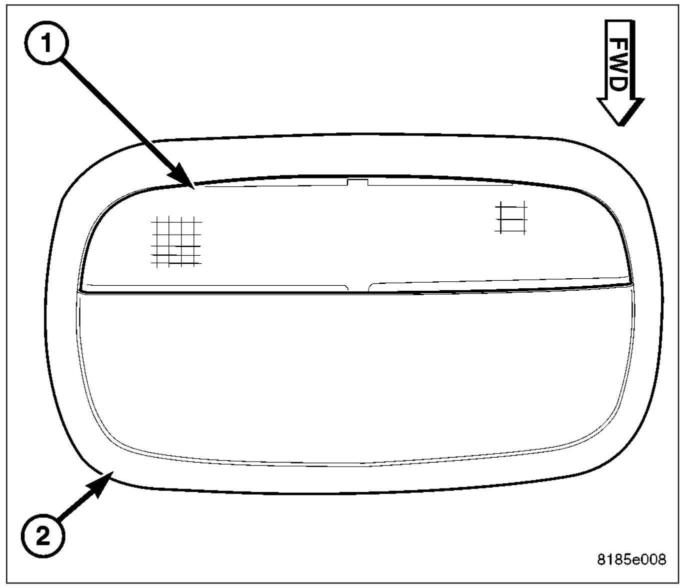


8185e221

REMOVAL

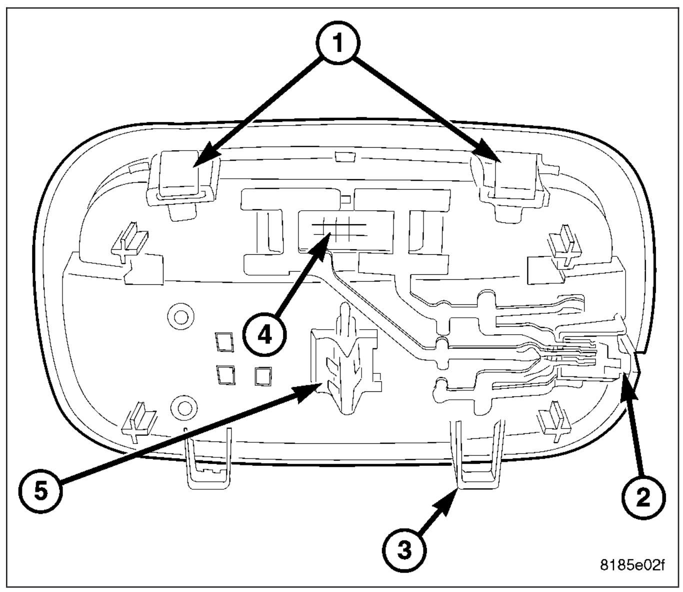
BULB

1. Open liftgate.
2. Using a trim stick or equivalent, gently pry between the lens (1) and the cargo lamp unit (2).
3. Pull bulb from unit.



UNIT

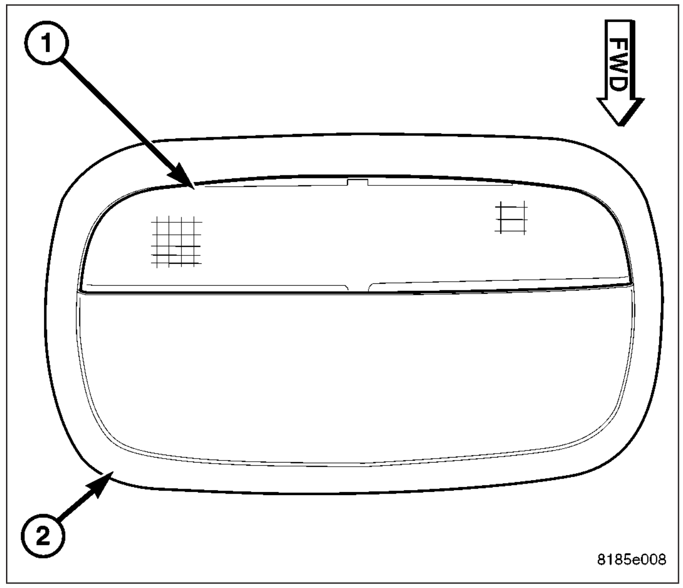
1. Open liftgate.
2. Peel down the rear of the headliner and disconnect the wire connector (2).
3. From the front of the rear cargo lamp unit, insert a trim stick between the cargo lamp unit bezel (3) and the headliner and gently pry down to release the clip (5) holding the unit to the roof panel , and the two clips (1) holding it to the headliner.
4. Pull the rear cargo lamp forward to release the two tabs (3) from the headliner.
5. Remove the rear cargo lamp unit from vehicle.



INSTALLATION

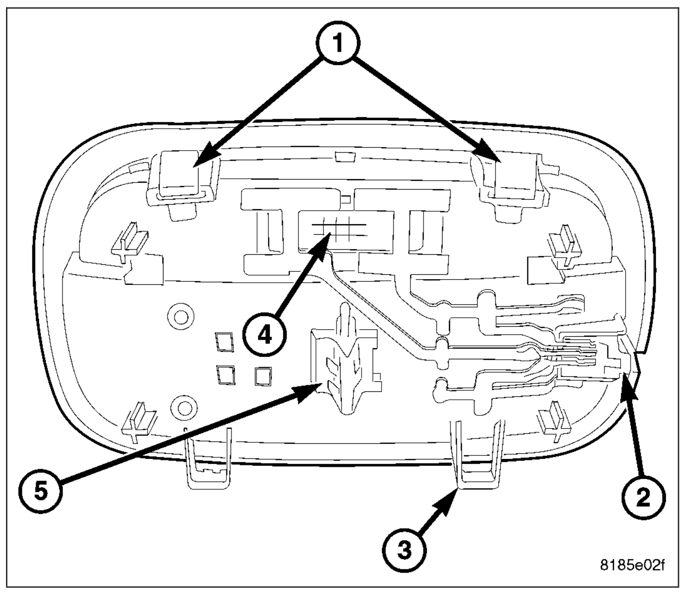
BULB

1. Push bulb into unit until seated.
2. Snap lens (1) onto lamp unit (2).



UNIT

1. Place lamp into position, insert the unit into headliner opening, place the two tabs (3) towards the rear of the vehicle.
2. Push up on the front of the rear cargo lamp until the three clips are fully engaged. The two front clips (1) to the headliner and the one clip (5) to the roof panel.
3. Peel down the rear of headliner and connect electrical connector (2).



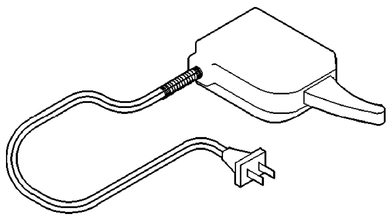
MESSAGE SYSTEMS

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MESSAGE CENTER

SPECIAL TOOLS

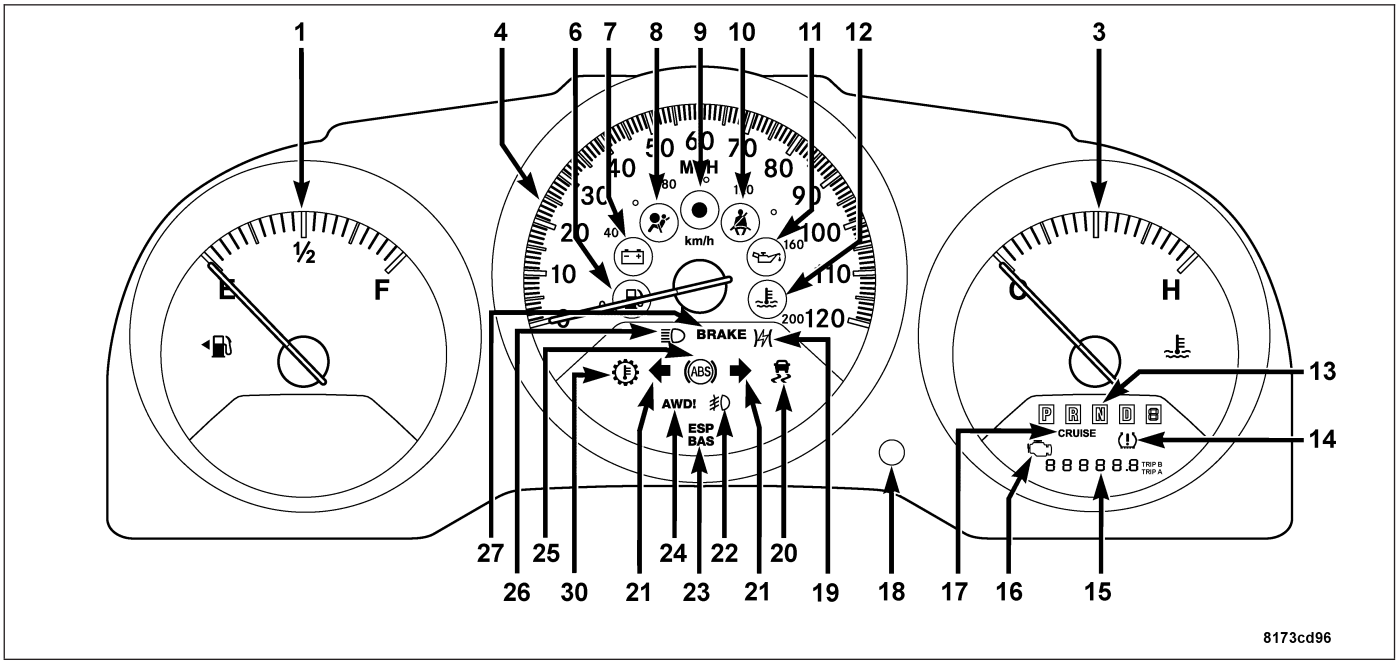
ELECTRONIC VEHICLE INFORMATION CENTER



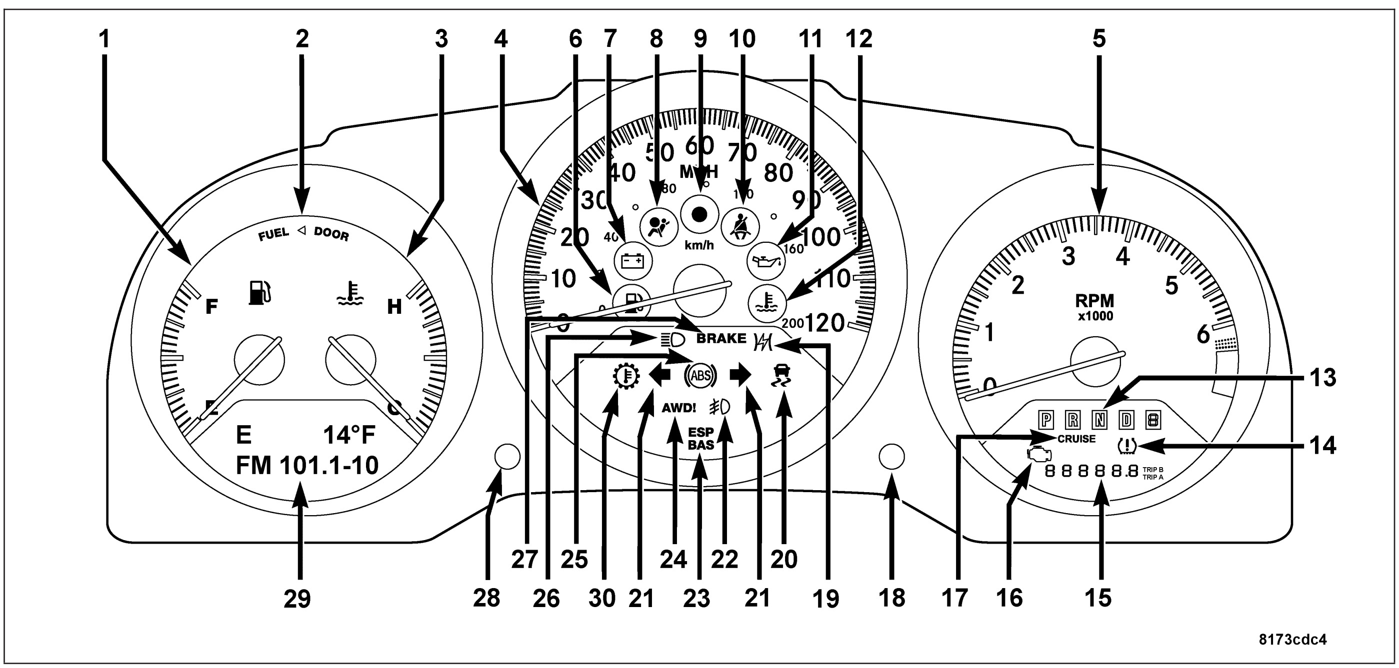
DEGAUSSING TOOL 6029

ELECTRONIC VEHICLE INFORMATION CENTER

DESCRIPTION



The base instrument cluster can be identified by the single **TRIP SHAFT** button (18) located to the left of the Temperature Gauge (3). The odometer display (15) doubles as the outside air temperature display when selected by toggling through the odometer menu using the **TRIP SHAFT** button.



The Electronic Vehicle Information Center (EVIC) features a driver-interactive display (29). The display is located in the lower left part of the instrument cluster below the fuel and engine temperature gauges (1 and 3). This system conveniently allows the driver to select a variety of useful information by pressing the **STEP** button (28) to the right of the EVIC display. The EVIC displays information related to the following:

- System Status
- Vehicle information warning message displays
- Personal Settings (customer programmable features)
- Compass display

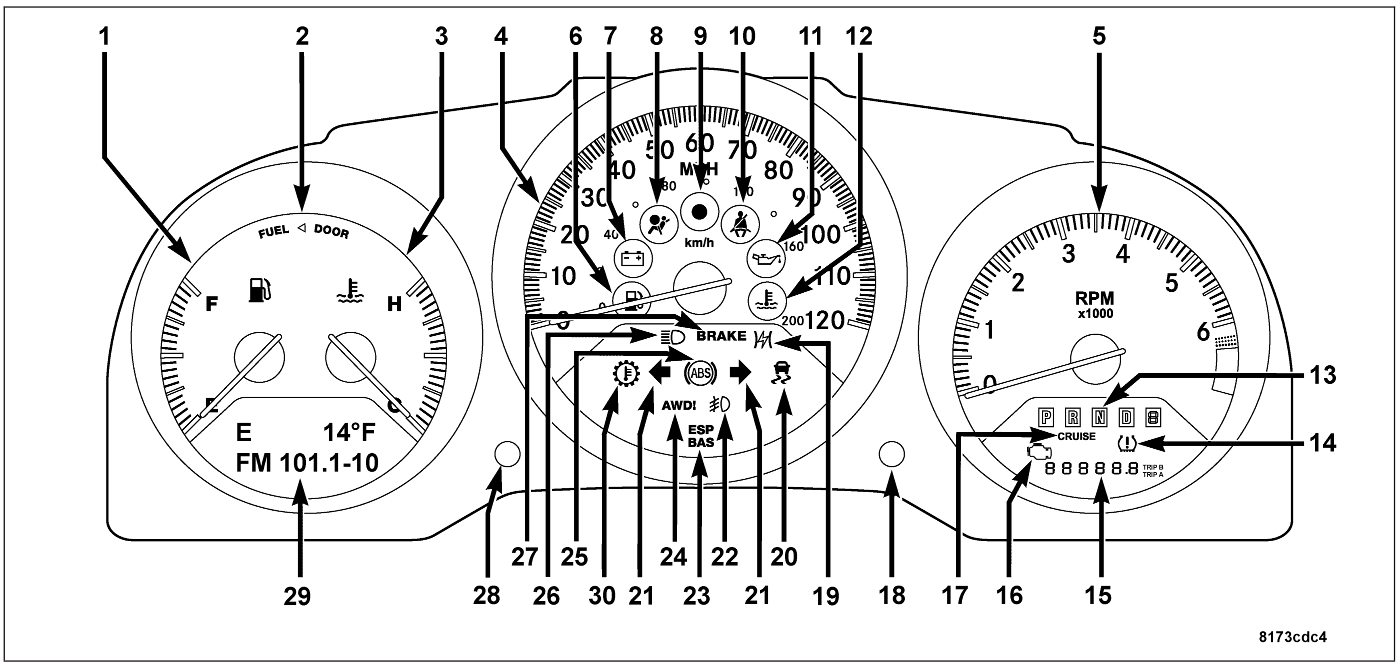
- Outside temperature display
- Trip computer functions
- UConnect™ hands-free communication system displays - If Equipped
- Navigation system screens - If Equipped
- Audio mode display

The EVIC system is comprised of several different components. Those components are:

- Instrument Cluster
- EVIC **STEP** Button
- Ambient Temperature Sensor
- Remote Compass Module (RCM)
- Controller Area Network (CAN) Data Bus
- Local Interface Network (LIN) Data Bus

The EVIC display and **STEP** button are part of the Instrument Cluster assembly and cannot be serviced as separate components. If the display or button are inoperative the complete Instrument Cluster assembly must be replaced, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

OPERATION



The Electronic Vehicle Information Center (EVIC) uses both non-switched and ignition switched sources of battery current so that some of its features remain operational at any time, while others may only operate with the ignition switch in the On position. When the ignition switch is turned to the On position, the EVIC display (29) will return to the last function being displayed before the ignition was turned to the Off position.

The EVIC system is comprised of several different components that communicate over the Controller Area Network (CAN) and Local Interface Network (LIN) Data Buses. If the system is inoperative a scan tool and the appropriate diagnostic information must be used to diagnose the system and related data buses.

The instrument cluster **STEP** button (28) is used to operate the different functions of the EVIC system. Pressing and releasing the **STEP** button will scroll through the following displays:

- Compass/Temperature/Audio
- Average Fuel Economy
- Distance to Empty
- Elapsed Time
- Personal Settings

Once a particular system is displayed, short and long presses of the **STEP** button will move the EVIC through the system menu. Pressing and holding the **STEP** button once will clear the resettable function currently being dis-

played. Reset will only occur if a resettable function is currently being displayed. To reset all resettable functions, press and release the **STEP** button a second time within 3 seconds of resetting the currently displayed function (Reset ALL will be displayed during this 3 second window).

EVIC DISPLAY MODES

SYSTEM STATUS MODE

System display mode displays warnings and user interaction messages on the EVIC display (29). The driver can scroll to view multiple messages by using the **STEP** button.

When the appropriate conditions exist, the EVIC displays the following messages:

- Turn Signal On (with a continuous warning chime)
- Left Front Turn Signal Lamp Out (with a single chime)
- Left Rear Turn Signal Lamp Out (with a single chime)
- Right Front Turn Signal Lamp Out (with a single chime)
- Right Rear Turn Signal Lamp Out (with a single chime)
- Personal Settings Not Available – Vehicle Not in Park (automatic transmissions) or vehicle in motion (manual transmissions)
- Left/Right Front Door Ajar (one or more, with a single chime if speed is above 1 mph (1.6 km/h))
- Left/Right Rear Door Ajar (one or more, with a single chime if speed is above 1 mph (1.6 km/h))
- Door(s) Ajar (with a single chime if vehicle is in motion)
- Trunk Ajar (with a single chime)
- Headlamps On/Lights On With Key Out Of Ignition.

COMPASS/TEMPERATURE/AUDIO

Compass heading and outside temperature are displayed at the top of the EVIC display screen. On the lower half of the screen the audio mode is displayed along with the odometer. One of eight compass headings to indicate the direction the vehicle is facing (N, S, E, W, NE, NW, SE, SW) and to select one of 15 compass variance settings. Outside temperature is displayed in °C (degrees Celsius) or °F (degrees Fahrenheit). Audio mode can display any one of 12 radio station preset frequencies, CD disc number, CD track number, tape, and one of 200 Satellite Radio Channels - if equipped.

For additional information regarding the compass, refer to Personal Settings (Customer Programmable Features) in this section.

AVERAGE FUEL ECONOMY

Shows the average fuel economy since the last reset. When the fuel economy is reset, the display will read “RESET” or show dashes for two seconds. Then, the history information will be erased, and the averaging will continue from where it was before the reset.

DISTANCE TO EMPTY (DTE)

NOTE: Significant changes in driving style or vehicle loading will greatly affect the actual drivable distance of the vehicle, regardless of the DTE displayed value.

Shows the estimated distance that can be travelled with the fuel remaining in the tank. This estimated distance is determined by a weighted average of the instantaneous and average fuel economy, according to the current fuel tank level. This is not resettable.When the DTE value is less than 30 miles (48 kilometers) estimated driving distance, the DTE display will change to a text display of ″LOW FUEL″. This display will continue until the vehicle runs out of fuel. Adding a significant amount of fuel to the vehicle will turn off the ″LOW FUEL″ text and a new DTE value will be displayed, based on the current values in the DTE calculation and the current fuel tank level.

ELAPSED TIME

Shows the total elapsed time of travel since the last reset when the ignition switch is in the ACC position. Elapsed time will increment when the ignition switch is in the ON or START position.

HANDS FREE TELEPHONE MODE - IF EQUIPPED

Provides the following information and features for the optional hands-free communications system:

- Phone status: idle, voice mail, roaming, battery strength and signal strength in increments of 20 percent
- Call status: Incoming call, connecting, connected, air time in minutes and seconds, call ended, busy, call failed, roaming and no phone connection
- Caller ID phone number display

PERSONAL SETTINGS MODE (CUSTOMER PROGRAMMABLE FEATURES)

Allows the driver to set and recall features when the transmission is in Park by pressing and releasing the **STEP** button until Personal Settings is displayed in the EVIC. The following personal settings can be set and recalled:

- Language: English, Spanish and French (domestic markets) German and Italian (export markets)
- Lock doors automatically at 15 mph (24 km/h), On or Off
- Unlock door automatically on exit, On or Off
- Remote Keyless Entry unlock driver door on first press or unlock all doors on first press
- Sound horn with Remote Keyless Entry Lock, On or Off
- Turn headlamps on with Remote Keyless Entry Lock, On or Off
- Delay turning headlamps off for 0, 30, 60 or 90 seconds
- Key-Off Power Delay (delay power off to accessories until exit off, 45-seconds maximum, 5-minute maximum, 10-minute maximum)
- Illuminated Approach - Turn headlamps on with Remote Keyless Entry Unlock, Off or 30, 60 or 90 seconds
- Display units in English or Metric
- Compass Variance Setting 1 through 15
- Calibrate Compass Yes/No

DIAGNOSIS AND TESTING

ELECTRONIC VEHICLE INFORMATION CENTER

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not place any electronic devices (cell phones, laptop computers, PDA's, portable DVD players, etc), on or near the instrument panel as the Remote Compass Module (RCM) performance may be effected. Do not use magnetic tools when servicing the RCM.

The Electronic Vehicle Information Center (EVIC) data is obtained from several components on the Controller Area Network (CAN) and Local Interface Network (LIN) Data Bus circuits. The EVIC will not function properly if the bus messages from any of these components is not received. If no EVIC data is displayed or the display indicates dashes ″– –″, check the CAN Data Bus circuit communications, the Instrument Cluster functions, the Remote Compass Module (RCM) and the Totally Integrated Power Module (TIPM).

The use of a scan tool and the proper diagnostic procedures information are recommended for further testing of the EVIC,the RCM, the CAN Data Bus and Local Interface Network (LIN) Data Bus circuits. Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

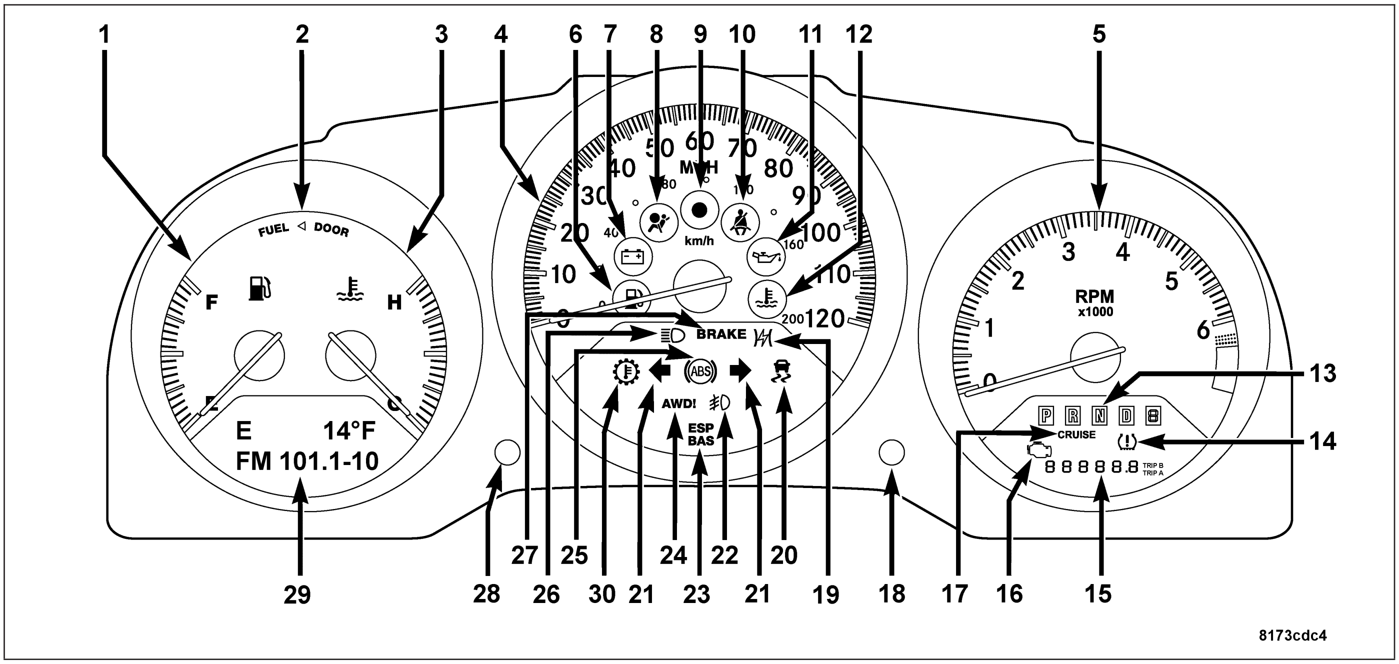
STANDARD PROCEDURE

COMPASS CALIBRATION

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not place any electronic devices (cell phones, laptop computers, PDA's, portable DVD players, etc), on or near the instrument panel as the Remote Compass Module (RCM) performance may be effected. Do not use magnetic tools when servicing the RCM.

The electronic compass unit features a continuous self-calibrating feature. This feature automatically updates the compass calibration as the vehicle is driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or

the Electronic Vehicle Information Center (EVIC) displays “CAL”, perform the following calibration procedure. Also, any time a new RCM is installed, it must be calibrated using this procedure.



Calibrate the compass manually as follows:

NOTE: Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

1. Start the engine but leave the vehicle in “PARK”.
2. Continue to depress and release the **STEP** button (28) until the “Personal Settings” menu is displayed.
3. Once in the “Personal Settings” menu depress and release the **STEP** button (28) several times until “Calibrate Compass (Yes)” is displayed.
4. A long (longer than two seconds) **STEP** button press will place the compass in calibration mode. The “Cal” indicator will change from flashing to on continuously in the EVIC display (29) to indicate that the compass is now in the calibration mode and that the vehicle can now be driven to calibrate. (A short **STEP** button press from the ″Calibrate Compass (Yes)″ screen will exit the EVIC Customer Programmable features, and return it to its normal operating mode).
5. To complete the compass calibration, drive the vehicle in one or more complete 360 degree circles under 5 mph (8 km/h) in an area free of large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines, until the “CAL” indicator turns off. The compass will now function normally.

NOTE: If the compass display indicates an inaccurate compass heading or the display is locked up, the RCM may be inoperative or the vehicle may need to be demagnetized. Perform the Compass Demagnetizing Procedure prior to performing any system diagnosis, (Refer to 8 - ELECTRICAL/MESSAGE CENTER/ELECT VEHICLE INFORMATION CENTER - STANDARD PROCEDURE - COMPASS DEMAGNETIZING).

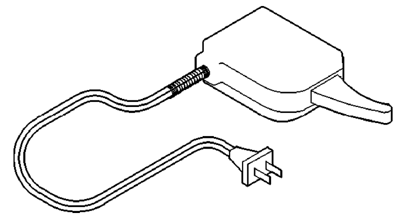
NOTE: If the compass display indicates dashes ″– –″ the RCM may be inoperative or the vehicle may need to be demagnetized. Perform the Compass Demagnetizing Procedure prior to performing any system diagnosis, (Refer to 8 - ELECTRICAL/MESSAGE CENTER/ELECT VEHICLE INFORMATION CENTER - STANDARD PROCEDURE - COMPASS DEMAGNETIZING).

NOTE: If the “CAL” message remains in the display or if the compass heading is inaccurate following the calibration procedure and there are no internal compass faults, either there is excessive magnetism near the compass, or the unit is inoperative. Repeat the calibration procedure at least one more time prior to performing any system diagnosis.

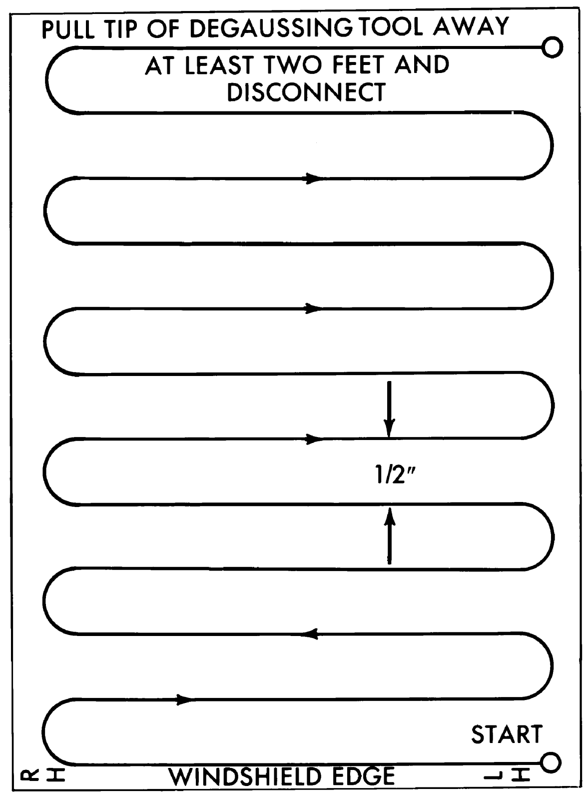
NOTE: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

COMPASS DEMAGNETIZING

A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the roof panel above the overhead console. Equivalent units must be rated as continuous duty for 110/115 volts and 60 Hz. They must also have a field strength of over 350 gauss at 7 millimeters (0.25 inch) beyond the tip of the probe.



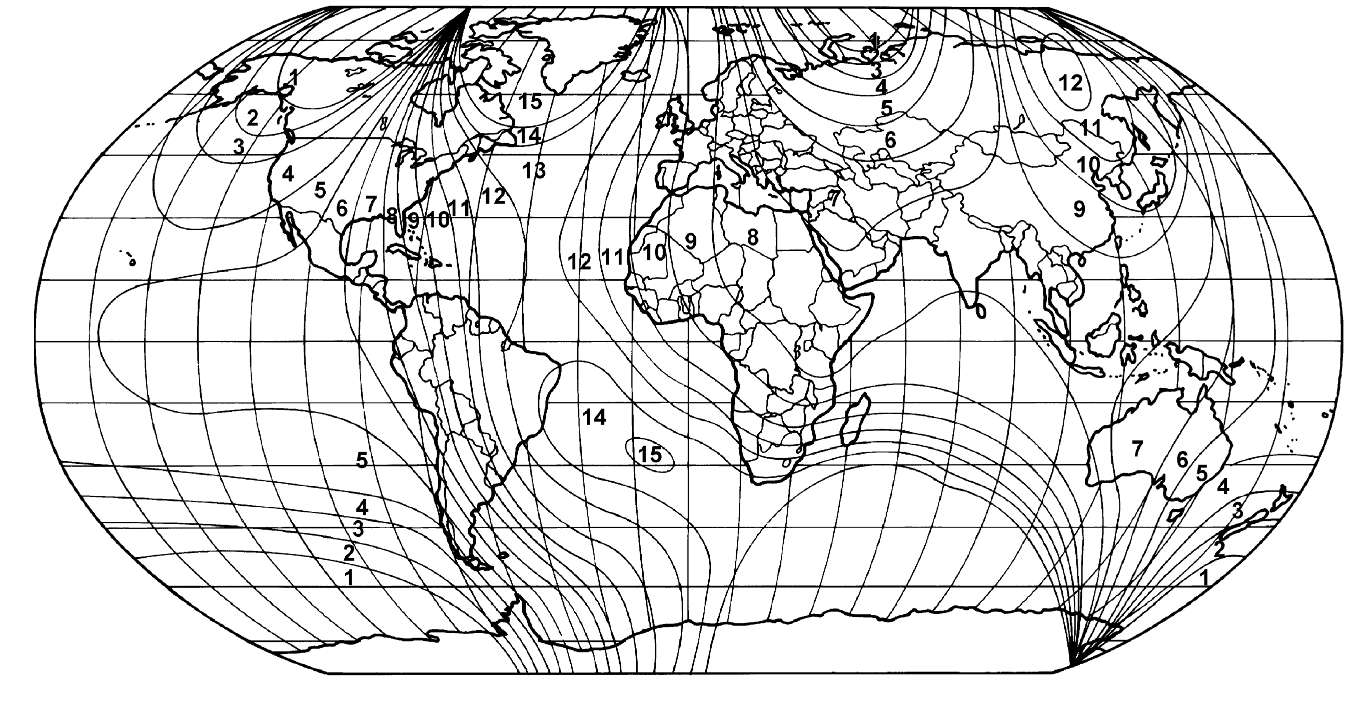
To demagnetize the roof panel proceed as follows:



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1. Be certain that the ignition switch is in the Off position, before you begin the demagnetizing procedure.
2. Place a piece of paper approximately 22 by 28 centimeters (8.5 by 11 inches), oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header. The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.
3. Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.
4. Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool connected.
5. Contact the roof panel with the plastic coated tip of the degaussing tool. Be sure that the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 13 millimeters (0.50 inch) between passes, move the tool at least 11 centimeters (4 inches) to each side of the roof center line, and 28 centimeters (11 inches) back from the windshield header.
6. With the degaussing tool still energized, slowly back it away from the roof panel. When the tip of the tool is at least 61 centimeters (2 feet) from the roof panel, disconnect the tool.
7. Calibrate the compass, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - STANDARD PROCEDURE - COMPASS CALIBRATION) and adjust the compass variance, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT).

COMPASS VARIANCE ADJUSTMENT

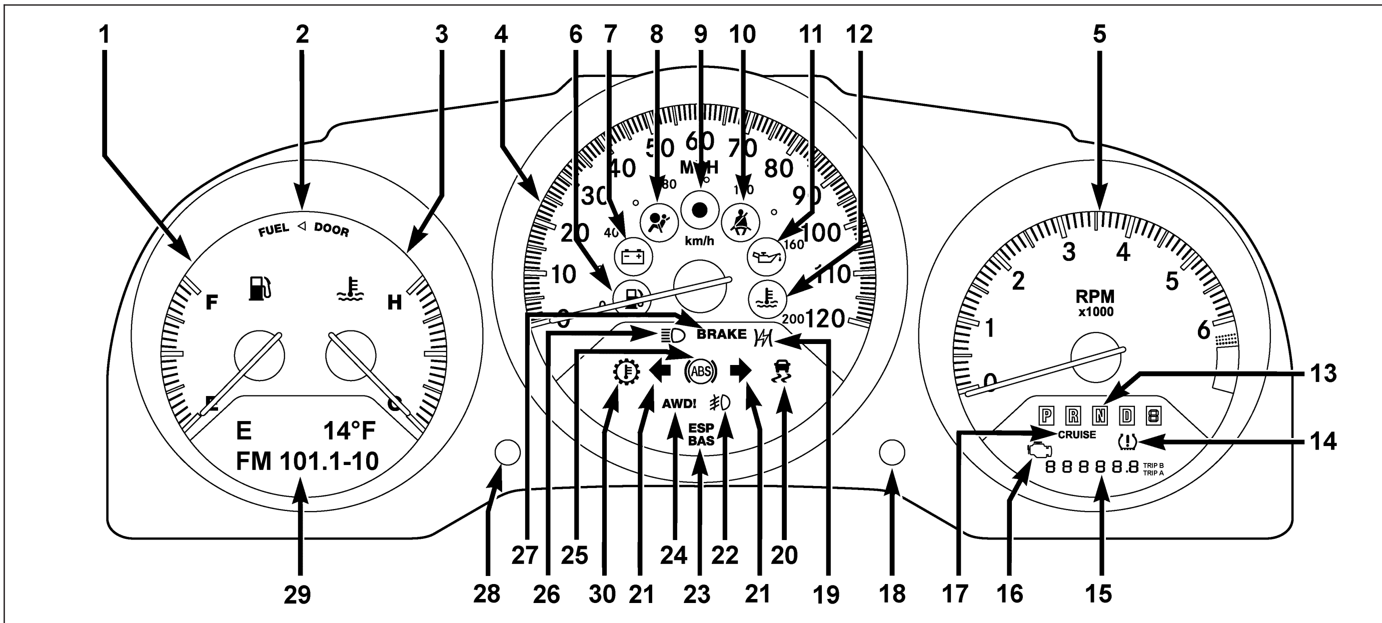


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Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give inaccurate readings. To optimize compass accuracy, the compass variance should be properly set according to the compass variance map zone for the region that the vehicle is in.

To set the compass variance:

1. Using the Variance Settings map, find your geographic location and note the zone number.



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2. Turn the ignition switch to the On position.
3. Continue to depress and release the **STEP** button (28) until the “Personal Settings” menu is displayed.

4. Once in the “Personal Settings” menu depress and release the **STEP** button (28) several times until “Compass Variance” is displayed. The “Compass Variance” message and the current variance zone number will be displayed. The default variance zone is 8.

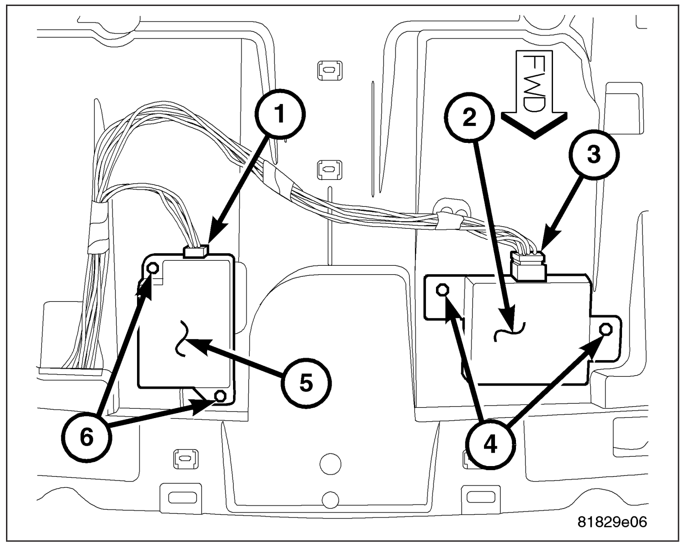
NOTE: During programming, the Zone value will wrap around from Zone 15 to Zone 1.

5. To change the zone, press and hold (longer than two seconds) the **STEP** button to increment the variance one step. Repeat as necessary, with individual long (longer than two seconds) **STEP** button presses for each increment, until the desired variance is achieved.
6. To exit the Variance Programming, press the **STEP** button with a short (less than one second) button press.
7. Confirm that the correct directions are now indicated by the compass.

REMOVAL - REMOTE COMPASS MODULE

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

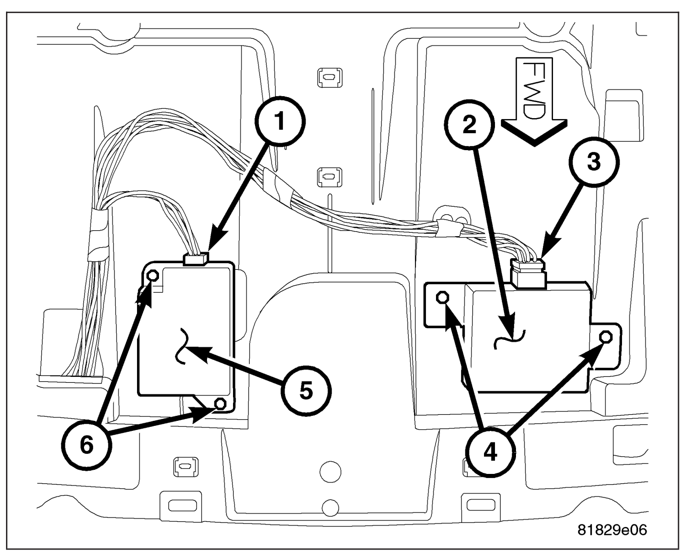
NOTE: RHD model shown in illustration. LHD model similar.



1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel upper panel, (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - REMOVAL).
3. Remove the screws (6) securing the Remote Compass Module (RCM) (5) to the instrument panel.
4. Disconnect the RCM electrical connector (1) and remove the RCM from the vehicle.

INSTALLATION - REMOTE COMPASS MODULE

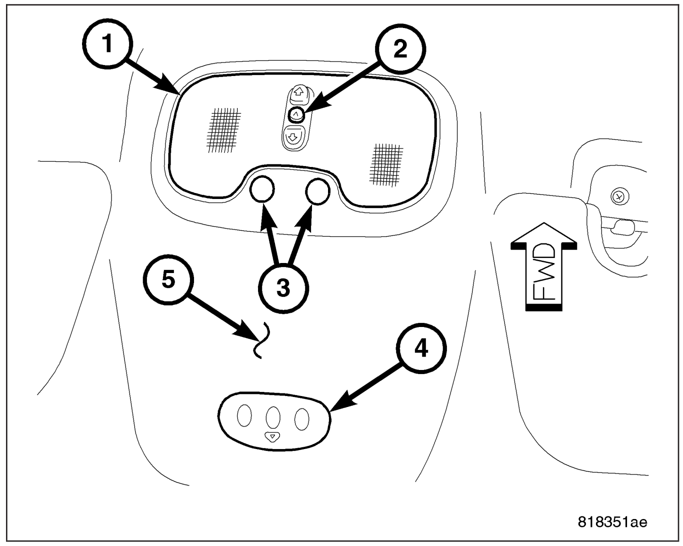
NOTE: RHD model shown in illustration. LHD model similar.



1. Position the Remote Compass Module (RCM) (5) on top of the instrument panel.
2. Install the screws (6) that secure the RCM to the instrument panel.
3. Connect the RCM electrical connector (1).
4. Install the instrument panel upper panel, (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - INSTALLATION).
5. Connect the battery negative cable.

UNIVERSAL TRANSMITTER

DESCRIPTION



Some vehicles are equipped with a Universal Transmitter transceiver (4). The universal transmitter transceiver (4) is located in the headliner (5) just to the rear of the courtesy/reading lamps (1). The only visible component of the universal transmitter are the three transmitter push buttons. The three universal transmitter push buttons are identified with raised buttons and contain a transmit indicator that lights during operation and programming functions.

Each of the three universal transmitter push buttons controls an independent radio transmitter channel. Each of these three channels can be trained to transmit a different radio frequency signal for the remote operation of garage door openers, motorized gate openers, home or office lighting, security systems or just about any other device that can be equipped with a radio receiver in the 280 to 435 MegaHertz (MHz) frequency range for remote operation. The universal transmitter is capable of operating systems using either rolling code or non-rolling code technology. The system will not transmit operating signals if the Vehicle Theft Security System is armed.

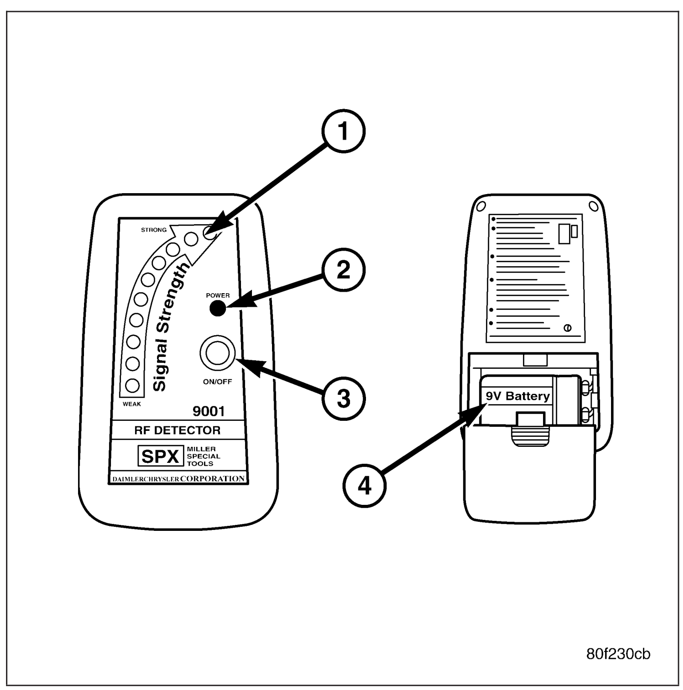
The universal transmitter cannot be repaired, and if inoperative or damaged, the complete module assembly must be replaced.

OPERATION

The universal transmitter operates on a non-switched source of battery current so the unit will remain functional, regardless of the ignition switch position. For more information on the features, programming procedures and operation of the universal transmitter, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING

UNIVERSAL TRANSMITTER



If the Universal Transmitter is inoperative, retrain the universal transmitter with a known good transmitter, insuring the transmitter battery is OK, (Refer to 8 - ELECTRICAL/MESSAGE CENTER/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE) for the proper procedure. Test the universal transmitter operation again. If the unit is still inoperative, test the universal transmitter with Radio Frequency Detector special tool as described below:

1. Turn the Radio Frequency (RF) Detector ON (3). A "chirp" will sound and the green power Light Emitting Diode (LED) will light (2). If the green LED does not light, replace the battery (4).
2. Hold the RF detector within one inch of the TRAINED universal transmitter and press any of the transmitters buttons.
3. The red signal detection LEDs (1) will light and the tool will beep if a radio signal is detected. Repeat this test for all three transmitter buttons. If the tool does not detect a radio signal for any of the three buttons, replace the inoperative universal transmit-

ter assembly, (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL).

STANDARD PROCEDURE

ERASING TRANSMITTER CODES

NOTE: Individual channels cannot be erased. Erasing the transmitter codes will erase ALL programmed codes.

To erase programming from the three buttons (individual buttons cannot be erased but can be ″reprogrammed″), follow the step noted:

- Press and hold the two outer HomeLink® buttons until the indicator light begins to flash-after 20 seconds. Release both buttons. Do not hold for longer that 30 seconds. HomeLink® is now in the train (or learning) mode and can be programmed at any time beginning with ″Programming″ (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE).

PROGRAMMING TRANSMITTER CODES

Programming Common Transmitter Codes

WARNING: Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

WARNING: Your motorized door or gate may open and close while you are training the Universal Transceiver if the vehicle is in range of the motorized device. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

NOTE: When programming a garage door opener, it is advised to park outside the garage. It is also recommended that a new battery be placed in the hand-held transmitter of the device being programmed to HomeLink® for quicker training and accurate transmission of the radio-frequency signal.

1. Press and hold the two outer HomeLink® buttons, and release only when the indicator light begins to flash (after 20 seconds). **Do not** hold the buttons for longer than 30 seconds and **do not** repeat step one to program a second and/or third hand-held transmitter to the remaining two HomeLink® buttons.
2. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink® buttons while keeping the indicator light in view.
3. Simultaneously press and hold both the HomeLink® button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**

NOTE: Some gate operators and garage door openers may require you to replace this Programming Step 3 with procedures noted in the ″Gate Operator/Canadian Programming″ section.

4. The HomeLink® indicator light will flash slowly and then rapidly after HomeLink® successfully receives the frequency signal from the hand-held transmitter. Release both buttons after the indicator light changes from the slow to the rapid flash.
5. Press and hold the just trained HomeLink® button and observe the indicator light. If the indicator light **stays on constantly, programming is complete** and your device should activate when the HomeLink® button is pressed and released.

NOTE: To program the remaining two HomeLink® buttons, begin with ″Programming″ step two. Do not repeat step one.
If the indicator light blinks rapidly for two seconds and then turns to a constant light, continue with ″Programming″ steps 6-8 to complete the programming of a rolling code equipped device (most commonly a garage door opener).

6. At the garage door opener receiver (motor-head unit) in the garage, locate the ″learn″ or ″smart″ button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.

7. Firmly press and release the ″learn″ or ″smart″ button. (The name and color of the button may vary by manufacturer.)

NOTE: There are 30 seconds in which to initiate step eight.

8. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink® button. Repeat the **″press/hold/release″** sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming. HomeLink® should now activate your rolling code equipped device.

NOTE: To program the remaining two HomeLink® buttons, begin with ″Programming″ step two. Do not repeat step one.

Canadian Programming/Gate Programming

Canadian radio-frequency laws require transmitter signals to ″time-out″ (or quit) after several seconds of transmission which may not be long enough for HomeLink® to pick up the signal during programming. Similar to this Canadian law, some U.S. gate operators are designed to ″time-out″ in the same manner.

If you live in Canada or you are having difficulties programming a gate operator by using the ″Programming″ procedures (regardless of where you live), **replace ″Programming HomeLink®″ step 3** with the following:

NOTE: When programming a garage door opener or gate operator, it is advised to unplug the device or move the vehicle out of range during the ″cycling″ process to prevent possible overheating.

3. Continue to press and hold the HomeLink® button while you **press and release every two seconds** (″cycle″) your hand-held transmitter until the frequency signal has successfully been accepted by HomeLink®. (The indicator light will flash slowly and then rapidly.) Proceed with ″Programming″ step four to complete.

REPROGRAMMING TRANSMITTER CODES

Reprogramming Basic Transmitter Codes

WARNING: Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

WARNING: Your motorized door or gate may open and close while you are training the Universal Transceiver if the vehicle is in range of the motorized device. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

To program a device to HomeLink® using a HomeLink® button previously trained, follow these steps:

1. Press and hold the desired HomeLink® button. **Do NOT** release the button.
2. The indicator light will begin to flash after 20 seconds. Without releasing the HomeLink® button, proceed to step 3.
3. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink® buttons while keeping the indicator light in view.
4. Simultaneously press and hold both the HomeLink button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**

NOTE: Some gate operators and garage door openers may require you to replace this Programming Step 3 with procedures noted in the ″Gate Operator/Canadian Programming″ section.

5. The HomeLink® indicator light will flash slowly and then rapidly after HomeLink® successfully receives the frequency signal from the hand-held transmitter. Release both buttons after the indicator light changes from the slow to the rapid flash.
6. Press and hold the just trained HomeLink® button and observe the indicator light. If the indicator light **stays on constantly, programming is complete** and your device should activate when the HomeLink® button is pressed and released.

NOTE: To program the remaining two HomeLink® buttons, begin with ″Programming″ step two. Do not repeat step one.
If the indicator light blinks rapidly for two seconds and then turns to a constant light, continue with ″Programming″ steps 6-8 to complete the programming of a rolling code equipped device (most commonly a garage door opener).

7. At the garage door opener receiver (motor-head unit) in the garage, locate the ″learn″ or ″smart″ button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.
8. Firmly press and release the ″learn″ or ″smart″ button. (The name and color of the button may vary by manufacturer.)

NOTE: There are 30 seconds in which to initiate step eight.

9. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink® button. Repeat the ″**press/hold/release**″ sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming. HomeLink® should now activate your rolling code equipped device.

Canadian Programming/Gate Programming

Canadian radio-frequency laws require transmitter signals to ″time-out″ (or quit) after several seconds of transmission which may not be long enough for HomeLink® to pick up the signal during programming. Similar to this Canadian law, some U.S. gate operators are designed to ″time-out″ in the same manner.

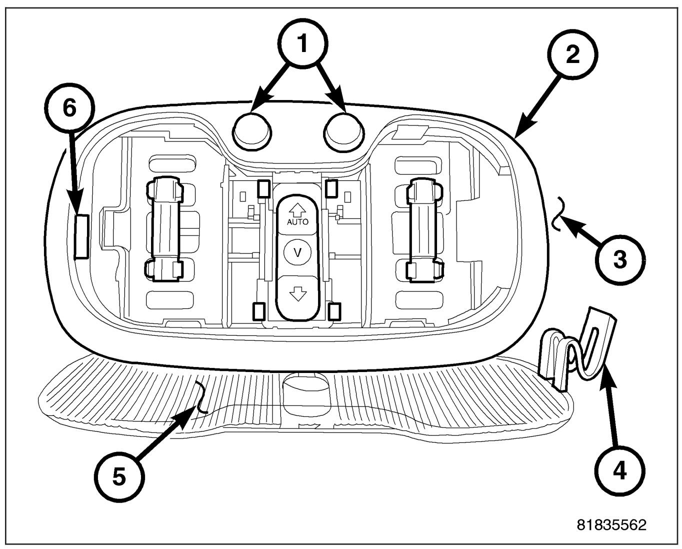
If you live in Canada or you are having difficulties programming a gate operator by using the ″Programming″ procedures (regardless of where you live), **replace ″Programming HomeLink®″ step 3** with the following:

NOTE: When programming a garage door opener or gate operator, it is advised to unplug the device or move the vehicle out of range during the ″cycling″ process to prevent possible overheating.

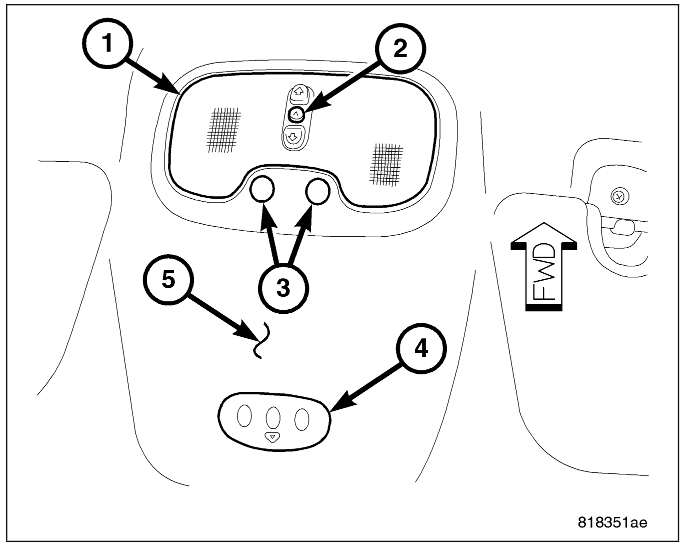
3. Continue to press and hold the HomeLink® button while you **press and release every two seconds** (″cycle″) your hand-held transmitter until the frequency signal has successfully been accepted by HomeLink®. (The indicator light will flash slowly and then rapidly.) Proceed with ″Programming″ step four to complete.

REMOVAL

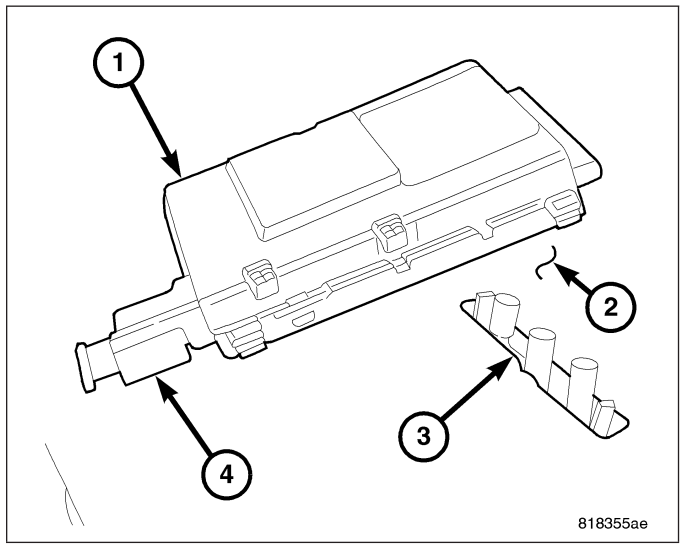
1. Disconnect and isolate the battery negative cable.
2. Remove the courtesy/reading lamp lens (5). Insert a suitable flat bladed tool into the slot (6) in the courtesy/reading lamp assembly (2). Pivot the lens down and to the left to release the holding tab (4). Remove the lamp assembly from the headliner (3).



3. Using an appropriate flat bladed tool, remove the universal transmitter button trim bezel (4).

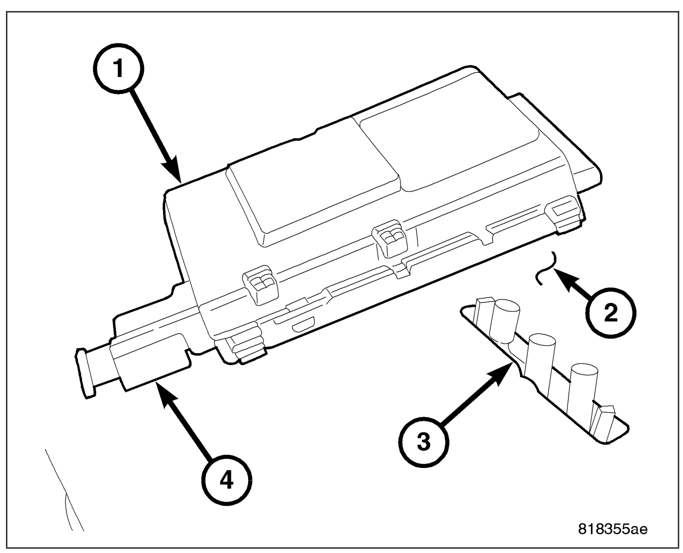


4. Working through the courtesy/reading lamp hole in the headliner, pull the universal transmitter module (1) forward and down through the headliner (2).
5. Disconnect the electrical connector.
6. Remove the universal transmitter module from the vehicle.

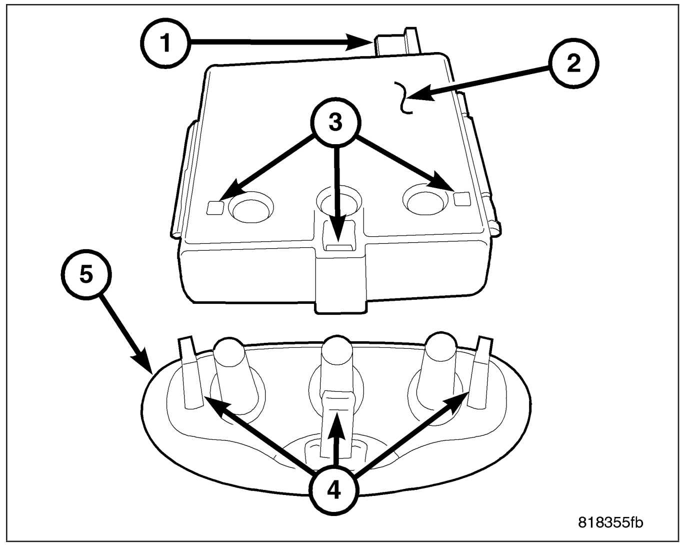


INSTALLATION

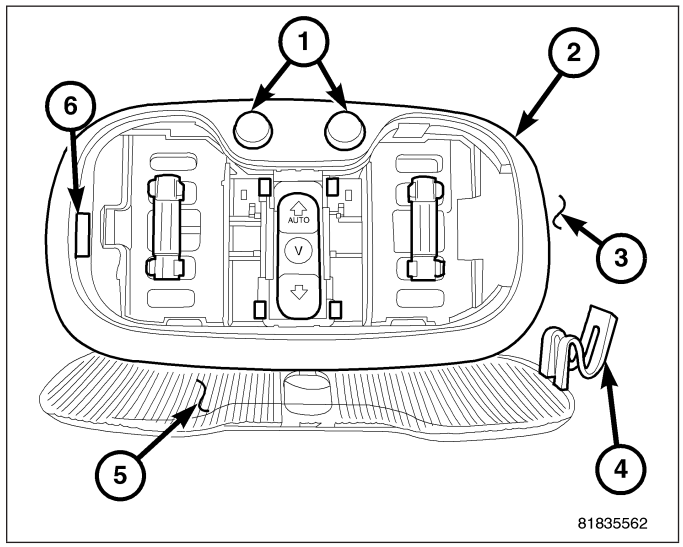
1. Position the universal transmitter module (1) into the vehicle.
2. Connect the electrical connector (4).
3. Working through the courtesy/reading lamp hole in the headliner (2), Insert the universal transmitter module up into place over the cut out for the button bezel (3).



4. Position the universal transmitter module (2) so that the mounting tabs (4) on the button bezel (5) are aligned with the module slots.
5. Holding the module in place push the universal transmitter button bezel through the headliner until the mounting tabs are securely engaged with the module.



6. Position the courtesy/reading lamp assembly (2) into the headliner (3).
7. Insert the mounting tab (4) on the lamp lens (5) into the right side of the lamp assembly and pivot the lens up until it snaps securely in place.
8. Connect the battery negative cable.

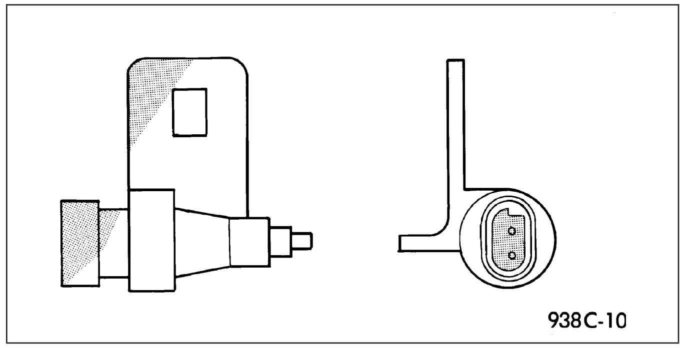


SENSOR-AMBIENT TEMPERATURE

DESCRIPTION

The ambient temperature sensor is a variable resistor type sensor. It is mounted to the lower front fascia behind the radiator grille and in front of the engine compartment.

The ambient temperature sensor cannot be adjusted or repaired and, if inoperative or damaged, it must be replaced.



OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal. The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the Totally Integrated Power Module (TIPM). Based upon the resistance in the sensor, the instrument cluster or Cab Compartment Node (CCN) display senses a specific voltage on the Controller Area Network (CAN) data bus circuit, which corresponds to a specific temperature. The compass/temperature display unit then displays the proper ambient temperature.

DIAGNOSIS AND TESTING

AMBIENT TEMPERATURE SENSOR

The thermometer function is supported by the ambient temperature sensor, the Totally Integrated Power Module (TIPM), the Controller Area Network (CAN) data bus circuit, and the instrument cluster or Cab Compartment Node (CCN) compass/temperature display unit.

If the display shows “OC” (-49° F (-45° C)) or “SC” (140° F (60° C)), there is an OPEN or SHORT CIRCUIT that must be repaired.

The ambient temperature sensor circuit can also be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, replace the instrument cluster or CCN assembly.

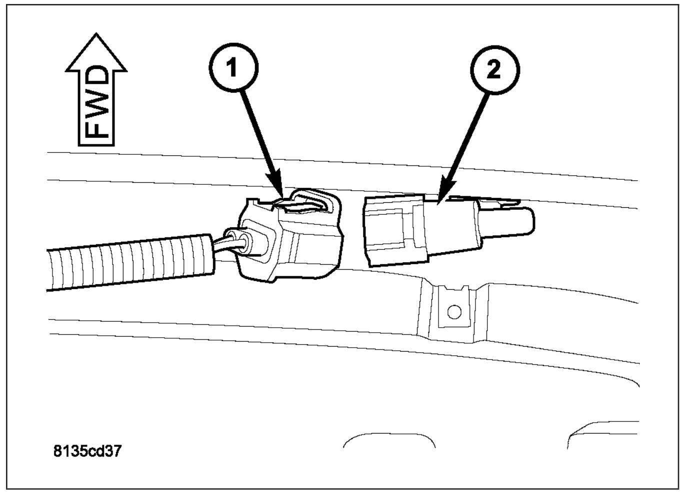
SENSOR TESTING

1. Turn the ignition switch to the OFF position. Disconnect and isolate the battery negative cable.
2. Disconnect the ambient temperature sensor wire harness connector.
3. Measure the resistance of the ambient temperature sensor. At room temperature (approx. 68°F (20° C)), the sensor resistance should be between 9-11 Kilohms (9000-11000 ohms). The sensor resistance should read between these two values. If OK, refer to the appropriate diagnostic information to continue diagnosis of the Totally Integrated Power Module (TIPM), the Controller Area Network (CAN) data bus circuit, and the instrument cluster or CCN. If not OK, replace the inoperative ambient temperature sensor.

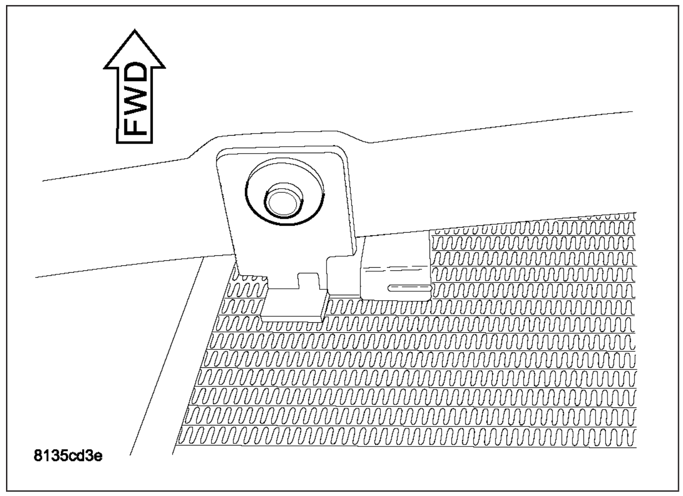
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the belly pan, (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).

3. Disconnect the wire harness connector (1) from the ambient temperature sensor (2).

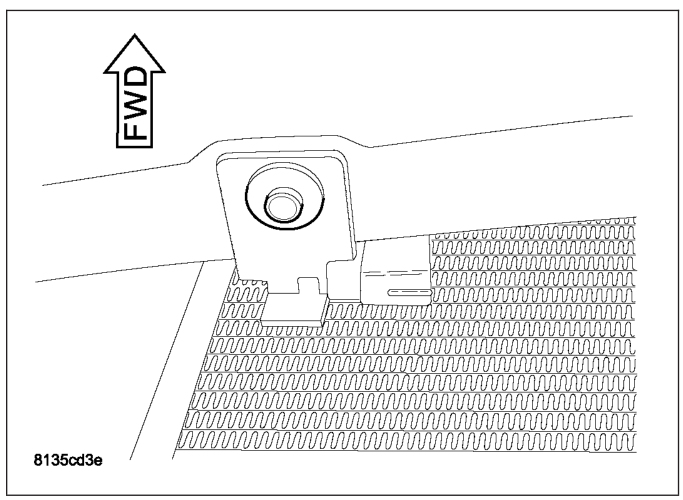


4. Remove the fastener that secures the ambient temperature sensor bracket to the front fascia.
5. Remove the ambient temperature sensor from the vehicle.

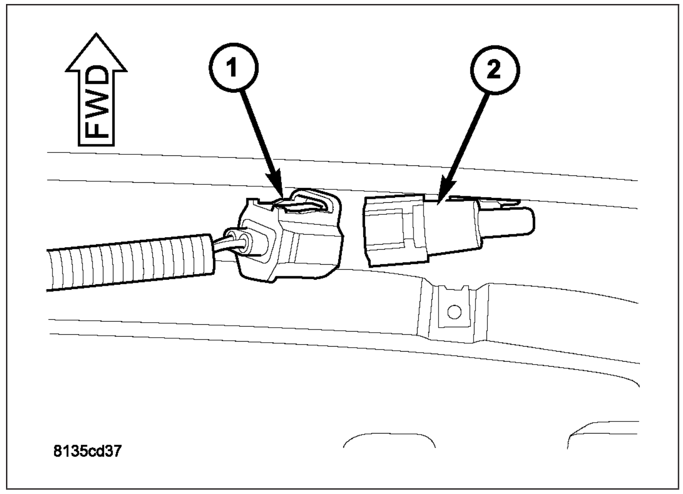


INSTALLATION

1. Position the ambient temperature sensor in the vehicle.
2. Install the fastener that secures the ambient temperature sensor to the front fascia.



3. Connect the wire harness connector (1) to the ambient temperature sensor (2).
4. Install the belly pan, (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).
5. Connect the battery negative cable.



POWER SYSTEMS

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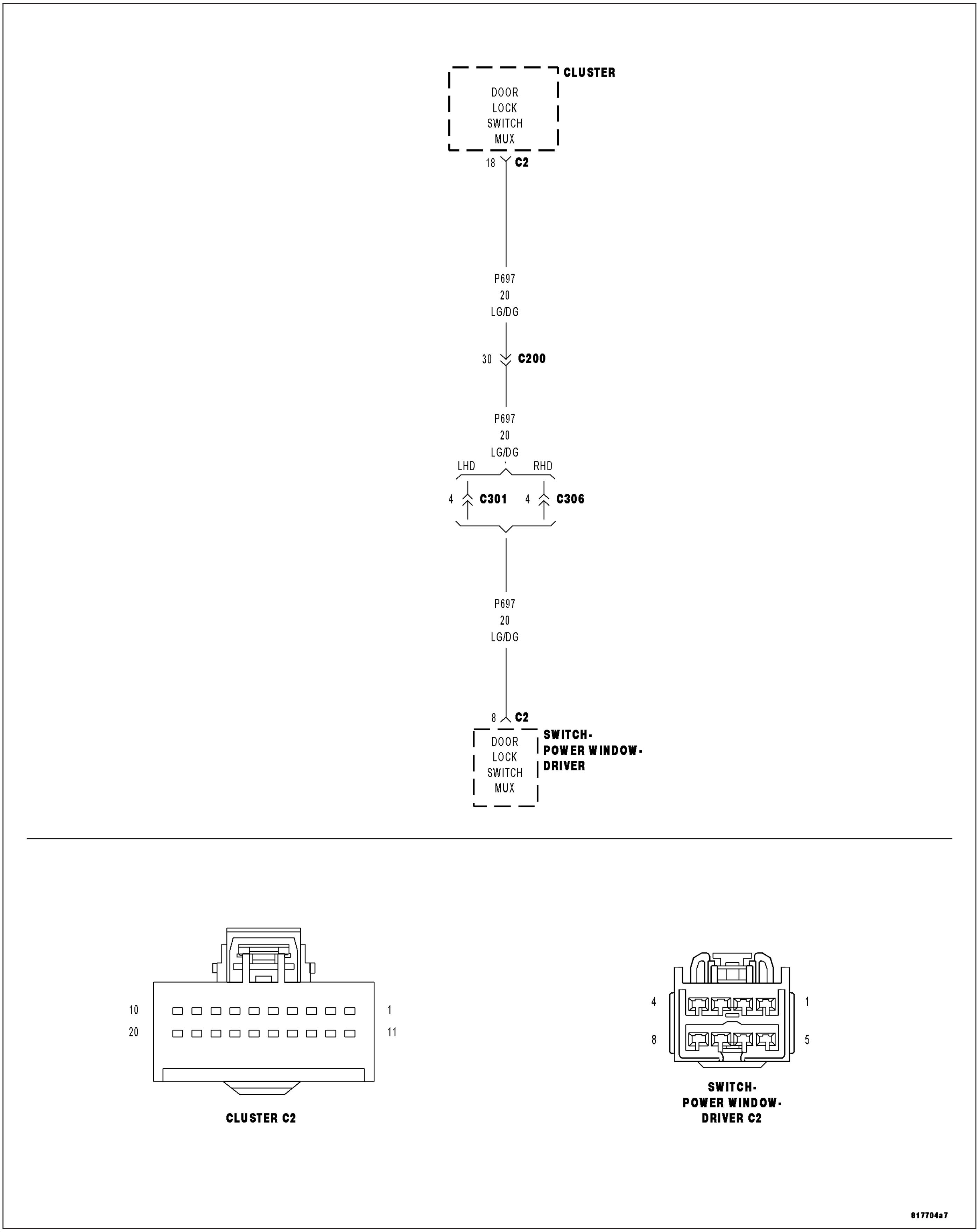
POWER LOCKS - ELECTRICAL DIAGNOSTICS

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POWER LOCKS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1800 DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Driver Door Lock Switch Mux circuit is below 1.5 volts or over 4.3 volts for 10 seconds, this code will set.

Possible Causes
(P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT OPEN
(P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO BATTERY
DOOR LOCK SWITCH
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC’s

Operate the Driver Door Lock Switch in all positions several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC’s.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT PERFORMANCE?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC’s.

Disconnect the Driver Window/Door Lock Switch connector.

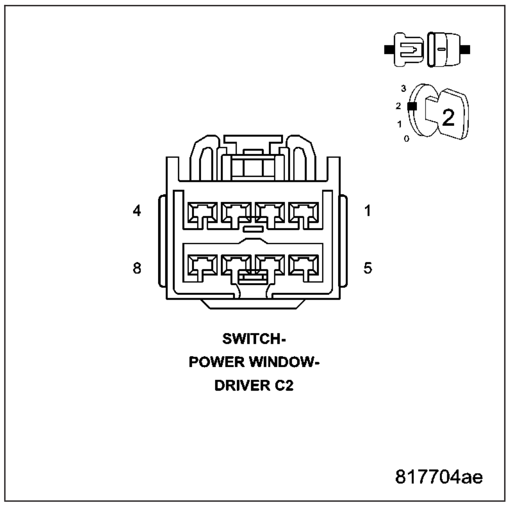
With the scan tool, read DTC’s.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT PERFORMANCE?

No >> Replace the Driver Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

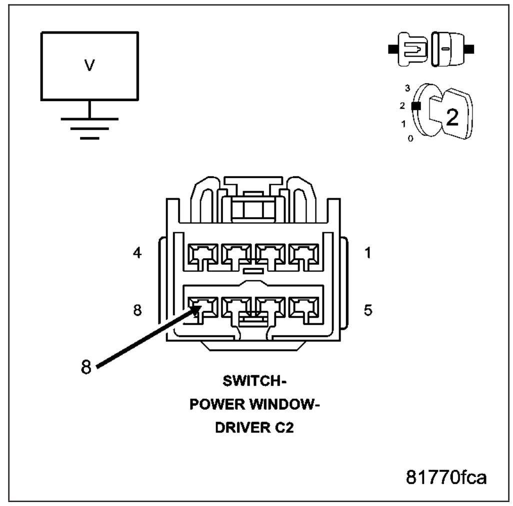
Yes >> Go To 3



3. (P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO BATTERY

Ensure the ignition is on.

Measure the voltage between the (P697) Driver Door Lock Switch Mux circuit and ground.



Is the voltage above 5.2 volts?

Yes >> Repair the (P697) Left Door Lock Switch Mux circuit for a short to battery.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

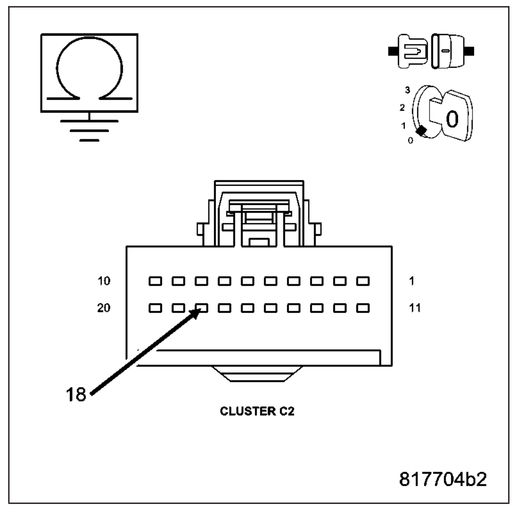
No >> Go To 4

4. (P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Cluster C2 connector.

Measure the resistance between ground and the (P697) Driver Door Lock Switch Mux circuit.



Is the resistance below 1000.0 ohms?

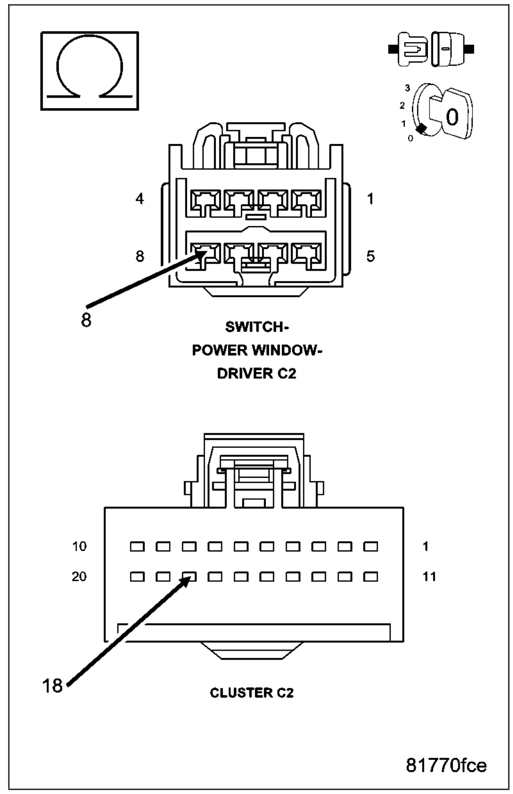
Yes >> Repair the (P697) Driver Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT OPEN

Measure the resistance of the (P697) Driver Door Lock Switch Mux circuit between the Cluster C2 connector and the Driver Window/Door Lock Switch connector.



Is the resistance below 5.0 ohms?

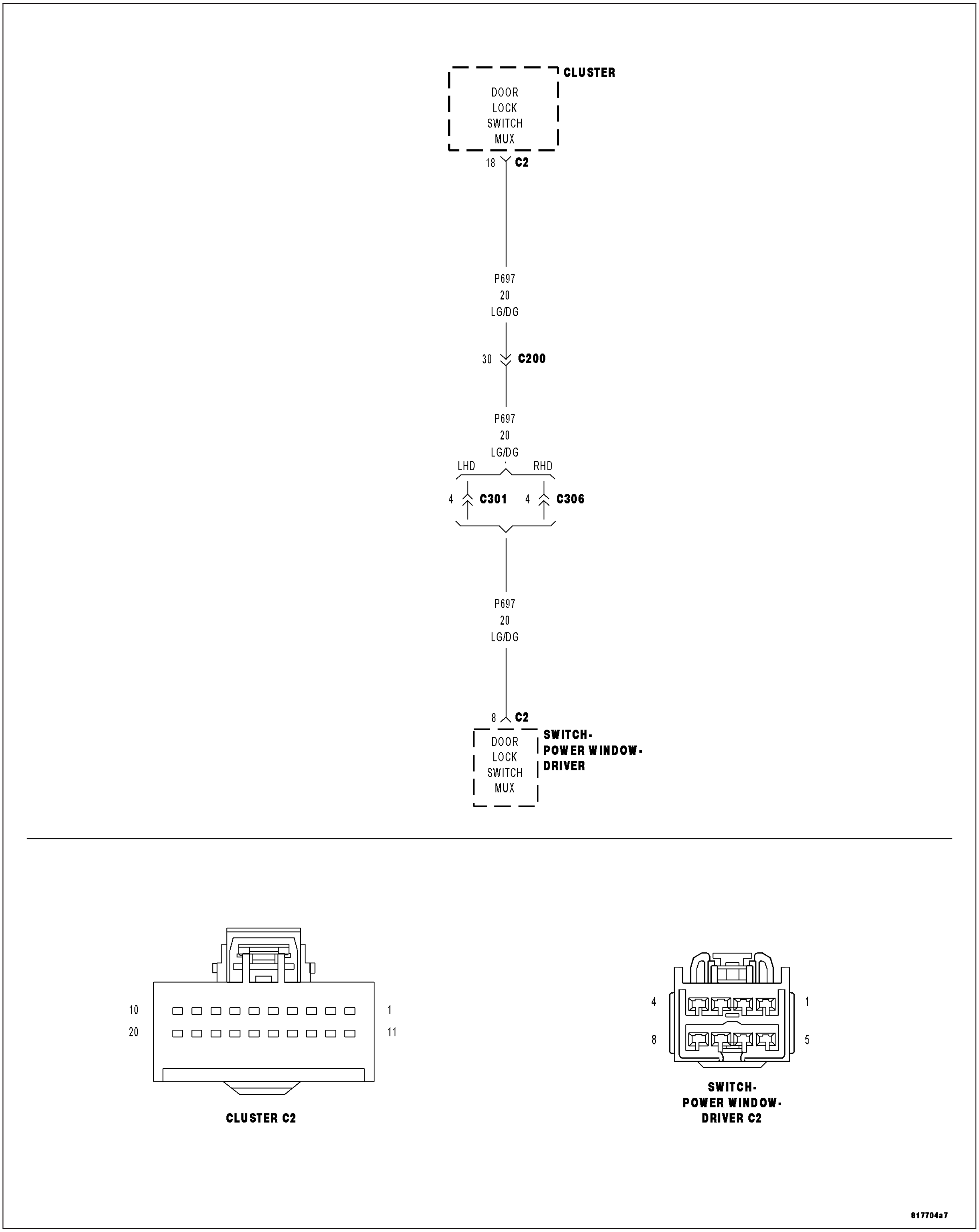
No >> Repair the (P697) Driver Door Lock Switch Mux circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

Yes >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1801 DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW – CLUSTER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Driver Door Lock Switch Mux circuit is below 0.15 volts for over 10 seconds.

Possible Causes
(P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display B1801–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.

Disconnect the Driver Window/Door Lock Switch connector.

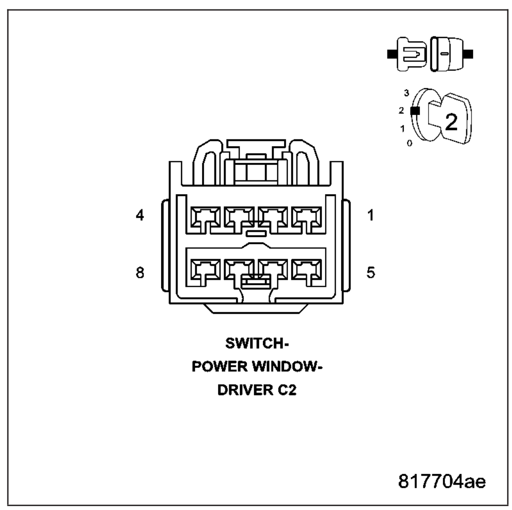
With the scan tool, read DTC's.

Does the scan tool display B1801–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?

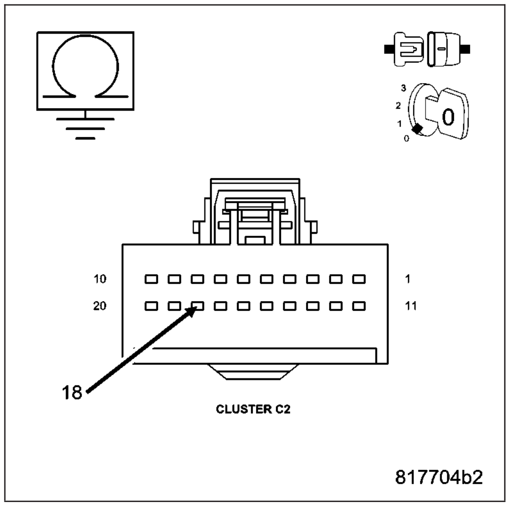
No >> Replace the Driver Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

Yes >> Go To 3



3. (P697) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND



Turn the ignition off.

Disconnect the Cluster C2 connector.

Measure the resistance between ground and the (P697) Driver Door Lock Switch Mux circuit.

Is the resistance below 10,000.0 ohms?

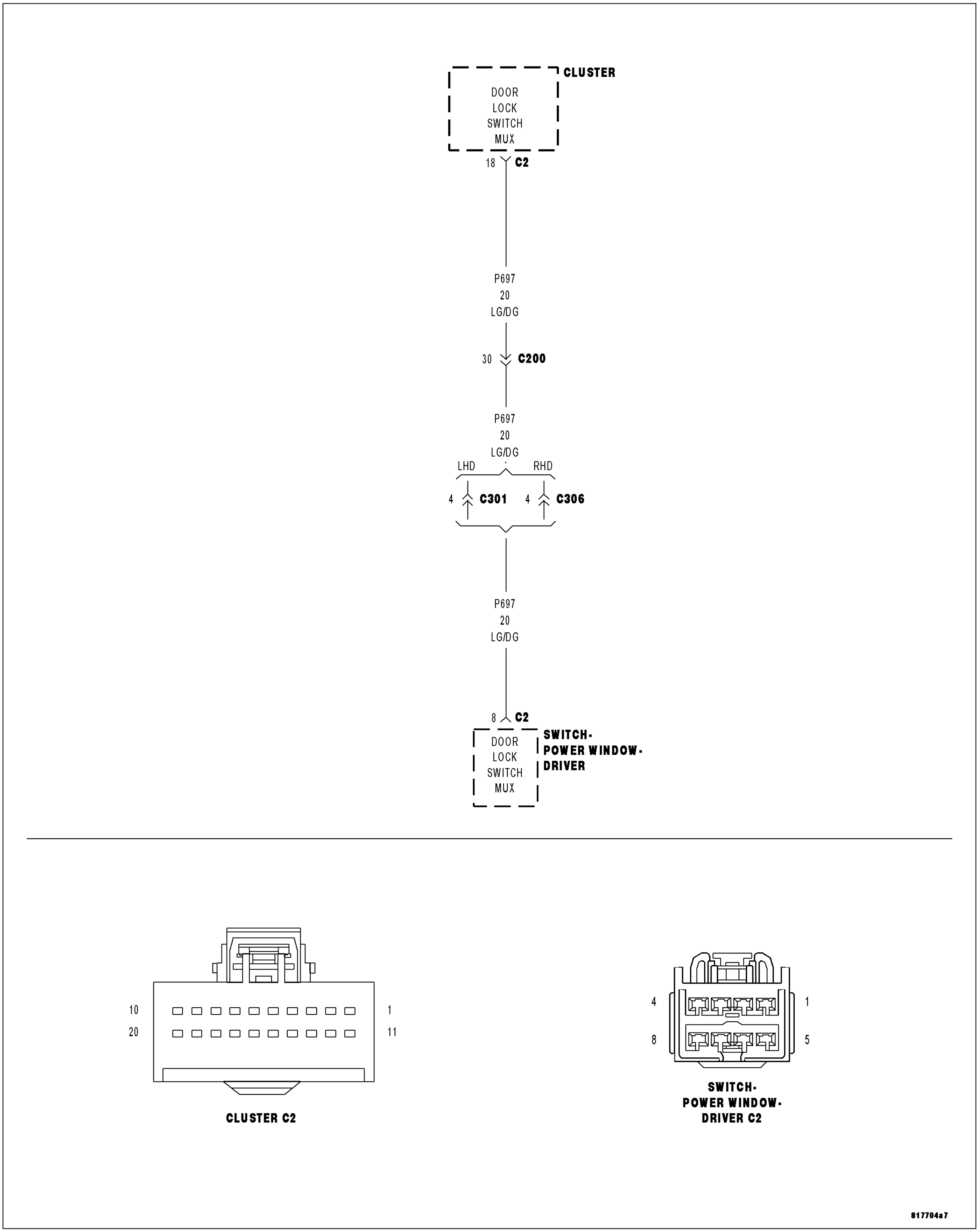
Yes >> Repair the (P697) Driver Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1934–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK – CLUSTER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Driver Door Lock Switch Mux circuit is between 0.8 and 3.5 volts for over 10 seconds.

Possible Causes
(P697) LEFT DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display B1934–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.

Disconnect the Driver Window/Door Lock Switch connector.

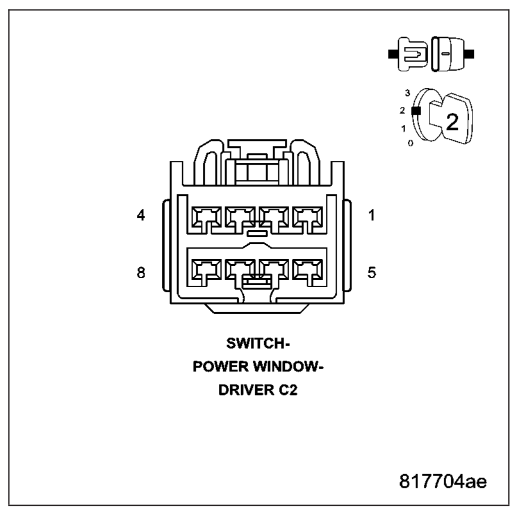
With the scan tool, read DTC's.

Does the scan tool display B1934–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK?

No >> Replace the Driver Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

Yes >> Go To 3

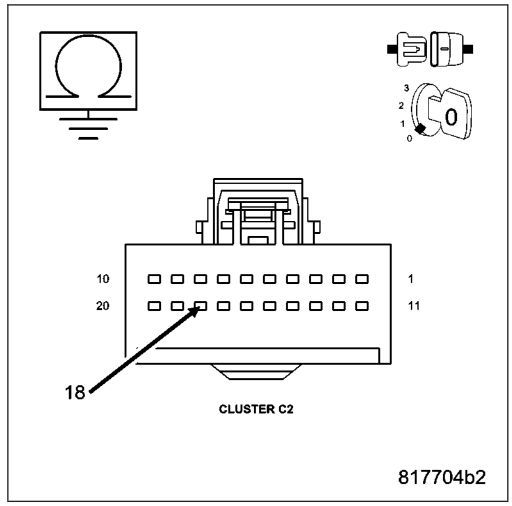


3. (P697) LEFT DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND

Turn the ignition off.

Disconnect the Cluster C2 connector.

Measure the resistance between ground and the (P697) Driver Door Lock Switch Mux circuit.



Is the resistance below 1,000.0 ohms?

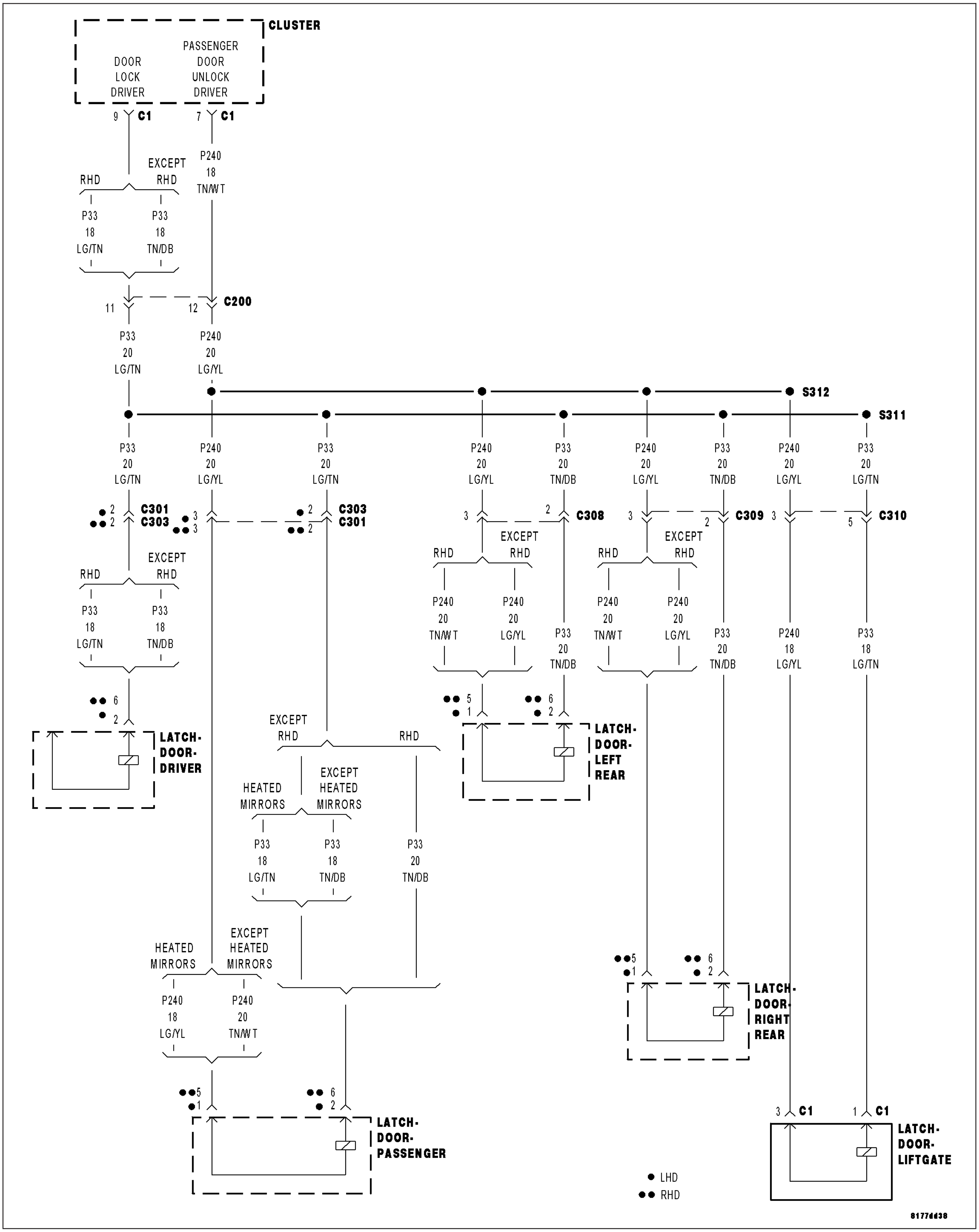
Yes >> Repair the (P697) Left Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

*ALL PASSENGER DOORS UNLOCK CONTROL CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

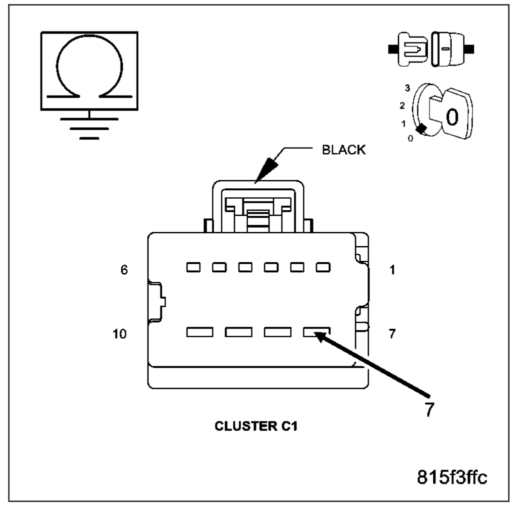
Possible Causes
(P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORT TO GROUND
(P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORT TO VOLTAGE
(P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT OPEN
(P33) DOOR LOCK DRIVER CIRCUIT SHORT TO THE (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT
INSTRUMENT CLUSTER

1. (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.



Is the resistance below 1,000.0 ohms?

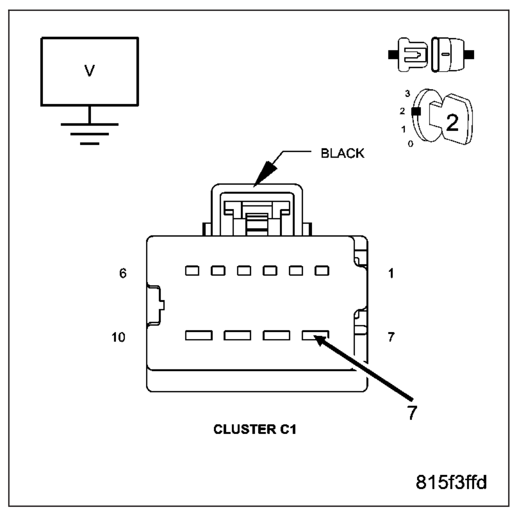
Yes >> Repair the (P240) Passenger Doors Unlock Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE) (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 2

2. (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORTED TO BATTERY

Turn the ignition on.

Measure the voltage between ground and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.



Is there any voltage present?

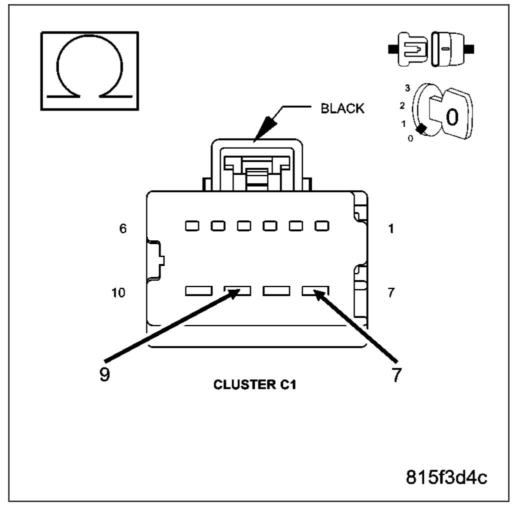
Yes >> Repair the (P240) Passenger Doors Unlock Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT OPEN

Turn the ignition off.

Measure the resistance between the (P33) Door Lock Driver circuit and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.



Is the resistance above 4.5 ohms?

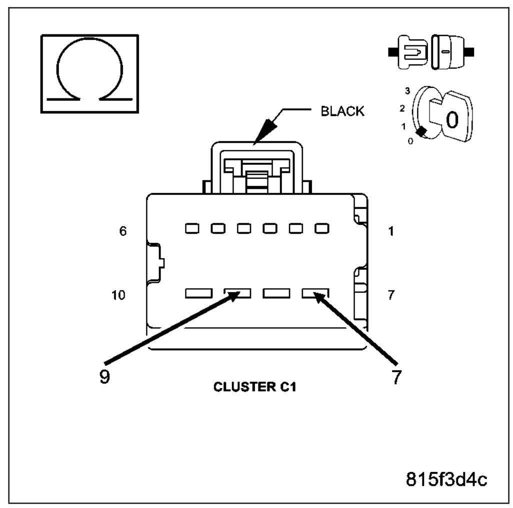
Yes >> Repair the (P33) Door Lock Driver or the (P240) Passenger Doors Unlock Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (P33) DOOR LOCK DRIVER SHORTED TO THE (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT

Measure the resistance between the (P33) Door Lock Driver circuit and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.



Is the resistance below 2.0 ohms?

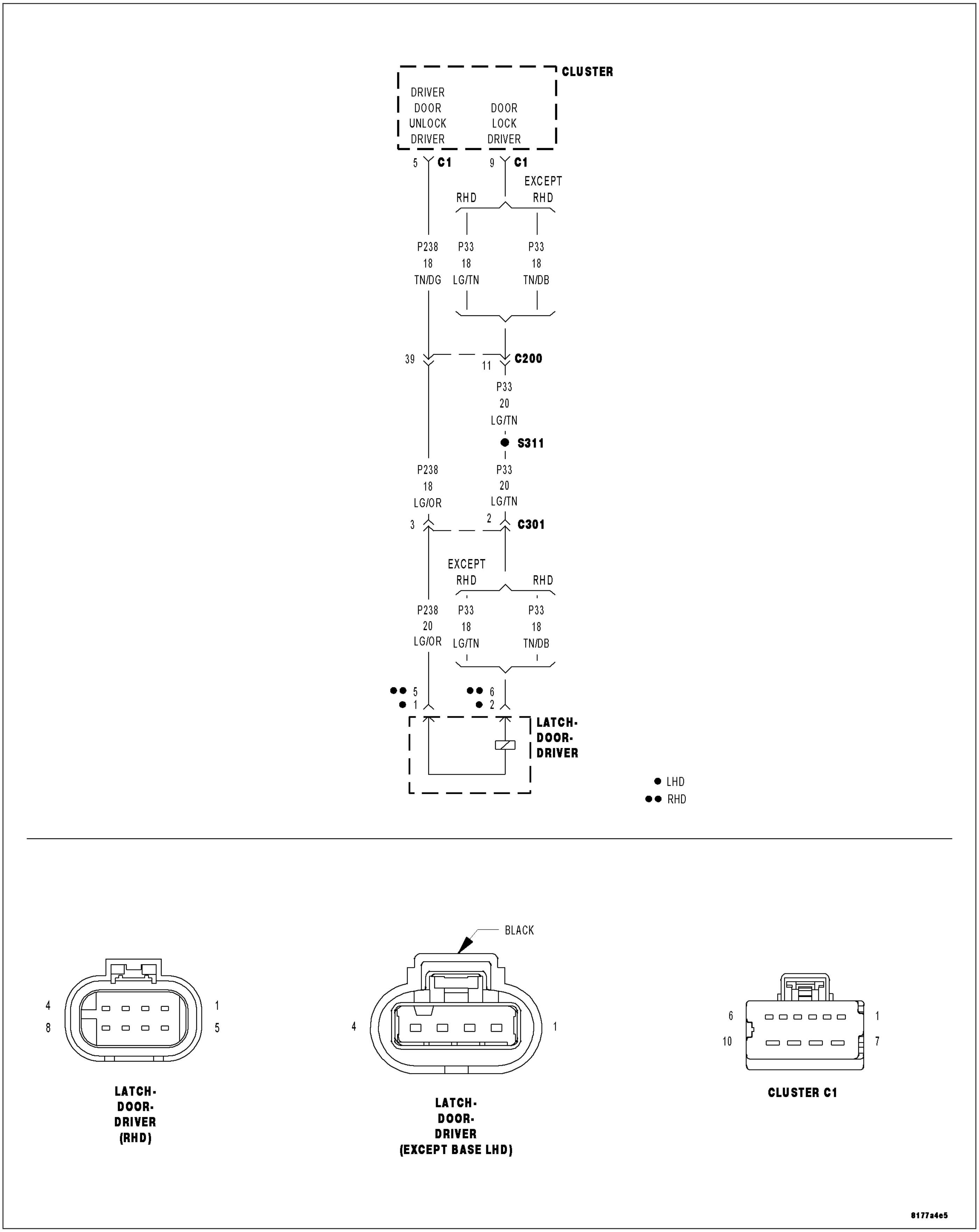
Yes >> Repair the (P33) Door Lock Driver for a short to the (P240) Passenger Doors Unlock Driver circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

*DRIVER DOOR UNLOCK CONTROL CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

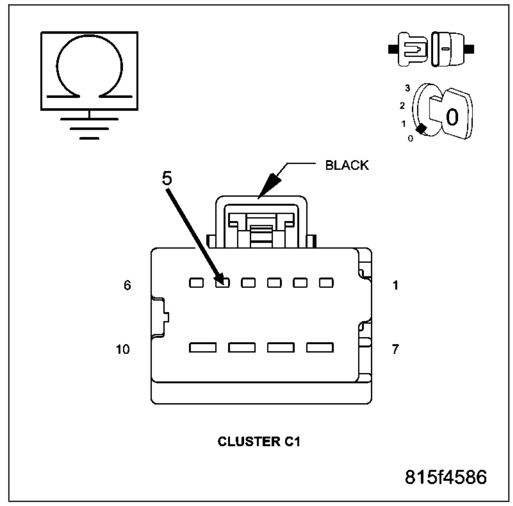
Possible Causes
(P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT SHORT TO GROUND
(P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT SHORT TO VOLTAGE
(P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT OPEN
(P33) DOOR LOCK DRIVER CIRCUIT SHORT TO THE (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT
INSTRUMENT CLUSTER

1. (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P238) Driver Door Unlock Driver circuit in the Cluster C1 connector.



Is the resistance below 1,000.0 ohms?

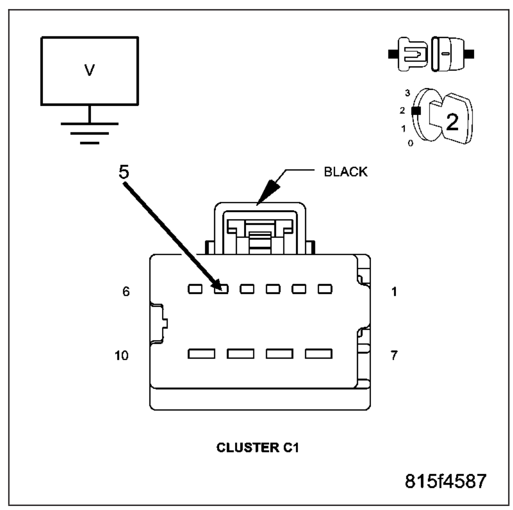
Yes >> Repair the (P238) Driver Door Unlock Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 2

2. (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT SHORTED TO BATTERY

Turn the ignition on.

Measure the voltage between ground and the (P238) Driver Door Unlock Driver circuit in the Cluster C1 connector.



Is there any voltage present?

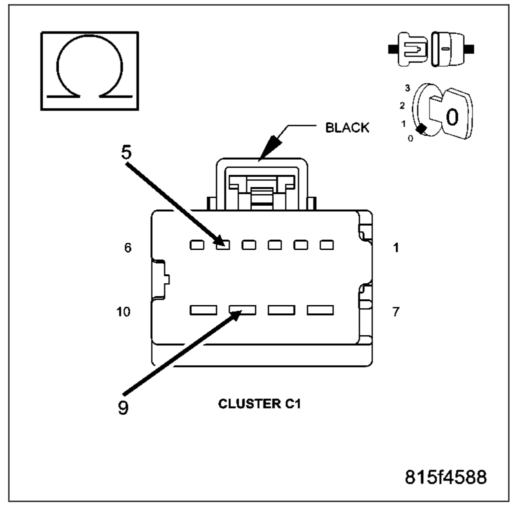
Yes >> Repair the (P238) Driver Door Unlock Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT OPEN

Turn the ignition off.

Measure the resistance between the (P33) Door Lock Driver circuit and the (P238) Driver Door Unlock Driver circuit in the Cluster C1 connector.



Is the resistance above 4.5 ohms?

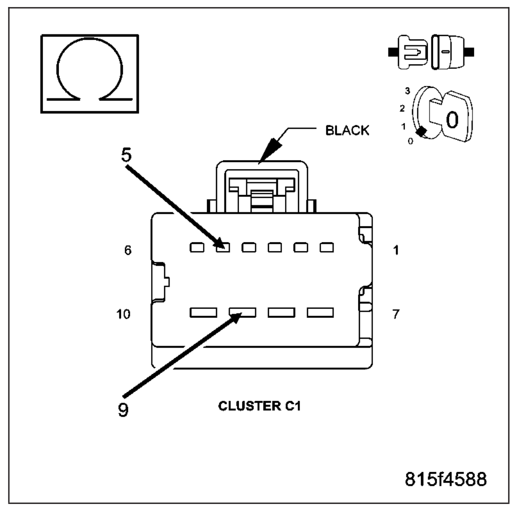
Yes >> Check and repair (if necessary) the (P33) Door Lock Driver or the (P238) Driver Door Unlock Driver circuit for an open. If the wiring is okay, replace the driver door latch.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (P33) DOOR LOCK DRIVER SHORTED TO THE (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT

Measure the resistance between the (P33) Door Lock Driver circuit and the (P238) Driver Door Unlock Driver circuit in the Cluster C1 connector.



Is the resistance below 2.0 ohms?

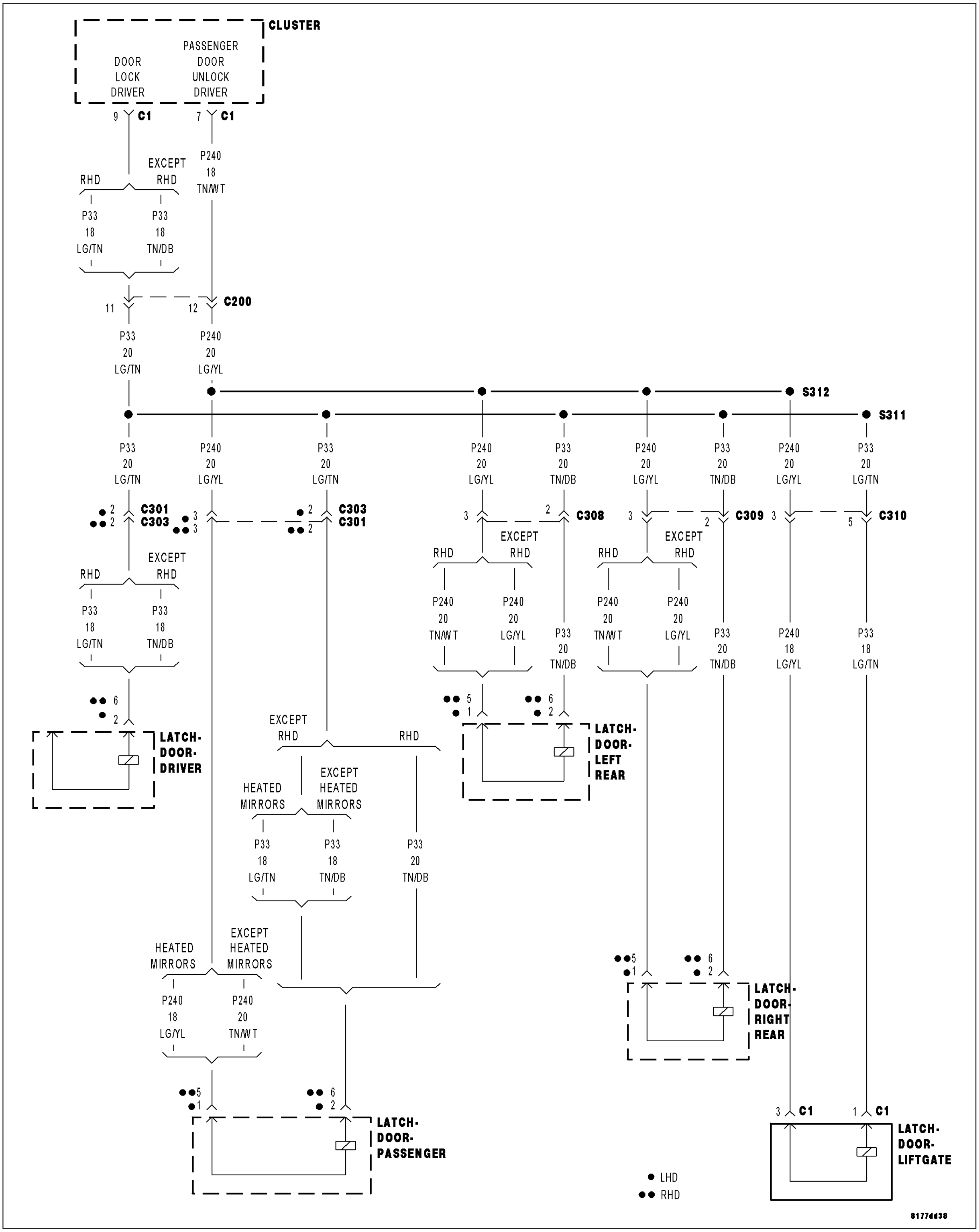
Yes >> Repair the (P33) Door Lock Driver for a short to the (P240) Passenger Doors Unlock Driver circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

*DOOR LOCK CONTROL CIRCUIT PERFORMANCE – CLUSTER



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(P33) DOOR LOCK DRIVER CIRCUIT SHORT TO GROUND
(P33) DOOR LOCK DRIVER CIRCUIT SHORT TO VOLTAGE
(P33) DOOR LOCK DRIVER CIRCUIT OPEN
(P33) DOOR LOCK DRIVER CIRCUIT SHORT TO THE (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the door locks several times.

Cycle the ignition from on to off.

Turn the ignition on.

With the scan tool, read DTC's.

Are there any Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the symptom list for problems relating to Power Door Locks

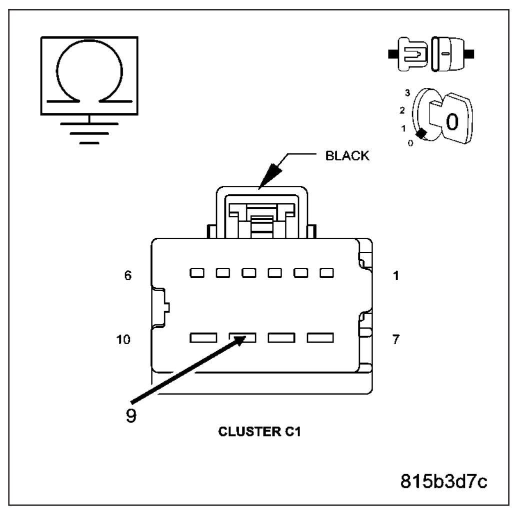
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (P33) DOOR LOCK DRIVER CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P33) Door Lock Driver circuit in the Cluster C1 connector.



Is the resistance below 1,000.0 ohms?

Yes >> Repair the (P33) Door Lock Driver circuit for a short to ground.

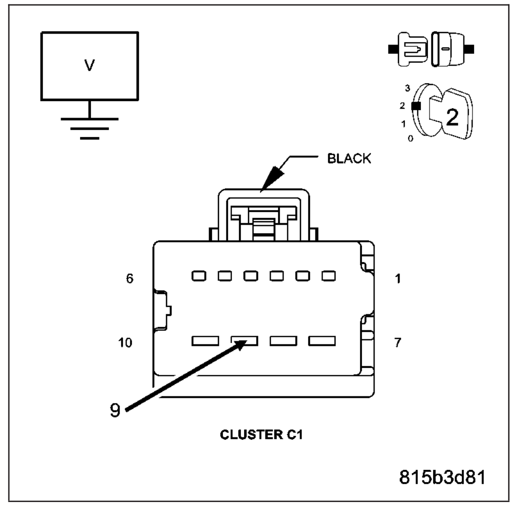
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (P33) DOOR LOCK DRIVER CIRCUIT SHORTED TO BATTERY

Turn the ignition on.

Measure the voltage between ground and the (P33) Door Lock Driver circuit in the Cluster C1 connector.



Is there any voltage present?

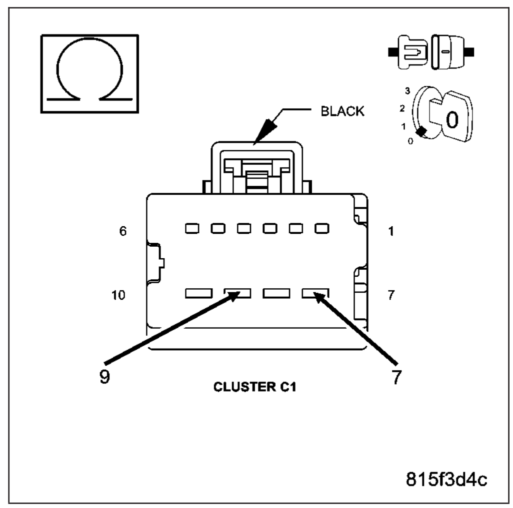
Yes >> Repair the (P33) Door Lock Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (P33) DOOR LOCK DRIVER SHORTED TO THE (P240) PASSENGER DOORS UNLOCK DRIVER CIRCUIT

Turn the ignition off.

Measure the resistance between the (P33) Door Lock Driver circuit and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.



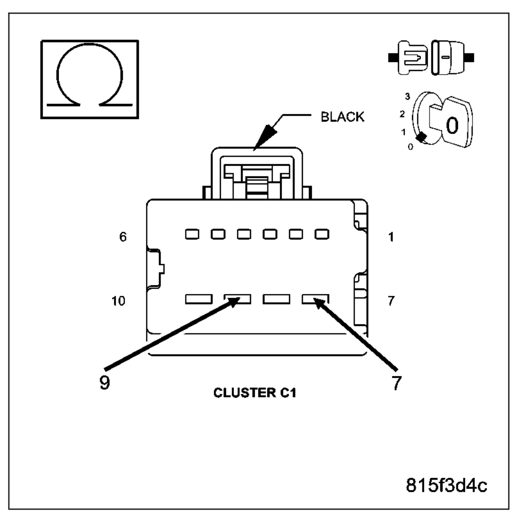
Is the resistance below 1.0 ohm?

Yes >> Repair the (P33) Door Lock Driver for a short to the (P240) Passenger Doors Unlock Driver circuit.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (P33) DOOR LOCK DRIVER CIRCUIT OPEN

Measure the resistance between the (P33) Door Lock Driver circuit and the (P240) Passenger Doors Unlock Driver circuit in the Cluster C1 connector.

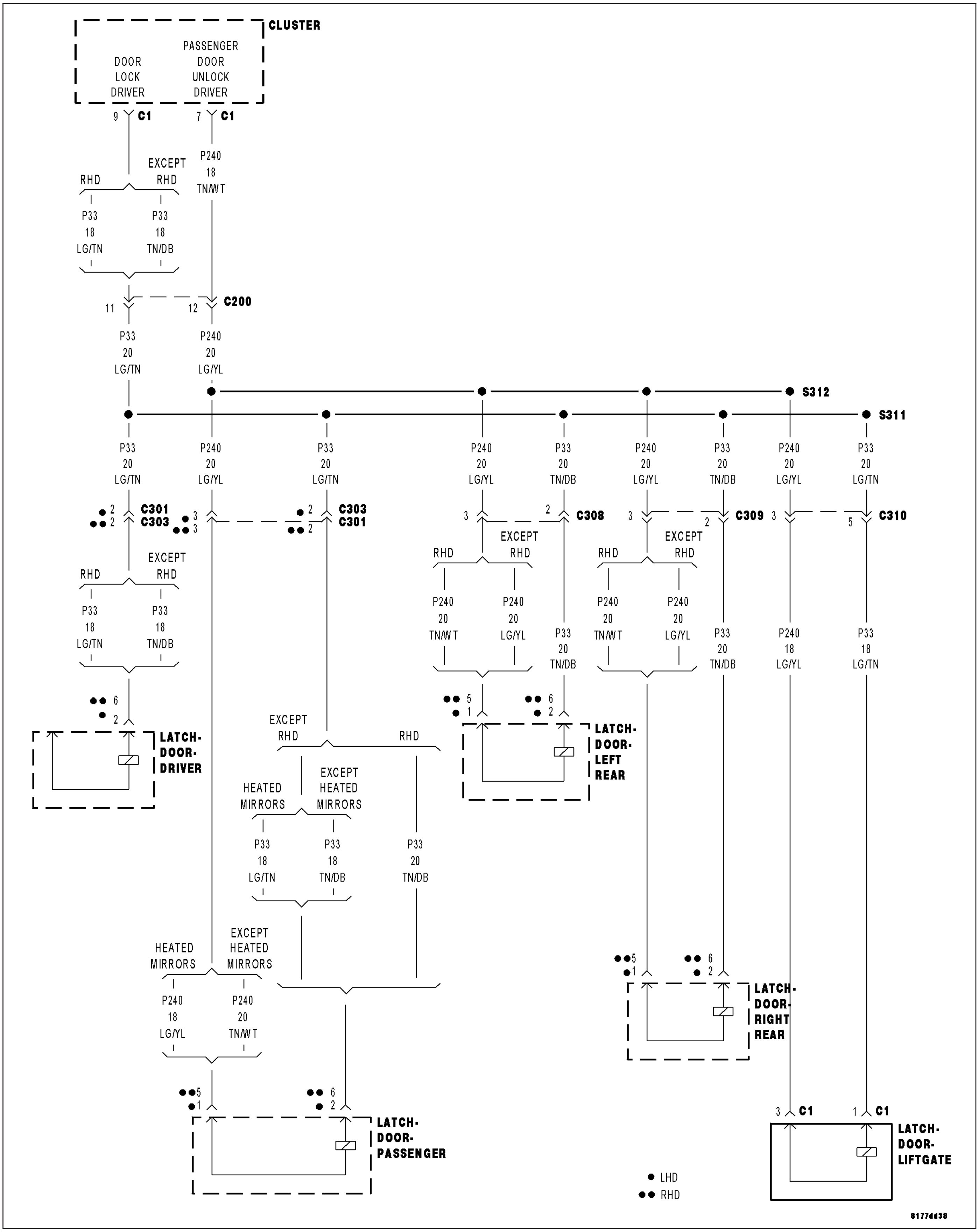


Is the resistance above 4.0 ohms?

Yes >> Repair the (P33) Door Lock Driver or the (P240) Passenger Doors Unlock Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Instrument Cluster in accordance with service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

*ONE PASSENGER DOOR FAILS TO LOCK AND UNLOCK



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(P33) DOOR LOCK DRIVER WIRE OPEN
(P240) PASSENGER DOOR UNLOCK DRIVER WIRE OPEN
DOOR LATCH OR LIFTGATE MOTOR

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

Diagnostic Test

1. TEST FOR DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off and wait for five seconds.
Turn the ignition on.
With the scan tool, read the active DTC's.

Does the scan tool display any Power Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the Table of Contents in this section to diagnose and repair the DTC's.

2. CHECK DOOR LOCK MOTOR CIRCUIT

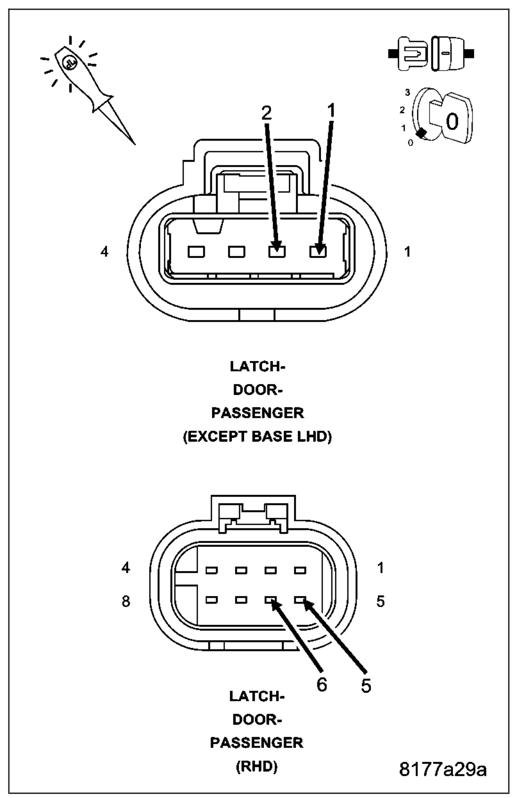
Turn the ignition off.

Disconnect the inoperative Door Latch (Motor) connector.

Connect a 12 volt test light between the (P33) Door Lock Driver and the (P240) Passenger Door Unlock Driver circuits in the latch connector.

NOTE: Graphic shows the Passenger Front Latch – all others similar.
Remove the key from the ignition switch.

Operate the door locks several times in the lock and unlock positions from the door lock switch and observe the test light.



Does the test light illuminate brightly when the locks are actuated in both directions?

Yes >> Replace the Door latch Assembly (or motor).
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

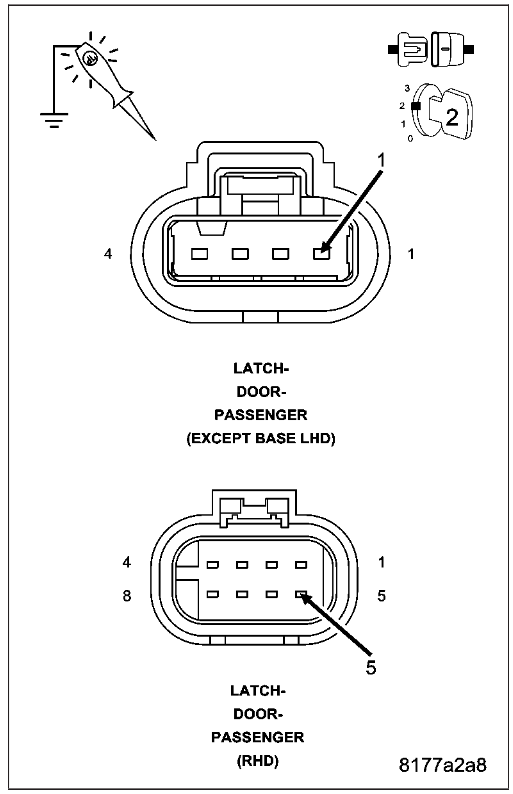
No >> Go To 3

3. (P240) PASSENGER DOOR UNLOCK DRIVER WIRE OPEN

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (P240) Passenger Door Unlock Driver circuit.

With the scan tool, actuate the Passenger Door Unlock Relay.



Does the test light illuminate brightly when the relay is actuated?

Yes >> Go To 4

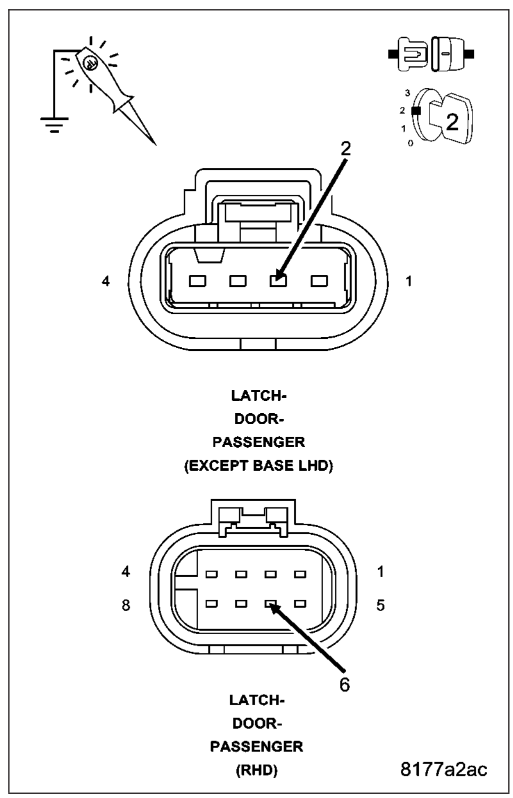
No >> Repair the (P240) Passenger Door Unlock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

4. (P33) DOOR LOCK DRIVER WIRE OPEN

Using a 12-volt test light connected to ground, check the (P33) Door Lock Driver circuit.

With the scan tool, actuate the Door Lock Relay.



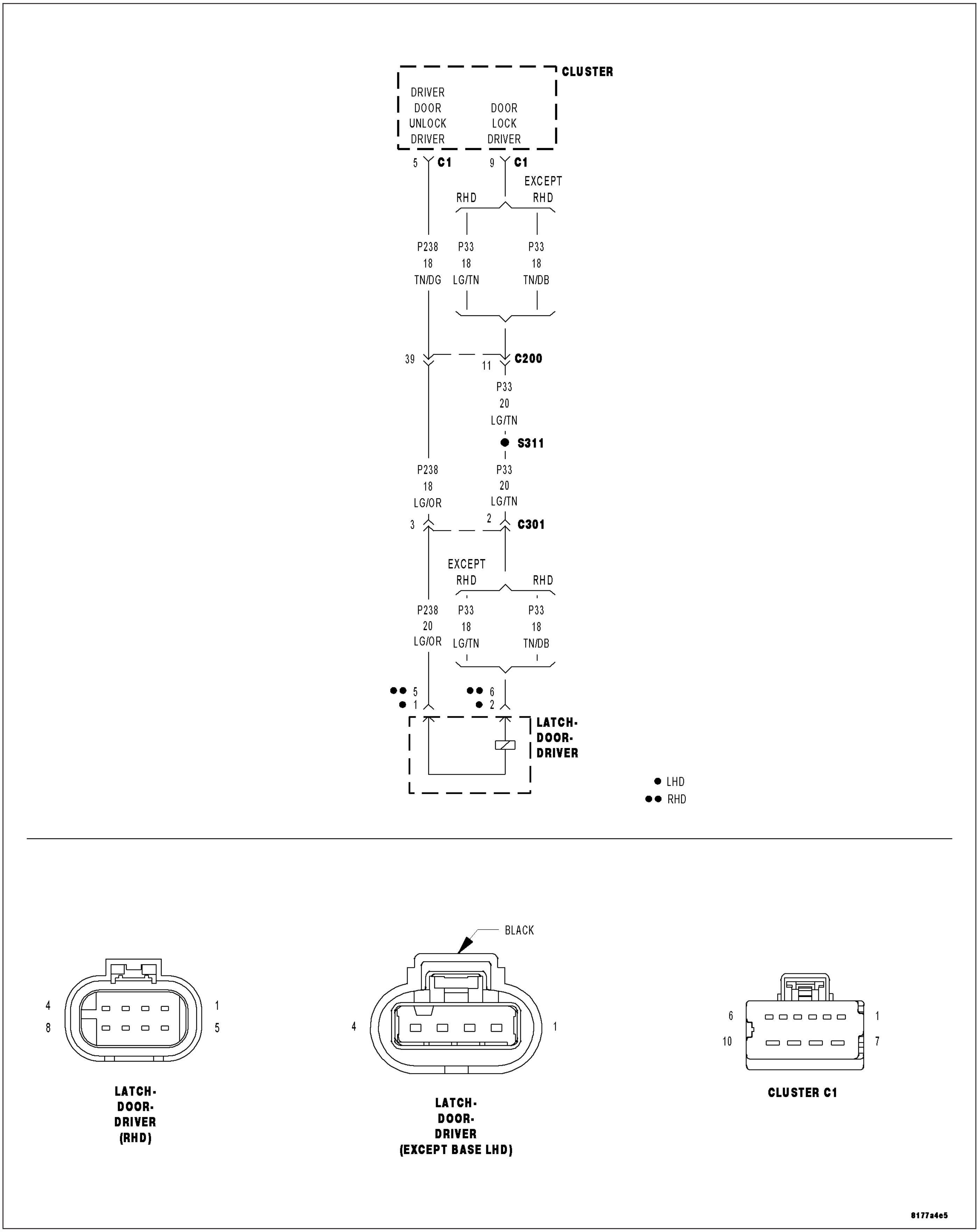
Does the test light illuminate brightly when the relay is actuated?

Yes >> Test Complete.

No >> Repair the (P33) Door Lock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

*DRIVER DOOR FAILS TO LOCK AND UNLOCK



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
DTC's PRESENT
(P238) DRIVER DOOR UNLOCK DRIVER WIRE OPEN
(P33) DOOR LOCK DRIVER WIRE OPEN
INSTRUMENT CLUSTER
DRIVER DOOR LATCH

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

Diagnostic Test

1. TEST FOR DIAGNOSTIC TROUBLE CODES

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

Cycle the ignition from on to off and wait for five seconds.

Turn the ignition on.

With the scan tool, read the active DTC's.

Does the scan tool display any Power Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the Table of Contents in this section to diagnose and repair the DTC's.

2. CHECK DOOR LOCK MOTOR CIRCUIT

Turn the ignition off.

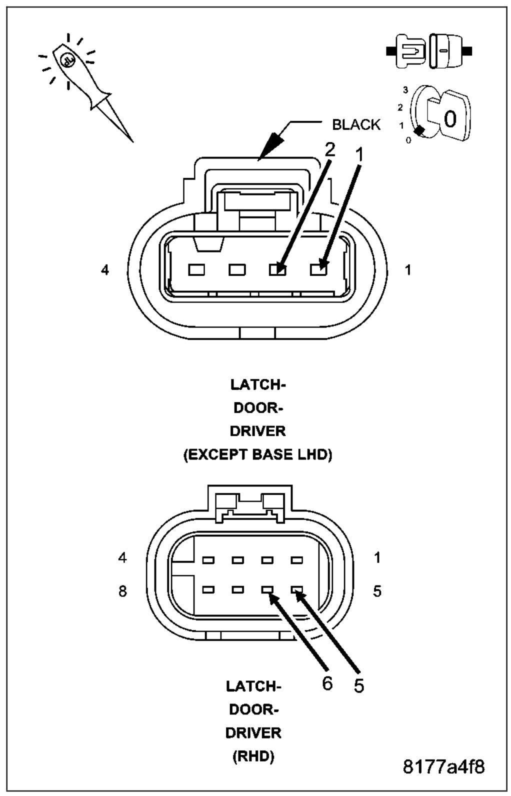
Disconnect the Driver Door Latch connector.

Connect a 12 volt test light between the (P33) Door Lock Driver and the (P238) Driver Door Unlock Driver circuits in the latch connector.

Remove the key from the ignition switch.

Close the driver door or trip the latch to the door closed position

Operate the door locks several times in the lock and unlock positions from the door lock switch and observe the test light.



Does the test light illuminate brightly when the locks are actuated in both directions?

Yes >> Replace the Driver Door Latch Assembly.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Go To 3

3. (P238) DRIVER DOOR UNLOCK DRIVER CIRCUIT OPEN

Using a 12-volt test light connected to ground, check the (P238) Driver Door Unlock Driver circuit.

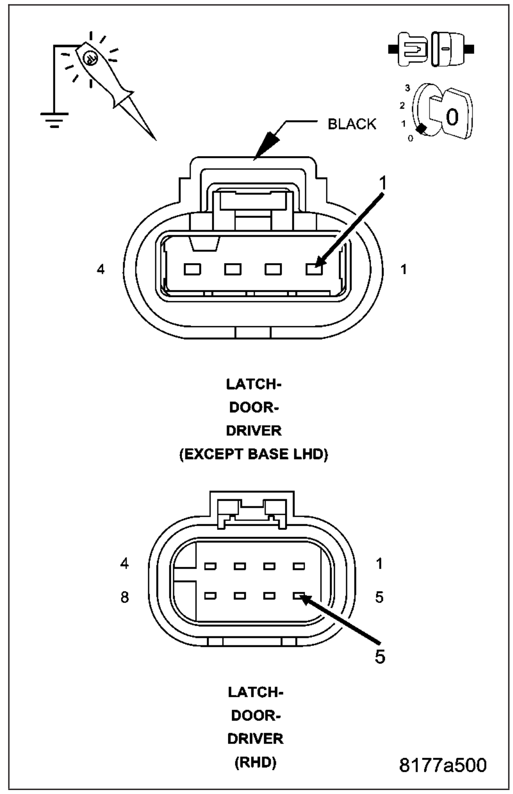
Close the driver door or trip the latch to the door closed position

With the scan tool, actuate the Driver Door Unlock Relay.

Does the test light illuminate brightly when the driver door unlock is actuated?

Yes >> Go To 4

No >> Go To 5



4. (P33) DOOR LOCK DRIVER WIRE OPEN

Using a 12-volt test light connected to ground, check the (P33) Door Lock Driver circuit.

Close the driver door or trip the latch to the door closed position

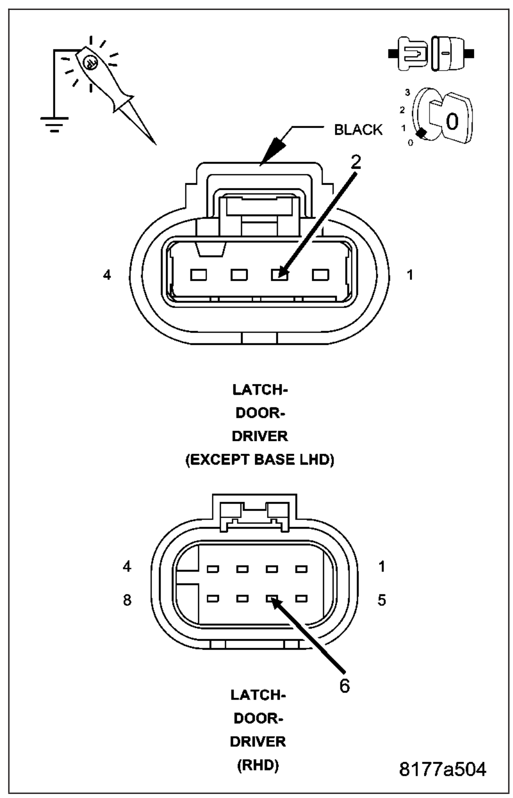
With the scan tool, actuate the Door Lock Relay.

Does the test light illuminate brightly when the door lock is actuated?

Yes >> Test Complete.

No >> Repair the (P33) Door Lock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)



5. (P238) DRIVER DOOR UNLOCK DRIVER WIRE OPEN

Disconnect the Cluster C1 connector.

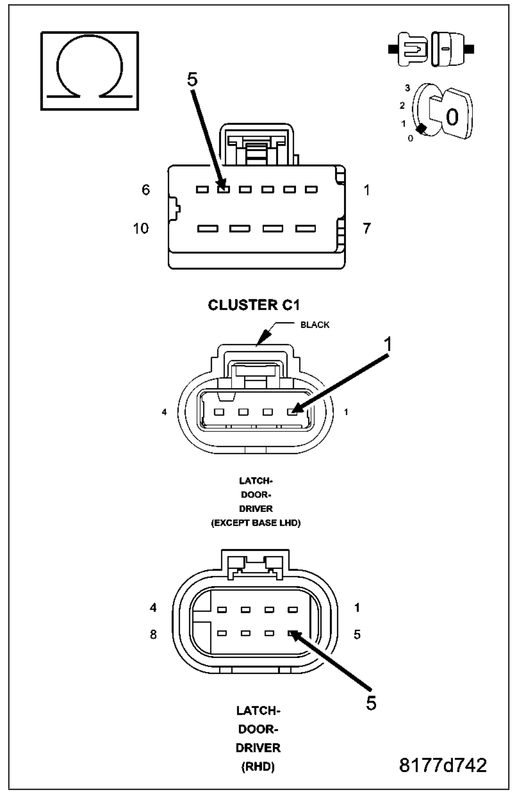
Measure the resistance of the (P238) Driver Door Unlock Driver wire between the Cluster C1 connector and the Driver Door Latch connector.

Is the resistance below 2.0 ohms?

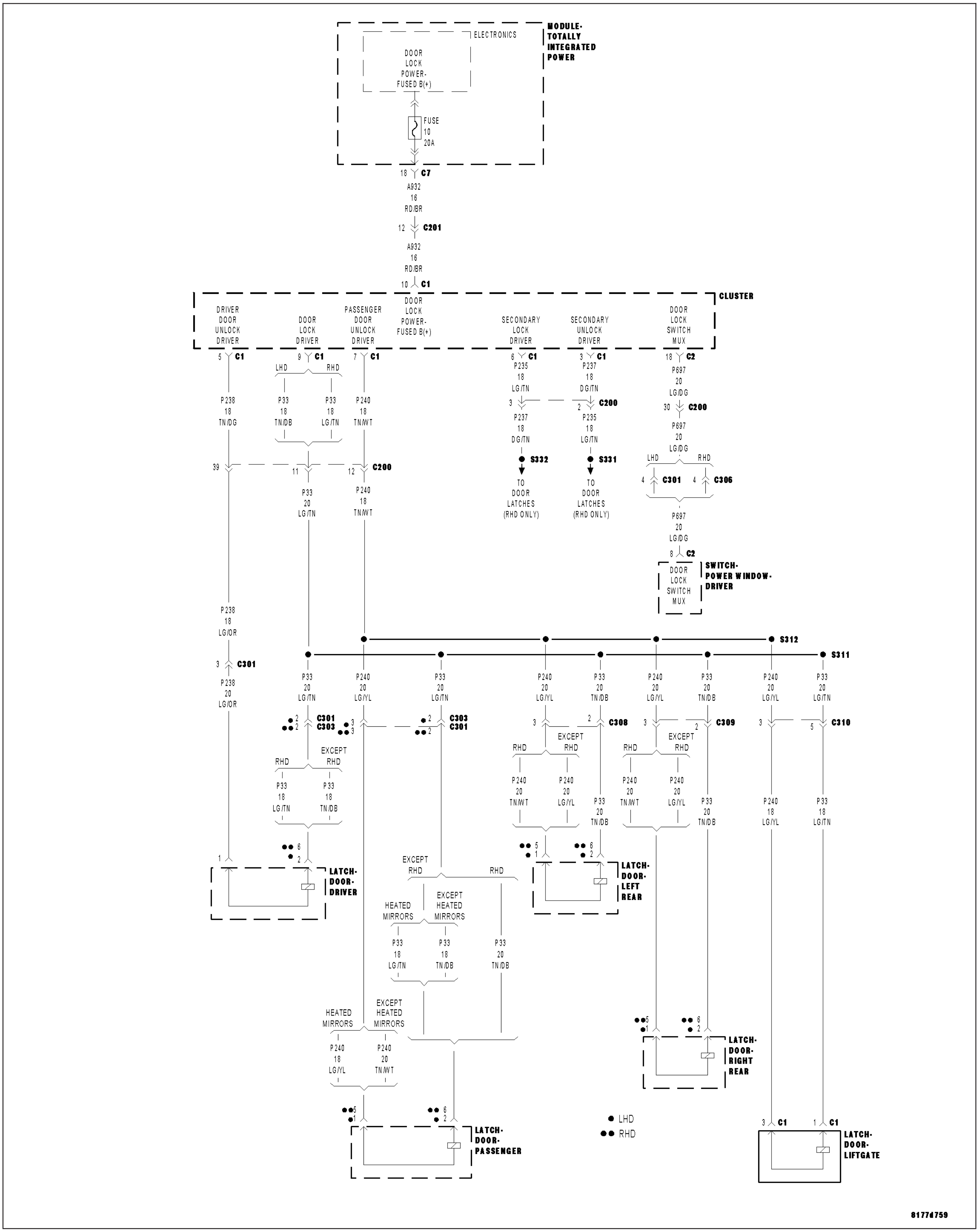
Yes >> Replace the Instrument Cluster in accordance with service information.Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Repair the (P238) Driver Door Unlock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)



*ALL DOORS FAIL TO LOCK AND UNLOCK



For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
DTC's PRESENT
TIPM FUSE NUMBER 10 OPEN
(P33) DOOR LOCK DRIVER WIRE OPEN
(A932) FUSED B+ CIRCUIT OPEN
INSTRUMENT CLUSTER

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

Diagnostic Test

1. TEST FOR DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off and wait for five seconds.
Turn the ignition on.
With the scan tool, read the active DTC's.

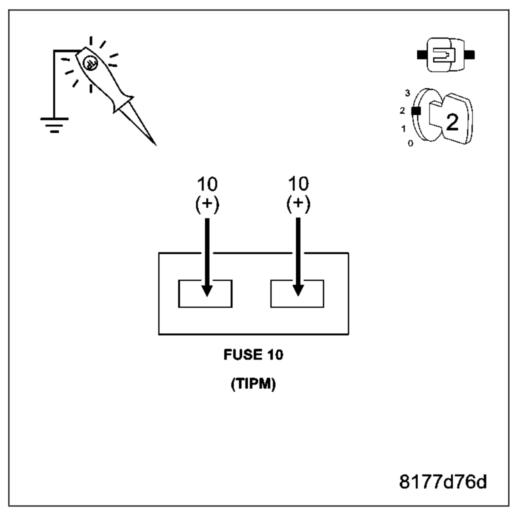
Does the scan tool display any Power Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the Table of Contents in this section to diagnose and repair the DTC's.

2. TIPM FUSE NUMBER 10 OPEN

Using a test light connected to ground, check both sides of the TIPM fuse number 10.



Does the test light illuminate brightly on both sides of the fuse?

No >> Repair the open circuit as necessary. If the fuse is blown, replace it and try the locks. If it blows again, use the schematics and locate and repair the short circuit.

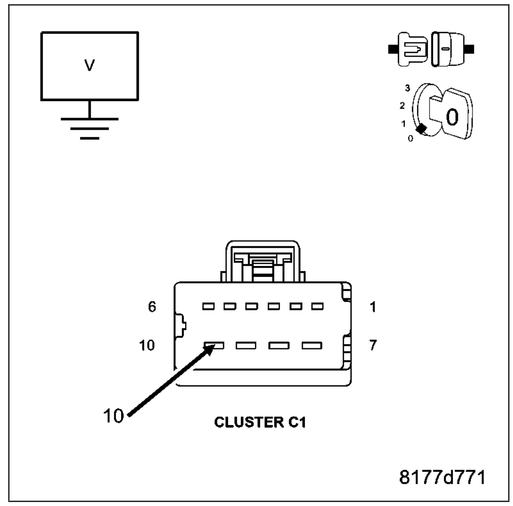
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

Yes >> Go To 3

3. (A 932) FUSED B+ CIRCUIT OPEN

Disconnect the Instrument Cluster C1 connector.

Measure the voltage of the (A932) Fused B+ circuit in the Cluster C1 connector.



Is the voltage above 11.0 volts?

Yes >> Go To 4

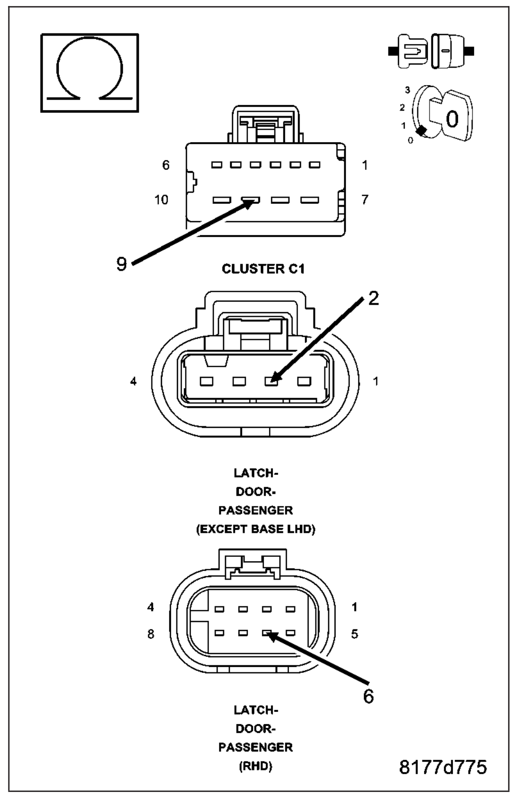
No >> Repair the (A932) Fused B+ circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

4. (P33) DOOR LOCK DRIVER WIRE OPEN

Disconnect any Door Latch Connector.

Measure the resistance of the (P33) Door Lock Driver wire between the Cluster C1 connector and the door latch connector.



Is the resistance below 5.0 ohms?

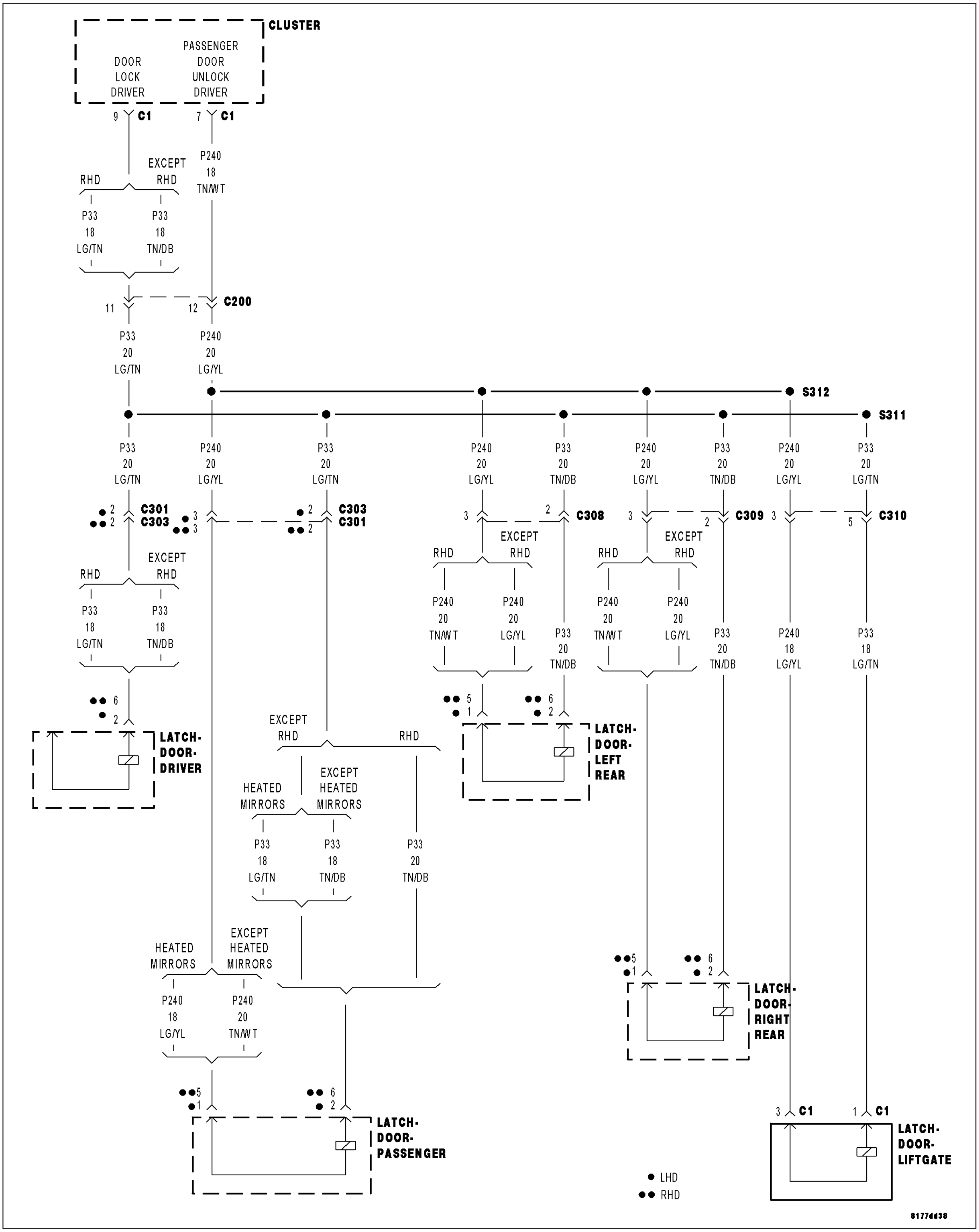
Yes >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Repair the (P33) Door Lock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

*ALL PASSENGER DOORS FAIL TO LOCK AND UNLOCK



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
DTC's PRESENT
(P240) PASSENGER DOORS UNLOCK DRIVER WIRE OPEN
INSTRUMENT CLUSTER

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

Diagnostic Test

1. TEST FOR DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off and wait for five seconds.
Turn the ignition on.
With the scan tool, read the active DTC's.

Does the scan tool display any Power Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the Table of Contents in this section to diagnose and repair the DTC's.

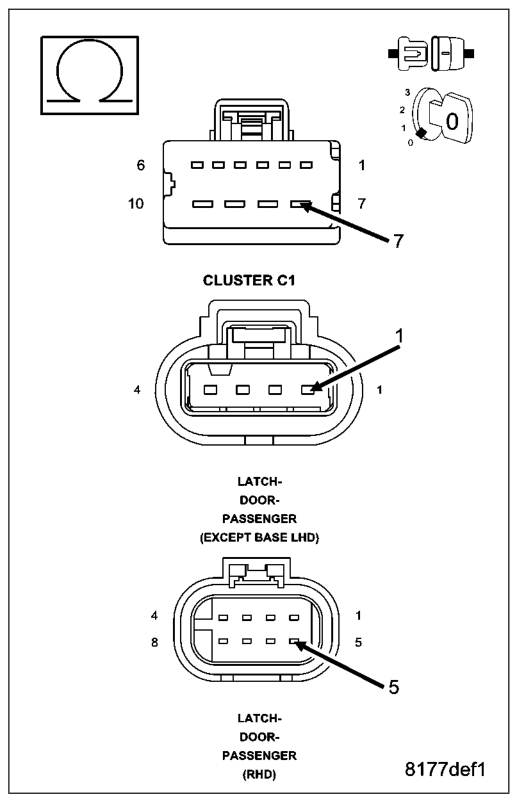
2. (P240) PASSENGER DOORS UNLOCK DRIVER WIRE OPEN

Turn the ignition off.
Disconnect any Door Latch Connector.
Measure the resistance of the (P240) Passenger Doors Unlock Driver wire between the Cluster C1 connector and the door latch connector.

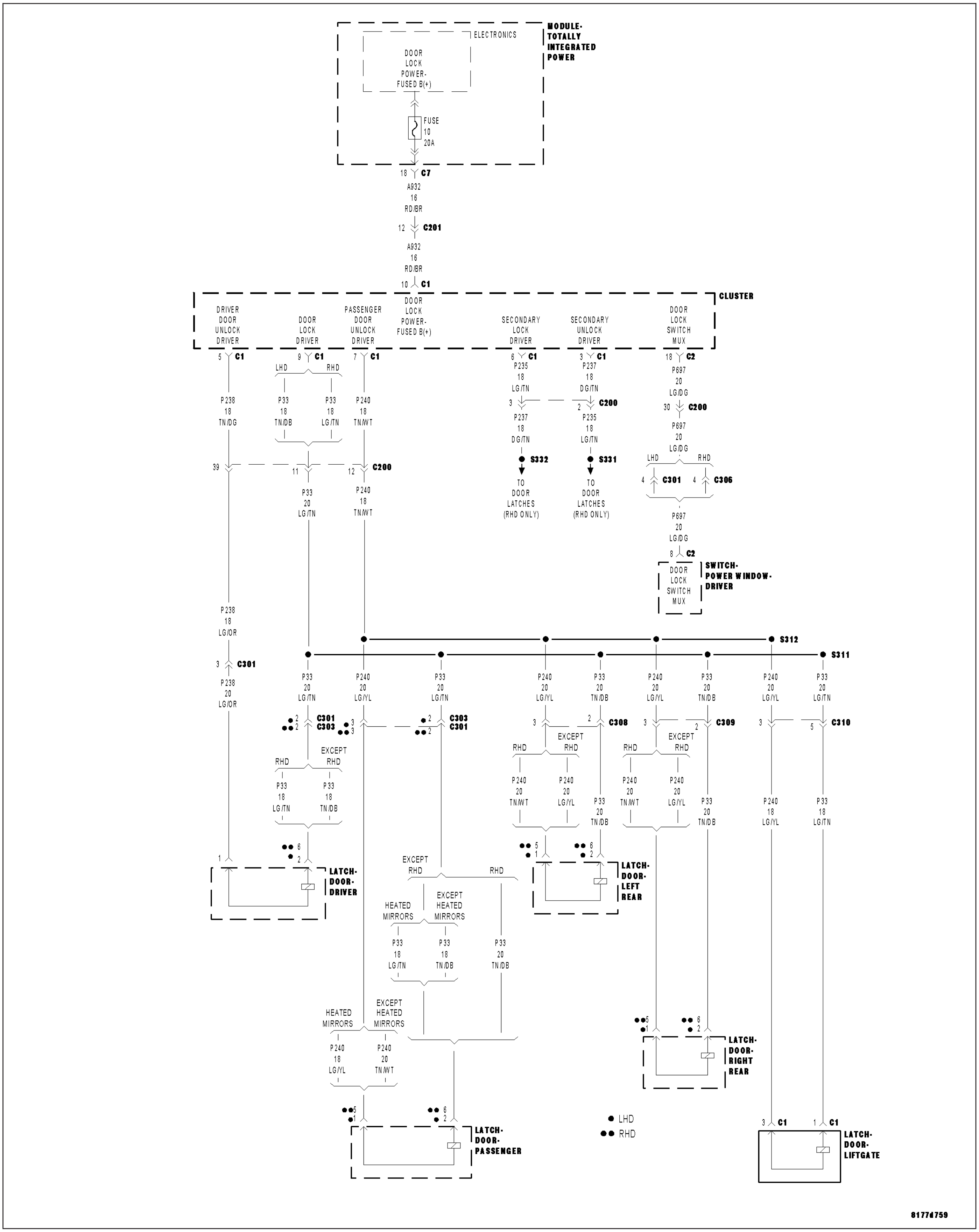
Is the resistance below 5.0 ohms?

Yes >> Replace the Instrument Cluster in accordance with service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Repair the (P240) Passenger Doors Unlock Driver wire for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)



*ALL PASSENGER DOORS FAIL TO UNLOCK



For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P240) PASSENGER DOORS UNLOCK DRIVER WIRE SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

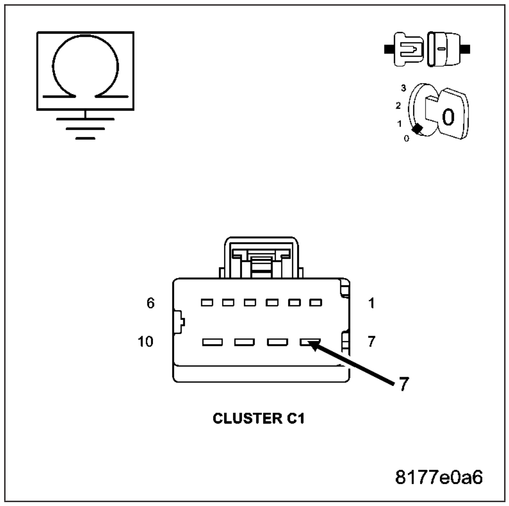
This test does not cover a secondary latch problem on a right hand drive vehicle.

1. (P240) PASSENGER DOORS UNLOCK DRIVER WIRE SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P240) Passenger Doors Unlock Driver circuit.



Is the resistance below 1,000.0 ohms?

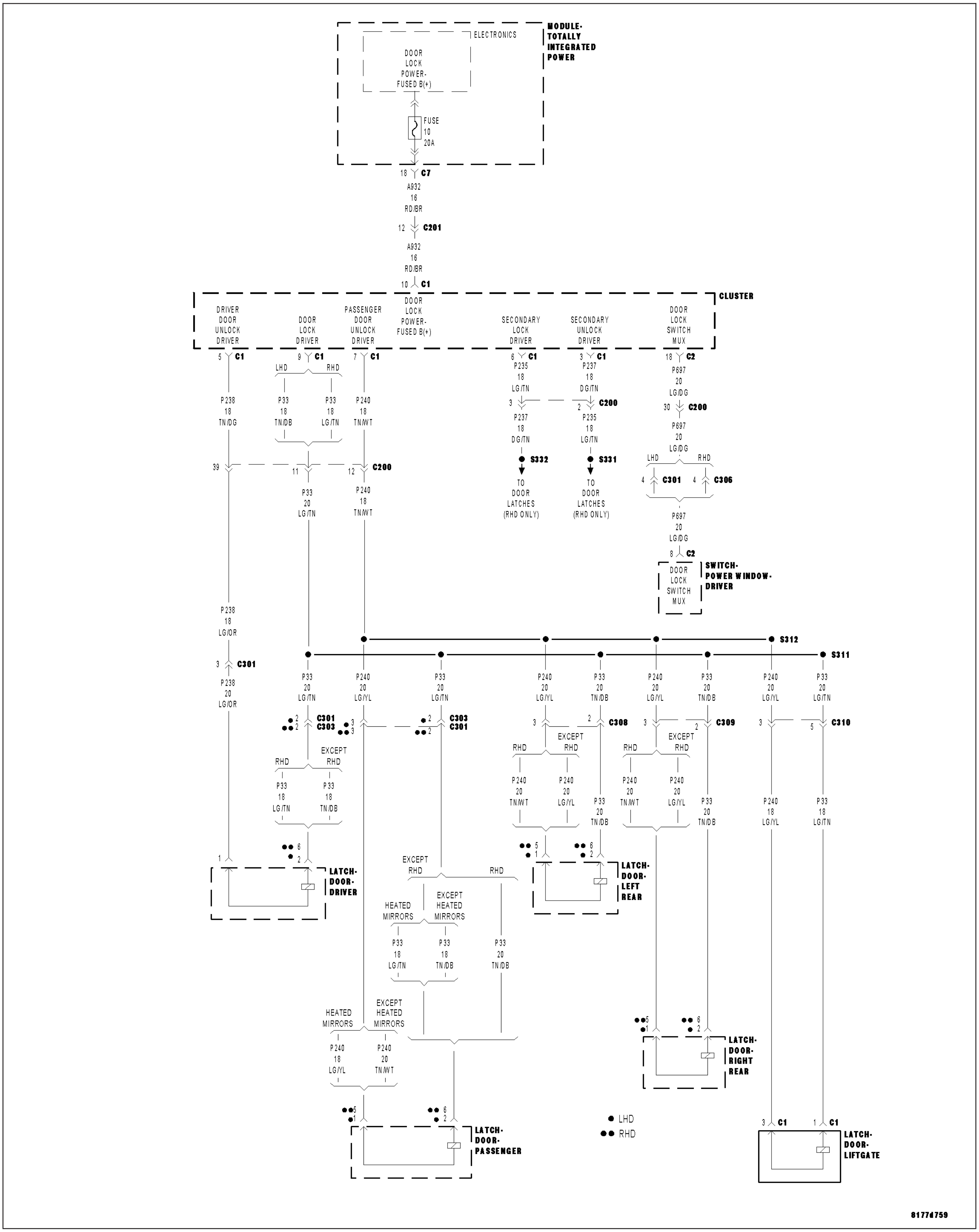
No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

Yes >> Repair the (P240) Passenger Doors Unlock Driver wire for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

*ALL DOORS FAIL TO LOCK



For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P33) DOOR LOCK DRIVER WIRE SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

1. (P33) DOOR LOCK DRIVER WIRE SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P33) Door Lock Driver circuit.

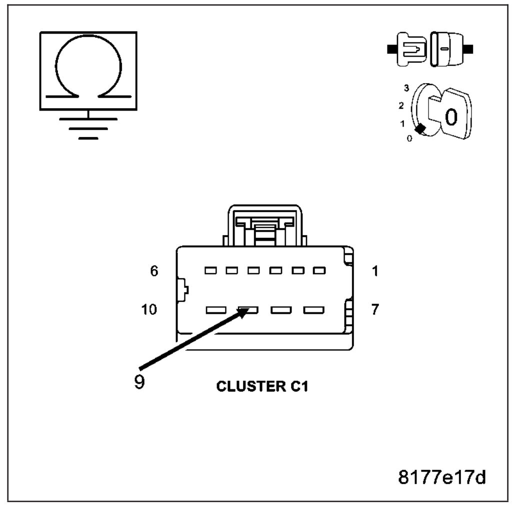
Is the resistance below 5.0 ohms?

No >> Replace the Instrument Cluster in accordance with service information.

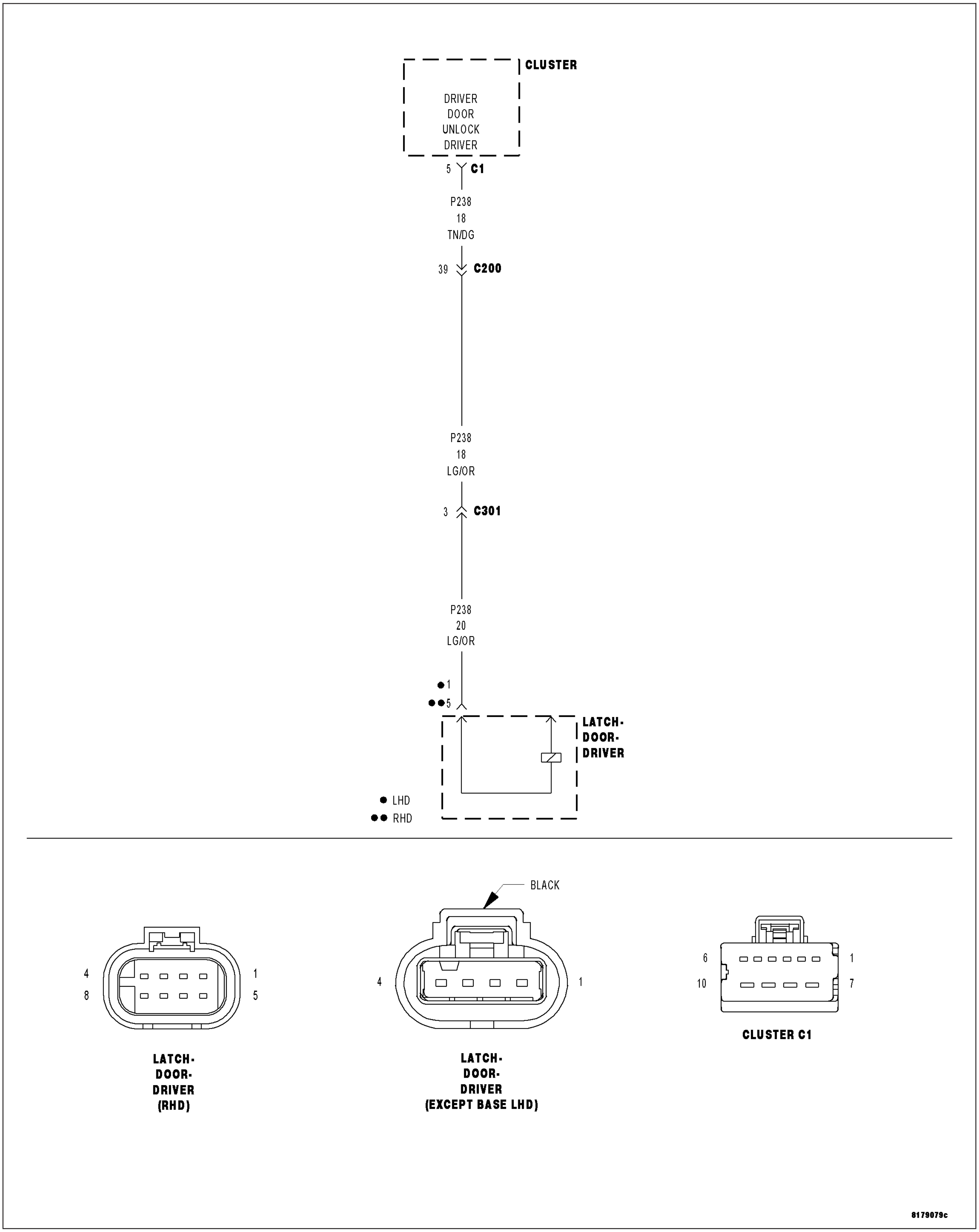
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

Yes >> Repair the (P33) Door Lock Driver wire for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)



*DRIVER DOOR FAILS TO UNLOCK



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(P238) DRIVER DOOR UNLOCK DRIVER WIRE SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This test does not cover a secondary latch problem on a right hand drive vehicle.

1. (P238) DRIVER DOOR UNLOCK DRIVER WIRE SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

Measure the resistance between ground and the (P238) Driver Door Unlock Driver circuit.

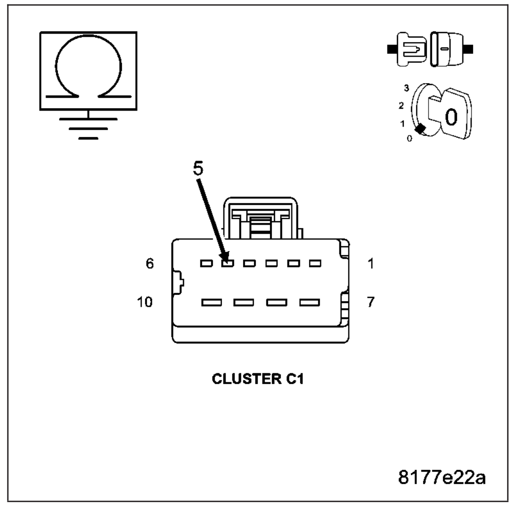
Is the resistance below 1,000.0 ohms?

Yes >> Repair the (P238) Driver Door Unlock Driver wire for a short to ground.

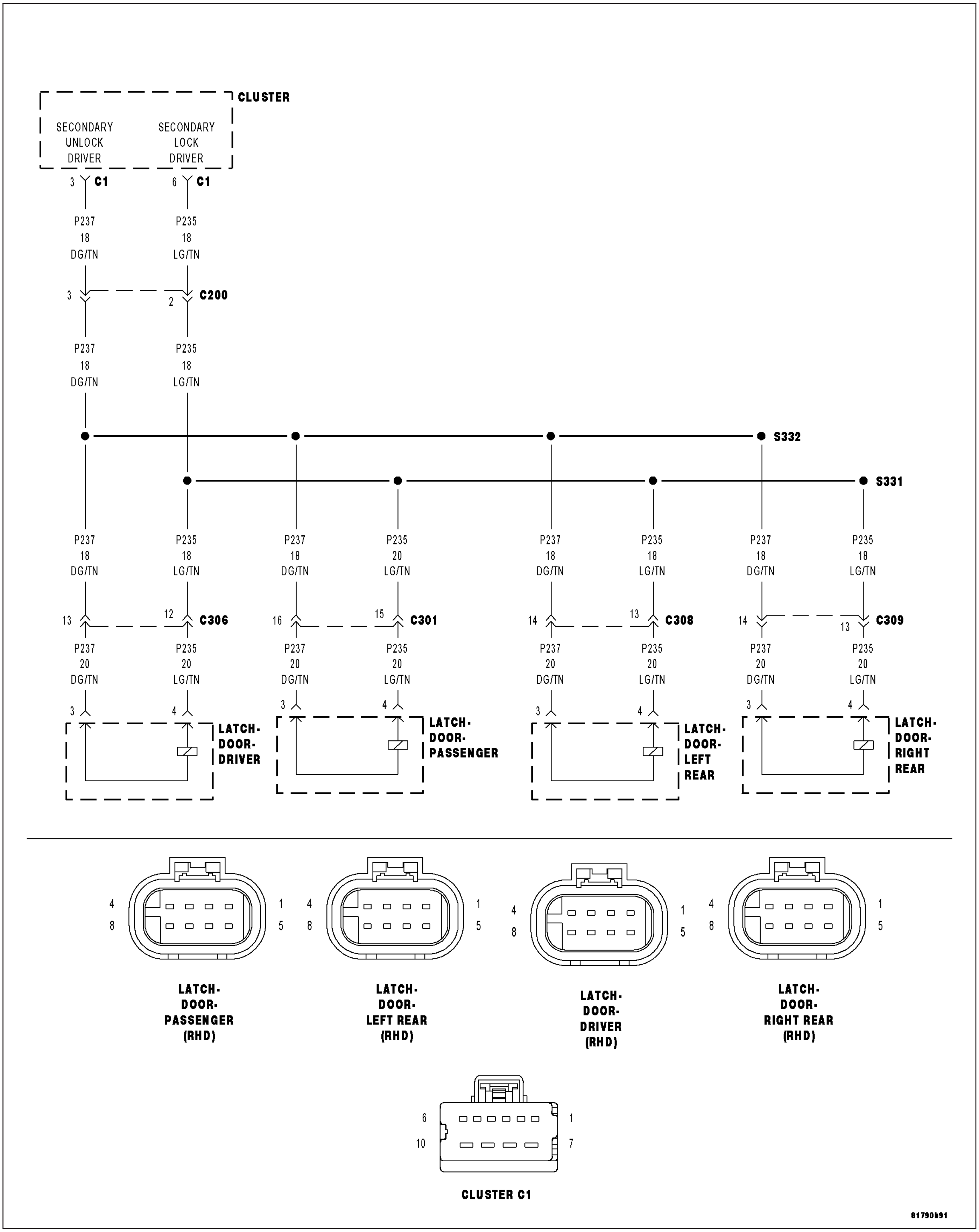
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Replace the Instrument Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)



*ONE SECONDARY DOOR LOCK INOPERATIVE – RHD ONLY



For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(P237) SECONDARY UNLOCK DRIVER WIRE OPEN
(P235) SECONDARY LOCK DRIVER WIRE OPEN
DOOR LATCH OR LIFTGATE MOTOR

Theory of Operation

The secondary lock is a dead bolt that prevents the door from being opened when the vehicle has been armed. It can only be locked when the key is out of the ignition, all doors are closed, the front door ajar switch transition has been completed and the RKE fob is pressed in the armed position. The secondary lock will operate approximately 18 seconds after the door latches are locked. The secondary locks are unlocked by a RKE fob unlock command after approximately 375 ms later than the door latches. They will also unlock when a valid SKIM key is turned to the ON position or the vehicle is driven and reaches Auto Door Lock (rolling) status. This system is only used on Right Hand Drive vehicles.

Diagnostic Test

1. TEST FOR DIAGNOSTIC TROUBLE CODES

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

Cycle the ignition from on to off and wait for five seconds.

Turn the ignition on.

With the scan tool, read the active DTC's.

Does the scan tool display any Power Door Lock related DTC's?

No >> Go To 2

Yes >> Refer to the Table of Contents in this section to diagnose and repair the DTC's.

2. DOOR LOCK MOTOR CIRCUIT

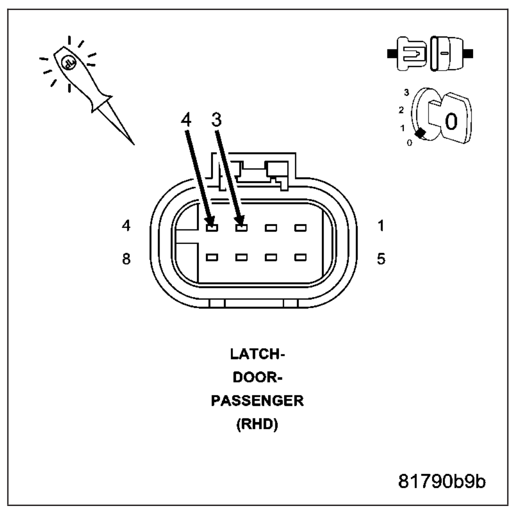
Lower the driver window.

Turn the ignition off.

Disconnect the inoperative Door Latch (Motor) connector.

Connect a 12 volt test light between the (P235) Secondary Lock Driver and the (P237) Secondary Unlock Driver circuits in the latch connector.

NOTE: Graphic shows the Passenger Front Latch – all others similar.



Remove the key from the ignition switch.

Using the RKE fob, operate the door lock. Wait 30 seconds and then operate the door unlock. Repeat this several times while observing the test light.

Does the test light illuminate brightly when the locks are actuated in both directions?

Yes >> Replace the Door latch Assembly (or motor).

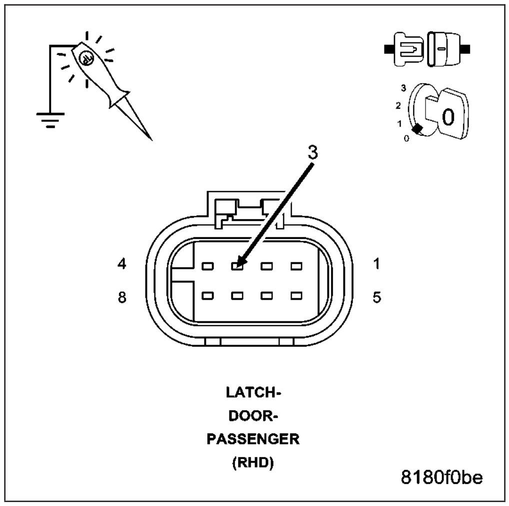
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

No >> Go To 3

3. (P237) SECONDARY UNLOCK DRIVER WIRE OPEN

Using a 12-volt test light connected to ground, check the (P237) Secondary Unlock Driver circuit.

Using the RKE fob, operate the door lock. Wait 30 seconds and then operate the door unlock. Wait 30 seconds and repeat this several times, waiting 30 seconds between fob presses, while observing the test light.



Does the test light illuminate brightly when the unlock cycle is actuated?

Yes >> Go To 4

No >> Repair the (P237) Secondary Unlock Driver wire for an open.

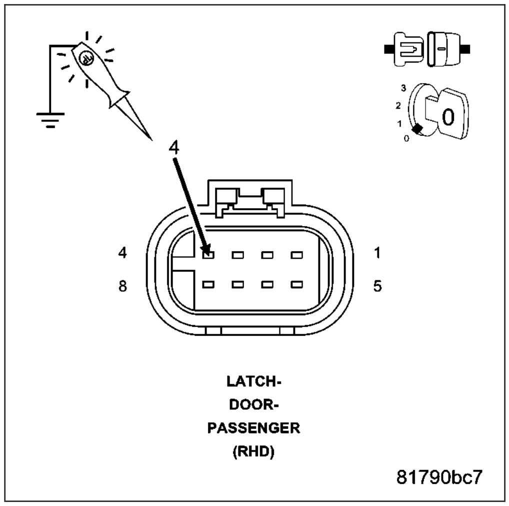
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

4. (P235) SECONDARY LOCK DRIVER WIRE OPEN

Using a 12-volt test light connected to ground, check the (P235) Secondary Lock Driver circuit.

Close all doors.

Using the RKE fob, operate the door lock. Wait 30 seconds and then operate the door unlock. Wait 30 seconds and repeat this several times, waiting 30 seconds between fob presses, while observing the test light.



Does the test light illuminate brightly when the lock cycle is actuated?

Yes >> Test Complete.

No >> Repair the (P235) Secondary Lock Driver wire for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING)

POWER LOCKS

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POWER LOCKS

DESCRIPTION

POWER LOCKS

The power lock system allows all of the doors and the liftgate to be locked or unlocked electrically by operating a switch on either front door trim panel. The power lock system receives non-switched battery current through a fuse in the Fuse Block, so that the power locks remain operational, regardless of the ignition switch position.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences.

The power lock system for this vehicle can also be operated remotely using the available Remote Keyless Entry (RKE) system Radio Frequency (RF) transmitters, if equipped.

Certain functions and features of the power lock system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. For proper diagnosis of these electronic modules or of the PCI data bus network, the use of a scan tool and the appropriate diagnostic information are required.

CHILD PROTECTION LOCKS

To provide a safer environment for children riding in the rear seat, the rear doors have the “child protection” door lock system.

The child protection locks are on the rear doors only. The lock, when engaged, will disable the inside door handle from opening the door. The lock is part of the latch/lock assembly.

DOOR LOCK INHIBIT

With the key in the ignition switch and the driver door open, the Remote Keyless Entry (RKE) module will ignore the command to lock the power door locks using the interior door lock switches. Once the key is removed, or the drivers door is closed, the RKE module will allow the power locks to lock using the door lock switch.

REMOTE KEYLESS ENTRY

The remote keyless entry system allows locking and unlocking of the vehicle door(s) liftgate, panic alarm and arming or disarming of the vehicle theft security system (if equipped), using the hand held (RF) transmitter.

The RKE module is also referred to as the Alarm Remote Keyless Entry Module (ARKEM). It also contains the functionality for the Vehicle Theft Security System (VTSS).

The module may receive signals from up to four transmitters. Each transmitter has its own code, and the code is programmed and stored into the module memory. If a transmitter is replaced or additional transmitters are added, the codes for all units have to be reprogrammed into the RKE module or ARKEM memory. If a module is replaced, the transmitter codes must be stored in the new memory (by performing the steps for programming transmitters). The RKE or ARKEM is capable of retaining all transmitter codes when power is removed from the module.

SECONDARY LOCKS — RHD ONLY

The secondary lock is a dead bolt that prevents the door from being opened when the vehicle is armed. It can only be actuated when the key is out of the ignition, all doors are closed and the lock function on the RKE fob is pressed. The secondary lock will arm approximately 16 seconds after the door latches are locked. The secondary locks are unlocked by a RKE fob unlock command approximately 375 milliseconds after the door latches are unlocked. They will also unlock when a valid SKIM key is turned to the ON position. The secondary locks will also be unlocked when the vehicle is driven and reaches the Auto Door Lock (rolling) status for safety reasons. This system is only used on Right Hand Drive vehicles.

OPERATION

POWER LOCKS

All doors can be locked or unlocked mechanically and independently with their respective locking knobs. The front doors can also be unlocked by actuation of the inside remote door handle.

CENTRAL LOCKING/UNLOCKING (IF EQUIPPED)

The door locks can be locked or unlocked electrically via the exterior door key cylinders to provide the central locking/unlocking feature. The central locking/unlocking feature incorporates a customer programmable ″Double activation unlock″ feature which operates in the following manner: When enabled, the first turn of the key cylinder to the UNLOCK position (toward the front of the vehicle) will mechanically unlock the door whose key cylinder is being turned. A second turn of the key cylinder to the UNLOCK position (within five seconds of the first turn) will cause all vehicle doors and liftgate to unlock electrically. When this feature is disabled, all vehicle doors and liftgate will be unlocked electrically upon the first turn of a key cylinder to the UNLOCK position. The vehicle is locked electrically by turning the key cylinder to the LOCK position once, regardless of the state of the double activation unlock feature.

REMOTE KEYLESS ENTRY

The transmitter has three buttons for operation: LOCK, UNLOCK and PANIC.

- Pressing the UNLOCK button will unlock the driver's door, flash the park lamps twice and enable illuminated entry. Pressing and releasing the button once will unlock the drivers door. Pressing and releasing the button two times within a five second interval will unlock all doors.
- Pressing the LOCK button will cause the horn to sound a short chirp (if enabled) and flash the park lamps to notify that the all door lock signal was received and set. Illuminated entry is cancelled and the interior lamps are faded to off.
- Pressing the PANIC button will cause the panic alarm to sound for three minutes, until the PANIC button is pressed a second time, or the vehicle reaches a speed of 25.7 Km/h (15 mph). The receiver is capable of retaining a Vehicle Access Code (VAC) even when power is removed. Each Remote Keyless Entry (RKE) module must have at least one and no more than four transmitters.

ROLLING DOOR LOCKS

When the rolling door lock system is enabled, the RKE module will automatically lock all the vehicle doors and liftgate when all of the following conditions are met:

- All doors are closed
- The vehicle speed exceeds 25.7 Km/h (15 +/- 1 mph).
- The throttle position sensor tip-in is greater than 10 +/- 2 degrees.

The RKE module will automatically re-lock all doors if the above conditions are met and if any of the doors become ajar and then closed again.

The enabling/disabling of the rolling door lock feature is customer programmable, as well as programmable with the scan tool.

The power lock motors are also equipped with a thermal protection system which prevents the motors from burning out. The motors may chatter if they are continuously activated.

DIAGNOSIS AND TESTING - POWER LOCKS

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures manual. The scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the power lock motors are being sent the proper hard wired outputs by the relays for them to perform their power lock system functions.

STANDARD PROCEDURE

STANDARD PROCEDURE - DOUBLE ACTIVATION UNLOCK

The toggling of the double activation unlock feature (between enabled and disabled) can be performed with the use of the scan tool, or by the customer.

SCAN TOOL PROGRAMMING

When using the scan tool, select:

1. "CCN"
2. "Miscellaneous Functions"

and then the desired function.

CUSTOMER PROGRAMMING

1. Open the driver door, sit in the driver seat, and close the driver door.
2. Turn the ignition switch to the RUN position (without starting the vehicle) and then back to OFF. Repeat this step three additional times (for a total of four key ON/OFF cycles).
3. Within 10 seconds of switching the ignition switch to the OFF position for the last time (at the end of the fourth cycle in the above step), press the driver interior door lock switch to UNLOCK.
4. A single chime will be heard to verify that the customer programmable toggle of the double activation unlock was successfully completed.

Steps 2 and 3 must be completed within 10 seconds.

NOTE: When toggling the double activation unlock feature (customer programmable), the toggle that happens will be from the last state of the double activation unlock. If the double activation unlock feature was enabled, after the toggle process, it will now be disabled and vice versa. There is no telltale to inform you of which state the double activation unlock feature is in.

STANDARD PROCEDURE - ROLLING DOOR LOCKS

The toggling of the rolling door lock feature (between enabled and disabled) can be performed with the use of the scan tool or by the customer.

SCAN TOOL PROGRAMMING

When using the scan tool, select:

1. "Theft Alarm"
2. "VTSS"
3. "Miscellaneous"

and then the desired function.

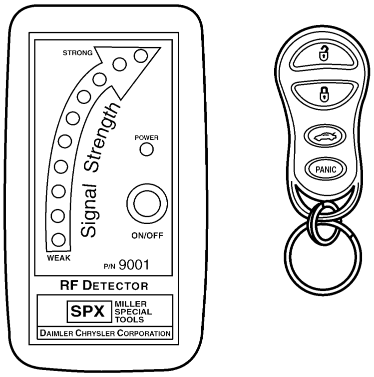
CUSTOMER PROGRAMMING

1. Open the driver door, sit in the driver seat, and close the driver door.
2. Turn the ignition switch to the RUN position (without starting the vehicle) and then back to OFF. Repeat this step three additional times (for a total of four key ON/OFF cycles).
3. Within 10 seconds of switching the ignition switch to the OFF position for the last time (at the end of the fourth cycle in the above step), press the driver interior door lock switch to LOCK.
4. A single chime will be heard to verify that the customer programmable toggle of the rolling door locks was successfully completed.

Steps 2 and 3 must be completed within 10 seconds.

NOTE: When toggling the rolling door locks (customer programmable), the toggle that happens will be from the last state of the rolling door locks. If the rolling door locks were enabled, after the toggle process, they will now be disabled and vice versa. There is no telltale to inform you of which state the rolling door locks are in.

SPECIAL TOOLS



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DOOR LOCK SWITCH

DIAGNOSIS AND TESTING - DOOR LOCK SWITCH

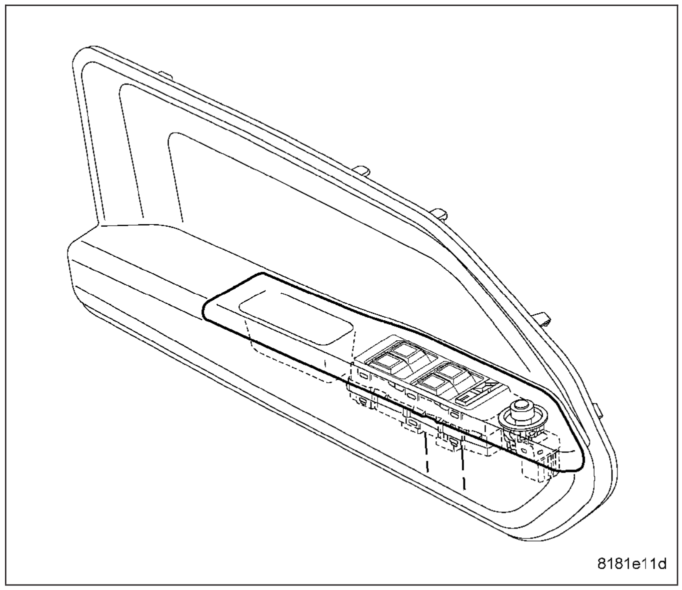
1. Remove the switch.
2. Using an ohmmeter, refer to Door Lock Switch Test table to determine if switch resistance is correct in the Lock and Unlock switch positions. Refer to Wiring Diagrams for harness connector pin-outs.

DOOR LOCK SWITCH TEST

SWITCH POSITION	PINS	RESISTANCE VALUE
LOCK	2 AND 3	1K OHM ±10 %
UNLOCK	2 AND 3	249 OHM ± 10 %

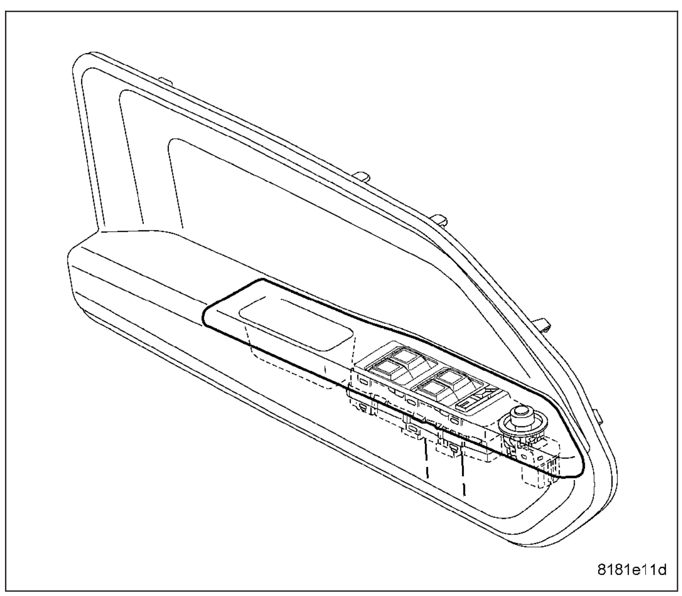
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL).
3. Disconnect the electrical harness connectors.
4. With the bolster on the bench, gently pry in on the tabs of the mirror switch and push through the front of the cover and remove.



INSTALLATION

1. Place the mirror switch in bolster opening and firmly snap into place.
2. Connect the electrical harness connectors.
3. Install the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)
4. Connect the battery negative cable.



DOOR LOCK MOTOR

DESCRIPTION

The lock mechanisms are actuated by a reversible electric motor mounted within each door and tailgate. The power lock motors are integral to the door latch units.

The power lock motors cannot be adjusted or repaired and, if inoperative or damaged, the door latch unit must be replaced.

OPERATION

The door lock motors are controlled by relays. A positive and negative battery connection to the two motor terminals will cause the motor to move in one direction. Reversing the current will cause the motor to move in the opposite direction.

DIAGNOSIS AND TESTING - DOOR LOCK MOTOR

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures manual.

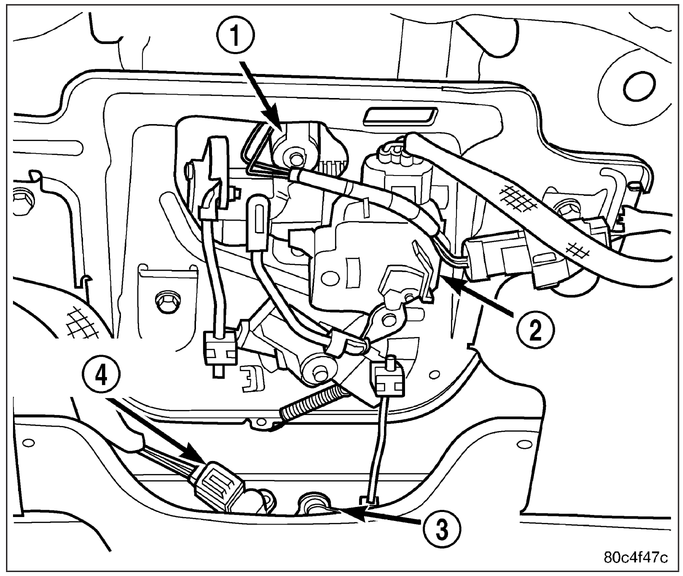
Refer to the appropriate wiring information.

1. Make certain battery is in normal condition and fuses powering the RKE module aren't blown before circuits are tested.
2. To determine which motor is inoperative, check each individual door for electrical lock and unlock or disconnect the motor connectors one at a time, while operating the door lock switch.
3. In the event that none of the motors work, the problem maybe caused by a shorted motor, a bad switch or a bad relay internal to the RKE module. Disconnecting a defective motor will allow the others to work.
4. To test an individual door lock motor, disconnect the electrical connector from the motor.
5. To lock the door, connect a 12 volt power source to one pin of the lock motor and a ground wire to the other pin.
6. To unlock the door, reverse the wire connections at the motor pin terminals.
7. If these results are NOT obtained, replace the motor.

LIFTGATE LOCK MOTOR

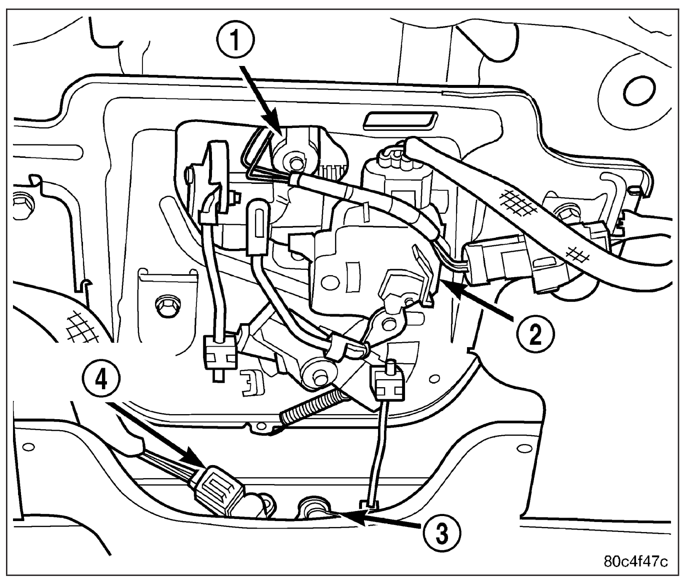
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove liftgate trim panel.
3. Disconnect motor wire harness connector.
4. Remove liftgate lock motor (2) from liftgate by gently unsnapping.



INSTALLATION

1. Install liftgate lock motor (2) on the liftgate.
2. Install motor wire harness connector.
3. Install the liftgate trim panel.
4. Connect the battery negative cable.



REMOTE KEYLESS ENTRY MODULE

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY MODULE

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures manual.

Refer to the appropriate wiring information.

REMOVAL

(Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY REMOTE ENTRY MODULE - REMOVAL)

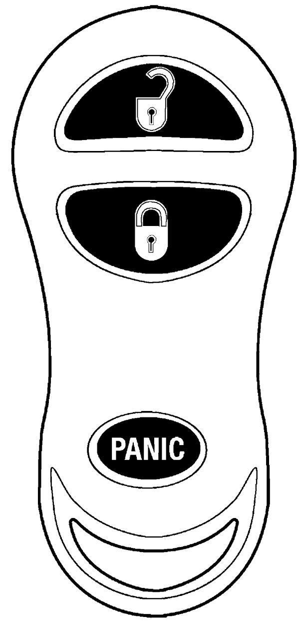
INSTALLATION

(Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY REMOTE ENTRY MODULE - INSTALLATION)

REMOTE KEYLESS ENTRY TRANSMITTER

DESCRIPTION

The transmitter has three buttons for operation. They are **LOCK**, **UNLOCK**, and **PANIC**.



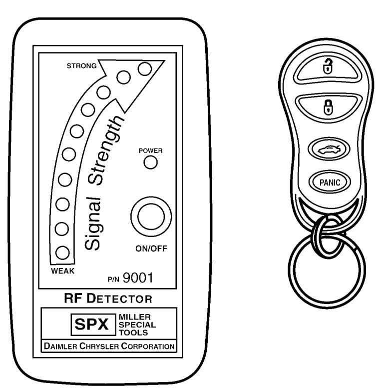
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OPERATION

- The **UNLOCK** button will unlock the driver door flash the Park lamps twice and enable illuminated entry. Pushing and releasing the button once will unlock the driver door. Pushing and releasing the button two times within a five second period will unlock all doors (double unlock activation enabled).
- Upon pressing the **LOCK** button, the horn will sound a short chirp (if enabled) and flash the park lamps to notify that the all door lock signal was received and acted upon. Illuminated entry is cancelled and the interior lamps are faded to off.
- Pushing the **PANIC** button will cause the panic alarm to sound for three minutes, until the panic button is pressed a second time, or until the vehicle reaches a speed of 15 mph.

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY TRANSMITTER

Using special tool 9001, first test to ensure that the transmitter is functioning. Typical testing distance is 2.5 centimeters (1 inch) for Asian transmitters and 30.5 centimeters (12 inches) for all others. To test, position the transmitter as shown. Press any transmitter button, then test each button individually. The tool will beep if a radio signal strength that lights five or more LED's is detected. Repeat this test three times. If transmitter fails any of the test refer to the Diagnostic Procedures manual.



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STANDARD PROCEDURE

STANDARD PROCEDURE - HORN CHIRP TOGGLE

The toggling of the horn chirp (between enabled and disabled) can be performed with the use of the scan tool or by the customer.

SCAN TOOL PROGRAMMING

When using the scan tool, select:

1. “TIPM”
2. “Miscellaneous Functions”

and then the desired function.

CUSTOMER PROGRAMMING

Using a transmitter programmed to the Sentry Key Remote Entry Module, the status of the horn chirp may be toggled by the customer.

NOTE: The SKREEM is responsible for keeping track of the horn chirp status; thus this procedure does not need to be repeated for each transmitter programmed to the system.

1. With the ignition switch in RUN position, press and hold the transmitter Unlock button for a minimum of 4 seconds to a maximum of 10 seconds.
2. While holding the UNLOCK button for 4-10 seconds, press the LOCK button. A chime will be heard to indicate a successful toggle, at which time both buttons may be released.

STANDARD PROCEDURE - TRANSMITTER PROGRAMING

New Remote Keyless Entry (RKE) transmitters can be programed using the scan tool and the proper Diagnostic Procedures manual, if no functioning transmitter is available.

The following procedure can be used as long as one functioning transmitter is available:

1. Insert the key into the ignition switch, and turn the ignition switch to the RUN position (without starting the vehicle).
2. Using the RKE transmitter programmed to the RKE module, press and continuously hold down the UNLOCK button for 4-10 seconds.
3. Within the 4-10 second time range, continue to hold the UNLOCK button and press the PANIC button. Both buttons may then be released. Upon the PANIC button being depressed, the message for customer programming mode will be transmitted to the RKE module.
4. A chime will be heard to verify that the customer programming mode has been entered.
5. Press and release any button on each transmitter that is to be programmed to the RKE module, including any transmitters which were previously programmed to the RKE module (with a maximum of four possible). After each transmitter is successfully programmed, a chime will be heard to verify that successful programming of the transmitter has occurred.
6. After 30 seconds, or upon the ignition switch being turned OFF, a chime will indicate that the RKE module has exited the programming mode.

STANDARD PROCEDURE - RKE TRANSMITTER BATTERIES

The Remote Keyless Entry (RKE) transmitter case snaps open and shut for battery access. To replace the RKE transmitter batteries:

1. Using a thin coin, gently pry at the notch in the center seam of the RKE transmitter case halves near the key ring until the two halves unsnap.
2. Lift the back half of the transmitter case off of the RKE transmitter.
3. Remove the two batteries from the RKE transmitter.
4. Replace the two batteries with new Panasonic 2016, or equivalent. Be certain that the batteries are installed with their polarity correctly oriented.

5. Align the two RKE transmitter case halves with each other, and squeeze them firmly and evenly together until they snap back into place.

SPECIFICATIONS - TRANSMITTER RANGE

Normal operation range is within 7 meters (23 ft.) of the vehicle. Range may be better or worse depending on the environment around the vehicle.

POWER MIRRORS

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POWER MIRRORS

DESCRIPTION

The mirrors are controlled by a single switch assembly located on the driver's door trim panel. A three-position rotary joystick switch selects the right or left power mirror for adjustment, or turns the power mirror system Off in the center position. A momentary joystick directional switch allows the driver to adjust the selected power mirror in the Up, Down, Right or Left directions.

The motors which operate the mirrors are part of the mirror assembly and cannot be replaced separately.

These vehicles may be equipped with power foldaway mirrors. This feature allows both the driver and passenger side view mirrors to fold inward (retract) on demand. The vehicle has an additional switch located below the power mirror switch that controls the folding function of the mirror assembly.

The foldaway side view mirror is attached to the vehicle's door in the same manner as mirrors without the foldaway option. The foldaway mirrors unique option is the internal motor which allows the mirrors to fold inward. The foldaway mirror motor is not serviceable separately and if a motor is found to be inoperative, the entire side view mirror must be replaced.

OPERATION

Use the mirror select switch, located on the driver's door trim panel, to adjust the view obtained in the outside mirrors. Rotate the joystick for Left or Right mirror selection. Use the center off position to guard against accidentally moving a mirror position.

Select a mirror and press the joystick in one of the four positions that correspond with the direction that you want the mirror to move.

DIAGNOSIS AND TESTING - POWER MIRRORS

WIRING VOLTAGE TEST (LHD)

The following wiring test determines whether or not voltage is continuous through the body harness to switch.

1. Remove the power mirror switch.
2. Disconnect wire connector from back of power mirror switch.
3. Connect the clip end of a 12 volt test light to Pin 7 in the harness connector at the mirror switch. Touch the test light probe to Pin 3.

If the test light illuminates, the wiring circuit between the battery and switch is OK.

If the lamp does not illuminate, first check fuse 18 in the Junction Block (JB). If fuse 18 is OK, then check for a broken wire.

Refer to the appropriate wiring information.

POWER MIRROR MOTOR TEST (LHD)

If the power mirror switch is receiving proper current and ground and mirrors do not operate, proceed with power mirror motor test. Refer to the appropriate wiring information.

1. Disconnect wire harness connector to power mirror switch.
2. Using two jumper wires:
   - Connect one to a 12 volt source
   - Connect the other to a good body ground
   - Refer to the Mirror Motor Test Chart for proper wire connections at the switch connector.

MIRROR MOTOR TEST CHART

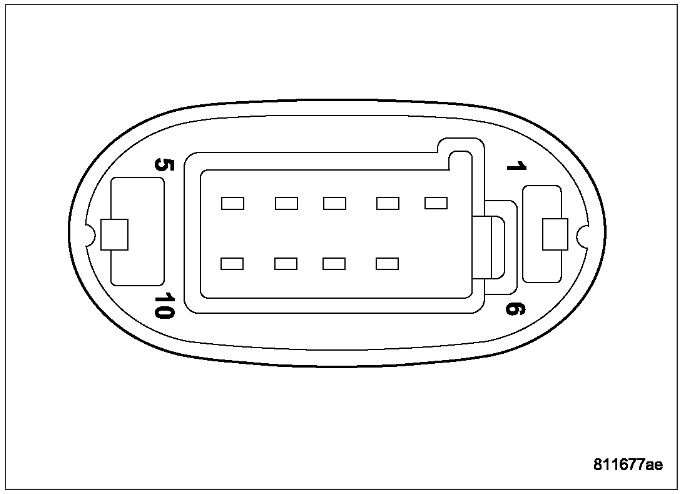
12 VOLTS	GROUND	MIRROR REACTION	
SWITCH CONNECTOR		RIGHT	LEFT
PIN 4	PIN 1	-	UP
PIN 8	PIN 1	-	LEFT
PIN 1	PIN 4	-	DOWN
PIN 1	PIN 8	-	RIGHT
PIN 9	PIN 10	UP	-
PIN 2	PIN 10	LEFT	-
PIN 10	PIN 9	DOWN	-
PIN 10	PIN 2	RIGHT	-

3. If results shown in table are not obtained, check for open or shorted circuit. Replace mirror assembly as necessary.

POWER MIRROR SWITCH - LHD

DIAGNOSIS AND TESTING - POWER MIRROR SWITCH - LHD

1. Disconnect and isolate the battery negative cable.
2. Remove power mirror switch (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).
3. Using an ohmmeter, test for continuity between the terminals of the switch as shown in the Mirror Switch Test table.
4. If test results are not obtained as shown in the Mirror Switch Test table, replace the switch.

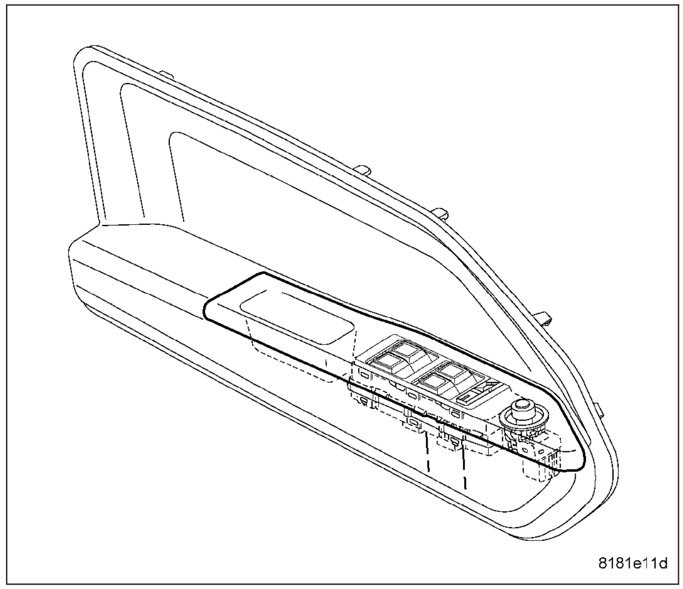


MIRROR SWITCH TEST TABLE

SWITCH POSITION MOVE BUTTON	CONTINUITY BETWEEN TERMINALS
MIRROR IN ″L″ POSITION	
UP	PIN 2 TO 4 PIN 4 TO 7 PIN 8 TO 10
RIGHT	PIN 3 TO 8 PIN 8 TO 9 PIN 4 TO 10
DOWN	PIN 2 TO 8 PIN 7 TO 8 PIN 4 TO 10
LEFT	PIN 3 TO 4 PIN 4 TO 9 PIN 8 TO 10
MIRROR IN ″R″ POSITION	
UP	PIN 2 TO 4 PIN 4 TO 7 PIN 1 TO 8
RIGHT	PIN 1 TO 4 PIN 3 TO 8 PIN 8 TO 9
DOWN	PIN 1 TO 4 PIN 2 TO 8 PIN 7 TO 8
LEFT	PIN 3 TO 4 PIN 1 TO 8 PIN 4 TO 9

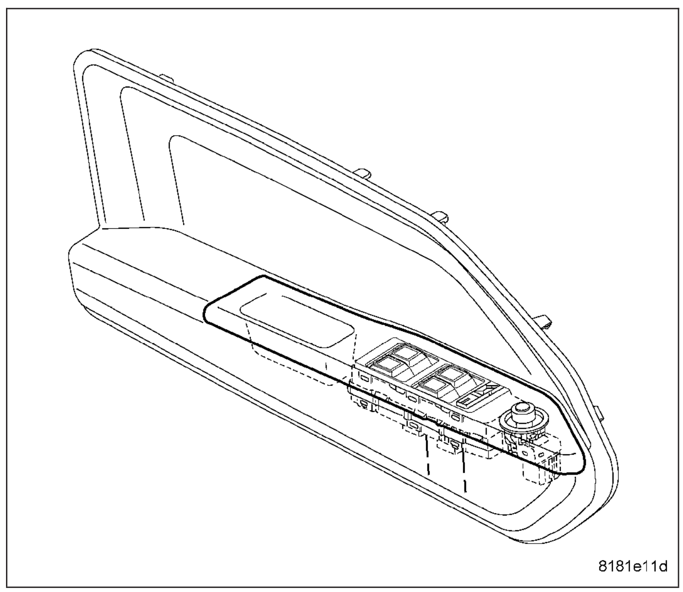
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL).
3. Disconnect the electrical harness connectors.
4. With the bolster on the bench, gently pry in on the tabs of the mirror switch and push through the front of the cover and remove.



INSTALLATION

1. Place the mirror switch in bolster opening and firmly snap into place.
2. Connect the electrical harness connectors.
3. Install the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)
4. Connect the battery negative cable.

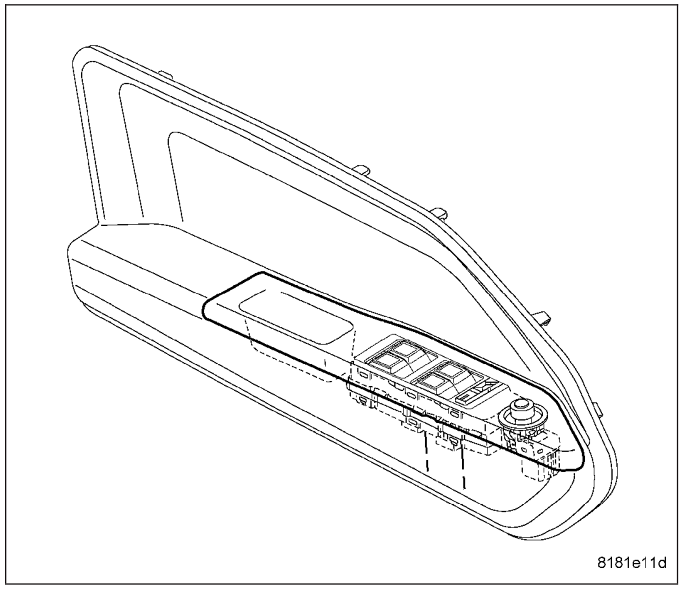


POWER FOLDAWAY MIRROR SWITCH - RHD

DIAGNOSIS AND TESTING - POWER FOLDAWAY MIRROR SWITCH - RHD

The following test is designed to be used only on vehicles equipped with power foldaway side view mirrors.

1. Remove power mirror switch from mounting position (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER FOLDAWAY MIRROR SWITCH - REMOVAL).
2. Using an ohmmeter, test for continuity between the terminals of the switch as shown in the tables below.



NOTE: When testing using the chart below be certain to read the chart correctly. Example - When testing left mirror "DOWN↓", pins 1, 9, 10 will show continuity to each other but not with 3, 4, 5.

3. If test results are not obtained as shown in the tables below, replace the switch.

EXTENDED MIRROR SWITCH CIRCUIT TEST

NOTE: Mirror position switch must be in the "extended" position to use chart below.

WOBBLE PLATE POSITION	LEFT MIRROR SELECTED	RIGHT MIRROR SELECTED
	CONTINUITY BETWEEN PINS	CONTINUITY BETWEEN PINS
DOWN	1, 9, 10 3, 4, 5	6, 9, 10 3, 4, 5
UP	1, 4, 5 3, 9, 10	6, 4, 5 3, 9, 10
RIGHT	2, 9, 10 3, 4, 5	7, 9, 10 3, 4, 5
LEFT	2, 4, 5 3, 9, 10	7, 4, 5 3, 9, 10

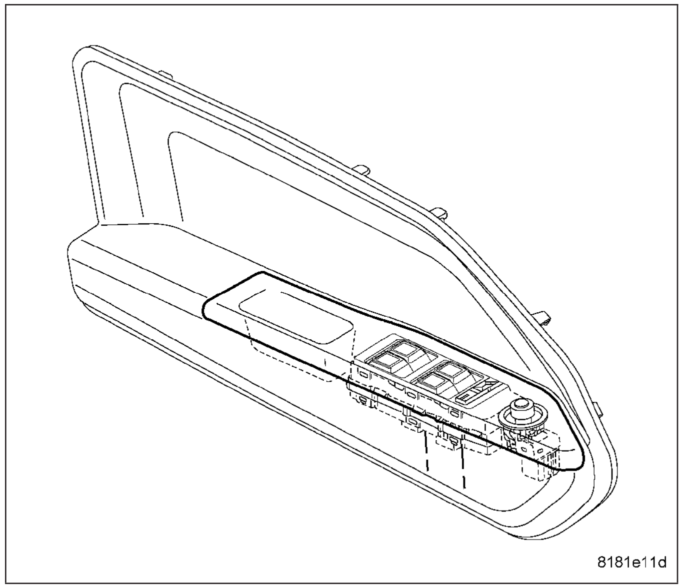
RETRACTED MIRROR SWITCH CIRCUIT TEST

NOTE: Mirror position switch must be in the "retracted" position to use chart below.

WOBBLE PLATE POSITION	LEFT MIRROR SELECTED	RIGHT MIRROR SELECTED
	CONTINUITY BETWEEN PINS	CONTINUITY BETWEEN PINS
DOWN	1, 3, 4, 9	3, 4, 6, 9
UP	1, 3, 4, 9	3, 4, 6, 9
RIGHT	2, 3, 4, 9	3, 4, 7, 9
LEFT	2, 3, 4, 9	3, 4, 7, 9

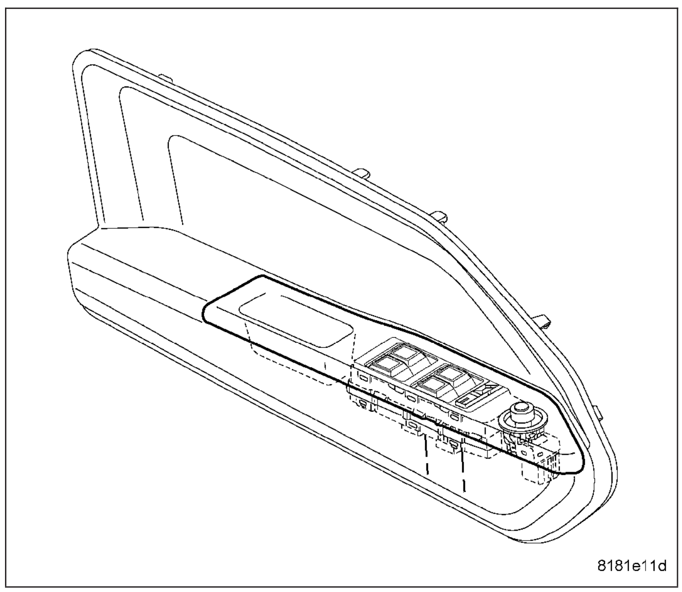
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL).
3. Disconnect the electrical harness connectors.
4. With the bolster on the bench, gently pry in on the tabs of the mirror switch and push through the front of the cover and remove.



INSTALLATION

1. Place the mirror switch in bolster opening and firmly snap into place.
2. Connect the electrical harness connectors.
3. Install the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)
4. Connect the battery negative cable.

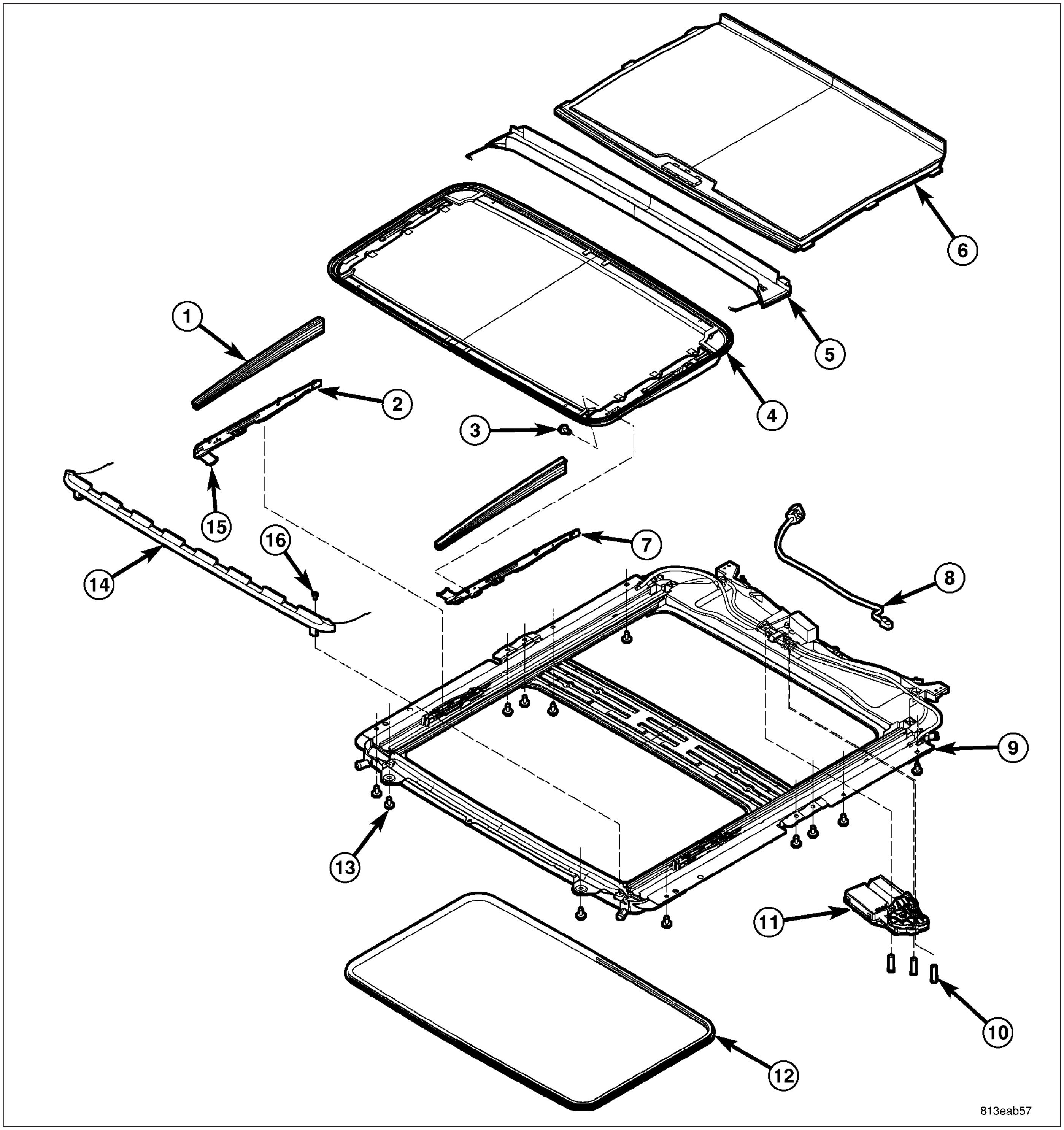


POWER TOP - SUNROOF - SERVICE INFORMATION

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POWER TOP - SUNROOF - SERVICE INFORMATION

DESCRIPTION



EXPLODED VIEW

WARNING: Keep fingers and other body parts out of sunroof opening at all times.

The power sunroof system allows the sunroof to be opened, closed or placed in the vent position electrically by actuating a switch located in the headliner on the courtesy/reading lamp assembly. The sunroof system receives battery feed through a 25 amp fuse in the Totally Integrated Power Module (TIPM). The sunroof system power is

supplied when the ignition switch is in the RUN and ACCESSORY positions. The sunroof will continue to operate normally with the key in the OFF position or with the key removed while the Accessory Delay System is active.

The sunroof glass panel (4) tilts upward at the rear for ventilation and slides rearward under the roof when open. The panel seals flush with the roof in the closed position to eliminate wind noise. The sunroof includes a manual-sliding sunshade (6) to cover the deep-tinted glass panel.

The sunroof is electrically operated from two switches located in the headliner in between the two courtesy/reading lamps. The “VENT” switch is a push button type switch and opens the sunroof to the vent position only. The other switch “OPEN/CLOSED” is a rocker type switch for opening and closing the sunroof. Pressing and releasing the open button once, the sunroof will express open and the wind deflector will raise. If the button is pressed a second time the sunroof will stop in that position. Pressing and releasing the close button once will express close the sunroof. If the close button is pressed a second time during the express close operation the sunroof will stop in that position.

The main components of the power sunroof system are:

- The motor/module assembly (11)
- The power sunroof glass and frame assembly (4)
- The power sunroof switch
- The manual-sliding sunshade (6)

(Refer to 23 - BODY/SUNROOF - DESCRIPTION) for additional information on the mechanical components of the power sunroof system.

OPERATION

This vehicle has a vent, tilt and slide power sunroof system with express (one-touch) open/close feature. The sunroof system receives battery feed through the “sunroof” relay and a 25 amp mini fuse located in the Totally Integrated Power Module (TIPM). The sunroof system power is supplied when the ignition switch is in the RUN and ACCESSORY positions. The sunroof will operate normally with the key in any position while the Accessory Delay system is active.

The sunroof is electrically operated from two switches located in the overhead console in between the two reading lamps. The “VENT” switch is a push button type switch and opens the sunroof to the vent position only. The other switch “OPEN/CLOSED” is a rocker type switch for opening and closing the sunroof. Pressing and releasing the open button once, the sunroof will express open and the wind deflector will raise. If the button is pressed a second time the sunroof will stop in that position. Pressing and releasing the close button once will express close the sunroof. If the close button is pressed a second time during the express close operation the sunroof will stop in that position.

DIAGNOSIS AND TESTING

SUNROOF

Refer to SUNROOF DIAGNOSIS CHART for possible causes. Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. If not, a common electrical problem may exist.

Check the condition of the circuit protection and inspect all wiring connector pins for proper engagement and continuity. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

SUNROOF DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE	CORRECTION
Sunroof completely inoperative.	Inoperative control switch.	Perform sunroof switch diagnostics, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING).
	Inoperative circuit ground between sunroof motor/module, control switch, and body harness.	Inspect ground connections and wiring. Repair as necessary.
	Inoperative power circuit between sunroof motor/module, control switch, and body harness.	Check the condition of the circuit protection and inspect all wiring. Repair as necessary.
	Inoperative sunroof motor/module.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
Audible whine when switch is depressed, sunroof does not operate.	Inoperative sunroof motor/module.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
	Binding cable.	Repair or replace binding cable as necessary.
Audible clicking or ratcheting when switch is pressed, sunroof does not operate.	Broken or worn drive cable.	Repair or replace binding cable as necessary.
	Worn drive motor gear.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
	Mechanisms not synchronized.	Synchronize mechanisms, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF MOTOR/MODULE CALIBRATION).
Sunroof vents and opens, but does not close.	Broken or disengaged trough guide.	Repair trough guide as necessary.
	Binding cable.	Repair or replace binding cable as necessary.
	Inoperative sunroof ″CLOSE″ circuit.	Check the condition of the circuit, connections and wiring. Repair as necessary.
	Inoperative control switch.	Perform sunroof switch diagnostics, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING).
	Sunroof motor/module out of calibration.	Perform sunroof motor Re-initialization Standard Procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - Re-Initialization).
	Inoperative sunroof motor/module.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).

SYMPTOM	POSSIBLE CAUSE	CORRECTION
Sunroof vents, but does not open.	Binding cable or mechanism.	Repair or replace binding cable as necessary.
	Inoperative sunroof ″OPEN″ circuit.	Check the condition of the circuit, connections and wiring. Repair as necessary.
	Inoperative control switch.	Perform sunroof switch diagnostics, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING).
	Inoperative sunroof motor/module.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
Sunroof does not vent	Binding cable or mechanism.	Repair or replace binding cable as necessary.
	Inoperative sunroof ″VENT″ circuit.	Check the condition of the circuit, connections and wiring. Repair as necessary.
	Inoperative control switch.	Perform sunroof switch diagnostics, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING).
	Inoperative sunroof motor/module.	Replace the sunroof motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
Glass movement not consistant or glass does not operate smoothly	Glass and Track timing. Glass and Track alignment. Cables and Guide alignment.	Perform the necessary adjustments, (Refer to 23 - BODY/SUNROOF/ GLASS PANEL - ADJUSTMENTS).

MOTOR/MODULE - SUNROOF

DIAGNOSIS AND TESTING

MOTOR/MODULE

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

If the power top is completely inoperative perform the following diagnostic steps.

1. Check the Accessory delay 25 amp fuse in the Totally Integrated Power Module (TIPM). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the inoperative fuse.
2. Partially remove the headliner to access the sunroof motor/module.
3. Disconnect the motor/module electrical connector. With the ignition switch in the “RUN” position check for Battery voltage at the Accessory Relay Output terminal of the harness connector. If OK, go to Step 4. If not OK repair the Accessory Relay Output circuit as necessary.
4. Using an ohmmeter test for continuity between the harness connector ground circuit and a known good ground. Continuity should be present. If OK, go to Step 5. If not OK, repair the open ground circuit as necessary.
5. Turn the ignition switch to the “OFF” position. Reconnect the motor/module electrical connector. With the ignition switch in the “RUN” position check for 5 volts on the “VENT”, “CLOSE” and “OPEN” control circuits at the back side of the motor/module connector. If OK, go to Step 6. If not OK, replace the motor/module assembly, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
6. Turn the ignition switch to the “OFF” position. Disconnect the motor/module and sunroof switch electrical connectors. Using an ohmmeter check for continuity on the “VENT”, “CLOSE” and “OPEN” circuits between the motor/module and sunroof switch. Continuity should be present. If OK, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING) for diagnosis of the sunroof switch. If not OK, repair the control circuits as necessary.

STANDARD PROCEDURE

POWER SUNROOF TIMING

NOTE: Perform the timing procedures if any of the following conditions exist:

- Glass skewed in the channel
- One side of the glass dropping before the other while moving from “VENT” to “CLOSE”
- Glass reversing direction when closing the sunroof
- Glass will not close or may stop at the wrong location
- The glass may over travel the “OPEN” position and stall the motor
- The glass may over travel the “CLOSE” position and stall the motor

NOTE: The timing of the motor/module and the sunroof assembly play a critical role in the proper function of the sunroof. If the motor/module is removed and the sunroof glass or cables are moved the sunroof module will have to be timed. REFER to the following procedure for the necessary steps.

1. Perform the motor/module re-initialization procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE).
2. Remove the motor/module, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - REMOVAL).
3. Remove sunroof glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL).
4. Now place both right and left arms in the closed position. Using a screwdriver, push the plastic cable all the way forward in the track until the glass mounting arm drops into the closed position.
5. Repeat this on the other side.
6. To verify correct timing, there is an 1/8 inch hole in the cable ramp that must be aligned with the front glass mounting screw hole.

7. Using an awl, verify alignment of both right and left timing holes. The tracks will now be timed to the fully closed position.
8. Install the motor/module (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - INSTALLATION).
9. Install the sunroof glass panel, (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION).
10. Perform the motor/module re-initialization procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE).

RE-INITIALIZATION

NOTE: If for some reason the sunroof is not operating normally it may be necessary to re-initialize the sunroof assembly. This procedure should be attempted prior to any diagnosis of the sunroof system.

NOTE: The re-initialization procedure is not complete if any one of the following conditions occurs before the re-initialization procedure is completed:

- The sunroof switch is not held in the CLOSE position.
- The ignition or battery power is lost.
- The glass panel has not reached its closed position.

NOTE: If the re-initialization procedure is not carried out completely, it must be started over.

1. Cycle the sunroof to full “CLOSED” position.
2. Once the sunroof is in the full “CLOSED” position, press and continuously hold the “CLOSE” button on the sunroof switch.
3. After a delay of 10 seconds the sunroof will begin to move past the normal “OPEN” position to the **hard stop** position. It will then reverse to the normal “VENT” position also known as the **soft stop**. Once the sunroof has reversed to the **soft stop**, immediately (within 5 seconds of stopping travel) release the “CLOSE” button and continuously press it again.
4. After a delay of three seconds the sunroof will begin moving to the “OPEN” and then “CLOSED” position. When the roof reaches the fully “CLOSED” position and stops the “CLOSE” button can be released.

The re-initialization procedure is now complete. Operate the sunroof in all directions to verify proper operation.

INITIALIZATION

NOTE: This procedure should be attempted any time a new motor/module is installed in the sunroof assembly.

NOTE: The initialization procedure is not complete if any one of the following conditions occurs before the initialization procedure is completed:

- The sunroof switch is not held in the CLOSE position.
- The ignition or battery power is lost.
- The glass panel has not reached its closed position.

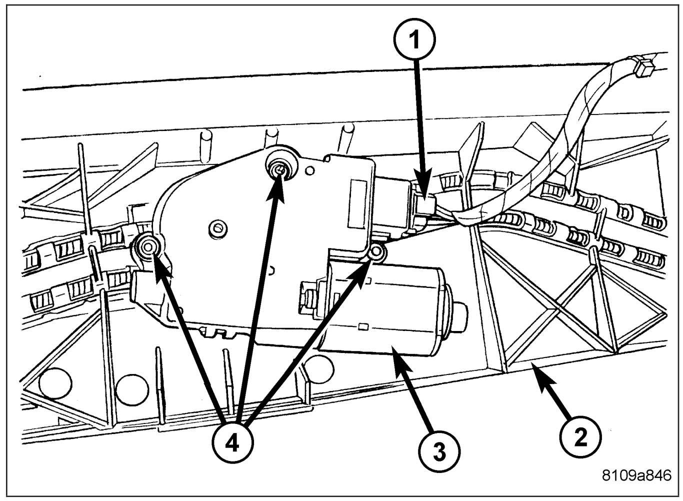
NOTE: if the initialization procedure is not carried out completely, it must be started over.

1. Turn the ignition key to the “RUN” position.
2. Continuously press the “CLOSE” button on the sunroof switch.
3. The sunroof will begin to move past the normal “VENT” position to the **hard stop** position. It will then reverse to the normal “VENT” position also known as the **soft stop**. Once the sunroof has reversed to the **soft stop**, immediately (within 5 seconds of stopping travel) release the “VENT” button and continuously press it again.
4. After a delay of three seconds the sunroof will begin moving to the “CLOSED” position. When the roof reaches the fully “CLOSED” position and stops the “VENT” button can be released.

The initialization procedure is now complete. Operate the sunroof in all directions to verify proper operation.

REMOVAL

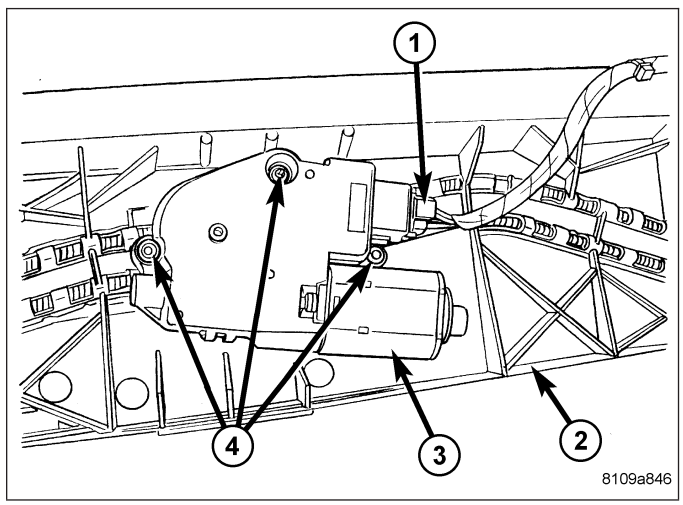
NOTE: The sunroof system is timed from the factory so that the motor/module shuts off automatically when the sunroof window reaches a certain position. Extreme care must be taken when removing the motor/module from the sunroof assembly or this timing may be thrown off causing damage to the sunroof system. Anytime the motor/module needs to be removed from the sunroof assembly the sunroof window must be in the FULLY CLOSED POSITION if possible.
If glass panel is not in the fully closed position and the motor/module is removed or inoperative, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE).



1. Disconnect and isolate the negative battery cable.
2. Remove headliner as necessary to gain access to sunroof motor/module. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
3. Disconnect the electrical connector (1).
4. Remove three motor assembly attaching screws (4) from bottom side of motor assembly (3) and remove motor assembly from the motor bracket (2).

INSTALLATION

NOTE: Before installing a new motor/module or the original motor/module ensure that the sunroof glass panel is in the FULLY CLOSED POSITION. If sunroof glass panel is not in the FULLY CLOSED POSITION, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE).



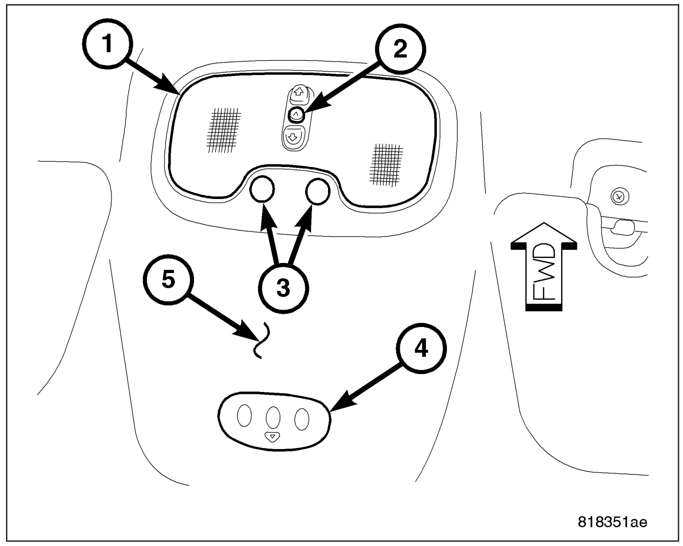
1. Ensure that sunroof assembly is in the FULLY CLOSED position before mounting the motor/module. If not in the fully closed position (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE).
2. Place motor/module into position on the sunroof housing and install attaching screws. Tighten the screws to 3.5 N·m (31 in. lbs.) torque.
3. Connect the motor/module, and sunroof switch wire connectors.
4. Install sunroof glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION).
5. Connect the battery negative cable.
6. Perform the motor/module initialization procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - MOTOR/MODULE INITIALIZATION).
7. Verify sunroof operation and alignment, and adjust as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).
8. Disconnect and isolate battery negative cable.
9. Complete the headliner installation. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

SWITCH-SUNROOF

DESCRIPTION

The power sunroof switch (2) is a combination push-button and rocker switch module mounted in the Courtesy/Reading Lamp assembly (1). The sunroof switch is a direct contact unit that is directly wired to the sunroof motor/module assembly. The sunroof switch performs the following functions:

- Power sunroof open (back of switch pushed)
- Power sunroof express open (back of switch pushed and released)
- Power sunroof closed (front of switch pushed)
- Power sunroof express closed (front of switch pushed and released)
- Power sunroof vent (switch center button pushed)



The power sunroof switch cannot be repaired. If the individual components are damaged or inoperative the switch assembly must be replaced, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - REMOVAL).

OPERATION

The sunroof is electrically operated from two switches located in the headliner on the courtesy/reading lamp assembly. The power sunroof switch is hard wired to the sunroof motor/module assembly. The “VENT” switch is a push button type switch and opens the sunroof to the vent position only. The other switch “OPEN/CLOSED” is a rocker type switch for opening and closing the sunroof. Pressing and releasing the open button once, the sunroof will express open and the wind deflector will raise. If the button is pressed a second time the sunroof will stop in that position. Pressing and releasing the close button once will express close the sunroof. If the close button is pressed a second time during the express close operation the sunroof will stop in that position.

The switch is grounded at one terminal and receives a 5 volt signal from the sunroof motor/module on the remaining three terminals. The switch pulls down the 5 volt reference voltage from the module signaling it to perform the desired function.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

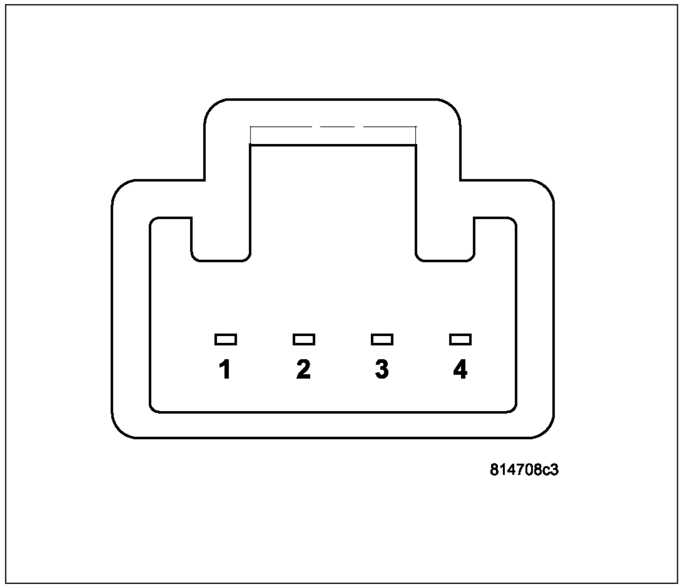
DIAGNOSIS AND TESTING

SUNROOF SWITCH

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

1. Remove the power sunroof switch, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - REMOVAL).
2. Disconnect the power sunroof switch wire harness connector.
3. With the ignition key in the “RUN” position check for 5 volts on the “OPEN”, “CLOSE” and “VENT” circuits of the sunroof switch harness connector. If OK, go to Step 4. If not OK, inspect the wiring harness and connectors between the motor/module and switch for damage and repair as necessary.

4. With the ignition key in the “OFF” position check for continuity between the ground circuit of the sunroof switch harness connector and a known good ground. Continuity should be present. If OK, go to Step 5. If not OK, inspect the wiring harness and connector and repair the ground circuit as necessary.
5. Using an ohmmeter, test the continuity of the power sunroof switch in each switch position. Refer to the POWER SUNROOF SWITCH CONTINUITY TABLE . If OK, inspect the wiring harness and connectors for damage and repair as necessary. If not OK, replace the power sunroof switch, (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - REMOVAL).

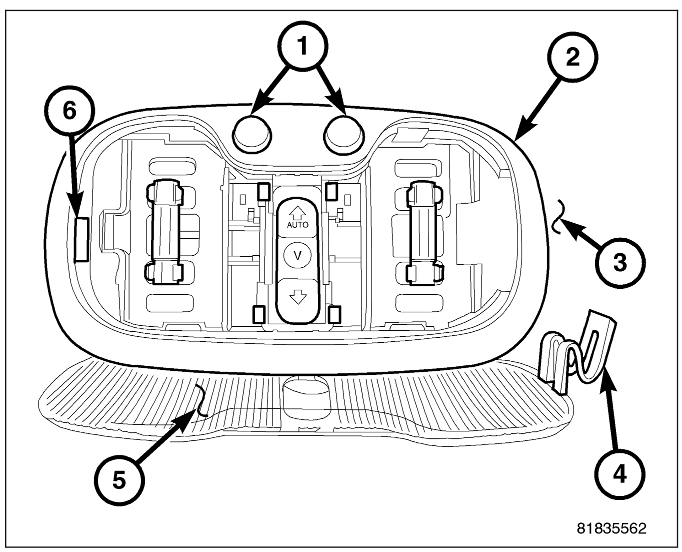


POWER SUNROOF SWITCH CONTINUITY TABLE

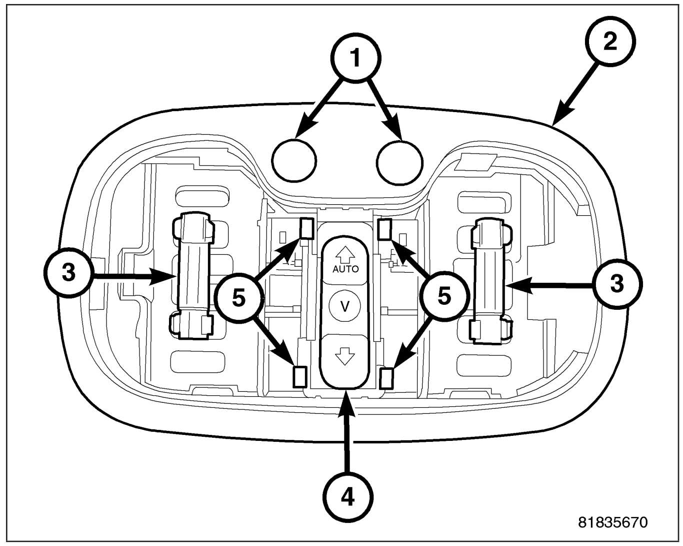
SWITCH POSITION	CONTINUITY BETWEEN PINS
OFF	NO CONTINUITY
SUNROOF OPEN	2 & 3
SUNROOF CLOSED	2 & 4
SUNROOF VENT	2 & 1

REMOVAL

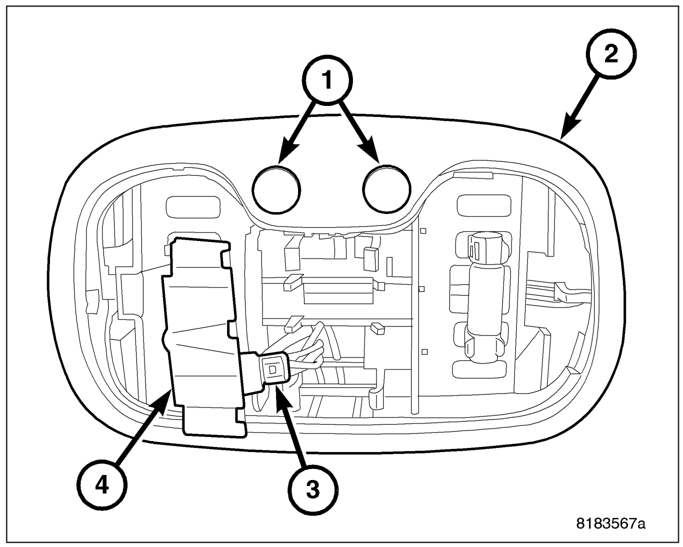
1. Disconnect and isolate the negative battery cable.
2. Remove the courtesy/reading lamp lens (5). Insert a suitable flat bladed tool into the slot (6) in the courtesy/reading lamp assembly (2). Pivot the lens down and to the left to release the holding tab (4).



3. Using a suitable flat bladed tool, release the mounting tabs (5) from the sides of the sunroof control switch (4) and pull the switch down from the courtesy/reading lamp assembly (2).

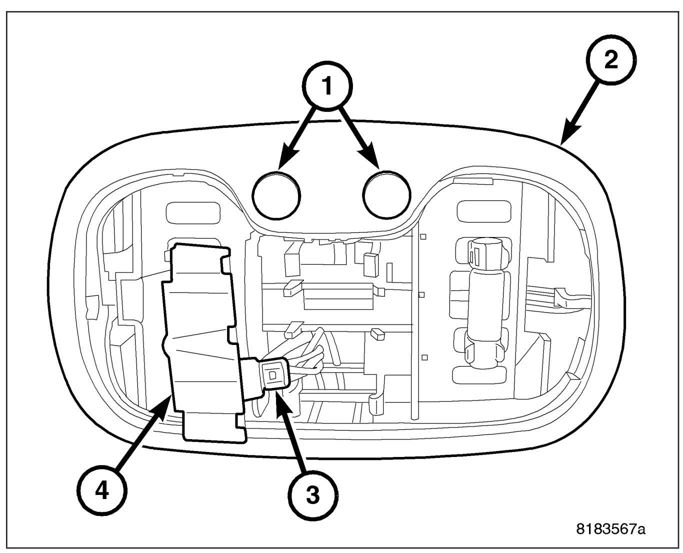


4. Disconnect the electrical connector (3) from the sunroof control switch (4).
5. Remove the switch from the vehicle.

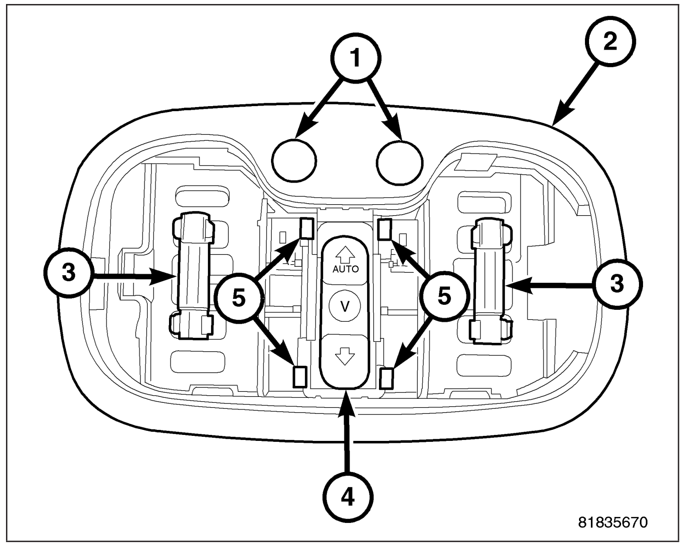


INSTALLATION

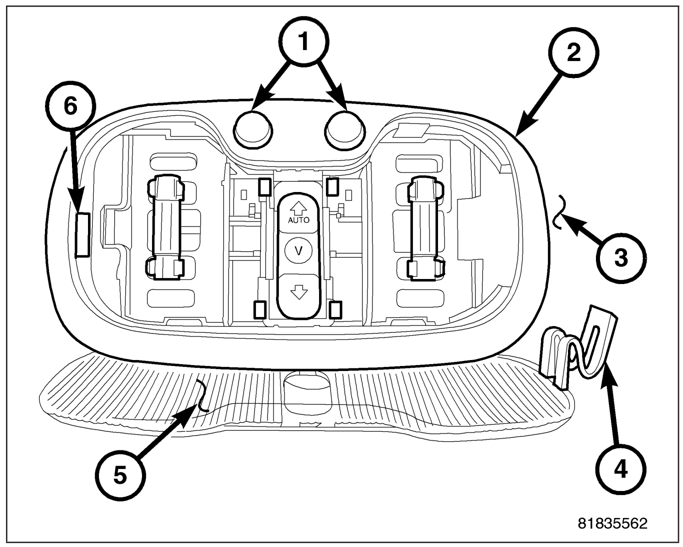
1. Position the sunroof control switch (4) into the vehicle.
2. Connect the sunroof control switch electrical connector (3).



3. Insert the sunroof control switch (4) into the courtesy/reading lamp assembly (2). Push up on the switch until it is securely held in place by the mounting tabs (5).



4. Insert the mounting tab (4) on the lamp lens (5) into the right side of the lamp assembly and pivot the lens up until it snaps securely in place.
5. Connect the negative battery cable.



POWER WINDOWS

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POWER WINDOWS

DESCRIPTION

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on the driver's door trim panel. The front window switch allows the front occupants to lock out the individual rear switches from operation. The power window system receives battery feed through a circuit breaker in the fuse block, only when the ignition switch is in the ON position.

The power window system includes the power window switches on the driver's door trim panel, passenger door and rear doors, the circuit breaker in the fuse block, and the power window motors.

OPERATION

The front and rear window lift motors are of the permanent magnet type. A battery positive and negative connection to either of the two motor terminals will cause the motor to rotate in one direction. Reversing current through these same two connections will cause the motor to rotate in the opposite direction.

Each individual motor is grounded through their respective switch.

DIAGNOSIS AND TESTING - POWER WINDOWS

WIRING VOLTAGE TEST

The following wiring test determines whether or not voltage is continuous through the body harness to the front switch.

1. Remove the power window switch and bezel.
2. Disconnect wire connector from back of power window switch.
3. Switch ignition to the ON position.
4. Connect the clip end of a 12 volt test light to Pin 4 of the window switch harness connector. Touch the test light probe to Pin 3.
   - If the test light illuminates, the wiring circuit between the battery and switch is OK.
   - If the lamp does not illuminate, first check 30 amp circuit breaker in the fuse block. If circuit breaker is OK, then check for a broken wire.

For complete circuit diagrams, refer to the appropriate wiring information.

POWER WINDOW MOTOR TEST

If the power window motor is receiving proper current and ground and does not operate, proceed with motor test.

For complete circuit diagrams, refer to the appropriate wiring information.

1. Remove front door trim panel as necessary to gain access to power window motor wire connector.
2. Disconnect power window motor wire connector from door harness.
3. Using two jumper wires, connect one to a battery (+) source and the other to a good ground (-).
4. Connect the Negative (-) jumper probe to one of the motor connector terminals.
5. Momentarily touch the Positive (+) jumper probe to the other motor connector terminal.

When positive probe is connected the motor should rotate in one direction to either move window up or down. If window is all the way up or down the motor will grunt and the inner door panel will flex when actuated in that one direction.

6. Reverse jumper probes at the motor connector terminals and window should now move in opposite direction. If window does not move or grunt, replace the motor.

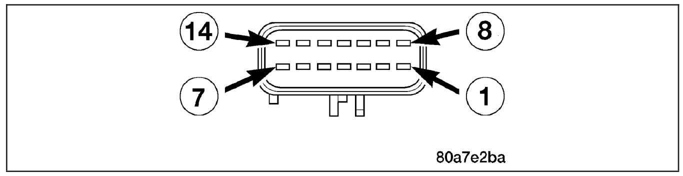
If window moved completely up or down, reverse the jumper probes and cycle window to the opposite position to verify full operation.

If motor grunts and does not move, verify that regulator is not binding.

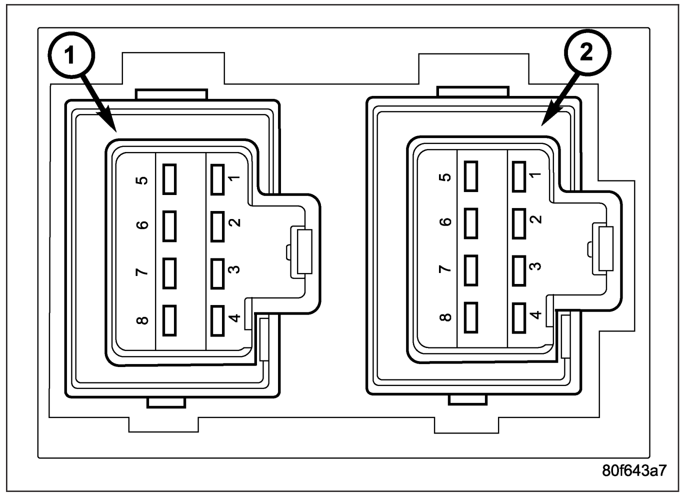
POWER WINDOW SWITCH

DIAGNOSIS AND TESTING - POWER WINDOW SWITCH

Remove the switch. Using an ohmmeter, test the window switch for continuity in all positions listed in the Continuity Table. Refer to the Power Window Switch Continuity table to determine if continuity is correct.



POWER WINDOW SWITCH CONTINUITY TABLE - SEDAN



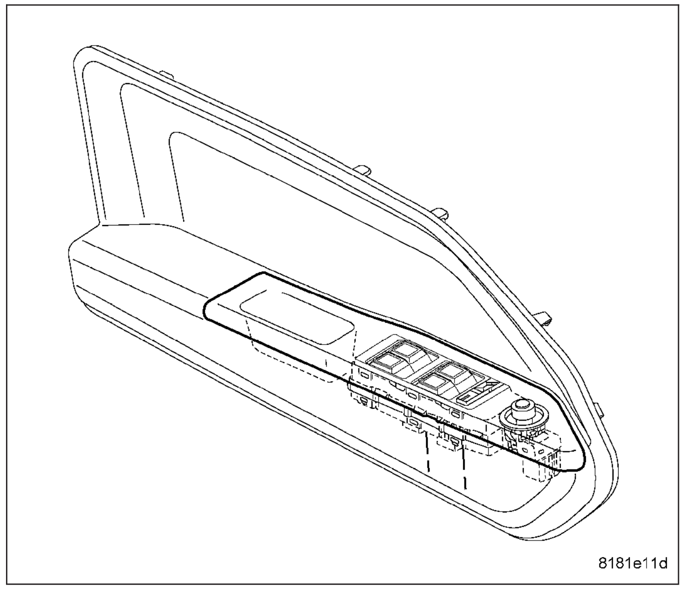
SWITCH POSITION	CONTINUITY BETWEEN
	FRONT WINDOW SWITCH
LOCKOUT SWITCH (TOP OF SWITCH DEPRESSED)	PIN 12 AND 5
LEFT FRONT UP	PIN 12 AND 14
RIGHT FRONT UP	PIN 12 AND 7
LEFT REAR UP	PIN 12 AND 8
LEFT REAR DOWN	PIN 12 AND 9
RIGHT REAR UP	PIN 12 AND 1
RIGHT REAR DOWN	PIN 12 AND 2
	LEFT OR RIGHT REAR SWITCH
OFF	PIN 2 AND 5 PIN 3 AND 8
UP	PIN 4 AND 5
DOWN	PIN 4 AND 8

To test the left front down and express down switch position, connect pin 4 to ground and pin 12 to a 12 volt source. Using a voltmeter, measure for voltage from pin 13 to ground.

To test the right front down and express down switch position, connect pin 4 to ground and pin 12 to a 12 volt source. Using a voltmeter, measure for voltage from pin 3 to ground. If the correct results are not obtained, replace the switch.

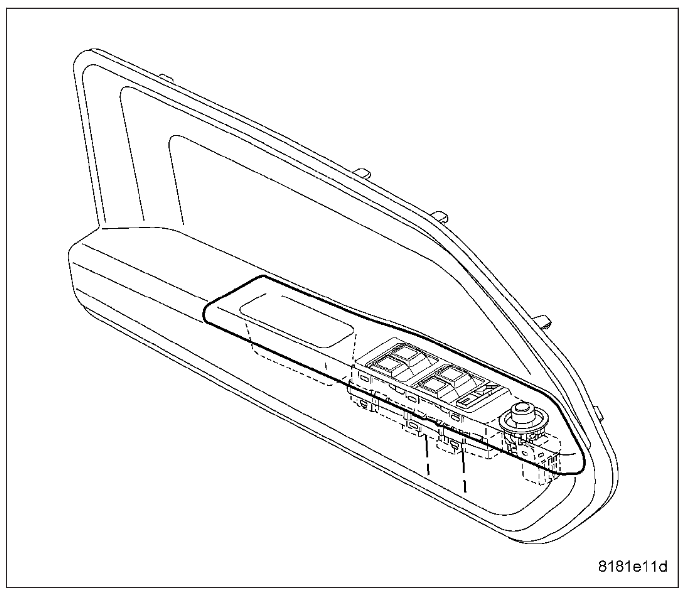
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL).
3. Disconnect the electrical harness connectors.
4. With the bolster on the bench, gently pry in on the tabs of the mirror switch and push through the front of the cover and remove.



INSTALLATION

1. Place the mirror switch in bolster opening and firmly snap into place.
2. Connect the electrical harness connectors.
3. Install the front door bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)
4. Connect the battery negative cable.



WINDOW MOTOR

REMOVAL

1. Move the window to the full UP position, if possible.
2. Disconnect and isolate the battery negative cable.
3. Remove door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
4. Disconnect electrical harness connector from motor.
5. Remove window regulator.
6. With regulator on bench, remove four screws retaining the motor to the regulator and remove motor.

INSTALLATION

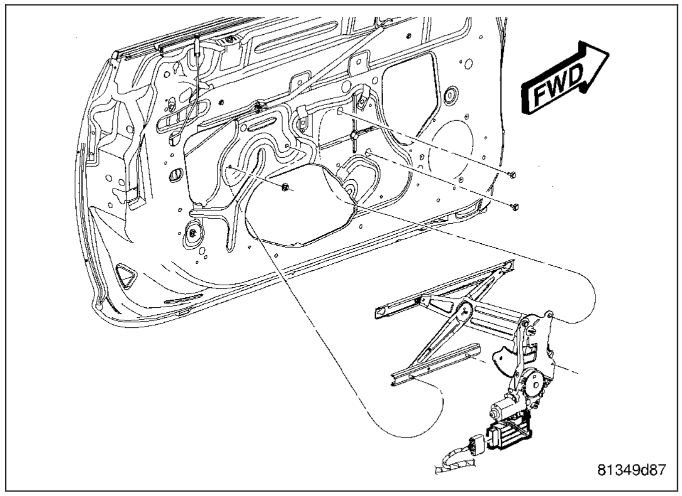
1. With regulator on bench, install four screws retaining the motor to the regulator.
2. Install the window regulator.
3. Connect the electrical harness connector to window motor.
4. Install door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
5. Connect battery negative cable.

WINDOW REGULATOR MODULE

DESCRIPTION

The window regulator modules are directly connected to each of the front door window regulator motors. The window switches are hard wired by a mux circuit to the respective window regulator module. The respective rear window motor is hard wired to the module. The front window motor is directly attached to the module. Both front door window switches have the express down feature. The module will cease lowering the front glass when a fully down position is sensed through the hall effect sensor.

When a module must be replaced, it is necessary to replace the entire regulator assembly.



OPERATION

When a door is opened, the respective module will receive a signal from the door ajar switch or the window drop switch. The window drop switch is directly controlled by both the interior and the exterior door handle switches. The drop switch is part of the door latch. This switch is faster than the door ajar switch to signal an open door operation. At that point the module will drop the front door glass 10 mm (.5 in). However, if the window drop switch should fail, the door ajar sense would also drop the window 10 mm (.5 in) and the module would set a trouble code. When the module then receives a door ajar switch open (door closed) it would raise the window 10 mm (.5 in). The module knows the position of the window by counting the motor rotation through the hall effect sensor in the module. If a door window is raised while that door is open, the module will raise the glass up, but when the door is closed it will raise the glass an additional 10 mm (.5 in). When the convertible top down switch is pressed to the first detent, input is received by the driver window regulator module and passenger window regulator module, which will lower the front windows approximately 40 mm (1.6 in), and lower the rear windows approximately 55 mm (2 in). After a 200 ms delay, it energizes the power top down relay to lower the convertible top.

DIAGNOSIS AND TESTING - WINDOW REGULATOR MODULE

Any diagnosis of the Window Regulator Modules should begin with the use of the scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service Information.

For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: Disable the airbag system before attempting any steering wheel, steering column, seat belt tensioner, side airbag, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

RESTRAINTS

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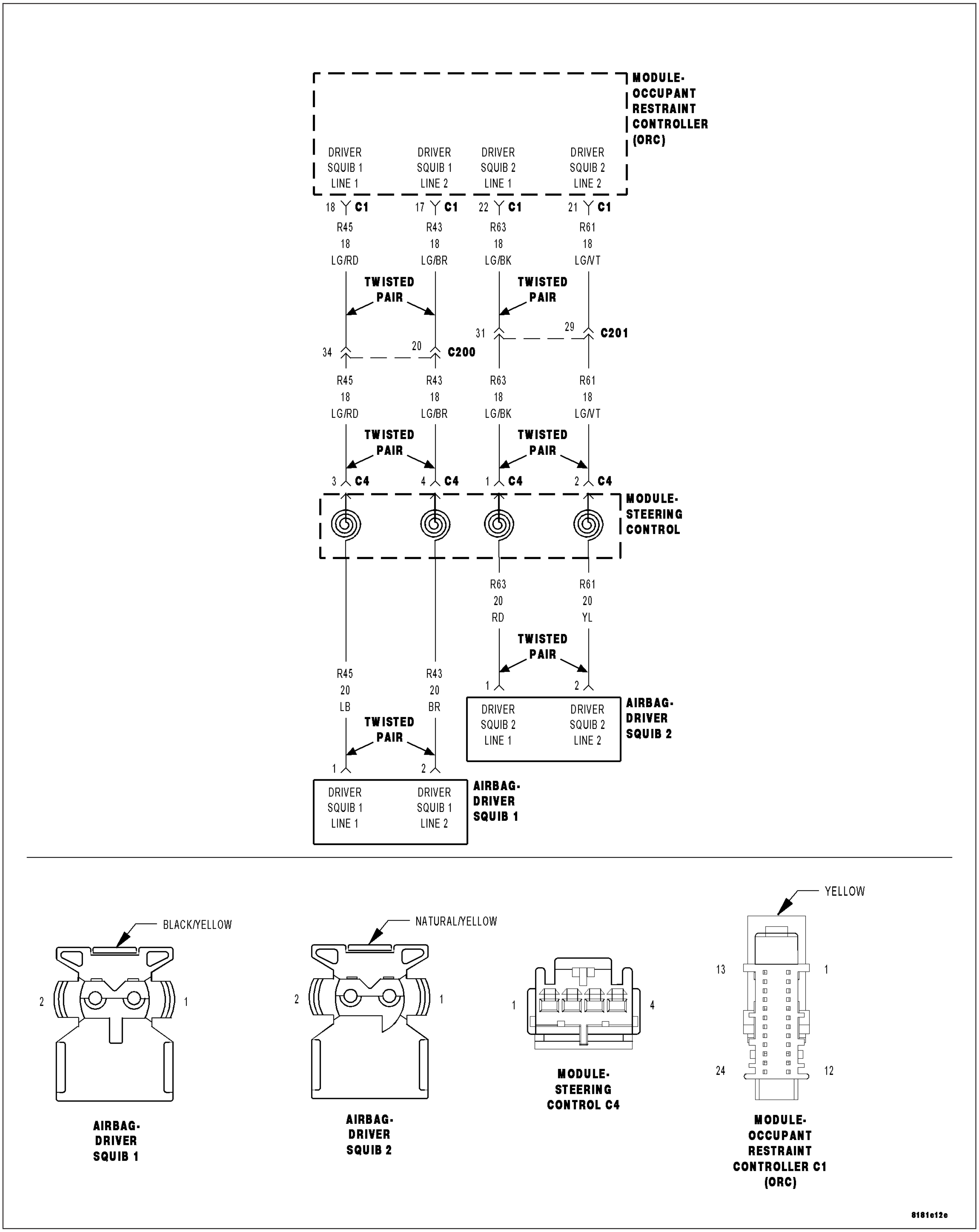
RESTRAINTS - ELECTRICAL DIAGNOSTICS

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RESTRAINTS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits. The ORC will set this DTC if it detects low resistance on the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OR (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT SHORTED TO GROUND
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

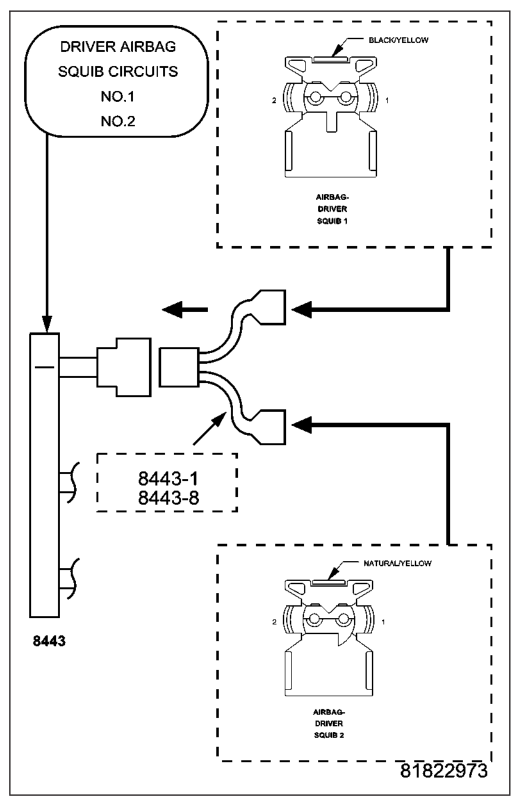
2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B00 DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

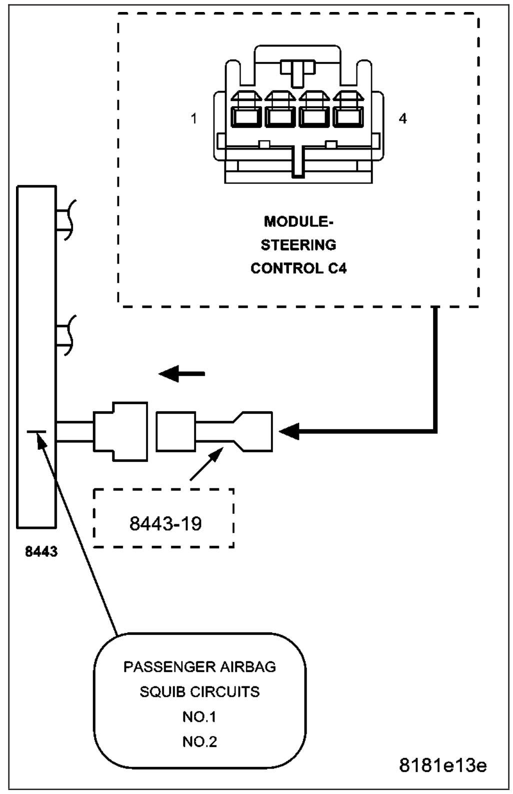
Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B00 DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go To 4

No >> Replace the Steering Column Control Module in accordance with the Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT AND (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module C4 connector.

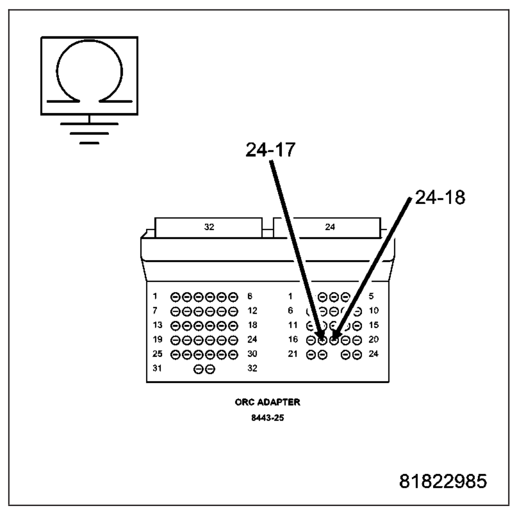
Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443-25 Load Tool ORC Adaptor to the ORC connectors.

Measure the resistance of the (R43) Driver Squib 1 Line 2 circuit between the 8443-25 Adapter cavity 24-17 and ground.

Measure the resistance of the (R45) Driver Squib 1 Line 1 circuit between 8443-25 Adapter cavity 24-17 ground.



Is the resistance below 10k ohms for either measurement?

Yes >> Repair the Driver Squib 1 circuits with resistance below 10k ohms for a short to ground.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

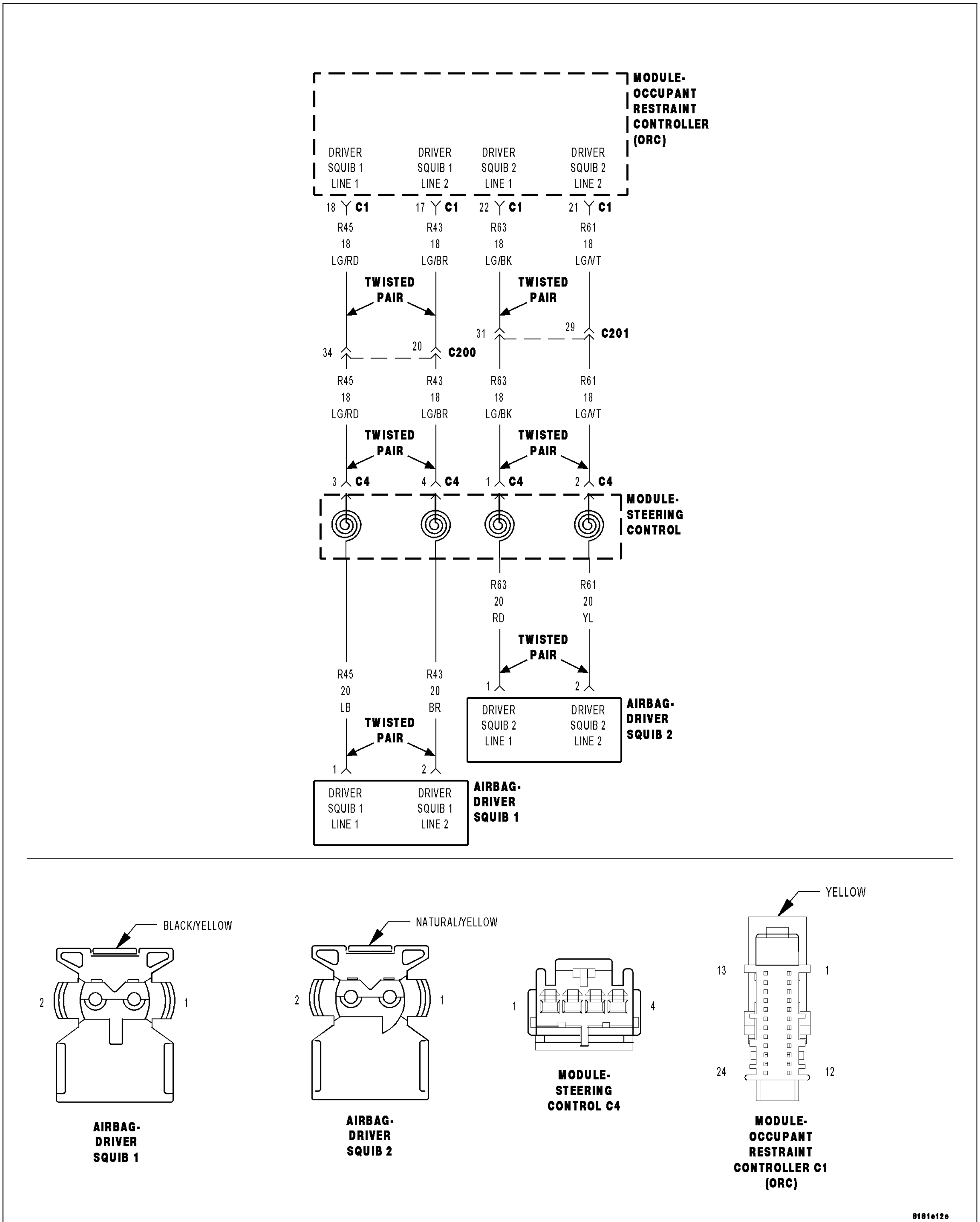
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Driver Squib 1 circuits. The ORC will set this DTC if it detects voltage on the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OR (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT SHORTED TO BATTERY
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Airbag Squib connectors.

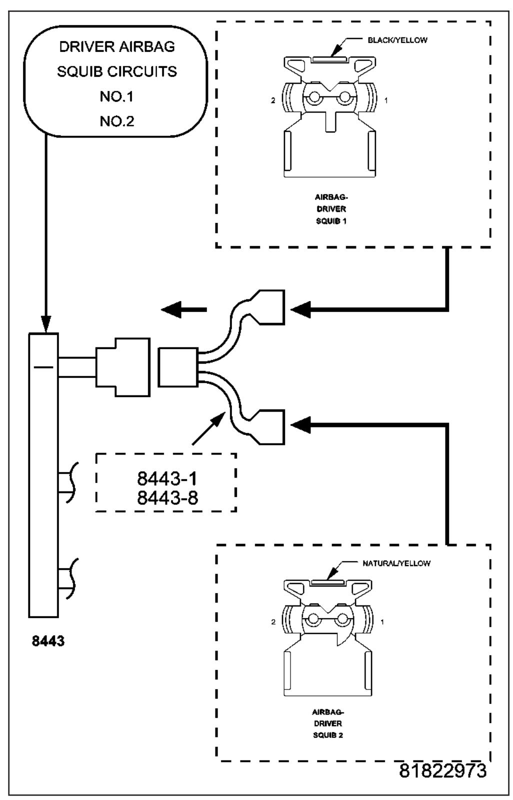
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

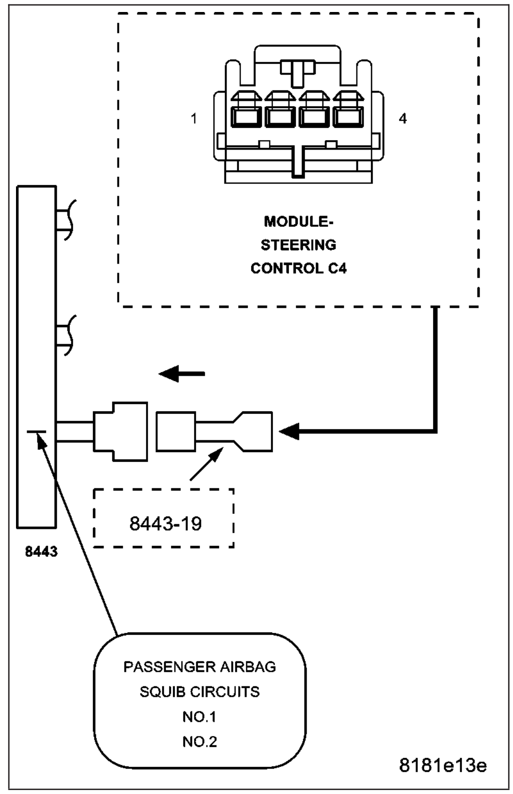


Does the scan tool display: B1B01 DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

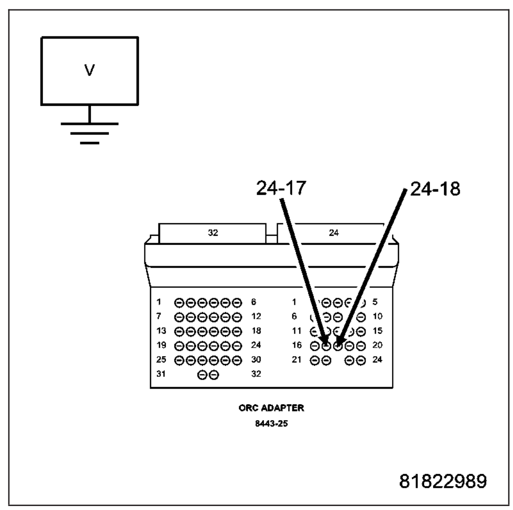
With the scan tool, read the active ORC DTCs.

Does the scan tool display: B1B01 DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT AND (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module C4 connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R43) Driver Squib 1 Line 2 circuit between the adapter and ground.

Measure the voltage of the (R45) Driver Squib 1 Line 1 circuit between the adapter connector and ground.

Is there any voltage present for either measurement?

Yes >> Repair the Driver Squib 1 circuits with voltage present for a short to battery.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

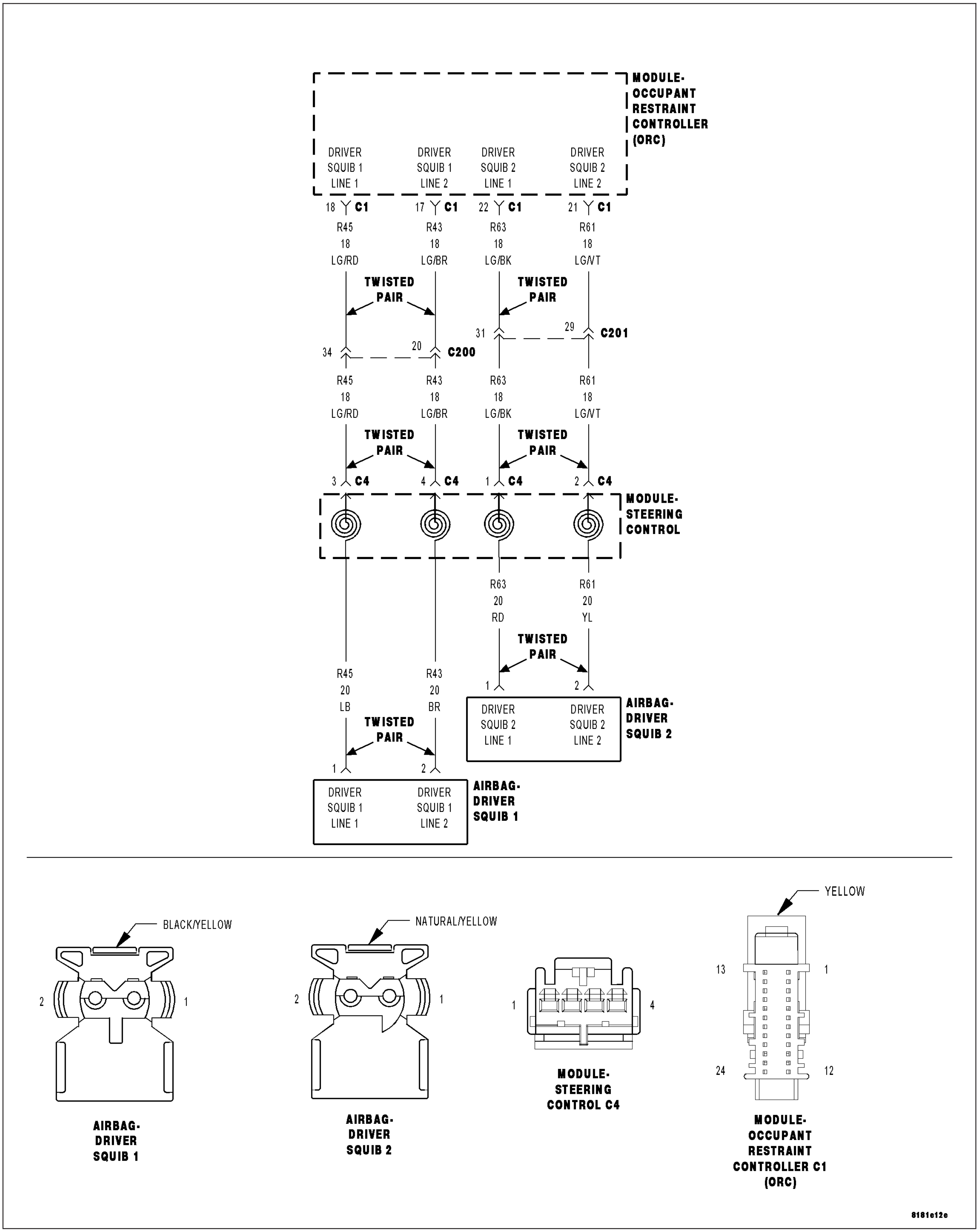
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits. The ORC will set this DTC if it detects an open or high resistance on the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OPEN
(R45) DRIVER SQUIB 1 LINE 1 CIRCUIT OPEN
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 6

2. CHECK FOR OPEN SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

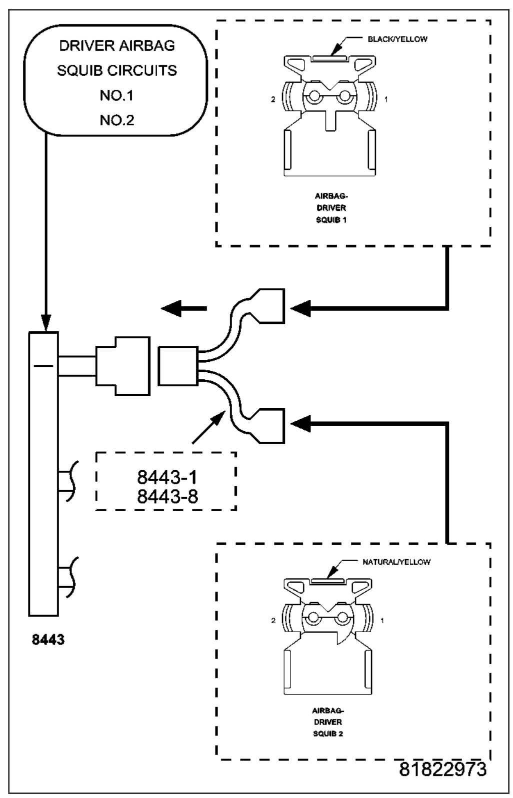
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

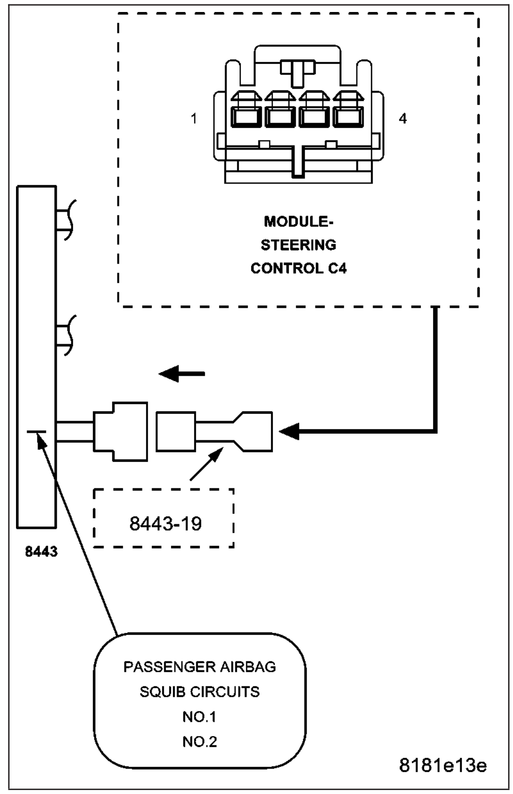
Does the scan tool display: B1B02 DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

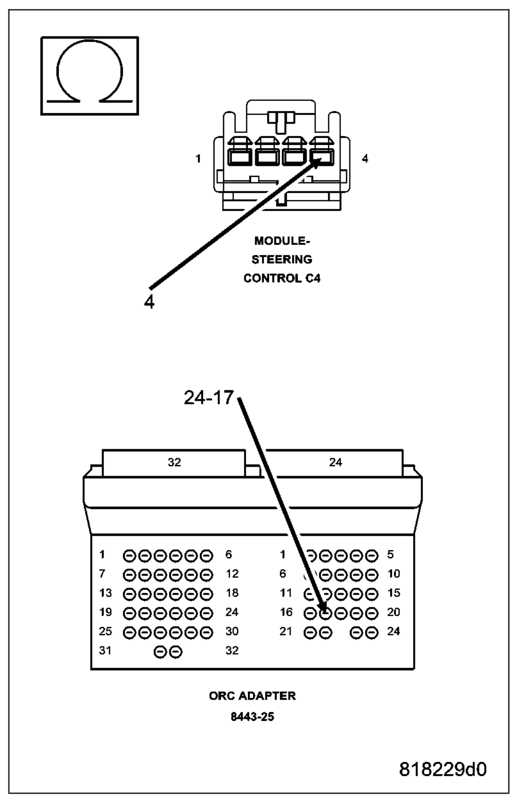
Does the scan tool display: B1B02 DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module C4 connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443-24 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R43) Driver Squib 1 Line 2 circuit between the Steering Control Module C4 connector cavity 4 and the ORC Load Tool 8443-25 Adaptor cavity 24-17.

Is the resistance below 1.0 ohm?

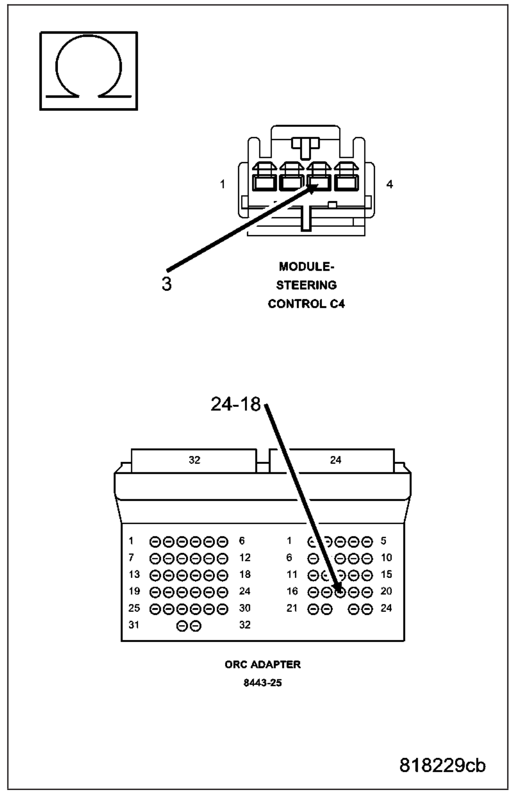
Yes >> Go To 5

No >> Repair the R43 Driver Squib 1 Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN

Measure the resistance of the (R45) Driver Squib 1 Line 1 circuit between the Steering Control Module C4 connector and the ORC Load Tool 8443-25 Adaptor.



Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R45) Driver Squib 1 Line 1 circuit for an open. Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

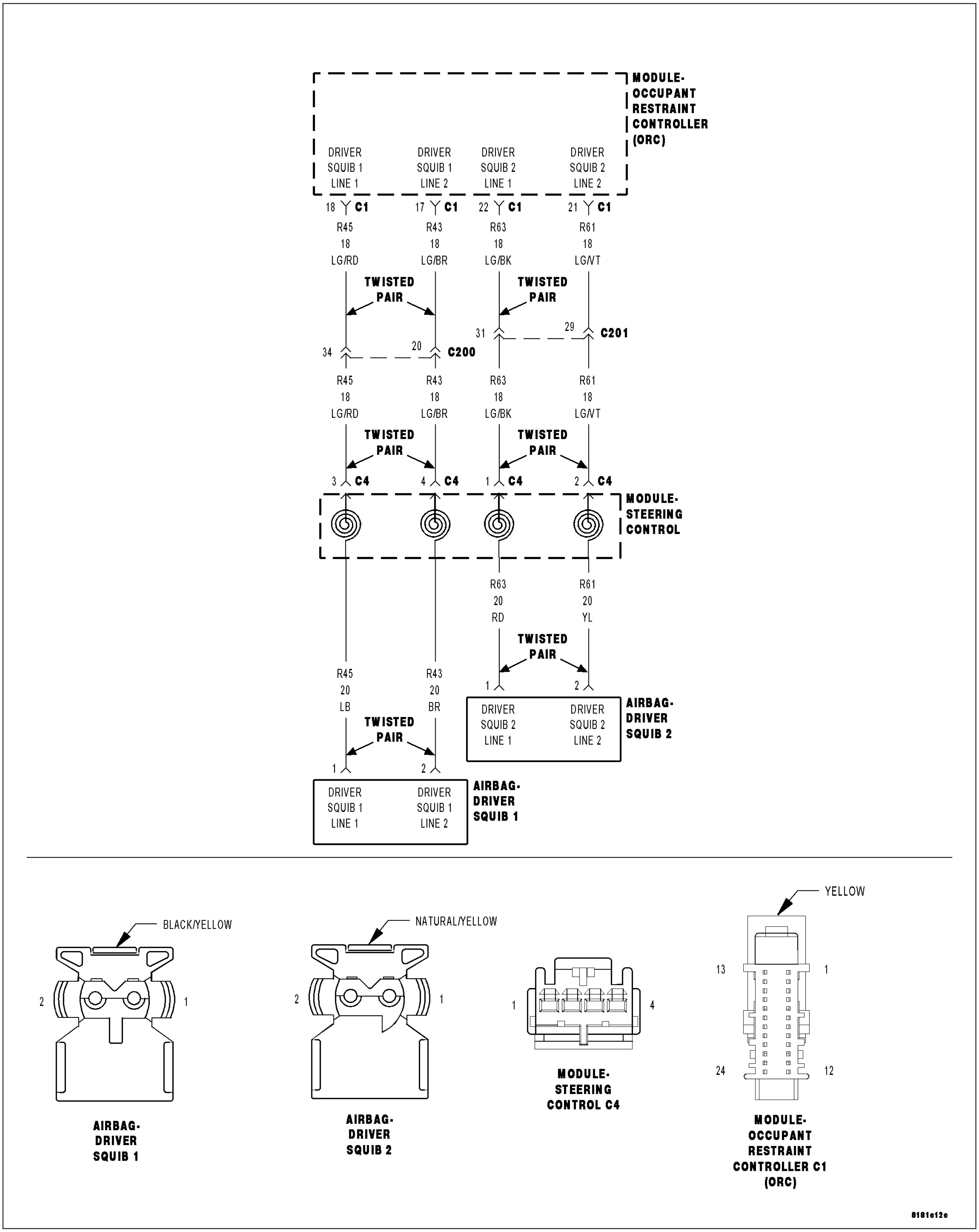
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits. The ORC will set this DTC if it detects low resistance between the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT SHORTED TO (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

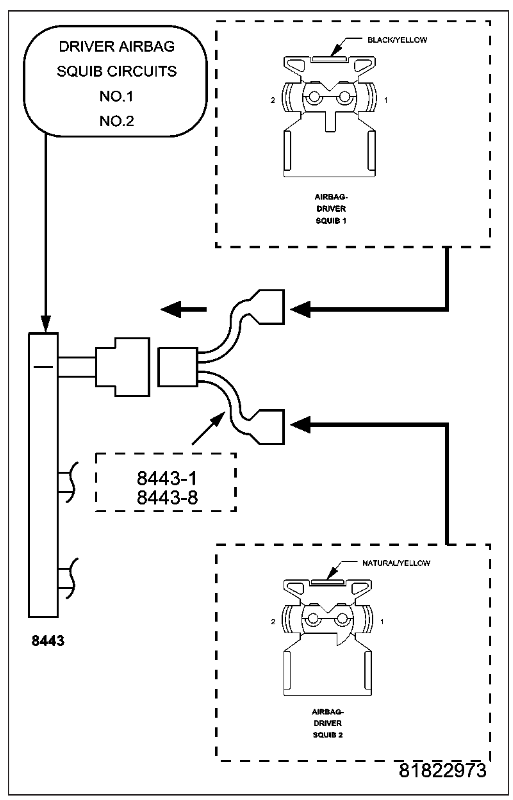
Disconnect the Driver Airbag Squib connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B03 DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

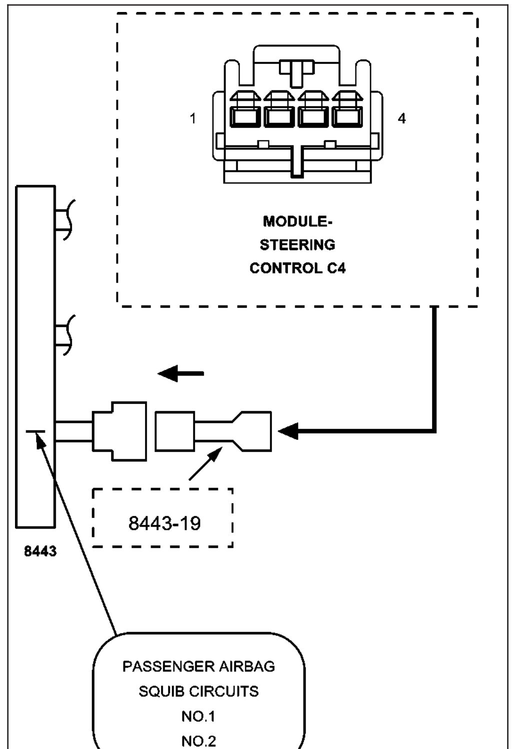
3. CHECK STEERING CONTROL MODULE C4 (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active ORC DTCs.



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Does the scan tool display: B1B03 DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

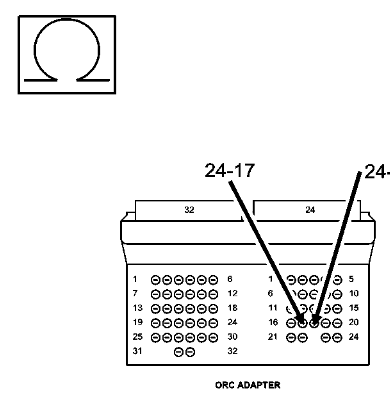
4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R43) Driver Squib 1 Line 2 circuit and the (R45) Driver Squib 1 Line 1 circuit at the ORC 8443-25 Adapter cavities 24-22 and 24-21.



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Is the resistance below 10k ohms?

Yes >> Repair the (R43) Driver Squib 1 Line 2 circuit for a short to the (R45) Driver Squib 1 Line 1 circuit.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

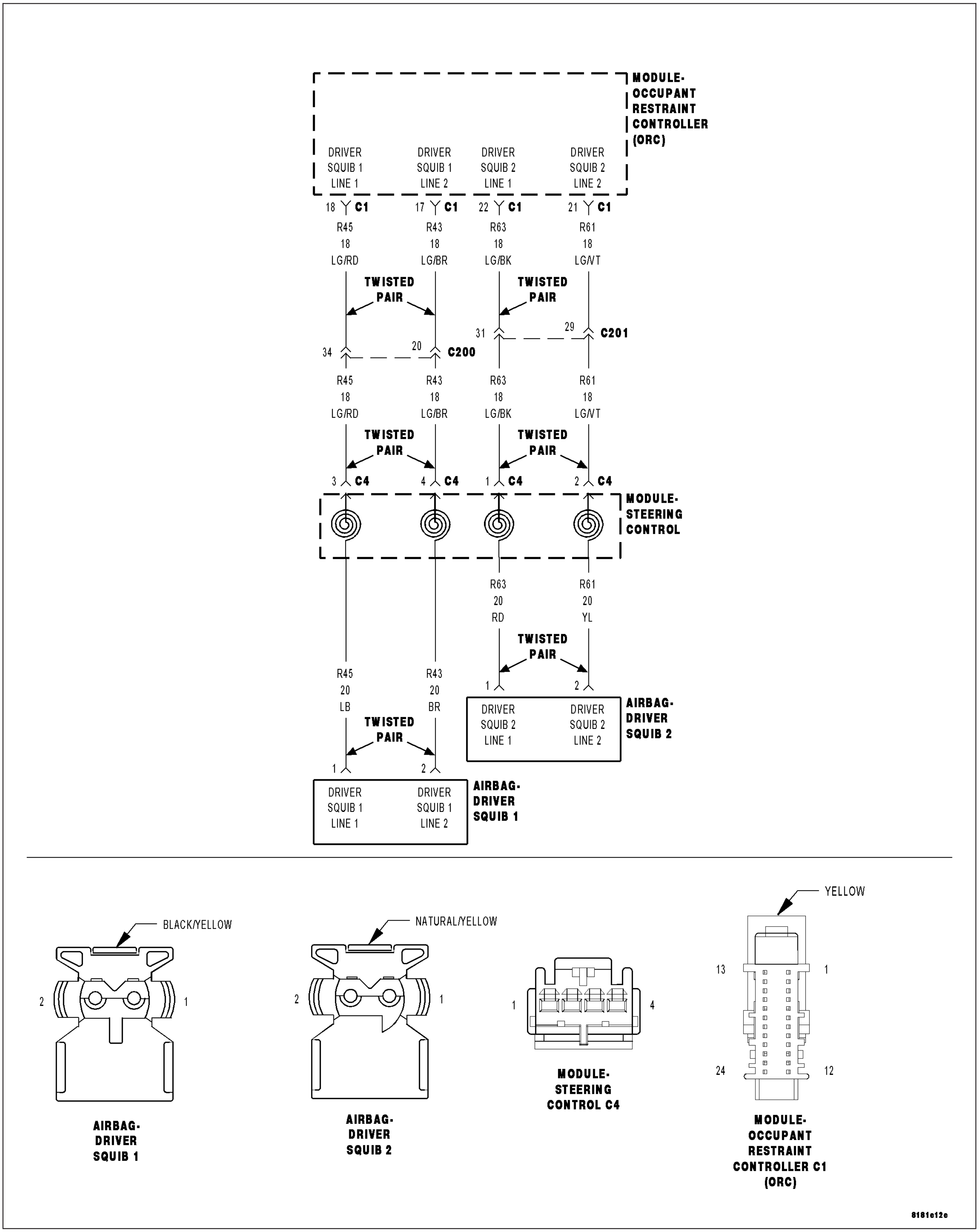
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits. The ORC will set this DTC if it detects low resistance on the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OR (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT SHORTED TO GROUND
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Airbag Squib connectors.

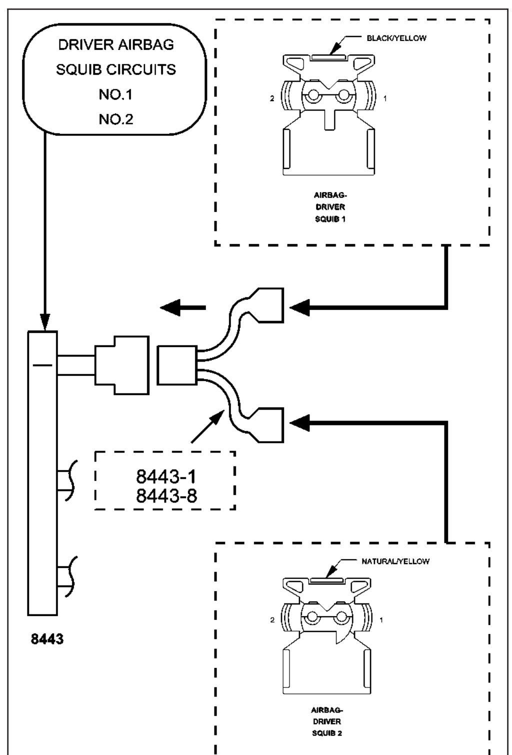
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



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Does the scan tool display: B1B04 DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

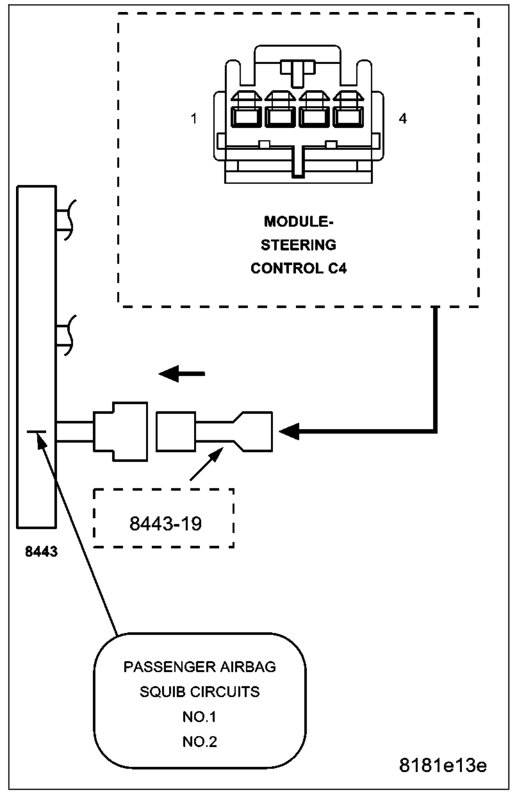
3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool Jumper from the Driver Airbag Squib connectors.

Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B04 DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT AND (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO GROUND

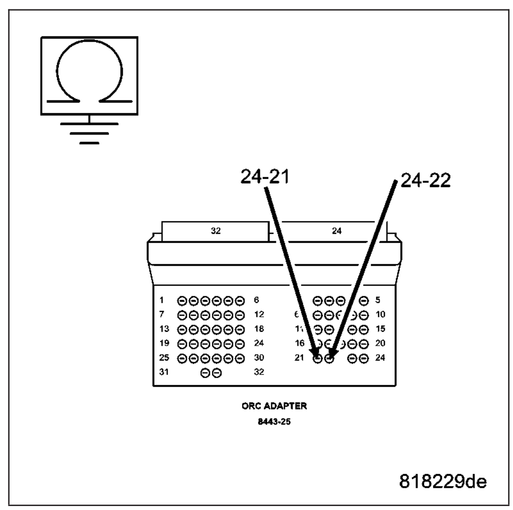
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Steering Control Module C4 connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC connectors.

Measure the resistance of the (R63) Driver Squib 2 Line 1 circuit between ground and the ORC 8443-25 Adaptor cavity 24-22.

Measure the resistance of the (R61) Driver Squib 2 Line 2 circuit between ground and the ORC 8443-25 Adaptor cavity 24-21.



Is the resistance below 10k ohms for either measurement?

Yes >> Repair the Driver Squib 2 circuits with resistance below 10k ohms for a short to ground.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

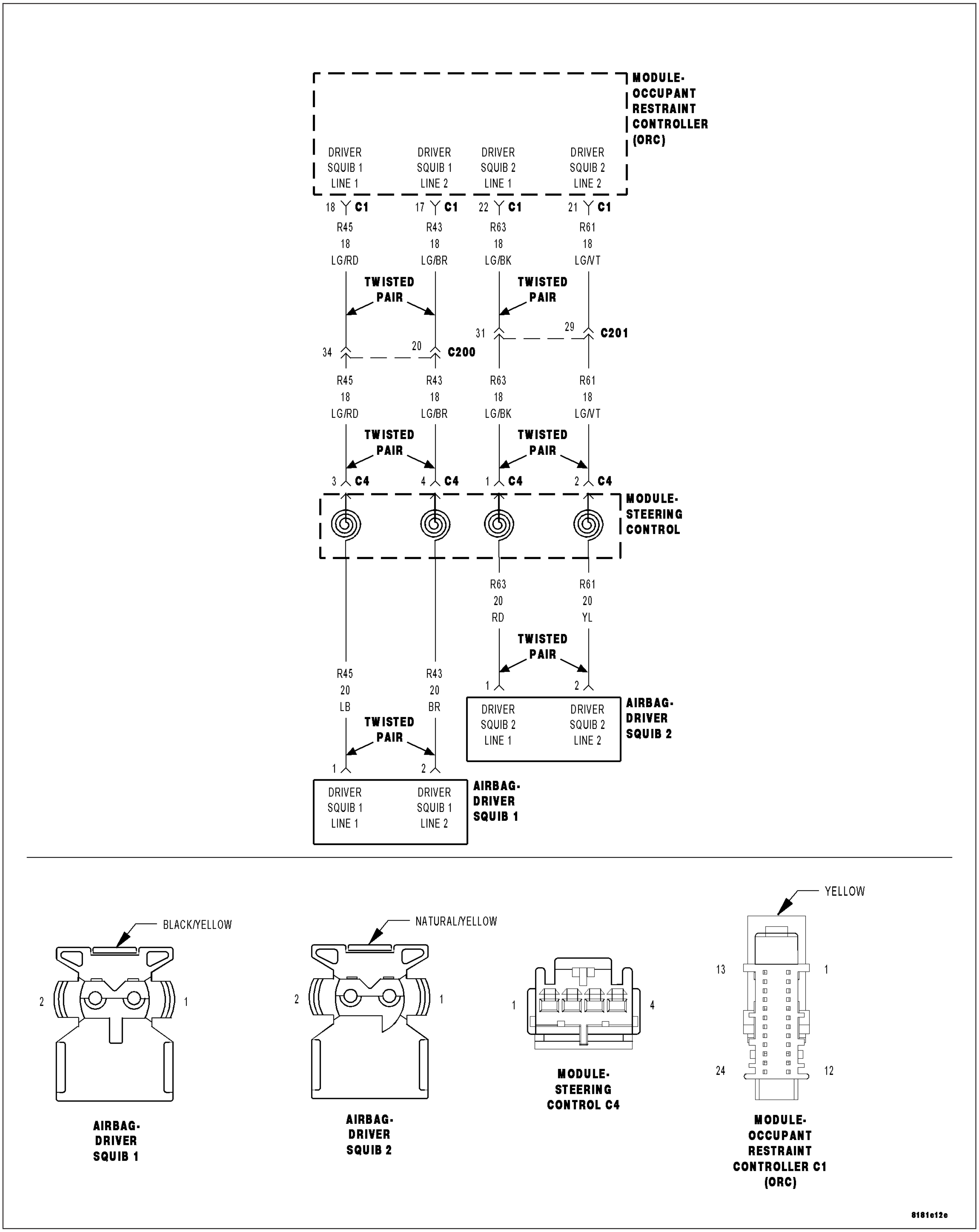
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Driver Squib 2 circuits. The ORC will set this DTC if it detects voltage on the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OR (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT SHORTED TO BATTERY
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Airbag Squib connectors.

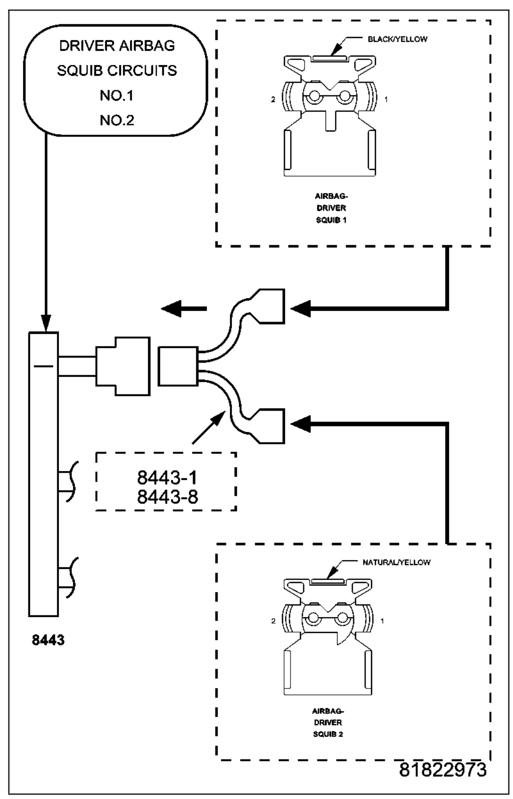
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B05 DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

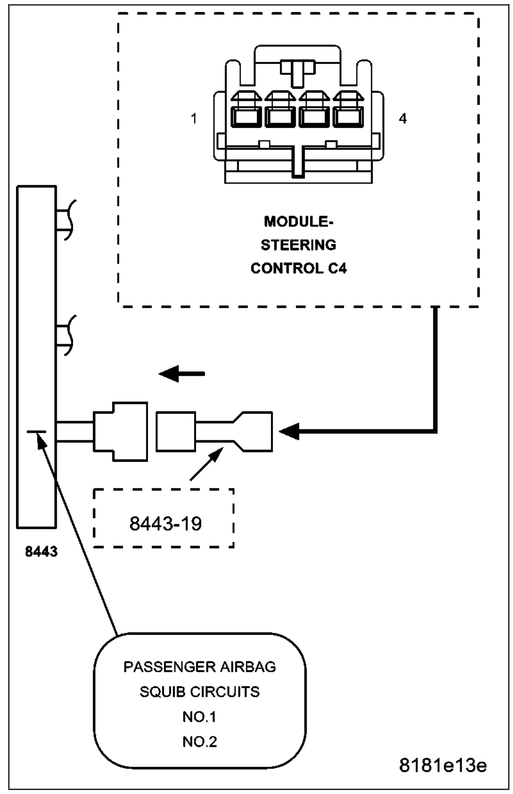
Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-19 appropriate Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B05 DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT AND (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

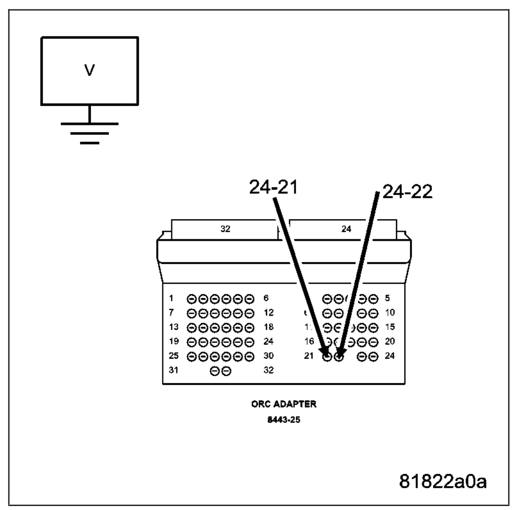
NOTE: Check connectors - Clean and repair as necessary.

Connect the Load Tool ORC 8443-25 Adaptor to the ORC connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R63) Driver Squib 2 Line 1 circuit between the 8443-25 Adaptor cavity 24-21 and ground.

Measure the voltage of the (R61) Driver Squib 2 Line 2 circuit between the 8443-25 Adaptor cavity 24-22 and ground.



Is there any voltage present for either measurement?

Yes >> Repair the Driver Squib 2 circuits with voltage present for a short to battery.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

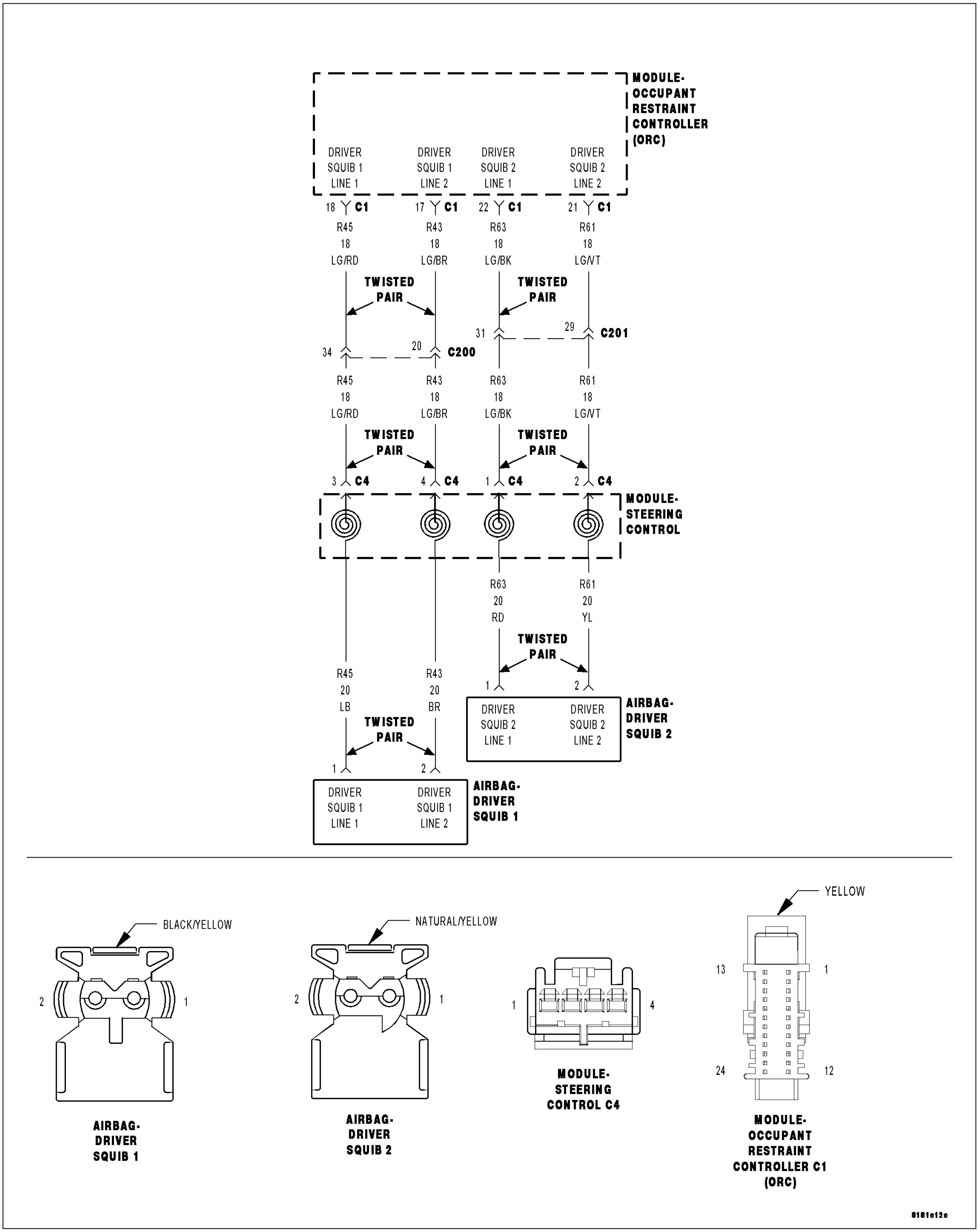
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits. The ORC will set this DTC if it detects an open or high resistance on the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OPEN
(R61) DRIVER SQUIB 2 LINE 2 CIRCUIT OPEN
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 6

2. CHECK FOR OPEN SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

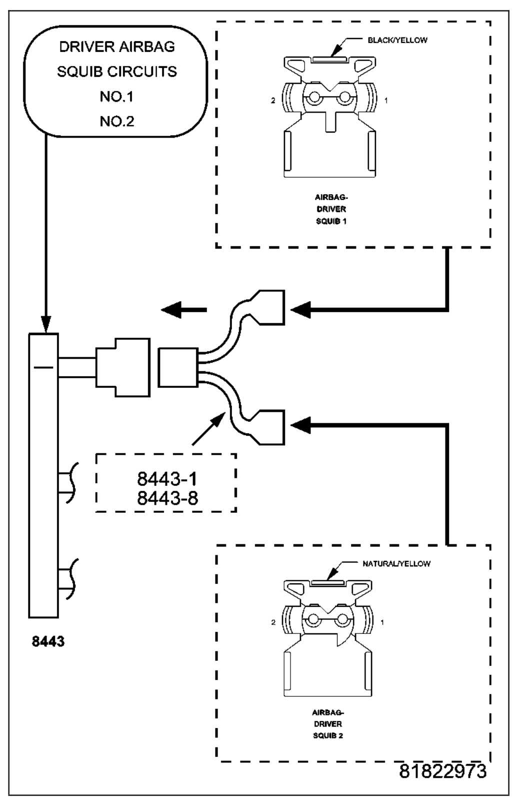
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

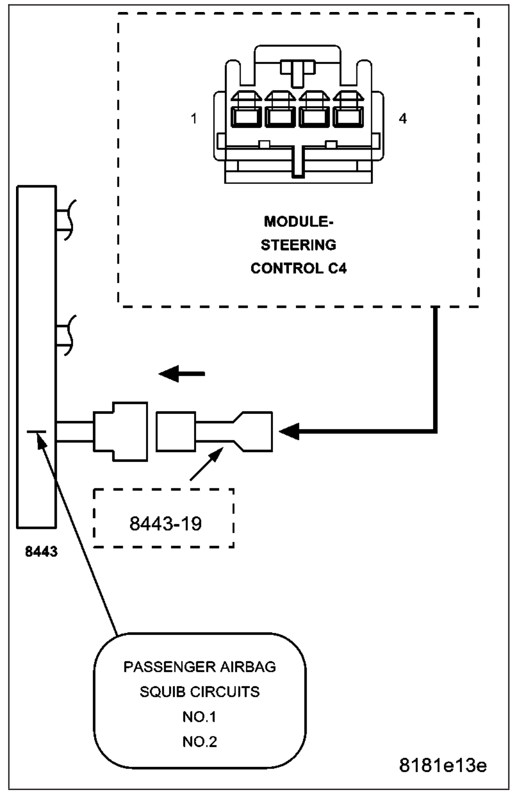
Does the scan tool display: B1B06 DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

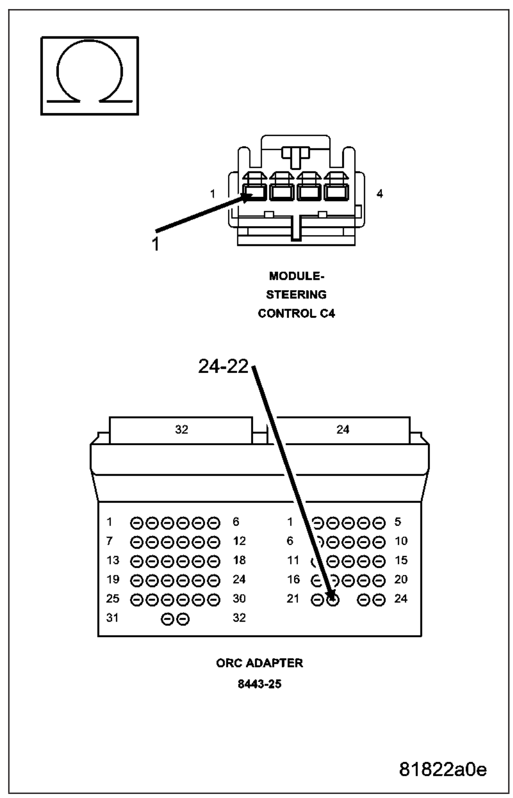
With the scan tool, read the active ORC DTCs.

Does the scan tool display: B1B06 DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R63) Driver Squib 2 Line 1 circuit between the Steering Control Module C4 connector and the ORC Load Tool 8443-25 Adaptor cavity 24-22.

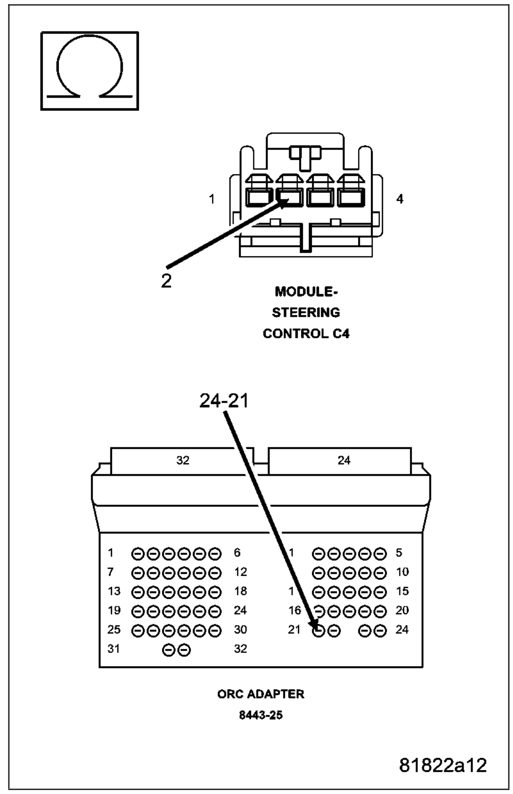
Is the resistance below 1.0 ohm?

Yes >> Go To 5

No >> Repair the (R63) Driver Squib 2 Line 1 circuit for an open.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR AN OPEN

Measure the resistance of the (R61) Driver Squib 2 Line 2 circuit between the Steering Control Module C4 connector and the ORC Load Tool 8443-25 Adaptor cavity 24-21.



Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R61) Driver Squib 2 Line 2 circuit for an open.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

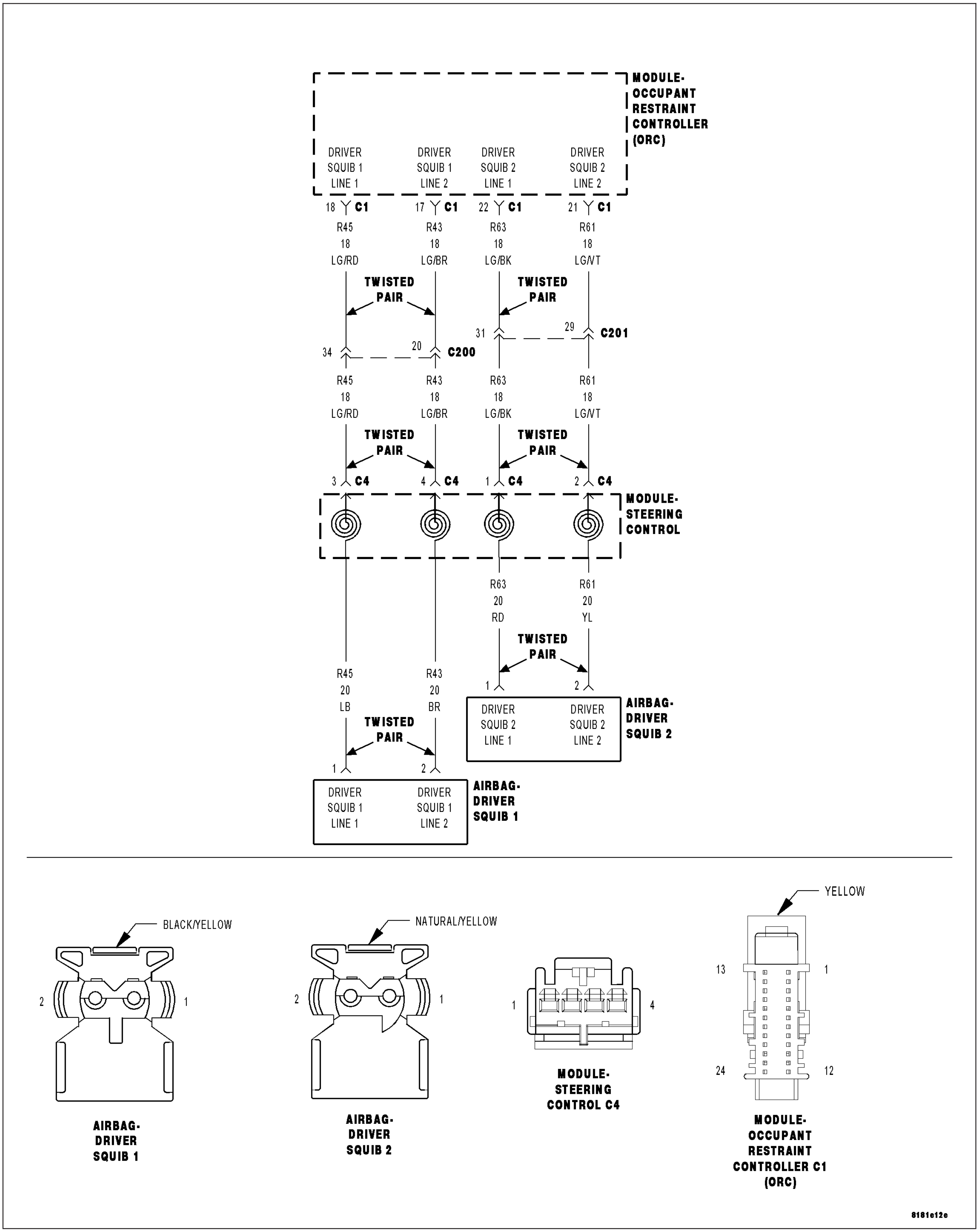
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits. The ORC will set this DTC if it detects low resistance between the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT SHORTED TO (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT
STEERING CONTROL MODULE
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

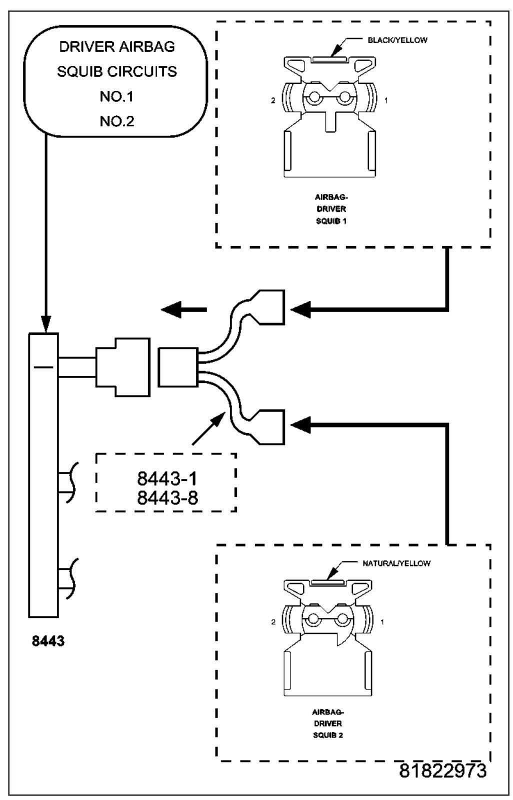
Disconnect the Driver Airbag Squib connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-1 Jumper to the Driver Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B07 DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Driver Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK STEERING CONTROL MODULE (CLOCKSPRING) SQUIB CIRCUITS FOR A SHORT TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and jumper from the Driver Airbag Squib connectors.

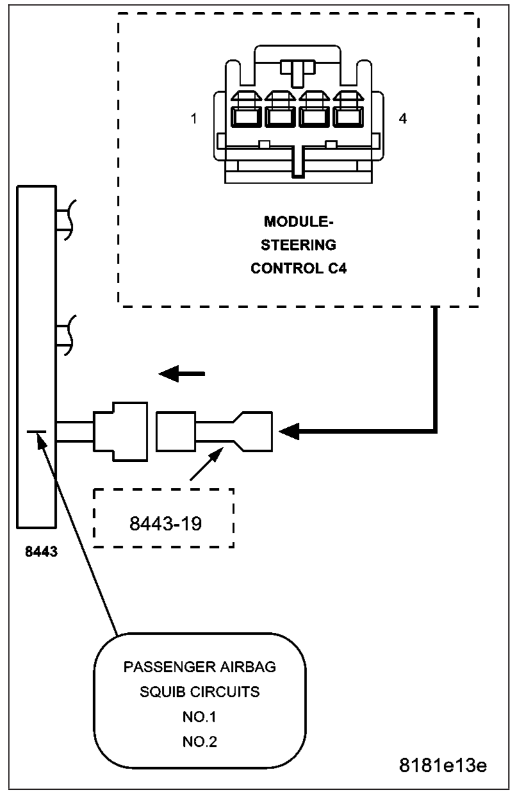
Disconnect the Steering Control Module C4 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-19 Jumper to the Steering Control Module C4 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.



Does the scan tool display: B1B07 DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 4

No >> Replace the Steering Control Module in accordance with the Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT FOR A SHORT TO (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

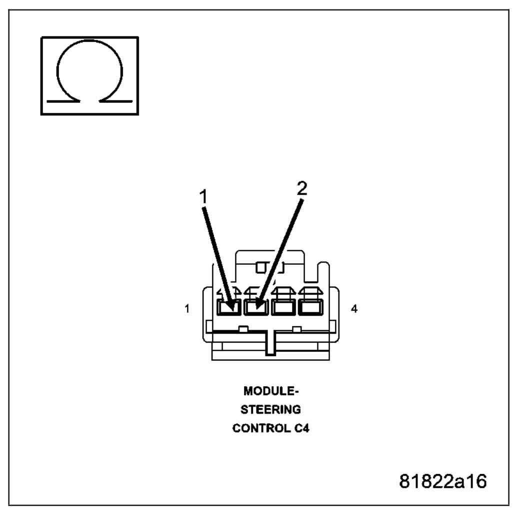
Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R63) Driver Squib 2 Line 1 circuit and the (R61) Driver Squib 2 Line 2 circuit at the ORC 8443-25 Adaptor cavities 24-22 and 24-21.



Is the resistance below 10k ohms?

Yes >> Repair the (R63) Driver Squib 2 Line 1 circuit for a short to the (R61) Driver Squib 2 Line 2 circuit.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

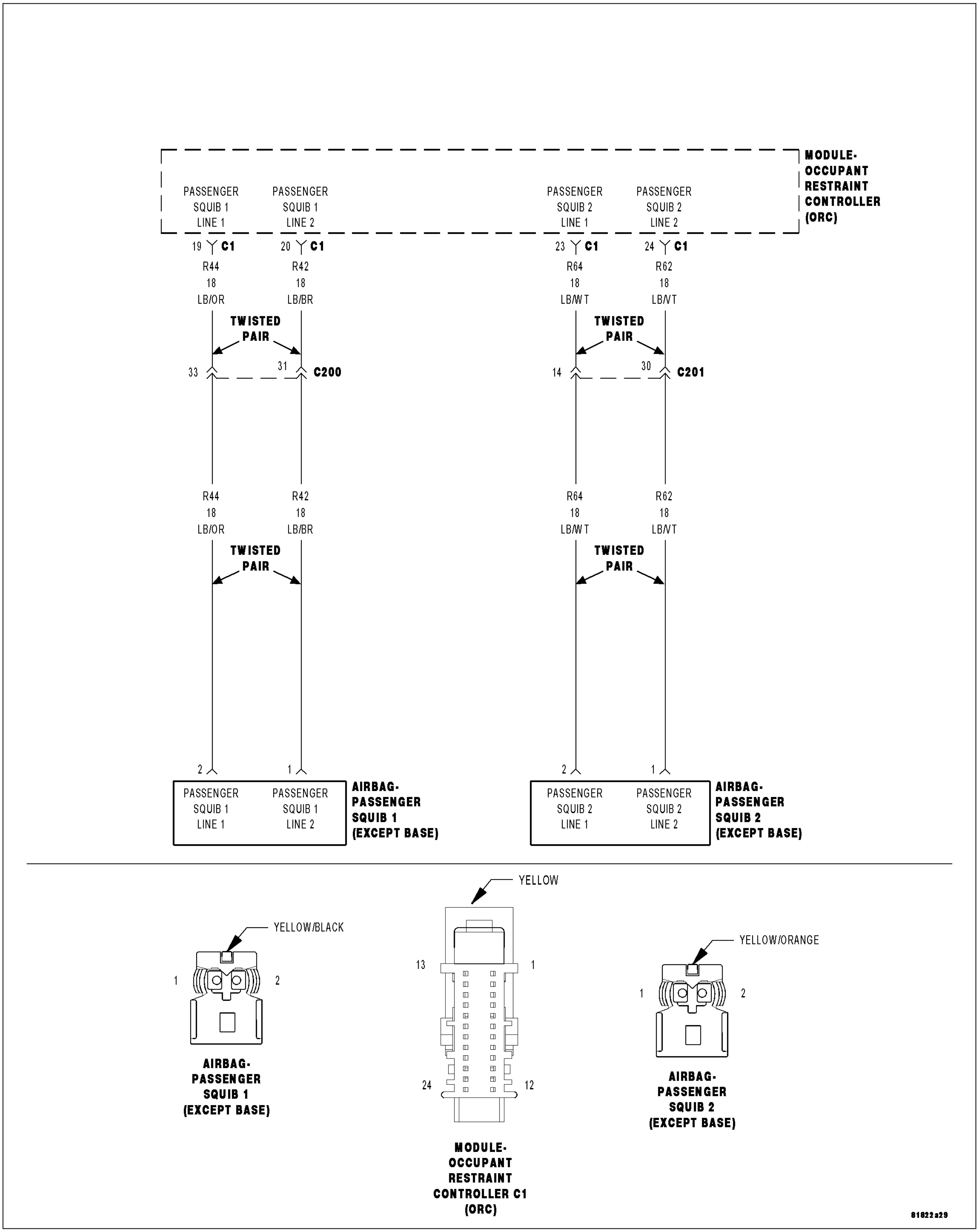
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits. The ORC will set this DTC if it detects low resistance on the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OR (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT SHORTED TO GROUND
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

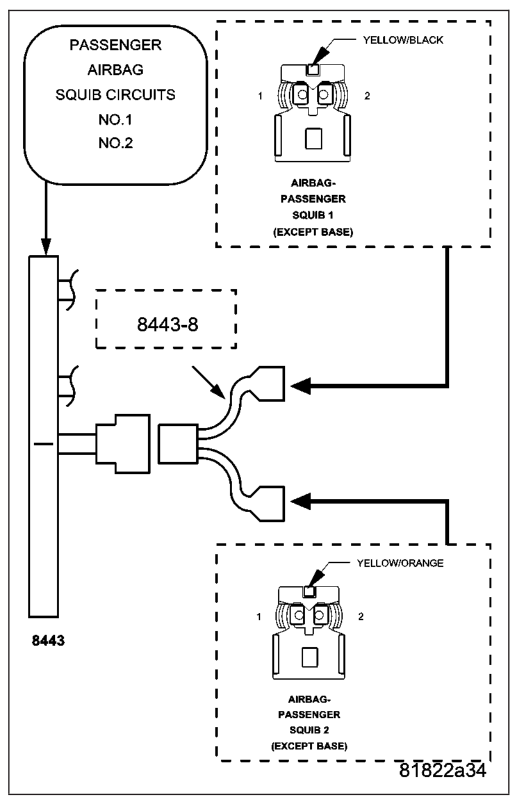
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

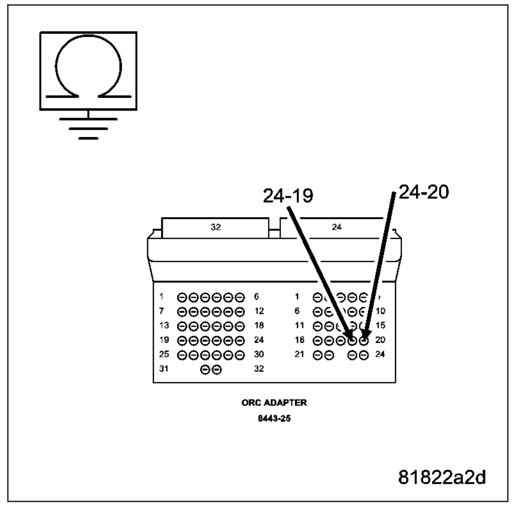
Does the scan tool display: B1B08 PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT AND (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R42) Passenger Squib 1 Line 2 circuit between the ORC 8443-25 Adaptor cavity 24-20 and ground.

Measure the resistance of the (R44) Passenger Squib 1 Line 1 circuit between the ORC 8443-25 Adaptor cavity 24-19 and ground.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Passenger Squib 1 circuits with resistance below 10k ohms for a short to ground.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

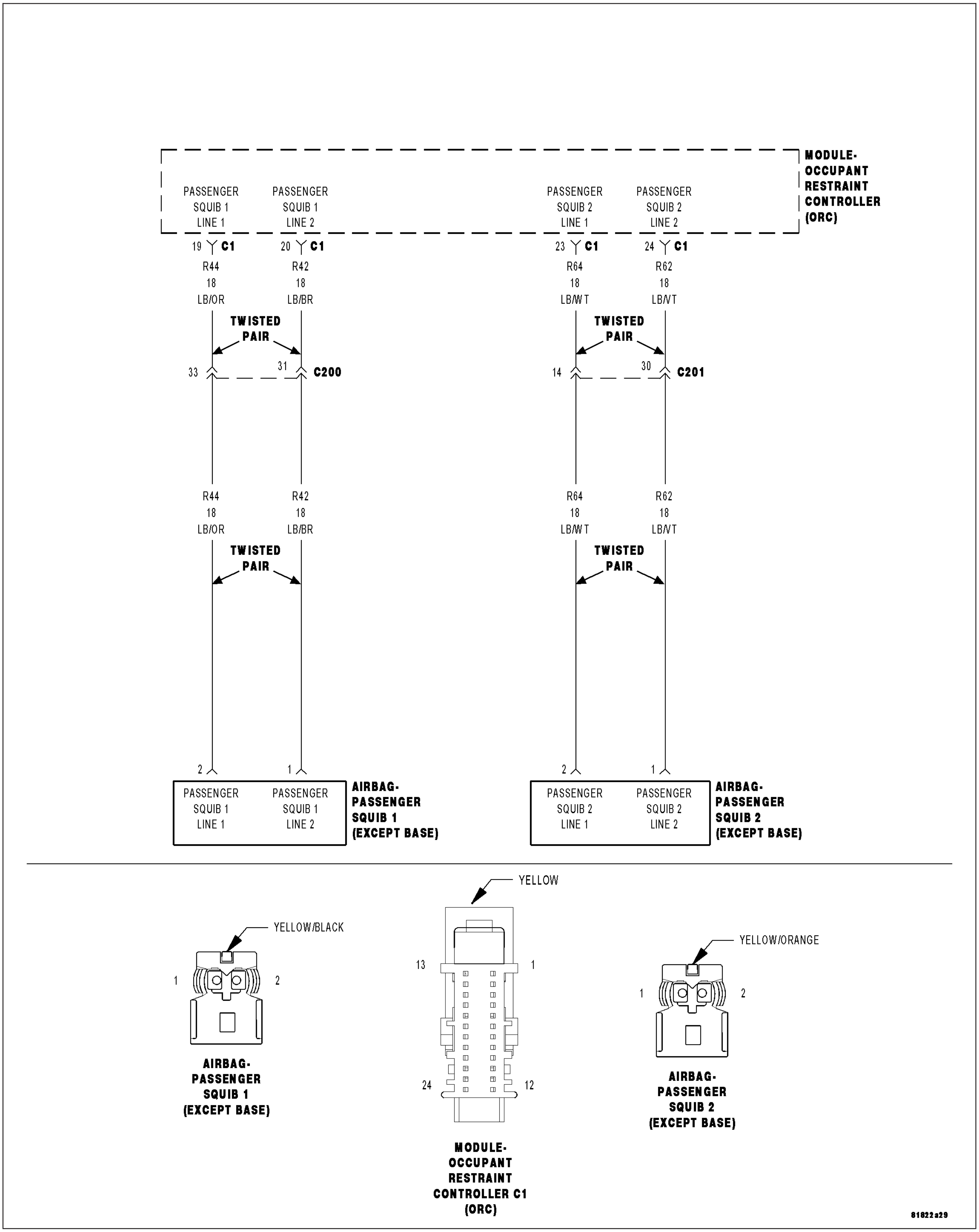
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Passenger Squib 1 circuits. The ORC will set this DTC if it detects voltage on the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OR (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT SHORTED TO BATTERY
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

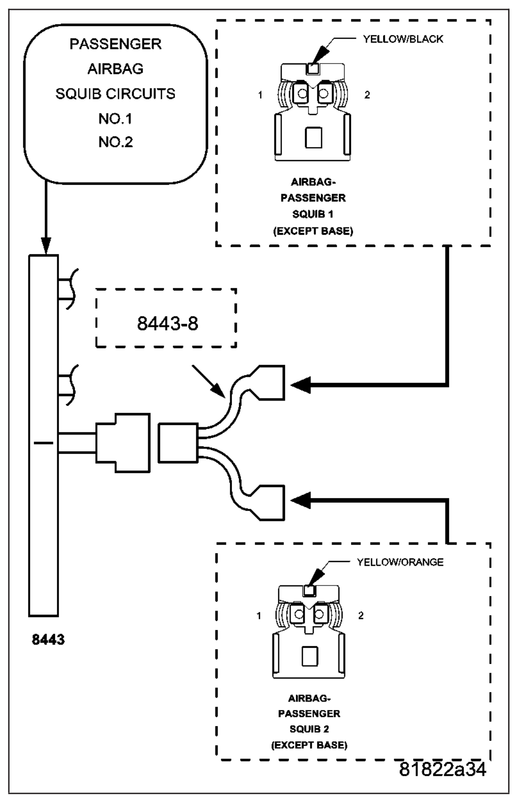
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

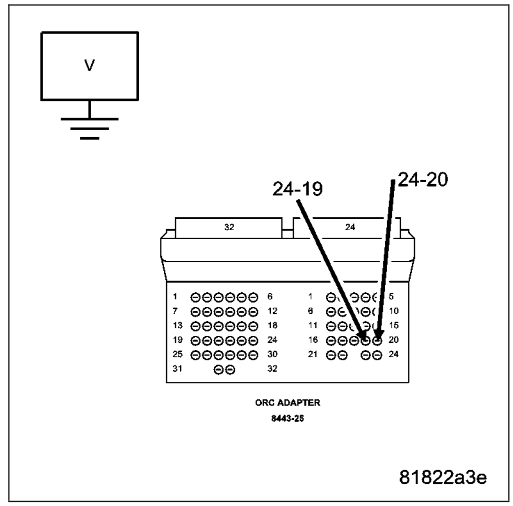


Does the scan tool display: B1B09 PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT AND (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the voltage of the (R42) Passenger Squib 1 Line 2 circuit between the ORC 8443-25 Adaptor cavity 24-20 and ground.

Measure the voltage of the (R44) Passenger Squib 1 Line 1 circuit between the ORC 8443-25 Adaptor cavity 24-19 and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Passenger Squib 1 circuits with voltage present for short to battery.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

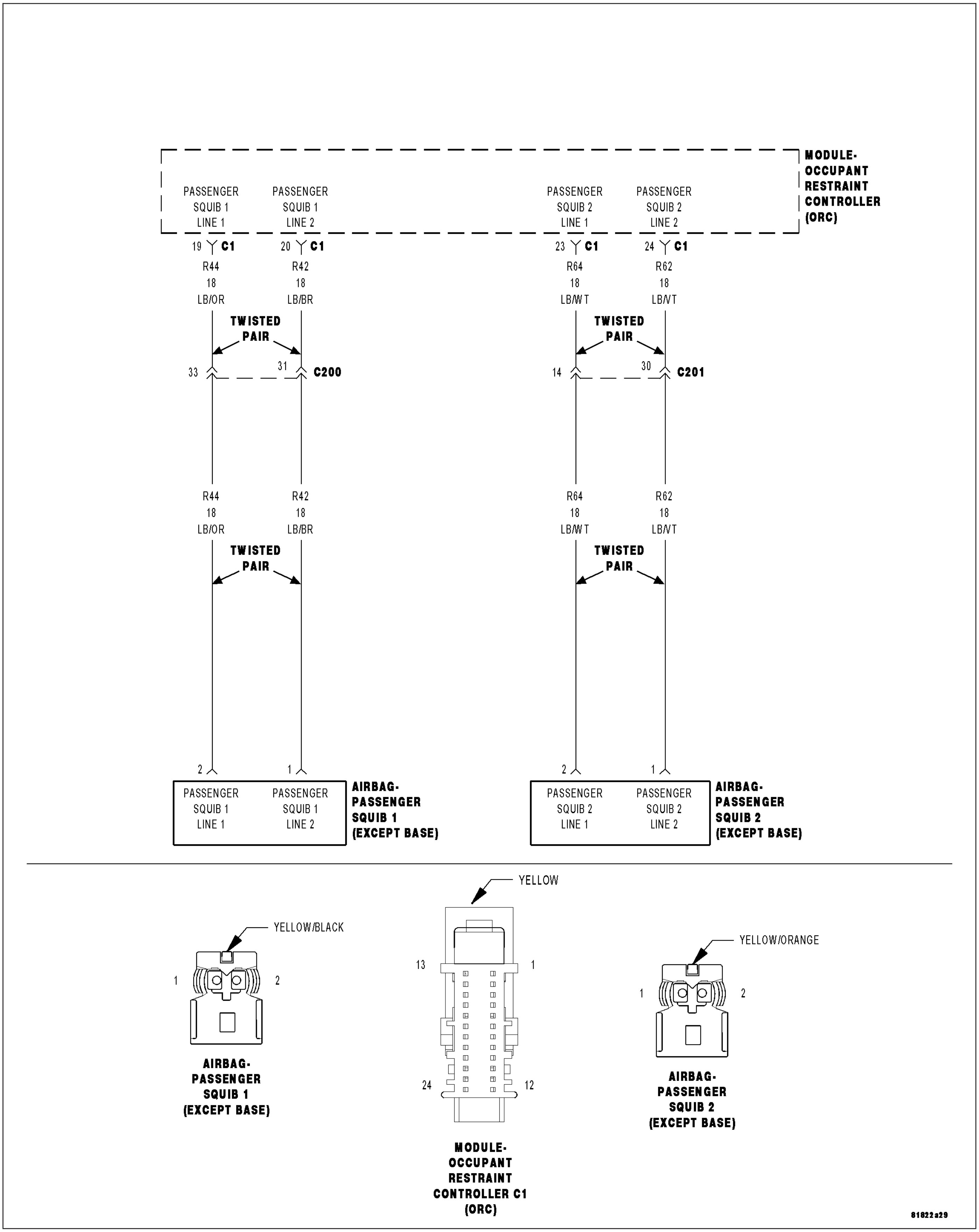
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits. The ORC will set this DTC if it detects an open or high resistance on the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OPEN
(R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT OPEN
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

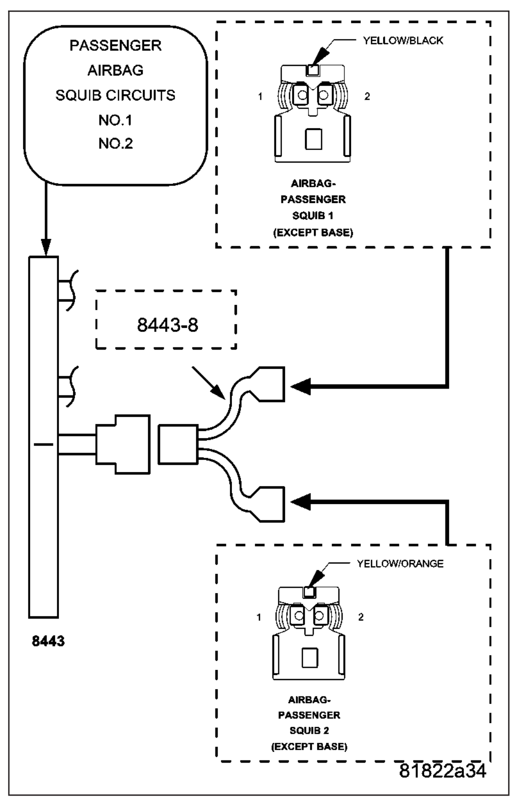
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

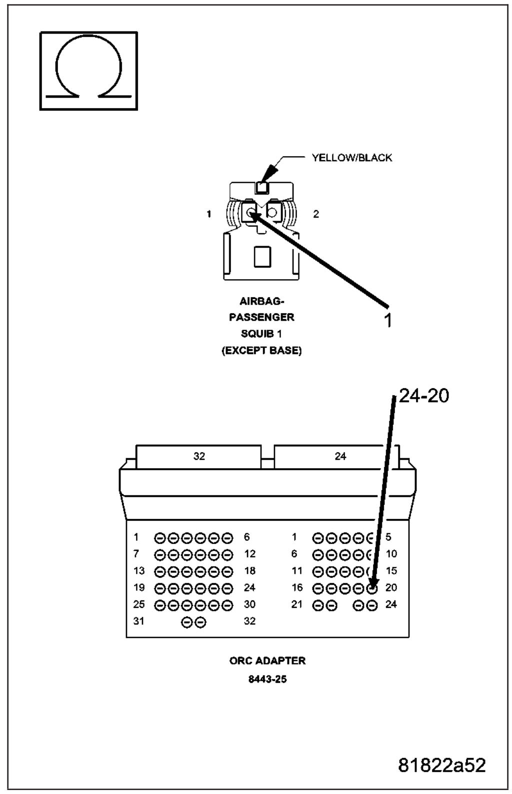
Does the scan tool display: B1B0A PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R42) Passenger Squib 1 Line 2 between the Passenger Airbag Squib connector circuit cavity 1 and the 8443-25 ORC Adaptor cavity 24-20.

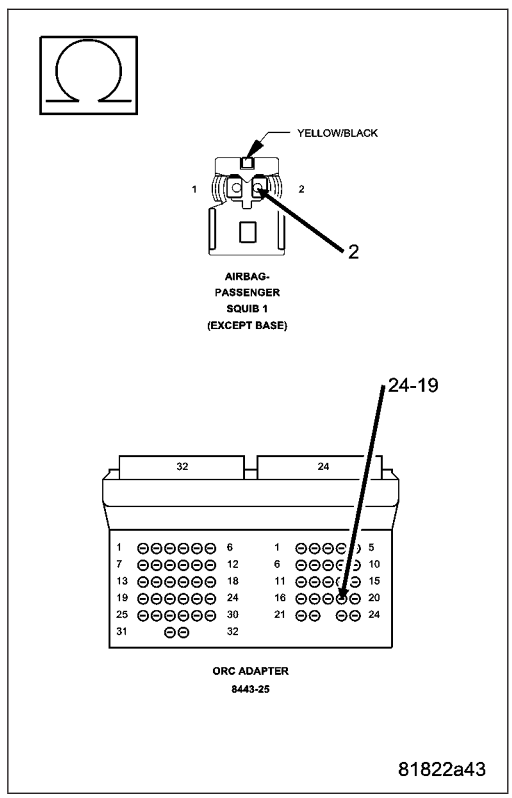
Is the resistance below 1.0 ohm?

Yes >> Go To 4

No >> Repair the (R42) Passenger Squib 1 Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN



Measure the resistance of the (R44) Passenger Squib 1 Line 1 circuit between the Passenger Airbag Squib connector circuit cavity 2 and the 8443 ORC 8443-25 Adaptor cavity 24-19.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R44) Passenger Squib 1 Line 1 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

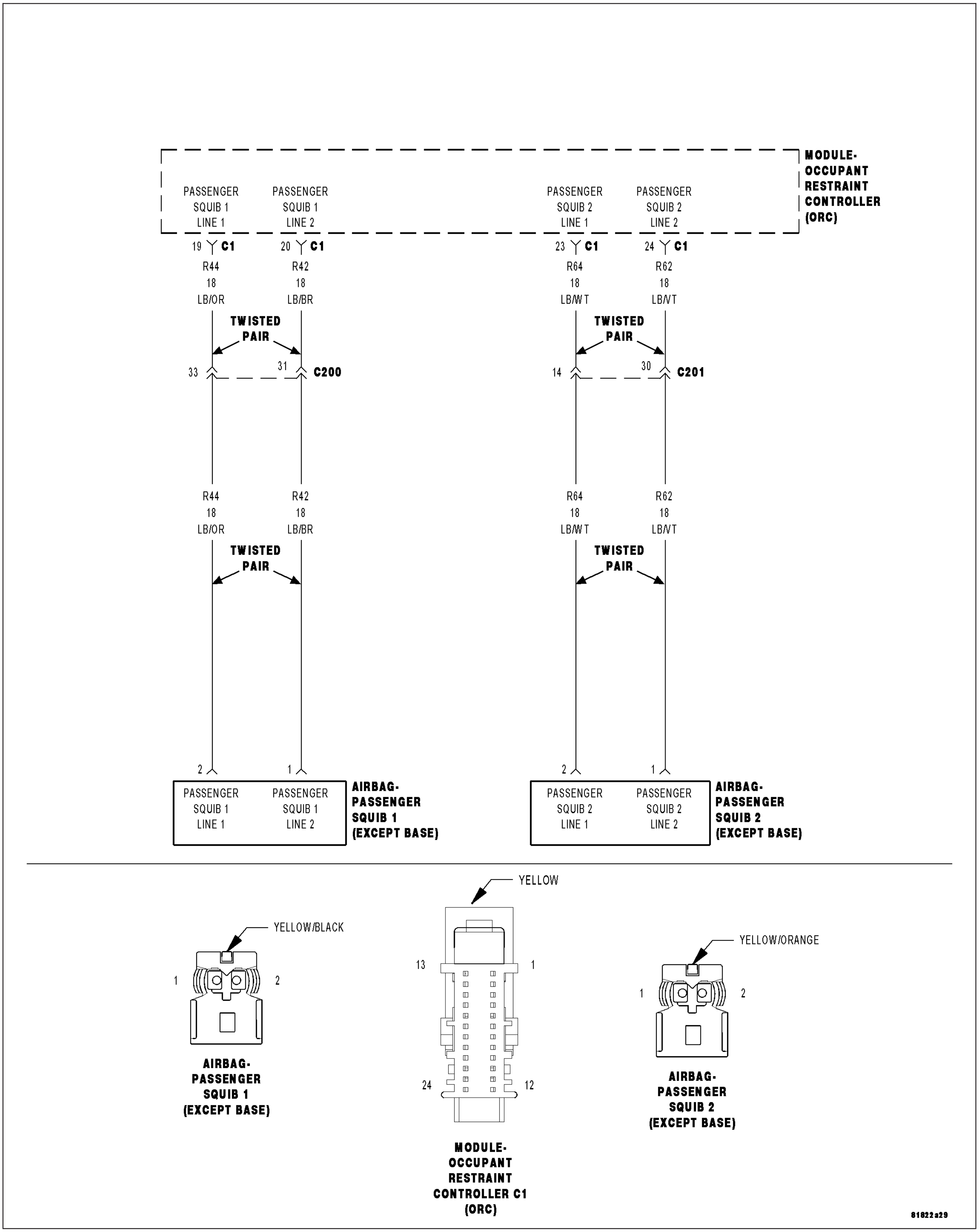
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits. The ORC will set this DTC if it detects low resistance between the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT SHORTED TO (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

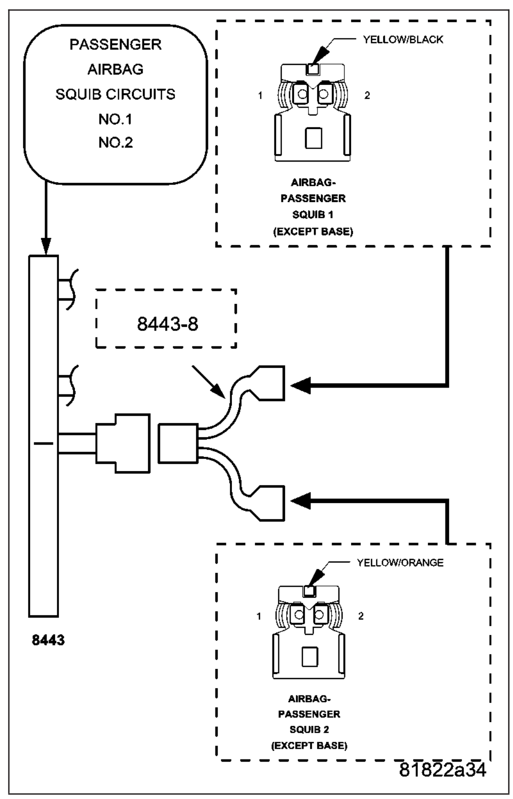
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

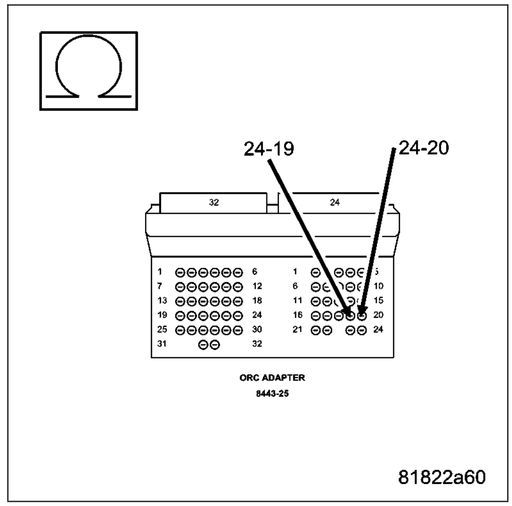
Does the scan tool display: B1B0B PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R42) Passenger Squib 1 Line 2 circuit cavity 24-20 and the (R44) Passenger Squib 1 Line 1 circuit cavity 24-19 at the ORC adaptor.

Is the resistance below 10k ohms?

Yes >> Repair the (R42) Passenger Squib 1 Line 2 circuit for a short to the (R44) Passenger Squib 1 Line 1 circuit.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits. The ORC will set this DTC if it detects low resistance on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OR (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT SHORTED TO GROUND
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

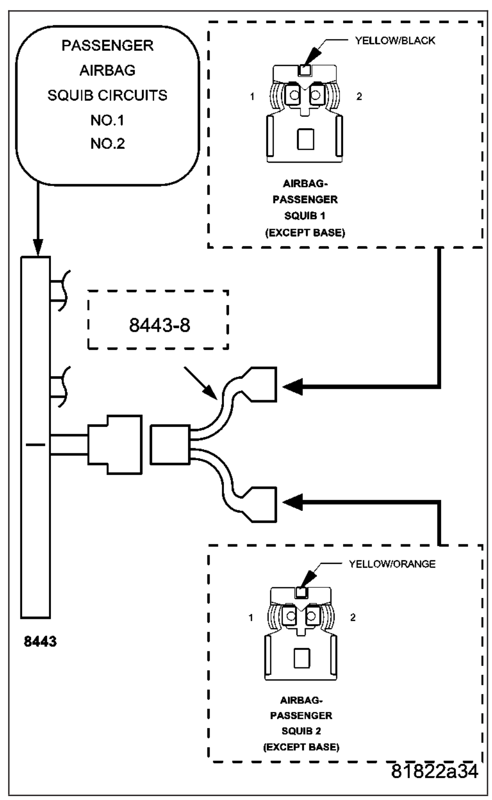
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

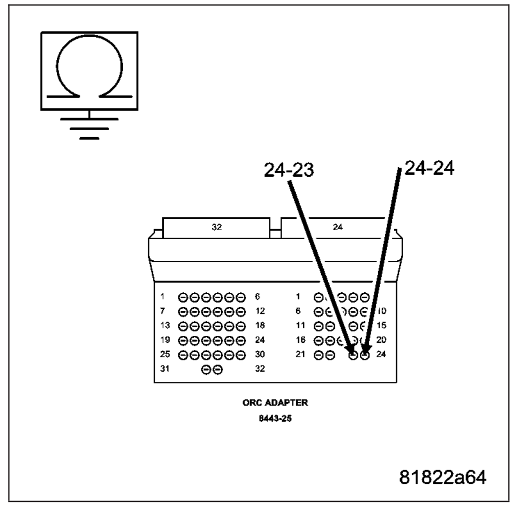


Does the scan tool display: B1B0C PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT AND (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R64) Passenger Squib 2 Line 1 circuit between ORC 8443-25 Adaptor cavity 24-23 and ground.

Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuit between ORC 8443-25 Adaptor cavity 24-24 and ground.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Passenger Squib 2 circuits with resistance below 10k ohms a short to ground.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

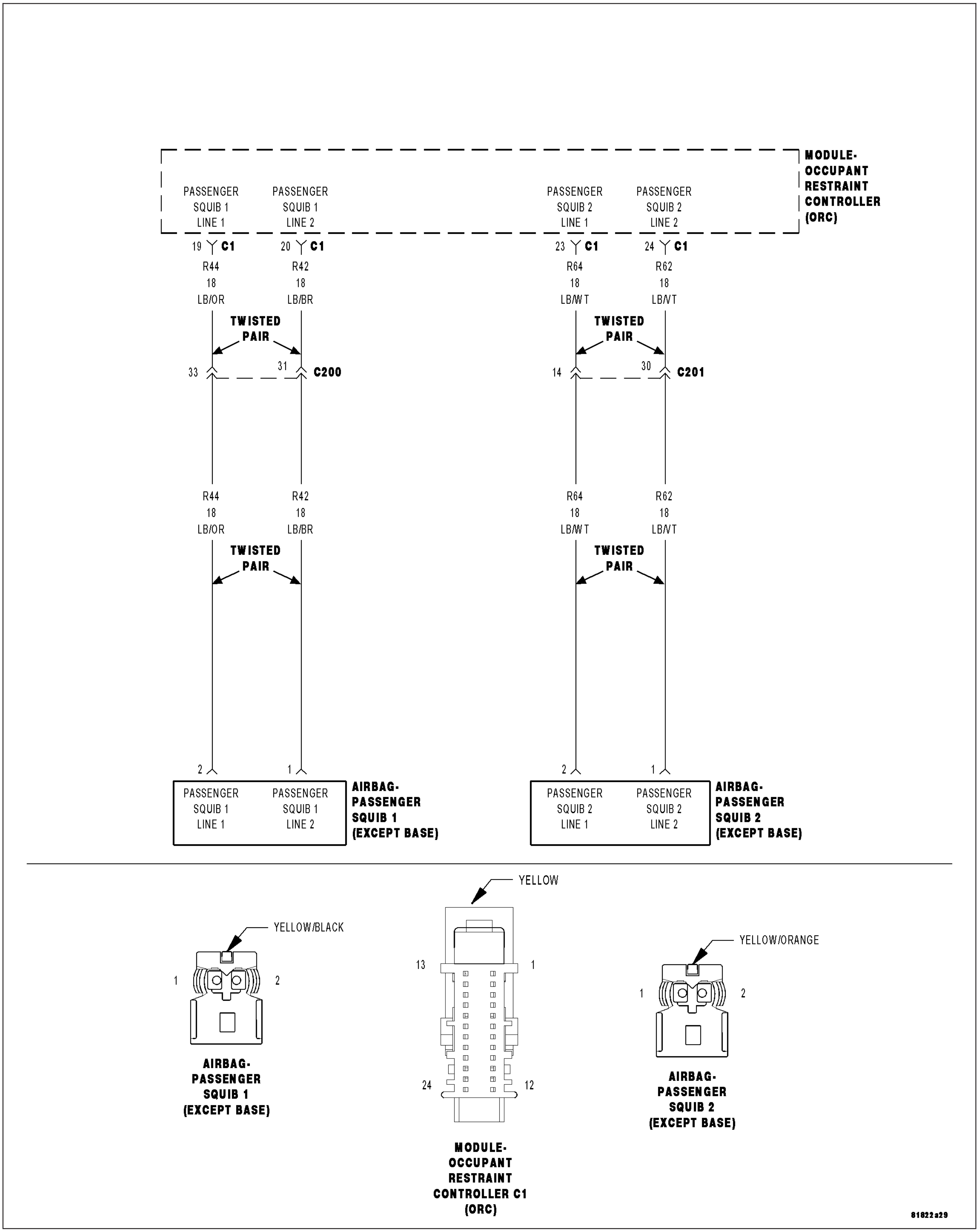
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage of the Passenger Squib 2 circuits. The ORC will set this DTC if it detects voltage on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OR (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT SHORTED TO BATTERY
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

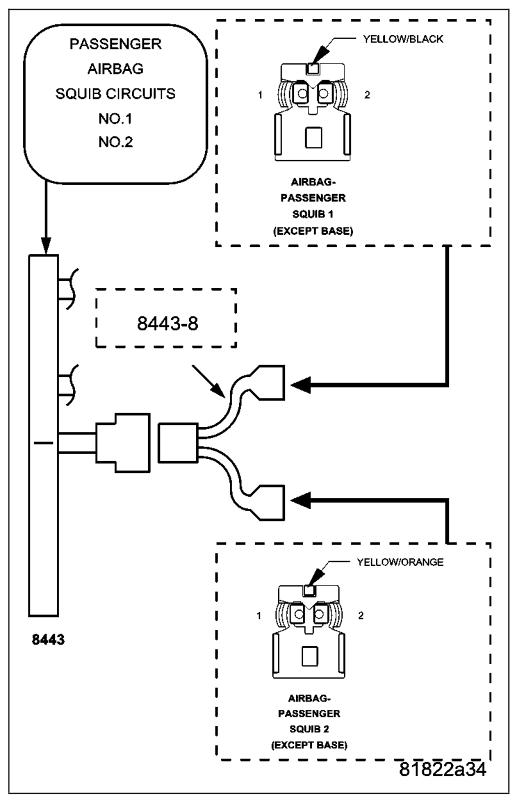
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

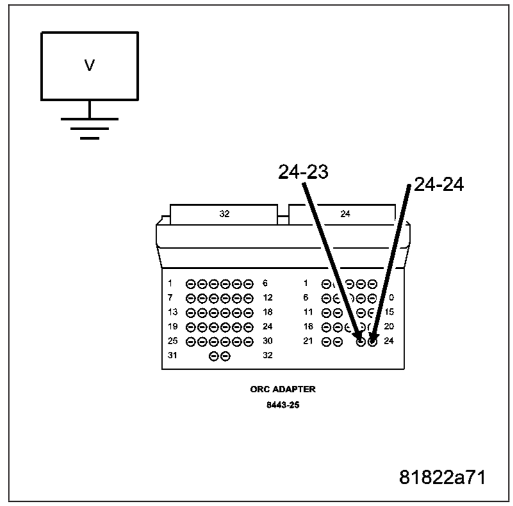


Does the scan tool display: B1B0D PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT AND (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the voltage of the (R64) Passenger Squib 2 Line 1 circuit between the ORC 8443-25 adaptor cavity 24-23 and ground.

Measure the voltage of the (R62) Passenger Squib 2 Line 2 circuit between the ORC 8443-25 adaptor cavity 24-24 and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Passenger Squib 2 circuits with voltage present for a short to battery.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

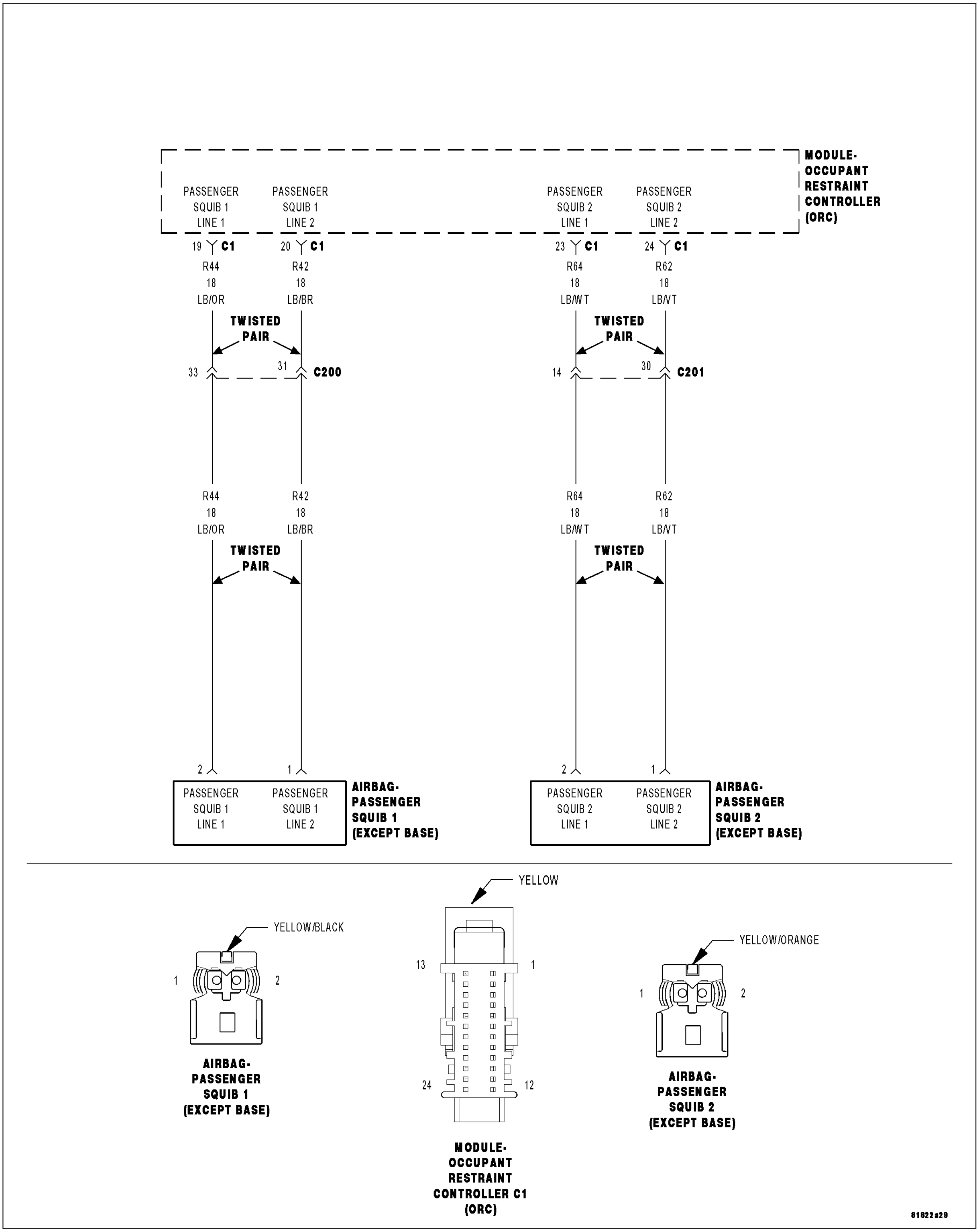
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits. The ORC will set this DTC if it detects an open or high resistance on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OPEN
(R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT OPEN
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

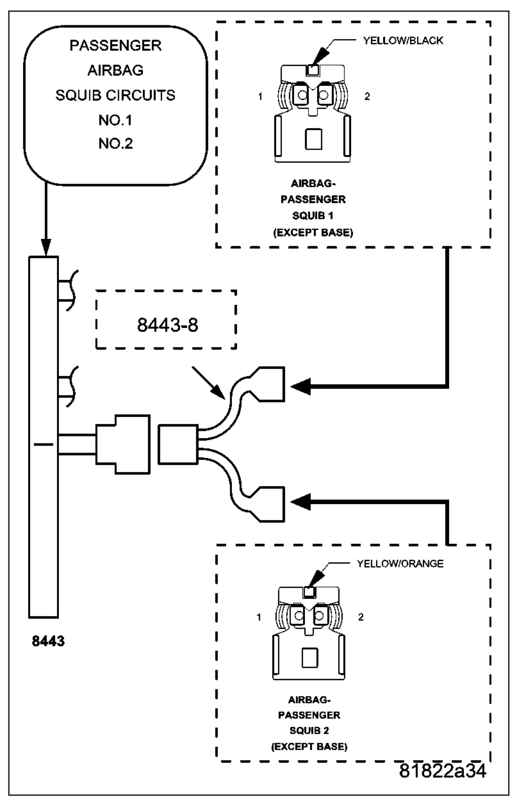
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

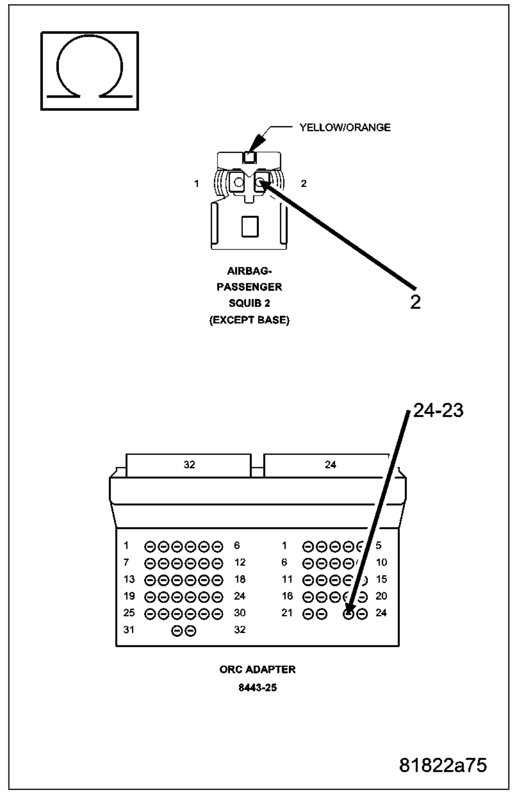


Does the scan tool display: B1B0E PASSENGER AIRBAG SQUIB CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R64) Passenger Squib 2 Line 1 circuit between the Passenger Airbag Squib connector and the 8443 Load Tool ORC 8443-25 Adaptor cavity 24-23.

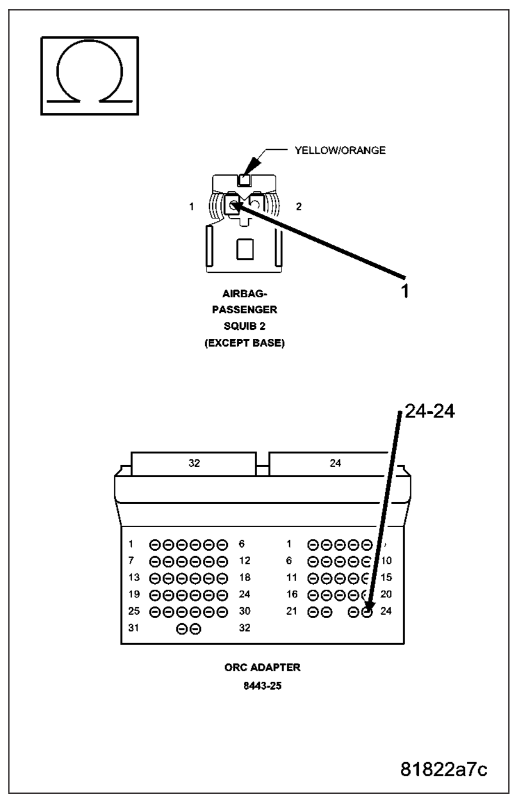
Is the resistance below 1.0 ohm?

Yes >> Go to 4

No >> Repair the (R64) Passenger Squib 2 Line 1 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR AN OPEN



Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuit between the Passenger Airbag Squib connector and the 8443 Load Tool ORC 8443-25 Adaptor cavity 24-24.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R62) Passenger Squib 2 Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

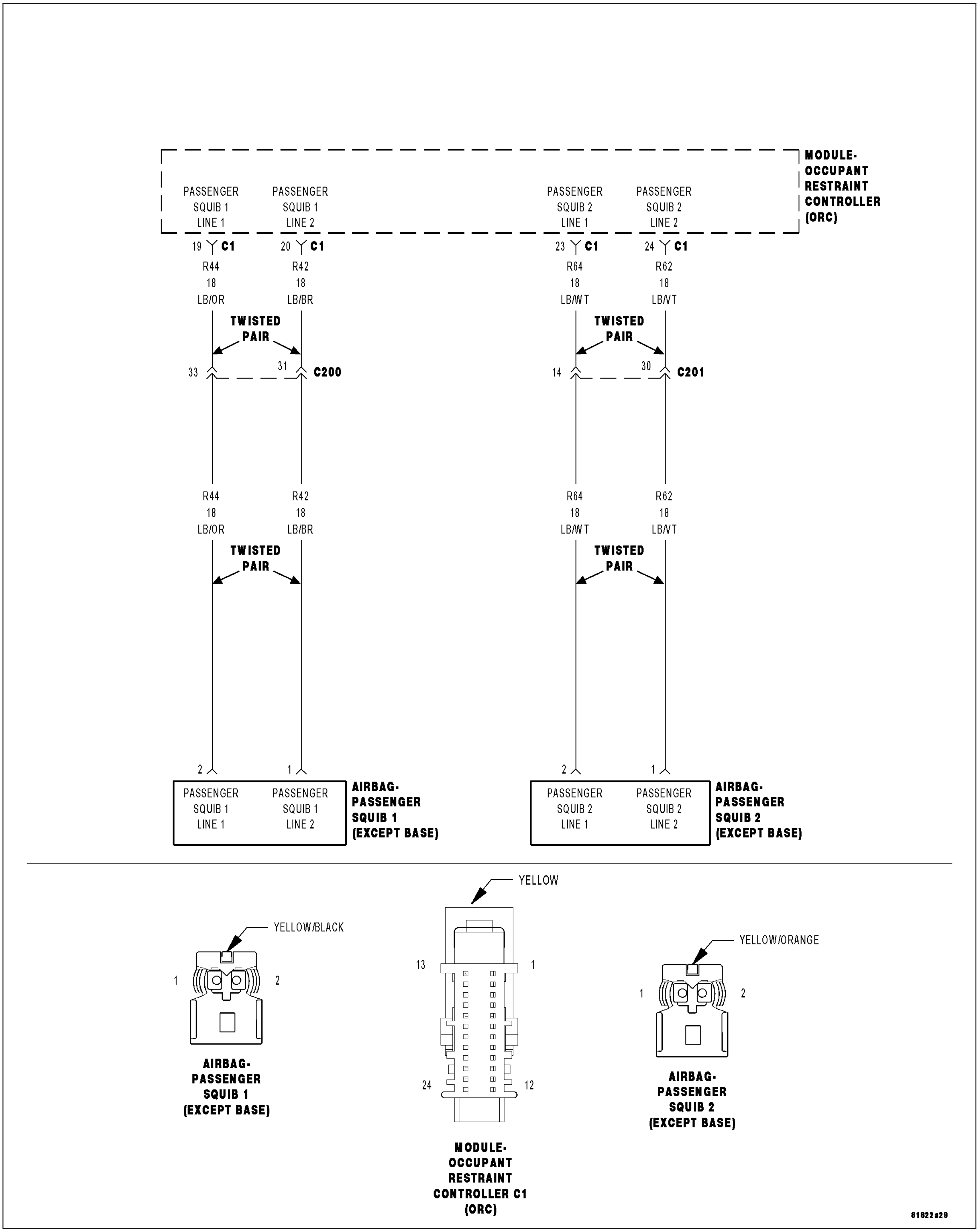
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits. The ORC will set this DTC if it detects low resistance between the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT SHORTED TO (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Airbag Squib connectors.

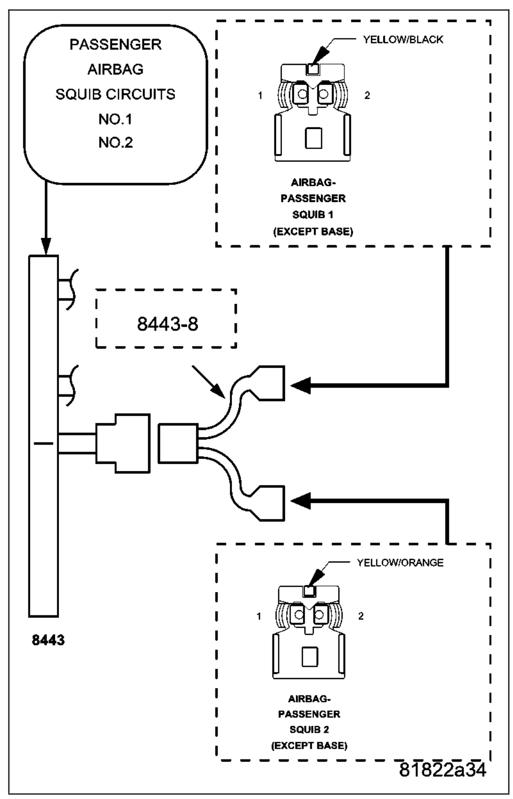
WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Passenger Airbag Squib connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery

With the scan tool, read the active ORC DTCs.

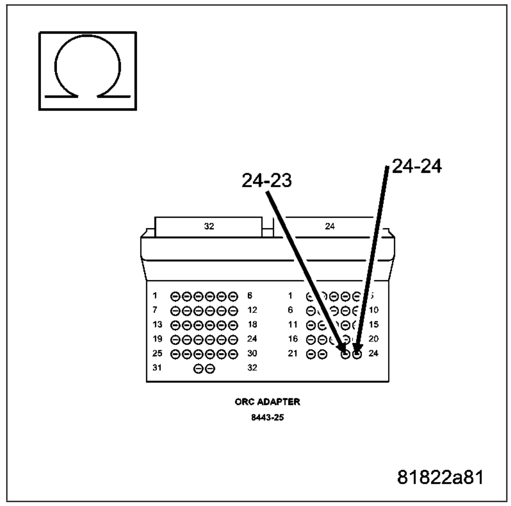


Does the scan tool display: B1B0F PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT FOR A SHORT TO (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connectors.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R64) Passenger Squib 2 Line 1 circuit and the (R62) Passenger Squib 2 Line 2 circuit at the ORC 8443-25 Adaptor cavities 24-23 and 24-24.

Is the resistance below 10k ohms?

Yes >> Repair the (R64) Passenger Squib 2 Line 1 circuit for a short to the (R62) Passenger Squib 2 Line 2 circuit.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

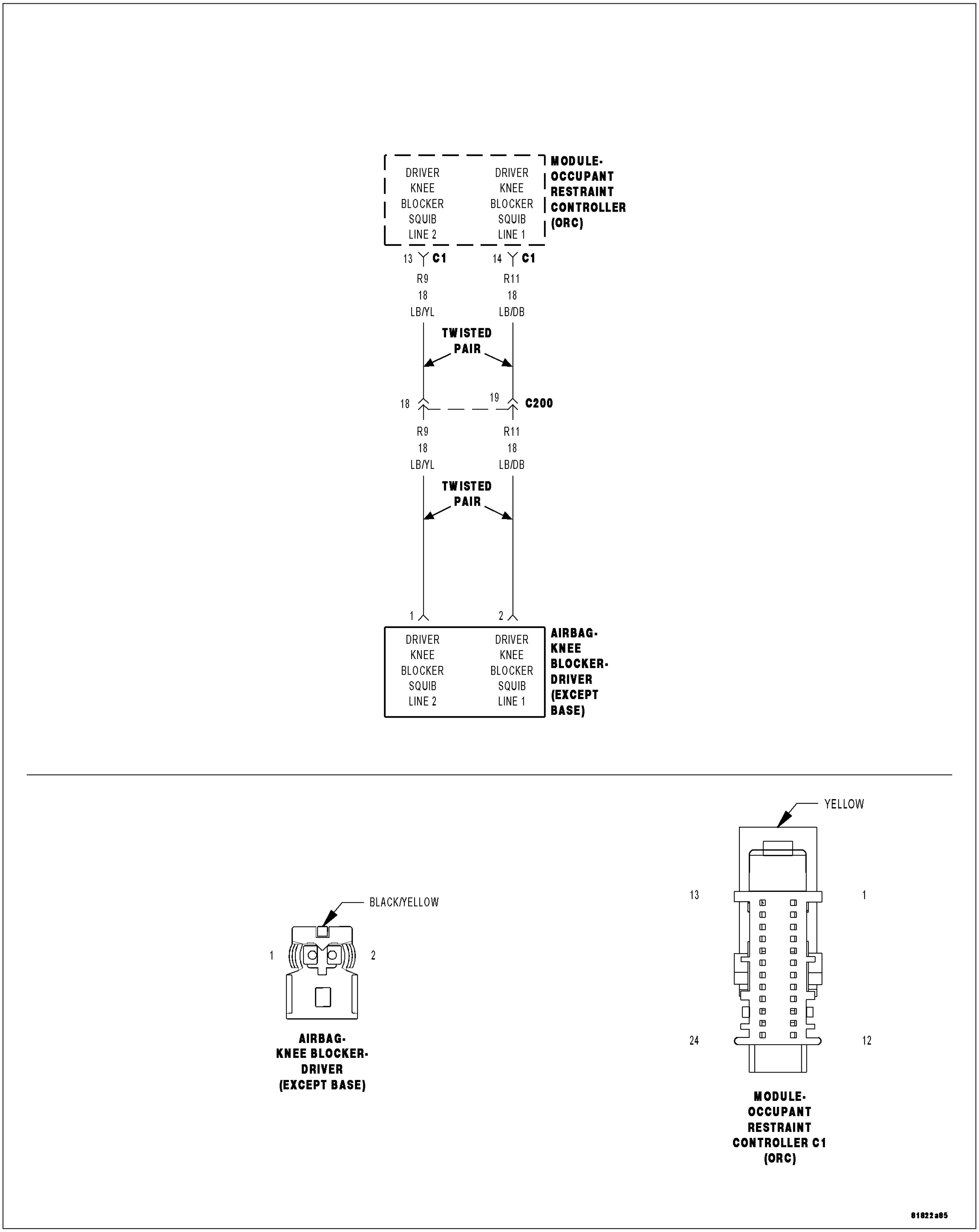
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B10-DRIVER KNEE BOLSTER SQUIB CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Knee Bolster Airbag circuits. The ORC will set this DTC if it detects low resistance on the Driver Knee Bolster Airbag circuits.

Possible Causes
(R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT OR (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT SHORTED TO GROUND
DRIVER KNEE BOLSTER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER KNEE BOLSTER AIRBAG CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Knee Bolster Airbag connector.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

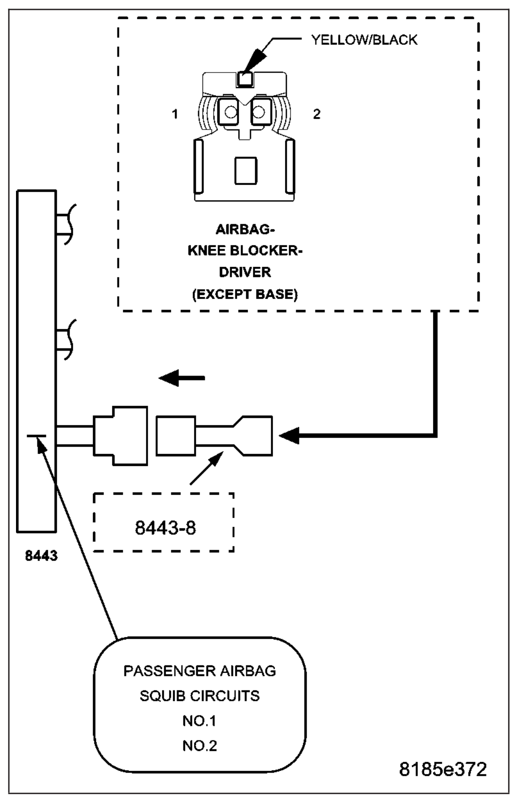
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool to the Driver Knee Bolster Airbag connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active ORC DTCs.

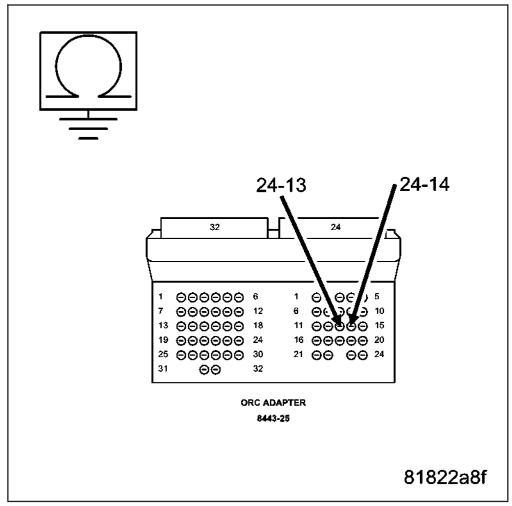
Does the scan tool display: B1B10-DRIVER KNEE BOLSTER SQUIB CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Driver Knee Bolster Airbag in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT OR (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool from the Driver Knee Bolster Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R11) Driver Knee Blocker Squib Line 1 circuit between ground and the adaptor.

Measure the resistance of the (R9) Driver Knee Blocker Squib Line 2 circuit between ground and the adaptor.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the (R11) Driver Knee Blocker Squib Line 1 or (R9) Driver Knee Blocker Squib Line 2 circuits for a short to ground.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

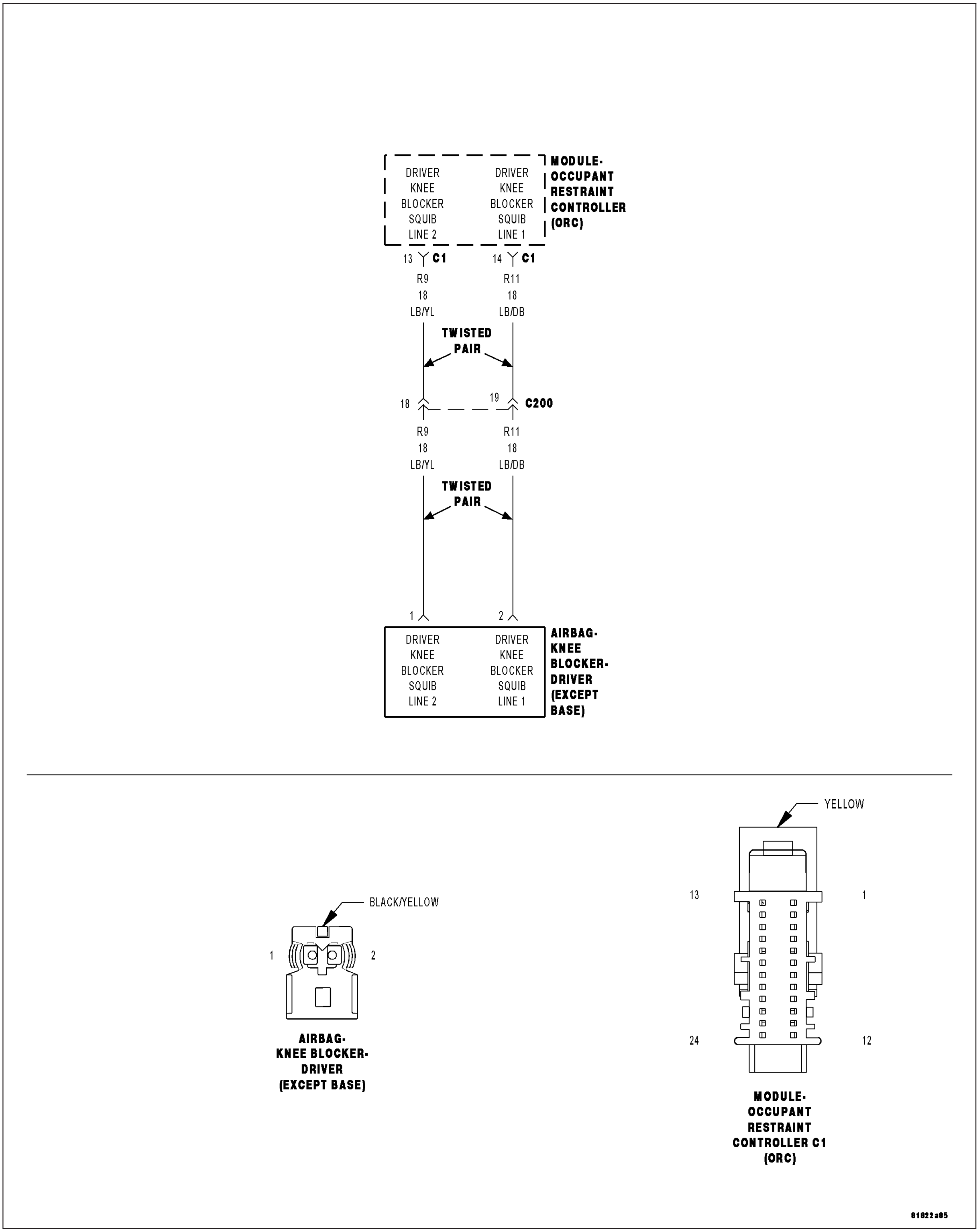
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B11-DRIVER KNEE BOLSTER SQUIB CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Driver Knee Bolster Airbag circuits. The ORC will set this DTC if it detects voltage on the Driver Knee Bolster Airbag circuits.

Possible Causes
(R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT OR (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT SHORTED TO BATTERY
DRIVER KNEE BOLSTER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER KNEE BOLSTER AIRBAG CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Knee Bolster Airbag connector.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Driver Knee Bolster Airbag connector.

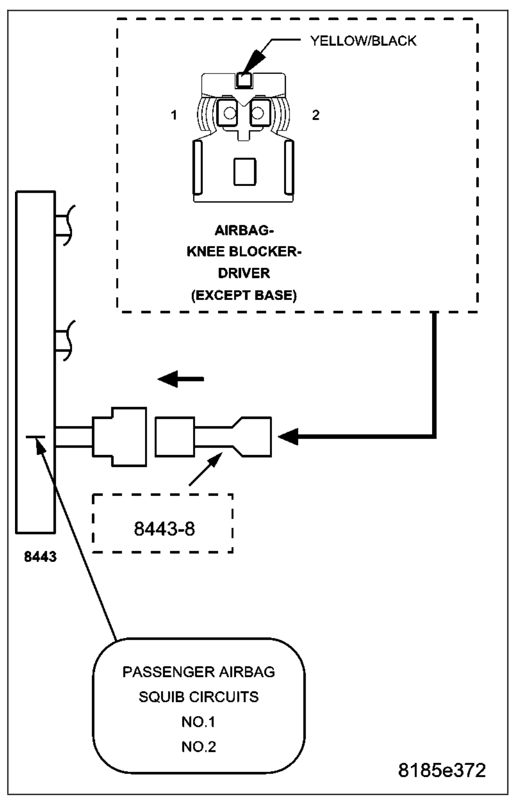
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

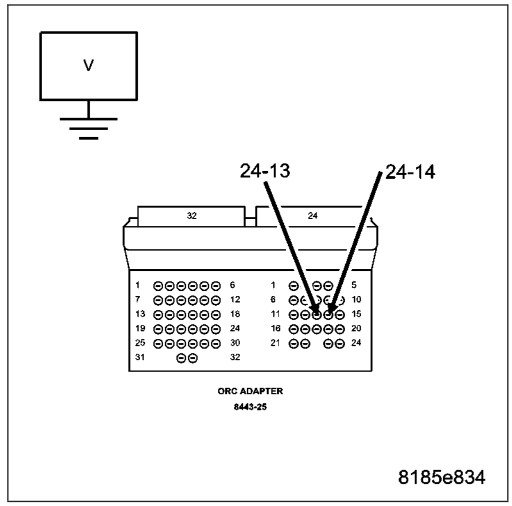
Does the scan tool display: B1B11-DRIVER KNEE BOLSTER SQUIB CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Driver Knee Bolster Airbag in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT OR (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool from the Driver Knee Bolster Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R11) Driver Knee Blocker Squib Line 1 circuit between the adaptor and ground.

Measure the voltage of the (R9) Driver Knee Blocker Squib Line 2 circuit between the adaptor and ground.

Is there any voltage present on either circuit?

Yes >> Repair the (R11) Driver Knee Blocker Squib Line 1 circuits or (R9) Driver Knee Blocker Squib Line 2 with voltage present for short to battery.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

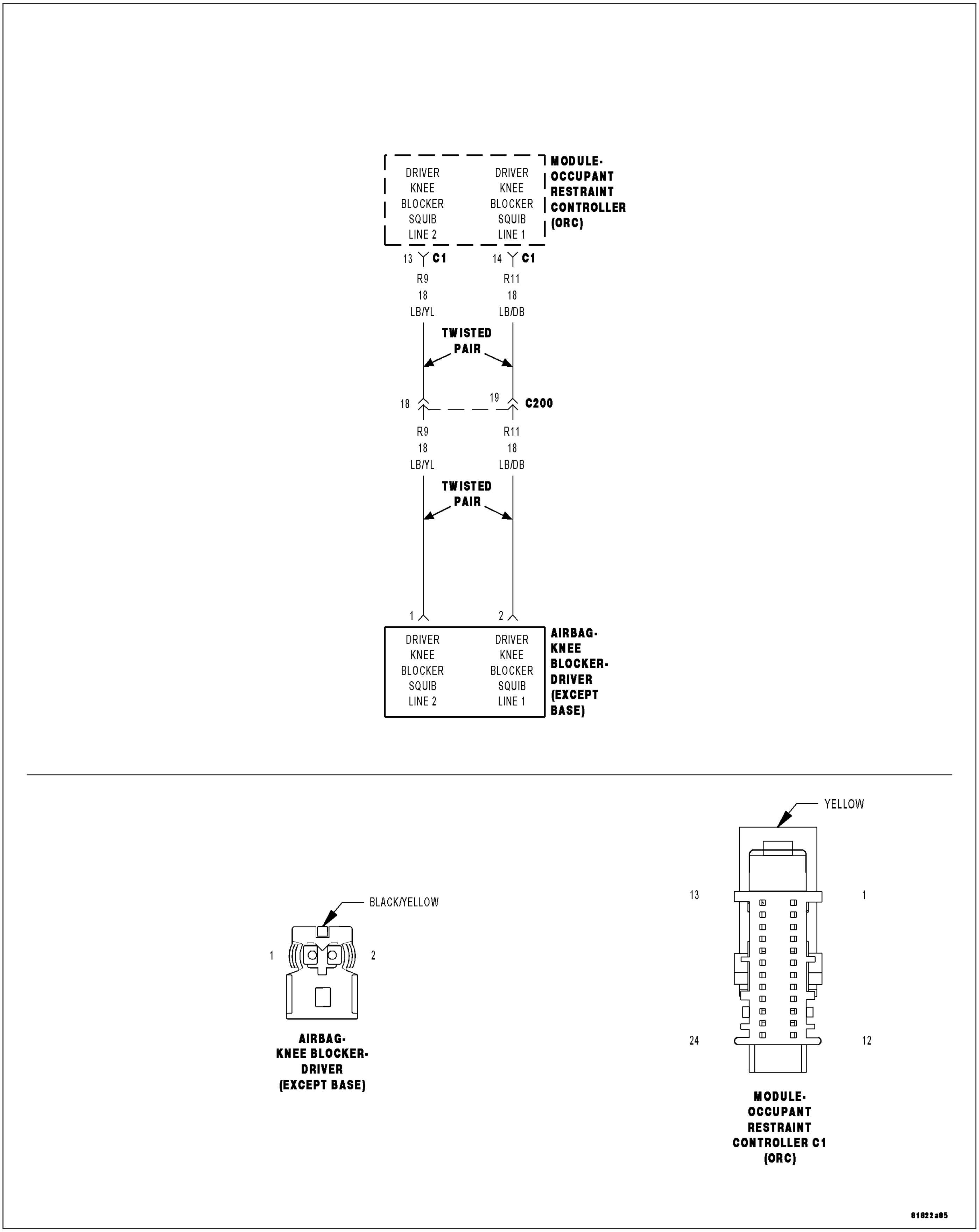
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question/causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B12-DRIVER KNEE BOLSTER SQUIB CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Knee Bolster Airbag circuits. The ORC will set this DTC if it detects an open or high resistance on the Driver Knee Bolster Airbag circuits.

Possible Causes
(R11) DRIVER KNEE BOLSTER SQUIB LINE 1 CIRCUIT OPEN
(R9) DRIVER KNEE BOLSTER SQUIB LINE 2 CIRCUIT OPEN
DRIVER KNEE BOLSTER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN DRIVER KNEE BOLSTER AIRBAG CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Knee Bolster Airbag connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Driver Knee Bolster Airbag connector.

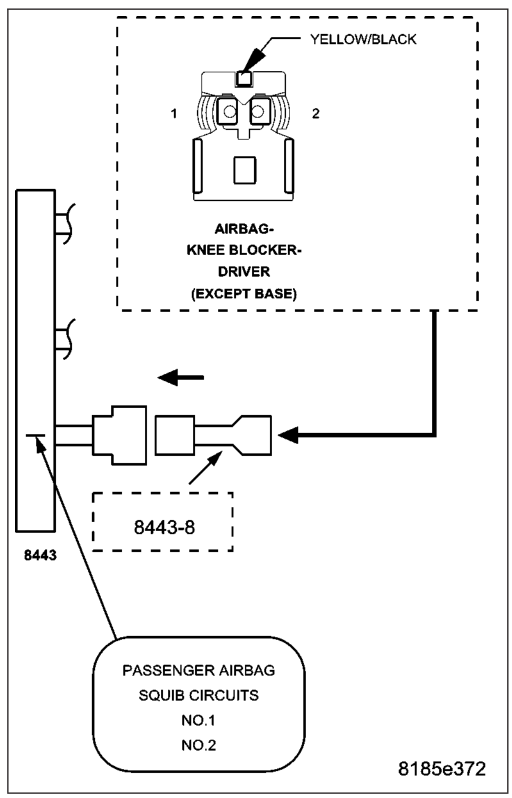
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

Does the scan tool display: B1B12-DRIVER KNEE BOLSTER SQUIB CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Driver Knee Bolster Airbag in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

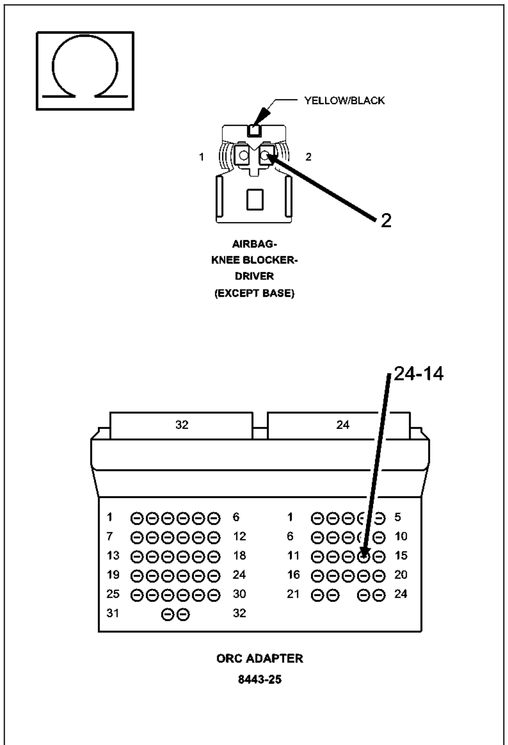
Disconnect the 8443 Load Tool from the Driver Knee Bolster Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R11) Driver Knee Blocker Squib Line 1 circuit between the Driver knee Bolster Airbag connector and the 8443 ORC Adaptor.



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Is the resistance below 1.0 ohm?

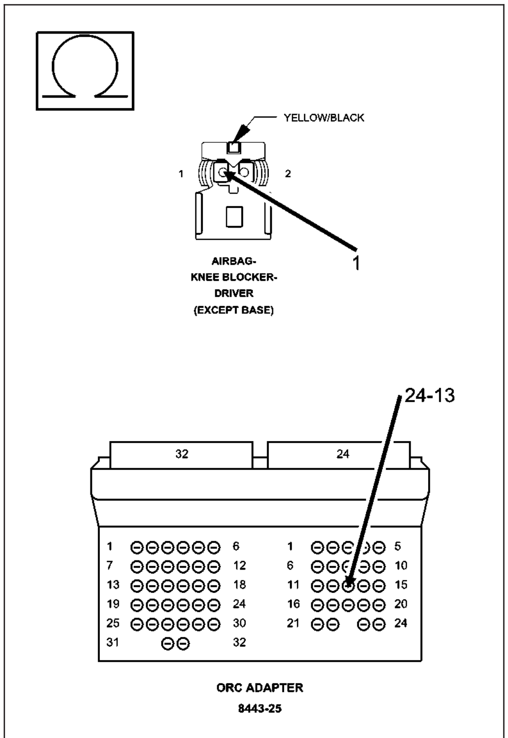
Yes >> Go To 4

No >> Repair the (R11) Driver Knee Blocker Squib Line 1 circuit for an open.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT FOR AN OPEN

Measure the resistance of the (R9) Driver Knee Blocker Squib Line 2 circuit between the Driver knee Bolster Airbag connector and the 8443 ORC Adaptor.



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Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

Replace the ORC in accordance with Service Information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R9) Driver Knee Blocker Squib Line 2 circuit for an open.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

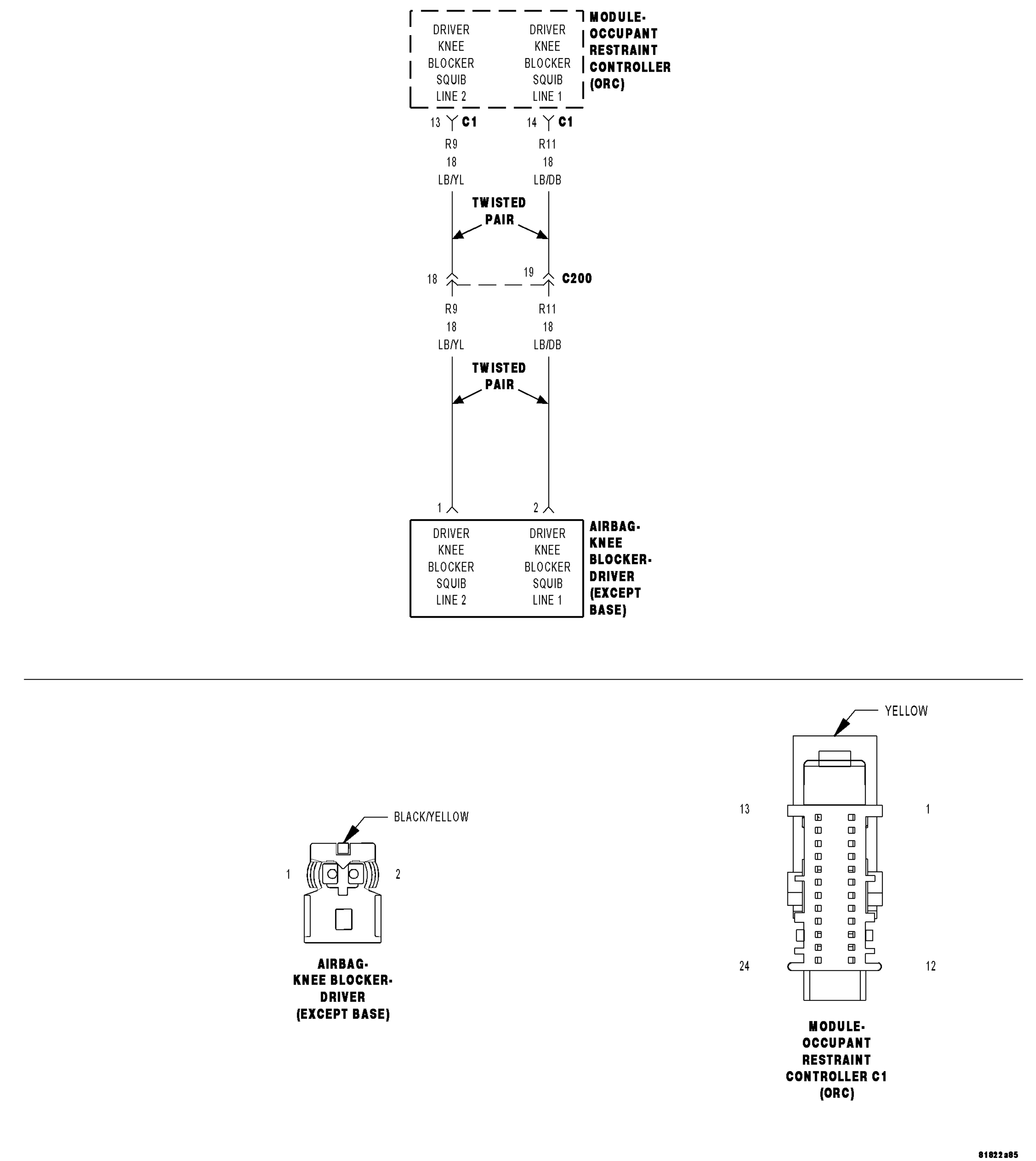
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question/ causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B13-DRIVER KNEE BOLSTER SQUIB CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Knee Bolster Airbag circuits. The ORC will set this DTC if it detects low resistance between the Driver Knee Bolster Airbag circuits.

Possible Causes
(R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT SHORTED TO (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT
DRIVER KNEE BOLSTER AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER KNEE BOLSTER AIRBAG CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Knee Bolster Airbag connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Driver Knee Bolster Airbag connector.

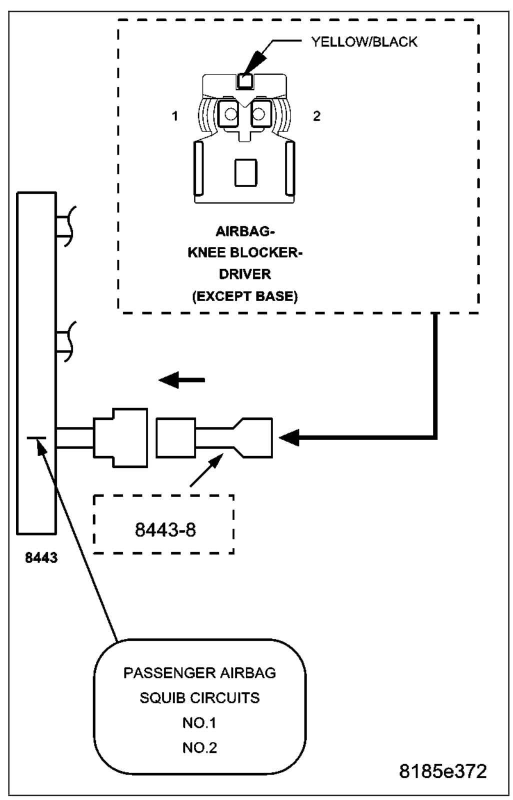
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

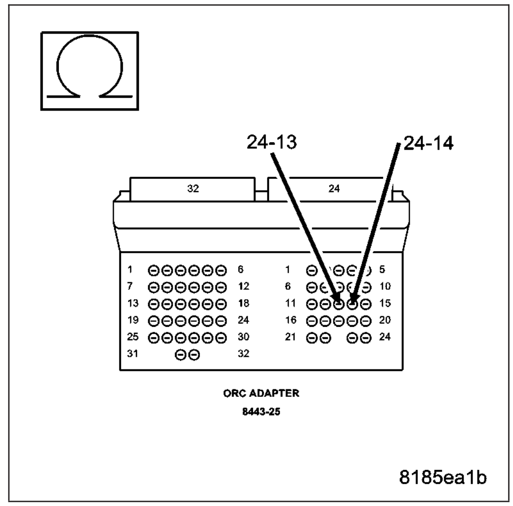
Does the scan tool display: B1B13-DRIVER KNEE BOLSTER SQUIB CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Driver Knee Bolster Airbag in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R11) DRIVER KNEE BLOCKER SQUIB LINE 1 CIRCUIT FOR A SHORT TO (R9) DRIVER KNEE BLOCKER SQUIB LINE 2 CIRCUIT



Disconnect the 8443 Load Tool from the Driver Knee Bolster Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance between the (R11) Driver Knee Blocker Squib Line 1 circuit and the (R9) Driver Knee Blocker Squib Line 2 circuit at the ORC adaptor.

Is the resistance below 10k ohms?

Yes >> Repair the (R11) Driver Knee Blocker Squib Line 1 circuit for a short to the (R9) Driver Knee Blocker Squib Line 2 circuit.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

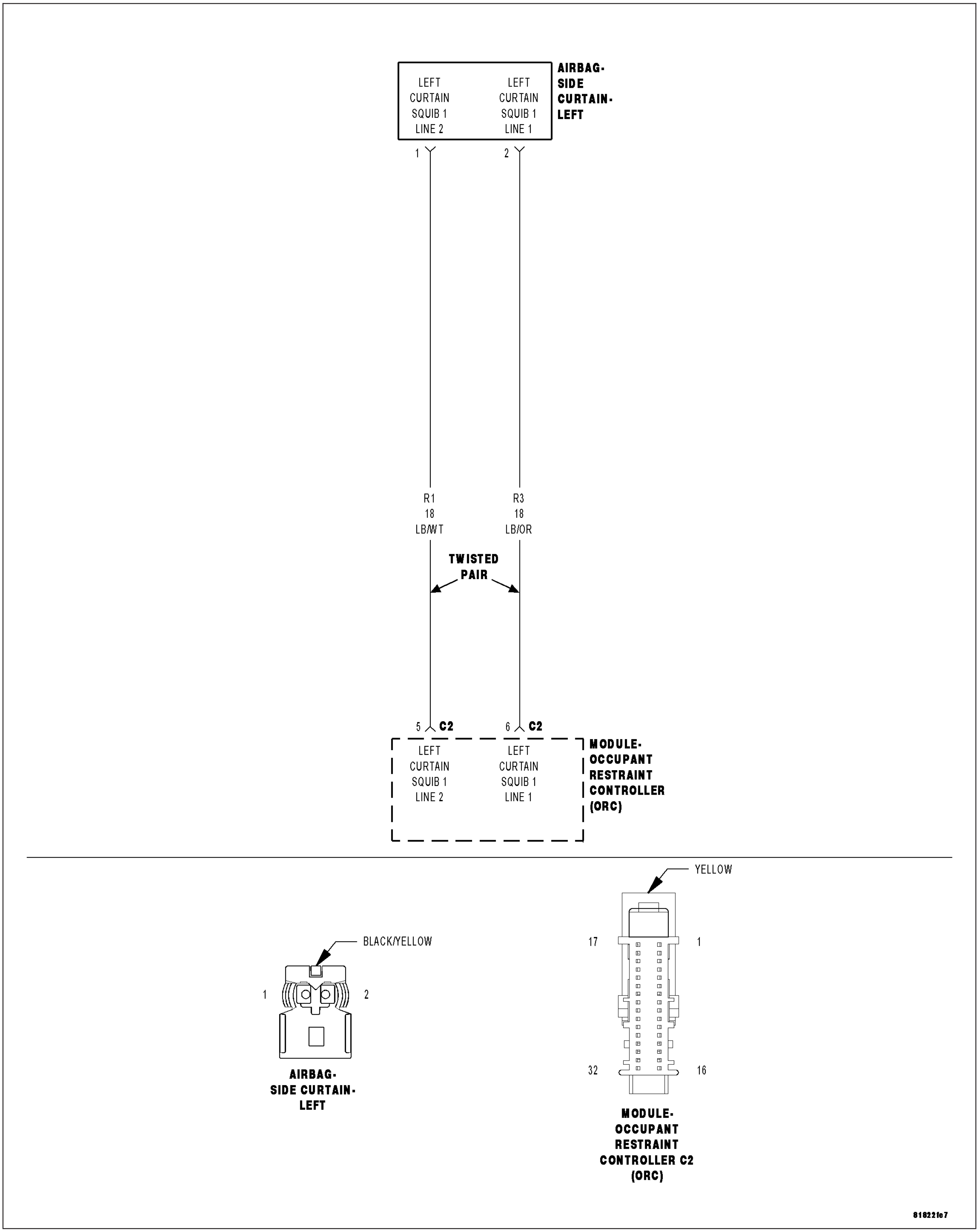
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question/causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B18-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits. The ORC will set this DTC if it detects low resistance of the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO GROUND
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Curtain Airbag connector.

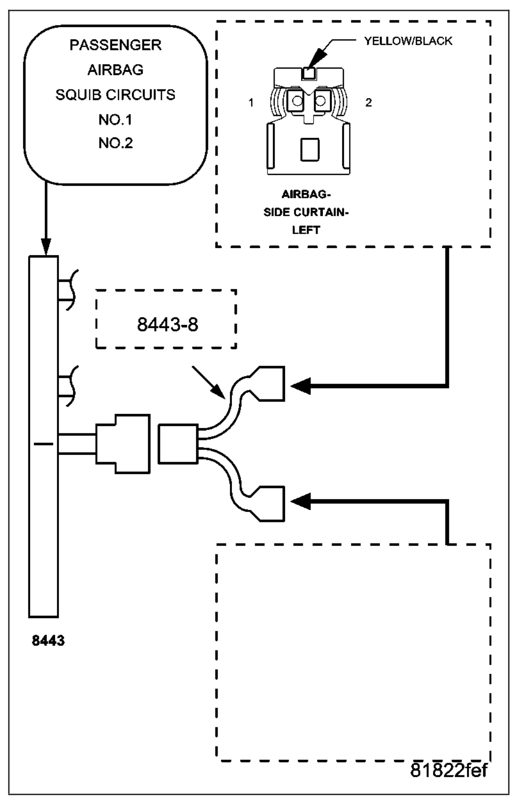
WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Left Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

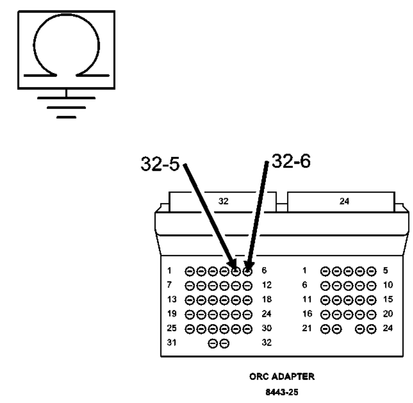


Does the scan tool display: B1B18 LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO GROUND



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WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 circuit between the ORC 8443-25 Adaptor cavity 6 and ground.

Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 circuit between the ORC 8443-25 Adaptor cavity 5 and ground.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Left Curtain Squib 1 circuits with resistance below 10k ohms for a short to ground.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

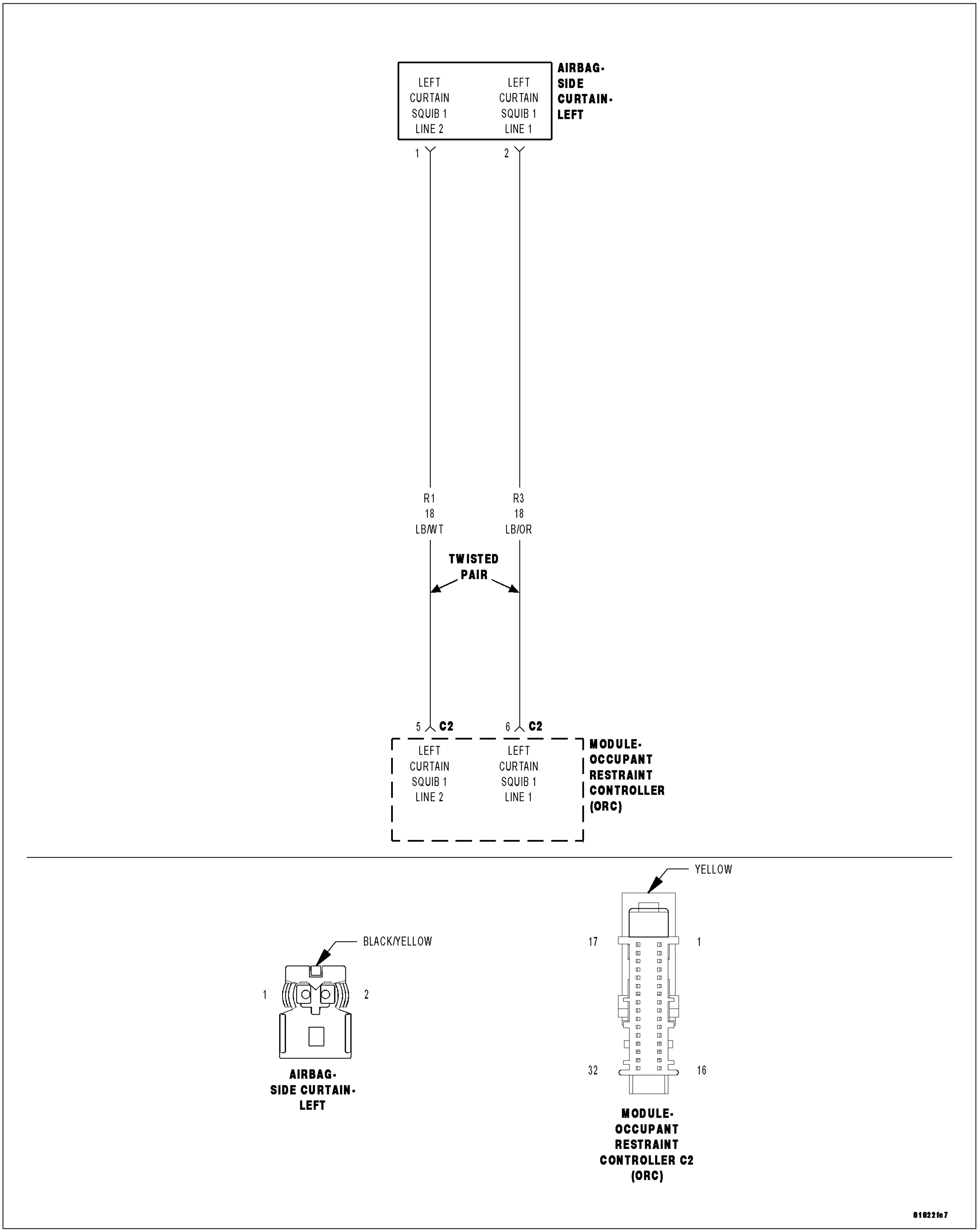
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B19-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Left Curtain Squib 1 circuits. The ORC will set this DTC if it detects voltage on the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO BATTERY
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Curtain Airbag connector.

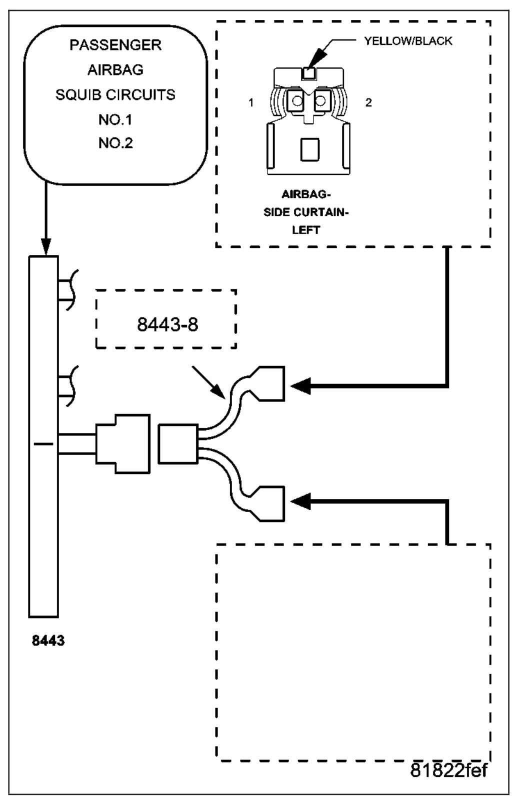
WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Left Side Curtain Airbag connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

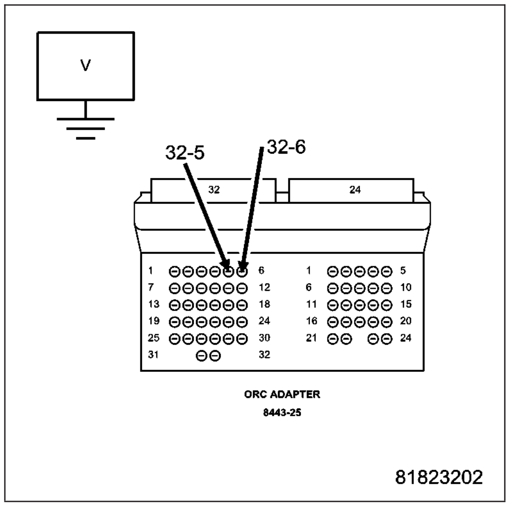


Does the scan tool display: B1B19 LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the voltage of the (R3) Left Curtain Squib 1 Line 1 circuit between the ORC 8443-25 adaptor cavity 6 and ground.

Measure the voltage of the (R1) Left Curtain Squib 1 Line 2 circuit between the ORC 8443-25 adaptor cavity 5 and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Left Curtain Squib 1 circuits with voltage present for a short to battery.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

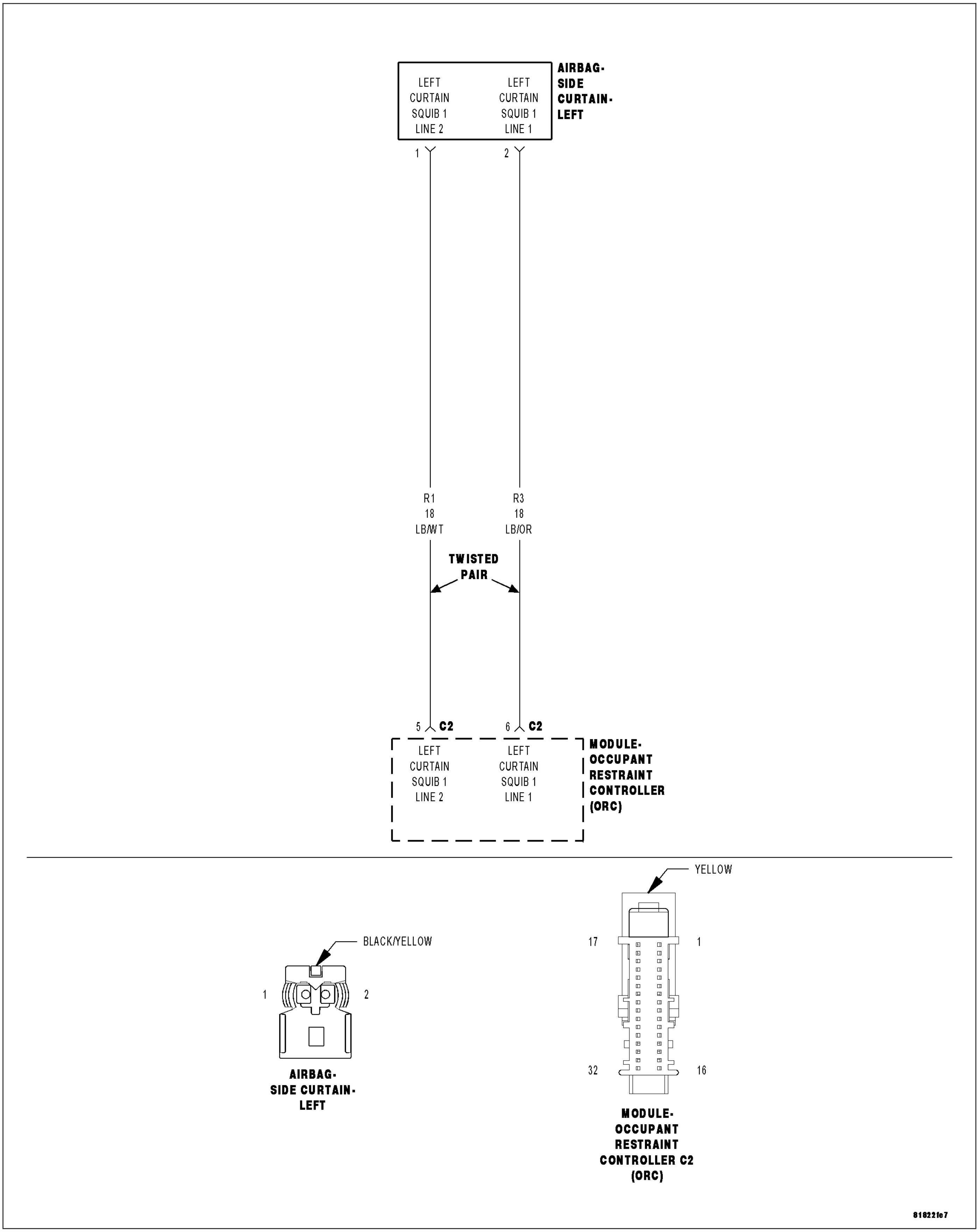
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits. The ORC will set this DTC if it detects an open or high resistance on the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OPEN
(R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Curtain Airbag connector.

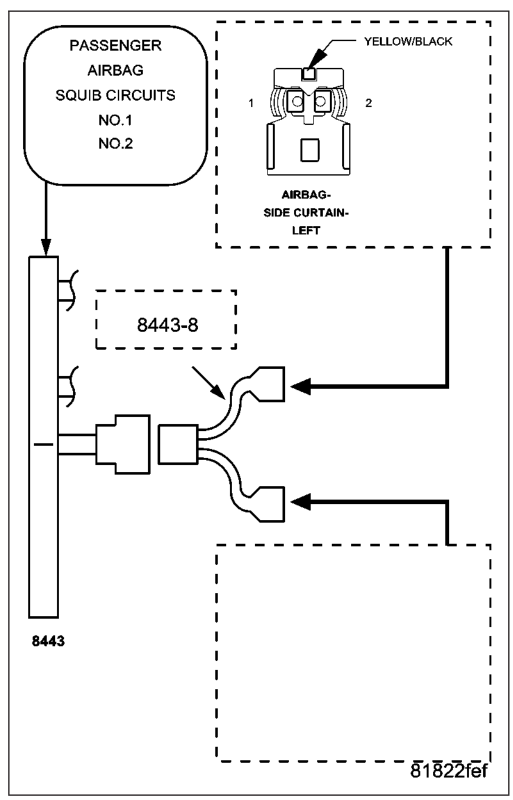
WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Left Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

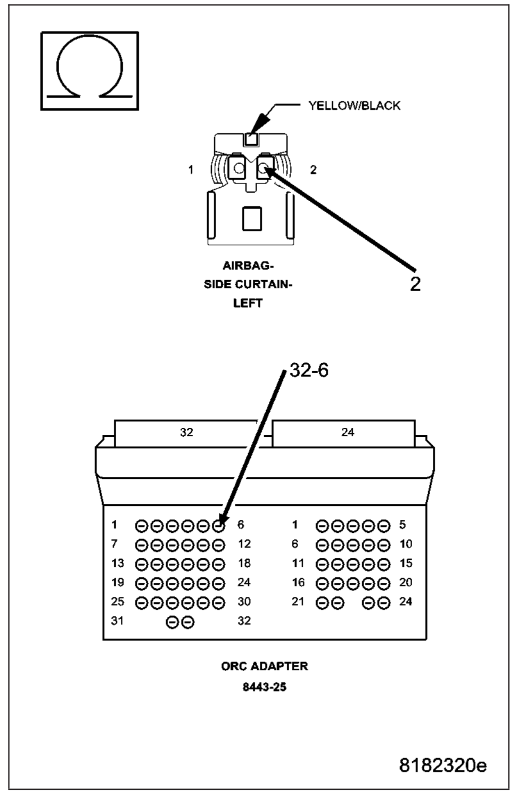


Does the scan tool display: B1B1A LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

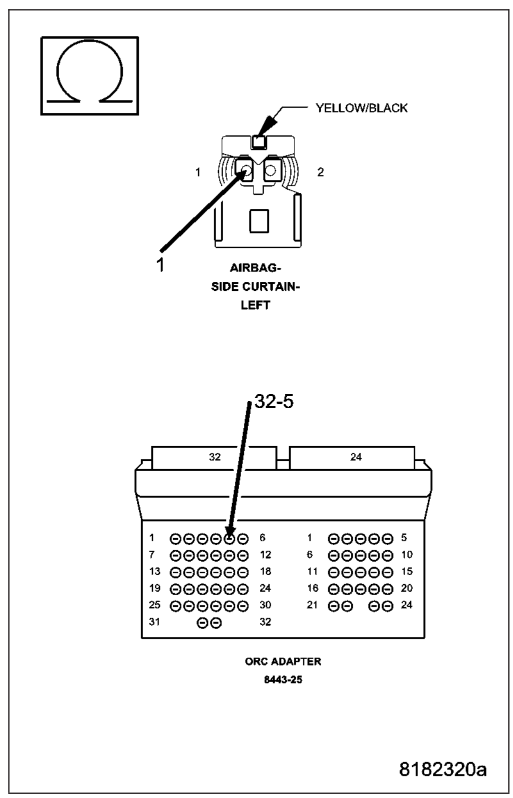
Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 circuit between the Left Side Curtain Airbag connector cavity 2 and the Load Tool ORC 8443-25 Adaptor cavity 32-6.

Is the resistance below 1.0 ohm?

Yes >> Go To 4

No >> Repair the (R3) Left Curtain Squib 1 Line 1 circuit for an open. Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN



Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 circuit between the Left Side Curtain Airbag connector cavity 1 and the Load Tool ORC 8443-25 Adaptor cavity 5.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R1) Left Curtain Squib 1 Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

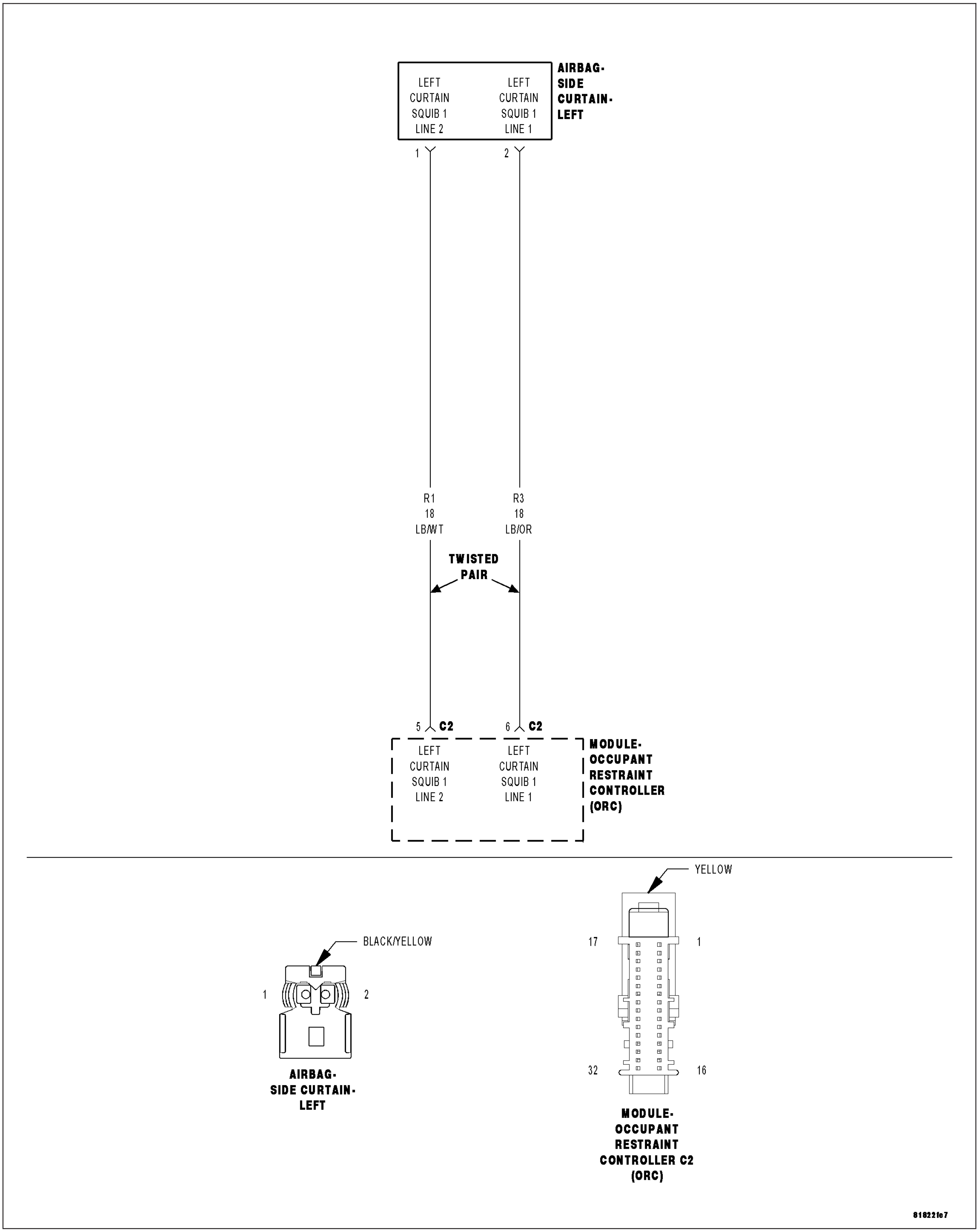
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B1B-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits. The ORC will set this DTC if it detects low resistance between the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT SHORTED TO (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Left Side Curtain Airbag connector.

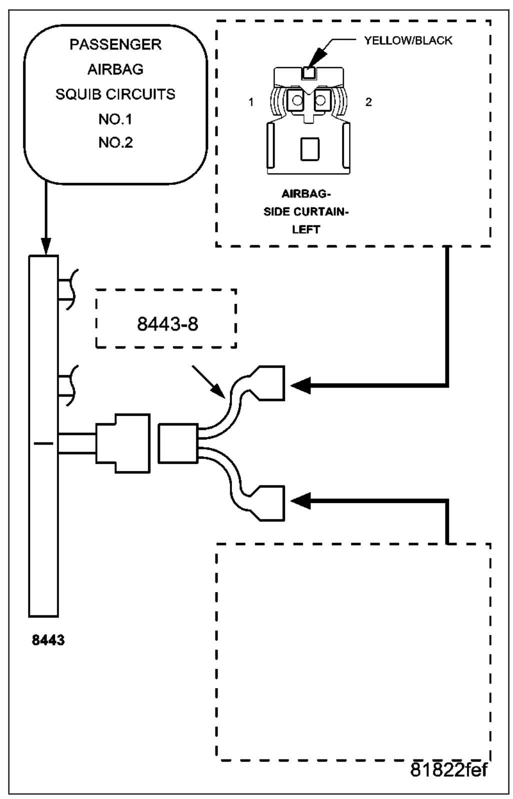
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

Does the scan tool display: B1B1B LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

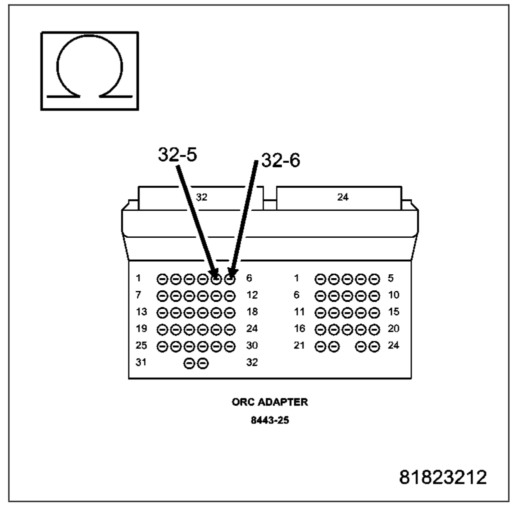
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R3) Left Curtain Squib 1 Line 1 circuit and the (R1) Left Curtain Squib 1 Line 2 circuit at the ORC 8443-25 adaptor cavities 32-5 and 32-6.



Is the resistance below 10k ohms?

Yes >> Repair the (R3) Left Curtain Squib 1 Line 1 circuit for a short to the (R1) Left Curtain Squib 1 Line 2 circuit.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

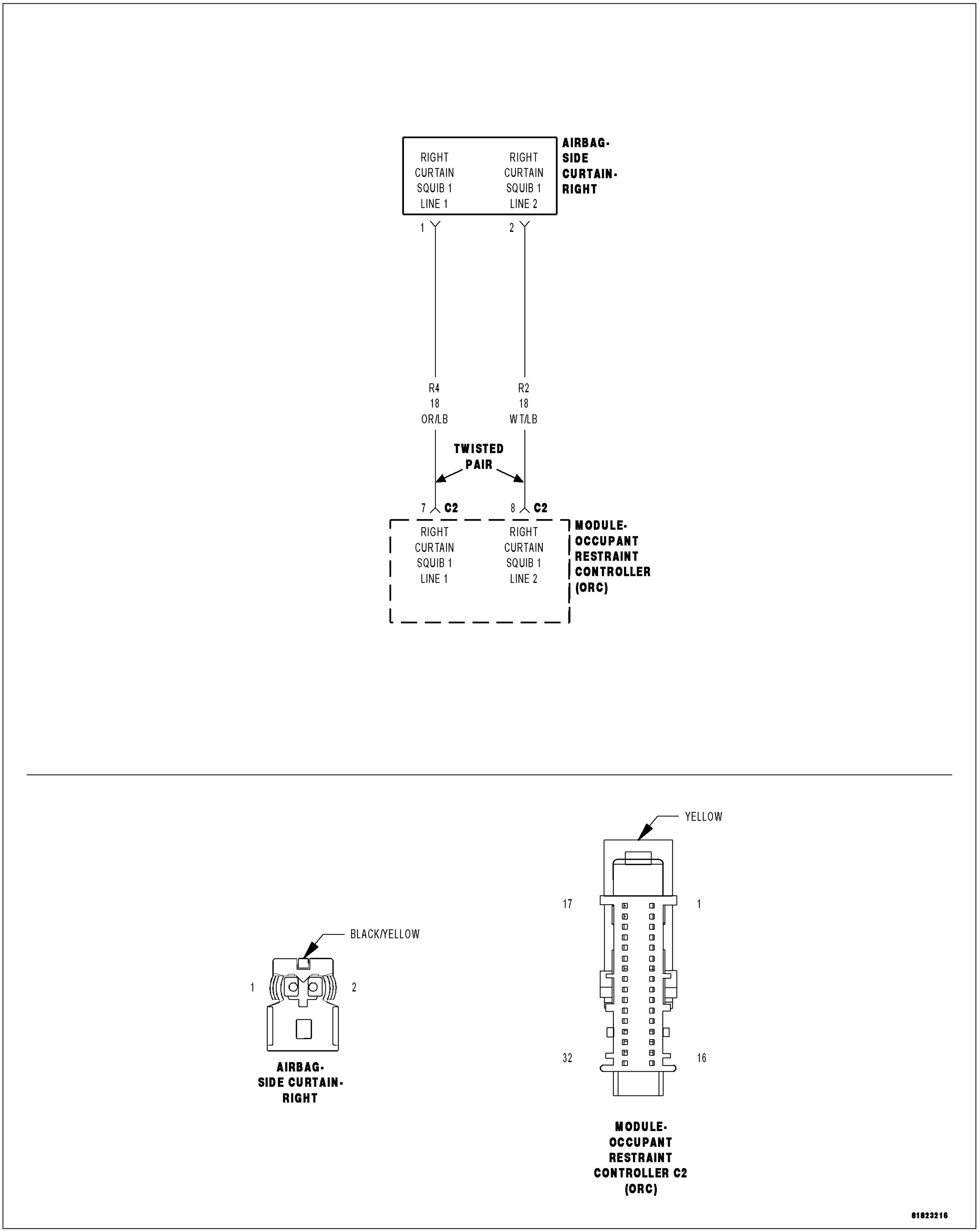
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B20-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits. The ORC will set this DTC if it detects low resistance on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO GROUND
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Curtain Airbag connector.

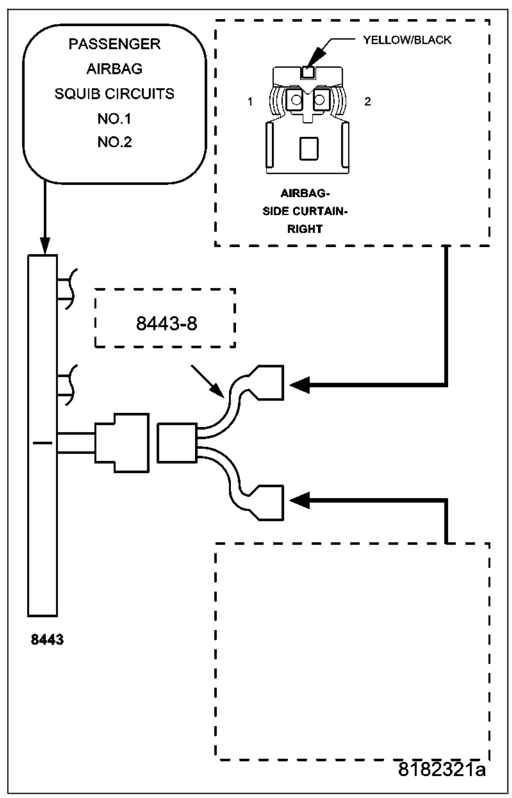
WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Right Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

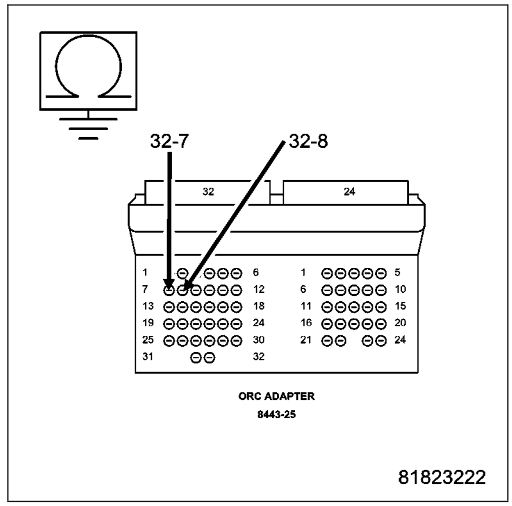


Does the scan tool display: B1B20 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Right Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC connectors.

Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 circuit between ORC 8443-25 adaptor cavity 8 and ground.

Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 circuit between ORC 8443-25 adaptor cavity 7 and ground.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Right Curtain Squib 1 circuits with resistance below 10k ohms for a short to ground.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

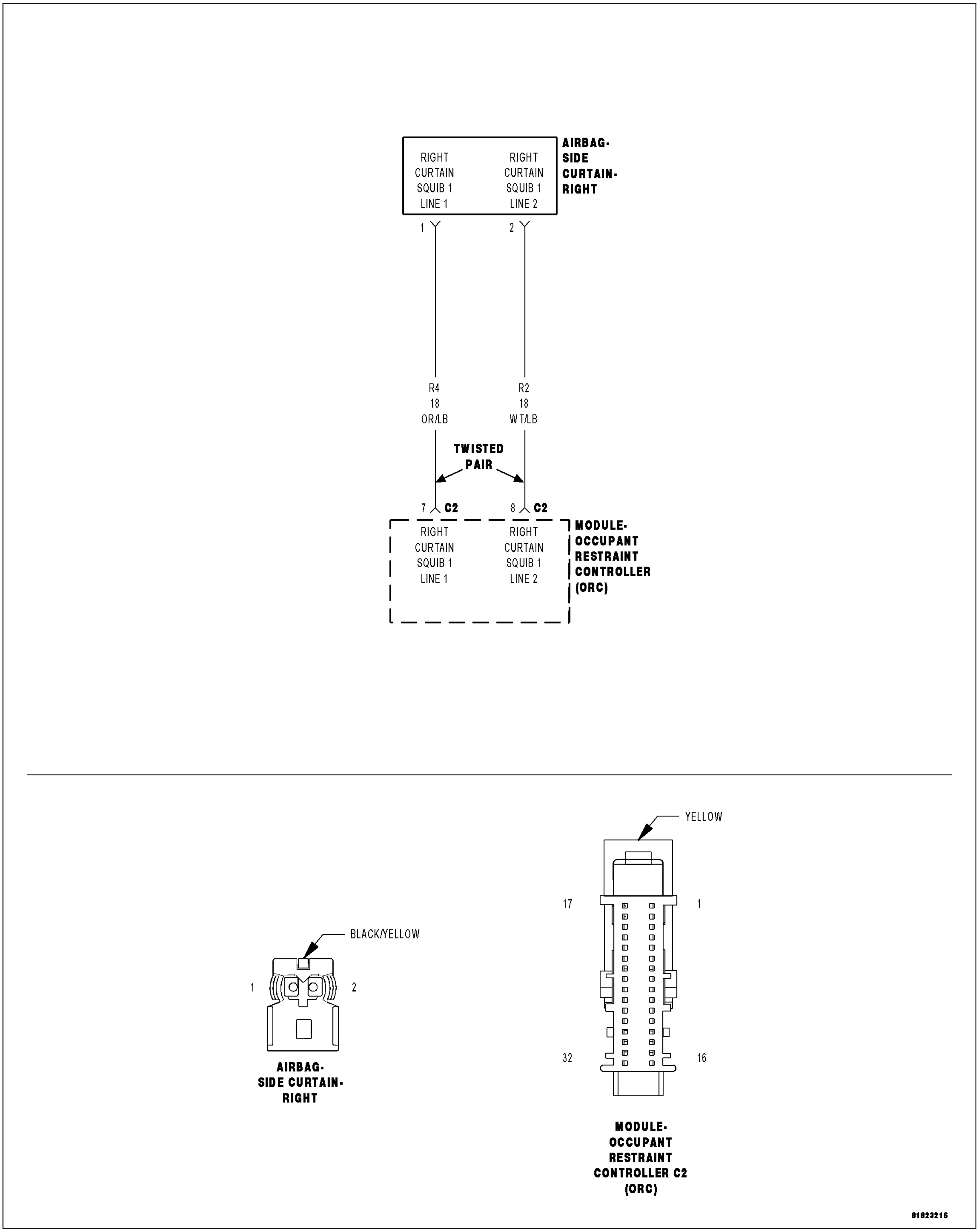
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B21-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Right Curtain Squib 1 circuits. The ORC will set this DTC if it detects voltage on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO BATTERY
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Right Side Curtain Airbag connector.

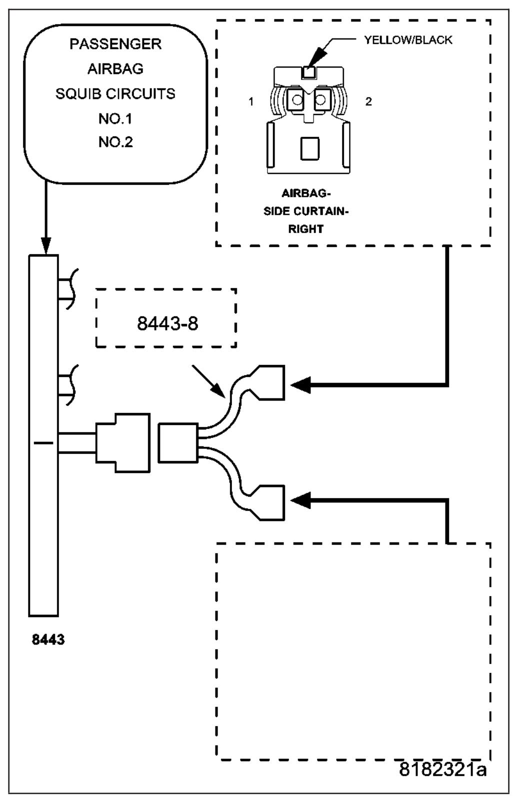
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

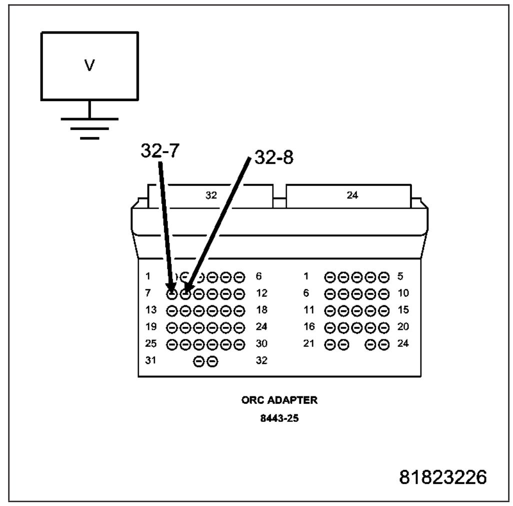
Does the scan tool display: B1B21 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Right Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the voltage of the (R4) Right Curtain Squib 1 Line 1 circuit between the ORC 8443-25 Adaptor cavity 7 and ground.

Measure the voltage of the (R2) Right Curtain Squib 1 Line 2 circuit between the ORC 8443-25 Adaptor cavity 8 and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Right Curtain Squib 1 circuits with voltage present for a short to battery.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

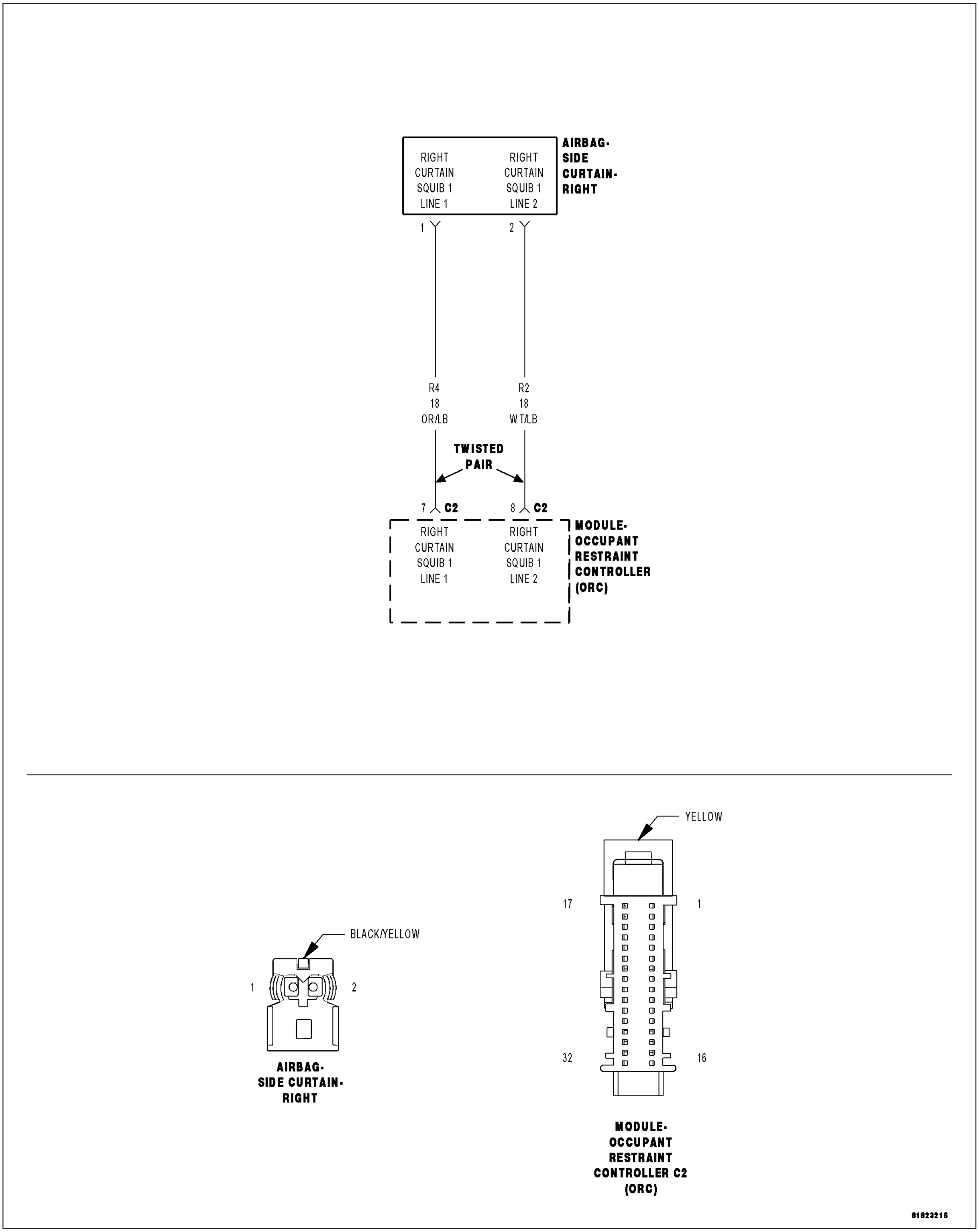
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits. The ORC will set this DTC if it detects an open or high resistance on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OPEN
(R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Curtain Airbag connector.

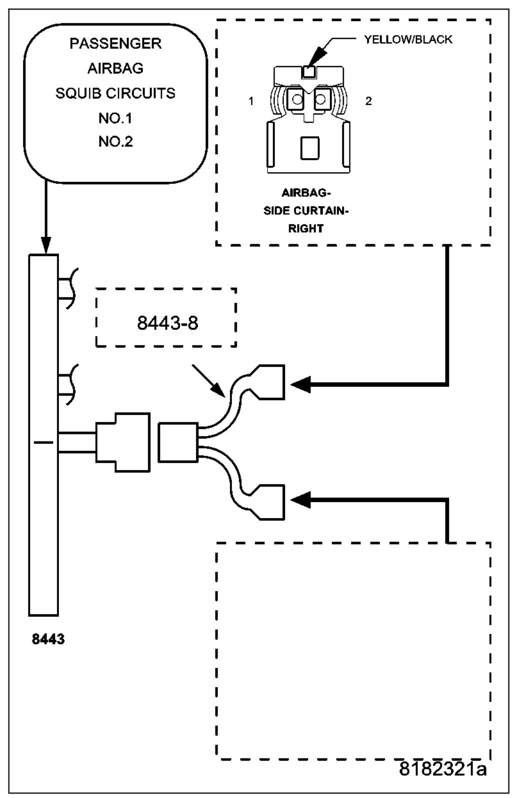
WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Right Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

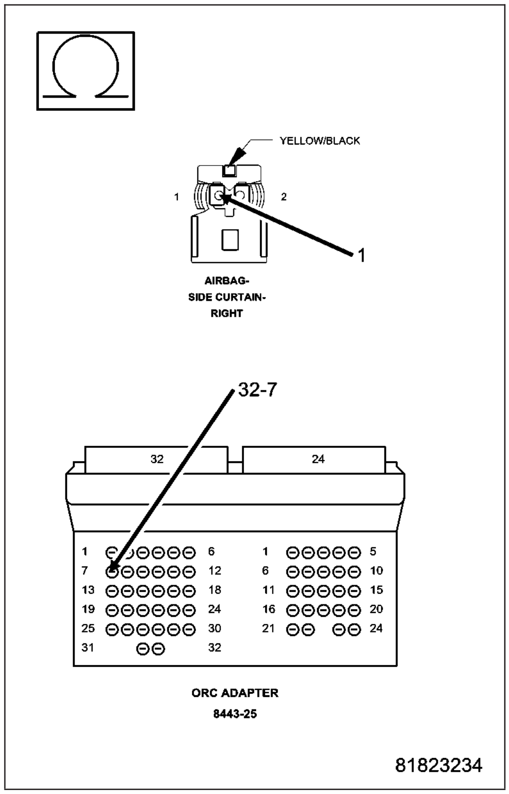


Does the scan tool display: B1B22 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Right Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

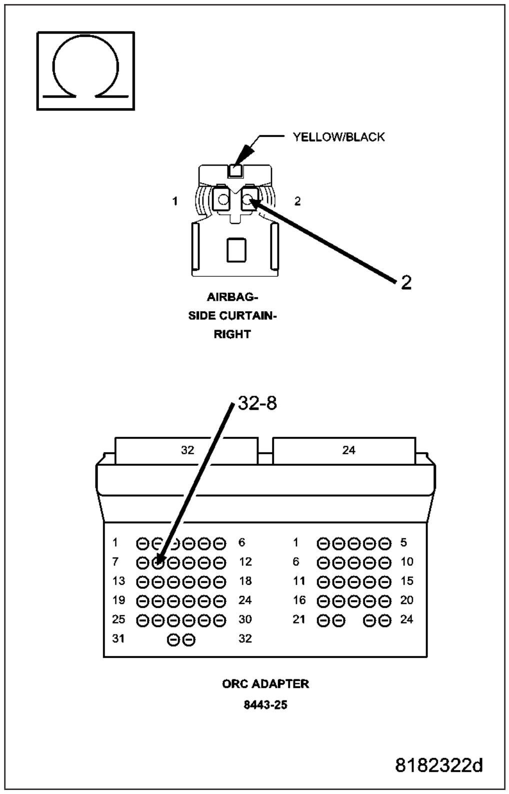
Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 circuit between the Right Side Curtain Airbag connector cavity 1 and the 8443 ORC 8443-25 Adaptor cavity 32-7.

Is the resistance below 1.0 ohm?

Yes >> Go To 4

No >> Repair the (R4) Right Curtain Squib 1 Line 1 circuit for an open. Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN



Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 circuit between the Right Side Curtain Airbag connector cavity 2 and the ORC 8443-25 Adaptor cavity 8.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R2) Right Curtain Squib 1 Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

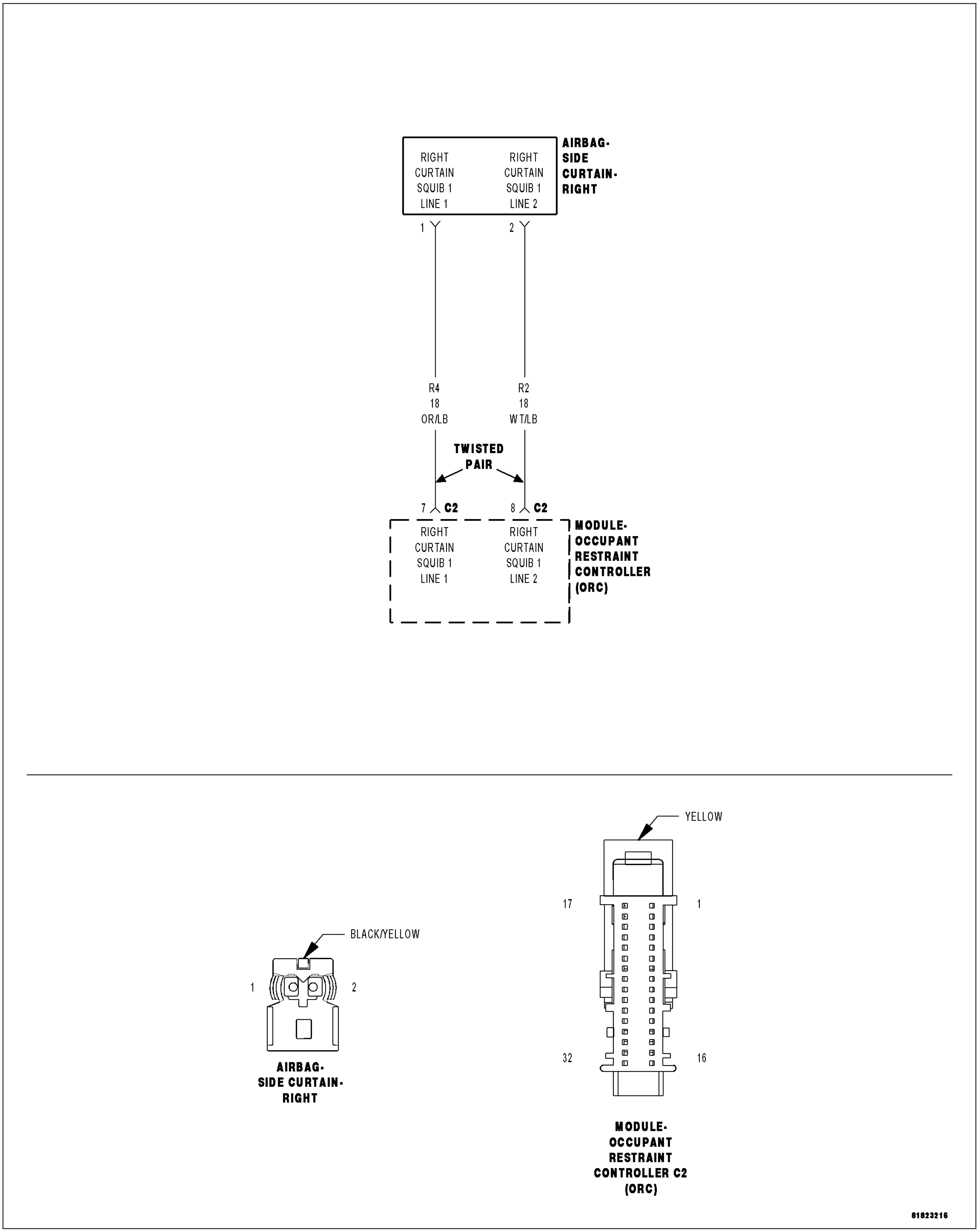
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits. The ORC will set this DTC if it detects low resistance between the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT SHORTED TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Curtain Airbag connector.

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Right Side Curtain Airbag connector.

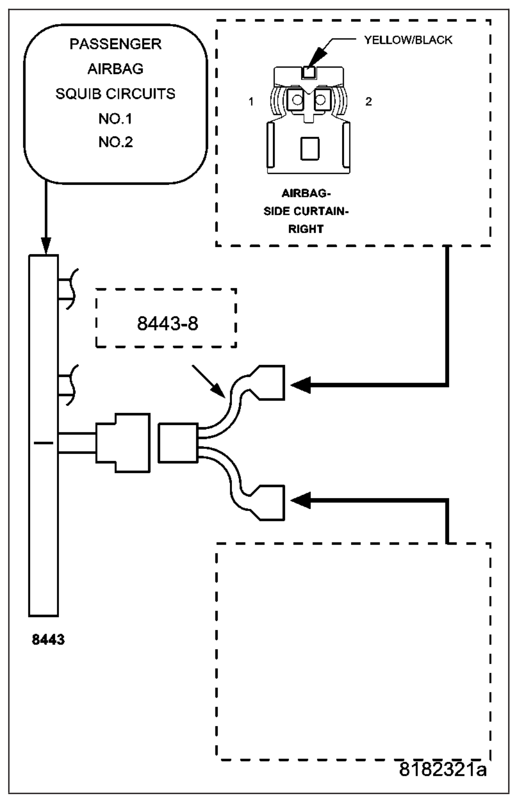
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

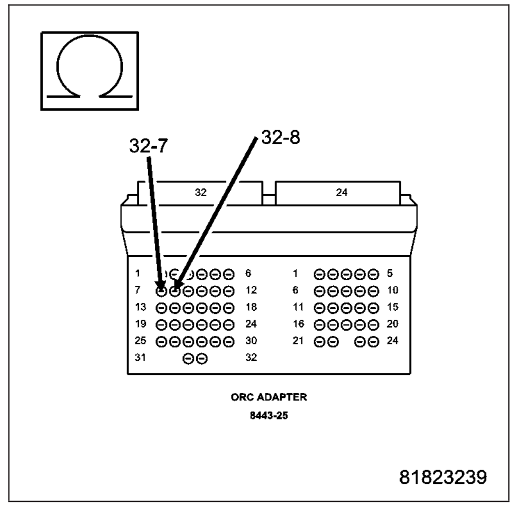
Does the scan tool display: B1B23 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER?

Yes >> Go to 3

No >> Replace the Right Side Curtain Airbag in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the resistance between the (R4) Right Curtain Squib 1 Line 1 circuit and the (R2) Right Curtain Squib 1 Line 2 circuit at the ORC 8443-25 Adaptor cavity 32-7 and 32-8.

Is the resistance below 10k ohms?

Yes >> Repair the (R4) Right Curtain Squib 1 Line 1 circuit for a short to the (R2) Right Curtain Squib 1 Line 2 circuit.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

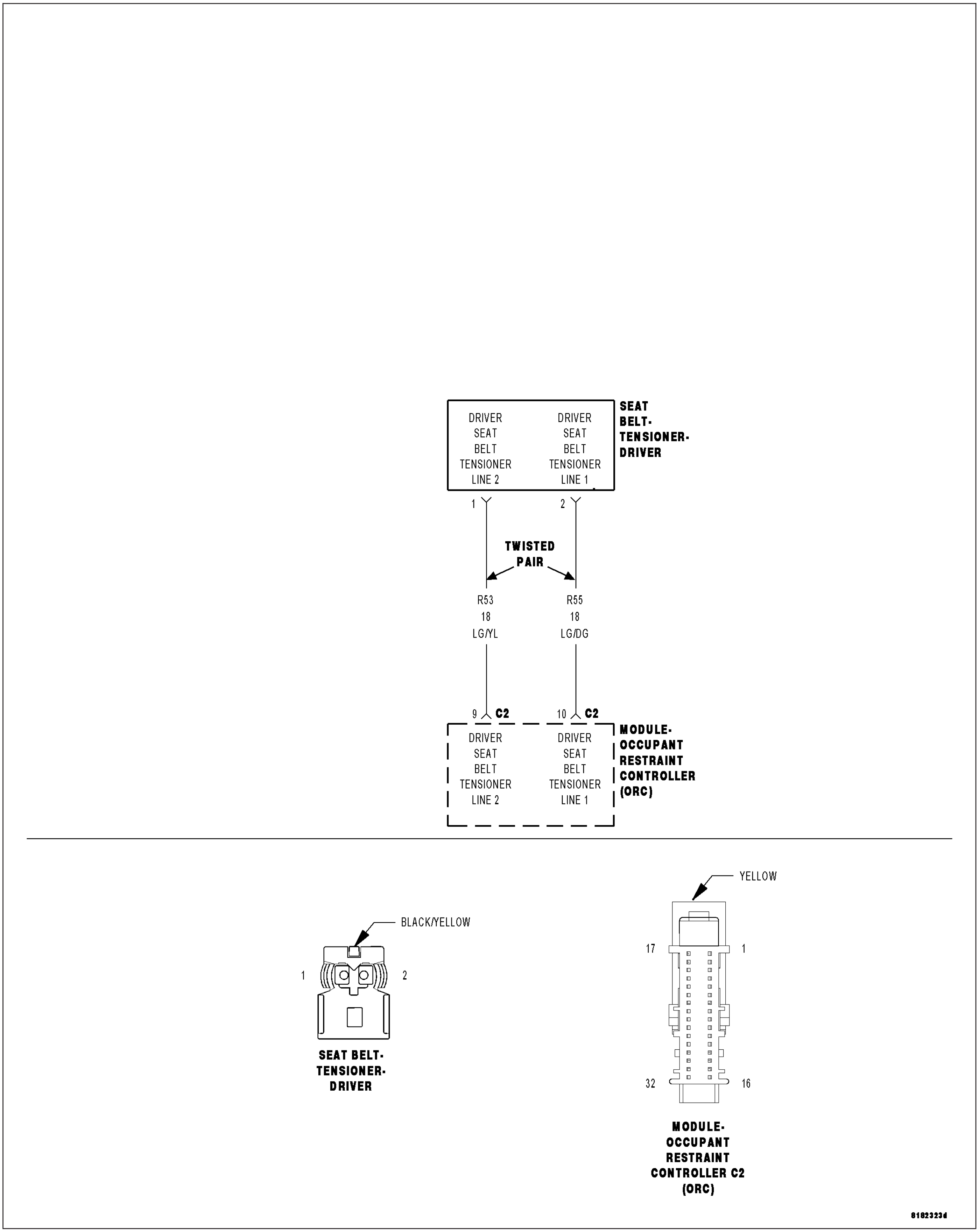
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits. The ORC will set this DTC if it detects low resistance on the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO GROUND
DRIVER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

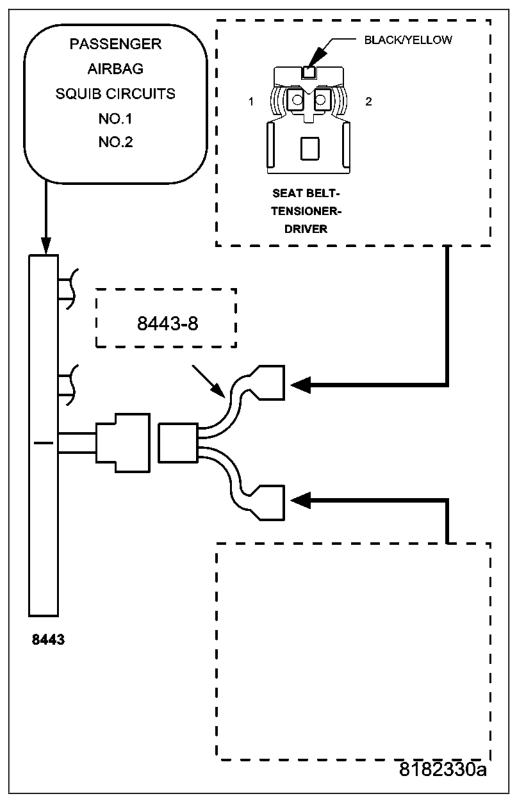
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

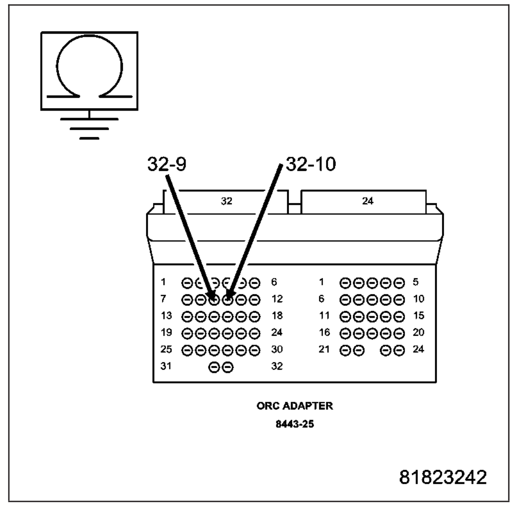
Does the scan tool display: B1B28 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 circuit between ground and the ORC adaptor.

Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 circuit between ground and the ORC adaptor.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Driver Seat Belt Tensioner circuits with resistance below 10k ohms for a short to ground.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

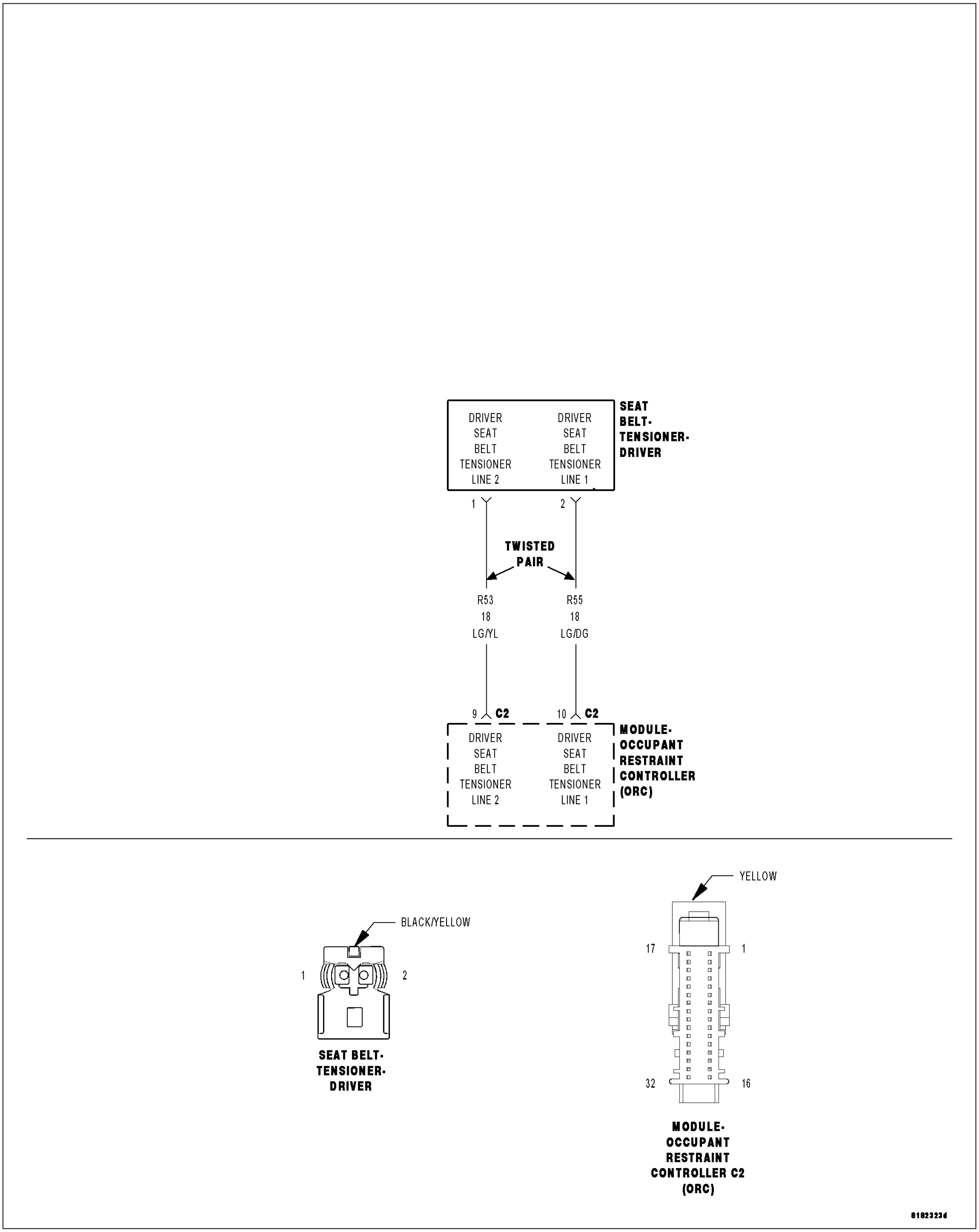
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B29-1ST ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Driver Seat Belt Tensioner circuits. The ORC will set this DTC if it detects voltage on the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO BATTERY
DRIVER SEAT BELT PRETENSIONER
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

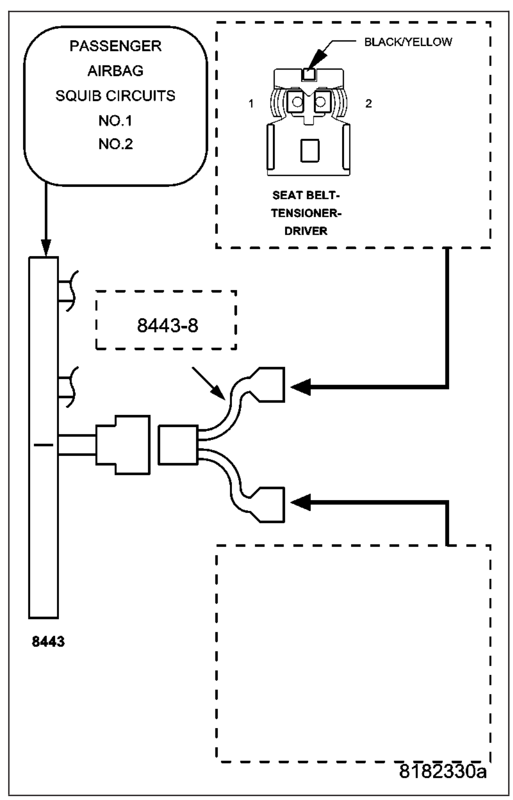
Disconnect the Driver Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and 8443-8 Jumper to the Driver Seat Belt Pretensioner connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

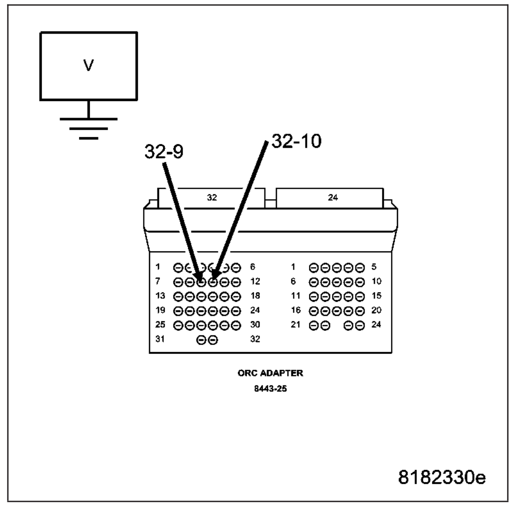


Does the scan tool display: B1B29 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC 8443-25 Adaptor to the ORC connectors.

Measure the voltage of the (R55) Driver Seat Belt Tensioner Line 1 circuit between the ORC 8443-25 Adaptor cavity 32-10 and ground.

Measure the voltage of the (R53) Driver Seat Belt Tensioner Line 2 circuit between the ORC 8443-25 Adaptor cavity 32-9 and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Driver Seat Belt Tensioner circuits with voltage present for a short to battery.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

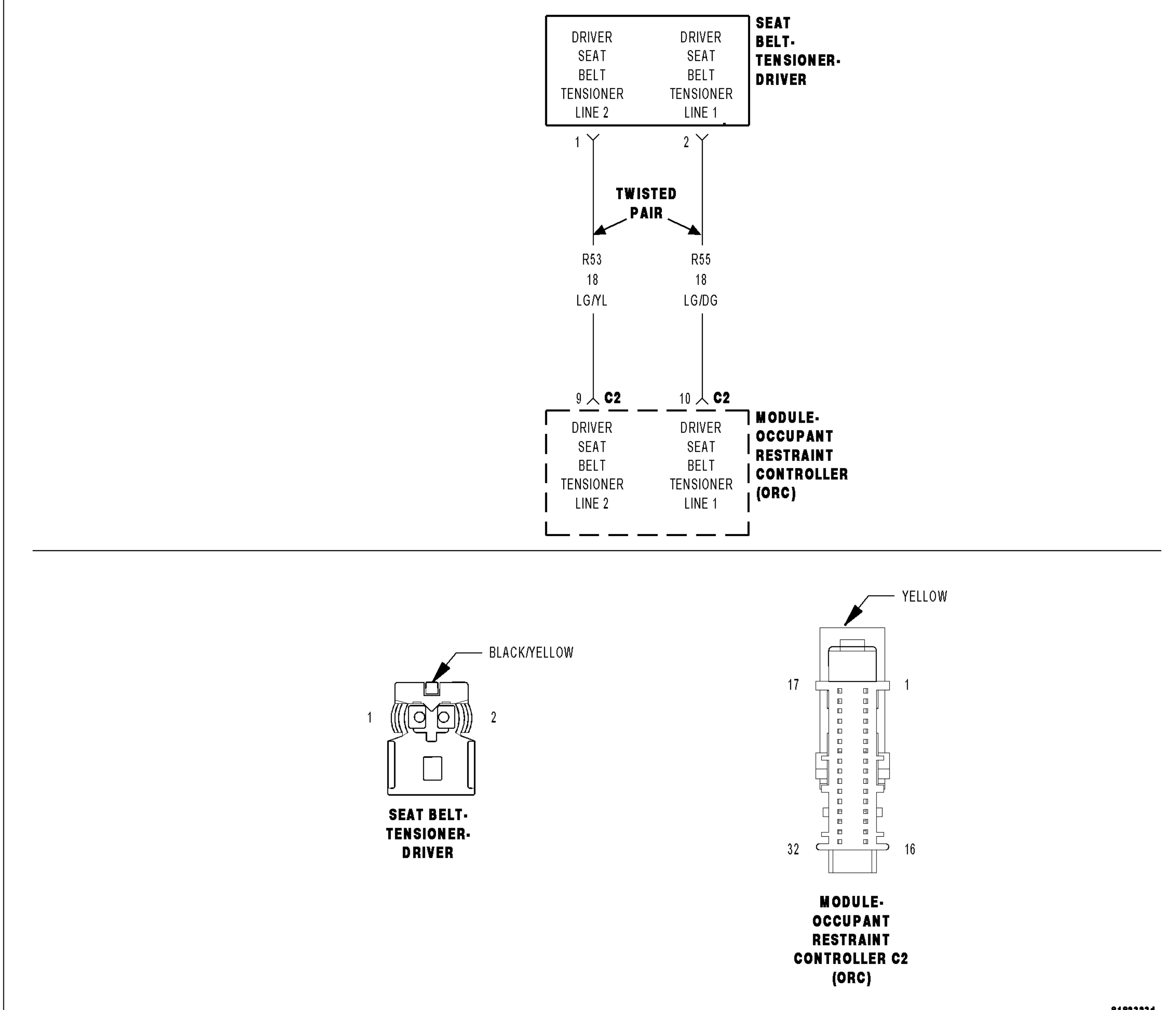
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits. The ORC will set this DTC if it detects an open or high resistance on the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN
DRIVER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

SELECT ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN DRIVER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

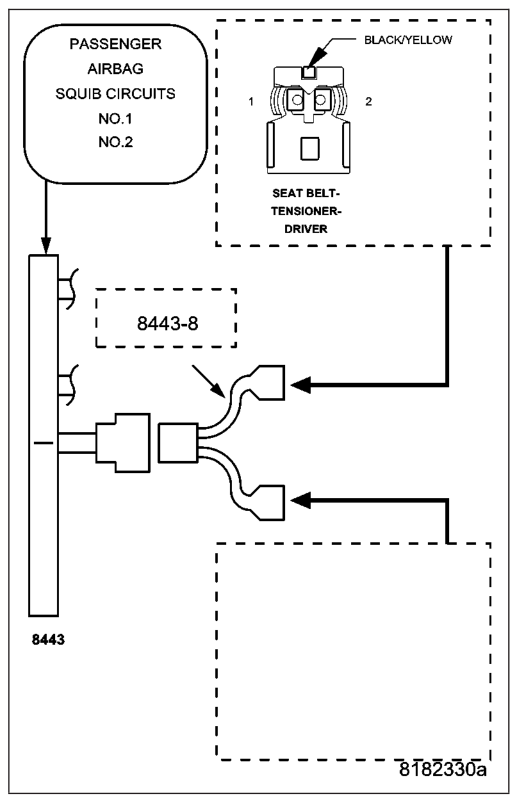
Disconnect the Driver Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

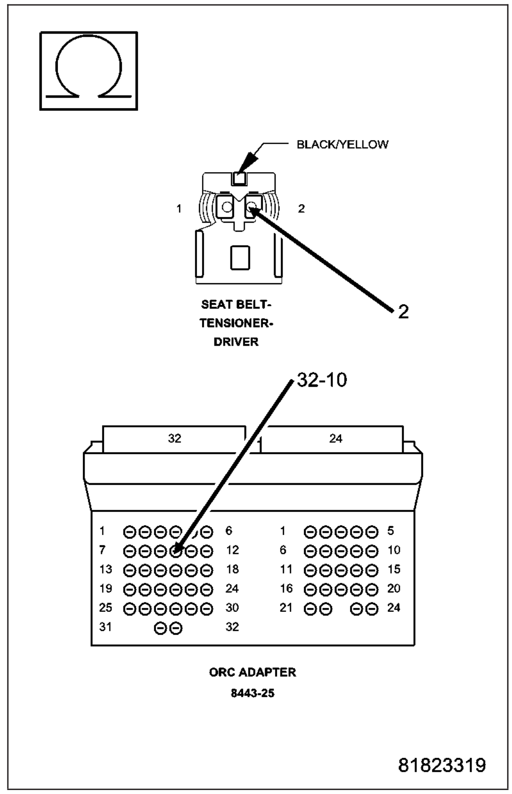


Does the scan tool display: B1B2A 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 circuit between the Driver Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

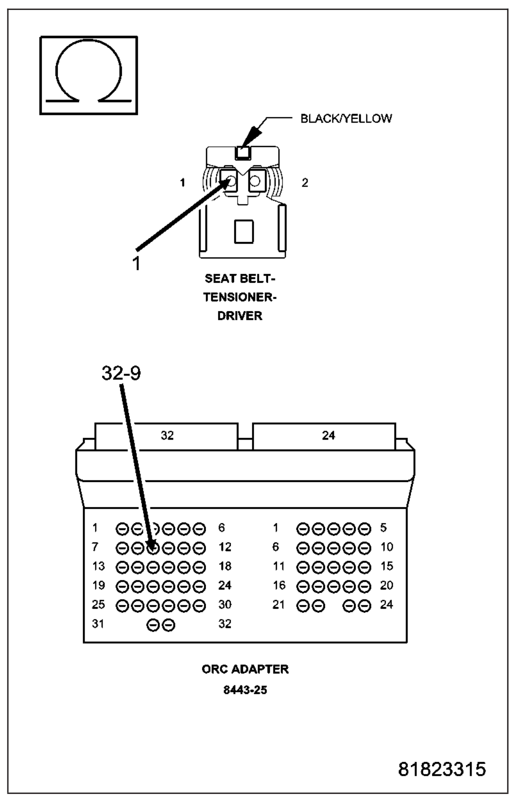
Is the resistance below 1.0 ohm?

Yes >> Go To 4

No >> Repair the (R55) Driver Seat Belt Tensioner Line 1 circuit for and open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR AN OPEN



Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 circuit between the Driver Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R53) Driver Seat Belt Tensioner Line 2 circuit for and open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

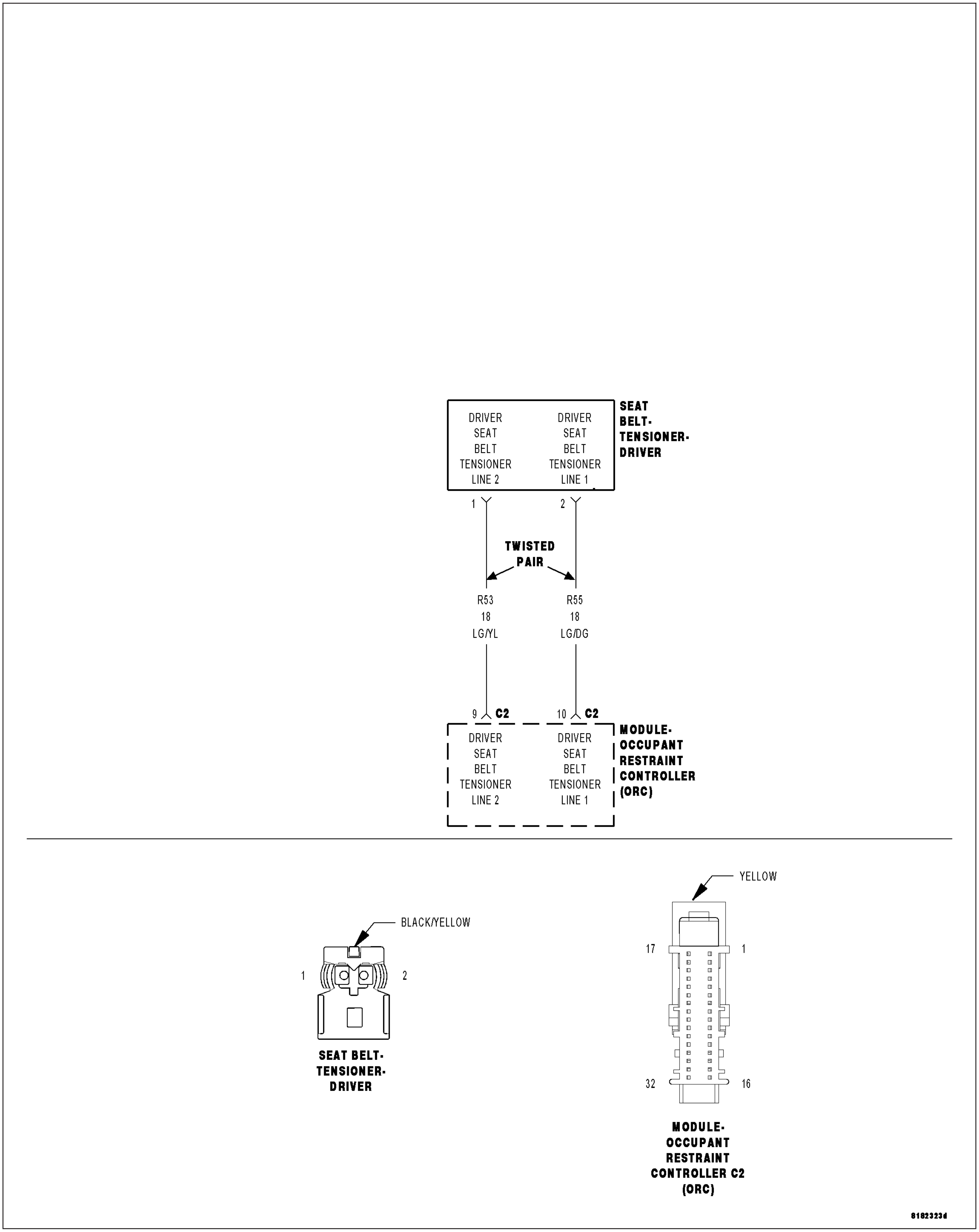
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits. The ORC will set this DTC if it detects low resistance between the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT SHORTED TO (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT
DRIVER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. SELECT ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Seatbelt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

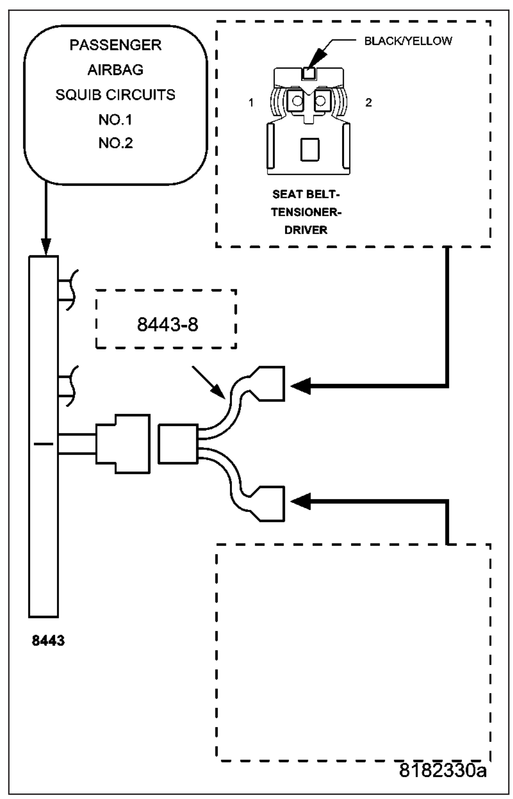
WARNING: To avoid personal injury or death, turn the ignition on then reconnect the battery.

With the scan tool, read the active ORC DTCs.

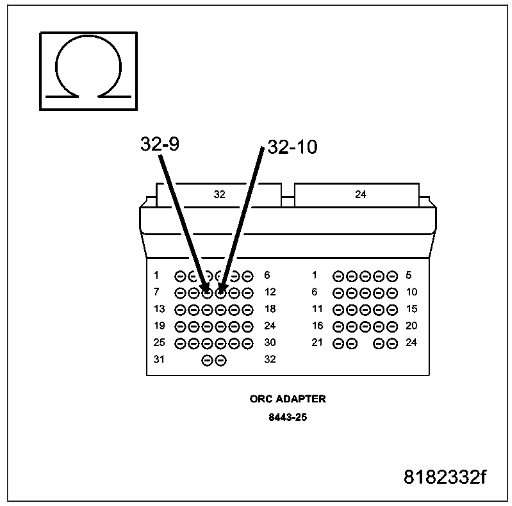
Does the scan tool display: B1B2B 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR A SHORT TO (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance between the (R55) Driver Seat Belt Tensioner Line 1 circuit and the (R53) Driver Seat Belt Tensioner Line 2 circuit at the ORC adaptor.

Is the resistance below 10k ohms?

Yes >> Repair the (R55) Driver Seat Belt Tensioner Line 1 circuit for a short to the (R53) Driver Seat Belt Tensioner Line 2 circuit.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

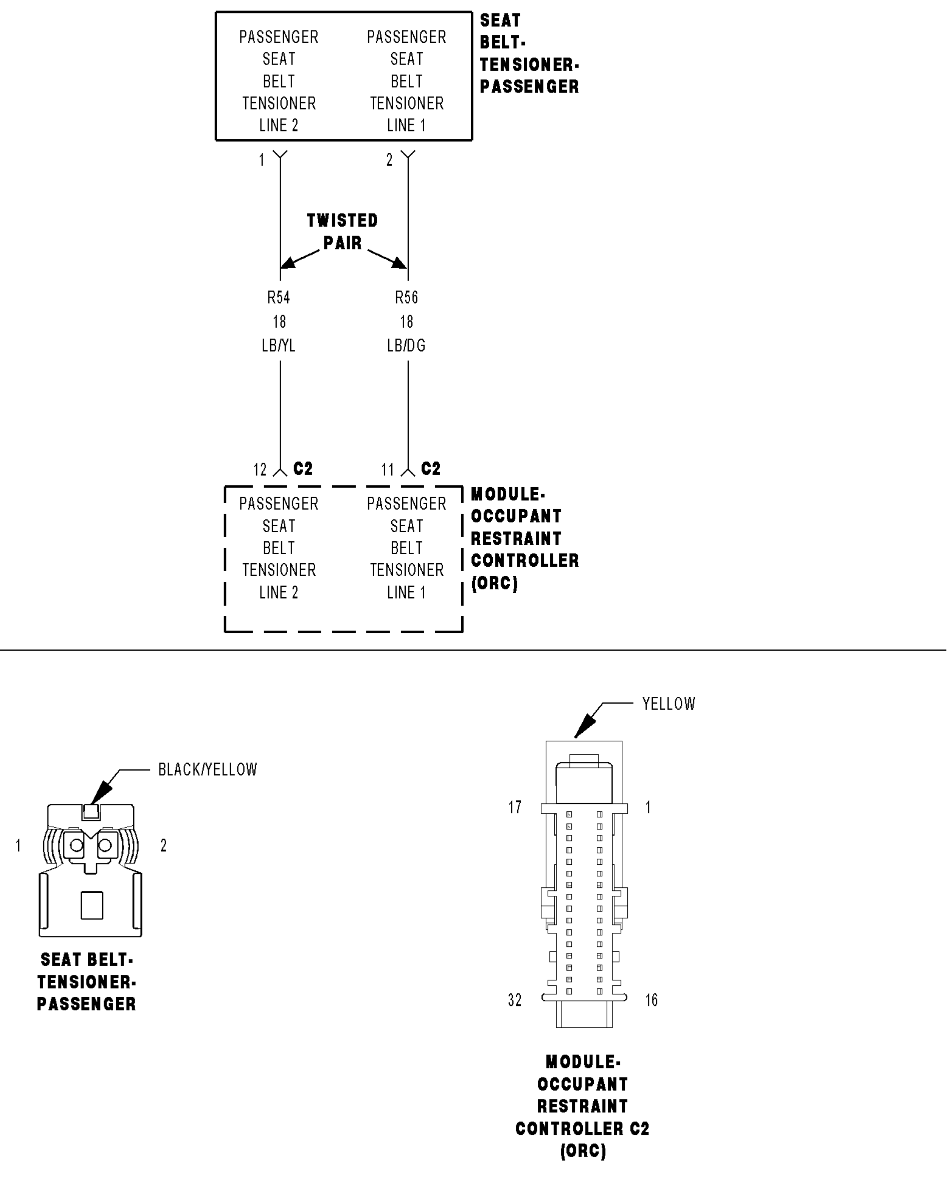
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits. The ORC will set this DTC if it detects low resistance on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO GROUND
PASSENGER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

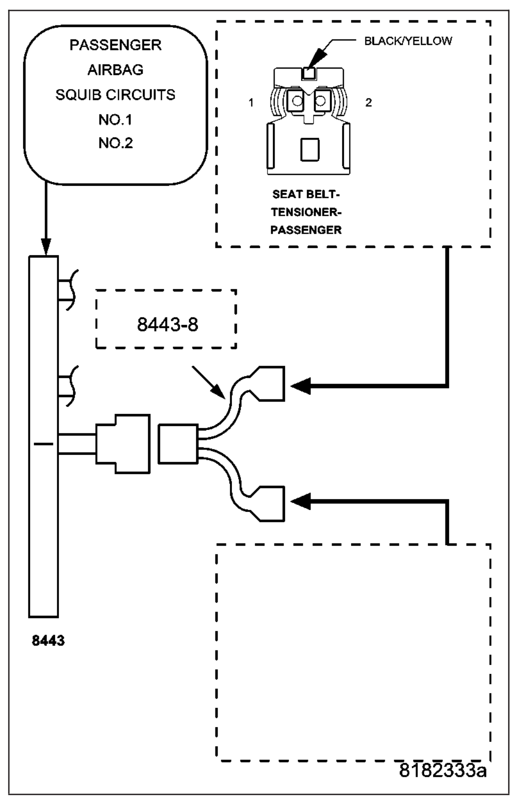
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

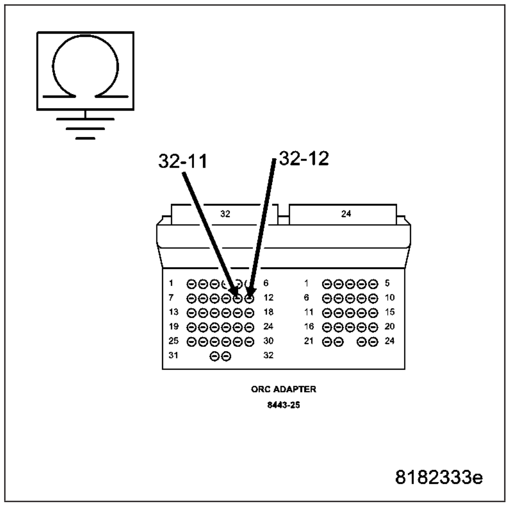
Does the scan tool display: B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between ground and the ORD adaptor.

Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between ground and the ORC adaptor.

Is the resistance below 10k ohms on either circuit?

Yes >> Repair the Passenger Seat Belt Tensioner circuits with resistance below 10k ohms for a short to ground.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

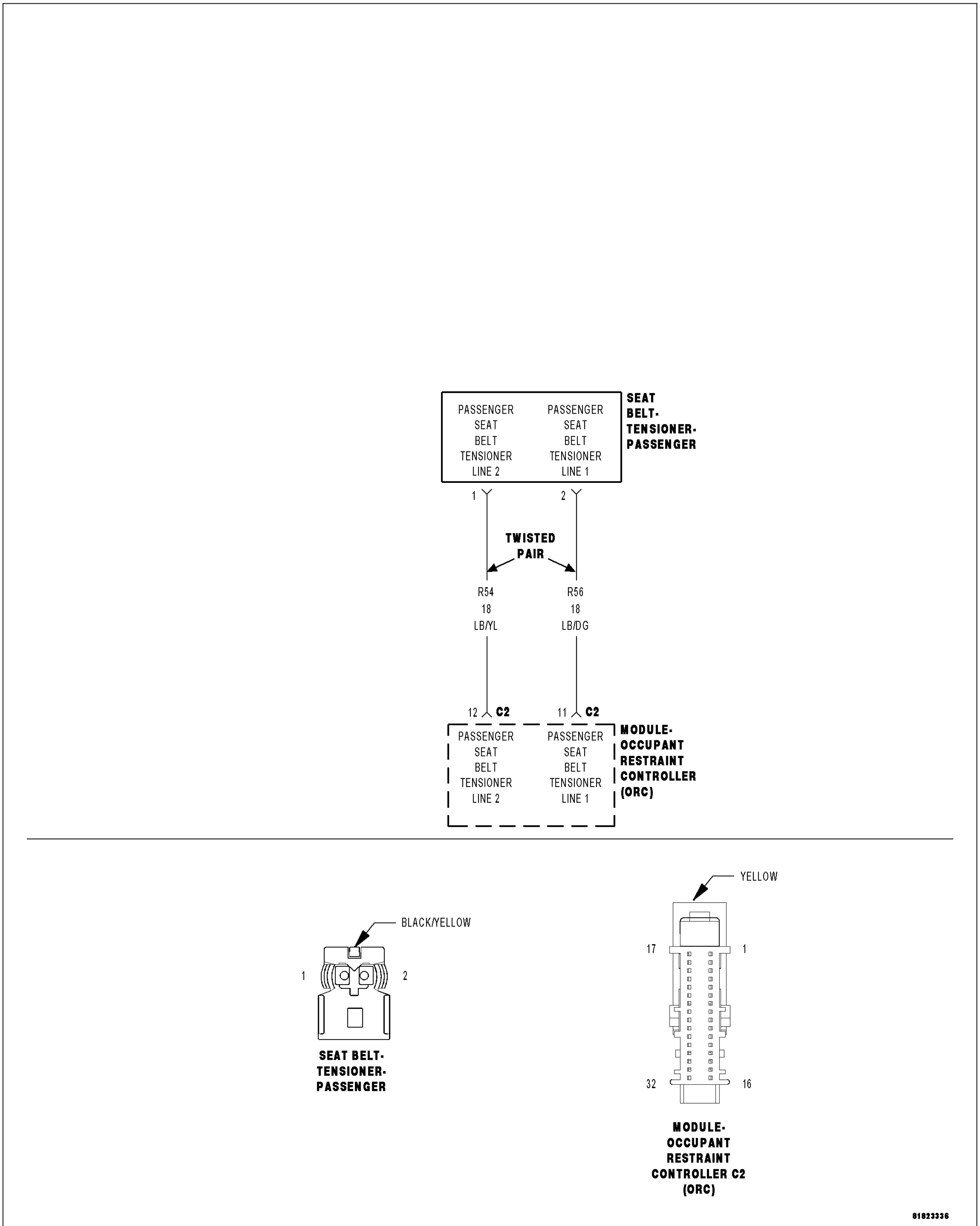
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the voltage on the Passenger Seat Belt Tensioner circuits. The ORC will set this DTC if it detects voltage on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO BATTERY
PASSENGER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

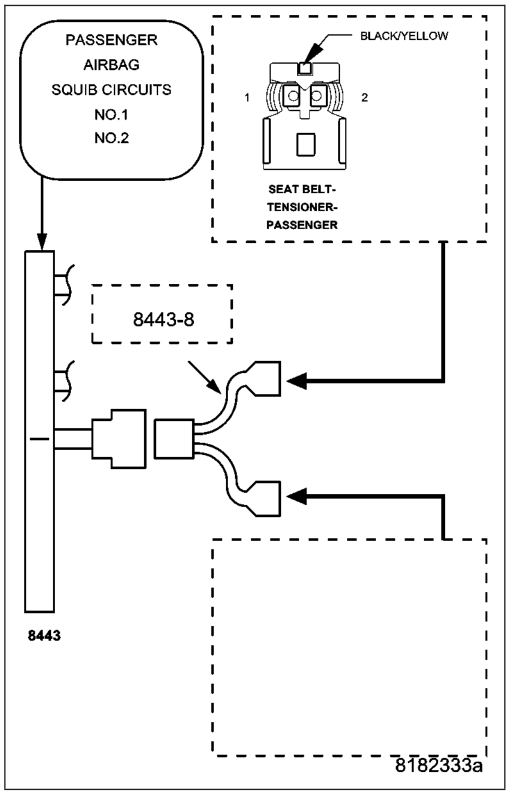
STORED DTC
Go To 4

2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active ORC DTCs.

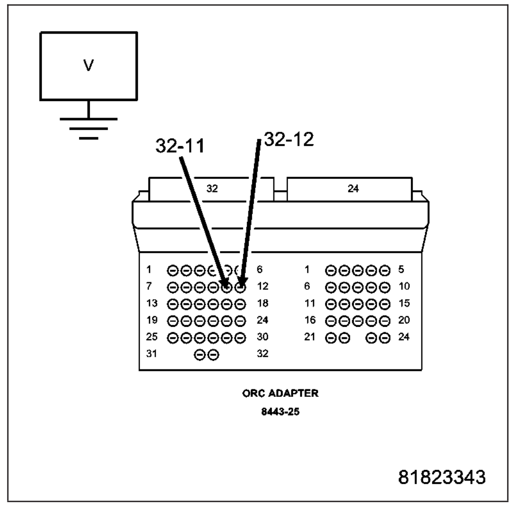


Does the scan tool display: B1B2D 1st ROW PASSENGER SEAT BELT TENSIONER CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the ORC adaptor and ground.

Measure the voltage of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between the ORC adaptor and ground.

Is there any voltage present on either circuit?

Yes >> Repair the Passenger Seat Belt Tensioner circuits with voltage present for a short to battery.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

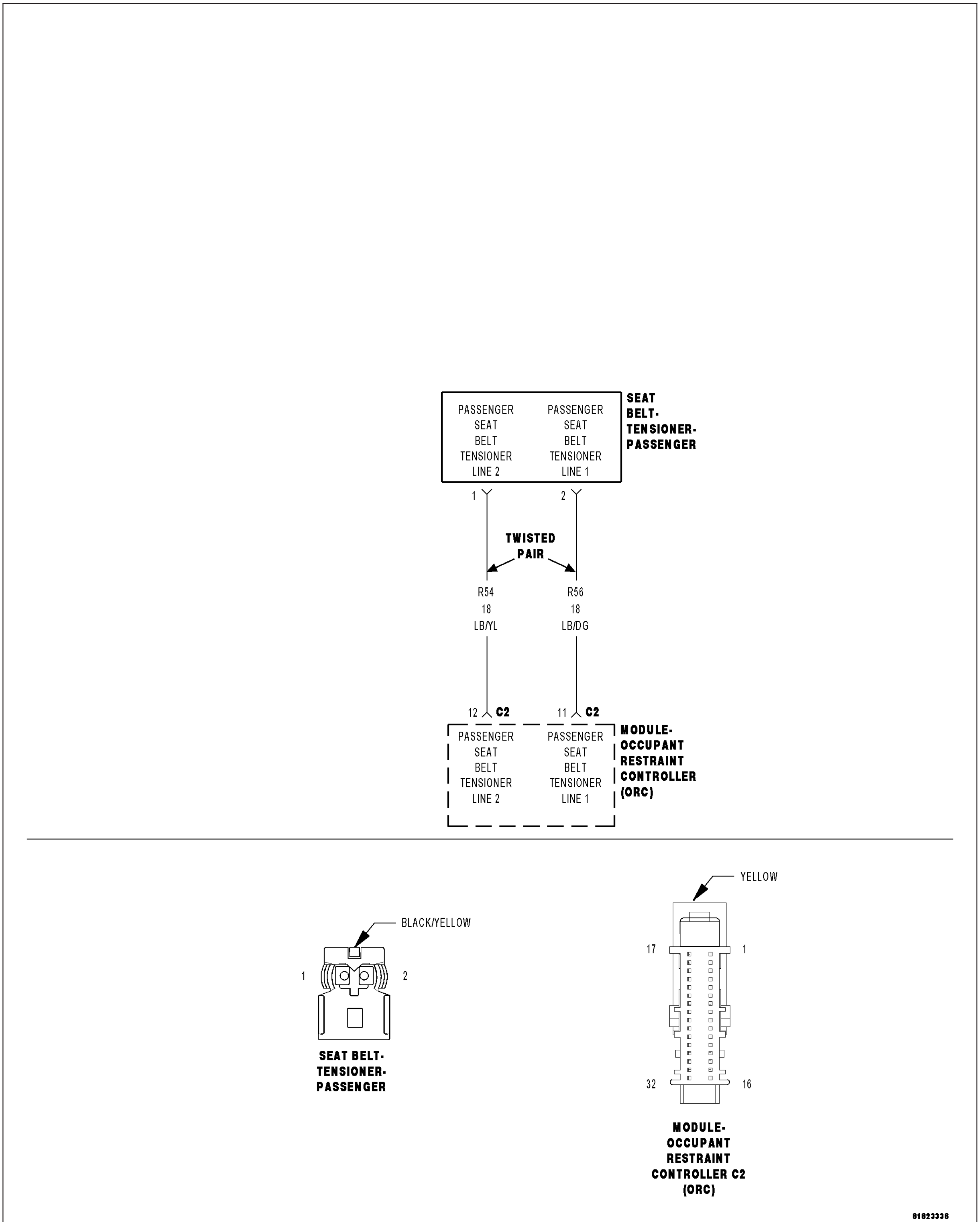
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits. The ORC will set this DTC if it detects an open or high resistance on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN
PASSENGER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 5

2. CHECK FOR OPEN PASSENGER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

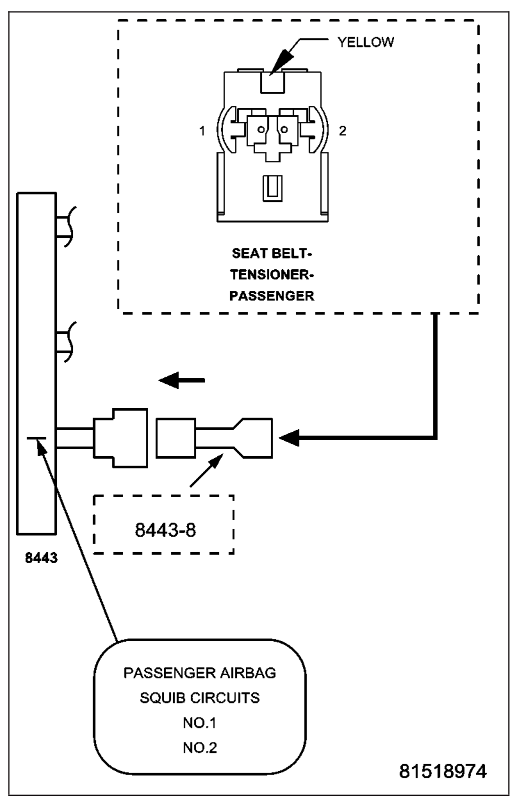
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTCs.

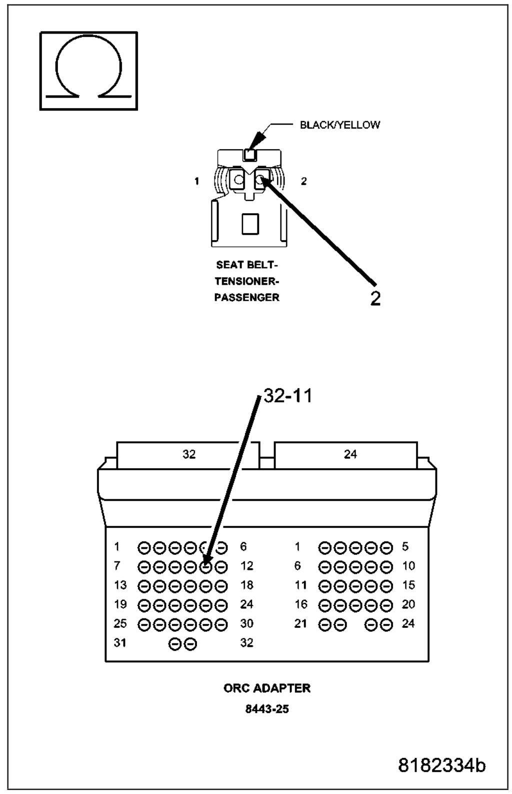
Does the scan tool display: B1B2E 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.



3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the Passenger Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

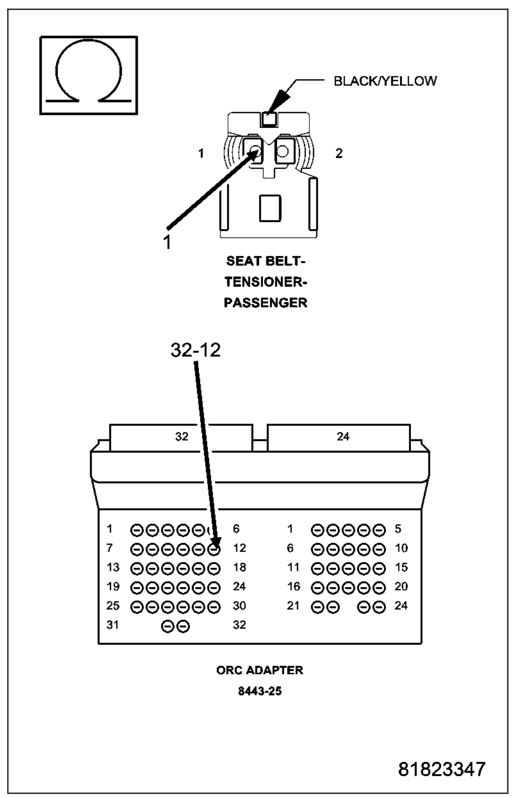
Is the resistance below 1.0 ohm?

Yes >> Go To 4

No >> Repair the (R56) Passenger Seat Belt Tensioner Line 1 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR AN OPEN



Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between the Passenger Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm?

Yes >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (R54) Passenger Seat Belt Tensioner Line 2 circuit for an open.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

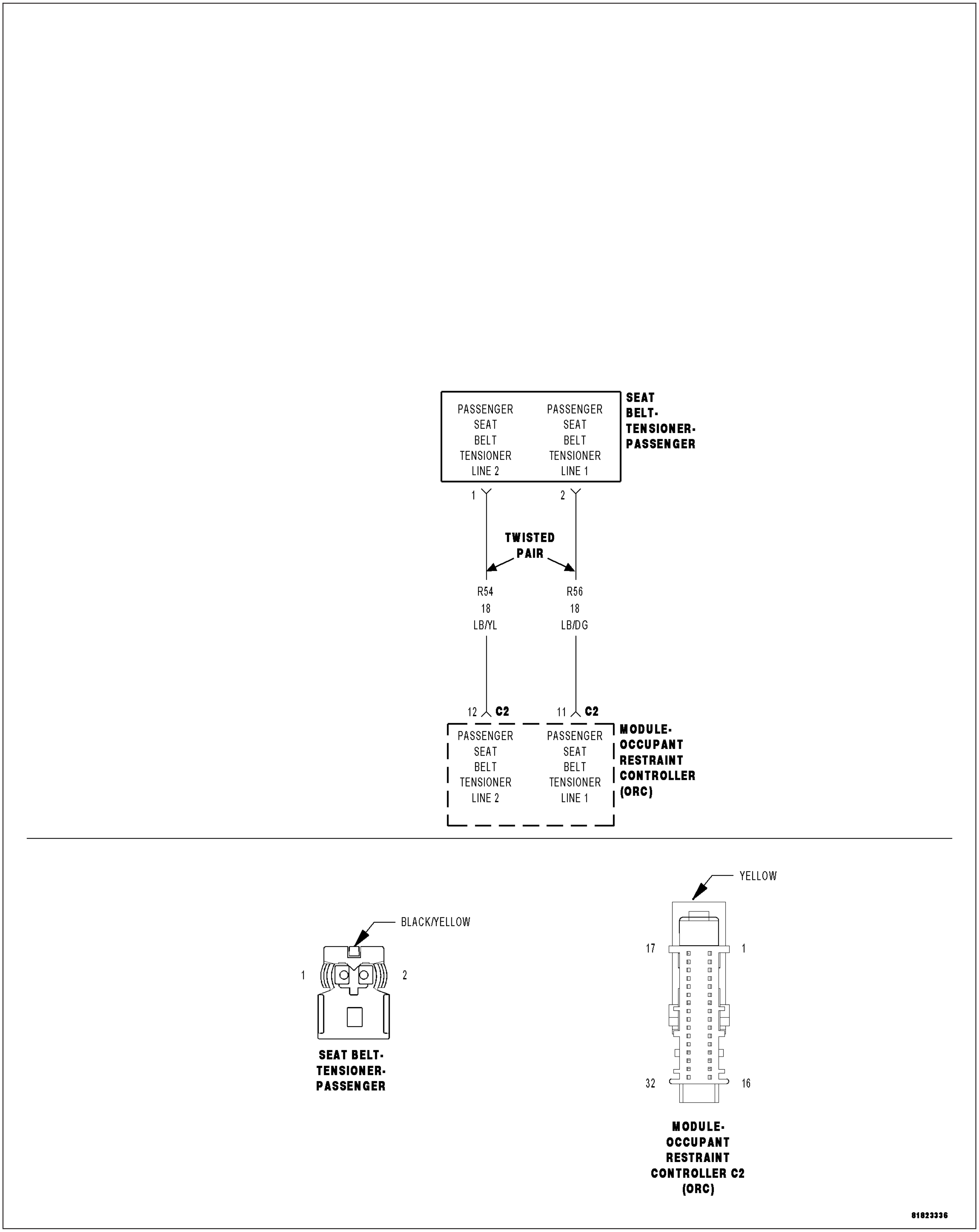
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits. The ORC will set this DTC if it detects low resistance between the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT SHORTED TO (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT
PASSENGER SEAT BELT PRETENSIONER
ORC

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure that the battery is fully charged.

NOTE: The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

Turn the ignition on.

Select ACTIVE or STORED DTC:

ACTIVE DTC
Go To 2

STORED DTC
Go To 4

2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

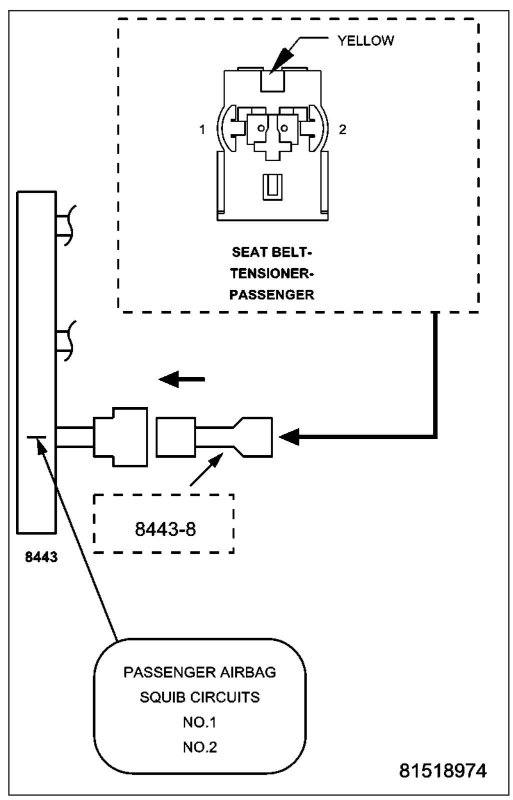
Disconnect the Passenger Seat Belt Pretensioner connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

WARNING: To avoid personal injury or death, turn the ignition on then reconnect the battery.

With the scan tool, read the active ORC DTCs.

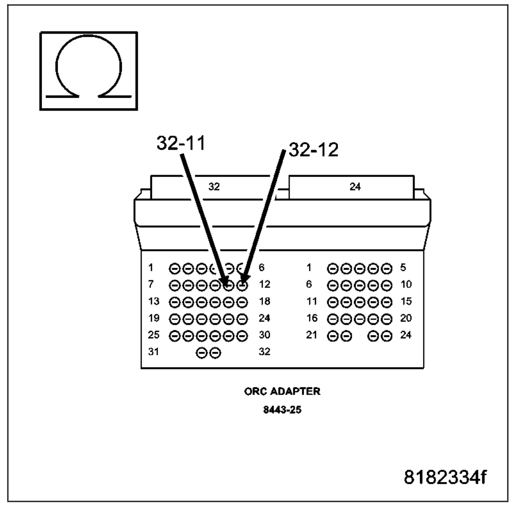


Does the scan tool display: B1B2F 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR A SHORT TO THE (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

Measure the resistance between the (R56) Passenger Seat Belt Tensioner Line 1 circuit and the (R54) Passenger Seat Belt Tensioner Line 2 circuit at the ORC adaptor.

Is the resistance below 10k ohms?

Yes >> Repair the (R56) Passenger Seat Belt Tensioner Line 1 circuit for a short to the (R54) Passenger Seat Belt Tensioner Line 2 circuit.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.Replace the ORC in accordance with Service Information.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.
With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

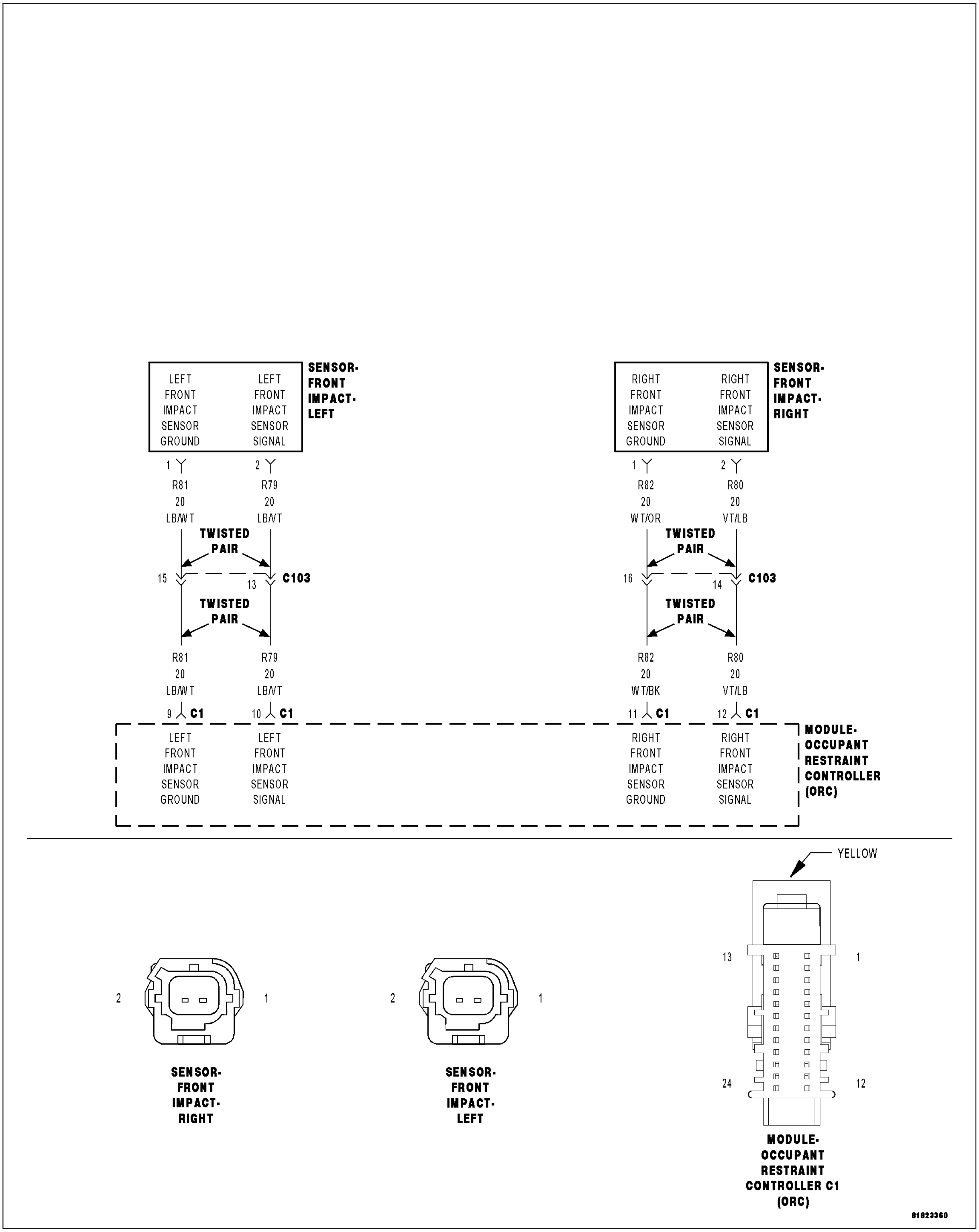
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning the vehicle to the customer.

B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Front Left Impact Sensor is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Front Left Impact Sensor Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Front Left Impact Sensor.

Possible Causes
FRONT LEFT IMPACT SENSOR
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE FRONT LEFT IMPACT SENSOR

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Front Left Impact Sensor.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Front Left Impact Sensor Internal DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

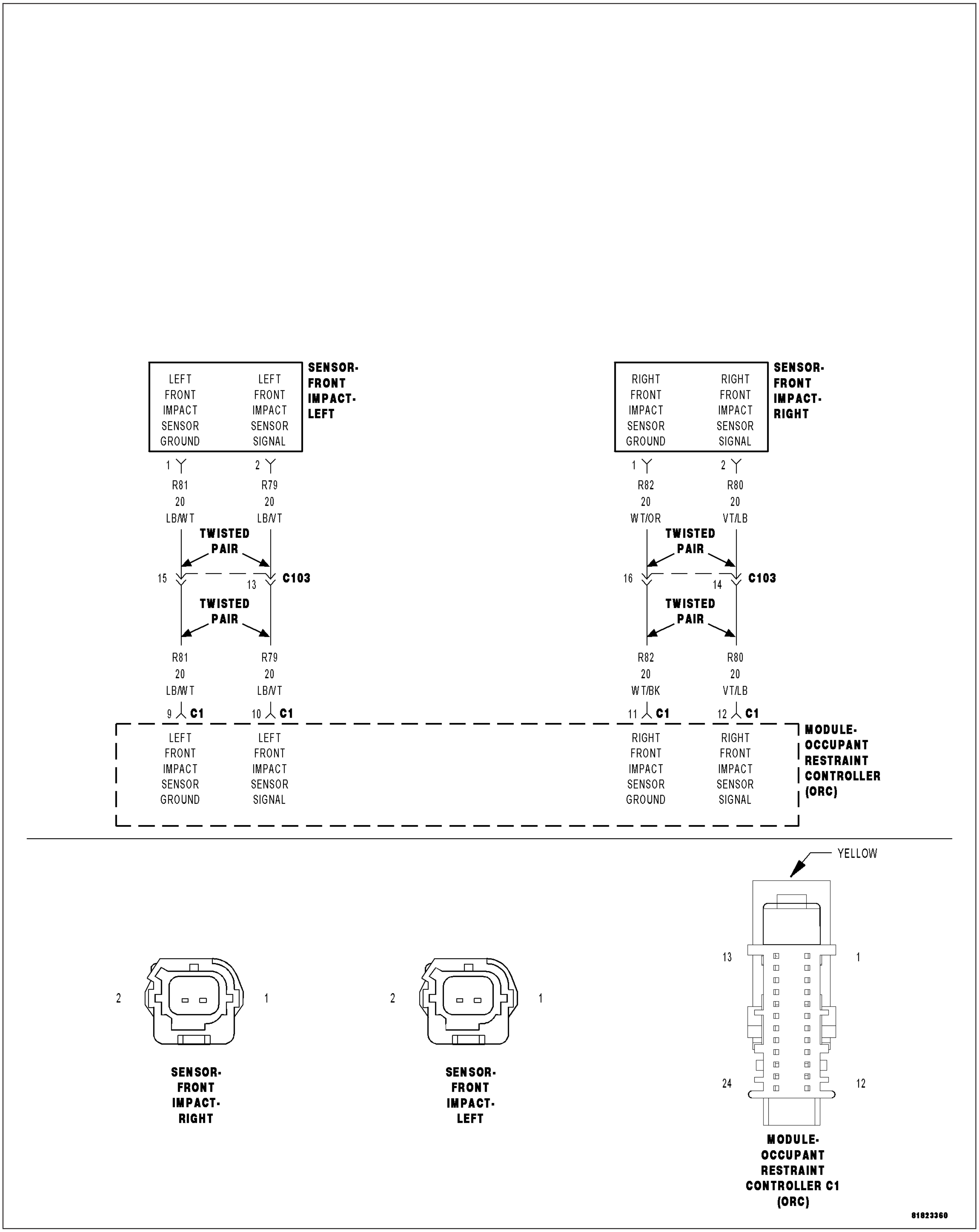
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Front Right Impact Sensor is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Front Right Impact Sensor Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Front Right Impact Sensor.

Possible Causes
FRONT RIGHT IMPACT SENSOR
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE FRONT RIGHT IMPACT SENSOR

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Front Right Impact Sensor.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Front Right Impact Sensor Internal DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

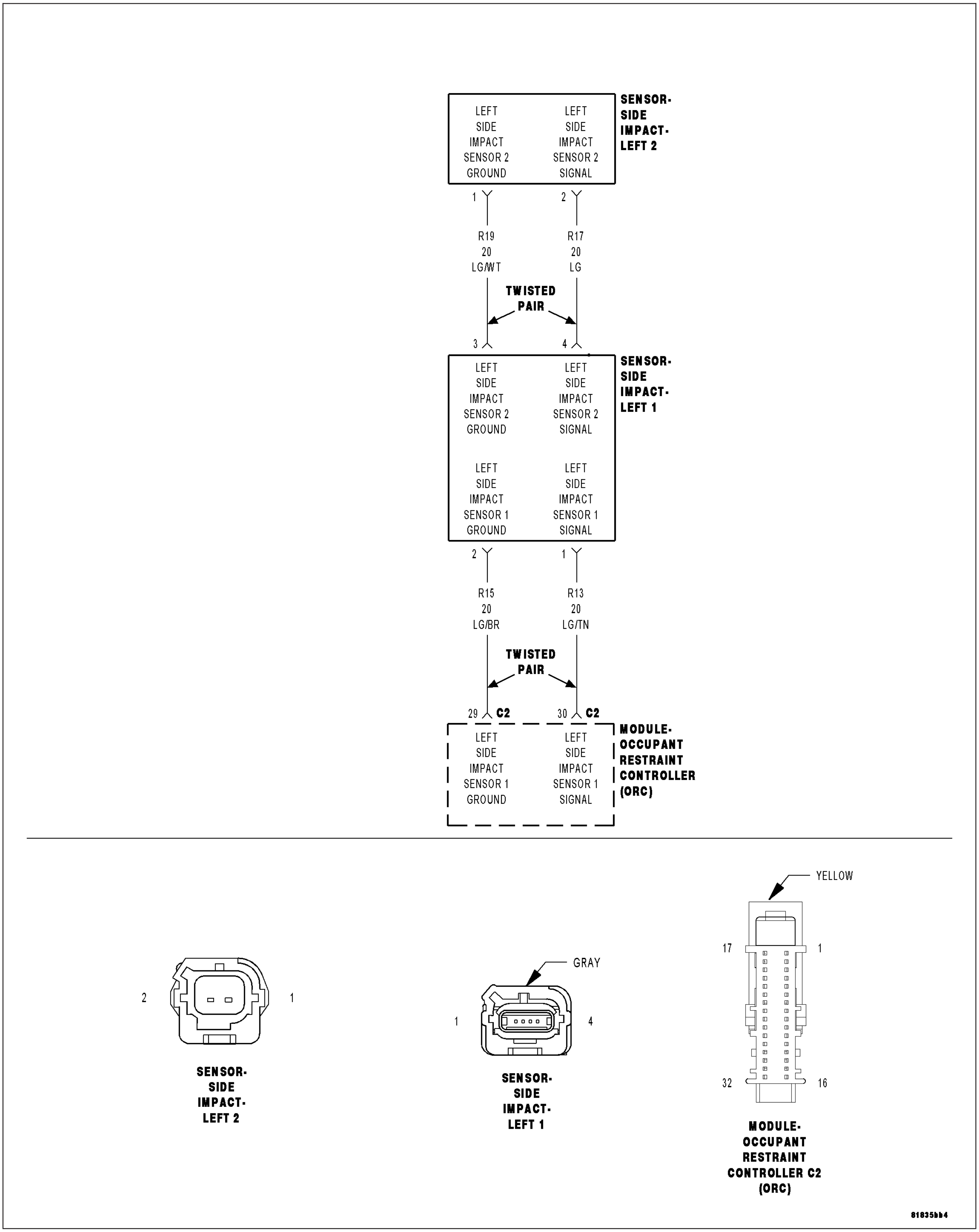
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Left Side Impact Sensor 1 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Left Side Impact Sensor 1 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Left Side Impact Sensor 1.

Possible Causes
LEFT SIDE IMPACT SENSOR 1
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

Turn the ignition on.

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE LEFT SIDE IMPACT SENSOR 1.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Left Side Impact Sensor 1.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Left Side Impact Sensor 1 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

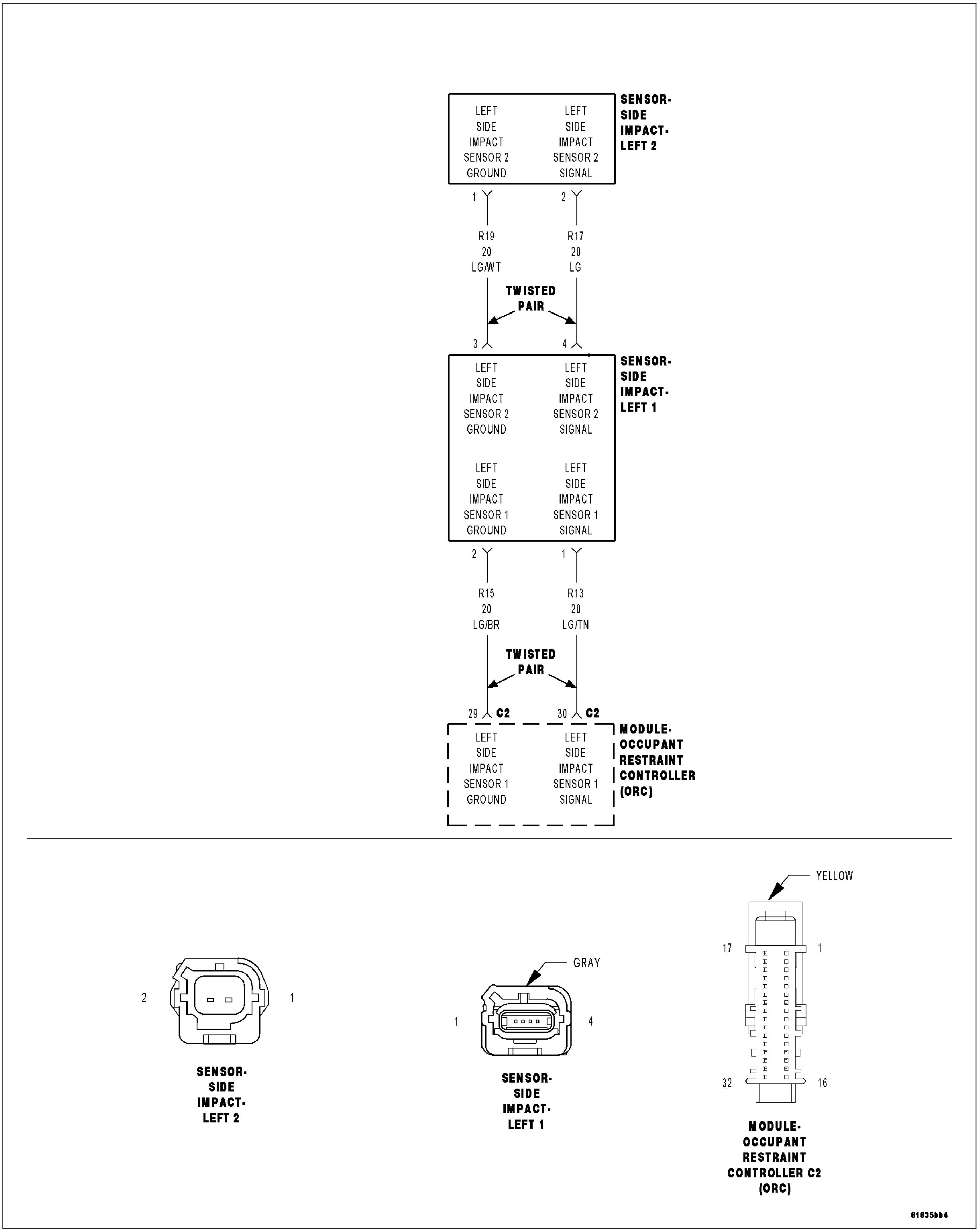
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL



For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Left Side Impact Sensor 2 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Left Side Impact Sensor 2 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Left Side Impact Sensor 2.

Possible Causes
LEFT SIDE IMPACT SENSOR 2
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE LEFT SIDE IMPACT SENSOR 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Left Side Impact Sensor 2.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Left Side Impact Sensor 2 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

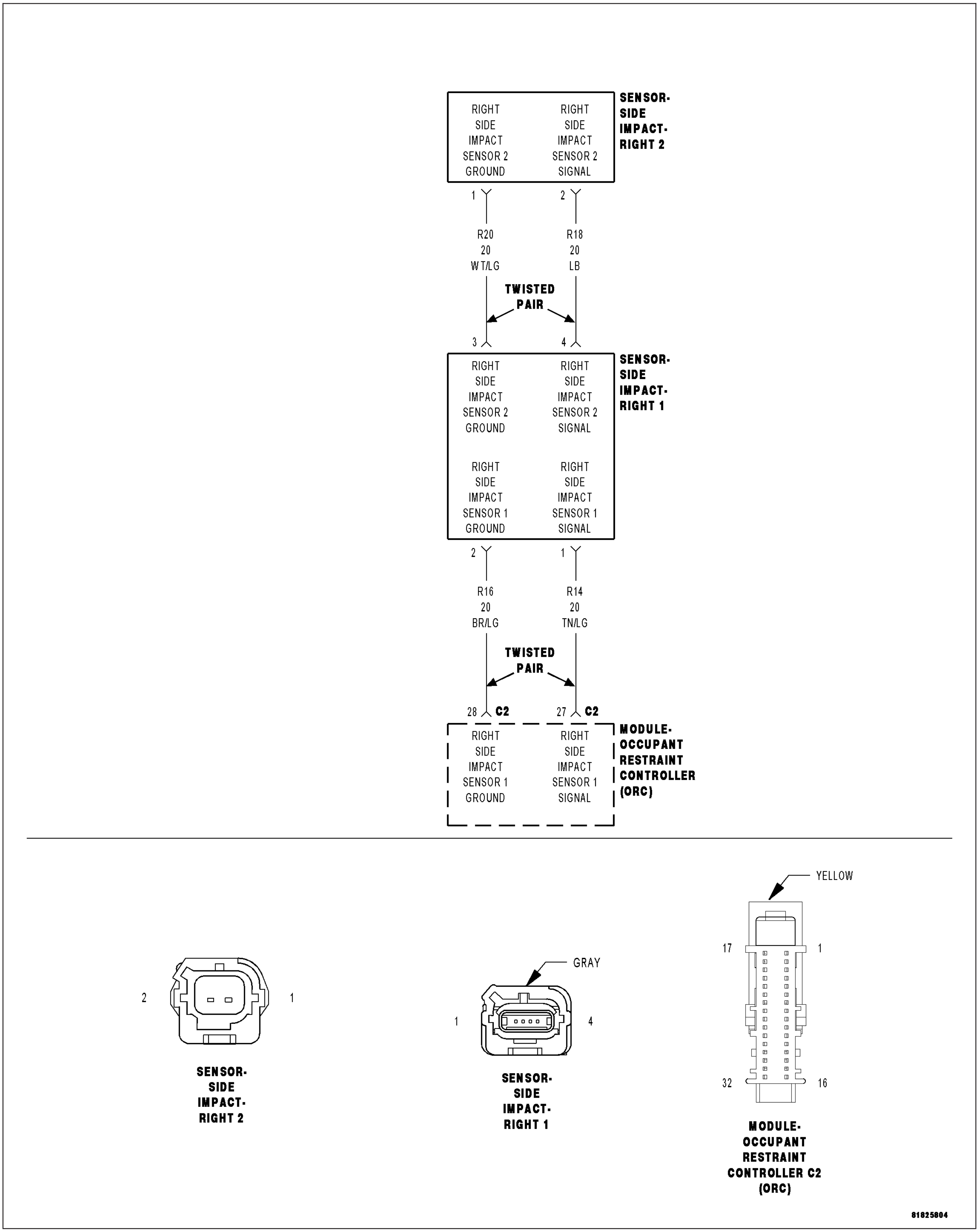
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Right Side Impact Sensor 1 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Right Side Impact Sensor 1 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Right Side Impact Sensor 1.

Possible Causes
RIGHT SIDE IMPACT SENSOR 1
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Right Side Impact Sensor 1.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Right Side Impact Sensor 1 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

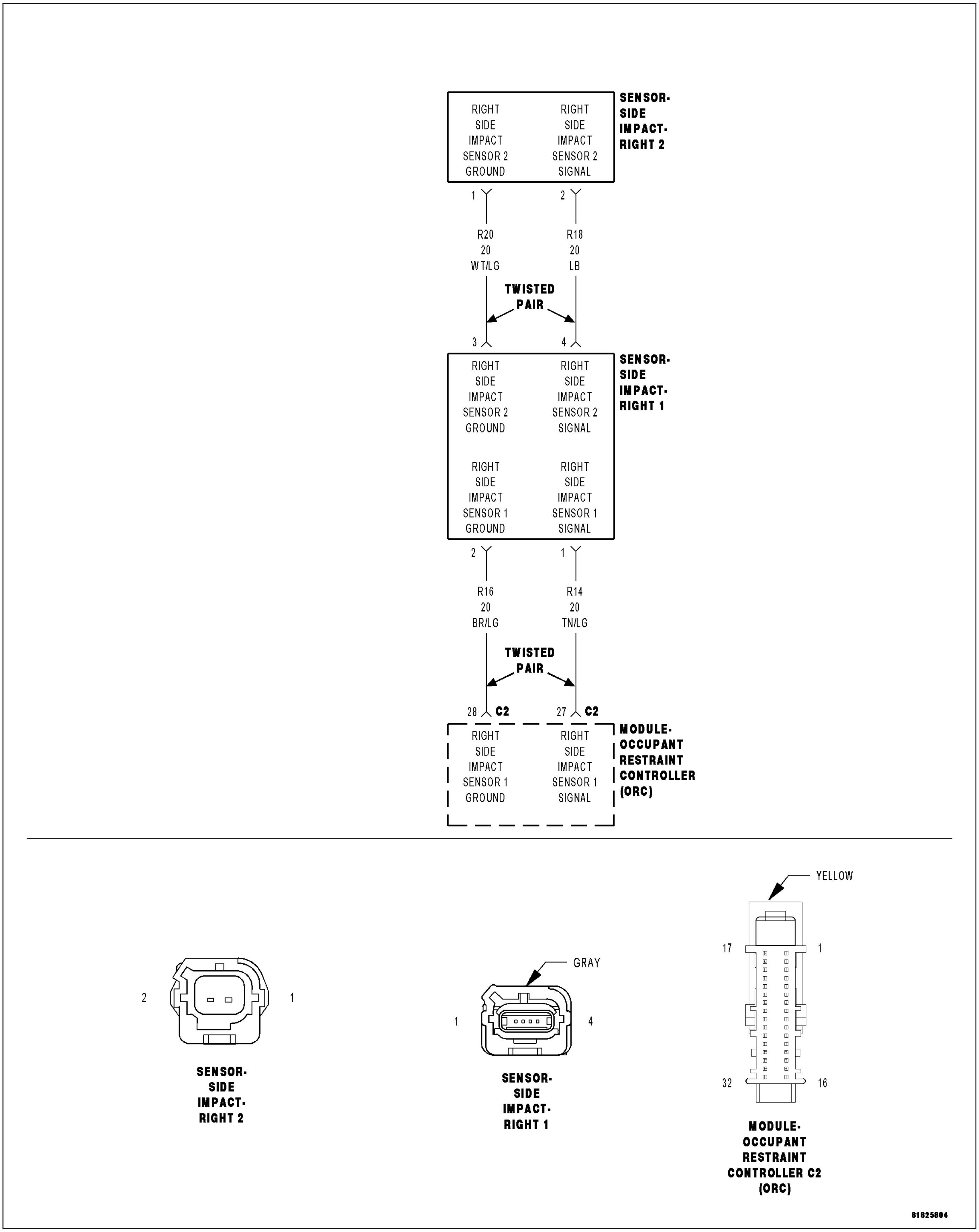
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Right Side Impact Sensor 2 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Right Side Impact Sensor 2 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Right Side Impact Sensor 2.

Possible Causes
RIGHT SIDE IMPACT SENSOR 2
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4

2. VERIFY OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Replace the Right Side Impact Sensor 2.

Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.

Did the active Right Side Impact Sensor 2 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

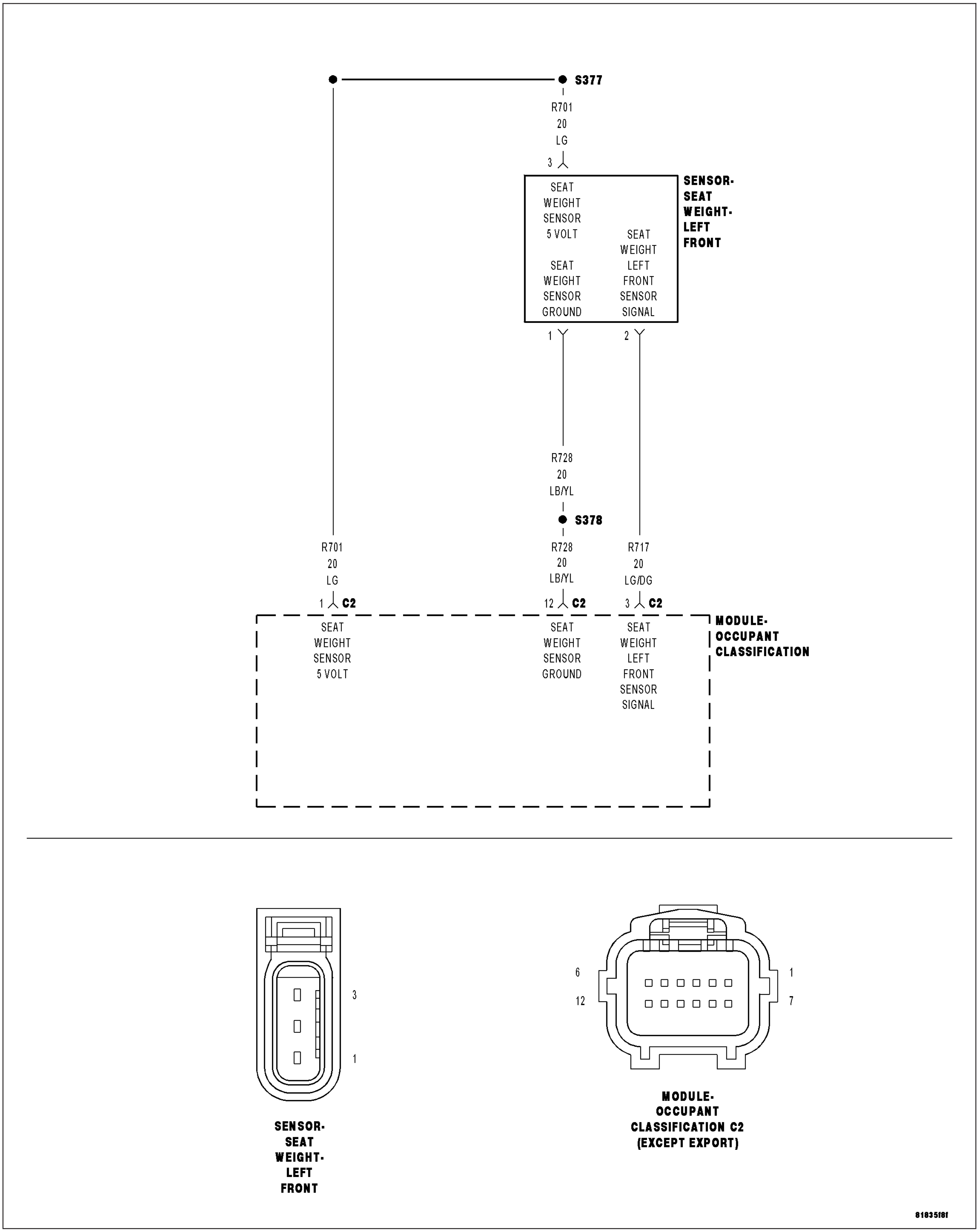
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification module system verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
LEFT-FRONT PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE?

Yes >> Go To 3

No >> Go To 5

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the Diagnosis/Checkout Procedure For Seat Weight Sensors in this Section.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.

Continue the test until either a code becomes active or the problem area is isolated.

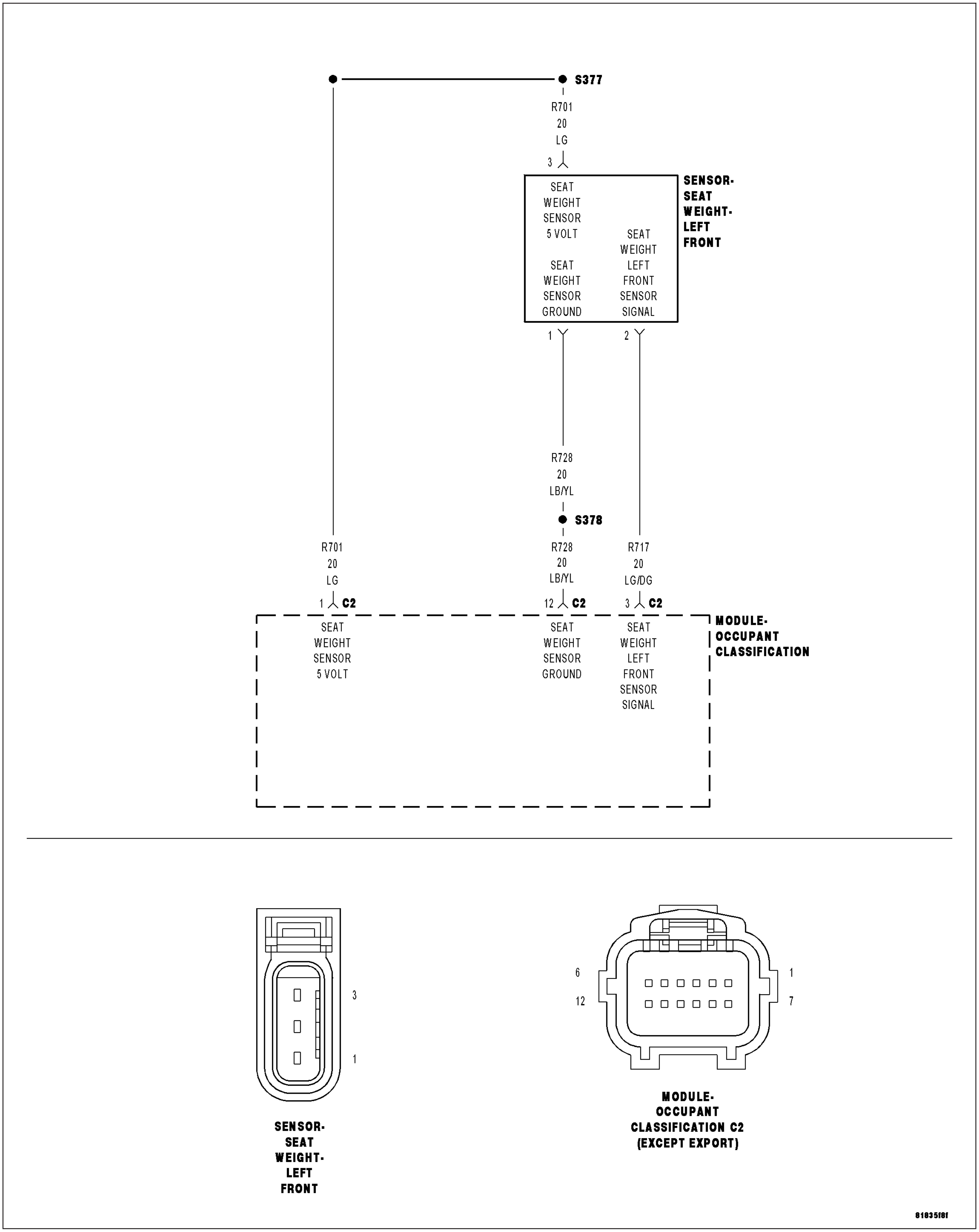
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 3.4 ± .6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules. Also, this DTC will remain active after the condition that set this fault is no longer present. This condition is referred to as latching the DTC for the ignition cycle. Cycling the ignition key will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
ACTIVE B1B79 DTC AND B1B7A DTC AT THE SAME TIME
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
LEFT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10

3. VERIFY THAT B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH DTC AND B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW DTC ARE ACTIVE AT THE SAME TIME

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH AND B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW AT THE SAME TIME?

Yes >> Perform B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH diagnostic test.

No >> Go To 4

4. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 6

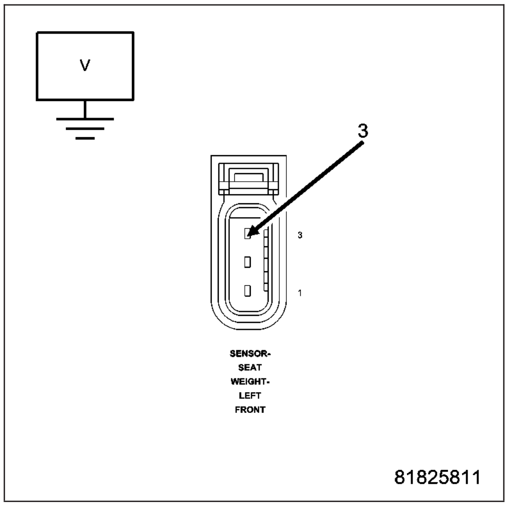
No >> Reroute the Passenger Seat Harness as necessary.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Front Seat Weight Sensor connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

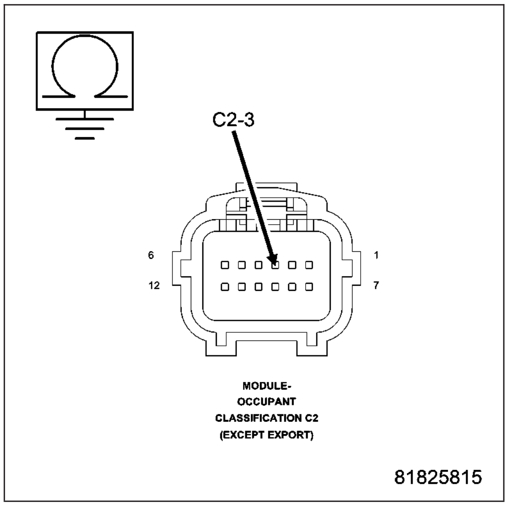
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9

7. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

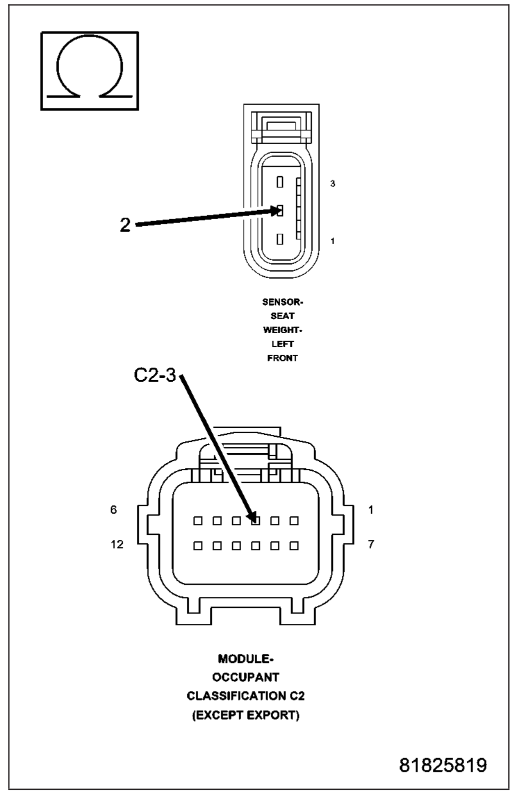
Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN



Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Left-Front Seat Weight Sensor in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1. If DTC B1B79–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

No >>

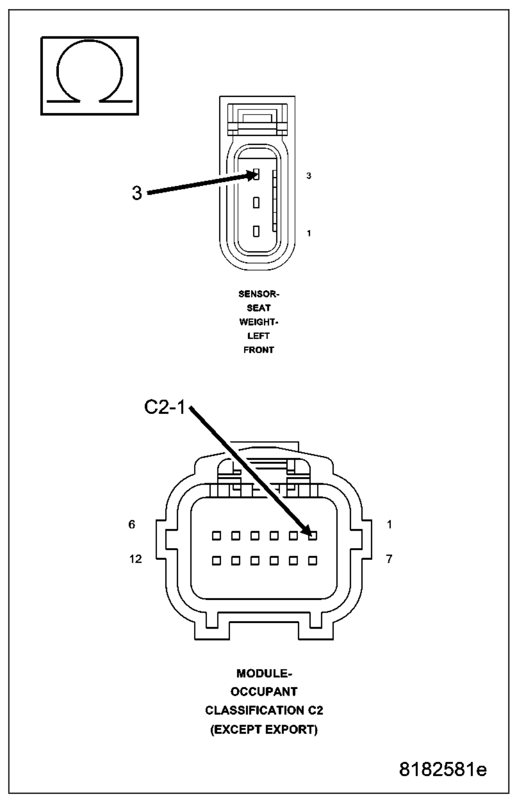
NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM connectors.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

10. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

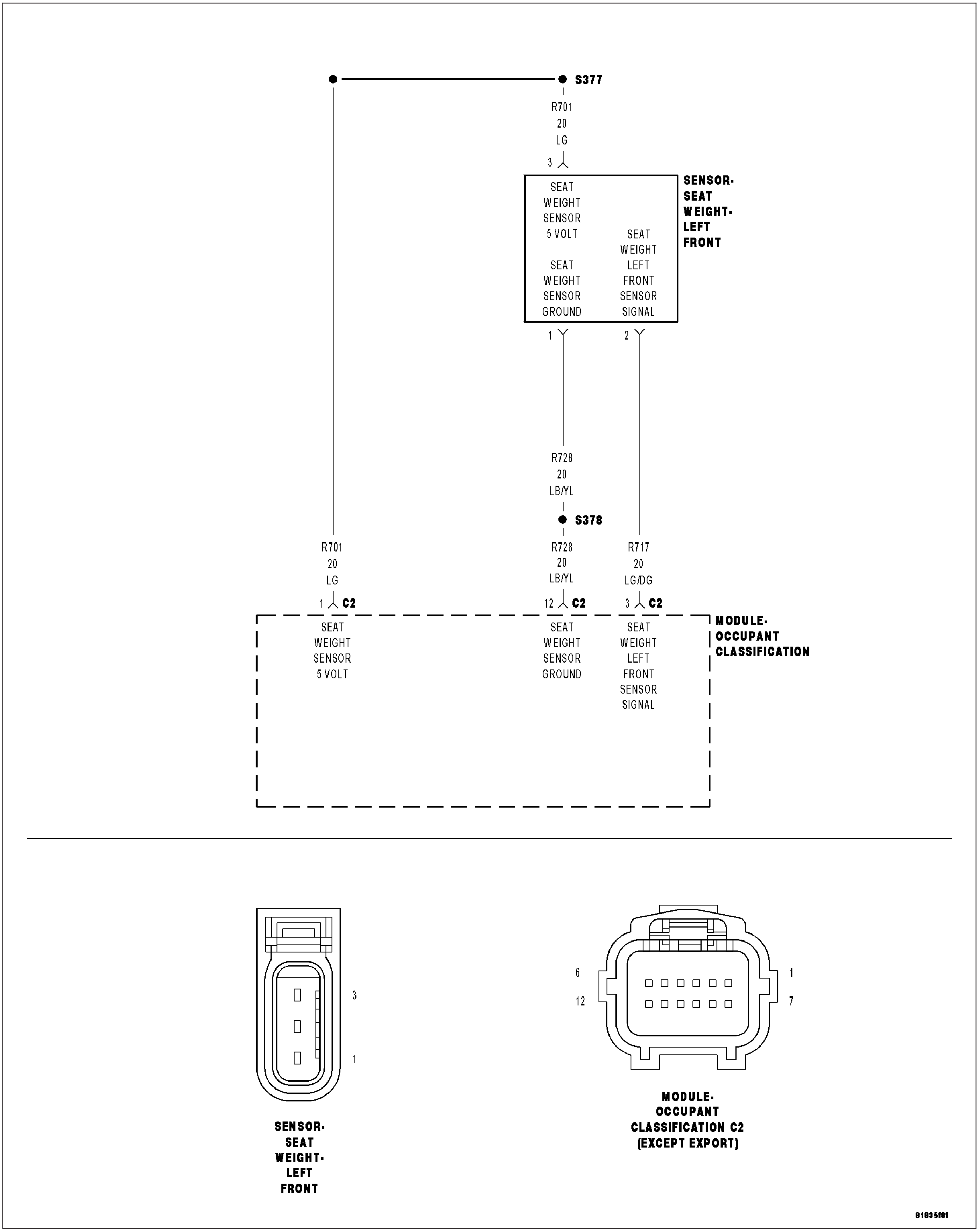
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. Note that this DTC will remain active after the condition that set this fault is no longer present. Performing the Occupant Classification Module System Verification Test will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
LEFT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to GROUP 23 for specification.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT

CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the OCM C2 connector.

Measure the voltage of the (R717) LT-FT Seat Weight Sensor Signal circuit.

Is the voltage above 0.2 volt?

Yes >>

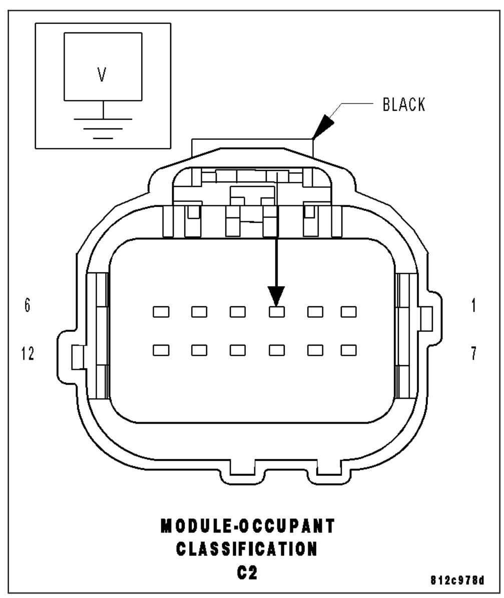
NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 6



6. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Front Seat Weight Sensor connector.

Measure the resistance between the (R717) LT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 7

7. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

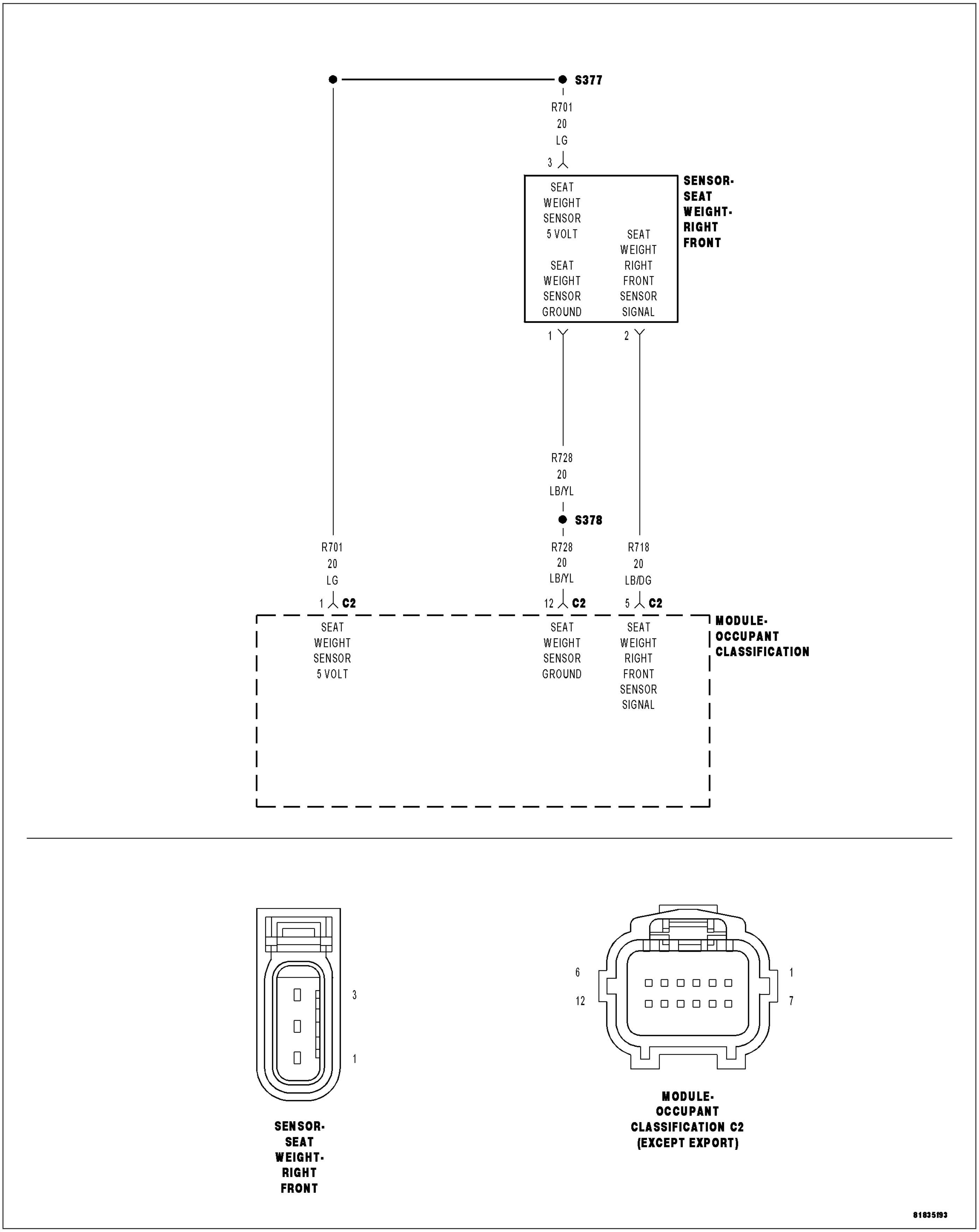
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification module system verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
RIGHT-FRONT PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE?

Yes >> Go To 3

No >> Go To 5

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are tightened to torqued to specification. Refer to GROUP 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the Diagnosis / Checkout Procedure For Seat Weight Sensors in this Section.

No >> But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.

Continue the test until either a code becomes active or the problem area is isolated.

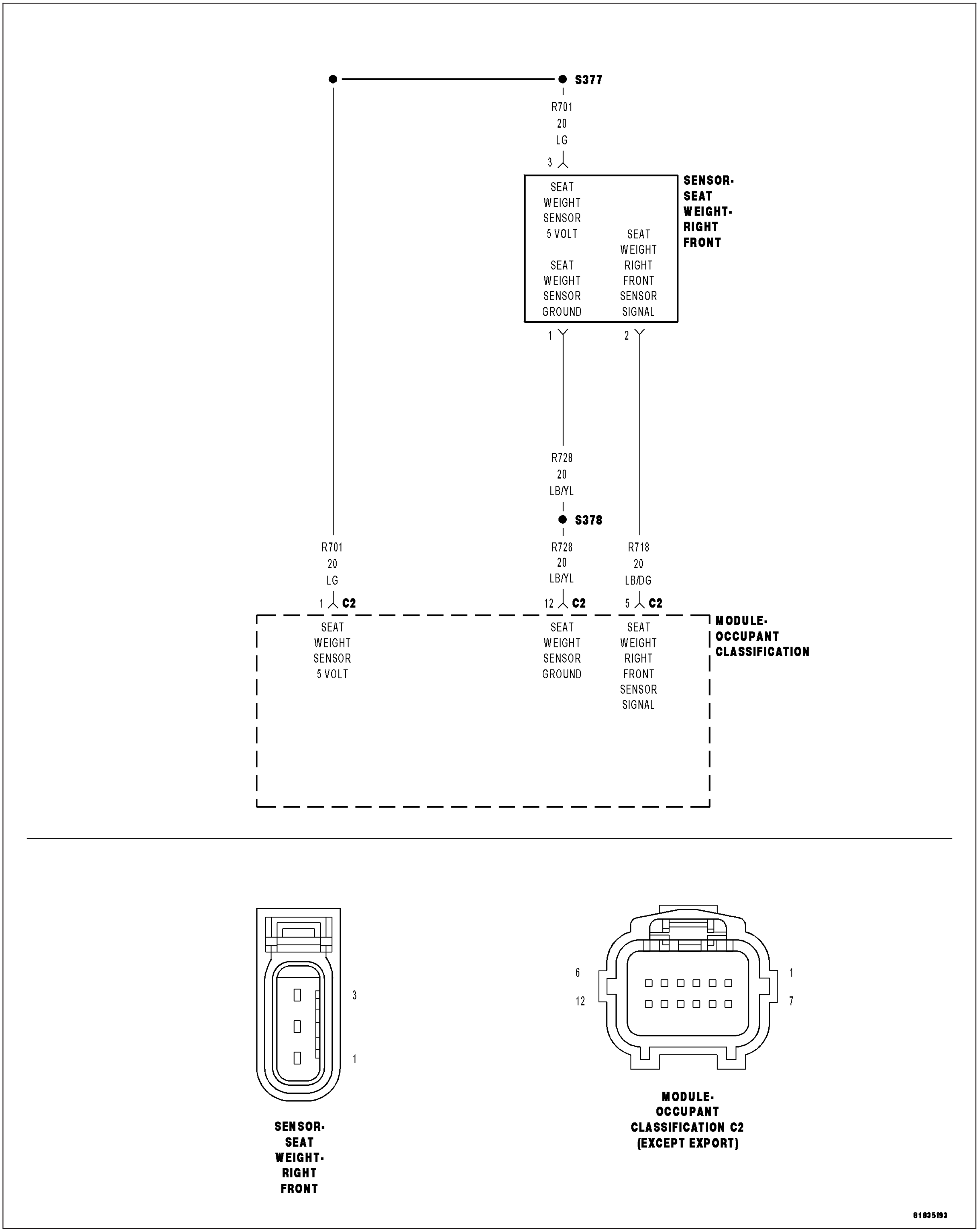
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 3.4 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules. Also, this DTC will remain active after the condition that set this fault is no longer present. This condition is referred to as latching the DTC for the ignition cycle. Cycling the ignition key will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
ACTIVE B1B7E DTC AND B1B7F DTC AT THE SAME TIME
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
RIGHT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10

3. VERIFY THAT DTC B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH AND B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW ARE BOTH ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH?

Yes >> Perform B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH.

No >> Go To 4

4. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 6

No >> Reroute the Passenger Seat Harness as necessary.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Front Seat Weight Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

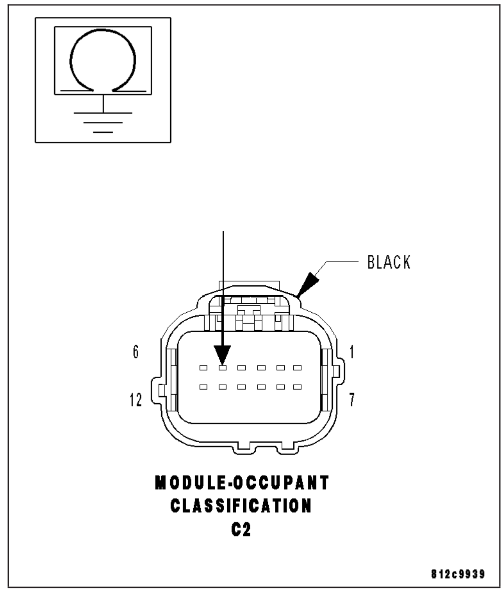
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9

7. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Right-Front Seat Weight Sensor in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1. If DTC B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

10. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

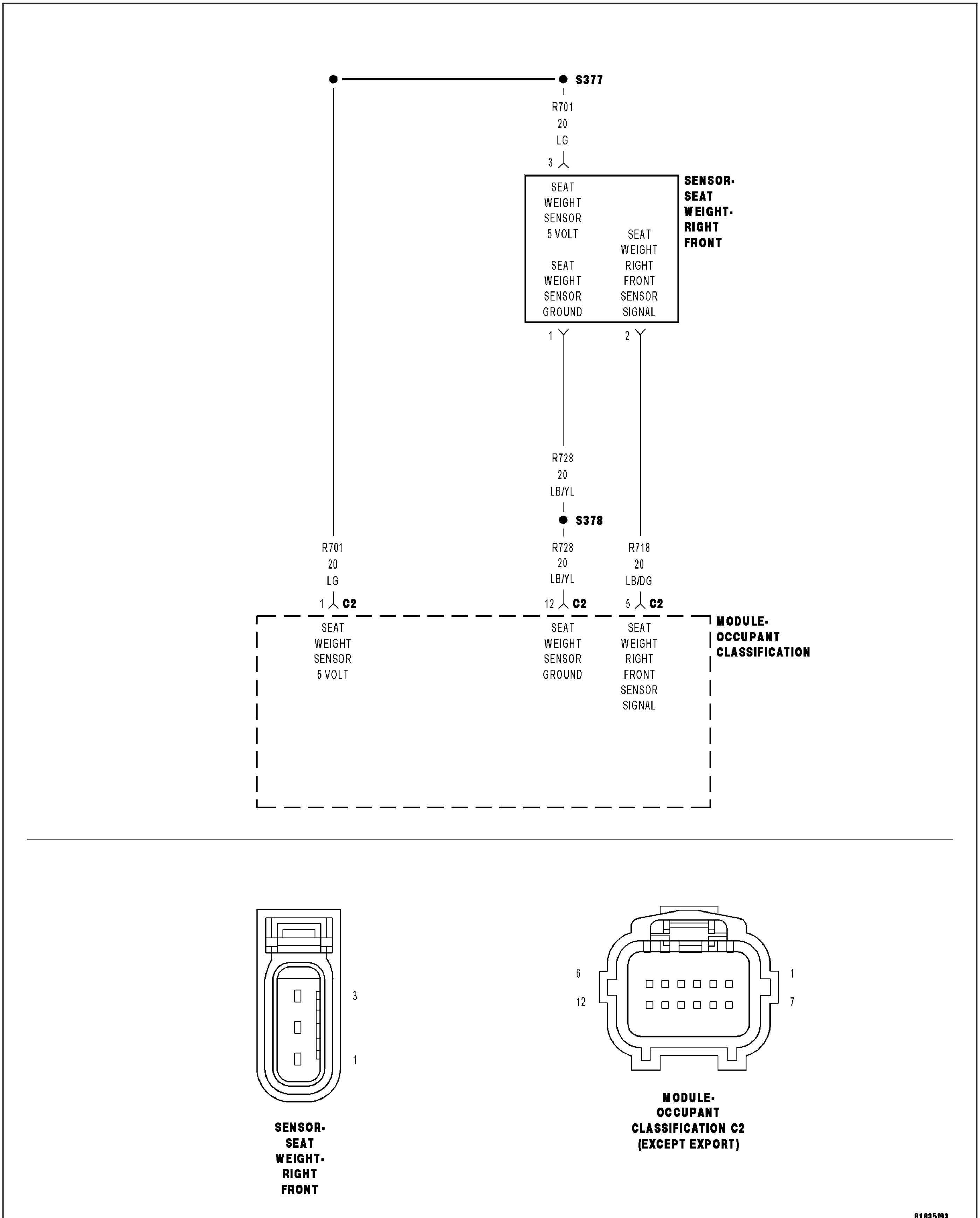
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. Note that this DTC will remain active after the condition that set this fault is no longer present. Performing the Occupant Classification Module System Verification Test will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
RIGHT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT

INPUT CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

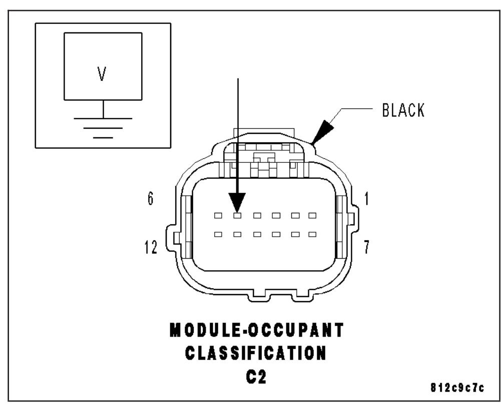
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the OCM C2 connector.

Measure the voltage of the (R718) RT-FT Seat Weight Sensor Signal circuit.



Is the voltage above 0.2 volt?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 6

6. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Front Seat Weight Sensor connector.

Measure the resistance between the (R718) RT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 7

7. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

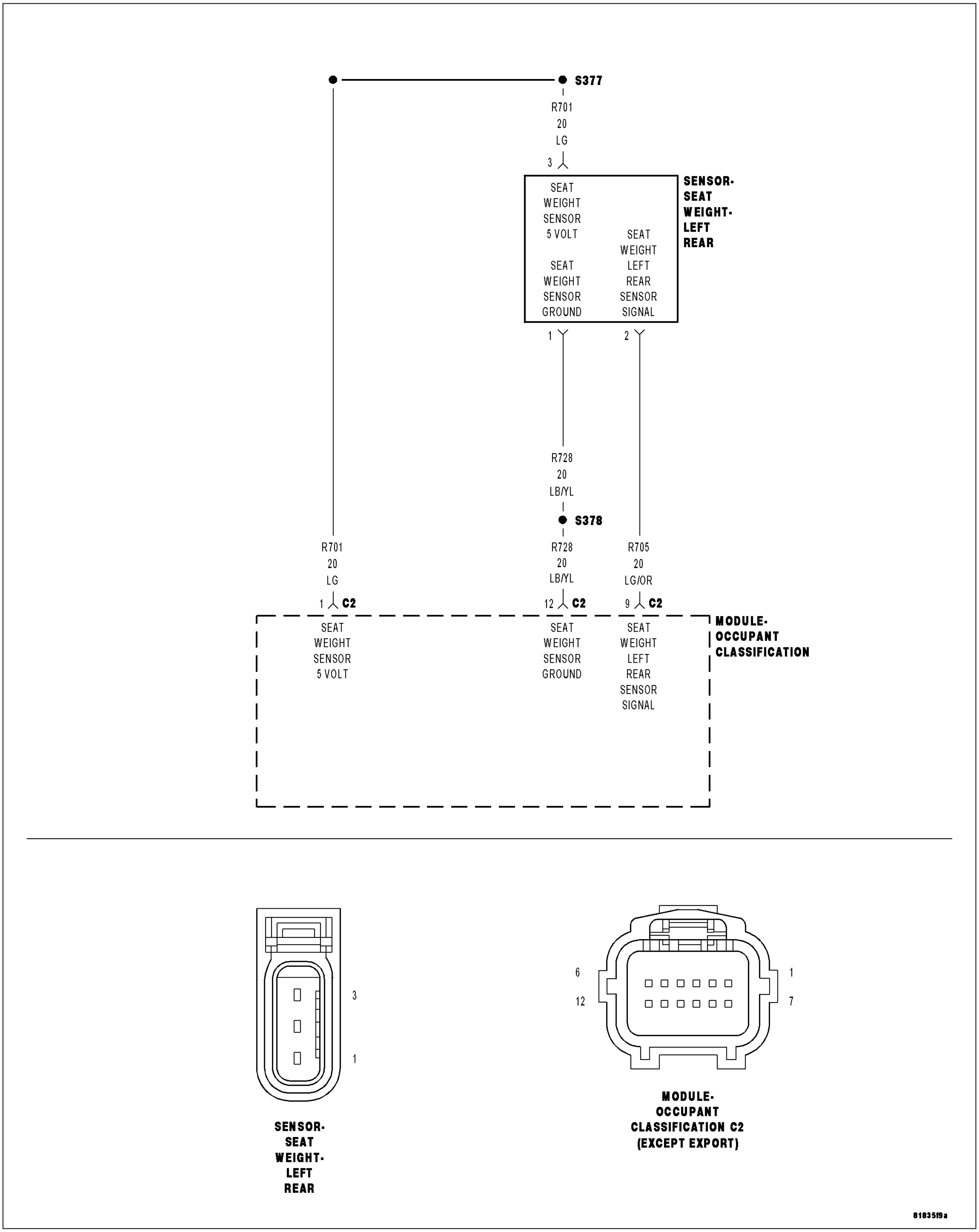
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification module system verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
LEFT-REAR PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

NOTE: When reconnecting airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B82- PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE?

Yes >> Go To 3

No >> Go To 5

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are tighten to torque specification. Refer to GROUP 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the Diagnosis/Checkout Procedure For Seat Weight Sensors in this Section.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.

Continue the test until either a code becomes active or the problem area is isolated.

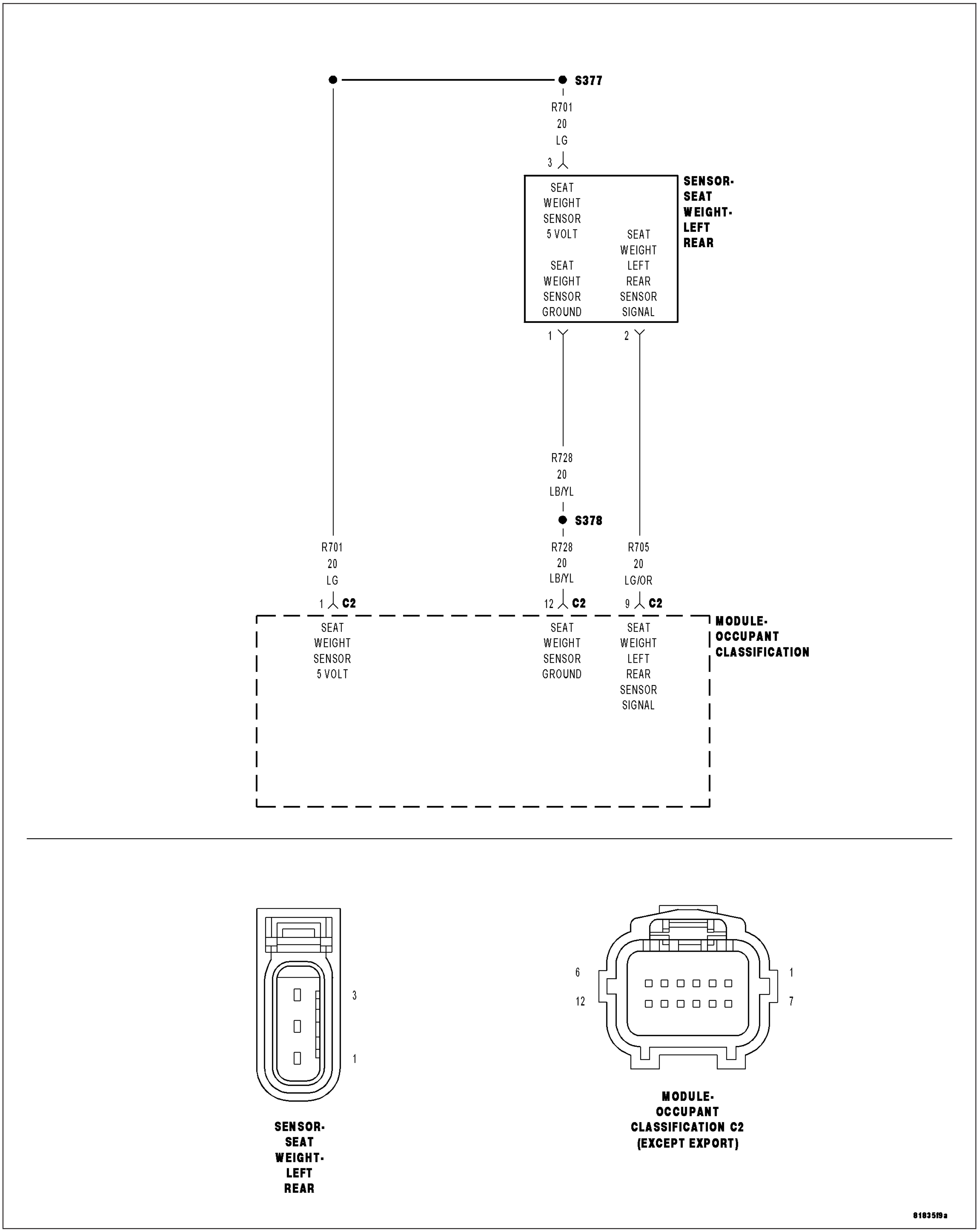
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 3.4 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules. Also, this DTC will remain active after the condition that set this fault is no longer present. This condition is referred to as latching the DTC for the ignition cycle. Cycling the ignition key will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
LEFT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10

3. VERIFY THAT B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW DTC AND B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH DTC ARE ACTIVE AT THE SAME TIME

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW AND B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH AT THE SAME TIME?

Yes >> Perform B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.
Replace the Passenger Seat Harness in accordance with the Service Information.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 6

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK VOLTAGE OF (R726) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Rear Seat Weight Sensor connector.

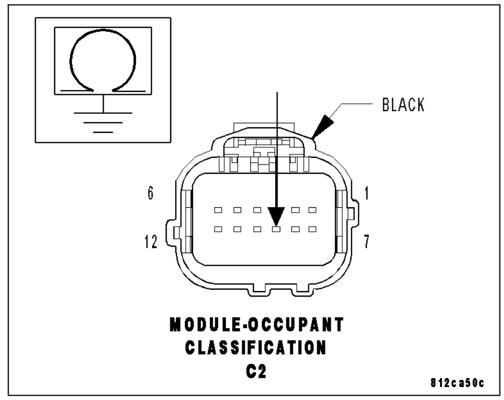
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9

7. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Left-Rear Seat Weight Sensor in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1. If DTC B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. CHECK (R726) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

10. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

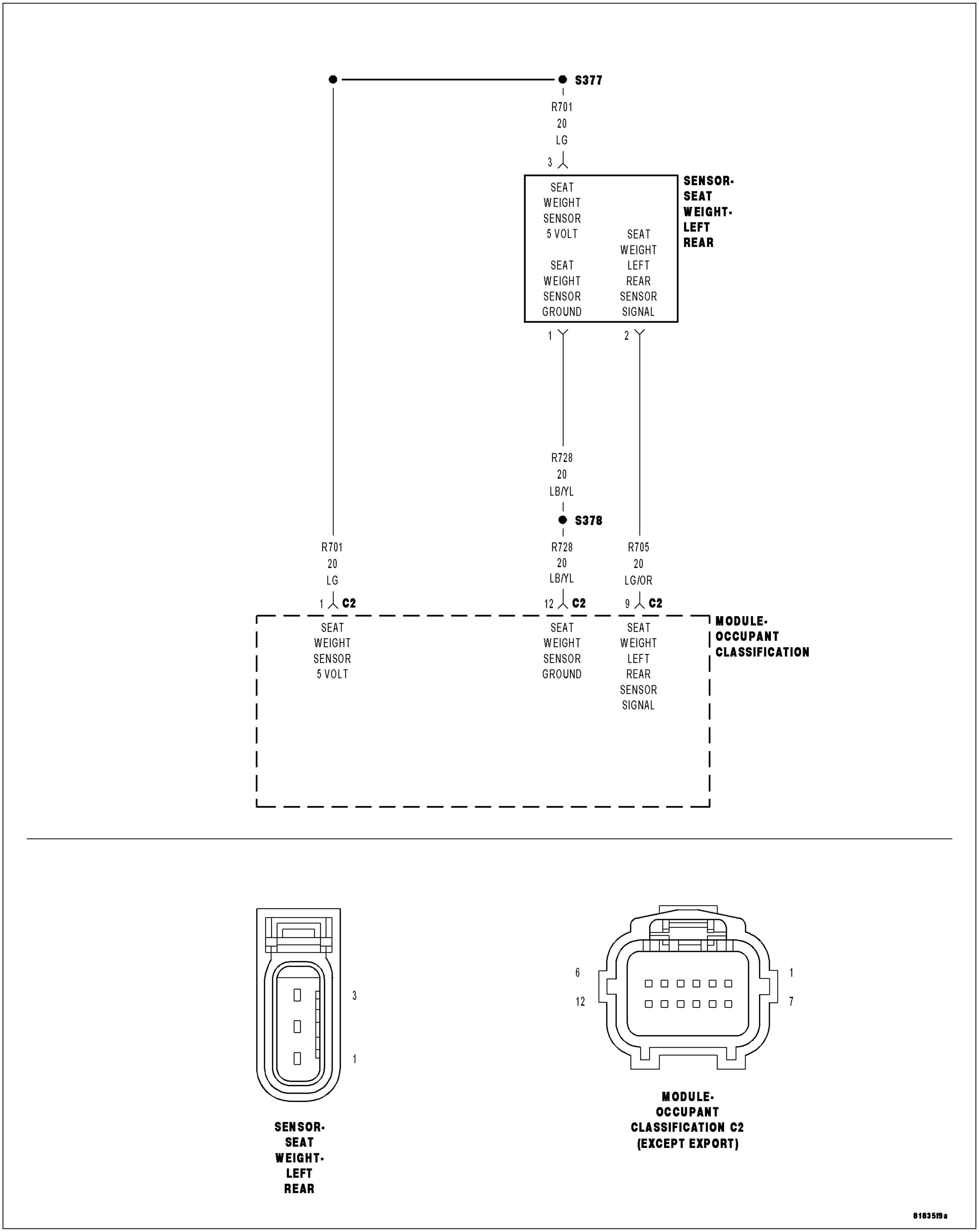
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. Note that this DTC will remain active after the condition that set this fault is no longer present. Performing the Occupant Classification Module System Verification Test will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
LEFT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to GROUP 23 for specification.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT

CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

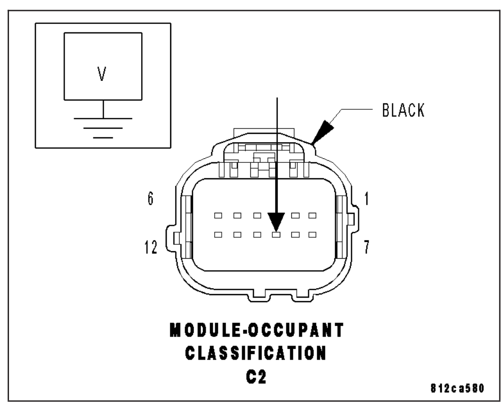
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the OCM C2 connector.

Measure the voltage of the (R705) LT-RR Seat Weight Sensor Signal circuit.



Is the voltage above 0.2 volt?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 6

6. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Rear Seat Weight Sensor connector.

Measure the resistance between the (R705) LT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 7

7. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

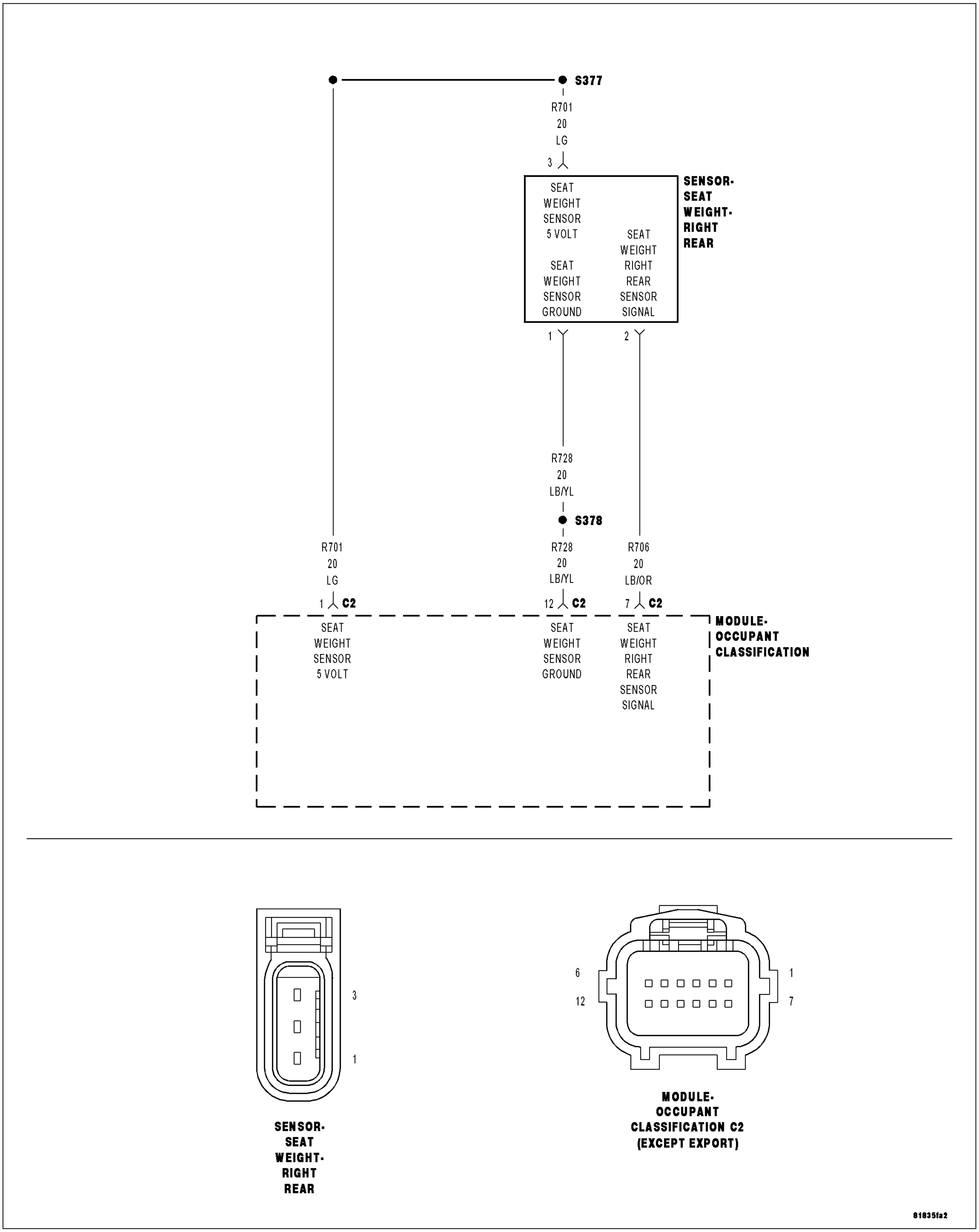
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification module system verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
RIGHT-REAR PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE?

Yes >> Go To 3

No >> Go To 5

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are tighten to torque specification. Refer to GROUP 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active: PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the Diagnosis / Checkout Procedure For Seat Weight Sensors in this Section.

No >> But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.

Continue the test until either a code becomes active or the problem area is isolated.

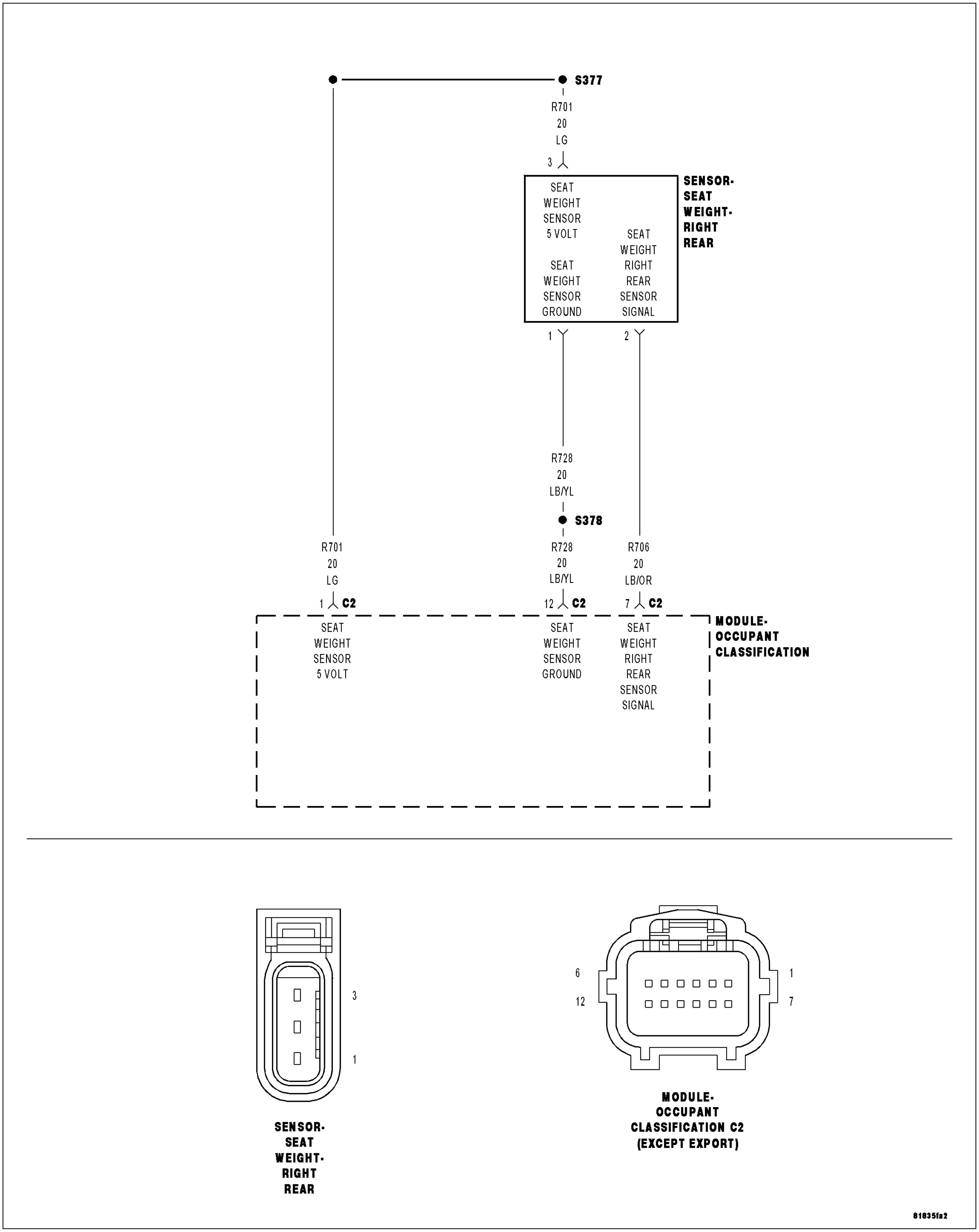
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 3.4 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules. Also, this DTC will remain active after the condition that set this fault is no longer present. This condition is referred to as latching the DTC for the ignition cycle. Cycling the ignition key will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
ACTIVE B1B88 DTC AND B1B89 DTC AT THE SAME TIME
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
RIGHT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10

3. VERIFY THAT DTC B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW AND B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH ARE ACTIVE AT THE SAME TIME

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW DTC AND B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH DTC AT THE SAME TIME?

Yes >> Perform B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH.

No >> Go To 4

4. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 6

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.
Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Rear Seat Weight Sensor connector.

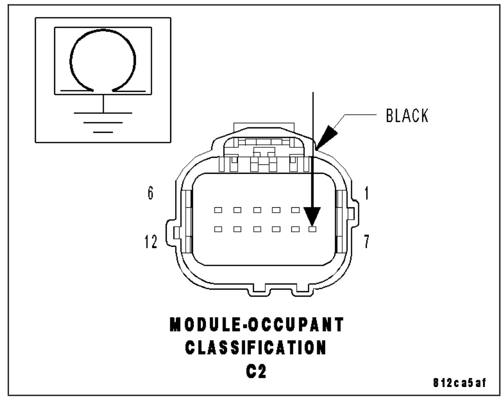
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9

7. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Right-Rear Seat Weight Sensor in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1. If DTC B1B88–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

10. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

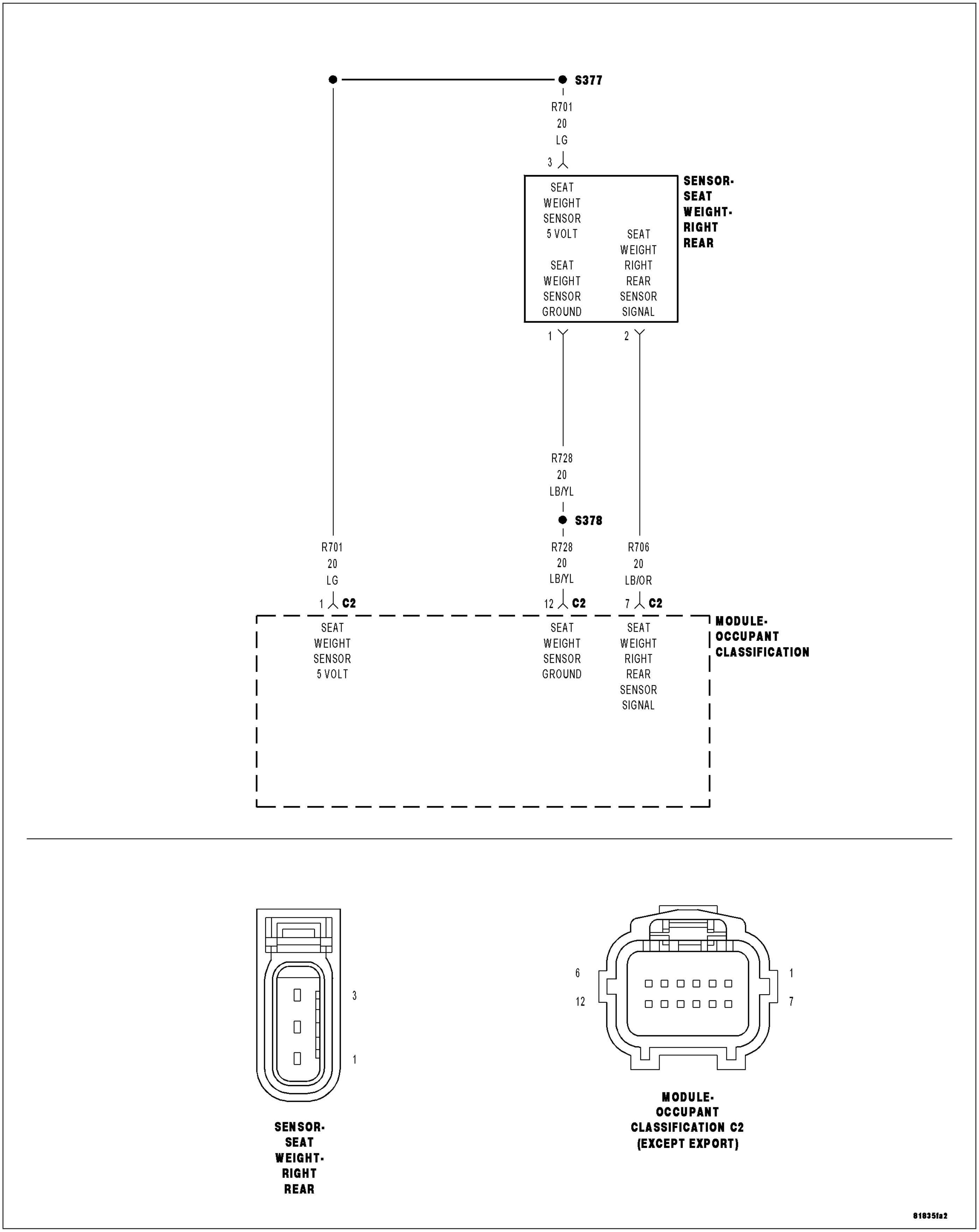
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. Note that this DTC will remain active after the condition that set this fault is no longer present. Performing the Occupant Classification Module System Verification Test will change the status from active to stored if the condition that set the fault is no longer present.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
RIGHT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure that the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are tighten to torque specification. Refer to GROUP 23 for specification.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B89–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT

CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

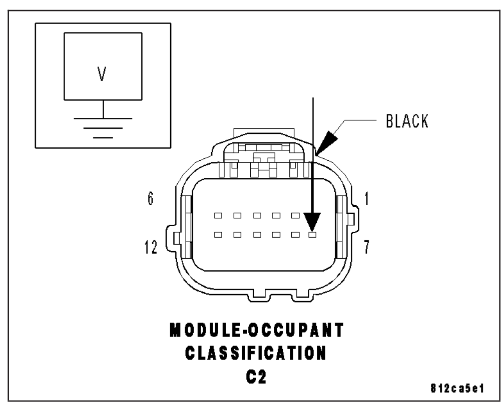
Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the OCM C2 connector.

Measure the voltage of the (R706) RT-RR Seat Weight Sensor Signal circuit.



Is the voltage above 0.2 volt?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 6

6. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Rear Seat Weight Sensor connector.

Measure the resistance between the (R706) RT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 7

7. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Perform AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chaffed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor for active codes while performing the following:

- Wiggle the wiring harness and connectors of the related airbag circuit.
- Continue the test until either a code becomes active or the problem area is isolated.

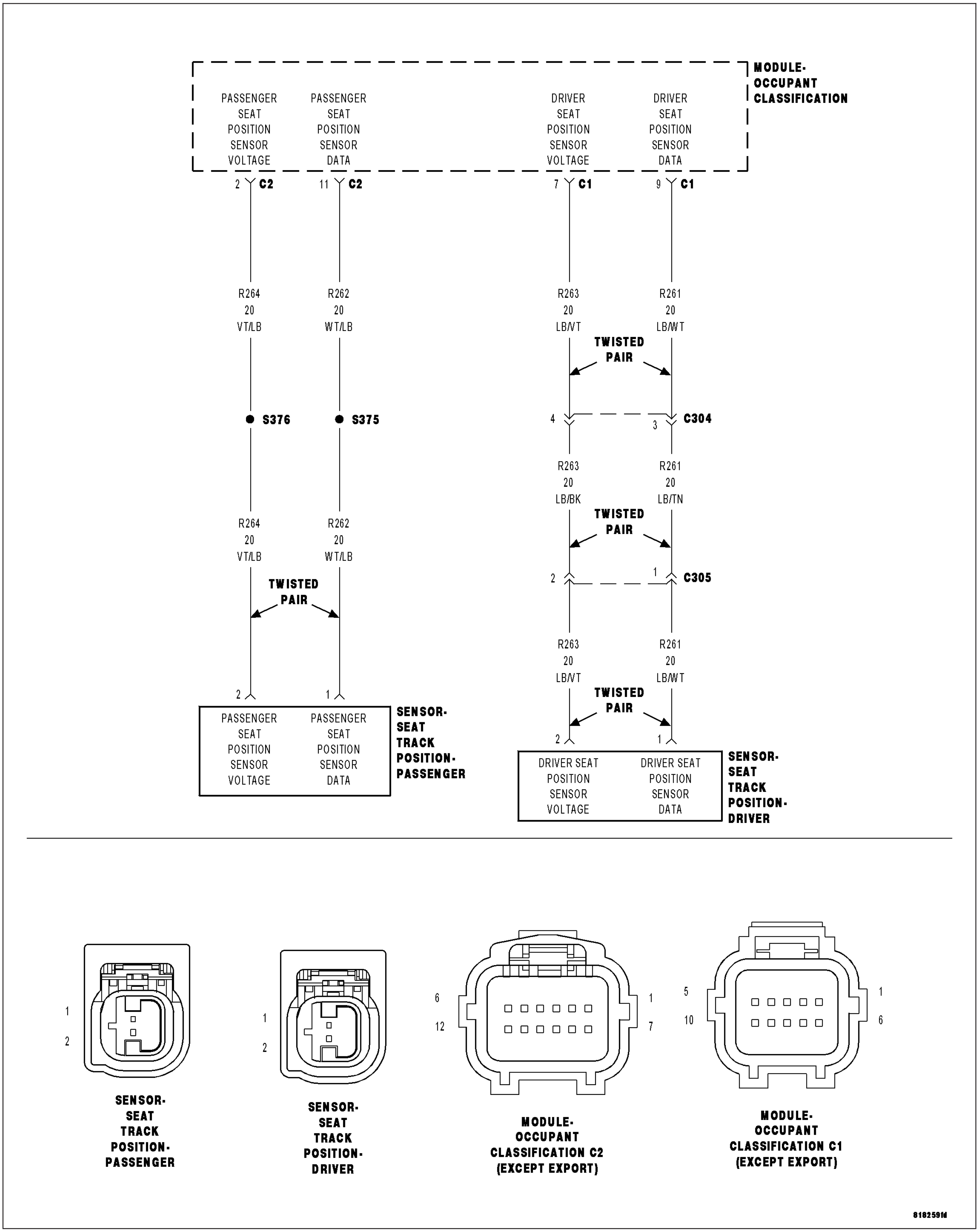
In the previous steps you have attempted to recreate the conditions responsible for setting the DTC in question / causing the intermittent condition.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is between 8 and 12 mA.

Possible Causes
DRIVER SEAT TRACK POSITION SENSOR (STPS)
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, BATTERY FAULTS, AND SEAT TRACK POSITION SENSOR CIRCUIT HIGH OR LOW FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, battery faults, or Seat Track Position Sensor Circuit High or Low faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> Go To 4

3. PERFORM SEAT TRACK POSITION SENSOR PERFORMANCE TEST

With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Cycle the driver seat to the full forward position and then to the full rearward position.

Return the driver seat to its approximate original position.

Wait two minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Replace the Driver Seat Track Position Sensor in accordance with the Service Information.

Perform the *OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING) If DTC B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE returns active, replace the OCM in accordance with the Service Information.

No >> Perform the *OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

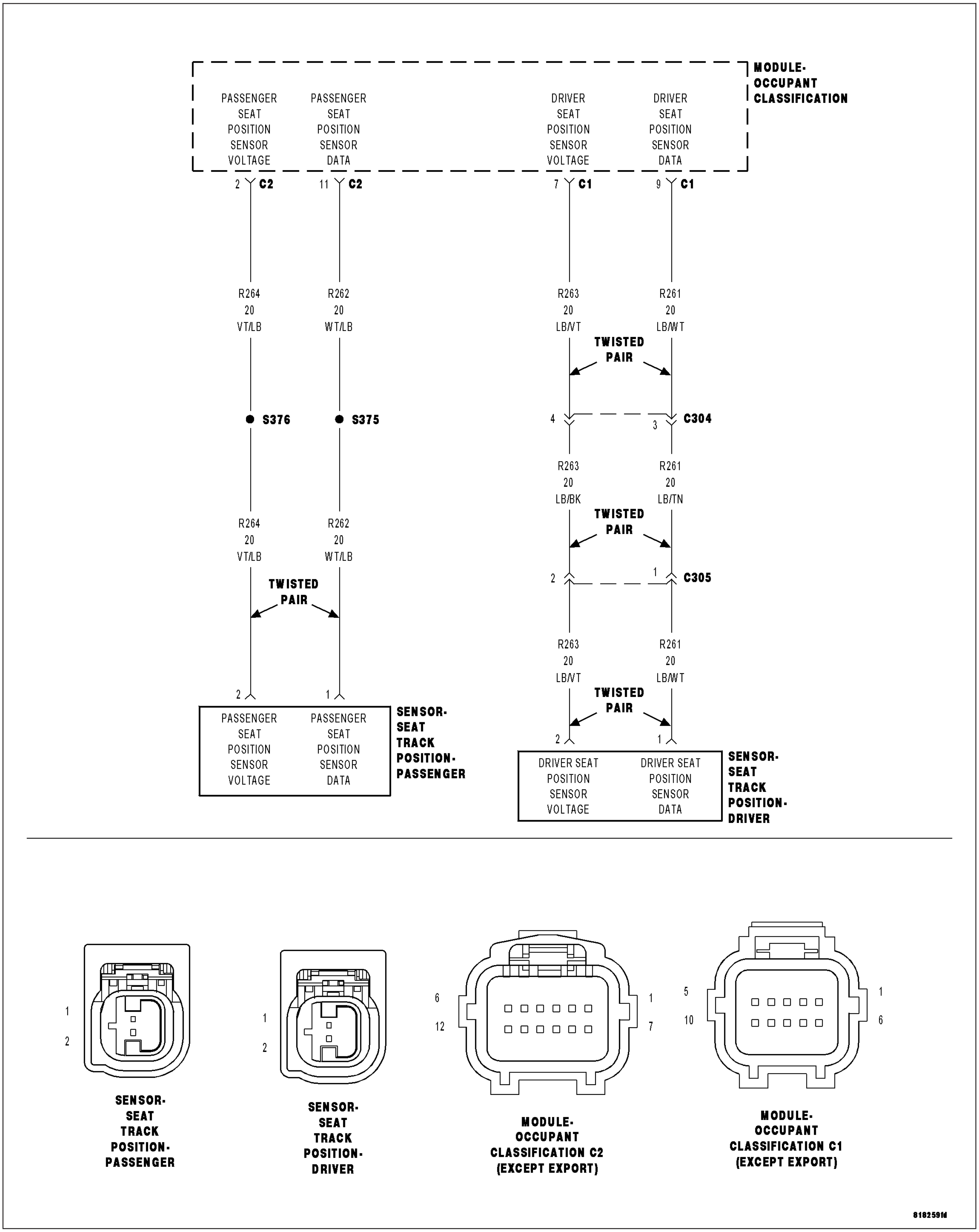
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor (STPS), the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than or equal to 0.3 ma. This DTC may set when the current is between 0.3 mA and 2.0 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO GROUND
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO GROUND
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT OPEN
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT OPEN
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 7

3. INSPECT DRIVER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 4

4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Driver Seat Harness is routed correctly.

Is the Driver Seat Harness routed correctly?

Yes >> Go To 5

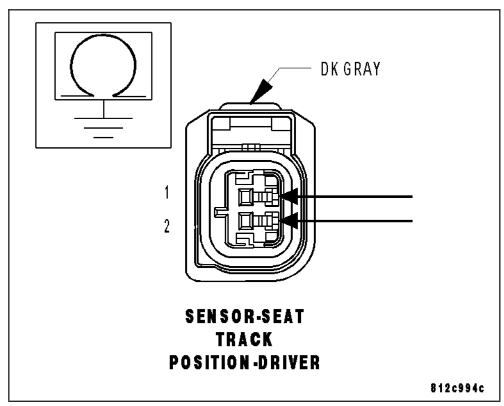
No >> Reroute the Driver Seat Harness as necessary.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

5. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT AND (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (R261) Seat Position Sensor Data-Driver circuit.

Measure the resistance between ground and the (R263) Seat Position Sensor Voltage-Driver circuit.



Is the resistance below 10k ohms on either circuit?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

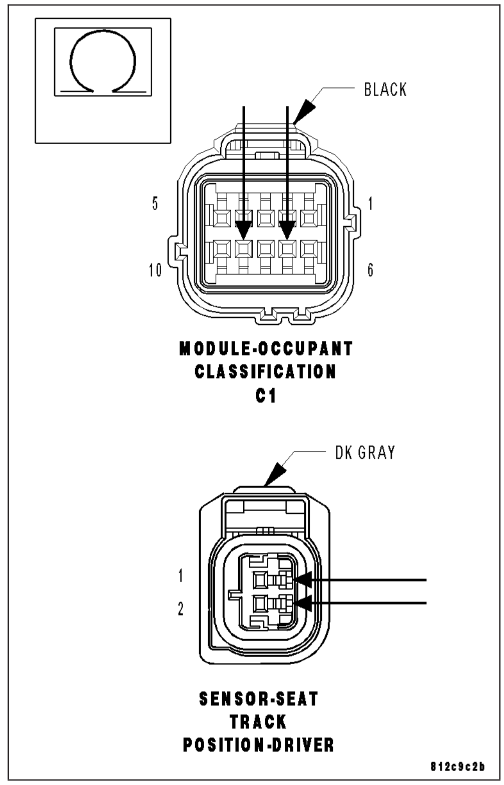
No >> Go To 6

6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT AND (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR AN OPEN

Disconnect the OCM C1 connector.

Measure the resistance of the (R261) Seat Position Sensor Data-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.

Measure the resistance of the (R263) Seat Position Sensor Voltage-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.



Is the resistance of either circuit above 5.0 ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the OCM in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

7. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

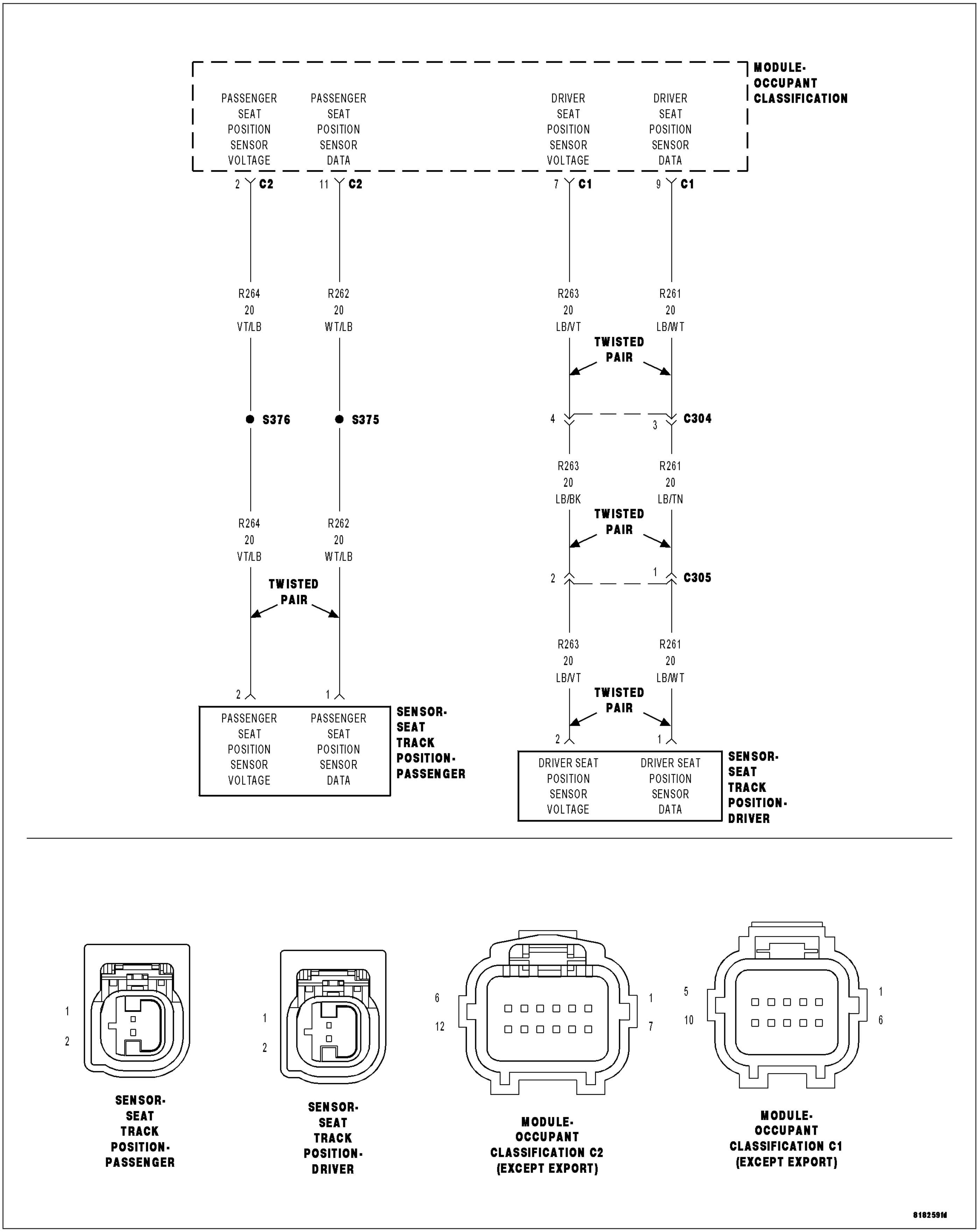
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than or equal to 20.5 mA. This DTC may set when the current is between 17 mA and 20.5 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO (R263) SEAT POSITION SENSOR VOLTAGE-DRVER CIRCUIT
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT DRIVER SEAT HARNESS WIRES AND CONNECTORS

With the scan tool, erase OCM DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 4

4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Driver Seat Harness is routed correctly.

Is the Driver Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Driver Seat Harness as necessary.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

5. CHECK FOR DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH WITH DRIVER SEAT TRACK POSITION SENSOR DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Driver Seat Track Position Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Wait two minutes, and then with the scan tool, read OCM DTCs.

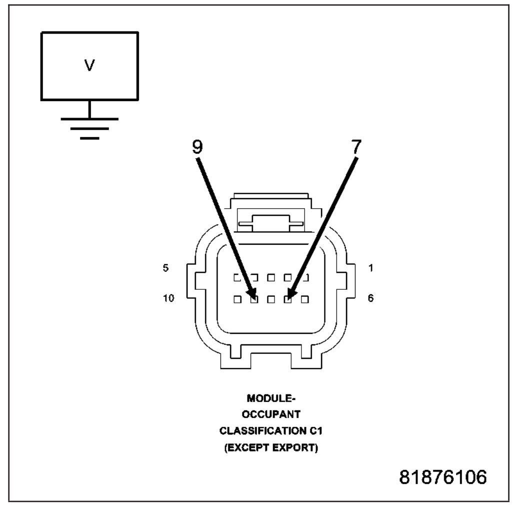
Does the scan tool display: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 6

No >> Replace the Driver Seat Track Position Sensor in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT AND (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO VOLTAGE



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R261) Seat Position Sensor Data-Driver circuit.

Measure the voltage of the (R263) Seat Position Sensor Voltage-Driver circuit.

Is the voltage above 0.2 volt on either circuit?

Yes >>

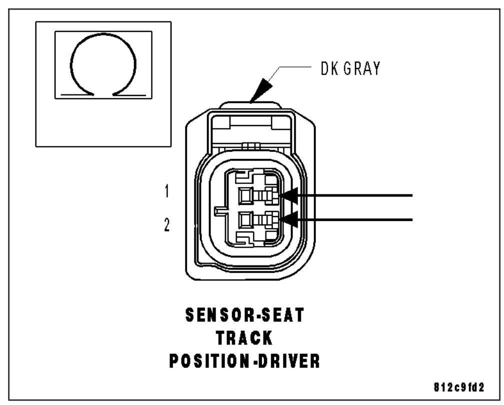
NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 7

7. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT FOR A SHORT TO (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Measure the resistance between the (R261) Seat Position Sensor Data-Driver circuit and the (R263) Seat Position Sensor Voltage-Driver circuit.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the OCM in accordance with the Service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

8. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.
Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

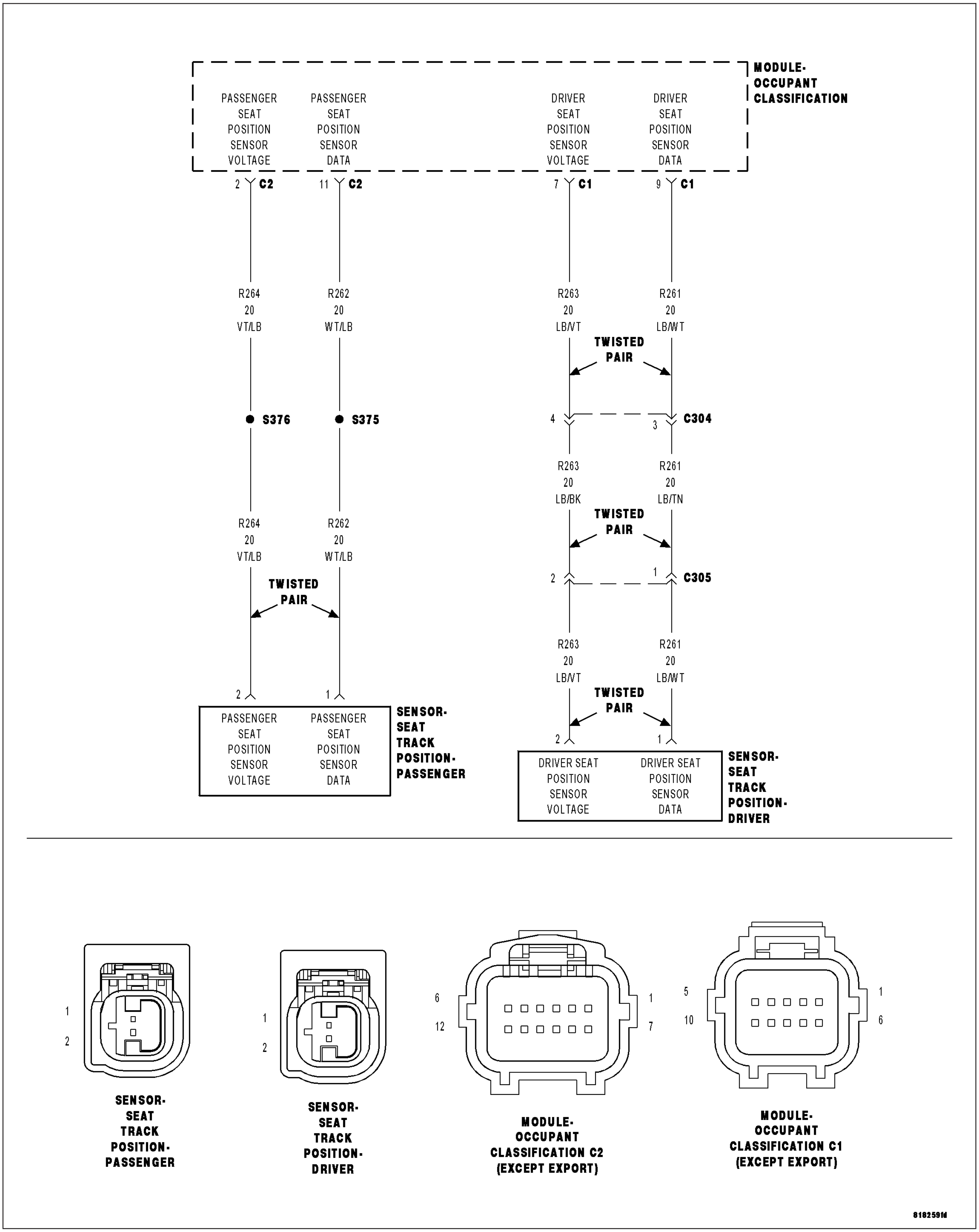
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on the OCM monitors the Seat Track Position Sensors (STPS) circuits.
- **Set Condition:**
  If the module detects current on the Seat Track Position Sensors circuits and the module is not configured for STPS.

Possible Causes
SEAT TRACK POSITION SENSORS (STPS)
WIRING
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH IS ACTIVE

With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Wait 2 minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display active: B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH?

Yes >> Go To 3

No >> Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

3. VERIFY WIRING

Turn the ignition off.

Inspect the driver and passenger seat wiring for Seat Position Sensors.

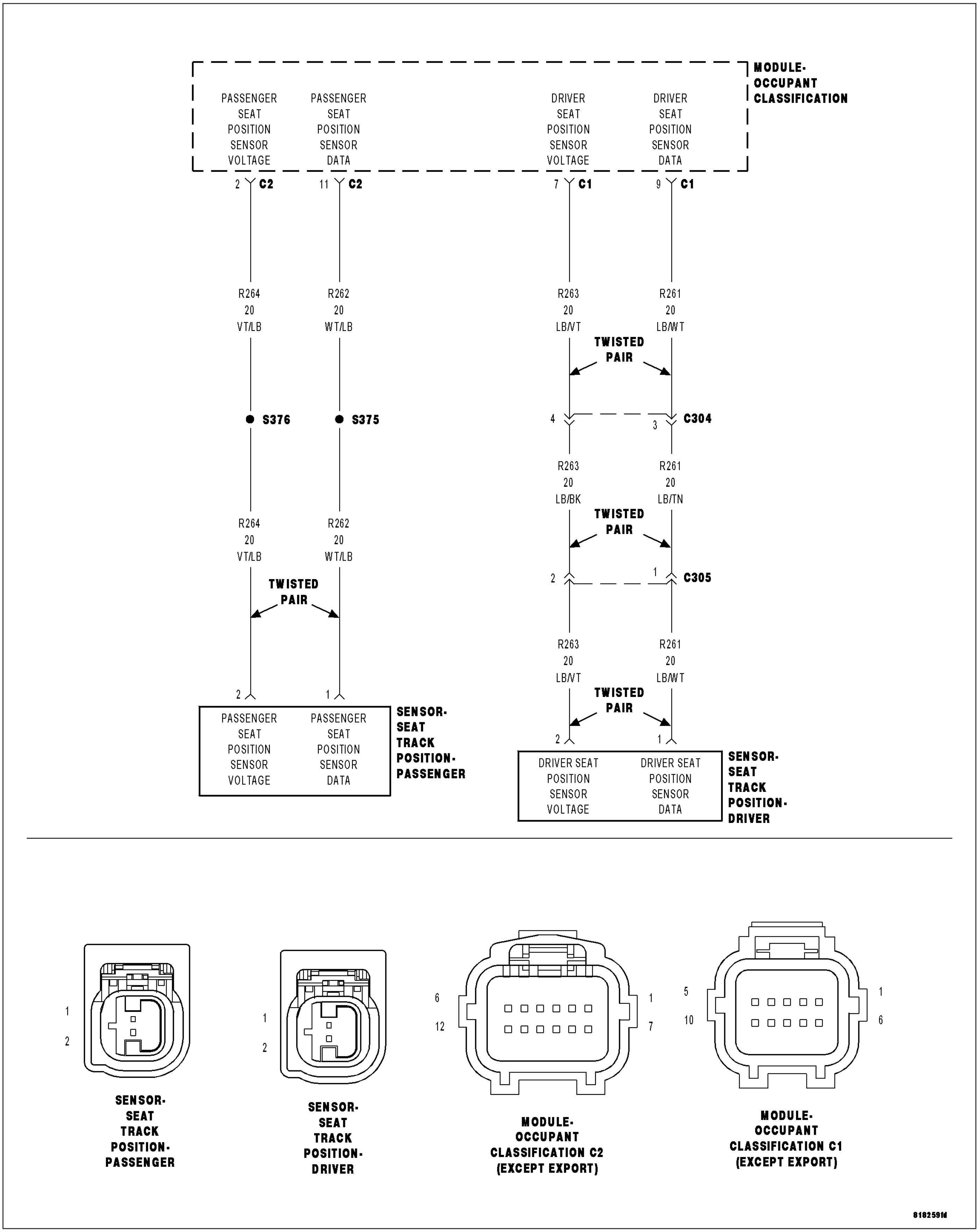
Are Seat Position Sensor(s) present?

Yes >> Replace the OCM in accordance with the Service Information.

Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is between 8 and 12 mA.

Possible Causes
DRIVER SEAT TRACK POSITION SENSOR (STPS)
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, BATTERY FAULTS, AND SEAT TRACK POSITION SENSOR CIRCUIT HIGH OR LOW FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, battery faults, or Seat Track Position Sensor Circuit High or Low faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> Go To 4

3. PERFORM SEAT TRACK POSITION SENSOR PERFORMANCE TEST

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Cycle the passenger seat to the full forward position and then to the full rearward position.

Return the passenger seat to its approximate original position.

Wait two minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display active: B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Replace the Passenger Seat Track Position Sensor in accordance with the Service Information.

Perform the *OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING) If DTC B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE returns active, replace the OCM in accordance with the Service Information.

No >> Perform the *OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

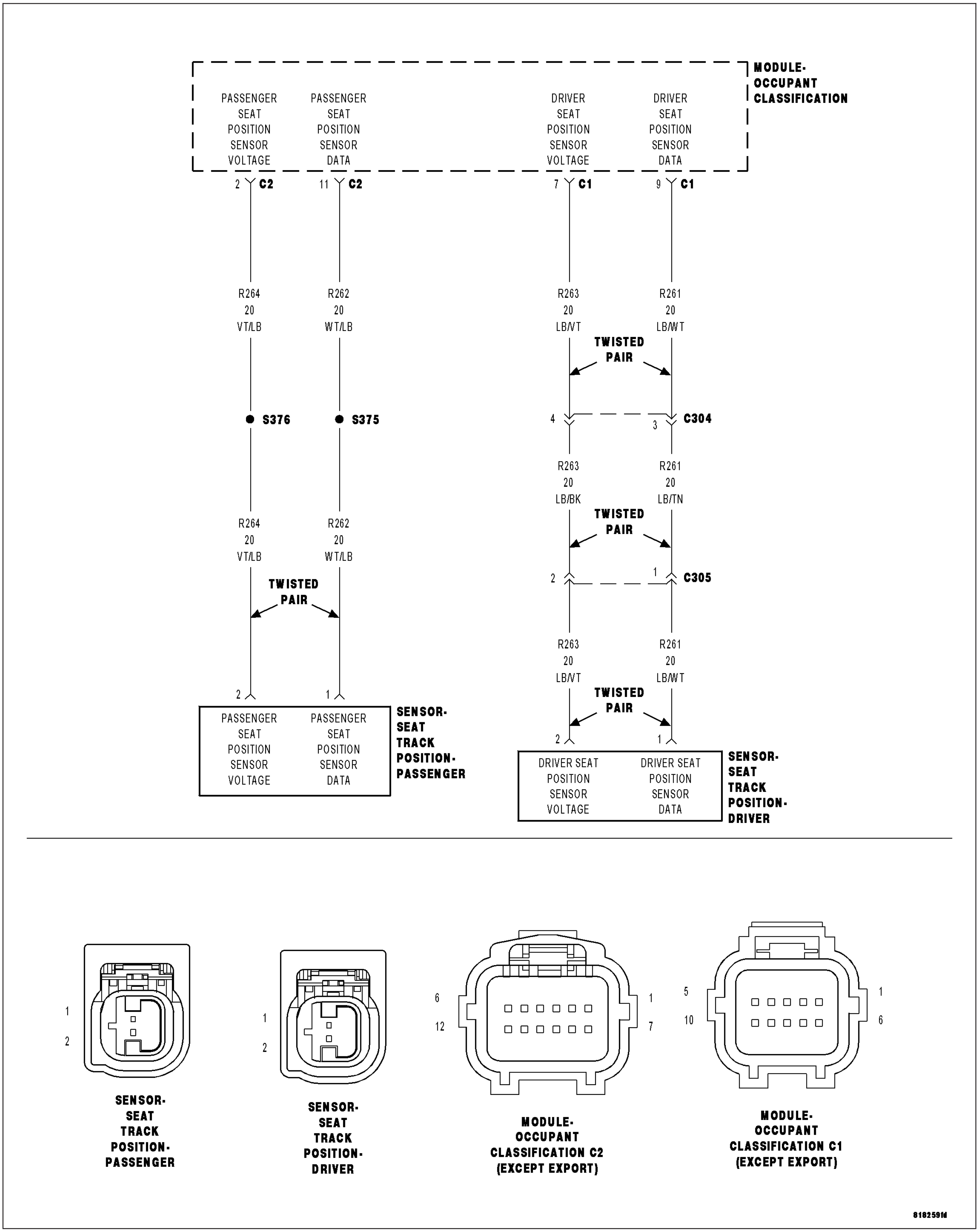
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor (STPS), the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than or equal to 0.3 ma. This DTC may set when the current is between 0.3 mA and 2.0 mA.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT SHORTED TO GROUND
(R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT SHORTED TO GROUND
(R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT OPEN
(R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT OPEN
PASSENGER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B8D-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8D-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 7

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

5. CHECK (R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT AND (R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (R262) Seat Position Sensor Data-Passenger circuit.

Measure the resistance between ground and the (R264) Seat Position Sensor Voltage-Passenger circuit.

Is the resistance below 10k ohms on either circuit?

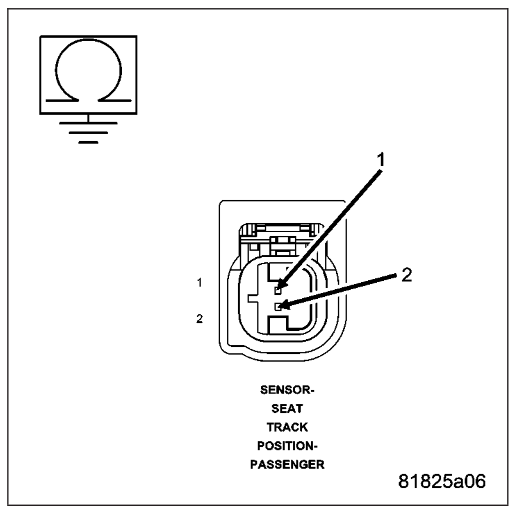
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 6

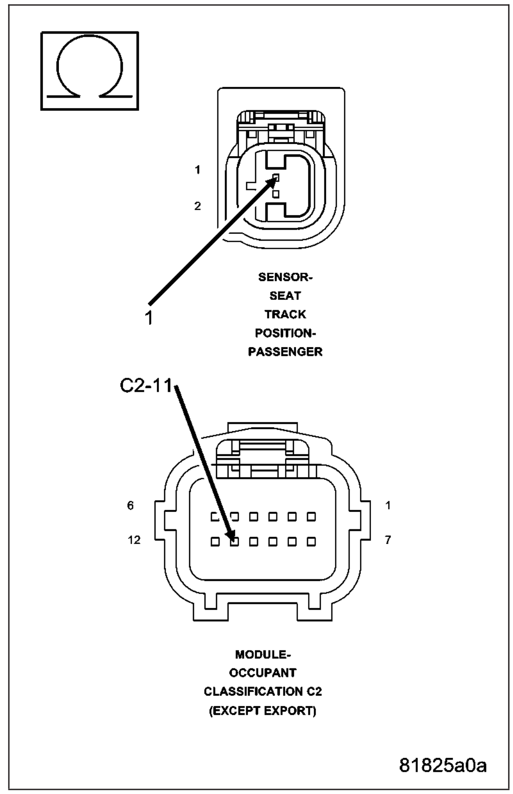


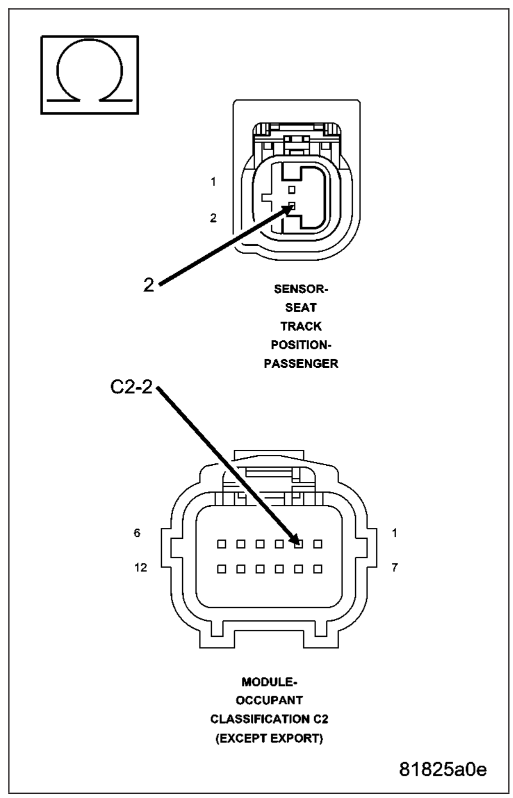
6. CHECK (R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT AND (R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT FOR AN OPEN

Disconnect the OCM C1 connector.

Measure the resistance of the (R262) Seat Position Sensor Data-Passenger circuit between the OCM C1 connector and the Passenger Seat Track Position Sensor connector.

Measure the resistance of the (R264) Seat Position Sensor Voltage-Passenger circuit between the OCM C1 connector and the Passenger Seat Track Position Sensor connector.





Is the resistance of either circuit above 5.0 ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the OCM in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

7. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

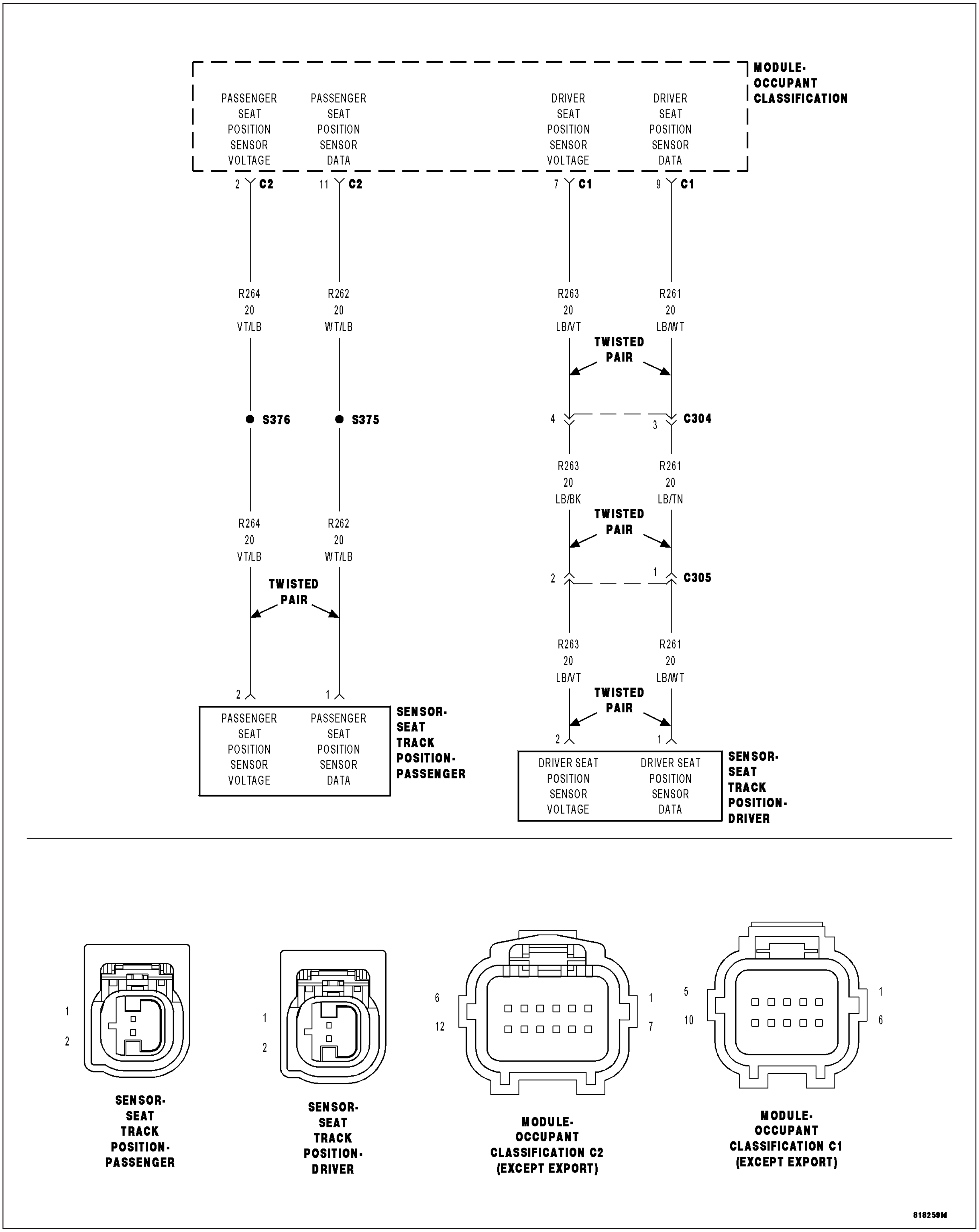
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor (STPS), the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than or equal to 20.5 mA. This DTC may set when the current is between 17 mA and 20.5 mA.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT SHORTED TO VOLTAGE
(R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT SHORTED TO VOLTAGE
(R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT SHORTED TO (R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT
PASSENGER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1B8E-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B8E-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

With the scan tool, erase OCM DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

Perform OCM VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

5. CHECK FOR DTC B1B8E-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH WITH PASSENGER SEAT TRACK POSITION SENSOR DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Passenger Seat Track Position Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Wait two minutes, and then with the scan tool, read OCM DTCs.

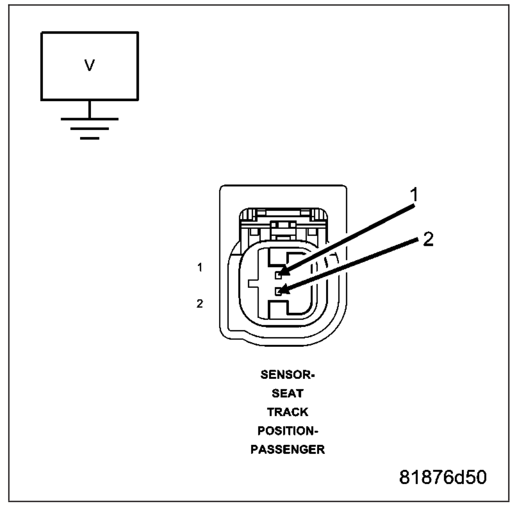
Does the scan tool display: B1B8E-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 6

No >> Replace the Passenger Seat Track Position Sensor in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

6. CHECK (R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT AND (R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT FOR A SHORT TO VOLTAGE



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R262) Seat Position Sensor Data-Passenger circuit.

Measure the voltage of the (R264) Seat Position Sensor Voltage-Passenger circuit.

Is the voltage above 0.2 volt on either circuit?

Yes >>

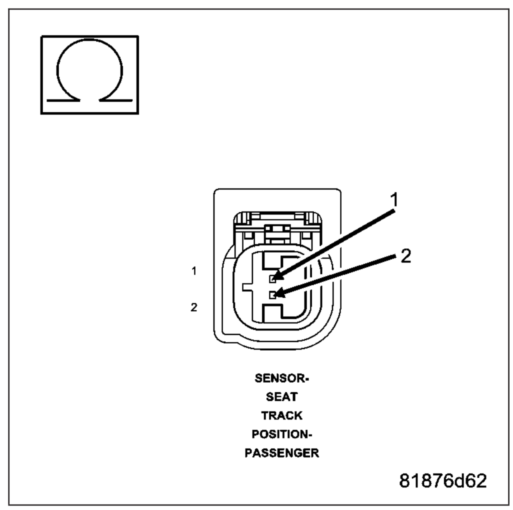
NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 7

7. CHECK (R262) SEAT POSITION SENSOR DATA-PASSENGER CIRCUIT FOR A SHORT TO (R264) SEAT POSITION SENSOR VOLTAGE-PASSENGER CIRCUIT



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Measure the resistance between the (R262) Seat Position Sensor Data-Passenger circuit and the (R264) Seat Position Sensor Voltage-Passenger circuit.

Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the OCM in accordance with the Service information.

Perform the OCM VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

8. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

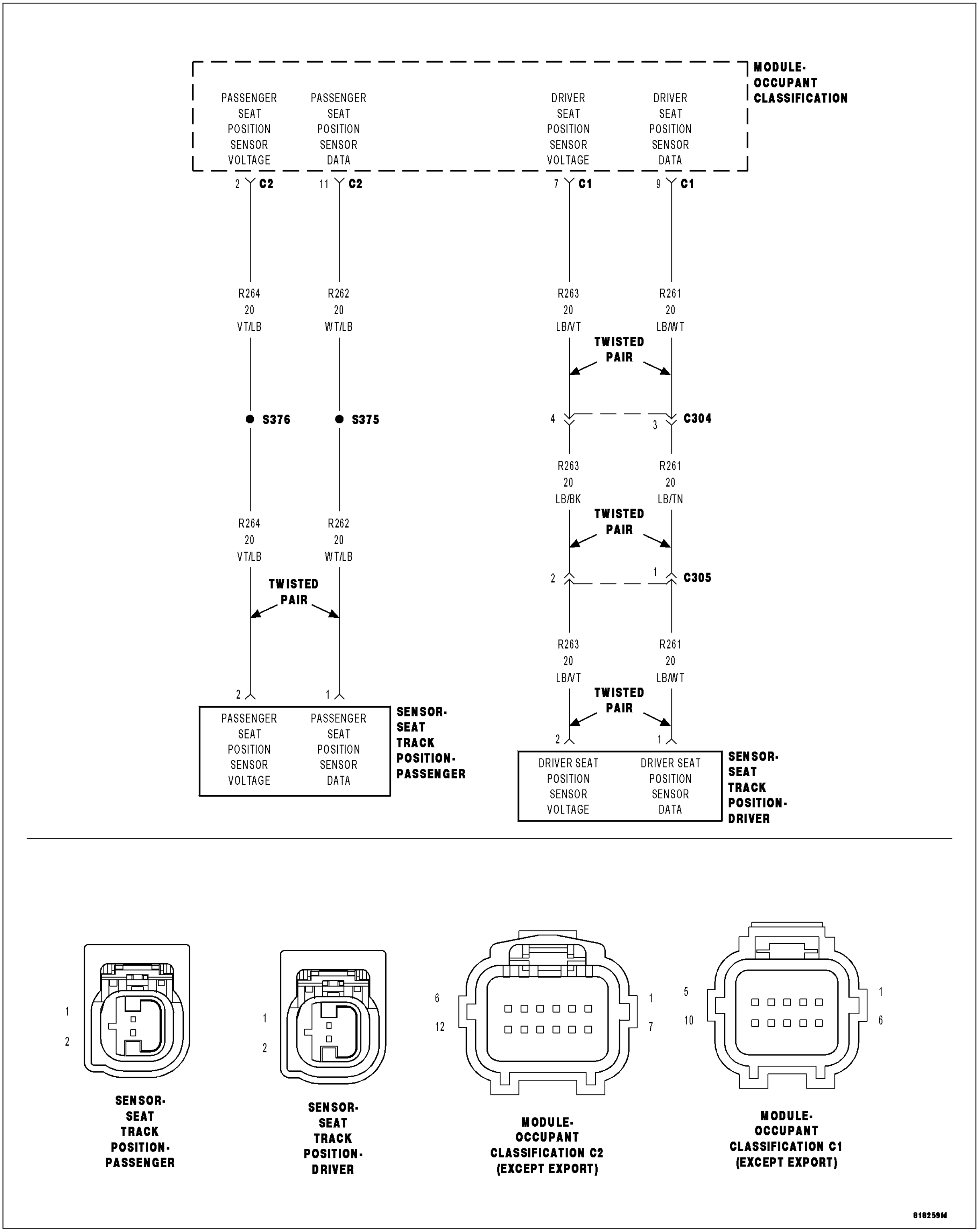
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on the OCM monitors the Seat Track Position Sensors (STPS) circuits.
- **Set Condition:**
  If the module detects current on the Seat Track Position Sensors circuits and the module is not configured for STPS.

Possible Causes
SEAT TRACK POSITION SENSORS (STPS)
WIRING
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH IS ACTIVE

With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Wait 2 minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display active: B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH?

Yes >> Go To 3

No >> Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

3. VERIFY WIRING

Turn the ignition off.

Inspect the passenger seat wiring for Seat Position Sensors.

Are Seat Position Sensor(s) present?

Yes >> Replace the OCM in accordance with the Service Information.

Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

No >> Perform the *OCM VERIFICATION TEST-VER. 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

B1BA3-DRIVER SEAT TRACK POSITION SENSOR (OCM)

- **When Monitored:**
  With the ignition on and bus communication with the Occupant Classification Module (OCM).
- **Set Condition:**
  This ORC DTC will set if the Occupant Classification Module (OCM) sends a Driver Seat Track Sensor active DTC message to the ORC.

Possible Causes
ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE

Diagnostic Test

1. VERIFY ACTIVE OCM SEAT TRACK POSITION SENSOR DTC

With the scan tool, read the OCCUPANT CLASSIFICATION MODULE (OCM) active DTCs.

Does the scan tool display an active OCM Seat Track Position Sensor DTC ?

Yes >> Refer to the symptom list and perform the appropriate Diagnostic Trouble Code.

No >> Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B1BA4-PASSENGER SEAT TRACK POSITION SENSOR (OCM)

- **When Monitored:**
  With the ignition on and bus communication with the Occupant Classification Module (OCM).
- **Set Condition:**
  This ORC DTC will set if the Occupant Classification Module (OCM) sends a Passenger Seat Track Sensor DTC active message to the ORC.

Possible Causes
DTC ACTIVE IN OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY ACTIVE OCM SEAT TRACK POSITION SENSOR DTC

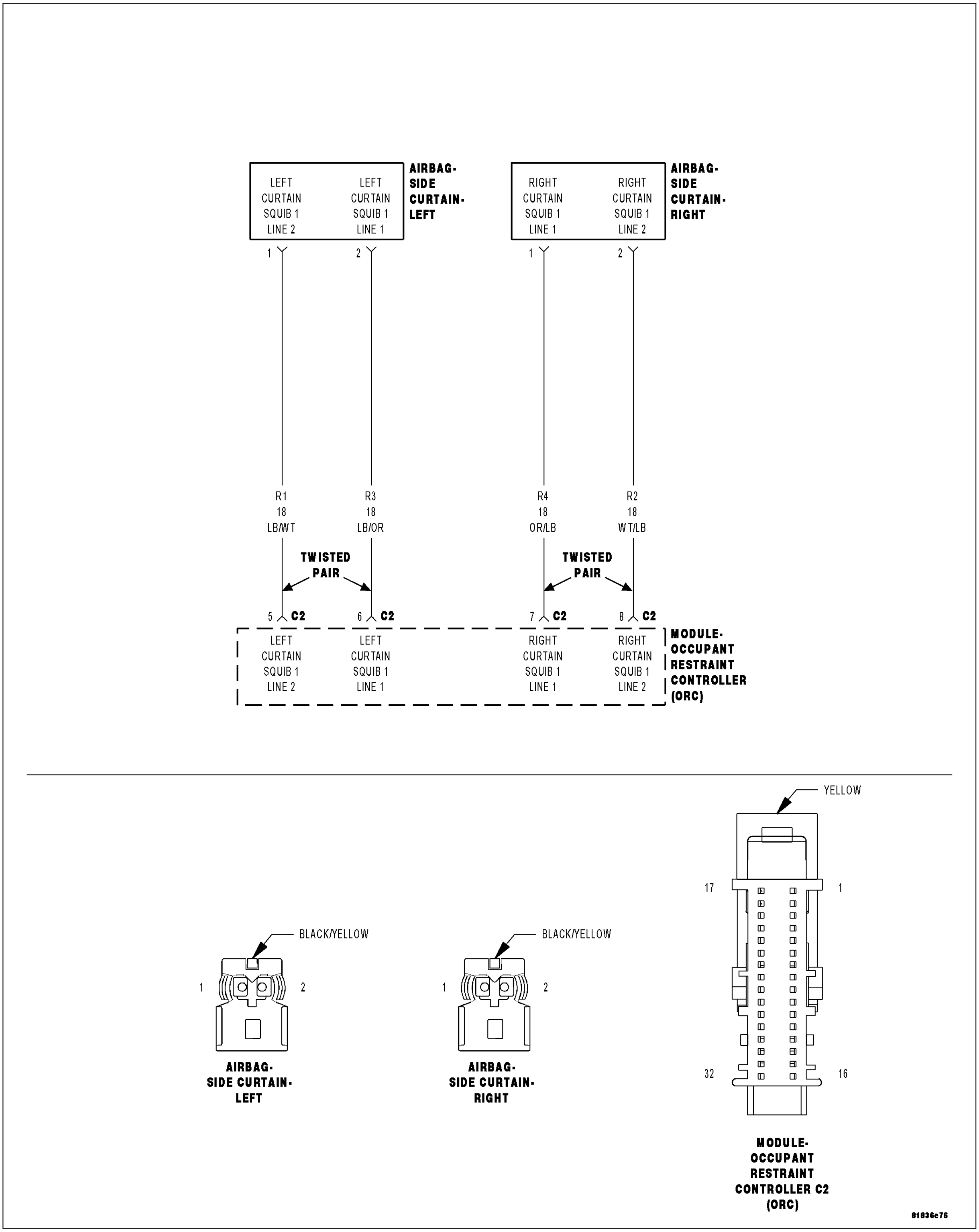
With the scan tool, read the OCCUPANT CLASSIFICATION MODULE (OCM) active DTCs.

Does the scan tool display an active OCM Seat Track Position Sensor DTC ?

Yes >> Refer to the symptom list and perform the appropriate Diagnostic Trouble Code.

No >> Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If an Occupant Restraint Controller (ORC) configured for vehicles without side airbags is installed in a vehicle with side airbags.

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1BA5 AIRBAG SQUIB CONFIGURATION MISMATCH IS ACTIVE

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH?

Yes >> Go To 2

No >> Go To 5

2. VERIFY THAT VEHICLE IS EQUIPPED WITH OCCUPANT CLASSIFICATION SYSTEM (OCS)

Verify that the vehicle is equipped with a Occupant Classification System (OCS).

With the scan tool, select ECU View and check that the Occupant Classification Module (OCM) is active on the bus.

Is the vehicle equipped with an Occupant Classification System (OCS)?

Yes >> Go To 3

No >> Replace the ORC in accordance with Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. CHECK ORC PART NUMBER WITH SCAN TOOL

With the scan tool, select ECU View, select ORC, select ECU Details, and read the ORC part number.

Is the part number correct for the vehicle?

Yes >> Go To 4

No >> Replace the ORC in accordance with Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK VIN WITH SCAN TOOL

With the scan tool, read the VIN.

Is the correct VIN displayed?

Yes >> Replace the ORC in accordance with Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module (PCM) in accordance with Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

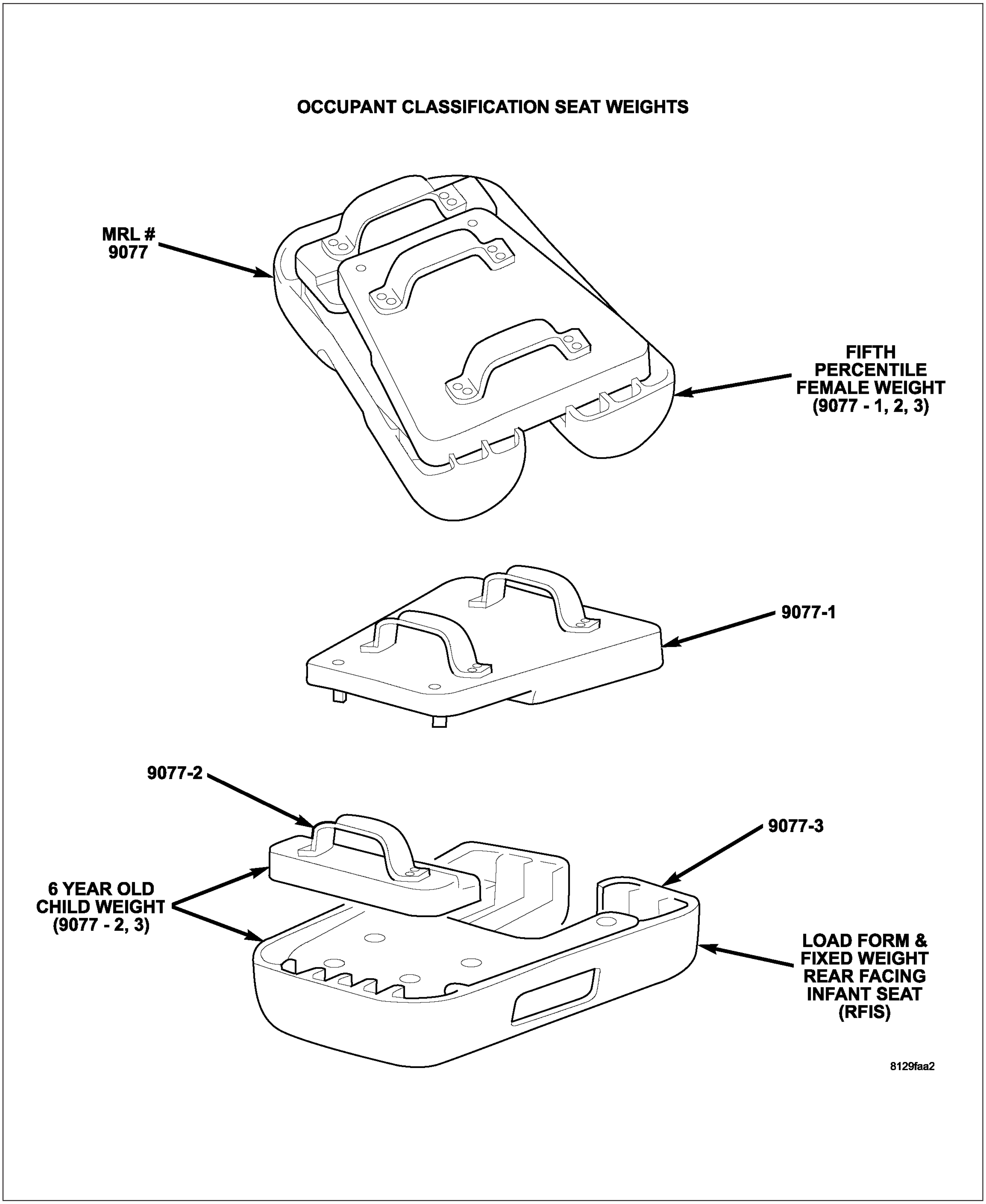
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BA6-OCCUPANT CLASSIFICATION UNDETERMINED

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Because other DTCs have made occupant detection impossible. This DTC will set in addition to all sensor and module DTCs and will be erased when the repairs are completed.

Refer to **B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED** for the diagnostic test procedure.

B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED



OCS SEAT WEIGHTS MRL #9077

- **When Monitored:**
  With the CAN ignition status as IGN_RUN, the module tries to detect potentially damaging events and monitors the CAN Bus for the Impact messages (crash event causing one or more airbag or pretensioner to deploy) or upon detecting an Offset Event (if equipped).
- **Set Condition:**
  This DTC will set if the module detects a potentially damaging event or the Impact messages from the CAN Bus input.

Possible Causes
B1BA7-OCS VERIFICATION REQUIRED DTC ACTIVE

Diagnostic Test

1. CHECK FOR OCCUPANT CLASSIFICATION MODULE (OCM) ACTIVE DTCs:

- ACTIVE INTERNAL FAULTS
- IGNITION FAULTS
- BATTERY FAULT
- SEAT WEIGHT SENSOR DTCs

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs listed above?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?

Yes >> Go To 3

No >> Go To 5

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?

Yes >> Go To 4

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

4. PERFORM SENSOR TORQUE TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA7–OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - Active DTCs Present

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

5. CHECK FOR ACTIVE DTC B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B1BB8-SRS WARNING INDICATOR STATUS MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After the Instrument Cluster bulb check is completed, the ORC compares the lamp request by the ORC (On or Off) and the Lamp On request by the Instrument Cluster (On or Off) Can bus messages. Each message is transmitted one time per second or when a change in the lap state occurs.
- **Set Condition:**
  If the lamp request by the ORC (On or Off), and the Lamp On by the Instrument Cluster (On or Off), messages do not match, this code will set.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER, INSTRUMENT CLUSTER MESSAGE MISMATCH
INSTRUMENT CLUSTER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC B1BB8-SRS WARNING INDICATOR STATUS MISMATCH

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1BB8-SRS WARNING INDICATOR STATUS MISMATCH?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR ACTIVE INSTRUMENT CLUSTER DTCs

With the scan tool, read Instrument Cluster DTCs.

Does the scan tool display and active Instrument Cluster DTCs?

Yes >> Refer to symptom list for problems related to the Instrument Cluster.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE ORC AND INSTRUMENT CLUSTER FOR LAMP STATUS

With the scan tool view the Instrument Cluster Data Display.

Cycle the ignition key and observe the SRS Indicator Lamp Request status (Set/Not Set) during the Instrument Cluster bulb check.

With the scan tool view the ORC Data Display.

Select SRS Indicator Lamp Status from Bussed Inputs and sect SRS Indicator Lamp request from the Bussed Outputs.

Cycle the ignition key and observe the Status of each during the Instrument Cluster bulb check.

Did the Data Display information match each other?

Yes >> Go To 4

No >> Replace the Instrument Cluster in accordance with the service information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

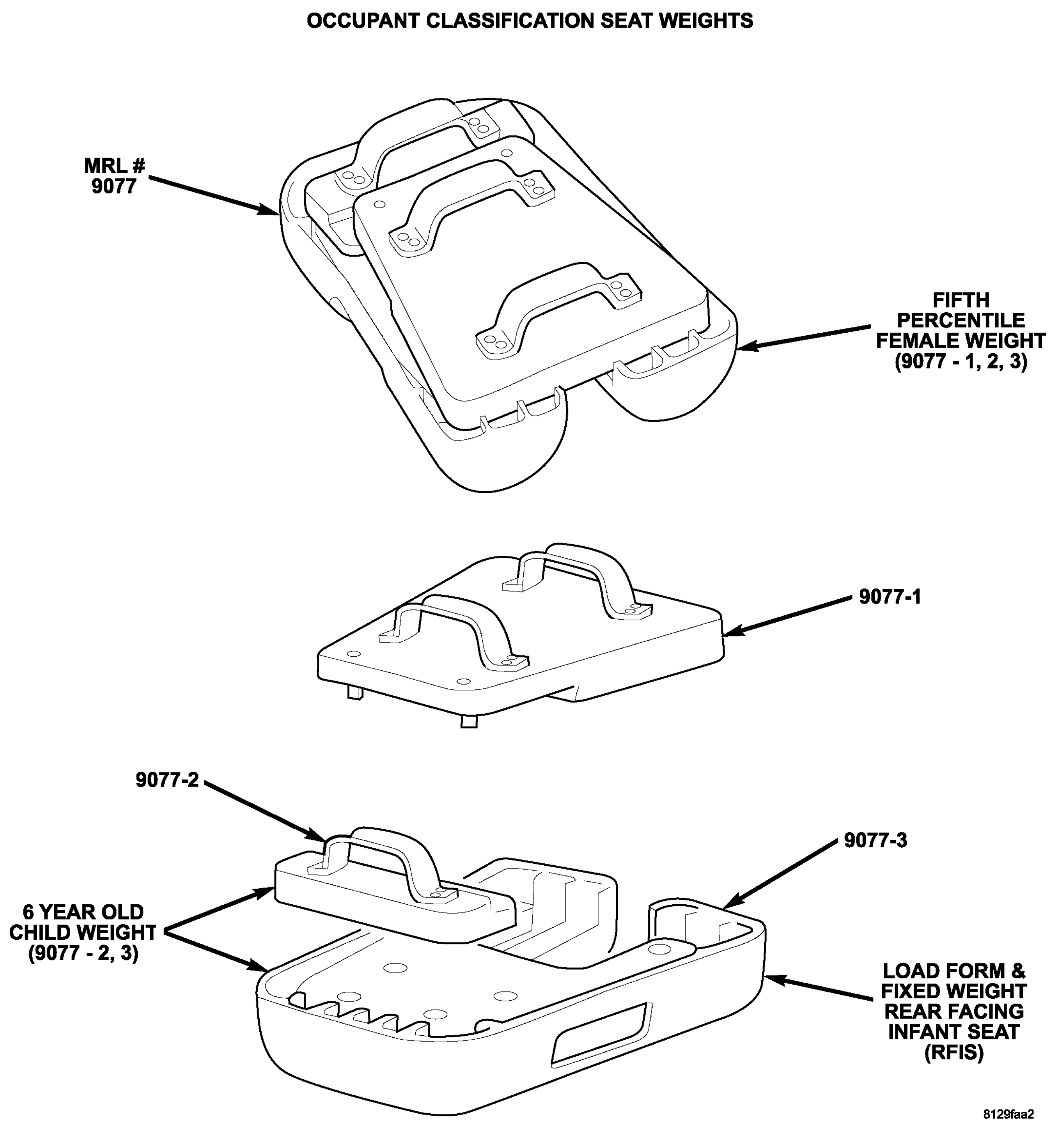
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED



OCS SEAT WEIGHTS MRL #9077

- **When Monitored:**
  While the CAN bus ignition status is IGN_RUN or signal not available.
- **Set Condition:**
  This DTC will set if the module has initiated a re-zero and did not successfully complete the system verification, a system verification routine has been aborted or a update option table from flash routine has been completed.

Diagnostic Test

1. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active DTCs?

Yes >> Go To 2

Yes >> But Other DTCs Present?
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present?
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST. Diagnostic Test

2. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

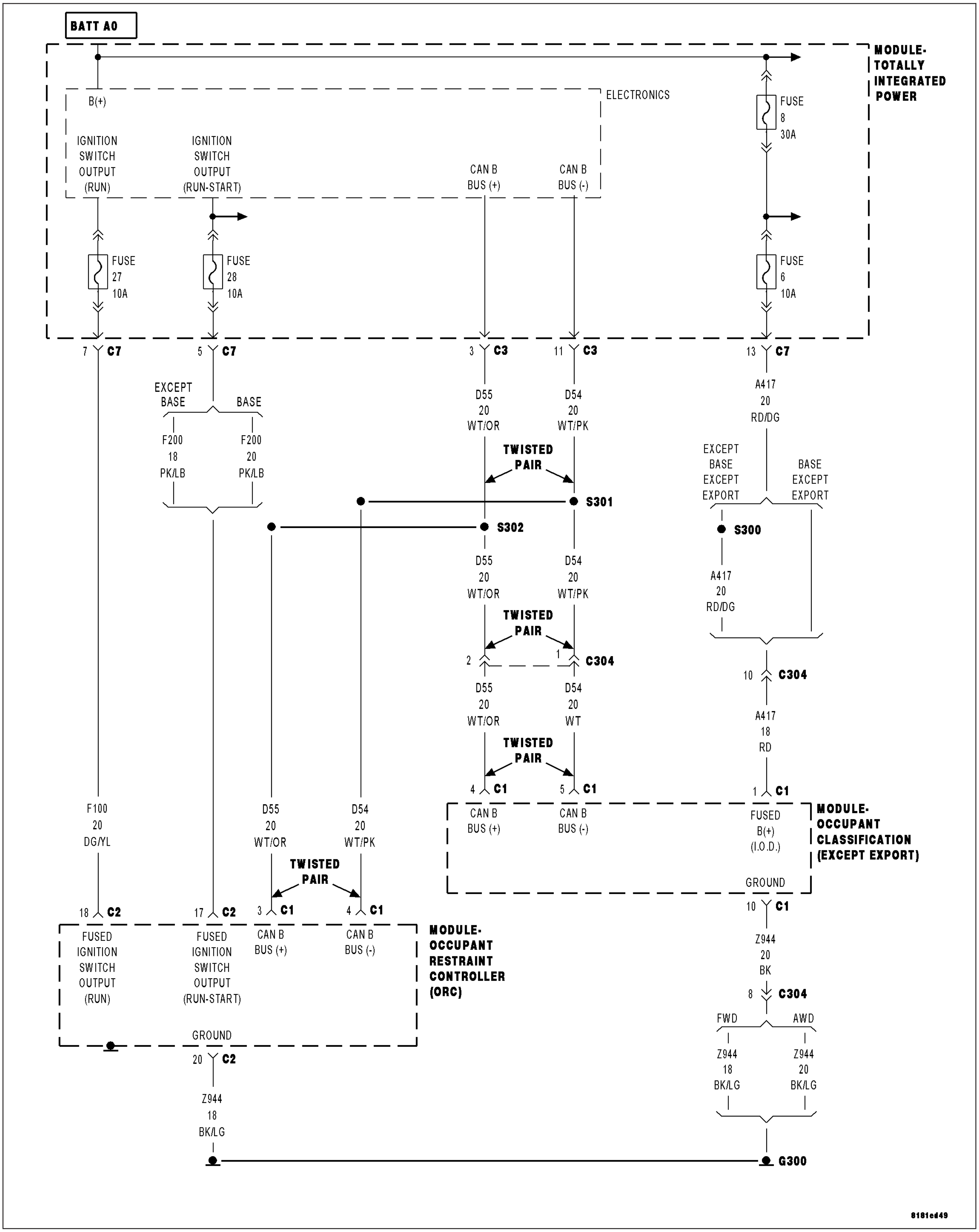
Does the scan tool display any active DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Yes >> But Other DTCs Present?
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present?
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B1BAA-OCCUPANT CLASSIFICATION MODULE CONFIGURATION MISMATCH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is IGN_RUN.
- **Set Condition:**
  This DTC will set if the ORC is not configured for Occupant Classification Module and the OCM is active on the CAN Bus. Note: Because all ORCs are originally configured for the OCM the ORC must learn the not equipped with OCM state from the TIPM.

Possible Causes
LOSS OF COMMUNICATION BETWEEN ORC AND TIPM
MISSING CAN BUS CONFIGURATION MESSAGE
CORRUPT CONFIGURATION MESSAGE
OCCUPANT RESTRAINT CONTROLLER (ORC)

1. CHECK FOR ACTIVE B1BAA-OCCUPANT CLASSIFICATION MODULE CONFIGURATION MISMATCH

With the scan tool, read Occupant Restraints Controller (ORC) DTCs.

Does the scan tool display an active: B1BAA-OCCUPANT CLASSIFICATION MODULE CONFIGURATION MISMATCH DTCs?

Yes >> Go To 2

No >> Go To 5

2. CHECKING FOR CORRUPT CONFIGURATION MESSAGE

With the scan tool, read Occupant Restraints Controller (ORC) DTCs.

Does the scan tool display an active U1414-IMPLAUSIBLE/MISSING ECU NETWORK CONFIGURATION DATA DTCs?

Yes >> Go To U1414-IMPLAUSIBLE/MISSING ECU NETWORK CONFIGURATION DATA DTC (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 3

3. CHECKING FOR LOSS OF CAN BUS CONFIGURATION MESSAGE

With the scan tool, read Occupant Restraints Controller (ORC) DTCs.

Does the scan tool display an active U1415-IMPLAUSIBLE/MISSING VEHICLE CONFIGURATION DATA DTCs?

Yes >> Go To U1415-IMPLAUSIBLE/MISSING VEHICLE CONFIGURATION DATA DTC (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 4

4. CHECKING FOR LOSS OF COMMUNICATION WITH THE TIPM

With the scan tool, read Occupant Restraints Controller (ORC) DTCs.

Does the scan tool display an active: U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TOTALLY INTEGRATED POWER MODULE)?

Yes >> Go To U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TOTALLY INTEGRATED POWER MODULE) (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Go To 6

5. VERIFYING STORED B1BAA-OCCUPANT CLASSIFICATION MODULE CONFIGURATION MISMATCH DTC

With the scan tool, record and erase all DTC's from the Occupant Restraint Controller.

Turn the ignition off, and wait 15 seconds, then turn the ignition on.

Wait one minute, and read active and stored codes.

Does the scan tool display an active or stored B1BAA-OCCUPANT CLASSIFICATION MODULE CONFIGURATION MISMATCH DTCs?

Yes >> For active DTC-Go To 2

Yes >> For stored-Go To 6

No >> Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

6. REPLACE THE ORC

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

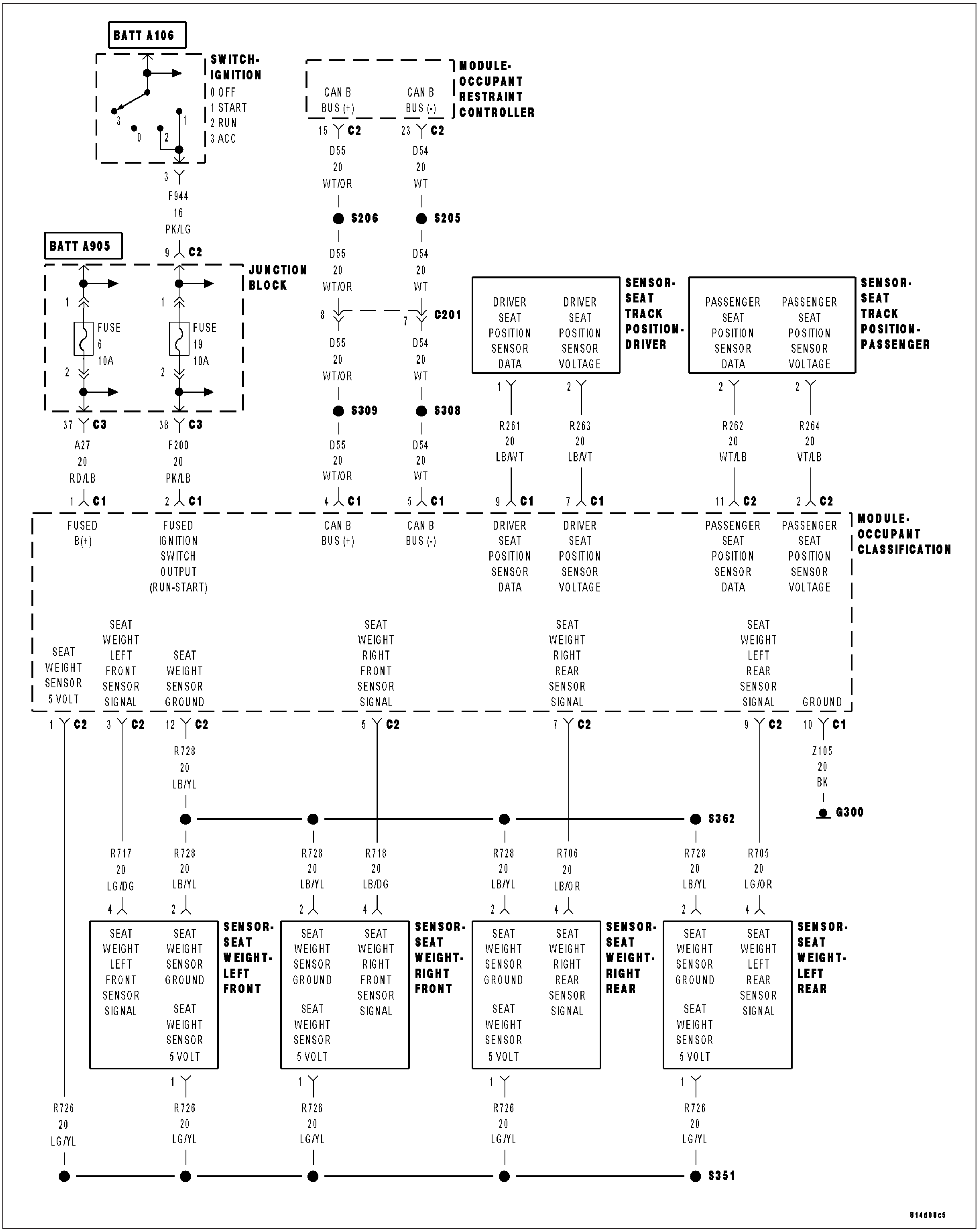
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Repair

Replace the ORC in accordance with the Service Information.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor supply.
- **Set Condition:**
  If the OCM detects that the sensor supply shorted. **NOTE: A shorted supply circuit will cause a ’NO RESPONSE FROM OCM” condition.**

Possible Causes
OCS SUPPLY CIRCUIT SHORTED
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY THAT B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT DTC IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT?

Yes >> Replace the OCM in accordance with the Service Information.
Perform the OCS VERIFICATION REQUIRED procedure.

No >> Go To 2

2. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> Go To 3

3. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.
Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

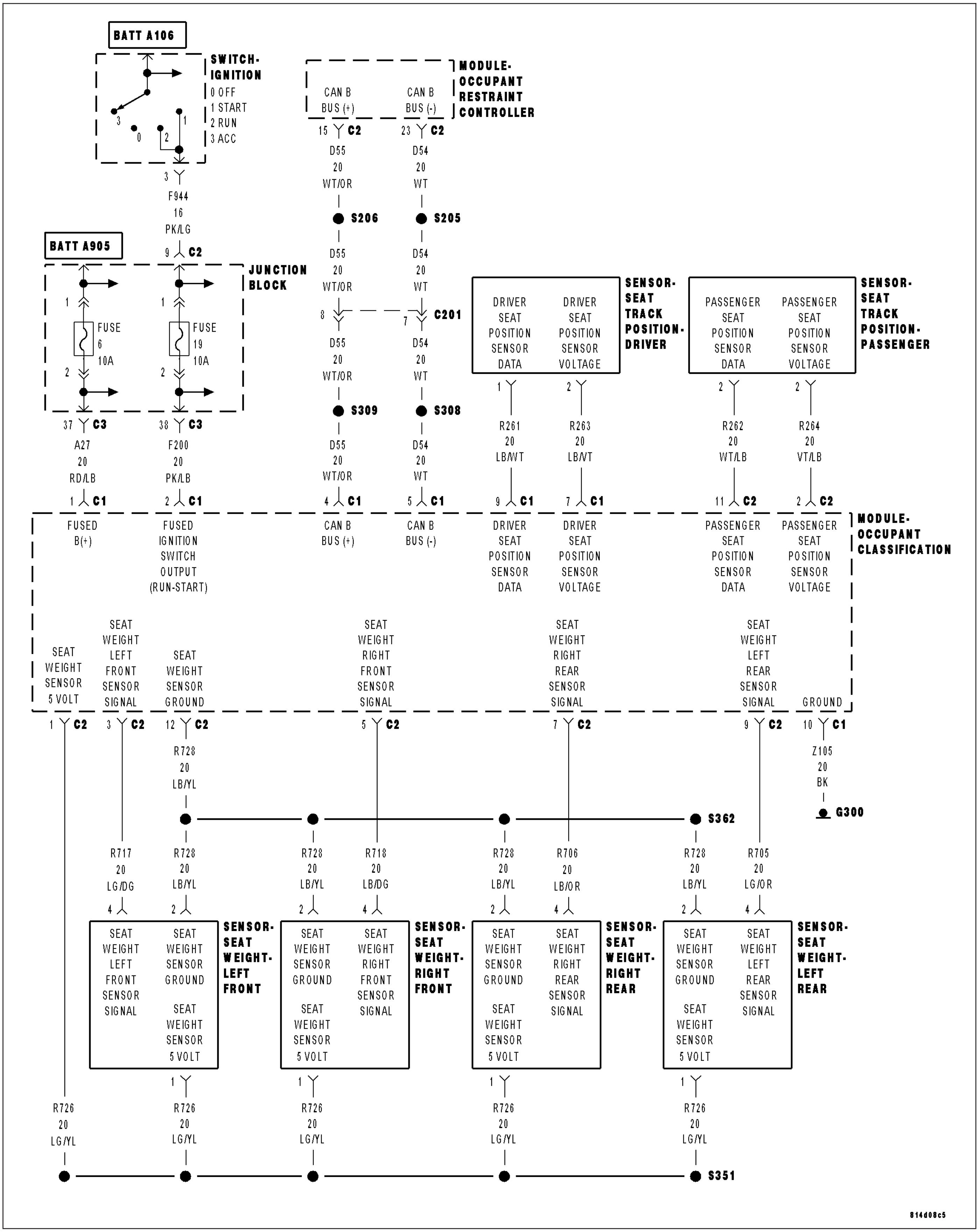
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN.
- **Set Condition:**
  If the OCM detects any two sensors voltages below 20 mV for 10 minutes while any other sensor is greater than 40 mV. Note: 1 A/D count is equal to 5 mV.
- **NOTE: A shorted supply circuit will cause a “NO RESPONSE FROM OCM” condition.**

Possible Causes
OCS SENSOR CIRCUITS SHORTED TOGETHER
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY THAT B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER DTC IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER ?

Yes >> Replace the OCM in accordance with the Service Information.
Perform the OCS VERIFICATION REQUIRED procedure.

No >> Go To 2

2. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> Go To 3

3. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

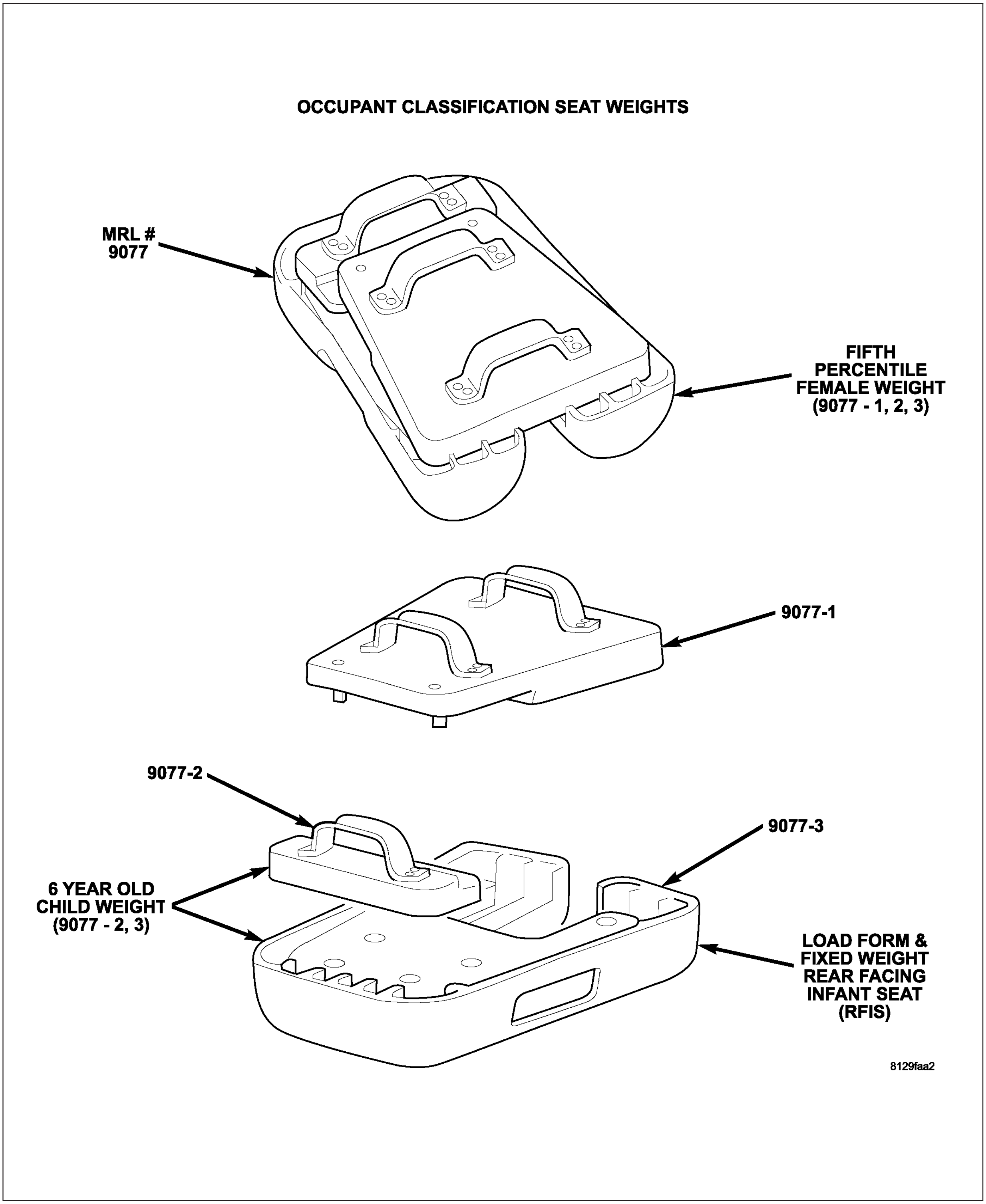
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1BBC-OCS NEGATIVE SYSTEM WEIGHT



- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects a seat weight sensor input with the total seat weight below -6.5 kg +/- 1kg.

Possible Causes
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OBJECT UNDER SEAT OR REAR SEAT FOLDED DOWN AND RESTING AGAINST PASSENGER SEAT
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE OCM DTCs

- ACTIVE INTERNAL DTC
- IGNITION DTC
- BATTERY DTC
- SEAT WEIGHT SENSOR DTC

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs listed above?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. ACTIVE OR STORED DTC

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BBC-OCS NEGATIVE SYSTEM WEIGHT?

Yes >> Go To 3

No >> Go To 5

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA8-OCS NOT CALIBRATED DTC?

Yes >> Go To 4

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> But Other DTCs Present? Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present? Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

4. VERIFY SEAT WEIGHT SENSOR TORQUE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA8-OCS NOT CALIBRATED DTC?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> But Other DTCs Present? Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> No Active DTCs Present? Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

5. STORED B1BBC-OCS NEGATIVE SYSTEM WEIGHT DTC

With the scan tool, record and erase all DTCs from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  If the Configuration Table is not programmed at the supplier or when the checksum is invalid.
- **Set Condition:**
  This DTC will set if the module was received unprogrammed from the supplier, the vehicle line was not identified correctly or if the flash procedure was not completed successfully

Possible Causes
NEW OCCUPANT CLASSIFICATION MODULE
INTERNAL CHECKSUM FAILURE

Diagnostic Test

1. MODULE CONFIGURATION

Does the scan tool display B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED?

Yes >> Perform the B1BA7–OCS VERIFICATION REQUIRED diagnostic procedure.

No >> Replace the Occupant Classification Module in accordance with the service information.
With the scan tool, perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B1BC7-DEPLOYMENT DATA RECORD FULL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

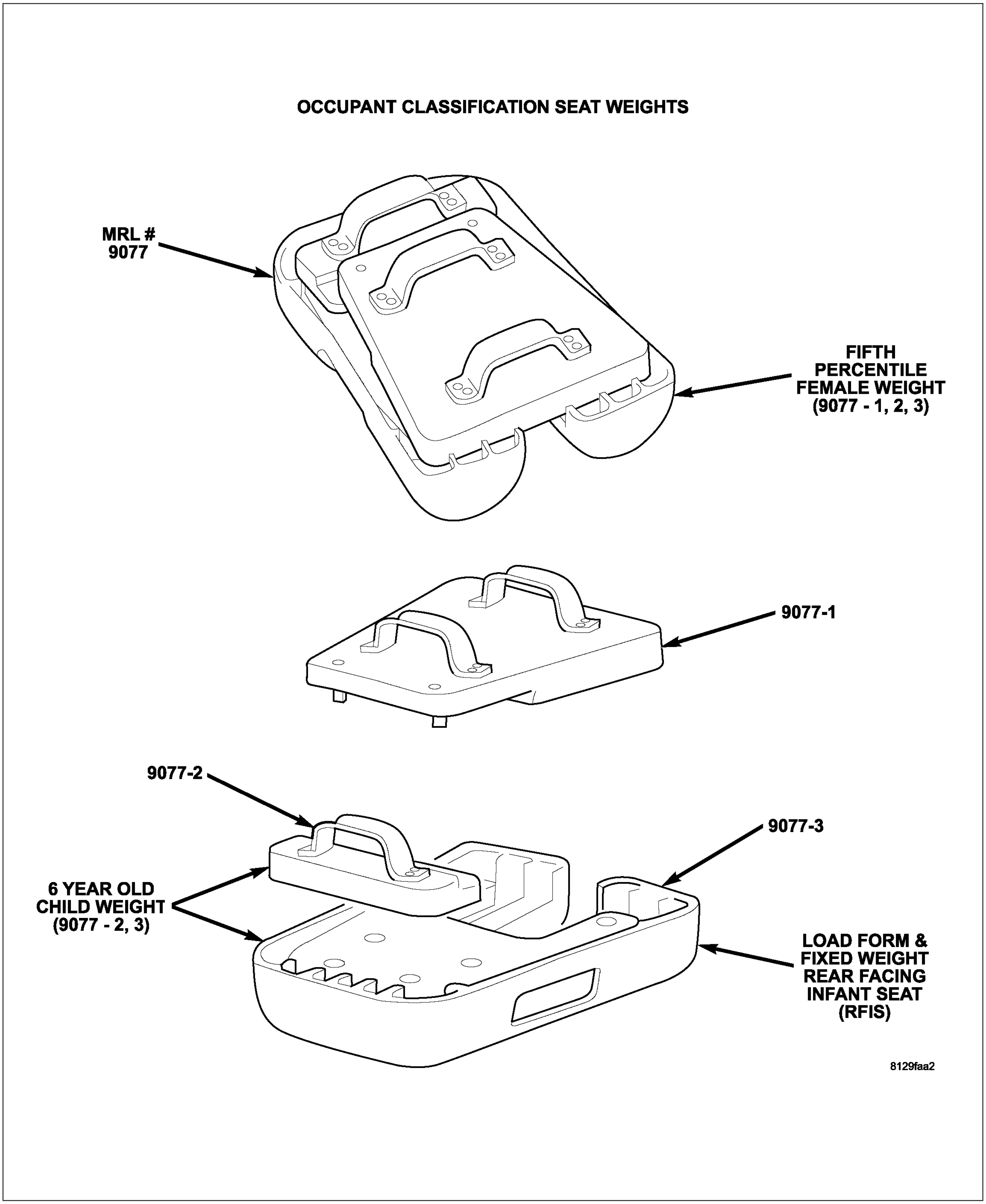
View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects the difference between 2 sensors is less than 3 A/D (15 mV) counts for 10 consecutive minutes while at least one sensor count is changing and greater than 8 A/D (40 mV) counts.

Possible Causes
OTHER SEAT WEIGHT SENSOR FAULTS ACTIVE IN THE OCM
PASSENGER SEAT HARNESS WIRES CHAFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
PASSENGER SEAT WEIGHT SENSORS
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, AND BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.
Turn the ignition on, then off, and then on again.

NOTE: This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.
With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE?

Yes >> Go To 3

No >> Go To 6

3. CHECK FOR OTHER ACTIVE PASSENGER SEAT WEIGHT SENSOR FAULTS IN THE OCM

With the scan tool, read OCM DTCs.

Does the scan tool display any other active Seat Weight Sensor DTCs?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 4

4. INSPECT PASSENGER SEAT HARNESS WIRES AND CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> Go To 5

5. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Yes >> Other DTCs ACTIVE? Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

6. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

NOTE: This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Perform the Occupant Classification Module System Verification Test in this Section. Erase all codes before returning vehicle to customer.

B1C2F-PASSENGER AIRBAG INDICATOR STATUS MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After the Switch Bank bulb check is completed, the ORC compares the lamp request by the ORC (Set/Not Set) and the (Set/Not Set) request by the Instrument Cluster Can bus messages. Each message is transmitted one time per second or when a change in the lamp state occurs.
- **Set Condition:**
  If the lamp request by the ORC (On or Off), and the Lamp On by the Instrument Cluster (On or Off), messages do not match, this code will set.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER, INSTRUMENT CLUSTER MESSAGE MISMATCH
INSTRUMENT CLUSTER (CCN)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC B1BB8-SRS WARNING INDICATOR STATUS MISMATCH

NOTE: Ensure the battery is fully charged.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1C2F-PASSENGER AIRBAG INDICATOR STATUS MISMATCH?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR ACTIVE INSTRUMENT CLUSTER DTCs

With the scan tool, read Instrument Cluster DTCs.

Does the scan tool display and active Instrument Cluster DTCs?

Yes >> Refer to symptom list for problems related to the Instrument Cluster.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE ORC AND INSTRUMENT CLUSTER FOR LAMP STATUS

With the scan tool view the Instrument Cluster (CCN) Display.

Cycle the ignition key and observe the Passenger Airbag Indicator Lamp (PADL) Request status (Set/Not Set) during the Instrument Cluster bulb check.

With the scan tool view the ORC Data Display.

Select Indicator Lamp Status from Bussed Inputs and select SRS Indicator Lamp request from the Bussed Outputs.

Cycle the ignition key and observe the Passenger Airbag Indicator Lamp (PADL) Status (Set/Not Set) during bulb check.

Did the Data Display information match each other?

Yes >> Go To 4

No >> Replace the Instrument Cluster in accordance with the service information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related Switch Bank circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

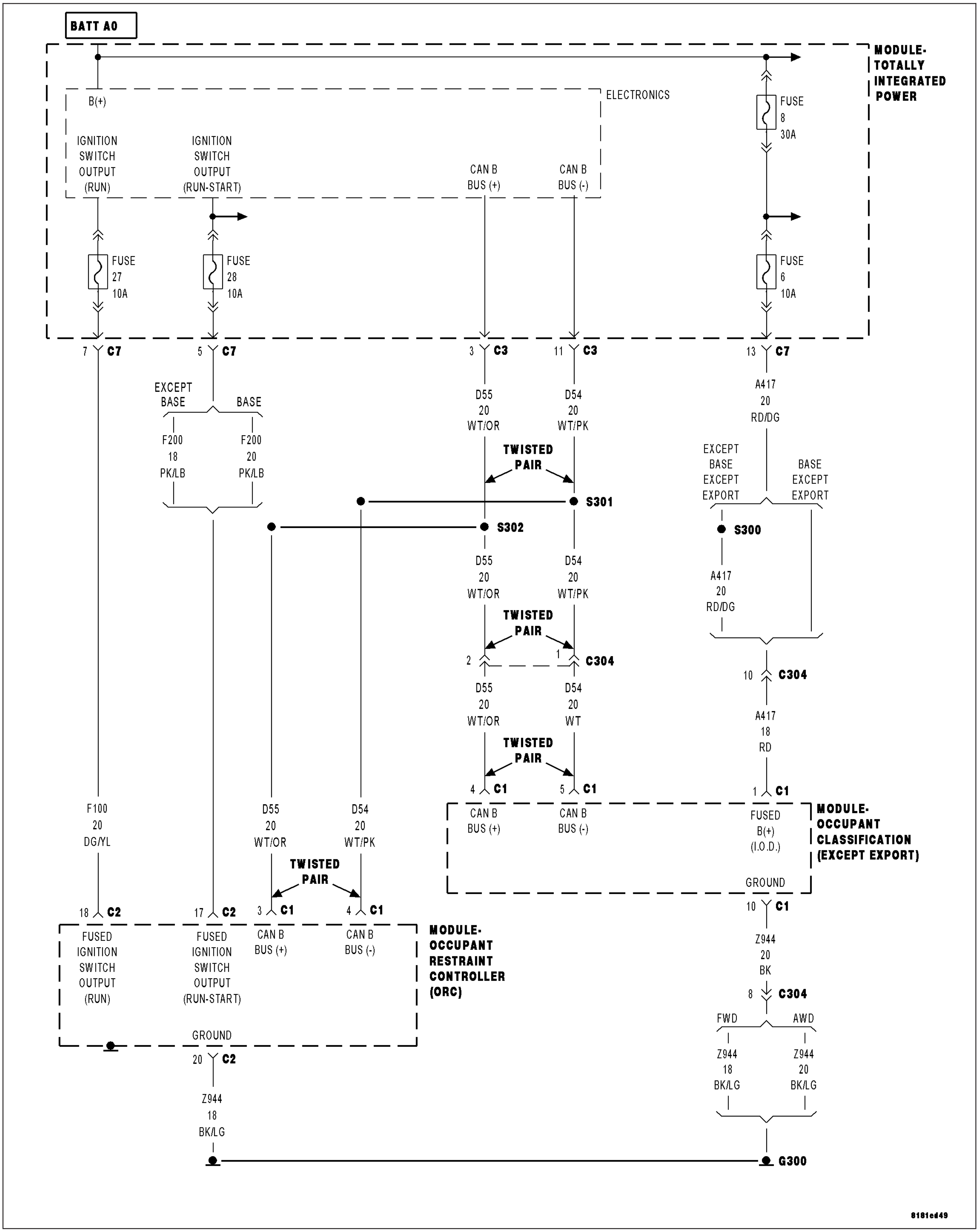
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B2101-IGNITION RUN/START INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus is RUN or SNA (signal not available) and the IOD status is "IN". The Occupant Classification Module (OCM) checks the Fused Ignition Switch Output (Run-Start) circuit voltage.
- **Set Condition:**
  With the ignition on, if voltage on the Fused Ignition Switch Output (Run-Start) circuit is equal to or below 6.25 ± 0.25 volts or within 60 seconds of turning the ignition off, if the Fused Ignition Switch Output (Run-Start) circuit is between 2.4 to 5.0 volts.

Possible Causes
ORC - (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
ORC - (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
ORC - (F944) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
ORC - OPEN TIPM FUSE 29
OCCUPANT RESTRAINT CONTROLLER (ORC)
OCS - (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
OCS - (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
OCS - OPEN JB FUSE 19
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY THAT DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW IS ACTIVE IN THE ORC.

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 2

2. CHECK FOR ACTIVE DTC B2101-IGNITION RUN/START INPUT CIRCUIT LOW IN OCM.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: B2101-IGNITION RUN/START INPUT CIRCUIT LOW?

Yes >> Go To 6

No >> Go To 11

3. INSPECT AIRBAG RUN-START FUSE (IPM 29)

Turn the ignition off.

Remove the Airbag Run-Start Fuse 29 from the IPM and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the Run/Start fuse open?

Yes >> Go To 4

No >> Go To 8

4. CHECK (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE

Measure the resistance of the (F20) Fused Ignition Switch Output (Run-Start) circuit between ground and the Airbag Run-Start fuse terminal (output side).

Is the resistance below 100.0 ohms?

Yes >> Go To 5

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace Airbag Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1.

5. CHECK (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC CONNECTORS DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the both ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the Load Tool ORC 8443-24 Adaptor to the ORC C2 connector.

Measure the resistance of the (F20) Fused Ignition Switch Output (Run-Start) circuit between 8443-24 adaptor and ground).

Is the resistance below 100.0 ohms?

Yes >> Repair the (F20) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.

Replace the Airbag Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the ORC in accordance with the Service Information.

Replace the Airbag Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

6. INSPECT AIRBAG RUN-START FUSE (JB 19)

Turn the ignition off.

Remove the Airbag Run-Start Fuse 19 from the Junction Block and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the Run/Start fuse open?

Yes >> Go To 7

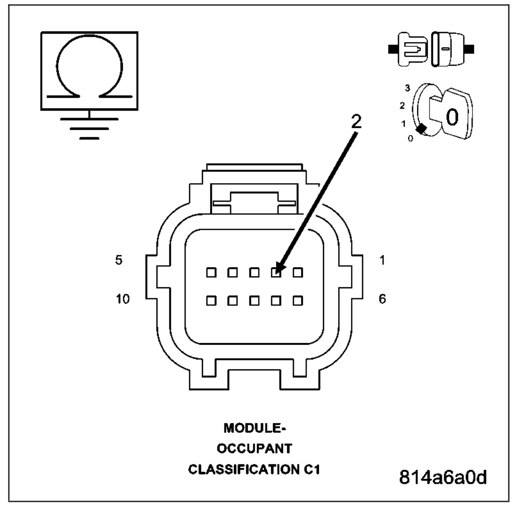
No >> Go To 10

7. CHECK (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH OCM C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

Disconnect the OCM C1 connector.

Measure the resistance of the (F200) Fused Ignition Switch Output (Run-Start) circuit between ground and the Occupant Classification Module C1 connector.



Is the resistance below 100.0 ohms?

Yes >> Repair the (F200) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.
Replace the Airbag Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Replace the OCM in accordance with the Service Information.
Replace the Airbag Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

8. CHECK (F944) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

Turn the ignition on.

Measure the voltage of the (F944) Ignition Switch Output (Run-Start) circuit at the Airbag Run-Start fuse terminal (supply side).

Is the voltage above 6.0 volts?

Yes >> Go To 9

No >> Repair the open (F944) Ignition Switch Output (Run-Start) circuit.
Perform ORC VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

9. CHECK (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Reinstall the Airbag Run-Start Fuse.

Disconnect the both ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Install the Airbag Load tool ORC 8443-24 adaptor to the ORC C2 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

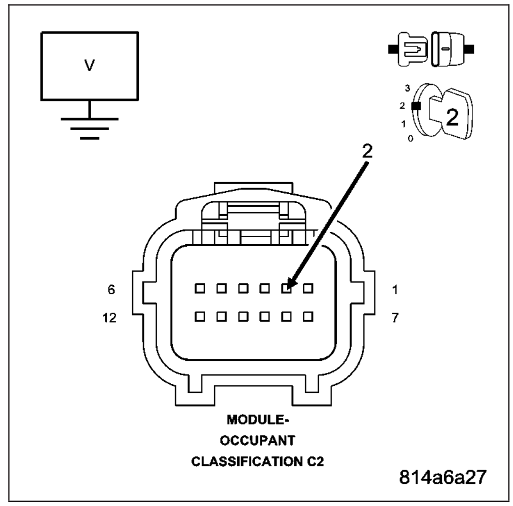
Measure the voltage of the (F20) Fused Ignition Switch Output (Run-Start) Circuit between the 8443-24 connector and ground.

Is the voltage above 6.0 volts?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Repair the open (F20) Fused Ignition Switch Output (Run-Start) circuit.
Perform ORC VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

10. CHECK (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Reinstall the JB 19 Airbag Run-Start Fuse.

Disconnect both Occupant Classification Module (OCM) connectors.

NOTE: Check connectors - Clean and repair as necessary.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (F200) Fused Ignition Switch Output (Run-Start) Circuit between the OCM connector and ground.

Is the voltage above 6.0 volts?

Yes >> Replace the Occupant Classification Module (OCM) in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

No >> Repair the open (F200) Fused Ignition Switch Output (Run-Start) circuit between the OCM and the splice.

Perform OCS VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

11. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.
Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

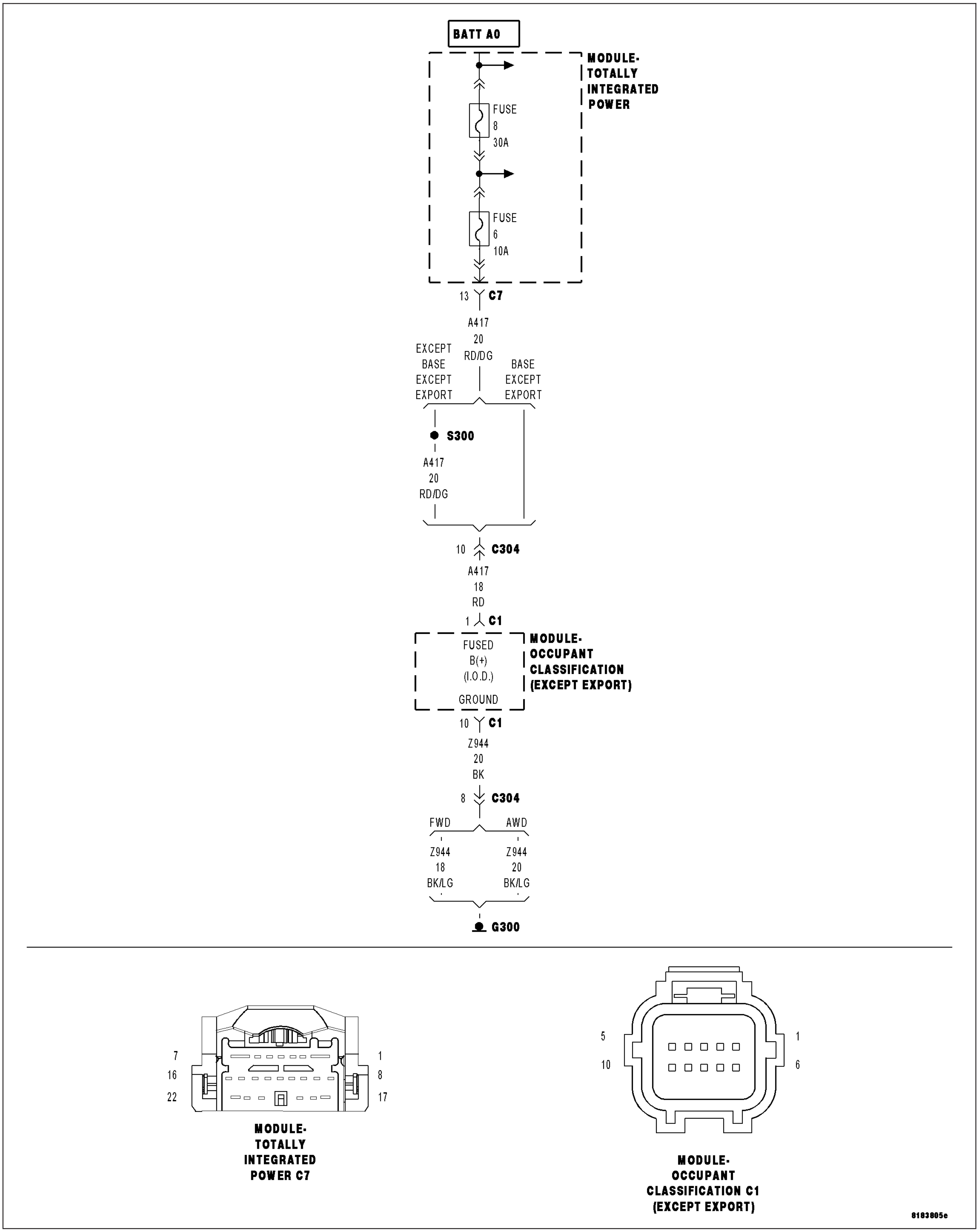
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found Erase all codes before returning vehicle to customer.

B2102-IGNITION RUN/START INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is Run or signal not available (SNA) and the IOD status is “IN”. The module checks the (F200) Fused Ignition Switch Output (Run/Start) circuit voltage input range.
- **Set Condition:**
  If the module detects that the ignition voltage is greater than 24.25 volts ±0.25 volts for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. VERIFY THAT DTC B2102-IGNITION RUN/START INPUT CIRCUIT HIGH IS ACTIVE

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B2102-IGNITION RUN/START INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> Go To 3

2. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the ORC in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

3. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

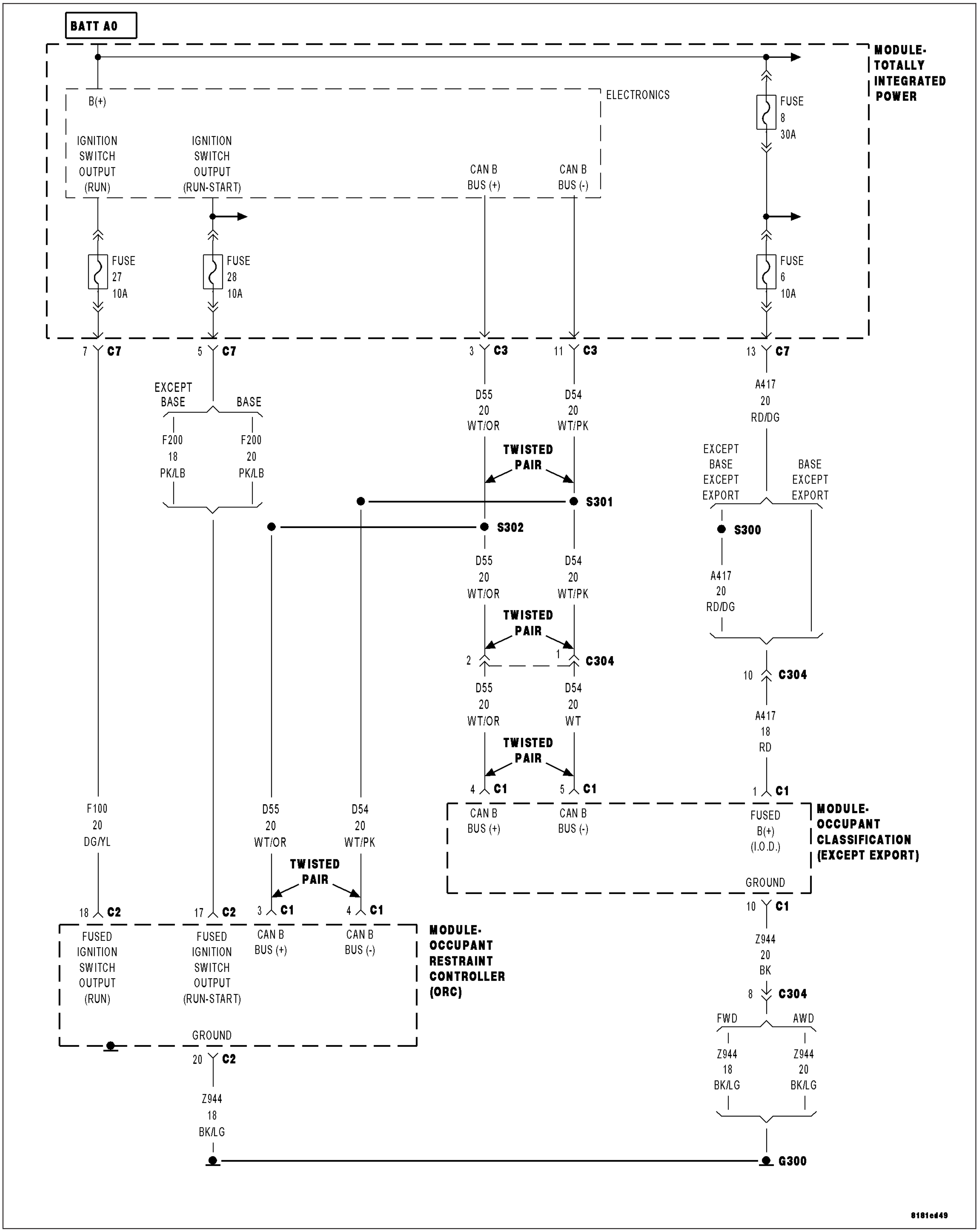
If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found. Erase all codes before returning vehicle to customer.

B210D-BATTERY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the Occupant Classification Module (OCM) CAN bus ignition status received is RUN or signal not available, the module checks the (A417) Fused B(+) circuit voltage input range.
- **Set Condition:**
  If the OCM detects that the battery voltage is less than or equal to 6.25 volts ± 0.25 volt.

Possible Causes
OCM (A417) FUSED B(+) CIRCUIT OPEN
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE (ORC)

Diagnostic Test

1. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

Turn the ignition on.

With the scan tool, read the Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: B210D-BATTERY VOLTAGE LOW IS ACTIVE?

Yes >> Go To 2

No >> Go To 3

2. CHECK VOLTAGE OF OCM (A27) FUSED B(+) AND (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUITS.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage between Ground and the (A417) Fused B(+) circuit.

Is the voltage above 6.0 volts on both circuits?

Yes >> Replace the OCM in accordance with the service information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

No >> Repair the (A417) Fused B(+) circuit for an open or high resistance.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

3. CHECKING STORED OR INTERMITTENT CODES

NOTE: Diagnose and repair all active codes before diagnosing stored codes. Refer to the Table of Contents in this Section for a complete list of airbag system diagnostic procedures.

With the scan tool, record and erase all Airbag System Module DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors for chafed, pierced, pinched, and partially broken wires, and for broken, bent, pushed out, corroded, and contaminated terminals. Repair as necessary.

Reconnect all disconnected components and harness connectors.

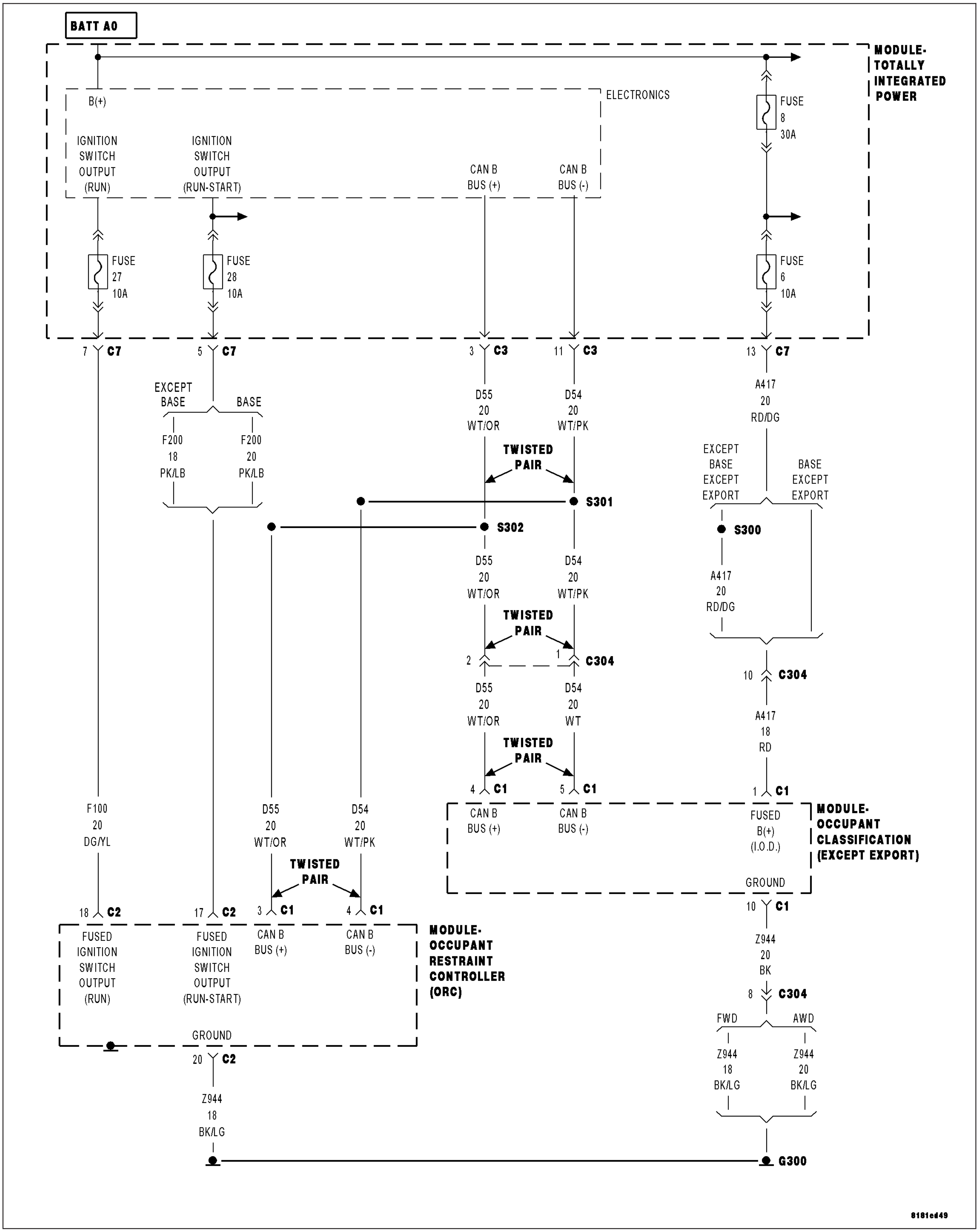
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B210E-BATTERY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status received is RUN or Signal Not Available (SNA), the module checks the (A417) Fused B(+) circuit voltage input range.
- **Set Condition:**
  If the module detects that the battery voltage is greater than or equal to 24.25 volts ± 0.25 volt for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

Turn the ignition on.
With the scan tool, read OCM DTCs.

Does the scan tool display active: B210E-BATTERY VOLTAGE HIGH?

Yes >> Go To 2

No >> Go To 4

2. CHECK THE BATTERY VOLTAGE TO THE OCCUPANT CLASSIFICATION MODULE

With the scan tool in Data Display, read OCM battery voltage.

Is the battery voltage greater than 24.0 volts?

Yes >> Go To 3

No >> Replace the OCM in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the OCM in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

4. TEST FOR INTERMITTENT CONDITION

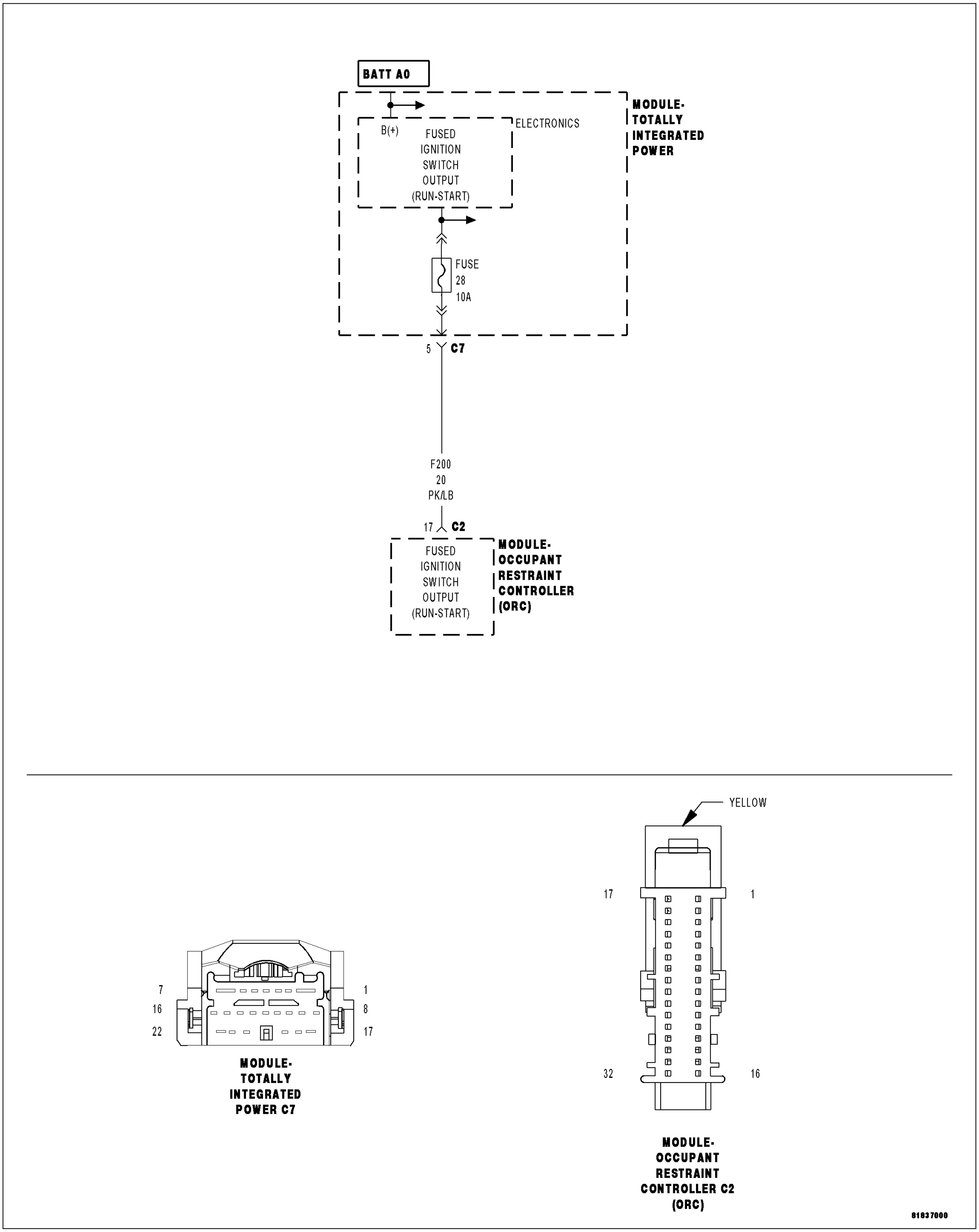
With the scan tool, record and erase all DTCs from all Airbag modules.
If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found. Erase all codes before returning vehicle to customer.

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Run-Start position.
- **Set Condition:**
  If voltage on the (F200) Fused Ignition Switch Output (Run-Start) circuit drops below 6.0 volts.

Possible Causes
(F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
(F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
OPEN IPM FUSE 28
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN IS ACTIVE IN THE ORC.

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

Wait 10 seconds.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> Go To 7

2. INSPECT AIRBAG RUN-START FUSE

Turn the ignition off.

Remove the Airbag Run-Start Fuse 28 from the Integrated Power Module and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the Run/Start fuse open?

Yes >> Go To 3

No >> Go To 5

3. CHECK (F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE

Measure the resistance of the (F200) Fused Ignition Switch Output (Run-Start) circuit between ground and the Airbag Run-Start fuse terminal (output side).

Is the resistance below 100.0 ohms?

Yes >> Go To 4

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace Airbag Run-Start Fuse.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC CONNECTORS DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect both ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the Load Tool ORC 8443-24 Adaptor to the ORC C2 connector.

Measure the resistance of the (F200) Fused Ignition Switch Output (Run-Start) circuit between the 8443-24 adaptor and ground).

Is the resistance below 100.0 ohms?

Yes >> Repair the (F200) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.
Replace the Airbag Run-Start Fuse.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Replace the ORC in accordance with the Service Information.
Replace the Airbag Run-Start Fuse.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK (F944) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

Turn the ignition on.

Measure the voltage between Ground and the (F200) Ignition Switch Output (Run-Start) circuit at the Airbag Run-Start fuse terminal (supply side).

Is the voltage above 6.0 volts?

Yes >> Go To 6

No >> Repair the (F200) Ignition Switch Output (Run-Start) circuit for an open.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK (F200) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Reinstall the Airbag Run-Start Fuse.

Disconnect the both ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Install the Airbag Load tool ORC 8443-24 adaptor to the ORC C2 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (F200) Fused Ignition Switch Output (Run-Start) Circuit between the 8443-24 connector and ground.

Is the voltage above 6.0 volts?

Yes >> Replace the ORC in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (F20) Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

7. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

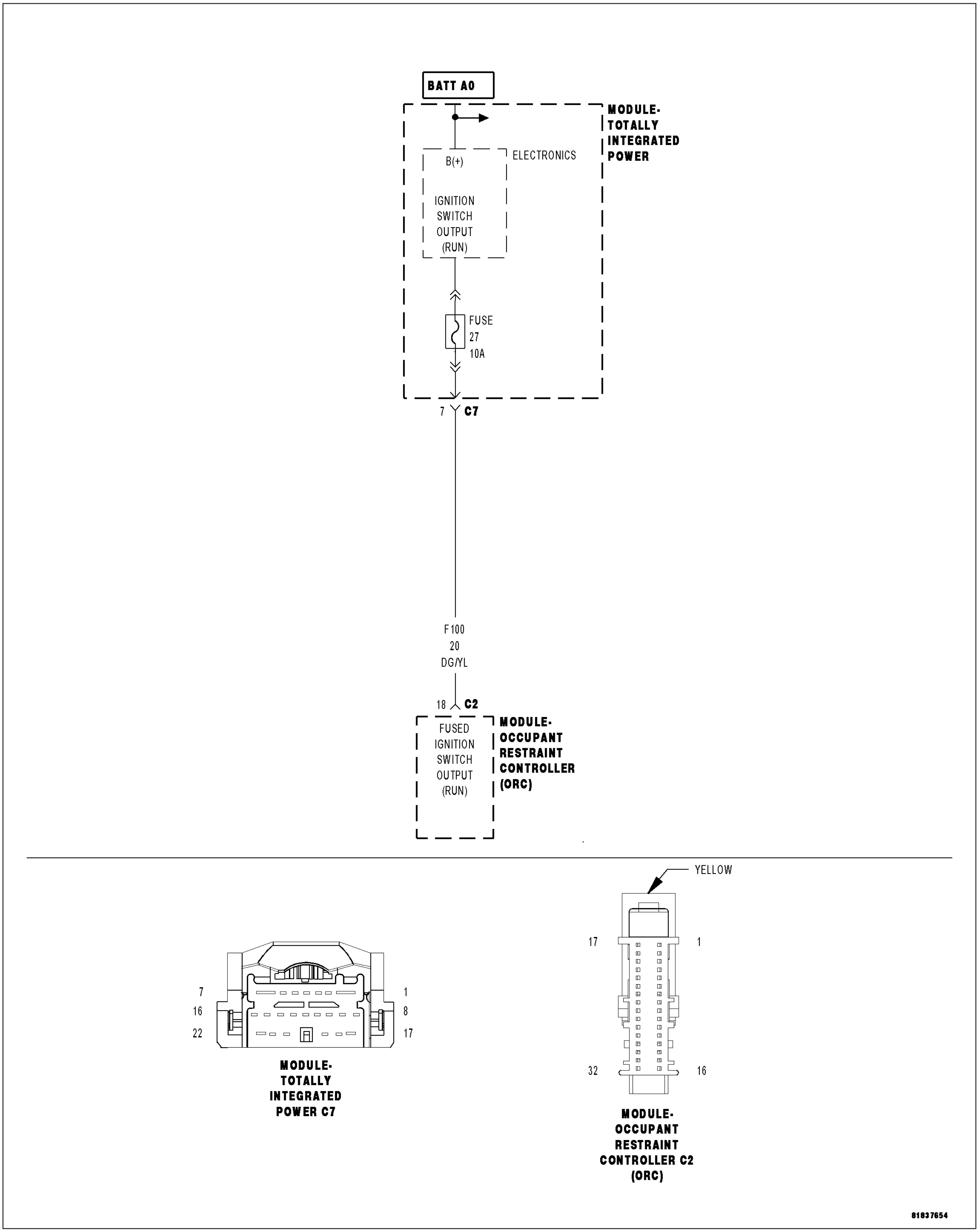
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found. Erase all codes before returning the vehicle to the customer.

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Run position.
- **Set Condition:**
  If voltage on the (F100) Fused Ignition Switch Output (RUN) circuit drops below 6.0 volts.

Possible Causes
TIPM FUSE 27 OPEN
TIPM FUSE 27 SUPPLY VOLTAGE LOW
(F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
(F100) FUSED RUN RELAY OUTPUT CIRCUIT SHORT TO GROUND
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN IS ACTIVE

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

Wait 10 seconds.

With the scan tool, read Occupant Restraint Controller (ORC) and Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> Go To 7

2. INSPECT AIRBAG RUN CIRCUIT FUSE

Turn the ignition off.

Remove the Fuse 27 from the IPM and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the fuse open?

Yes >> Go To 3

No >> Go To 5

3. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORT TO GROUND

Measure the resistance of the (F100) Fused Ignition Switch Output (Run) circuit between the TIPM Fuse 27 (output side) terminal and ground.

Is the resistance below 100.0 ohms?

Yes >> Go To 4

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace TIPM Fuse 27.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT RESISTANCE WITH ORC C2 CONNECTOR DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC connectors.

NOTE: Check connectors - Clean and repair as necessary.

Connect the Load Tool ORC 8443-24 Adaptor to the ORC C2 connector.

Measure the resistance of the (F100) Fused Ignition Switch Output (Run) circuit between 8443-24 adaptor and ground.

Is the resistance below 100.0 ohms?

Yes >> Repair the (F100) Fused Ignition Switch Output (Run) circuit for a short to ground.
Replace the TIPM Fuse 27.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Replace the ORC in accordance with the Service Information.
Replace the TIPM Fuse 27.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

5. CHECK TIPM FUSE 27 SUPPLY SIDE CIRCUIT VOLTAGE

Turn the ignition on.

Measure the voltage of the TIPM Fuse 27 (supply side) of the fuse to ground.

Is the voltage above 6.0 volts?

Yes >> Go To 6

No >> Replace the TIPM in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) OUTPUT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Reinstall the TIPM Fuse 27.

Disconnect the ORC C2 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the Airbag Load Tool ORC 8443-24 Adaptor to the ORC C2 harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (F100) Fused Ignition Switch Output (Run) circuit between the 8443–24 adaptor and ground.

Is the voltage above 6.0 volts?

Yes >> Replace the ORC in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the open (F100) Fused Ignition Switch Output (Run) circuit between the ORC module and the IPM Fuse 27.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

7. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found. Erase all codes before returning vehicle to customer.

B2201-CALIBRATION MISMATCH

- **When Monitored:**
  With the Ignition on.
- **Set Condition:**
  This DTC will be set when the VIN stored in the PCM does not match the VIN stored in the Occupant Restraint Controller (ORC). The ORC does not support a stored B2201 DTC.

Possible Causes
INCORRECT PCM
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B2201-CALIBRATION MISMATCH IS ACTIVE

Turn the ignition on.

With the scan tool, read ORC DTCs.

NOTE: Ensure the battery is fully charged.

Does the scan tool display active: B2201-CALIBRATION MISMATCH?

Yes >> Go To 2

No >> Test Complete.

2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN stored in the ORC.

Does the VIN programmed into the PCM match the VIN stored in the ORC?

Yes >> Go To 3

No >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1

B2205-ORIGINAL VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

Possible Causes
INCORRECT VIN PROGRAMMED IN PCM
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. VERIFY THAT DTC B2205-ORIGINAL VIN MISSING/MISMATCH

Turn the ignition on.

With the scan tool, read ORC DTCs.

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active : B2205-ORIGINAL VIN MISSING/MISMATCH?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN on the vehicle.

Does the VIN programmed into the PCM match the vehicles VIN?

Yes >> Go To 3

No >> Replace the Powertrain Control Module in accordance with Service Information.

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

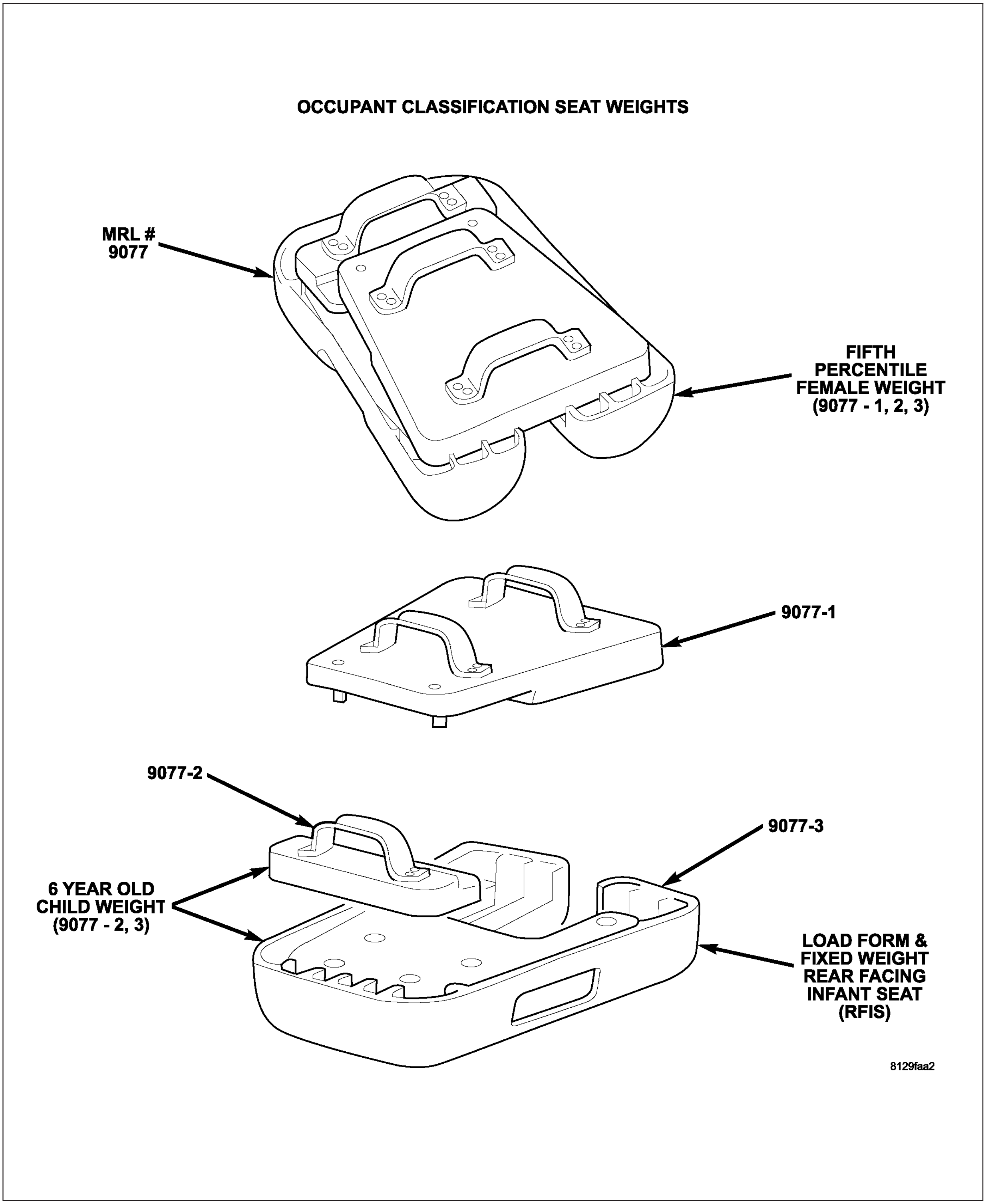
View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B2206-CURRENT VIN MISSING/MISMATCH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During power-up, the ORC and OCM monitors the CAN bus for the VIN message.
- **Set Condition:**
  This DTC will set if the VIN information received from the PCM is different from the stored VIN.

Possible Causes
INCORRECT VIN PROGRAMMED INTO THE PCM
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: Troubleshoot any Ignition, Battery, Seat Weight Sensor, or OCM Internal DTCs BEFORE proceeding

NOTE: Ensure that the battery is fully charged.

With the scan tool, read DTCs.

Select the module and DTC type.

OCM-Active
Go To 2

OCM-Stored
Erase code with scan tool, test complete.

2. CHECK THE VIN STORED IN THE PCM

With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.

Does the VIN stored in the PCM match the vehicle's VIN?

Yes >> Go To 3

No >> Replace and Configure the Powertrain Control Module in accordance with the service information.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specification.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B2206-CURRENT VIN MISSING/MISMATCH?

Yes >> Replace the OCM in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present

Erase all codes before returning vehicle to customer.

4. CHECK THE VIN STORED IN THE PCM

With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.

Does the VIN stored in the PCM match the vehicle's VIN?

Yes >> Go To 5

No >> Replace and Configure the Powertrain Control Module in accordance with the service information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

Perform the *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B2207-OCCUPANT RESTRAINT CONTROLLER INTERNAL 1

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B2208-OCCUPANT RESTRAINT CONTROLLER INTERNAL 2

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B2209-OCCUPANT RESTRAINT CONTROLLER INTERNAL 3

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B220A-OCCUPANT RESTRAINT CONTROLLER INTERNAL 4

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B220B-OCCUPANT RESTRAINT CONTROLLER FIRING STORED ENERGY

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B220C-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 1 INTERNAL

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B220D-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 2 INTERNAL

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

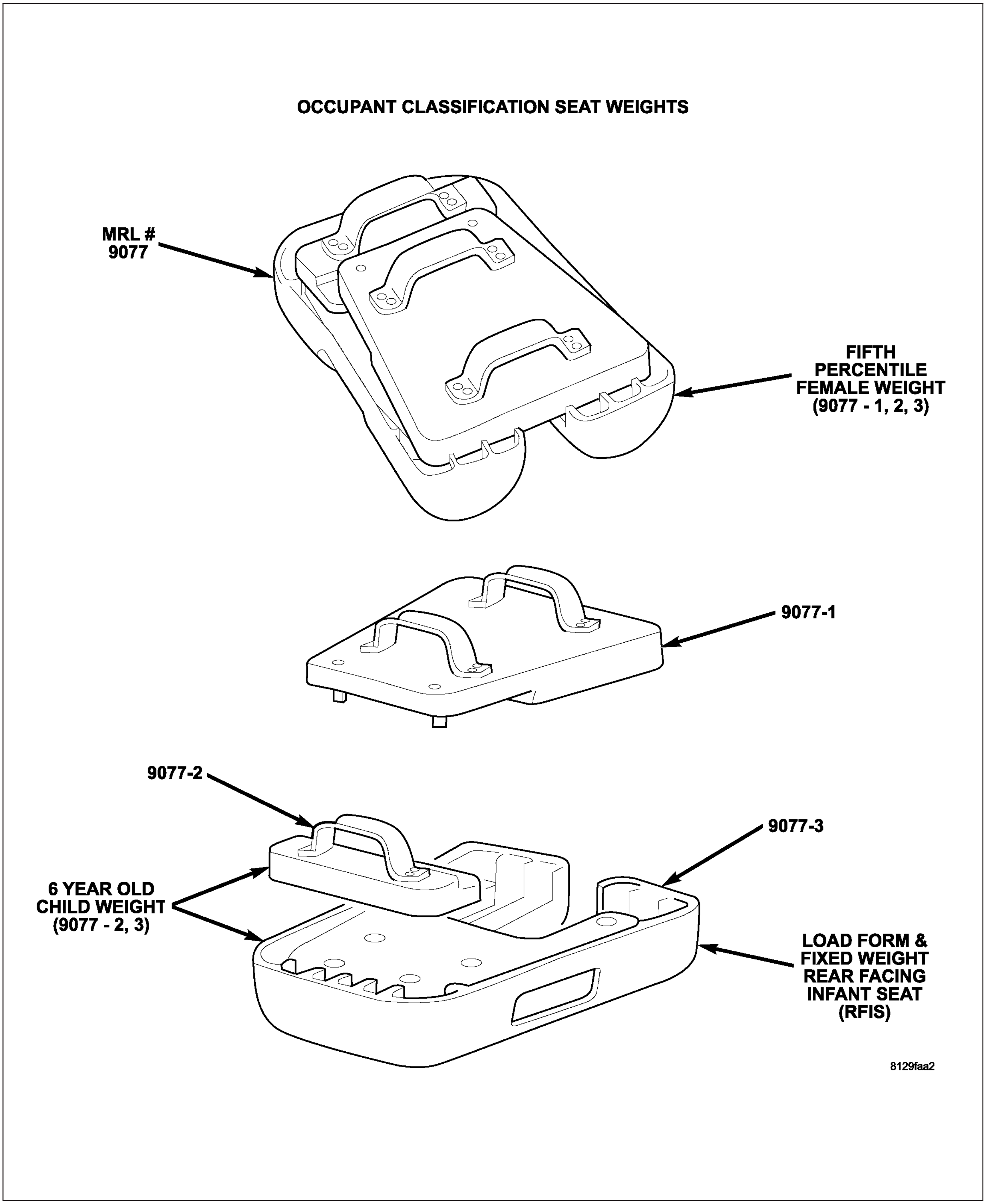
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL



- **When Monitored:**
  While the IGN status is RUN or signal not available, while the CAN bus system voltage is between 10 and 16 volts, and during the OCS Verification Test.
- **Set Condition:**
  This DTC will set if the module detects an internal failure.

Possible Causes
OCCUPANT CLASSIFICATION MODULE (ORC)

Diagnostic Test

1. PERFORM THE OCCUPANT CLASSIFICATION MODULE VERIFICATION TEST

NOTE: Ensure that the passenger seat is empty.

Turn the ignition off, wait 10 seconds and turn ignition on.

With the scan tool, read OCM DTCs.

Did the DTC: B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL reset?

Yes >> Go To 2

No >> Perform the *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

2. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active DTCs?

Yes - B2212 is ACTIVE
Go To 3

Yes - other DTCs ACTIVE
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

3. VERIFY SENSOR TORQUE

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are tightened to torque specification. Refer to Group 23 for specifications.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module

System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active DTCs?

Yes - B2212 is ACTIVE

Replace the Occupant Classification Module in accordance with the service information.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

Yes - other DTCs ACTIVE

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if the ORC receives a bus message with the active OCM DTC Present bit set.

Possible Causes
ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B223D-OCCUPANT CLASSIFICATION MODULE DTC IS ACTIVE

With the scan tool, read the OCCUPANT RESTRAINT CONTROLLER active DTCs.

Does the scan tool display active: B223D-OCCUPANT CLASSIFICATION MODULE?

Yes >> Go To 2

No >> With the scan tool, perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

2. ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE

With the scan tool, read the OCCUPANT CLASSIFICATION MODULE active DTCs.

Are there any active DTC present?

Yes >> Refer to the symptom list for problems related to the OCCUPANT CLASSIFICATION MODULE (OCM).

No >> Go To 3

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

U0019-CAN B BUS–OCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY DTC U0019–CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

Disconnect the OCM C1 connector.

NOTE: Check connectors - Clean and repair as necessary.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the OCM C1 connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the OCM C1 connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

U0019-CAN B BUS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY DTC U0019-CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: U0019-CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform ORC VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

Disconnect the ORC C2 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the Load Tool ORC 8443–24 Adaptor to the ORC C2 connector.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the ORC C2 connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the ORC C2 connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the ORC in accordance with the Service Information.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

U0020-CAN B BUS OFF PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0020 CAN B BUS DTC IN OCCUPANT CLASSIFICATION MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY DTC U0020–CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: U0019-CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the OCM connectors.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the OCM C1 connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the OCM C1 connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST.

U0020-CAN B BUS OFF PERFORMANCE–ORC

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0020 CAN B BUS DTC IN OCCUPANT CLASSIFICATION MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY DTC U0020–CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the OCM C1 connector.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the ORC C2 connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the ORC C2 connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the ORC in accordance with the Service Information.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

U0022-CAN B BUS (+) CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0023-CAN B BUS (+) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0026-CAN B BUS (-) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TOTALLY INTEGRATED POWER MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

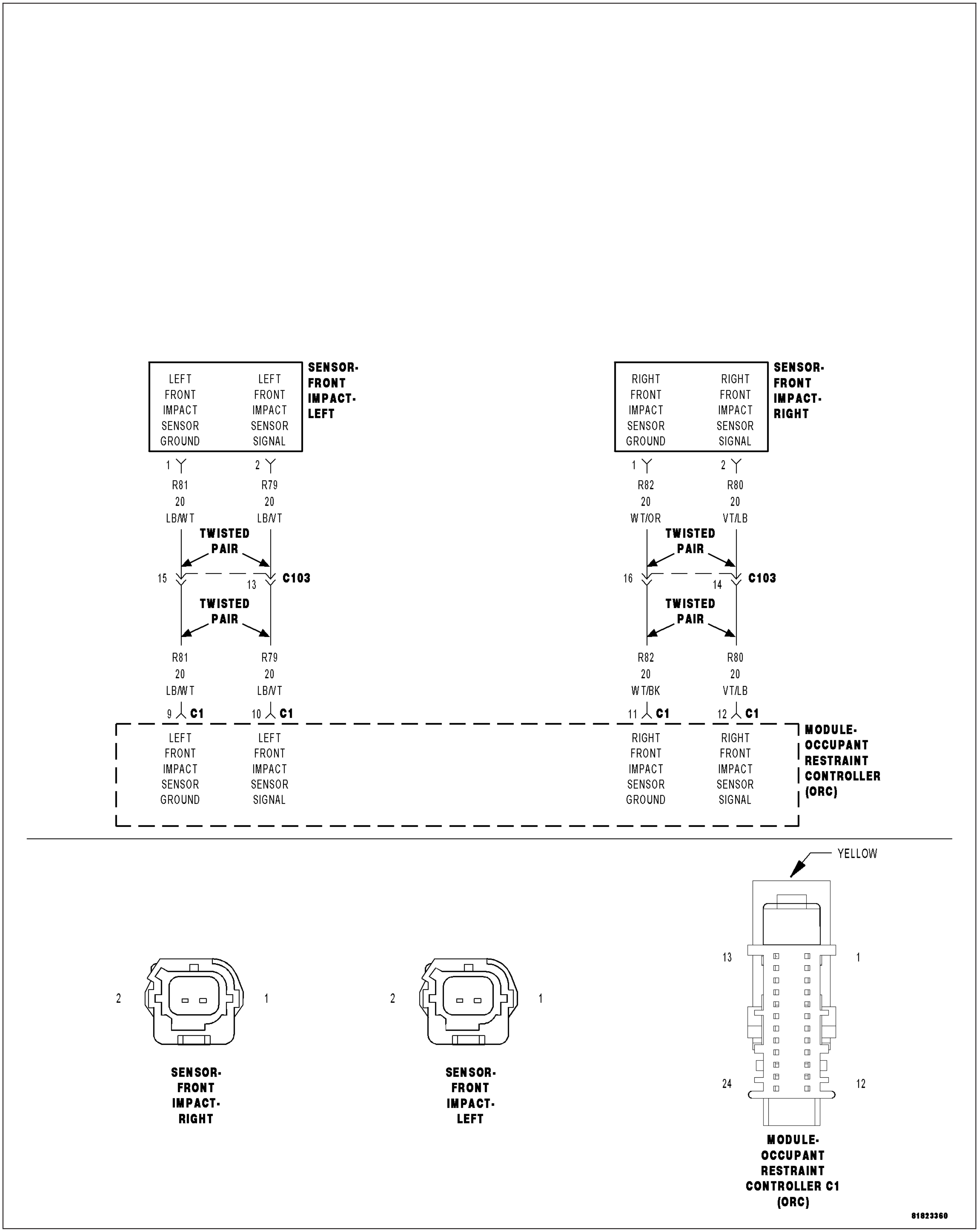
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Front Left Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Front Left Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R79) SIGNAL CIRCUIT SHORTED TO BATTERY
(R79) SIGNAL CIRCUIT SHORTED TO GROUND
(R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT OPEN
(R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

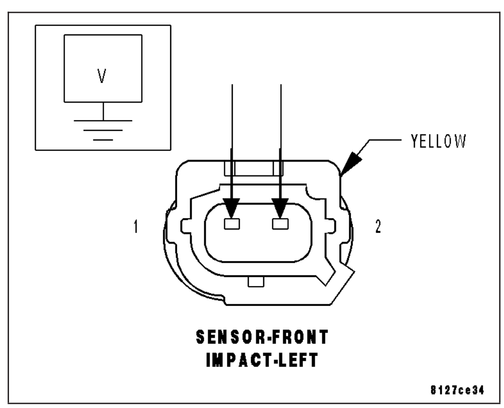
With the scan tool, read ORC DTCs.

Does the scan tool display active: U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Left Impact Sensor connector.

Disconnect the ORC connectors.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

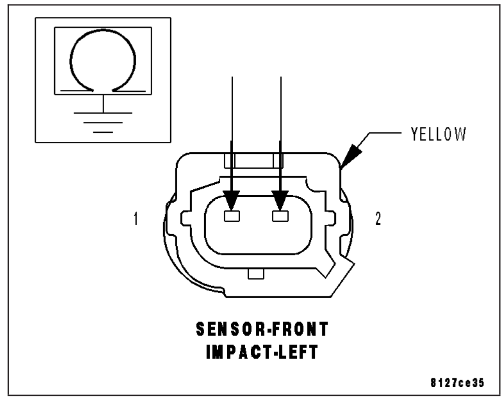
Measure the voltage of the (R79) Front Left Impact Sensor Signal circuit and (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and ground.

Is there any voltage present?

Yes >> Repair the R79 and R81 Front Left Impact Sensor circuits for a short to battery.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R79 AND R81) FRONT LEFT IMPACT SENSOR CIRCUITS FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Measure the resistance of the (R79) Front Left Impact Sensor Signal circuit and (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and ground.

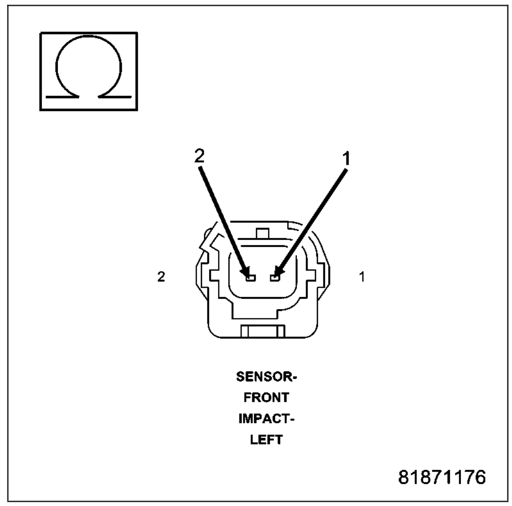
Is the resistance below 100K ohms?

Yes >> Repair the (R79 and R81) Front Left Impact Sensor circuits for a short to ground.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R79 AND R81) FRONT LEFT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER



Measure the resistance between the (R79) Front Left Impact Sensor Signal and (R81) Front Left Impact Sensor Ground circuits at the Front Left Impact Sensor connector.

Is the resistance below 100K ohms?

Yes >> Repair the (R79 and R81) Front Left Impact Sensor circuits shorted together.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC 8443-25 Adaptor to the Occupant Restraint Control Module connectors.

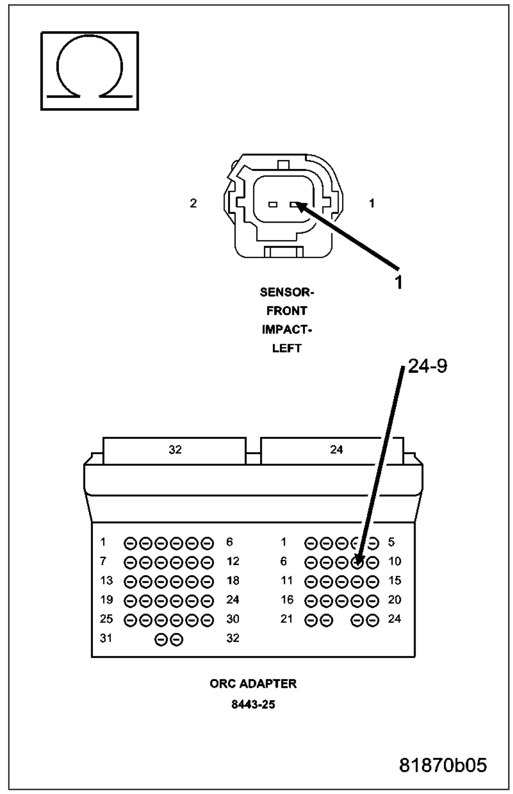
Measure the resistance of the (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the ORC 8443-25 Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R81) Front Left Impact Sensor 1 Ground circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



6. CHECK THE (R79) FRONT LEFT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

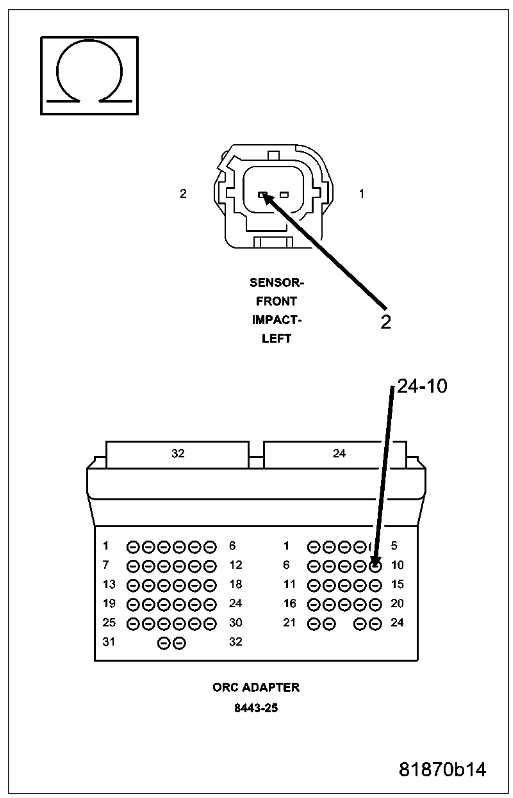
Measure the resistance of the (R79) Front Left Impact Sensor Signal circuit between the Front Left Impact Sensor connector and the ORC 8443-25 Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R79) Front Left Impact Sensor Signal circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



7. CHECK OPERATION OF THE FRONT LEFT IMPACT SENSOR

Replace the Front Left Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Front Left Impact Sensor DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram / schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

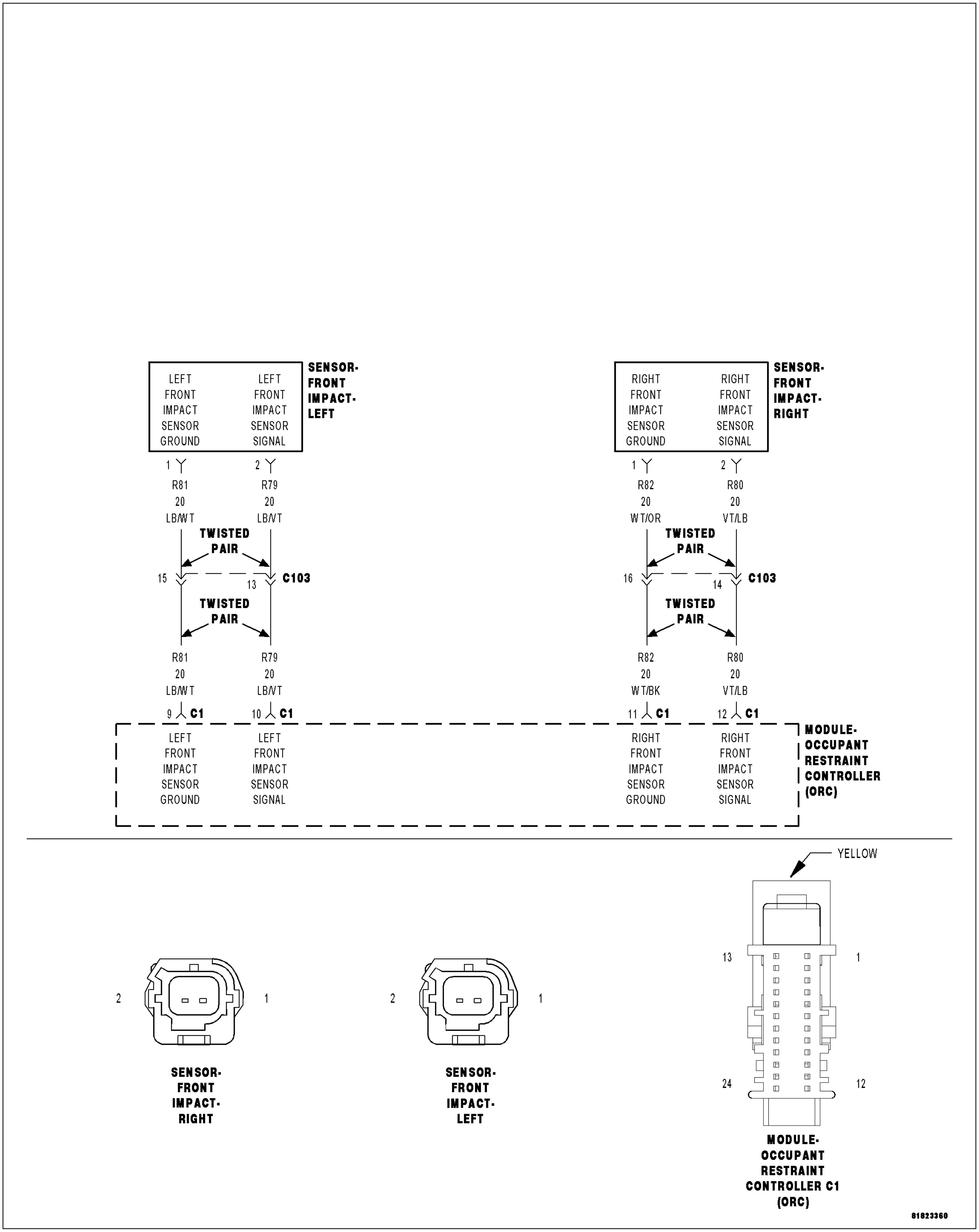
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Front Right Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Front Right Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R80) SIGNAL CIRCUIT SHORTED TO BATTERY
(R80) SIGNAL CIRCUIT SHORTED TO GROUND
(R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT OPEN
(R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

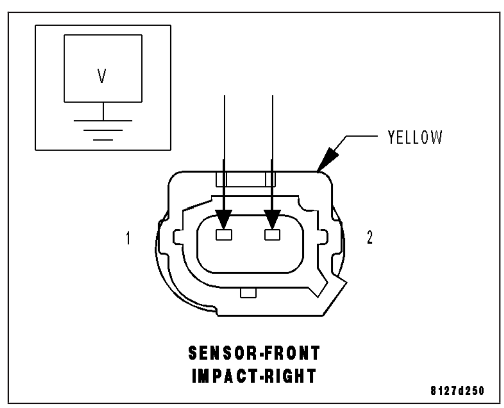
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Right Impact Sensor connector.

Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R80) Front Right Impact Sensor Signal circuit and (R82) Sensor Ground circuit at the Front Right Impact Sensor connector and ground.



Is there any voltage present?

Yes >> Repair the R80 and R82 Front Right Impact Sensor circuits for a short to battery.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE R80 AND R82 FRONT RIGHT IMPACT SENSOR CIRCUITS FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.

Measure the resistance of the R80 and R82 Front Right Impact Sensor circuits between the Front Right Impact Sensor connector and ground.

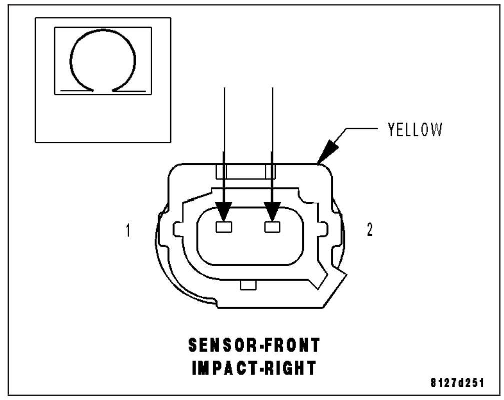
Is the resistance below 100K ohms?

Yes >> Repair the R80 and R82 Front Right Impact Sensor circuits for a short to ground.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE R80 AND R82 FRONT RIGHT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R80) Front Right Impact Sensor Signal and (R82) Sensor Ground circuit at the Front Right Impact Sensor connector.



Is the resistance below 100K ohms?

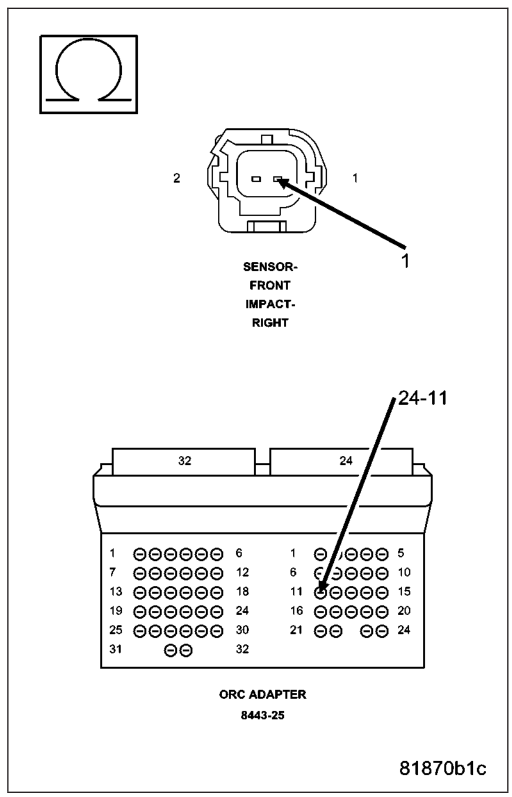
Yes >> Repair the (R80, R82) Front Right Impact Sensor circuits shorted together.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R82) Front Right Impact Sensor Ground circuit between the Front Right Impact Sensor connector and the ORC 8443-25 Adaptor.



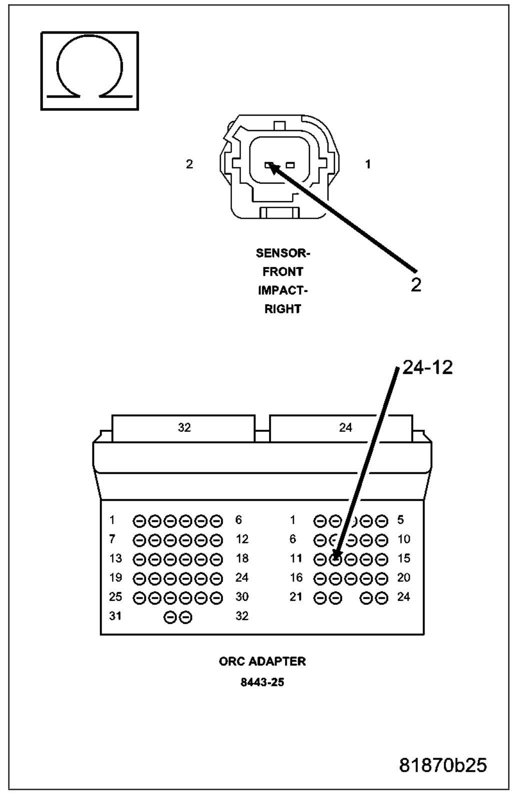
Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R82) Front Right Impact Sensor 2 Ground circuit for an open or high resistance.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and the ORC 8443-25 Adaptor.



Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R80) Front Right Impact Sensor Signal circuit for an open or high resistance.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

7. CHECK OPERATION OF THE FRONT RIGHT IMPACT SENSOR

Replace the Front Right Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Front Right Impact Sensor DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

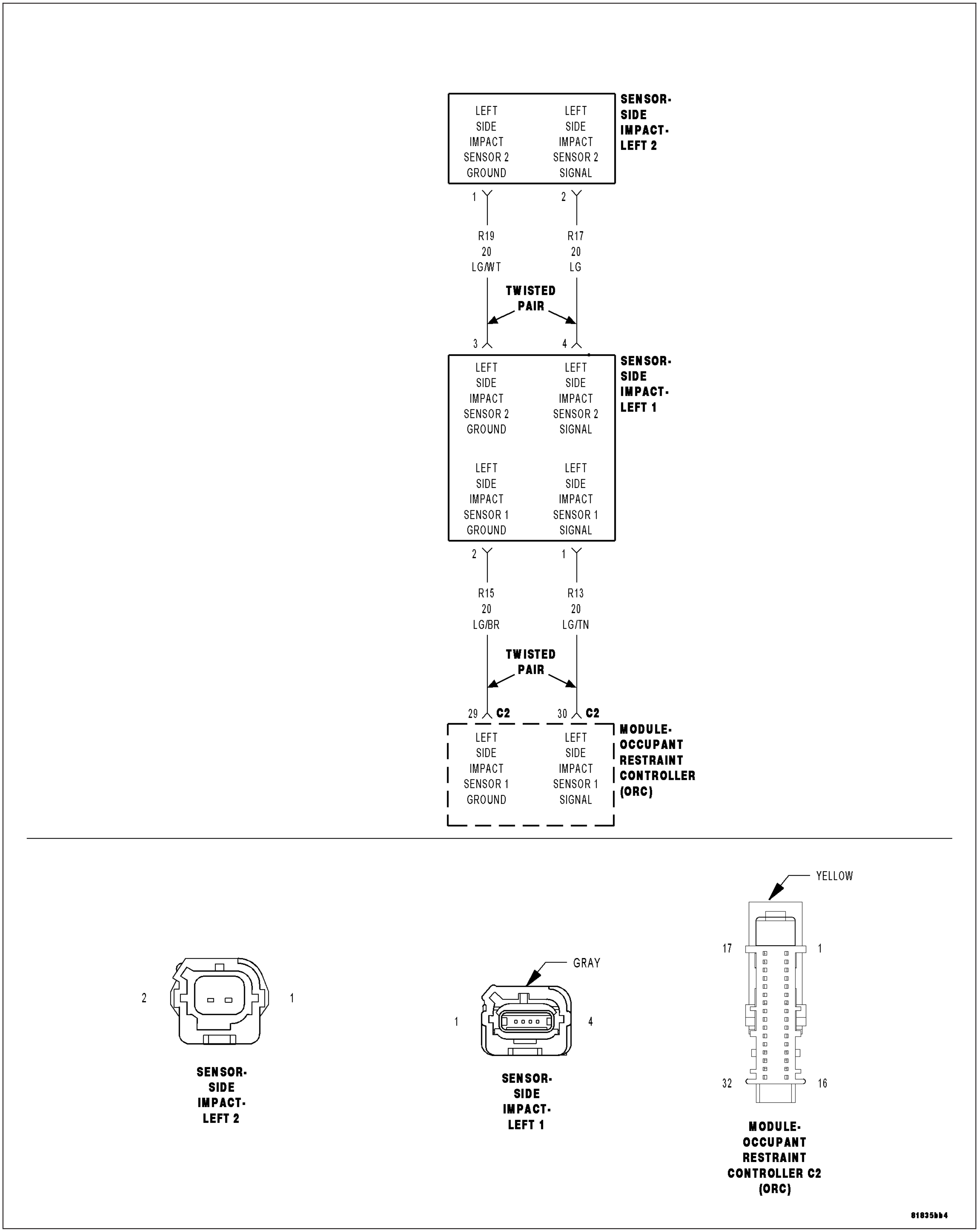
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Left Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R13) SIGNAL CIRCUIT SHORTED TO BATTERY
(R13) SIGNAL CIRCUIT SHORTED TO GROUND
(R13, R15) LEFT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 1

Diagnostic Test

1. VERIFY THAT DTC U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0172-LOST COMMUNICATION W/LEFT SIDE IMPACT SENSOR 1?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

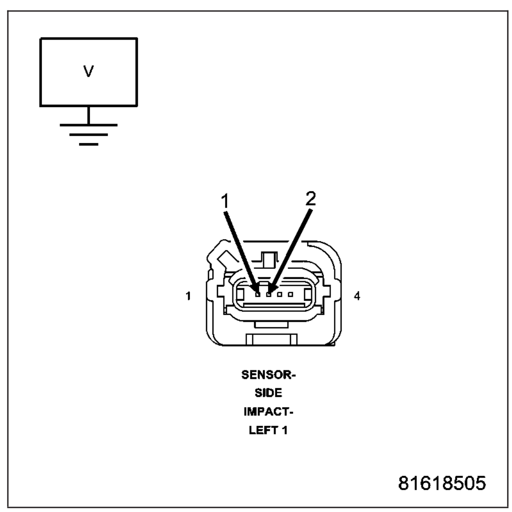
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Impact Sensor 1 connector.

Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R13) Left Side Impact Sensor 1 Signal circuit and (R15) Sensor Ground circuit at the Left Side Impact Sensor 1 connector and ground.



Is there any voltage present?

Yes >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits for a short to battery.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

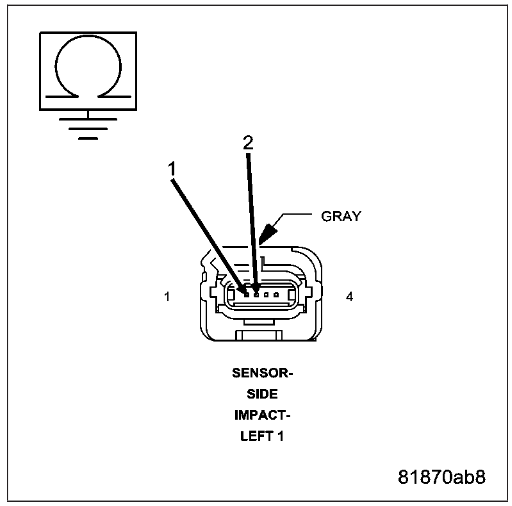
No >> Go To 3

3. CHECK THE (R13,R15) LEFT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.

Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and ground.

Measure the resistance of the (R15) Left Side Impact Sensor 1 Ground circuit between the Left Side Impact Sensor 1 connector and ground.



Is the resistance below 100K ohms on either circuit?

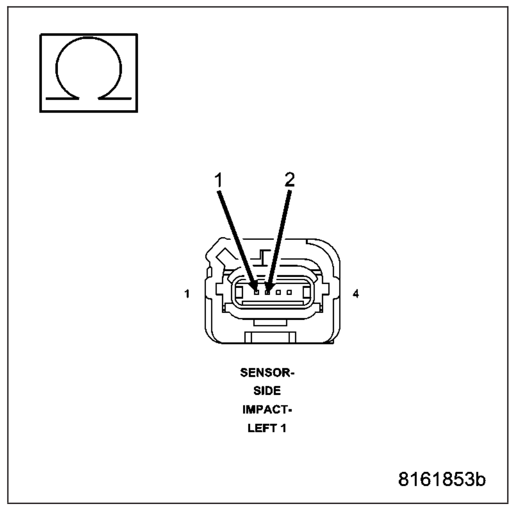
Yes >> Repair the (R13,R15) Left Side Impact Sensor 1 Signal and Ground circuit for a short to ground.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R13) Left Side Impact Sensor 1 Signal and (R15) Sensor Ground circuits at the Left Side Impact Sensor 1 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits shorted together.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

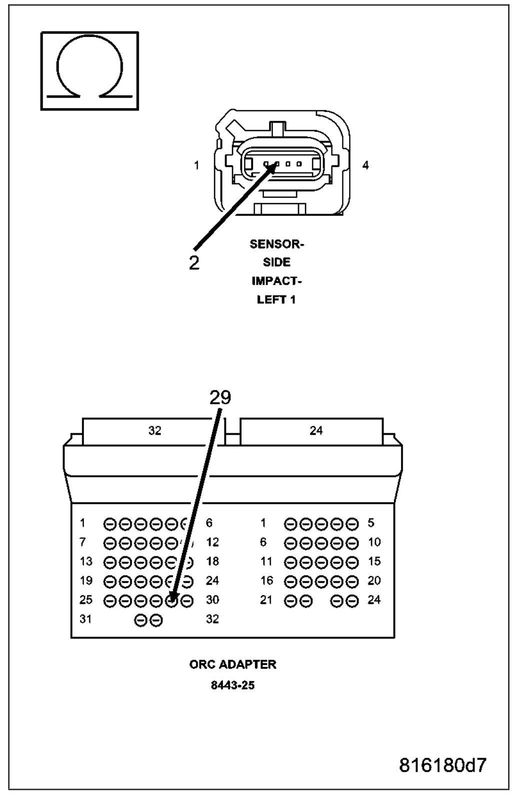
Measure the resistance of the (R15) Left Side Impact Sensor 1 Ground circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R15) Left Side Impact Sensor 1 Ground circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



6. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

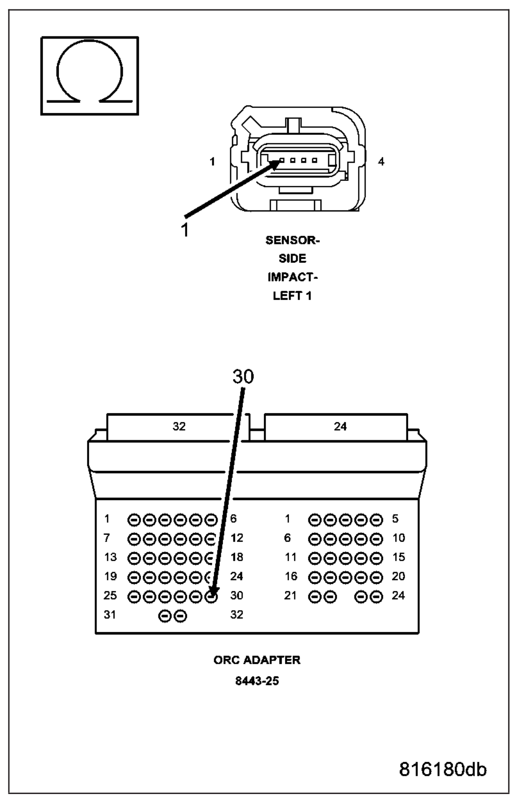
Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 1

Replace the Left Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Left Side Impact Sensor 1 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

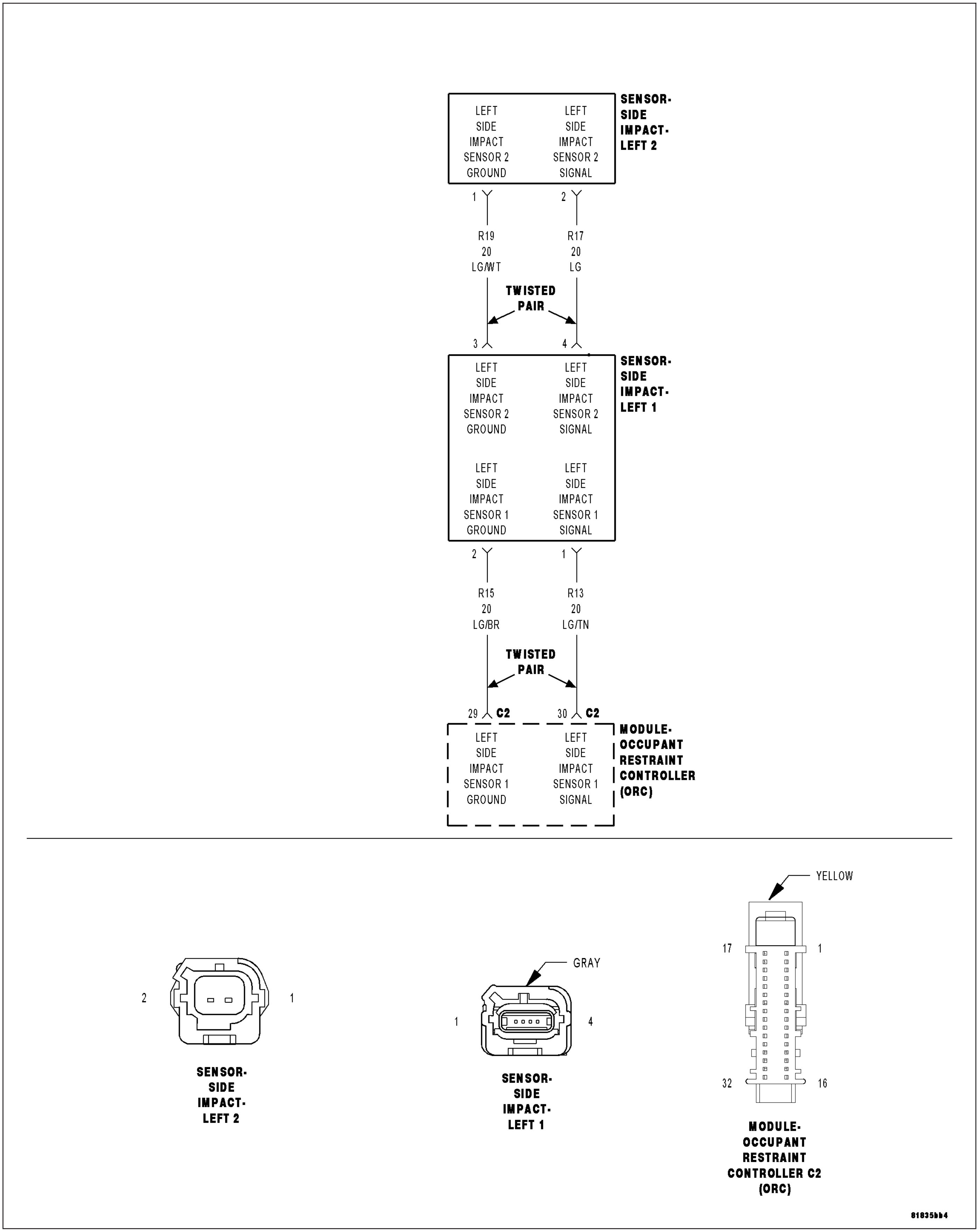
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Left Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R17) SIGNAL CIRCUIT SHORTED TO BATTERY
(R17) SIGNAL CIRCUIT SHORTED TO GROUND
(R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 2

Diagnostic Test

1. VERIFY THAT DTC U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

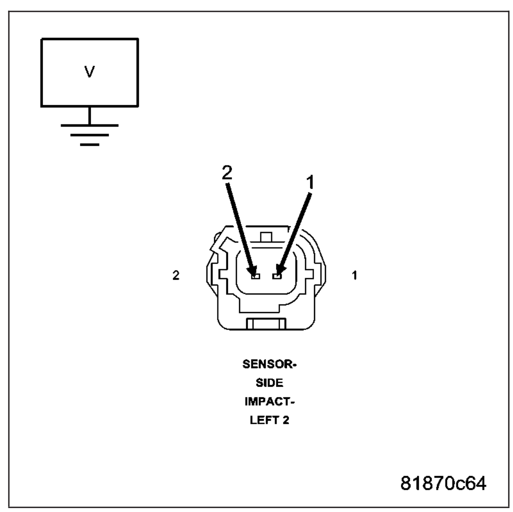
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left Side Impact Sensor 2 connector.

Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R17) Left Side Impact Sensor 2 Signal circuit and (R19) Sensor Ground circuit at the Left Side Impact Sensor 2 connector and ground.



Is there any voltage present?

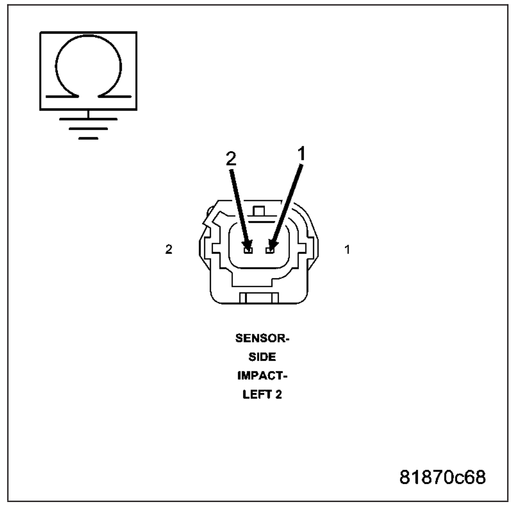
Yes >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits for a short to battery.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.

Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and ground.



Is the resistance below 100K ohms?

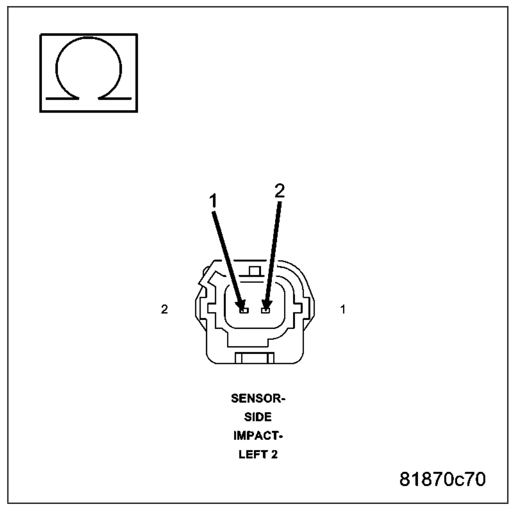
Yes >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits for a short to ground.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R17) Left Side Impact Sensor 2 Signal and (R19) Sensor Ground circuits at the Left Side Impact Sensor 2 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits shorted together.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

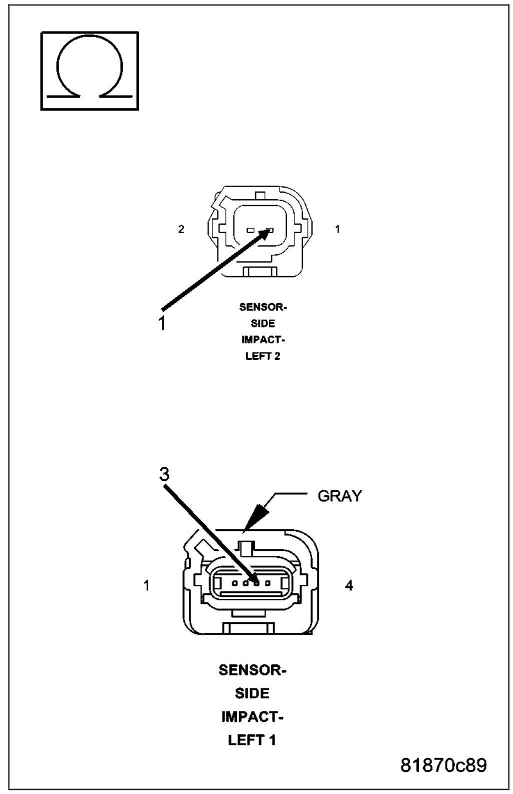
Measure the resistance of the (R19) Left Side Impact Sensor 2 Ground circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R19) Left Side Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



6. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

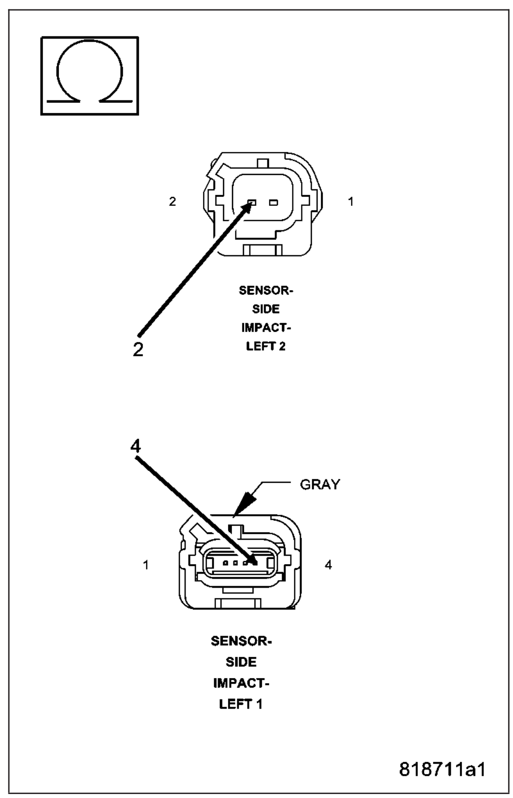
Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 2

Replace the Left Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Left Side Impact Sensor 2 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

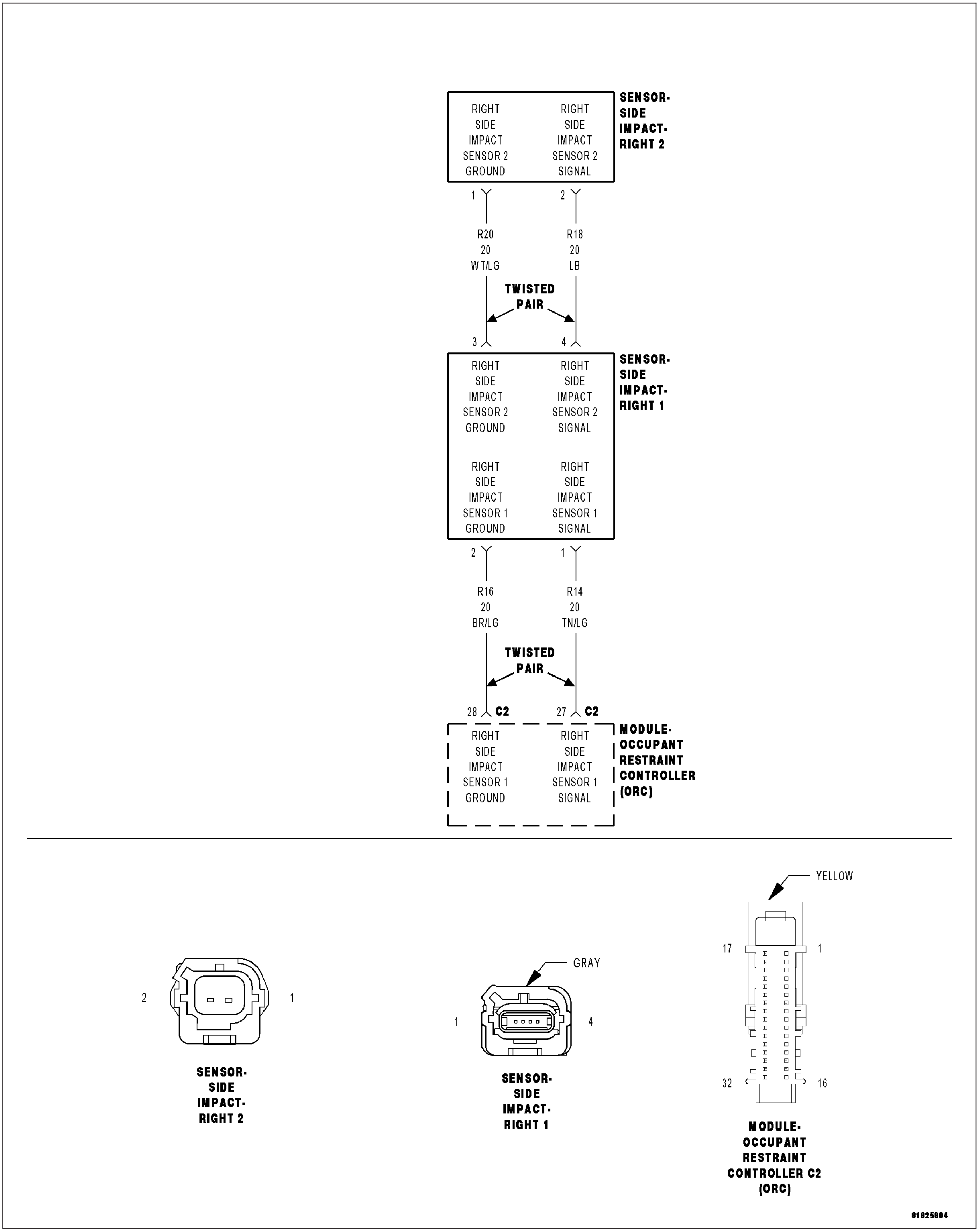
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Right Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R14) SIGNAL CIRCUIT SHORTED TO BATTERY
(R14) SIGNAL CIRCUIT SHORTED TO GROUND
(R14, R16) RIGHT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 1

Diagnostic Test

1. VERIFY THAT DTC U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

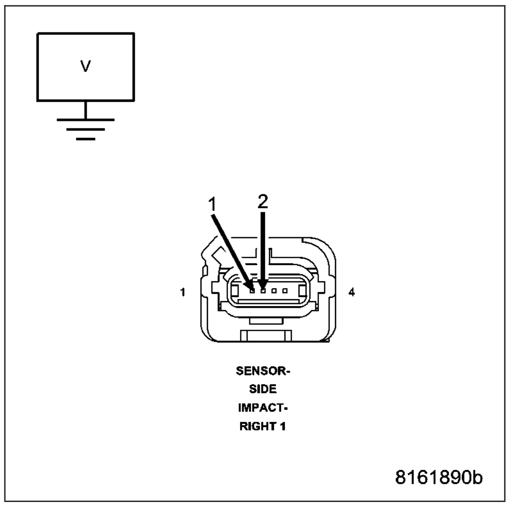
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Impact Sensor 1 connector.

Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R14) Right Side Impact Sensor 1 Signal circuit and (R16) Sensor Ground circuit at the Right Side Impact Sensor 1 connector and ground.



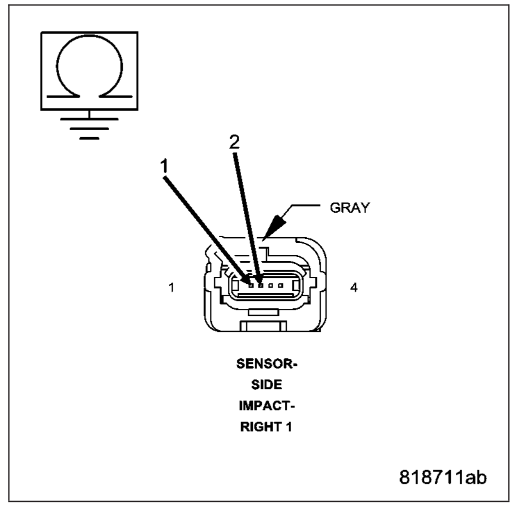
Is there any voltage present?

Yes >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits for a short to battery.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO GROUND



WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.

Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and ground.

Measure the resistance of the (R16) Right Side Impact Sensor Ground circuit between the Right Side Impact Sensor 1 connector and ground.

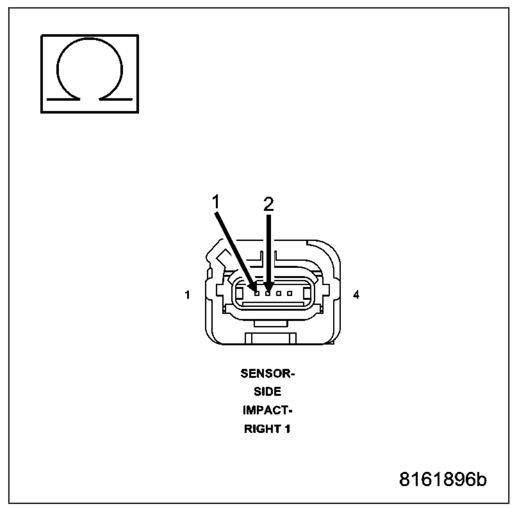
Is the resistance below 100K ohms on either circuit?

Yes >> Repair the (R14) Right Side Impact Sensor 1 Signal or (R16) Right Side Impact Sensor 1 Ground circuit for a short to ground.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER



Measure the resistance between the (R14) Right Side Impact Sensor 1 Signal and (R16) Sensor Ground circuits at the Right Side Impact Sensor 1 connector.

Is the resistance below 100K ohms?

Yes >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits shorted together.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

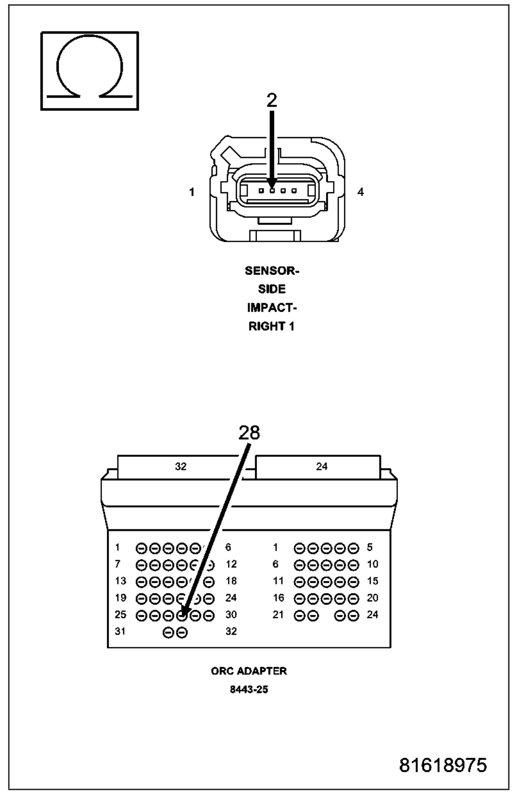
Measure the resistance of the (R16) Right Side Impact Sensor 1 Ground circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R16) Right Side Impact Sensor 1 Ground circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



6. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

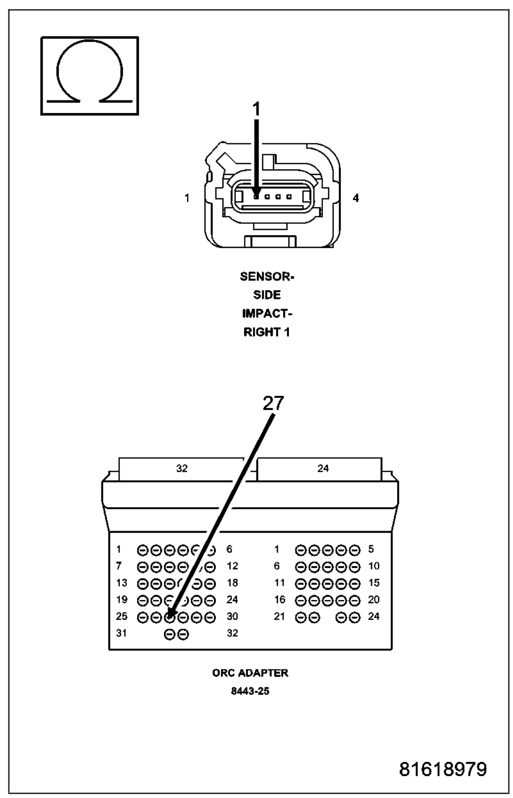
Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.



7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1

Replace the Right Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Right Side Impact Sensor 1 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

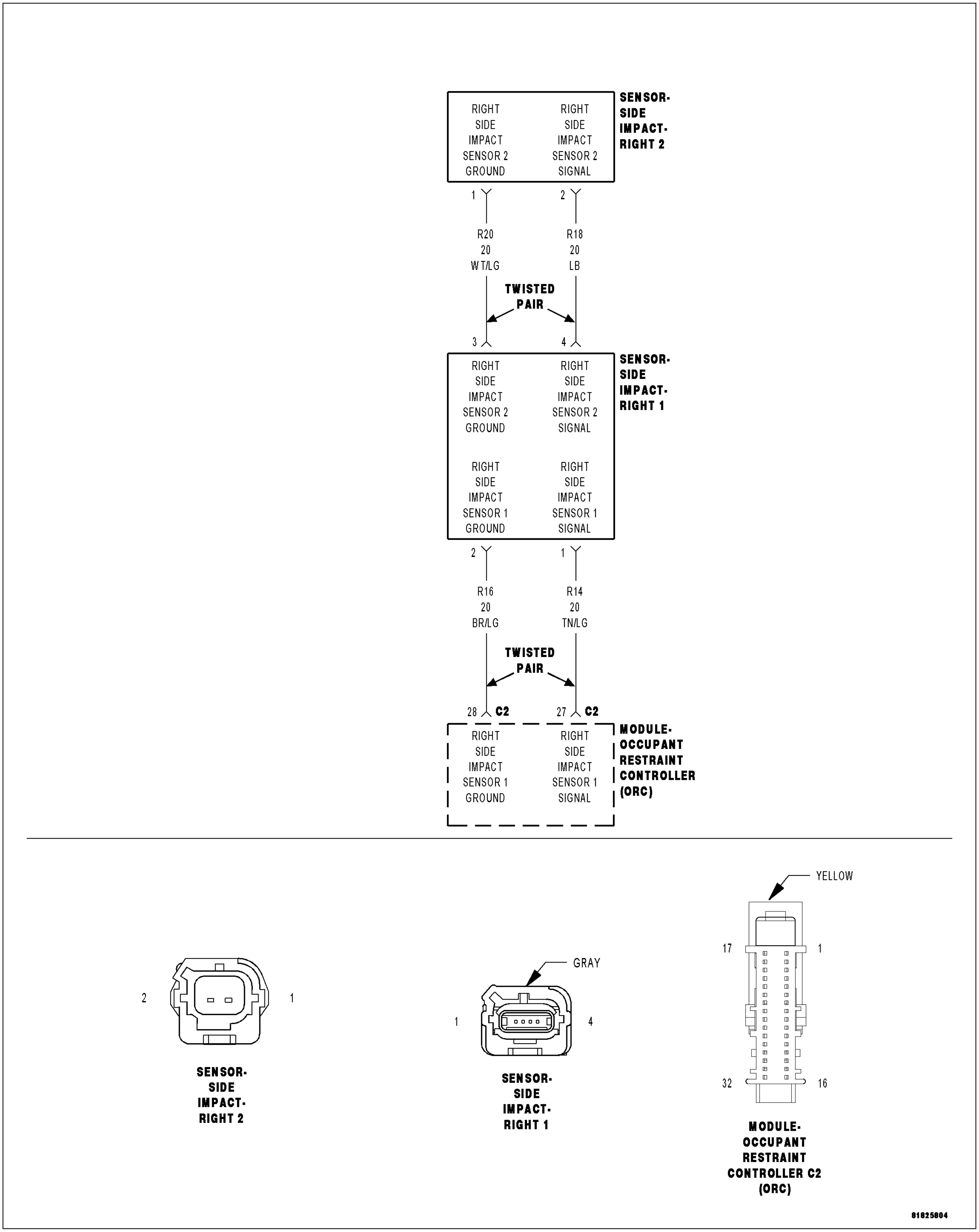
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Right Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R18) SIGNAL CIRCUIT SHORTED TO BATTERY
(R18) SIGNAL CIRCUIT SHORTED TO GROUND
(R18, R20) RIGHT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R20) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 2

Diagnostic Test

1. VERIFY THAT DTC U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2

Turn the ignition on.

With the scan tool, read ORC DTCs.

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active: U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2?

Yes >> Go To 2

No >> Go To 9

2. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

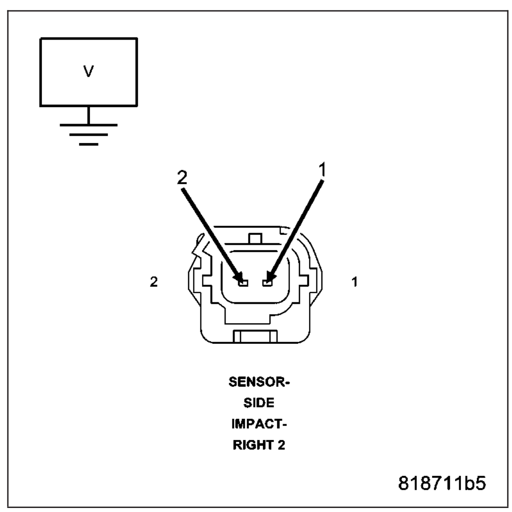
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right Side Impact Sensor 2 connector.

Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R18) Right Side Impact Sensor 2 Signal circuit and (R20) Sensor Ground circuit at the Right Side Impact Sensor 2 connector and ground.



Is there any voltage present?

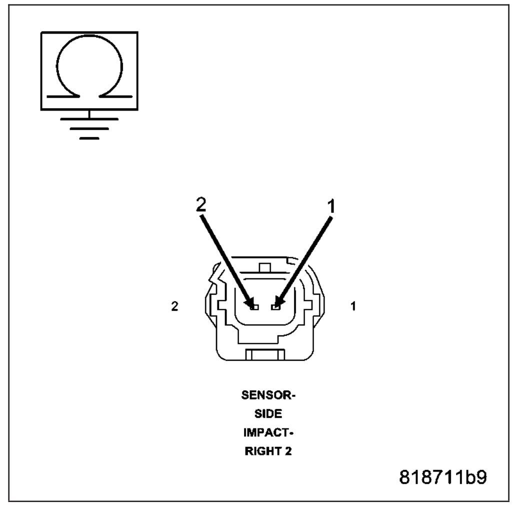
Yes >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits for a short to battery.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.

Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and ground.



Is the resistance below 100K ohms?

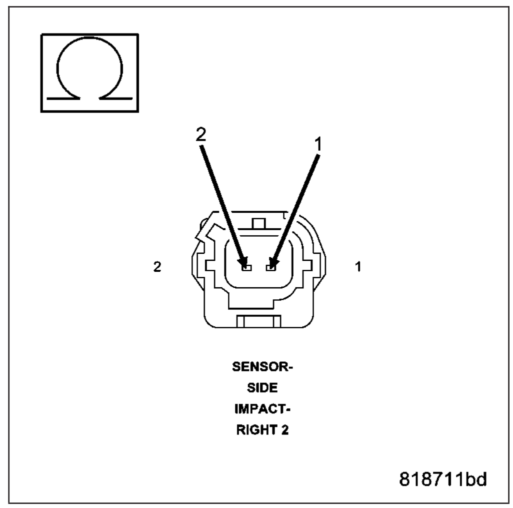
Yes >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for a short to ground.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R18) Right Side Impact Sensor 2 Signal and (R20) Sensor Ground circuits at the Right Side Impact Sensor 2 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits shorted together.

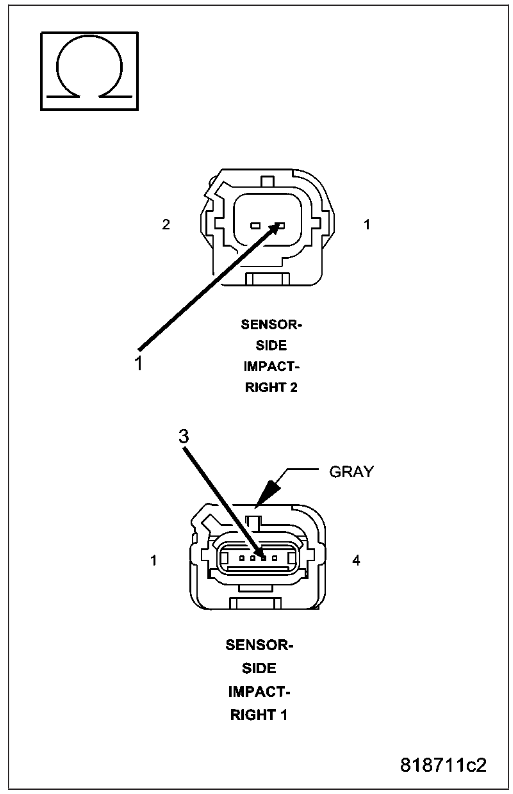
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK THE (R20) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R20) Right Side Impact Sensor 2 Ground circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.



Is the resistance below 1 ohm?

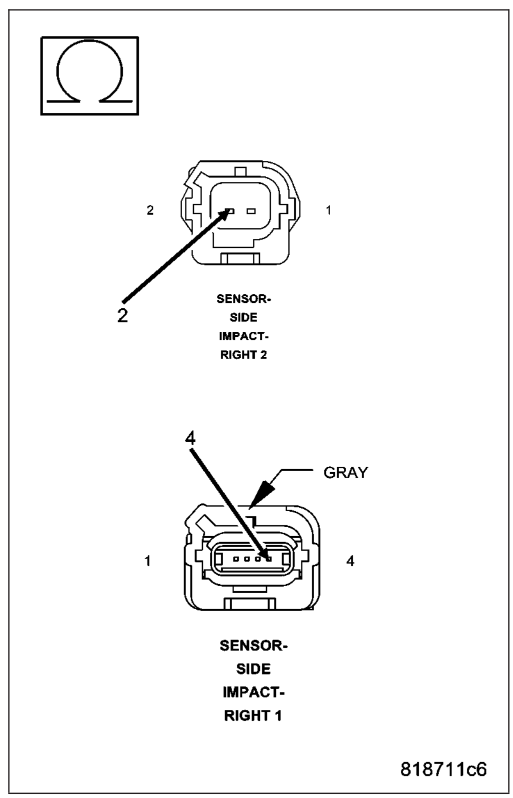
Yes >> Go To 6

No >> Repair the (R20) Right Side Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

6. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.



Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for an open or high resistance.

Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2

Replace the Right Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

Did the active Right Side Impact Sensor 2 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (LEFT WINDOW REGULATOR MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASS DOOR MODULE (RIGHT WINDOW REGULATOR MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0201-LOST COMMUNICATION WITH LEFT REAR DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0202-LOST COMMUNICATION WITH RIGHT REAR DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0212-LOST COMMUNICATION WITH SCM - CAN-B

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0241-LOST COMMUNICATION WITH AUTO HIGHBEAM HEADLAMP CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U1414-IMPLAUSIBLE/MISSING ECU CONFIGURATION DATA

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The ORC on board diagnostics continuously monitors the CAN Bus message from the TIPM containing the ORC Configuration Data.
- **Set Condition:**
  This DTC will set if the appropriate CAN Bus message is not received by the ORC.

Possible Causes
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. TOTALLY INTEGRATED POWER MODULE FAILURE

Turn the ignition on.

With the scan tool, read TIPM DTCs.

Does the scan tool display any TIPM DTCs?

Yes >> Select appropriate symptom from Symptom List. Repair all TIPM active DTCs and before diagnosing the ORC DTCs.

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.
Perform *ORC VERIFICATION TEST - VER 1.

U1415-IMPLAUSIBLE/MISSING VEHICLE CONFIGURATION DATA

- **When Monitored:**
  With the ignition on. The ORC on board diagnostics loads the ORC Configuration Data from the TIPM CAN Bus message.
- **Set Condition:**
  This DTC will set if the CAN Bus message was received but the information is invalid or corrupt.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.

Perform *ORC VERIFICATION TEST - VER 1.

*AIRBAG SYSTEM VERIFICATION TEST - VER 1

1. *AIRBAG SYSTEM VERIFICATION TEST - VER 1

1. Remove all special tools and jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

2. Connect the scan tool to the Data Link Connector - use the most current software available.

3. If sent here from an Occupant Classification System (OCS) related diagnostic procedure or if repairs were made to the OCS, perform the Occupant Classification Module System Verification Test in this Section before proceeding.

4. If repairs were made to the Occupant Classification System (OCS), perform the Belt Tension Sensor Verification Test in this Section before proceeding.

5. With the scan tool, erase stored DTCs in all Airbag System Modules.

6. Turn the ignition off, and wait 15 seconds, then turn the ignition on.

7. Wait one minute, and read active DTCs in all Airbag System Modules.

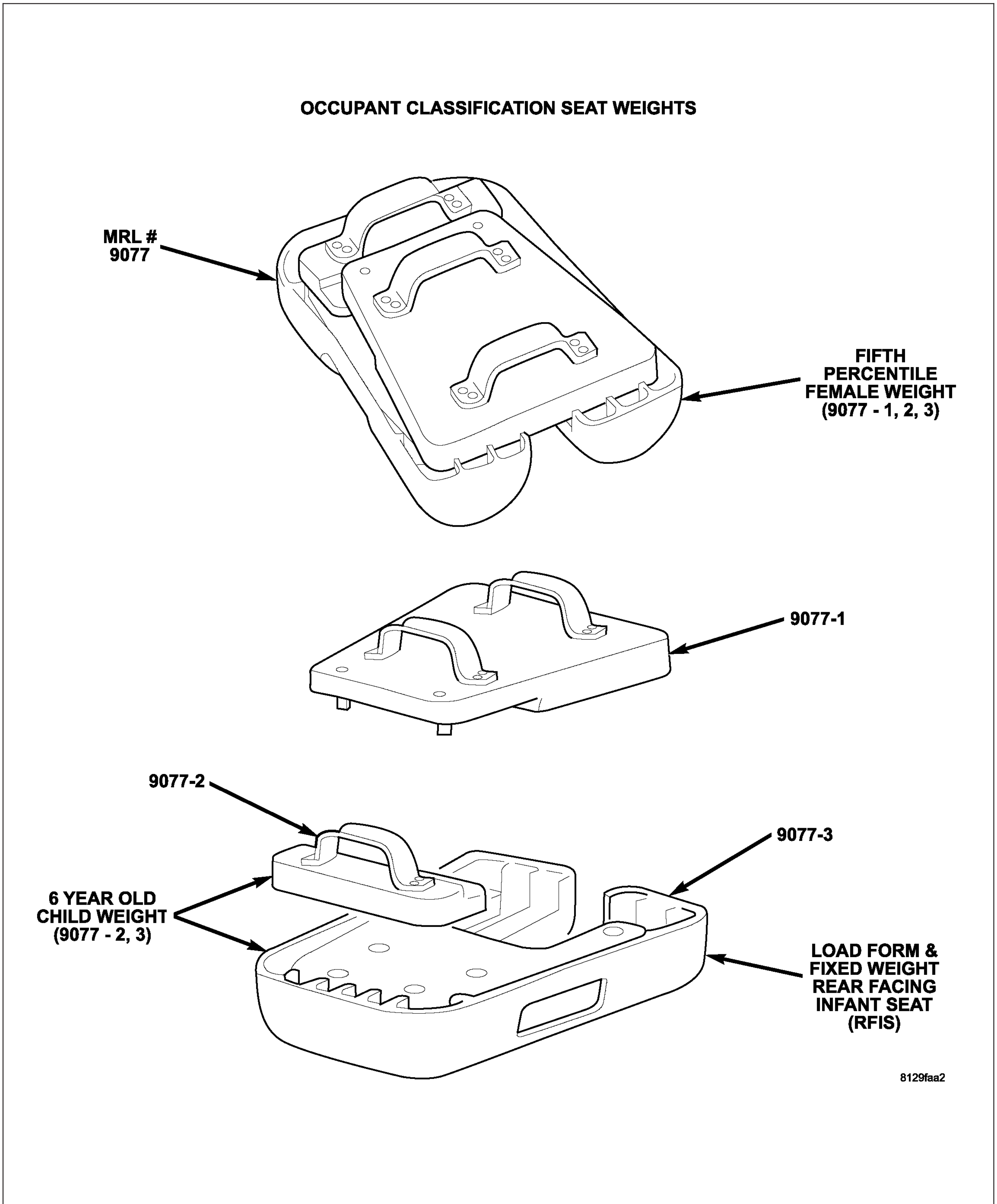
8. Read the stored DTCs in all Airbag System Modules.

Are any DTCs present or if the original condition still present?

Yes >> Repair is not complete. Select the appropriate diagnostic procedure from the Table of Contents in this section.

No >> Repair is complete.

*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS



1. VERIFY COMPLAINT

Turn the ignition off.

Move the front passenger seat to the full rear position. Verify that the seat is empty, the seat back is in the normal upright position, and that the seat is not interfering with any interior components.

Verify that all related connectors are properly seated and locked.

Turn the ignition on.

With the scan tool in OCM, select Data Display and note the Passenger Seat Weight Sensor voltage for all four sensors (Left Front, Right Front, Left Rear and Right Rear).

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position (full rear, mid track, and full forward).

Is any sensor's voltage reading out of the acceptable range in any position?

Yes >> Go To 2

No >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

2. CHECKING FOR BENT FLOOR PAN

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat to the vehicle crossmembers, but do not remove them. Verify that the seat is loose and that no binding exists between the seat and the crossmembers.

Move the front passenger seat to the full rear position and then to the full forward position.

Tighten all of the mounting screws to specification. Refer to Group 23 for specification.

Move the front passenger seat to the full rear position.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position.

Is any sensor's voltage reading out of the acceptable range in any position?

Yes >> Go To 3

No >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

3. CHECKING SEAT TO RISER STRESS

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat track to the riser, but do not remove them. Verify that the seat track is loose and that no binding exists between the seat track and the risers.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.5 to 3.5 volts for each sensor.

Is any sensor's voltage reading out of the acceptable range?

Yes >> Go To 4

No >> Visually inspect for damaged or bent risers and crossmembers. Also, verify that the riser holes line up with the seat mounts in the crossmembers.

If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

If crossmember or floorpan damage is present, repair or replace the components as necessary in accordance with the Service Information. Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the directions displayed on the scan tool. When the test is complete, Go To 1.

4. TEST SEAT FRAME

Turn the ignition off.

Remove the front passenger seat from the risers in accordance with the Service Information. Return the risers to their normal mounting position.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

Is any sensor's voltage reading out of the acceptable range?

Yes >> Go To 5

No >> Visually inspect for damaged or bent risers, a damaged or bent seat and seat structure, and damaged or bent seat tracks. Also, verify that the holes in the center of the sensors line up with the seat track holes and that the seat track position locating tabs are locked in the same parallel slots. If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

If seat or seat track damage is present, replace the components as necessary in accordance with the Service Information. Then, Go To 7

5. TEST SENSOR

Turn the ignition off.

Loosen the mounting screws of all of the Seat Weight Sensors, but do not remove them. Verify that the sensors are loose and that no binding exists between the sensors and the risers.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

Is any sensor's voltage reading out of the acceptable range?

Yes >> Replace any Seat Weight Sensors that have an unacceptable voltage reading in accordance with the Service Information. Then, Go To 6.

No >> Replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6

6. CHECKING FOR IMPROPER SEAT WEIGHT SENSOR TORQUE

Turn the ignition off.

Tighten all of the Seat Weight Sensor mounting screws to specification. Refer to Group 23 for specification.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

Is any sensor's voltage reading out of the acceptable range?

Yes >> Loosen the mounting screws of all Seat Weight Sensors with an unacceptable voltage reading, and repeat Steps 5 and 6.

No >> Go To 7

7. TEST SEAT TRACKS

Turn the ignition off.

Mount the front passenger seat on the risers in accordance with service information.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

Is any sensor's voltage reading out of the acceptable range?

Yes >> Replace the seat track in accordance with the Service Information. Verify that no binding exists between the seat and risers. Then, repeat Steps 6 and 7.

No >>

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed by the scan tool. When the test is complete, Go To 1

*OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Diagnostic Test

1. PERFORM THE OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

NOTE: Ensure that the battery is fully charged.

NOTE: The Occupant Classification Seat Weights 9077 are required to perform this test.

Remove any special tools or jumper wires and reconnect all previously disconnected components – except the battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes >> Go To 2

No >> Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1. Diagnostic Test

2. PERFORM THE OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to Group 23 for specification.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: verify that all tests steps that led you here were performed as directed; verify that the ignition is in run; Wait 30 seconds after changing the seat weight before proceeding to allow the system to stabilize; only press scan tool buttons when directed to do so; and perform the Occupant Classification Module System Verification Test to completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active DTCs?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform *AIRBAG SYSTEM VERIFICATION TEST - VER 1.

RESTRAINTS - SERVICE INFORMATION

TABLE OF CONTENTS

RESTRAINTS - SERVICE INFORMATION

DESCRIPTION

Available occupant restraints for this vehicle include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed.

ACTIVE RESTRAINTS

The active restraints for this vehicle include:

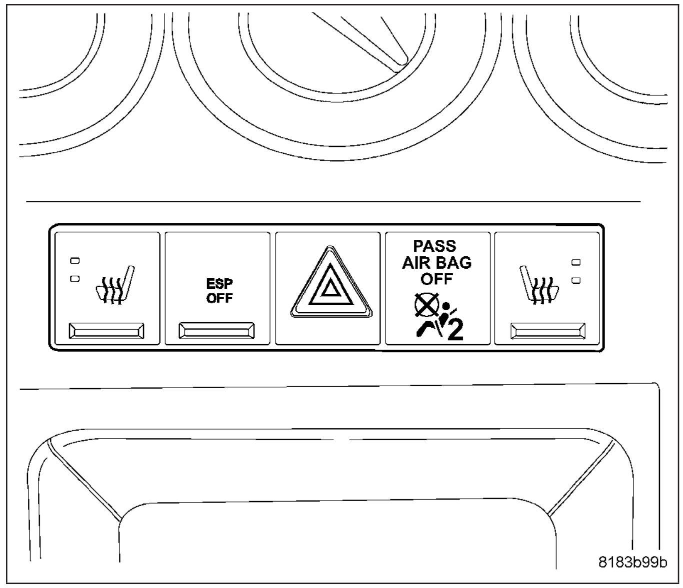
- **Child Restraint Anchors** - All vehicles are equipped with three, fixed-position, child seat upper tether anchors for the rear seating. Two anchors are integral to the back of the left rear seat back panel, and one is integral to the right rear seat back panel. Two lower anchors are also provided for each rear outboard seating position. The lower anchors are integral to the rear seat back panel bracket on the rear floor panel and are accessed from the front of the rear seat where the seat back meets the seat cushion.
- **Front Seat Belts** - Both front seating positions are equipped with three-point seat belt systems employing lower B-pillar mounted inertia latch-type emergency locking retractors, height-adjustable upper B-pillar mounted turning loops, a traveling lower seat belt anchor secured to the outboard side of the seat frame, and a traveling end-release seat belt buckle secured to the inboard side of the seat frame. Both front seat belt retractors include an integral seat belt switch that detects whether the front seat belts have been fastened.
- **Rear Seat Belts** - All three rear seating positions are equipped with three-point seat belt systems. The outboard seating position belts employ lower C-pillar mounted inertia latch-type emergency locking retractors, fixed position upper C-pillar mounted turning loops, self-cinching latch plates for compatibility with child seats, and fixed lower seat belt anchors secured to the rear floor panel by fasteners shared with the rear seat back panel bracket. The rear seat center seating position has a D-pillar inertia latch-type emergency locking retractor. The center retractor for this vehicle is unique in the fact that the lower anchor is unlatchable to enable the folding flat of the rear seat backs. The rear seat center seating position belt lower anchors are secured to the rear floor panel with the outboard seat belt buckles. All three rear seat belts have fixed end-release seat belt buckles secured to the rear floor panel by fasteners shared with the rear seat back panel bracket.

PASSIVE RESTRAINTS

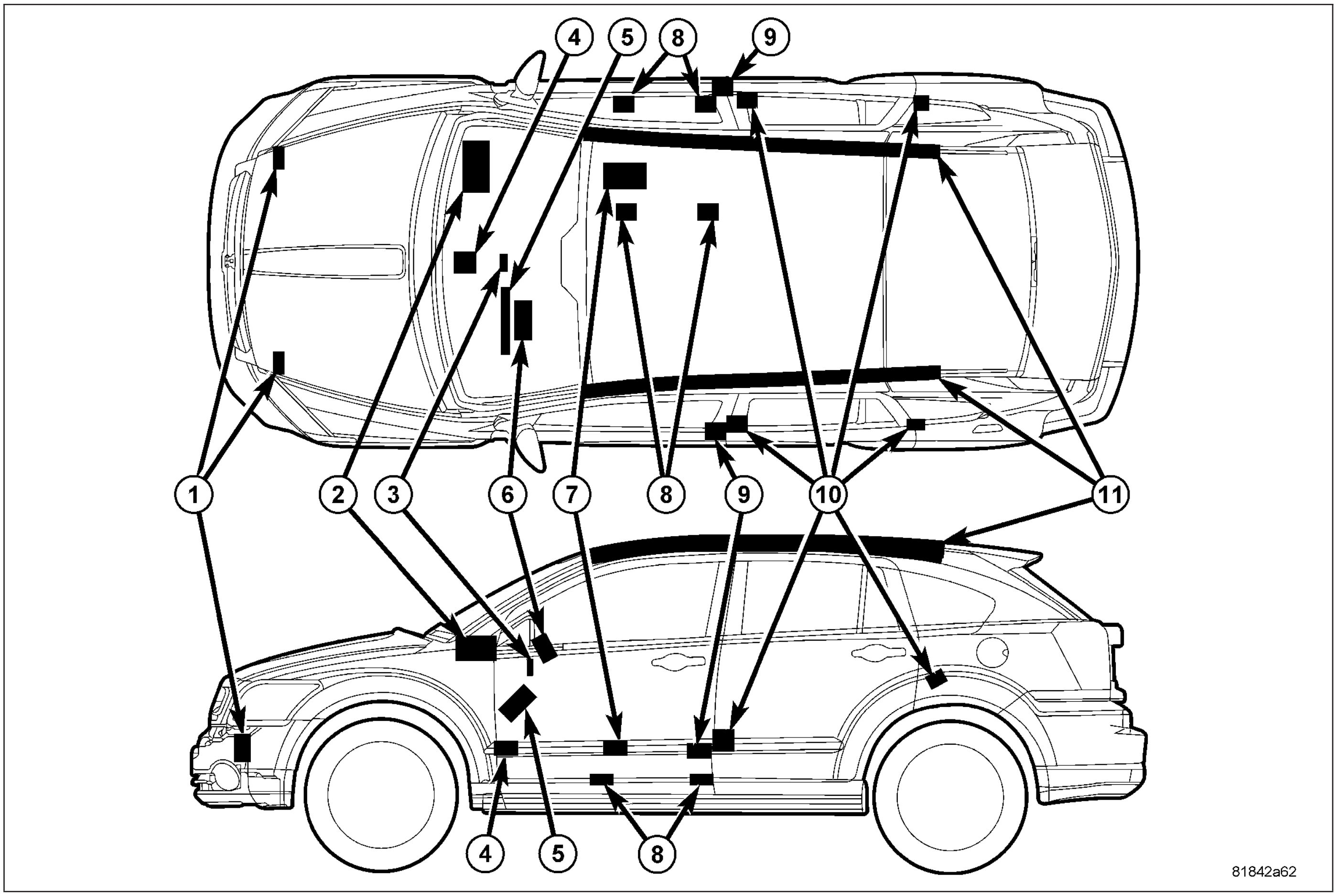
The passive restraints available for this vehicle include the following:



- **Curtain Airbags** - Curtain airbags are available for this vehicle when it is also equipped with dual front airbags. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS).
- **Dual Front Airbags/Knee Blocker Airbag** - Multistage driver and front passenger airbags are used in this vehicle. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by the **SRS - AIRBAG** logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag area of the instrument panel top panel above the glove box. Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the Electro-Mechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) for about seven seconds as a bulb test each time the ignition switch is turned to the ON position. A pyrotechnic-type seat belt tensioner is also integral to the front seat belt tensioner units mounted on both left and right side B-pillars to work in conjunction with the dual front airbags. The front airbag system also includes a Knee Blocker Airbag (if equipped) that is located just beneath the steering column, behind the under column cover. If not equipped with the knee blocker airbag, a rigid plastic brace will replace it in the instrument panel to prevent the driver from being pushed underneath the instrument panel in the case of a frontal impact.



- **Occupant Classification System** - Vehicles manufactured for sale in North America (except Mexico) also include an Occupant Classification System (OCS) with components that are located on the front seats. These components include an Occupant Classification Module (OCM) and four seat weight sensors on the passenger seat, and seat track position sensors on both the driver and passenger front seats. Vehicles equipped with the OCS components can be readily identified by a passenger airbag on/off indicator located on the Accessory Switch Bank Module (ASBM) on the instrument panel center stack, just below the heat and A/C controls.



The supplemental restraint system includes the following major components, which are described in further detail elsewhere in this service information:

- **Airbag Indicator** - The airbag indicator is integral to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN), which is located on the instrument panel in front of the driver.
- **Clockspring** - The clockspring is located near the top of the steering column, directly beneath the steering wheel.
- **Curtain Airbag (11)** - In vehicles equipped with this option, a side curtain airbag is secured to each inside roof side rail above the headliner, and extends from the A-pillar to just beyond the C-pillar.
- **Driver Airbag (6)** - The driver airbag is located in the center of the steering wheel, beneath the driver airbag trim cover.
- **Driver Knee Blocker** - The driver knee blocker is a structural unit secured to the instrument panel, underneath the under column cover.
- **Front Impact Sensor (1)** - Two front impact sensors are used on vehicles equipped with dual front airbags, one left side and one right side. One sensor is located on the back side of each vertical member of the radiator support.
- **Knee Blocker Airbag (if equipped) (5)** - On vehicles with dual front airbags, there is an optional knee blocker airbag available that is mounted behind the under column cover, just below the steering column on the instrument panel.
- **Occupant Classification Module (7)** - Vehicles equipped with the Occupant Classification System (OCS) include an Occupant Classification Module (OCM) which is secured to the seat riser frame under the passenger side front seat cushion.
- **Occupant Restraint Controller (4)** - The Occupant Restraint Controller (ORC) is located on a mount on the floor panel tunnel, below the instrument panel center stack and HVAC unit.
- **Passenger Airbag (2)** - The passenger airbag is located in the instrument panel, beneath the instrument panel top panel and above the glove box on the passenger side of the vehicle.

- **Passenger Airbag On/Off Indicator (3)** - The Occupant Classification System (OCS) includes a passenger airbag on/off indicator which is located in the Accessory Switch Bank Module (ASBM) on the instrument panel center stack, just below the heat and A/C controls.
- **Passenger Knee Blocker** - The passenger knee blocker is a structural reinforcement that is integral to and concealed within the glove box door.
- **Seat Belt Tensioner (9)** - A seat belt tensioner is integral to both front seat belt retractor units on vehicles equipped with dual front airbags. The seat belt tensioner units are secured to the B-pillar and concealed beneath the lower trim panels.
- **Seat Track Position Sensor** - The Occupant Classification System (OCS) includes two seat track position sensors. One sensor is located on the inboard side of one of the seat adjuster tracks on both the driver and the passenger front seats.
- **Seat Weight Sensor (8)** - Vehicles equipped with the Occupant Classification System (OCS) include four seat weight sensors, one on each corner of the passenger side front seat between the seat riser frame and the seat track.
- **Side Impact Sensor (10)** - Four side impact sensors are used on vehicles equipped with the optional curtain airbags, two on each side of the vehicle. One sensor is located behind the B-pillar trim near the base of each B-pillar, and one sensor is located behind the quarter panel trim near the base of each C-pillar.

OPERATION

ACTIVE RESTRAINTS

The primary passenger restraints in this or any other vehicle are the seat belts and child restraint anchors. Seat belts and child restraint anchors are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them. See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed active restraints.

PASSIVE RESTRAINTS

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle **only** when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the supplemental restraint system.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Occupant Restraint Controller (ORC). An airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the ON or START positions. Following the bulb test, the airbag indicator is turned ON or OFF by the ORC to indicate the status of the supplemental restraint system. If the airbag indicator comes ON at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the supplemental restraints depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of deceleration as measured by the forces of gravity (G force) upon the impact sensors. When an impact is severe enough, the microprocessor in the ORC signals the inflator of the appropriate airbag units to deploy their airbag cushions. The front seat belt tensioners are provided with a deployment signal by the ORC in conjunction with the front airbags.

During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the front seat passenger to the structure of the instrument panel. If equipped with the optional knee blocker airbag, the driver has enhanced security to maintain the proper position. The seat belt tensioners remove the slack from the front seat belts to provide further assurance that the driver and front seat passenger are properly positioned and restrained for an airbag deployment.

The airbag deployment and deflation occur very rapidly. In a typical 48 kilometer-per-hour (30 mile-per-hour) barrier impact, from the moment of impact until the airbags are fully inflated takes about 40 milliseconds. Within one to two seconds from the moment of impact, the airbags are almost entirely deflated. The times cited for these events are

approximations, which apply only to a barrier impact at the given speed. Actual times will vary somewhat, depending upon the vehicle speed, impact angle, severity of the impact, and the type of collision.

When the ORC monitors a problem in any of the supplemental restraint system circuits or components, including the seat belt tensioners, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit and sends an electronic message to the EMIC/CCN to turn ON the airbag indicator.

To diagnose the supplemental restraint system or the electronic controls and communication related to supplemental restraint system operation, as well as the retrieval or erasure of a DTC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed passive restraints.

OCCUPANT CLASSIFICATION SYSTEM

In vehicles equipped with the Occupant Classification System (OCS), the OCS automatically suppresses or enables passenger airbag and seat belt tensioner operation based upon whether or not the passenger side front seat is occupied and, if the seat is occupied, classifies the size of the occupant and whether the seat is occupied by a child seat.

The OCS has an Occupant Classification Module (OCM) that monitors inputs from the seat weight sensors under the passenger side front seat cushion and from the seat track position sensors on the passenger side and driver side seat adjuster tracks. Based upon those inputs the microprocessor within the OCM classifies the occupant of the passenger side front seat, and the proximity of each front seat to the front airbags. The OCM then sends electronic **occupant classification** messages to the Occupant Restraint Controller (ORC). The microprocessor and programming of the ORC determines whether to enable or disable the deployment circuits for the passenger airbag and seat belt tensioner; and, if enabled, what force level should be used to deploy each front airbag.

The OCS electrical circuits and components are continuously monitored by the OCM, and the OCM is continuously monitored by the ORC. A passenger airbag on/off indicator is located in the Accessory Switch Bank Module (ASBM) in the instrument panel center stack, just below the heat and A/C controls. This indicator receives battery current whenever the ignition switch is in the ON or START positions, and illuminates only when the ORC pulls the indicator control circuit to ground. The indicator illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the ON or START positions. Following the bulb test, the indicator is turned ON or OFF by the ORC based upon the electronic **occupant classification** messages received from the OCM. This indicator is illuminated whenever the seat is occupied and passenger airbag and seat belt tensioner operation has been suppressed. The indicator is turned OFF whenever the seat is empty or when the seat is occupied and the passenger airbag and seat belt tensioner are enabled.

When the OCM monitors a problem in any of the OCS circuits or components, it stores a fault code or DTC in its memory circuit and sends an electronic message to the ORC. The ORC then sends an electronic message to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) to turn ON the airbag indicator. If for any reason the OCM is unable to classify the occupant it sends an electronic message to the ORC, and the ORC suppresses passenger airbag and seat belt tensioner operation.

To diagnosis the OCS or the electronic controls or communication related to OCS operation, as well as the retrieval or erasure of a DTC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed passive restraints.

WARNING

FRONT AIRBAG SYSTEM

This system contains a sensitive, complex electronic unit. Disconnect and isolate the battery negative remote cable before beginning airbag system component removal or installation procedures. This will disable the airbag system. Failure to disconnect the battery could result in accidental airbag deployment, personal injury, or death.

Allow system capacitor to discharge for two minutes before removing airbag components.

Do not place an intact undeployed airbag face down on a solid surface, the airbag will propel into the air if accidentally deployed and could result in personal injury or death. When carrying or handling an undeployed airbag, the trim side of the airbag should be pointing toward the body to minimize possibility of injury or death if accidental deployment occurs.

Replace airbag system components with Mopar® replacement parts only. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection, personal injury or death.

Wear safety glasses, rubber gloves, and long sleeved clothing when cleaning powder residue from the vehicle after an airbag deployment. A powder residue emitted from a deployed airbag can cause skin irritation. Flush affected area with cool water if irritation is experienced. If nasal or throat irritation is experienced, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.

Do not use a replacement airbag that is not in the original packaging, improper deployment, personal injury or death may result.

The factory installed fasteners, screws and bolts used to fasten airbag components are specifically designed for the airbag system. Do not use substitute fasteners, use only original equipment fasteners listed in the parts catalog when fastener replacement is required.

Airbags should be stored in a cool, dry place, away from excessive heat and static electrical activity with the fabric airbag facing up. If not, a premature deployment can result in personal injury or death.

Please refer to the Hazardous Substance Control System for proper disposal. Dispose of deployed air bags in a manner consistent with state, provincial, local, and federal regulations.

SIDE IMPACT AIRBAG SYSTEM

The side impact airbag system contains sensitive, complex electronic units. Before attempting to diagnose or service any side impact airbag system components, you must first disconnect and isolate the battery negative remote cable. This is the only sure way to disable the side impact airbag system. Failure to do this could result in accidental curtain airbag deployment and possible personal injury or death.

Allow system capacitor to discharge for two minutes before removing airbag components.

Do not attempt to dismantle a curtain airbag or tamper with its inflator. Do not puncture, incinerate, or bring into contact with electricity. Do not store at temperatures exceeding 93° C (200° F).

Replace side impact airbag system components only with parts specified in the Mopar® parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection.

The fasteners, screws, and bolts originally used for the side impact airbag system components are specifically designed for the side impact airbag system. They must never be replaced with any substitutes. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the Mopar® parts catalog.

Deployed and nondeployed airbags may or may not have live pyrotechnic material within the airbag inflator. Do not dispose of driver, passenger, or curtain airbags unless you are sure of complete deployment. Please refer to the Hazardous Substance Control System for proper disposal. Dispose of deployed airbags in a manner consistent with state, provincial, local, and federal regulations.

LOWER ANCHOR AND TETHER FOR CHILDREN

During, and following, any child restraint anchor service, due to an impact event or vehicle repair, carefully inspect all mounting hardware, tether straps, and anchors for proper installation, operation, or damage. If a child restraint anchor is found damaged in any way, the anchor must be replaced.

DIAGNOSIS AND TESTING

AIRBAG SYSTEM

1. With the battery negative remote cable disconnected, connect the scan tool to the Data Link Connector (DLC).
2. Turn the ignition key to the ON position, then exit vehicle with the scan tool.
3. After checking that no one is inside the vehicle, connect the battery negative remote terminal.
4. Read and record the **ACTIVE** Diagnostic Trouble Code (DTC) data.
5. Read and record any **STORED** DTC's.
6. Refer to the proper diagnostic information if any DTC's are found in Step 4 and Step 5.
7. If the airbag warning lamp either fails to light, or goes ON and stays ON, there is a system malfunction. To test the airbag warning lamp (bulb) operation in the cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Refer to the proper diagnostic information for any other system problems.

STANDARD PROCEDURE

HANDLING AIRBAGS

DEPLOYED AIRBAG

The vehicle interior may contain a very small amount of sodium hydroxide powder, a by-product of airbag deployment. Sodium hydroxide powder can irritate the skin, eyes, nose and throat. Wear safety glasses, rubber gloves, and long sleeved clothing when cleaning any of the powder residue from the vehicle.

If you find that the cleanup is irritating your skin, run cool water over the affected area. Also, if you experience nasal or throat irritation, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.

UNDEPLOYED AIRBAG

The airbags must be stored in its original special container until used for service. At no time should a source of electricity be permitted near the inflator on the back of an airbag. When carrying or handling an undeployed airbag, the trim side of the airbag should be pointing toward the body to minimize possibility of injury if accidental deployment occurs. Do not place undeployed airbag face down on a solid surface, the airbag will propel into the air if accidental deployment occurs.

SERVICE AFTER AN AIRBAG DEPLOYMENT

DRIVER AIRBAG

After a Driver Airbag has been deployed due to a collision, the following **MUST** be replaced:

- Driver Airbag
- Clockspring Assembly
- Steering Wheel
- Complete Steering Column Assembly with Lower Steering Column Coupler

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

PASSENGER AIRBAG

After a Passenger Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Passenger Airbag
- Passenger Airbag Cover

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

KNEE BLOCKER AIRBAG

After a Knee Blocker Airbag has been deployed due to a collision, the following **MUST** be replaced:

- Knee Blocker Airbag
- Knee Blocker Airbag Trim Cover
- Instrument Panel and Pad Assembly

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

CURTAIN AIRBAG

After a Curtain Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Curtain Airbag Assembly
- Headliner
- A, B, C, and D-pillar trim on deployed side.

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

OCCUPANT CLASSIFICATION SYSTEM (OCS)

After an impact event, either front, rear, or side, the OCS system components need to be inspected and replaced if found to be damaged.

This includes:

- Occupant Classification Module (OCM)
- Passenger Airbag Disabled Indicator
- Seat Weight Sensors (4)

WARNING: Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and result in personal injury or death.

Whether replaced or not, the OCS must be re-zeroed to make sure that the system in within proper parameters to sense the occupants weight correctly.

WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

WARNING: Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information. Personal injury or death may result if the system test is not performed.

SEAT BELTS AND TENSIONERS

After a frontal impact where an airbag has been deployed due to a collision. the following **MUST** be replaced:

- Front Seat Belt Retractors (driver and passenger) with integral Tensioners.

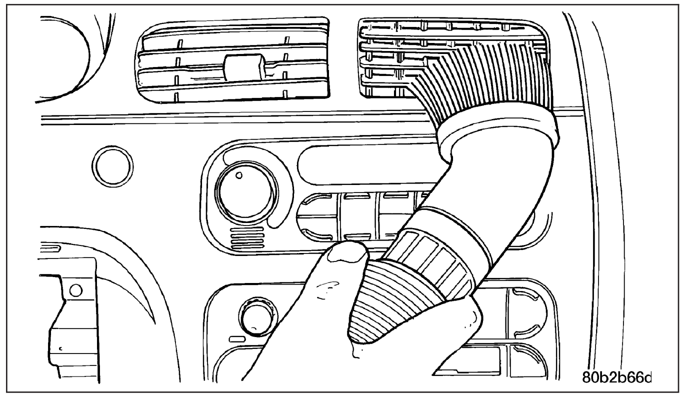
All other seat belts should be closely inspected for cuts, tears, fraying, or damage in any way following any frontal impact or airbag deployment. The other seat belts are to be replaced when visible damage is incurred. Inspect the Lower Anchors and Tether for CHildren (LATCH) child restraint anchors for damage after an impact event and replace as needed.

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

CLEAN UP PROCEDURE

Roll or fold the airbag towards its mounting point (i.e. instrument panel, steering wheel, or seat back). Then tape the ripped cover over the deployed airbag.

Use a vacuum cleaner to remove any residual powder from the vehicle interior. Work from the outside in to avoid kneeling or sitting in a contaminated area. Vacuum the heater and A/C outlets as well. If the heater or air conditioner was in RECIRC mode at time of airbag deployment, operate blower motor on low speed and vacuum powder residue expelled from the heater and A/C outlets. Multiple vacuum cleaning may be necessary to decontaminate the interior of the vehicle.



SPECIFICATIONS

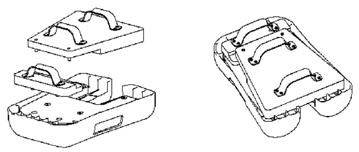
RESTRAINTS - TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Curtain Airbag Retaining Bolts	8	6	71
Driver Airbag Retaining Bolts	10	7.5	88.5
Front Impact Sensor Retaining Screws	8	6	71
Front Seatbelt Buckle Retaining Bolt	51	37.5	-
Front Seatbelt Height Adjuster Retaining Bolts	40	30	-
Front Seatbelt Retractor Lower Retaining Bolt	40	30	-
Front Seatbelt Upper Turning Loop Retaining Bolt	40	30	-
Front Seatbelt Webbing Anchor Bolt	51	37.5	-
Knee Blocker Airbag Retaining Nuts	10.5	8	93
Occupant Restraint Controller Retaining Nuts	9	6.5	79.5
Passenger Airbag Retaining Bolts	9.5	7	84
Rear Center Seatbelt Retractor Retaining Bolt	40	30	-
Rear Seatbelt Retractor Lower Retaining Bolt	40	30	-
Rear Seatbelt Webbing Anchor Bolt	40	30	-
Rear Seatbelt Buckle Retaining Bolt	56	41.5	-
Seat Weight Sensor to Adjuster Retaining Nut	45	33	-
Seat Weight Sensor to Riser Retaining Nuts	28	20.5	248
Side Impact Sensor Retaining Screw (B and C-pillar)	8	6	71

SPECIAL TOOLS

RESTRAINT SYSTEMS



OCS Seat Weight Tool 9077

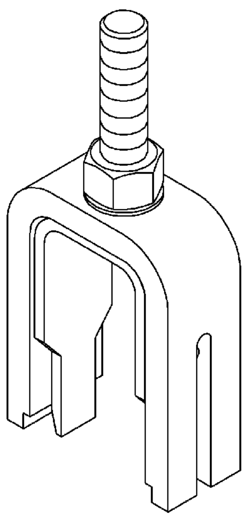
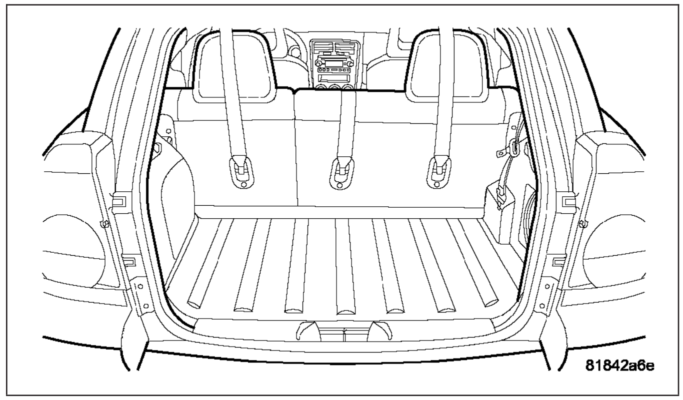


Fig. 1 Strain Gauge Alignment Tool 9689

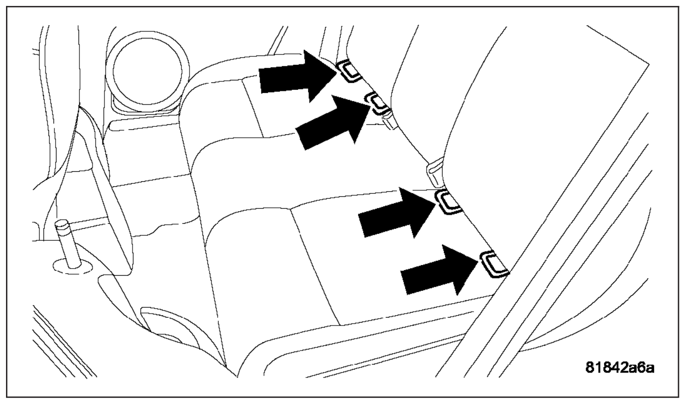
CHILD RESTRAINT ANCHOR

DESCRIPTION

The Lower Anchors and Tether for CHildren, or LATCH child restraint anchorage system provides for the installation of suitable child restraints in certain seating positions without using the seat belt provided for that seating position. The second row seats are equipped with a fixed-position child restraint upper tether anchor for all three seating positions.



There are child restraint lower anchors for both outboard seating positions in the second row. The left lower anchors are permanently mounted on the second row seat hinge, along with the right outboard lower anchor. The right inboard lower anchor is mounted on a bracket mounted to the seat floor pan. These anchors are constructed from a heavy-gauge steel wire loop. They are each accessed from the front of their respective seats, at each side where the seat back meets the seat cushion. These lower anchors cannot be adjusted or repaired and, if faulty or damaged, the entire mounting assembly must be replaced, either the right inboard bracket or seat hinge(s).

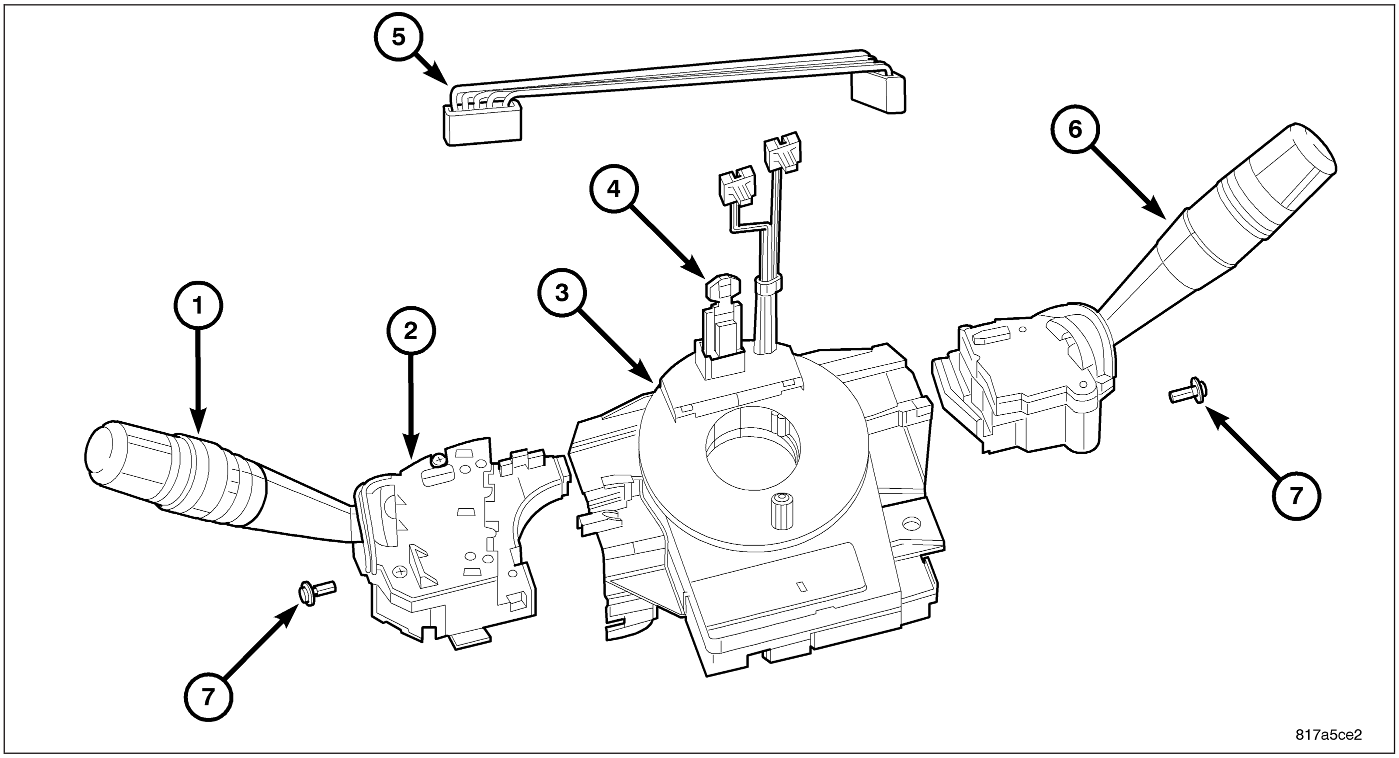


OPERATION

See the owner’s manual in the vehicle glove box for more information on the proper use of all of the child restraint anchors.

CLOCKSPRING

DESCRIPTION



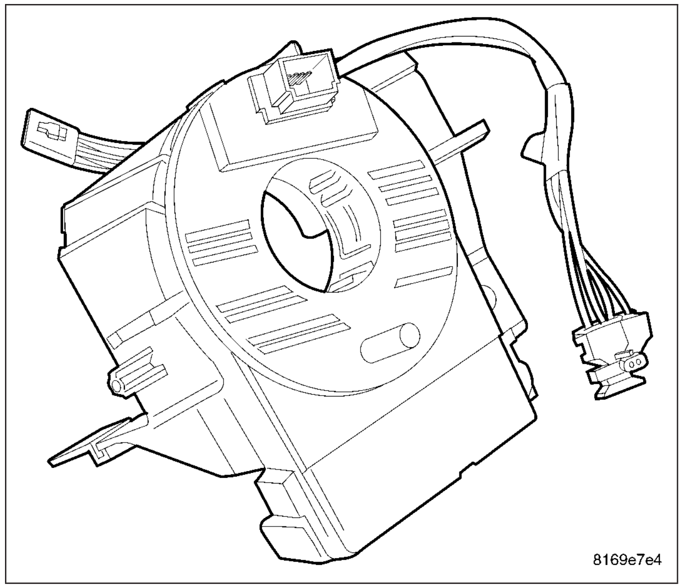
The clockspring (3) is mounted to the steering column behind the steering wheel. This assembly consists of a flat, ribbon like, electrically conductive tape that winds and unwinds with the steering wheel rotation. The headlamp (left), and wiper (right) stalks have their own connector to the I/P wiring harness. The clockspring is used to maintain a continuous electrical circuit between the wiring harness and the:

- Driver Airbag through the two squib connectors
- Horn Switch
- Steering wheel mounted radio controls
- Speed Control Switch

The left and right multi-function switches (1 and 2) attach to the clockspring (3) and is then mounted to the steering column as an assembly.

The clockspring is part of the Steering Column Control Module (SCCM). The SCCM is secured near the top of the steering column below the steering wheel. The SCCM is a modular unit that also interfaces with and supports the left (lighting) multi-function switch and the right (wiper) multi-function switch. Each of these switches and the clock-spring can be separated from and are serviced individually from the SCCM.

Within the plastic case is a spool-like molded plastic rotor with a large exposed hub. The upper surface of the rotor hub has a large, keyed center hole, an index hole, two short pigtail wires with connectors, and one connector receptacle that face toward the steering wheel. Wound around the rotor spool within the case is a long ribbon-like tape that consists of several thin copper wire leads sandwiched between two thin plastic membranes. The outer end of the tape terminates at the connector receptacles that face the instrument panel, while the inner end of the tape terminates at the pigtail wires and connector receptacles on the hub of the clockspring rotor that face the steering wheel. The lower surface of the rotor hub has a molded plastic turn signal cancel cam with two lobes that is keyed to the clockspring rotor.



The service replacement clockspring is shipped with the clockspring pre-centered and with a molded plastic locking pin installed. The locking pin secures the centered clockspring rotor during shipment and handling, but must be removed after the SCCM is installed on the steering column and after the steering wheel is installed (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring cannot be repaired. If the clockspring is faulty, damaged, or if the driver airbag has been deployed, the clockspring must be replaced. (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - REMOVAL).

OPERATION

The clockspring is a mechanical electrical circuit component that is used to provide continuous electrical continuity between the instrument panel wire harness and certain electrical components mounted on or in the rotating steering wheel and steering column. The rotating electrical components include the driver airbag, horn switch, and speed control switch, if the vehicle is so equipped. The clockspring is positioned and secured near the top of the steering column. The electrical connector on the back of the clockspring case connect the clockspring to the vehicle electrical system through two connectors from the instrument panel wire harness.

The turn signal cancel cam is keyed so as to move with the rotation of the steering column shaft and the steering wheel. The cancel cam is secured and also keyed to the lower surface of the clockspring rotor hub, which indexes the clockspring rotor to the turn signal cancel cam. Two short, sleeved pigtail wires on the upper surface of the clockspring rotor connect the clockspring to the driver airbag.

Like the clockspring in a timepiece, the clockspring tape has travel limits and can be damaged by being wound too tightly during full stop-to-stop steering wheel rotation. To prevent this from occurring, the clockspring is centered when it is installed on the steering column. Centering the clockspring indexes the clockspring tape to the movable steering components so that the tape can operate within its designed travel limits. However, if the clockspring is removed from the steering column or if the steering shaft is disconnected from the steering gear, the clockspring spool can change position relative to the other steering components. The clockspring must be re-centered following completion of this service or the tape may be damaged.

Service replacement clocksprings are shipped pre-centered and with a locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column and the steering wheel is installed (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION). If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

STANDARD PROCEDURE

CLOCKSPRING CENTERING

If the rotating tape within the clockspring is not positioned properly with the steering wheel and the front wheels, the clockspring may fail during use. The following procedure **MUST BE USED** to center the clockspring if:

- The clockspring is not known to be properly positioned.
- The front wheels were moved.
- The steering wheel was moved from the half turn (180 degrees) to the right (clockwise) position.

1. Place the wheels in the straight ahead position.
2. Open hood.
3. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

4. Remove the steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).

NOTE: Once the driver airbag and steering wheel are removed, the clockspring doesn't have to be removed to center it. The clockspring rotor moves freely once the steering wheel is removed.

5. Rotate the clockspring rotor in the CLOCKWISE DIRECTION to the end of travel. Do not apply excessive torque.
6. From end of travel rotate counterclockwise more than 180 degrees so the connector and squib wire are at the twelve o'clock position (top). Rotate counter clockwise two additional full turns. Engage clockspring locking mechanism.
7. Install the steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).
8. Install the driver airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

CURTAIN AIRBAG

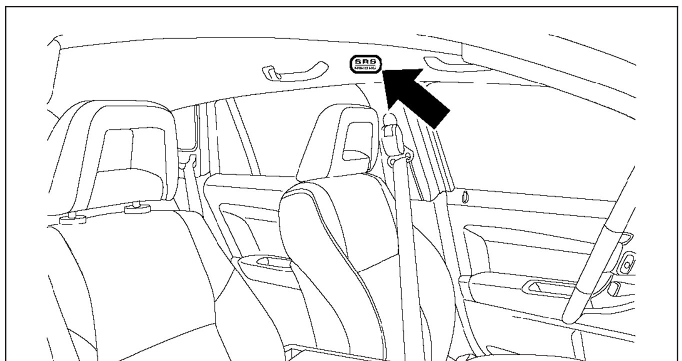
DESCRIPTION

Curtain airbags are available when also equipped with dual front airbags. These airbags are passive, inflatable, Supplemental Restraint System (SRS) components, and can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located near the top of each upper B-pillar trim panel. This system is designed to reduce injuries to the vehicle occupants in the event of a side impact collision.



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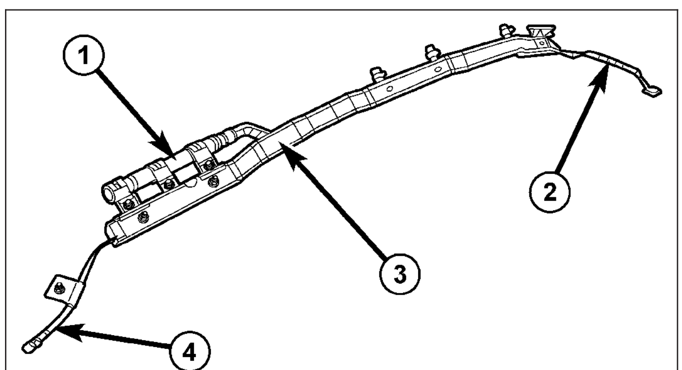
Curtain airbags have two individually controlled curtain airbags. These airbags are concealed and mounted above the headliner where they are each secured to one of the roof side rails. Each folded airbag cushion extends along the roof rail from the A-pillar at the front of the vehicle to the D-pillar at the rear of the vehicle. The airbag cushion is initially secured during installation with plastic push-in fasteners to the roof rail, and then with bolts to securely fasten it to the roof side rail.


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A long tether (2) extends down the A-pillar from the front of the airbag cushion. A short tether (4) is secured near the top of the D-pillar.

The hybrid-type inflator (1) for each airbag is secured to the roof rail at the rear of airbag, back by the C and D-pillars. The entire assembly is secured to the inside of the roof rail with screws.

An airbag squib harness connector is routed up to the rear of the airbag inflator (1). The body harness then connects the curtain airbag to the Occupant Restraint Controller (ORC).



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The curtain airbag cannot be adjusted or repaired and must be replaced if deployed, faulty, or in any way damaged. Once a curtain airbag has been deployed, the complete airbag, the headliner, the upper A, B, C and D-pillar trim, and all other visibly damaged components must be replaced.

OPERATION

Each curtain airbag is deployed individually by an electrical signal generated by the Occupant Restraint Controller (ORC) to which it is connected through squib circuits. The hybrid-type inflator assembly for each airbag contains a small canister of highly compressed inert gas. When the ORC sends the proper electrical signal to the airbag inflator, the electrical energy creates enough heat to ignite chemical pellets within the inflator.

Once ignited, these chemicals burn rapidly and produce the pressure necessary to rupture a containment disk in the inert gas canister. The inflator and inert gas canister are sealed and connected to a tubular manifold so that all of the released gas is directed into the folded curtain airbag cushion, causing the cushion to inflate. As the airbag cushion inflates it will drop down from the roof rail between the edge of the headliner and the side glass/body pillars to form a curtain-like cushion to protect the vehicle occupants during a side impact collision.

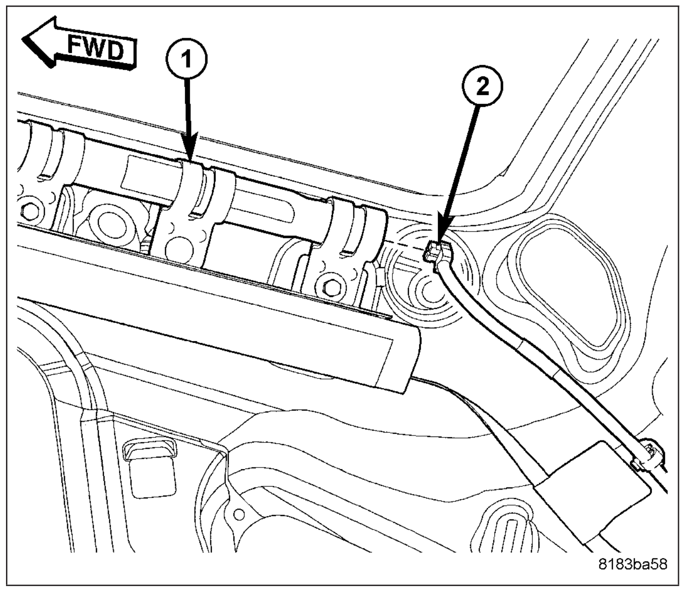
The front and rear tethers keep the airbag cushion taut to the side of the vehicle, thus ensuring that the bag will deploy in the proper position. Following the airbag deployment, the airbag cushion quickly deflates by venting the inert gas through the loose weave of the cushion fabric, and the deflated cushion hangs down loosely from the roof rail.

REMOVAL

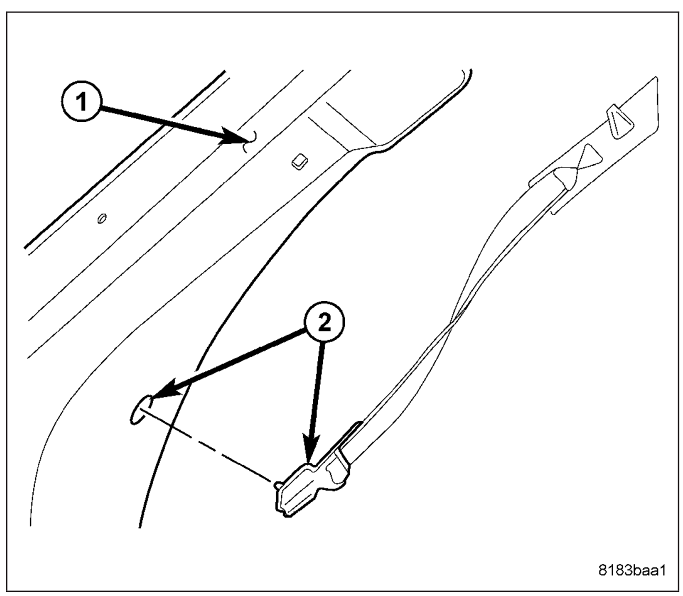
1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

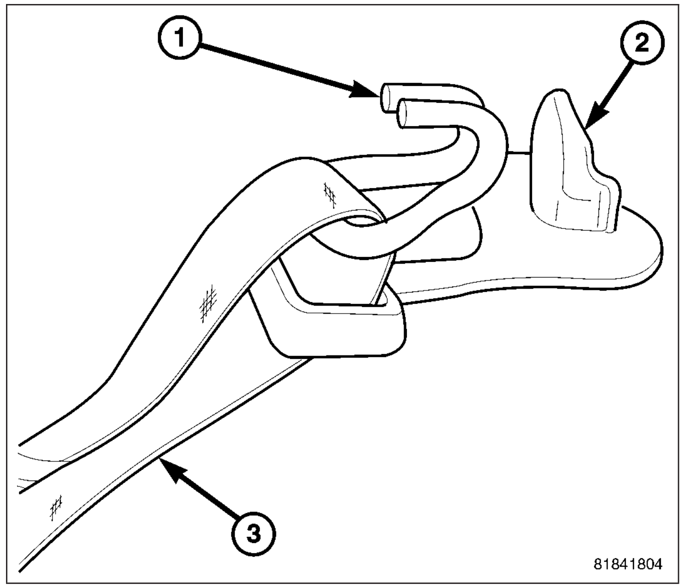
2. Remove the headliner from the vehicle (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Disconnect the curtain airbag squib connector (2) from the inflator (1).

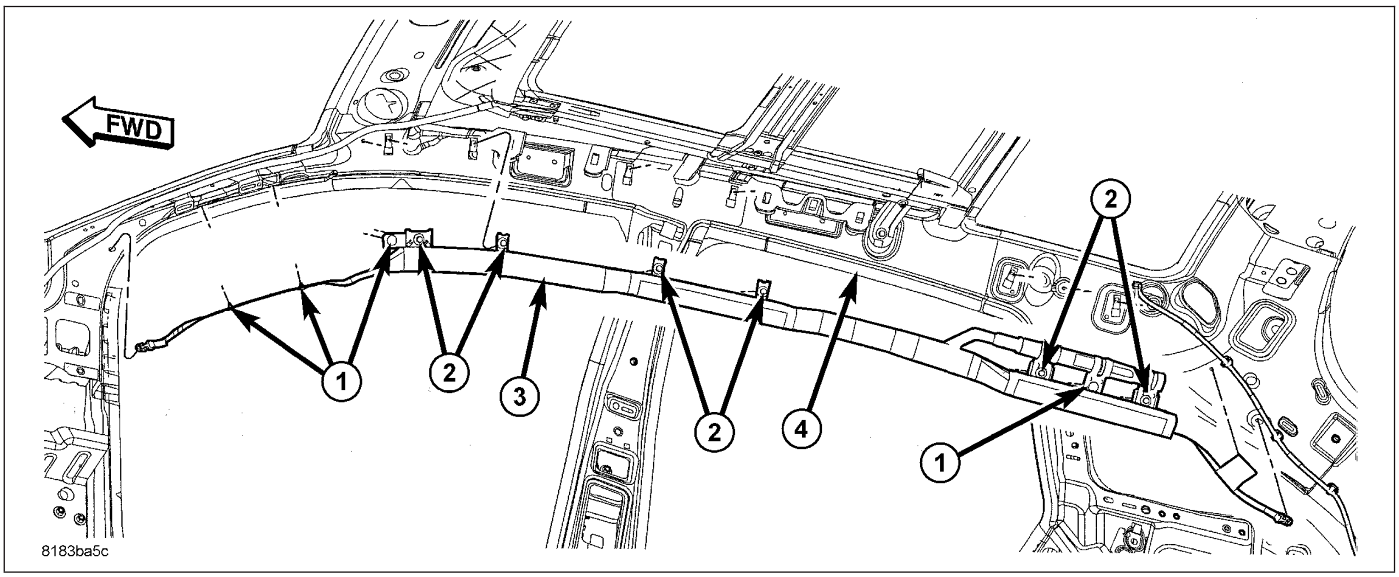


4. Remove the push pin and unhook the front tether (2) from the A-pillar (1).



5. Remove the push pin (2) and unhook (1) the rear tether (3) from the D-pillar.

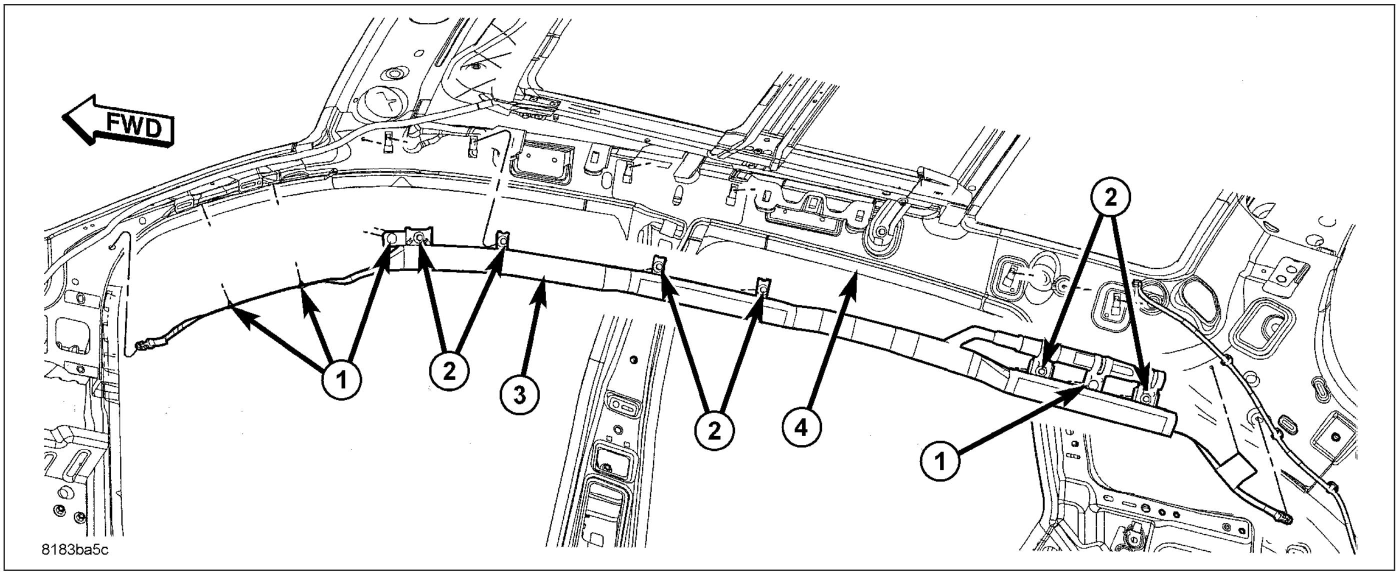




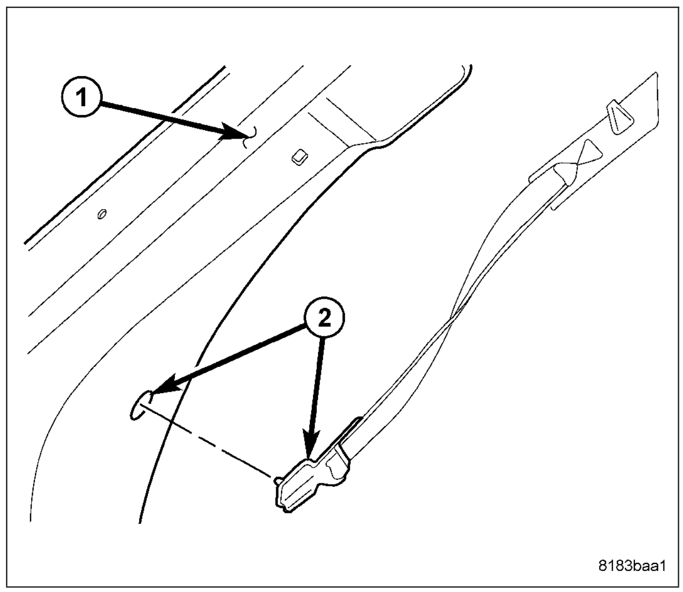
6. Remove the screws (2) that secure the curtain airbag (3) to the spring nuts in the roof side rail (4).
7. The curtain airbag will be held in place with push pins (1). Release the push pins and remove bag (3) from vehicle.

INSTALLATION

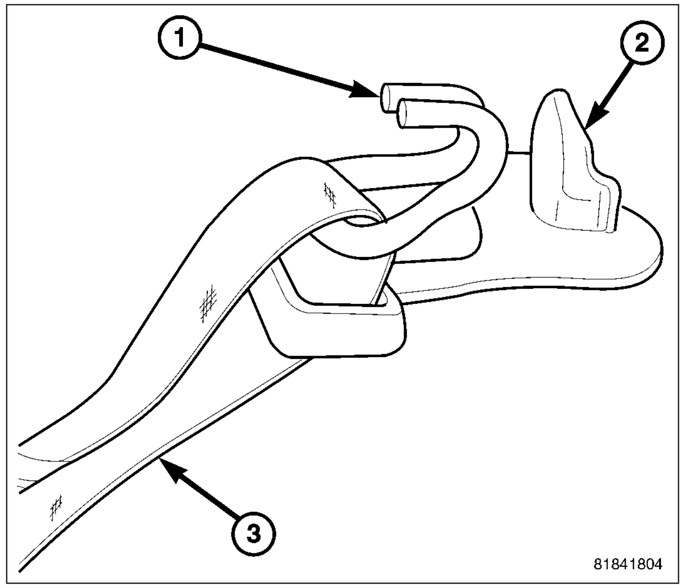
NOTE: When replacing a curtain airbag because of deployment, the headliner must be replaced as well, including any damaged interior components.



1. Position the curtain airbag in vehicle along roof side rail (4) and install by fastening to roof side rail with integral push fasteners (1).
2. Install the bolts (2) holding the curtain to the roof side rail. Tighten bolts to 8 N·m (71 in. lbs.).
3. Clip the front tether (2) to the A-pillar (1) and secure push fastener.

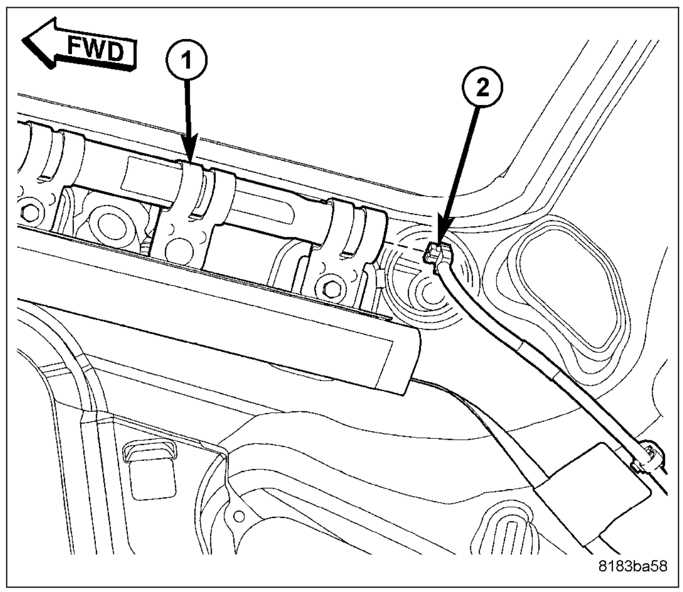


4. Clip the rear tether (3) hook (1) to the D-pillar and secure push fastener (2).



5. Connect the curtain airbag squib connector (2) to the inflator (1).
6. Install the headliner into the vehicle (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).

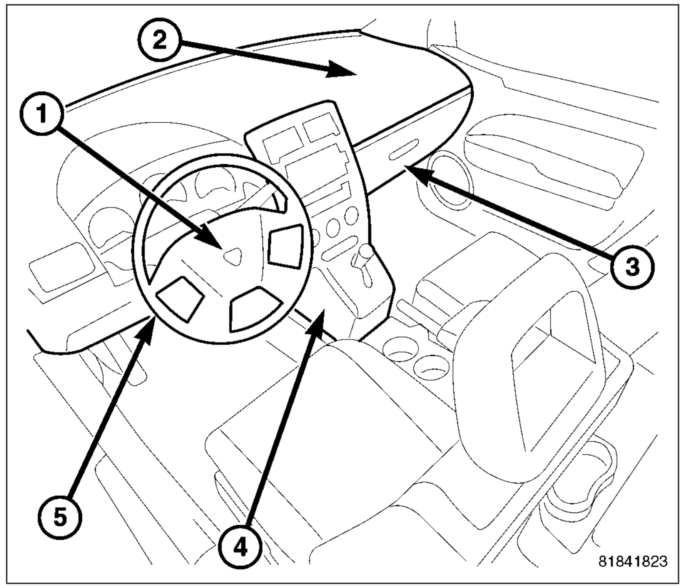
WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



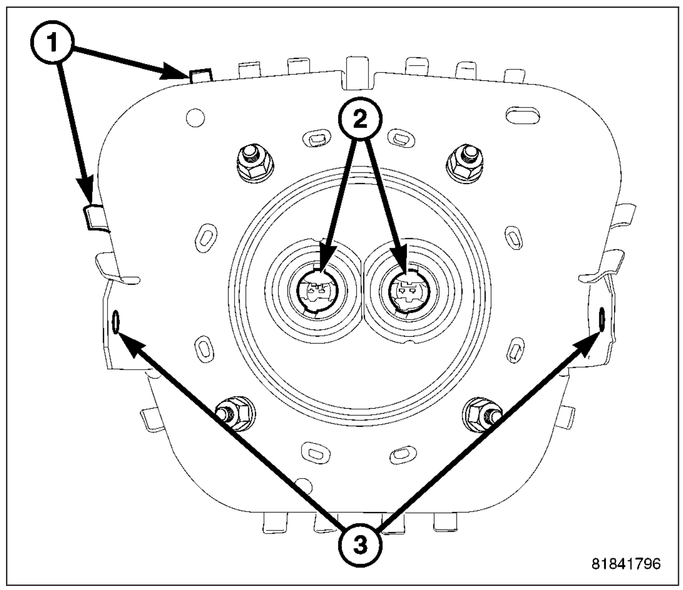
DRIVER AIRBAG

DESCRIPTION

The driver airbag protective trim cover (1) is the most visible part of the driver airbag system.



The driver airbag trim cover is held in place by a latch and hook system (1). The driver airbag is mounted directly to the steering wheel by two bolts on either side of the airbag (3). Located under the airbag cover are the folded airbag cushion, the igniter and two squib connectors (2), the inflator, and the airbag cushion supporting components. The driver airbag is a multistage-type that is designed to deploy with less force than those used in some prior models. A radial deploying fabric airbag cushion with internal tethers is used. The airbag inflator is a dual-initiator, non-azide, pyrotechnic-type unit. Two keyed and color-coded connector receptacles on the driver airbag inflator connect the two inflator initiators to the vehicle electrical system through two yellow-jacketed, two-wire pigtail harnesses of the clockspring.



The driver airbag cannot be repaired, and must be replaced if deployed or in any way damaged. The driver airbag trim cover may be disassembled from the driver airbag unit, and is available for individual service replacement.

OPERATION

The multistage driver airbag is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the driver airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of four delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch and tray unit. Following an airbag deployment, the airbag cushion

quickly deflates by venting the inert gas towards the instrument panel through vent holes within the fabric used to construct the back (steering wheel side) panel of the airbag cushion.

Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event.

The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

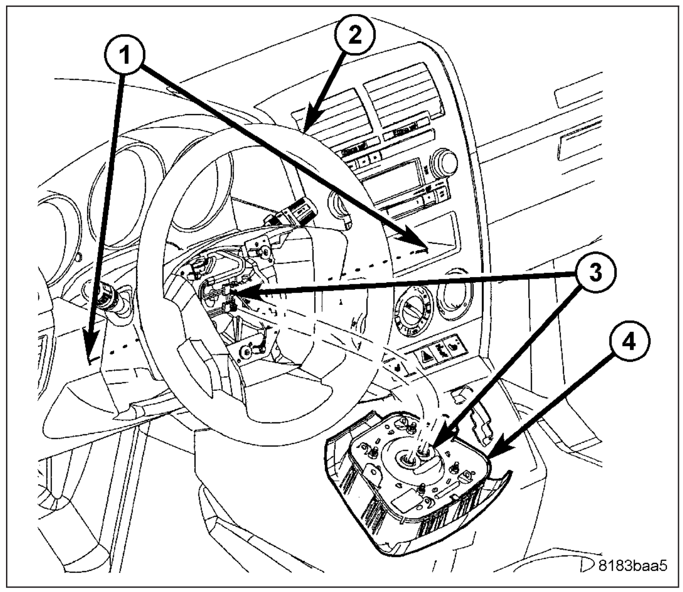
REMOVAL

1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

3. From behind the steering wheel (2), gently pry off the driver airbag bolt covers.
4. Remove the two driver airbag attaching bolts (1).
5. Pull airbag rearward and disconnect the two airbag squib connectors (3).
6. Remove airbag (4) from vehicle.

WARNING: When replacing a deployed driver airbag, the clockspring must also be replaced (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



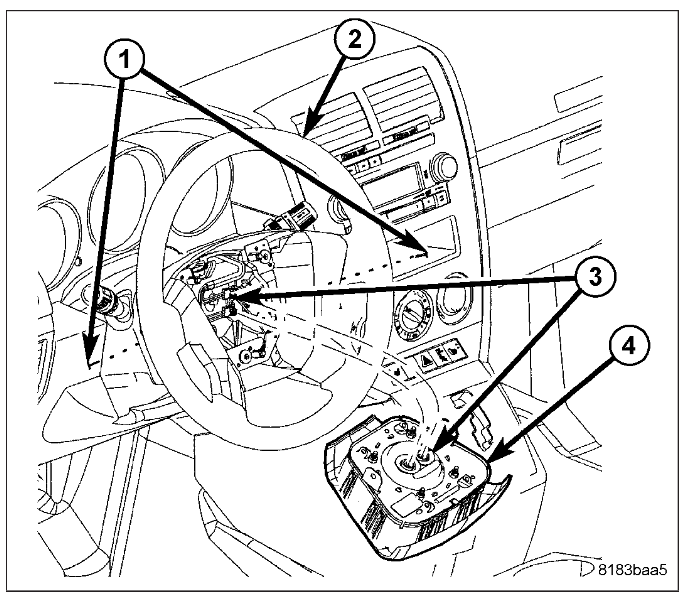
INSTALLATION

1. Connect the squib wires (3) to the driver airbag (4). Make airbag connection by pressing straight in on the connector. The connector should be fully seated. Feel for positive snap to assure positive connection.
2. Position the driver airbag (4) in the steering wheel (2) and push forward.

NOTE: Make sure not to pinch any wires underneath the driver airbag.

3. Install the two airbag retaining bolts (1). Tighten bolts to 10 N·m (89 in. lbs.).
4. Install the airbag bolt access covers.

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



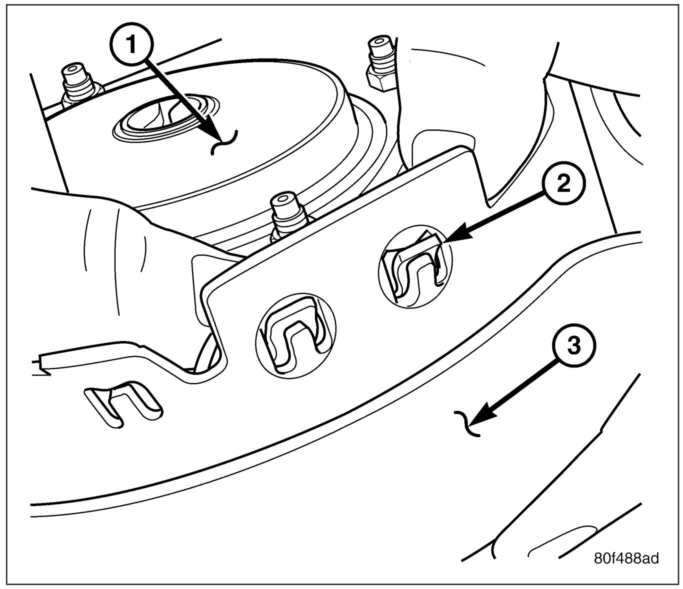
DRIVER AIRBAG COVER

REMOVAL

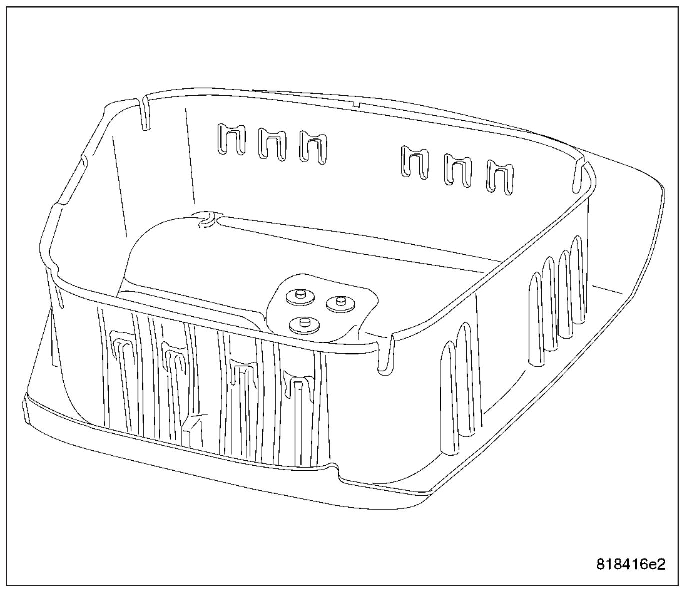
1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

3. Remove the driver airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
4. With driver airbag removed, pick a corner and push down on the inflator or latch hook mounting plate (1) until the latch hooks (2) push out of the driver airbag cover (3).



5. Starting at a point on the airbag, work your way around the airbag until all the hooks have been released.
6. Remove driver airbag trim cover from driver airbag.

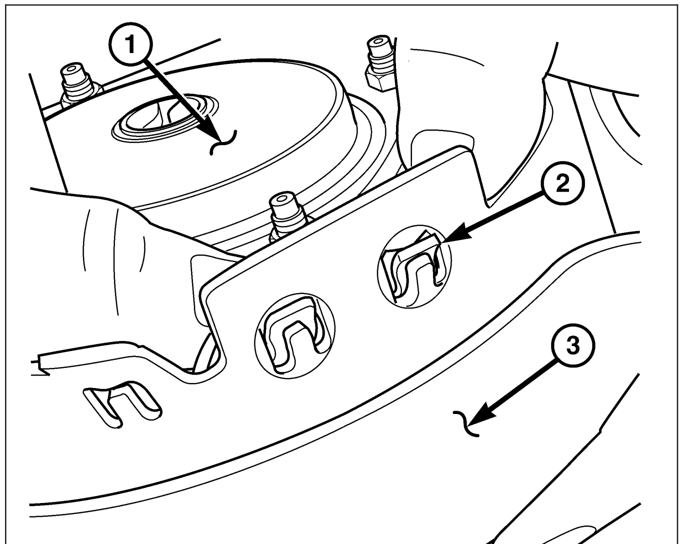


INSTALLATION

1. Place driver airbag into new driver airbag cover.

WARNING: Be careful not to pinch airbag cushion between latch hook mounting plate and cover.

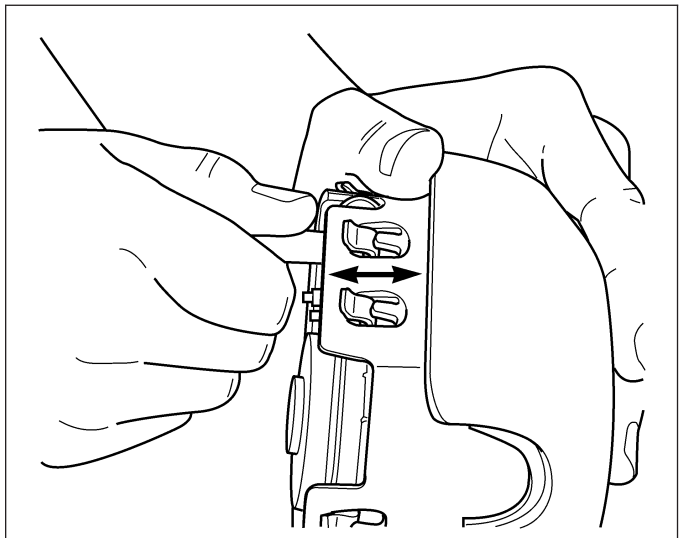
2. Push down on the latch hook mounting plate (1) and guide the latch hooks (2) into the slots on the driver airbag cover (3).



80f488ad

3. Once all the latch hooks have been started, pull the driver airbag cover away from the driver airbag to fully seat the latch hooks.
4. Install the driver airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.


80f476e6

FRONT SEAT BELT AND RETRACTOR

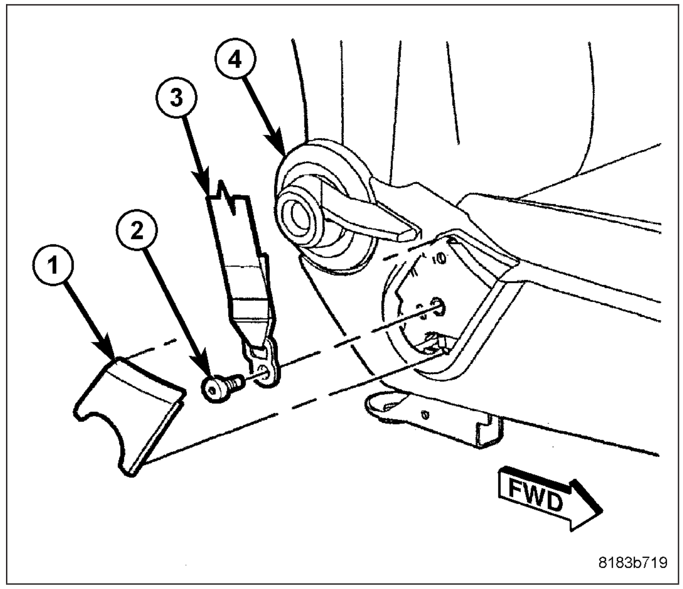
REMOVAL

WARNING: Due to the integral tensioners, the front seat belt retractor assemblies must be replaced following a collision where the airbags were deployed.

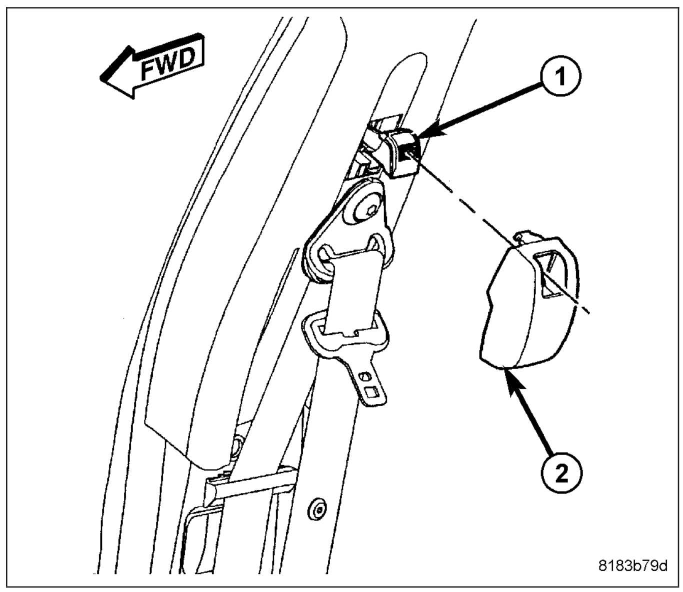
1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

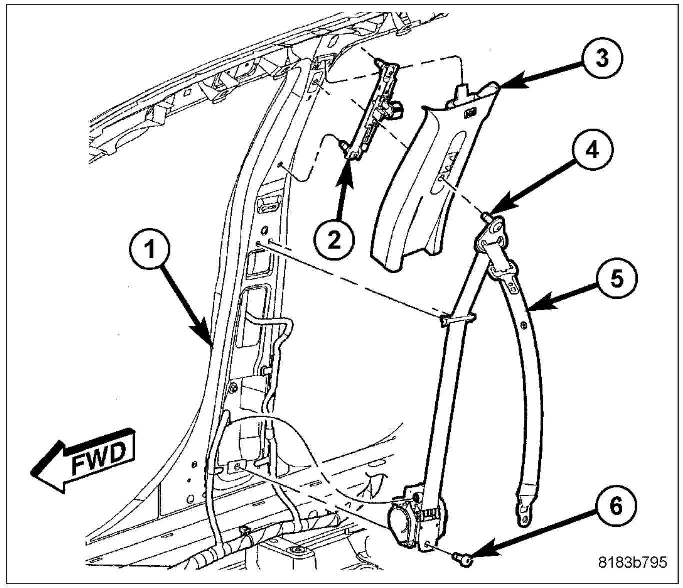
2. Using a trim stick or equivalent, gently pry off the trim cover (1) to the retractor lower anchor bolt (2).
3. Remove the lower anchor bolt (2).



4. Using a trim stick or equivalent, gently pry off the plastic turning loop cover (2) from the height adjuster (1).

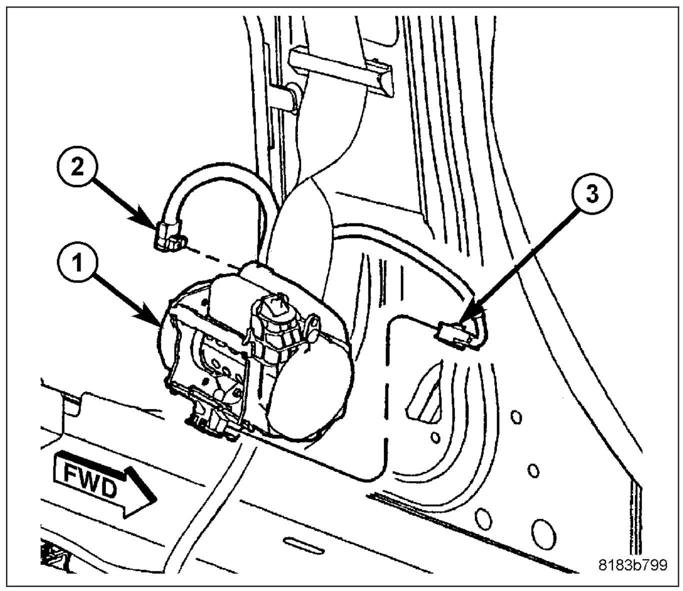


5. Remove the bolt (4) attaching the turning loop to the belt height adjuster (2).
6. Remove upper B-pillar trim (3) (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL) and lower B-pillar trim panels (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
7. Using a trim stick or equivalent, gently pry the seat-belt webbing guide from the B-pillar (1).
8. Remove anchor bolt (6) from lower B-pillar (1)



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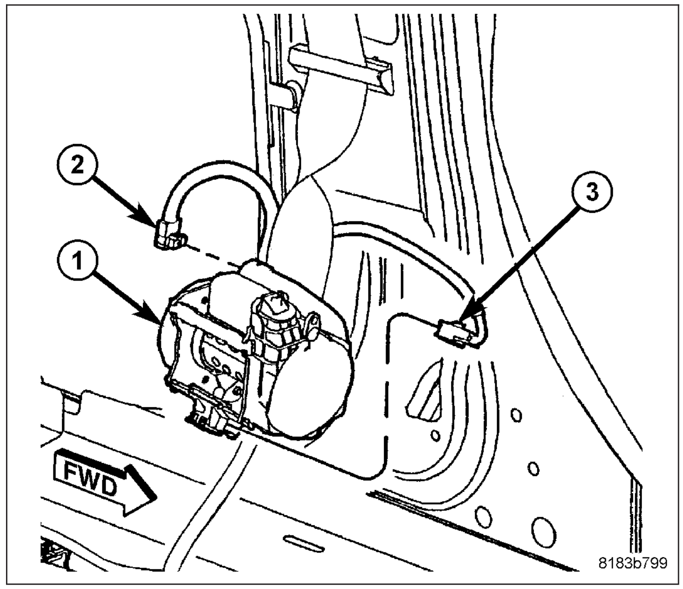
9. Disconnect electrical connectors. One is for the tensioner squib (2) and the other is for the seat belt switch (3).
10. Remove front seat belt retractor (1) from vehicle.



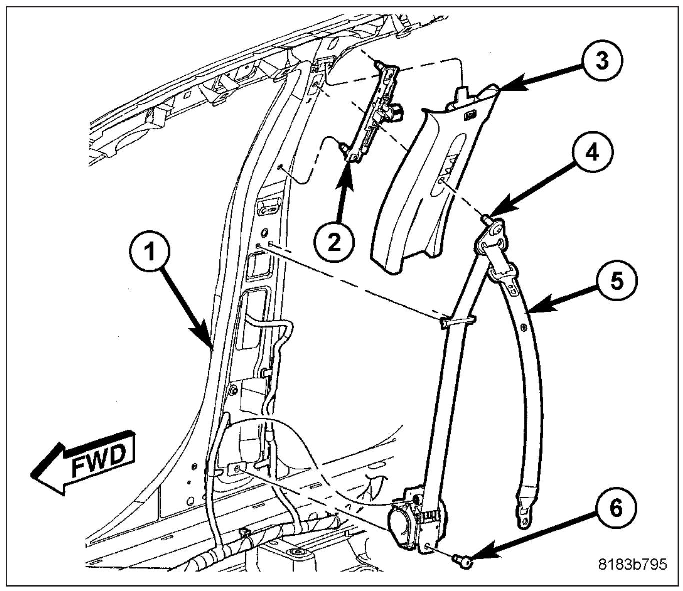
INSTALLATION

WARNING: Due to the integral tensioners, the front seat belt retractor assemblies must be replaced following a collision where the airbags were deployed.

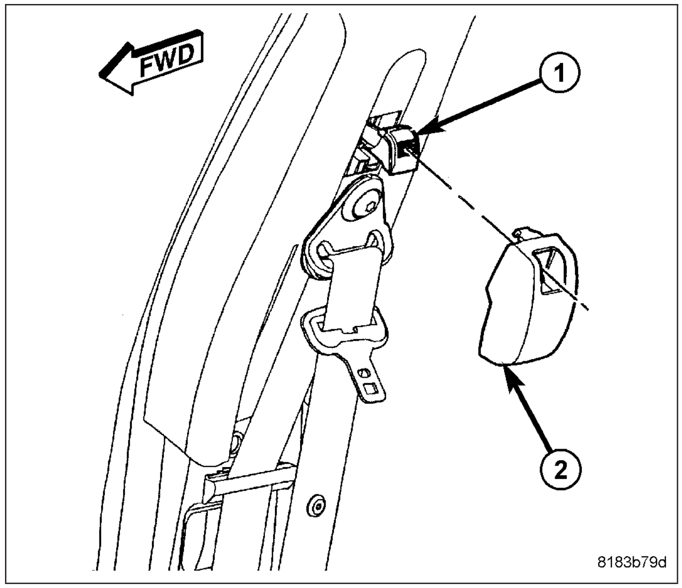
1. Position the front seat belt retractor (1) into B-pillar pocket.
2. Connect electrical connectors. One is for the tensioner squib (2) and the other is for the seat belt switch (3).



3. Install the anchor bolt (6) to the lower B-pillar (1). Tighten bolt to 40 N·m (29.5 ft. lbs.).
4. Install the seatbelt webbing guide into the B-pillar (1).
5. Install the lower B-pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION) and upper B-pillar trim (3) (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION).
6. Install the bolt (4) attaching the turning loop to the belt height adjuster (2). Tighten bolt to 40 N·m (29.5 ft. lbs.).

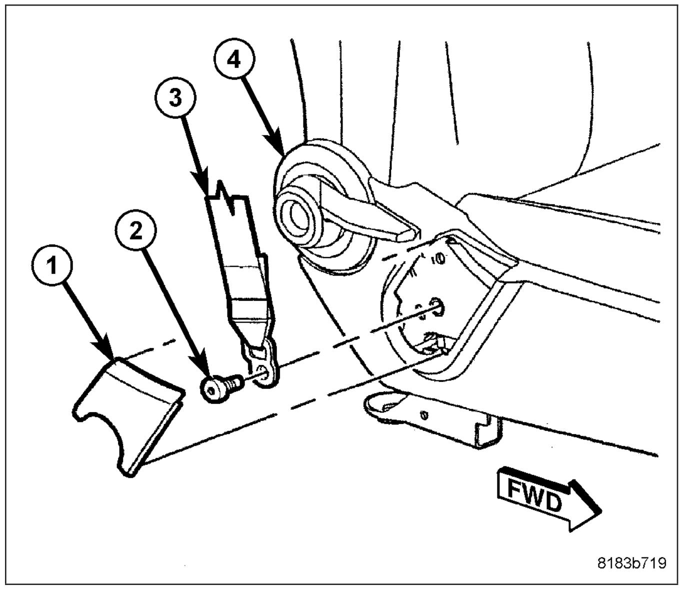


7. Install the plastic turning loop cover (2) onto the height adjuster (1).



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8. Install the lower webbing anchor bolt (2) to the seat cushion frame (4). Tighten bolt to 51 N·m (37.5 ft. lbs.).
9. Install the trim cover (1) to the retractor lower anchor bolt (2).



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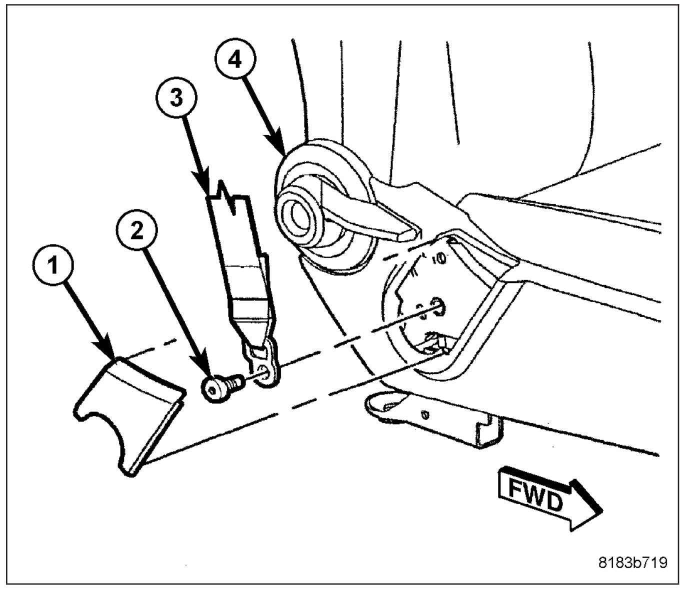
WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

FRONT SEAT BELT BUCKLE

REMOVAL

NOTE: Graphic is of seatbelt retractor anchor bolt, buckle is same mounting but on the outboard side of the seat cushion frame.

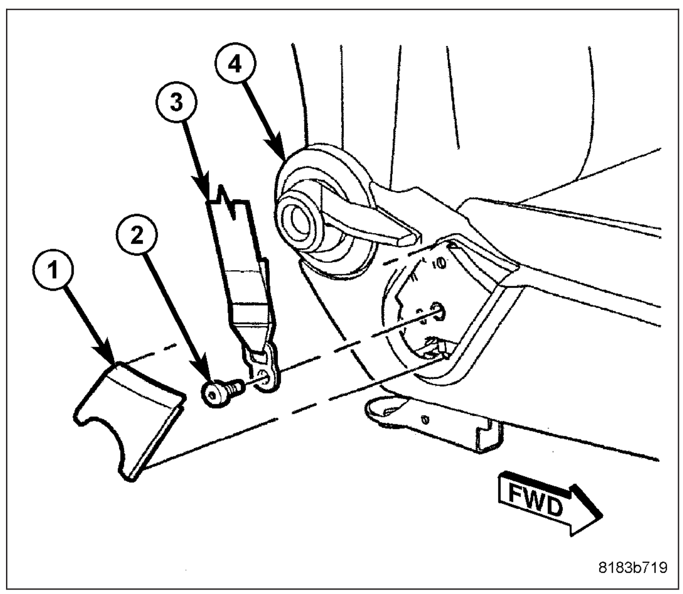
1. Using a trim stick or equivalent, gently pry off the trim cover (1) to the seatbelt buckle bolt (2).
2. Remove the buckle anchor bolt (2).



INSTALLATION

NOTE: Graphic is of seatbelt retractor anchor bolt, buckle is same mounting but on the outboard side of the seat cushion frame.

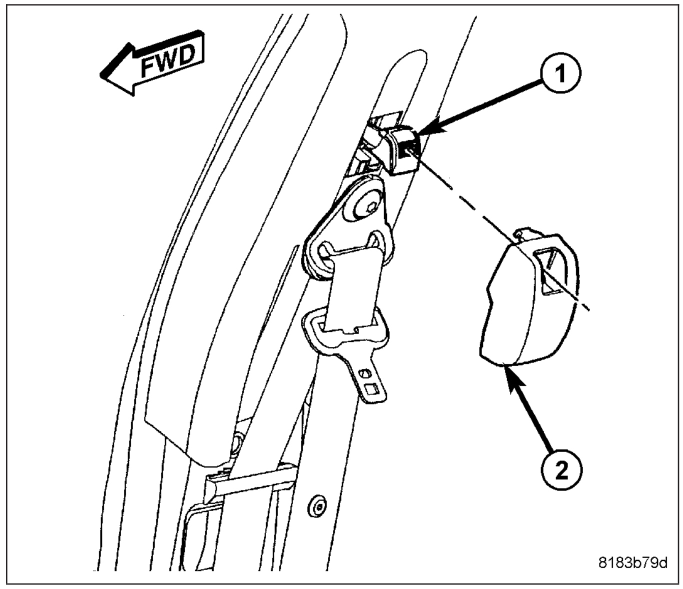
1. Install the seatbelt buckle and then the anchor bolt (2). Tighten bolt to 51 N·m (37.5 ft. lbs.).
2. Install the trim cover (1) to the seatbelt buckle bolt (2).



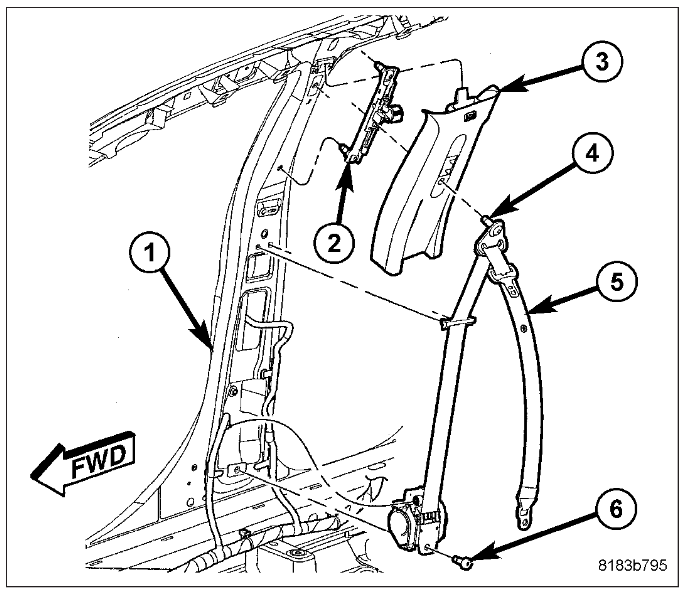
FRONT SEAT BELT HEIGHT ADJUSTER

REMOVAL

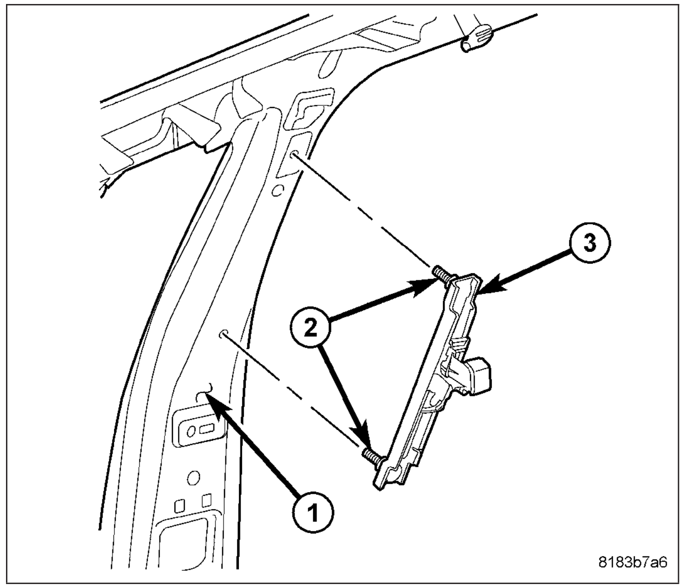
1. Firmly grasp the turning loop cover (2) and pull inward to remove from height adjuster.



2. Remove the one bolt to the front seat belt retractor turning loop (4).
3. Remove Upper B-pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).

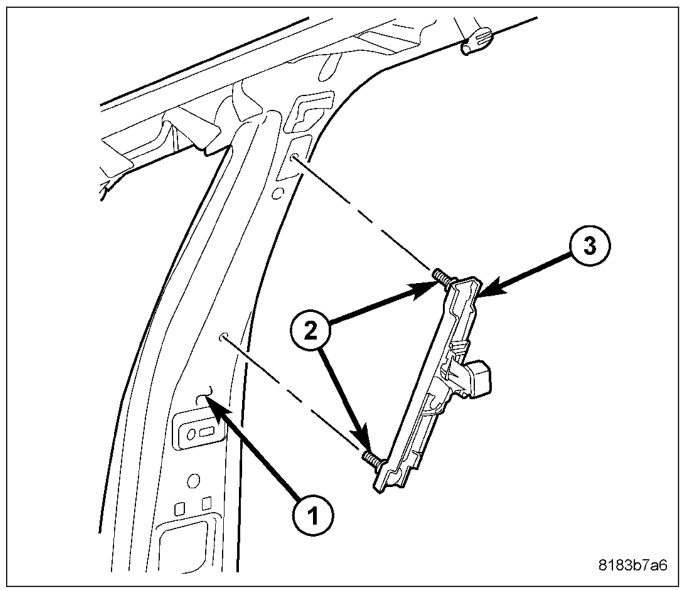


4. Remove the two bolts (2) attaching front seat belt height adjuster (3) to B-pillar (1).
5. Remove front seat belt height adjuster (3) from vehicle.

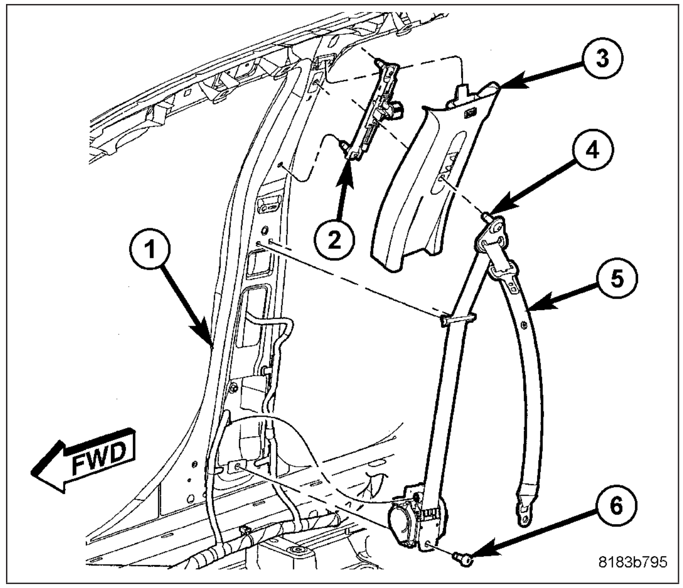


INSTALLATION

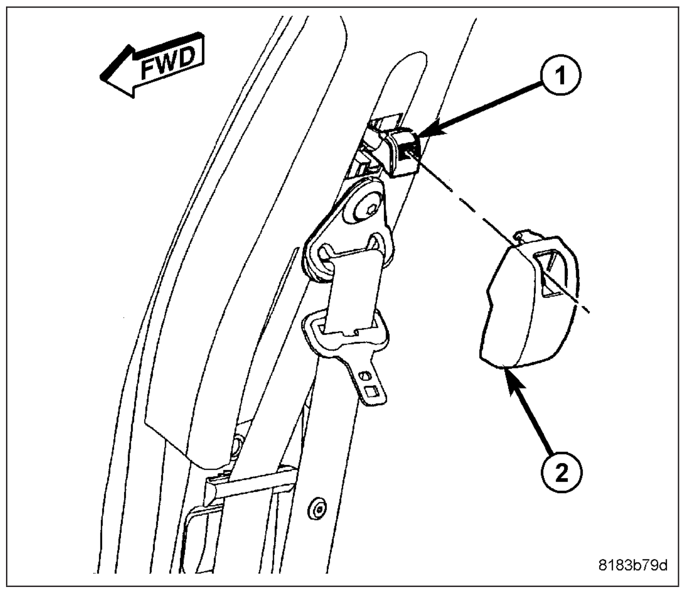
1. Install front seat belt height adjuster (3) in vehicle.
2. Tighten the two bolts (2) attaching front seat belt height adjuster (3) to B-pillar (1) to 40 N·m (29.5 ft. lbs.).



3. Install the upper B-pillar trim (Refer to 23 - BODY/ INTERIOR/B-PILLAR TRIM - INSTALLATION).
4. Install the one bolt to the front seat belt retractor turning loop (4). Tighten bolt to 40 N·m (29.5 ft. lbs.).



5. Snap the turning loop cover (2) onto the height adjuster.

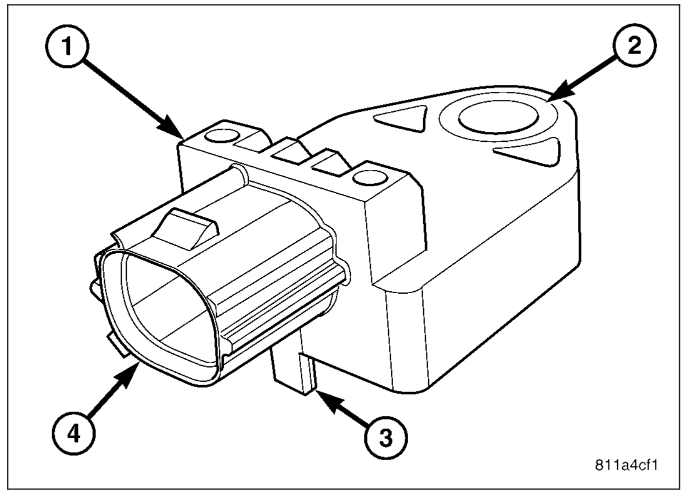


IMPACT SENSOR

DESCRIPTION

FRONT

Two front impact sensors (1) are used on this vehicle, one each for the left and right sides of the vehicle. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each front sensor is secured with a screw to the backs of the right and left vertical members of the radiator support within the engine compartment.

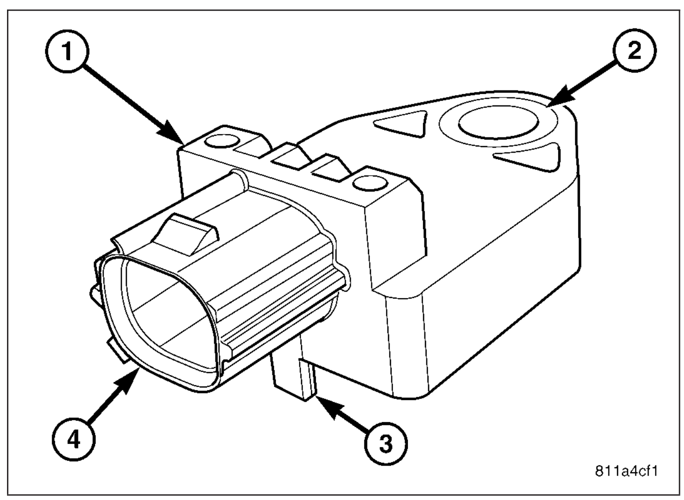


The right and left front impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material that fills the cavity to seal and protect the internal electronic circuitry and components. The front impact sensors are each connected to the vehicle electrical system through the headlamp and dash wire harness.

The impact sensors cannot be repaired or adjusted and, if damaged or ineffective, they must be replaced.

SIDE

Four side impact sensors (1) are used on this vehicle when it is equipped with the optional side airbags, two each for the left and right sides of the vehicle. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each side sensor is secured with a screw to the right or left B-pillar and C-pillar.



The right and left side impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The side impact sensors are each connected to the vehicle electrical system through the body wire harness.

The impact sensors cannot be repaired or adjusted and, if damaged or ineffective, they must be replaced.

OPERATION

FRONT

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).

The ORC microprocessor continuously monitors all of the passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

To diagnose the impact sensors or the electronic controls and communication related to front impact sensor operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

SIDE

The side impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).

The ORC microprocessor continuously monitors all of the side passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through the same left or right sensor plus and minus circuits in a series arrangement from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

To diagnose the impact sensors or the electronic controls and communication related to side impact sensor operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

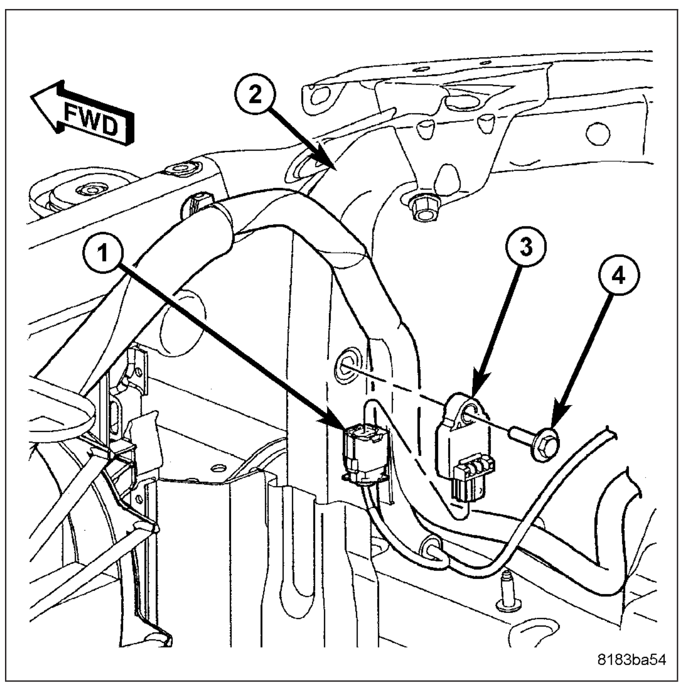
REMOVAL

FRONT

1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

2. Remove the screw (4) that secures the right or left front impact sensor (3) to the back of the right or left radiator support vertical member (2).
3. Disconnect the connector (1) from the sensor (3).
4. Remove the right or left front impact sensor from the engine compartment.

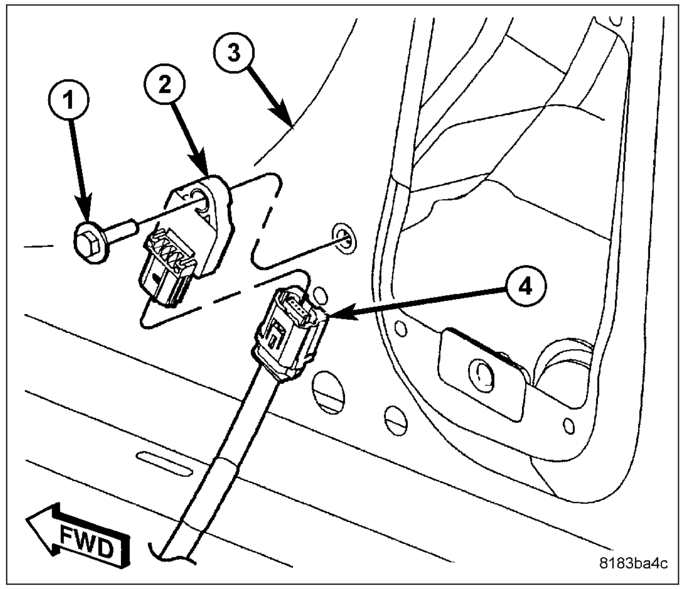


SIDE - B-PILLAR

1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

2. Remove the B-pillar lower trim panel (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
3. Disconnect the harness connector (4) from the sensor (2).
4. Remove the screw (1) retaining the B-pillar side impact sensor (2)
5. Remove the sensor (2) from the vehicle.

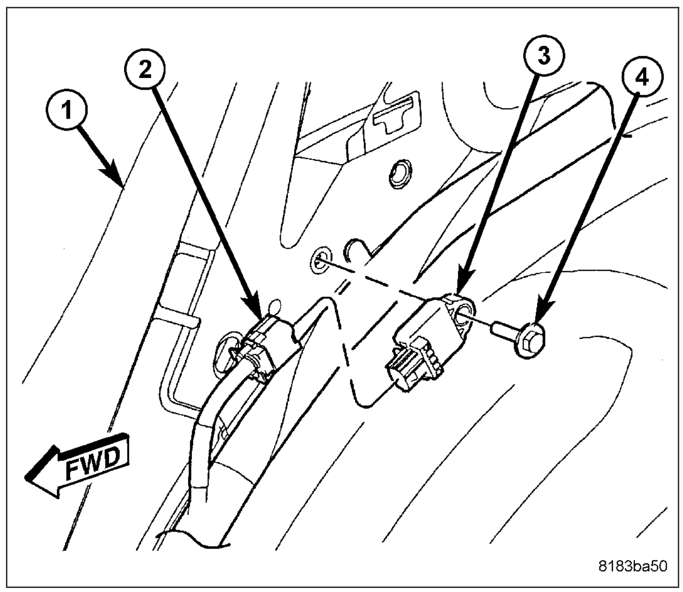


SIDE - C-PILLAR

1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

2. Remove the rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Remove the screw (4) that secures the side impact sensor (3) to the C-pillar (1).
4. Disconnect the harness connector (2) from the sensor (3).
5. Remove the sensor from the C-pillar.



INSTALLATION

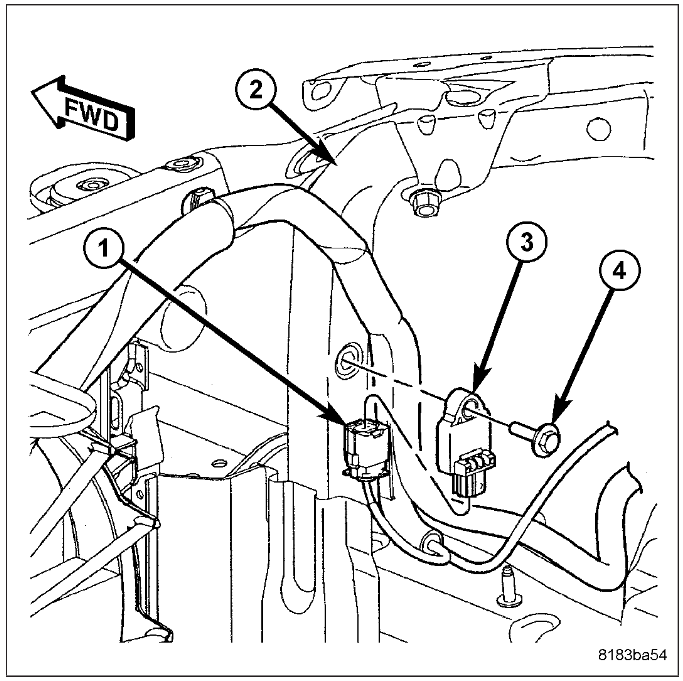
FRONT

1. Position the right or left front impact sensor (3) into the engine compartment near it mounting area.
2. connect the harness connector (1) to the sensor.
3. Position the sensor onto the back of the right or left radiator support vertical member (2).

NOTE: Be certain that the anti-rotation pin on the back of the sensor is engaged in the lower clearance hole of the radiator support.

4. Install and tighten the screw (4) that secures the sensor (3) to the back of the support vertical member (2). Tighten the screw to 8 N·m (71 in. lbs.).

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



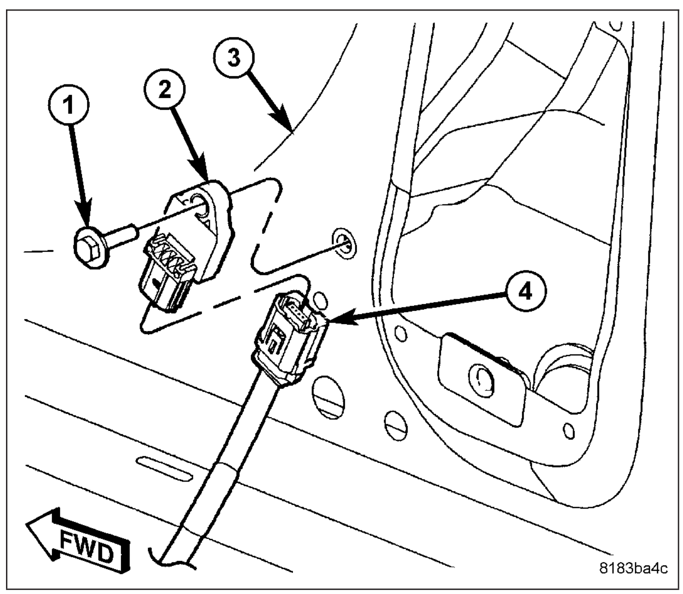
SIDE - B-PILLAR

1. Position the sensor onto the B-pillar and install the mounting screw (1). Tighten the screw to 8 N·m (71 in. lbs.).

NOTE: Be certain that the anti-rotation pin on the back of the sensor is engaged in the hole just below the mounting hole in the B-pillar (3).

2. Connect the harness connector (4) to the sensor (2).
3. Install the B-pillar lower trim panel (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

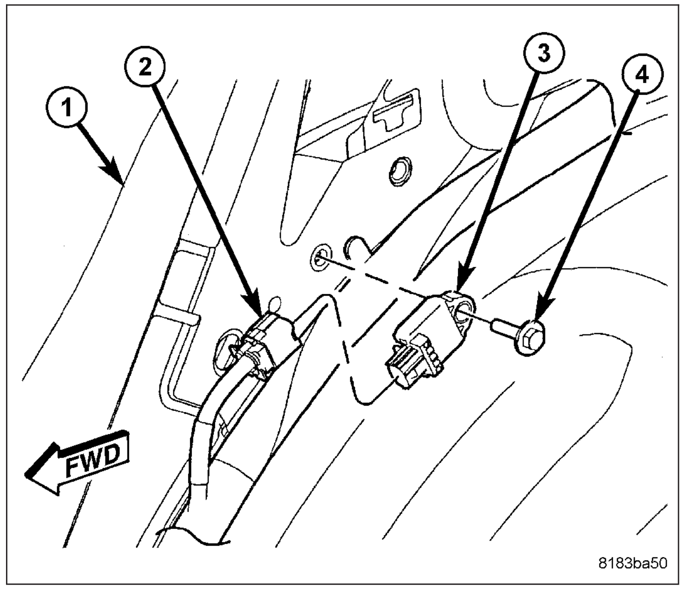
WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



SIDE - C-PILLAR

1. Position the side impact sensor near the inner C-pillar.
2. Connect the harness connector (2) to the sensor (3).
3. Position the sensor onto the C-pillar.

NOTE: Be certain that the anti-rotation pin on the back of the sensor is engaged in the clearance hole on the C-pillar below the sensor mounting hole.



4. Install screw (4) that secures the sensor (3) to the C-pillar (1). Tighten the screw to 8 N·m (71 in. lbs.).
5. Install the rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

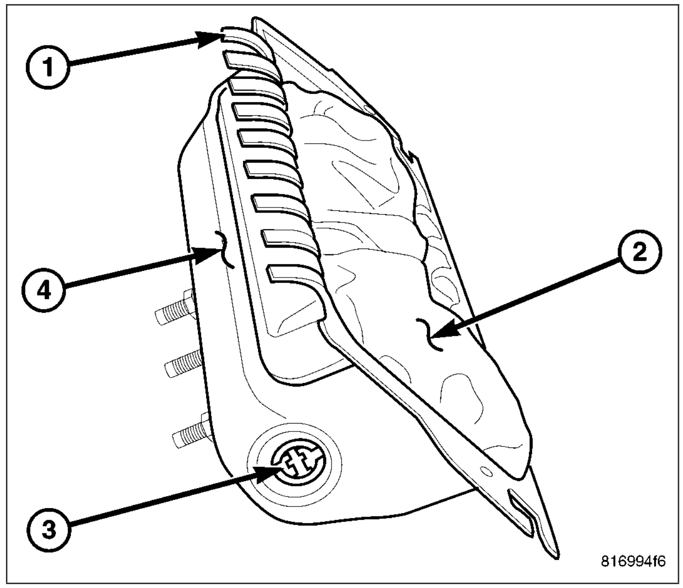
KNEE BLOCKER AIRBAG

DESCRIPTION

The Knee Blocker Airbag is located on the driver side of the vehicle below the steering column, at the bottom edge of the instrument panel. The knee blocker airbag contains:

- A stamped steel housing (4) with retaining hooks (1) for the knee blocker airbag trim cover to attach to.
- An airbag cushion (2)
- An igniter (3)

WARNING: Following a knee blocker airbag deployment, the knee blocker airbag and instrument panel assembly must be replaced. Refer to the proper diagnostic information for diagnosis and testing.



OPERATION

The knee blocker airbag is equipped with a single inflator. When the Occupant Restraint Controller (ORC) sends the proper electrical signals to the initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the knee blocker airbag trim deploy. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas towards the instrument panel through vent holes within the fabric used to construct the back panel of the airbag cushion.

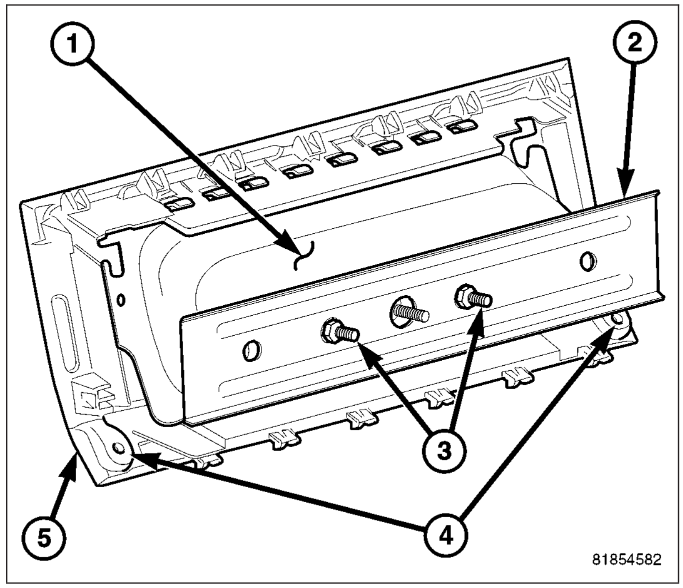
Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, the potentially hazardous chemicals are burned during an airbag deployment event.

WARNING: The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

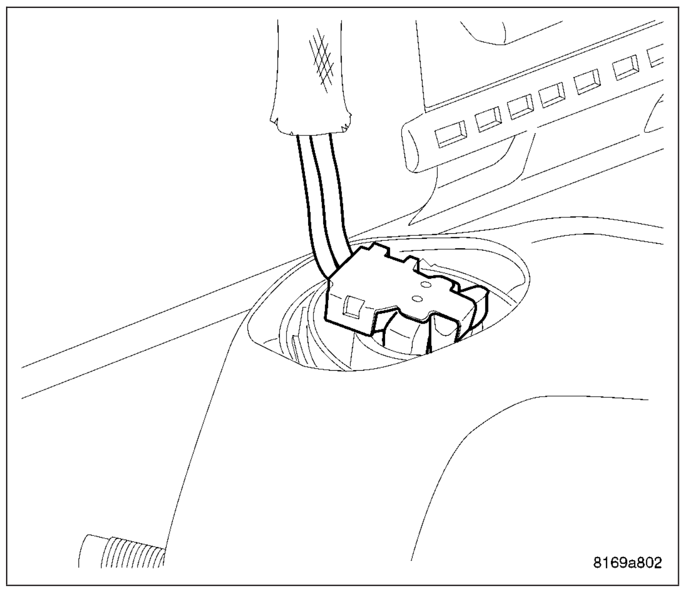
REMOVAL

1. Open hood, disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.



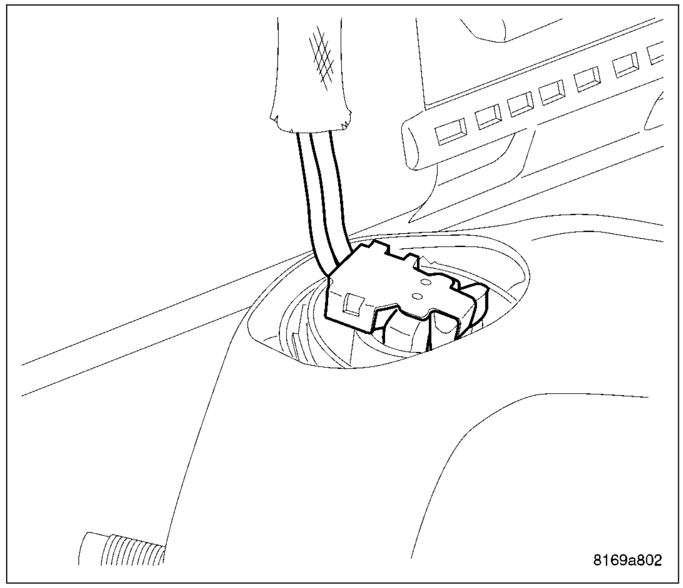
2. Remove the two lower knee blocker airbag trim cover screws (4).
3. Reach up behind the knee blocker airbag (1) and remove the two nuts (3) holding the airbag to the instrument panel (2).



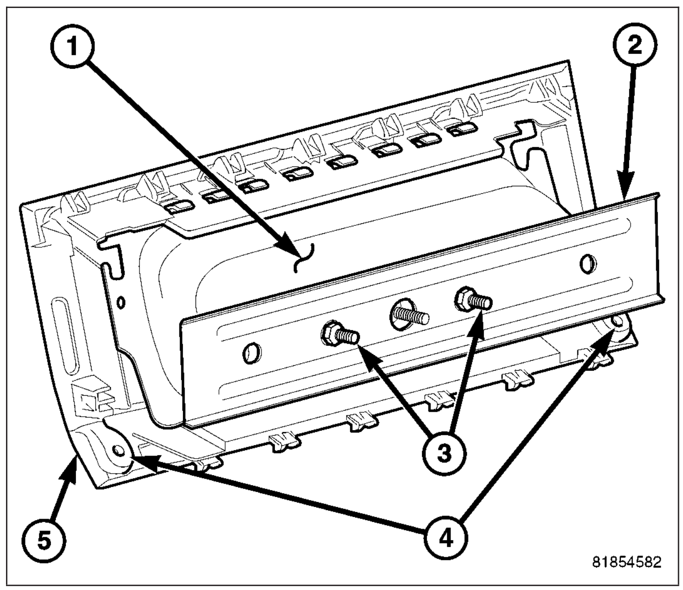
4. Pull the knee blocker airbag rearward.
5. Disconnect the knee blocker airbag electrical connector and remove from vehicle.

INSTALLATION

1. Connect the knee blocker airbag electrical connector.



2. Position the knee blocker airbag with trim cover (5) in the instrument panel cavity.
3. Reach up behind the instrument panel and install the two knee blocker airbag retaining nuts. Tighten nuts to 10.5 N·m (93 in. lbs.).
4. Install the two knee blocker airbag cover screws (4).



WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

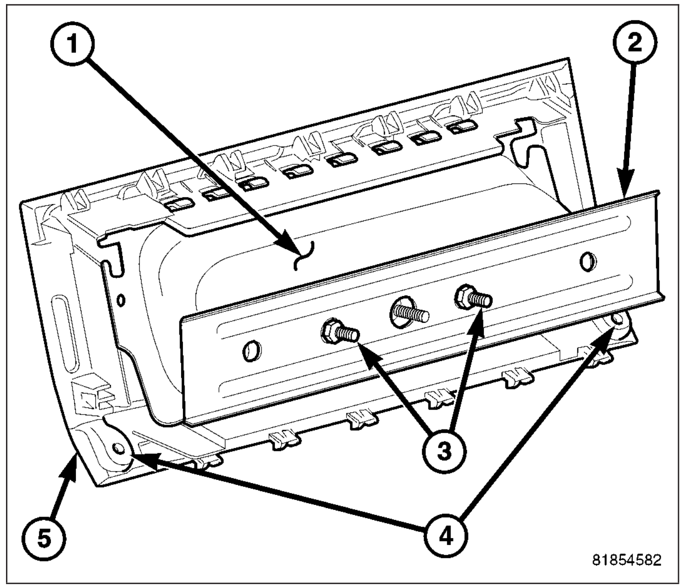
KNEE BLOCKER AIRBAG COVER

REMOVAL

NOTE: It is not necessary to remove the knee blocker airbag (1) from the instrument panel (2) all the way. After loosening the two nuts (3) to the instrument panel there should be enough room to unlatch the trim cover (5).

1. Open hood, disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

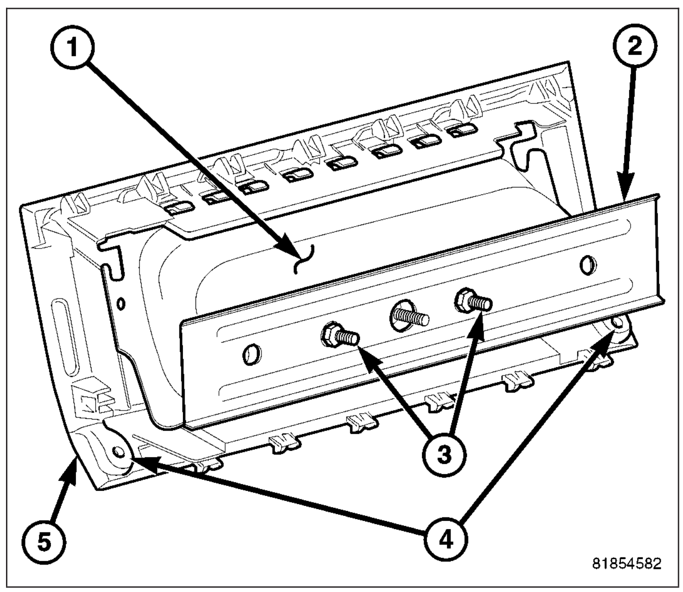


2. Remove the two lower knee blocker airbag trim cover screws (4).
3. Reach up behind the knee blocker airbag (1) and remove the two nuts (3) holding the airbag to the instrument panel (2).
4. Pull the knee blocker airbag rearward enough to undo the hook and latch retainers to the airbag trim cover (5).

INSTALLATION

1. Slide the airbag trim cover over the hook and latch retainers on the knee blocker airbag (1).
2. Push the airbag forward.
3. Reach up behind the instrument panel and install the two knee blocker airbag retaining nuts. Tighten nuts to 10.5 N·m (93 in. lbs.).
4. Install the two knee blocker airbag cover screws (4).

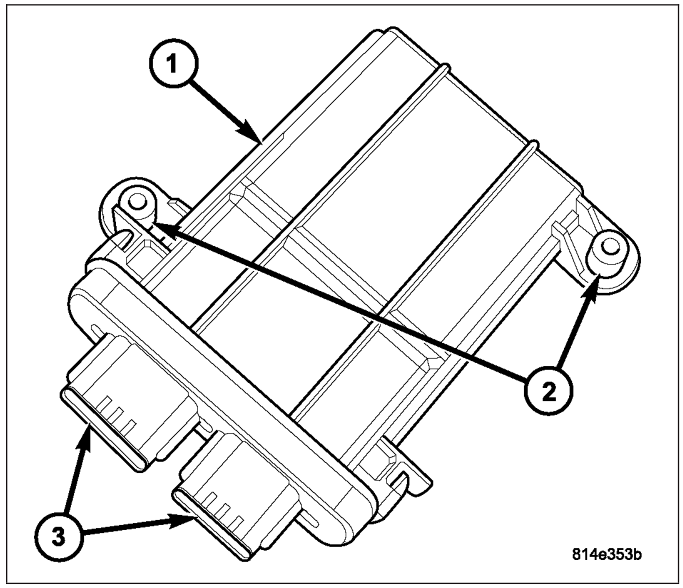
WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



OCCUPANT CLASSIFICATION MODULE

DESCRIPTION

The Occupant Classification Module (OCM) (1) is secured to the passenger side outboard front seat track riser. Concealed within a hollow in the center of the molded plastic OCM housing is a microprocessor and the other electronic circuitry of the module. The module housing is sealed to enclose and protect the internal electronic circuitry.



The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger side front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool 9077, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

The OCM cannot be adjusted or repaired and, if damaged or faulty, it must be replaced. The OCM software is flash programmable. A non-calibrated OCM is available for separate service replacement.

OPERATION

The microprocessor in the Occupant Classification Module (OCM) contains the Occupant Classification System (OCS) logic circuits. The OCM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is also used for OCS diagnosis and testing through the 16-way Data Link Connector (DLC) located on the driver side lower edge of the instrument panel.

The OCM provides voltage to the four seat weight sensors located on each of the four corners of the passenger side front seat, and to the seat track position sensors located on the passenger and driver front seat tracks. The OCM then monitors return inputs from each of the sensors on dedicated hard wired data communication circuits. The seat weight sensor input allows the OCM to determine whether the passenger front seat is occupied and the relative size of the occupant by providing a weight-sensing reference to the load on the seat. The seat track position sensor provides an additional logic input to the OCM microprocessor that allows it to determine the position of the front seat passenger and driver relative to the front airbags.

Pre-programmed decision algorithms and OCS calibration allow the OCM microprocessor to determine when passenger airbag protection is appropriate based upon the seat load as signaled by the seat weight sensors. When the programmed conditions are met, the OCM sends the proper electronic occupant classification messages over the CAN data bus to the Occupant Restraint Controller (ORC), and the ORC enables or disables the deployment circuits for the passenger front supplemental restraints. On vehicles so equipped, the ORC also provides a control output for the passenger airbag on/off indicator in the instrument panel based upon the electronic occupant classification messages it receives from the OCM.

The OCM also sends electronic driver and passenger seat track position messages to the ORC over the CAN data bus. The ORC uses the seat track position data as an additional logic input for determining the force level with which to deploy the multistage front airbags.

The OCM microprocessor continuously monitors all of the OCS electrical circuits and components to determine the system readiness. If the OCM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends the appropriate electronic messages to the ORC over the CAN data bus. Then the ORC sets a DTC and sends messages to control the airbag indicator operation accordingly. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the OCM and the ORC. For some DTC's, if a fault does not recur for a

number of ignition cycles, the OCM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The OCM receives battery current on a fused ignition switch output (run-start) circuit through a fuse in the Junction Block (JB). The OCM receives ground through a ground circuit of the body wire harness. These connections allow the OCM to be operational whenever the ignition switch is in the Start or On positions.

To diagnose the OCM and all its inputs, outputs and related circuits, use a diagnostic scan tool and the appropriate diagnostic information.

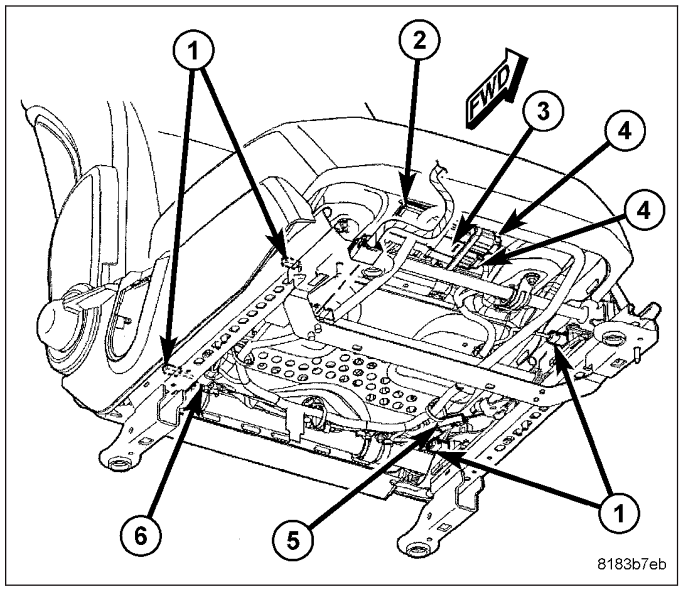
REMOVAL

WARNING: The replacement Occupant Classification Module (OCM) is a non-calibrated unit when first installed. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool 9077, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

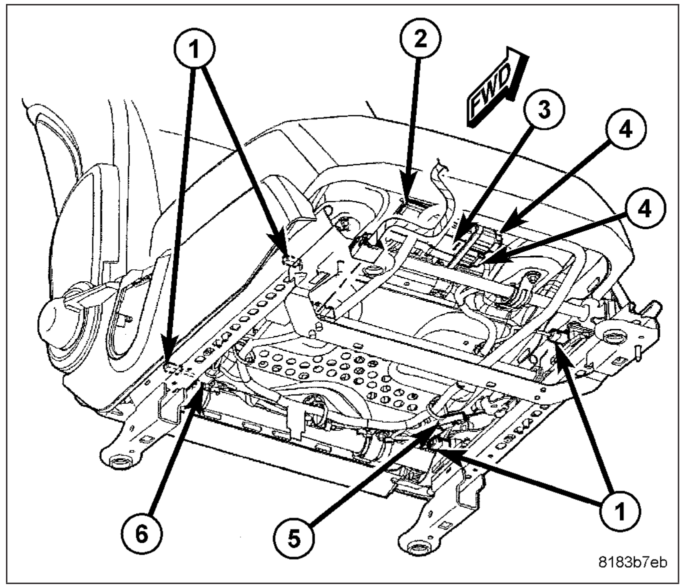
2. Reach under the front edge of the passenger side front seat cushion to access and remove the two screws that secure the Occupant Classification Module (OCM) (3) to the underside of the passenger front seat cushion pan.
3. Pull the OCM down far enough to access the module wiring connections (4).
4. Disconnect the two electrical connectors (4) from the OCM (3).
5. Remove the OCM (3) from under the passenger front seat.



INSTALLATION

WARNING: A non-calibrated Occupant Classification Module (OCM) is available for separate service replacement. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger side front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool 9077, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

1. Position the Occupant Classification Module (OCM) (3) under the passenger front seat cushion.
2. Connect the two electrical connectors (4) to the OCM (3).
3. Carefully position the OCM to the seat cushion pan.
4. Install the two screws that secure the OCM to the seat cushion pan.



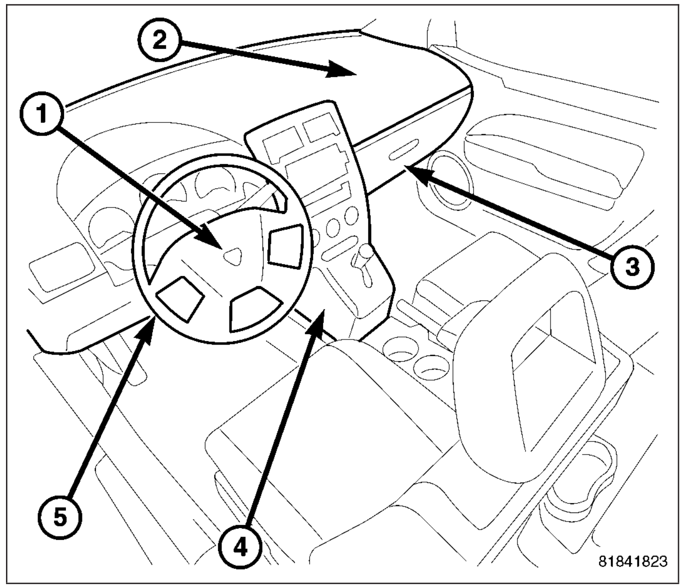
WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

WARNING: Following successful completion of the Airbag System verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool and the Occupant Classification Seat Weight special tool 9077. Refer to the appropriate diagnostic information.

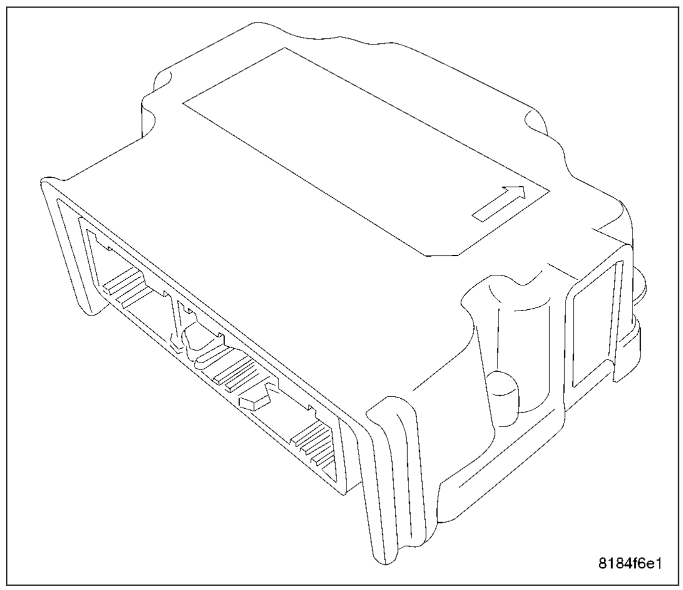
OCCUPANT RESTRAINT CONTROLLER

DESCRIPTION

The Occupant Restraint Controller (ORC) (4) is sometimes referred to as the Airbag Control Module (ACM). The ORC is mounted on the tunnel floor pan in front of the transmission floor shifter.



The Occupant Restraint Controller (ORC) is secured with three nuts to a stamped steel mounting bracket welded onto the top of the floor panel transmission tunnel beneath the instrument panel floor console. Concealed within a hollow in the center of the die cast aluminum ORC housing is the electronic circuitry of the ORC which includes a microprocessor, an electronic impact sensor, an electronic safing sensor, and an energy storage capacitor. A stamped metal cover plate is secured to the bottom of the ORC housing with four screws to enclose and protect the internal electronic circuitry and components.



An arrow printed on the label on the top of the ORC housing provides a visual verification of the proper orientation of the unit, and should always be pointed toward the front of the vehicle. The ORC housing has integral mounting flanges on three of the four corners. Two electrical connectors exit the rearward facing side of the ORC housing. These connect the ORC to the vehicle electrical system, one from the instrument panel wire harness and the second from the body wire harness.

The impact sensor and safing sensor internal to the ORC are calibrated for the specific vehicle, and are only serviced as a unit with the ORC. In addition, there are unique versions of the ORC for vehicles with or without the optional side airbags. The ORC cannot be repaired or adjusted and, if damaged or ineffective, it must be replaced.

OPERATION

The microprocessor in the Occupant Restraint Controller (ORC), sometimes referred to as the Airbag Control Module (ACM), contains the supplemental restraint system logic circuits and controls all of the supplemental restraint system components. The ORC uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is used for control of the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) sometimes referred to as the Cab Compartment Node (CCN), and for supplemental restraint system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/AIRBAG INDICATOR - OPERATION).

The ORC microprocessor continuously monitors all of the supplemental restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the EMIC/CCN over the CAN data bus to turn ON the airbag indicator. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ORC. For some DTC's, if a fault does not recur for a number of ignition cycles, the ORC will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

On vehicles equipped with the Occupant Classification System (OCS), the ORC communicates with the Occupant Classification Module (OCM) over the CAN data bus. The ORC will internally disable the passenger airbag and seat belt tensioner deployment circuits if the OCM detects that the passenger front seat is unoccupied or that it is occupied by a load that is inappropriate for an airbag deployment. The ORC also provides a control output to the passenger airbag ON/OFF indicator through the passenger airbag indicator driver circuit. The OCM notifies the ORC when it has detected a monitored system fault and stored a DTC in its memory for any ineffective OCS component or circuit, then the ORC sets a DTC and controls the airbag indicator operation accordingly.

The ORC receives battery current through two circuits; an ignition switch output (run) circuit and an ignition switch output (run-start) circuit. The ORC receives ground through a ground circuit of the instrument panel wire harness. These connections allow the ORC to be operational whenever the ignition switch is in the START or ON positions.

The ORC also contains an energy-storage capacitor. When the ignition switch is in the START or ON positions, this capacitor is continually being charged with enough electrical energy to deploy the supplemental restraint components for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup supplemental restraint system protection in case there is a loss of battery current supply to the ORC during an impact.

Two sensors are contained within the ORC, an electronic impact sensor and a safing sensor. The ORC also monitors inputs from two remote front impact sensors located on the back of the right and left vertical members of the radiator support near the front of the vehicle. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. On vehicles equipped with optional side airbags, the ORC also monitors inputs from an internal rollover sensor and four additional remote impact sensors located on the left and right inner B-pillars and C-pillars to control deployment of the side airbag units.

The safing sensor is an electronic accelerometer sensor within the ORC that provides an additional logic input to the ORC microprocessor. The safing sensor is used to verify the need for a supplemental restraint deployment by detecting impact energy of a lesser magnitude than that of the primary electronic impact sensors, and must exceed a safing threshold in order for the airbags to deploy. Vehicles equipped with optional side airbags, feature a second safing sensor within the ORC to provide confirmation to the ORC microprocessor of side impact forces. This second safing sensor is a bi-directional unit that detects impact forces from either side of the vehicle.

Pre-programmed decision algorithms in the ORC microprocessor determine when the deceleration rate as signaled by the impact sensors and the safing sensors indicate an impact that is severe enough to require supplemental restraint system protection and, based upon the severity of the monitored impact, determines the level of front airbag deployment force required for each front seating position. When the programmed conditions are met, the ORC sends the proper electrical signals to deploy the dual multistage front airbags at the programmed force levels, the front seat belt tensioners and, if the vehicle is so equipped, either side airbag unit. For vehicles equipped with the OCS, the passenger front airbag and seat belt tensioner will be deployed by the ORC only if enabled by the OCM messages (passenger airbag ON/OFF indicator OFF) at the time of the impact.

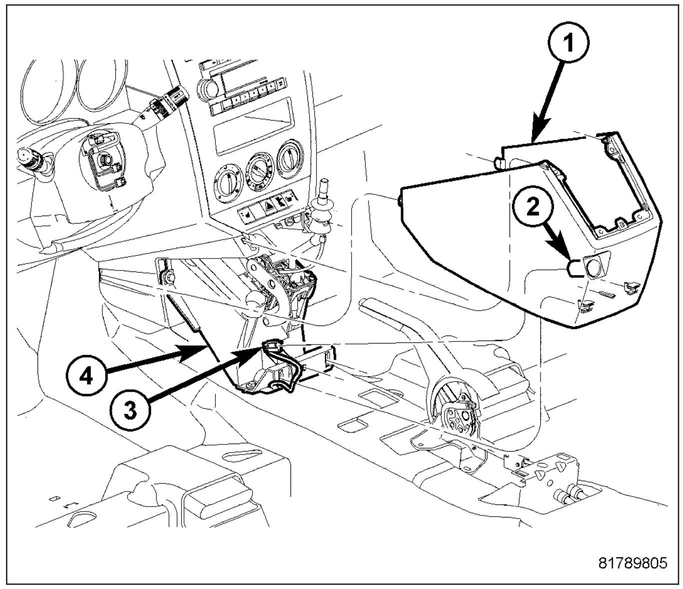
To diagnose the ORC or the electronic controls and communication related to ORC operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

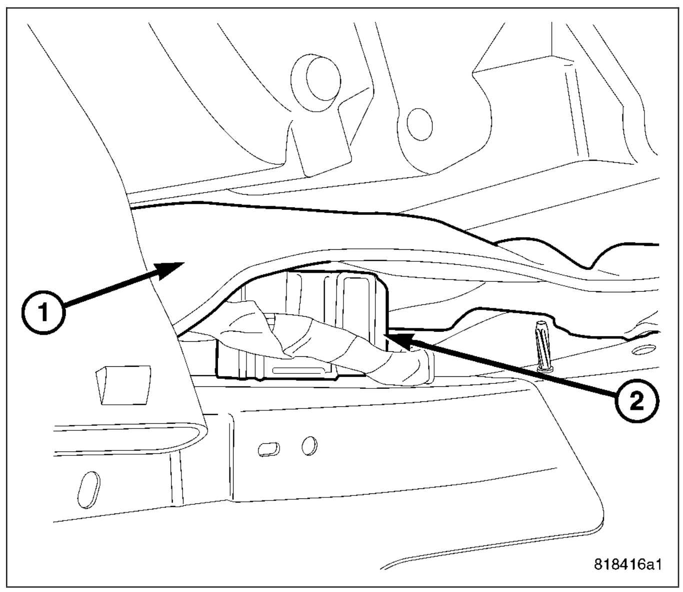
1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

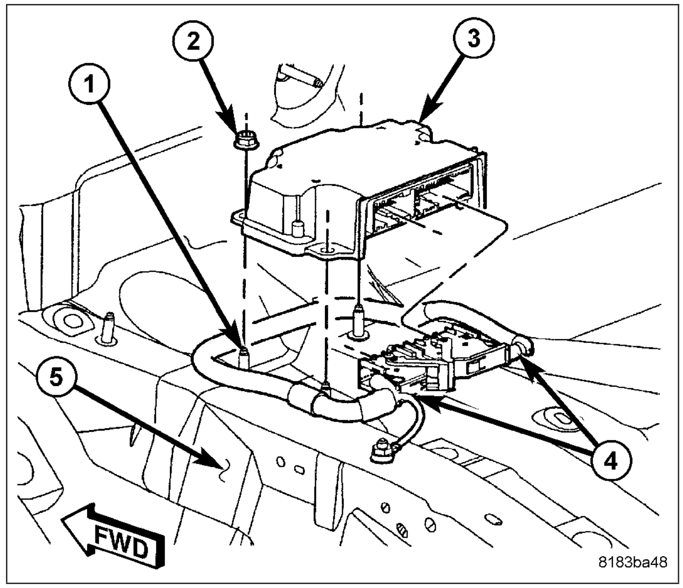
3. Remove the floor shifter bezel (1) (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)



4. It is necessary to lift up but not remove on the jute covered panel (1) covering the ORC (2).



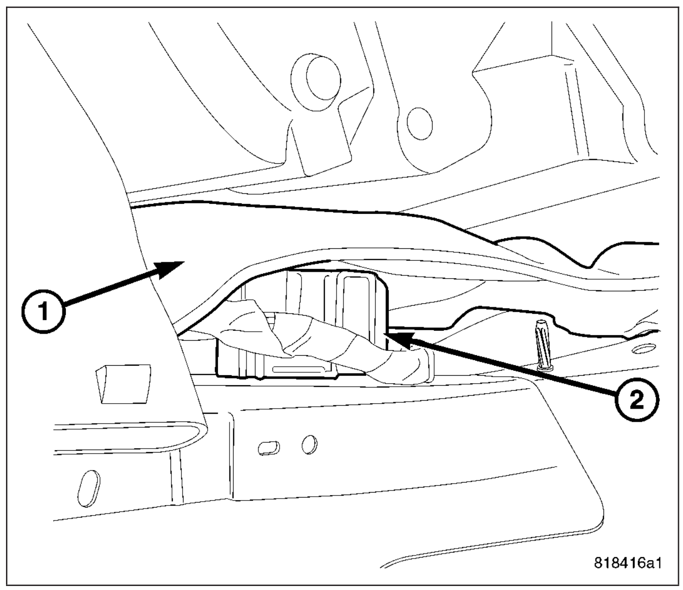
5. Remove the ORC mounting nuts (2).
6. Disconnect the two ORC connectors (4).
7. Remove ORC (3) from vehicle.



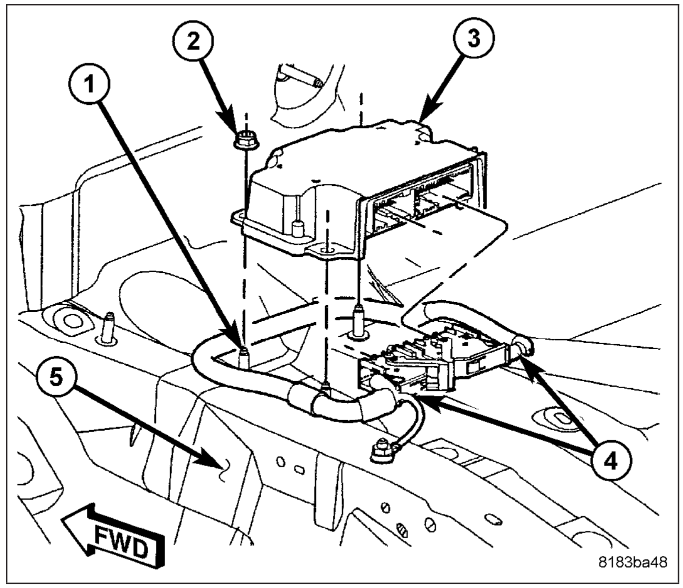
INSTALLATION

NOTE: Make sure to leave the ORC covering panel (1) is in place. Failure to do so may result in false ORC DTC's. The covering prevents the shifter cables from smacking on the top of the ORC and possibly setting a false code.

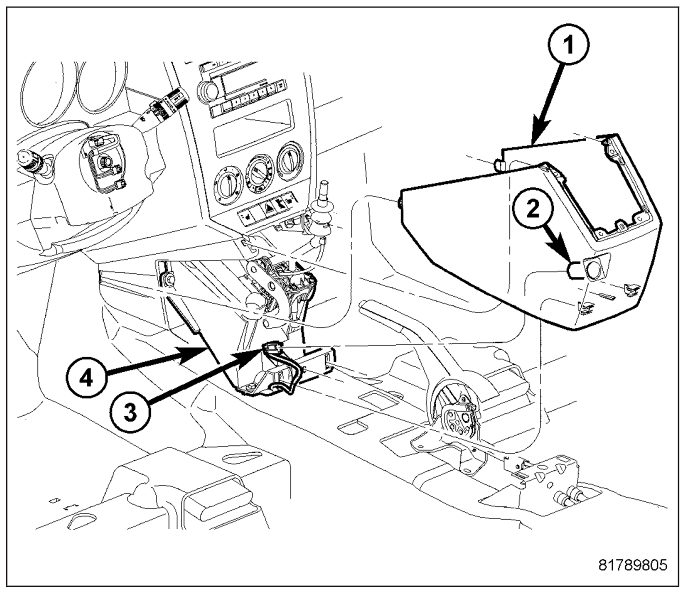
1. Make sure to lift up on the ORC covering panel to insert the ORC.



2. Connect the two ORC connectors (4) and ensure that the connectors are engaged.
3. Position ORC (arrow pointing forward) on the console floor bracket and mounting studs (1).
4. Install the three ORC retaining nuts (2) and tighten to 9 N·m (79.5 in. lbs.).



5. Install floor shifter bezel (1) (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION).

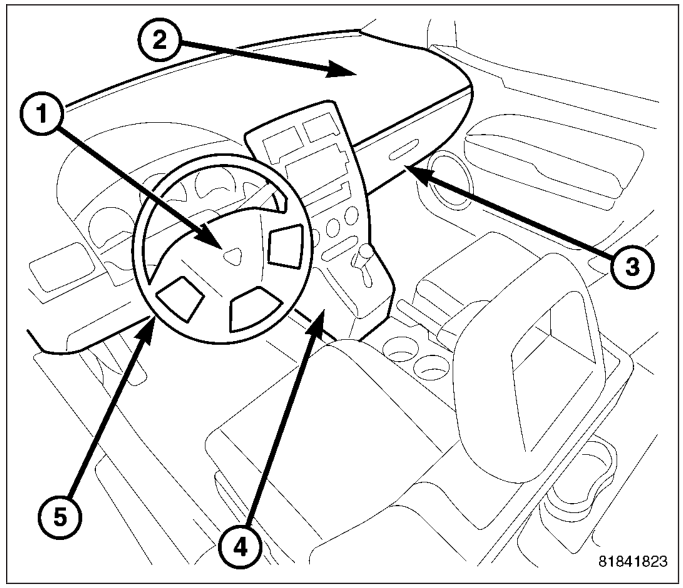


WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

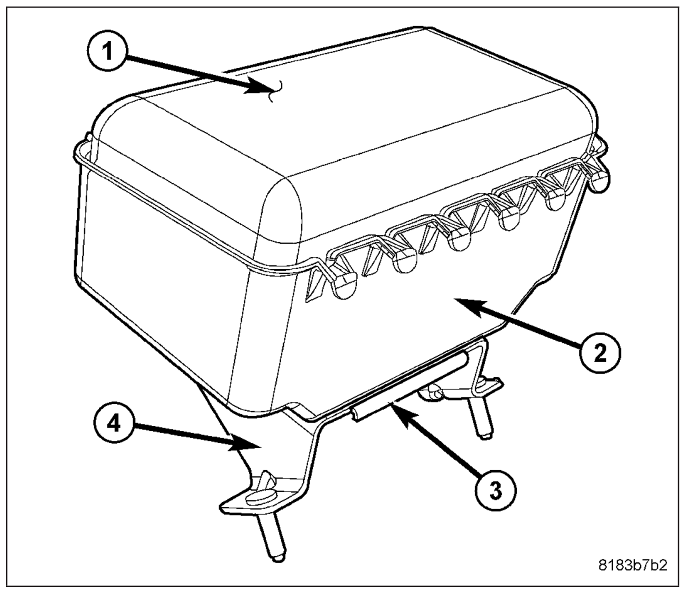
PASSENGER AIRBAG

DESCRIPTION

The horizontal surface of the instrument panel top panel (2) above the glove box (3) is the most visible part of the Passenger Airbag (PAB). The PAB door/cover is available for separate service replacement.

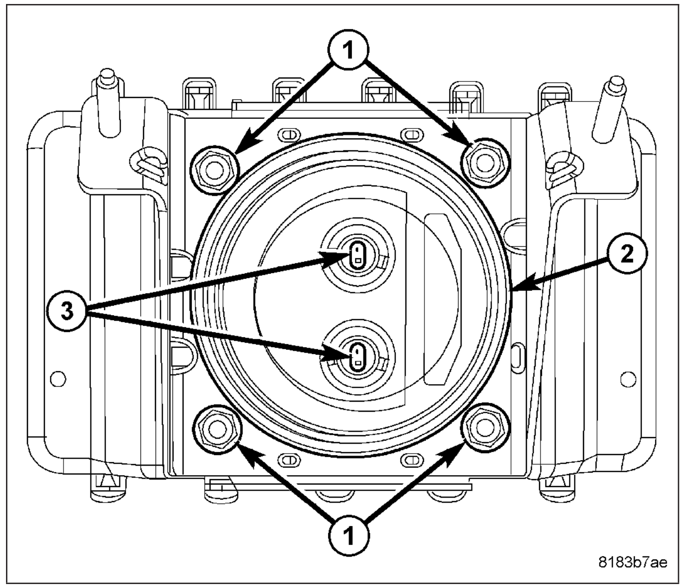


The PAB includes an aluminum housing (2) within which the cushion (1) and inflator (3) are mounted and sealed. A stamped metal bracket mounts the PAB to the instrument panel. It is mounted directly to the instrument panel reinforcement.



The bottom of the PAB houses the inflater (2). It is attached to the PAB by four nuts (1) and contains the two squib connectors (3) which connect the PAB to the vehicle electrical system through the instrument panel wire harness.

Following a PAB deployment, the PAB and the PAB cover must be replaced. The PAB cannot be repaired, and must be replaced if deployed or in any way damaged.



OPERATION

The multistage Passenger Airbag (PAB) is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the PAB squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of four delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the airbag cushion and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the PAB cover will split at predetermined tear seam lines concealed on the underside of the PAB cover, then the door will pivot up over the top of the instrument panel and out of the way. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas through vent holes within the fabric used to construct the back (windshield side) of the airbag cushion.

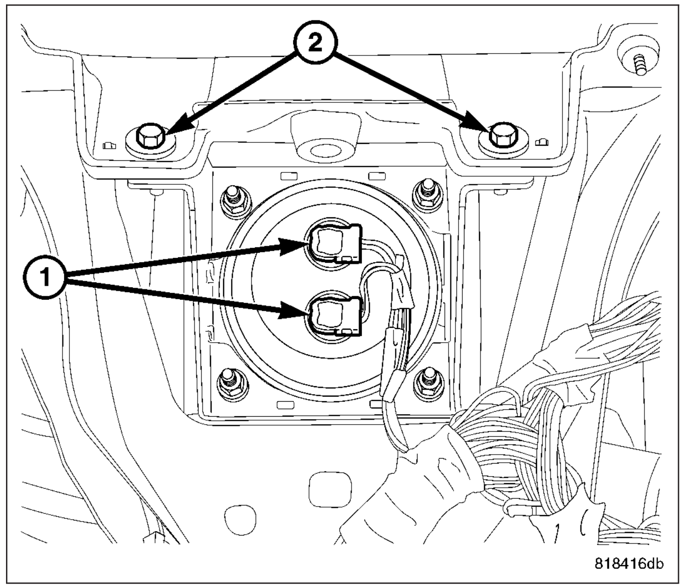
Proper diagnosis of the PAB inflator and squib circuits requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

NON-DEPLOYED AIRBAG

1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

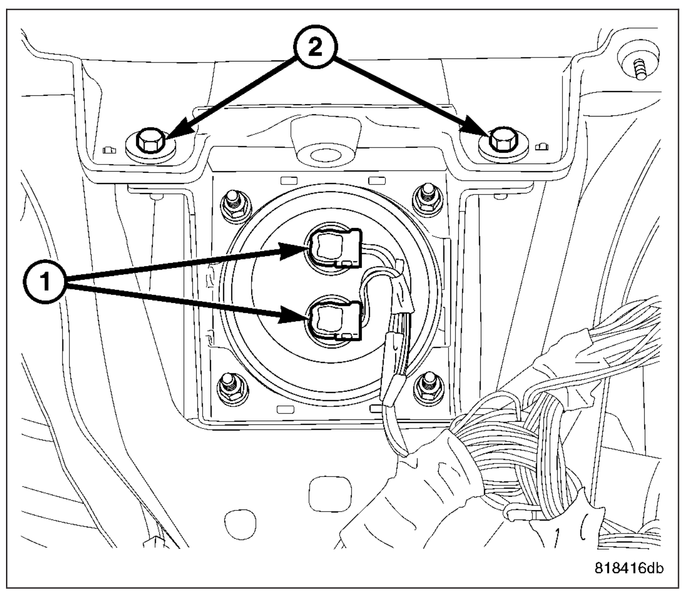


3. Remove both left and right A-pillar trim panels (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
4. Remove instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
5. Remove the glove box (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).
6. Remove PAB cover screws.
7. Remove two fasteners (2) retaining PAB to instrument panel assembly inside glove box opening.
8. Disconnect the two PAB squib connectors (1).
9. Remove PAB from vehicle.

DEPLOYED AIRBAG

1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

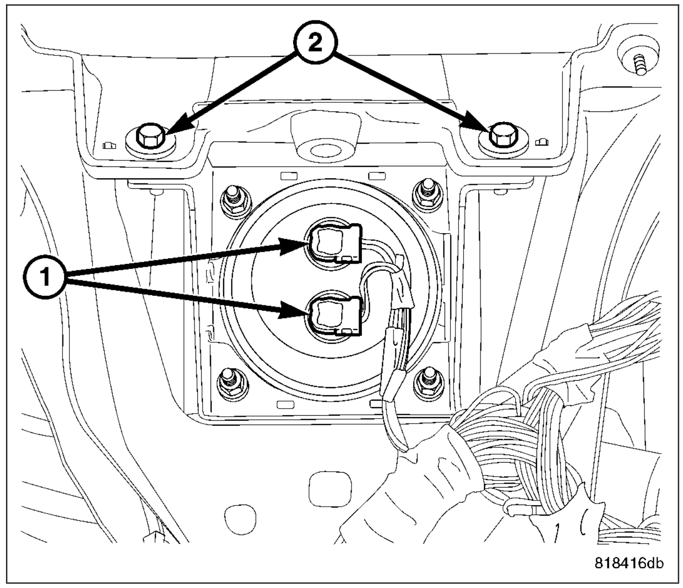


3. Roll/fold PAB towards instrument panel.
4. Close door over folded airbag and tape door closed.
5. Remove both left and right A-pillar trim panels (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
6. Remove instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
7. Remove the glove box (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).
8. Remove PAB cover screws.
9. Remove two fasteners (2) retaining PAB to instrument panel assembly inside glove box opening.
10. Disconnect the two PAB squib connectors (1).
11. Remove PAB from vehicle.

INSTALLATION

1. Place PAB into instrument panel opening.
2. Install the two fasteners (2) retaining PAB to instrument panel assembly inside glove box opening. Tighten to 9.5 N·m (84 in. lbs.).
3. Connect the two PAB squib connectors (1).
4. Install PAB cover screws.
5. Install the right and left A-pillar trim panels (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).
6. Install the glove box (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION).
7. Install instrument panel top cover (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



PASSENGER AIRBAG COVER

REMOVAL

1. Open hood.
2. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

3. Remove the passenger airbag from the instrument panel (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL).
4. Unhook the trim cover from the passenger airbag by lifting the cover over the hook and latch retainers.

INSTALLATION

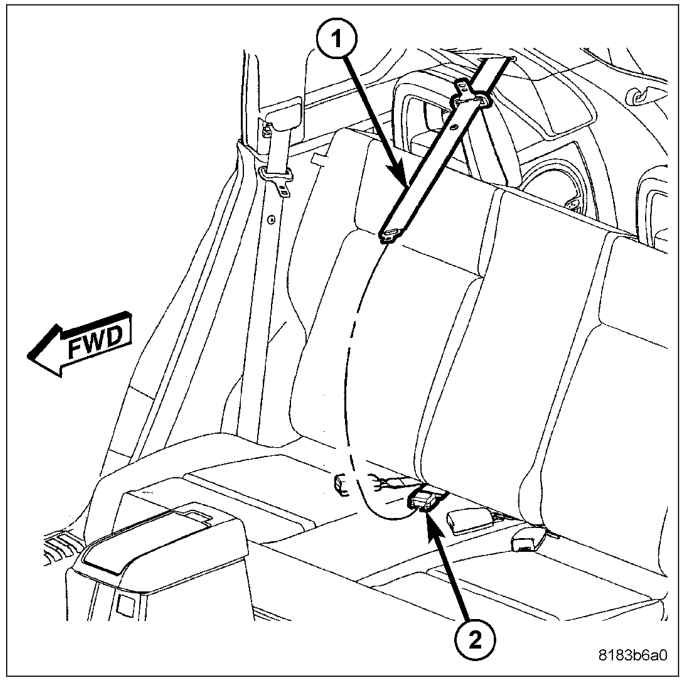
1. Install the passenger airbag trim cover over the hook and loop retainers on the passenger airbag.
2. Install the passenger airbag in the instrument panel (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION).

WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

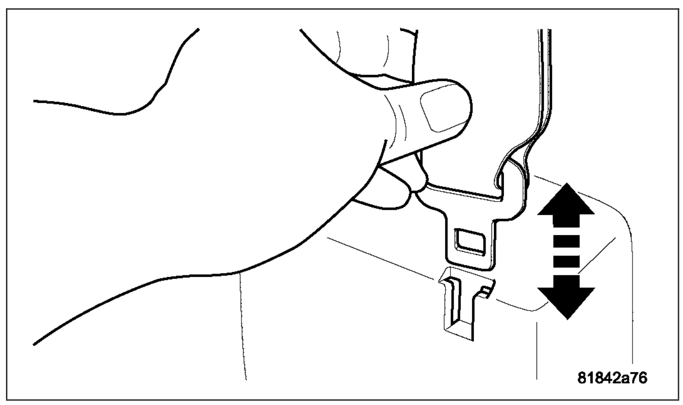
REAR CENTER SEAT BELT AND RETRACTOR

REMOVAL

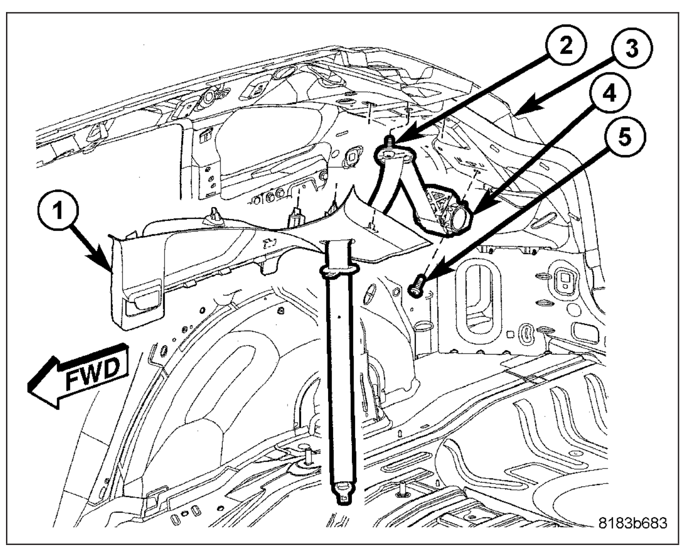
1. If center rear seatbelt (1) is latched to its anchor, detach the Quick Connect Anchor by depressing tab (2).



2. If seatbelt is unlatched from its anchor then remove it from its stowage slot on the right quarter trim panel.

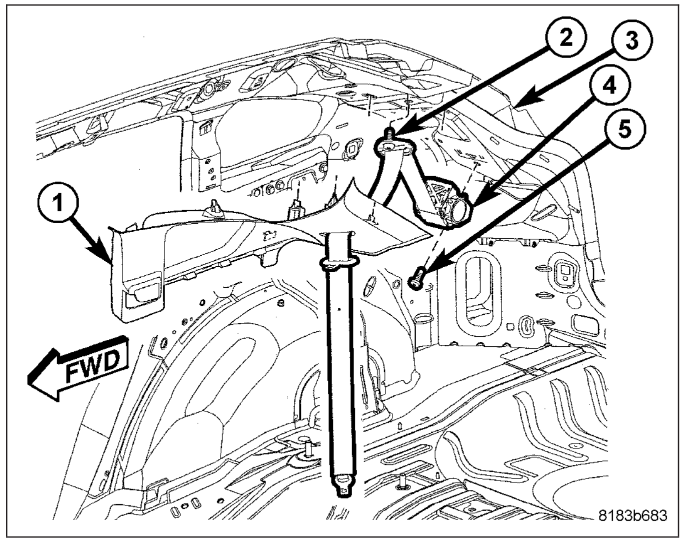


3. Remove C-pillar upper trim panel (1) (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
4. Feed seatbelt webbing through C-pillar upper trim panel.
5. Remove the rear center seatbelt upper turning loop bolt (2).
6. Remove the rear center seatbelt retractor retaining bolt (5) from the D-pillar (3).
7. Remove rear center seatbelt retractor (4) from the vehicle.

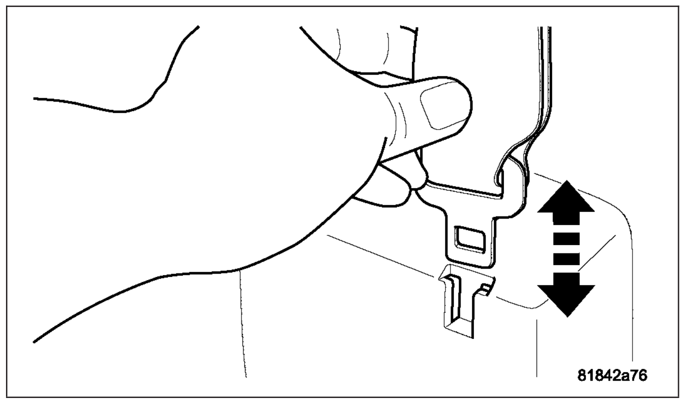


INSTALLATION

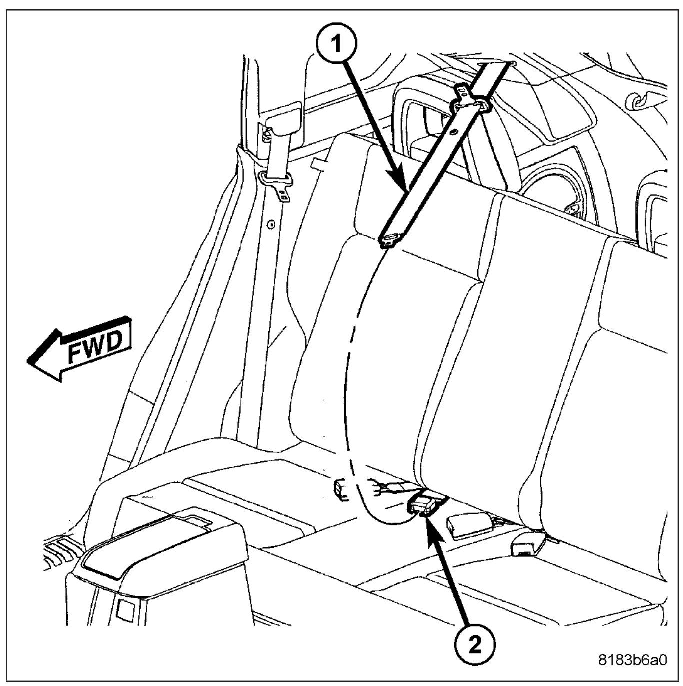
1. Position rear center seatbelt retractor into hollow in the D-pillar (3).
2. Install the rear center seatbelt retractor retaining bolt (5). Tighten bolt to 40 N·m (29.5 ft. lbs.).
3. Feed seatbelt webbing through upper C-pillar trim panel.
4. Install the upper C-pillar trim panel (Refer to 23 - BODY/INTERIOR/UPPER C-PILLAR TRIM - INSTALLATION).



5. If replacing the seatbelt into the latch stowage, place into slot and push down.



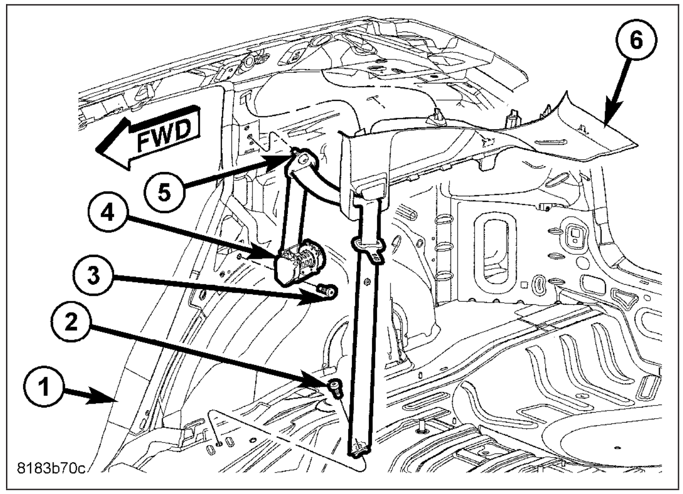
6. If latching seatbelt (1) to anchor (2), attach Quick Connect Anchor (2).



REAR SEAT BELT AND RETRACTOR

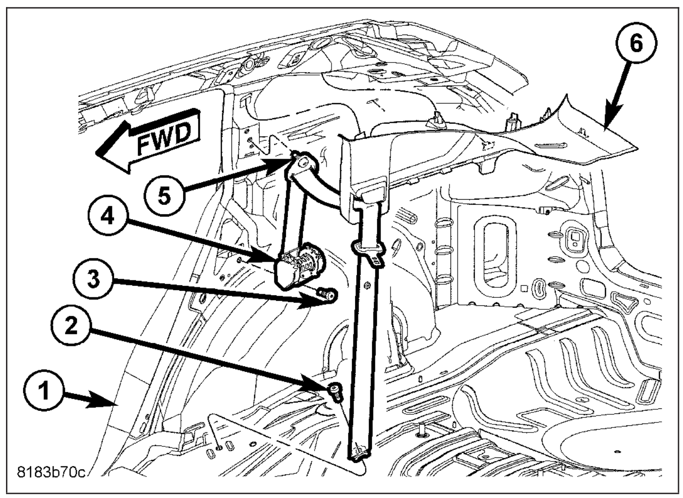
REMOVAL

1. Remove the upper C-pillar trim (6) (Refer to 23 - BODY/INTERIOR/UPPER C-PILLAR TRIM - INSTALLATION).
2. Remove the rear quarter panel trim (Refer to 23 - BODY/INTERIOR/REAR QUARTER PANEL TRIM - INSTALLATION).
3. Remove the rear outer seatbelt anchor bolt (2).
4. Feed the seatbelt webbing through the upper C-pillar trim panel (6).
5. Remove the upper seatbelt turning loop bolt (5).
6. Remove the rear outer seatbelt retractor retaining bolt (3).
7. Remove the rear outer seatbelt retractor (4) from the C-pillar (1).



INSTALLATION

1. Position the rear outer seatbelt retractor (4) into the C-pillar (1).
2. Install the rear outer seatbelt retractor retaining bolt (3). Tighten bolt to 40 N·m (29.5 ft. lbs.).
3. Install the upper seatbelt turning loop bolt (5). Tighten bolt to 40 N·m (29.5 ft. lbs.).
4. Feed the seatbelt webbing through the upper C-pillar trim panel (6).
5. Install the rear outer seatbelt anchor bolt (2). Tighten bolt to 40 N·m (29.5 ft. lbs.).
6. Install the rear quarter panel trim (Refer to 23 - BODY/INTERIOR/REAR QUARTER PANEL TRIM - INSTALLATION).
7. Install upper C-pillar trim (6) (Refer to 23 - BODY/INTERIOR/UPPER C-PILLAR TRIM - INSTALLATION).

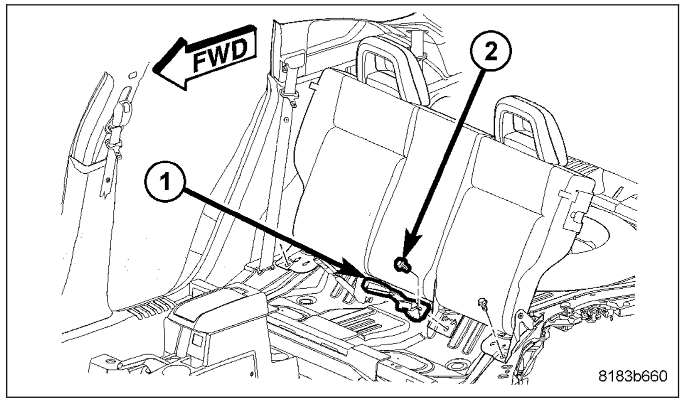


REAR SEAT BELT BUCKLE

REMOVAL

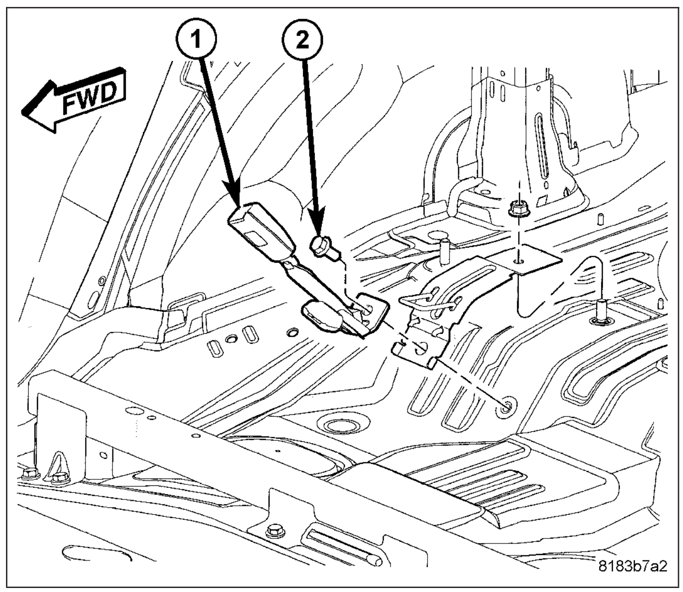
CENTER/LEFT BUCKLE

1. Remove the rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - REMOVAL)
2. Remove the left and center seatbelt buckle retaining bolt (2).
3. Remove the left and center seatbelt buckle (1) from the vehicle.



RIGHT BUCKLE/CENTER SEAT BELT ANCHOR LATCH

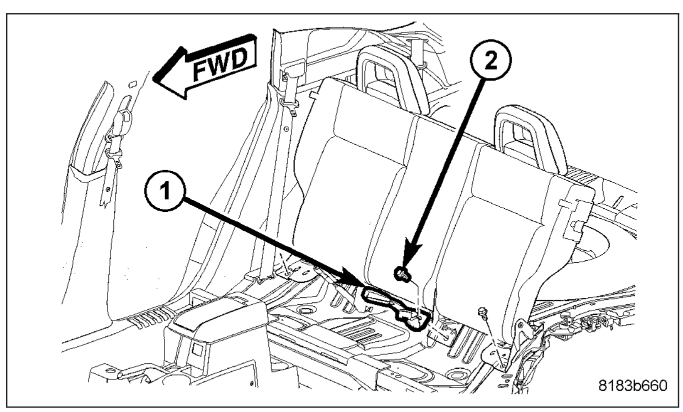
1. Remove the rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - REMOVAL).
2. Remove the right buckle/center seatbelt anchor latch retaining bolt (2).
3. Remove the right buckle/center seatbelt anchor latch (1) from the vehicle.



INSTALLATION

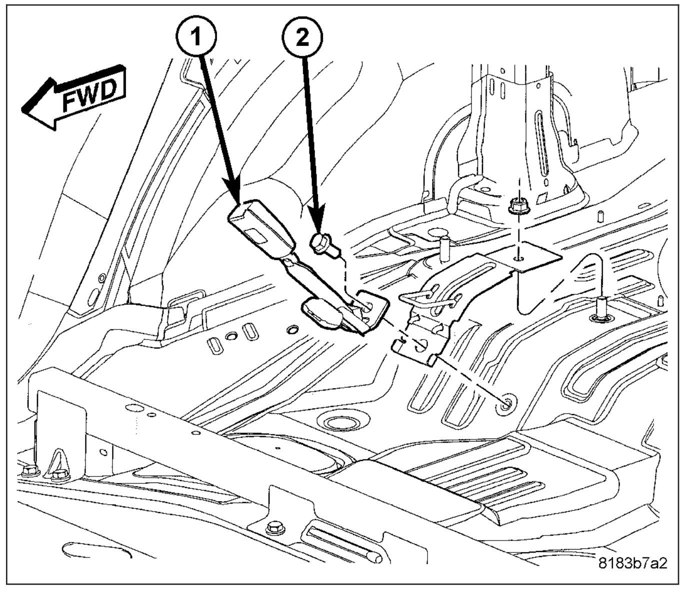
CENTER/LEFT BUCKLE

1. Position the buckle (1) over the left inner seat back hinge and install the retaining bolt (2). Tighten bolt to 56 N·m (41.5 ft. lbs.).
2. Install the rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - INSTALLATION).



RIGHT BUCKLE/CENTER SEAT BELT ANCHOR LATCH

1. Position the right buckle/center seatbelt anchor latch (1) in the vehicle.
2. Install the right buckle/center seatbelt anchor latch retaining bolt (2). Tighten bolt to 56 N·m (41.5 ft. lbs.).
3. Install the rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - INSTALLATION).



SEAT BELT-TENSIONER

DESCRIPTION

Seat belt tensioners supplement the dual front airbags for this vehicle. The seat belt tensioners are integral to the front outboard seat belt retractor units, which are secured to the inner B-pillar on the right and left sides of the vehicle. The retractor is concealed beneath the molded plastic inner B-pillar trim.

The seat belt tensioner consists primarily of a sprocket/pinion, a steel tube, a cast metal housing, numerous steel balls, a stamped metal ball trap, a torsion bar and a small pyrotechnically activated gas generator with a connector receptacle. All of these components are located on one side of the retractor spool on the outside of the retractor housing except for the torsion bar, which serves as the spindle upon which the retractor spool rides. The seat belt tensioners are controlled by the Occupant Restraint Controller (ORC) and are connected to the vehicle electrical system through a dedicated take out of the body wire harness by a keyed and latching yellow molded plastic connector insulator to ensure a secure connection.

The seat belt tensioners cannot be repaired and, if ineffective or damaged, the entire front seat belt and retractor unit must be replaced. If the front airbags have been deployed, the seat belt tensioners have also been deployed. The seat belt tensioners are not intended for reuse and must be replaced following any front airbag deployment. A growling or grinding sound while attempting to operate the seat belt retractor is a sure indication that the seat belt tensioner has been deployed and requires replacement (Refer to 8 - ELECTRICAL/RESTRAINTS/FRONT SEAT BELT & RETRACTOR - REMOVAL).

OPERATION

The seat belt tensioners are deployed in conjunction with the dual front airbags by a signal generated by the Occupant Restraint Controller (ORC) through the driver or passenger seat belt tensioner line 1 and line 2 (or squib) circuits. When the ORC sends the proper electrical signal to the tensioners, the electrical energy generates enough heat to initiate a small pyrotechnic gas generator.

The gas generator is installed in one end of a steel tube that contains numerous steel balls. As the gas expands, it pushes the steel balls through the tube into a cast metal housing, where a ball guide directs the balls into engagement with the teeth of a sprocket that is geared to one end of the retractor spool. As the balls drive past the sprocket, the sprocket turns and drives the seat belt retractor spool causing the slack to be removed from the front seat belts. The ball trap captures the balls as they leave the sprocket and are expelled from the housing.

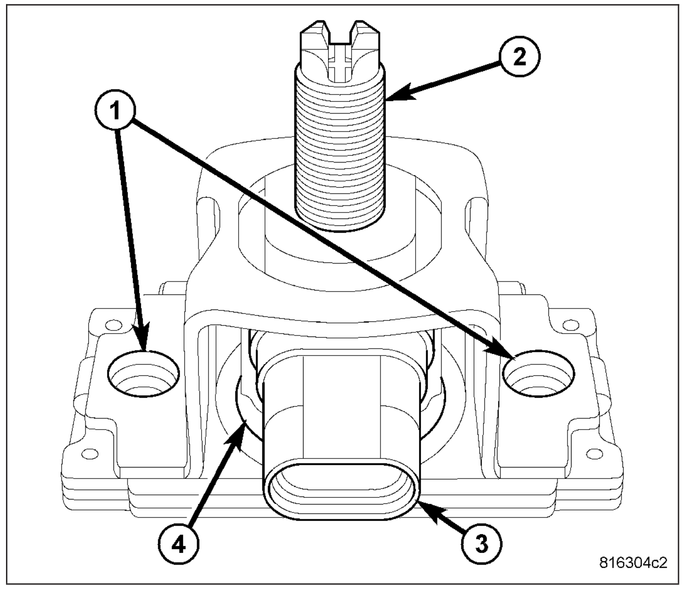
Removing excess slack from the front seat belts not only keeps the occupants properly positioned for an airbag deployment following a frontal impact of the vehicle, but also helps to reduce injuries that the occupant might experience in these situations as a result of harmful contact with the steering wheel, steering column, instrument panel or windshield. Also, the seat belt tensioner torsion bar that the retractor spool rides upon is designed to deform in order to control the loading being applied to the occupants by the seat belts during a frontal impact, further reducing the potential for occupant injuries.

The ORC monitors the condition of the seat belt tensioners through circuit resistance, and will illuminate the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) and store a Diagnostic Trouble Code (DTC) for any fault that is detected. Proper diagnosis of the seat belt tensioner gas generator and the seat belt tensioner squib circuits requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

SENSOR-SEAT WEIGHT

DESCRIPTION

The seat weight sensors are strain gauge-type units. The electronic elements of the sensor are encased within the sensor body (4). Four sensors are used in the Occupant Classification System (OCS). The sensors are located below the seat cushion between the seat adjuster track and the seat adjuster riser at each corner of the passenger side front seat.



A threaded mounting stud (2) on each sensor body is secured by a nut to the seat adjuster riser, and two nuts secure each sensor mounting flange (1) to two studs integral to the front and rear of the inboard and outboard passenger side lower seat adjuster tracks. A molded connector receptacle (3) integral to each sensor body is oriented towards the center of the seat and is connected to the vehicle electrical system through a dedicated connector and take out of the passenger seat wire harness beneath the seat cushion.

The seat weight sensors cannot be adjusted or repaired and, if faulty or damaged, the entire sensor must be replaced.

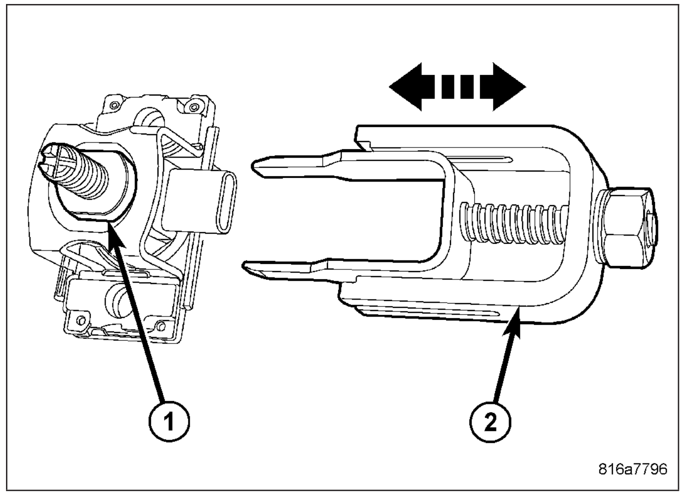
OPERATION

The seat weight sensor units are designed to sense the relative weight of a load applied to the passenger side front seat, which provides a logic input to the microprocessor of the Occupant Classification Module (OCM). When any load is applied to the seat the load is transmitted through the sensor mounting flange to the sensor body (strain gauge) of each sensor, causing a change of electrical resistance through the strain gauge. These changes in resistance within the internal sensor circuitry change the sensor output voltage.

Each weight sensor receives a nominal five volts and a clean ground through parallel hard wired circuits from the OCM. The OCM then monitors the output voltage of each sensor on dedicated hard wired data communication circuits. The hard wired circuits between the sensors and the OCM may be diagnosed and tested using conventional diagnostic tools and procedures. However, the most reliable, efficient, and accurate means to diagnose the seat weight sensor inputs to the OCM, and the electronic message communication between the OCM and the Occupant Restraint Controller (ORC) requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: To avoid personal injury or death, never strike or drop a seat weight sensor or the passenger side front seat assembly to which the sensors are secured as it can damage the sensors or affect their calibration. The seat weight sensors and the passenger side front seat assembly must be handled with care to avoid damage to the sensors. Do not sit upon or place any loads upon a passenger side front seat while it is removed from its mounts in or outside of the vehicle. If an individual sensor is dropped or damaged, replace the sensor with a new and unused unit. If a seat has been dropped during removal or loaded while removed from its mounts, replace each of the seat weight sensors with new and unused units. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.



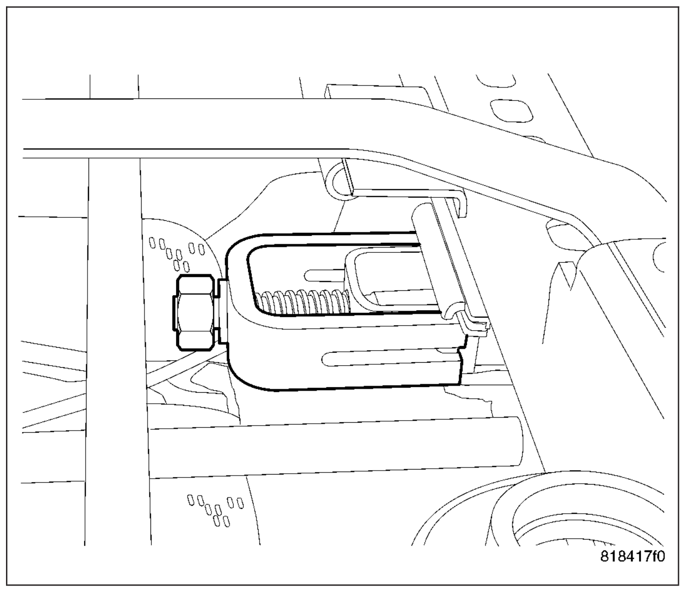
1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the system reserve capacitor to discharge before servicing any airbag components.

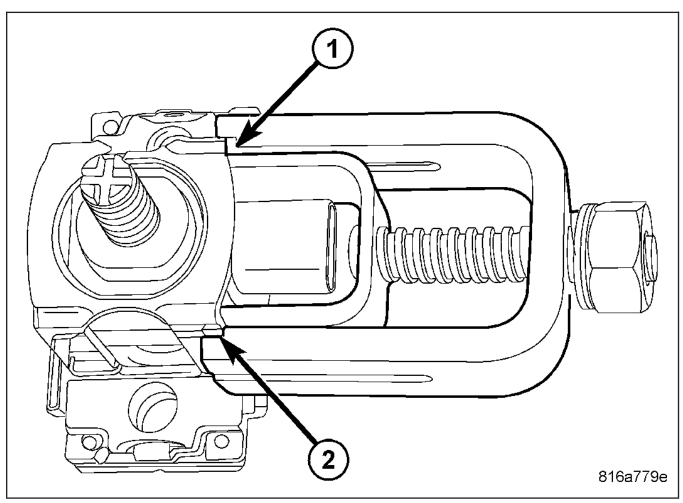
2. Remove the passenger front seat from the vehicle as a unit (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)

CAUTION: Strain gauge alignment tool 9689 (2) must be used to secure the body of the seat weight sensor (1) from any rotation during removal or installation of the nut that secures the sensor stud to the seat adjuster riser. In addition, the sensor fasteners should always be serviced using hand tools ONLY, and not electric or pneumatic power tools. Failure to observe these precautions may result in irreversible sensor damage and require sensor replacement.

3. Remove the passenger front seat riser from the seat (Refer to 23 - BODY/SEATS/SEAT RISER - REMOVAL).
4. Disconnect each weight sensor electrical connector and install strain gauge alignment tool 9689.



5. Insert the fork (1) into weight sensor and seat the support yoke (2) firmly against the weight sensor cage.
6. Remove center stud nut and repeat these steps for each of the four weight sensors.
7. Separate the seat track from the seat risers.
8. Remove the nuts securing the seat weight sensor to the adjuster track and remove the seat weight sensor.

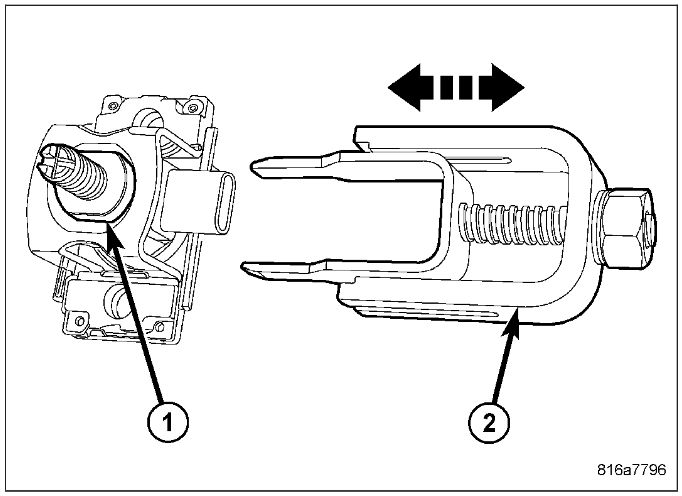


INSTALLATION

WARNING: To avoid personal injury or death, never strike or drop a seat weight sensor or the passenger side front seat assembly to which the sensors are secured as it can damage the sensors or affect their calibration. The seat weight sensors and the passenger side front seat assembly must be handled with care to avoid damage to the sensors. Do not sit upon or place any loads upon a passenger side front seat while it is removed from its mounts in or outside of the vehicle. If an individual sensor is dropped or damaged, replace the sensor with a new and unused unit. If a seat has been dropped during removal or loaded while removed from its mounts, replace each of the seat weight sensors with new and unused units. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.

WARNING: To avoid personal injury or death on vehicles equipped with the Occupant Classification System (OCS), any time the passenger side front seat assembly has been removed or loosened from the vehicle for service of any vehicle component or system the Occupant Classification System Verification Test must be performed using a diagnostic scan tool and the Occupant Classification Seat Weight special tool following reinstallation. Refer to the appropriate diagnostic procedures. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.

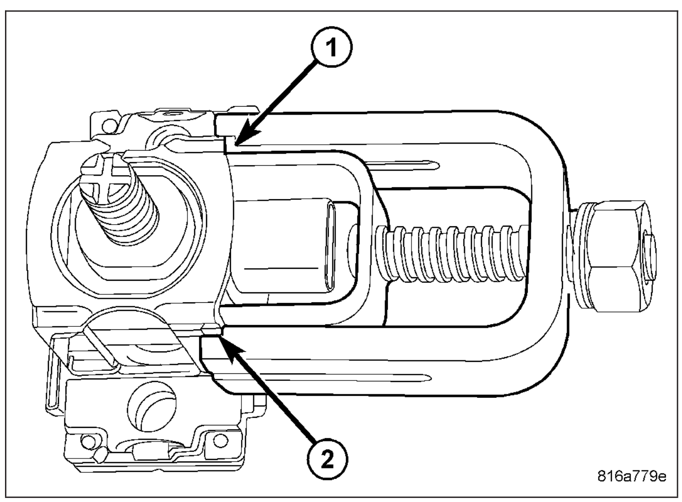
CAUTION: Strain gauge alignment tool 9689 (2) must be used to secure the body of the seat weight sensor (1) from any rotation during removal or installation of the nut that secures the sensor stud to the seat adjuster riser. In addition, the sensor fasteners should always be serviced using hand tools ONLY, and not electric or pneumatic power tools. Failure to observe these precautions may result in irreversible sensor damage and require sensor replacement.



1. Install the seat weight sensor and install the nuts securing the seat weight sensor to the adjuster track. Tighten nuts to 28 N·m (21 ft. lbs.).
2. Place the seat track onto the seat riser.
3. Install the nut on the center stud and repeat for each of the four weight sensors.

CAUTION: Do not tighten the center nut to the seat weight sensors without the use of strain gauge alignment tool 9689.

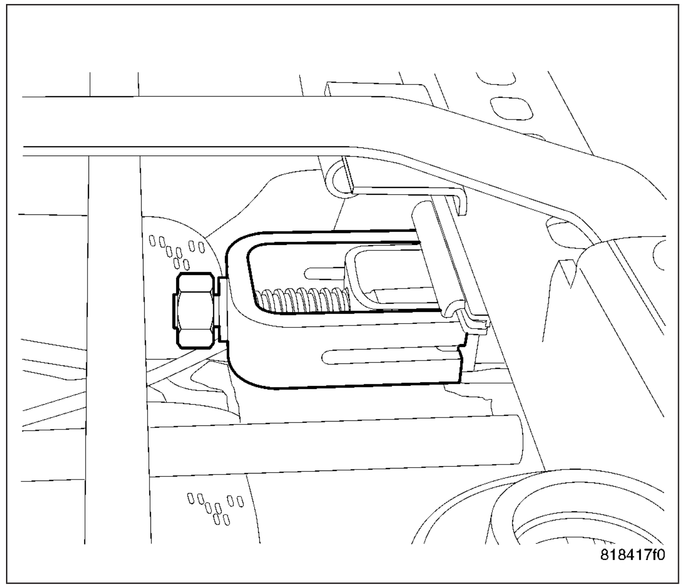
4. Insert the fork (1) into weight sensor and seat the support yoke (2) firmly against the weight sensor cage. Tighten nut to 45 N·m (33 ft. lbs.). Repeat for all four sensors.



5. Connect each weight sensor electrical connector.
6. Reinstall the passenger front seat (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

WARNING: Following successful completion of the Airbag System verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool and the Occupant Classification Seat Weight special tool 9077. Refer to the appropriate diagnostic information.



SPEED CONTROL

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SPEED CONTROL

DESCRIPTION

The speed control system is fully and electronically controlled by the Powertrain Control Module (PCM). **A cable and a vacuum controlled servo are not used. This is a servo-less system.** The switch is labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 25 mph (40 km/h).

WARNING: the use of speed control is not recommended when driving conditions do not permit maintaining a constant speed, such as in heavy traffic or on roads that are winding, icy, snow covered, or slippery.

OPERATION

OPERATION

When speed control is activated by depressing the ON switch, the PCM allows a set speed to be stored in RAM for speed control. To store a set speed, depress and release the SET switch while the vehicle is moving at a speed between 25 and 85 mph (40 km/h and 137 km/h). In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral (ATX) or 1st/2nd gear (MTX). The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.
- Depressing the clutch pedal
- Operating in 1st or 2nd gear (autostick, if equipped)

NOTE: Turning the system off by depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph (16 km/h) per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- The speed signal decreases at a rate of 10 mph (16 km/h) per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is greater than 20 mph (32 km/h) over the set speed.
- Autostick shifts into 1st or 2nd gear (autostick, if equipped)

Once the speed control has been disengaged, depressing the RESUME switch when speed is greater than 20 mph (32 km/h) allows the vehicle to resume control to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the ACCEL switch. The new target speed is stored in the PCM when the ACCEL switch is released. The PCM also has a tap-up feature in which target speed increases by 2 mph (3 km/h) for each momentary switch activation of the ACCEL switch. The PCM also provides a means to decelerate to a new lower target speed without disengaging speed control. Depress and hold the COAST switch until the desired speed is reached, then release the switch.

The PCM also has a Tap Down feature in which target speed decreases at 1 mph (1.5 km/h) for each momentary switch activation of the coast switch.

OPERATION - CHECKING FOR DIAGNOSTIC CODES

When trying to verify a speed control system electronic malfunction: Connect a scan tool if available to the data link connector. The connector is located near the steering column, and at lower edge of the dash panel.

A speed control malfunction may occur without a diagnostic code being indicated. For further information and usage of the scan tool and a more complete list of Diagnostic Trouble Code and No Trouble Codes, refer to the Powertrain Diagnostic.

DIAGNOSIS AND TESTING - ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to the Instrument Cluster for speedometer diagnosis.

If a road test verifies an inoperative system, and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Conduct electrical test at PCM.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

SWITCH

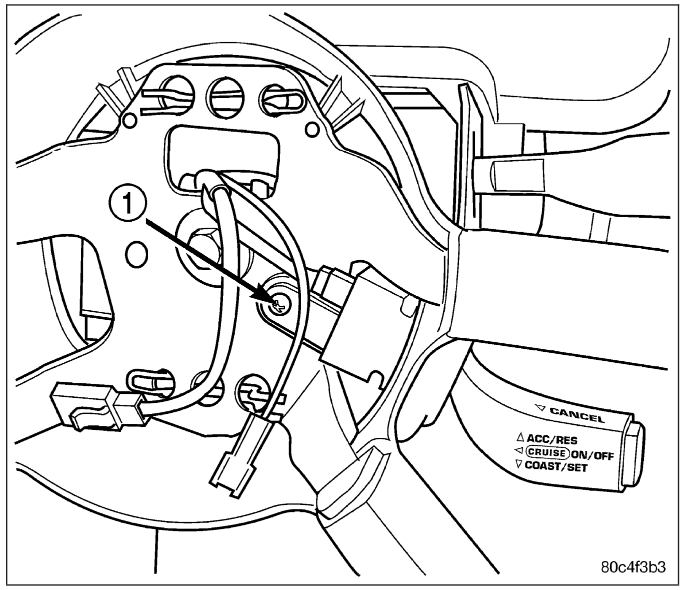
REMOVAL

WARNING:

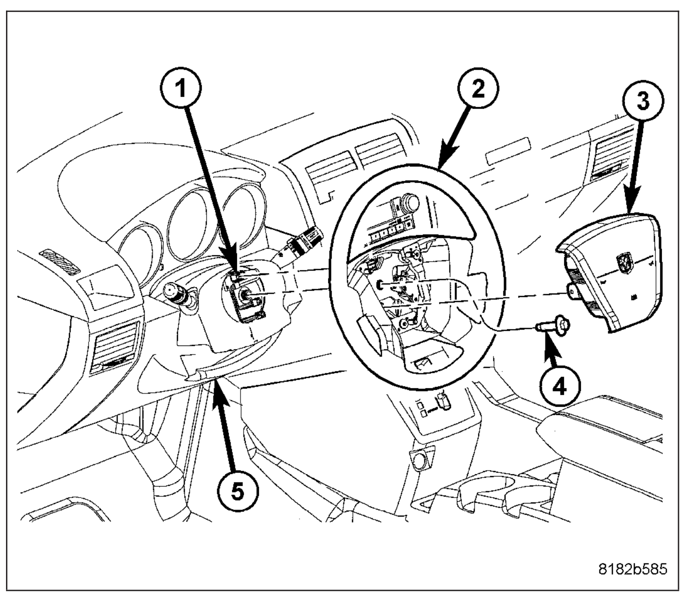
- **Do not place a non-deployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed, and could result in serious or fatal injury.**
- **Disconnect and isolate the battery negative (ground) cable before beginning steering wheel removal or installation. This will disable the front airbag system. Failure to disconnect the battery could result in accidental front airbag module deployment and possible personal injury.**
- **Allow the front airbag system capacitor to discharge for two minutes before removing the steering wheel or any front airbag system component.**

The speed control switches is mounted in the steering wheel and wired through the clock spring device under the airbag module.

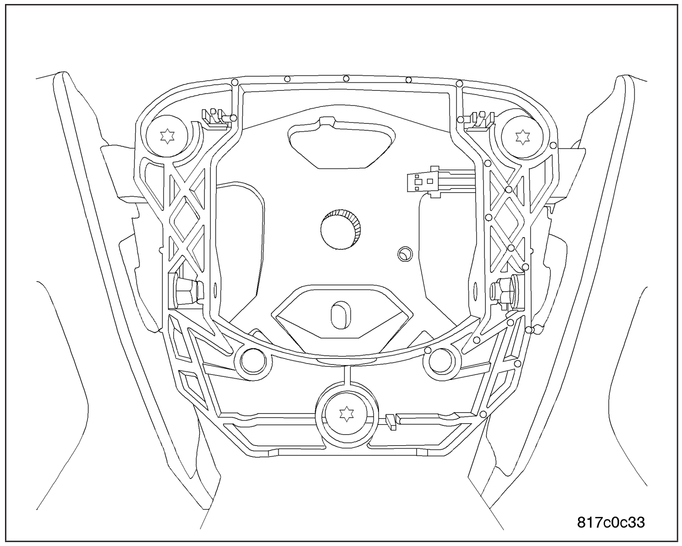
1. Adjust the steering wheel so that the tires are in the STRAIGHT-AHEAD position.
2. Remove the negative battery cable.
3. Turn off ignition.



4. Remove air bag, refer to the Restraint systems section.

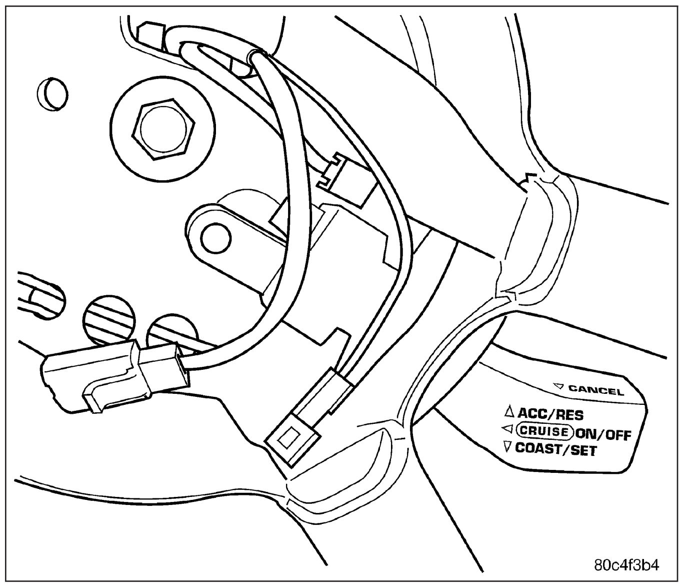


5. Disconnect the connector from the clockspring.
6. Remove the three mounting fasteners.
7. Remove the horn switch.



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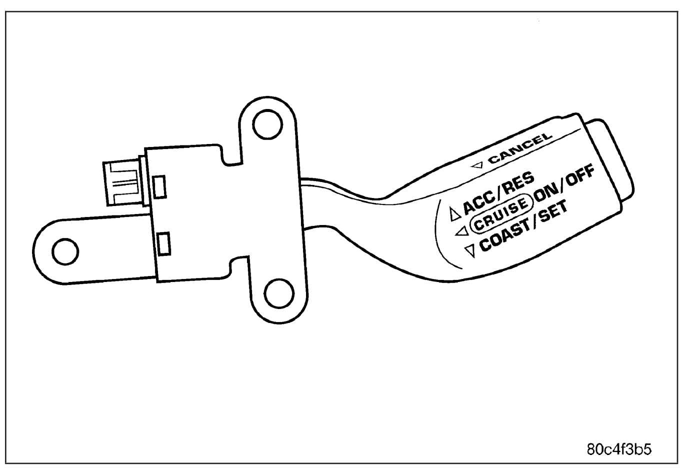
8. Remove 2 speed control switch mounting screws.
9. Disconnect the electrical connector.
10. Remove switch.



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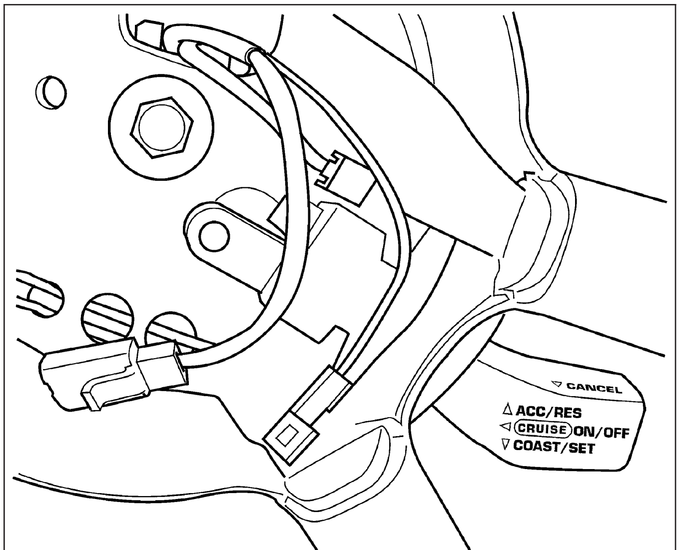
INSTALLATION

The speed control switch is mounted in the steering wheel and wired through the clock spring device under the airbag module.



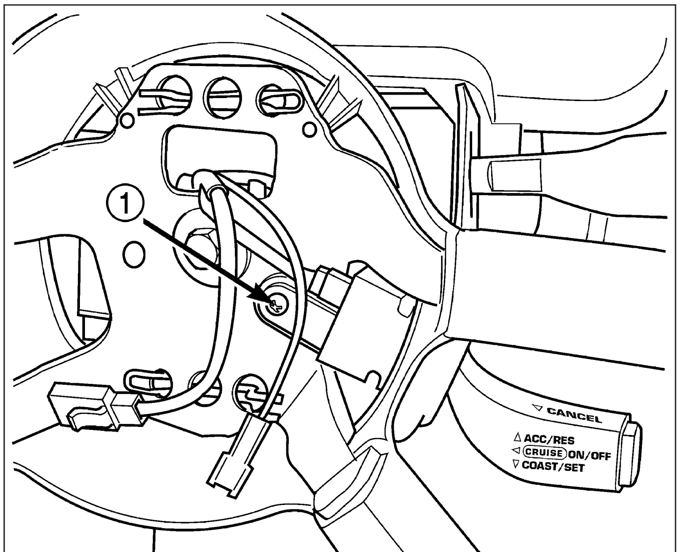
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1. Connect the electrical connector to speed control switch.



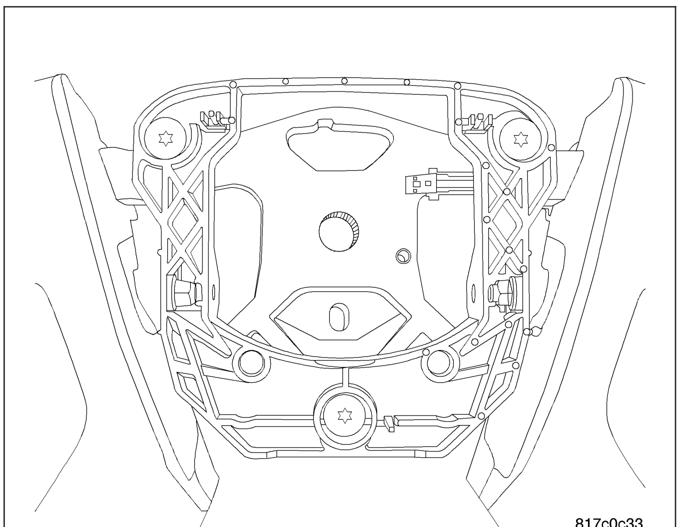
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2. Install the 2 speed control screw.
3. Tighten the screws (1) to 1.6 N·m (15 in. lbs.). Make sure rubber seal is in place around switch.



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4. Install the horn switch.
5. Install the three mounting fasteners.
6. Connect the electrical connector to the clockspring.

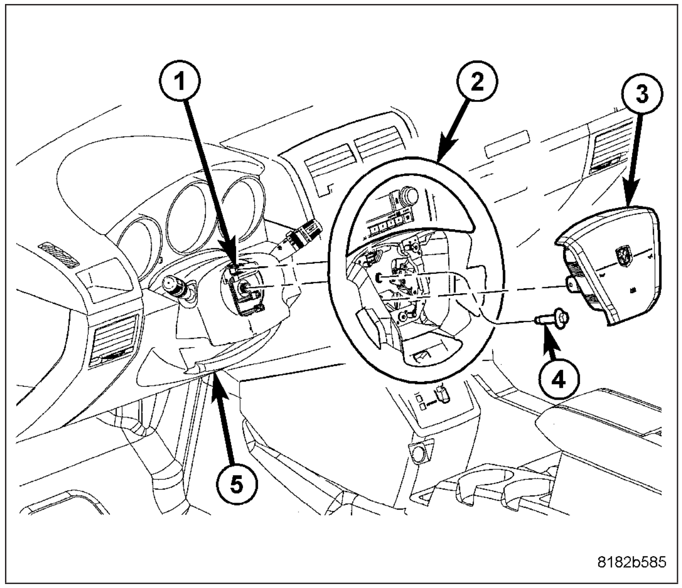


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7. Install the driver airbag (3). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION)

WARNING: Do not connect battery negative cable yet. Refer first to airbag system test. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)

8. Reconnect battery using Airbag System Test procedure in Restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)
9. Close hood.
10. Verify vehicle and system operation.



VEHICLE THEFT SECURITY

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VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS

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VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1A20-PRE-ARM TIMEOUT

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the VTSS pre-arm process.
- **Set Condition:**
  If the VTSS pre-arm sequence is interrupted within 16 seconds after securing the vehicle.

Possible Causes
INTERMITTENT PROBLEM WITH FUSED (B+) TO CLUSTER
INTERMITTENT PROBLEM WITH CAN B BUS CIRCUITS TO CLUSTER

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Communication DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Turn the ignition off and remove the key from the ignition.

Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.

Disarm the VTSS.

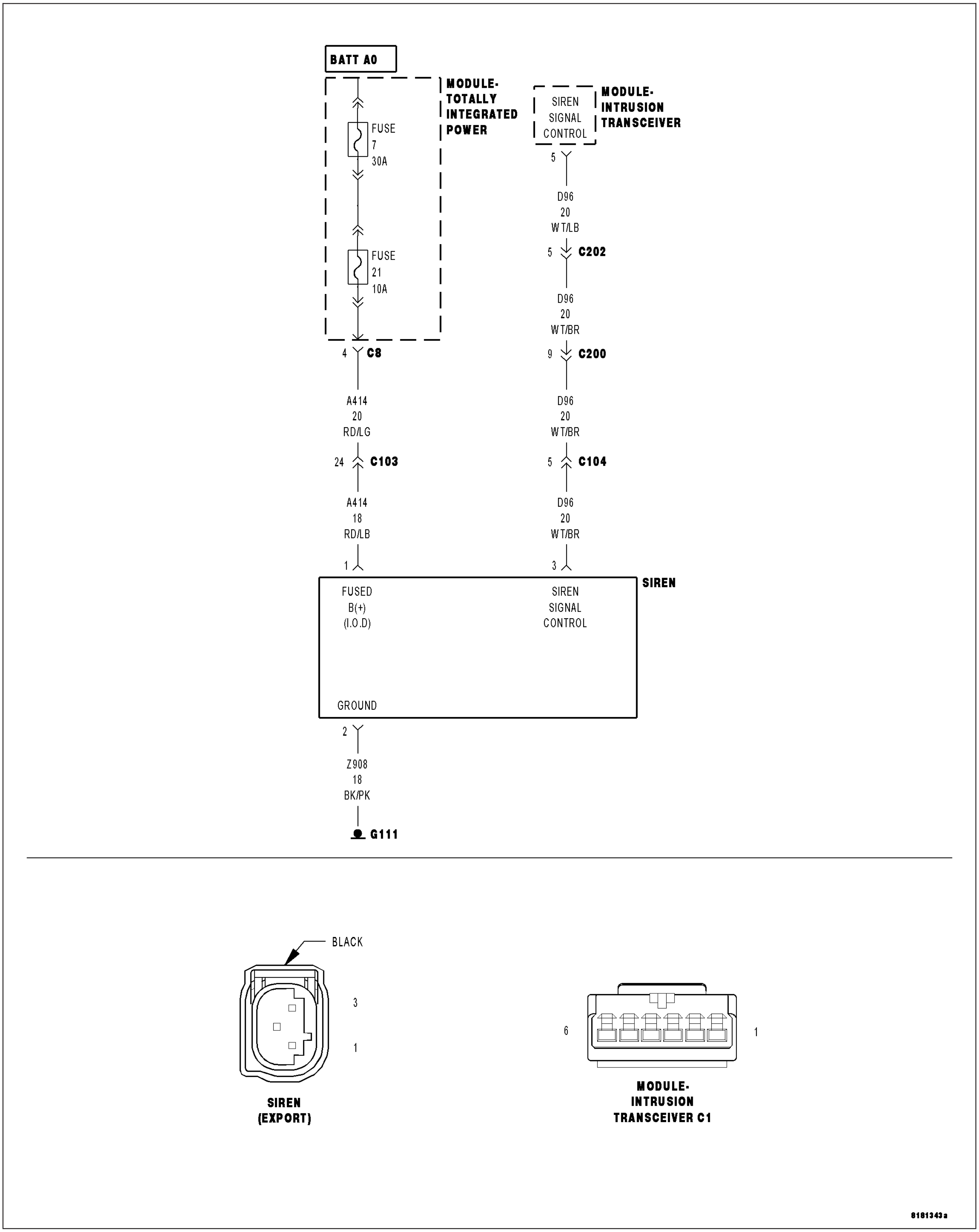
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Remove the Cluster and inspect the Fused B (+) and both CAN B BUS circuits for spread terminals or intermittent opens.

No >> DTC is not active at this time. Test complete.

B1A3C-INTERNAL SIREN BATTERY



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the engine over 600 RPM.
- **Set Condition:**
  When the internal battery within the siren does not charge as expected, the Intrusion Transceiver Module (ITM) sets this code.

Possible Causes
VEHICLE STORED WITH NO BATTERY VOLTAGE FOR EXTENDED PERIOD OF TIME
SIREN

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With a scan tool, read and record DTC(s).
With the scan tool, clear DTC(s).
Start the engine and allow it to idle for 2 minutes then turn the engine off.
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 2

No >> DTC is not active at this time. Test complete.

2. VEHICLE STORED WITH NO BATTERY VOLTAGE FOR EXTENDED PERIOD OF TIME

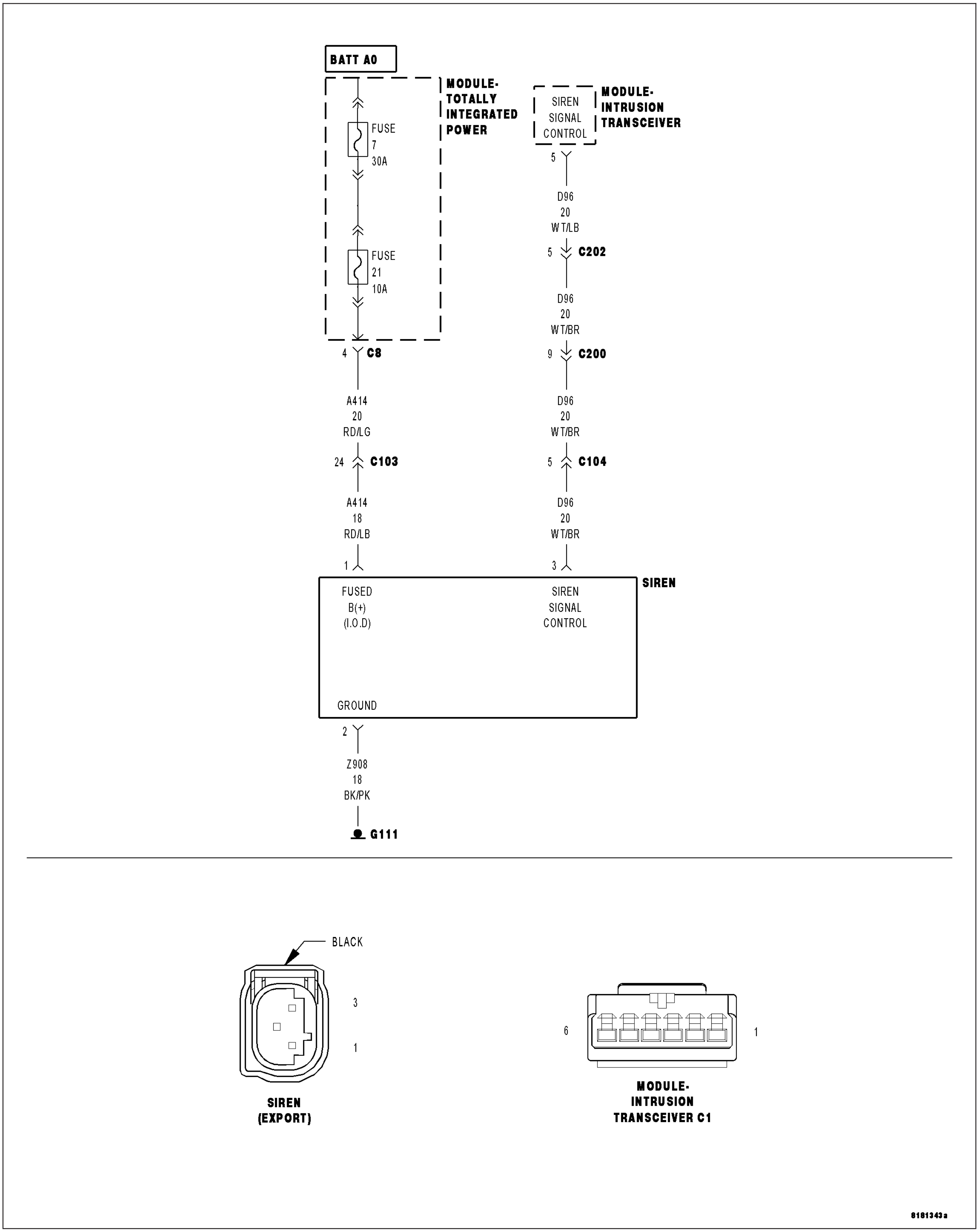
NOTE: If the vehicle was allowed to sit with no battery voltage for an extended period of time the back up battery located in the siren may discharge and need to be recharged.

Was the vehicle battery power just restored after the vehicle was stored with no power for an extended period of time?

Yes >> Allow the vehicle to sit with a fully charged battery for two hours then restart this procedure.

No >> Replace the Siren the in accordance with the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1A3D-SIREN BATTERY TAMPER / LOSS OF POWER SUPPLY



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the VTSS armed.
- **Set Condition:**
  If the ITM detects incorrect voltage at the siren this code will set.

Possible Causes
HARNESS TAMPERING / INTERMITTENT CONDITION
(A414) FUSED B(+) CIRCUIT
(Z908) GROUND OPEN
SIREN

Diagnostic Test

1. INSPECT SIREN HARNESS

Inspect the wiring harness to the siren for any signs of tampering or intermittent condition.

Were there any problems found?

Yes >> Repair wiring as necessary.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 2

2. DETERMINING IF DTC IS CURRENT

With a scan tool, read and record DTC(s).
With the scan tool, clear DTC(s).
Turn the ignition off and remove the key from the ignition.
Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.
Disarm the VTSS.
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

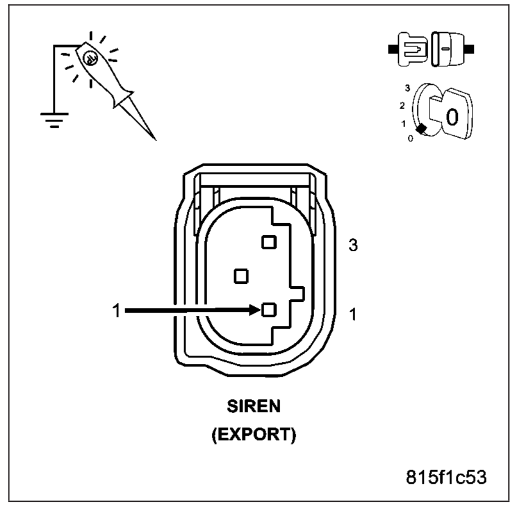
No >> DTC is not active at this time. Test complete.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. CHECK THE (A414) FUSED B(+) CIRCUIT AT THE SIREN

Turn the ignition off.

Disconnect the Siren connector.

Using a 12-volt test light connected to ground, check the (A414) Fused B(+) circuit at the siren connector.



Does the test light illuminate brightly?

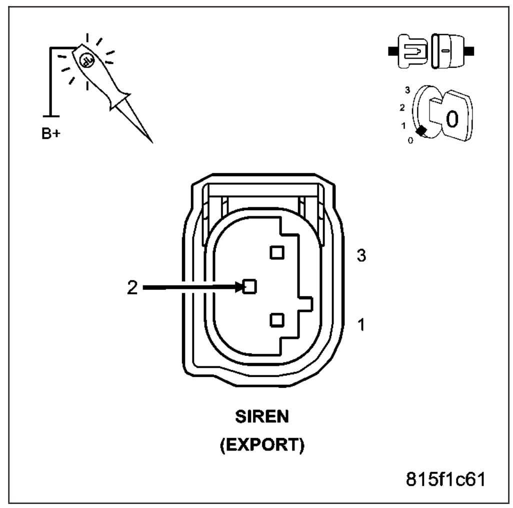
Yes >> Go To 4

No >> Repair the (A414) Fused B(+) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. CHECK THE (Z908) GROUND CIRCUIT AT THE SIREN

Using a 12-volt test light connected to 12-volts, check the (Z908) Ground circuit at the siren connector.



Does the test light illuminate brightly?

Yes >> Replace the Siren in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (Z908) Ground circuit for an open.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1A3E-SIREN / ITM MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the VTSS is armed.
- **Set Condition:**
  ITM losses battery voltage.

Possible Causes
CAN B BUS COMMUNICATION PROBLEMS
INTERMITTENT LOSS OF FUSED B(+) TO THE ITM WITH THE VTSS ARMED

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Communication DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Turn the ignition off and remove the key from the ignition.

Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.

Disarm the VTSS.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Check for and correct any CAN B Bus DTC's set in the ITM or other modules. Also check for intermittent loss Fused B(+) to the ITM.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1A3F-ITM ARMING SEQUENCE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During the VTSS pre-arm process.
- **Set Condition:**
  ITM losses battery voltage.

Possible Causes
CAN B BUS COMMUNICATION PROBLEMS
INTERMITTENT LOSS OF FUSED B(+) TO THE ITM DURING THE VTSS PRE-ARM PROCESS

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Communication DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Turn the ignition off and remove the key from the ignition.

Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.

Disarm the VTSS.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Check for and correct any CAN B Bus DTC's set in the ITM or other modules. Also check for intermittent loss Fused B(+) to the ITM.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2206-CURRENT VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Anytime the ignition key is in the ON position.
- **Set Condition:**
  VIN stored in Intrusion Transceiver Module does not match the VIN stored in the Cluster.

Possible Causes
INTRUSION TRANSCEIVER MODULE SWAPPED FROM DIFFERENT VEHICLE

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With a scan tool, read and record DTC(s).
With the scan tool, clear DTC(s).
Turn the ignition off and remove the key from the ignition.
Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.
Disarm the VTSS.
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Using the scan tool under Miscellaneous functions initialize the Intrusion Transceiver Module.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B222A-VEHICLE LINE MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Anytime the ignition key is in the ON position.
- **Set Condition:**
  If the Intrusion Transceiver Module is not configured.

Possible Causes
INTRUSION TRANSCEIVER MODULE CONFIGURATION

Diagnostic Test

1. CONFIGURE THE INTRUSION TRANSCEIVER MODULE

Using the scan tool under miscellaneous functions perform the initialization procedure for the Intrusion Transceiver Module.

With the scan tool, clear DTC(s).

Turn the ignition off and remove the key from the ignition.

Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.

Disarm the VTSS.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace the Intrusion Transceiver Module in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Test complete.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B223C-INTRUSION TRANSCEIVER MODULE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Internal Intrusion Transceiver Module test failed.

Possible Causes
INTRUSION TRANSCEIVER MODULE

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

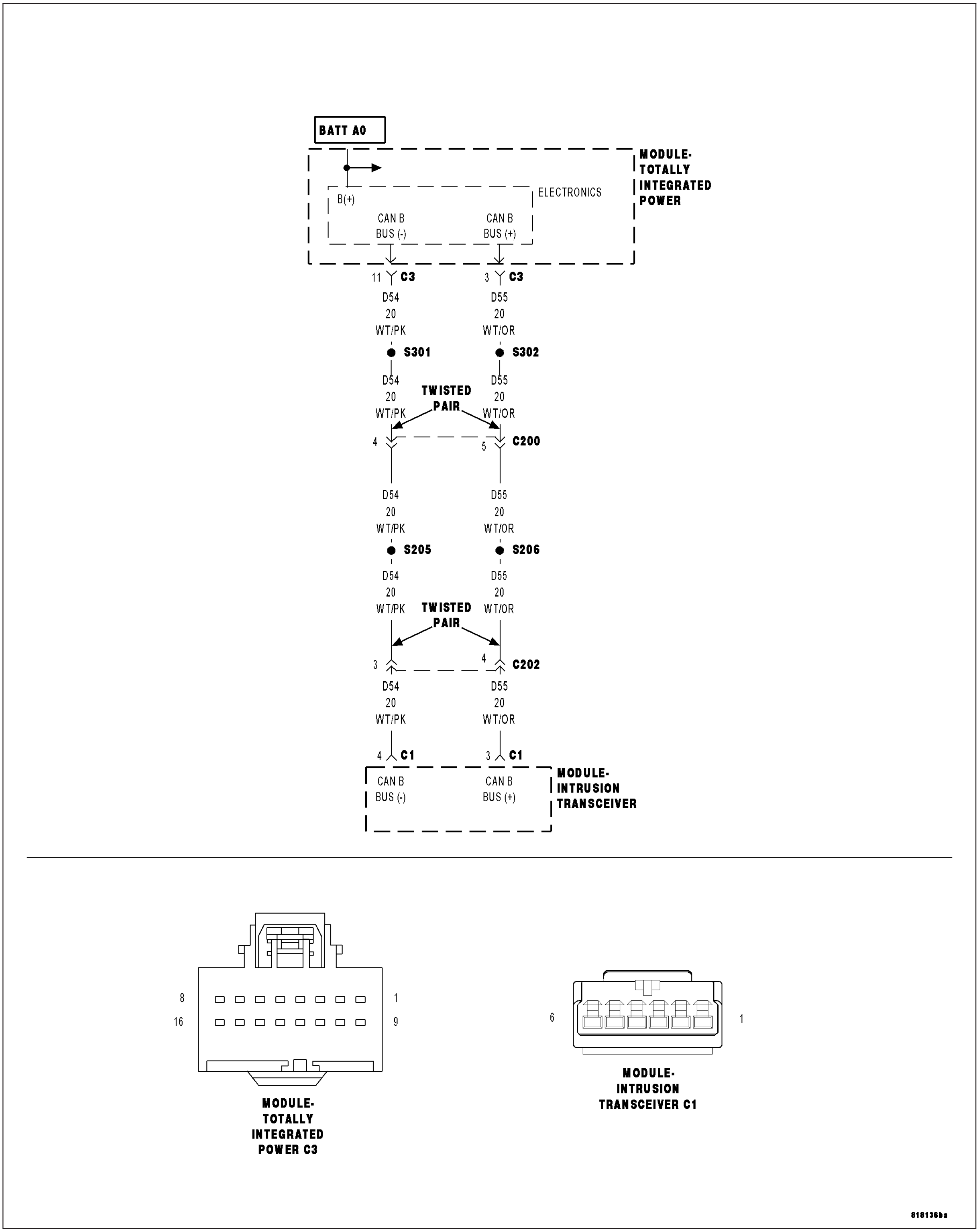
With a scan tool, read and record DTC(s).
With the scan tool, clear DTC(s).
Turn the ignition off and remove the key from the ignition.
Lock and close all doors to allow the VTSS to go from pre-arm to armed status and wait one minute.
Disarm the VTSS.
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace the Intrusion Transceiver Module in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.
Perform BODY VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U0019–CAN B BUS – ITM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN TOTALLY INTEGRATED POWER MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
INTRUSION TRANSCEIVER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK TOTALLY INTEGRATED POWER MODULE DTC's

With the scan tool, read TIPM active DTC's.

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

3. (D55) CAN B BUS (+) CIRCUIT OPEN

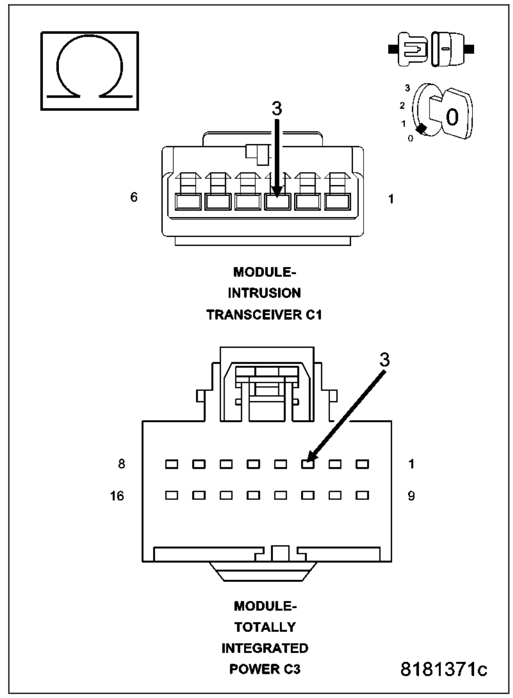
Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Intrusion Transceiver Module connector.

Disconnect the TIPM C3 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the TIPM C3 connector and the Intrusion Transceiver Module connector.



Is the resistance below 2.0 ohms?

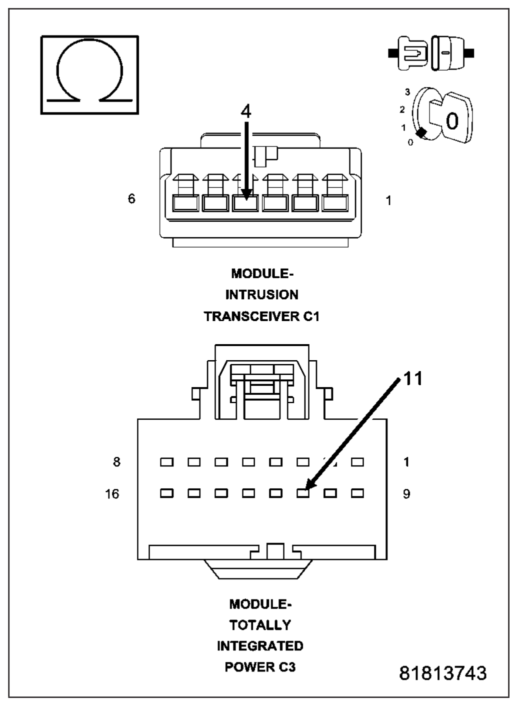
Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the TIPM C3 connector and the Intrusion Transceiver Module connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the Intrusion Transceiver Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (D54) CAN B Bus (–) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

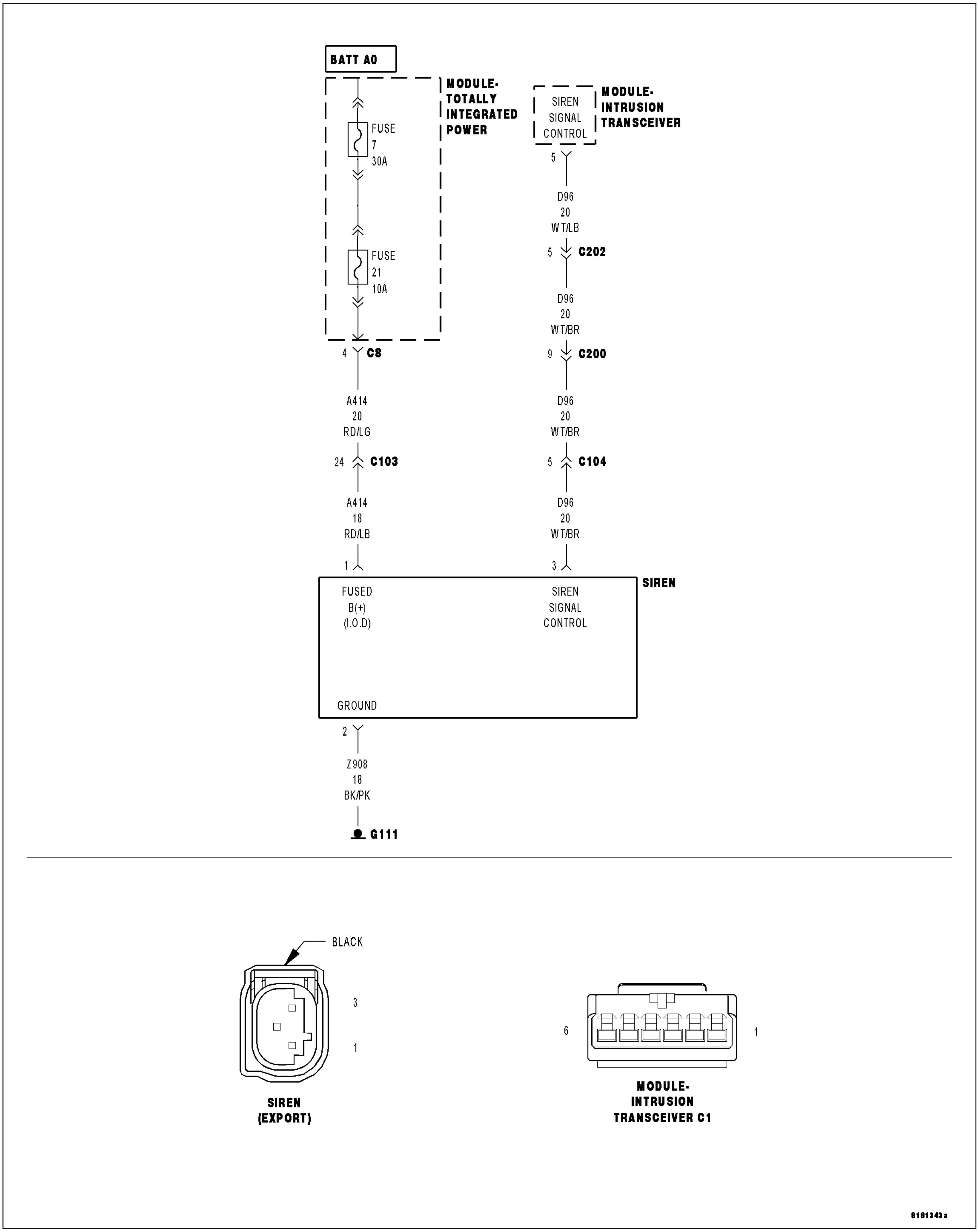
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U110D-LOST COMMUNICATION WITH SECURITY SIREN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously while the VTSS is armed.
- **Set Condition:**
  If the Intrusion Transceiver Module does not receive messages from the Siren.

Possible Causes
INTERMITTENT CONDITION
(A414) FUSED B+ CIRCUIT OPEN
(Z908) GROUND CIRCUIT OPEN
(D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO BATTERY
(D96) SIREN SIGNAL CONTROL CIRCUIT OPEN
(D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO GROUND
SIREN
INTRUSION TRANSCEIVER MODULE

Diagnostic Test

1. INTERMITTENT DTC

With the scan tool, erase the current Intrusion Transceiver Module DTC's.

Turn the ignition off.

Arm the VTSS and wait 1 minute.

Disarm the VTSS and turn the ignition on.

Does the scan tool display the same DTC?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires.

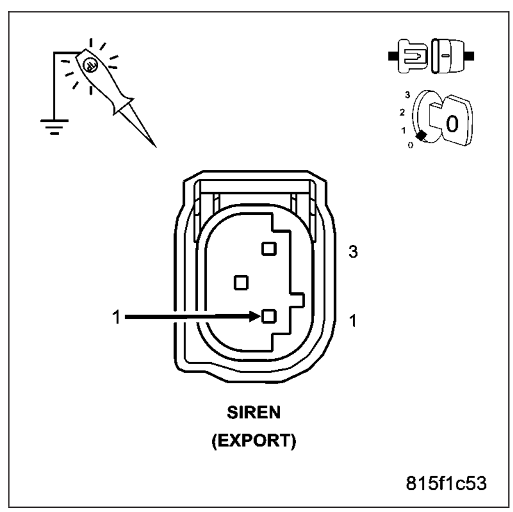
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (A414) FUSED B+

Gain access to the VTSS Siren.

Disconnect the Siren connector.

Using a 12-volt test light connected to ground, check the (A414) Fused B(+) circuit in the Siren connector.



Does the test light illuminate brightly?

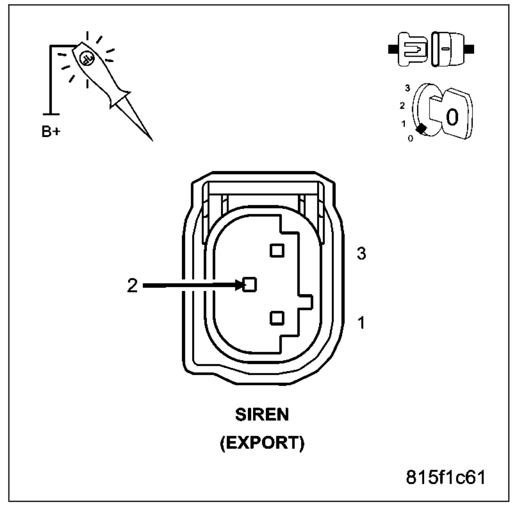
Yes >> Go To 3

No >> Repair the (A414) Fused B+ circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

3. (Z908) GROUND CIRCUIT

Using a 12-volt test light connected to 12-volts, check the (Z908) Ground circuit at the siren connector.



Does the test light illuminate brightly?

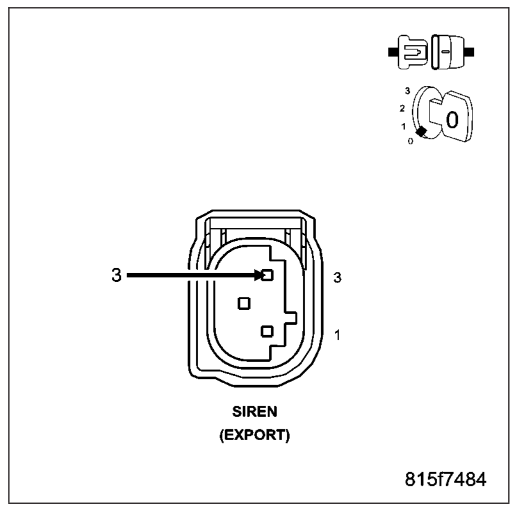
Yes >> Go To 4

No >> Repair the (Z908) Ground circuit for an open.

Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. FAULTY SIREN

Use the DRBIII® and set up as follows:



Use the Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.

Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable.

Select DRBIII® Stand-alone.

Select lab scope.

Select Live.

Select 12 volt square wave.

Press F2 for Scope.

Press F2 and use the down arrow to set voltage range to 20 volts. Press F2 again when complete.

Disconnect the Siren connector.

Connect the black lead to the chassis ground. Connect the red lead to the (D96) Siren Signal Control circuit in the Siren connector.

Close all doors and arm the VTSS.

Observe the voltage displayed on the DRBIII® Lab Scope.

Is there a voltage square wave present 1 to 2 seconds?

Yes >> Connect a known good siren and try to reset the DTC. If the DTC does not reset the original siren needs to be replaced. If the DTC does reset replace the Intrusion Transceiver Module in accordance with the Service Information.

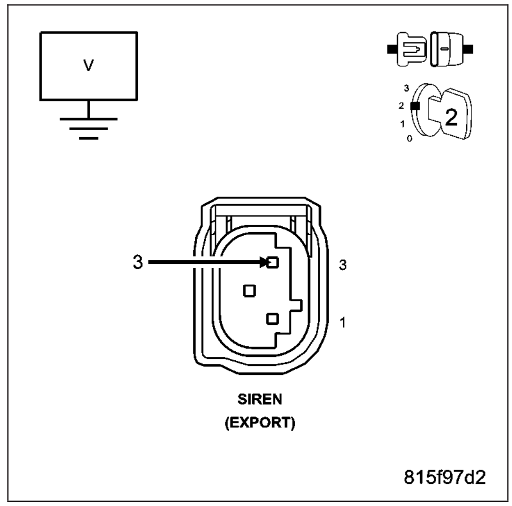
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO BATTERY

Disconnect the Siren harness connector.

Measure the voltage of the (D96) Siren Signal Control circuit.



Is there any voltage present?

Yes >> Repair the (D96) Siren Signal Control circuit for a short to voltage.Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

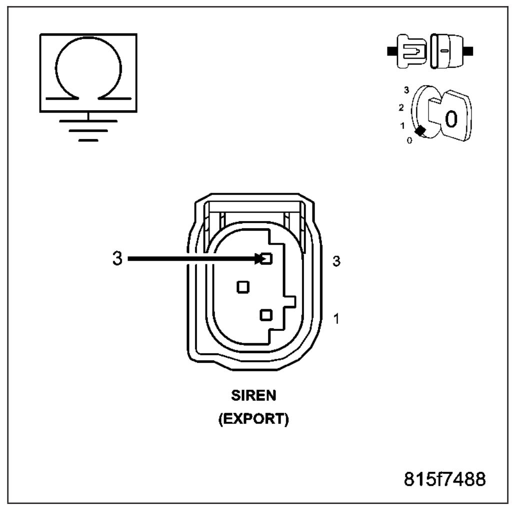
No >> Go To 6

6. (D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO GROUND

Disconnect the Siren harness connector.

Disconnect the Intrusion Transceiver Module harness connector.

Measure the resistance between ground and the (D96) Siren Signal Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 7

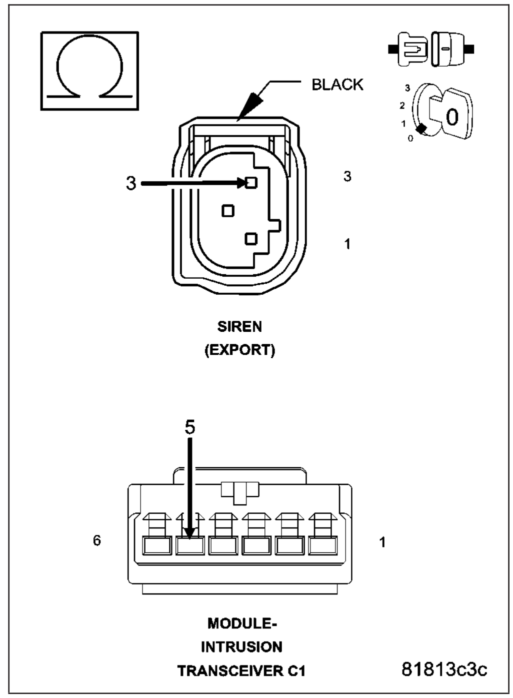
No >> Repair the (D96) Siren Signal Control circuit for a short to ground.

Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

7. (D96) SIREN SIGNAL CONTROL CIRCUIT OPEN

Disconnect the Intrusion Transceiver Module harness connector.

Measure the resistance of the (D96) Siren Signal Control circuit between the Intrusion Transceiver Module and the Siren connector.



Is the resistance below 5.0 ohms?

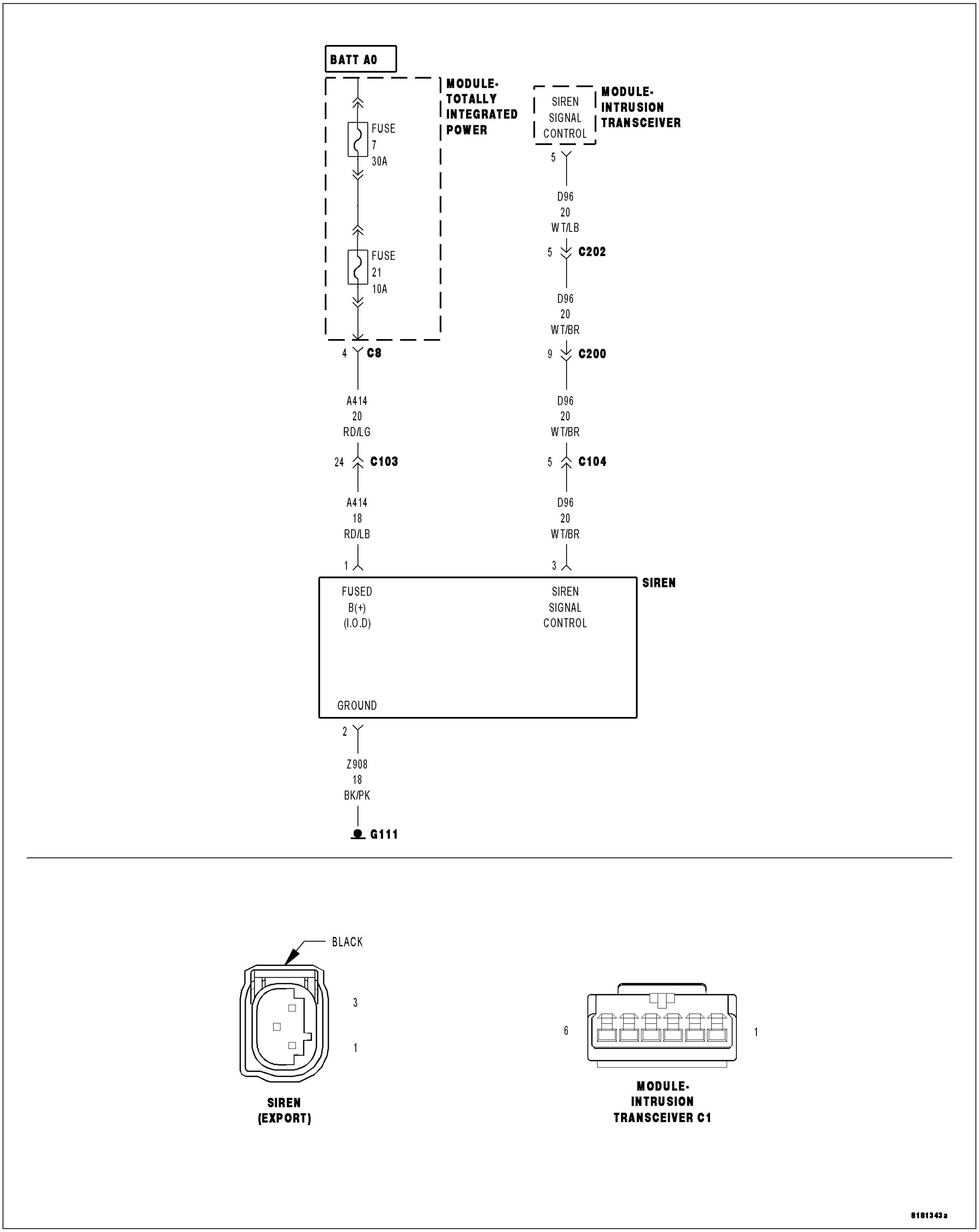
Yes >> Replace the Intrusion Transceiver Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (D96) Siren Signal Control circuit for an open.

Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

U1416-IMPLAUSIBLE SECURITY SIREN SIGNAL RECEIVED



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously while the VTSS is armed.
- **Set Condition:**
  If the Intrusion Transceiver Module does not receive messages from the Siren.

Possible Causes
INTERMITTENT CONDITION
(A414) FUSED B+ CIRCUIT OPEN
(Z908) GROUND CIRCUIT OPEN
(D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO BATTERY
(D96) SIREN SIGNAL CONTROL CIRCUIT OPEN
(D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO GROUND
SIREN
INTRUSION TRANSCEIVER MODULE

Diagnostic Test

1. INTERMITTENT DTC

With the scan tool, erase the current Intrusion Transceiver Module DTC's.

Turn the ignition off.

Arm the VTSS and wait 1 minute.

Disarm the VTSS and turn the ignition on.

Does the scan tool display the same DTC?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (A414) FUSED B+

Gain access to the VTSS Siren.

Disconnect the Siren connector.

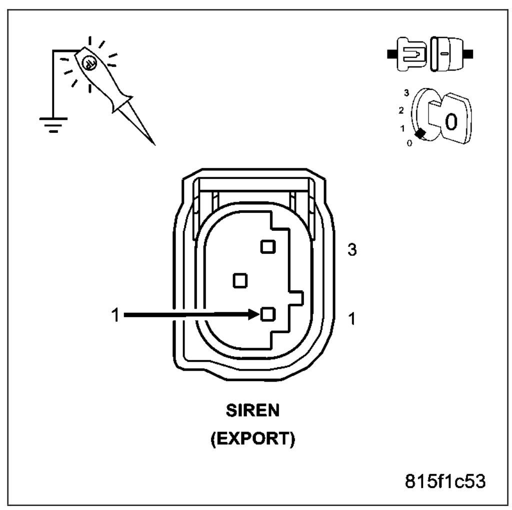
Using a 12-volt test light connected to ground, check the (A414) Fused B(+) circuit in the Siren connector.

Does the test light illuminate brightly?

Yes >> Go To 3

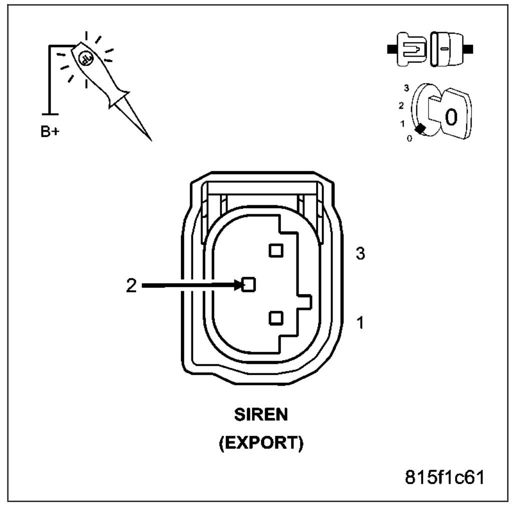
No >> Repair the (A114) Fused B+ circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



3. (Z908) GROUND CIRCUIT

Using a 12-volt test light connected to 12-volts, check the (Z908) Ground circuit at the siren connector.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z908) Ground circuit for an open.

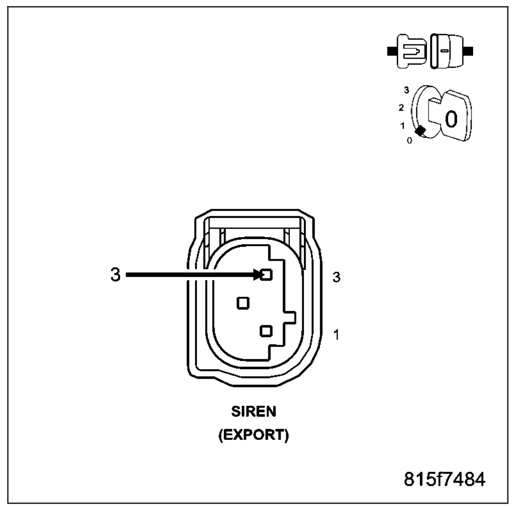
Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

4. FAULTY SIREN

Use the DRBIII® and set up as follows:

Use the Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.

Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable.



Select DRBIII® Stand-alone.

Select lab scope.

Select Live.

Select 12 volt square wave.

Press F2 for Scope.

Press F2 and use the down arrow to set voltage range to 20 volts. Press F2 again when complete.

Disconnect the Siren connector.

Connect the black lead to the chassis ground. Connect the red lead to the (D96) Siren Signal Control circuit in the Siren connector.

Close all doors and arm the VTSS.

Observe the voltage displayed on the DRBIII® Lab Scope.

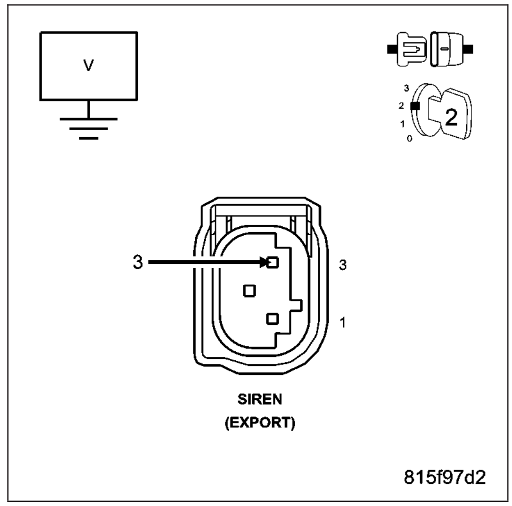
Is there a voltage square wave present 1 to 2 seconds?

Yes >> Connect a known good siren and try to reset the DTC. If the DTC does not reset the original siren needs to be replaced. If the DTC does reset replace the Intrusion Transceiver Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO BATTERY



Disconnect the Siren harness connector.

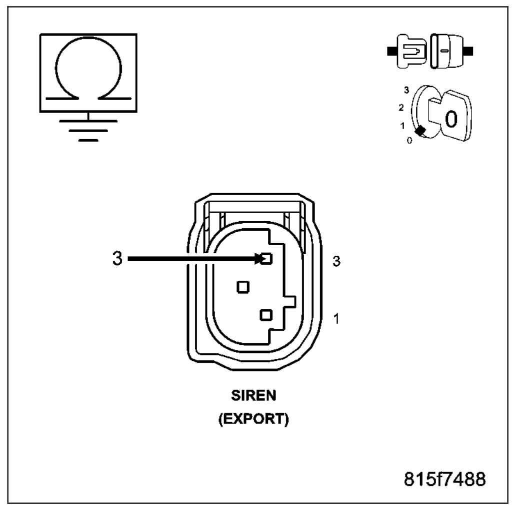
Measure the voltage of the (D96) Siren Signal Control circuit.

Is there any voltage present?

Yes >> Repair the (D96) Siren Signal Control circuit for a short to voltage.Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 6

6. (D96) SIREN SIGNAL CONTROL CIRCUIT SHORT TO GROUND



Disconnect the Siren harness connector.

Disconnect the Intrusion Transceiver Module harness connector.

Measure the resistance between ground and the (D96) Siren Signal Control circuit.

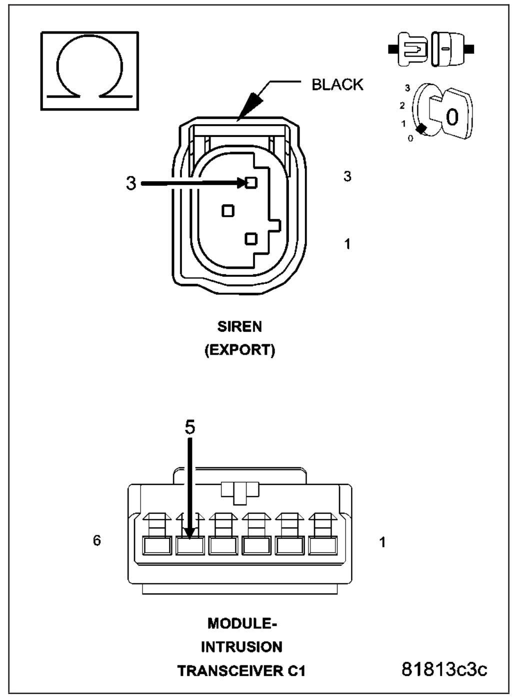
Is the resistance above 5.0 ohms?

Yes >> Go To 7

No >> Repair the (D96) Siren Signal Control circuit for a short to ground.

Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

7. (D96) SIREN SIGNAL CONTROL CIRCUIT OPEN



Disconnect the Intrusion Transceiver Module harness connector.

Measure the resistance of the (D96) Siren Signal Control circuit between the Intrusion Transceiver Module and the Siren connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Intrusion Transceiver Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the (D96) Siren Signal Control circuit for an open.

Perform BODY VERIFICATION TEST - 1A. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B1A24–KEY NOT PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
KEY NOT PROGRAMMED
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. PROGRAM ALL OF THE IGNITION KEYS

Turn the ignition on.

With the scan tool, attempt to program the key(s) into the SKREEM.

Was the programming of the key(s) successful?

Yes >> Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

No >> Replace the ignition key and attempt to program it into the SKREEM. If the DTC resets, replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

B1A25-INVALID KEY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A26–MAXIMUM NUMBER OF KEYS PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the maximum number of keys (8) have been programmed into the Sentry Key Remote Entry Module (SKREEM).

Possible Causes
MAXIMUM AMOUNT OF KEY PROGRAMMED INTO SKREEM
SKREEM

Diagnostic Test

1. REPROGRAM ALL IGNITION KEYS

NOTE: This procedure will clear all the key information from the SKREEM. It is important to obtain all of the customer's ignition keys so they may be reprogrammed into the module.

Turn the ignition on.

With the scan tool, clear all the key information in the SKREEM.

Program the all of the customer keys into the SKREEM (maximum eight).

Did the "Maximum Number of Keys Programmed" display again?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

No >> Programming of the keys was successful. Test complete.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

B1A27–SKREEM PROGRAMMING PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

NOTE: Before continuing, review and check for the following:
- **Review the repair history of the vehicle.**
- **Ensure that the vehicle has the correct PCM and SKREEM installed by verifying the part numbers.**
- **With the scan tool, ensure that the PCM and SKREEM are programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINs match.**

With the scan tool, clear DTCs.

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

No >> The DTC is not active at this time. Test complete.

B1A28-ECM MISMATCH WITH SKIM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
INTERMITTENT WIRING HARNESS PROBLEM
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on and wait 2 minutes.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

2. VERIFYING THE PCM VIN

Turn the ignition on.
With the scan tool, select Engine system from the main menu.
Display and record the Vehicle Identification Number.

NOTE: Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A29-SKIM BASESTATION MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
INTERMITTENT WIRING HARNESS PROBLEM
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on and wait 2 minutes.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

2. VERIFYING THE PCM VIN

Turn the ignition on.
With the scan tool, select Engine system from the main menu.
Display and record the Vehicle Identification Number.

NOTE: Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.
Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Turn the ignition on.
With the scan tool, display and clear all PCM and SKREEM DTC's.
Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.
With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A2A-KEY 1 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A2B-KEY 2 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A2C-KEY 3 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B1A2D-KEY 4 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B1A2E-KEY 5 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B1A2F-KEY 6 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B1A30-KEY 7 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B1A31-KEY 8 COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM
INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Replace the ignition key(s) that cause the SKIM DTC.
Perform SKREEM VERIFICATION TEST.

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.
With the scan tool, program the new ignition key to the SKREEM.
With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

No >> Test complete.

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

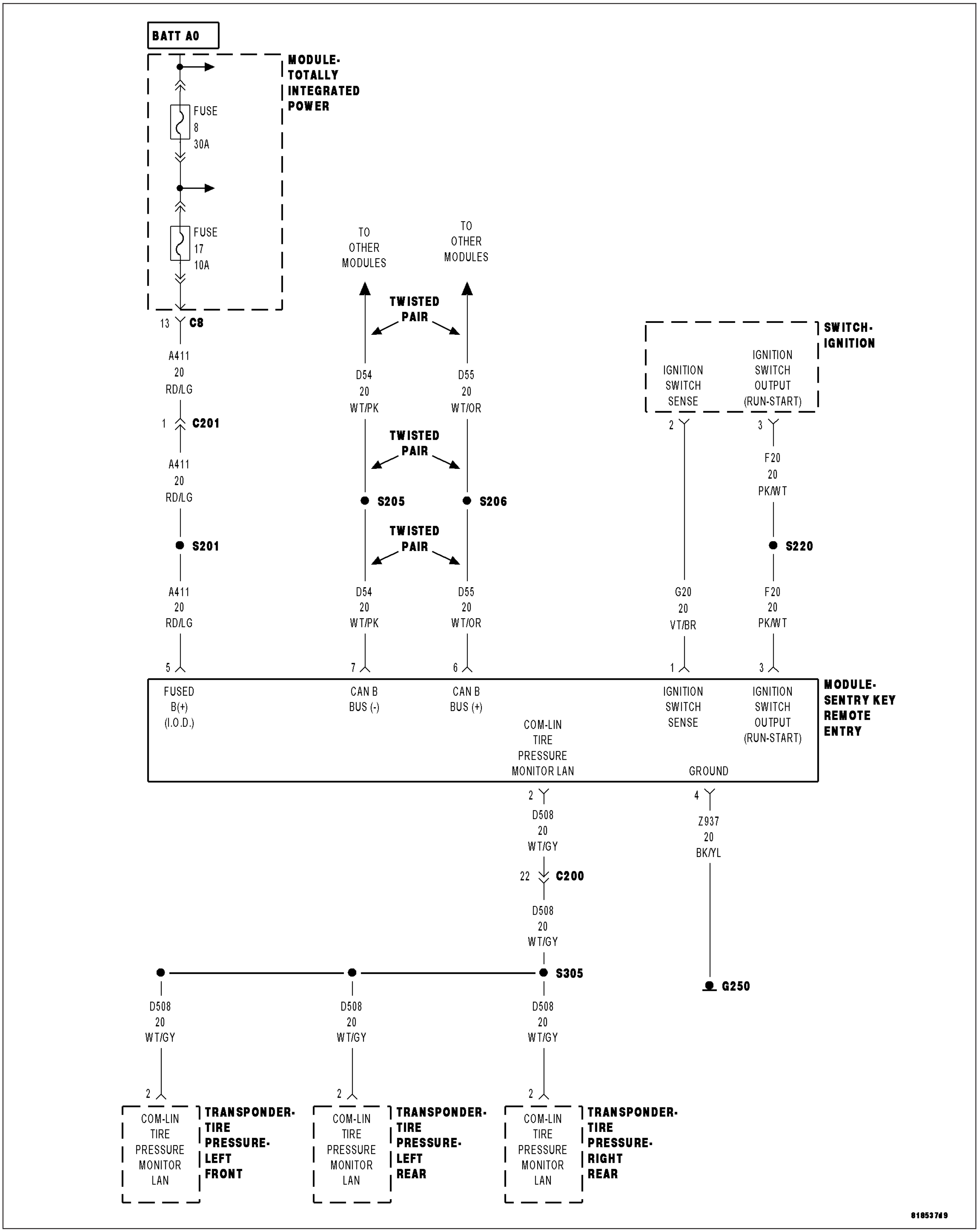
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST.

No >> Test Complete.

B2101-IGNITION RUN/START INPUT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the ignition switch input voltage below a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:
- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

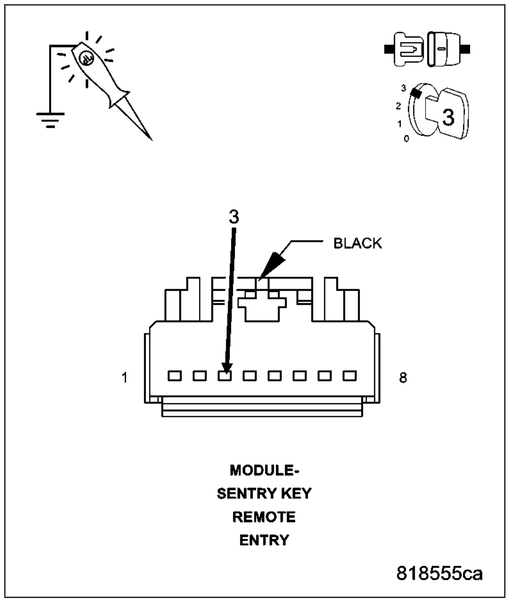
Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST.

No >> DTC is not active at this time. Test complete.

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN



NOTE: Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open, repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform SKREEM VERIFICATION TEST.

4. SKREEM

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector

Back probe the Fused Ignition Switch Output (Run-Start) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

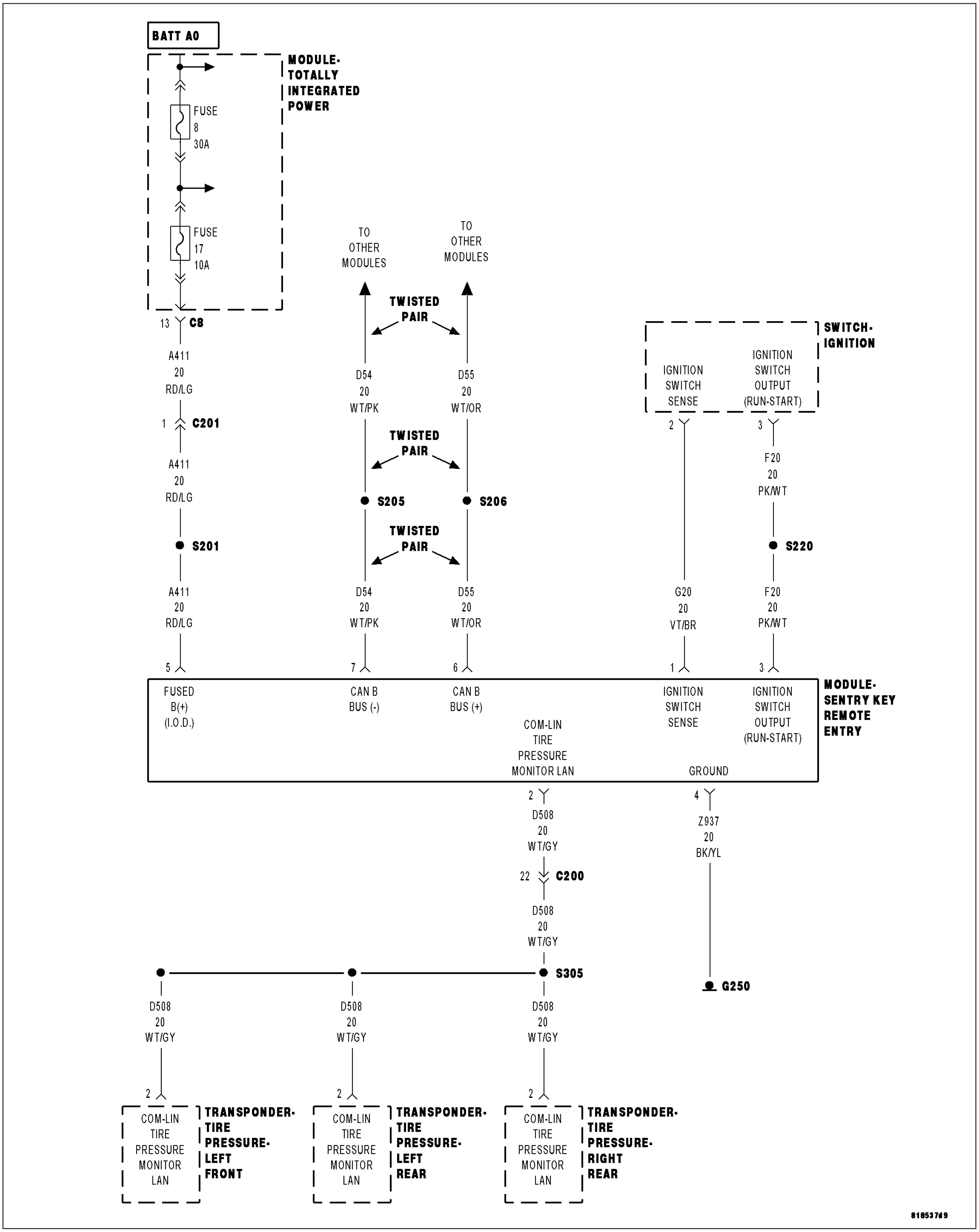
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for high resistance.
Perform SKREEM VERIFICATION TEST.

B2102-IGNITION RUN/START INPUT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the ignition switch input voltage above a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.
With a scan tool, read and record DTC(s).
With the scan tool, clear DTC(s).
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:
- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.
Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST.

No >> DTC is not active at this time. Test complete.

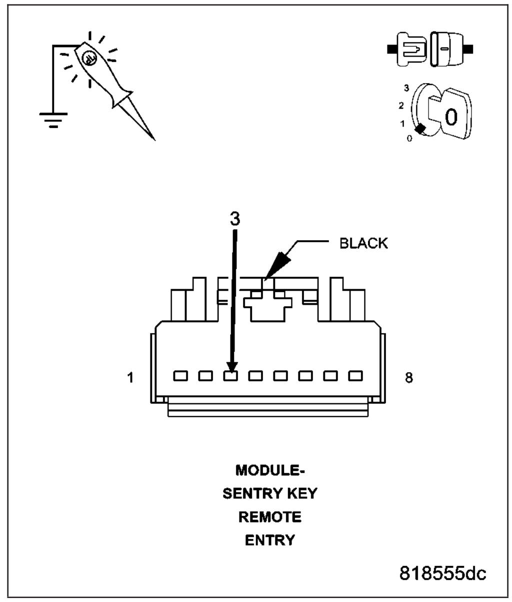
3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

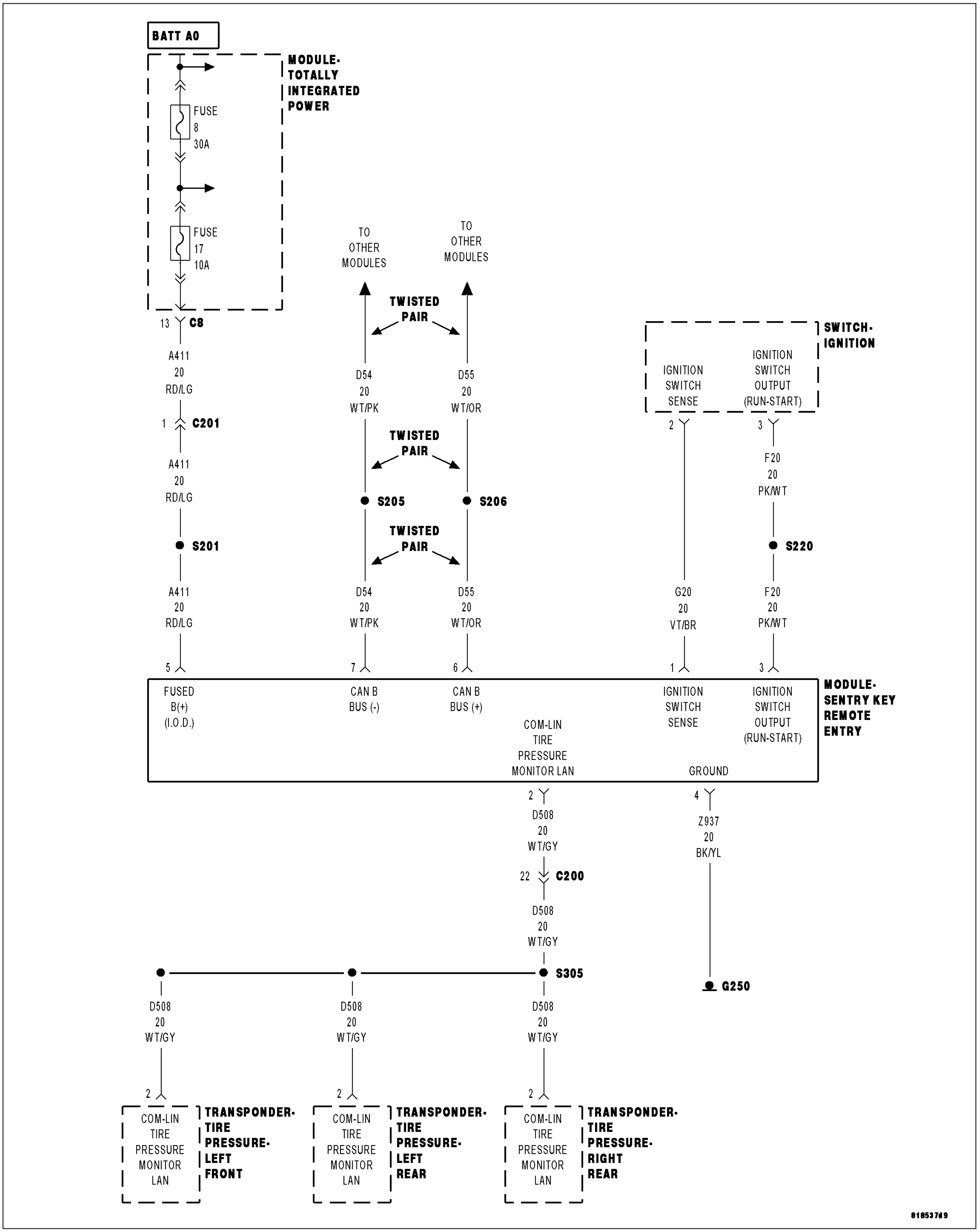


Does the test light illuminate brightly?

Yes >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.
Perform SKREEM VERIFICATION TEST.

No >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

B210A-SYSTEM VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the system voltage is below a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
FUSED (B+) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:
- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST.

No >> DTC is not active at this time. Test complete.

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN

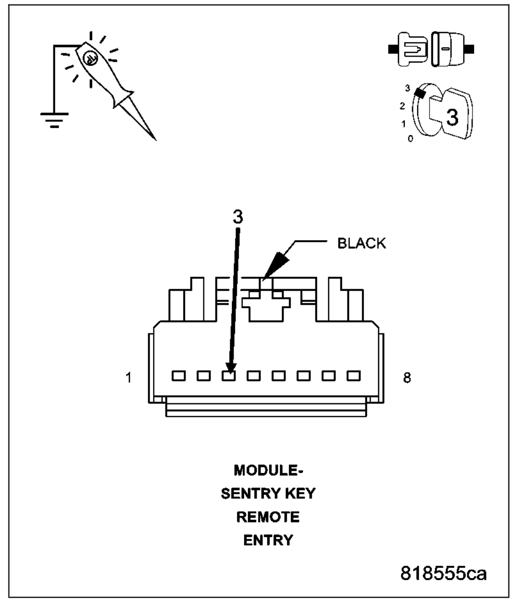
NOTE: Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

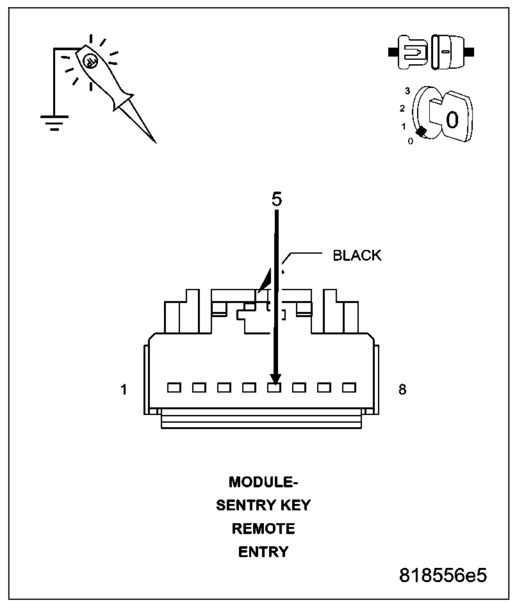
Yes >> Go to 4

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform SKREEM VERIFICATION TEST.

4. FUSED (B+) CIRCUIT OPEN

Turn the ignition off.

Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

Yes >> Go to 5

No >> Repair the Fused (B+) circuit for an open.
Perform SKREEM VERIFICATION TEST.

5. SKREEM

NOTE: Repeat the below procedure for both the Fused Ignition Switch Output (Run-Start) circuit and the Fused (B+) circuit.

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector.

Back probe the Fused Ignition Switch Output (Run-Start) circuit and then the Fused (B+) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

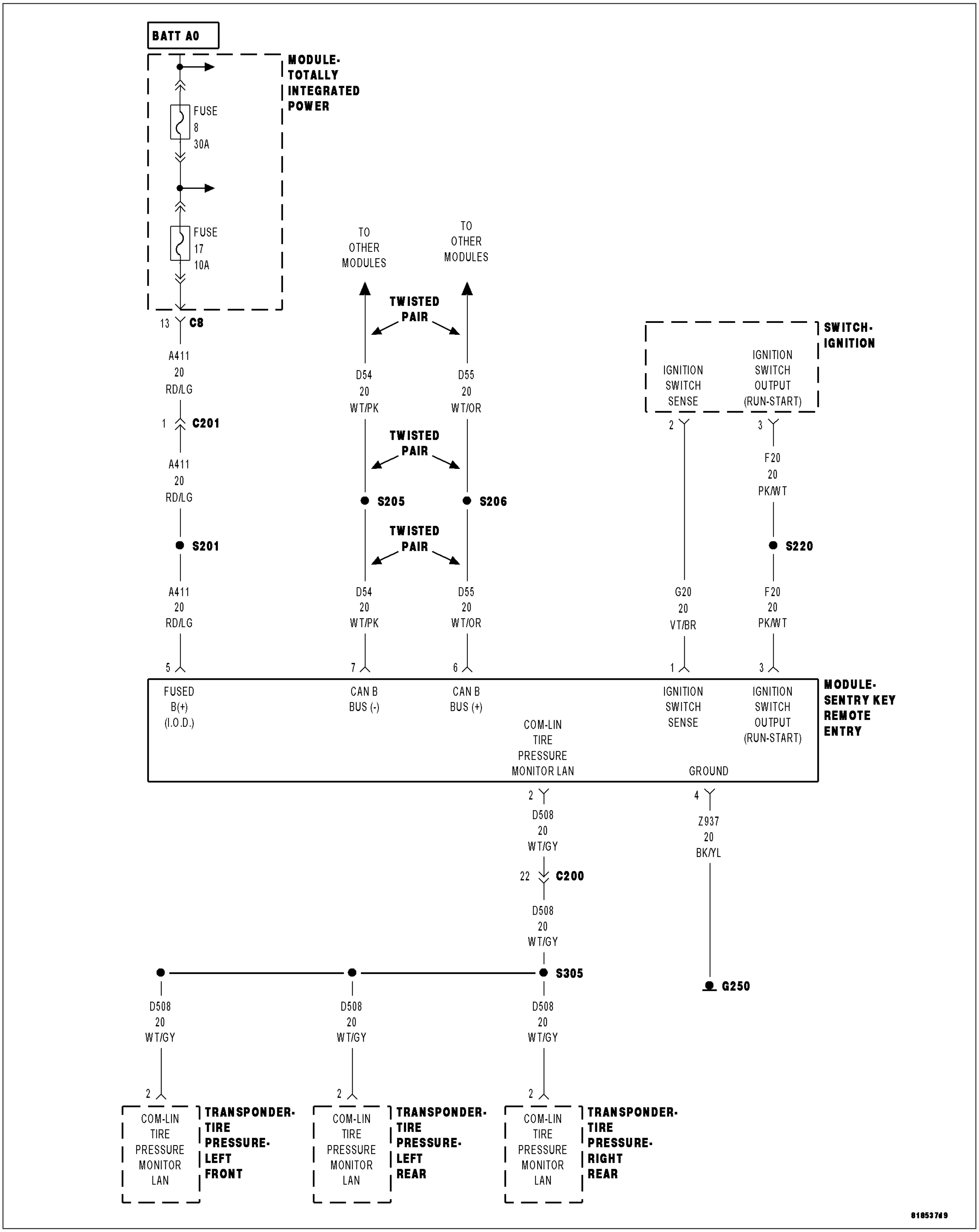
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Repair the circuit(s) that indicated the incorrect voltage.
Perform SKREEM VERIFICATION TEST.

B210B-SYSTEM VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the system voltage above a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:
- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST.

No >> DTC is not active at this time. Test complete.

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

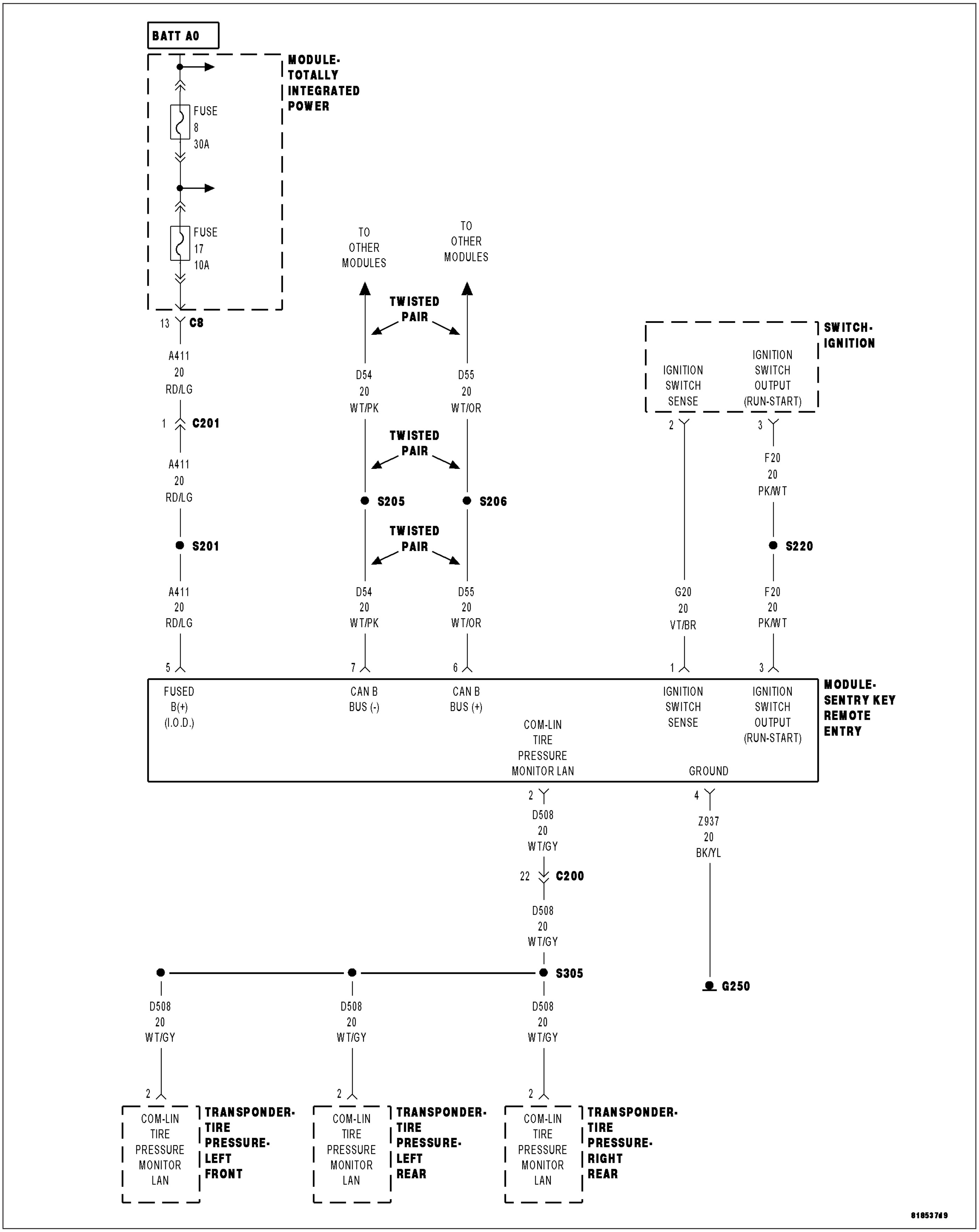
Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

Does the test light illuminate brightly?

Yes >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.
Perform SKREEM VERIFICATION TEST.

No >> Replace and reprogram the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

B210D-BATTERY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the Fused (B+) input voltage below a calibrated value.

Possible Causes
FUSED (B+) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:
- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

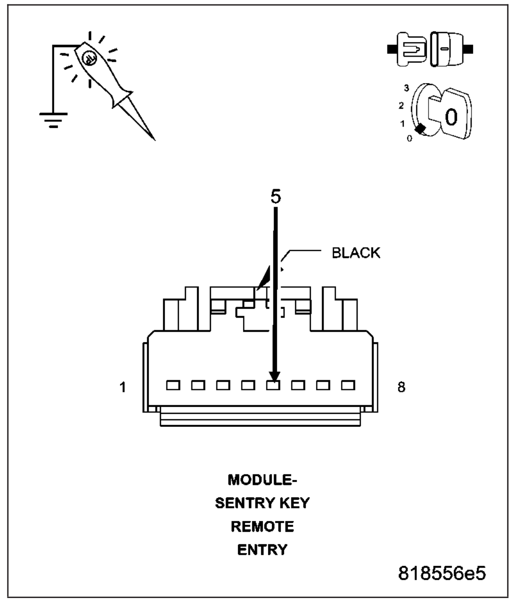
Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST.

No >> DTC is not active at this time. Test complete.

3. FUSED (B+) CIRCUIT OPEN



NOTE: Check the related fuses to the Fused (B+) circuit. If the fuse is found to be open repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.

Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the Fused (B+) circuit for an open.
Perform SKREEM VERIFICATION TEST.

4. SKREEM

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector

Back probe the Fused (B+) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

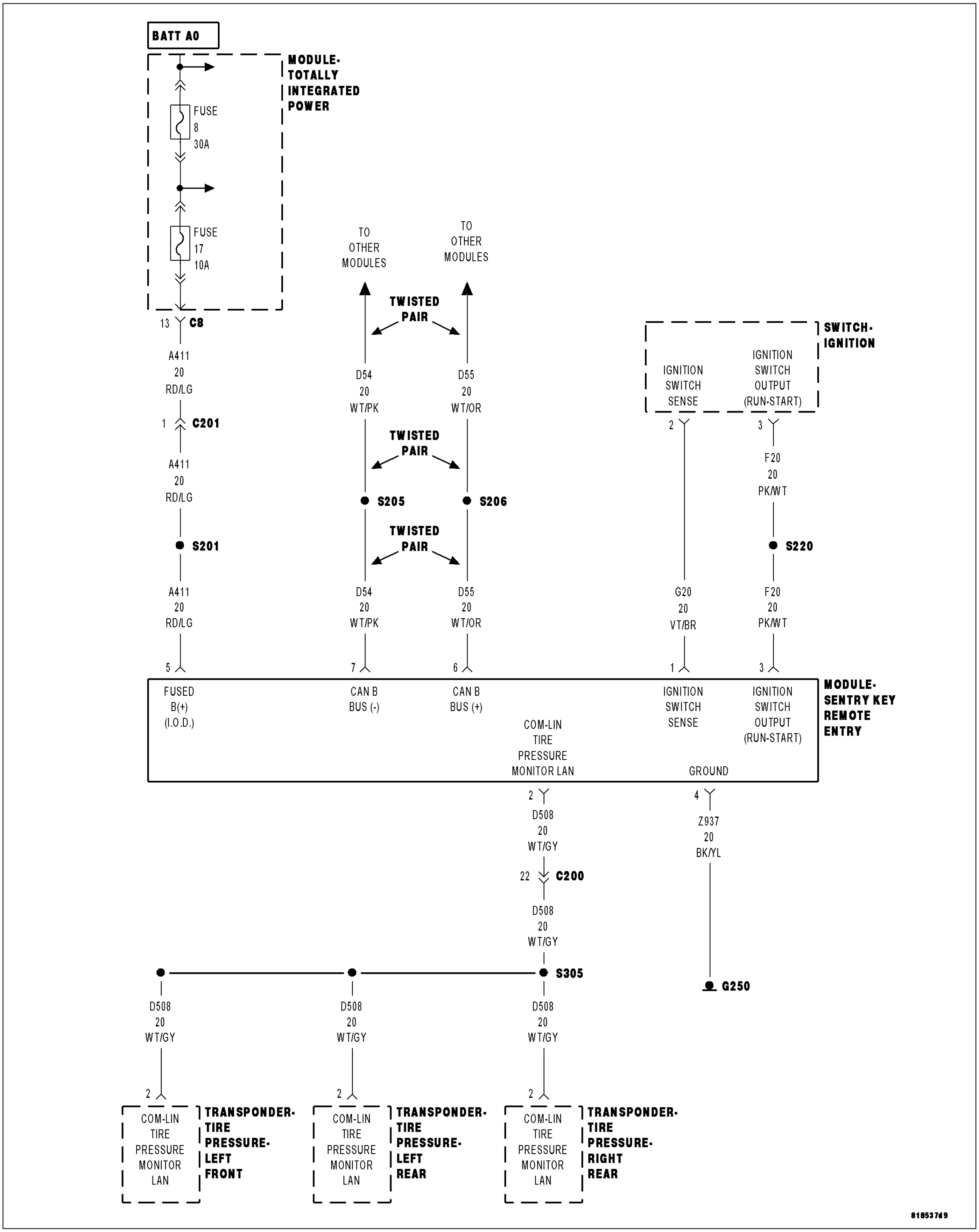
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Repair the Fused (B+) circuit for high resistances.
Perform SKREEM VERIFICATION TEST.

B210E-BATTERY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the Fused (B+) input voltage above a calibrated value.

Possible Causes
VEHICLE CHARGING SYSTEM
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose and repair all Powertrain DTCs before continuing.
Turn the ignition on.
With the scan tool, record and erase the SKREEM DTCs.
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.
Using the scan tool, read the SKREEM DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST.

No >> Perform SKREEM VERIFICATION TEST.

B2204-ECU CONFIGURATION MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

NOTE: Before continuing, review and check for the following:
- **Review the repair history of the vehicle.**
- **Ensure that the vehicle has the correct PCM and SKREEM installed by verifying the part numbers.**
- **With the scan tool, ensure that the PCM and SKREEM are programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINs match.**

With the scan tool, clear DTCs.

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2205-ORIGINAL VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
INTERMITTENT WIRING HARNESS PROBLEM
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on and wait 2 minutes.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

2. VERIFYING THE PCM VIN

Turn the ignition on.

With the scan tool, select Engine system from the main menu.

Display and record the Vehicle Identification Number.

NOTE: Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.
Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.
Turn the ignition on.
With the scan tool, display and clear all PCM and SKREEM DTC's.
Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.
With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST

No >> Test Complete.

B2224–SKREEM INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

NOTE: Before continuing, review and check for the following:
- **Review the repair history of the vehicle.**
- **Ensure that the vehicle has the correct PCM and SKREEM installed by verifying the part numbers.**
- **With the scan tool, ensure that the PCM and SKREEM are programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINs match.**

With the scan tool, clear DTCs.

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2228-SKREEM INTERNAL - RKE RECEIVER

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

NOTE: Before continuing, review and check for the following:
- **Review the repair history of the vehicle.**
- **Ensure that the vehicle has the correct PCM and SKREEM installed by verifying the part numbers.**
- **With the scan tool, ensure that the PCM and SKREEM are programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINs match.**

With the scan tool, clear DTCs.

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2229-SKREEM INTERNAL - SKIM IMMOBILIZER

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.

Possible Causes
SENTRY KEY REMOTE ENTRY MODULE (SKREEM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

NOTE: Before continuing, review and check for the following:
- **Review the repair history of the vehicle.**
- **Ensure that the vehicle has the correct PCM and SKREEM installed by verifying the part numbers.**
- **With the scan tool, ensure that the PCM and SKREEM are programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINs match.**

With the scan tool, clear DTCs.

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

U0019-CAN B BUS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (–) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. CHECK FOR ACTIVE DTC's

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module active DTC's.

Does the scan tool display any CAN B BUS DTC's - ACTIVE?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING.

No >> Go To 3

3. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the SKREEM connector.

Disconnect the Front Control Module connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module harness connector and the SKREEM harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module harness connector and the SKREEM harness connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the SKREEM in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

STANDARD PROCEDURE

SKREEM/SKIM VERIFICATION

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SKREEM/SKIM VERIFICATION

NOTE: When entering the PIN, care should be taken because the SKREEM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PIN's are entered the SKREEM will Lock Out the scan tool. To exit Lock Mode, the ignition key must remain the Run position for I hour. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

NOTE: On vehicles equipped with a premium Tire Pressure Monitoring (TPM) system, when the SKREEM and/or the spare tire pressure sensor is replaced with a new unit, a diagnostic scan tool MUST be used to run a routine that allows the SKREEM to be programmed with the ID number and location of the spare tire pressure sensor mounted in the wheel of the spare tire. Follow the programming steps outlined in the diagnostic scan tool for "Learn Spare Tire Sensor ID" under "Miscellaneous Functions" for the "WCM/Wireless Control Module" menu item as appropriate. In addition, if the SKREEM is replaced, the spare tire must be dismounted from its wheel to access and note the ID number on the spare tire pressure sensor so that the ID code for that sensor can be programmed into the new SKREEM.

1. Reconnect the previously disconnected components and connectors.
2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKREEM. This number can be obtained from the vehicle invoice or from the DaimlerChrysler Customer Center (Phone 1-800-992-1997).
3.

NOTE: If the PCM and the SKREEM are replaced at the same time, program the PCM VIN into the PCM first. All vehicle keys will then need to be replaced and programmed to the new SKREEM.

4. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
5. If the vehicle is equipped with Tire Pressure Monitoring System program the Palcard Pressure Values into the WCM/SKREEM.
6. Ensure all the customer's key have been programmed into the new module if necessary.
7. With the scan tool, ease all DTCs. Perform 5 ignition key cycles, leaving the key on for at least 90 seconds per cycle.
8. With the scan tool, read SKREEM DTC(s).
9.

NOTE: During PCM/ECM replacement, ensure to transfer the secret key information from the SKREEM to the new PCM. The PCM stores this information only. If the SKREEM ever needs to be replaced, the secret key information can be retrieved from the PCM and then transferred to the SKREEM for security use.

10.

NOTE: If this vehicle is equipped with a Steering Column Lock Module, it must be replaced along with the SKREEM.

Are there any SKREEM DTC(s) present?

Yes >> Repair not complete, refer to the appropriate symptom.

No >> Repair is complete.

VEHICLE THEFT SECURITY - SERVICE INFORMATION

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VEHICLE THEFT SECURITY - SERVICE INFORMATION

DESCRIPTION

The Vehicle Theft Security System (VTSS) is comprised of two primary subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). The VTA is an active system that provides visual and audible responses as deterrents to and warnings of unauthorized vehicle tampering. The SKIS is a passive system that effectively immobilizes the vehicle against unauthorized operation. Following are paragraphs which describe these subsystems of the VTSS.

Certain functions and features of the VTSS rely upon resources shared with or controlled by other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. Other modules that may affect VTSS operation are:

- **ElectroMechanical Instrument Cluster (EMIC)** - Also sometimes referred to as the Cab Compartment Node (CCN). Driver and passenger front and rear doors, and liftgate ajar switch status. VTA system logic. Security indicator control. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Powertrain Control Module (PCM)** - SKIS engine control logic. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION).
- **Steering Control Module (SCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/STEERING CONTROL MODULE - DESCRIPTION).
- **Totally Integrated Power Module (TIPM)** - Hood ajar switch status (export only). Exterior lighting system and horn system control. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/POWER DISTRIBUTION CENTER - DESCRIPTION).

Except for the Sentry Key transponders, which rely upon Radio Frequency (RF) communication, hard wired circuitry connects the VTA and SKIS components to the electrical system of the vehicle.

VEHICLE THEFT ALARM

The VTA is available in two different configurations, one is designed for vehicles manufactured for sale in North America; while the other is designed for vehicles manufactured for sale in markets outside of North America. In addition, the VTA for export is available in two versions: base and premium. All vehicles equipped with VTA are also equipped with the Remote Keyless Entry (RKE) system and the Sentry Key Immobilizer System (SKIS), regardless of their market destination.

The North American and export base version of the VTA system provide perimeter vehicle protection by monitoring the vehicle doors, the ignition switch, the liftgate, the liftgate flip-up glass and, for vehicles built for certain markets where it is required equipment, the hood. If unauthorized vehicle use or tampering is detected, these systems respond by pulsing the vehicle horn as an audible deterrent and flashing certain exterior lamps as a visual deterrent.

The export premium version of the VTA system is only available in vehicles manufactured for sale in certain markets where it is required equipment. The export premium version of the VTA provides the same perimeter protection features as the base version, but adds interior vehicle intrusion protection. The export premium VTA also supplements the pulsing horn feature of the base version with a siren as the audible deterrent, while retaining the flashing exterior lamps as the visual deterrent.

The VTA includes the following major components, which are described in further detail elsewhere in this service information:

- **Door Ajar Switches** - A door ajar switch is integral to the door latch mechanism of each front and rear door.
- **Hood Ajar Switch** - A hood ajar switch is located in a bracket on the left rear side of the engine compartment, near the shock tower of vehicles built for sale in certain export markets where it is required equipment.
- **Intrusion Module** - An intrusion module is located underneath the instrument panel upper panel, just to the right centerline of the instrument panel base, next to the remote compass module, of vehicles built for sale in certain export markets where it is required equipment.
- **Intrusion Sensor Receiver** - An intrusion sensor receiver is located behind and mounted to the right A-Pillar trim panel of vehicles built for sale in certain export markets where it is required equipment.
- **Intrusion Sensor Transmitter** - An intrusion sensor transmitter is located behind and mounted to the left Upper C-Pillar trim panel of vehicles built for sale in certain export markets where it is required equipment.
- **Liftgate Ajar Switch** - A liftgate ajar switch is integral to the latch for the liftgate in the vehicle.
- **Security Indicator** - A security indicator is integral to the ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN).

- **Siren** - An alarm siren is located in a hollow behind the right front splash shield, on the outer load beam of vehicles built for sale in certain export markets where it is required equipment.

SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is available as factory-installed standard equipment on this model. Vehicles equipped with the Vehicle Theft Alarm (VTA) are also equipped with SKIS. The SKIS provides passive vehicle protection by preventing the engine from operating unless a valid electronically encoded key is detected in the ignition lock cylinder. The SKIS used in combination with the export premium version of the VTA adds a steering shaft lock feature that provides passive protection by preventing the vehicle from being steered unless a valid electronically encoded key is detected in the ignition lock cylinder, but is only available in vehicles manufactured for sale in certain markets where it is required equipment.

The SKIS includes the following major components, which are described in further detail elsewhere in this service information:

- **Sentry Key Remote Entry Module** - The Sentry Key REmote Entry Module (SKREEM) is sometimes referred to as the Wireless Control Module (WCM). The SKREEM/WCM is located on the instrument panel to the right side of the steering column near the ignition lock cylinder housing and an integral molded plastic antenna ring circles the ignition lock cylinder like a halo. The SKREEM/WCM and its antenna are concealed beneath an ignition switch bezel on the instrument panel. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY REMOTE ENTRY MODULE - DESCRIPTION).
- **Sentry Key Transponder** - The Sentry Key transponder is contained within the Remote Keyless Entry (RKE) transmitter integral to the head of the ignition key. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - DESCRIPTION).
- **Security Indicator** - A security indicator is integral to the ElectroMechanical Instrument Cluster (EMIC).

OPERATION

The Vehicle Theft Security System (VTSS) is divided into two basic subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). Following are paragraphs that briefly describe the operation of each of these two subsystems.

VEHICLE THEFT ALARM

The ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN), is used on this model to control and integrate many of the functions and features included in the Vehicle Theft Alarm (VTA). In the VTA system, the CCN receives inputs indicating the status of the door ajar switches, the ignition switch, the liftgate ajar switch, and the power lock switches. In vehicles built for certain export markets where it is required, the hood ajar switch provides a hard wired input to the Totally Integrated Power Module (TIPM) and both the TIPM and the intrusion module provide electronic message inputs to the CCN over the Controller Area Network (CAN) data bus. The CCN processes the information from all of these inputs, internally controls the security indicator as appropriate, and sends electronic messages to the TIPM over the CAN data bus. The TIPM internally controls the output to the hazard warning lamps and sends a control output to energize or de-energize the horn relay as appropriate. On vehicles with an intrusion module, the horn output of the TIPM is supplemented by an output of the siren module that is controlled by the intrusion module.

Following are paragraphs that briefly describe the operation of each of the VTA features. See the owner’s manual in the vehicle glove box for more information on the features, use and operation of the VTA.

ENABLING

The CCN must have the VTA function electronically enabled in order for the VTA to perform as designed. The logic in the CCN keeps its VTA function dormant until it is enabled using a diagnostic scan tool. The VTA function of the CCN is enabled on vehicles equipped with the VTA option at the factory, but a service replacement CCN must be VTA-enabled by the dealer using a diagnostic scan tool. Refer to the appropriate diagnostic information.

ARMING

Passive arming of the VTA occurs when the vehicle is exited with the key removed from the ignition switch and the doors are locked while they are open using the power lock switch. Active arming occurs when the “Lock” button on the Remote Keyless Entry (RKE) transmitter is depressed to lock the vehicle. For active arming to occur, the doors, the liftgate and the flip-up glass must be closed and the ignition switch must be in the Off position when the RKE

transmitter “Lock” button is depressed. The power lock switch will not function with the door ajar and the key in the ignition switch.

Pre-arming of the VTA is initiated when a door or the liftgate is open when the vehicle is locked using a power door lock switch or when the RKE transmitter “Lock” button is depressed. Pre-arming will not occur if the key is in the ignition switch with the driver side front door open. When the VTA is pre-armed, the arming sequence is delayed until all of the doors and the liftgate have been closed. The VTA will remain in “Pre-Armed” mode for up to 16 seconds after all doors and the liftgate have been closed.

Once the VTA begins the passive or active arming sequence, the security indicator in the instrument cluster will flash rapidly for about 16 seconds. This indicates that VTA arming is in progress. If the ignition switch is turned to the On position, if a door is unlocked and opened by any means during the 16 second arming process, the security indicator will stop flashing and the arming process will abort. If the liftgate is open during the pre-arming period, the security indicator will turn ON solid for the balance of the pre-arm period. Once the arming sequence is successfully completed, the security indicator will flash at a slower rate, indicating that the VTA is armed.

On vehicles equipped with the hood ajar switch, the VTA arming sequence will occur regardless of whether the hood is open or closed, but the underhood area will not be protected until the hood is closed. Also, if the status of the hood ajar switch changes from open to closed during the 16 second arming process, the security indicator will change from ON solid to flashing to indicate normal pre-arming. Once the arming process is successfully completed, the security indicator will flash at a slower rate, indicating that the VTA is armed.

DISARMING

For vehicles built for the North American market, passive disarming of the VTA occurs by inserting the valid key in ignition or by turning the ignition switch to the On position using a valid Sentry Key Immobilizer System (SKIS) key. Active disarming of the VTA for all markets occurs when the vehicle is unlocked by depressing the “Unlock” button of the RKE transmitter. Once the alarm has been activated, either disarming method will also deactivate the alarm. Depressing the “Panic” button (if equipped) on the RKE transmitter will **not** disarm the VTA.

POWER-UP MODE

When the armed VTA senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the alarm system remains armed following a battery failure or disconnect. If the VTA was armed prior to a battery disconnect or failure, the technician or vehicle operator will have to actively or passively disarm the alarm system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is attempted. The VTA will be armed until the technician or vehicle operator has actively or passively disarmed the alarm system. If the VTA is in the disarmed mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

ALARM

The VTA alarm output varies by the version of the VTA with which the vehicle is equipped. In all cases, the alarm provides both visual and audible outputs; however, the time intervals of these outputs vary by the requirements of the market for which the vehicle is manufactured. In all cases, the visual output will be a flashing on and off of the exterior lamps. For vehicles equipped with the North American or the export base version of the VTA, the audible output will be a pulsing of the horn. For vehicles with the export premium version of the VTA, the additional audible output will be a cycling of the alarm siren. See the owner’s manual in the vehicle glove box for details of the alarm output requirements of the specific market for which the vehicle was manufactured. The inputs that will trigger the alarm include the door ajar switches, the liftgate ajar switch, key cylinder, and in vehicles built for certain markets where they are required, the hood ajar switch and the intrusion module.

TAMPER ALERT

The VTA tamper alert feature will pulse the horn three times upon VTA disarming, if the alarm was triggered and has since timed-out, or if the battery has been disconnected and reconnected (battery disconnect only on North American vehicles). This feature alerts the vehicle operator that the VTA alarm was activated while the vehicle was unattended.

INTRUSION ALARM

The intrusion alarm is an exclusive feature of the export premium version of the VTA, which is only available in certain markets where it is required. When the VTA is armed, the intrusion module uses a hard wired outputs to control an ultrasonic transmitter and receiver which allows the module to monitor the interior of the vehicle for movement. If motion is detected, the intrusion module sends an electronic message to the CCN and the TIPM over the CAN data bus to invoke the visual alarm features, and sends an electronic message to the alarm siren in the engine compartment over a dedicated serial bus to invoke the audible alarm feature.

The motion detect feature of the intrusion module can be disabled by depressing the “Lock” button on the RKE transmitter 3 times within 15 seconds during VTA arming, while the security indicator is still flashing rapidly. The VTA provides a single short siren “chirp” as an audible confirmation that the motion detect disable request has been received.

The intrusion module must be electronically enabled in order for the intrusion alarm to perform as designed. The intrusion alarm function of the module is enabled on vehicles equipped with this option at the factory, but a service replacement module must be configured and enabled by the dealer using a diagnostic scan tool. Refer to the appropriate diagnostic information. The intrusion module monitors the conditions of the transmitter and receiver sensors as well as the siren, and will store fault information in the form of a Diagnostic Trouble Code (DTC) if a system malfunction is detected. The intrusion module can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is designed to provide passive protection against unauthorized vehicle use by disabling the engine after about two seconds of running, whenever any method other than a valid Sentry Key is used to start the vehicle. The SKIS is considered a passive protection system because it is always active when the ignition system is energized and does not require any customer intervention. The SKIS uses Radio Frequency (RF) communication to obtain confirmation that the key in the ignition switch is a valid key for operating the vehicle. The microprocessor-based SKIS hardware and software also uses electronic messages to communicate with other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

Pre-programmed Sentry Key transponders are provided with the vehicle from the factory. Each Sentry Key REmote Entry Module (SKREEM), sometimes referred to as the Wireless Control Module (WCM), will recognize a maximum of eight Sentry Keys. If the customer would like additional keys other than those provided with the vehicle, they may be purchased from any authorized dealer. These additional keys must be programmed to the SKREEM/WCM in the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer using a scan tool or, if Customer Learn programming is an available SKIS feature in the market where the vehicle was purchased, the customer can program the additional keys, as long as at least two valid Sentry Keys are already available. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKREEM/WCM performs a self-test of the SKIS each time the ignition switch is turned to the On position, and will store fault information in the form of a Diagnostic Trouble Code (DTC) if a system malfunction is detected. The SKREEM/WCM will also send an electronic message to the instrument cluster if a fault is detected, and the instrument cluster illuminates the security indicator. The SKIS can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool and the appropriate diagnostic information.

DIAGNOSIS AND TESTING

VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft Security System (VTSS) is divided into two basic subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). Following are the recommended procedures for diagnosis and testing of each of these two subsystems.

VEHICLE THEFT ALARM

Models equipped with the export premium version of the Vehicle Theft Alarm (VTA) provide some preliminary diagnostic feedback by illuminating the security indicator located in the ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN). If the security indicator illuminates with the ignition switch in the On position for approximately 15 seconds. it indicates that there is a communication problem between

the intrusion module and the EMIC/CCN, or between the intrusion module and the siren module. The EMIC/CCN will also turn on the security indicator if it receives a message from the intrusion module indicating that a Diagnostic Trouble Code (DTC) has been stored for a siren module fault.

To diagnose the EMIC/CCN, the Totally Integrated Power Module (TIPM), the intrusion module, the Controller Area Network (CAN) data bus, or the electronic message inputs and outputs used to provide the electronic features of the VTA, use a diagnostic scan tool and refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM

To diagnose the Sentry Key REmote Entry Module (SKREEM) (sometimes referred to as the Wireless Control Module (WCM), the ElectroMechanical Instrument Cluster (EMIC) (sometimes referred to as the Cab Compartment Node (CCN), the Totally Integrated Power Module (TIPM), the intrusion module, the Controller Area Network (CAN) data bus, or the electronic message inputs and outputs used to provide the electronic features of the VTA, use a diagnostic scan tool and refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
SECURITY INDICATOR FAILS TO LIGHT DURING BULB TEST	1. Light-Emitting Diode (LED) faulty.	1. Use a diagnostic scan tool to perform the instrument cluster actuator test. Refer to the appropriate diagnostic information.
	2. Ignition feed faulty.	2. Check for battery voltage at the connector for the SKREEM with the ignition switch in the On position. Repair the faulty ignition feed circuit, as required.
SECURITY INDICATOR FLASHES FOLLOWING BULB TEST OR THE WCM DETECTS AN ISSUE WITH THE VIN AND/OR PCM.	1. Invalid key in ignition switch lock cylinder.	1. Replace the key with a known valid key.
	2. Key-related fault.	2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.
SECURITY INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	1. SKIS system malfunction/ fault detected.	1. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.
	2. SKIS system inoperative.	2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.

STANDARD PROCEDURE

SKIS INITIALIZATION

The Sentry Key Immobilizer System (SKIS) must be initialized following a Sentry Key REmote Entry Module (SKREEM), sometimes referred to as the Wireless Control Module (WCM), replacement. SKIS initialization requires the use of a diagnostic scan tool. Initialization will also require that you have access to the unique four-digit PIN code that was assigned to the original SKREEM/WCM. The PIN code **MUST** be used to enter the Secured Access Mode in the SKREEM/WCM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKREEM PROGRAMMING).

NOTE: If a Powertrain Control Module (PCM) is replaced on a vehicle equipped with the Sentry Key Immobilizer System (SKIS), the unique Secret Key data must be transferred from the Sentry Key REmote Entry Module (SKREEM) to the new PCM using the appropriate programming procedure. This procedure also requires the use of a diagnostic scan tool and the unique four-digit PIN code to enter the Secured Access Mode in the SKREEM/WCM.

TRANSPONDER PROGRAMMING

All Sentry Keys included with the vehicle are pre-programmed to work with the Sentry Key Remote Entry System (SKREES) when it is shipped from the factory. The Sentry Key REmote Entry Module (SKREEM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition switch lock cylinder in the vehicle for which it will be used. Once the additional or new key has been cut, the SKREEM must be programmed to recognize it as a valid key. There are two possible methods to program the SKREEM to recognize a new or additional valid key, the Secured Access Method and the Customer Learn Method. Following are the details of these two programming methods.

SECURED ACCESS METHOD

The Secured Access method applies to all vehicles. This method requires the use of a diagnostic scan tool. This method will also require that you have access to the unique four-digit PIN code that was assigned to the original SKREEM. The PIN code **must** be used to enter the Secured Access Mode in the SKREEM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. Refer to the appropriate diagnostic information for the proper Secured Access method programming procedures.

NOTE: The Remote Keyless Entry (RKE) Transmitter will also be programmed during this procedure.

CUSTOMER LEARN METHOD

The Customer Learn feature is only available on domestic vehicles, or those vehicles which have a U.S. country code designator. This programming method also requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, or if the vehicle does not have a U.S. country code designator, the Secured Access Method **must** be used to program new or additional valid keys to the SKREEM. The Customer Learn programming method procedures are as follows:

1. Obtain the blank Sentry Key(s) that are to be programmed as valid keys for the vehicle. Cut the blank key(s) to match the ignition switch lock cylinder mechanical key codes.
2. Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the On position.
3. After the ignition switch has been in the On position for longer than 3 seconds, but no more than 15 seconds, cycle the ignition switch back to the Off position. Replace the first valid Sentry Key in the ignition switch lock cylinder with the second valid Sentry Key and turn the ignition switch back to the On position. The second valid Sentry Key must be inserted in the lock cylinder within 15 seconds of removing the first valid key.
4. About 10 seconds after the completion of Step 3, the security indicator in the instrument cluster will start to flash to indicate that the system has entered the Customer Learn programming mode.
5. Within 60 seconds of entering the Customer Learn programming mode, turn the ignition switch to the Off position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the On position.
6. About 10 seconds after the completion of Step 5, the security indicator will stop flashing, stay on solid for 3 seconds, then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKREES will immediately exit the Customer Learn programming mode. After the ignition is cycled the vehicle may be started using the newly programmed valid Sentry Key.

NOTE: The Remote Keyless Entry (RKE) Transmitter will also be programmed during this procedure.

Each of these steps must be repeated and completed in their entirety for each additional Sentry Key that is to be programmed. If the above steps are not completed in the given sequence, or within the allotted time, the SKREEM will exit the Customer Learn programming mode and the programming will be unsuccessful. The SKREEM will also automatically exit the Customer Learn programming mode if it sees a non-blank Sentry Key transponder when it should see a blank, if it has already programmed eight (8) valid Sentry Keys, or if the ignition switch is turned to the Off position for more than about 50 seconds.

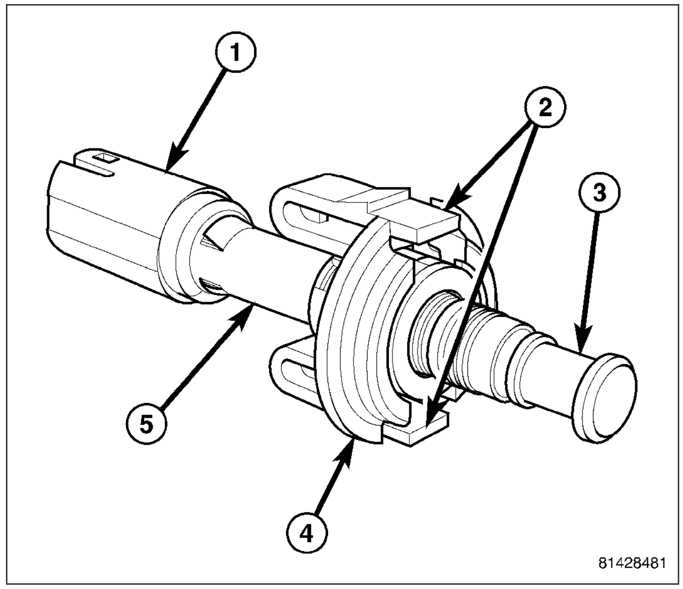
NOTE: If an attempt is made to start the vehicle while in the Customer Learn mode (security indicator flashing), the SKIS will respond as though the vehicle were being started with an invalid key. In other words, the engine will stall after about two seconds of operation. No faults will be set.

NOTE: Once a Sentry Key has been programmed as a valid key to a vehicle, it cannot be programmed as a valid key for use on any other vehicle.

HOOD AJAR SWITCH - EXPORT

DESCRIPTION

The hood ajar switch is a normally closed, single pole, spring-loaded plunger switch that is used only on vehicles equipped with the Vehicle Theft Security System (VTSS) for sale in certain markets where it is required equipment. The molded plastic switch body (5) has an integral molded connector (1) on the lower end containing two terminal pins. The switch is connected to the vehicle electrical system through the headlamp and dash wire harness.



The sleeve has a one-time, self-adjustment feature that is activated after the switch is installed by closing the hood. Two integral latches (2) lock the switch into a keyed mounting hole in the stamped steel switch mounting bracket. The mounting bracket is secured with screws to the left rear engine compartment, near the left strut tower. The underside of the hood panel inner reinforcement actuates the switch plunger as the hood panel is closed.

An installed hood ajar switch cannot be readjusted or repaired. If the switch is damaged, ineffective, or requires readjustment, it must be replaced with a new unit.

OPERATION

The hood ajar switch is a normally closed switch that is held open as the spring-loaded switch plunger is depressed by the inner hood panel reinforcement when the hood panel is closed and latched. When the hood is opened, the spring-loaded switch plunger extends from the switch body and the switch contacts are closed. The switch is connected in series between ground and the hood ajar switch sense input of the Totally Integrated Power Module (TIPM). The TIPM uses an internal resistor pull up to monitor the state of the hood ajar switch contacts.

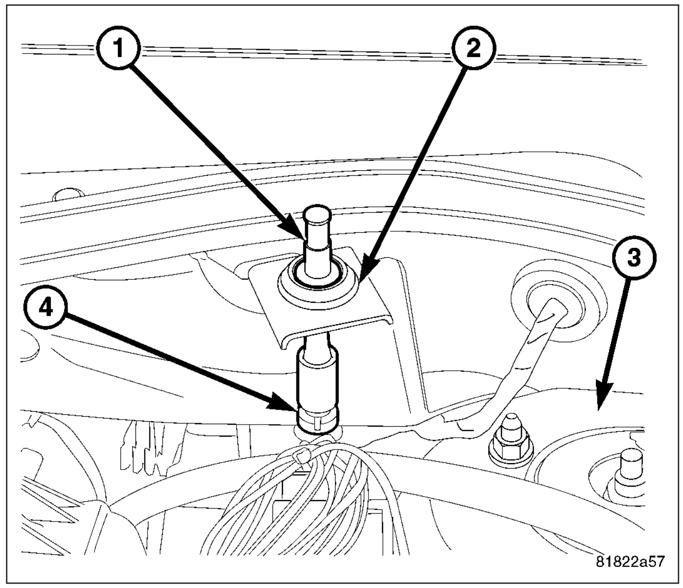
The components of the switch self-adjustment feature include an integral stop on the shaft of the plunger and a ribbed, ratcheting sleeve at the top of the switch body from which the plunger extends. With the switch mounting collar secured in its mounting bracket, the plunger is depressed by the hood inner reinforcement as the hood is closed. As the plunger is depressed, the plunger stop contacts the top of the sleeve and the sleeve is driven downward, ratcheting through the switch mounting collar until the hood is fully closed and latched. The ribs on the sleeve are engaged within the mounting collar to maintain this adjusted position.

The hood ajar switch and the hard wired circuits for the switch may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the TIPM, the ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN), or the electronic communication between these modules. The most reliable, efficient, and accurate means to diagnose the hood ajar switch, the TIPM, the EMIC/CCN or the electronic communication related to hood ajar switch operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

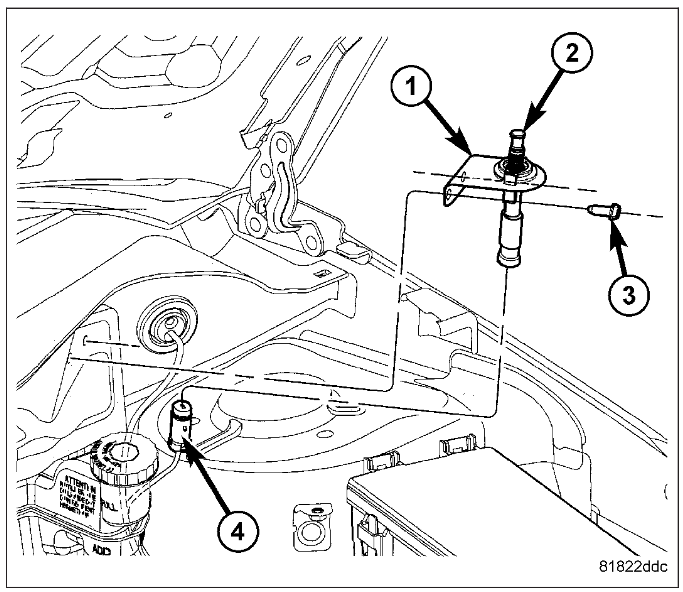
HOOD SWITCH

1. Open hood.
2. Disconnect and isolate the battery negative cable.
3. Disconnect wire harness connector from hood ajar switch (4).
4. Firmly press tangs on the bottom side of the switch (1) together and push up through bracket (2).
5. Remove switch from vehicle.



HOOD SWITCH BRACKET

1. Open hood.
2. Disconnect and isolate the battery negative cable.
3. Disconnect wire harness connector (4) from hood ajar switch (2).
4. Firmly press tangs on the bottom side of the switch (2) together and push up through bracket (1).
5. Remove the two screws (3) holding the bracket (1) to the bulkhead.



INSTALLATION

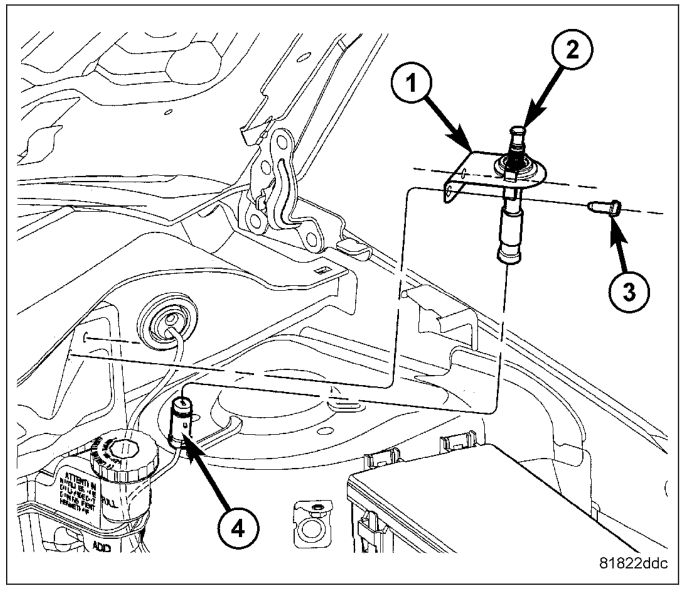
NOTE: NEW SWITCH - The switch will be adjusted when the hood is closed.

NOTE: OLD SWITCH - The switch should be adjusted from prior use. If adjustment is not correct then a new switch must be installed and the self adjustment will take place upon the first hood closure.

HOOD SWITCH BRACKET

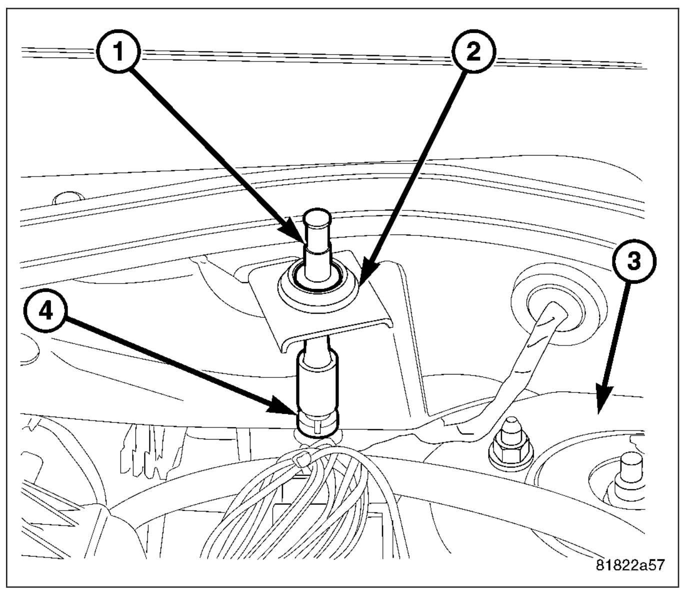
NOTE: Removal of the bracket may cause the switch not to be adjusted correctly causing a new switch to be needed. Only remove bracket when necessary.

1. Position the hood switch bracket (1) on bulkhead and install the two screws (3) holding the bracket (1) to the bulkhead.
2. Place the switch (2) into the bracket (1) hole and firmly push down to engage the retaining tangs.
3. Connect the wire harness connector (4) to the hood ajar switch (2).
4. Connect the battery negative cable.
5. Close hood.



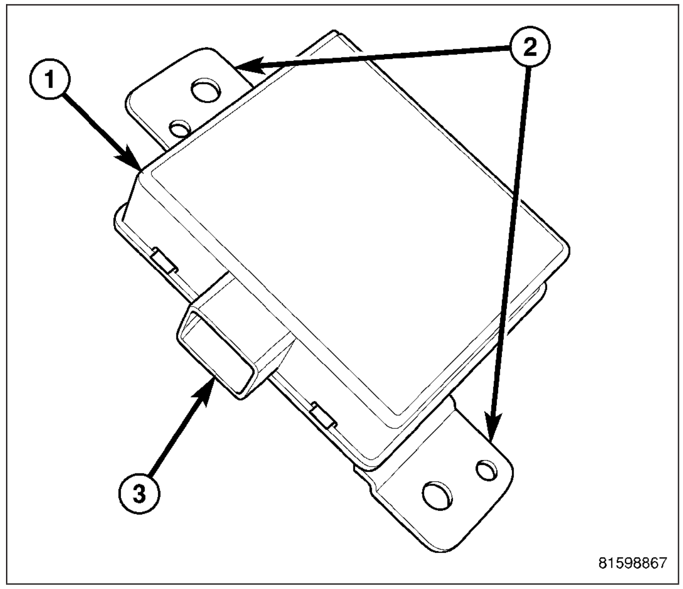
HOOD SWITCH

1. Place the switch (1) into the bracket (2) hole and firmly push down to engage the retaining tangs.
2. Connect the wire harness connector (4) to the hood ajar switch (1).
3. Connect the battery negative cable.
4. Close hood.



INTRUSION MODULE

DESCRIPTION



An intrusion module (1) is part of the premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS). The premium version of the VTA is only available in vehicles built for certain markets, where the additional features offered by this system are required. The intrusion module is located in the passenger compartment. This unit is designed to work in conjunction with the intrusion sensor transmitter and intrusion sensor receiver to provide interior motion detection and serves as the interface between the Totally Integrated Power Module (TIPM), the ElectroMechanical Instrument Cluster (EMIC) (sometimes referred to as the Cab Compartment Node (CCN), and the alarm siren.

The intrusion module has two integral mounts (2) that are secured by two screws underneath the instrument panel upper cover, just above the center stack. Concealed within the molded plastic housing is the circuitry of the module, which includes a microprocessor. The module is connected to the vehicle electrical system wire harness.

The intrusion module unit cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The microprocessor in the intrusion module contains the motion detection logic circuits and controls all of the features of the premium version of the Vehicle Theft Alarm (VTA). The module uses On-Board Diagnostics (OBD) and can communicate with other modules in the vehicle as well as with a diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is used by the module to communicate with the Totally Integrated Power Module (TIPM) and the ElectroMechanical Instrument Cluster (EMIC). The module also communicates with the alarm siren over a dedicated serial bus circuit.

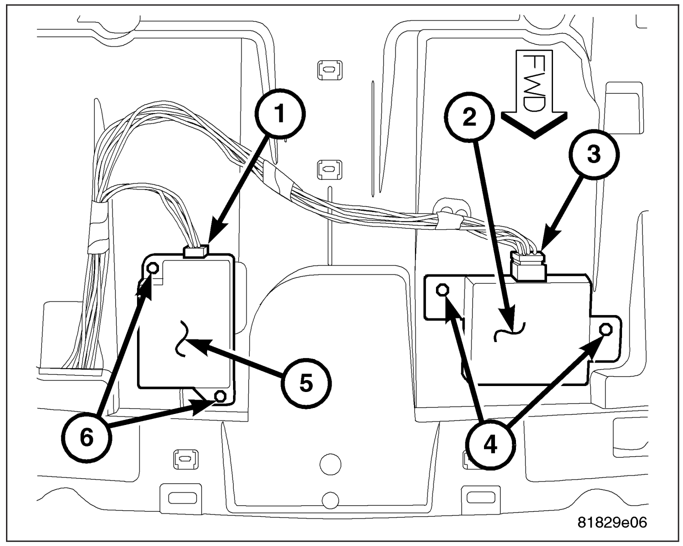
The intrusion module microprocessor continuously monitors inputs from the intrusion sensor transmitter and receiver as well as inputs from the EMIC and the alarm siren module. The module energizes the intrusion sensor transmitter, which transmits ultrasonic signals into the vehicle cabin through a transmit transducer, then monitors the current draw of the transmitter to detect problems with the transmitter and transmitter circuits. The module also energizes the intrusion sensor receiver, which listens to the ultrasonic signals through a receive transducer as they bounce off of objects in the vehicle interior, then monitors the current draw of the receiver for data signals and to detect problems with the receiver and receiver circuits. If an object is moving in the interior, a detection circuit in the module senses this movement through the modulation of the returning data signals from the receiver.

If movement is detected, the intrusion module sends an electronic message to the CCN over the CAN data bus to trigger the alarm. The CCN sends the alarm message over the CAN date bus to the TIPM and intrusion module. The intrusion module sends another message to the alarm siren module over the dedicated serial bus line to sound the siren. When the EMIC detects a breach in the perimeter protection through a door or liftgate, it sends an electronic message to the intrusion module and the TIPM. The intrusion module sends a message to the alarm siren module to sound the siren. The module also monitors message inputs from the alarm siren module for siren battery or siren input/output circuit tamper alerts, and siren battery condition alerts, then sets active and stored Diagnostic Trouble Codes (DTC) for any monitored system faults it detects. An active fault only remains for the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the module. If a fault does not recur for fifty ignition cycles, the module will automatically erase the stored DTC.

The intrusion module receives battery voltage on a B(+) circuit and is grounded at all times through a hard wired remote ground point. These connections allow the module to remain operational, regardless of the ignition switch position. To diagnose the intrusion module, the CAN data bus, and the electronic message inputs to and outputs from the module requires the use of a diagnostic scan tool and refer to the appropriate diagnostic information.

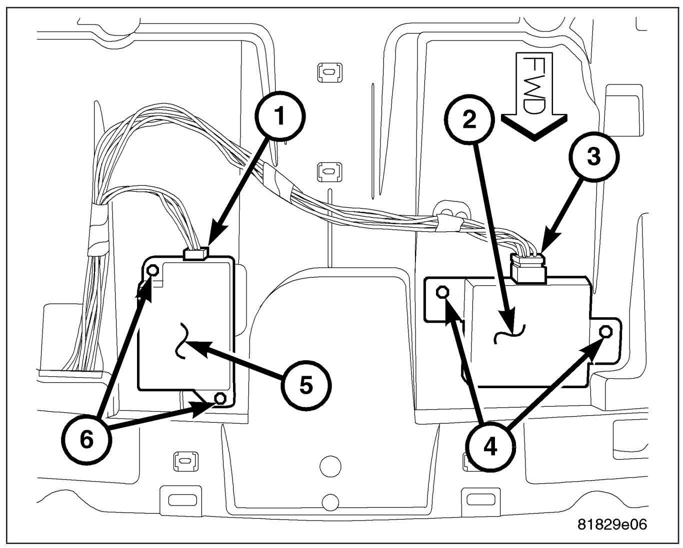
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel upper panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL UPPER PANEL - REMOVAL).
3. Disconnect the module electrical connector (3).
4. Remove the two screws (4) that secure the module (2) to the instrument panel.
5. Remove the module from the instrument panel.



INSTALLATION

1. Position the intrusion module (2) onto the instrument panel.
2. Install the two screws (4) that secure the module (2) to the instrument panel.
3. Connect the electrical connector (3) on the module (1).
4. Install the instrument panel upper panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - INSTALLATION).
5. Connect the battery negative cable.

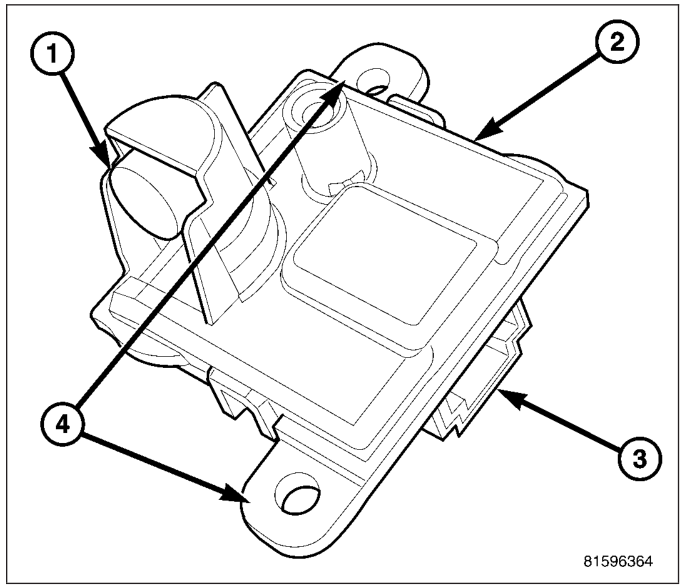


INTRUSION SENSOR - EXPORT

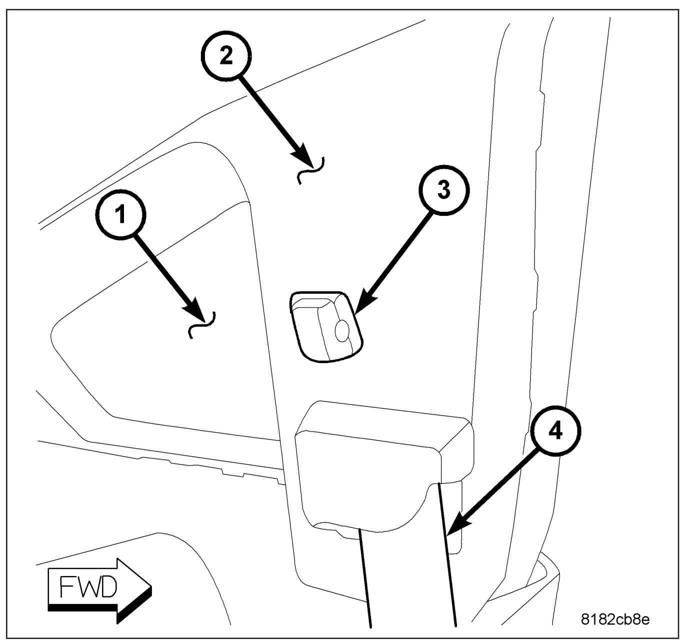
DESCRIPTION

TRANSMITTER

An intrusion sensor transmitter (2) is part of the premium version of the Vehicle Theft Security System (VTSS). The premium version of the VTSS is only available in vehicles built for certain markets, where the additional features offered by this system are required. This unit is designed to work in conjunction with the intrusion sensor receiver to provide interior motion detection inputs to the intrusion module, which serves as an input to the ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN), and the alarm siren. Concealed within the molded plastic transmitter housing is the circuitry of the transmitter which includes an ultrasonic transmit transducer (1). The intrusion sensor transmitter cannot be adjusted or repaired and, if faulty or damaged, it must be replaced. The transmitter mounting bracket is serviced as a unit with the headliner. The transducer trim bezel is available for separate service replacement.

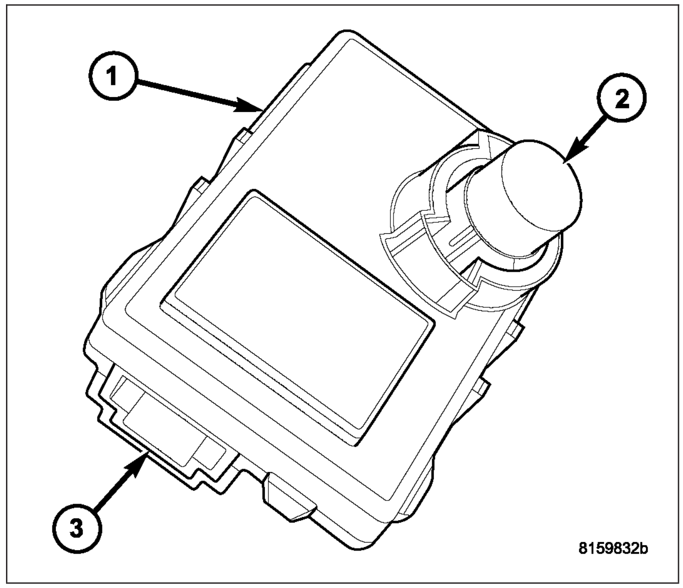


The transmitter is located in the passenger compartment, where it is concealed behind the left C-pillar upper trim panel (2), above the seat belt (4). The trim bezel has a small round opening that faces the front of the vehicle through which the transducer (3) is aimed.

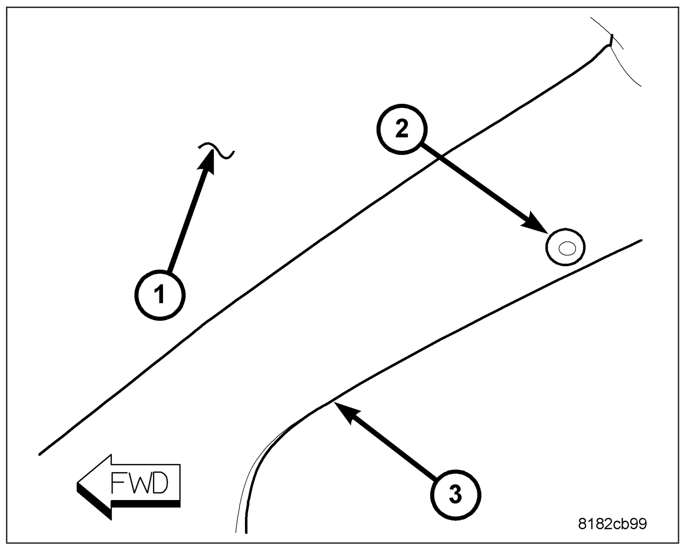


RECEIVER

An intrusion sensor receiver (1) is part of the premium version of the Vehicle Theft Security System (VTSS). The premium version of the VTSS is only available in vehicles built for certain markets, where the additional features offered by this system are required. This unit is designed to work in conjunction with the intrusion sensor transmitter to provide interior motion detection inputs to the intrusion module, which serves as an input to the ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN), and the alarm siren.



The receiver (2) is located in the passenger compartment, where it is concealed behind the right A-pillar trim panel (3) and engages two latch tabs of a bracket that is serviced with the A-pillar trim panel. The ultrasonic receiver transducer (2) is aimed through a small dedicated round opening in the a-pillar and is the only evidence of the receiver that is visible from the passenger compartment.



Concealed within the receiver housing is the circuitry which includes the receive transducer. The receiver is connected to the vehicle electrical system wire harness that is integral to the headliner.

The intrusion sensor receiver cannot be adjusted or repaired and, if faulty or damaged, it must be replaced. The receiver mounting bracket is serviced as a unit with the A-pillar trim panel.

OPERATION

TRANSMITTER

The intrusion sensor transmitter operates only when it is energized by the intrusion module. The transmitter generates ultrasonic signals into the vehicle cabin through a transmit transducer. Then the intrusion sensor receiver listens to the returning signals as they bounce off of objects in the vehicle interior and provides input signals to the intrusion module. If an object is moving in the interior, a detection circuit in the intrusion module senses this movement through the modulation of the returning signals that occur due to the Doppler effect. The intrusion module monitors the current draw of the transmitter circuits to determine the condition of the transmitter and, if the draw is too high or too low, it will store a Diagnostic Trouble Code (DTC) for any fault that is detected.

Use a diagnostic scan tool and refer to the appropriate diagnostic information for diagnosis and testing of the system.

RECEIVER

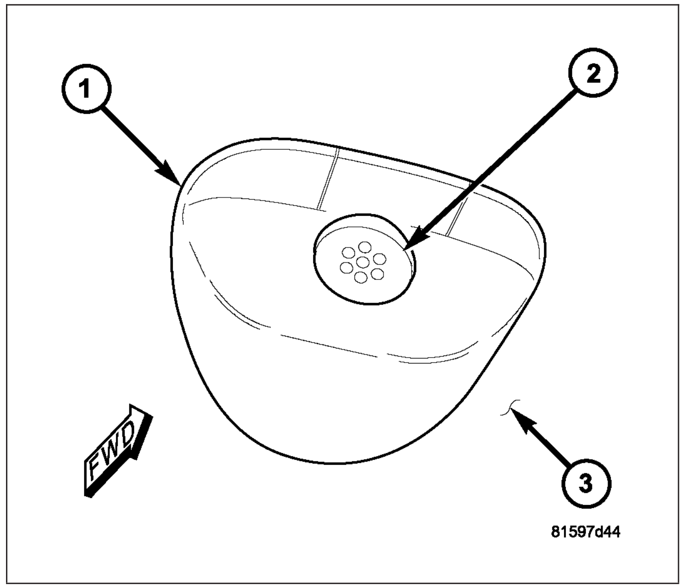
The intrusion sensor receiver operates only when it is energized by the intrusion module. The receiver monitors ultrasonic signals generated in the vehicle cabin by the intrusion sensor transmitter through a receive transducer. The receiver listens to the ultrasonic signals as they bounce off of objects in the vehicle interior and provides input signals to the intrusion module. If an object is moving in the interior, a detection circuit in the intrusion module senses this movement through the modulation of the returning signals that occur due to the Doppler effect. The intrusion module monitors the current draw of the receiver circuits to determine the condition of the receiver and, if the draw is too high or too low, it will store a Diagnostic Trouble Code (DTC) for any fault that is detected.

Use a diagnostic scan tool and refer to the appropriate diagnostic information for diagnosis and testing of the system.

REMOVAL

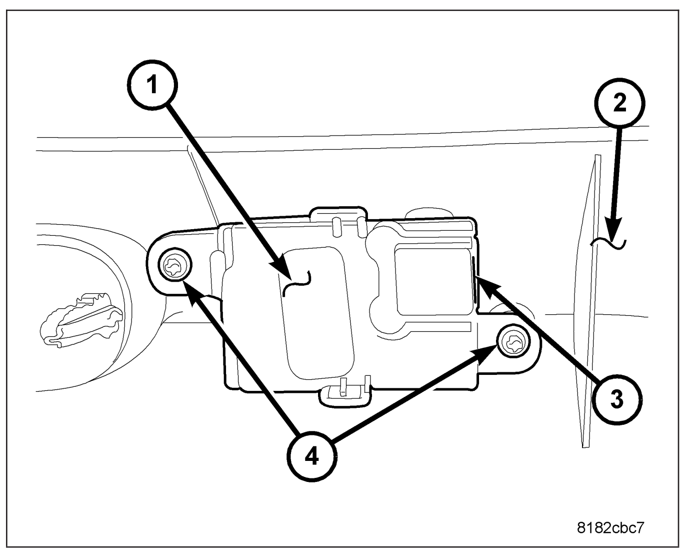
TRANSMITTER

1. Disconnect and isolate the battery negative cable.
2. Remove the C-pillar upper trim (Refer to 23 - BODY/INTERIOR/C-PILLAR UPPER TRIM - REMOVAL).
3. Remove the two retaining screws from the C-pillar and remove the sensor.

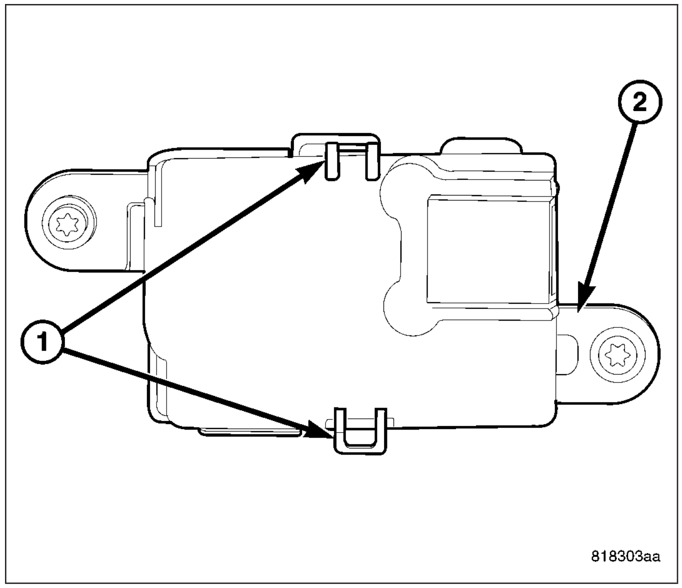


RECEIVER

1. Disconnect and isolate the battery negative cable.
2. Remove the right A-pillar trim panel (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
3. Disconnect the electrical connector (35) on the receiver housing.



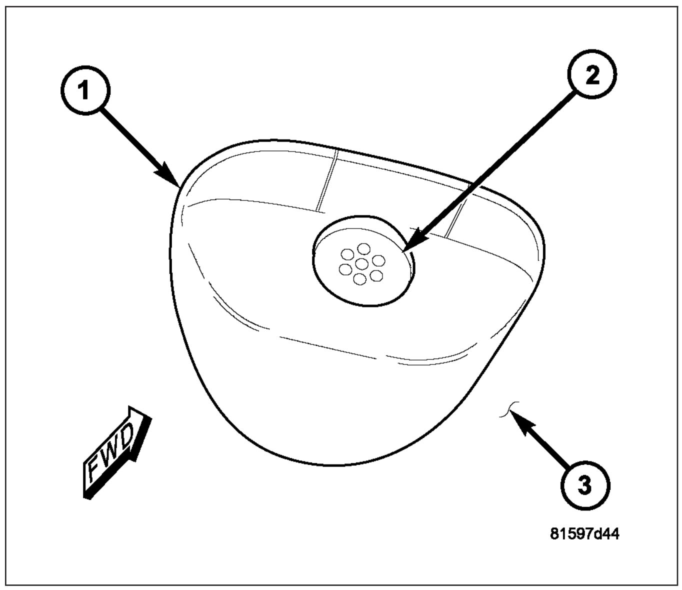
4. Release the two latch features (1) of the mounting bracket (2) and disengage the receiver from the bracket.



INSTALLATION

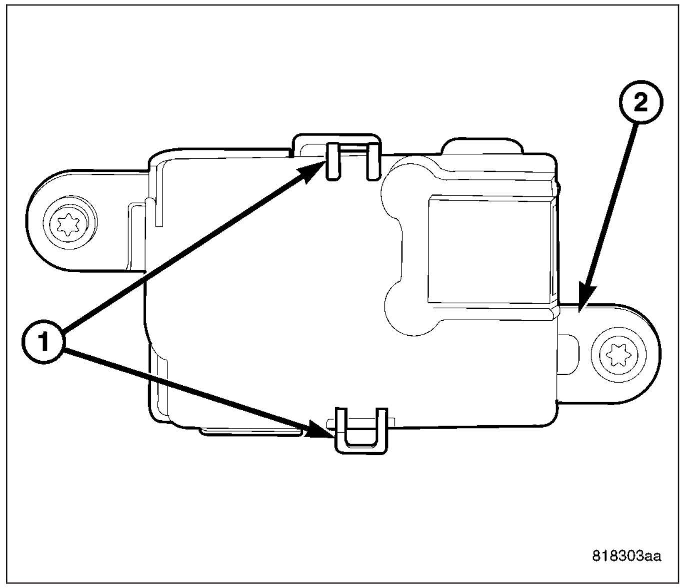
TRANSMITTER

1. Position the sensor on the inside of the C-pillar.
2. Install the two retaining screws.
3. Connect the electrical connector.
4. Install the C-pillar (Refer to 23 - BODY/INTERIOR/ C-PILLAR UPPER TRIM - INSTALLATION).
5. Connect the battery negative cable.

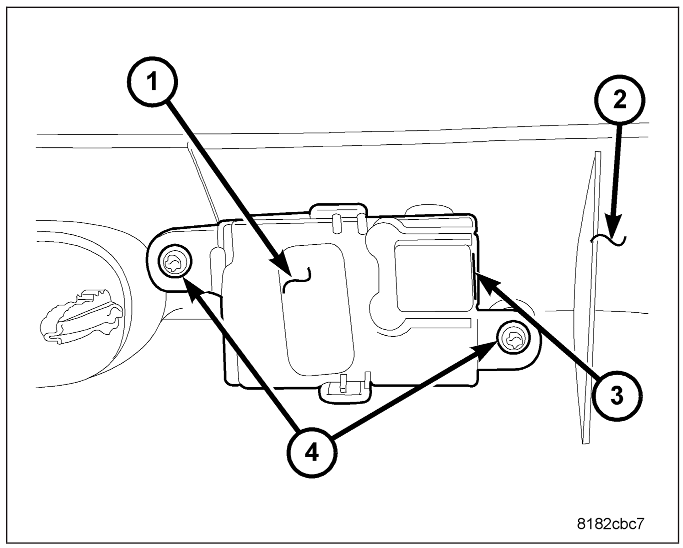


RECEIVER

1. Position the intrusion sensor receiver to the mounting bracket (2) and firmly push down to latch the retaining clips (1).



2. Connect the electrical connector (3) on the receiver housing.
3. Install the A-pillar trim panel (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).
4. Connect the battery negative cable.



SENTRY KEY REMOTE ENTRY MODULE

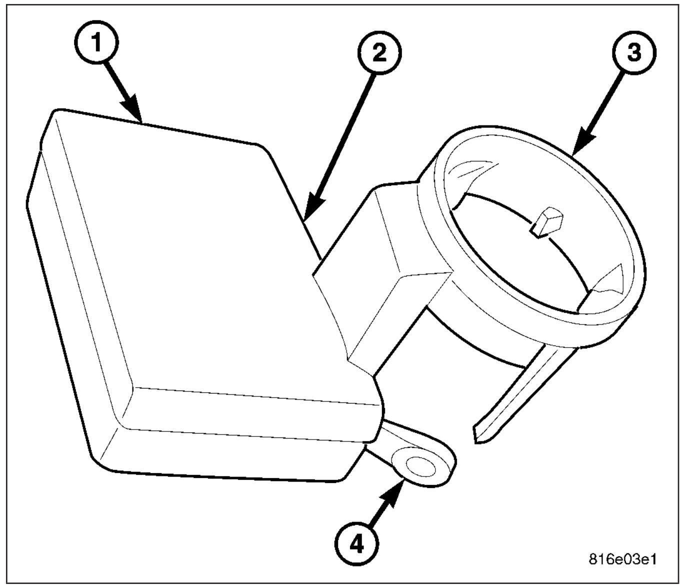
DESCRIPTION

When a PCM and the SKREEM are replaced at the same time, perform the following steps in order:

1. Program the new PCM.
2. Program the new SKREEM.
3. Replace all ignition keys and program them to the new SKREEM.

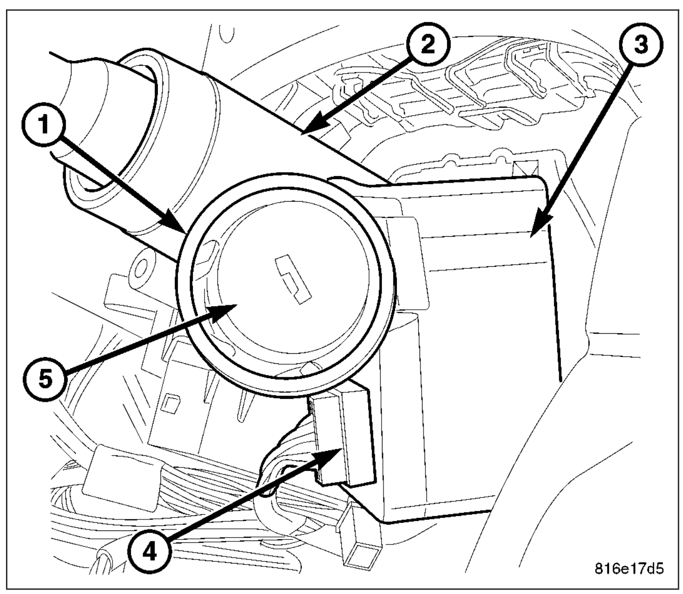
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKREEM PROGRAMMING)

The Sentry Key REmote Entry Module (SKREEM) is sometimes referred to as the Wireless Control Module (WCM). The SKREEM/WCM is the primary component of the Sentry Key Immobilizer System (SKIS). It is also the receiver for the Remote Keyless Entry (RKE) system and the Tire Pressure Monitor (TPM) system. The SKREEM/WCM is located on the steering column, around the ignition lock cylinder housing and is concealed beneath the steering column shrouds. The molded black plastic housing for the SKREEM/WCM has an integral molded plastic halo-like antenna ring (3) that extends from one side. When the SKREEM/WCM is properly installed, the antenna ring is oriented around the ignition lock cylinder housing.



A single connector (1) is located next to the antenna ring on the SKREEM/WCM housing. A molded plastic mounting tab (2) on the SKREEM/WCM housing secures the unit to the steering column. The SKREEM/WCM is connected to the vehicle electrical system through the instrument panel wire harness.

The SKREEM/WCM cannot be adjusted or repaired. If faulty or damaged, the entire SKREEM unit must be replaced.



OPERATION

The Sentry Key REmote Entry Module (SKREEM), sometimes referred to as the Wireless Control Module (WCM), contains a Radio Frequency (RF) transceiver and a microprocessor. The SKREEM/WCM transmits RF signals to, and receives RF signals from the Sentry Key transponder through a tuned antenna enclosed within the molded plastic antenna ring integral to the SKREEM/WCM housing. If this antenna ring is not mounted properly around the ignition lock cylinder housing, communication problems between the SKREEM/WCM and the transponder may arise. These communication problems will result in Sentry Key transponder-related faults.

The SKREEM also serves as the Remote Keyless Entry (RKE) RF receiver and, if the vehicle is so equipped, the receiver for the Tire Pressure Monitoring (TPM) system. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION) or (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - DESCRIPTION). The SKREEM/WCM communicates over the Controller Area Network (CAN) data bus with the ElectroMechanical Instrument Cluster (EMIC) (sometimes referred to as the Cab Compartment Node (CCN), the Powertrain Control Module (PCM), and/or the diagnostic scan tool.

The SKREEM/WCM retains in memory the ID numbers of any Sentry Key transponder that is programmed into it. A maximum of eight Sentry Key transponders can be programmed into the SKREEM/WCM. For added system security, each SKREEM/WCM is programmed with a unique Secret Key code. This code is stored in memory, sent over the CAN data bus to the PCM, and is encoded to the transponder of every Sentry Key that is programmed into the SKREEM/WCM. Therefore, the Secret Key code is a common element that is found in every component of the Sentry Key Immobilizer System (SKIS). Another security code, called a PIN, is used to gain access to the SKREEM/WCM Secured Access Mode. The Secured Access Mode is required during service to perform the SKIS initialization and Sentry Key transponder programming procedures. The SKREEM/WCM also stores the Vehicle Identification Number (VIN) in its memory, which it learns through a CAN data bus message from the PCM during SKIS initialization.

In the event that a SKREEM/WCM replacement is required, the Secret Key code can be transferred to the new SKREEM/WCM from the PCM using the diagnostic scan tool and the SKIS initialization procedure. Proper completion of the SKIS initialization will allow the existing Sentry Keys to be programmed into the new SKREEM/WCM so that new keys will not be required. In the event that the original Secret Key code cannot be recovered, SKREEM/WCM replacement will also require new Sentry Keys. The diagnostic scan tool will alert the technician during the SKIS initialization procedure if new Sentry Keys are required.

When the ignition switch is turned to the On position, the SKREEM/WCM transmits an RF signal to the transponder in the ignition key. The SKREEM/WCM then waits for an RF signal response from the transponder. If the response received identifies the key as valid, the SKREEM/WCM sends a valid key message to the PCM over the CAN data bus. If the response received identifies the key as invalid or if no response is received from the key transponder, the SKREEM/WCM sends an invalid key message to the PCM. The PCM will enable or disable engine operation based upon the status of the SKREEM/WCM messages. It is important to note that the default condition in the PCM is an invalid key; therefore, if no message is received from the SKREEM/WCM by the PCM, the engine will be disabled and the vehicle immobilized after two seconds of running.

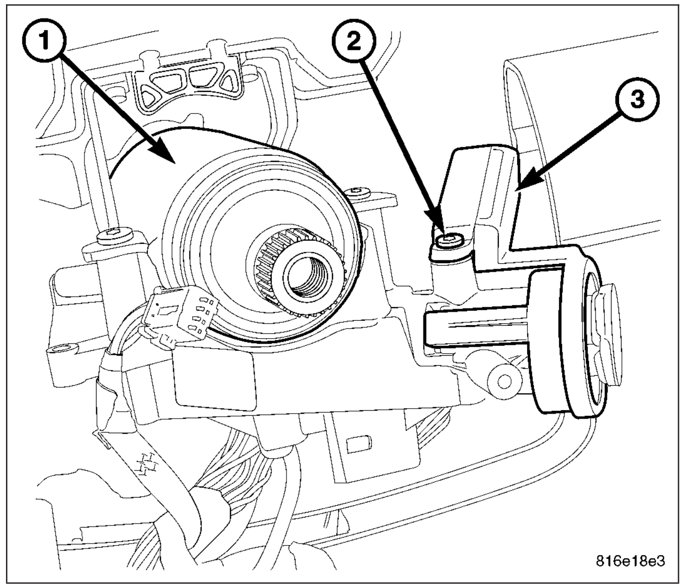
The SKREEM/WCM also sends security indicator status messages to the EMIC/CCN over the CAN data bus to tell the EMIC/CCN how to operate the security indicator. The security indicator status message from the SKREEM/WCM tells the EMIC/CCN to turn the indicator on for about three seconds each time the ignition switch is turned to the On position as a bulb test. After completion of the bulb test, the SKREEM/WCM sends security indicator status messages to the EMIC/CCN to turn the indicator off, turn the indicator on, or to flash the indicator on and off. If the security indicator flashes or stays on solid after the bulb test, it signifies a SKIS fault. If the SKREEM/WCM detects a system malfunction and/or the SKIS has become inoperative, the security indicator will stay on solid. If the SKREEM/WCM detects an invalid key or if a key transponder-related fault exists, the security indicator will flash. If the vehicle is equipped with the Customer Learn transponder programming feature, the SKREEM/WCM will also send messages to the EMIC/CCN to flash the security indicator whenever the Customer Learn programming mode is being utilized (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of a Diagnostic Trouble Code (DTC) in SKREEM/WCM memory if a system malfunction is detected. The SKREEM/WCM can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

NOTE: The steering wheel does not have to be removed to service the SKREEM/WCM.

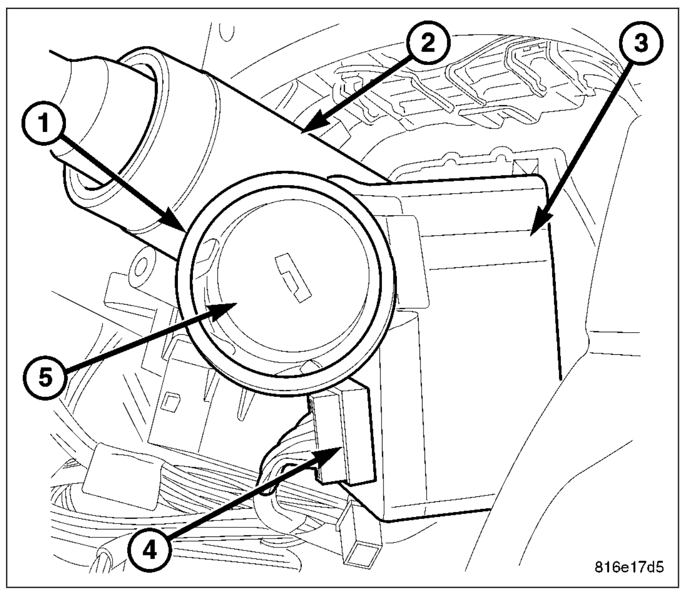
NOTE: The Steering Column Control Module (SCCM) assembly, which consists of the left/right multi-function switches and the clockspring, does not have to be removed to service the SKREEM/WCM. There is an access hole in the top of the right multi-function switch to access the mounting screw (2).



1. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Remove the upper and lower steering column shrouds (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - REMOVAL) and (Refer to 19 - STEERING/COLUMN/LOWER SHROUD - REMOVAL).
3. Remove the SKREEM/WCM mounting screw (2) on the ignition lock assembly and separate the SKREEM/WCM (3) from the ignition lock assembly.
4. Disconnect the SKREEM/WCM electrical connector (4).
5. Remove SKREEM/WCM (1 and 3) from column (2).



When a PCM and the SKREEM/WCM are replaced at the same time, perform the following steps in order (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKREEM PROGRAMMING).

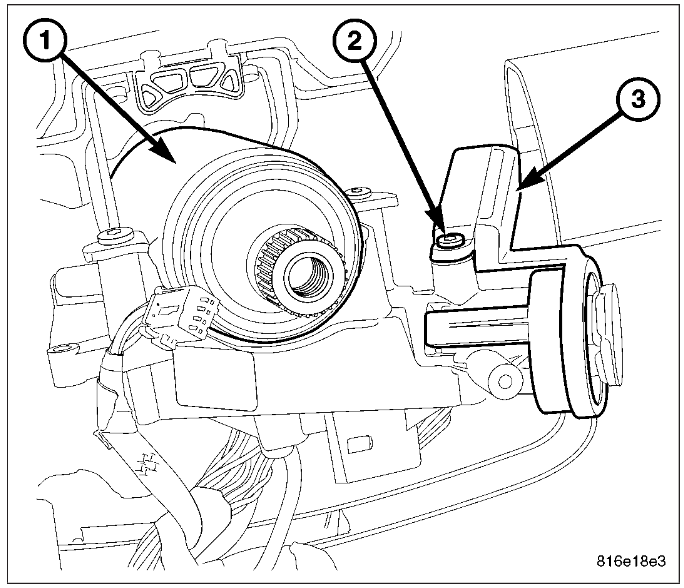
- Program the new PCM.
- Program the new SKREEM/WCM.
- Replace all ignition keys and program them to the new SKREEM/WCM.

INSTALLATION

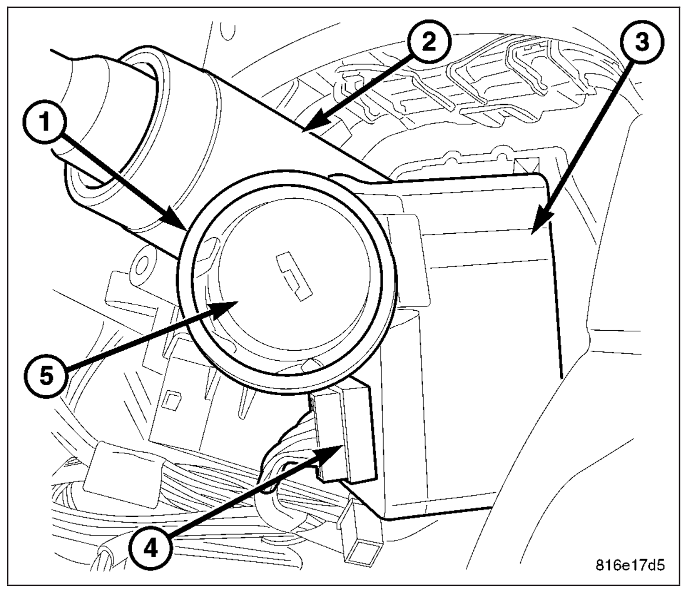
When a PCM and the SKREEM/WCM are replaced at the same time, perform the following steps in order (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/ SKREEM PROGRAMMING).

- Program the new PCM.
- Program the new SKREEM/WCM.
- Replace all ignition keys and program them to the new SKREEM/WCM.

1. Position the SKREEM/WCM (3) on the ignition lock housing and install the retaining screw (1).



2. Connect the SKREEM/WCM electrical connector (4).



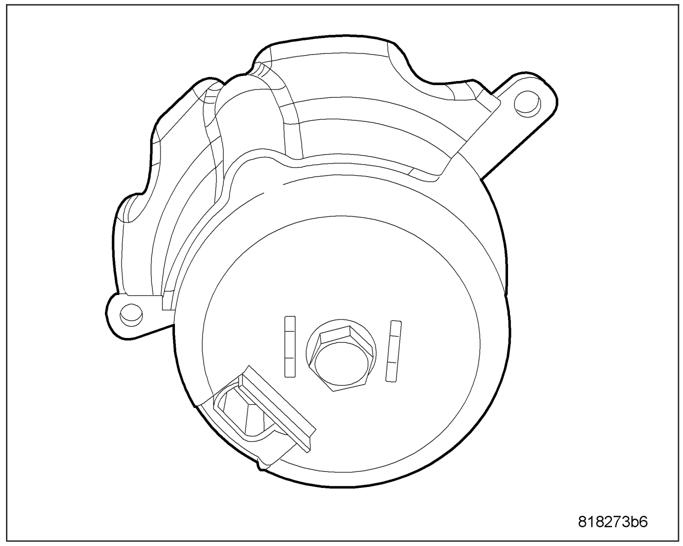
NOTE: On vehicles equipped with the optional Sentry Key Immobilizer System (SKIS), when the SKREEM is replaced with a new unit, a diagnostic scan tool MUST be used to initialize the new SKREEM and to program at least two Sentry Key transponders before the vehicle can be operated (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SKIS INITIALIZATION).

3. Connect the battery negative cable.

SIREN - EXPORT

DESCRIPTION

An alarm siren module is part of the premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS). The premium version of the VTA is only available in vehicles built for certain markets, where the additional features offered by this system are required. This unit is designed to provide the audible alert requirements for the premium VTA.



The alarm siren module consists of microprocessor-based electronic control circuitry, the siren, and a nickel metal hydride backup battery. All of the alarm module components are protected and sealed within a molded plastic housing. The housing also has a threaded insert within the mounting hole on the back through which a screw secures it to a stamped metal mounting bracket.

The alarm siren module cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The microprocessor within the alarm siren module provides the siren unit features and functions based upon internal programming and electronic arm and disarm messages received from the intrusion module over a dedicated serial bus communication circuit. The siren module receives battery voltage on a fused B(+) circuit through a fuse in the Totally Integrated Power Module (TIPM), and receives a path to ground through a ground circuit in the wire harness. These connections allow the siren to remain operational, regardless of the ignition switch position.

When the premium version of the Vehicle Theft Alarm (VTA) is armed, the siren module continuously monitors electronic message inputs from the intrusion module to sound its internal siren. While armed, the siren also enters its auto-detect mode. While in the auto-detect mode, if the siren module detects that its power supply or communication circuits are being tampered with or have been sabotaged, it will sound an audible alarm and continue to operate through an on-board backup battery. If the siren module is in its disarmed mode when its power supply or communication circuits are interrupted, the siren will not sound.

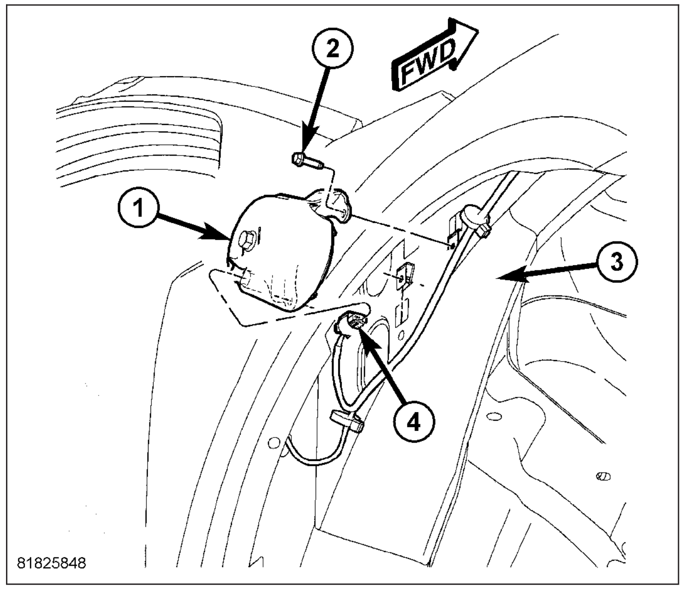
The siren module will also notify the intrusion module when the backup battery requires charging, and the intrusion module will send electronic messages that will allow the backup battery to be recharged through the battery voltage and ground circuits to the siren module only while the ignition switch is in the On position and the engine is running. This prevents the potential discharge of the main battery while the vehicle is not being operated.

The siren will self-detect problems with its internal and external power supply and communication circuits, then send electronic messages indicating the problem to the intrusion module upon receiving an arm or disarm request. The intrusion module will store a Diagnostic Trouble Code (DTC) for any detected alarm siren module fault. The DTC can then be retrieved with a diagnostic scan tool through the 16-way Data Link Connector (DLC) located under the driver side lower edge of the instrument panel over the Controller Area Network (CAN) data bus.

To diagnose the siren, the intrusion module, the CAN data bus communication line, and the electronic message inputs to and outputs from the siren requires the use of a diagnostic scan tool and the appropriate diagnostic information.

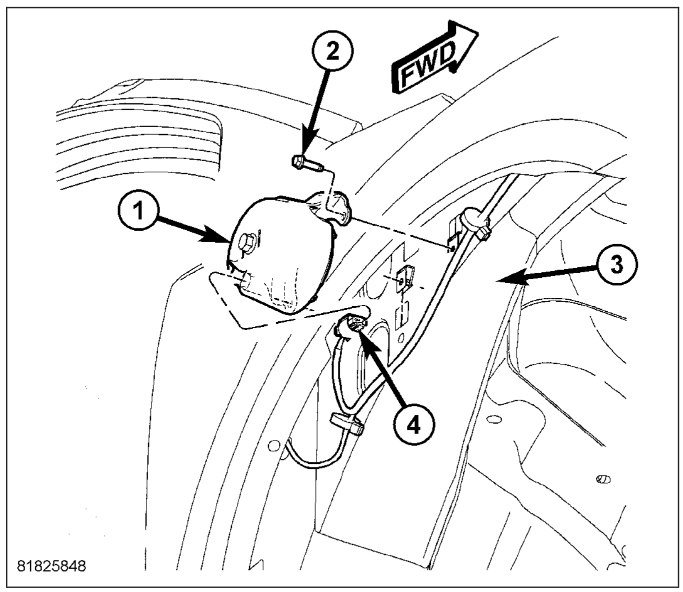
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the right front wheel well splash shield (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
3. Disconnect the electrical connector (4).
4. Remove the siren retaining screws (2) and remove the siren (1) from the load form (3).



INSTALLATION

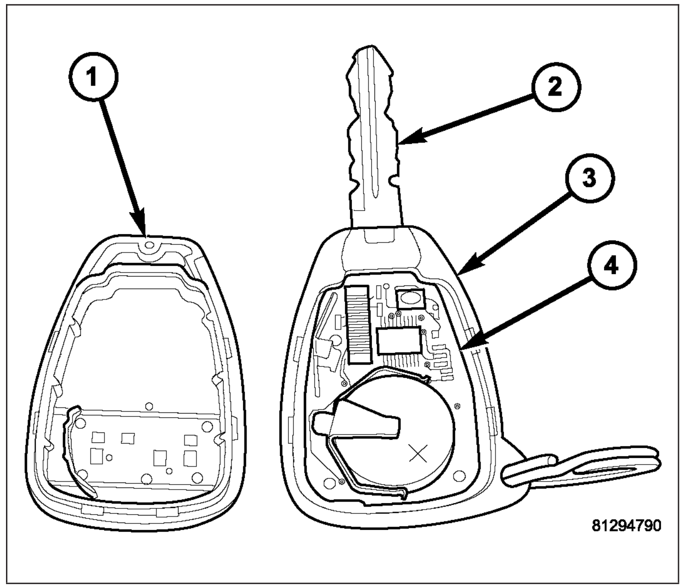
1. Position siren (1) on load form and install retaining screws (2).
2. Connect the siren electrical connector (4).
3. Install the right front wheel well splash shield (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Connect the battery negative cable.



TRANSPONDER KEY

DESCRIPTION

Each ignition key (2) used in the Sentry Key Remote Entry System (SKREES) has a transponder chip included on the circuit board (4) beneath the cover (1) of the integral Remote Keyless Entry (RKE) transmitter (3). In addition to having to be cut to match the mechanical coding of the ignition lock cylinder and programmed for operation of the RKE system, each new Sentry Key has a unique transponder identification code that is permanently programmed into it by the manufacturer, and which must be programmed into the Sentry Key REmote Entry Module (SKREEM), sometimes referred to as the Wireless Control Module (WCM), to be recognized by the SKREES as a valid key. The Sentry Key transponder cannot be adjusted or repaired. If faulty or damaged, the entire key and RKE transmitter unit must be replaced.



OPERATION

When the ignition switch is turned to the On position, the Sentry Key REmote Entry Module (SKREEM), sometimes referred to as the Wireless Control Module (WCM), communicates through its antenna with the Sentry Key transponder using a Radio Frequency (RF) signal. The SKREEM/WCM then listens for a RF response from the transponder through the same antenna. The Sentry Key transponder chip is within the range of the SKREEM/WCM transceiver antenna ring when it is inserted into the ignition lock cylinder. The SKREEM/WCM determines whether a valid key is present in the ignition lock cylinder based upon the response from the transponder. If a valid key is detected, that fact is communicated by the SKREEM/WCM to the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus, and the PCM allows the engine to continue running. If the PCM receives an invalid key message, or receives no message from the SKREEM/WCM over the CAN data bus, the engine will be disabled after about two seconds of operation. The ElectroMechanical Instrument Cluster (EMIC), sometimes referred to as the Cab Compartment Node (CCN), will also respond to the invalid key message on the CAN data bus by flashing the security indicator on and off.

Each Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. Likewise, the SKREEM/WCM has a unique Secret Key code programmed into it by the manufacturer. When a Sentry Key is programmed into the memory of the SKREEM/WCM, the SKREEM/WCM stores the transponder identification code from the Sentry Key, and the Sentry Key learns the Secret Key code from the SKREEM/WCM. Once the Sentry Key learns the Secret Key code of the SKREEM/WCM, it is permanently stored in the memory of the transponder. Therefore, once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - STANDARD PROCEDURE).

The Sentry Key REmote Entry System (SKREES) performs a self-test each time the ignition switch is turned to the On position, and will store key-related fault information in the form of a Diagnostic Trouble Code (DTC) in SKREEM/WCM memory if a Sentry Key transponder problem is detected. The Sentry Key transponder chip can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

Common communication problems:

- Two transponder keys too close together.
- Speed Pass too close to transponder key.
- Loss of PCM communication.
- Failed antenna circuit.

WIPERS/WASHERS

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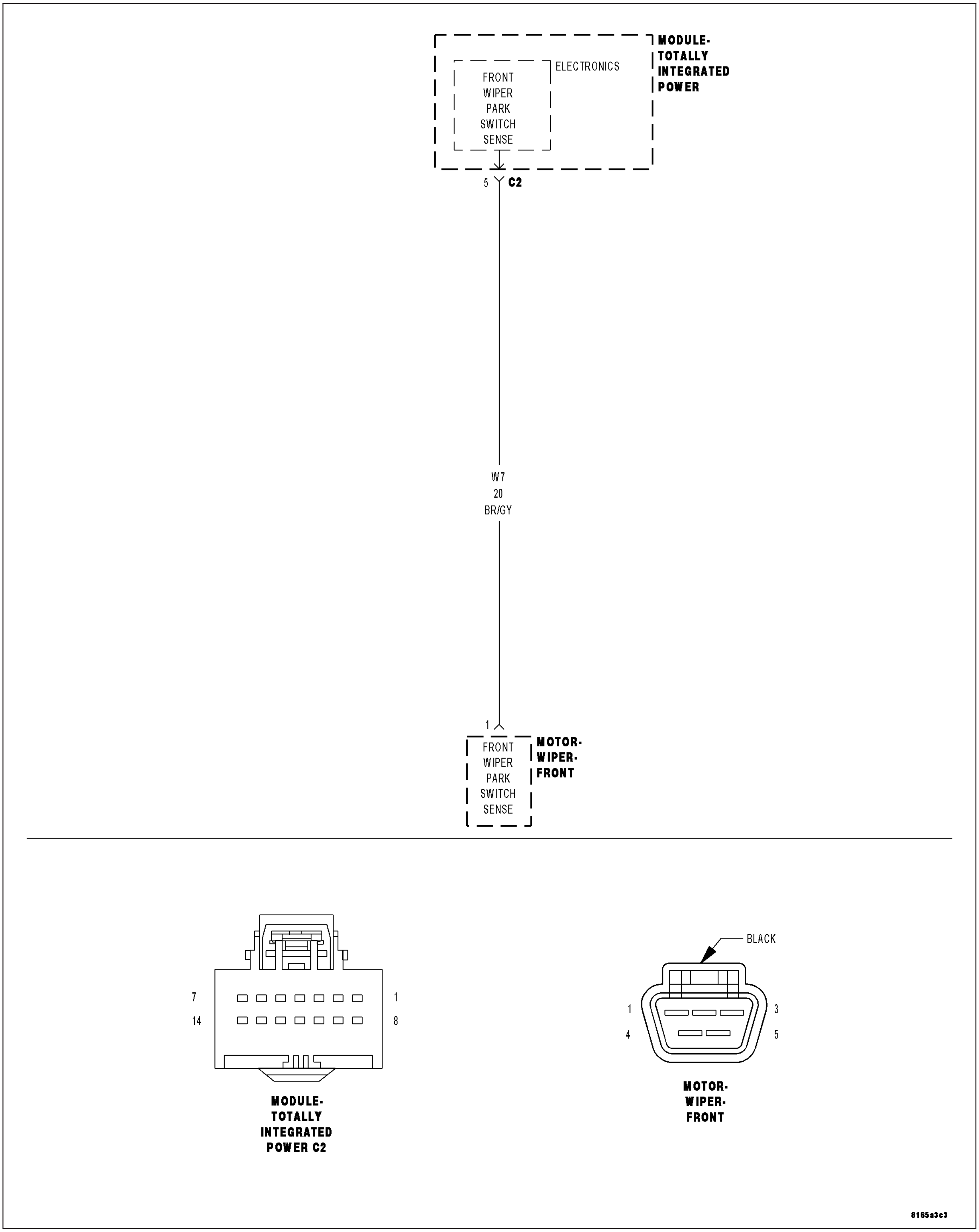
WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

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WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The TIPM detects a short to ground condition.

Possible Causes
FRONT WIPER MOTOR
(W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORT TO GROUND
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Wipers on.
With the Scan Tool, read the Wiper DTC's.

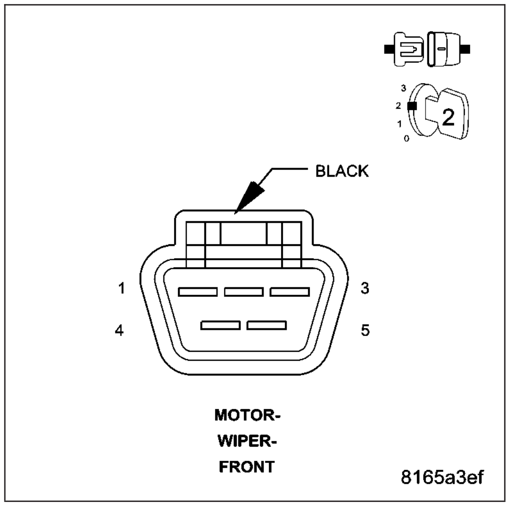
Does the Scan Tool read: B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. WIPER MOTOR

With the scan tool, erase DTCs.
Turn the ignition off.
Disconnect the Front Wiper Motor harness connector.
Turn the ignition on.
Wait 30 seconds
With the scan tool, read DTCs.

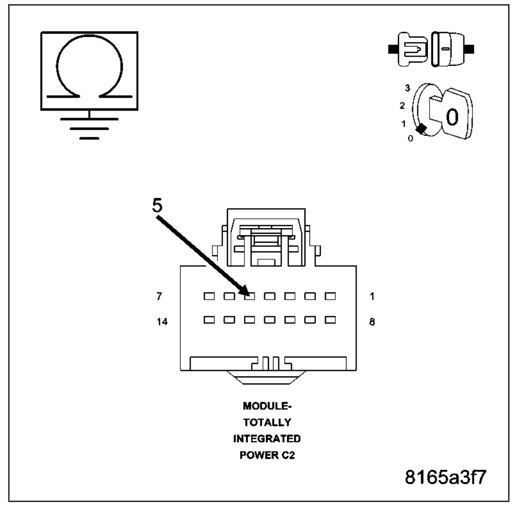


Does the Scan Tool read: B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH?

Yes >> Replace the Front Wiper Motor in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (W7) FRONT WIPER MOTOR PARK SWITCH SENSE CIRCUIT SHORT TO GROUND



Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Measure the resistance between ground and the (W7) Front Wiper Park Switch Sense circuit.

Is the resistance below 5.0 ohms?

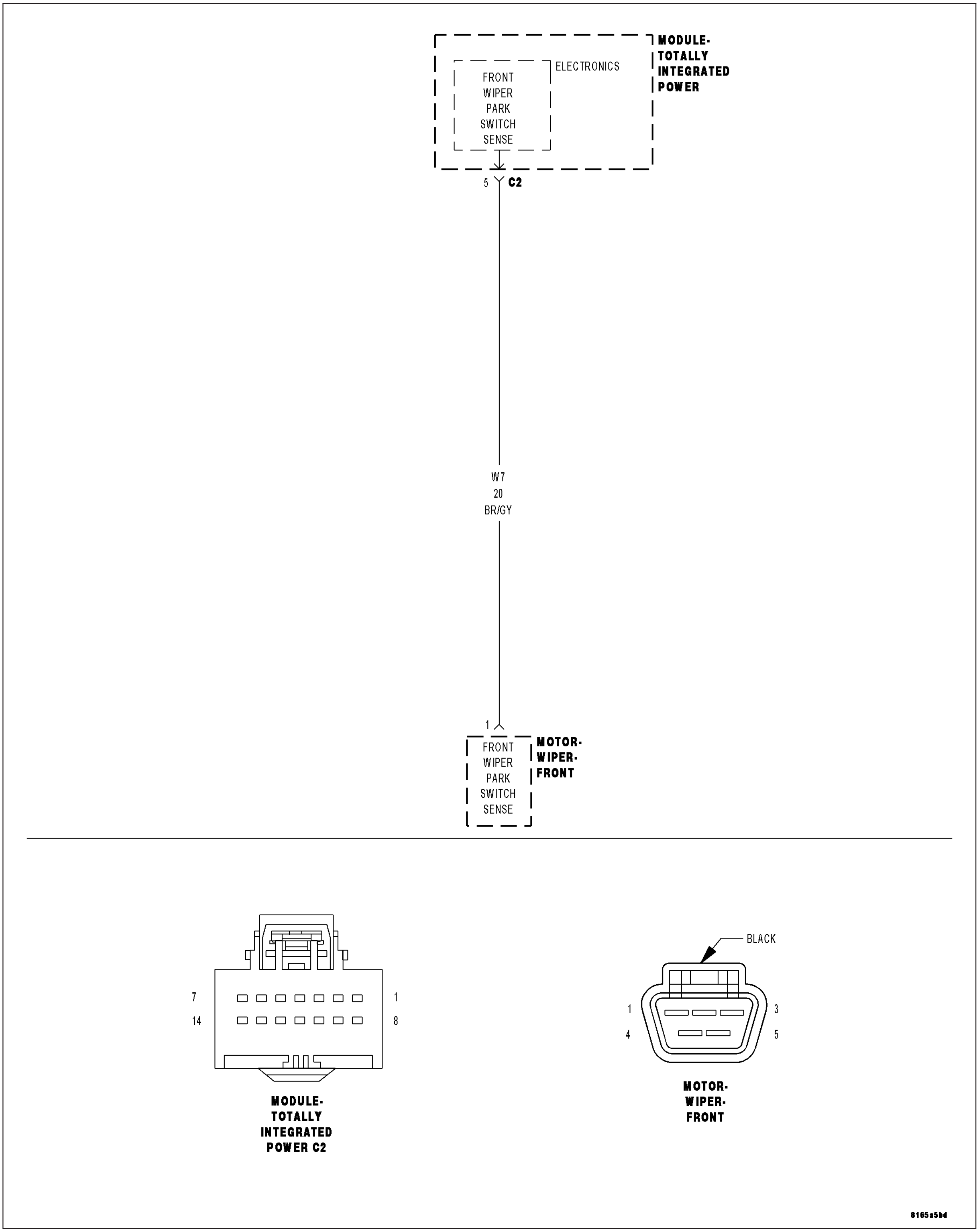
Yes >> Repair the (W7) Front Wiper Park Switch Sense circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- The TIPM detects an open condition.

Possible Causes
(W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Front Wipers on.

With the Scan Tool, read the Front Wiper DTC's.

Does the Scan Tool read: B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

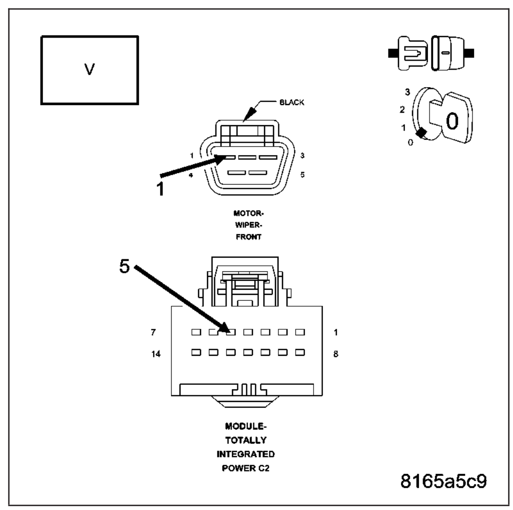
2. (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Front Wiper Motor harness connector.

Disconnect the TIPM C2 harness connector.

Measure the voltage on the (W7) Front Wiper Park Switch Sense circuit.



Is the voltage above 5.0 volts?

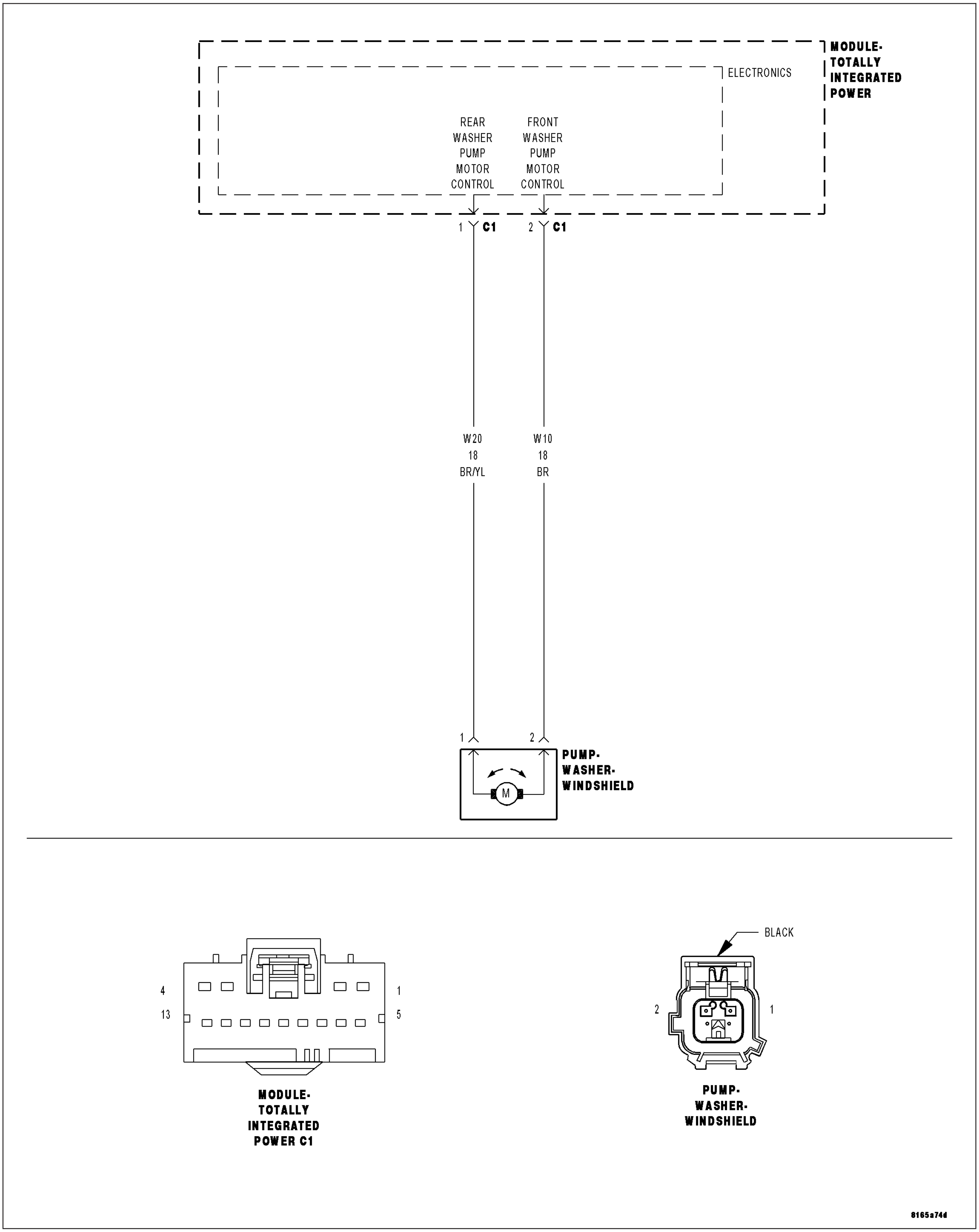
Yes >> Repair the (W7) Front Wiper Park Switch Sense circuit for a short to voltage.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the TIPM detects a short/low condition on the washer Pump Motor Control circuit.

Possible Causes
(W10)/(W20) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TOGETHER
(W10) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO GROUND
(W20) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO GROUND
WIPER WASHER PUMP
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all TIPM DTC's.
Turn the Washers on.
With the Scan Tool, read the Wiper/Washers DTC's.

Does the Scan Tool read: B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

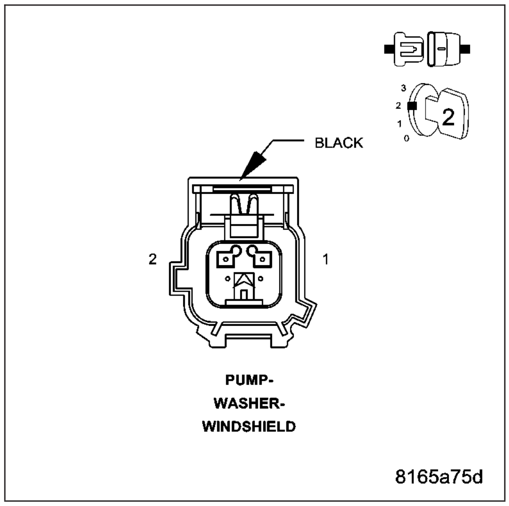
2. WASHER PUMP MOTOR

Turn the ignition off.
Disconnect the Washer Pump Motor connector.
Turn the ignition on.
With the Scan Tool, read the DTC's.

Does the Scan Tool read: B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Washer Pump Motor in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



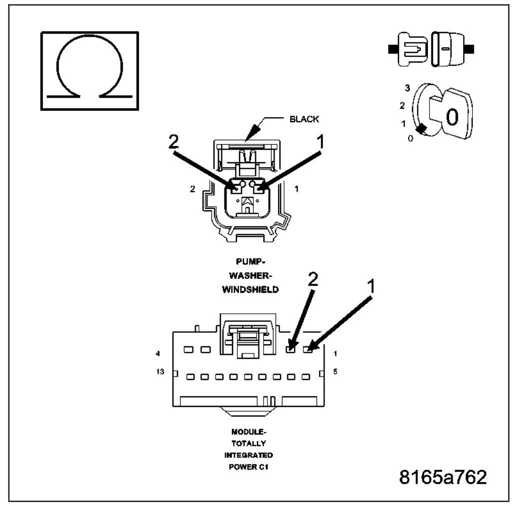
3. (W10)/(W20) WASHER PUMP MOTOR CONTROL CIRCUITS SHORT TOGETHER

Turn the ignition off.

Disconnect the Washer Pump Motor harness connector.

Disconnect the TIPM C1 harness connector.

Measure the resistance between the (W10) and (W20) Washer Pump Motor Control circuits.



Is the resistance below 5.0 ohms?

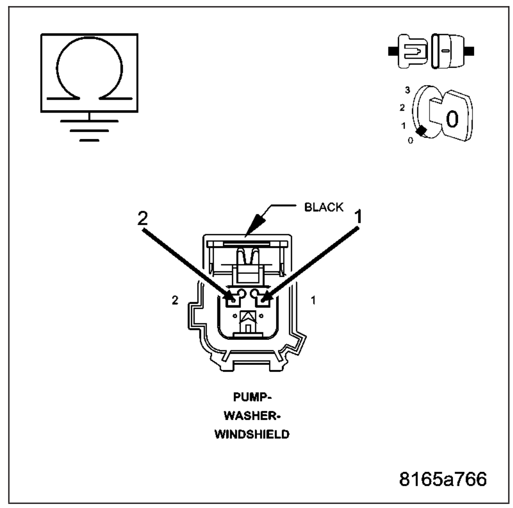
Yes >> Repair the (W10) and (W20) Washer Pump Motor Control circuits for a short together.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (W10) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (W10) Washer Pump Motor Control circuit.



Is the resistance below 5.0 ohms?

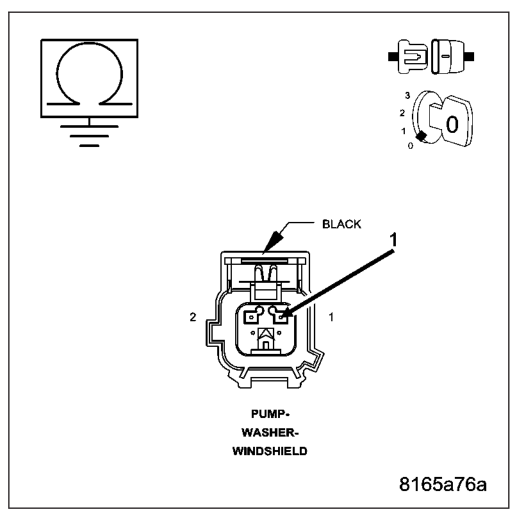
Yes >> Repair the (W10) Washer Pump Motor Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (W20) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (W20) Washer Pump Motor Control circuit.



Is the resistance below 5.0 ohms?

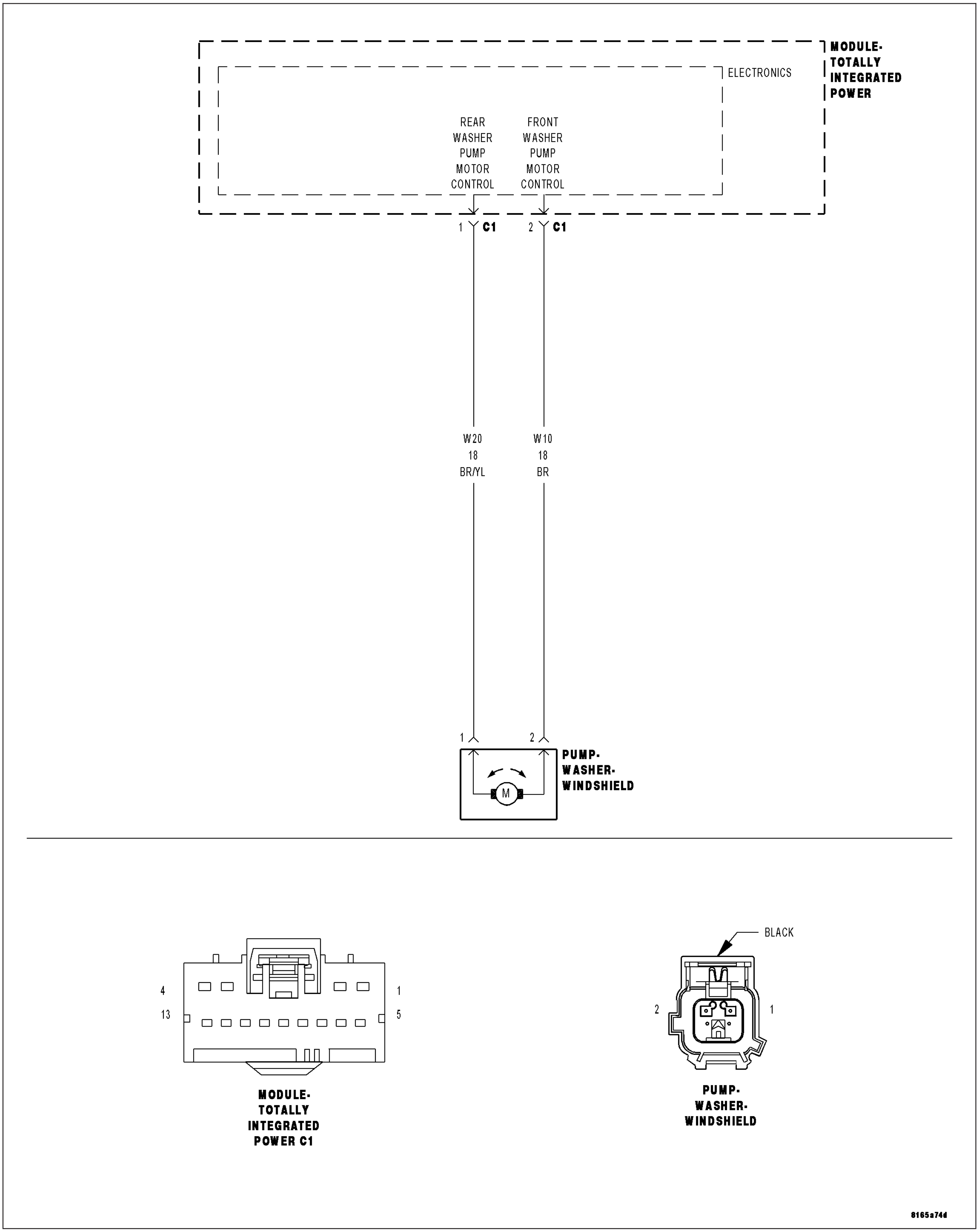
Yes >> Repair the (W20) Washer Pump Motor Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B2320-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects an open condition.

Possible Causes
(W10) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO VOLTAGE
(W20) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all TIPM DTC's.

Turn the Washers on.

With the Scan Tool, read the Wiper/Washers DTC's.

Does the Scan Tool read: B2320-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

2. (W10) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO VOLTAGE

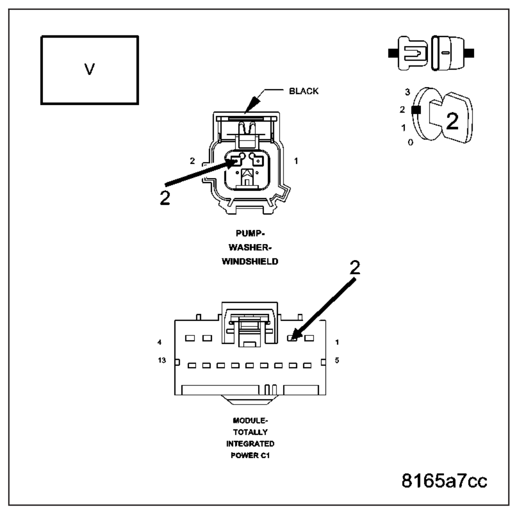
Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Disconnect the Washer Pump Motor harness connector.

Turn the ignition on.

Measure the voltage of the (W10) Washer Pump Motor Control circuit.



Is the voltage above 5.0 volts?

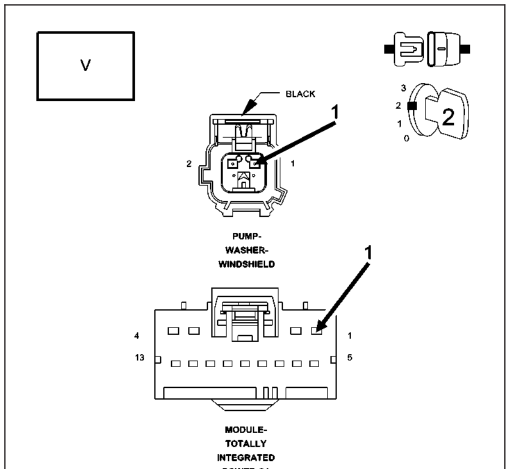
Yes >> Repair the (W10) Washer Pump Motor Control circuit for a short to voltage.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 3

3. (W20) WASHER PUMP MOTOR CONTROL CIRCUIT SHORT TO VOLTAGE

Measure the Voltage of the (W20) Washer Pump Motor Control circuit.



8165a7d0

Is the voltage above 5.0 volts?

Yes >> Repair the (W20) Washer Pump Motor Control circuit for a short to voltage.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A1) FUSED B+ CIRCUIT OPEN
REAR WIPER RELAY
FRONT CONTROL MODULE
INTEGRATED POWER MODULE

Diagnostic Test

1. (A1) FUSED B+ CIRCUIT OPEN

NOTE: Check all fuses and circuit breakers before proceeding with the diagnosis of this DTC.

Turn the ignition on.

Remove the Rear Wiper relay.

Measure the voltage at cavity 86 of the Rear Wiper Relay.

Is the voltage above 10.0 volts?

Yes >> Go To 2

No >> Check the (A1) Fused B+ circuit for an open.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

2. REAR WIPER RELAY

Turn the ignition off.

Replace the Rear Wiper Relay with a known good relay.

Turn the ignition on.

With the Scan Tool, clear all FCM DTC’s.

Turn the Rear Wipers ON then OFF.

With the Scan Tool, read the FCM DTC’s.

Does the Scan Tool read: B231B-WIPER ON/OFF CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Rear Wiper relay.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

3. INTEGRATED POWER MODULE

Turn the ignition off.

Disconnect the FCM from the IPM.

Turn the ignition on.

Measure the voltage on cavity 28 (Rear Wiper Relay Control) of the IPM.

Is the voltage above 10.0 volts?

Yes >> Replace the FCM in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the IPM in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
REAR WIPER RELAY
INTEGRATED POWER MODULE

Diagnostic Test

1. INTEGRATED POWER MODULE

Turn the ignition off.

Replace the Rear Wiper relay with a known good relay.

With the Scan Tool, clear all FCM DTC’s.

Turn the Rear Wipers ON then OFF.

With the Scan Tool, read the FCM DTC’s.

Does the Scan Tool read: B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH?

Yes >> Replace the Integrated Power Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2324-HEADLAMP WASHER MOTOR CONTROL CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
INTEGRATED POWER MODULE

Diagnostic Test

1. HEADLAMP WASHER RELAY

Turn the ignition off.

Replace the Rear Wiper relay with a known good relay.

With the Scan Tool, clear all FCM DTC's.

Turn the Rear Wipers ON then OFF.

With the Scan Tool, read the FCM DTC's.

Does the Scan Tool read: B2324-REAR WIPER MOTOR CONTROL CIRCUIT HIGH?

Yes >> Replace the Integrated Power Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.
Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2325-HEADLAMP WASHER MOTOR CONTROL CIRCUIT OPEN

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
INTEGRATED POWER MODULE

Diagnostic Test

1. INTEGRATED POWER MODULE

Turn the ignition off.

Replace the Wiper ON/OFF relay with a known good relay.

With the Scan Tool, clear all FCM DTC's.

Turn the Wipers ON then OFF.

With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2325-WIPER ON/OFF CONTROL CIRCUIT HIGH?

Yes >> Replace the Integrated Power Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

Perform the BODY VERIFICATION TEST — VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

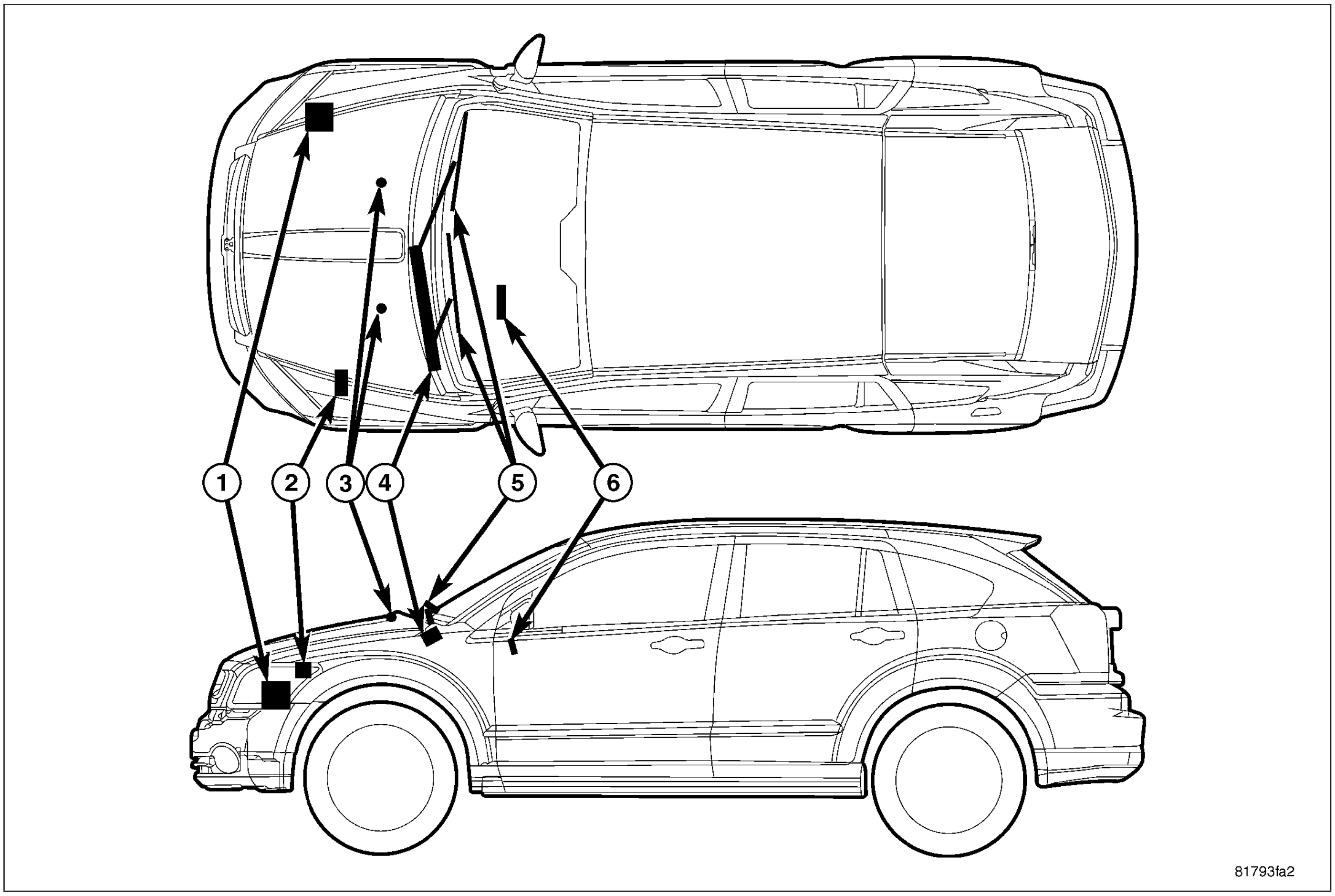
WIPERS/WASHERS - SERVICE INFORMATION

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WIPERS/WASHERS - SERVICE INFORMATION

DESCRIPTION

FRONT

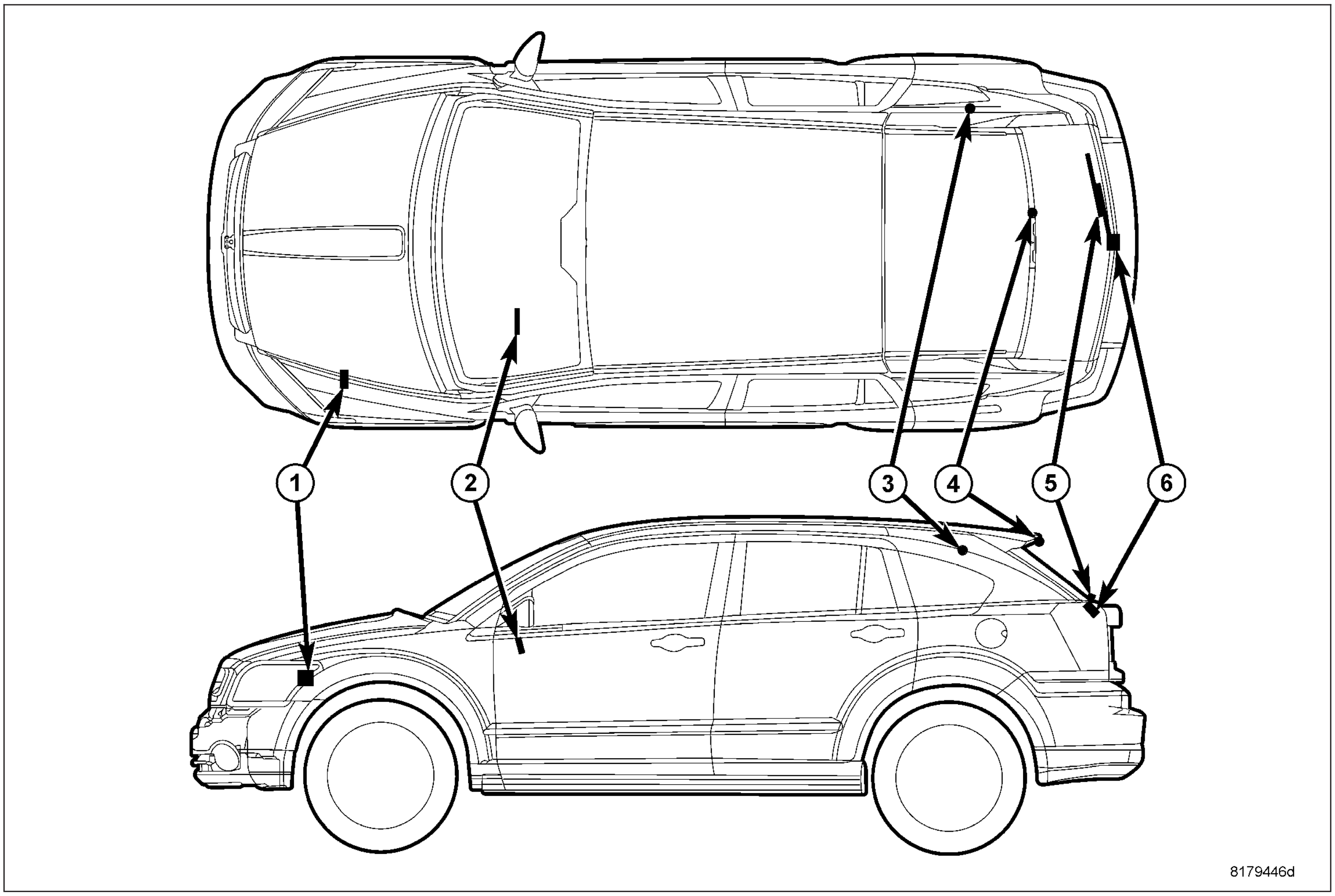


An electrically operated intermittent front wiper and washer system is standard factory-installed safety equipment on this vehicle. The wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **ElectroMechanical Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) is located on the instrument panel directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Front Washer Nozzle (3)** - Two fluidic front washer nozzles with integral check valves are secured by latch features to dedicated openings in the hood panel near the base of the windshield.
- **Front Washer Plumbing** - The plumbing for the washer system consists of rubber hoses and molded rubber or plastic fittings. The plumbing is routed to the engine compartment from the washer reservoir. The front washer hose is routed along the right side of the engine compartment to the cowl plenum panel, then across the underside of the inner hood panel reinforcement to the washer nozzles.
- **Front Wiper Arms And Blades (5)** - The two front wiper arms are secured with nuts to the threaded ends of the two wiper pivot shafts, which extend through the cowl plenum cover/grille panel located near the base of the windshield. The two unequal length front wiper blades are each secured to their wiper arm with an integral latch, and are parked on the glass near the bottom of the windshield when the front wiper system is not in operation.
- **Front Wiper Module (4)** - The wiper pivot shafts are the only visible components of the front wiper module. The remainder of the module is concealed within the cowl plenum beneath the cowl plenum cover/grille panel. The wiper module includes the wiper module bracket, three rubber-isolated wiper module mounts, the wiper motor, the wiper motor crank arm, the two wiper drive links, the two wiper pivots and the two pivot water shields.

- **Right Multi-Function Switch (6)** - The right (wiper) multi-function switch and the left (lighting) multi-function switch are secured to brackets integral to the clockspring housing on the top of the steering column just below the steering wheel. The right multi-function switch is connected by a short jumper harness to the Steering Control Module (SCM), which is internal to the left multi-function switch housing. Only the switch control stalk extending from the right side of the steering column is visible, while the remainder of the switch is concealed beneath the steering column shrouds. The right multi-function switch is dedicated to providing all of the driver controls for both the front and rear wiper and washer systems.
- **Steering Control Module** - The Steering Control Module (SCM) is internal to the left multi-function switch housing, which is secured to a bracket integral to the left side of the clockspring housing on the top of the steering column just below the steering wheel. Only the left switch control stalk extending from the left side of the steering column is visible, while the remainder of the switch housing containing the SCM is concealed beneath the steering column shrouds. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ STEERING COLUMN CONTROL MODULE - DESCRIPTION).
- **Totally Integrated Power Module (2)** - The Totally Integrated Power Module (TIPM) is located in the engine compartment, near the battery. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/TOTALLY INTEGRATED POWER MODULE - DESCRIPTION).
- **Washer Pump/Motor** - The reversible electric washer pump/motor unit is located in a dedicated hole in a sump area on the lower, forward facing surface of the washer reservoir, ahead of the right front wheel house. This single reversible washer pump/motor provides washer fluid to either the front or rear washer system plumbing, depending upon the direction of the pump motor rotation.
- **Washer Reservoir (1)** - The washer reservoir is located in the engine compartment ahead of the right front strut tower and wheel house. The filler neck and cap are accessed from the right front corner of the engine compartment.

REAR



An electrically operated fixed interval intermittent rear wiper and washer system is standard factory-installed equipment on this vehicle. The rear wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **ElectroMechanical Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) is located on the instrument panel directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Rear Washer Nozzle (4)** - The fluidic rear washer nozzle is integrated into the rear spoiler on the liftgate outer panel above the liftgate glass and is located to the right of the Center High-Mounted Stop Lamp (CHMSL).
- **Rear Washer Plumbing** - The plumbing for the rear washer system consists of rubber hoses, molded plastic fittings and a rear washer system check valve. The plumbing is routed along the right side of the engine compartment from the washer reservoir, through the dash into the passenger compartment, up the right cowl side and A-pillar to the headliner then through the upper liftgate opening header and the upper liftgate to the rear washer nozzle on the upper liftgate spoiler. The rear washer system check valve (3) connects the headliner washer hose to the liftgate washer hose and is located near the upper liftgate opening header behind the right upper D-pillar trim.
- **Rear Wiper Arm And Blade (5)** - The single rear wiper arm is secured by a nut directly to the rear wiper motor output shaft, which extends through a rubber grommet inserted into a hole in the center at the base of the liftgate glass. The rear wiper blade is secured to the rear wiper arm with an integral latch, and is parked near the base of the glass when the rear wiper system is not in operation.
- **Rear Wiper Motor (6)** - The rear wiper motor includes the motor bracket and three rubber-isolated wiper motor mounts. The wiper motor output shaft is the only visible component of the rear wiper motor. The remainder of the motor is concealed by the inner liftgate trim on the inside of the liftgate beneath the liftgate glass opening.
- **Right Multi-Function Switch (2)** - The right (wiper) multi-function switch and the left (lighting) multi-function switch are secured to brackets integral to the clockspring housing, on the top of the steering column just below the steering wheel. The right multi-function switch is connected by a short jumper harness to the Steering Control Module (SCM), which is internal to the left multi-function switch housing. Only the switch control stalk

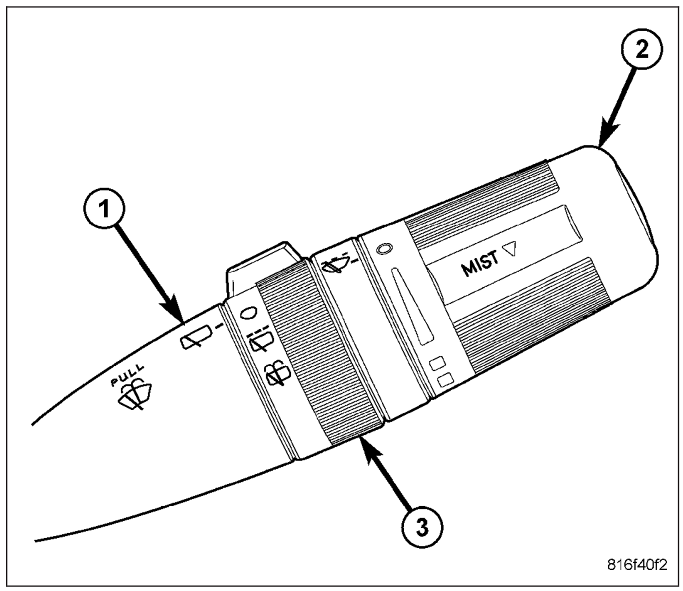
extending from the right side of the steering column is visible, while the remainder of the switch is concealed beneath the steering column shrouds. The right multi-function switch is dedicated to providing all of the driver controls for both the front and rear wiper and washer systems.

- **Steering Control Module** - The Steering Control Module (SCM) is internal to the left multi-function switch housing, which is secured to a bracket integral to the left side of the clockspring housing on the top of the steering column just below the steering wheel. Only the left switch control stalk extending from the left side of the steering column is visible, while the remainder of the switch housing containing the SCM is concealed beneath the steering column shrouds. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ STEERING COLUMN CONTROL MODULE - DESCRIPTION).
- **Totally Integrated Power Module (1)** - The Totally Integrated Power Module (TIPM) is located in the engine compartment, near the battery. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/TOTALLY INTEGRATED POWER MODULE - DESCRIPTION).
- **Washer Reservoir** - The rear washer system shares a single reservoir and reversible pump with the front washer system, but has its own dedicated plumbing. The washer reservoir is located in the engine compartment ahead of the right front strut tower and wheel house. The filler neck and cap are accessed from the right front corner of the engine compartment.

OPERATION

FRONT

The front wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the windshield glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blades to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outer surface of the windshield glass that might be encountered while driving the vehicle under numerous types of inclement operating conditions.



The vehicle operator initiates all front and rear wiper and washer system functions with the control stalk of the right (wiper) multi-function switch (1) that extends from the right side of the steering column, just below the steering wheel. Rotating the control knob (2) on the end of the control stalk, selects the OFF, DELAY, LOW, or HIGH front wiper system operating modes. In the DELAY mode, the control knob also allows the vehicle operator to select from one of five intermittent wipe delay intervals.

Pulling the control stalk rearward actuates the momentary front washer system switch, which selects the WASH and WIPE-AFTER-WASH modes, depending upon when and how long the switch is held closed. Pushing the control stalk downward actuates a momentary switch and selects the MIST mode, which cycles the wiper blades for as long as the switch is held closed then completes the current cycle and parks the blades at the base of the windshield after the switch is released.

The right multi-function switch provides hard wired analog and resistor multiplexed inputs to the Steering Control Module (SCM) internal to the left (lighting) multi-function switch housing for all of the wiper and washer system functions. The SCM then sends electronic **wiper** and **washer switch** status messages to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN), over a Local Interconnect Network (LIN) data bus. The EMIC responds to the SCM inputs by sending electronic **wiper** and **washer system** request messages to the Totally Integrated Power Module (TIPM) over the Controller Area Network (CAN) data bus requesting the appropriate wiper and washer system operating modes.

Front wiper and washer system operation is completely controlled by the SCM, EMIC and TIPM logic circuits, and that logic will only allow these systems to operate when the ignition switch is in the ACCESSORY or ON positions. The TIPM uses intelligent, high current, self-protected high side switches to control wiper system operation by energizing or de-energizing the wiper motor low and high speed brushes. The TIPM uses an H-bridge circuit to control the operation of the reversible washer pump/motor unit. The right multi-function switch circuitry receives battery current and a clean ground output from the SCM, then provides analog and multiplexed inputs to the SCM to indicate the selected front wiper and front washer system mode.

To diagnose the front wiper and washer system or the electronic controls and communication related to front wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the front wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the LOW position of the control knob on the control stalk of the right (wiper) multi-function switch is selected the SCM sends an electronic **wiper switch low** status message to the EMIC over the LIN data bus, the EMIC relays an electronic **wiper switch low** request message to the TIPM over the CAN data bus, then the TIPM directs battery current to the low speed brush of the wiper motor, causing the wipers to cycle at low speed.

When the HIGH position of the control knob is selected the SCM sends an electronic **wiper switch high** status message to the EMIC, the EMIC relays an electronic **wiper switch high** request message to the TIPM, then the TIPM directs battery current to the high speed brush of the wiper motor, causing the wipers to cycle at high speed.

When the OFF position of the multi-function switch control knob is selected, the SCM sends an electronic **wiper switch off** status message to the EMIC, the EMIC relays an electronic **wiper switch off** request message to the TIPM, then one of two events will occur. The event that occurs depends upon the position of the wiper blades on the windshield at the moment that the control knob OFF position is selected.

If the wiper blades are in the down position on the windshield when the OFF position is selected, the park switch that is integral to the wiper motor is closed to ground, which provides a hard wired park switch sense input to the TIPM. The TIPM then de-energizes the wiper motor and the wiper motor ceases to operate. If the wiper blades are not in the down position on the windshield at the moment the OFF position is selected, the park switch is an open circuit and the TIPM continues running the wiper motor at low speed until the wiper blades are in the down position on the windshield and the park switch input to the TIPM is again closed to ground.

INTERMITTENT WIPE MODE

When the control knob on the control stalk of the right (wiper) multi-function switch is moved to one of the five DELAY interval positions the SCM sends an electronic **wiper switch delay interval** status message to the EMIC, the EMIC relays an electronic **wiper switch delay interval** request message to the TIPM, then the TIPM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input.

The TIPM monitors the changing state of the wiper motor park switch through a hard wired park switch sense input. This input allows the TIPM to determine the proper intervals at which to energize and de-energize the wiper motor intermittently for one low speed cycle at a time.

The TIPM logic is also programmed to provide vehicle speed sensitivity to the selected intermittent wipe delay intervals. In order to provide this feature the TIPM monitors electronic **vehicle speed** messages from the Controller Antilock Brake (CAB) and doubles the selected delay interval whenever the vehicle speed is about 16 kilometers-per-hour (10 miles-per-hour) or less.

MIST WIPE MODE

When the control stalk of the right (wiper) multi-function switch is moved downward to the momentary MIST position, the SCM sends an electronic **wiper mist mode** status message to the EMIC, the EMIC relays an electronic **wiper mist mode** request message to the TIPM, then the TIPM energizes the low speed brush of the wiper motor for as long as the switch is held closed, then de-energizes the motor when the state of the switch changes to open, parking the wiper blades near the base of the windshield. The TIPM can operate the front wiper motor in this mode for

only one low speed cycle at a time, or for an indefinite number of sequential low speed cycles, depending upon how long the switch is held closed.

WASH MODE

When the control stalk of the right (wiper) multi-function switch is pulled rearward to the front momentary WASH position for more than about one-half second with the wiper system operating, the SCM sends an electronic **washer switch** status message to the EMIC, the EMIC relays an electronic **washer switch** request message to the TIPM, then the TIPM directs battery current and ground to the washer pump/motor. This will cause the washer pump/motor to be energized in the front wash direction for as long as the switch is held closed and to be de-energize when the control stalk is released.

When the control stalk is pulled rearward to the front momentary WASH position while the front wiper system is operating in one of the delay interval positions, the washer pump/motor operation is the same. However, the TIPM also overrides the selected delay interval and operates the front wiper motor in a continuous low speed mode for as long as the control stalk is held in the front momentary WASH position, then reverts to the selected delay interval several wipe cycles after the control stalk is released. If the WASH switch is held closed for more than approximately 10 seconds, the TIPM will suspend washer pump/motor operation until the control stalk is released for about 2 seconds and then cycled back to the WASH position.

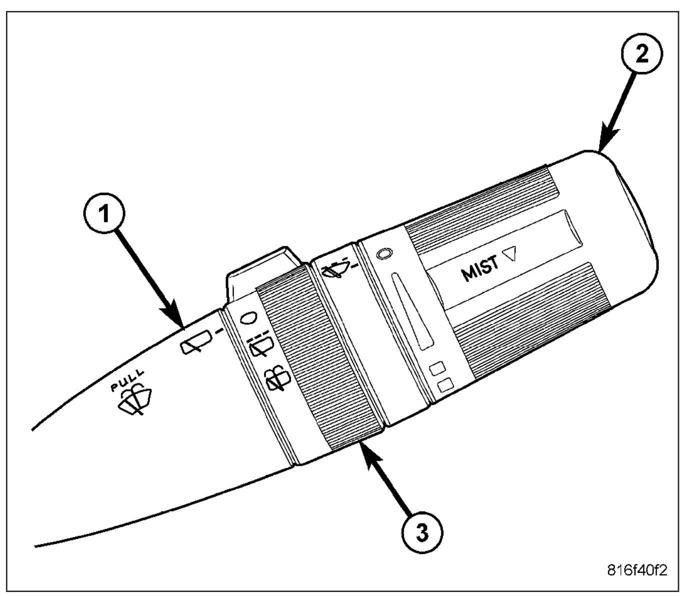
WIPE-AFTER-WASH MODE

When the control stalk of the right (wiper) multi-function switch is pulled rearward to the front momentary WASH position for more than about one-half second while the wiper system is not operating, the SCM sends an electronic **washer switch** status message to the EMIC, the EMIC relays an electronic **washer switch** request message to the TIPM, and the TIPM directs battery current and ground to the washer pump/motor and energizes the wiper motor in a continuous low speed mode for as long as the switch is held closed (up to approximately 10 seconds). When the control stalk is released, the TIPM de-energizes the washer pump/motor, but allows the wiper motor to operate for two or three additional wipe cycles before it de-energizes the wiper motor and parks the wiper blades near the base of the windshield.

If the control stalk is held rearward for more than about 10 seconds, the TIPM will suspend washer pump/motor operation until the stalk is released for about 2 seconds and then cycled back to the WASH position; however, the wipers will continue to operate for as long as the switch is held closed. The TIPM monitors the changing state of the wiper motor park switch through a hard wired wiper park switch sense circuit input. This input allows the TIPM to count the number of wipe cycles that occur after the control stalk is released, and to determine the proper interval at which to de-energize the wiper motor to complete the WIPE-AFTER-WASH mode cycle.

REAR

The rear wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the liftgate glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blade to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outer surface of the liftgate glass that might be encountered while driving the vehicle under numerous types of inclement operating conditions.



The vehicle operator initiates all front and rear wiper and washer system functions with the control stalk (1) of the right (wiper) multi-function switch that extends from the right side of the steering column, just below the steering

wheel. Rotating the control sleeve (3) on the control stalk to the OFF or INTERMITTENT detent positions or the momentary WASH position selects the rear wiper and washer system operating modes.

The right multi-function switch provides hard wired analog and resistor multiplexed inputs to the Steering Control Module (SCM) integral to the left (lighting) multi-function switch for all of the wiper and washer system functions. The SCM then sends electronic **rear wiper/washer switch** status messages to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) over a Local Interconnect Network (LIN) data bus. The EMIC then sends electronic **rear wiper/washer switch** request messages to the Totally Integrated Power Module (TIPM) over the Controller Area Network (CAN) data bus requesting the appropriate rear wiper and washer system operating modes.

Rear wiper and washer system operation is completely controlled by the SCM, EMIC and TIPM logic circuits, and that logic will only allow these systems to operate when the ignition switch is in the ACCESSORY or ON positions. The TIPM uses intelligent, high current, self-protected high side switches to control wiper system operation by energizing or de-energizing the rear wiper motor. The TIPM uses an H-bridge circuit to control the operation of the reversible washer pump/motor unit. The right multi-function switch circuitry receives a clean ground output from the SCM on a multi-function switch return circuit, then provides resistor multiplexed inputs to the SCM to indicate the selected rear wiper and rear washer system mode.

To diagnose the rear wiper and washer system or the electronic controls and communication related to rear wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the rear wiper and washer system operating modes.

INTERMITTENT WIPE MODE

When the INTERMITTENT WIPE position of the control sleeve on the control stalk of the right multi-function switch is selected, the SCM sends an electronic **rear wiper switch** status message to the EMIC over the LIN data bus, then the EMIC relays an electronic **rear wiper switch** request message to the TIPM over the CAN data bus, and the TIPM directs battery current to the rear wiper motor at fixed delay intervals to enable the rear wiper motor intermittent wipe mode.

WASH MODE

When the control sleeve of the right multi-function switch is rotated counterclockwise past the INTERMITTENT detent position to the momentary rear WASH position, the SCM sends an electronic **rear washer switch** status message to the EMIC over the LIN data bus, then the EMIC relays an electronic **rear washer switch** request message to the TIPM over the CAN data bus, and the TIPM directs battery current to the rear wiper motor and directs battery current and ground to the washer pump/motor unit. These outputs will cause the washer pump motor and the rear wiper motor to operate continuously for as long as the switch is held closed up to approximately 10 seconds. The washer pump is de-energized as soon as the control sleeve is released, but the rear wiper motor continues to operate for two to three continuous cycles before reverting to the fixed delay interval operation. The TIPM uses a hard wired output from a park switch internal to the rear wiper motor as an additional logic input to monitor the position of the rear wiper blade on the glass and to control the number of continuous wiper sweeps following washer operation.

DIAGNOSIS AND TESTING

FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

If the front wiper motor operates, but the wipers do not move on the windshield, replace the ineffective front wiper module. If the washer pump/motor operates, but no washer fluid is dispensed on the glass; or, if the wipers operate, but chatter, lift, or do not clear the glass, clean and inspect the front wiper and washer system components as required. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - CLEANING - FRONT) and (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - INSPECTION - FRONT).

The hard wired front wiper and washer system circuits and components may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the front wiper and washer system or the electronic controls or communication between other modules and devices that provide some features of the front wiper and washer system. The most reliable, efficient, and accurate means to diagnose the front wiper and washer system or the electronic controls and communication related to front wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER MOTOR DOES NOT OPERATE IN ANY SWITCH POSITION	1. Ineffective ground circuit.	1. Test and repair open wiper motor ground circuit if required.
	2. Ineffective switch.	2. Test and replace right multi-function switch if required. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING).
	3. Ineffective switch jumper harness.	3. Test and repair or replace open multi-function switch jumper harness if required.
	4. Ineffective SCM.	4. Use a diagnostic scan tool to check for SCM Diagnostic Trouble Codes (DTCs) and correct if required. Refer to the appropriate diagnostic information.
	5. Ineffective LIN bus.	5. Use a diagnostic scan tool to check for LIN DTCs and correct if required. Refer to the appropriate diagnostic information.
	6. Ineffective EMIC (CCN).	6. Use a diagnostic scan tool to check for CCN DTCs and correct if required. Refer to the appropriate diagnostic information.
	7. Ineffective CAN bus.	7. Use a diagnostic scan tool to check for CAN DTCs and correct if required. Refer to the appropriate diagnostic information.
	8. Ineffective TIPM.	8. Use a diagnostic scan tool to check for TIPM DTCs and correct if required. Refer to the appropriate diagnostic information.
	9. Ineffective wiper motor.	9. Test and replace open or shorted wiper motor as required.

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER MOTOR OPERATES SLOWLY IN ALL SWITCH POSITIONS	1. Ineffective wiper motor.	1. Check amperage draw with linkage disconnected from wiper motor crank arm. Correct draw should be about 6 amperes. If incorrect, refer to the appropriate Possible Cause that follows:
	2. Amperage draw too low.	2. Test and repair shorted low or high speed feed circuit if required.
	3. Amperage draw too high.	3. With linkage disconnected from wiper motor crank arm check linkage and pivots for binding. If binding is detected, repair or replace front wiper module if required. If no linkage binding detected, replace the front wiper motor if required.
WIPERS RUN AT HIGH SPEED WITH SWITCH LOW SPEED SELECTED OR AT LOW SPEED WITH SWITCH HIGH SPEED SELECTED	1. Ineffective motor feed circuit wiring.	1. Test and repair low speed and high speed feed circuit wiring between TIPM and front wiper motor if required.
	2. Ineffective switch wiring.	2. Test and repair jumper harness wiring between right multi-function switch and SCM (left multi-function switch) if required.
	3. Ineffective right multi-function switch.	3. Test and replace right multi-function switch if required. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING).

REAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment, possible personal injury or death.

If the rear wiper motor operates, but the wiper motor output shaft does not move, replace the ineffective rear wiper motor. If the washer pump/motor operates, but no washer fluid is dispensed on the glass; or, if the wiper operates, but chatters, lifts, or does not clear the glass, clean and inspect the rear wiper and washer system components as required. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - CLEANING - REAR) and (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - INSPECTION - REAR).

The hard wired rear wiper and washer system circuits and components may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

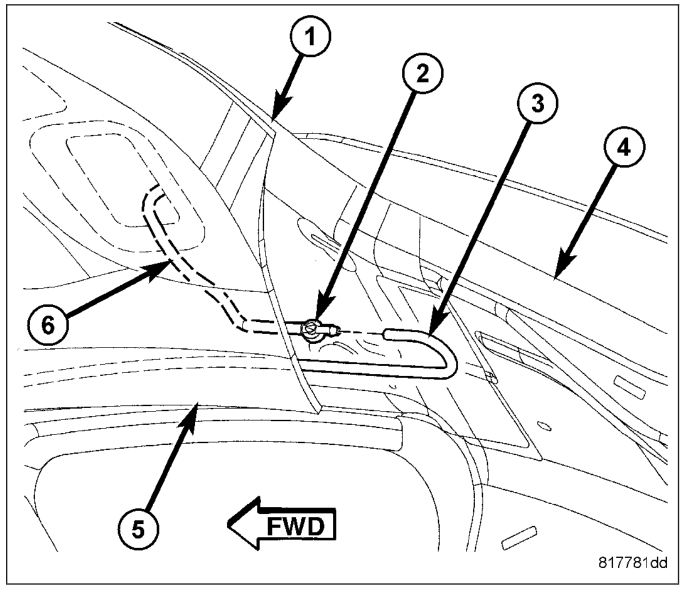
However, conventional diagnostic methods will not prove conclusive in the diagnosis of the rear wiper and washer system or the electronic controls or communication between other modules and devices that provide some features of the rear wiper and washer system. The most reliable, efficient, and accurate means to diagnose the rear wiper and washer system or the electronic controls and communication related to rear wiper and washer system operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CONDITION	POSSIBLE CAUSES	CORRECTION
WIPER MOTOR DOES NOT OPERATE IN ANY SWITCH POSITION	1. Ineffective wiper motor ground circuit.	1. Test and repair open wiper motor ground circuit if required.
	2. Ineffective right multi-function switch.	2. Test and replace right multi-function switch if required. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING).
	3. Ineffective multi-function switch jumper harness.	3. Test and repair or replace open multi-function switch jumper harness if required.
	4. Ineffective SCM.	4. Use a diagnostic scan tool to check for SCM Diagnostic Trouble Codes (DTCs) and correct if required. Refer to the appropriate diagnostic information.
	5. Ineffective LIN bus.	5. Use a diagnostic scan tool to check for LIN DTCs and correct if required. Refer to the appropriate diagnostic information.
	6. Ineffective EMIC (CCN).	6. Use a diagnostic scan tool to check for CCN DTCs and correct if required. Refer to the appropriate diagnostic information.
	7. Ineffective CAN bus.	7. Use a diagnostic scan tool to check for CAN DTCs and correct if required. Refer to the appropriate diagnostic information.
	8. Ineffective TIPM.	8. Use a diagnostic scan tool to check for TIPM DTCs and correct if required. Refer to the appropriate diagnostic information.
	9. Ineffective wiper motor.	9. Test and replace open or shorted wiper motor if required.
WIPER MOTOR OPERATES SLOWLY	1. Improper wiper motor amperage draw.	1. Check amperage draw with wiper arm disconnected from rear wiper motor output shaft. Correct draw should be about 6 amperes. If incorrect, refer to the appropriate Possible Cause that follows:
	2. Amperage draw too low.	2. Test and repair the shorted rear wiper motor signal and fused ignition switch output (run - accessory) circuits if required.
	3. Amperage draw too high.	3. With wiper arm disconnected from wiper motor output shaft check for binding between output shaft and rubber grommet in liftgate glass. If binding is detected, lubricate or replace grommet if required. If no binding is detected, replace the wiper motor if required.

CHECK VALVE

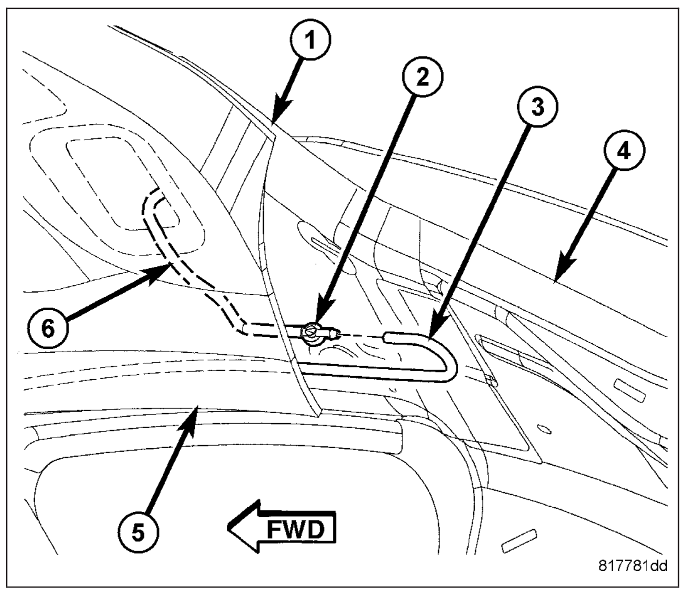
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Partially remove the quarter trim from the right upper D-pillar (4). (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Pull the headliner (5) away from the upper liftgate opening header (1) far enough to access and disconnect the liftgate washer supply hose (6) and the headliner washer supply hose (3) from the barbed nipple on each side of the check valve (2).
4. Remove the check valve.



INSTALLATION

1. Position the rear check valve (2) between the upper liftgate opening header (1) and the headliner (5). Be certain that the raised arrow that indicates the flow direction on the center section of the valve is pointed toward the liftgate washer supply hose (6).
2. Reconnect the liftgate washer supply hose and the headliner washer supply hose (3) to the barbed nipples of the valve.
3. Reinstall the quarter trim onto the right upper D-pillar (4). (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
4. Reconnect the battery negative cable.

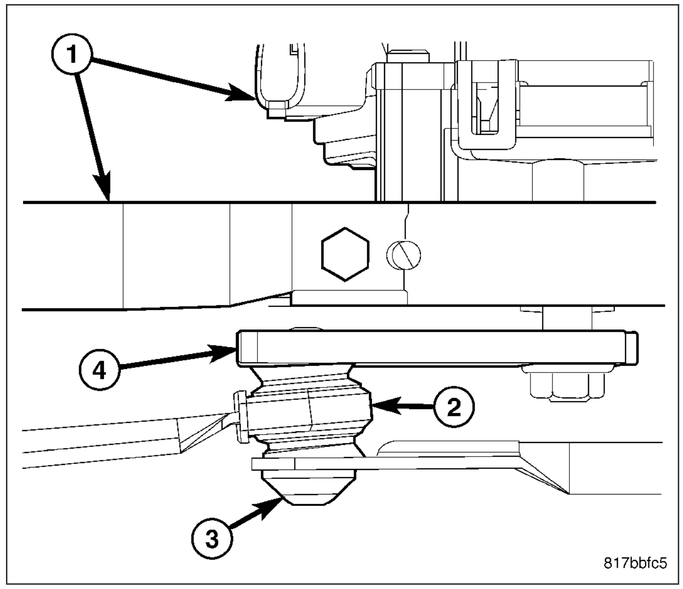


FRONT WIPER MOTOR

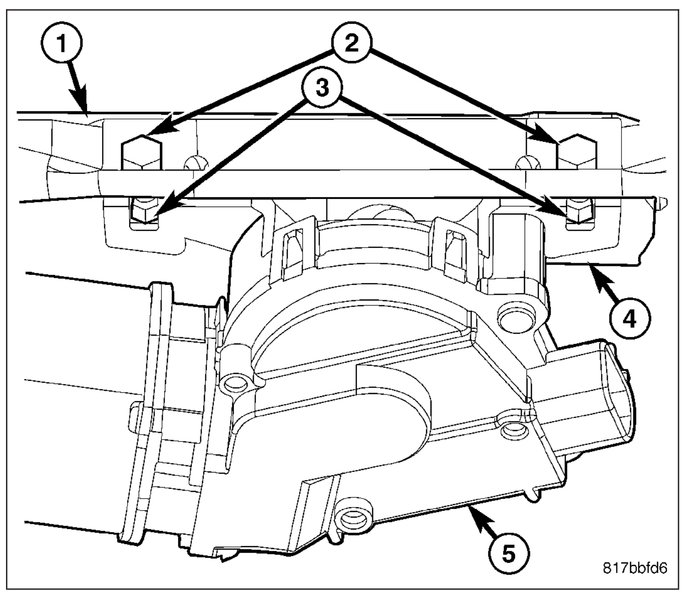
REMOVAL

CAUTION: Do not apply pressure to, or pry on, the plastic drive link bushings. When removing the drive link from, or installing the drive link to the ball stud on the wiper motor crank arm, apply pressure to, or pry on, only the metal portions of the drive link around the bushing. If the bushing is damaged, the entire front wiper module MUST be replaced.

CAUTION: Do not remove the crank arm nut from the wiper motor output shaft. The crank arm is indexed to the output shaft with the motor in the park position during the manufacturing process, but there are no provisions made for correctly indexing this connection in the field. If the crank arm to output shaft indexing is incorrect, the entire front wiper module MUST be replaced.



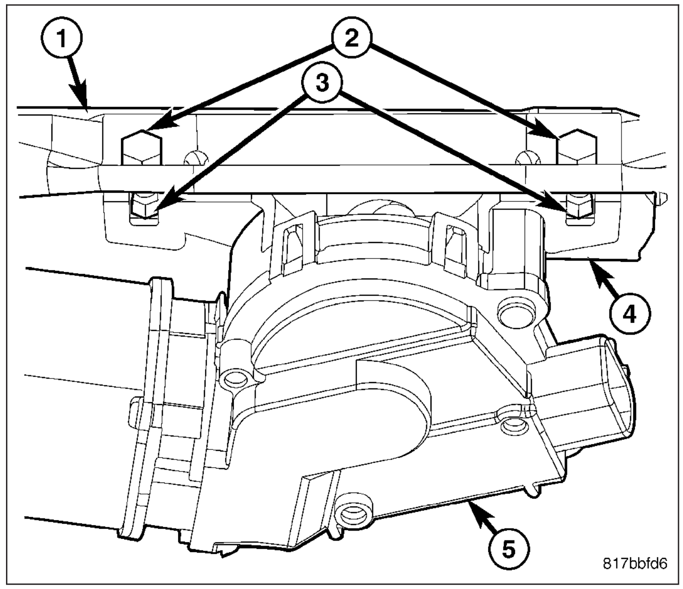
1. Disconnect and isolate the battery negative cable.
2. Remove the front wiper module (1) from the vehicle. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL/FRONT WIPER MODULE).
3. Disengage the socket bushing (3) of the passenger side wiper drive link from the ball stud on the wiper motor crank arm (4) using two large screwdrivers, one on each side of the ball stud. Pry firmly and evenly between the crank arm and the metal portion of the drive link until the socket unsnaps from the ball.
4. Remove the sleeve bushing (2) of the driver side wiper drive link from the ball stud on the wiper motor crank arm.
5. Remove the two screws (2) that secure the motor bracket (4) to the module bracket (1).
6. Remove the wiper motor and crank arm unit (5) from the underside of the module bracket.



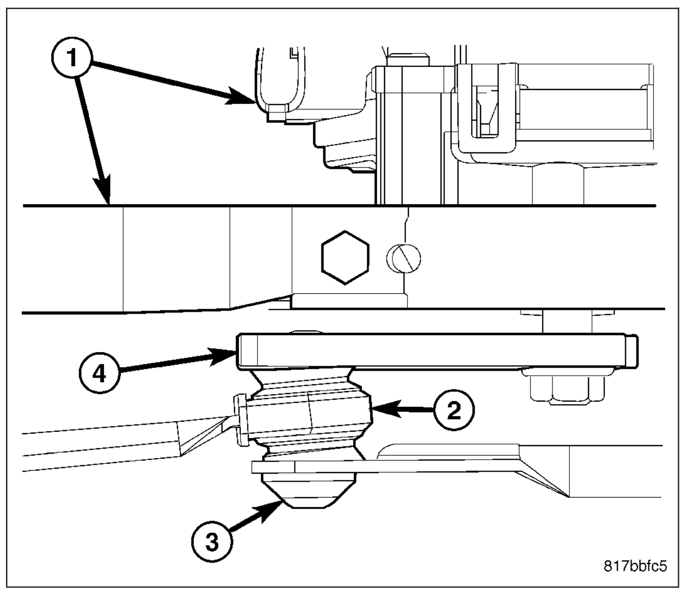
INSTALLATION

CAUTION: Do not apply pressure to, or pry on, the plastic drive link bushings. When removing the drive link from, or installing the drive link to the ball stud on the wiper motor crank arm, apply pressure to, or pry on, only the metal portions of the drive link around the bushing. If the bushing is damaged, the entire front wiper module MUST be replaced.

CAUTION: Do not remove the crank arm nut from the wiper motor output shaft. The crank arm is indexed to the output shaft with the motor in the park position during the manufacturing process, but there are no provisions made for correctly indexing this connection in the field. If the crank arm to output shaft indexing is incorrect, the entire front wiper module MUST be replaced.



1. Position the front wiper motor and crank arm unit (5) to the underside of the front wiper module bracket (1).
2. Install and tighten the two screws (2) into the two nuts (3) that secure the motor bracket (4) to the module brackeT.
3. Position the sleeve bushing (2) of the driver side wiper drive link onto the ball stud on the end of the motor crank arm (4).
4. Position the socket bushing (3) of the passenger side wiper drive link over the ball stud on the crank arm.
5. Place a short 19 millimeter or 3/4 inch socket over the domed cap side of the socket bushing as an installation tool. Use large channel-lock pliers to firmly and evenly apply enough pressure to the underside of the crank arm and the top of the socket installation tool to snap the bushing onto the ball stud. **Do not apply pressure directly to the plastic bushings.**



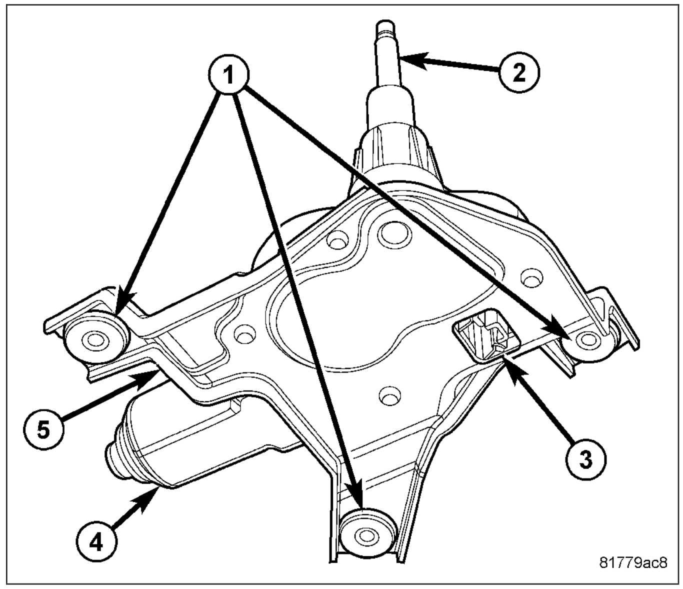
NOTE: Be certain to turn the ignition switch to the ON position, then turn the front wiper switch ON and OFF again to cycle the wiper motor and linkage to their natural park position before reinstalling the front wiper arms onto the wiper pivots.

6. Reinstall the front wiper module (1) into the vehicle. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION/FRONT WIPER MODULE).
7. Reconnect the battery negative cable.

REAR WIPER MOTOR

DESCRIPTION

The rear wiper motor (4) is concealed within the liftgate, below the liftgate glass and behind the liftgate inner trim panel. The end of the motor output shaft (2) that extends through the lower edge of the liftgate glass to drive the rear wiper arm and blade is the only visible component of the rear wiper motor. A rubber grommet is engaged within the output shaft hole of the liftgate glass and seals the output shaft where it passes through the glass. An integral connector receptacle (3) connects the rear wiper motor to the vehicle electrical system through a dedicated take out and connector of the liftgate wire harness. The rear wiper motor consists of the following major components:



- **Bracket (5)** - The rear wiper motor bracket consists of a stamped metal mounting plate for the wiper motor that is secured to the wiper motor housing, and through three screws with rubber isolators (1) to the liftgate inner panel.
- **Motor** - The single-speed permanent magnet rear wiper motor is secured to the rear wiper motor bracket. The wiper motor includes an integral transmission, motor output shaft, automatic resetting circuit breaker and the rear wiper motor park switch.

The rear wiper motor cannot be adjusted or repaired. If any component of the motor is ineffective or damaged, the entire rear wiper motor unit must be replaced. The motor output shaft rubber grommet is available for individual service replacement.

OPERATION

The rear wiper motor operation is controlled by the Totally Integrated Power Module (TIPM), which uses intelligent, high current, self-protected high side switches to control rear wiper system operation for energizing or de-energizing the rear wiper motor. The TIPM uses internal programming and electronic messages received over the Controller Area Network (CAN) data bus from the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) to provide the appropriate rear wiper and washer system operating modes. The EMIC uses electronic messages received from the Steering Control Module (SCM) over a Local Interconnect Network (LIN) data bus to determine when to send electronic rear wiper system requests to the TIPM.

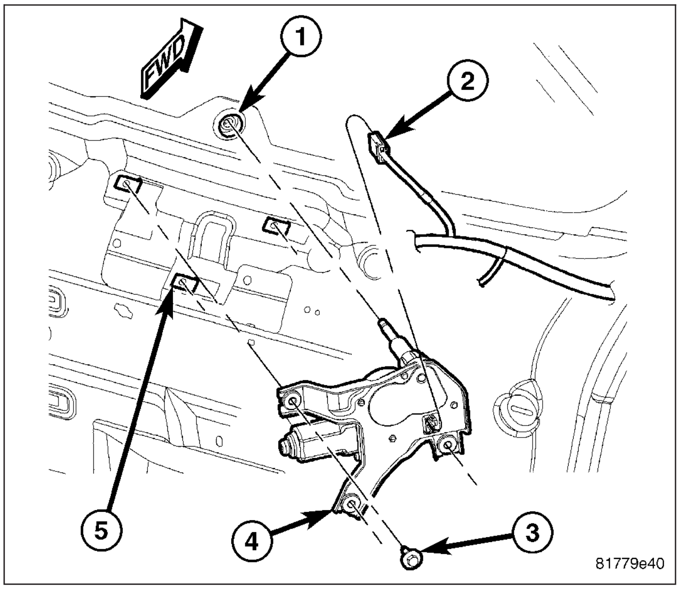
The rear wiper motor park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes and opens a path to ground for the rear wiper motor electronic control logic circuitry of the TIPM, depending upon the position of the rear wiper blade on the liftgate glass. This input allows the electronic logic circuits of the TIPM to control all of the electronic features of rear wiper motor operation and to keep the motor energized long enough to complete its current wipe cycle and park the wiper blade after the wiper system or the ignition switch has been turned OFF.

The rear wiper motor is grounded at all times through a take out with an eyelet terminal connector in the body wire harness that is secured to a ground location in the passenger compartment. The automatic resetting circuit breaker protects the motor from overloads. The rear wiper motor transmission converts the rotary output of the wiper motor to the back and forth wiping motion of the rear wiper arm and blade on the liftgate glass.

The hard wired inputs and outputs of the rear wiper motor may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the rear wiper motor or the electronic controls or communication between other modules and devices that provide some features of the rear wiper and washer system. The most reliable, efficient, and accurate means to diagnose the rear wiper motor or the electronic controls and communication related to rear wiper motor operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

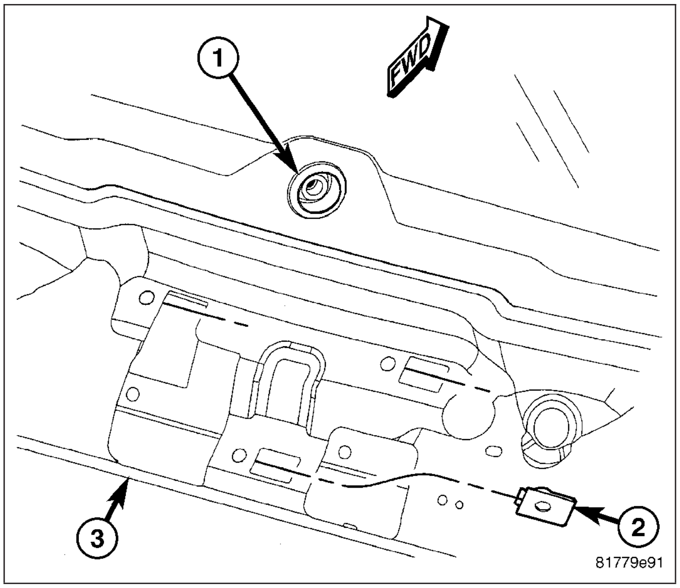
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the rear wiper arm from the rear wiper motor output shaft. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARM - REMOVAL - REAR).
3. Remove the trim from the liftgate inner panel. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
4. Disconnect the liftgate wire harness connector (2) from the rear wiper motor (4).
5. Remove the three screws (3) that secure the motor mounting bracket to the U-nuts (5) on the liftgate inner panel.
6. Pull the wiper motor forward far enough to disengage the output shaft from the rubber grommet (1) in the liftgate glass.
7. Remove the motor from the liftgate.
8. Remove the rubber grommet from the output shaft clearance hole in the liftgate glass and discard.

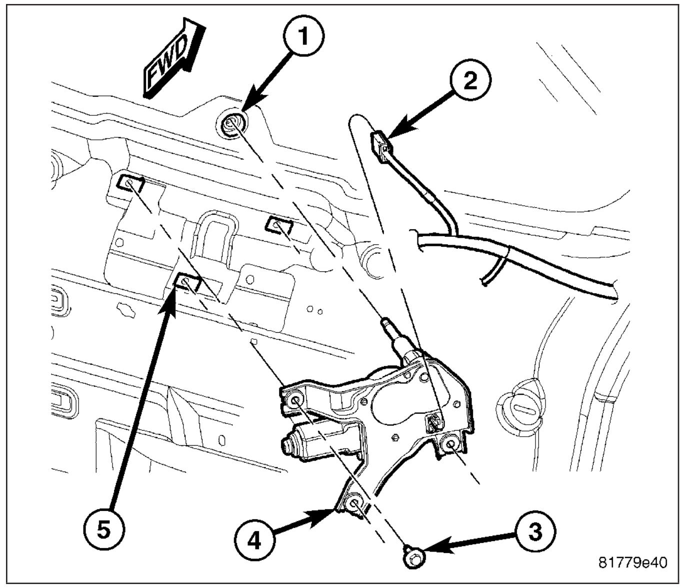


INSTALLATION

1. Install a new rubber grommet (1) into the rear wiper motor output shaft clearance hole located in the liftgate glass. Always use a new rubber grommet in the glass.
2. Check to be certain that the three U-nuts (2) are properly installed and in good condition in the liftgate inner panel (3).



CAUTION: A new replacement rear wiper motor is shipped with a rubber lubricant applied to the motor output shaft where it contacts the rubber grommet in the liftgate glass. If a rear wiper motor is removed then reinstalled, an appropriate rubber lubricant (Mopar® Nye Synthetic Lubricant - also known as Fluorocarbon Gel 880 Synthetic Lubricant) must be applied to the motor output shaft in the area just below the taper where the shaft will contact the grommet before the motor is reinstalled. Failure to comply with this caution can result in premature grommet failure, excessive motor loads and water leaks.

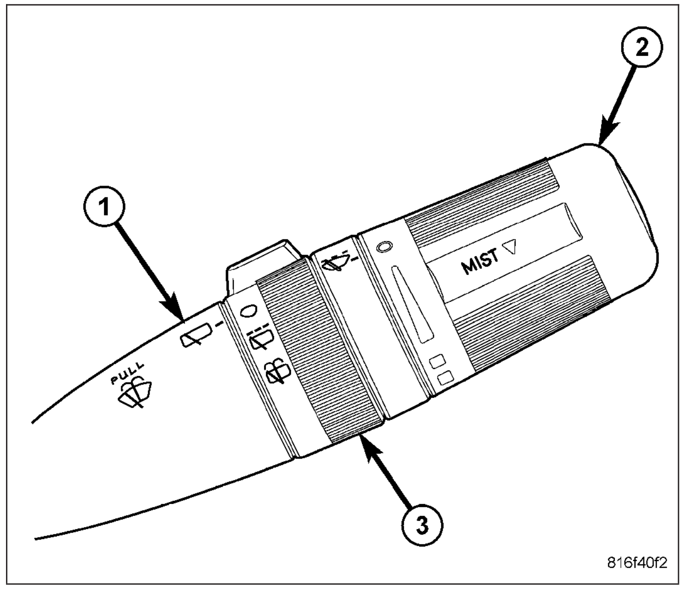


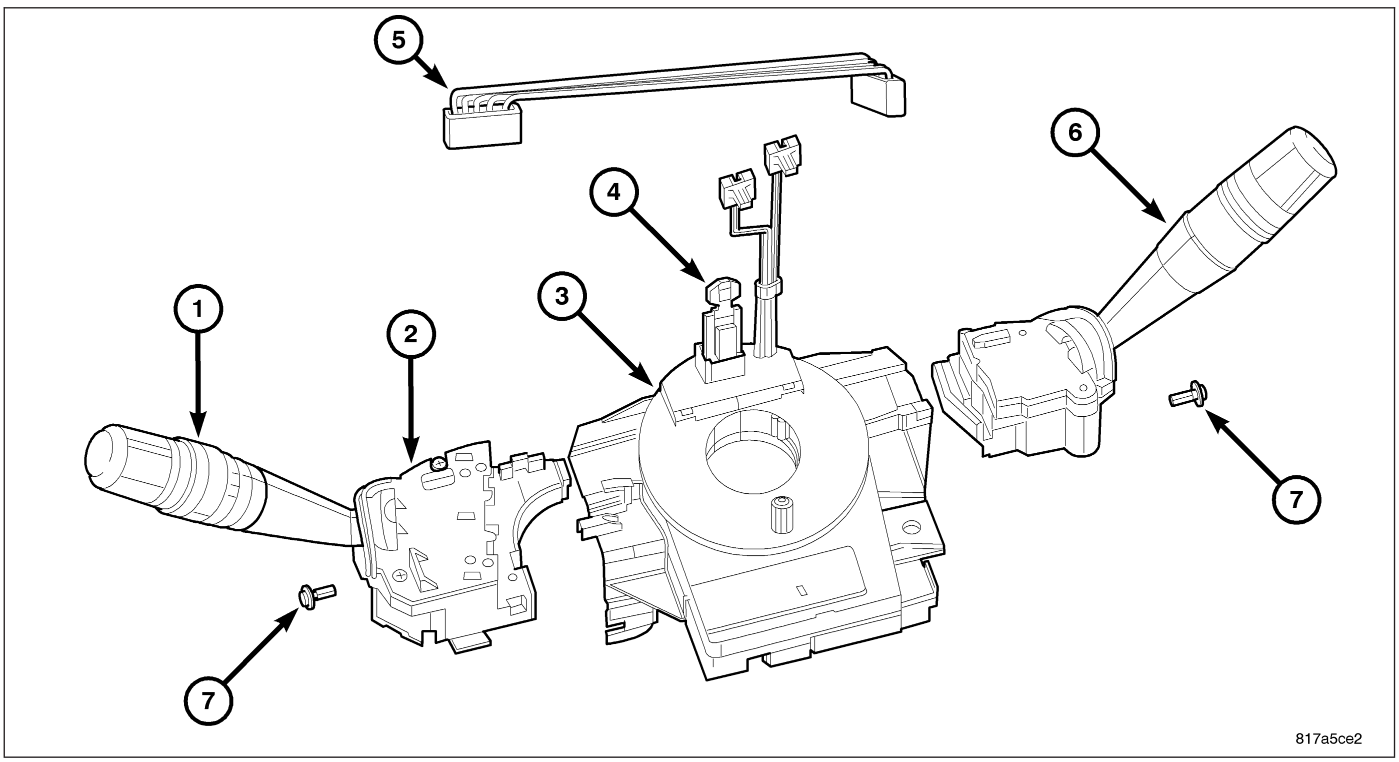
3. Insert the rear wiper motor (4) output shaft through the rubber grommet (1) in the liftgate glass.
4. Position the rear wiper motor and mounting bracket to the U-nuts (5) in the liftgate inner panel as a unit
5. Install and tighten the three screws (3) that secure the motor mounting bracket to the liftgate.
6. Reconnect the liftgate wire harness connector (2) to the wiper motor connector receptacle.
7. Reinstall the trim onto the liftgate inner panel. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).
8. Reinstall the rear wiper arm onto the output shaft. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION - REAR).
9. Reconnect the battery negative cable.

RIGHT MULTI-FUNCTION SWITCH

DESCRIPTION

The right (wiper) multi-function switch is located on the right side of the steering column, just below the steering wheel. This switch is the primary control for the front and rear wiper and washer systems. The only visible components of the switch are the control stalk (1), control knob (2) and control sleeve (3) that extend through the steering column shrouds on the right side of the column. The remainder of the switch including its mounting provisions and electrical connection are concealed beneath the shrouds.





The switch housing and controls (6) are constructed of molded black plastic. Each of the switch controls has white International Control and Display Symbol graphics applied to it, which clearly identify its many functions. A single screw (7) through a mounting tab integral to the back of the switch housing, and a slide tab integral to the bottom of the switch housing secure the switch to the mounting bracket integral to the clockspring (3). A single connector receptacle containing seven terminal pins is integral to the inboard end of the switch housing and is connected by a jumper wire harness (5) directly to the Steering Control Module (SCM), which is internal to the housing (2) of the left multi-function switch (1).

The right (wiper) multi-function switch provides the vehicle operator with a control interface for the following wiper and washer system functions:

- **Continuous Front Wipers** - The right multi-function switch control knob provides detent switching for two continuous front wipe modes, low speed or high speed.
- **Intermittent Front Wipers** - The right multi-function switch control knob provides detent switching for the intermittent front wipe mode with five minor detent delay interval positions.
- **Front Wiper Mist Mode** - The right multi-function switch control stalk includes momentary switching of the front wiper motor low speed circuit to provide a mist mode features (sometimes referred to as pulse wipe), which allows the vehicle operator to momentarily operate the front wipers for one or more complete cycles.
- **Front Washer Mode** - The right multi-function switch control stalk provides momentary switching for control of the front washer system operation.
- **Intermittent Rear Wipe Mode** - The right multi-function switch control sleeve provides detent switching for a single fixed interval intermittent rear wiper mode.
- **Rear Washer Mode** - The right multi-function switch control sleeve provides two momentary switch positions for control of rear washer system operation.

The right multi-function switch cannot be adjusted or repaired. If any function of the switch is ineffective, or if the switch is damaged, the entire switch unit must be replaced. The clockspring (with the multi-function switch mounting bracket), the left multi-function switch (with the SCM), the right multi-function switch and the jumper wire harness are each available for separate service replacement.

OPERATION

The right (wiper) multi-function switch uses a combination of resistor multiplexing and conventional switching to control the many functions and features it provides. The switch receives a clean ground from the Steering Control Module (SCM), then provides resistor multiplexed and conventional analog return outputs to the SCM to indicate the selected switch positions. The SCM then sends electronic **switch status** messages over a Local Interface Network (LIN) data bus to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN), and the EMIC relays electronic **wiper** and **washer switch** request messages over the Controller Area Network (CAN) data bus to other electronic modules in the vehicle.

If the SCM detects no inputs from the right multi-function switch, it transmits an electronic **Signal Not Available (SNA)** status message over the LIN data bus. The SNA status signals the EMIC to request other electronic modules to implement a failsafe mode of operation for the front and rear wiper systems. The failsafe mode will maintain the last selected front and rear wiper system operation for the remainder of the current ignition cycle, after which both wiper systems will default to OFF.

The right multi-function switch as well as the hard wired inputs and outputs of the switch may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, the most reliable, efficient and accurate means to diagnose this component requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

Following are descriptions of how the right multi-function switch is operated to control the many front and rear wiper and washer system functions and features it provides:

- **Front Wiper Control** - The control knob on the end of the right multi-function switch control stalk is rotated to one of the two continuous wiper detents, to one of five intermittent wiper detents, or to the OFF position to select the front wiper mode. The SCM reads the input from the right multi-function switch and sends electronic **wiper switch** status messages over the LIN data bus to the EMIC, which relays an electronic **wiper switch** request message over the CAN data bus to other electronic modules in the vehicle.
- **Front Wiper Mist Mode** - The front wiper mist mode is requested when the right multi-function switch control stalk is depressed downward towards the floor to a momentary MIST position. The front wiper motor will continue to operate, one complete cycle at a time, for as long as the control stalk is held in this position. The SCM reads the resistor multiplexed input from the right multi-function switch and sends an electronic **wiper switch** status message over the LIN data bus to the EMIC, which relays an electronic **wiper switch** request message over the CAN data bus to other electronic modules in the vehicle.
- **Front Washer Control** - The right multi-function switch control stalk is pulled rearward towards the steering wheel to a momentary WASH position to activate the washer pump/motor in the front washer mode. The washer pump/motor will continue to operate for as long as the control stalk is held in this position. The SCM reads the resistor multiplexed input from the right multi-function switch and sends an electronic **washer switch** status message over the LIN data bus to the EMIC, which relays an electronic **washer switch** request message over the CAN data bus to other electronic modules in the vehicle.
- **Rear Wiper Control** - The rear wiper mode is selected when the right multi-function switch control sleeve is rotated to the fixed interval intermittent rear wipe detent position, or the OFF detent position. The SCM reads

the input from the right multi-function switch and sends an electronic **wiper switch** status message over the LIN data bus to the EMIC, which relays an electronic **wiper switch** request message over the CAN data bus to other electronic modules in the vehicle.

- **Rear Washer Control** - The right multi-function switch control sleeve is rotated to one of two momentary WASH positions, either fully forward or fully rearward, to activate the washer pump/motor in the rear washer mode. The washer pump/motor will continue to operate in the rear washer mode until the control sleeve is released. The SCM reads the input from the right multi-function switch and sends an electronic **washer switch** status message over the LIN data bus to the EMIC, which relays an electronic **washer switch** request message over the CAN data bus to other electronic modules in the vehicle.

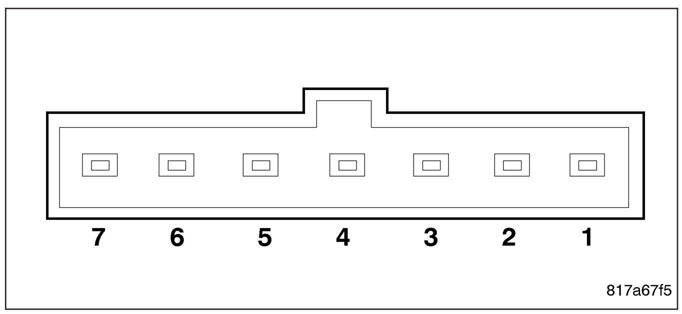
DIAGNOSIS AND TESTING

RIGHT MULTI-FUNCTION SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The right multi-function switch as well as the hard wired inputs and outputs of the switch may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the Steering Control Module (SCM) or the electronic controls or communication between other modules and devices that provide some features of the front and rear wiper and washer systems. The most reliable, efficient and accurate means to diagnose the SCM or the electronic controls and communication related to SCM operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

1. Remove the right multi-function switch from the integral mounting bracket on the right side of the clockspring. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - REMOVAL).
2. Using an ohmmeter, test the resistance between the terminals of the switch as shown in the three Function Tests tables. For all functions except those of the control stalk the values should be either less than 100 ohms (switch CLOSED) or greater than 1 megohm (switch OPEN).



CONTROL STALK FUNCTION TESTS

FUNCTION	PINS		RESISTANCE
	1	7	
Front Wash	X	X	10000 Ohms
Front Mist	X	X	5490 Ohms

CONTROL KNOB FUNCTION TESTS

FUNCTION	BETWEEN PIN 7 (GROUND) AND PINS		
	4	5	6
Off	CLOSED	CLOSED	OPEN
Front Delay 1	CLOSED	CLOSED	CLOSED
Front Delay 2	CLOSED	OPEN	CLOSED
Front Delay 3	OPEN	OPEN	CLOSED

FUNCTION	BETWEEN PIN 7 (GROUND) AND PINS		
	4	5	6
Front Delay 4	OPEN	CLOSED	CLOSED
Front Delay 5	OPEN	CLOSED	OPEN
Front Wiper Low	OPEN	OPEN	OPEN
Front Wiper High	CLOSED	OPEN	OPEN

CONTROL SLEEVE FUNCTION TESTS

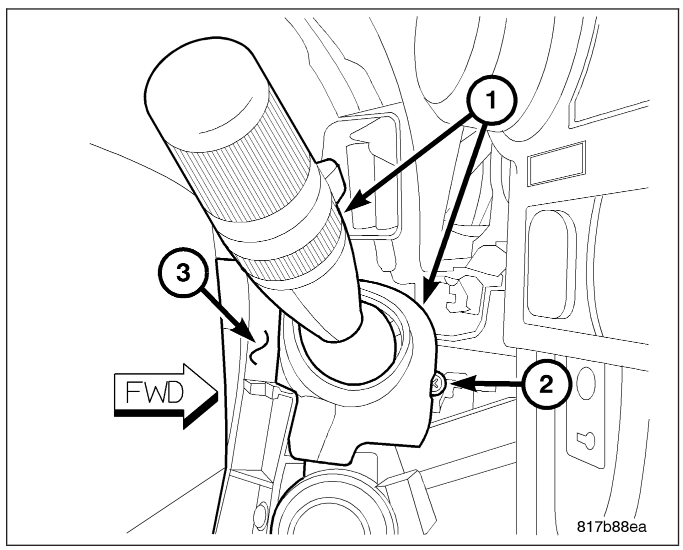
FUNCTION	BETWEEN PIN 7 (GROUND) AND PINS	
	2	3
Off	CLOSED	OPEN
Rear Wipe	CLOSED	CLOSED
Rear Wash	OPEN	CLOSED

3. If the switch fails any of the tests, replace the ineffective right multi-function switch as required. If the switch tests okay, but the switch input to the Steering Control Module (SCM) remains incorrect, be certain to check for a short or open in the jumper harness between the right multi-function switch and the SCM.

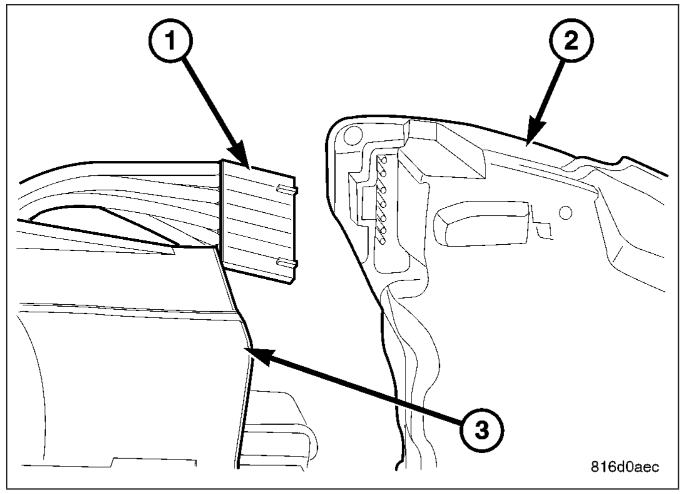
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Remove both the upper and lower shrouds from the steering column. (Refer to 19 - STEERING/COLUMN/SHROUD - REMOVAL).
3. Remove the screw (2) that secures the right multi-function switch (1) to the mounting bracket integral to the right side of the clockspring (3) on the steering column.
4. Slide the switch away from the clockspring far enough to disengage the slide tab on the bottom of the switch housing from the channel formation in the mounting bracket.



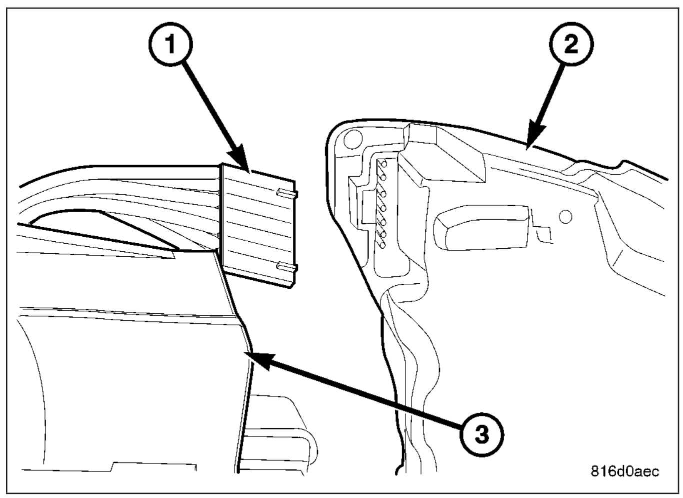
5. Disconnect the jumper wire harness connector (1) from the connector receptacle on the inboard end of the right multi-function switch (2).
6. Remove the switch from the clockspring (3).



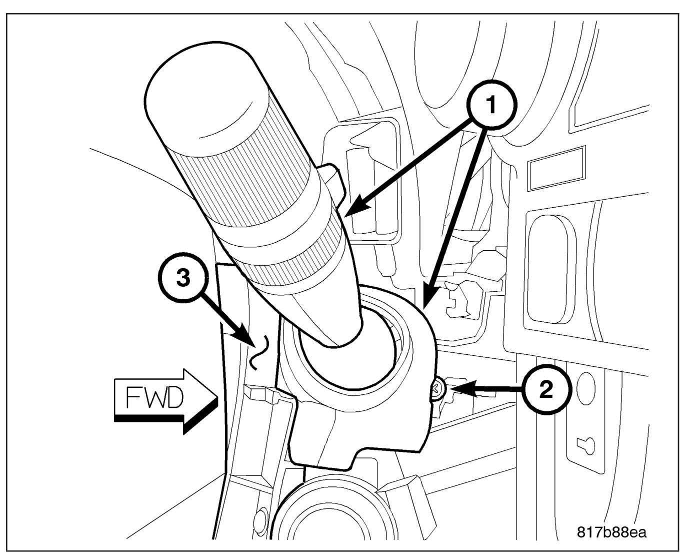
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the right multi-function switch (2) close enough to the mounting bracket (3) integral to the right side of the clockspring to reconnect the jumper wire harness connector (1) to the connector receptacle on the inboard side of the switch housing.
2. Align the slide tab on the bottom of the switch housing with the channel integral to the clockspring mounting bracket, then slide the switch into the bracket until it is firmly seated.



3. Install and tighten the screw (2) that secures the mounting tab on the back of the right multi-function switch (1) to the mounting bracket on the clockspring (3).
4. Reinstall the upper and lower shrouds onto the steering column. (Refer to 19 - STEERING/COLUMN/SHROUD - INSTALLATION).
5. Reconnect the battery negative cable.



WASHER NOZZLE

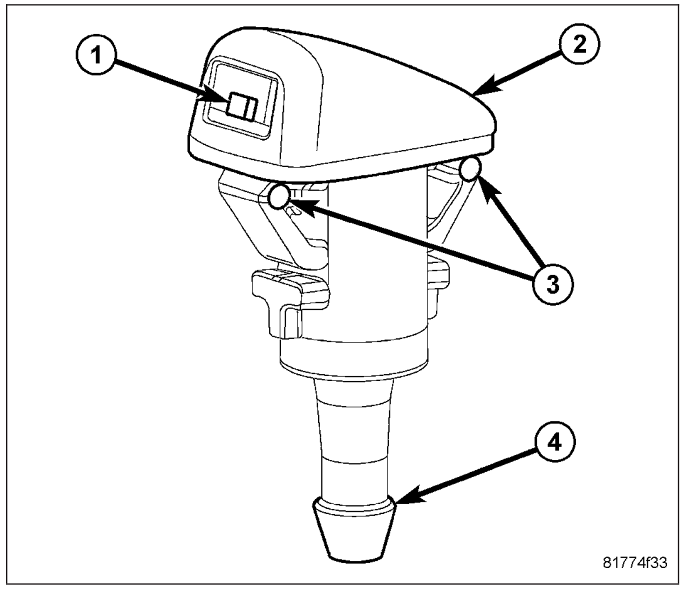
DESCRIPTION

FRONT

The fluidic front washer nozzles (2) are constructed of molded plastic and include an integral check valve. Each nozzle has two integral latches (3) that secure them in dedicated holes in the hood panel near the base of the windshield. The domed upper surface of the washer nozzle is visible on the outside of the hood panel, and the two nozzle orifices (1) are oriented towards the windshield glass.

An integral diaphragm type check valve is contained within the body of each nozzle. The washer plumbing fittings (4) for the washer nozzles extend below the hood panel and are accessible from the engine compartment.

The front washer nozzles cannot be adjusted or repaired and, if ineffective or damaged, they must be replaced.

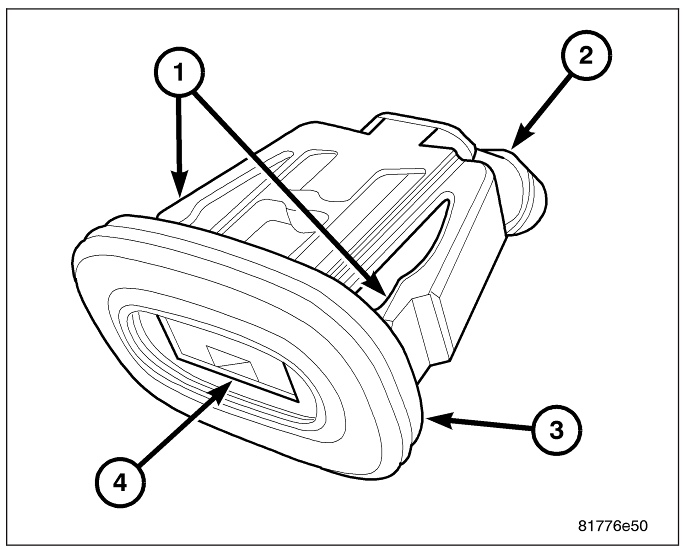


REAR

The fluidic rear washer nozzle is constructed of molded plastic. The rear washer nozzle is secured by two integral latch features (1) within a mounting hole to the right of the Center High-Mounted Stop Lamp (CHMSL) in the lower surface of the rear spoiler above the liftgate glass opening on the outer liftgate panel.

The outer surface of the washer nozzle is visible on the lower exterior surface of the spoiler, and a rubber gasket (3) seals the nozzle to the spoiler mounting hole. The nozzle orifice (4) is oriented downward towards the liftgate glass. The washer plumbing fitting (2) is concealed between the spoiler and the liftgate outer panel.

The rear washer nozzle cannot be adjusted or repaired and, if ineffective or damaged, it must be replaced.



OPERATION

FRONT

The two front washer nozzles are designed to dispense washer fluid into the wiper pattern area on the outside of the windshield glass. Pressurized washer fluid is fed to each nozzle from the washer reservoir by the washer pump/motor unit through a single hose, which is attached to a barbed nipple on each washer nozzle below the inner hood panel. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

The integral check valve in each nozzle prevents washer fluid from draining out of the washer supply hoses back to the washer reservoir. This drain-back would result in a lengthy delay after the washer switch is actuated until washer

fluid was dispensed through the nozzles, because the washer pump would have to refill the washer plumbing from the reservoir to the nozzles. Such a drain-back condition could also result in water, dirt, or other outside contaminants being siphoned into the washer system through the washer nozzle orifice. This water could subsequently freeze and plug the nozzle, while other contaminants could interfere with proper nozzle operation and cause improper nozzle spray patterns. In addition, the check valve prevents washer fluid from siphoning through the washer nozzles after the washer system is turned OFF.

When the washer pump pressurizes and pumps washer fluid from the reservoir through the washer plumbing, the fluid pressure unseats a diaphragm from over a sump well within the nozzle by overriding the spring pressure applied to it by a piston. With the diaphragm unseated, washer fluid is allowed to flow toward the nozzle orifice. When the washer pump stops operating, the spring pressure on the piston seats the diaphragm over the sump well in the nozzle and fluid flow in either direction within the washer plumbing is prevented.

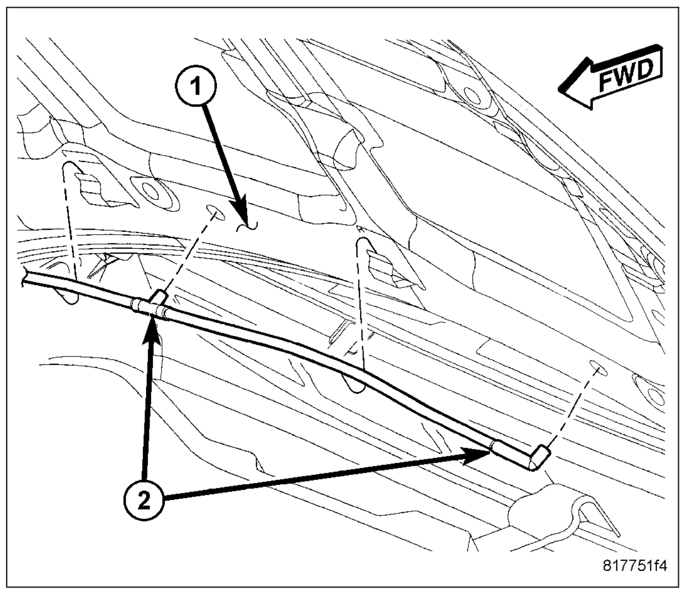
REAR

The rear washer nozzle is designed to dispense washer fluid into the wiper pattern area on the outside of the lift-gate glass. Pressurized washer fluid is fed to the nozzle from the washer reservoir by the washer pump/motor through a single hose, which is attached to a barbed nipple on the back of the nozzle. A fluidic matrix within the nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

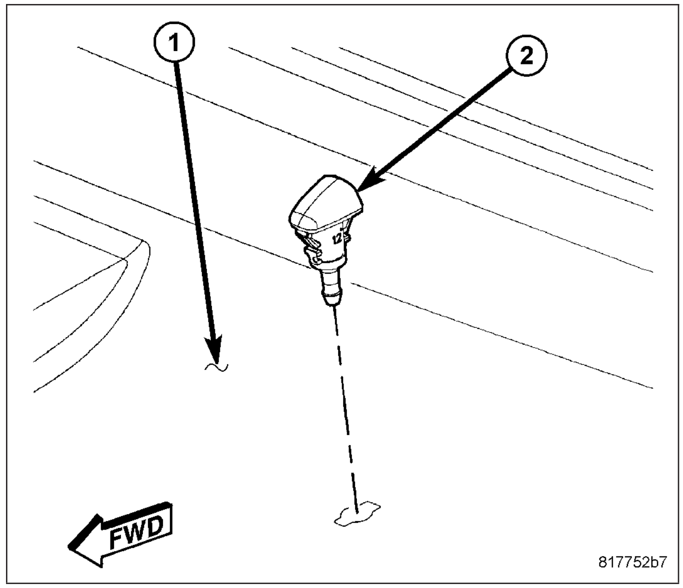
REMOVAL

FRONT

1. From the underside of the hood, disengage the rear edge of the silencer pad from the tabs that secure it to the inner hood reinforcement (1) as necessary to access the front washer nozzle hose connections (2).
2. Disconnect the hose connection from the barbed nipple of the front washer nozzle.

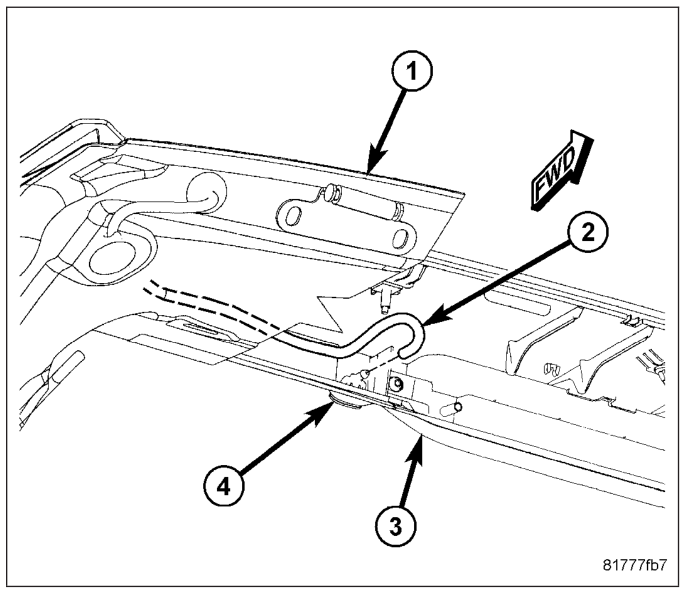


3. From the underside of the hood, release the integral latches of the front washer nozzle (2) and push the nozzle out through the mounting hole toward the top side of the hood (1).
4. Remove the nozzle from the top of the hood panel.



REAR

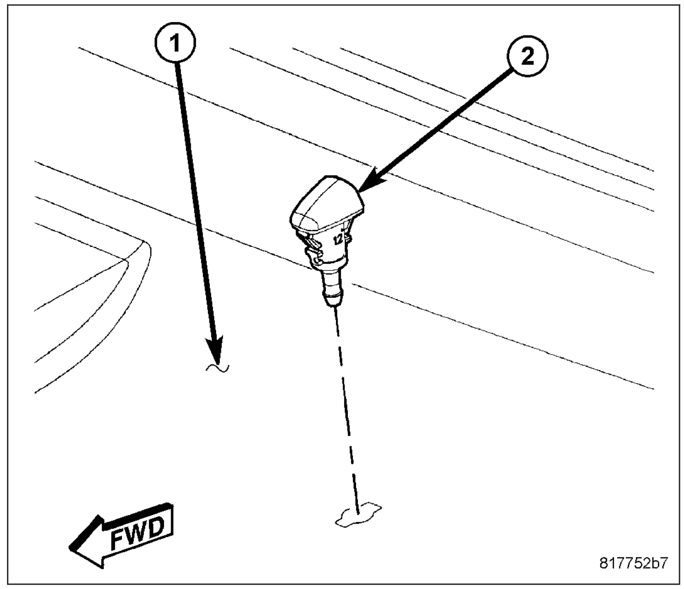
1. Disconnect and isolate the battery negative cable.
2. Remove the fasteners that secure the spoiler (3) to the liftgate outer panel (1). (Refer to 23 - BODY/EXTERIOR/LIFTGATE SPOILER - REMOVAL).
3. Pull the spoiler away from the liftgate far enough to access and disconnect the liftgate washer supply hose (2) from the barbed nipple on the back of the rear washer nozzle (4).
4. From the back of the spoiler, depress the two integral latch features of the nozzle, while pulling the nozzle out through the face of the spoiler.



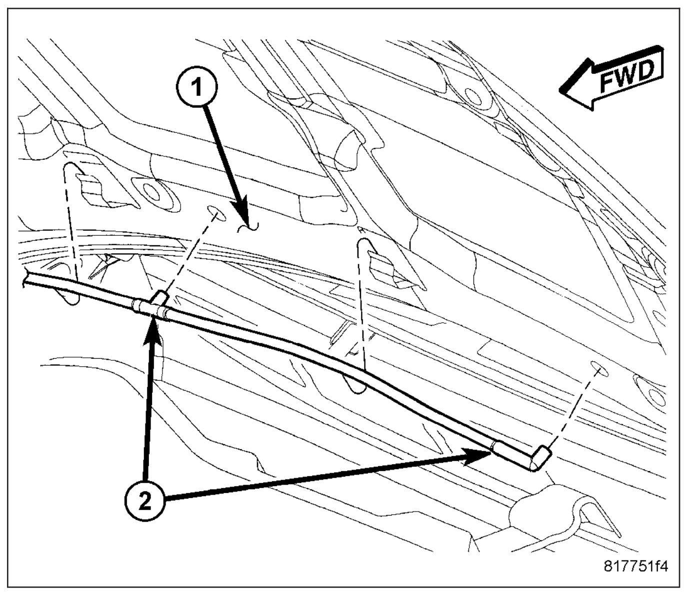
INSTALLATION

FRONT

1. Position the front washer nozzle (2) to the mounting hole on the outside of the hood panel (1).
2. Align the anti-rotation tab of the nozzle with the anti-rotation notch in the mounting hole.
3. Using hand pressure, push firmly and evenly on the top of the nozzle until the integral latches lock into place on the underside of the hood.

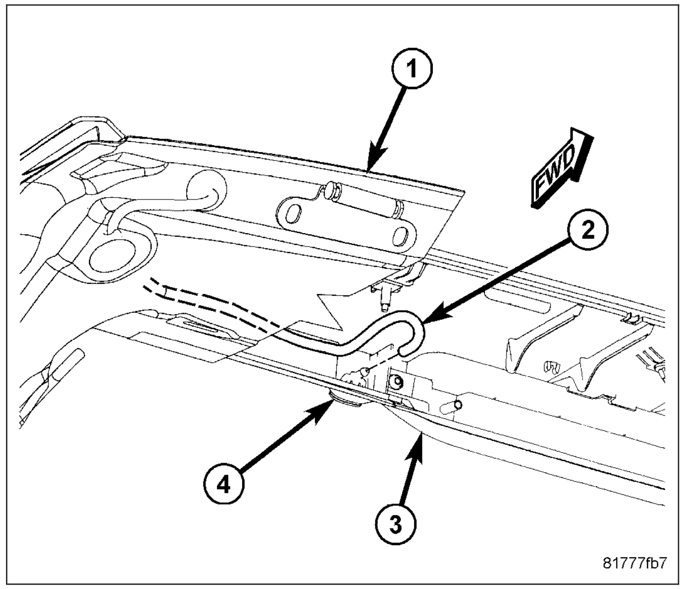


4. From the underside of the hood, reconnect the washer hose connector (2) to the barbed nipple of the nozzle.
5. Reinstall the rear edge of the hood silencer pad to the clips on the inner hood reinforcement (1).



REAR

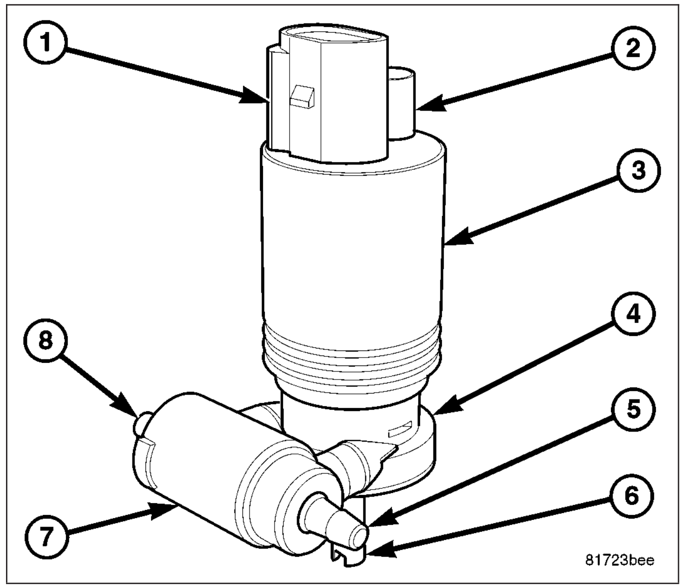
1. Position the rear washer nozzle (4) through the mounting hole from the face of the liftgate spoiler (3).
2. Using hand pressure, press the nozzle firmly and evenly into the mounting hole until the two integral latch features are fully engaged on the back of the spoiler.
3. From the back of the spoiler, reconnect the liftgate washer supply hose (2) to the barbed nipple of the nozzle.
4. Reinstall the spoiler onto the liftgate outer panel (1). (Refer to 23 - BODY/EXTERIOR/LIFTGATE SPOILER - INSTALLATION).
5. Reconnect the battery negative cable.



PUMP-WASHER-WINDSHIELD

DESCRIPTION

The washer pump/motor unit is located on the top of a sump area of the washer reservoir, on the forward side of the reservoir ahead of the right front strut tower in the engine compartment. A small permanently lubricated and sealed reversible electric motor (3) is coupled to the rotor-type washer pump (4). The use of an integral valve body (7) allows the washer pump/motor unit to provide washer fluid to either the front or the rear washer systems, depending upon the direction of the motor/pump impeller rotation.



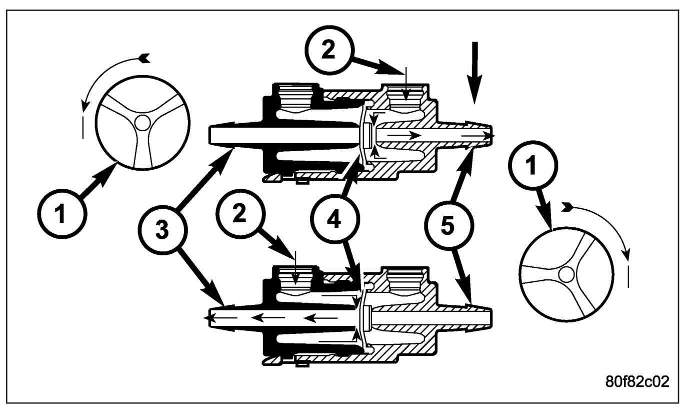
An inlet nipple (6) on the pump housing passes through a rubber grommet seal/filter screen installed in a dedicated mounting hole of the washer reservoir sump. The filter screen prevents most debris from entering the pump housing. When the pump is installed in the reservoir the one barbed outlet nipple (5 and 8) on the pump valve body housing connects the unit to the front washer hose, and the other barbed outlet nipple connects the unit to the rear washer hose.

The washer pump/motor unit is retained on the reservoir by the interference fit between the pump inlet nipple and the grommet seal, which is a light press fit that allows for mounting of the washer pump without the use of fasteners. An integral connector receptacle (1) on the top of the motor housing connects the unit to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness.

The washer pump/motor unit cannot be repaired. If ineffective or damaged, the entire washer pump/motor unit must be replaced.

OPERATION

The washer pump/motor unit features a reversible electric motor. The direction of the motor is controlled by hard wired outputs from the Totally Integrated Power Module (TIPM). When battery current and ground are applied to the two pump motor terminals, the motor rotates in one direction. When the polarity of these connections is reversed, the motor rotates in the opposite direction. When the pump motor is energized, the rotor-type pump pressurizes the washer fluid and forces it through one of the two pump outlet nipples, and into the front or rear washer plumbing.



The TIPM controls the hard wired outputs to the pump motor based upon electronic **washer request** messages received over the Controller Area Network (CAN) data bus from the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN). The EMIC receives electronic **washer switch** status messages over a Local Interface Network (LIN) bus connection from the Steering Control Module (SCM) within the left (lighting) multi-function switch housing. The SCM monitors hard wired analog and multiplex inputs from the washer switch circuitry contained within the right (wiper) multi-function switch to determine the proper electronic messages to send.

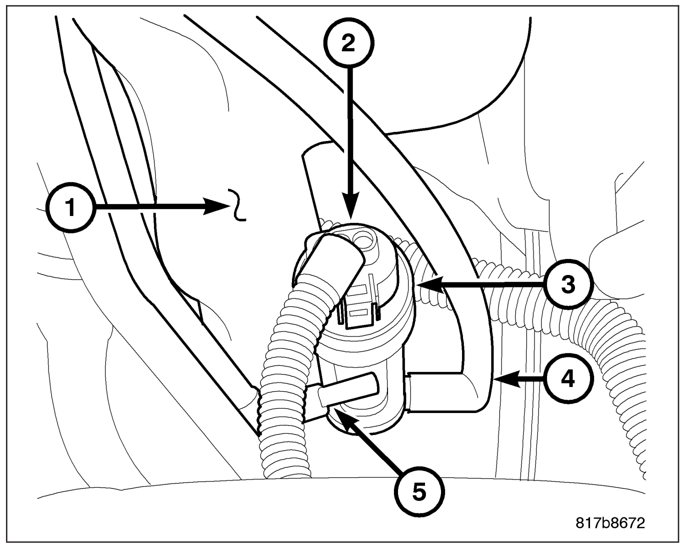
Washer fluid is drawn through the pump inlet nipple from the washer reservoir to the inlet port of the washer pump housing. An integral valve body is located in a housing on the outlet port side (2) of the pump housing. A diaphragm (4) in this valve body controls which washer system plumbing receives the washer fluid being pressurized by the pump.

When the pump impeller (1) rotates in the counterclockwise direction (viewed from the bottom), the biased diaphragm is sealing off the rear washer system outlet and nipple so the pressurized washer fluid is pushed out through the pump front outlet port and the front washer outlet nipple (5). When the pump impeller rotates in the clockwise direction (viewed from the bottom), pressurized washer fluid is pushed out through the pump rear outlet port and moves the diaphragm to open the rear washer outlet nipple and seal off the front washer outlet nipple, then the pressurized washer fluid is pushed out through the rear washer outlet nipple (3).

The washer pump/motor unit and the hard wired motor control circuits from the TIPM may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the washer pump/motor unit or the electronic controls or communication between other modules and devices that provide some features of the front and rear wiper and washer system. The most reliable, efficient, and accurate means to diagnose the washer pump/motor unit or the electronic controls and communication related to washer pump/motor unit operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

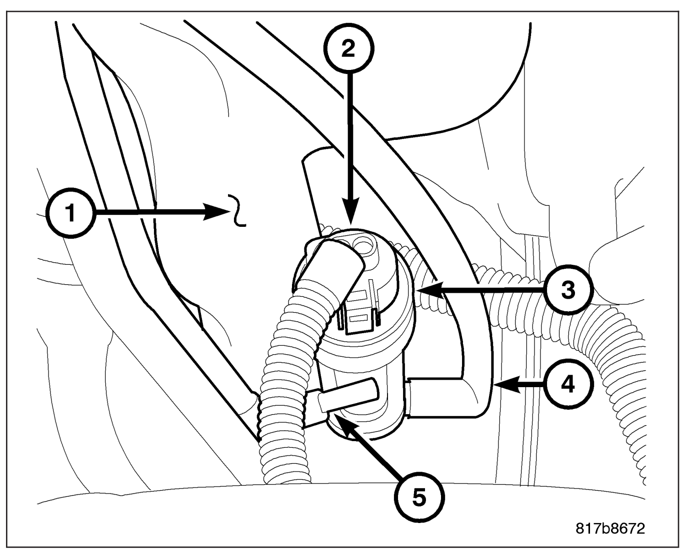
REMOVAL

NOTE: The washer pump/motor can be removed from the washer reservoir without removing the reservoir from the vehicle.



1. Disconnect and isolate the battery negative cable.
2. Siphon the washer fluid from the washer reservoir (1) into a clean container for reuse.
3. Disconnect the headlamp and dash wire harness connector (2) from the washer pump/motor unit (3) connector receptacle on the top of the motor housing.
4. Disconnect the two washer hoses (4 and 5) from the two washer pump/motor unit outlet nipples.
5. Pull the washer pump/motor unit straight up and out of the washer reservoir far enough to disengage the inlet nipple from the rubber grommet seal/filter screen in the reservoir. Care must be taken not to damage the reservoir.
6. Remove the rubber grommet seal/filter screen for the washer pump from the pump mounting hole in the washer reservoir and discard.

INSTALLATION



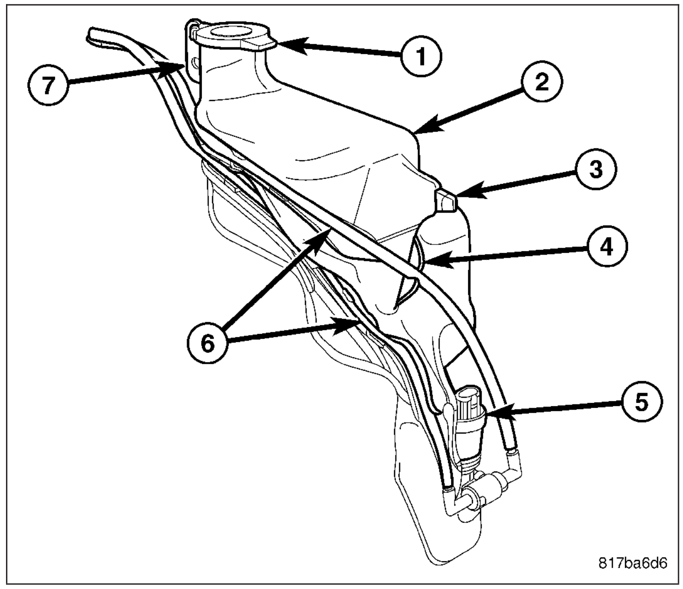
1. Install a new rubber grommet seal/filter screen unit into the washer pump mounting hole in the washer reservoir (1). Always use a new rubber grommet seal/filter screen on the reservoir.
2. Position the inlet nipple of the washer pump (3) to the rubber grommet seal/filter screen in the washer reservoir.
3. Using hand pressure, press firmly and evenly downward on the washer pump/motor unit until the inlet nipple is fully seated in the rubber grommet seal/filter screen in the pump mounting hole of the reservoir.
4. Reconnect the two washer hoses (4 and 5) to the two barbed pump outlet nipples. Be certain that the hose in the trough on the outboard side of the reservoir is connected to the rear (black) nipple, and the hose on the inboard side of the reservoir is connected to the front (white) nipple.

5. Reconnect the headlamp and dash wire harness connector (2) for the washer pump/motor unit to the connector receptacle on the top of the motor housing.
6. Reconnect the battery negative cable.
7. Refill the washer reservoir with the washer fluid siphoned from the reservoir during the removal procedure.

WASHER RESERVOIR

DESCRIPTION

A single washer fluid reservoir (2) is used for both the front and rear washer systems. The molded plastic washer fluid reservoir is mounted on the forward side of the right front strut tower and wheel house in the engine compartment. The filler neck extends upward into the engine compartment and a single screw installed through a mounting tab (7) on the back of the filler neck secures the unit to a stamped metal bracket on the front of the strut tower. A bright yellow plastic filler cap (1) with an International Control and Display Symbol icon for **Windshield Washer** molded into it snaps over the open end of the filler neck. The cap hinges on and is secured to a molded-in hook formation on the top of the mounting tab on the filler neck.



There is a dedicated hole in the sump area at the lower front end of the reservoir provided for the washer pump/motor unit (5). The outboard side of the washer reservoir has an integral clip (4) and two integral troughs (6) through which the washer hoses are routed from the washer pump up into the engine compartment. An integral mounting post on the bottom of the reservoir is inserted into a hole in the horizontal front extension of the fender wheel house to locate and secure the lower end of the reservoir. An integral latch tab (3) on the upper outboard side of the reservoir engages a slot in the inboard side of the coolant reserve container (gasoline engine) or coolant pressure container (diesel engine) to aid in mounting that unit in the engine compartment. The coolant reserve container or coolant pressure container must be dismounted, but need not be removed to access the washer reservoir for service.

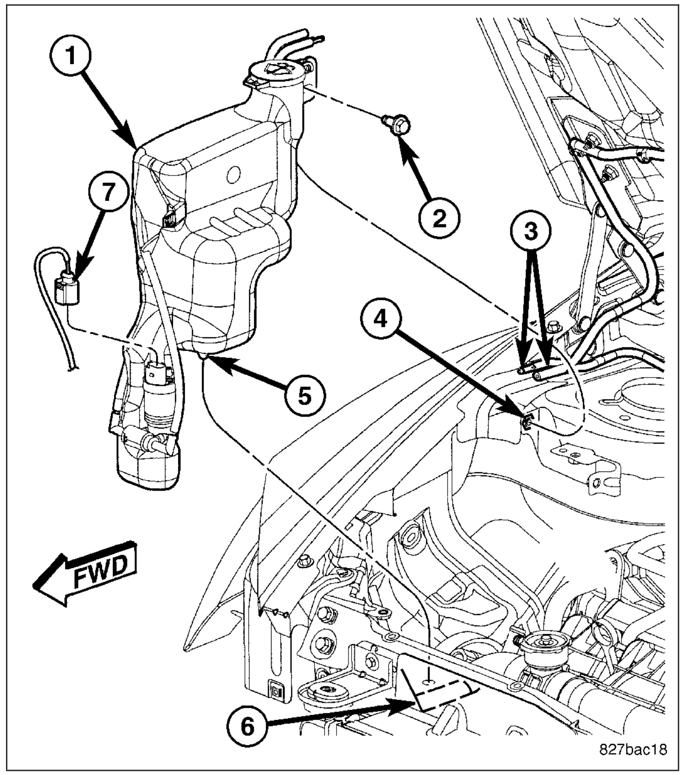
The washer reservoir cannot be repaired and, if ineffective or damaged, it must be replaced. The washer reservoir, rubber grommet seal/filter screen for the washer pump/motor unit and the filler cap are each available for individual service replacement.

OPERATION

The washer fluid reservoir provides a secure, on-vehicle storage location for a large reserve of washer fluid for operation of the front and rear washer systems. The washer reservoir filler cap provides a clearly marked and readily accessible point from which to add washer fluid to the reservoir. The washer pump/motor unit is located in a sump area near the lower forward side of the reservoir to be certain that washer fluid will be available to the pump as the fluid level in the reservoir becomes depleted. The washer pump/motor unit is mounted in the lowest position in the sump.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove or disengage each of the fasteners that secure the coolant reserve container (gasoline engine) or the coolant pressure container (diesel engine) to the inboard side of the washer reservoir and move the container aside as necessary to gain access to the washer reservoir for removal. Refer to 7 - COOLING/ENGINE for the appropriate procedures for the engine and coolant container type as the vehicle is equipped.
3. Siphon the washer fluid from the washer reservoir (1) into a clean container for reuse.
4. Disconnect the headlamp and dash wire harness connector (7) from the washer pump/motor.

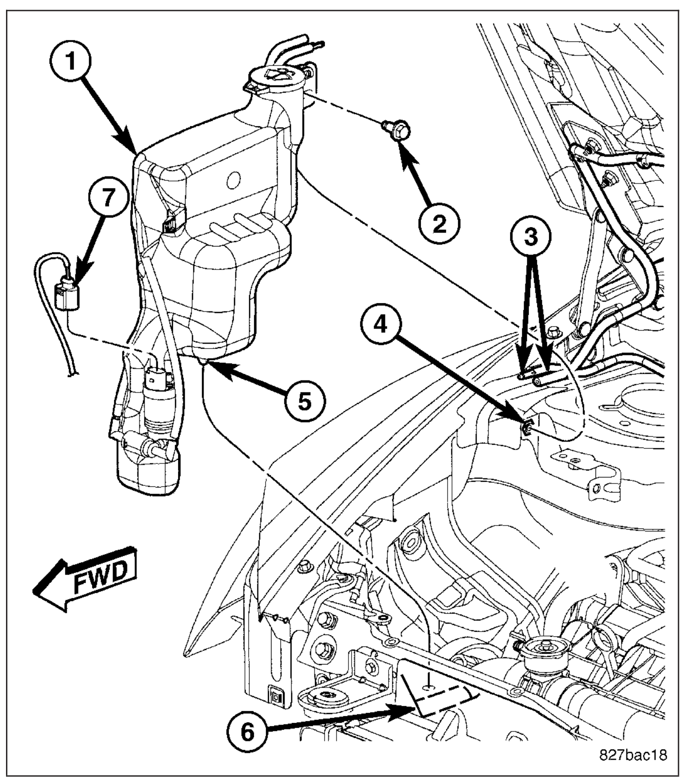


NOTE: To aid in reinstallation, note the installed position of the washer hoses prior to disconnecting them.

5. Disconnect the front and rear washer hoses (3) from the reservoir washer hoses near the top of the right front strut tower.
6. Remove the screw (2) that secures the mounting tab on the back of the reservoir filler neck to the bracket (4) on the forward side of the right front strut tower.
7. Pull the washer reservoir upward far enough to disengage the post (5) on the underside of the reservoir from the hole in the horizontal extension of the right front wheel house (6).
8. Remove the washer reservoir from the engine compartment.

INSTALLATION

1. Position the washer reservoir (1) into the right front corner of the engine compartment.
2. Align and engage the post (5) on the underside of the reservoir into the hole in the horizontal extension of the right front wheel house (6).
3. Install and tighten the screw (2) that secures the mounting tab on the back of the reservoir filler neck to the bracket (4) on the forward side of the right front strut tower.



NOTE: Be certain to reconnect the front and rear washer hoses to the proper reservoir hoses from the washer pump. Failure to properly connect the hoses will cause the front and rear washer systems to operate incorrectly.

4. Reconnect the front and rear washer hoses (3) to the reservoir washer hoses near the top of the right front strut tower.
5. Reconnect the headlamp and dash wire harness connector (7) to the washer pump/motor unit.
6. Position the coolant reserve container (gasoline engine) or the coolant pressure container (diesel engine) to the inboard side of the washer reservoir

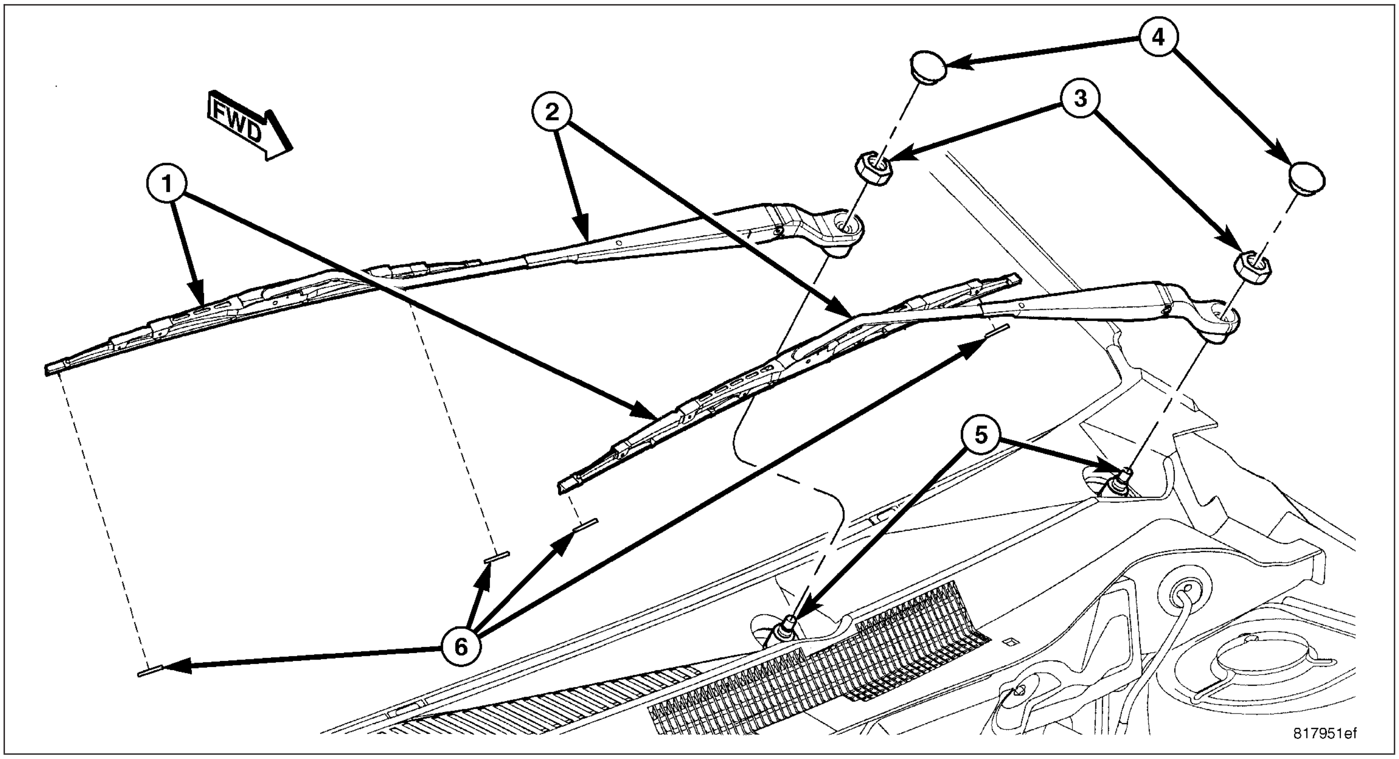
and reinstall or engage each of the fasteners that secure the container. Refer to 7 - COOLING/ENGINE for the appropriate procedures for the engine and coolant container type as the vehicle is equipped.

7. Refill the washer reservoir with the washer fluid drained during removal.
8. Reconnect the battery negative cable.

WIPER ARM

REMOVAL

FRONT



1. Lift the front wiper arm (2) to its over-center position to hold the wiper blade (1) off of the glass and relieve the spring tension on the wiper arm to pivot shaft connection.
2. Carefully pry the plastic nut cap (4) off of the pivot end of the wiper arm.
3. Remove the nut (3) that secures the wiper arm to the wiper pivot shaft (5).

CAUTION: The use of a battery terminal puller when removing the front wiper arm is NOT recommended as this may damage the front wiper arm.

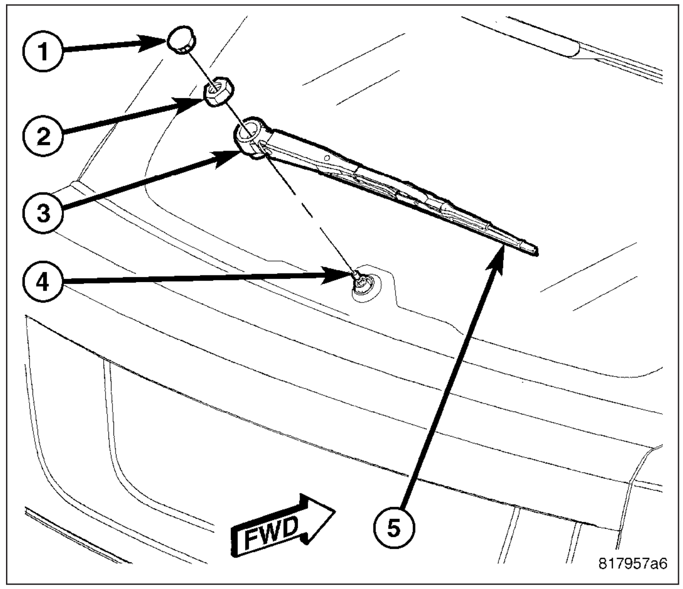
4. Use a slight rocking action to disengage the front wiper arm pivot end from the pivot shaft and remove the wiper arm.

REAR

1. Lift the rear wiper arm (3) to hold the wiper blade (5) off of the glass and relieve the spring tension on the wiper arm to output shaft connection.
2. Carefully pry the plastic nut cap (1) off of the pivot end of the wiper arm.
3. Remove the nut (2) that secures the wiper arm to the rear wiper motor output shaft (4).

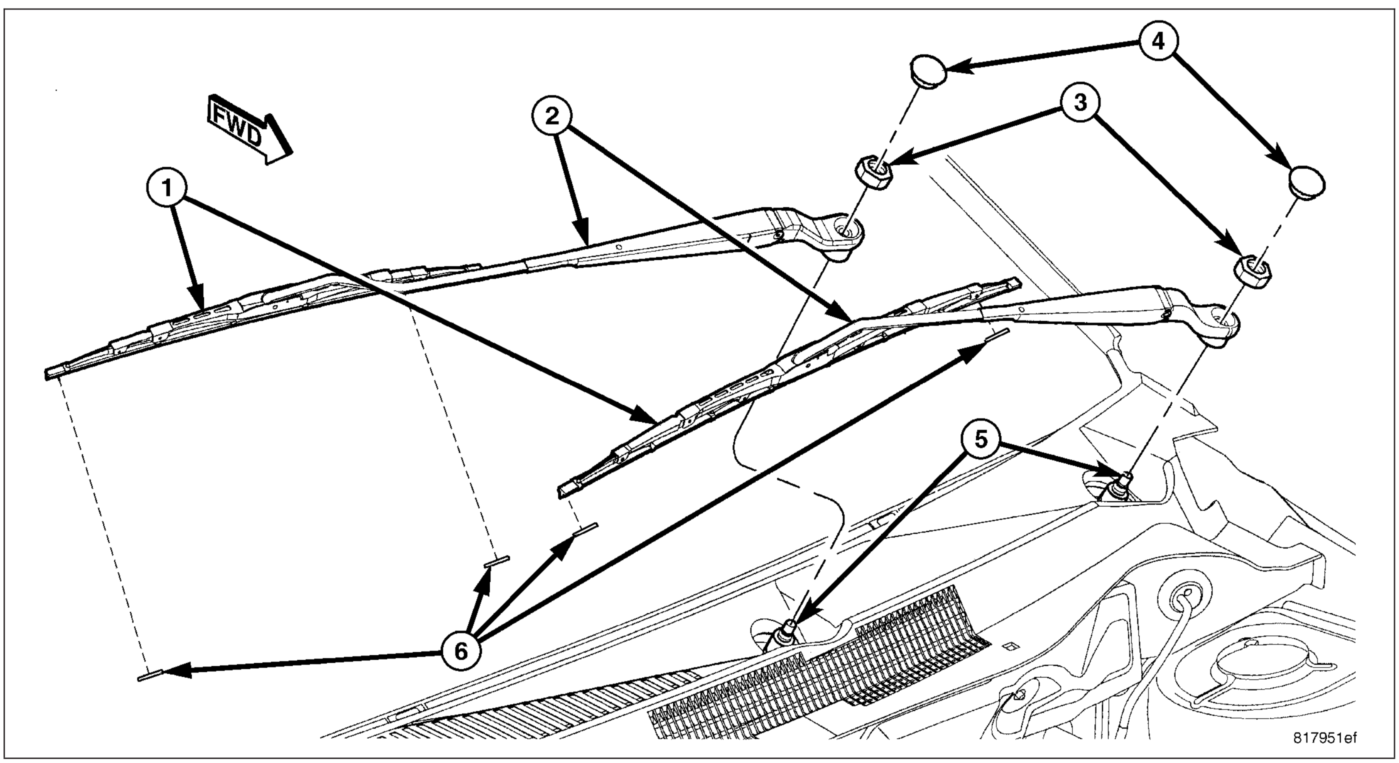
CAUTION: The use of a battery terminal puller when removing the rear wiper arm is NOT recommended as this may damage the front wiper arm.

4. Use a slight rocking action to disengage the rear wiper arm pivot end from the output shaft and remove the wiper arm.



INSTALLATION

FRONT



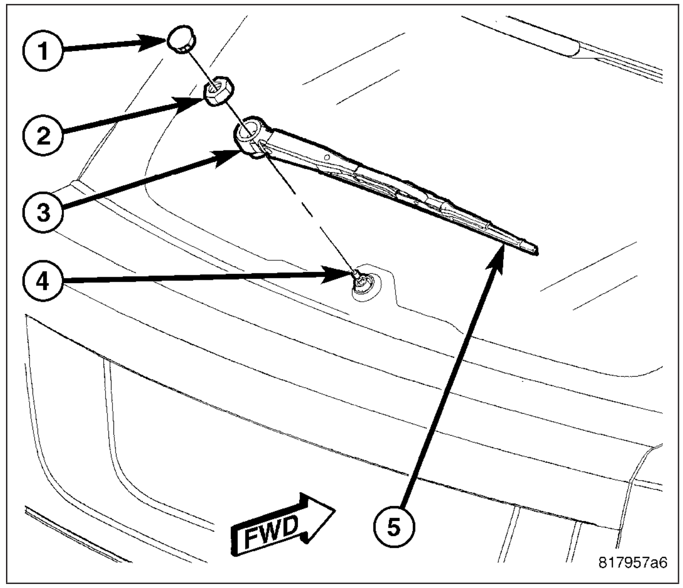
NOTE: Be certain that the wiper motor is in the park position before attempting to install the front wiper arms. Turn the ignition switch to the ON position and move the right (wiper) multi-function switch control knob to its OFF position. If the wiper pivots move, wait until they stop moving, then turn the ignition switch back to the OFF position. The front wiper motor is now in its park position.

1. The front wiper arms (2) must be indexed to the pivot shafts (5) with the front wiper motor in the park position to be properly installed. Position the wiper arm pivot end onto the wiper pivot shaft so that the wiper blade (1) is aligned with the wiper alignment lines (6), which are horizontal marks concealed in the upper margin of the lower windshield blackout area.

2. Once the wiper blade is aligned, lift the wiper arm away from the windshield slightly to relieve the spring tension on the pivot end and push the pivot end of the wiper arm down firmly and evenly over the pivot shaft.
3. Install and tighten the nut (3) that secures the wiper arm to the pivot shaft. Tighten the nut to 26 N·m (19 ft. lbs.).
4. Wet the windshield glass, then operate the front wipers. Turn the wiper switch to the OFF position, then check for the correct wiper arm position and readjust as required.
5. Reinstall the plastic nut cap (4) onto the wiper arm pivot nut.

REAR

NOTE: Be certain that the rear wiper motor is in the park position before attempting to install the rear wiper arm. Turn the ignition switch to the ON position and move the rear wiper switch to its OFF position. If the wiper motor output shaft moves, wait until it stops moving, then turn the ignition switch back to the OFF position. The wiper motor is now in its park position.



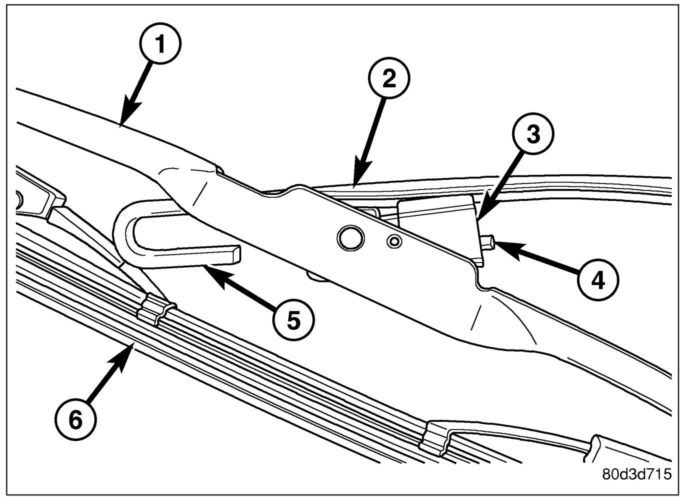
1. The rear wiper arm (3) must be indexed to the motor output shaft (4) with the rear wiper motor in the park position to be properly installed. Position the wiper arm pivot end onto the output shaft so that the wiper blade (5) is aligned with the lowest horizontal line of the rear window defogger grid.
2. With the rear wiper arm properly indexed, push the tapered mounting hole on the pivot end of the wiper arm down over the output shaft.
3. Install and tighten the nut (2) that secures the rear wiper arm to the rear wiper motor output shaft. Tighten the nut to 9 N·m (7 ft. lbs.).
4. Wet the liftgate glass and operate the rear wiper. Turn the rear wiper switch to the OFF position, then check for correct wiper arm position and readjust as required.
5. Reinstall the plastic nut cap over the nut on the pivot end of the rear wiper arm.

WIPER BLADE

REMOVAL

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

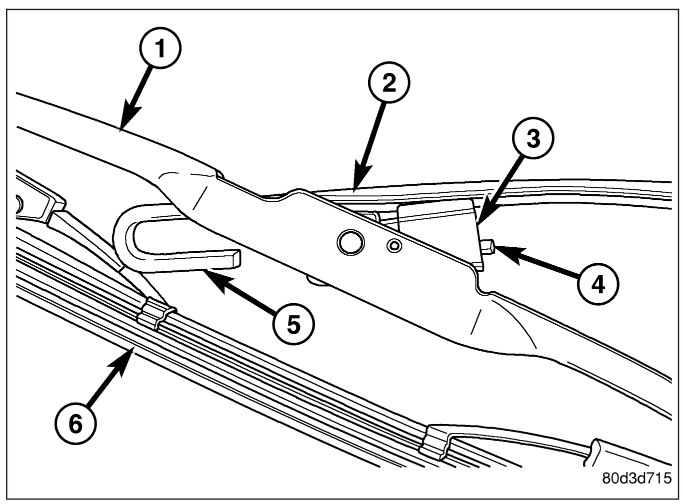


1. Lift the wiper arm (2) to raise the wiper blade and element (6) off of the glass, until the wiper arm hinge is in its over-center position.
2. To remove the blade from the arm, depress the latch release tab (4) on the pivot block (3) under the tip of the arm and slide the blade away from the tip towards the pivot end of the arm far enough to disengage the pivot block from the hook formation (5) on the end of the arm.
3. Extract the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure (1) just ahead of the pivot block.
4. Gently lower the tip of the wiper arm onto the glass.

INSTALLATION

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

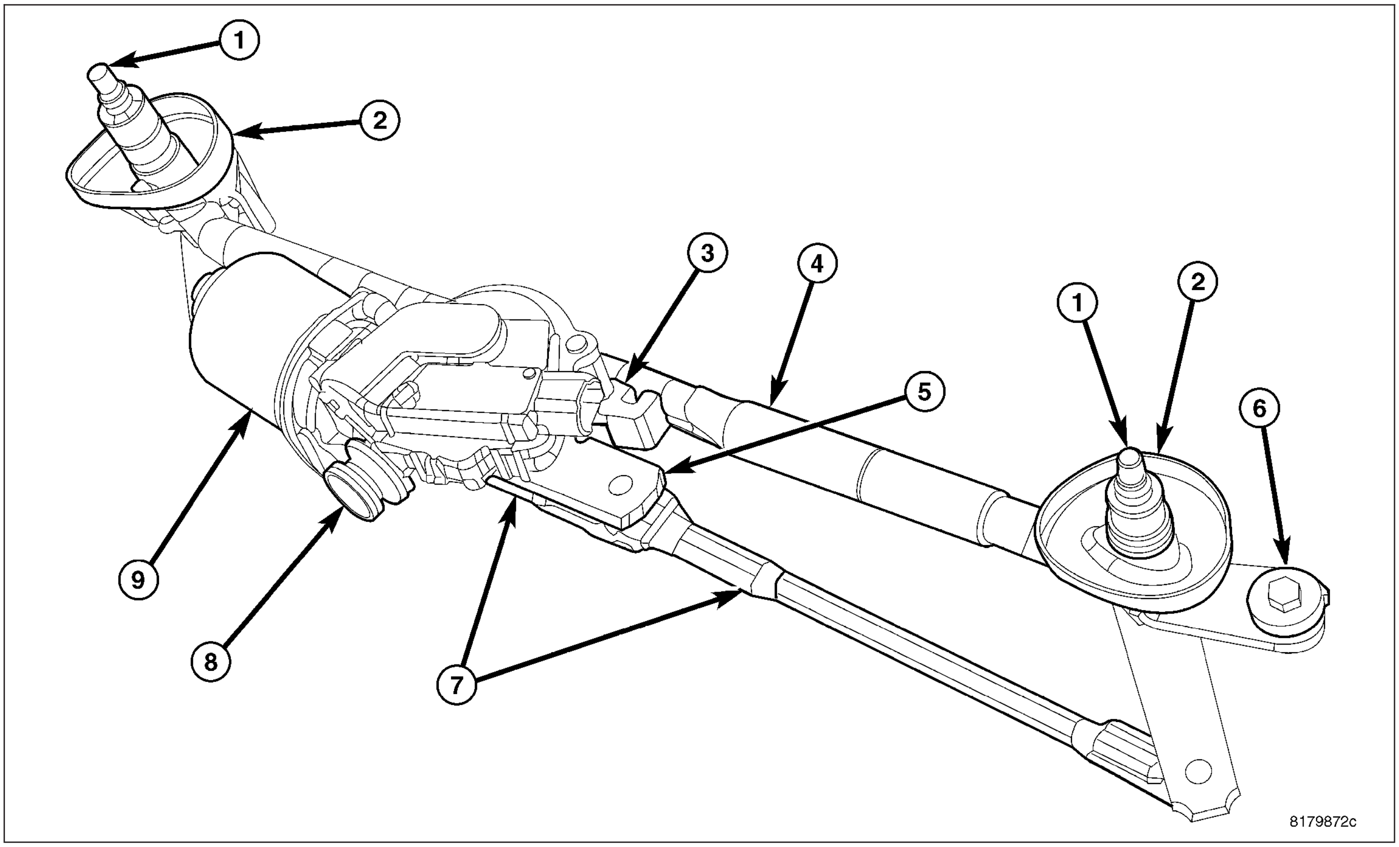
NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.



1. Lift the wiper arm (2) off of the windshield glass, until the wiper arm hinge is in its over-center position.
2. Position the wiper blade near the hook formation (5) on the tip of the arm with the notched end of the wiper element flexor oriented towards the end of the wiper arm that is nearest to the wiper pivot.
3. Insert the hook formation on the tip of the arm through the opening in the blade superstructure (1) ahead of the pivot block (3) far enough to engage the pivot block into the hook.
4. Slide the pivot block up into the hook formation on the tip of the wiper arm until the latch release tab (4) snaps into its locked position. Latch engagement will be accompanied by an audible click.
5. Gently lower the wiper blade and element (6) onto the glass.

WIPER MODULE

DESCRIPTION



The front wiper module is secured to stamped brackets within the cowl plenum panel beneath the cowl plenum cover/grille panel. The ends of the wiper pivot shafts protrude through dedicated openings in the cowl plenum cover/grille panel to drive the wiper arms and blades and are the only visible components of the front wiper module.

The front wiper module consists of the following major components:

- **Bracket** - The front wiper module bracket (4) consists of a long tubular steel main member that has a stamped pivot bracket formation near each end where the two wiper pivots are secured. The front wiper module bracket is secured within the cowl plenum by two screws through two rubber insulators (6).
- **Crank Arm** - The front wiper motor crank arm (5) is a stamped steel unit with a slotted hole on the driven end that is secured to the wiper motor output shaft with a nut, and a ball stud secured to the drive end.
- **Linkage** - Two stamped steel drive links (7) connect the wiper motor crank arm to the two wiper pivot lever arms. The passenger side link has a plastic socket-type bushing on each end, while the driver side link has a socket-type bushing on the pivot end and a sleeve-type bushing on the crank arm end. The bushing on the pivot end of each link is snap-fit over a ball stud on the pivot lever arm. The sleeve-type bushing on the driver side link is snap fit over the inner ball formation of a double ball stud on the crank arm, then the socket-type bushing of the passenger side drive link is snapped over the outer ball formation.
- **Motor** - The front wiper motor (9) is secured by a bracket (3) integral to the motor transmission housing with two screws and nuts near the center of the wiper module bracket. A knob-like rubber insulator (8) on a stud integral to the motor transmission housing is engaged in a slot in a stamped bracket on the forward wall of the cowl plenum. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal automatic resetting circuit breaker.
- **Pivots** - The two front wiper pivots (1) are secured to the ends of the wiper module bracket. The lever arms that extend from the bottom of the pivot shafts. A molded plastic shield (2) is fit over the top of each pivot housing. The upper end of each pivot shaft where the wiper arms will be fastened each is tapered and serrated with a threaded stud formation at the tip.

The front wiper motor and crank arm unit is available for separate service replacement. Any other component of the front wiper module cannot be adjusted or repaired. If any component of the module other than the motor is ineffective or damaged, the entire front wiper module unit must be replaced.

OPERATION

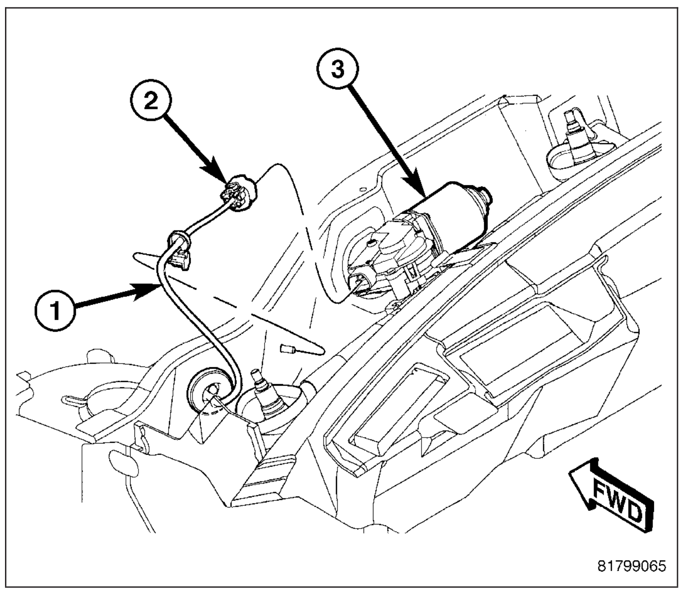
The front wiper module operation is controlled by the battery current inputs received by the wiper motor through the Totally Integrated Power Module (TIPM). The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes the wiper park switch sense circuit to ground or to battery current, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned OFF, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads.

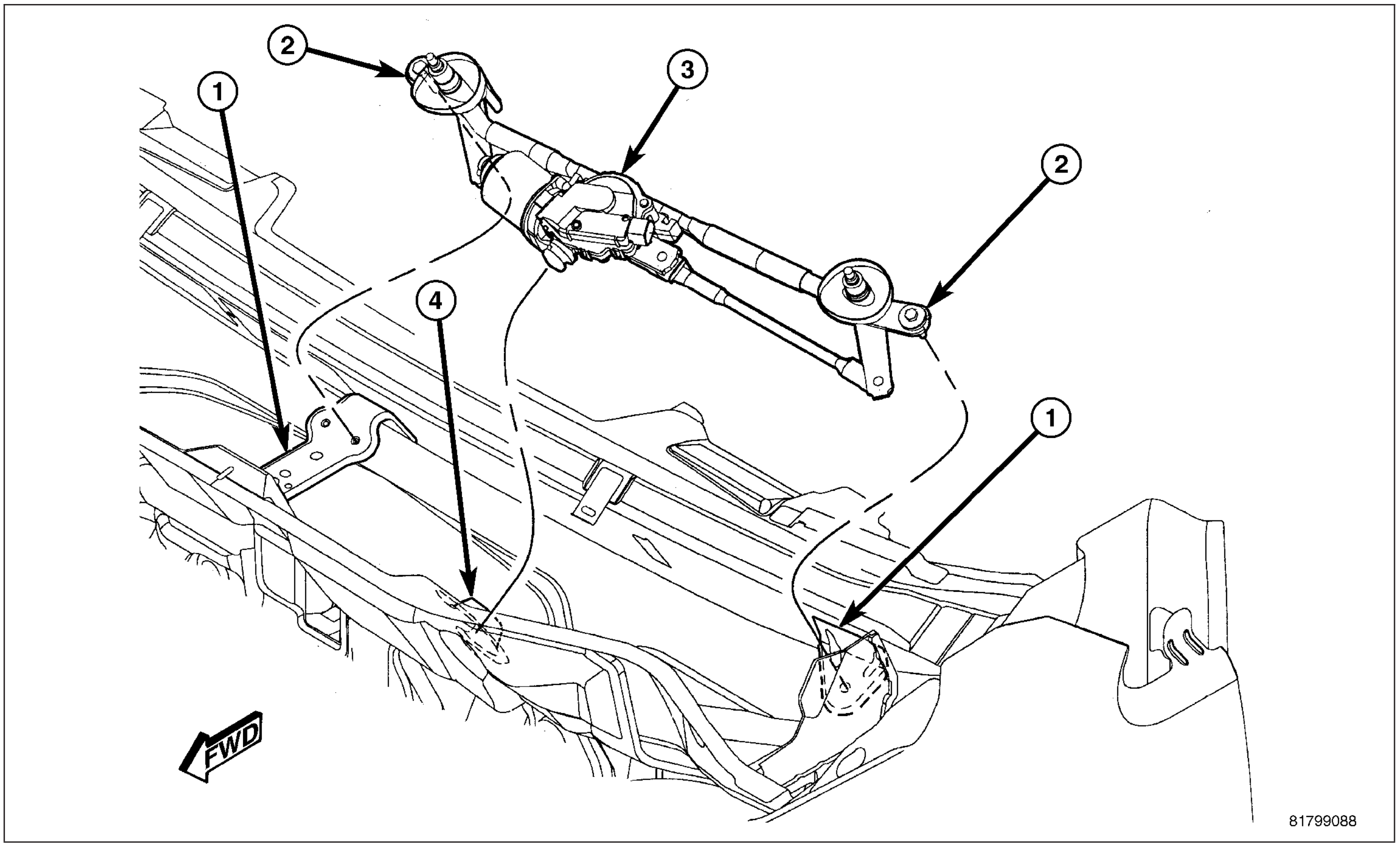
The wiper motor crank arm, the two wiper linkage members and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

The hard wired inputs and outputs of the front wiper motor may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the front wiper motor or the electronic controls or communication between other modules and devices that provide some features of the front wiper and washer system. The most reliable, efficient, and accurate means to diagnose the front wiper motor or the electronic controls and communication related to front wiper motor operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

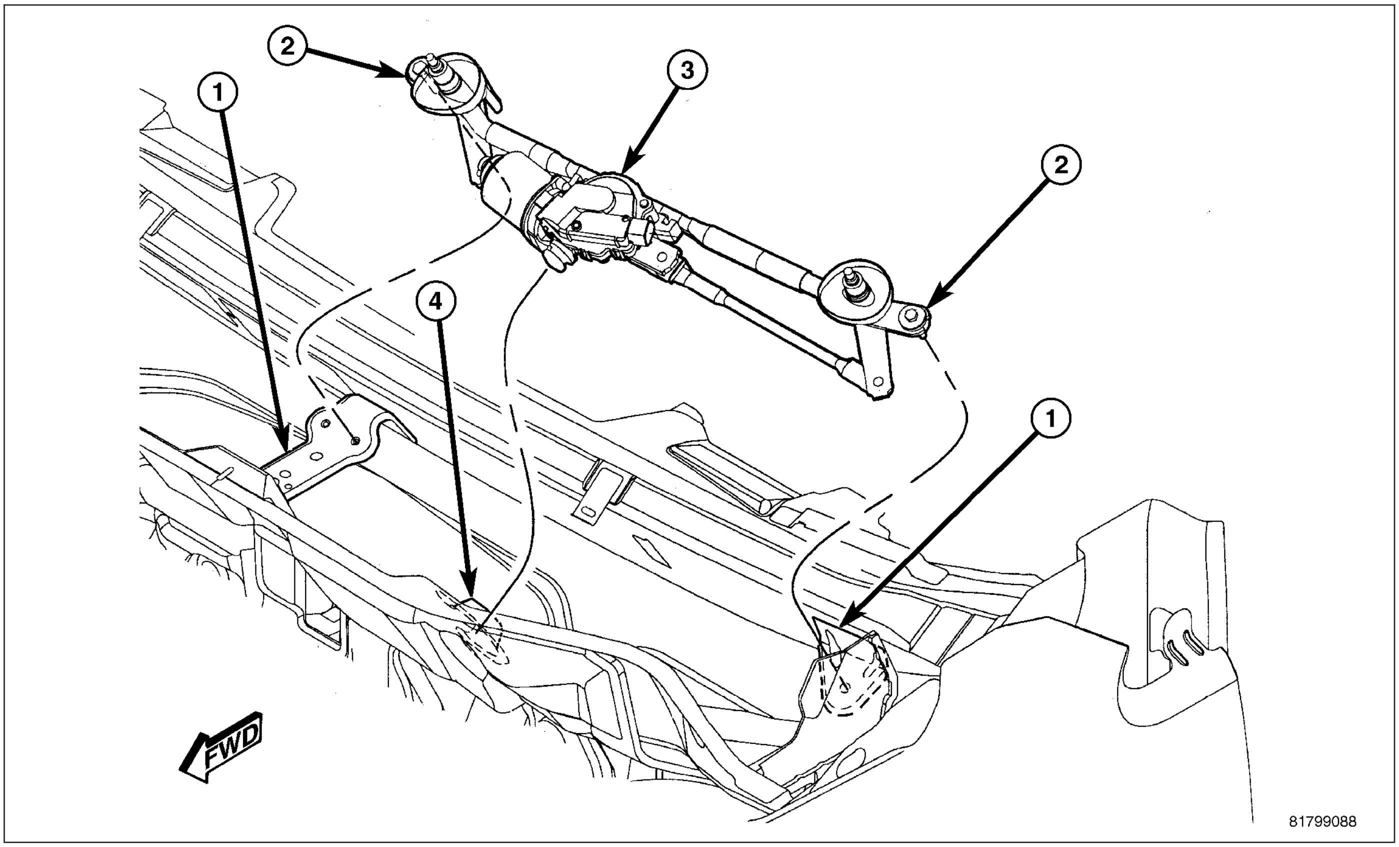
1. Disconnect and isolate the battery negative cable.
2. Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARM - REMOVAL - FRONT).
3. Remove the cowl plenum cover/grille panel from over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).
4. Disengage the routing clip (2) from the stud in the cowl plenum and disconnect the wire harness (1) connector from the connector receptacle for the front wiper motor (3).



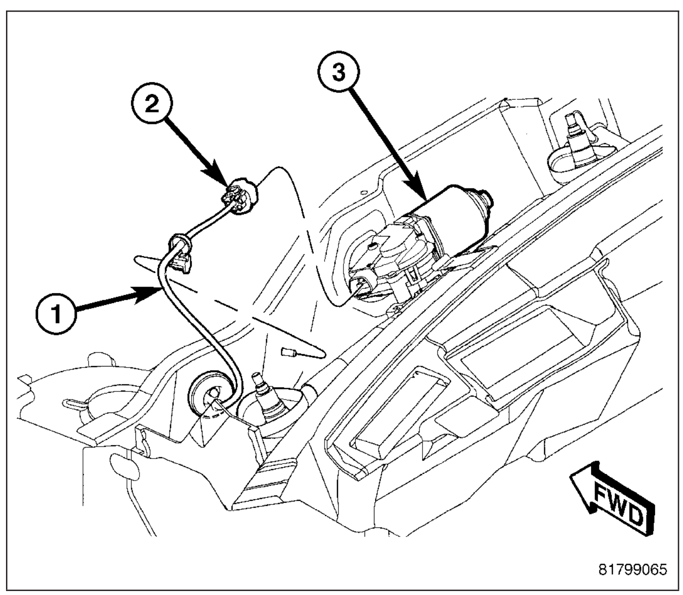


5. Remove the two screws (2) that secure the ends of the front wiper module bracket (3) to the stamped brackets (1) within the cowl plenum.
6. Pull the front wiper module inboard far enough to disengage the knob-like rubber isolator from the slotted bracket (4) on the forward wall of the cowl plenum.
7. Remove the front wiper module from the cowl plenum as a unit.

INSTALLATION



1. Position the front wiper module (3) into the cowl plenum as a unit.
2. Position the knob-like rubber isolator to the slotted bracket (4) on the forward wall of the cowl plenum and pull the module outboard far enough to seat the isolator in the bracket.
3. Loosely install the two screws (2) that secure the ends of the front wiper module bracket to the stamped brackets (1) within the cowl plenum.
4. Tighten the two screws, driver side followed by passenger side.
5. Reconnect the wire harness (1) connector to the connector receptacle for the front wiper motor (3) and engage the routing clip onto the stud in the cowl plenum.
6. Reinstall the cowl plenum cover/grille panel over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).



NOTE: Be certain to turn the ignition switch to the ON position, then turn the front wiper switch ON and OFF again to cycle the wiper motor and linkage to their natural park position before reinstalling the front wiper arms onto the wiper pivots.

7. Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARM - INSTALLATION - FRONT).
8. Reconnect the battery negative cable.

NAVIGATION/TELECOMMUNICATION

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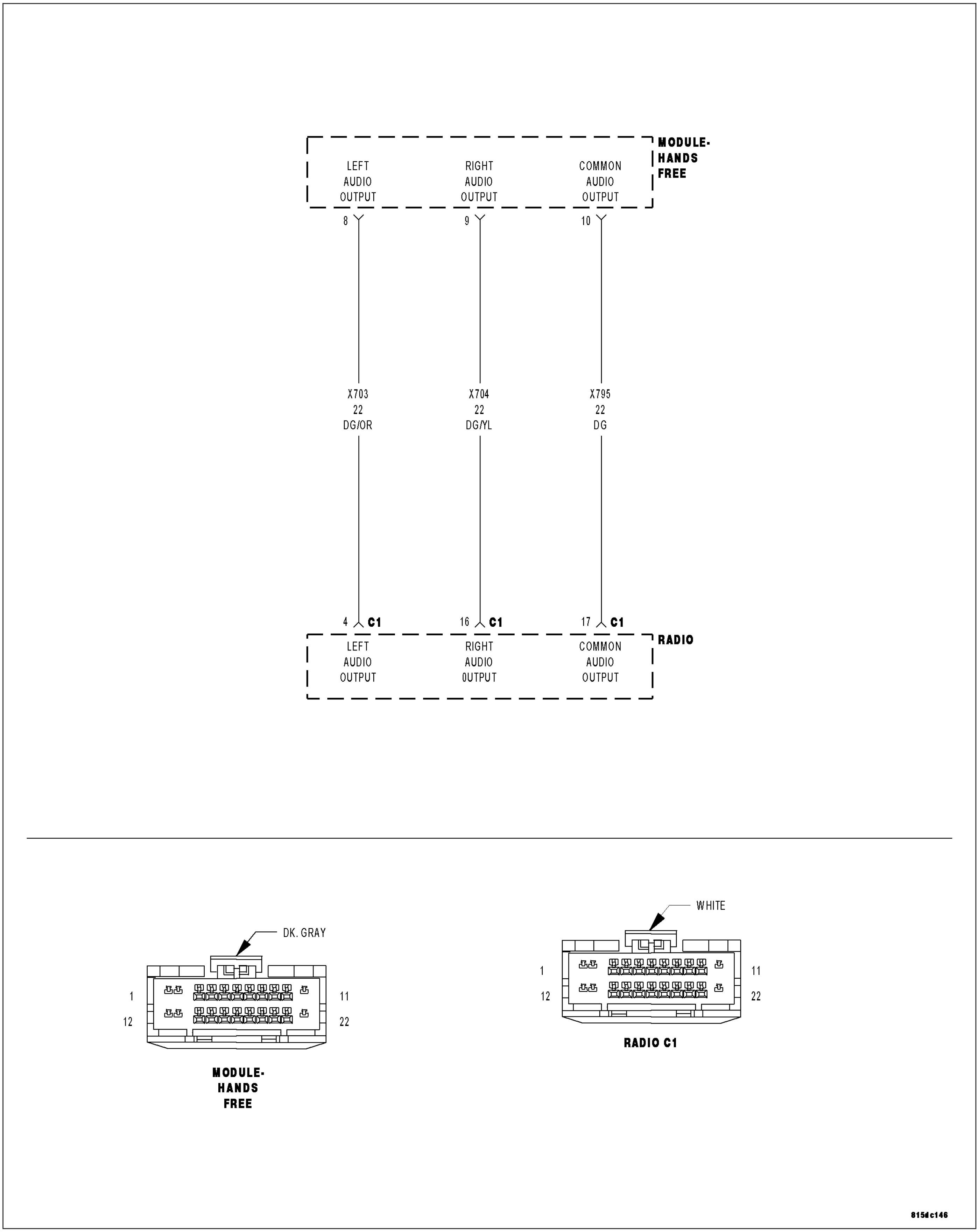
NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

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NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X703) Left Audio Output circuit.

Possible Causes
(X703) LEFT AUDIO OUTPUT CIRCUIT OPEN
(X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO GROUND
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

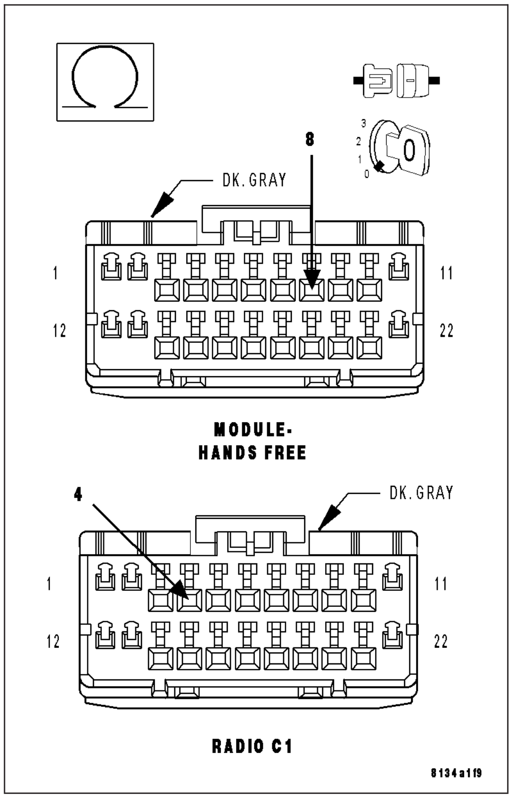
2. (X703) LEFT AUDIO OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Radio C1 harness connector.

Measure the resistance of the (X703) Left Audio Output circuit between the HFM connector and the radio connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X703) Left Audio Output circuit for an open
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

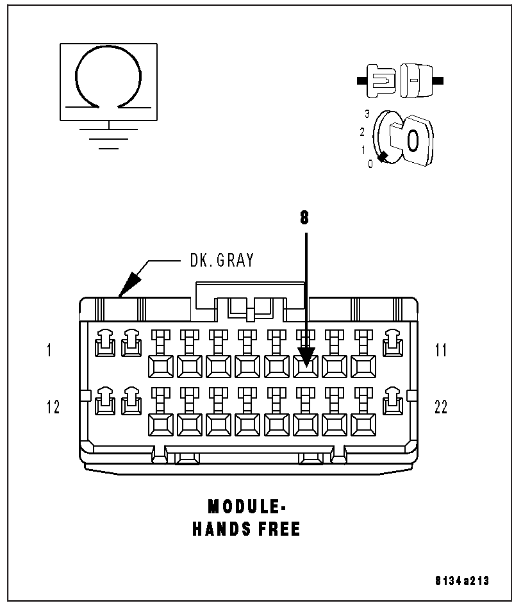
3. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (X703) Left Audio Output circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (X703) Left Audio Output circuit for short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4



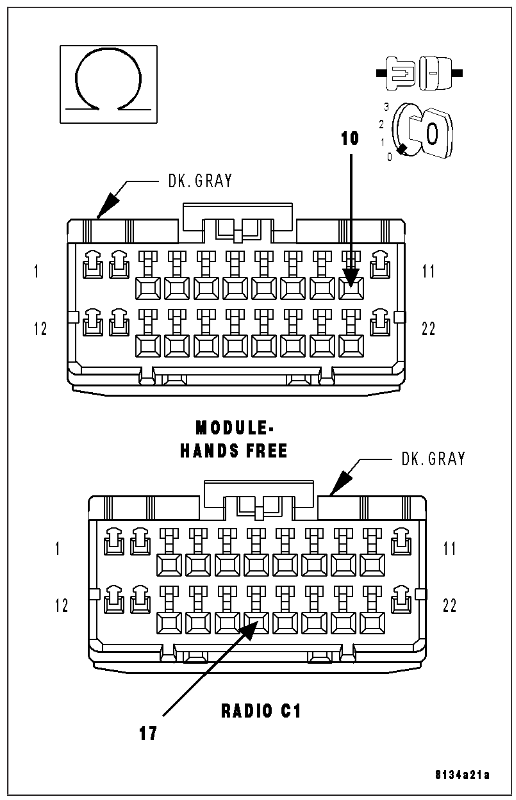
4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

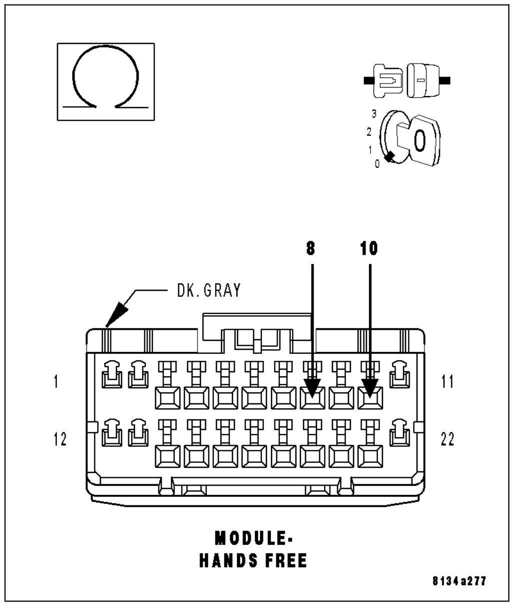
Yes >> Go To 5

No >> Repair the (X795) Common Audio Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



5. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT

Measure the resistance between the (X703) Left Audio Output circuit and the (X795) Common Audio Output circuit.



Is the resistance below 5.0 ohms?

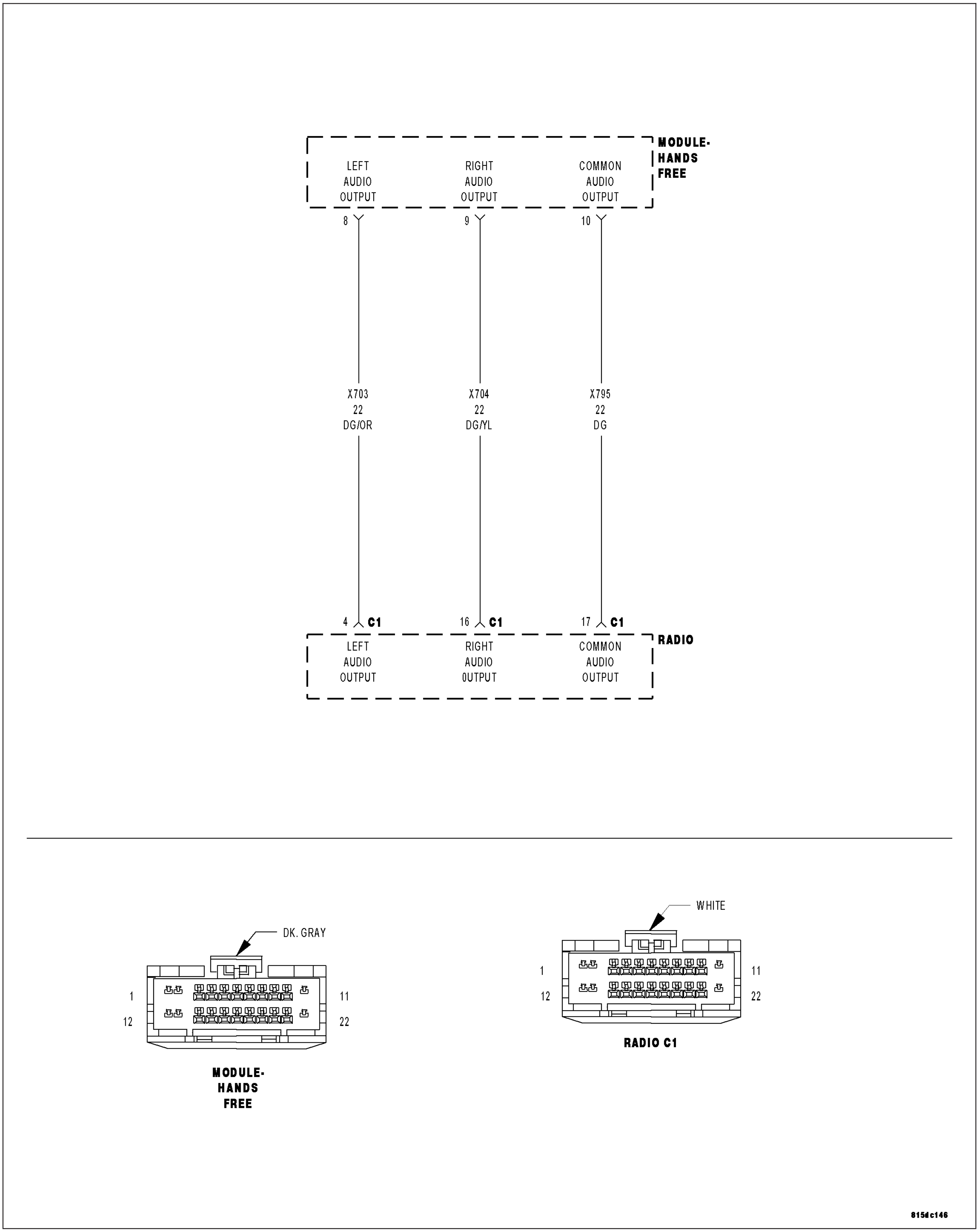
Yes >> Repair the (X703) Left Audio Output circuit for a short to the (X795) Common Audio Output circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X703) Left Audio Output circuit.

Possible Causes
(X703) LEFT AUDIO OUTPUT CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. (X703) LEFT AUDIO OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

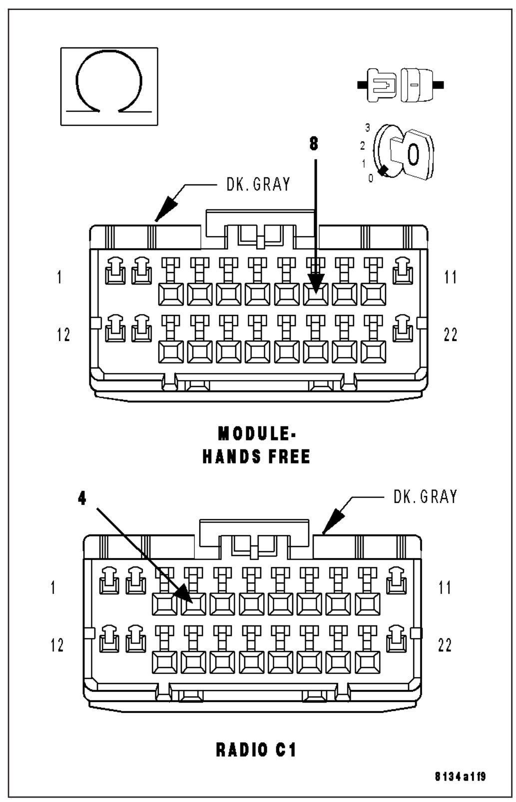
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X703) Left Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X703) Left Audio Output circuit for an open
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

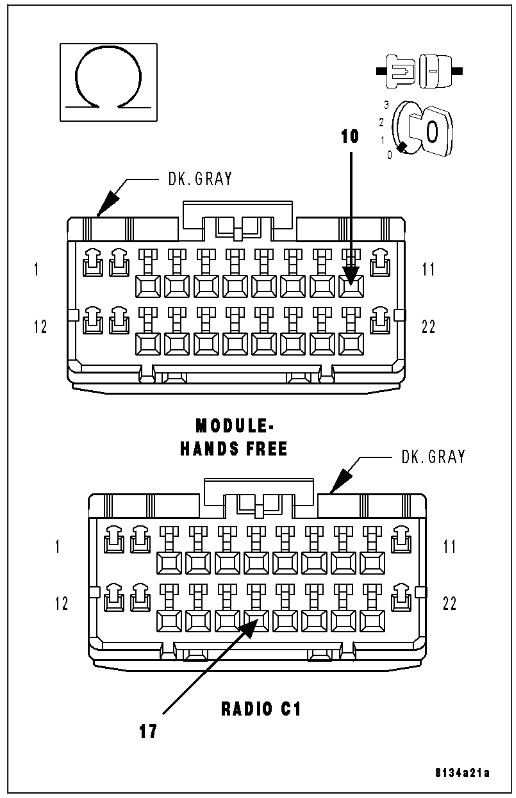
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



4. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X703) Left Audio Output circuit.

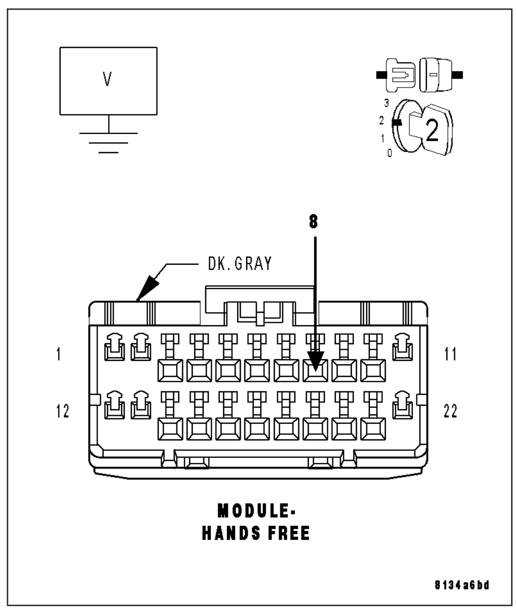
Is the voltage above 1.0 volts?

Yes >> Repair the (X703) Left Audio Output circuit for a short to voltage.

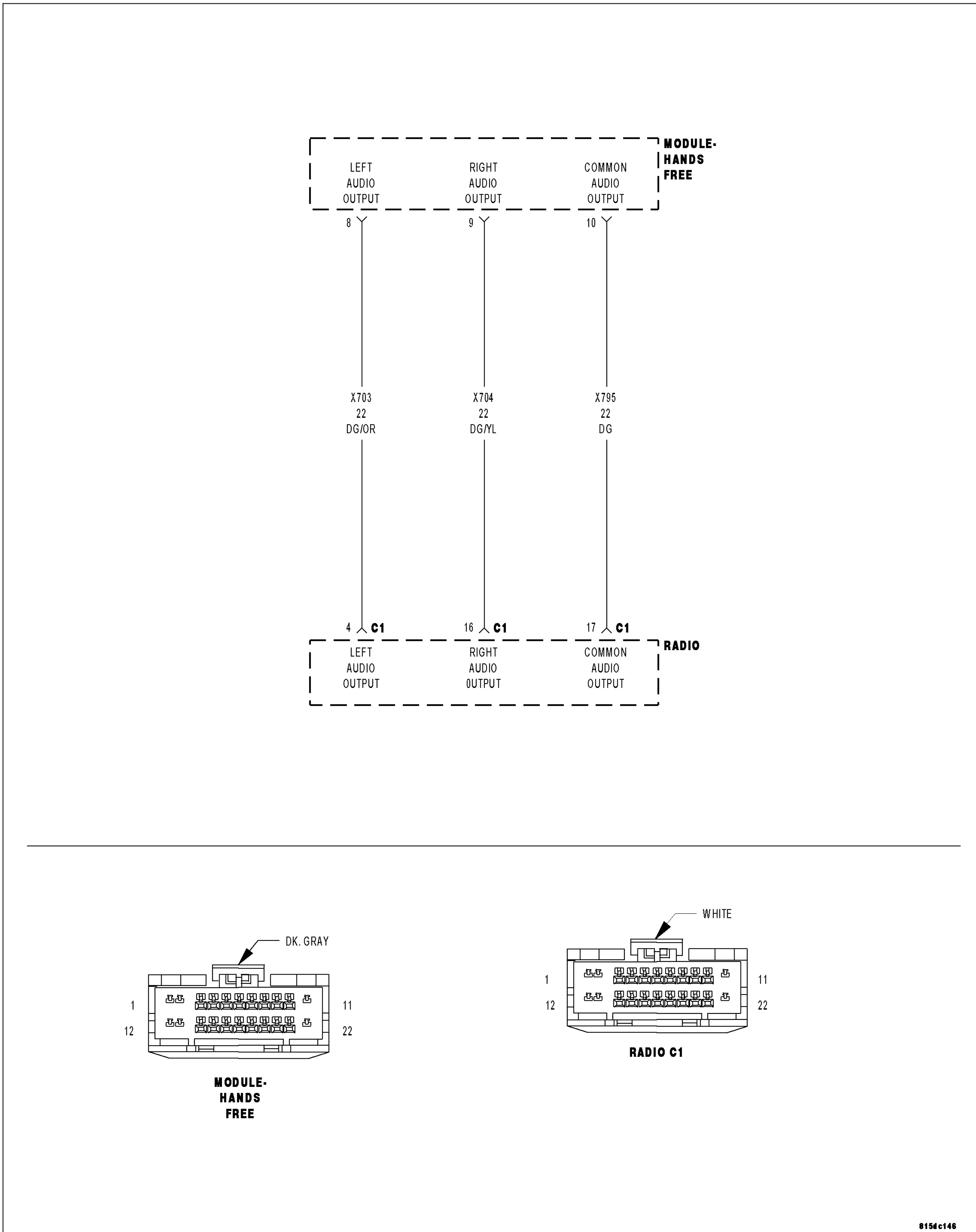
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X704) Right Audio Output circuit.

Possible Causes
(X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN
(X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO GROUND
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC’s.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC’s.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

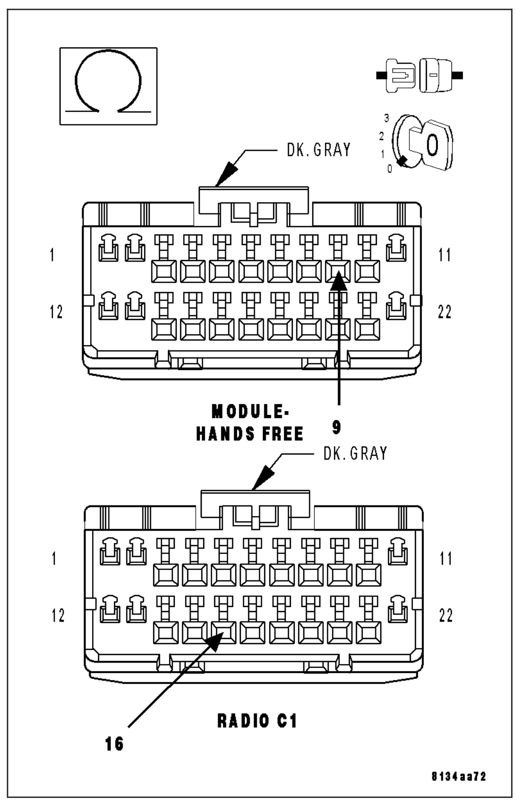
2. (X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Radio C1 harness connector.

Measure the resistance of the (X704) Right Audio Output circuit between the HFM connector and the radio connector.



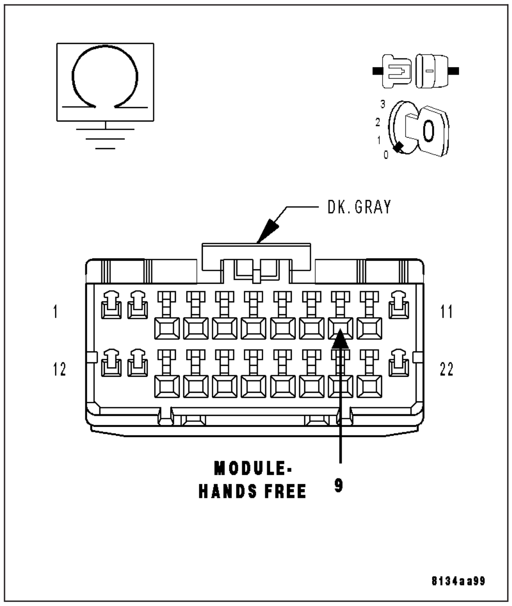
Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X704) Right Audio Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (X704) Right Audio Output circuit.



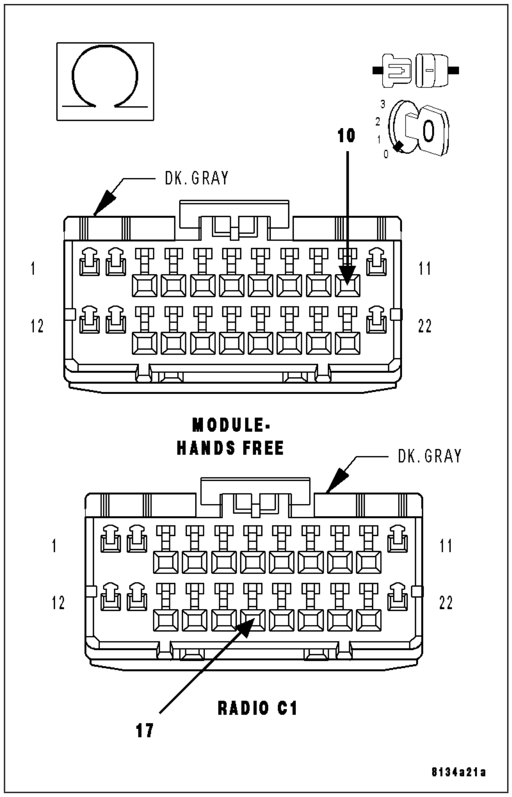
Is the resistance below 5.0 ohms?

Yes >> Repair the (X704) Right Audio Output circuit for short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.



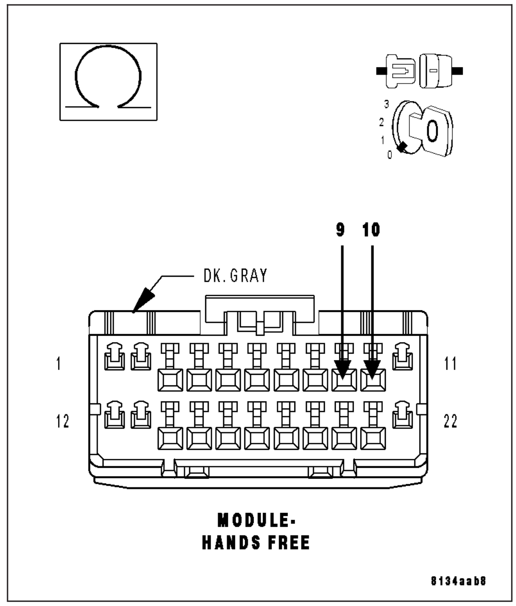
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (X795) Common Audio Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

5. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT

Measure the resistance between the (X704) Right Audio Output circuit and the (X795) Common Audio Output circuit.



Is the resistance below 5.0 ohms?

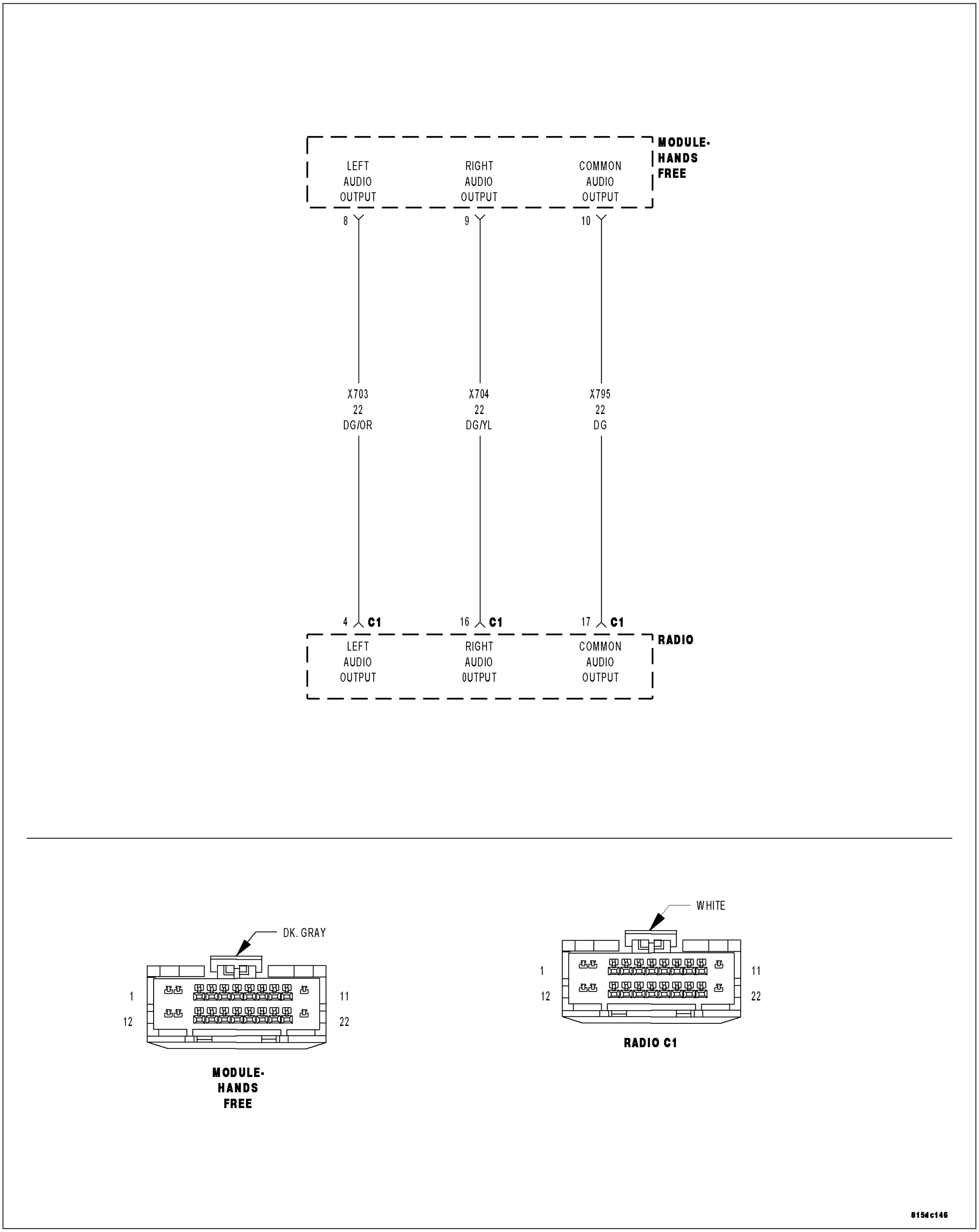
Yes >> Repair the (X704) Right Audio Output circuit for a short to the (X795) Common Audio Output circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X704) Right Audio Output circuit.

Possible Causes
(X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. (X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

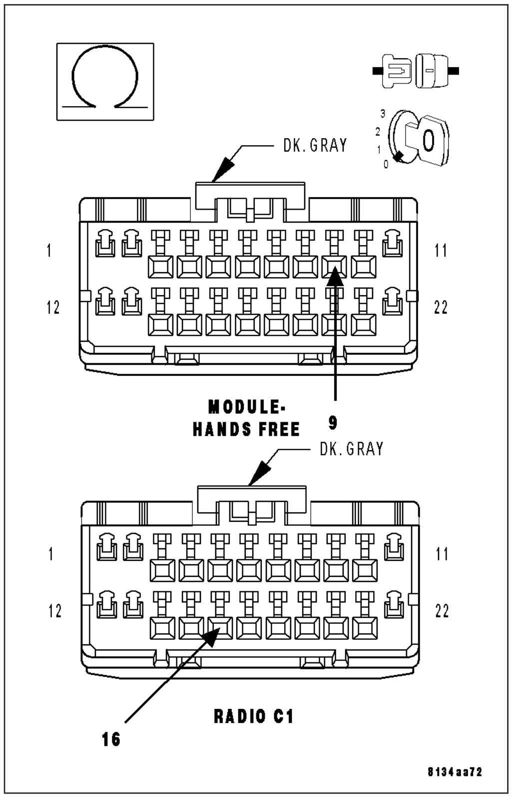
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X704) Right Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X704) Right Audio Output circuit for an open
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

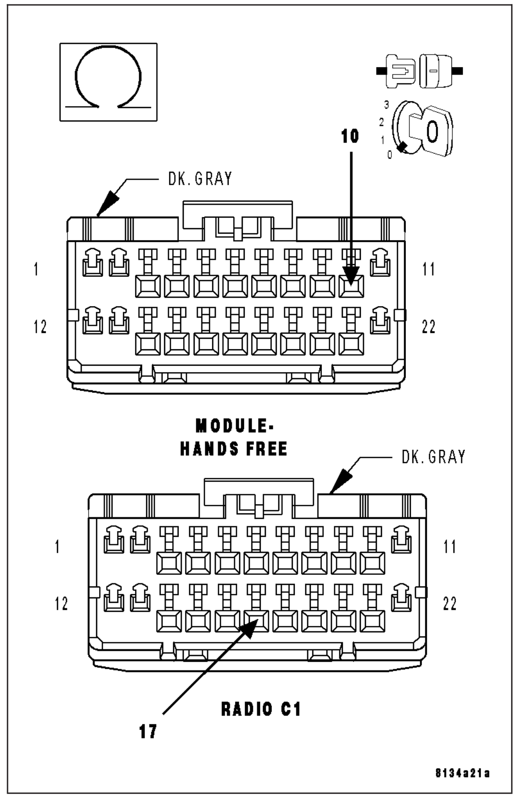
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



4. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X704) Right Audio Output circuit.

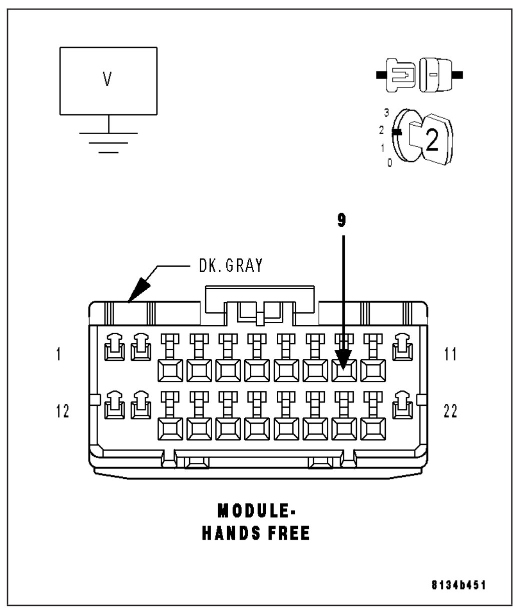
Is the voltage above 1.0 volts?

Yes >> Repair the (X704) Right Audio Output circuit for a short to voltage.

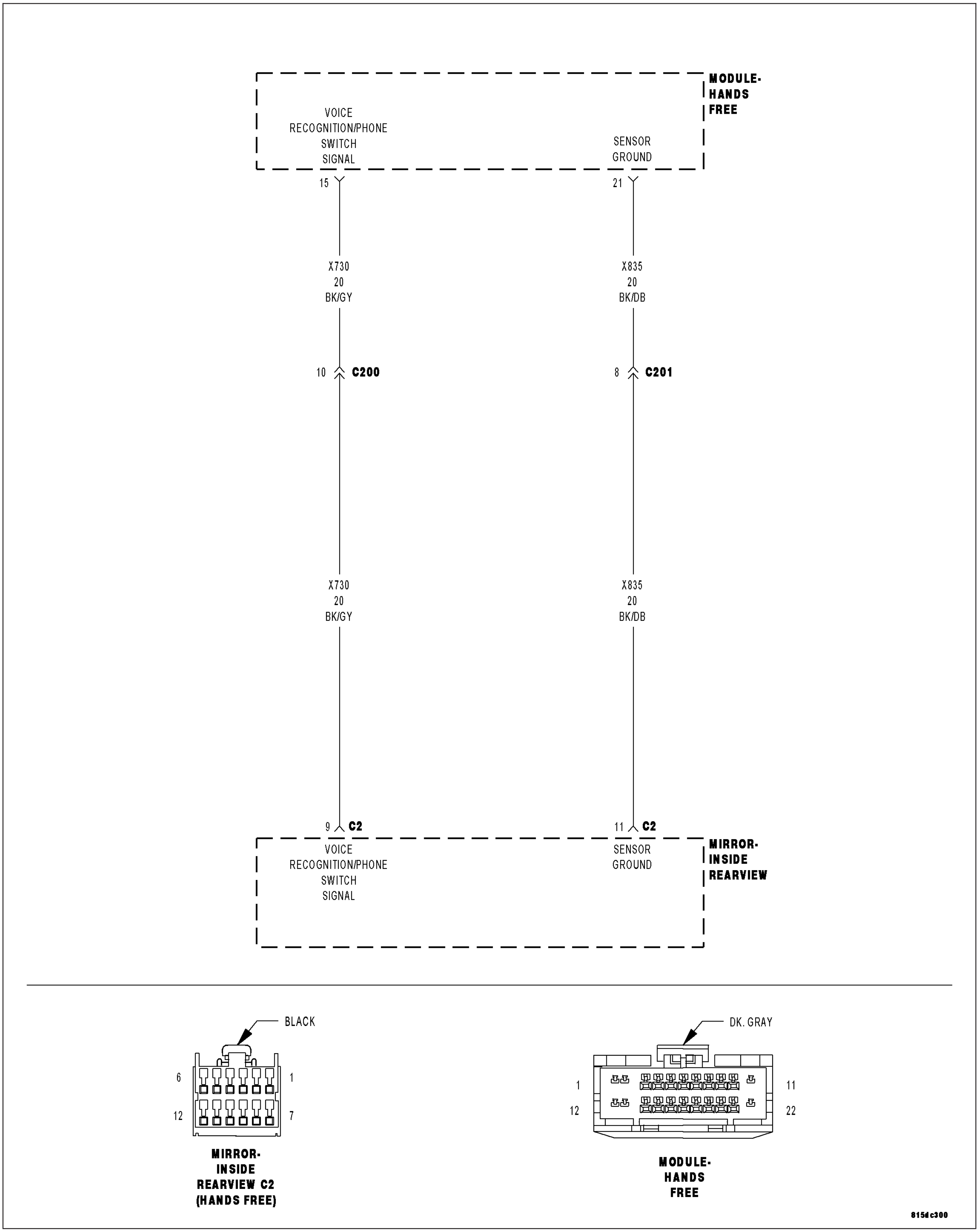
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



B1435-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects an invalid voltage signal on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL

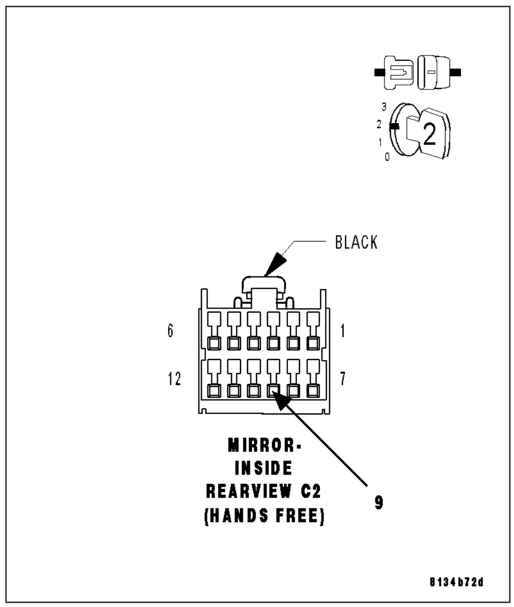
Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between the (X730) Voice Recognition/Phone Switch Signal circuit and ground.



NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

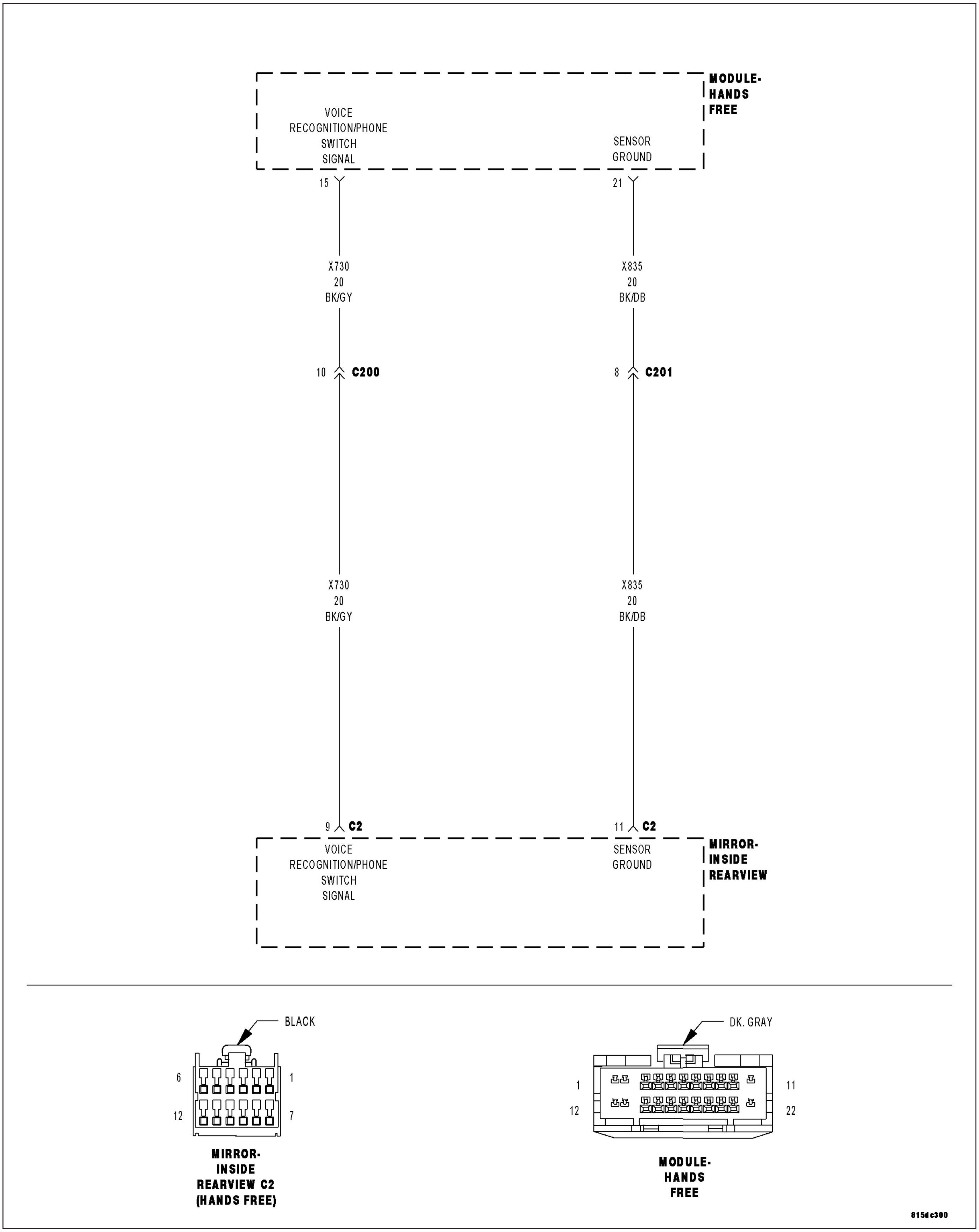
Yes >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage below 0.6 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REAR VIEW MIRROR
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO (X835) SENSOR GROUND CIRCUIT
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO GROUND
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

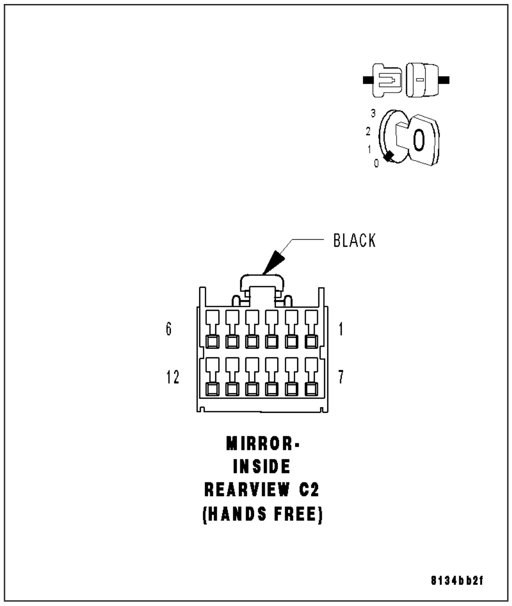
2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.



Is the voltage above 4.7 volts?

Yes >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

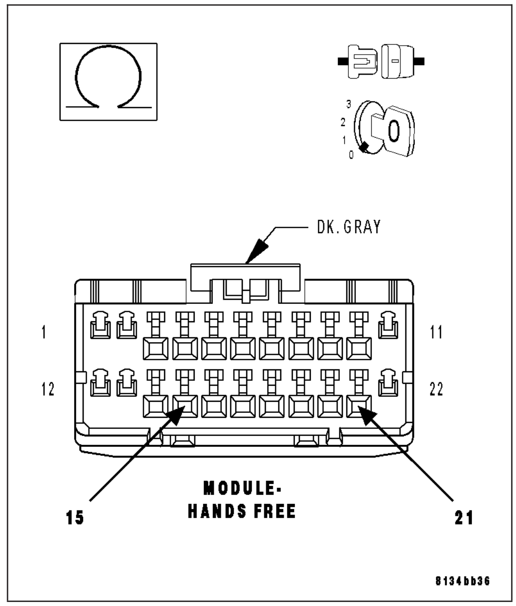
No >> Go To 3

3. (X730) VOICE/RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORTED TO THE (X835) SENSOR GROUND CIRCUIT

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Measure the resistance between the (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit.



Is the resistance below 100.0 ohms?

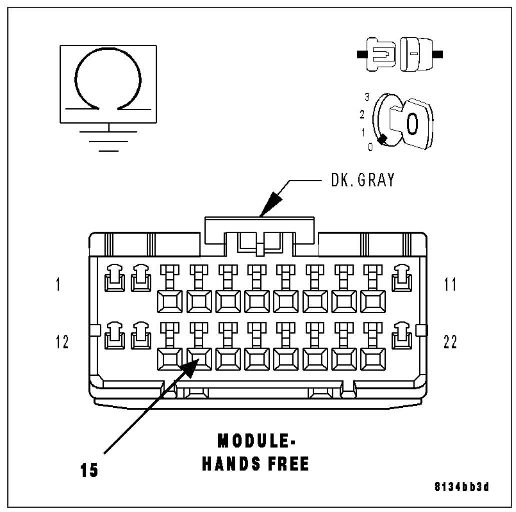
Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to the (X835) Sensor Ground circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. (X730) VOICE/RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (X730) Voice Recognition/Phone Switch Signal circuit.



Is the resistance below 100.0 ohms?

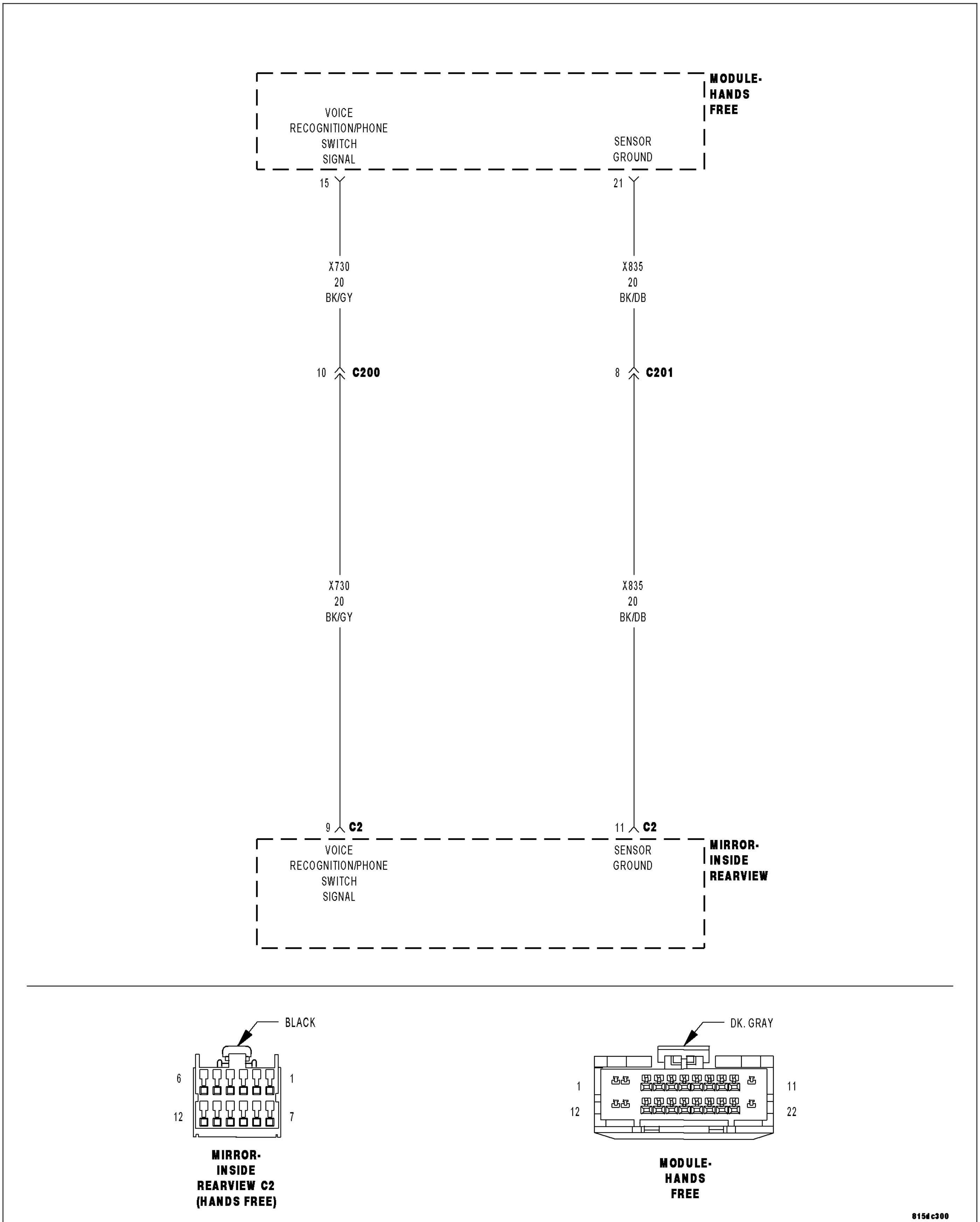
Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage above 4.7 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT OPEN
(X835) SENSOR GROUND CIRCUIT OPEN
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

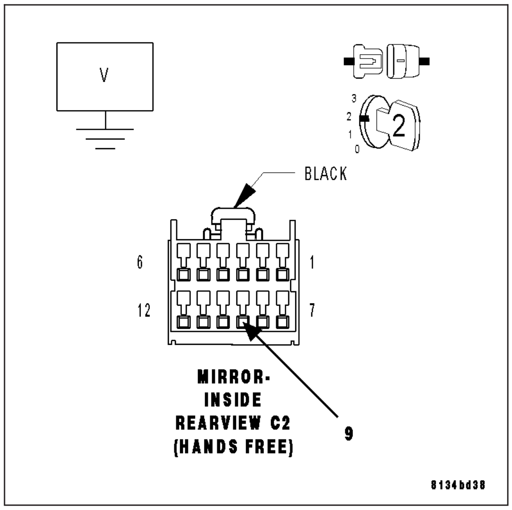
2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

Measure the voltage of the (X730) Voice Recognition/Phone Switch Signal circuit.



Is the voltage above 5.3 volts?

Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

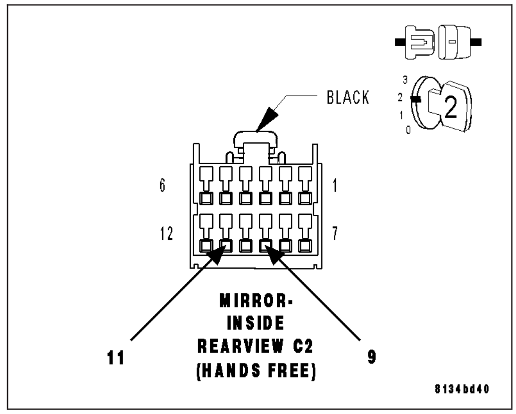
3. INSIDE REAR VIEW MIRROR

Turn the ignition off.

Connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch Voltage.



Is the voltage approximately 0 volts?

Yes >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

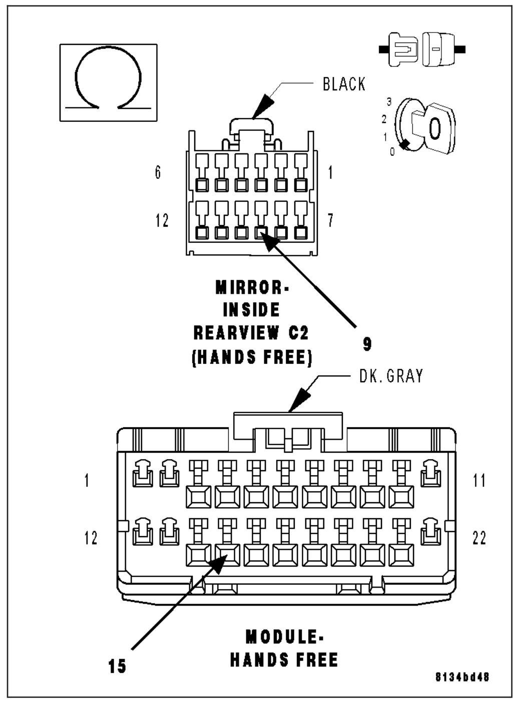
No >> Go To 4

4. (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Measure the resistance of the (X730) Voice Recognition/Phone Switch Signal circuit between the HFM connector and the inside rear view mirror connector.



Is the resistance below 5.0 ohms?

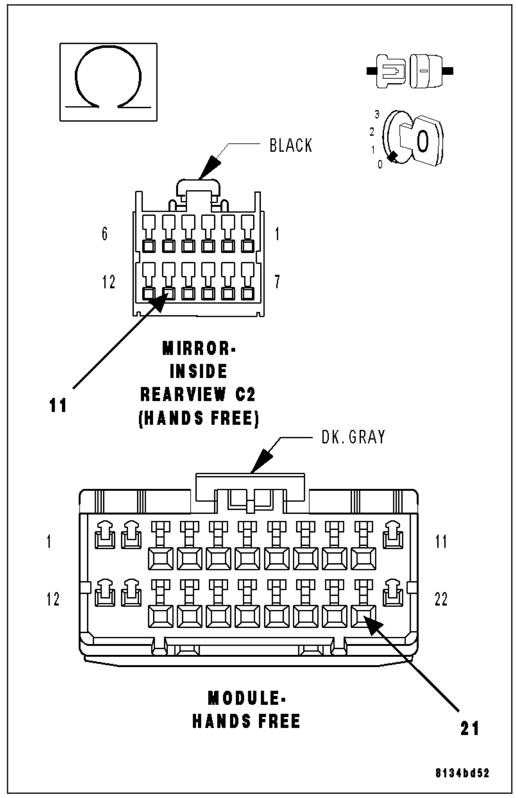
Yes >> Go To 5

No >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

5. (X835) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (X835) Sensor Ground circuit between the HFM connector and the inside rear view mirror connector.



Is the resistance below 5.0 ohms?

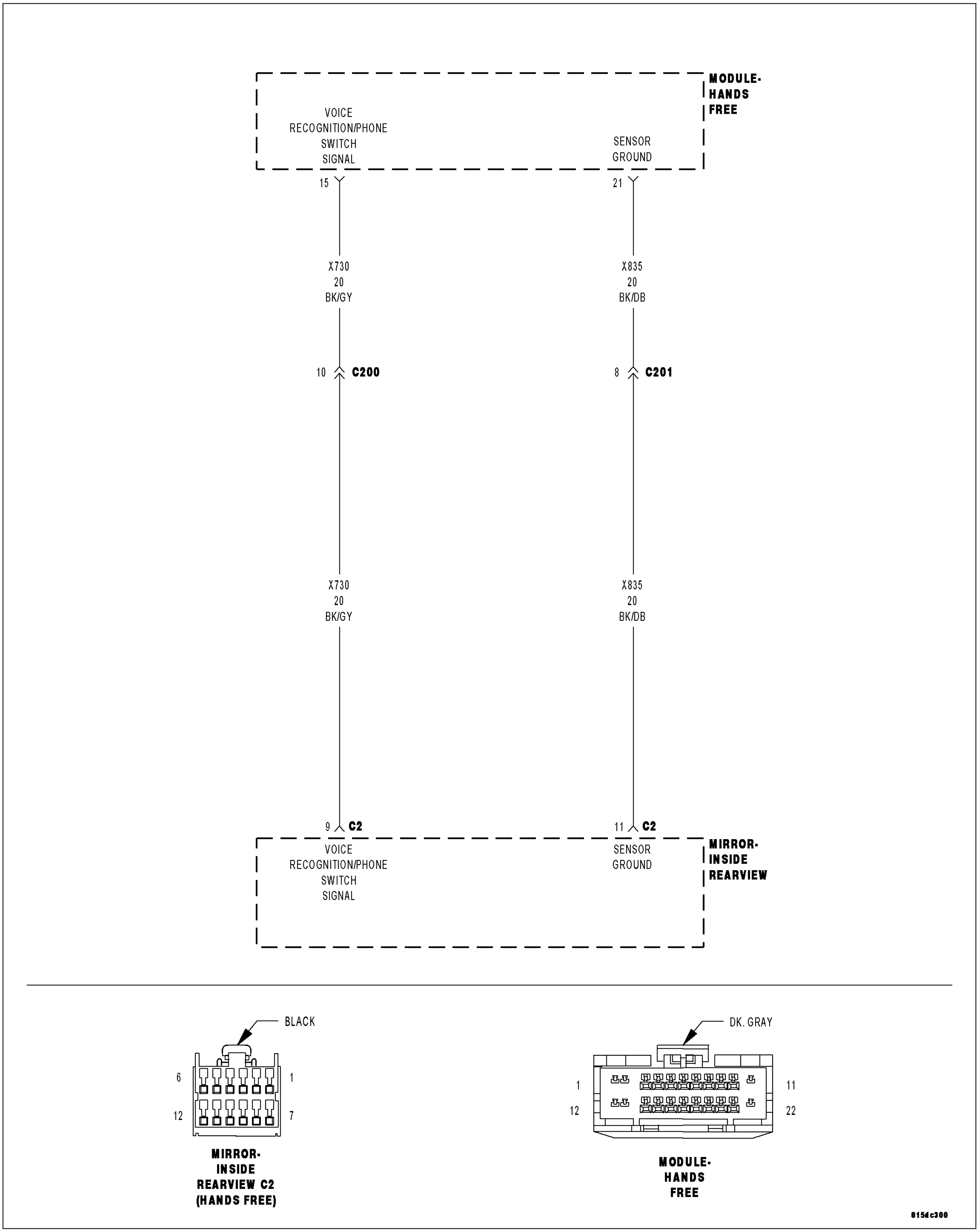
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (X835) Sensor Ground circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1438–VOICE RECOGNITION SWITCH STUCK



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage between 3.5 volts and 4.0 volts on the (X730) Voice Recognition/ Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL

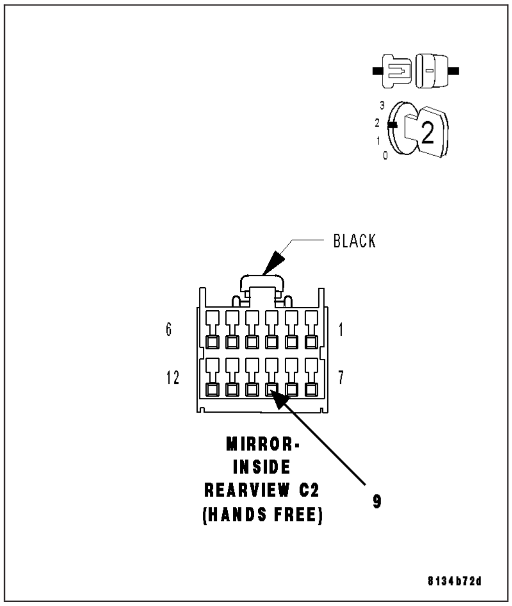
Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.



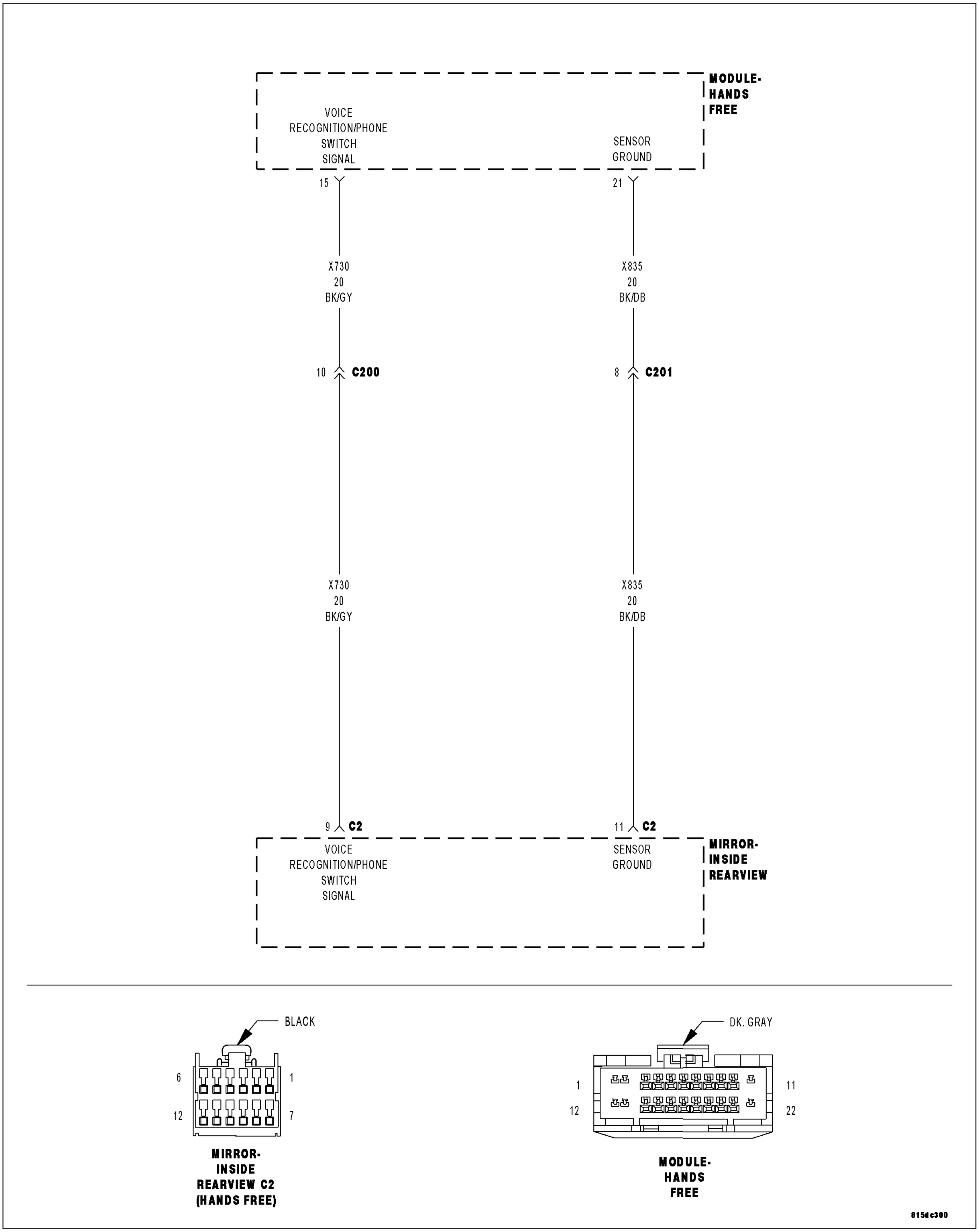
NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

Yes >> Replace the Inside Rear View Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1439-PHONE SWITCH STUCK



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage between 2.8 volts and 3.3 volts on the (X730) Voice Recognition/Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL

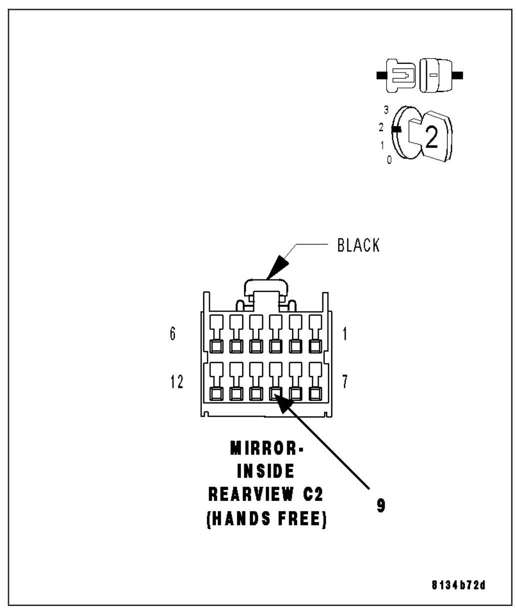
Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.



NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

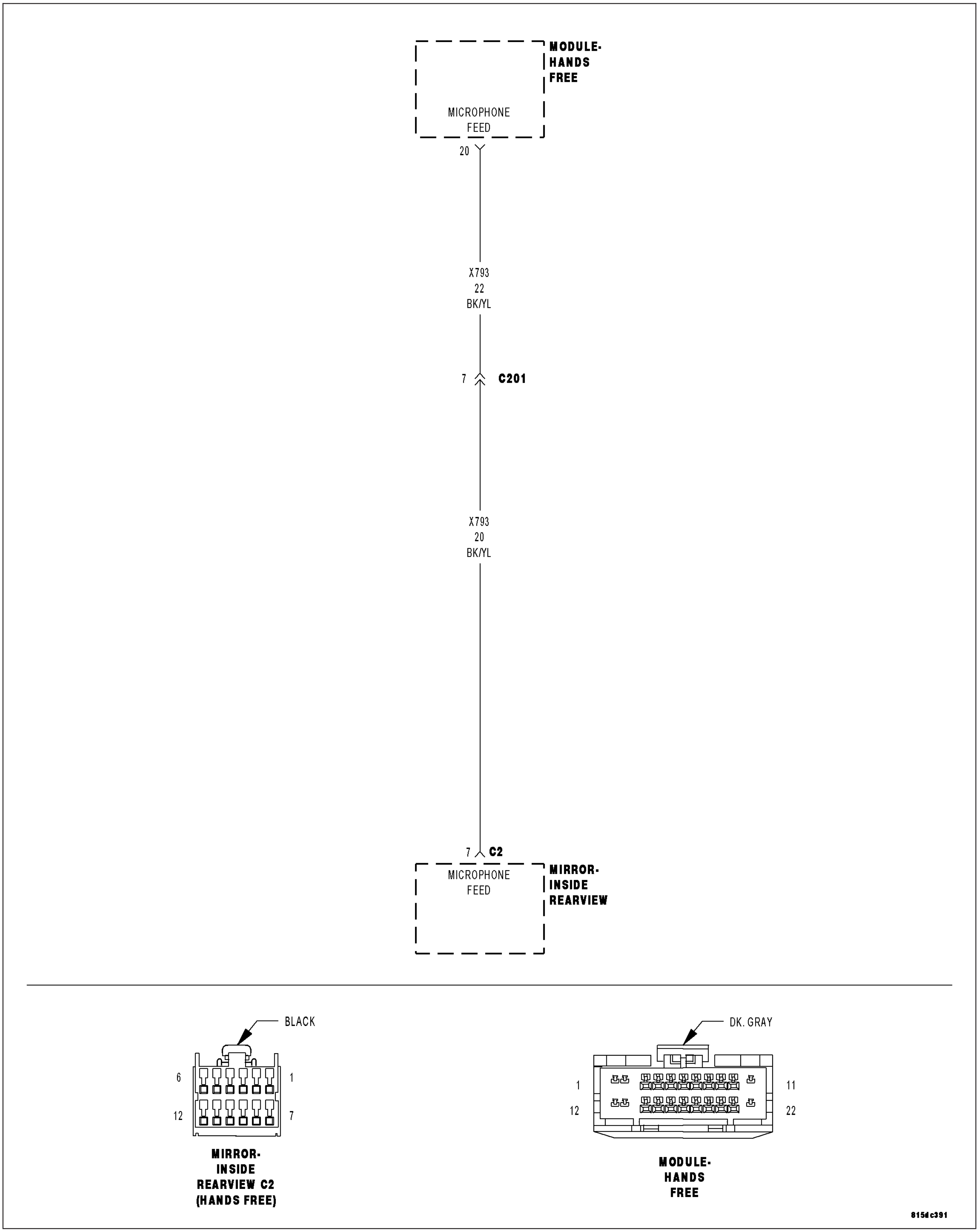
Yes >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN
(X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

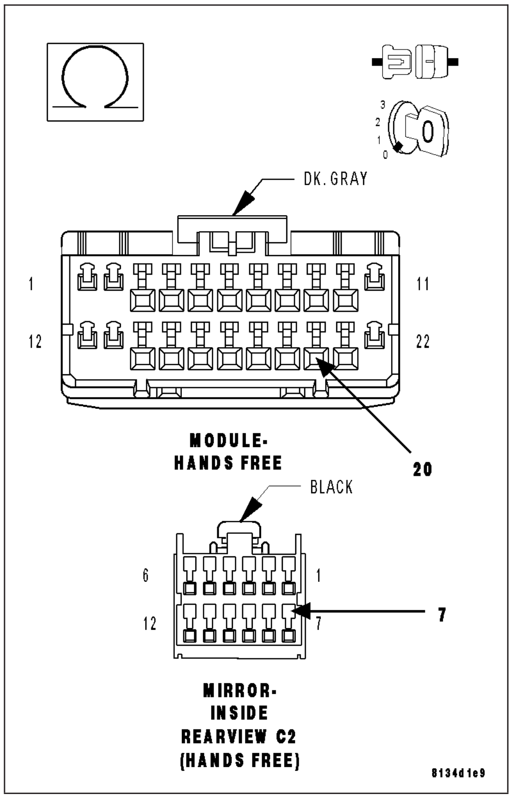
2. (X793) MICROPHONE FEED CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rear view mirror connector.



Is the resistance below 5.0 ohms?

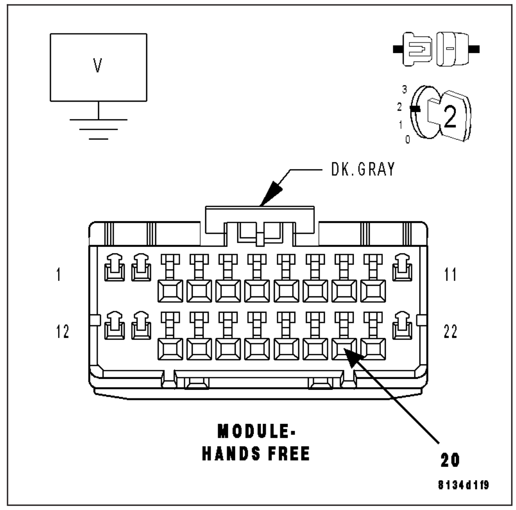
Yes >> Go To 3

No >> Repair the (X793) Microphone Feed circuit for an open.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X793) Microphone Feed circuit.



Is the voltage above 1.0 volt?

Yes >> Repair the (X793) Microphone Feed circuit for short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. INSIDE REAR VIEW MIRROR

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

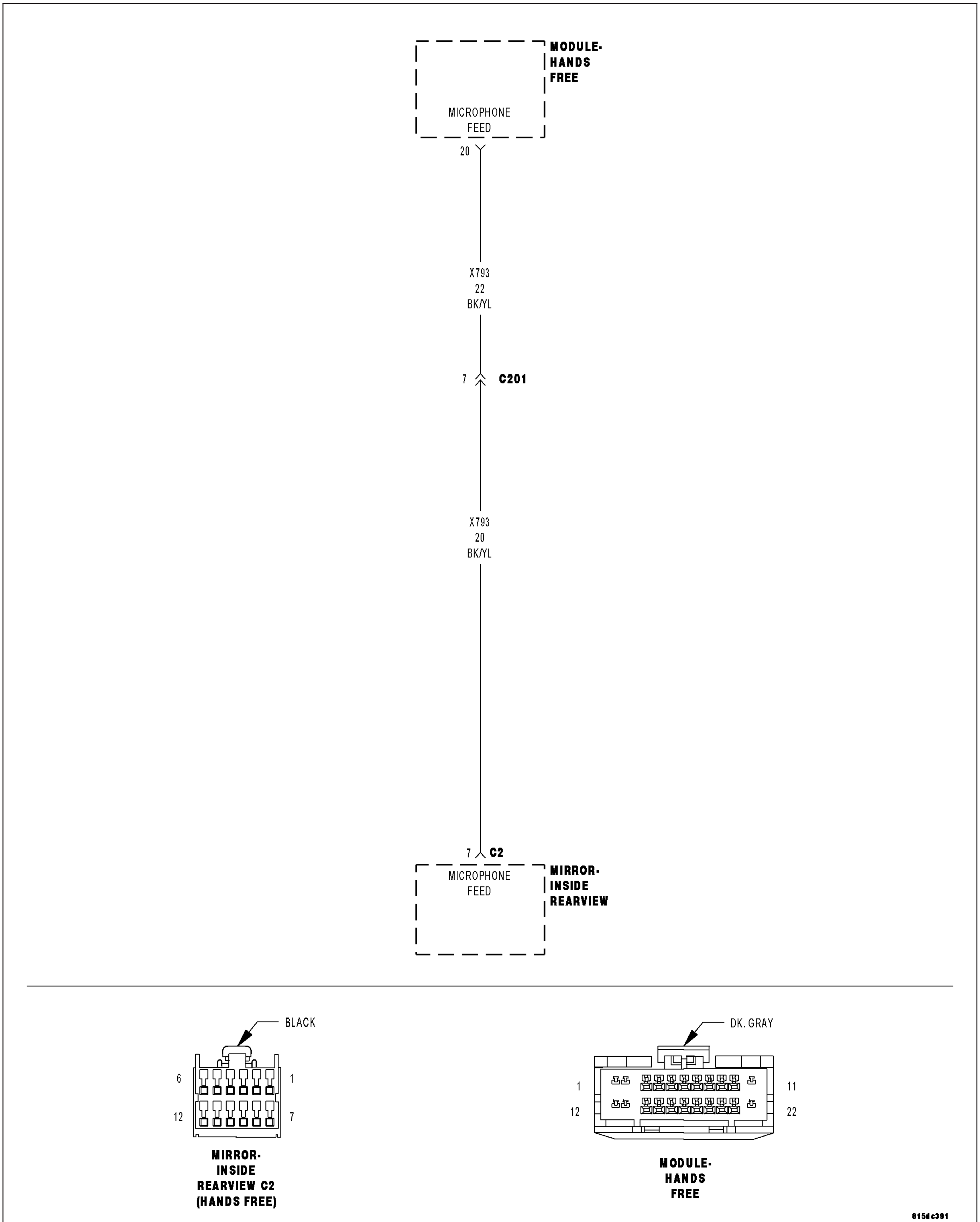
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN
(X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC’s.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC’s.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

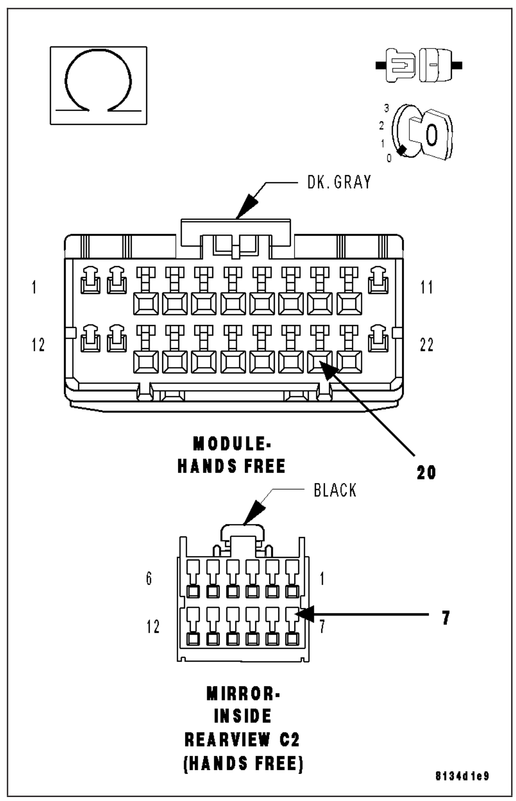
2. (X793) MICROPHONE FEED CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rear view mirror connector.



Is the resistance below 5.0 ohms?

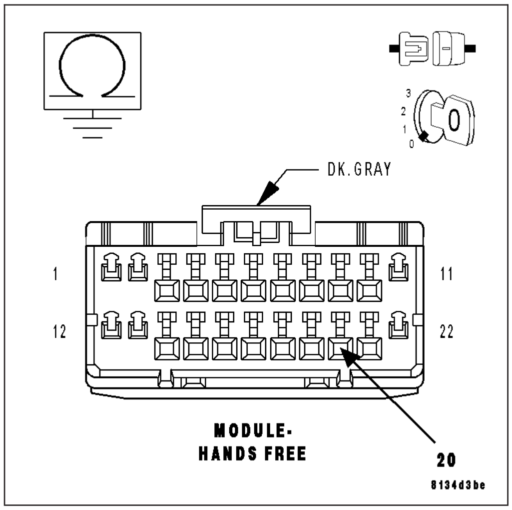
Yes >> Go To 3

No >> Repair the (X793) Microphone Feed circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (X793) Microphone Feed circuit.



Is the resistance below 100.0 ohms?

Yes >> Repair the (X793) Microphone Feed circuit for short to ground.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. INSIDE REAR VIEW MIRROR

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

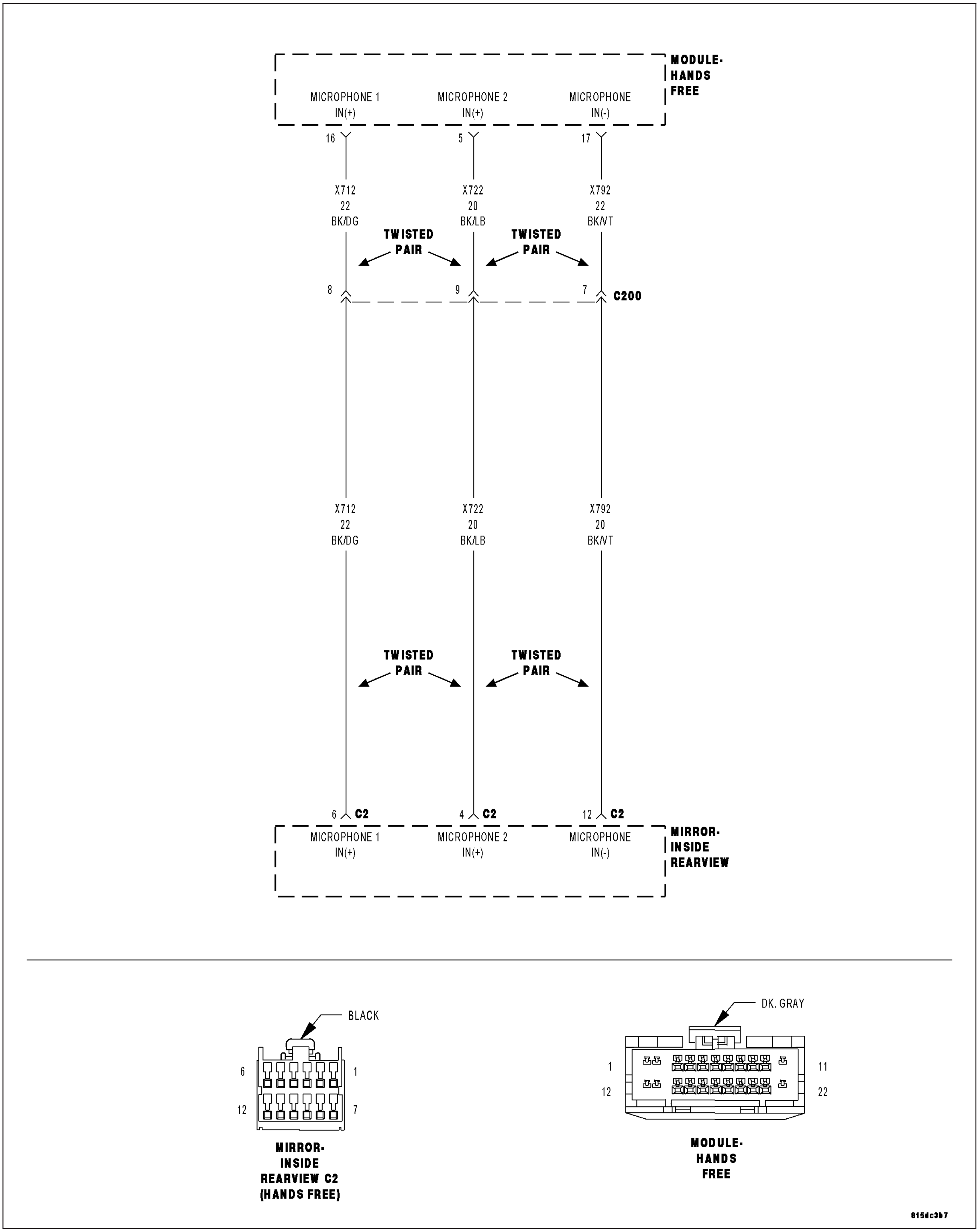
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair is complete.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B1492–GENERAL MICROPHONE PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault in any of the microphone circuits.

Possible Causes
(X712) MICROPHONE 1 IN (+) CIRCUIT OPEN
(X722) MICROPHONE 2 IN (+) CIRCUIT OPEN
(X792) MICROPHONE IN (-) CIRCUIT OPEN
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. (X712) MICROPHONE 1 IN (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

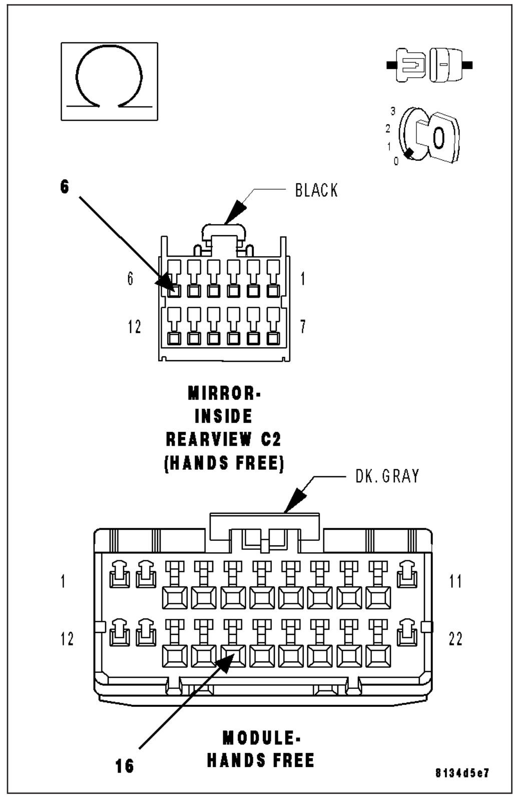
Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X712) Microphone 1 IN (+) circuit between the HFM connector and the inside rear view mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X712) Microphone 1 IN (+) circuit for an open. Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



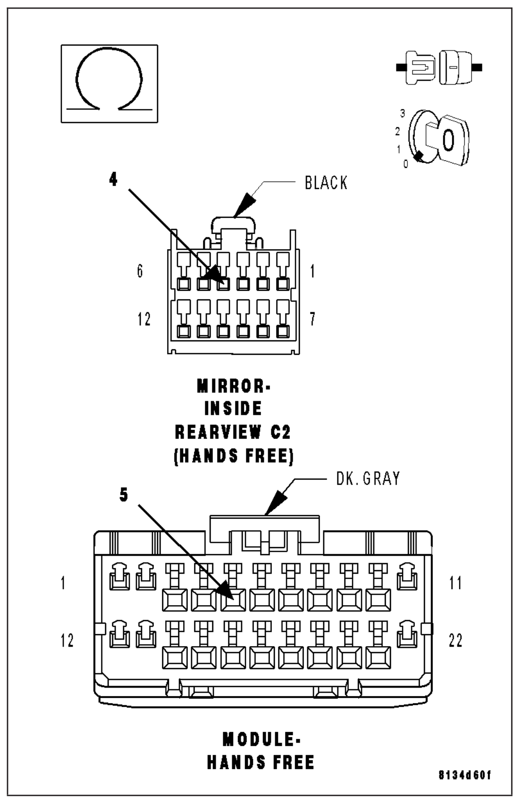
3. (X722) MICROPHONE 2 IN (+) CIRCUIT OPEN

Measure the resistance of the (X722) Microphone 2 IN (+) circuit between the HFM connector and the inside rear view mirror connector.

Is the resistance below 5.0 ohms?

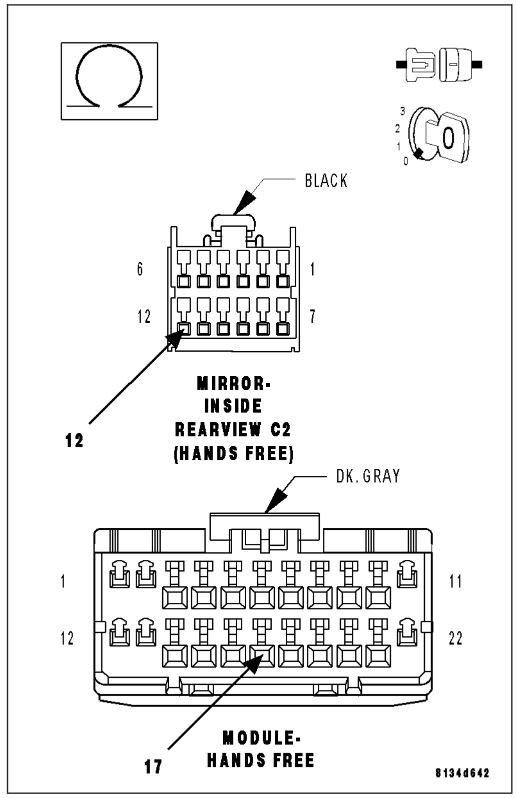
Yes >> Go To 4

No >> Repair the (X722) Microphone 2 IN (+) circuit for an open. Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



4. (X792) MICROPHONE IN (-) CIRCUIT OPEN

Measure the resistance of the (X792) Microphone IN (-) circuit between the HFM connector and the inside rear view mirror connector.



Is the resistance below 5.0 ohms?

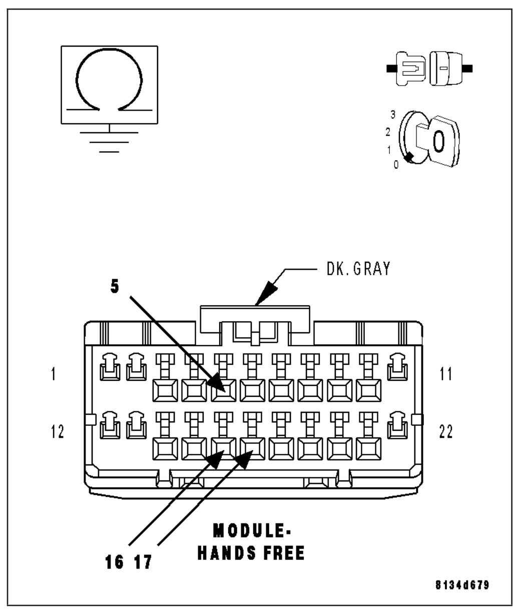
Yes >> Go To 5

No >> Repair the (X792) Microphone IN (-) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

5. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND

Measure the resistance between ground and each (X712) (X722) (X792) Microphone circuit.



Is the resistance below 100.0 ohms?

Yes >> Repair the Microphone circuit that measured below 100.0 ohms for short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

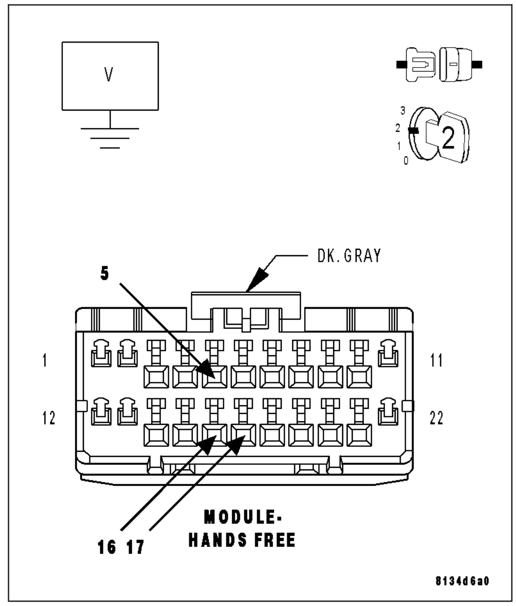
No >> Go To 6

6. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of each (X712) (X722) (X792) Microphone circuit.

Is the voltage above 1.0 volt?



Yes >> Repair the Microphone circuit that measured above 1.0 volt for short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

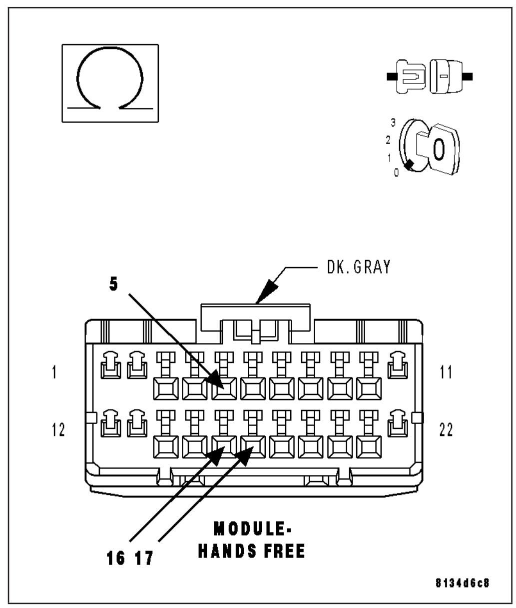
No >> Go To 7

7. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER

Turn the ignition off.

Measure the resistance between each (X712) (X722) (X792) Microphone circuit.

Is the resistance below 100.0 ohms?



Yes >> Repair the Microphone circuit that measured below 100.0 ohms for a short together.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 8

8. INSIDE REAR VIEW MIRROR

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC’s.

Does the scan tool display this DTC as active?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B2203–ROM CHECKSUM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

Diagnostic Test

1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B222A-VEHICLE LINE MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module will receive and monitor the vehicle line message from the PCM and record the vehicle line if different from the last vehicle line.

Possible Causes
INCORRECT PCM
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK VEHICLE LINE IN PCM

With the scan tool compare the vehicle line that is programmed into the PCM to the vehicle line of the vehicle.

Does the vehicle line programmed into the PCM match the vehicle?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.

Perform POWERTRAIN VERIFICATION TEST.

B222E–FLASH CHECKSUM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

Diagnostic Test

1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B222F–FLASH WRITE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

Diagnostic Test

1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2223-(HFM) HANDS FREE PHONE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

Diagnostic Test

1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2230–RAM WRITE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

Diagnostic Test

1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

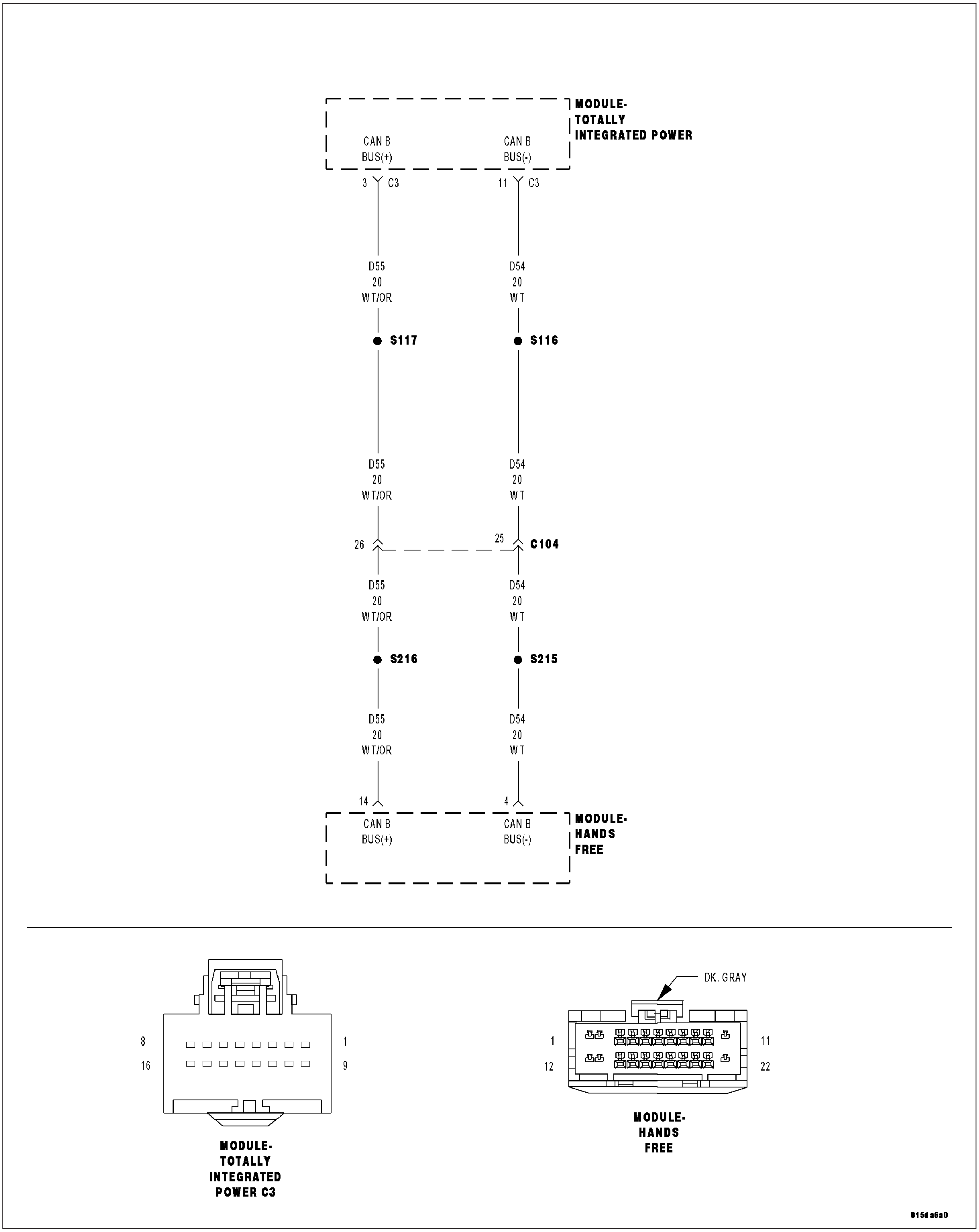
Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

U0019–CAN B BUS



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN THE TOTALLY INTEGRATED POWER MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK THE TOTALLY INTEGRATED POWER MODULE DTC's

With the scan tool, read the Totally Integrated Power Module active DTC's.

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

3. (D55) CAN B BUS (+) CIRCUIT OPEN

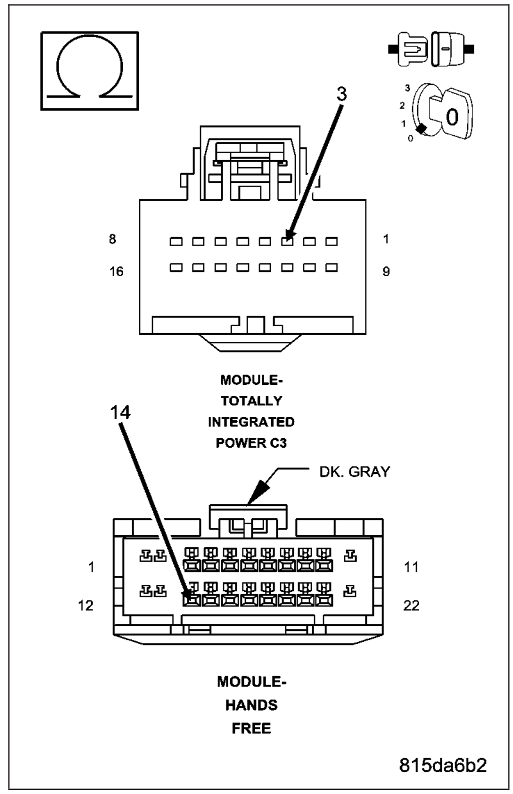
Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Hands Free Module harness connector.

Disconnect the Totally Integrated Power Module harness connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Totally Integrated Power Module connector and the Hands Free Module connector.



Is the resistance below 2.0 ohms?

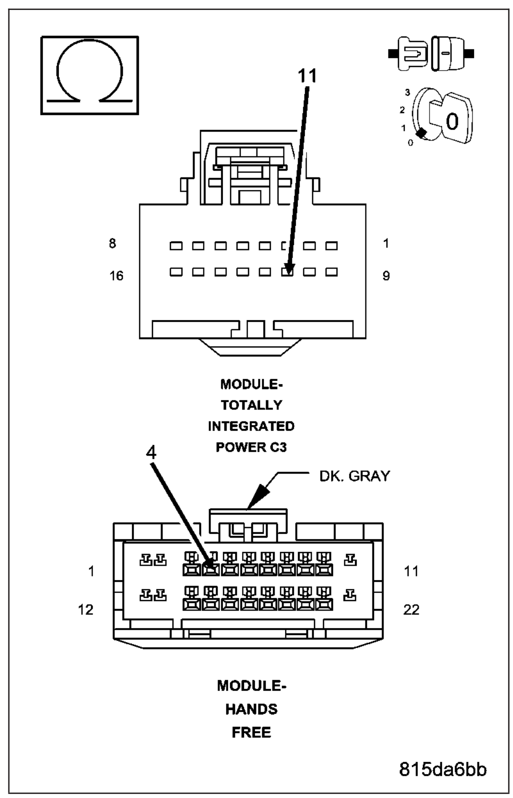
Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Totally Integrated Power Module connector and the Hands Free Module connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (D54) CAN B Bus (–) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE (TOTALLY INTEGRATED POWER MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (LEFT WINDOW REGULATOR MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE (RIGHT WINDOW REGULATOR MODULE)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

NAVIGATION/TELECOMMUNICATION

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NAVIGATION/TELECOMMUNICATION

DESCRIPTION

TELECOMMUNICATION

The hands-free cellular system on this vehicle uses Bluetooth™ technology to provide wireless communication between the operator's compatible cellular telephone and the vehicle's on-board receiver.

The system uses voice recognition technology to control operation. The incoming voice is broadcast through the vehicle's radio speakers, automatically overriding any other audio signals on the front speakers when the hands-free system is in use. A microphone in the rearview mirror picks up vehicle occupant's voices.

The system will communicate with a telephone that is anywhere within the vehicle. However, covering the hand held phone or the hands-free phone module with a metal object may block the signal. The system will recognize up to seven Bluetooth™ cellular phones, each of which is given a spoken identification by the user during the setup process. The system includes Spanish voice recognition in addition to English.

Two buttons on the rearview mirror, identified with ISO icons, control the system: A ″phone″ button turns the system on and off; a ″voice recognition″ (or voice command) button prompts the hands-free system to listen for a voice command.

OPERATION

TELECOMMUNICATION

Two buttons on the rearview mirror, identified with ISO icons, control the system: A ″phone″ button turns the system on and off; a ″voice recognition″ (or voice command) button prompts the hands-free system to listen for a voice command. The system includes the following features:

- Phone book - Stores telephone numbers for later recall by name or other verbal identification, called a voice tag, and memory location.
- Four memory locations - Home, Work, Cellular and Pager. A maximum of 32 unique names or voice tags may be stored at the same time, with a different number in each of the four memory locations.
- Voice tag dialing - Dials the number associated with a voice tag and memory location.
- Digit dialing - Dials the telephone number by recognizing the names of the digits as they are spoken.
- Receiving calls - A voice prompt notifies the user of an incoming call. A voice response accepts or rejects the call without manual intervention.
- Privacy Mode - Switches the call to the handheld telephone and the hands-free system and back again using the “voice recognition” (or “voice command”) button and a voice command, if desired.

DIAGNOSIS AND TESTING - TELECOMMUNICATIONS

Any diagnosis of the Telecommunication system should begin with the use of scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: On vehicles equipped with airbags, refer to electrical, restraints before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury.

TELECOMMUNICATION SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
Phone Not Available	1. Bluetooth™ phone not paired to the system.	1. Ensure that phone(s) are paired to the system.
	2. Bluetooth™ phone not present or turned OFF.	2. Make sure paired phone is present, turned ON and that the Bluetooth™ option is enabled on the phone.

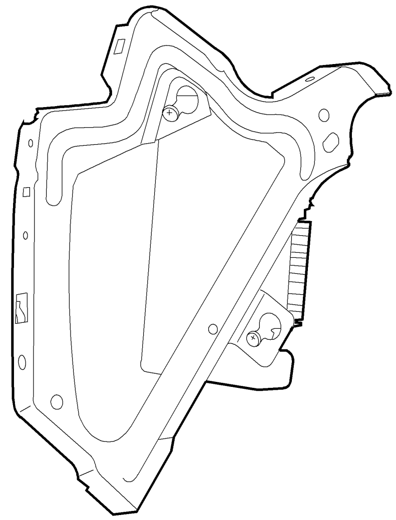
CONDITION	POSSIBLE CAUSE	CORRECTION
	3. Bluetooth™ phone has low battery.	3. At low battery levels, some phones will turn off Bluetooth™ functionality. Ensure cellular phone is charged to an adequate level.
Phone Pairing Failed	1. Phone does not support Hands Free Profile	1. The Telecommunication system requires the cellular phone to be Bluetooth™ enabled, as well as supporting the Hands Free Profile. The customer will have to upgrade their phone to one supporting Hands Free Profile. A list of suggested phones is available at: http://www.chrysler.com/uconnect.
	2. Phone not Bluetooth™ enabled.	2. The Telecommunication system requires the cellular phone to be Bluetooth™ enabled. A list of suggested phones is available at: http://www.chrysler.com/uconnect.
	3. PIN entered on the phone is not the same as PIN spoken to the system.	3. The PIN spoken to the system must be the same PIN entered into the phone.
	4. Phone has reached maximum number of allowed devices paired.	4. Remove one of the previously paired devices from it's list.
Poor Voice Recognition	1. Microphone failure	1. Using a scan tool, check for microphone fault codes.
	2. Customer not waiting for the beep before speaking.	2. Ensure customer is waiting for the system ″beep″ prior to beginning the speech to be recognized.
	3. Customer not speaking in a smooth normal manner.	3. Verify that the customer is attempting to use the system with a smooth consistent voice. The system is designed to accept normal speech spoken at a normal tone, some people tend to speak to a computer loud and slow, which results in reduced performance.
	4. Rear view mirror not properly attached to mounting.	4. Mirror must be firmly mounted to the mounting location. Ensure that mirror is tightened to the specified torque.
	5. High levels of noise in vehicle compartment	5. System performance is increased when noise conditions in the vehicle are lowered. Ideal conditions include windows closed.
	6. Object interfering with microphone input	6. Verify that there is no object, hanging from the mirror, that could be obstructing the microphone.
	7. User not saying ″send″ after a pager dialing request	7. User must say ″send″ at the end of a Pager Dialing request.
	8. Other passengers talking while customer is attempting to use the system	8. Although designed for primary use by the driver, the microphone will pick up passengers in any seat of the vehicle. System performance is increased in low noise environments.
Phonebook names not recognized consistently	1. Phonebook names recorded in high noise conditions	1. For increased system performance, it is recommended that the phone book entries are recorded in a low noise environment. That is, vehicle in park, with windows up.
	2. Phonebook name(s) short	2. For increased performance it is recommended that the user use both first and last name as a phonebook entry. Example ″Daniel Johnson″ as opposed to ″Dan″.
	3. Phonebook names recorded by another user	3. It is recommended that each user of the system record their own phonebook entries. This will increase the recognition performance.

CONDITION	POSSIBLE CAUSE	CORRECTION
	4. Similar names in phonebook	4. For increased system performance it is recommended that the user do not enter similar sounding names in the phonebook.
	5. Object interfering with microphone input	5. Object interfering with microphone input.
Poor Phone audio quality.	1. Microphone failure	1. Use a scan tool, and check for Microphone faults.
	2. Rear view mirror not properly fixed to mounting button	2. Mirror must be firmly mounted to the mounting location. Tighten mirror to the specified torque.
	3. System being used in high noise conditions	3. System performance is increased when noise conditions in the vehicle are lowered. Ideal conditions include windows closed.
No Phone Audio	1. Phone setting cause phone audio to be routed to handset.	1. Route audio to ″Hands free″ device.

HANDS FREE MODULE

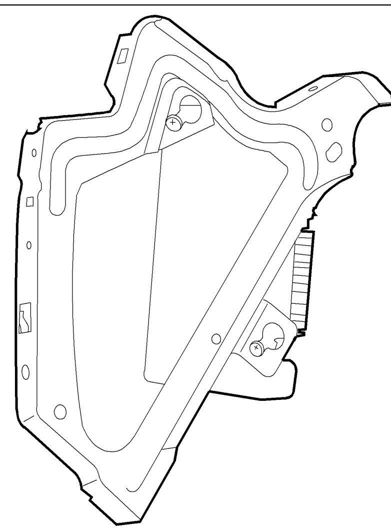
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
3. Remove the accessory switch bezel (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - REMOVAL).
4. Remove the module mounting fasteners.
5. Disconnect the electrical harness connector and remove module.
6. Separate the module from the mounting bracket.


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INSTALLATION

1. Install module to mounting bracket.
2. Connect electrical harness connector and position module.
3. Install module mounting fasteners.
4. Install accessory switch bezel (Refer to 23 - BODY/INSTRUMENT PANEL/ACCESSORY SWITCH BEZEL - INSTALLATION).
5. Install radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
6. Connect battery negative cable.


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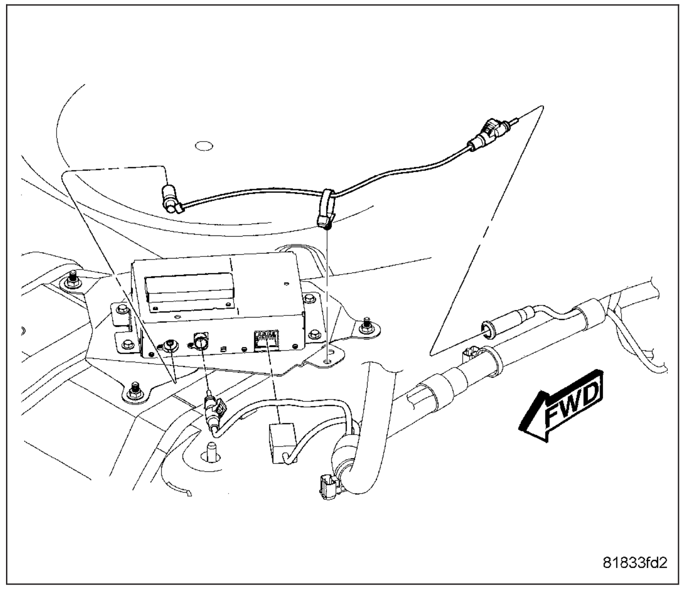
TRAFFIC MESSAGE CENTER MODULE

DESCRIPTION

The Traffic Message Channel module (TMC) provides traffic information to the navigation system to update planned routes in the event of a traffic accident, construction or any other condition that causes traffic to be increased. This allows the users to avoid these congested areas and be automatically rerouted to get to their destination.

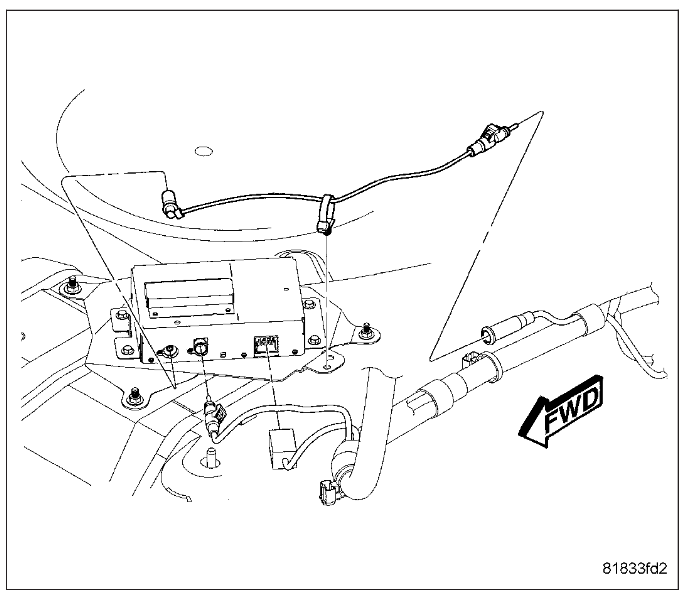
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Disconnect the antenna cables.
3. Disconnect the wire harness connector.
4. Remove the retaining fasteners.
5. Remove the Traffic Message Channel module (TMC).



INSTALLATION

1. Install TMC.
2. Install the mounting fasteners.
3. Connect the wire harness connector.
4. Connect the antenna cables
5. Connect battery negative cable.



WIRING

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8W-01 WIRING DIAGRAM INFORMATION

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WIRING DIAGRAM INFORMATION

DESCRIPTION

DESCRIPTION - HOW TO USE WIRING DIAGRAMS

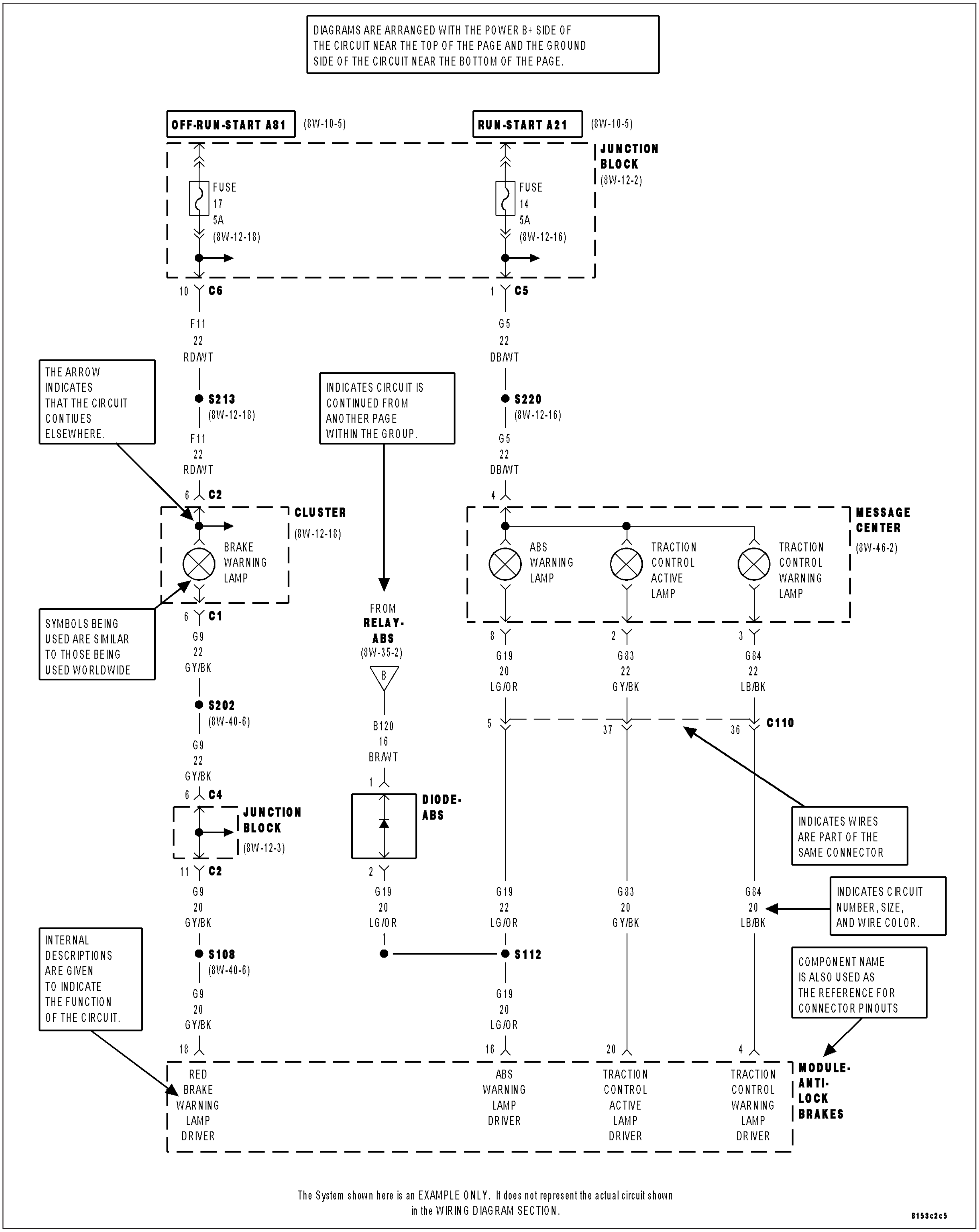
DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

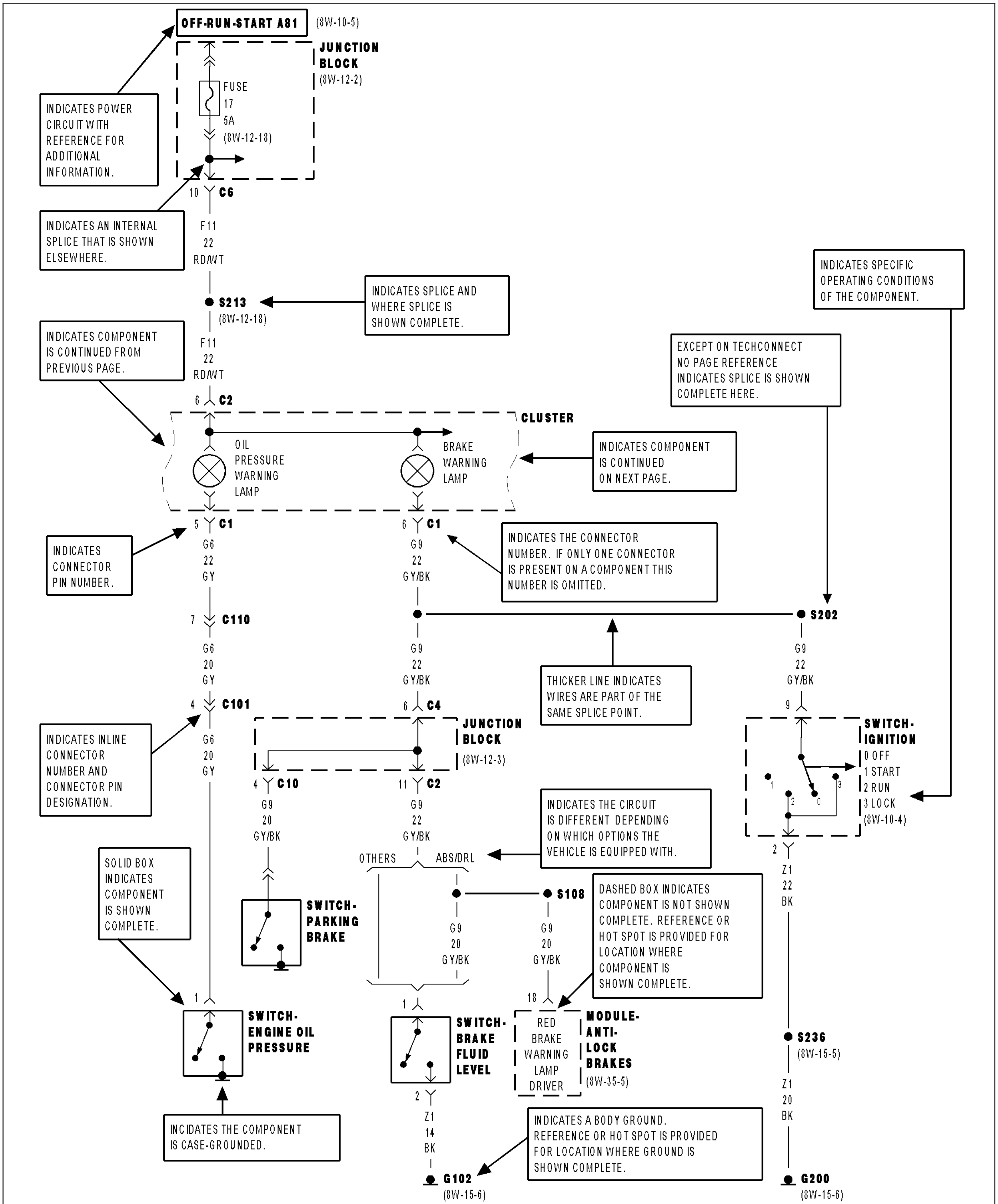
Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page.

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition.

Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.


DIAGRAMS ARE ARRANGED WITH THE POWER B+ SIDE OF THE CIRCUIT NEAR THE TOP OF THE PAGE AND THE GROUND SIDE OF THE CIRCUIT NEAR THE BOTTOM OF THE PAGE.
OFF-RUN-START A81
(8W-10-5)
RUN-START A21
(8W-10-5)
JUNCTION BLOCK
(8W-12-2)
FUSE 17 5A (8W-12-18)
FUSE 14 5A (8W-12-16)
10 C6
1 C5
F11 22 RD/WT
G5 22 DB/WT
THE ARROW INDICATES THAT THE CIRCUIT CONTIUES ELSEWHERE.
INDICATES CIRCUIT IS CONTINUED FROM ANOTHER PAGE WITHIN THE GROUP.
S213 (8W-12-18)
S220 (8W-12-16)
F11 22 RD/WT
G5 22 DB/WT
6 C2
4
CLUSTER
(8W-12-18)
BRAKE WARNING LAMP
MESSAGE CENTER
(8W-46-2)
ABS WARNING LAMP
TRACTION CONTROL ACTIVE LAMP
TRACTION CONTROL WARNING LAMP
SYMBOLS BEING USED ARE SIMILAR TO THOSE BEING USED WORLDWIDE
6 C1
FROM RELAY-ABS (8W-35-2)
B
8
2
3
G9 22 GY/BK
G19 20 LG/OR
G83 22 GY/BK
G84 22 LB/BK
S202 (8W-40-6)
5
37
36
C110
B120 16 BR/WT
G9 22 GY/BK
1
6 C4
JUNCTION BLOCK
(8W-12-3)
DIODE-ABS
INDICATES WIRES ARE PART OF THE SAME CONNECTOR
11 C2
2
G9 20 GY/BK
G19 20 LG/OR
G19 22 LG/OR
G83 20 GY/BK
G84 20 LB/BK
INDICATES CIRCUIT NUMBER, SIZE, AND WIRE COLOR.
INTERNAL DESCRIPTIONS ARE GIVEN TO INDICATE THE FUNCTION OF THE CIRCUIT.
S108 (8W-40-6)
S112
COMPONENT NAME IS ALSO USED AS THE REFERENCE FOR CONNECTOR PINOUTS
G9 20 GY/BK
G19 20 LG/OR
18
16
20
4
RED BRAKE WARNING LAMP DRIVER
ABS WARNING LAMP DRIVER
TRACTION CONTROL ACTIVE LAMP DRIVER
TRACTION CONTROL WARNING LAMP DRIVER
MODULE-ANTI-LOCK BRAKES
The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.
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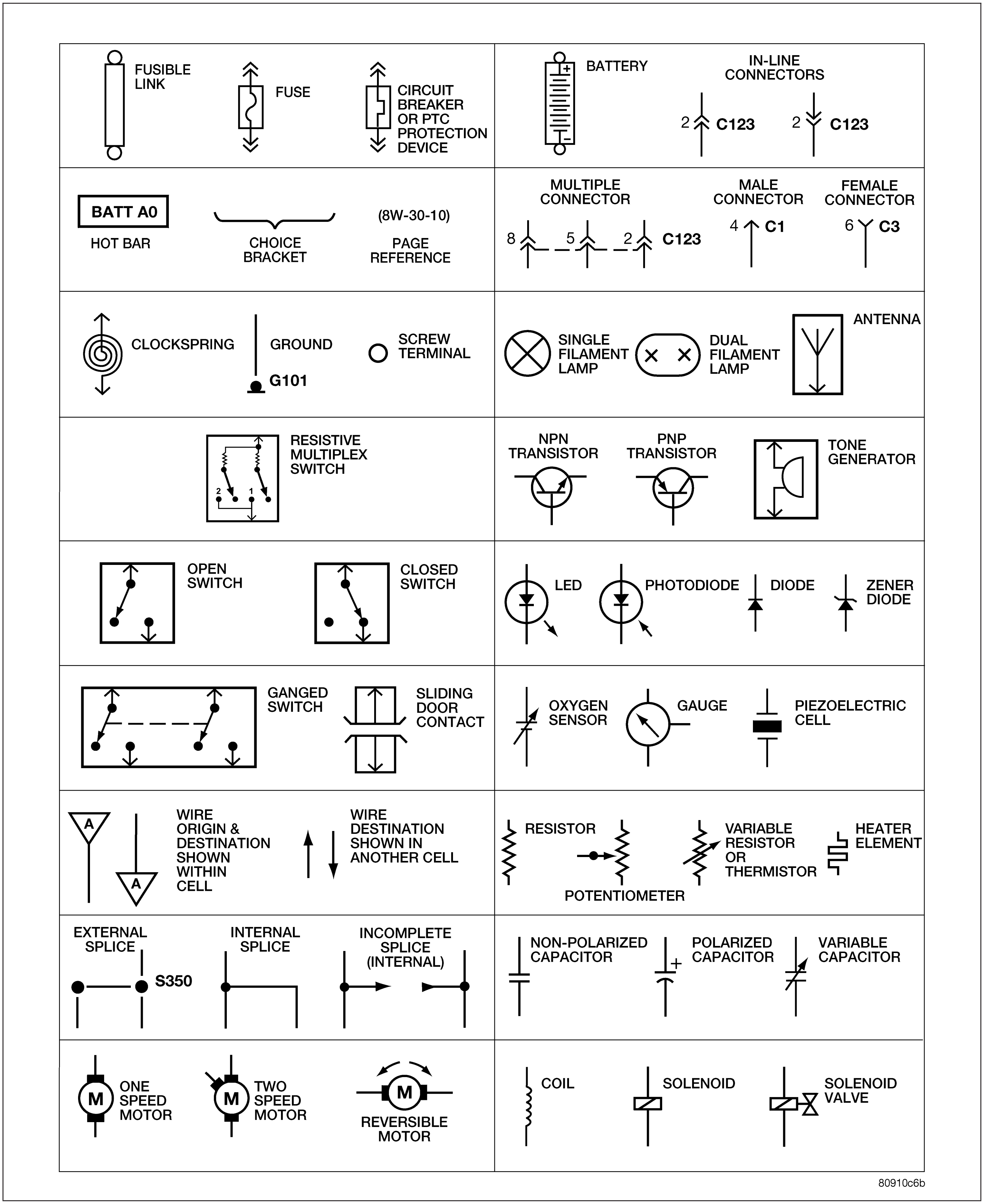


The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

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SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world.



FUSIBLE LINK
FUSE
CIRCUIT BREAKER OR PTC PROTECTION DEVICE
BATTERY
IN-LINE CONNECTORS
2 C123
2 C123
BATT A0
HOT BAR
CHOICE BRACKET
(8W-30-10)
PAGE REFERENCE
MULTIPLE CONNECTOR
8 5 2 C123
MALE CONNECTOR
4 C1
FEMALE CONNECTOR
6 C3
CLOCKSPRING
GROUND
G101
SCREW TERMINAL
SINGLE FILAMENT LAMP
DUAL FILAMENT LAMP
ANTENNA
RESISTIVE MULTIPLEX SWITCH
2 1
NPN TRANSISTOR
PNP TRANSISTOR
TONE GENERATOR
OPEN SWITCH
CLOSED SWITCH
LED
PHOTODIODE
DIODE
ZENER DIODE
GANGED SWITCH
SLIDING DOOR CONTACT
OXYGEN SENSOR
GAUGE
PIEZOELECTRIC CELL
A
A
WIRE ORIGIN & DESTINATION SHOWN WITHIN CELL
WIRE DESTINATION SHOWN IN ANOTHER CELL
RESISTOR
POTENTIOMETER
VARIABLE RESISTOR OR THERMISTOR
HEATER ELEMENT
EXTERNAL SPLICE
S350
INTERNAL SPLICE
INCOMPLETE SPLICE (INTERNAL)
NON-POLARIZED CAPACITOR
POLARIZED CAPACITOR
VARIABLE CAPACITOR
M
ONE SPEED MOTOR
M
TWO SPEED MOTOR
M
REVERSIBLE MOTOR
COIL
SOLENOID
SOLENOID VALVE
80910c6b

TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD	Left Hand Drive Vehicles
RHD	Right Hand Drive Vehicles
ATX	Automatic Transmissions-Front Wheel Drive
MTX	Manual Transmissions-Front Wheel Drive
AT	Automatic Transmissions-Rear Wheel Drive
MT	Manual Transmissions-Rear Wheel Drive
SOHC	Single Over Head Cam Engine
DOHC	Double Over Head Cam Engine
Export	Vehicles Built For Sale In Markets Other Than North America
Except Export	Vehicles Built For Sale In North America

DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, a specific part of the main circuit, gage of wire, and color. An example would be **A 2 18 LB/YL**. This is a Battery Feed circuit, level two, eighteen gauge, light blue with a yellow tracer.

WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it’s function. To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	MULTIPLE
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	MULTIPLE
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/ TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/ WASHER
W	WIPERS
X	AUDIO SYSTEMS
Y	TEMPORARY
Z	GROUNDS

DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the diagram pages.

DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

CAUTION: Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers.
- In-line connectors located in the instrument panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a "G" and follow the same series numbering as the in-line connectors.
- Splices are identified with an "S" and follow the same series numbering as the in-line connectors. In addition, S001–S099 numbers are located in the engine compartment.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component. The abbreviation N/S means Not Shown in the illustrations

WARNING

WARNINGS - GENERAL

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: Always wear safety glasses for eye protection.

WARNING: Use safety stands anytime a procedure requires being under a vehicle.

WARNING: Be sure that the ignition switch always is in the off position, unless the procedure requires it to be on.

WARNING: Set the parking brake when working on any vehicle. An automatic transmission should be in park. A manual transmission should be in neutral.

WARNING: Operate the engine only in a well-ventilated area.

WARNING: Keep away from moving parts when the engine is running, especially the fan and belts.

WARNING: To prevent serious burns, avoid contact with hot parts such as the radiator, exhaust manifold(s), tail pipe, catalytic converter and muffler.

WARNING: Do not allow flame or sparks near the battery. Gases are always present in and around the battery.

WARNING: Always remove rings, watches, loose hanging jewelry and avoid loose clothing.

DIAGNOSIS AND TESTING - WIRING HARNESS

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: Never use a jumper wire across a load, such as a motor, connected between a battery feed and ground.

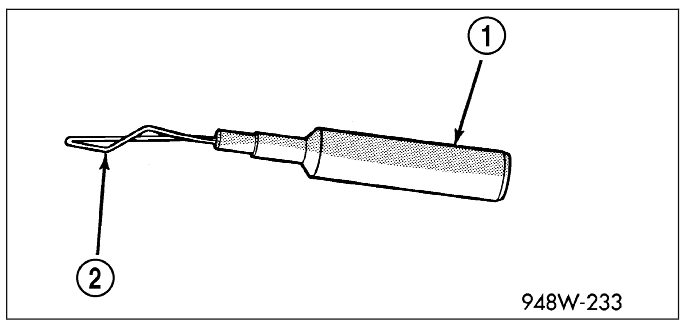
- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

- Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

- Probing Tools - These tools are used for probing terminals in connectors. Select the proper size tool from Special Tool Package 6807, and insert the probing end (2) into the terminal being tested. Use the other end of the tool (1) to insert the meter probe.



INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked into position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt or moisture
- Wire insulation that has rubbed through causing a short to ground
- Some or all of the wiring strands broken inside of the insulation
- Wiring broken inside of the insulation

TROUBLESHOOTING WIRING PROBLEMS

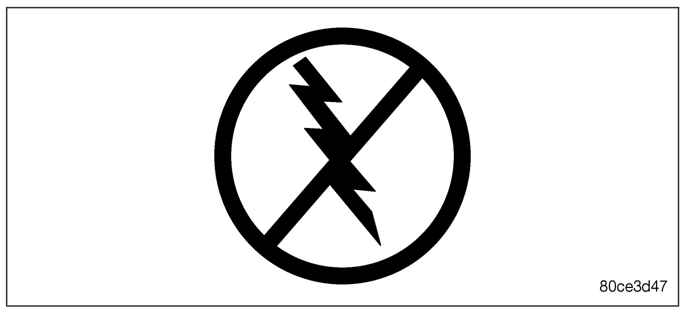
When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

1. Verify the problem.
2. Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.
3. Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.
4. Isolate the problem area.
5. Repair the problem area.
6. Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

STANDARD PROCEDURE

STANDARD PROCEDURE - ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

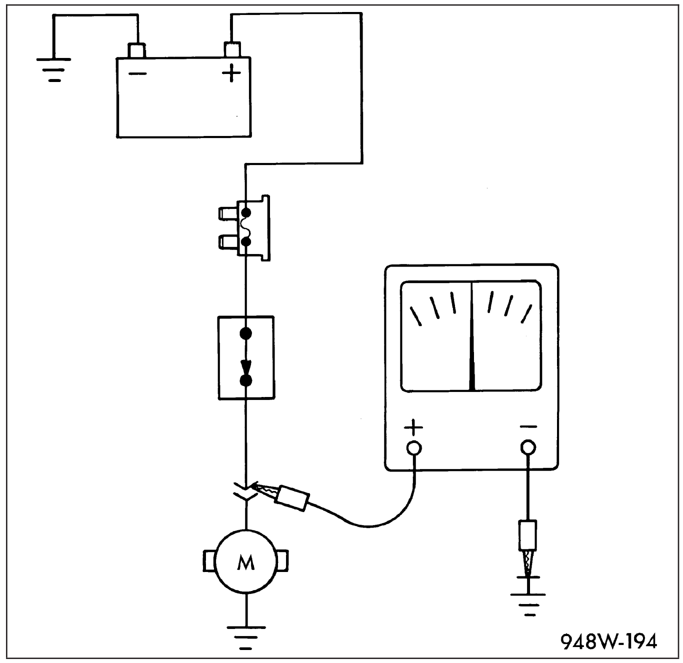
All ESD sensitive components are solid state and a symbol is used to indicate this. When handling any component with this symbol, comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.



1. Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.
2. Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.
3. When using a voltmeter, be sure to connect the ground lead first.
4. Do not remove the part from it’s protective packing until it is time to install the part.
5. Before removing the part from it’s package, ground the package to a known good ground on the vehicle.

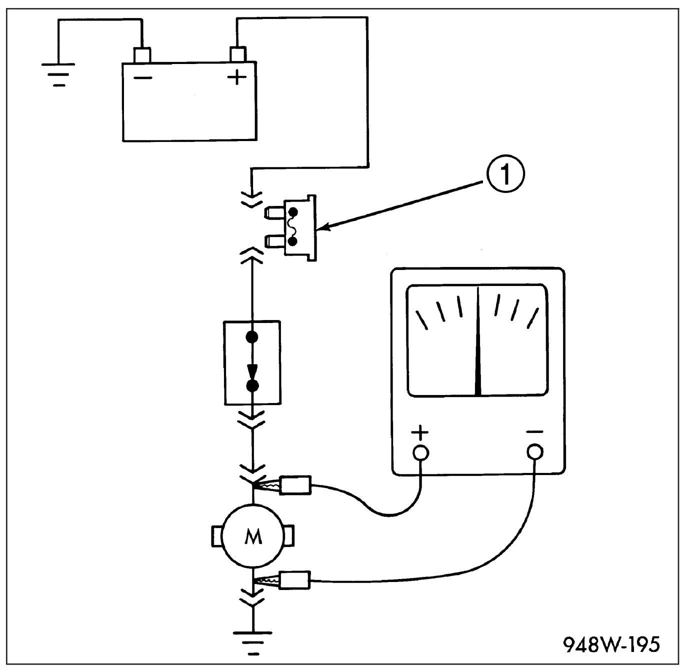
STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

1. Connect the ground lead of a voltmeter to a known good ground.
2. Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.



STANDARD PROCEDURE - TESTING FOR CONTINUITY

1. Remove the fuse (1) for the circuit being checked or, disconnect the battery.
2. Connect one lead of the ohmmeter to one side of the circuit being tested
3. Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.



STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND

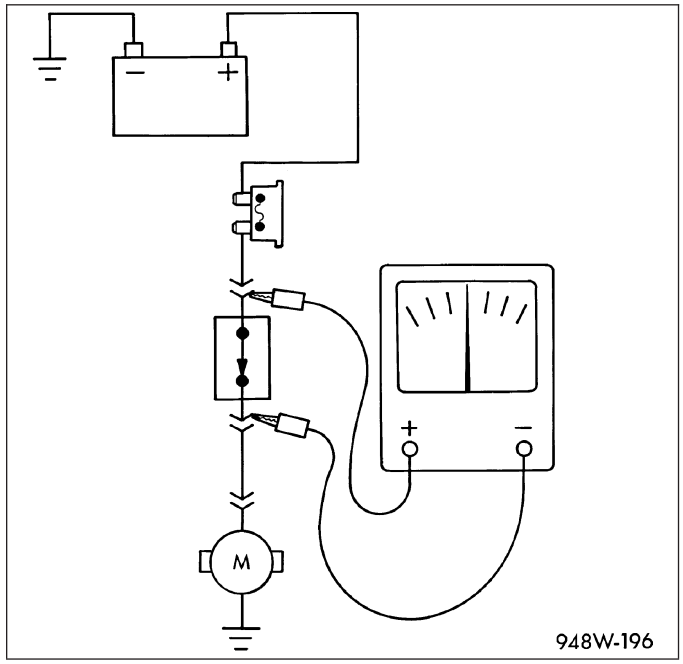
1. Remove the fuse and disconnect all items involved with the fuse.
2. Connect a test light or a voltmeter across the terminals of the fuse.
3. Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.
4. If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

1. Refer to the wiring diagrams and disconnect or isolate all items on the suspected fused circuits.
2. Replace the blown fuse.
3. Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.
4. Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

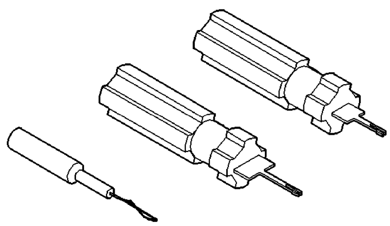
STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

1. Connect the positive lead of the voltmeter to the side of the circuit closest to the battery.
2. Connect the other lead of the voltmeter to the other side of the switch, component or circuit.
3. Operate the item.
4. The voltmeter will show the difference in voltage between the two points.

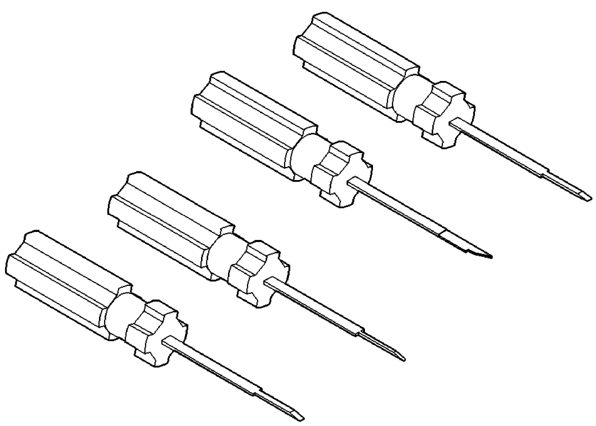


SPECIAL TOOLS

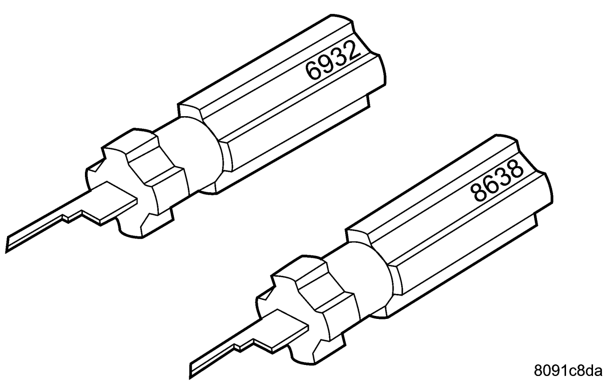
WIRING/TERMINAL



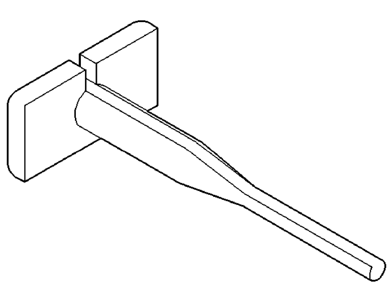
PROBING TOOL PACKAGE 6807



TERMINAL PICK TOOL SET 6680



TERMINAL REMOVING TOOLS 6932 AND 8638

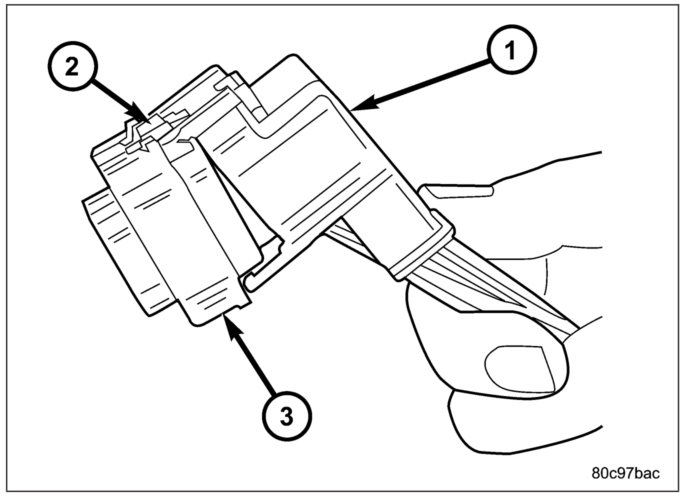


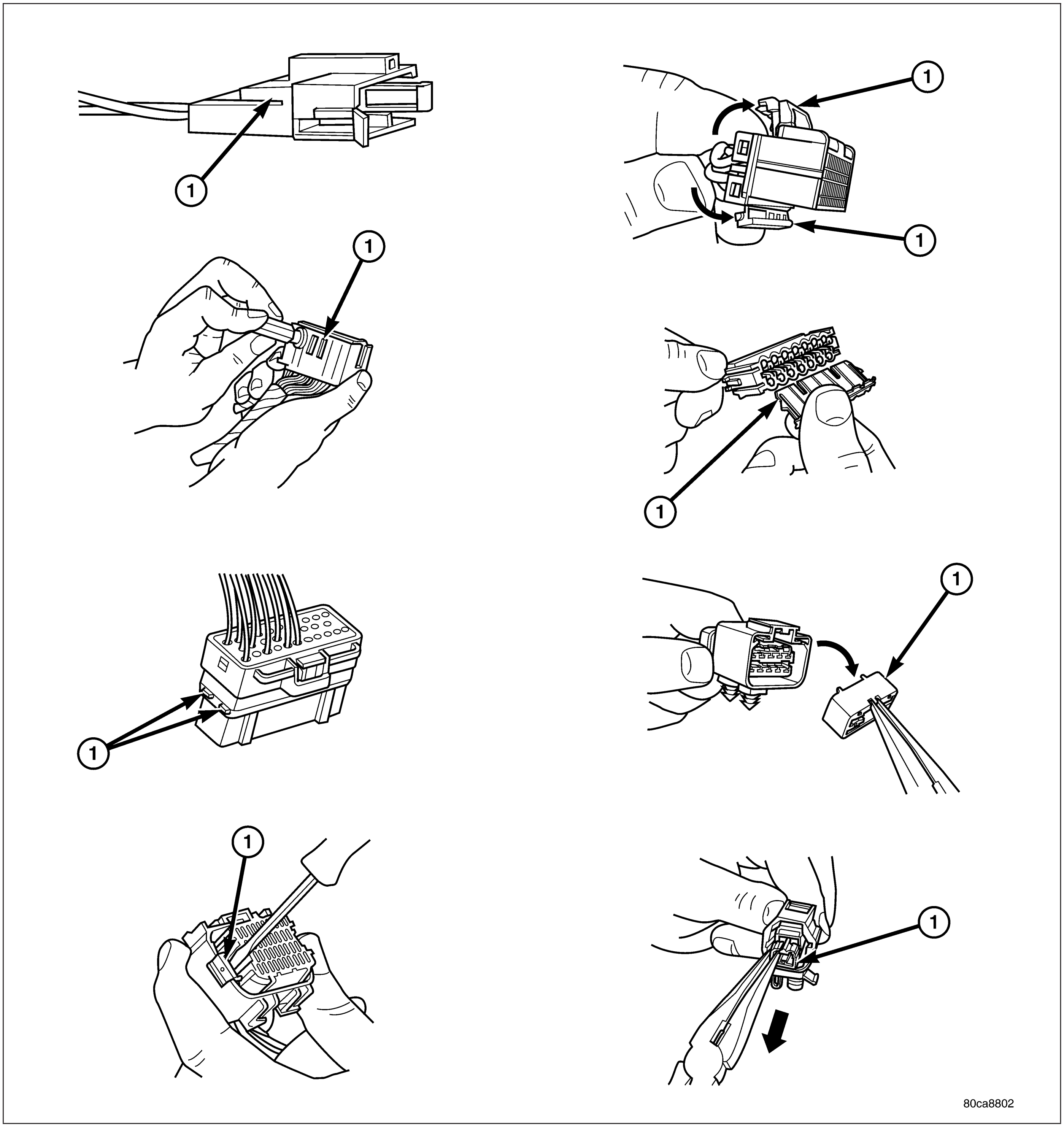
TERMINAL REMOVING TOOL 6934

CONNECTOR

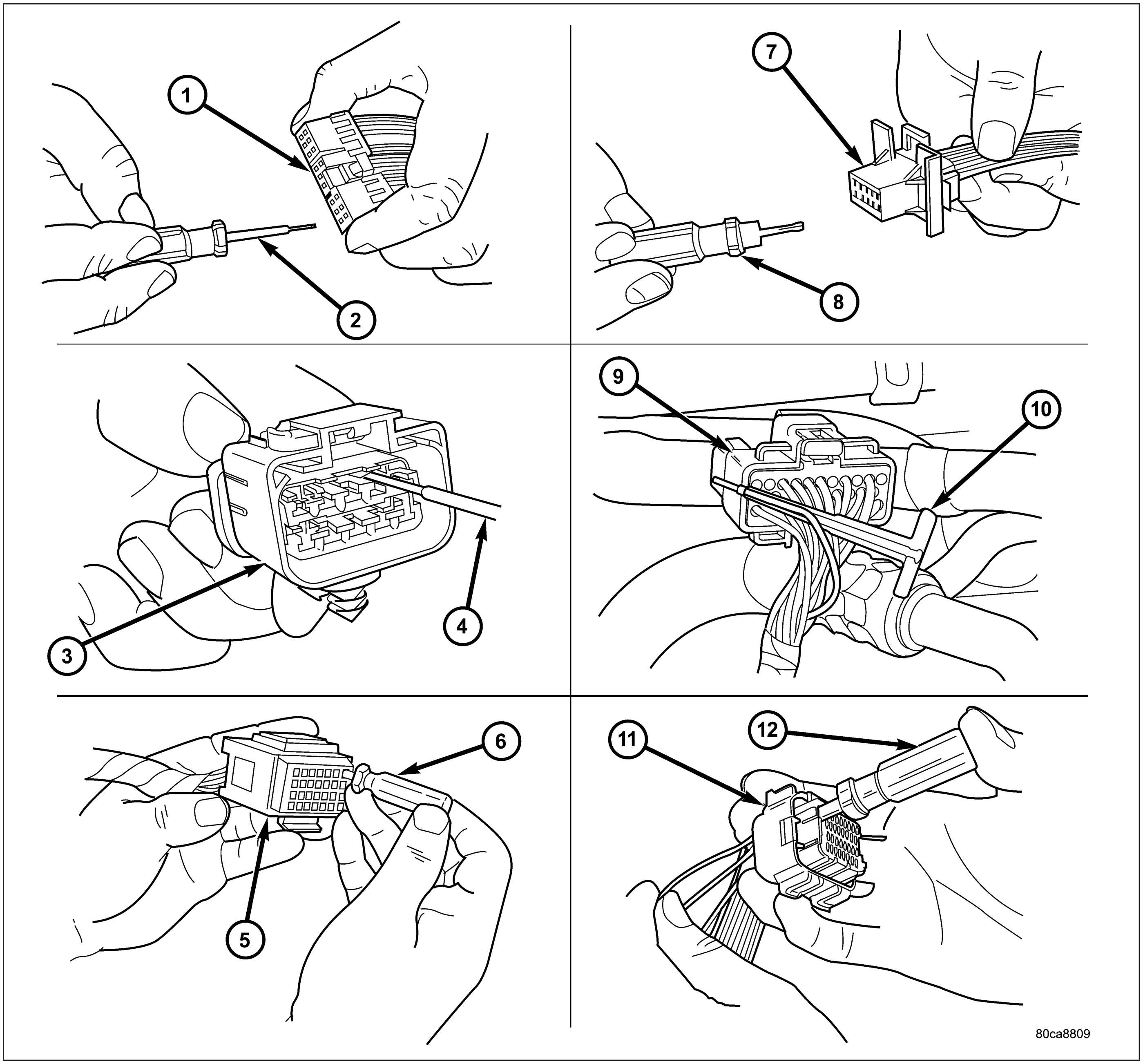
REMOVAL

1. Disconnect battery.
2. Release Connector Lock (2).
3. Disconnect the connector (3) being repaired from its mating half/component.
4. Remove the dress cover (if applicable) (1).





5. Release the Secondary Terminal Lock, if required (1).



1 - TYPICAL CONNECTOR
2 - PICK FROM SPECIAL TOOL KIT 6680
3 - APEX CONNECTOR
4 - PICK FROM SPECIAL TOOL KIT 6680
5 - AUGAT CONNECTOR
6 - SPECIAL TOOL 6932
7 - MOLEX CONNECTOR
8 - SPECIAL TOOL 6742
9 - THOMAS AND BETTS CONNECTOR
10 - SPECIAL TOOL 6934
11 - TYCO CONNECTOR
12 - SPECIAL TOOL 8638

6. Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector.

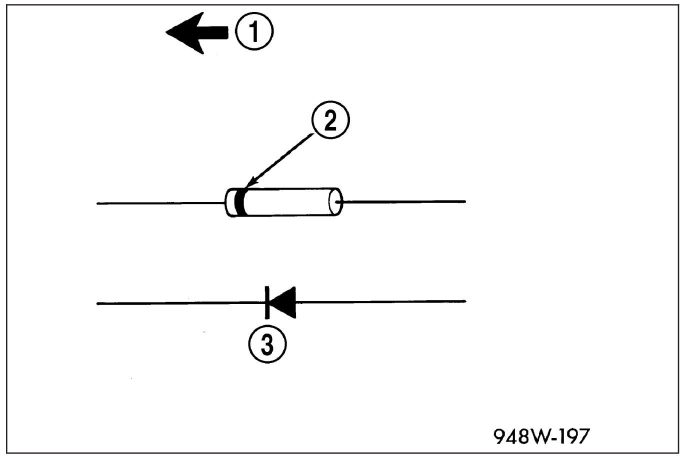
INSTALLATION

1. Insert the removed terminal in the same cavity on the repair connector.
2. Repeat steps for each terminal in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.
3. When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.
4. Replace dress cover (if applicable).
5. Connect connector to its mating half/component.
6. Connect battery and test all affected systems.

DIODE

REMOVAL

1. Disconnect the battery.
2. Locate the diode in the harness, and remove the protective covering.
3. Remove the diode from the harness, pay attention to the current flow direction (1) (2) (3).



INSTALLATION

1. Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.
2. Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow.
3. Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
4. Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.
5. Re-connect the battery and test affected systems.

TERMINAL

REMOVAL

1. Follow steps for removing terminals described in the connector removal section.
2. Cut the wire 6 inches from the back of the connector.

INSTALLATION

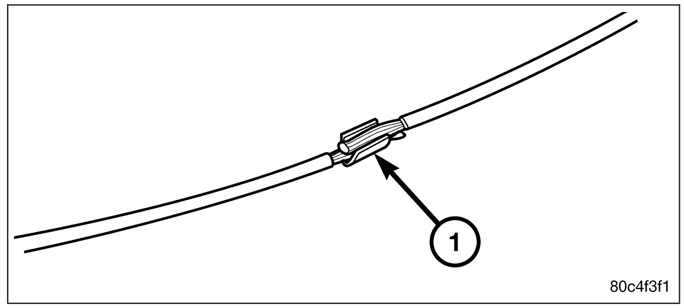
1. Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.
2. Cut the repair wire to the proper length and remove one–half (1/2) inch of insulation.
3. Splice the repair wire to the wire harness (see wire splicing procedure) (Refer to 8 - ELECTRICAL/WIRING DIAGRAM INFORMATION/WIRE - STANDARD PROCEDURE).
4. Insert the repaired wire into the connector.
5. Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.
6. Re-tape the wire harness starting at 1–1/2 inches behind the connector and 2 inches past the repair.
7. Connect battery and test all affected systems.

WIRE

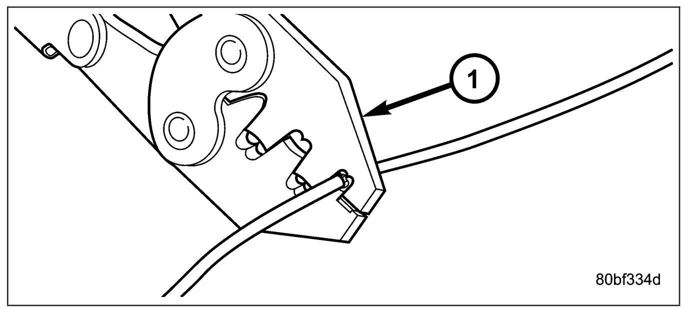
STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

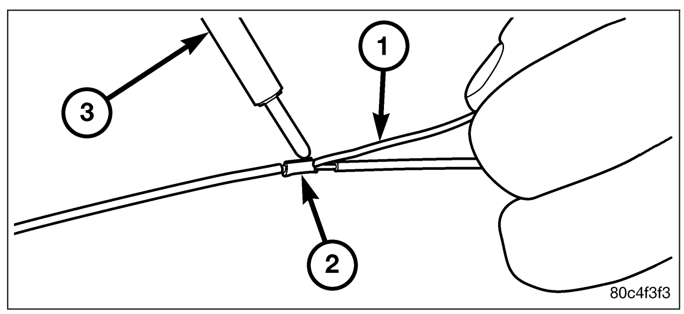
1. Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.
2. Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.
3. Place the strands of wire overlapping each other inside of the splice clip (1).



4. Using crimping tool (1), Mopar p/n 05019912AA, crimp the splice clip and wires together.

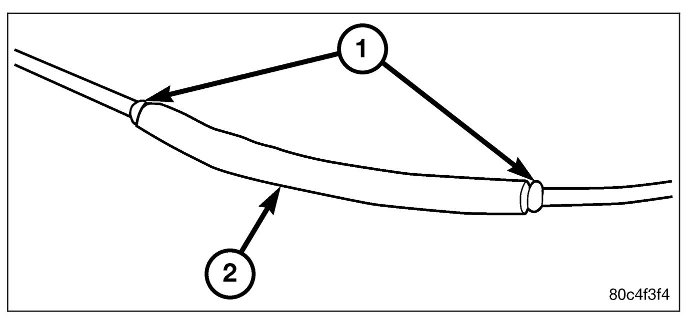


5. Solder (3) the connection (2) together using rosin core type solder (1) only.



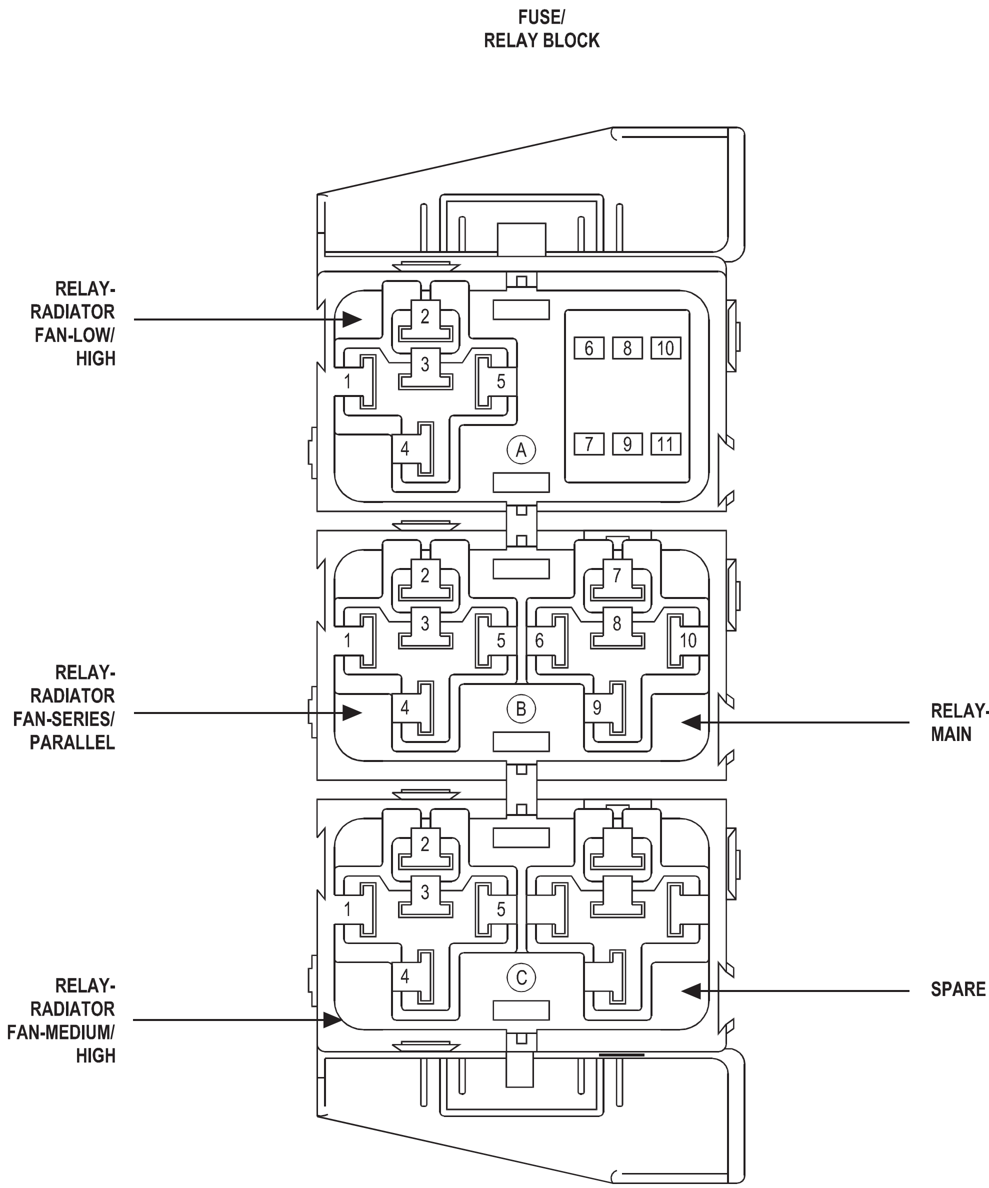
CAUTION: DO NOT USE ACID CORE SOLDER.

6. Center the heat shrink tubing (2) over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant (1) comes out of both ends of the tubing.



8W-02 COMPONENT INDEX

8W-11 FUSE/RELAY BLOCK


FUSE/
RELAY BLOCK
RELAY-
RADIATOR
FAN-LOW/
HIGH
2
3
1
5
4
A
6
8
10
7
9
11
RELAY-
RADIATOR
FAN-SERIES/
PARALLEL
2
3
1
5
4
B
7
8
6
10
9
RELAY-
MAIN
RELAY-
RADIATOR
FAN-MEDIUM/
HIGH
2
3
1
5
4
C
SPARE

FUSES
(F/RB)
(DIESEL)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
6	25A	A284 10RD/LB	FUSED B(+)
8	25A	A283 10RD/YL	FUSED B(+)
10	50A	A29 10RD/GY	FUSED B(+)

RELAYS
(F/RB)

RELAY-MAIN

CAVITY	CIRCUIT	FUNCTION
B6	A935 20RD/LB	FUSED B(+)
B7	K542 12BR	MAIN RELAY OUTPUT
B8	-	-
B9	A14 12RD/YL	FUSED B(+)
B10	K51 20BR/LG	MAIN RELAY CONTROL

RELAY-RADIATOR FAN-LOW/HIGH

CAVITY	CIRCUIT	FUNCTION
A1	A935 20RD/LB	FUSED B(+)
A2	N23 10DB/DG ▼	LOW/HIGH RAD FAN RELAY OUTPUT
A2	N23 12DB/GY ▼▼	LOW/HIGH RAD FAN RELAY OUTPUT
A3	-	-
A4	A16 12RD/BR	FUSED B(+)
A5	N201 20DB/LG	LOW/HIGH RAD FAN RELAY CONTROL

▼ OPTION 1
▼▼ OPTION 2

RELAYS (F/RB)

RELAY-RADIATOR FAN-MEDIUM/HIGH

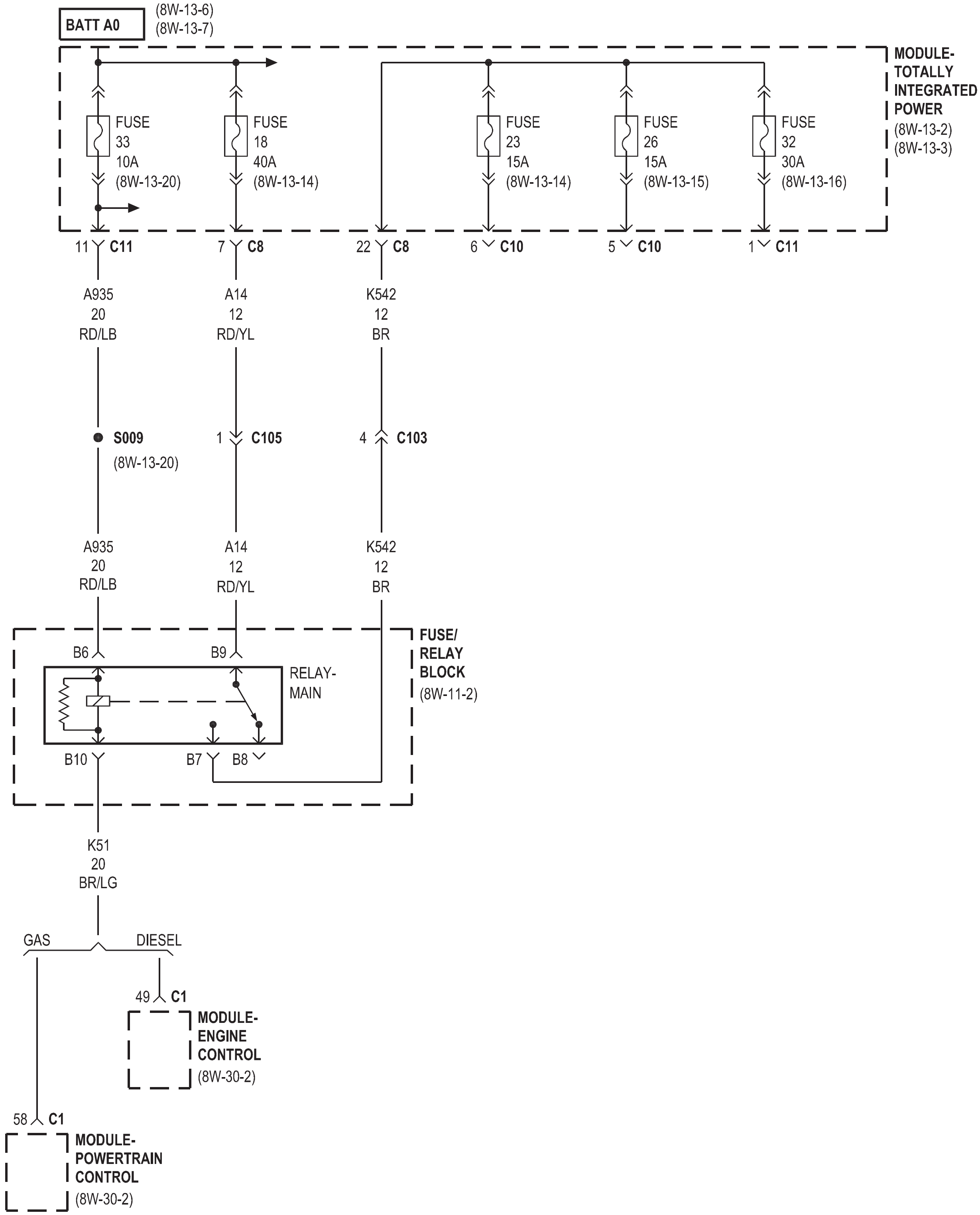
CAVITY	CIRCUIT	FUNCTION
C1	A935 20RD/LB	FUSED B(+)
C2	N24 10DG/DB ▼	RAD FAN RELAY OUTPUT
C2	N24 12DG/DB ▼▼	RAD FAN RELAY OUTPUT
C3	-	-
C4	A16 12RD/BR	FUSED B(+)
C5	N112 20DB/OR	RAD FAN RELAY CONTROL

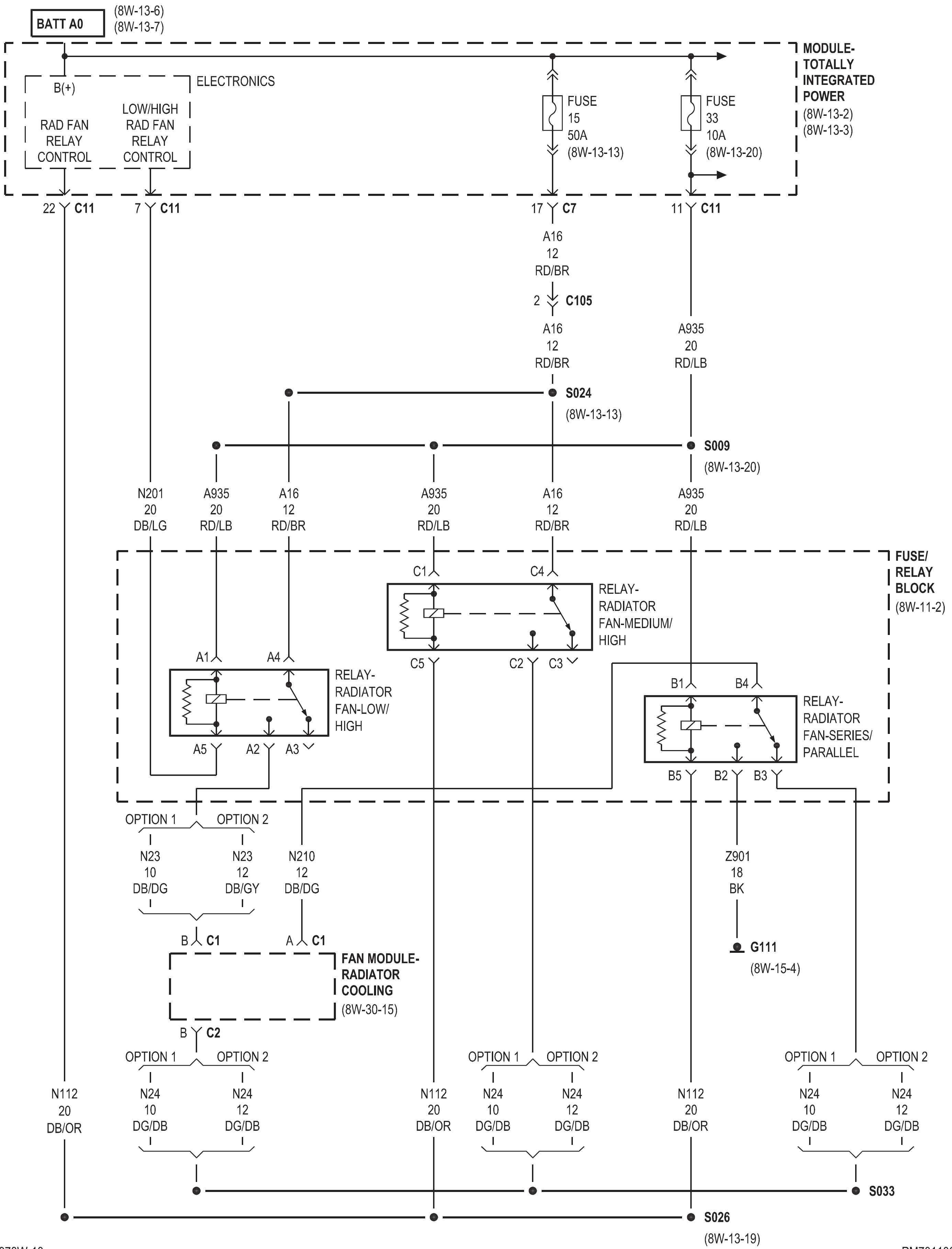
RELAY-RADIATOR FAN-SERIES/PARALLEL

CAVITY	CIRCUIT	FUNCTION
B1	A935 20RD/LB	FUSED B(+)
B2	Z901 18BK	GROUND
B3	N24 10DG/DB ▼	RAD FAN RELAY OUTPUT
B3	N24 12DG/DB ▼▼	RAD FAN RELAY OUTPUT
B4	N210 12DB/DG	SERIES/PARALLEL RAD FAN RELAY FEED
B5	N112 20DB/OR	RAD FAN RELAY CONTROL

▼ OPTION 1

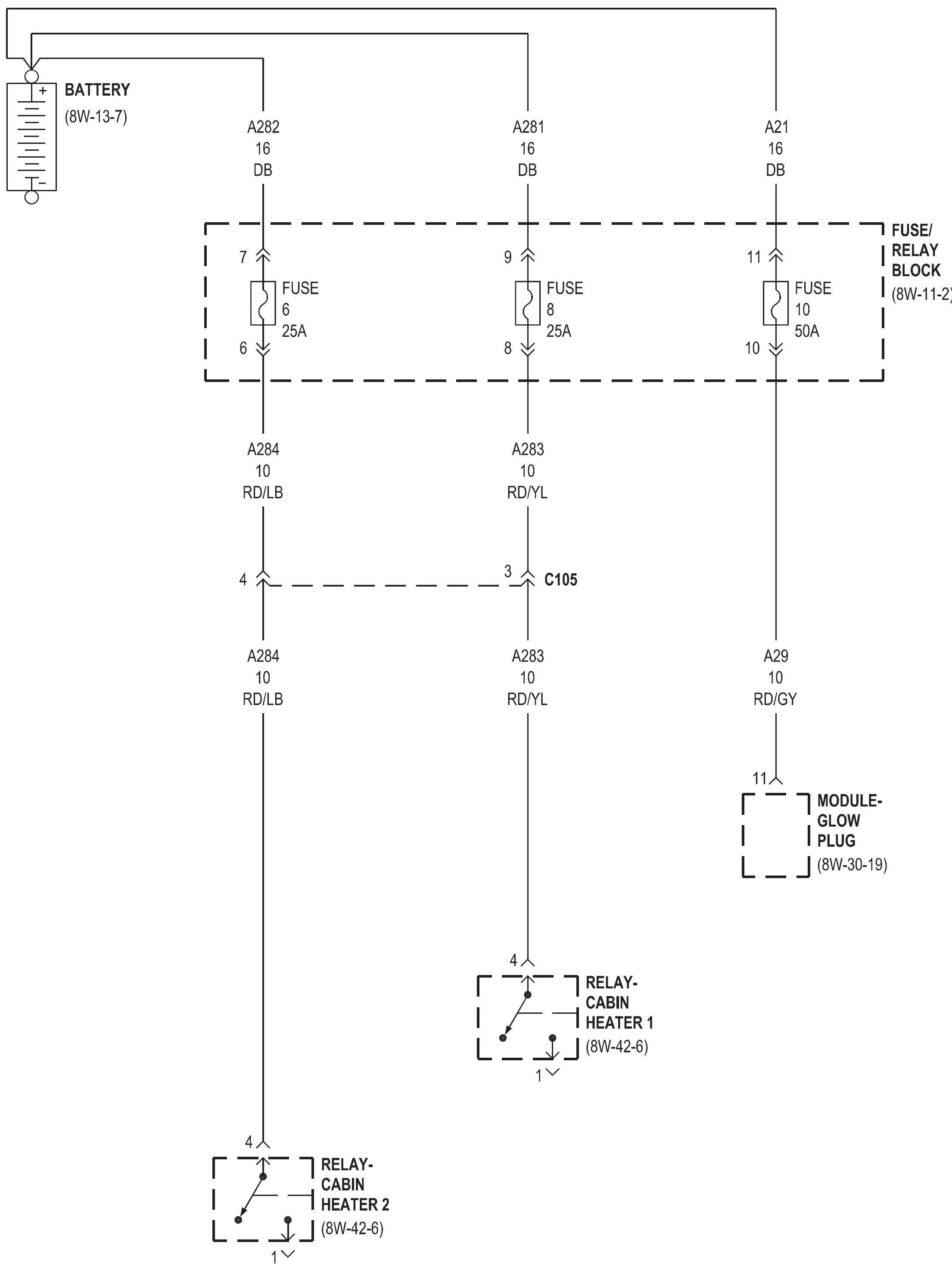
▼▼ OPTION 2


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
33
10A
(8W-13-20)
FUSE
18
40A
(8W-13-14)
FUSE
23
15A
(8W-13-14)
FUSE
26
15A
(8W-13-15)
FUSE
32
30A
(8W-13-16)
11 C11
7 C8
22 C8
6 C10
5 C10
1 C11
A935
20
RD/LB
A14
12
RD/YL
K542
12
BR
S009
(8W-13-20)
1 C105
4 C103
A935
20
RD/LB
A14
12
RD/YL
K542
12
BR
FUSE/
RELAY
BLOCK
(8W-11-2)
B6
B9
RELAY-
MAIN
B10
B7
B8
K51
20
BR/LG
GAS
DIESEL
49 C1
MODULE-
ENGINE
CONTROL
(8W-30-2)
58 C1
MODULE-
POWERTRAIN
CONTROL
(8W-30-2)



BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
RAD FAN RELAY CONTROL
LOW/HIGH RAD FAN RELAY CONTROL
FUSE 15 50A (8W-13-13)
FUSE 33 10A (8W-13-20)
22 C11
7 C11
17 C7
11 C11
A16 12 RD/BR
2 C105
A935 20 RD/LB
S024 (8W-13-13)
S009 (8W-13-20)
N201 20 DB/LG
FUSE/RELAY BLOCK (8W-11-2)
C1 C4 C5 C2 C3
RELAY-RADIATOR FAN-MEDIUM/HIGH
A1 A4 A5 A2 A3
RELAY-RADIATOR FAN-LOW/HIGH
B1 B4 B5 B2 B3
RELAY-RADIATOR FAN-SERIES/PARALLEL
OPTION 1
OPTION 2
N23 10 DB/DG
N23 12 DB/GY
N210 12 DB/DG
Z901 18 BK
G111 (8W-15-4)
B C1
A C1
FAN MODULE-RADIATOR COOLING (8W-30-15)
B C2
N112 20 DB/OR
N24 10 DG/DB
N24 12 DG/DB
S033
S026 (8W-13-19)

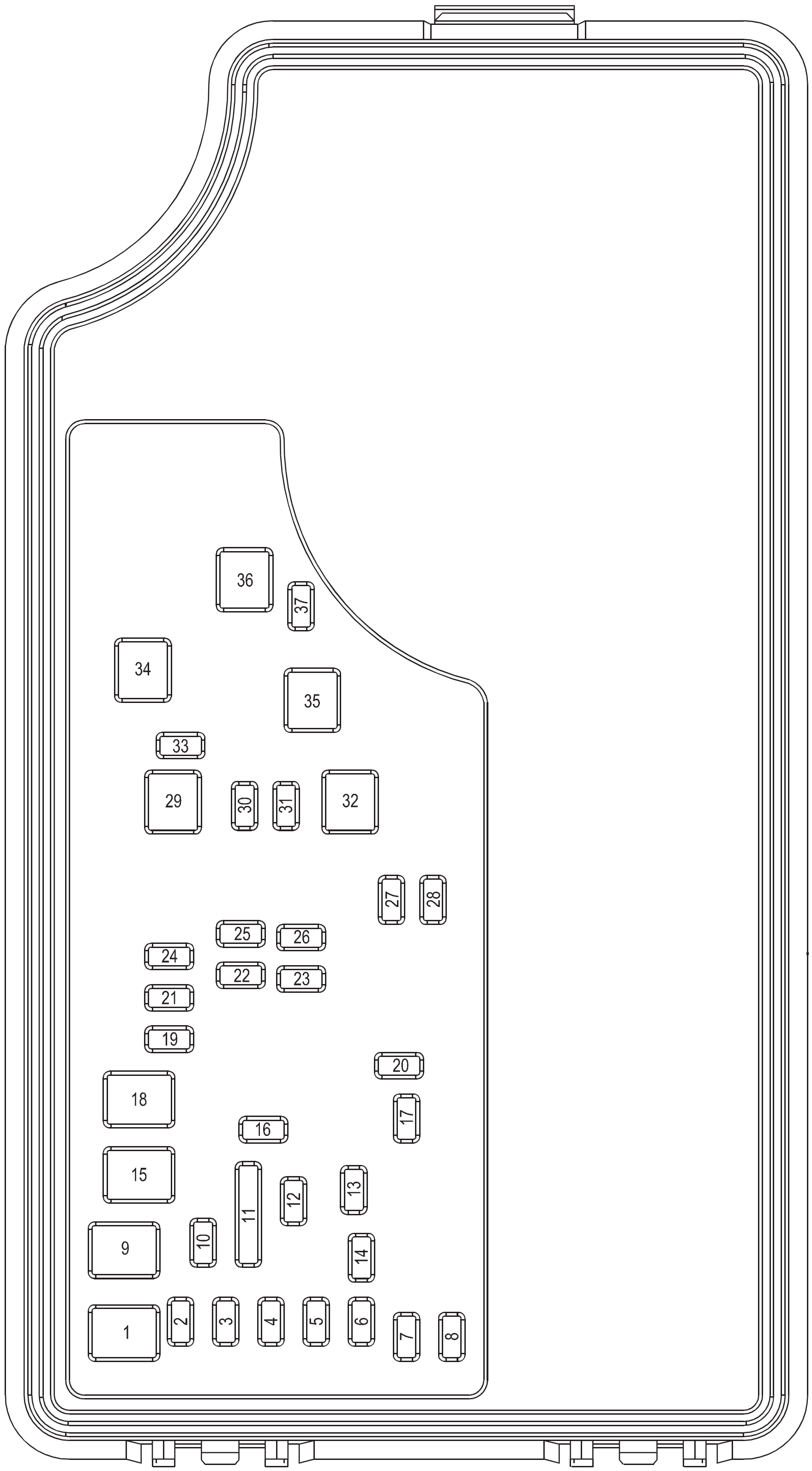
DIESEL



BATTERY
(8W-13-7)
A282
16
DB
A281
16
DB
A21
16
DB
FUSE/
RELAY
BLOCK
(8W-11-2)
7
FUSE
6
25A
6
9
FUSE
8
25A
8
11
FUSE
10
50A
10
A284
10
RD/LB
A283
10
RD/YL
4
3
C105
A284
10
RD/LB
A283
10
RD/YL
A29
10
RD/GY
11
MODULE-
GLOW
PLUG
(8W-30-19)
4
RELAY-
CABIN
HEATER 1
(8W-42-6)
1
4
RELAY-
CABIN
HEATER 2
(8W-42-6)
1

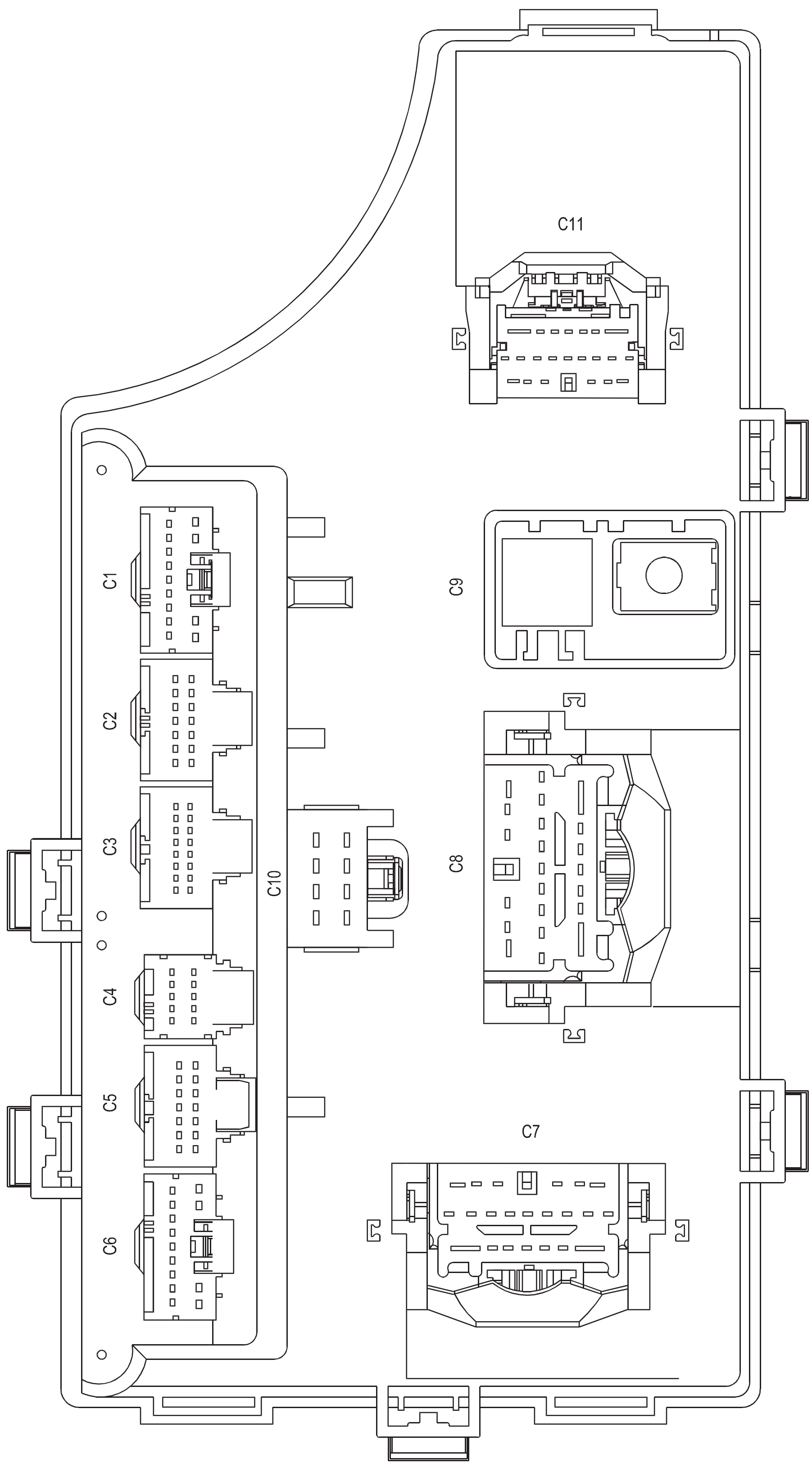
8W-13 TOTALLY INTEGRATED POWER MODULE

MODULE- TOTALLY INTEGRATED POWER
(FRONT VIEW)



078W-10 PM701302

MODULE- TOTALLY INTEGRATED POWER
(REAR VIEW)



FUSES (TIPM)

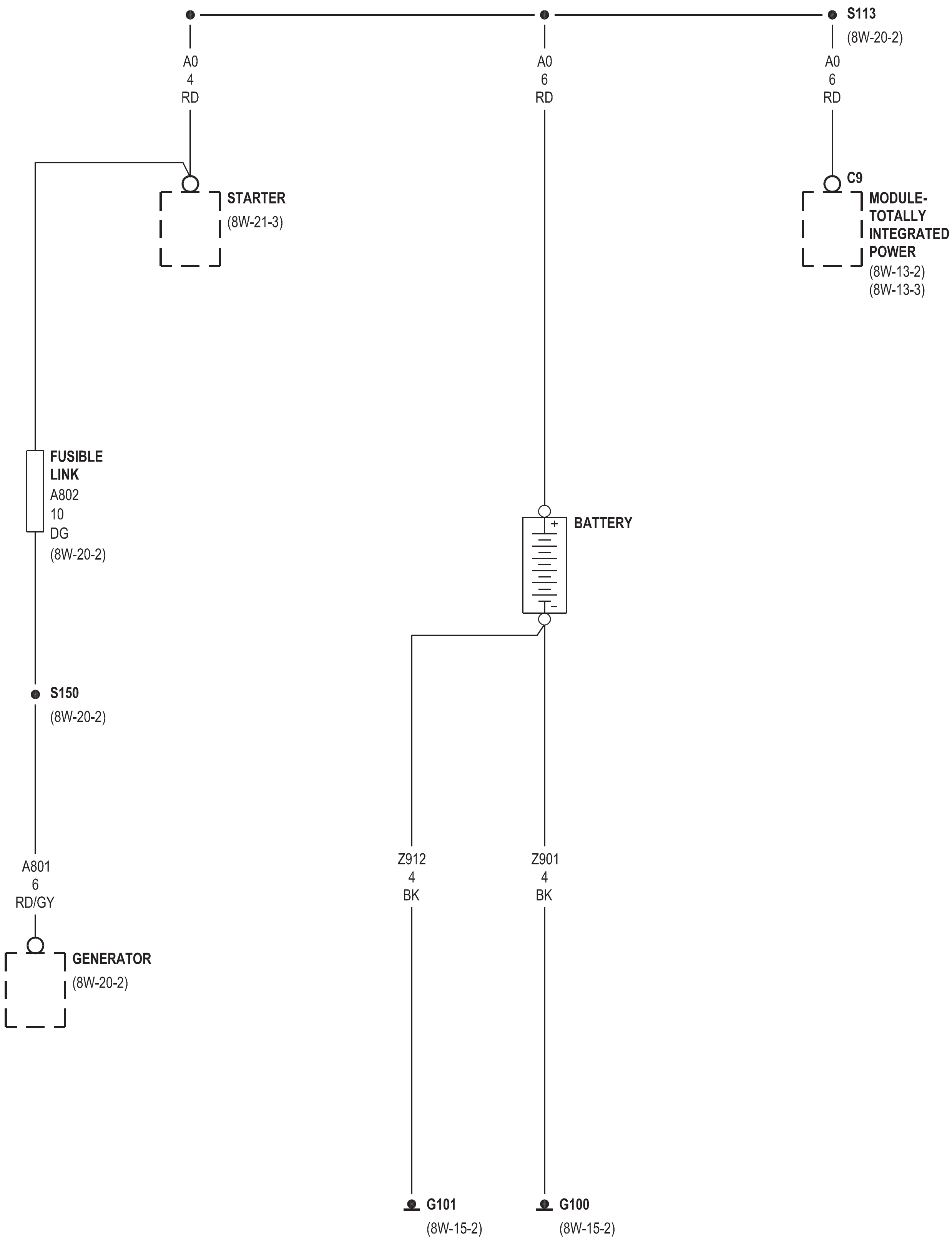
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	-	-	-
2	20A	A923 20RD ⌗⌗	FUSED B(+)
3	10A	A924 20DG/WT	FUSED B(+)
4	10A	A952 20RD/OR	FUSED B(+)
5	-	-	-
6	10A	A417 20RD/DG	FUSED B(+) (I.O.D.)
7	30A	INTERNAL	FUSED B(+) (I.O.D.)
8	30A	INTERNAL	FUSED B(+) (I.O.D.)
9	-	-	-
10	20A	A932 16RD/BR	DOOR LOCK POWER-FUSED B(+)
11	-	-	-
12	20A	A999 16RD/WT ▲	FUSED B(+)
13	20A	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
14	10A	INTERNAL	FUSED B(+) (I.O.D.)
15	50A	A16 12RD/BR	FUSED B(+)
16	15A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
17	10A	INTERNAL	FUSED B(+) (I.O.D.)
18	40A	A14 12RD/YL	FUSED B(+)
19	20A	INTERNAL ◆◆◆◆	FUSED B(+) (I.O.D.)

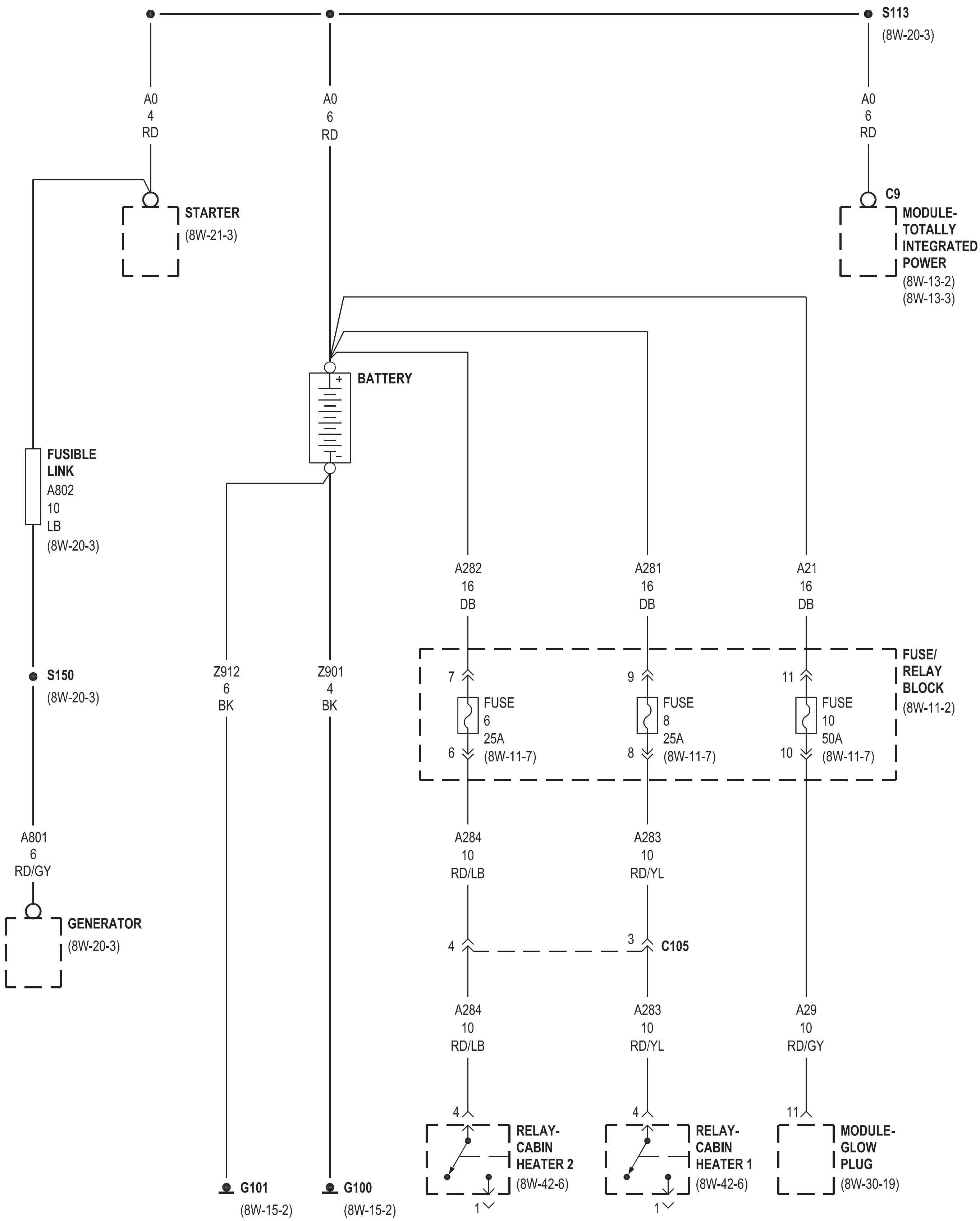
⌗⌗ AWD
◆◆◆◆ MIDLINE/HIGHLINE
▲ EXCEPT EXPORT

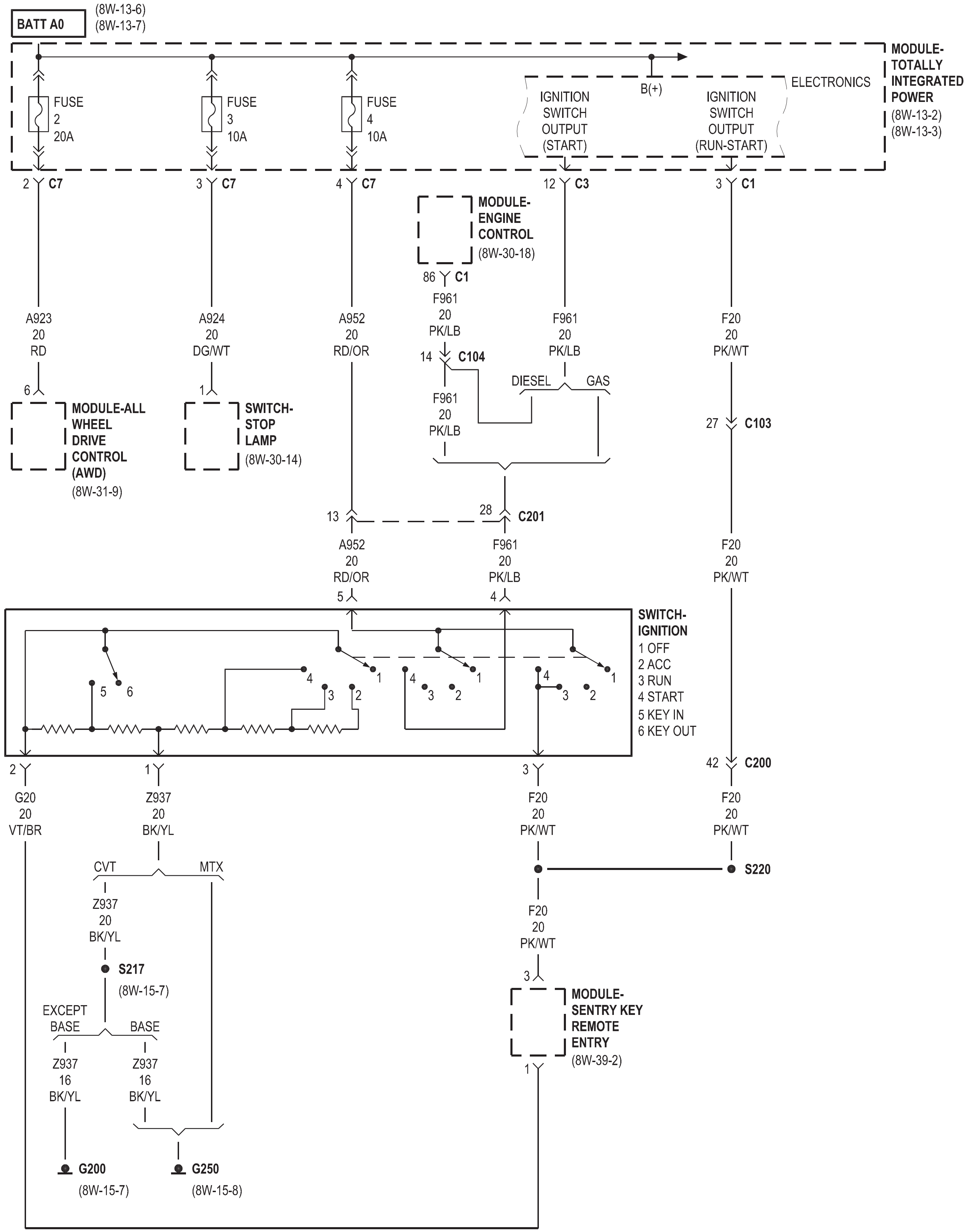
FUSES
(TIPM)

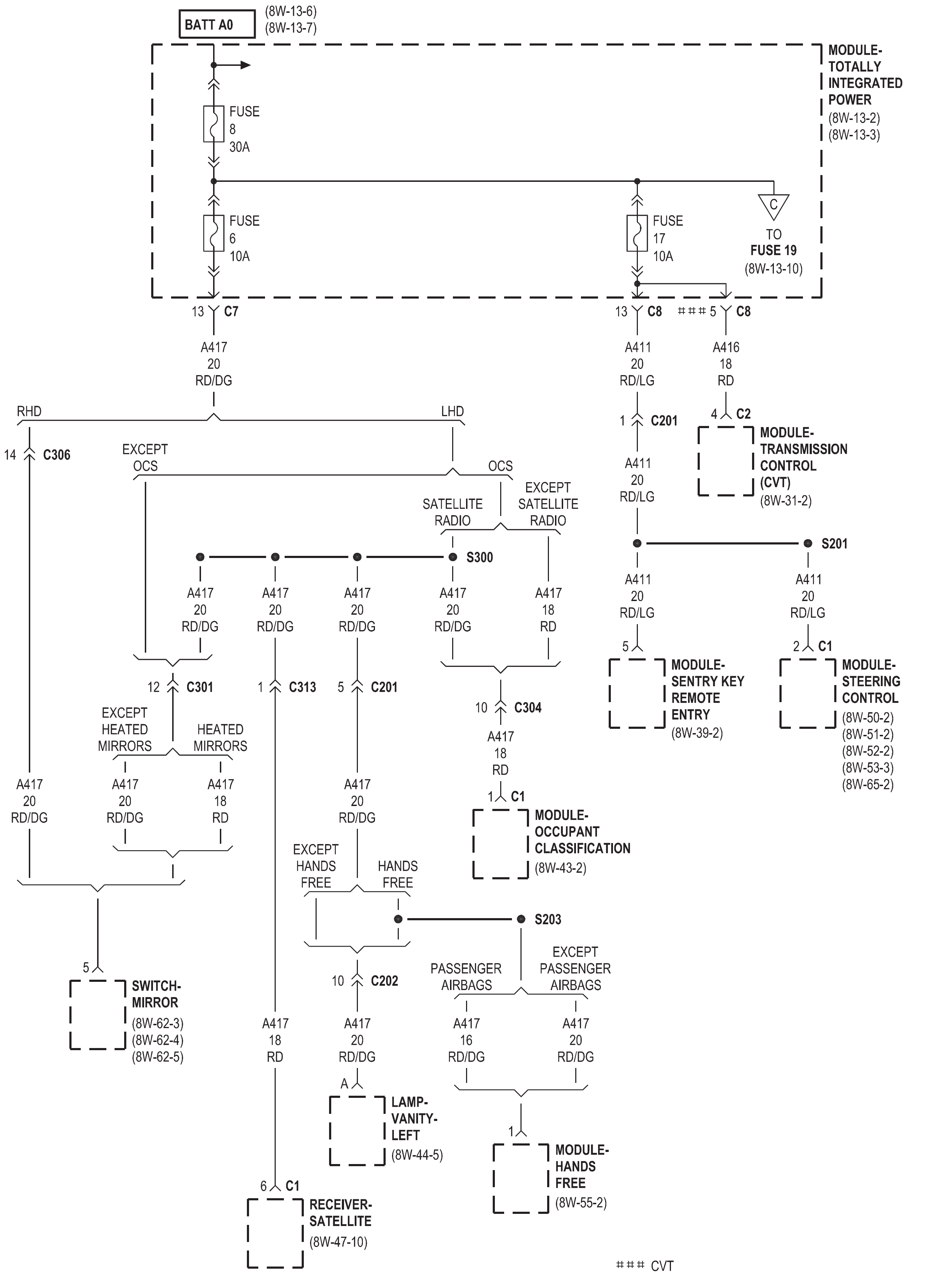
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
20	15A	A413 18RD/LB	FUSED B(+) (I.O.D.)
21	10A	INTERNAL	FUSED B(+) (I.O.D.)
22	10A	F929 20PK/RD ▲▲	FUSED IGNITION SWITCH OUTPUT (RUN)
22	10A	F929 18PK/RD ▲	FUSED IGNITION SWITCH OUTPUT (RUN)
23	15A	K344 18DB/LB	FUSED MAIN RELAY OUTPUT
24	25A	A927 16RD/GY ▽▽	FUSED B(+)
25	10A	C16 20DB/GY ▽▽	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
26	15A	K343 18DB/LG	FUSED MAIN RELAY OUTPUT
27	10A	F100 20DG/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
28	10A	F200 18PK/LB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
29	-	-	-
30	20A	F937 18PK/YL ▼▼▼	FUSED IGNITION SWITCH OUTPUT (RUN)
30	20A	F937 20PK/YL ▼▼▼▼	FUSED IGNITION SWITCH OUTPUT (RUN)
31	10A	F936 20PK/YL ○○	FUSED IGNITION SWITCH OUTPUT (RUN)
32	30A	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
33	10A	INTERNAL	FUSED B(+)
34	30A	A922 14RD/BK △△	FUSED B(+) (VALVE)
34	30A	A922 12RD/DB △	FUSED B(+) (VALVE)
35	40A	A921 12RD/DB △△	FUSED B(+) (PUMP)
35	40A	A921 12RD/YL △	FUSED B(+) (PUMP)
36	-	-	-
37	-	-	-

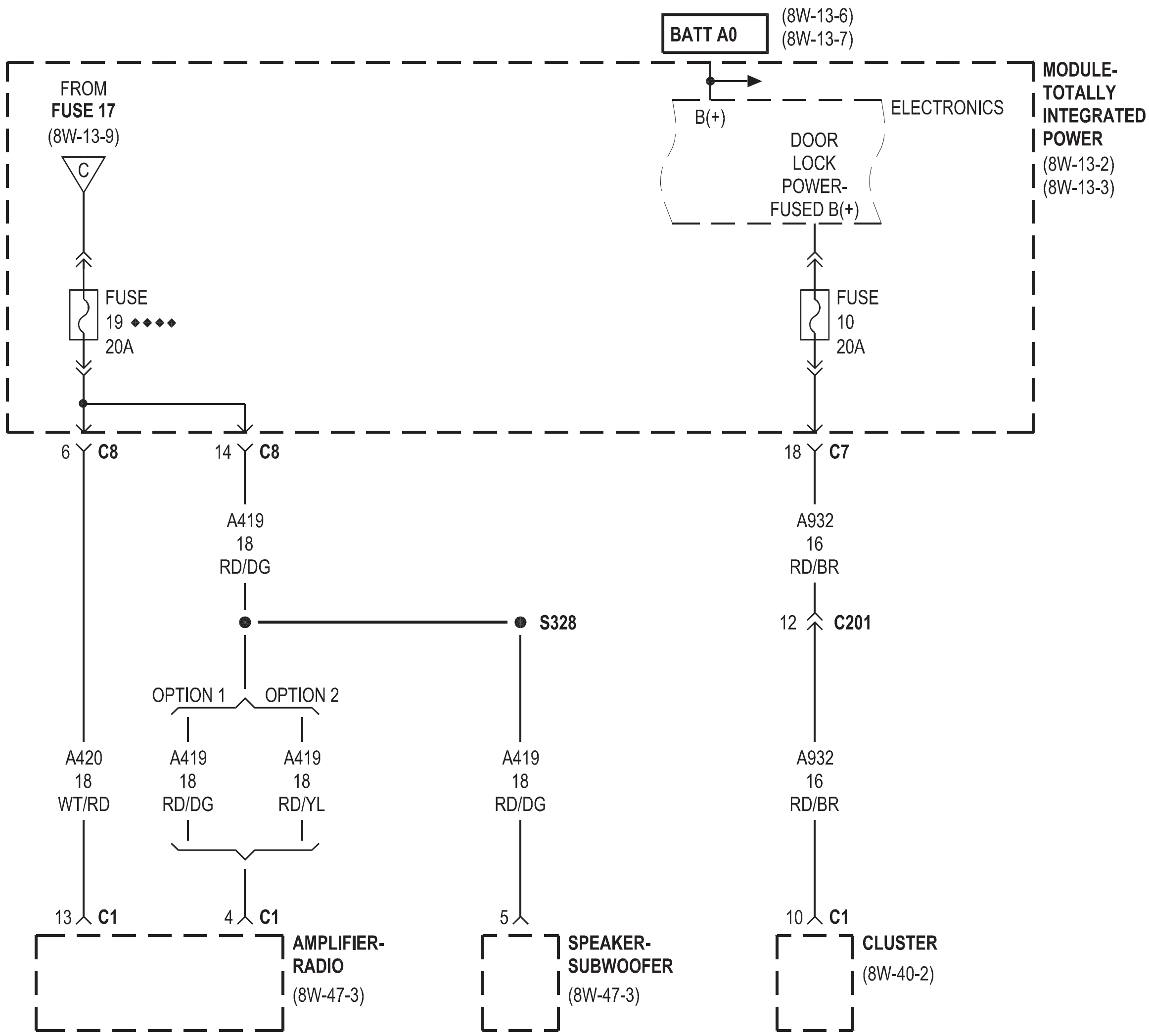
△ ESP
△△ TCS
▼▼▼ GAS HEATED SEATS
▼▼▼▼ DIESEL HEATED SEATS
○○ DIESEL
▲ EXCEPT EXPORT
▲▲ EXPORT
▽▽ EXCEPT BASE


S113
(8W-20-2)
A0
4
RD
A0
6
RD
A0
6
RD
STARTER
(8W-21-3)
C9
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSIBLE
LINK
A802
10
DG
(8W-20-2)
BATTERY
S150
(8W-20-2)
A801
6
RD/GY
Z912
4
BK
Z901
4
BK
GENERATOR
(8W-20-2)
G101
(8W-15-2)
G100
(8W-15-2)

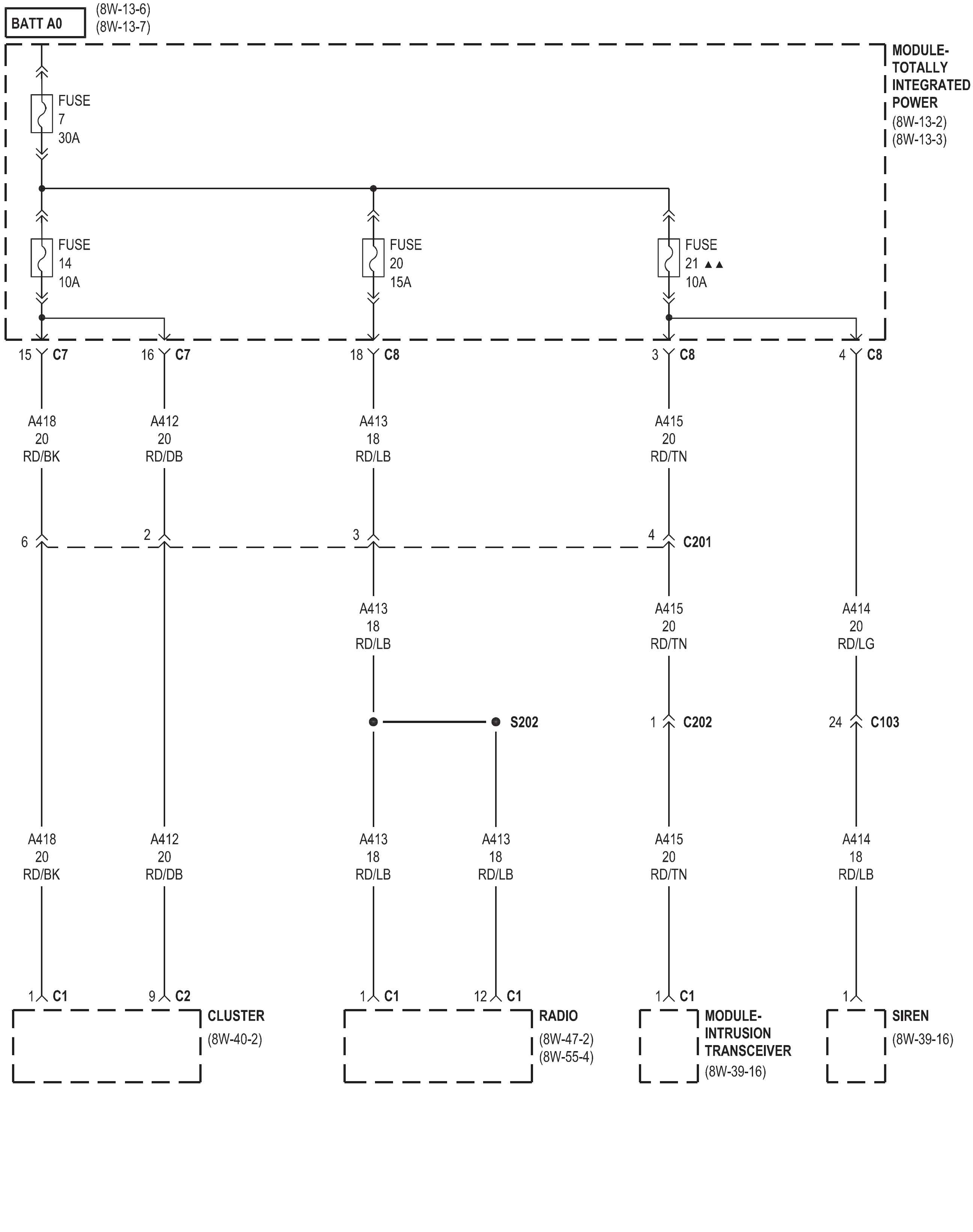

S113
(8W-20-3)
A0
4
RD
A0
6
RD
A0
6
RD
STARTER
(8W-21-3)
C9
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
BATTERY
FUSIBLE
LINK
A802
10
LB
(8W-20-3)
A282
16
DB
A281
16
DB
A21
16
DB
S150
(8W-20-3)
Z912
6
BK
Z901
4
BK
FUSE/
RELAY
BLOCK
(8W-11-2)
7
FUSE
6
25A
6
(8W-11-7)
9
FUSE
8
25A
8
(8W-11-7)
11
FUSE
10
50A
10
(8W-11-7)
A801
6
RD/GY
A284
10
RD/LB
A283
10
RD/YL
GENERATOR
(8W-20-3)
4
3
C105
A284
10
RD/LB
A283
10
RD/YL
A29
10
RD/GY
4
RELAY-
CABIN
HEATER 2
(8W-42-6)
1
4
RELAY-
CABIN
HEATER 1
(8W-42-6)
1
11
MODULE-
GLOW
PLUG
(8W-30-19)
G101
(8W-15-2)
G100
(8W-15-2)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 2 20A
FUSE 3 10A
FUSE 4 10A
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (START)
IGNITION SWITCH OUTPUT (RUN-START)
2 C7
3 C7
4 C7
12 C3
3 C1
MODULE-ENGINE CONTROL
(8W-30-18)
86 C1
F961 20 PK/LB
14 C104
F961 20 PK/LB
DIESEL
GAS
A923 20 RD
A924 20 DG/WT
A952 20 RD/OR
F961 20 PK/LB
F20 20 PK/WT
6
MODULE-ALL WHEEL DRIVE CONTROL (AWD)
(8W-31-9)
1
SWITCH-STOP LAMP
(8W-30-14)
27 C103
13
28 C201
A952 20 RD/OR
F961 20 PK/LB
F20 20 PK/WT
5
4
SWITCH-IGNITION
1 OFF
2 ACC
3 RUN
4 START
5 KEY IN
6 KEY OUT
42 C200
2
1
3
G20 20 VT/BR
Z937 20 BK/YL
F20 20 PK/WT
F20 20 PK/WT
CVT
MTX
S220
Z937 20 BK/YL
S217
(8W-15-7)
F20 20 PK/WT
3
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
1
EXCEPT BASE
BASE
Z937 16 BK/YL
Z937 16 BK/YL
G200
(8W-15-7)
G250
(8W-15-8)

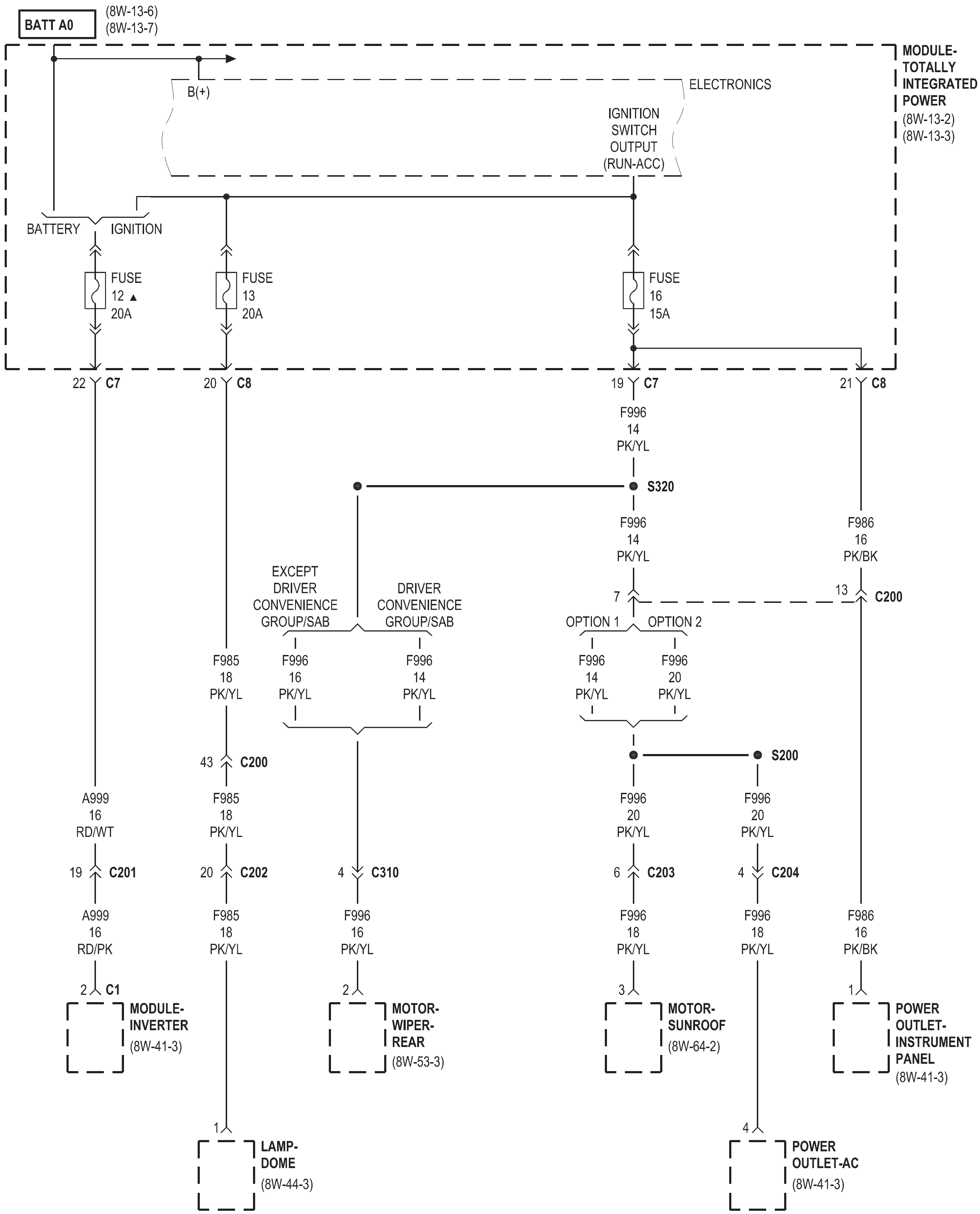

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
8
30A
FUSE
6
10A
FUSE
17
10A
C
TO
FUSE 19
(8W-13-10)
13 C7
13 C8
5 C8
A417
20
RD/DG
A411
20
RD/LG
A416
18
RD
RHD
LHD
14 C306
EXCEPT
OCS
OCS
1 C201
4 C2
MODULE-
TRANSMISSION
CONTROL
(CVT)
(8W-31-2)
SATELLITE
RADIO
EXCEPT
SATELLITE
RADIO
S300
S201
A417
18
RD
MODULE-
SENTRY KEY
REMOTE
ENTRY
(8W-39-2)
2 C1
MODULE-
STEERING
CONTROL
(8W-50-2)
(8W-51-2)
(8W-52-2)
(8W-53-3)
(8W-65-2)
12 C301
1 C313
5 C201
10 C304
EXCEPT
HEATED
MIRRORS
HEATED
MIRRORS
1 C1
MODULE-
OCCUPANT
CLASSIFICATION
(8W-43-2)
EXCEPT
HANDS
FREE
HANDS
FREE
S203
5
SWITCH-
MIRROR
(8W-62-3)
(8W-62-4)
(8W-62-5)
10 C202
PASSENGER
AIRBAGS
EXCEPT
PASSENGER
AIRBAGS
A417
16
RD/DG
A
LAMP-
VANITY-
LEFT
(8W-44-5)
1
MODULE-
HANDS
FREE
(8W-55-2)
6 C1
RECEIVER-
SATELLITE
(8W-47-10)
CVT



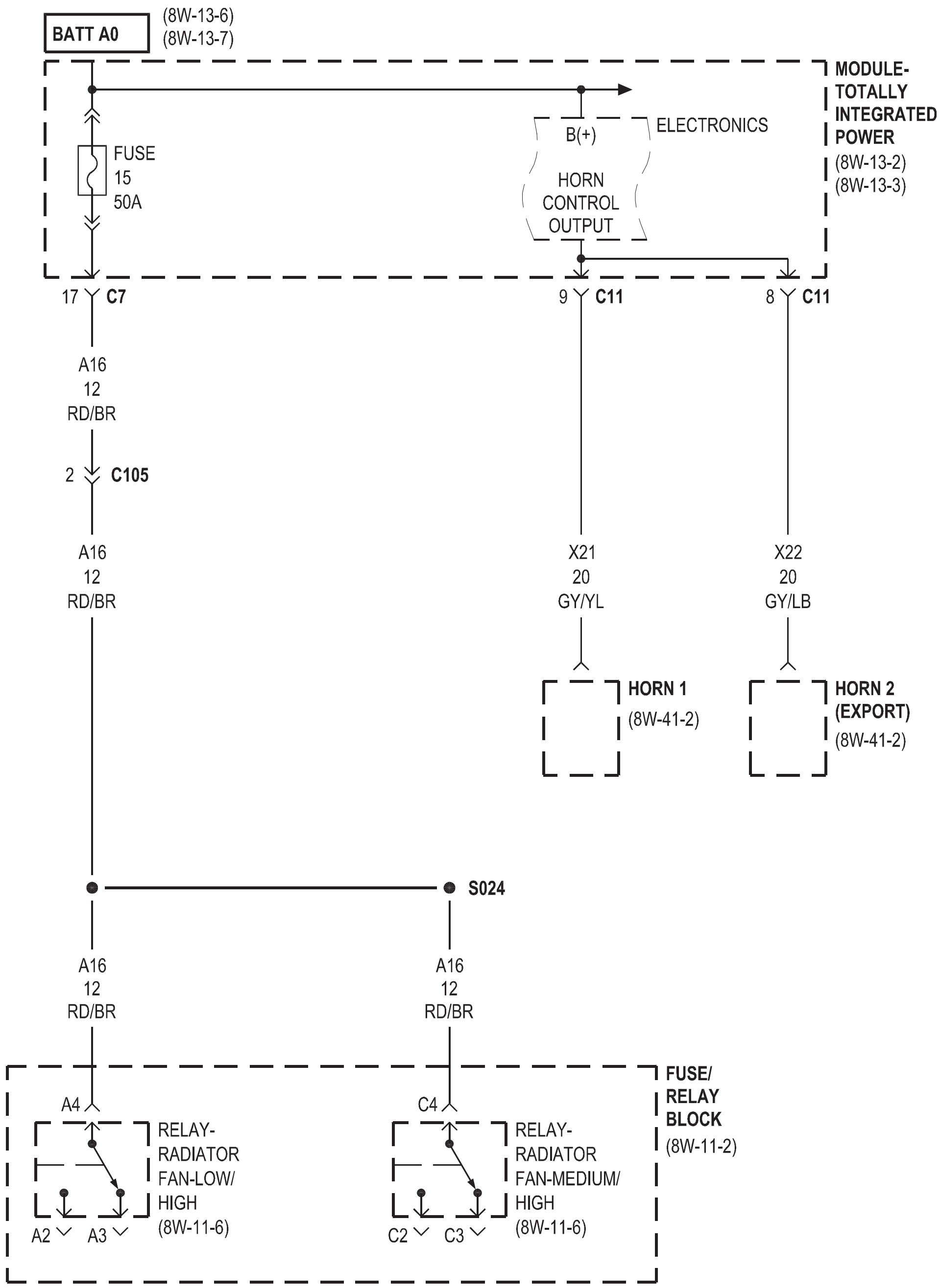
◆◆◆◆ MIDLINE/HIGHLINE

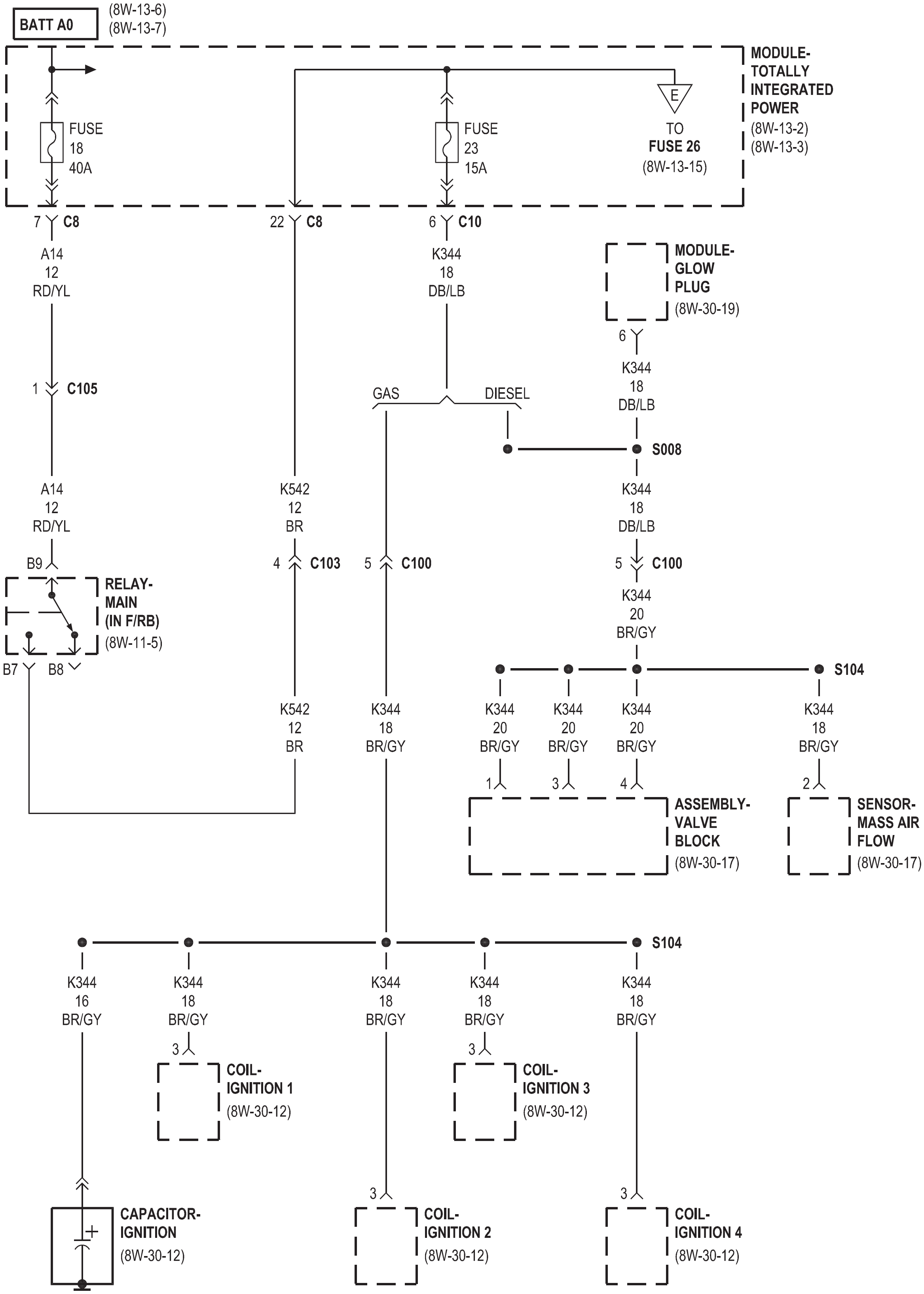

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
7
30A
FUSE
14
10A
FUSE
20
15A
FUSE
21 ▲▲
10A
15 C7
16 C7
18 C8
3 C8
4 C8
A418
20
RD/BK
A412
20
RD/DB
A413
18
RD/LB
A415
20
RD/TN
6
2
3
4
C201
A413
18
RD/LB
A415
20
RD/TN
A414
20
RD/LG
S202
1 C202
24 C103
A418
20
RD/BK
A412
20
RD/DB
A413
18
RD/LB
A413
18
RD/LB
A415
20
RD/TN
A414
18
RD/LB
1 C1
9 C2
1 C1
12 C1
1 C1
1
CLUSTER
(8W-40-2)
RADIO
(8W-47-2)
(8W-55-4)
MODULE-
INTRUSION
TRANSCEIVER
(8W-39-16)
SIREN
(8W-39-16)

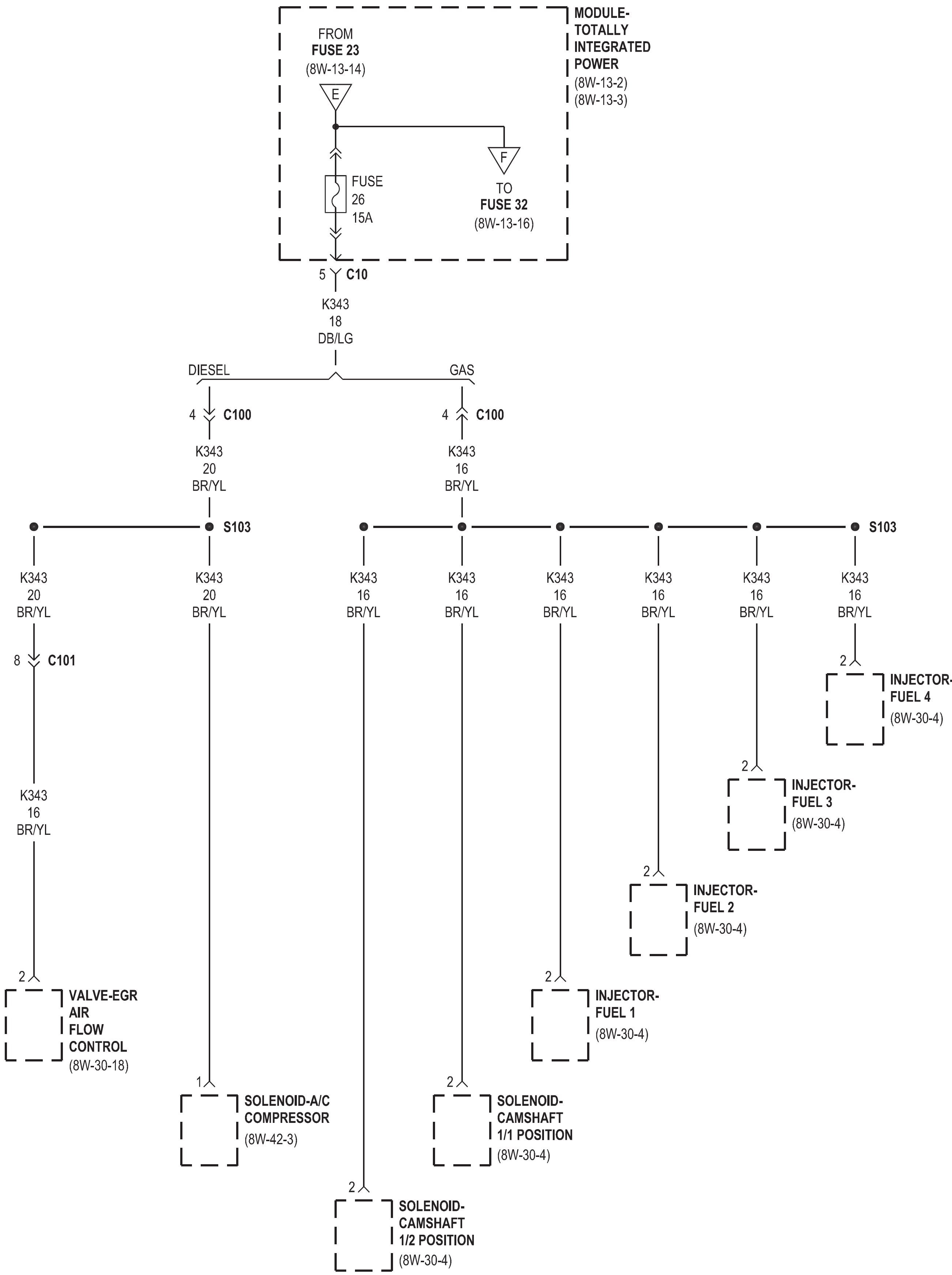
▲▲ EXPORT

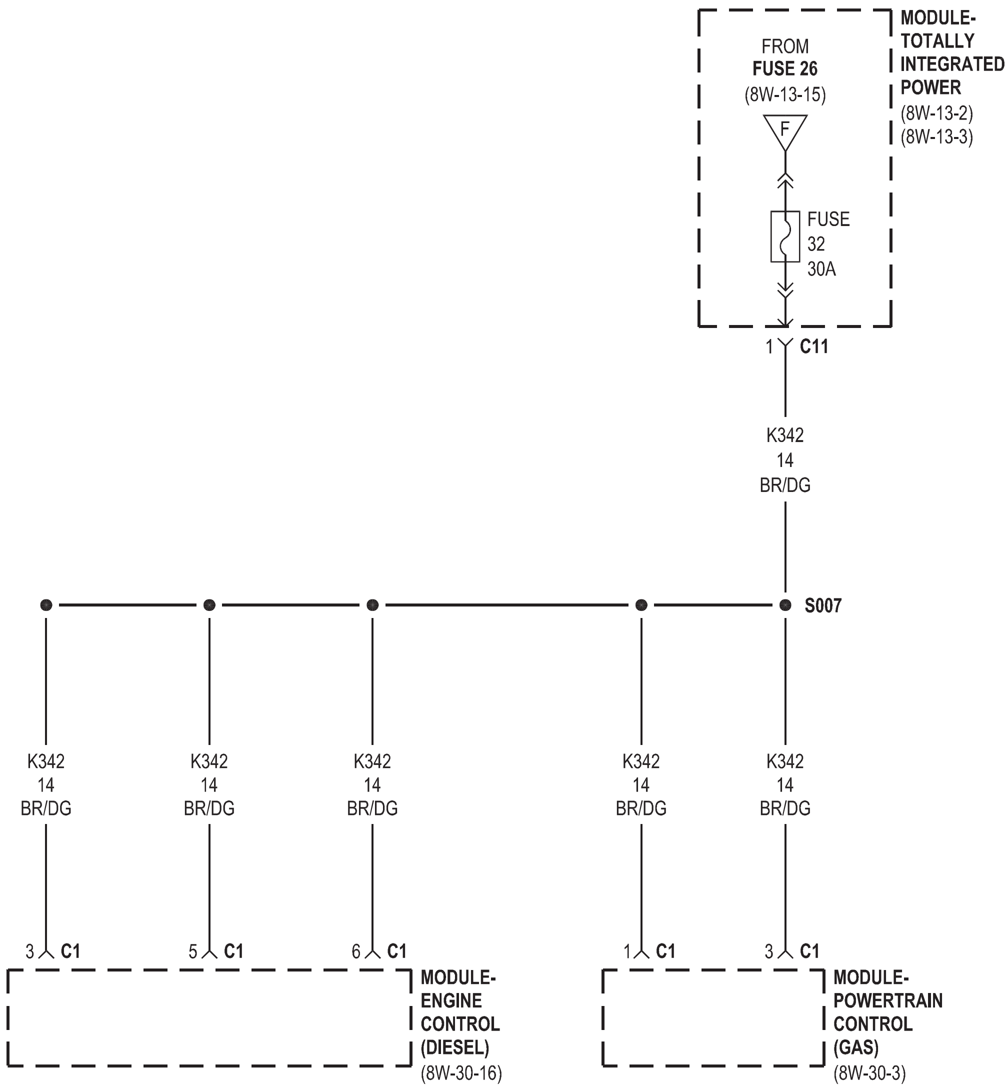


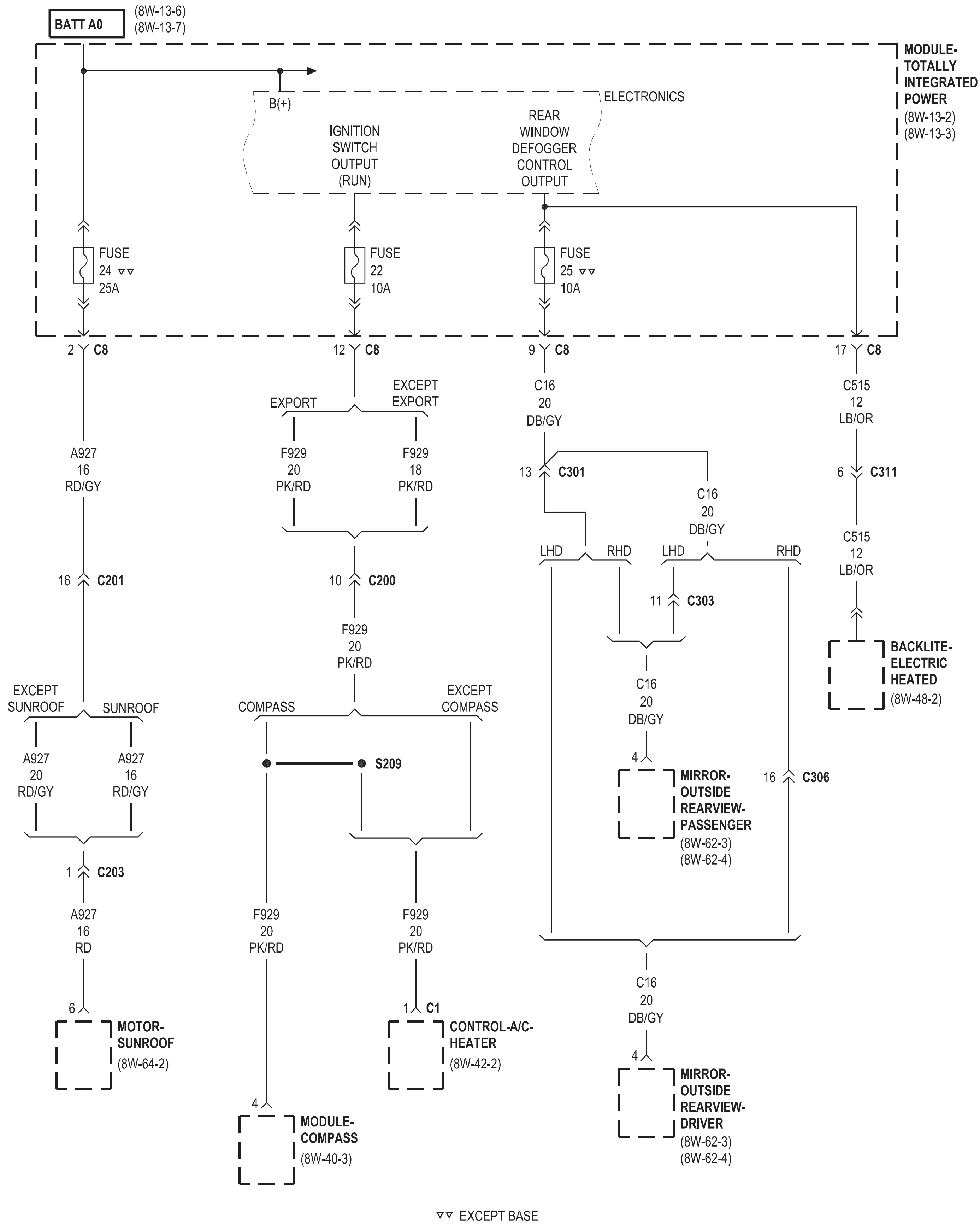
▲ EXCEPT EXPORT

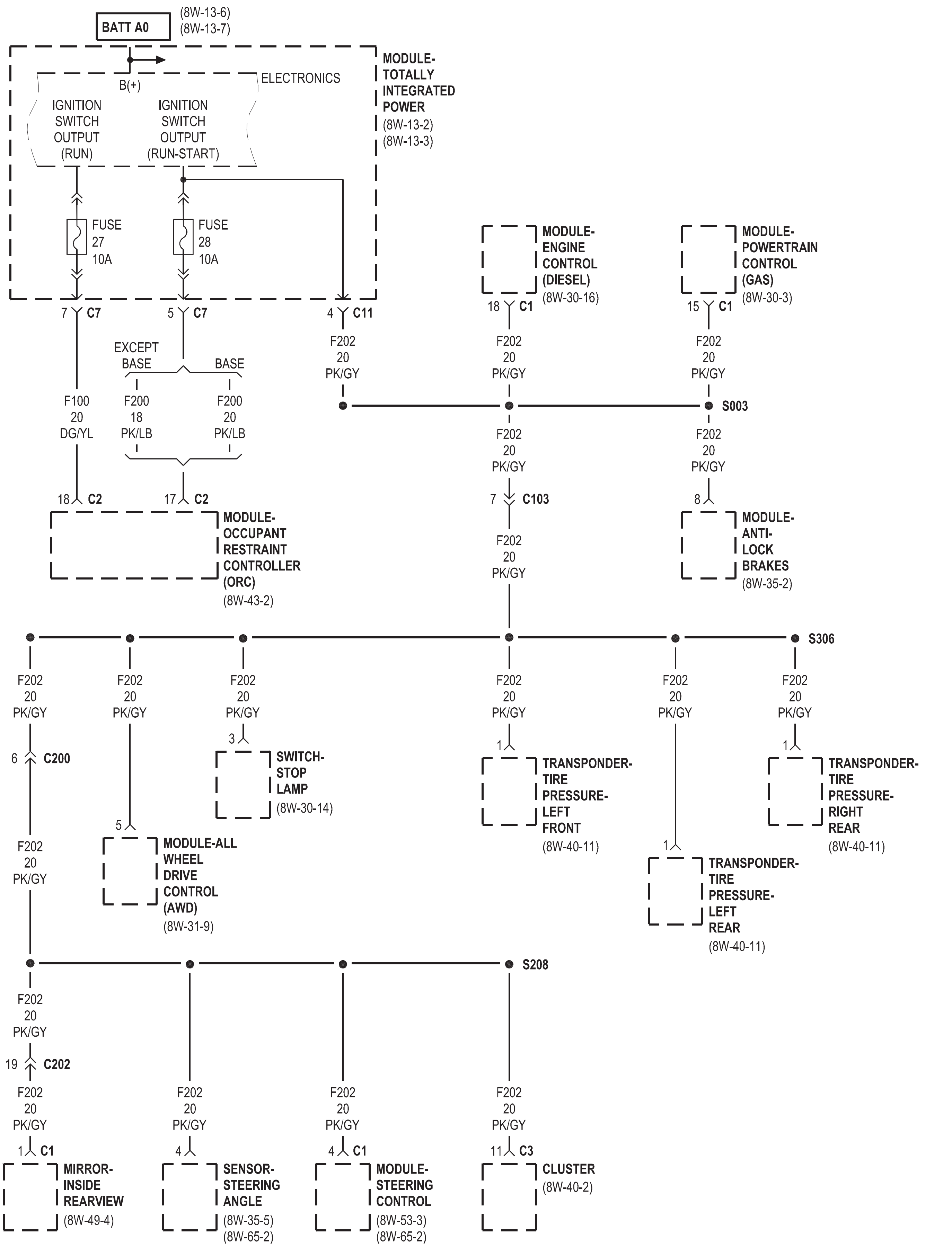

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
15
50A
B(+)
ELECTRONICS
HORN
CONTROL
OUTPUT
17
C7
9
C11
8
C11
A16
12
RD/BR
2
C105
A16
12
RD/BR
X21
20
GY/YL
X22
20
GY/LB
HORN 1
(8W-41-2)
HORN 2
(EXPORT)
(8W-41-2)
S024
A16
12
RD/BR
A16
12
RD/BR
FUSE/
RELAY
BLOCK
(8W-11-2)
A4
RELAY-
RADIATOR
FAN-LOW/
HIGH
(8W-11-6)
A2
A3
C4
RELAY-
RADIATOR
FAN-MEDIUM/
HIGH
(8W-11-6)
C2
C3

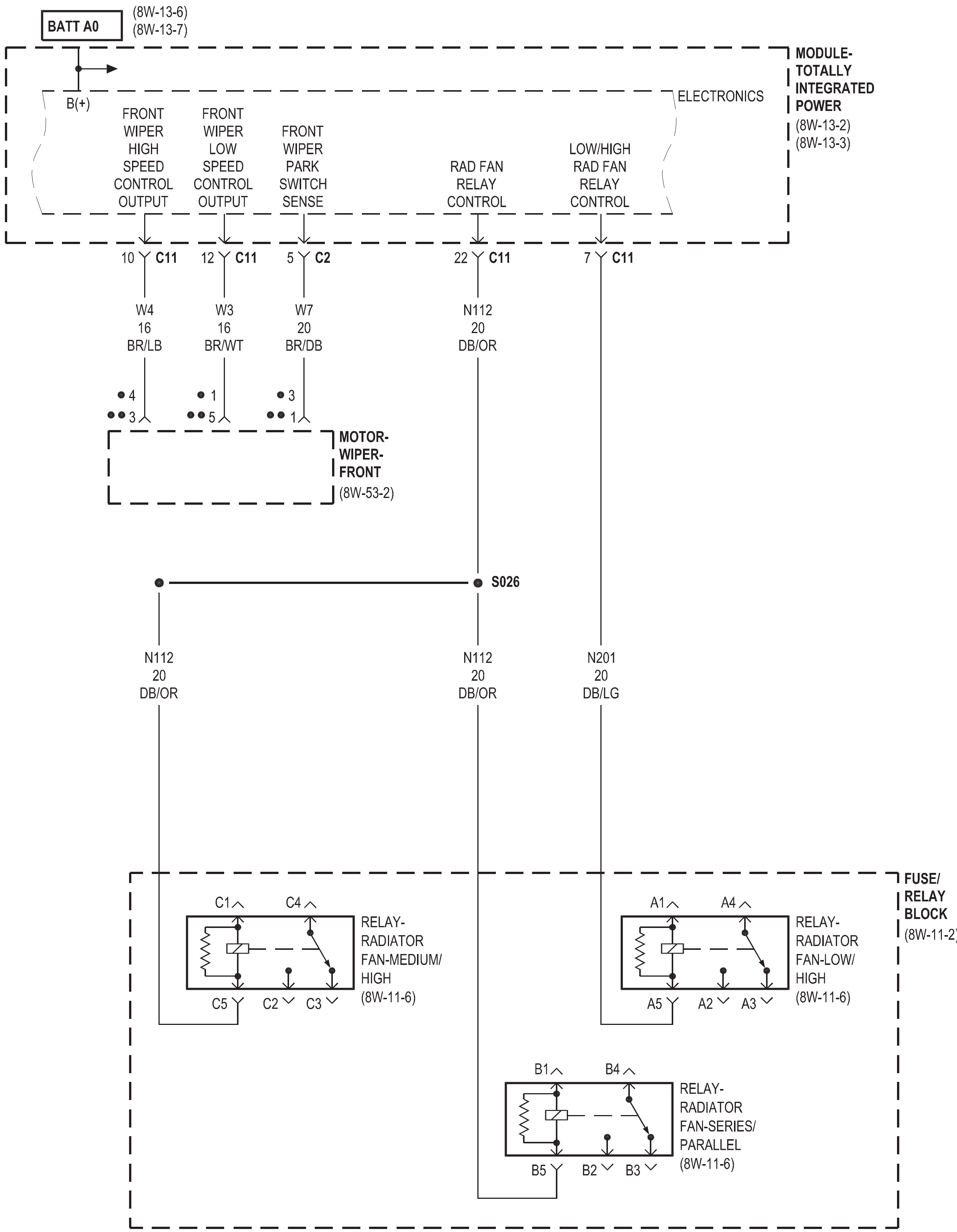

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
18
40A
FUSE
23
15A
E
TO
FUSE 26
(8W-13-15)
7 C8
22 C8
6 C10
A14
12
RD/YL
K344
18
DB/LB
MODULE-
GLOW
PLUG
(8W-30-19)
6
K344
18
DB/LB
1 C105
GAS
DIESEL
S008
A14
12
RD/YL
K542
12
BR
K344
18
DB/LB
B9
4 C103
5 C100
5 C100
RELAY-
MAIN
(IN F/RB)
(8W-11-5)
K344
20
BR/GY
B7
B8
S104
K542
12
BR
K344
18
BR/GY
K344
20
BR/GY
K344
20
BR/GY
K344
20
BR/GY
K344
18
BR/GY
1
3
4
2
ASSEMBLY-
VALVE
BLOCK
(8W-30-17)
SENSOR-
MASS AIR
FLOW
(8W-30-17)
S104
K344
16
BR/GY
K344
18
BR/GY
K344
18
BR/GY
K344
18
BR/GY
K344
18
BR/GY
3
COIL-
IGNITION 1
(8W-30-12)
3
COIL-
IGNITION 3
(8W-30-12)
3
3
CAPACITOR-
IGNITION
(8W-30-12)
COIL-
IGNITION 2
(8W-30-12)
COIL-
IGNITION 4
(8W-30-12)


MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FROM
FUSE 23
(8W-13-14)
E
F
FUSE
26
15A
TO
FUSE 32
(8W-13-16)
5 C10
K343
18
DB/LG
DIESEL
GAS
4 C100
4 C100
K343
20
BR/YL
K343
16
BR/YL
S103
S103
K343
20
BR/YL
8 C101
K343
16
BR/YL
INJECTOR-
FUEL 4
(8W-30-4)
INJECTOR-
FUEL 3
(8W-30-4)
INJECTOR-
FUEL 2
(8W-30-4)
INJECTOR-
FUEL 1
(8W-30-4)
VALVE-EGR
AIR
FLOW
CONTROL
(8W-30-18)
SOLENOID-A/C
COMPRESSOR
(8W-42-3)
SOLENOID-
CAMSHAFT
1/1 POSITION
(8W-30-4)
SOLENOID-
CAMSHAFT
1/2 POSITION
(8W-30-4)

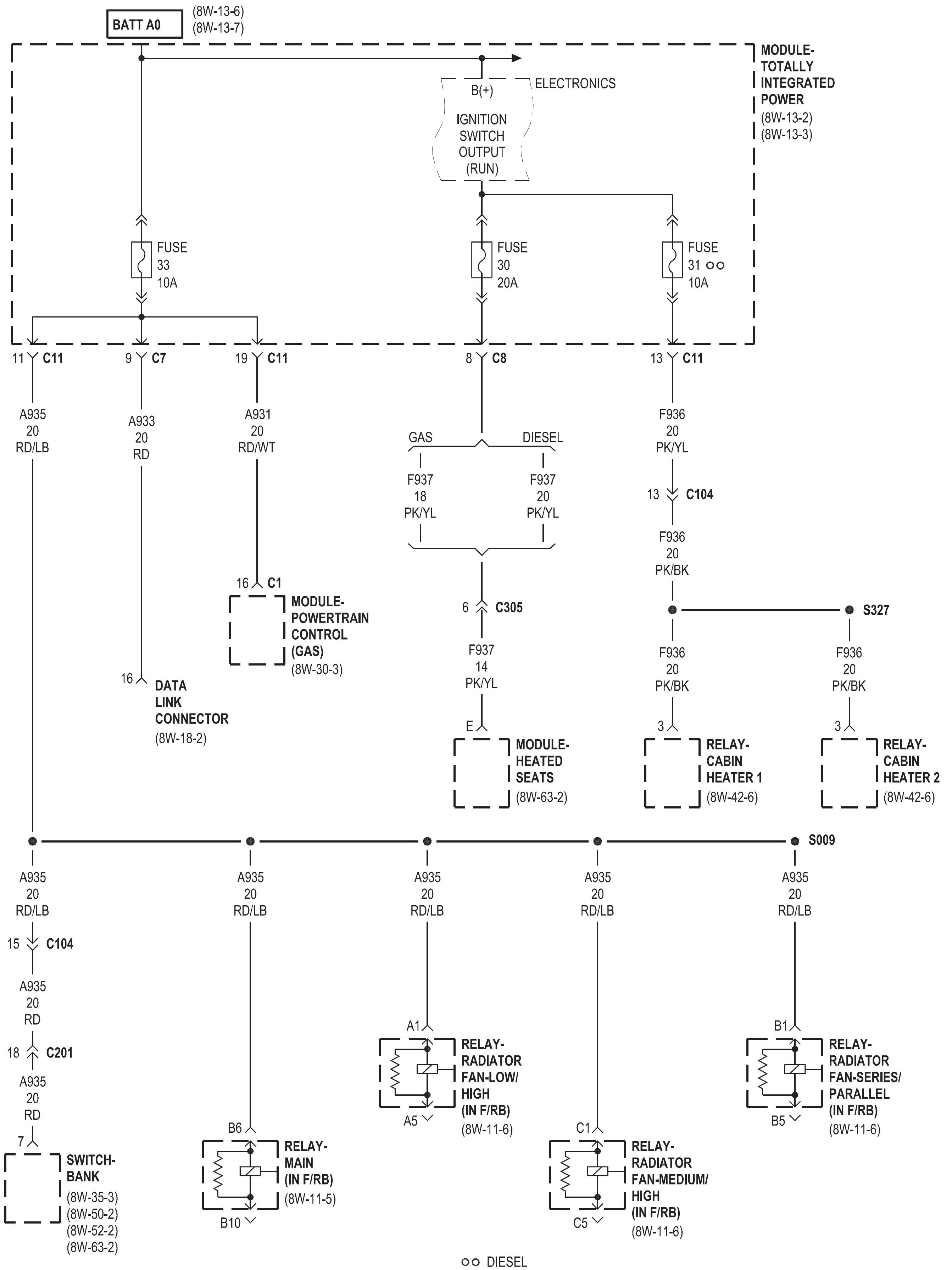

MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FROM
FUSE 26
(8W-13-15)
F
FUSE
32
30A
1 C11
K342
14
BR/DG
S007
K342
14
BR/DG
3 C1
5 C1
6 C1
1 C1
3 C1
MODULE-
ENGINE
CONTROL
(DIESEL)
(8W-30-16)
MODULE-
POWERTRAIN
CONTROL
(GAS)
(8W-30-3)

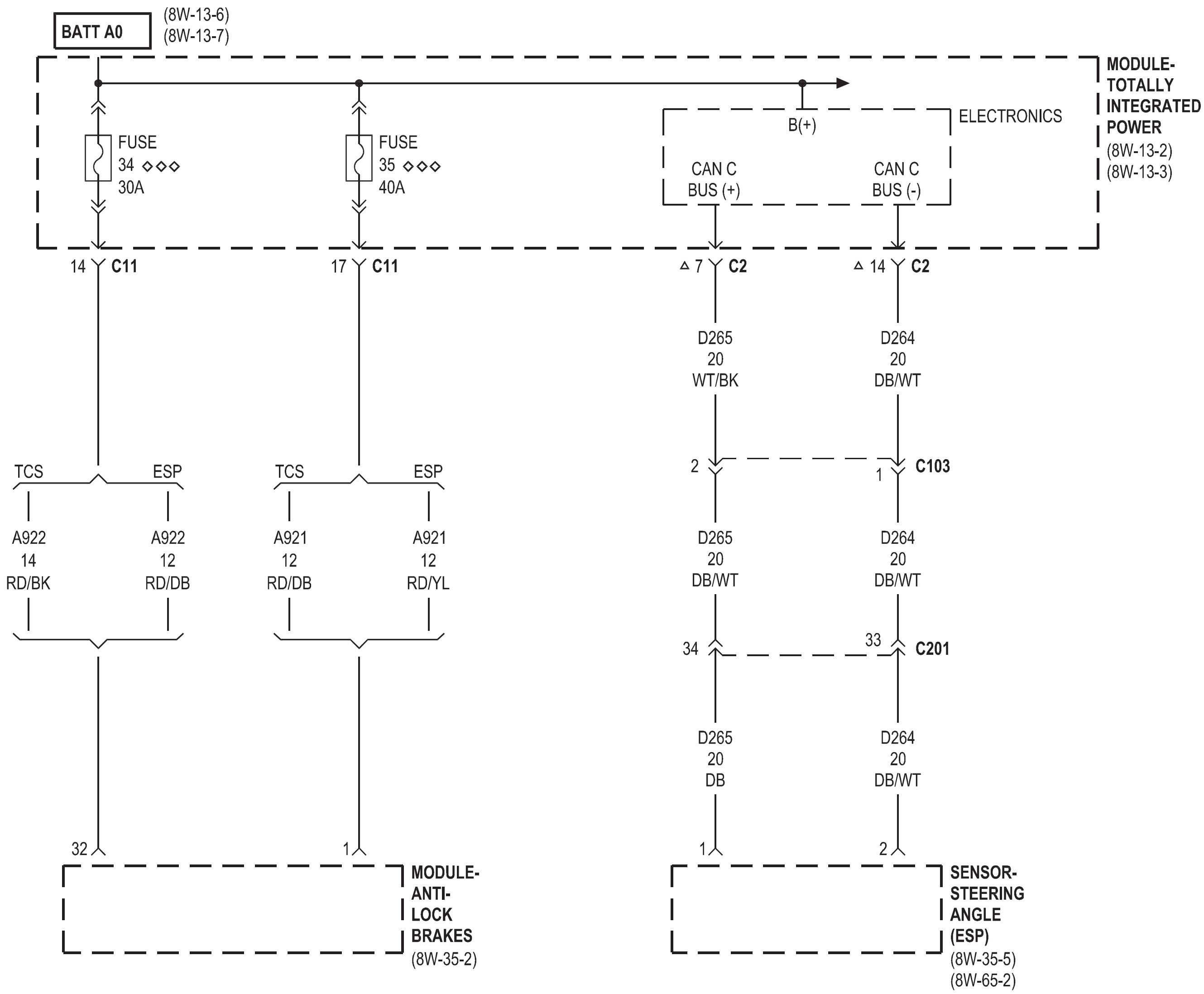

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION
SWITCH
OUTPUT
(RUN)
REAR
WINDOW
DEFOGGER
CONTROL
OUTPUT
FUSE
24 ▽▽
25A
FUSE
22
10A
FUSE
25 ▽▽
10A
2 C8
12 C8
9 C8
17 C8
A927
16
RD/GY
EXPORT
EXCEPT
EXPORT
F929
20
PK/RD
F929
18
PK/RD
C16
20
DB/GY
C515
12
LB/OR
13 C301
6 C311
C16
20
DB/GY
C515
12
LB/OR
LHD
RHD
LHD
RHD
16 C201
10 C200
11 C303
BACKLITE-
ELECTRIC
HEATED
(8W-48-2)
F929
20
PK/RD
EXCEPT
SUNROOF
SUNROOF
COMPASS
EXCEPT
COMPASS
C16
20
DB/GY
S209
A927
20
RD/GY
A927
16
RD/GY
4
MIRROR-
OUTSIDE
REARVIEW-
PASSENGER
(8W-62-3)
(8W-62-4)
16 C306
1 C203
A927
16
RD
F929
20
PK/RD
F929
20
PK/RD
C16
20
DB/GY
6
MOTOR-
SUNROOF
(8W-64-2)
1 C1
CONTROL-A/C-
HEATER
(8W-42-2)
4
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
(8W-62-3)
(8W-62-4)
4
MODULE-
COMPASS
(8W-40-3)
▽▽ EXCEPT BASE

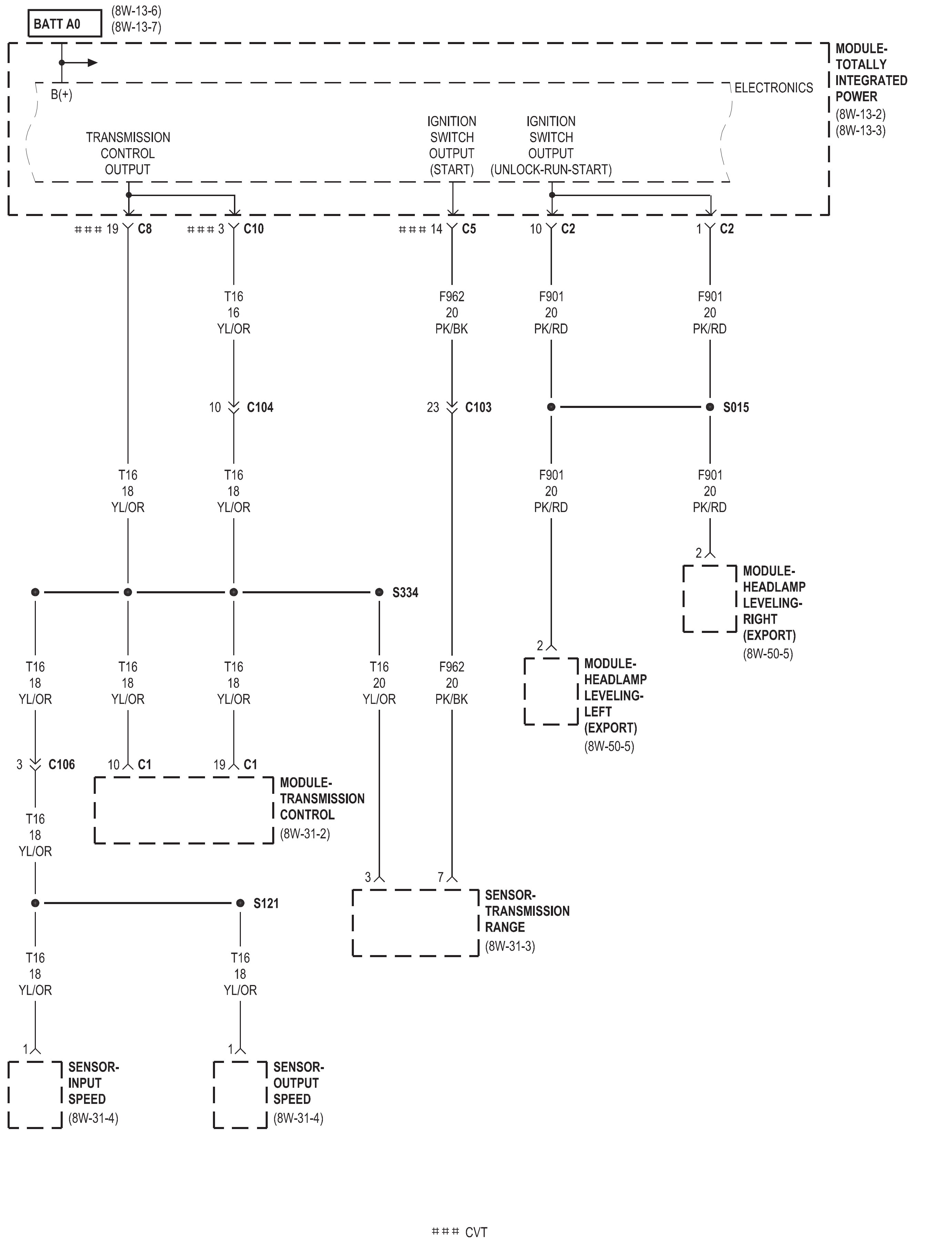

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN)
IGNITION SWITCH OUTPUT (RUN-START)
FUSE 27 10A
FUSE 28 10A
7 C7
5 C7
4 C11
EXCEPT BASE
BASE
F100 20 DG/YL
F200 18 PK/LB
F200 20 PK/LB
18 C2
17 C2
MODULE-OCCUPANT RESTRAINT CONTROLLER (ORC)
(8W-43-2)
MODULE-ENGINE CONTROL (DIESEL)
(8W-30-16)
18 C1
MODULE-POWERTRAIN CONTROL (GAS)
(8W-30-3)
15 C1
F202 20 PK/GY
S003
7 C103
8
MODULE-ANTI-LOCK BRAKES
(8W-35-2)
S306
6 C200
5
MODULE-ALL WHEEL DRIVE CONTROL (AWD)
(8W-31-9)
3
SWITCH-STOP LAMP
(8W-30-14)
1
TRANSPONDER-TIRE PRESSURE-LEFT FRONT
(8W-40-11)
TRANSPONDER-TIRE PRESSURE-LEFT REAR
(8W-40-11)
TRANSPONDER-TIRE PRESSURE-RIGHT REAR
(8W-40-11)
S208
19 C202
1 C1
MIRROR-INSIDE REARVIEW
(8W-49-4)
4
SENSOR-STEERING ANGLE
(8W-35-5)
(8W-65-2)
4 C1
MODULE-STEERING CONTROL
(8W-53-3)
(8W-65-2)
11 C3
CLUSTER
(8W-40-2)

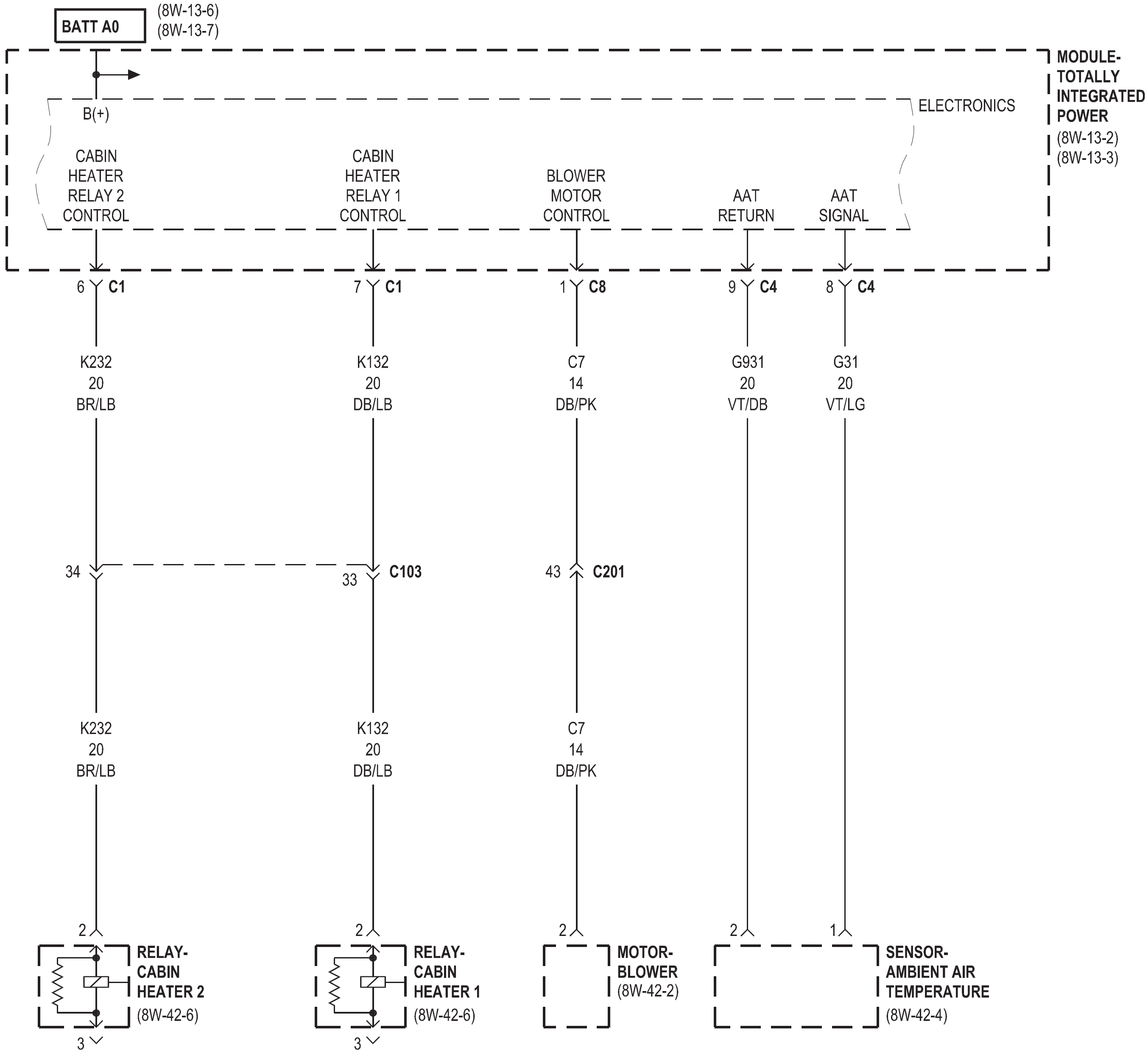

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
FRONT WIPER HIGH SPEED CONTROL OUTPUT
FRONT WIPER LOW SPEED CONTROL OUTPUT
FRONT WIPER PARK SWITCH SENSE
RAD FAN RELAY CONTROL
LOW/HIGH RAD FAN RELAY CONTROL
10 C11
12 C11
5 C2
22 C11
7 C11
W4 16 BR/LB
W3 16 BR/WT
W7 20 BR/DB
N112 20 DB/OR
4
3
1
5
3
1
MOTOR-WIPER-FRONT
(8W-53-2)
S026
N112 20 DB/OR
N112 20 DB/OR
N201 20 DB/LG
FUSE/RELAY BLOCK
(8W-11-2)
C1
C4
C5
C2
C3
RELAY-RADIATOR FAN-MEDIUM/HIGH
(8W-11-6)
A1
A4
A5
A2
A3
RELAY-RADIATOR FAN-LOW/HIGH
(8W-11-6)
B1
B4
B5
B2
B3
RELAY-RADIATOR FAN-SERIES/PARALLEL
(8W-11-6)

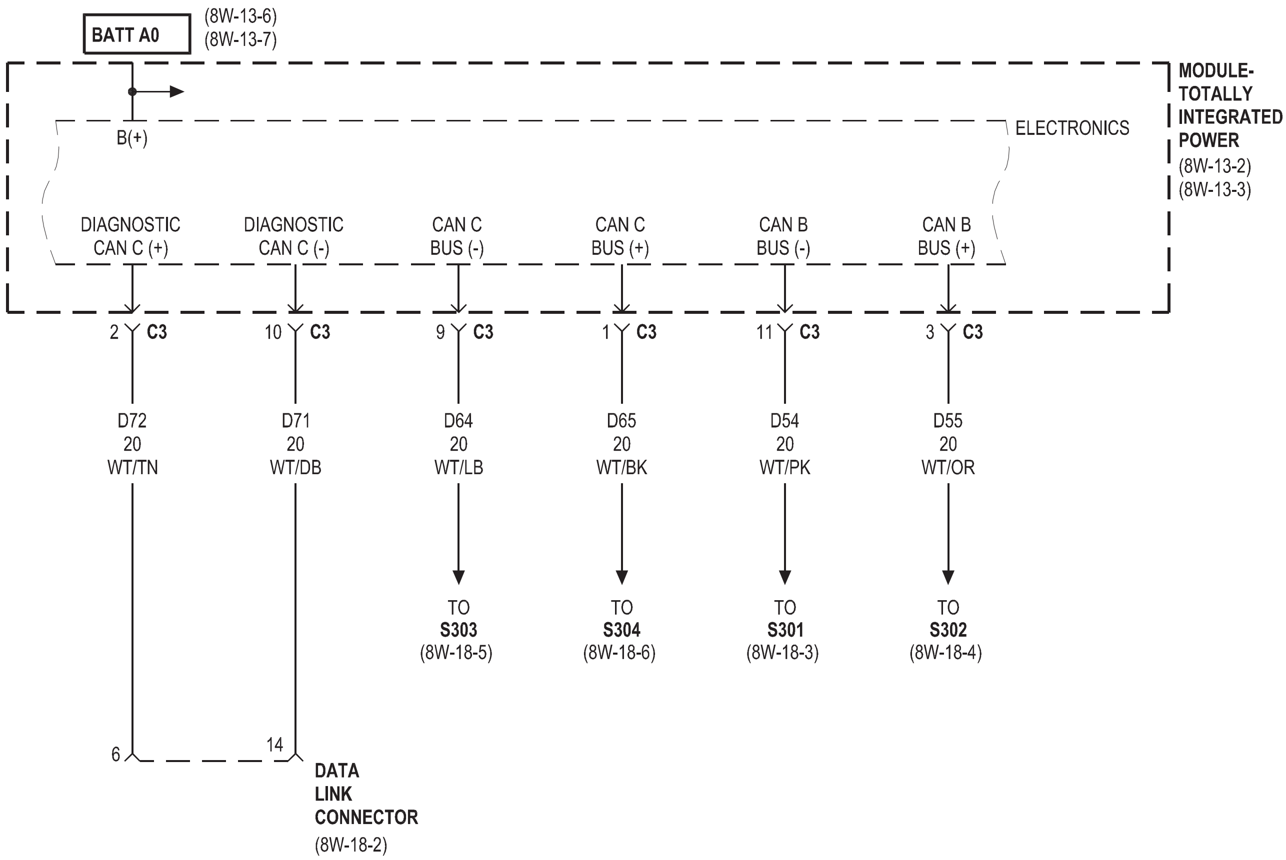
● LHD
●● RHD

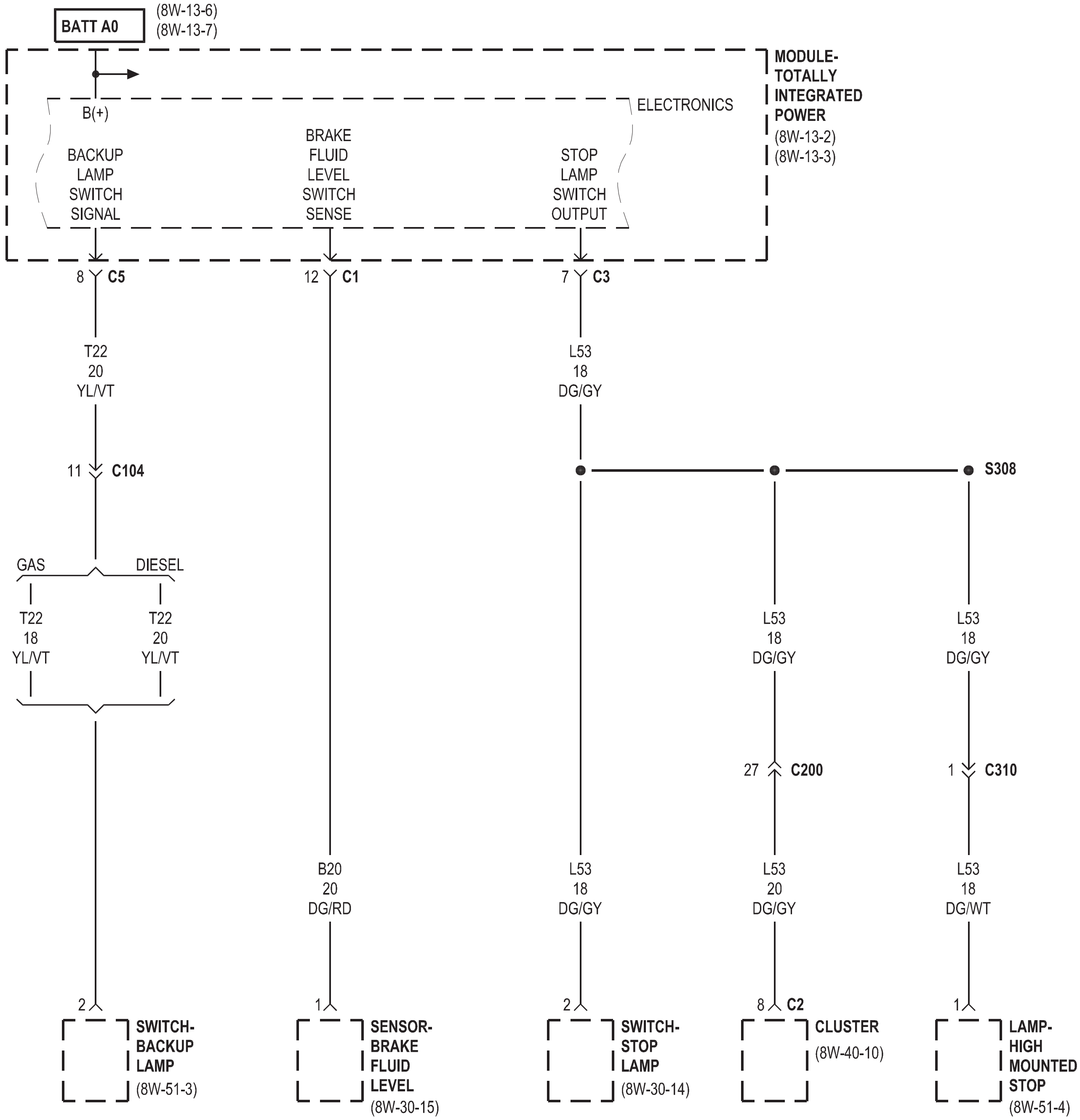

BATT A0
(8W-13-6)
(8W-13-7)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 33 10A
FUSE 30 20A
FUSE 31 10A
11 C11
9 C7
19 C11
8 C8
13 C11
A935 20 RD/LB
A933 20 RD
A931 20 RD/WT
GAS
DIESEL
F937 18 PK/YL
F937 20 PK/YL
F936 20 PK/YL
13 C104
F936 20 PK/BK
16 C1
MODULE-POWERTRAIN CONTROL (GAS)
(8W-30-3)
6 C305
F937 14 PK/YL
S327
F936 20 PK/BK
F936 20 PK/BK
16
DATA LINK CONNECTOR
(8W-18-2)
E
MODULE-HEATED SEATS
(8W-63-2)
3
RELAY-CABIN HEATER 1
(8W-42-6)
3
RELAY-CABIN HEATER 2
(8W-42-6)
S009
A935 20 RD/LB
A935 20 RD/LB
A935 20 RD/LB
A935 20 RD/LB
A935 20 RD/LB
15 C104
A935 20 RD
18 C201
A935 20 RD
7
SWITCH-BANK
(8W-35-3)
(8W-50-2)
(8W-52-2)
(8W-63-2)
B6
B10
RELAY-MAIN (IN F/RB)
(8W-11-5)
A1
A5
RELAY-RADIATOR FAN-LOW/HIGH (IN F/RB)
(8W-11-6)
C1
C5
RELAY-RADIATOR FAN-MEDIUM/HIGH (IN F/RB)
(8W-11-6)
B1
B5
RELAY-RADIATOR FAN-SERIES/PARALLEL (IN F/RB)
(8W-11-6)
DIESEL


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CAN C
BUS (+)
CAN C
BUS (-)
FUSE
34 ◇◇◇
30A
FUSE
35 ◇◇◇
40A
14 C11
17 C11
△ 7 C2
△ 14 C2
D265
20
WT/BK
D264
20
DB/WT
2
1
C103
TCS
ESP
A922
14
RD/BK
A922
12
RD/DB
A921
12
RD/DB
A921
12
RD/YL
D265
20
DB/WT
D264
20
DB/WT
34
33
C201
D265
20
DB
D264
20
DB/WT
32
1
1
2
MODULE-
ANTI-
LOCK
BRAKES
(8W-35-2)
SENSOR-
STEERING
ANGLE
(ESP)
(8W-35-5)
(8W-65-2)
△ ESP
◇◇◇ ABS

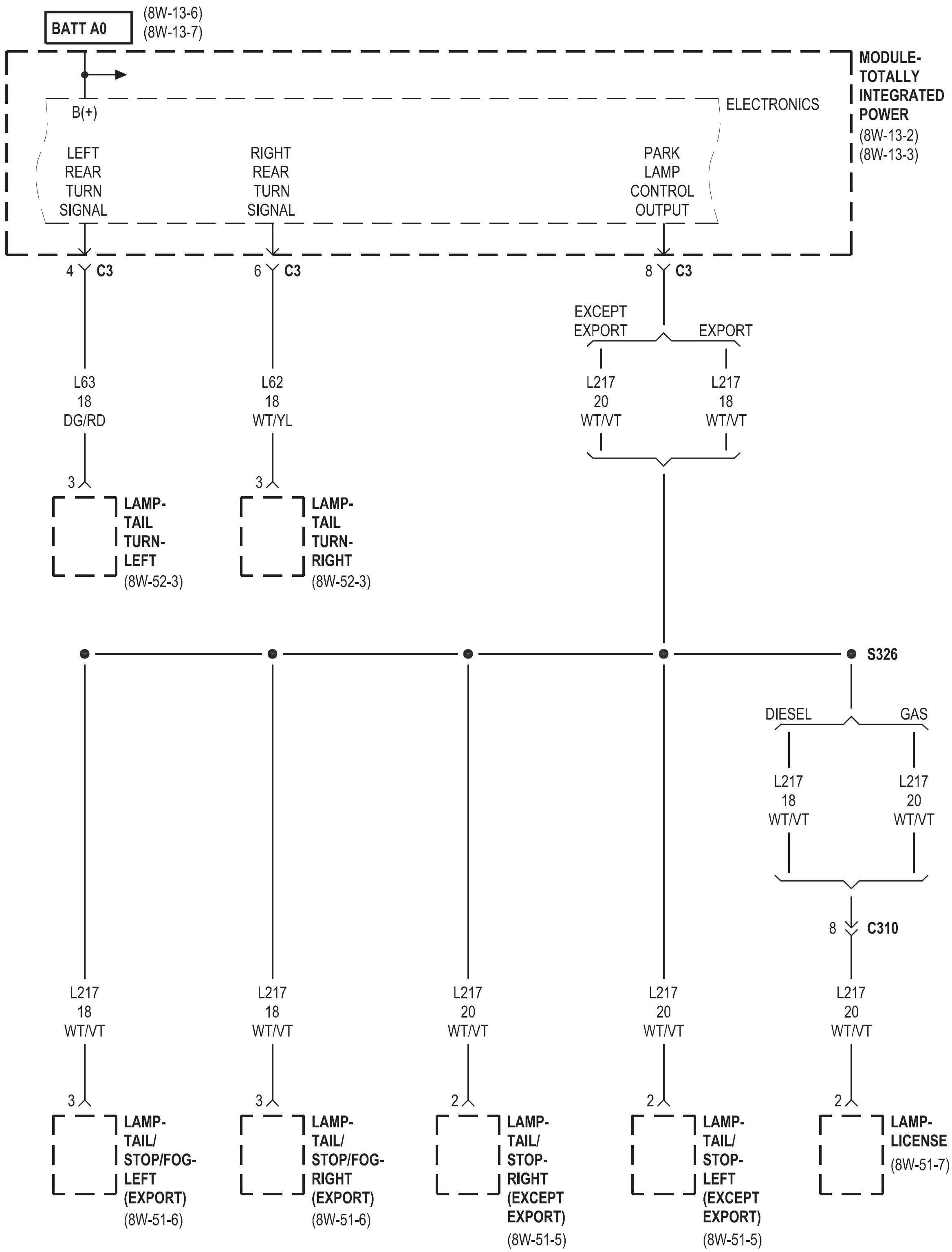

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
TRANSMISSION
CONTROL
OUTPUT
IGNITION
SWITCH
OUTPUT
(START)
IGNITION
SWITCH
OUTPUT
(UNLOCK-RUN-START)
19 C8
3 C10
14 C5
10 C2
1 C2
T16
16
YL/OR
F962
20
PK/BK
F901
20
PK/RD
F901
20
PK/RD
10 C104
23 C103
S015
T16
18
YL/OR
T16
18
YL/OR
F901
20
PK/RD
F901
20
PK/RD
2
MODULE-
HEADLAMP
LEVELING-
RIGHT
(EXPORT)
(8W-50-5)
S334
2
MODULE-
HEADLAMP
LEVELING-
LEFT
(EXPORT)
(8W-50-5)
T16
18
YL/OR
T16
18
YL/OR
T16
18
YL/OR
T16
20
YL/OR
F962
20
PK/BK
3 C106
10 C1
19 C1
MODULE-
TRANSMISSION
CONTROL
(8W-31-2)
T16
18
YL/OR
S121
3
7
SENSOR-
TRANSMISSION
RANGE
(8W-31-3)
T16
18
YL/OR
T16
18
YL/OR
1
1
SENSOR-
INPUT
SPEED
(8W-31-4)
SENSOR-
OUTPUT
SPEED
(8W-31-4)
CVT

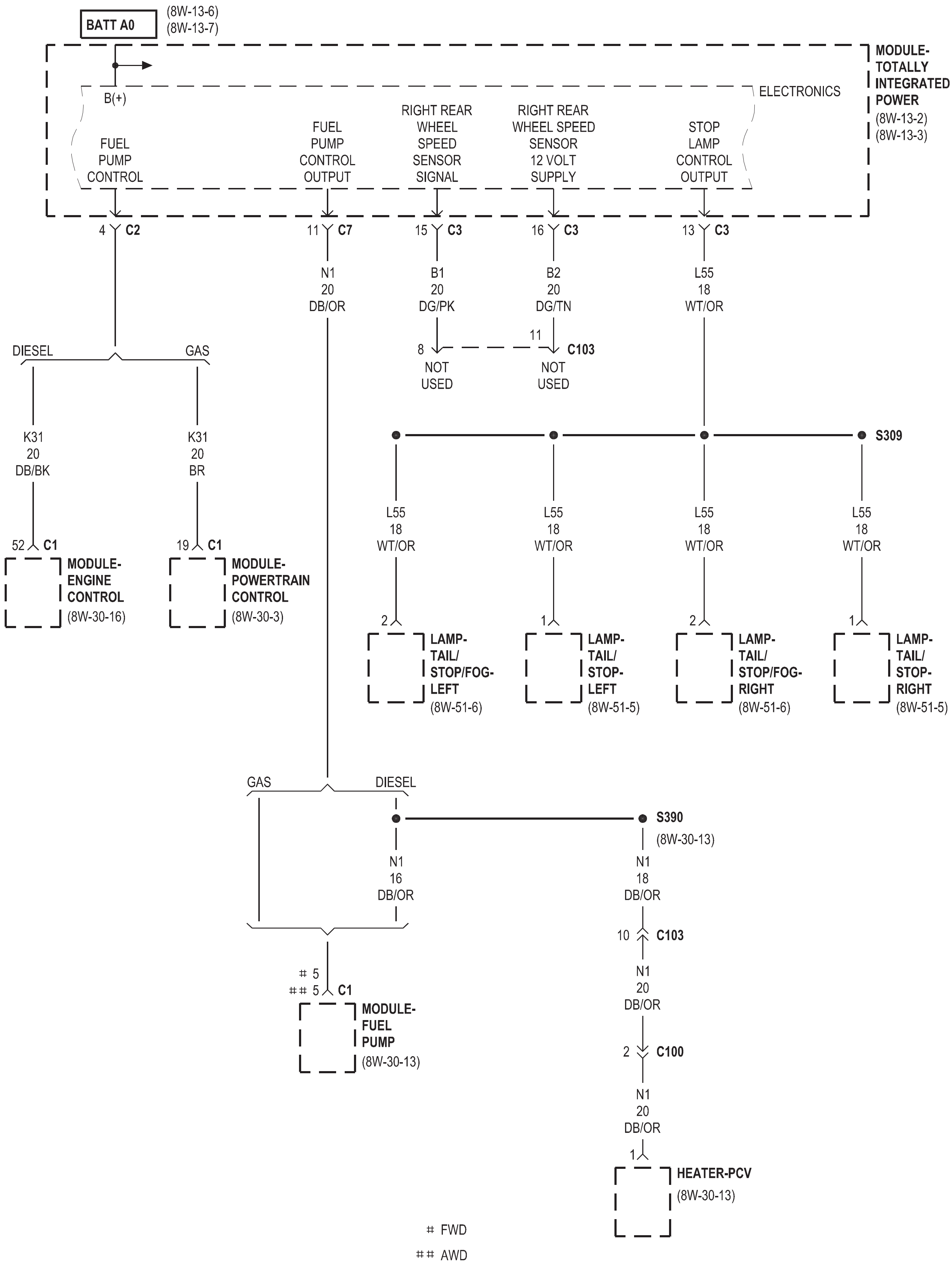

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CABIN
HEATER
RELAY 2
CONTROL
CABIN
HEATER
RELAY 1
CONTROL
BLOWER
MOTOR
CONTROL
AAT
RETURN
AAT
SIGNAL
6 C1
7 C1
1 C8
9 C4
8 C4
K232
20
BR/LB
K132
20
DB/LB
C7
14
DB/PK
G931
20
VT/DB
G31
20
VT/LG
34
33 C103
43 C201
K232
20
BR/LB
K132
20
DB/LB
C7
14
DB/PK
2
2
2
2
1
RELAY-
CABIN
HEATER 2
(8W-42-6)
RELAY-
CABIN
HEATER 1
(8W-42-6)
MOTOR-
BLOWER
(8W-42-2)
SENSOR-
AMBIENT AIR
TEMPERATURE
(8W-42-4)
3
3

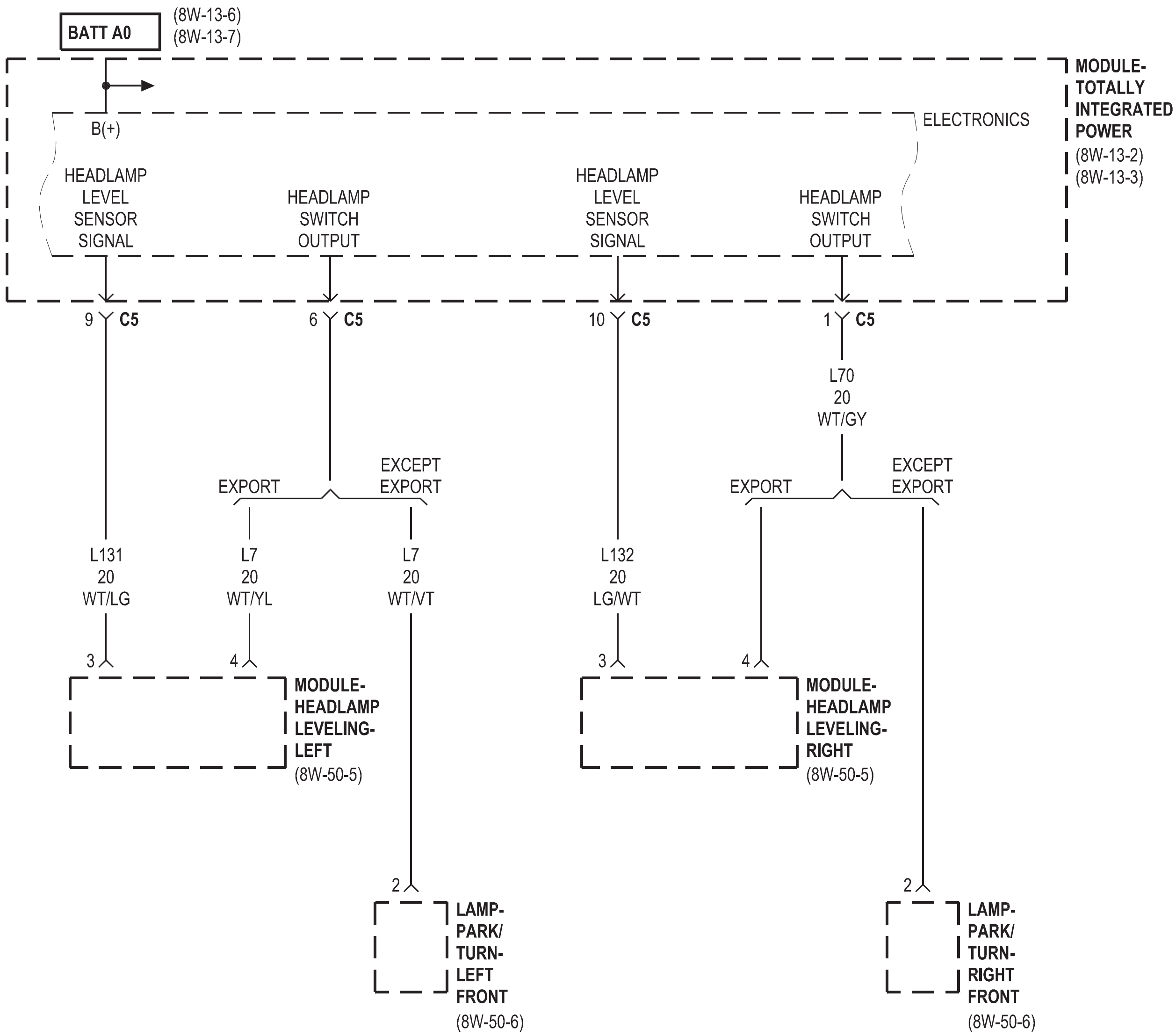

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
DIAGNOSTIC
CAN C (+)
DIAGNOSTIC
CAN C (-)
CAN C
BUS (-)
CAN C
BUS (+)
CAN B
BUS (-)
CAN B
BUS (+)
2 C3
10 C3
9 C3
1 C3
11 C3
3 C3
D72
20
WT/TN
D71
20
WT/DB
D64
20
WT/LB
D65
20
WT/BK
D54
20
WT/PK
D55
20
WT/OR
TO
S303
(8W-18-5)
TO
S304
(8W-18-6)
TO
S301
(8W-18-3)
TO
S302
(8W-18-4)
6
14
DATA
LINK
CONNECTOR
(8W-18-2)

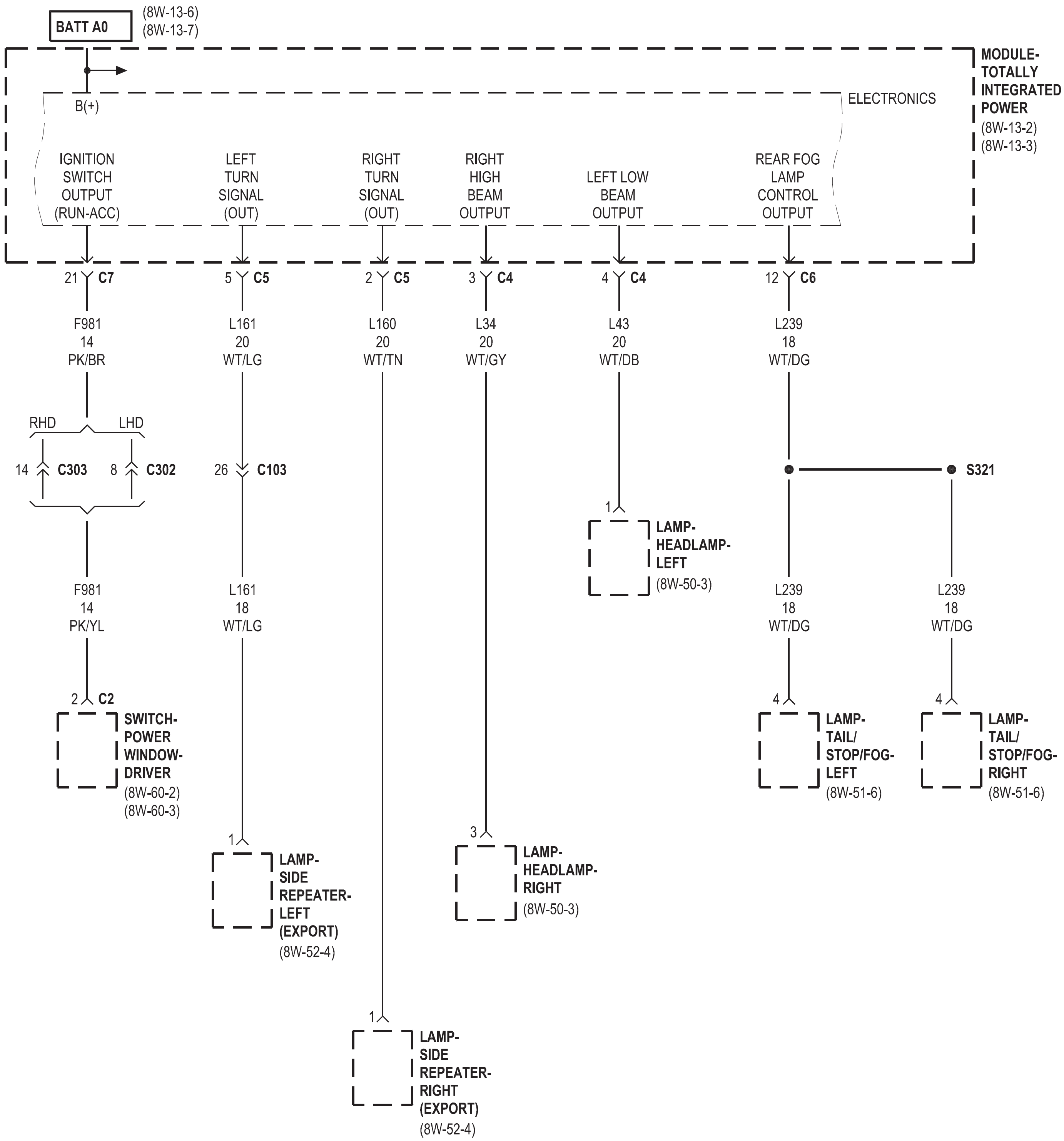


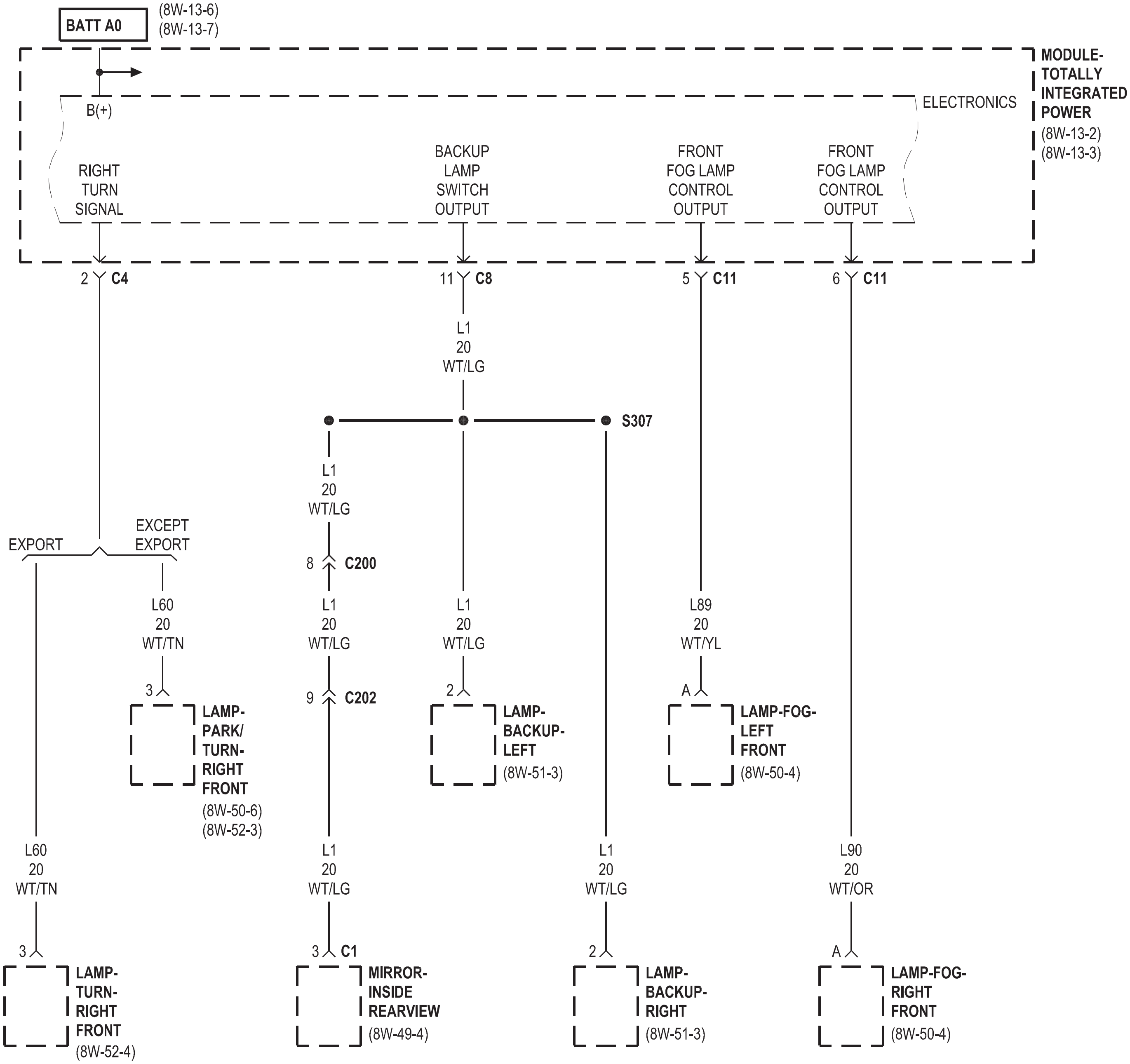
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
BACKUP LAMP SWITCH SIGNAL
BRAKE FLUID LEVEL SWITCH SENSE
STOP LAMP SWITCH OUTPUT
8 C5
12 C1
7 C3
T22 20 YL/VT
L53 18 DG/GY
11 C104
S308
GAS
DIESEL
T22 18 YL/VT
T22 20 YL/VT
L53 18 DG/GY
L53 18 DG/GY
27 C200
1 C310
B20 20 DG/RD
L53 18 DG/GY
L53 20 DG/GY
L53 18 DG/WT
2
1
2
8 C2
1
SWITCH-BACKUP LAMP
(8W-51-3)
SENSOR-BRAKE FLUID LEVEL
(8W-30-15)
SWITCH-STOP LAMP
(8W-30-14)
CLUSTER
(8W-40-10)
LAMP-HIGH MOUNTED STOP
(8W-51-4)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
LEFT
REAR
TURN
SIGNAL
RIGHT
REAR
TURN
SIGNAL
PARK
LAMP
CONTROL
OUTPUT
4 C3
6 C3
8 C3
EXCEPT
EXPORT
EXPORT
L63
18
DG/RD
L62
18
WT/YL
L217
20
WT/VT
L217
18
WT/VT
3
LAMP-
TAIL
TURN-
LEFT
(8W-52-3)
3
LAMP-
TAIL
TURN-
RIGHT
(8W-52-3)
S326
DIESEL
GAS
L217
18
WT/VT
L217
20
WT/VT
8 C310
L217
18
WT/VT
L217
18
WT/VT
L217
20
WT/VT
L217
20
WT/VT
L217
20
WT/VT
3
LAMP-
TAIL/
STOP/FOG-
LEFT
(EXPORT)
(8W-51-6)
3
LAMP-
TAIL/
STOP/FOG-
RIGHT
(EXPORT)
(8W-51-6)
2
LAMP-
TAIL/
STOP-
RIGHT
(EXCEPT
EXPORT)
(8W-51-5)
2
LAMP-
TAIL/
STOP-
LEFT
(EXCEPT
EXPORT)
(8W-51-5)
2
LAMP-
LICENSE
(8W-51-7)

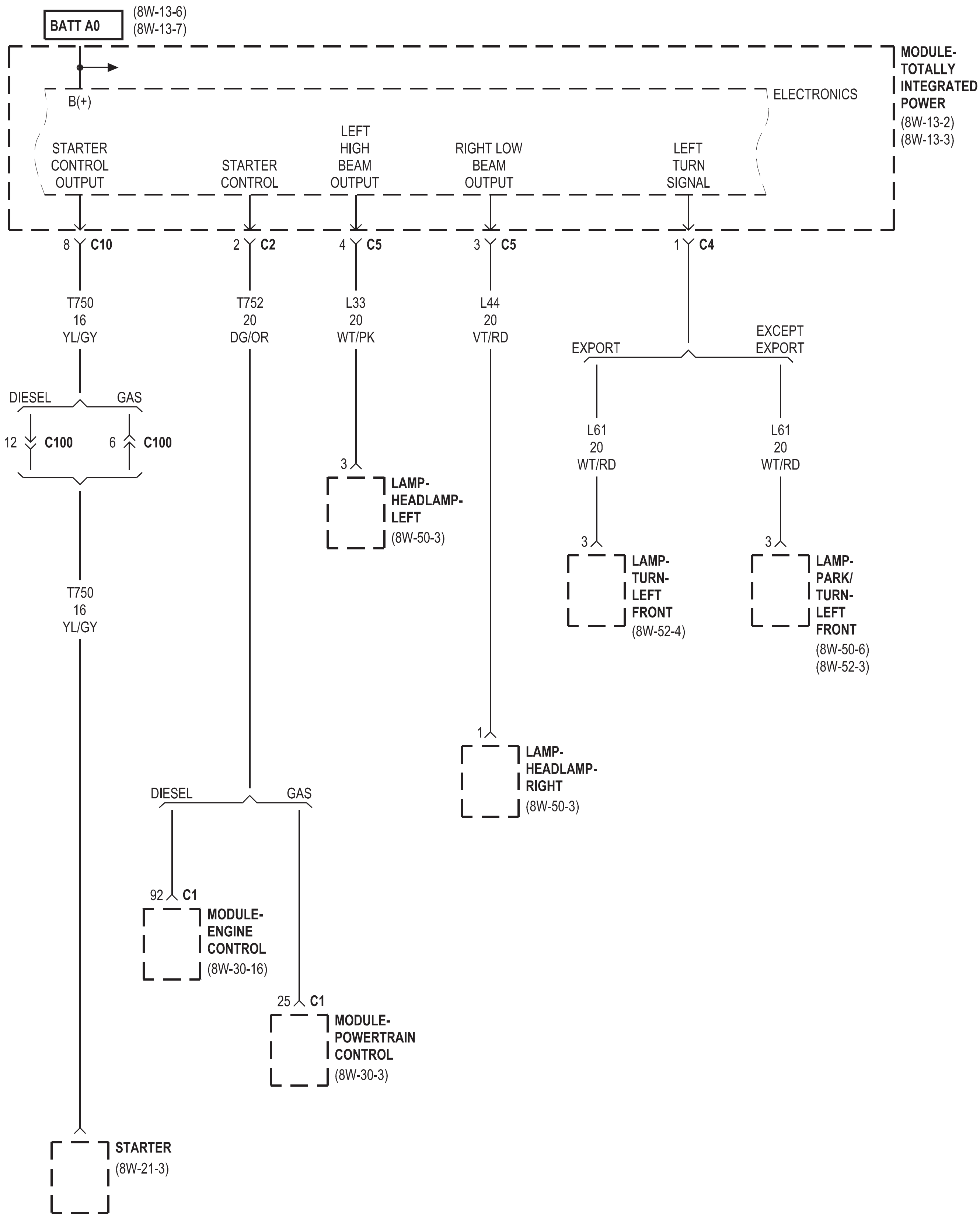

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
FUEL PUMP CONTROL
FUEL PUMP CONTROL OUTPUT
RIGHT REAR WHEEL SPEED SENSOR SIGNAL
RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
STOP LAMP CONTROL OUTPUT
4 C2
11 C7
15 C3
16 C3
13 C3
N1 20 DB/OR
B1 20 DG/PK
B2 20 DG/TN
L55 18 WT/OR
8
11 C103
NOT USED
NOT USED
DIESEL
GAS
K31 20 DB/BK
K31 20 BR
S309
L55 18 WT/OR
L55 18 WT/OR
L55 18 WT/OR
L55 18 WT/OR
52 C1
MODULE-ENGINE CONTROL
(8W-30-16)
19 C1
MODULE-POWERTRAIN CONTROL
(8W-30-3)
2
LAMP-TAIL/STOP/FOG-LEFT
(8W-51-6)
1
LAMP-TAIL/STOP-LEFT
(8W-51-5)
2
LAMP-TAIL/STOP/FOG-RIGHT
(8W-51-6)
1
LAMP-TAIL/STOP-RIGHT
(8W-51-5)
GAS
DIESEL
S390
(8W-30-13)
N1 16 DB/OR
N1 18 DB/OR
10 C103
N1 20 DB/OR
2 C100
N1 20 DB/OR
1
HEATER-PCV
(8W-30-13)
5
5 C1
MODULE-FUEL PUMP
(8W-30-13)
FWD
AWD

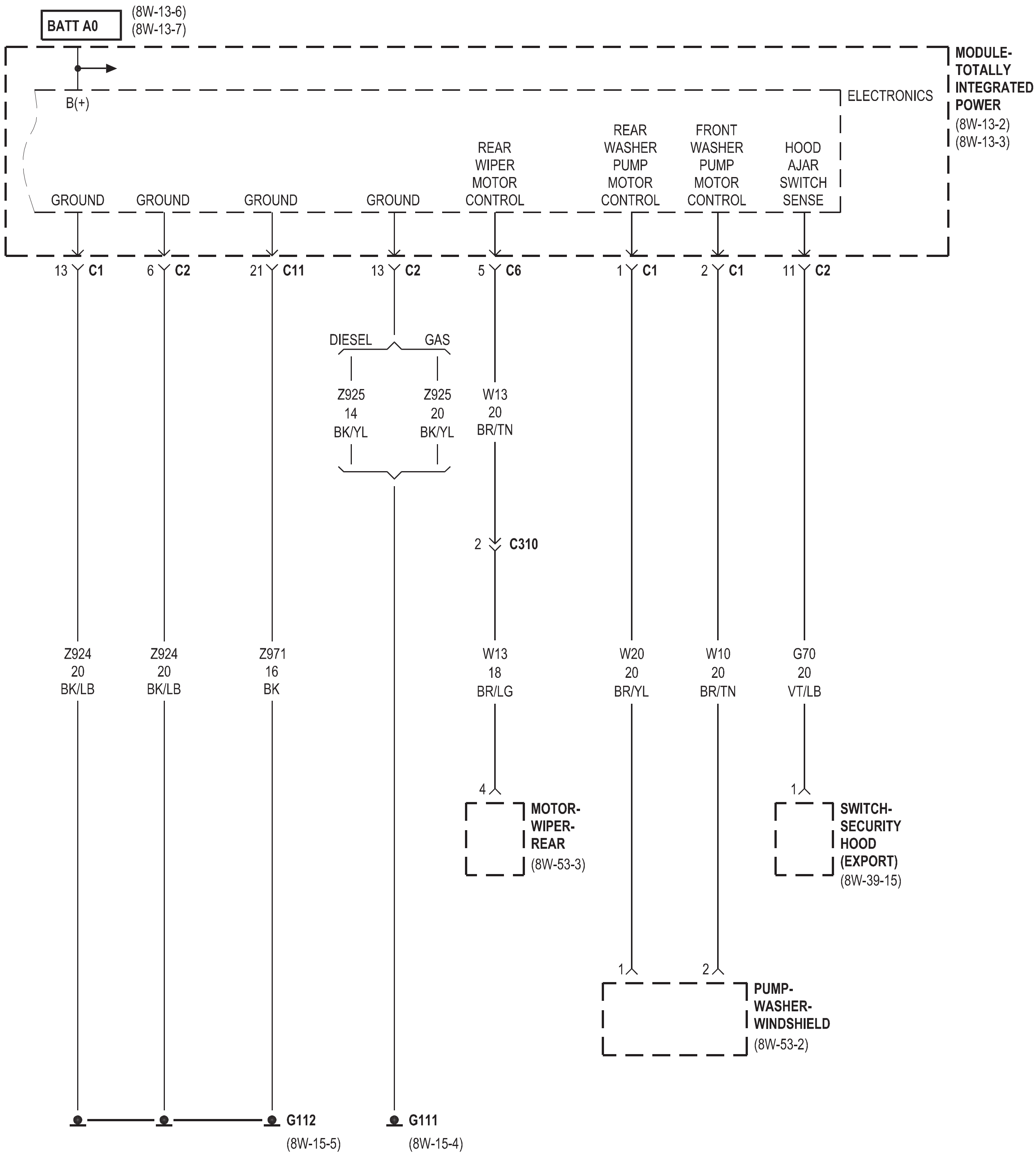

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
HEADLAMP
LEVEL
SENSOR
SIGNAL
HEADLAMP
SWITCH
OUTPUT
HEADLAMP
LEVEL
SENSOR
SIGNAL
HEADLAMP
SWITCH
OUTPUT
9 C5
6 C5
10 C5
1 C5
L70
20
WT/GY
EXPORT
EXCEPT
EXPORT
EXPORT
EXCEPT
EXPORT
L131
20
WT/LG
L7
20
WT/YL
L7
20
WT/VT
L132
20
LG/WT
3
4
3
4
MODULE-
HEADLAMP
LEVELING-
LEFT
(8W-50-5)
MODULE-
HEADLAMP
LEVELING-
RIGHT
(8W-50-5)
2
2
LAMP-
PARK/
TURN-
LEFT
FRONT
(8W-50-6)
LAMP-
PARK/
TURN-
RIGHT
FRONT
(8W-50-6)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN-ACC)
LEFT TURN SIGNAL (OUT)
RIGHT TURN SIGNAL (OUT)
RIGHT HIGH BEAM OUTPUT
LEFT LOW BEAM OUTPUT
REAR FOG LAMP CONTROL OUTPUT
21 C7
5 C5
2 C5
3 C4
4 C4
12 C6
F981 14 PK/BR
L161 20 WT/LG
L160 20 WT/TN
L34 20 WT/GY
L43 20 WT/DB
L239 18 WT/DG
RHD
LHD
14 C303
8 C302
26 C103
S321
1
LAMP-
HEADLAMP-
LEFT
(8W-50-3)
F981 14 PK/YL
L161 18 WT/LG
L239 18 WT/DG
L239 18 WT/DG
2 C2
SWITCH-
POWER
WINDOW-
DRIVER
(8W-60-2)
(8W-60-3)
4
LAMP-
TAIL/
STOP/FOG-
LEFT
(8W-51-6)
4
LAMP-
TAIL/
STOP/FOG-
RIGHT
(8W-51-6)
1
LAMP-
SIDE
REPEATER-
LEFT
(EXPORT)
(8W-52-4)
3
LAMP-
HEADLAMP-
RIGHT
(8W-50-3)
1
LAMP-
SIDE
REPEATER-
RIGHT
(EXPORT)
(8W-52-4)

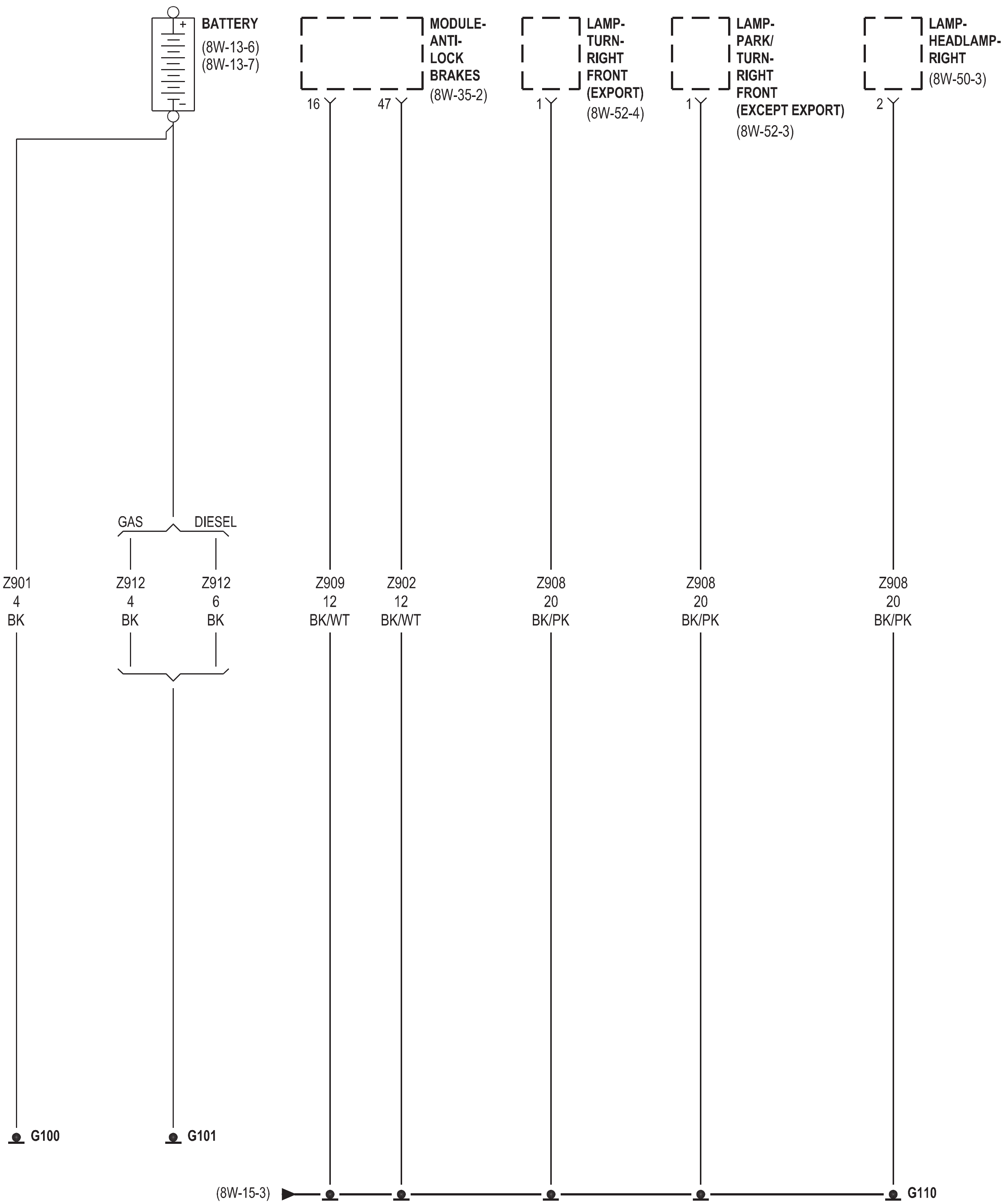


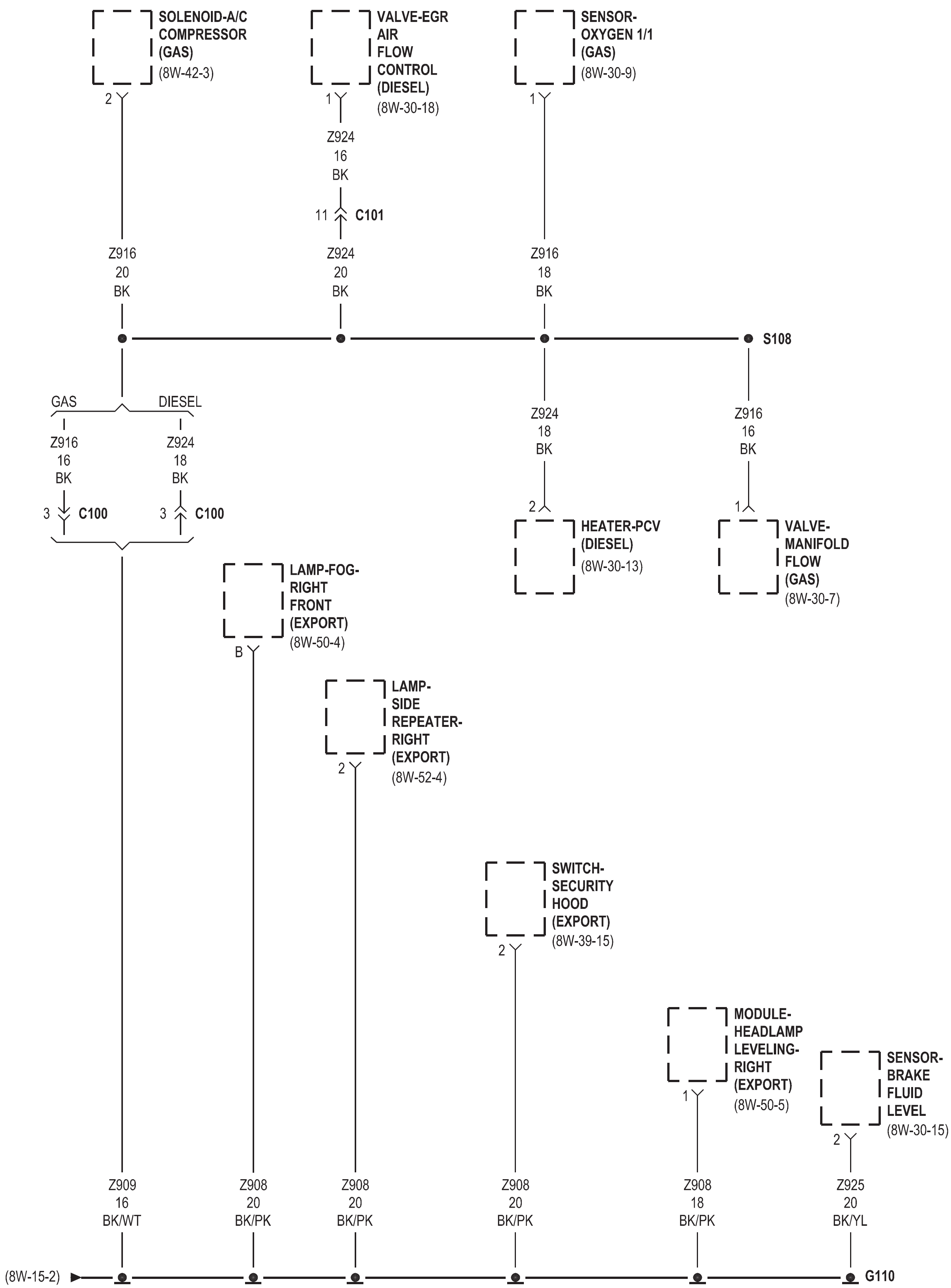
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
RIGHT TURN SIGNAL
BACKUP LAMP SWITCH OUTPUT
FRONT FOG LAMP CONTROL OUTPUT
FRONT FOG LAMP CONTROL OUTPUT
2 C4
11 C8
5 C11
6 C11
L1 20 WT/LG
S307
L1 20 WT/LG
8 C200
L1 20 WT/LG
9 C202
EXPORT
EXCEPT EXPORT
L60 20 WT/TN
3
LAMP-PARK/TURN-RIGHT FRONT
(8W-50-6)
(8W-52-3)
L1 20 WT/LG
2
LAMP-BACKUP-LEFT
(8W-51-3)
L89 20 WT/YL
A
LAMP-FOG-LEFT FRONT
(8W-50-4)
L60 20 WT/TN
3
LAMP-TURN-RIGHT FRONT
(8W-52-4)
L1 20 WT/LG
3 C1
MIRROR-INSIDE REARVIEW
(8W-49-4)
L1 20 WT/LG
2
LAMP-BACKUP-RIGHT
(8W-51-3)
L90 20 WT/OR
A
LAMP-FOG-RIGHT FRONT
(8W-50-4)

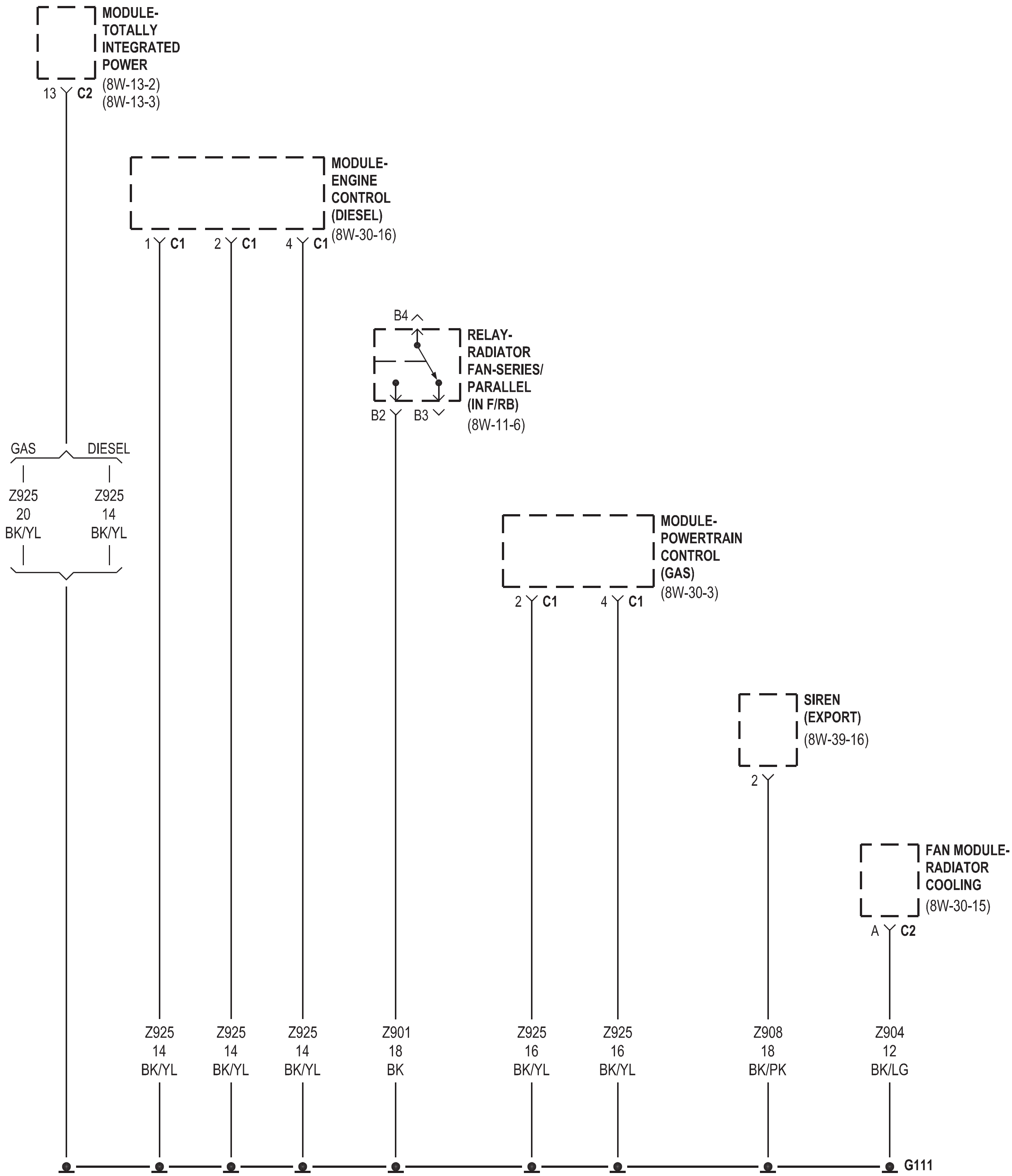

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
STARTER
CONTROL
OUTPUT
STARTER
CONTROL
LEFT
HIGH
BEAM
OUTPUT
RIGHT LOW
BEAM
OUTPUT
LEFT
TURN
SIGNAL
8 C10
2 C2
4 C5
3 C5
1 C4
T750
16
YL/GY
T752
20
DG/OR
L33
20
WT/PK
L44
20
VT/RD
EXPORT
EXCEPT
EXPORT
DIESEL
GAS
12 C100
6 C100
L61
20
WT/RD
L61
20
WT/RD
3
LAMP-
HEADLAMP-
LEFT
(8W-50-3)
3
LAMP-
TURN-
LEFT
FRONT
(8W-52-4)
3
LAMP-
PARK/
TURN-
LEFT
FRONT
(8W-50-6)
(8W-52-3)
T750
16
YL/GY
1
LAMP-
HEADLAMP-
RIGHT
(8W-50-3)
DIESEL
GAS
92 C1
MODULE-
ENGINE
CONTROL
(8W-30-16)
25 C1
MODULE-
POWERTRAIN
CONTROL
(8W-30-3)
STARTER
(8W-21-3)


BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
GROUND
GROUND
GROUND
GROUND
REAR
WIPER
MOTOR
CONTROL
REAR
WASHER
PUMP
MOTOR
CONTROL
FRONT
WASHER
PUMP
MOTOR
CONTROL
HOOD
AJAR
SWITCH
SENSE
13 C1
6 C2
21 C11
13 C2
5 C6
1 C1
2 C1
11 C2
DIESEL
GAS
Z925
14
BK/YL
Z925
20
BK/YL
W13
20
BR/TN
2 C310
Z924
20
BK/LB
Z924
20
BK/LB
Z971
16
BK
W13
18
BR/LG
W20
20
BR/YL
W10
20
BR/TN
G70
20
VT/LB
4
MOTOR-
WIPER-
REAR
(8W-53-3)
1
SWITCH-
SECURITY
HOOD
(EXPORT)
(8W-39-15)
1
2
PUMP-
WASHER-
WINDSHIELD
(8W-53-2)
G112
(8W-15-5)
G111
(8W-15-4)

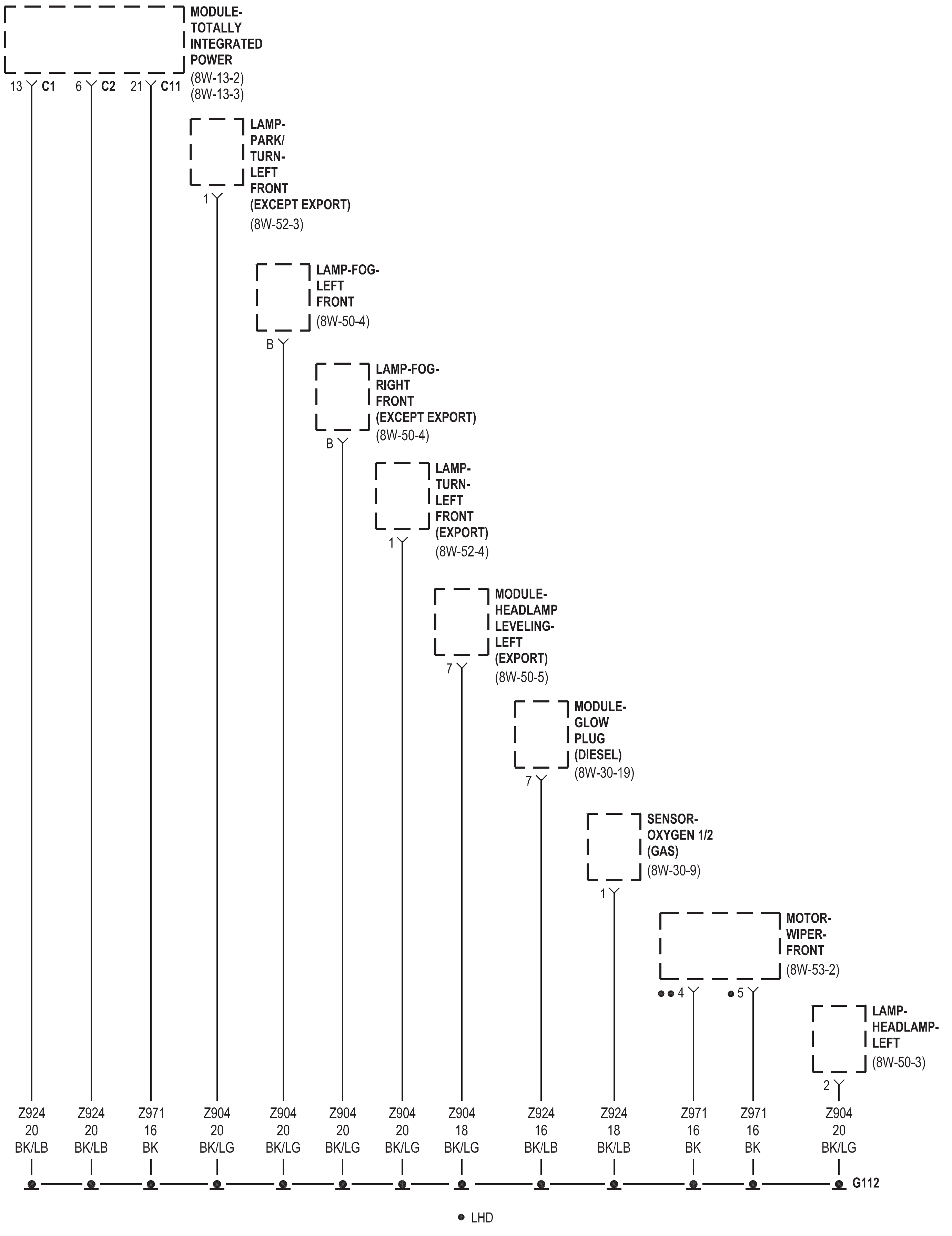
8W-15 GROUND DISTRIBUTION


BATTERY
(8W-13-6)
(8W-13-7)
MODULE-
ANTI-
LOCK
BRAKES
(8W-35-2)
LAMP-
TURN-
RIGHT
FRONT
(EXPORT)
(8W-52-4)
LAMP-
PARK/
TURN-
RIGHT
FRONT
(EXCEPT EXPORT)
(8W-52-3)
LAMP-
HEADLAMP-
RIGHT
(8W-50-3)
16
47
1
1
2
GAS
DIESEL
Z901
4
BK
Z912
4
BK
Z912
6
BK
Z909
12
BK/WT
Z902
12
BK/WT
Z908
20
BK/PK
Z908
20
BK/PK
Z908
20
BK/PK
G100
G101
(8W-15-3)
G110

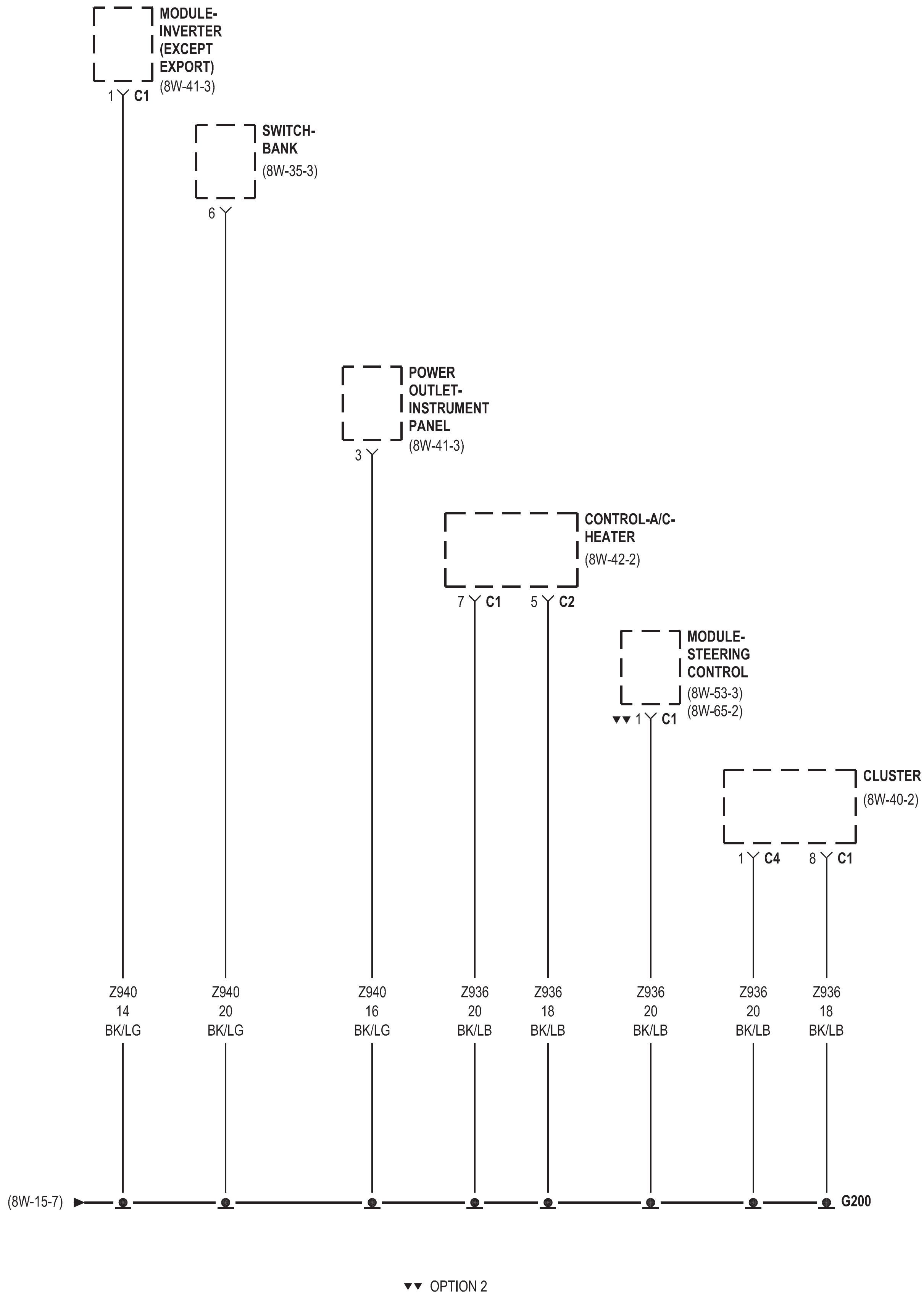

SOLENOID-A/C COMPRESSOR (GAS)
(8W-42-3)
2
VALVE-EGR AIR FLOW CONTROL (DIESEL)
(8W-30-18)
1
Z924 16 BK
11 C101
SENSOR-OXYGEN 1/1 (GAS)
(8W-30-9)
1
Z916 20 BK
Z924 20 BK
Z916 18 BK
S108
GAS
DIESEL
Z916 16 BK
Z924 18 BK
3 C100
3 C100
Z924 18 BK
Z916 16 BK
2
HEATER-PCV (DIESEL)
(8W-30-13)
1
VALVE-MANIFOLD FLOW (GAS)
(8W-30-7)
LAMP-FOG-RIGHT FRONT (EXPORT)
(8W-50-4)
B
LAMP-SIDE REPEATER-RIGHT (EXPORT)
(8W-52-4)
2
SWITCH-SECURITY HOOD (EXPORT)
(8W-39-15)
2
MODULE-HEADLAMP LEVELING-RIGHT (EXPORT)
(8W-50-5)
1
SENSOR-BRAKE FLUID LEVEL
(8W-30-15)
2
Z909 16 BK/WT
Z908 20 BK/PK
Z908 20 BK/PK
Z908 20 BK/PK
Z908 18 BK/PK
Z925 20 BK/YL
(8W-15-2)
G110

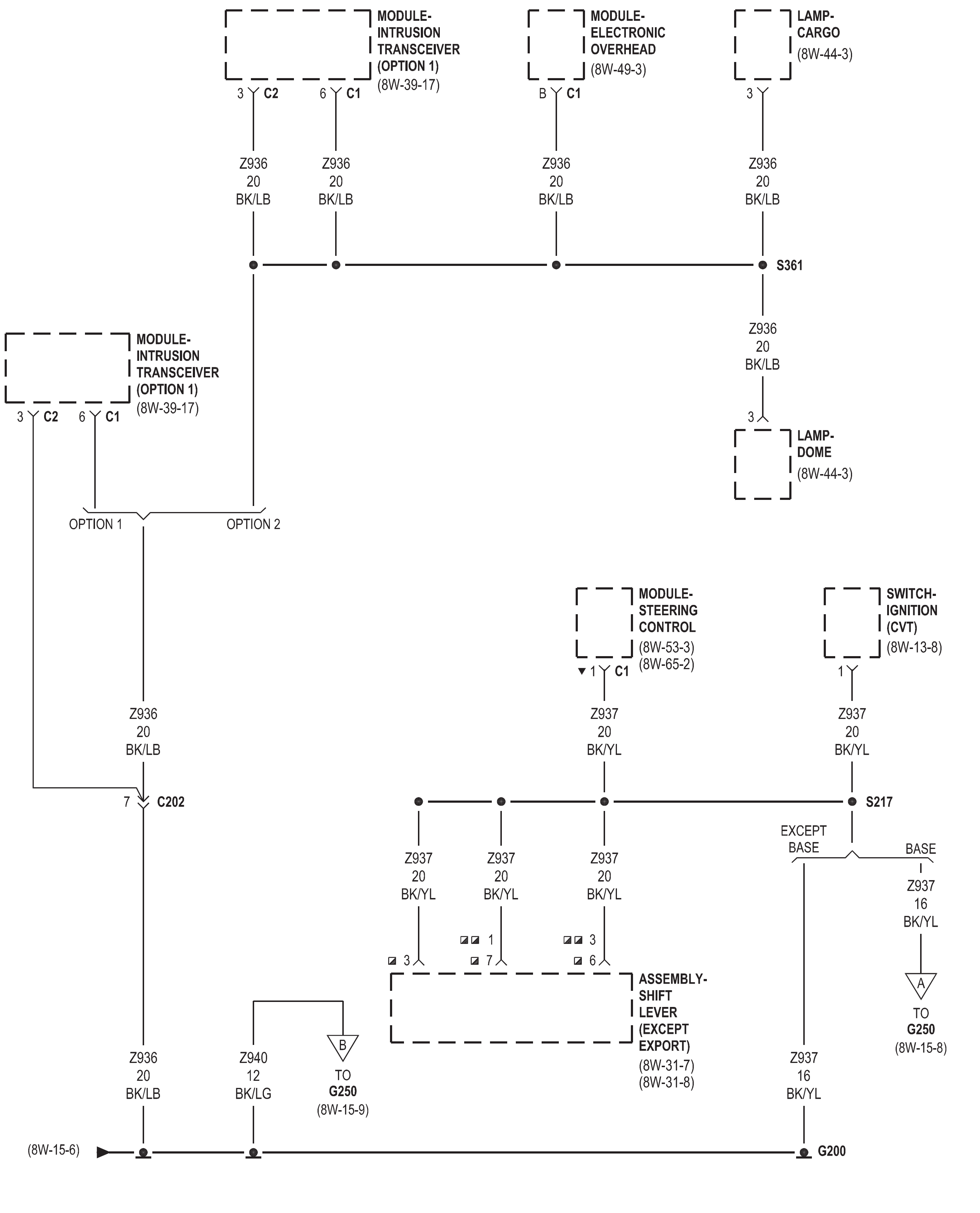


MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
13 C2
MODULE-
ENGINE
CONTROL
(DIESEL)
(8W-30-16)
1 C1
2 C1
4 C1
B4
RELAY-
RADIATOR
FAN-SERIES/
PARALLEL
(IN F/RB)
(8W-11-6)
B2
B3
GAS
DIESEL
Z925
20
BK/YL
Z925
14
BK/YL
MODULE-
POWERTRAIN
CONTROL
(GAS)
(8W-30-3)
2 C1
4 C1
SIREN
(EXPORT)
(8W-39-16)
2
FAN MODULE-
RADIATOR
COOLING
(8W-30-15)
A C2
Z925
14
BK/YL
Z925
14
BK/YL
Z925
14
BK/YL
Z901
18
BK
Z925
16
BK/YL
Z925
16
BK/YL
Z908
18
BK/PK
Z904
12
BK/LG
G111

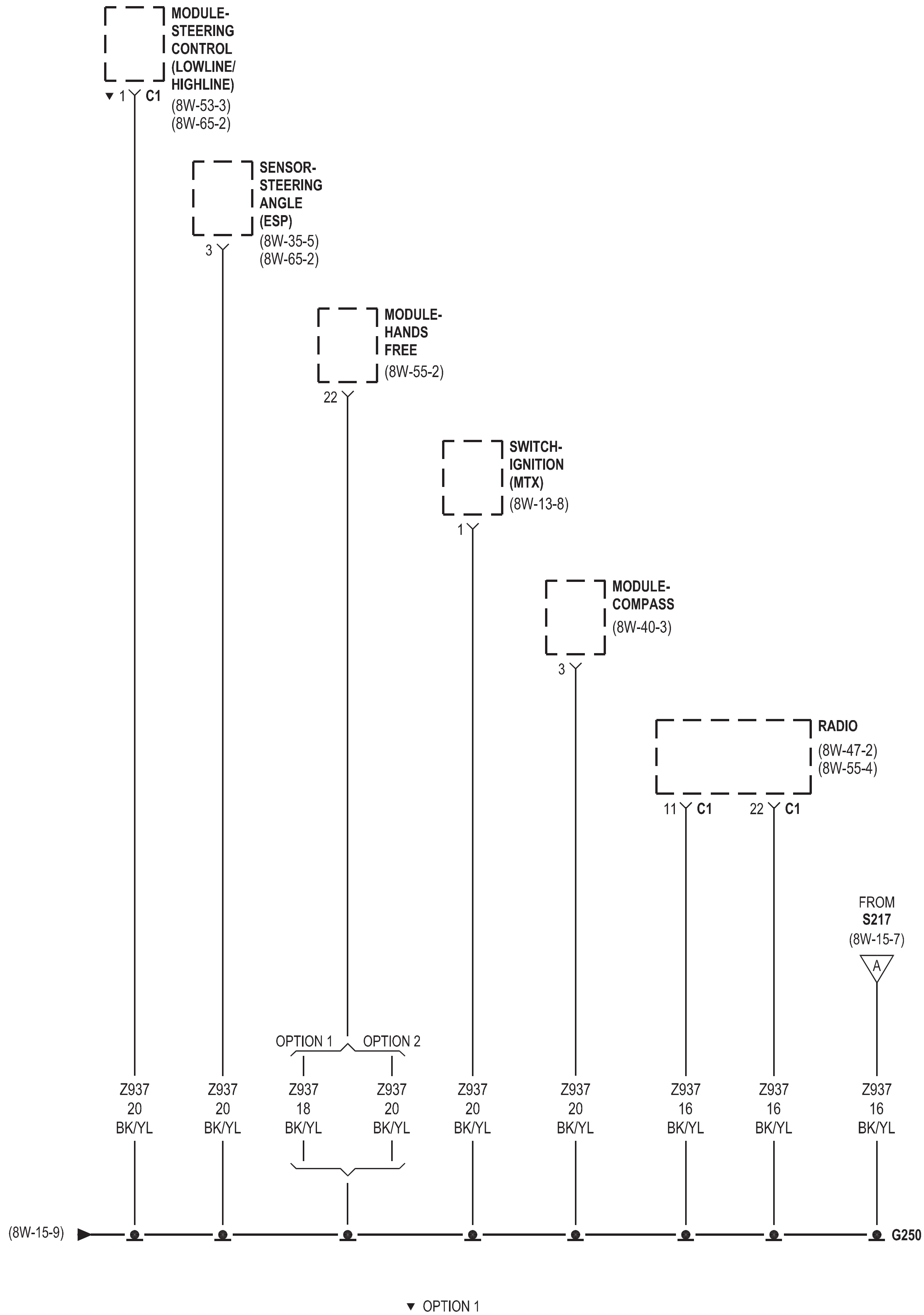


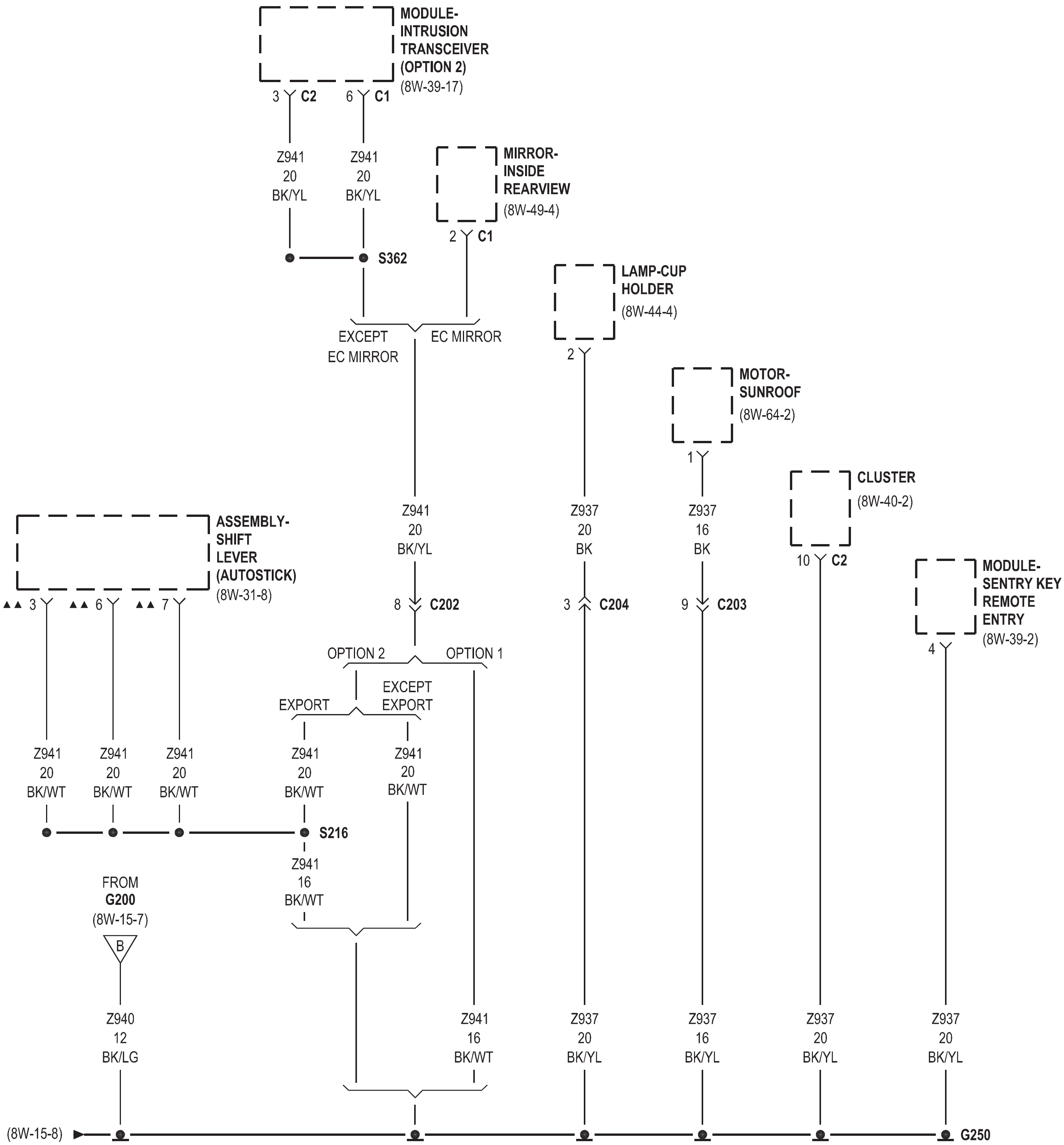
PM701505 078W-10


MODULE-
INVERTER
(EXCEPT
EXPORT)
(8W-41-3)
1 C1
SWITCH-
BANK
(8W-35-3)
6
POWER
OUTLET-
INSTRUMENT
PANEL
(8W-41-3)
3
CONTROL-A/C-
HEATER
(8W-42-2)
7 C1
5 C2
MODULE-
STEERING
CONTROL
(8W-53-3)
(8W-65-2)
▾▾ 1 C1
CLUSTER
(8W-40-2)
1 C4
8 C1
Z940 14 BK/LG
Z940 20 BK/LG
Z940 16 BK/LG
Z936 20 BK/LB
Z936 18 BK/LB
Z936 20 BK/LB
Z936 20 BK/LB
Z936 18 BK/LB
(8W-15-7)
G200
▾▾ OPTION 2

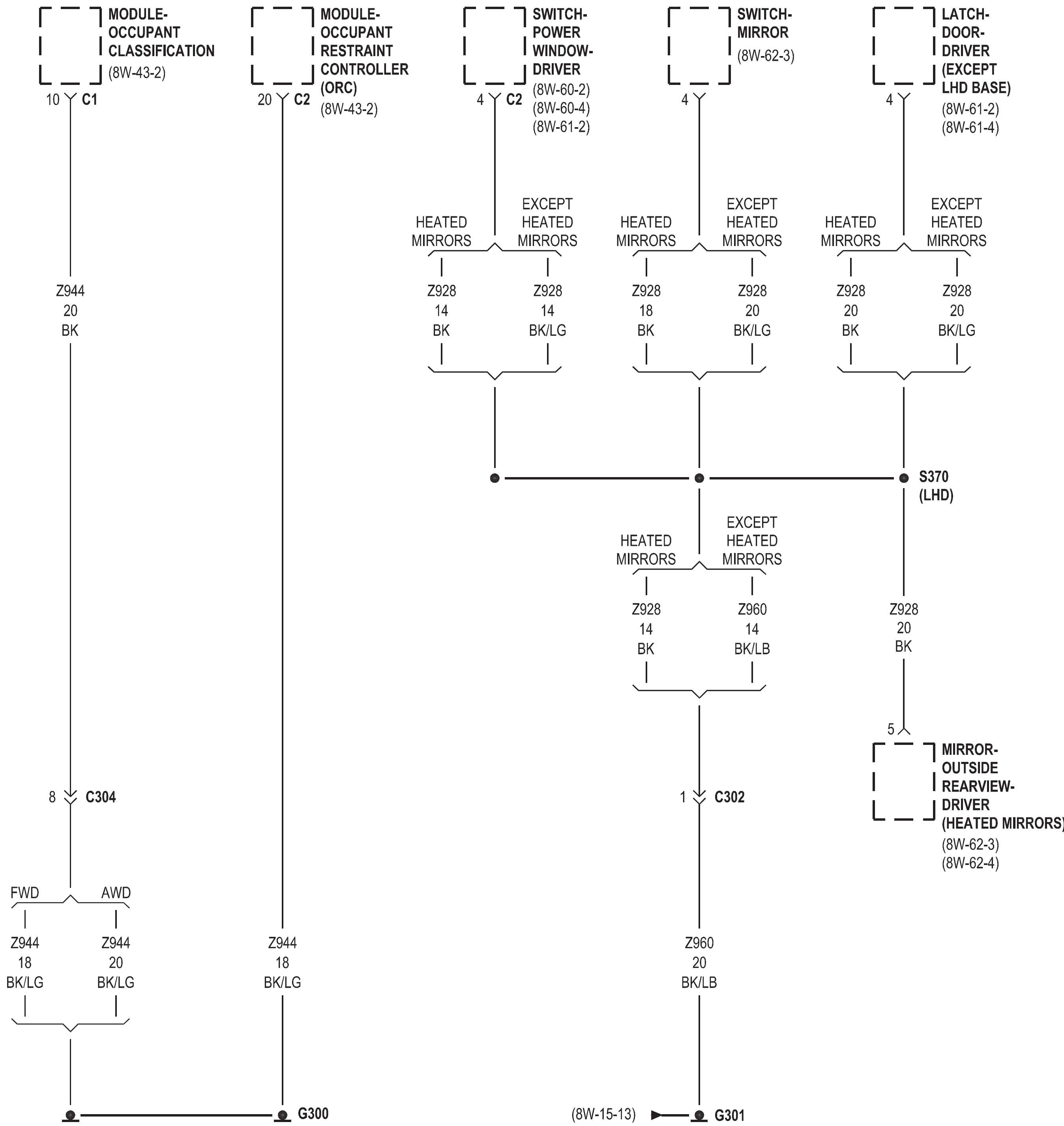


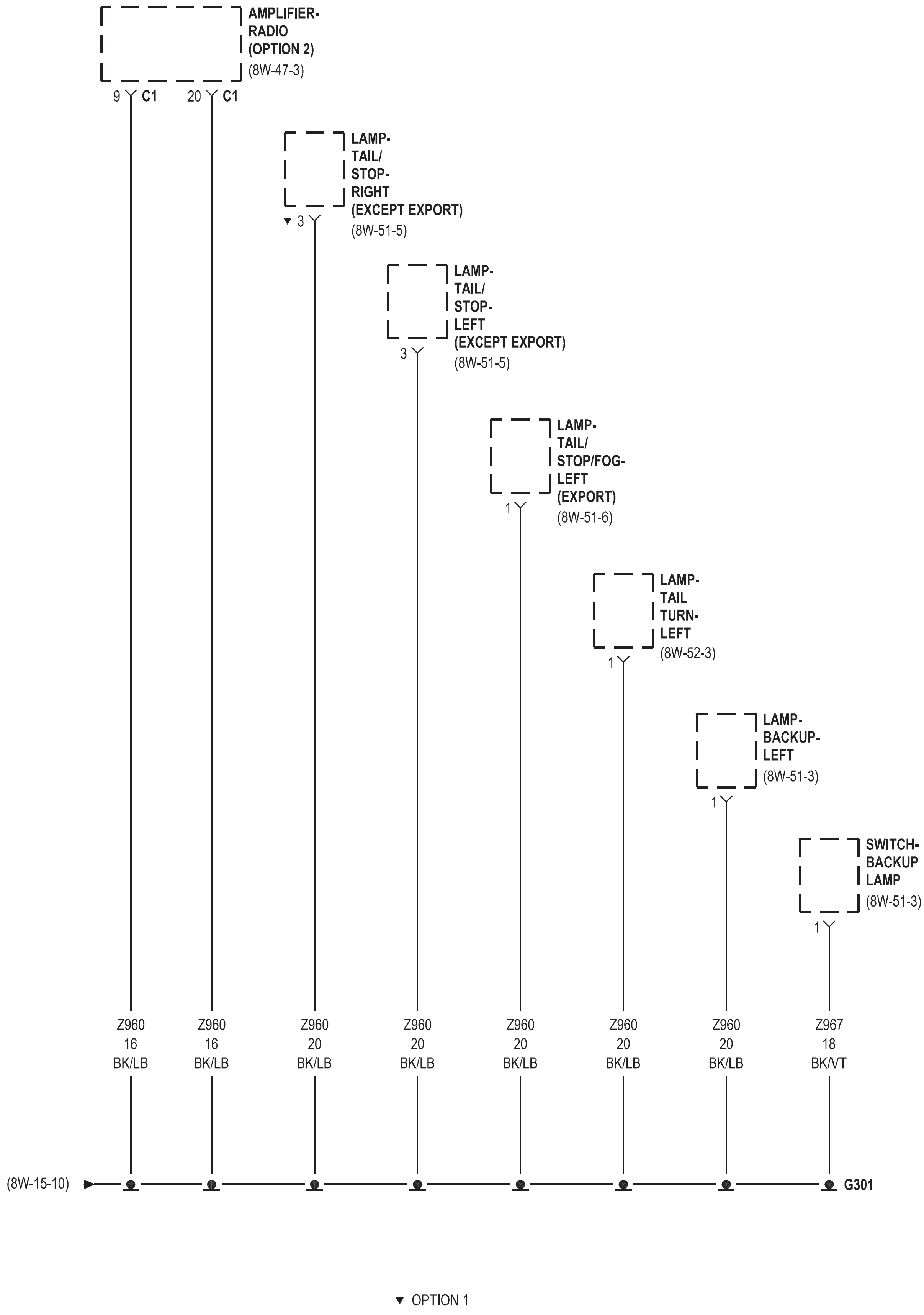
▼ OPTION 1
◪ AUTOSTICK
◪◪ EXCEPT AUTOSTICK

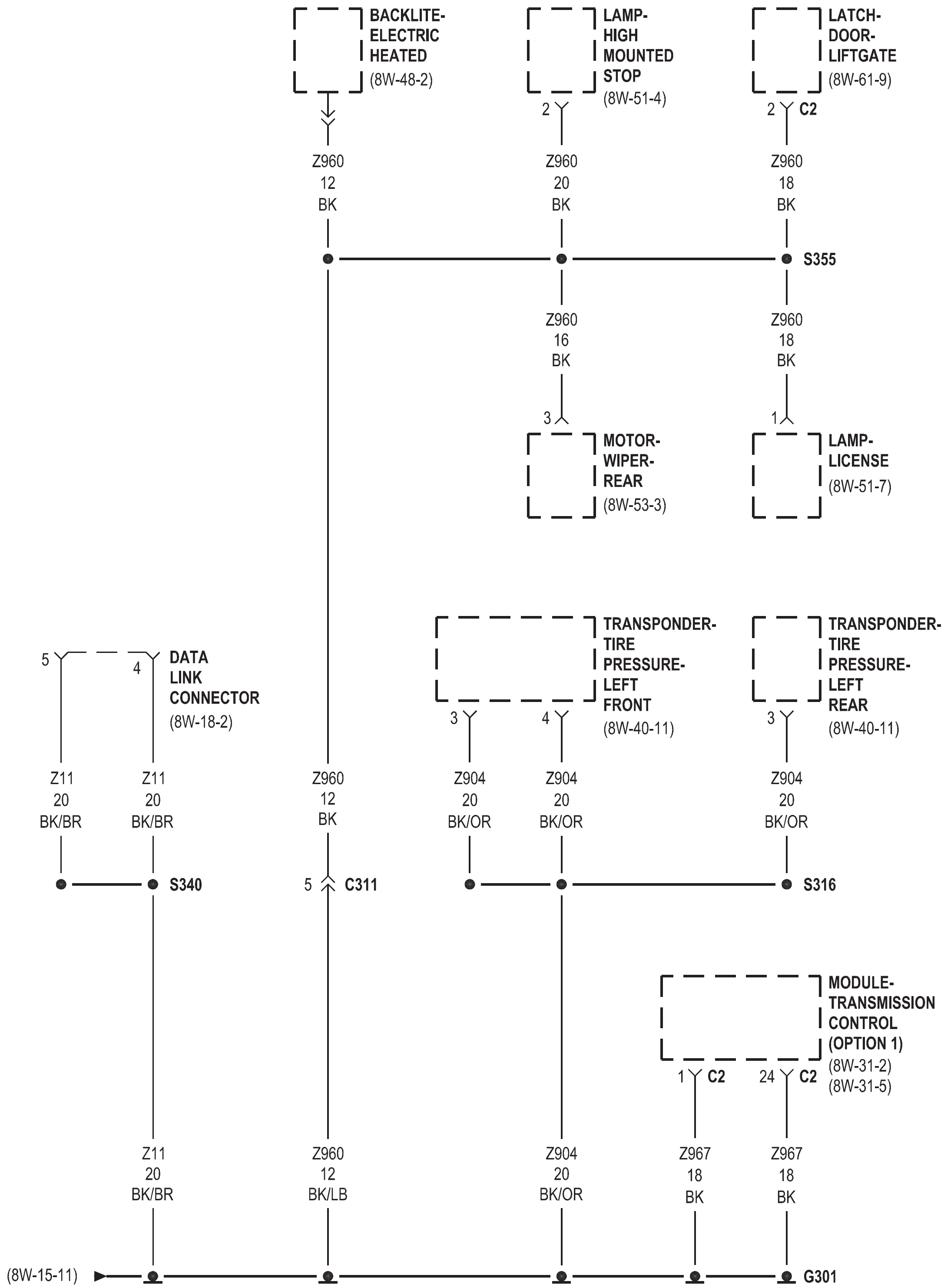

MODULE-
STEERING
CONTROL
(LOWLINE/
HIGHLINE)
1 C1
(8W-53-3)
(8W-65-2)
SENSOR-
STEERING
ANGLE
(ESP)
3
(8W-35-5)
(8W-65-2)
MODULE-
HANDS
FREE
(8W-55-2)
22
SWITCH-
IGNITION
(MTX)
(8W-13-8)
1
MODULE-
COMPASS
(8W-40-3)
3
RADIO
(8W-47-2)
(8W-55-4)
11 C1
22 C1
FROM
S217
(8W-15-7)
A
OPTION 1
OPTION 2
Z937
20
BK/YL
Z937
20
BK/YL
Z937
18
BK/YL
Z937
20
BK/YL
Z937
20
BK/YL
Z937
20
BK/YL
Z937
16
BK/YL
Z937
16
BK/YL
Z937
16
BK/YL
(8W-15-9)
G250
▼ OPTION 1

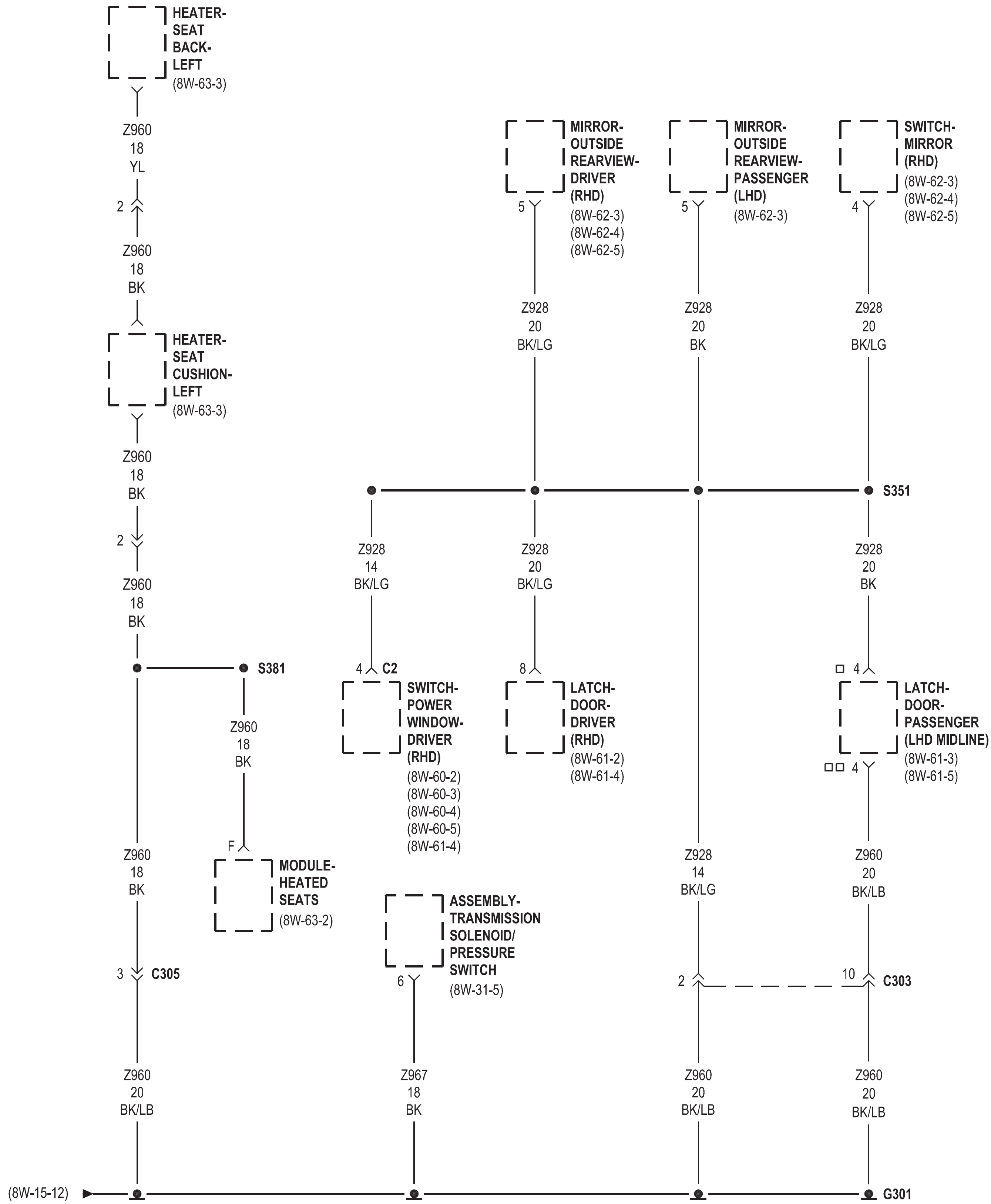

MODULE-
INTRUSION
TRANSCEIVER
(OPTION 2)
(8W-39-17)
3 C2
6 C1
Z941
20
BK/YL
Z941
20
BK/YL
S362
MIRROR-
INSIDE
REARVIEW
(8W-49-4)
2 C1
EXCEPT
EC MIRROR
EC MIRROR
LAMP-CUP
HOLDER
(8W-44-4)
2
MOTOR-
SUNROOF
(8W-64-2)
1
CLUSTER
(8W-40-2)
10 C2
MODULE-
SENTRY KEY
REMOTE
ENTRY
(8W-39-2)
4
ASSEMBLY-
SHIFT
LEVER
(AUTOSTICK)
(8W-31-8)
▲▲ 3
▲▲ 6
▲▲ 7
Z941
20
BK/YL
8 C202
Z937
20
BK
3 C204
Z937
16
BK
9 C203
OPTION 2
OPTION 1
EXPORT
EXCEPT
EXPORT
Z941
20
BK/WT
Z941
20
BK/WT
Z941
20
BK/WT
Z941
20
BK/WT
Z941
20
BK/WT
S216
Z941
16
BK/WT
FROM
G200
(8W-15-7)
B
Z940
12
BK/LG
Z941
16
BK/WT
Z937
20
BK/YL
Z937
16
BK/YL
Z937
20
BK/YL
Z937
20
BK/YL
(8W-15-8)
G250

▲▲ EXPORT


MODULE-
OCCUPANT
CLASSIFICATION
(8W-43-2)
10 C1
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(ORC)
(8W-43-2)
20 C2
SWITCH-
POWER
WINDOW-
DRIVER
(8W-60-2)
(8W-60-4)
(8W-61-2)
4 C2
SWITCH-
MIRROR
(8W-62-3)
4
LATCH-
DOOR-
DRIVER
(EXCEPT
LHD BASE)
(8W-61-2)
(8W-61-4)
4
HEATED MIRRORS
EXCEPT HEATED MIRRORS
Z928 14 BK
Z928 14 BK/LG
Z928 18 BK
Z928 20 BK/LG
Z928 20 BK
Z928 20 BK/LG
Z944 20 BK
S370 (LHD)
Z928 14 BK
Z960 14 BK/LB
Z928 20 BK
5
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
(HEATED MIRRORS)
(8W-62-3)
(8W-62-4)
8 C304
1 C302
FWD
AWD
Z944 18 BK/LG
Z944 20 BK/LG
Z944 18 BK/LG
Z960 20 BK/LB
G300
(8W-15-13)
G301

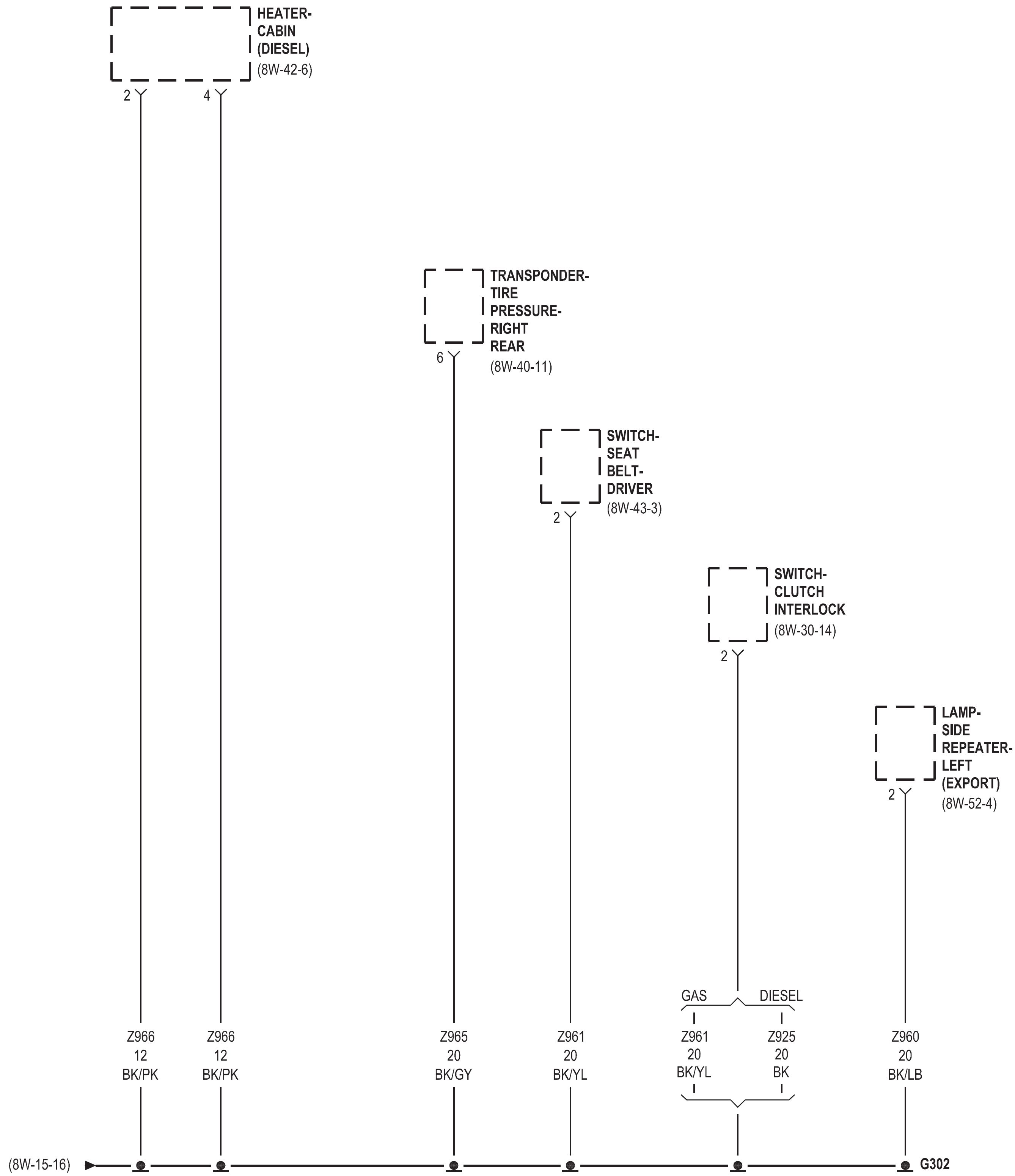

AMPLIFIER-
RADIO
(OPTION 2)
(8W-47-3)
9 C1
20 C1
LAMP-
TAIL/
STOP-
RIGHT
(EXCEPT EXPORT)
(8W-51-5)
3
LAMP-
TAIL/
STOP-
LEFT
(EXCEPT EXPORT)
(8W-51-5)
3
LAMP-
TAIL/
STOP/FOG-
LEFT
(EXPORT)
(8W-51-6)
1
LAMP-
TAIL
TURN-
LEFT
(8W-52-3)
1
LAMP-
BACKUP-
LEFT
(8W-51-3)
1
SWITCH-
BACKUP
LAMP
(8W-51-3)
1
Z960 16 BK/LB
Z960 16 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
Z967 18 BK/VT
(8W-15-10)
G301
▼ OPTION 1

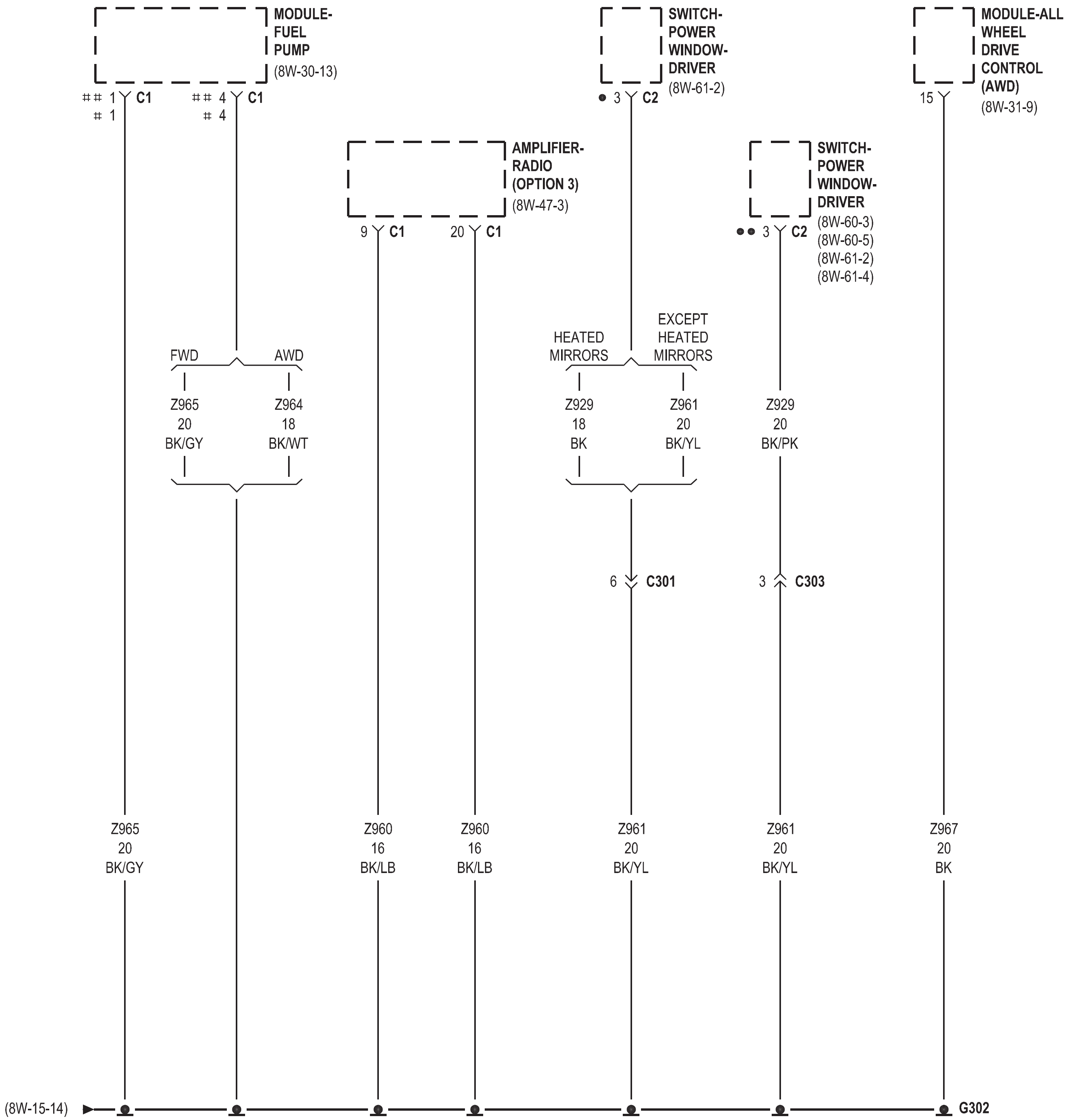

BACKLITE-
ELECTRIC
HEATED
(8W-48-2)
LAMP-
HIGH
MOUNTED
STOP
(8W-51-4)
LATCH-
DOOR-
LIFTGATE
(8W-61-9)
2
2 C2
Z960
12
BK
Z960
20
BK
Z960
18
BK
S355
Z960
16
BK
Z960
18
BK
3
1
MOTOR-
WIPER-
REAR
(8W-53-3)
LAMP-
LICENSE
(8W-51-7)
TRANSPONDER-
TIRE
PRESSURE-
LEFT
FRONT
(8W-40-11)
TRANSPONDER-
TIRE
PRESSURE-
LEFT
REAR
(8W-40-11)
5
4
DATA
LINK
CONNECTOR
(8W-18-2)
3
4
3
Z11
20
BK/BR
Z11
20
BK/BR
Z960
12
BK
Z904
20
BK/OR
Z904
20
BK/OR
Z904
20
BK/OR
S340
5 C311
S316
MODULE-
TRANSMISSION
CONTROL
(OPTION 1)
(8W-31-2)
(8W-31-5)
1 C2
24 C2
Z11
20
BK/BR
Z960
12
BK/LB
Z904
20
BK/OR
Z967
18
BK
Z967
18
BK
(8W-15-11)
G301



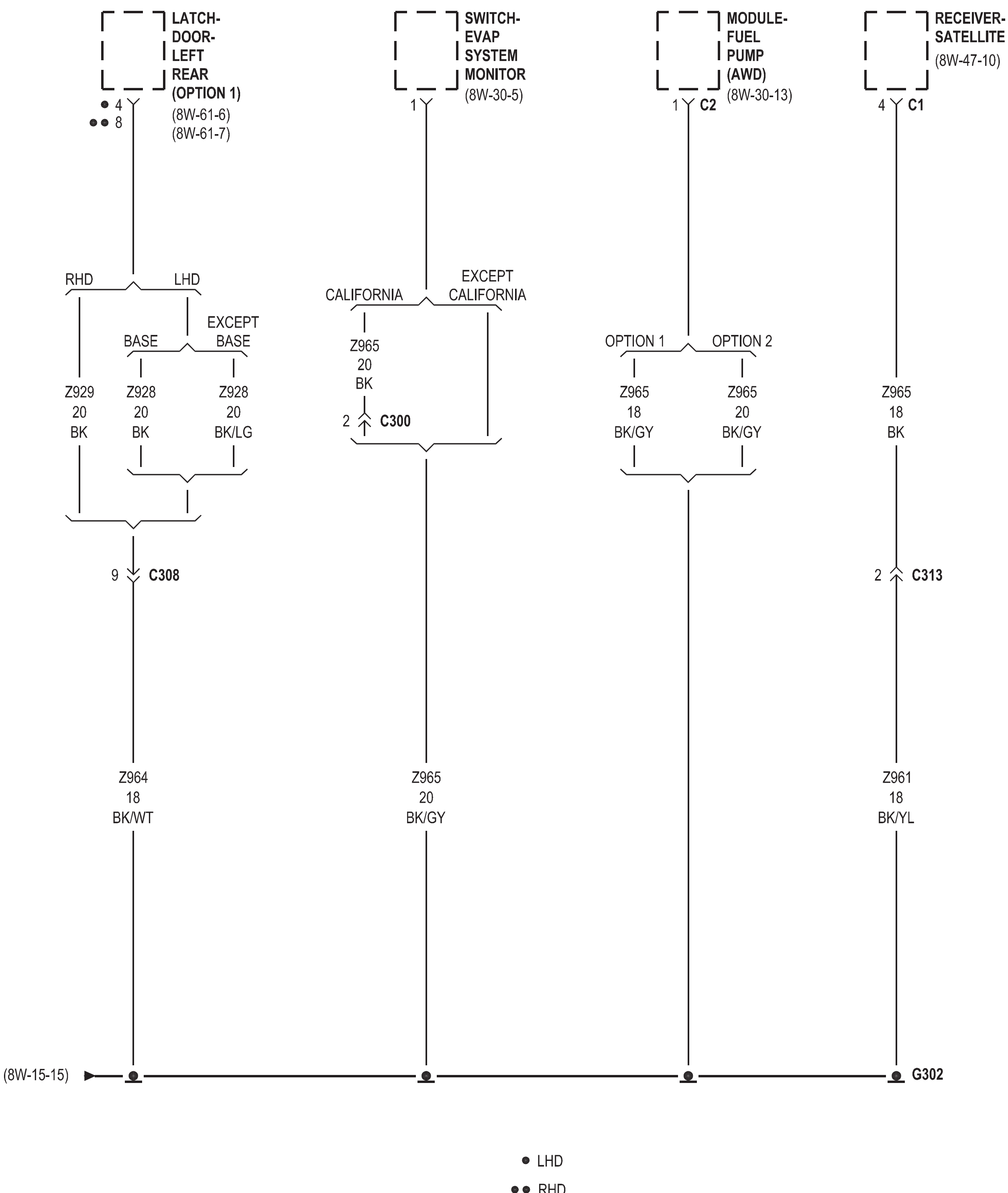
□ HEATED MIRRORS

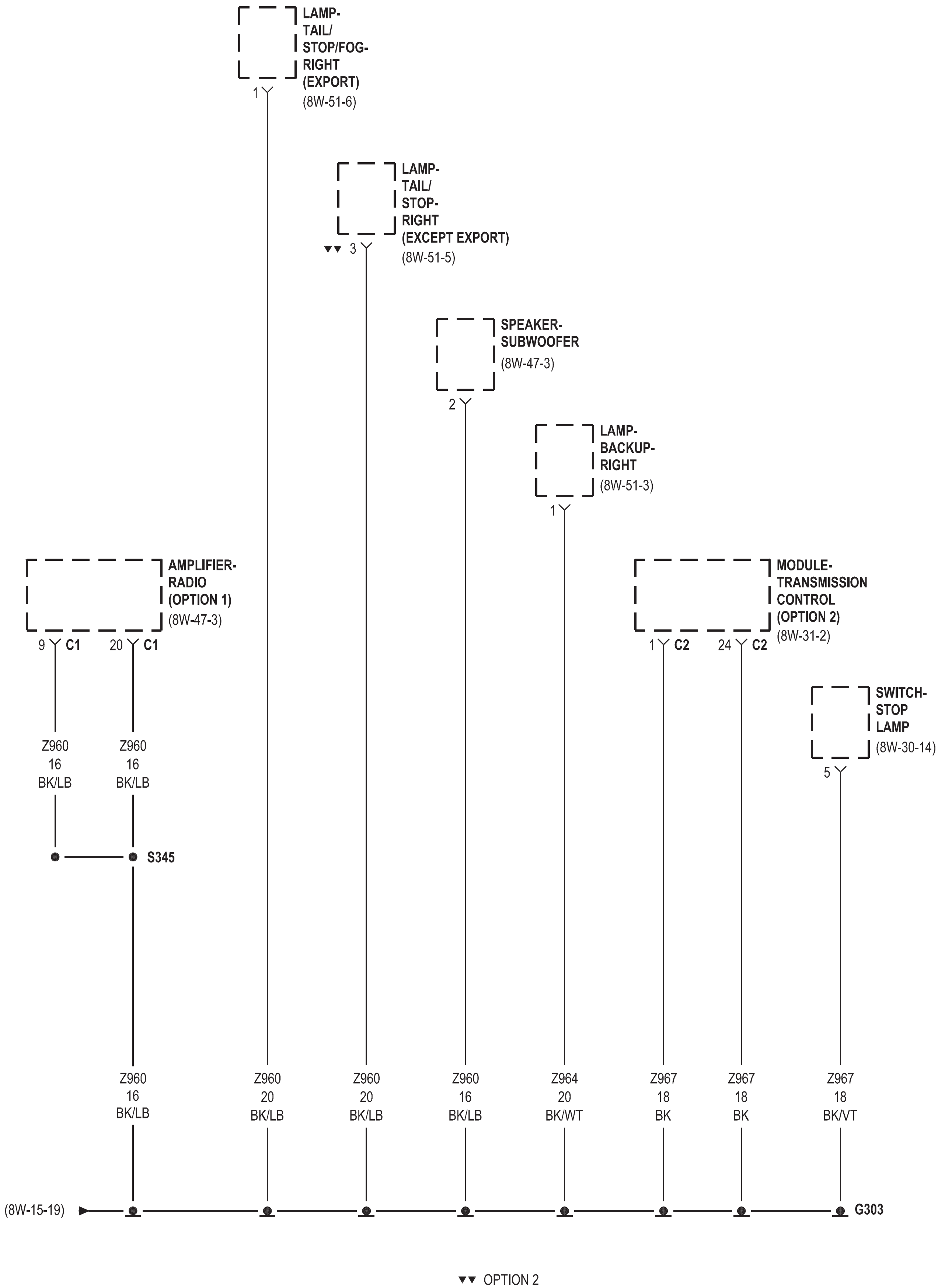
□□ EXCEPT HEATED MIRRORS

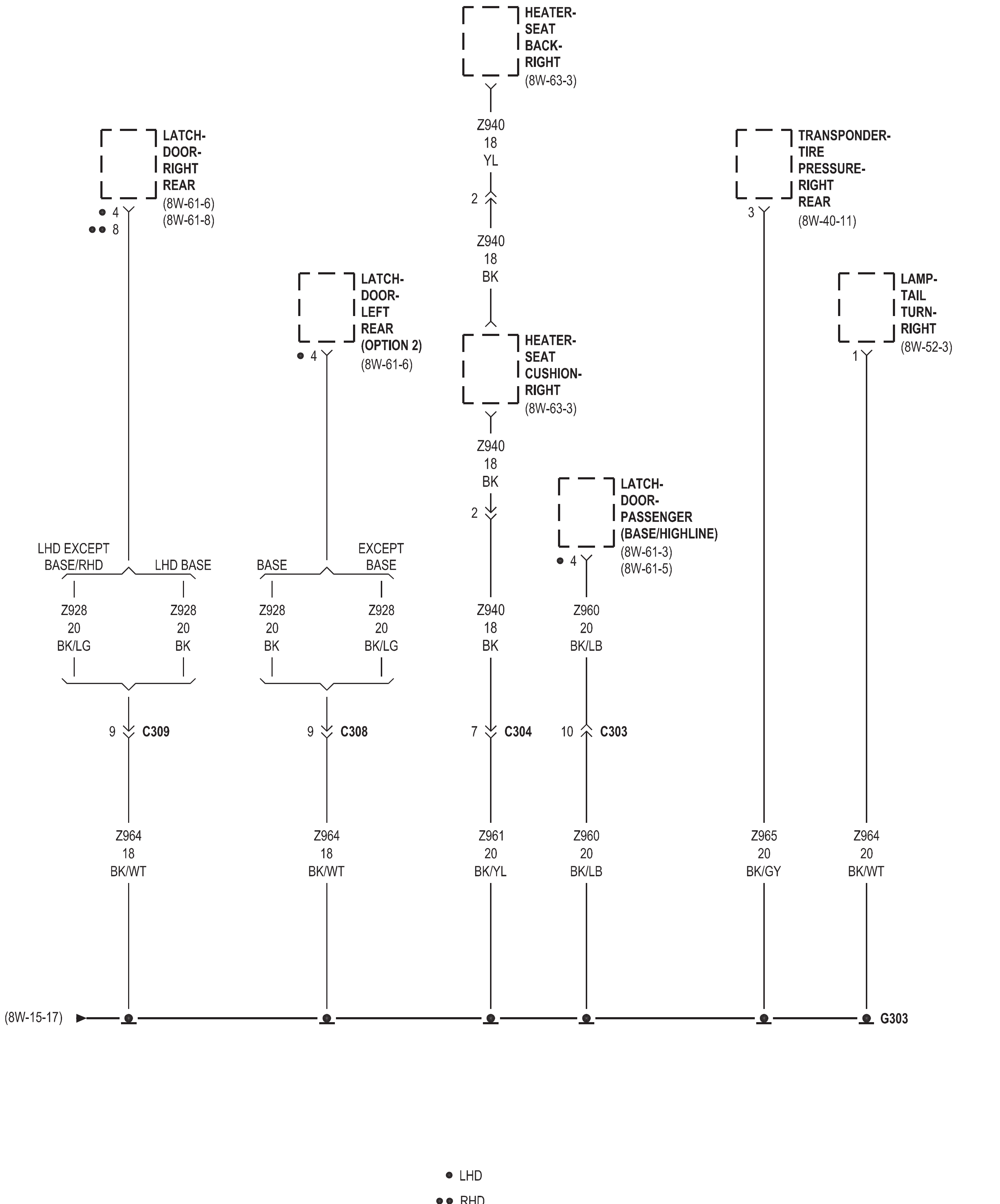

HEATER-
CABIN
(DIESEL)
(8W-42-6)
2
4
TRANSPONDER-
TIRE
PRESSURE-
RIGHT
REAR
(8W-40-11)
6
SWITCH-
SEAT
BELT-
DRIVER
(8W-43-3)
2
SWITCH-
CLUTCH
INTERLOCK
(8W-30-14)
2
LAMP-
SIDE
REPEATER-
LEFT
(EXPORT)
(8W-52-4)
2
GAS
DIESEL
Z966 12 BK/PK
Z966 12 BK/PK
Z965 20 BK/GY
Z961 20 BK/YL
Z961 20 BK/YL
Z925 20 BK
Z960 20 BK/LB
(8W-15-16)
G302

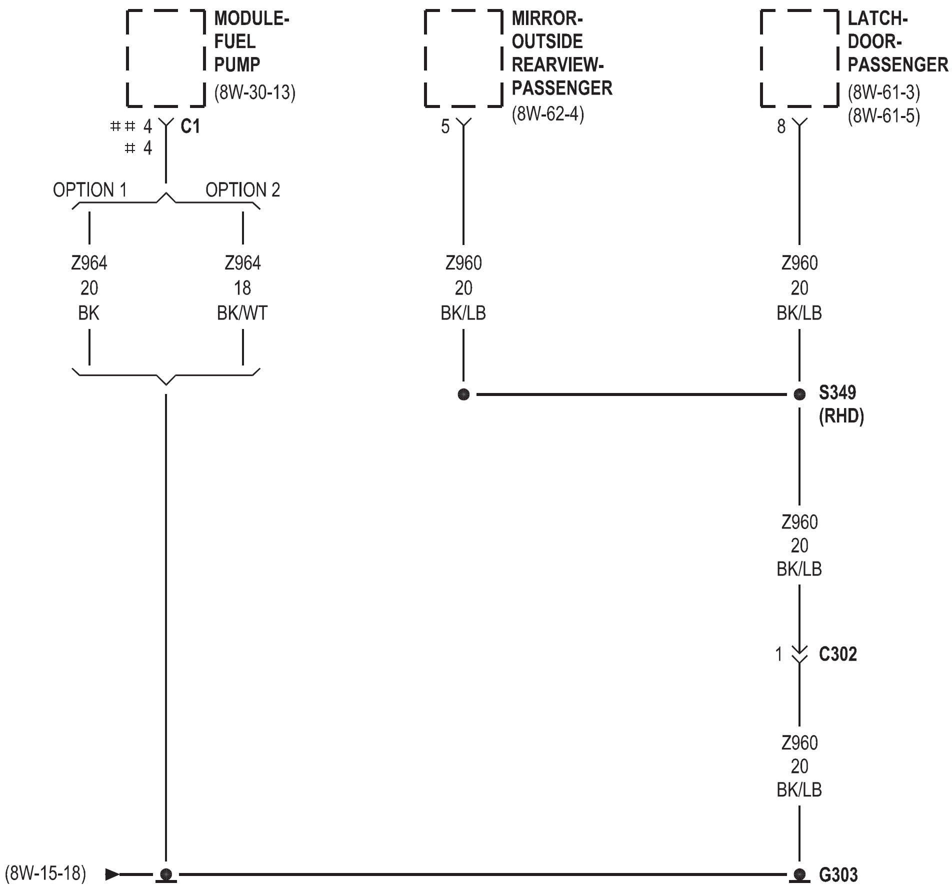


⌗ FWD ● LHD
⌗⌗ AWD ●● RHD


LATCH-
DOOR-
LEFT
REAR
(OPTION 1)
(8W-61-6)
(8W-61-7)
● 4
●● 8
SWITCH-
EVAP
SYSTEM
MONITOR
(8W-30-5)
1
MODULE-
FUEL
PUMP
(AWD)
(8W-30-13)
1 C2
RECEIVER-
SATELLITE
(8W-47-10)
4 C1
RHD
LHD
BASE
EXCEPT BASE
Z929 20 BK
Z928 20 BK
Z928 20 BK/LG
CALIFORNIA
EXCEPT CALIFORNIA
Z965 20 BK
2 C300
OPTION 1
OPTION 2
Z965 18 BK/GY
Z965 20 BK/GY
Z965 18 BK
9 C308
2 C313
Z964 18 BK/WT
Z965 20 BK/GY
Z961 18 BK/YL
(8W-15-15)
G302
● LHD
●● RHD


LAMP-
TAIL/
STOP/FOG-
RIGHT
(EXPORT)
(8W-51-6)
1
LAMP-
TAIL/
STOP-
RIGHT
(EXCEPT EXPORT)
(8W-51-5)
▾▾ 3
SPEAKER-
SUBWOOFER
(8W-47-3)
2
LAMP-
BACKUP-
RIGHT
(8W-51-3)
1
AMPLIFIER-
RADIO
(OPTION 1)
(8W-47-3)
9 C1
20 C1
MODULE-
TRANSMISSION
CONTROL
(OPTION 2)
(8W-31-2)
1 C2
24 C2
SWITCH-
STOP
LAMP
(8W-30-14)
5
Z960 16 BK/LB
Z960 16 BK/LB
S345
Z960 16 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
Z960 16 BK/LB
Z964 20 BK/WT
Z967 18 BK
Z967 18 BK
Z967 18 BK/VT
(8W-15-19)
G303
▾▾ OPTION 2

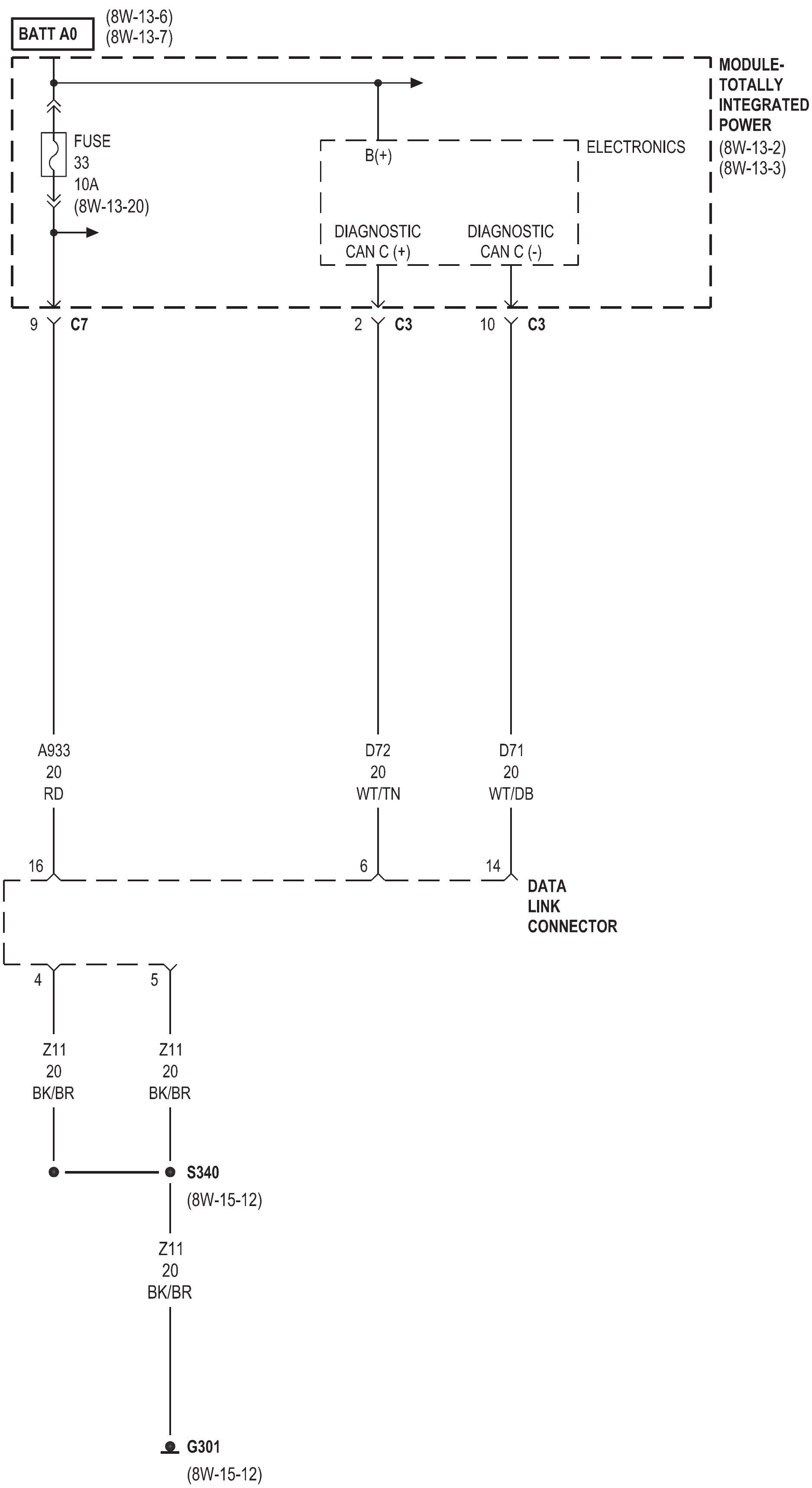

HEATER-SEAT BACK-RIGHT
(8W-63-3)
Z940
18
YL
2
Z940
18
BK
HEATER-SEAT CUSHION-RIGHT
(8W-63-3)
Z940
18
BK
2
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
● 4
●● 8
LATCH-DOOR-LEFT REAR (OPTION 2)
(8W-61-6)
● 4
TRANSPONDER-TIRE PRESSURE-RIGHT REAR
(8W-40-11)
3
LAMP-TAIL TURN-RIGHT
(8W-52-3)
1
LATCH-DOOR-PASSENGER (BASE/HIGHLINE)
(8W-61-3)
(8W-61-5)
● 4
LHD EXCEPT BASE/RHD
LHD BASE
BASE
EXCEPT BASE
Z928
20
BK/LG
Z928
20
BK
Z928
20
BK
Z928
20
BK/LG
Z940
18
BK
Z960
20
BK/LB
9 C309
9 C308
7 C304
10 C303
Z964
18
BK/WT
Z964
18
BK/WT
Z961
20
BK/YL
Z960
20
BK/LB
Z965
20
BK/GY
Z964
20
BK/WT
(8W-15-17)
G303
● LHD
●● RHD

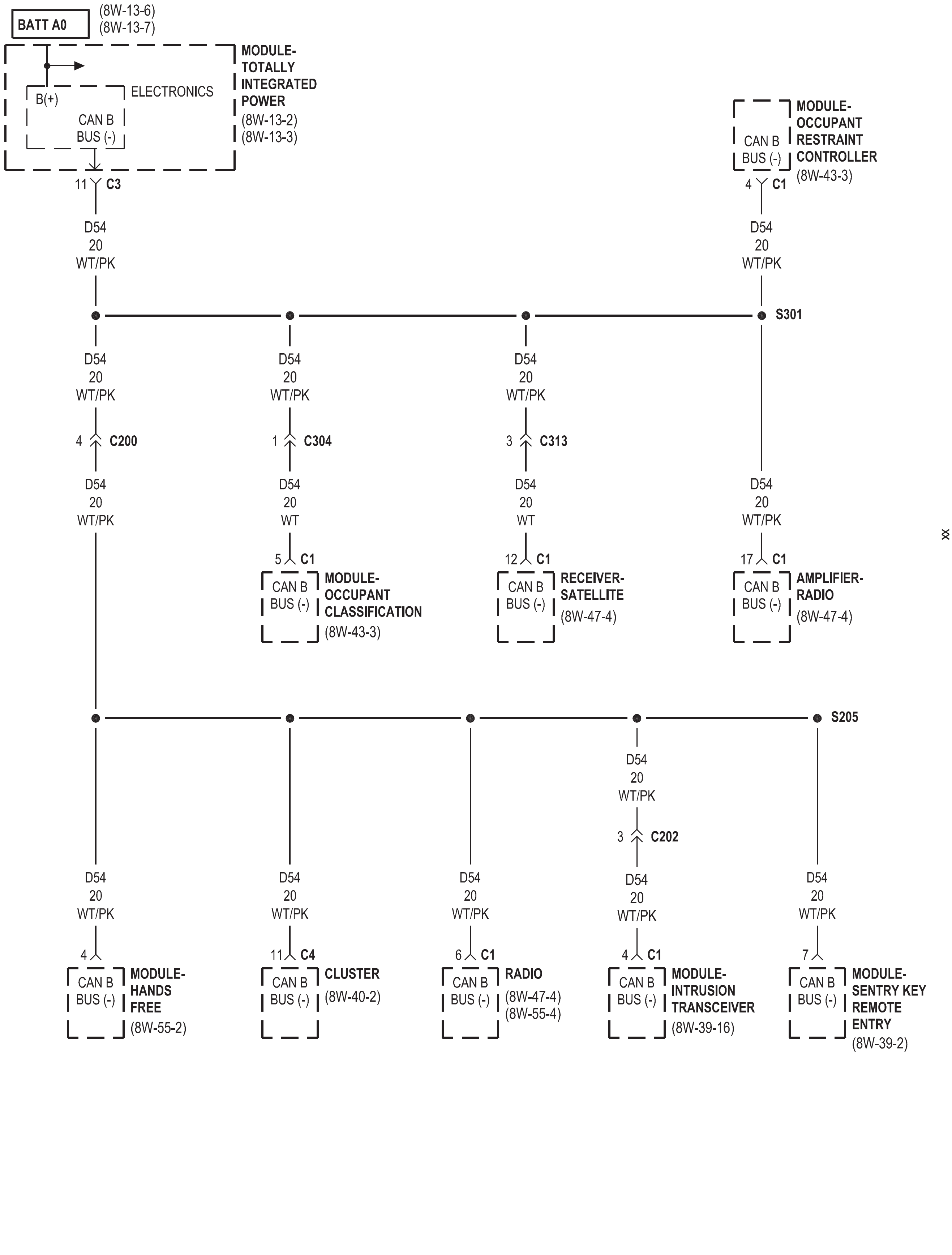

MODULE-
FUEL
PUMP
(8W-30-13)
MIRROR-
OUTSIDE
REARVIEW-
PASSENGER
(8W-62-4)
LATCH-
DOOR-
PASSENGER
(8W-61-3)
(8W-61-5)
4
4
C1
5
8
OPTION 1
OPTION 2
Z964
20
BK
Z964
18
BK/WT
Z960
20
BK/LB
Z960
20
BK/LB
S349
(RHD)
Z960
20
BK/LB
1
C302
Z960
20
BK/LB
(8W-15-18)
G303

FWD

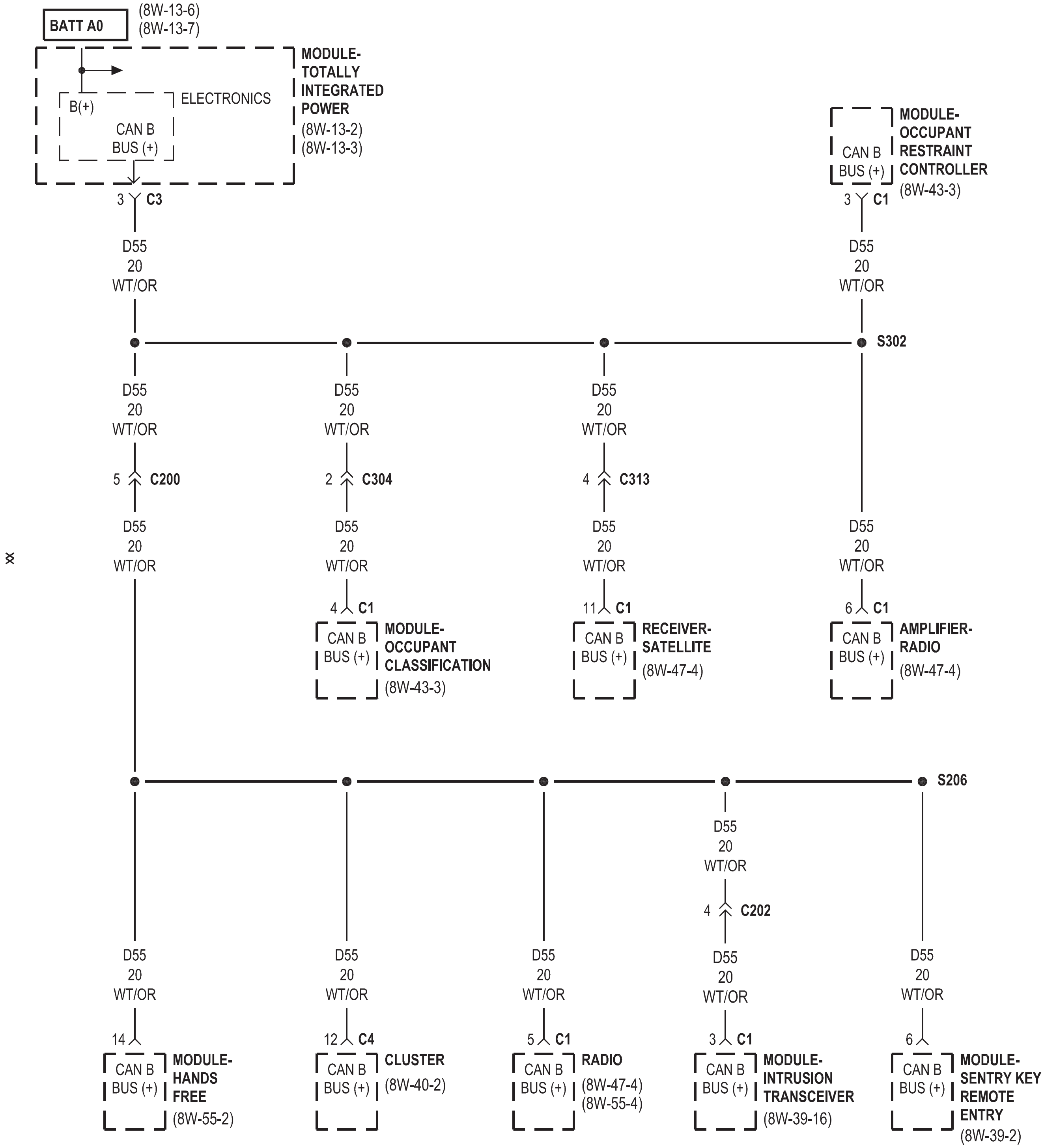
AWD

8W-18 BUS COMMUNICATIONS

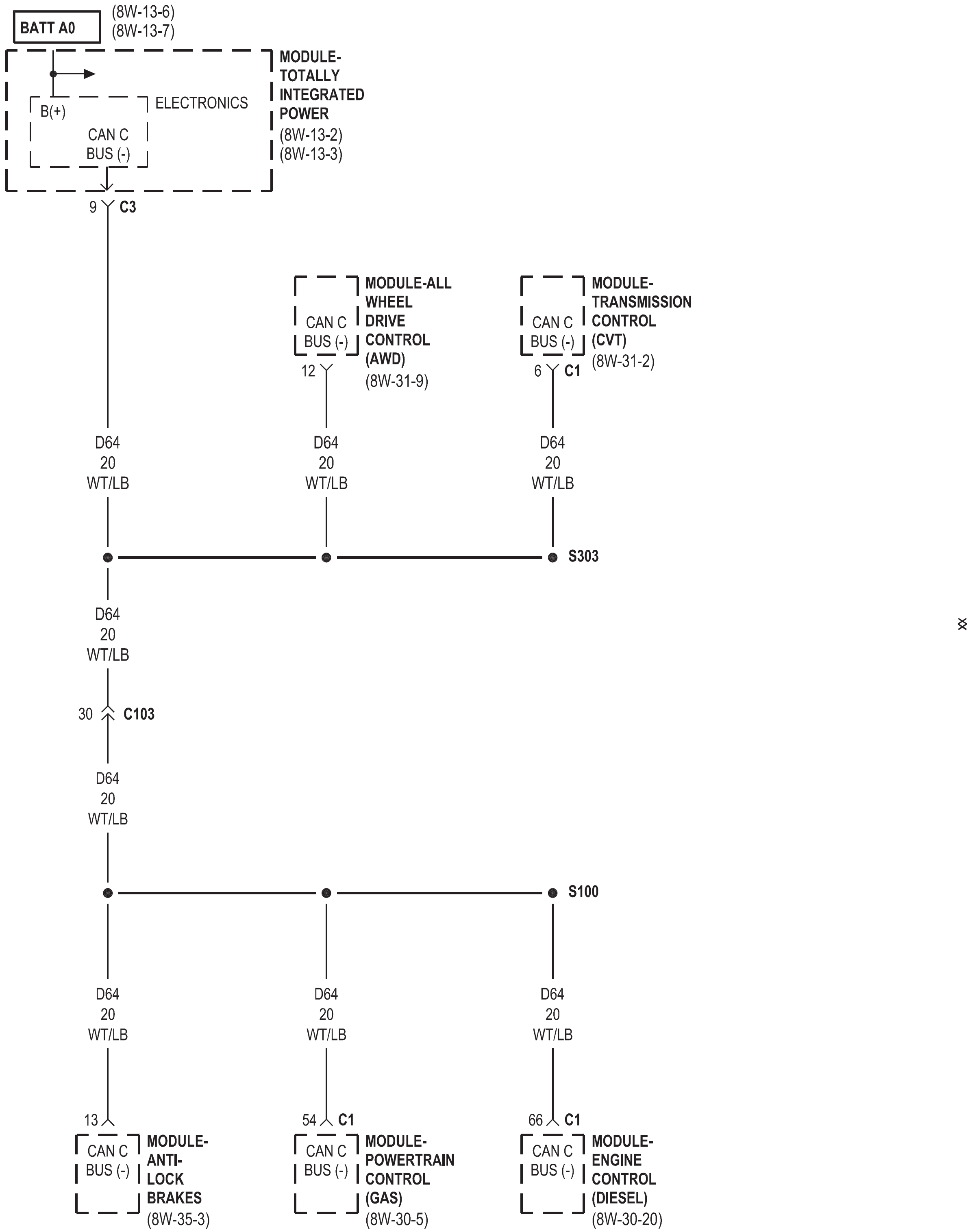

BATT A0
(8W-13-6)
(8W-13-7)
FUSE
33
10A
(8W-13-20)
B(+)
ELECTRONICS
DIAGNOSTIC
CAN C (+)
DIAGNOSTIC
CAN C (-)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
9 C7
2 C3
10 C3
A933
20
RD
D72
20
WT/TN
D71
20
WT/DB
16
6
14
DATA
LINK
CONNECTOR
4
5
Z11
20
BK/BR
Z11
20
BK/BR
S340
(8W-15-12)
Z11
20
BK/BR
G301
(8W-15-12)



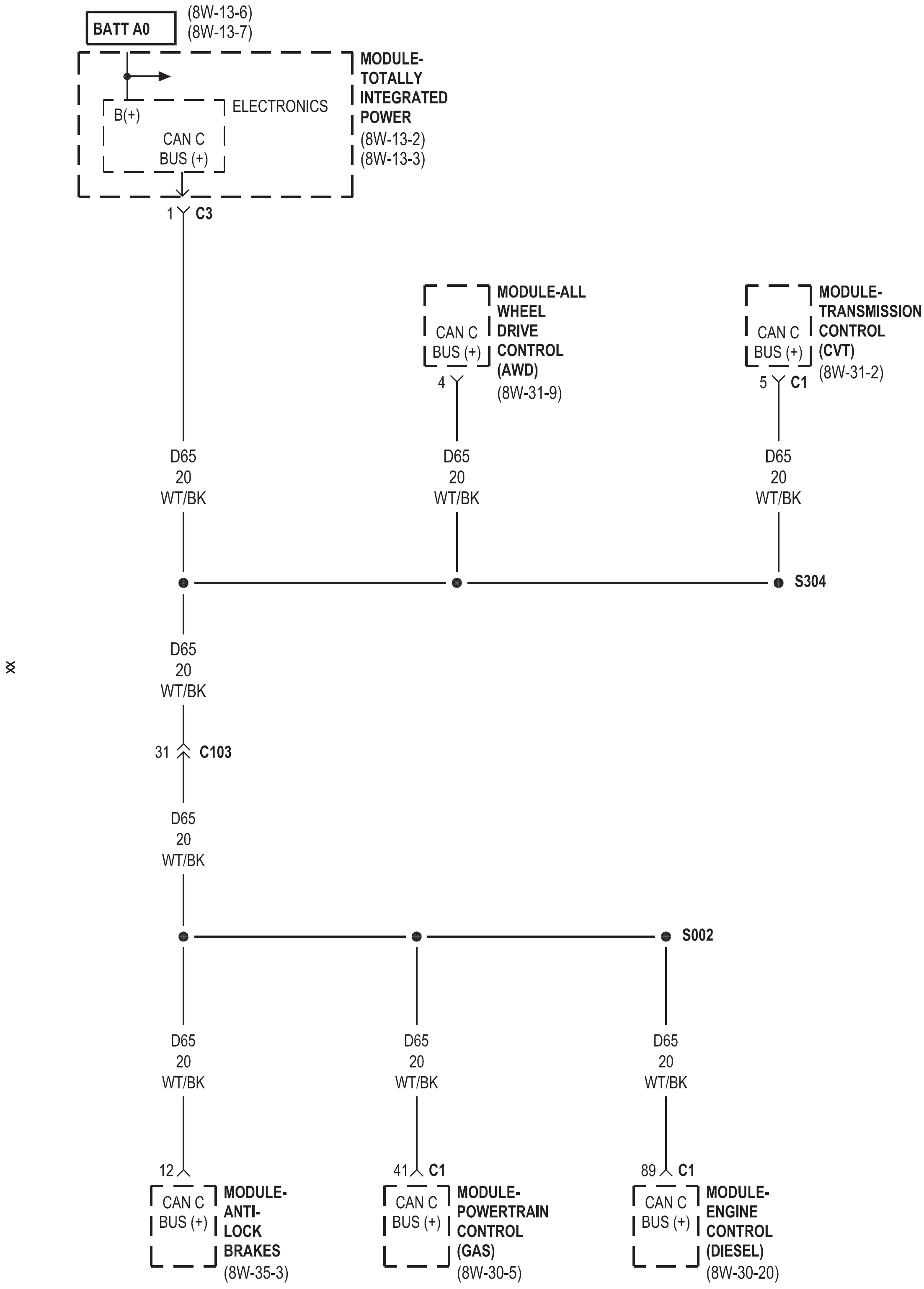
NOTE: D54, D55 CIRCUITS ARE TWISTED PAIR



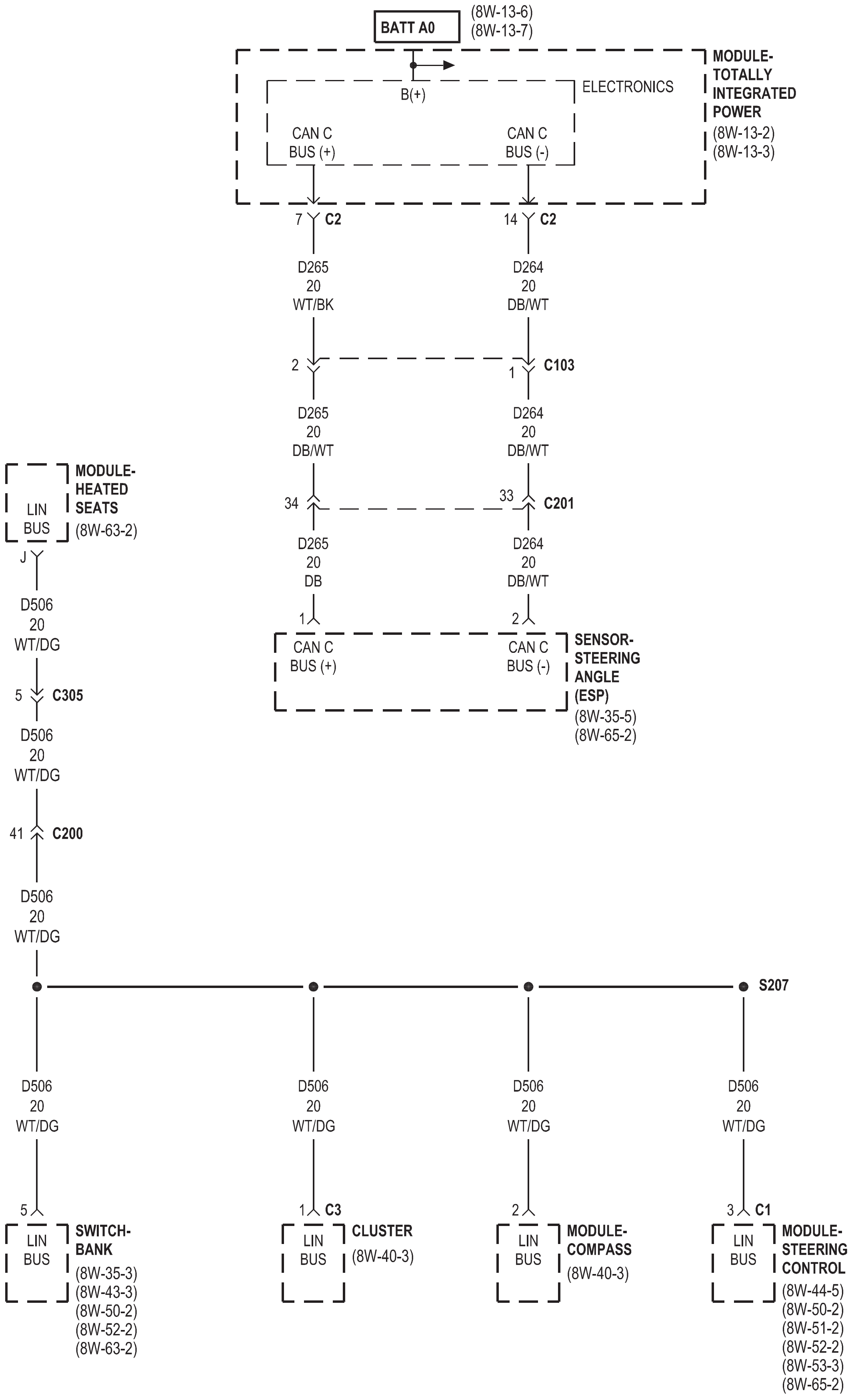
NOTE: D54, D55 CIRCUITS ARE TWISTED PAIR



NOTE: D64, D65 CIRCUITS ARE TWISTED PAIR

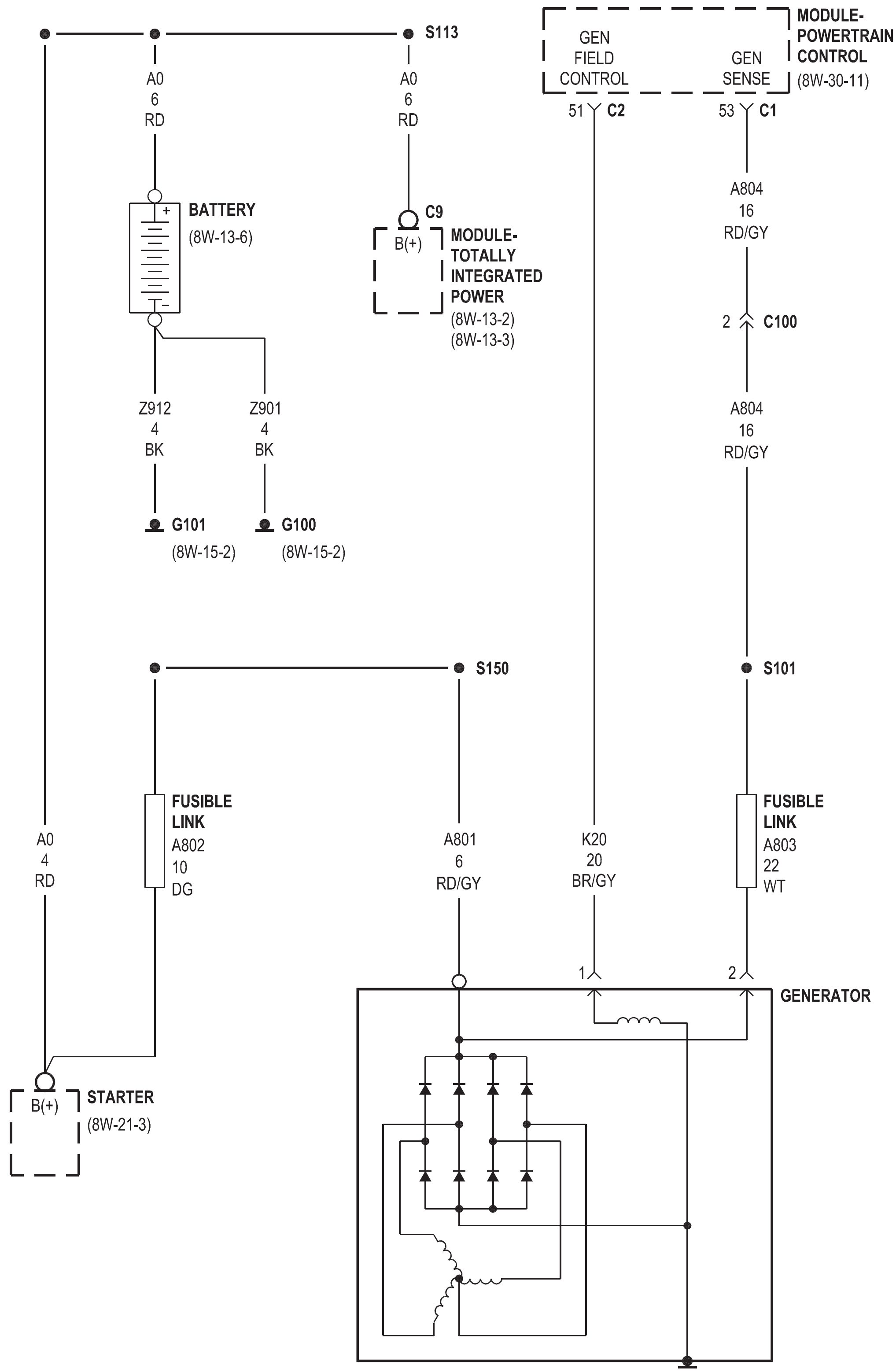


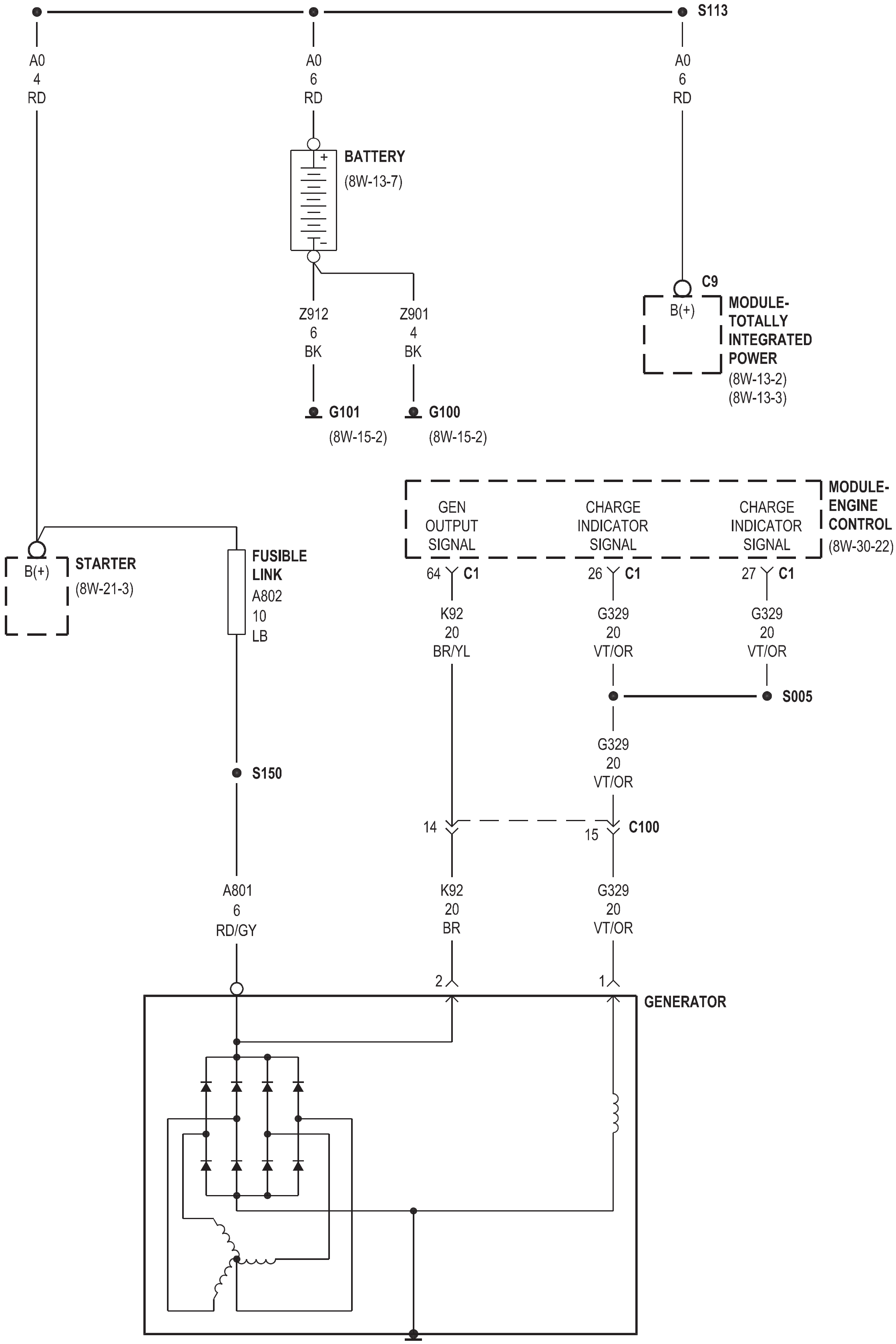
NOTE: D64, D65 CIRCUITS ARE TWISTED PAIR



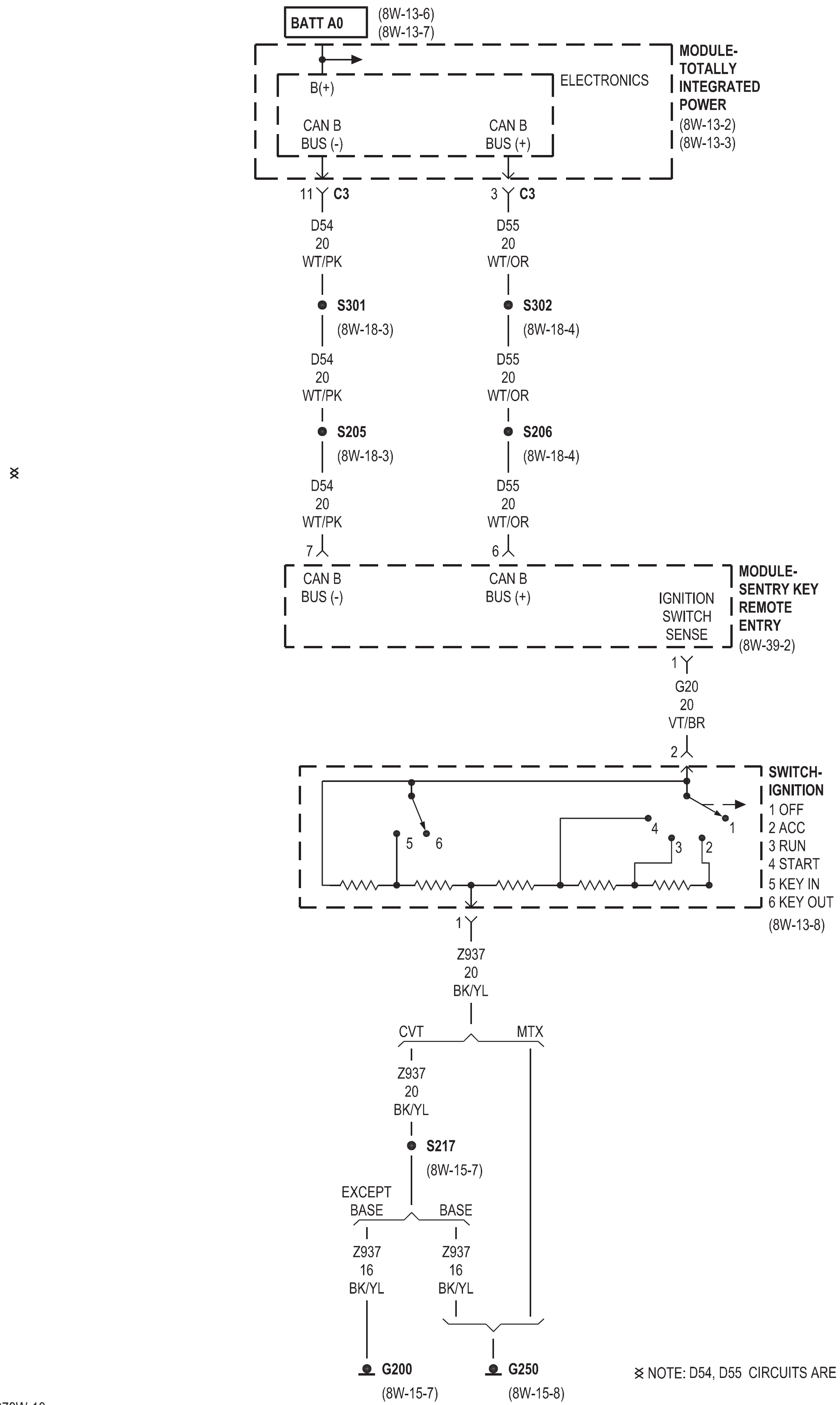
BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
CAN C BUS (+)
CAN C BUS (-)
7 C2
14 C2
D265 20 WT/BK
D264 20 DB/WT
2 C103 1
D265 20 DB/WT
D264 20 DB/WT
34 C201 33
D265 20 DB
D264 20 DB/WT
1
2
CAN C BUS (+)
CAN C BUS (-)
SENSOR-STEERING ANGLE (ESP)
(8W-35-5)
(8W-65-2)
MODULE-HEATED SEATS
(8W-63-2)
LIN BUS
J
D506 20 WT/DG
5 C305
D506 20 WT/DG
41 C200
D506 20 WT/DG
S207
D506 20 WT/DG
D506 20 WT/DG
D506 20 WT/DG
D506 20 WT/DG
5
1 C3
2
3 C1
LIN BUS
SWITCH-BANK
(8W-35-3)
(8W-43-3)
(8W-50-2)
(8W-52-2)
(8W-63-2)
LIN BUS
CLUSTER
(8W-40-3)
LIN BUS
MODULE-COMPASS
(8W-40-3)
LIN BUS
MODULE-STEERING CONTROL
(8W-44-5)
(8W-50-2)
(8W-51-2)
(8W-52-2)
(8W-53-3)
(8W-65-2)

8W-20 CHARGING SYSTEM

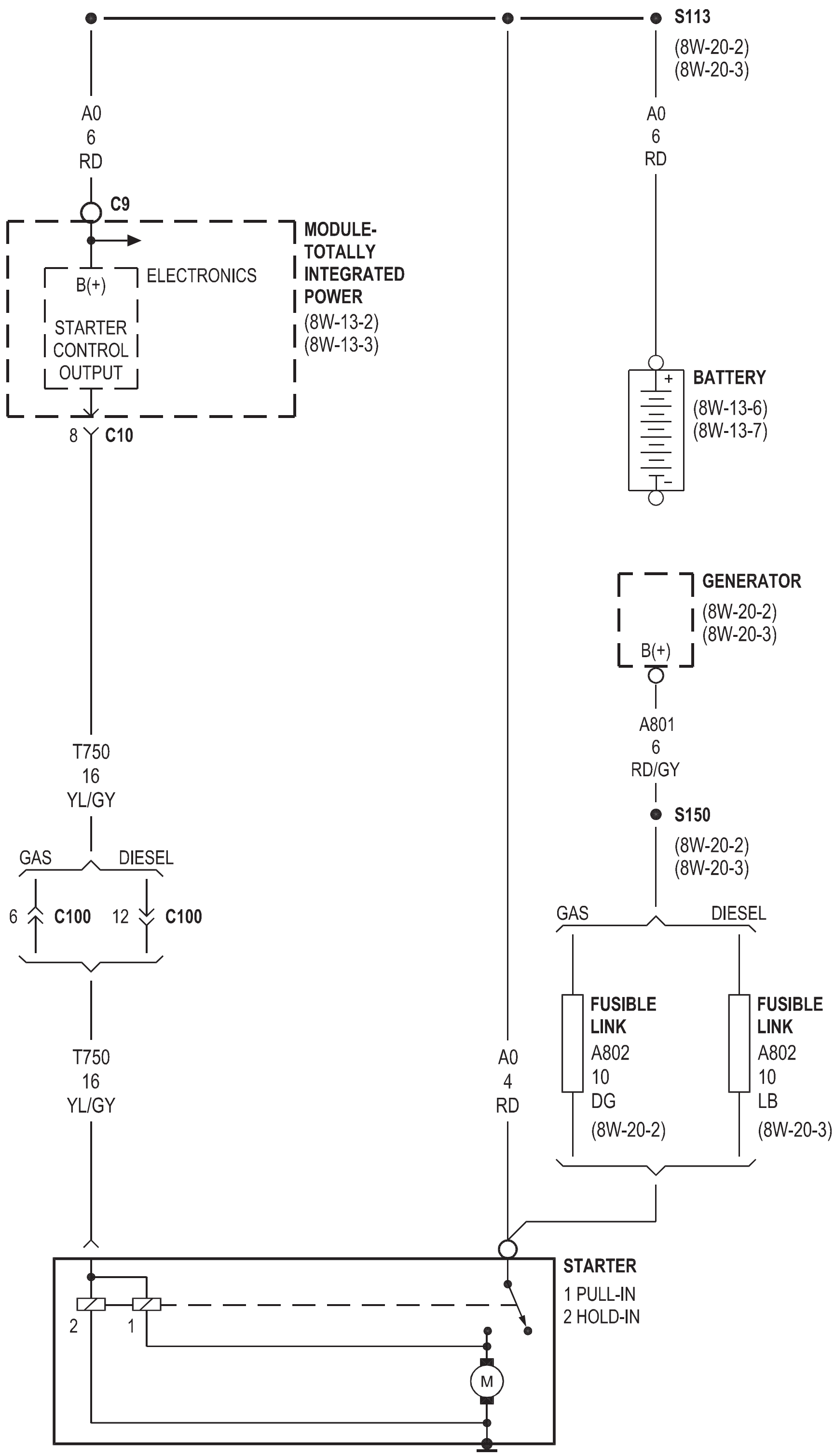

S113
A0
6
RD
A0
6
RD
MODULE-
POWERTRAIN
CONTROL
(8W-30-11)
GEN
FIELD
CONTROL
GEN
SENSE
51 C2
53 C1
BATTERY
(8W-13-6)
C9
B(+)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
A804
16
RD/GY
2 C100
A804
16
RD/GY
Z912
4
BK
Z901
4
BK
G101
(8W-15-2)
G100
(8W-15-2)
S150
S101
FUSIBLE
LINK
A802
10
DG
A0
4
RD
A801
6
RD/GY
K20
20
BR/GY
FUSIBLE
LINK
A803
22
WT
1
2
GENERATOR
B(+)
STARTER
(8W-21-3)


S113
A0
4
RD
A0
6
RD
A0
6
RD
BATTERY
(8W-13-7)
C9
B(+)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
Z912
6
BK
Z901
4
BK
G101
(8W-15-2)
G100
(8W-15-2)
GEN
OUTPUT
SIGNAL
CHARGE
INDICATOR
SIGNAL
CHARGE
INDICATOR
SIGNAL
MODULE-
ENGINE
CONTROL
(8W-30-22)
B(+)
STARTER
(8W-21-3)
FUSIBLE
LINK
A802
10
LB
64 C1
26 C1
27 C1
K92
20
BR/YL
G329
20
VT/OR
G329
20
VT/OR
S005
G329
20
VT/OR
S150
14
15
C100
A801
6
RD/GY
K92
20
BR
G329
20
VT/OR
2
1
GENERATOR

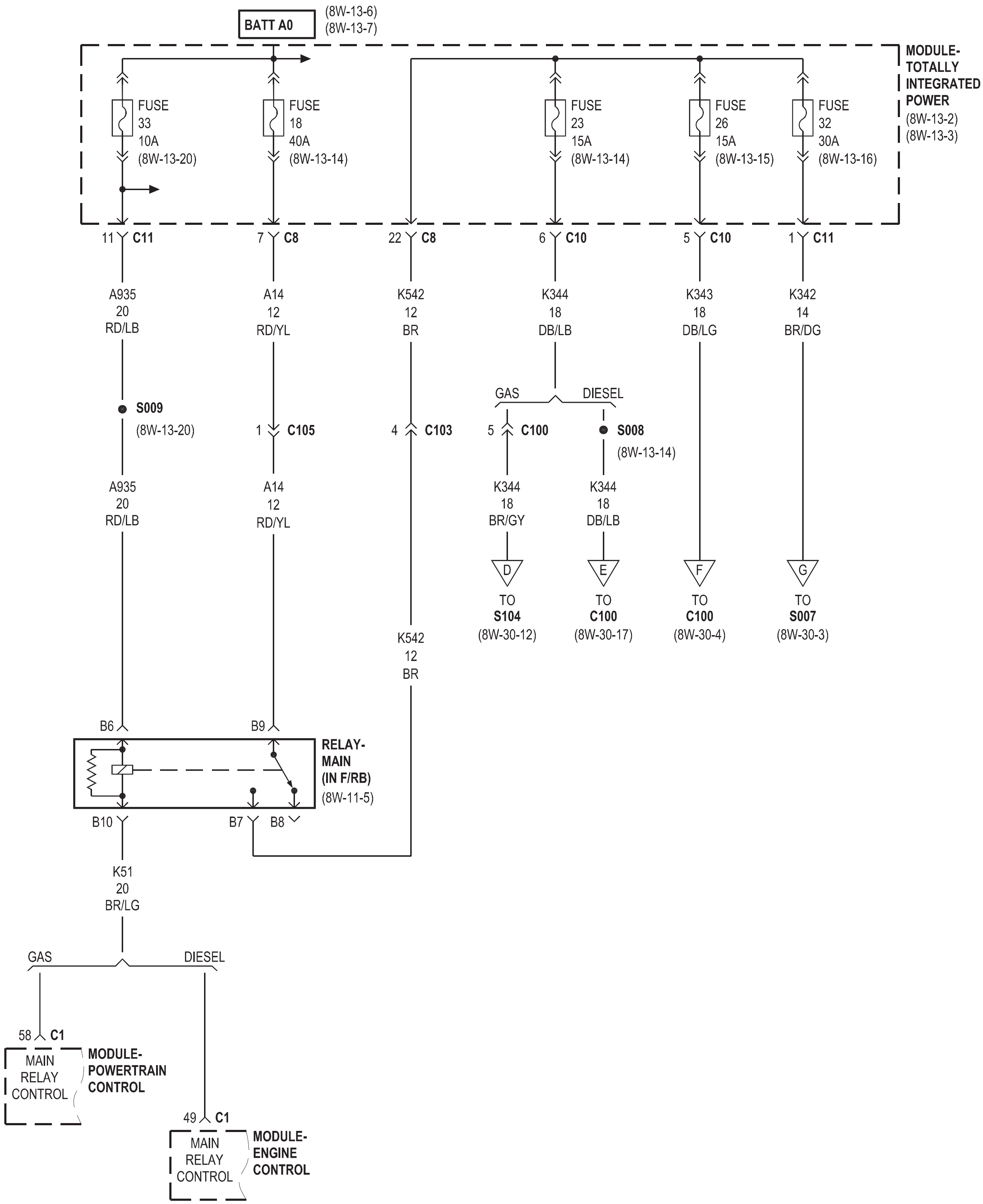
8W-21 STARTING SYSTEM



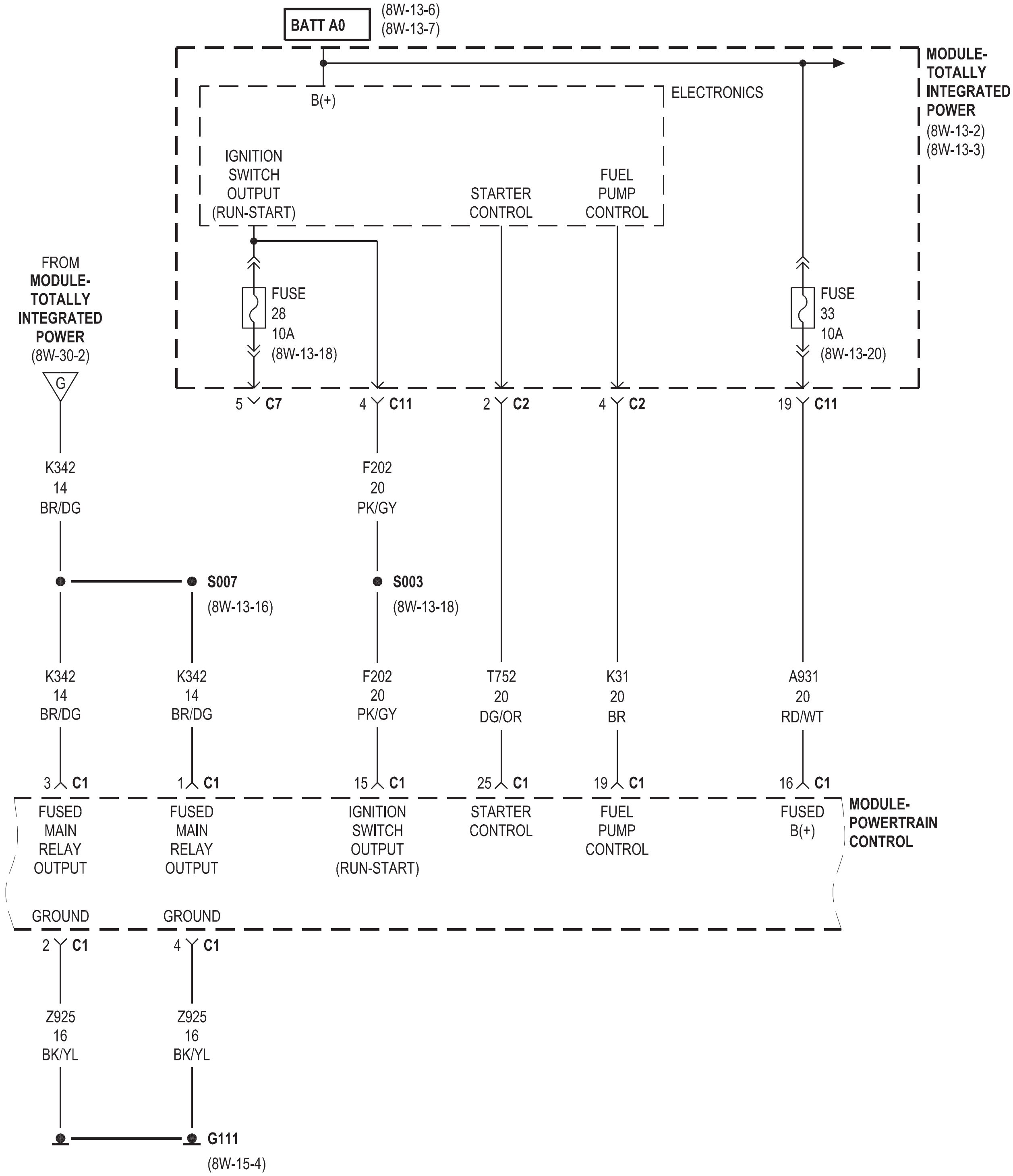
※ NOTE: D54, D55 CIRCUITS ARE TWISTED PAIR

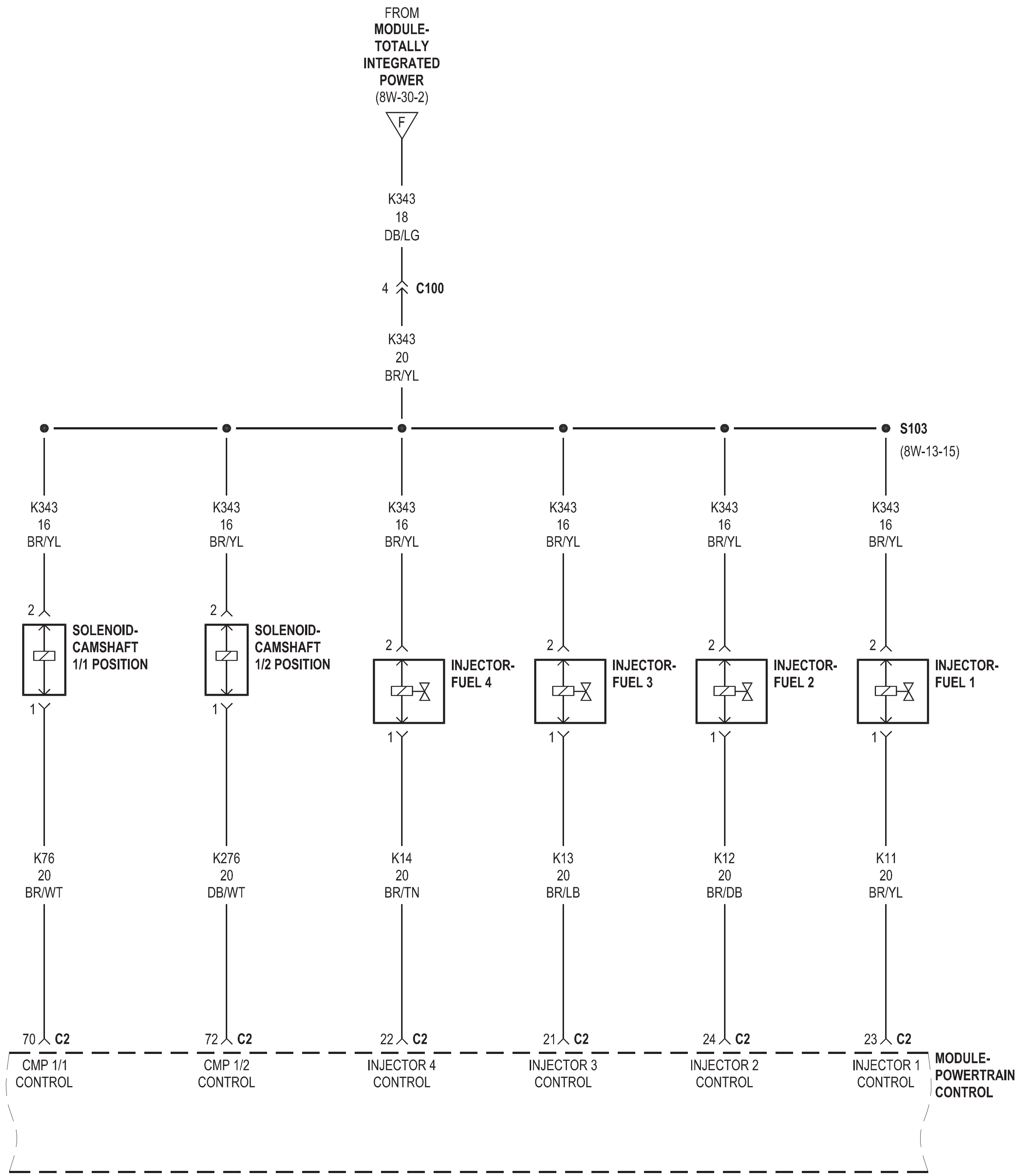

S113
(8W-20-2)
(8W-20-3)
A0
6
RD
A0
6
RD
C9
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
STARTER
CONTROL
OUTPUT
8
C10
BATTERY
(8W-13-6)
(8W-13-7)
GENERATOR
(8W-20-2)
(8W-20-3)
B(+)
A801
6
RD/GY
S150
(8W-20-2)
(8W-20-3)
T750
16
YL/GY
GAS
DIESEL
6
C100
12
C100
GAS
DIESEL
FUSIBLE
LINK
A802
10
DG
(8W-20-2)
FUSIBLE
LINK
A802
10
LB
(8W-20-3)
T750
16
YL/GY
A0
4
RD
STARTER
1 PULL-IN
2 HOLD-IN
2
1
M

8W-30 FUEL/IGNITION SYSTEM

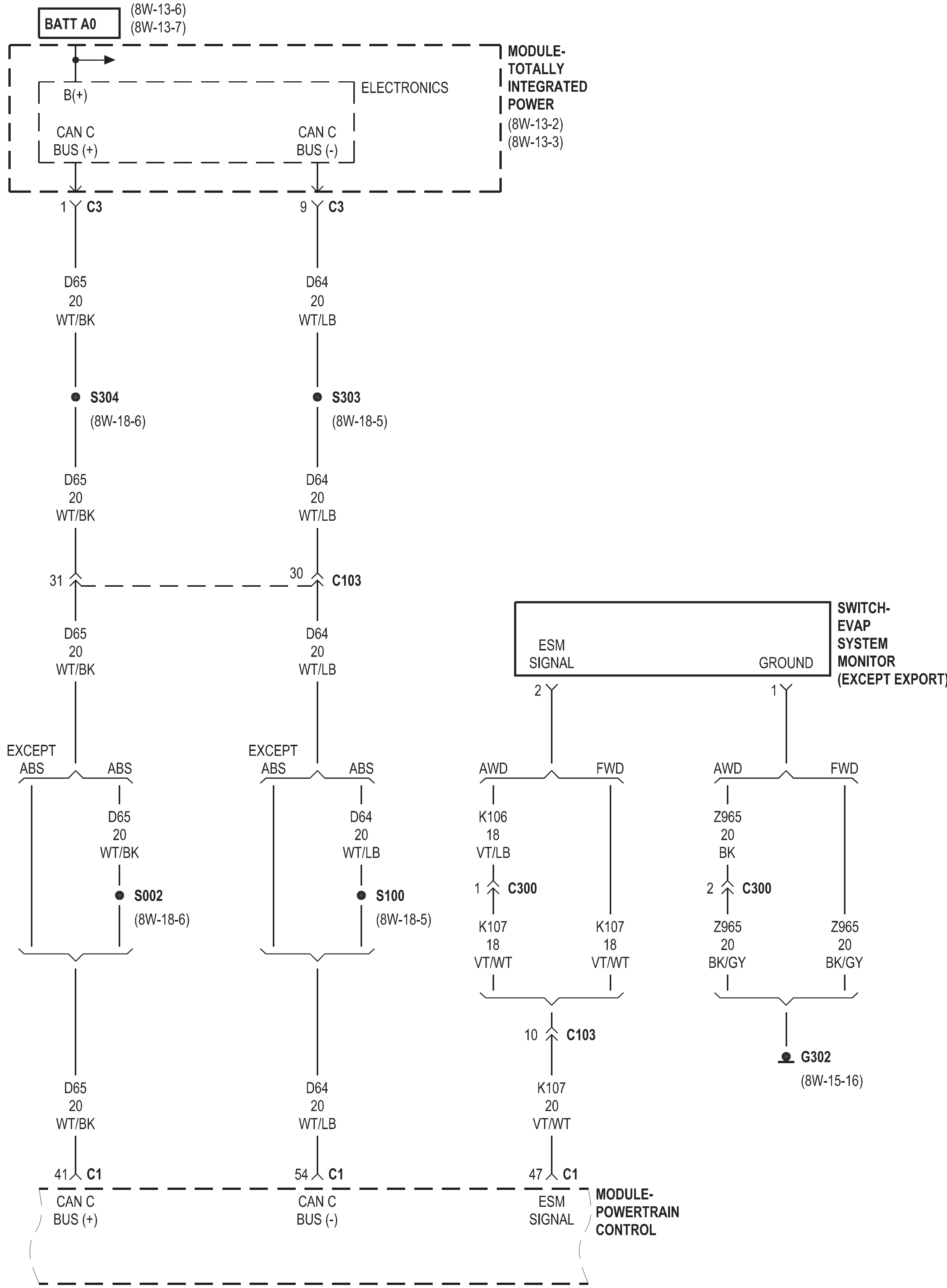

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE 33 10A (8W-13-20)
FUSE 18 40A (8W-13-14)
FUSE 23 15A (8W-13-14)
FUSE 26 15A (8W-13-15)
FUSE 32 30A (8W-13-16)
11 C11
7 C8
22 C8
6 C10
5 C10
1 C11
A935 20 RD/LB
A14 12 RD/YL
K542 12 BR
K344 18 DB/LB
K343 18 DB/LG
K342 14 BR/DG
GAS
DIESEL
S009
(8W-13-20)
1 C105
4 C103
5 C100
S008
(8W-13-14)
A935 20 RD/LB
A14 12 RD/YL
K344 18 BR/GY
K344 18 DB/LB
D
E
F
G
TO S104 (8W-30-12)
TO C100 (8W-30-17)
TO C100 (8W-30-4)
TO S007 (8W-30-3)
K542 12 BR
B6
B9
RELAY-
MAIN
(IN F/RB)
(8W-11-5)
B10
B7
B8
K51 20 BR/LG
GAS
DIESEL
58 C1
MAIN RELAY CONTROL
MODULE-
POWERTRAIN
CONTROL
49 C1
MAIN RELAY CONTROL
MODULE-
ENGINE
CONTROL

8W-30 FUEL/IGNITION SYSTEM
GAS

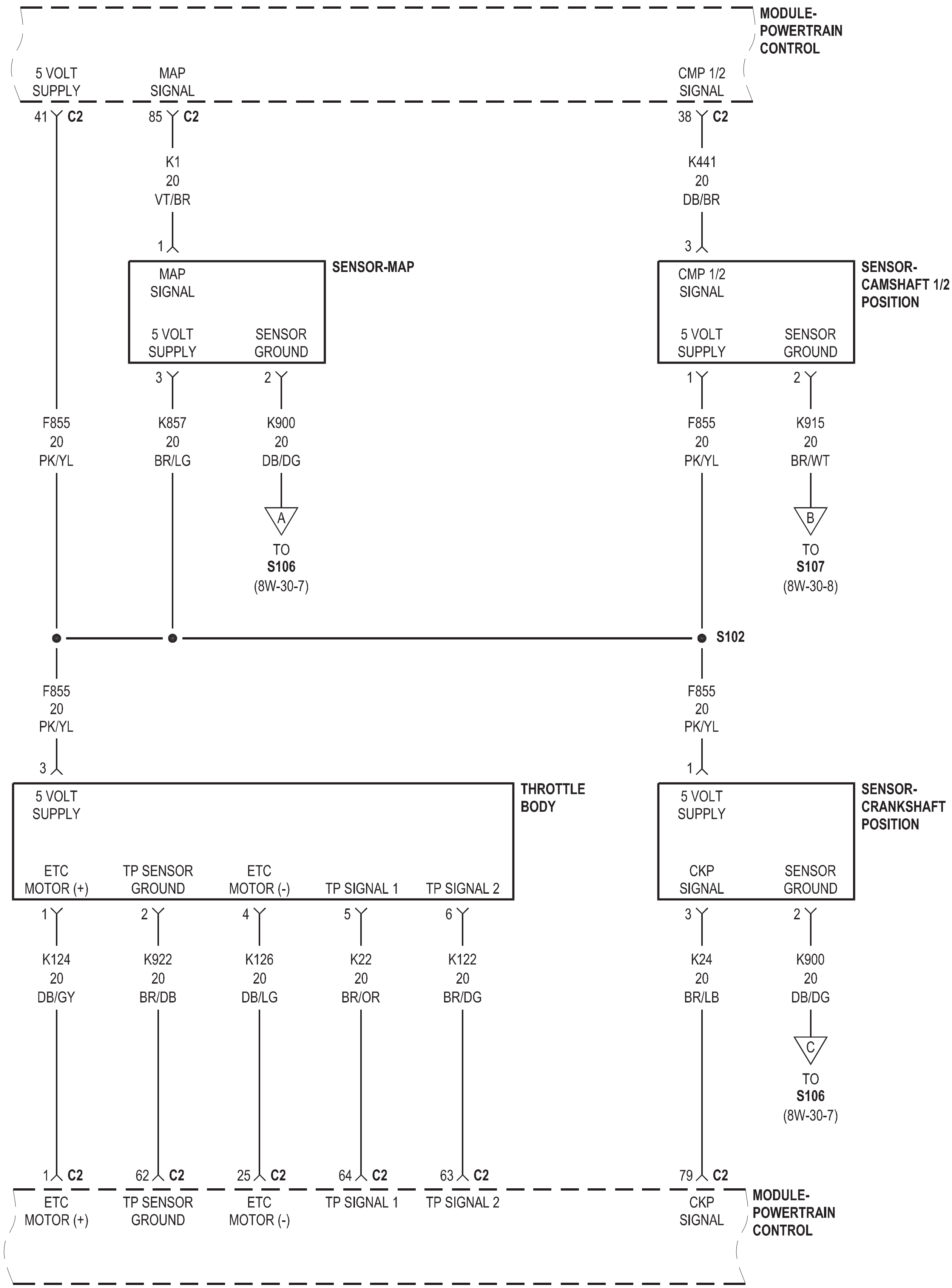


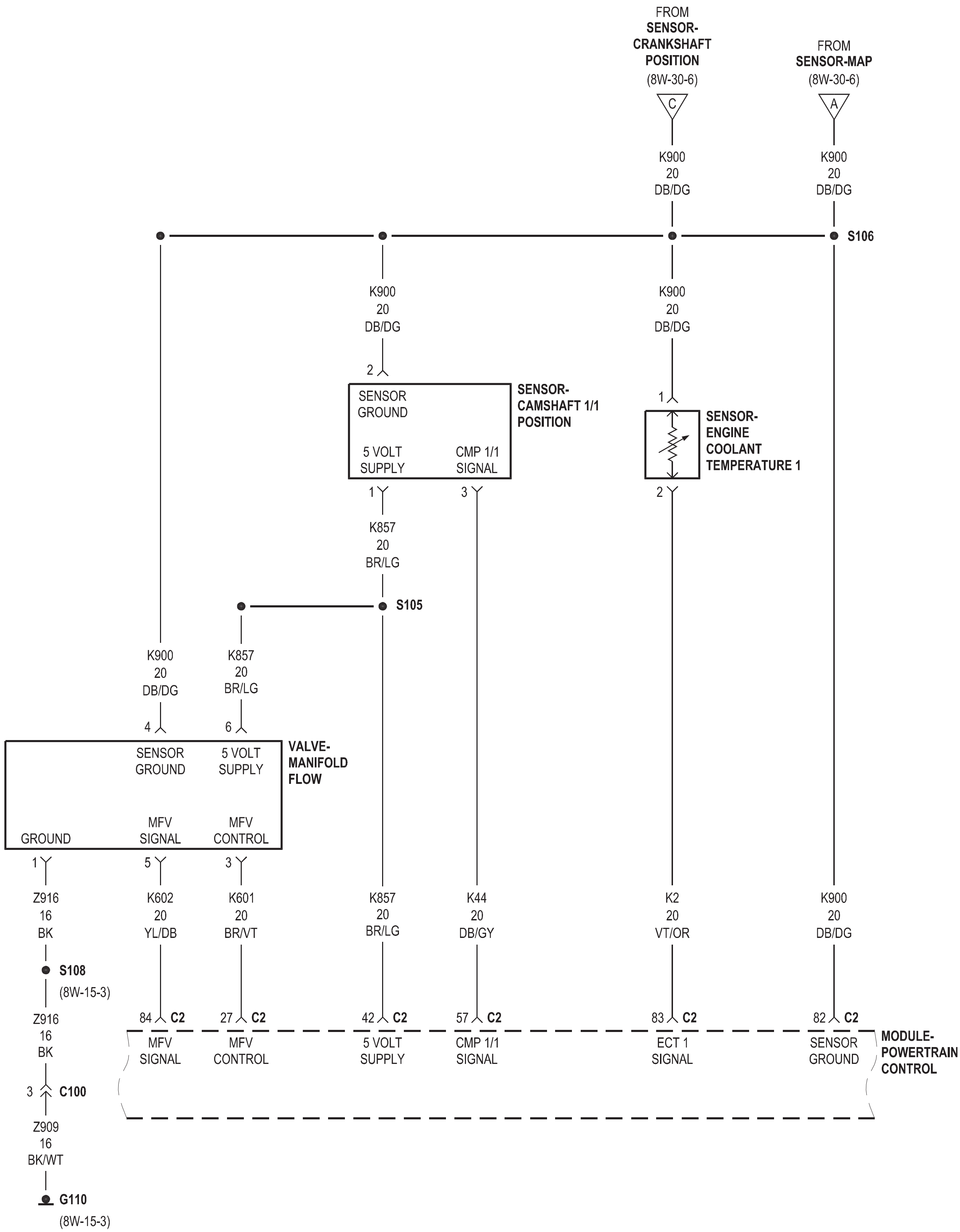

FROM
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-30-2)
F
K343
18
DB/LG
4
C100
K343
20
BR/YL
S103
(8W-13-15)
K343
16
BR/YL
2
SOLENOID-
CAMSHAFT
1/1 POSITION
1
SOLENOID-
CAMSHAFT
1/2 POSITION
INJECTOR-
FUEL 4
INJECTOR-
FUEL 3
INJECTOR-
FUEL 2
INJECTOR-
FUEL 1
K76
20
BR/WT
K276
20
DB/WT
K14
20
BR/TN
K13
20
BR/LB
K12
20
BR/DB
K11
20
BR/YL
70 C2
72 C2
22 C2
21 C2
24 C2
23 C2
CMP 1/1
CONTROL
CMP 1/2
CONTROL
INJECTOR 4
CONTROL
INJECTOR 3
CONTROL
INJECTOR 2
CONTROL
INJECTOR 1
CONTROL
MODULE-
POWERTRAIN
CONTROL

GAS

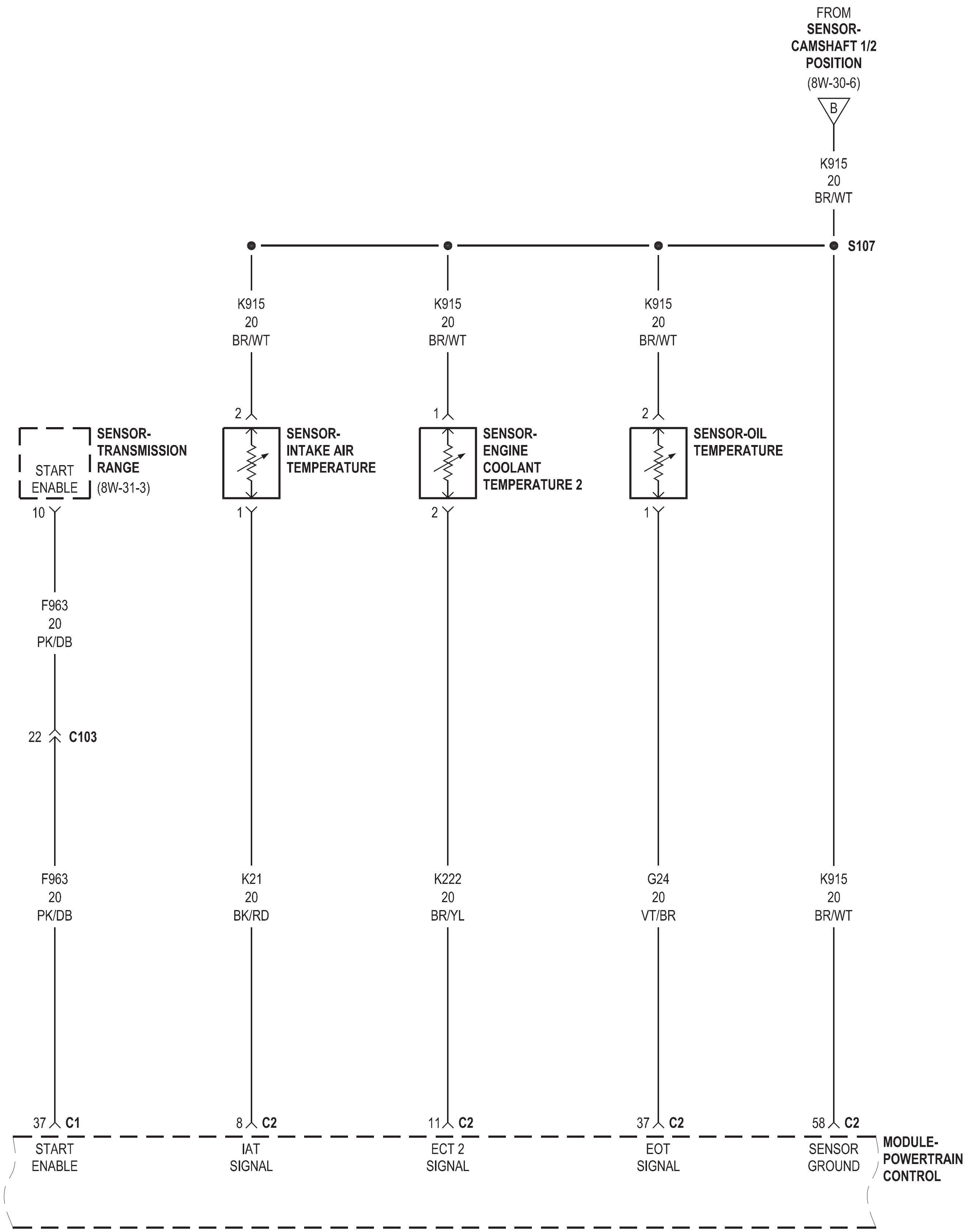


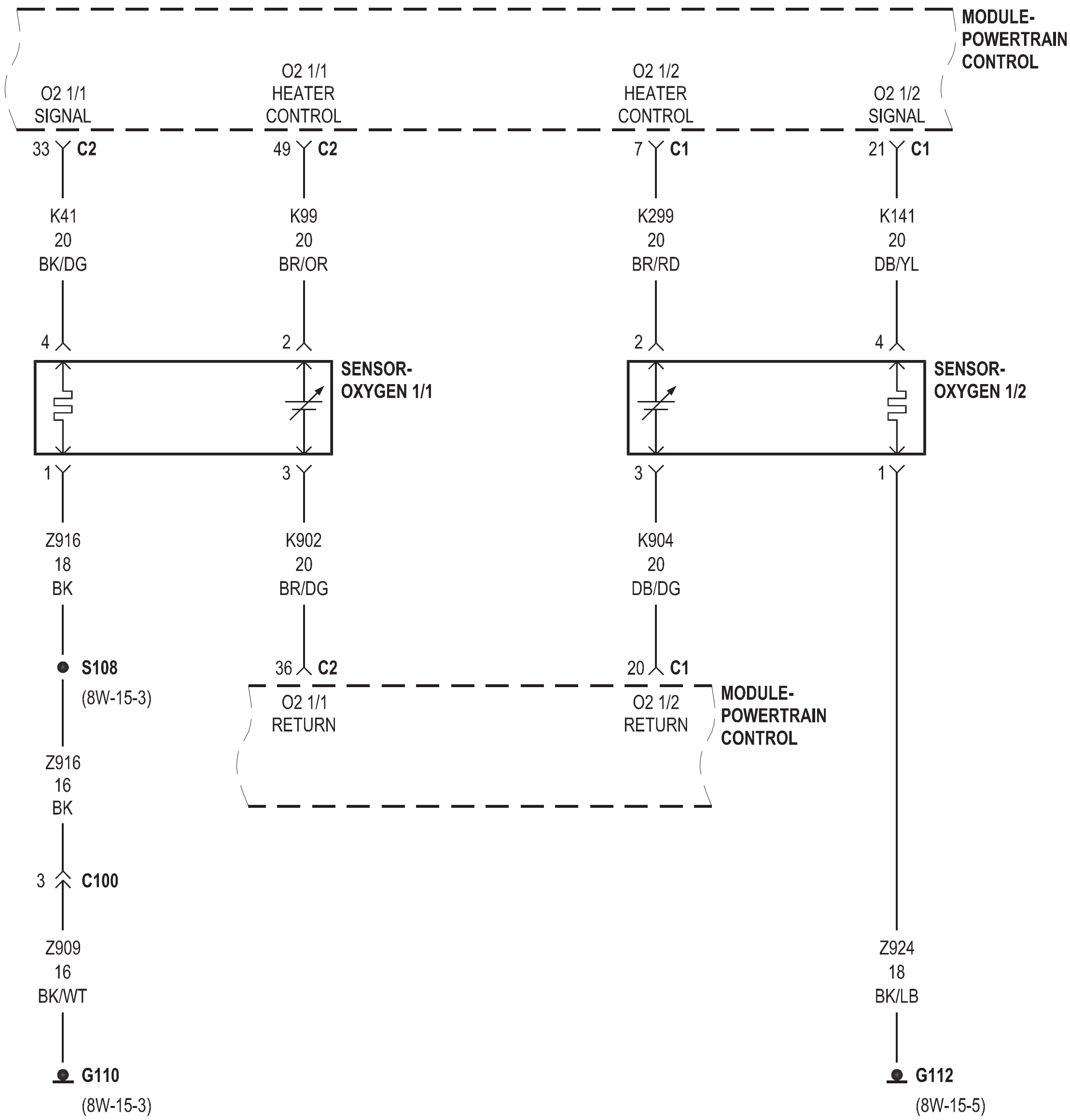
NOTE: D64, D65 CIRCUITS ARE TWISTED PAIR

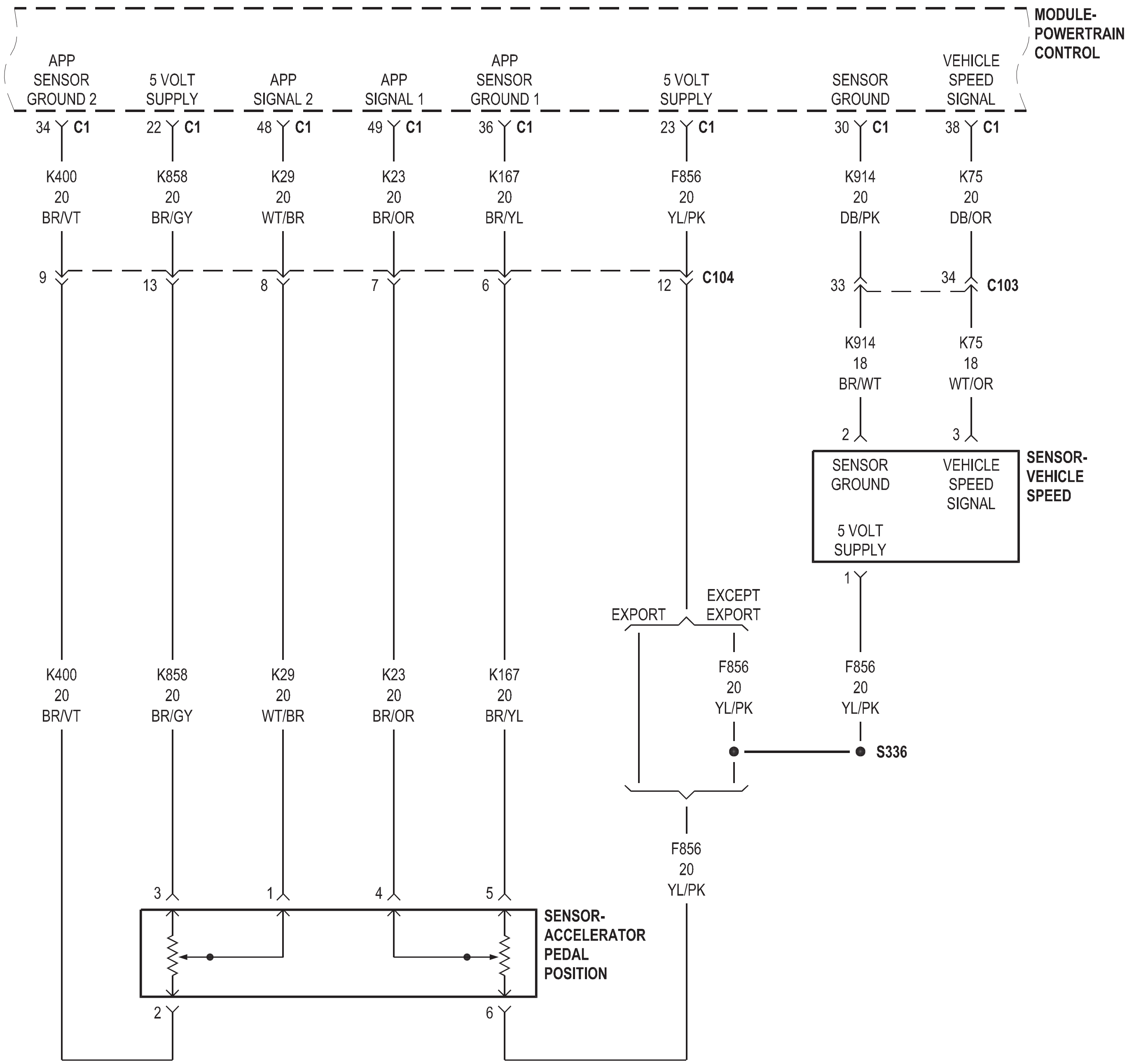

MODULE-
POWERTRAIN
CONTROL
5 VOLT
SUPPLY
MAP
SIGNAL
CMP 1/2
SIGNAL
41 C2
85 C2
38 C2
K1
20
VT/BR
K441
20
DB/BR
1
3
MAP
SIGNAL
5 VOLT
SUPPLY
SENSOR
GROUND
SENSOR-MAP
CMP 1/2
SIGNAL
5 VOLT
SUPPLY
SENSOR
GROUND
SENSOR-
CAMSHAFT 1/2
POSITION
3
2
1
2
F855
20
PK/YL
K857
20
BR/LG
K900
20
DB/DG
F855
20
PK/YL
K915
20
BR/WT
A
TO
S106
(8W-30-7)
B
TO
S107
(8W-30-8)
S102
F855
20
PK/YL
F855
20
PK/YL
3
1
5 VOLT
SUPPLY
THROTTLE
BODY
ETC
MOTOR (+)
TP SENSOR
GROUND
ETC
MOTOR (-)
TP SIGNAL 1
TP SIGNAL 2
5 VOLT
SUPPLY
CKP
SIGNAL
SENSOR
GROUND
SENSOR-
CRANKSHAFT
POSITION
1
2
4
5
6
3
2
K124
20
DB/GY
K922
20
BR/DB
K126
20
DB/LG
K22
20
BR/OR
K122
20
BR/DG
K24
20
BR/LB
K900
20
DB/DG
C
TO
S106
(8W-30-7)
1 C2
62 C2
25 C2
64 C2
63 C2
79 C2
ETC
MOTOR (+)
TP SENSOR
GROUND
ETC
MOTOR (-)
TP SIGNAL 1
TP SIGNAL 2
CKP
SIGNAL
MODULE-
POWERTRAIN
CONTROL

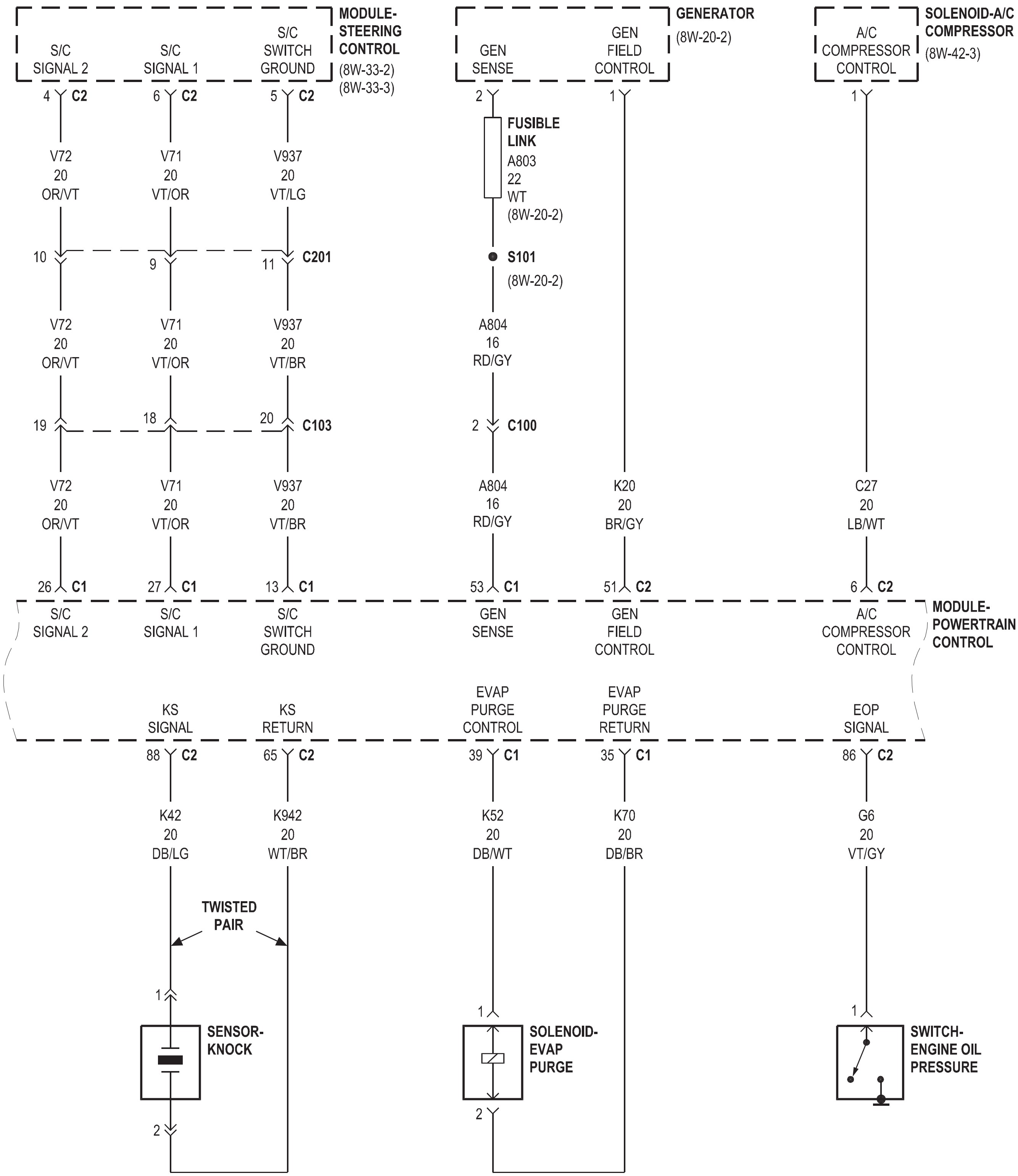


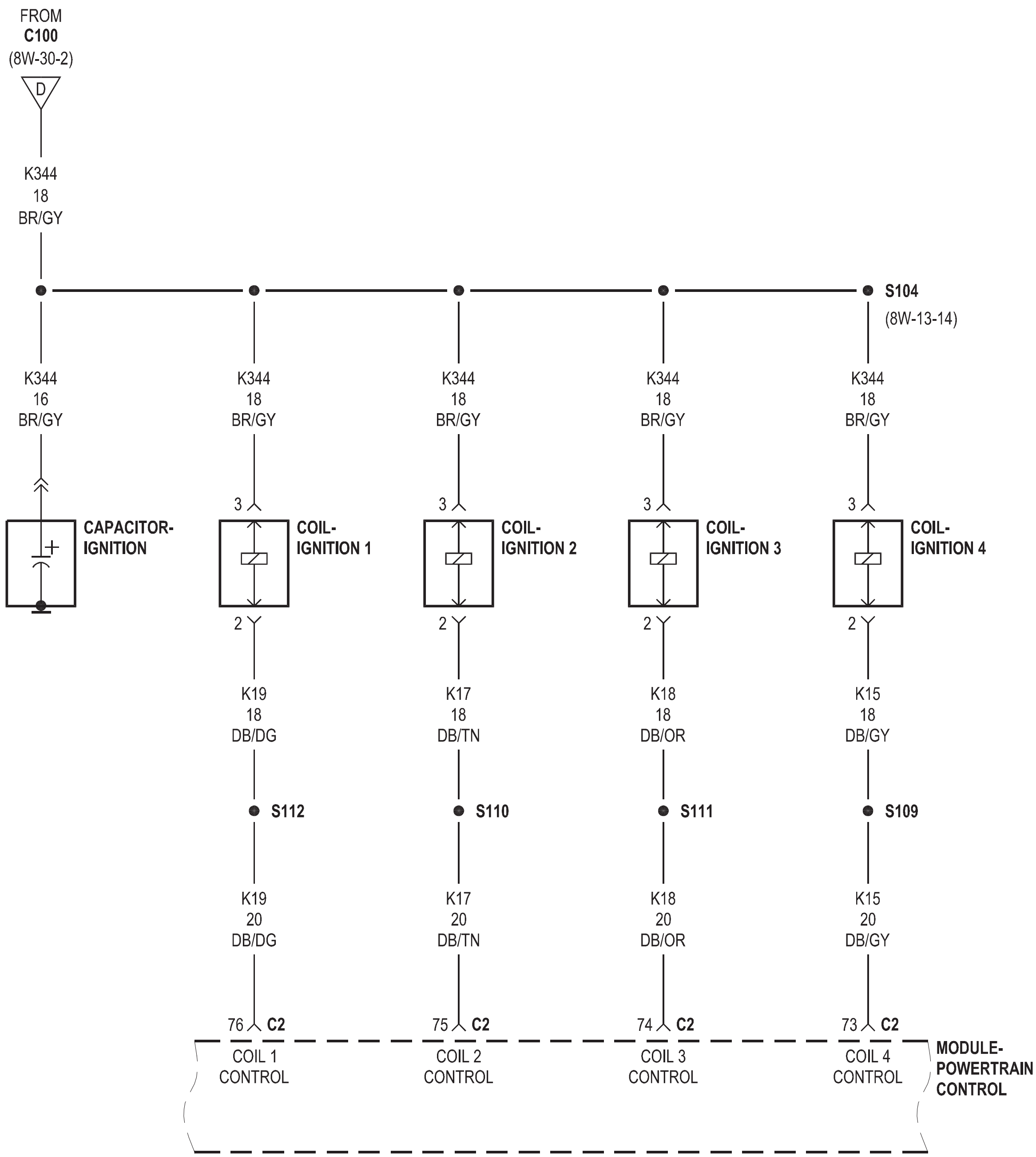
FROM
SENSOR-CRANKSHAFT POSITION
(8W-30-6)
C
FROM
SENSOR-MAP
(8W-30-6)
A
K900
20
DB/DG
K900
20
DB/DG
S106
K900
20
DB/DG
K900
20
DB/DG
2
SENSOR GROUND
5 VOLT SUPPLY
CMP 1/1 SIGNAL
SENSOR-CAMSHAFT 1/1 POSITION
1
SENSOR-ENGINE COOLANT TEMPERATURE 1
2
1
3
K857
20
BR/LG
S105
K900
20
DB/DG
K857
20
BR/LG
4
6
SENSOR GROUND
5 VOLT SUPPLY
VALVE-MANIFOLD FLOW
GROUND
MFV SIGNAL
MFV CONTROL
1
5
3
Z916
16
BK
K602
20
YL/DB
K601
20
BR/VT
K857
20
BR/LG
K44
20
DB/GY
K2
20
VT/OR
K900
20
DB/DG
S108
(8W-15-3)
Z916
16
BK
84 C2
27 C2
42 C2
57 C2
83 C2
82 C2
MFV SIGNAL
MFV CONTROL
5 VOLT SUPPLY
CMP 1/1 SIGNAL
ECT 1 SIGNAL
SENSOR GROUND
MODULE-POWERTRAIN CONTROL
3
C100
Z909
16
BK/WT
G110
(8W-15-3)

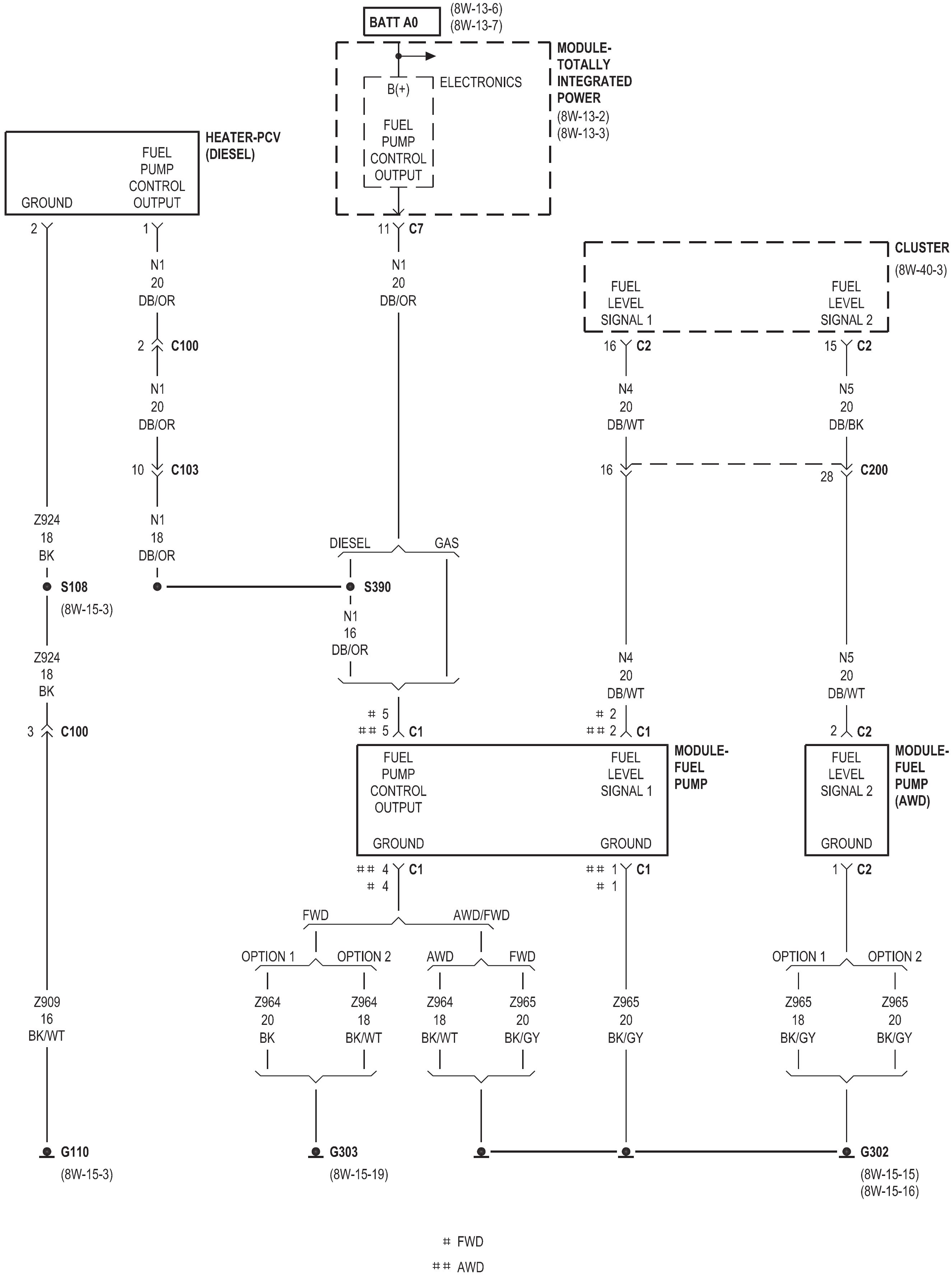

FROM
SENSOR-
CAMSHAFT 1/2
POSITION
(8W-30-6)
B
K915
20
BR/WT
S107
K915
20
BR/WT
K915
20
BR/WT
K915
20
BR/WT
2
1
2
SENSOR-
TRANSMISSION
RANGE
(8W-31-3)
START
ENABLE
SENSOR-
INTAKE AIR
TEMPERATURE
SENSOR-
ENGINE
COOLANT
TEMPERATURE 2
SENSOR-OIL
TEMPERATURE
10
1
2
1
F963
20
PK/DB
22
C103
F963
20
PK/DB
K21
20
BK/RD
K222
20
BR/YL
G24
20
VT/BR
K915
20
BR/WT
37
C1
8
C2
11
C2
37
C2
58
C2
START
ENABLE
IAT
SIGNAL
ECT 2
SIGNAL
EOT
SIGNAL
SENSOR
GROUND
MODULE-
POWERTRAIN
CONTROL

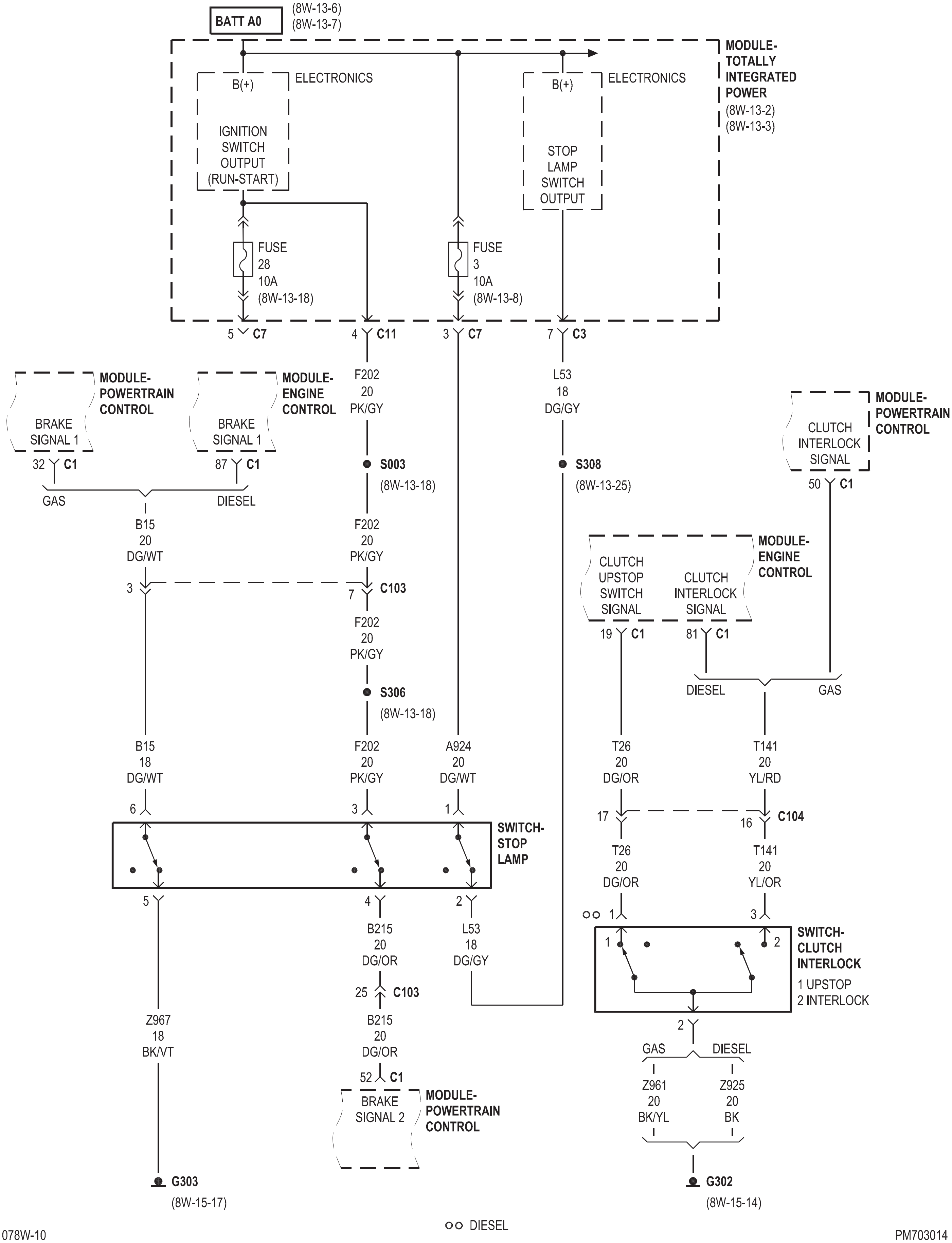

MODULE-
POWERTRAIN
CONTROL
O2 1/1
SIGNAL
O2 1/1
HEATER
CONTROL
O2 1/2
HEATER
CONTROL
O2 1/2
SIGNAL
33 C2
49 C2
7 C1
21 C1
K41
20
BK/DG
K99
20
BR/OR
K299
20
BR/RD
K141
20
DB/YL
4
2
2
4
SENSOR-
OXYGEN 1/1
SENSOR-
OXYGEN 1/2
1
3
3
1
Z916
18
BK
K902
20
BR/DG
K904
20
DB/DG
S108
(8W-15-3)
36 C2
20 C1
O2 1/1
RETURN
O2 1/2
RETURN
MODULE-
POWERTRAIN
CONTROL
Z916
16
BK
3 C100
Z909
16
BK/WT
Z924
18
BK/LB
G110
(8W-15-3)
G112
(8W-15-5)

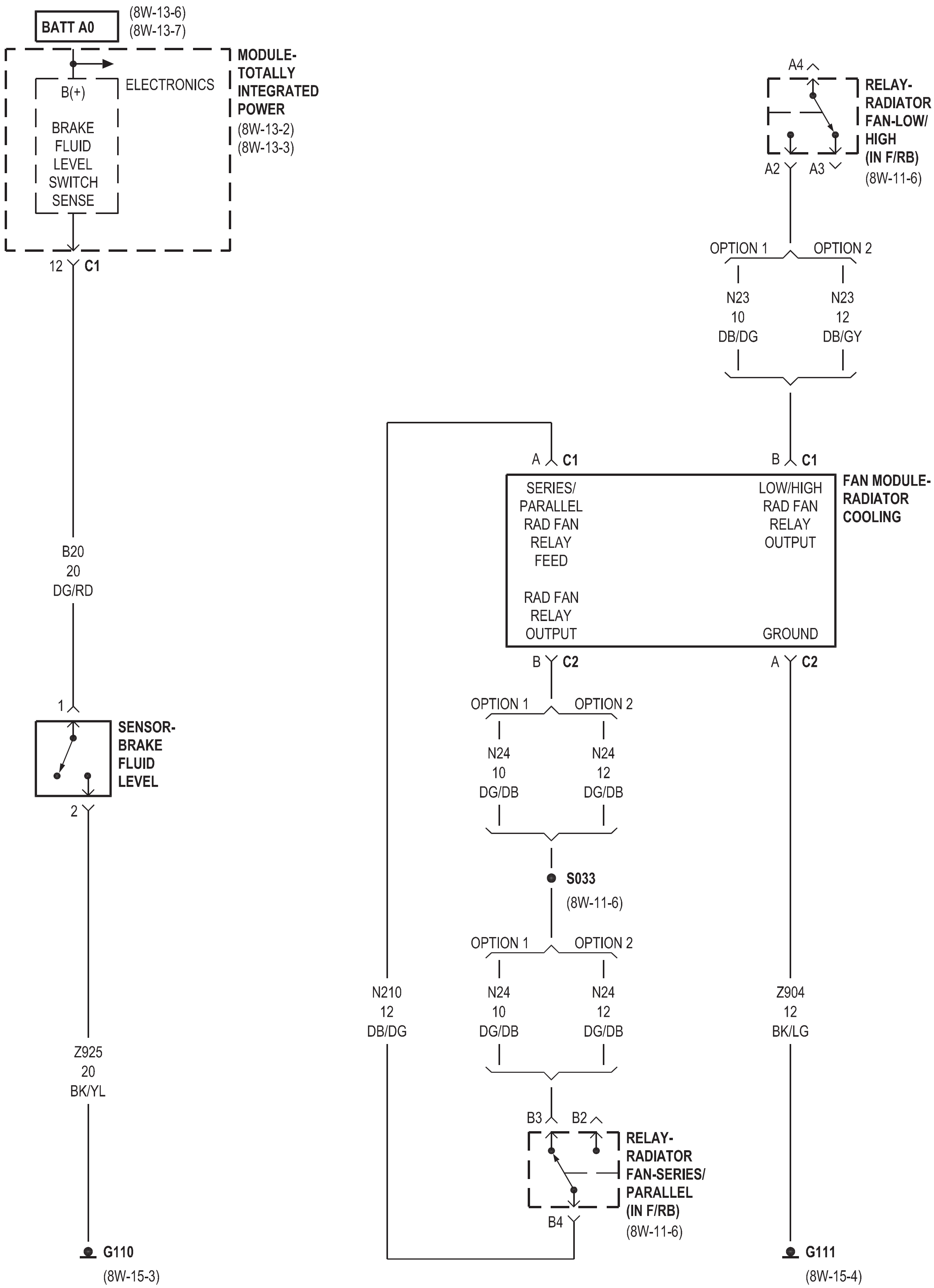

MODULE-POWERTRAIN CONTROL
APP SENSOR GROUND 2
5 VOLT SUPPLY
APP SIGNAL 2
APP SIGNAL 1
APP SENSOR GROUND 1
5 VOLT SUPPLY
SENSOR GROUND
VEHICLE SPEED SIGNAL
34 C1
22 C1
48 C1
49 C1
36 C1
23 C1
30 C1
38 C1
K400 20 BR/VT
K858 20 BR/GY
K29 20 WT/BR
K23 20 BR/OR
K167 20 BR/YL
F856 20 YL/PK
K914 20 DB/PK
K75 20 DB/OR
9
13
8
7
6
12
C104
33
34
C103
K914 18 BR/WT
K75 18 WT/OR
2
3
SENSOR GROUND
VEHICLE SPEED SIGNAL
5 VOLT SUPPLY
SENSOR-VEHICLE SPEED
1
EXPORT
EXCEPT EXPORT
F856 20 YL/PK
F856 20 YL/PK
S336
K400 20 BR/VT
K858 20 BR/GY
K29 20 WT/BR
K23 20 BR/OR
K167 20 BR/YL
F856 20 YL/PK
3
1
4
5
SENSOR-ACCELERATOR PEDAL POSITION
2
6


MODULE-STEERING CONTROL
(8W-33-2)
(8W-33-3)
S/C SIGNAL 2
S/C SIGNAL 1
S/C SWITCH GROUND
4 C2
6 C2
5 C2
V72 20 OR/VT
V71 20 VT/OR
V937 20 VT/LG
10
9
11
C201
V72 20 OR/VT
V71 20 VT/OR
V937 20 VT/BR
19
18
20
C103
V72 20 OR/VT
V71 20 VT/OR
V937 20 VT/BR
26 C1
27 C1
13 C1
GENERATOR
(8W-20-2)
GEN SENSE
GEN FIELD CONTROL
2
1
FUSIBLE LINK
A803 22 WT (8W-20-2)
S101
(8W-20-2)
A804 16 RD/GY
2 C100
A804 16 RD/GY
K20 20 BR/GY
53 C1
51 C2
SOLENOID-A/C COMPRESSOR
(8W-42-3)
A/C COMPRESSOR CONTROL
1
C27 20 LB/WT
6 C2
MODULE-POWERTRAIN CONTROL
S/C SIGNAL 2
S/C SIGNAL 1
S/C SWITCH GROUND
GEN SENSE
GEN FIELD CONTROL
A/C COMPRESSOR CONTROL
KS SIGNAL
KS RETURN
EVAP PURGE CONTROL
EVAP PURGE RETURN
EOP SIGNAL
88 C2
65 C2
39 C1
35 C1
86 C2
K42 20 DB/LG
K942 20 WT/BR
K52 20 DB/WT
K70 20 DB/BR
G6 20 VT/GY
TWISTED PAIR
1
SENSOR-KNOCK
2
1
SOLENOID-EVAP PURGE
2
1
SWITCH-ENGINE OIL PRESSURE

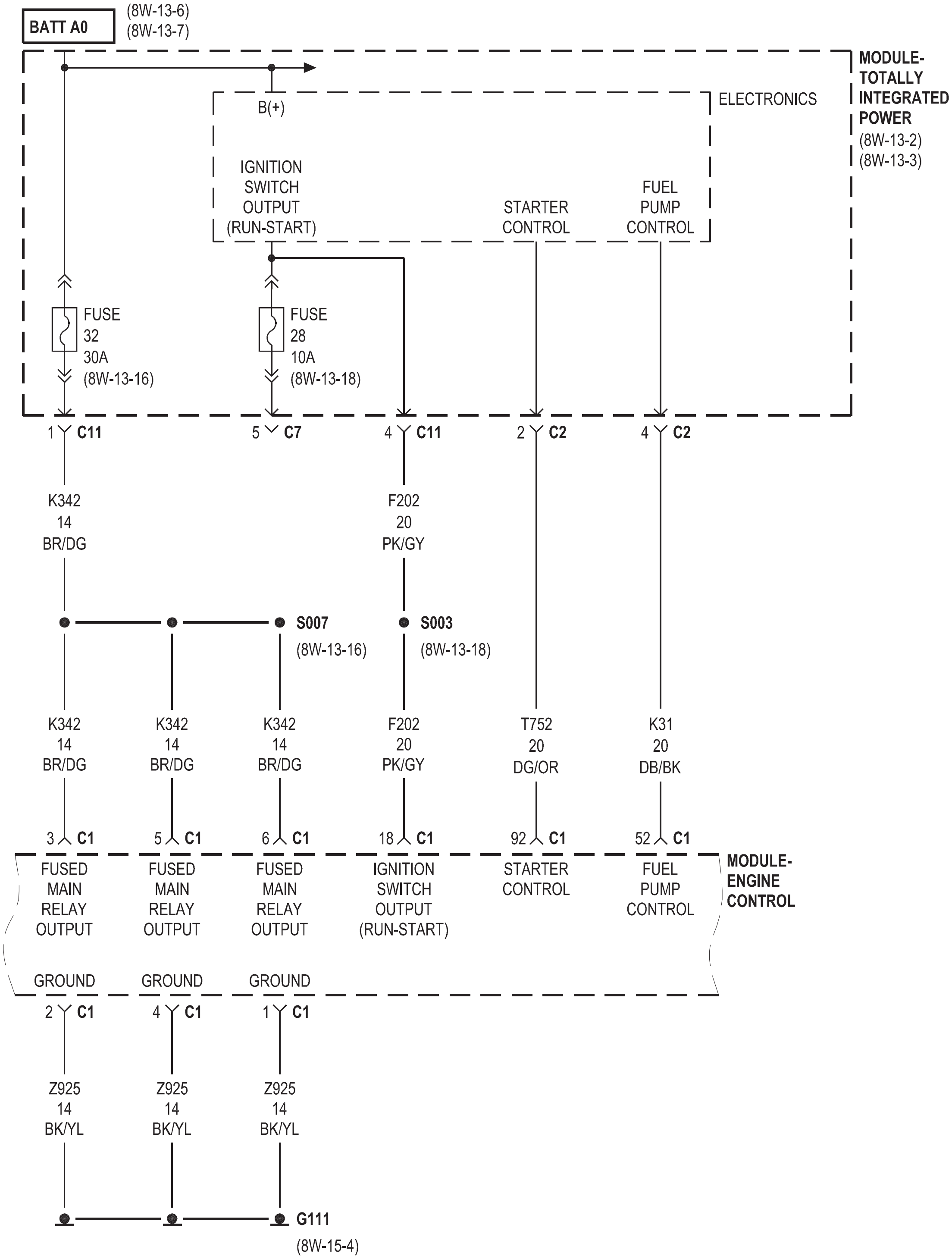

FROM
C100
(8W-30-2)
D
K344
18
BR/GY
S104
(8W-13-14)
K344
16
BR/GY
K344
18
BR/GY
K344
18
BR/GY
K344
18
BR/GY
K344
18
BR/GY
CAPACITOR-
IGNITION
3
COIL-
IGNITION 1
3
COIL-
IGNITION 2
3
COIL-
IGNITION 3
3
COIL-
IGNITION 4
2
2
2
2
K19
18
DB/DG
K17
18
DB/TN
K18
18
DB/OR
K15
18
DB/GY
S112
S110
S111
S109
K19
20
DB/DG
K17
20
DB/TN
K18
20
DB/OR
K15
20
DB/GY
76 C2
75 C2
74 C2
73 C2
COIL 1
CONTROL
COIL 2
CONTROL
COIL 3
CONTROL
COIL 4
CONTROL
MODULE-
POWERTRAIN
CONTROL

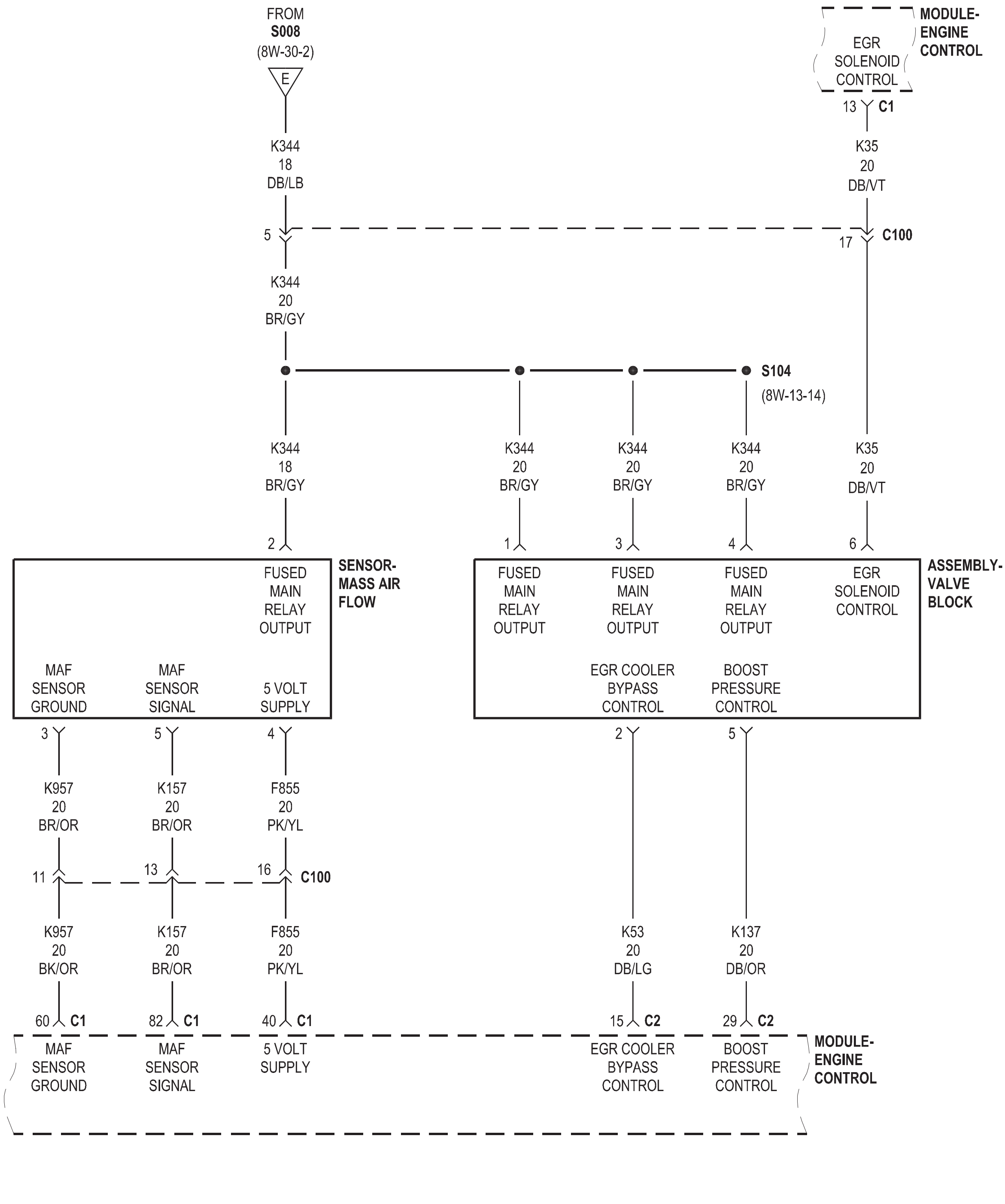

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
FUEL PUMP CONTROL OUTPUT
HEATER-PCV (DIESEL)
FUEL PUMP CONTROL OUTPUT
GROUND
2
1
11 C7
N1 20 DB/OR
N1 20 DB/OR
2 C100
N1 20 DB/OR
10 C103
CLUSTER
(8W-40-3)
FUEL LEVEL SIGNAL 1
FUEL LEVEL SIGNAL 2
16 C2
15 C2
N4 20 DB/WT
N5 20 DB/BK
16
28 C200
Z924 18 BK
N1 18 DB/OR
DIESEL
GAS
S108
(8W-15-3)
S390
N1 16 DB/OR
Z924 18 BK
N4 20 DB/WT
N5 20 DB/WT
3 C100
5
5 C1
2
2 C1
2 C2
MODULE-FUEL PUMP
FUEL PUMP CONTROL OUTPUT
FUEL LEVEL SIGNAL 1
GROUND
GROUND
MODULE-FUEL PUMP (AWD)
FUEL LEVEL SIGNAL 2
GROUND
4 C1
4
1 C1
1
1 C2
FWD
AWD/FWD
OPTION 1
OPTION 2
AWD
FWD
OPTION 1
OPTION 2
Z909 16 BK/WT
Z964 20 BK
Z964 18 BK/WT
Z964 18 BK/WT
Z965 20 BK/GY
Z965 20 BK/GY
Z965 18 BK/GY
Z965 20 BK/GY
G110
(8W-15-3)
G303
(8W-15-19)
G302
(8W-15-15)
(8W-15-16)
FWD
AWD


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (RUN-START)
STOP LAMP SWITCH OUTPUT
FUSE 28 10A (8W-13-18)
FUSE 3 10A (8W-13-8)
5 C7
4 C11
3 C7
7 C3
MODULE-POWERTRAIN CONTROL
BRAKE SIGNAL 1
32 C1
MODULE-ENGINE CONTROL
87 C1
GAS
DIESEL
F202 20 PK/GY
L53 18 DG/GY
S003 (8W-13-18)
S308 (8W-13-25)
MODULE-POWERTRAIN CONTROL
CLUTCH INTERLOCK SIGNAL
50 C1
B15 20 DG/WT
MODULE-ENGINE CONTROL
CLUTCH UPSTOP SWITCH SIGNAL
CLUTCH INTERLOCK SIGNAL
19 C1
81 C1
3
7 C103
S306 (8W-13-18)
B15 18 DG/WT
A924 20 DG/WT
T26 20 DG/OR
T141 20 YL/RD
6
3
1
SWITCH-STOP LAMP
17
16 C104
T141 20 YL/OR
5
4
2
B215 20 DG/OR
L53 18 DG/GY
25 C103
1 2
3
SWITCH-CLUTCH INTERLOCK
1 UPSTOP
2 INTERLOCK
Z967 18 BK/VT
52 C1
MODULE-POWERTRAIN CONTROL
BRAKE SIGNAL 2
Z961 20 BK/YL
Z925 20 BK
G303 (8W-15-17)
G302 (8W-15-14)
○○ DIESEL

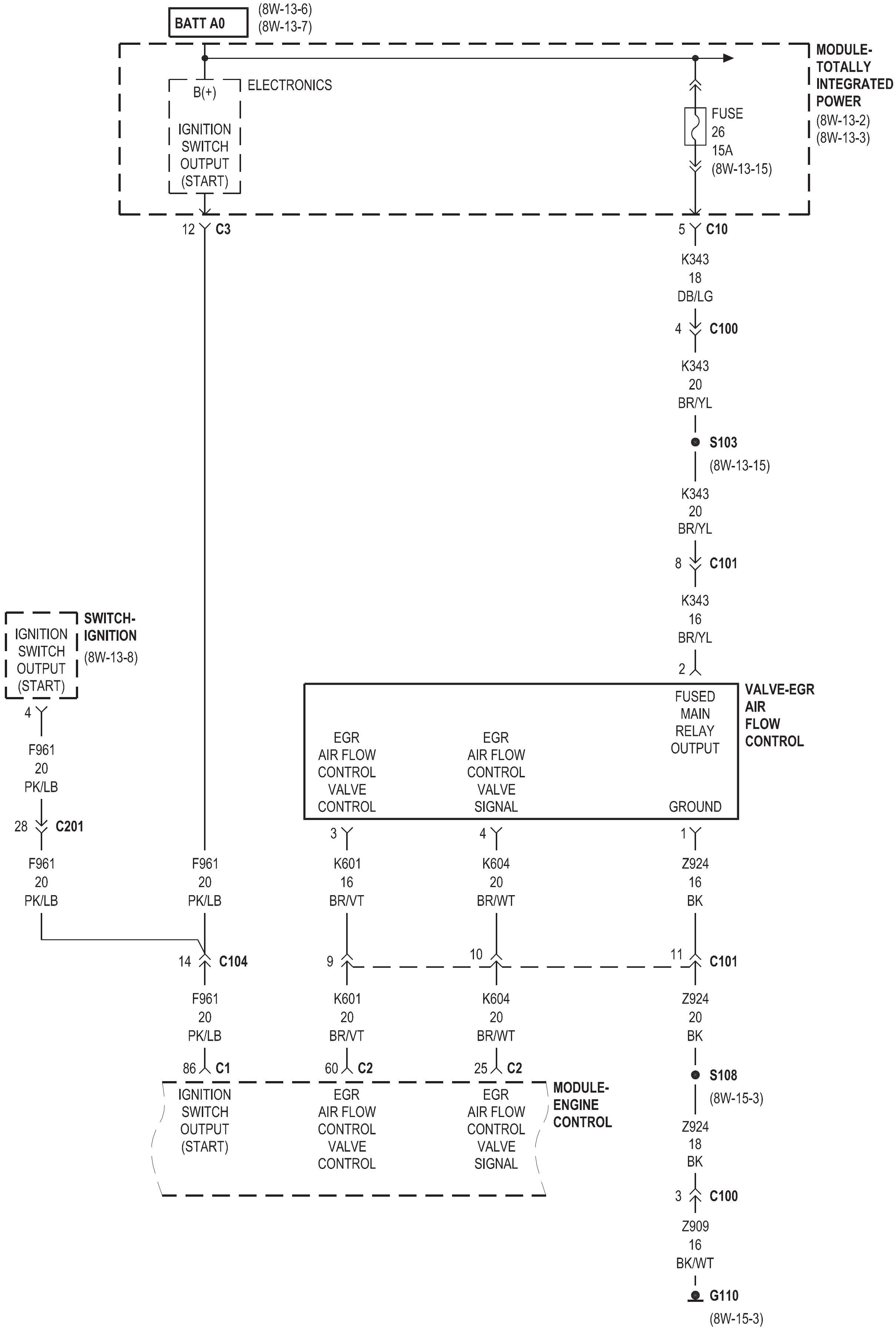

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
BRAKE
FLUID
LEVEL
SWITCH
SENSE
12 C1
B20
20
DG/RD
1
SENSOR-
BRAKE
FLUID
LEVEL
2
Z925
20
BK/YL
G110
(8W-15-3)
A4
RELAY-
RADIATOR
FAN-LOW/
HIGH
(IN F/RB)
(8W-11-6)
A2
A3
OPTION 1
OPTION 2
N23
10
DB/DG
N23
12
DB/GY
A C1
B C1
SERIES/
PARALLEL
RAD FAN
RELAY
FEED
LOW/HIGH
RAD FAN
RELAY
OUTPUT
FAN MODULE-
RADIATOR
COOLING
RAD FAN
RELAY
OUTPUT
GROUND
B C2
A C2
OPTION 1
OPTION 2
N24
10
DG/DB
N24
12
DG/DB
S033
(8W-11-6)
OPTION 1
OPTION 2
N210
12
DB/DG
N24
10
DG/DB
N24
12
DG/DB
Z904
12
BK/LG
B3
B2
RELAY-
RADIATOR
FAN-SERIES/
PARALLEL
(IN F/RB)
(8W-11-6)
B4
G111
(8W-15-4)

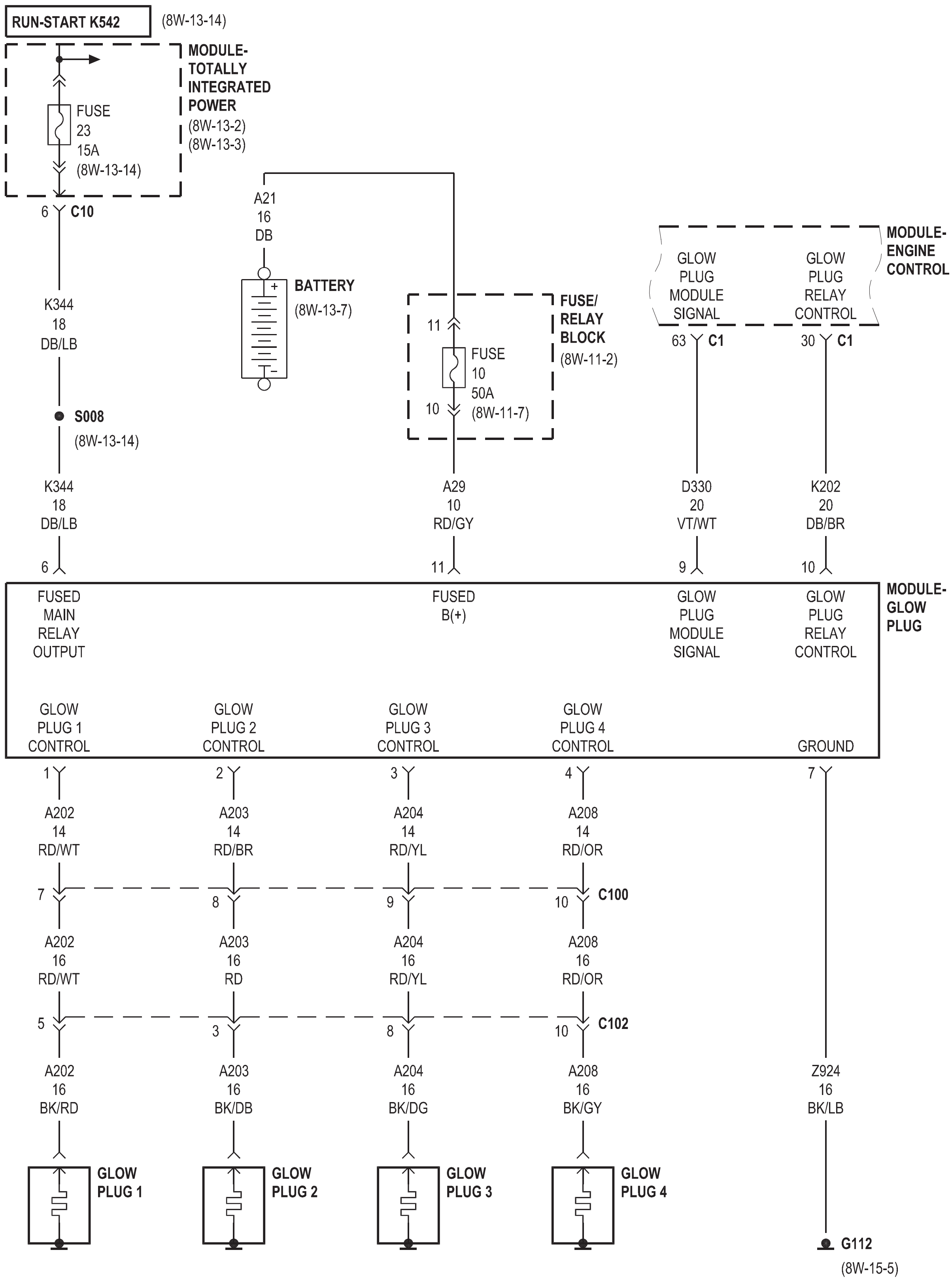
DIESEL

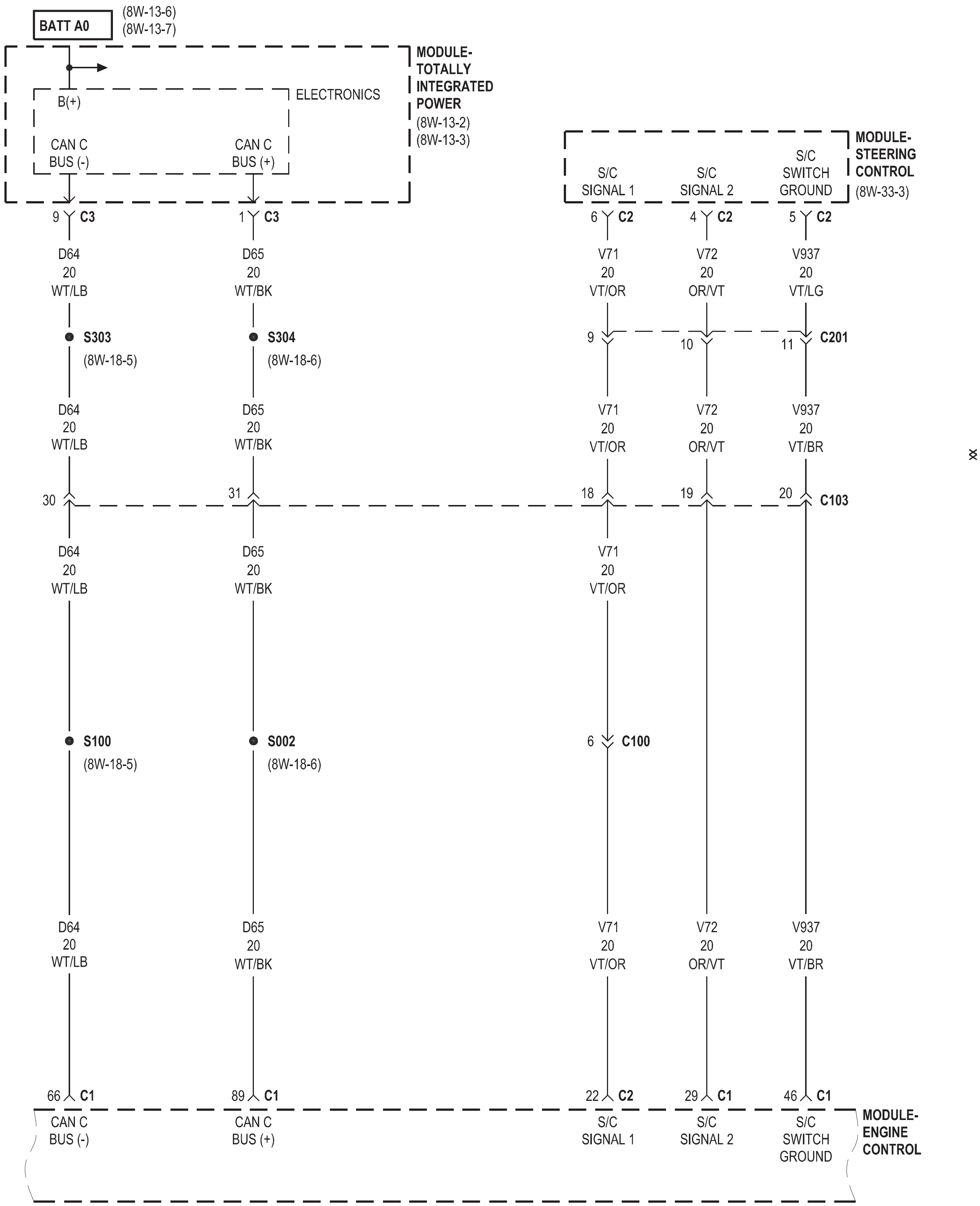

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION
SWITCH
OUTPUT
(RUN-START)
STARTER
CONTROL
FUEL
PUMP
CONTROL
FUSE
32
30A
(8W-13-16)
FUSE
28
10A
(8W-13-18)
1 C11
5 C7
4 C11
2 C2
4 C2
K342
14
BR/DG
F202
20
PK/GY
S007
(8W-13-16)
S003
(8W-13-18)
K342
14
BR/DG
K342
14
BR/DG
K342
14
BR/DG
F202
20
PK/GY
T752
20
DG/OR
K31
20
DB/BK
3 C1
5 C1
6 C1
18 C1
92 C1
52 C1
MODULE-
ENGINE
CONTROL
FUSED
MAIN
RELAY
OUTPUT
FUSED
MAIN
RELAY
OUTPUT
FUSED
MAIN
RELAY
OUTPUT
IGNITION
SWITCH
OUTPUT
(RUN-START)
STARTER
CONTROL
FUEL
PUMP
CONTROL
GROUND
GROUND
GROUND
2 C1
4 C1
1 C1
Z925
14
BK/YL
Z925
14
BK/YL
Z925
14
BK/YL
G111
(8W-15-4)


FROM
S008
(8W-30-2)
E
K344
18
DB/LB
5
K344
20
BR/GY
MODULE-
ENGINE
CONTROL
EGR
SOLENOID
CONTROL
13 C1
K35
20
DB/VT
17 C100
S104
(8W-13-14)
K344
18
BR/GY
K344
20
BR/GY
K344
20
BR/GY
K344
20
BR/GY
K35
20
DB/VT
2
1
3
4
6
FUSED
MAIN
RELAY
OUTPUT
SENSOR-
MASS AIR
FLOW
MAF
SENSOR
GROUND
MAF
SENSOR
SIGNAL
5 VOLT
SUPPLY
FUSED
MAIN
RELAY
OUTPUT
FUSED
MAIN
RELAY
OUTPUT
FUSED
MAIN
RELAY
OUTPUT
EGR
SOLENOID
CONTROL
ASSEMBLY-
VALVE
BLOCK
EGR COOLER
BYPASS
CONTROL
BOOST
PRESSURE
CONTROL
3
5
4
2
5
K957
20
BR/OR
K157
20
BR/OR
F855
20
PK/YL
11
13
16
C100
K957
20
BK/OR
K157
20
BR/OR
F855
20
PK/YL
K53
20
DB/LG
K137
20
DB/OR
60 C1
82 C1
40 C1
15 C2
29 C2
MAF
SENSOR
GROUND
MAF
SENSOR
SIGNAL
5 VOLT
SUPPLY
EGR COOLER
BYPASS
CONTROL
BOOST
PRESSURE
CONTROL
MODULE-
ENGINE
CONTROL

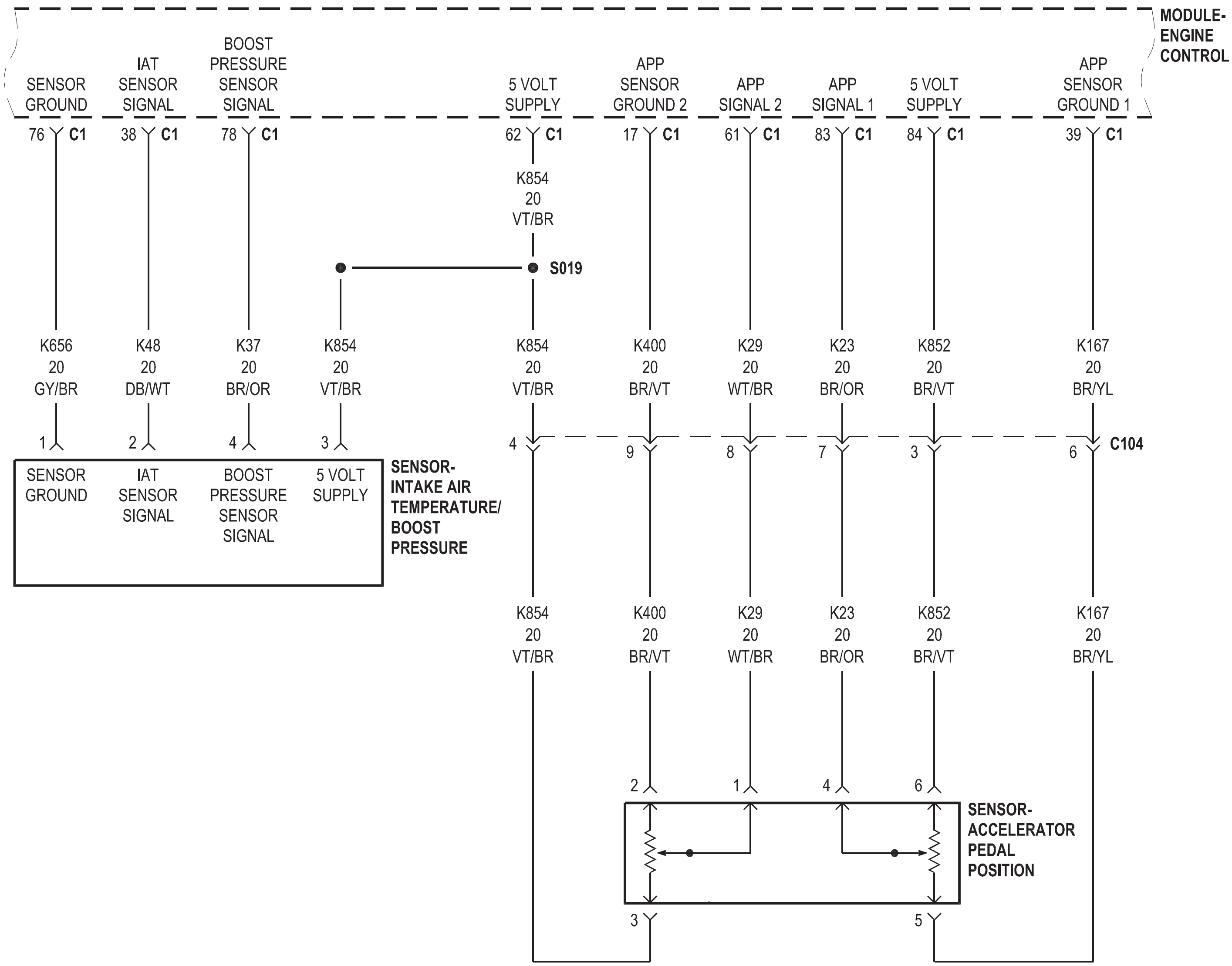
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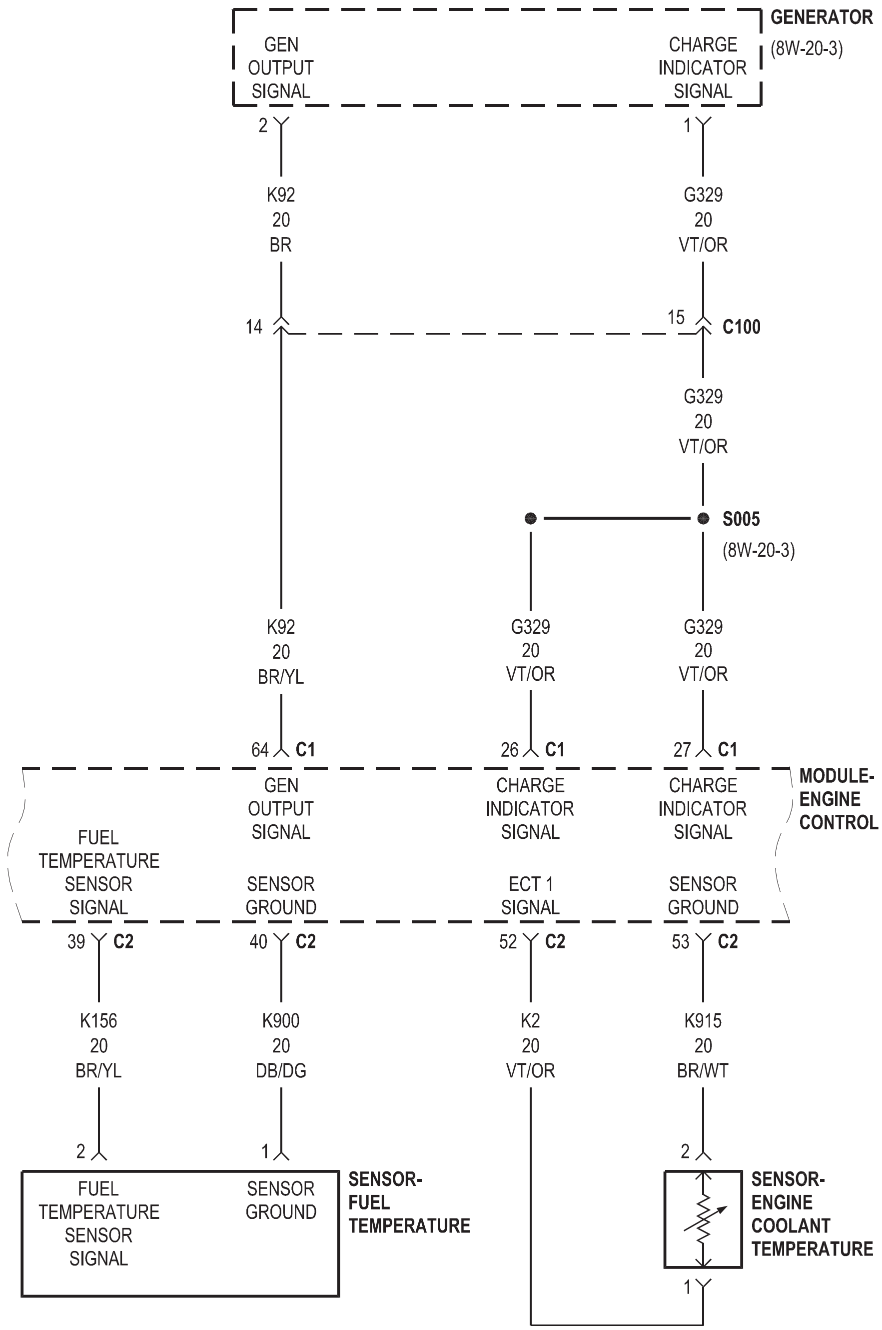

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (START)
FUSE 26 15A (8W-13-15)
12 C3
5 C10
K343 18 DB/LG
4 C100
K343 20 BR/YL
S103
(8W-13-15)
K343 20 BR/YL
8 C101
K343 16 BR/YL
2
SWITCH-IGNITION
(8W-13-8)
IGNITION SWITCH OUTPUT (START)
4
F961 20 PK/LB
28 C201
F961 20 PK/LB
VALVE-EGR AIR FLOW CONTROL
EGR AIR FLOW CONTROL VALVE CONTROL
EGR AIR FLOW CONTROL VALVE SIGNAL
FUSED MAIN RELAY OUTPUT
GROUND
3
4
1
F961 20 PK/LB
K601 16 BR/VT
K604 20 BR/WT
Z924 16 BK
14 C104
9
10
11 C101
F961 20 PK/LB
K601 20 BR/VT
K604 20 BR/WT
Z924 20 BK
86 C1
60 C2
25 C2
S108
(8W-15-3)
MODULE-ENGINE CONTROL
IGNITION SWITCH OUTPUT (START)
EGR AIR FLOW CONTROL VALVE CONTROL
EGR AIR FLOW CONTROL VALVE SIGNAL
Z924 18 BK
3 C100
Z909 16 BK/WT
G110
(8W-15-3)

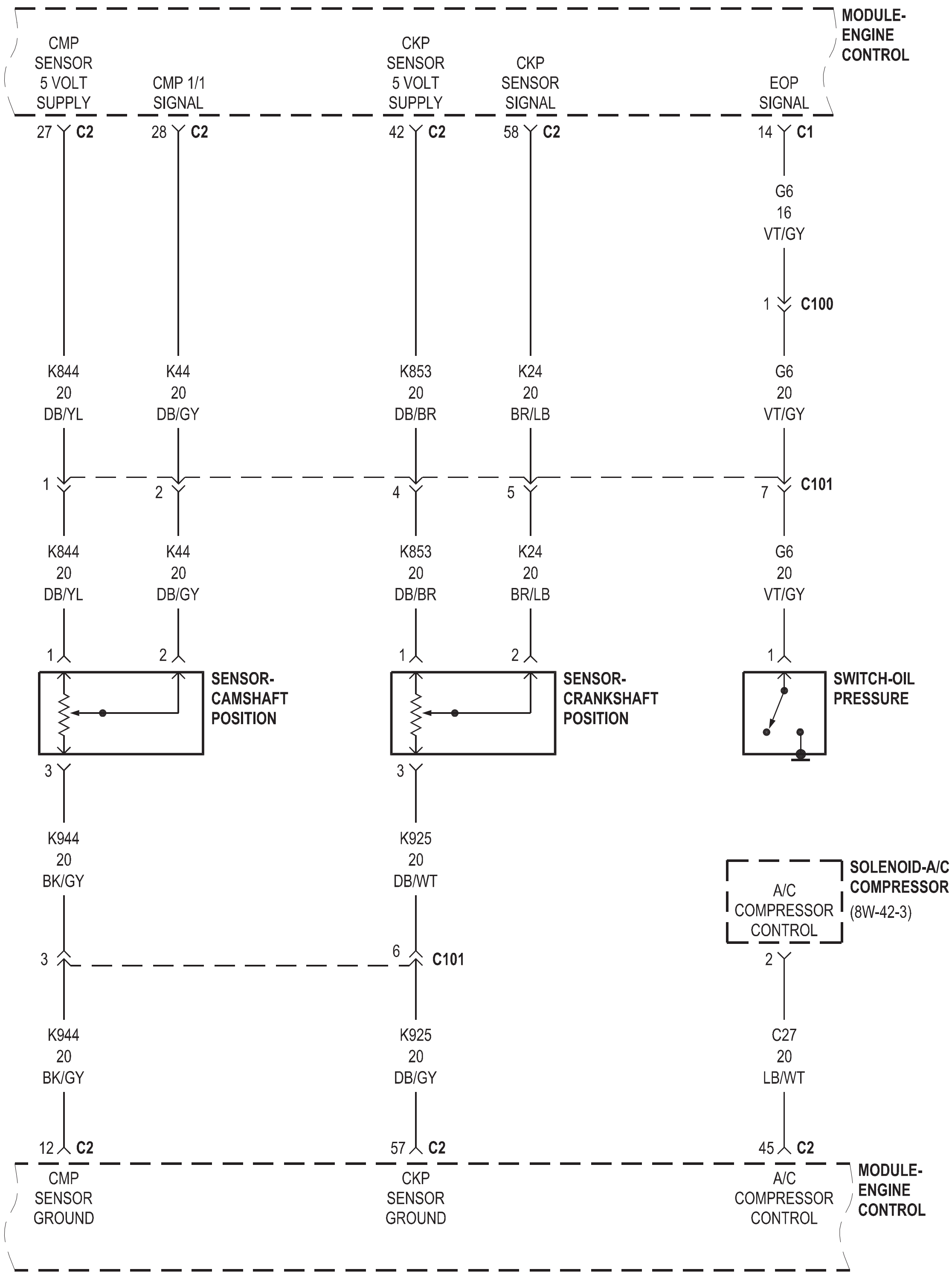

RUN-START K542
(8W-13-14)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
23
15A
(8W-13-14)
6 C10
K344
18
DB/LB
S008
(8W-13-14)
K344
18
DB/LB
A21
16
DB
BATTERY
(8W-13-7)
FUSE/
RELAY
BLOCK
(8W-11-2)
11
FUSE
10
50A
(8W-11-7)
10
A29
10
RD/GY
MODULE-
ENGINE
CONTROL
GLOW
PLUG
MODULE
SIGNAL
GLOW
PLUG
RELAY
CONTROL
63 C1
30 C1
D330
20
VT/WT
K202
20
DB/BR
6
11
9
10
MODULE-
GLOW
PLUG
FUSED
MAIN
RELAY
OUTPUT
FUSED
B(+)
GLOW
PLUG
MODULE
SIGNAL
GLOW
PLUG
RELAY
CONTROL
GLOW
PLUG 1
CONTROL
GLOW
PLUG 2
CONTROL
GLOW
PLUG 3
CONTROL
GLOW
PLUG 4
CONTROL
GROUND
1
2
3
4
7
A202
14
RD/WT
A203
14
RD/BR
A204
14
RD/YL
A208
14
RD/OR
7
8
9
10
C100
A202
16
RD/WT
A203
16
RD
A204
16
RD/YL
A208
16
RD/OR
5
3
8
10
C102
A202
16
BK/RD
A203
16
BK/DB
A204
16
BK/DG
A208
16
BK/GY
Z924
16
BK/LB
GLOW
PLUG 1
GLOW
PLUG 2
GLOW
PLUG 3
GLOW
PLUG 4
G112
(8W-15-5)

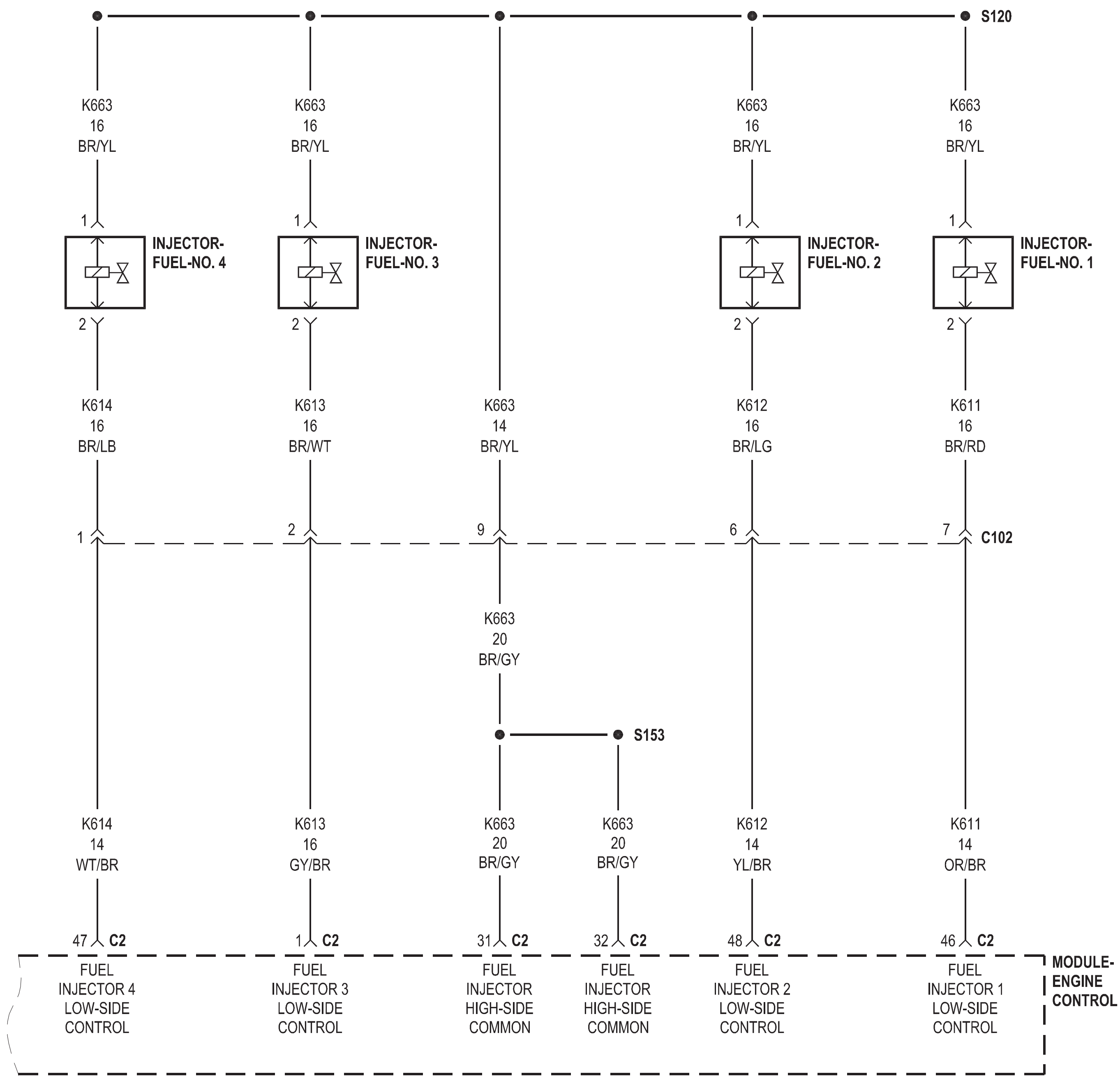


NOTE: D64, D65 CIRCUITS ARE TWISTED PAIR

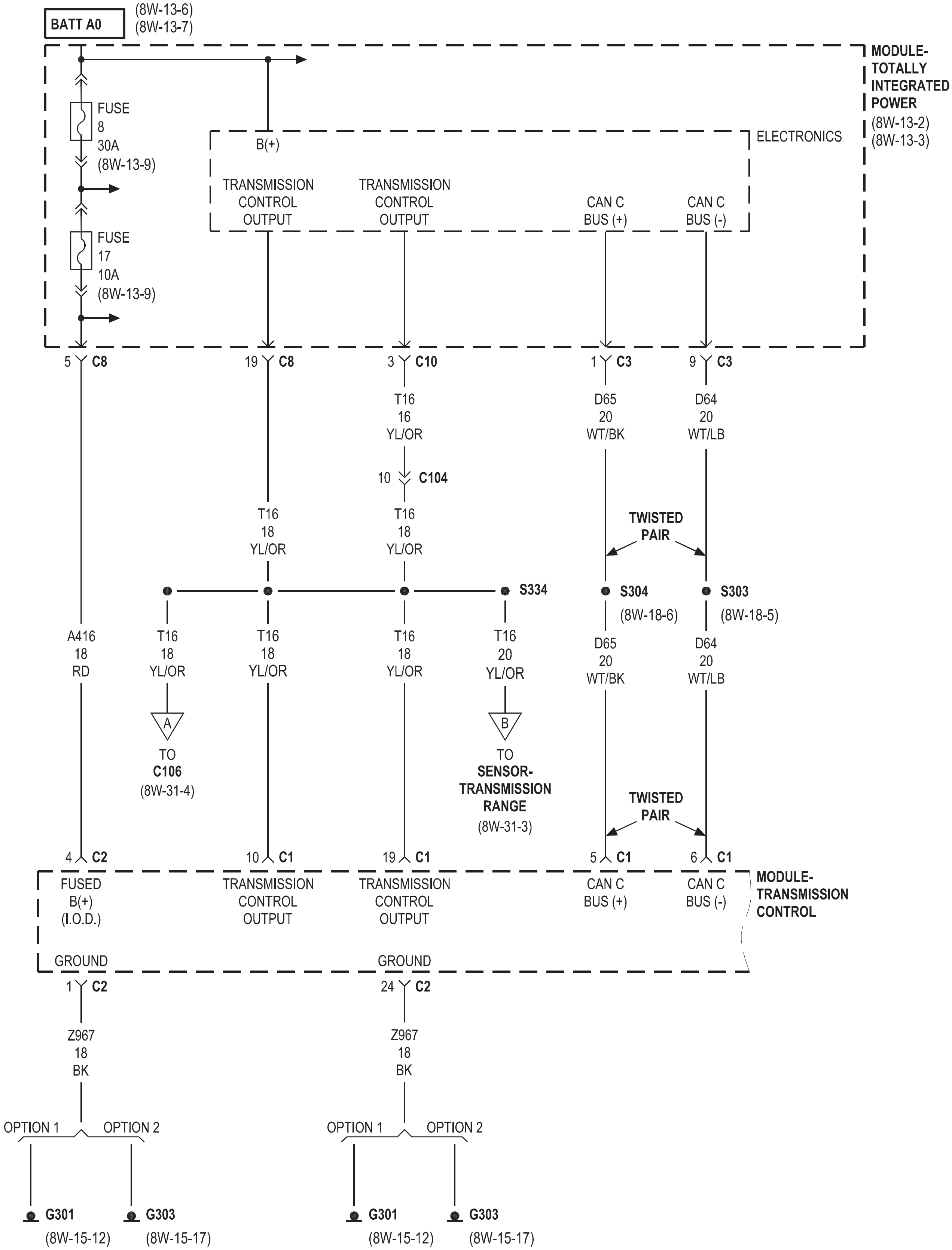

MODULE-ENGINE CONTROL
SENSOR GROUND
IAT SENSOR SIGNAL
BOOST PRESSURE SENSOR SIGNAL
5 VOLT SUPPLY
APP SENSOR GROUND 2
APP SIGNAL 2
APP SIGNAL 1
5 VOLT SUPPLY
APP SENSOR GROUND 1
76 C1
38 C1
78 C1
62 C1
17 C1
61 C1
83 C1
84 C1
39 C1
K854 20 VT/BR
S019
K656 20 GY/BR
K48 20 DB/WT
K37 20 BR/OR
K854 20 VT/BR
K854 20 VT/BR
K400 20 BR/VT
K29 20 WT/BR
K23 20 BR/OR
K852 20 BR/VT
K167 20 BR/YL
C104
SENSOR GROUND
IAT SENSOR SIGNAL
BOOST PRESSURE SENSOR SIGNAL
5 VOLT SUPPLY
SENSOR-INTAKE AIR TEMPERATURE/BOOST PRESSURE
K854 20 VT/BR
K400 20 BR/VT
K29 20 WT/BR
K23 20 BR/OR
K852 20 BR/VT
K167 20 BR/YL
SENSOR-ACCELERATOR PEDAL POSITION

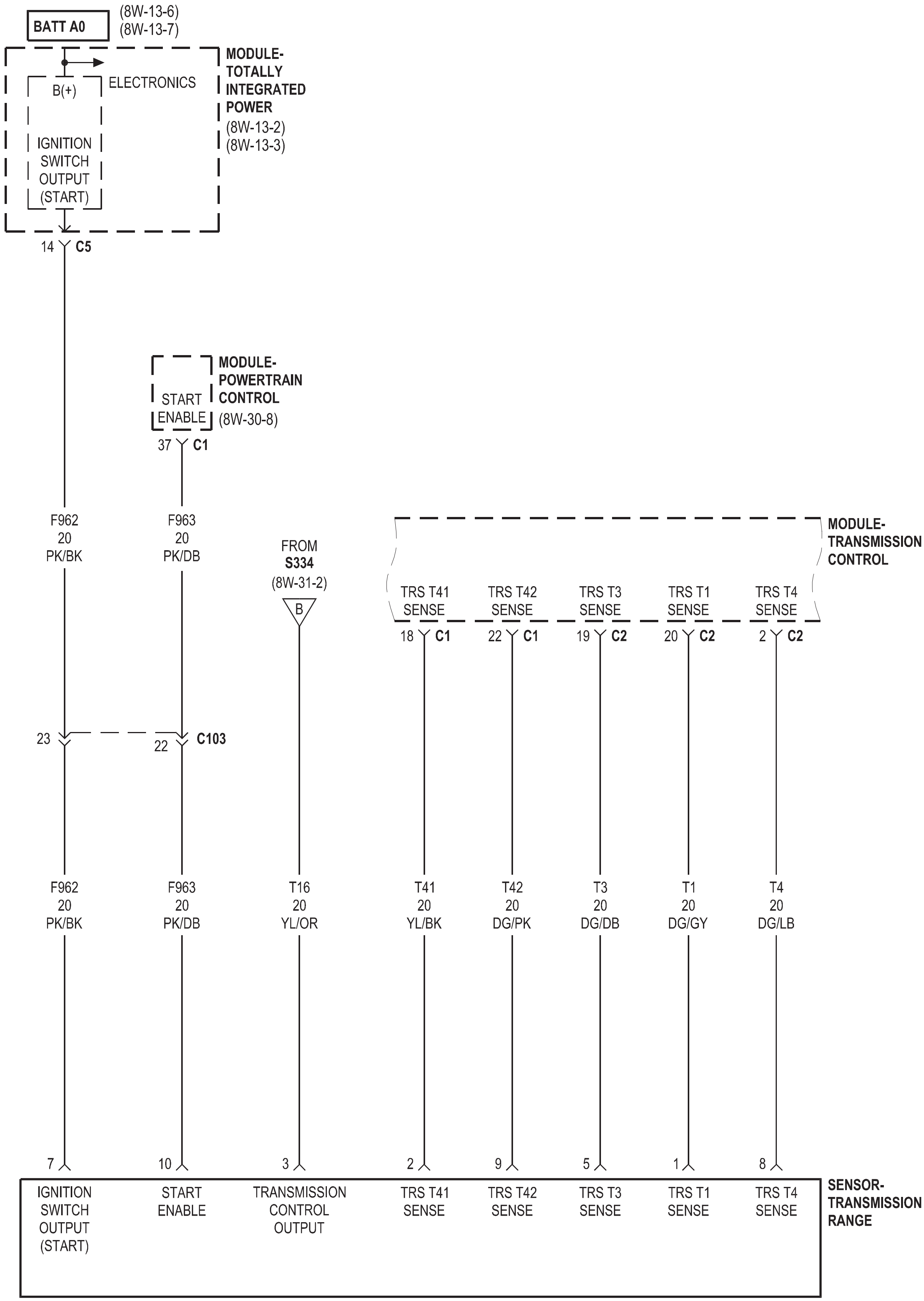

GENERATOR
(8W-20-3)
GEN OUTPUT SIGNAL
CHARGE INDICATOR SIGNAL
2
1
K92 20 BR
G329 20 VT/OR
14
15
C100
G329 20 VT/OR
S005
(8W-20-3)
K92 20 BR/YL
G329 20 VT/OR
G329 20 VT/OR
64 C1
26 C1
27 C1
MODULE-ENGINE CONTROL
GEN OUTPUT SIGNAL
CHARGE INDICATOR SIGNAL
CHARGE INDICATOR SIGNAL
FUEL TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
ECT 1 SIGNAL
SENSOR GROUND
39 C2
40 C2
52 C2
53 C2
K156 20 BR/YL
K900 20 DB/DG
K2 20 VT/OR
K915 20 BR/WT
2
1
2
FUEL TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
SENSOR-FUEL TEMPERATURE
SENSOR-ENGINE COOLANT TEMPERATURE
1

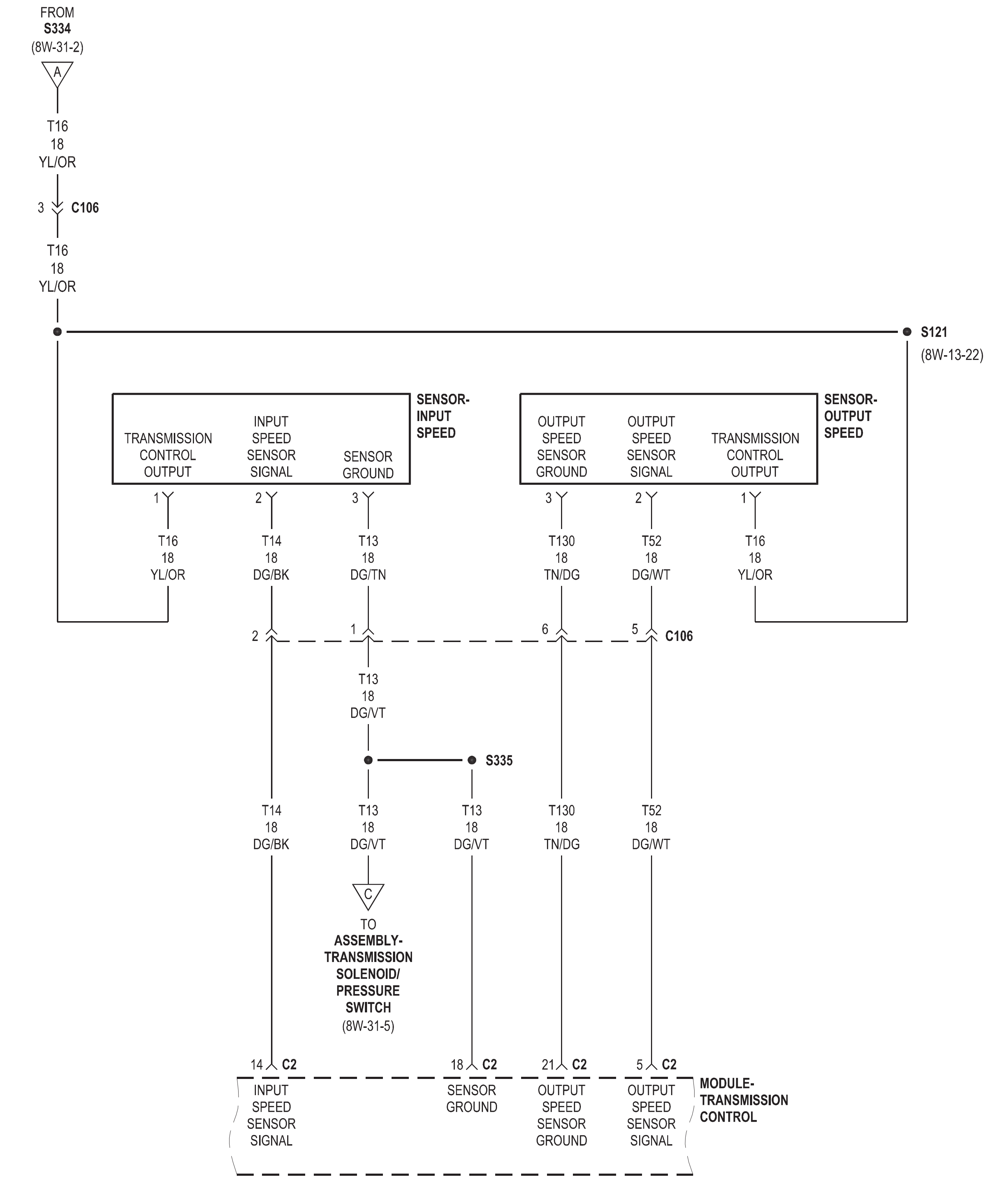

MODULE-ENGINE CONTROL
CMP SENSOR 5 VOLT SUPPLY
CMP 1/1 SIGNAL
CKP SENSOR 5 VOLT SUPPLY
CKP SENSOR SIGNAL
EOP SIGNAL
27 C2
28 C2
42 C2
58 C2
14 C1
G6 16 VT/GY
1 C100
K844 20 DB/YL
K44 20 DB/GY
K853 20 DB/BR
K24 20 BR/LB
G6 20 VT/GY
C101
SENSOR-CAMSHAFT POSITION
SENSOR-CRANKSHAFT POSITION
SWITCH-OIL PRESSURE
K944 20 BK/GY
K925 20 DB/WT
SOLENOID-A/C COMPRESSOR
(8W-42-3)
A/C COMPRESSOR CONTROL
C101
K944 20 BK/GY
K925 20 DB/GY
C27 20 LB/WT
12 C2
57 C2
45 C2
CMP SENSOR GROUND
CKP SENSOR GROUND
A/C COMPRESSOR CONTROL
MODULE-ENGINE CONTROL

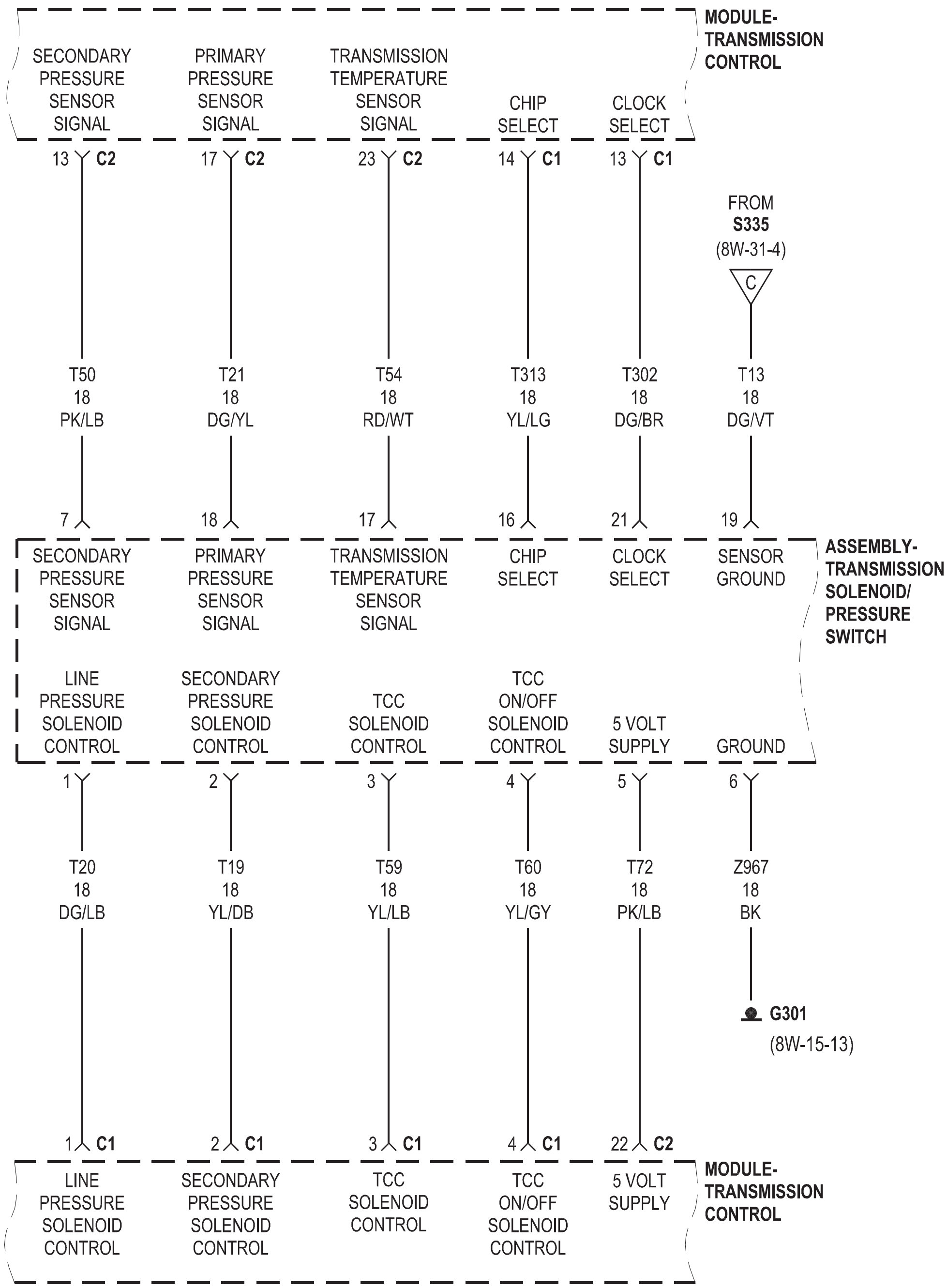

S120
K663
16
BR/YL
K663
16
BR/YL
K663
16
BR/YL
K663
16
BR/YL
INJECTOR-FUEL-NO. 4
INJECTOR-FUEL-NO. 3
INJECTOR-FUEL-NO. 2
INJECTOR-FUEL-NO. 1
K614
16
BR/LB
K613
16
BR/WT
K663
14
BR/YL
K612
16
BR/LG
K611
16
BR/RD
C102
K663
20
BR/GY
S153
K614
14
WT/BR
K613
16
GY/BR
K663
20
BR/GY
K663
20
BR/GY
K612
14
YL/BR
K611
14
OR/BR
47 C2
1 C2
31 C2
32 C2
48 C2
46 C2
FUEL INJECTOR 4 LOW-SIDE CONTROL
FUEL INJECTOR 3 LOW-SIDE CONTROL
FUEL INJECTOR HIGH-SIDE COMMON
FUEL INJECTOR HIGH-SIDE COMMON
FUEL INJECTOR 2 LOW-SIDE CONTROL
FUEL INJECTOR 1 LOW-SIDE CONTROL
MODULE-ENGINE CONTROL

8W-31 TRANSMISSION CONTROL SYSTEM

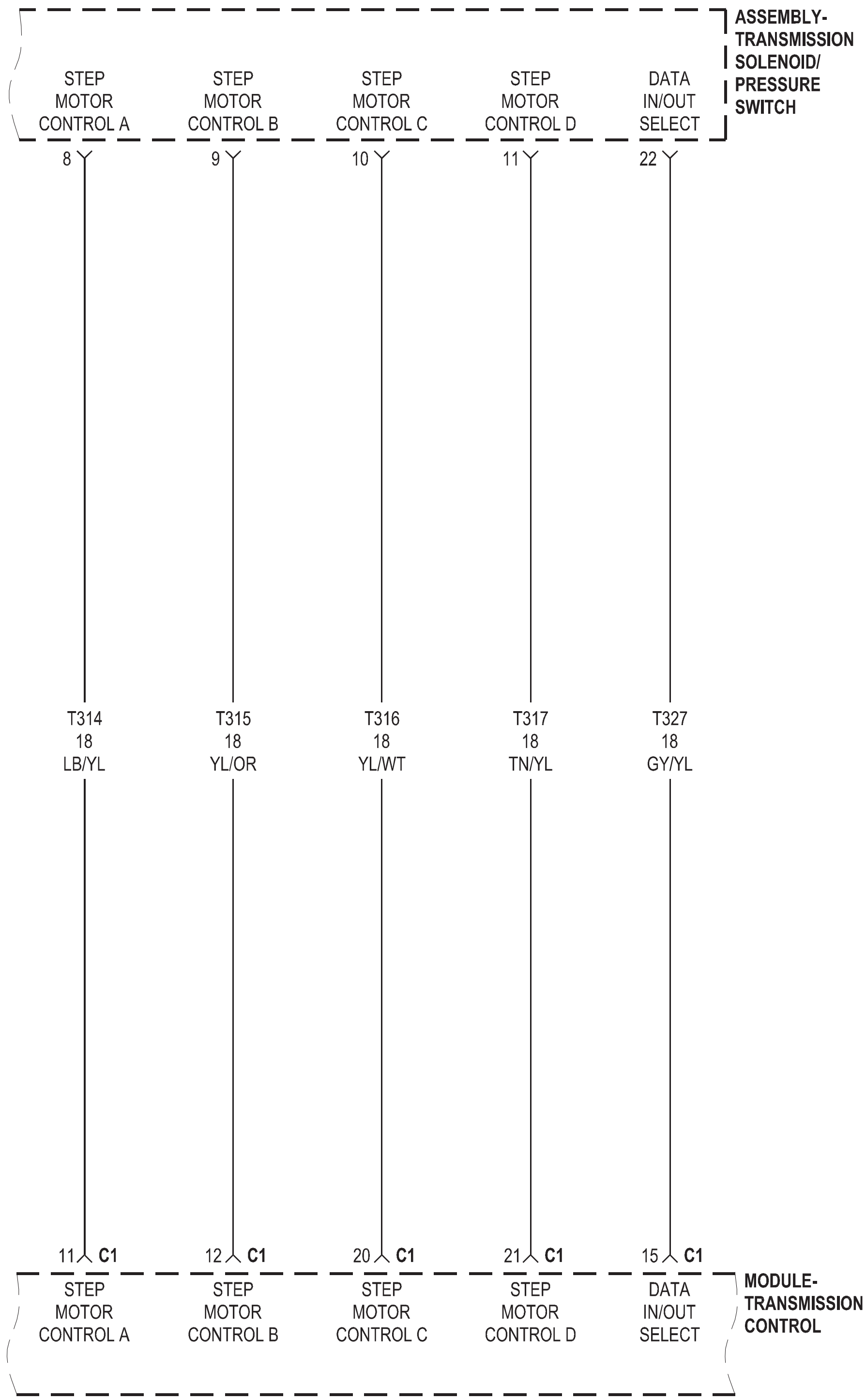

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
8
30A
(8W-13-9)
FUSE
17
10A
(8W-13-9)
ELECTRONICS
B(+)
TRANSMISSION
CONTROL
OUTPUT
TRANSMISSION
CONTROL
OUTPUT
CAN C
BUS (+)
CAN C
BUS (-)
5 C8
19 C8
3 C10
1 C3
9 C3
T16
16
YL/OR
D65
20
WT/BK
D64
20
WT/LB
10 C104
T16
18
YL/OR
T16
18
YL/OR
TWISTED
PAIR
S334
S304
(8W-18-6)
S303
(8W-18-5)
A416
18
RD
T16
18
YL/OR
T16
18
YL/OR
T16
18
YL/OR
T16
20
YL/OR
D65
20
WT/BK
D64
20
WT/LB
A
TO
C106
(8W-31-4)
B
TO
SENSOR-
TRANSMISSION
RANGE
(8W-31-3)
TWISTED
PAIR
4 C2
10 C1
19 C1
5 C1
6 C1
FUSED
B(+)
(I.O.D.)
TRANSMISSION
CONTROL
OUTPUT
TRANSMISSION
CONTROL
OUTPUT
CAN C
BUS (+)
CAN C
BUS (-)
MODULE-
TRANSMISSION
CONTROL
GROUND
GROUND
1 C2
24 C2
Z967
18
BK
Z967
18
BK
OPTION 1
OPTION 2
OPTION 1
OPTION 2
G301
(8W-15-12)
G303
(8W-15-17)
G301
(8W-15-12)
G303
(8W-15-17)

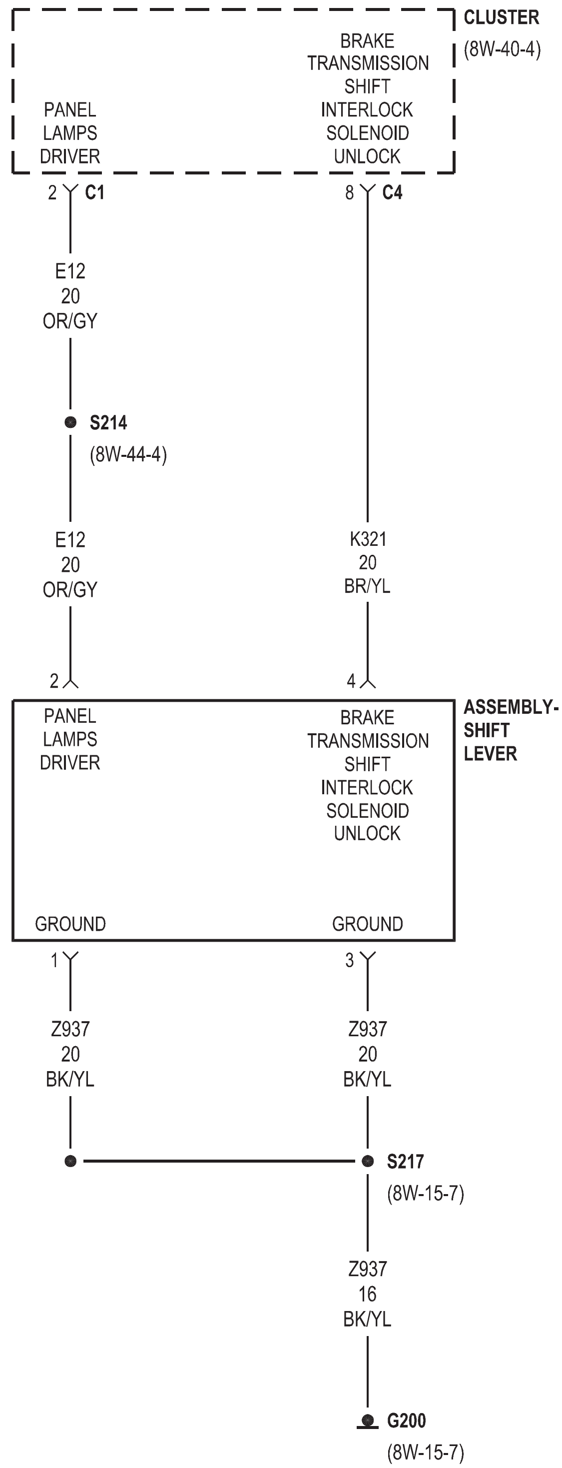

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (START)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
14 C5
START ENABLE
MODULE-POWERTRAIN CONTROL
(8W-30-8)
37 C1
F962 20 PK/BK
F963 20 PK/DB
FROM S334 (8W-31-2)
B
MODULE-TRANSMISSION CONTROL
TRS T41 SENSE
TRS T42 SENSE
TRS T3 SENSE
TRS T1 SENSE
TRS T4 SENSE
18 C1
22 C1
19 C2
20 C2
2 C2
23
22
C103
F962 20 PK/BK
F963 20 PK/DB
T16 20 YL/OR
T41 20 YL/BK
T42 20 DG/PK
T3 20 DG/DB
T1 20 DG/GY
T4 20 DG/LB
7
10
3
2
9
5
1
8
IGNITION SWITCH OUTPUT (START)
START ENABLE
TRANSMISSION CONTROL OUTPUT
TRS T41 SENSE
TRS T42 SENSE
TRS T3 SENSE
TRS T1 SENSE
TRS T4 SENSE
SENSOR-TRANSMISSION RANGE


FROM
S334
(8W-31-2)
A
T16
18
YL/OR
3 C106
T16
18
YL/OR
S121
(8W-13-22)
SENSOR-
INPUT
SPEED
TRANSMISSION CONTROL OUTPUT
INPUT SPEED SENSOR SIGNAL
SENSOR GROUND
SENSOR-
OUTPUT
SPEED
OUTPUT SPEED SENSOR GROUND
OUTPUT SPEED SENSOR SIGNAL
TRANSMISSION CONTROL OUTPUT
1 T16 18 YL/OR
2 T14 18 DG/BK
3 T13 18 DG/TN
3 T130 18 TN/DG
2 T52 18 DG/WT
1 T16 18 YL/OR
2 1 6 5 C106
T13
18
DG/VT
S335
T14 18 DG/BK
T13 18 DG/VT
T13 18 DG/VT
T130 18 TN/DG
T52 18 DG/WT
C
TO
ASSEMBLY-
TRANSMISSION
SOLENOID/
PRESSURE
SWITCH
(8W-31-5)
14 C2
18 C2
21 C2
5 C2
INPUT SPEED SENSOR SIGNAL
SENSOR GROUND
OUTPUT SPEED SENSOR GROUND
OUTPUT SPEED SENSOR SIGNAL
MODULE-
TRANSMISSION
CONTROL

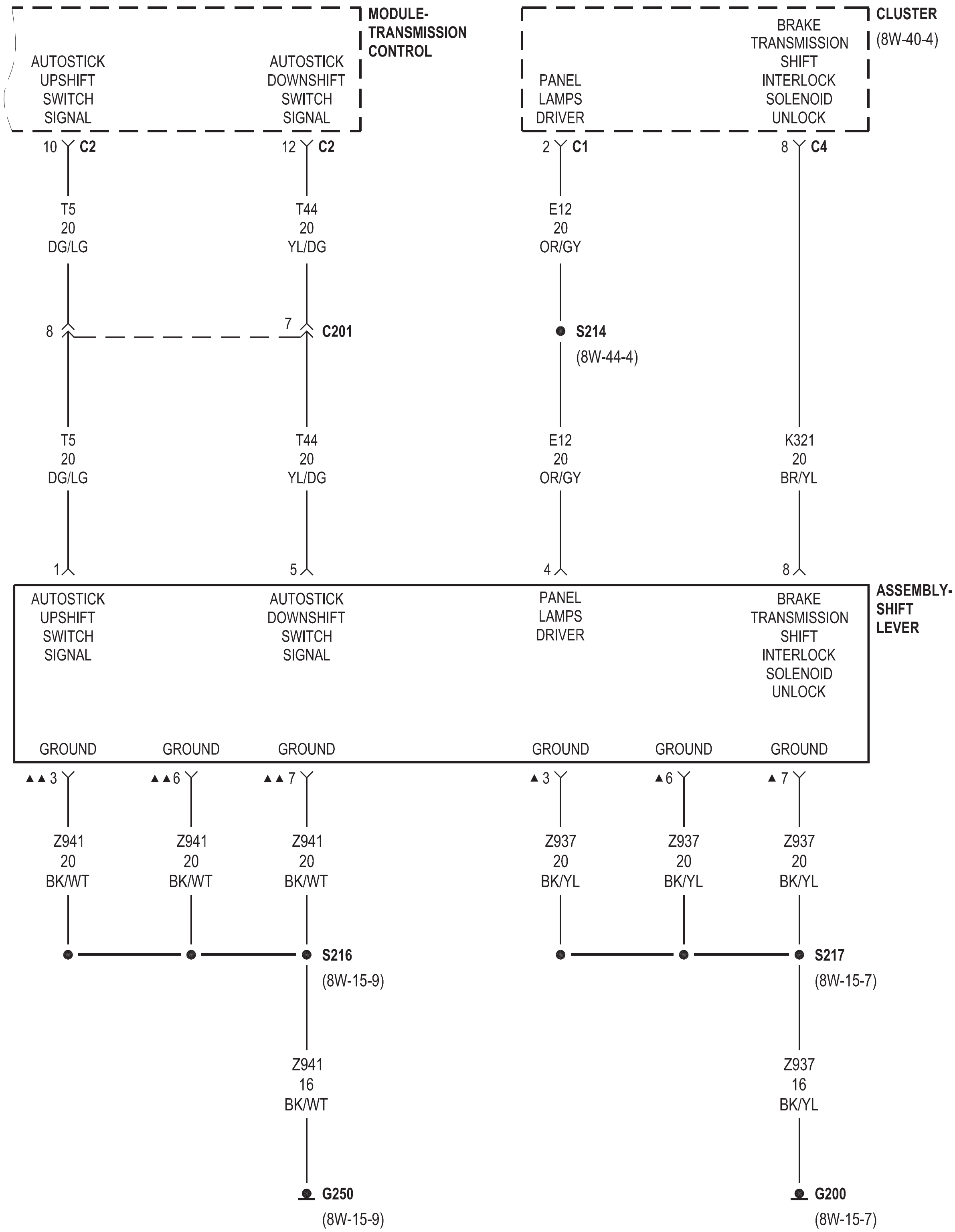

MODULE-
TRANSMISSION
CONTROL
SECONDARY
PRESSURE
SENSOR
SIGNAL
PRIMARY
PRESSURE
SENSOR
SIGNAL
TRANSMISSION
TEMPERATURE
SENSOR
SIGNAL
CHIP
SELECT
CLOCK
SELECT
13 C2
17 C2
23 C2
14 C1
13 C1
FROM
S335
(8W-31-4)
C
T50
18
PK/LB
T21
18
DG/YL
T54
18
RD/WT
T313
18
YL/LG
T302
18
DG/BR
T13
18
DG/VT
7
18
17
16
21
19
ASSEMBLY-
TRANSMISSION
SOLENOID/
PRESSURE
SWITCH
SENSOR
GROUND
LINE
PRESSURE
SOLENOID
CONTROL
SECONDARY
PRESSURE
SOLENOID
CONTROL
TCC
SOLENOID
CONTROL
TCC
ON/OFF
SOLENOID
CONTROL
5 VOLT
SUPPLY
GROUND
1
2
3
4
5
6
T20
18
DG/LB
T19
18
YL/DB
T59
18
YL/LB
T60
18
YL/GY
T72
18
PK/LB
Z967
18
BK
G301
(8W-15-13)
1 C1
2 C1
3 C1
4 C1
22 C2

CVT


ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH
STEP MOTOR CONTROL A
STEP MOTOR CONTROL B
STEP MOTOR CONTROL C
STEP MOTOR CONTROL D
DATA IN/OUT SELECT
8
9
10
11
22
T314 18 LB/YL
T315 18 YL/OR
T316 18 YL/WT
T317 18 TN/YL
T327 18 GY/YL
11 C1
12 C1
20 C1
21 C1
15 C1
STEP MOTOR CONTROL A
STEP MOTOR CONTROL B
STEP MOTOR CONTROL C
STEP MOTOR CONTROL D
DATA IN/OUT SELECT
MODULE-TRANSMISSION CONTROL


CLUSTER
(8W-40-4)
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK
PANEL LAMPS DRIVER
2 C1
8 C4
E12 20 OR/GY
S214
(8W-44-4)
E12 20 OR/GY
K321 20 BR/YL
2
4
ASSEMBLY-SHIFT LEVER
PANEL LAMPS DRIVER
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK
GROUND
GROUND
1
3
Z937 20 BK/YL
Z937 20 BK/YL
S217
(8W-15-7)
Z937 16 BK/YL
G200
(8W-15-7)

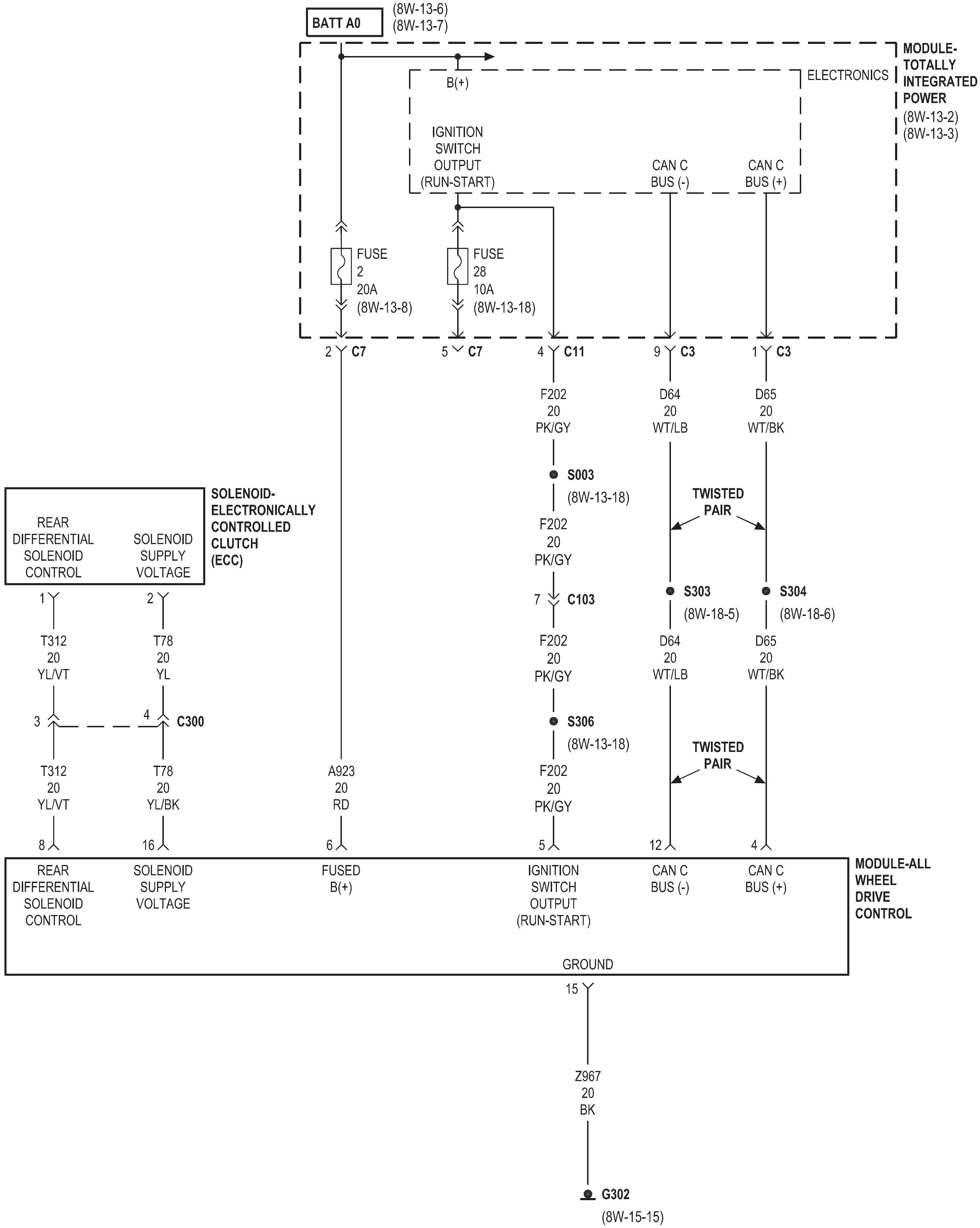
AUTOSTICK



▲ EXCEPT EXPORT

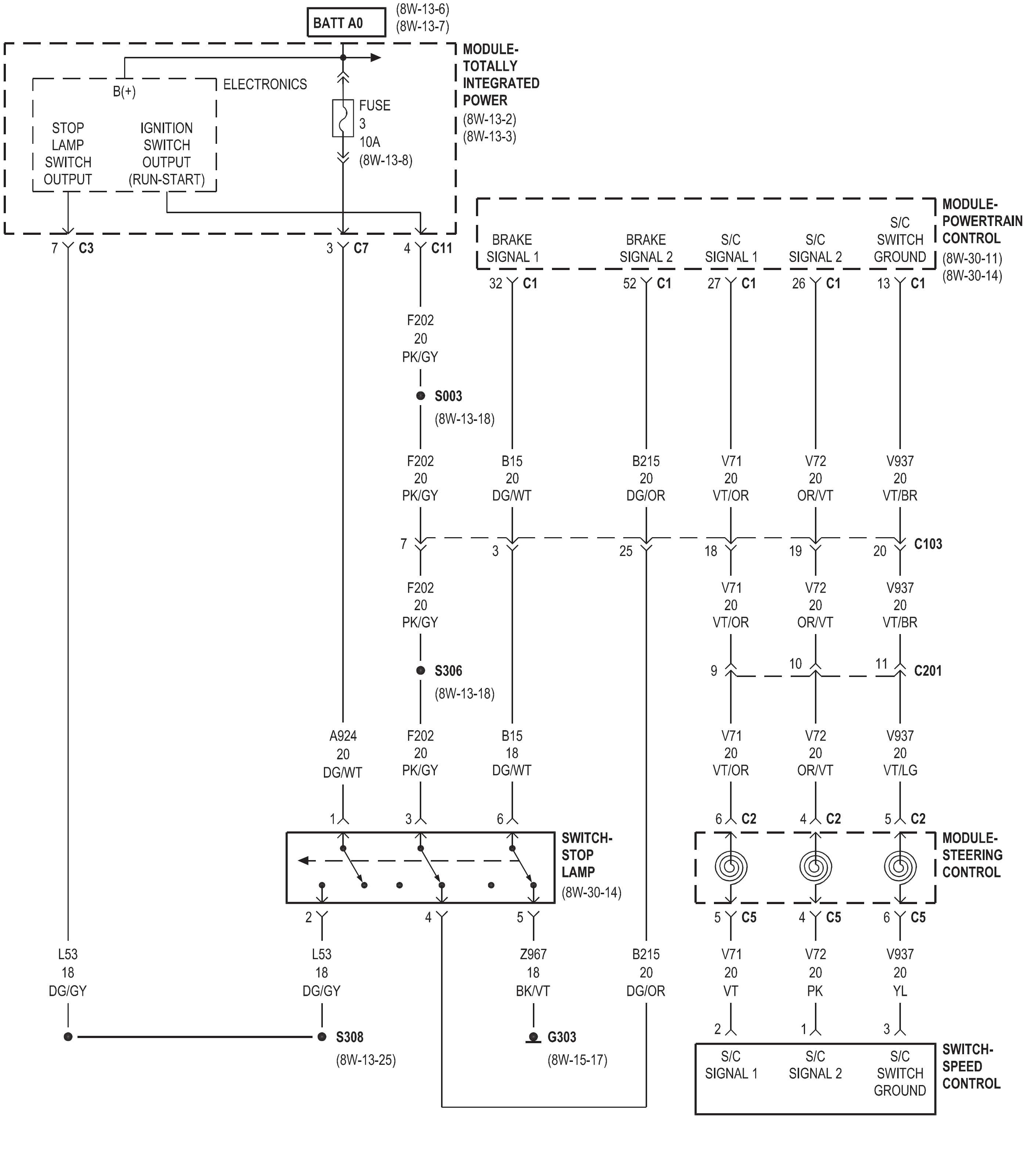
▲▲ EXPORT

AWD

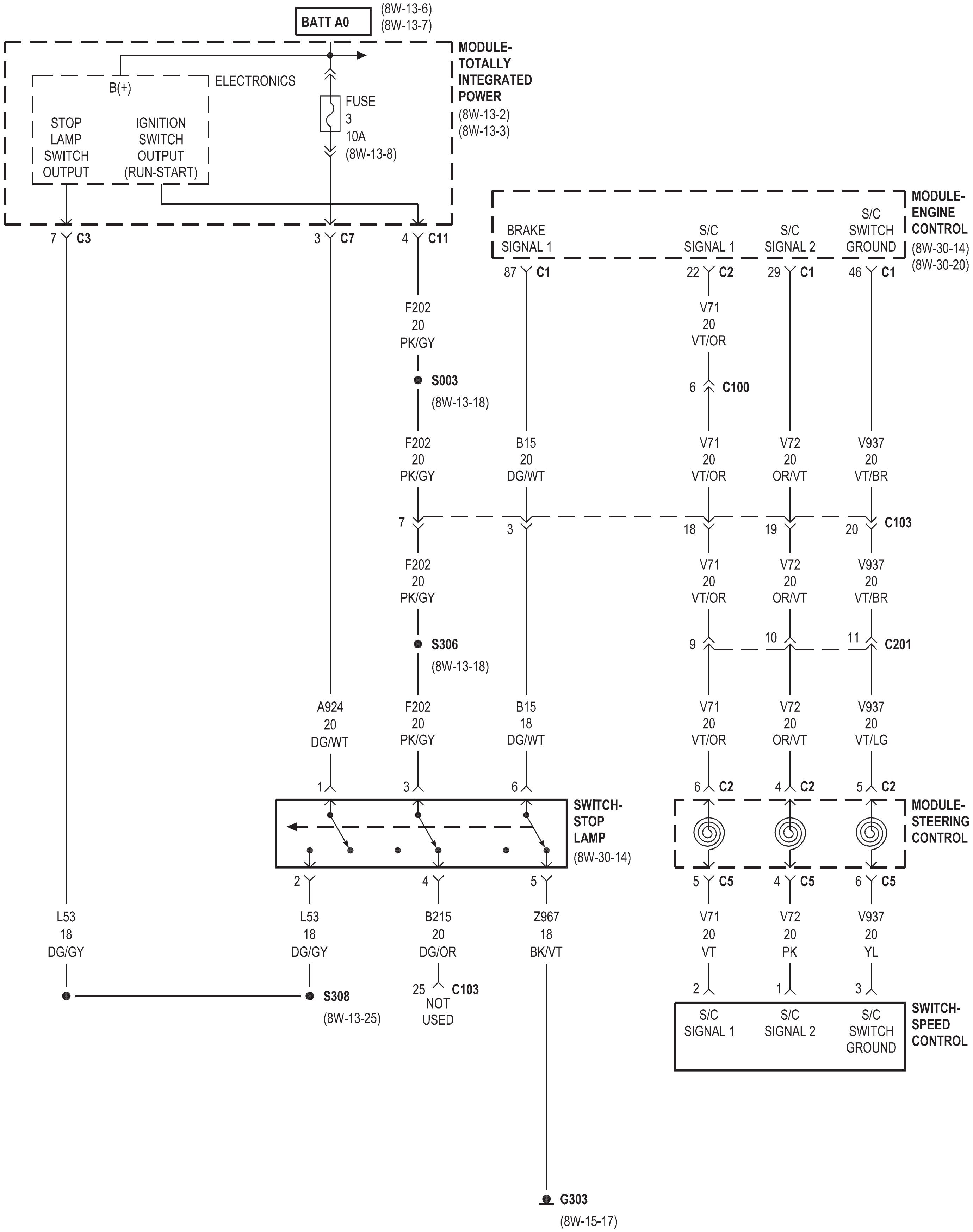


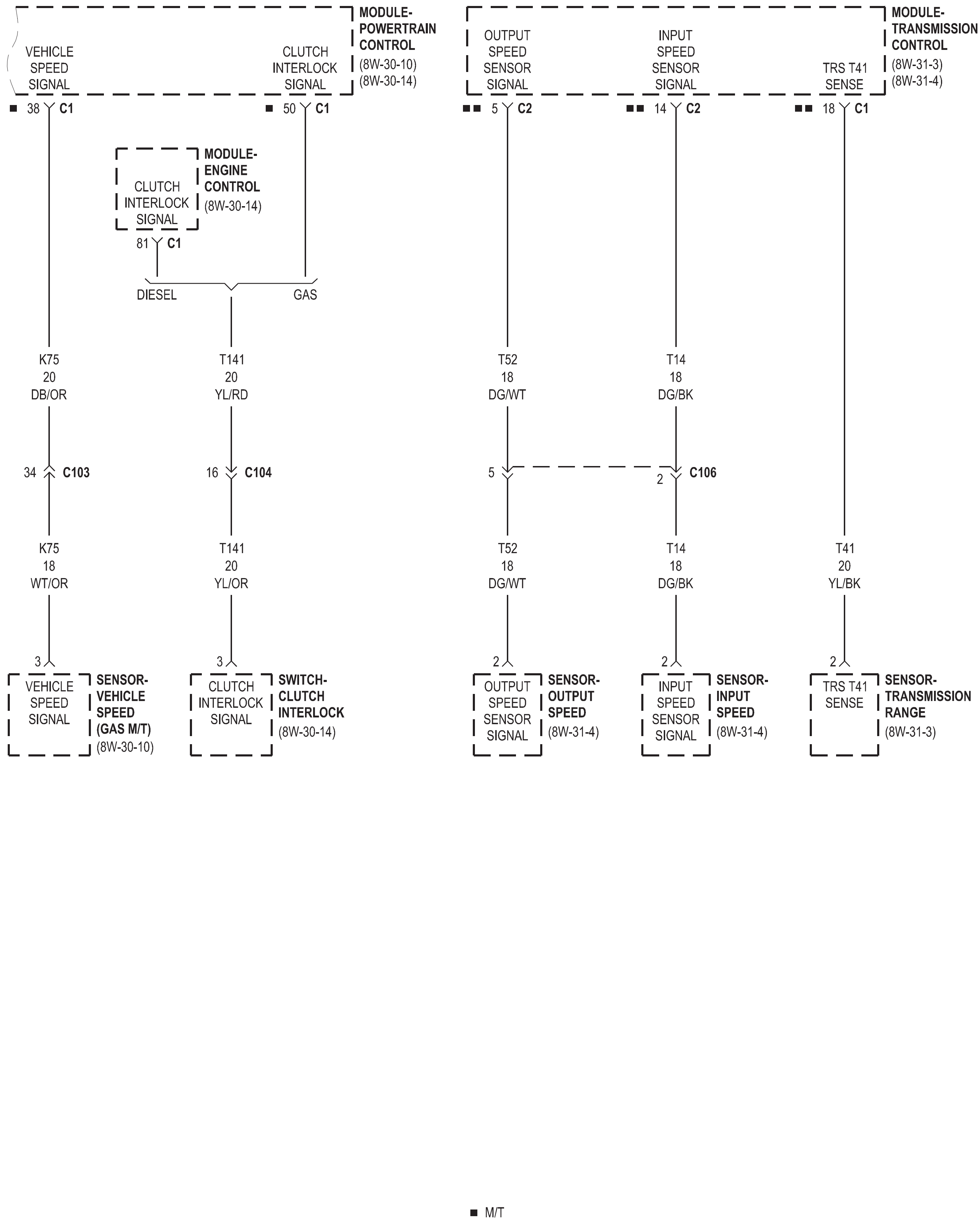
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN-START)
CAN C BUS (-)
CAN C BUS (+)
FUSE 2 20A (8W-13-8)
FUSE 28 10A (8W-13-18)
2 C7
5 C7
4 C11
9 C3
1 C3
F202 20 PK/GY
D64 20 WT/LB
D65 20 WT/BK
S003 (8W-13-18)
TWISTED PAIR
7 C103
S303 (8W-18-5)
S304 (8W-18-6)
S306 (8W-13-18)
SOLENOID-ELECTRONICALLY CONTROLLED CLUTCH (ECC)
REAR DIFFERENTIAL SOLENOID CONTROL
SOLENOID SUPPLY VOLTAGE
T312 20 YL/VT
T78 20 YL
3 4 C300
T78 20 YL/BK
A923 20 RD
8 16 6 5 12 4
FUSED B(+)
MODULE-ALL WHEEL DRIVE CONTROL
GROUND
15
Z967 20 BK
G302 (8W-15-15)

8W-33 VEHICLE SPEED CONTROL

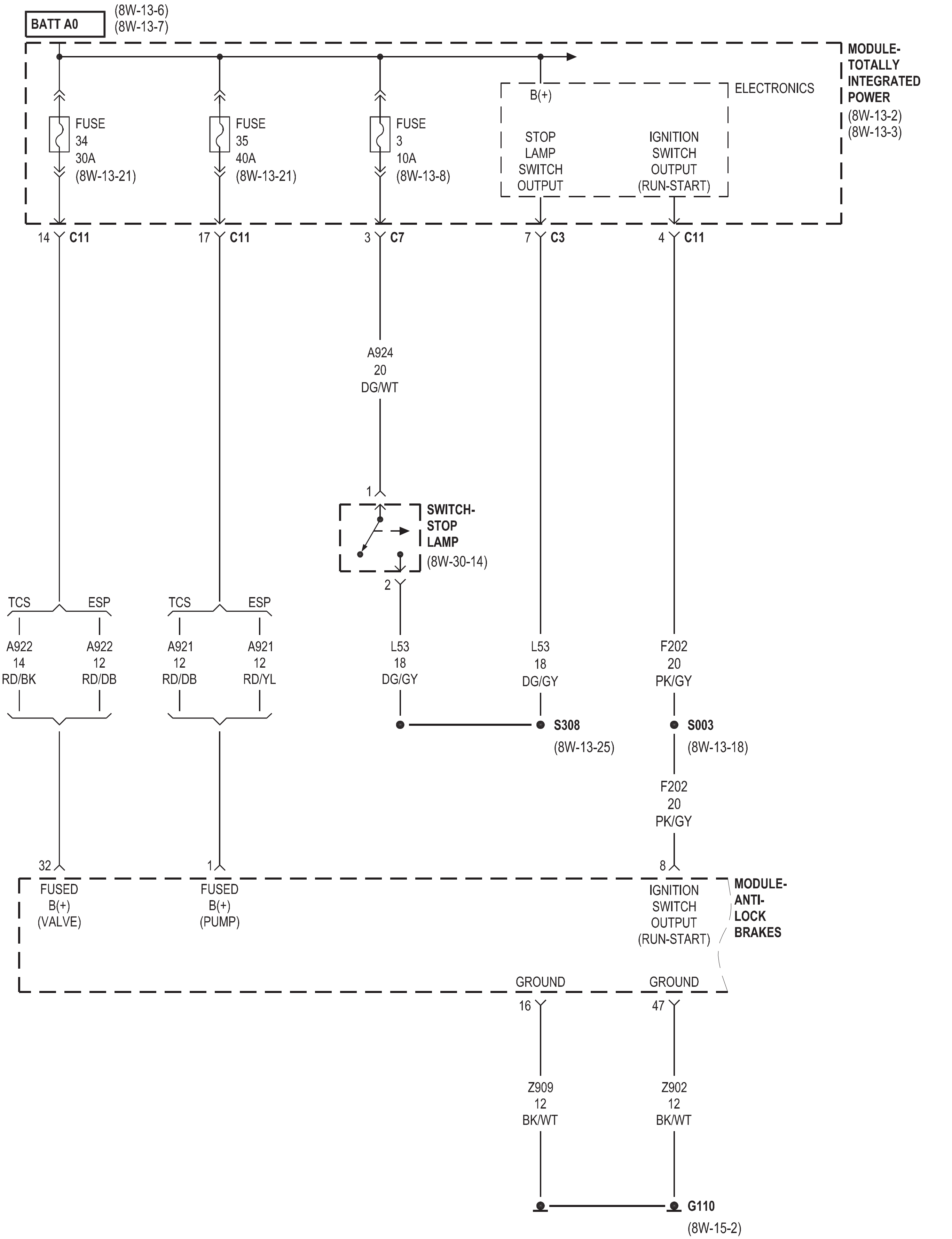

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
STOP LAMP SWITCH OUTPUT
IGNITION SWITCH OUTPUT (RUN-START)
FUSE 3 10A (8W-13-8)
7 C3
3 C7
4 C11
MODULE-POWERTRAIN CONTROL
(8W-30-11)
(8W-30-14)
BRAKE SIGNAL 1
BRAKE SIGNAL 2
S/C SIGNAL 1
S/C SIGNAL 2
S/C SWITCH GROUND
32 C1
52 C1
27 C1
26 C1
13 C1
F202 20 PK/GY
S003 (8W-13-18)
B15 20 DG/WT
B215 20 DG/OR
V71 20 VT/OR
V72 20 OR/VT
V937 20 VT/BR
C103
7
3
25
18
19
20
C201
9
10
11
S306 (8W-13-18)
A924 20 DG/WT
B15 18 DG/WT
V937 20 VT/LG
1
3
6
6 C2
4 C2
5 C2
SWITCH-STOP LAMP (8W-30-14)
MODULE-STEERING CONTROL
2
4
5
5 C5
4 C5
6 C5
L53 18 DG/GY
Z967 18 BK/VT
V71 20 VT
V72 20 PK
V937 20 YL
S308 (8W-13-25)
G303 (8W-15-17)
2
1
3
SWITCH-SPEED CONTROL
S/C SIGNAL 1
S/C SIGNAL 2
S/C SWITCH GROUND

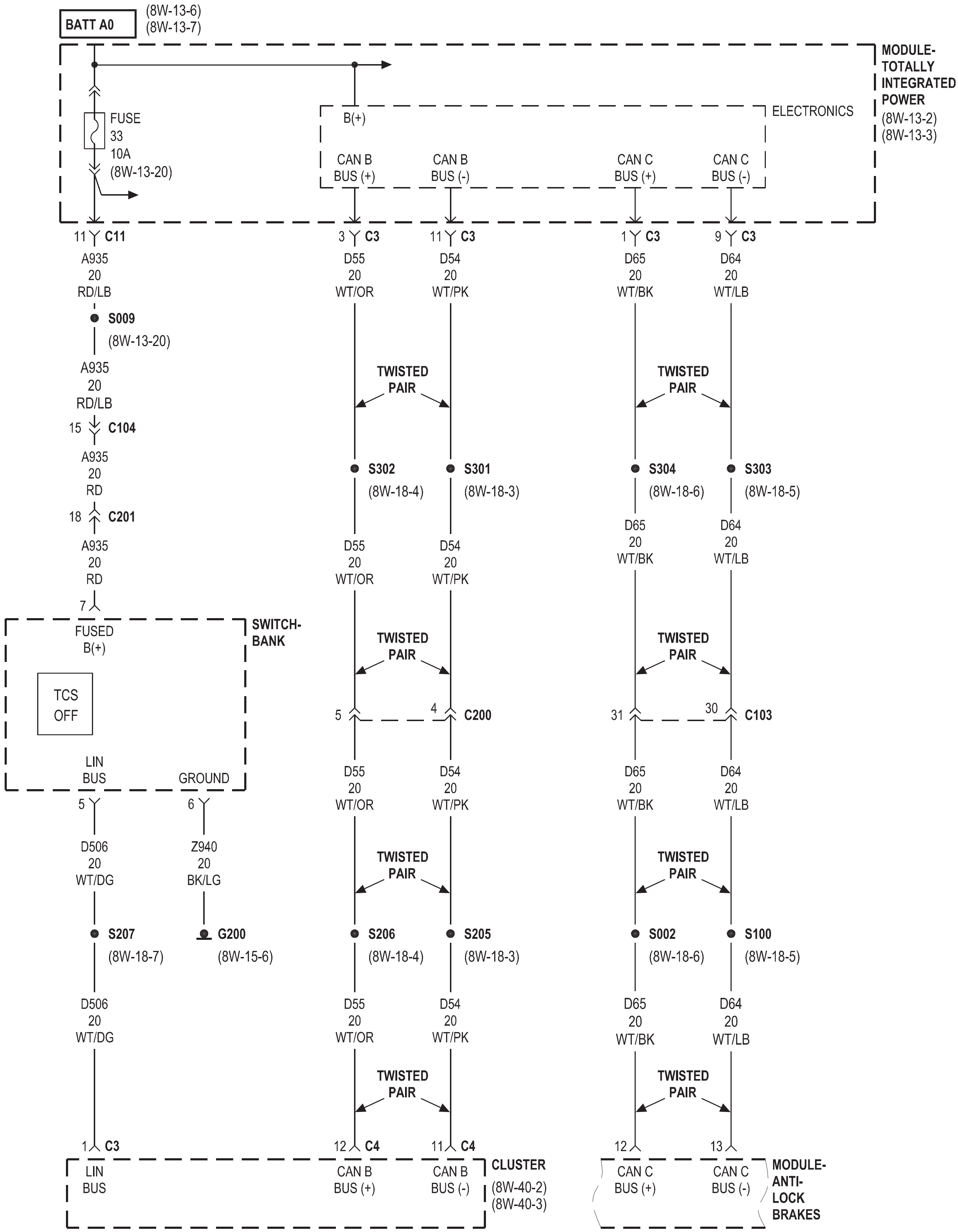
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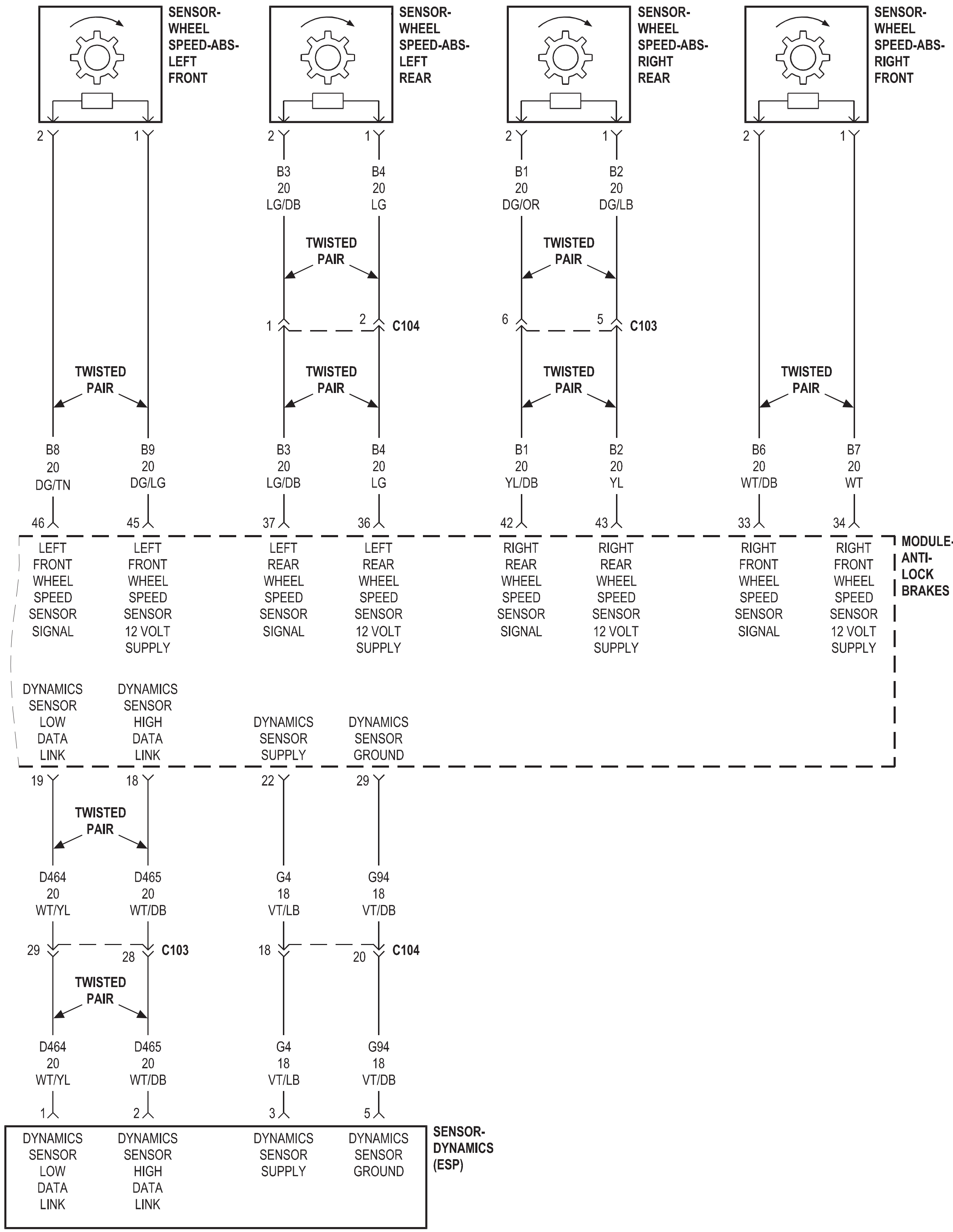

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
STOP LAMP SWITCH OUTPUT
IGNITION SWITCH OUTPUT (RUN-START)
FUSE 3 10A
(8W-13-8)
7 C3
3 C7
4 C11
MODULE-ENGINE CONTROL
(8W-30-14)
(8W-30-20)
BRAKE SIGNAL 1
S/C SIGNAL 1
S/C SIGNAL 2
S/C SWITCH GROUND
87 C1
22 C2
29 C1
46 C1
F202 20 PK/GY
S003
(8W-13-18)
V71 20 VT/OR
6 C100
B15 20 DG/WT
V72 20 OR/VT
V937 20 VT/BR
7
3
18
19
20
C103
S306
(8W-13-18)
9
10
11
C201
A924 20 DG/WT
B15 18 DG/WT
V937 20 VT/LG
1
3
6
6 C2
4 C2
5 C2
SWITCH-STOP LAMP
(8W-30-14)
MODULE-STEERING CONTROL
2
4
5
5 C5
4 C5
6 C5
L53 18 DG/GY
B215 20 DG/OR
Z967 18 BK/VT
V71 20 VT
V72 20 PK
V937 20 YL
S308
(8W-13-25)
25 C103
NOT USED
2
1
3
S/C SIGNAL 1
S/C SIGNAL 2
S/C SWITCH GROUND
SWITCH-SPEED CONTROL
G303
(8W-15-17)

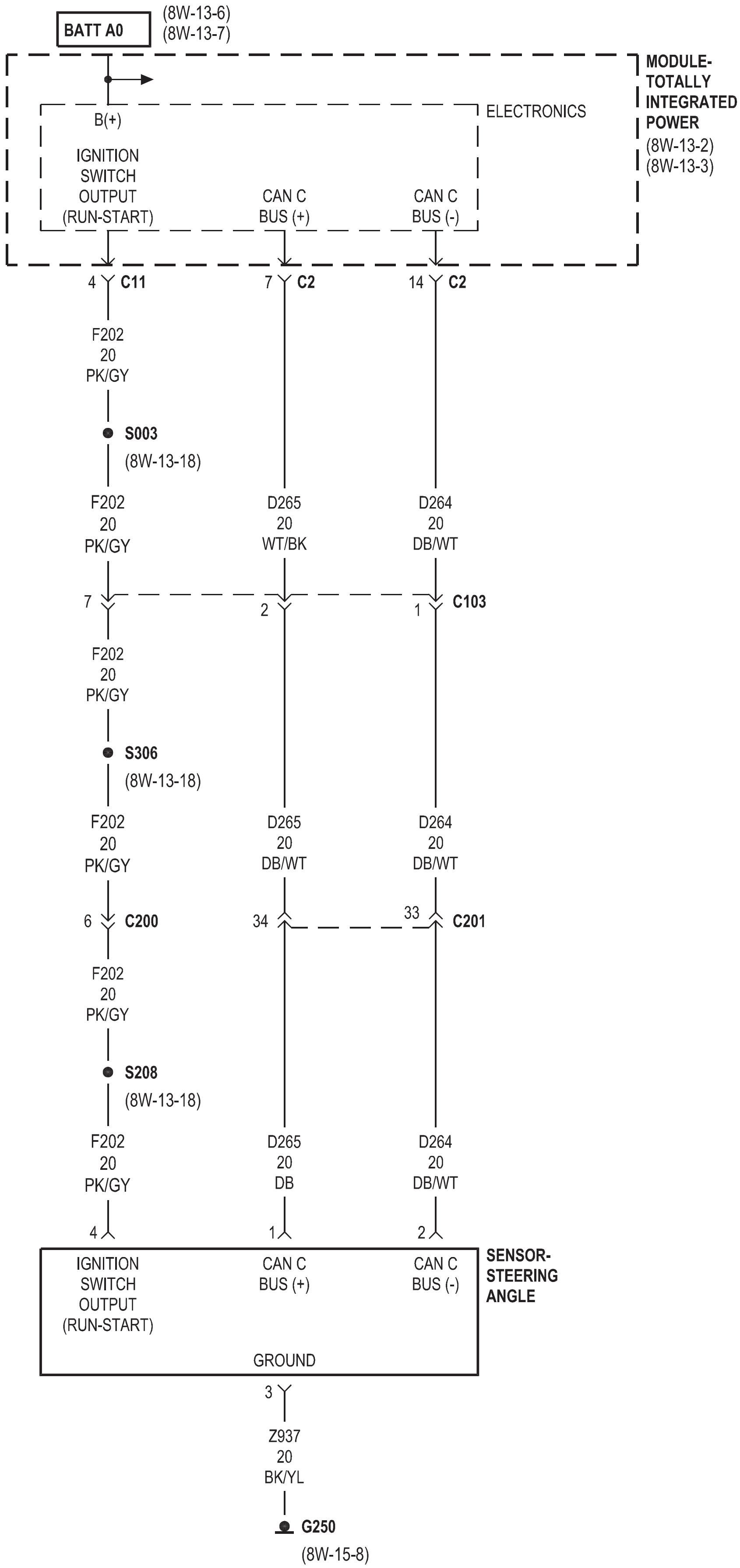

MODULE-
POWERTRAIN
CONTROL
(8W-30-10)
(8W-30-14)
VEHICLE
SPEED
SIGNAL
CLUTCH
INTERLOCK
SIGNAL
38 C1
50 C1
MODULE-
ENGINE
CONTROL
(8W-30-14)
CLUTCH
INTERLOCK
SIGNAL
81 C1
DIESEL
GAS
K75
20
DB/OR
T141
20
YL/RD
34 C103
16 C104
K75
18
WT/OR
T141
20
YL/OR
3
3
VEHICLE
SPEED
SIGNAL
SENSOR-
VEHICLE
SPEED
(GAS M/T)
(8W-30-10)
CLUTCH
INTERLOCK
SIGNAL
SWITCH-
CLUTCH
INTERLOCK
(8W-30-14)
MODULE-
TRANSMISSION
CONTROL
(8W-31-3)
(8W-31-4)
OUTPUT
SPEED
SENSOR
SIGNAL
INPUT
SPEED
SENSOR
SIGNAL
TRS T41
SENSE
5 C2
14 C2
18 C1
T52
18
DG/WT
T14
18
DG/BK
5
2 C106
T52
18
DG/WT
T14
18
DG/BK
T41
20
YL/BK
2
2
2
OUTPUT
SPEED
SENSOR
SIGNAL
SENSOR-
OUTPUT
SPEED
(8W-31-4)
INPUT
SPEED
SENSOR
SIGNAL
SENSOR-
INPUT
SPEED
(8W-31-4)
TRS T41
SENSE
SENSOR-
TRANSMISSION
RANGE
(8W-31-3)
■ M/T
■■ A/T

8W-35 ANTILOCK BRAKES


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
STOP LAMP SWITCH OUTPUT
IGNITION SWITCH OUTPUT (RUN-START)
FUSE 34 30A (8W-13-21)
FUSE 35 40A (8W-13-21)
FUSE 3 10A (8W-13-8)
14 C11
17 C11
3 C7
7 C3
4 C11
A924 20 DG/WT
1
SWITCH-STOP LAMP
(8W-30-14)
2
TCS
ESP
A922 14 RD/BK
A922 12 RD/DB
A921 12 RD/DB
A921 12 RD/YL
L53 18 DG/GY
L53 18 DG/GY
F202 20 PK/GY
S308
(8W-13-25)
S003
(8W-13-18)
F202 20 PK/GY
32
1
8
FUSED B(+) (VALVE)
FUSED B(+) (PUMP)
IGNITION SWITCH OUTPUT (RUN-START)
MODULE-ANTI-LOCK BRAKES
GROUND
GROUND
16
47
Z909 12 BK/WT
Z902 12 BK/WT
G110
(8W-15-2)

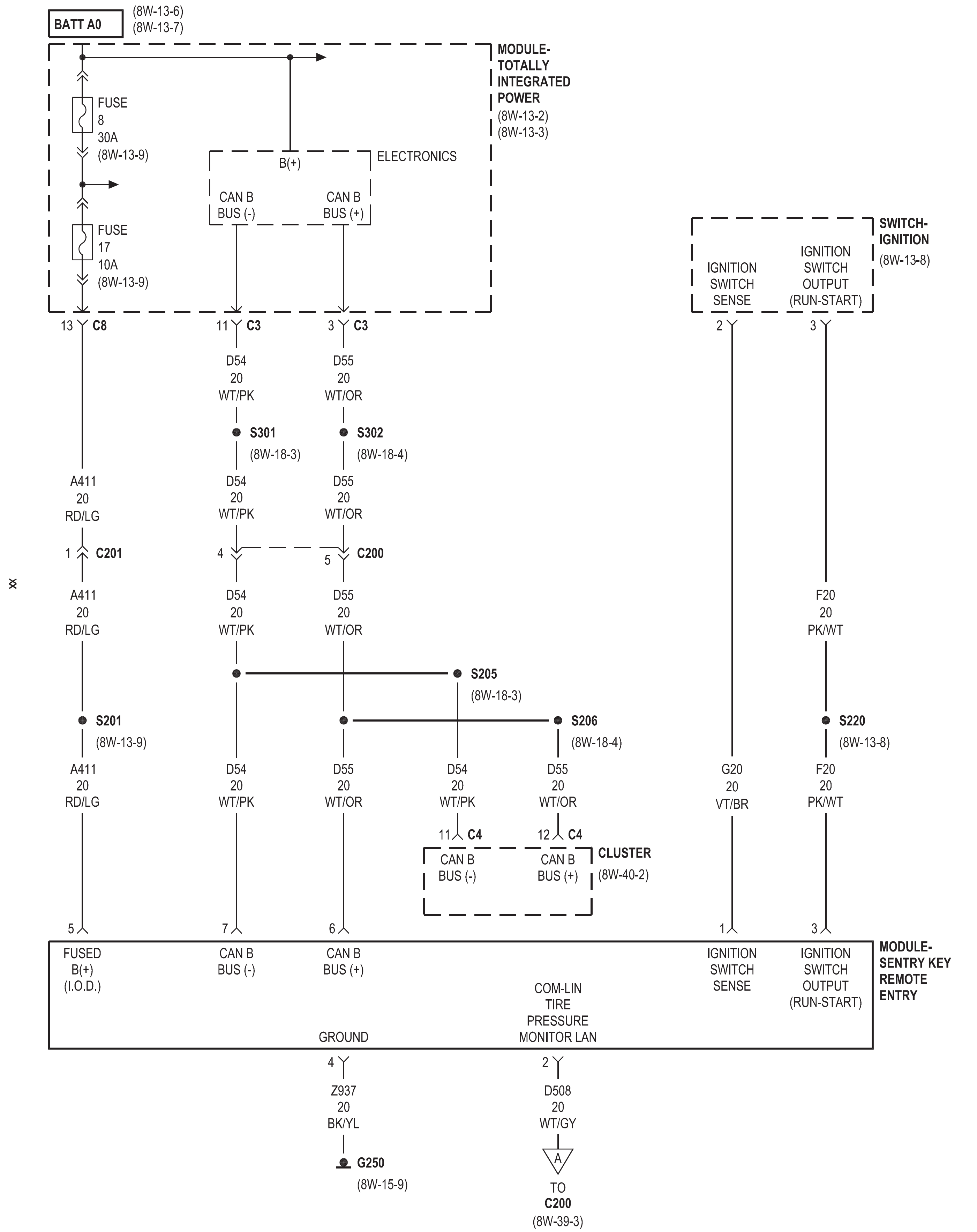

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
33
10A
(8W-13-20)
B(+)
ELECTRONICS
CAN B
BUS (+)
CAN B
BUS (-)
CAN C
BUS (+)
CAN C
BUS (-)
11 C11
3 C3
11 C3
1 C3
9 C3
A935
20
RD/LB
D55
20
WT/OR
D54
20
WT/PK
D65
20
WT/BK
D64
20
WT/LB
S009
(8W-13-20)
TWISTED
PAIR
15 C104
A935
20
RD
S302
(8W-18-4)
S301
(8W-18-3)
S304
(8W-18-6)
S303
(8W-18-5)
18 C201
7
SWITCH-
BANK
FUSED
B(+)
TCS
OFF
LIN
BUS
GROUND
5 4 C200
31 30 C103
5
6
D506
20
WT/DG
Z940
20
BK/LG
S207
(8W-18-7)
G200
(8W-15-6)
S206
(8W-18-4)
S205
(8W-18-3)
S002
(8W-18-6)
S100
(8W-18-5)
1 C3
12 C4
11 C4
12
13
LIN
BUS
CLUSTER
(8W-40-2)
(8W-40-3)
MODULE-
ANTI-
LOCK
BRAKES


SENSOR-WHEEL SPEED-ABS-LEFT FRONT
SENSOR-WHEEL SPEED-ABS-LEFT REAR
SENSOR-WHEEL SPEED-ABS-RIGHT REAR
SENSOR-WHEEL SPEED-ABS-RIGHT FRONT
B3 20 LG/DB
B4 20 LG
B1 20 DG/OR
B2 20 DG/LB
TWISTED PAIR
C104
C103
B8 20 DG/TN
B9 20 DG/LG
B3 20 LG/DB
B4 20 LG
B1 20 YL/DB
B2 20 YL
B6 20 WT/DB
B7 20 WT
MODULE-ANTI-LOCK BRAKES
LEFT FRONT WHEEL SPEED SENSOR SIGNAL
LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
LEFT REAR WHEEL SPEED SENSOR SIGNAL
LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT REAR WHEEL SPEED SENSOR SIGNAL
RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
DYNAMICS SENSOR LOW DATA LINK
DYNAMICS SENSOR HIGH DATA LINK
DYNAMICS SENSOR SUPPLY
DYNAMICS SENSOR GROUND
D464 20 WT/YL
D465 20 WT/DB
G4 18 VT/LB
G94 18 VT/DB
SENSOR-DYNAMICS (ESP)

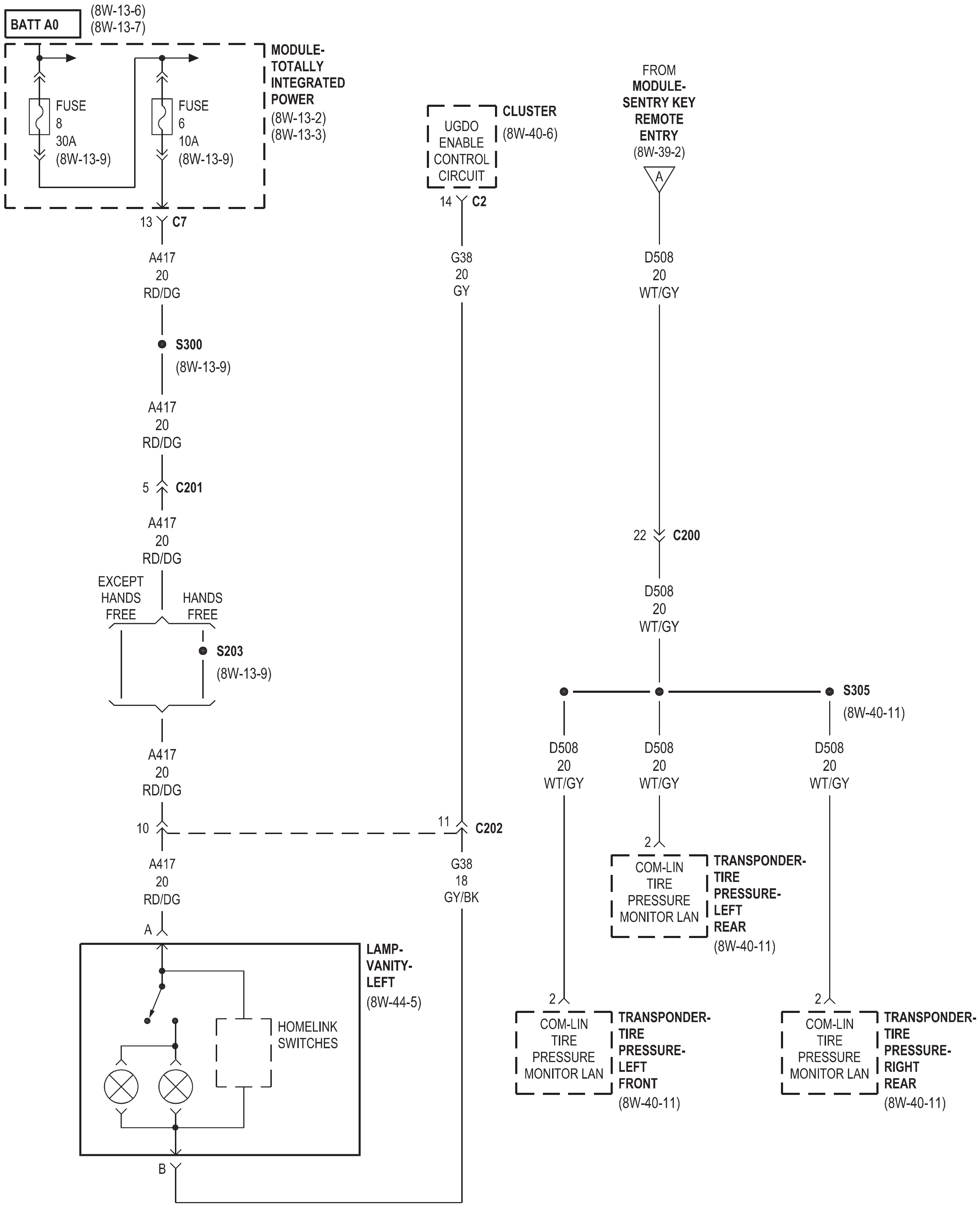


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION
SWITCH
OUTPUT
(RUN-START)
CAN C
BUS (+)
CAN C
BUS (-)
4 C11
7 C2
14 C2
F202
20
PK/GY
S003
(8W-13-18)
F202
20
PK/GY
D265
20
WT/BK
D264
20
DB/WT
7
2
1
C103
F202
20
PK/GY
S306
(8W-13-18)
F202
20
PK/GY
D265
20
DB/WT
D264
20
DB/WT
6 C200
34
33
C201
F202
20
PK/GY
S208
(8W-13-18)
F202
20
PK/GY
D265
20
DB
D264
20
DB/WT
4
1
2
IGNITION
SWITCH
OUTPUT
(RUN-START)
CAN C
BUS (+)
CAN C
BUS (-)
SENSOR-
STEERING
ANGLE
GROUND
3
Z937
20
BK/YL
G250
(8W-15-8)

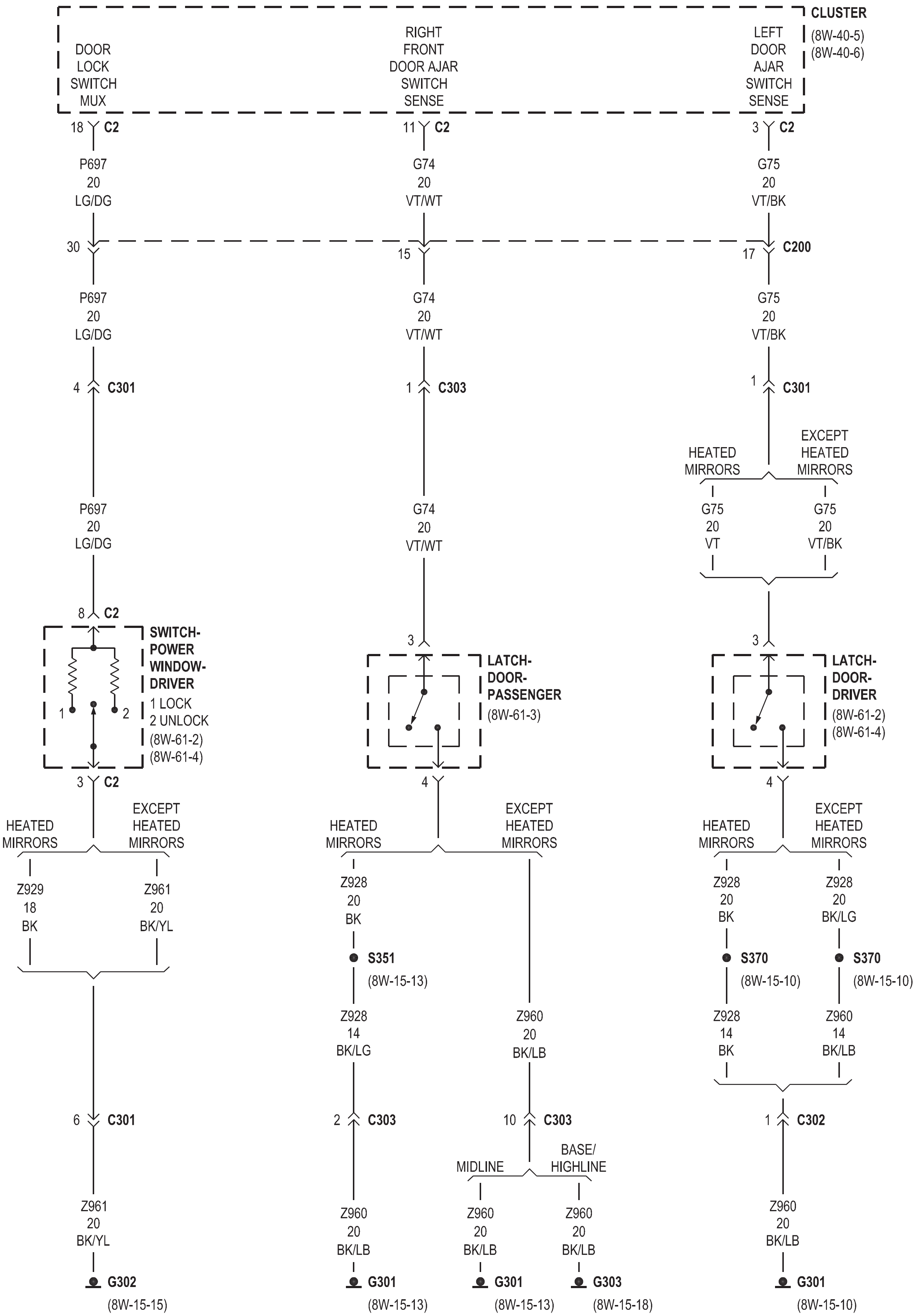
8W-39 VEHICLE THEFT SECURITY SYSTEM

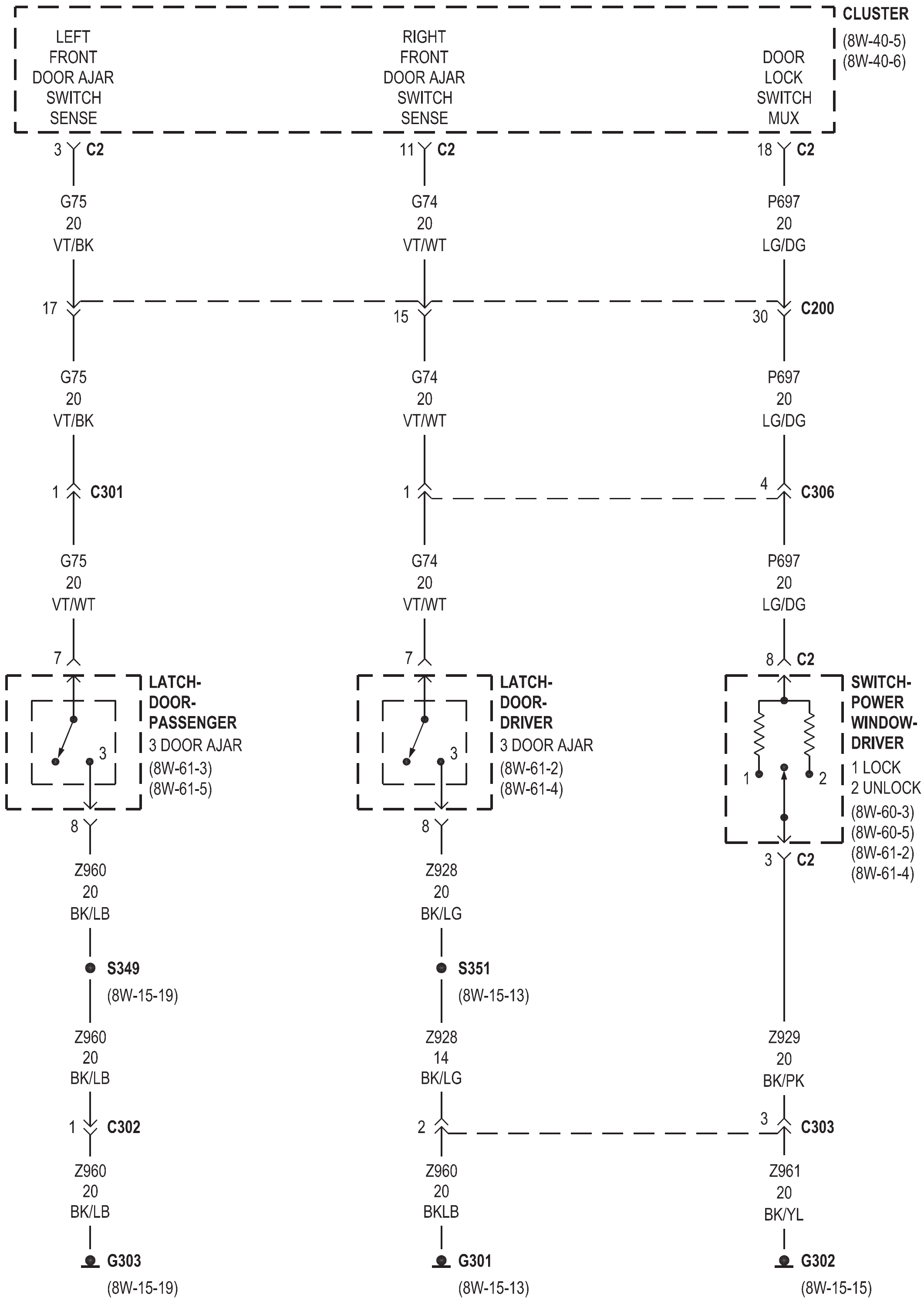


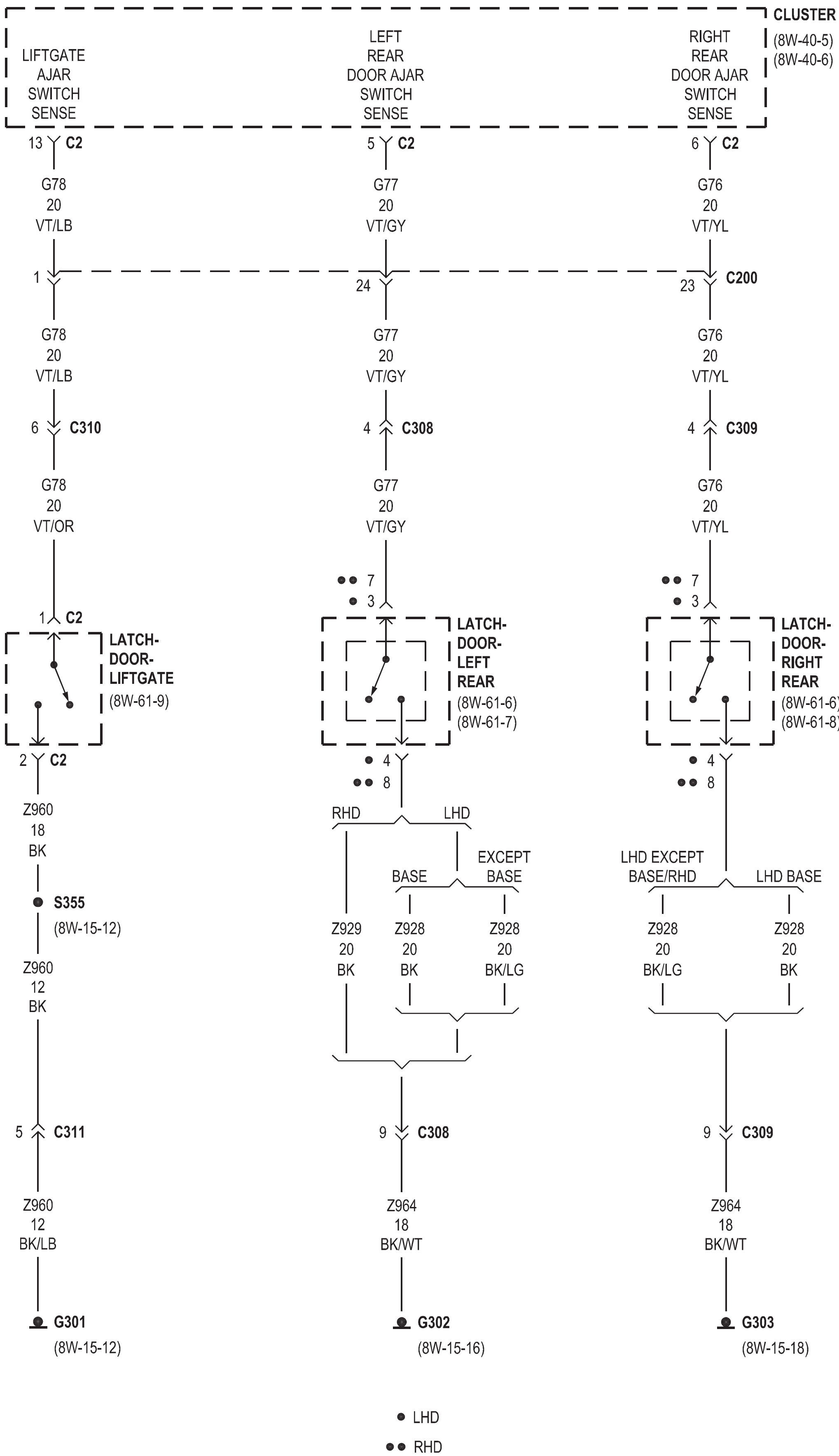
※ NOTE: D54, D55 CIRCUITS ARE TWISTED PAIR


BATT A0
(8W-13-6)
(8W-13-7)
FUSE
8
30A
(8W-13-9)
FUSE
6
10A
(8W-13-9)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
13 C7
A417
20
RD/DG
S300
(8W-13-9)
A417
20
RD/DG
5 C201
A417
20
RD/DG
EXCEPT
HANDS
FREE
HANDS
FREE
S203
(8W-13-9)
A417
20
RD/DG
10
A417
20
RD/DG
A
LAMP-
VANITY-
LEFT
(8W-44-5)
HOMELINK
SWITCHES
B
UGDO
ENABLE
CONTROL
CIRCUIT
CLUSTER
(8W-40-6)
14 C2
G38
20
GY
11 C202
G38
18
GY/BK
FROM
MODULE-
SENTRY KEY
REMOTE
ENTRY
(8W-39-2)
A
D508
20
WT/GY
22 C200
D508
20
WT/GY
S305
(8W-40-11)
D508
20
WT/GY
D508
20
WT/GY
D508
20
WT/GY
2
COM-LIN
TIRE
PRESSURE
MONITOR LAN
TRANSPONDER-
TIRE
PRESSURE-
LEFT
REAR
(8W-40-11)
2
COM-LIN
TIRE
PRESSURE
MONITOR LAN
TRANSPONDER-
TIRE
PRESSURE-
LEFT
FRONT
(8W-40-11)
2
COM-LIN
TIRE
PRESSURE
MONITOR LAN
TRANSPONDER-
TIRE
PRESSURE-
RIGHT
REAR
(8W-40-11)

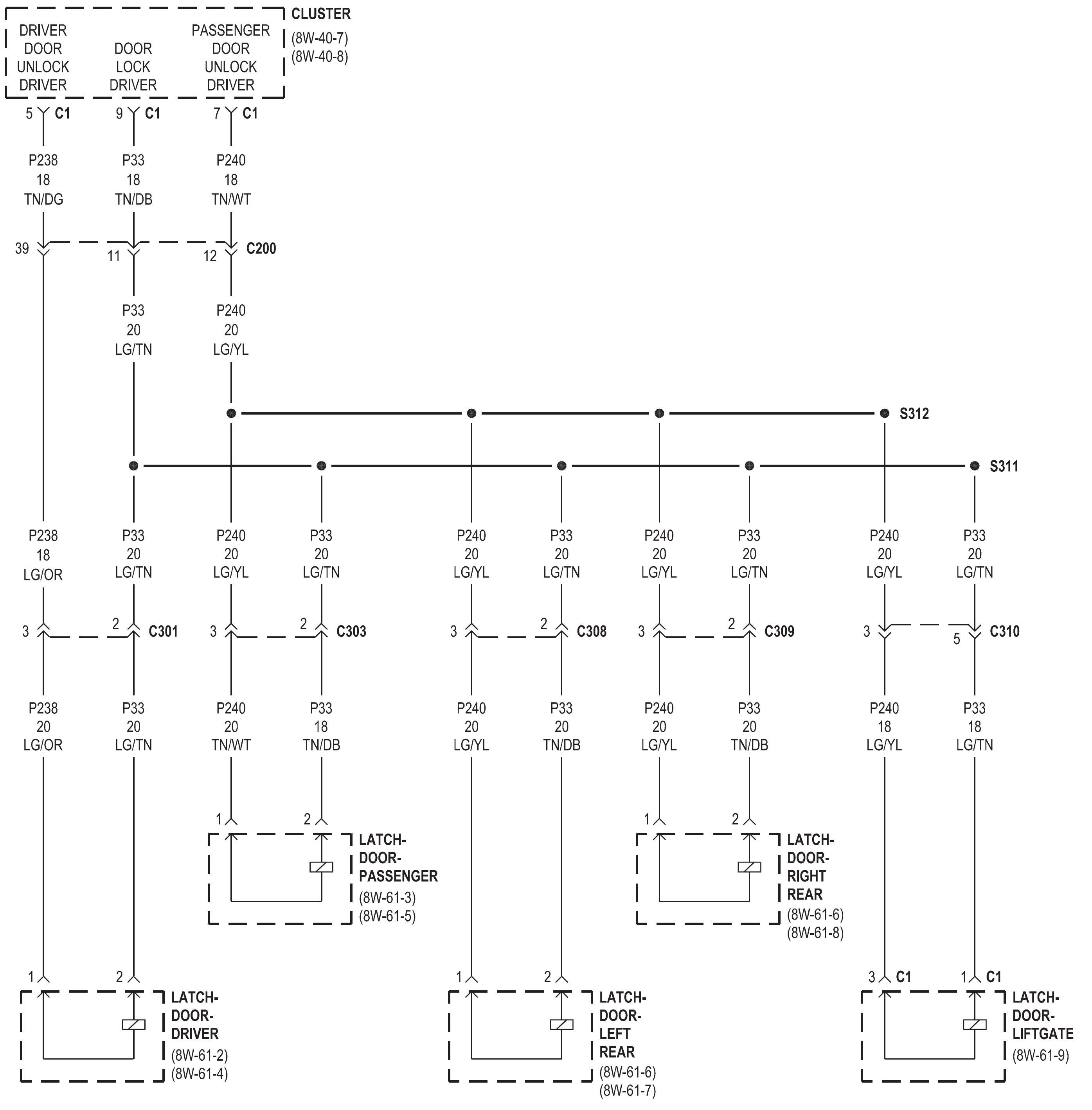
LHD

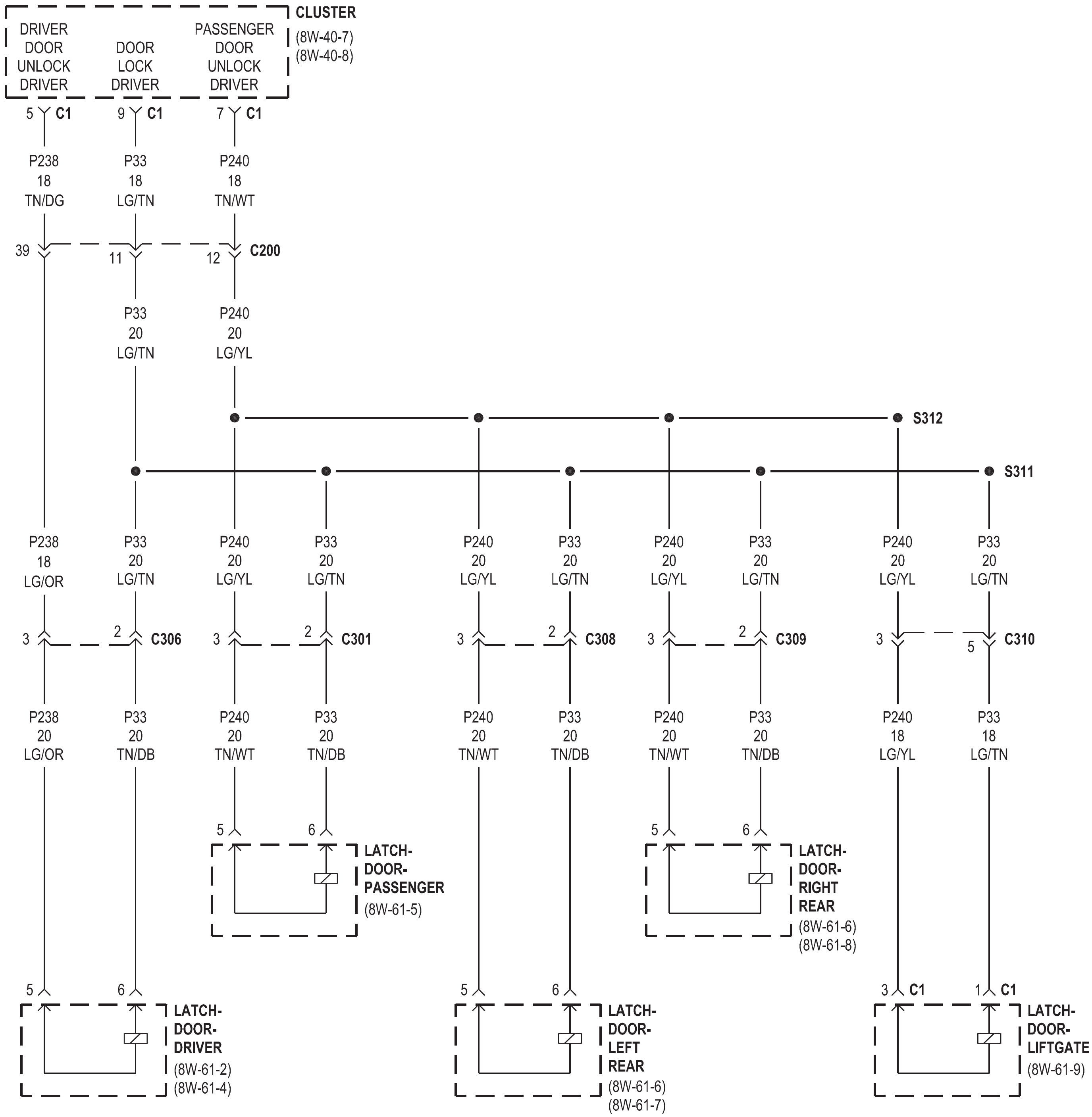

CLUSTER
(8W-40-5)
(8W-40-6)
DOOR LOCK SWITCH MUX
RIGHT FRONT DOOR AJAR SWITCH SENSE
LEFT DOOR AJAR SWITCH SENSE
18 C2
11 C2
3 C2
P697 20 LG/DG
G74 20 VT/WT
G75 20 VT/BK
30
15
17 C200
4 C301
1 C303
1 C301
HEATED MIRRORS
EXCEPT HEATED MIRRORS
G75 20 VT
G75 20 VT/BK
8 C2
SWITCH-POWER WINDOW-DRIVER
1 LOCK
2 UNLOCK
(8W-61-2)
(8W-61-4)
3 C2
LATCH-DOOR-PASSENGER
(8W-61-3)
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
Z929 18 BK
Z961 20 BK/YL
Z928 20 BK
S351 (8W-15-13)
Z928 14 BK/LG
Z960 20 BK/LB
Z928 20 BK/LG
S370 (8W-15-10)
Z928 14 BK
Z960 14 BK/LB
6 C301
2 C303
10 C303
1 C302
MIDLINE
BASE/ HIGHLINE
G302 (8W-15-15)
G301 (8W-15-13)
G303 (8W-15-18)
G301 (8W-15-10)

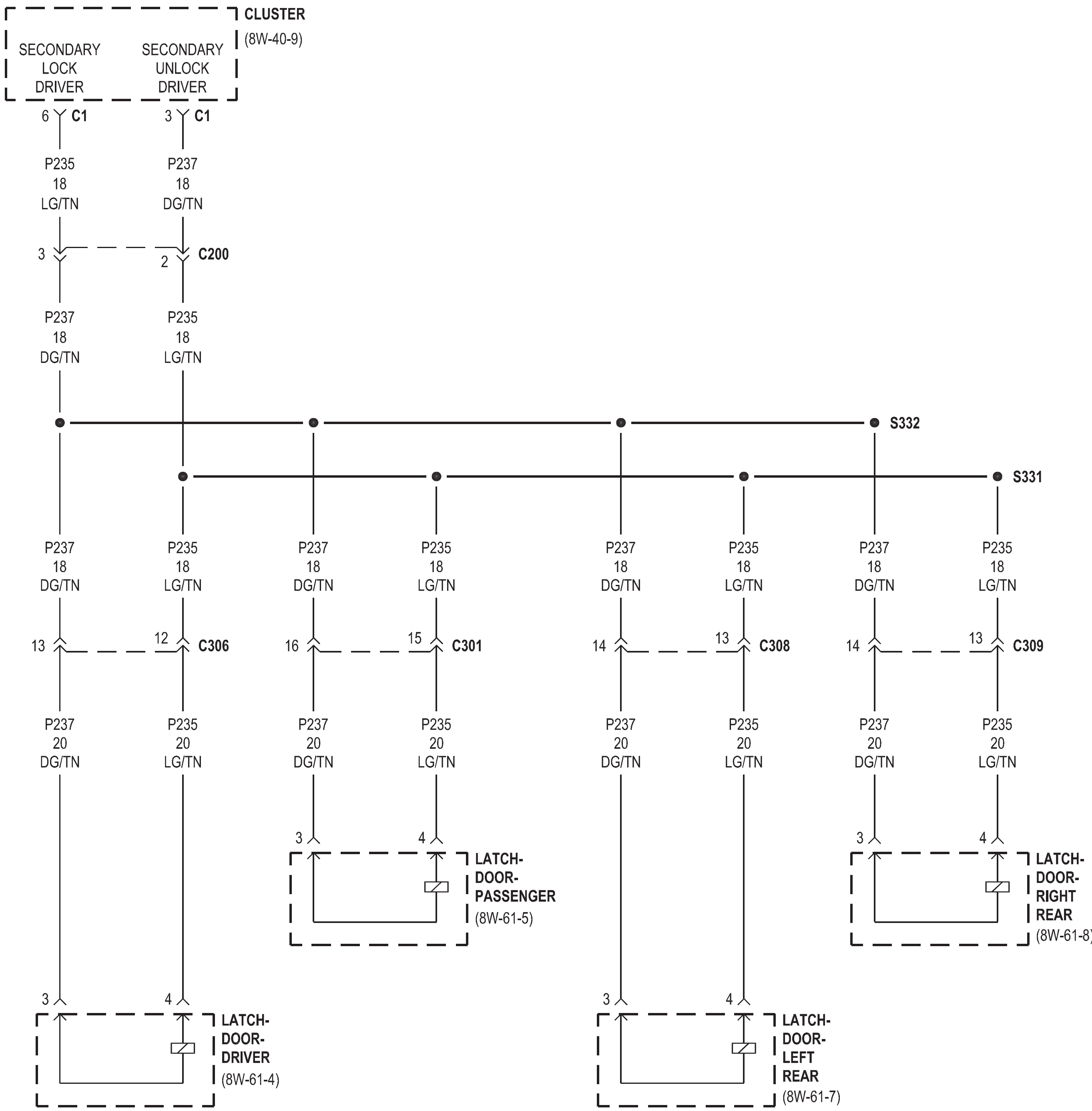

CLUSTER
(8W-40-5)
(8W-40-6)
LEFT FRONT DOOR AJAR SWITCH SENSE
RIGHT FRONT DOOR AJAR SWITCH SENSE
DOOR LOCK SWITCH MUX
3 C2
11 C2
18 C2
G75 20 VT/BK
G74 20 VT/WT
P697 20 LG/DG
17
15
30
C200
G75 20 VT/BK
G74 20 VT/WT
P697 20 LG/DG
1 C301
1
4 C306
G75 20 VT/WT
G74 20 VT/WT
P697 20 LG/DG
7
7
8 C2
LATCH-DOOR-PASSENGER
3 DOOR AJAR
(8W-61-3)
(8W-61-5)
LATCH-DOOR-DRIVER
3 DOOR AJAR
(8W-61-2)
(8W-61-4)
SWITCH-POWER WINDOW-DRIVER
1 LOCK
2 UNLOCK
(8W-60-3)
(8W-60-5)
(8W-61-2)
(8W-61-4)
3
3
1
2
8
8
3 C2
Z960 20 BK/LB
Z928 20 BK/LG
S349
(8W-15-19)
S351
(8W-15-13)
Z960 20 BK/LB
Z928 14 BK/LG
Z929 20 BK/PK
1 C302
2
3 C303
Z960 20 BK/LB
Z960 20 BKLB
Z961 20 BK/YL
G303
(8W-15-19)
G301
(8W-15-13)
G302
(8W-15-15)

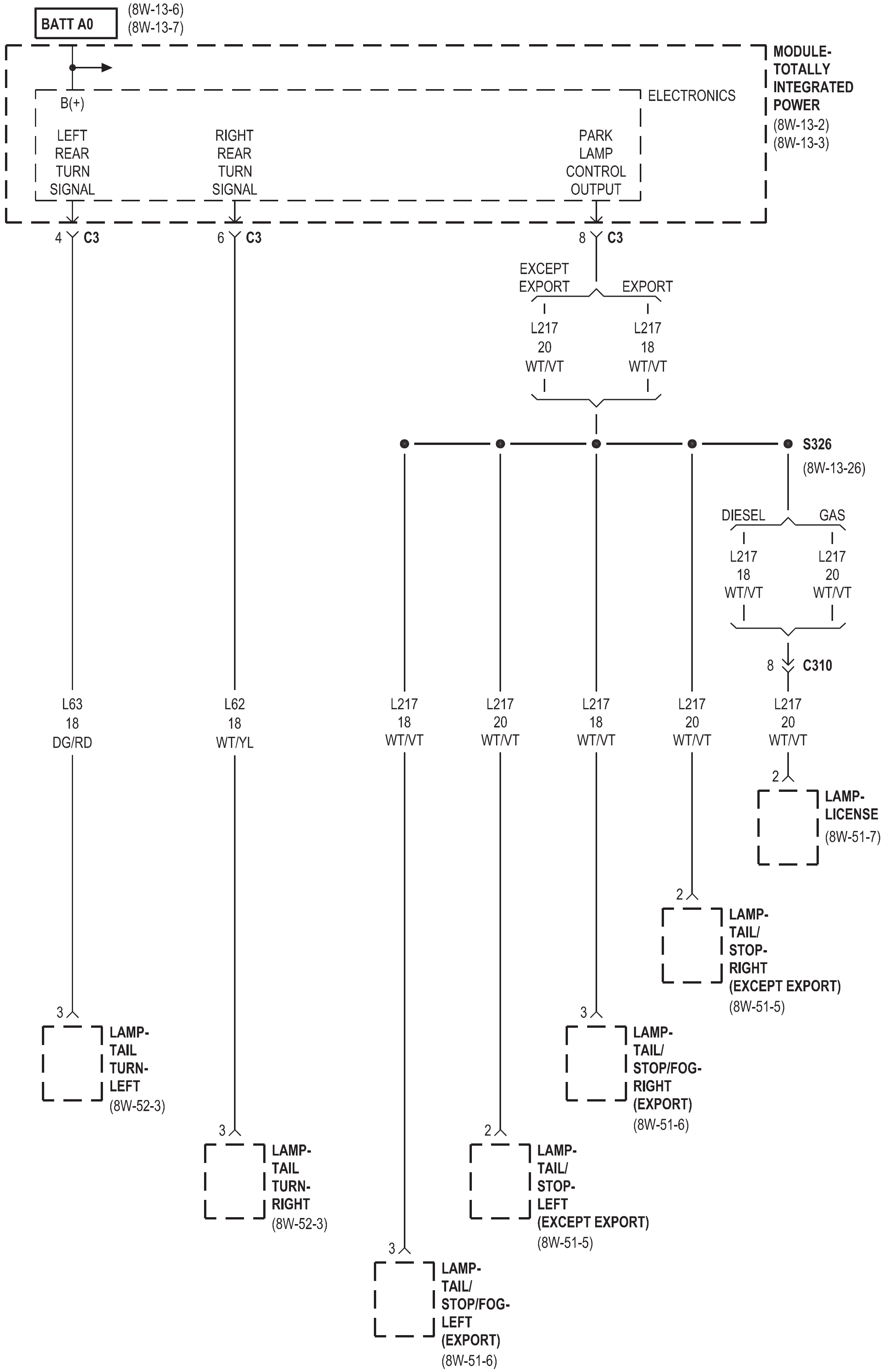

CLUSTER
(8W-40-5)
(8W-40-6)
LIFTGATE AJAR SWITCH SENSE
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
13 C2
5 C2
6 C2
G78 20 VT/LB
G77 20 VT/GY
G76 20 VT/YL
1
24
23
C200
G78 20 VT/LB
G77 20 VT/GY
G76 20 VT/YL
6 C310
4 C308
4 C309
G78 20 VT/OR
G77 20 VT/GY
G76 20 VT/YL
7
3
1 C2
LATCH-DOOR-LIFTGATE
(8W-61-9)
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
2 C2
4
8
Z960 18 BK
S355
(8W-15-12)
Z960 12 BK
RHD
LHD
BASE
EXCEPT BASE
LHD EXCEPT BASE/RHD
LHD BASE
Z929 20 BK
Z928 20 BK
Z928 20 BK/LG
Z928 20 BK/LG
Z928 20 BK
5 C311
9 C308
9 C309
Z960 12 BK/LB
Z964 18 BK/WT
Z964 18 BK/WT
G301
(8W-15-12)
G302
(8W-15-16)
G303
(8W-15-18)
● LHD
●● RHD

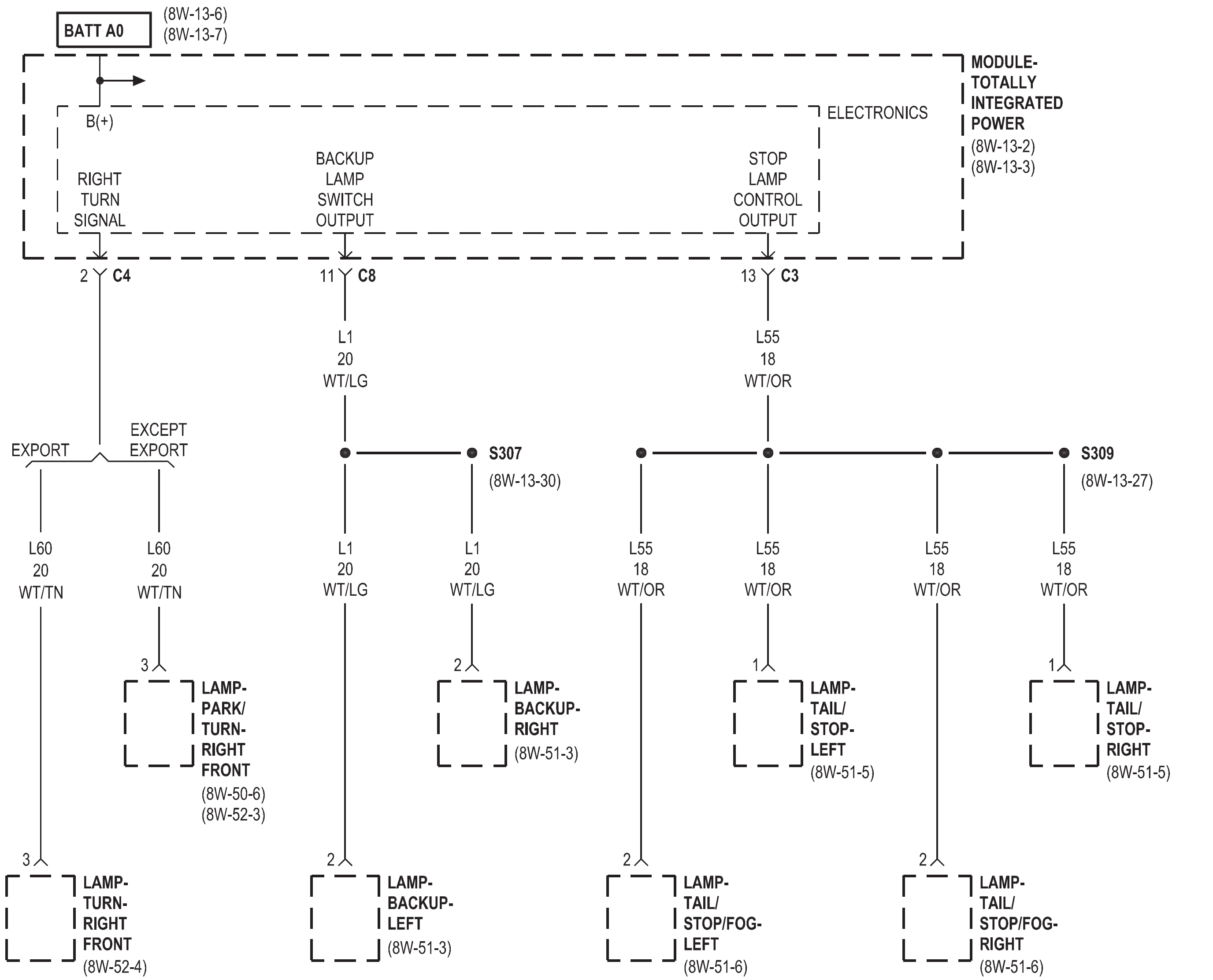
LHD

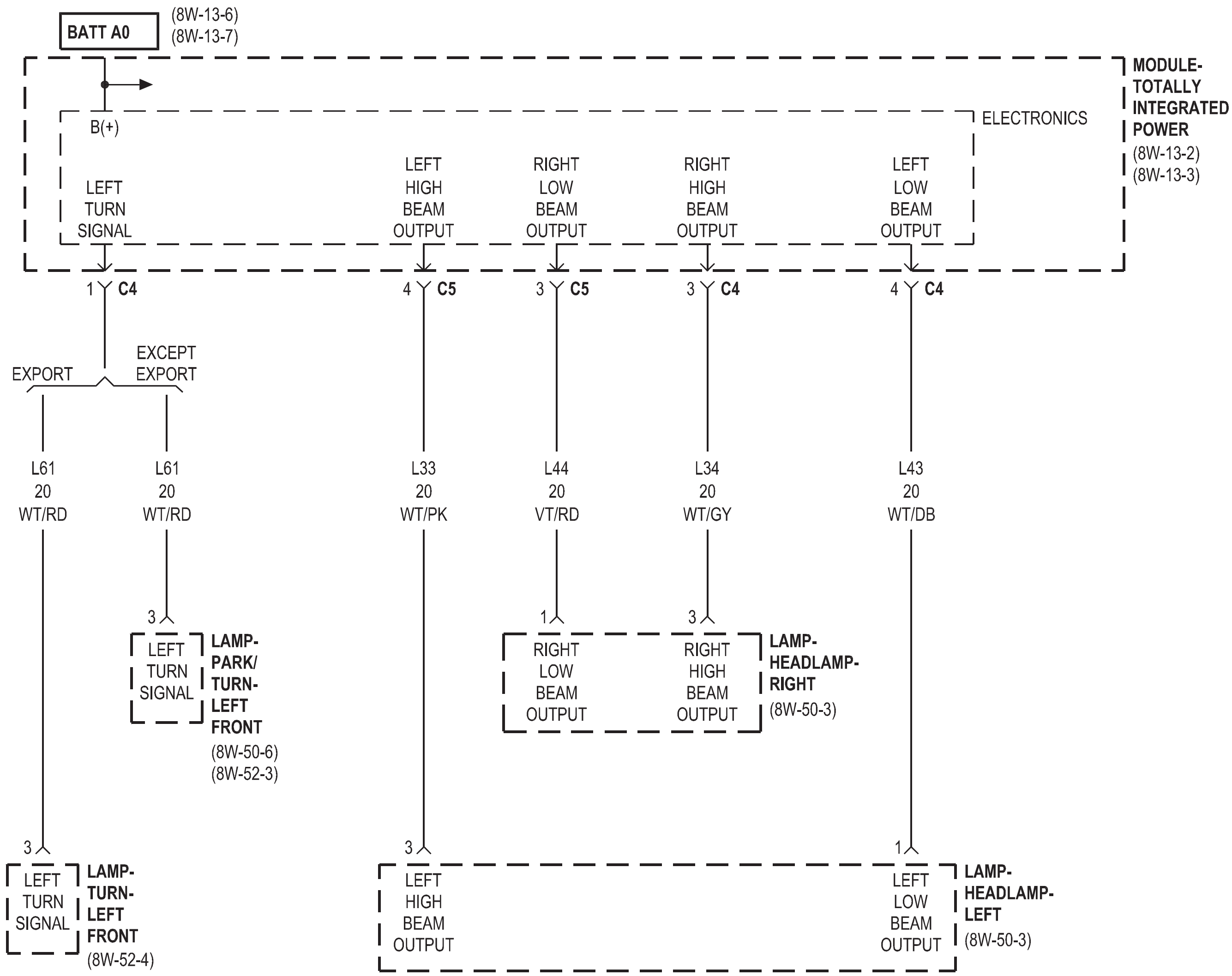

CLUSTER
(8W-40-7)
(8W-40-8)
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
PASSENGER DOOR UNLOCK DRIVER
5 C1
9 C1
7 C1
P238 18 TN/DG
P33 18 TN/DB
P240 18 TN/WT
39
11
12
C200
P33 20 LG/TN
P240 20 LG/YL
S312
S311
P238 18 LG/OR
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
3
2
C301
3
2
C303
3
2
C308
3
2
C309
3
5
C310
P238 20 LG/OR
P33 20 LG/TN
P240 20 TN/WT
P33 18 TN/DB
P240 20 LG/YL
P33 20 TN/DB
P240 20 LG/YL
P33 20 TN/DB
P240 18 LG/YL
P33 18 LG/TN
1
2
LATCH-DOOR-PASSENGER
(8W-61-3)
(8W-61-5)
1
2
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
1
2
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
1
2
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
3 C1
1 C1
LATCH-DOOR-LIFTGATE
(8W-61-9)

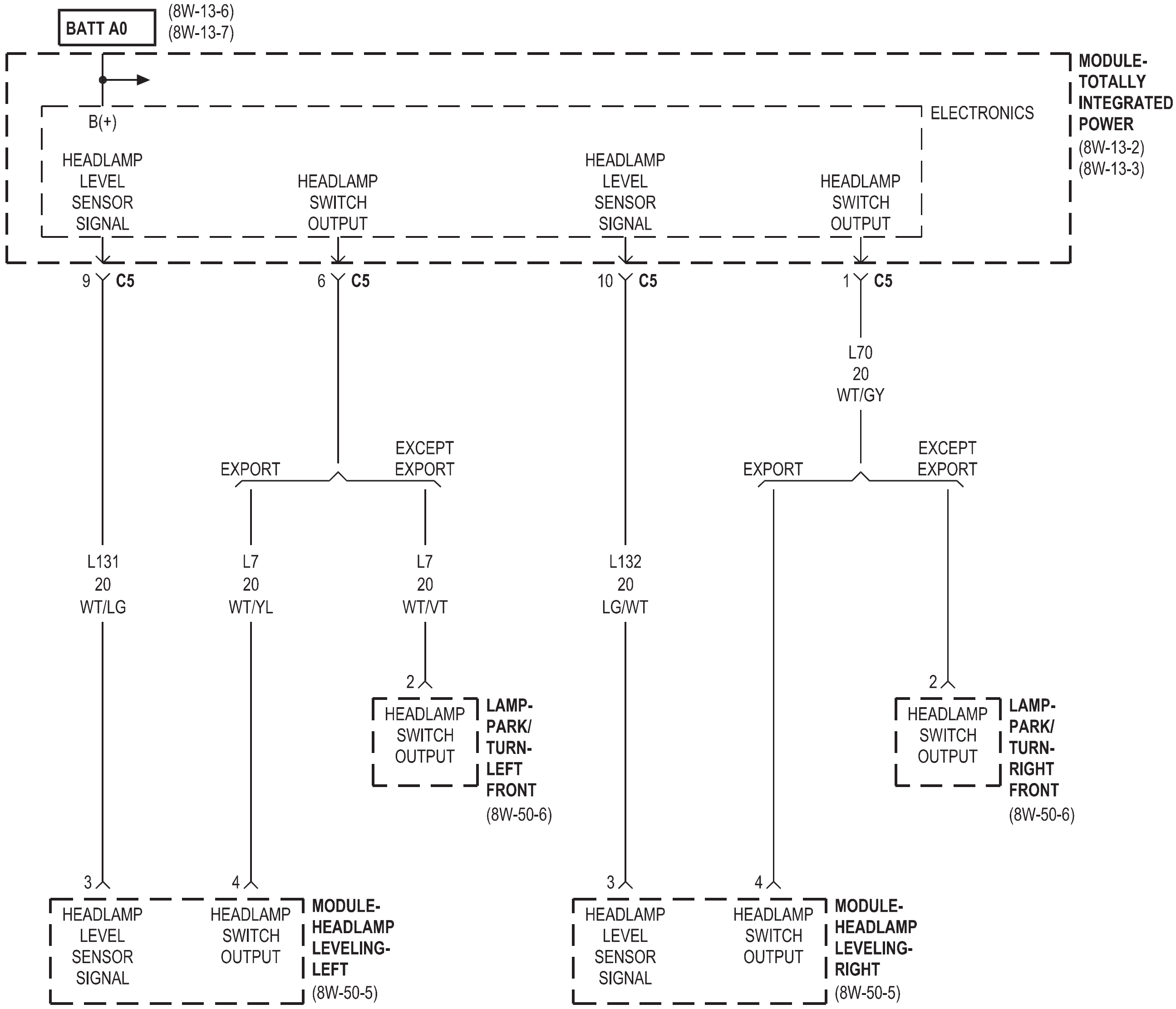

CLUSTER
(8W-40-7)
(8W-40-8)
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
PASSENGER DOOR UNLOCK DRIVER
5 C1
9 C1
7 C1
P238 18 TN/DG
P33 18 LG/TN
P240 18 TN/WT
39
11
12
C200
P33 20 LG/TN
P240 20 LG/YL
S312
S311
P238 18 LG/OR
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
3
2
C306
3
2
C301
3
2
C308
3
2
C309
3
5
C310
P238 20 LG/OR
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 18 LG/YL
P33 18 LG/TN
5
6
LATCH-DOOR-PASSENGER
(8W-61-5)
5
6
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
5
6
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
5
6
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
3 C1
1 C1
LATCH-DOOR-LIFTGATE
(8W-61-9)

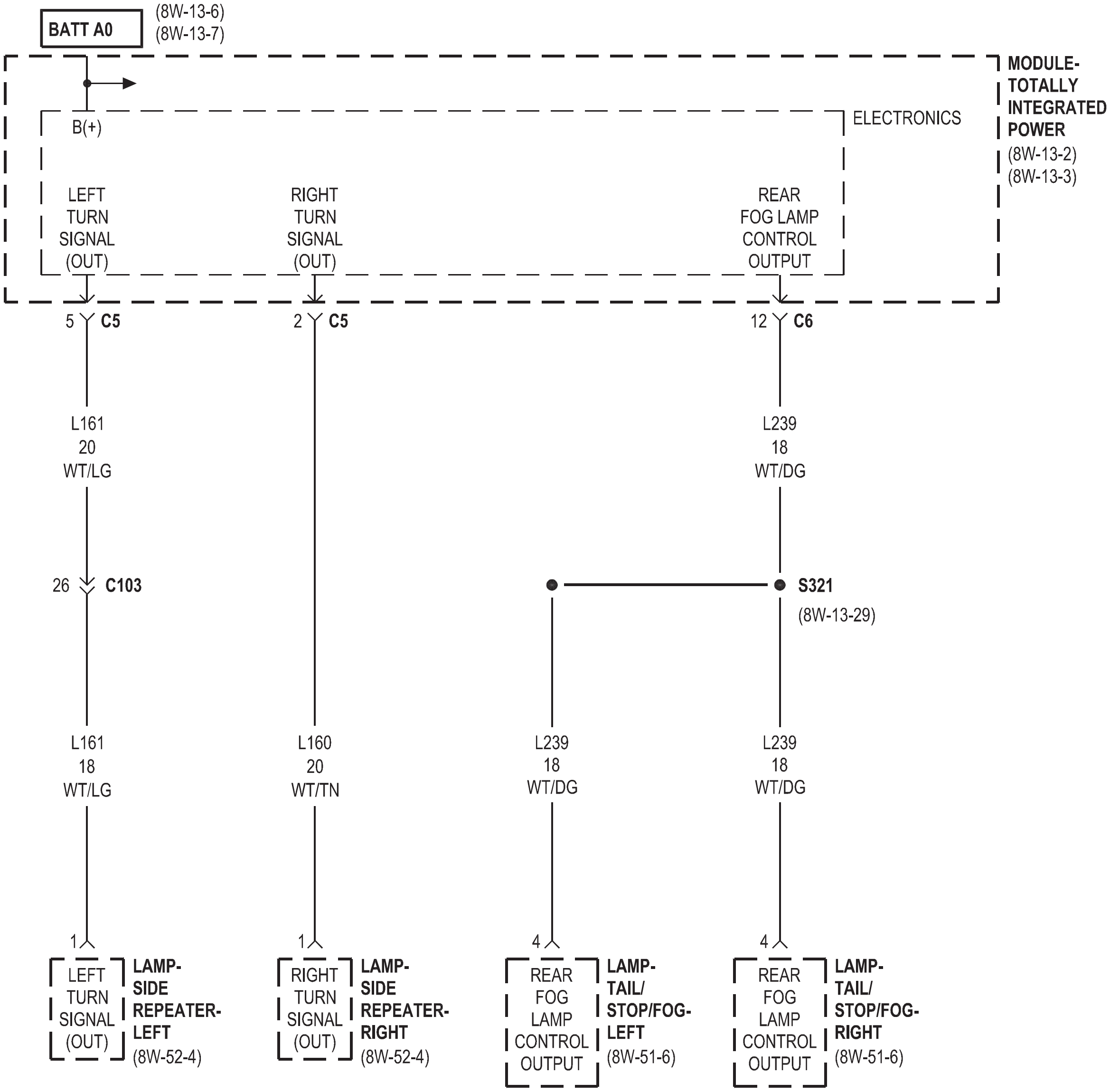

CLUSTER
(8W-40-9)
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
6 C1
3 C1
P235 18 LG/TN
P237 18 DG/TN
3
2 C200
P237 18 DG/TN
P235 18 LG/TN
S332
S331
P237 18 DG/TN
P235 18 LG/TN
13
12 C306
16
15 C301
14
13 C308
14
13 C309
P237 20 DG/TN
P235 20 LG/TN
3
4
LATCH-DOOR-PASSENGER
(8W-61-5)
LATCH-DOOR-RIGHT REAR
(8W-61-8)
LATCH-DOOR-DRIVER
(8W-61-4)
LATCH-DOOR-LEFT REAR
(8W-61-7)

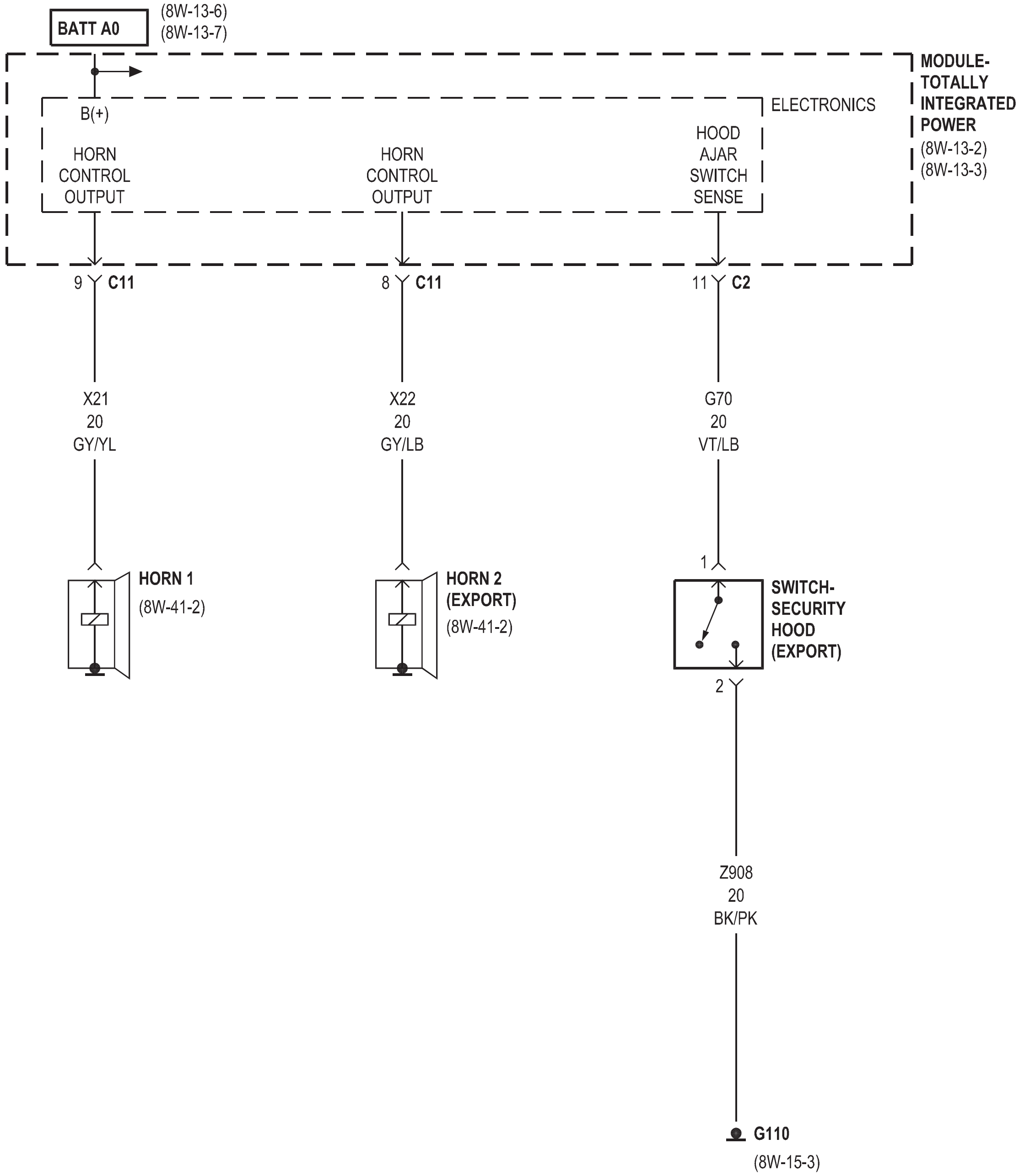

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
LEFT REAR TURN SIGNAL
RIGHT REAR TURN SIGNAL
PARK LAMP CONTROL OUTPUT
4 C3
6 C3
8 C3
EXCEPT EXPORT
EXPORT
L217 20 WT/VT
L217 18 WT/VT
S326
(8W-13-26)
DIESEL
GAS
L217 18 WT/VT
L217 20 WT/VT
8 C310
L63 18 DG/RD
L62 18 WT/YL
L217 18 WT/VT
L217 20 WT/VT
L217 18 WT/VT
L217 20 WT/VT
L217 20 WT/VT
2
LAMP-
LICENSE
(8W-51-7)
2
LAMP-
TAIL/
STOP-
RIGHT
(EXCEPT EXPORT)
(8W-51-5)
3
LAMP-
TAIL
TURN-
LEFT
(8W-52-3)
3
LAMP-
TAIL/
STOP/FOG-
RIGHT
(EXPORT)
(8W-51-6)
3
LAMP-
TAIL
TURN-
RIGHT
(8W-52-3)
2
LAMP-
TAIL/
STOP-
LEFT
(EXCEPT EXPORT)
(8W-51-5)
3
LAMP-
TAIL/
STOP/FOG-
LEFT
(EXPORT)
(8W-51-6)

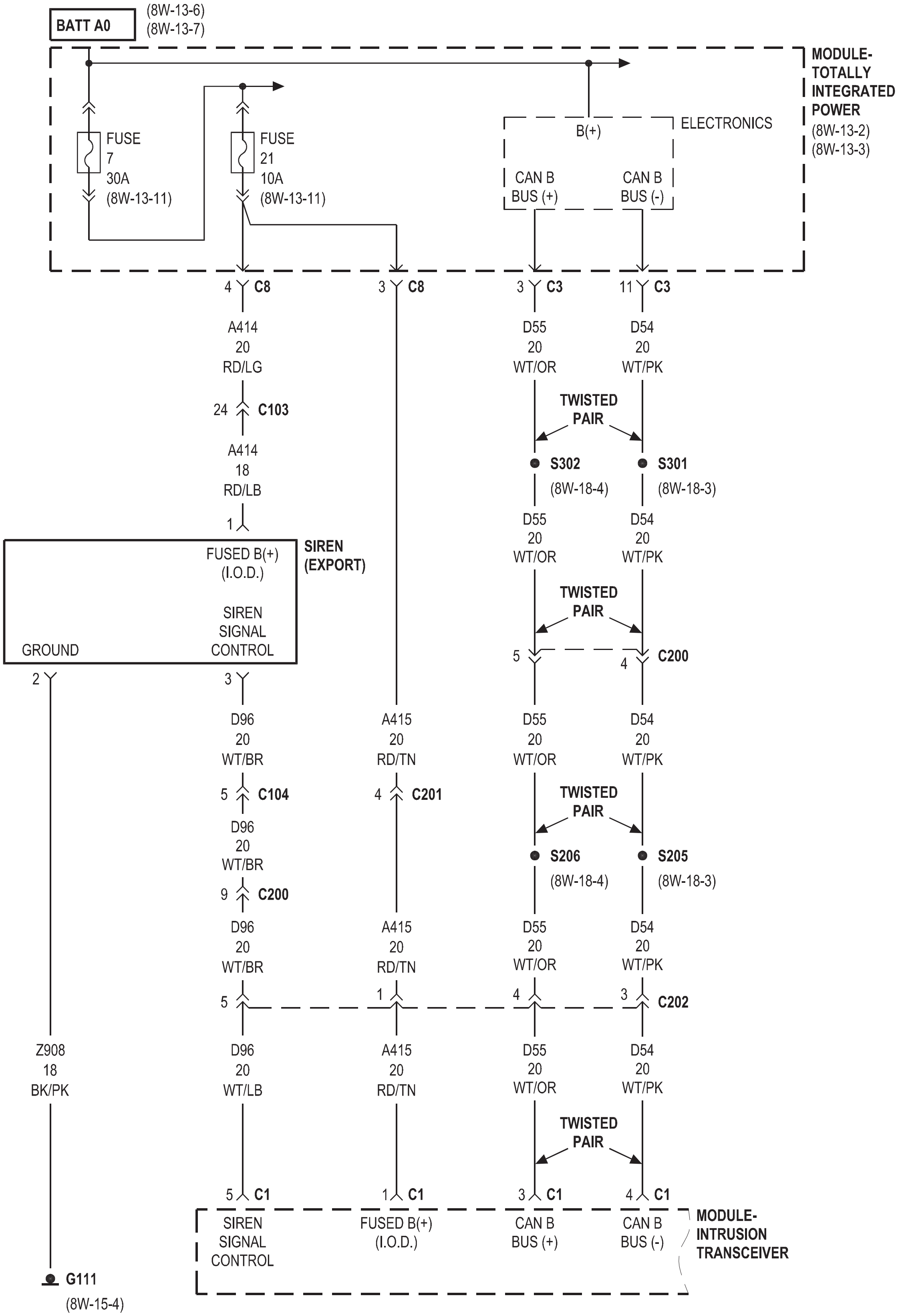

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
RIGHT TURN SIGNAL
BACKUP LAMP SWITCH OUTPUT
STOP LAMP CONTROL OUTPUT
2 C4
11 C8
13 C3
L1 20 WT/LG
L55 18 WT/OR
EXPORT
EXCEPT EXPORT
S307
(8W-13-30)
S309
(8W-13-27)
L60 20 WT/TN
L60 20 WT/TN
L1 20 WT/LG
L1 20 WT/LG
L55 18 WT/OR
L55 18 WT/OR
L55 18 WT/OR
L55 18 WT/OR
3
LAMP-
PARK/
TURN-
RIGHT
FRONT
(8W-50-6)
(8W-52-3)
2
LAMP-
BACKUP-
RIGHT
(8W-51-3)
1
LAMP-
TAIL/
STOP-
LEFT
(8W-51-5)
1
LAMP-
TAIL/
STOP-
RIGHT
(8W-51-5)
3
LAMP-
TURN-
RIGHT
FRONT
(8W-52-4)
2
LAMP-
BACKUP-
LEFT
(8W-51-3)
2
LAMP-
TAIL/
STOP/FOG-
LEFT
(8W-51-6)
2
LAMP-
TAIL/
STOP/FOG-
RIGHT
(8W-51-6)

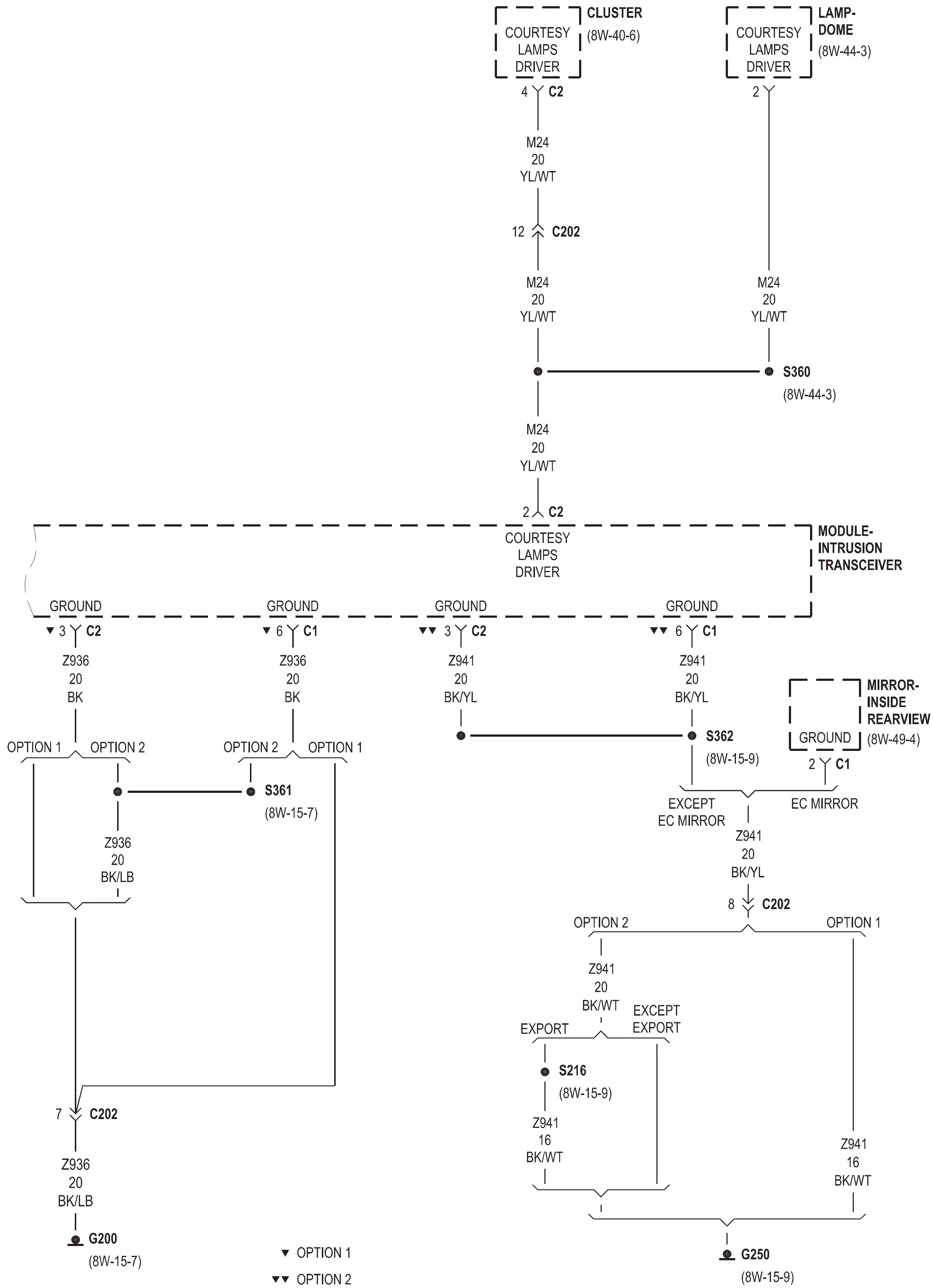

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
LEFT TURN SIGNAL
LEFT HIGH BEAM OUTPUT
RIGHT LOW BEAM OUTPUT
RIGHT HIGH BEAM OUTPUT
LEFT LOW BEAM OUTPUT
1 C4
4 C5
3 C5
3 C4
4 C4
EXPORT
EXCEPT EXPORT
L61 20 WT/RD
L61 20 WT/RD
L33 20 WT/PK
L44 20 VT/RD
L34 20 WT/GY
L43 20 WT/DB
3
LEFT TURN SIGNAL
LAMP-
PARK/
TURN-
LEFT
FRONT
(8W-50-6)
(8W-52-3)
1
3
RIGHT LOW BEAM OUTPUT
RIGHT HIGH BEAM OUTPUT
LAMP-
HEADLAMP-
RIGHT
(8W-50-3)
3
LEFT TURN SIGNAL
LAMP-
TURN-
LEFT
FRONT
(8W-52-4)
3
1
LEFT HIGH BEAM OUTPUT
LEFT LOW BEAM OUTPUT
LAMP-
HEADLAMP-
LEFT
(8W-50-3)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
9 C5
6 C5
10 C5
1 C5
L70
20
WT/GY
EXPORT
EXCEPT EXPORT
EXPORT
EXCEPT EXPORT
L131
20
WT/LG
L7
20
WT/YL
L7
20
WT/VT
L132
20
LG/WT
2
HEADLAMP SWITCH OUTPUT
LAMP-
PARK/
TURN-
LEFT
FRONT
(8W-50-6)
2
HEADLAMP SWITCH OUTPUT
LAMP-
PARK/
TURN-
RIGHT
FRONT
(8W-50-6)
3
4
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
MODULE-
HEADLAMP
LEVELING-
LEFT
(8W-50-5)
3
4
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
MODULE-
HEADLAMP
LEVELING-
RIGHT
(8W-50-5)

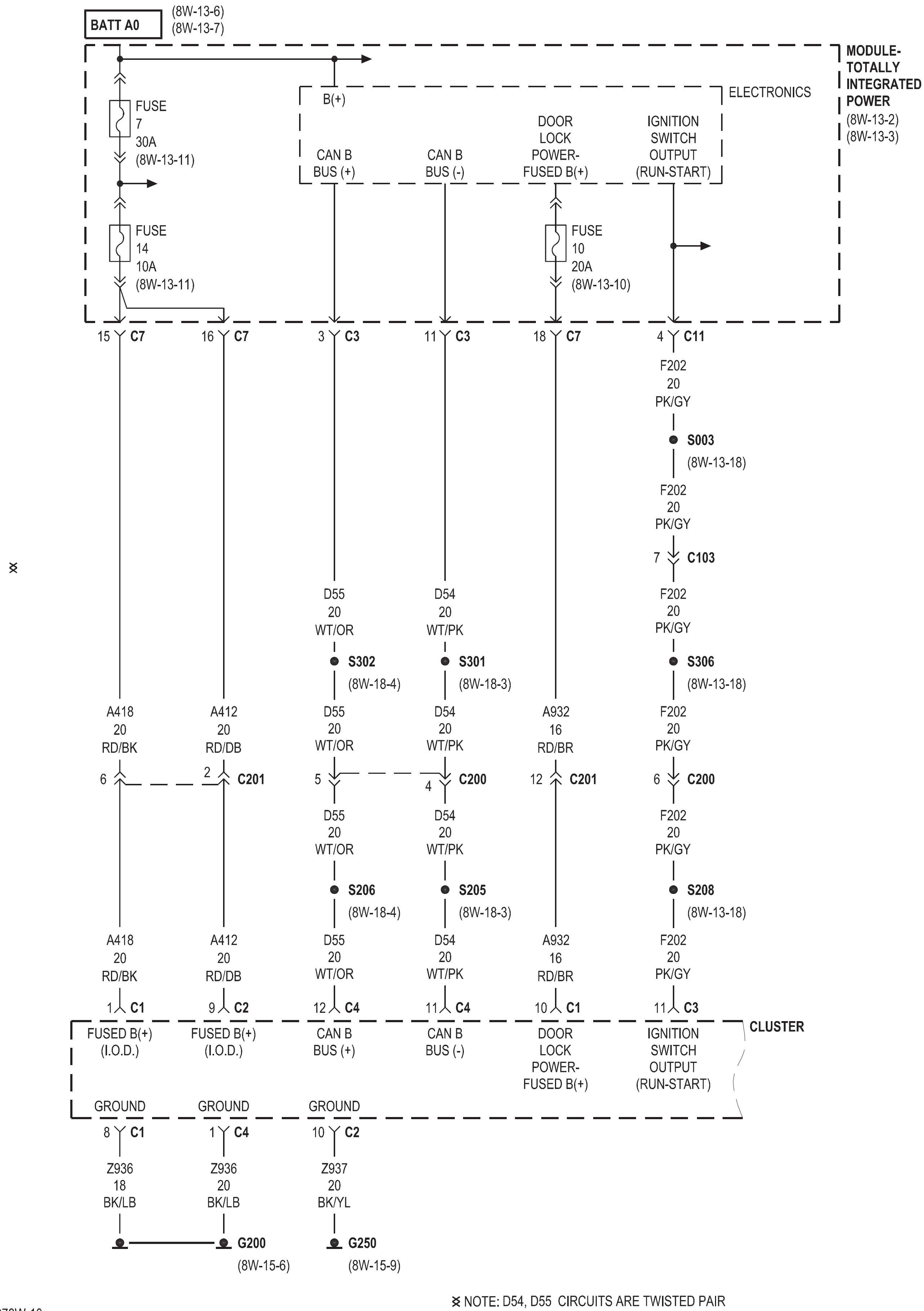

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
LEFT TURN SIGNAL (OUT)
RIGHT TURN SIGNAL (OUT)
REAR FOG LAMP CONTROL OUTPUT
5 C5
2 C5
12 C6
L161 20 WT/LG
L239 18 WT/DG
26 C103
S321
(8W-13-29)
L161 18 WT/LG
L160 20 WT/TN
L239 18 WT/DG
L239 18 WT/DG
1
1
4
4
LEFT TURN SIGNAL (OUT)
LAMP-
SIDE
REPEATER-
LEFT
(8W-52-4)
RIGHT TURN SIGNAL (OUT)
LAMP-
SIDE
REPEATER-
RIGHT
(8W-52-4)
REAR FOG LAMP CONTROL OUTPUT
LAMP-
TAIL/
STOP/FOG-
LEFT
(8W-51-6)
REAR FOG LAMP CONTROL OUTPUT
LAMP-
TAIL/
STOP/FOG-
RIGHT
(8W-51-6)

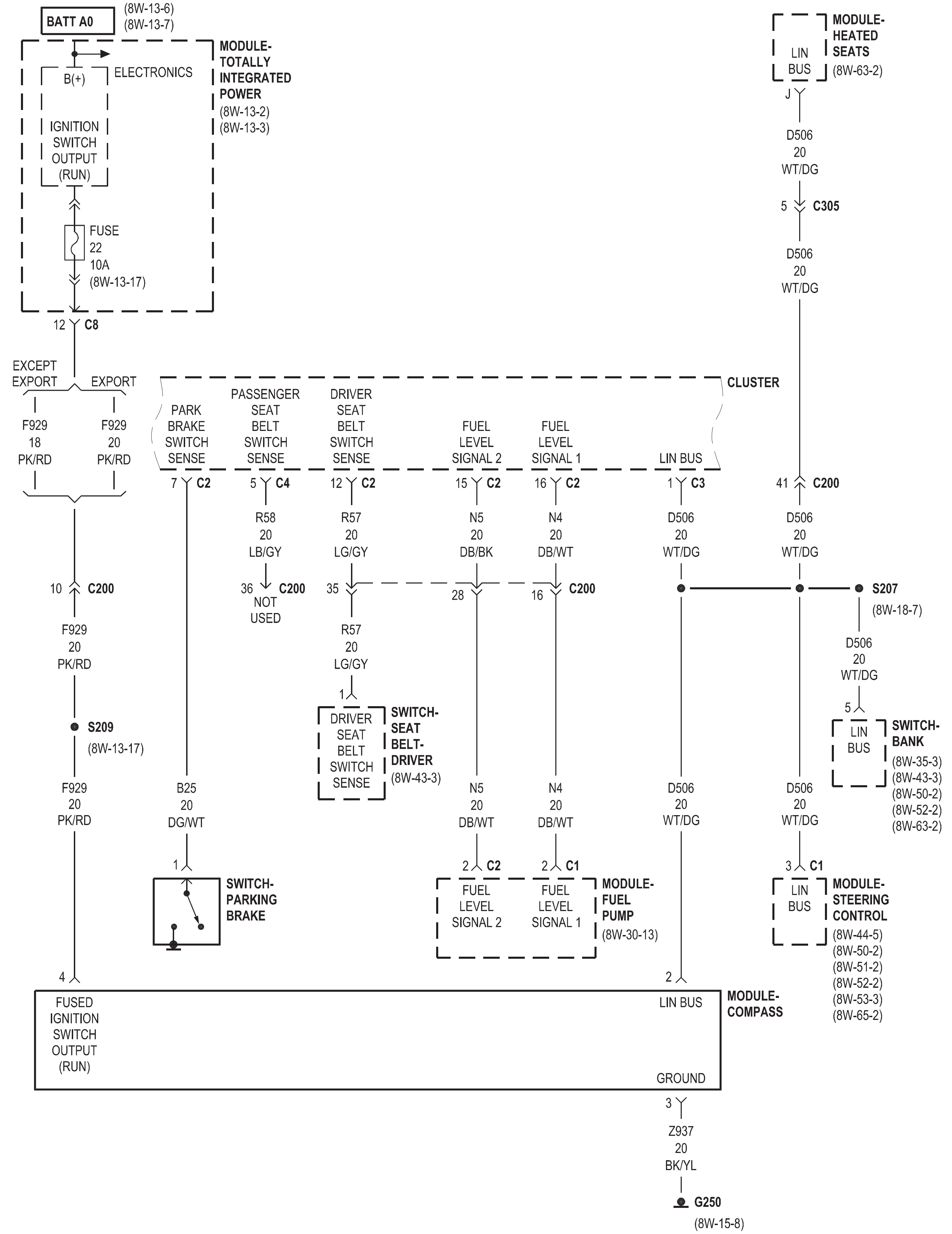

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
HORN
CONTROL
OUTPUT
HORN
CONTROL
OUTPUT
HOOD
AJAR
SWITCH
SENSE
9 C11
8 C11
11 C2
X21
20
GY/YL
X22
20
GY/LB
G70
20
VT/LB
HORN 1
(8W-41-2)
HORN 2
(EXPORT)
(8W-41-2)
1
SWITCH-
SECURITY
HOOD
(EXPORT)
2
Z908
20
BK/PK
G110
(8W-15-3)

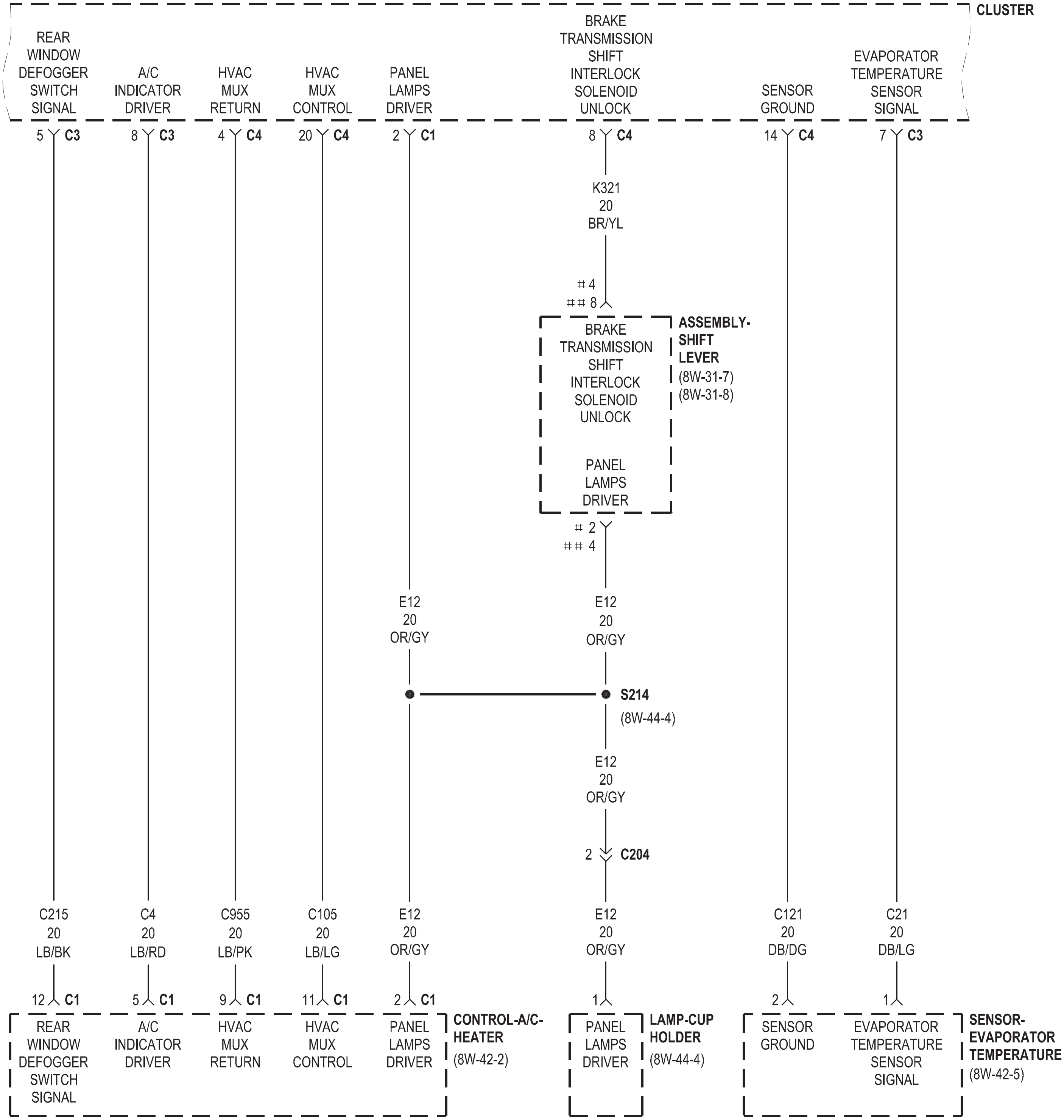

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
7
30A
(8W-13-11)
FUSE
21
10A
(8W-13-11)
ELECTRONICS
B(+)
CAN B
BUS (+)
CAN B
BUS (-)
4 C8
3 C8
3 C3
11 C3
A414
20
RD/LG
D55
20
WT/OR
D54
20
WT/PK
TWISTED
PAIR
24 C103
A414
18
RD/LB
S302
(8W-18-4)
S301
(8W-18-3)
1
SIREN
(EXPORT)
FUSED B(+)
(I.O.D.)
SIREN
SIGNAL
CONTROL
GROUND
5
4
C200
2
3
D96
20
WT/BR
A415
20
RD/TN
5 C104
4 C201
S206
(8W-18-4)
S205
(8W-18-3)
9 C200
5
1
4
3
C202
Z908
18
BK/PK
D96
20
WT/LB
5 C1
1 C1
3 C1
4 C1
MODULE-
INTRUSION
TRANSCEIVER
SIREN
SIGNAL
CONTROL
FUSED B(+)
(I.O.D.)
CAN B
BUS (+)
CAN B
BUS (-)
G111
(8W-15-4)


CLUSTER
COURTESY LAMPS DRIVER
(8W-40-6)
4 C2
LAMP-DOME
COURTESY LAMPS DRIVER
(8W-44-3)
2
M24 20 YL/WT
12 C202
M24 20 YL/WT
M24 20 YL/WT
S360
(8W-44-3)
M24 20 YL/WT
2 C2
MODULE-INTRUSION TRANSCEIVER
COURTESY LAMPS DRIVER
GROUND
3 C2
6 C1
Z936 20 BK
Z941 20 BK/YL
MIRROR-INSIDE REARVIEW
GROUND
(8W-49-4)
2 C1
OPTION 1
OPTION 2
S361
(8W-15-7)
S362
(8W-15-9)
EXCEPT EC MIRROR
EC MIRROR
Z936 20 BK/LB
Z941 20 BK/YL
8 C202
Z941 20 BK/WT
EXPORT
EXCEPT EXPORT
S216
(8W-15-9)
Z941 16 BK/WT
7 C202
Z936 20 BK/LB
G200
(8W-15-7)
G250
(8W-15-9)
▼ OPTION 1
▼▼ OPTION 2

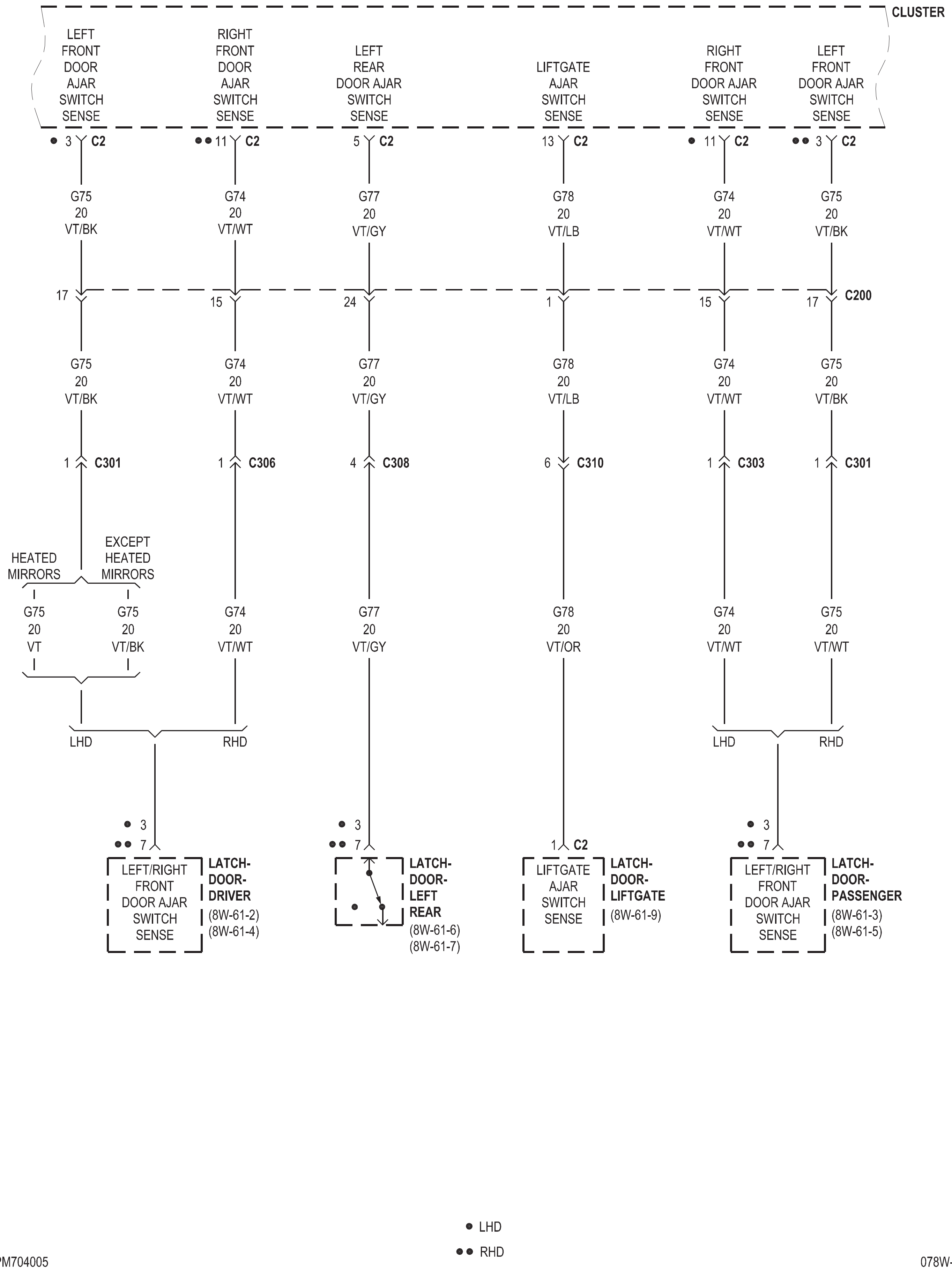
8W-40 INSTRUMENT CLUSTER

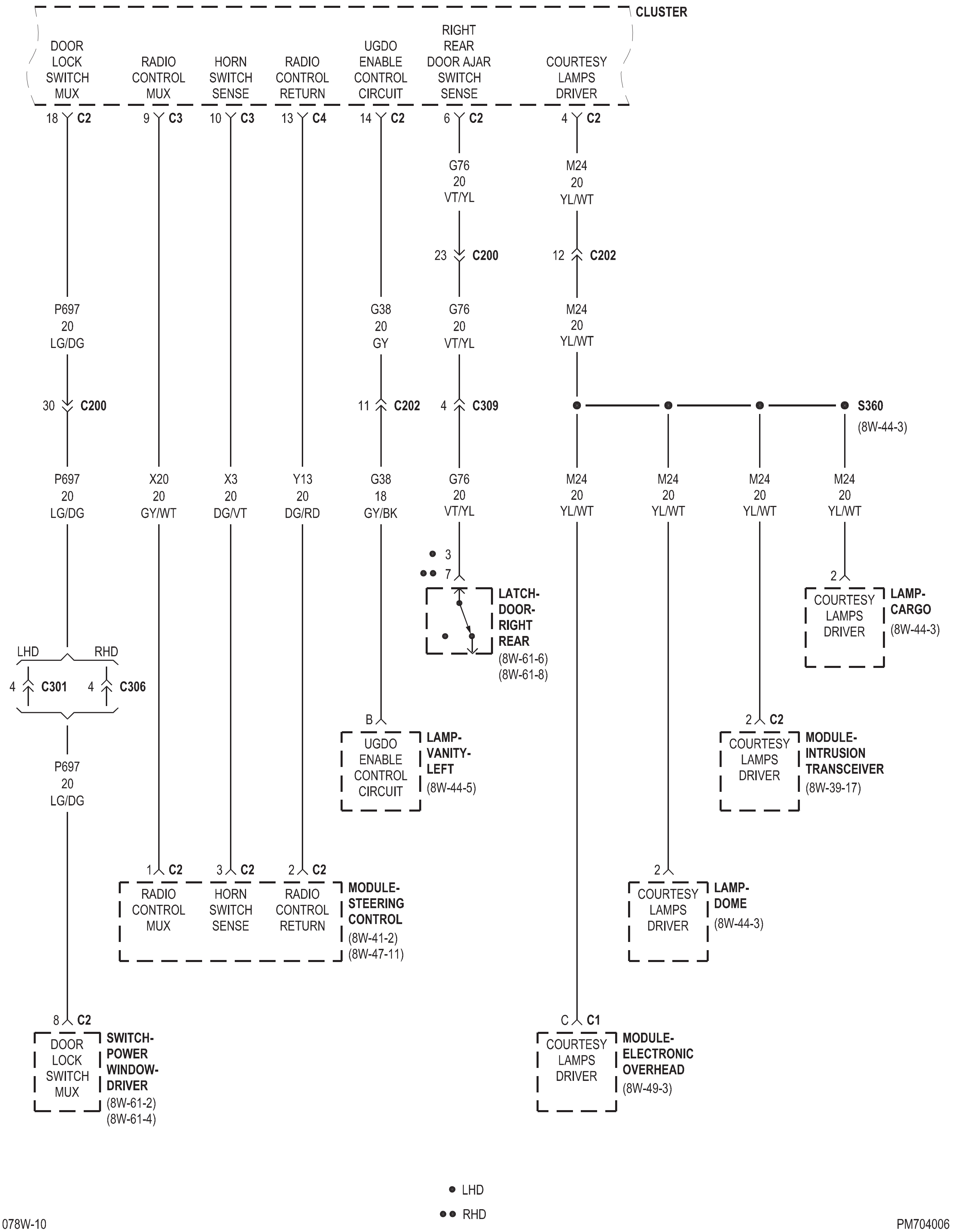

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
FUSE
7
30A
(8W-13-11)
FUSE
14
10A
(8W-13-11)
CAN B
BUS (+)
CAN B
BUS (-)
DOOR
LOCK
POWER-
FUSED B(+)
IGNITION
SWITCH
OUTPUT
(RUN-START)
FUSE
10
20A
(8W-13-10)
15 C7
16 C7
3 C3
11 C3
18 C7
4 C11
F202
20
PK/GY
S003
(8W-13-18)
7 C103
D55
20
WT/OR
D54
20
WT/PK
S302
(8W-18-4)
S301
(8W-18-3)
S306
(8W-13-18)
A418
20
RD/BK
A412
20
RD/DB
A932
16
RD/BR
6
2 C201
5
4 C200
12 C201
6 C200
S206
(8W-18-4)
S205
(8W-18-3)
S208
(8W-13-18)
1 C1
9 C2
12 C4
11 C4
10 C1
11 C3
CLUSTER
FUSED B(+)
(I.O.D.)
GROUND
8 C1
1 C4
10 C2
Z936
18
BK/LB
Z936
20
BK/LB
Z937
20
BK/YL
G200
(8W-15-6)
G250
(8W-15-9)
NOTE: D54, D55 CIRCUITS ARE TWISTED PAIR

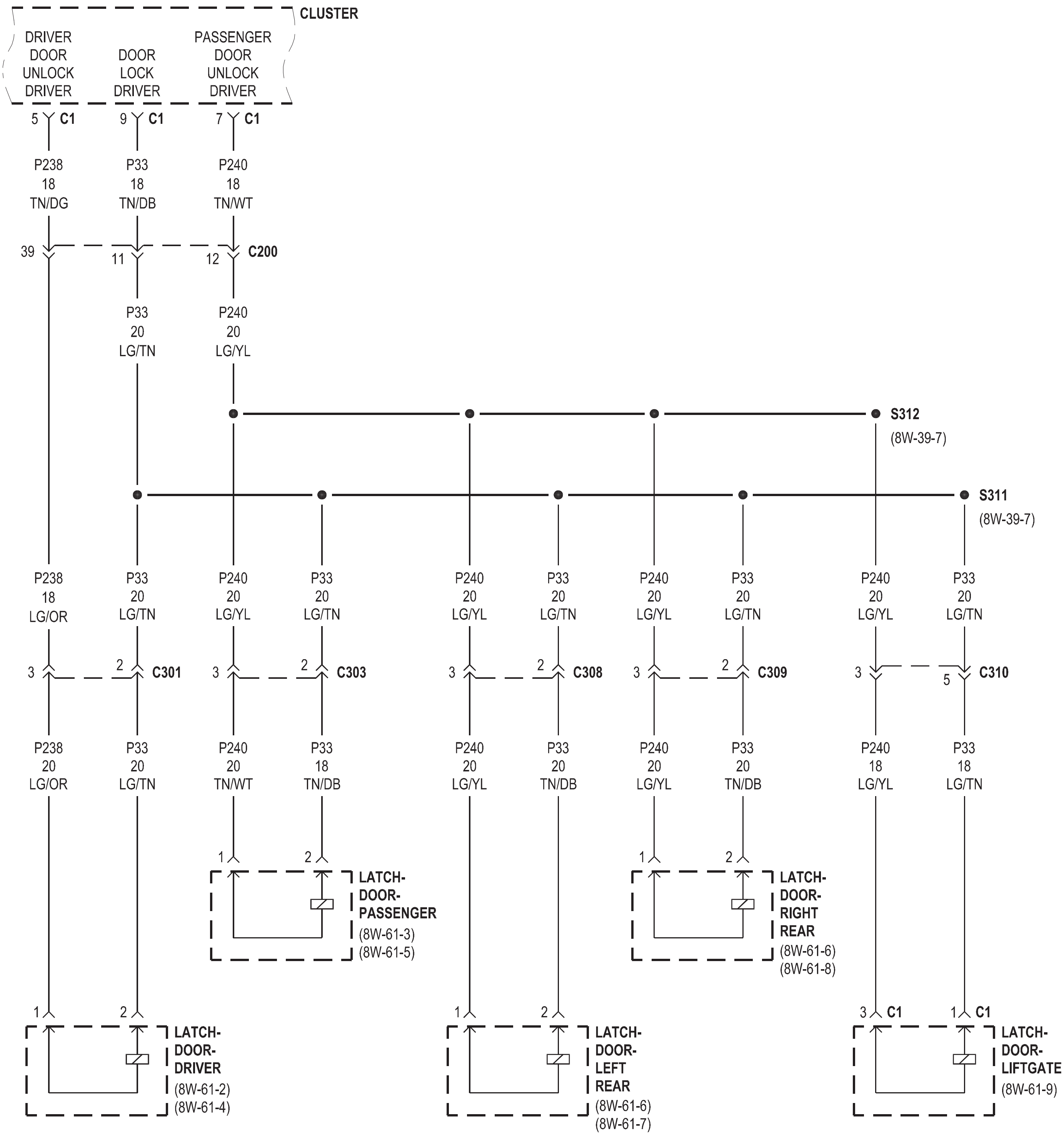

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (RUN)
FUSE 22 10A (8W-13-17)
12 C8
EXCEPT EXPORT
EXPORT
F929 18 PK/RD
F929 20 PK/RD
10 C200
F929 20 PK/RD
S209 (8W-13-17)
F929 20 PK/RD
CLUSTER
PARK BRAKE SWITCH SENSE
PASSENGER SEAT BELT SWITCH SENSE
DRIVER SEAT BELT SWITCH SENSE
FUEL LEVEL SIGNAL 2
FUEL LEVEL SIGNAL 1
LIN BUS
7 C2
5 C4
12 C2
15 C2
16 C2
1 C3
41 C200
B25 20 DG/WT
R58 20 LB/GY
36 C200 NOT USED
R57 20 LG/GY
35
28
16 C200
R57 20 LG/GY
N5 20 DB/BK
N4 20 DB/WT
D506 20 WT/DG
1
DRIVER SEAT BELT SWITCH SENSE
SWITCH-SEAT BELT-DRIVER (8W-43-3)
N5 20 DB/WT
N4 20 DB/WT
1
SWITCH-PARKING BRAKE
2 C2
2 C1
FUEL LEVEL SIGNAL 2
FUEL LEVEL SIGNAL 1
MODULE-FUEL PUMP (8W-30-13)
MODULE-HEATED SEATS (8W-63-2)
LIN BUS
J
D506 20 WT/DG
5 C305
D506 20 WT/DG
S207 (8W-18-7)
D506 20 WT/DG
5
LIN BUS
SWITCH-BANK (8W-35-3) (8W-43-3) (8W-50-2) (8W-52-2) (8W-63-2)
3 C1
LIN BUS
MODULE-STEERING CONTROL (8W-44-5) (8W-50-2) (8W-51-2) (8W-52-2) (8W-53-3) (8W-65-2)
4
2
FUSED IGNITION SWITCH OUTPUT (RUN)
LIN BUS
GROUND
MODULE-COMPASS
3
Z937 20 BK/YL
G250 (8W-15-8)

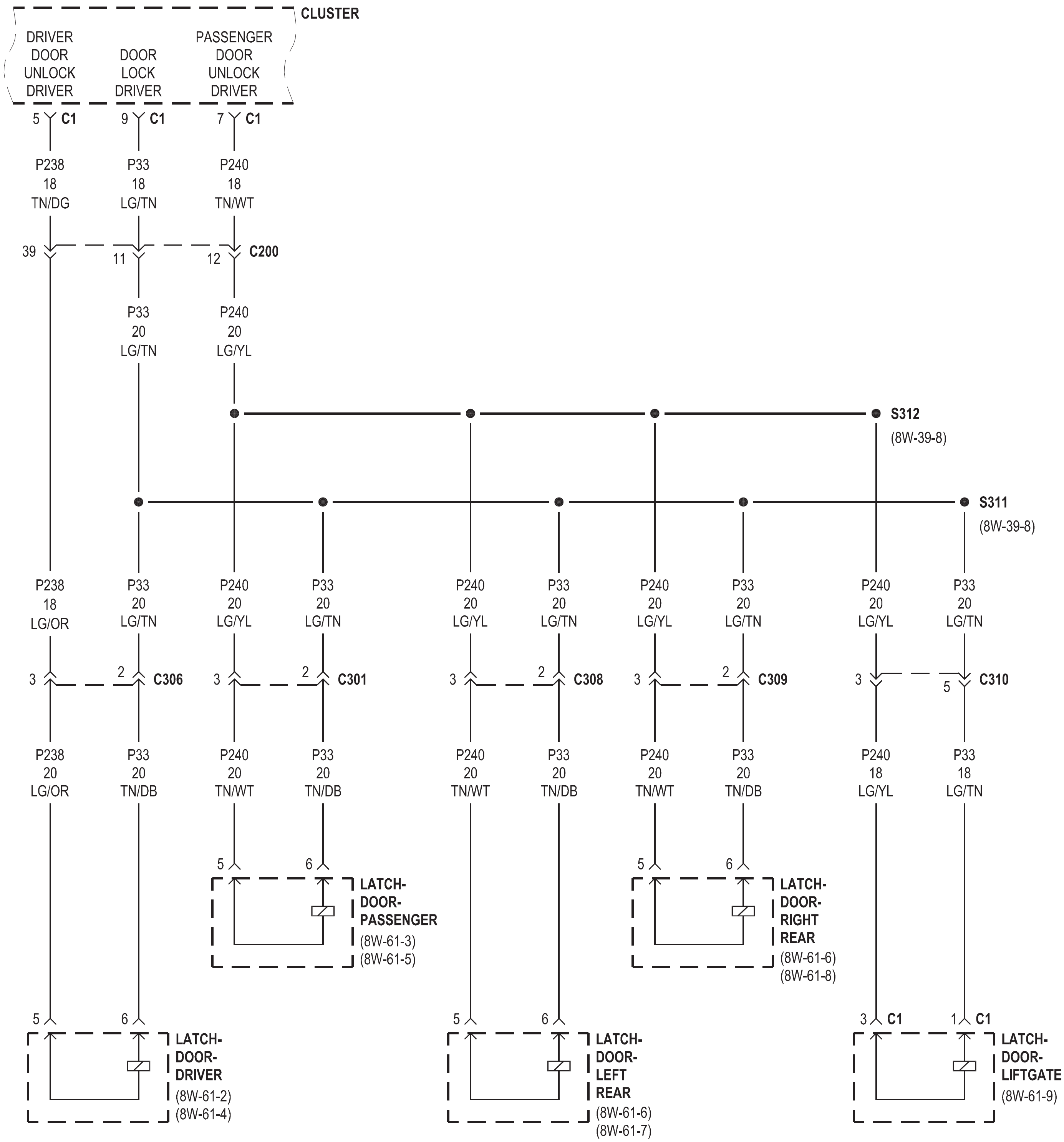

CLUSTER
REAR WINDOW DEFOGGER SWITCH SIGNAL
A/C INDICATOR DRIVER
HVAC MUX RETURN
HVAC MUX CONTROL
PANEL LAMPS DRIVER
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK
SENSOR GROUND
EVAPORATOR TEMPERATURE SENSOR SIGNAL
5 C3
8 C3
4 C4
20 C4
2 C1
8 C4
14 C4
7 C3
K321 20 BR/YL
4
8
ASSEMBLY-SHIFT LEVER
(8W-31-7)
(8W-31-8)
BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK
PANEL LAMPS DRIVER
2
4
E12 20 OR/GY
E12 20 OR/GY
S214
(8W-44-4)
E12 20 OR/GY
2 C204
C215 20 LB/BK
C4 20 LB/RD
C955 20 LB/PK
C105 20 LB/LG
E12 20 OR/GY
E12 20 OR/GY
C121 20 DB/DG
C21 20 DB/LG
12 C1
5 C1
9 C1
11 C1
2 C1
1
2
1
REAR WINDOW DEFOGGER SWITCH SIGNAL
A/C INDICATOR DRIVER
HVAC MUX RETURN
HVAC MUX CONTROL
PANEL LAMPS DRIVER
CONTROL-A/C-HEATER
(8W-42-2)
PANEL LAMPS DRIVER
LAMP-CUP HOLDER
(8W-44-4)
SENSOR GROUND
EVAPORATOR TEMPERATURE SENSOR SIGNAL
SENSOR-EVAPORATOR TEMPERATURE
(8W-42-5)

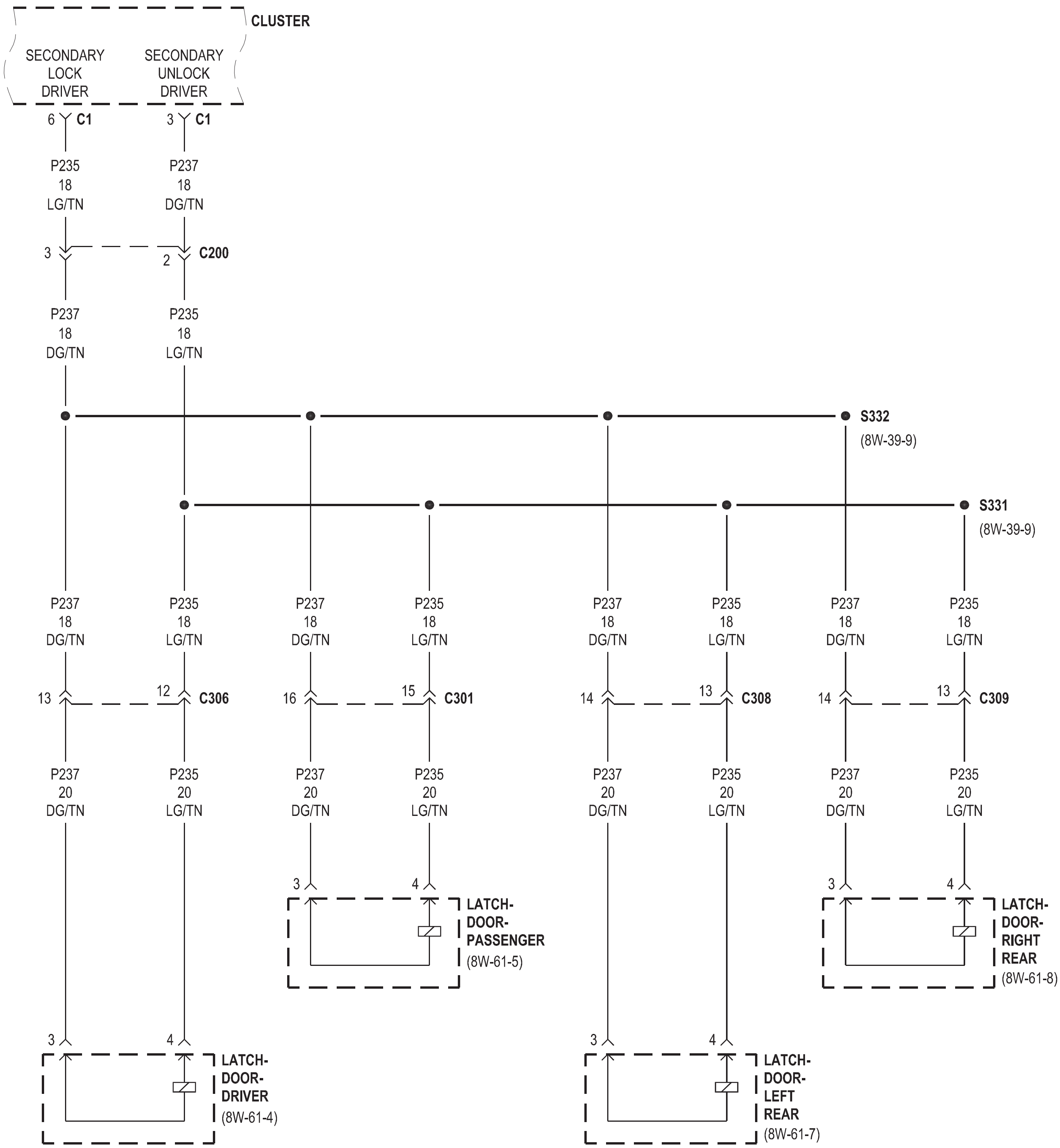
FWD
AWD

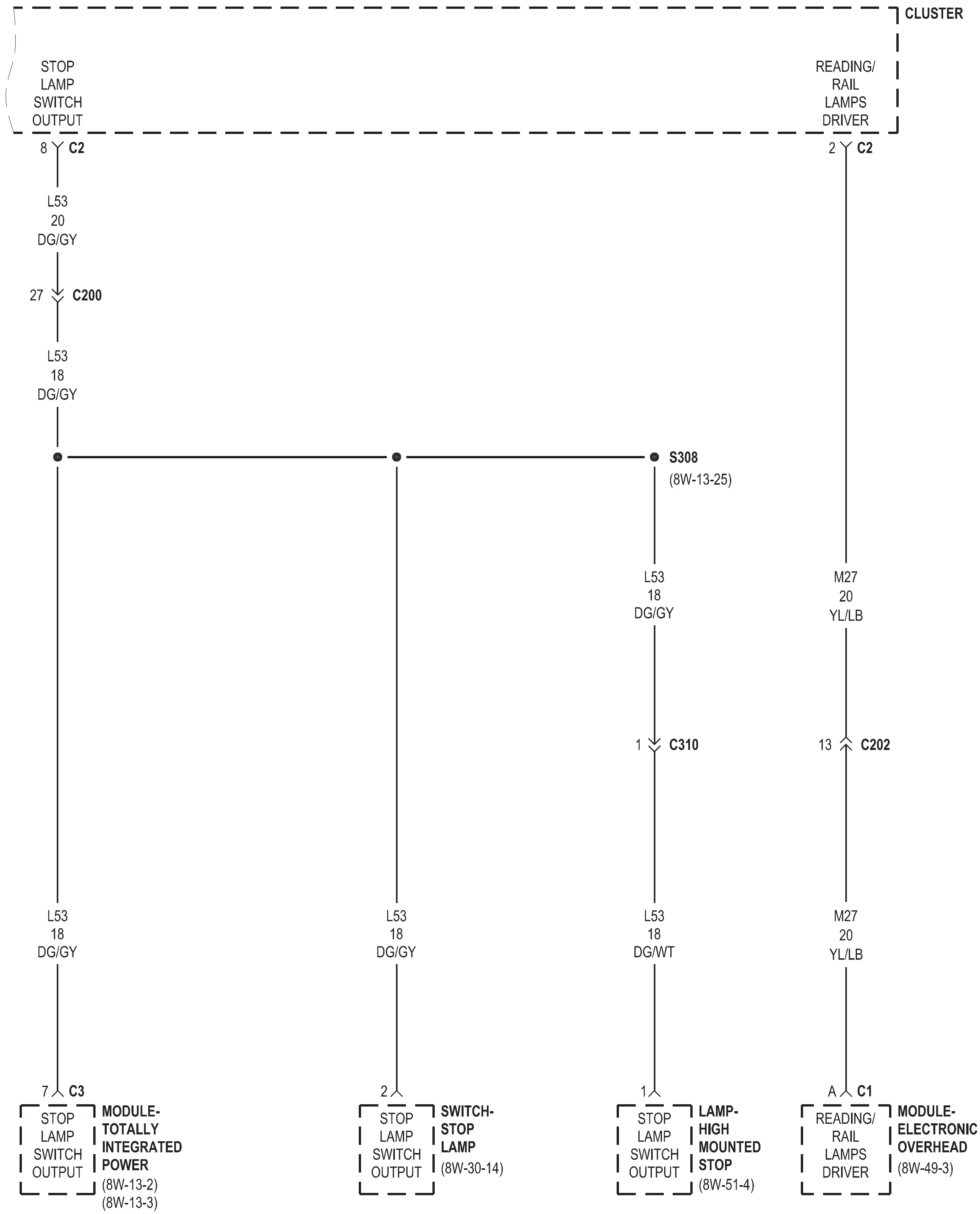

CLUSTER
LEFT FRONT DOOR AJAR SWITCH SENSE
RIGHT FRONT DOOR AJAR SWITCH SENSE
LEFT REAR DOOR AJAR SWITCH SENSE
LIFTGATE AJAR SWITCH SENSE
RIGHT FRONT DOOR AJAR SWITCH SENSE
LEFT FRONT DOOR AJAR SWITCH SENSE
3 C2
11 C2
5 C2
13 C2
11 C2
3 C2
G75 20 VT/BK
G74 20 VT/WT
G77 20 VT/GY
G78 20 VT/LB
G74 20 VT/WT
G75 20 VT/BK
17
15
24
1
15
17
C200
G75 20 VT/BK
G74 20 VT/WT
G77 20 VT/GY
G78 20 VT/LB
G74 20 VT/WT
G75 20 VT/BK
1 C301
1 C306
4 C308
6 C310
1 C303
1 C301
HEATED MIRRORS
EXCEPT HEATED MIRRORS
G75 20 VT
G75 20 VT/BK
G74 20 VT/WT
G77 20 VT/GY
G78 20 VT/OR
G74 20 VT/WT
G75 20 VT/WT
LHD
RHD
LHD
RHD
3
7
3
7
1 C2
3
7
LEFT/RIGHT FRONT DOOR AJAR SWITCH SENSE
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
LIFTGATE AJAR SWITCH SENSE
LATCH-DOOR-LIFTGATE
(8W-61-9)
LEFT/RIGHT FRONT DOOR AJAR SWITCH SENSE
LATCH-DOOR-PASSENGER
(8W-61-3)
(8W-61-5)
● LHD
●● RHD

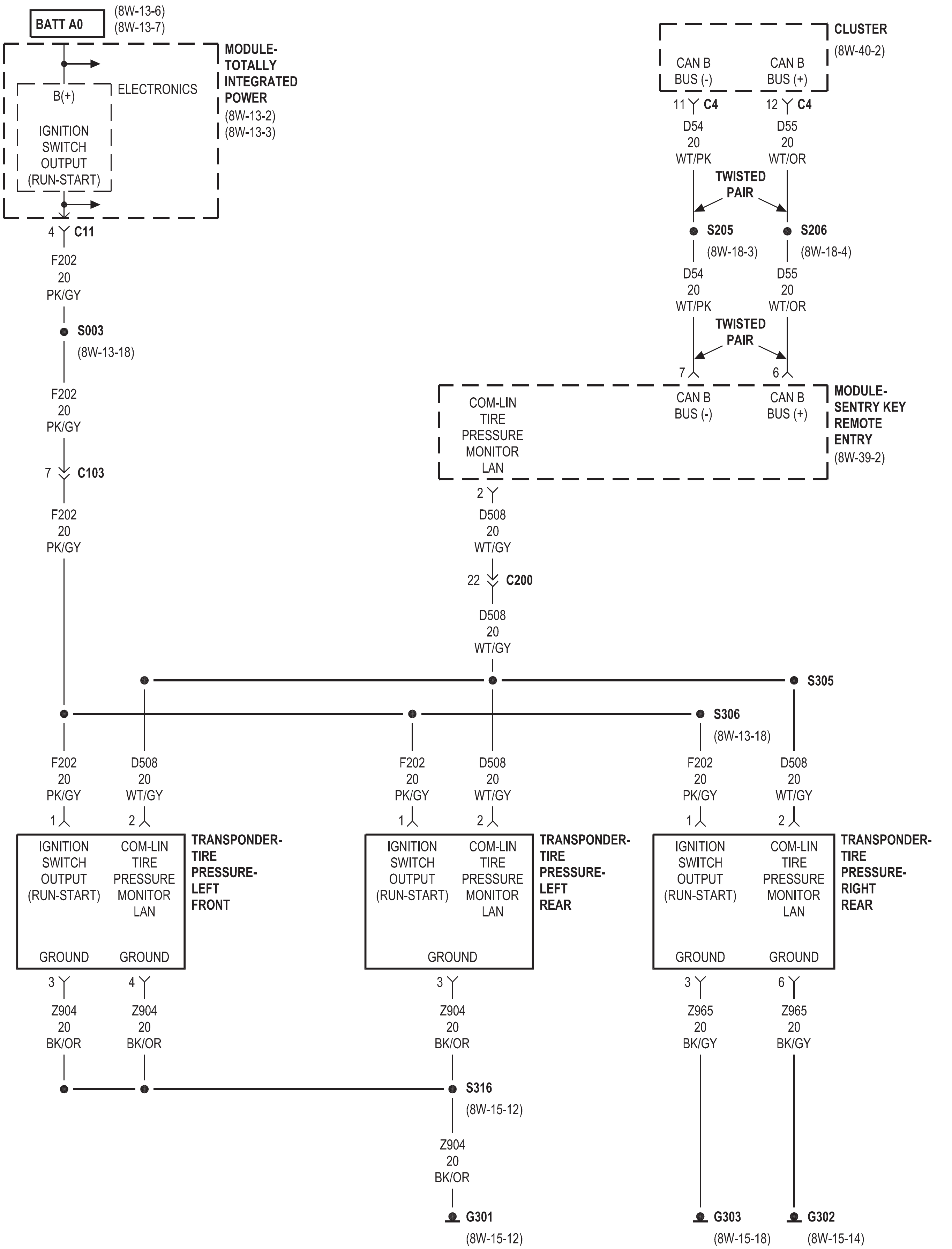

CLUSTER
DOOR LOCK SWITCH MUX
RADIO CONTROL MUX
HORN SWITCH SENSE
RADIO CONTROL RETURN
UGDO ENABLE CONTROL CIRCUIT
RIGHT REAR DOOR AJAR SWITCH SENSE
COURTESY LAMPS DRIVER
18 C2
9 C3
10 C3
13 C4
14 C2
6 C2
4 C2
G76 20 VT/YL
M24 20 YL/WT
23 C200
12 C202
P697 20 LG/DG
G38 20 GY
G76 20 VT/YL
M24 20 YL/WT
30 C200
11 C202
4 C309
S360
(8W-44-3)
P697 20 LG/DG
X20 20 GY/WT
X3 20 DG/VT
Y13 20 DG/RD
G38 18 GY/BK
G76 20 VT/YL
M24 20 YL/WT
M24 20 YL/WT
M24 20 YL/WT
M24 20 YL/WT
3
7
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
2
COURTESY LAMPS DRIVER
LAMP-CARGO
(8W-44-3)
LHD
RHD
4 C301
4 C306
B
UGDO ENABLE CONTROL CIRCUIT
LAMP-VANITY-LEFT
(8W-44-5)
2 C2
COURTESY LAMPS DRIVER
MODULE-INTRUSION TRANSCEIVER
(8W-39-17)
P697 20 LG/DG
1 C2
3 C2
2 C2
RADIO CONTROL MUX
HORN SWITCH SENSE
RADIO CONTROL RETURN
MODULE-STEERING CONTROL
(8W-41-2)
(8W-47-11)
2
COURTESY LAMPS DRIVER
LAMP-DOME
(8W-44-3)
8 C2
DOOR LOCK SWITCH MUX
SWITCH-POWER WINDOW-DRIVER
(8W-61-2)
(8W-61-4)
C C1
COURTESY LAMPS DRIVER
MODULE-ELECTRONIC OVERHEAD
(8W-49-3)
● LHD
●● RHD


CLUSTER
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
PASSENGER DOOR UNLOCK DRIVER
5 C1
9 C1
7 C1
P238 18 TN/DG
P33 18 TN/DB
P240 18 TN/WT
39
11
12
C200
P33 20 LG/TN
P240 20 LG/YL
S312
(8W-39-7)
S311
(8W-39-7)
P238 18 LG/OR
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
3 2 C301
3 2 C303
3 2 C308
3 2 C309
3 5 C310
P238 20 LG/OR
P33 20 LG/TN
P240 20 TN/WT
P33 18 TN/DB
P240 20 LG/YL
P33 20 TN/DB
P240 20 LG/YL
P33 20 TN/DB
P240 18 LG/YL
P33 18 LG/TN
LATCH-DOOR-PASSENGER
(8W-61-3)
(8W-61-5)
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
3 C1
1 C1
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
LATCH-DOOR-LIFTGATE
(8W-61-9)

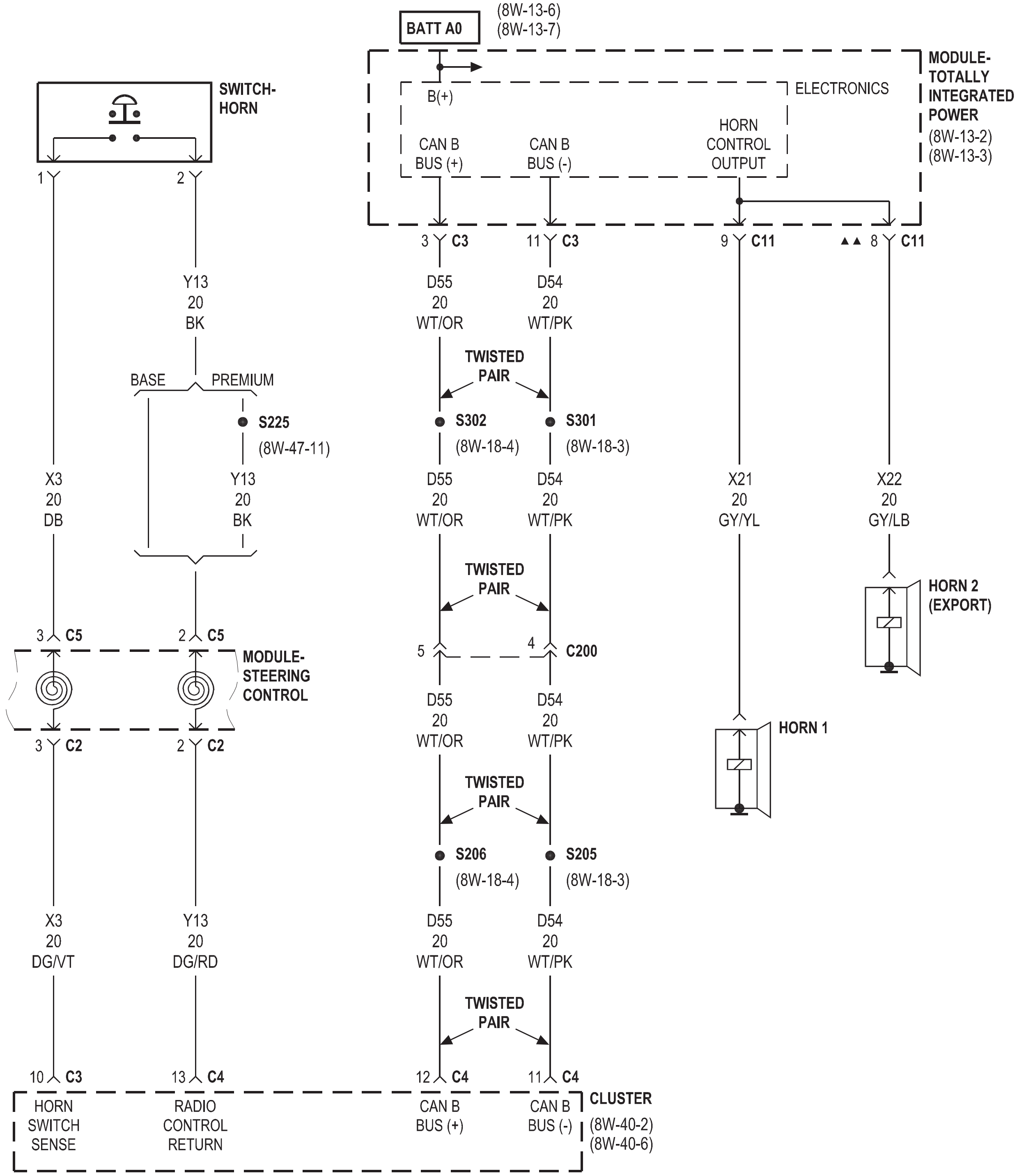

CLUSTER
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
PASSENGER DOOR UNLOCK DRIVER
5 C1
9 C1
7 C1
P238 18 TN/DG
P33 18 LG/TN
P240 18 TN/WT
39
11
12
C200
P33 20 LG/TN
P240 20 LG/YL
S312
(8W-39-8)
S311
(8W-39-8)
P238 18 LG/OR
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
P240 20 LG/YL
P33 20 LG/TN
3
2
C306
3
2
C301
3
2
C308
3
2
C309
3
5
C310
P238 20 LG/OR
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 20 TN/WT
P33 20 TN/DB
P240 18 LG/YL
P33 18 LG/TN
5
6
LATCH-DOOR-PASSENGER
(8W-61-3)
(8W-61-5)
5
6
LATCH-DOOR-RIGHT REAR
(8W-61-6)
(8W-61-8)
5
6
LATCH-DOOR-DRIVER
(8W-61-2)
(8W-61-4)
5
6
LATCH-DOOR-LEFT REAR
(8W-61-6)
(8W-61-7)
3 C1
1 C1
LATCH-DOOR-LIFTGATE
(8W-61-9)


CLUSTER
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
6 C1
3 C1
P235 18 LG/TN
P237 18 DG/TN
3
2 C200
P237 18 DG/TN
P235 18 LG/TN
S332 (8W-39-9)
S331 (8W-39-9)
P237 18 DG/TN
P235 18 LG/TN
13
12 C306
16
15 C301
14
13 C308
14
13 C309
P237 20 DG/TN
P235 20 LG/TN
3
4
LATCH-DOOR-PASSENGER (8W-61-5)
LATCH-DOOR-RIGHT REAR (8W-61-8)
LATCH-DOOR-DRIVER (8W-61-4)
LATCH-DOOR-LEFT REAR (8W-61-7)

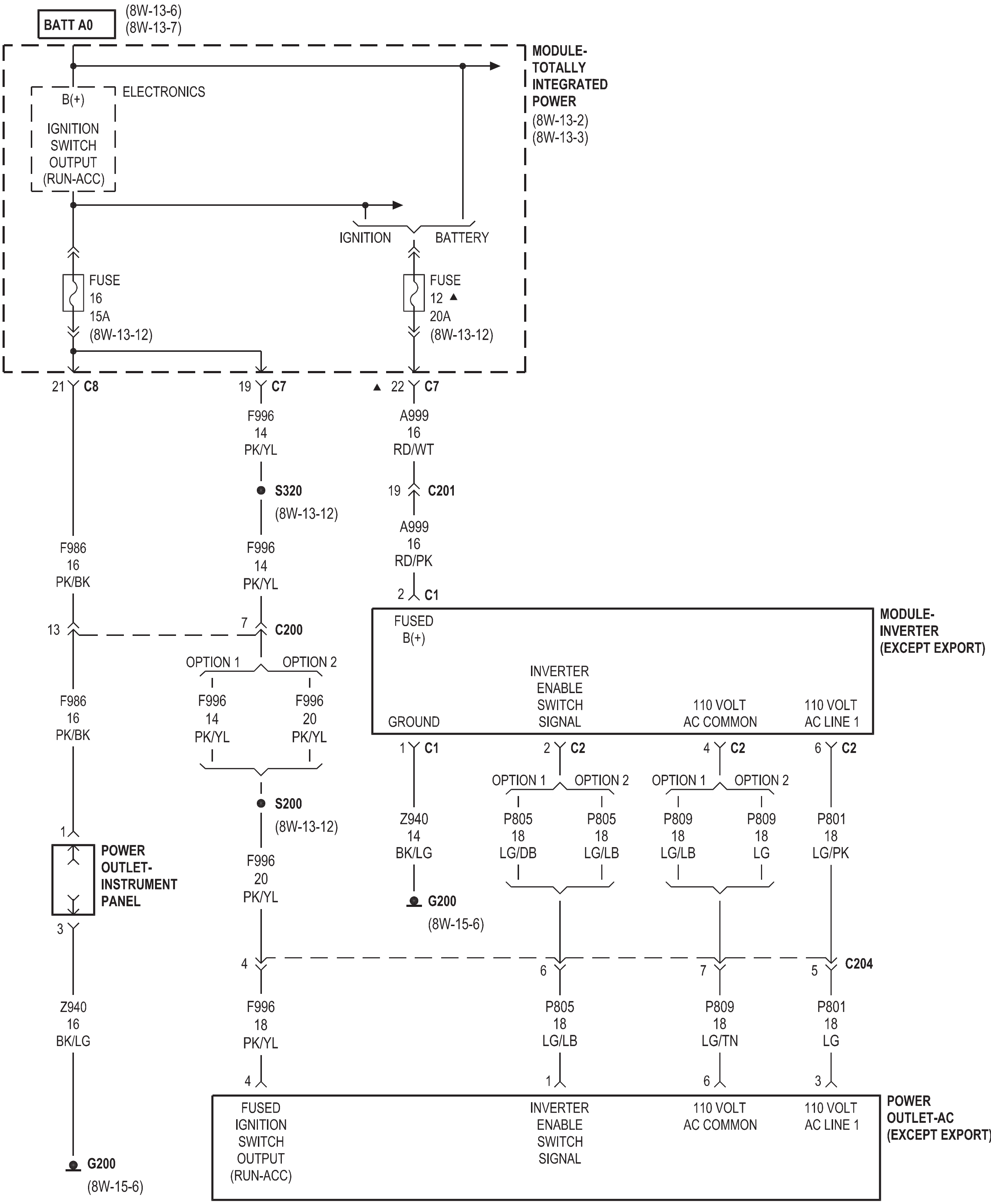

CLUSTER
STOP LAMP SWITCH OUTPUT
READING/ RAIL LAMPS DRIVER
8 C2
2 C2
L53 20 DG/GY
27 C200
L53 18 DG/GY
S308
(8W-13-25)
L53 18 DG/GY
M27 20 YL/LB
1 C310
13 C202
L53 18 DG/GY
L53 18 DG/GY
L53 18 DG/WT
M27 20 YL/LB
7 C3
2
1
A C1
STOP LAMP SWITCH OUTPUT
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
STOP LAMP SWITCH OUTPUT
SWITCH-STOP LAMP
(8W-30-14)
STOP LAMP SWITCH OUTPUT
LAMP-HIGH MOUNTED STOP
(8W-51-4)
READING/ RAIL LAMPS DRIVER
MODULE-ELECTRONIC OVERHEAD
(8W-49-3)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN-START)
4 C11
F202 20 PK/GY
S003
(8W-13-18)
F202 20 PK/GY
7 C103
F202 20 PK/GY
CLUSTER
(8W-40-2)
CAN B BUS (-)
CAN B BUS (+)
11 C4
12 C4
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S205
(8W-18-3)
S206
(8W-18-4)
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
7
6
COM-LIN TIRE PRESSURE MONITOR LAN
CAN B BUS (-)
CAN B BUS (+)
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
2
D508 20 WT/GY
22 C200
D508 20 WT/GY
S305
S306
(8W-13-18)
F202 20 PK/GY
D508 20 WT/GY
F202 20 PK/GY
D508 20 WT/GY
F202 20 PK/GY
D508 20 WT/GY
1
2
1
2
1
2
IGNITION SWITCH OUTPUT (RUN-START)
COM-LIN TIRE PRESSURE MONITOR LAN
GROUND
GROUND
TRANSPONDER-TIRE PRESSURE-LEFT FRONT
IGNITION SWITCH OUTPUT (RUN-START)
COM-LIN TIRE PRESSURE MONITOR LAN
GROUND
TRANSPONDER-TIRE PRESSURE-LEFT REAR
IGNITION SWITCH OUTPUT (RUN-START)
COM-LIN TIRE PRESSURE MONITOR LAN
GROUND
GROUND
TRANSPONDER-TIRE PRESSURE-RIGHT REAR
3
4
3
3
6
Z904 20 BK/OR
Z904 20 BK/OR
Z904 20 BK/OR
Z965 20 BK/GY
Z965 20 BK/GY
S316
(8W-15-12)
Z904 20 BK/OR
G301
(8W-15-12)
G303
(8W-15-18)
G302
(8W-15-14)

8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

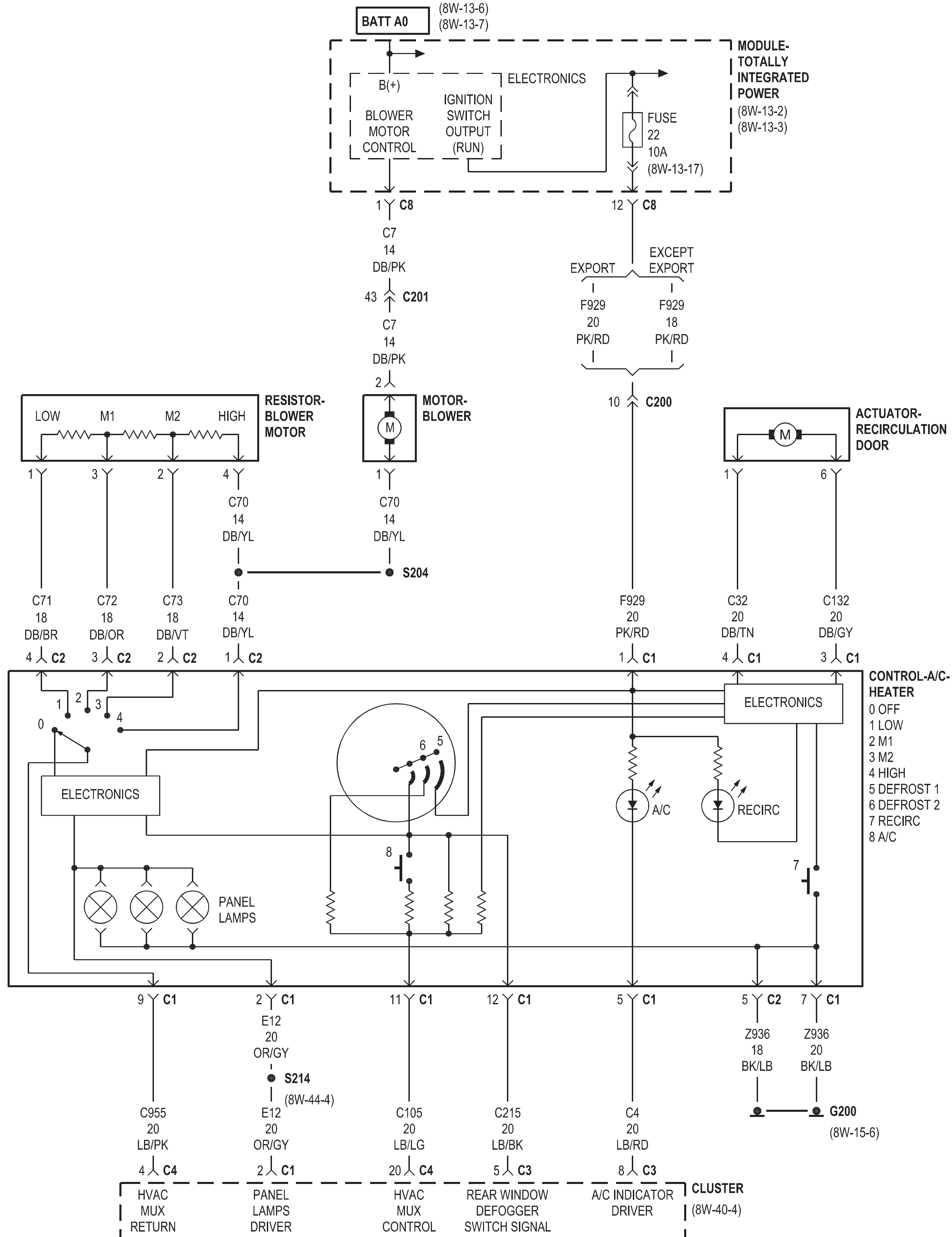

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CAN B
BUS (+)
CAN B
BUS (-)
HORN
CONTROL
OUTPUT
SWITCH-
HORN
1
2
3 C3
11 C3
9 C11
▲▲ 8 C11
Y13
20
BK
D55
20
WT/OR
D54
20
WT/PK
TWISTED
PAIR
BASE
PREMIUM
S225
(8W-47-11)
S302
(8W-18-4)
S301
(8W-18-3)
X3
20
DB
Y13
20
BK
X21
20
GY/YL
X22
20
GY/LB
HORN 2
(EXPORT)
3 C5
2 C5
MODULE-
STEERING
CONTROL
5
4
C200
3 C2
2 C2
HORN 1
S206
(8W-18-4)
S205
(8W-18-3)
X3
20
DG/VT
Y13
20
DG/RD
10 C3
13 C4
12 C4
11 C4
CLUSTER
(8W-40-2)
(8W-40-6)
HORN
SWITCH
SENSE
RADIO
CONTROL
RETURN
CAN B
BUS (+)
CAN B
BUS (-)

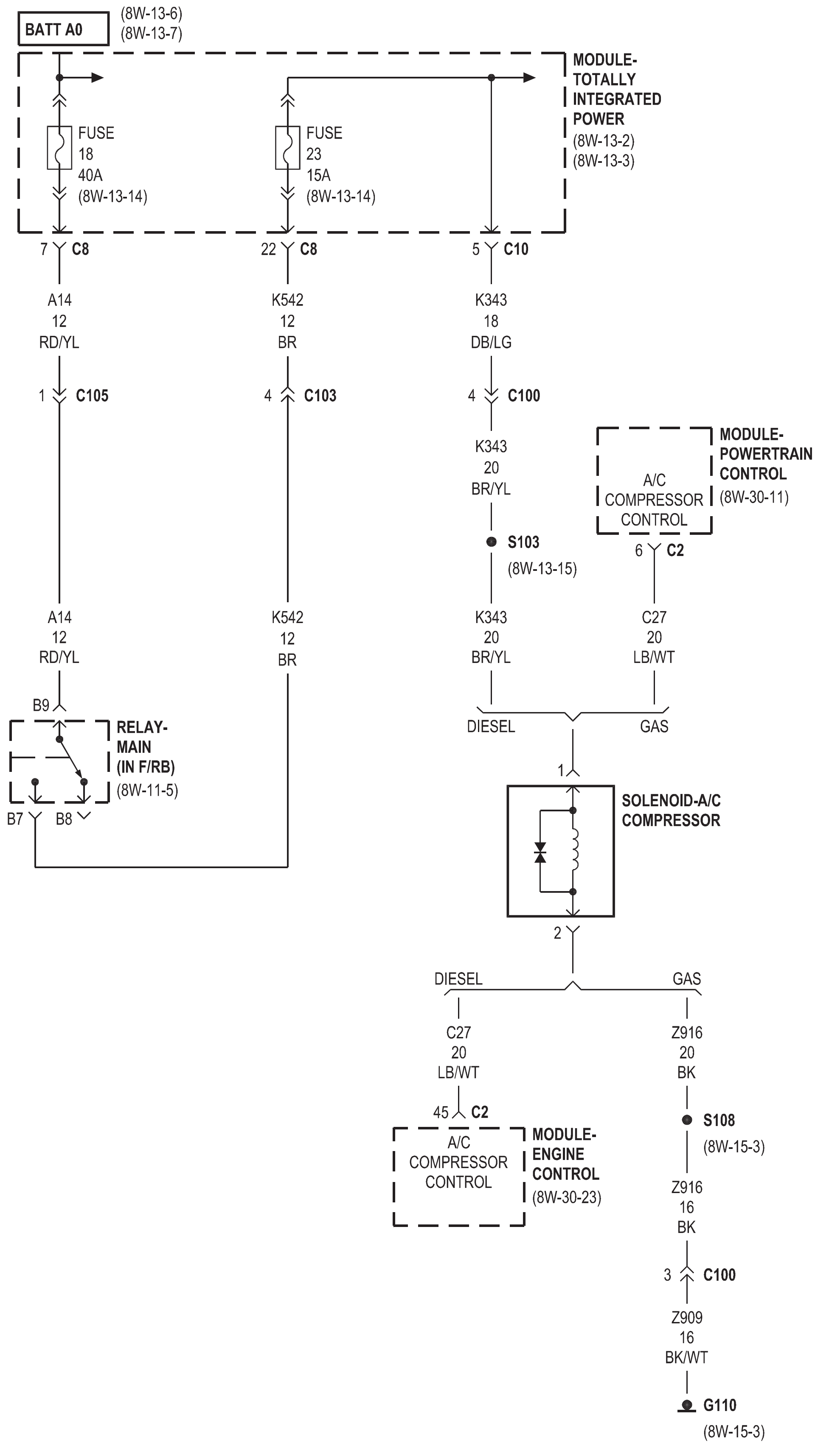
▲▲ EXPORT

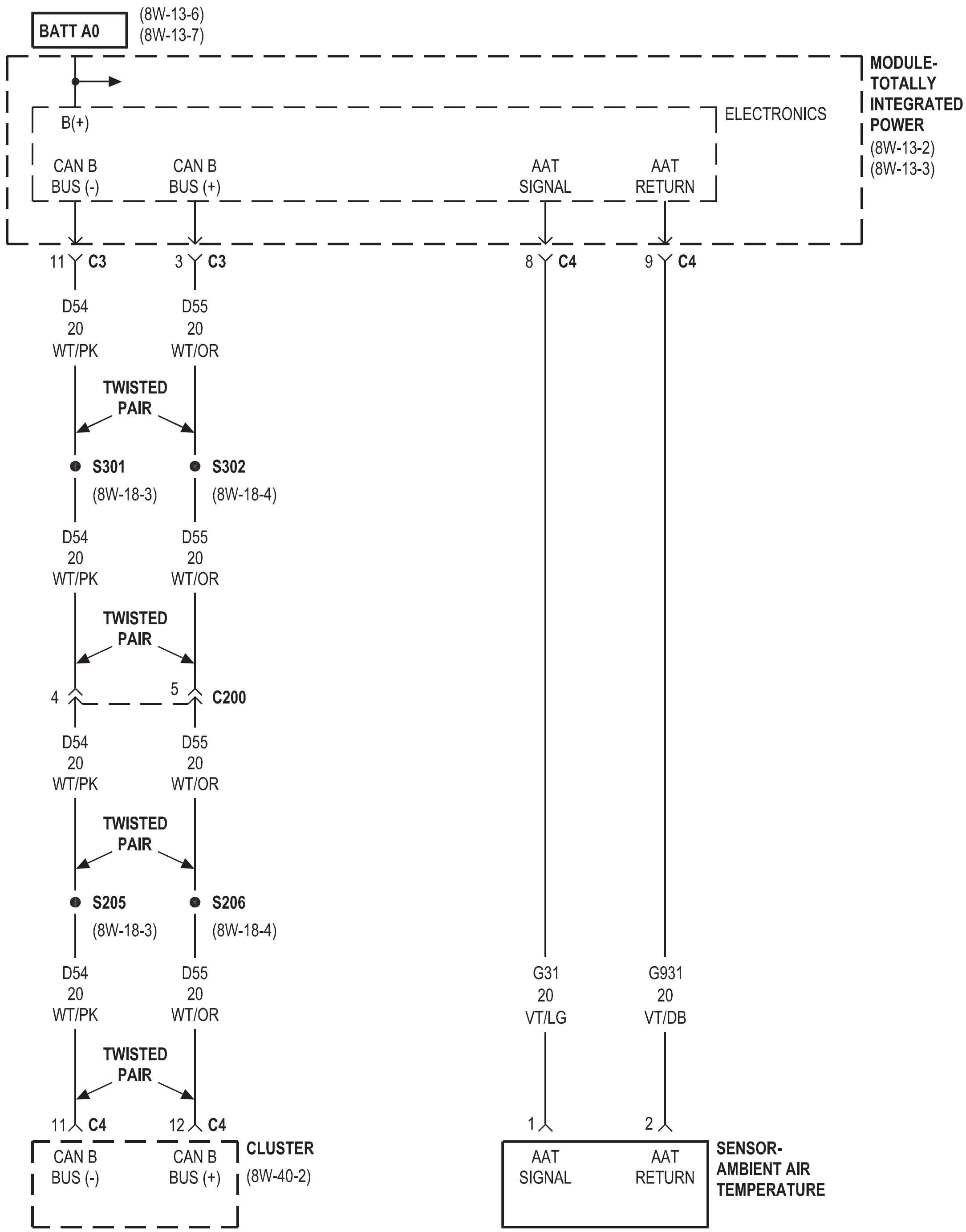


▲ EXCEPT EXPORT

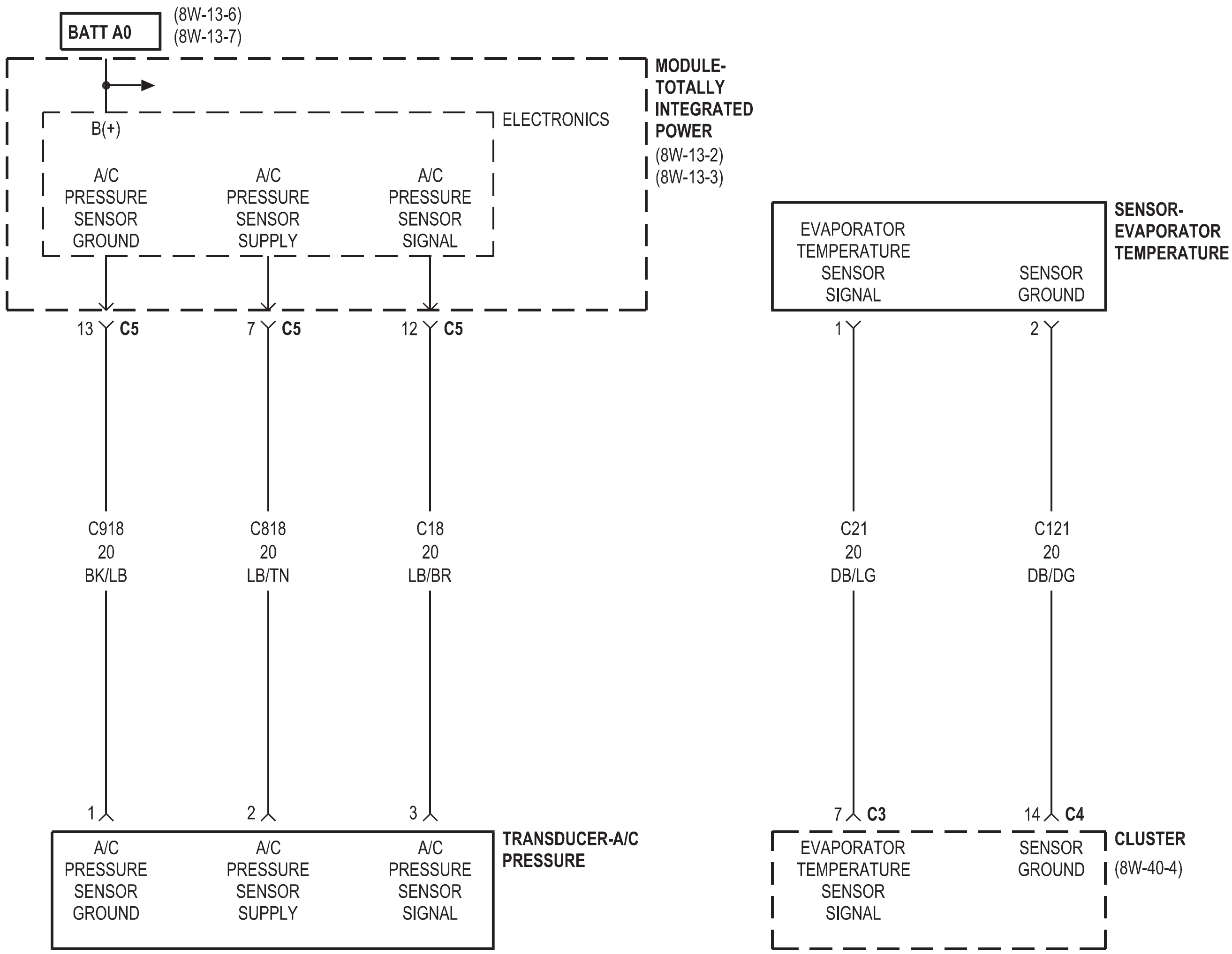
8W-42 AIR CONDITIONING/HEATER


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
BLOWER MOTOR CONTROL
IGNITION SWITCH OUTPUT (RUN)
FUSE 22 10A
(8W-13-17)
1 C8
12 C8
C7 14 DB/PK
43 C201
EXPORT
EXCEPT EXPORT
F929 20 PK/RD
F929 18 PK/RD
10 C200
RESISTOR-BLOWER MOTOR
LOW M1 M2 HIGH
MOTOR-BLOWER
ACTUATOR-RECIRCULATION DOOR
C70 14 DB/YL
S204
C71 18 DB/BR
C72 18 DB/OR
C73 18 DB/VT
F929 20 PK/RD
C32 20 DB/TN
C132 20 DB/GY
4 C2
3 C2
2 C2
1 C2
1 C1
4 C1
3 C1
CONTROL-A/C-HEATER
0 OFF
1 LOW
2 M1
3 M2
4 HIGH
5 DEFROST 1
6 DEFROST 2
7 RECIRC
8 A/C
ELECTRONICS
PANEL LAMPS
A/C
RECIRC
9 C1
2 C1
11 C1
12 C1
5 C1
5 C2
7 C1
E12 20 OR/GY
S214
(8W-44-4)
Z936 18 BK/LB
Z936 20 BK/LB
G200
(8W-15-6)
C955 20 LB/PK
C105 20 LB/LG
C215 20 LB/BK
C4 20 LB/RD
4 C4
2 C1
20 C4
5 C3
8 C3
HVAC MUX RETURN
PANEL LAMPS DRIVER
HVAC MUX CONTROL
REAR WINDOW DEFOGGER SWITCH SIGNAL
A/C INDICATOR DRIVER
CLUSTER
(8W-40-4)

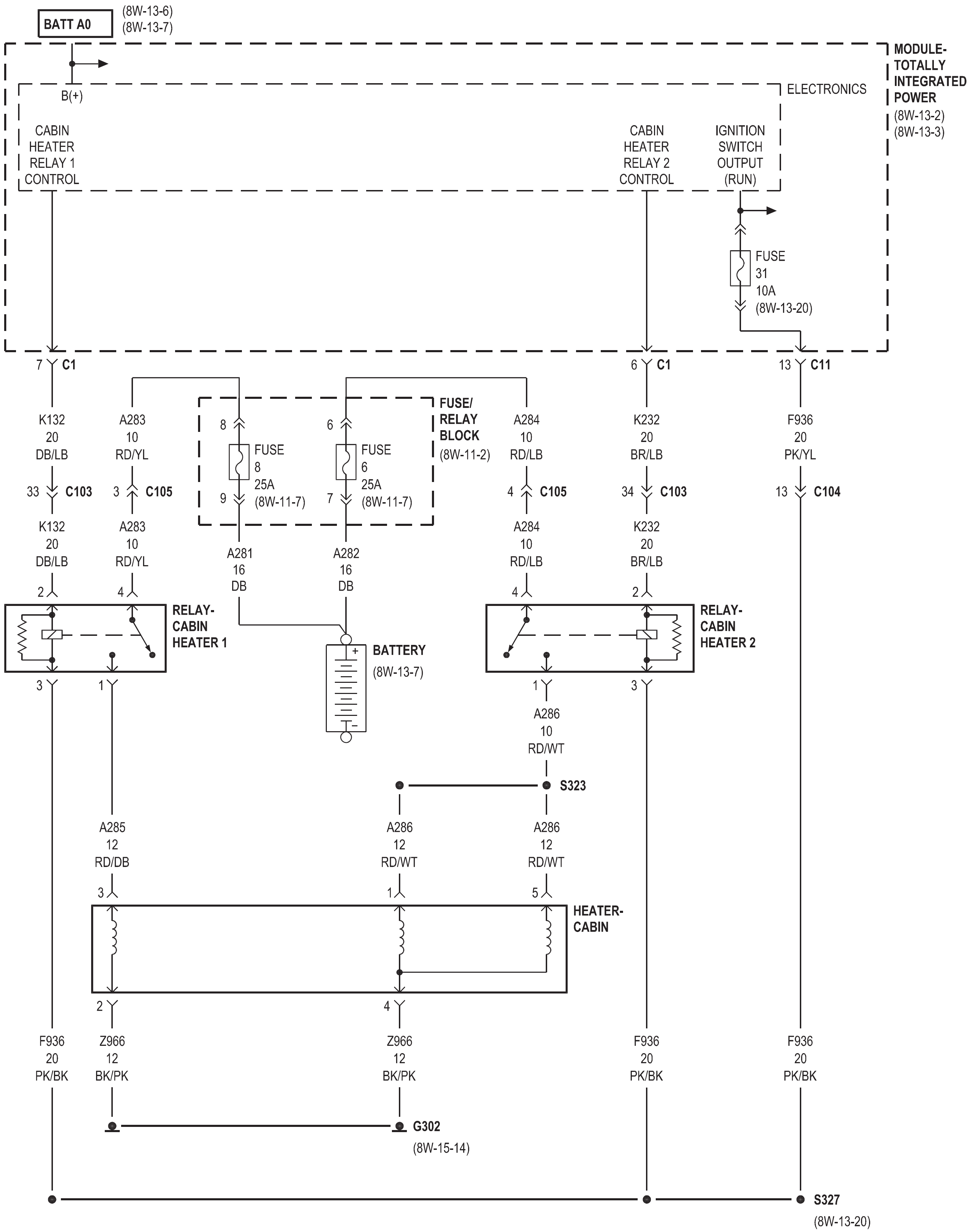

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
18
40A
(8W-13-14)
FUSE
23
15A
(8W-13-14)
7 C8
22 C8
5 C10
A14
12
RD/YL
K542
12
BR
K343
18
DB/LG
1 C105
4 C103
4 C100
K343
20
BR/YL
MODULE-
POWERTRAIN
CONTROL
(8W-30-11)
A/C
COMPRESSOR
CONTROL
S103
(8W-13-15)
6 C2
A14
12
RD/YL
K542
12
BR
K343
20
BR/YL
C27
20
LB/WT
B9
RELAY-
MAIN
(IN F/RB)
(8W-11-5)
B7
B8
DIESEL
GAS
1
SOLENOID-A/C
COMPRESSOR
2
DIESEL
GAS
C27
20
LB/WT
Z916
20
BK
45 C2
A/C
COMPRESSOR
CONTROL
MODULE-
ENGINE
CONTROL
(8W-30-23)
S108
(8W-15-3)
Z916
16
BK
3 C100
Z909
16
BK/WT
G110
(8W-15-3)

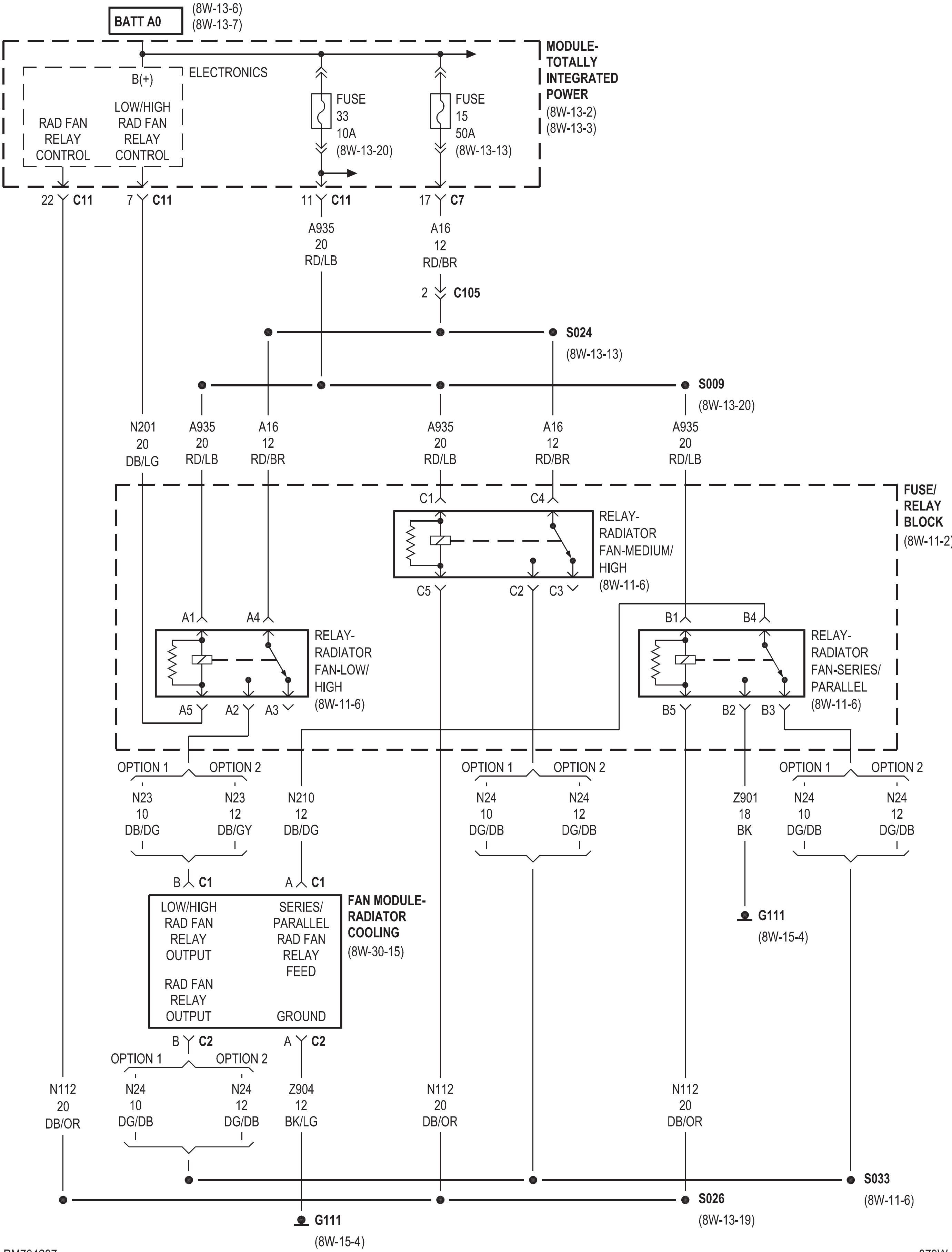

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CAN B BUS (-)
CAN B BUS (+)
AAT SIGNAL
AAT RETURN
11 C3
3 C3
8 C4
9 C4
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S301
(8W-18-3)
S302
(8W-18-4)
4
5
C200
S205
(8W-18-3)
S206
(8W-18-4)
G31 20 VT/LG
G931 20 VT/DB
11 C4
12 C4
1
2
CAN B BUS (-)
CAN B BUS (+)
CLUSTER
(8W-40-2)
AAT SIGNAL
AAT RETURN
SENSOR-AMBIENT AIR TEMPERATURE

AIR CONDITIONING



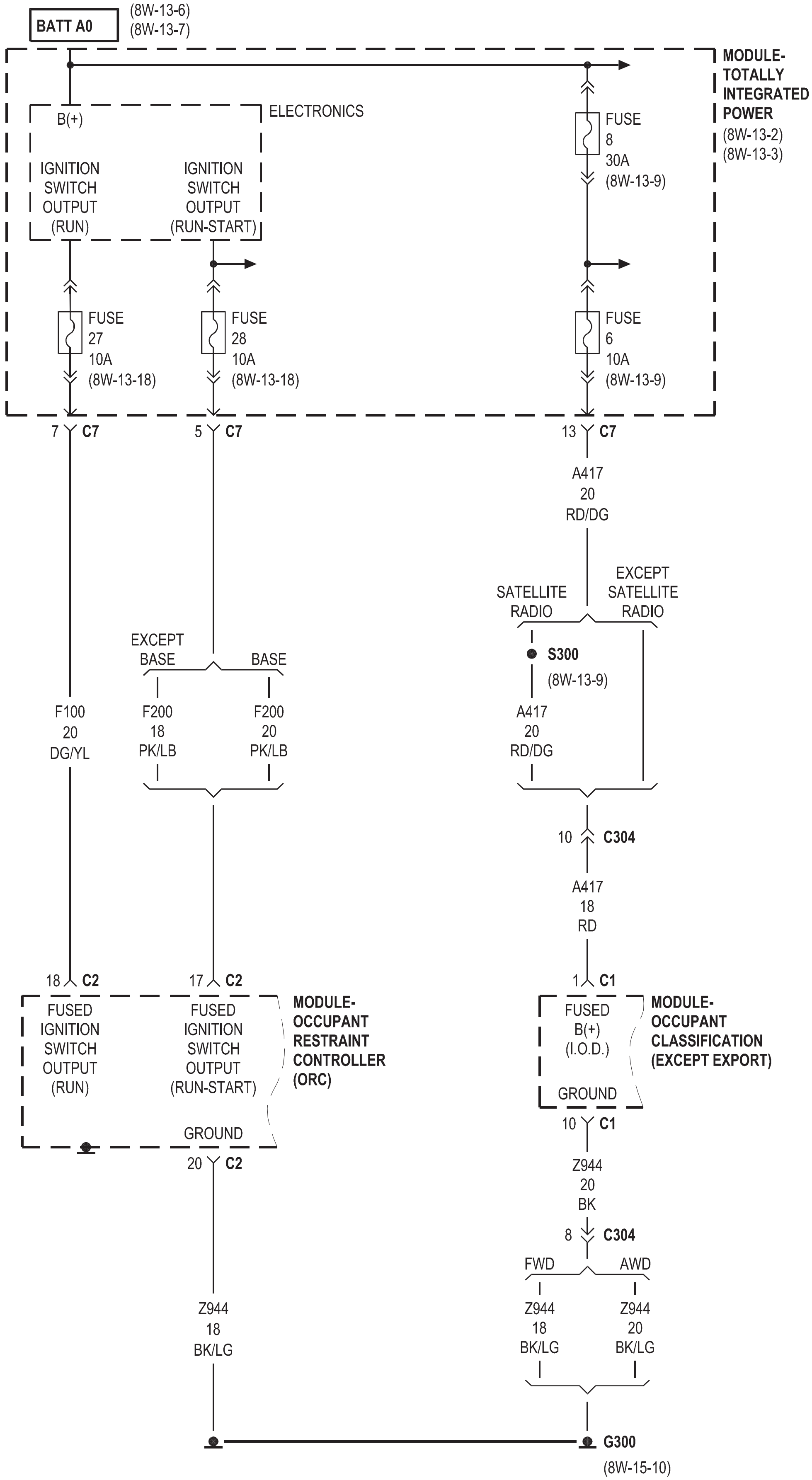
DIESEL

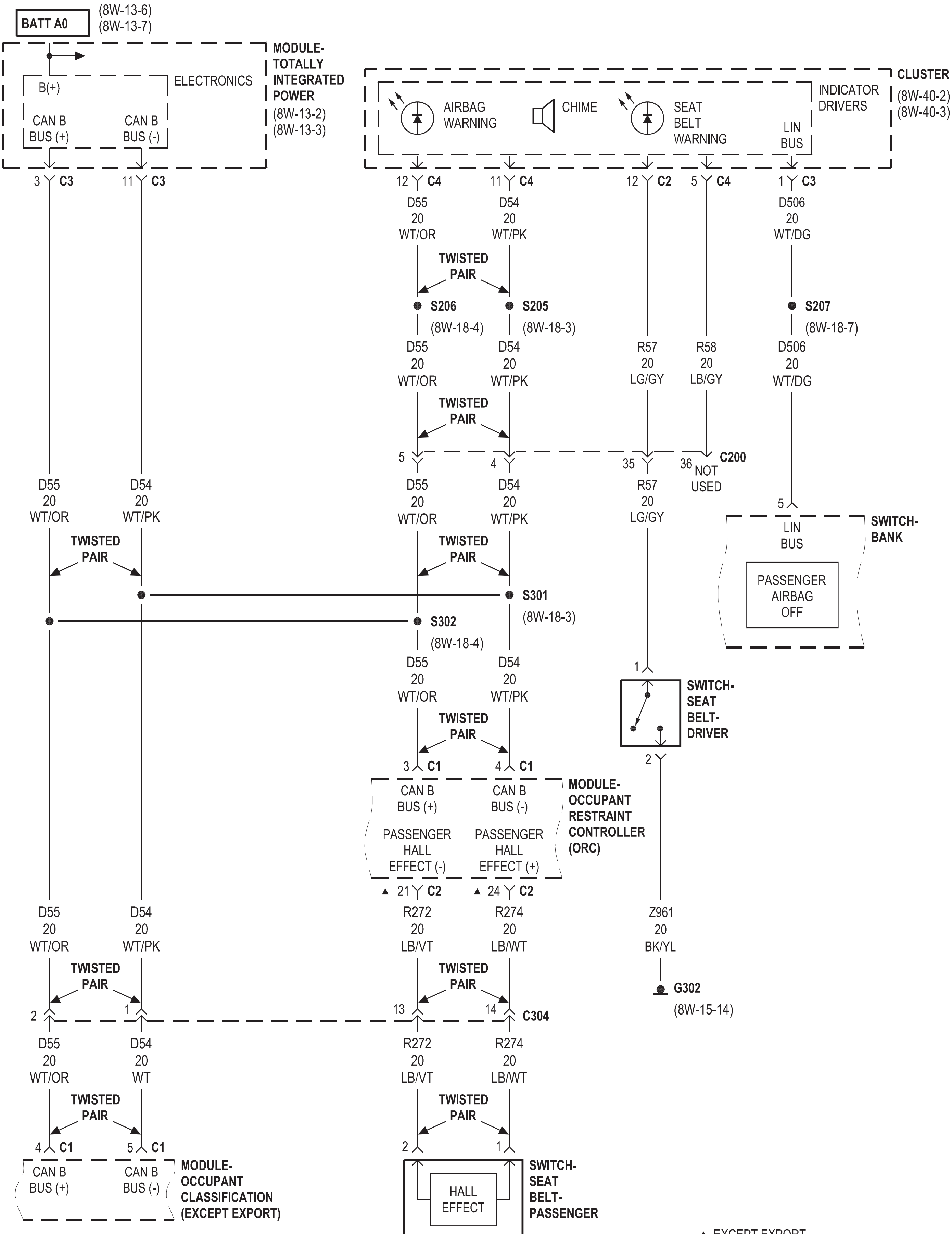

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CABIN HEATER RELAY 1 CONTROL
CABIN HEATER RELAY 2 CONTROL
IGNITION SWITCH OUTPUT (RUN)
FUSE 31 10A (8W-13-20)
7 C1
6 C1
13 C11
K132 20 DB/LB
A283 10 RD/YL
FUSE/RELAY BLOCK (8W-11-2)
8
9
FUSE 8 25A (8W-11-7)
6
7
FUSE 6 25A (8W-11-7)
A284 10 RD/LB
K232 20 BR/LB
F936 20 PK/YL
33 C103
3 C105
4 C105
34 C103
13 C104
K132 20 DB/LB
A283 10 RD/YL
A281 16 DB
A282 16 DB
A284 10 RD/LB
K232 20 BR/LB
RELAY-CABIN HEATER 1
RELAY-CABIN HEATER 2
BATTERY (8W-13-7)
A286 10 RD/WT
S323
A285 12 RD/DB
A286 12 RD/WT
A286 12 RD/WT
HEATER-CABIN
F936 20 PK/BK
Z966 12 BK/PK
Z966 12 BK/PK
F936 20 PK/BK
F936 20 PK/BK
G302 (8W-15-14)
S327 (8W-13-20)

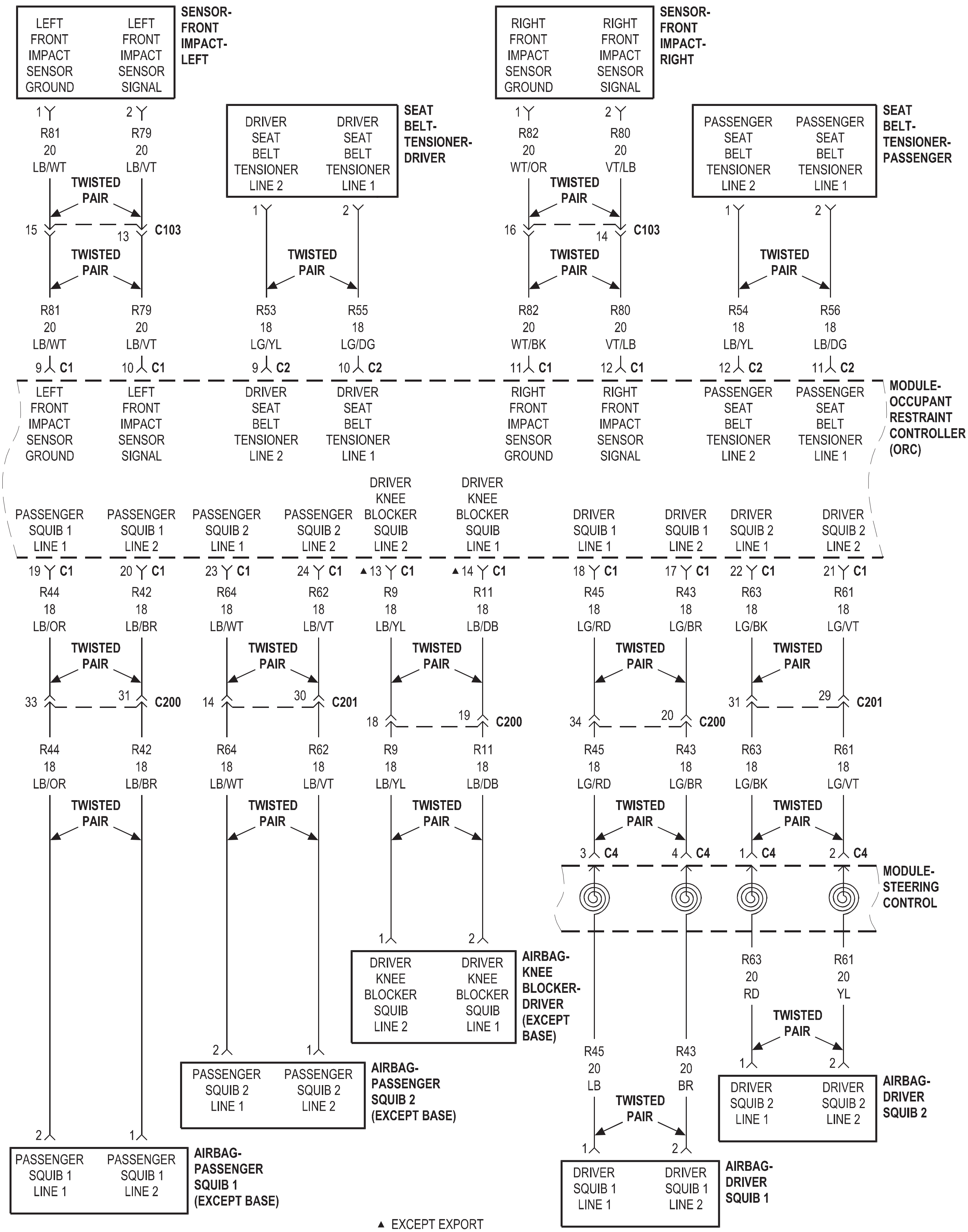


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
RAD FAN RELAY CONTROL
LOW/HIGH RAD FAN RELAY CONTROL
FUSE 33 10A (8W-13-20)
FUSE 15 50A (8W-13-13)
22 C11
7 C11
11 C11
17 C7
A935 20 RD/LB
A16 12 RD/BR
2 C105
S024 (8W-13-13)
S009 (8W-13-20)
N201 20 DB/LG
A935 20 RD/LB
A16 12 RD/BR
FUSE/RELAY BLOCK (8W-11-2)
C1
C4
RELAY-RADIATOR FAN-MEDIUM/HIGH (8W-11-6)
C5
C2
C3
A1
A4
RELAY-RADIATOR FAN-LOW/HIGH (8W-11-6)
A5
A2
A3
B1
B4
RELAY-RADIATOR FAN-SERIES/PARALLEL (8W-11-6)
B5
B2
B3
OPTION 1
OPTION 2
N23 10 DB/DG
N23 12 DB/GY
N210 12 DB/DG
N24 10 DG/DB
N24 12 DG/DB
Z901 18 BK
G111 (8W-15-4)
B C1
A C1
FAN MODULE-RADIATOR COOLING (8W-30-15)
LOW/HIGH RAD FAN RELAY OUTPUT
SERIES/PARALLEL RAD FAN RELAY FEED
RAD FAN RELAY OUTPUT
GROUND
B C2
A C2
N112 20 DB/OR
Z904 12 BK/LG
S033 (8W-11-6)
S026 (8W-13-19)
G111 (8W-15-4)

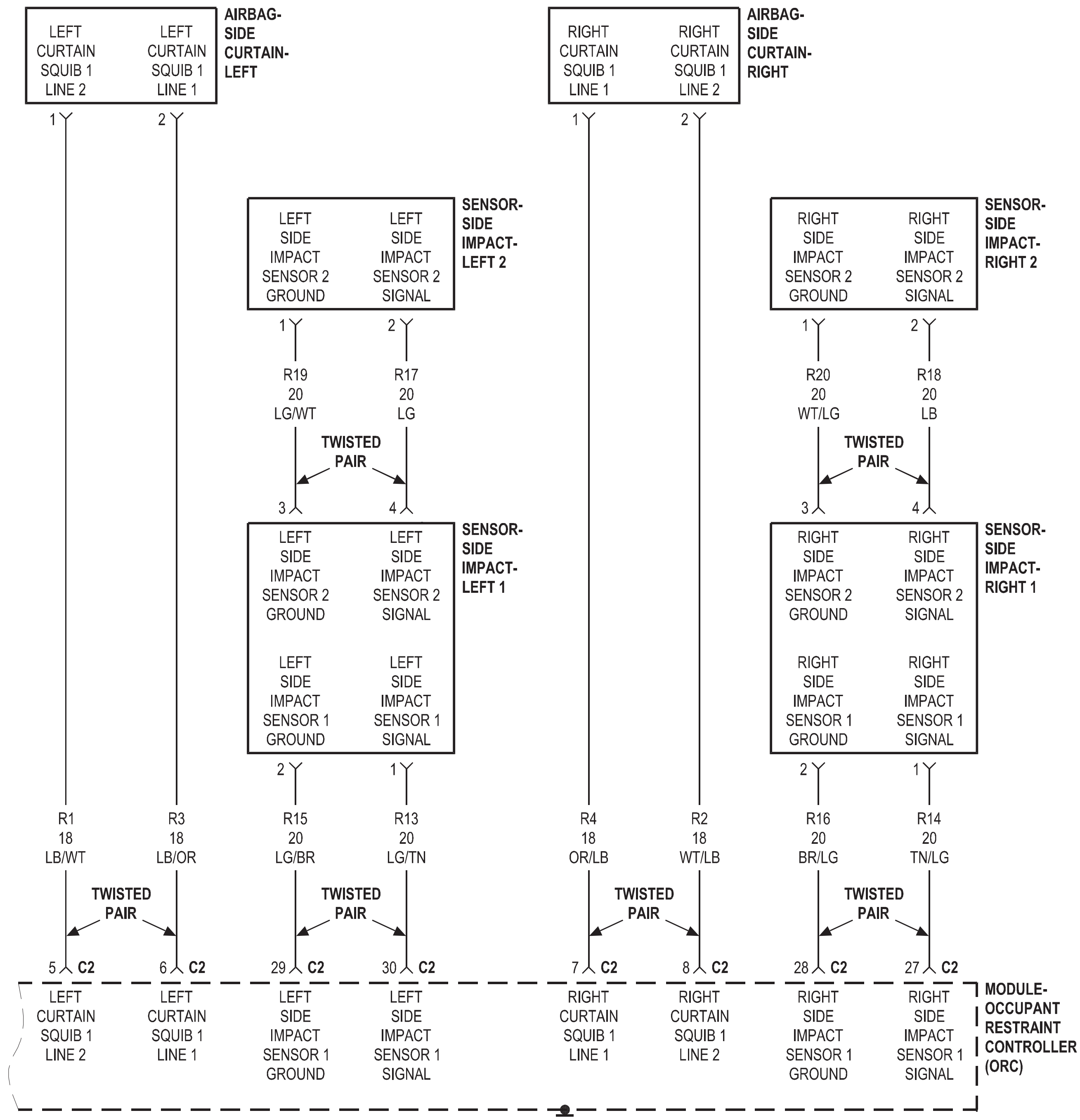
8W-43 OCCUPANT RESTRAINT SYSTEM


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION
SWITCH
OUTPUT
(RUN)
IGNITION
SWITCH
OUTPUT
(RUN-START)
FUSE
8
30A
(8W-13-9)
FUSE
27
10A
(8W-13-18)
FUSE
28
10A
(8W-13-18)
FUSE
6
10A
(8W-13-9)
7 C7
5 C7
13 C7
A417
20
RD/DG
SATELLITE
RADIO
EXCEPT
SATELLITE
RADIO
S300
(8W-13-9)
A417
20
RD/DG
EXCEPT
BASE
BASE
F100
20
DG/YL
F200
18
PK/LB
F200
20
PK/LB
10 C304
A417
18
RD
18 C2
17 C2
1 C1
FUSED
IGNITION
SWITCH
OUTPUT
(RUN)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
GROUND
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(ORC)
FUSED
B(+)
(I.O.D.)
GROUND
MODULE-
OCCUPANT
CLASSIFICATION
(EXCEPT EXPORT)
20 C2
10 C1
Z944
20
BK
8 C304
FWD
AWD
Z944
18
BK/LG
Z944
18
BK/LG
Z944
20
BK/LG
G300
(8W-15-10)

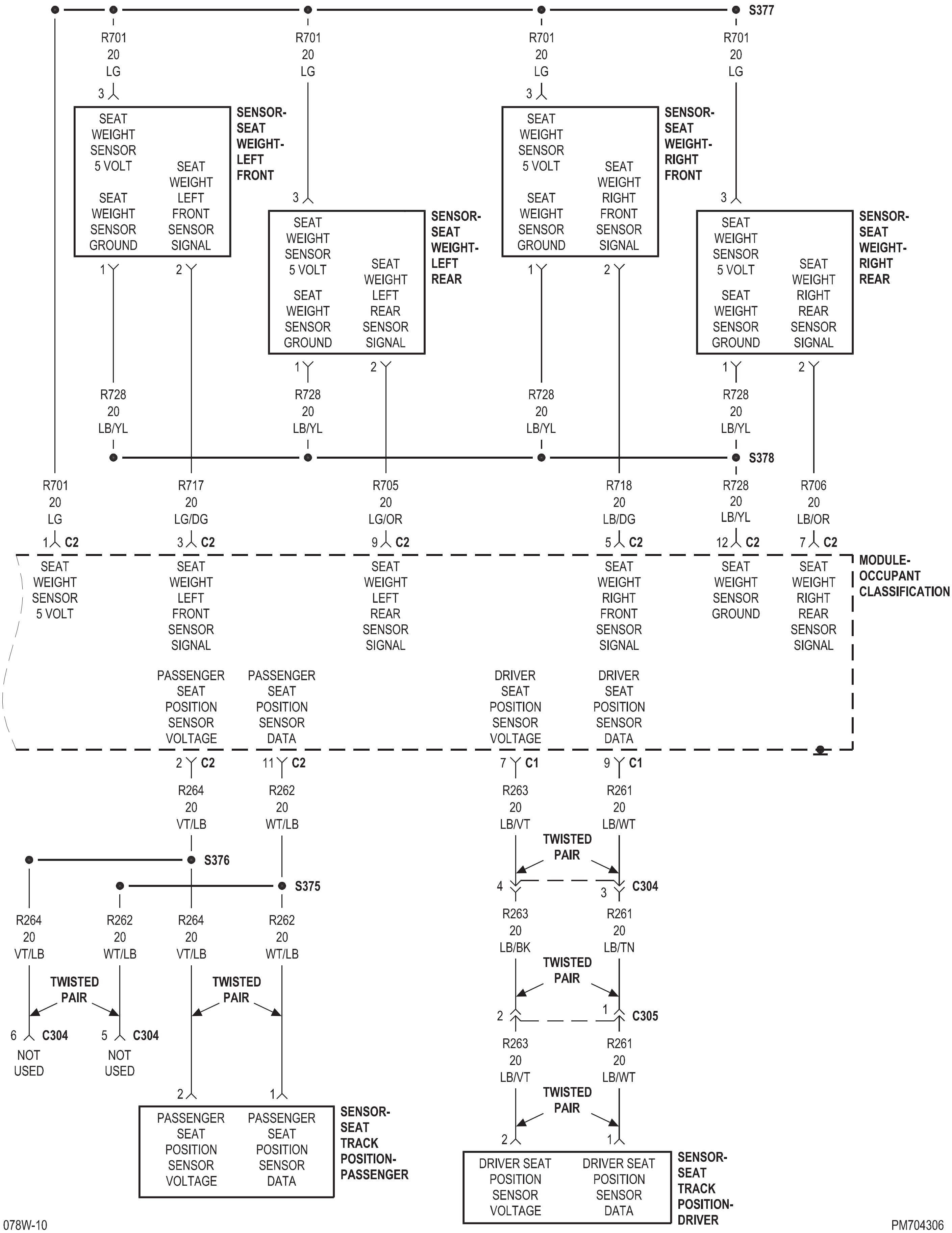

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CAN B BUS (+)
CAN B BUS (-)
3 C3
11 C3
CLUSTER
(8W-40-2)
(8W-40-3)
INDICATOR DRIVERS
AIRBAG WARNING
CHIME
SEAT BELT WARNING
LIN BUS
12 C4
11 C4
12 C2
5 C4
1 C3
D55 20 WT/OR
D54 20 WT/PK
D506 20 WT/DG
TWISTED PAIR
S206
(8W-18-4)
S205
(8W-18-3)
S207
(8W-18-7)
R57 20 LG/GY
R58 20 LB/GY
C200
5
4
35
36 NOT USED
5
SWITCH-BANK
LIN BUS
PASSENGER AIRBAG OFF
S301
(8W-18-3)
S302
(8W-18-4)
1
SWITCH-SEAT BELT-DRIVER
2
3 C1
4 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER (ORC)
CAN B BUS (+)
CAN B BUS (-)
PASSENGER HALL EFFECT (-)
PASSENGER HALL EFFECT (+)
▲ 21 C2
▲ 24 C2
R272 20 LB/VT
R274 20 LB/WT
Z961 20 BK/YL
G302
(8W-15-14)
2
1
13
14
C304
D54 20 WT
4 C1
5 C1
MODULE-OCCUPANT CLASSIFICATION (EXCEPT EXPORT)
2
1
SWITCH-SEAT BELT-PASSENGER
HALL EFFECT
▲ EXCEPT EXPORT


SENSOR-FRONT IMPACT-LEFT
LEFT FRONT IMPACT SENSOR GROUND
LEFT FRONT IMPACT SENSOR SIGNAL
SENSOR-FRONT IMPACT-RIGHT
RIGHT FRONT IMPACT SENSOR GROUND
RIGHT FRONT IMPACT SENSOR SIGNAL
SEAT BELT-TENSIONER-DRIVER
DRIVER SEAT BELT TENSIONER LINE 2
DRIVER SEAT BELT TENSIONER LINE 1
SEAT BELT-TENSIONER-PASSENGER
PASSENGER SEAT BELT TENSIONER LINE 2
PASSENGER SEAT BELT TENSIONER LINE 1
R81 20 LB/WT
R79 20 LB/VT
R82 20 WT/OR
R80 20 VT/LB
TWISTED PAIR
C103
R53 18 LG/YL
R55 18 LG/DG
R82 20 WT/BK
R80 20 VT/LB
R54 18 LB/YL
R56 18 LB/DG
C1
C2
MODULE-OCCUPANT RESTRAINT CONTROLLER (ORC)
PASSENGER SQUIB 1 LINE 1
PASSENGER SQUIB 1 LINE 2
PASSENGER SQUIB 2 LINE 1
PASSENGER SQUIB 2 LINE 2
DRIVER KNEE BLOCKER SQUIB LINE 2
DRIVER KNEE BLOCKER SQUIB LINE 1
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
DRIVER SQUIB 2 LINE 1
DRIVER SQUIB 2 LINE 2
R44 18 LB/OR
R42 18 LB/BR
R64 18 LB/WT
R62 18 LB/VT
R9 18 LB/YL
R11 18 LB/DB
R45 18 LG/RD
R43 18 LG/BR
R63 18 LG/BK
R61 18 LG/VT
C200
C201
C4
MODULE-STEERING CONTROL
R63 20 RD
R61 20 YL
R45 20 LB
R43 20 BR
AIRBAG-KNEE BLOCKER-DRIVER (EXCEPT BASE)
AIRBAG-PASSENGER SQUIB 2 (EXCEPT BASE)
AIRBAG-PASSENGER SQUIB 1 (EXCEPT BASE)
AIRBAG-DRIVER SQUIB 2
AIRBAG-DRIVER SQUIB 1
▲ EXCEPT EXPORT

SIDE CURTAIN AIRBAGS

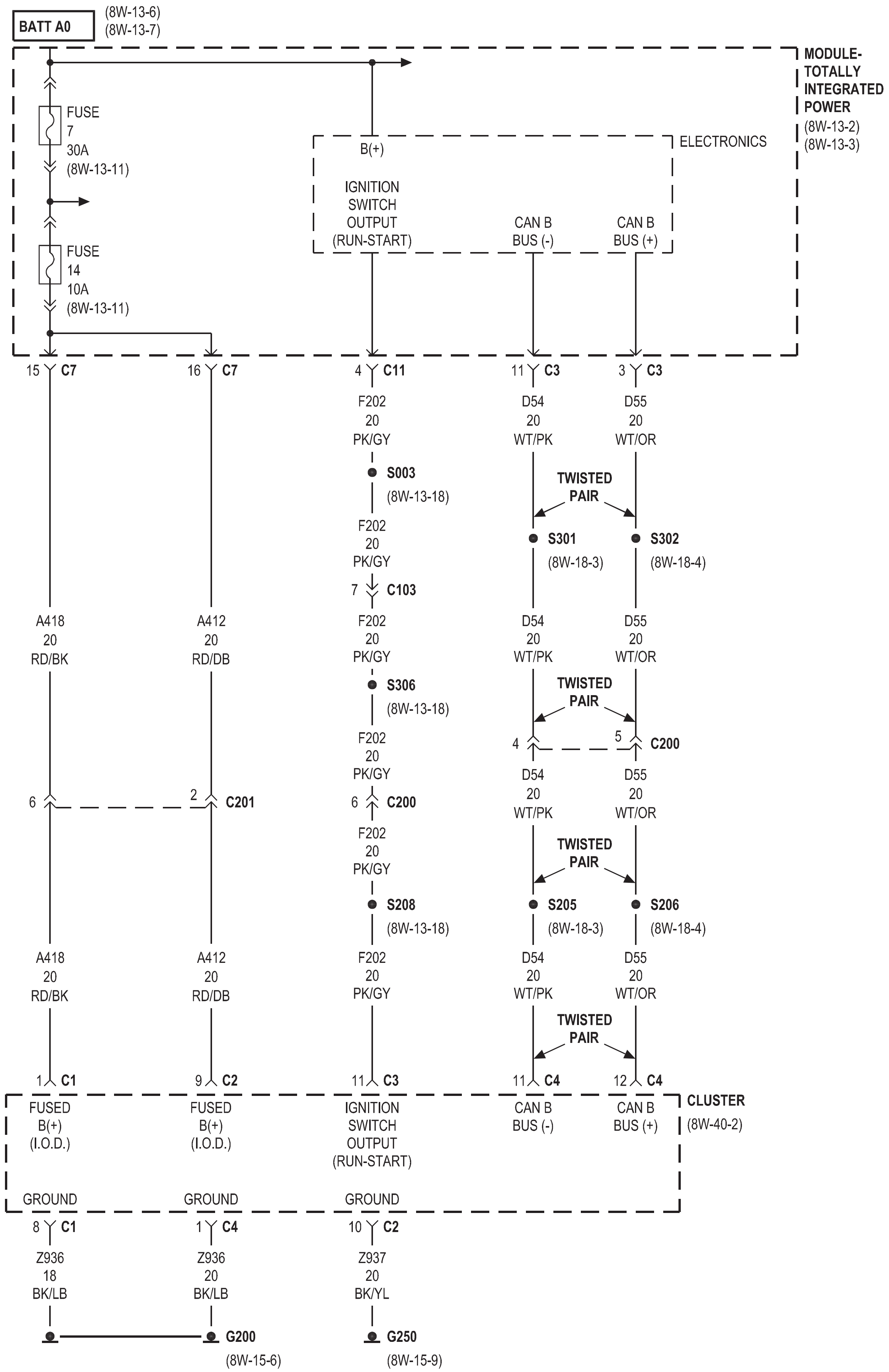


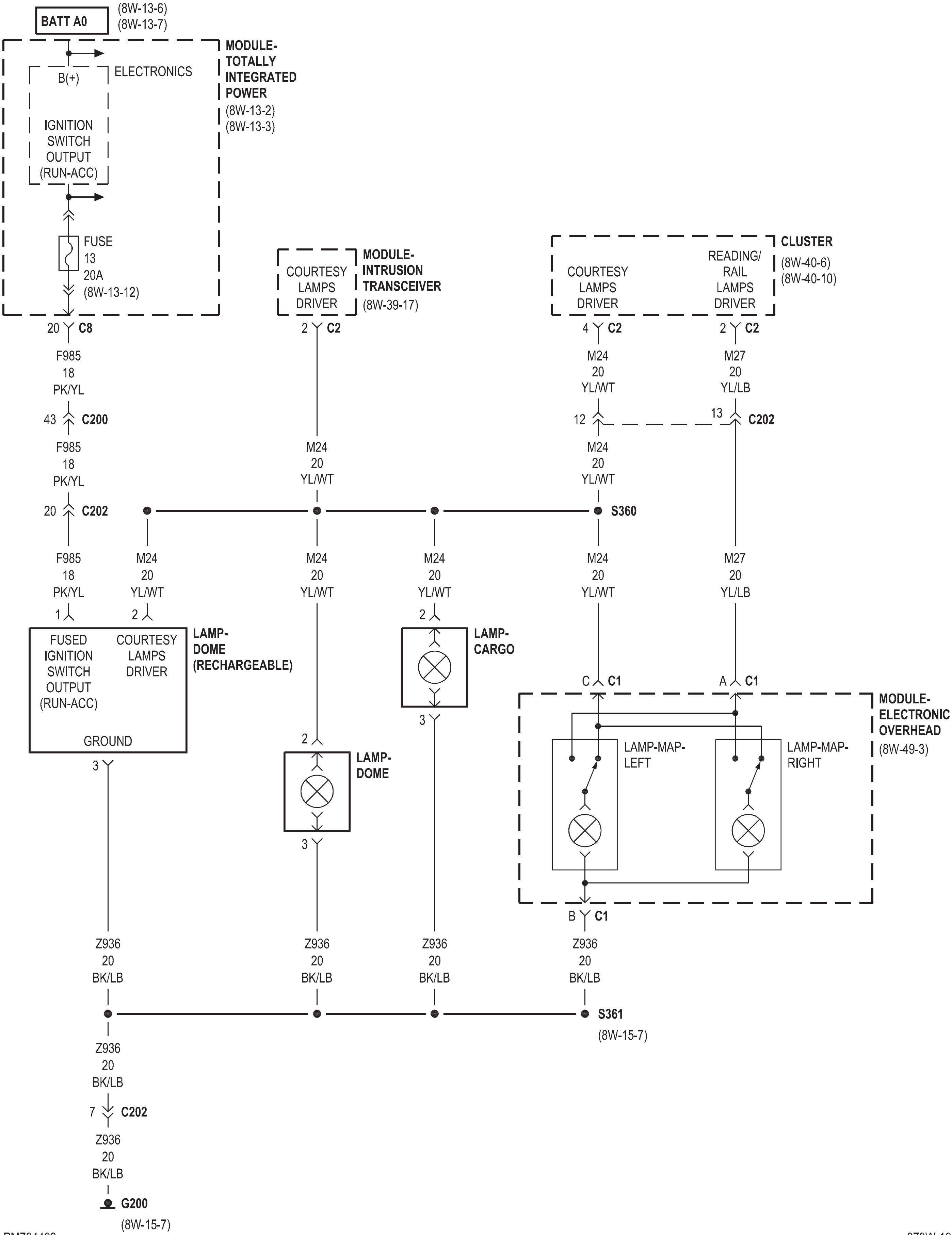
EXCEPT EXPORT

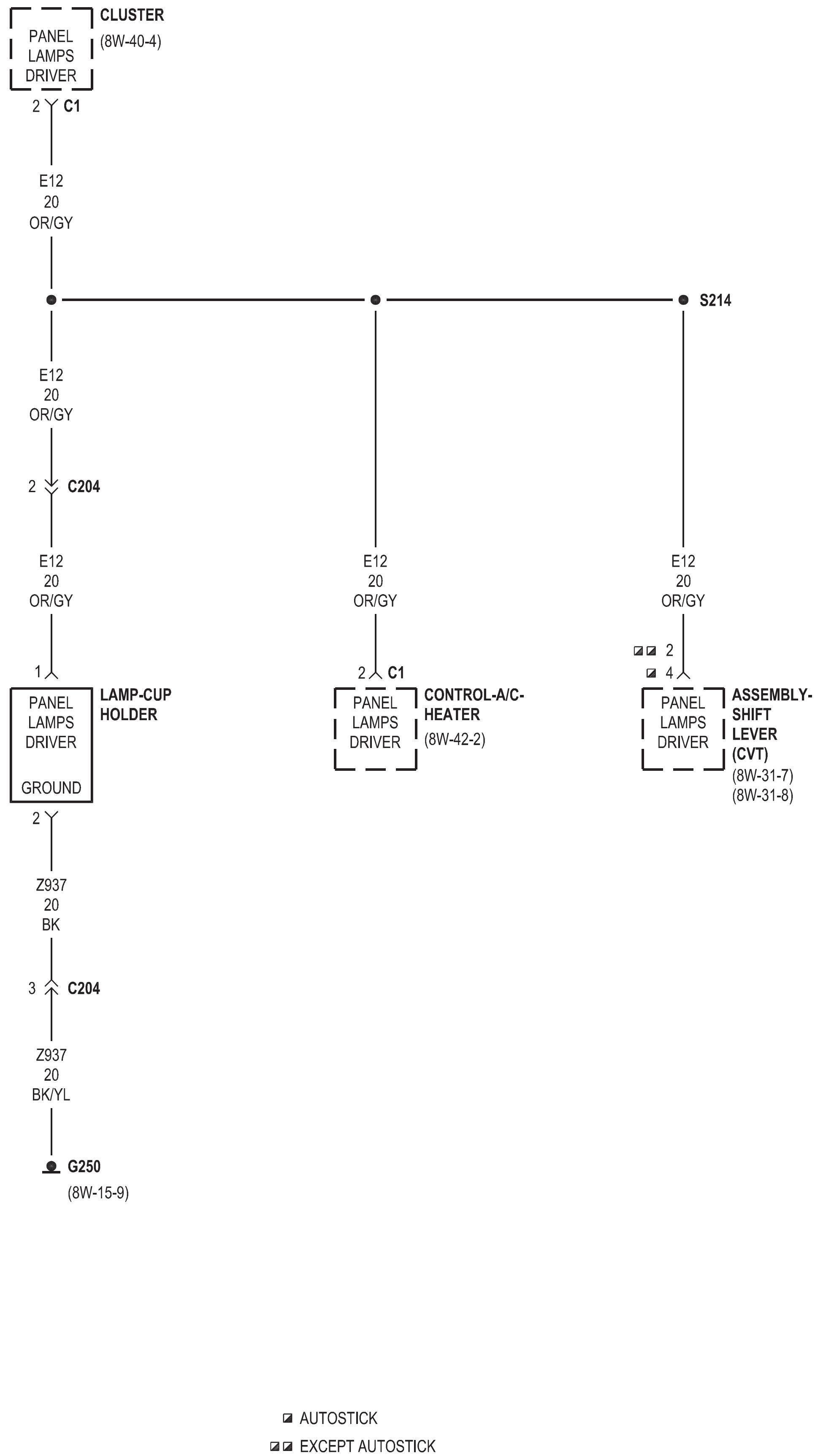


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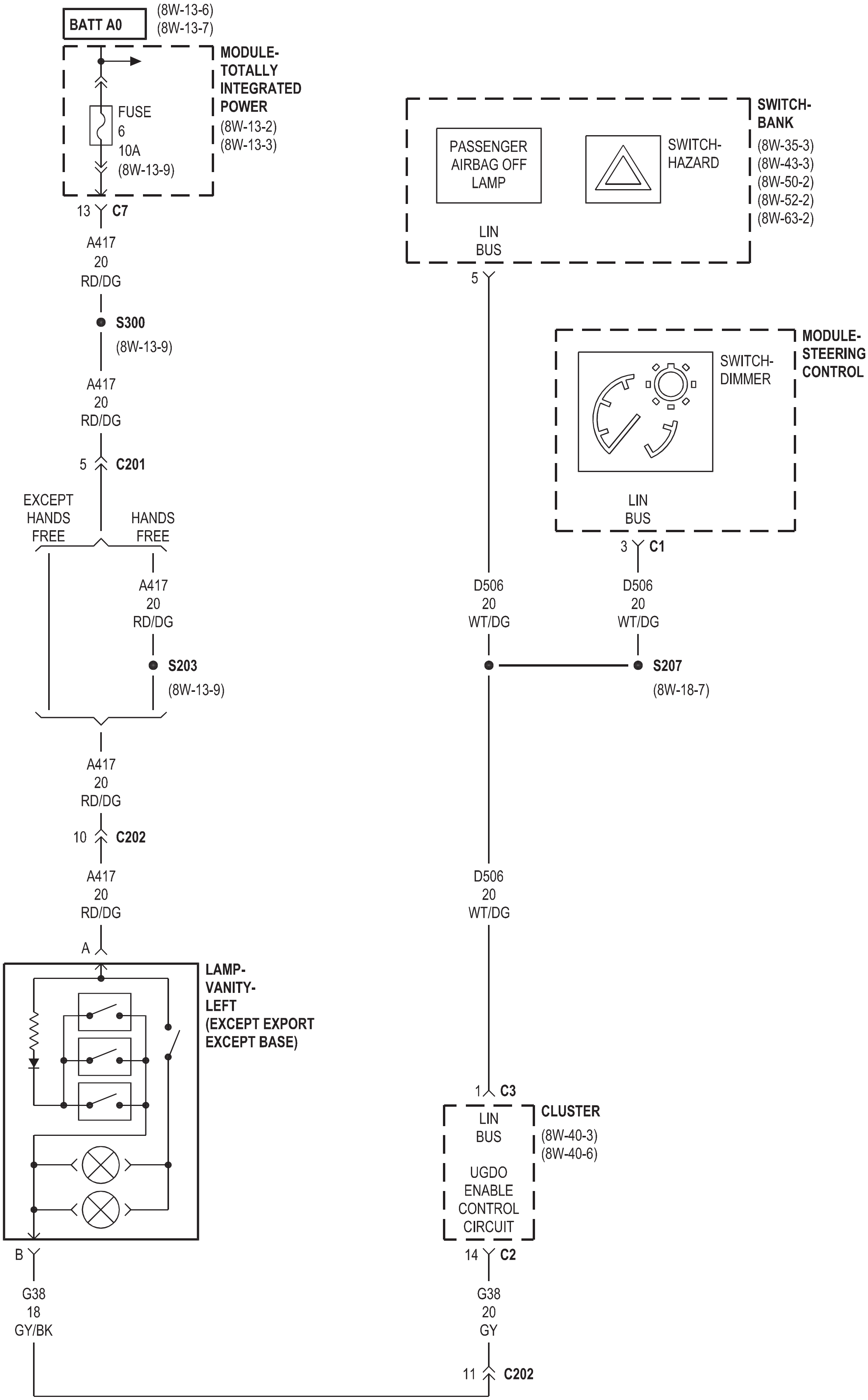
8W-44 INTERIOR LIGHTING


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
7
30A
(8W-13-11)
FUSE
14
10A
(8W-13-11)
ELECTRONICS
B(+)
IGNITION
SWITCH
OUTPUT
(RUN-START)
CAN B
BUS (-)
CAN B
BUS (+)
15 C7
16 C7
4 C11
11 C3
3 C3
F202
20
PK/GY
D54
20
WT/PK
D55
20
WT/OR
S003
(8W-13-18)
TWISTED
PAIR
S301
(8W-18-3)
S302
(8W-18-4)
7 C103
A418
20
RD/BK
A412
20
RD/DB
S306
(8W-13-18)
4
5
C200
6
2
C201
6 C200
S208
(8W-13-18)
S205
(8W-18-3)
S206
(8W-18-4)
1 C1
9 C2
11 C3
11 C4
12 C4
CLUSTER
(8W-40-2)
FUSED
B(+)
(I.O.D.)
GROUND
8 C1
1 C4
10 C2
Z936
18
BK/LB
Z936
20
BK/LB
Z937
20
BK/YL
G200
(8W-15-6)
G250
(8W-15-9)

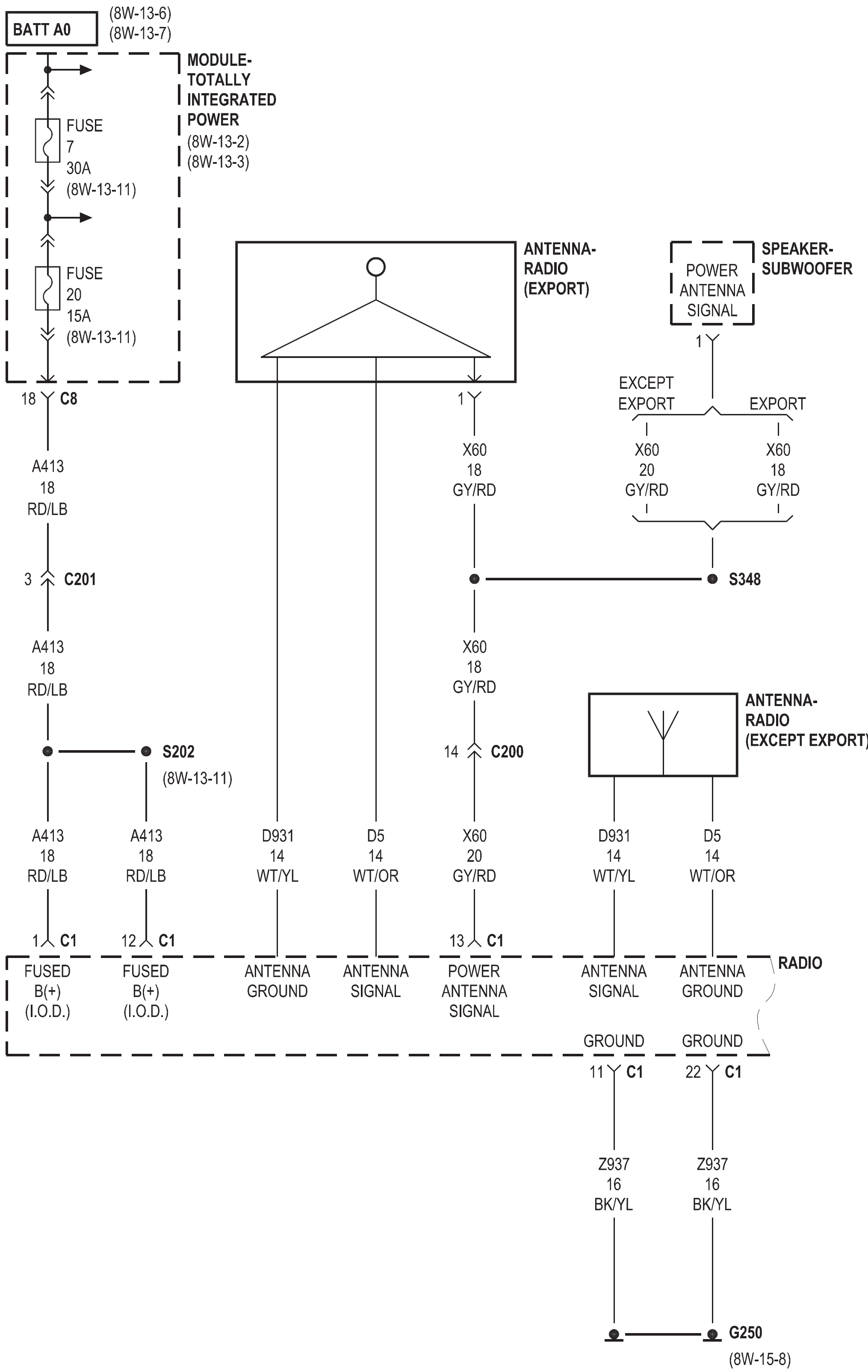

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (RUN-ACC)
FUSE 13 20A (8W-13-12)
20 C8
F985 18 PK/YL
43 C200
F985 18 PK/YL
20 C202
F985 18 PK/YL
COURTESY LAMPS DRIVER
MODULE-INTRUSION TRANSCEIVER
(8W-39-17)
2 C2
M24 20 YL/WT
CLUSTER
(8W-40-6)
(8W-40-10)
COURTESY LAMPS DRIVER
READING/ RAIL LAMPS DRIVER
4 C2
2 C2
M24 20 YL/WT
M27 20 YL/LB
12
13 C202
S360
M24 20 YL/WT
M27 20 YL/LB
1
2
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
COURTESY LAMPS DRIVER
GROUND
LAMP-DOME (RECHARGEABLE)
3
LAMP-CARGO
LAMP-DOME
C C1
A C1
MODULE-ELECTRONIC OVERHEAD
(8W-49-3)
LAMP-MAP-LEFT
LAMP-MAP-RIGHT
B C1
Z936 20 BK/LB
S361
(8W-15-7)
7 C202
G200
(8W-15-7)

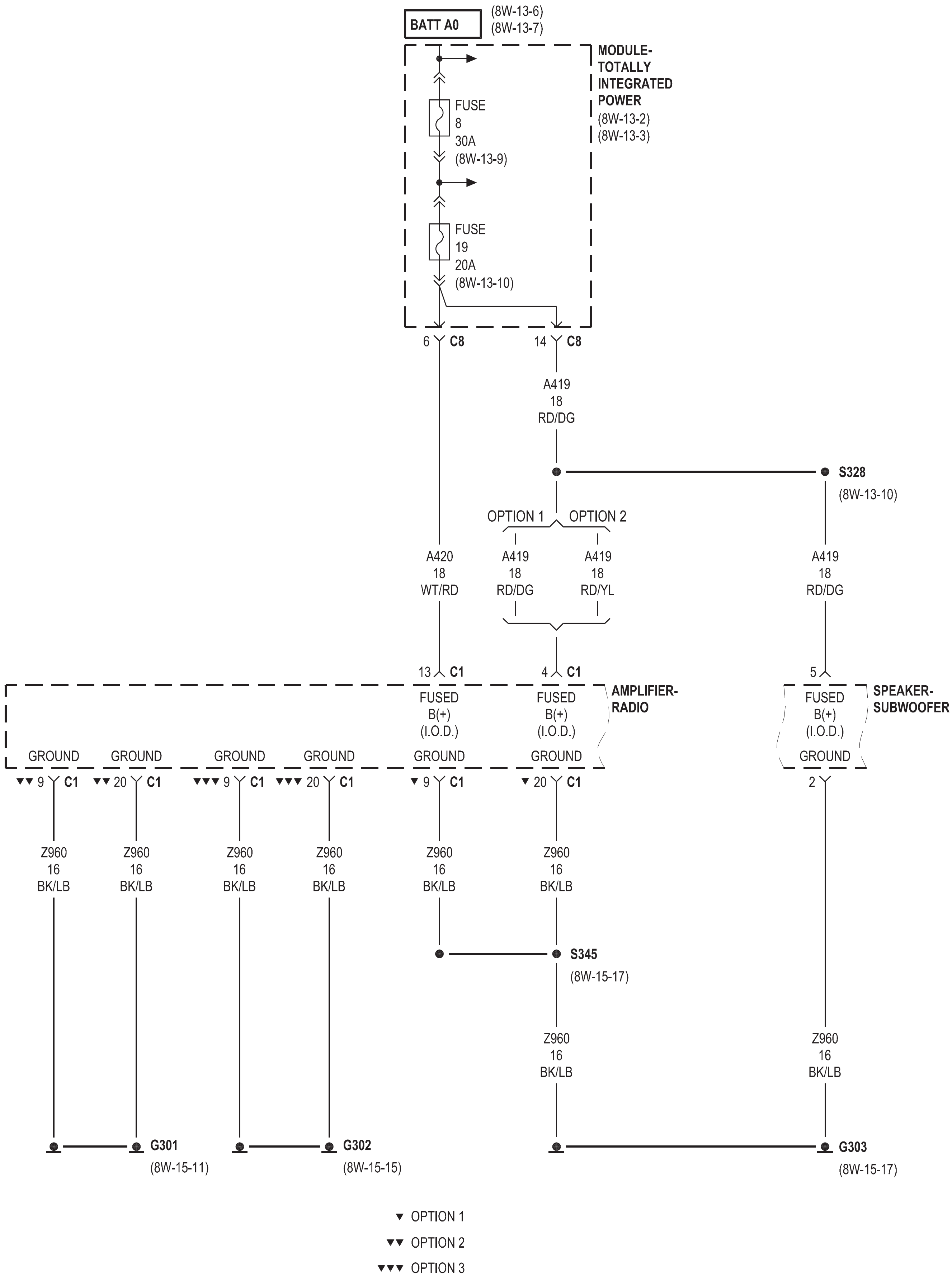


CLUSTER
(8W-40-4)
PANEL LAMPS DRIVER
2 C1
E12 20 OR/GY
S214
E12 20 OR/GY
2 C204
E12 20 OR/GY
E12 20 OR/GY
E12 20 OR/GY
1
PANEL LAMPS DRIVER
GROUND
LAMP-CUP HOLDER
2 C1
PANEL LAMPS DRIVER
CONTROL-A/C-HEATER
(8W-42-2)
2
4
PANEL LAMPS DRIVER
ASSEMBLY-SHIFT LEVER (CVT)
(8W-31-7)
(8W-31-8)
2
Z937 20 BK
3 C204
Z937 20 BK/YL
G250
(8W-15-9)
AUTOSTICK
EXCEPT AUTOSTICK

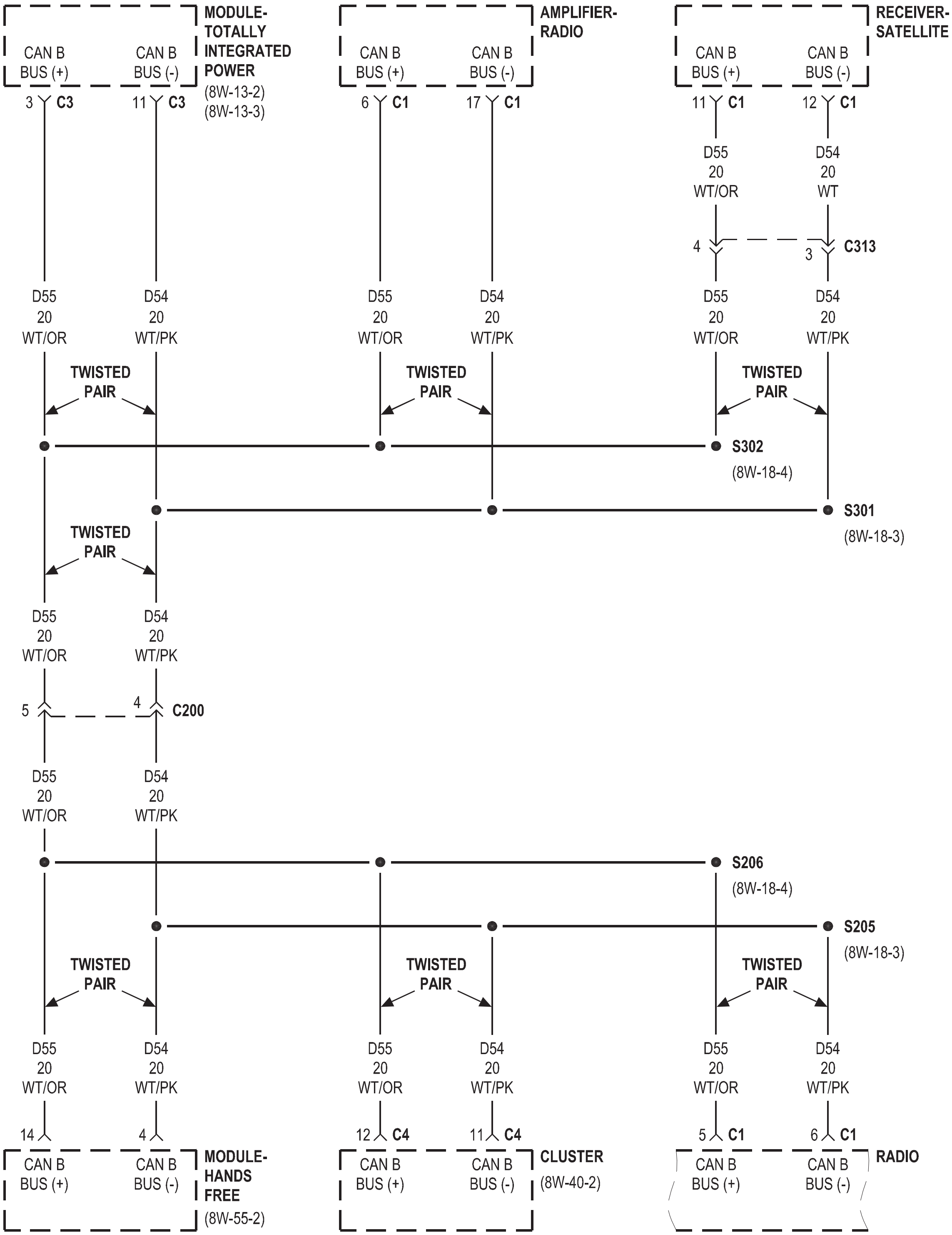

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
6
10A
(8W-13-9)
13 C7
A417
20
RD/DG
S300
(8W-13-9)
A417
20
RD/DG
5 C201
EXCEPT
HANDS
FREE
HANDS
FREE
A417
20
RD/DG
S203
(8W-13-9)
A417
20
RD/DG
10 C202
A417
20
RD/DG
A
LAMP-
VANITY-
LEFT
(EXCEPT EXPORT
EXCEPT BASE)
B
G38
18
GY/BK
PASSENGER
AIRBAG OFF
LAMP
SWITCH-
HAZARD
SWITCH-
BANK
(8W-35-3)
(8W-43-3)
(8W-50-2)
(8W-52-2)
(8W-63-2)
LIN
BUS
5
SWITCH-
DIMMER
MODULE-
STEERING
CONTROL
LIN
BUS
3 C1
D506
20
WT/DG
D506
20
WT/DG
S207
(8W-18-7)
D506
20
WT/DG
1 C3
LIN
BUS
UGDO
ENABLE
CONTROL
CIRCUIT
CLUSTER
(8W-40-3)
(8W-40-6)
14 C2
G38
20
GY
11 C202

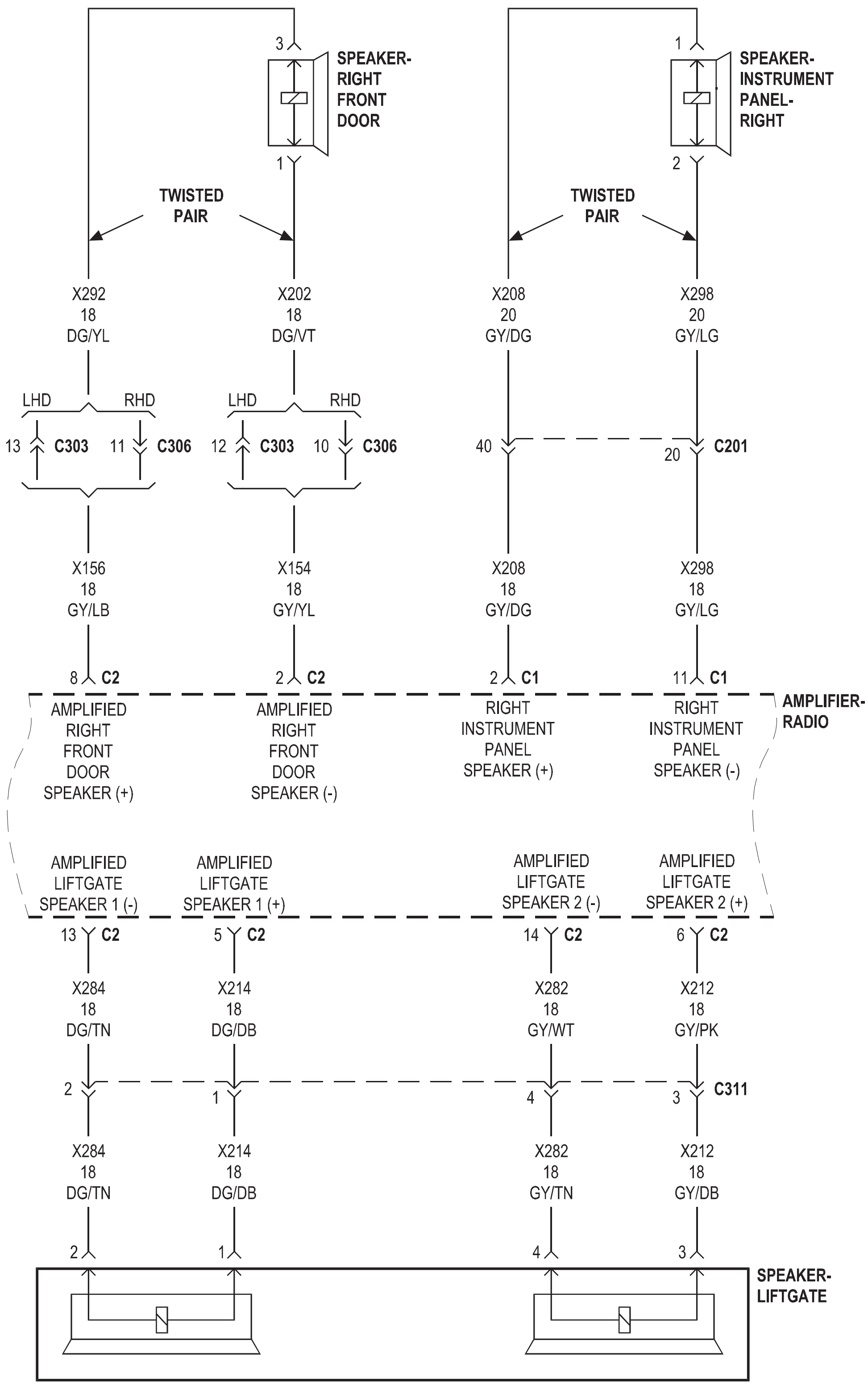
8W-47 AUDIO SYSTEM

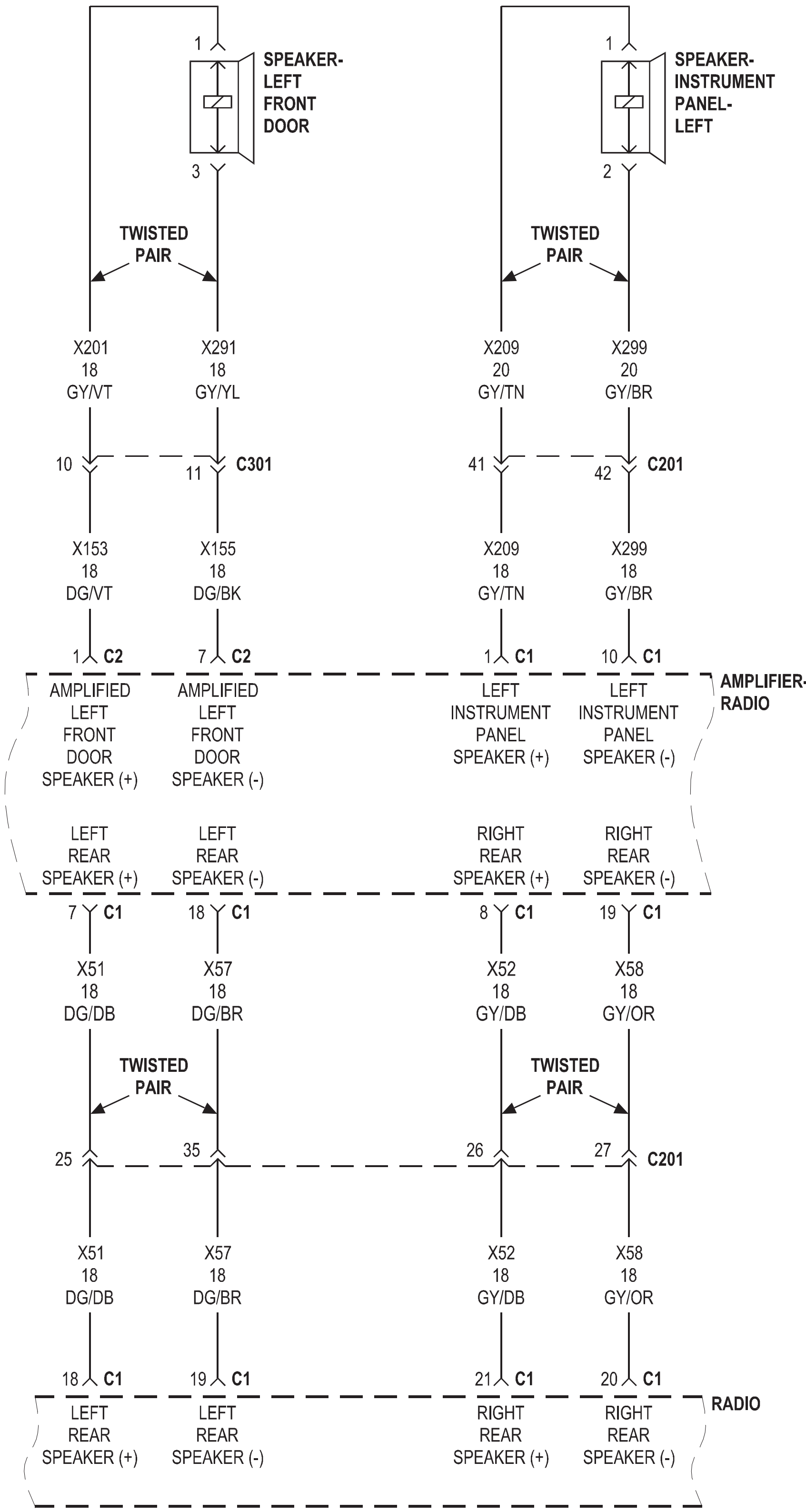

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 7 30A (8W-13-11)
FUSE 20 15A (8W-13-11)
18 C8
A413 18 RD/LB
3 C201
A413 18 RD/LB
S202
(8W-13-11)
A413 18 RD/LB
A413 18 RD/LB
ANTENNA-RADIO (EXPORT)
1
X60 18 GY/RD
SPEAKER-SUBWOOFER
POWER ANTENNA SIGNAL
1
EXCEPT EXPORT
EXPORT
X60 20 GY/RD
X60 18 GY/RD
S348
X60 18 GY/RD
14 C200
ANTENNA-RADIO (EXCEPT EXPORT)
D931 14 WT/YL
D5 14 WT/OR
X60 20 GY/RD
D931 14 WT/YL
D5 14 WT/OR
1 C1
12 C1
13 C1
RADIO
FUSED B(+) (I.O.D.)
FUSED B(+) (I.O.D.)
ANTENNA GROUND
ANTENNA SIGNAL
POWER ANTENNA SIGNAL
ANTENNA SIGNAL
ANTENNA GROUND
GROUND
GROUND
11 C1
22 C1
Z937 16 BK/YL
Z937 16 BK/YL
G250
(8W-15-8)

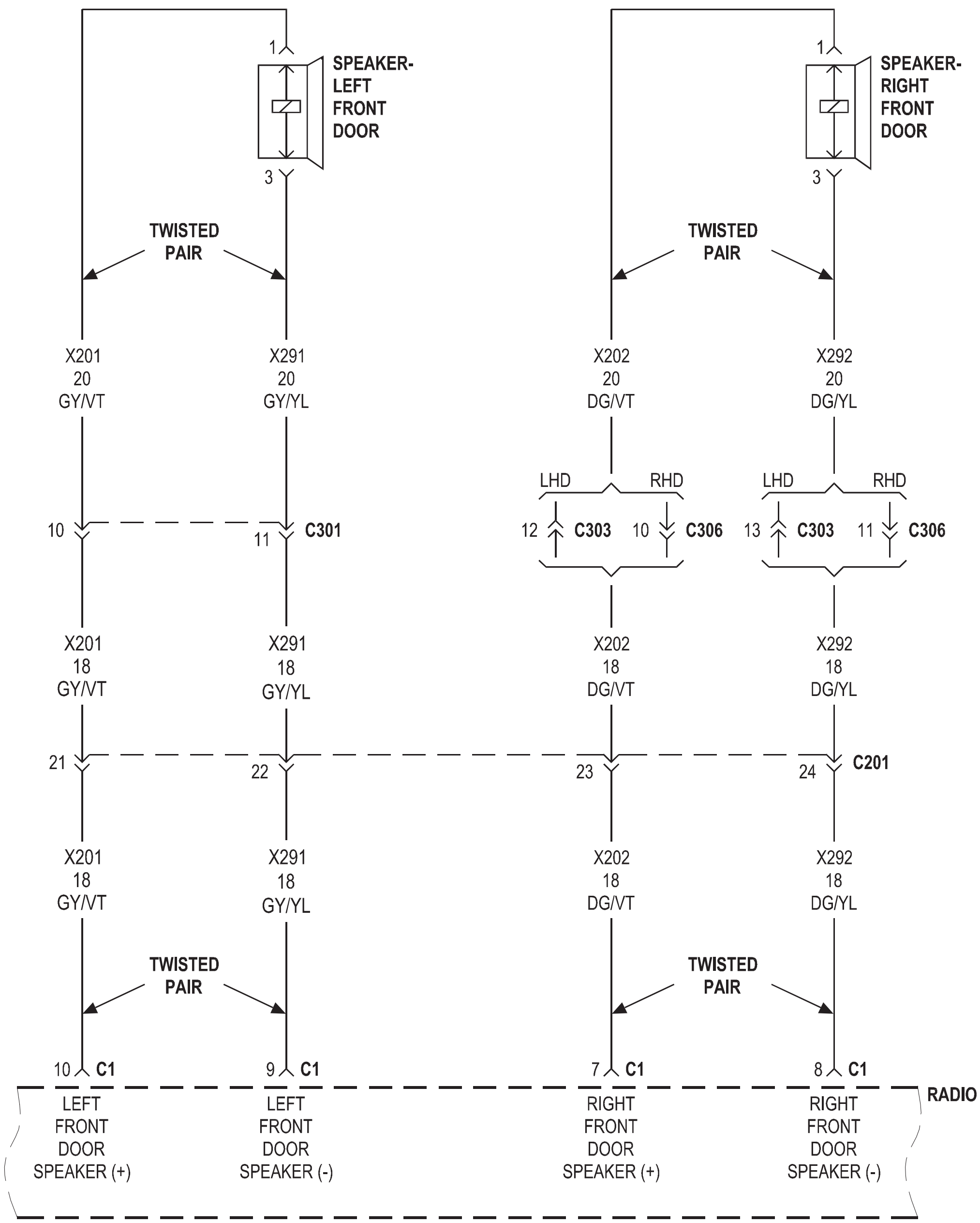


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 8 30A (8W-13-9)
FUSE 19 20A (8W-13-10)
6 C8
14 C8
A419 18 RD/DG
S328 (8W-13-10)
OPTION 1
OPTION 2
A420 18 WT/RD
A419 18 RD/DG
A419 18 RD/YL
A419 18 RD/DG
13 C1
4 C1
5
AMPLIFIER-RADIO
FUSED B(+) (I.O.D.)
SPEAKER-SUBWOOFER
GROUND
9 C1
20 C1
2
Z960 16 BK/LB
S345 (8W-15-17)
G301 (8W-15-11)
G302 (8W-15-15)
G303 (8W-15-17)
▼ OPTION 1
▼▼ OPTION 2
▼▼▼ OPTION 3

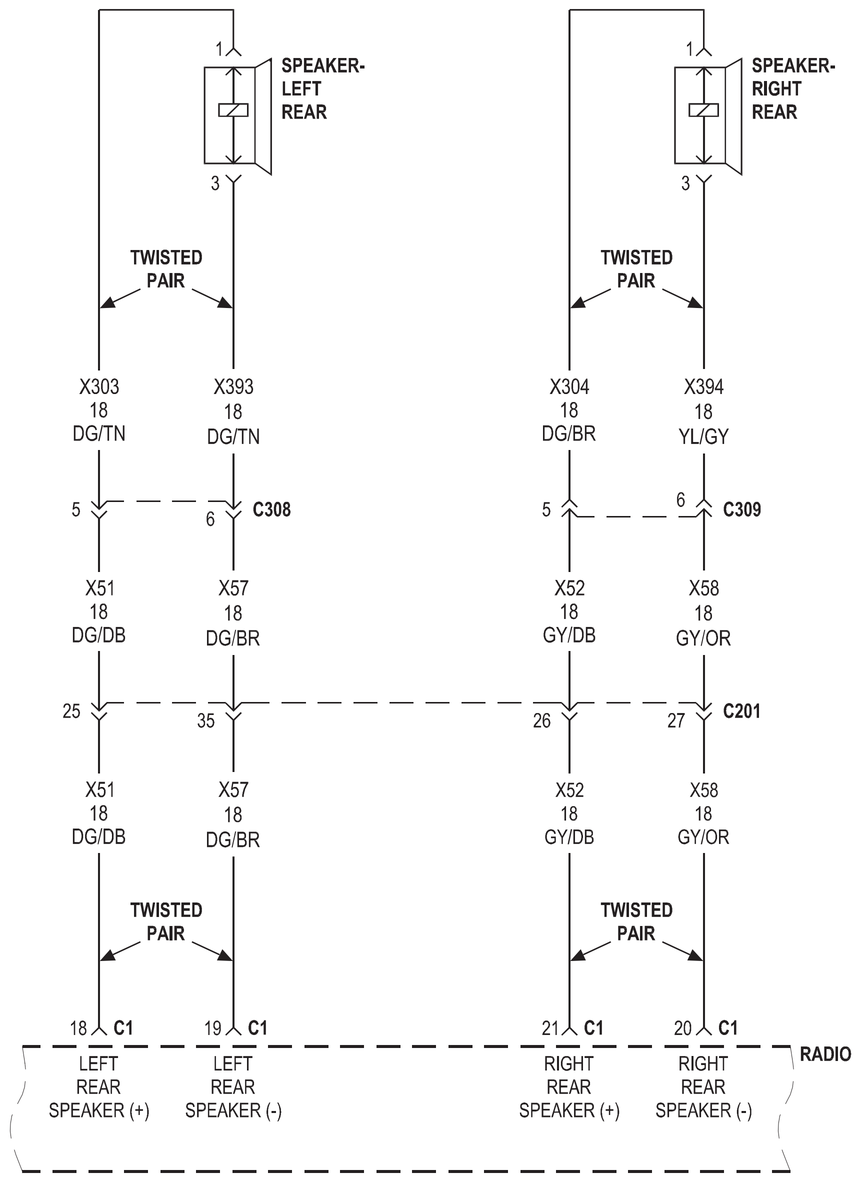

MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
CAN B
BUS (+)
CAN B
BUS (-)
3 C3
11 C3
AMPLIFIER-
RADIO
6 C1
17 C1
RECEIVER-
SATELLITE
11 C1
12 C1
D55
20
WT/OR
D54
20
WT
C313
D54
20
WT/PK
TWISTED
PAIR
S302
(8W-18-4)
S301
(8W-18-3)
C200
S206
(8W-18-4)
S205
(8W-18-3)
14
4
12 C4
11 C4
5 C1
6 C1
MODULE-
HANDS
FREE
(8W-55-2)
CLUSTER
(8W-40-2)
RADIO

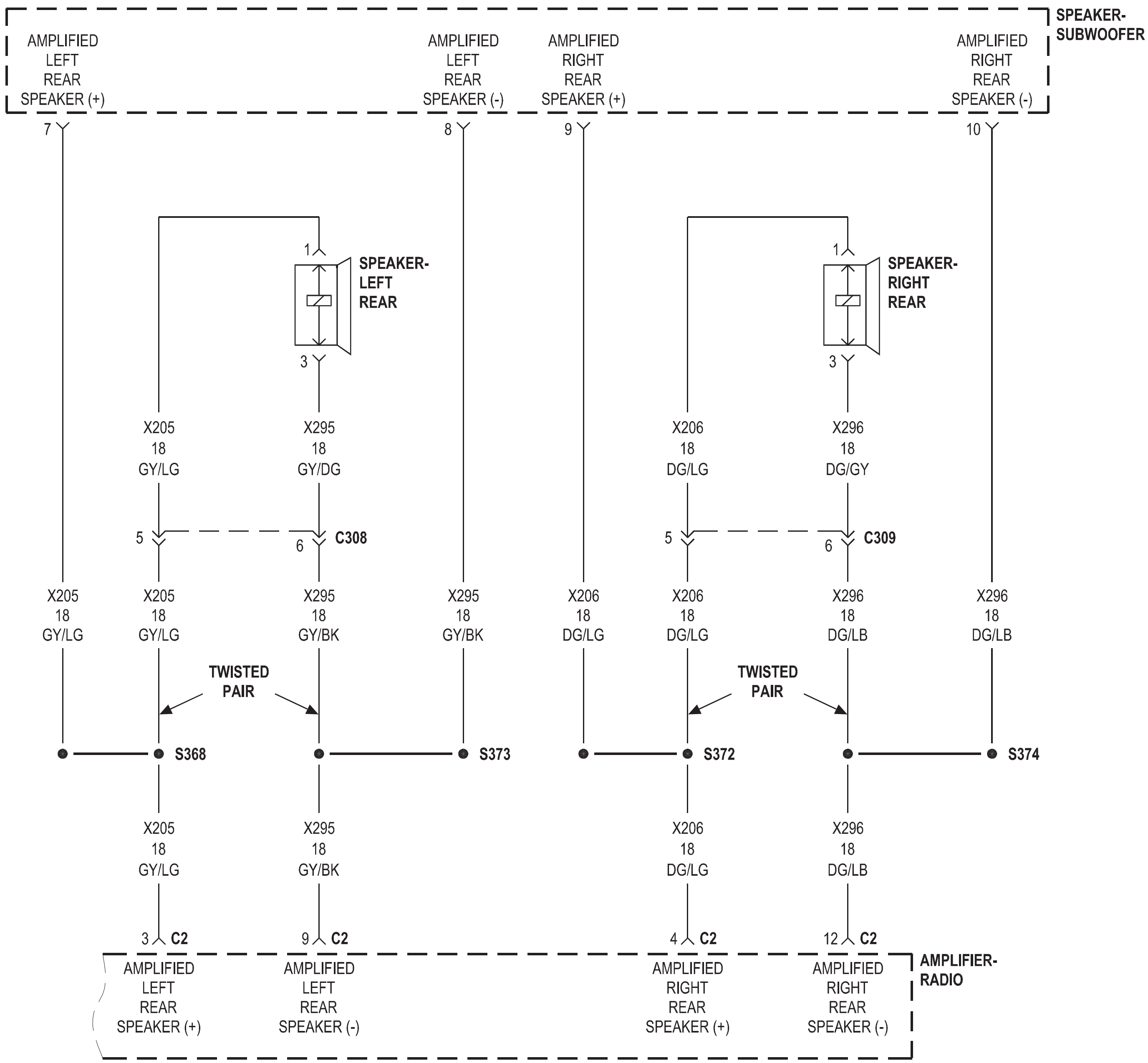

3
SPEAKER-
RIGHT
FRONT
DOOR
1
1
SPEAKER-
INSTRUMENT
PANEL-
RIGHT
2
TWISTED
PAIR
TWISTED
PAIR
X292
18
DG/YL
X202
18
DG/VT
X208
20
GY/DG
X298
20
GY/LG
LHD
RHD
LHD
RHD
13
C303
11
C306
12
C303
10
C306
40
20
C201
X156
18
GY/LB
X154
18
GY/YL
X208
18
GY/DG
X298
18
GY/LG
8
C2
2
C2
2
C1
11
C1
AMPLIFIER-
RADIO
AMPLIFIED
RIGHT
FRONT
DOOR
SPEAKER (+)
AMPLIFIED
RIGHT
FRONT
DOOR
SPEAKER (-)
RIGHT
INSTRUMENT
PANEL
SPEAKER (+)
RIGHT
INSTRUMENT
PANEL
SPEAKER (-)
AMPLIFIED
LIFTGATE
SPEAKER 1 (-)
AMPLIFIED
LIFTGATE
SPEAKER 1 (+)
AMPLIFIED
LIFTGATE
SPEAKER 2 (-)
AMPLIFIED
LIFTGATE
SPEAKER 2 (+)
13
C2
5
C2
14
C2
6
C2
X284
18
DG/TN
X214
18
DG/DB
X282
18
GY/WT
X212
18
GY/PK
2
1
4
3
C311
X284
18
DG/TN
X214
18
DG/DB
X282
18
GY/TN
X212
18
GY/DB
2
1
4
3
SPEAKER-
LIFTGATE


1
SPEAKER-
LEFT
FRONT
DOOR
3
1
SPEAKER-
INSTRUMENT
PANEL-
LEFT
2
TWISTED
PAIR
TWISTED
PAIR
X201
18
GY/VT
X291
18
GY/YL
X209
20
GY/TN
X299
20
GY/BR
10
11
C301
41
42
C201
X153
18
DG/VT
X155
18
DG/BK
X209
18
GY/TN
X299
18
GY/BR
1 C2
7 C2
1 C1
10 C1
AMPLIFIER-
RADIO
AMPLIFIED
LEFT
FRONT
DOOR
SPEAKER (+)
AMPLIFIED
LEFT
FRONT
DOOR
SPEAKER (-)
LEFT
INSTRUMENT
PANEL
SPEAKER (+)
LEFT
INSTRUMENT
PANEL
SPEAKER (-)
LEFT
REAR
SPEAKER (+)
LEFT
REAR
SPEAKER (-)
RIGHT
REAR
SPEAKER (+)
RIGHT
REAR
SPEAKER (-)
7 C1
18 C1
8 C1
19 C1
X51
18
DG/DB
X57
18
DG/BR
X52
18
GY/DB
X58
18
GY/OR
TWISTED
PAIR
TWISTED
PAIR
25
35
26
27
C201
X51
18
DG/DB
X57
18
DG/BR
X52
18
GY/DB
X58
18
GY/OR
18 C1
19 C1
21 C1
20 C1
RADIO
LEFT
REAR
SPEAKER (+)
LEFT
REAR
SPEAKER (-)
RIGHT
REAR
SPEAKER (+)
RIGHT
REAR
SPEAKER (-)

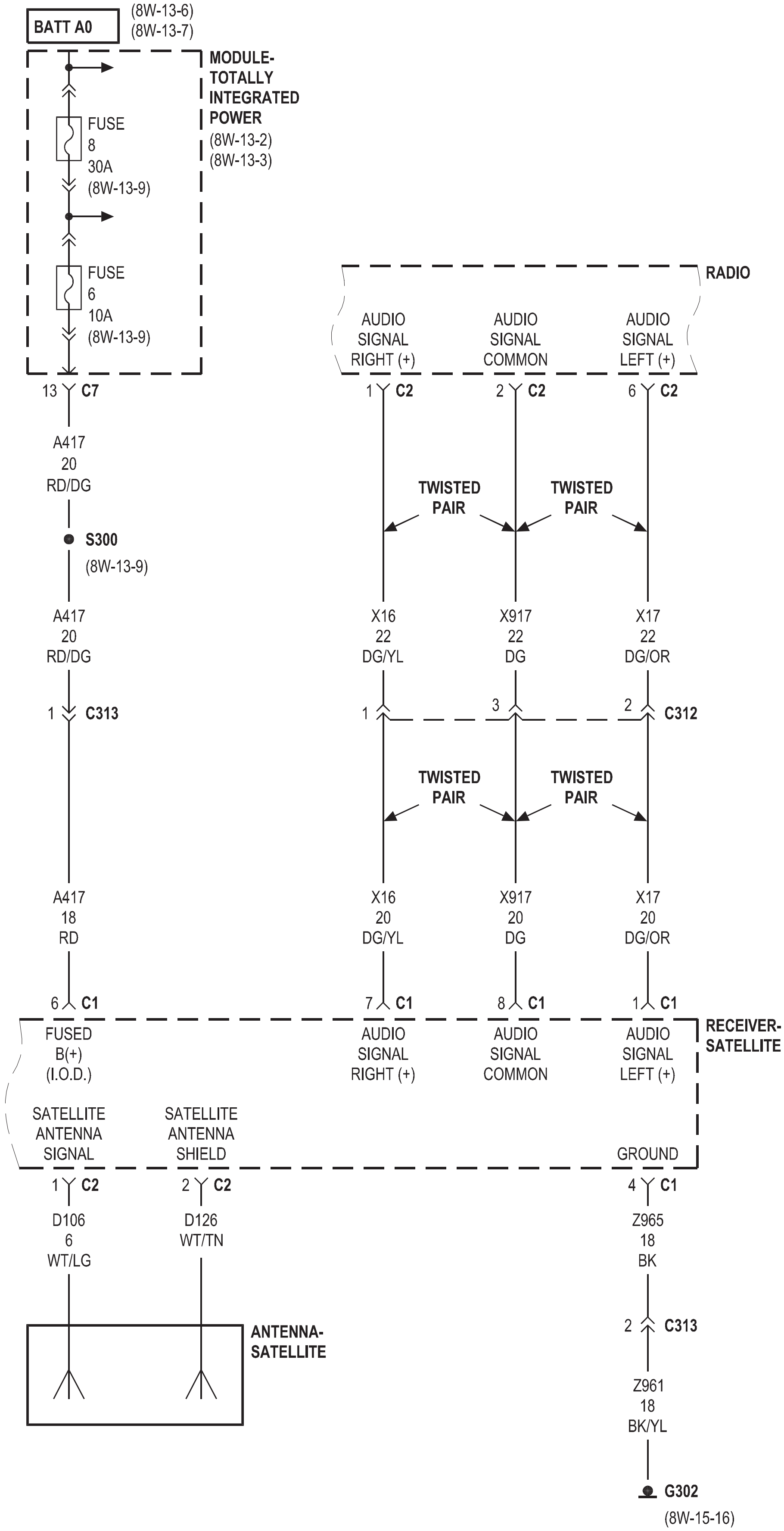


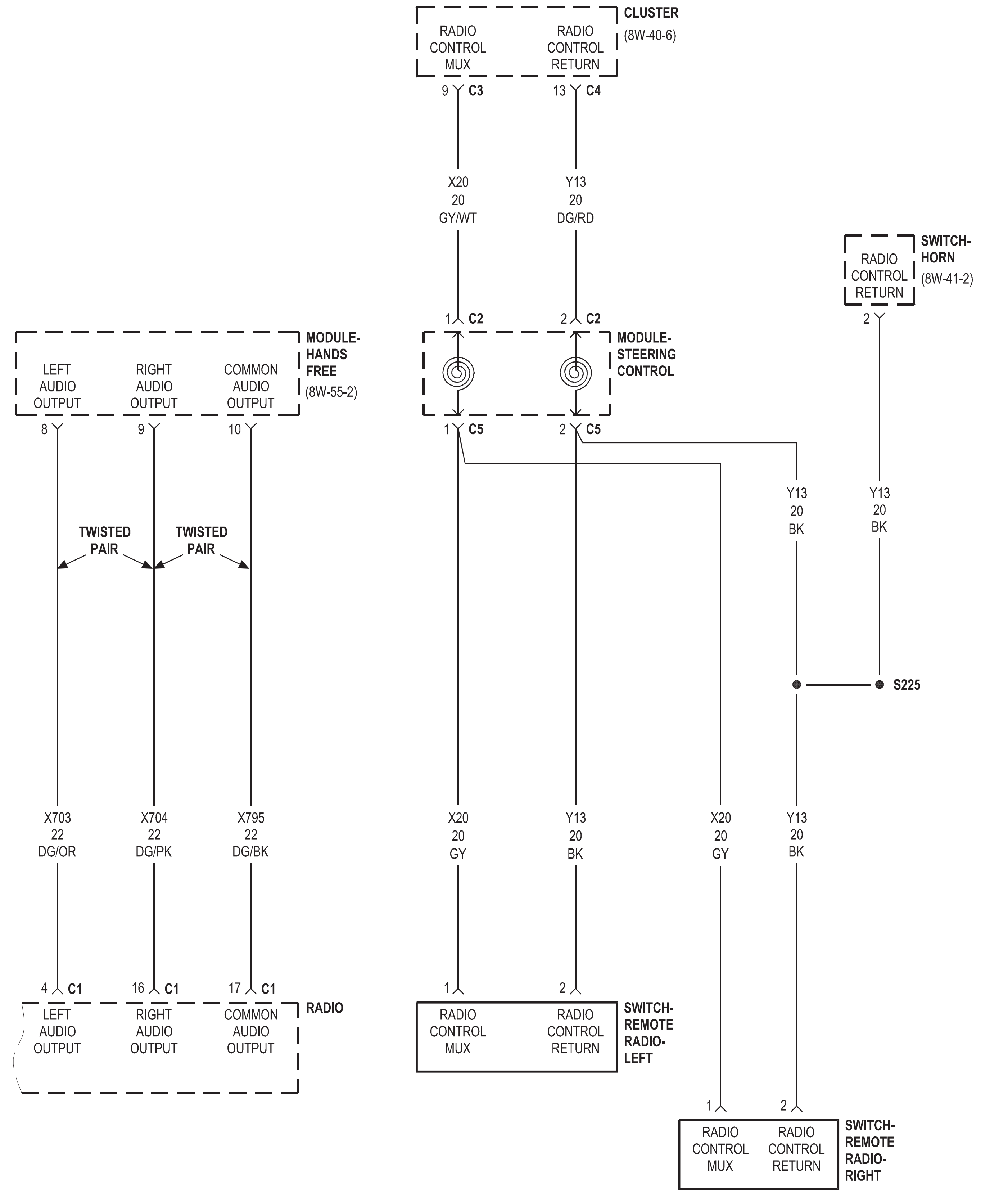
SPEAKER-
LEFT
FRONT
DOOR
1
3
SPEAKER-
RIGHT
FRONT
DOOR
1
3
TWISTED
PAIR
TWISTED
PAIR
X201
20
GY/VT
X291
20
GY/YL
X202
20
DG/VT
X292
20
DG/YL
LHD
RHD
LHD
RHD
10
11
C301
12
C303
10
C306
13
C303
11
C306
X201
18
GY/VT
X291
18
GY/YL
X202
18
DG/VT
X292
18
DG/YL
21
22
23
24
C201
X201
18
GY/VT
X291
18
GY/YL
X202
18
DG/VT
X292
18
DG/YL
TWISTED
PAIR
TWISTED
PAIR
10 C1
9 C1
7 C1
8 C1
RADIO
LEFT
FRONT
DOOR
SPEAKER (+)
LEFT
FRONT
DOOR
SPEAKER (-)
RIGHT
FRONT
DOOR
SPEAKER (+)
RIGHT
FRONT
DOOR
SPEAKER (-)


1
SPEAKER-
LEFT
REAR
3
1
SPEAKER-
RIGHT
REAR
3
TWISTED
PAIR
TWISTED
PAIR
X303
18
DG/TN
X393
18
DG/TN
X304
18
DG/BR
X394
18
YL/GY
5
6
C308
5
6
C309
X51
18
DG/DB
X57
18
DG/BR
X52
18
GY/DB
X58
18
GY/OR
25
35
26
27
C201
X51
18
DG/DB
X57
18
DG/BR
X52
18
GY/DB
X58
18
GY/OR
TWISTED
PAIR
TWISTED
PAIR
18 C1
19 C1
21 C1
20 C1
RADIO
LEFT
REAR
SPEAKER (+)
LEFT
REAR
SPEAKER (-)
RIGHT
REAR
SPEAKER (+)
RIGHT
REAR
SPEAKER (-)

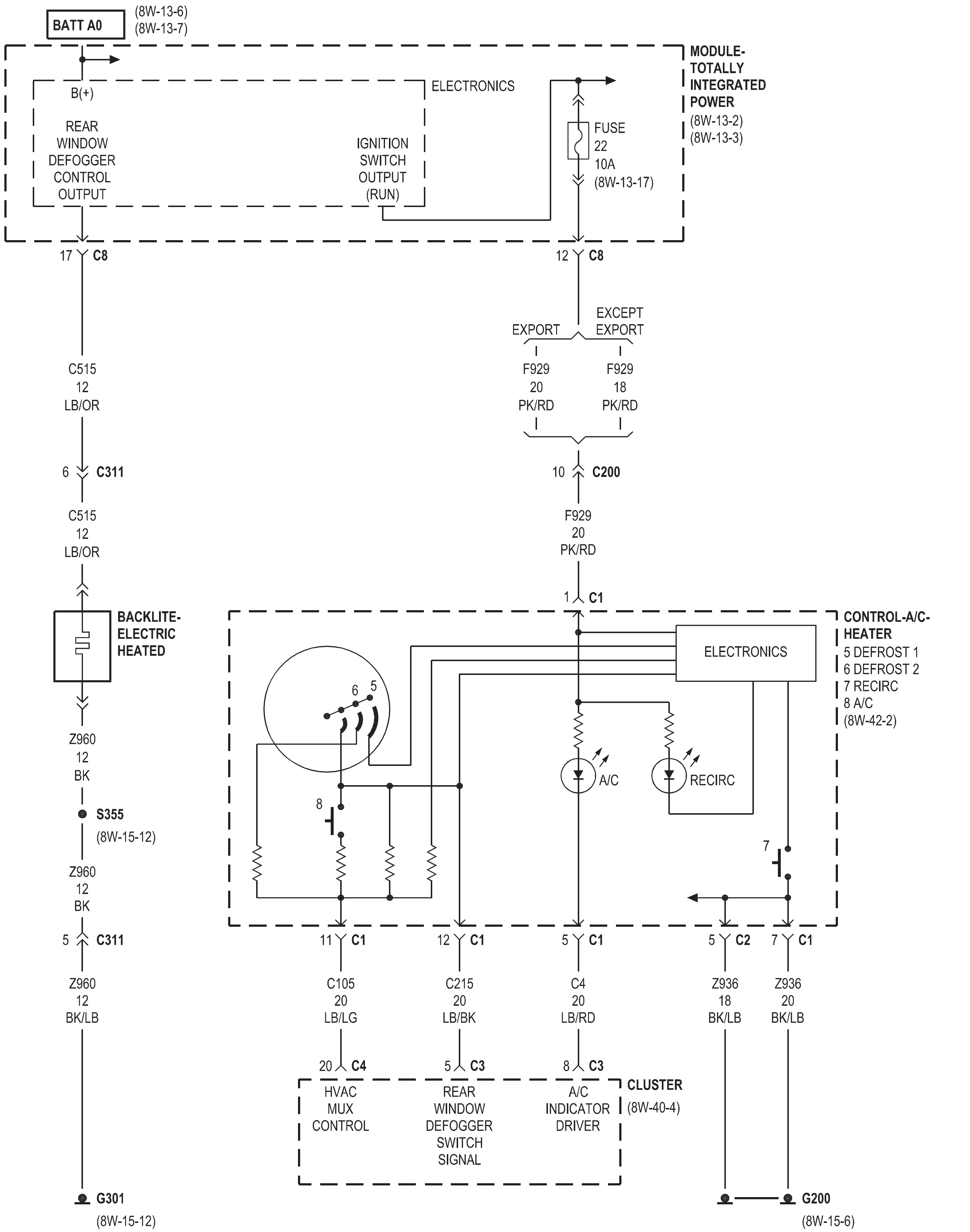

SPEAKER-SUBWOOFER
AMPLIFIED LEFT REAR SPEAKER (+)
AMPLIFIED LEFT REAR SPEAKER (-)
AMPLIFIED RIGHT REAR SPEAKER (+)
AMPLIFIED RIGHT REAR SPEAKER (-)
7
8
9
10
1
3
SPEAKER-LEFT REAR
SPEAKER-RIGHT REAR
X205 18 GY/LG
X295 18 GY/DG
X206 18 DG/LG
X296 18 DG/GY
5
6
C308
C309
X205 18 GY/LG
X295 18 GY/BK
X206 18 DG/LG
X296 18 DG/LB
TWISTED PAIR
S368
S373
S372
S374
3 C2
9 C2
4 C2
12 C2
AMPLIFIER-RADIO

SATELLITE RADIO

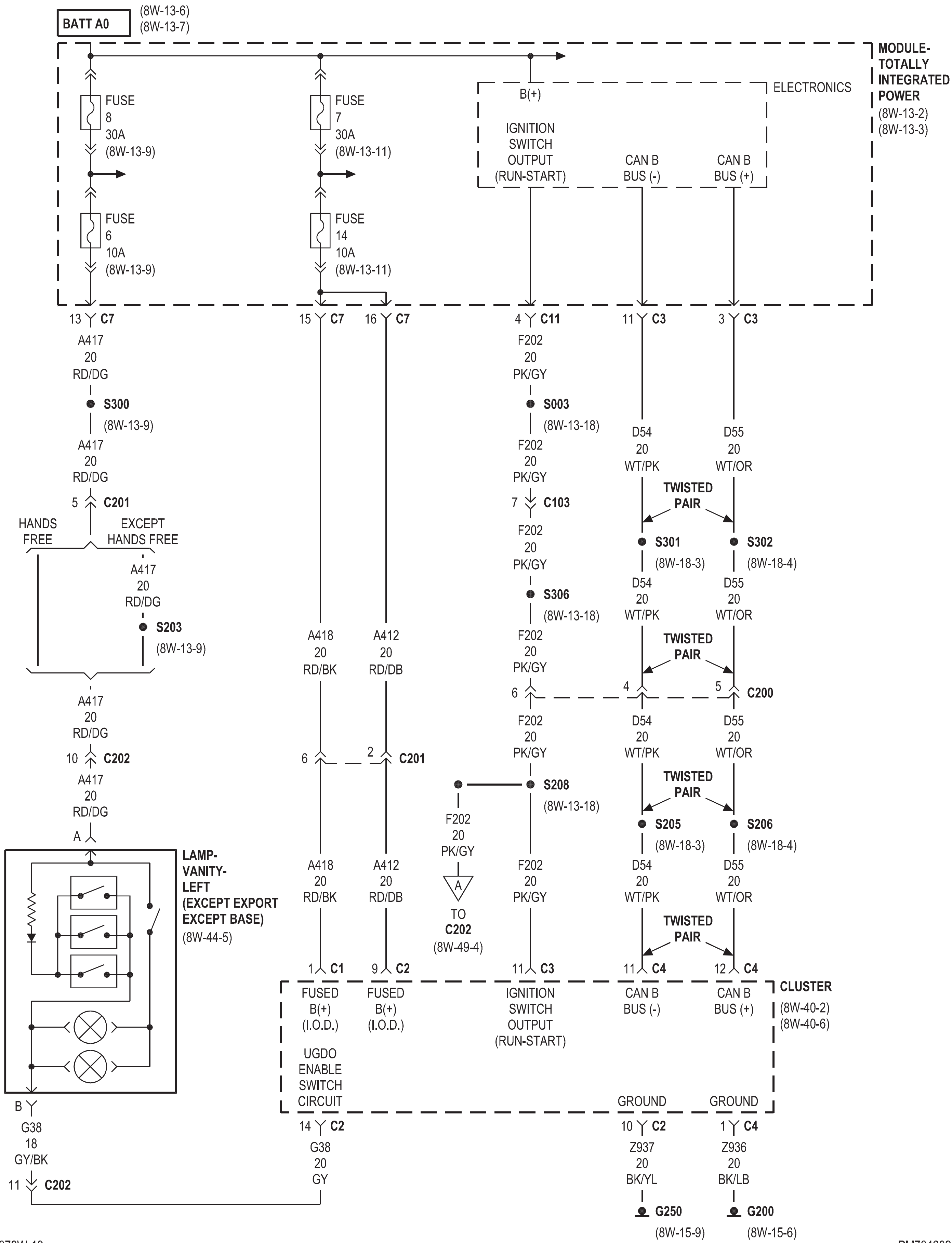


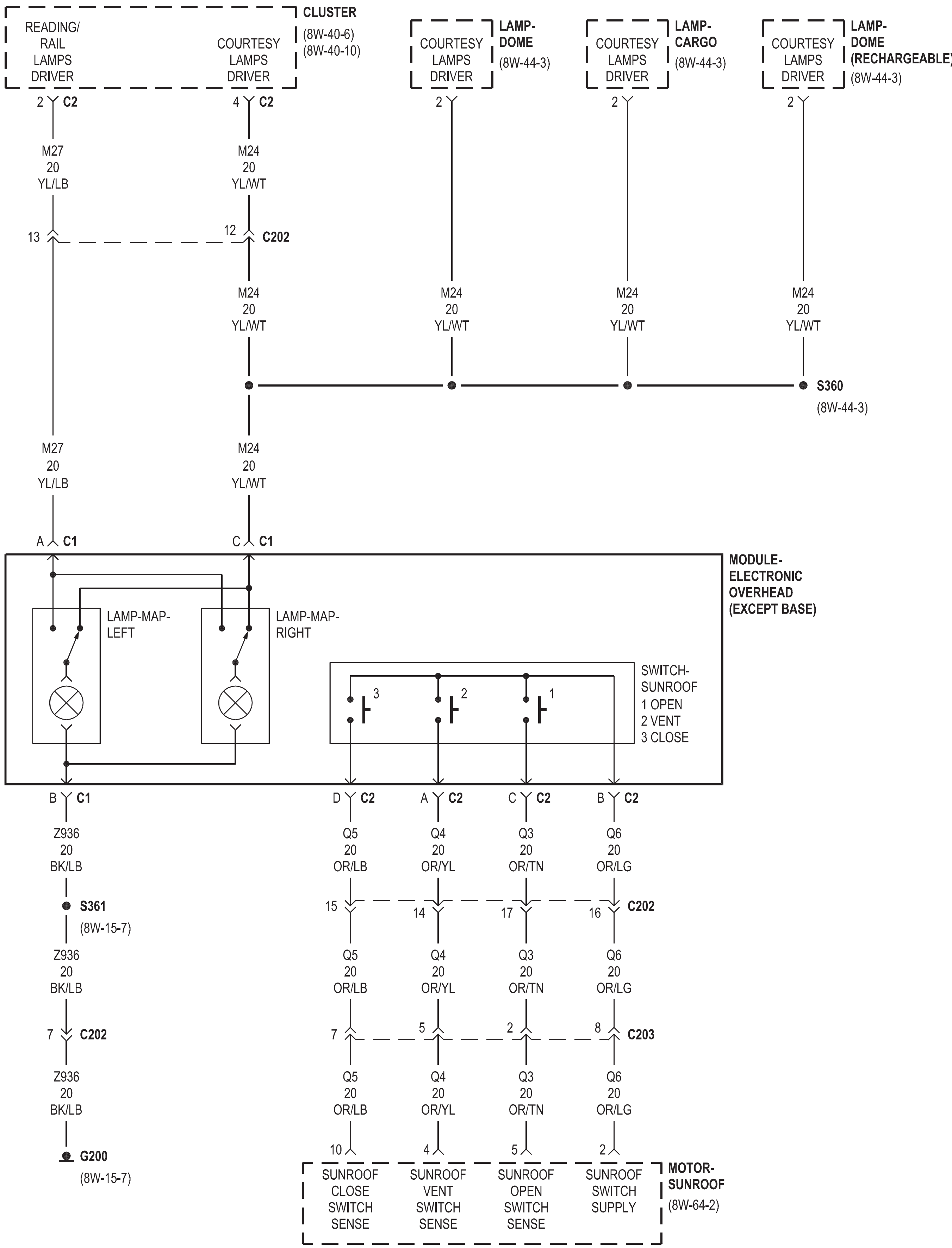

CLUSTER
(8W-40-6)
RADIO CONTROL MUX
RADIO CONTROL RETURN
9 C3
13 C4
X20 20 GY/WT
Y13 20 DG/RD
SWITCH-HORN
(8W-41-2)
RADIO CONTROL RETURN
2
1 C2
2 C2
MODULE-HANDS FREE
(8W-55-2)
LEFT AUDIO OUTPUT
RIGHT AUDIO OUTPUT
COMMON AUDIO OUTPUT
MODULE-STEERING CONTROL
8
9
10
1 C5
2 C5
Y13 20 BK
Y13 20 BK
TWISTED PAIR
TWISTED PAIR
S225
X703 22 DG/OR
X704 22 DG/PK
X795 22 DG/BK
X20 20 GY
Y13 20 BK
X20 20 GY
Y13 20 BK
4 C1
16 C1
17 C1
RADIO
LEFT AUDIO OUTPUT
RIGHT AUDIO OUTPUT
COMMON AUDIO OUTPUT
1
2
SWITCH-REMOTE RADIO-LEFT
RADIO CONTROL MUX
RADIO CONTROL RETURN
1
2
SWITCH-REMOTE RADIO-RIGHT
RADIO CONTROL MUX
RADIO CONTROL RETURN

8W-48 REAR WINDOW DEFOGGER

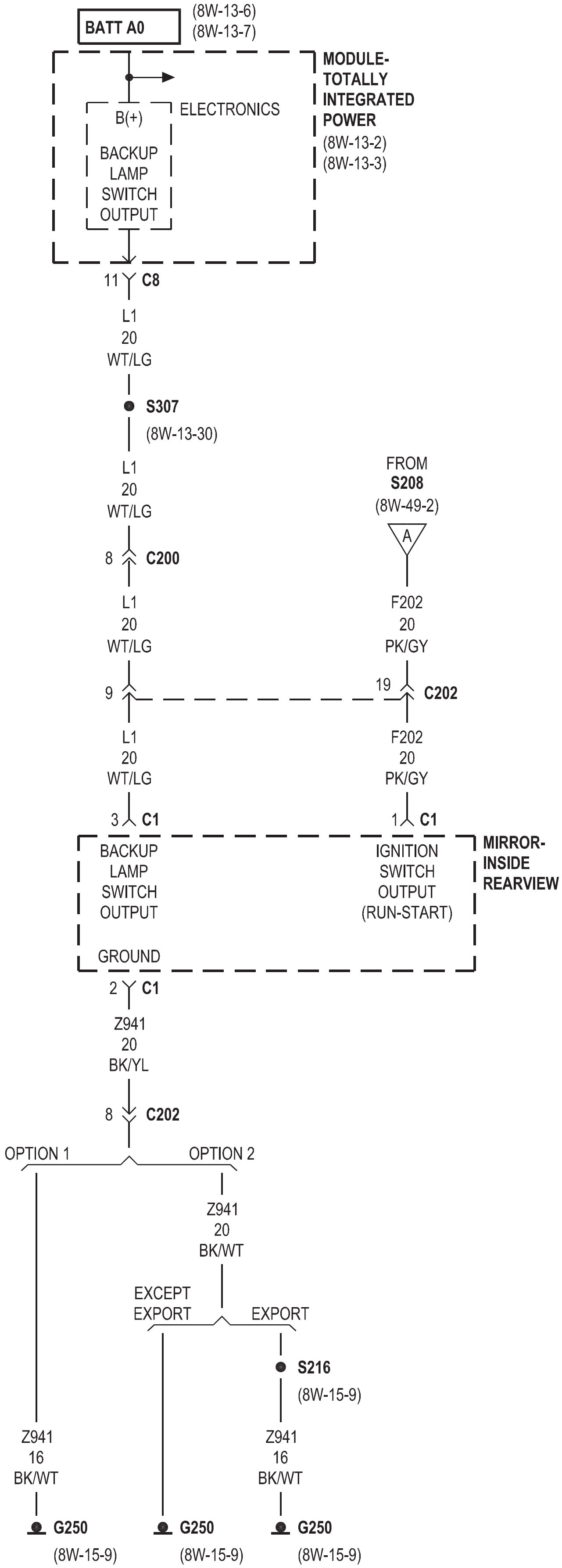

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
REAR WINDOW DEFOGGER CONTROL OUTPUT
IGNITION SWITCH OUTPUT (RUN)
FUSE 22 10A (8W-13-17)
17 C8
12 C8
EXPORT
EXCEPT EXPORT
C515 12 LB/OR
F929 20 PK/RD
F929 18 PK/RD
6 C311
10 C200
C515 12 LB/OR
F929 20 PK/RD
1 C1
BACKLITE-ELECTRIC HEATED
CONTROL-A/C-HEATER
5 DEFROST 1
6 DEFROST 2
7 RECIRC
8 A/C
(8W-42-2)
ELECTRONICS
6
5
8
A/C
RECIRC
7
Z960 12 BK
S355
(8W-15-12)
Z960 12 BK
5 C311
Z960 12 BK/LB
11 C1
12 C1
5 C1
5 C2
7 C1
C105 20 LB/LG
C215 20 LB/BK
C4 20 LB/RD
Z936 18 BK/LB
Z936 20 BK/LB
20 C4
5 C3
8 C3
CLUSTER
(8W-40-4)
HVAC MUX CONTROL
REAR WINDOW DEFOGGER SWITCH SIGNAL
A/C INDICATOR DRIVER
G301
(8W-15-12)
G200
(8W-15-6)

8W-49 OVERHEAD CONSOLE


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 8 30A (8W-13-9)
FUSE 6 10A (8W-13-9)
FUSE 7 30A (8W-13-11)
FUSE 14 10A (8W-13-11)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN-START)
CAN B BUS (-)
CAN B BUS (+)
13 C7
15 C7
16 C7
4 C11
11 C3
3 C3
A417 20 RD/DG
S300 (8W-13-9)
5 C201
HANDS FREE
EXCEPT HANDS FREE
S203 (8W-13-9)
10 C202
A
LAMP-VANITY-LEFT (EXCEPT EXPORT EXCEPT BASE)
(8W-44-5)
B
G38 18 GY/BK
11 C202
A418 20 RD/BK
A412 20 RD/DB
6 C201
2 C201
F202 20 PK/GY
S003 (8W-13-18)
7 C103
S306 (8W-13-18)
6 C200
S208 (8W-13-18)
A
TO C202 (8W-49-4)
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S301 (8W-18-3)
S302 (8W-18-4)
4 C200
5 C200
S205 (8W-18-3)
S206 (8W-18-4)
1 C1
9 C2
11 C3
11 C4
12 C4
CLUSTER
(8W-40-2)
(8W-40-6)
FUSED B(+) (I.O.D.)
UGDO ENABLE SWITCH CIRCUIT
IGNITION SWITCH OUTPUT (RUN-START)
GROUND
14 C2
G38 20 GY
10 C2
1 C4
Z937 20 BK/YL
Z936 20 BK/LB
G250 (8W-15-9)
G200 (8W-15-6)

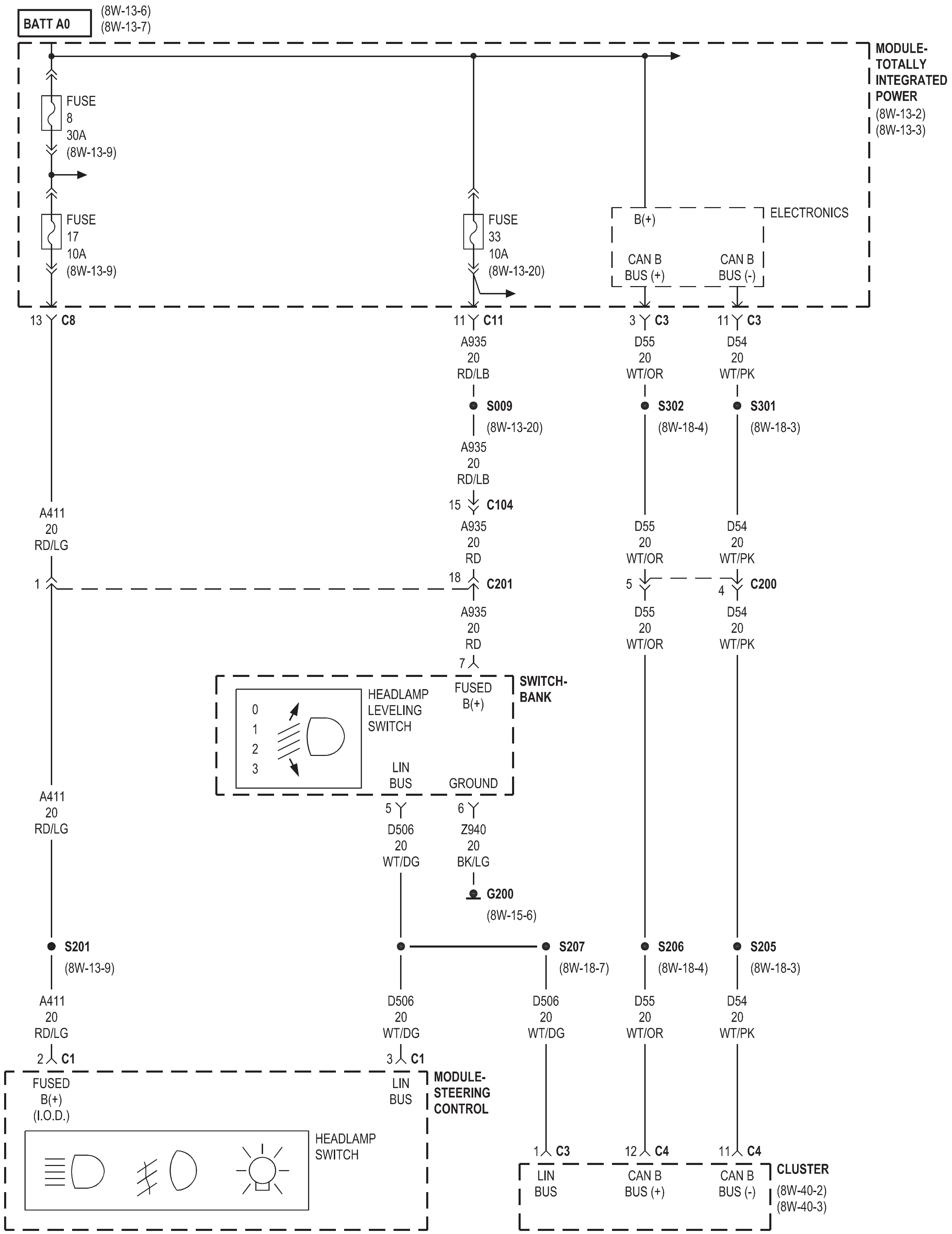

CLUSTER
(8W-40-6)
(8W-40-10)
READING/ RAIL LAMPS DRIVER
COURTESY LAMPS DRIVER
LAMP-DOME
(8W-44-3)
COURTESY LAMPS DRIVER
LAMP-CARGO
(8W-44-3)
COURTESY LAMPS DRIVER
LAMP-DOME (RECHARGEABLE)
(8W-44-3)
COURTESY LAMPS DRIVER
2 C2
4 C2
2
2
2
M27 20 YL/LB
M24 20 YL/WT
13
12 C202
M24 20 YL/WT
M24 20 YL/WT
M24 20 YL/WT
M24 20 YL/WT
S360
(8W-44-3)
M27 20 YL/LB
M24 20 YL/WT
A C1
C C1
MODULE-ELECTRONIC OVERHEAD (EXCEPT BASE)
LAMP-MAP-LEFT
LAMP-MAP-RIGHT
SWITCH-SUNROOF
1 OPEN
2 VENT
3 CLOSE
3
2
1
B C1
D C2
A C2
C C2
B C2
Z936 20 BK/LB
S361
(8W-15-7)
Z936 20 BK/LB
7 C202
Z936 20 BK/LB
G200
(8W-15-7)
Q5 20 OR/LB
Q4 20 OR/YL
Q3 20 OR/TN
Q6 20 OR/LG
15
14
17
16 C202
Q5 20 OR/LB
Q4 20 OR/YL
Q3 20 OR/TN
Q6 20 OR/LG
7
5
2
8 C203
Q5 20 OR/LB
Q4 20 OR/YL
Q3 20 OR/TN
Q6 20 OR/LG
10
4
5
2
MOTOR-SUNROOF
(8W-64-2)
SUNROOF CLOSE SWITCH SENSE
SUNROOF VENT SWITCH SENSE
SUNROOF OPEN SWITCH SENSE
SUNROOF SWITCH SUPPLY

EC MIRROR

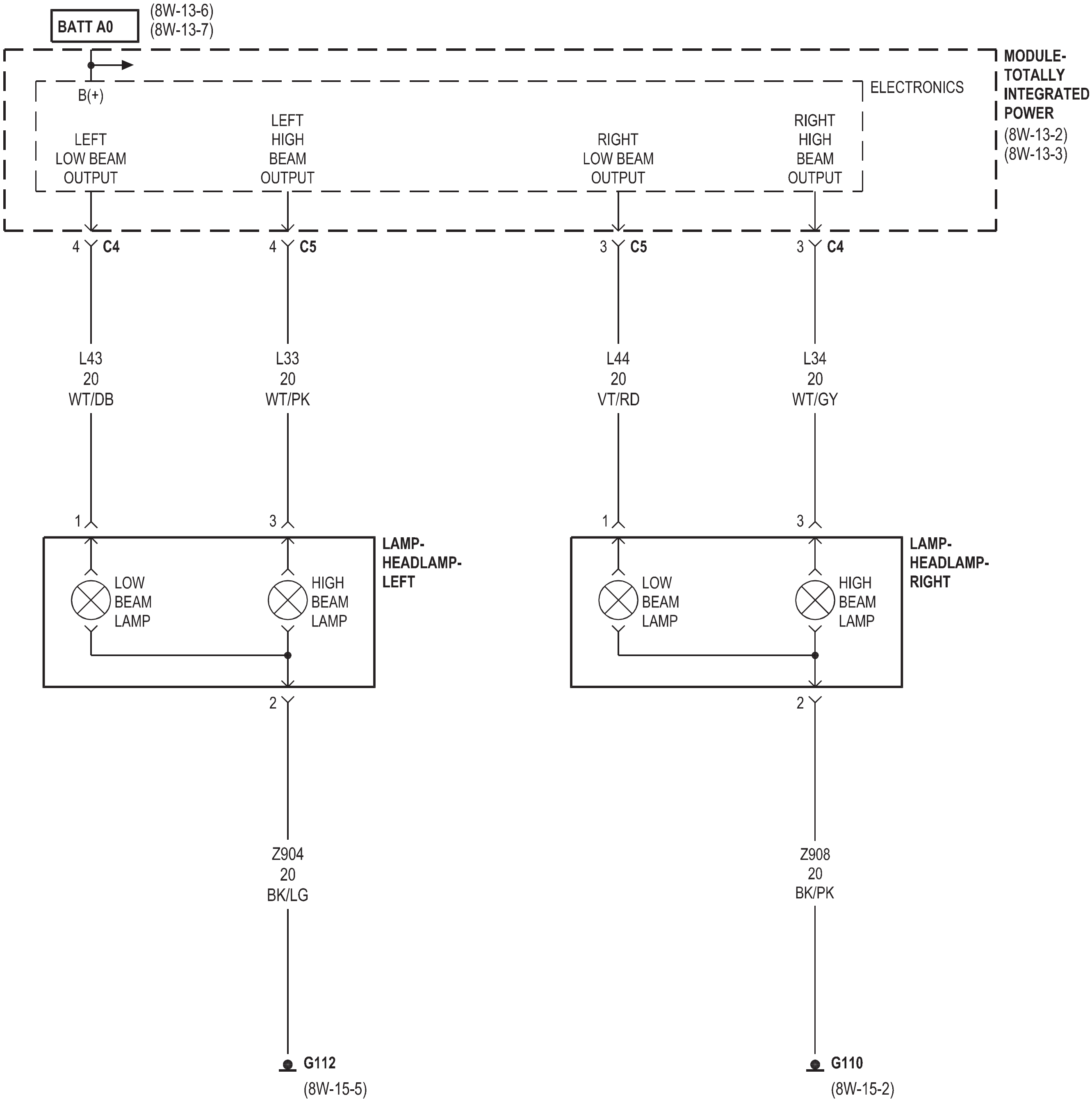


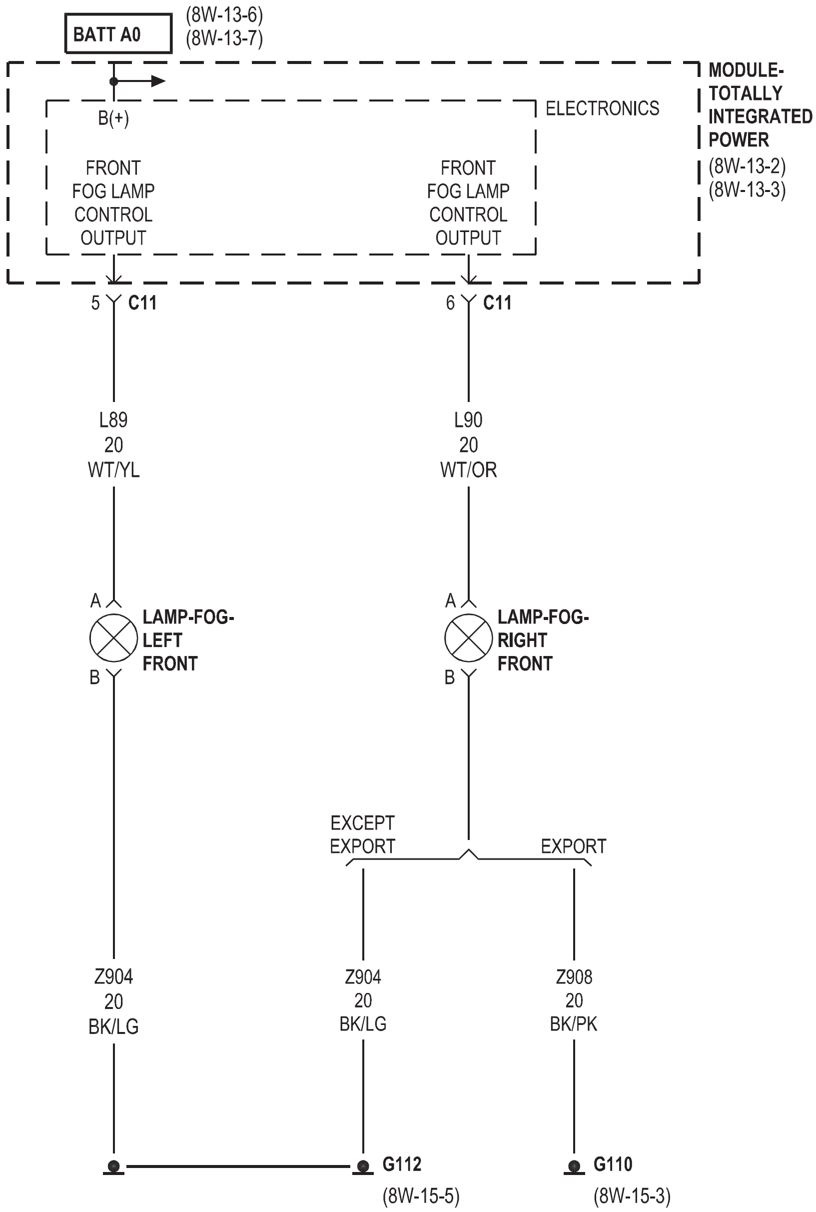
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
BACKUP
LAMP
SWITCH
OUTPUT
11 C8
L1
20
WT/LG
S307
(8W-13-30)
L1
20
WT/LG
FROM
S208
(8W-49-2)
A
8 C200
L1
20
WT/LG
F202
20
PK/GY
9
19 C202
L1
20
WT/LG
F202
20
PK/GY
3 C1
1 C1
BACKUP
LAMP
SWITCH
OUTPUT
IGNITION
SWITCH
OUTPUT
(RUN-START)
MIRROR-
INSIDE
REARVIEW
GROUND
2 C1
Z941
20
BK/YL
8 C202
OPTION 1
OPTION 2
Z941
20
BK/WT
EXCEPT
EXPORT
EXPORT
S216
(8W-15-9)
Z941
16
BK/WT
Z941
16
BK/WT
G250
(8W-15-9)
G250
(8W-15-9)
G250
(8W-15-9)

8W-50 FRONT LIGHTING

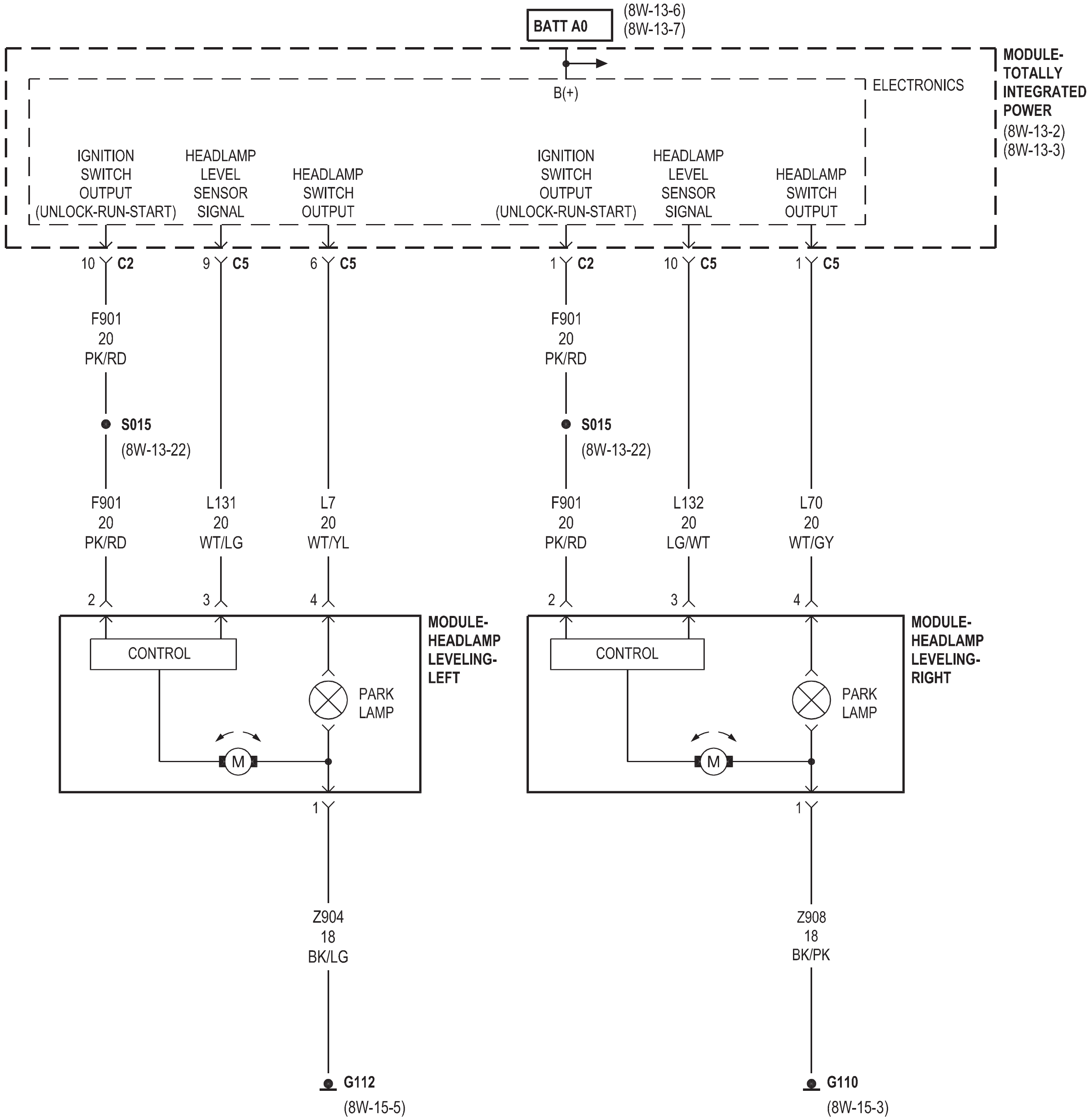


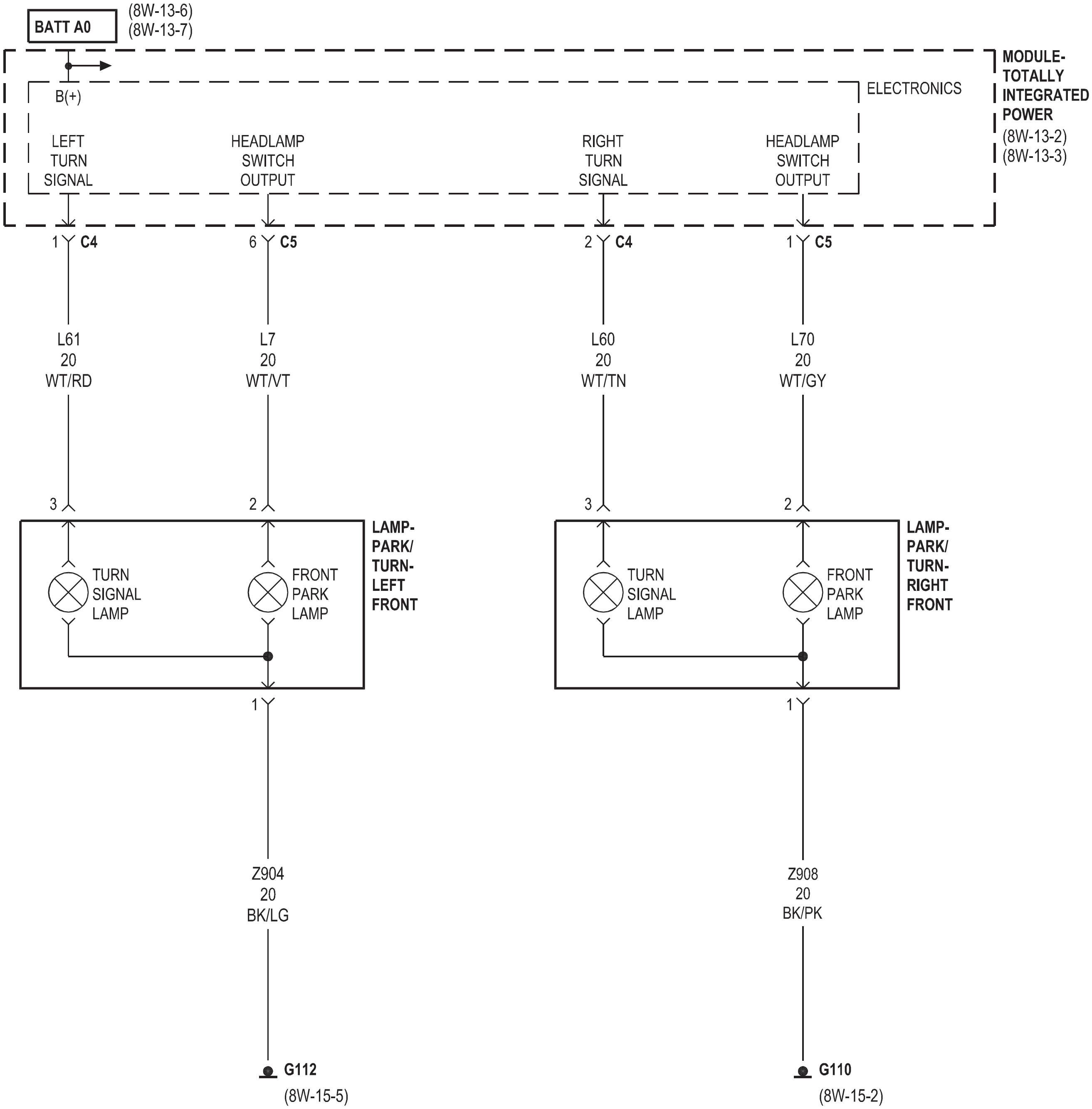
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 8 30A (8W-13-9)
FUSE 17 10A (8W-13-9)
FUSE 33 10A (8W-13-20)
ELECTRONICS
B(+)
CAN B BUS (+)
CAN B BUS (-)
13 C8
11 C11
3 C3
11 C3
A935 20 RD/LB
D55 20 WT/OR
D54 20 WT/PK
S009 (8W-13-20)
S302 (8W-18-4)
S301 (8W-18-3)
15 C104
A935 20 RD
A411 20 RD/LG
1
18 C201
5
4 C200
7
SWITCH-BANK
HEADLAMP LEVELING SWITCH
0 1 2 3
FUSED B(+)
LIN BUS
GROUND
5
6
D506 20 WT/DG
Z940 20 BK/LG
G200 (8W-15-6)
S201 (8W-13-9)
S207 (8W-18-7)
S206 (8W-18-4)
S205 (8W-18-3)
2 C1
3 C1
MODULE-STEERING CONTROL
FUSED B(+) (I.O.D.)
HEADLAMP SWITCH
1 C3
12 C4
11 C4
CLUSTER
(8W-40-2)
(8W-40-3)
LIN BUS


BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
LEFT
LOW BEAM
OUTPUT
LEFT
HIGH
BEAM
OUTPUT
RIGHT
LOW BEAM
OUTPUT
RIGHT
HIGH
BEAM
OUTPUT
4 C4
4 C5
3 C5
3 C4
L43
20
WT/DB
L33
20
WT/PK
L44
20
VT/RD
L34
20
WT/GY
1
3
1
3
LOW
BEAM
LAMP
HIGH
BEAM
LAMP
LAMP-
HEADLAMP-
LEFT
LOW
BEAM
LAMP
HIGH
BEAM
LAMP
LAMP-
HEADLAMP-
RIGHT
2
2
Z904
20
BK/LG
Z908
20
BK/PK
G112
(8W-15-5)
G110
(8W-15-2)

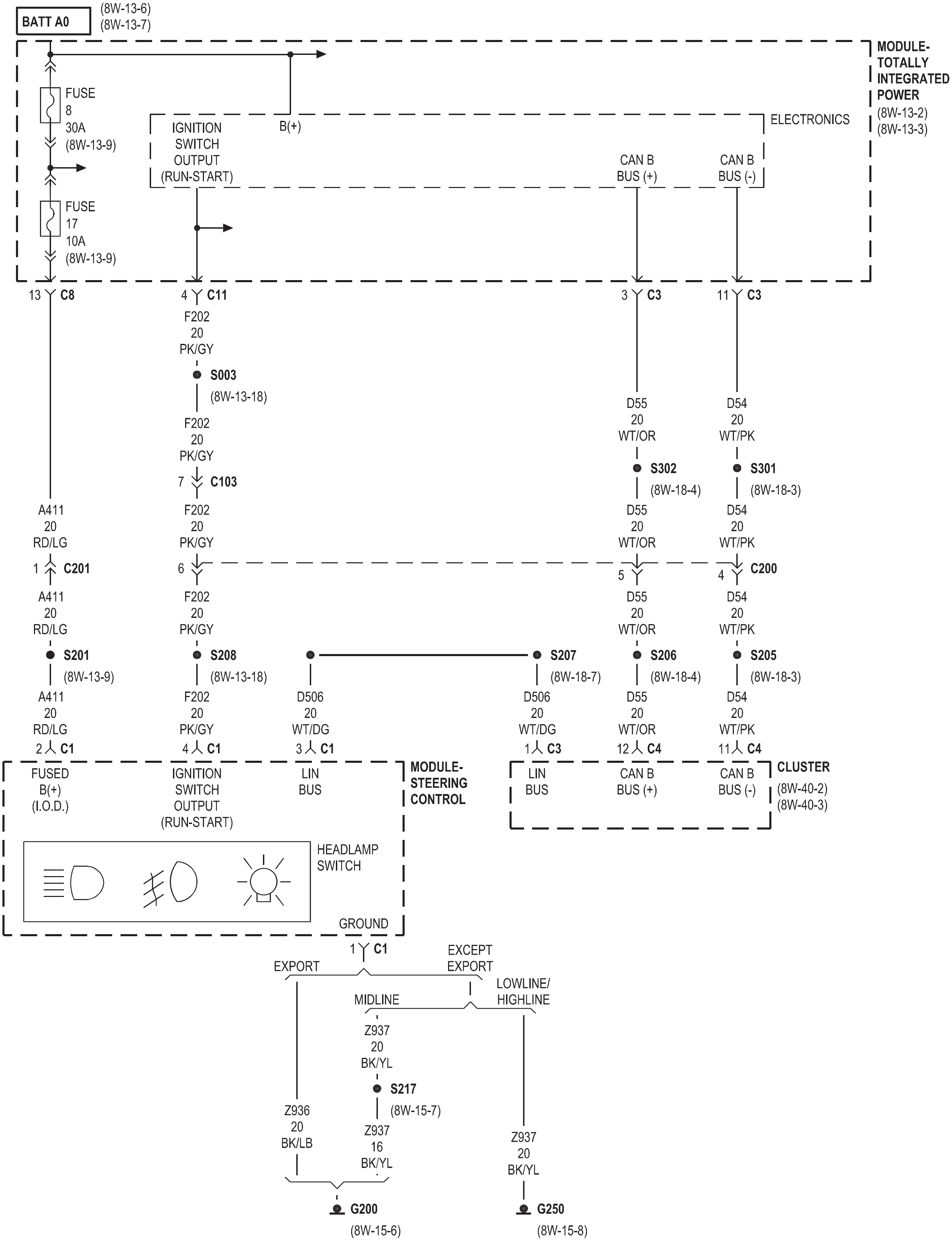

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FRONT
FOG LAMP
CONTROL
OUTPUT
FRONT
FOG LAMP
CONTROL
OUTPUT
5 C11
6 C11
L89
20
WT/YL
L90
20
WT/OR
A
B
LAMP-FOG-
LEFT
FRONT
A
B
LAMP-FOG-
RIGHT
FRONT
EXCEPT
EXPORT
EXPORT
Z904
20
BK/LG
Z904
20
BK/LG
Z908
20
BK/PK
G112
(8W-15-5)
G110
(8W-15-3)

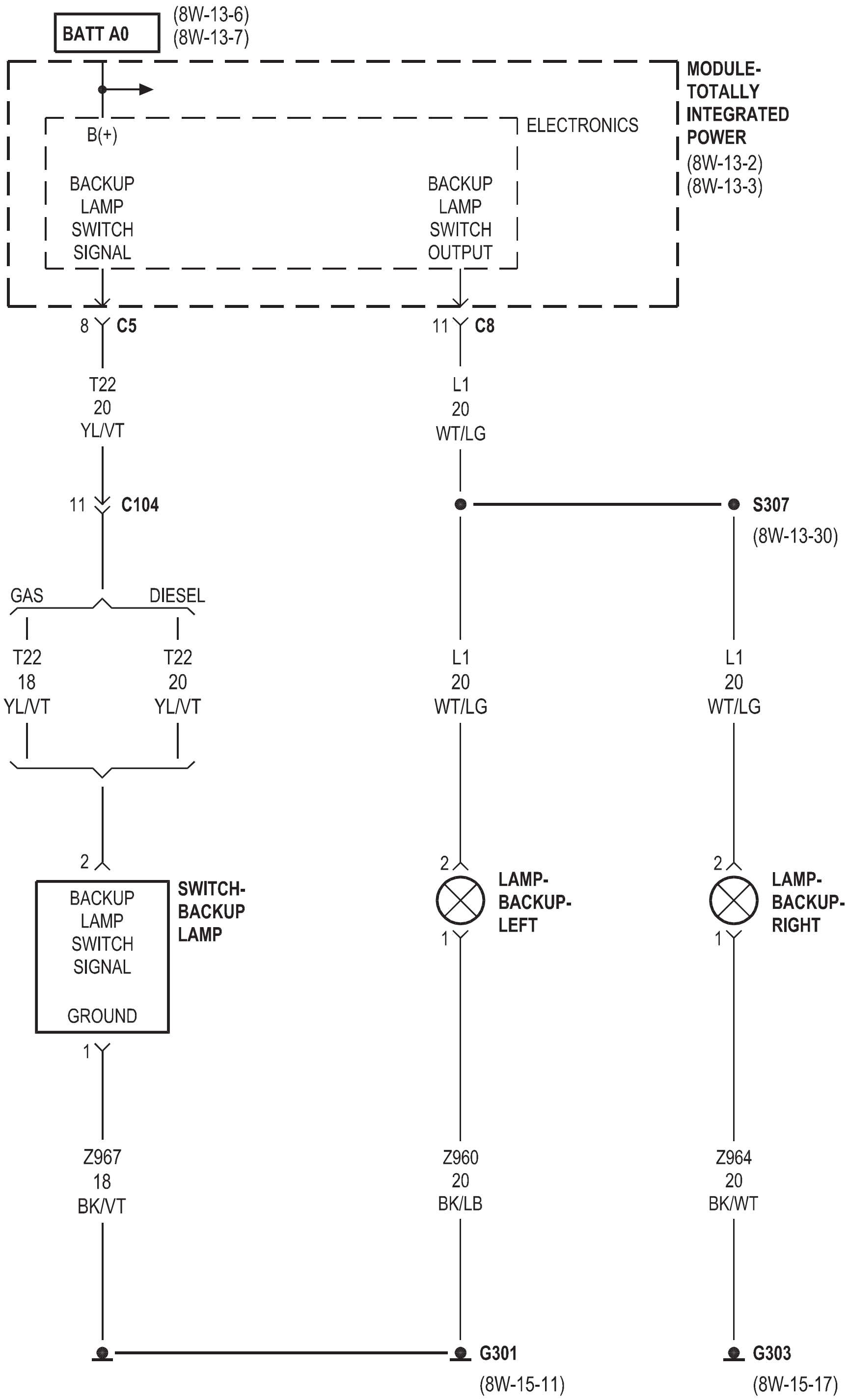
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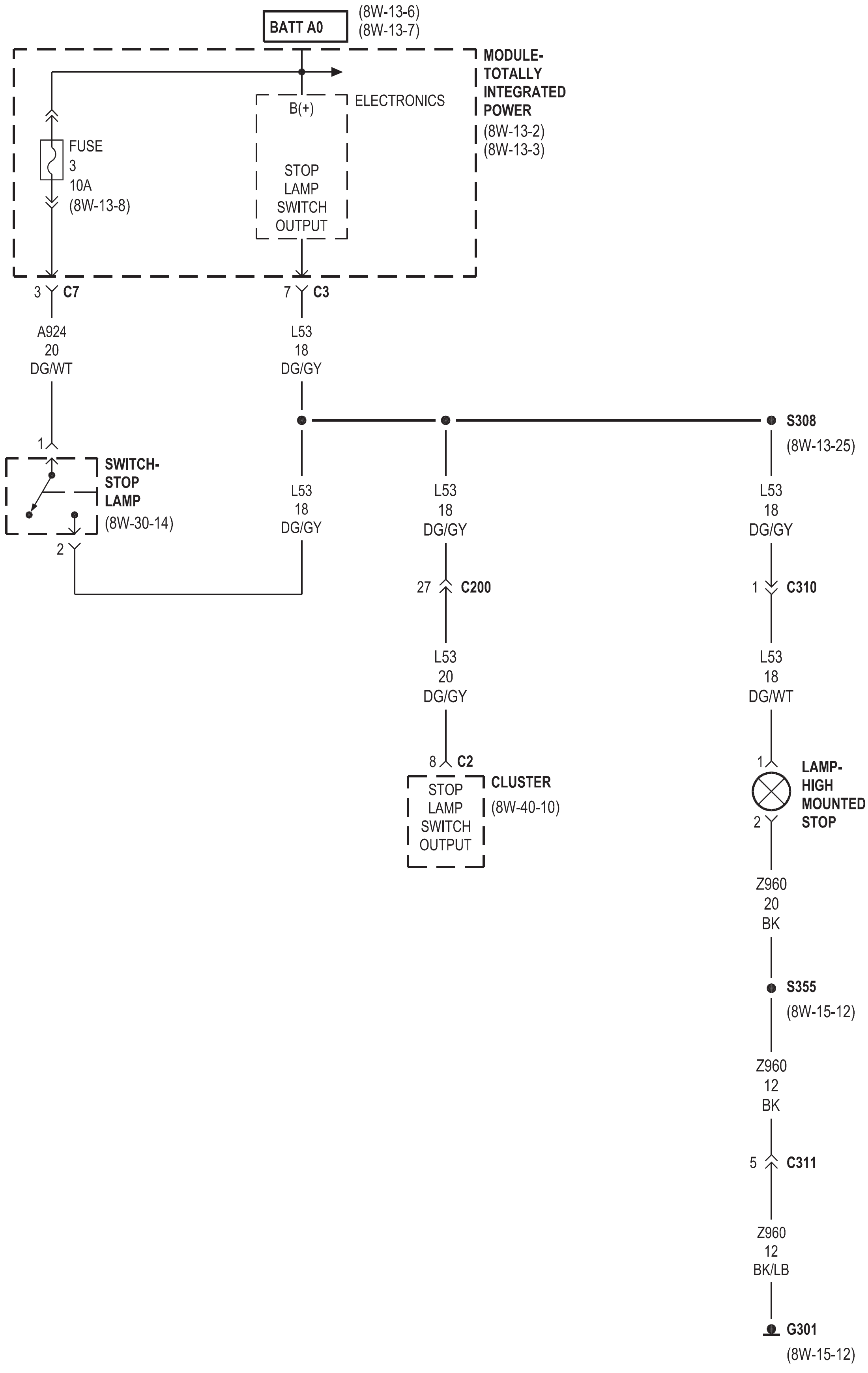

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
HEADLAMP LEVEL SENSOR SIGNAL
HEADLAMP SWITCH OUTPUT
10 C2
9 C5
6 C5
1 C2
10 C5
1 C5
F901 20 PK/RD
S015 (8W-13-22)
F901 20 PK/RD
F901 20 PK/RD
S015 (8W-13-22)
F901 20 PK/RD
L131 20 WT/LG
L7 20 WT/YL
L132 20 LG/WT
L70 20 WT/GY
2
3
4
2
3
4
CONTROL
PARK LAMP
M
MODULE-HEADLAMP LEVELING-LEFT
CONTROL
PARK LAMP
M
MODULE-HEADLAMP LEVELING-RIGHT
1
1
Z904 18 BK/LG
Z908 18 BK/PK
G112 (8W-15-5)
G110 (8W-15-3)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
LEFT
TURN
SIGNAL
HEADLAMP
SWITCH
OUTPUT
RIGHT
TURN
SIGNAL
HEADLAMP
SWITCH
OUTPUT
1 C4
6 C5
2 C4
1 C5
L61
20
WT/RD
L7
20
WT/VT
L60
20
WT/TN
L70
20
WT/GY
3
2
3
2
TURN
SIGNAL
LAMP
FRONT
PARK
LAMP
LAMP-
PARK/
TURN-
LEFT
FRONT
TURN
SIGNAL
LAMP
FRONT
PARK
LAMP
LAMP-
PARK/
TURN-
RIGHT
FRONT
1
1
Z904
20
BK/LG
Z908
20
BK/PK
G112
(8W-15-5)
G110
(8W-15-2)

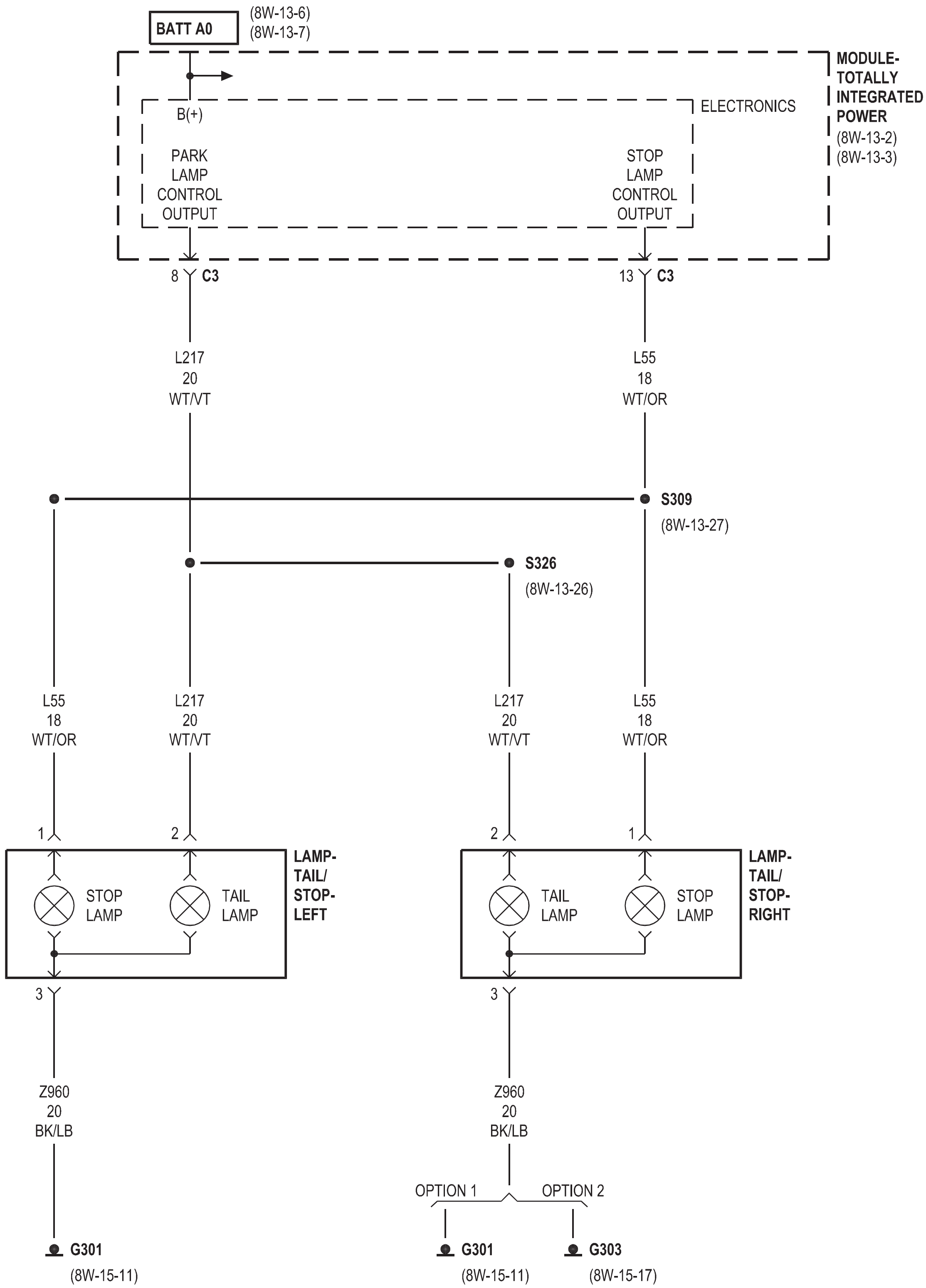
8W-51 REAR LIGHTING


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
8
30A
(8W-13-9)
FUSE
17
10A
(8W-13-9)
IGNITION
SWITCH
OUTPUT
(RUN-START)
B(+)
ELECTRONICS
CAN B
BUS (+)
CAN B
BUS (-)
13 C8
4 C11
3 C3
11 C3
F202
20
PK/GY
S003
(8W-13-18)
7 C103
D55
20
WT/OR
D54
20
WT/PK
S302
(8W-18-4)
S301
(8W-18-3)
A411
20
RD/LG
1 C201
6
5
4 C200
S201
(8W-13-9)
S208
(8W-13-18)
S207
(8W-18-7)
S206
(8W-18-4)
S205
(8W-18-3)
D506
20
WT/DG
2 C1
4 C1
3 C1
1 C3
12 C4
11 C4
FUSED
B(+)
(I.O.D.)
LIN
BUS
MODULE-
STEERING
CONTROL
CLUSTER
(8W-40-2)
(8W-40-3)
HEADLAMP
SWITCH
GROUND
1 C1
EXPORT
EXCEPT
EXPORT
MIDLINE
LOWLINE/
HIGHLINE
Z937
20
BK/YL
S217
(8W-15-7)
Z936
20
BK/LB
Z937
16
BK/YL
G200
(8W-15-6)
G250
(8W-15-8)

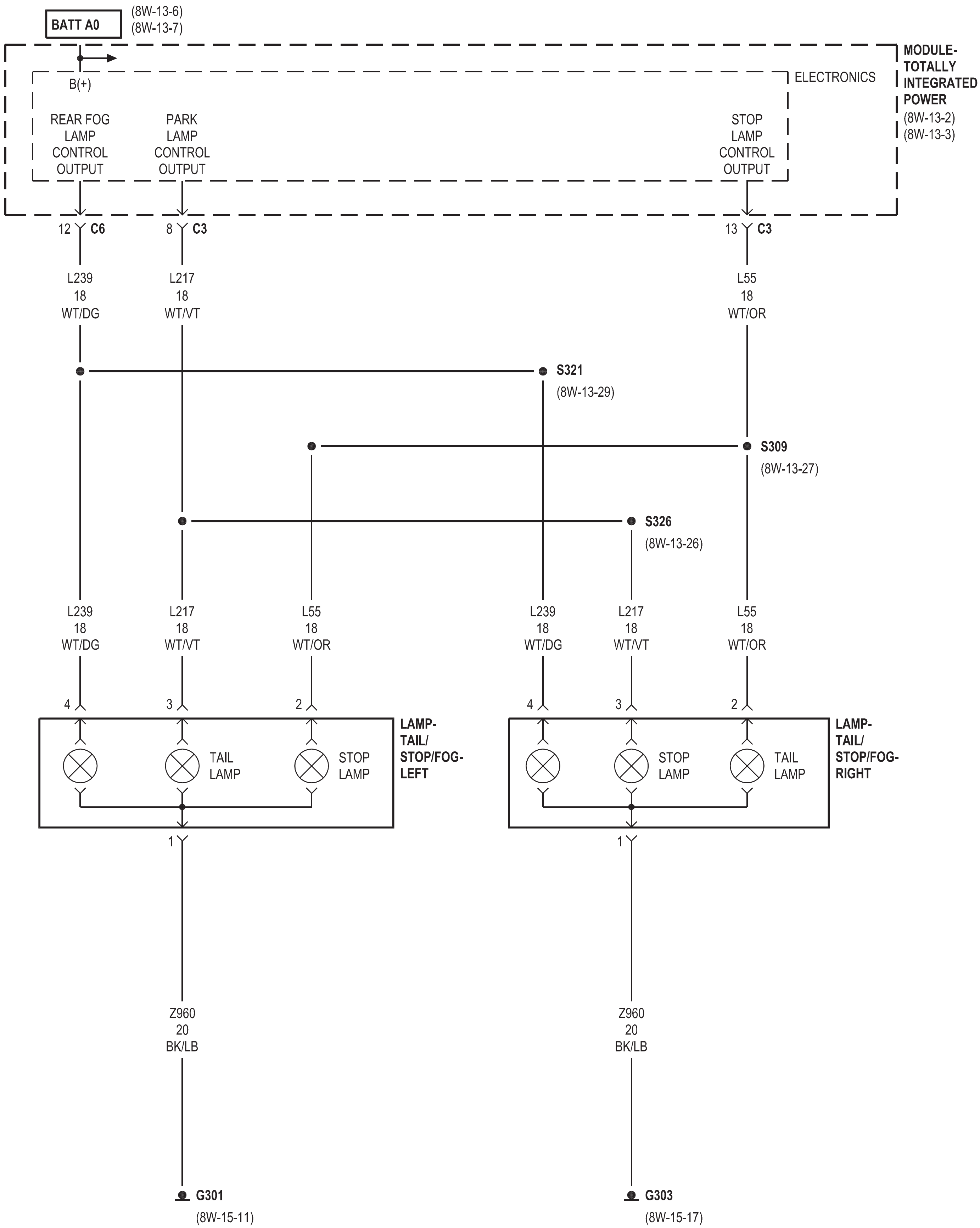

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
BACKUP
LAMP
SWITCH
SIGNAL
BACKUP
LAMP
SWITCH
OUTPUT
8 C5
11 C8
T22
20
YL/VT
L1
20
WT/LG
11 C104
S307
(8W-13-30)
GAS
DIESEL
T22
18
YL/VT
T22
20
YL/VT
L1
20
WT/LG
L1
20
WT/LG
2
BACKUP
LAMP
SWITCH
SIGNAL
GROUND
1
SWITCH-
BACKUP
LAMP
2
LAMP-
BACKUP-
LEFT
1
2
LAMP-
BACKUP-
RIGHT
1
Z967
18
BK/VT
Z960
20
BK/LB
Z964
20
BK/WT
G301
(8W-15-11)
G303
(8W-15-17)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
STOP
LAMP
SWITCH
OUTPUT
FUSE
3
10A
(8W-13-8)
3 C7
7 C3
A924
20
DG/WT
L53
18
DG/GY
S308
(8W-13-25)
1
SWITCH-
STOP
LAMP
(8W-30-14)
2
L53
18
DG/GY
L53
18
DG/GY
L53
18
DG/GY
27 C200
1 C310
L53
20
DG/GY
L53
18
DG/WT
8 C2
STOP
LAMP
SWITCH
OUTPUT
CLUSTER
(8W-40-10)
1
LAMP-
HIGH
MOUNTED
STOP
2
Z960
20
BK
S355
(8W-15-12)
Z960
12
BK
5 C311
Z960
12
BK/LB
G301
(8W-15-12)

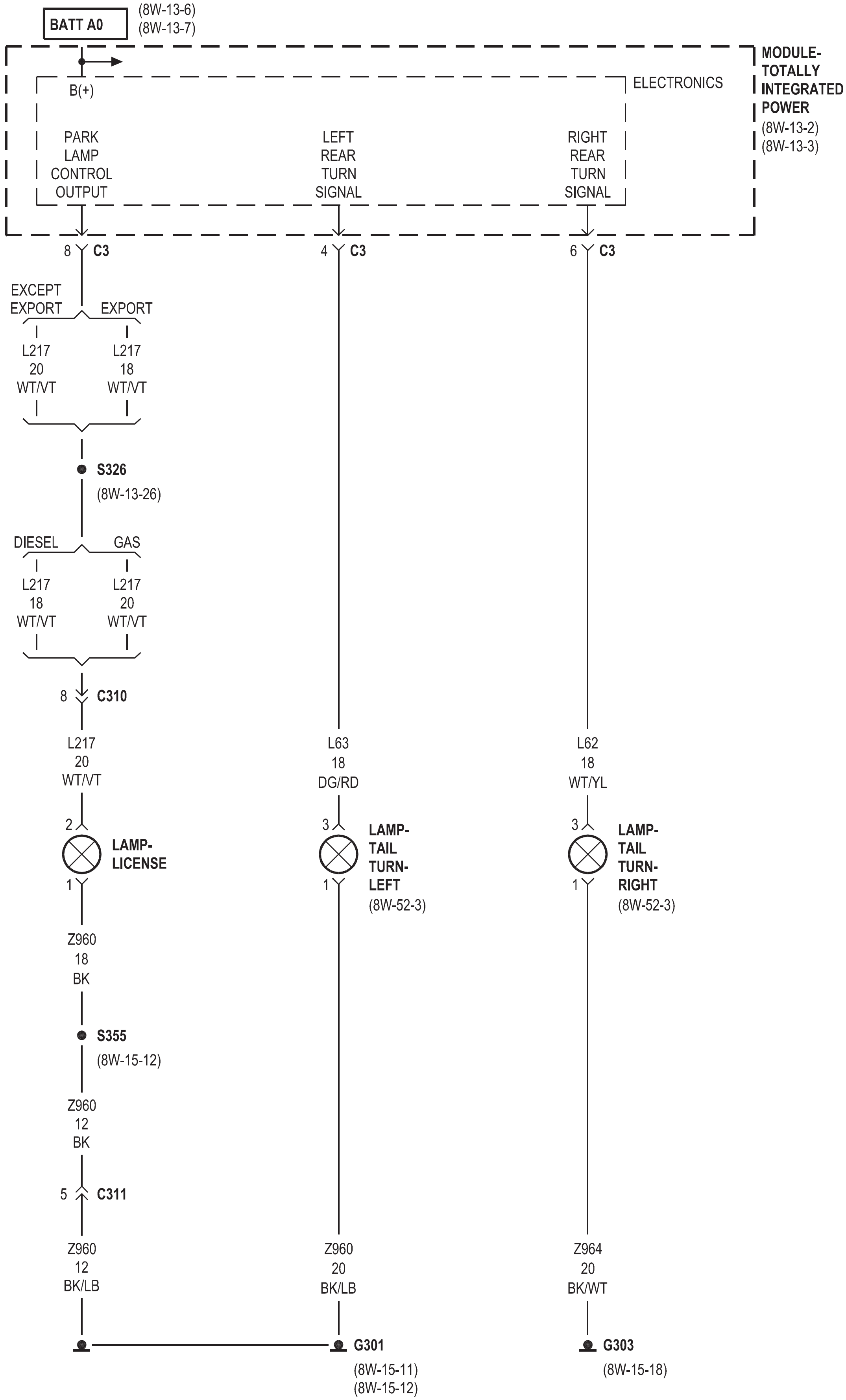
8W-51 REAR LIGHTING
EXCEPT EXPORT



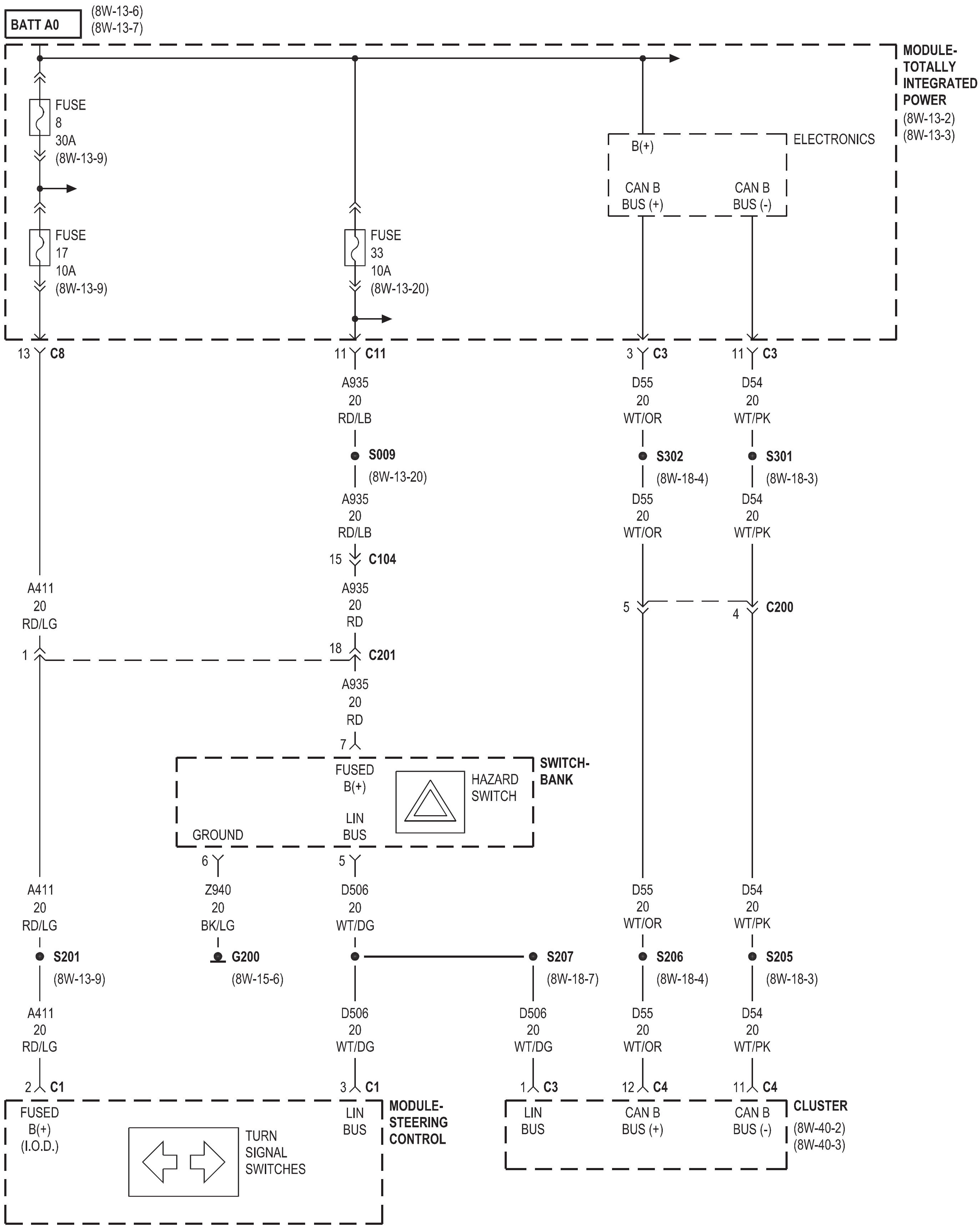
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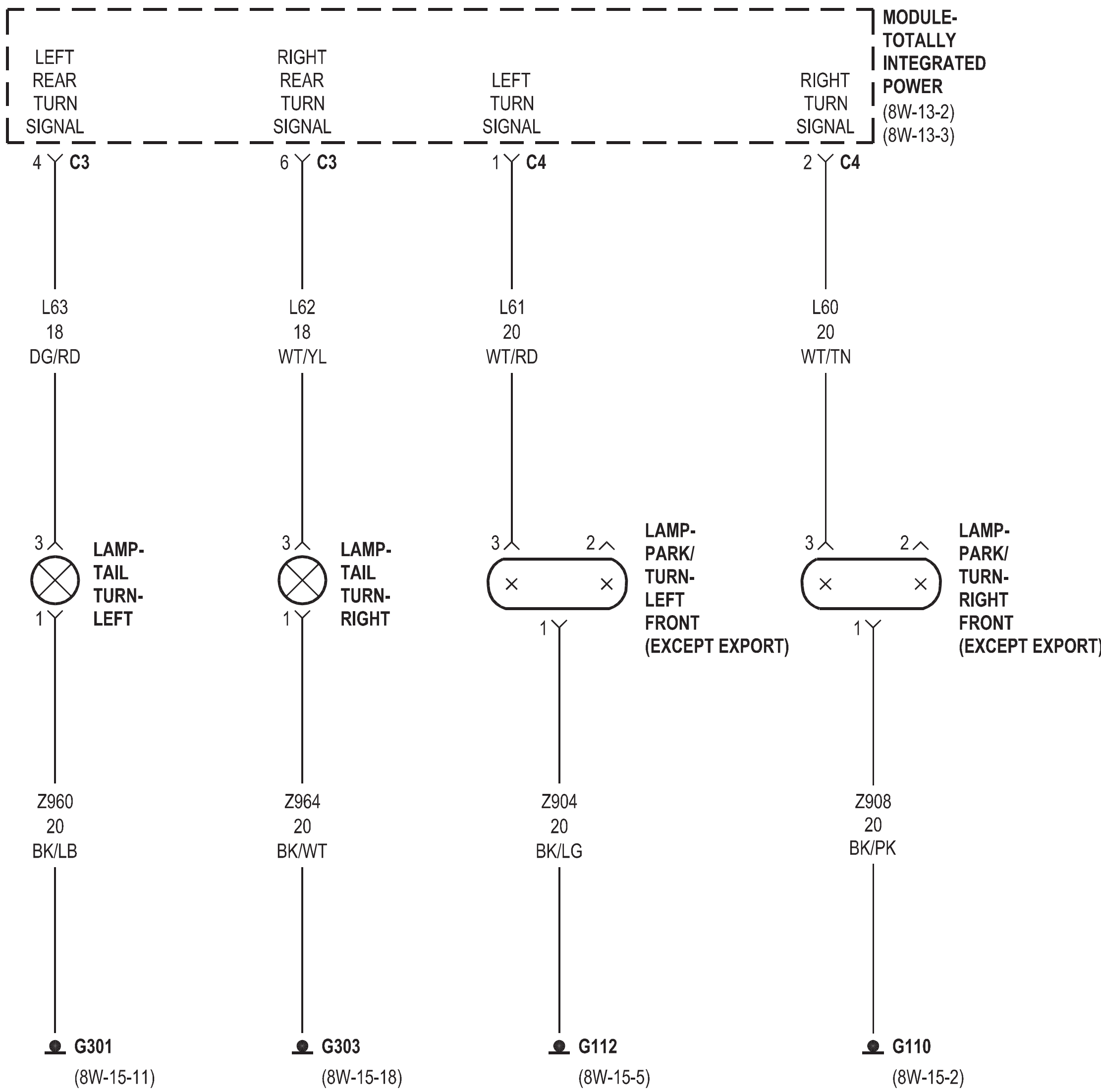


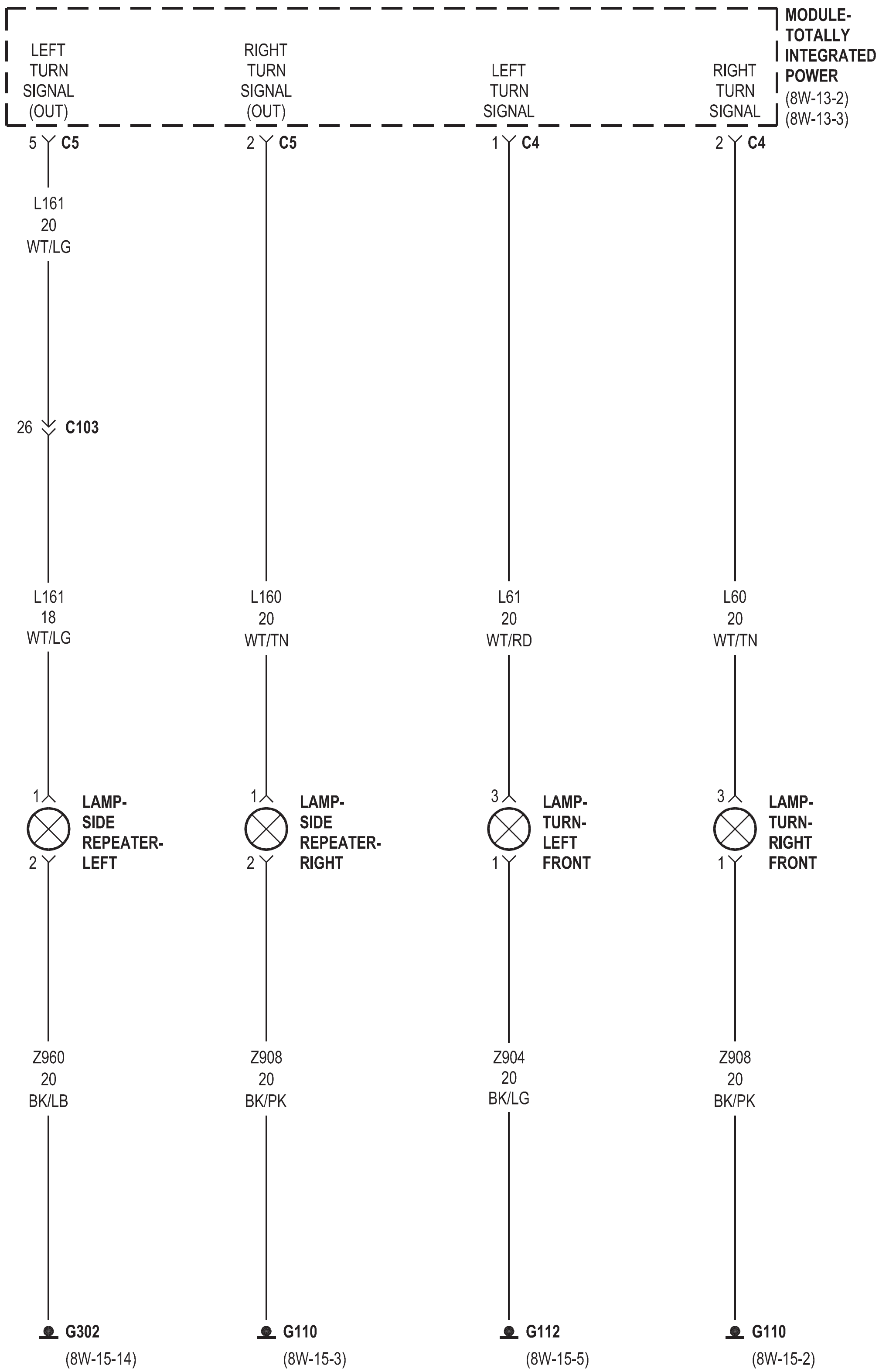
BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
REAR FOG
LAMP
CONTROL
OUTPUT
PARK
LAMP
CONTROL
OUTPUT
STOP
LAMP
CONTROL
OUTPUT
12 C6
8 C3
13 C3
L239
18
WT/DG
L217
18
WT/VT
L55
18
WT/OR
S321
(8W-13-29)
S309
(8W-13-27)
S326
(8W-13-26)
L239
18
WT/DG
L217
18
WT/VT
L55
18
WT/OR
L239
18
WT/DG
L217
18
WT/VT
L55
18
WT/OR
4
3
2
TAIL
LAMP
STOP
LAMP
LAMP-
TAIL/
STOP/FOG-
LEFT
4
3
2
STOP
LAMP
TAIL
LAMP
LAMP-
TAIL/
STOP/FOG-
RIGHT
1
1
Z960
20
BK/LB
Z960
20
BK/LB
G301
(8W-15-11)
G303
(8W-15-17)


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
PARK
LAMP
CONTROL
OUTPUT
LEFT
REAR
TURN
SIGNAL
RIGHT
REAR
TURN
SIGNAL
8 C3
4 C3
6 C3
EXCEPT
EXPORT
EXPORT
L217
20
WT/VT
L217
18
WT/VT
S326
(8W-13-26)
DIESEL
GAS
L217
18
WT/VT
L217
20
WT/VT
8 C310
L217
20
WT/VT
L63
18
DG/RD
L62
18
WT/YL
2
3
3
LAMP-
LICENSE
LAMP-
TAIL
TURN-
LEFT
(8W-52-3)
LAMP-
TAIL
TURN-
RIGHT
(8W-52-3)
1
1
1
Z960
18
BK
S355
(8W-15-12)
Z960
12
BK
5 C311
Z960
12
BK/LB
Z960
20
BK/LB
Z964
20
BK/WT
G301
(8W-15-11)
(8W-15-12)
G303
(8W-15-18)

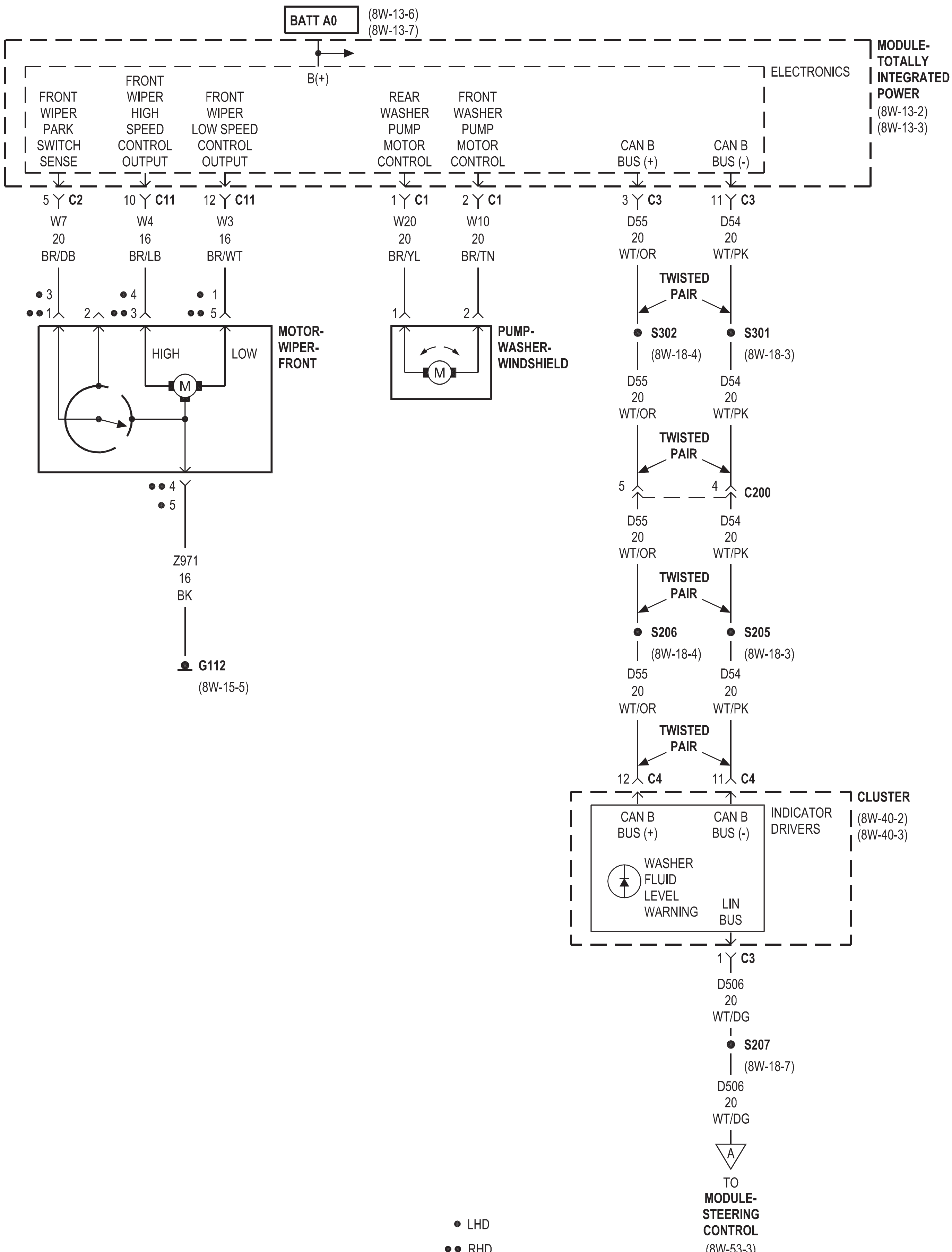
8W-52 TURN SIGNALS


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
FUSE
8
30A
(8W-13-9)
FUSE
17
10A
(8W-13-9)
FUSE
33
10A
(8W-13-20)
ELECTRONICS
B(+)
CAN B
BUS (+)
CAN B
BUS (-)
13 C8
11 C11
3 C3
11 C3
A935
20
RD/LB
S009
(8W-13-20)
A935
20
RD/LB
15 C104
A935
20
RD
D55
20
WT/OR
S302
(8W-18-4)
D55
20
WT/OR
D54
20
WT/PK
S301
(8W-18-3)
D54
20
WT/PK
5
4 C200
A411
20
RD/LG
1
18 C201
A935
20
RD
7
SWITCH-
BANK
FUSED
B(+)
HAZARD
SWITCH
LIN
BUS
GROUND
6
5
A411
20
RD/LG
S201
(8W-13-9)
A411
20
RD/LG
Z940
20
BK/LG
G200
(8W-15-6)
D506
20
WT/DG
S207
(8W-18-7)
D506
20
WT/DG
D506
20
WT/DG
D55
20
WT/OR
S206
(8W-18-4)
D55
20
WT/OR
D54
20
WT/PK
S205
(8W-18-3)
D54
20
WT/PK
2 C1
3 C1
1 C3
12 C4
11 C4
FUSED
B(+)
(I.O.D.)
TURN
SIGNAL
SWITCHES
LIN
BUS
MODULE-
STEERING
CONTROL
LIN
BUS
CAN B
BUS (+)
CAN B
BUS (-)
CLUSTER
(8W-40-2)
(8W-40-3)

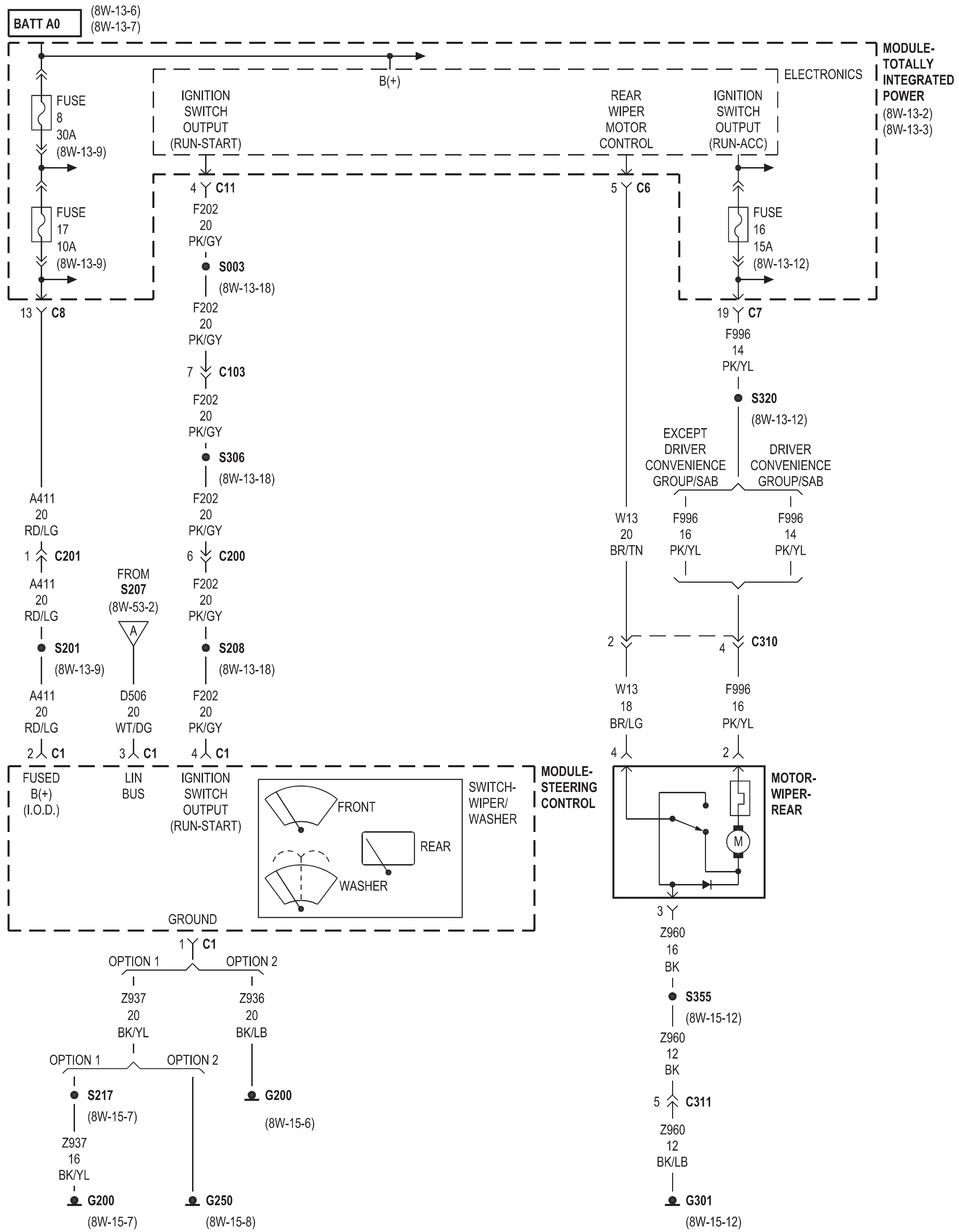

MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
LEFT
REAR
TURN
SIGNAL
RIGHT
REAR
TURN
SIGNAL
LEFT
TURN
SIGNAL
RIGHT
TURN
SIGNAL
4 C3
6 C3
1 C4
2 C4
L63
18
DG/RD
L62
18
WT/YL
L61
20
WT/RD
L60
20
WT/TN
3
1
LAMP-
TAIL
TURN-
LEFT
3
1
LAMP-
TAIL
TURN-
RIGHT
3
2
1
LAMP-
PARK/
TURN-
LEFT
FRONT
(EXCEPT EXPORT)
3
2
1
LAMP-
PARK/
TURN-
RIGHT
FRONT
(EXCEPT EXPORT)
Z960
20
BK/LB
Z964
20
BK/WT
Z904
20
BK/LG
Z908
20
BK/PK
G301
(8W-15-11)
G303
(8W-15-18)
G112
(8W-15-5)
G110
(8W-15-2)


MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
LEFT
TURN
SIGNAL
(OUT)
RIGHT
TURN
SIGNAL
(OUT)
LEFT
TURN
SIGNAL
RIGHT
TURN
SIGNAL
5 C5
2 C5
1 C4
2 C4
L161
20
WT/LG
26 C103
L161
18
WT/LG
L160
20
WT/TN
L61
20
WT/RD
L60
20
WT/TN
1
2
LAMP-
SIDE
REPEATER-
LEFT
1
2
LAMP-
SIDE
REPEATER-
RIGHT
3
1
LAMP-
TURN-
LEFT
FRONT
3
1
LAMP-
TURN-
RIGHT
FRONT
Z960
20
BK/LB
Z908
20
BK/PK
Z904
20
BK/LG
Z908
20
BK/PK
G302
(8W-15-14)
G110
(8W-15-3)
G112
(8W-15-5)
G110
(8W-15-2)

8W-53 WIPERS

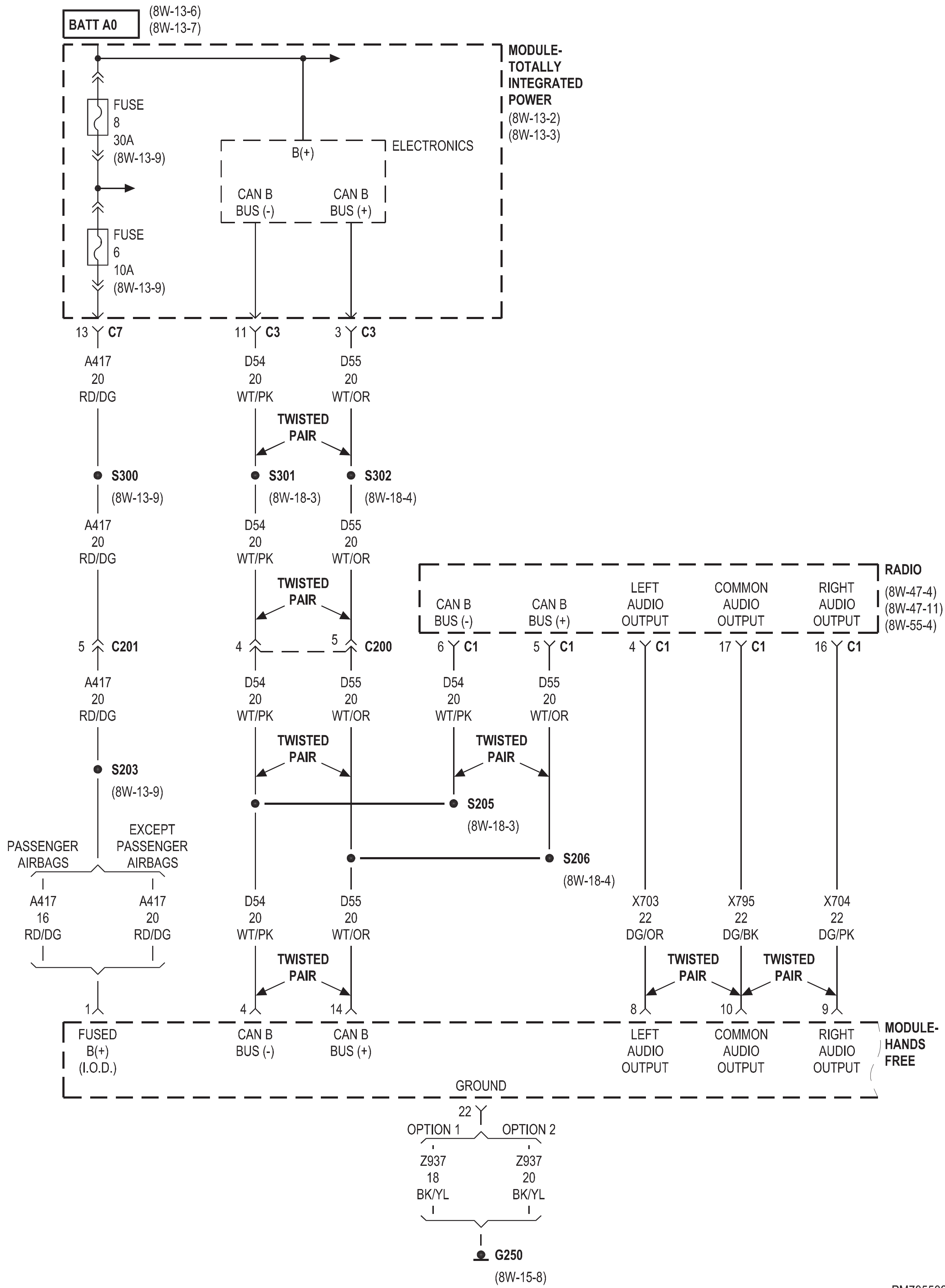


BATT A0
(8W-13-6)
(8W-13-7)
B(+)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
FRONT WIPER PARK SWITCH SENSE
FRONT WIPER HIGH SPEED CONTROL OUTPUT
FRONT WIPER LOW SPEED CONTROL OUTPUT
REAR WASHER PUMP MOTOR CONTROL
FRONT WASHER PUMP MOTOR CONTROL
CAN B BUS (+)
CAN B BUS (-)
5 C2
10 C11
12 C11
1 C1
2 C1
3 C3
11 C3
W7 20 BR/DB
W4 16 BR/LB
W3 16 BR/WT
W20 20 BR/YL
W10 20 BR/TN
D55 20 WT/OR
D54 20 WT/PK
TWISTED PAIR
HIGH
LOW
M
MOTOR-WIPER-FRONT
PUMP-WASHER-WINDSHIELD
S302
(8W-18-4)
S301
(8W-18-3)
C200
S206
(8W-18-4)
S205
(8W-18-3)
Z971 16 BK
G112
(8W-15-5)
12 C4
11 C4
CLUSTER
(8W-40-2)
(8W-40-3)
INDICATOR DRIVERS
WASHER FLUID LEVEL WARNING
LIN BUS
1 C3
D506 20 WT/DG
S207
(8W-18-7)
A
TO MODULE-STEERING CONTROL
(8W-53-3)
● LHD
●● RHD

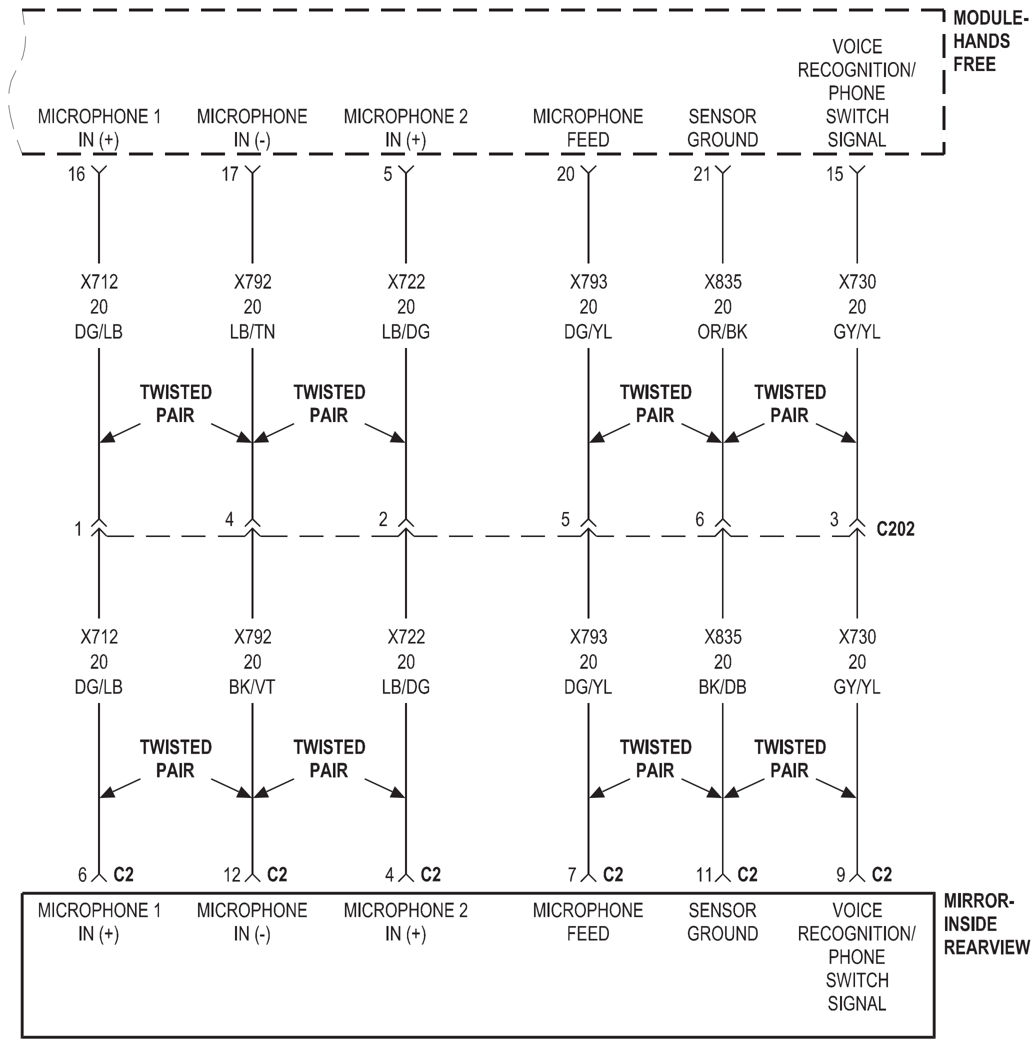

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
FUSE 8 30A (8W-13-9)
FUSE 17 10A (8W-13-9)
ELECTRONICS
IGNITION SWITCH OUTPUT (RUN-START)
REAR WIPER MOTOR CONTROL
IGNITION SWITCH OUTPUT (RUN-ACC)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 16 15A (8W-13-12)
4 C11
5 C6
13 C8
19 C7
F202 20 PK/GY
S003 (8W-13-18)
7 C103
S306 (8W-13-18)
6 C200
S208 (8W-13-18)
F996 14 PK/YL
S320 (8W-13-12)
EXCEPT DRIVER CONVENIENCE GROUP/SAB
DRIVER CONVENIENCE GROUP/SAB
F996 16 PK/YL
F996 14 PK/YL
W13 20 BR/TN
A411 20 RD/LG
1 C201
S201 (8W-13-9)
FROM S207 (8W-53-2)
A
D506 20 WT/DG
2 C310 4
W13 18 BR/LG
F996 16 PK/YL
2 C1
3 C1
4 C1
FUSED B(+) (I.O.D.)
LIN BUS
IGNITION SWITCH OUTPUT (RUN-START)
FRONT
REAR
WASHER
SWITCH-WIPER/WASHER
MODULE-STEERING CONTROL
GROUND
M
MOTOR-WIPER-REAR
1 C1
OPTION 1
OPTION 2
Z937 20 BK/YL
Z936 20 BK/LB
S217 (8W-15-7)
Z937 16 BK/YL
G200 (8W-15-7)
G250 (8W-15-8)
G200 (8W-15-6)
3
Z960 16 BK
S355 (8W-15-12)
Z960 12 BK
5 C311
Z960 12 BK/LB
G301 (8W-15-12)

8W-55 NAVIGATION/TELECOMMUNICATIONS

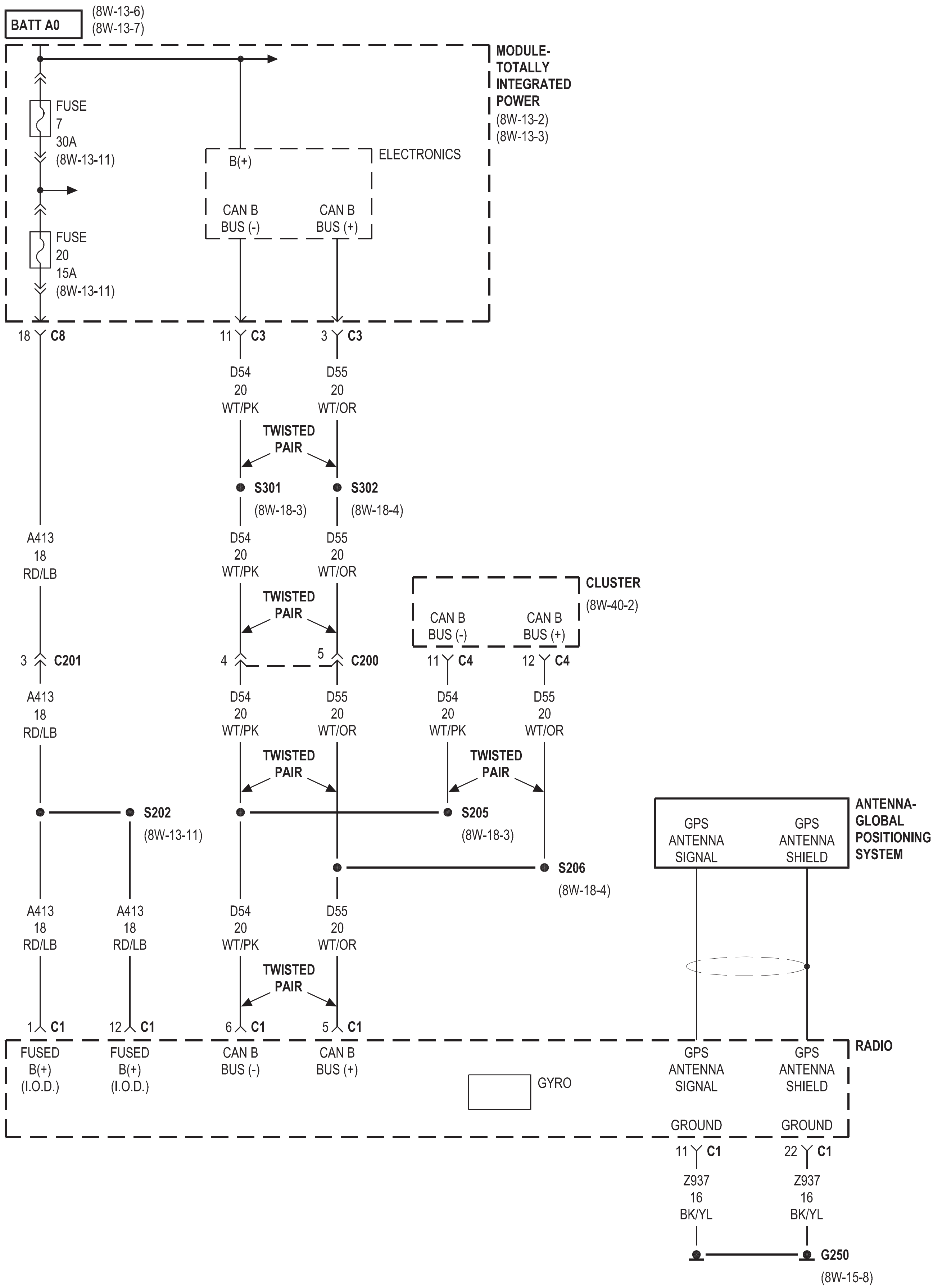
HANDS FREE


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 8 30A (8W-13-9)
FUSE 6 10A (8W-13-9)
ELECTRONICS
B(+)
CAN B BUS (-)
CAN B BUS (+)
13 C7
11 C3
3 C3
A417 20 RD/DG
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S300 (8W-13-9)
S301 (8W-18-3)
S302 (8W-18-4)
RADIO
(8W-47-4)
(8W-47-11)
(8W-55-4)
LEFT AUDIO OUTPUT
COMMON AUDIO OUTPUT
RIGHT AUDIO OUTPUT
5 C201
4
5 C200
6 C1
5 C1
4 C1
17 C1
16 C1
S203 (8W-13-9)
S205 (8W-18-3)
S206 (8W-18-4)
PASSENGER AIRBAGS
EXCEPT PASSENGER AIRBAGS
A417 16 RD/DG
A417 20 RD/DG
X703 22 DG/OR
X795 22 DG/BK
X704 22 DG/PK
1
4
14
8
10
9
FUSED B(+) (I.O.D.)
MODULE-HANDS FREE
GROUND
22
OPTION 1
OPTION 2
Z937 18 BK/YL
Z937 20 BK/YL
G250
(8W-15-8)

HANDS FREE


MODULE-HANDS FREE
MICROPHONE 1 IN (+)
MICROPHONE IN (-)
MICROPHONE 2 IN (+)
MICROPHONE FEED
SENSOR GROUND
VOICE RECOGNITION/ PHONE SWITCH SIGNAL
16
17
5
20
21
15
X712 20 DG/LB
X792 20 LB/TN
X722 20 LB/DG
X793 20 DG/YL
X835 20 OR/BK
X730 20 GY/YL
TWISTED PAIR
1
4
2
5
6
3
C202
X712 20 DG/LB
X792 20 BK/VT
X722 20 LB/DG
X793 20 DG/YL
X835 20 BK/DB
X730 20 GY/YL
6 C2
12 C2
4 C2
7 C2
11 C2
9 C2
MIRROR-INSIDE REARVIEW
MICROPHONE 1 IN (+)
MICROPHONE IN (-)
MICROPHONE 2 IN (+)
MICROPHONE FEED
SENSOR GROUND
VOICE RECOGNITION/ PHONE SWITCH SIGNAL

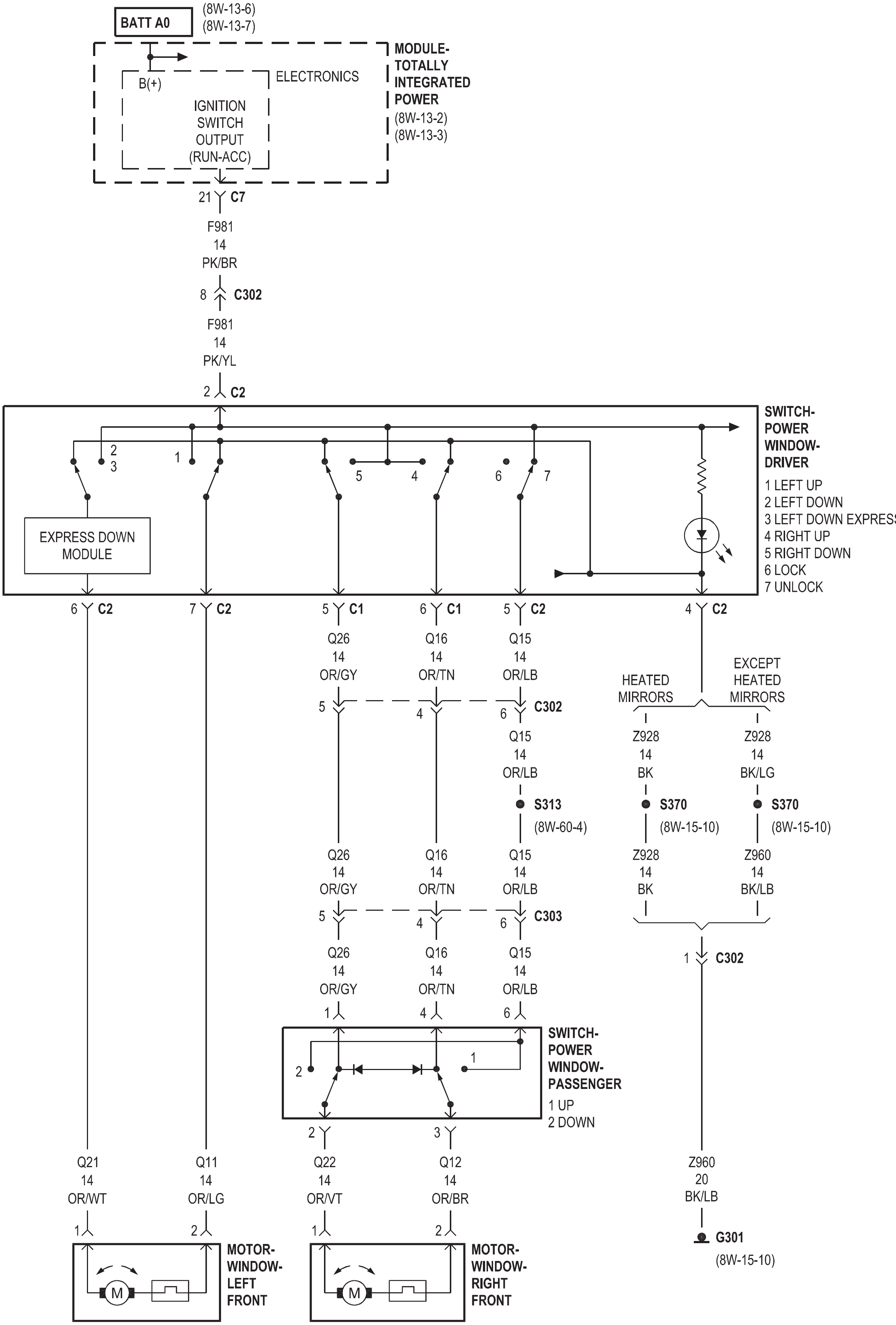
NAVIGATION



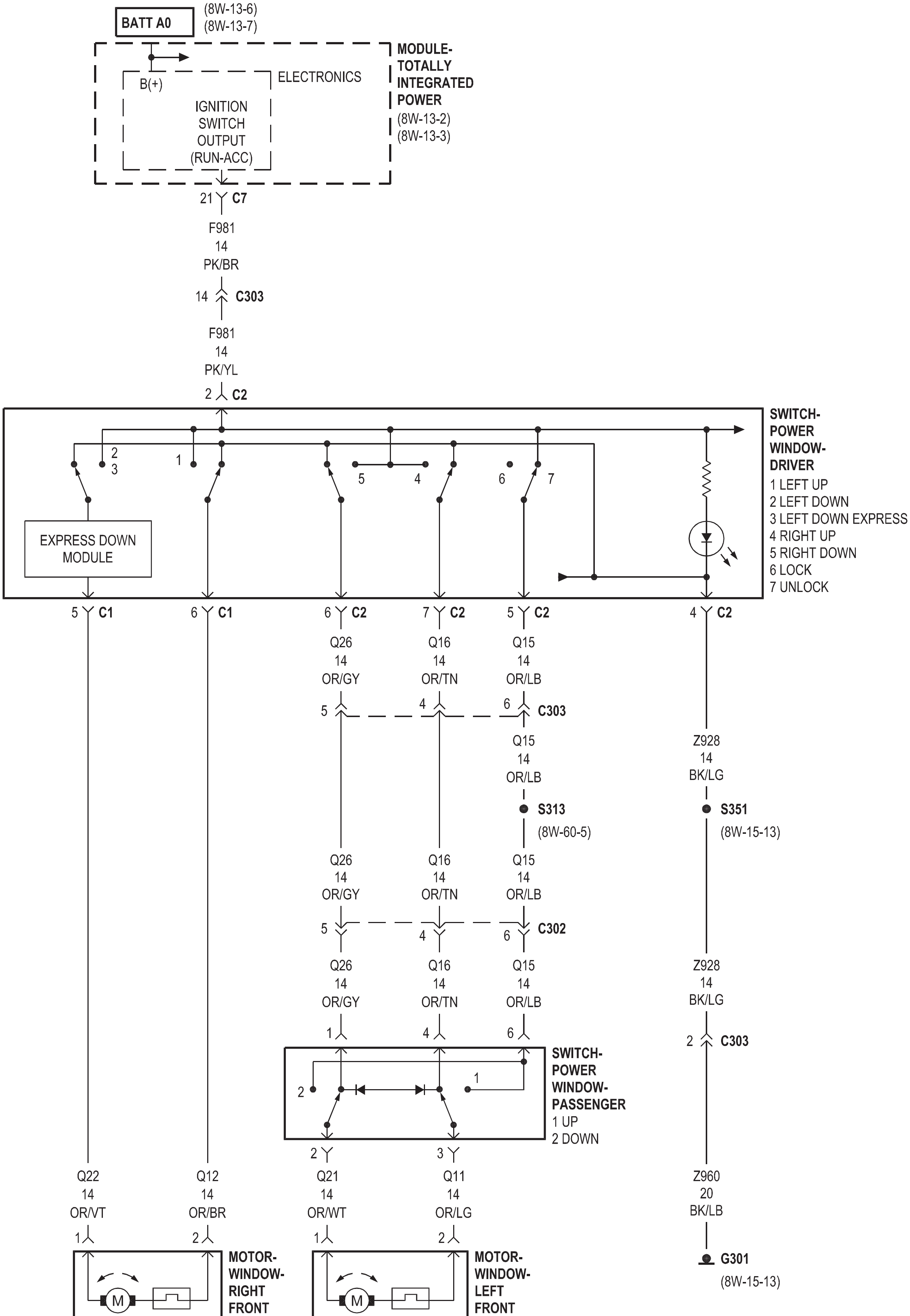
BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 7 30A (8W-13-11)
FUSE 20 15A (8W-13-11)
ELECTRONICS
B(+)
CAN B BUS (-)
CAN B BUS (+)
18 C8
11 C3
3 C3
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S301 (8W-18-3)
S302 (8W-18-4)
A413 18 RD/LB
CLUSTER (8W-40-2)
3 C201
4
5 C200
11 C4
12 C4
S202 (8W-13-11)
S205 (8W-18-3)
S206 (8W-18-4)
ANTENNA-GLOBAL POSITIONING SYSTEM
GPS ANTENNA SIGNAL
GPS ANTENNA SHIELD
1 C1
12 C1
6 C1
5 C1
RADIO
FUSED B(+) (I.O.D.)
GYRO
GROUND
11 C1
22 C1
Z937 16 BK/YL
G250 (8W-15-8)

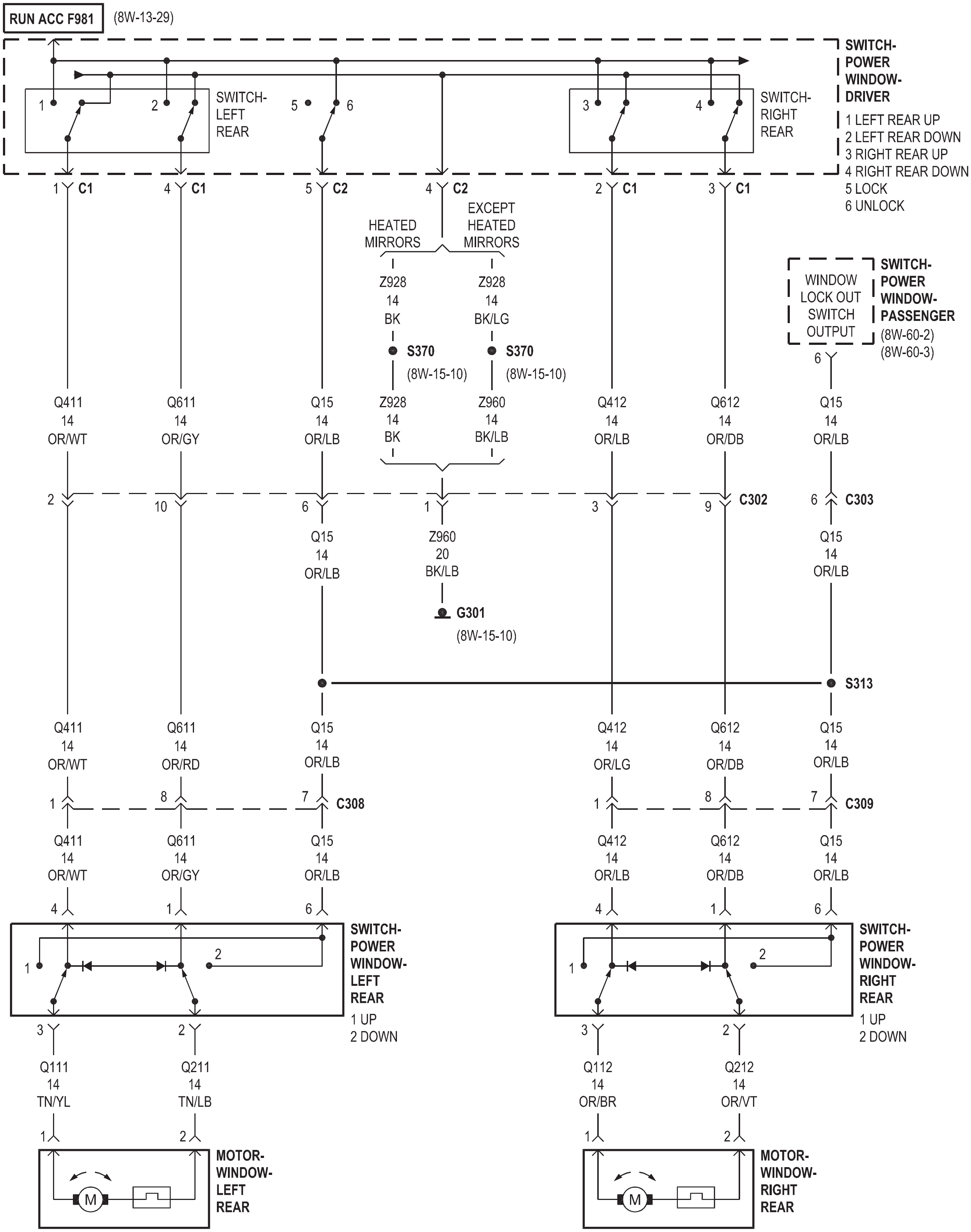
8W-60 POWER WINDOWS

LHD

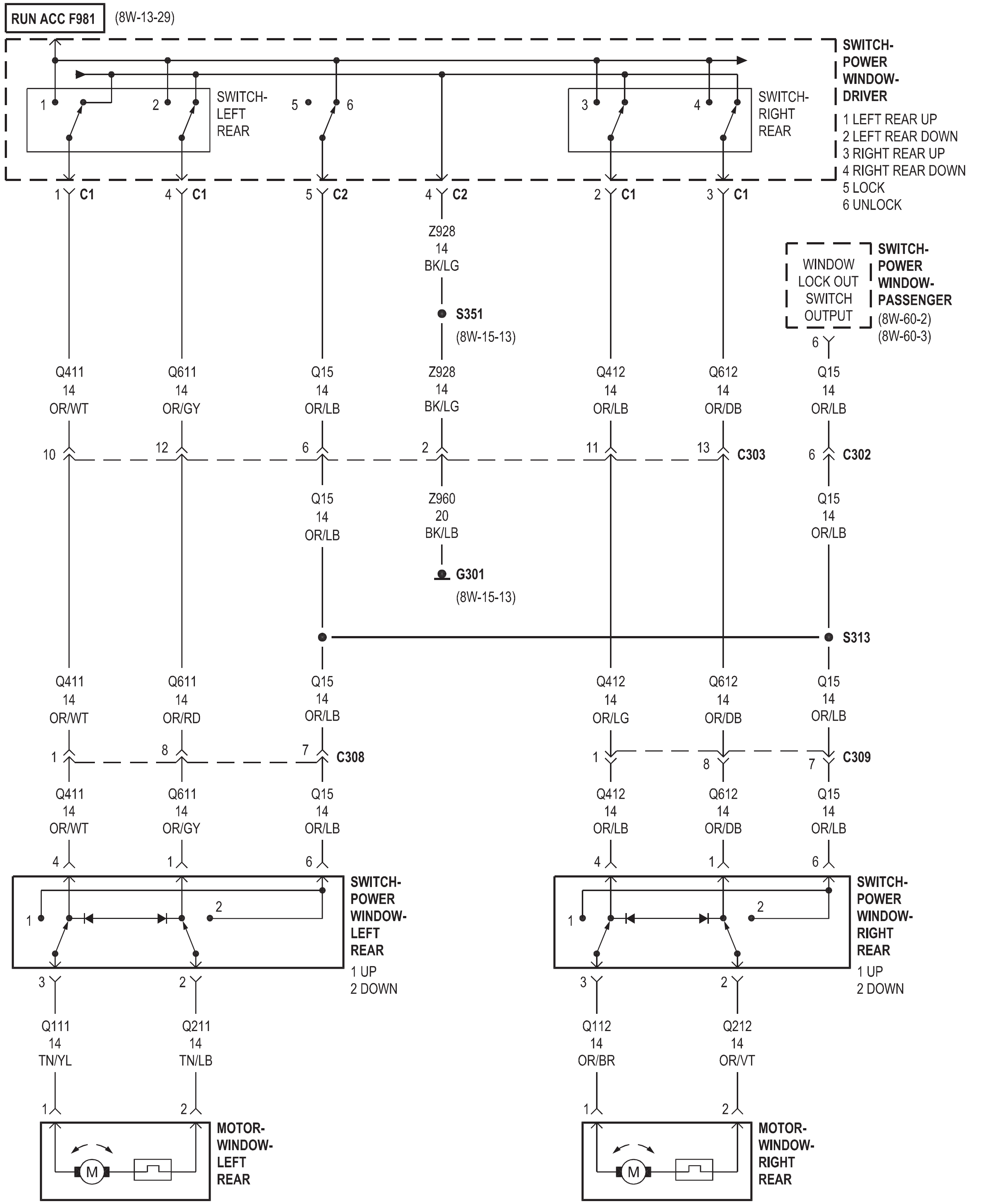

BATT A0
(8W-13-6)
(8W-13-7)
MODULE-
TOTALLY
INTEGRATED
POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
IGNITION
SWITCH
OUTPUT
(RUN-ACC)
21 C7
F981
14
PK/BR
8 C302
F981
14
PK/YL
2 C2
SWITCH-
POWER
WINDOW-
DRIVER
1 LEFT UP
2 LEFT DOWN
3 LEFT DOWN EXPRESS
4 RIGHT UP
5 RIGHT DOWN
6 LOCK
7 UNLOCK
EXPRESS DOWN
MODULE
6 C2
7 C2
5 C1
6 C1
5 C2
4 C2
Q26
14
OR/GY
Q16
14
OR/TN
Q15
14
OR/LB
C302
HEATED
MIRRORS
EXCEPT
HEATED
MIRRORS
Z928
14
BK
Z928
14
BK/LG
S313
(8W-60-4)
S370
(8W-15-10)
S370
(8W-15-10)
Z960
14
BK/LB
C303
1 C302
SWITCH-
POWER
WINDOW-
PASSENGER
1 UP
2 DOWN
Q21
14
OR/WT
Q11
14
OR/LG
Q22
14
OR/VT
Q12
14
OR/BR
Z960
20
BK/LB
G301
(8W-15-10)
MOTOR-
WINDOW-
LEFT
FRONT
MOTOR-
WINDOW-
RIGHT
FRONT
M

RHD

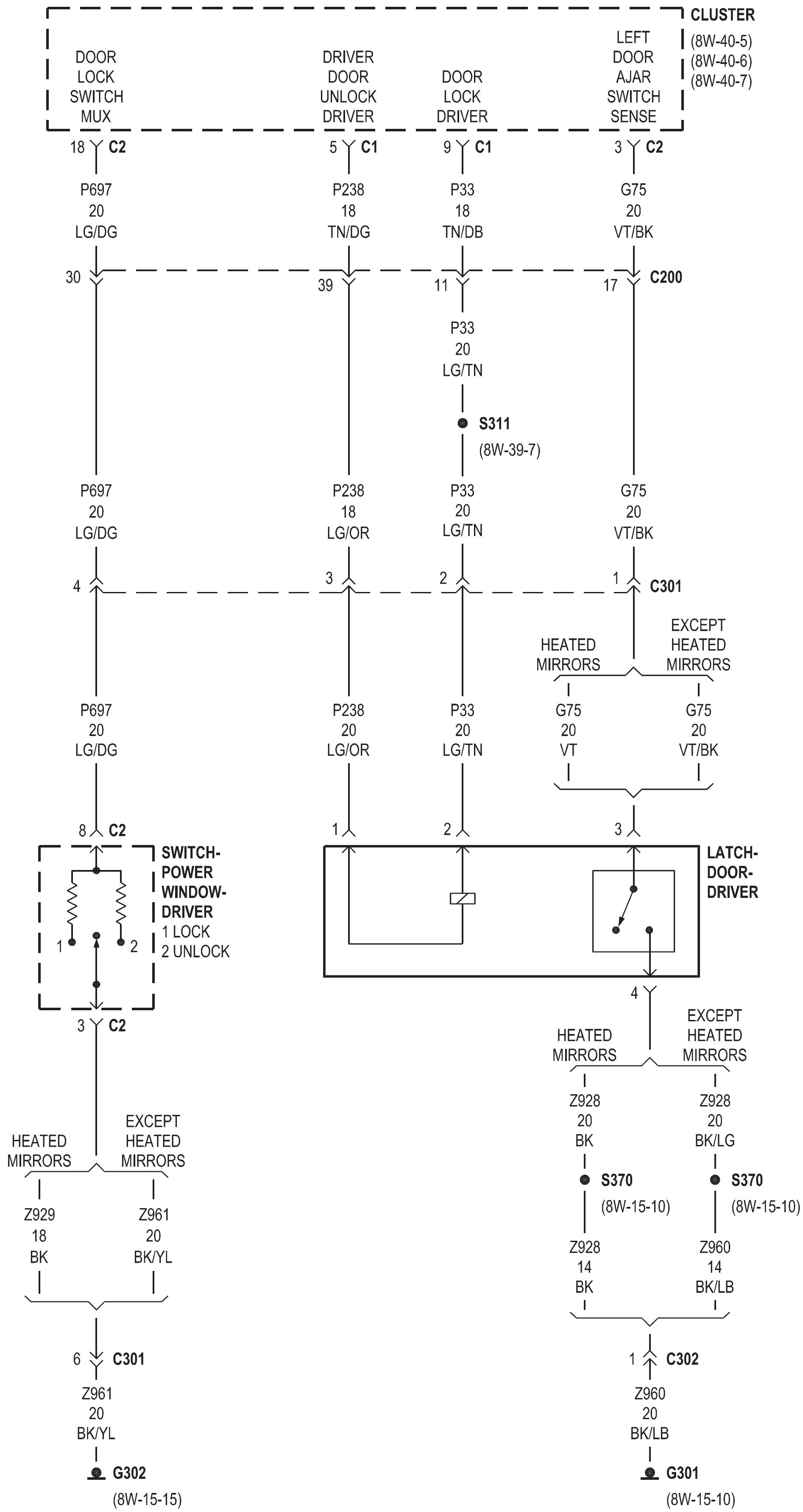

BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
IGNITION SWITCH OUTPUT (RUN-ACC)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
21 C7
F981 14 PK/BR
14 C303
F981 14 PK/YL
2 C2
EXPRESS DOWN MODULE
SWITCH-POWER WINDOW-DRIVER
1 LEFT UP
2 LEFT DOWN
3 LEFT DOWN EXPRESS
4 RIGHT UP
5 RIGHT DOWN
6 LOCK
7 UNLOCK
5 C1
6 C1
6 C2
7 C2
5 C2
4 C2
Q26 14 OR/GY
Q16 14 OR/TN
Q15 14 OR/LB
C303
Z928 14 BK/LG
S313
(8W-60-5)
S351
(8W-15-13)
C302
2 C303
SWITCH-POWER WINDOW-PASSENGER
1 UP
2 DOWN
Z960 20 BK/LB
G301
(8W-15-13)
Q22 14 OR/VT
Q12 14 OR/BR
Q21 14 OR/WT
Q11 14 OR/LG
M
MOTOR-WINDOW-RIGHT FRONT
MOTOR-WINDOW-LEFT FRONT


RUN ACC F981
(8W-13-29)
SWITCH-
POWER
WINDOW-
DRIVER
1 LEFT REAR UP
2 LEFT REAR DOWN
3 RIGHT REAR UP
4 RIGHT REAR DOWN
5 LOCK
6 UNLOCK
SWITCH-
LEFT
REAR
SWITCH-
RIGHT
REAR
C1
C2
HEATED
MIRRORS
EXCEPT
HEATED
MIRRORS
Z928
14
BK
Z928
14
BK/LG
S370
(8W-15-10)
Z960
14
BK/LB
WINDOW
LOCK OUT
SWITCH
OUTPUT
SWITCH-
POWER
WINDOW-
PASSENGER
(8W-60-2)
(8W-60-3)
Q411
14
OR/WT
Q611
14
OR/GY
Q15
14
OR/LB
Q412
14
OR/LB
Q612
14
OR/DB
C302
C303
Z960
20
BK/LB
G301
(8W-15-10)
S313
Q611
14
OR/RD
Q412
14
OR/LG
C308
C309
SWITCH-
POWER
WINDOW-
LEFT
REAR
1 UP
2 DOWN
SWITCH-
POWER
WINDOW-
RIGHT
REAR
1 UP
2 DOWN
Q111
14
TN/YL
Q211
14
TN/LB
Q112
14
OR/BR
Q212
14
OR/VT
MOTOR-
WINDOW-
LEFT
REAR
MOTOR-
WINDOW-
RIGHT
REAR
M

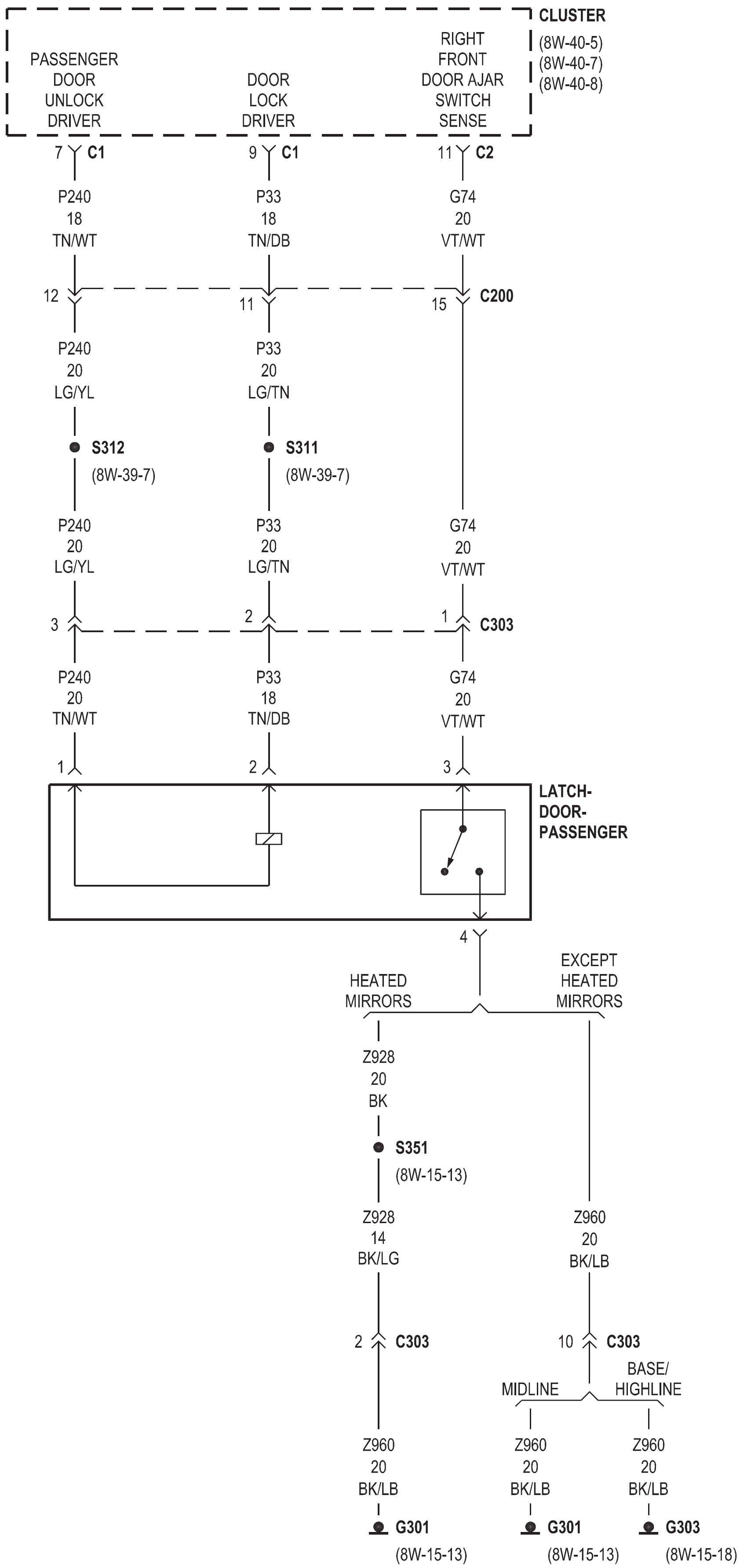
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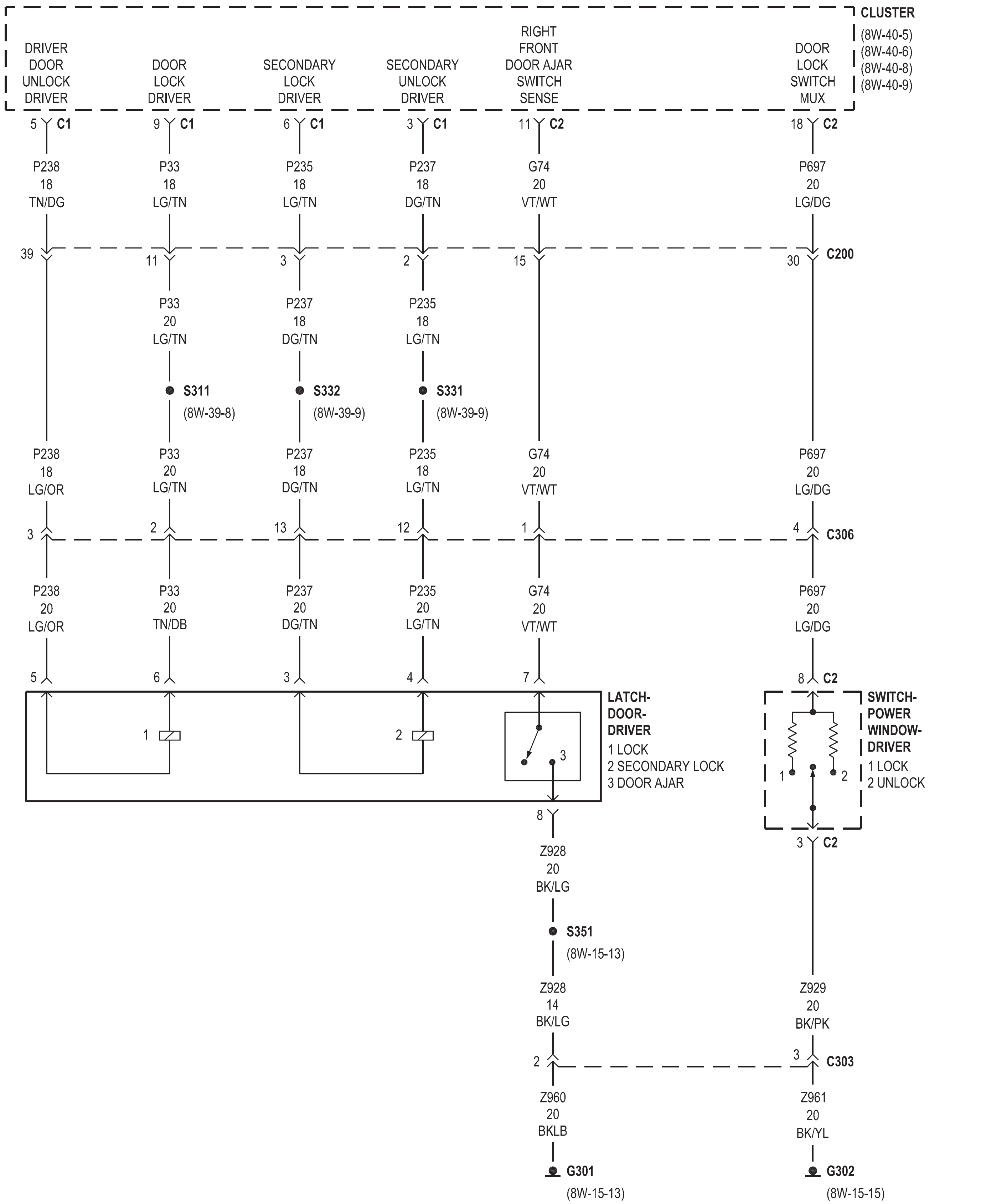

RUN ACC F981
(8W-13-29)
SWITCH-POWER WINDOW-DRIVER
1 LEFT REAR UP
2 LEFT REAR DOWN
3 RIGHT REAR UP
4 RIGHT REAR DOWN
5 LOCK
6 UNLOCK
SWITCH-LEFT REAR
SWITCH-RIGHT REAR
C1
C2
Z928 14 BK/LG
S351
(8W-15-13)
WINDOW LOCK OUT SWITCH OUTPUT
SWITCH-POWER WINDOW-PASSENGER
(8W-60-2)
(8W-60-3)
Q411 14 OR/WT
Q611 14 OR/GY
Q15 14 OR/LB
Q412 14 OR/LB
Q612 14 OR/DB
C303
C302
Z960 20 BK/LB
G301
(8W-15-13)
S313
Q611 14 OR/RD
Q412 14 OR/LG
C308
C309
SWITCH-POWER WINDOW-LEFT REAR
1 UP
2 DOWN
SWITCH-POWER WINDOW-RIGHT REAR
1 UP
2 DOWN
Q111 14 TN/YL
Q211 14 TN/LB
Q112 14 OR/BR
Q212 14 OR/VT
MOTOR-WINDOW-LEFT REAR
MOTOR-WINDOW-RIGHT REAR

8W-61 POWER DOOR LOCKS

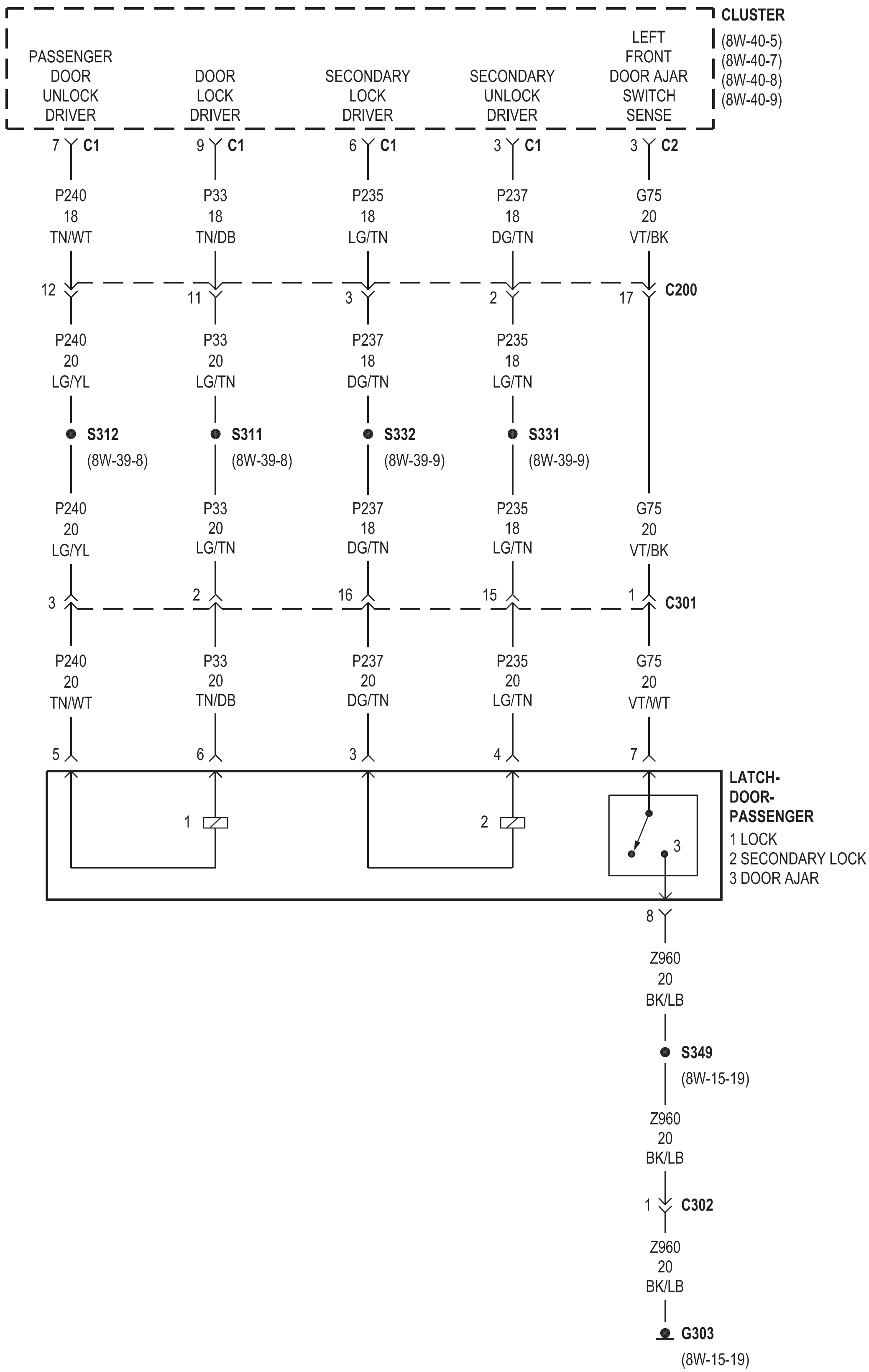

CLUSTER
(8W-40-5)
(8W-40-6)
(8W-40-7)
DOOR LOCK SWITCH MUX
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
LEFT DOOR AJAR SWITCH SENSE
18 C2
5 C1
9 C1
3 C2
P697 20 LG/DG
P238 18 TN/DG
P33 18 TN/DB
G75 20 VT/BK
30
39
11
17
C200
P33 20 LG/TN
S311
(8W-39-7)
P697 20 LG/DG
P238 18 LG/OR
P33 20 LG/TN
G75 20 VT/BK
4
3
2
1
C301
HEATED MIRRORS
EXCEPT HEATED MIRRORS
P697 20 LG/DG
P238 20 LG/OR
P33 20 LG/TN
G75 20 VT
G75 20 VT/BK
8 C2
1
2
3
SWITCH-POWER WINDOW-DRIVER
1 LOCK
2 UNLOCK
1
2
LATCH-DOOR-DRIVER
4
3 C2
HEATED MIRRORS
EXCEPT HEATED MIRRORS
Z928 20 BK
Z928 20 BK/LG
S370
(8W-15-10)
S370
(8W-15-10)
Z928 14 BK
Z960 14 BK/LB
HEATED MIRRORS
EXCEPT HEATED MIRRORS
Z929 18 BK
Z961 20 BK/YL
6 C301
Z961 20 BK/YL
G302
(8W-15-15)
1 C302
Z960 20 BK/LB
G301
(8W-15-10)

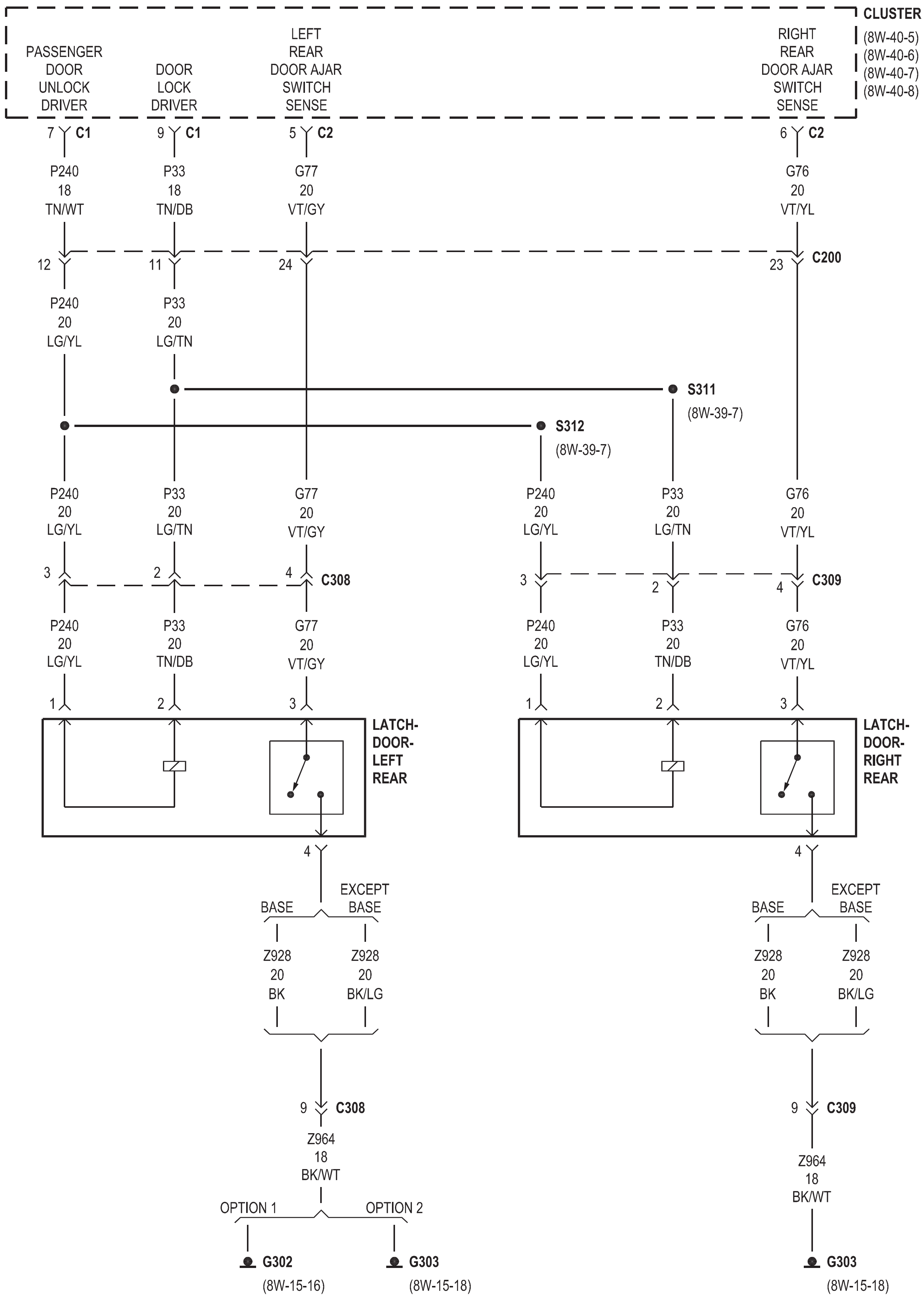
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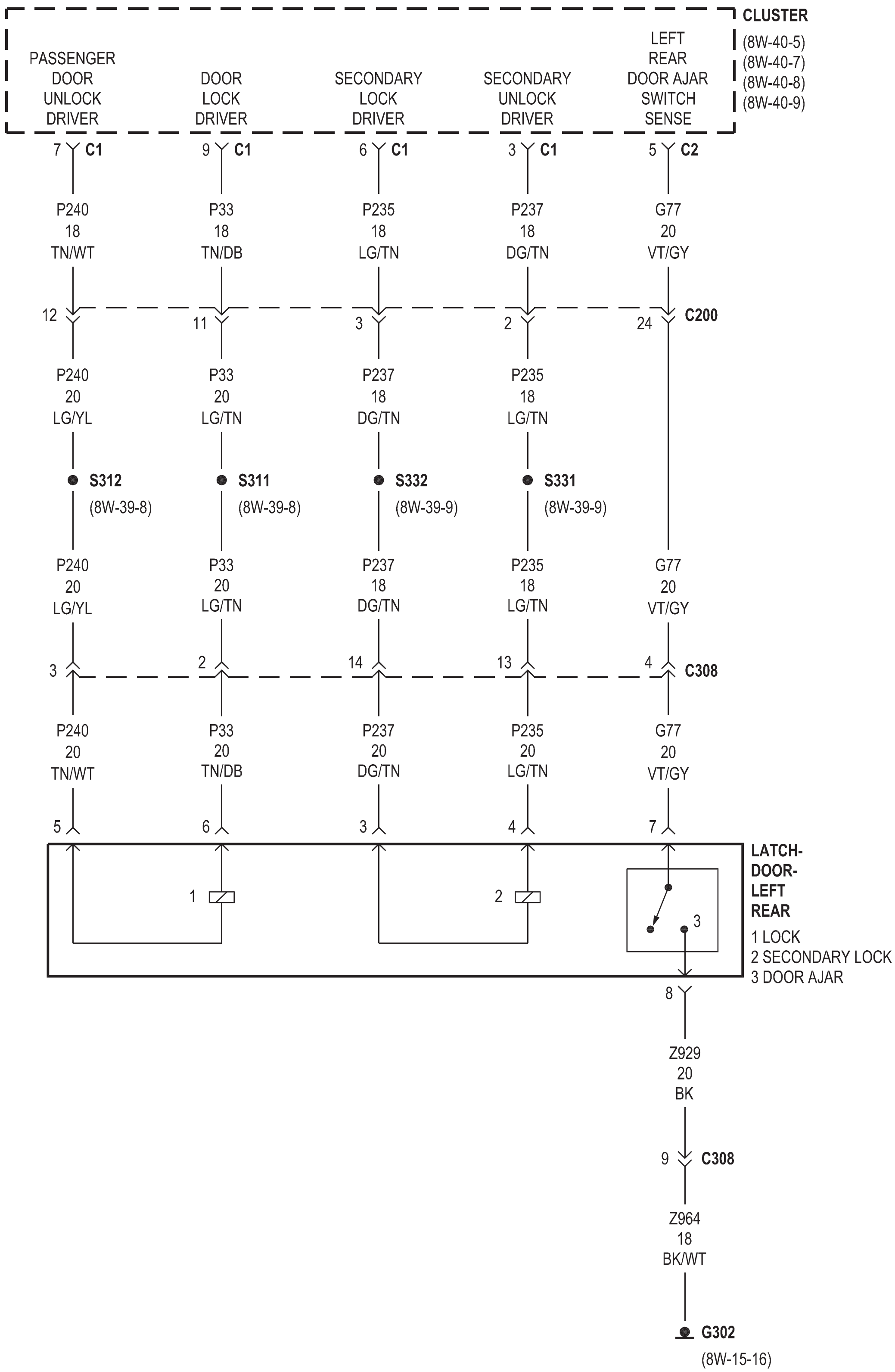

CLUSTER
(8W-40-5)
(8W-40-7)
(8W-40-8)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
RIGHT FRONT DOOR AJAR SWITCH SENSE
7 C1
9 C1
11 C2
P240 18 TN/WT
P33 18 TN/DB
G74 20 VT/WT
12
11
15
C200
P240 20 LG/YL
P33 20 LG/TN
S312
(8W-39-7)
S311
(8W-39-7)
P240 20 LG/YL
P33 20 LG/TN
G74 20 VT/WT
3
2
1
C303
P240 20 TN/WT
P33 18 TN/DB
G74 20 VT/WT
1
2
3
LATCH-DOOR-PASSENGER
4
HEATED MIRRORS
EXCEPT HEATED MIRRORS
Z928 20 BK
S351
(8W-15-13)
Z928 14 BK/LG
Z960 20 BK/LB
2 C303
10 C303
MIDLINE
BASE/ HIGHLINE
Z960 20 BK/LB
Z960 20 BK/LB
Z960 20 BK/LB
G301
(8W-15-13)
G301
(8W-15-13)
G303
(8W-15-18)

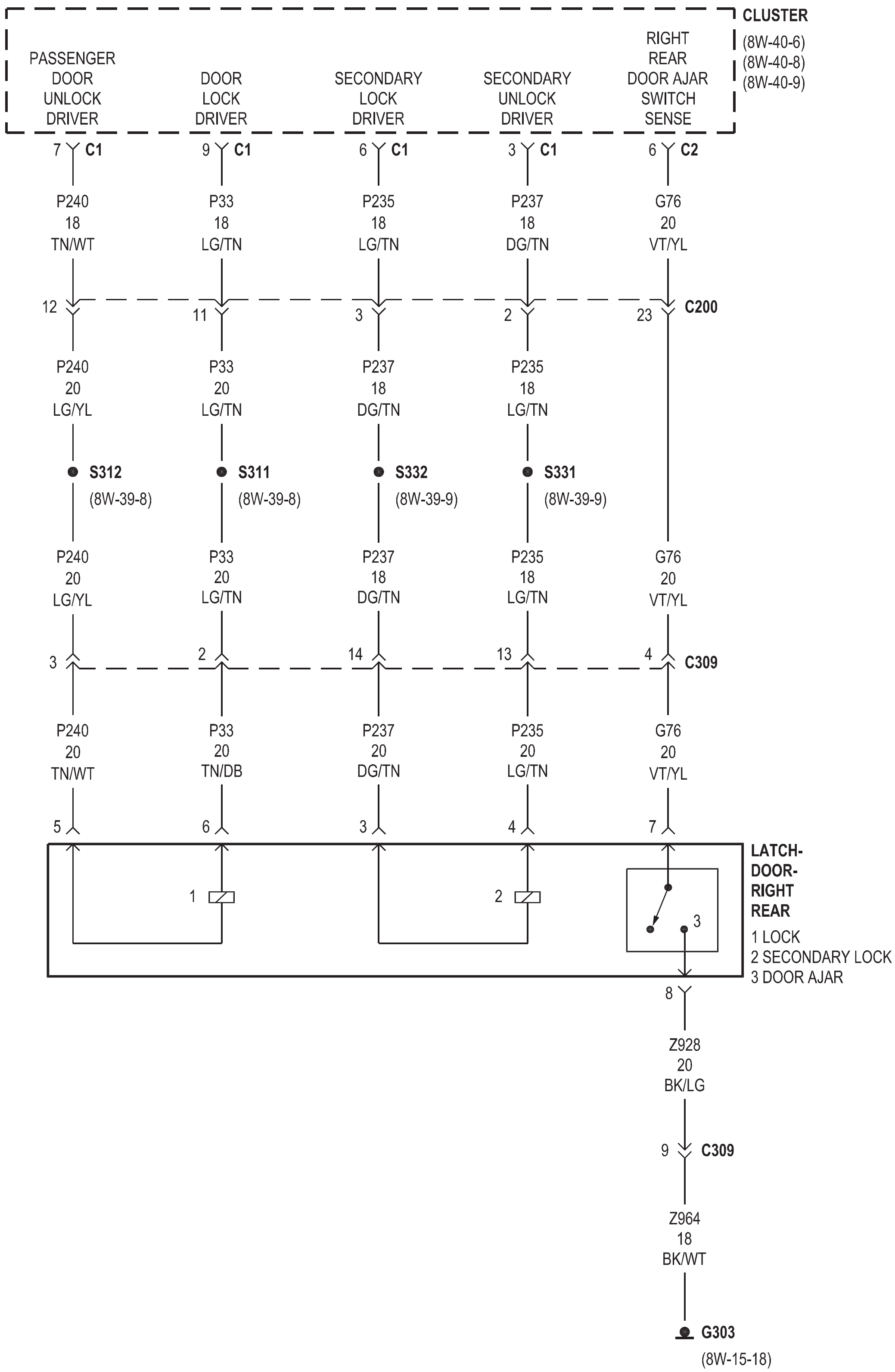

CLUSTER
(8W-40-5)
(8W-40-6)
(8W-40-8)
(8W-40-9)
DRIVER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
RIGHT FRONT DOOR AJAR SWITCH SENSE
DOOR LOCK SWITCH MUX
5 C1
9 C1
6 C1
3 C1
11 C2
18 C2
P238 18 TN/DG
P33 18 LG/TN
P235 18 LG/TN
P237 18 DG/TN
G74 20 VT/WT
P697 20 LG/DG
39
11
3
2
15
30
C200
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
S311
(8W-39-8)
S332
(8W-39-9)
S331
(8W-39-9)
P238 18 LG/OR
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
G74 20 VT/WT
P697 20 LG/DG
3
2
13
12
1
4
C306
P238 20 LG/OR
P33 20 TN/DB
P237 20 DG/TN
P235 20 LG/TN
G74 20 VT/WT
P697 20 LG/DG
5
6
3
4
7
8 C2
LATCH-DOOR-DRIVER
1 LOCK
2 SECONDARY LOCK
3 DOOR AJAR
1
2
3
SWITCH-POWER WINDOW-DRIVER
1 LOCK
2 UNLOCK
1
2
8
3 C2
Z928 20 BK/LG
S351
(8W-15-13)
Z928 14 BK/LG
Z929 20 BK/PK
2
3
C303
Z960 20 BKLB
Z961 20 BK/YL
G301
(8W-15-13)
G302
(8W-15-15)

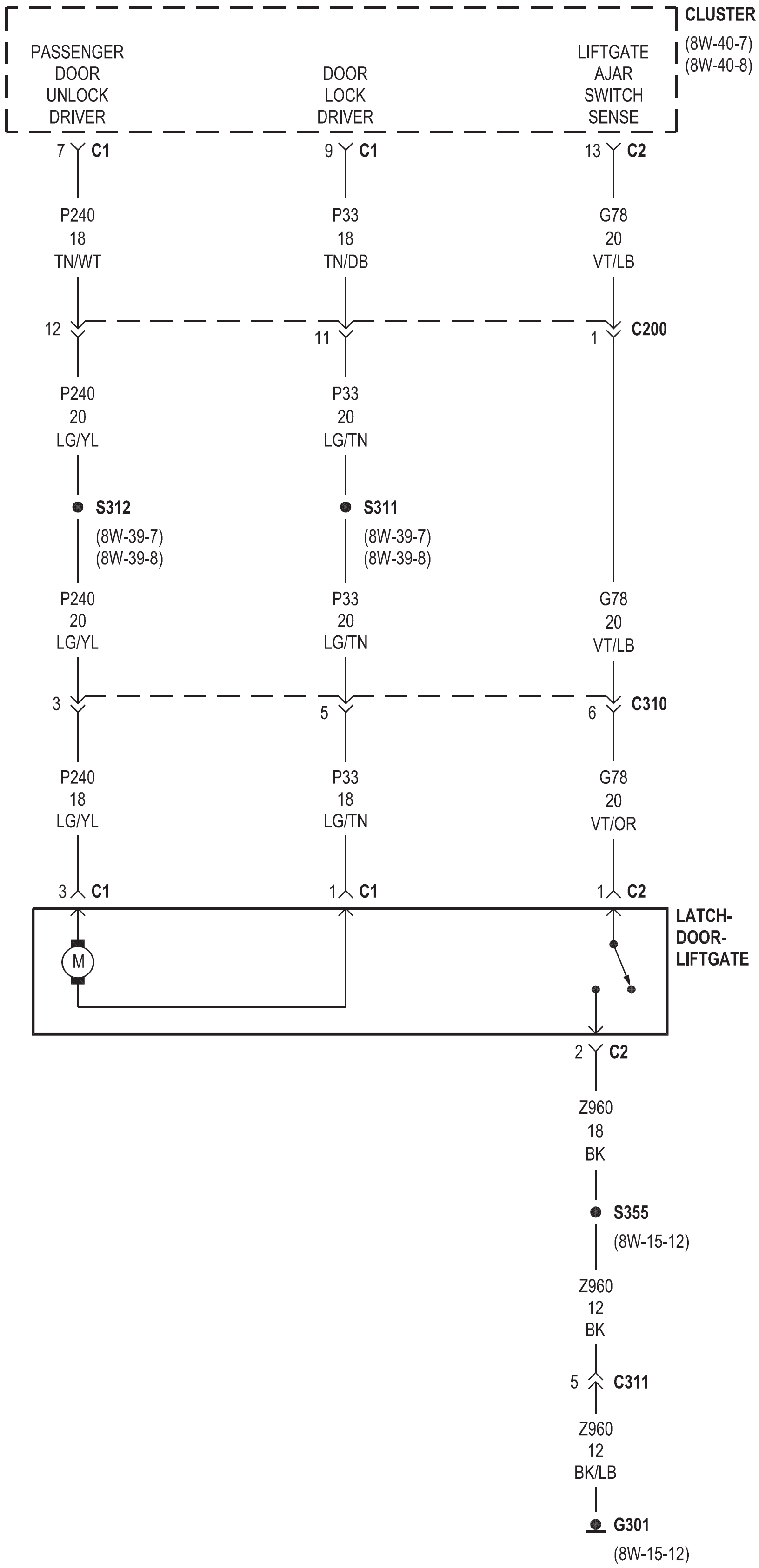
RHD


CLUSTER
(8W-40-5)
(8W-40-7)
(8W-40-8)
(8W-40-9)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
LEFT FRONT DOOR AJAR SWITCH SENSE
7 C1
9 C1
6 C1
3 C1
3 C2
P240 18 TN/WT
P33 18 TN/DB
P235 18 LG/TN
P237 18 DG/TN
G75 20 VT/BK
12
11
3
2
17
C200
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
S312 (8W-39-8)
S311 (8W-39-8)
S332 (8W-39-9)
S331 (8W-39-9)
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
G75 20 VT/BK
3
2
16
15
1
C301
P240 20 TN/WT
P33 20 TN/DB
P237 20 DG/TN
P235 20 LG/TN
G75 20 VT/WT
5
6
3
4
7
1
2
3
LATCH-DOOR-PASSENGER
1 LOCK
2 SECONDARY LOCK
3 DOOR AJAR
8
Z960 20 BK/LB
S349 (8W-15-19)
Z960 20 BK/LB
1 C302
Z960 20 BK/LB
G303 (8W-15-19)

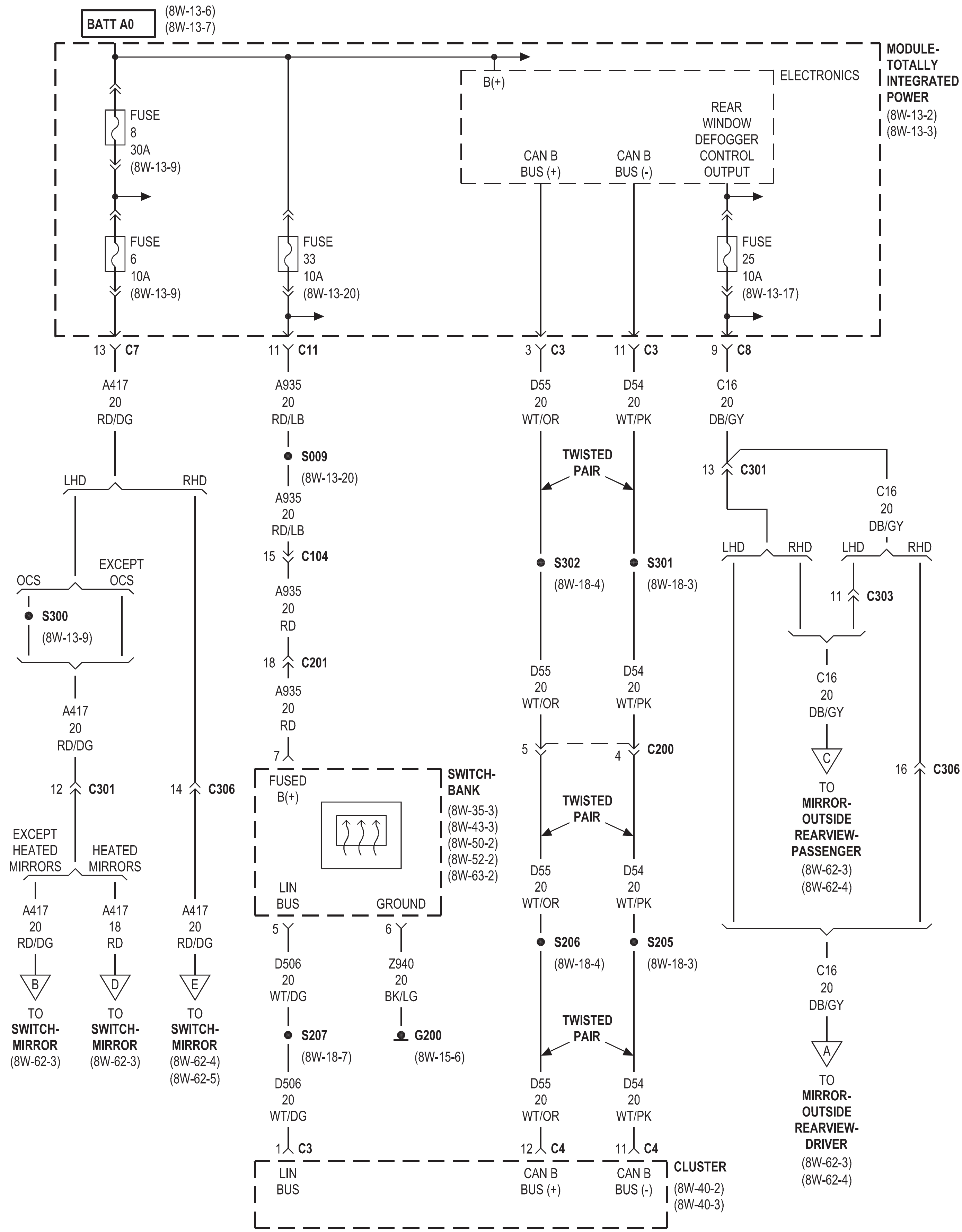

CLUSTER
(8W-40-5)
(8W-40-6)
(8W-40-7)
(8W-40-8)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
7 C1
9 C1
5 C2
6 C2
P240 18 TN/WT
P33 18 TN/DB
G77 20 VT/GY
G76 20 VT/YL
12
11
24
23
C200
P240 20 LG/YL
P33 20 LG/TN
S311
(8W-39-7)
S312
(8W-39-7)
P240 20 LG/YL
P33 20 LG/TN
G77 20 VT/GY
P240 20 LG/YL
P33 20 LG/TN
G76 20 VT/YL
3
2
4
C308
3
2
4
C309
P240 20 LG/YL
P33 20 TN/DB
G77 20 VT/GY
P240 20 LG/YL
P33 20 TN/DB
G76 20 VT/YL
1
2
3
LATCH-DOOR-LEFT REAR
1
2
3
LATCH-DOOR-RIGHT REAR
4
BASE
EXCEPT BASE
Z928 20 BK
Z928 20 BK/LG
9
C308
Z964 18 BK/WT
OPTION 1
OPTION 2
G302
(8W-15-16)
G303
(8W-15-18)
4
BASE
EXCEPT BASE
Z928 20 BK
Z928 20 BK/LG
9
C309
Z964 18 BK/WT
G303
(8W-15-18)


CLUSTER
(8W-40-5)
(8W-40-7)
(8W-40-8)
(8W-40-9)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
LEFT REAR DOOR AJAR SWITCH SENSE
7 C1
9 C1
6 C1
3 C1
5 C2
P240 18 TN/WT
P33 18 TN/DB
P235 18 LG/TN
P237 18 DG/TN
G77 20 VT/GY
12
11
3
2
24
C200
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
S312 (8W-39-8)
S311 (8W-39-8)
S332 (8W-39-9)
S331 (8W-39-9)
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
G77 20 VT/GY
3
2
14
13
4
C308
P240 20 TN/WT
P33 20 TN/DB
P237 20 DG/TN
P235 20 LG/TN
G77 20 VT/GY
5
6
3
4
7
1
2
3
LATCH-DOOR-LEFT REAR
1 LOCK
2 SECONDARY LOCK
3 DOOR AJAR
8
Z929 20 BK
9 C308
Z964 18 BK/WT
G302
(8W-15-16)


CLUSTER
(8W-40-6)
(8W-40-8)
(8W-40-9)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
SECONDARY LOCK DRIVER
SECONDARY UNLOCK DRIVER
RIGHT REAR DOOR AJAR SWITCH SENSE
7 C1
9 C1
6 C1
3 C1
6 C2
P240 18 TN/WT
P33 18 LG/TN
P235 18 LG/TN
P237 18 DG/TN
G76 20 VT/YL
12
11
3
2
23
C200
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
S312 (8W-39-8)
S311 (8W-39-8)
S332 (8W-39-9)
S331 (8W-39-9)
P240 20 LG/YL
P33 20 LG/TN
P237 18 DG/TN
P235 18 LG/TN
G76 20 VT/YL
3
2
14
13
4
C309
P240 20 TN/WT
P33 20 TN/DB
P237 20 DG/TN
P235 20 LG/TN
G76 20 VT/YL
5
6
3
4
7
1
2
3
LATCH-DOOR-RIGHT REAR
1 LOCK
2 SECONDARY LOCK
3 DOOR AJAR
8
Z928 20 BK/LG
9 C309
Z964 18 BK/WT
G303
(8W-15-18)

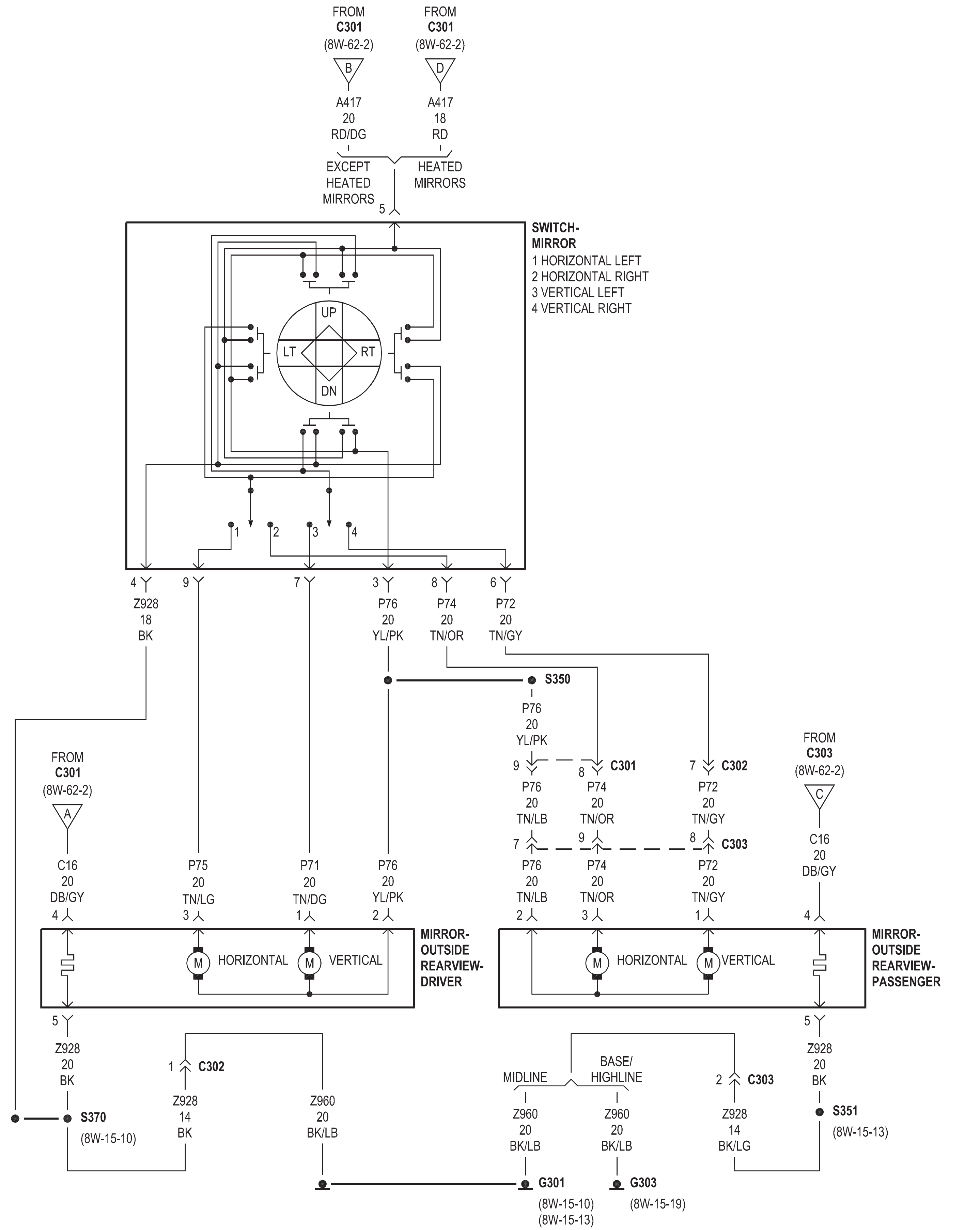

CLUSTER
(8W-40-7)
(8W-40-8)
PASSENGER DOOR UNLOCK DRIVER
DOOR LOCK DRIVER
LIFTGATE AJAR SWITCH SENSE
7 C1
9 C1
13 C2
P240 18 TN/WT
P33 18 TN/DB
G78 20 VT/LB
12
11
1
C200
P240 20 LG/YL
P33 20 LG/TN
S312
(8W-39-7)
(8W-39-8)
S311
(8W-39-7)
(8W-39-8)
P240 20 LG/YL
P33 20 LG/TN
G78 20 VT/LB
3
5
6
C310
P240 18 LG/YL
P33 18 LG/TN
G78 20 VT/OR
3 C1
1 C1
1 C2
M
LATCH-DOOR-LIFTGATE
2 C2
Z960 18 BK
S355
(8W-15-12)
Z960 12 BK
5 C311
Z960 12 BK/LB
G301
(8W-15-12)

8W-62 POWER MIRRORS

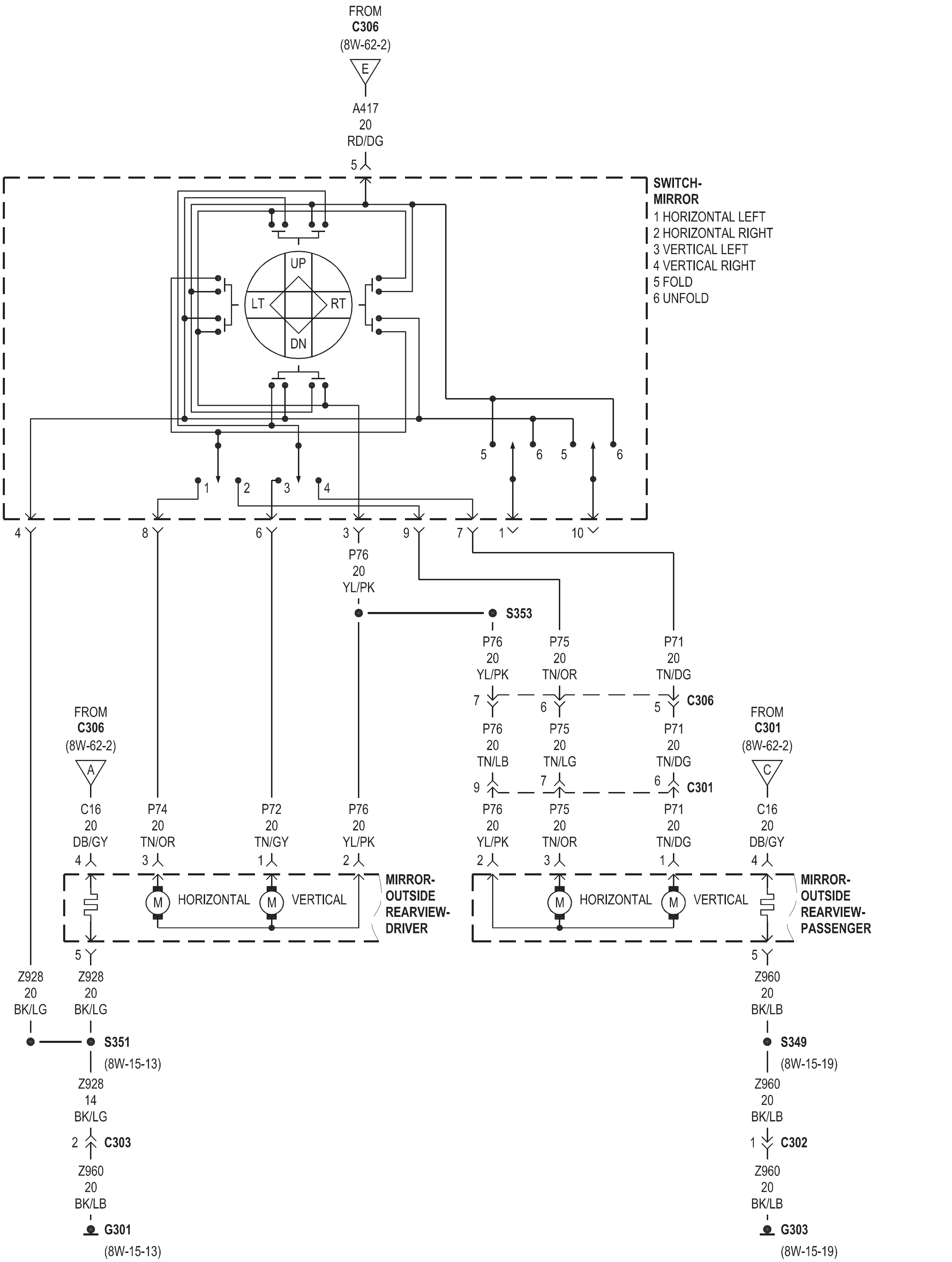


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
B(+)
CAN B BUS (+)
CAN B BUS (-)
REAR WINDOW DEFOGGER CONTROL OUTPUT
FUSE 8 30A (8W-13-9)
FUSE 6 10A (8W-13-9)
FUSE 33 10A (8W-13-20)
FUSE 25 10A (8W-13-17)
13 C7
11 C11
3 C3
11 C3
9 C8
A417 20 RD/DG
A935 20 RD/LB
D55 20 WT/OR
D54 20 WT/PK
C16 20 DB/GY
S009
(8W-13-20)
TWISTED PAIR
13 C301
LHD
RHD
15 C104
A935 20 RD
18 C201
S302
(8W-18-4)
S301
(8W-18-3)
11 C303
OCS
EXCEPT OCS
S300
(8W-13-9)
5
4
C200
7
FUSED B(+)
SWITCH-BANK
(8W-35-3)
(8W-43-3)
(8W-50-2)
(8W-52-2)
(8W-63-2)
LIN BUS
GROUND
16 C306
C
TO MIRROR-OUTSIDE REARVIEW-PASSENGER
(8W-62-3)
(8W-62-4)
12 C301
14 C306
EXCEPT HEATED MIRRORS
HEATED MIRRORS
A417 20 RD/DG
A417 18 RD
5
6
D506 20 WT/DG
Z940 20 BK/LG
S207
(8W-18-7)
G200
(8W-15-6)
S206
(8W-18-4)
S205
(8W-18-3)
B
D
E
TO SWITCH-MIRROR (8W-62-3)
TO SWITCH-MIRROR (8W-62-3)
TO SWITCH-MIRROR (8W-62-4) (8W-62-5)
A
TO MIRROR-OUTSIDE REARVIEW-DRIVER
(8W-62-3)
(8W-62-4)
1 C3
12 C4
11 C4
CLUSTER
(8W-40-2)
(8W-40-3)

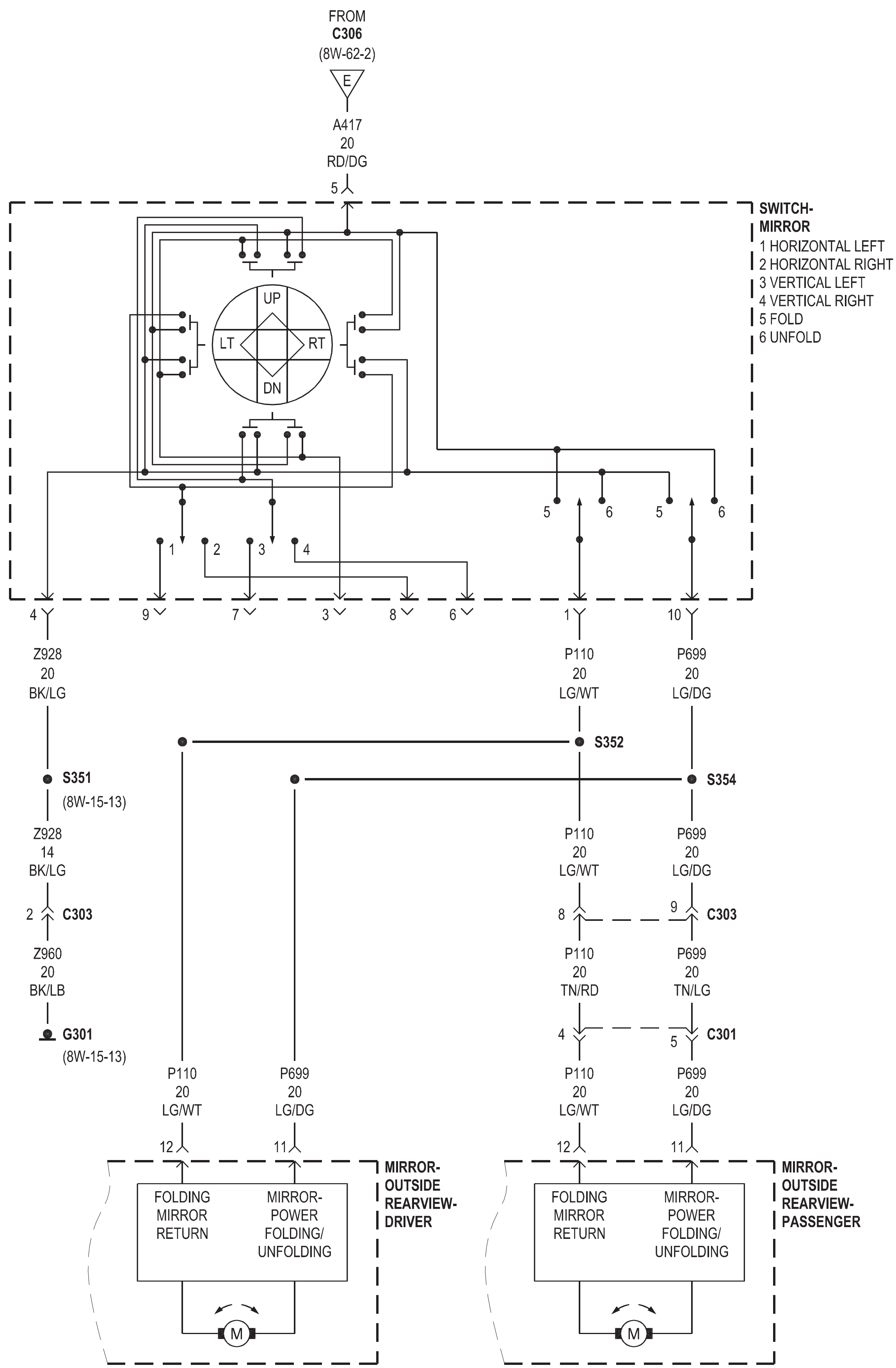
LHD


FROM
C301
(8W-62-2)
B
FROM
C301
(8W-62-2)
D
A417
20
RD/DG
A417
18
RD
EXCEPT
HEATED
MIRRORS
HEATED
MIRRORS
5
SWITCH-
MIRROR
1 HORIZONTAL LEFT
2 HORIZONTAL RIGHT
3 VERTICAL LEFT
4 VERTICAL RIGHT
UP
LT
RT
DN
1
2
3
4
4
9
7
3
8
6
Z928
18
BK
P76
20
YL/PK
P74
20
TN/OR
P72
20
TN/GY
S350
P76
20
YL/PK
9
8
C301
7
C302
P76
20
TN/LB
P74
20
TN/OR
P72
20
TN/GY
7
9
8
C303
FROM
C303
(8W-62-2)
C
C16
20
DB/GY
FROM
C301
(8W-62-2)
A
C16
20
DB/GY
P75
20
TN/LG
P71
20
TN/DG
P76
20
YL/PK
P76
20
TN/LB
P74
20
TN/OR
P72
20
TN/GY
4
3
1
2
2
3
1
4
M
HORIZONTAL
M
VERTICAL
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
M
HORIZONTAL
M
VERTICAL
MIRROR-
OUTSIDE
REARVIEW-
PASSENGER
5
Z928
20
BK
1
C302
Z928
14
BK
Z960
20
BK/LB
S370
(8W-15-10)
MIDLINE
BASE/
HIGHLINE
Z960
20
BK/LB
Z960
20
BK/LB
2
C303
Z928
14
BK/LG
5
Z928
20
BK
S351
(8W-15-13)
G301
(8W-15-10)
(8W-15-13)
G303
(8W-15-19)

RHD

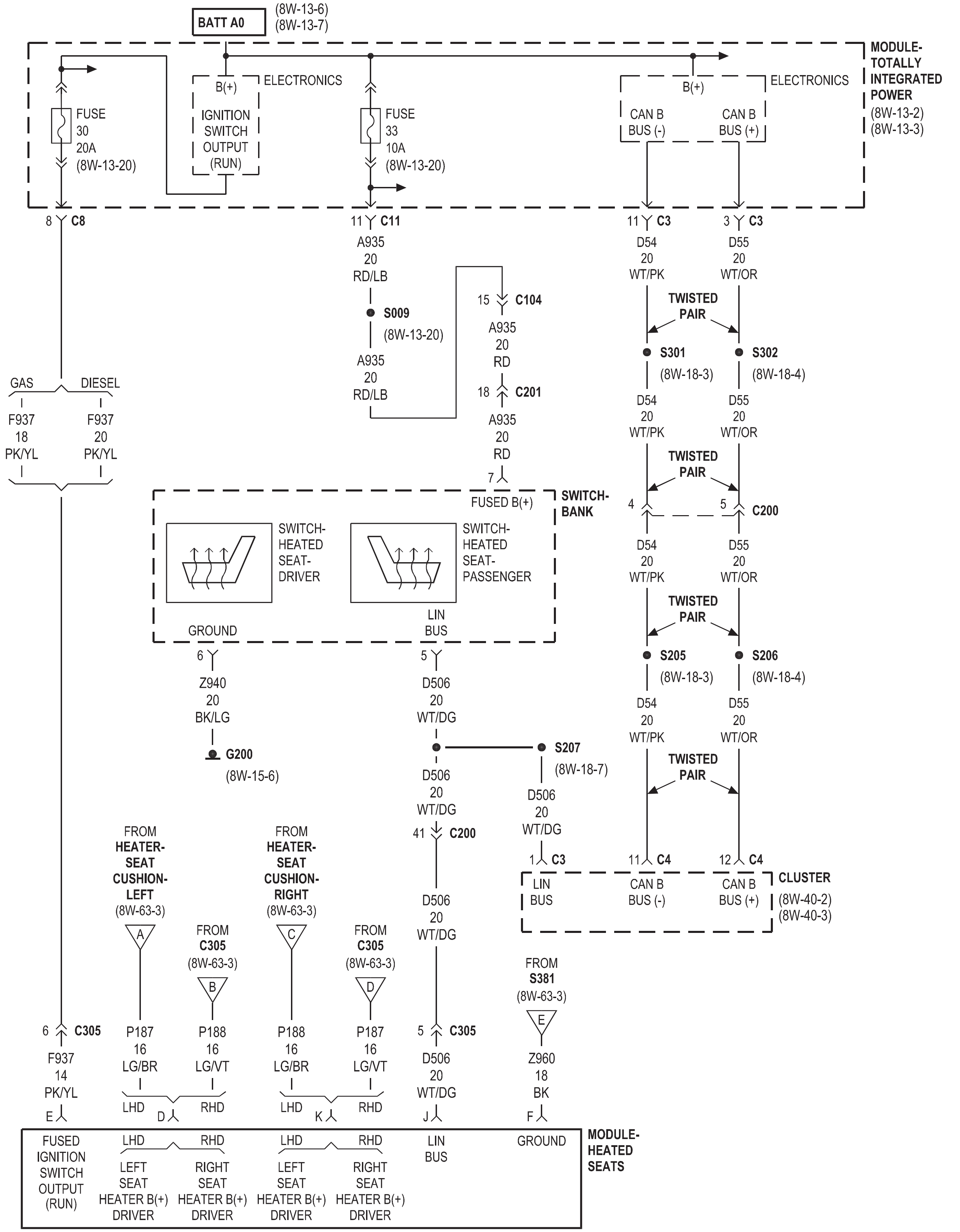

FROM
C306
(8W-62-2)
E
A417
20
RD/DG
5
SWITCH-
MIRROR
1 HORIZONTAL LEFT
2 HORIZONTAL RIGHT
3 VERTICAL LEFT
4 VERTICAL RIGHT
5 FOLD
6 UNFOLD
UP
LT
RT
DN
5 6 5 6
1 2 3 4
4 8 6 3 9 7 1 10
P76
20
YL/PK
S353
P76
20
YL/PK
P75
20
TN/OR
P71
20
TN/DG
7 6 5 C306
P76
20
TN/LB
P75
20
TN/LG
P71
20
TN/DG
9 7 6 C301
FROM
C306
(8W-62-2)
A
C16
20
DB/GY
P74
20
TN/OR
P72
20
TN/GY
P76
20
YL/PK
P76
20
YL/PK
P75
20
TN/OR
P71
20
TN/DG
FROM
C301
(8W-62-2)
C
C16
20
DB/GY
4 3 1 2 2 3 1 4
M HORIZONTAL M VERTICAL
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
M HORIZONTAL M VERTICAL
MIRROR-
OUTSIDE
REARVIEW-
PASSENGER
5 5
Z928
20
BK/LG
Z928
20
BK/LG
Z960
20
BK/LB
S351
(8W-15-13)
S349
(8W-15-19)
Z928
14
BK/LG
Z960
20
BK/LB
2 C303
1 C302
Z960
20
BK/LB
Z960
20
BK/LB
G301
(8W-15-13)
G303
(8W-15-19)

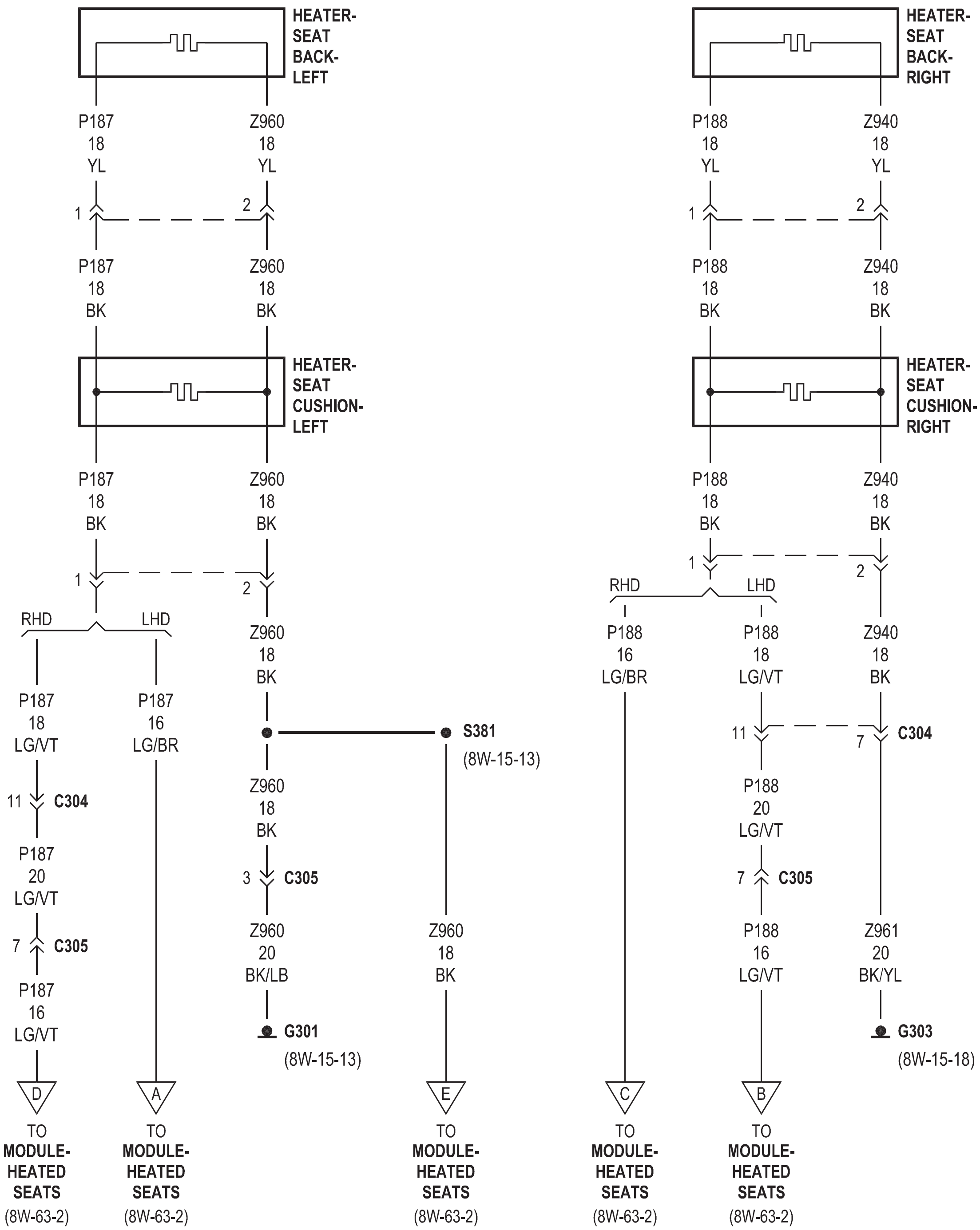
RHD POWER FOLDING MIRRORS



8W-63 POWER SEATS

HEATED SEATS

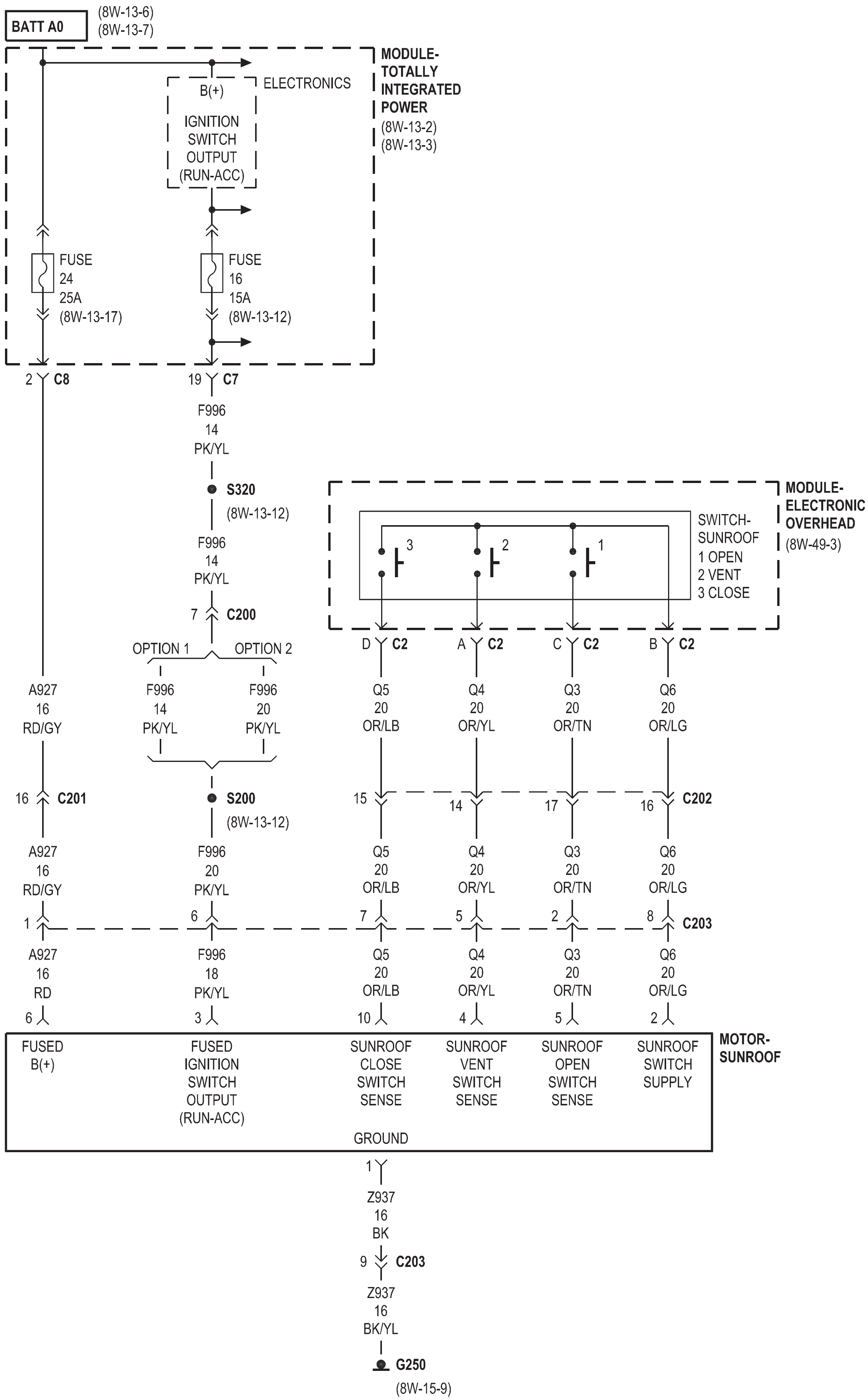




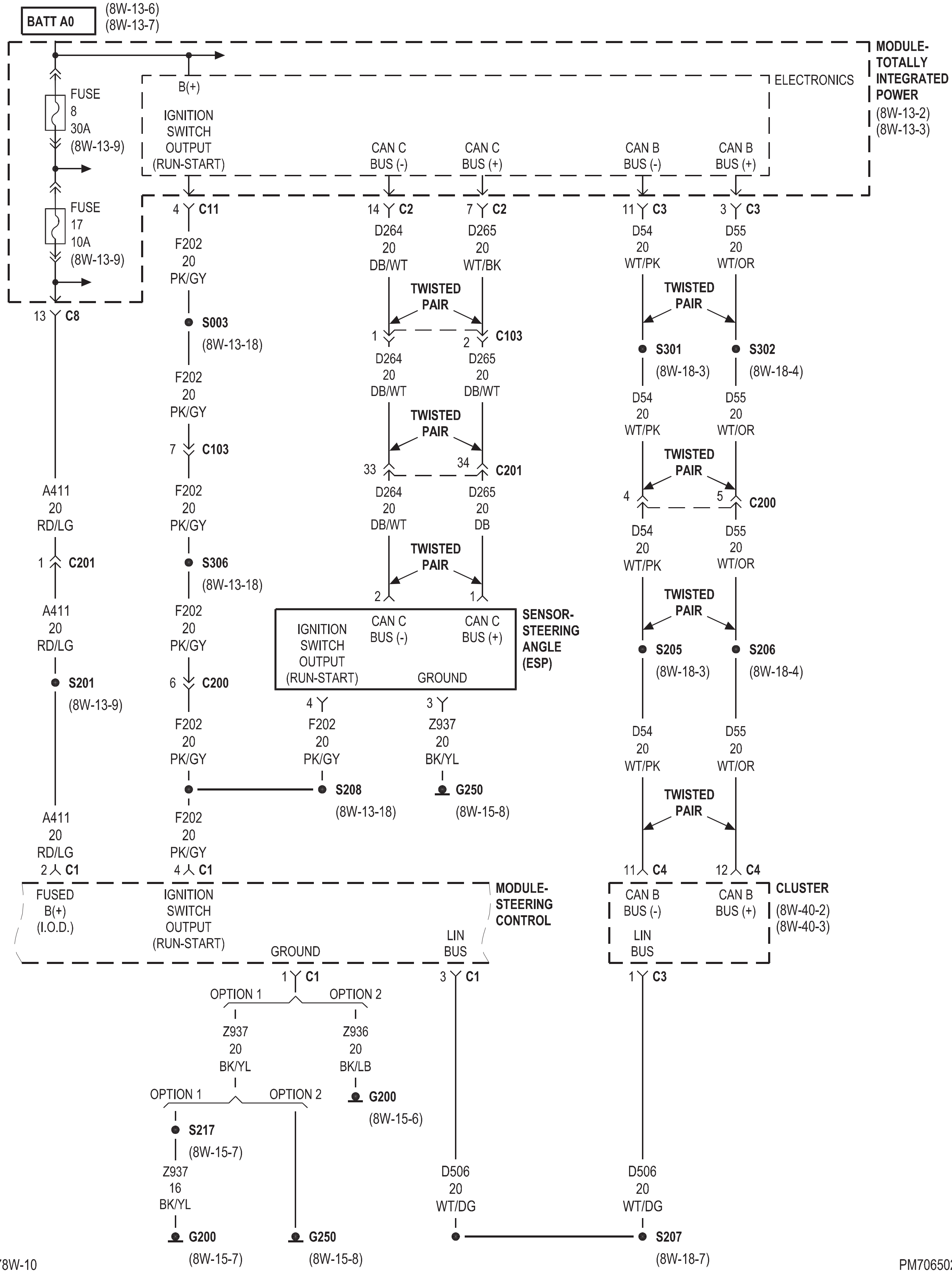
HEATER-SEAT BACK-LEFT
P187 18 YL
Z960 18 YL
1
2
P187 18 BK
Z960 18 BK
HEATER-SEAT CUSHION-LEFT
P187 18 BK
Z960 18 BK
1
2
RHD
LHD
P187 18 LG/VT
P187 16 LG/BR
Z960 18 BK
S381
(8W-15-13)
11 C304
P187 20 LG/VT
Z960 18 BK
3 C305
7 C305
P187 16 LG/VT
Z960 20 BK/LB
Z960 18 BK
G301
(8W-15-13)
D
A
E
TO MODULE-HEATED SEATS (8W-63-2)
TO MODULE-HEATED SEATS (8W-63-2)
TO MODULE-HEATED SEATS (8W-63-2)
HEATER-SEAT BACK-RIGHT
P188 18 YL
Z940 18 YL
1
2
P188 18 BK
Z940 18 BK
HEATER-SEAT CUSHION-RIGHT
P188 18 BK
Z940 18 BK
1
2
RHD
LHD
P188 16 LG/BR
P188 18 LG/VT
Z940 18 BK
11
7 C304
P188 20 LG/VT
7 C305
P188 16 LG/VT
Z961 20 BK/YL
G303
(8W-15-18)
C
B
TO MODULE-HEATED SEATS (8W-63-2)
TO MODULE-HEATED SEATS (8W-63-2)

8W-64 POWER SUNROOF

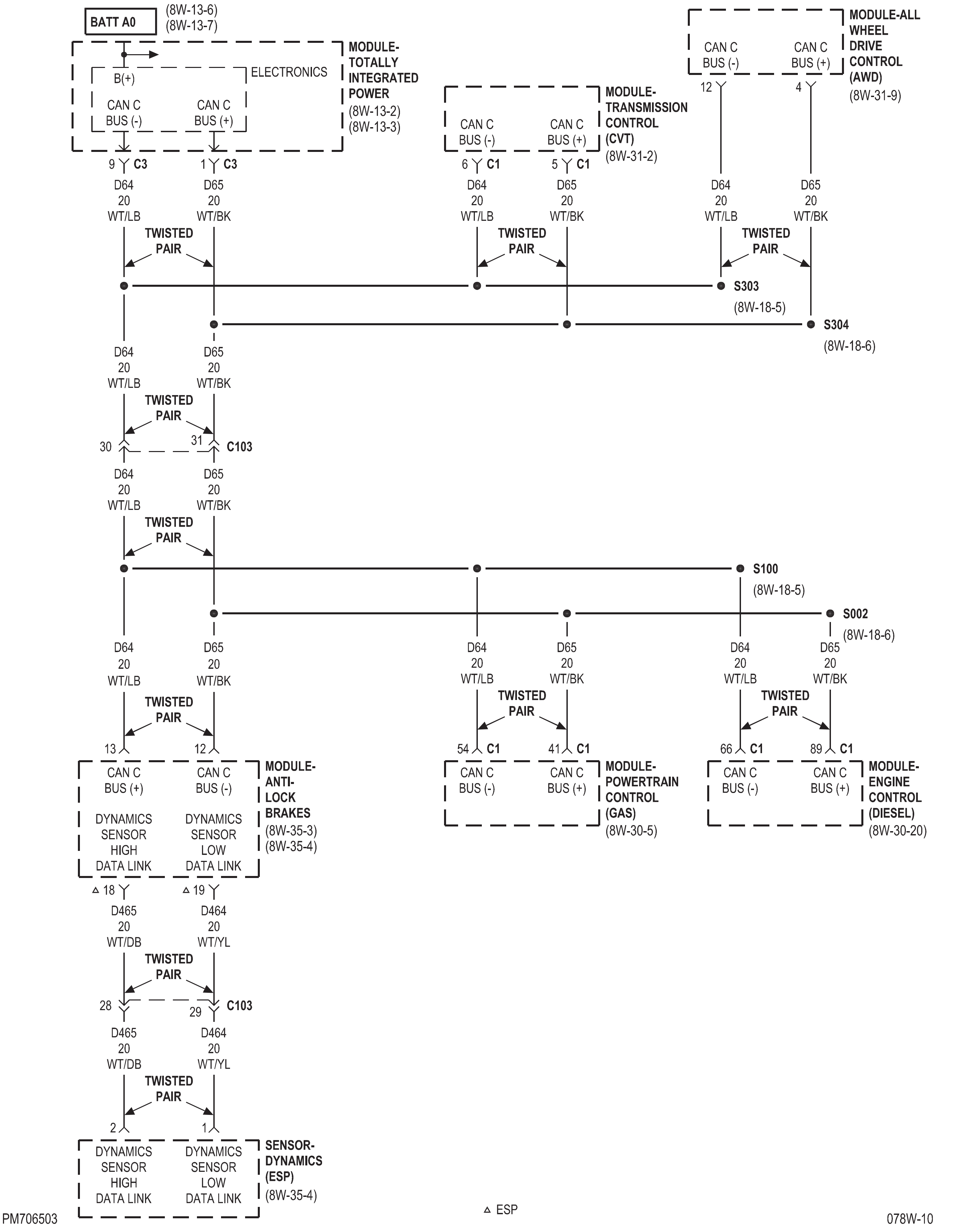
Component — **Page**


BATT A0
(8W-13-6)
(8W-13-7)
ELECTRONICS
B(+)
IGNITION SWITCH OUTPUT (RUN-ACC)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
FUSE 24 25A (8W-13-17)
FUSE 16 15A (8W-13-12)
2 C8
19 C7
F996 14 PK/YL
S320 (8W-13-12)
F996 14 PK/YL
7 C200
OPTION 1
OPTION 2
F996 14 PK/YL
F996 20 PK/YL
S200 (8W-13-12)
F996 20 PK/YL
A927 16 RD/GY
16 C201
A927 16 RD/GY
SWITCH-SUNROOF
1 OPEN
2 VENT
3 CLOSE
MODULE-ELECTRONIC OVERHEAD (8W-49-3)
D C2
A C2
C C2
B C2
Q5 20 OR/LB
Q4 20 OR/YL
Q3 20 OR/TN
Q6 20 OR/LG
15 14 17 16 C202
1 6 7 5 2 8 C203
A927 16 RD
F996 18 PK/YL
6 3 10 4 5 2
MOTOR-SUNROOF
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
SUNROOF CLOSE SWITCH SENSE
SUNROOF VENT SWITCH SENSE
SUNROOF OPEN SWITCH SENSE
SUNROOF SWITCH SUPPLY
GROUND
1
Z937 16 BK
9 C203
Z937 16 BK/YL
G250 (8W-15-9)

8W-65 SPEED PROPORTIONAL STEERING

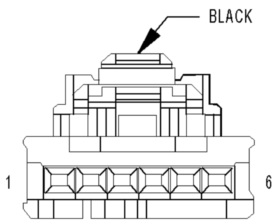


BATT A0
(8W-13-6)
(8W-13-7)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
ELECTRONICS
FUSE 8 30A (8W-13-9)
FUSE 17 10A (8W-13-9)
B(+)
IGNITION SWITCH OUTPUT (RUN-START)
CAN C BUS (-)
CAN C BUS (+)
CAN B BUS (-)
CAN B BUS (+)
13 C8
4 C11
14 C2
7 C2
11 C3
3 C3
F202 20 PK/GY
D264 20 DB/WT
D265 20 WT/BK
D54 20 WT/PK
D55 20 WT/OR
TWISTED PAIR
S003 (8W-13-18)
1 C103
2 C103
D265 20 DB/WT
S301 (8W-18-3)
S302 (8W-18-4)
7 C103
33 C201
34 C201
D265 20 DB
4 C200
5 C200
A411 20 RD/LG
1 C201
S306 (8W-13-18)
S205 (8W-18-3)
S206 (8W-18-4)
SENSOR-STEERING ANGLE (ESP)
GROUND
S201 (8W-13-9)
6 C200
4
3
Z937 20 BK/YL
S208 (8W-13-18)
G250 (8W-15-8)
2 C1
4 C1
11 C4
12 C4
MODULE-STEERING CONTROL
FUSED B(+) (I.O.D.)
LIN BUS
CLUSTER (8W-40-2) (8W-40-3)
1 C1
3 C1
1 C3
OPTION 1
OPTION 2
Z936 20 BK/LB
G200 (8W-15-6)
S217 (8W-15-7)
Z937 16 BK/YL
G200 (8W-15-7)
G250 (8W-15-8)
D506 20 WT/DG
S207 (8W-18-7)


BATT A0
(8W-13-6)
(8W-13-7)
B(+)
ELECTRONICS
CAN C BUS (-)
CAN C BUS (+)
MODULE-TOTALLY INTEGRATED POWER
(8W-13-2)
(8W-13-3)
9 C3
1 C3
MODULE-TRANSMISSION CONTROL (CVT)
(8W-31-2)
6 C1
5 C1
MODULE-ALL WHEEL DRIVE CONTROL (AWD)
(8W-31-9)
12
4
D64 20 WT/LB
D65 20 WT/BK
TWISTED PAIR
S303
(8W-18-5)
S304
(8W-18-6)
30
31
C103
S100
(8W-18-5)
S002
(8W-18-6)
13
12
MODULE-ANTI-LOCK BRAKES
(8W-35-3)
(8W-35-4)
CAN C BUS (+)
CAN C BUS (-)
DYNAMICS SENSOR HIGH DATA LINK
DYNAMICS SENSOR LOW DATA LINK
54 C1
41 C1
MODULE-POWERTRAIN CONTROL (GAS)
(8W-30-5)
66 C1
89 C1
MODULE-ENGINE CONTROL (DIESEL)
(8W-30-20)
18
19
D465 20 WT/DB
D464 20 WT/YL
28
29
C103
2
1
SENSOR-DYNAMICS (ESP)
(8W-35-4)
ESP
PM706503
078W-10

8W-70 SPLICE INFORMATION

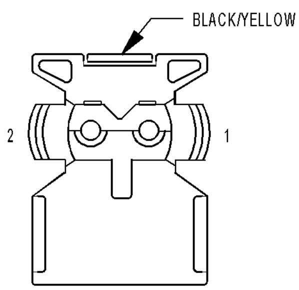
8W-80 CONNECTOR PIN-OUTS



ACTUATOR-RECIRCULATION DOOR

ACTUATOR-RECIRCULATION DOOR - BLACK 6 WAY

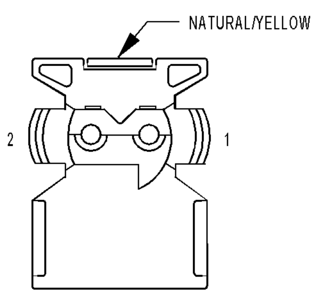
CAV	CIRCUIT	FUNCTION
1	C32 20DB/TN	RECIRCULATION DOOR DRIVER (A)
2	-	-
3	-	-
4	-	-
5	-	-
6	C132 20DB/GY	RECIRCULATION DOOR DRIVER (B)



AIRBAG-DRIVER SQUIB 1

AIRBAG-DRIVER SQUIB 1 - BLACK/YELLOW 2 WAY

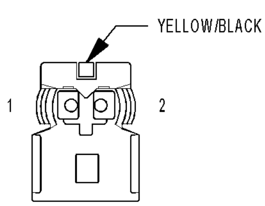
CAV	CIRCUIT	FUNCTION
1	R45 20LB	DRIVER SQUIB 1 LINE 1
2	R43 20BR	DRIVER SQUIB 1 LINE 2



AIRBAG-DRIVER SQUIB 2

AIRBAG-DRIVER SQUIB 2 - NATURAL/YELLOW 2 WAY

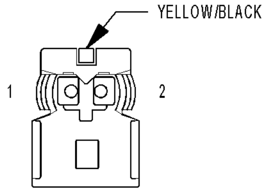
CAV	CIRCUIT	FUNCTION
1	R63 20RD	DRIVER SQUIB 2 LINE 1
2	R61 20YL	DRIVER SQUIB 2 LINE 2



AIRBAG-KNEE BLOCKER-DRIVER (EXCEPT BASE)

AIRBAG-KNEE BLOCKER-DRIVER (EXCEPT BASE) - YELLOW/BLACK 2 WAY

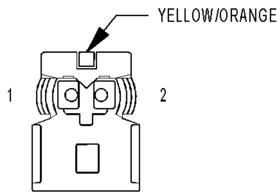
CAV	CIRCUIT	FUNCTION
1	R9 18LB/YL	DRIVER KNEE BLOCKER SQUIB LINE 2
2	R11 18LB/DB	DRIVER KNEE BLOCKER SQUIB LINE 1



AIRBAG-
PASSENGER
SQUIB 1
(EXCEPT BASE)

AIRBAG-PASSENGER SQUIB 1 (EXCEPT BASE) - YELLOW/BLACK 2 WAY

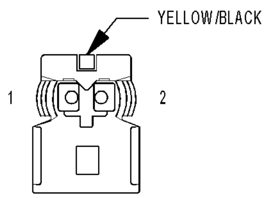
CAV	CIRCUIT	FUNCTION
1	R42 18LB/BR	PASSENGER SQUIB 1 LINE 2
2	R44 18LB/OR	PASSENGER SQUIB 1 LINE 1



AIRBAG-
PASSENGER
SQUIB 2
(EXCEPT BASE)

AIRBAG-PASSENGER SQUIB 2 (EXCEPT BASE) - YELLOW/ORANGE 2 WAY

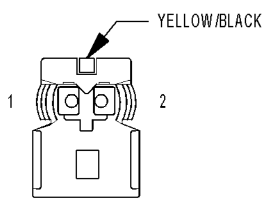
CAV	CIRCUIT	FUNCTION
1	R62 18LB/VT	PASSENGER SQUIB 2 LINE 2
2	R64 18LB/WT	PASSENGER SQUIB 2 LINE 1



AIRBAG-
SIDE CURTAIN-
LEFT

AIRBAG-SIDE CURTAIN-LEFT - YELLOW/BLACK 2 WAY

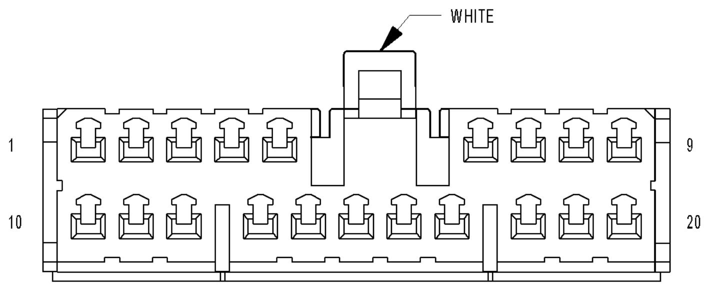
CAV	CIRCUIT	FUNCTION
1	R1 18LB/WT	LEFT CURTAIN SQUIB 1 LINE 2
2	R3 18LB/OR	LEFT CURTAIN SQUIB 1 LINE 1



AIRBAG-
SIDE CURTAIN-
RIGHT

AIRBAG-SIDE CURTAIN-RIGHT - YELLOW/BLACK 2 WAY

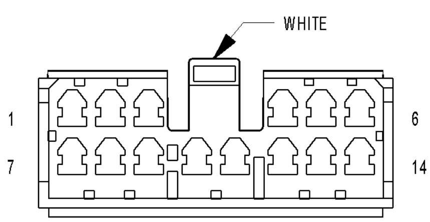
CAV	CIRCUIT	FUNCTION
1	R4 18OR/LB	RIGHT CURTAIN SQUIB 1 LINE 1
2	R2 18WT/LB	RIGHT CURTAIN SQUIB 1 LINE 2



AMPLIFIER-
RADIO C1

AMPLIFIER-RADIO C1 - WHITE 20 WAY

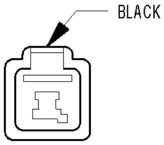
CAV	CIRCUIT	FUNCTION
1	X209 18GY/TN	LEFT INSTRUMENT PANEL SPEAKER (+)
2	X208 18GY/DG	RIGHT INSTRUMENT PANEL SPEAKER (+)
3	-	-
4	A419 18RD/DG (OPTION 1)	FUSED B(+) (I.O.D.)
4	A419 18RD/YL (OPTION 2)	FUSED B(+) (I.O.D.)
5	-	-
6	D55 20WT/OR	CAN B BUS (+)
7	X51 18DG/DB	LEFT REAR SPEAKER (+)
8	X52 18GY/DB	RIGHT REAR SPEAKER (+)
9	Z960 16BK/LB	GROUND
10	X299 18GY/BR	LEFT INSTRUMENT PANEL SPEAKER (-)
11	X298 18GY/LG	RIGHT INSTRUMENT PANEL SPEAKER (-)
12	-	-
13	A420 18WT/RD	FUSED B(+) (I.O.D.)
14	-	-
15	-	-
16	-	-
17	D54 20WT/PK	CAN B BUS (-)
18	X57 18DG/BR	LEFT REAR SPEAKER (-)
19	X58 18GY/OR	RIGHT REAR SPEAKER (-)
20	Z960 16BK/LB	GROUND



AMPLIFIER-
RADIO C2

AMPLIFIER-RADIO C2 - WHITE 14 WAY

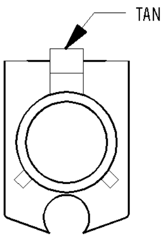
CAV	CIRCUIT	FUNCTION
1	X153 18DG/VT	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	X154 18GY/YL	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
3	X205 18GY/LG	AMPLIFIED LEFT REAR SPEAKER (+)
4	X206 18DG/LG	AMPLIFIED RIGHT REAR SPEAKER (+)
5	X214 18DG/DB	AMPLIFIED LIFTGATE SPEAKER 1 (+)
6	X212 18GY/PK	AMPLIFIED LIFTGATE SPEAKER 2 (+)
7	X155 18DG/BK	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
8	X156 18GY/LB	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
9	X295 18GY/BK	AMPLIFIED LEFT REAR SPEAKER (-)
10	-	-
11	-	-
12	X296 18DG/LB	AMPLIFIED RIGHT REAR SPEAKER (-)
13	X284 18DG/TN	AMPLIFIED LIFTGATE SPEAKER 1 (-)
14	X282 18GY/WT	AMPLIFIED LIFTGATE SPEAKER 2 (-)



ANTENNA-
RADIO
(EXPORT)

ANTENNA-RADIO (EXPORT) - BLACK 1 WAY

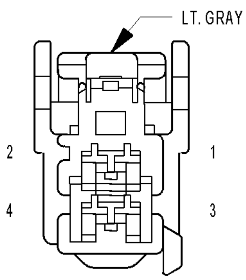
CAV	CIRCUIT	FUNCTION
1	X60 18GY/RD	POWER ANTENNA SIGNAL



ANTENNA-
SATELLITE

ANTENNA-SATELLITE - TAN 2 WAY

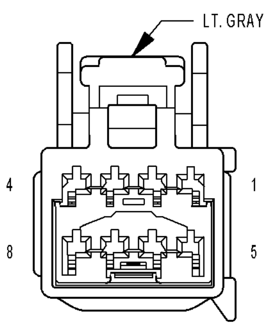
CAV	CIRCUIT	FUNCTION
1	D106 6WT/LG	SATELLITE ANTENNA SIGNAL
2	D126 WT/TN	SATELLITE ANTENNA SHIELD



ASSEMBLY-
SHIFT
LEVER
(EXCEPT AUTOSTICK)

ASSEMBLY-SHIFT LEVER (EXCEPT AUTOSTICK) - LT. GRAY 4 WAY

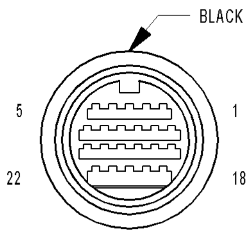
CAV	CIRCUIT	FUNCTION
1	Z937 20BK/YL	GROUND
2	E12 20OR/GY	PANEL LAMPS DRIVER
3	Z937 20BK/YL	GROUND
4	K321 20BR/YL	BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK



ASSEMBLY-
SHIFT
LEVER
(AUTOSTICK)

ASSEMBLY-SHIFT LEVER (AUTOSTICK) - LT. GRAY 8 WAY

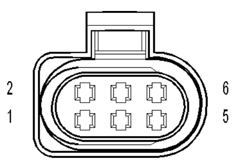
CAV	CIRCUIT	FUNCTION
1	T5 20DG/LG	AUTOSTICK UPSHIFT SWITCH SIGNAL
2	-	-
3	Z937 20BK/YL (EXCEPT EXPORT)	GROUND
3	Z941 20BK/WT (EXPORT)	GROUND
4	E12 20OR/GY	PANEL LAMPS DRIVER
5	T44 20YL/DG	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
6	Z937 20BK/YL (EXCEPT EXPORT)	GROUND
6	Z941 20BK/WT (EXPORT)	GROUND
7	Z937 20BK/YL (EXCEPT EXPORT)	GROUND
7	Z941 20BK/WT (EXPORT)	GROUND
8	K321 20BR/YL	BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK



ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH

ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH - BLACK 22 WAY

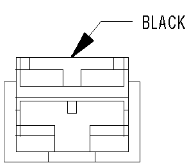
CAV	CIRCUIT	FUNCTION
1	T20 18DG/LB	LINE PRESSURE SOLENOID CONTROL
2	T19 18YL/DB	SECONDARY PRESSURE SOLENOID CONTROL
3	T59 18YL/LB	TCC SOLENOID CONTROL
4	T60 18YL/GY	TCC ON/OFF SOLENOID CONTROL
5	T72 18PK/LB	5 VOLT SUPPLY
6	Z967 18BK	GROUND
7	T50 18PK/LB	SECONDARY PRESSURE SENSOR SIGNAL
8	T314 18LB/YL	STEP MOTOR CONTROL A
9	T315 18YL/OR	STEP MOTOR CONTROL B
10	T316 18YL/WT	STEP MOTOR CONTROL C
11	T317 18TN/YL	STEP MOTOR CONTROL D
12	-	-
13	-	-
14	-	-
15	-	-
16	T313 18YL/LG	CHIP SELECT
17	T54 18RD/WT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
18	T21 18DG/YL	PRIMARY PRESSURE SENSOR SIGNAL
19	T13 18DG/VT	SENSOR GROUND
20	-	-
21	T302 18DG/BR	CLOCK SELECT
22	T327 18GY/YL	DATA IN/OUT SELECT



ASSEMBLY-VALVE BLOCK (DIESEL)

ASSEMBLY-VALVE BLOCK (DIESEL) - 6 WAY

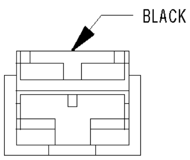
CAV	CIRCUIT	FUNCTION
1	K344 20BR/GY	FUSED MAIN RELAY OUTPUT
2	K53 20DB/LG	EGR COOLER BYPASS CONTROL
3	K344 20BR/GY	FUSED MAIN RELAY OUTPUT
4	K344 20BR/GY	FUSED MAIN RELAY OUTPUT
5	K137 20DB/OR	BOOST PRESSURE CONTROL
6	K35 20DB/VT	EGR SOLENOID CONTROL



BACKLITE-ELECTRIC HEATED (GROUND)

BACKLITE-ELECTRIC HEATED (GROUND) - BLACK 1 WAY

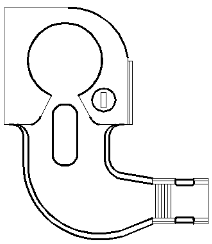
CAV	CIRCUIT	FUNCTION
1	Z960 12BK	GROUND



BACKLITE-ELECTRIC HEATED (POWER)

BACKLITE-ELECTRIC HEATED (POWER) - BLACK 1 WAY

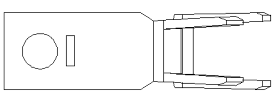
CAV	CIRCUIT	FUNCTION
1	C515 12LB/OR	REAR WINDOW DEFOGGER CONTROL OUTPUT



BATTERY-NEGATIVE (DIESEL)

BATTERY-NEGATIVE (DIESEL) - 1 WAY

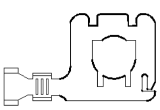
CAV	CIRCUIT	FUNCTION
1	Z901 4BK	GROUND
1	Z912 6BK	GROUND



BATTERY-NEGATIVE (GAS)

BATTERY-NEGATIVE (GAS) - 1 WAY

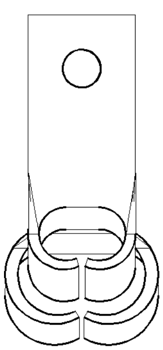
CAV	CIRCUIT	FUNCTION
1	Z901 4BK	GROUND
1	Z912 4BK	GROUND



BATTERY-POSITIVE (DIESEL)

BATTERY-POSITIVE (DIESEL) - 1 WAY

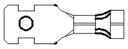
CAV	CIRCUIT	FUNCTION
1	A0 6RD	B(+)
1	A0 4RD	B(+)



BATTERY-POSITIVE (GAS)

BATTERY-POSITIVE (GAS) - 1 WAY

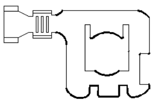
CAV	CIRCUIT	FUNCTION
1	A0 4RD	B(+)



BATTERY-POSITIVE (GAS)

BATTERY-POSITIVE (GAS) - 1 WAY

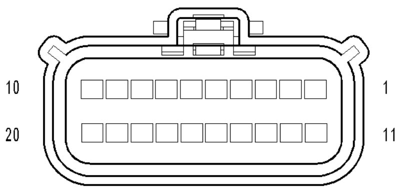
CAV	CIRCUIT	FUNCTION
1	A0 6RD	B(+)



BATTERY-POSITIVE (DIESEL)

BATTERY-POSITIVE (DIESEL) - 1 WAY

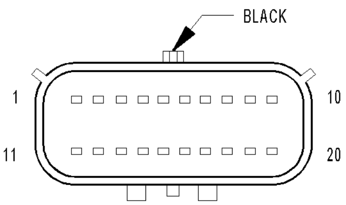
CAV	CIRCUIT	FUNCTION
1	A281 16DB	B(+)
1	A282 16DB	B(+)



C100 (DIESEL)

C100 (DIESEL) - BLACK (POWERTRAIN SIDE) 20 WAY

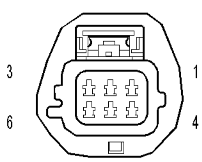
CAV	CIRCUIT	FUNCTION
1	G6 20VT/GY	EOP SIGNAL
2	N1 20DB/OR	FUEL PUMP CONTROL OUTPUT
3	Z924 18BK	GROUND
4	K343 20BR/YL	FUSED MAIN RELAY OUTPUT
5	K344 20BR/GY	FUSED MAIN RELAY OUTPUT
6	V71 20VT/OR	S/C SIGNAL 1
7	A202 16RD/WT	GLOW PLUG 1 CONTROL
8	A203 16RD	GLOW PLUG 2 CONTROL
9	A204 16RD/YL	GLOW PLUG 3 CONTROL
10	A208 16RD/OR	GLOW PLUG 4 CONTROL
11	K957 20BR/OR	MAF SENSOR GROUND
12	T750 16YL/GY	STARTER CONTROL OUTPUT
13	K157 20BR/OR	MAF SENSOR SIGNAL
14	K92 20BR	GEN OUTPUT SIGNAL
15	G329 20VT/OR	CHARGE INDICATOR SIGNAL
16	F855 20PK/YL	5 VOLT SUPPLY
17	K35 20DB/VT	EGR SOLENOID CONTROL
18	-	-
19	-	-
20	-	-



C100
(DIESEL)

C100 (DIESEL) - BLACK (ENGINE COMPARTMENT SIDE) 20 WAY

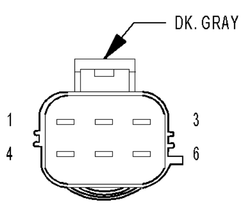
CAV	CIRCUIT	FUNCTION
1	G6 16VT/GY	EOP SIGNAL
2	N1 20DB/OR	FUEL PUMP CONTROL OUTPUT
3	Z909 16BK/WT	GROUND
4	K343 18DB/LG	FUSED MAIN RELAY OUTPUT
5	K344 18DB/LB	FUSED MAIN RELAY OUTPUT
6	V71 20VT/OR	S/C SIGNAL 1
7	A202 14RD/WT	GLOW PLUG 1 CONTROL
8	A203 14RD/BR	GLOW PLUG 2 CONTROL
9	A204 14RD/YL	GLOW PLUG 3 CONTROL
10	A208 14RD/OR	GLOW PLUG 4 CONTROL
11	K957 20BK/OR	MAF SENSOR GROUND
12	T750 16YL/GY	STARTER CONTROL OUTPUT
13	K157 20BR/OR	MAF SENSOR SIGNAL
14	K92 20BR/YL	GEN OUTPUT SIGNAL
15	G329 20VT/OR	CHARGE INDICATOR SIGNAL
16	F855 20PK/YL	5 VOLT SUPPLY
17	K35 20DB/VT	EGR SOLENOID CONTROL
18	-	-
19	-	-
20	-	-



C100
(GAS)

C100 (GAS) - DK. GRAY (ENGINE COMPARTMENT SIDE) 6 WAY

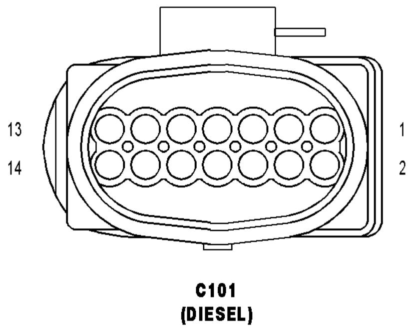
CAV	CIRCUIT	FUNCTION
1	-	-
2	A804 16RD/GY	GEN SENSE
3	Z909 16BK/WT	GROUND
4	K343 18DB/LG	FUSED MAIN RELAY OUTPUT
5	K344 18DB/LB	FUSED MAIN RELAY OUTPUT
6	T750 16YL/GY	STARTER CONTROL OUTPUT



C100
(GAS)

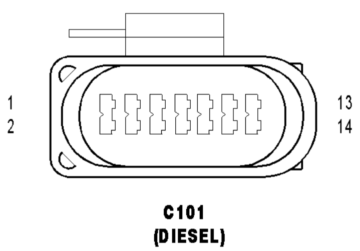
C100 (GAS) - DK. GRAY (POWERTRAIN SIDE) 6 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	A804 16RD/GY	GEN SENSE
3	Z916 16BK	GROUND
4	K343 16BR/YL	FUSED MAIN RELAY OUTPUT
5	K344 18BR/GY	FUSED MAIN RELAY OUTPUT
6	T750 16YL/GY	STARTER CONTROL OUTPUT



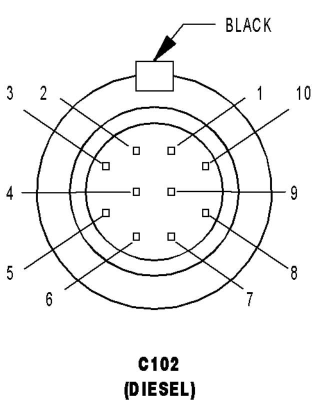
C101 (DIESEL) - BLACK (POWERTRAIN SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	K844 20DB/YL	CMP SENSOR 5 VOLT SUPPLY
2	K44 20DB/GY	CMP 1/1 SIGNAL
3	K944 20BK/GY	CMP SENSOR GROUND
4	K853 20DB/BR	CKP SENSOR 5 VOLT SUPPLY
5	K24 20BR/LB	CKP SENSOR SIGNAL
6	K925 20DB/GY	CKP SENSOR GROUND
7	G6 20VT/GY	EOP SIGNAL
8	K343 20BR/YL	FUSED MAIN RELAY OUTPUT
9	K601 20BR/VT	EGR AIR FLOW CONTROL VALVE CONTROL
10	K604 20BR/WT	EGR AIR FLOW CONTROL VALVE SIGNAL
11	Z924 20BK	GROUND
12	-	-
13	-	-
14	-	-



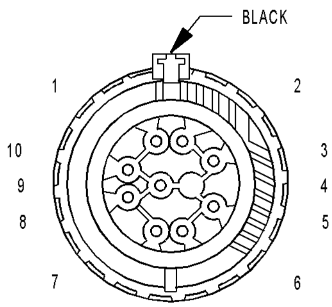
C101 (DIESEL) - BLACK (ENGINE SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	K844 20DB/YL	CMP SENSOR 5 VOLT SUPPLY
2	K44 20DB/GY	CMP 1/1 SIGNAL
3	K944 20BK/GY	CMP SENSOR GROUND
4	K853 20DB/BR	CKP SENSOR 5 VOLT SUPPLY
5	K24 20BR/LB	CKP SENSOR SIGNAL
6	K925 20DB/WT	CKP SENSOR GROUND
7	G6 20VT/GY	EOP SIGNAL
8	K343 16BR/YL	FUSED MAIN RELAY OUTPUT
9	K601 16BR/VT	EGR AIR FLOW CONTROL VALVE CONTROL
10	K604 20BR/WT	EGR AIR FLOW CONTROL VALVE SIGNAL
11	Z924 16BK	GROUND
12	-	-
13	-	-
14	-	-



C102 (DIESEL) - BLACK (INJECTOR SIDE) 10 WAY

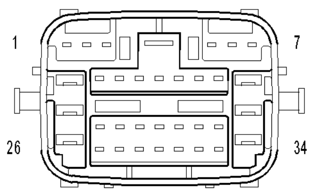
CAV	CIRCUIT	FUNCTION
1	K614 16BR/LB	FUEL INJECTOR 4 LOW-SIDE CONTROL
2	K613 16BR/WT	FUEL INJECTOR 3 LOW-SIDE CONTROL
3	A203 16BK/DB	GLOW PLUG 2 CONTROL
4	-	-
5	A202 16BK/RD	GLOW PLUG 1 CONTROL
6	K612 16BR/LG	FUEL INJECTOR 2 LOW-SIDE CONTROL
7	K611 16BR/RD	FUEL INJECTOR 1 LOW-SIDE CONTROL
8	A204 16BK/DG	GLOW PLUG 3 CONTROL
9	K663 14BR/YL	FUEL INJECTOR HIGH-SIDE COMMON
10	A208 16BK/GY	GLOW PLUG 4 CONTROL



C102 (DIESEL)

C102 (DIESEL) - BLACK (POWERTRAIN SIDE) 10 WAY

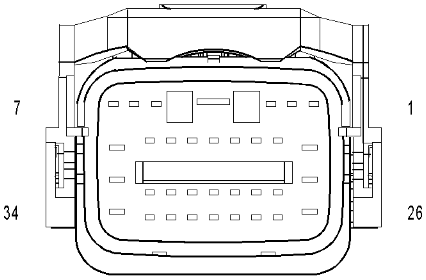
CAV	CIRCUIT	FUNCTION
1	K614 14WT/BR	FUEL INJECTOR 4 LOW-SIDE CONTROL
2	K613 16GY/BR	FUEL INJECTOR 3 LOW-SIDE CONTROL
3	A203 16RD	GLOW PLUG 2 CONTROL
4	-	-
5	A202 16RD/WT	GLOW PLUG 1 CONTROL
6	K612 14YL/BR	FUEL INJECTOR 2 LOW-SIDE CONTROL
7	K611 14OR/BR	FUEL INJECTOR 1 LOW-SIDE CONTROL
8	A204 16RD/YL	GLOW PLUG 3 CONTROL
9	K663 20BR/GY	FUEL INJECTOR HIGH-SIDE COMMON
10	A208 16RD/OR	GLOW PLUG 4 CONTROL



C103

C103 - BLACK (BODY SIDE) 34 WAY

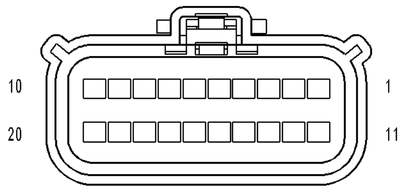
CAV	CIRCUIT	FUNCTION
1	D264 20DB/WT	CAN C BUS (-)
2	D265 20DB/WT	CAN C BUS (+)
3	B15 18DG/WT	BRAKE SIGNAL 1
4	K542 12BR	MAIN RELAY OUTPUT
5	B2 20DG/LB	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
6	B1 20DG/OR	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
7	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
8	B1 20DG/PK	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
9	-	-
10	N1 18DB/OR (DIESEL)	FUEL PUMP CONTROL OUTPUT
10	K107 18VT/WT (GAS EXCEPT EXPORT)	ESM SIGNAL
11	B2 20DG/TN	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
12	-	-
13	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL
14	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL
15	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
16	R82 20WT/BK	RIGHT FRONT IMPACT SENSOR GROUND
17	-	-
18	V71 20VT/OR	S/C SIGNAL 1
19	V72 20OR/VT	S/C SIGNAL 2
20	V937 20VT/BR	S/C SWITCH GROUND
21	-	-
22	F963 20PK/DB (CVT)	START ENABLE
23	F962 20PK/BK (CVT)	IGNITION SWITCH OUTPUT (START)
24	A414 20RD/LG	FUSED B(+) (I.O.D.)
25	B215 20DG/OR	BRAKE SIGNAL 2
26	L161 18WT/LG	LEFT TURN SIGNAL (OUT)
27	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
28	D465 20WT/DB	DYNAMICS SENSOR HIGH DATA LINK
29	D464 20WT/YL	DYNAMICS SENSOR LOW DATA LINK
30	D64 20WT/LB	CAN C BUS (-)
31	D65 20WT/BK	CAN C BUS (+)
32	-	-
33	K132 20DB/LB (DIESEL)	CABIN HEATER RELAY 1 CONTROL
33	K914 18BR/WT (GAS)	SENSOR GROUND
34	K232 20BR/LB (DIESEL)	CABIN HEATER RELAY 2 CONTROL
34	K75 18WT/OR (GAS)	VEHICLE SPEED SIGNAL



C103

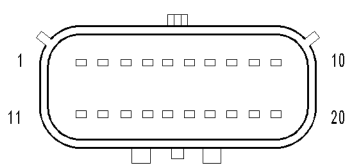
C103 - BLACK (ENGINE COMPARTMENT SIDE) 34 WAY

CAV	CIRCUIT	FUNCTION
1	D264 20DB/WT	CAN C BUS (-)
2	D265 20WT/BK	CAN C BUS (+)
3	B15 20DG/WT	BRAKE SIGNAL 1
4	K542 12BR	MAIN RELAY OUTPUT
5	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
6	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
7	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
8	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
9	-	-
10	N1 20DB/OR (DIESEL)	FUEL PUMP CONTROL OUTPUT
10	K107 20VT/WT (GAS EXCEPT EXPORT)	ESM SIGNAL
11	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
12	-	-
13	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL
14	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL
15	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
16	R82 20WT/OR	RIGHT FRONT IMPACT SENSOR GROUND
17	-	-
18	V71 20VT/OR	S/C SIGNAL 1
19	V72 20OR/VT	S/C SIGNAL 2
20	V937 20VT/BR	S/C SWITCH GROUND
21	-	-
22	F963 20PK/DB	START ENABLE
23	F962 20PK/BK	IGNITION SWITCH OUTPUT (START)
24	A414 18RD/LB	FUSED B(+) (I.O.D.)
25	B215 20DG/OR	BRAKE SIGNAL 2
26	L161 20WT/LG	LEFT TURN SIGNAL (OUT)
27	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
28	D465 20WT/DB	DYNAMICS SENSOR HIGH DATA LINK
29	D464 20WT/YL	DYNAMICS SENSOR LOW DATA LINK
30	D64 20WT/LB	CAN C BUS (-)
31	D65 20WT/BK	CAN C BUS (+)
32	-	-
33	K132 20DB/LB (DIESEL)	CABIN HEATER RELAY 1 CONTROL
33	K914 20DB/PK (GAS)	SENSOR GROUND
34	K232 20BR/LB (DIESEL)	CABIN HEATER RELAY 2 CONTROL
34	K75 20DB/OR (GAS)	VEHICLE SPEED SIGNAL



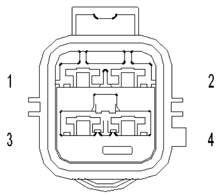
C104 - BLACK (ENGINE COMPARTMENT SIDE) 20 WAY

CAV	CIRCUIT	FUNCTION
1	B3 20LG/DB (ABS)	LEFT REAR WHEEL SPEED SENSOR SIGNAL
2	B4 20LG (ABS)	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
3	K852 20BR/VT (DIESEL)	5 VOLT SUPPLY
4	K854 20VT/BR (DIESEL)	5 VOLT SUPPLY
5	D96 20WT/BR (EXPORT)	SIREN SIGNAL CONTROL
6	K167 20BR/YL	APP SENSOR GROUND 1
7	K23 20BR/OR	APP SIGNAL 1
8	K29 20WT/BR	APP SIGNAL 2
9	K400 20BR/VT	APP SENSOR GROUND 2
10	T16 16YL/OR (CVT)	TRANSMISSION CONTROL OUTPUT
11	T22 20YL/VT	BACKUP LAMP SWITCH SIGNAL
12	F856 20YL/PK (GAS)	5 VOLT SUPPLY
13	F936 20PK/YL (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN)
13	K858 20BR/GY (GAS)	5 VOLT SUPPLY
14	F961 20PK/LB (DIESEL)	IGNITION SWITCH OUTPUT (START)
15	A935 20RD/LB	FUSED B(+)
16	T141 20YL/RD	CLUTCH INTERLOCK SIGNAL
17	T26 20DG/OR (DIESEL)	CLUTCH UPSTOP SWITCH SIGNAL
18	G4 18VT/LB (ESP)	DYNAMICS SENSOR SUPPLY
19	-	-
20	G94 18VT/DB (ESP)	DYNAMICS SENSOR GROUND



C104 - BLACK (BODY SIDE) 20 WAY

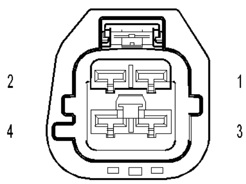
CAV	CIRCUIT	FUNCTION
1	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL
2	B4 20LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
3	K852 20BR/VT (DIESEL)	5 VOLT SUPPLY
4	K854 20VT/BR (DIESEL)	5 VOLT SUPPLY
5	D96 20WT/BR (EXPORT)	SIREN SIGNAL CONTROL
6	K167 20BR/YL	APP SENSOR GROUND 1
7	K23 20BR/OR	APP SIGNAL 1
8	K29 20WT/BR	APP SIGNAL 2
9	K400 20BR/VT	APP SENSOR GROUND 2
10	T16 18YL/OR (CVT)	TRANSMISSION CONTROL OUTPUT
11	T22 20YL/VT (DIESEL)	BACKUP LAMP SWITCH SIGNAL
11	T22 18YL/VT (GAS MTX)	BACKUP LAMP SWITCH SIGNAL
12	F856 20YL/PK (GAS)	5 VOLT SUPPLY
13	F936 20PK/BK (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN)
13	K858 20BR/GY (GAS)	5 VOLT SUPPLY
14	F961 20PK/LB (DIESEL)	IGNITION SWITCH OUTPUT (START)
15	A935 20RD	FUSED B(+)
16	T141 20YL/OR (MTX)	CLUTCH INTERLOCK SIGNAL
17	T26 20DG/OR (DIESEL)	CLUTCH UPSTOP SWITCH SIGNAL
18	G4 18VT/LB (ESP)	DYNAMICS SENSOR SUPPLY
19	-	-
20	G94 18VT/LB (ESP)	DYNAMICS SENSOR GROUND



C105

C105 - DK. GRAY (BODY SIDE) 4 WAY

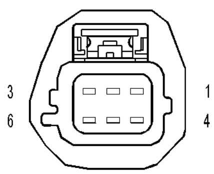
CAV	CIRCUIT	FUNCTION
1	A14 12RD/YL	FUSED B(+)
2	A16 12RD/BR	FUSED B(+)
3	A283 10RD/YL	FUSED B(+)
4	A284 10RD/LB	FUSED B(+)



C105

C105 - DK. GRAY (ENGINE COMPARTMENT SIDE) 4 WAY

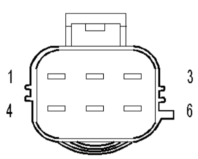
CAV	CIRCUIT	FUNCTION
1	A14 12RD/YL	FUSED B(+)
2	A16 12RD/BR	FUSED B(+)
3	A283 10RD/YL	FUSED B(+)
4	A284 10RD/LB	FUSED B(+)



C106
(CVT)

C106 (CVT) - BLACK (BODY SIDE) 6 WAY

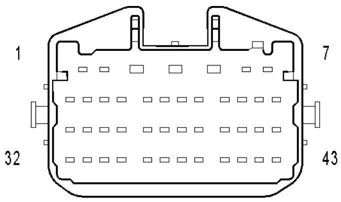
CAV	CIRCUIT	FUNCTION
1	T13 18DG/VT	SENSOR GROUND
2	T14 18DG/BK	INPUT SPEED SENSOR SIGNAL
3	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
4	-	-
5	T52 18DG/WT	OUTPUT SPEED SENSOR SIGNAL
6	T130 18TN/DG	OUTPUT SPEED SENSOR GROUND



C106
(CVT)

C106 (CVT) - BLACK (TRANSMISSION SIDE) 6 WAY

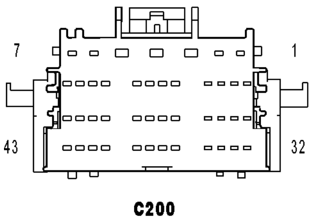
CAV	CIRCUIT	FUNCTION
1	T13 18DG/TN	SENSOR GROUND
2	T14 18DG/BK	INPUT SPEED SENSOR SIGNAL
3	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
4	-	-
5	T52 18DG/WT	OUTPUT SPEED SENSOR SIGNAL
6	T130 18TN/DG	OUTPUT SPEED SENSOR GROUND



C200

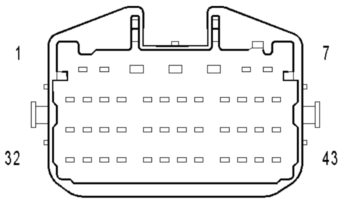
C200 - BLACK (INSTRUMENT PANEL SIDE) 43 WAY

CAV	CIRCUIT	FUNCTION
1	G78 20VT/LB	LIFTGATE AJAR SWITCH SENSE
2	P237 18DG/TN	SECONDARY UNLOCK DRIVER
3	P235 18LG/TN	SECONDARY LOCK DRIVER
4	D54 20WT/PK	CAN B BUS (-)
5	D55 20WT/OR	CAN B BUS (+)
6	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
7	F996 14PK/YL (OPTION 1)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
7	F996 20PK/YL (OPTION 2)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
8	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
9	D96 20WT/BR	SIREN SIGNAL CONTROL
10	F929 20PK/RD	FUSED IGNITION SWITCH OUTPUT (RUN)
11	P33 18TN/DB (LHD)	DOOR LOCK DRIVER
11	P33 18LG/TN (RHD)	DOOR LOCK DRIVER
12	P240 18TN/WT	PASSENGER DOOR UNLOCK DRIVER
13	F986 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
14	X60 20GY/RD	POWER ANTENNA SIGNAL
15	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
16	N4 20DB/WT	FUEL LEVEL SIGNAL 1
17	G75 20VT/BK	LEFT FRONT DOOR AJAR SWITCH SENSE
18	R9 18LB/YL	DRIVER KNEE BLOCKER SQUIB LINE 2
19	R11 18LB/DB	DRIVER KNEE BLOCKER SQUIB LINE 1
20	R43 18LG/BR	DRIVER SQUIB 1 LINE 2
21	-	-
22	D508 20WT/GY	COM-LIN TIRE PRESSURE MONITOR LAN
23	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
24	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
25	-	-
26	-	-
27	L53 20DG/GY	STOP LAMP SWITCH OUTPUT
28	N5 20DB/BK	FUEL LEVEL SIGNAL 2
29	-	-
30	P697 20LG/DG	DOOR LOCK SWITCH MUX
31	R42 18LB/BR	PASSENGER SQUIB 1 LINE 2
32	-	-
33	R44 18LB/OR	PASSENGER SQUIB 1 LINE 1
34	R45 18LG/RD	DRIVER SQUIB 1 LINE 1
35	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
36	R58 20LB/GY	PASSENGER SEAT BELT SWITCH SENSE
37	-	-
38	-	-
39	P238 18TN/DG	DRIVER DOOR UNLOCK DRIVER
40	-	-
41	D506 20WT/DG (HEATED SEATS)	LIN BUS
42	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
43	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



C200 - BLACK (BODY SIDE) 43 WAY

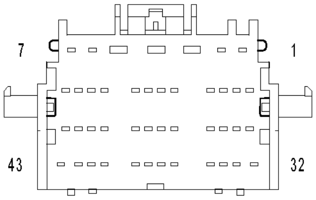
CAV	CIRCUIT	FUNCTION
1	G78 20VT/LB	LIFTGATE AJAR SWITCH SENSE
2	P235 18LG/TN	SECONDARY LOCK DRIVER
3	P237 18DG/TN	SECONDARY UNLOCK DRIVER
4	D54 20WT/PK	CAN B BUS (-)
5	D55 20WT/OR	CAN B BUS (+)
6	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
7	F996 14PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
8	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
9	D96 20WT/BR	SIREN SIGNAL CONTROL
10	F929 18PK/RD (EXCEPT EXPORT)	FUSED IGNITION SWITCH OUTPUT (RUN)
10	F929 20PK/RD (EXPORT)	FUSED IGNITION SWITCH OUTPUT (RUN)
11	P33 20LG/TN	DOOR LOCK DRIVER
12	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
13	F986 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
14	X60 18GY/RD	POWER ANTENNA SIGNAL
15	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
16	N4 20DB/WT	FUEL LEVEL SIGNAL 1
17	G75 20VT/BK	LEFT FRONT DOOR AJAR SWITCH SENSE
18	R9 18LB/YL	DRIVER KNEE BLOCKER SQUIB LINE 2
19	R11 18LB/DB	DRIVER KNEE BLOCKER SQUIB LINE 1
20	R43 18LG/BR	DRIVER SQUIB 1 LINE 2
21	-	-
22	D508 20WT/GY	COM-LIN TIRE PRESSURE MONITOR LAN
23	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
24	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
25	-	-
26	-	-
27	L53 18DG/GY	STOP LAMP SWITCH OUTPUT
28	N5 20DB/WT	FUEL LEVEL SIGNAL 2
29	-	-
30	P697 20LG/DG	DOOR LOCK SWITCH MUX
31	R42 18LB/BR	PASSENGER SQUIB 1 LINE 2
32	-	-
33	R44 18LB/OR	PASSENGER SQUIB 1 LINE 1
34	R45 18LG/RD	DRIVER SQUIB 1 LINE 1
35	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
36	-	-
37	-	-
38	-	-
39	P238 18LG/OR	DRIVER DOOR UNLOCK DRIVER
40	-	-
41	D506 20WT/DG (HEATED SEATS)	LIN BUS
42	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
43	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



C201

C201 - LT. GRAY (INSTRUMENT PANEL SIDE) 43 WAY

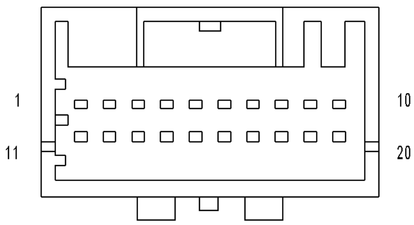
CAV	CIRCUIT	FUNCTION
1	A411 20RD/LG	FUSED B(+) (I.O.D.)
2	A412 20RD/DB	FUSED B(+) (I.O.D.)
3	A413 18RD/LB	FUSED B(+) (I.O.D.)
4	A415 20RD/TN	FUSED B(+) (I.O.D.)
5	A417 20RD/DG	FUSED B(+) (I.O.D.)
6	A418 20RD/BK	FUSED B(+) (I.O.D.)
7	T44 20YL/DG	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
8	T5 20DG/LG	AUTOSTICK UPSHIFT SWITCH SIGNAL
9	V71 20VT/OR	S/C SIGNAL 1
10	V72 20OR/VT	S/C SIGNAL 2
11	V937 20VT/LG	S/C SWITCH GROUND
12	A932 16RD/BR	DOOR LOCK POWER-FUSED B(+)
13	A952 20RD/OR	FUSED B(+)
14	R64 18LB/WT	PASSENGER SQUIB 2 LINE 1
15	-	-
16	A927 20RD/GY (EXCEPT SUNROOF)	FUSED B(+)
16	A927 16RD/GY (SUNROOF)	FUSED B(+)
17	-	-
18	A935 20RD	FUSED B(+)
19	A999 16RD/PK	FUSED B(+)
20	X298 20GY/LG	RIGHT INSTRUMENT PANEL SPEAKER (-)
21	X201 18GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
22	X291 18GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
23	X202 18DG/VT (BASE)	RIGHT FRONT DOOR SPEAKER (+)
24	X292 18DG/YL (BASE)	RIGHT FRONT DOOR SPEAKER (-)
25	X51 18DG/DB	LEFT REAR SPEAKER (+)
26	X52 18GY/DB	RIGHT REAR SPEAKER (+)
27	X58 18GY/OR	RIGHT REAR SPEAKER (-)
28	F961 20PK/LB	IGNITION SWITCH OUTPUT (START)
29	R61 18LG/VT	DRIVER SQUIB 2 LINE 2
30	R62 18LB/VT	PASSENGER SQUIB 2 LINE 2
31	R63 18LG/BK	DRIVER SQUIB 2 LINE 1
32	-	-
33	D264 20DB/WT	CAN C BUS (-)
34	D265 20DB	CAN C BUS (+)
35	X57 18DG/BR	LEFT REAR SPEAKER (-)
36	-	-
37	-	-
38	-	-
39	-	-
40	X208 20GY/DG	RIGHT INSTRUMENT PANEL SPEAKER (+)
41	X209 20GY/TN	LEFT INSTRUMENT PANEL SPEAKER (+)
42	X299 20GY/BR	LEFT INSTRUMENT PANEL SPEAKER (-)
43	C7 14DB/PK	BLOWER MOTOR CONTROL



C201

C201 - LT. GRAY (BODY SIDE) 43 WAY

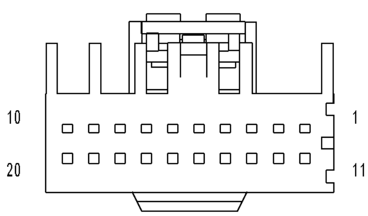
CAV	CIRCUIT	FUNCTION
1	A411 20RD/LG	FUSED B(+) (I.O.D.)
2	A412 20RD/DB	FUSED B(+) (I.O.D.)
3	A413 18RD/LB	FUSED B(+) (I.O.D.)
4	A415 20RD/TN	FUSED B(+) (I.O.D.)
5	A417 20RD/DG	FUSED B(+) (I.O.D.)
6	A418 20RD/BK	FUSED B(+) (I.O.D.)
7	T44 20YL/DG	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
8	T5 20DG/LG	AUTOSTICK UPSHIFT SWITCH SIGNAL
9	V71 20VT/OR	S/C SIGNAL 1
10	V72 20OR/VT	S/C SIGNAL 2
11	V937 20VT/BR	S/C SWITCH GROUND
12	A932 16RD/BR	DOOR LOCK POWER-FUSED B(+)
13	A952 20RD/OR	FUSED B(+)
14	R64 18LB/WT	PASSENGER SQUIB 2 LINE 1
15	-	-
16	A927 16RD/GY	FUSED B(+)
17	-	-
18	A935 20RD	FUSED B(+)
19	A999 16RD/WT	FUSED B(+)
20	X298 18GY/LG	RIGHT INSTRUMENT PANEL SPEAKER (-)
21	X201 18GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
22	X291 18GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
23	X202 18DG/VT (BASE)	RIGHT FRONT DOOR SPEAKER (+)
24	X292 18DG/YL (BASE)	RIGHT FRONT DOOR SPEAKER (-)
25	X51 18DG/DB	LEFT REAR SPEAKER (+)
26	X52 18GY/DB	RIGHT REAR SPEAKER (+)
27	X58 18GY/OR	RIGHT REAR SPEAKER (-)
28	F961 20PK/LB	IGNITION SWITCH OUTPUT (START)
29	R61 18LG/VT	DRIVER SQUIB 2 LINE 2
30	R62 18LB/VT	PASSENGER SQUIB 2 LINE 2
31	R63 18LG/BK	DRIVER SQUIB 2 LINE 1
32	-	-
33	D264 20DB/WT	CAN C BUS (-)
34	D265 20DB/WT	CAN C BUS (+)
35	X57 18DG/BR	LEFT REAR SPEAKER (-)
36	-	-
37	-	-
38	-	-
39	-	-
40	X208 18GY/DG	RIGHT INSTRUMENT PANEL SPEAKER (+)
41	X209 18GY/TN	LEFT INSTRUMENT PANEL SPEAKER (+)
42	X299 18GY/BR	LEFT INSTRUMENT PANEL SPEAKER (-)
43	C7 14DB/PK	BLOWER MOTOR CONTROL



C202

C202 - LT. GRAY (HEADLINER SIDE) 20 WAY

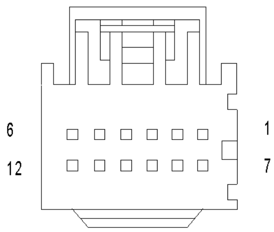
CAV	CIRCUIT	FUNCTION
1	X712 20DG/LB (HANDS FREE)	MICROPHONE 1 IN(+)
1	A415 20RD/TN (PREMIUM SECURITY)	FUSED B(+) (I.O.D.)
2	X722 20LB/DG	MICROPHONE 2 IN(+)
3	X730 20GY/YL (HANDS FREE)	VOICE RECOGNITION/PHONE SWITCH SIGNAL
3	D54 20WT/PK (PREMIUM SECURITY)	CAN B BUS (-)
4	X792 20BK/VT (HANDS FREE)	MICROPHONE IN(-)
4	D55 20WT/OR (PREMIUM SECURITY)	CAN B BUS (+)
5	X793 20DG/YL (HANDS FREE)	MICROPHONE FEED
5	D96 20WT/LB (PREMIUM SECURITY)	SIREN SIGNAL CONTROL
6	X835 20BK/DB	SENSOR GROUND
7	Z936 20BK/LB	GROUND
8	Z941 20BK/YL	GROUND
9	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
10	A417 20RD/DG	FUSED B(+) (I.O.D.)
11	G38 18GY/BK	UGDO ENABLE CONTROL CIRCUIT
12	M24 20YL/WT	COURTESY LAMPS DRIVER
13	M27 20YL/LB	READING/RAIL LAMPS DRIVER
14	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
15	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE
16	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
17	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
18	-	-
19	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
20	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



C202

C202 - LT. GRAY (INSTRUMENT PANEL SIDE) 20 WAY

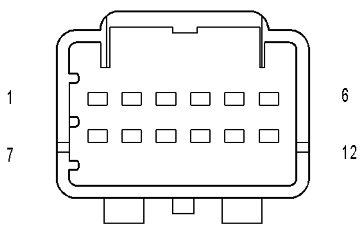
CAV	CIRCUIT	FUNCTION
1	X712 20DG/LB (HANDS FREE)	MICROPHONE 1 IN(+)
1	A415 20RD/TN (PREMIUM SECURITY)	FUSED B(+) (I.O.D.)
2	X722 20LB/DG	MICROPHONE 2 IN(+)
3	X730 20GY/YL (HANDS FREE)	VOICE RECOGNITION/PHONE SWITCH SIGNAL
3	D54 20WT/PK (PREMIUM SECURITY)	CAN B BUS (-)
4	X792 20LB/TN (HANDS FREE)	MICROPHONE IN(-)
4	D55 20WT/OR (PREMIUM SECURITY)	CAN B BUS (+)
5	X793 20DG/YL (HANDS FREE)	MICROPHONE FEED
5	D96 20WT/BR (PREMIUM SECURITY)	SIREN SIGNAL CONTROL
6	X835 20OR/BK	SENSOR GROUND
7	Z936 20BK/LB	GROUND
8	Z941 16BK/WT (OPTION 1)	GROUND
8	Z941 20BK/WT (OPTION 2)	GROUND
9	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
10	A417 20RD/DG	FUSED B(+) (I.O.D.)
11	G38 20GY	UGDO ENABLE CONTROL CIRCUIT
12	M24 20YL/WT	COURTESY LAMPS DRIVER
13	M27 20YL/LB	READING/RAIL LAMPS DRIVER
14	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
15	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE
16	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
17	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
18	-	-
19	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
20	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)



C203

C203 - LT. GRAY (A-PILLAR JUMPER SIDE) 12 WAY

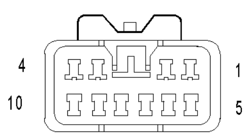
CAV	CIRCUIT	FUNCTION
1	A927 16RD	FUSED B(+)
2	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
3	-	-
4	-	-
5	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
6	F996 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
7	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE
8	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
9	Z937 16BK	GROUND
10	-	-
11	-	-
12	-	-



C203

C203 - LT. GRAY (INSTRUMENT PANEL SIDE) 12 WAY

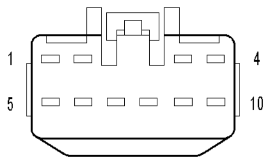
CAV	CIRCUIT	FUNCTION
1	A927 20RD/GY (EXCEPT SUNROOF)	FUSED B(+)
1	A927 16RD/GY (SUNROOF)	FUSED B(+)
2	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
3	-	-
4	-	-
5	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
6	F996 20PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
7	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE
8	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
9	Z937 16BK/YL	GROUND
10	-	-
11	-	-
12	-	-



C204

C204 - NATURAL (INSTRUMENT PANEL SIDE) 10 WAY

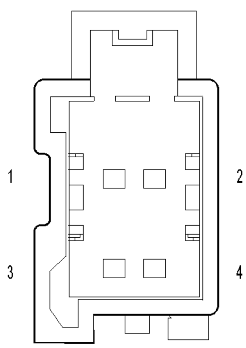
CAV	CIRCUIT	FUNCTION
1	-	-
2	E12 20OR/GY	PANEL LAMPS DRIVER
3	Z937 20BK/YL	GROUND
4	F996 20PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P801 18LG/PK	110 VOLT AC LINE 1
6	P805 18LG/DB (OPTION 1)	INVERTER ENABLE SWITCH SIGNAL
6	P805 18LG/LB (OPTION 2)	INVERTER ENABLE SWITCH SIGNAL
7	P809 18LG/LB (OPTION 1)	110 VOLT AC COMMON
7	P809 18LG (OPTION 2)	110 VOLT AC COMMON
8	-	-
9	-	-
10	-	-



C204

C204 - NATURAL (CENTER CONSOLE SIDE) 10 WAY

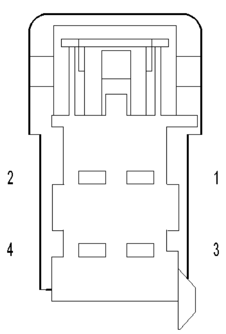
CAV	CIRCUIT	FUNCTION
1	-	-
2	E12 20OR/GY	PANEL LAMPS DRIVER
3	Z937 20BK	GROUND
4	F996 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P801 18LG	110 VOLT AC LINE 1
6	P805 18LG/LB	INVERTER ENABLE SWITCH SIGNAL
7	P809 18LG/TN	110 VOLT AC COMMON
8	-	-
9	-	-
10	-	-



C300

C300 - LT. GRAY (BODY SIDE) 4 WAY

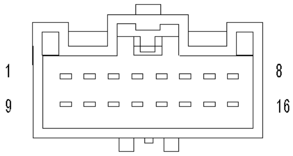
CAV	CIRCUIT	FUNCTION
1	K107 18VT/WT	ESM SIGNAL
2	Z965 20BK/GY	GROUND
3	T312 20YL/VT	REAR DIFFERENTIAL SOLENOID CONTROL
4	T78 20YL/BK	SOLENOID SUPPLY VOLTAGE



C300

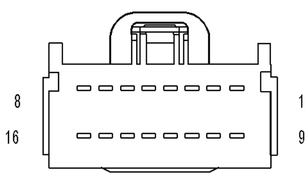
C300 - LT. GRAY (DIFF VENT JUMPER SIDE) 4 WAY

CAV	CIRCUIT	FUNCTION
1	K106 18VT/LB	ESM SIGNAL
2	Z965 20BK	GROUND
3	T312 20YL/VT	REAR DIFFERENTIAL SOLENOID CONTROL
4	T78 20YL	SOLENOID SUPPLY VOLTAGE



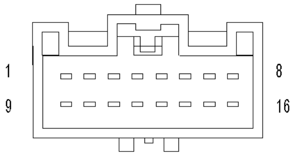
C301 (LHD) - GREEN (LEFT FRONT DOOR SIDE) 16 WAY

CAV	CIRCUIT	FUNCTION
1	G75 20VT (BASE/HEATED MIRRORS)	LEFT FRONT DOOR AJAR SWITCH SENSE
1	G75 20VT/BK (EXCEPT BASE/HEATED MIRRORS)	LEFT FRONT DOOR AJAR SWITCH SENSE
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P238 20LG/OR	DRIVER DOOR UNLOCK DRIVER
4	P697 20LG/DG	DOOR LOCK SWITCH MUX
5	-	-
6	Z929 18BK (HEATED MIRRORS)	GROUND
6	Z961 20BK/YL (POWER LOCKS EXCEPT HEATED MIRRORS)	GROUND
7	-	-
8	P74 20TN/OR	RIGHT MIRROR HORIZONTAL DRIVER
9	P76 20YL/PK	MIRROR COMMON DRIVER
10	X201 20GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
10	X201 18GY/VT (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
11	X291 20GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
11	X291 18GY/YL (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
12	A417 18RD (HEATED MIRRORS)	FUSED B(+) (I.O.D.)
12	A417 20RD/DG (POWER LOCKS EXCEPT HEATED MIRRORS)	FUSED B(+) (I.O.D.)
13	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
14	-	-
15	-	-
16	-	-



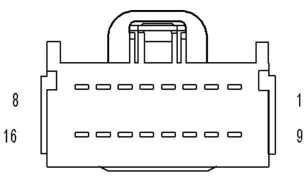
C301 (LHD) - GREEN (BODY SIDE) 16 WAY

CAV	CIRCUIT	FUNCTION
1	G75 20VT/BK	LEFT FRONT DOOR AJAR SWITCH SENSE
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P238 18LG/OR	DRIVER DOOR UNLOCK DRIVER
4	P697 20LG/DG	DOOR LOCK SWITCH MUX
5	-	-
6	Z961 20BK/YL	GROUND
7	-	-
8	P74 20TN/OR	RIGHT MIRROR HORIZONTAL DRIVER
9	P76 20TN/LB	MIRROR COMMON DRIVER
10	X201 18GY/VT (BASE AUDIO)	LEFT FRONT DOOR SPEAKER (+)
10	X153 18DG/VT (PREMIUM AUDIO)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
11	X291 18GY/YL (BASE AUDIO)	LEFT FRONT DOOR SPEAKER (-)
11	X155 18DG/BK (PREMIUM AUDIO)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
12	A417 20RD/DG	FUSED B(+) (I.O.D.)
13	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
14	-	-
15	-	-
16	-	-



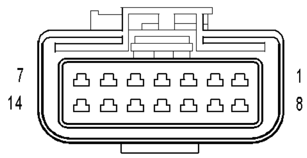
C301 (RHD) - GREEN (LEFT FRONT DOOR SIDE) 16 WAY

CAV	CIRCUIT	FUNCTION
1	G75 20VT/WT	LEFT FRONT DOOR AJAR SWITCH SENSE
2	P33 20TN/DB	DOOR LOCK DRIVER
3	P240 20TN/WT	PASSENGER DOOR UNLOCK DRIVER
4	P110 20LG/WT	FOLDING MIRROR RETURN
5	P699 20LG/DG	MIRROR-POWER FOLDING/UNFOLDING
6	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
7	P75 20TN/OR	LEFT MIRROR HORIZONTAL DRIVER
8	-	-
9	P76 20YL/PK	MIRROR COMMON DRIVER
10	X201 18GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
10	X201 18GY/VT (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
11	X291 18GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
11	X291 18GY/YL (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
12	-	-
13	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUT-PUT
14	-	-
15	P235 20LG/TN	SECONDARY LOCK DRIVER
16	P237 20DG/TN	SECONDARY UNLOCK DRIVER



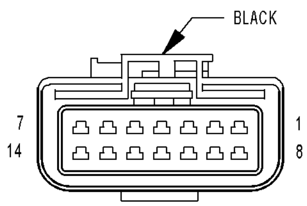
C301 (RHD) - GREEN (BODY SIDE) 16 WAY

CAV	CIRCUIT	FUNCTION
1	G75 20VT/BK	LEFT FRONT DOOR AJAR SWITCH SENSE
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
4	P110 20TN/RD	FOLDING MIRROR RETURN
5	P699 20TN/LG	MIRROR-POWER FOLDING/UNFOLDING
6	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
7	P75 20TN/LG	LEFT MIRROR HORIZONTAL DRIVER
8	-	-
9	P76 20TN/LB	MIRROR COMMON DRIVER
10	X201 18GY/VT (BASE AUDIO)	LEFT FRONT DOOR SPEAKER (+)
10	X153 18DG/VT (PREMIUM AUDIO)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
11	X291 18GY/YL (BASE AUDIO)	LEFT FRONT DOOR SPEAKER (-)
11	X155 18DG/BK (PREMIUM AUDIO)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
12	-	-
13	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUT-PUT
14	-	-
15	P235 18LG/TN	SECONDARY LOCK DRIVER
16	P237 18DG/TN	SECONDARY UNLOCK DRIVER



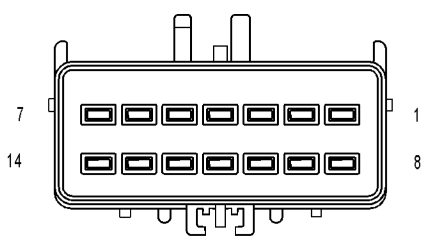
C302 (LHD) - BLACK (BODY SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
3	Q412 14OR/LG	RIGHT REAR WINDOW DRIVER (UP)
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	P72 20TN/GY	RIGHT MIRROR VERTICAL DRIVER
8	F981 14PK/BR	IGNITION SWITCH OUTPUT (RUN-ACC)
9	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
10	Q611 14OR/RD	LEFT REAR WINDOW DRIVER (DOWN)
11	-	-
12	-	-
13	-	-
14	-	-



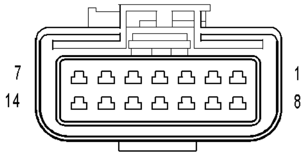
C302 (RHD) - BLACK (BODY SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	-	-
3	-	-
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-



C302 (LHD) - BLACK (LEFT FRONT DOOR SIDE) 14 WAY

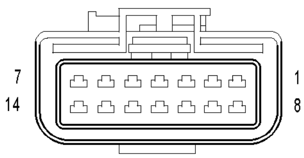
CAV	CIRCUIT	FUNCTION
1	Z960 14BK/LB (EXCEPT HEATED MIRRORS)	GROUND
1	Z928 14BK (HEATED MIRRORS EXCEPT POWER FOLDING)	GROUND
2	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
3	Q412 14OR/LB	RIGHT REAR WINDOW DRIVER (UP)
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	P72 20TN/GY	RIGHT MIRROR VERTICAL DRIVER
8	F981 14PK/YL	IGNITION SWITCH OUTPUT (RUN-ACC)
9	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
10	Q611 14OR/GY	LEFT REAR WINDOW DRIVER (DOWN)
11	-	-
12	-	-
13	-	-
14	-	-



C302 (RHD)

C302 (RHD) - BLACK (LEFT FRONT DOOR SIDE) 14 WAY

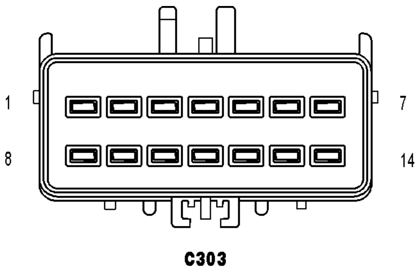
CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	-	-
3	-	-
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-



C303

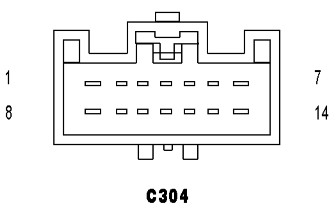
C303 - BLACK (BODY SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	P33 20LG/TN (LHD)	DOOR LOCK DRIVER
2	Z960 20BK/LB (RHD)	GROUND
3	P240 20LG/YL (LHD)	PASSENGER DOOR UNLOCK DRIVER
3	Z961 20BK/YL (RHD)	GROUND
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	P76 20TN/LB (LHD)	MIRROR COMMON DRIVER
8	P72 20TN/GY (LHD)	RIGHT MIRROR VERTICAL DRIVER
8	P110 20TN/RD (RHD)	FOLDING MIRROR RETURN
9	P74 20TN/OR (LHD)	RIGHT MIRROR HORIZONTAL DRIVER
9	P699 20TN/LG (RHD)	MIRROR-POWER FOLDING/UNFOLDING
10	Z960 20BK/LB (LHD)	GROUND
10	Q411 14OR/WT (RHD)	LEFT REAR WINDOW DRIVER (UP)
11	C16 20DB/GY (LHD)	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
11	Q412 14OR/LG (RHD)	RIGHT REAR WINDOW DRIVER (UP)
12	X202 18DG/VT (LHD BASE AUDIO)	RIGHT FRONT DOOR SPEAKER (+)
12	X154 18GY/YL (LHD PREMIUM AUDIO)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
12	Q611 14OR/RD (RHD)	LEFT REAR WINDOW DRIVER (DOWN)
13	X292 18DG/YL (LHD BASE AUDIO)	RIGHT FRONT DOOR SPEAKER (-)
13	X156 18GY/LB (LHD PREMIUM AUDIO)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
13	Q612 14OR/DB (RHD)	RIGHT REAR WINDOW DRIVER (DOWN)
14	F981 14PK/BR (RHD)	IGNITION SWITCH OUTPUT (RUN-ACC)



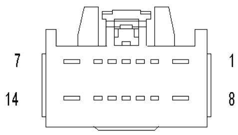
C303 - BLACK (RIGHT FRONT DOOR SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	P33 20TN/DB (LHD)	DOOR LOCK DRIVER
2	Z928 14BK/LG (RHD)	GROUND
3	P240 20TN/WT (LHD)	PASSENGER DOOR UNLOCK DRIVER
3	Z929 20BK/PK (RHD)	GROUND
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
7	P76 20YL/PK (LHD)	MIRROR COMMON DRIVER
8	P72 20TN/GY (LHD)	RIGHT MIRROR VERTICAL DRIVER
8	P110 20LG/WT (RHD)	FOLDING MIRROR RETURN
9	P74 20TN/OR (LHD)	RIGHT MIRROR HORIZONTAL DRIVER
9	P699 20LG/DG (RHD)	MIRROR-POWER FOLDING/UNFOLDING
10	Z960 20BK/LB (LHD)	GROUND
10	Q411 14OR/WT (RHD)	LEFT REAR WINDOW DRIVER (UP)
11	Q412 14OR/LB (RHD)	RIGHT REAR WINDOW DRIVER (UP)
12	X202 18DG/VT (LHD)	RIGHT FRONT DOOR SPEAKER (+)
12	Q611 14OR/GY (RHD)	LEFT REAR WINDOW DRIVER (DOWN)
13	X292 18DG/YL (LHD)	RIGHT FRONT DOOR SPEAKER (-)
13	Q612 14OR/DB (RHD)	RIGHT REAR WINDOW DRIVER (DOWN)
14	F981 14PK/YL (RHD)	IGNITION SWITCH OUTPUT (RUN-ACC)



C304 - LT. GRAY (PASSENGER SEAT SIDE) 14 WAY

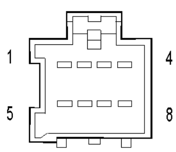
CAV	CIRCUIT	FUNCTION
1	D54 20WT (OCS)	CAN B BUS (-)
2	D55 20WT/OR (OCS)	CAN B BUS (+)
3	R261 20LB/WT (OCS)	DRIVER SEAT POSITION SENSOR DATA
4	R263 20LB/VT (OCS)	DRIVER SEAT POSITION SENSOR VOLTAGE
5	R262 20WT/LB (OCS)	PASSENGER SEAT POSITION SENSOR DATA
6	R264 20VT/LB (OCS)	PASSENGER SEAT POSITION SENSOR VOLTAGE
7	Z940 18BK (HEATED SEATS)	GROUND
8	Z944 20BK (OCS)	GROUND
9	-	-
10	A417 18RD (OCS)	FUSED B(+) (I.O.D.)
11	P188 18LG/VT (LHD HEATED SEATS)	RIGHT SEAT HEATER B(+) DRIVER
11	P187 18LG/VT (RHD HEATED SEATS)	LEFT SEAT HEATER B(+) DRIVER
12	-	-
13	R272 20LB/VT (OCS)	PASSENGER HALL EFFECT (-)
14	R274 20LB/WT (OCS)	PASSENGER HALL EFFECT (+)



C304

C304 - LT. GRAY (BODY SIDE) 14 WAY

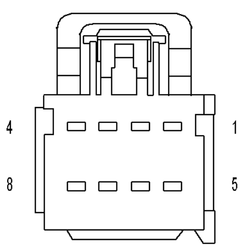
CAV	CIRCUIT	FUNCTION
1	D54 20WT/PK (OCS)	CAN B BUS (-)
2	D55 20WT/OR (OCS)	CAN B BUS (+)
3	R261 20LB/TN (OCS)	DRIVER SEAT POSITION SENSOR DATA
4	R263 20LB/BK (OCS)	DRIVER SEAT POSITION SENSOR VOLTAGE
5	-	-
6	-	-
7	Z961 20BK/YL (HEATED SEATS)	GROUND
8	Z944 20BK/LG (OCS AWD)	GROUND
8	Z944 18BK/LG (OCS FWD)	GROUND
9	-	-
10	A417 20RD/DG (OCS)	FUSED B(+) (I.O.D.)
11	P188 20LG/VT (LHD HEATED SEATS)	RIGHT SEAT HEATER B(+) DRIVER
11	P187 20LG/VT (RHD HEATED SEATS)	LEFT SEAT HEATER B(+) DRIVER
12	-	-
13	R272 20LB/VT (OCS)	PASSENGER HALL EFFECT (-)
14	R274 20LB/WT (OCS)	PASSENGER HALL EFFECT (+)



C305

C305 - LT. GRAY (DRIVER SEAT SIDE) 8 WAY

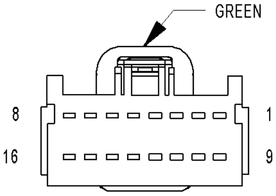
CAV	CIRCUIT	FUNCTION
1	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
2	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE
3	Z960 18BK (HEATED SEATS)	GROUND
4	-	-
5	D506 20WT/DG (HEATED SEATS)	LIN BUS
6	F937 14PK/YL (HEATED SEATS)	FUSED IGNITION SWITCH OUTPUT (RUN)
7	P188 16LG/VT (LHD HEATED SEATS)	RIGHT SEAT HEATER B(+) DRIVER
7	P187 16LG/VT (RHD HEATED SEATS)	LEFT SEAT HEATER B(+) DRIVER
8	-	-



C305

C305 - LT. GRAY (BODY SIDE) 8 WAY

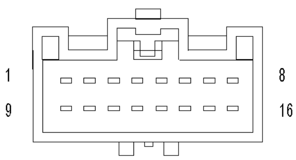
CAV	CIRCUIT	FUNCTION
1	R261 20LB/TN	DRIVER SEAT POSITION SENSOR DATA
2	R263 20LB/BK	DRIVER SEAT POSITION SENSOR VOLTAGE
3	Z960 20BK/LB (HEATED SEATS)	GROUND
4	-	-
5	D506 20WT/DG (HEATED SEATS)	LIN BUS
6	F937 20PK/YL (DIESEL HEATED SEATS)	FUSED IGNITION SWITCH OUTPUT (RUN)
6	F937 18PK/YL (GAS HEATED SEATS)	FUSED IGNITION SWITCH OUTPUT (RUN)
7	P188 20LG/VT (LHD HEATED SEATS)	RIGHT SEAT HEATER B(+) DRIVER
7	P187 20LG/VT (RHD HEATED SEATS)	LEFT SEAT HEATER B(+) DRIVER
8	-	-



C306
(RHD)

C306 (RHD) - GREEN (RIGHT FRONT DOOR SIDE) 16 WAY

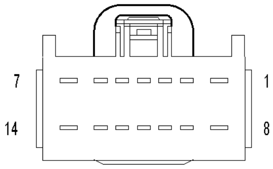
CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	P33 20TN/DB	DOOR LOCK DRIVER
3	P238 20LG/OR	DRIVER DOOR UNLOCK DRIVER
4	P697 20LG/DG	DOOR LOCK SWITCH MUX
5	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
6	P75 20TN/OR	LEFT MIRROR HORIZONTAL DRIVER
7	P76 20YL/PK	MIRROR COMMON DRIVER
8	-	-
9	-	-
10	X202 20DG/VT (BASE)	RIGHT FRONT DOOR SPEAKER (+)
10	X202 18DG/VT (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
11	X292 20DG/YL (BASE)	RIGHT FRONT DOOR SPEAKER (-)
11	X292 18DG/YL (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
12	P235 20LG/TN	SECONDARY LOCK DRIVER
13	P237 20DG/TN	SECONDARY UNLOCK DRIVER
14	A417 20RD/DG	FUSED B(+) (I.O.D.)
15	-	-
16	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUT-PUT



C306
(RHD)

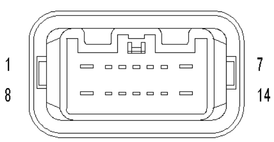
C306 (RHD) - GREEN (BODY SIDE) 16 WAY

CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P238 18LG/OR	DRIVER DOOR UNLOCK DRIVER
4	P697 20LG/DG	DOOR LOCK SWITCH MUX
5	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
6	P75 20TN/LG	LEFT MIRROR HORIZONTAL DRIVER
7	P76 20TN/LB	MIRROR COMMON DRIVER
8	-	-
9	-	-
10	X202 18DG/VT (BASE AUDIO)	RIGHT FRONT DOOR SPEAKER (+)
10	X154 18GY/YL (PREMIUM AUDIO)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
11	X292 18DG/YL (BASE AUDIO)	RIGHT FRONT DOOR SPEAKER (-)
11	X156 18GY/LB (PREMIUM AUDIO)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
12	P235 18LG/TN	SECONDARY LOCK DRIVER
13	P237 18DG/TN	SECONDARY UNLOCK DRIVER
14	A417 20RD/DG	FUSED B(+) (I.O.D.)
15	-	-
16	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUT-PUT



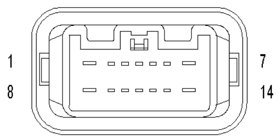
C308 - LT. GRAY (BODY SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
4	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
5	X51 18DG/DB (BASE AUDIO)	LEFT REAR SPEAKER (+)
5	X205 18GY/LG (PREMIUM AUDIO)	AMPLIFIED LEFT REAR SPEAKER (+)
6	X57 18DG/BR (BASE AUDIO)	LEFT REAR SPEAKER (-)
6	X295 18GY/BK (PREMIUM AUDIO)	AMPLIFIED LEFT REAR SPEAKER (-)
7	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
8	Q611 14OR/RD	LEFT REAR WINDOW DRIVER (DOWN)
9	Z964 18BK/WT	GROUND
10	-	-
11	-	-
12	-	-
13	P235 18LG/TN (RHD)	SECONDARY LOCK DRIVER
14	P237 18DG/TN (RHD)	SECONDARY UNLOCK DRIVER



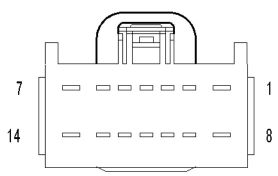
C308 - LT. GRAY (LEFT REAR DOOR SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
2	P33 20TN/DB	DOOR LOCK DRIVER
3	P240 20LG/YL (LHD)	PASSENGER DOOR UNLOCK DRIVER
3	P240 20TN/WT (RHD)	PASSENGER DOOR UNLOCK DRIVER
4	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
5	X303 18DG/TN (BASE)	LEFT REAR SPEAKER (+)
5	X205 18GY/LG (PREMIUM)	AMPLIFIED LEFT REAR SPEAKER (+)
6	X393 18DG/TN (BASE)	LEFT REAR SPEAKER (-)
6	X295 18GY/DG (PREMIUM)	AMPLIFIED LEFT REAR SPEAKER (-)
7	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
8	Q611 14OR/GY	LEFT REAR WINDOW DRIVER (DOWN)
9	Z929 20BK (EXCEPT LHD/POWER LOCKS)	GROUND
9	Z928 20BK/LG (LHD/POWER LOCKS)	GROUND
10	-	-
11	-	-
12	-	-
13	P235 20LG/TN (RHD)	SECONDARY LOCK DRIVER
14	P237 20DG/TN (RHD)	SECONDARY UNLOCK DRIVER



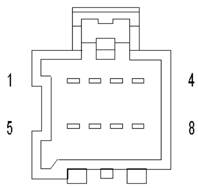
C309 - LT. GRAY (RIGHT REAR DOOR SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Q412 14OR/LB	RIGHT REAR WINDOW DRIVER (UP)
2	P33 20TN/DB	DOOR LOCK DRIVER
3	P240 20LG/YL (LHD)	PASSENGER DOOR UNLOCK DRIVER
3	P240 20TN/WT (RHD)	PASSENGER DOOR UNLOCK DRIVER
4	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
5	X304 18DG/BR (BASE)	RIGHT REAR SPEAKER (+)
5	X206 18DG/LG (PREMIUM)	AMPLIFIED RIGHT REAR SPEAKER (+)
6	X394 18YL/GY (BASE)	RIGHT REAR SPEAKER (-)
6	X296 18DG/GY (PREMIUM)	AMPLIFIED RIGHT REAR SPEAKER (-)
7	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
8	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
9	Z928 20BK (BASE)	GROUND
9	Z928 20BK/LG (EXCEPT BASE)	GROUND
10	-	-
11	-	-
12	-	-
13	P235 20LG/TN	SECONDARY LOCK DRIVER
14	P237 20DG/TN	SECONDARY UNLOCK DRIVER



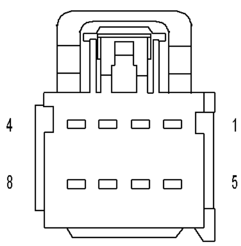
C309 - LT. GRAY (BODY SIDE) 14 WAY

CAV	CIRCUIT	FUNCTION
1	Q412 14OR/LG	RIGHT REAR WINDOW DRIVER (UP)
2	P33 20LG/TN	DOOR LOCK DRIVER
3	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
4	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
5	X52 18GY/DB (BASE AUDIO)	RIGHT REAR SPEAKER (+)
5	X206 18DG/LG (PREMIUM AUDIO)	AMPLIFIED RIGHT REAR SPEAKER (+)
6	X58 18GY/OR (BASE AUDIO)	RIGHT REAR SPEAKER (-)
6	X296 18DG/LB (PREMIUM AUDIO)	AMPLIFIED RIGHT REAR SPEAKER (-)
7	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
8	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
9	Z964 18BK/WT	GROUND
10	-	-
11	-	-
12	-	-
13	P235 18LG/TN (RHD)	SECONDARY LOCK DRIVER
14	P237 18DG/TN (RHD)	SECONDARY UNLOCK DRIVER



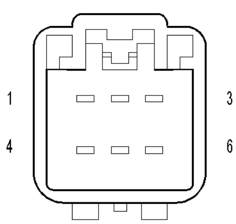
C310 - LT. GRAY (BODY SIDE) 8 WAY

CAV	CIRCUIT	FUNCTION
1	L53 18DG/GY	STOP LAMP SWITCH OUTPUT
2	W13 20BR/TN	REAR WIPER MOTOR CONTROL
3	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
4	F996 14PK/YL (DRIVER CONVENIENCE GROUP/SIDE AIRBAGS)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	F996 16PK/YL (EXCEPT DRIVER CON-VENIENCE GROUP/SIDE AIRBAGS)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P33 20LG/TN	DOOR LOCK DRIVER
6	G78 20VT/LB	LIFTGATE AJAR SWITCH SENSE
7	-	-
8	L217 18WT/VT (DIESEL)	PARK LAMP CONTROL OUTPUT
8	L217 20WT/VT (GAS)	PARK LAMP CONTROL OUTPUT



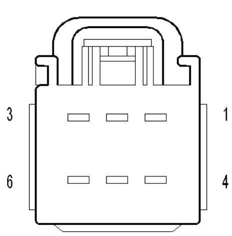
C310 - LT. GRAY (LIFTGATE SIDE) 8 WAY

CAV	CIRCUIT	FUNCTION
1	L53 18DG/WT	STOP LAMP SWITCH OUTPUT
2	W13 18BR/LG	REAR WIPER MOTOR CONTROL
3	P240 18LG/YL	PASSENGER DOOR UNLOCK DRIVER
4	F996 16PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P33 18LG/TN	DOOR LOCK DRIVER
6	G78 20VT/OR	LIFTGATE AJAR SWITCH SENSE
7	-	-
8	L217 20WT/VT	PARK LAMP CONTROL OUTPUT



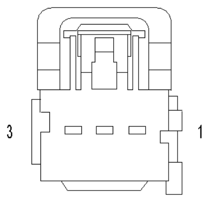
C311 - LT. GRAY (BODY SIDE) 6 WAY

CAV	CIRCUIT	FUNCTION
1	X214 18DG/DB	AMPLIFIED LIFTGATE SPEAKER 1 (+)
2	X284 18DG/TN	AMPLIFIED LIFTGATE SPEAKER 1 (-)
3	X212 18GY/PK	AMPLIFIED LIFTGATE SPEAKER 2 (+)
4	X282 18GY/WT	AMPLIFIED LIFTGATE SPEAKER 2 (-)
5	Z960 12BK/LB	GROUND
6	C515 12LB/OR	REAR WINDOW DEFOGGER CONTROL OUTPUT



C311 - LT. GRAY (LIFTGATE SIDE) 6 WAY

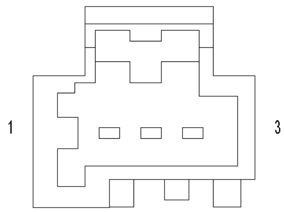
CAV	CIRCUIT	FUNCTION
1	X214 18DG/DB	AMPLIFIED LIFTGATE SPEAKER 1 (+)
2	X284 18DG/TN	AMPLIFIED LIFTGATE SPEAKER 1 (-)
3	X212 18GY/DB	AMPLIFIED LIFTGATE SPEAKER 2 (+)
4	X282 18GY/TN	AMPLIFIED LIFTGATE SPEAKER 2 (-)
5	Z960 12BK	GROUND
6	C515 12LB/OR	REAR WINDOW DEFOGGER CONTROL OUTPUT



C312

C312 - LT. GRAY (SDARS JUMPER SIDE) 3 WAY

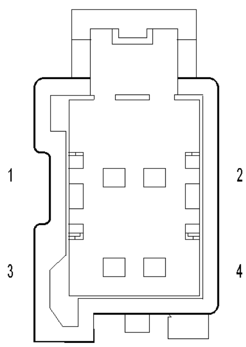
CAV	CIRCUIT	FUNCTION
1	X16 20DG/YL	AUDIO SIGNAL RIGHT (+)
2	X17 20DG/OR	AUDIO SIGNAL LEFT (+)
3	X917 20DG	AUDIO SIGNAL COMMON



C312

C312 - LT. GRAY (SDARS I/P OVERLAY SIDE) 3 WAY

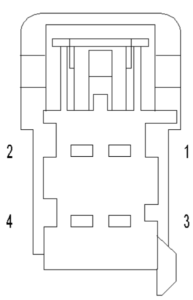
CAV	CIRCUIT	FUNCTION
1	X16 22DG/YL	AUDIO SIGNAL RIGHT (+)
2	X17 22DG/OR	AUDIO SIGNAL LEFT (+)
3	X917 22DG	AUDIO SIGNAL COMMON



C313

C313 - LT. GRAY (SDARS JUMPER SIDE) 4 WAY

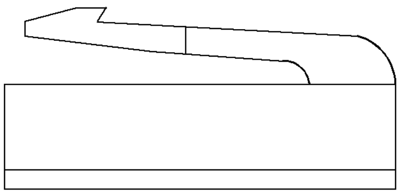
CAV	CIRCUIT	FUNCTION
1	A417 18RD	FUSED B(+) (I.O.D.)
2	Z965 18BK	GROUND
3	D54 20WT	CAN B BUS (-)
4	D55 20WT/OR	CAN B BUS (+)



C313

C313 - LT. GRAY (BODY SIDE) 4 WAY

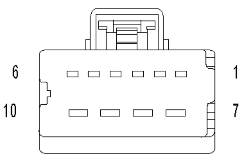
CAV	CIRCUIT	FUNCTION
1	A417 20RD/DG	FUSED B(+) (I.O.D.)
2	Z961 18BK/YL	GROUND
3	D54 20WT/PK	CAN B BUS (-)
4	D55 20WT/OR	CAN B BUS (+)



CAPACITOR-IGNITION (GAS)

CAPACITOR-IGNITION (GAS) - NATURAL 1 WAY

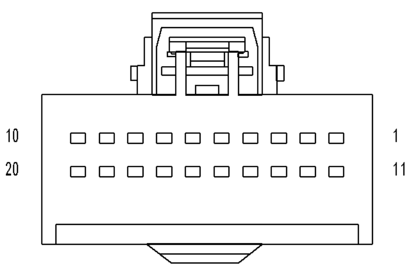
CAV	CIRCUIT	FUNCTION
1	K344 16BR/GY	FUSED MAIN RELAY OUTPUT



CLUSTER C1

CLUSTER C1 - BLACK 10 WAY

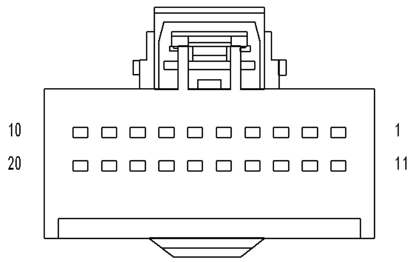
CAV	CIRCUIT	FUNCTION
1	A418 20RD/BK	FUSED B(+) (I.O.D.)
2	E12 20OR/GY	PANEL LAMPS DRIVER
3	P237 18DG/TN (RHD)	SECONDARY UNLOCK DRIVER
4	-	-
5	P238 18TN/DG	DRIVER DOOR UNLOCK DRIVER
6	P235 18LG/TN (RHD)	SECONDARY LOCK DRIVER
7	P240 18TN/WT	PASSENGER DOOR UNLOCK DRIVER
8	Z936 18BK/LB	GROUND
9	P33 18TN/DB (LHD)	DOOR LOCK DRIVER
9	P33 18LG/TN (RHD)	DOOR LOCK DRIVER
10	A932 16RD/BR	DOOR LOCK POWER-FUSED B(+)



CLUSTER C2

CLUSTER C2 - BROWN 20 WAY

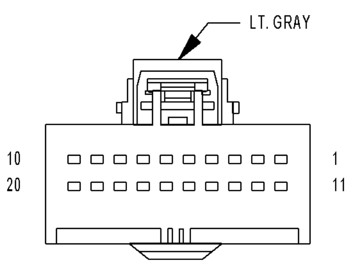
CAV	CIRCUIT	FUNCTION
1	-	-
2	M27 20YL/LB	READING/RAIL LAMPS DRIVER
3	G75 20VT/BK	LEFT FRONT DOOR AJAR SWITCH SENSE
4	M24 20YL/WT	COURTESY LAMPS DRIVER
5	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
6	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
7	B25 20DG/WT	PARK BRAKE SWITCH SENSE
8	L53 20DG/GY	STOP LAMP SWITCH OUTPUT
9	A412 20RD/DB	FUSED B(+) (I.O.D.)
10	Z937 20BK/YL	GROUND
11	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
12	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
13	G78 20VT/LB	LIFTGATE AJAR SWITCH SENSE
14	G38 20GY	UGDO ENABLE CONTROL CIRCUIT
15	N5 20DB/BK	FUEL LEVEL SIGNAL 2
16	N4 20DB/WT	FUEL LEVEL SIGNAL 1
17	-	-
18	P697 20LG/DG	DOOR LOCK SWITCH MUX
19	-	-
20	-	-



CLUSTER C3

CLUSTER C3 - BLACK 20 WAY

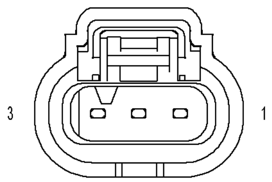
CAV	CIRCUIT	FUNCTION
1	D506 20WT/DG	LIN BUS
2	-	-
3	-	-
4	-	-
5	C215 20LB/BK	REAR WINDOW DEFOGGER SWITCH SIGNAL
6	-	-
7	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
8	C4 20LB/RD	A/C INDICATOR DRIVER
9	X20 20GY/WT	RADIO CONTROL MUX
10	X3 20DG/VT	HORN SWITCH SENSE
11	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-



CLUSTER C4

CLUSTER C4 - LT. GRAY 20 WAY

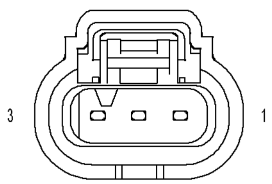
CAV	CIRCUIT	FUNCTION
1	Z936 20BK/LB	GROUND
2	-	-
3	-	-
4	C955 20LB/PK	HVAC MUX RETURN
5	R58 20LB/GY	PASSENGER SEAT BELT SWITCH SENSE
6	-	-
7	-	-
8	K321 20BR/YL	BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID UNLOCK
9	-	-
10	-	-
11	D54 20WT/PK	CAN B BUS (-)
12	D55 20WT/OR	CAN B BUS (+)
13	Y13 20DG/RD	RADIO CONTROL RETURN
14	C121 20DB/DG	SENSOR GROUND
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	C105 20LB/LG	HVAC MUX CONTROL



COIL-
IGNITION 1
(GAS)

COIL-IGNITION 1 (GAS) - DK. GRAY 3 WAY

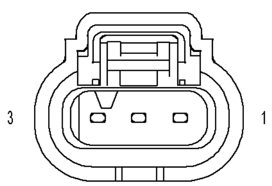
CAV	CIRCUIT	FUNCTION
1	-	-
2	K19 18DB/DG	COIL 1 CONTROL
3	K344 18BR/GY	FUSED MAIN RELAY OUTPUT



COIL-
IGNITION 2
(GAS)

COIL-IGNITION 2 (GAS) - DK. GRAY 3 WAY

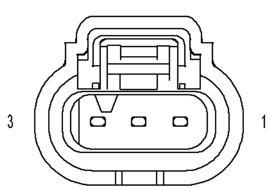
CAV	CIRCUIT	FUNCTION
1	-	-
2	K17 18DB/TN	COIL 2 CONTROL
3	K344 18BR/GY	FUSED MAIN RELAY OUTPUT



COIL-
IGNITION 3
(GAS)

COIL-IGNITION 3 (GAS) - DK. GRAY 3 WAY

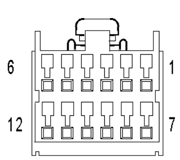
CAV	CIRCUIT	FUNCTION
1	-	-
2	K18 18DB/OR	COIL 3 CONTROL
3	K344 18BR/GY	FUSED MAIN RELAY OUTPUT



COIL-
IGNITION 4
(GAS)

COIL-IGNITION 4 (GAS) - DK. GRAY 3 WAY

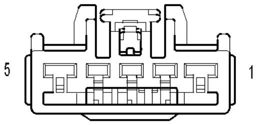
CAV	CIRCUIT	FUNCTION
1	-	-
2	K15 18DB/GY	COIL 4 CONTROL
3	K344 18BR/GY	FUSED MAIN RELAY OUTPUT



CONTROL-A/C-
HEATER C1

CONTROL-A/C-HEATER C1 - BLACK 12 WAY

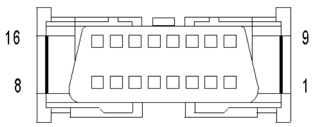
CAV	CIRCUIT	FUNCTION
1	F929 20PK/RD	FUSED IGNITION SWITCH OUTPUT (RUN)
2	E12 20OR/GY	PANEL LAMPS DRIVER
3	C132 20DB/GY	RECIRCULATION DOOR DRIVER (B)
4	C32 20DB/TN	RECIRCULATION DOOR DRIVER (A)
5	C4 20LB/RD	A/C INDICATOR DRIVER
6	-	-
7	Z936 20BK/LB	GROUND
8	-	-
9	C955 20LB/PK	HVAC MUX RETURN
10	-	-
11	C105 20LB/LG	HVAC MUX CONTROL
12	C215 20LB/BK	REAR WINDOW DEFOGGER SWITCH SIGNAL



CONTROL-A/C-HEATER C2

CONTROL-A/C-HEATER C2 - BLACK 5 WAY

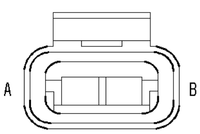
CAV	CIRCUIT	FUNCTION
1	C70 14DB/YL	BLOWER MOTOR HIGH SPEED
2	C73 18DB/VT	FRONT BLOWER M2 SPEED
3	C72 18DB/OR	FRONT BLOWER M1 SPEED
4	C71 18DB/BR	FRONT BLOWER LOW SPEED
5	Z936 18BK/LB	GROUND



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK 16 WAY

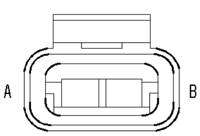
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Z11 20BK/BR	GROUND
5	Z11 20BK/BR	GROUND
6	D72 20WT/TN	DIAGNOSTIC CAN C (+)
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	D71 20WT/DB	DIAGNOSTIC CAN C (-)
15	-	-
16	A933 20RD	FUSED B(+)



FAN MODULE-RADIATOR COOLING C1

FAN MODULE-RADIATOR COOLING C1 - BLACK 2 WAY

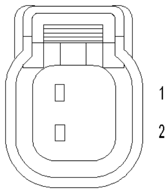
CAV	CIRCUIT	FUNCTION
A	N210 12DB/DG	SERIES/PARALLEL RAD FAN RELAY FEED
B	N23 10DB/DG (OPTION 1)	LOW/HIGH RAD FAN RELAY OUTPUT
B	N23 12DB/GY (OPTION 2)	LOW/HIGH RAD FAN RELAY OUTPUT



FAN MODULE-RADIATOR COOLING C2

FAN MODULE-RADIATOR COOLING C2 - BLACK 2 WAY

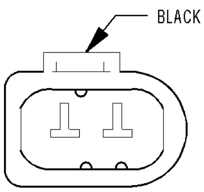
CAV	CIRCUIT	FUNCTION
A	Z904 12BK/LG	GROUND
B	N24 10DG/DB (OPTION 1)	RAD FAN RELAY OUTPUT
B	N24 12DG/DB (OPTION 2)	RAD FAN RELAY OUTPUT



GENERATOR (GAS)

GENERATOR (GAS) - BLACK 2 WAY

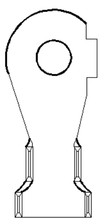
CAV	CIRCUIT	FUNCTION
1	K20 20BR/GY	GEN FIELD CONTROL
2	A803 22WT	GEN SENSE



GENERATOR (DIESEL)

GENERATOR (DIESEL) - BLACK 2 WAY

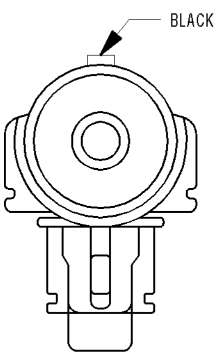
CAV	CIRCUIT	FUNCTION
1	G329 20VT/OR	CHARGE INDICATOR SIGNAL
2	K92 20BR	GEN OUTPUT SIGNAL



GENERATOR-EYELET

GENERATOR-EYELET - 1 WAY

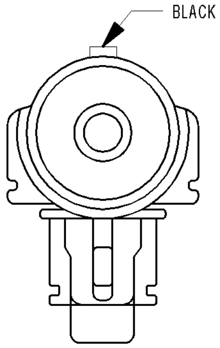
CAV	CIRCUIT	FUNCTION
1	A801 6RD/GY	B(+)



GLOW PLUG 1 (DIESEL)

GLOW PLUG 1 (DIESEL) - BLACK 1 WAY

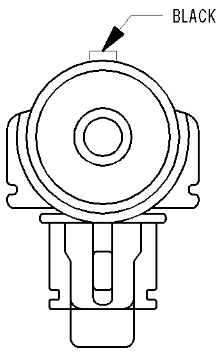
CAV	CIRCUIT	FUNCTION
1	A202 16BK/RD	GLOW PLUG 1 CONTROL



GLOW PLUG 2 (DIESEL)

GLOW PLUG 2 (DIESEL) - BLACK 1 WAY

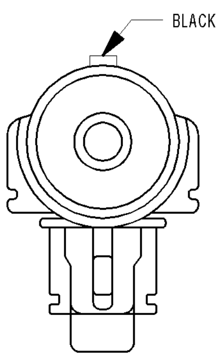
CAV	CIRCUIT	FUNCTION
1	A203 16BK/DB	GLOW PLUG 2 CONTROL



GLOW PLUG 3 (DIESEL)

GLOW PLUG 3 (DIESEL) - BLACK 1 WAY

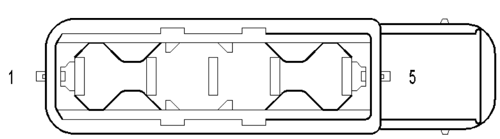
CAV	CIRCUIT	FUNCTION
1	A204 16BK/DG	GLOW PLUG 3 CONTROL



GLOW PLUG 4 (DIESEL)

GLOW PLUG 4 (DIESEL) - BLACK 1 WAY

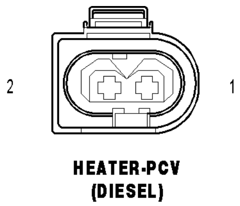
CAV	CIRCUIT	FUNCTION
1	A208 16BK/GY	GLOW PLUG 4 CONTROL



HEATER-CABIN (DIESEL)

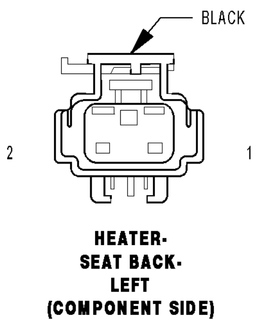
HEATER-CABIN (DIESEL) - 5 WAY

CAV	CIRCUIT	FUNCTION
1	A286 12RD/WT	CABIN HEATER RELAY 2 OUTPUT
2	Z966 12BK/PK	GROUND
3	A285 12RD/DB	CABIN HEATER RELAY 1 OUTPUT
4	Z966 12BK/PK	GROUND
5	A286 12RD/WT	CABIN HEATER RELAY 2 OUTPUT



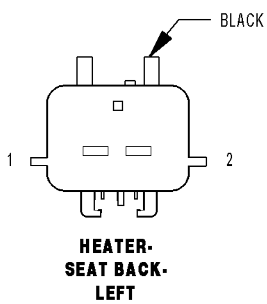
HEATER-PCV (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	N1 20DB/OR	FUEL PUMP CONTROL OUTPUT
2	Z924 18BK	GROUND



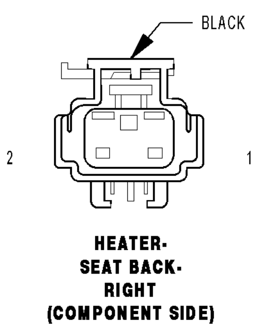
HEATER-SEAT BACK-LEFT (COMPONENT SIDE) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	P187 18YL	LEFT SEAT HEATER B(+) DRIVER
2	Z960 18YL	GROUND



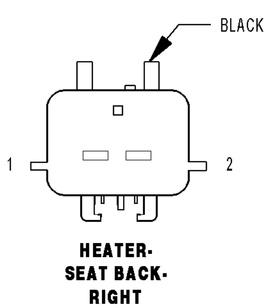
HEATER-SEAT BACK-LEFT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	P187 18BK	LEFT SEAT HEATER B(+) DRIVER
2	Z960 18BK	GROUND



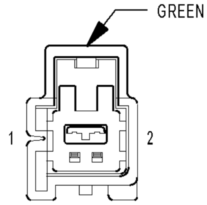
HEATER-SEAT BACK-RIGHT (COMPONENT SIDE) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	P188 18YL	RIGHT SEAT HEATER B(+) DRIVER
2	Z940 18YL	GROUND



HEATER-SEAT BACK-RIGHT - BLACK 2 WAY

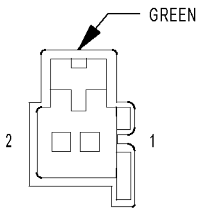
CAV	CIRCUIT	FUNCTION
1	P188 18BK	RIGHT SEAT HEATER B(+) DRIVER
2	Z940 18BK	GROUND



HEATER-
SEAT CUSHION-
LEFT
(COMPONENT SIDE)

HEATER-SEAT CUSHION-LEFT (COMPONENT SIDE) - GREEN 2 WAY

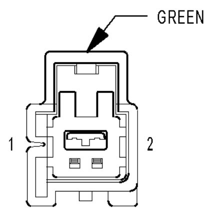
CAV	CIRCUIT	FUNCTION
1	P187 18BK	LEFT SEAT HEATER B(+) DRIVER
2	Z960 18BK	GROUND



HEATER-
SEAT CUSHION-
LEFT

HEATER-SEAT CUSHION-LEFT - GREEN 2 WAY

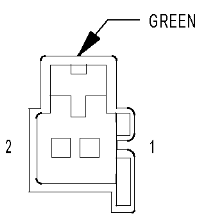
CAV	CIRCUIT	FUNCTION
1	P187 16LG/BR (LHD)	LEFT SEAT HEATER B(+) DRIVER
1	P187 18LG/VT (RHD)	LEFT SEAT HEATER B(+) DRIVER
2	Z960 18BK	GROUND



HEATER-
SEAT CUSHION-
RIGHT
(COMPONENT SIDE)

HEATER-SEAT CUSHION-RIGHT (COMPONENT SIDE) - GREEN 2 WAY

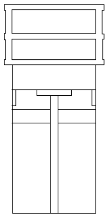
CAV	CIRCUIT	FUNCTION
1	P188 18BK	RIGHT SEAT HEATER B(+) DRIVER
2	Z940 18BK	GROUND



HEATER-
SEAT CUSHION-
RIGHT

HEATER-SEAT CUSHION-RIGHT - GREEN 2 WAY

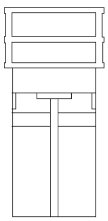
CAV	CIRCUIT	FUNCTION
1	P188 18LG/VT (LHD)	RIGHT SEAT HEATER B(+) DRIVER
1	P188 16LG/BR (RHD)	RIGHT SEAT HEATER B(+) DRIVER
2	Z940 18BK	GROUND



HORN 1

HORN 1 - BLACK 1 WAY

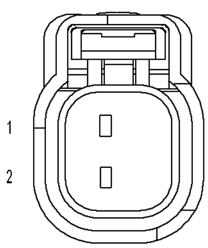
CAV	CIRCUIT	FUNCTION
1	X21 20GY/YL	HORN CONTROL OUTPUT



HORN 2 (EXPORT)

HORN 2 (EXPORT) - BLACK 1 WAY

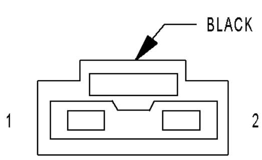
CAV	CIRCUIT	FUNCTION
1	X22 20GY/LB	HORN CONTROL OUTPUT



INJECTOR-FUEL 1 (GAS)

INJECTOR-FUEL 1 (GAS) - BLACK 2 WAY

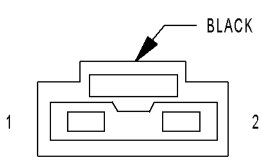
CAV	CIRCUIT	FUNCTION
1	K11 20BR/YL	INJECTOR 1 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



INJECTOR-FUEL 1 (DIESEL)

INJECTOR-FUEL 1 (DIESEL) - BLACK 2 WAY

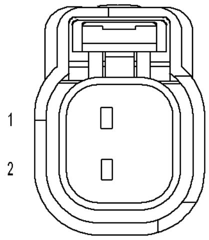
CAV	CIRCUIT	FUNCTION
1	K663 16BR/YL	FUEL INJECTOR HIGH-SIDE COMMON
2	K611 16BR/RD	FUEL INJECTOR 1 LOW-SIDE CONTROL



INJECTOR-FUEL 2 (DIESEL)

INJECTOR-FUEL 2 (DIESEL) - BLACK 2 WAY

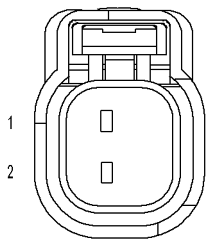
CAV	CIRCUIT	FUNCTION
1	K663 16BR/YL	FUEL INJECTOR HIGH-SIDE COMMON
2	K612 16BR/LG	FUEL INJECTOR 2 LOW-SIDE CONTROL



INJECTOR-FUEL 2 (GAS)

INJECTOR-FUEL 2 (GAS) - BLACK 2 WAY

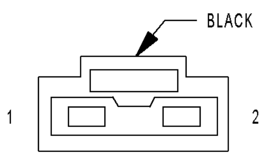
CAV	CIRCUIT	FUNCTION
1	K12 20BR/DB	INJECTOR 2 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



INJECTOR-FUEL 3 (GAS)

INJECTOR-FUEL 3 (GAS) - BLACK 2 WAY

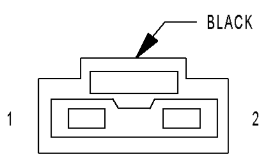
CAV	CIRCUIT	FUNCTION
1	K13 20BR/LB	INJECTOR 3 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



INJECTOR-FUEL 3 (DIESEL)

INJECTOR-FUEL 3 (DIESEL) - BLACK 2 WAY

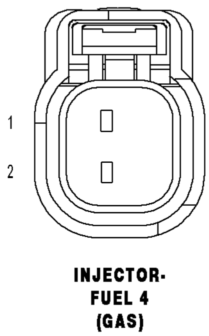
CAV	CIRCUIT	FUNCTION
1	K663 16BR/YL	FUEL INJECTOR HIGH-SIDE COMMON
2	K613 16BR/WT	FUEL INJECTOR 3 LOW-SIDE CONTROL



INJECTOR-FUEL 4 (DIESEL)

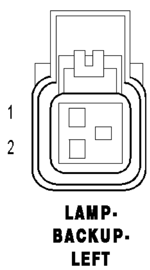
INJECTOR-FUEL 4 (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K663 16BR/YL	FUEL INJECTOR HIGH-SIDE COMMON
2	K614 16BR/LB	FUEL INJECTOR 4 LOW-SIDE CONTROL



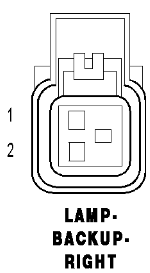
INJECTOR-FUEL 4 (GAS) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K14 20BR/TN	INJECTOR 4 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



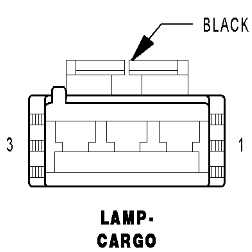
LAMP-BACKUP-LEFT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT



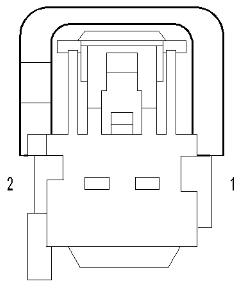
LAMP-BACKUP-RIGHT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z964 20BK/WT	GROUND
2	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT



LAMP-CARGO - BLACK 3 WAY

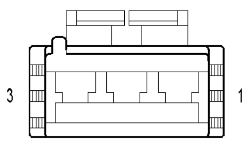
CAV	CIRCUIT	FUNCTION
1	-	-
2	M24 20YL/WT	COURTESY LAMPS DRIVER
3	Z936 20BK/LB	GROUND



LAMP-CUP HOLDER

LAMP-CUP HOLDER - LT. GRAY 2 WAY

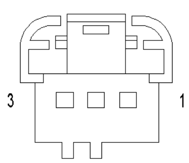
CAV	CIRCUIT	FUNCTION
1	E12 20OR/GY	PANEL LAMPS DRIVER
2	Z937 20BK	GROUND



LAMP-DOME

LAMP-DOME - BLACK 3 WAY

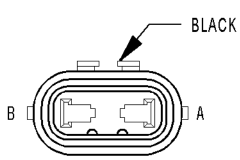
CAV	CIRCUIT	FUNCTION
1	-	-
2	M24 20YL/WT	COURTESY LAMPS DRIVER
3	Z936 20BK/LB	GROUND



LAMP-DOME (RECHARGABLE)

LAMP-DOME (RECHARGABLE) - 3 WAY

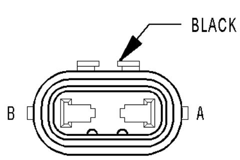
CAV	CIRCUIT	FUNCTION
1	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	M24 20YL/WT	COURTESY LAMPS DRIVER
3	Z936 20BK/LB	GROUND



LAMP-FOG-LEFT FRONT

LAMP-FOG-LEFT FRONT - BLACK 2 WAY

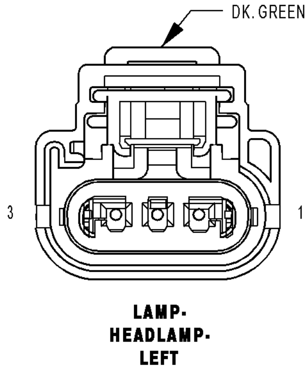
CAV	CIRCUIT	FUNCTION
A	L89 20WT/YL	FRONT FOG LAMP CONTROL OUTPUT
B	Z904 20BK/LG	GROUND



LAMP-FOG-RIGHT FRONT

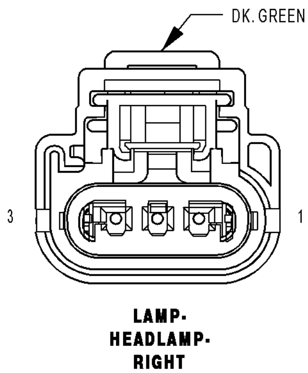
LAMP-FOG-RIGHT FRONT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
A	L90 20WT/OR	FRONT FOG LAMP CONTROL OUTPUT
B	Z904 20BK/LG (EXCEPT EXPORT)	GROUND
B	Z908 20BK/PK (EXPORT)	GROUND



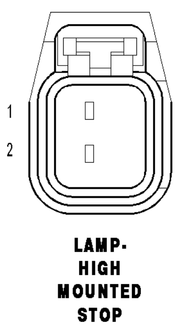
LAMP-HEADLAMP-LEFT - DK. GREEN 3 WAY

CAV	CIRCUIT	FUNCTION
1	L43 20WT/DB	LEFT LOW BEAM OUTPUT
2	Z904 20BK/LG	GROUND
3	L33 20WT/PK	LEFT HIGH BEAM OUTPUT



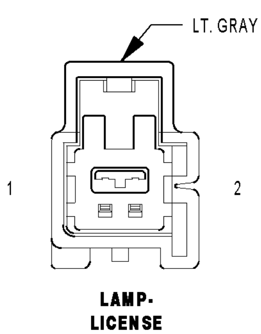
LAMP-HEADLAMP-RIGHT - DK. GREEN 3 WAY

CAV	CIRCUIT	FUNCTION
1	L44 20VT/RD	RIGHT LOW BEAM OUTPUT
2	Z908 20BK/PK	GROUND
3	L34 20WT/GY	RIGHT HIGH BEAM OUTPUT



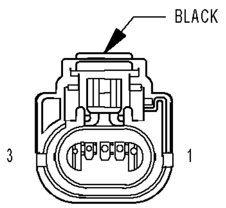
LAMP-HIGH MOUNTED STOP - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	L53 18DG/WT	STOP LAMP SWITCH OUTPUT
2	Z960 20BK	GROUND



LAMP-LICENSE - LT. GRAY 2 WAY

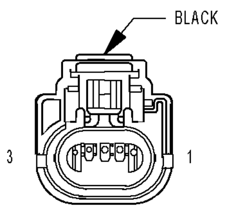
CAV	CIRCUIT	FUNCTION
1	Z960 18BK	GROUND
2	L217 20WT/VT	PARK LAMP CONTROL OUTPUT



LAMP-PARK/TURN-LEFT FRONT (EXCEPT EXPORT)

LAMP-PARK/TURN-LEFT FRONT (EXCEPT EXPORT) - BLACK 3 WAY

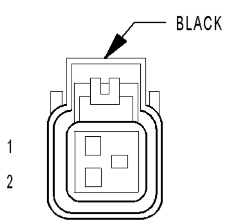
CAV	CIRCUIT	FUNCTION
1	Z904 20BK/LG	GROUND
2	L7 20WT/VT	HEADLAMP SWITCH OUTPUT
3	L61 20WT/RD	LEFT TURN SIGNAL



LAMP-PARK/TURN-RIGHT FRONT (EXCEPT EXPORT)

LAMP-PARK/TURN-RIGHT FRONT (EXCEPT EXPORT) - BLACK 3 WAY

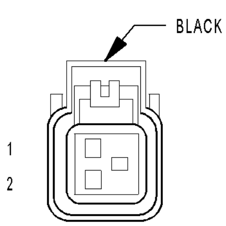
CAV	CIRCUIT	FUNCTION
1	Z908 20BK/PK	GROUND
2	L70 20WT/GY	HEADLAMP SWITCH OUTPUT
3	L60 20WT/TN	RIGHT TURN SIGNAL



LAMP-SIDE REPEATER-LEFT (EXPORT)

LAMP-SIDE REPEATER-LEFT (EXPORT) - BLACK 2 WAY

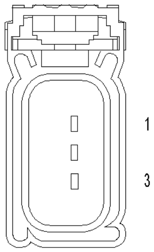
CAV	CIRCUIT	FUNCTION
1	L161 18WT/LG	LEFT TURN SIGNAL (OUT)
2	Z960 20BK/LB	GROUND



LAMP-SIDE REPEATER-RIGHT (EXPORT)

LAMP-SIDE REPEATER-RIGHT (EXPORT) - BLACK 2 WAY

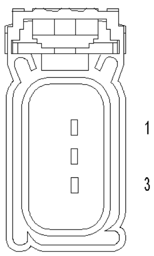
CAV	CIRCUIT	FUNCTION
1	L160 20WT/TN	RIGHT TURN SIGNAL (OUT)
2	Z908 20BK/PK	GROUND



LAMP-
TAIL
TURN-
LEFT

LAMP-TAIL TURN-LEFT - BROWN 3 WAY

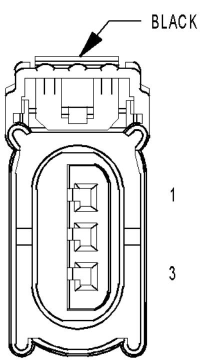
CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	-	-
3	L63 18DG/RD	LEFT REAR TURN SIGNAL



LAMP-
TAIL
TURN-
RIGHT

LAMP-TAIL TURN-RIGHT - BROWN 3 WAY

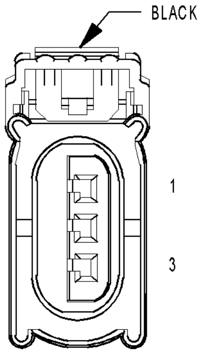
CAV	CIRCUIT	FUNCTION
1	Z964 20BK/WT	GROUND
2	-	-
3	L62 18WT/YL	RIGHT REAR TURN SIGNAL



LAMP-
TAIL/
STOP-
LEFT
(EXCEPT EXPORT)

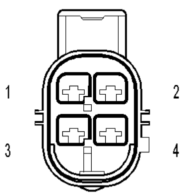
LAMP-TAIL/STOP-LEFT (EXCEPT EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	L55 18WT/OR	STOP LAMP CONTROL OUTPUT
2	L217 20WT/VT	PARK LAMP CONTROL OUTPUT
3	Z960 20BK/LB	GROUND



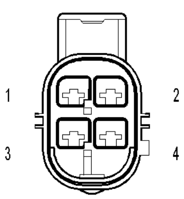
LAMP-TAIL/STOP-RIGHT (EXCEPT EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	L55 18WT/OR	STOP LAMP CONTROL OUTPUT
2	L217 20WT/VT	PARK LAMP CONTROL OUTPUT
3	Z960 20BK/LB	GROUND



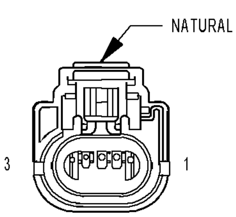
LAMP-TAIL/STOP/FOG-LEFT (EXPORT) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	L55 18WT/OR	STOP LAMP CONTROL OUTPUT
3	L217 18WT/VT	PARK LAMP CONTROL OUTPUT
4	L239 18WT/DG	REAR FOG LAMP CONTROL OUTPUT



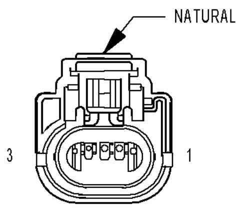
LAMP-TAIL/STOP/FOG-RIGHT (EXPORT) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z960 20BK/LB	GROUND
2	L55 18WT/OR	STOP LAMP CONTROL OUTPUT
3	L217 18WT/VT	PARK LAMP CONTROL OUTPUT
4	L239 18WT/DG	REAR FOG LAMP CONTROL OUTPUT



LAMP-TURN-LEFT FRONT (EXPORT) - NATURAL 3 WAY

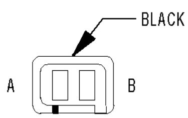
CAV	CIRCUIT	FUNCTION
1	Z904 20BK/LG	GROUND
2	-	-
3	L61 20WT/RD	LEFT TURN SIGNAL



LAMP-TURN-RIGHT FRONT (EXPORT)

LAMP-TURN-RIGHT FRONT (EXPORT) - NATURAL 3 WAY

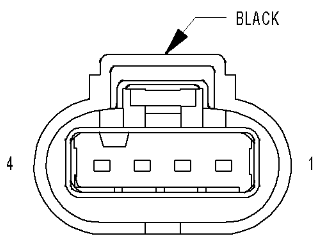
CAV	CIRCUIT	FUNCTION
1	Z908 20BK/PK	GROUND
2	-	-
3	L60 20WT/TN	RIGHT TURN SIGNAL



LAMP-VANITY-LEFT

LAMP-VANITY-LEFT - BLACK 2 WAY

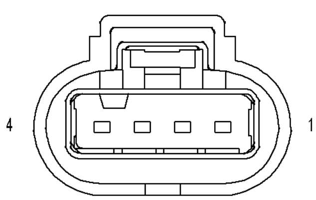
CAV	CIRCUIT	FUNCTION
A	A417 20RD/DG	FUSED B(+) (I.O.D.)
B	G38 18GY/BK	UGDO ENABLE CONTROL CIRCUIT



LATCH-DOOR-DRIVER (EXCEPT LHD BASE)

LATCH-DOOR-DRIVER (EXCEPT LHD BASE) - BLACK 4 WAY

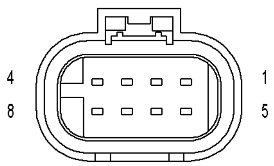
CAV	CIRCUIT	FUNCTION
1	P238 20LG/OR	DRIVER DOOR UNLOCK DRIVER
2	P33 20LG/TN	DOOR LOCK DRIVER
3	G75 20VT/BK (EXCEPT HEATED MIRRORS)	LEFT FRONT DOOR AJAR SWITCH SENSE
3	G75 20VT (HEATED MIRRORS)	LEFT FRONT DOOR AJAR SWITCH SENSE
4	Z928 20BK/LG (EXCEPT HEATED MIRRORS)	GROUND
4	Z928 20BK (HEATED MIRRORS)	GROUND



LATCH-DOOR-DRIVER (LHD BASE)

LATCH-DOOR-DRIVER (LHD BASE) - 4 WAY

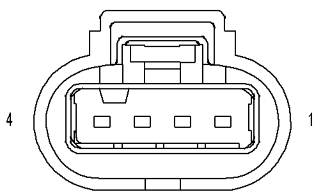
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	G75 20VT	LEFT FRONT DOOR AJAR SWITCH SENSE
4	Z928 20BK	GROUND



LATCH-DOOR-DRIVER (RHD)

LATCH-DOOR-DRIVER (RHD) - 8 WAY

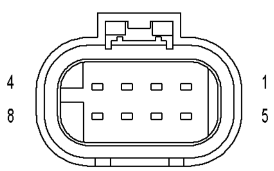
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P237 20DG/TN	SECONDARY UNLOCK DRIVER
4	P235 20LG/TN	SECONDARY LOCK DRIVER
5	P238 20LG/OR	DRIVER DOOR UNLOCK DRIVER
6	P33 20TN/DB	DOOR LOCK DRIVER
7	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
8	Z928 20BK/LG	GROUND



LATCH-DOOR-LEFT REAR (EXCEPT LHD BASE)

LATCH-DOOR-LEFT REAR (EXCEPT LHD BASE) - 4 WAY

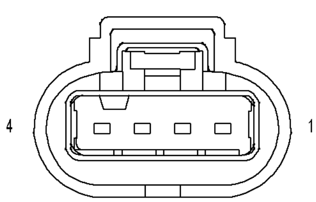
CAV	CIRCUIT	FUNCTION
1	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
2	P33 20TN/DB	DOOR LOCK DRIVER
3	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
4	Z928 20BK/LG	GROUND



LATCH-DOOR-LEFT REAR (RHD)

LATCH-DOOR-LEFT REAR (RHD) - 8 WAY

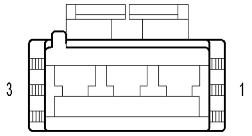
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P237 20DG/TN	SECONDARY UNLOCK DRIVER
4	P235 20LG/TN	SECONDARY LOCK DRIVER
5	P240 20TN/WT	PASSENGER DOOR UNLOCK DRIVER
6	P33 20TN/DB	DOOR LOCK DRIVER
7	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
8	Z929 20BK	GROUND



LATCH-DOOR-LEFT REAR (LHD BASE)

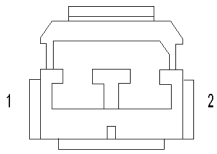
LATCH-DOOR-LEFT REAR (LHD BASE) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
4	Z928 20BK	GROUND



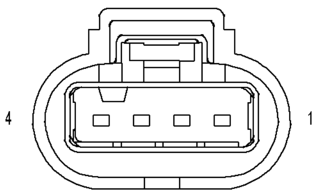
LATCH-DOOR-LIFTGATE C1 - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	P33 18LG/TN	DOOR LOCK DRIVER
2	-	-
3	P240 18LG/YL	PASSENGER DOOR UNLOCK DRIVER



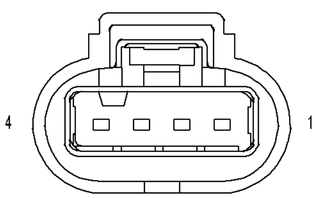
LATCH-DOOR-LIFTGATE C2 - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	G78 20VT/OR	LIFTGATE AJAR SWITCH SENSE
2	Z960 18BK	GROUND



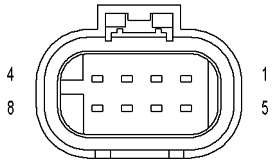
LATCH-DOOR-PASSENGER (EXCEPT LHD BASE) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	P240 20TN/WT (EXCEPT HEATED MIRRORS)	PASSENGER DOOR UNLOCK DRIVER
1	P240 18LG/YL (HEATED MIRRORS)	PASSENGER DOOR UNLOCK DRIVER
2	P33 18TN/DB (EXCEPT HEATED MIRRORS)	DOOR LOCK DRIVER
2	P33 18LG/TN (HEATED MIRRORS)	DOOR LOCK DRIVER
3	G74 20VT/WT (LHD)	RIGHT FRONT DOOR AJAR SWITCH SENSE
3	G75 20VT/WT (RHD)	LEFT FRONT DOOR AJAR SWITCH SENSE
4	Z960 20BK/LB (EXCEPT HEATED MIRRORS)	GROUND
4	Z928 20BK (HEATED MIRRORS)	GROUND



LATCH-DOOR-PASSENGER (LHD BASE) - 4 WAY

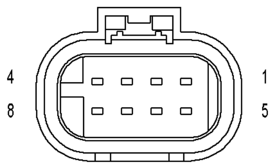
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	G74 20VT/WT	RIGHT FRONT DOOR AJAR SWITCH SENSE
4	Z928 20BK	GROUND



LATCH-DOOR-PASSENGER (RHD)

LATCH-DOOR-PASSENGER (RHD) - 8 WAY

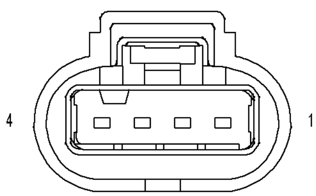
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P237 20DG/TN	SECONDARY UNLOCK DRIVER
4	P235 20LG/TN	SECONDARY LOCK DRIVER
5	P240 20TN/WT	PASSENGER DOOR UNLOCK DRIVER
6	P33 20TN/DB	DOOR LOCK DRIVER
7	G75 20VT/WT	LEFT FRONT DOOR AJAR SWITCH SENSE
8	Z960 20BK/LB	GROUND



LATCH-DOOR-RIGHT REAR (RHD)

LATCH-DOOR-RIGHT REAR (RHD) - 8 WAY

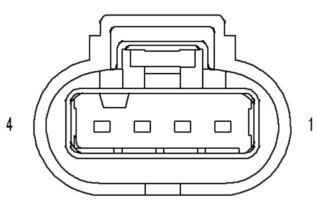
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P237 20DG/TN	SECONDARY UNLOCK DRIVER
4	P235 20LG/TN	SECONDARY LOCK DRIVER
5	P240 20TN/WT	PASSENGER DOOR UNLOCK DRIVER
6	P33 20TN/DB	DOOR LOCK DRIVER
7	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
8	Z928 20BK/LG	GROUND



LATCH-DOOR-RIGHT REAR (LHD BASE)

LATCH-DOOR-RIGHT REAR (LHD BASE) - 4 WAY

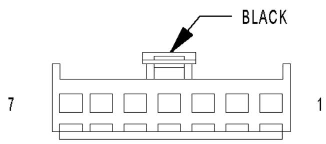
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
4	Z928 20BK	GROUND



LATCH-DOOR-RIGHT REAR (EXCEPT LHD BASE)

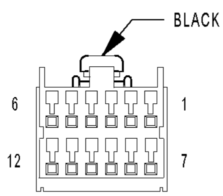
LATCH-DOOR-RIGHT REAR (EXCEPT LHD BASE) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	P240 20LG/YL	PASSENGER DOOR UNLOCK DRIVER
2	P33 20TN/DB	DOOR LOCK DRIVER
3	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
4	Z928 20BK/LG	GROUND



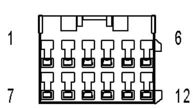
MIRROR-INSIDE REARVIEW C1 - BLACK 7 WAY

CAV	CIRCUIT	FUNCTION
1	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
2	Z941 20BK/YL	GROUND
3	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
4	-	-
5	-	-
6	-	-
7	-	-



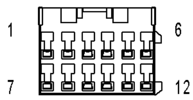
MIRROR-INSIDE REARVIEW C2 (HANDS FREE) - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	X722 20LB/DG	MICROPHONE 2 IN(+)
5	-	-
6	X712 20DG/LB	MICROPHONE 1 IN(+)
7	X793 20DG/YL	MICROPHONE FEED
8	-	-
9	X730 20GY/YL	VOICE RECOGNITION/PHONE SWITCH SIGNAL
10	-	-
11	X835 20BK/DB	SENSOR GROUND
12	X792 20BK/VT	MICROPHONE IN(-)



MIRROR-OUTSIDE REARVIEW-DRIVER - BLACK 12 WAY

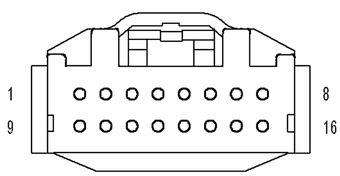
CAV	CIRCUIT	FUNCTION
1	P71 20TN/DG (LHD)	LEFT MIRROR VERTICAL DRIVER
1	P72 20TN/GY (RHD)	RIGHT MIRROR VERTICAL DRIVER
2	P76 20YL/PK	MIRROR COMMON DRIVER
3	P75 20TN/LG (LHD)	LEFT MIRROR HORIZONTAL DRIVER
3	P74 20TN/OR (RHD)	RIGHT MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY (HEATED MIRRORS)	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
5	Z928 20BK (LHD)	GROUND
5	Z928 20BK/LG (RHD)	GROUND
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	P699 20LG/DG (RHD)	MIRROR-POWER FOLDING/UNFOLDING
12	P110 20LG/WT (RHD)	FOLDING MIRROR RETURN



MIRROR-OUTSIDE REARVIEW-PASSENGER

MIRROR-OUTSIDE REARVIEW-PASSENGER - 12 WAY

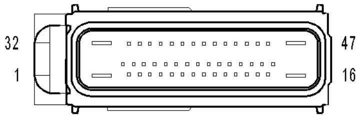
CAV	CIRCUIT	FUNCTION
1	P72 20TN/GY (LHD)	RIGHT MIRROR VERTICAL DRIVER
1	P71 20TN/DG (RHD)	LEFT MIRROR VERTICAL DRIVER
2	P76 20TN/LB (LHD)	MIRROR COMMON DRIVER
2	P76 20YL/PK (RHD)	MIRROR COMMON DRIVER
3	P74 20TN/OR (LHD)	RIGHT MIRROR HORIZONTAL DRIVER
3	P75 20TN/OR (RHD)	LEFT MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY (HEATED MIRRORS)	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
5	Z928 20BK (LHD)	GROUND
5	Z960 20BK/LB (RHD)	GROUND
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	P699 20LG/DG (RHD)	MIRROR-POWER FOLDING/UNFOLDING
12	P110 20LG/WT (RHD)	FOLDING MIRROR RETURN



MODULE-ALL WHEEL DRIVE CONTROL (AWD)

MODULE-ALL WHEEL DRIVE CONTROL (AWD) - 16 WAY

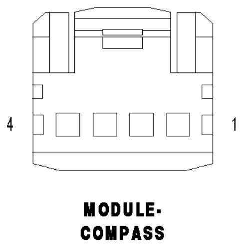
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	D65 20WT/BK	CAN C BUS (+)
5	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
6	A923 20RD	FUSED B(+)
7	-	-
8	T312 20YL/VT	REAR DIFFERENTIAL SOLENOID CONTROL
9	-	-
10	-	-
11	-	-
12	D64 20WT/LB	CAN C BUS (-)
13	-	-
14	-	-
15	Z967 20BK	GROUND
16	T78 20YL/BK	SOLENOID SUPPLY VOLTAGE



MODULE-
ANTI-LOCK
BRAKES

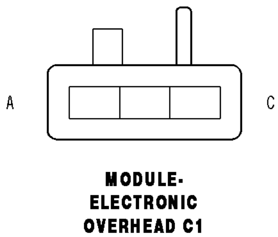
MODULE-ANTI-LOCK BRAKES - BLACK 47 WAY

CAV	CIRCUIT	FUNCTION
1	A921 12RD/YL (ESP)	FUSED B(+) (PUMP)
1	A921 12RD/DB (TCS)	FUSED B(+) (PUMP)
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
9	-	-
10	-	-
11	-	-
12	D65 20WT/BK	CAN C BUS (+)
13	D64 20WT/LB	CAN C BUS (-)
14	-	-
15	-	-
16	Z909 12BK/WT	GROUND
17	-	-
18	D465 20WT/DB (ESP)	DYNAMICS SENSOR HIGH DATA LINK
19	D464 20WT/YL (ESP)	DYNAMICS SENSOR LOW DATA LINK
20	-	-
21	-	-
22	G4 18VT/LB (ESP)	DYNAMICS SENSOR SUPPLY
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	G94 18VT/DB (ESP)	DYNAMICS SENSOR GROUND
30	-	-
31	-	-
32	A922 12RD/DB (ESP)	FUSED B(+) (VALVE)
32	A922 14RD/BK (TCS)	FUSED B(+) (VALVE)
33	B6 20WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
34	B7 20WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
35	-	-
36	B4 20LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
37	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL
38	-	-
39	-	-
40	-	-
41	-	-
42	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
43	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
44	-	-
45	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUP-PLY
46	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
47	Z902 12BK/WT	GROUND



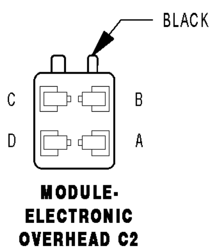
MODULE-COMPASS - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	D506 20WT/DG	LIN BUS
3	Z937 20BK/YL	GROUND
4	F929 20PK/RD	FUSED IGNITION SWITCH OUTPUT (RUN)



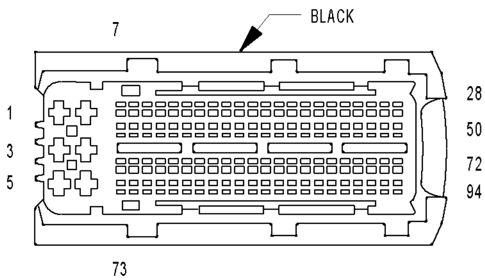
MODULE-ELECTRONIC OVERHEAD C1 - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
A	M27 20YL/LB	READING/RAIL LAMPS DRIVER
B	Z936 20BK/LB	GROUND
C	M24 20YL/WT	COURTESY LAMPS DRIVER



MODULE-ELECTRONIC OVERHEAD C2 - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
A	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
B	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
C	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
D	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE



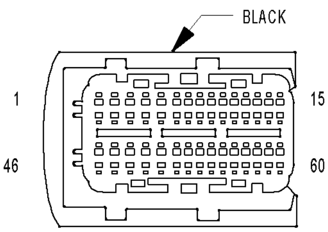
MODULE-ENGINE CONTROL C1 (DIESEL)

MODULE-ENGINE CONTROL C1 (DIESEL) - BLACK 94 WAY

CAV	CIRCUIT	FUNCTION
1	Z925 14BK/YL	GROUND
2	Z925 14BK/YL	GROUND
3	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
4	Z925 14BK/YL	GROUND
5	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
6	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	K35 20DB/VT	EGR SOLENOID CONTROL
14	G6 16VT/GY	EOP SIGNAL
15	-	-
16	-	-
17	K400 20BR/VT	APP SENSOR GROUND 2
18	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
19	T26 20DG/OR	CLUTCH UPSTOP SWITCH SIGNAL
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	G329 20VT/OR	CHARGE INDICATOR SIGNAL
27	G329 20VT/OR	CHARGE INDICATOR SIGNAL
28	-	-
29	V72 20OR/VT	S/C SIGNAL 2
30	K202 20DB/BR	GLOW PLUG RELAY CONTROL
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	-	-
37	-	-
38	K48 20DB/WT	IAT SENSOR SIGNAL
39	K167 20BR/YL	APP SENSOR GROUND 1
40	F855 20PK/YL	5 VOLT SUPPLY
41	-	-
42	-	-
43	-	-
44	-	-
45	-	-
46	V937 20VT/BR	S/C SWITCH GROUND
47	-	-
48	-	-
49	K51 20BR/LG	MAIN RELAY CONTROL
50	-	-
51	-	-
52	K31 20DB/BK	FUEL PUMP CONTROL
53	-	-
54	-	-

MODULE-ENGINE CONTROL C1 (DIESEL) - BLACK 94 WAY

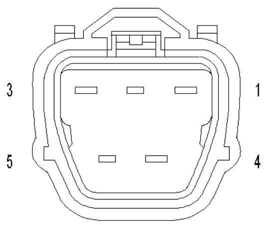
CAV	CIRCUIT	FUNCTION
55	-	-
56	-	-
57	-	-
58	-	-
59	-	-
60	K957 20BK/OR	MAF SENSOR GROUND
61	K29 20WT/BR	APP SIGNAL 2
62	K854 20VT/BR	5 VOLT SUPPLY
63	D330 20VT/WT	GLOW PLUG MODULE SIGNAL
64	K92 20BR/YL	GEN OUTPUT SIGNAL
65	-	-
66	D64 20WT/LB	CAN C BUS (-)
67	-	-
68	-	-
69	-	-
70	-	-
71	-	-
72	-	-
73	-	-
74	-	-
75	-	-
76	K656 20GY/BR	SENSOR GROUND
77	-	-
78	K37 20BR/OR	BOOST PRESSURE SENSOR SIGNAL
79	-	-
80	-	-
81	T141 20YL/RD	CLUTCH INTERLOCK SIGNAL
82	K157 20BR/OR	MAF SENSOR SIGNAL
83	K23 20BR/OR	APP SIGNAL 1
84	K852 20BR/VT	5 VOLT SUPPLY
85	-	-
86	F961 20PK/LB	IGNITION SWITCH OUTPUT (START)
87	B15 20DG/WT	BRAKE SIGNAL 1
88	-	-
89	D65 20WT/BK	CAN C BUS (+)
90	-	-
91	-	-
92	T752 20DG/OR	STARTER CONTROL
93	-	-
94	-	-



MODULE-ENGINE CONTROL C2 (DIESEL)

MODULE-ENGINE CONTROL C2 (DIESEL) - BLACK 60 WAY

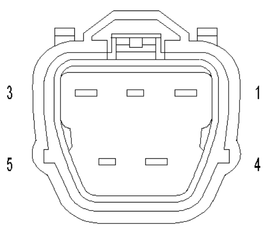
CAV	CIRCUIT	FUNCTION
1	K613 16GY/BR	FUEL INJECTOR 3 LOW-SIDE CONTROL
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	K944 20BK/GY	CMP SENSOR GROUND
13	-	-
14	-	-
15	K53 20DB/LG	EGR COOLER BYPASS CONTROL
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	V71 20VT/OR	S/C SIGNAL 1
23	-	-
24	-	-
25	K604 20BR/WT	EGR AIR FLOW CONTROL VALVE SIGNAL
26	-	-
27	K844 20DB/YL	CMP SENSOR 5 VOLT SUPPLY
28	K44 20DB/GY	CMP 1/1 SIGNAL
29	K137 20DB/OR	BOOST PRESSURE CONTROL
30	-	-
31	K663 20BR/GY	FUEL INJECTOR HIGH-SIDE COMMON
32	K663 20BR/GY	FUEL INJECTOR HIGH-SIDE COMMON
33	-	-
34	-	-
35	-	-
36	-	-
37	-	-
38	-	-
39	K156 20BR/YL	FUEL TEMPERATURE SENSOR SIGNAL
40	K900 20DB/DG	SENSOR GROUND
41	-	-
42	K853 20DB/BR	CKP SENSOR 5 VOLT SUPPLY
43	-	-
44	-	-
45	C27 20LB/WT	A/C COMPRESSOR CONTROL
46	K611 14OR/BR	FUEL INJECTOR 1 LOW-SIDE CONTROL
47	K614 14WT/BR	FUEL INJECTOR 4 LOW-SIDE CONTROL
48	K612 14YL/BR	FUEL INJECTOR 2 LOW-SIDE CONTROL
49	-	-
50	-	-
51	-	-
52	K2 20VT/OR	ECT 1 SIGNAL
53	K915 20BR/WT	SENSOR GROUND
54	-	-
55	-	-
56	-	-
57	K925 20DB/GY	CKP SENSOR GROUND
58	K24 20BR/LB	CKP SENSOR SIGNAL
59	-	-
60	K601 20BR/VT	EGR AIR FLOW CONTROL VALVE CONTROL



MODULE-FUEL PUMP (FWD)

MODULE-FUEL PUMP (FWD) - DK. GRAY 5 WAY

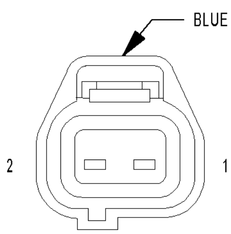
CAV	CIRCUIT	FUNCTION
1	Z965 20BK/GY	GROUND
2	N4 20DB/WT	FUEL LEVEL SIGNAL 1
3	-	-
4	Z964 20BK	GROUND
4	Z964 18BK/WT	GROUND
4	Z965 20BK/GY	GROUND
5	N1 16DB/OR (DIESEL)	FUEL PUMP CONTROL OUTPUT
5	N1 20DB/OR (GAS)	FUEL PUMP CONTROL OUTPUT



MODULE-FUEL PUMP C1 (AWD)

MODULE-FUEL PUMP C1 (AWD) - DK. GRAY 5 WAY

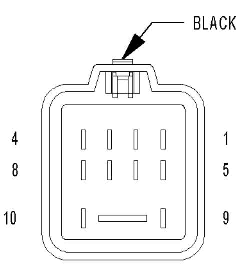
CAV	CIRCUIT	FUNCTION
1	Z965 20BK/GY	GROUND
2	N4 20DB/WT	FUEL LEVEL SIGNAL 1
3	-	-
4	Z964 18BK/WT	GROUND
5	N1 20DB/OR	FUEL PUMP CONTROL OUTPUT



MODULE-FUEL PUMP C2 (AWD)

MODULE-FUEL PUMP C2 (AWD) - BLUE 2 WAY

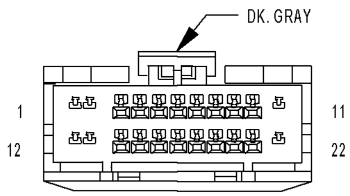
CAV	CIRCUIT	FUNCTION
1	Z965 18BK/GY	GROUND
1	Z965 20BK/GY	GROUND
2	N5 20DB/WT	FUEL LEVEL SIGNAL 2



MODULE-GLOW PLUG

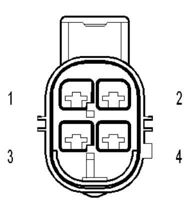
MODULE-GLOW PLUG - BLACK 11 WAY

CAV	CIRCUIT	FUNCTION
1	A202 14RD/WT	GLOW PLUG 1 CONTROL
2	A203 14RD/BR	GLOW PLUG 2 CONTROL
3	A204 14RD/YL	GLOW PLUG 3 CONTROL
4	A208 14RD/OR	GLOW PLUG 4 CONTROL
5	-	-
6	K344 18DB/LB	FUSED MAIN RELAY OUTPUT
7	Z924 16BK/LB	GROUND
8	-	-
9	D330 20VT/WT	GLOW PLUG MODULE SIGNAL
10	K202 20DB/BR	GLOW PLUG RELAY CONTROL
11	A29 10RD/GY	FUSED B(+)



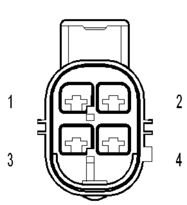
MODULE-HANDS FREE - DK. GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	A417 20RD/DG (EXCEPT PASSENGER AIRBAGS)	FUSED B(+) (I.O.D.)
1	A417 16RD/DG (PASSENGER AIR-BAGS)	FUSED B(+) (I.O.D.)
2	-	-
3	-	-
4	D54 20WT/PK	CAN B BUS (-)
5	X722 20LB/DG	MICROPHONE 2 IN(+)
6	-	-
7	-	-
8	X703 22DG/OR	LEFT AUDIO OUTPUT
9	X704 22DG/PK	RIGHT AUDIO OUTPUT
10	X795 22DG/BK	COMMON AUDIO OUTPUT
11	-	-
12	-	-
13	-	-
14	D55 20WT/OR	CAN B BUS (+)
15	X730 20GY/YL	VOICE RECOGNITION/PHONE SWITCH SIGNAL
16	X712 20DG/LB	MICROPHONE 1 IN(+)
17	X792 20LB/TN	MICROPHONE IN(-)
18	-	-
19	-	-
20	X793 20DG/YL	MICROPHONE FEED
21	X835 20OR/BK	SENSOR GROUND
22	Z937 18BK/YL (OPTION 1)	GROUND
22	Z937 20BK/YL (OPTION 2)	GROUND



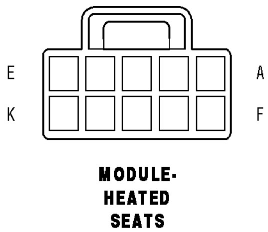
MODULE-HEADLAMP LEVELING-LEFT (EXPORT) - DK. GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z904 18BK/LG	GROUND
2	F901 20PK/RD	IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
3	L131 20WT/LG	HEADLAMP LEVEL SENSOR SIGNAL
4	L7 20WT/YL	HEADLAMP SWITCH OUTPUT



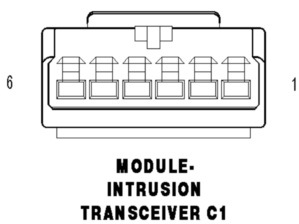
MODULE-HEADLAMP LEVELING-RIGHT (EXPORT) - DK. GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z908 18BK/PK	GROUND
2	F901 20PK/RD	IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
3	L132 20LG/WT	HEADLAMP LEVEL SENSOR SIGNAL
4	L70 20WT/GY	HEADLAMP SWITCH OUTPUT



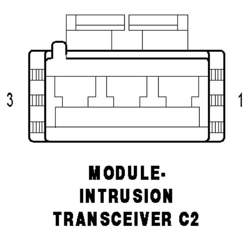
MODULE-HEATED SEATS - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
A	-	-
B	-	-
C	-	-
D	P187 16LG/BR (LHD)	LEFT SEAT HEATER B(+) DRIVER
D	P188 16LG/BR (RHD)	RIGHT SEAT HEATER B(+) DRIVER
E	F937 14PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
F	Z960 18BK	GROUND
G	-	-
H	-	-
J	D506 20WT/DG	LIN BUS
K	P188 16LG/VT (LHD)	RIGHT SEAT HEATER B(+) DRIVER
K	P187 16LG/VT (RHD)	LEFT SEAT HEATER B(+) DRIVER



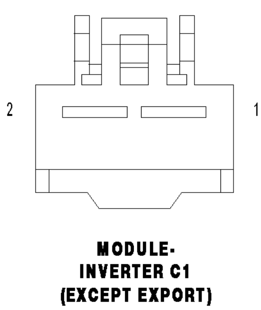
MODULE-INTRUSION TRANSCEIVER C1 - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	A415 20RD/TN	FUSED B(+) (I.O.D.)
2	-	-
3	D55 20WT/OR	CAN B BUS (+)
4	D54 20WT/PK	CAN B BUS (-)
5	D96 20WT/LB	SIREN SIGNAL CONTROL
6	Z936 20BK/LB (OPTION 1)	GROUND
6	Z941 20BK/YL (OPTION 2)	GROUND



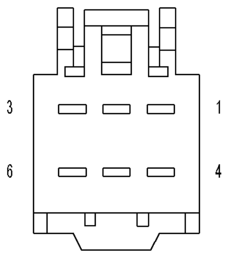
MODULE-INTRUSION TRANSCEIVER C2 - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	M24 20YL/WT	COURTESY LAMPS DRIVER
3	Z936 20BK/LB (OPTION 1)	GROUND
3	Z941 20BK/YL (OPTION 2)	GROUND



MODULE-INVERTER C1 (EXCEPT EXPORT) - 2 WAY

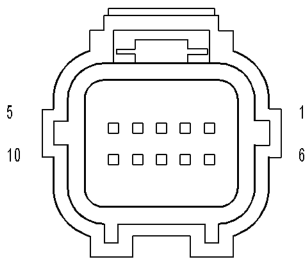
CAV	CIRCUIT	FUNCTION
1	Z940 14BK/LG	GROUND
2	A999 16RD/PK	FUSED B(+)



MODULE-INVERTER C2 (EXCEPT EXPORT)

MODULE-INVERTER C2 (EXCEPT EXPORT) - ORANGE 6 WAY

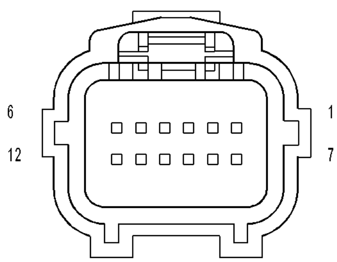
CAV	CIRCUIT	FUNCTION
1	-	-
2	P805 18LG/DB (OPTION 1)	INVERTER ENABLE SWITCH SIGNAL
2	P805 18LG/LB (OPTION 2)	INVERTER ENABLE SWITCH SIGNAL
3	-	-
4	P809 18LG/LB (OPTION 1)	110 VOLT AC COMMON
4	P809 18LG (OPTION 2)	110 VOLT AC COMMON
5	-	-
6	P801 18LG/PK	110 VOLT AC LINE 1



MODULE-OCCUPANT CLASSIFICATION C1 (EXCEPT EXPORT)

MODULE-OCCUPANT CLASSIFICATION C1 (EXCEPT EXPORT) - BLACK 10 WAY

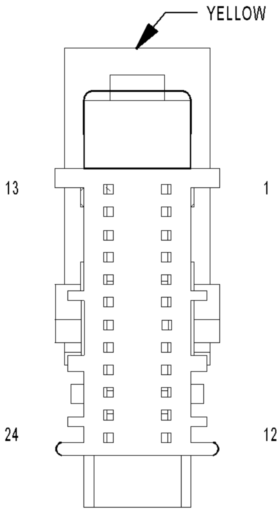
CAV	CIRCUIT	FUNCTION
1	A417 18RD	FUSED B(+) (I.O.D.)
2	-	-
3	-	-
4	D55 20WT/OR	CAN B BUS (+)
5	D54 20WT	CAN B BUS (-)
6	-	-
7	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE
8	-	-
9	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
10	Z944 20BK	GROUND



MODULE-OCCUPANT CLASSIFICATION C2 (EXCEPT EXPORT)

MODULE-OCCUPANT CLASSIFICATION C2 (EXCEPT EXPORT) - BLACK 12 WAY

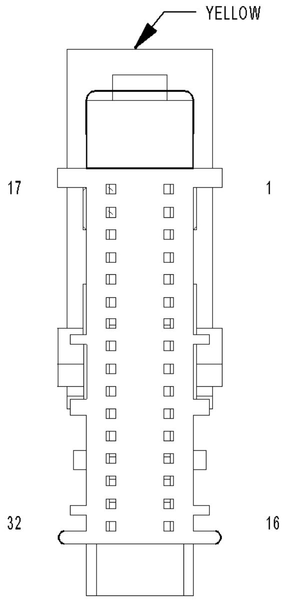
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	R264 20VT/LB	PASSENGER SEAT POSITION SENSOR VOLTAGE
3	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
4	-	-
5	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
6	-	-
7	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
8	-	-
9	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL
10	-	-
11	R262 20WT/LB	PASSENGER SEAT POSITION SENSOR DATA
12	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND



MODULE-OCCUPANT RESTRAINT CONTROLLER C1 (ORC)

MODULE-OCCUPANT RESTRAINT CONTROLLER C1 (ORC) - YELLOW 24 WAY

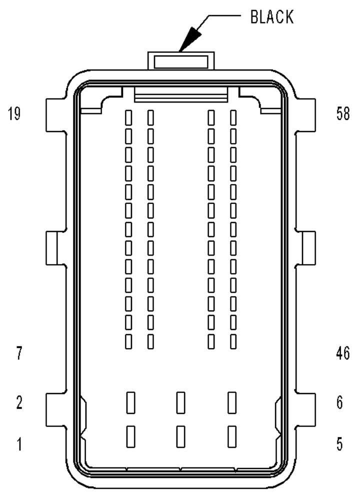
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	D55 20WT/OR	CAN B BUS (+)
4	D54 20WT/PK	CAN B BUS (-)
5	-	-
6	-	-
7	-	-
8	-	-
9	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
10	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL
11	R82 20WT/BK	RIGHT FRONT IMPACT SENSOR GROUND
12	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL
13	R9 18LB/YL (EXCEPT EXPORT)	DRIVER KNEE BLOCKER SQUIB LINE 2
14	R11 18LB/DB (EXCEPT EXPORT)	DRIVER KNEE BLOCKER SQUIB LINE 1
15	-	-
16	-	-
17	R43 18LG/BR	DRIVER SQUIB 1 LINE 2
18	R45 18LG/RD	DRIVER SQUIB 1 LINE 1
19	R44 18LB/OR	PASSENGER SQUIB 1 LINE 1
20	R42 18LB/BR	PASSENGER SQUIB 1 LINE 2
21	R61 18LG/VT	DRIVER SQUIB 2 LINE 2
22	R63 18LG/BK	DRIVER SQUIB 2 LINE 1
23	R64 18LB/WT	PASSENGER SQUIB 2 LINE 1
24	R62 18LB/VT	PASSENGER SQUIB 2 LINE 2



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (ORC)

MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (ORC) - YELLOW 32 WAY

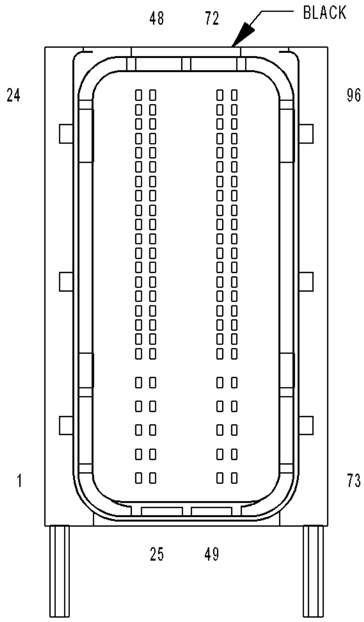
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	R1 18LB/WT (SIDE AIR BAG)	LEFT CURTAIN SQUIB 1 LINE 2
6	R3 18LB/OR (SIDE AIR BAG)	LEFT CURTAIN SQUIB 1 LINE 1
7	R4 18OR/LB (SIDE AIR BAG)	RIGHT CURTAIN SQUIB 1 LINE 1
8	R2 18WT/LB (SIDE AIR BAG)	RIGHT CURTAIN SQUIB 1 LINE 2
9	R53 18LG/YL	DRIVER SEAT BELT TENSIONER LINE 2
10	R55 18LG/DG	DRIVER SEAT BELT TENSIONER LINE 1
11	R56 18LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1
12	R54 18LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2
13	-	-
14	-	-
15	-	-
16	-	-
17	F200 20PK/LB (BASE)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
17	F200 18PK/LB (EXCEPT BASE)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	F100 20DG/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
19	-	-
20	Z944 18BK/LG	GROUND
21	R272 20LB/VT (EXCEPT EXPORT)	PASSENGER HALL EFFECT (-)
22	-	-
23	-	-
24	R274 20LB/WT (EXCEPT EXPORT)	PASSENGER HALL EFFECT (+)
25	-	-
26	-	-
27	R14 20TN/LG (SIDE AIR BAG)	RIGHT SIDE IMPACT SENSOR 1 SIGNAL
28	R16 20BR/LG (SIDE AIR BAG)	RIGHT SIDE IMPACT SENSOR 1 GROUND
29	R15 20LG/BR (SIDE AIR BAG)	LEFT SIDE IMPACT SENSOR 1 GROUND
30	R13 20LG/TN (SIDE AIR BAG)	LEFT SIDE IMPACT SENSOR 1 SIGNAL
31	-	-
32	-	-



MODULE-POWERTRAIN CONTROL C1 (GAS)

MODULE-POWERTRAIN CONTROL C1 (GAS) - BLACK 58 WAY

CAV	CIRCUIT	FUNCTION
1	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
2	Z925 16BK/YL	GROUND
3	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
4	Z925 16BK/YL	GROUND
5	-	-
6	-	-
7	K299 20BR/RD	O2 1/2 HEATER CONTROL
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	V937 20VT/BR	S/C SWITCH GROUND
14	-	-
15	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
16	A931 20RD/WT	FUSED B(+)
17	-	-
18	-	-
19	K31 20BR	FUEL PUMP CONTROL
20	K904 20DB/DG	O2 1/2 RETURN
21	K141 20DB/YL	O2 1/2 SIGNAL
22	K858 20BR/GY	5 VOLT SUPPLY
23	F856 20YL/PK	5 VOLT SUPPLY
24	-	-
25	T752 20DG/OR	STARTER CONTROL
26	V72 20OR/VT	S/C SIGNAL 2
27	V71 20VT/OR	S/C SIGNAL 1
28	-	-
29	-	-
30	K914 20DB/PK	SENSOR GROUND
31	-	-
32	B15 20DG/WT	BRAKE SIGNAL 1
33	-	-
34	K400 20BR/VT	APP SENSOR GROUND 2
35	K70 20DB/BR	EVAP PURGE RETURN
36	K167 20BR/YL	APP SENSOR GROUND 1
37	F963 20PK/DB	START ENABLE
38	K75 20DB/OR	VEHICLE SPEED SIGNAL
39	K52 20DB/WT	EVAP PURGE CONTROL
40	-	-
41	D65 20WT/BK	CAN C BUS (+)
42	-	-
43	-	-
44	-	-
45	-	-
46	-	-
47	K107 20VT/WT	ESM SIGNAL
48	K29 20WT/BR	APP SIGNAL 2
49	K23 20BR/OR	APP SIGNAL 1
50	T141 20YL/RD	CLUTCH INTERLOCK SIGNAL
51	-	-
52	B215 20DG/OR	BRAKE SIGNAL 2
53	A804 16RD/GY	GEN SENSE
54	D64 20WT/LB	CAN C BUS (-)
55	-	-
56	-	-
57	-	-
58	K51 20BR/LG	MAIN RELAY CONTROL



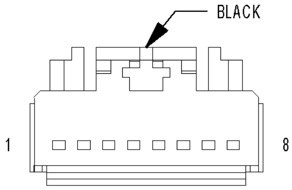
MODULE-POWERTRAIN CONTROL C2 (GAS)

MODULE-POWERTRAIN CONTROL C2 (GAS) - BLACK 96 WAY

CAV	CIRCUIT	FUNCTION
1	K124 20DB/GY	ETC MOTOR (+)
2	-	-
3	-	-
4	-	-
5	-	-
6	C27 20LB/WT	A/C COMPRESSOR CONTROL
7	-	-
8	K21 20BK/RD	IAT SIGNAL
9	-	-
10	-	-
11	K222 20BR/YL	ECT 2 SIGNAL
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	K13 20BR/LB	INJECTOR 3 CONTROL
22	K14 20BR/TN	INJECTOR 4 CONTROL
23	K11 20BR/YL	INJECTOR 1 CONTROL
24	K12 20BR/DB	INJECTOR 2 CONTROL
25	K126 20DB/LG	ETC MOTOR (-)
26	-	-
27	K601 20BR/VT	MFV CONTROL
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-
33	K41 20BK/DG	O2 1/1 SIGNAL
34	-	-
35	-	-
36	K902 20BR/DG	O2 1/1 RETURN
37	G24 20VT/BR	EOT SIGNAL
38	K441 20DB/BR	CMP 1/2 SIGNAL
39	-	-
40	-	-
41	F855 20PK/YL	5 VOLT SUPPLY
42	K857 20BR/LG	5 VOLT SUPPLY
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	-	-
49	K99 20BR/OR	O2 1/1 HEATER CONTROL
50	-	-
51	K20 20BR/GY	GEN FIELD CONTROL
52	-	-
53	-	-
54	-	-

MODULE-POWERTRAIN CONTROL C2 (GAS) - BLACK 96 WAY

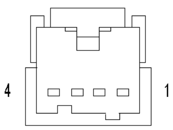
CAV	CIRCUIT	FUNCTION
55	-	-
56	-	-
57	K44 20DB/GY	CMP 1/1 SIGNAL
58	K915 20BR/WT	SENSOR GROUND
59	-	-
60	-	-
61	-	-
62	K922 20BR/DB	TP SENSOR GROUND
63	K122 20BR/DG	TP SIGNAL 2
64	K22 20BR/OR	TP SIGNAL 1
65	K942 20WT/BR	KS RETURN
66	-	-
67	-	-
68	-	-
69	-	-
70	K76 20BR/WT	CMP 1/1 CONTROL
71	-	-
72	K276 20DB/WT	CMP 1/2 CONTROL
73	K15 20DB/GY	COIL 4 CONTROL
74	K18 20DB/OR	COIL 3 CONTROL
75	K17 20DB/TN	COIL 2 CONTROL
76	K19 20DB/DG	COIL 1 CONTROL
77	-	-
78	-	-
79	K24 20BR/LB	CKP SIGNAL
80	-	-
81	-	-
82	K900 20DB/DG	SENSOR GROUND
83	K2 20VT/OR	ECT 1 SIGNAL
84	K602 20YL/DB	MFV SIGNAL
85	K1 20VT/BR	MAP SIGNAL
86	G6 20VT/GY	EOP SIGNAL
87	-	-
88	K42 20DB/LG	KS SIGNAL
89	-	-
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-



MODULE-SENTRY KEY REMOTE ENTRY

MODULE-SENTRY KEY REMOTE ENTRY - BLACK 8 WAY

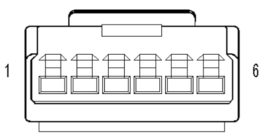
CAV	CIRCUIT	FUNCTION
1	G20 20VT/BR	IGNITION SWITCH SENSE
2	D508 20WT/GY (TIRE PRESSURE MONITOR)	COM-LIN TIRE PRESSURE MONITOR LAN
3	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
4	Z937 20BK/YL	GROUND
5	A411 20RD/LG	FUSED B(+) (I.O.D.)
6	D55 20WT/OR	CAN B BUS (+)
7	D54 20WT/PK	CAN B BUS (-)
8	-	-



MODULE-STEERING CONTROL C1

MODULE-STEERING CONTROL C1 - WHITE 4 WAY

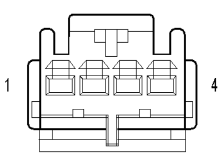
CAV	CIRCUIT	FUNCTION
1	Z937 20BK/YL (OPTION 1)	GROUND
1	Z936 20BK/LB (OPTION 2)	GROUND
2	A411 20RD/LG	FUSED B(+) (I.O.D.)
3	D506 20WT/DG	LIN BUS
4	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)



MODULE-STEERING CONTROL C2

MODULE-STEERING CONTROL C2 - WHITE 6 WAY

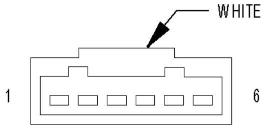
CAV	CIRCUIT	FUNCTION
1	X20 20GY/WT (REMOTE RADIO CONTROL)	RADIO CONTROL MUX
2	Y13 20DG/RD	RADIO CONTROL RETURN
3	X3 20DG/VT	HORN SWITCH SENSE
4	V72 20OR/VT	S/C SIGNAL 2
5	V937 20VT/LG	S/C SWITCH GROUND
6	V71 20VT/OR	S/C SIGNAL 1



MODULE-STEERING CONTROL C4

MODULE-STEERING CONTROL C4 - WHITE 4 WAY

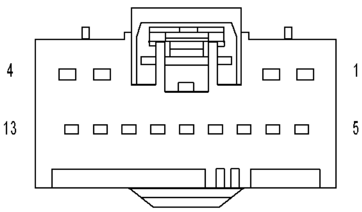
CAV	CIRCUIT	FUNCTION
1	R63 18LG/BK	DRIVER SQUIB 2 LINE 1
2	R61 18LG/VT	DRIVER SQUIB 2 LINE 2
3	R45 18LG/RD	DRIVER SQUIB 1 LINE 1
4	R43 18LG/BR	DRIVER SQUIB 1 LINE 2



MODULE-
STEERING
CONTROL C5

MODULE-STEERING CONTROL C5 - WHITE 6 WAY

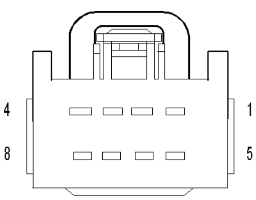
CAV	CIRCUIT	FUNCTION
1	X20 20GY	RADIO CONTROL MUX
1	X20 20GY	RADIO CONTROL MUX
2	Y13 20BK	RADIO CONTROL RETURN
2	Y13 20BK	RADIO CONTROL RETURN
3	X3 20DB	HORN SWITCH SENSE
4	V72 20PK	S/C SIGNAL 2
5	V71 20VT	S/C SIGNAL 1
6	V937 20YL	S/C SWITCH GROUND



MODULE-
TOTALLY
INTEGRATED
POWER C1

MODULE-TOTALLY INTEGRATED POWER C1 - BLACK 13 WAY

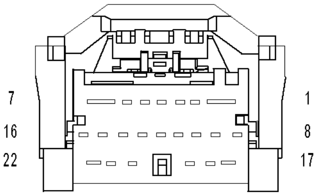
CAV	CIRCUIT	FUNCTION
1	W20 20BR/YL	REAR WASHER PUMP MOTOR CONTROL
2	W10 20BR/TN	FRONT WASHER PUMP MOTOR CONTROL
3	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
4	-	-
5	-	-
6	K232 20BR/LB (DIESEL)	CABIN HEATER RELAY 2 CONTROL
7	K132 20DB/LB (DIESEL)	CABIN HEATER RELAY 1 CONTROL
8	-	-
9	-	-
10	-	-
11	-	-
12	B20 20DG/RD	BRAKE FLUID LEVEL SWITCH SENSE
13	Z924 20BK/LB	GROUND



MODULE-
TOTALLY
INTEGRATED
POWER C10

MODULE-TOTALLY INTEGRATED POWER C10 - LT. GRAY 8 WAY

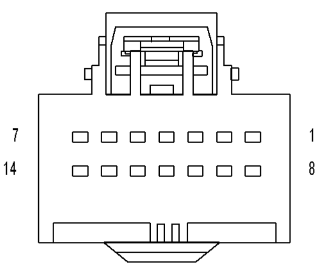
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	T16 16YL/OR (CVT)	TRANSMISSION CONTROL OUTPUT
4	-	-
5	K343 18DB/LG	FUSED MAIN RELAY OUTPUT
6	K344 18DB/LB	FUSED MAIN RELAY OUTPUT
7	-	-
8	T750 16YL/GY	STARTER CONTROL OUTPUT



MODULE-TOTALLY INTEGRATED POWER C11

MODULE-TOTALLY INTEGRATED POWER C11 - GREEN 22 WAY

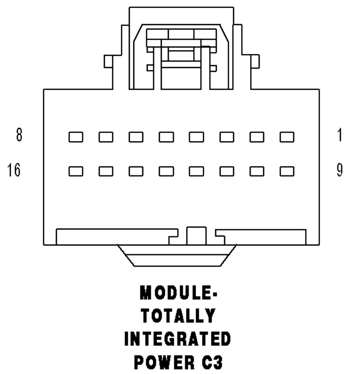
CAV	CIRCUIT	FUNCTION
1	K342 14BR/DG	FUSED MAIN RELAY OUTPUT
2	-	-
3	-	-
4	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
5	L89 20WT/YL (FOG LAMPS)	FRONT FOG LAMP CONTROL OUTPUT
6	L90 20WT/OR (FOG LAMPS)	FRONT FOG LAMP CONTROL OUTPUT
7	N201 20DB/LG	LOW/HIGH RAD FAN RELAY CONTROL
8	X22 20GY/LB (EXPORT)	HORN CONTROL OUTPUT
9	X21 20GY/YL	HORN CONTROL OUTPUT
10	W4 16BR/LB	FRONT WIPER HIGH SPEED CONTROL OUTPUT
11	A935 20RD/LB	FUSED B(+)
12	W3 16BR/WT	FRONT WIPER LOW SPEED CONTROL OUTPUT
13	F936 20PK/YL (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN)
14	A922 12RD/DB (ESP)	FUSED B(+) (VALVE)
14	A922 14RD/BK (TCS)	FUSED B(+) (VALVE)
15	-	-
16	-	-
17	A921 12RD/YL (ESP)	FUSED B(+) (PUMP)
17	A921 12RD/DB (TCS)	FUSED B(+) (PUMP)
18	-	-
19	A931 20RD/WT (GAS)	FUSED B(+)
20	-	-
21	Z971 16BK	GROUND
22	N112 20DB/OR	RAD FAN RELAY CONTROL



MODULE-TOTALLY INTEGRATED POWER C2

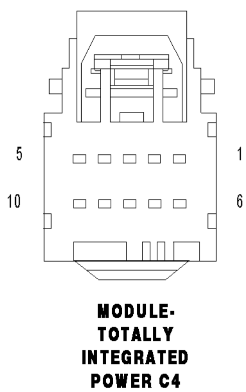
MODULE-TOTALLY INTEGRATED POWER C2 - LT. GRAY 14 WAY

CAV	CIRCUIT	FUNCTION
1	F901 20PK/RD	IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
2	T752 20DG/OR	STARTER CONTROL
3	-	-
4	K31 20DB/BK (DIESEL)	FUEL PUMP CONTROL
4	K31 20BR (GAS)	FUEL PUMP CONTROL
5	W7 20BR/DB	FRONT WIPER PARK SWITCH SENSE
6	Z924 20BK/LB	GROUND
7	D265 20WT/BK (ESP)	CAN C BUS (+)
8	-	-
9	-	-
10	F901 20PK/RD	IGNITION SWITCH OUTPUT (UNLOCK-RUN-START)
11	G70 20VT/LB (EXPORT)	HOOD AJAR SWITCH SENSE
12	-	-
13	Z925 14BK/YL (DIESEL)	GROUND
13	Z925 20BK/YL (GAS)	GROUND
14	D264 20DB/WT (ESP)	CAN C BUS (-)



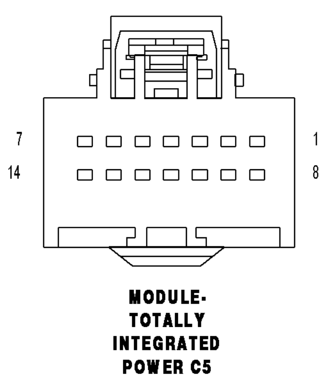
MODULE-TOTALLY INTEGRATED POWER C3 - BROWN 16 WAY

CAV	CIRCUIT	FUNCTION
1	D65 20WT/BK	CAN C BUS (+)
2	D72 20WT/TN	DIAGNOSTIC CAN C (+)
3	D55 20WT/OR	CAN B BUS (+)
4	L63 18DG/RD	LEFT REAR TURN SIGNAL
5	-	-
6	L62 18WT/YL	RIGHT REAR TURN SIGNAL
7	L53 18DG/GY	STOP LAMP SWITCH OUTPUT
8	L217 20WT/VT (EXCEPT EXPORT)	PARK LAMP CONTROL OUTPUT
8	L217 18WT/VT (EXPORT)	PARK LAMP CONTROL OUTPUT
9	D64 20WT/LB	CAN C BUS (-)
10	D71 20WT/DB	DIAGNOSTIC CAN C (-)
11	D54 20WT/PK	CAN B BUS (-)
12	F961 20PK/LB	IGNITION SWITCH OUTPUT (START)
13	L55 18WT/OR	STOP LAMP CONTROL OUTPUT
14	-	-
15	B1 20DG/PK (EXCEPT ABS)	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
16	B2 20DG/TN (EXCEPT ABS)	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY



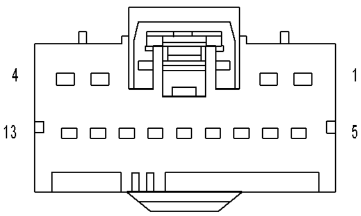
MODULE-TOTALLY INTEGRATED POWER C4 - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	L61 20WT/RD	LEFT TURN SIGNAL
2	L60 20WT/TN	RIGHT TURN SIGNAL
3	L34 20WT/GY	RIGHT HIGH BEAM OUTPUT
4	L43 20WT/DB	LEFT LOW BEAM OUTPUT
5	-	-
6	-	-
7	-	-
8	G31 20VT/LG	AAT SIGNAL
9	G931 20VT/DB	AAT RETURN
10	-	-



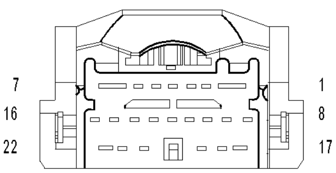
MODULE-TOTALLY INTEGRATED POWER C5 - BLUE 14 WAY

CAV	CIRCUIT	FUNCTION
1	L70 20WT/GY	HEADLAMP SWITCH OUTPUT
2	L160 20WT/TN (EXPORT)	RIGHT TURN SIGNAL (OUT)
3	L44 20VT/RD	RIGHT LOW BEAM OUTPUT
4	L33 20WT/PK	LEFT HIGH BEAM OUTPUT
5	L161 20WT/LG	LEFT TURN SIGNAL (OUT)
6	L7 20WT/VT (EXCEPT EXPORT)	HEADLAMP SWITCH OUTPUT
6	L7 20WT/YL (EXPORT)	HEADLAMP SWITCH OUTPUT
7	C818 20LB/TN	A/C PRESSURE SENSOR SUPPLY
8	T22 20YL/VT	BACKUP LAMP SWITCH SIGNAL
9	L131 20WT/LG (EXPORT)	HEADLAMP LEVEL SENSOR SIGNAL
10	L132 20LG/WT (EXPORT)	HEADLAMP LEVEL SENSOR SIGNAL
11	-	-
12	C18 20LB/BR	A/C PRESSURE SENSOR SIGNAL
13	C918 20BK/LB	A/C PRESSURE SENSOR GROUND
14	F962 20PK/BK (GAS)	IGNITION SWITCH OUTPUT (START)



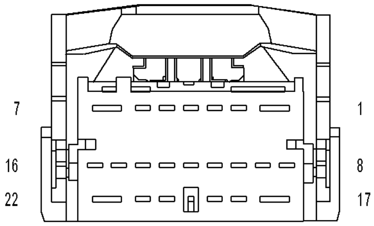
MODULE-TOTALLY INTEGRATED POWER C6 - LT. GRAY 13 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	W13 20BR/TN	REAR WIPER MOTOR CONTROL
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	L239 18WT/DG (EXPORT)	REAR FOG LAMP CONTROL OUTPUT
13	-	-



MODULE-TOTALLY INTEGRATED POWER C7 - LT. GRAY 22 WAY

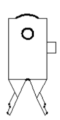
CAV	CIRCUIT	FUNCTION
1	-	-
2	A923 20RD (AWD)	FUSED B(+)
3	A924 20DG/WT	FUSED B(+)
4	A952 20RD/OR	FUSED B(+)
5	F200 20PK/LB (BASE)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	F200 18PK/LB (EXCEPT BASE)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	-	-
7	F100 20DG/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
8	-	-
9	A933 20RD	FUSED B(+)
10	-	-
11	N1 20DB/OR	FUEL PUMP CONTROL OUTPUT
12	-	-
13	A417 20RD/DG	FUSED B(+) (I.O.D.)
14	-	-
15	A418 20RD/BK	FUSED B(+) (I.O.D.)
16	A412 20RD/DB	FUSED B(+) (I.O.D.)
17	A16 12RD/BR	FUSED B(+)
18	A932 16RD/BR	DOOR LOCK POWER-FUSED B(+)
19	F996 14PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
20	-	-
21	F981 14PK/BR (EXCEPT BASE)	IGNITION SWITCH OUTPUT (RUN-ACC)
22	A999 16RD/WT (EXCEPT EXPORT)	FUSED B(+)



MODULE-TOTALLY INTEGRATED POWER C8

MODULE-TOTALLY INTEGRATED POWER C8 - BLACK 22 WAY

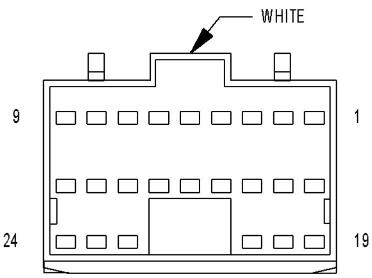
CAV	CIRCUIT	FUNCTION
1	C7 14DB/PK	BLOWER MOTOR CONTROL
2	A927 16RD/GY (POWER SUNROOF)	FUSED B(+)
3	A415 20RD/TN (EXPORT)	FUSED B(+) (I.O.D.)
4	A414 20RD/LG (EXPORT)	FUSED B(+) (I.O.D.)
5	A416 18RD (CVT)	FUSED B(+) (I.O.D.)
6	A420 18WT/RD (PREMIUM AUDIO)	FUSED B(+) (I.O.D.)
7	A14 12RD/YL	FUSED B(+)
8	F937 20PK/YL (DIESEL HEATED SEATS)	FUSED IGNITION SWITCH OUTPUT (RUN)
8	F937 18PK/YL (GAS HEATED SEATS)	FUSED IGNITION SWITCH OUTPUT (RUN)
9	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER CONTROL OUTPUT
10	-	-
11	L1 20WT/LG	BACKUP LAMP SWITCH OUTPUT
12	F929 18PK/RD (EXCEPT EXPORT)	FUSED IGNITION SWITCH OUTPUT (RUN)
12	F929 20PK/RD (EXPORT)	FUSED IGNITION SWITCH OUTPUT (RUN)
13	A411 20RD/LG	FUSED B(+) (I.O.D.)
14	A419 18RD/DG (PREMIUM AUDIO)	FUSED B(+) (I.O.D.)
15	-	-
16	-	-
17	C515 12LB/OR	REAR WINDOW DEFOGGER CONTROL OUTPUT
18	A413 18RD/LB	FUSED B(+) (I.O.D.)
19	T16 18YL/OR (CVT)	TRANSMISSION CONTROL OUTPUT
20	F985 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
21	F986 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
22	K542 12BR	MAIN RELAY OUTPUT



MODULE-TOTALLY INTEGRATED POWER C9

MODULE-TOTALLY INTEGRATED POWER C9 - 1 WAY

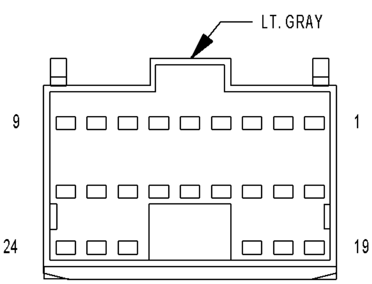
CAV	CIRCUIT	FUNCTION
1	A0 6RD	B(+)



MODULE-TRANSMISSION CONTROL C1 (CVT)

MODULE-TRANSMISSION CONTROL C1 (CVT) - WHITE 24 WAY

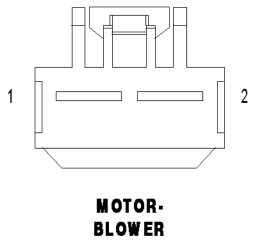
CAV	CIRCUIT	FUNCTION
1	T20 18DG/LB	LINE PRESSURE SOLENOID CONTROL
2	T19 18YL/DB	SECONDARY PRESSURE SOLENOID CONTROL
3	T59 18YL/LB	TCC SOLENOID CONTROL
4	T60 18YL/GY	TCC ON/OFF SOLENOID CONTROL
5	D65 20WT/BK	CAN C BUS (+)
6	D64 20WT/LB	CAN C BUS (-)
7	-	-
8	-	-
9	-	-
10	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
11	T314 18LB/YL	STEP MOTOR CONTROL A
12	T315 18YL/OR	STEP MOTOR CONTROL B
13	T302 18DG/BR	CLOCK SELECT
14	T313 18YL/LG	CHIP SELECT
15	T327 18GY/YL	DATA IN/OUT SELECT
16	-	-
17	-	-
18	T41 20YL/BK	TRS T41 SENSE
19	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
20	T316 18YL/WT	STEP MOTOR CONTROL C
21	T317 18TN/YL	STEP MOTOR CONTROL D
22	T42 20DG/PK	TRS T42 SENSE
23	-	-
24	-	-



MODULE-TRANSMISSION CONTROL C2 (CVT)

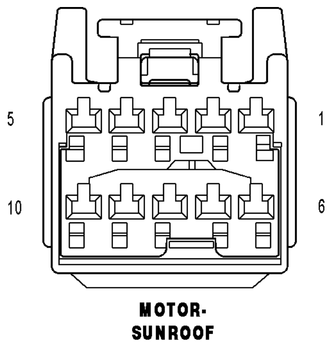
MODULE-TRANSMISSION CONTROL C2 (CVT) - LT. GRAY 24 WAY

CAV	CIRCUIT	FUNCTION
1	Z967 18BK	GROUND
2	T4 20DG/LB	TRS T4 SENSE
3	-	-
4	A416 18RD	FUSED B(+) (I.O.D.)
5	T52 18DG/WT	OUTPUT SPEED SENSOR SIGNAL
6	-	-
7	-	-
8	-	-
9	-	-
10	T5 20DG/LG (AUTOSTICK)	AUTOSTICK UPSHIFT SWITCH SIGNAL
11	-	-
12	T44 20YL/DG (AUTOSTICK)	AUTOSTICK DOWNSHIFT SWITCH SIGNAL
13	T50 18PK/LB	SECONDARY PRESSURE SENSOR SIGNAL
14	T14 18DG/BK	INPUT SPEED SENSOR SIGNAL
15	-	-
16	-	-
17	T21 18DG/YL	PRIMARY PRESSURE SENSOR SIGNAL
18	T13 18DG/VT	SENSOR GROUND
19	T3 20DG/DB	TRS T3 SENSE
20	T1 20DG/GY	TRS T1 SENSE
21	T130 18TN/DG	OUTPUT SPEED SENSOR GROUND
22	T72 18PK/LB	5 VOLT SUPPLY
23	T54 18RD/WT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
24	Z967 18BK	GROUND



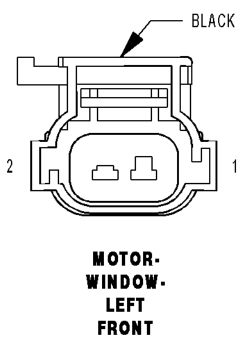
MOTOR-BLOWER - NATURAL 2 WAY

CAV	CIRCUIT	FUNCTION
1	C70 14DB/YL	BLOWER MOTOR HIGH SPEED
2	C7 14DB/PK	BLOWER MOTOR CONTROL



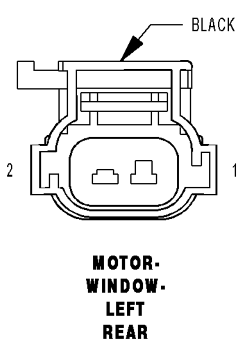
MOTOR-SUNROOF - LT. GRAY 10 WAY

CAV	CIRCUIT	FUNCTION
1	Z937 16BK	GROUND
2	Q6 20OR/LG	SUNROOF SWITCH SUPPLY
3	F996 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	Q4 20OR/YL	SUNROOF VENT SWITCH SENSE
5	Q3 20OR/TN	SUNROOF OPEN SWITCH SENSE
6	A927 16RD	FUSED B(+)
7	-	-
8	-	-
9	-	-
10	Q5 20OR/LB	SUNROOF CLOSE SWITCH SENSE



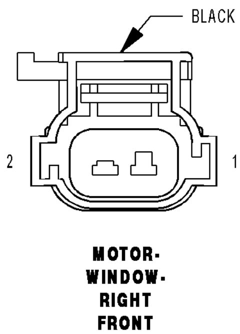
MOTOR-WINDOW-LEFT FRONT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q21 14OR/WT	LEFT FRONT WINDOW DRIVER (DOWN)
2	Q11 14OR/LG	LEFT FRONT WINDOW DRIVER (UP)



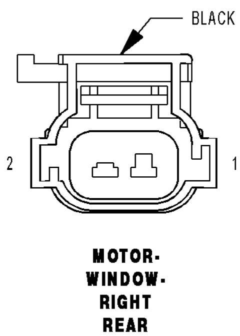
MOTOR-WINDOW-LEFT REAR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q111 14TN/YL	LEFT REAR WINDOW DRIVER (UP)
2	Q211 14TN/LB	LEFT REAR WINDOW DRIVER (DOWN)



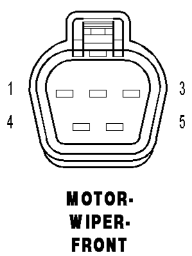
MOTOR-WINDOW-RIGHT FRONT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q22 14OR/VT	RIGHT FRONT WINDOW DRIVER (DOWN)
2	Q12 14OR/BR	RIGHT FRONT WINDOW DRIVER (UP)



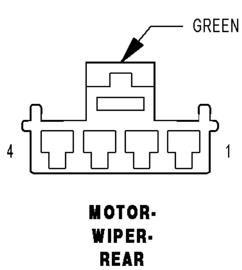
MOTOR-WINDOW-RIGHT REAR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q112 14OR/BR	RIGHT REAR WINDOW DRIVER (UP)
2	Q212 14OR/VT	RIGHT REAR WINDOW DRIVER (DOWN)



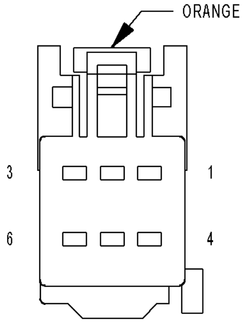
MOTOR-WIPER-FRONT - LT. GRAY 5 WAY

CAV	CIRCUIT	FUNCTION
1	W3 16BR/WT (LHD)	FRONT WIPER LOW SPEED CONTROL OUTPUT
1	W7 20BR/DB (RHD)	FRONT WIPER PARK SWITCH SENSE
2	-	-
3	W7 20BR/DB (LHD)	FRONT WIPER PARK SWITCH SENSE
3	W4 16BR/LB (RHD)	FRONT WIPER HIGH SPEED CONTROL OUTPUT
4	W4 16BR/LB (LHD)	FRONT WIPER HIGH SPEED CONTROL OUTPUT
4	Z971 16BK (RHD)	GROUND
5	Z971 16BK (LHD)	GROUND
5	W3 16BR/WT (RHD)	FRONT WIPER LOW SPEED CONTROL OUTPUT



MOTOR-WIPER-REAR - GREEN 4 WAY

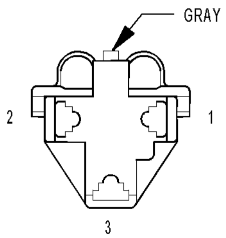
CAV	CIRCUIT	FUNCTION
1	-	-
2	F996 16PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	Z960 16BK	GROUND
4	W13 18BR/LG	REAR WIPER MOTOR CONTROL



POWER OUTLET-AC (EXCEPT EXPORT)

POWER OUTLET-AC (EXCEPT EXPORT) - ORANGE 6 WAY

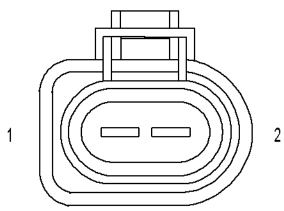
CAV	CIRCUIT	FUNCTION
1	P805 18LG/LB	INVERTER ENABLE SWITCH SIGNAL
2	-	-
3	P801 18LG	110 VOLT AC LINE 1
4	F996 18PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	-	-
6	P809 18LG/TN	110 VOLT AC COMMON



POWER OUTLET-INSTRUMENT PANEL

POWER OUTLET-INSTRUMENT PANEL - GRAY 3 WAY

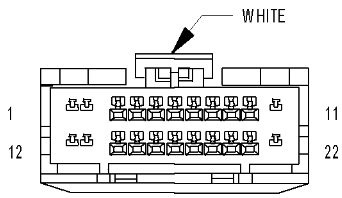
CAV	CIRCUIT	FUNCTION
1	F986 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-
3	Z940 16BK/LG	GROUND



PUMP-WASHER-WINDSHIELD

PUMP-WASHER-WINDSHIELD - BLACK 2 WAY

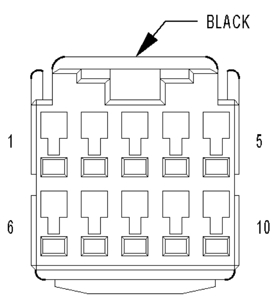
CAV	CIRCUIT	FUNCTION
1	W20 20BR/YL	REAR WASHER PUMP MOTOR CONTROL
2	W10 20BR/TN	FRONT WASHER PUMP MOTOR CONTROL



RADIO C1

RADIO C1 - WHITE 22 WAY

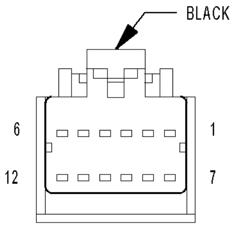
CAV	CIRCUIT	FUNCTION
1	A413 18RD/LB	FUSED B(+) (I.O.D.)
2	-	-
3	-	-
4	X703 22DG/OR (HANDS FREE)	LEFT AUDIO OUTPUT
5	D55 20WT/OR	CAN B BUS (+)
6	D54 20WT/PK	CAN B BUS (-)
7	X202 18DG/VT (BASE)	RIGHT FRONT DOOR SPEAKER (+)
8	X292 18DG/YL (BASE)	RIGHT FRONT DOOR SPEAKER (-)
9	X291 18GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
10	X201 18GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
11	Z937 16BK/YL	GROUND
12	A413 18RD/LB	FUSED B(+) (I.O.D.)
13	X60 20GY/RD (PREMIUM)	POWER ANTENNA SIGNAL
14	-	-
15	-	-
16	X704 22DG/PK (HANDS FREE)	RIGHT AUDIO OUTPUT
17	X795 22DG/BK (HANDS FREE)	COMMON AUDIO OUTPUT
18	X51 18DG/DB	LEFT REAR SPEAKER (+)
19	X57 18DG/BR	LEFT REAR SPEAKER (-)
20	X58 18GY/OR	RIGHT REAR SPEAKER (-)
21	X52 18GY/DB	RIGHT REAR SPEAKER (+)
22	Z937 16BK/YL	GROUND



RADIO C2
(SATELLITE RADIO)

RADIO C2 (SATELLITE RADIO) - BLACK 10 WAY

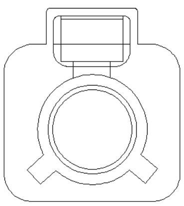
CAV	CIRCUIT	FUNCTION
1	X16 22DG/YL	AUDIO SIGNAL RIGHT (+)
2	X917 22DG	AUDIO SIGNAL COMMON
3	-	-
4	-	-
5	-	-
6	X17 22DG/OR	AUDIO SIGNAL LEFT (+)
7	-	-
8	-	-
9	-	-
10	-	-



RECEIVER-
SATELLITE C1

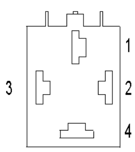
RECEIVER-SATELLITE C1 - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	X17 20DG/OR	AUDIO SIGNAL LEFT (+)
2	-	-
3	-	-
4	Z965 18BK	GROUND
5	-	-
6	A417 18RD	FUSED B(+) (I.O.D.)
7	X16 20DG/YL	AUDIO SIGNAL RIGHT (+)
8	X917 20DG	AUDIO SIGNAL COMMON
9	-	-
10	-	-
11	D55 20WT/OR	CAN B BUS (+)
12	D54 20WT	CAN B BUS (-)


RECEIVER-
SATELLITE C2

RECEIVER-SATELLITE C2 - TAN 2 WAY

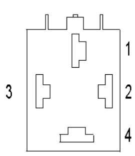
CAV	CIRCUIT	FUNCTION
1	D106 6WT/LG	SATELLITE ANTENNA SIGNAL
2	D126 WT/TN	SATELLITE ANTENNA SHIELD



RELAY-
CABIN
HEATER 1
(DIESEL)

RELAY-CABIN HEATER 1 (DIESEL) - BLACK 4 WAY

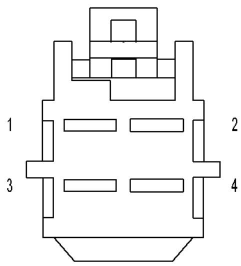
CAV	CIRCUIT	FUNCTION
1	A285 12RD/DB	CABIN HEATER RELAY 1 OUTPUT
2	K132 20DB/LB	CABIN HEATER RELAY 1 CONTROL
3	F936 20PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN)
4	A283 10RD/YL	FUSED B(+)



RELAY-
CABIN
HEATER 2
(DIESEL)

RELAY-CABIN HEATER 2 (DIESEL) - BLACK 4 WAY

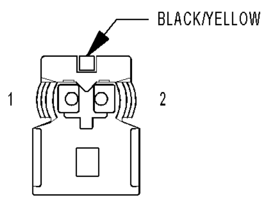
CAV	CIRCUIT	FUNCTION
1	A286 10RD/WT	CABIN HEATER RELAY 2 OUTPUT
2	K232 20BR/LB	CABIN HEATER RELAY 2 CONTROL
3	F936 20PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN)
4	A284 10RD/LB	FUSED B(+)



RESISTOR-BLOWER MOTOR

RESISTOR-BLOWER MOTOR - GRAY 4 WAY

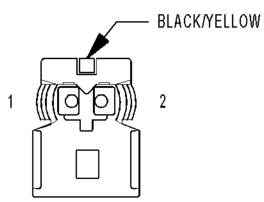
CAV	CIRCUIT	FUNCTION
1	C71 18DB/BR	FRONT BLOWER LOW SPEED
2	C73 18DB/VT	FRONT BLOWER M2 SPEED
3	C72 18DB/OR	FRONT BLOWER M1 SPEED
4	C70 14DB/YL	BLOWER MOTOR HIGH SPEED



SEAT BELT-TENSIONER-DRIVER

SEAT BELT-TENSIONER-DRIVER - YELLOW/BLACK 2 WAY

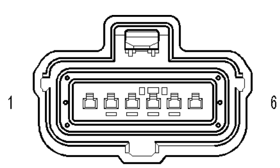
CAV	CIRCUIT	FUNCTION
1	R53 18LG/YL	DRIVER SEAT BELT TENSIONER LINE 2
2	R55 18LG/DG	DRIVER SEAT BELT TENSIONER LINE 1



SEAT BELT-TENSIONER-PASSENGER

SEAT BELT-TENSIONER-PASSENGER - YELLOW/BLACK 2 WAY

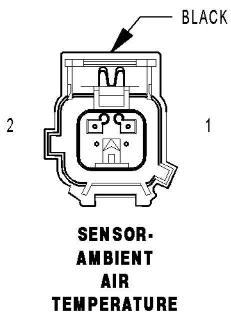
CAV	CIRCUIT	FUNCTION
1	R54 18LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2
2	R56 18LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1



SENSOR-ACCELERATOR PEDAL POSITION

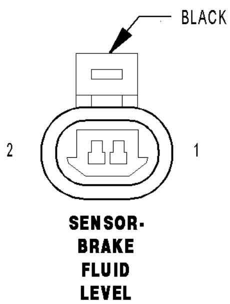
SENSOR-ACCELERATOR PEDAL POSITION - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	K29 20WT/BR	APP SIGNAL 2
2	K400 20BR/VT	APP SENSOR GROUND 2
3	K854 20VT/BR (DIESEL)	5 VOLT SUPPLY
3	K858 20BR/GY (GAS)	5 VOLT SUPPLY
4	K23 20BR/OR	APP SIGNAL 1
5	K167 20BR/YL	APP SENSOR GROUND 1
6	K852 20BR/VT (DIESEL)	5 VOLT SUPPLY
6	F856 20YL/PK (GAS)	5 VOLT SUPPLY



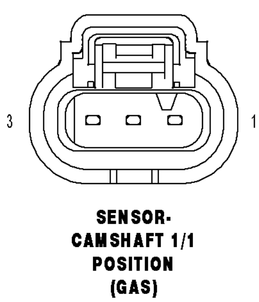
SENSOR-AMBIENT AIR TEMPERATURE - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G31 20VT/LG	AAT SIGNAL
2	G931 20VT/DB	AAT RETURN



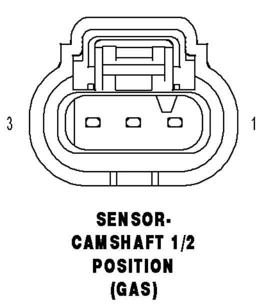
SENSOR-BRAKE FLUID LEVEL - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B20 20DG/RD	BRAKE FLUID LEVEL SWITCH SENSE
2	Z925 20BK/YL	GROUND



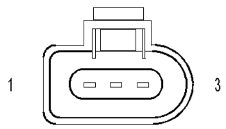
SENSOR-CAMSHAFT 1/1 POSITION (GAS) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K857 20BR/LG	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K44 20DB/GY	CMP 1/1 SIGNAL



SENSOR-CAMSHAFT 1/2 POSITION (GAS) - BLACK 3 WAY

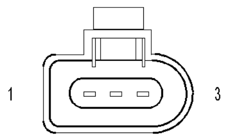
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K915 20BR/WT	SENSOR GROUND
3	K441 20DB/BR	CMP 1/2 SIGNAL



SENSOR-
CAMSHAFT
POSITION
(DIESEL)

SENSOR-CAMSHAFT POSITION (DIESEL) - BLACK 3 WAY

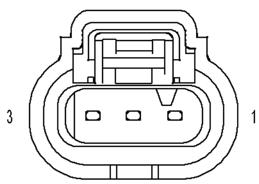
CAV	CIRCUIT	FUNCTION
1	K844 20DB/YL	CMP SENSOR 5 VOLT SUPPLY
2	K44 20DB/GY	CMP 1/1 SIGNAL
3	K944 20BK/GY	CMP SENSOR GROUND



SENSOR-
CRANKSHAFT
POSITION
(DIESEL)

SENSOR-CRANKSHAFT POSITION (DIESEL) - BLACK 3 WAY

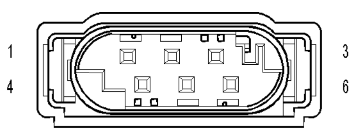
CAV	CIRCUIT	FUNCTION
1	K853 20DB/BR	CKP SENSOR 5 VOLT SUPPLY
2	K24 20BR/LB	CKP SENSOR SIGNAL
3	K925 20DB/WT	CKP SENSOR GROUND



SENSOR-
CRANKSHAFT
POSITION
(GAS)

SENSOR-CRANKSHAFT POSITION (GAS) - 3 WAY

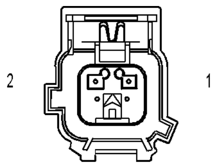
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K24 20BR/LB	CKP SIGNAL



SENSOR-
DYNAMICS
(ESP)

SENSOR-DYNAMICS (ESP) - BLACK 6 WAY

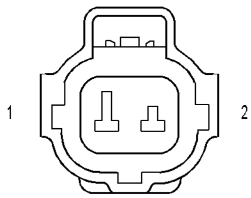
CAV	CIRCUIT	FUNCTION
1	D464 20WT/YL	DYNAMICS SENSOR LOW DATA LINK
2	D465 20WT/DB	DYNAMICS SENSOR HIGH DATA LINK
3	G4 18VT/LB	DYNAMICS SENSOR SUPPLY
4	-	-
5	G94 18VT/DB	DYNAMICS SENSOR GROUND
6	-	-



SENSOR-ENGINE COOLANT TEMPERATURE (DIESEL)

SENSOR-ENGINE COOLANT TEMPERATURE (DIESEL) - BLACK 2 WAY

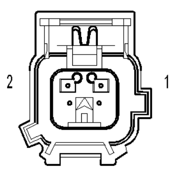
CAV	CIRCUIT	FUNCTION
1	K2 20VT/OR	ECT 1 SIGNAL
2	K915 20BR/WT	SENSOR GROUND



SENSOR-ENGINE COOLANT TEMPERATURE 1 (GAS)

SENSOR-ENGINE COOLANT TEMPERATURE 1 (GAS) - DK. GRAY 2 WAY

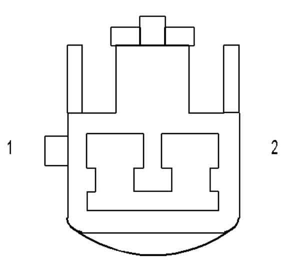
CAV	CIRCUIT	FUNCTION
1	K900 20DB/DG	SENSOR GROUND
2	K2 20VT/OR	ECT 1 SIGNAL



SENSOR-ENGINE COOLANT TEMPERATURE 2 (GAS)

SENSOR-ENGINE COOLANT TEMPERATURE 2 (GAS) - BLACK 2 WAY

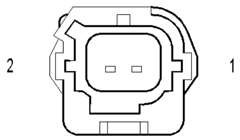
CAV	CIRCUIT	FUNCTION
1	K915 20BR/WT	SENSOR GROUND
2	K222 20BR/YL	ECT 2 SIGNAL



SENSOR-EVAPORATOR TEMPERATURE

SENSOR-EVAPORATOR TEMPERATURE - NATURAL 2 WAY

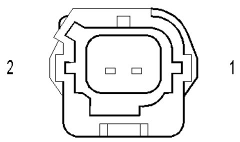
CAV	CIRCUIT	FUNCTION
1	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
2	C121 20DB/DG	SENSOR GROUND



SENSOR-FRONT IMPACT-LEFT

SENSOR-FRONT IMPACT-LEFT - YELLOW 2 WAY

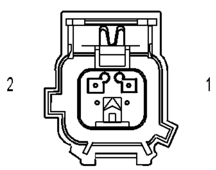
CAV	CIRCUIT	FUNCTION
1	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
2	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL



SENSOR-FRONT IMPACT-RIGHT

SENSOR-FRONT IMPACT-RIGHT - YELLOW 2 WAY

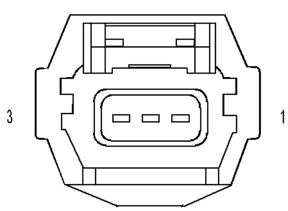
CAV	CIRCUIT	FUNCTION
1	R82 20WT/OR	RIGHT FRONT IMPACT SENSOR GROUND
2	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL



SENSOR-FUEL TEMPERATURE (DIESEL)

SENSOR-FUEL TEMPERATURE (DIESEL) - BLACK 2 WAY

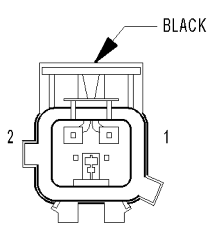
CAV	CIRCUIT	FUNCTION
1	K900 20DB/DG	SENSOR GROUND
2	K156 20BR/YL	FUEL TEMPERATURE SENSOR SIGNAL



SENSOR-INPUT SPEED (CVT)

SENSOR-INPUT SPEED (CVT) - BLACK 3 WAY

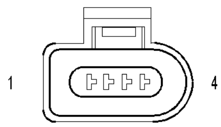
CAV	CIRCUIT	FUNCTION
1	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
2	T14 18DG/BK	INPUT SPEED SENSOR SIGNAL
3	T13 18DG/TN	SENSOR GROUND



SENSOR-INTAKE AIR TEMPERATURE (GAS)

SENSOR-INTAKE AIR TEMPERATURE (GAS) - BLACK 2 WAY

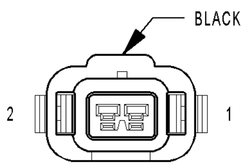
CAV	CIRCUIT	FUNCTION
1	K21 20BK/RD	IAT SIGNAL
2	K915 20BR/WT	SENSOR GROUND



SENSOR-INTAKE AIR TEMPERATURE/BOOST PRESSURE (DIESEL)

SENSOR-INTAKE AIR TEMPERATURE/BOOST PRESSURE (DIESEL) - BLACK 4 WAY

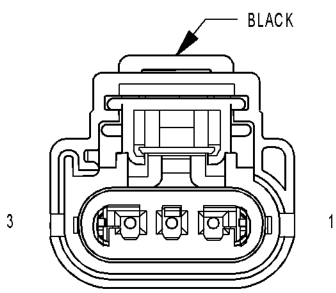
CAV	CIRCUIT	FUNCTION
1	K656 20GY/BR	SENSOR GROUND
2	K48 20DB/WT	IAT SENSOR SIGNAL
3	K854 20VT/BR	5 VOLT SUPPLY
4	K37 20BR/OR	BOOST PRESSURE SENSOR SIGNAL



SENSOR-KNOCK (GAS)

SENSOR-KNOCK (GAS) - BLACK 2 WAY

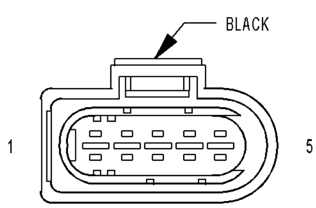
CAV	CIRCUIT	FUNCTION
1	K42 20DB/LG	KS SIGNAL
2	K942 20WT/BR	KS RETURN



SENSOR-MAP (GAS)

SENSOR-MAP (GAS) - BLACK 3 WAY

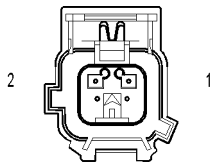
CAV	CIRCUIT	FUNCTION
1	K1 20VT/BR	MAP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	K857 20BR/LG	5 VOLT SUPPLY



SENSOR-MASS AIR FLOW (DIESEL)

SENSOR-MASS AIR FLOW (DIESEL) - BLACK 5 WAY

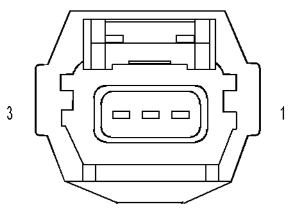
CAV	CIRCUIT	FUNCTION
1	-	-
2	K344 18BR/GY	FUSED MAIN RELAY OUTPUT
3	K957 20BR/OR	MAF SENSOR GROUND
4	F855 20PK/YL	5 VOLT SUPPLY
5	K157 20BR/OR	MAF SENSOR SIGNAL



SENSOR-OIL TEMPERATURE (GAS)

SENSOR-OIL TEMPERATURE (GAS) - BLACK 2 WAY

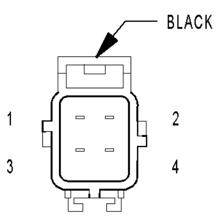
CAV	CIRCUIT	FUNCTION
1	G24 20VT/BR	EOT SIGNAL
2	K915 20BR/WT	SENSOR GROUND



SENSOR-OUTPUT SPEED (CVT)

SENSOR-OUTPUT SPEED (CVT) - BLACK 3 WAY

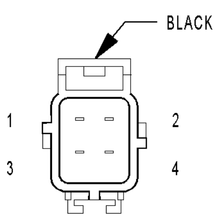
CAV	CIRCUIT	FUNCTION
1	T16 18YL/OR	TRANSMISSION CONTROL OUTPUT
2	T52 18DG/WT	OUTPUT SPEED SENSOR SIGNAL
3	T130 18TN/DG	OUTPUT SPEED SENSOR GROUND



SENSOR-OXYGEN 1/1 (GAS)

SENSOR-OXYGEN 1/1 (GAS) - GRAY 4 WAY

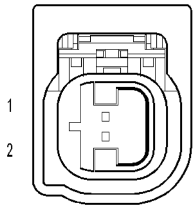
CAV	CIRCUIT	FUNCTION
1	Z916 18BK	GROUND
2	K99 20BR/OR	O2 1/1 HEATER CONTROL
3	K902 20BR/DG	O2 1/1 RETURN
4	K41 20BK/DG	O2 1/1 SIGNAL



SENSOR-OXYGEN 1/2 (GAS)

SENSOR-OXYGEN 1/2 (GAS) - BLACK 4 WAY

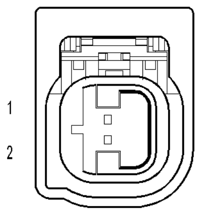
CAV	CIRCUIT	FUNCTION
1	Z924 18BK/LB	GROUND
2	K299 20BR/RD	O2 1/2 HEATER CONTROL
3	K904 20DB/DG	O2 1/2 RETURN
4	K141 20DB/YL	O2 1/2 SIGNAL



SENSOR-SEAT TRACK POSITION-DRIVER

SENSOR-SEAT TRACK POSITION-DRIVER - DK. GRAY 2 WAY

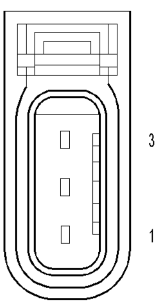
CAV	CIRCUIT	FUNCTION
1	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
2	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE



SENSOR-SEAT TRACK POSITION-PASSENGER

SENSOR-SEAT TRACK POSITION-PASSENGER - DK. GRAY 2 WAY

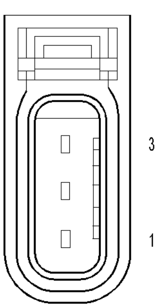
CAV	CIRCUIT	FUNCTION
1	R262 20WT/LB	PASSENGER SEAT POSITION SENSOR DATA
2	R264 20VT/LB	PASSENGER SEAT POSITION SENSOR VOLTAGE



SENSOR-SEAT WEIGHT-LEFT FRONT

SENSOR-SEAT WEIGHT-LEFT FRONT - BLACK 3 WAY

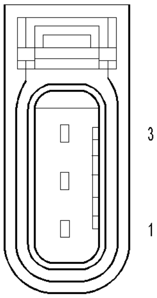
CAV	CIRCUIT	FUNCTION
1	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
2	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
3	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT



SENSOR-SEAT WEIGHT-LEFT REAR

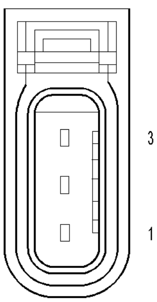
SENSOR-SEAT WEIGHT-LEFT REAR - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
2	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL
3	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT



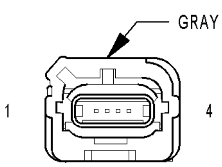
SENSOR-SEAT WEIGHT-RIGHT FRONT - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
2	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
3	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT



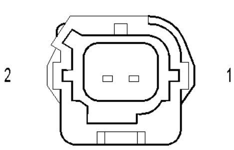
SENSOR-SEAT WEIGHT-RIGHT REAR - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
2	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
3	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT



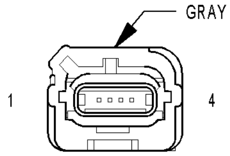
SENSOR-SIDE IMPACT-LEFT 1 - YELLOW 4 WAY

CAV	CIRCUIT	FUNCTION
1	R13 20LG/TN	LEFT SIDE IMPACT SENSOR 1 SIGNAL
2	R15 20LG/BR	LEFT SIDE IMPACT SENSOR 1 GROUND
3	R19 20LG/WT	LEFT SIDE IMPACT SENSOR 2 GROUND
4	R17 20LG	LEFT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-SIDE IMPACT-LEFT 2 - YELLOW 2 WAY

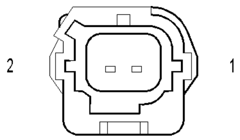
CAV	CIRCUIT	FUNCTION
1	R19 20LG/WT	LEFT SIDE IMPACT SENSOR 2 GROUND
2	R17 20LG	LEFT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-SIDE IMPACT-RIGHT 1

SENSOR-SIDE IMPACT-RIGHT 1 - YELLOW 4 WAY

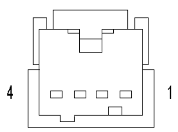
CAV	CIRCUIT	FUNCTION
1	R14 20TN/LG	RIGHT SIDE IMPACT SENSOR 1 SIGNAL
2	R16 20BR/LG	RIGHT SIDE IMPACT SENSOR 1 GROUND
3	R20 20WT/LG	RIGHT SIDE IMPACT SENSOR 2 GROUND
4	R18 20LB	RIGHT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-SIDE IMPACT-RIGHT 2

SENSOR-SIDE IMPACT-RIGHT 2 - YELLOW 2 WAY

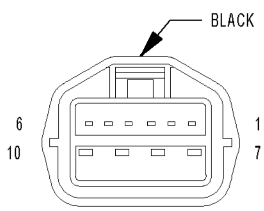
CAV	CIRCUIT	FUNCTION
1	R20 20WT/LG	RIGHT SIDE IMPACT SENSOR 2 GROUND
2	R18 20LB	RIGHT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-STEERING ANGLE

SENSOR-STEERING ANGLE - WHITE 4 WAY

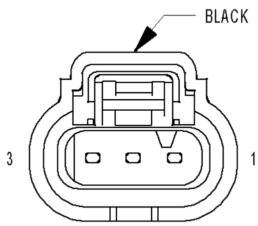
CAV	CIRCUIT	FUNCTION
1	D265 20DB	CAN C BUS (+)
2	D264 20DB/WT	CAN C BUS (-)
3	Z937 20BK/YL	GROUND
4	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)



SENSOR-TRANSMISSION RANGE

SENSOR-TRANSMISSION RANGE - BLACK 10 WAY

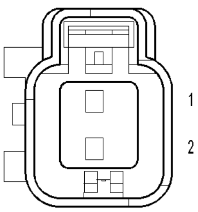
CAV	CIRCUIT	FUNCTION
1	T1 20DG/GY	TRS T1 SENSE
2	T41 20YL/BK	TRS T41 SENSE
3	T16 20YL/OR	TRANSMISSION CONTROL OUTPUT
4	-	-
5	T3 20DG/DB	TRS T3 SENSE
6	-	-
7	F962 20PK/BK	IGNITION SWITCH OUTPUT (START)
8	T4 20DG/LB	TRS T4 SENSE
9	T42 20DG/PK	TRS T42 SENSE
10	F963 20PK/DB	START ENABLE



SENSOR-VEHICLE SPEED (GAS MTX)

SENSOR-VEHICLE SPEED (GAS MTX) - BLACK 3 WAY

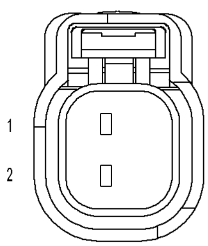
CAV	CIRCUIT	FUNCTION
1	F856 20YL/PK	5 VOLT SUPPLY
2	K914 18BR/WT	SENSOR GROUND
3	K75 18WT/OR	VEHICLE SPEED SIGNAL



SENSOR-WHEEL SPEED-ABS-LEFT FRONT

SENSOR-WHEEL SPEED-ABS-LEFT FRONT - BLACK 2 WAY

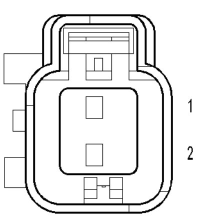
CAV	CIRCUIT	FUNCTION
1	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



SENSOR-WHEEL SPEED-ABS-LEFT REAR

SENSOR-WHEEL SPEED-ABS-LEFT REAR - BLACK 2 WAY

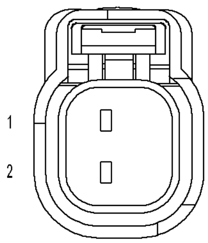
CAV	CIRCUIT	FUNCTION
1	B4 20LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL



SENSOR-WHEEL SPEED-ABS-RIGHT FRONT

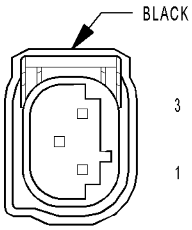
SENSOR-WHEEL SPEED-ABS-RIGHT FRONT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B7 20WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 20WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



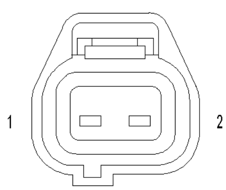
SENSOR-WHEEL SPEED-ABS-RIGHT REAR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B2 20DG/LB	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUP-PLY
2	B1 20DG/OR	RIGHT REAR WHEEL SPEED SENSOR SIGNAL



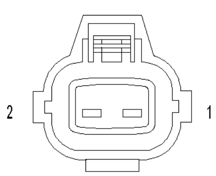
SIREN (EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	A414 18RD/LB	FUSED B(+) (I.O.D.)
2	Z908 18BK/PK	GROUND
3	D96 20WT/BR	SIREN SIGNAL CONTROL



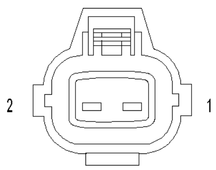
SOLENOID-A/C COMPRESSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K343 20BR/YL (DIESEL)	FUSED MAIN RELAY OUTPUT
1	C27 20LB/WT (GAS)	A/C COMPRESSOR CONTROL
2	C27 20LB/WT (DIESEL)	A/C COMPRESSOR CONTROL
2	Z916 20BK (GAS)	GROUND



SOLENOID-CAMSHAFT 1/1 POSITION (GAS) - BLACK 2 WAY

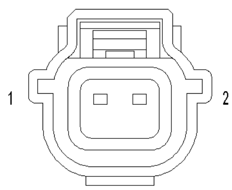
CAV	CIRCUIT	FUNCTION
1	K76 20BR/WT	CMP 1/1 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



SOLENOID-CAMSHAFT 1/2 POSITION (GAS)

SOLENOID-CAMSHAFT 1/2 POSITION (GAS) - BLACK 2 WAY

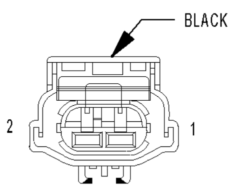
CAV	CIRCUIT	FUNCTION
1	K276 20DB/WT	CMP 1/2 CONTROL
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT



SOLENOID-ELECTRONICALLY CONTROLLED CLUTCH (ECC)

SOLENOID-ELECTRONICALLY CONTROLLED CLUTCH (ECC) - 2 WAY

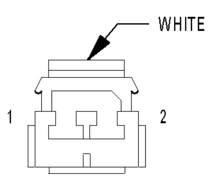
CAV	CIRCUIT	FUNCTION
1	T312 20YL/VT	REAR DIFFERENTIAL SOLENOID CONTROL
2	T78 20YL	SOLENOID SUPPLY VOLTAGE



SOLENOID-EVAP PURGE (GAS)

SOLENOID-EVAP PURGE (GAS) - BLACK 2 WAY

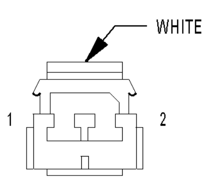
CAV	CIRCUIT	FUNCTION
1	K52 20DB/WT	EVAP PURGE CONTROL
2	K70 20DB/BR	EVAP PURGE RETURN



SPEAKER-INSTRUMENT PANEL-LEFT (PREMIUM)

SPEAKER-INSTRUMENT PANEL-LEFT (PREMIUM) - WHITE 2 WAY

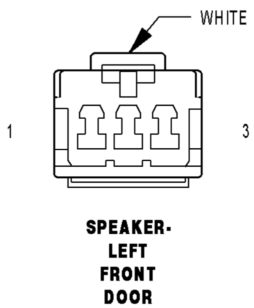
CAV	CIRCUIT	FUNCTION
1	X209 20GY/TN	LEFT INSTRUMENT PANEL SPEAKER (+)
2	X299 20GY/BR	LEFT INSTRUMENT PANEL SPEAKER (-)



SPEAKER-INSTRUMENT PANEL-RIGHT (PREMIUM)

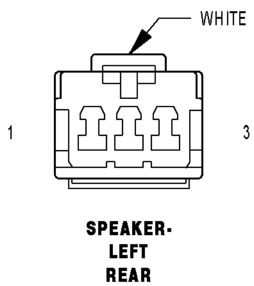
SPEAKER-INSTRUMENT PANEL-RIGHT (PREMIUM) - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	X208 20GY/DG	RIGHT INSTRUMENT PANEL SPEAKER (+)
2	X298 20GY/LG	RIGHT INSTRUMENT PANEL SPEAKER (-)



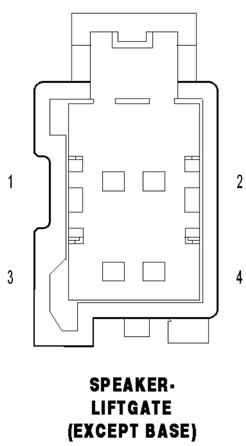
SPEAKER-LEFT FRONT DOOR - WHITE 3 WAY

CAV	CIRCUIT	FUNCTION
1	X201 20GY/VT (BASE)	LEFT FRONT DOOR SPEAKER (+)
1	X201 18GY/VT (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	-	-
3	X291 20GY/YL (BASE)	LEFT FRONT DOOR SPEAKER (-)
3	X291 18GY/YL (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)



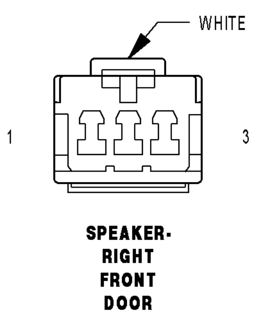
SPEAKER-LEFT REAR - WHITE 3 WAY

CAV	CIRCUIT	FUNCTION
1	X303 18DG/TN (BASE)	LEFT REAR SPEAKER (+)
1	X205 18GY/LG (PREMIUM)	AMPLIFIED LEFT REAR SPEAKER (+)
2	-	-
3	X393 18DG/TN (BASE)	LEFT REAR SPEAKER (-)
3	X295 18GY/DG (PREMIUM)	AMPLIFIED LEFT REAR SPEAKER (-)



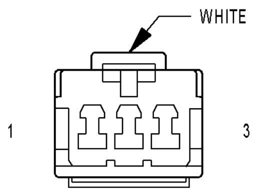
SPEAKER-LIFTGATE (EXCEPT BASE) - LT. GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	X214 18DG/DB	AMPLIFIED LIFTGATE SPEAKER 1 (+)
2	X284 18DG/TN	AMPLIFIED LIFTGATE SPEAKER 1 (-)
3	X212 18GY/DB	AMPLIFIED LIFTGATE SPEAKER 2 (+)
4	X282 18GY/TN	AMPLIFIED LIFTGATE SPEAKER 2 (-)



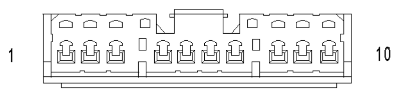
SPEAKER-RIGHT FRONT DOOR - WHITE 3 WAY

CAV	CIRCUIT	FUNCTION
1	X202 20DG/VT (BASE)	RIGHT FRONT DOOR SPEAKER (+)
1	X202 18DG/VT (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
2	-	-
3	X292 20DG/YL (BASE)	RIGHT FRONT DOOR SPEAKER (-)
3	X292 18DG/YL (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)



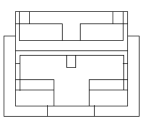
SPEAKER-RIGHT REAR - WHITE 3 WAY

CAV	CIRCUIT	FUNCTION
1	X304 18DG/BR (BASE)	RIGHT REAR SPEAKER (+)
1	X206 18DG/LG (PREMIUM)	AMPLIFIED RIGHT REAR SPEAKER (+)
2	-	-
3	X394 18YL/GY (BASE)	RIGHT REAR SPEAKER (-)
3	X296 18DG/GY (PREMIUM)	AMPLIFIED RIGHT REAR SPEAKER (-)



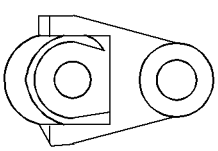
SPEAKER-SUBWOOFER (PREMIUM) - WHITE 10 WAY

CAV	CIRCUIT	FUNCTION
1	X60 20GY/RD (EXCEPT EXPORT)	POWER ANTENNA SIGNAL
1	X60 18GY/RD (EXPORT)	POWER ANTENNA SIGNAL
2	Z960 16BK/LB	GROUND
3	-	-
4	-	-
5	A419 18RD/DG	FUSED B(+) (I.O.D.)
6	-	-
7	X205 18GY/LG	AMPLIFIED LEFT REAR SPEAKER (+)
8	X295 18GY/BK	AMPLIFIED LEFT REAR SPEAKER (-)
9	X206 18DG/LG	AMPLIFIED RIGHT REAR SPEAKER (+)
10	X296 18DG/LB	AMPLIFIED RIGHT REAR SPEAKER (-)



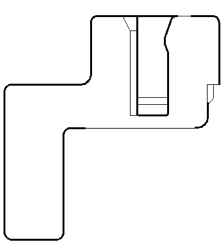
STARTER - BLACK 1 WAY

CAV	CIRCUIT	FUNCTION
1	T750 16YL/GY	STARTER CONTROL OUTPUT



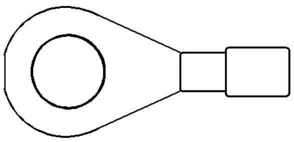
STARTER-EYELET-BATTERY SIDE (GAS)

CAV	CIRCUIT	FUNCTION
1	A0 4RD	B(+)



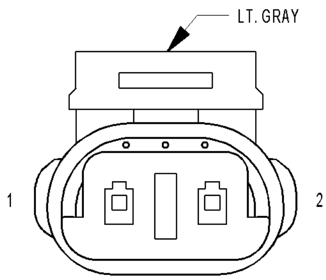
STARTER-EYELET-BATTERY SIDE (DIESEL) - 1 WAY

CAV	CIRCUIT	FUNCTION
1	A0 4RD	B(+)



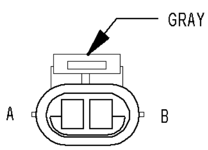
STARTER-EYELET-GENERATOR SIDE - 1 WAY

CAV	CIRCUIT	FUNCTION
1	A802 10LB (DIESEL)	B(+)
1	A802 10DG (GAS)	B(+)



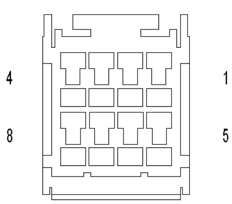
SWITCH-BACKUP LAMP (DIESEL) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z967 18BK/VT	GROUND
2	T22 20YL/VT	BACKUP LAMP SWITCH SIGNAL



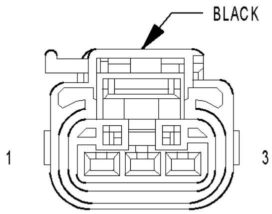
SWITCH-BACKUP LAMP (GAS MTX) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
A	Z967 18BK/VT	GROUND
B	T22 18YL/VT	BACKUP LAMP SWITCH SIGNAL



SWITCH-BANK - BLACK 8 WAY

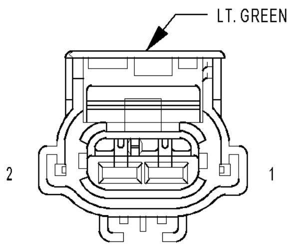
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	D506 20WT/DG	LIN BUS
6	Z940 20BK/LG	GROUND
7	A935 20RD	FUSED B(+)
8	-	-



SWITCH-CLUTCH INTERLOCK (MTX)

SWITCH-CLUTCH INTERLOCK (MTX) - BLACK 3 WAY

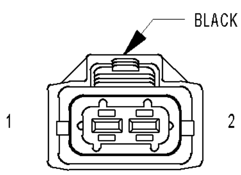
CAV	CIRCUIT	FUNCTION
1	T26 20DG/OR (DIESEL)	CLUTCH UPSTOP SWITCH SIGNAL
2	Z925 20BK (DIESEL)	GROUND
2	Z961 20BK/YL (GAS)	GROUND
3	T141 20YL/OR	CLUTCH INTERLOCK SIGNAL



SWITCH-ENGINE OIL PRESSURE (GAS)

SWITCH-ENGINE OIL PRESSURE (GAS) - LT. GREEN 2 WAY

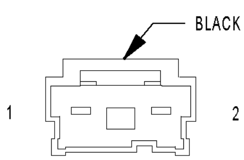
CAV	CIRCUIT	FUNCTION
1	G6 20VT/GY	EOP SIGNAL
2	-	-



SWITCH-EVAP SYSTEM MONITOR (EXCEPT EXPORT)

SWITCH-EVAP SYSTEM MONITOR (EXCEPT EXPORT) - BLACK 2 WAY

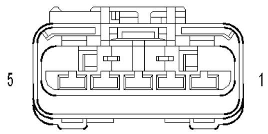
CAV	CIRCUIT	FUNCTION
1	Z965 20BK (AWD)	GROUND
1	Z965 20BK/GY (FWD)	GROUND
2	K106 18VT/LB (AWD)	ESM SIGNAL
2	K107 18VT/WT (FWD)	ESM SIGNAL



SWITCH-HORN

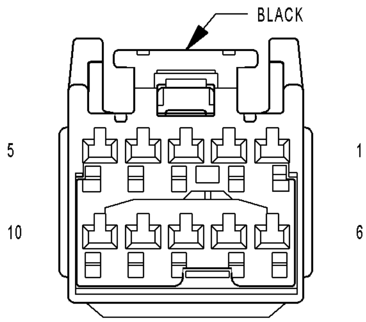
SWITCH-HORN - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	X3 20DB	HORN SWITCH SENSE
2	Y13 20BK	RADIO CONTROL RETURN



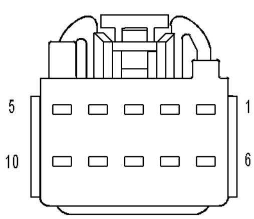
SWITCH-IGNITION - BLACK 5 WAY

CAV	CIRCUIT	FUNCTION
1	Z937 20BK/YL	GROUND
2	G20 20VT/BR	IGNITION SWITCH SENSE
3	F20 20PK/WT	IGNITION SWITCH OUTPUT (RUN-START)
4	F961 20PK/LB	IGNITION SWITCH OUTPUT (START)
5	A952 20RD/OR	FUSED B(+)



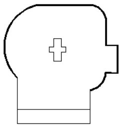
SWITCH-MIRROR (LHD) - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	P76 20YL/PK	MIRROR COMMON DRIVER
4	Z928 18BK (POWER HEATED MIRROR)	GROUND
4	Z928 20BK/LG (POWER MIRROR)	GROUND
5	A417 18RD (POWER HEATED MIR-ROR)	FUSED B(+) (I.O.D.)
5	A417 20RD/DG (POWER MIRROR)	FUSED B(+) (I.O.D.)
6	P72 20TN/GY	RIGHT MIRROR VERTICAL DRIVER
7	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
8	P74 20TN/OR	RIGHT MIRROR HORIZONTAL DRIVER
9	P75 20TN/LG	LEFT MIRROR HORIZONTAL DRIVER
10	-	-



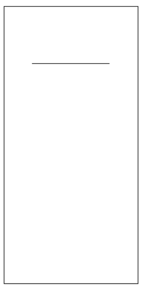
SWITCH-MIRROR (RHD) - 10 WAY

CAV	CIRCUIT	FUNCTION
1	P110 20LG/WT	FOLDING MIRROR RETURN
2	-	-
3	P76 20YL/PK	MIRROR COMMON DRIVER
4	Z928 20BK/LG	GROUND
5	A417 20RD/DG	FUSED B(+) (I.O.D.)
6	P72 20TN/GY	RIGHT MIRROR VERTICAL DRIVER
7	P71 20TN/DG	LEFT MIRROR VERTICAL DRIVER
8	P74 20TN/OR	RIGHT MIRROR HORIZONTAL DRIVER
9	P75 20TN/OR	LEFT MIRROR HORIZONTAL DRIVER
10	P699 20LG/DG	MIRROR-POWER FOLDING/UNFOLDING



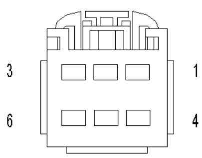
SWITCH-OIL PRESSURE (DIESEL) - BLACK 1 WAY

CAV	CIRCUIT	FUNCTION
1	G6 20VT/GY	EOP SIGNAL



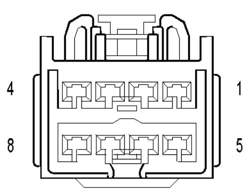
SWITCH-PARKING BRAKE - NATURAL 1 WAY

CAV	CIRCUIT	FUNCTION
1	B25 20DG/WT	PARK BRAKE SWITCH SENSE



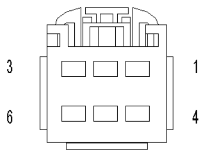
SWITCH-POWER WINDOW-DRIVER C1 - LT. GRAY 6 WAY

CAV	CIRCUIT	FUNCTION
1	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
2	Q412 14OR/LB	RIGHT REAR WINDOW DRIVER (UP)
3	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
4	Q611 14OR/GY	LEFT REAR WINDOW DRIVER (DOWN)
5	Q26 14OR/GY (LHD)	MASTER WINDOW SWITCH PASSENGER (DOWN)
5	Q22 14OR/VT (RHD)	RIGHT FRONT WINDOW DRIVER (DOWN)
6	Q16 14OR/TN (LHD)	MASTER WINDOW SWITCH PASSENGER (UP)
6	Q12 14OR/BR (RHD)	RIGHT FRONT WINDOW DRIVER (UP)



SWITCH-POWER WINDOW-DRIVER C2 - LT. GRAY 8 WAY

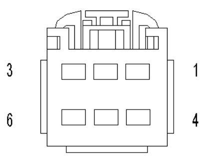
CAV	CIRCUIT	FUNCTION
1	-	-
2	F981 14PK/YL	IGNITION SWITCH OUTPUT (RUN-ACC)
3	Z961 20BK/YL (LHD EXCEPT HEATED MIRRORS)	GROUND
3	Z929 18BK (LHD HEATED MIRRORS)	GROUND
3	Z929 20BK/PK (RHD)	GROUND
4	Z928 14BK/LG (LHD EXCEPT HEATED MIRRORS)	GROUND
4	Z928 14BK (LHD HEATED MIRRORS)	GROUND
5	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
6	Q21 14OR/WT (LHD)	LEFT FRONT WINDOW DRIVER (DOWN)
6	Q26 14OR/GY (RHD)	MASTER WINDOW SWITCH PASSENGER (DOWN)
7	Q11 14OR/LG (LHD)	LEFT FRONT WINDOW DRIVER (UP)
7	Q16 14OR/TN (RHD)	MASTER WINDOW SWITCH PASSENGER (UP)
8	P697 20LG/DG	DOOR LOCK SWITCH MUX



SWITCH-POWER WINDOW-LEFT REAR

SWITCH-POWER WINDOW-LEFT REAR - LT. GRAY 6 WAY

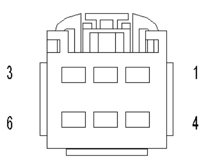
CAV	CIRCUIT	FUNCTION
1	Q611 14OR/GY	LEFT REAR WINDOW DRIVER (DOWN)
2	Q211 14TN/LB	LEFT REAR WINDOW DRIVER (DOWN)
3	Q111 14TN/YL	LEFT REAR WINDOW DRIVER (UP)
4	Q411 14OR/WT	LEFT REAR WINDOW DRIVER (UP)
5	-	-
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT



SWITCH-POWER WINDOW-PASSENGER

SWITCH-POWER WINDOW-PASSENGER - LT. GRAY 6 WAY

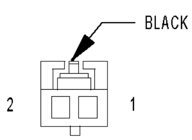
CAV	CIRCUIT	FUNCTION
1	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER (DOWN)
2	Q22 14OR/VT (LHD)	RIGHT FRONT WINDOW DRIVER (DOWN)
2	Q21 14OR/WT (RHD)	LEFT FRONT WINDOW DRIVER (DOWN)
3	Q12 14OR/BR (LHD)	RIGHT FRONT WINDOW DRIVER (UP)
3	Q11 14OR/LG (RHD)	LEFT FRONT WINDOW DRIVER (UP)
4	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER (UP)
5	-	-
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT



SWITCH-POWER WINDOW-RIGHT REAR

SWITCH-POWER WINDOW-RIGHT REAR - LT. GRAY 6 WAY

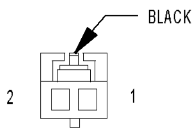
CAV	CIRCUIT	FUNCTION
1	Q612 14OR/DB	RIGHT REAR WINDOW DRIVER (DOWN)
2	Q212 14OR/VT	RIGHT REAR WINDOW DRIVER (DOWN)
3	Q112 14OR/BR	RIGHT REAR WINDOW DRIVER (UP)
4	Q412 14OR/LB	RIGHT REAR WINDOW DRIVER (UP)
5	-	-
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT



SWITCH-REMOTE RADIO-LEFT

SWITCH-REMOTE RADIO-LEFT - BLACK 2 WAY

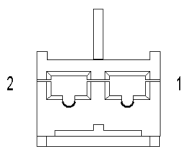
CAV	CIRCUIT	FUNCTION
1	X20 20GY	RADIO CONTROL MUX
2	Y13 20BK	RADIO CONTROL RETURN



SWITCH-REMOTE RADIO-RIGHT

SWITCH-REMOTE RADIO-RIGHT - BLACK 2 WAY

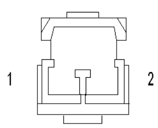
CAV	CIRCUIT	FUNCTION
1	X20 20GY	RADIO CONTROL MUX
2	Y13 20BK	RADIO CONTROL RETURN



SWITCH-SEAT BELT-DRIVER

SWITCH-SEAT BELT-DRIVER - BLACK 2 WAY

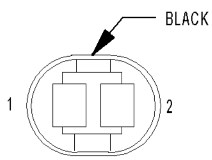
CAV	CIRCUIT	FUNCTION
1	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
2	Z961 20BK/YL	GROUND



SWITCH-SEAT BELT-PASSENGER

SWITCH-SEAT BELT-PASSENGER - WHITE 2 WAY

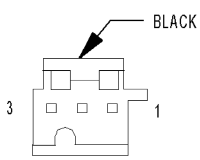
CAV	CIRCUIT	FUNCTION
1	R274 20LB/WT	PASSENGER HALL EFFECT (+)
2	R272 20LB/VT	PASSENGER HALL EFFECT (-)



SWITCH-SECURITY HOOD (EXPORT)

SWITCH-SECURITY HOOD (EXPORT) - BLACK 2 WAY

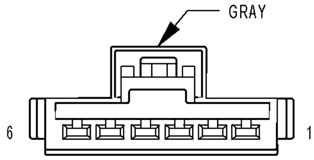
CAV	CIRCUIT	FUNCTION
1	G70 20VT/LB	HOOD AJAR SWITCH SENSE
2	Z908 20BK/PK	GROUND



SWITCH-SPEED CONTROL

SWITCH-SPEED CONTROL - BLACK 3 WAY

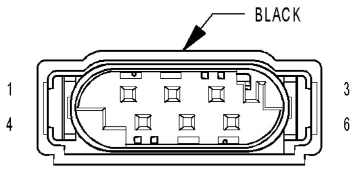
CAV	CIRCUIT	FUNCTION
1	V72 20PK	S/C SIGNAL 2
2	V71 20VT	S/C SIGNAL 1
3	V937 20YL	S/C SWITCH GROUND



SWITCH-STOP LAMP

SWITCH-STOP LAMP - BLACK 6 WAY

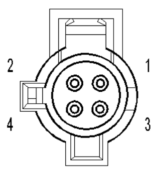
CAV	CIRCUIT	FUNCTION
1	A924 20DG/WT	FUSED B(+)
2	L53 18DG/GY	STOP LAMP SWITCH OUTPUT
3	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
4	B215 20DG/OR	BRAKE SIGNAL 2
5	Z967 18BK/VT	GROUND
6	B15 18DG/WT	BRAKE SIGNAL 1



THROTTLE BODY (GAS)

THROTTLE BODY (GAS) - BLACK 6 WAY

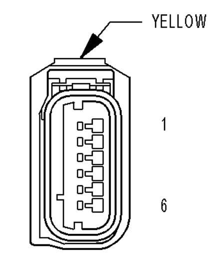
CAV	CIRCUIT	FUNCTION
1	K124 20DB/GY	ETC MOTOR (+)
2	K922 20BR/DB	TP SENSOR GROUND
3	F855 20PK/YL	5 VOLT SUPPLY
4	K126 20DB/LG	ETC MOTOR (-)
5	K22 20BR/OR	TP SIGNAL 1
6	K122 20BR/DG	TP SIGNAL 2



TRANSDUCER-A/C-PRESSURE

TRANSDUCER-A/C PRESSURE - GRAY 4 WAY

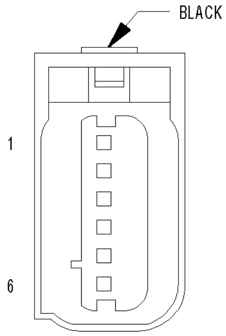
CAV	CIRCUIT	FUNCTION
1	C918 20BK/LB	A/C PRESSURE SENSOR GROUND
2	C818 20LB/TN	A/C PRESSURE SENSOR SUPPLY
3	C18 20LB/BR	A/C PRESSURE SENSOR SIGNAL
4	-	-



TRANSPONDER-TIRE PRESSURE-LEFT FRONT (TIRE PRESSURE MONITOR)

TRANSPONDER-TIRE PRESSURE-LEFT FRONT (TIRE PRESSURE MONITOR) - YELLOW 6 WAY

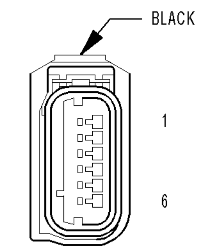
CAV	CIRCUIT	FUNCTION
1	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
2	D508 20WT/GY	COM-LIN TIRE PRESSURE MONITOR LAN
3	Z904 20BK/OR	GROUND
4	Z904 20BK/OR	GROUND
5	-	-
6	-	-



TRANSPONDER-TIRE PRESSURE-LEFT REAR (TIRE PRESSURE MONITOR)

TRANSPONDER-TIRE PRESSURE-LEFT REAR (TIRE PRESSURE MONITOR) - BLACK 6 WAY

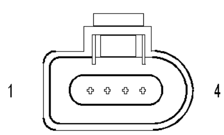
CAV	CIRCUIT	FUNCTION
1	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
2	D508 20WT/GY	COM-LIN TIRE PRESSURE MONITOR LAN
3	Z904 20BK/OR	GROUND
4	-	-
5	-	-
6	-	-



TRANSPONDER-TIRE PRESSURE-RIGHT REAR (TIRE PRESSURE MONITOR)

TRANSPONDER-TIRE PRESSURE-RIGHT REAR (TIRE PRESSURE MONITOR) - BLACK 6 WAY

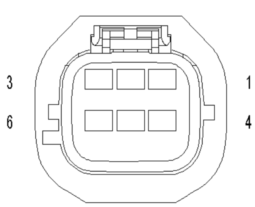
CAV	CIRCUIT	FUNCTION
1	F202 20PK/GY	IGNITION SWITCH OUTPUT (RUN-START)
2	D508 20WT/GY	COM-LIN TIRE PRESSURE MONITOR LAN
3	Z965 20BK/GY	GROUND
4	-	-
5	-	-
6	Z965 20BK/GY	GROUND



VALVE-EGR AIR FLOW CONTROL (DIESEL)

VALVE-EGR AIR FLOW CONTROL (DIESEL) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z924 16BK	GROUND
2	K343 16BR/YL	FUSED MAIN RELAY OUTPUT
3	K601 16BR/VT	EGR AIR FLOW CONTROL VALVE CONTROL
4	K604 20BR/WT	EGR AIR FLOW CONTROL VALVE SIGNAL



VALVE-MANIFOLD FLOW (GAS)

VALVE-MANIFOLD FLOW (GAS) - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	Z916 16BK	GROUND
2	-	-
3	K601 20BR/VT	MFV CONTROL
4	K900 20DB/DG	SENSOR GROUND
5	K602 20YL/DB	MFV SIGNAL
6	K857 20BR/LG	5 VOLT SUPPLY

8W-91 CONNECTOR/GROUND/SPLICE LOCATION

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CONNECTOR/GROUND/SPLICE LOCATION

DESCRIPTION

This section provides illustrations identifying connector, ground and splice locations in the vehicle. Connector, ground and splice indexes are provided. Use the wiring diagrams in each section for connector, ground and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Actuator-Recirculation Door	Black	Lower Passenger Side Instrument Panel	25, 27, 31, 33
Airbag-Driver Squib 1	Black/Yellow	Rear of Steering Wheel Pad	26, 32, 34
Airbag-Driver Squib 2	Natural/Yellow	Rear of Steering Wheel Pad	26, 32, 34
Airbag-Knee Blocker-Driver	Yellow/Black	Lower Driver Side Instrument Panel	23, 24, 26
Airbag-Passenger Squib 1	Yellow/Black	Passenger Side of Instrument Panel	25, 29, 31, 33
Airbag-Passenger Squib 2	Yellow/Orange	Passenger Side of Instrument Panel	25, 29, 31, 33
Airbag-Side Curtain-Left	Yellow/Black	Near Top of Left C-PIllar	65
Airbag-Side Curtain-Right	Yellow/Black	Near Top of Right C-PIllar	63
Amplifier-Radio C1	White	Right Side of Luggage Compartment	63
Amplifier-Radio C2	White	Right Side of Luggage Compartment	63
Antenna-Radio (LHD)	-	Right Side Instrument Panel	26, 37, 44
Antenna-Radio (RHD)	-	Left Side of Instrument Panel	29, 31, 32, 38, 46
Antenna-Satellite	Tan	Mid Rear Roof	66
Assembly-Shift Lever	Lt. Gray	Lower Center Instrument Panel	24, 26, 30, 31, 32, 35
Assembly-Transmission Solenoid/Pressure Switch	Black	Left Side of Transmission	21
Assembly-Valve Block		Left Side of Engine	18
Backlite-Electric Heated	Black	Upper Left of Liftgate	67
Battery-Negative (Diesel)	-	Under Passenger Seat	18, 22

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Battery-Negative (Gas)	-	Left Front Engine Compartment	14, 22
Battery-Positive (Diesel)	-	Under Passenger Seat	18, 22
Battery-Positive (Gas)	-	Left Front Engine Compartment	14, 22
C100	Black	Left Front Engine Compartment	8, 11, 14, 16, 18
C101	Black	Front of Engine	18
C102	Black	Front Left Side of Engine Compartment	18, 19, 20
C103	Black	Left Front Engine Compartment	10, 11, 12
C104	Black	Left Front Engine Compartment	10, 11, 12
C105	Dk. Gray	Left Front Engine Compartment	8, 11
C106	Black	Lower Front of Transmission	21
C200	Black	Left Side of Instrument Panel	23, 24, 26, 29, 31, 33, 37, 38, 44, 46
C201	Lt. Gray	Left Side of Instrument Panel	23, 24, 26, 29, 31, 37, 38, 44, 46
C202	Lt. Gray	Base of Left A-Pillar	23, 24, 26, 29, 31, 33, 36, 42
C203	Lt. Gray	Upper Right Side Instrument Panel	23, 25, 29, 30, 32, 41
C204	Natural	Below Center Console	35, 40
C300	Lt. Gray	Left Side of Luggage Compartment	60
C301	Green	Left Kick Panel	44, 46, 53
C302	Black	Left Kick Panel	44, 46, 53
C303	Black	Below Left Side of Instrument Panel	45, 47, 53
C304	Lt. Gray	Below Passenger Seat	50, 57
C305	Lt. Gray	Below Driver Seat	48, 57
C306	Green	Below Left Side of Instrument Panel	47, 53
C308	Lt. Gray	Left B-Pillar	48, 55, 56
C309	Lt. Gray	Right B-Pillar	50, 55, 56
C310	Lt. Gray	Body Near Left Top Corner of Liftgate	65, 67
C311	Lt. Gray	Body Near Left Top Corner of Liftgate	65, 67
C312	Lt. Gray	Left Side of Instrument Panel	23, 24, 26, 37, 61
C313	Lt. Gray	Left Side of Luggage Compartment	60, 62, 64
Capacitor-Ignition	Natural	Left Side of Engine	14, 16
Cluster C1	Black	Driver’s Side of Instrument Panel	26, 32
Cluster C2	Brown	Driver’s Side of Instrument Panel	26, 32
Cluster C3	Black	Driver’s Side of Instrument Panel	26, 32
Cluster C4	Lt. Gray	Driver’s Side of Instrument Panel	26, 32
Coil-Ignition 1	Dk. Gray	Right Top of Engine	16
Coil-Ignition 2	Dk. Gray	Right Top of Engine	16
Coil-Ignition 3	Dk. Gray	Left Top of Engine	16
Coil-Ignition 4	Dk. Gray	Left Top of Engine	16

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Control-A/C-Heater C1	Black	Center of Instrument Panel	26, 32
Control-A/C-Heater C2	Black	Center of Instrument Panel	26, 32
Data Link Connector	Black	Left Side of Instrument Panel	37, 44, 47
Fan Module-Radiator Cooling C1	Black	Front Center Engine Compartment	7
Fan Module-Radiator Cooling C2	Black	Front Center Engine Compartment	7
Fuse/Relay Block	Black	Left Front Engine Compartment	10, 11, 12
Generator (Diesel)	Black	Right Front of Engine	18
Generator (Gas)	Black	Right Front of Engine	14
Generator-Eyelet (Diesel)	-	Right Front of Engine	18
Generator-Eyelet (Gas)	-	Right Front of Engine	14
Glow Plug 1	Black	Right Top of Engine	20
Glow Plug 2	Black	Right Top of Engine	20
Glow Plug 3	Black	Left Top of Engine	20
Glow Plug 4	Black	Left Top of Engine	20
Heater-Cabin		Lower Instrument Panel	39, 44, 46
Heater-PCV	Black	Right Top of Engine	18
Heater-Seat Back-Left	Black	Left Seat	N/S
Heater-Seat Back-Right	Black	Right Seat	N/S
Heater-Seat Cushion-Left	Green	Left Seat	57
Heater-Seat Cushion-Right	Green	Right Seat	57
Horn 1	Black	Left Inner Fender	10
Horn 2	Black	Right Inner Fender	2
Injector-Fuel 1 (Diesel)	Black	Right Top of Engine	20
Injector-Fuel 1 (Gas)	Black	Right Top of Engine	16
Injector-Fuel 2 (Diesel)	Black	Right Top of Engine	20
Injector-Fuel 2 (Gas)	Black	Right Top of Engine	16
Injector-Fuel 3 (Diesel)	Black	Left Top of Engine	20
Injector-Fuel 3 (Gas)	Black	Left Top of Engine	16
Injector-Fuel 4 (Diesel)	Black	Left Top of Engine	20
Injector-Fuel 4 (Gas)	Black	Left Top of Engine	16
Lamp-Backup-Left	Black	Left Side of Rear Fascia	60
Lamp-Backup-Right	Black	Right Side of Rear Fascia	63, 68, 69
Lamp-Cargo	Black	Cargo Area	43
Lamp-Cup Holder	Lt. Gray	In Center Console	40
Lamp-Dome		Center of Headliner	43
Lamp-Fog-Left Front	Black	Lower Left Front Fascia	10
Lamp-Fog-Right Front	Black	Lower Right Front Fascia	2
Lamp-Headlamp-Left	Dk. Green	At Headlamp Assembly	10
Lamp-Headlamp-Right	Dk. Green	Right Front Headlamp Assembly	1, 2
Lamp-High Mounted Stop	Black	Top of Liftgate	67

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Lamp-License	Lt. Gray	Center of Rear Fascia	67
Lamp-Park/Turn-Left Front	Black	Left Front of Vehicle	1
Lamp-Park/Turn-Right Front	Black	Right Front of Vehicle	1
Lamp-Side Repeater-Left (Export)	Black	Left Front Wheel Opening	13
Lamp-Side Repeater-Right (Export)	Black	Right Front Wheel Opening	3
Lamp-Tail Turn-Left	Brown	In Rear Lamp Assembly	60
Lamp-Tail Turn-Right	Brown	In Rear Lamp Assembly	63, 68, 69
Lamp-Tail/Stop/Fog-Left (Export)		In Rear Lamp Assembly	69
Lamp-Tail/Stop/Fog-Right (Export)		In Rear Lamp Assembly	69
Lamp-Tail/Stop-Left (Except Export)	Black	In Rear Lamp Assembly	60
Lamp-Tail/Stop-Right (Except Export)	Black	In Rear Lamp Assembly	63, 68
Lamp-Turn-Left Front (Export)	Natural	Left Front of Vehicle	2
Lamp-Turn-Right Front (Export)	Natural	Right Front of Vehicle	2
Lamp-Vanity-Left	Black	Left Front Side of Headliner	43
Latch-Door-Driver	Black	Left Door	53
Latch-Door-Left Rear	Black	Rear of Left Rear Door	55
Latch-Door-Liftgate C1	Black	Inside Liftgate	67
Latch-Door-Liftgate C2	White	Inside Liftgate	67
Latch-Door-Passenger	Black	Right Door	53
Latch-Door-Right Rear	Black	Right Rear Door	55
Mirror-Inside Rearview C1	Black	Center Top Windshield	43
Mirror-Inside Rearview C2	Black	Center Top Windshield	43
Mirror-Outside Rearview-Driver	Black	Left Front Door	52, 53
Mirror-Outside Rearview-Passenger	Black	Right Front Door	53
Module-All Wheel Drive (AWD) Control	Natural	Left Kick Panel Near Grommet to Engine Compartment	44
Module-Anti-lock Brakes	Black	Engine Compartment Near Right Shock Tower	5, 8
Module-Compass	Black	Center Stack	29, 32
Module-Electronic Overhead C1 (Overhead Console)	Black	Front Center of Headliner	43
Module-Electronic Overhead C2 (Overhead Console)	Black	Front Center of Headliner	43
Module-Engine Control C1	Black	Left Side of Engine Compartment	8
Module-Engine Control C2	Black	Left Side of Engine Compartment	18
Module-Fuel Pump (FWD)	Dk. Gray	On Fuel Tank	58

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Module-Fuel Pump C1 (AWD)	Dk. Gray	On Fuel Tank	58
Module-Fuel Pump C2 (AWD)	Blue	On Fuel Tank	59
Module-Glow Plug	Black	Lower Left Front Fender	12
Module-Hands Free	Dk. Gray	Left Side of Instrument Panel	23, 24, 26
Module-Headlamp Leveling-Left (Export)	Dk. Gray	Left Front of Vehicle at Headlamp Assembly	10
Module-Headlamp Leveling-Right (Export)	Dk. Gray	Right Front of Vehicle at Headlamp Assembly	1, 2
Module-Heated Seats	Black	Driver Seat	57
Module-Intrusion Transceiver C1	Black	Center Instrument Panel	41, 43
Module-Intrusion Transceiver C2	Black	Right Front Headliner	43
Module-Inverter C1		Lower Center Instrument Panel	24, 26
Module-Inverter C2	Orange	Lower Center Instrument Panel	24, 26
Module-Occupant Classification C1	Black	Front of Passenger Seat	57
Module-Occupant Classification C2	Black	Front of Passenger Seat	57
Module-Occupant Restraint Controller C1	Yellow/Black	Under Center Console	45, 46
Module-Occupant Restraint Controller C2	Yellow/Black	Under Center Console	45, 46
Module-Powertrain Control C1	Black	Left Side Engine Compartment	8
Module-Powertrain Control C2	Black	Left Side Engine Compartment	8, 14, 16
Module-Sentry Key Remote Entry	Black	Right of Steering Column	28
Module-Steering Control C1	White	At Steering Column	28
Module-Steering Control C2	White	At Steering Column	28
Module-Steering Control C4	White	At Steering Column	28
Module-Steering Control C5	White	At Steering Column	34
Module-Totally Integrated Power C1	Black	Left Side Engine Compartment	8, 9
Module-Totally Integrated Power C2	Lt. Gray	Left Side Engine Compartment	8, 9
Module-Totally Integrated Power C3	Brown	Left Side Engine Compartment	9
Module-Totally Integrated Power C4	Black	Left Side Engine Compartment	8, 9
Module-Totally Integrated Power C5	Blue	Left Side Engine Compartment	9
Module-Totally Integrated Power C6	Lt. Gray	Left Side Engine Compartment	9
Module-Totally Integrated Power C7	Lt. Gray	Left Side Engine Compartment	9

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Module-Totally Integrated Power C8	Black	Left Side Engine Compartment	9
Module-Totally Integrated Power C9	-	Left Side Engine Compartment	9
Module-Totally Integrated Power C10	Lt. Gray	Left Side Engine Compartment	8, 9
Module-Totally Integrated Power C11	Green	Left Side Engine Compartment	8, 9
Module-Transmission Control C1	White	Body Harness Below Left Side Instrument Panel	44
Module-Transmission Control C2	Lt. Gray	Body Harness Below Left Side Instrument Panel	44
Motor-Blower	Natural	Lower Passenger Side Instrument Panel	25, 27, 31, 33
Motor-Sunroof	Lt. Gray	Front of Sunroof Assembly	41
Motor-Window-Left Front	Black	Left Front Door	53
Motor-Window-Left Rear	Black	Left Rear Door	56
Motor-Window-Right Front	Black	Right Front Door	53
Motor-Window-Right Rear	Black	Right Rear Door	56
Motor-Wiper-Front	Lt. Gray	Center of Cowl Panel	8
Motor-Wiper-Rear	Green	Center of Liftgate	67
Power Outlet-AC	Orange	In Center Console	40
Power Outlet-Instrument Panel	Gray	Bottom Center of Instrument Panel	35
Pump-Washer-Windshield	Black	Right Front Inner Fender Attached to Washer Reservoir	2, 4
Radio C1	Dk. Gray	Center of Instrument Panel	26, 32
Radio C2	Dk. Gray	Center of Instrument Panel	26
Receiver-Satellite Antenna 1	Black	Left Rear Body	64
Receiver-Satellite Antenna 2	Tan	Left Rear Body	64
Receiver-Satellite C1	—	Left Rear Body	N/S
Receiver-Satellite C2	—	Left Rear Body	64
Relay-Cabin Heater 1	Black	Lower Left Front Fender	12
Relay-Cabin Heater 2	Black	Lower Left Front Fender	12
Resistor-Blower Motor	Gray	Lower Passenger Side Instrument Panel	25, 27, 31, 33
Seat Belt-Tensioner-Driver	Yellow/Black	Right B-Pillar	48
Seat Belt-Tensioner-Passenger	Yellow/Black	Left B-Pillar	50
Sensor-Accelerator Pedal Position	Black	At Base of Pedal	44, 47
Sensor-Ambient AirTemperature	Black	Lower Left Front Fascia	10
Sensor-Brake Fluid Level	Black	Left Rear Engine Compartment	6, 8

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Camshaft 1 Position (Gas)	Black	Left Rear Top of Engine	16, 17
Sensor-Camshaft 2 Position (Gas)	Black	RIght Rear Top of Engine	16
Sensor-Camshaft Position (Diesel)	Black	Left Side of Engine	19
Sensor-Crankshaft Position (Gas)	Black	Lower Left Rear of Engine	16, 17
Sensor-Crankshaft Position (Diesel)	Black	Lower Left Front of Engine	19
Sensor-Dynamics	Black	Center Body Below Instrument Panel	45
Sensor-Engine Coolant Temperature (Diesel)	Black	Left Side of Engine	18
Sensor-Engine Coolant Temperature 1 (Gas)	Black	Left Top of Engine	14, 16
Sensor-Engine Coolant Temperature 2 (Gas)	Black	Center Front of Engine Under Intake Manifold	14, 15
Sensor-Evaporator Temperature	Natural	Left Side of HVAC Unit	23, 24, 26, 29, 30, 32
Sensor-Front Impact-Left	Yellow	Left Side Body	7
Sensor-Front Impact-Right	Yellow	Right Front Engine Compartment	4
Sensor-Fuel Temperature	Black	Left Front of Engine	18
Sensor-Input Speed (CVT)	Black	Front of Transmission	21
Sensor-Intake Air Temperature (Gas)	Black	Left Top of Engine	14
Sensor-Intake Air Temperature/Boost Pressure (Diesel)	Black	Lower Left Front Fender	12
Sensor-Knock	Black	Left Front of Engine	14, 15
Sensor-MAP	Black	Right Front of Engine	14
Sensor-Mass Air Flow (Diesel)	Black	Left Top of Engine	18
Sensor-Oil Temperature	Black	Top Front of Engine	14
Sensor-Output Speed	Black	Rear of Transmission	21
Sensor-Oxygen 1/1	Gray	Left Side of Engine	14, 16, 17
Sensor-Oxygen 1/2	Black	Lower Right Engine Compartment	8
Sensor-Seat Track Position-Driver	Dk. Gray	Right Rear of Driver Seat	57
Sensor-Seat Track Position-Passenger	Dk. Gray	Right Rear of Passenger Seat	57
Sensor-Seat Weight-Left Front	Black	Passenger Seat	57
Sensor-Seat Weight-Left Rear	Black	Passenger Seat	57
Sensor-Seat Weight-Right Front	Black	Passenger Seat	57
Sensor-Seat Weight-Right Rear	Black	Passenger Seat	57

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Side Impact-Left 1	Yellow	Lower Left B-Pillar	48
Sensor-Side Impact-Left 2	Yellow	Above Left Rear Wheel Well	60
Sensor-Side Impact-Right 1	Yellow	Base of Right B-Pillar	50
Sensor-Side Impact-Right 2	Yellow	Above Right Rear Wheel Well	63
Sensor-Steering Angle	White	Base of Right B-Pillar	28
Sensor-Transmission Range	Black	Front of Transmission	21
Sensor-Vehicle Speed	Black	Top of Transmission	17
Sensor-Wheel Speed-ABS-Left Front	Black	Left Front Wheel Opening	8
Sensor-Wheel Speed-ABS-Left Rear	Black	Left Rear Wheel Opening	60
Sensor-Wheel Speed-ABS-Right Front	Black	Right Front Wheel Opening	5, 6
Sensor-Wheel Speed-ABS-Right Rear	Black	Right Rear Wheel Opening	63
Siren	Black	Right Front Wheel Opening	3
Solenoid-A/C Compressor	Black	Lower Front of Engine at Compressor	14, 18
Solenoid-Camshaft 1/1 Position	Black	Right Side of Enginet	14
Solenoid-Camshaft 1/2 Position	Black	Right Rear of Engine	14
Solenoid-Electronically Controlled Clutch		At Rear Differential	59
Solenoid-EVAP Purge	Black	Lower Rear of Engine Compartment	8
Speaker-Instrument Panel-Left (Premium)	White	Left Upper Instrument Panel	23, 24, 29, 31, 33
Speaker-Instrument Panel-Right (Premium)	White	Right Upper Instrument Panel	23, 25, 29, 30, 32
Speaker-Left Front Door	White	Left Door	53
Speaker-Left Rear	White	Left Side Body	55, 56
Speaker-Liftgate	Lt. Gray	Lower Center of Liftgate	67
Speaker-Right Front Door	White	Right Door	53
Speaker-Right Rear	White	Right Side Body	55, 56
Speaker-Subwoofer	White	Right Side of Luggage Compartment	63
Starter (Diesel)	-	Lower Left Front of Engine	18
Starter (Gas)	-	Left Front of Engine	14, 15
Starter-Eyelet-Battery Side (Diesel)	-	Lower Left Front of Engine	18
Starter-Eyelet-Battery Side (Gas)	-	Left Front of Engine	15
Starter-Eyelet-Generator Side (Diesel)	-	Lower Left Front of Engine	18

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Starter-Eyelet Generator Side (Gas)	-	Left Front of Engine	14, 15
Switch-Backup Lamp		Left Side of Engine Compartment on Manual Transmission	12
Switch-Bank	White	Center Stack	26, 32, 35
Switch-Clutch Interlock	White	Left Side of Steering Column	44, 47
Switch-Engine Oil Pressure (Gas)	Lt. Green	Front Center Engine Under Intake Manifold	14, 15
Switch-EVAP System Monitor	Black	Right Front Fuel Tank	58
Switch-Horn	Black	Steering Wheel Below Horn Pad	34
Switch-Ignition	Black	Right Side of Steering Column	28
Switch-Mirror	Lt. Gray	Driver Door at Switch	54
Switch-Oil Pressure (Diesel)	Black	Left Front of Engine	19
Switch-Parking Brake	Natural	Rear of Front Center Console	35
Switch-Power Window-Driver C1	Lt. Gray	Driver Door at Switch	54
Switch-Power Window-Driver C2	Lt. Gray	Driver Door at Switch	54
Switch-Power Window-Left Rear	Lt. Gray	Left Rear Door at Switch	56
Switch-Power Window-Passenger	Lt. Gray	Passenger Front Door at Switch	54
Switch-Power Window-Right Rear	Lt. Gray	Right Rear Door at Switch	56
Switch-Remote Radio-Left	Black	Left Side of Steering Wheel	34
Switch-Remote Radio-Right	Black	Right Side of Steering Wheel	34
Switch-Seat Belt-Driver	Black	Lower Left B-Pillar	48
Switch-Seat Belt-Passenger	White	Passenger Seat	57
Switch-Security Hood	Black	Left Rear Engine Compartment	8
Switch-Speed Control	Black	On Steering Wheel	34
Switch-Stop Lamp	Black	Left Side of Brake Pedal	44, 47
Throttle Body	Black	Left Front of Engine	14
Transducer-A/C Pressure	Gray	Top Right of Radiator Fan Assembly	4
Transponder-Tire Pressure-Left Front	Yellow	Rear of Left Front Fender	13
Transponder-Tire Pressure-Left Rear	Black	At Left Rear Wheel Well	58
Transponder-Tire Pressure-Right Rear	Black	At Right Rear Wheel Well	59
Valve-EGR Air Flow Control (Diesel)	Black	Left Front of Engine	19
Valve-Manifold Flow	Black	Left Front of Engine	14

GROUNDS

GROUND	LOCATION	FIG.
G100	Left Front of Engine	14, 15, 22
G101 (Diesel)	Front of Transmission	18
G101 (Gas)	Left Front Engine Compartment	7, 14, 22
G110	Right Front Engine Compartment Side Frame	4
G111	Upper Left Front Engine Compartment	7, 22
G112	Left Front Inner Fender	7
G200	Left Side of Instrument Panel	23, 24, 26, 29, 31, 36
G250	Right Kick Panel	23, 25, 29, 30, 32
G300	Center Body Below Instrument Panel	45, 46
G301	Left Side of Luggage Compartment	60
G302	Left Side of Luggage Compartment	60
G303	Right Side of Luggage Compartment Floor	63

SPLICES

SPLICE	LOCATION	FIG.
S001	Front of Right Front Shock Tower	5
S002	Front of Right Front Shock Tower	5
S003	Front Center Engine Compartment above Left Radiator Fan	7
S005	Left Side Engine Compartment, Rear of TIPM	8
S007	Left Side Engine Compartment in PCM C1 T/O	8
S008	Left Rear Engine Compartment	8
S013	Left Rear Engine Compartment in ABS Module T/O	8
S015	Left Front Engine Compartment in Park Lamp T/O	10
S019	Left Rear Engine Compartment in PCM T/O	8
S020	Left Front Engine Compartment	7
S021	Front Center Engine Compartment above Left Radiator Fan	7
S023	Front Center Engine Compartment above Left Radiator Fan	7
S024	Left Side Engine Compartment under Fuse/Relay Block	12
S026	Left Side Engine Compartment Below TIPM	8
S027	Left Front Engine Compartment	7, 12
S032	Left Front Engine Compartment	7
S033	Left Front Engine Compartment Near Impact Sensor T/O	7
S100	Left Rear Engine Compartment in ABS Module T/O	8
S101	Near Engine Starter Eyelet	14
S102	In T/O for Powertrain Control Module C2	16
S103 (Diesel)	Lower Center Front of Engine	18
S103 (Gas)	Right Top of Engine	14
S104 (Diesel)	Left Side of Engine	18
S104 (Gas)	Near T/O for Ignition Coil 4	16
S105	Left Front of Engine	14

SPLICE	LOCATION	FIG.
S106	Left Front of Engine	14
S107	Left Front of Engine	14
S108 (Diesel)	Left Front of Engine	18
S109	Powertrain Harness	N/S
S110	Powertrain Harness	N/S
S111	Powertrain Harness	N/S
S112	Powertrain Harness	N/S
S113	Near Battery	N/S
S120	Top of Engine in Injector Wire Harness Trough	N/S
S121	Top Front of Transaxle	21
S150	Left Front of Engine	14, 18
S153	Left Side of Engine In T/O for Engine Control Module C2	18
S200	Below Center Console	35
S201	Center Instrument Panel	30
S202 (LHD)	Left of Instrument Panel	24
S202 (RHD)	Center of Instrument Panel	30
S203 (LHD)	Left of Instrument Panel	24
S203 (RHD)	Center of Instrument Panel	30
S204 (LHD)	Left of Instrument Panel	25
S204 (RHD)	Left of Instrument Panel	31
S205 (LHD)	Left of Instrument Panel	24
S205 (RHD)	Right of Instrument Panel	30
S206 (LHD)	Left of Instrument Panel	24
S206 (RHD)	Center of Instrument Pane	30
S207	Left of Instrument Panel	24, 31
S208 (LHD)	Left of Instrument Panel	24
S208 (RHD)	Right of Instrument Panel	30
S209	Left of Instrument Panel	24, 31
S214	Lower Center of Instrument Panel	30, 35
S216 (LHD)	Left of Instrument Panel	24
S216 (RHD)	Right of Instrument Panel	30
S217	In Cluster T/O	29
S220	Left Side of Instrument Panel	24
S225 (LHD)	Right Side of Steering Wheel	34
S300	Left Side Body Below B-Pillar	48
S301 (LHD)	Body Harness Below Right Side of Instrument Panel	45
S301 (RHD)	Body Harness Below Left Side of Instrument Panel	46
S302 (LHD)	Body Harness Below Right Side of Instrument Panel	45
S302 (RHD)	Body Harness Below Left Side of Instrument Panel	46
S303	Left Front Fender	13
S304	Rear of Left Front Fender	13
S305	Body Harness Near Left Side Instrument Panel	44
S306	Left Side Body Below Front Door Opening	48
S307	Body Harness Below Left Side Instrument Panel	44, 46
S308	Left Side Body Below Front Door Opening	48
S309	Body Harness Below Center of Instrument Panel	45

SPLICE	LOCATION	FIG.
S311	Body Harness Below Left Side Instrument Panel	44, 46
S312 (LHD)	Body Harness Below Right Side of Instrument Panel	45
S312 (RHD)	Body Harness Below Left Side of Instrument Panel	46
S313	Body Harness Below Left Side Instrument Panel	44, 47
S316	Left Side Body Below Left Rear Door Opening	46, 49
S320	Left Side Body Below B-Pillar	48
S321	Body Harness Below Left Side of Instrument Panel	44, 46
S323	Below Center Instrument Panel in T/O for Cabin Heater	44
S326	Left Side Body Below B-Pillar	48
S327 (LHD)	Left Front Engine Compartment	11
S327 (RHD)	Body Harness Under Right Side of Instrument Panel	11
S328 (LHD)	Above Right Rear Wheel Well	63
S328 (RHD)	Body Harness Below Center Instrument Panel	47
S331 (RHD)	Body Harness Below Left Side Instrument Panel	46
S332	Body Harness Below Left Side Instrument Panel	46
S333	Body Harness Under Left Seat	48
S334	Left Front Engine Compartment	11
S335	Left Front Engine Compartment	11
S336	Left Front Fender	13
S340	Left Side Body Below Left Rear Door Opening	49
S345	Above Right Rear Wheel Well	63
S348	Above Right Rear Wheel Well	63
S349	Front of Left Front Door	53
S350	Front of Left Front Door	53
S351	Center of Right Front Door	53
S352	Front of Right Front Door	53
S353	Center of Right Front Door	53
S354	Front of Right Front Door	53
S355	Near Upper Left Corner of Liftgate	67
S360	Left Front Headliner	42
S361	Left Front Headliner	42
S362	Left Front Headliner	42
S368	Above Right Rear Wheel Well	63
S370	Center of Left Front Door	53
S372	Right Body Below Right Rear Door Opening	50, 51
S373	Right Body Below Right Rear Door Opening	51, 63
S374	Above Right Rear Wheel Well	63
S375	Passenger Seat	57
S376	Right Side of Passenger Seat	57
S377	Left Side of Passenger Seat	57
S378	Left Side of Passenger Seat	57
S381	Driver Seat	57

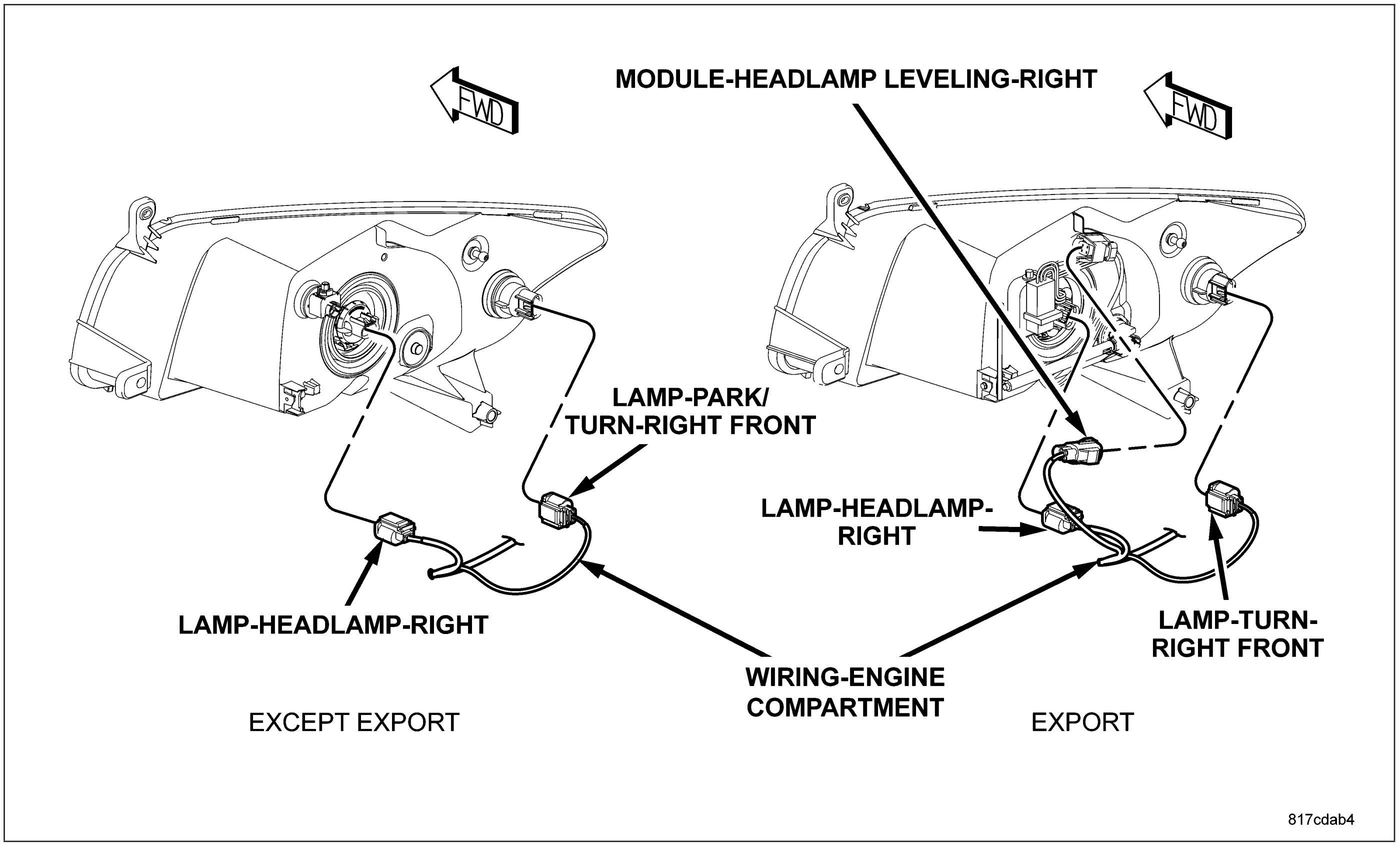


Fig. 1 LIGHTING - RIGHT FRONT (LEFT SIMILAR)

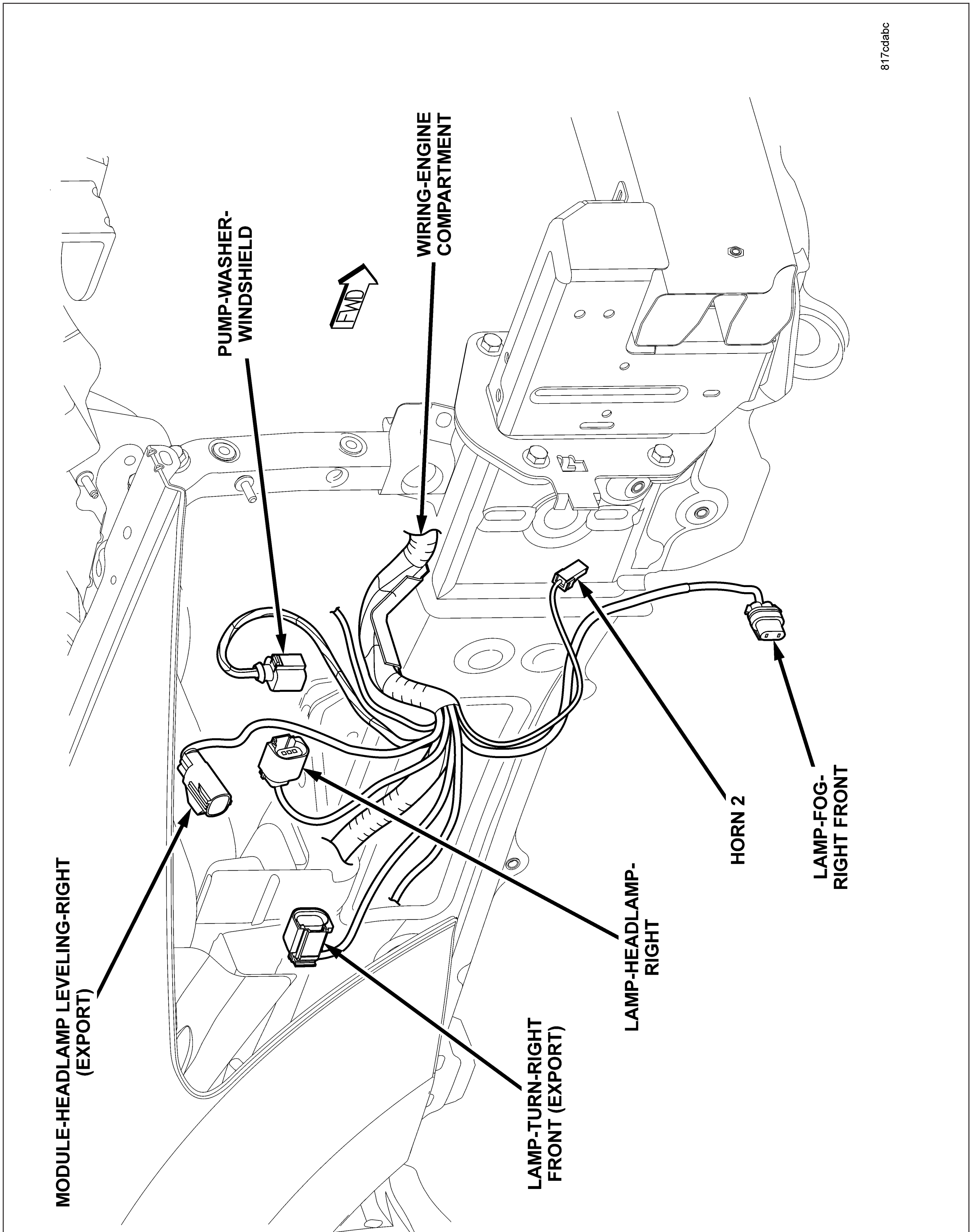


Fig. 2 ENGINE COMPARTMENT - FRONT RIGHT (LEFT SIMILAR)

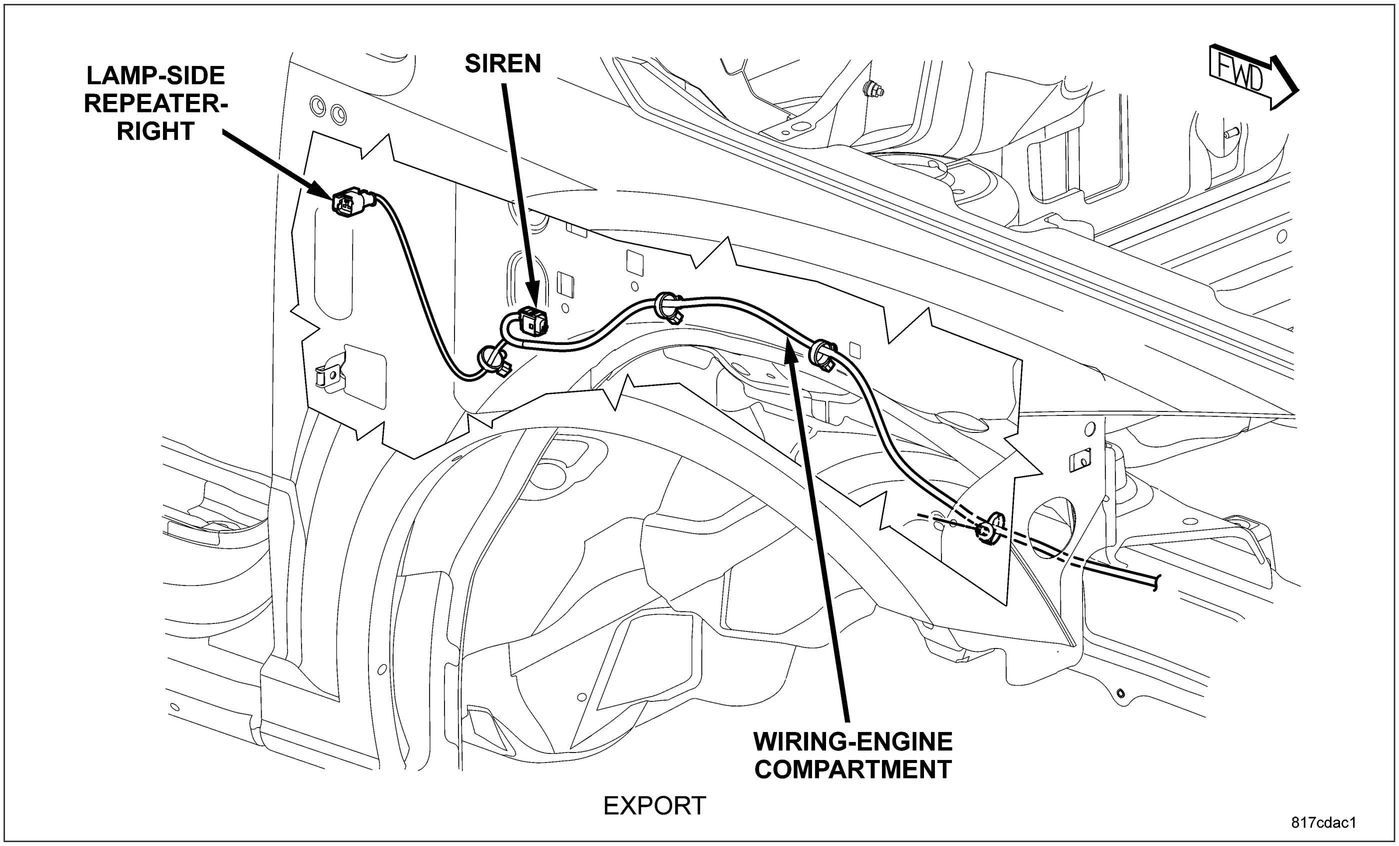


Fig. 3 WHEEL WELL - RIGHT FRONT

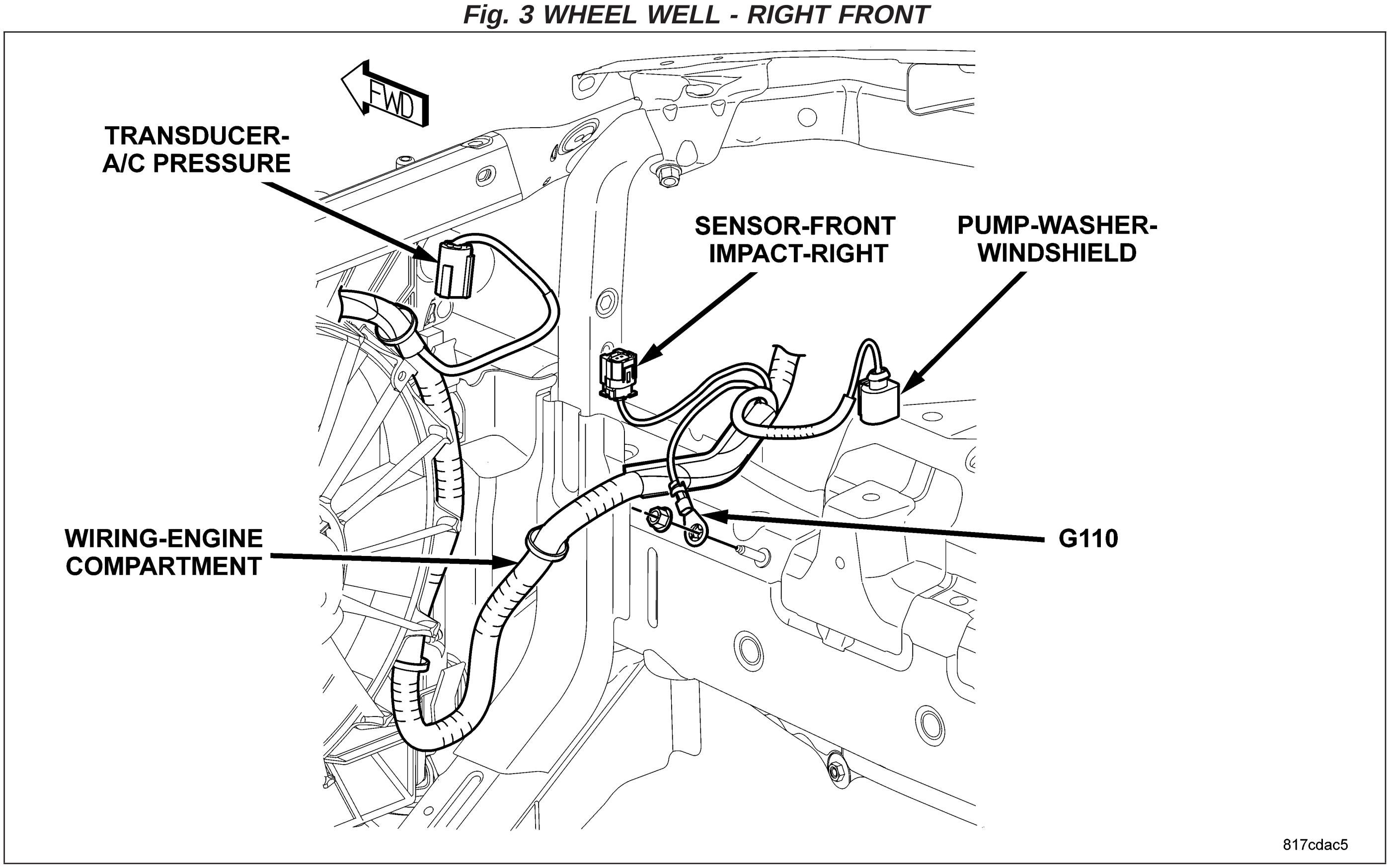


Fig. 4 ENGINE COMPARTMENT - RIGHT FRONT

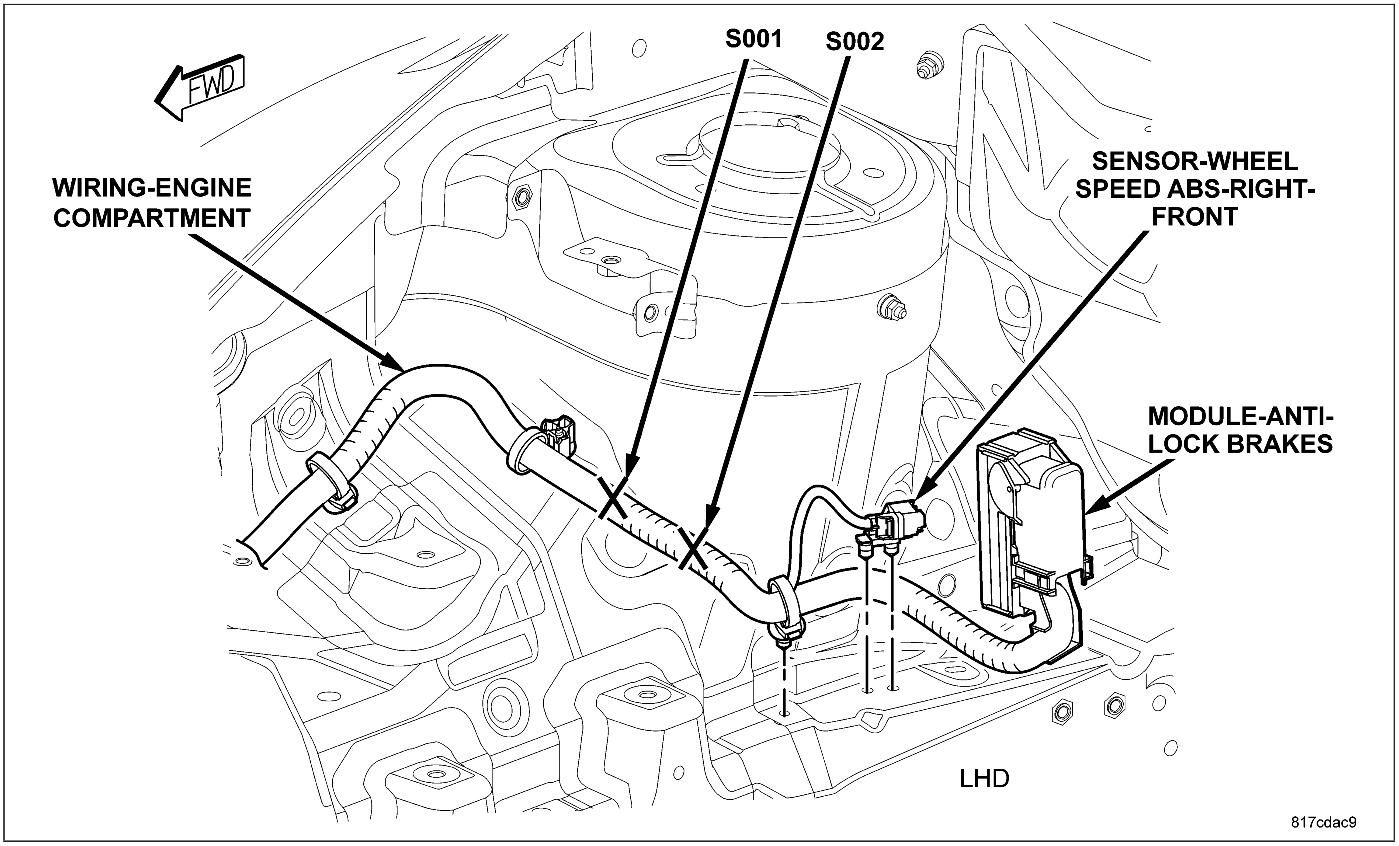


Fig. 5 SHOCK TOWER - RIGHT FRONT (LHD)

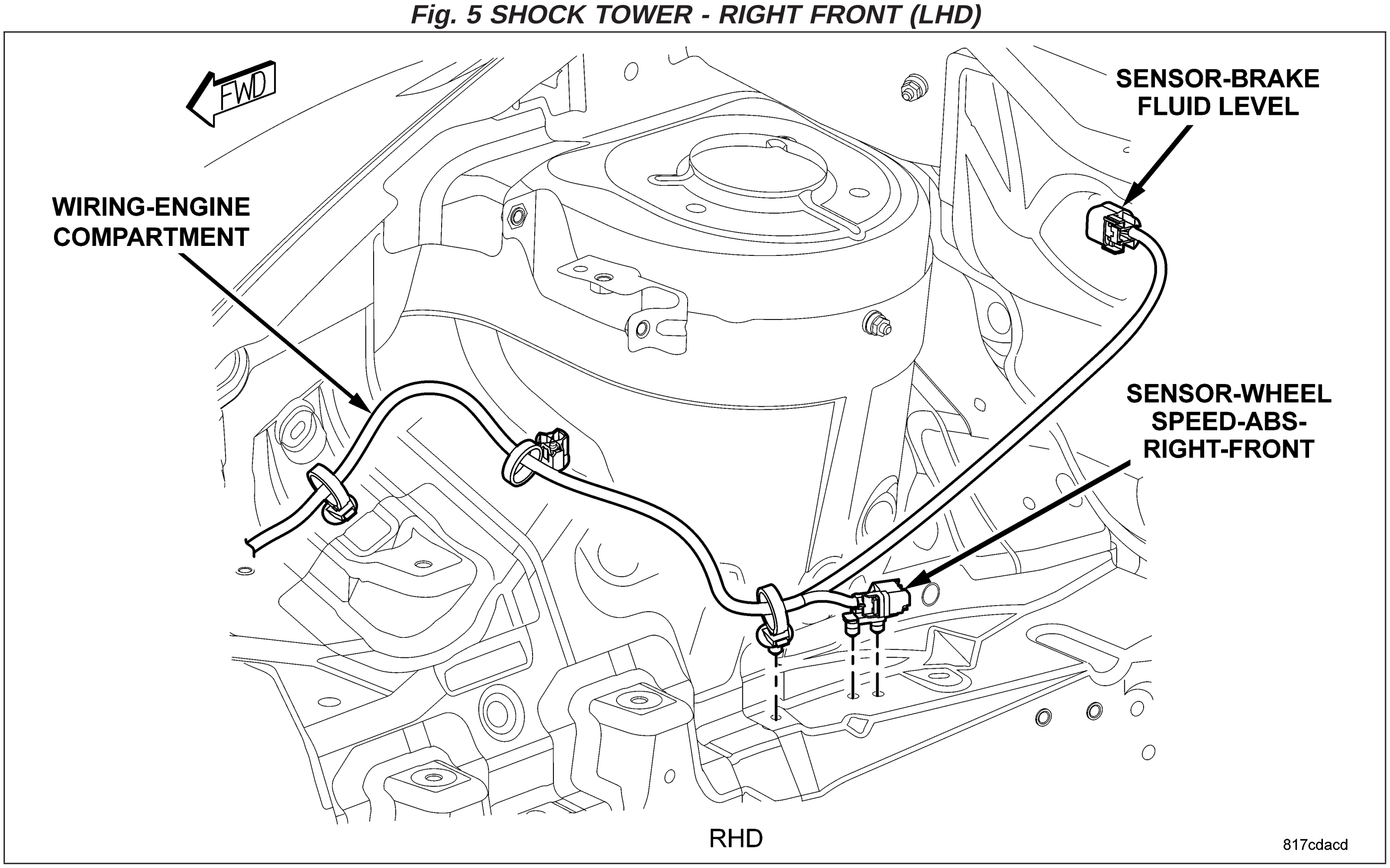


Fig. 6 SHOCK TOWER - RIGHT FRONT (RHD)

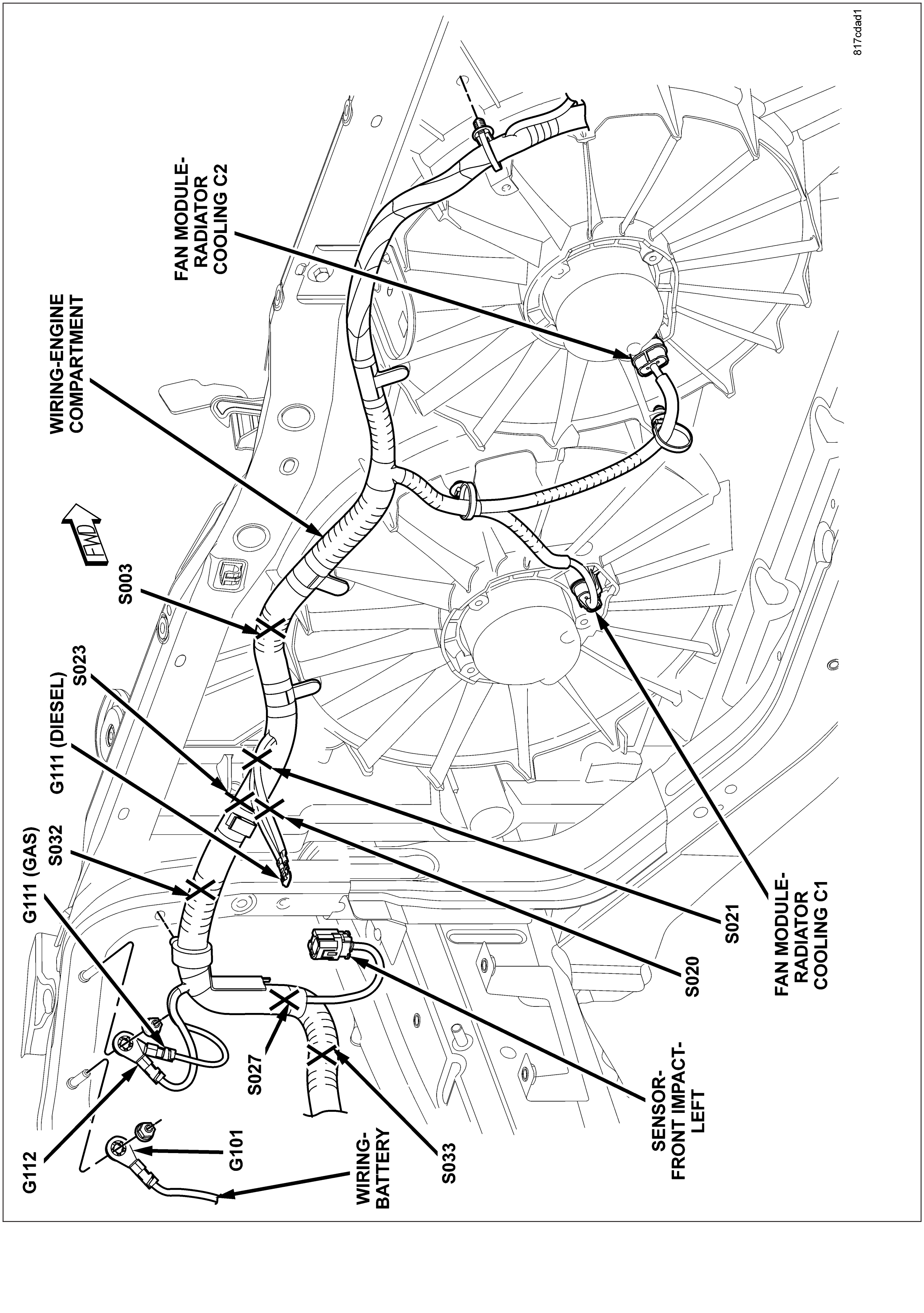


Fig. 7 ENGINE COMPARTMENT - FRONT

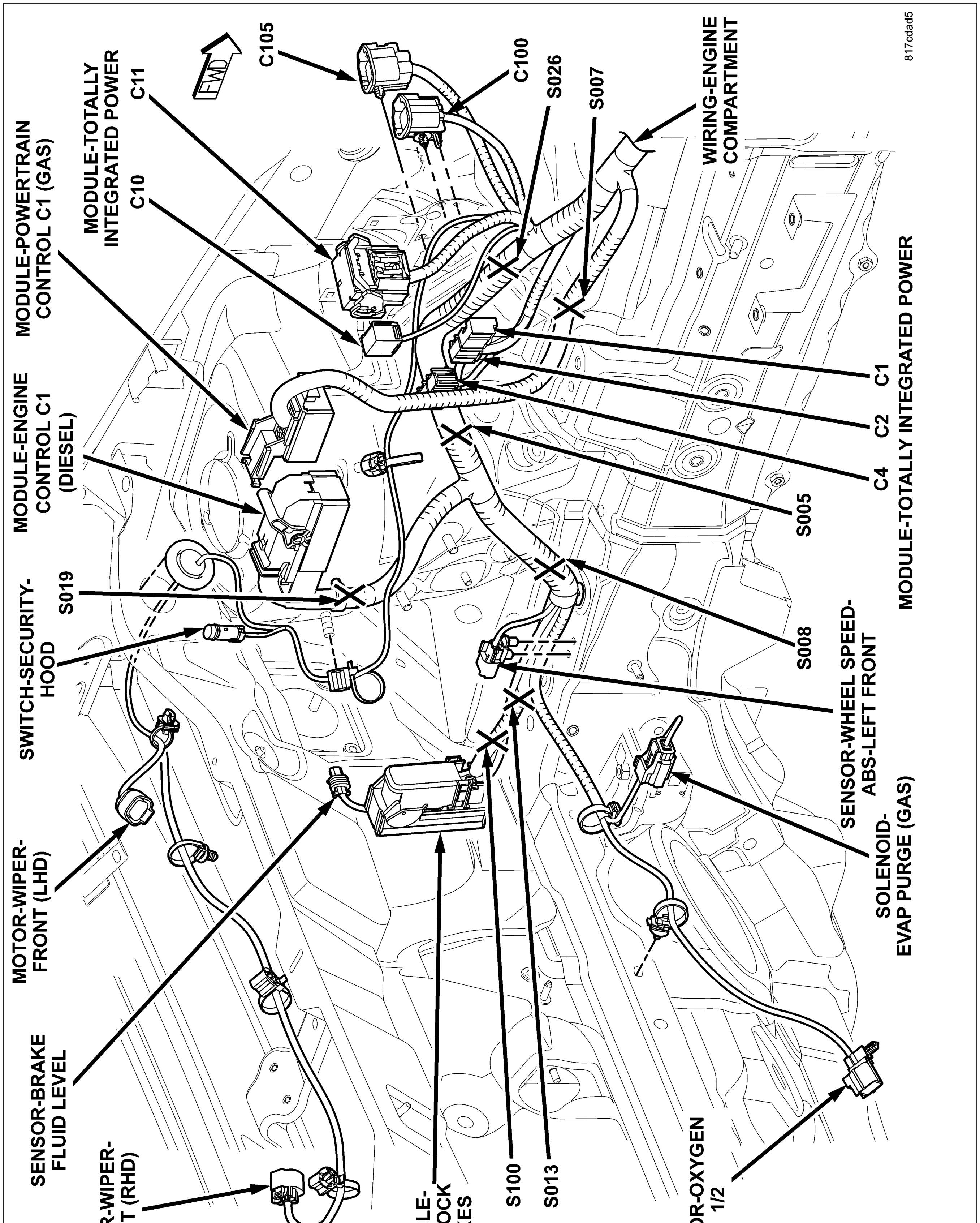


Fig. 8 ENGINE COMPARTMENT - LEFT REAR

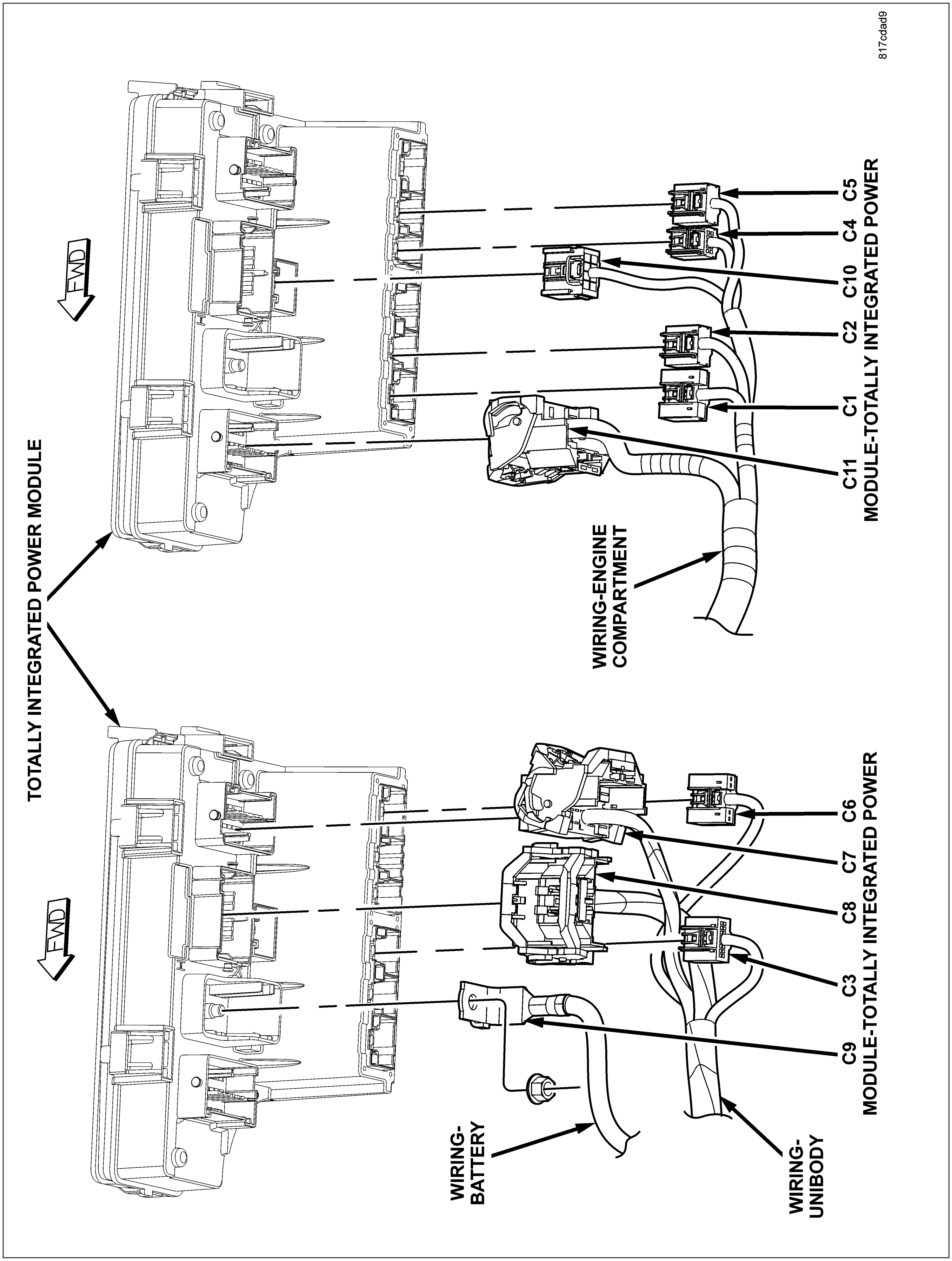


Fig. 9 ENGINE COMPARTMENT - LEFT SIDE

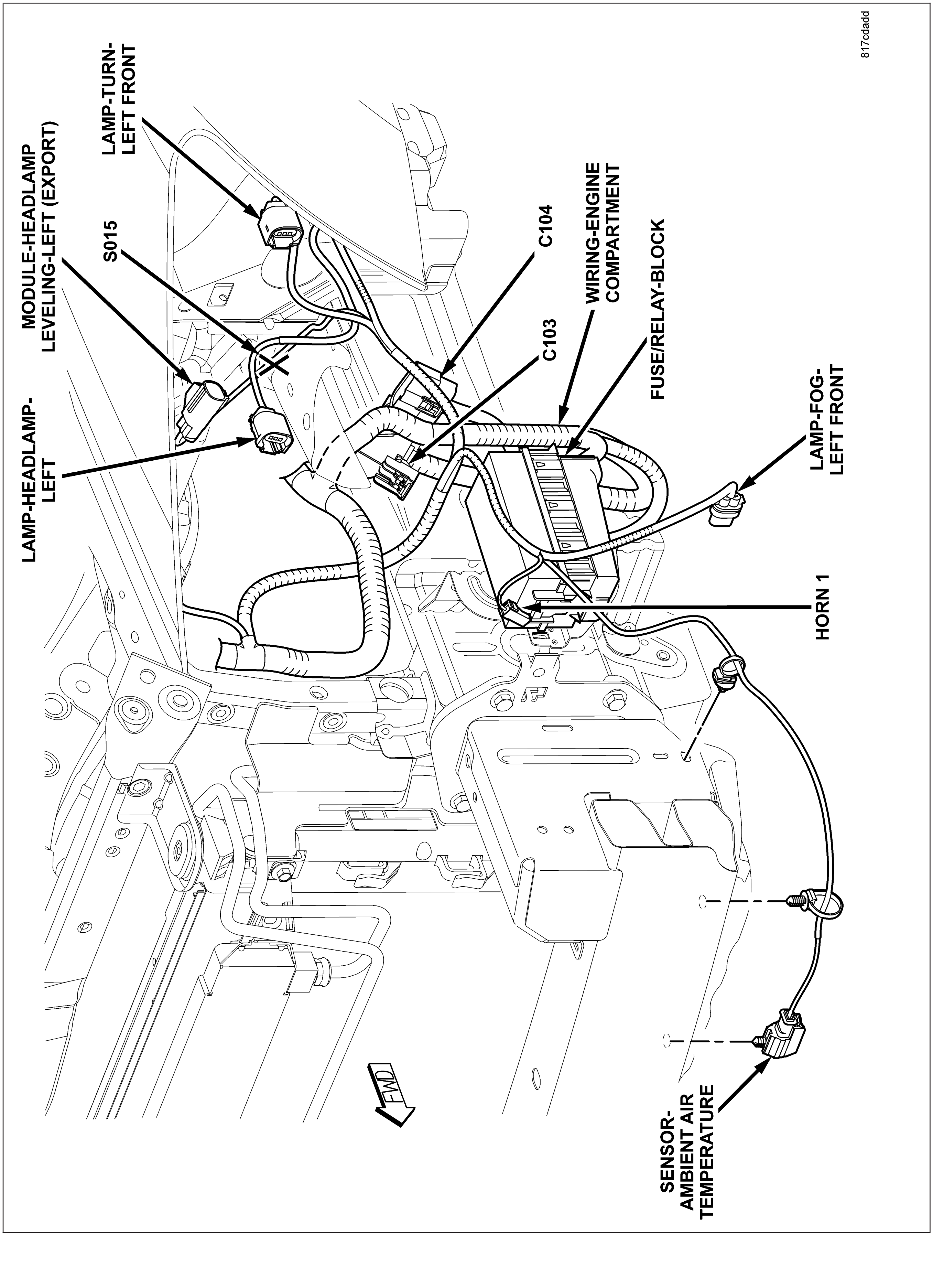


Fig. 10 ENGINE COMPARTMENT - FRONT LEFT

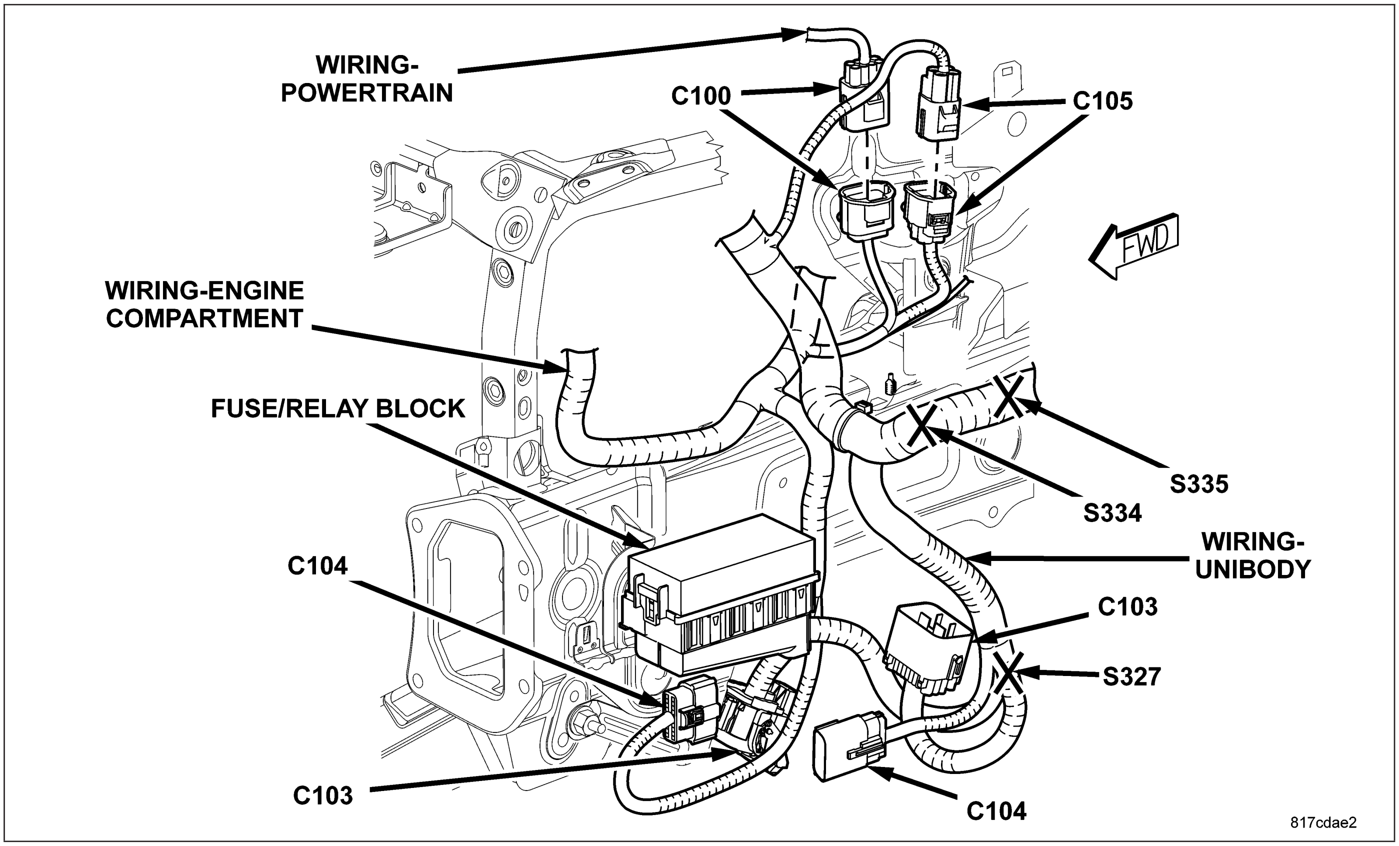


Fig. 11 FRAME RAIL - LEFT FRONT (GAS)

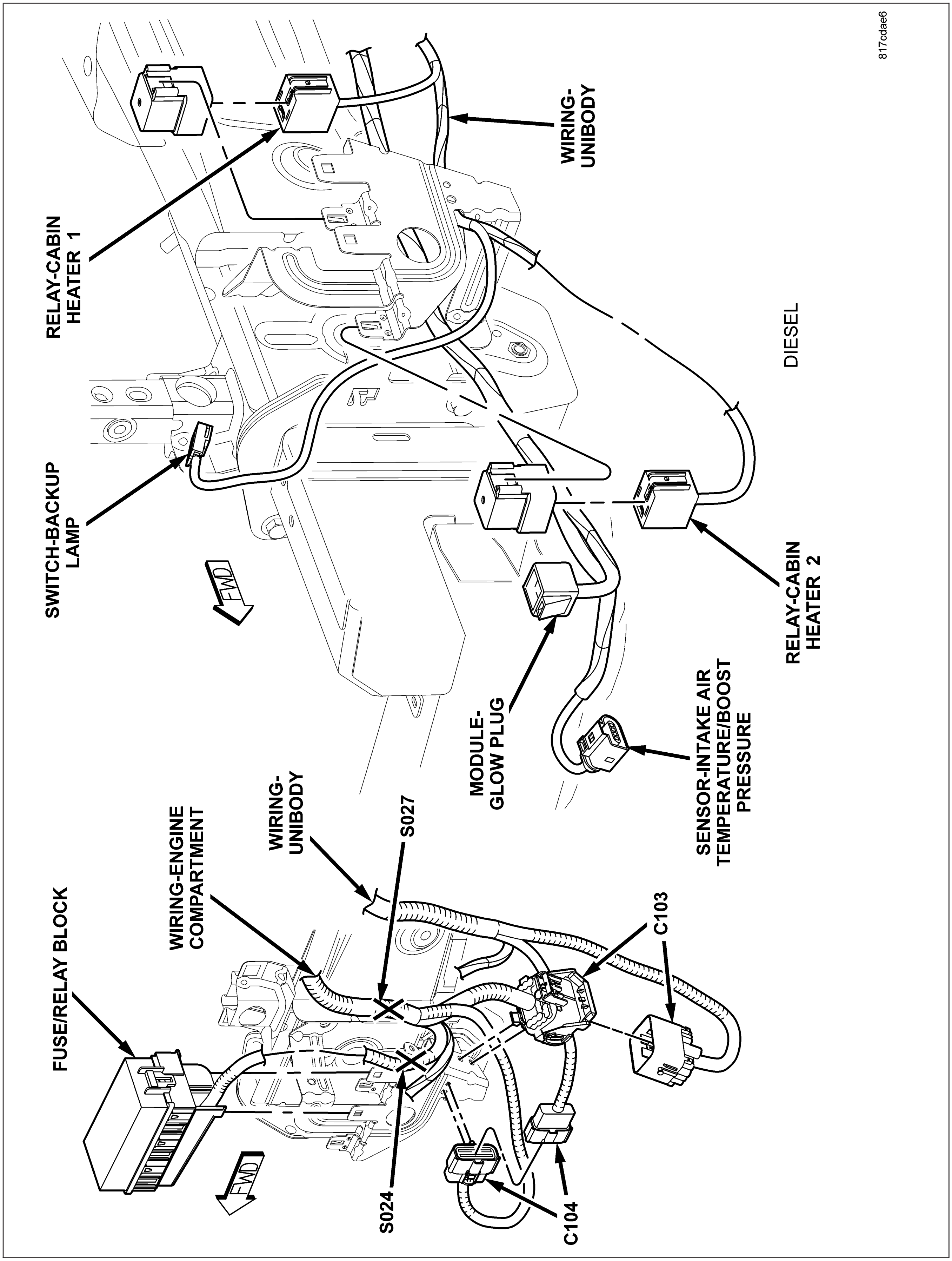


Fig. 12 FRAME RAIL - LEFT FRONT (DIESEL)

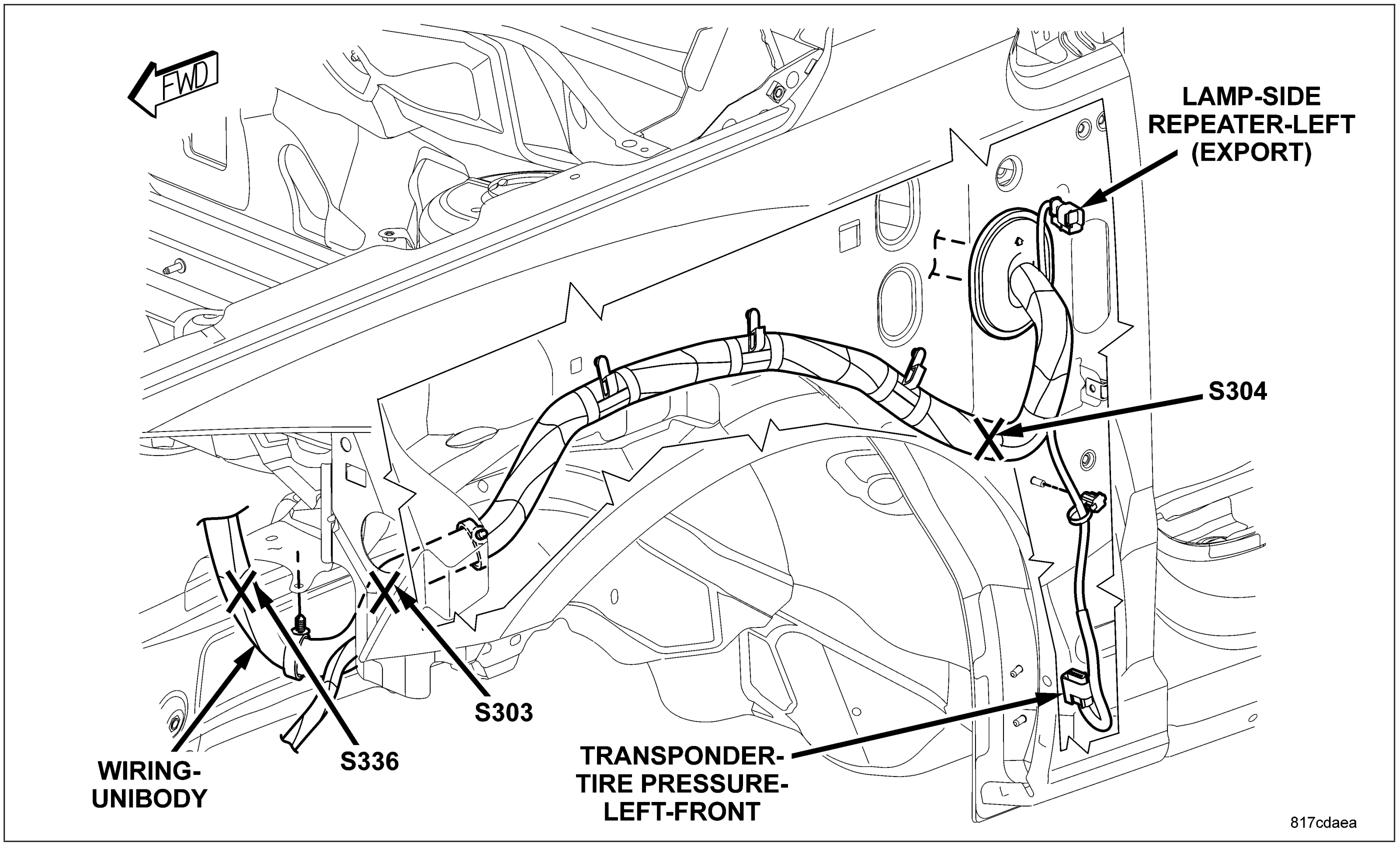


Fig. 13 WHEEL WELL - LEFT FRONT

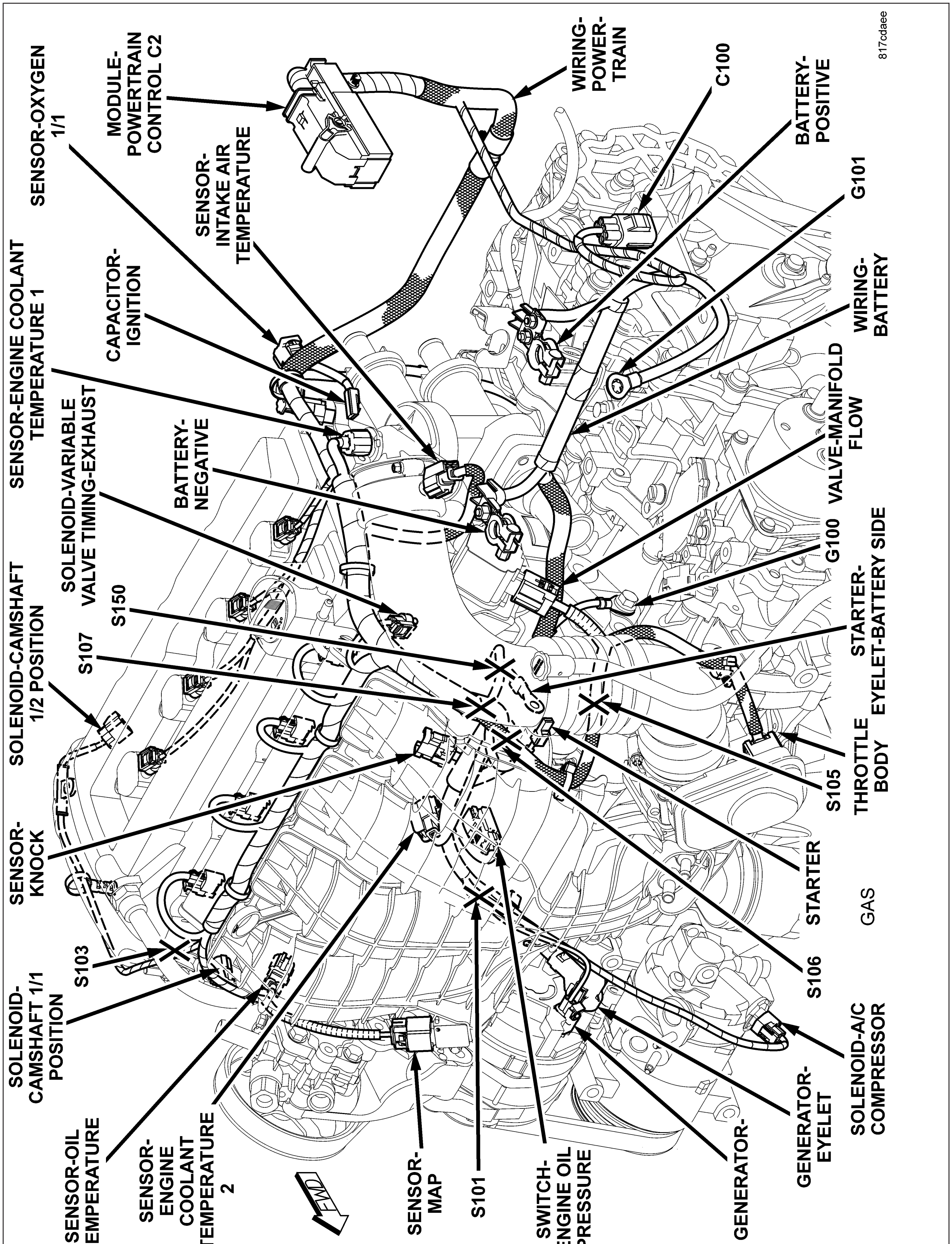


Fig. 14 ENGINE - LEFT FRONT (GAS)

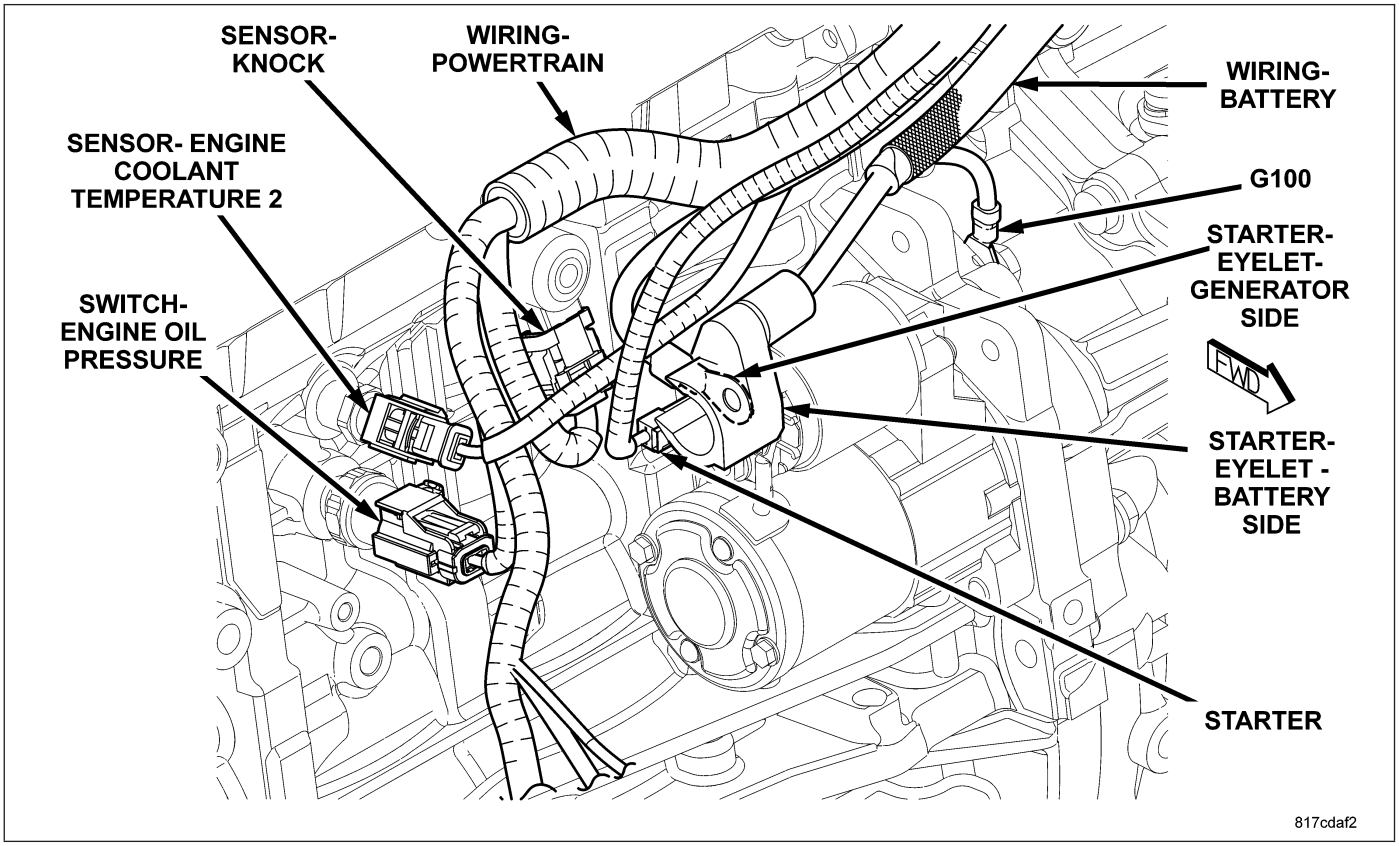


Fig. 15 ENGINE - FRONT (GAS)

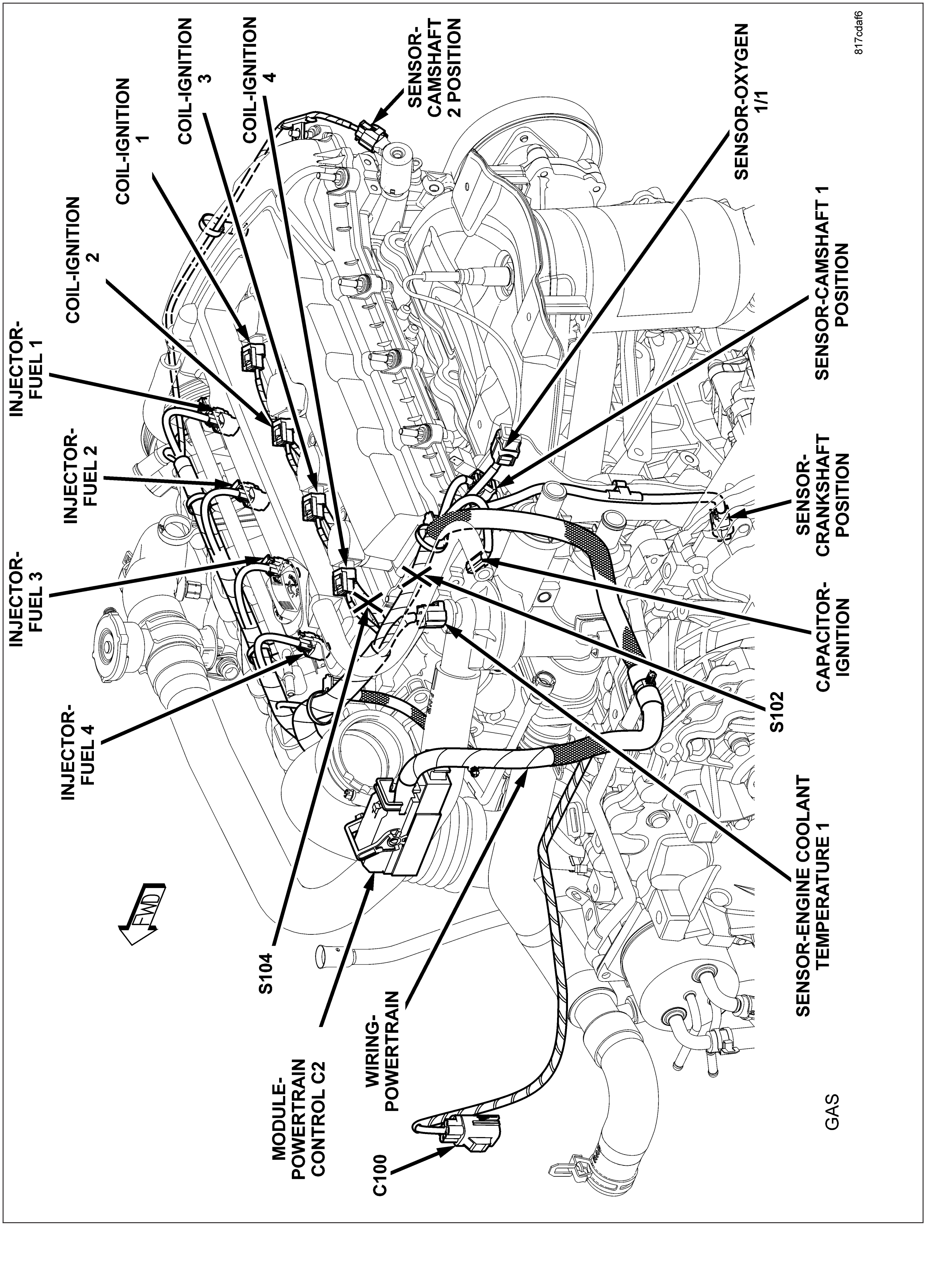


Fig. 16 ENGINE - LEFT REAR (GAS)

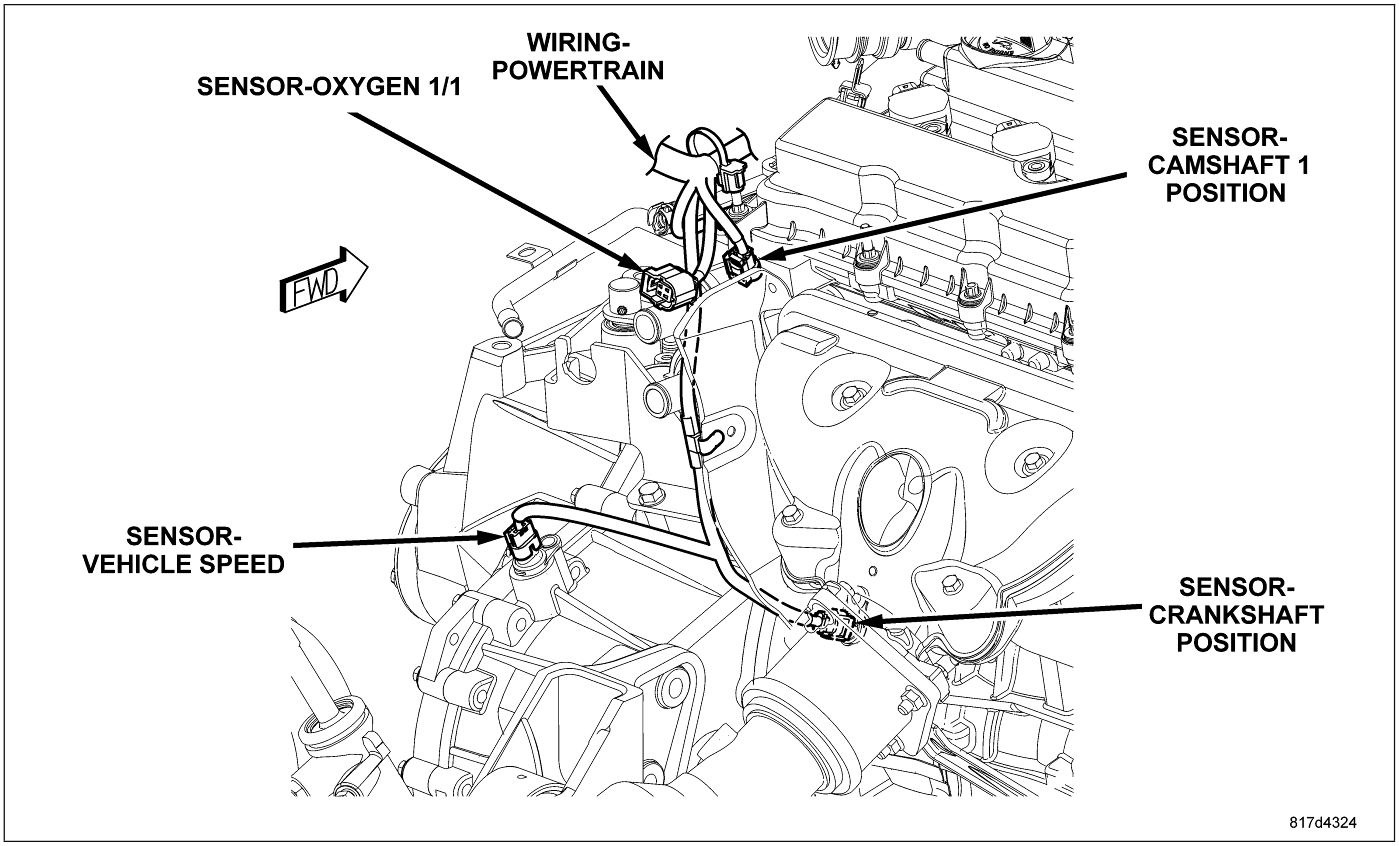


Fig. 17 ENGINE - REAR (GAS)

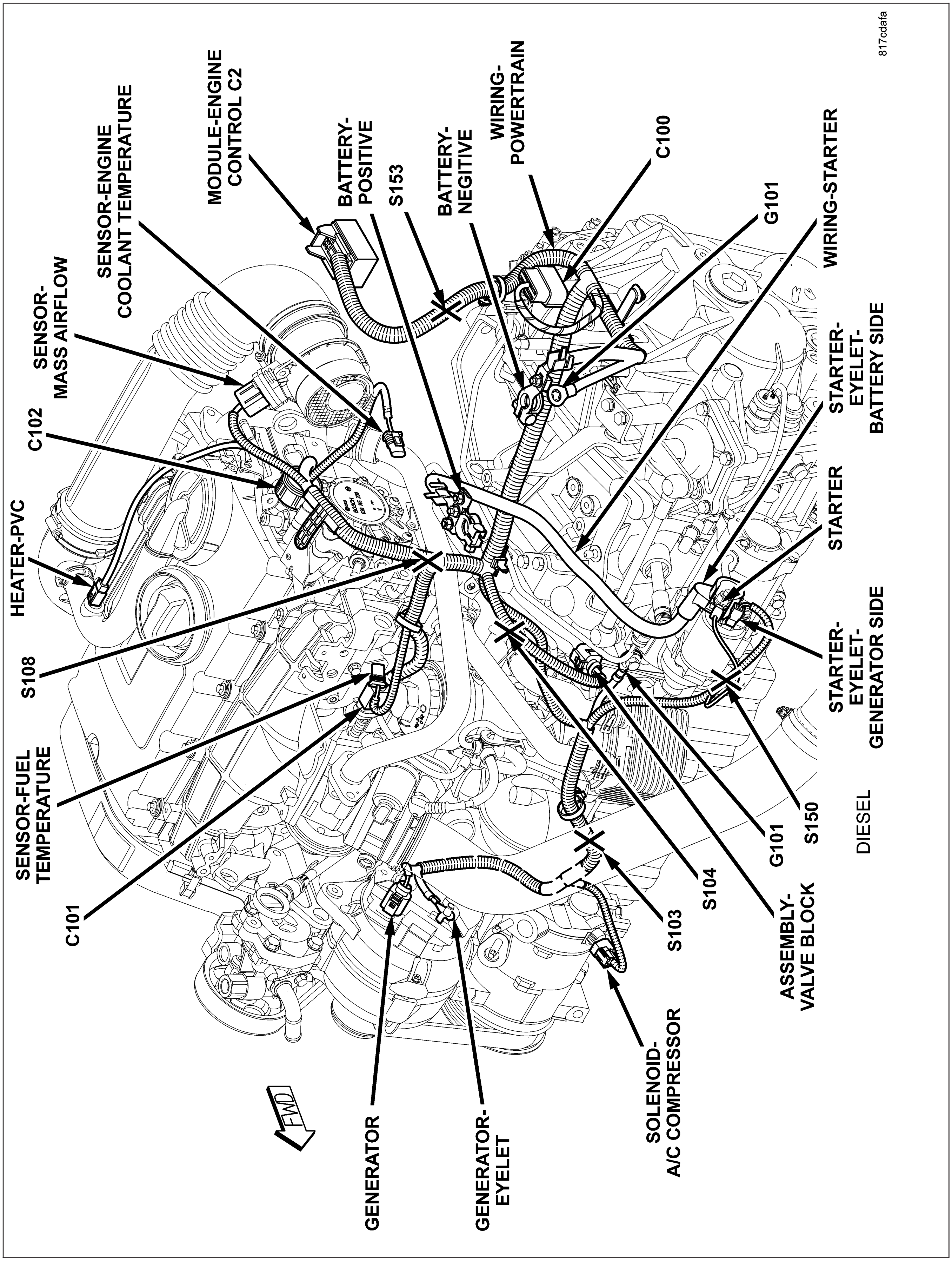


Fig. 18 ENGINE - LEFT FRONT (DIESEL)

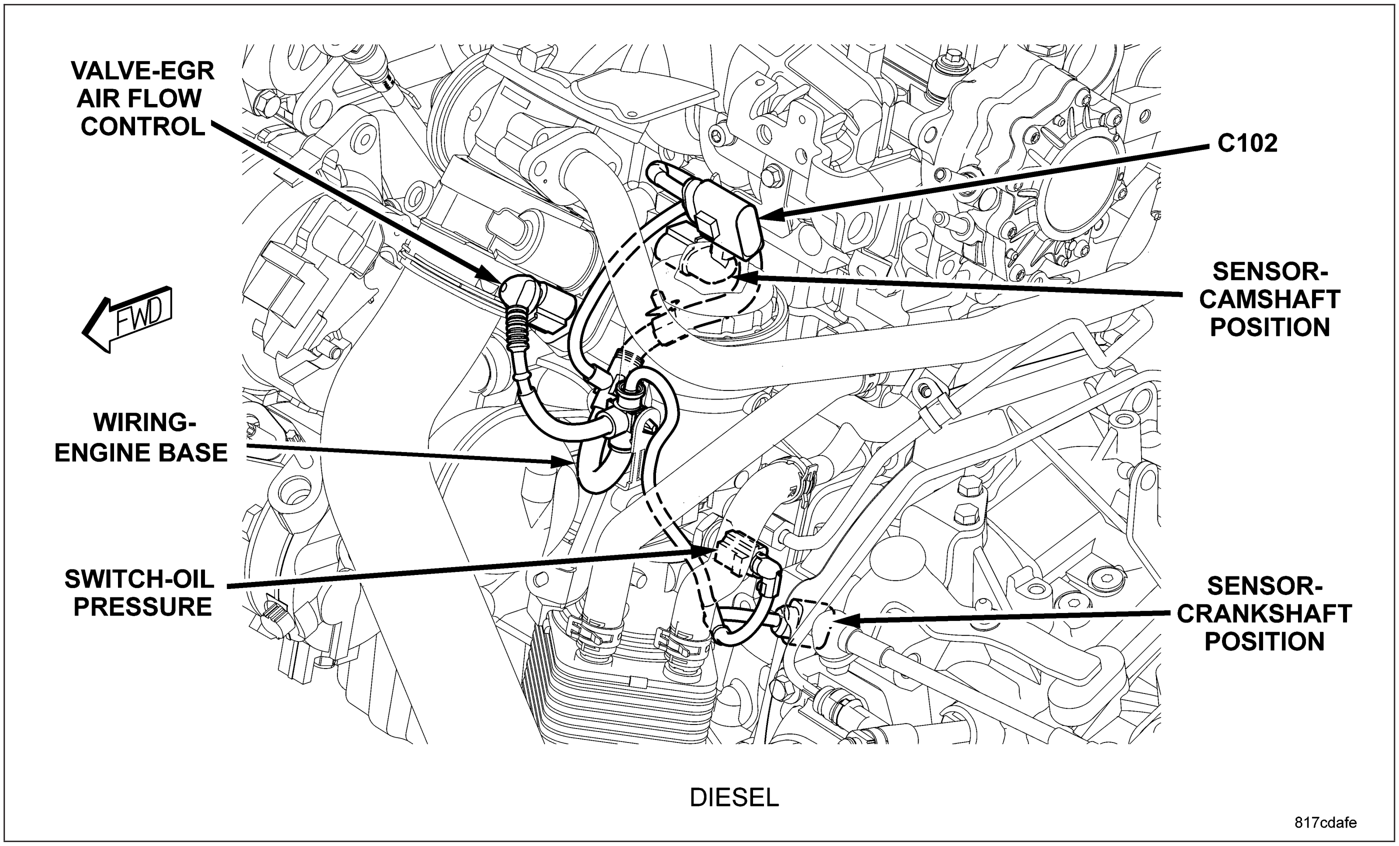


Fig. 19 ENGINE - LOWER LEFT FRONT (DIESEL)

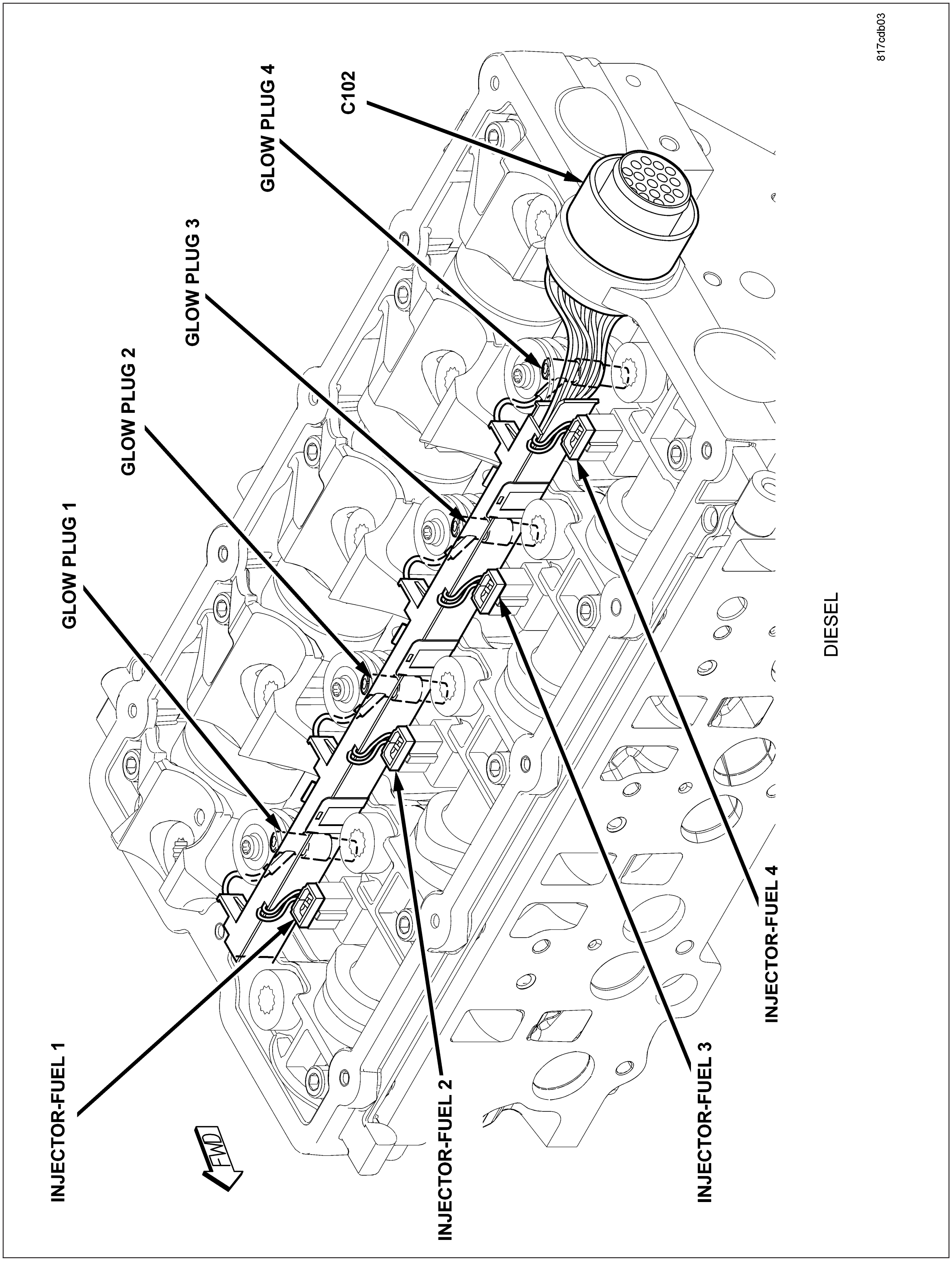


Fig. 20 ENGINE - TOP (DIESEL)

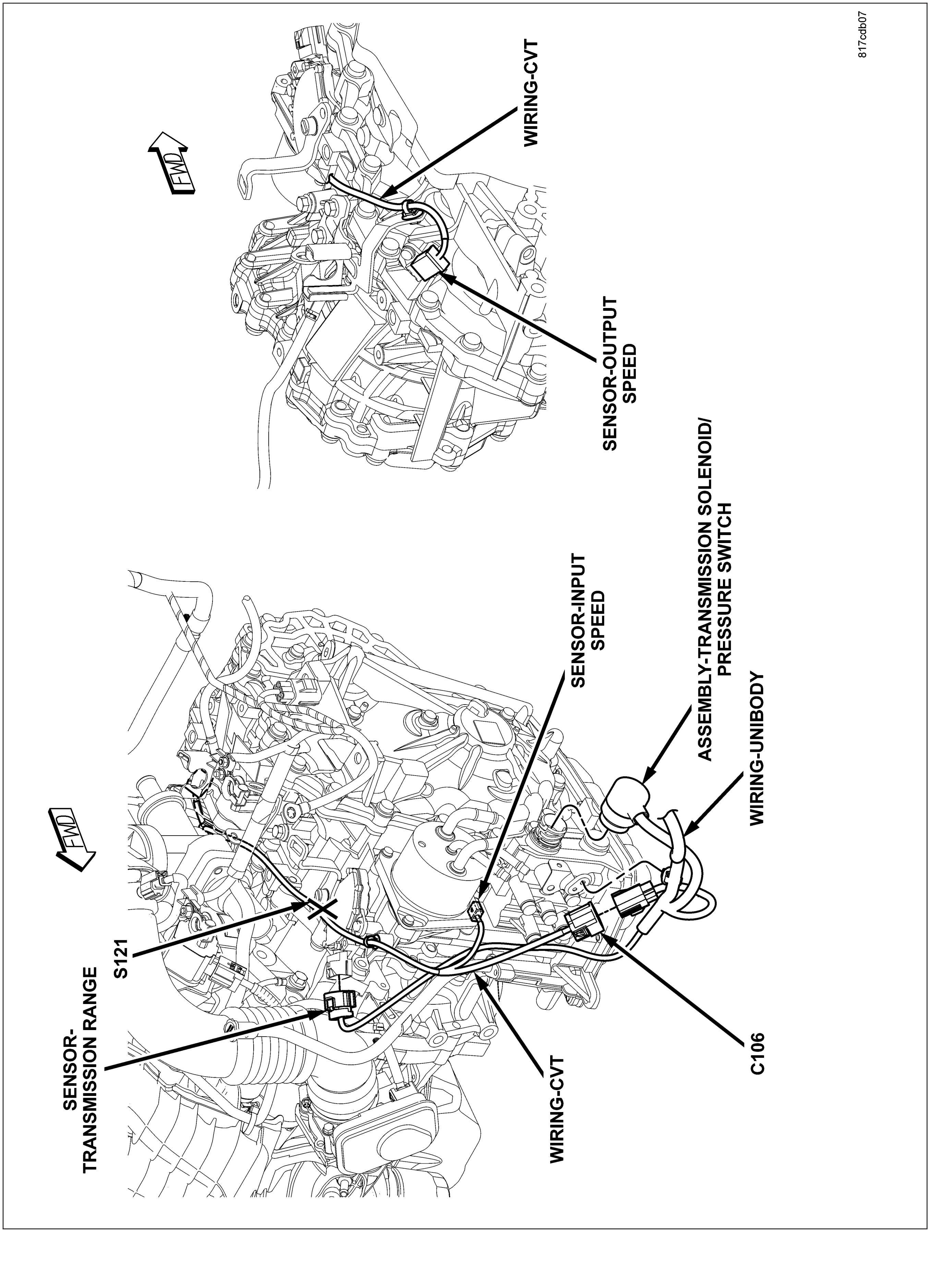


Fig. 21 TRANSMISSION (CVT)

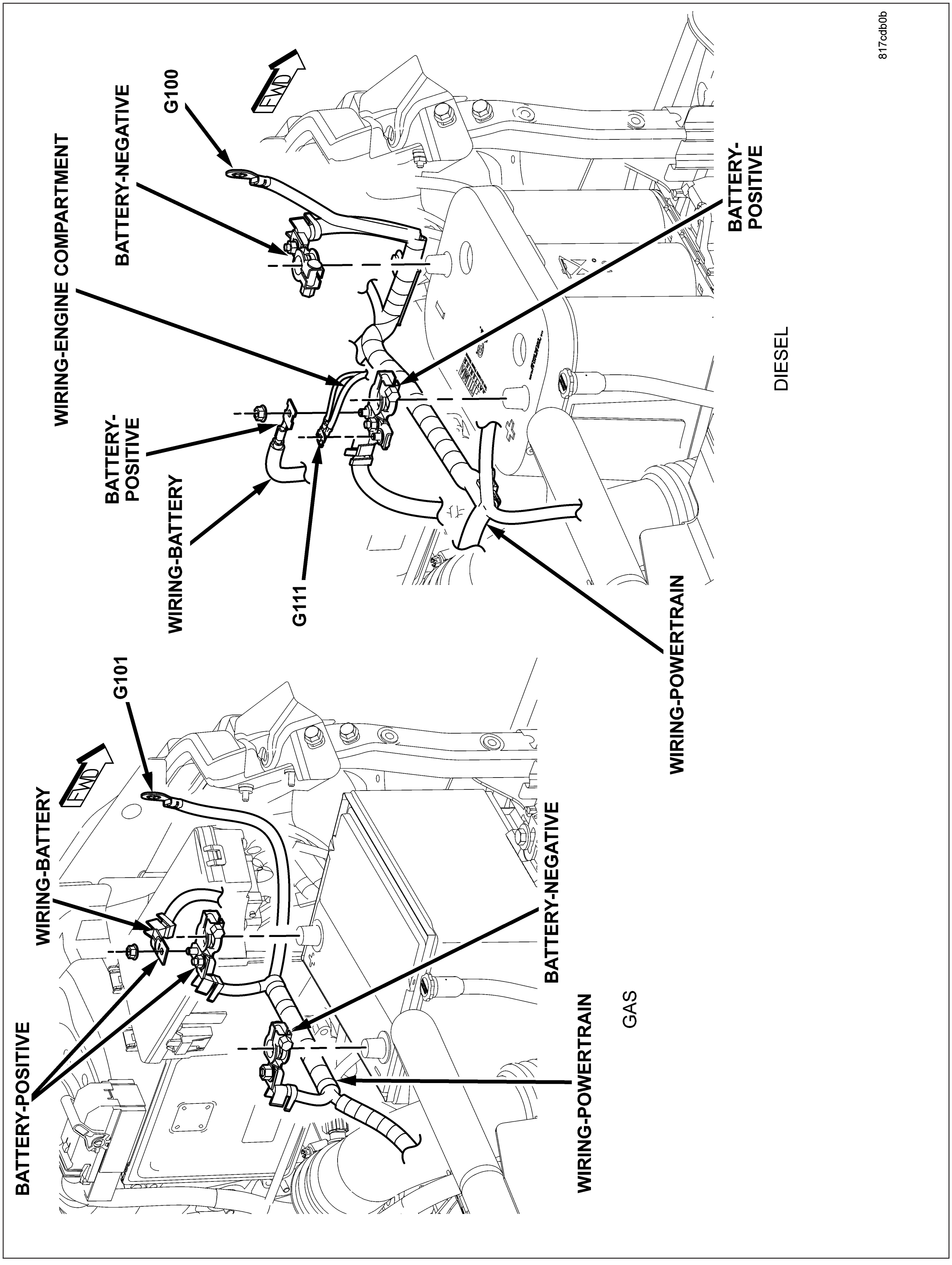


Fig. 22 BATTERY

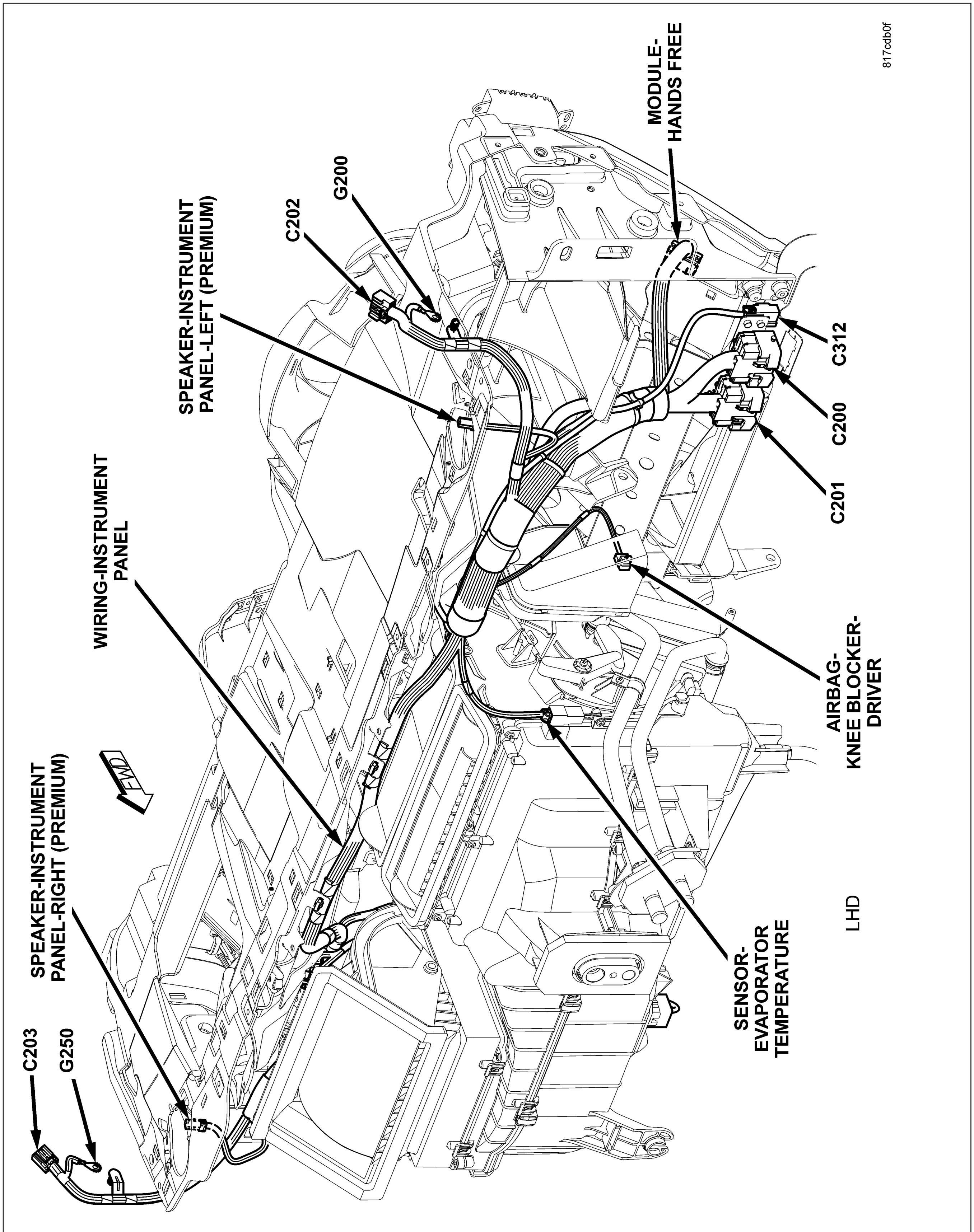


Fig. 23 INSTRUMENT PANEL (LHD)

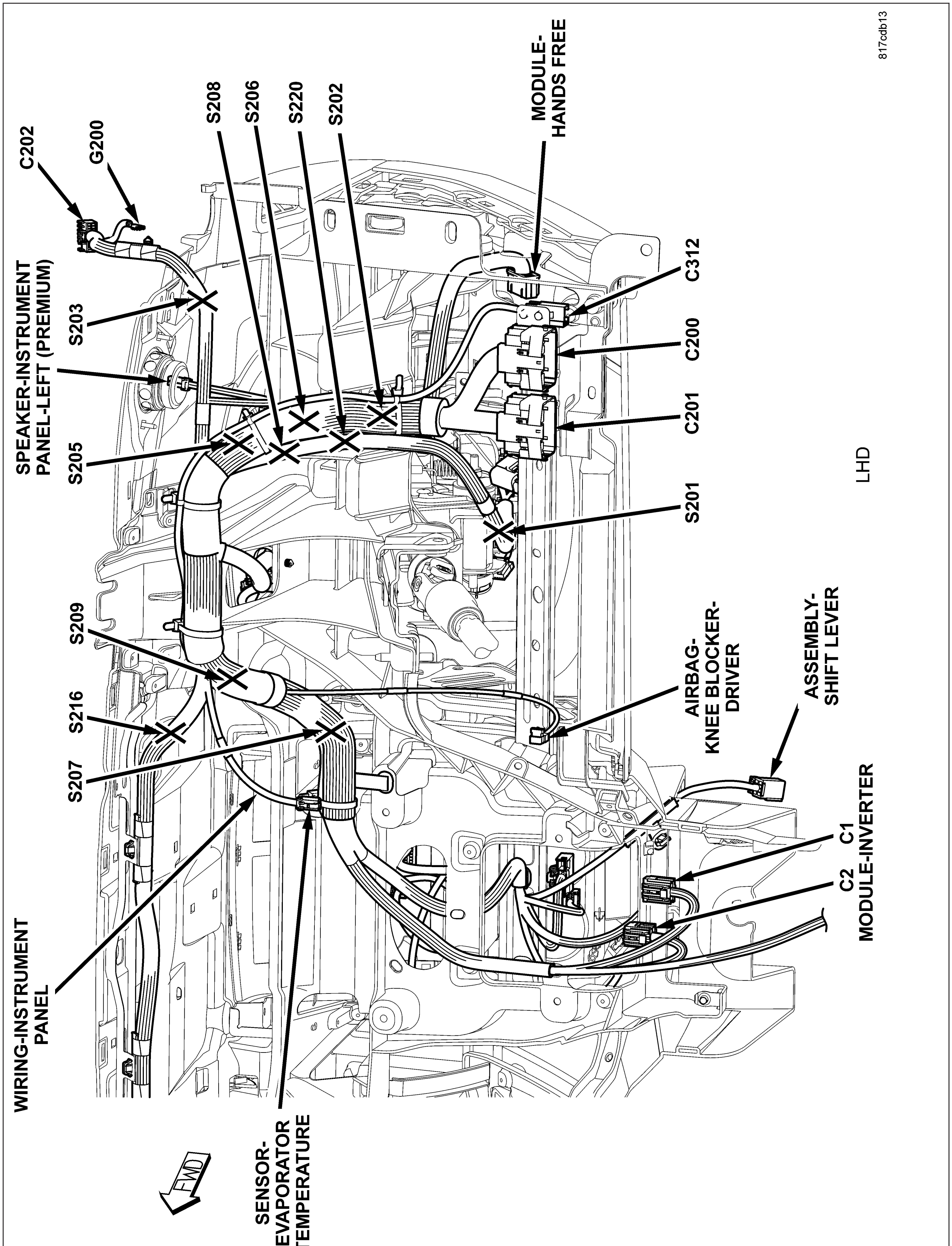


Fig. 24 INSTRUMENT PANEL - LEFT (LHD)

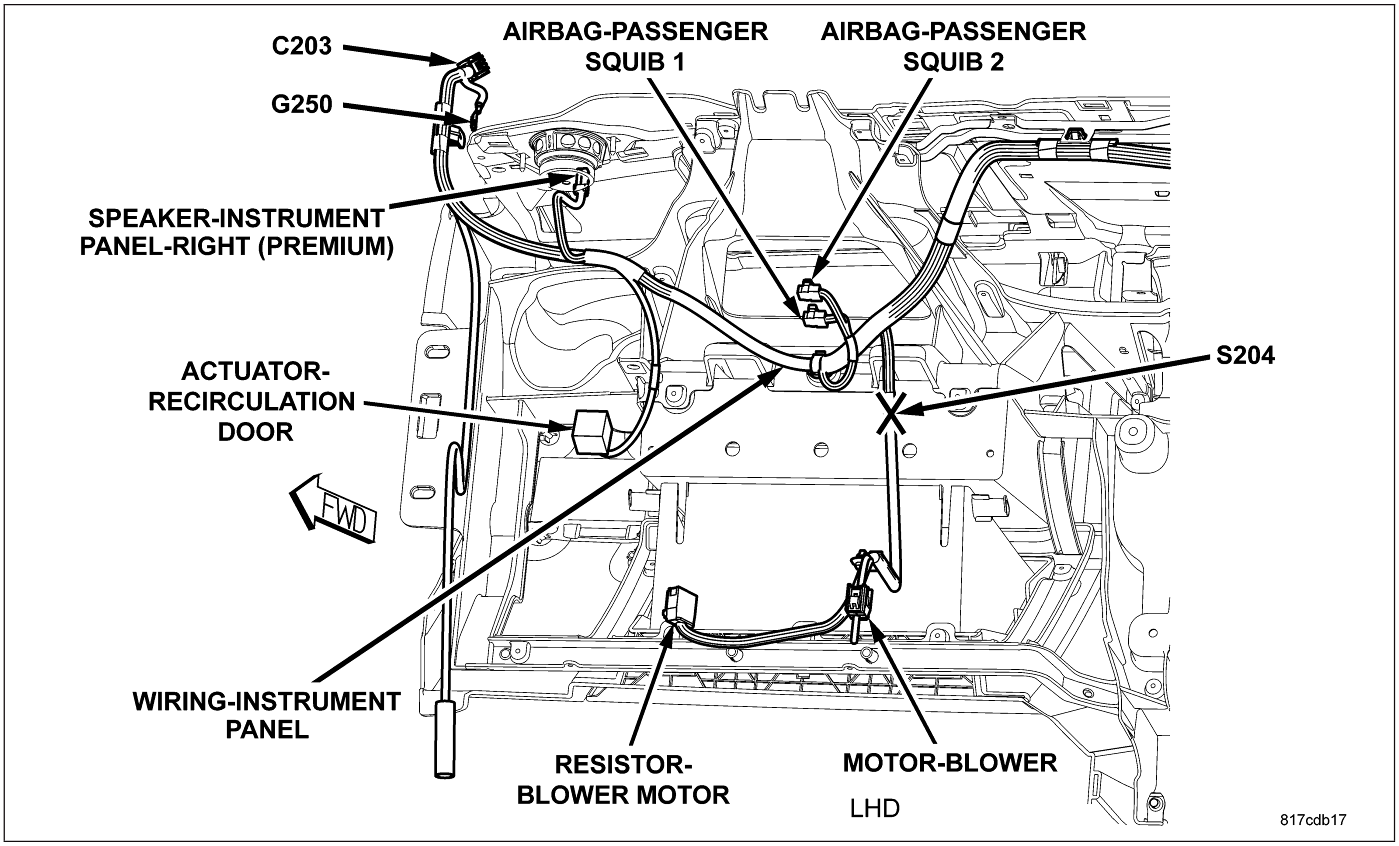


Fig. 25 INSTRUMENT PANEL - LWR RT (LHD)

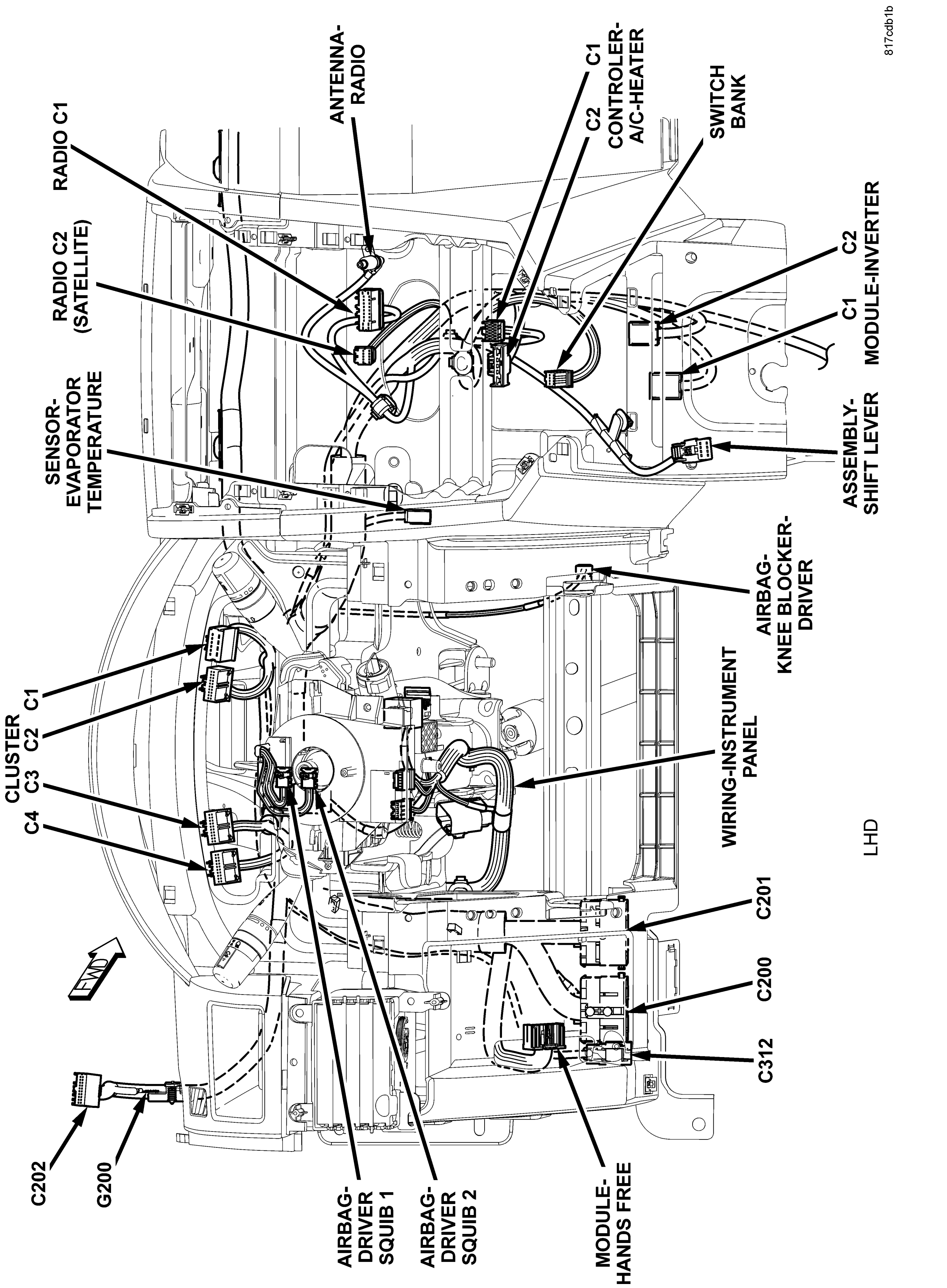


Fig. 26 INSTRUMENT PANEL - LEFT CENTER (LHD)

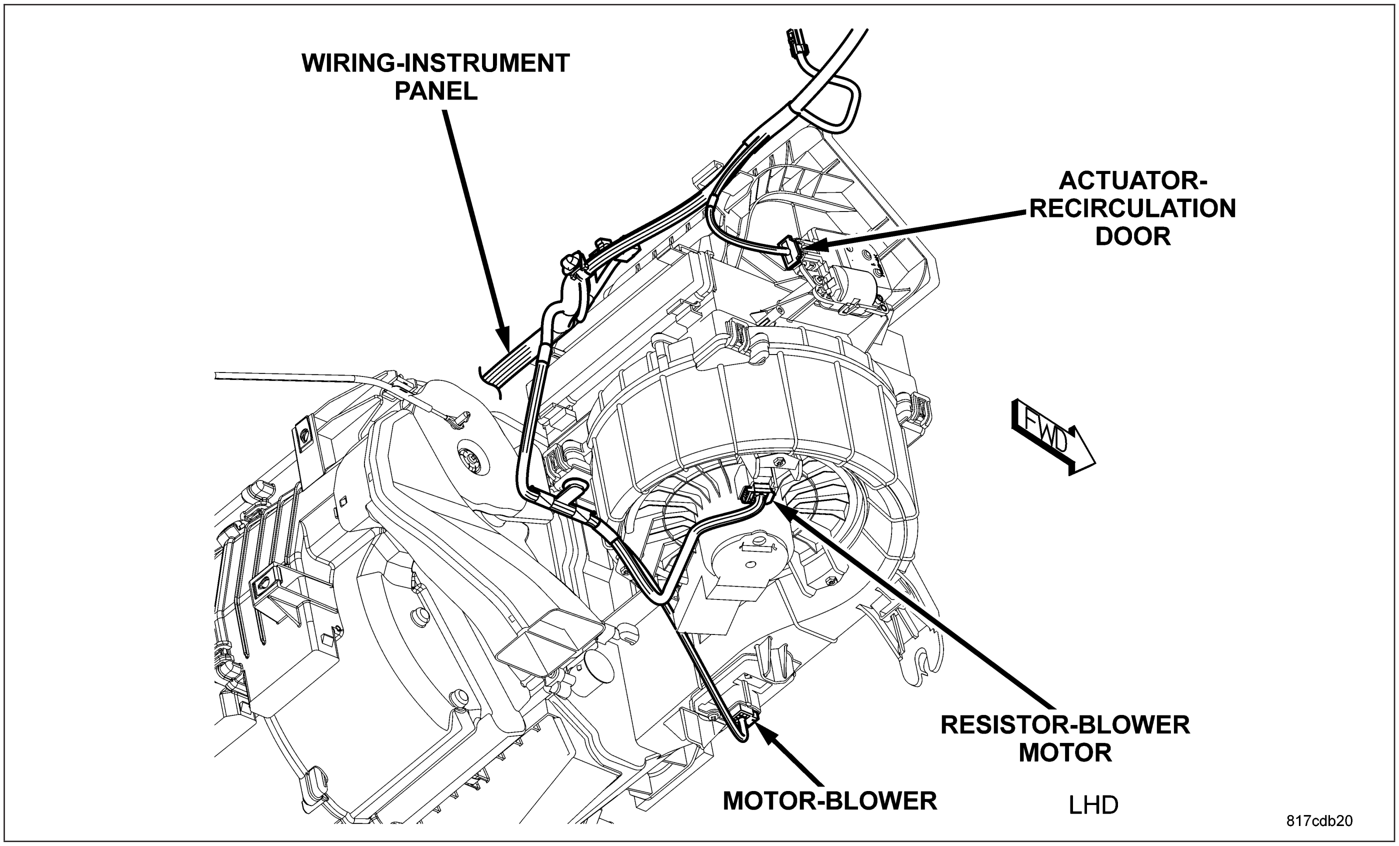


Fig. 27 HVAC

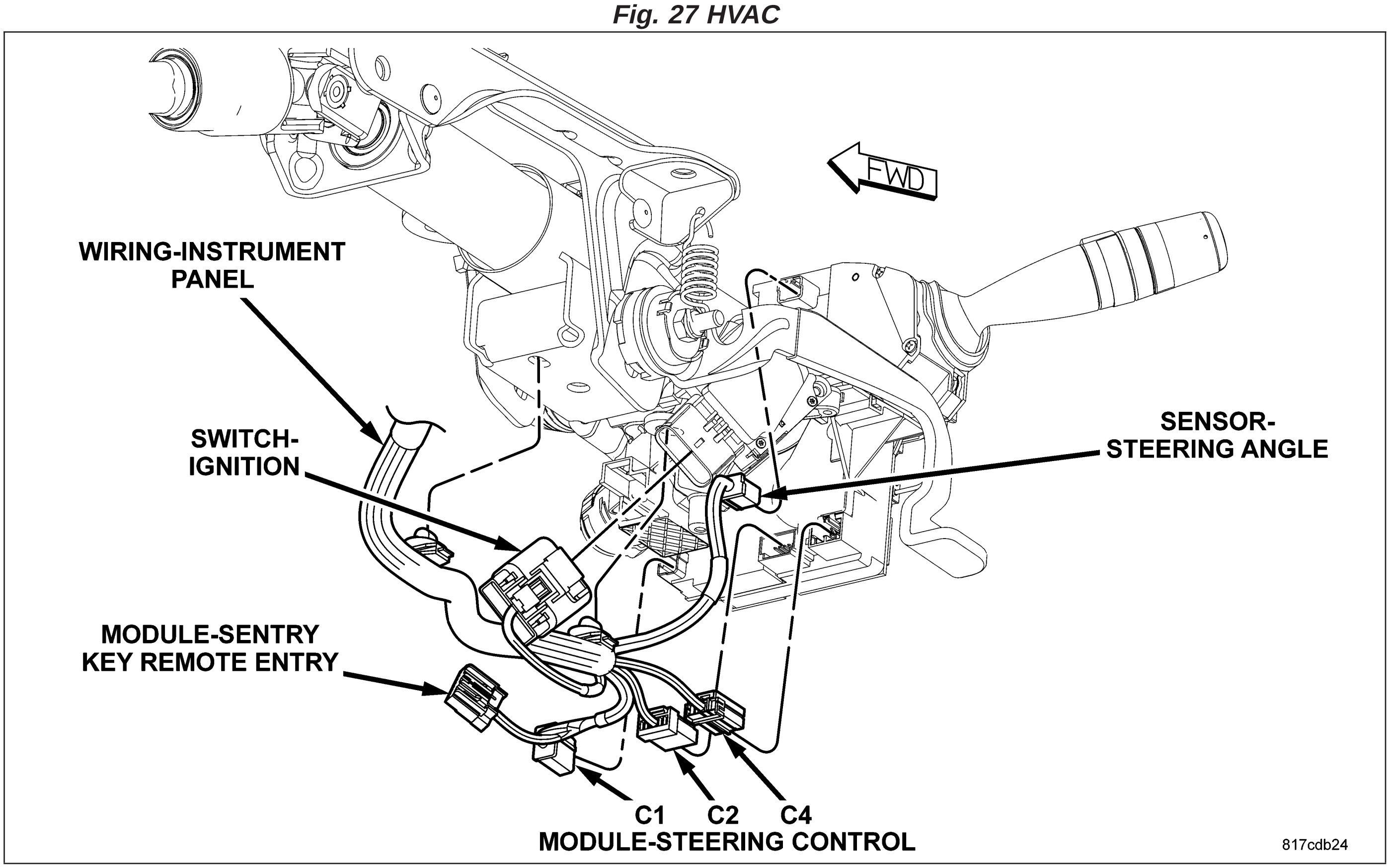


Fig. 28 STEERING COLUMN

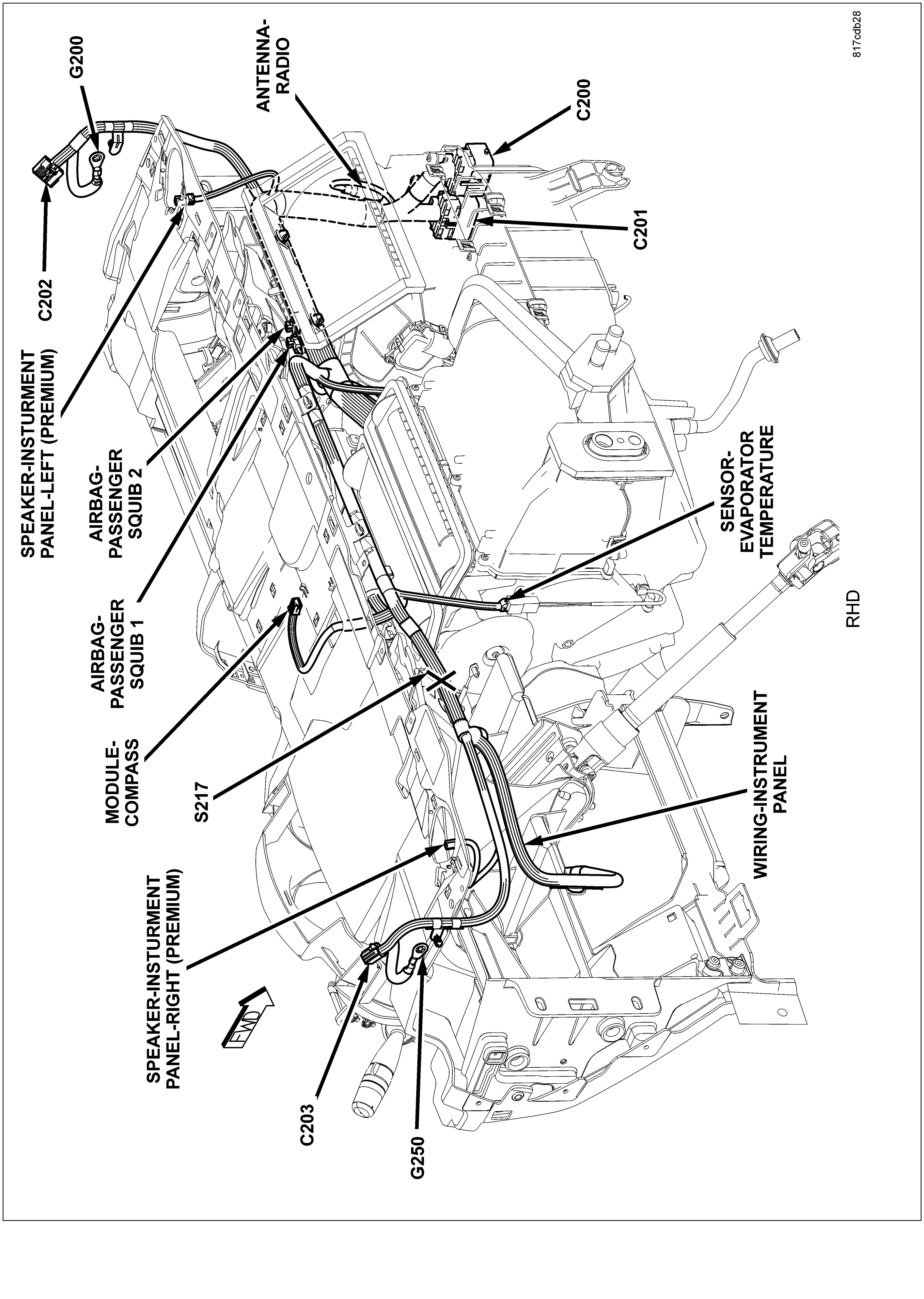


Fig. 29 INSTRUMENT PANEL (RHD)

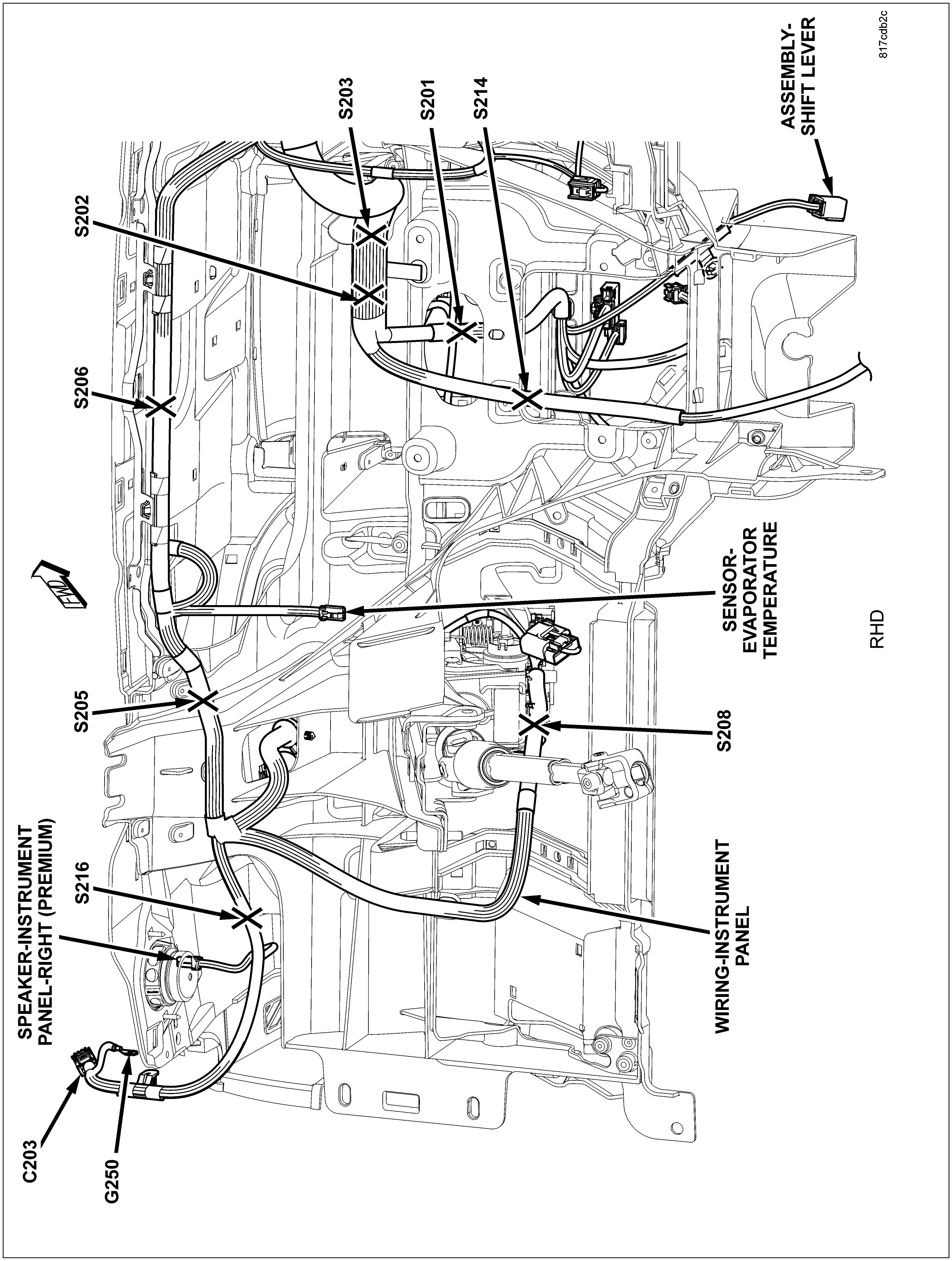


Fig. 30 INSTRUMENT PANEL - RIGHT (RHD)

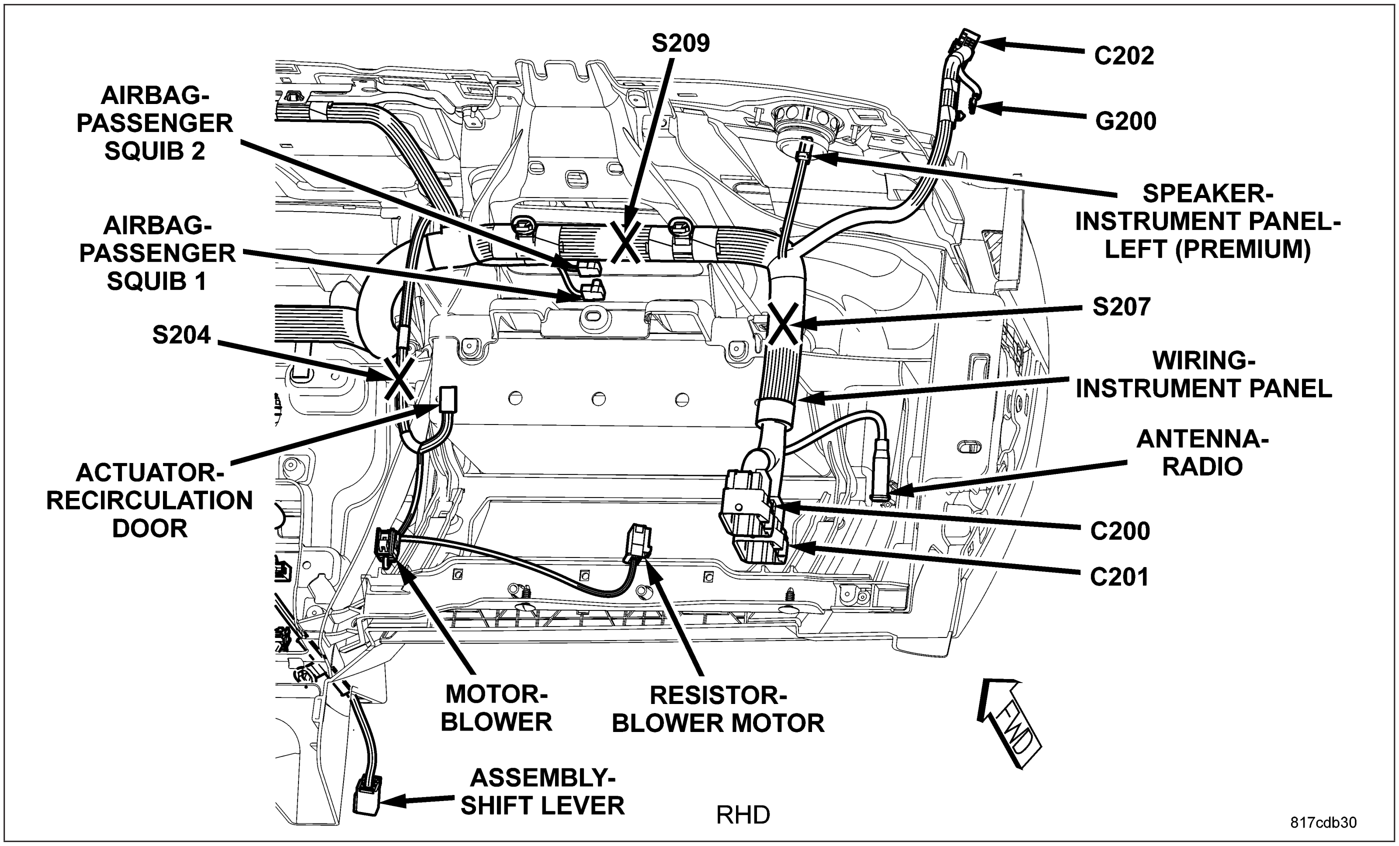


Fig. 31 INSTRUMENT PANEL - LEFT (RHD)

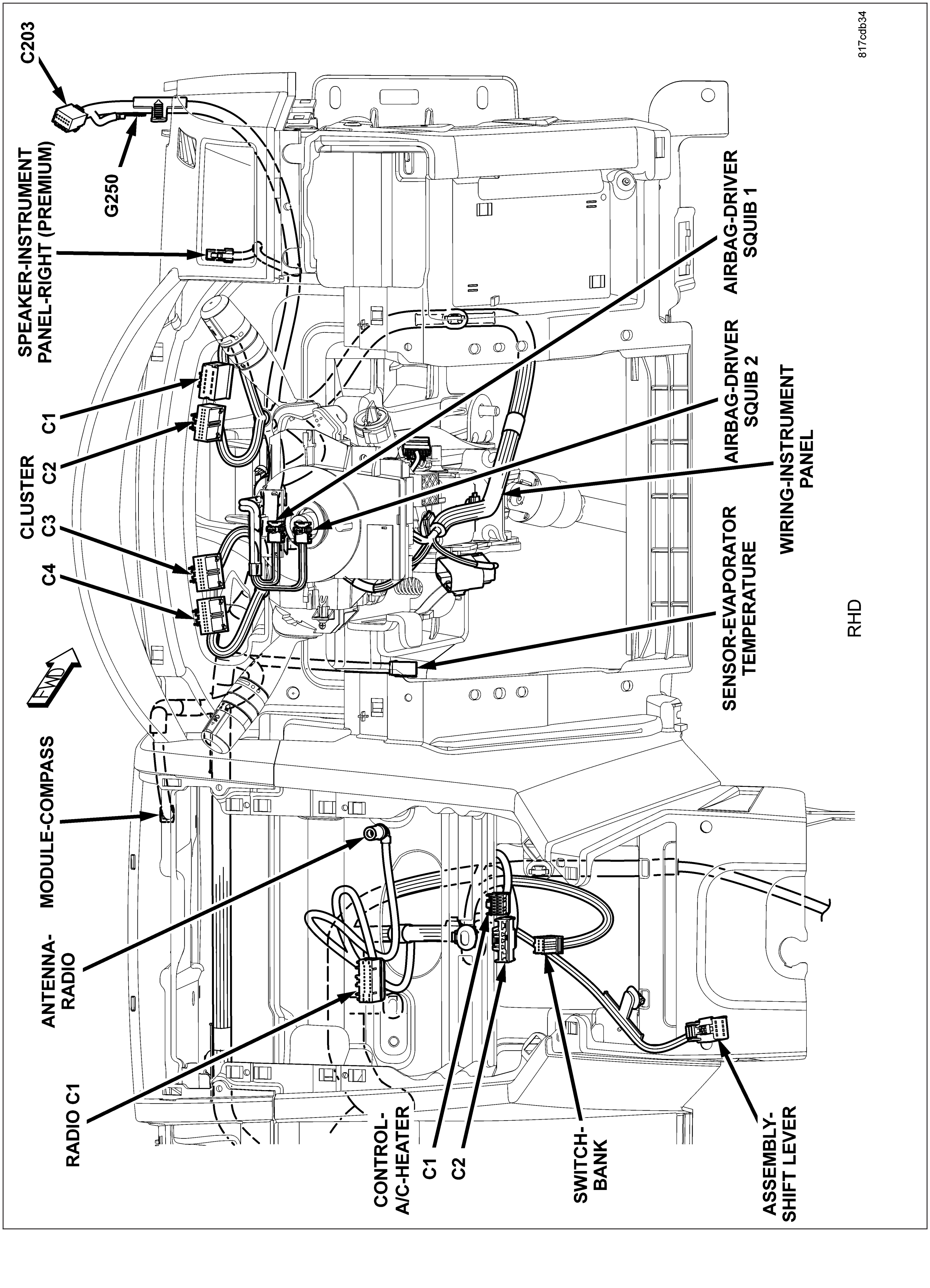


Fig. 32 INSTRUMENT PANEL - RIGHT CENTER (RHD)

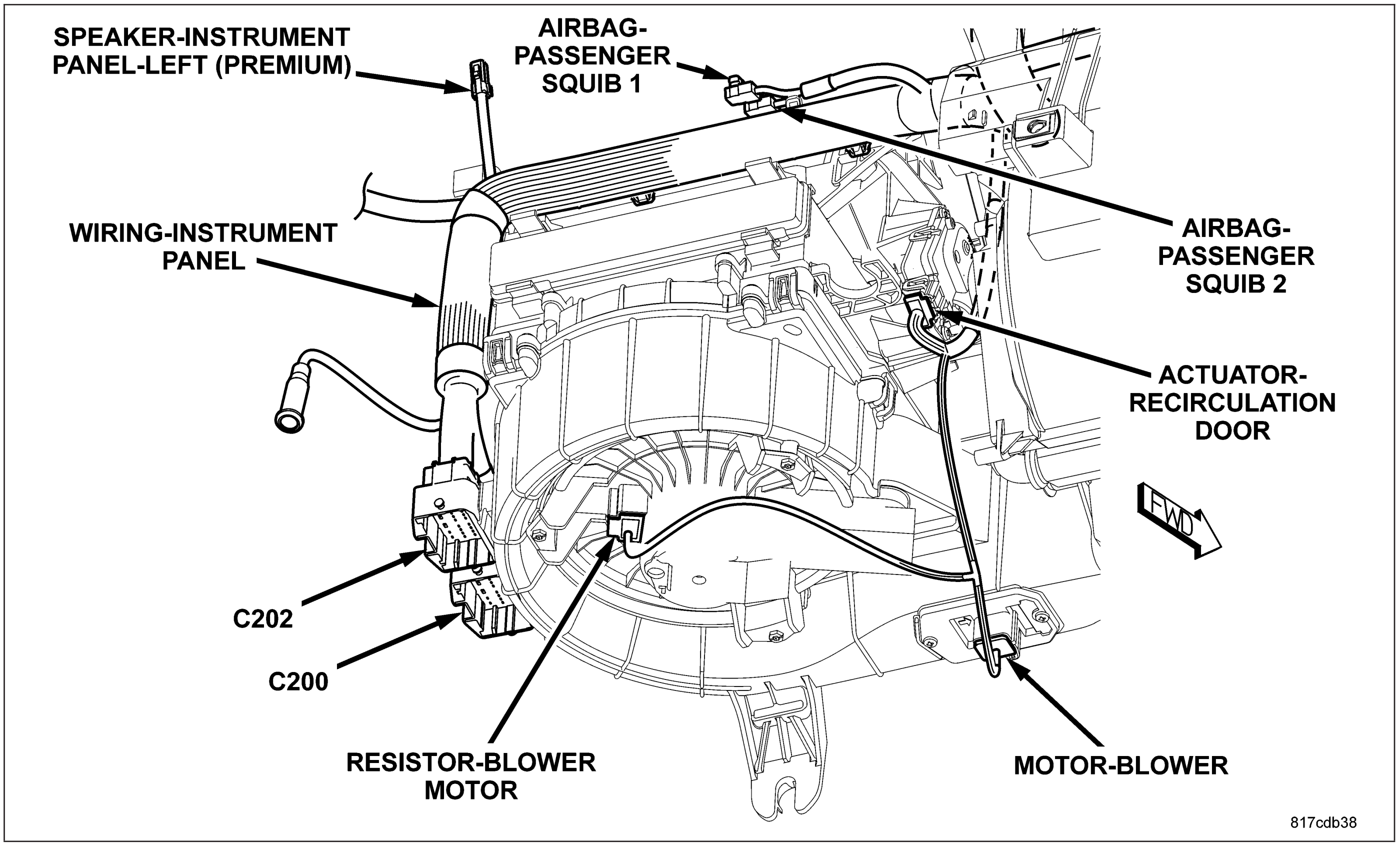


Fig. 33 INSTRUMENT PANEL - LOWER LEFT (RHD)

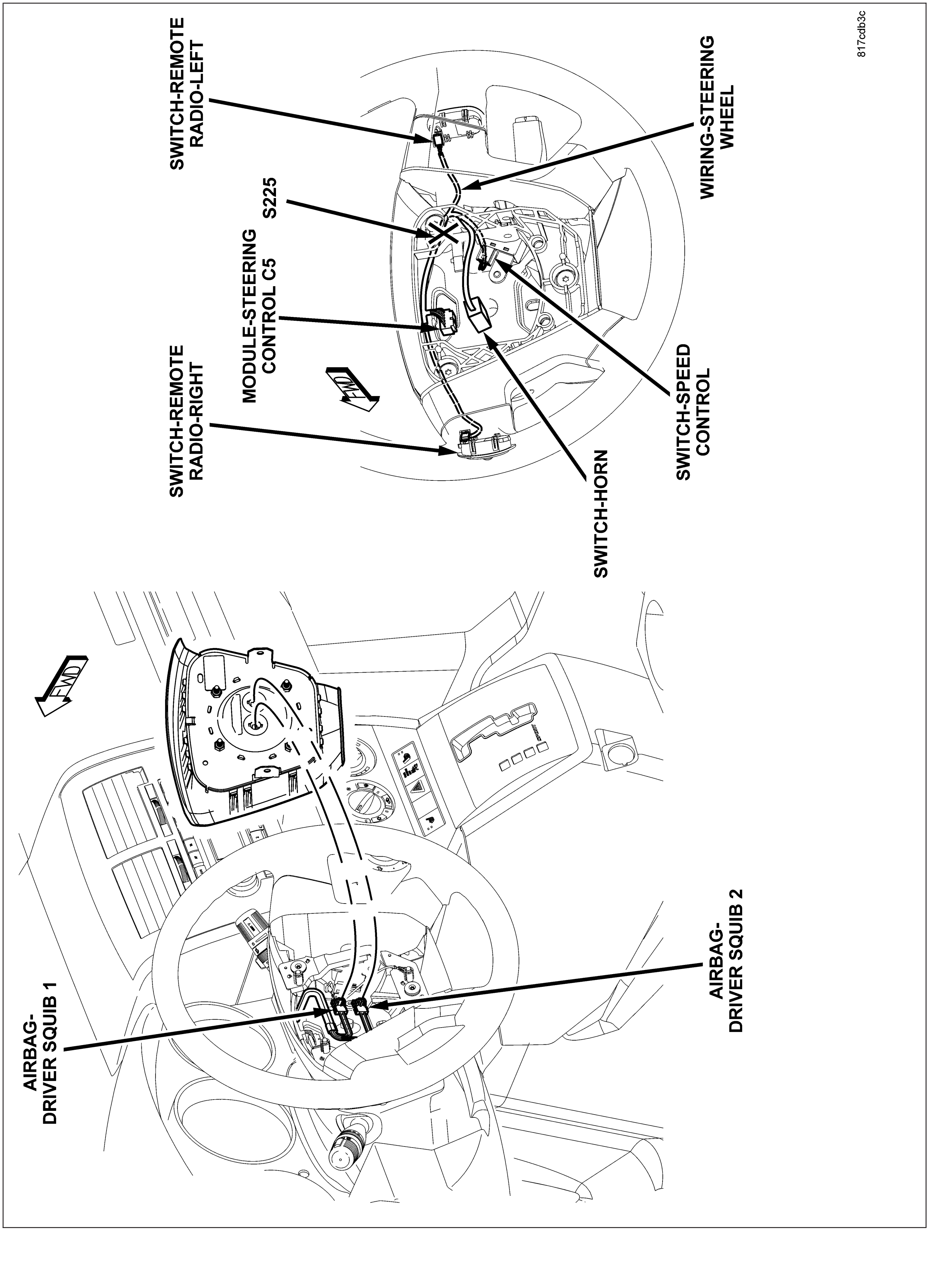


Fig. 34 STEERING WHEEL

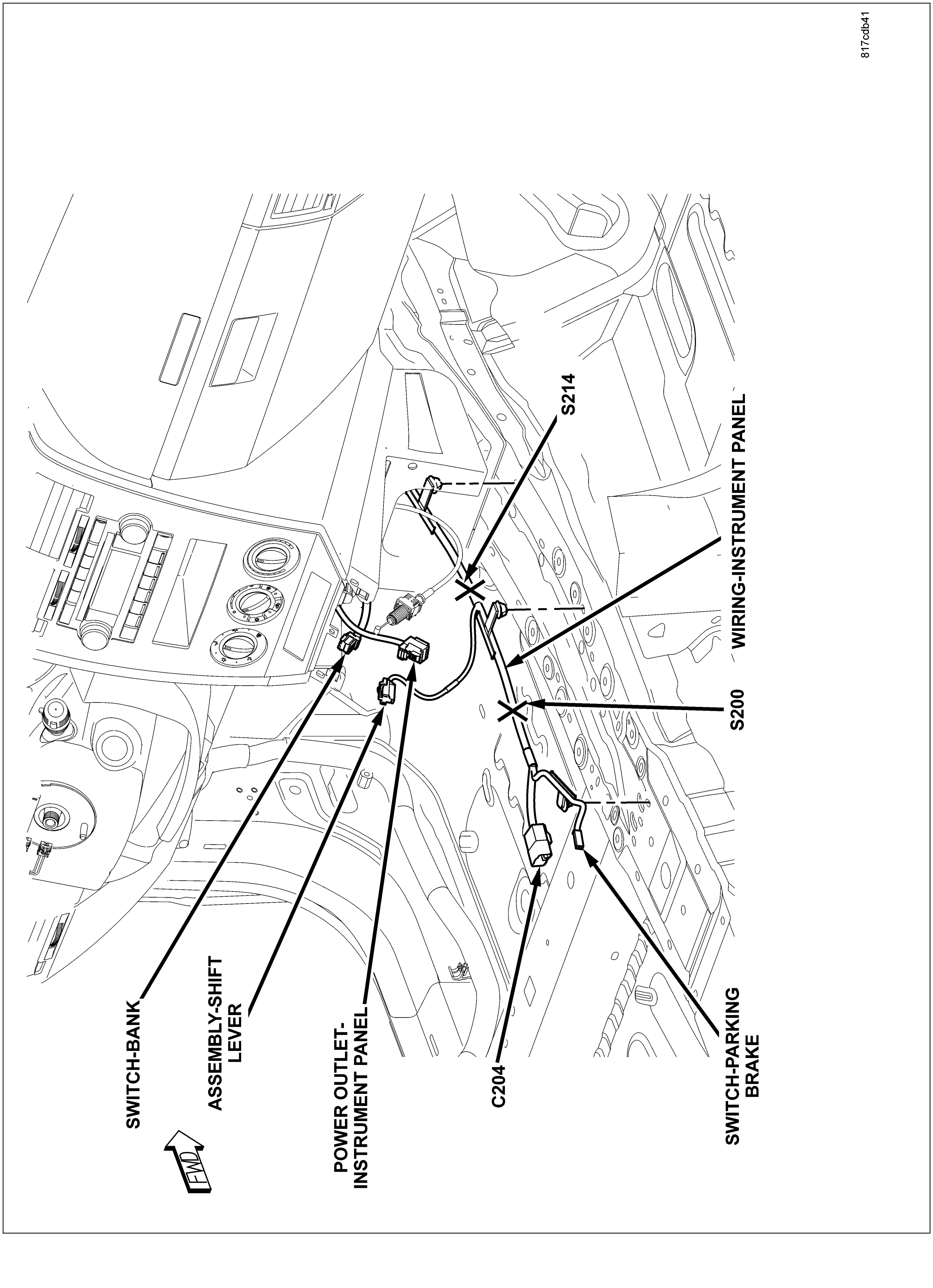


Fig. 35 BODY - FRONT CENTER

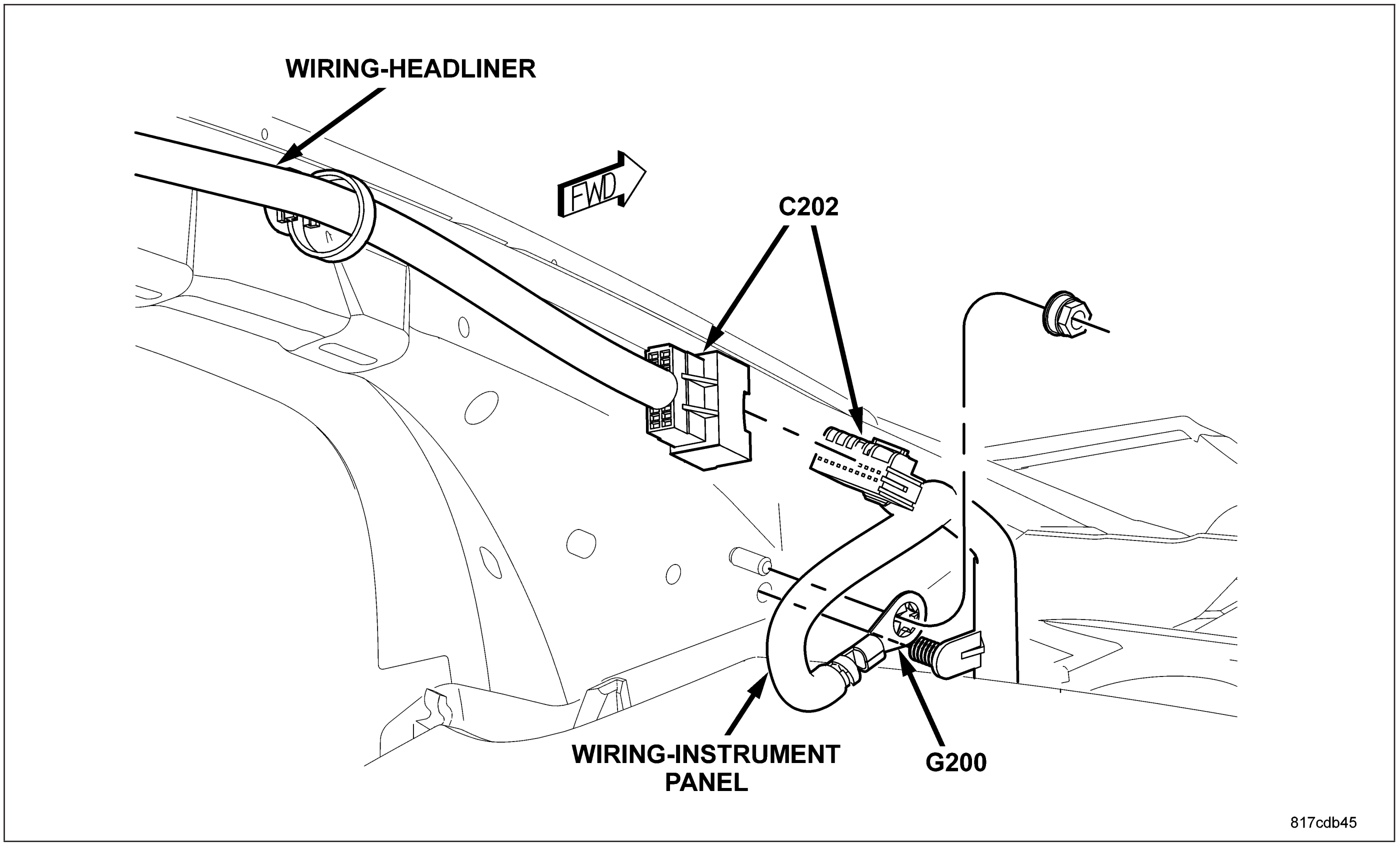


Fig. 36 A-PILLAR - LEFT

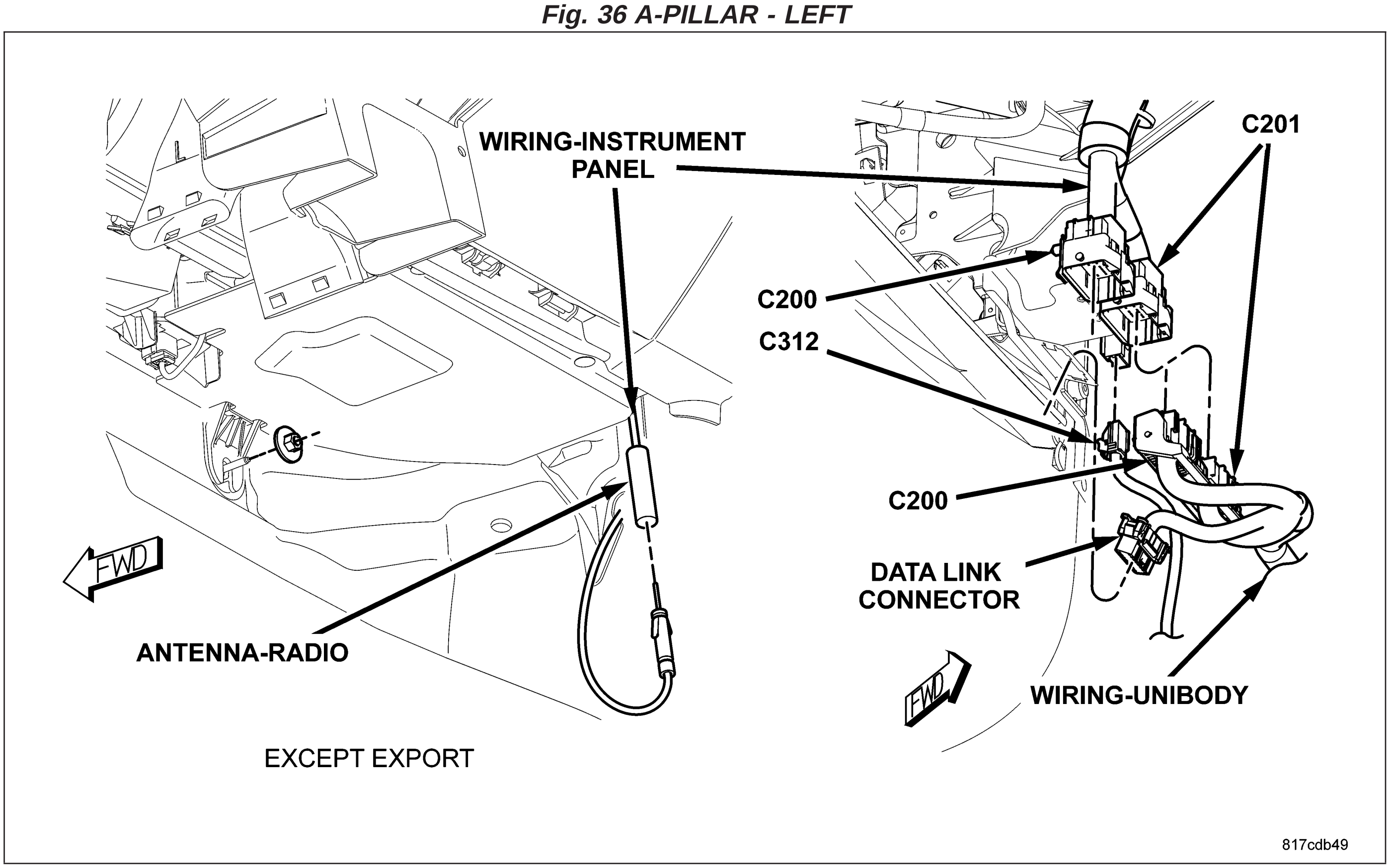


Fig. 37 INSTRUMENT PANEL - LOWER SIDES (EXCEPT EXPORT)

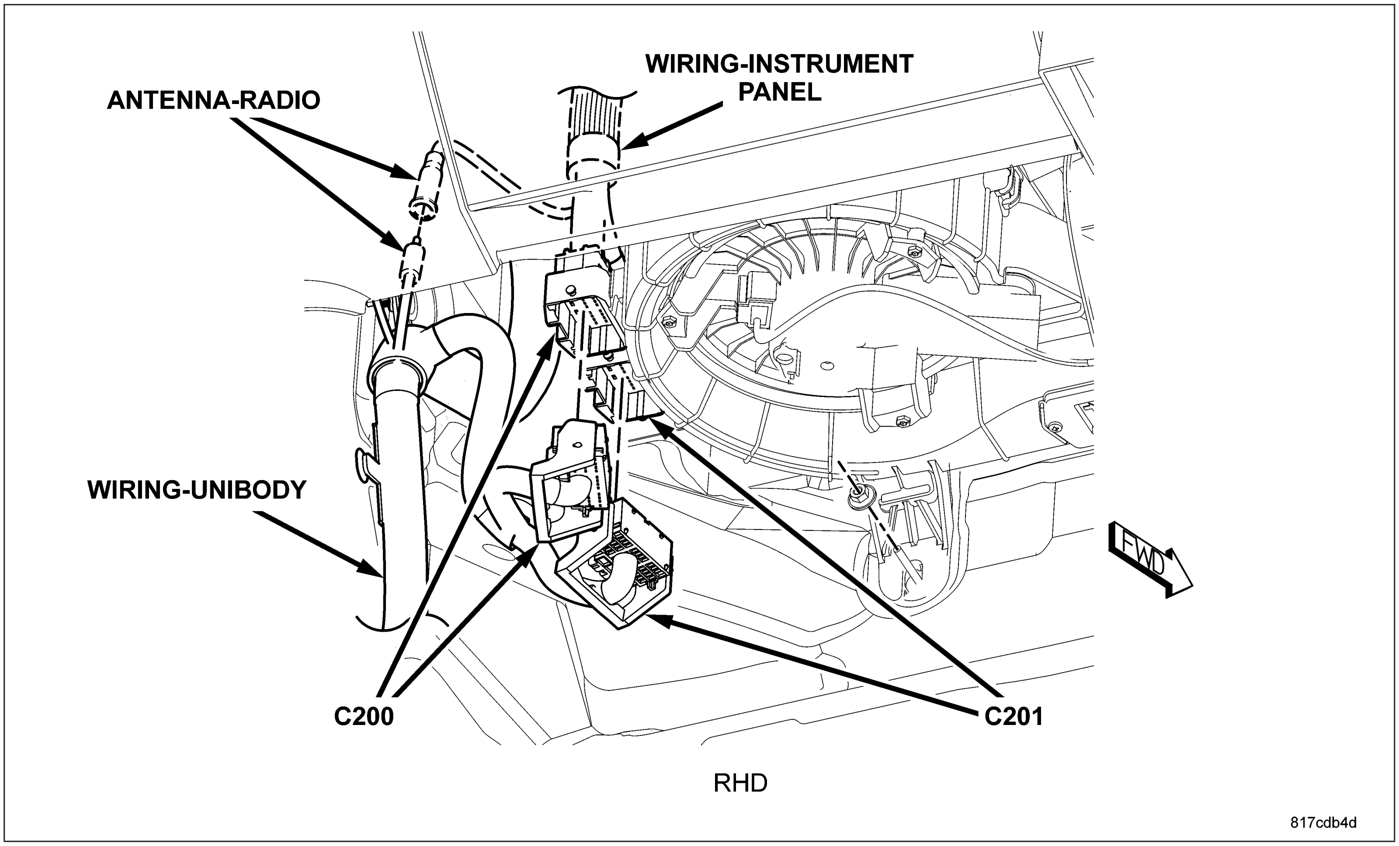


Fig. 38 INSTRUMENT PANEL - LOWER LEFT SIDE (RHD)

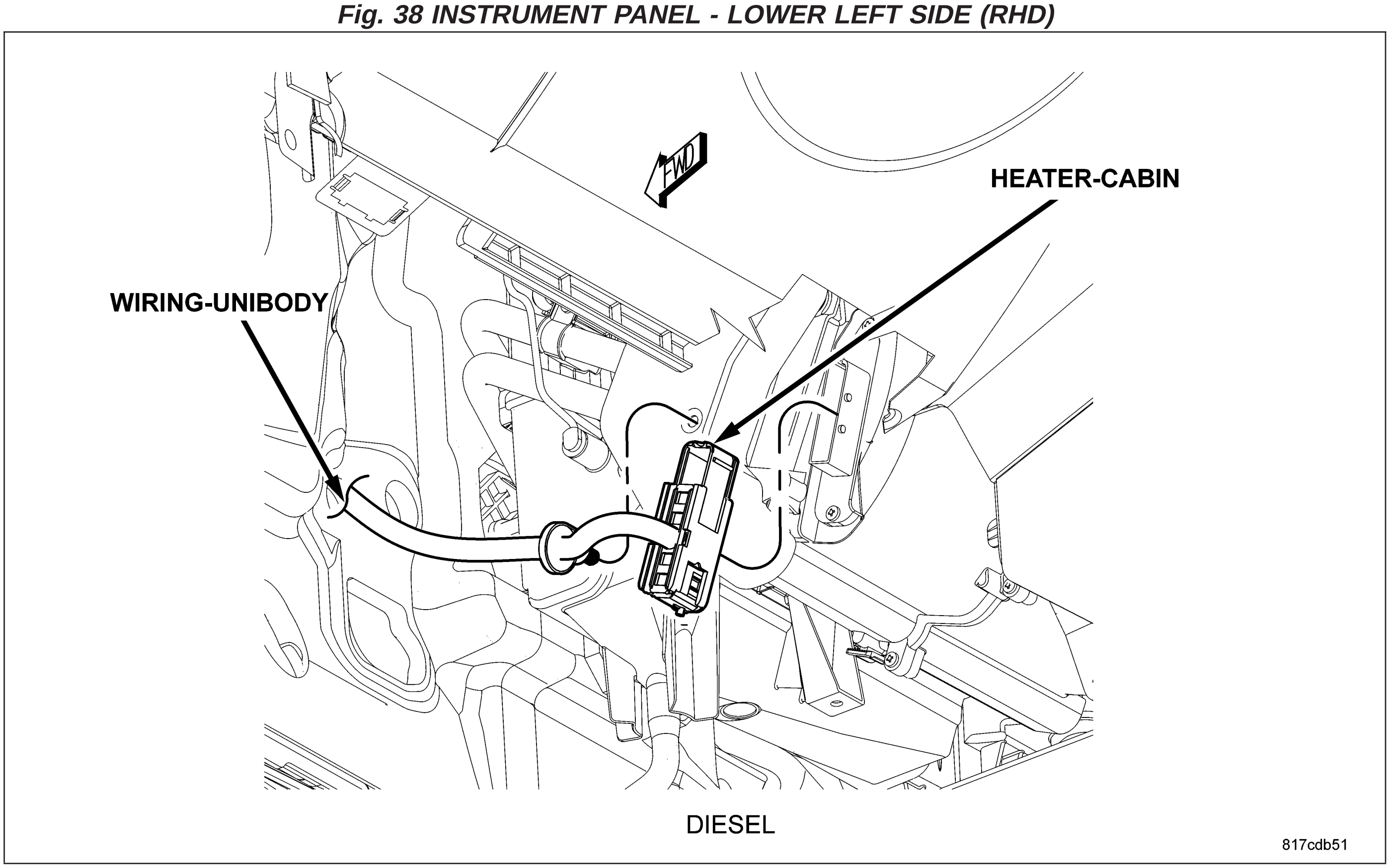


Fig. 39 INSTRUMENT PANEL - LOWER CENTER (DIESEL)

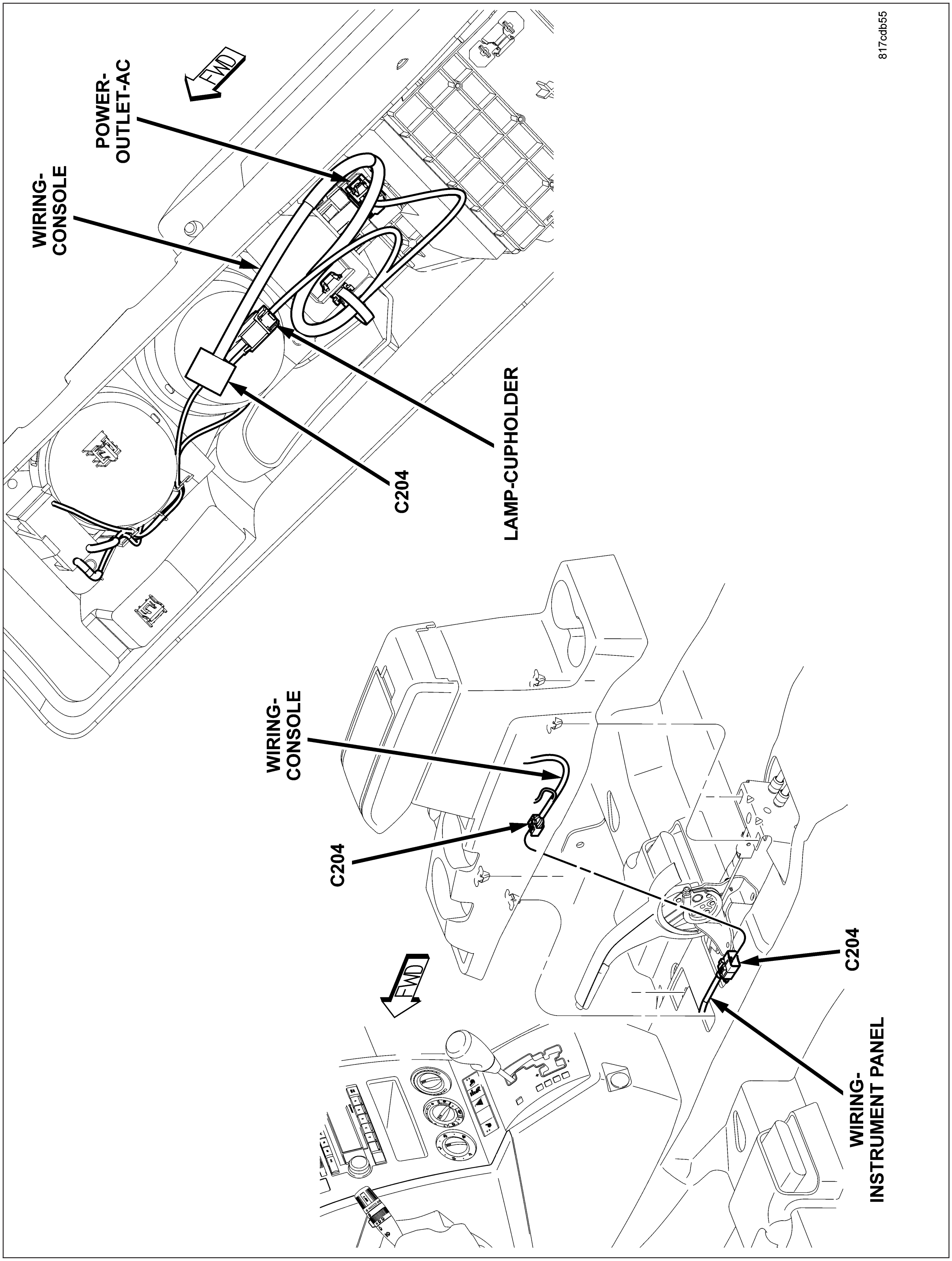


Fig. 40 CENTER CONSOLE

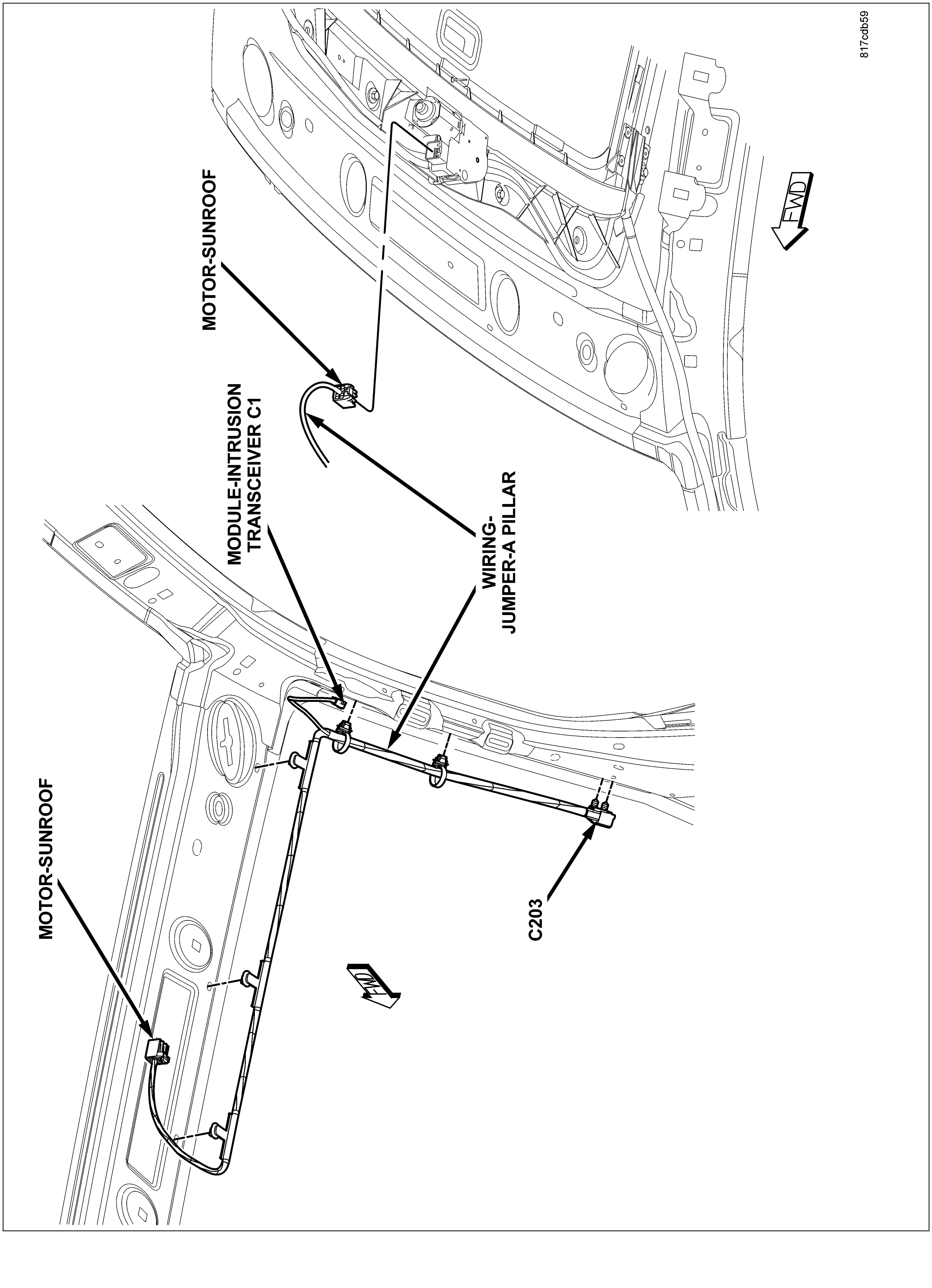


Fig. 41 A-PILLAR - RIGHT

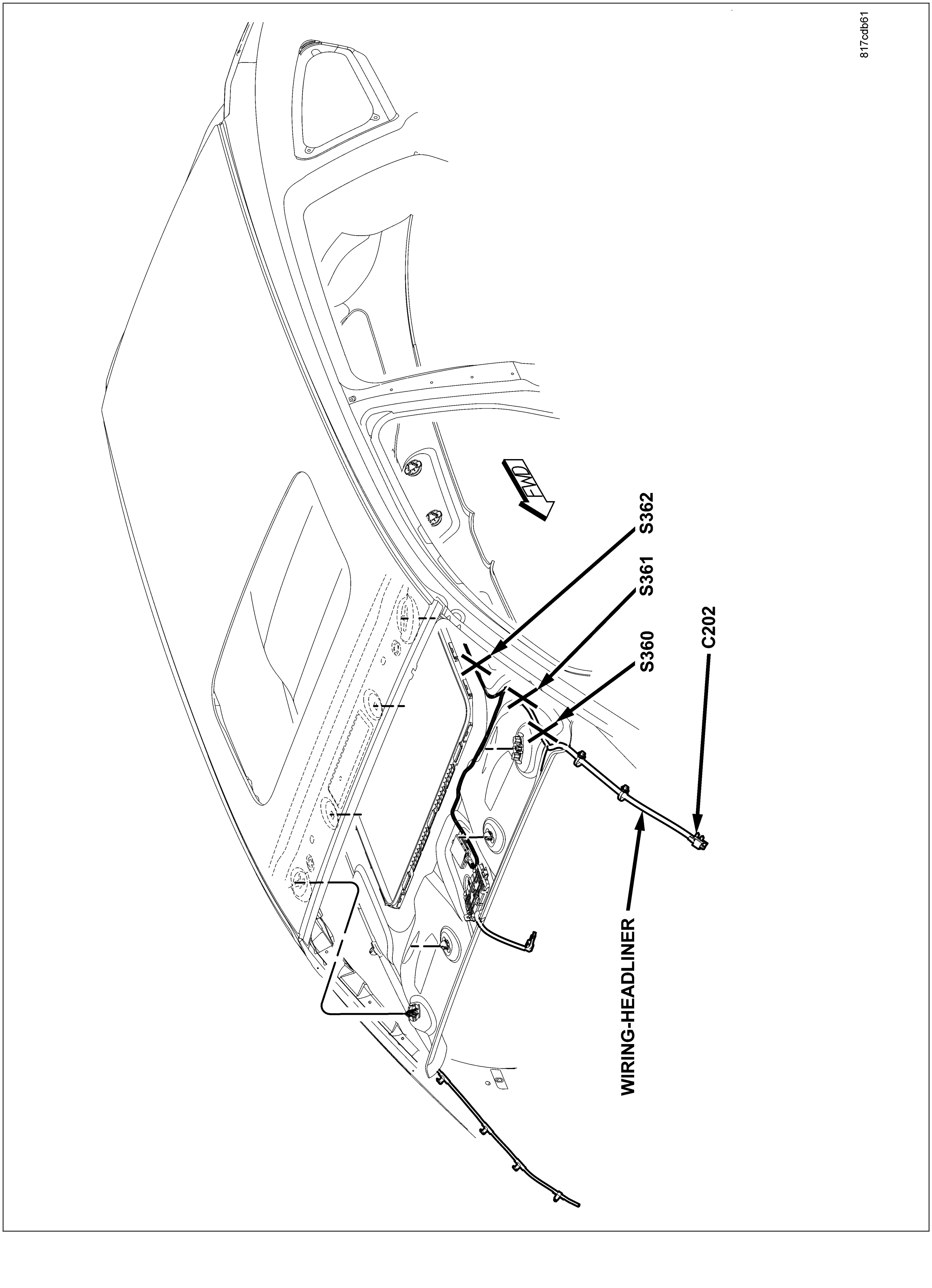


Fig. 42 HEADLINER - FRONT

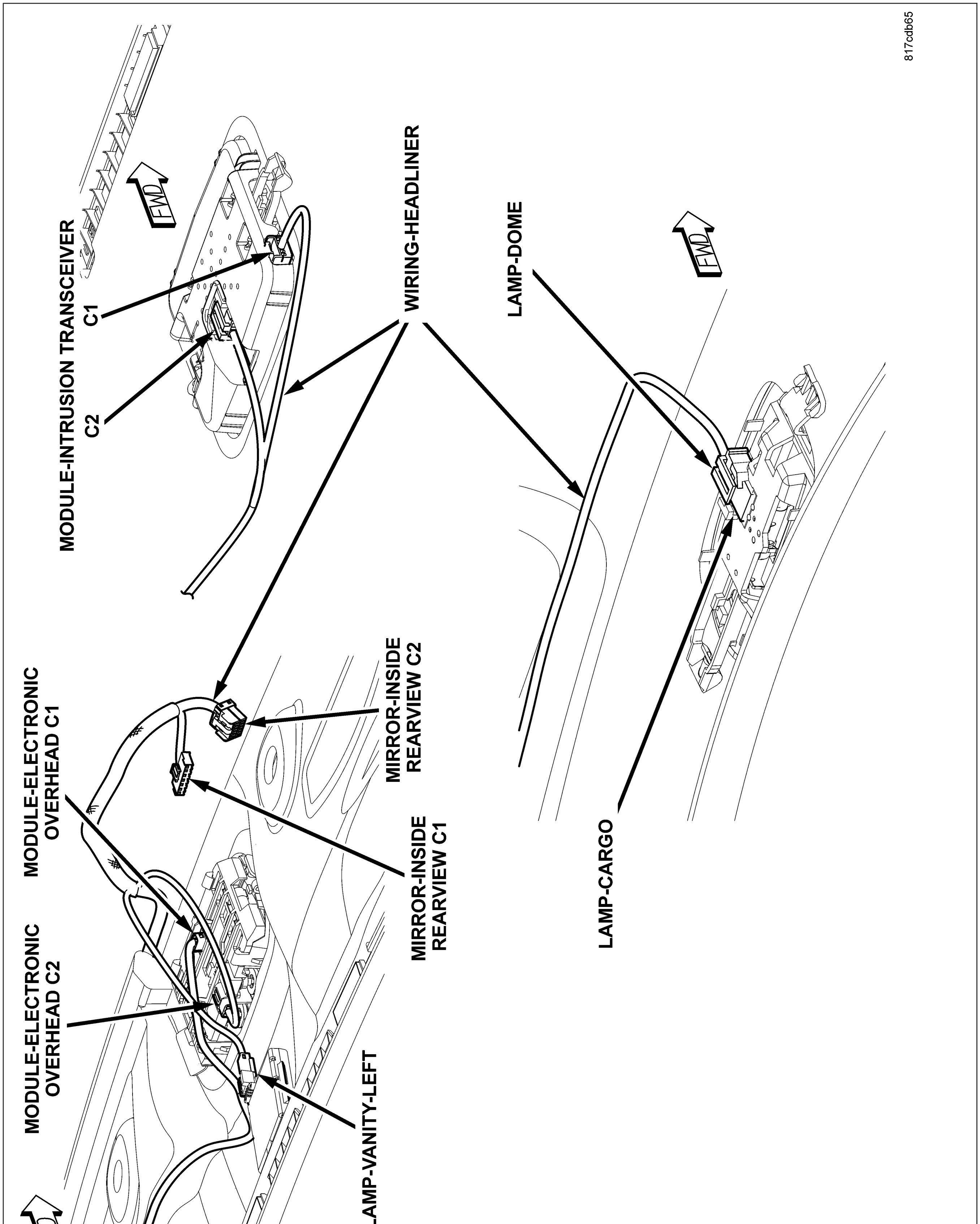


Fig. 43 HEADLINER

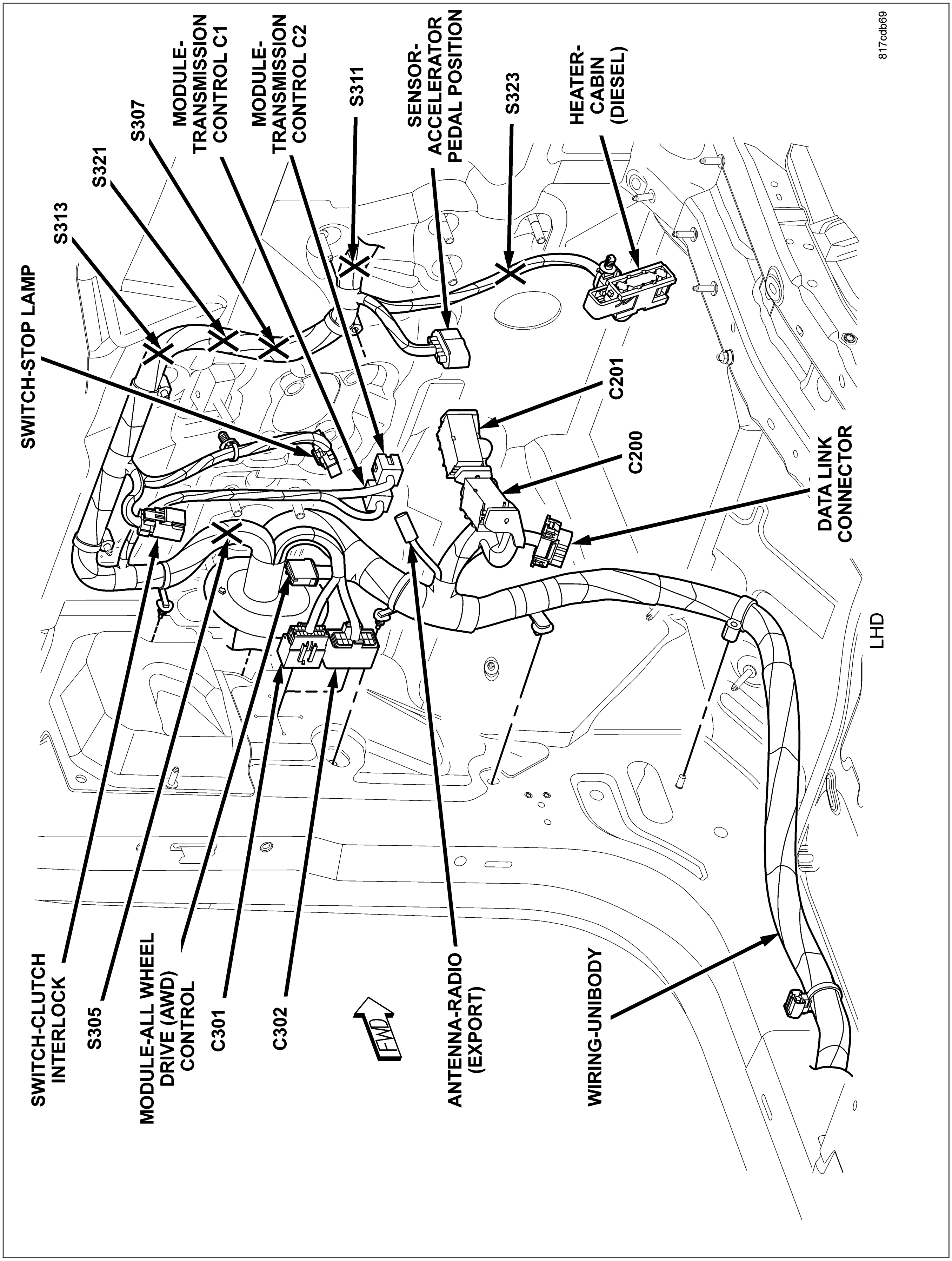


Fig. 44 BODY - LEFT FRONT (LHD)

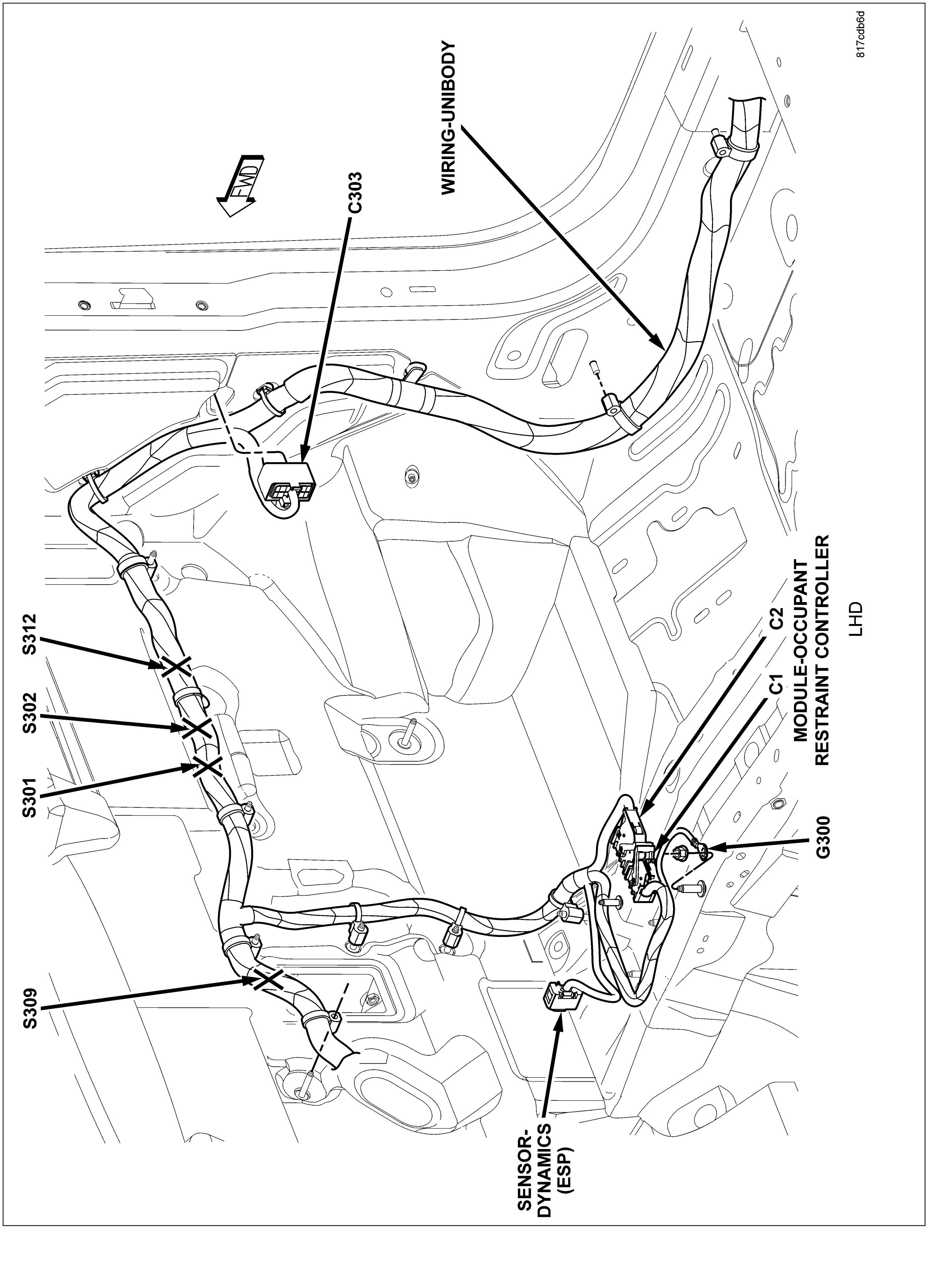


Fig. 45 BODY - RIGHT FRONT (LHD)

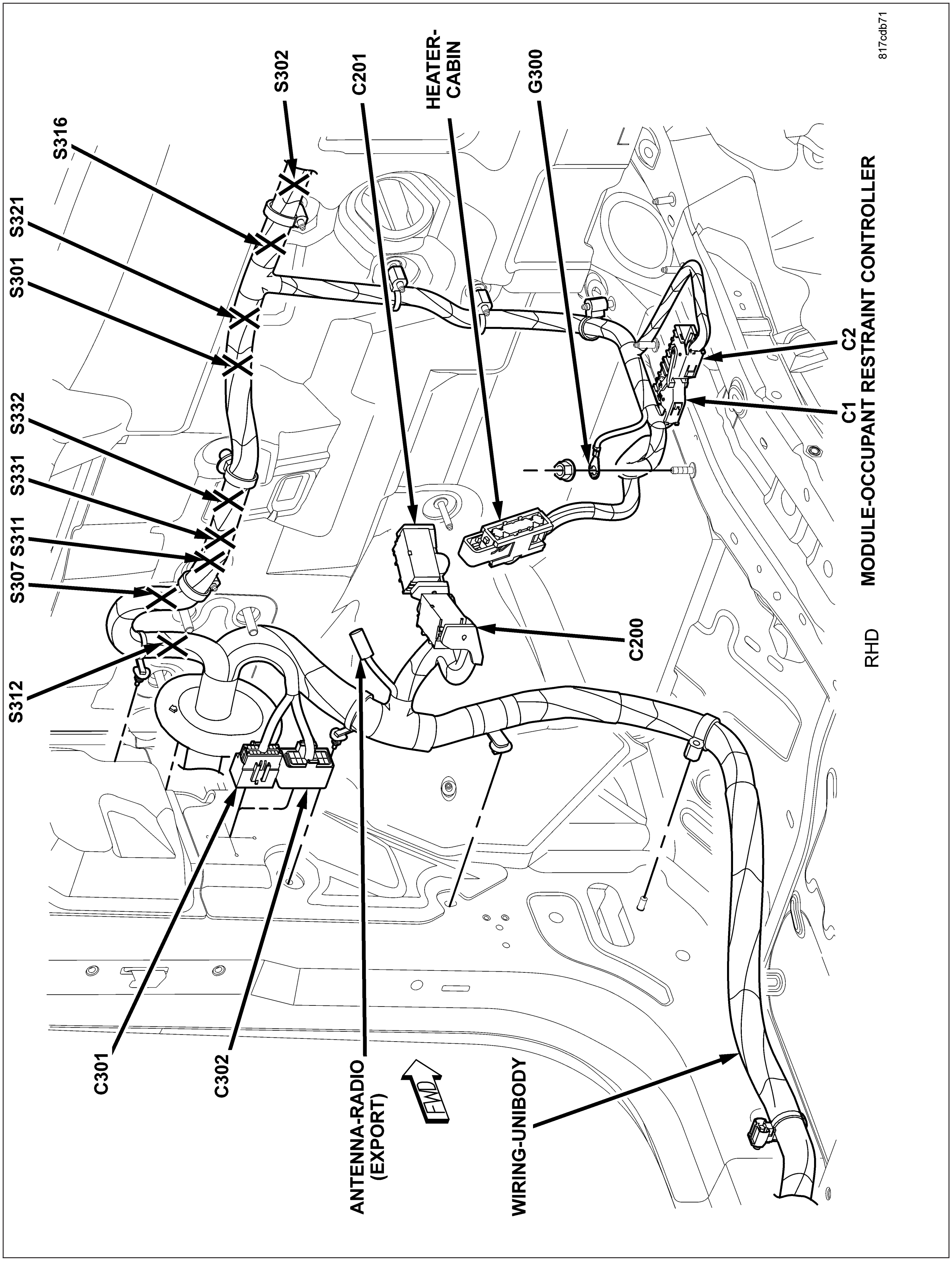


Fig. 46 BODY - LEFT FRONT (RHD)

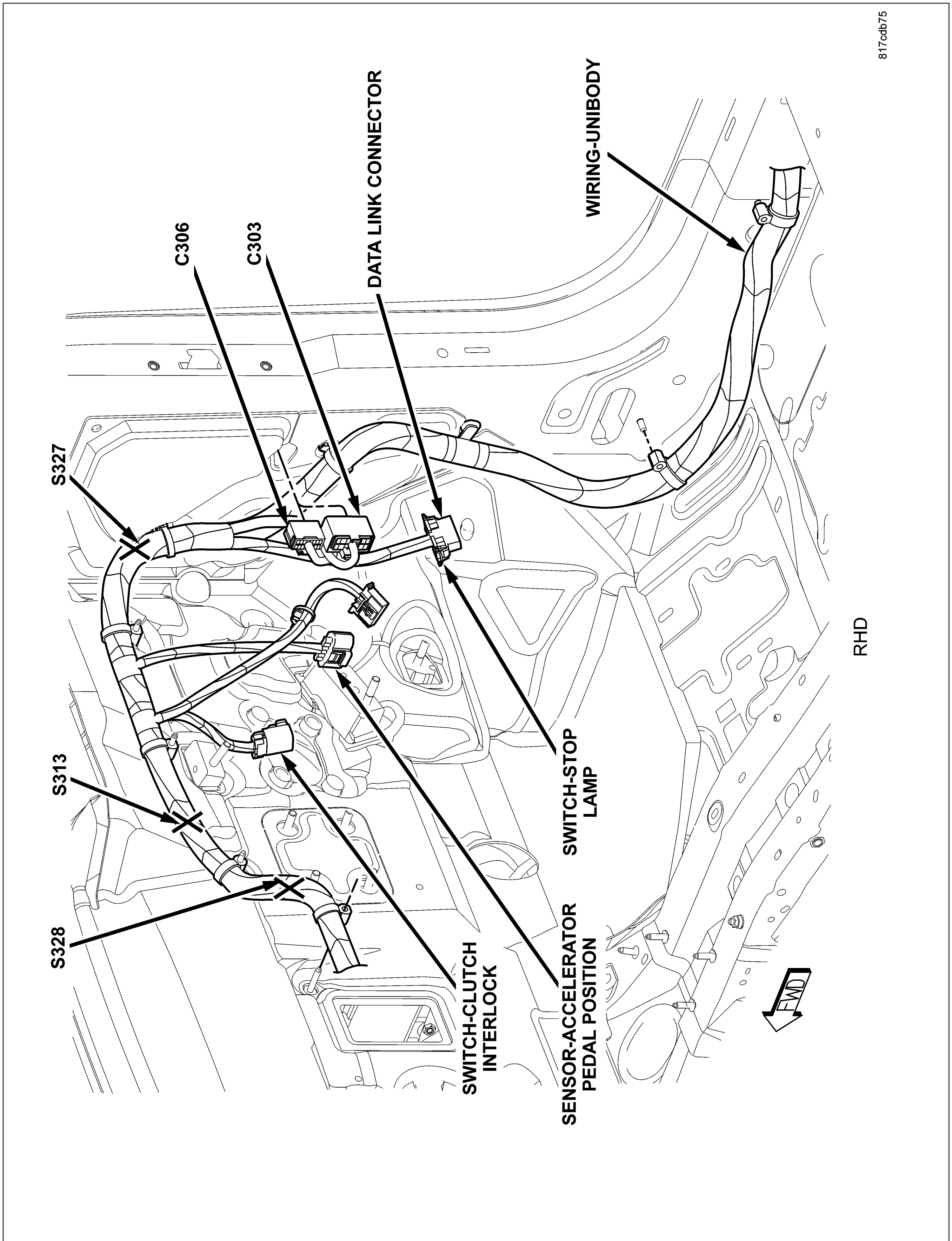


Fig. 47 BODY - RIGHT FRONT (RHD)

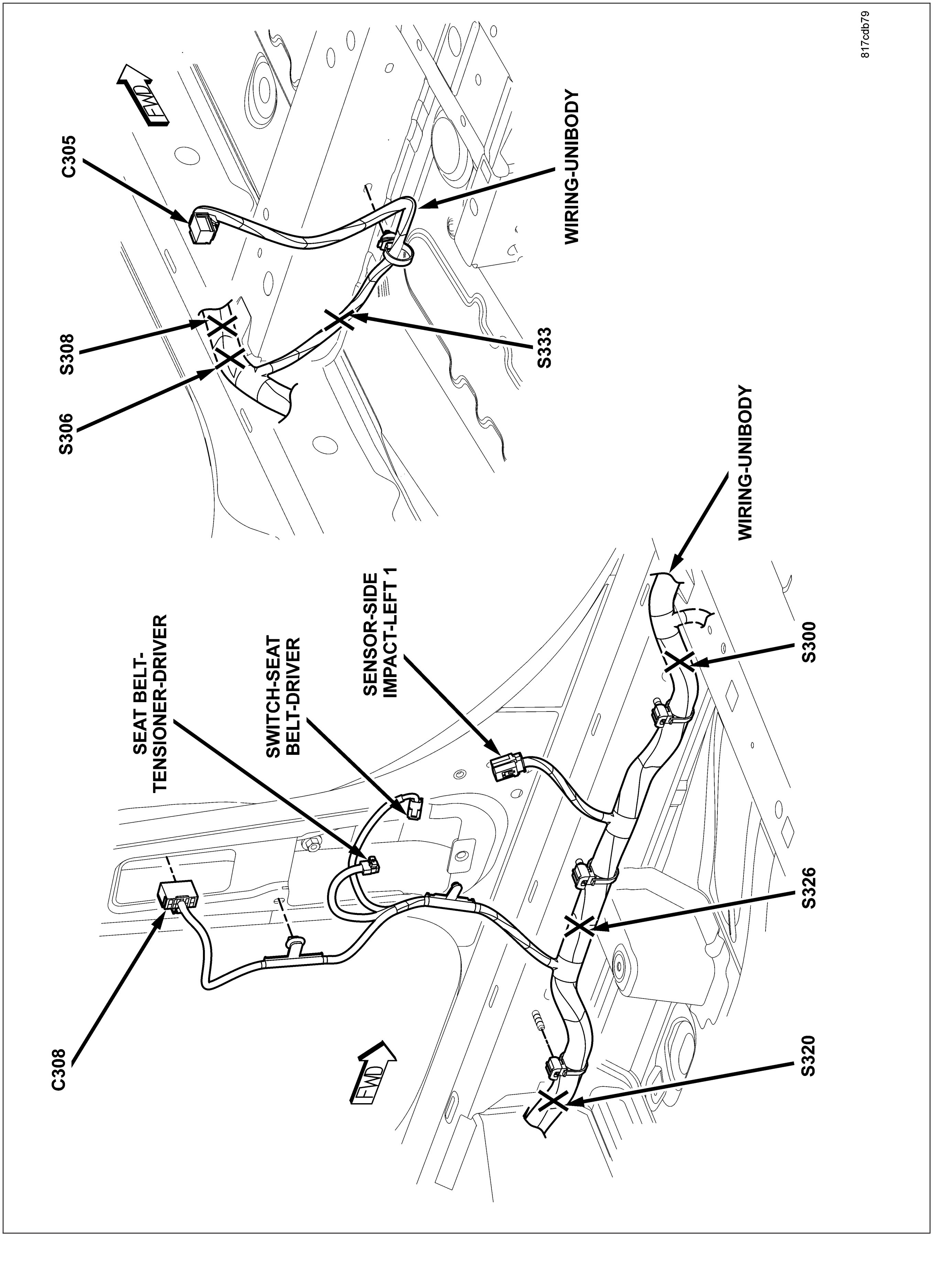


Fig. 48 B-PILLAR - LEFT

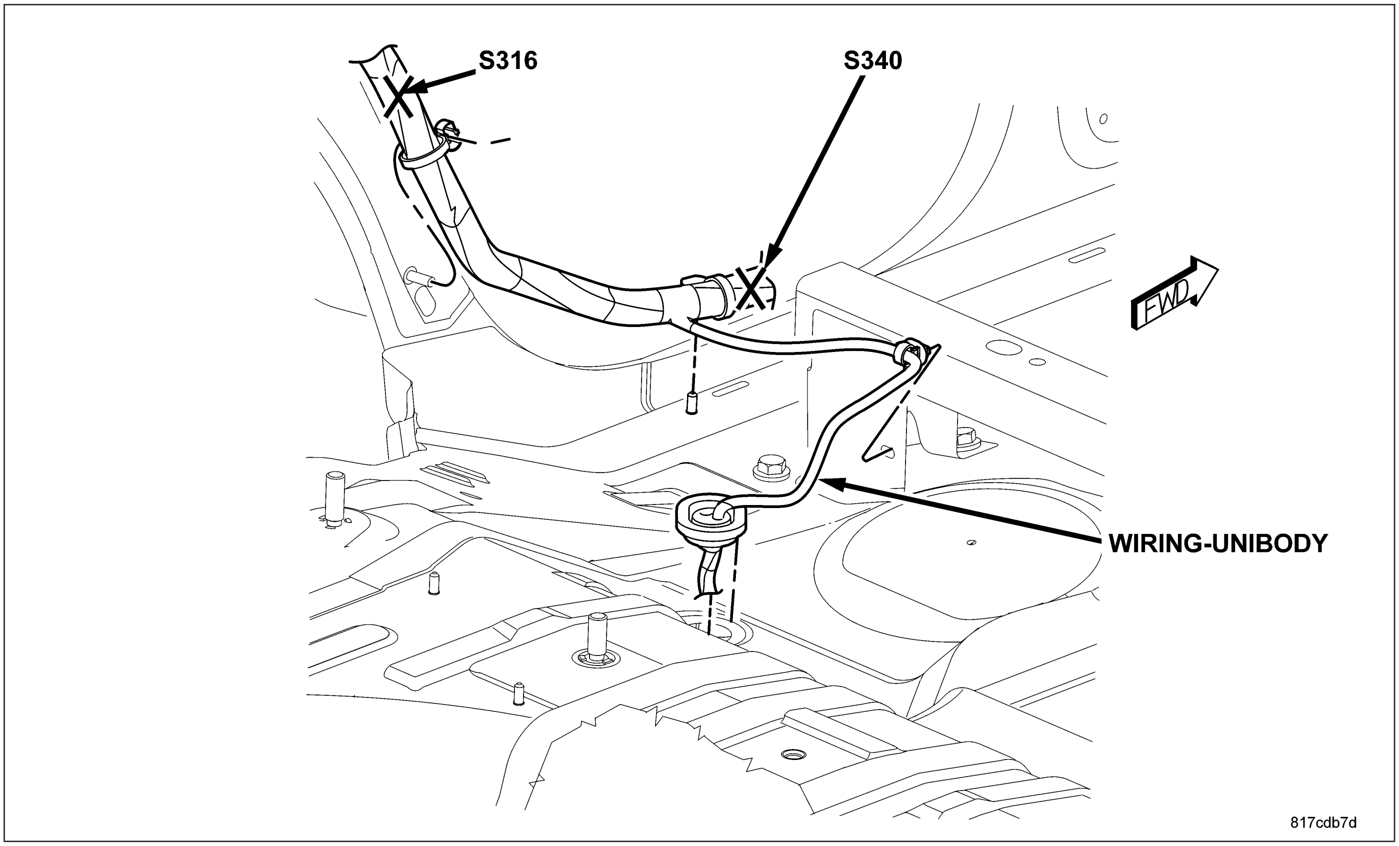


Fig. 49 BODY - LOWER LEFT REAR

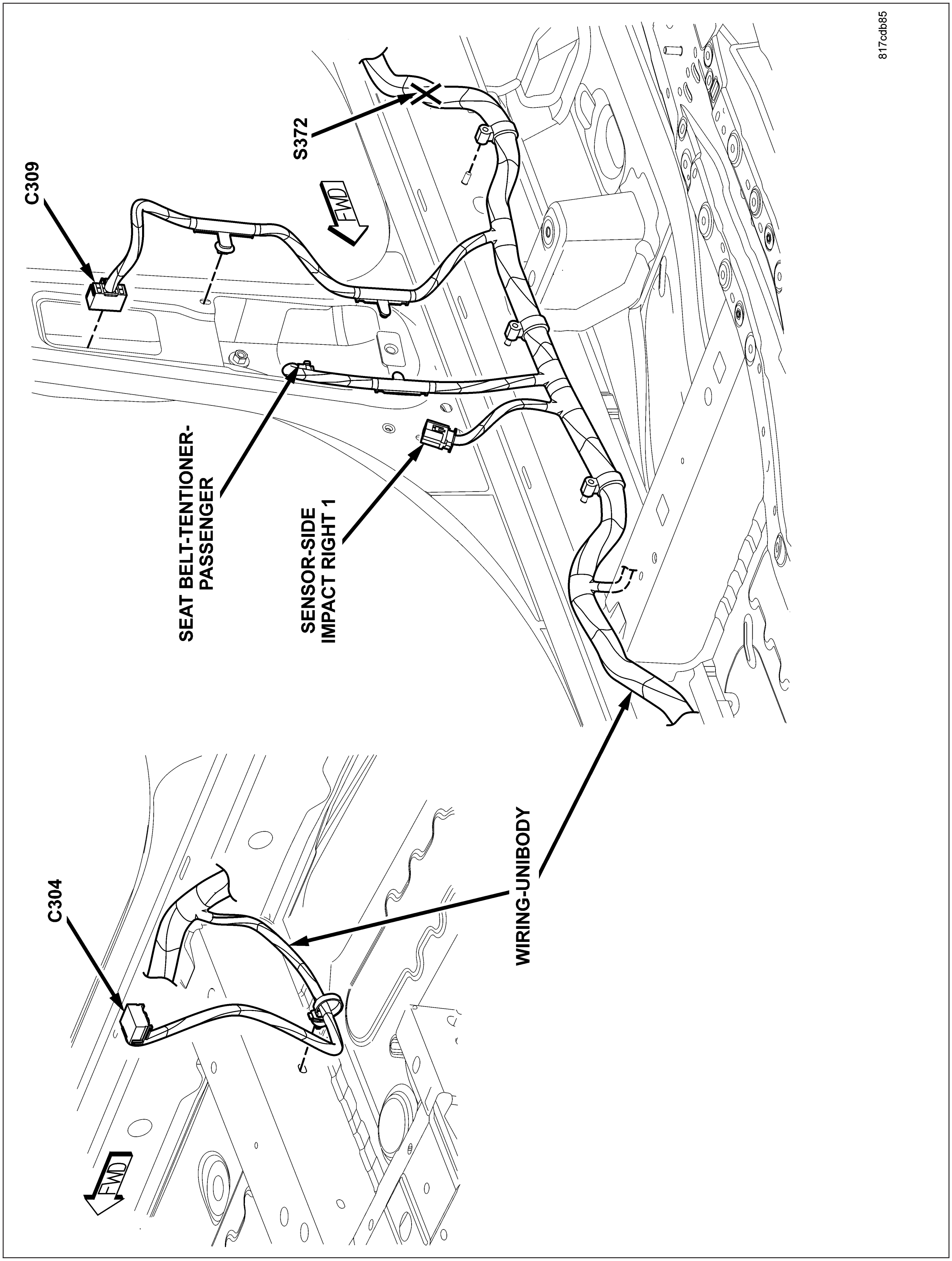


Fig. 50 B-PILLAR - RIGHT

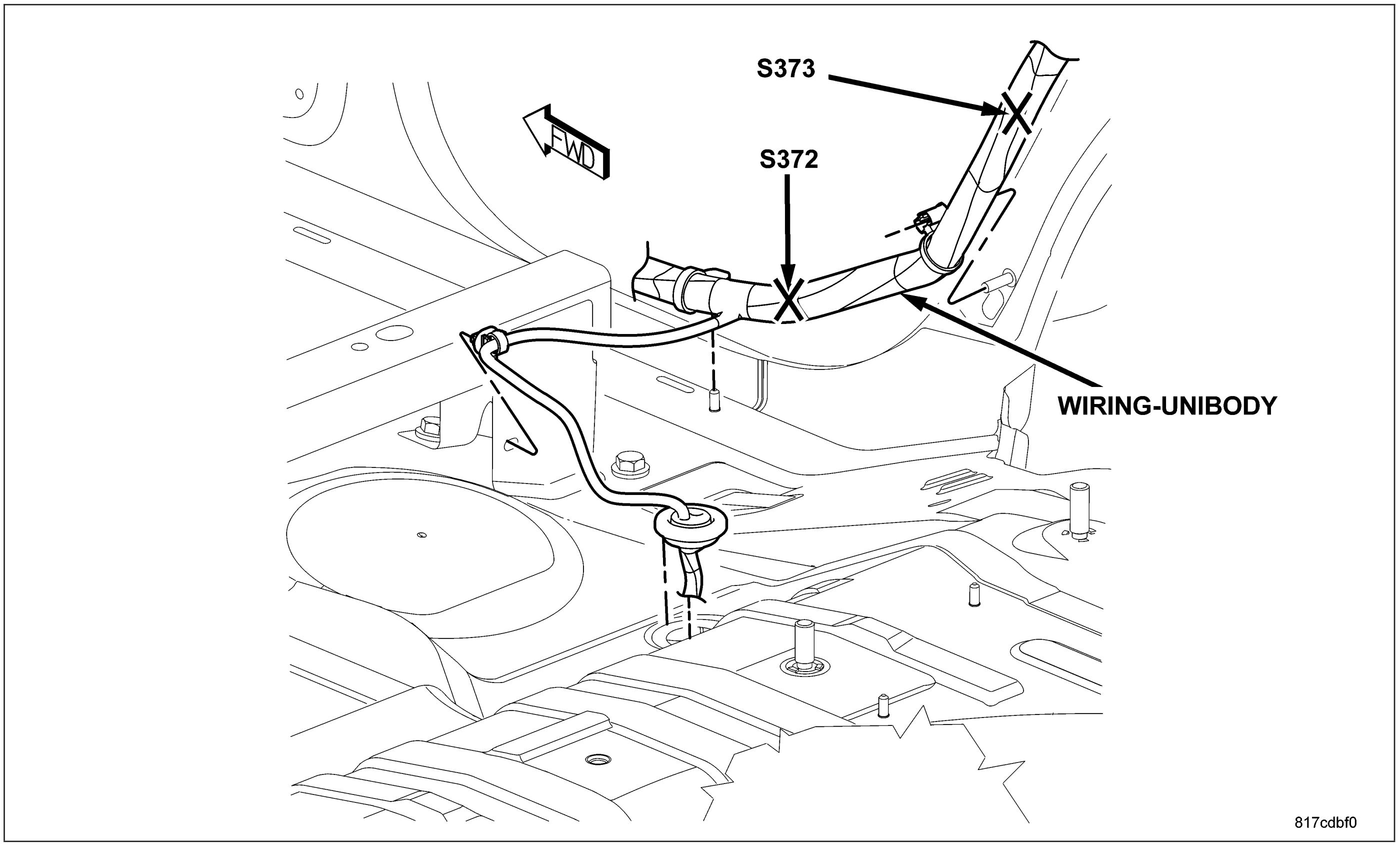


Fig. 51 BODY - LOWER RIGHT REAR

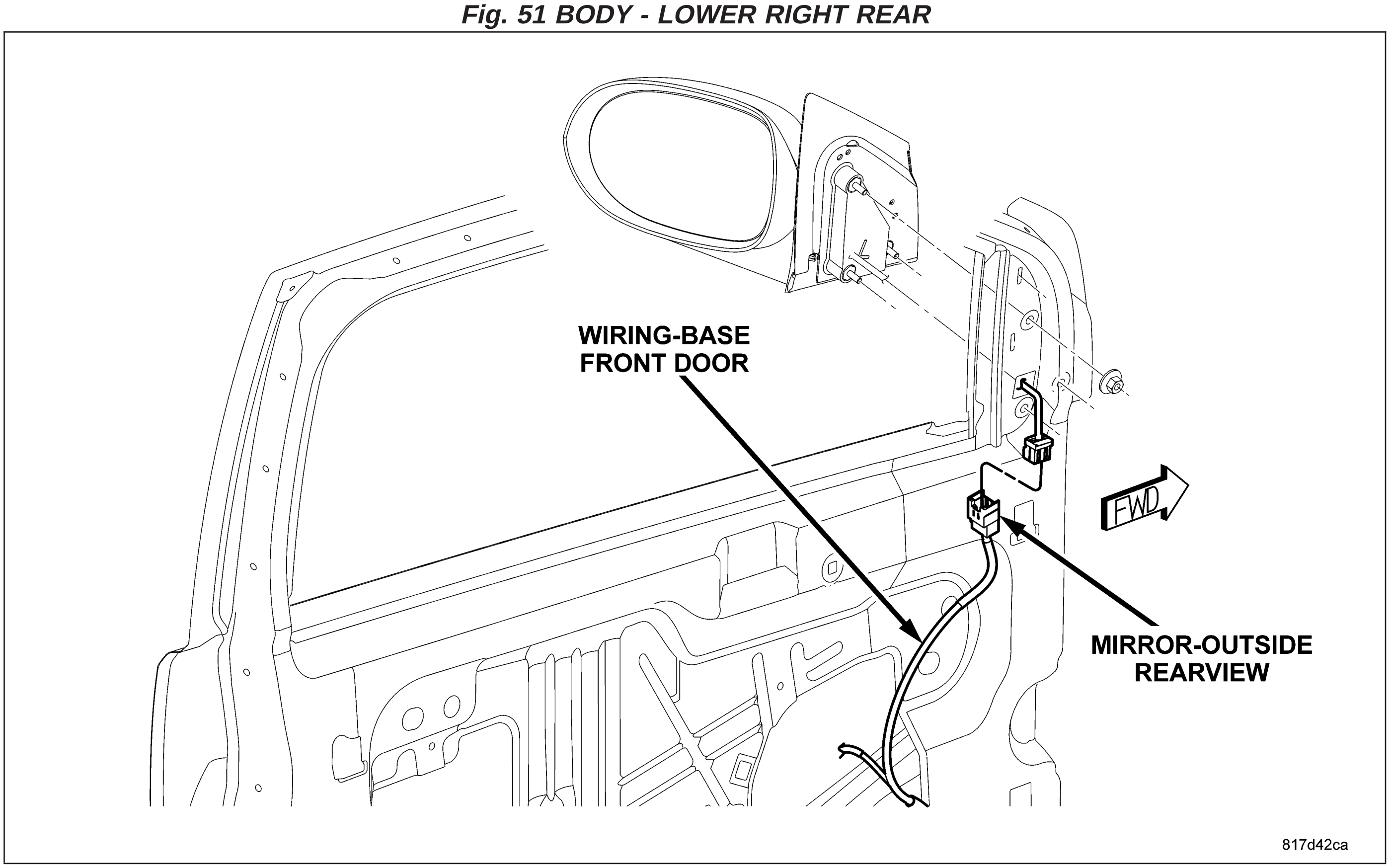


Fig. 52 FRONT DOOR - MIRROR

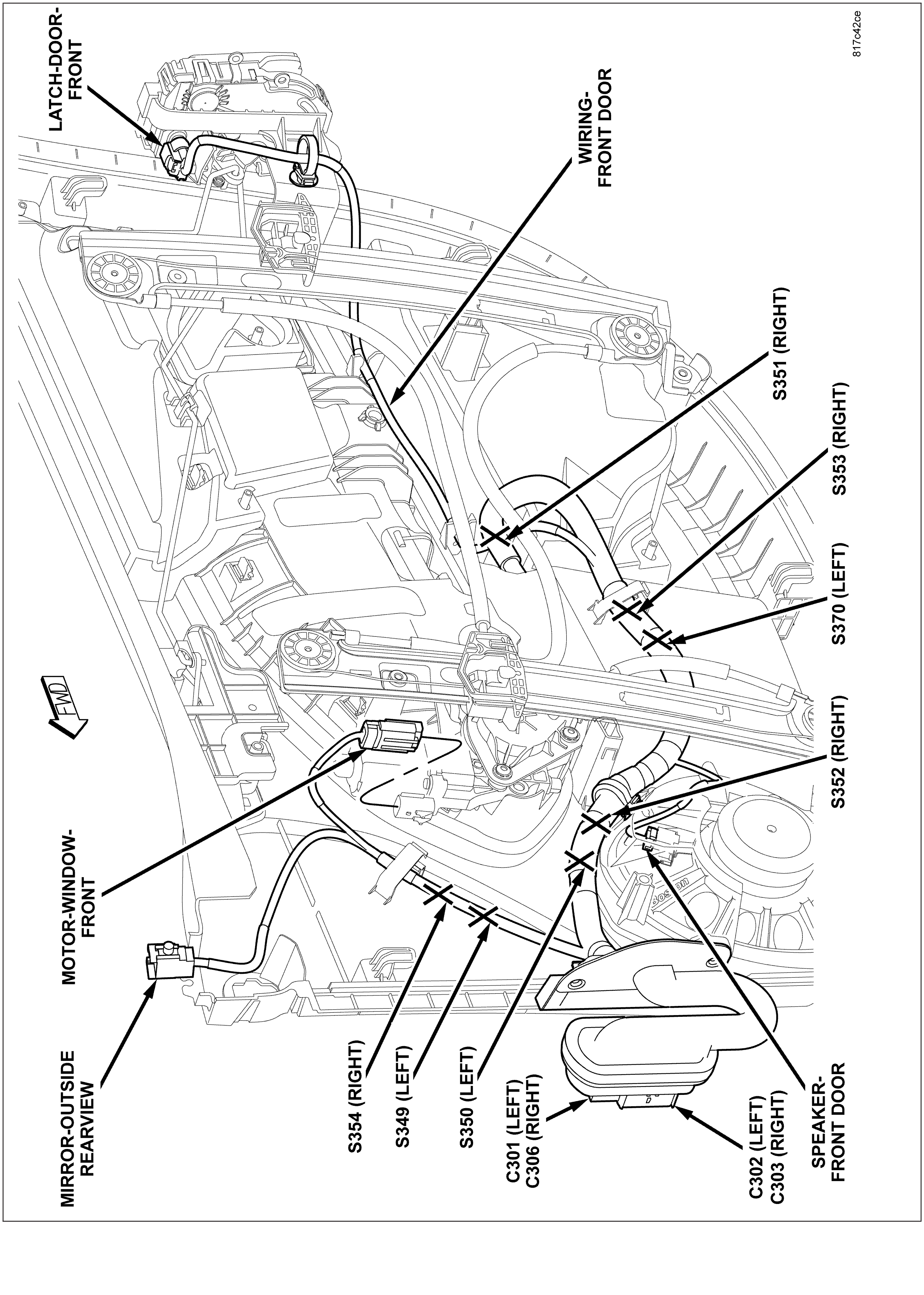


Fig. 53 FRONT DOOR (RIGHT SHOWN, LEFT SIMILAR)

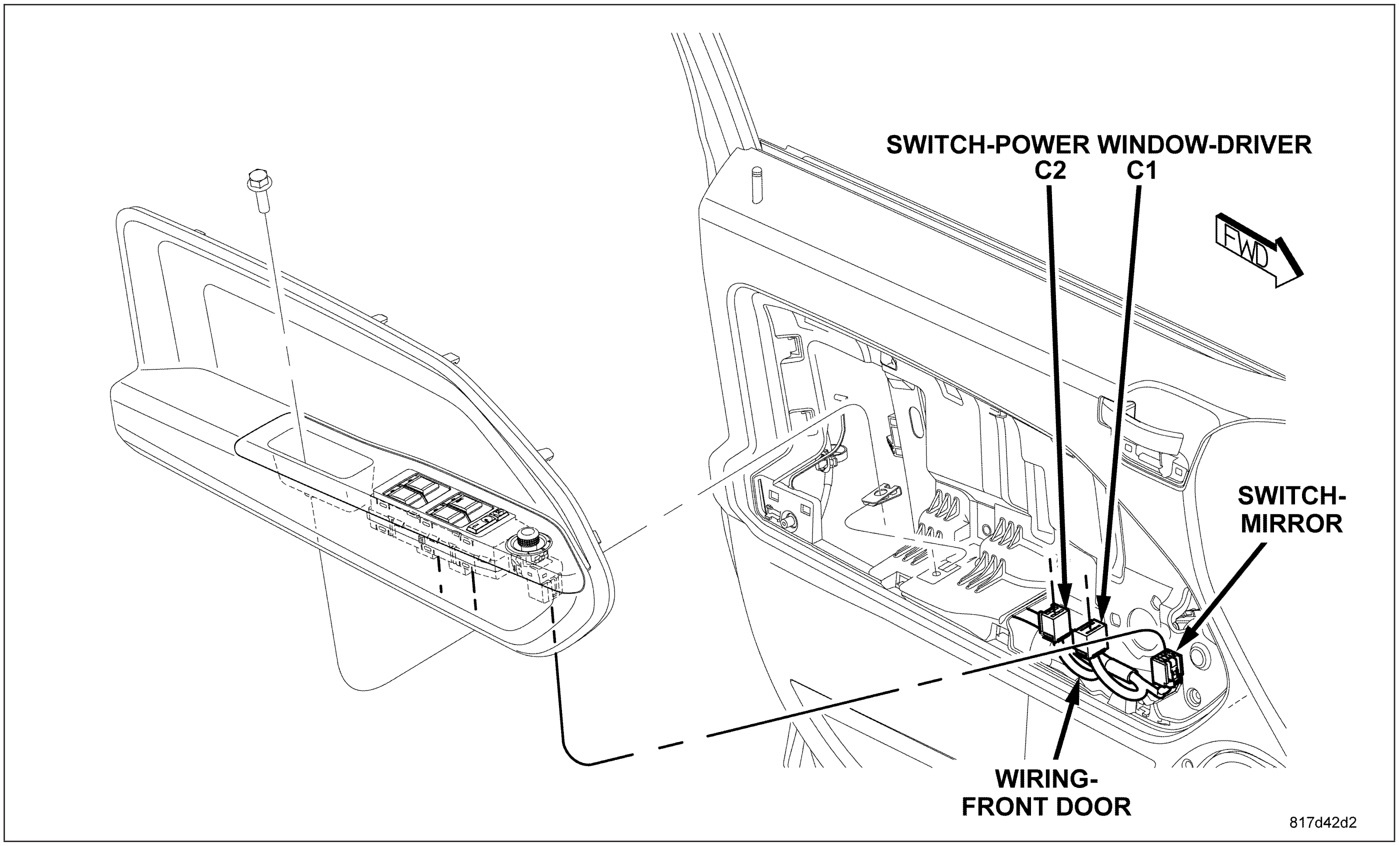


Fig. 54 FRONT DOOR - WITH TRIM (LEFT SHOWN, RIGHT SIMILAR)

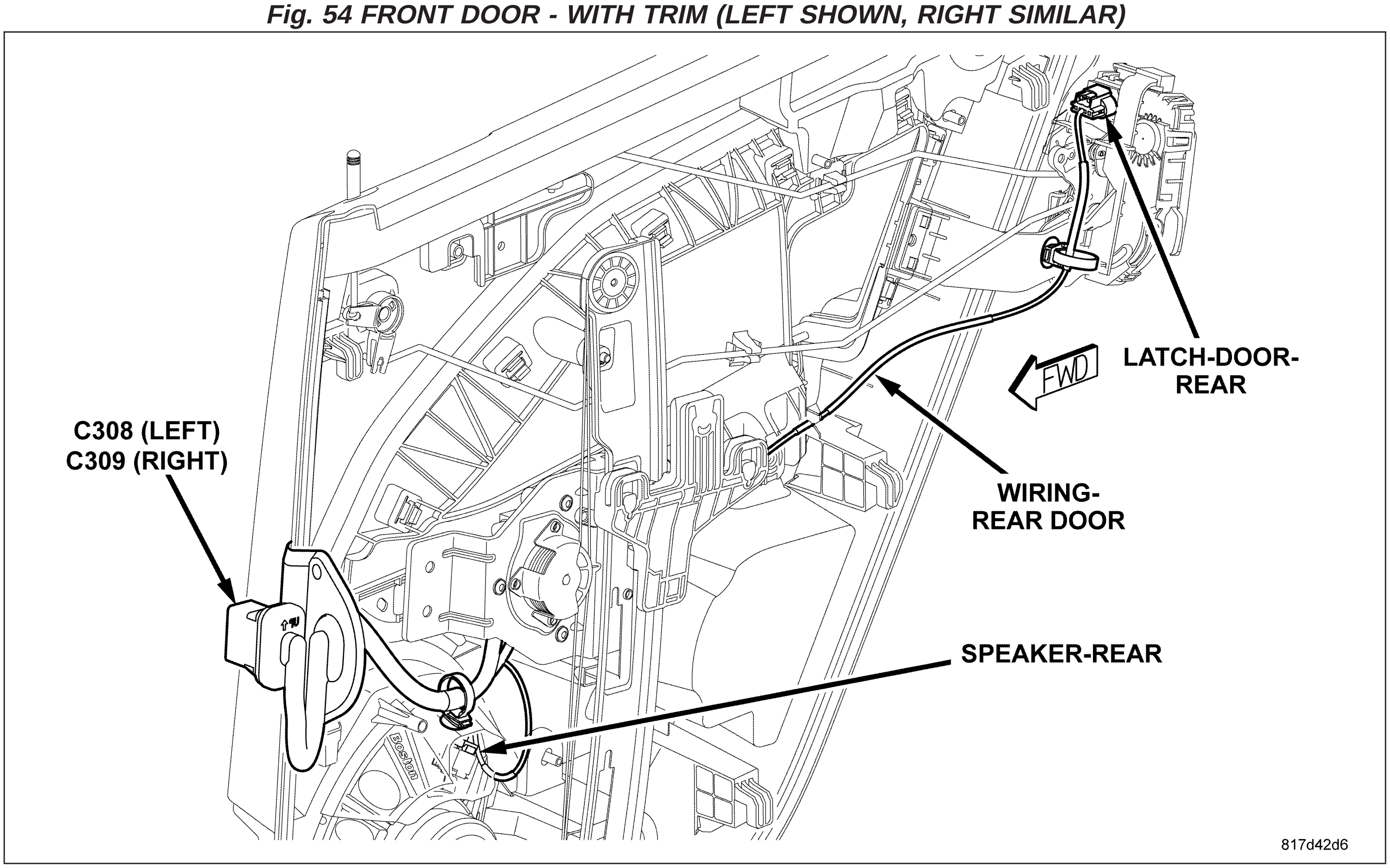


Fig. 55 REAR DOOR (RIGHT SHOWN, LEFT SIMILAR)

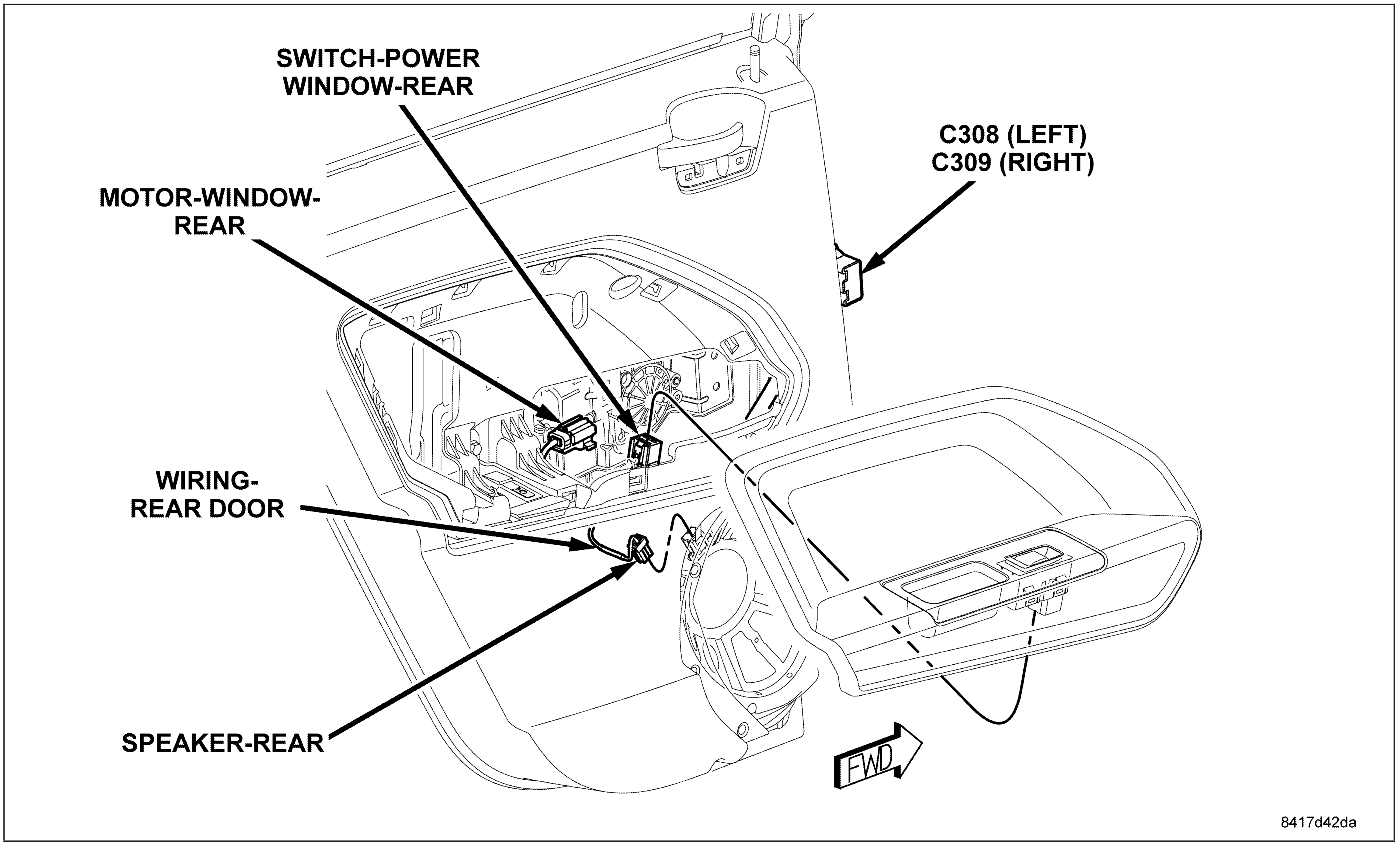


Fig. 56 REAR DOOR - WITH TRIM (LEFT SHOWN, RIGHT SIMILAR)

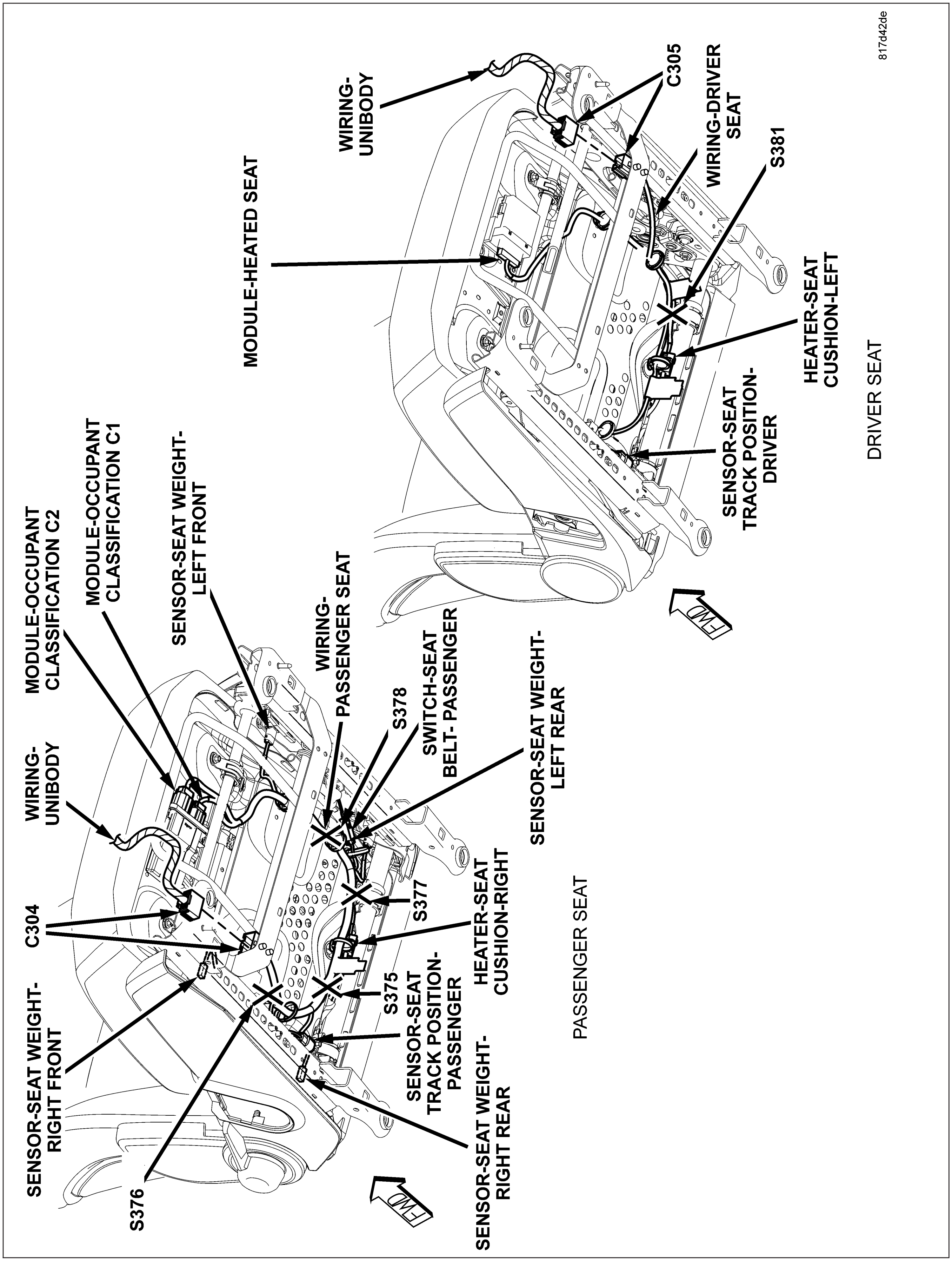


Fig. 57 SEATS - FRONT

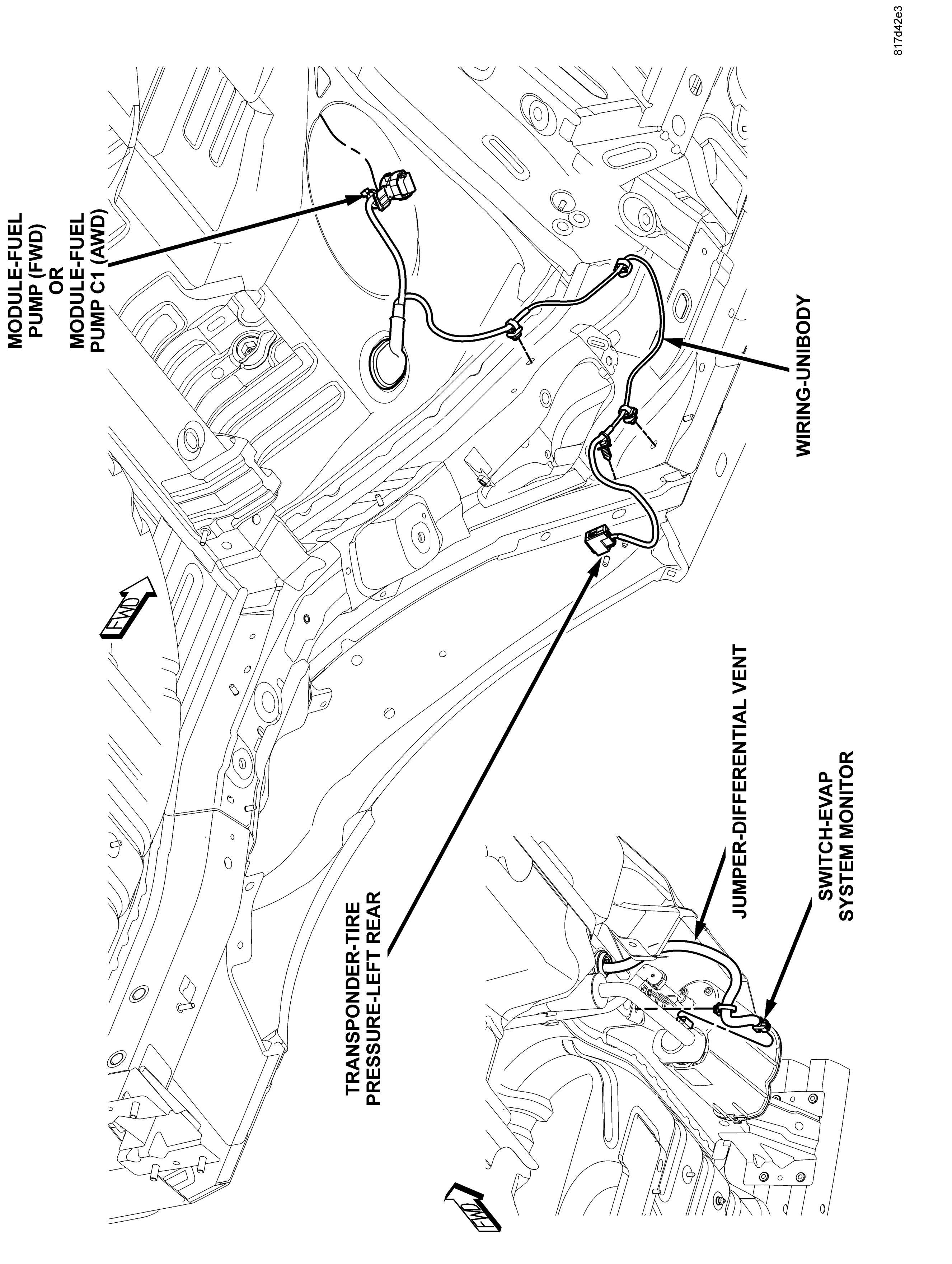


Fig. 58 UNDERBODY - LEFT REAR

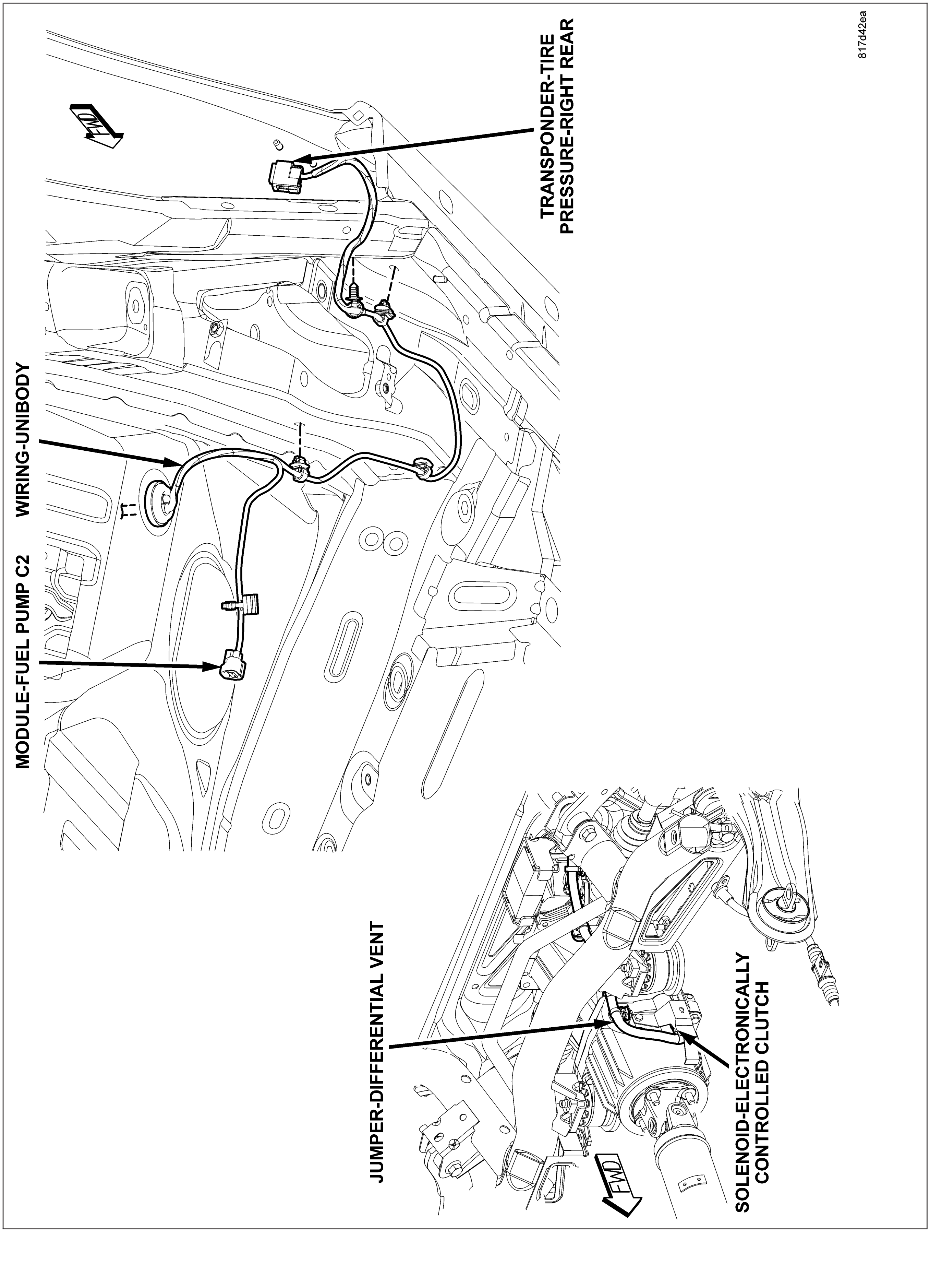


Fig. 59 UNDERBODY - RIGHT REAR

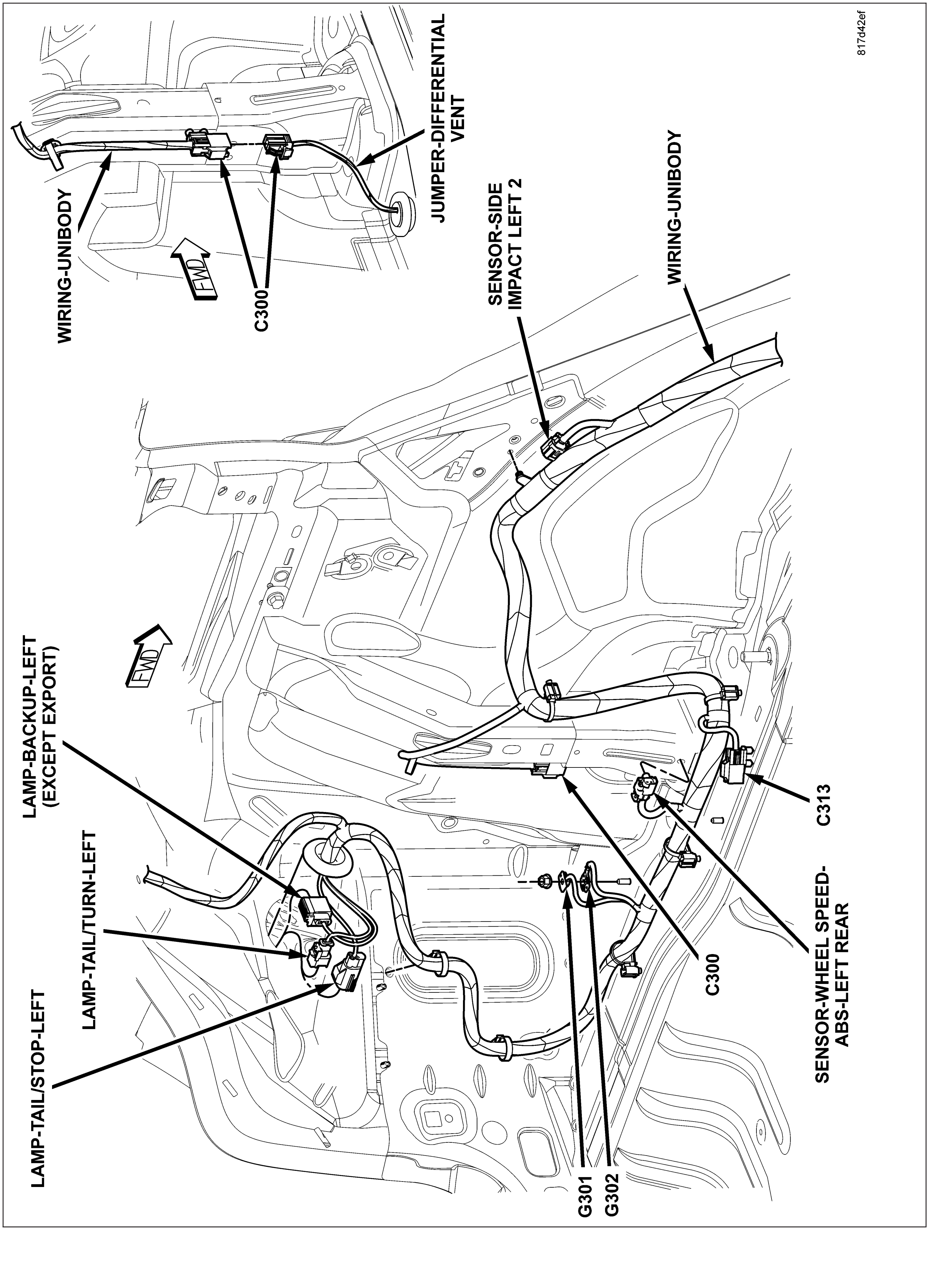


Fig. 60 BODY - LEFT REAR

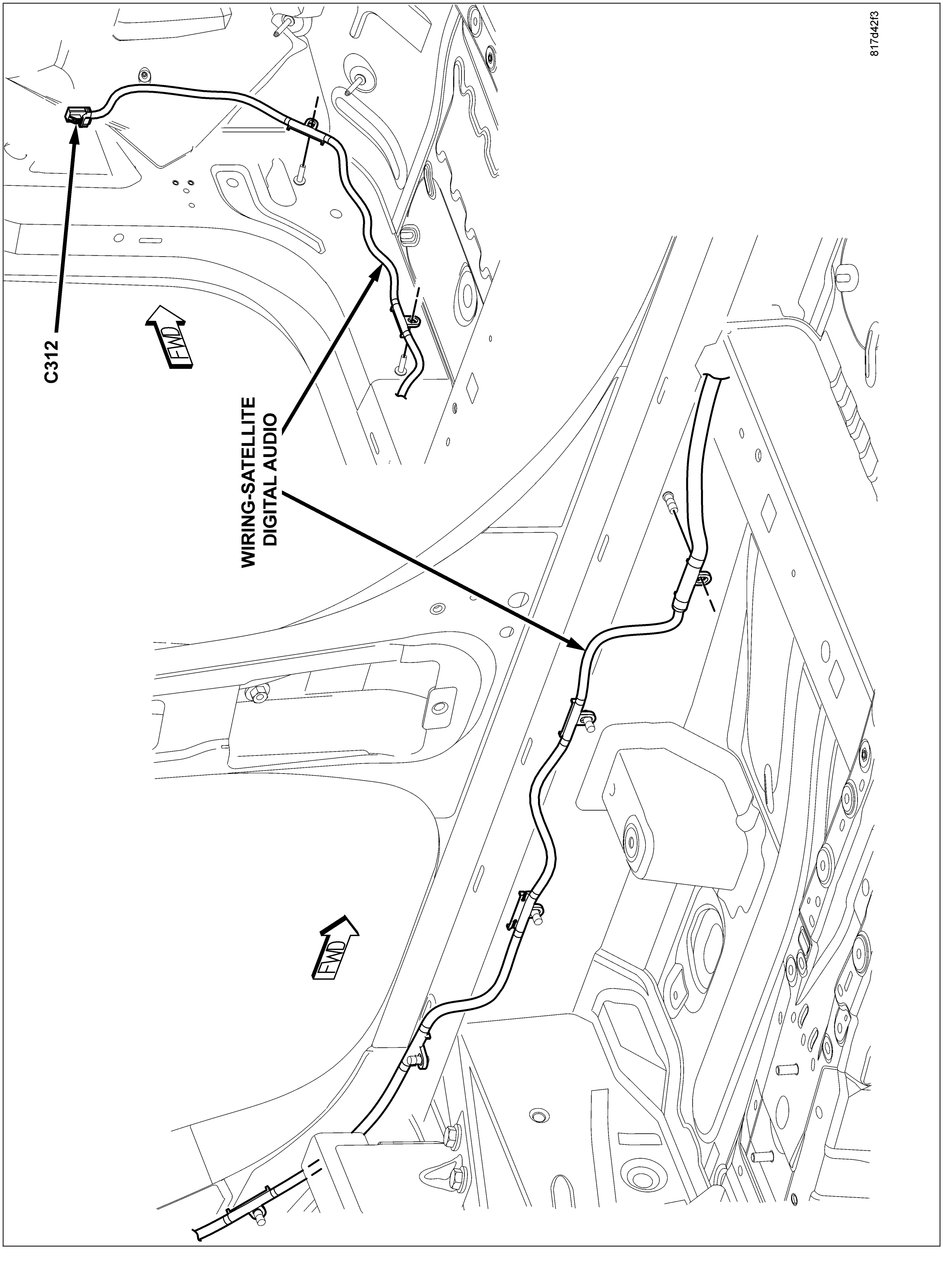


Fig. 61 BODY - LEFT SIDE (SATELLITE RADIO)

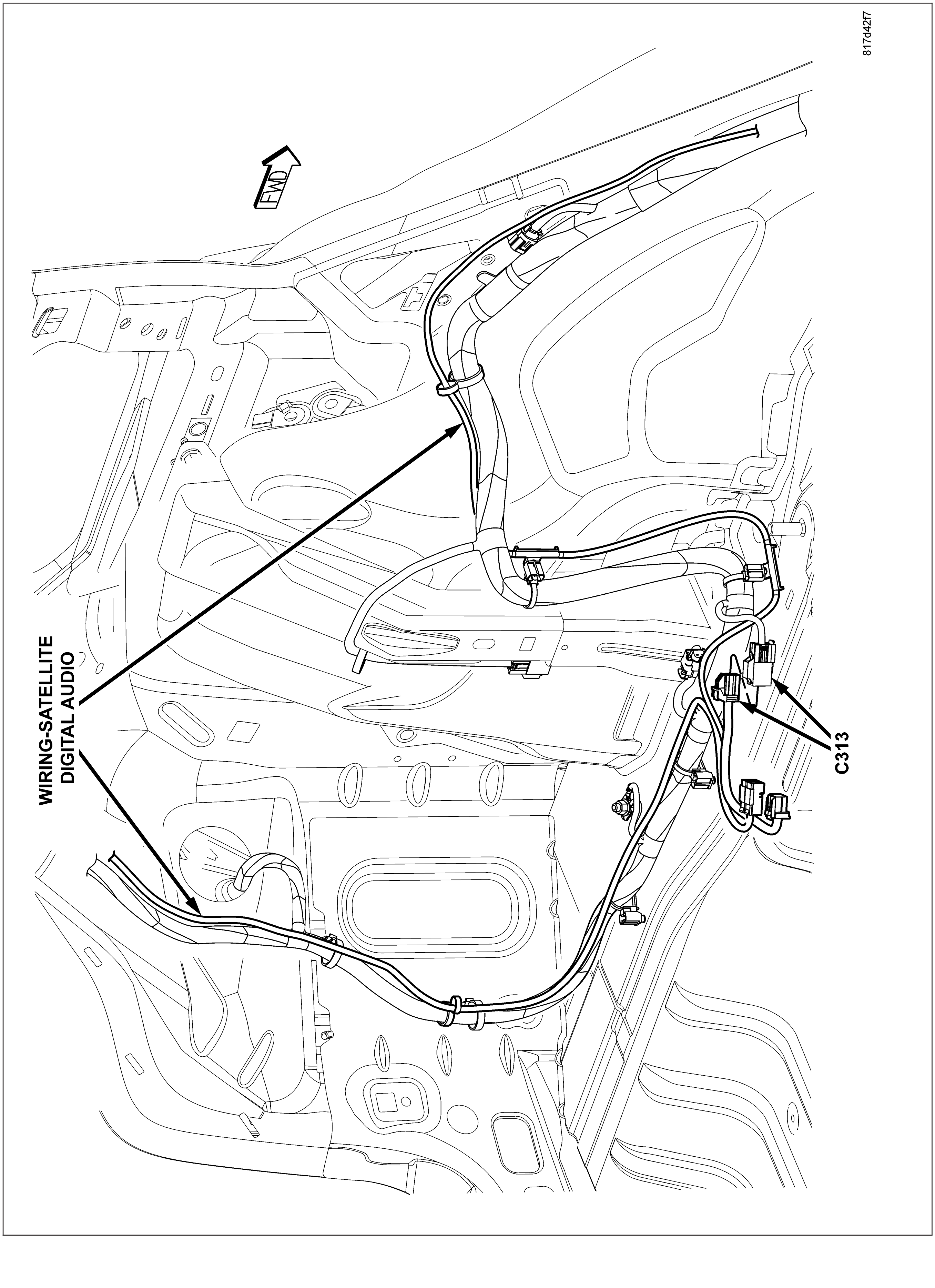


Fig. 62 BODY - LEFT REAR (SATELLITE RADIO)

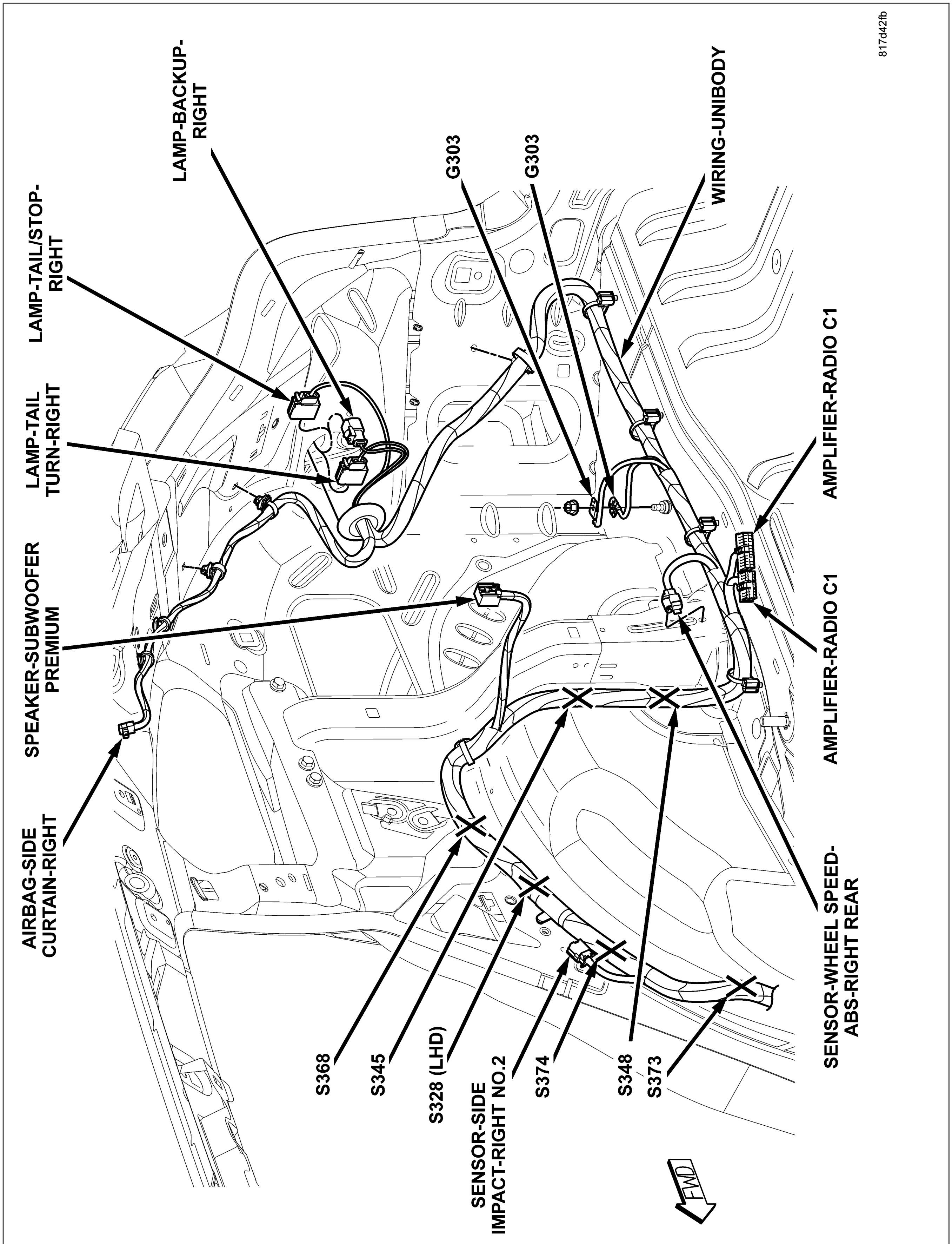


Fig. 63 BODY - RIGHT REAR

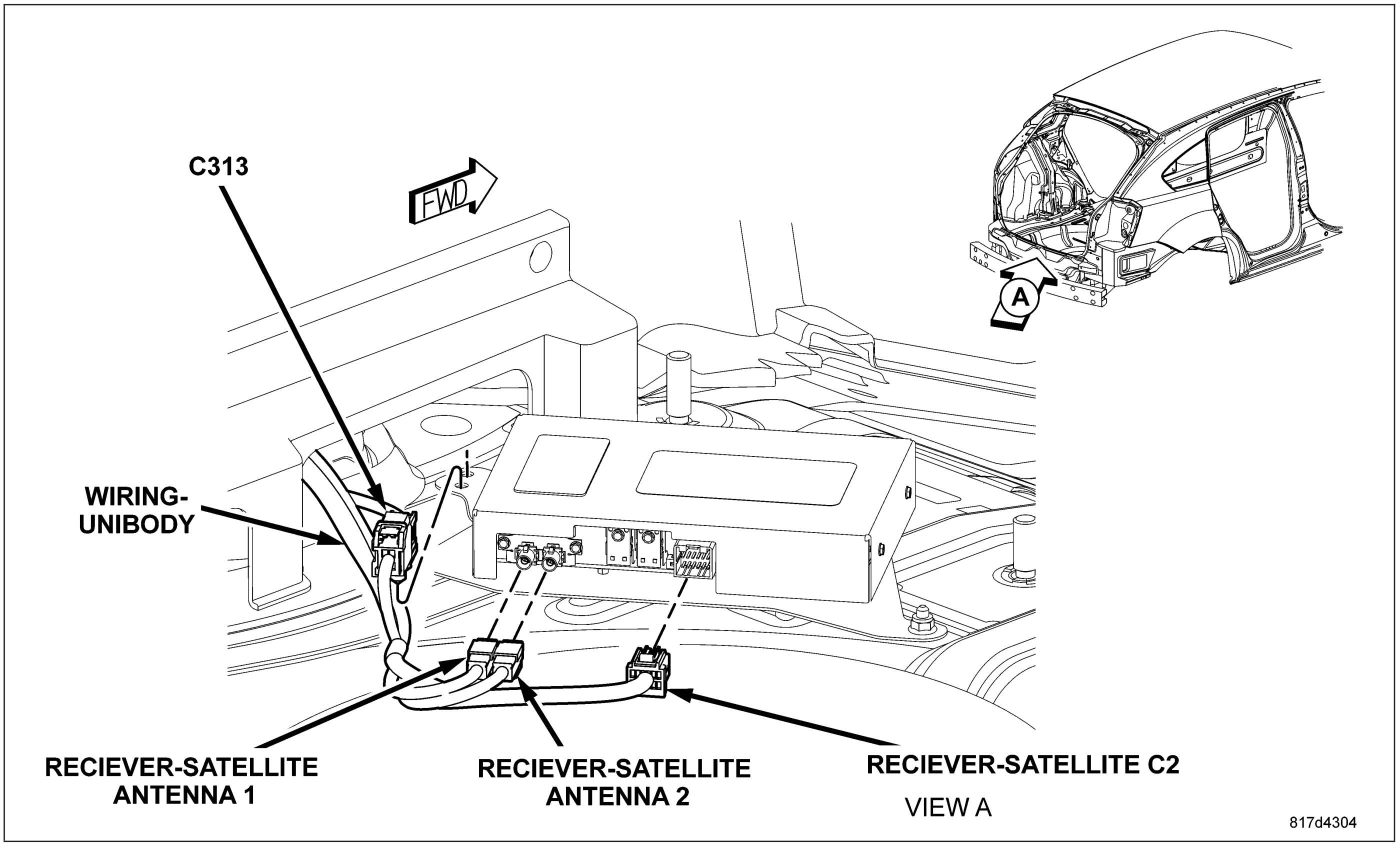


Fig. 64 LUGGAGE COMPARTMENT - LOWER LEFT (SATELLITE RADIO)

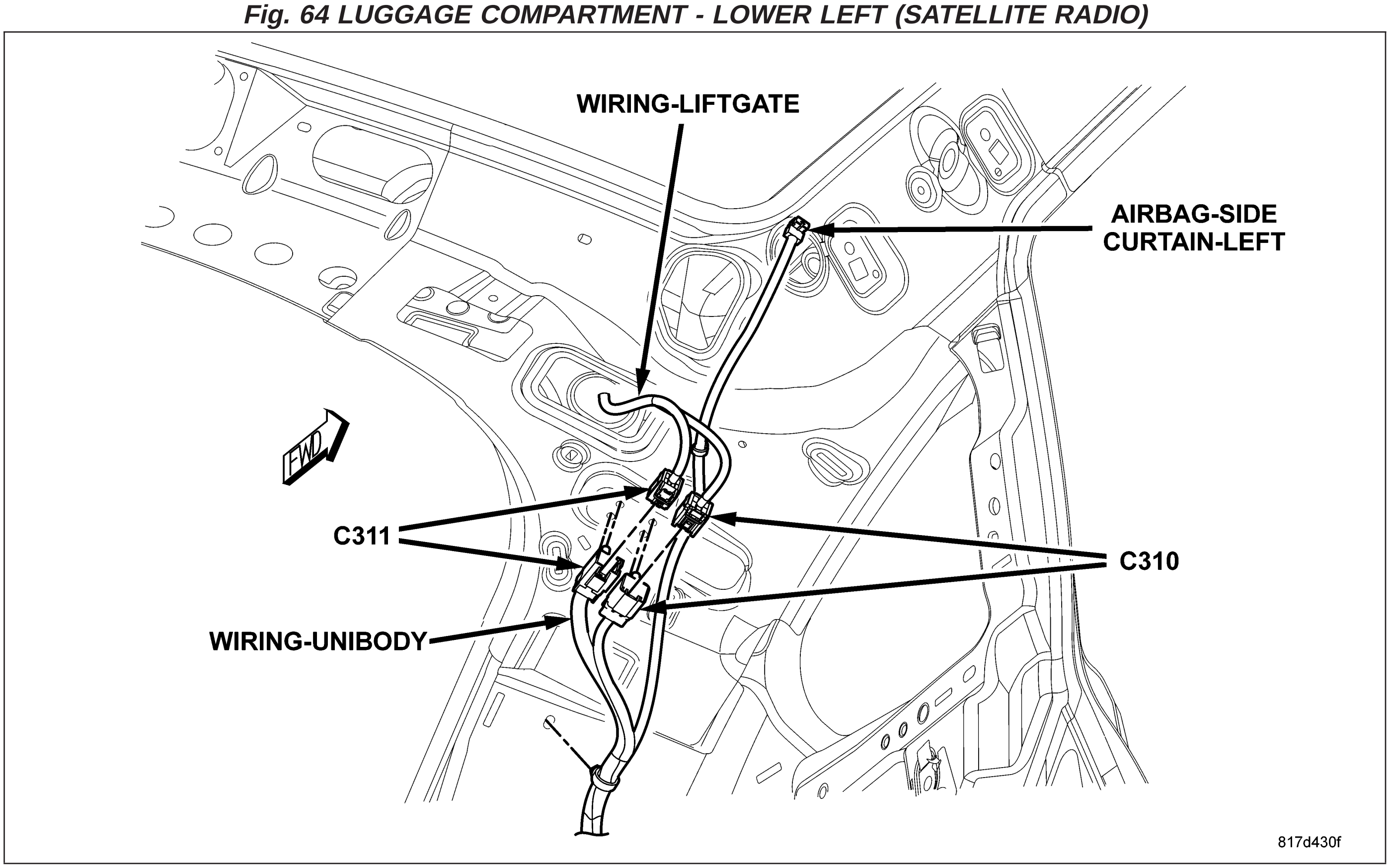


Fig. 65 BODY - UPPER LEFT REAR

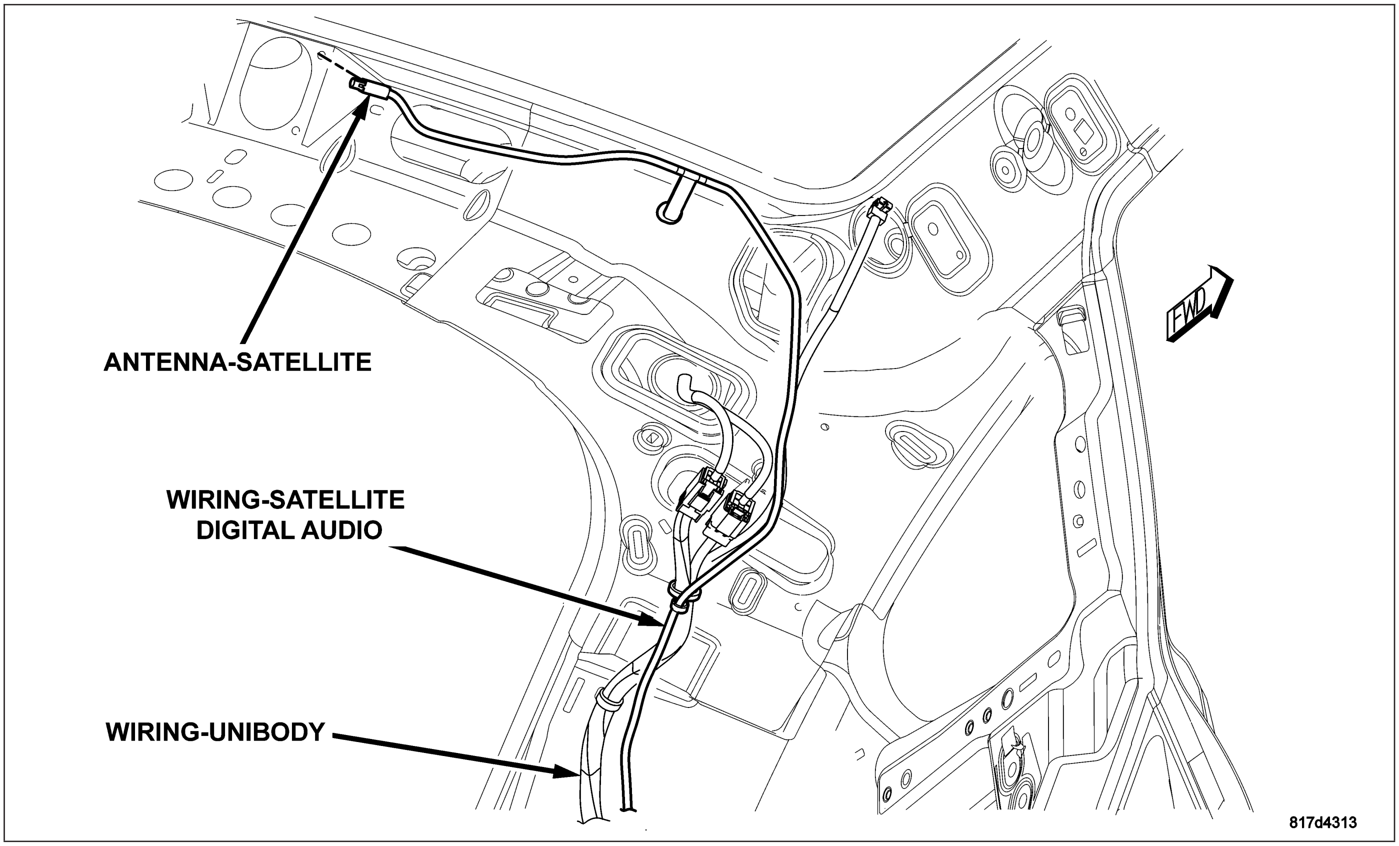


Fig. 66 BODY - UPPER LEFT REAR (SATELLITE RADIO)

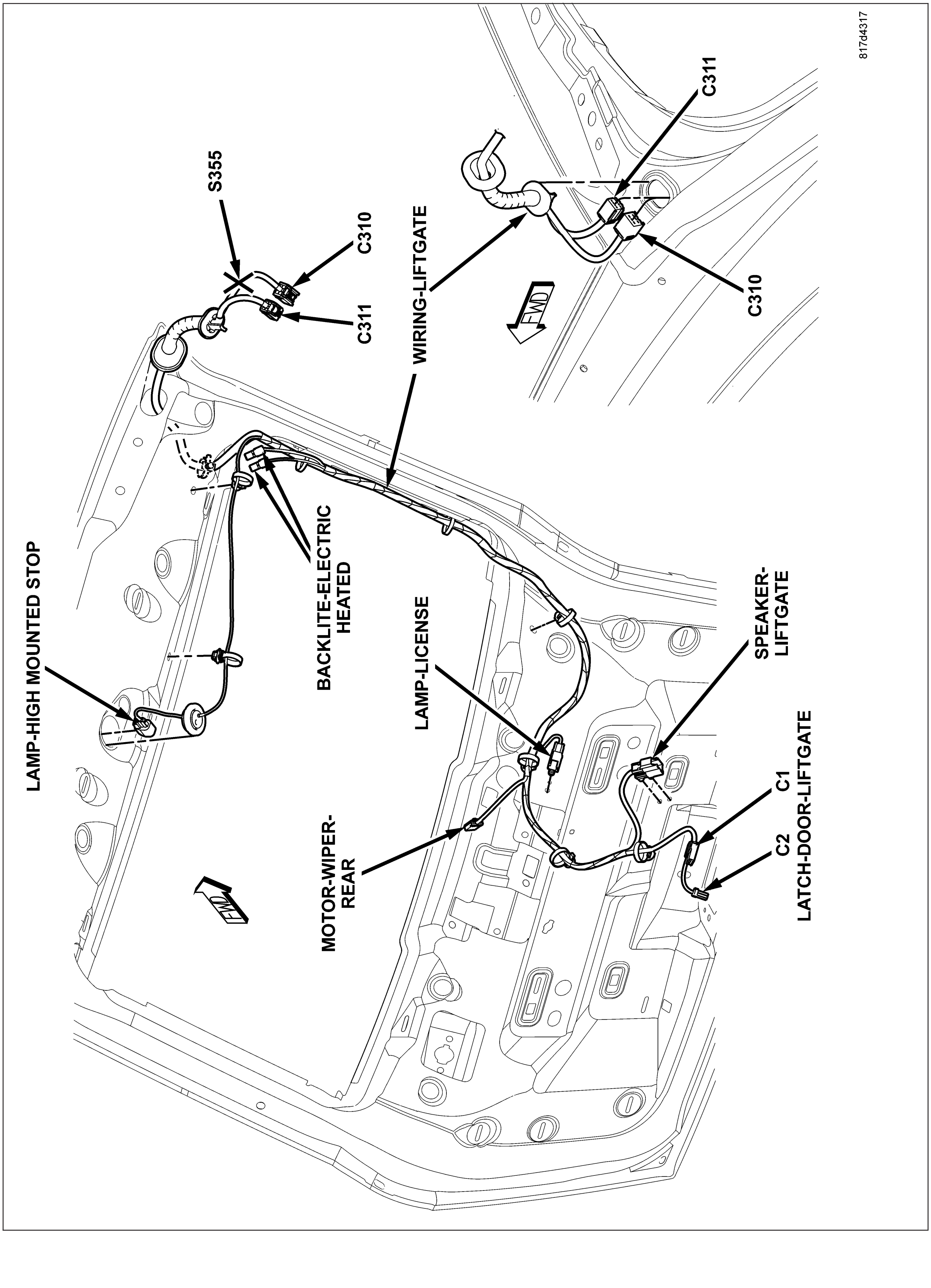


Fig. 67 LIFTGATE

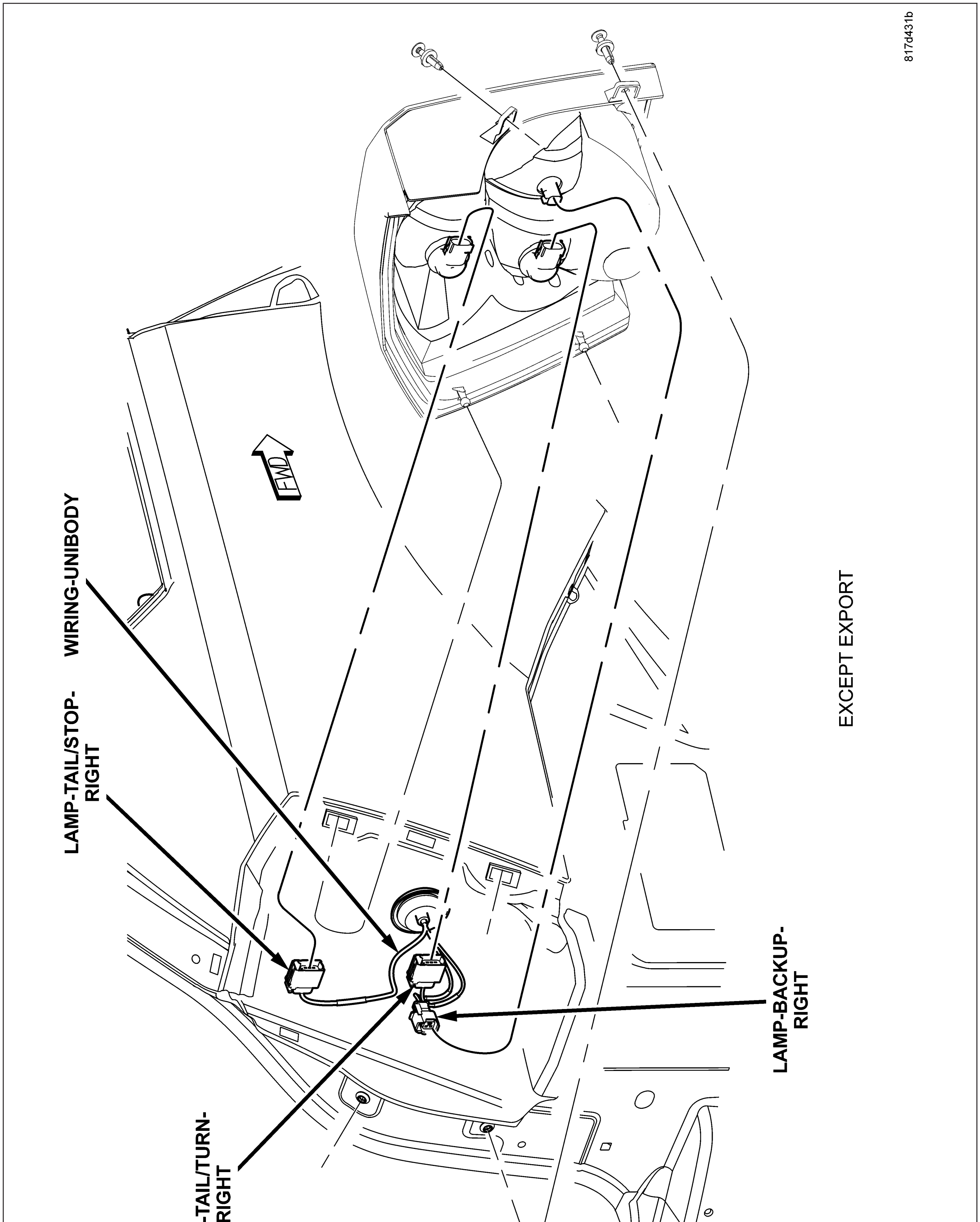


Fig. 68 LIGHTING - REAR (EXCEPT EXPORT)

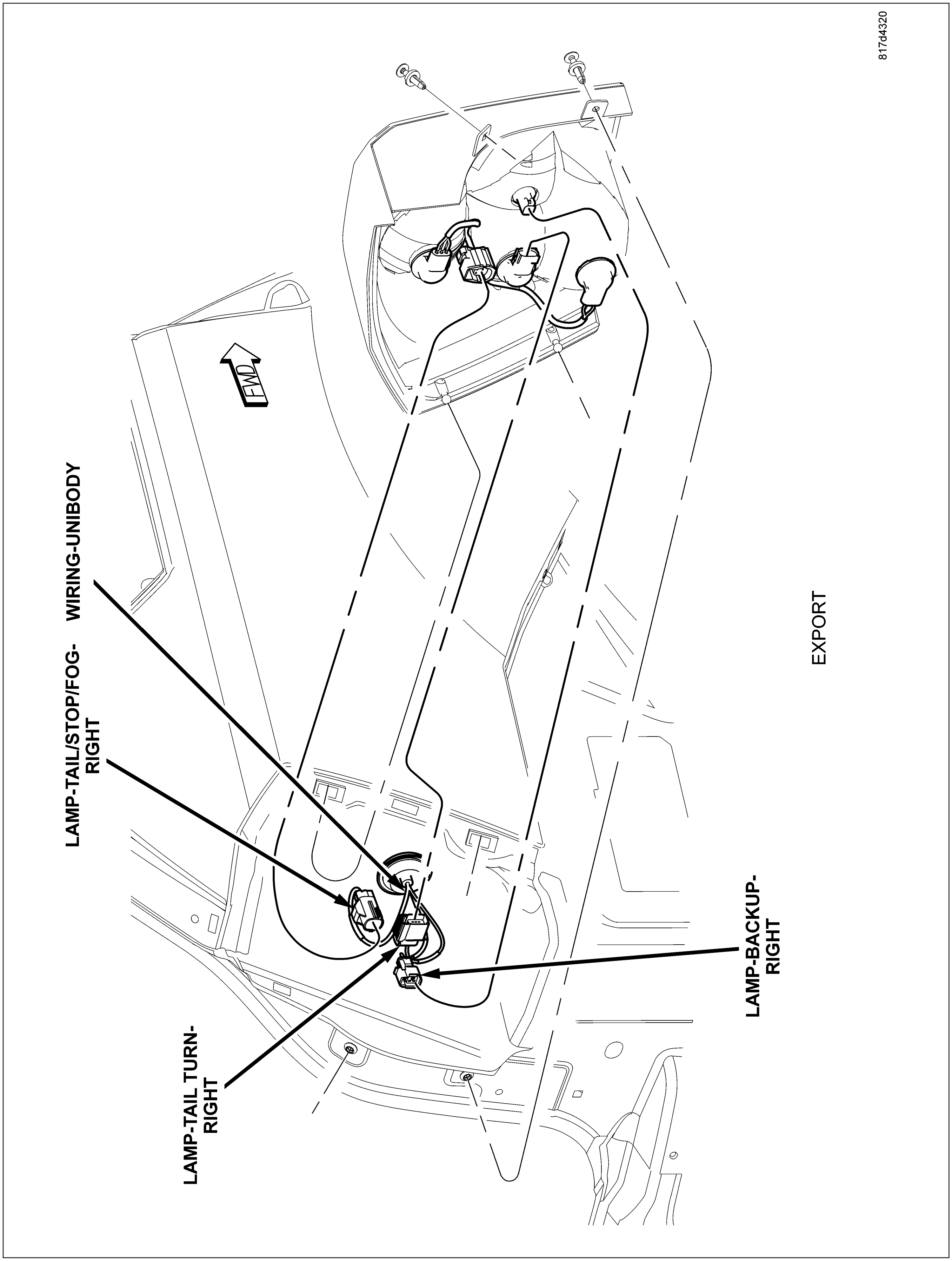


Fig. 69 LIGHTING - RIGHT REAR (EXPORT) (LEFT SIMILAR)

8W-97 POWER DISTRIBUTION

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POWER DISTRIBUTION

DESCRIPTION

The power distribution system for this vehicle consists of the following components:

- Totally Integrated Power Module (TIPM)
- Fuse Block

OPERATION

The power distribution system for this vehicle is designed to provide safe, reliable, centralized, and convenient to access, distribution of the electrical current required to operate all of the many standard and optional factory-installed electrical and electronic powertrain, chassis, safety, comfort and convenience systems. At the same time, these systems were designed to provide centralized locations for conducting diagnosis of faulty circuits, and for sourcing the additional current requirements of many aftermarket vehicle accessory and convenience items.

These power distribution systems also incorporate various types of circuit control and protection features, including:

- Fuses
- Fuse cartridges
- Fusible links
- Automatic resetting circuit breakers
- Relays
- Flashers
- Timers
- Circuit splice blocks.

CIGAR LIGHTER/POWER OUTLET

DESCRIPTION

INSTRUMENT PANEL MOUNTED

An instrument panel mounted cigar lighter/power outlet receptacle is optional equipment on this model. On models equipped with the optional Smoker's Package, the cigar lighter knob and heating element are included. On models without the Smoker's Package, the cigar lighter receptacle is equipped with a snap fit plastic cap and is treated as an auxiliary power outlet. The cigar lighter receptacle is installed in the instrument panel accessory switch bezel, which is located near the bottom of the instrument panel center stack area, below the radio. The cigar lighter base is secured by a snap fit within the center lower bezel. This power outlet has a constant 12 volt battery feed.

The cigar lighter receptacle is serviced with the accessory switch bezel and if defective, the entire switch bezel must be replaced. The plastic cap and the knob and heating element unit are available for service replacement. These components cannot be repaired and, if faulty or damaged, they must be replaced.

FRONT CONSOLE AND REAR CARGO MOUNTED

A front console mounted power outlet is standard equipment and a rear cargo area power outlet is optional equipment on this model. The front console mounted power outlet is mounted near the front of the console just in front of the cup holders. This outlet can be used as a cigar lighter or power outlet, but only has 12 volt battery voltage when the ignition is in the ON or ACC positions. The rear power outlet is installed in the right rear quarter trim panel, near the spare tire jack (2). The power outlet base and mount are secured by a snap fit within the quarter trim panel. A plastic protective cap snaps into the power outlet base when the power outlet is not being used, and hangs from the power outlet base mount by an integral bail strap while the power outlet is in use. While the power outlet is very similar to a cigar lighter base unit, it does not include the two small spring-clip retainers inside the bottom of the receptacle shell that are used to secure the cigar lighter heating element to the insulated contact. It has 12 volt battery voltage when the ignition is in the ON or ACC positions.

OPERATION

CIGAR LIGHTER/POWER OUTLET

The cigar lighter consists of two major components: a knob and heating element unit, and the cigar lighter base or receptacle shell. The receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current.

The cigar lighter knob and heating element are encased within a spring-loaded housing, which also features a sliding protective heat shield. When the knob and heating element are inserted in the receptacle shell, the heating element resistor coil is grounded through its housing to the receptacle shell. If the cigar lighter knob is pushed inward, the heat shield slides up toward the knob exposing the heating element, and the heating element extends from the housing toward the insulated contact in the bottom of the receptacle shell.

Two small spring-clip retainers are located on either side of the insulated contact inside the bottom of the receptacle shell. These clips engage and hold the heating element against the insulated contact long enough for the resistor coil to heat up. When the heating element is engaged with the contact, battery current can flow through the resistor coil to ground, causing the resistor coil to heat.

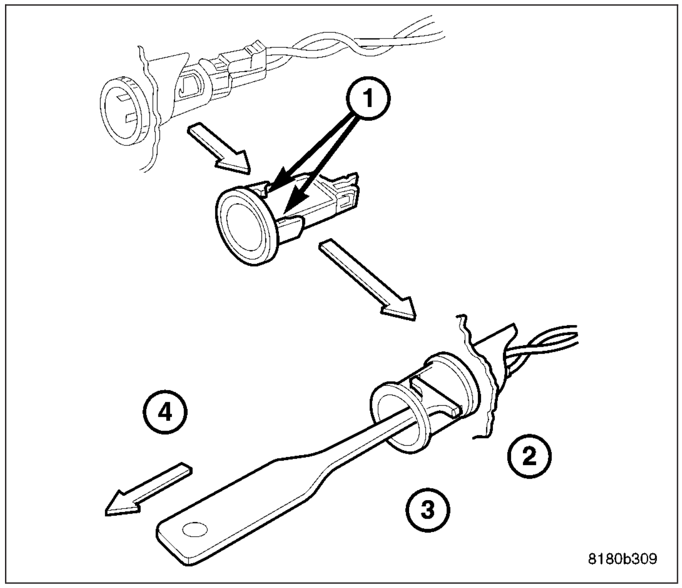
When the resistor coil becomes sufficiently heated, excess heat radiates from the heating element causing the spring-clips to expand. Once the spring-clips expand far enough to release the heating element, the spring-loaded housing forces the knob and heating element to pop back outward to their relaxed position. When the cigar lighter knob and element are pulled out of the receptacle shell, the protective heat shield slides downward on the housing so that the heating element is recessed and shielded around its circumference for safety.

POWER OUTLET

The power outlet base or receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The power outlet receives battery voltage from a fuse in the Totally Integrated Power Module (TIPM) through a fuse in the fuse block when the ignition is in the ON or ACC positions.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Look inside and note position of the retaining bosses (1).
3. Using special tool 9857 Power Outlet Remover. Insert the tool forcing the bosses out of base.
4. Pull out the base through mounting ring (4) by gently rocking the tool (3).
5. Disconnect the base wires.
6. Set base aside and remove base mount ring.



INSTALLATION

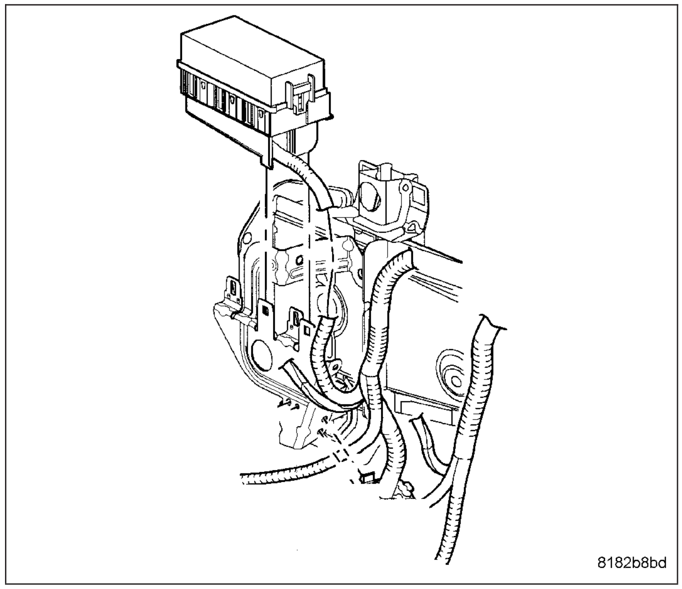
1. Position mount ring to the instrument panel and feed the wires through ring. Index the cap and the mount ring with the index tab at 9 o'clock to the key in the instrument panel. Install the ring.
2. Connect wires to base. Orient base alignment rib at 11 o'clock to mate the groove in mount ring at the same location
3. Push base into the bezel till it locks.
4. Install cigar lighter cap.
5. Connect the battery negative cable.

FUSE BLOCK

DESCRIPTION

An electrical Fuse Block is located in the left front bumper fascia. It serves to simplify and centralize numerous electrical components, as well as to distribute electrical current to many of the accessory systems in the vehicle.

The Fuse Block is positioned on a mounting bracket up and under the left instrument panel. It is secured by two screws. The fuse block is concealed behind a fuse panel cover. The fuse panel cover is a snap-fit access cover that conceals the fuse block fuses. A fuse layout placard is on the back of the end cap to ensure proper fuse identification.



OPERATION

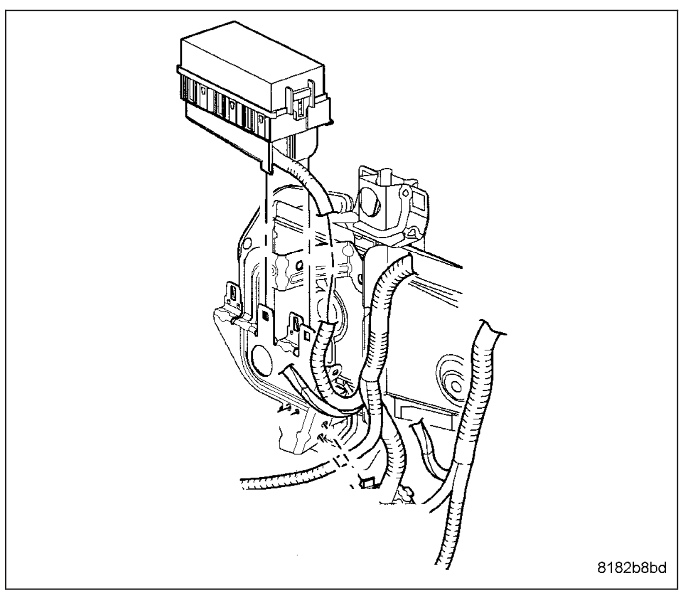
The fuse block houses blade-type fuses and automatic resetting circuit breakers. Internal connection of all the fuse block circuits is accomplished by an intricate network of hard wiring and bus bars. Refer to Wiring Diagrams for complete circuit diagrams.

The fuses and circuit breakers are available for service replacement. The fuse block unit cannot be repaired and is only serviced as an assembly. If any circuit or the fuse block housing is faulty or damaged, the entire fuse block must be replaced.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING COLUMN OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

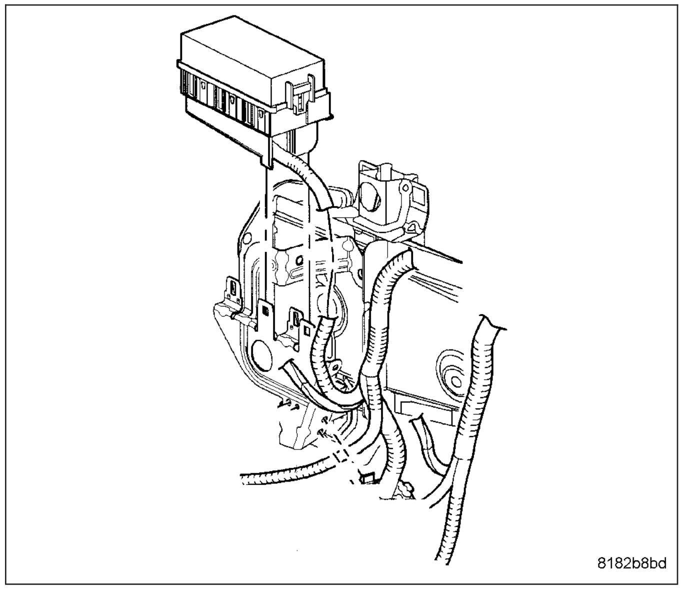
1. Disconnect and isolate the battery negative cable.
2. Remove the front bumper fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
3. Remove mounting fasteners.
4. Remove the wire harness and fuse block.



INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING COLUMN OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

1. Install the new wire harness and fuse block.
2. Install mounting fasteners.
3. Install the front bumper fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
4. Connect the battery negative cable.



IOD FUSE

DESCRIPTION

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse that is disconnected within the Totally Integrated Power Module (TIPM) when the vehicle is shipped from the factory. Dealer personnel are to reconnect the IOD fuse in the TIPM as part of the preparation procedures performed just prior to new vehicle delivery.

OPERATION

The term ignition-off draw identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. The IOD fuse feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the Off position, including the clock. The only reason the IOD fuse is disconnected is to reduce the normal IOD of the vehicle electrical system during new vehicle transportation and pre-delivery storage to reduce battery depletion, while still allowing vehicle operation so that the vehicle can be loaded, unloaded and moved as needed by both vehicle transportation company and dealer personnel.

The IOD fuse is disconnected from Totally Integrated Power Module (TIPM) fuse cavity 18 when the vehicle is shipped from the assembly plant. Dealer personnel must reconnect the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation. Once the vehicle is prepared for delivery, the IOD function of this fuse becomes transparent and the fuse that has been assigned the IOD designation becomes only another Fused B(+) circuit fuse. The IOD fuse serves no useful purpose to the dealer technician in the service or diagnosis of any vehicle system or condition, other than the same purpose as that of any other standard circuit protection device.

The IOD fuse can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about thirty days. However, it must be remembered that disconnecting the IOD fuse will not eliminate IOD, but only reduce this normal condition. If a vehicle will be stored for more than about thirty days, the battery negative cable should be disconnected to eliminate normal IOD; and, the battery should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged.

REMOVAL

NOTE: When removing or installing the IOD fuse, it is important that the ignition switch be in the Off position. Failure to place the ignition switch in the Off position can cause the radio display to become scrambled when the IOD fuse is installed. Removing and installing the IOD fuse again with the ignition switch in the Off position will usually correct the scrambled radio display condition.

1. Turn the ignition switch to the Off position.
2. Remove the cover from the Totally Integrated Power Module (TIPM).
3. Remove fuse 7/8 from the TIPM.

INSTALLATION

1. Insert fuse 7/8 into the Totally Integrated Power Module (TIPM).
2. Install the cover to the TIPM.

POWER DISTRIBUTION CENTER

DESCRIPTION

All of the electrical current distributed throughout this vehicle is directed through the standard equipment Totally Integrated Power Module (TIPM) (1). The molded plastic TIPM housing is located in the left front corner of the engine compartment, just behind the air cleaner housing and the battery. The TIPM housing has a molded plastic cover. The TIPM cover is easily removed for service access and has a convenient fuse and relay layout label affixed to the inside surface of the cover to ensure proper component identification.

The TIPM housing is secured to the left inner fender well an indexing pin and one screw. All of the TIPM outputs are through the integral engine compartment wire harness.

OPERATION

All of the current from the generator cable connection goes to the battery through a 10 gauge fusible link that is secured with a nut to the positive battery terminal at the starter. Internal connection of all the Totally Integrated Power Module (TIPM) circuits is accomplished by an intricate network of hard wiring and bus bars. Refer to Wiring Diagrams for complete circuit diagrams.

The fusible link, fuses and relays are available for service replacement. The TIPM unit cannot be repaired and is only serviced as a unit with the engine compartment wire harness. If the TIPM is inoperative or damaged, the engine compartment wire harness assembly must be replaced.

REMOVAL

The TIPM (TIPM) is serviced as a unit with the engine compartment wire harness. If any internal circuit of the TIPM or the TIPM housing is faulty or damaged, the entire TIPM and engine compartment wire harness unit must be replaced. Refer to Wiring Diagrams for more information on the locations of the affected connectors.

1. Open hood.
2. Disconnect and isolate the battery negative cable.
3. Disconnect each of the engine compartment wire harness connectors.
4. Remove the fasteners that secure each of the engine compartment wire harness ground eyelets to the vehicle body and chassis components.
5. Disengage each of the retainers that secure the engine compartment wire harness to the vehicle body and chassis components.
6. Disengage and remove the TIPM housing from its mounting bracket.
7. Remove the TIPM and the engine compartment wire harness from the engine compartment as a unit.

INSTALLATION

The Totally Integrated Power Module (TIPM) is serviced as a unit with the engine compartment wire harness. If any internal circuit of the TIPM or the TIPM housing is faulty or damaged, the entire TIPM and engine compartment wire harness unit must be replaced.

NOTE: If the power distribution center (TIPM) is being replaced with a new unit, be certain to transfer each of the fuses and relays from the old power distribution center to the proper cavities of the new power distribution center. Refer to Wiring Diagrams for the proper power distribution center cavity assignments.

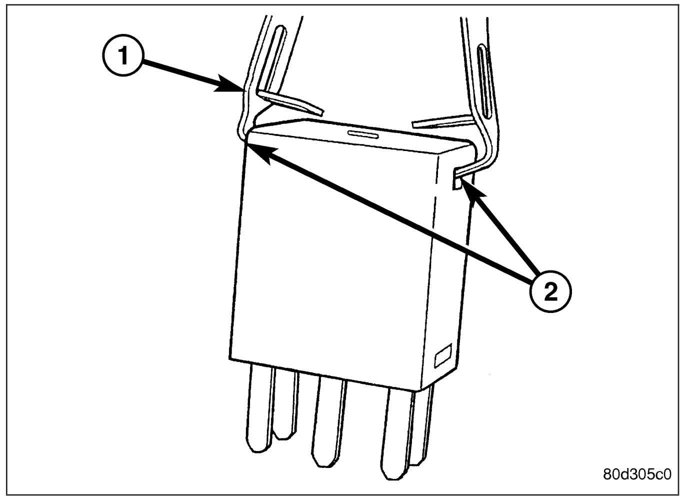
1. Position the TIPM in the engine compartment.
2. Align the TIPM on its mounting bracket and install.
3. Route the engine compartment wire harness from the TIPM through the engine compartment, engaging each of the harness retainers to the mounting provisions in the vehicle body and chassis components. Refer to Wiring Diagrams for more information on the harness routing and retainer locations.
4. Install and tighten the fasteners that secure each of the engine compartment wire harness ground eyelets to the vehicle body and chassis components. Refer to Wiring Diagrams for more information on the ground eyelet locations.
5. Reconnect each of the engine compartment wire harness connectors. Refer to Wiring Diagrams for more information on the locations of the affected connectors.

6. Torque nut retaining positive battery cable at TIPM to 96 - 141 N·m (85 - 130 in. lbs.).
7. Reconnect the battery negative cable.
8. Close hood.
9. Verify vehicle and system operation.

RELAY

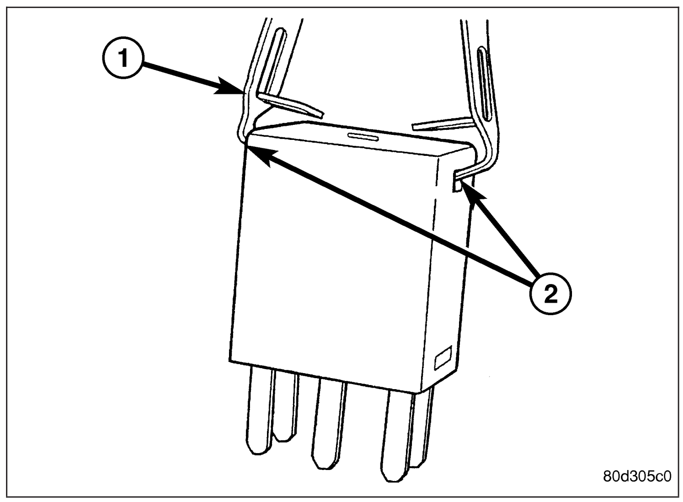
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove cover from Totally Integrated Power module (TIPM).
3. Using special tool C-4817 (1), grip the relay (2) by the sides and pull upward with an even effort.



INSTALLATION

1. Align relay (2) with Totally Integrated Power Module (TIPM) and press into position.
2. Install cover to TIPM.
3. Connect battery negative cable.



ENGINE

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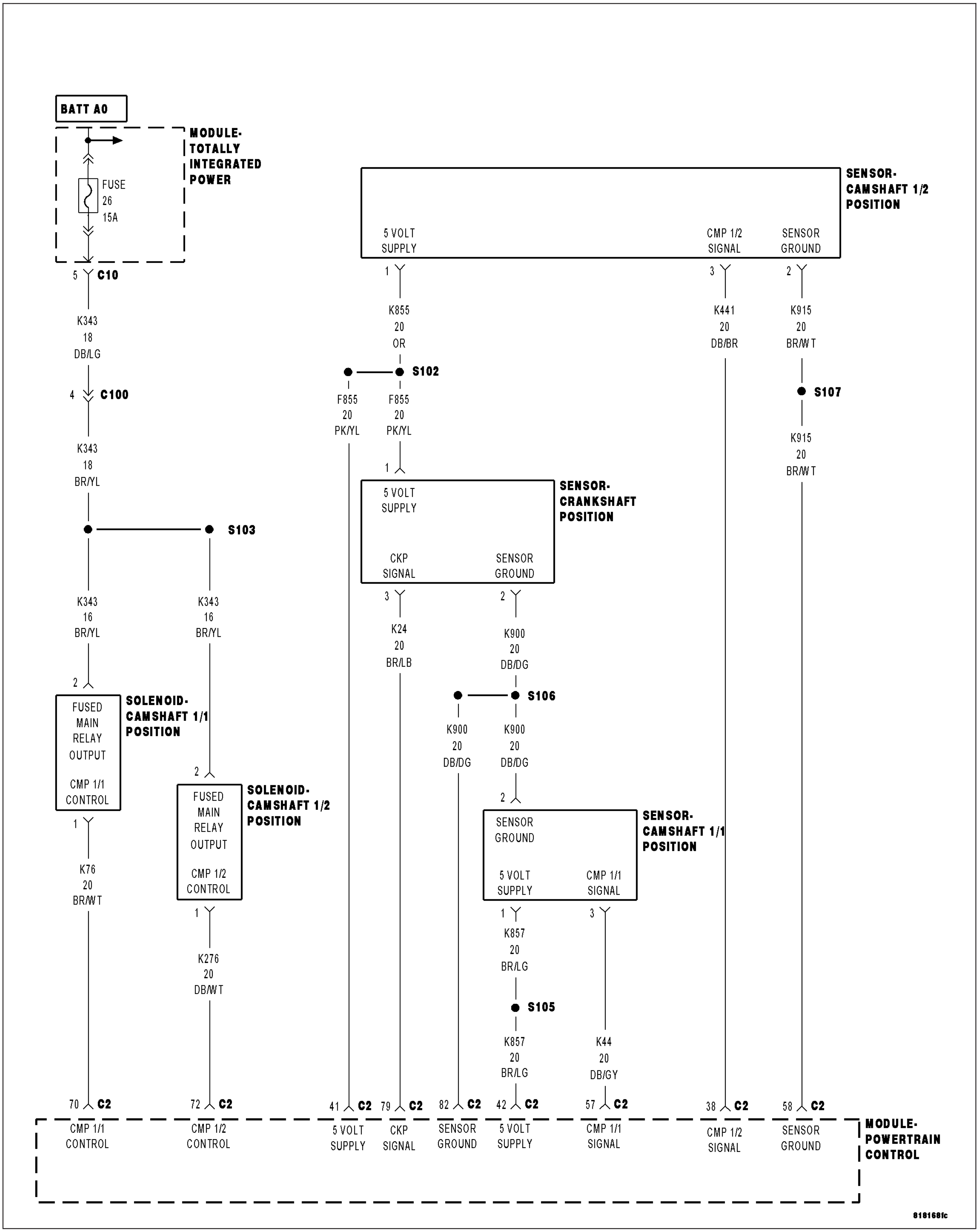
ENGINE ELECTRICAL DIAGNOSTICS - GPEC

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ENGINE ELECTRICAL DIAGNOSTICS - GPEC

DIAGNOSIS AND TESTING

P000A-BANK 1 CAMSHAFT 1 POSITION SLOW RESPONSE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Variable Valve Timing (VVT) rationality is monitored under the following conditions: (1) Cam phasing is commanded off of the default (lockpin) position; (2) Oil temperature is between 15° F and 280° F (-9°C to 138°C); (3) Battery voltage is greater than 10 volts; (3) Engine speed is at least 1000 to 1400 rpm, depending on oil temperature; (4) No CMP sensor, CKP sensor, or OBDI plausibility errors. Before VVT can be enabled, reference adaptation must be completed.
- **Set Condition:**
  The actual camshaft phasing setpoint does not match the desired camshaft phasing setpoint.

Possible Causes
INTERMITTENT DTC
ENGINE OIL DIRTY OR CONTAMINATED
INCORRECT ENGINE OIL VISCOSITY
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE
(K76) CMP 1/1 CONTROL CIRCUIT HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SOLENOID
CAMSHAFT PHASER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

Dual Variable Valve Timing (VVT) allows the PCM to monitor and adjust the position of each camshaft, based on desired torque levels and engine operating conditions. The PCM controls two solenoid operated control valves, one for each camshaft, that are used to direct oil pressure to hydraulic actuators mounted between each camshaft and its driving sprocket. The oil pressure alters the angular position or phasing of each camshaft relative to crankshaft rotation. A sensor is used to monitor the position of each camshaft.

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any system voltage DTCs before continuing with this test.

NOTE: Diagnose and repair any CMP sensor or CKP sensor DTCs before continuing with this test.

NOTE: Diagnose and repair any oil pressure or oil pressure sensor DTCs before continuing with this test.
Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Test drive the vehicle under the conditions in which the DTC is monitored, as outlined above.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE OIL DIRTY OR CONTAMINATED

Turn the ignition off.

Inspect engine oil for signs of contamination, sludge, or foreign material.

Were any problems found?

Yes >> Clean the engine oil system, including oil passages and, if necessary, replace the Oil Control Valve inlet screen(s), in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. INCORRECT ENGINE OIL VISCOSITY

Review service history to determine if the correct viscosity engine oil was used.

Were any problems found?

Yes >> Change the engine oil in accordance with the Service Information and retest.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CAMSHAFT 1/1 POSITION SOLENOID CONTROL ACTUATION

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to toggle on and off.

Listen for the Camshaft 1/1 Position Solenoid to click open and closed during the actuation.

Does the Camshaft 1/1 Position Solenoid click open and closed during the actuation?

Yes >> Go to 8

No >> Go to 5

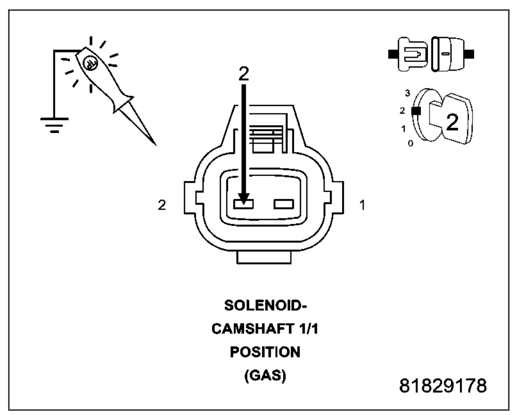
5. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 6

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K76) CMP 1/1 CONTROL CIRCUIT HIGH RESISTANCE

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to the ON (100%) position.

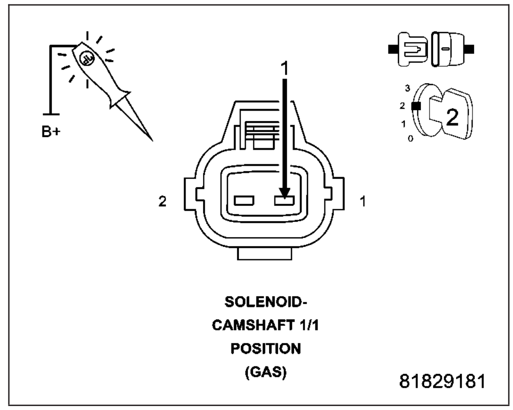
Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 7

No >> Repair the (K76) CMP 1/1 Control circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



7. CAMSHAFT 1/1 POSITION SOLENOID

Turn the ignition off.

Inspect the wiring and connectors between the Camshaft 1/1 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Remove the Camshaft 1/1 Position Solenoid in accordance with the Service Information.

Inspect the Camshaft 1/1 Position Solenoid for contamination, foreign material, or any condition that would restrict movement of the valve.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. CAMSHAFT PHASER

Turn the ignition off.

Remove the appropriate Camshaft Phaser in accordance with the Service information.

Inspect the Phaser for contamination, foreign material, or any condition that would restrict operation of the Phaser.

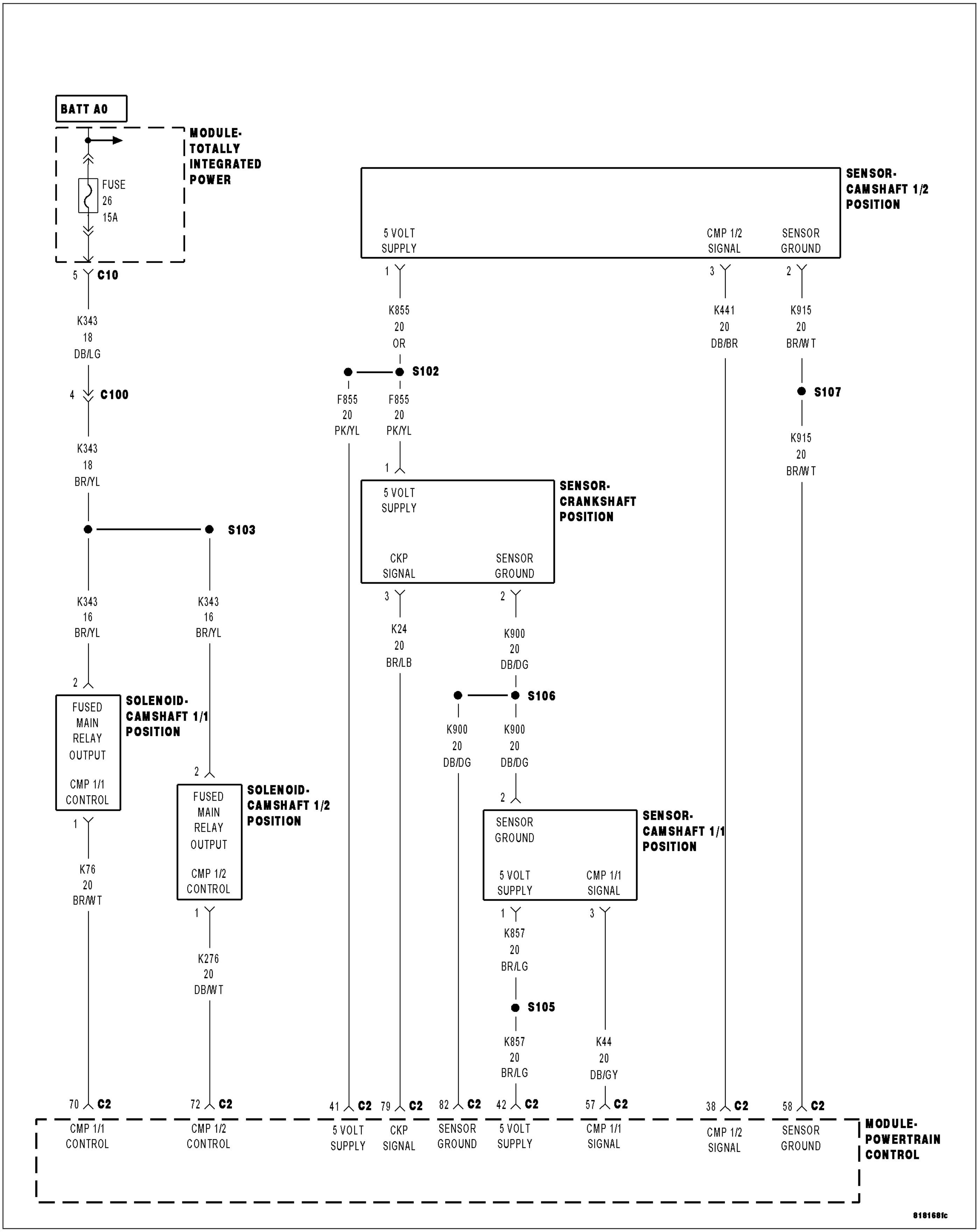
Inspect the Phaser oil passages for signs of sludge or foreign material.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the appropriate Camshaft Phaser in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P000B-BANK 1 CAMSHAFT 2 POSITION SLOW RESPONSE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Variable Valve Timing (VVT) rationality is monitored under the following conditions: (1) Cam phasing is commanded off of the default (lockpin) position; (2) Oil temperature is between 15° F and 280° F (-9°C to 138°C); (3) Battery voltage is greater than 10 volts; (3) Engine speed is at least 1000 to 1400 rpm, depending on oil temperature; (4) No CMP sensor, CKP sensor, or OBDI plausibility errors. Before VVT can be enabled, reference adaptation must be completed.
- **Set Condition:**
  The actual camshaft phasing setpoint does not match the desired camshaft phasing setpoint.

Possible Causes
INTERMITTENT DTC
ENGINE OIL DIRTY OR CONTAMINATED
INCORRECT ENGINE OIL VISCOSITY
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE
(K276) CMP 1/2 CONTROL CIRCUIT HIGH RESISTANCE
CAMSHAFT 1/2 POSITION SOLENOID
CAMSHAFT PHASER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

Dual Variable Valve Timing (VVT) allows the PCM to monitor and adjust the position of each camshaft, based on desired torque levels and engine operating conditions. The PCM controls two solenoid operated control valves, one for each camshaft, that are used to direct oil pressure to hydraulic actuators mounted between each camshaft and its driving sprocket. The oil pressure alters the angular position or phasing of each camshaft relative to crankshaft rotation. A sensor is used to monitor the position of each camshaft.

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any system voltage DTCs before continuing with this test.

NOTE: Diagnose and repair any CMP sensor or CKP sensor DTCs before continuing with this test.

NOTE: Diagnose and repair any oil pressure or oil pressure sensor DTCs before continuing with this test.

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Test drive the vehicle under the conditions in which the DTC is monitored, as outlined above.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE OIL DIRTY OR CONTAMINATED

Turn the ignition off.

Inspect engine oil for signs of contamination, sludge, or foreign material.

Were any problems found?

Yes >> Clean the engine oil system, including oil passages and, if necessary, replace the Oil Control Valve inlet screen(s), in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. INCORRECT ENGINE OIL VISCOSITY

Review service history to determine if the correct viscosity engine oil was used.

Were any problems found?

Yes >> Change the engine oil in accordance with the Service Information and retest.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CAMSHAFT 1/2 POSITION SOLENOID CONTROL ACTUATION

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to toggle on and off.

Listen for the Camshaft 1/2 Position Solenoid to click open and closed during the actuation.

Does the Camshaft 1/2 Position Solenoid click open and closed during the actuation?

Yes >> Go to 8

No >> Go to 5

5. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE

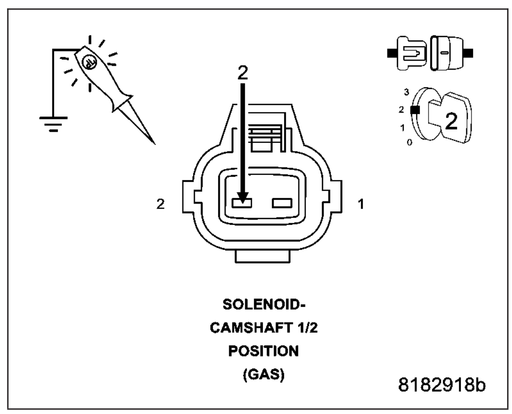
Turn the ignition off.

Disconnect the Camshaft 1/2 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/2 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



Is the test light illuminated and bright?

Yes >> Go to 6

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance.

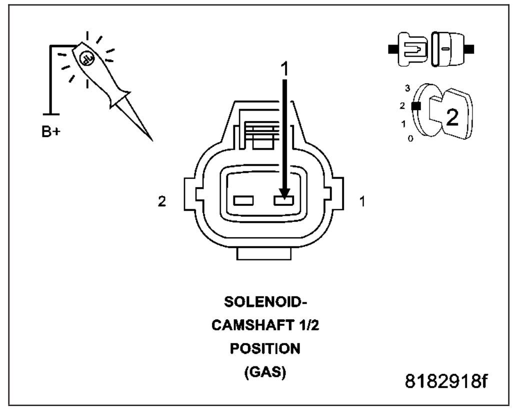
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K276) CMP 1/2 CONTROL CIRCUIT HIGH RESISTANCE

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



Is the test light illuminated and bright?

Yes >> Go to 7

No >> Repair the (K276) CMP 1/2 Control circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. CAMSHAFT 1/2 POSITION SOLENOID

Turn the ignition off.

Inspect the wiring and connectors between the Camshaft 1/2 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Remove the Camshaft 1/2 Position Solenoid in accordance with the Service Information.

Inspect the Camshaft 1/2 Position Solenoid for contamination, foreign material, or any condition that would restrict movement of the valve.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. CAMSHAFT PHASER

Turn the ignition off.

Remove the appropriate Camshaft Phaser in accordance with the Service information.

Inspect the Phaser for contamination, foreign material, or any condition that would restrict operation of the Phaser.

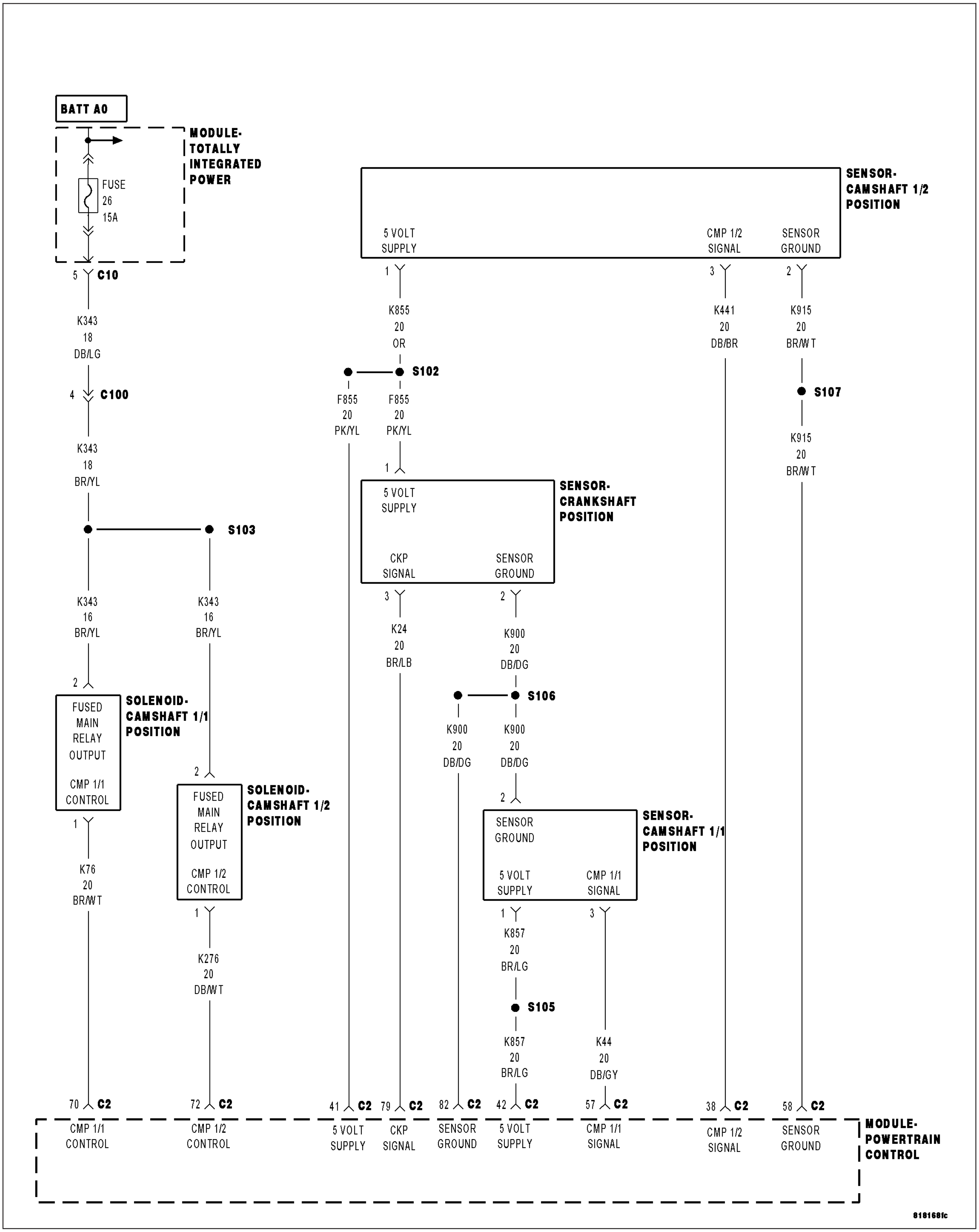
Inspect the Phaser oil passages for signs of sludge or foreign material.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the appropriate Camshaft Phaser in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0010-BANK 1 CAMSHAFT 1 POSITION ACTUATOR CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the Camshaft 1/1 Position Solenoid does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

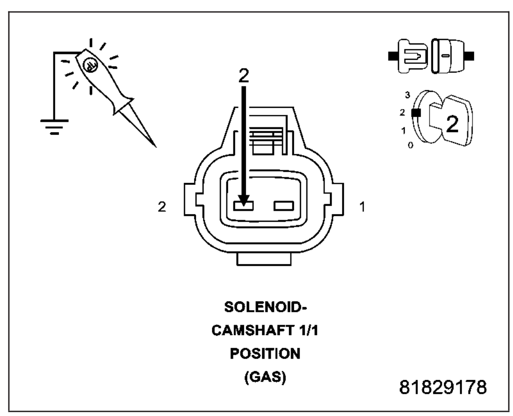
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

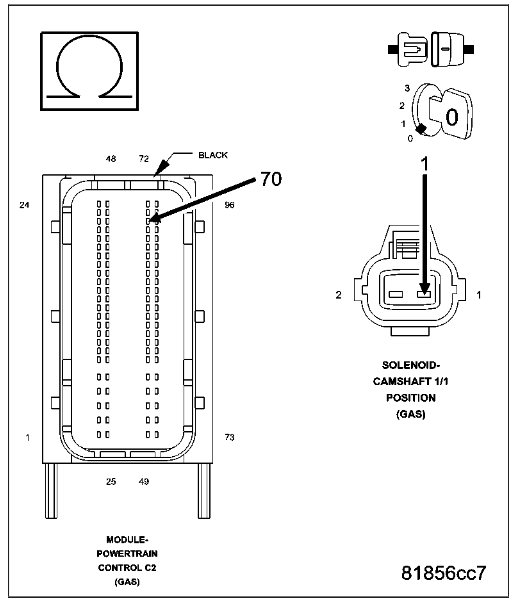
No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K76) CMP 1/1 Control circuit between the Camshaft 1/1 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K76) CMP 1/1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. CAMSHAFT 1/1 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Camshaft 1/1 Position Solenoid in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

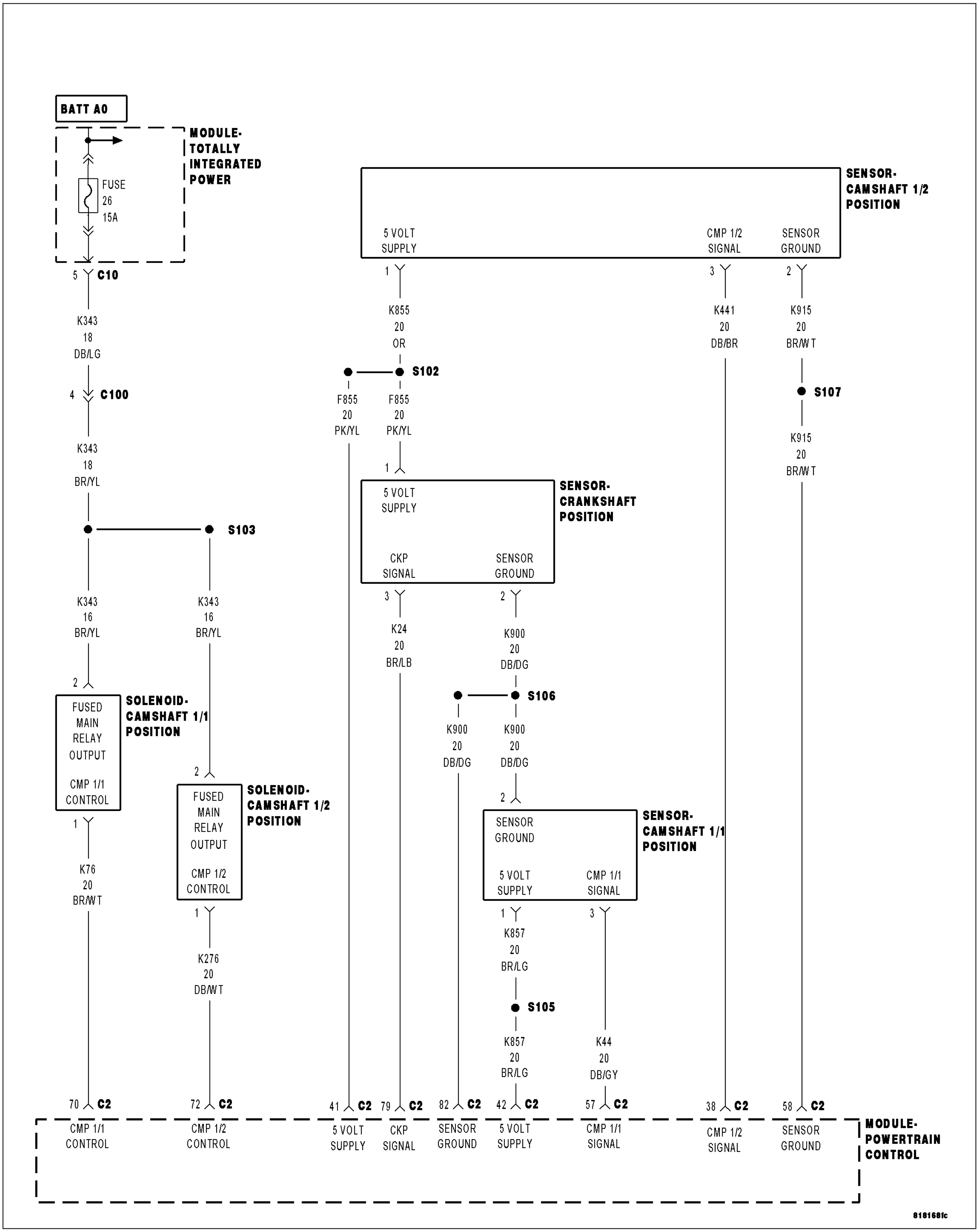
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0011-BANK 1 CAMSHAFT 1 POSITION TARGET PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Variable Valve Timing (VVT) rationality is monitored under the following conditions: (1) Cam phasing is commanded off of the default (lockpin) position; (2) Oil temperature is between 15° F and 280° F (-9°C to 138°C); (3) Battery voltage is greater than 10 volts; (3) Engine speed is at least 1000 to 1400 rpm, depending on oil temperature; (4) No CMP sensor, CKP sensor, or OBDI plausibility errors. Before VVT can be enabled, reference adaptation must be completed.
- **Set Condition:**
  The actual camshaft phasing setpoint does not match the desired camshaft phasing setpoint.

Possible Causes
INTERMITTENT DTC
ENGINE OIL DIRTY OR CONTAMINATED
INCORRECT ENGINE OIL VISCOSITY
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE
(K76) CMP 1/1 CONTROL CIRCUIT HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SOLENOID
CAMSHAFT PHASER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

Dual Variable Valve Timing (VVT) allows the PCM to monitor and adjust the position of each camshaft, based on desired torque levels and engine operating conditions. The PCM controls two solenoid operated control valves, one for each camshaft, that are used to direct oil pressure to hydraulic actuators mounted between each camshaft and its driving sprocket. The oil pressure alters the angular position or phasing of each camshaft relative to crankshaft rotation. A sensor is used to monitor the position of each camshaft.

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any system voltage DTCs before continuing with this test.

NOTE: Diagnose and repair any CMP sensor or CKP sensor DTCs before continuing with this test.

NOTE: Diagnose and repair any oil pressure or oil pressure sensor DTCs before continuing with this test.

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Test drive the vehicle under the conditions in which the DTC is monitored, as outlined above.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE OIL DIRTY OR CONTAMINATED

Turn the ignition off.

Inspect engine oil for signs of contamination, sludge, or foreign material.

Were any problems found?

Yes >> Clean the engine oil system, including oil passages and, if necessary, replace the Oil Control Valve inlet screen(s), in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. INCORRECT ENGINE OIL VISCOSITY

Review service history to determine if the correct viscosity engine oil was used.

Were any problems found?

Yes >> Change the engine oil in accordance with the Service Information and retest.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CAMSHAFT 1/1 POSITION SOLENOID CONTROL ACTUATION

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to toggle on and off.

Listen for the Camshaft 1/1 Position Solenoid to click open and closed during the actuation.

Does the Camshaft 1/1 Position Solenoid click open and closed during the actuation?

Yes >> Go to 8

No >> Go to 5

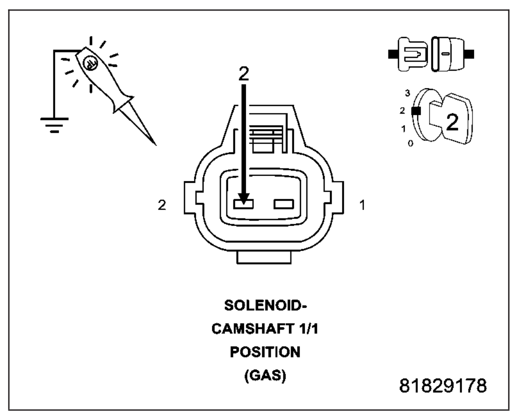
5. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

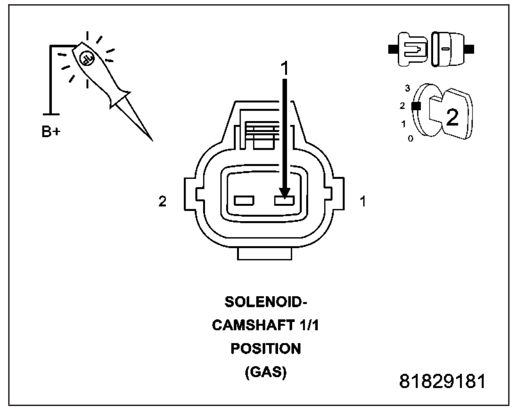
Yes >> Go to 6

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K76) CMP 1/1 CONTROL CIRCUIT HIGH RESISTANCE

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 7

No >> Repair the (K76) CMP 1/1 Control circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. CAMSHAFT 1/1 POSITION SOLENOID

Turn the ignition off.

Inspect the wiring and connectors between the Camshaft 1/1 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Remove the Camshaft 1/1 Position Solenoid in accordance with the Service Information.

Inspect the Camshaft 1/1 Position Solenoid for contamination, foreign material, or any condition that would restrict movement of the valve.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. CAMSHAFT PHASER

Turn the ignition off.

Remove the appropriate Camshaft Phaser in accordance with the Service information.

Inspect the Phaser for contamination, foreign material, or any condition that would restrict operation of the Phaser.

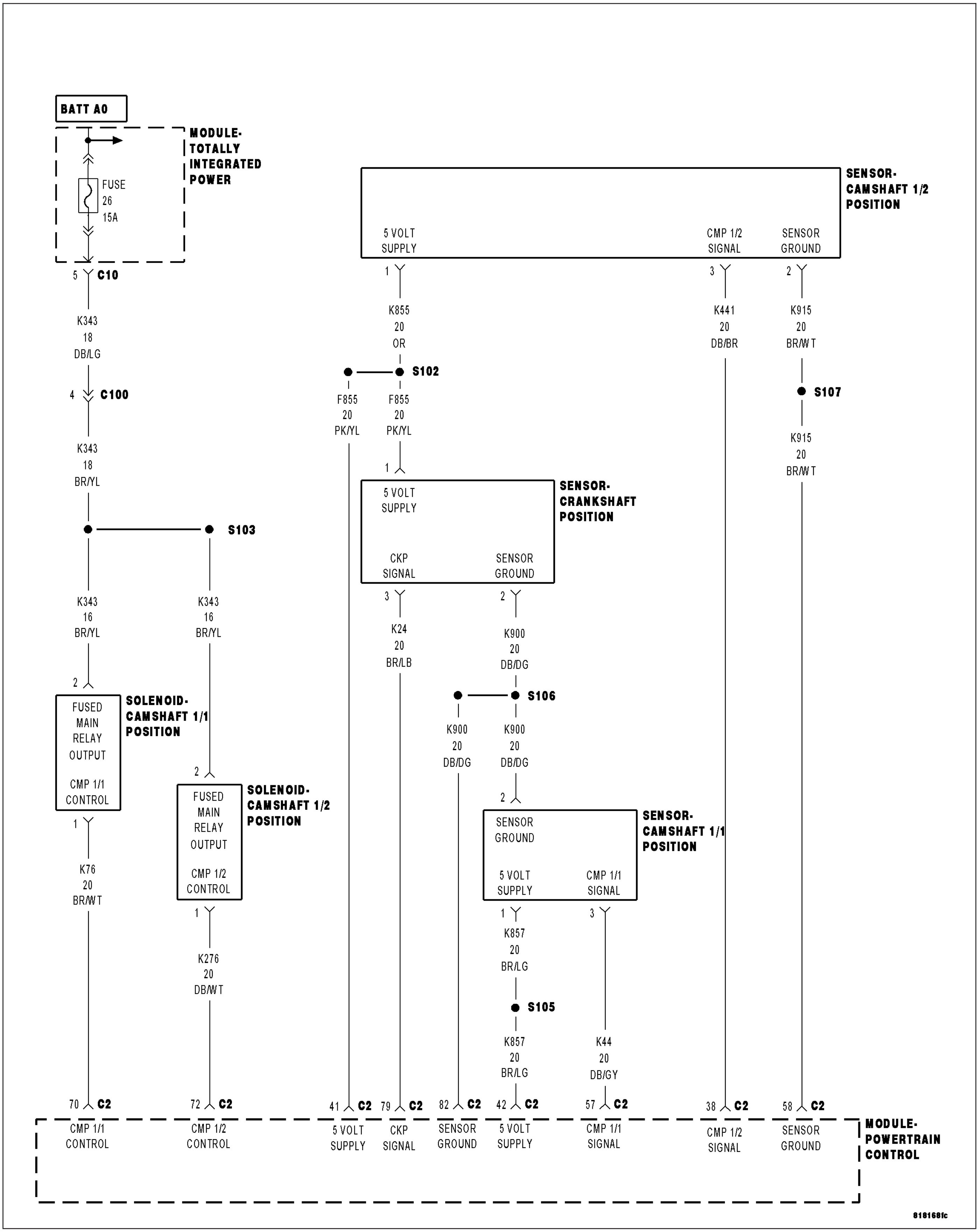
Inspect the Phaser oil passages for signs of sludge or foreign material.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the appropriate Camshaft Phaser in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0013-BANK 1 CAMSHAFT 2 POSITION ACTUATOR CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the Camshaft 1/2 Position Solenoid does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/2 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

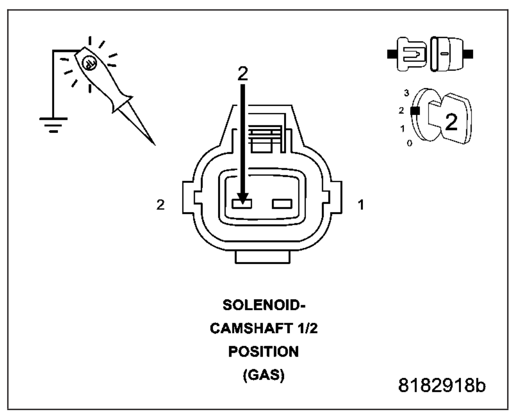
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/2 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

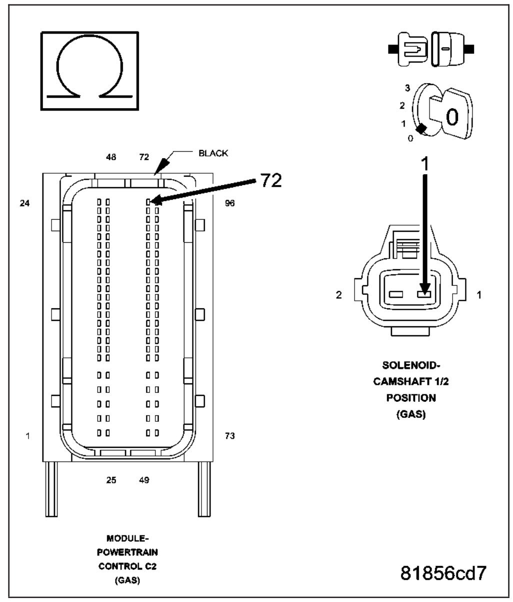
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K276) CMP 1/2 Control circuit between the Camshaft 1/2 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K276) CMP 1/2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. CAMSHAFT 1/2 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Camshaft 1/2 Position Solenoid in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

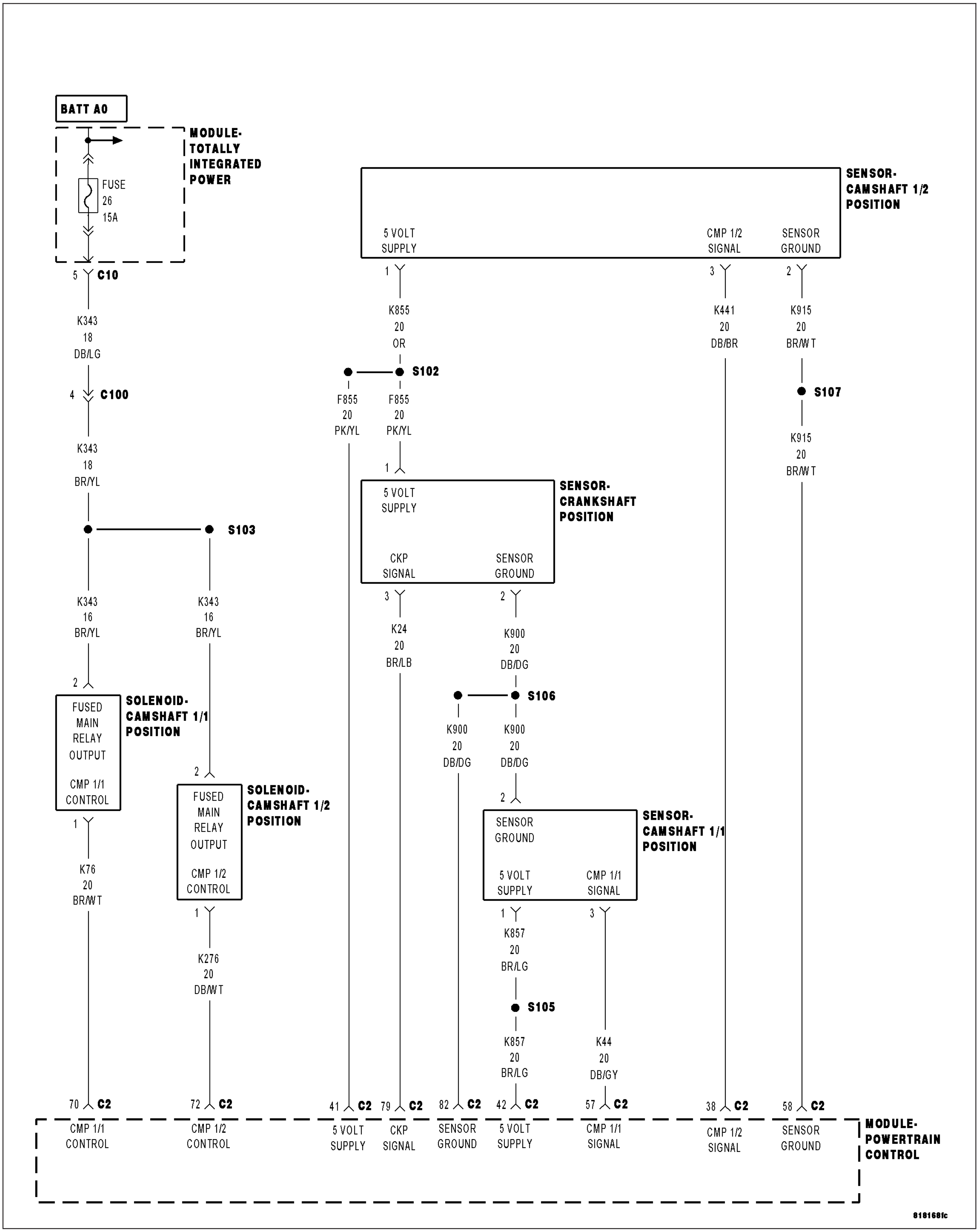
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0014-BANK 1 CAMSHAFT 2 POSITION TARGET PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Variable Valve Timing (VVT) rationality is monitored under the following conditions: (1) Cam phasing is commanded off of the default (lockpin) position; (2) Oil temperature is between 15° F and 280° F (-9°C to 138°C); (3) Battery voltage is greater than 10 volts; (3) Engine speed is at least 1000 to 1400 rpm, depending on oil temperature; (4) No CMP sensor, CKP sensor, or OBDI plausibility errors. Before VVT can be enabled, reference adaptation must be completed.
- **Set Condition:**
  The actual camshaft phasing setpoint does not match the desired camshaft phasing setpoint.

Possible Causes
INTERMITTENT DTC
ENGINE OIL DIRTY OR CONTAMINATED
INCORRECT ENGINE OIL VISCOSITY
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE
(K276) CMP 1/2 CONTROL CIRCUIT HIGH RESISTANCE
CAMSHAFT 1/2 POSITION SOLENOID
CAMSHAFT PHASER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

Dual Variable Valve Timing (VVT) allows the PCM to monitor and adjust the position of each camshaft, based on desired torque levels and engine operating conditions. The PCM controls two solenoid operated control valves, one for each camshaft, that are used to direct oil pressure to hydraulic actuators mounted between each camshaft and its driving sprocket. The oil pressure alters the angular position or phasing of each camshaft relative to crankshaft rotation. A sensor is used to monitor the position of each camshaft.

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any system voltage DTCs before continuing with this test.

NOTE: Diagnose and repair any CMP sensor or CKP sensor DTCs before continuing with this test.

NOTE: Diagnose and repair any oil pressure or oil pressure sensor DTCs before continuing with this test.

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Test drive the vehicle under the conditions in which the DTC is monitored, as outlined above.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE OIL DIRTY OR CONTAMINATED

Turn the ignition off.

Inspect engine oil for signs of contamination, sludge, or foreign material.

Were any problems found?

Yes >> Clean the engine oil system, including oil passages and, if necessary, replace the Oil Control Valve inlet screen(s), in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. INCORRECT ENGINE OIL VISCOSITY

Review service history to determine if the correct viscosity engine oil was used.

Were any problems found?

Yes >> Change the engine oil in accordance with the Service Information and retest.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CAMSHAFT 1/2 POSITION SOLENOID CONTROL ACTUATION

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to toggle on and off.

Listen for the Camshaft 1/2 Position Solenoid to click open and closed during the actuation.

Does the Camshaft 1/2 Position Solenoid click open and closed during the actuation?

Yes >> Go to 8

No >> Go to 5

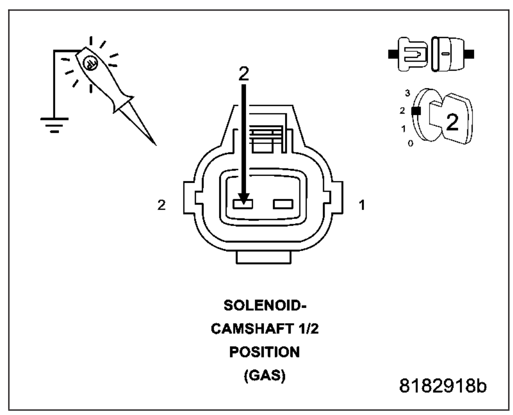
5. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/2 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 6

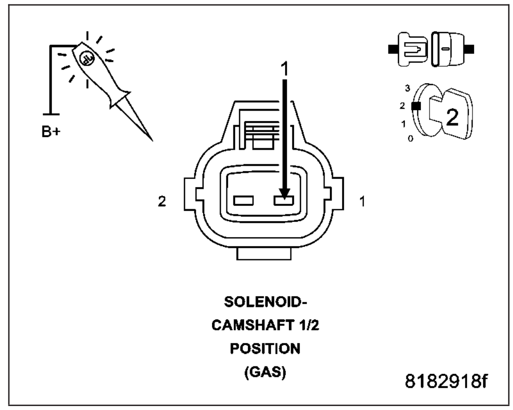
No >> Repair the (K343) Fused Main Relay Output circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K276) CMP 1/2 CONTROL CIRCUIT HIGH RESISTANCE

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



Is the test light illuminated and bright?

Yes >> Go to 7

No >> Repair the (K276) CMP 1/2 Control circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. CAMSHAFT 1/2 POSITION SOLENOID

Turn the ignition off.

Inspect the wiring and connectors between the Camshaft 1/2 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Remove the Camshaft 1/2 Position Solenoid in accordance with the Service Information.

Inspect the Camshaft 1/2 Position Solenoid for contamination, foreign material, or any condition that would restrict movement of the valve.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. CAMSHAFT PHASER

Turn the ignition off.

Remove the appropriate Camshaft Phaser in accordance with the Service information.

Inspect the Phaser for contamination, foreign material, or any condition that would restrict operation of the Phaser.

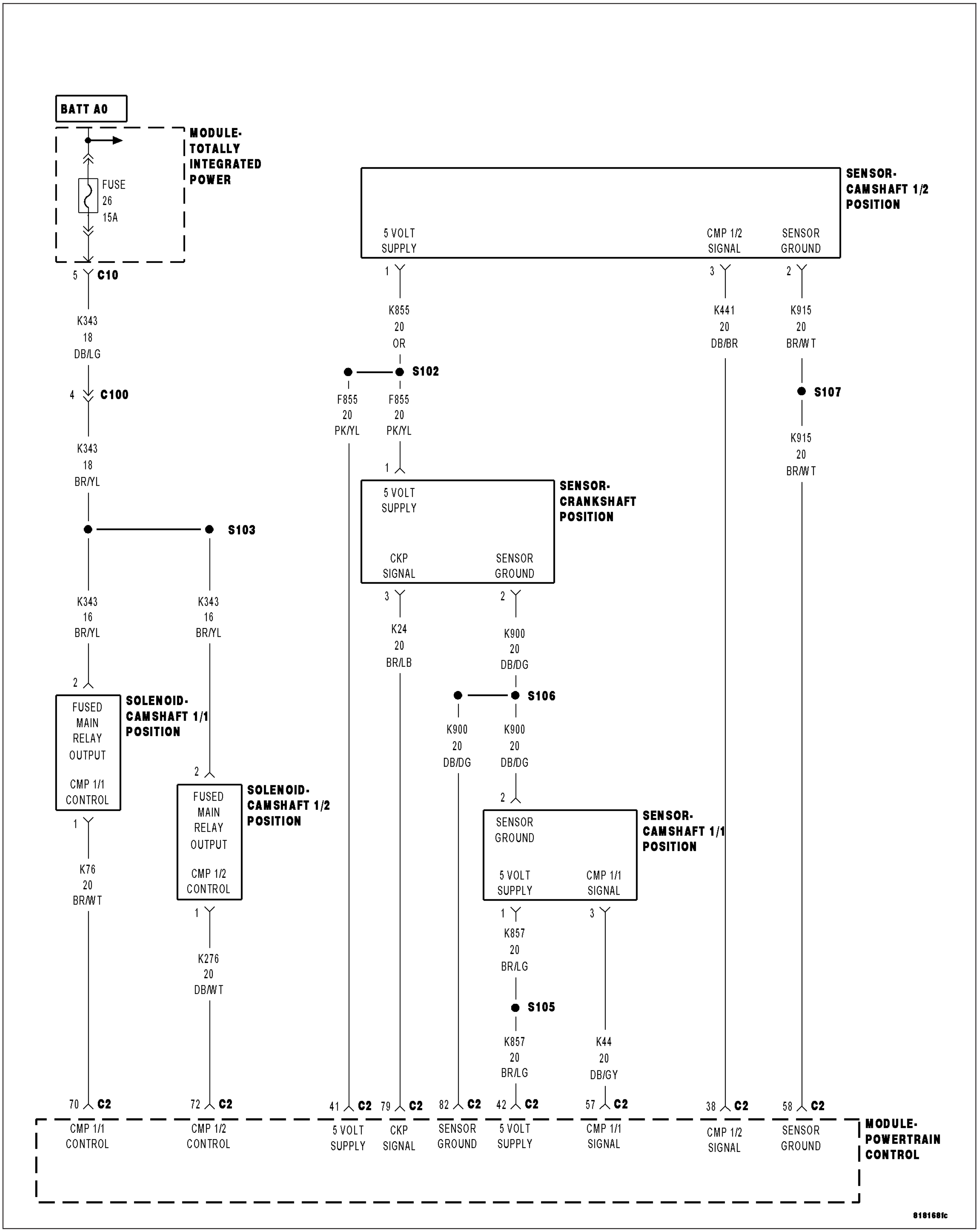
Inspect the Phaser oil passages for signs of sludge or foreign material.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the appropriate Camshaft Phaser in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0016-CRANKSHAFT-CAMSHAFT TIMING MISALIGNMENT-BANK 1 SENSOR 1



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine speed present and within a calibrated amount.
- **Set Condition:**
  The PCM detects that the camshaft position is out of phase with the crankshaft position. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CRANKSHAFT POSITION SENSOR
CAMSHAFT 1/1 POSITION SENSOR
CRANKSHAFT, TONE WHEEL OR FLEX PLATE
CAMSHAFT, TONE WHEEL OR PULSE RING

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

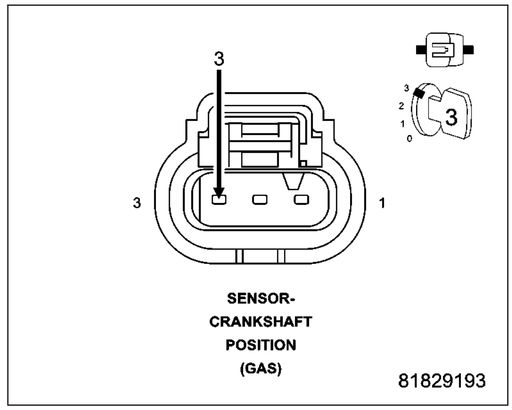
Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CRANKSHAFT POSITION SENSOR IRREGULAR SIGNAL



Using a lab scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor while monitoring the lab scope screen.

Start the engine.

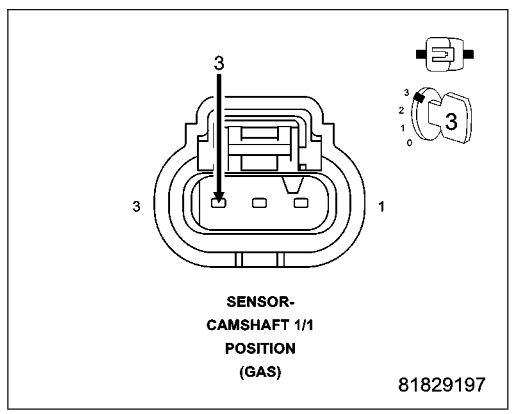
Monitor the Crankshaft Position Sensor signal on the lab scope screen.

Were any Crankshaft Position Sensor signals irregular or missing?

Yes >> Go to 6

No >> Go to 5

5. CAMSHAFT 1/1 POSITION SENSOR IRREGULAR SIGNAL



Turn the ignition off.

Using a lab scope and the Miller special tool #6801, backprobe the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/1 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/1 Position Sensor signal on the lab scope screen.

Were any Camshaft 1/1 Position Sensor signals irregular or missing?

Yes >> Go to 7

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

7. CAMSHAFT, TONE WHEEL OR PULSE RING

Turn the ignition off.

Remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

8. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

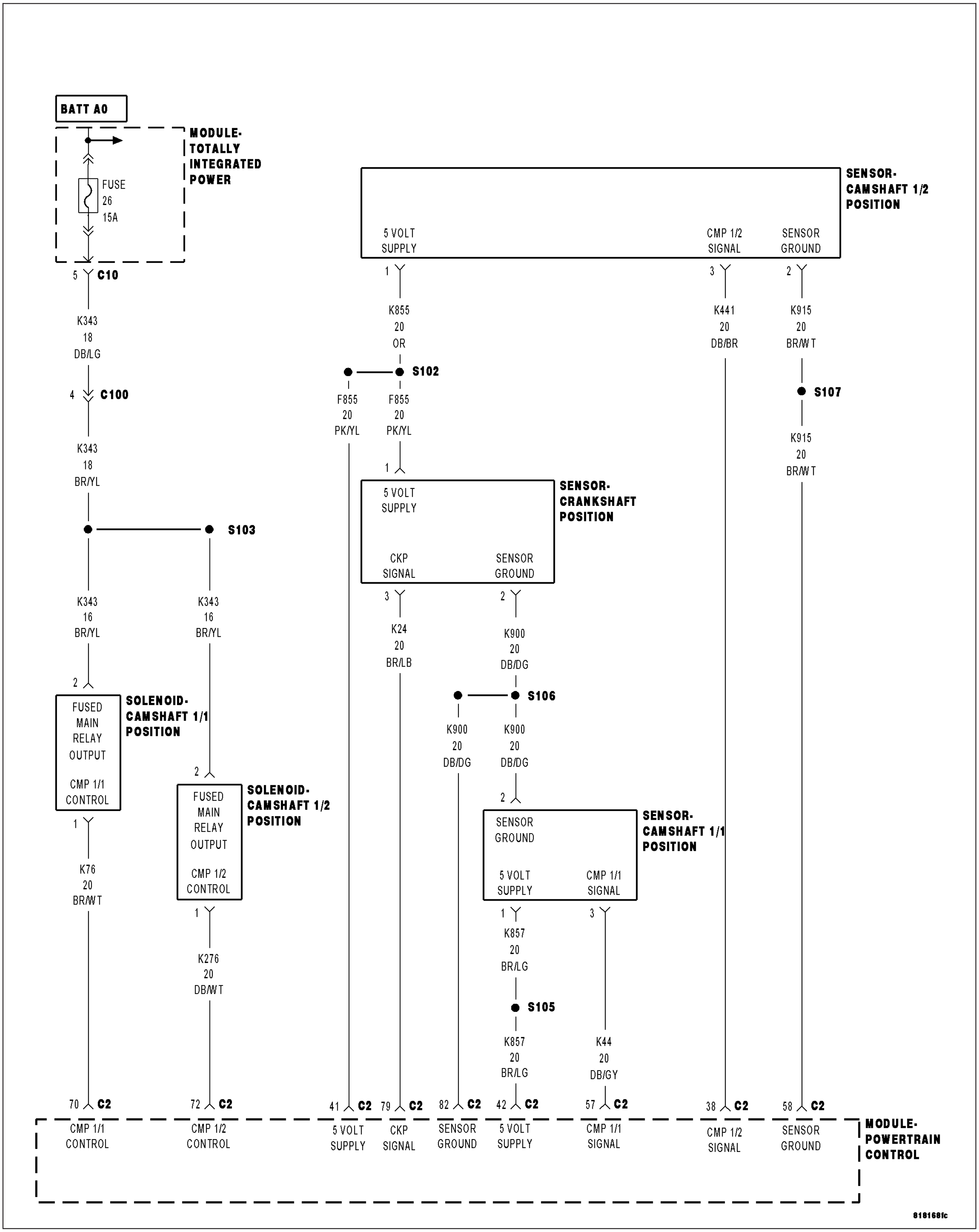
Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0017-CRANKSHAFT-CAMSHAFT TIMING MISALIGNMENT-BANK 1 SENSOR 2



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine speed present and within a calibrated amount.
- **Set Condition:**
  The PCM detects that the camshaft position is out of phase with the crankshaft position. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CRANKSHAFT POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
CRANKSHAFT, TONE WHEEL OR FLEX PLATE
CAMSHAFT, TONE WHEEL OR PULSE RING

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. CRANKSHAFT POSITION SENSOR IRREGULAR SIGNAL

Using a lab scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Crankshaft Position Sensor signal on the lab scope screen.

Were any Crankshaft Position Sensor signals irregular or missing?

Yes >> Go to 6

No >> Go to 5

5. CAMSHAFT 1/2 POSITION SENSOR IRREGULAR SIGNAL

Turn the ignition off.

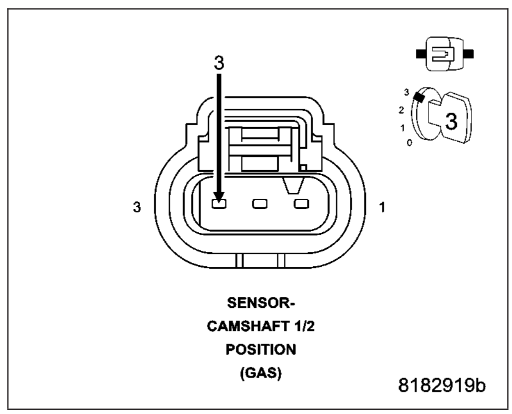
Using a lab scope and the Miller special tool #6801, backprobe the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/2 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/2 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/2 Position Sensor signals irregular or missing?

Yes >> Go to 7

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

7. CAMSHAFT, TONE WHEEL OR PULSE RING

Turn the ignition off.

Remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

8. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

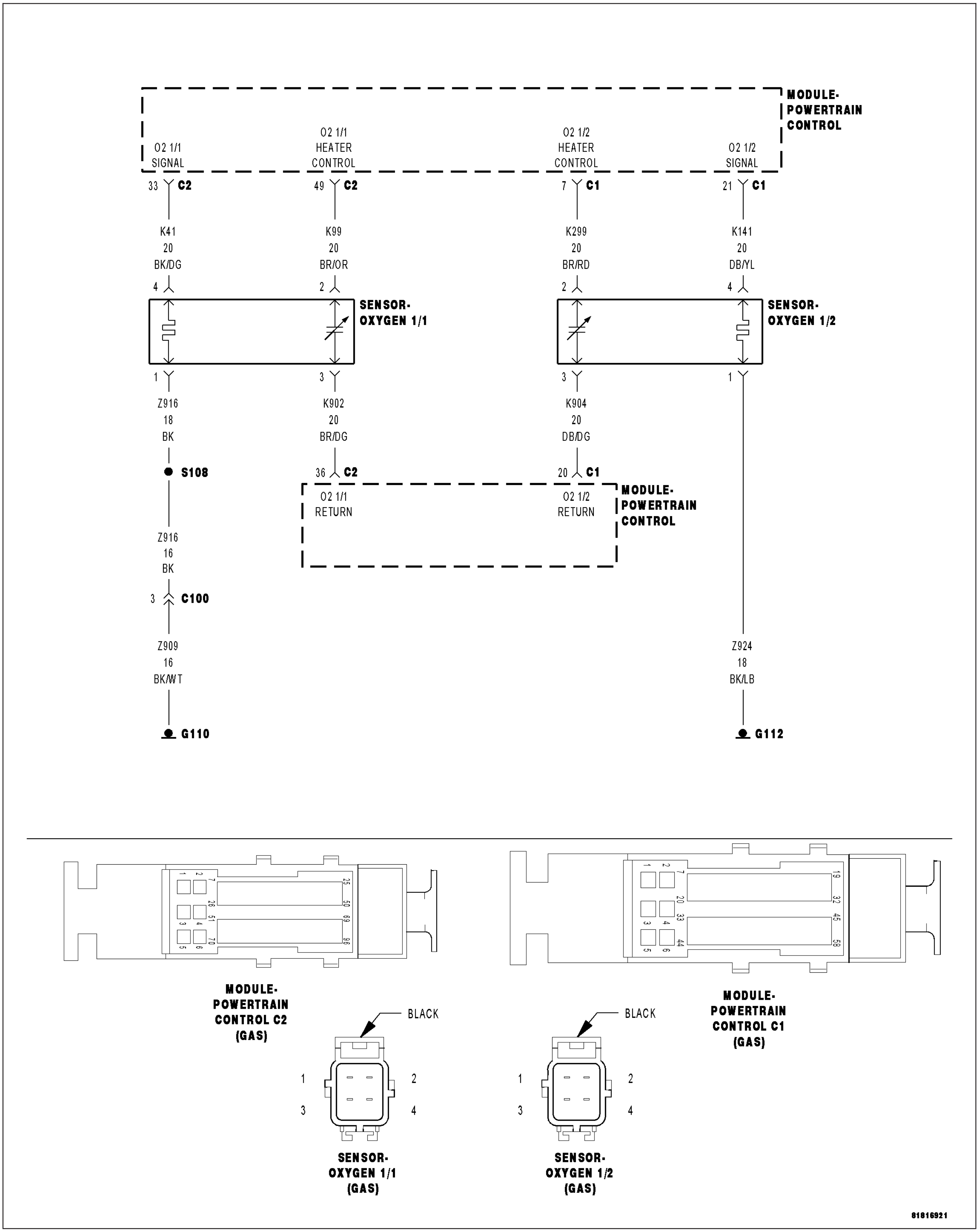
Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0031-O2 SENSOR 1-1 HEATER CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/1 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

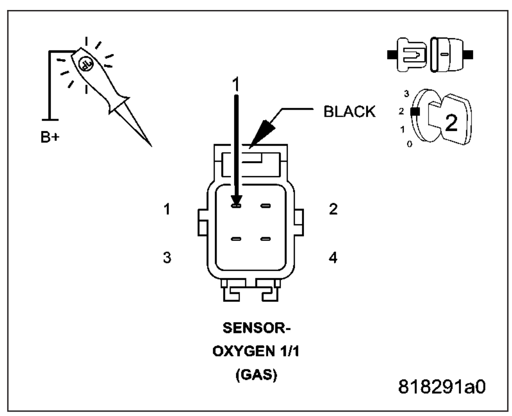
2. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Oxygen Sensor 1/1 connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the Oxygen Sensor 1/1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.

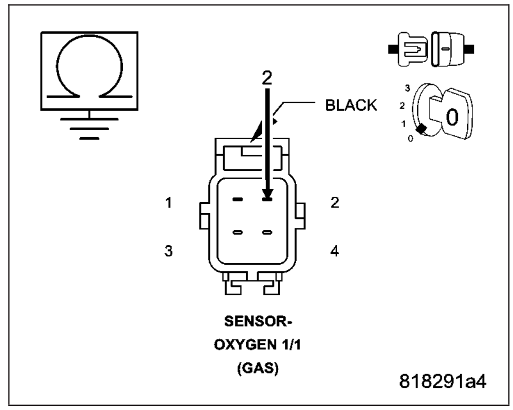
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.



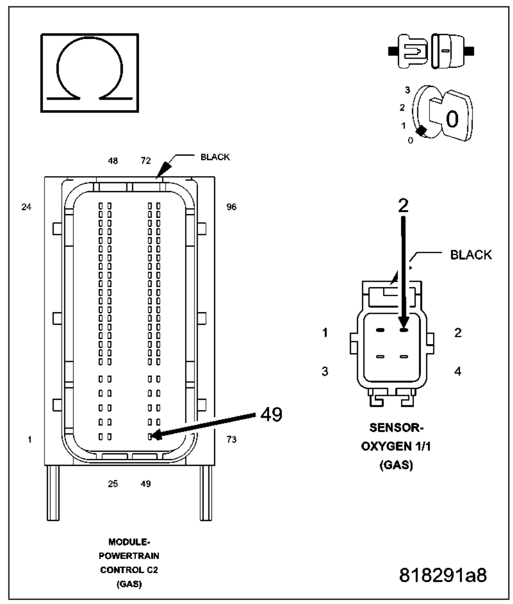
Is the resistance below 100 ohms?

Yes >> Repair the (K99) O2 1/1 Heater Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K99) O2 1/1 Heater Control circuit between the Oxygen Sensor 1/1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K99) O2 1/1 Heater Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

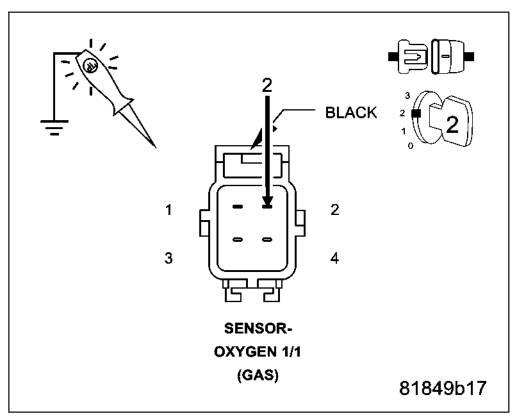
5. OXYGEN SENSOR 1/1

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Oxygen Sensor 1/1 control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Oxygen Sensor 1/1 control to OFF (0%).

Using a 12 volt test light connected to ground, check the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Oxygen Sensor 1/1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

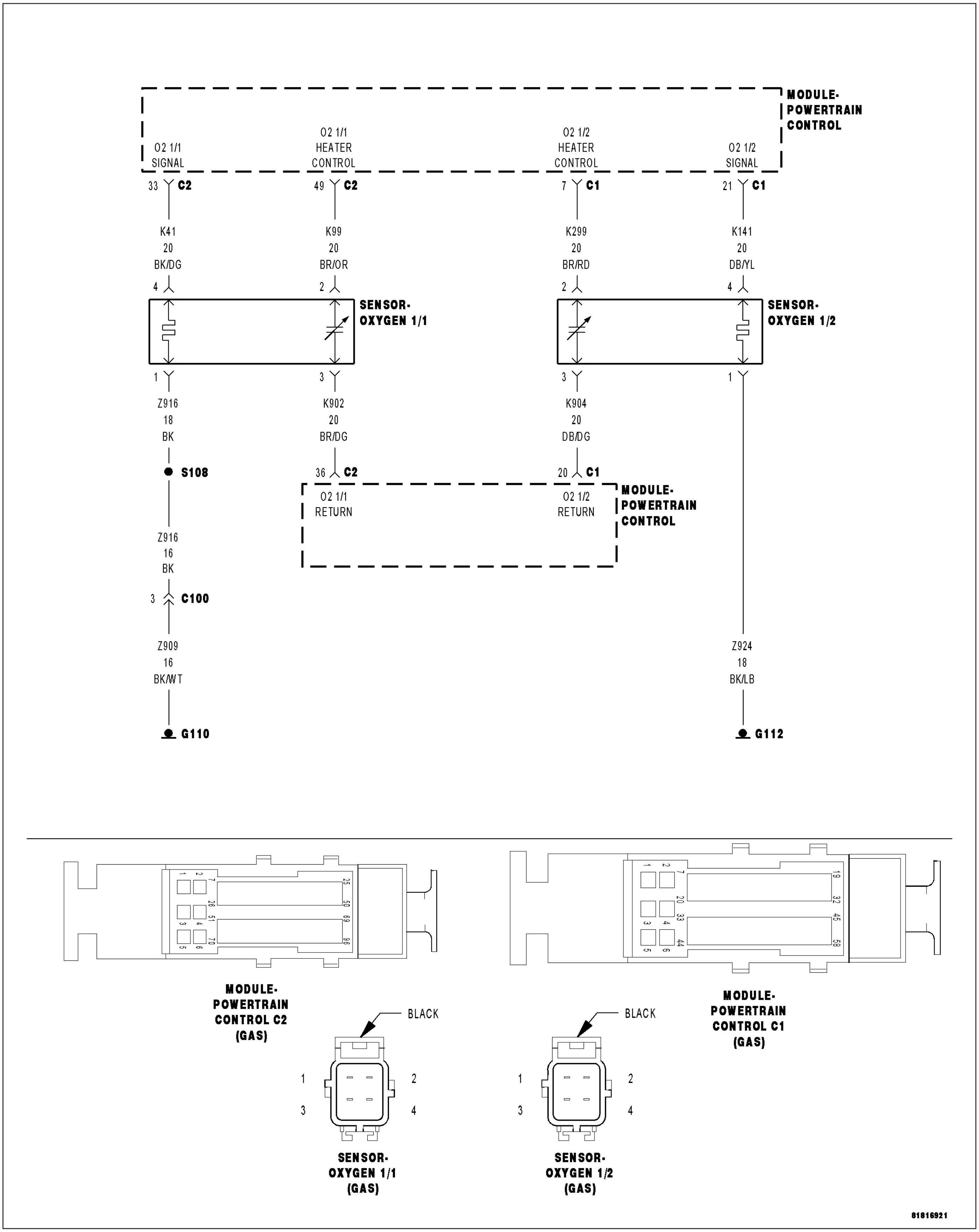
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0032-O2 SENSOR 1-1 HEATER CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/1 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE

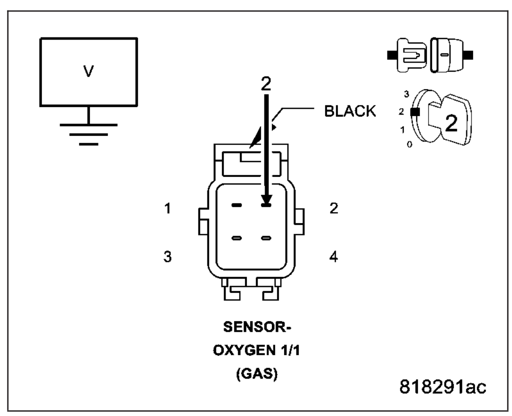
Turn the ignition off.

Disconnect the Oxygen Sensor 1/1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.



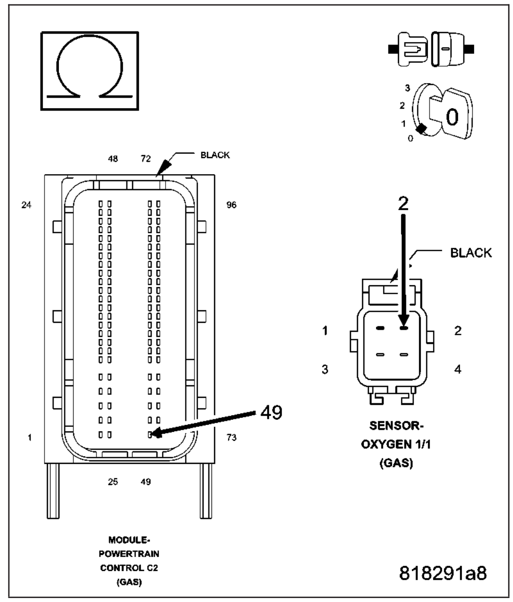
Is there any voltage present?

Yes >> Repair the (K99) O2 1/1 Heater Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K99) O2 1/1 Heater Control circuit between the Oxygen Sensor 1/1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K99) O2 1/1 Heater Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

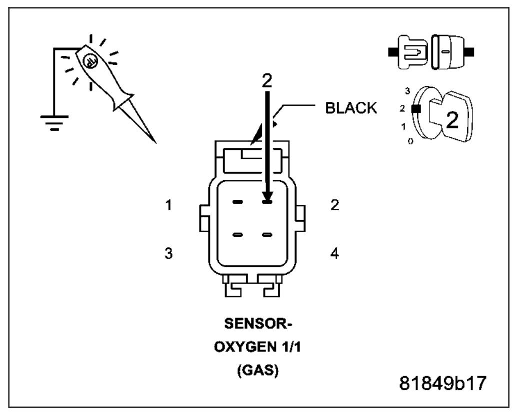
4. OXYGEN SENSOR 1/1

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Oxygen Sensor 1/1 control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Oxygen Sensor 1/1 control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K99) O2 1/1 Heater Control circuit in the Oxygen Sensor 1/1 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuator ON (100%) and not illuminated with the actuator OFF (0%)?

Yes >> Replace the Oxygen Sensor 1/1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

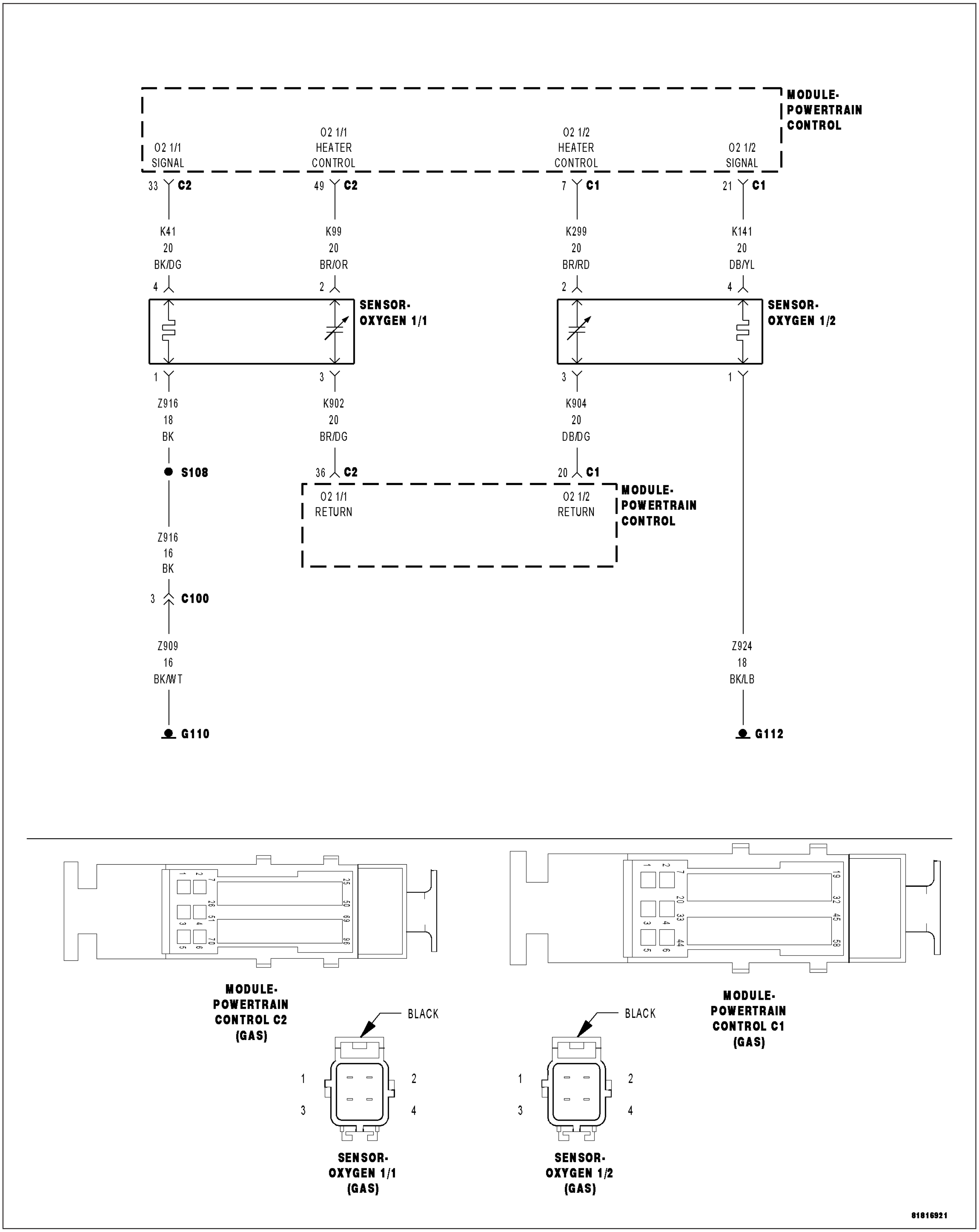
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0037-O2 SENSOR 1-2 HEATER CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/2 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

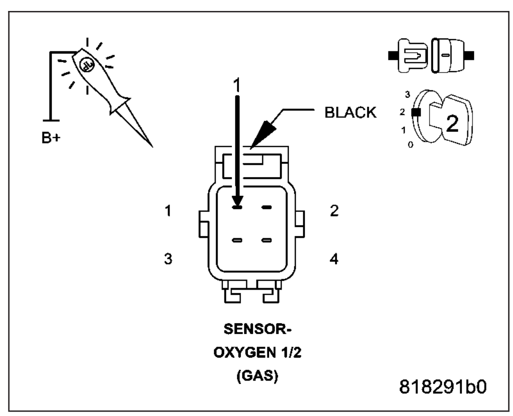
2. (Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Oxygen Sensor 1/2 connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (Z924) Ground circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (Z924) Ground circuit for an open circuit or high resistance.

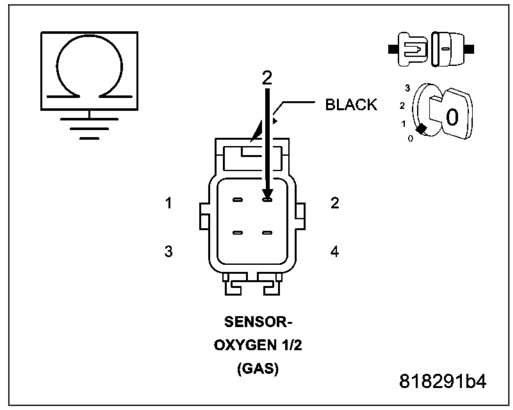
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

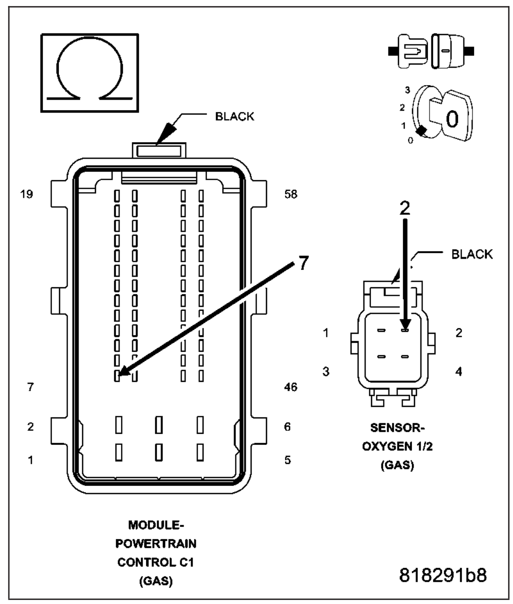
Yes >> Repair the (K299) O2 1/2 Heater Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K299) O2 1/2 Heater Control circuit between the Oxygen Sensor 1/2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K299) O2 1/2 Heater Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

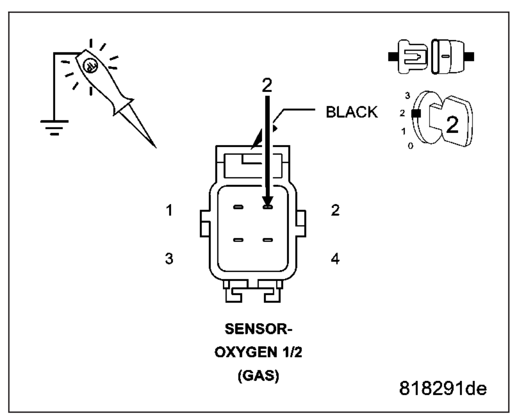
5. OXYGEN SENSOR 1/2

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Oxygen Sensor 1/2 control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Oxygen Sensor 1/2 control to OFF (0%).

Using a 12 volt test light connected to ground, check the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0038-O2 SENSOR 1-2 HEATER CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/2 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Oxygen Sensor 1/2 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.

Is there any voltage present?

Yes >> Repair the (K299) O2 1/2 Heater Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K299) O2 1/2 Heater Control circuit between the Oxygen Sensor 1/2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K299) O2 1/2 Heater Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. OXYGEN SENSOR 1/2

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Oxygen Sensor 1/2 control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Oxygen Sensor 1/2 control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuator ON (100%) and not illuminated with the actuator OFF (0%)?

Yes >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

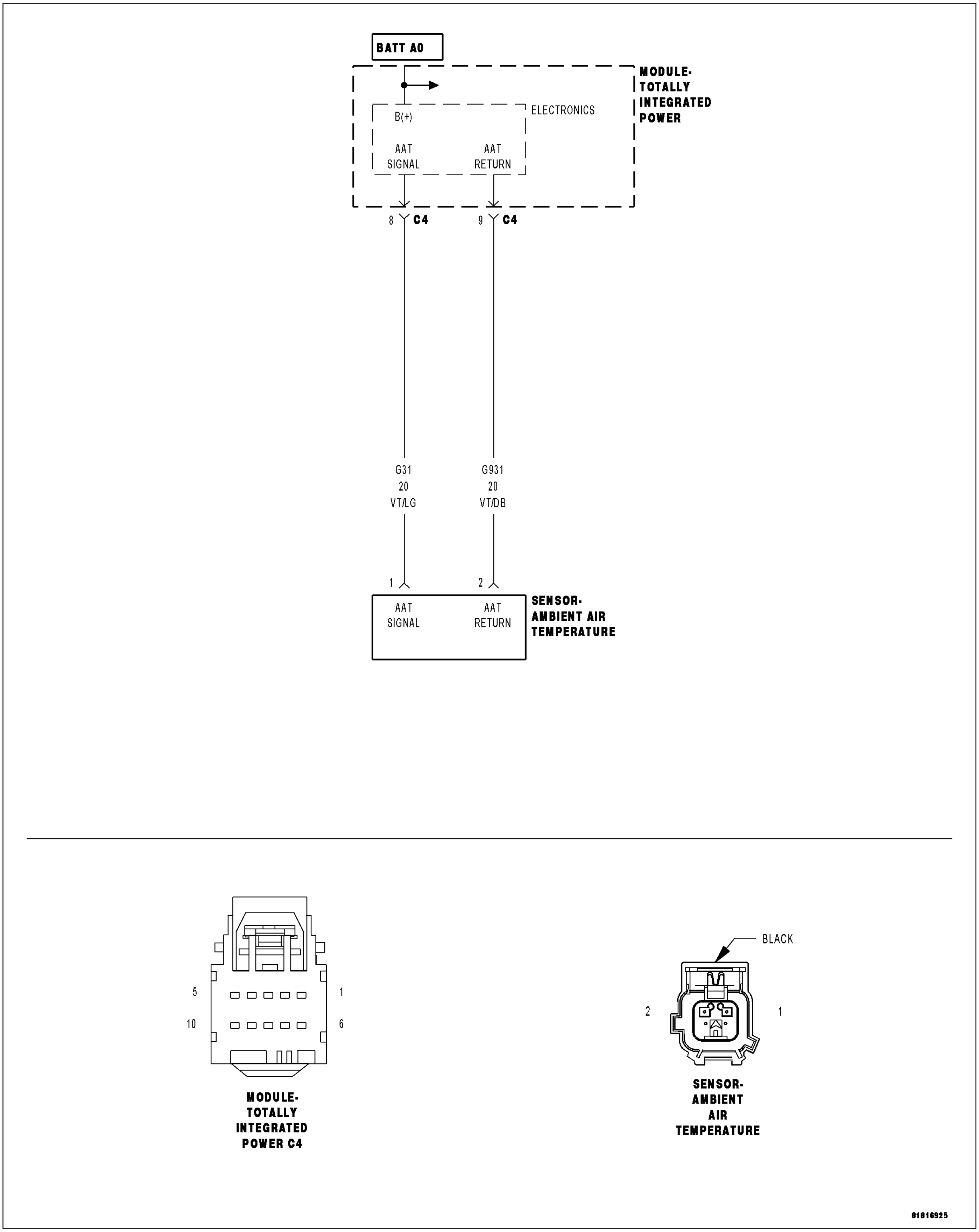
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects that the Ambient Air Temperature Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(G31) AAT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AAT SIGNAL CIRCUIT SHORTED TO (G931) AAT SENSOR GROUND CIRCUIT
(G31) AAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(G931) AAT SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
AMBIENT AIR TEMPERATURE SENSOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G31) AAT SIGNAL CIRCUIT SHORTED TO VOLTAGE

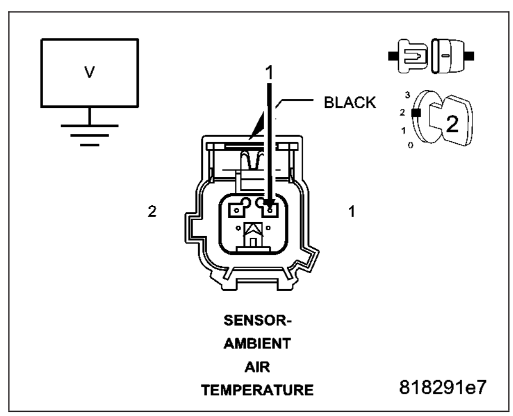
Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor connector.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Turn the ignition on.

Measure the voltage of the (G31) AAT Signal circuit in the Ambient Air Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (G31) AAT Signal circuit for a short to voltage.

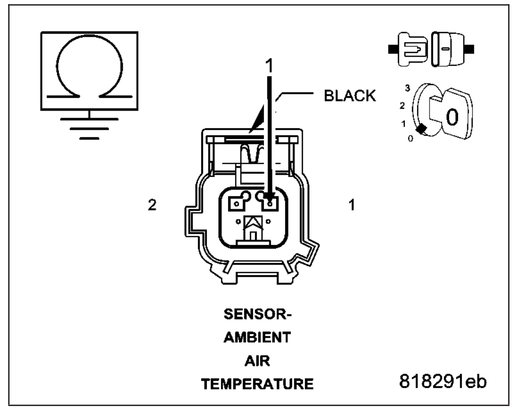
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (G31) AAT Signal circuit in the Ambient Air Temperature Sensor harness connector.



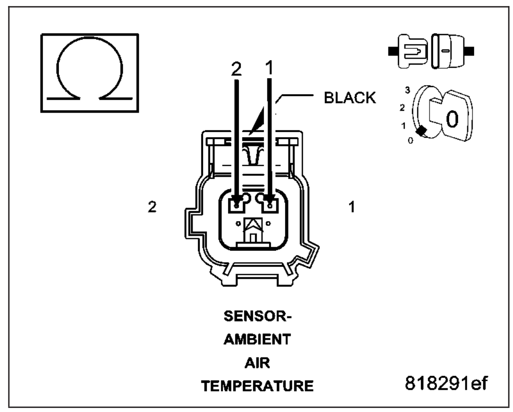
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (G31) AAT Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (G31) AAT SIGNAL CIRCUIT SHORTED TO (G931) AAT SENSOR GROUND CIRCUIT

Measure the resistance between the (G31) AAT Signal circuit and the (G931) AAT Sensor Ground circuit in the Ambient Air Temperature Sensor harness connector.



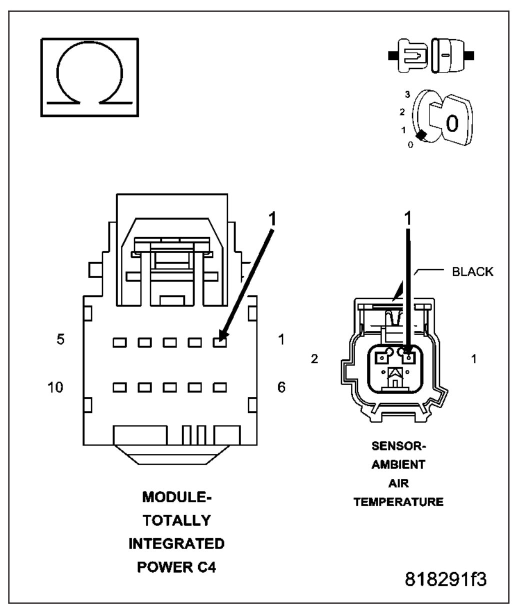
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (G31) AAT Signal circuit for a short to the (G931) AAT Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (G31) AAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (G31) AAT Signal circuit between the Ambient Air Temperature Sensor harness connector and the Totally Integrated Power Module (TIPM) harness connector.



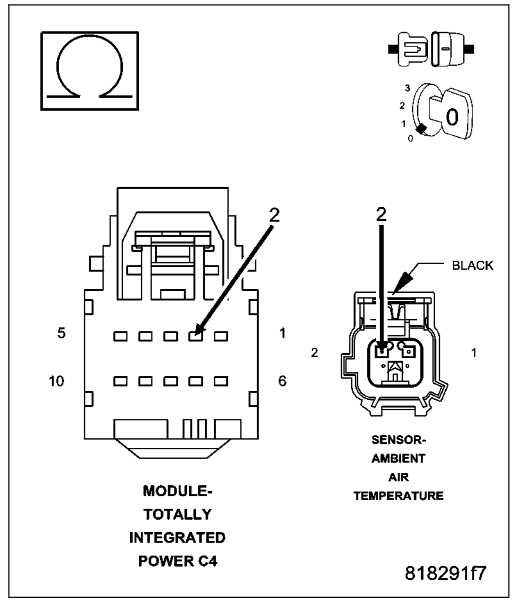
Is the resistance below 5.0 ohms?

Yes >> Go to 6

No >> Repair the (G31) AAT Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (G931) AAT SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (G931) AAT Sensor Ground circuit between the Ambient Air Temperature Sensor harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (G931) AAT Sensor Ground for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. AMBIENT AIR TEMPERATURE SENSOR

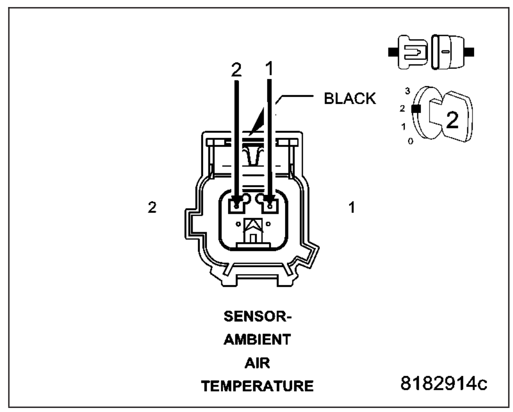
Turn the ignition off.

Connect the Totally Integrated Power Module (TIPM) connector.

Connect a jumper wire between the (G931) AAT Sensor Ground circuit and the (G31) AAT Signal circuit in the Ambient Air Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Ambient Air Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Ambient Air Temperature Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. TOTALLY INTEGRATED POWER MODULE (TIPM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ambient Air Temperature Sensor and the Totally Integrated Power Module (TIPM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

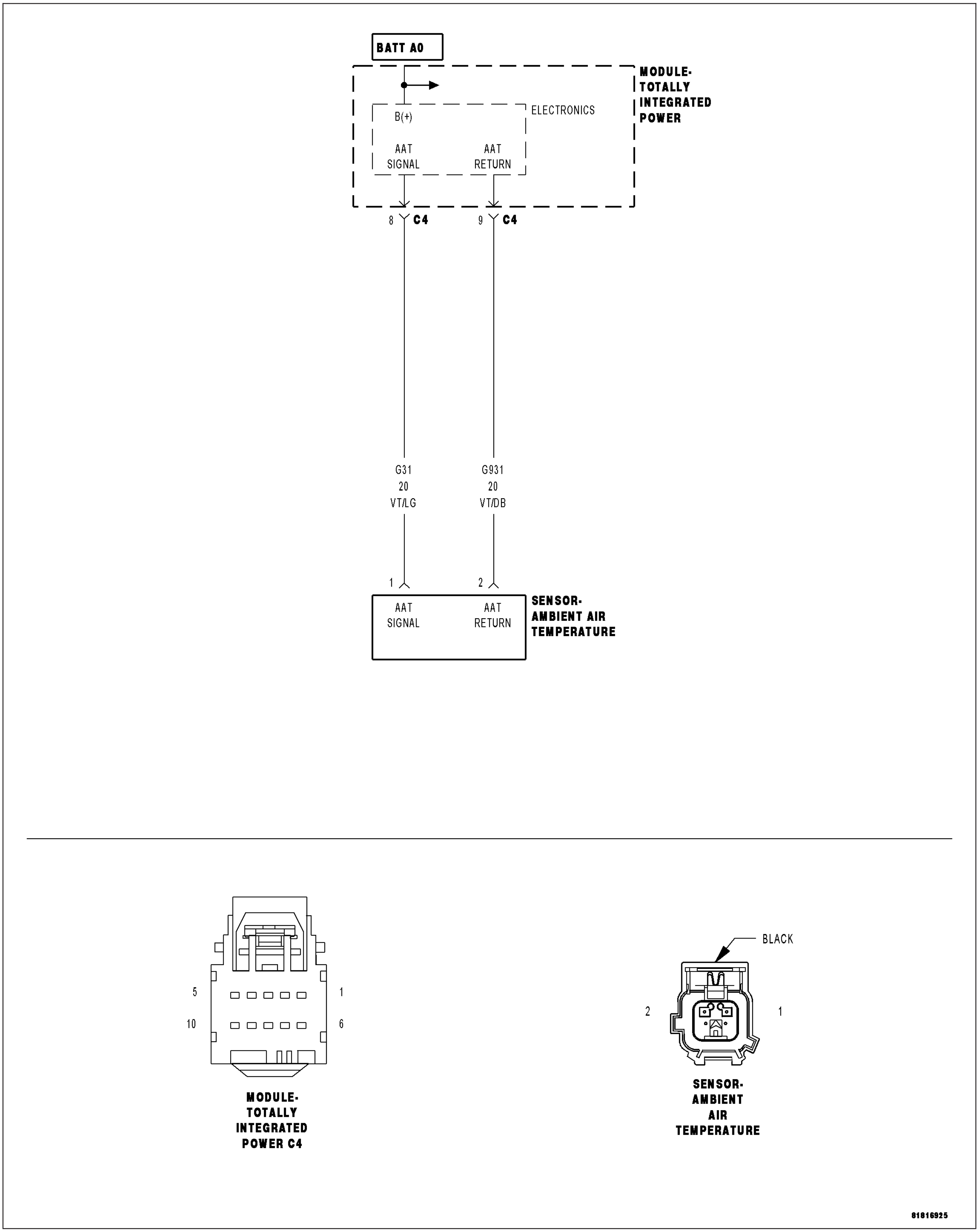
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Ambient Air Temperature Sensor circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AAT SIGNAL CIRCUIT SHORTED TO (G931) AAT SENSOR GROUND
(G31) AAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
AMBIENT AIR TEMPERATURE SENSOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

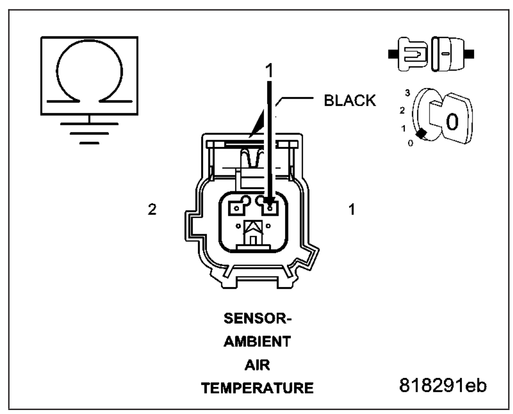
2. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor connector.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Measure the resistance between ground and the (G31) AAT Signal circuit in the Ambient Air Temperature Sensor harness connector.



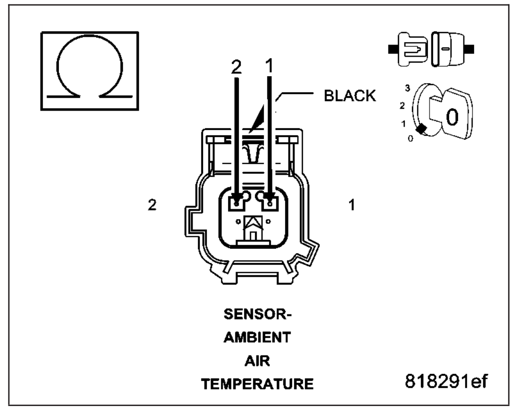
Is the resistance above 100 ohms?

Yes >> Go to 3

No >> Repair the (G31) AAT Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (G31) AAT SIGNAL CIRCUIT SHORTED TO (G931) AAT SENSOR GROUND CIRCUIT

Measure the resistance between the (G31) AAT Signal circuit and the (G931) AAT Sensor Ground circuit in the Ambient Air Temperature Sensor harness connector.



Is the resistance above 100 ohms?

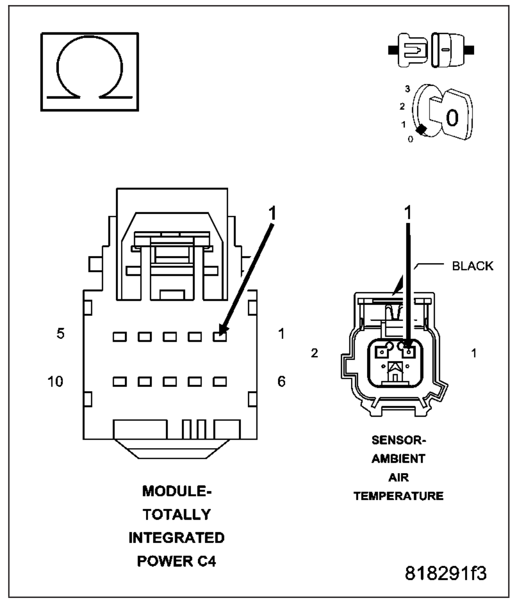
Yes >> Go to 4

No >> Repair the (G31) AAT Signal circuit for a short to the (G931) AAT Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (G31) AAT SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (G31) AAT Signal circuit between the Ambient Air Temperature Sensor harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (G31) AAT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. AMBIENT AIR TEMPERATURE SENSOR

Turn the ignition off.

Connect the Totally Integrated Power Module (TIPM) connector.

Turn the ignition on.

With the scan tool, read the Ambient Air Temperature Sensor signal voltage.

Is the voltage above 4.5 volts with the Ambient Air Temperature Sensor harness disconnected?

Yes >> Replace the Ambient Air Temperature Sensor in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. TOTALLY INTEGRATED POWER MODULE (TIPM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ambient Air Temperature Sensor and the Totally Integrated Power Module (TIPM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

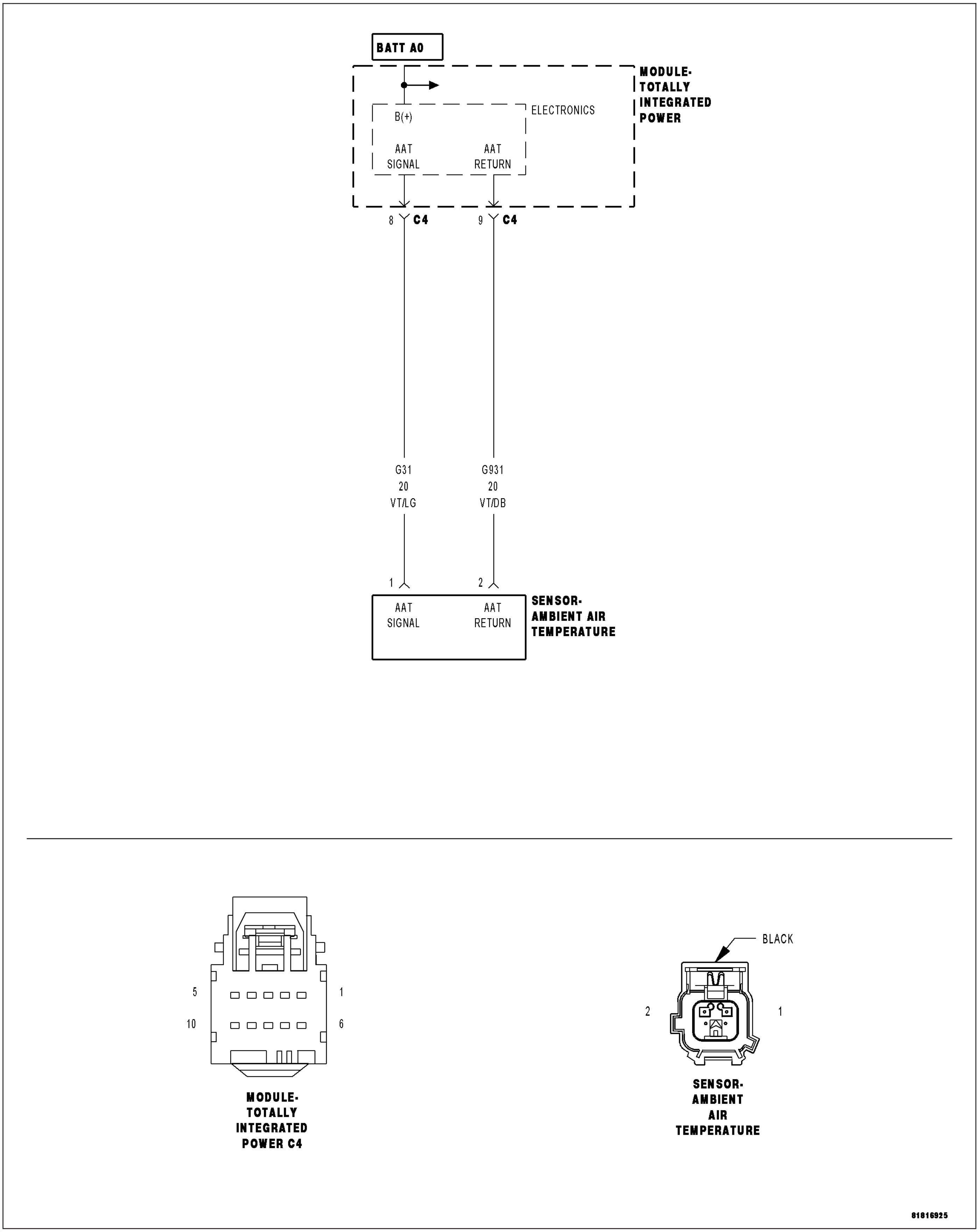
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0073-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (G31) AAT Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(G31) AAT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G31) AAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(G931) AAT SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
AMBIENT AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G31) AAT SIGNAL CIRCUIT SHORTED TO VOLTAGE

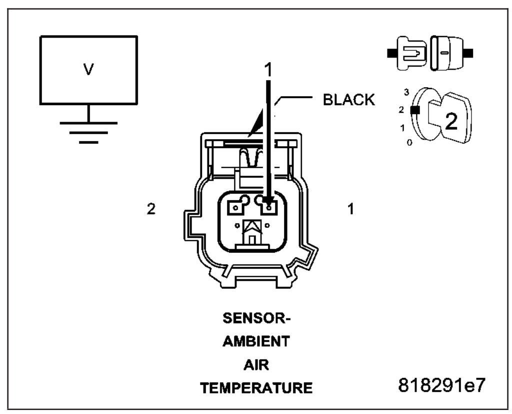
Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (G31) AAT Signal circuit in the Ambient Air Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (G31) AAT Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (G31) AAT SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

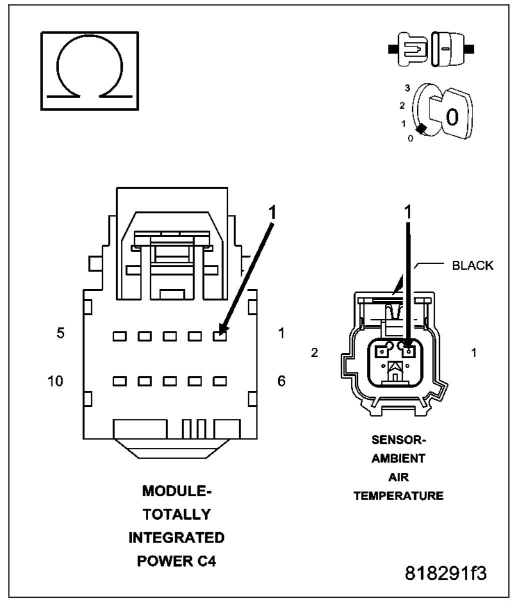
Measure the resistance of the (G31) AAT Signal circuit between the Ambient Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (G31) AAT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (G931) AAT SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

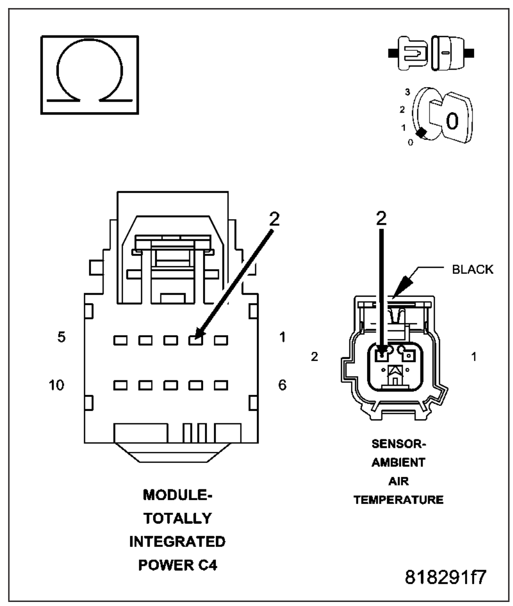
Measure the resistance of the (G931) AAT Sensor Ground circuit between the Ambient Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (G931) AAT Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. AMBIENT AIR TEMPERATURE SENSOR

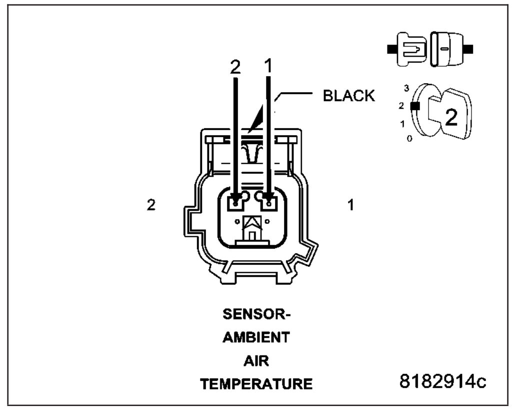
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (G31) AAT Signal circuit and the (G931) AAT Sensor Ground in the Ambient Air Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Ambient Air Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Ambient Air Temperature Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ambient Air Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

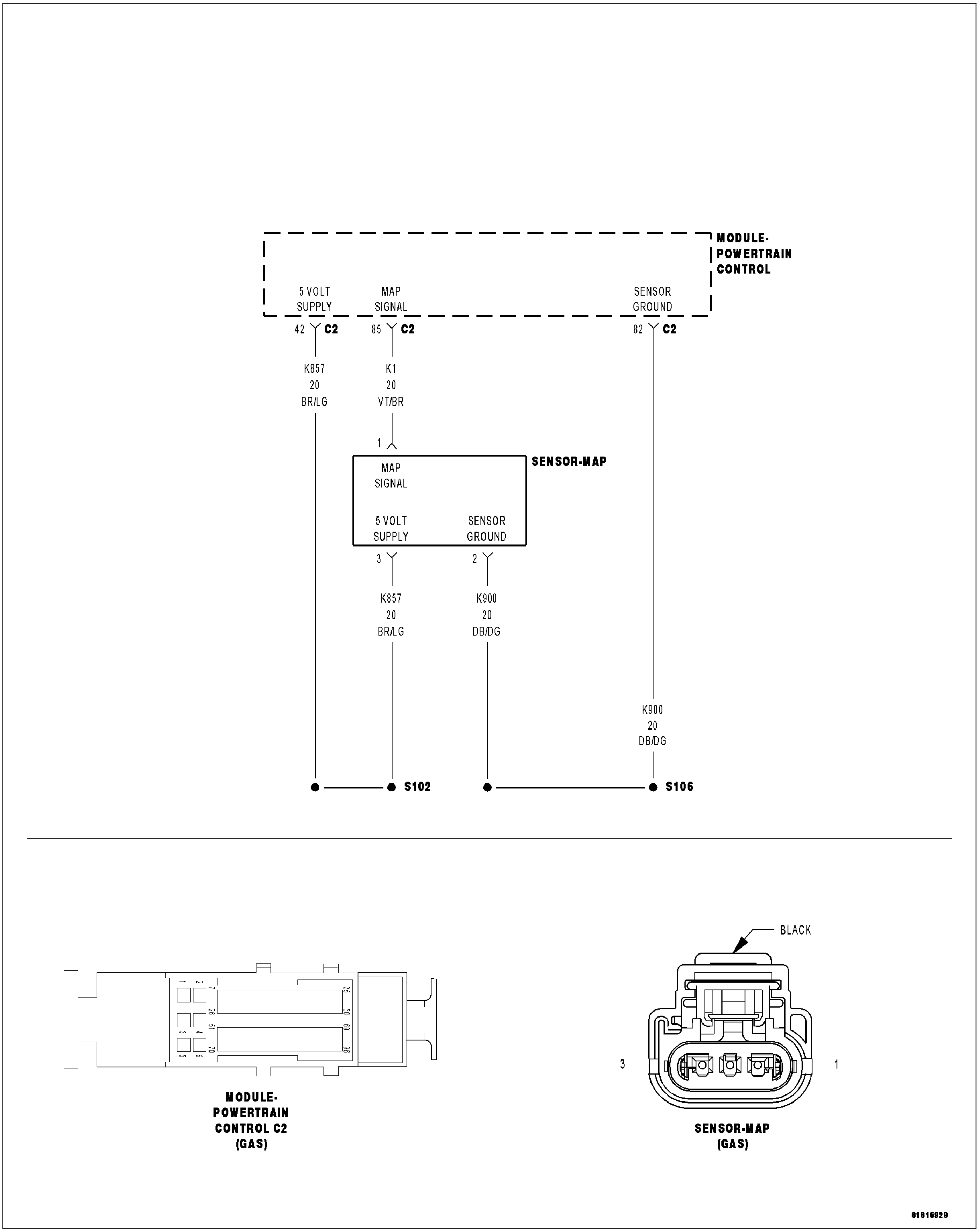
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0106-MANIFOLD ABSOLUTE PRESSURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the MAP Sensor circuit.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K1) MAP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K1) MAP SIGNAL CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MAP SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

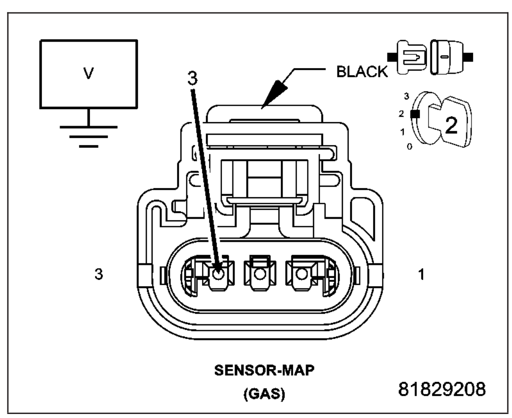
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the MAP Sensor connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.

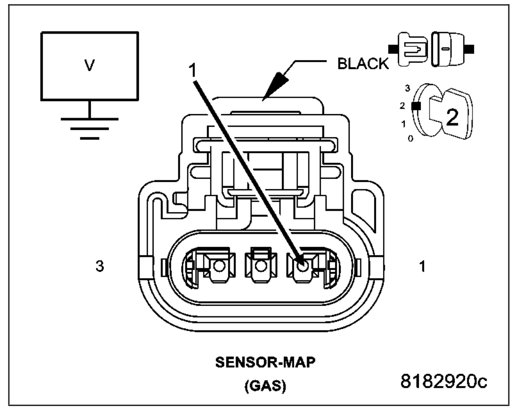


Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K1) MAP SIGNAL CIRCUIT VOLTAGE



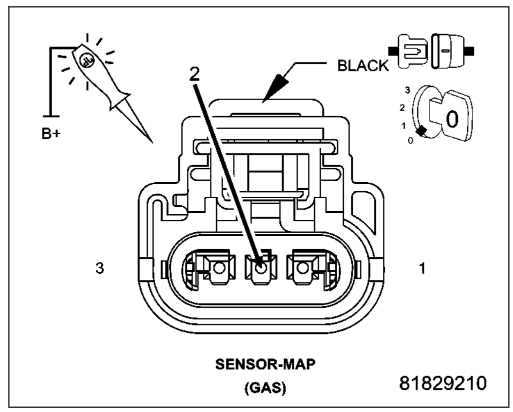
Measure the voltage of the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11

4. (K900) SENSOR GROUND CIRCUIT TEST



Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the MAP Sensor harness connector.

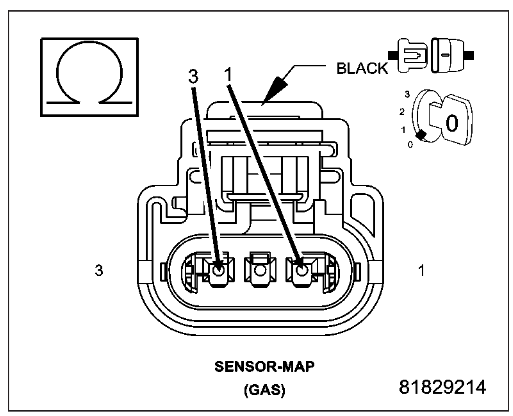
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K1) MAP SIGNAL CIRCUIT



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K1) MAP Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. MAP SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the MAP Sensor for any condition that would result in an incorrect signal, such as damage or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

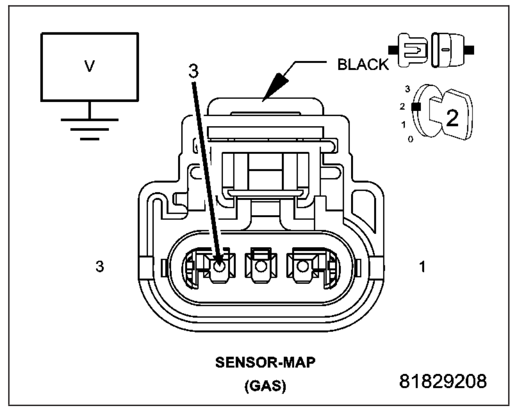
7. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.



Is there any voltage present?

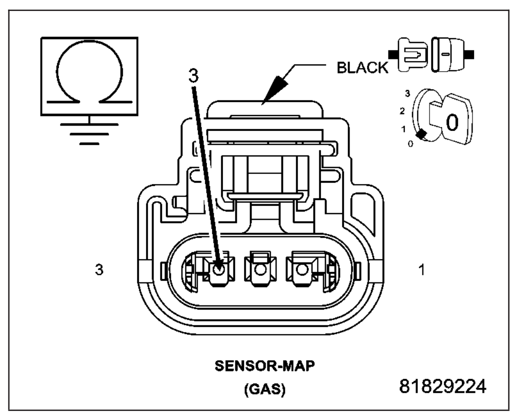
Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.



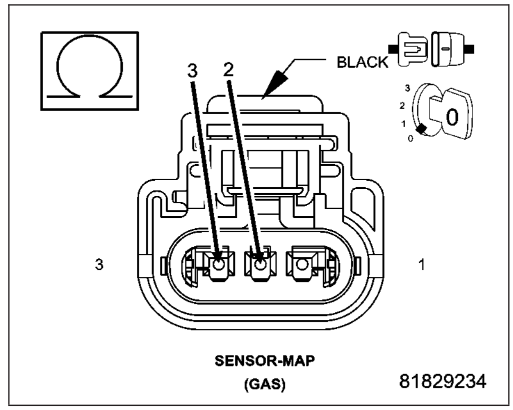
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.



Is the resistance above 100 ohms?

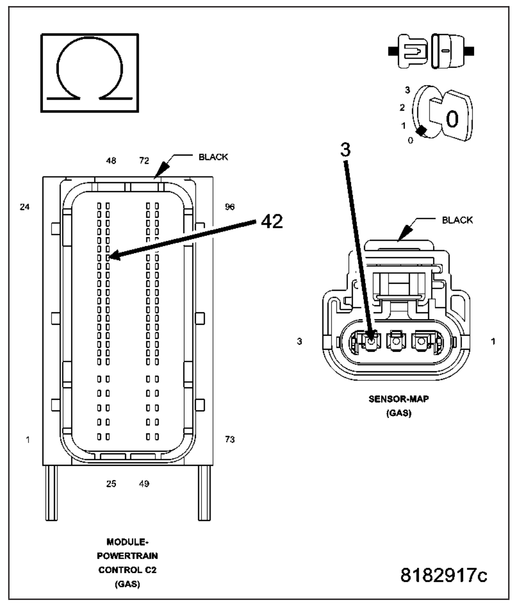
Yes >> Go to 10

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

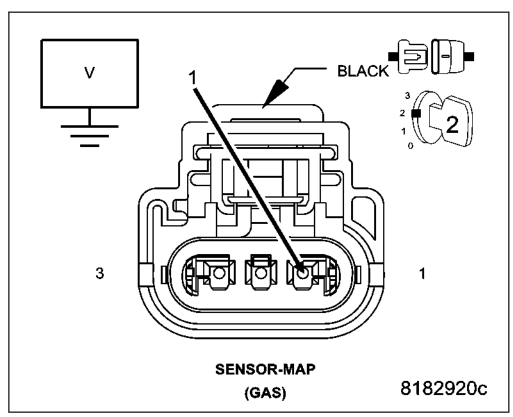
11. (K1) MAP SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K1) MAP Signal circuit for a short to voltage.

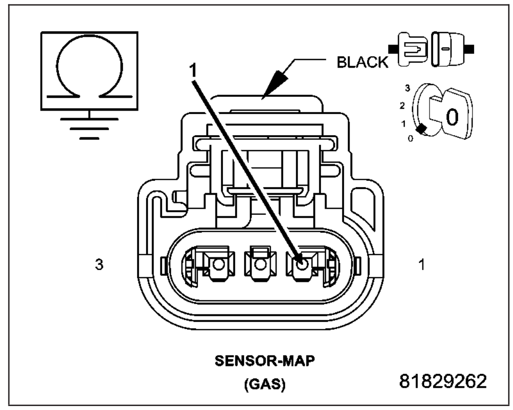
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the resistance above 100 ohms?

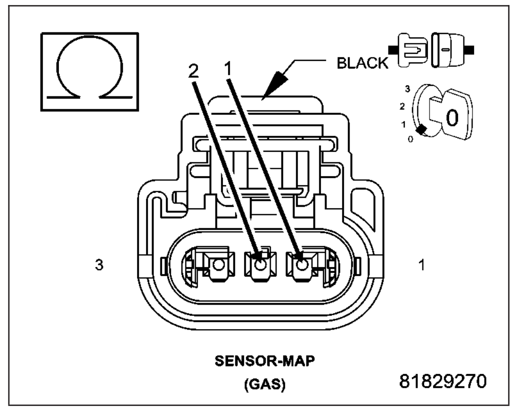
Yes >> Go to 13

No >> Repair the (K1) MAP Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K1) MAP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.



Is the resistance above 100 ohms?

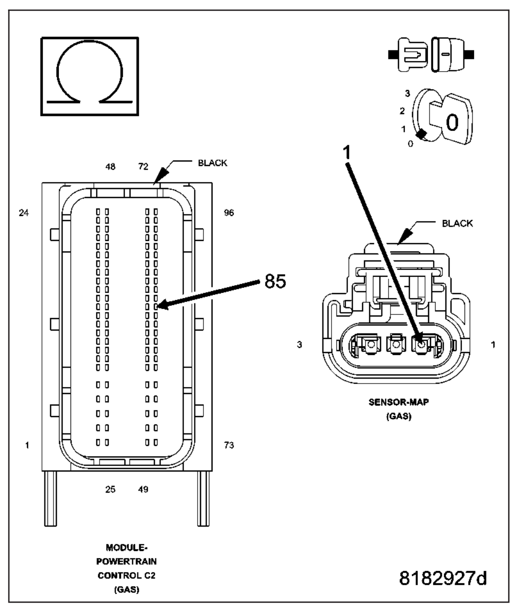
Yes >> Go to 14

No >> Repair the (K1) MAP Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K1) MAP Signal circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K1) MAP Signal circuit for an open circuit or high resistance.

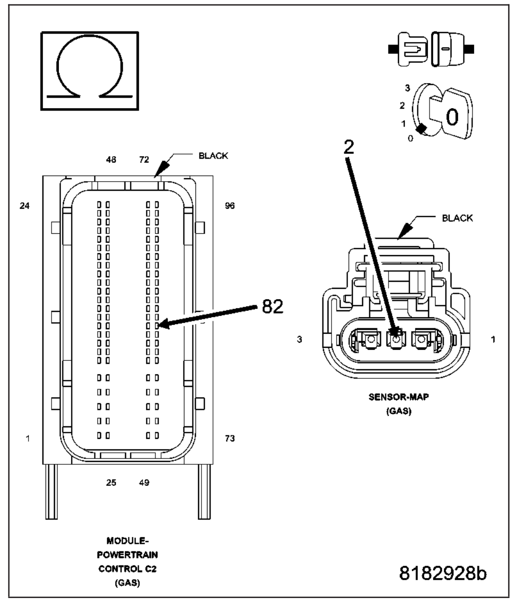
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

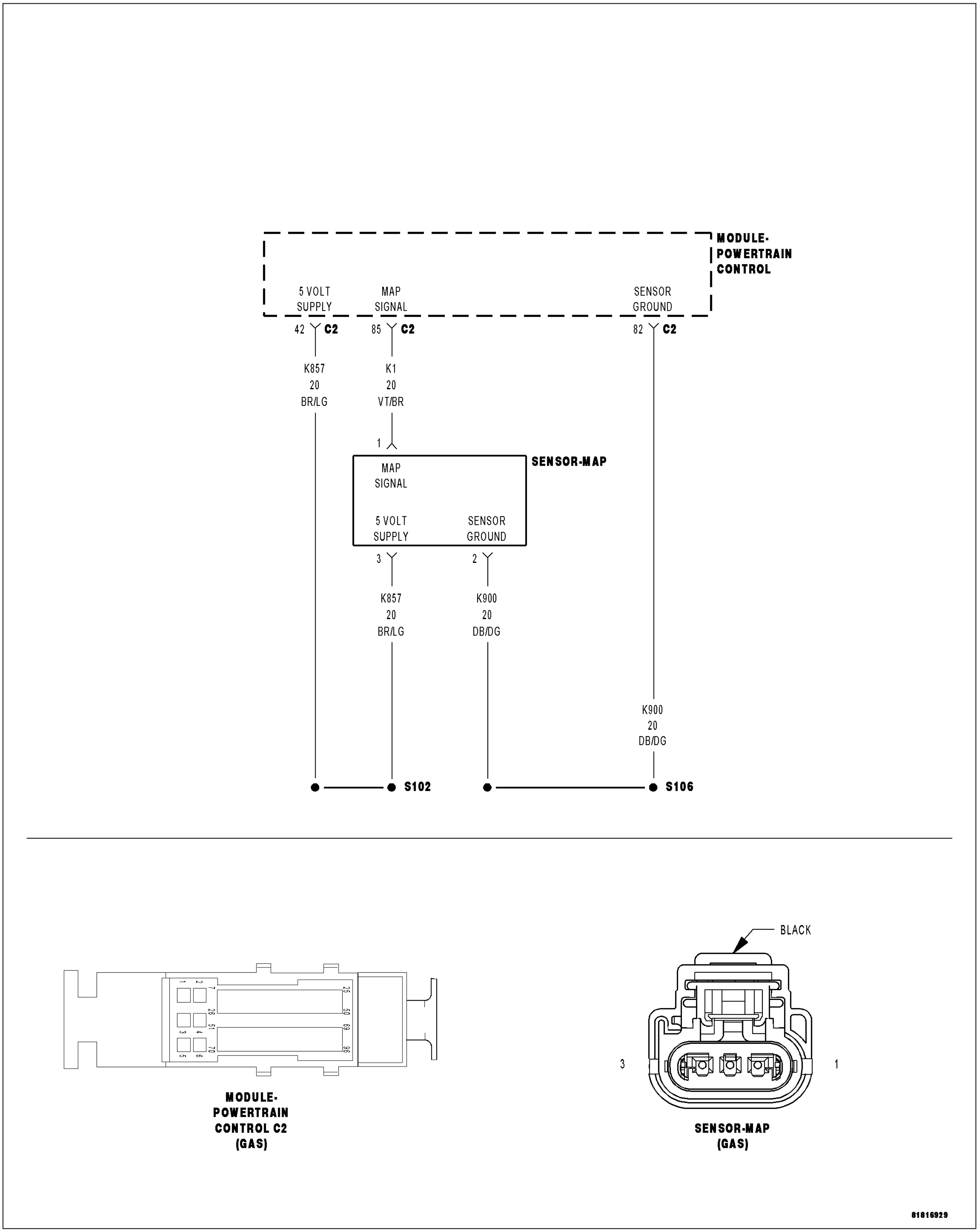
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K1) MAP Signal circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
MAP SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

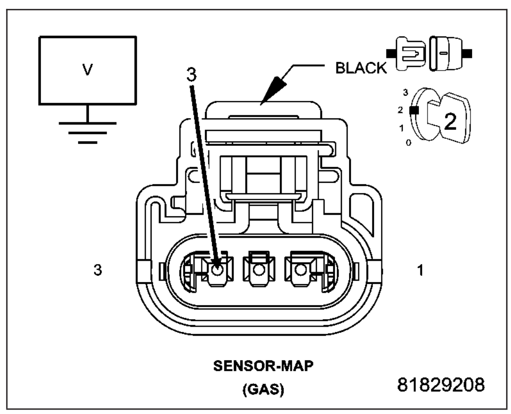
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the MAP Sensor connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

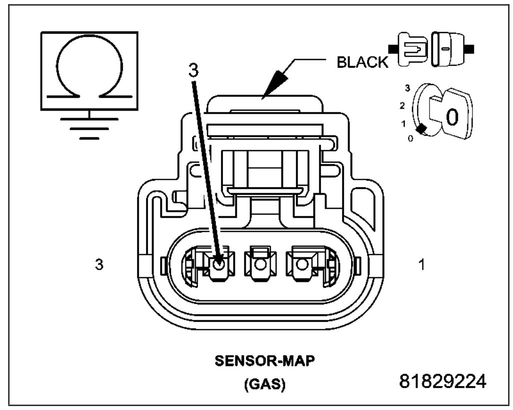
No >> Go to 3

3. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.



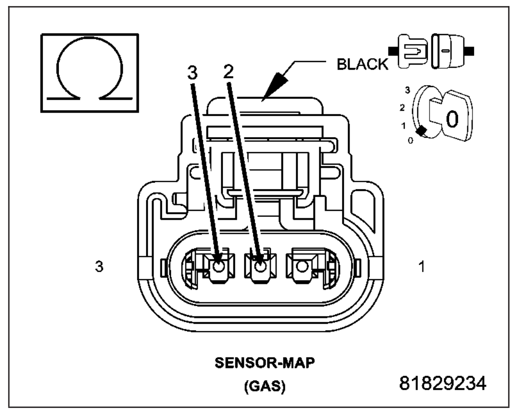
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.



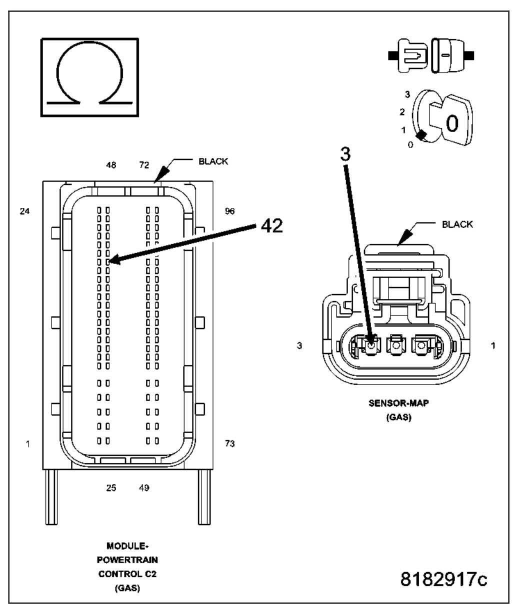
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

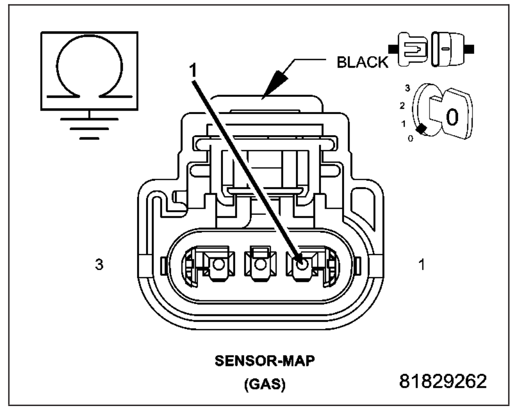
No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



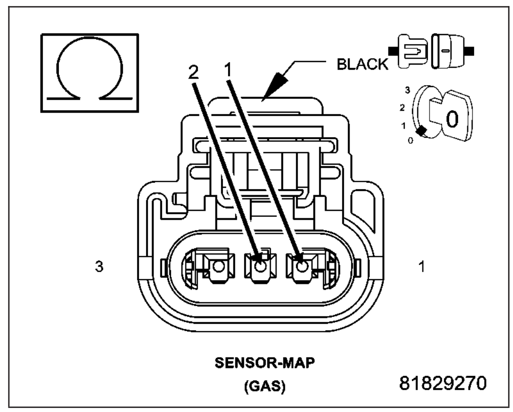
Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (K1) MAP Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K1) MAP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.



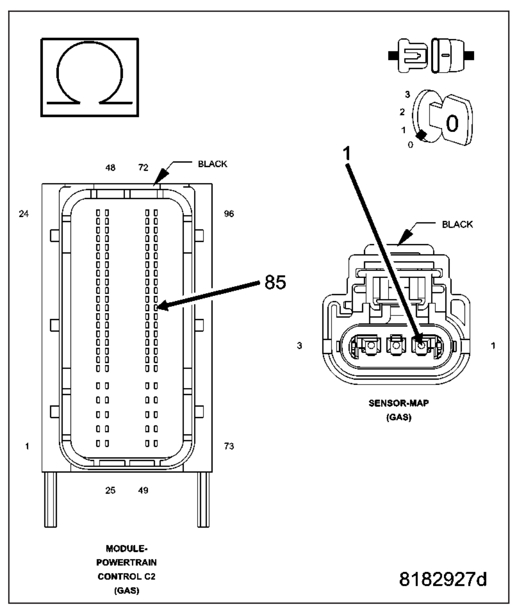
Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (K1) MAP Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K1) MAP Signal circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K1) MAP Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. MAP SENSOR

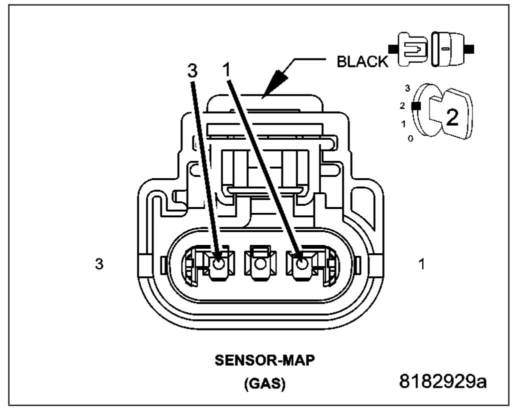
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K857) 5 Volt Supply circuit and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Turn the ignition on.

With the scan tool, read the MAP Sensor signal voltage.



Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the MAP Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

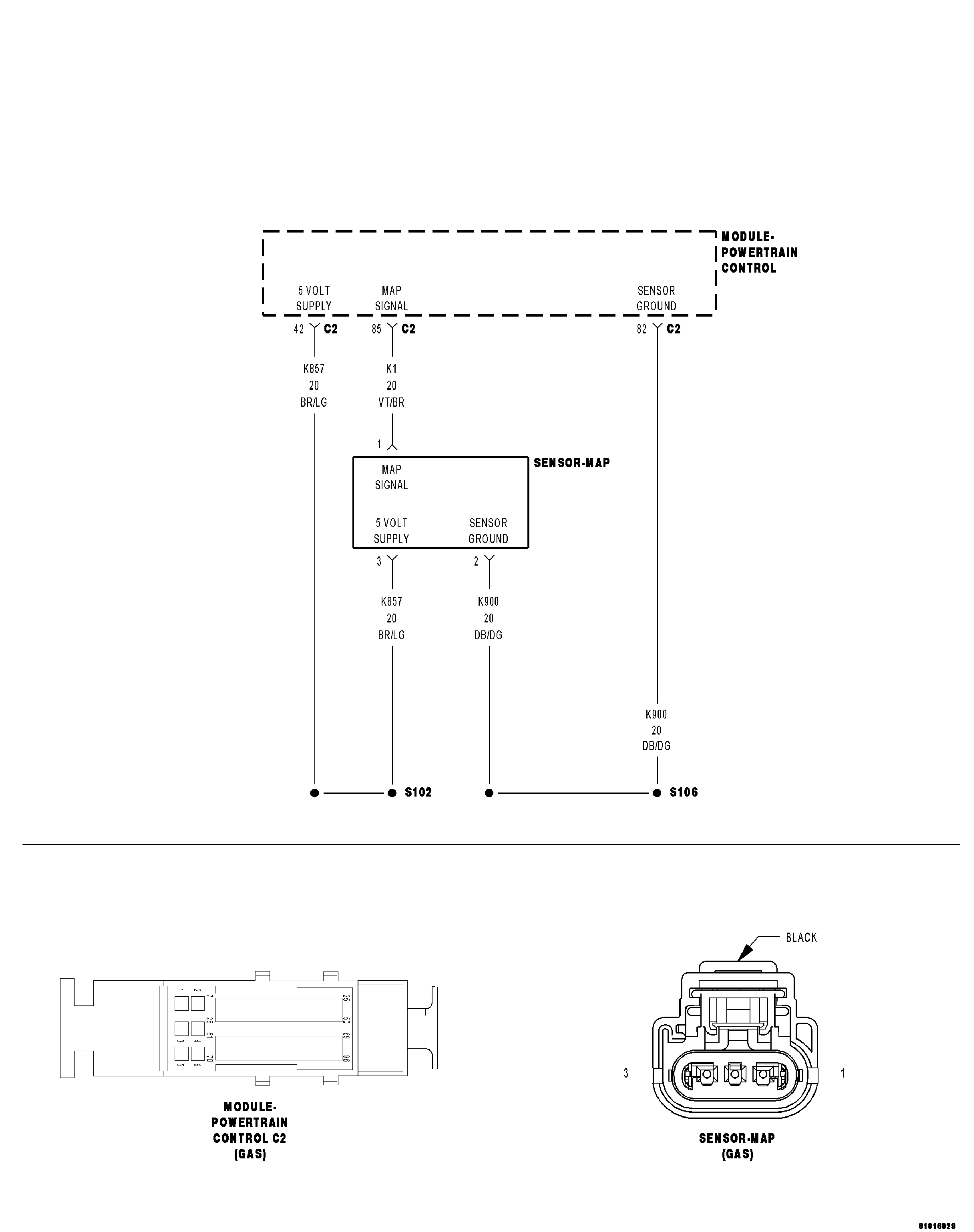
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K1) MAP Signal circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K1) MAP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT
(K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MAP SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

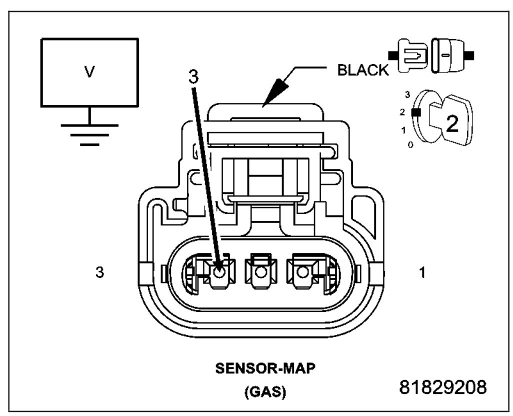
Turn the ignition off.

Disconnect the Manifold Absolute Pressure Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Absolute Pressure Sensor harness connector.



Is there any voltage present?

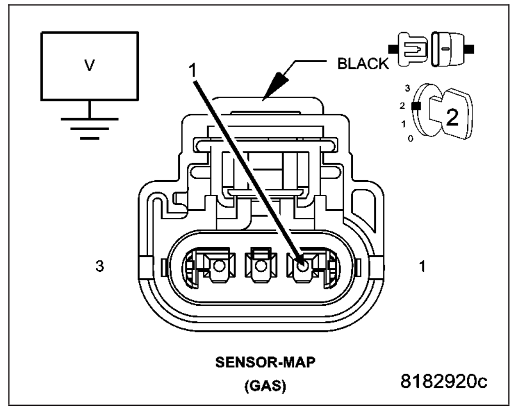
Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K1) MAP SIGNAL CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K1) MAP Signal circuit in the Manifold Absolute Pressure Sensor harness connector.



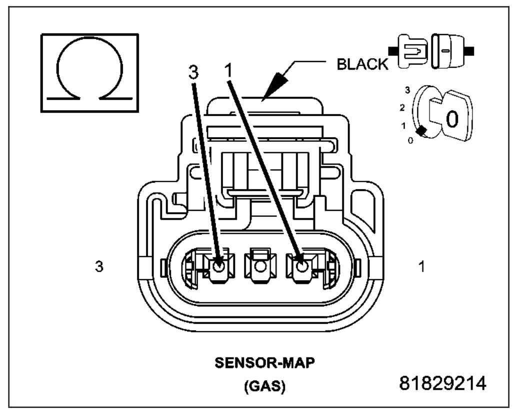
Is there any voltage present?

Yes >> Repair the (K1) MAP Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (K857) 5 Volt Supply in the Manifold Absolute Pressure Sensor harness connector.



Is the resistance below 100 ohms?

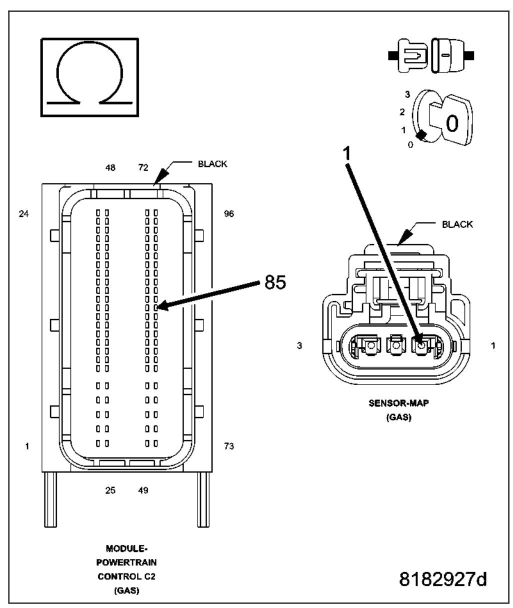
Yes >> Repair the (K1) MAP Signal circuit for a short to the (K857) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K1) MAP Signal between the Manifold Absolute Pressure Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



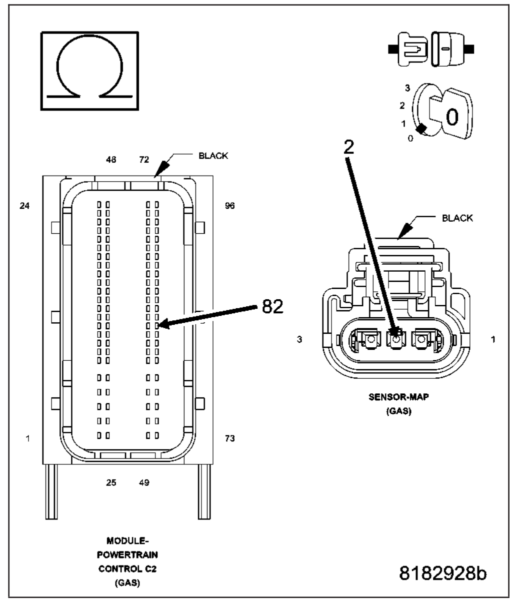
Is the resistance below 5.0 ohms?

Yes >> Go to 6

No >> Repair the (K1) MAP Signal for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Manifold Absolute Pressure Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. MAP SENSOR

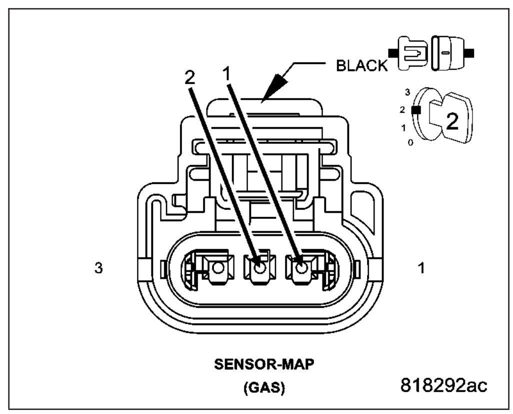
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (K1) MAP Signal circuit in the Manifold Absolute Pressure Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Manifold Absolute Pressure Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Manifold Absolute Pressure Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Absolute Pressure Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

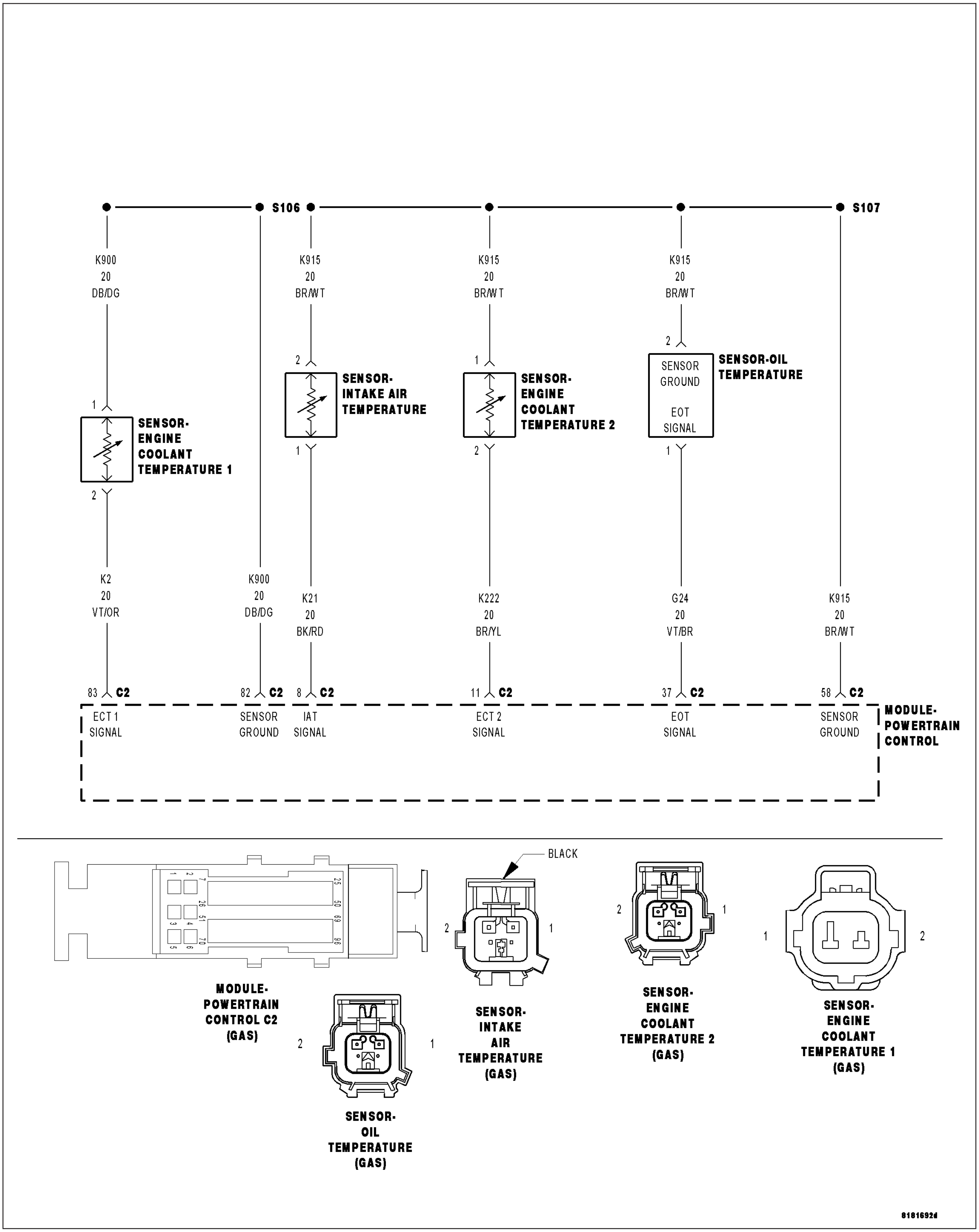
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0111-INTAKE AIR TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Intake Air Temperature Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(K21) IAT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND
(K21) IAT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT
(K21) IAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
INTAKE AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K21) IAT SIGNAL CIRCUIT SHORTED TO VOLTAGE

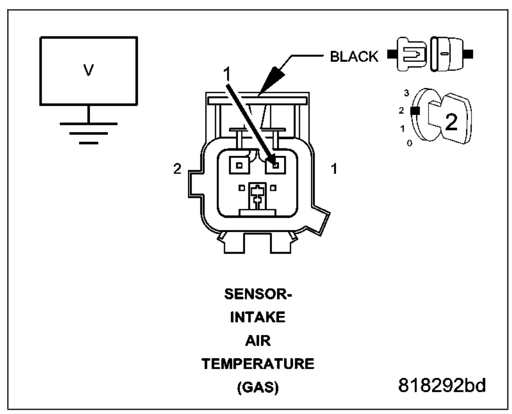
Turn the ignition off.

Disconnect the Intake Air Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K21) IAT Signal circuit in the Intake Air Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K21) IAT Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

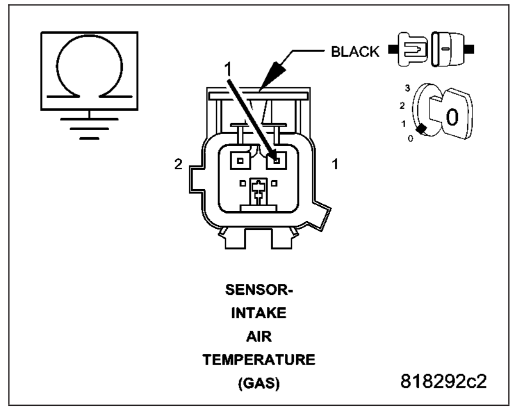
Measure the resistance between ground and the (K21) IAT Signal circuit in the Intake Air Temperature Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K21) IAT Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (K21) IAT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

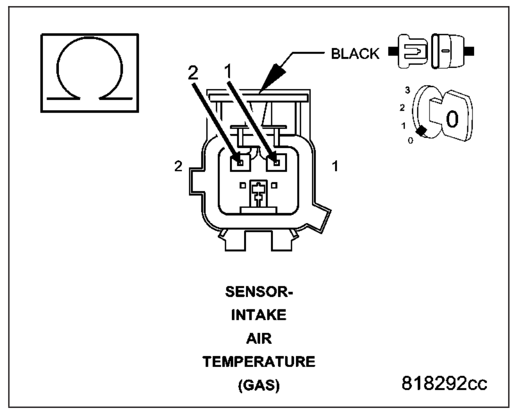
Measure the resistance between the (K21) IAT Signal circuit and the (K915) Sensor Ground circuit in the Intake Air Temperature Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K21) IAT Signal circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (K21) IAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

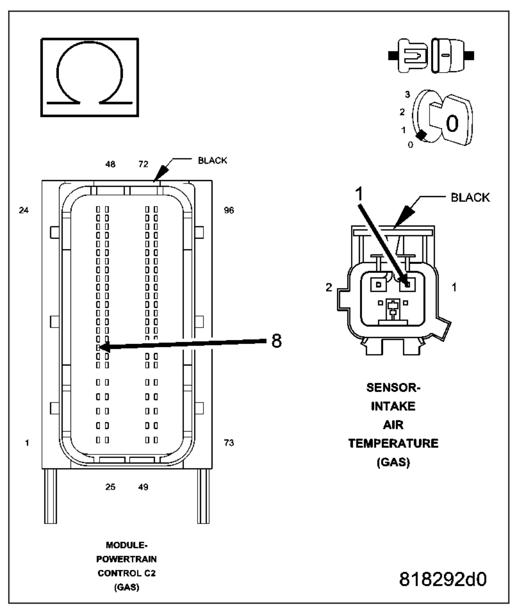
Measure the resistance of the (K21) IAT Signal circuit between the Intake Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 6

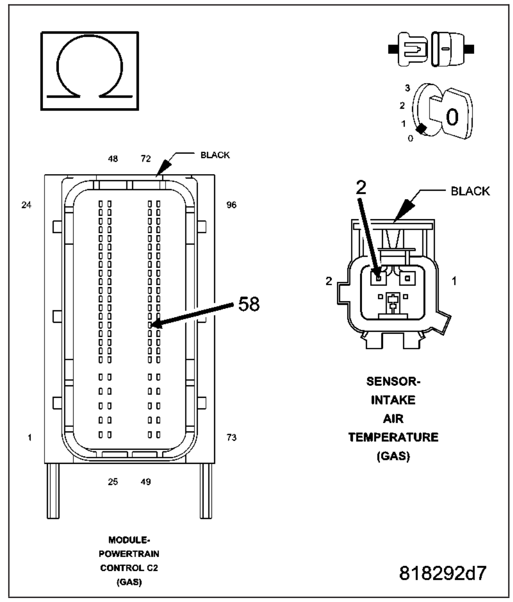
No >> Repair the (K21) IAT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Sensor Ground circuit between the Intake Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K915) Sensor Ground for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. INTAKE AIR TEMPERATURE SENSOR

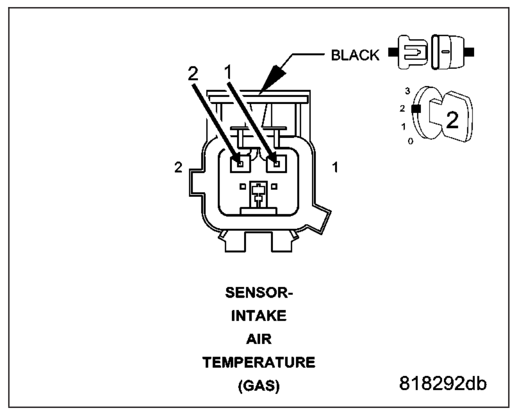
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K915) Sensor Ground circuit and the (K21) IAT Signal circuit in the Intake Air Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Intake Air Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Intake Air Temperature Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Intake Air Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

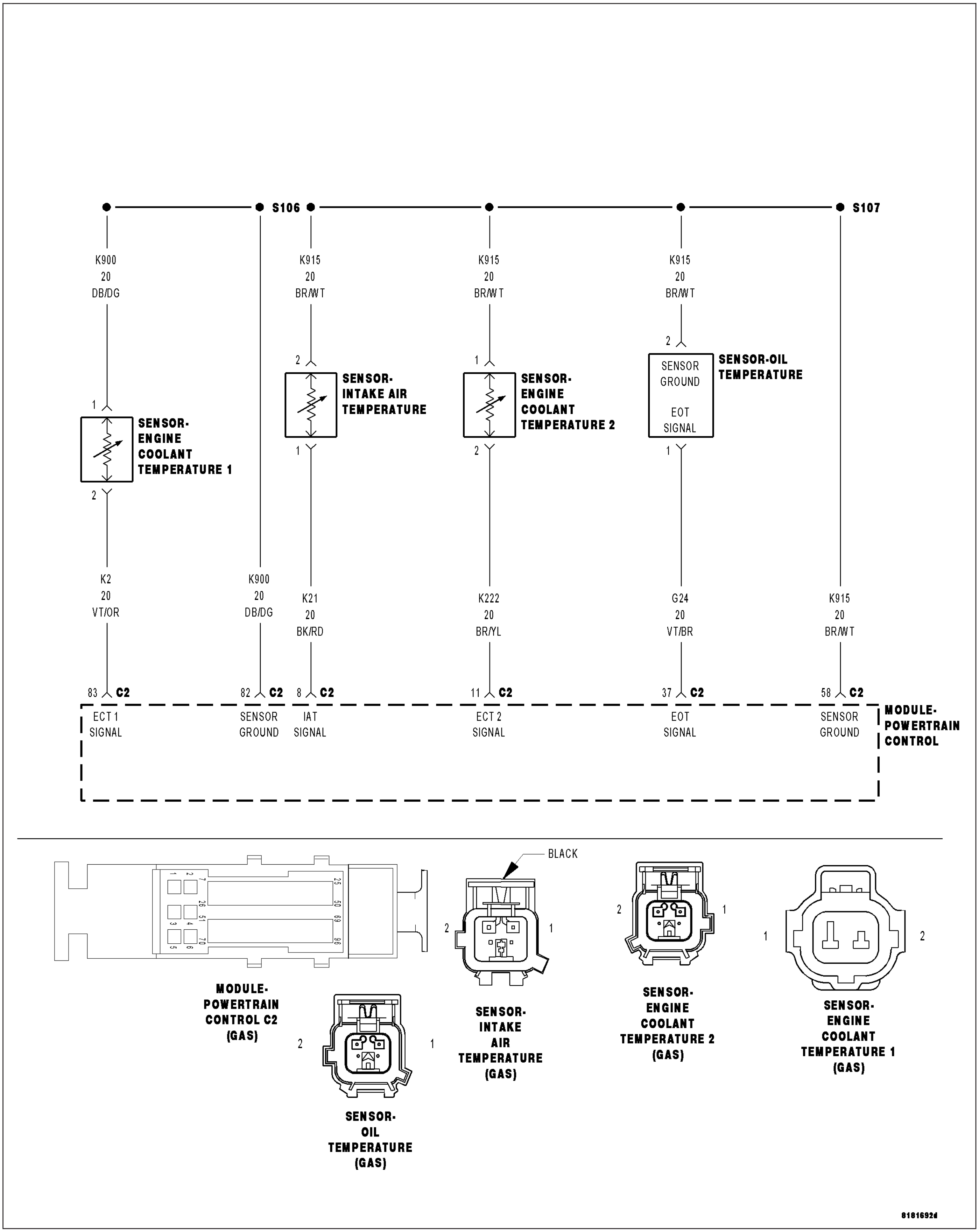
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Intake Air Temperature Sensor circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND
(K21) IAT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND
(K21) IAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
INTAKE AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

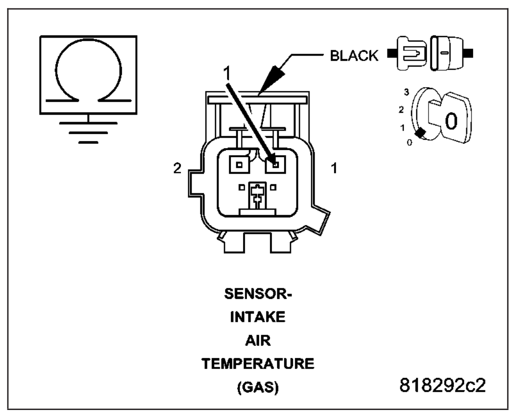
2. (K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Intake Air Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K21) IAT Signal circuit in the Intake Air Temperature Sensor harness connector.



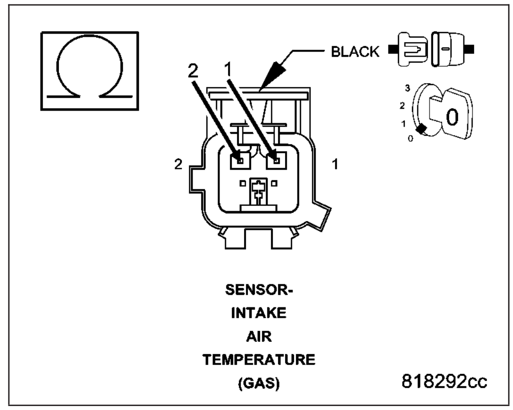
Is the resistance above 100 ohms?

Yes >> Go to 3

No >> Repair the (K21) IAT Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K21) IAT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (K21) IAT Signal circuit and the (K915) Sensor Ground circuit in the Intake Air Temperature Sensor harness connector.



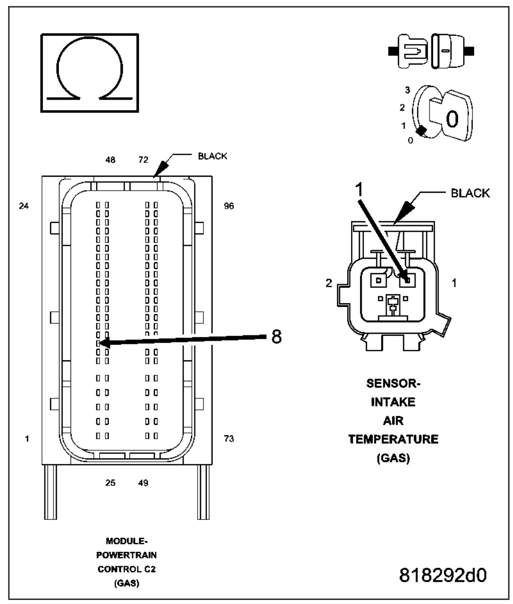
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K21) IAT Signal circuit for a short to the (K915) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K21) IAT SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (K21) IAT Signal circuit between the Intake Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K21) IAT Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. INTAKE AIR TEMPERATURE SENSOR

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, read the Intake Air Temperature Sensor signal voltage.

Is the voltage above 4.5 volts with the Intake Air Temperature Sensor harness disconnected?

Yes >> Replace the Intake Air Temperature Sensor in accordance with the service information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Intake Air Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

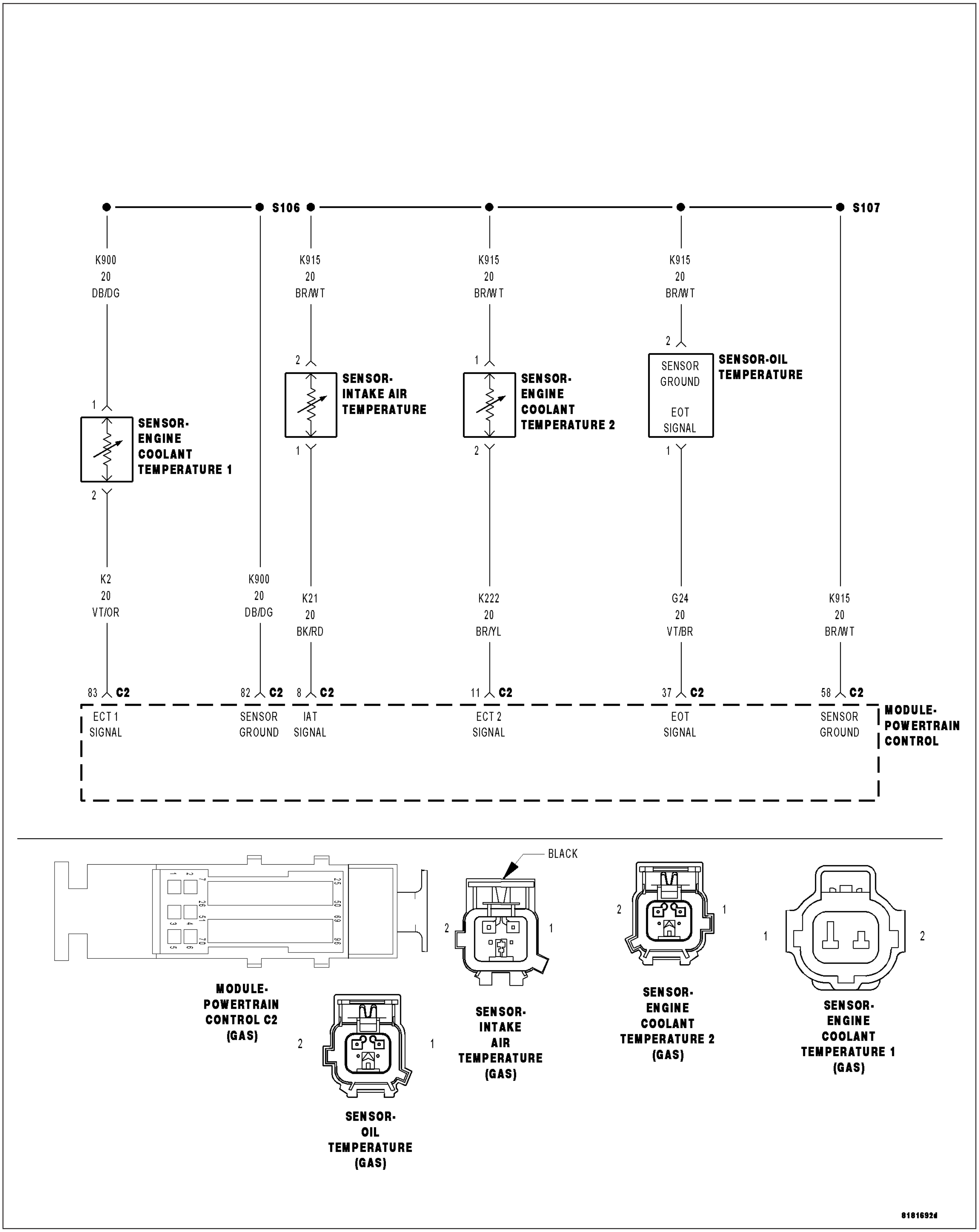
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K21) IAT Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(K21) IAT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K21) IAT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
INTAKE AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K21) IAT SIGNAL CIRCUIT SHORTED TO VOLTAGE

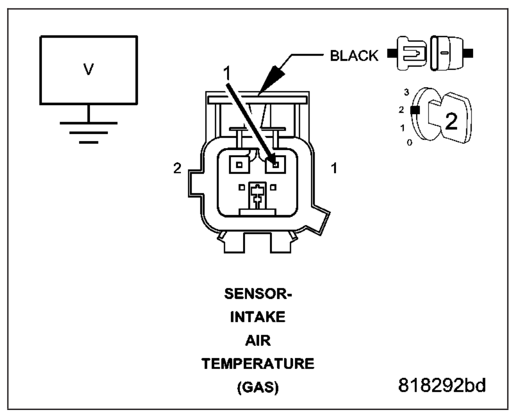
Turn the ignition off.

Disconnect the Intake Air Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K21) IAT Signal circuit in the Intake Air Temperature Sensor harness connector.



Is there any voltage present?

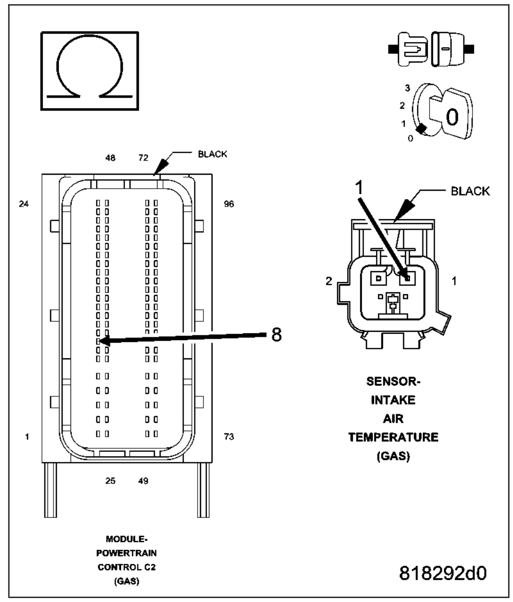
Yes >> Repair the (K21) IAT Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K21) IAT SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K21) IAT Signal circuit between the Intake Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

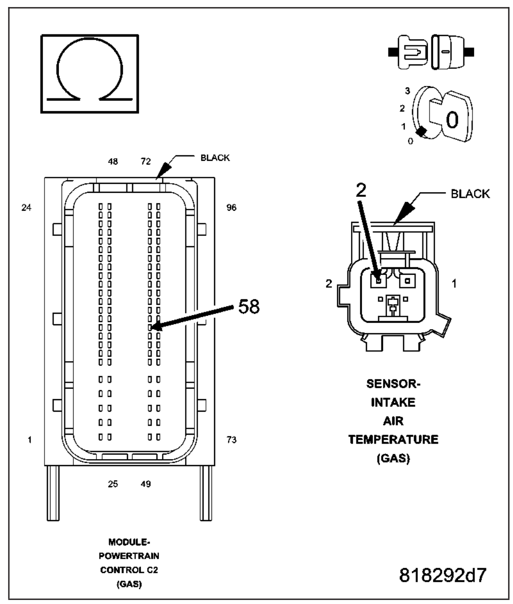
Yes >> Go to 4

No >> Repair the (K21) IAT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Sensor Ground circuit between the Intake Air Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K915) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. INTAKE AIR TEMPERATURE SENSOR

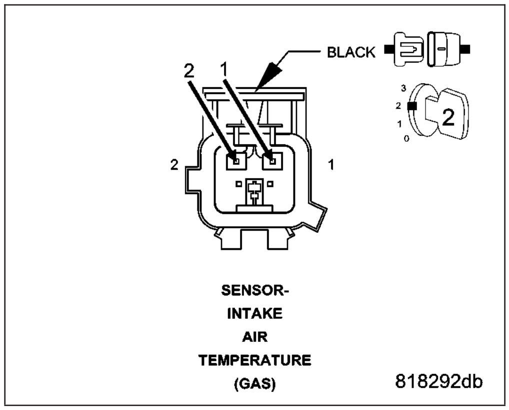
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K21) IAT Signal circuit and the (K915) Sensor Ground in the Intake Air Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Intake Air Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Intake Air Temperature Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Intake Air Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

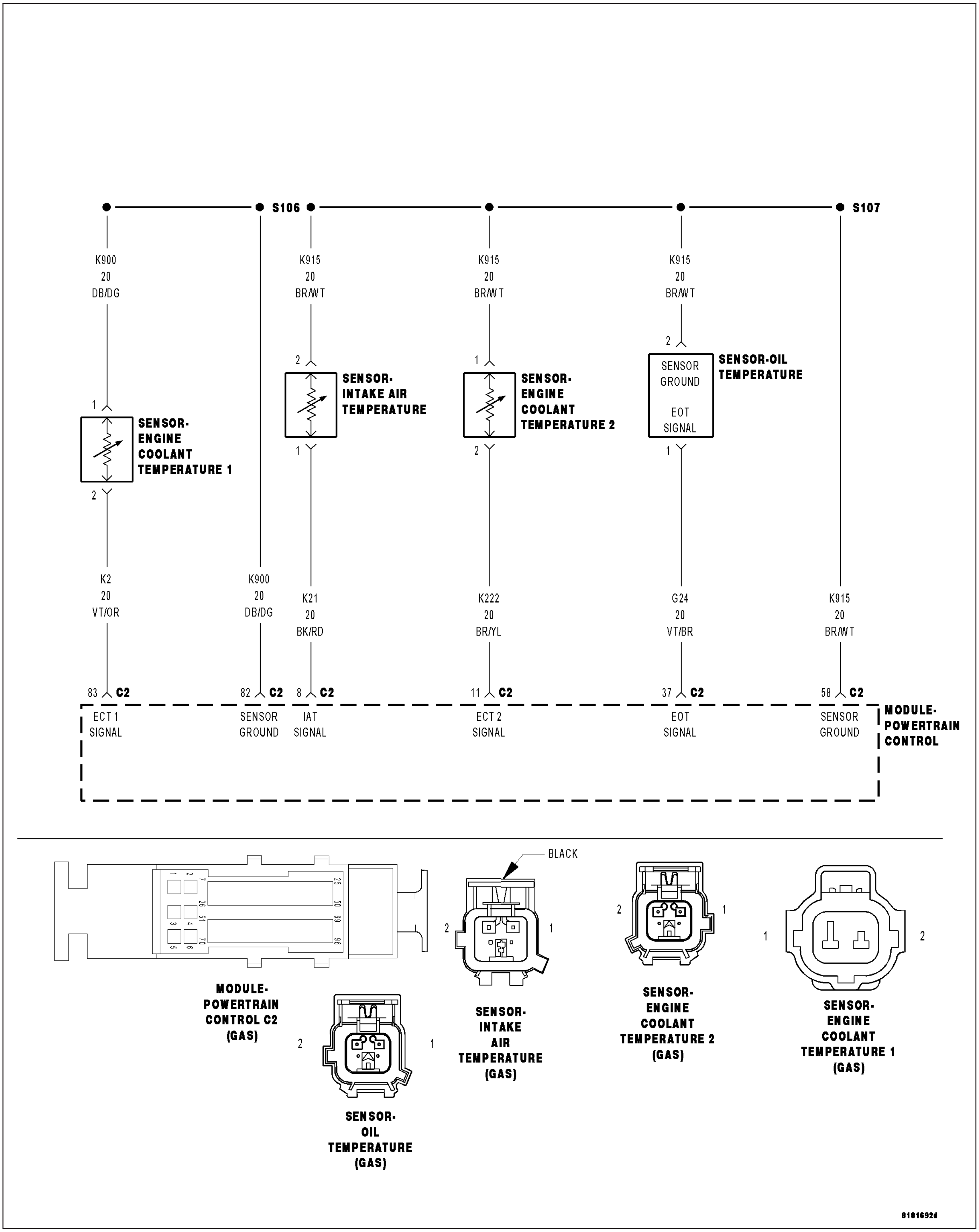
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0116-ENGINE COOLANT TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Engine Coolant Temperature Sensor 1 circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

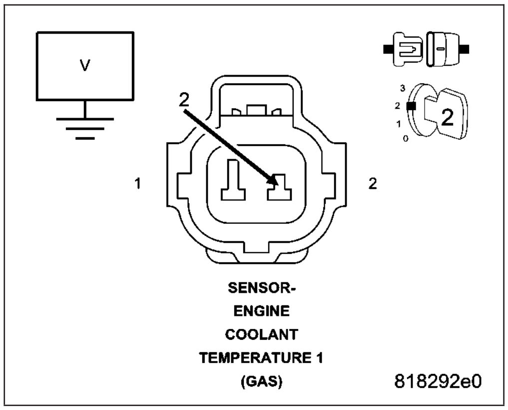
Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is there any voltage present?

Yes >> Repair the (K2) ECT 1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND

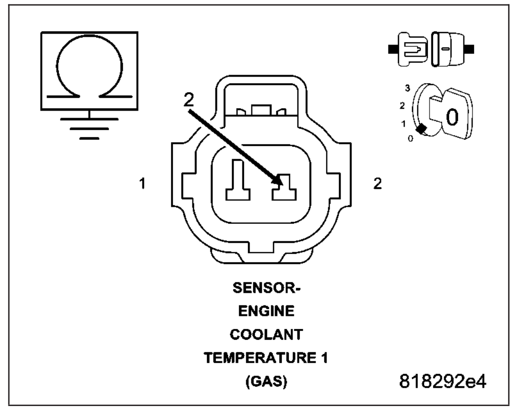
Turn the ignition off.

Measure the resistance between ground and the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K2) ECT 1 Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



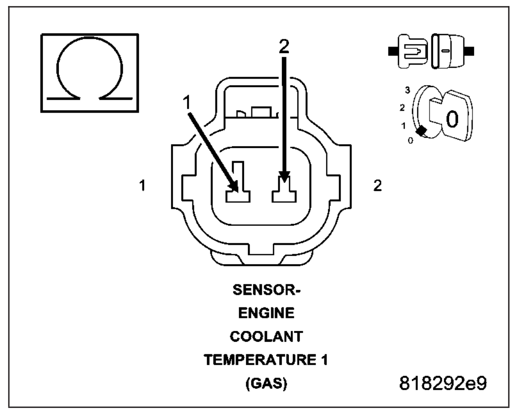
4. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K2) ECT 1 Signal circuit and the (K900) Sensor Ground circuit in the Engine Coolant Temperature Sensor 1 harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K2) ECT 1 Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



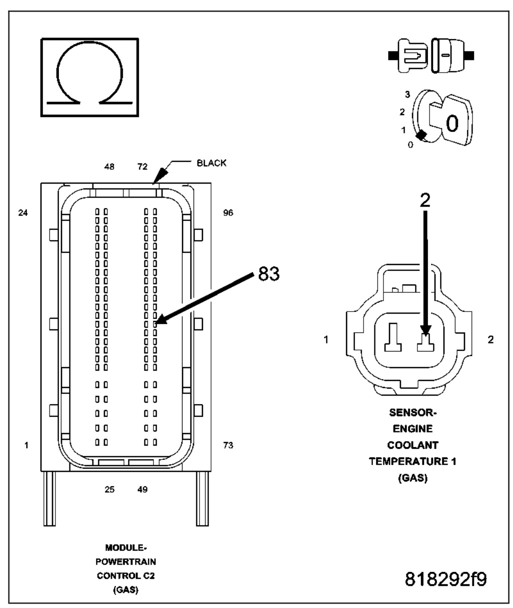
5. (K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K2) ECT 1 Signal circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

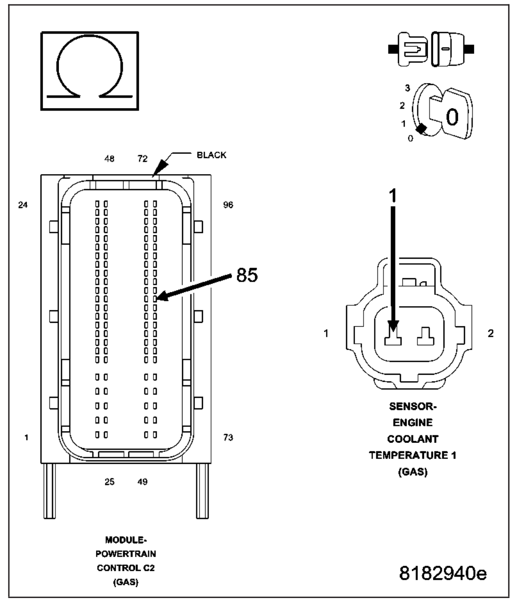
Yes >> Go to 6

No >> Repair the (K2) ECT 1 Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K900) Sensor Ground for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. ENGINE COOLANT TEMPERATURE SENSOR 1

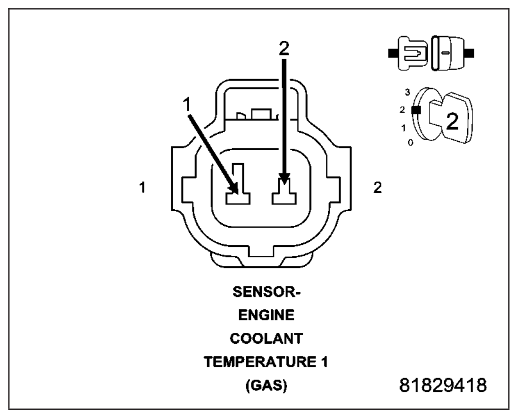
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 1 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Coolant Temperature Sensor 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

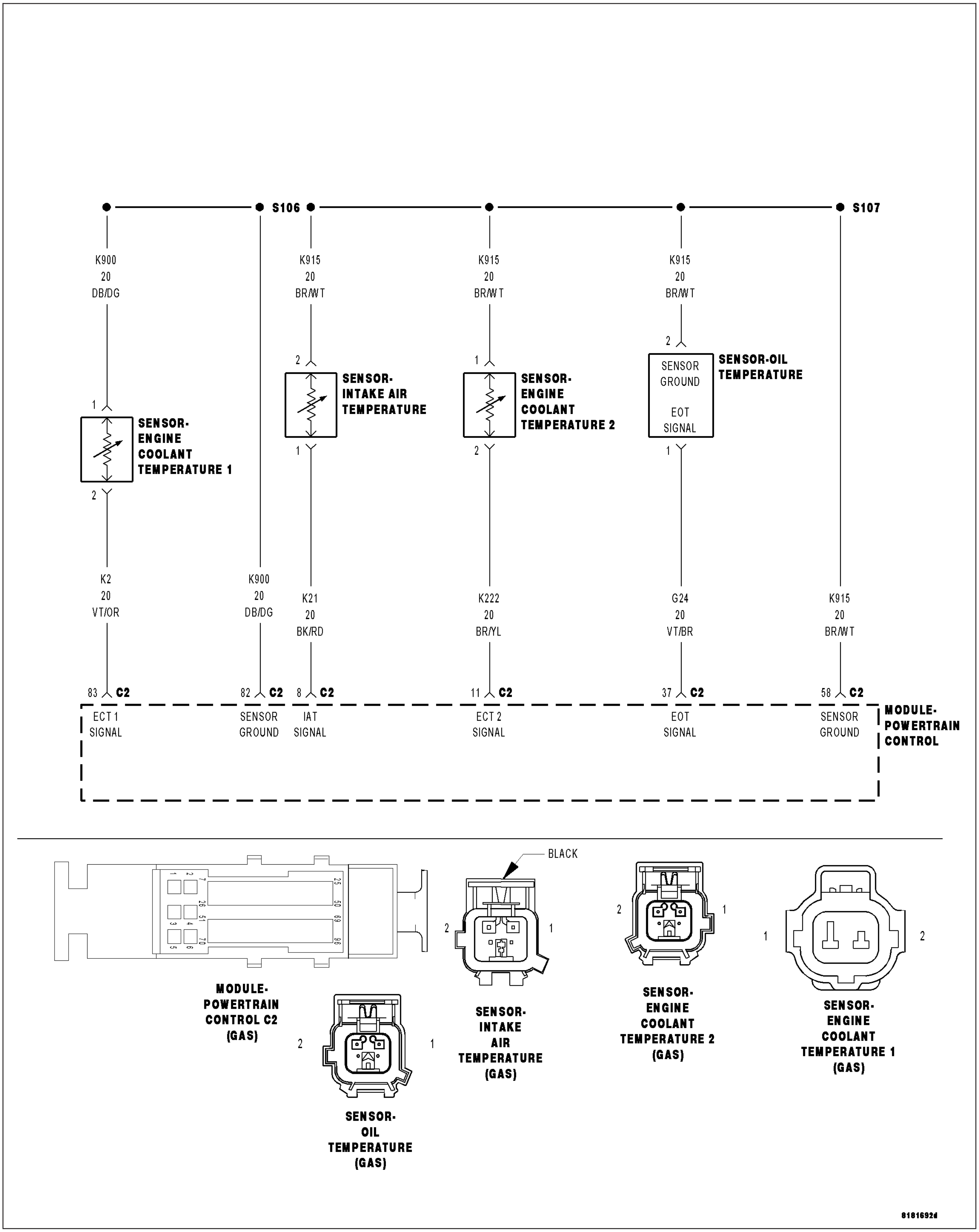
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Engine Coolant Temperature Sensor 1 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND
(K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

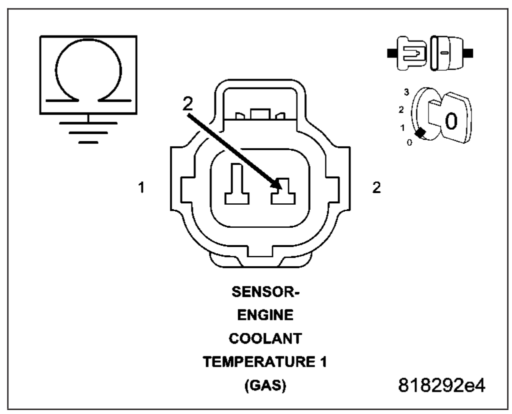
2. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



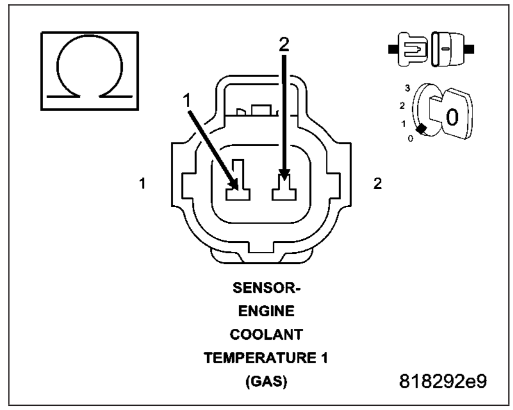
Is the resistance above 100 ohms?

Yes >> Go to 3

No >> Repair the (K2) ECT 1 Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K2) ECT 1 Signal circuit and the (K900) Sensor Ground circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is the resistance above 100 ohms?

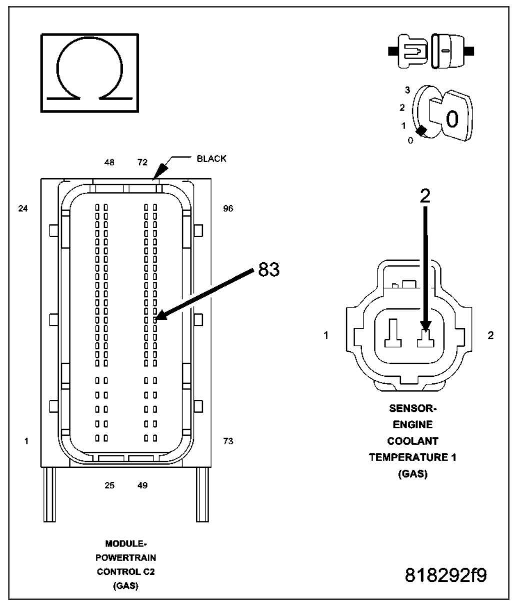
Yes >> Go to 4

No >> Repair the (K2) ECT 1 Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K2) ECT 1 SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (K2) ECT 1 Signal circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K2) ECT 1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE COOLANT TEMPERATURE SENSOR 1

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 1 signal voltage.

Is the voltage above 4.5 volts with the Engine Coolant Temperature Sensor 1 harness disconnected?

Yes >> Replace the Engine Coolant Temperature Sensor 1 in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

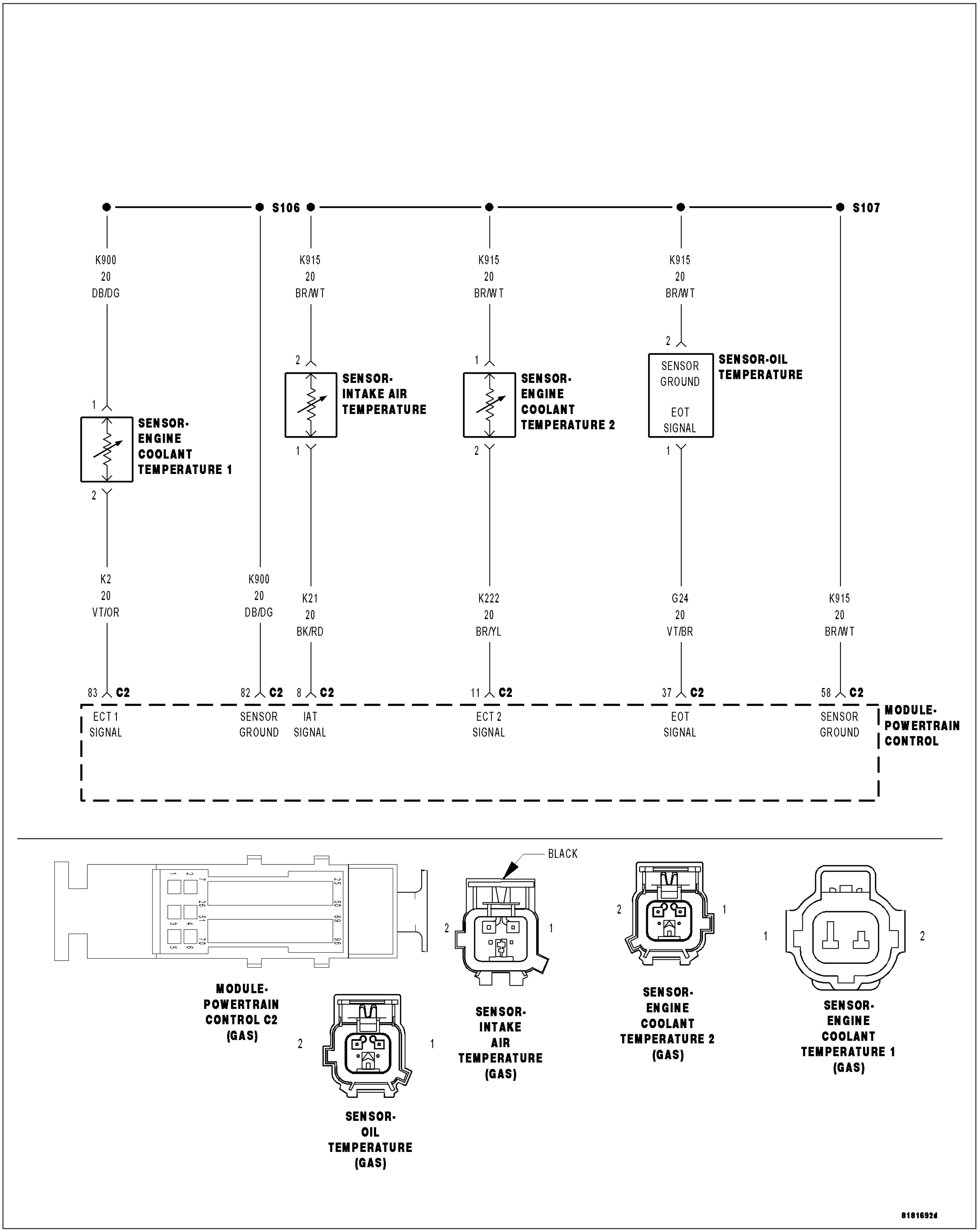
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K2) ECT 1 Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

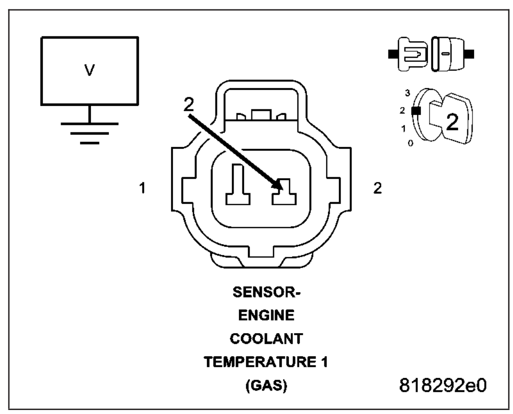
Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is there any voltage present?

Yes >> Repair the (K2) ECT 1 Signal circuit for a short to voltage.

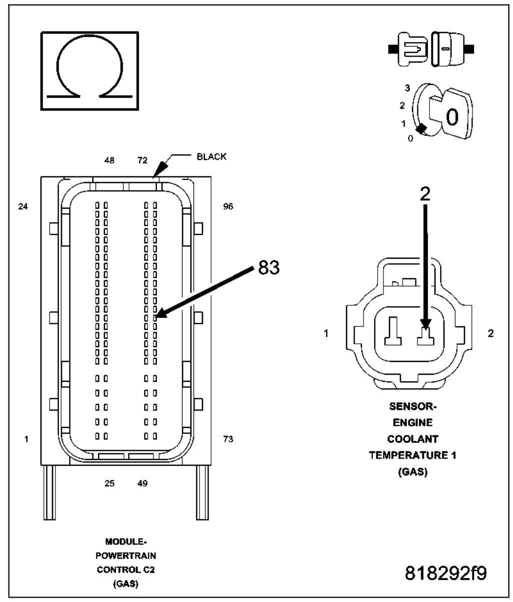
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K2) ECT 1 SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K2) ECT 1 Signal circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

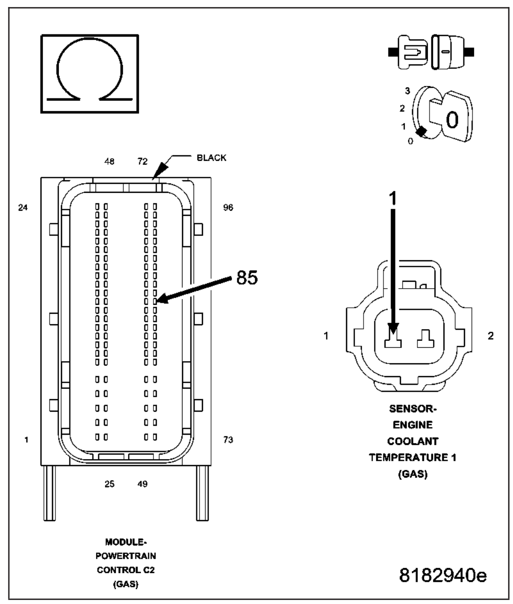
Yes >> Go to 4

No >> Repair the (K2) ECT 1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE COOLANT TEMPERATURE SENSOR 1

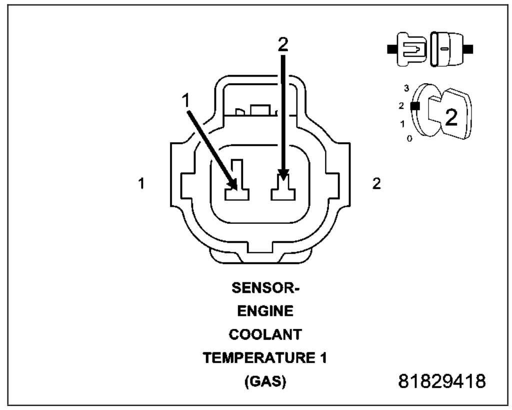
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K2) ECT 1 Signal circuit and the (K900) Sensor Ground in the Engine Coolant Temperature Sensor 1 harness connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 1 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Coolant Temperature Sensor 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

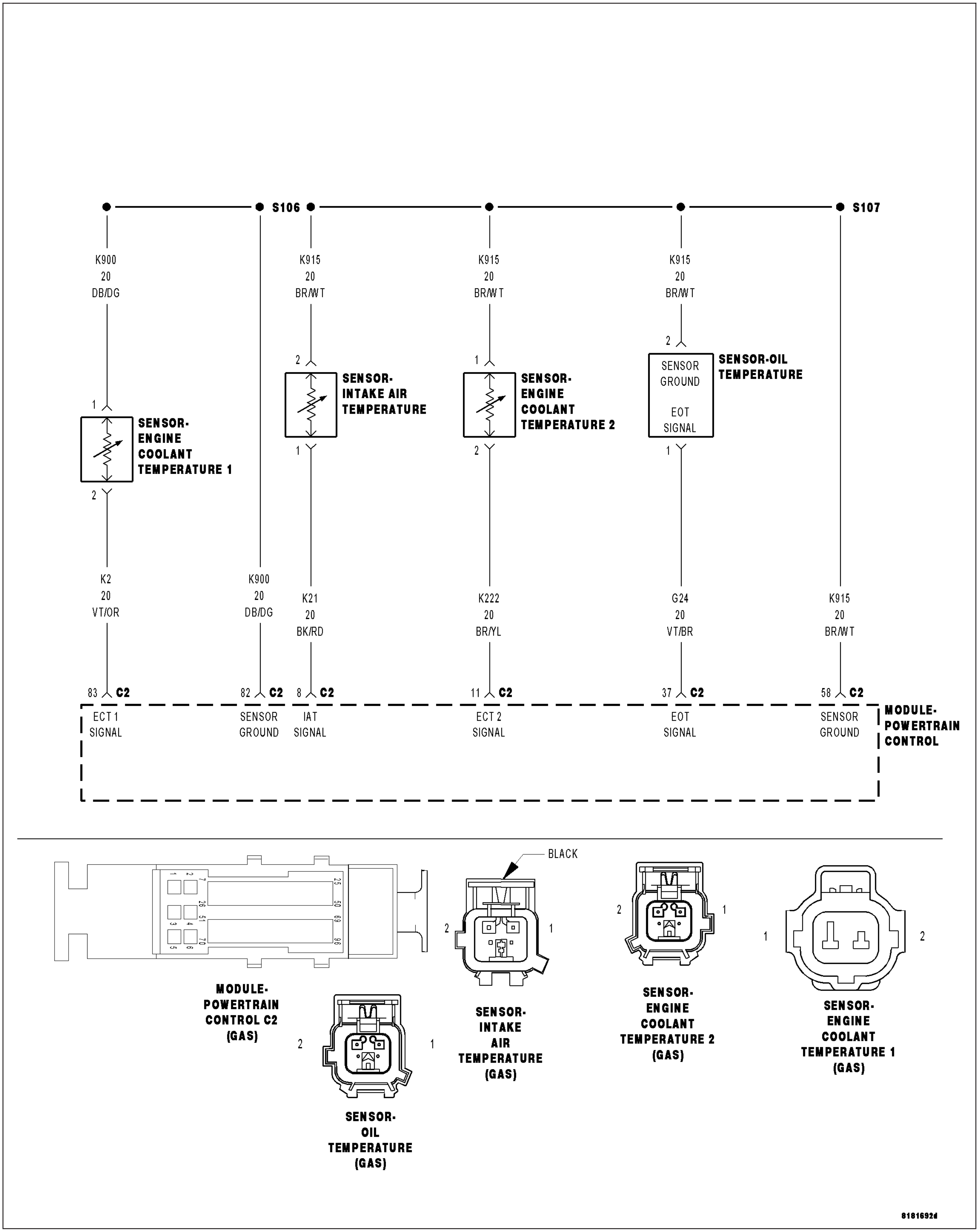
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0119-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT 1 INTERMITTENT/ ERRATIC



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K2) ECT 1 Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

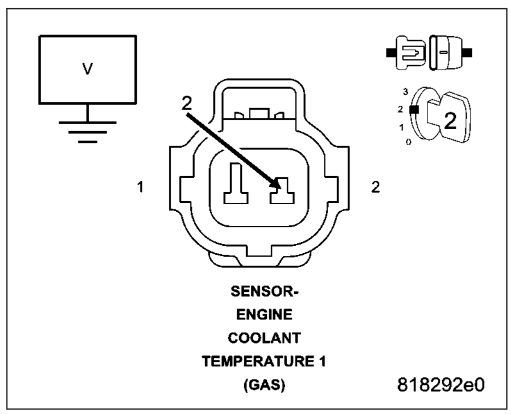
Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is there any voltage present?

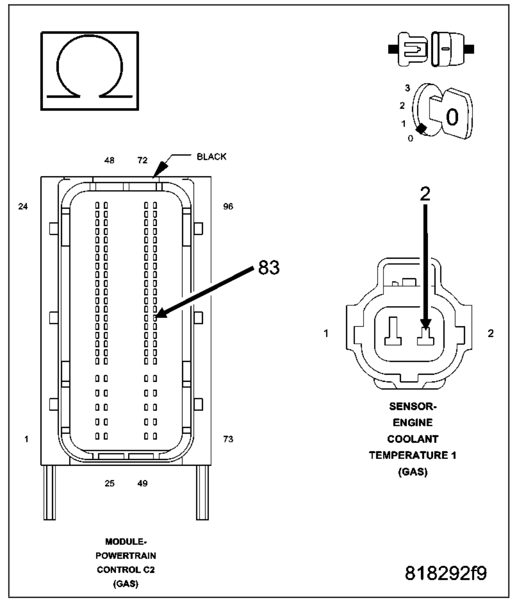
Yes >> Repair the (K2) ECT 1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K2) ECT 1 SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K2) ECT 1 Signal circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

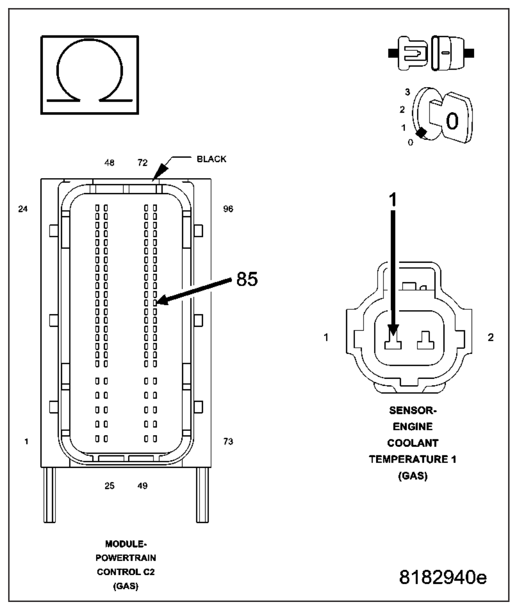
Yes >> Go to 4

No >> Repair the (K2) ECT 1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE COOLANT TEMPERATURE SENSOR 1

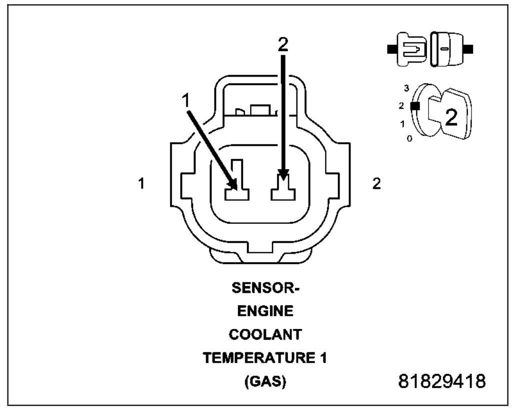
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K2) ECT 1 Signal circuit and the (K900) Sensor Ground in the Engine Coolant Temperature Sensor 1 harness connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 1 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Coolant Temperature Sensor 1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

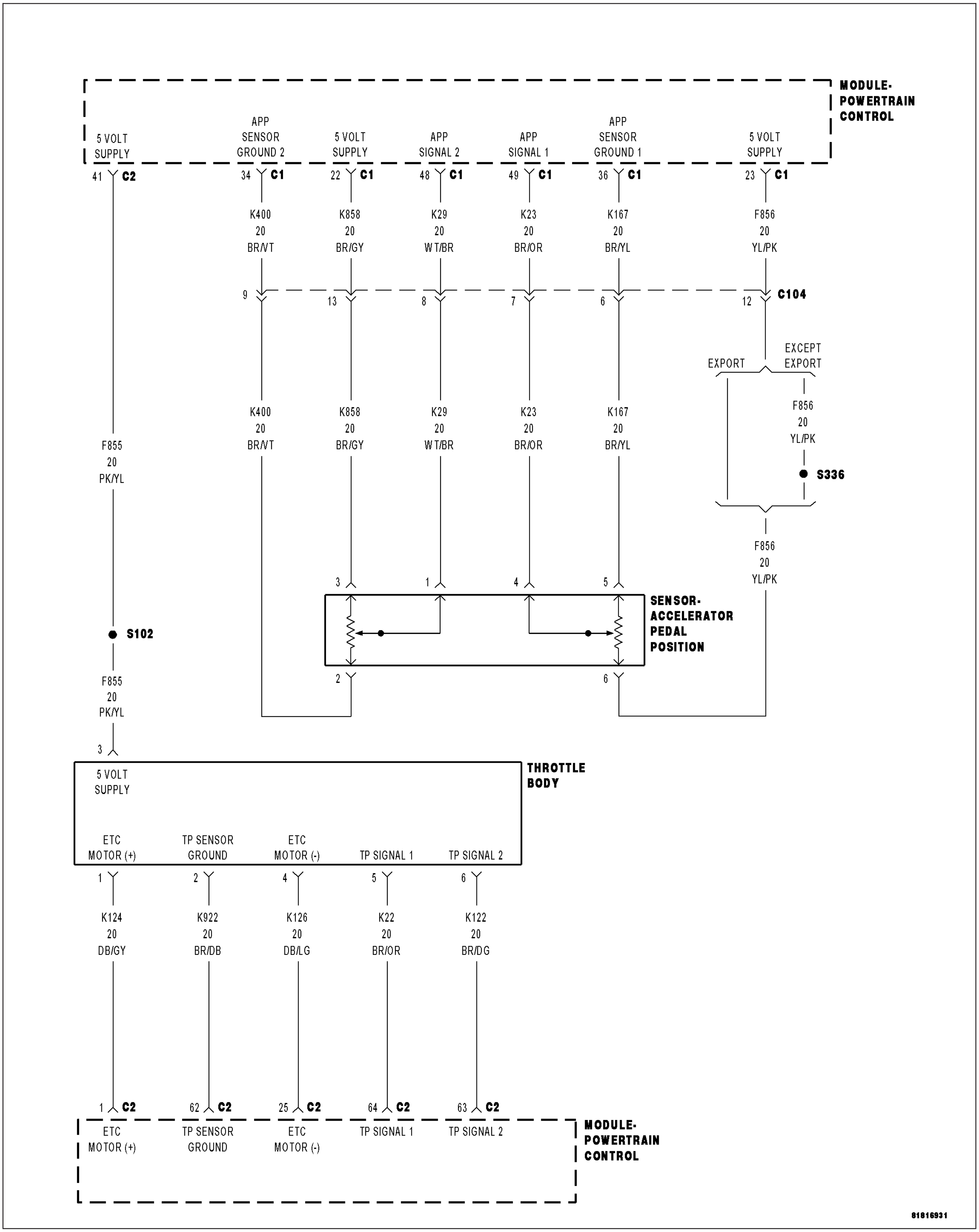
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the Throttle Body circuit.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K22) TP SIGNAL 1 CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

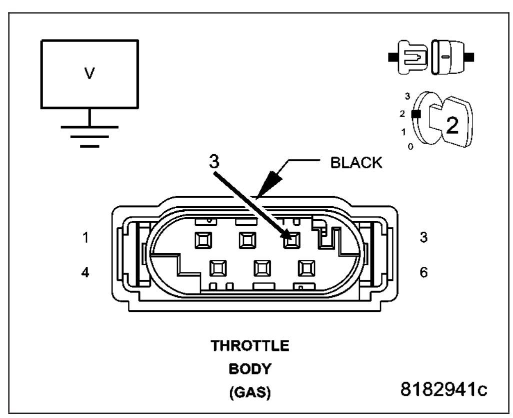
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



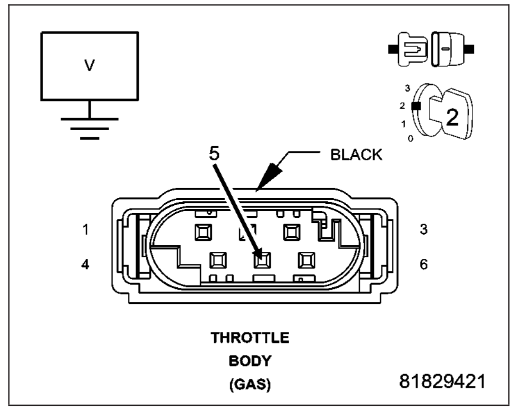
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K22) TP SIGNAL 1 CIRCUIT VOLTAGE

Measure the voltage of the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

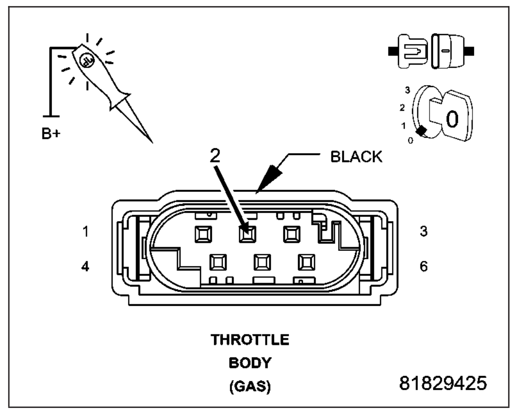
No >> Go to 11

4. (K922) TP SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K922) TP Sensor Ground in the Throttle Body harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



Is the test light illuminated and bright?

Yes >> Go to 5

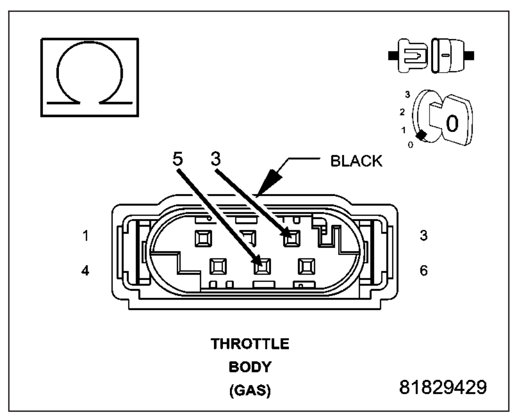
No >> Go to 15

5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K22) TP SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K22) TP Signal 1 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. THROTTLE BODY

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Throttle Body for any condition that would result in an incorrect signal, such as damage or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

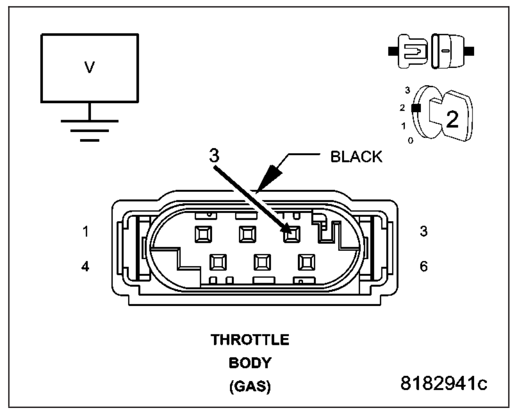
Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.

Is there any voltage present?

Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

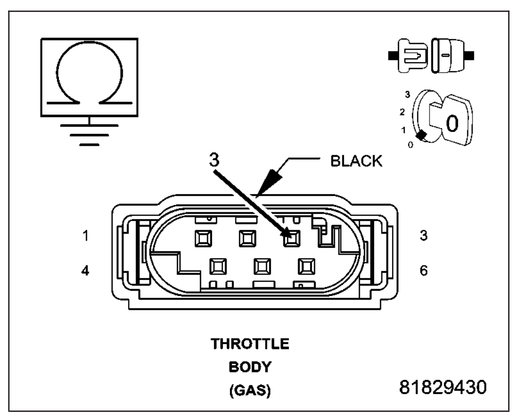
Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

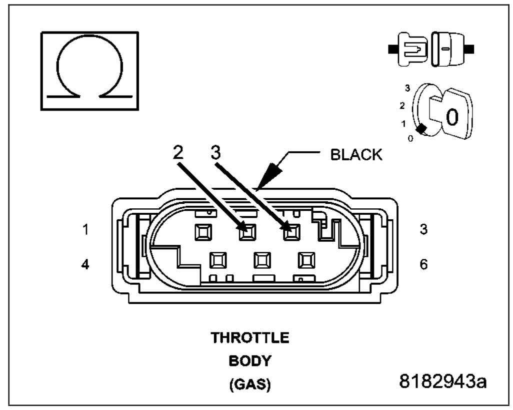
Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



Is the resistance above 100 ohms?

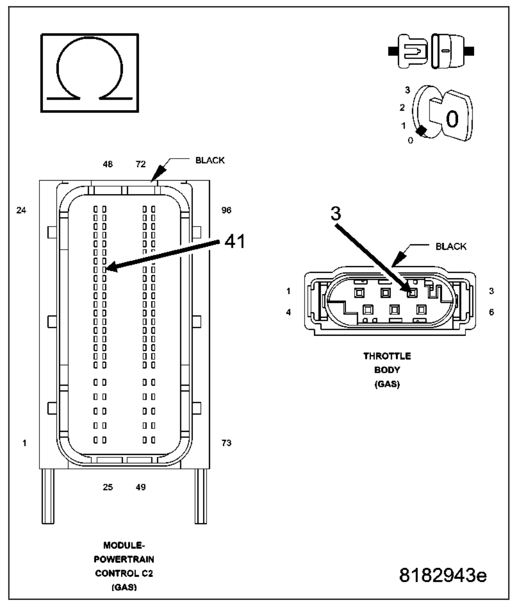
Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K922) TP Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

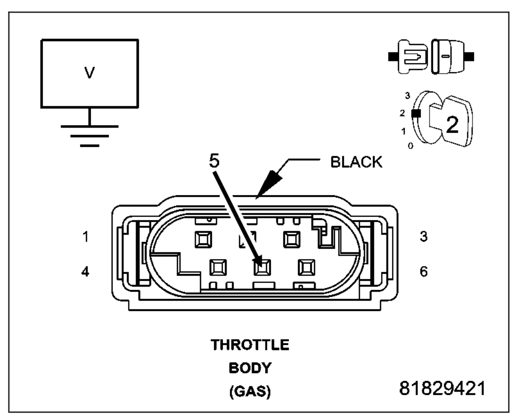
11. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



Is there any voltage present?

Yes >> Repair the (K22) TP Signal 1 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

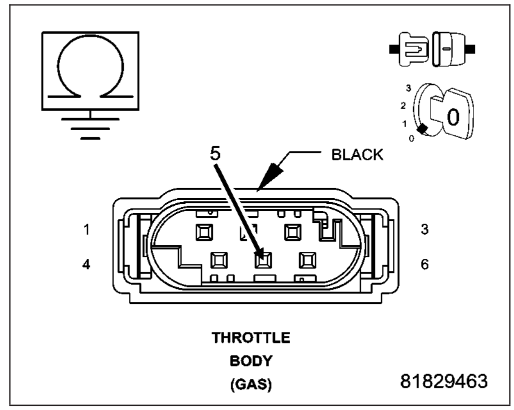
Measure the resistance between ground and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K22) TP Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



13. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

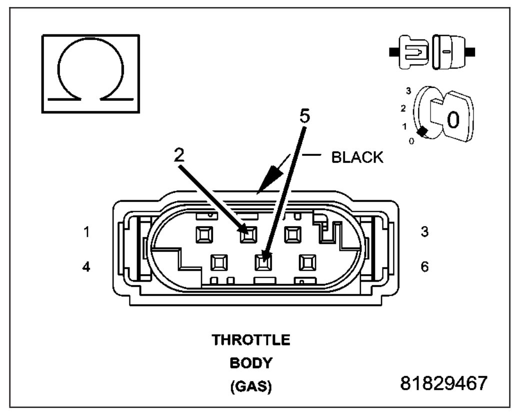
Measure the resistance between the (K22) TP Signal 1 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K22) TP Signal 1 circuit for a short to the (K922) TP Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



14. (K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

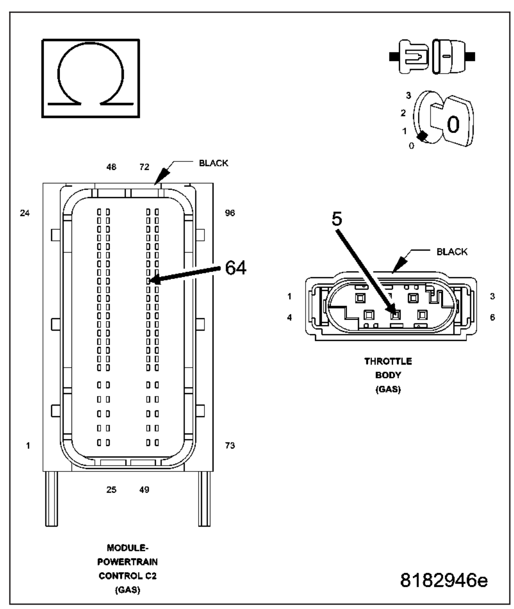
Measure the resistance of the (K22) TP Signal 1 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K22) TP Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

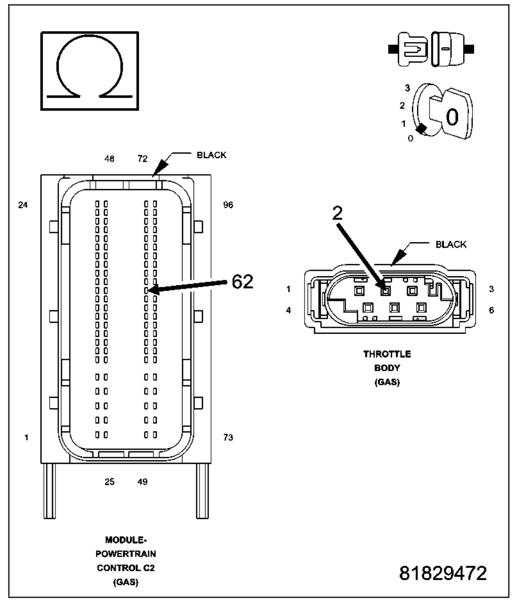


15. (K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K922) TP Sensor Ground circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

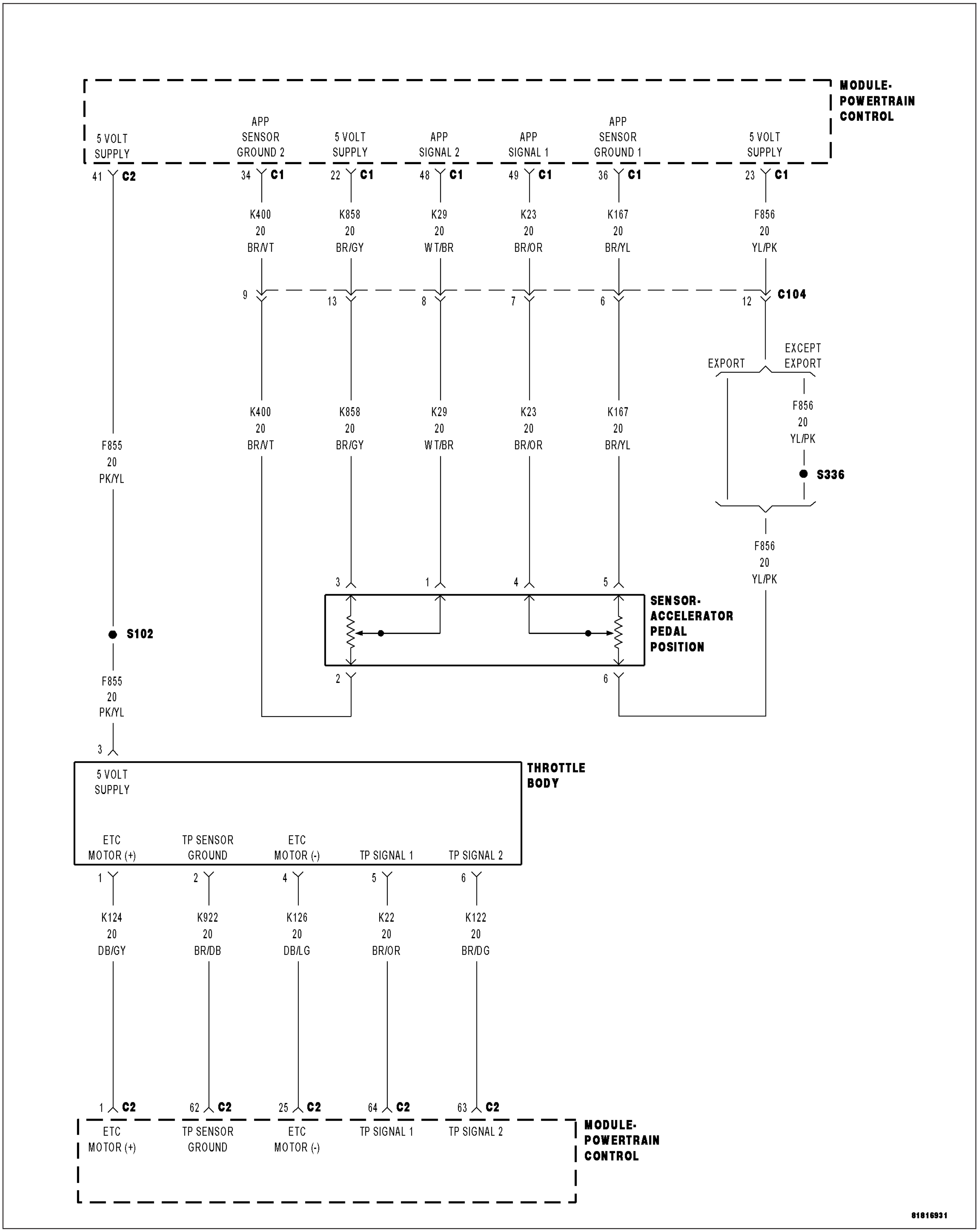
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K22) TP Signal 1 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

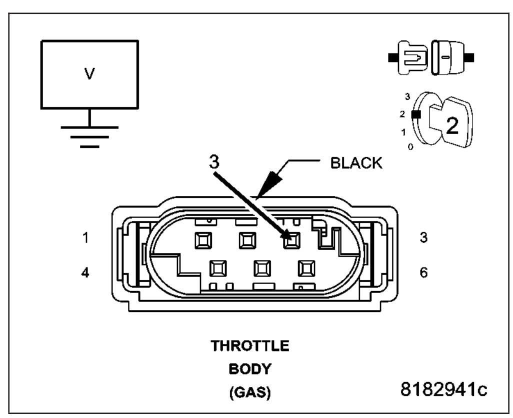
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

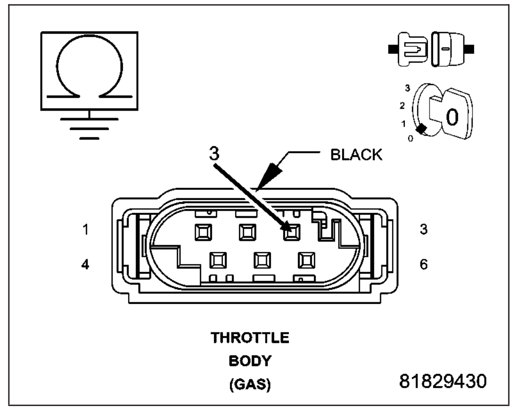
No >> Go to 3

3. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



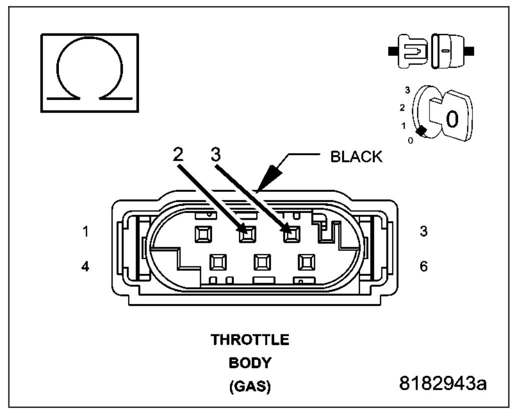
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



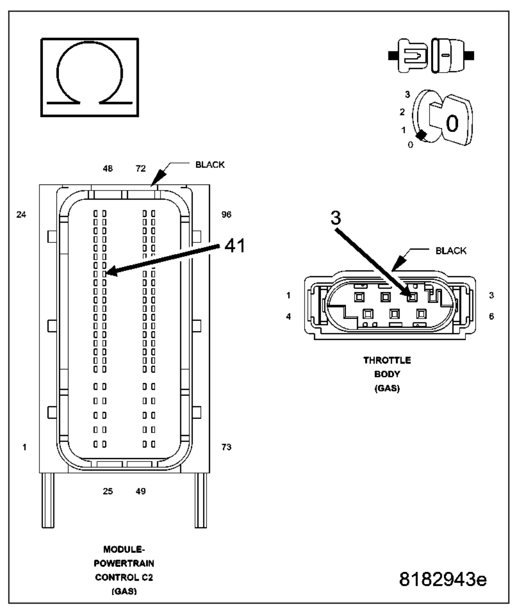
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 12

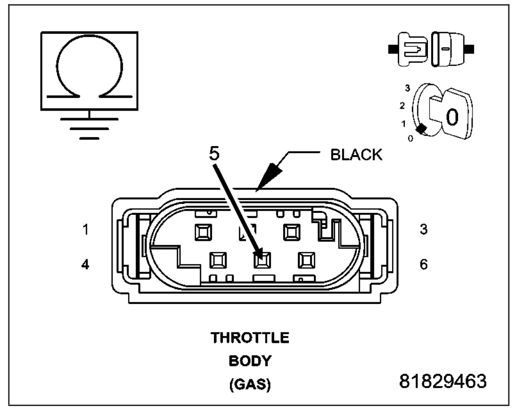
No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



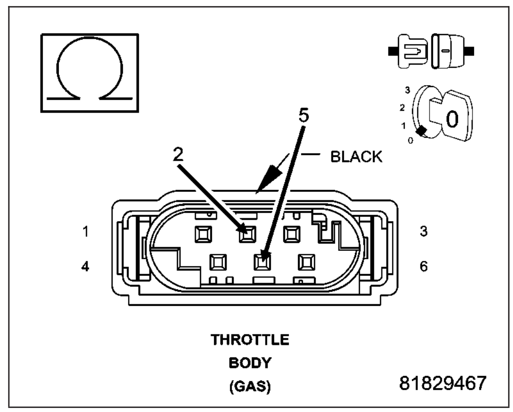
Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (K22) TP Signal 1 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



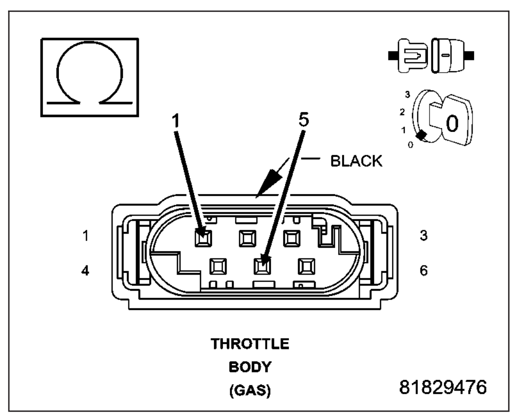
Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (K22) TP Signal 1 circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (K124) ETC Motor (+) in the Throttle Body harness connector.



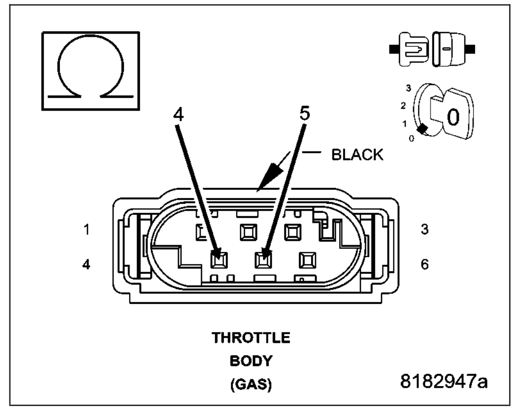
Is the resistance below 100 ohms?

Yes >> Repair the (K124) ETC Motor (+) circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (K126) ETC Motor (-) in the Throttle Body harness connector.



Is the resistance below 100 ohms?

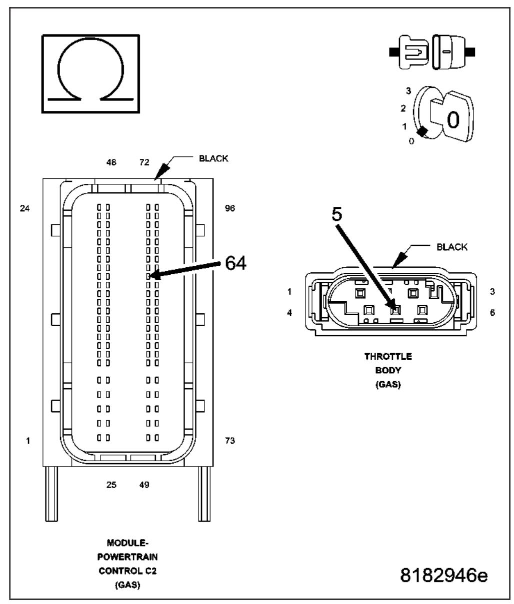
Yes >> Repair the (K22) TP Signal 1 circuit for a short to the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. (K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K22) TP Signal 1 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K22) TP Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. THROTTLE BODY

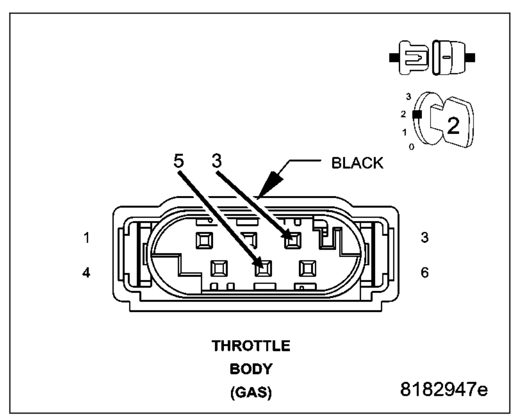
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (F855) 5 Volt Supply circuit and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.

Turn the ignition on.

With the scan tool, read the TP Signal 1 circuit voltage.



Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the Throttle Body in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

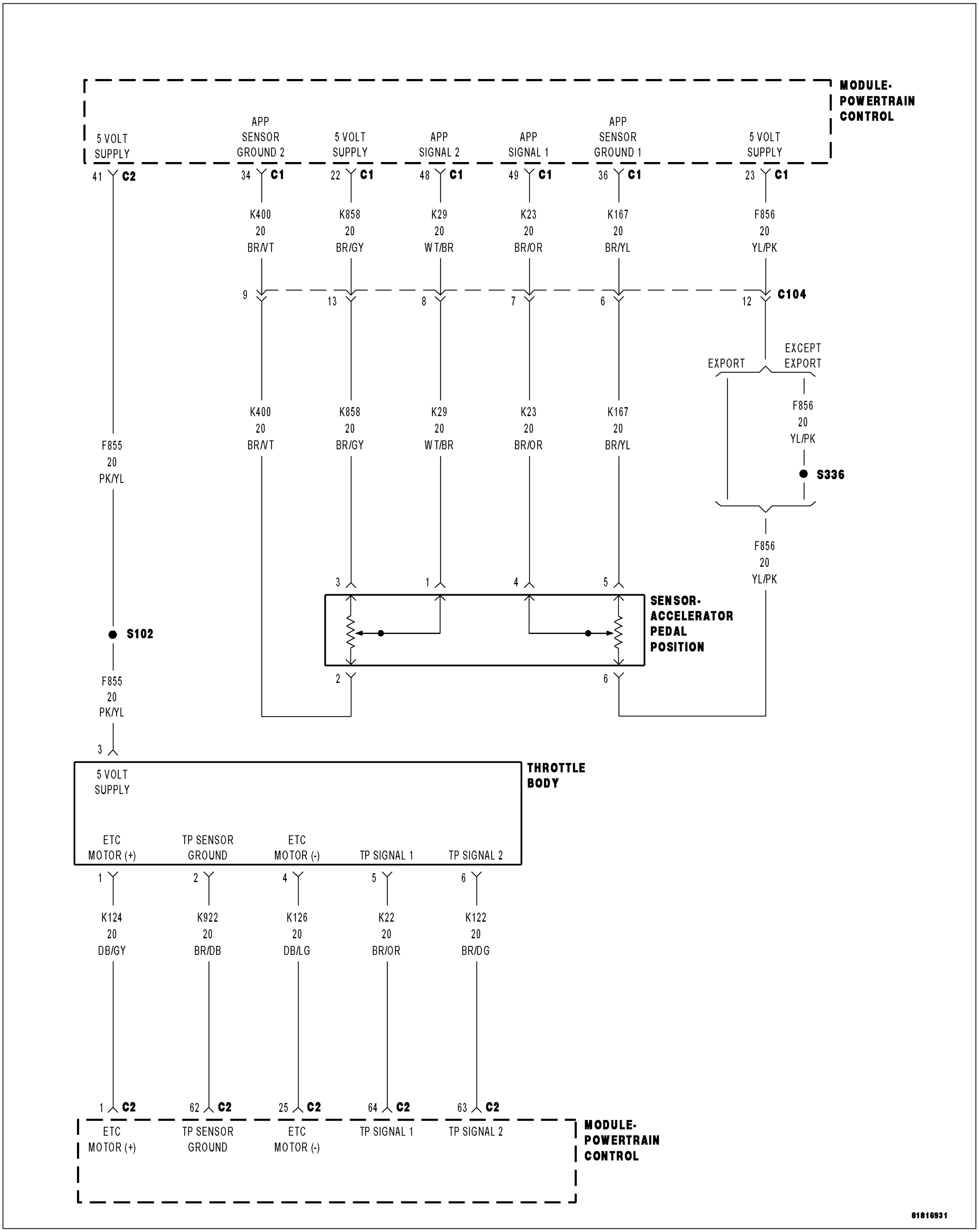
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K22) TP Signal 1 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (F855) 5 VOLT SUPPLY CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

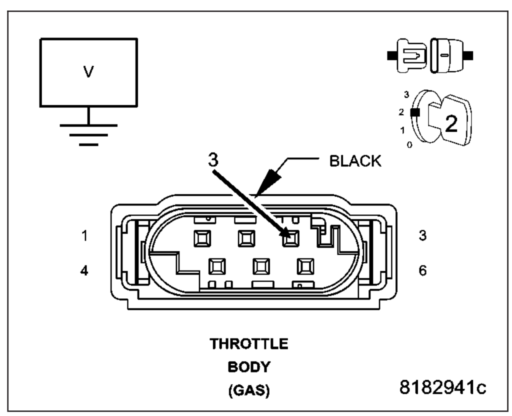
Turn the ignition off.

Disconnect the Throttle Body connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



Is there any voltage present?

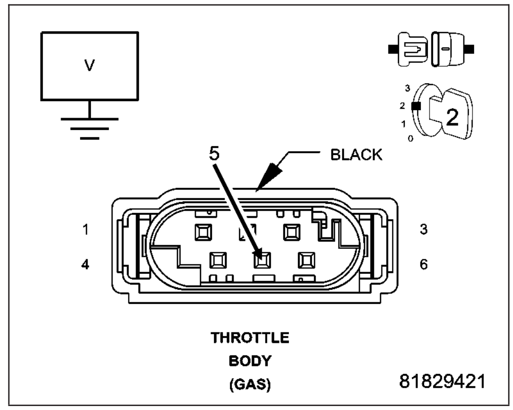
Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



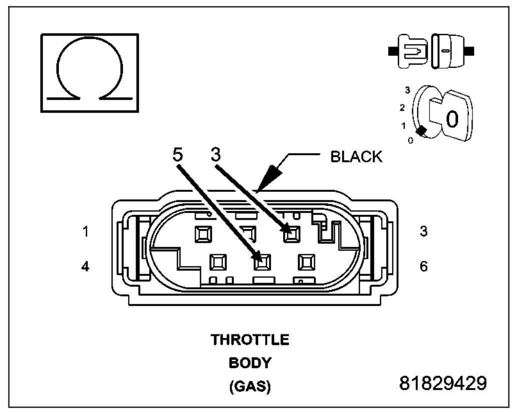
Is there any voltage present?

Yes >> Repair the (K22) TP Signal 1 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (F855) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (F855) 5 Volt Supply in the Throttle Body harness connector.



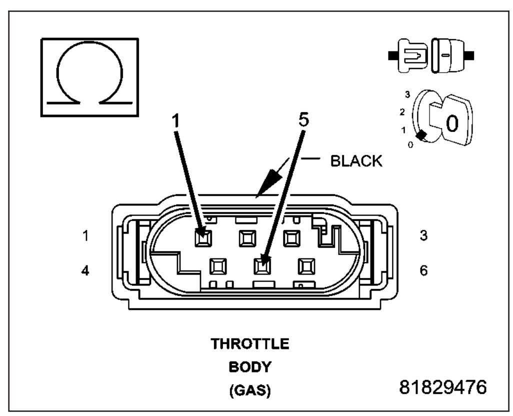
Is the resistance below 100 ohms?

Yes >> Repair the (K22) TP Signal 1 circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (K124) ETC Motor (+) in the Throttle Body harness connector.



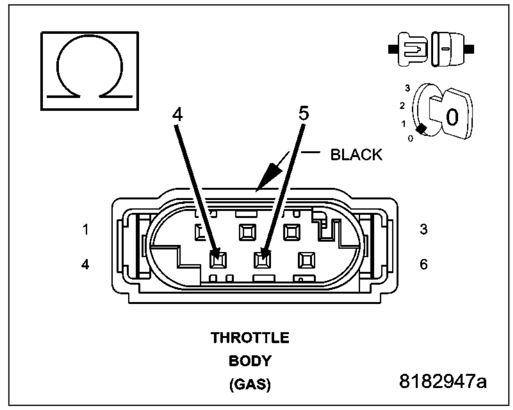
Is the resistance below 100 ohms?

Yes >> Repair the (K124) ETC Motor (+) circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Measure the resistance between the (K22) TP Signal 1 circuit and the (K126) ETC Motor (-) in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the (K22) TP Signal 1 circuit for a short to the (K126) ETC Motor (-) circuit.

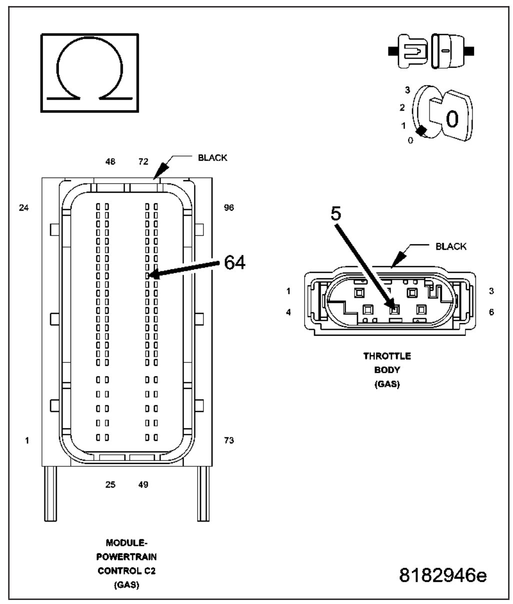
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K22) TP Signal 1 between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



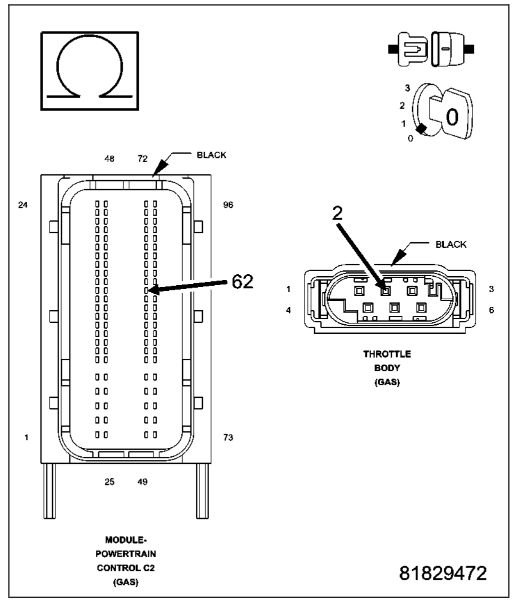
Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K22) TP Signal 1 for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (K922) TP Sensor Ground circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.

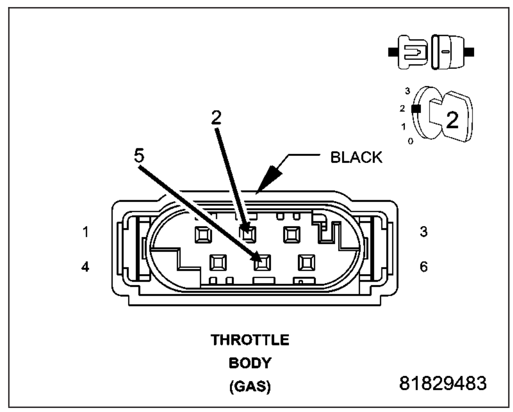
Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K922) TP Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. THROTTLE BODY



Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K922) TP Sensor Ground circuit and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.

Turn the ignition on.

With the scan tool, read the TP Signal 1 circuit voltage.

Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Throttle Body in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the engine temperature necessary to allow closed loop fuel control has not been reached within a set amount of time. The set time depends on start-up coolant temperature and ambient temperature. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL
THERMOSTAT
ENGINE COOLANT TEMPERATURE SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW ENGINE COOLANT LEVEL

Ignition on, engine not running.

With a scan tool, select View DTCs.

NOTE: Diagnose and repair any Engine Coolant Temperature (ECT) sensor DTCs before proceeding with this test.

NOTE: Inspect the ECT sensor and related PCM connector terminals for corrosion or damage.

NOTE: Extremely cold ambient temperatures may cause this DTC to set.

WARNING: Allow the engine to cool before opening the cooling system. The system may be under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in personal injury or death.

Inspect the cooling system for proper coolant level and condition.

Were any problems found?

Yes >> Inspect the vehicle for a coolant leak. Repair as necessary in accordance with the Service Information. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. ENGINE COOLANT TEMPERATURE

Ignition on, engine not running.

NOTE: Allow the engine to cool to ambient temperature before proceeding with this test.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

With a scan tool, read the ECT sensor value. If the engine was allowed to cool completely, the value should be approximately equal to the ambient temperature.

Start the engine and allow it to reach operating temperature while monitoring the ECT sensor value. The sensor value change should be a smooth transition from start up to normal operating temperature. Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the coolant temperature value on the scan tool should be relatively close. The thermostat should not open until the engine reaches the temperature specified in the Service Information.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> If no problems are found, the test is complete.

P0128-THERMOSTAT RATIONALITY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual engine temperature is significantly different than the desired engine temperature. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL
THERMOSTAT
ENGINE COOLANT TEMPERATURE SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW ENGINE COOLANT LEVEL

Ignition on, engine not running.

With a scan tool, select View DTCs.

NOTE: Diagnose and repair any temperature sensor DTCs set in the PCM or TIPM before proceeding with this test.

NOTE: Inspect all temperature sensor and related PCM or TIPM connector terminals for corrosion or damage.

NOTE: Extremely cold ambient temperatures may cause this DTC to set.

WARNING: Allow the engine to cool before opening the cooling system. The system may be under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in personal injury or death.

Inspect the cooling system for proper coolant level and condition.

Were any problems found?

Yes >> Inspect the vehicle for a coolant leak. Repair as necessary in accordance with the Service Information. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. ENGINE COOLANT TEMPERATURE

Ignition on, engine not running.

NOTE: Allow the engine to cool to ambient temperature before proceeding with this test.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

With the scan tool, read the ECT sensor value. If the engine was allowed to cool completely, the value should be approximately equal to the ambient temperature.

With the scan tool, read the Ambient Air Temperature (AAT) sensor value in the TIPM and the Intake Air Temperature (IAT) sensor value in the PCM. With the engine at ambient temperature, all values should be approximately the same.

NOTE: If the ambient temperature sensor value is found to be in question, be sure to drive the vehicle for at least 5 minutes above 30 MPH to verify that the ambient temperature gets updated before continuing with the diagnosis.

Start the engine and allow it to reach operating temperature while monitoring the temperature sensor values. The value change for each sensor should be a smooth transition from start up to normal operating temperature. Also monitor the actual coolant temperature with a thermometer.

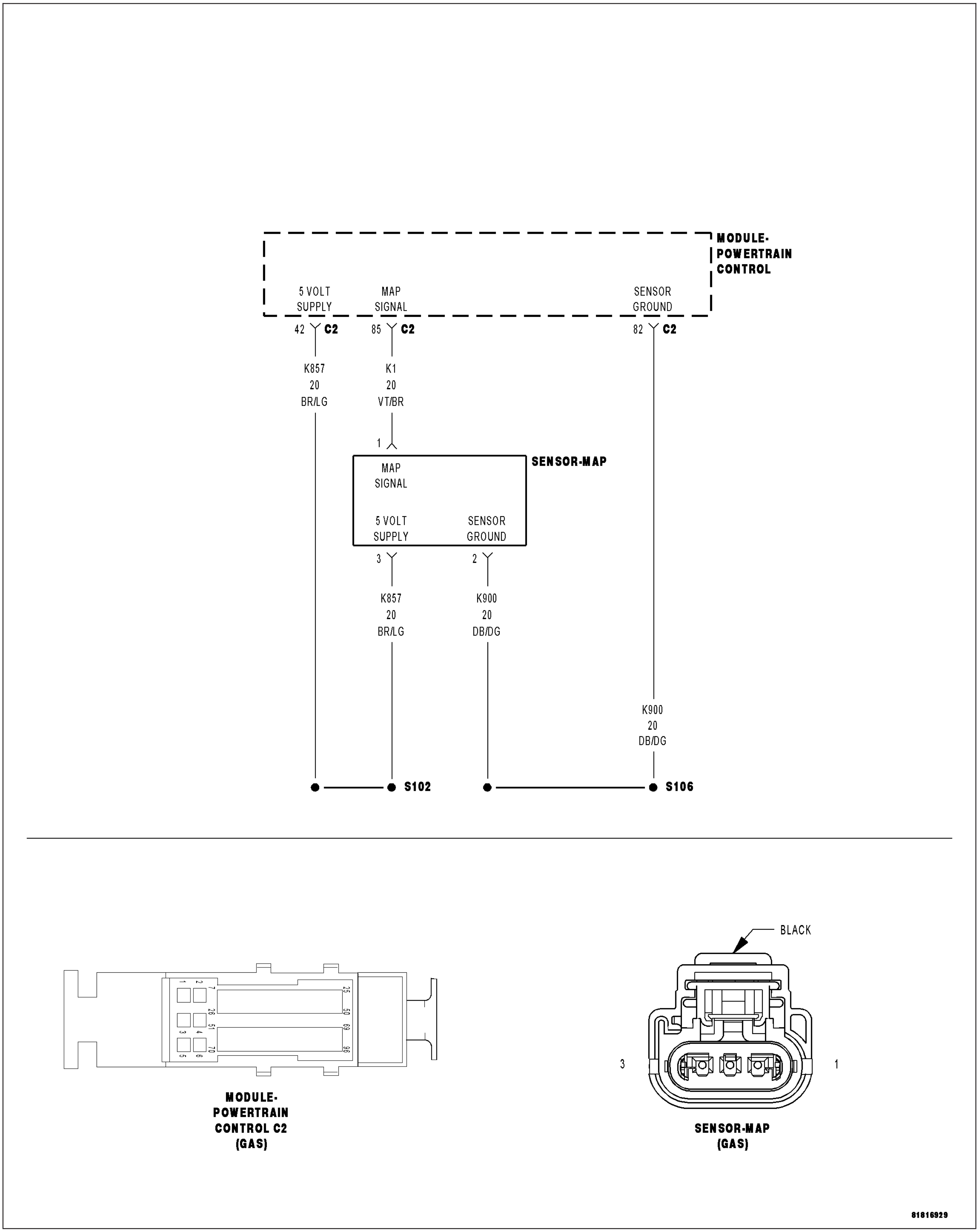
NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the coolant temperature value on the scan tool should be relatively close. The thermostat should not open until the engine reaches the temperature specified in the Service Information.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.

P0129-BAROMETRIC PRESSURE OUT OF RANGE LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, no CMP or CKP signal within 75 ms, and engine speed less than 250 RPM.
- **Set Condition:**
  The PCM detects that the MAP sensor voltage is less than 2.2 volts but above 0.04 volts for 300 milliseconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MAP SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

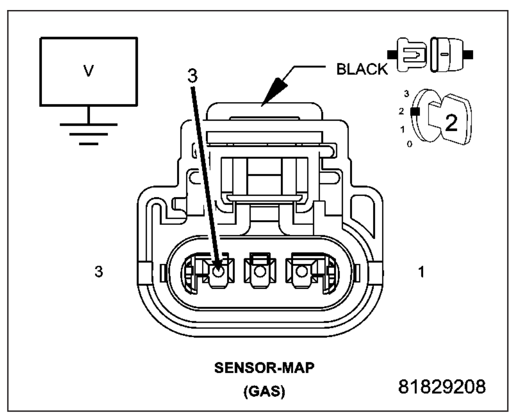
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the MAP Sensor connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.



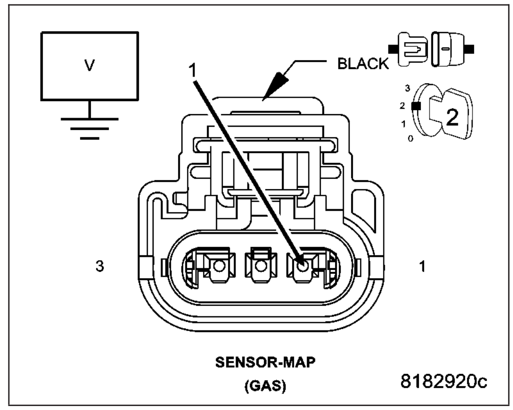
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 6

3. (K1) MAP SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

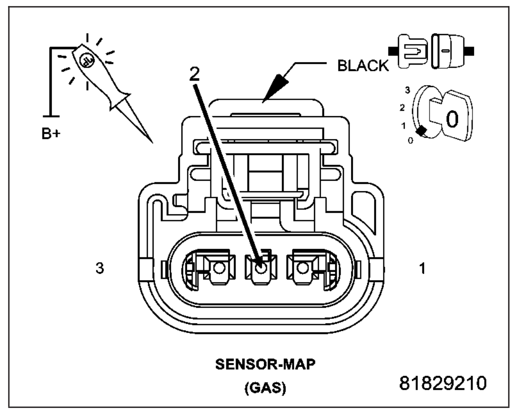
No >> Go to 9

4. (K900) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the MAP Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 12

5. MAP SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the MAP Sensor for any condition that would result in an incorrect signal, such as damage or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

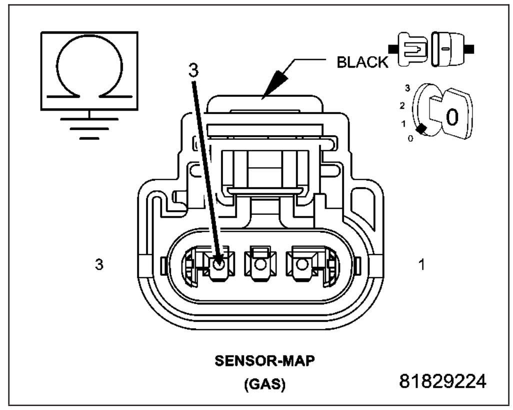
Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the MAP Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



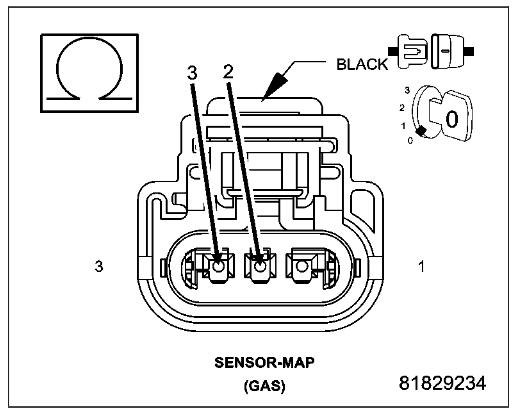
7. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



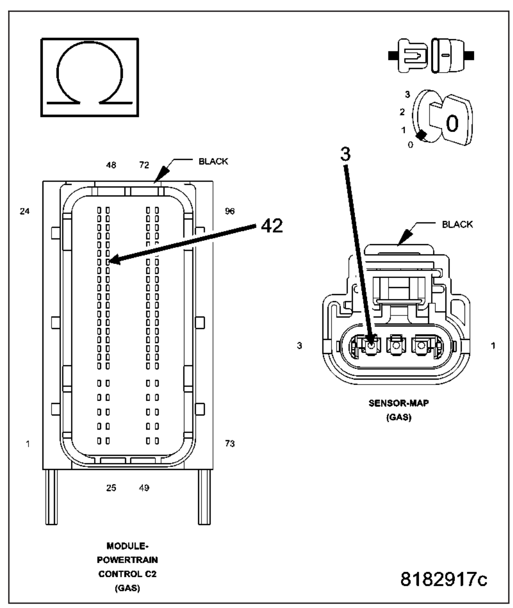
8. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 13

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

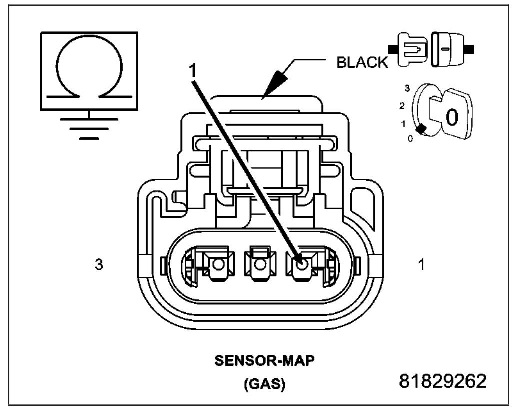


9. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



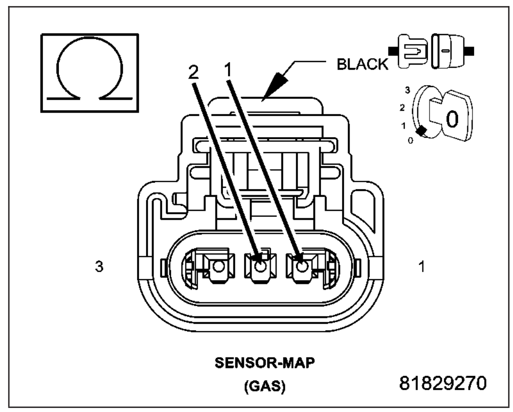
Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (K1) MAP Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K1) MAP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (K900) Sensor Ground circuit in the MAP Sensor harness connector.



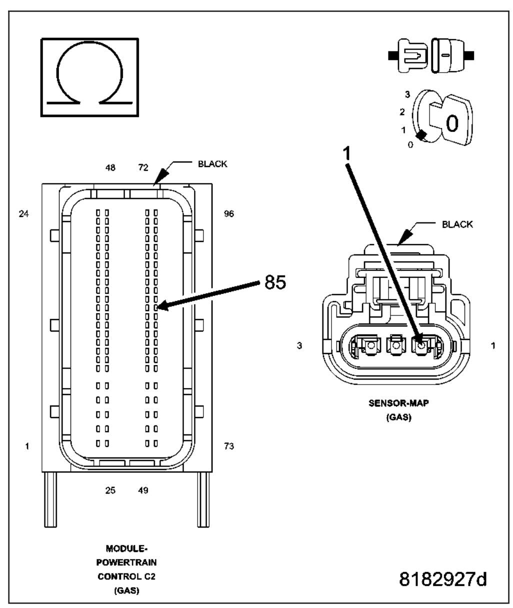
Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (K1) MAP Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (K1) MAP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K1) MAP Signal circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 13

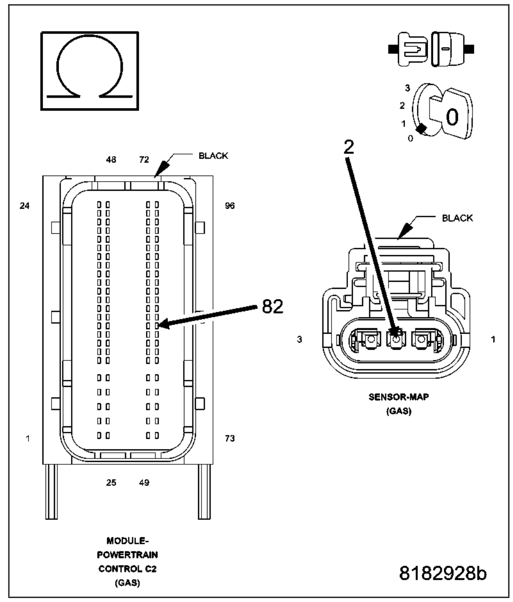
No >> Repair the (K1) MAP Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

12. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the MAP Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 13

No >> Repair the circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

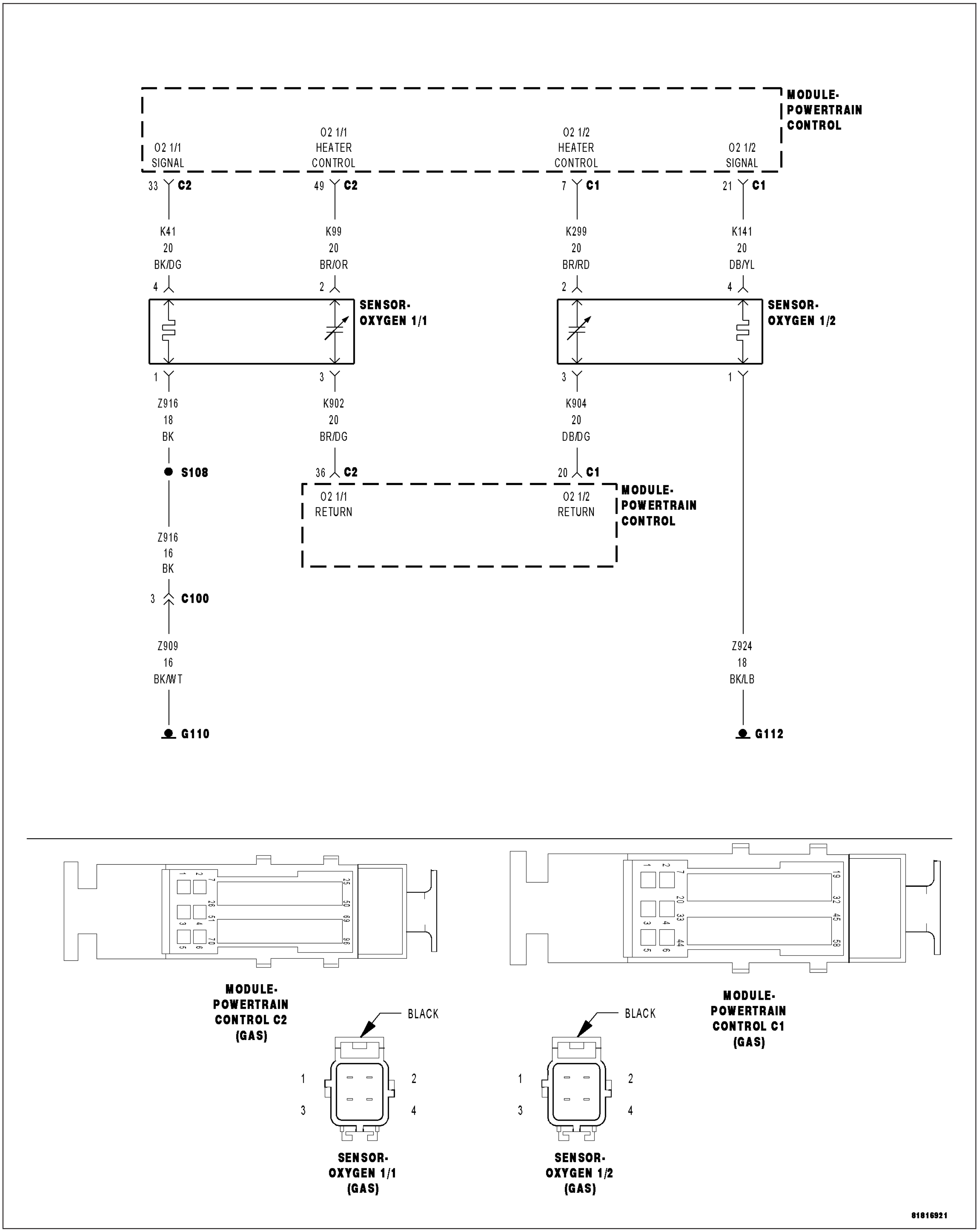
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0131-O2 SENSOR 1/1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running for less than 30 seconds, the Oxygen Sensor 1/1 heater temperature less than 251° C (484° F), and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/1 signal voltage is below 2.5196 volts for 6 seconds after engine startup. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K902) O2 1/1 RETURN CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 1/1 RETURN CIRCUIT
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (Z916) GROUND CIRCUIT
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/1 VOLTAGE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, monitor the Oxygen Sensor 1/1 voltage.

Is the voltage less than 2.52 volts?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K41) O2 1/1 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Oxygen Sensor 1/1 harness connector.

Turn the ignition on.

With a scan tool, monitor the Oxygen Sensor 1/1 voltage.

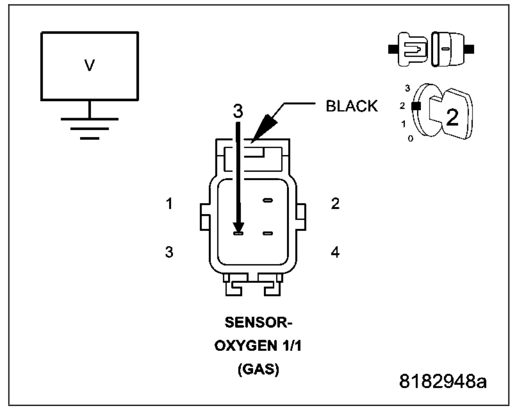
Is the Oxygen Sensor 1/1 voltage above 4.8 volts?

Yes >> Go to 3

No >> Go to 5

3. OXYGEN SENSOR 1/1

Measure the voltage on the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.



Is the voltage at 2.5 volts?

Yes >> Replace the Oxygen Sensor 1/1.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

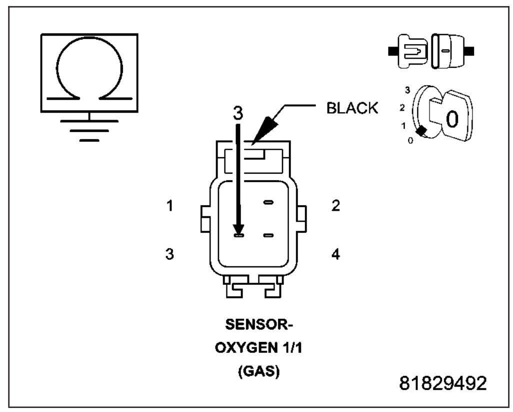
No >> Go to 4

4. (K902) O2 1/1 RETURN CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance between ground and the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100 ohms?

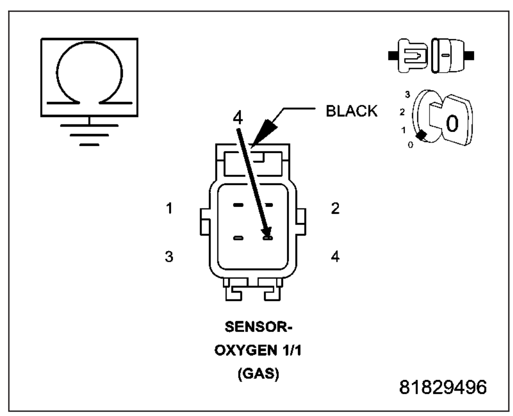
Yes >> Repair the (K902) O2 1/1 Return circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

5. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K41) O2 1/1 Signal circuit in the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100 ohms?

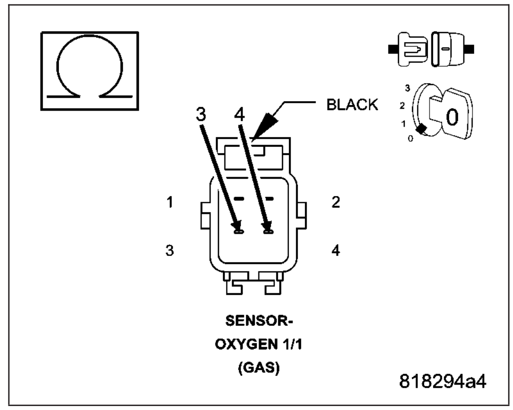
Yes >> Repair the (K41) O2 1/1 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 1/1 RETURN CIRCUIT

Measure the resistance between the (K41) O2 1/1 Signal circuit and the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.



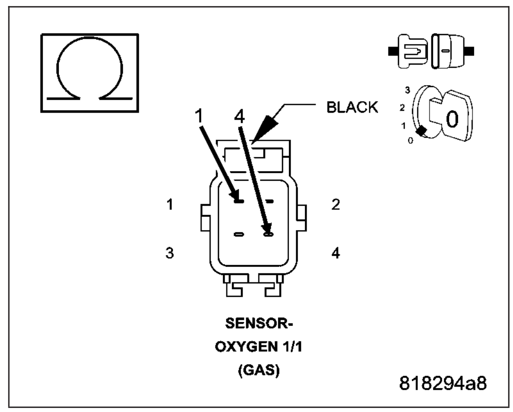
Is the resistance below 100 ohms?

Yes >> Repair the short between the (K902) O2 1/1 Return circuit and the (K41) O2 1/1 Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (Z916) GROUND CIRCUIT

Measure the resistance between the (K41) O2 1/1 Signal circuit and the (Z916) Ground circuit in the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (Z916) Ground circuit and the (K41) O2 1/1 Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

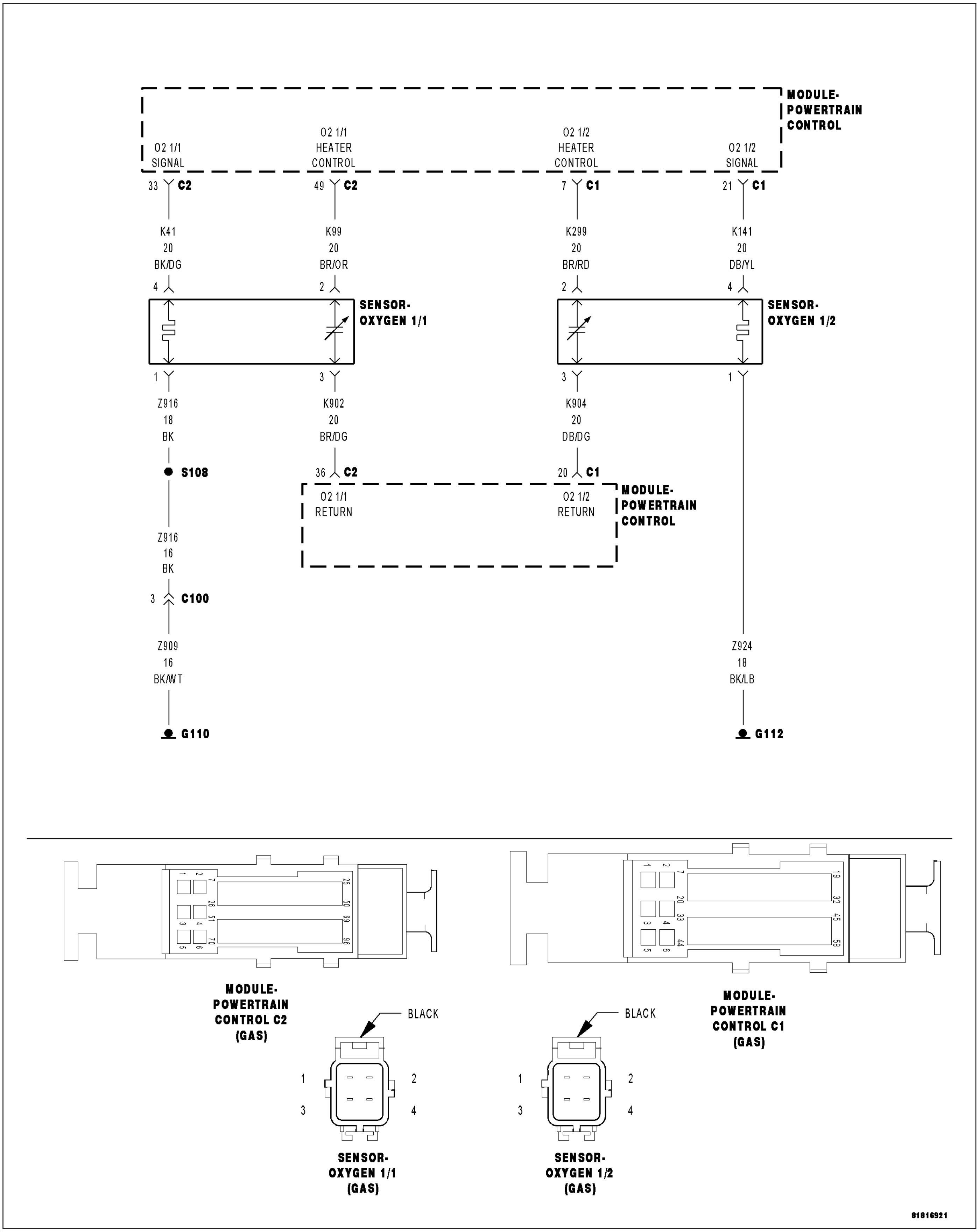
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0132-O2 SENSOR 1/1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the Oxygen Sensor 1/1 heater temperature greater than 496° C (925° F) and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/1 voltage is greater than 3.99 volts for 40 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K902) O2 1/1 RETURN CIRCUIT SHORTED TO VOLTAGE
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (K99) O2 1/1 HEATER CONTROL CIRCUIT
(K41) O2 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K902) O2 1/1 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/1 VOLTAGE

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, read the Oxygen Sensor 1/1 voltage.

Is the voltage greater than 3.9 volts?

Yes >> Go to 2

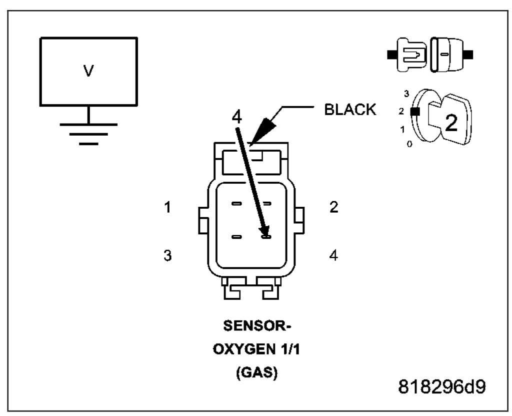
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/1 harness connector.

Measure the voltage on the (K41) O2 1/1 Signal circuit in the Oxygen Sensor 1/1 harness connector.



NOTE: Measure the voltage in reference to ground, not the (K902) O2 1/1 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K41) O2 1/1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

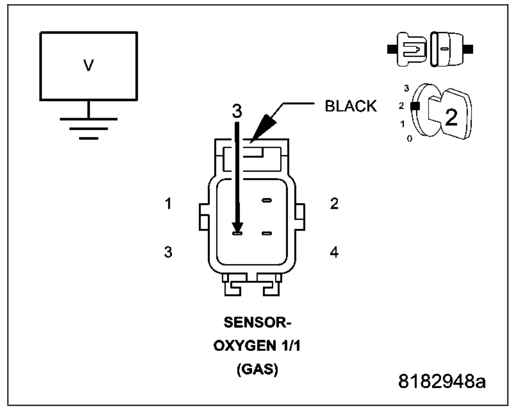
3. (K902) O2 1/1 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.



Is there any voltage present?

Yes >> Repair the (K902) O2 1/1 Return circuit for a short to voltage.

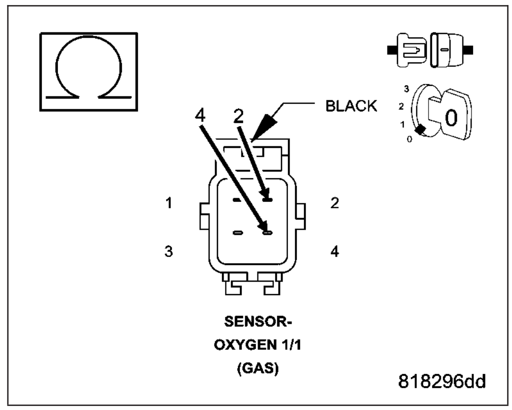
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (K99) O2 1/1 HEATER CONTROL CIRCUIT

Turn the ignition off.

Measure the resistance between the (K41) O2 1/1 Signal circuit and the (K99) O2 1/1 Heater Control circuit the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100.0 ohms?

Yes >> Repair the (K41) O2 1/1 Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. OXYGEN SENSOR 1/1

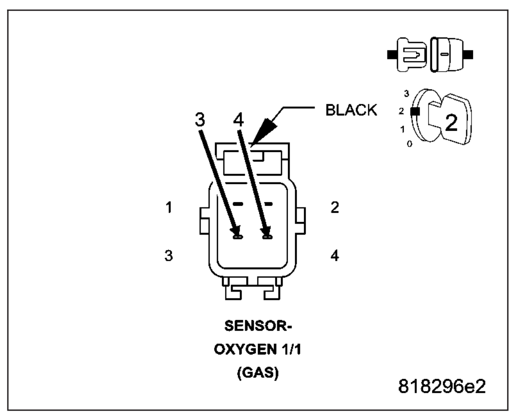
Turn the ignition off.

Connect the Powertrain Control Module (PCM) harness connector.

Connect a jumper wire between the (K41) O2 1/1 Signal circuit and the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.

Turn the ignition on.

With a scan tool, monitor the Oxygen Sensor 1/1 voltage.



Is the voltage between 2.3 and 2.7 volts with the jumper wire in place?

Yes >> Replace the Oxygen Sensor 1/1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

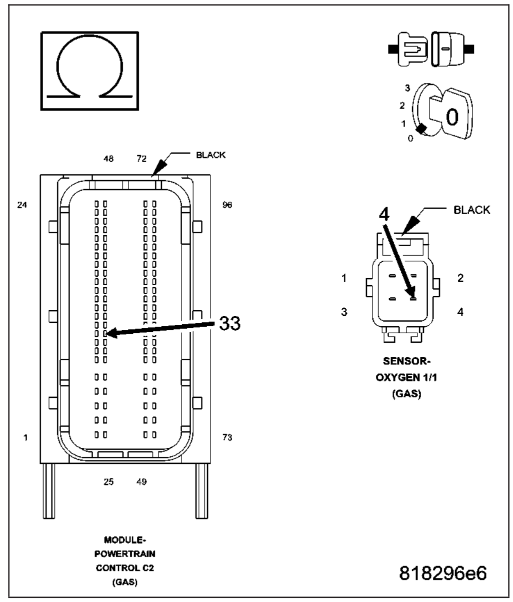
6. (K41) O2 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

If necessary, remove the jumper wire from between the (K41) O2 1/1 Signal circuit and the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K41) O2 1/1 Signal circuit between the Oxygen Sensor 1/1 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

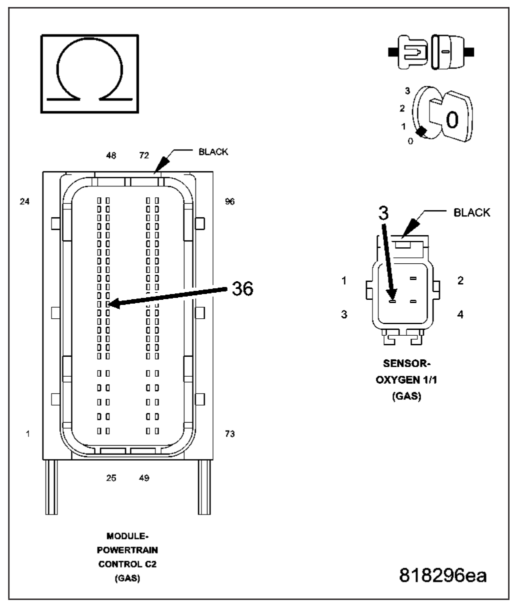
Yes >> Go to 7

No >> Repair the (K41) O2 1/1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K902) O2 1/1 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K902) O2 1/1 Return circuit between the Oxygen Sensor 1/1 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K902) O2 1/1 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

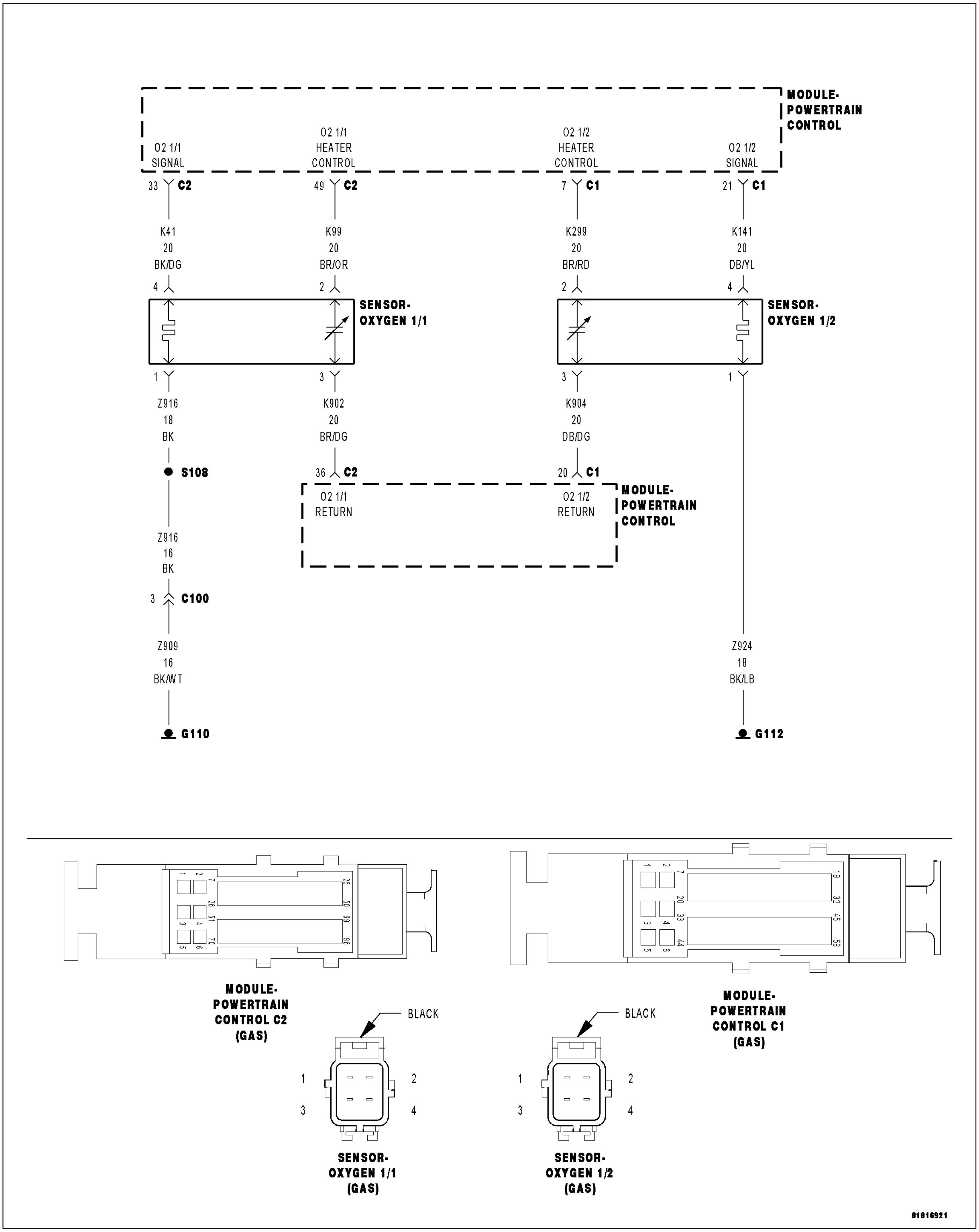
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0133-O2 SENSOR 1/1 SLOW RESPONSE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running, vehicle speed between 35 and 60 MPH, at medium throttle with no decels, ECT greater than 70° C (158° F), catalytic converter temperature greater than 600° C (1112° F) and EVAP Purge active
- **Set Condition:**
  The oxygen sensor signal voltage change is collected, added up, and divided by time. The resulting ratio must be greater than a calibrated fail ratio to pass. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
EXHAUST LEAK
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K902) O2 1/1 RETURN CIRCUIT SHORTED TO VOLTAGE
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K902) O2 1/1 RETURN CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K902) O2 1/1 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EXHAUST LEAK

NOTE: A thorough exhaust leak test must be completed before removing an O2 Sensor or any other part from the exhaust system. Do not remove any parts before an exhaust leak check has been completed.

NOTE: An exhaust leak may cause downstream fuel adaptives to rail out, resulting in a false 1/1 O2 Sensor failure

Turn the ignition off.

Inspect the exhaust system for leaks between the engine and the 1/1 Oxygen Sensor.

Perform a leak test with Miller Tool #8404A Evaporative Emissions Leak Detector (EELD), even if an audible leak is not heard. Pay particular attention to the exhaust manifold to head surface, exhaust pipe to manifold connection, and the O2 sensor boss for leaks.

Connect the SMOKE supply tip (black hose) to the exhaust cone adapter (if equipped) and place it into the tail pipe.

Set the smoke/air control switch to SMOKE.

Press the remote smoke/air start button.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the exhaust system path and look for a leak, indicated by exiting smoke.

If a leak is concealed from view, release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Were any exhaust leaks found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. DTC IS ACTIVE

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/1 harness connector.

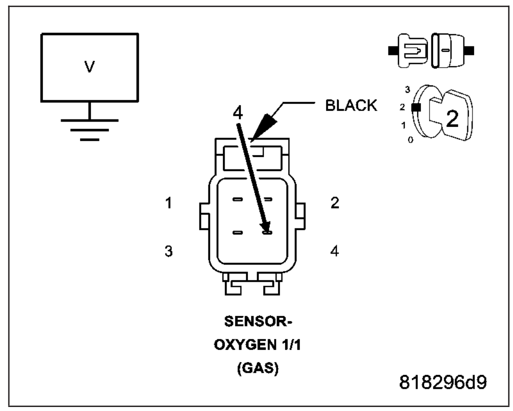
Measure the voltage on the (K41) O2 1/1 Signal circuit in the Oxygen Sensor 1/1 harness connector.

NOTE: Measure the voltage in reference to ground, not the (K902) O2 1/1 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K41) O2 1/1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



4. (K902) O2 1/1 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

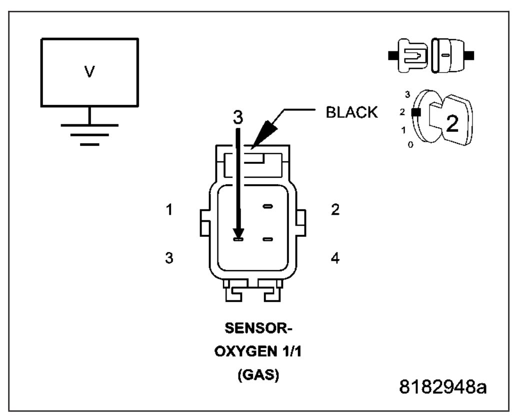
Turn the ignition on.

Measure the voltage on the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.

Is there any voltage present?

Yes >> Repair the (K902) O2 1/1 Return circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

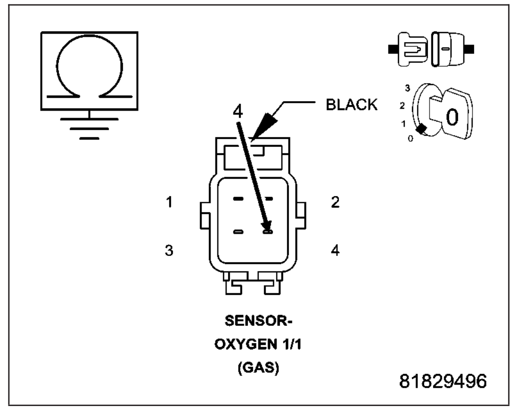
No >> Go to 5



5. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K41) O2 1/1 Signal circuit in the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100 ohms?

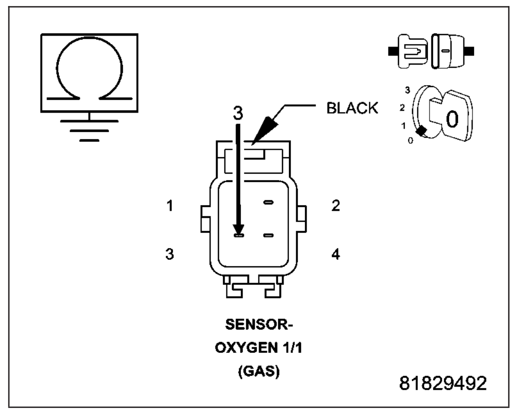
Yes >> Repair the (K41) O2 1/1 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K902) O2 1/1 RETURN CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K902) O2 1/1 Return circuit in the Oxygen Sensor 1/1 harness connector.



Is the resistance below 100 ohms?

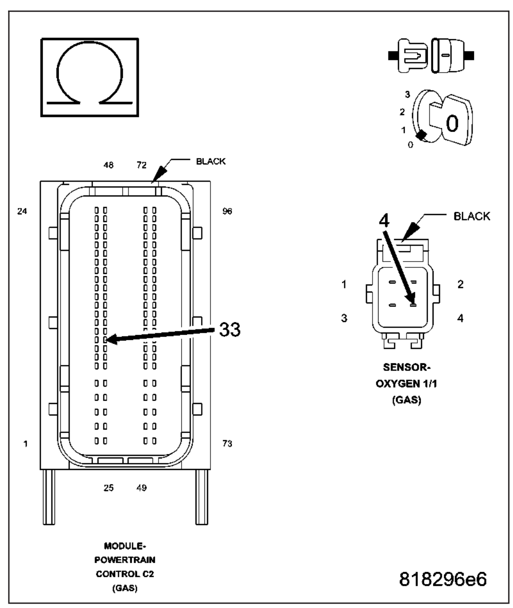
Yes >> Repair the (K902) O2 1/1 Return circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K41) O2 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K41) O2 1/1 Signal circuit between the Oxygen Sensor 1/1 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

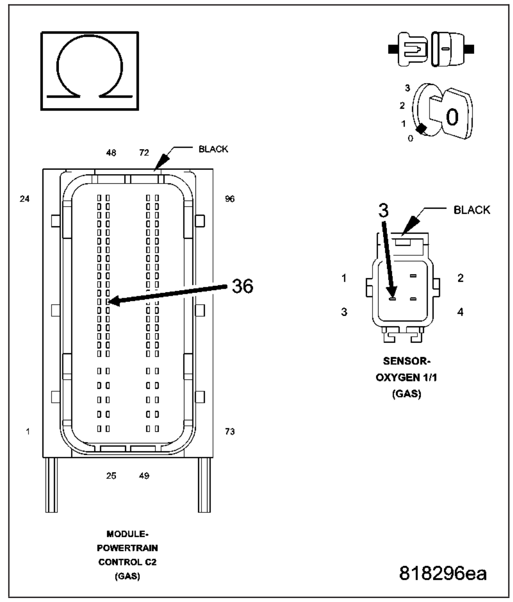
Yes >> Go to 8

No >> Repair the (K41) O2 1/1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K902) O2 1/1 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K902) O2 1/1 Return circuit between the Oxygen Sensor 1/1 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K902) O2 1/1 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. OXYGEN SENSOR 1/1

NOTE: Prior to replacing the O2 sensor, verify that the correct part number is being used in order to prevent improper O2 heater control.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

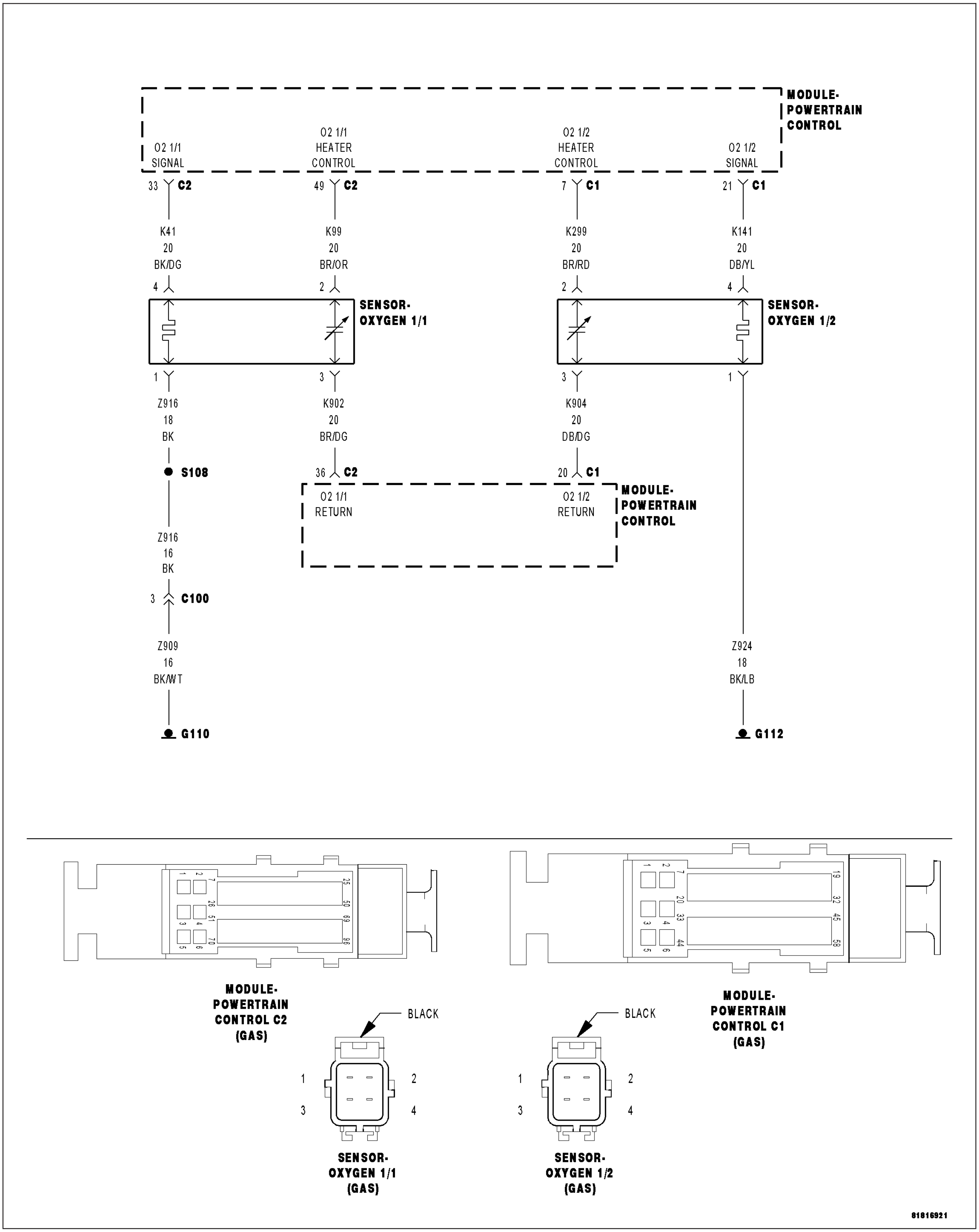
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Oxygen Sensor 1/1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0135-O2 SENSOR 1/1 HEATER PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The PCM performs a continuous check of the O2 sensor heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  With the engine running, O2 sensor heater duty cycle greater than 0%, and battery voltage greater than 11.0 volts.
- **Set Condition:**
  The PCM detects no O2 sensor output when the heater is powered up. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/1 HEATER CONTROL OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the sensor to cool down before continuing. The sensor voltage should stabilize between 4.6 and 5.0 volts.

Turn the ignition on.

With a scan tool, actuate the Oxygen Sensor 1/1 control.

With the scan tool, monitor Oxygen Sensor 1/1 voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. OXYGEN SENSOR 1/1

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the Oxygen Sensor 1/1 harness connector.

Measure the resistance of the O2 sensor heater element across the Oxygen Sensor 1/1 connector between the heater control terminal and the ground terminal.

NOTE: The O2 heater element resistance should be measured at 70° F (21.1° C). The resistance value will vary at different temperatures.

Is the resistance between 2.0 and 30.0 ohms?

Yes >> Go to 3

No >> Replace the Oxygen Sensor 1/1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

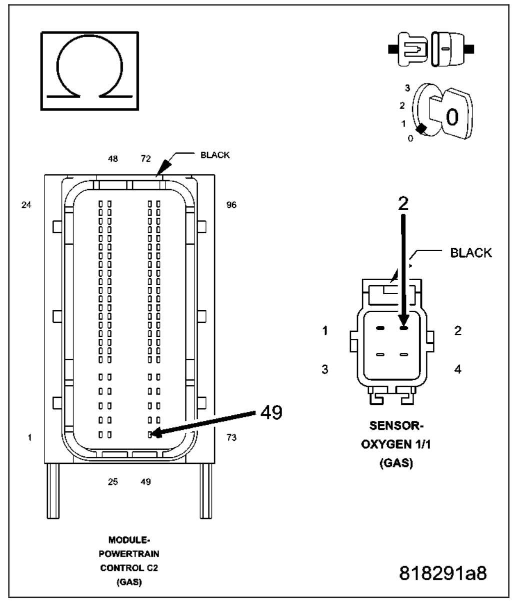
Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K99) O2 1/1 Heater Control circuit from the Oxygen Sensor 1/1 harness connector to the Powertrain Control Module (PCM) harness connector.

Is the resistance below 0.5 ohm?

Yes >> Go to 4

No >> Repair the (K99) O2 1/1 Heater Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

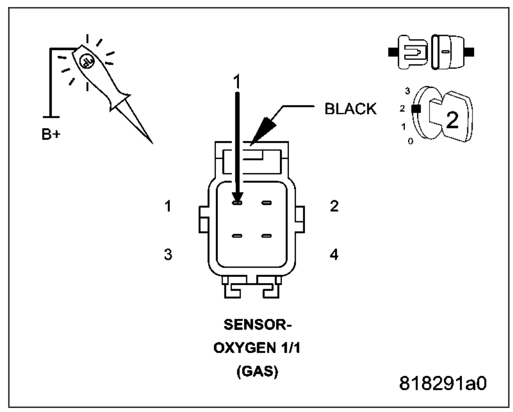
Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the Oxygen Sensor 1/1 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

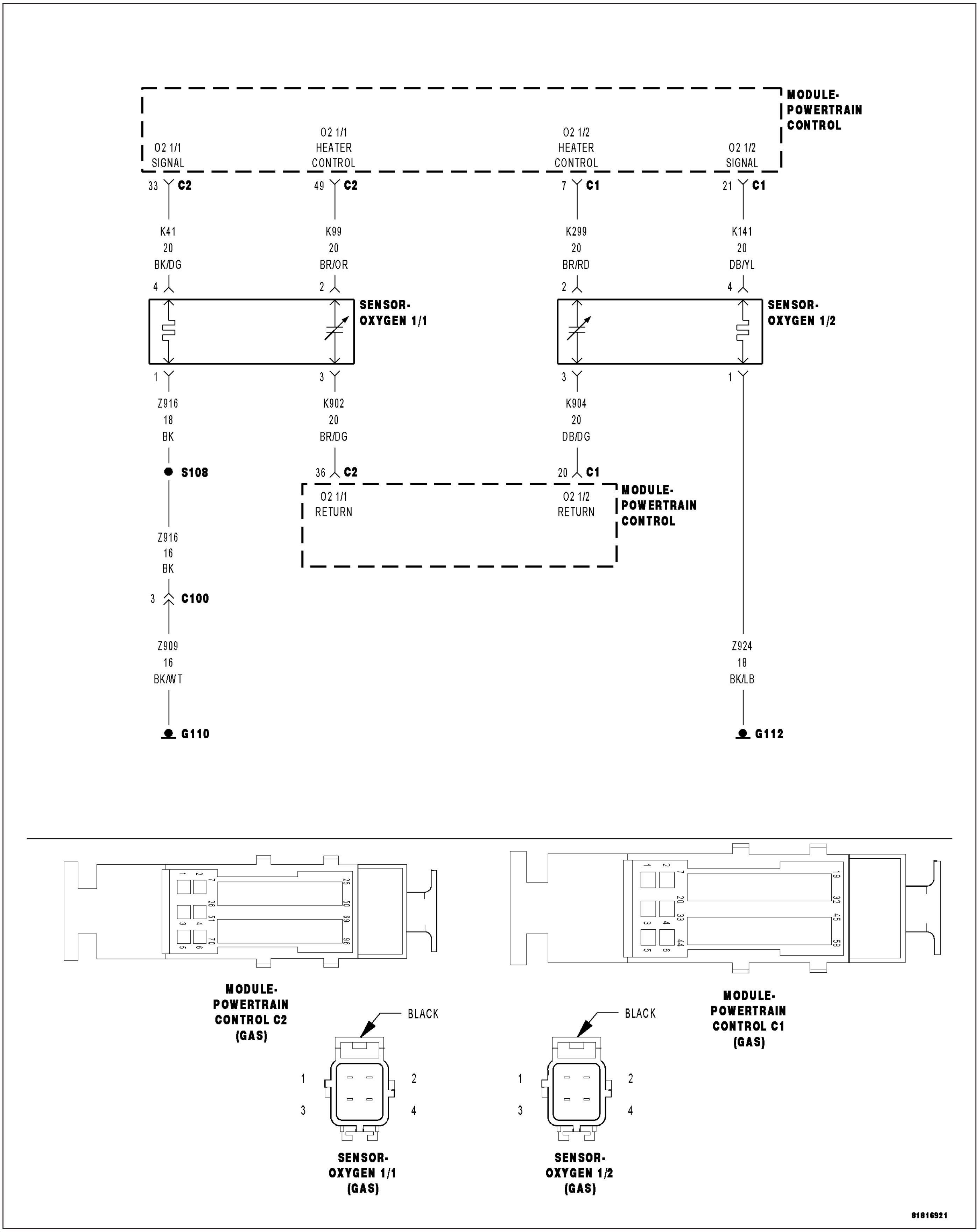
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0137-O2 SENSOR 1/2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running for less than 30 seconds, the Oxygen Sensor 1/2 heater temperature less than 251° C (484° F), and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/2 signal voltage is below 2.5196 volts for 6 seconds after engine startup. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K299) O2 1/2 HEATER CONTROL CIRCUIT
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/2 VOLTAGE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, monitor the Oxygen Sensor 1/2 voltage.

Is the voltage less than 2.52 volts?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K141) O2 1/2 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Oxygen Sensor 1/2 harness connector.

Turn the ignition on.

With a scan tool, monitor the Oxygen Sensor 1/2 voltage.

Is the Oxygen Sensor 1/2 voltage above 4.8 volts?

Yes >> Go to 3

No >> Go to 5

3. OXYGEN SENSOR 1/2

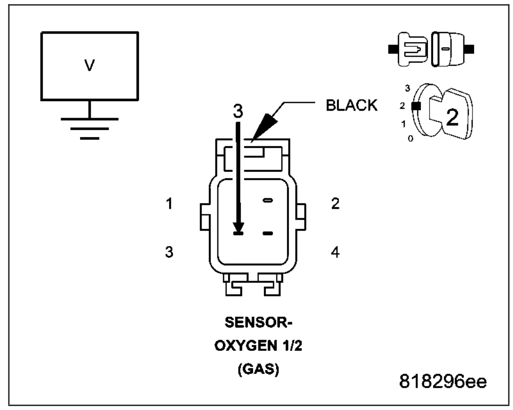
Measure the voltage on the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.

Is the voltage at 2.5 volts?

Yes >> Replace the Oxygen Sensor 1/2.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



4. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

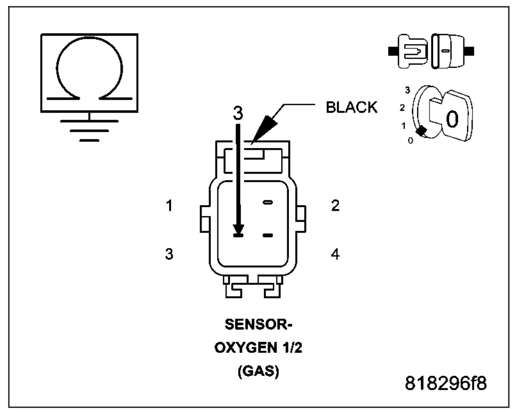
Measure the resistance between ground and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K904) O2 1/2 Return circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

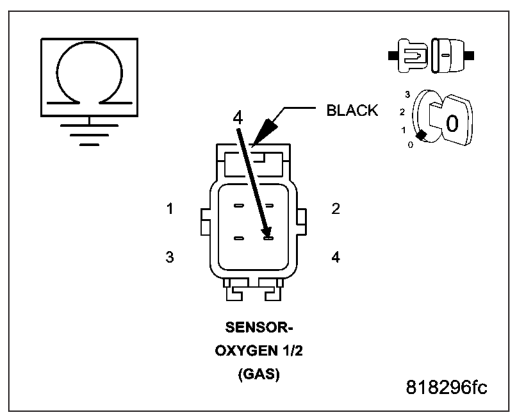
Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to ground.

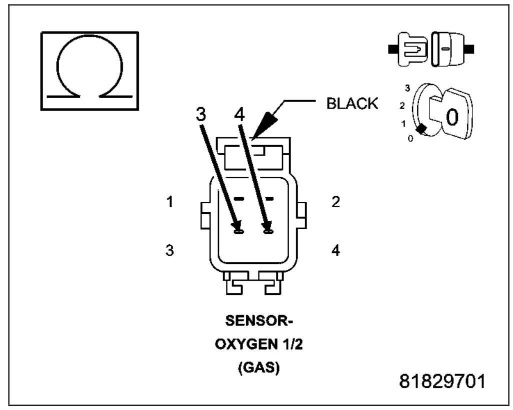
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6



6. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



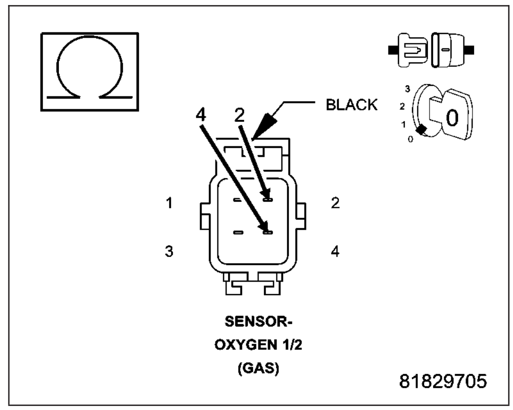
Is the resistance below 100 ohms?

Yes >> Repair the short between the (K904) O2 1/2 Return circuit and the (K141) O2 1/2 Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K299) O2 1/2 HEATER CONTROL CIRCUIT

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K299) O2 1/2 Heater Control circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K299) O2 1/2 Heater Control circuit and the (K141) O2 1/2 Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

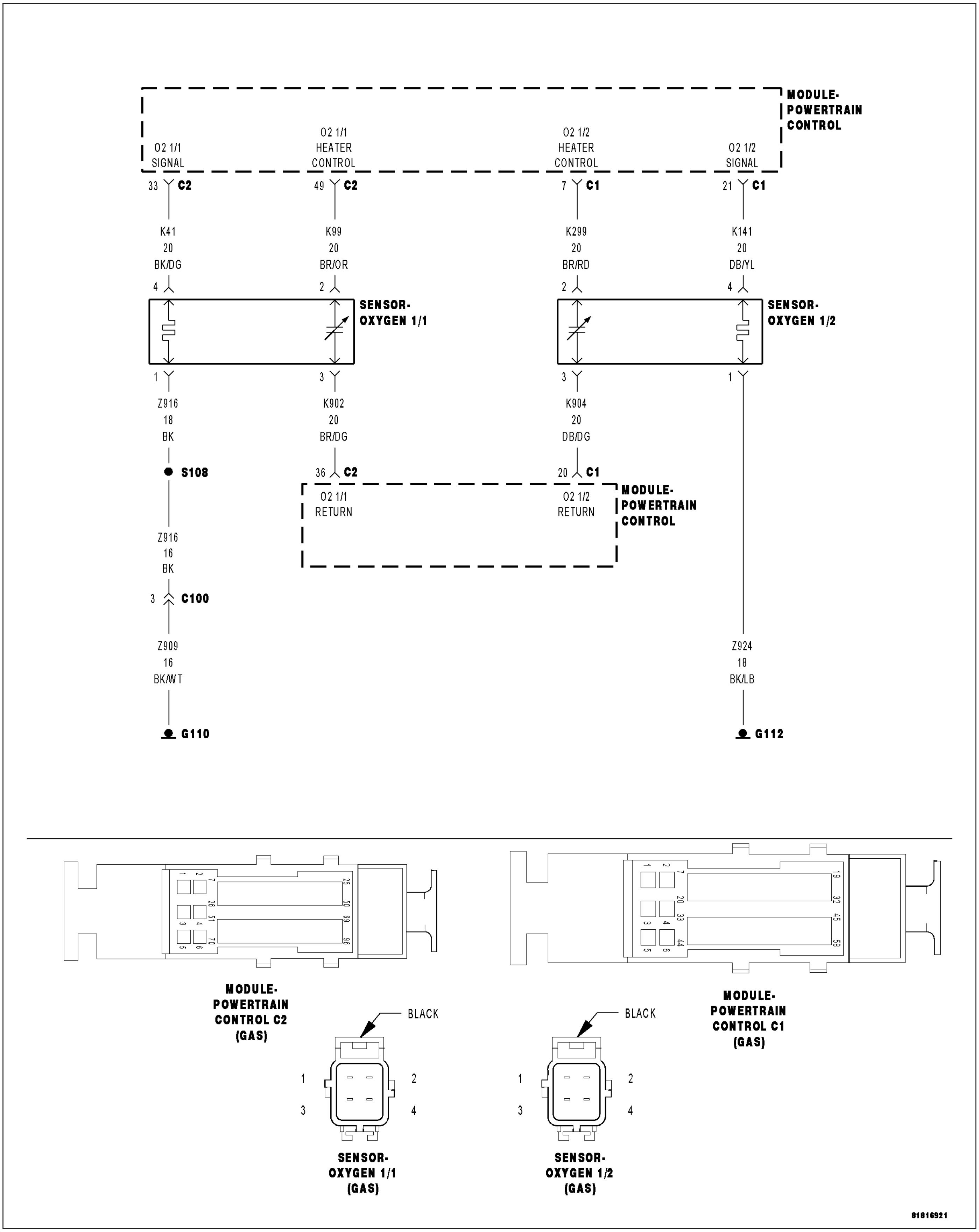
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0138-O2 SENSOR 1/2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the Oxygen Sensor 1/2 heater temperature greater than 496° C (925° F) and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Oxygen Sensor 1/2 voltage is greater than 3.99 volts for 40 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K299) O2 1/2 HEATER CONTROL CIRCUIT
(K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/2 VOLTAGE

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, read the Oxygen Sensor 1/2 voltage.

Is the voltage greater than 3.9 volts?

Yes >> Go to 2

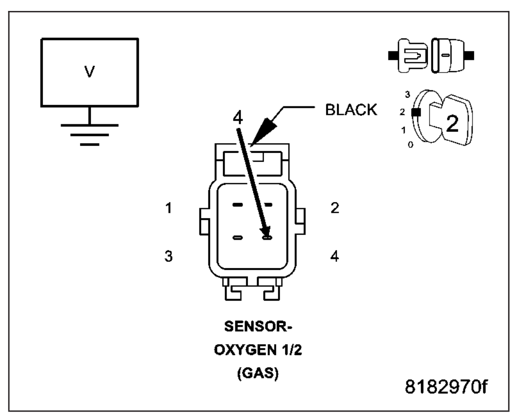
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/2 harness connector.

Measure the voltage on the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: Measure the voltage in reference to ground, not the (K904) O2 1/2 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

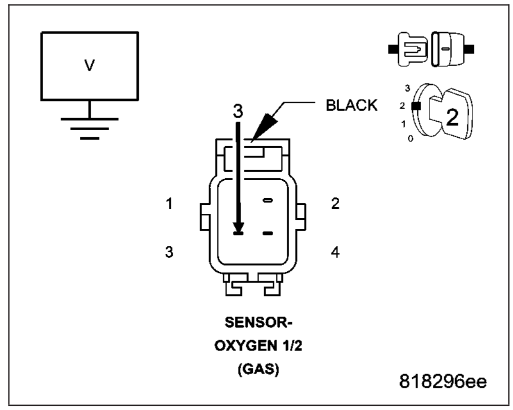
3. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is there any voltage present?

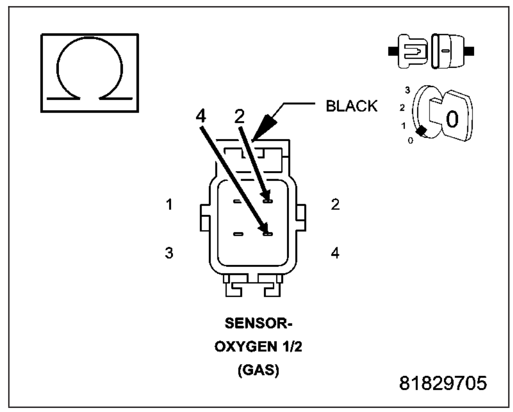
Yes >> Repair the (K904) O2 1/2 Return circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K299) O2 1/2 HEATER CONTROL CIRCUIT

Turn the ignition off.

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K299) O2 1/2 Heater Control circuit the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100.0 ohms?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. OXYGEN SENSOR 1/2

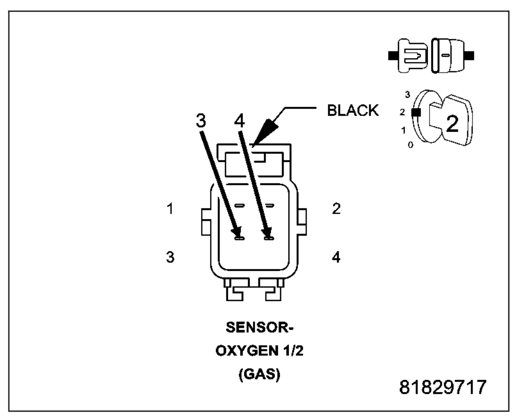
Turn the ignition off.

Connect the Powertrain Control Module (PCM) harness connector.

Connect a jumper wire between the (K141) O2 1/2 Signal circuit and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.

Turn the ignition on.

With a scan tool, monitor the Oxygen Sensor 1/2 voltage.



Is the voltage between 2.3 and 2.7 volts with the jumper wire in place?

Yes >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

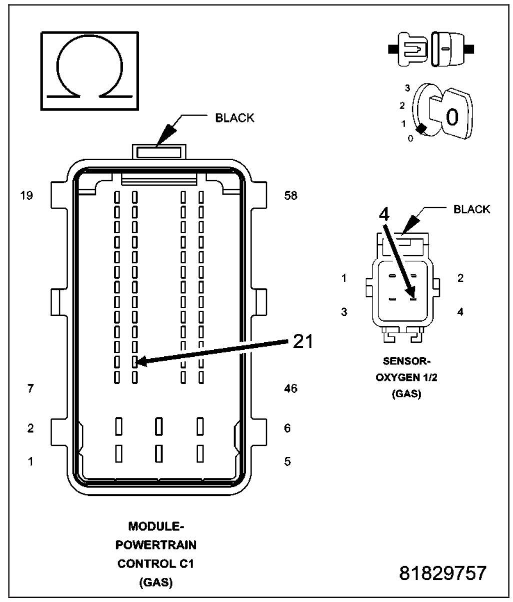
6. (K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

If necessary, remove the jumper wire from between the (K141) O2 1/2 Signal circuit and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K141) O2 1/2 Signal circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

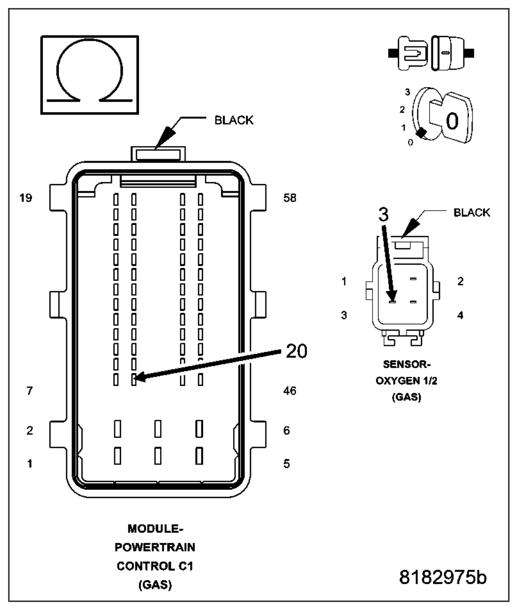
Yes >> Go to 7

No >> Repair the (K141) O2 1/2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K904) O2 1/2 Return circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K904) O2 1/2 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

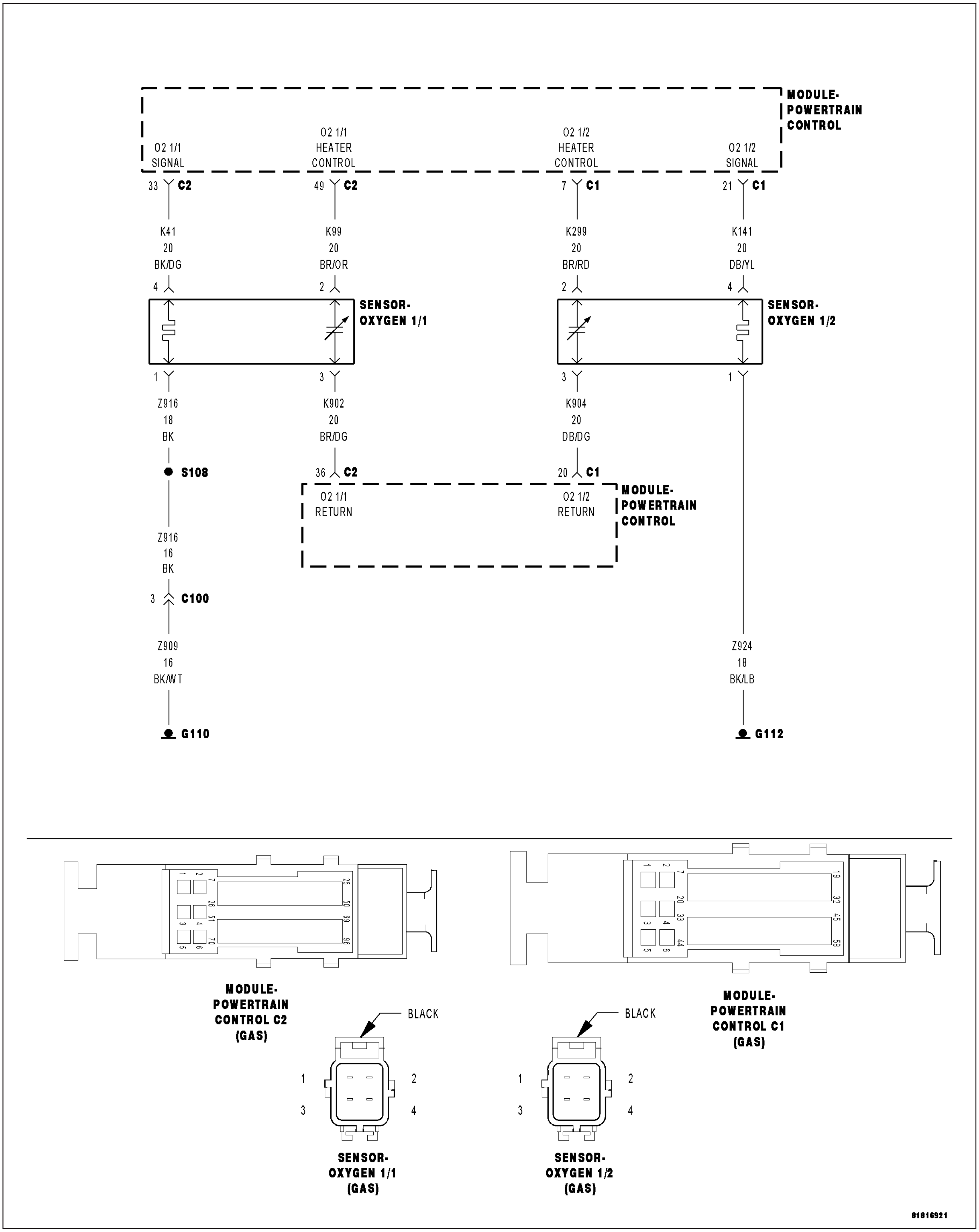
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0139-O2 SENSOR 1/2 SLOW RESPONSE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  For six minutes after engine start up, vehicle speed between 20 and 55 MPH.
- **Set Condition:**
  The O2 signal voltage does not switch lean or rich during monitoring for at least 2 to 4 minutes. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
EXHAUST LEAK
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

1. EXHAUST LEAK

NOTE: A thorough exhaust leak test must be completed before removing an O2 Sensor or any other part from the exhaust system. Do not remove any parts before an exhaust leak check has been completed.

NOTE: An exhaust leak may cause downstream fuel adaptives to rail out, resulting in a false 1/1 O2 Sensor failure.

Turn the ignition off.

Inspect the exhaust system for leaks between the engine and the 1/1 Oxygen Sensor.

Perform a leak test with Miller Tool #8404A Evaporative Emissions Leak Detector (EELD), even if an audible leak is not heard. Pay particular attention to the exhaust manifold to head surface, exhaust pipe to manifold connection, and the O2 sensor boss for leaks.

Connect the SMOKE supply tip (black hose) to the exhaust cone adapter (if equipped) and place it into the tail pipe.

Set the smoke/air control switch to SMOKE.

Press the remote smoke/air start button.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the exhaust system path and look for a leak, indicated by exiting smoke.

If a leak is concealed from view, release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Were any exhaust leaks found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. DTC IS ACTIVE

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

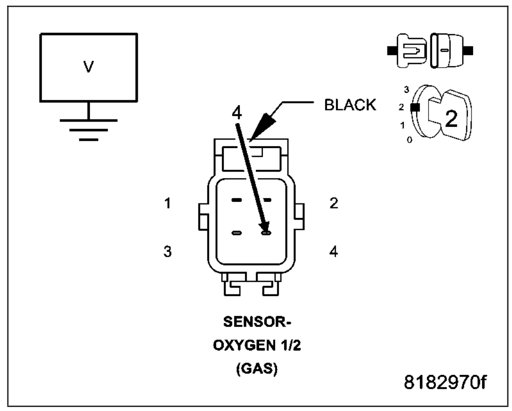
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/2 harness connector.

Measure the voltage on the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: Measure the voltage in reference to ground, not the (K904) O2 1/2 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

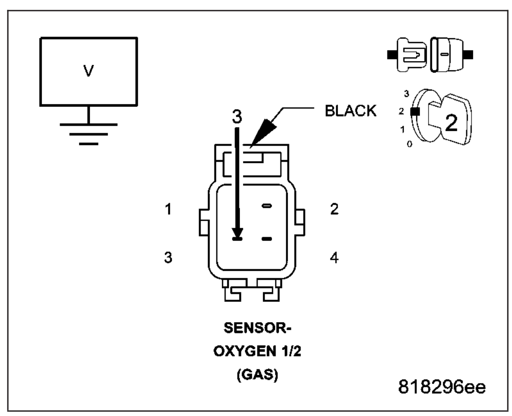
4. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is there any voltage present?

Yes >> Repair the (K904) O2 1/2 Return circuit for a short to voltage.

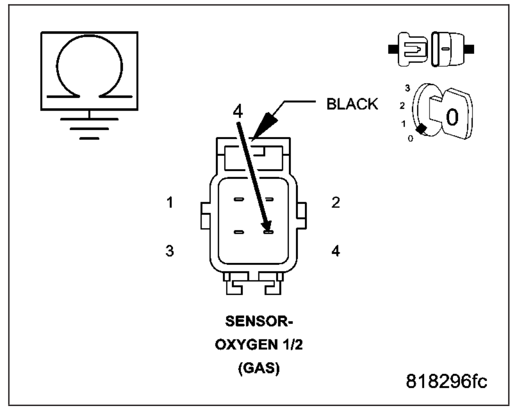
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

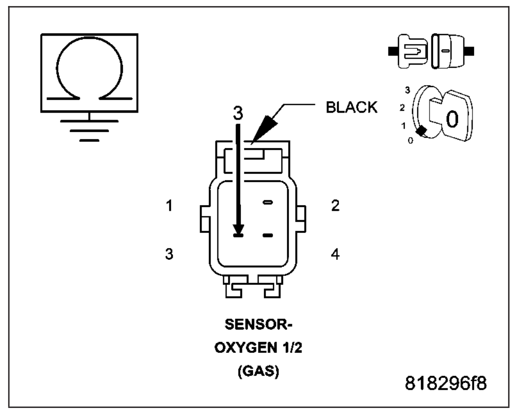
Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

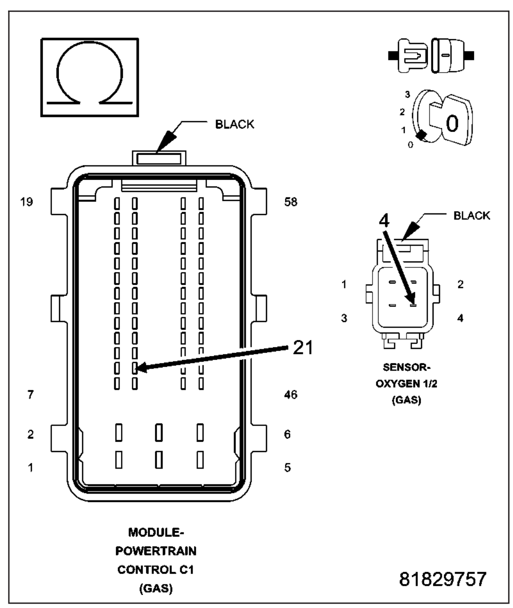
Yes >> Repair the (K904) O2 1/2 Return circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K141) O2 1/2 Signal circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

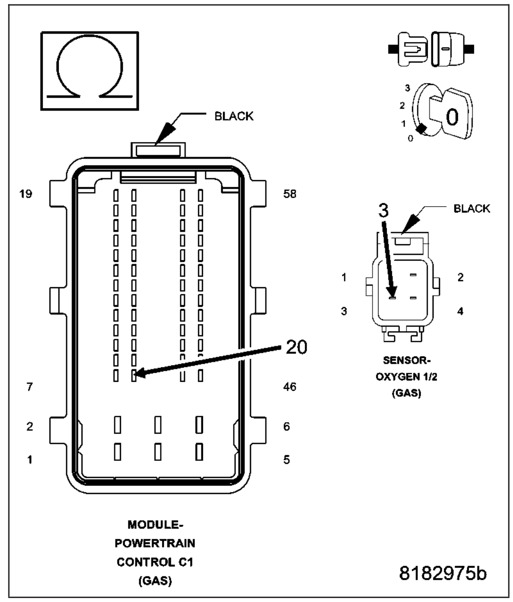
Yes >> Go to 8

No >> Repair the (K141) O2 1/2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K904) O2 1/2 Return circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K904) O2 1/2 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. OXYGEN SENSOR 1/2

NOTE: Prior to replacing the O2 sensor, verify that the correct part number is being used in order to prevent improper O2 heater control.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

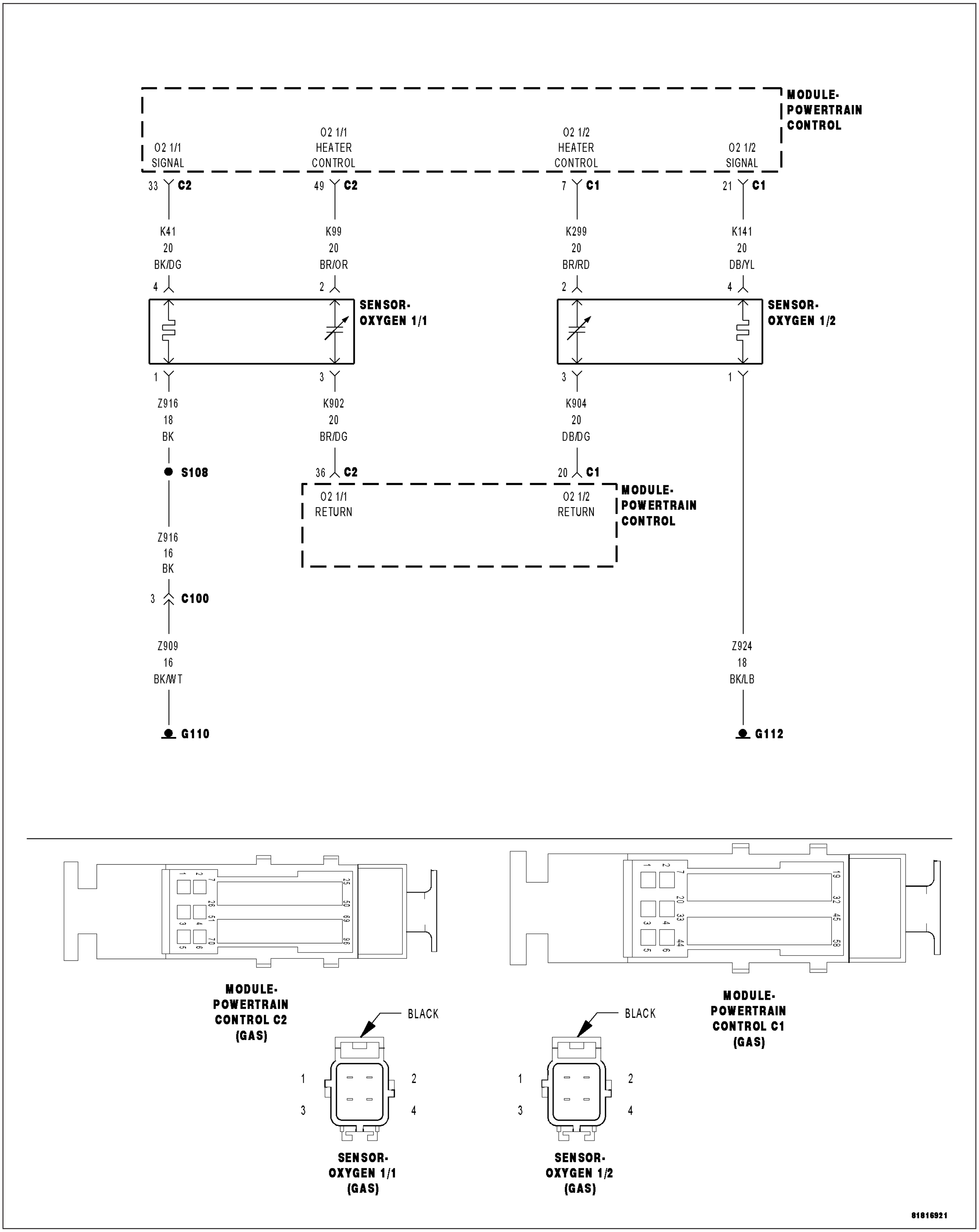
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0141-O2 SENSOR 1/2 HEATER PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The PCM performs a continuous check of the O2 sensor heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  With the engine running, O2 sensor heater duty cycle greater than 0%, and battery voltage greater than 11.0 volts.
- **Set Condition:**
  The PCM detects no O2 sensor output when the heater is powered up. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. OXYGEN SENSOR 1/2 HEATER CONTROL OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the sensor to cool down before continuing. The sensor voltage should stabilize between 4.6 and 5.0 volts.

Turn the ignition on.

With a scan tool, actuate the Oxygen Sensor 1/2 control.

With the scan tool, monitor Oxygen Sensor 1/2 voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. OXYGEN SENSOR 1/2

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the Oxygen Sensor 1/2 harness connector.

Measure the resistance of the O2 sensor heater element across the Oxygen Sensor 1/2 connector between the heater control terminal and the ground terminal.

NOTE: The O2 heater element resistance should be measured at 70° F (21.1° C). The resistance value will vary at different temperatures.

Is the resistance between 2.0 and 30.0 ohms?

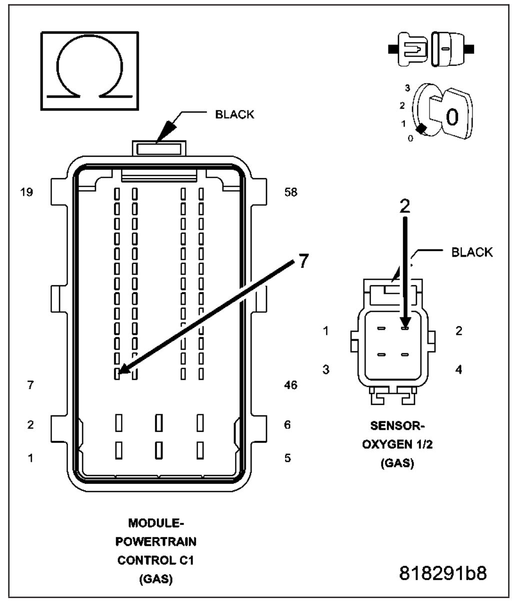
Yes >> Go to 3

No >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K299) O2 1/2 Heater Control circuit from the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 0.5 ohm?

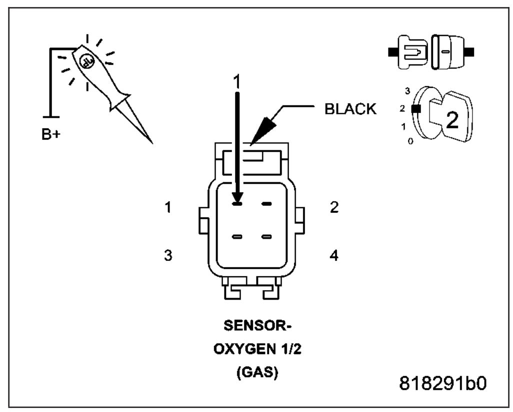
Yes >> Go to 4

No >> Repair the (K299) O2 1/2 Heater Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12 volt test light connected to 12 volts, check the (Z924) Ground circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (Z924) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0171-FUEL SYSTEM 1/1 LEAN

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop, the ambient/battery temperature above 20° F (-6° C) and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term adaptive by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a DTC is set. Two Trip Fault. Three good trips to turn off the MIL

Possible Causes
INTERMITTENT DTC
O2 SENSOR SIGNAL CIRCUIT
O2 SENSOR RETURN CIRCUIT
ECT SENSOR
MAP SENSOR
O2 SENSOR
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL FILTER/PRESSURE REGULATOR
FUEL PUMP MODULE
ENGINE MECHANICAL PROBLEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Diagnose all other trouble codes before continuing with this procedure.

NOTE: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL PRESSURE OUT OF SPECIFICATION

WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge on the fuel rail.

Ignition on, engine not running.

With a scan tool, actuate the fuel pump relay control and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop all actuation tests before continuing.

Choose a conclusion that best matches the fuel pressure reading.

Within Specification
Go to 3

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Below Specification
Go to 11

3. ENGINE COOLANT TEMPERATURE

Ignition on, engine not running.

NOTE: If necessary, allow the engine to cool to ambient temperature before proceeding.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

With a scan tool, read the ECT sensor value. If the engine was allowed to cool completely, the value should be approximately equal to the ambient temperature.

Start the engine and allow it to reach operating temperature while monitoring the ECT sensor value. The sensor value change should be a smooth transition from start up to normal operating temperature. Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the coolant temperature value on the scan tool should be relatively close. The thermostat should not open until the engine reaches the temperature specified in the Service Information.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Connect a vacuum gauge to a manifold vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the vacuum gauge reading?

Yes >> Go to 5

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. O2 SENSOR VOLTAGE

Start the engine.

If necessary, allow the engine to reach normal operating temperature.

With a scan tool, monitor all O2 Sensor voltage readings.

Is the voltage switching between 2.5 and 3.4 volts for all O2 sensors?

Yes >> Go to 6

No >> Go to 8

6. 1/1 O2 SENSOR HEATER

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the 1/1 O2 Sensor heater.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Replace the 1/1 O2 Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. ENGINE MECHANICAL PROBLEM

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 13

8. O2 SENSOR

Turn the ignition off.

Disconnect the O2 Sensor harness connector for the sensor where the voltage was not switching between 2.5 and 3.4 volts.

Turn the ignition on.

With a scan tool, monitor the O2 Sensor voltage.

NOTE: The voltage should be approximately 5.0 volts with the connector disconnected.

Connect a jumper wire between the signal circuit and the return circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor voltage change as described above?

Yes >> Replace the O2 Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. O2 SENSOR SIGNAL CIRCUIT

With a scan tool, monitor the O2 Sensor voltage with the jumper wire removed.

NOTE: The scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts when one O2 Sensor signal circuit is shorted to voltage.

NOTE: The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor signal circuit contains excessive resistance.

Inspect the O2 Sensor connector and the PCM harness connector for damage or corrosion.

Check the O2 Sensor signal circuit for a short to ground, open circuit, short to voltage, or high resistance.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. O2 SENSOR RETURN CIRCUIT

Check the O2 Sensor return circuit for a short to ground, open circuit, short to voltage or high resistance.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 13

11. RESTRICTED FUEL SUPPLY LINE

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special 5/16 fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.

Attach a fuel pressure test gauge to the T fitting on tool #6539.

Ignition on, engine not running.

With a scan tool, actuate the Fuel Pump Relay control and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop all actuation tests before proceeding.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Fuel Pump Module.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors relative to the components tested in this procedure.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to the components tested in this procedure and wiggle test the wiring and connectors.

Look for the data to change or for a DTC to set during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0172-FUEL SYSTEM 1/1 RICH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop, the ambient/battery temperature above 20° F (-6° C) and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term adaptive by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a DTC is set. Two Trip Fault. Three good trips to turn off the MIL

Possible Causes
INTERMITTENT DTC
O2 SENSOR SIGNAL CIRCUIT
O2 SENSOR RETURN CIRCUIT
ECT SENSOR
MAP SENSOR
O2 SENSOR
EVAP PURGE SOLENOID
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL FILTER/PRESSURE REGULATOR
FUEL PUMP MODULE
ENGINE MECHANICAL PROBLEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Diagnose all other trouble codes before continuing with this procedure.

NOTE: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL PRESSURE OUT OF SPECIFICATION

WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge on the fuel rail.

Ignition on, engine not running.

With a scan tool, actuate the fuel pump relay control and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop all actuation tests before continuing.

Choose a conclusion that best matches the fuel pressure reading.

Within Specification
Go to 3

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. EVAP PURGE SOLENOID

Turn the ignition off.

Disconnect the hoses at the EVAP Purge Solenoid.

Using a hand vacuum pump, apply 10 inches of vacuum to the EVAP Purge Solenoid vacuum source port on the component side.

Did the EVAP Purge Solenoid hold vacuum?

Yes >> Go to 4

No >> Replace the EVAP Purge Solenoid.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. ENGINE COOLANT TEMPERATURE

Ignition on, engine not running.

NOTE: If necessary, allow the engine to cool to ambient temperature before proceeding.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

With a scan tool, read the ECT sensor value. If the engine was allowed to cool completely, the value should be approximately equal to the ambient temperature.

Start the engine and allow it to reach operating temperature while monitoring the ECT sensor value. The sensor value change should be a smooth transition from start up to normal operating temperature. Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the coolant temperature value on the scan tool should be relatively close. The thermostat should not open until the engine reaches the temperature specified in the Service Information.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. MAP SENSOR

Turn the ignition off.

Connect a vacuum gauge to a manifold vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the vacuum gauge reading?

Yes >> Go to 6

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. O2 SENSOR VOLTAGE

Start the engine.

If necessary, allow the engine to reach normal operating temperature.

With a scan tool, monitor all O2 Sensor voltage readings.

Is the voltage switching between 2.5 and 3.4 volts for all O2 sensors?

Yes >> Go to 7

No >> Go to 9

7. 1/1 O2 SENSOR HEATER

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the 1/1 O2 Sensor heater.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Replace the 1/1 O2 Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. ENGINE MECHANICAL PROBLEM

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

9. O2 SENSOR

Turn the ignition off.

Disconnect the O2 Sensor harness connector for the sensor where the voltage was not switching between 2.5 and 3.4 volts.

Turn the ignition on.

With a scan tool, monitor the O2 Sensor voltage.

NOTE: The voltage should be approximately 5.0 volts with the connector disconnected.

Connect a jumper wire between the signal circuit and the return circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor voltage change as described above?

Yes >> Replace the O2 Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. O2 SENSOR SIGNAL CIRCUIT

With a scan tool, monitor the O2 Sensor voltage with the jumper wire removed.

NOTE: The scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts when one O2 Sensor signal circuit is shorted to voltage.

NOTE: The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor signal circuit contains excessive resistance.

Inspect the O2 Sensor connector and the PCM harness connector for damage or corrosion.

Check the O2 Sensor signal circuit for a short to ground, open circuit, short to voltage, or high resistance.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 11

11. O2 SENSOR RETURN CIRCUIT

Check the O2 Sensor return circuit for a short to ground, open circuit, short to voltage or high resistance.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors relative to the components tested in this procedure.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to the components tested in this procedure and wiggle test the wiring and connectors.

Look for the data to change or for a DTC to set during the wiggle test.

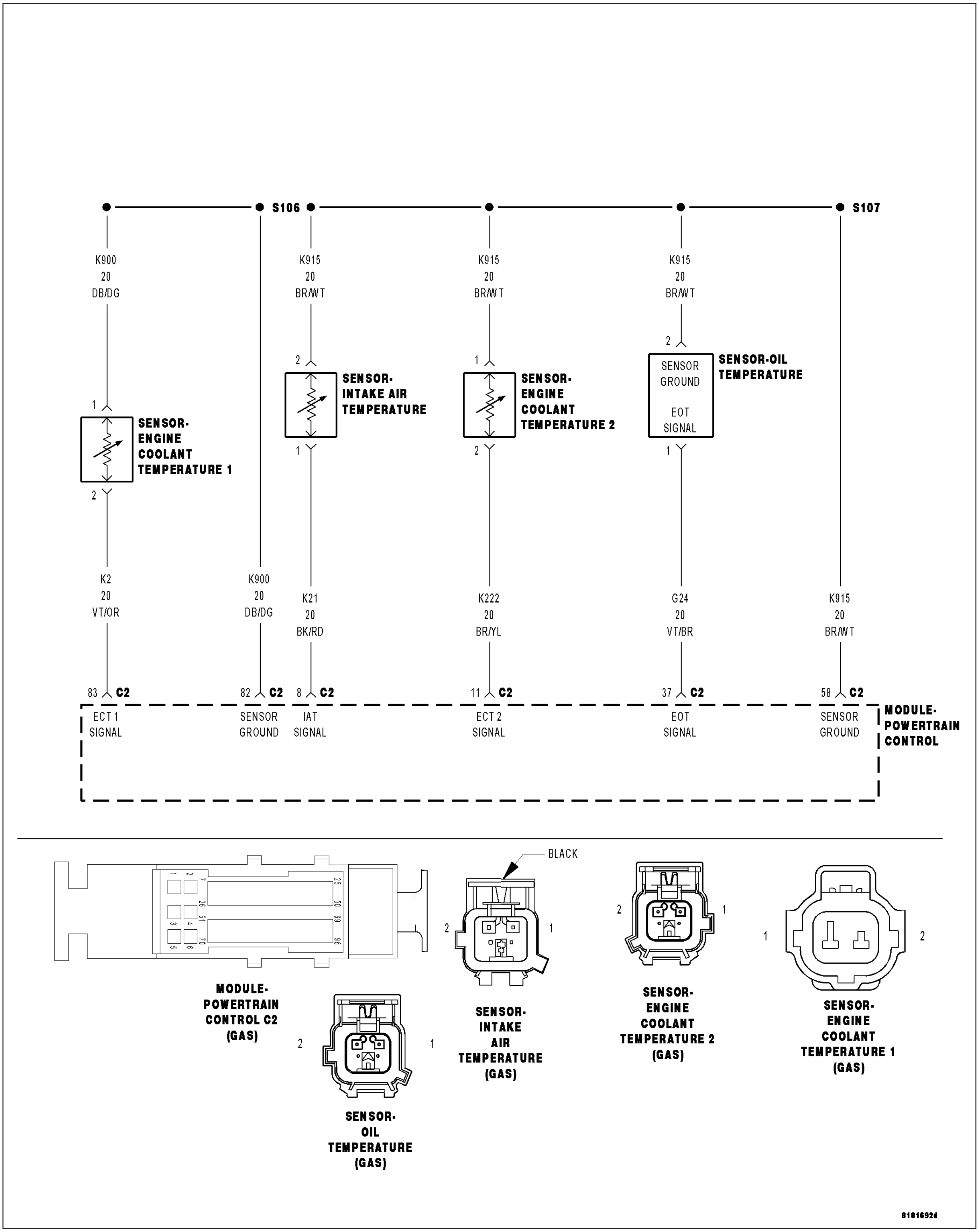
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0196-ENGINE OIL TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Engine Oil Temperature Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(G24) EOT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G24) EOT SIGNAL CIRCUIT SHORTED TO GROUND
(G24) EOT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT
(G24) EOT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE OIL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G24) EOT SIGNAL CIRCUIT SHORTED TO VOLTAGE

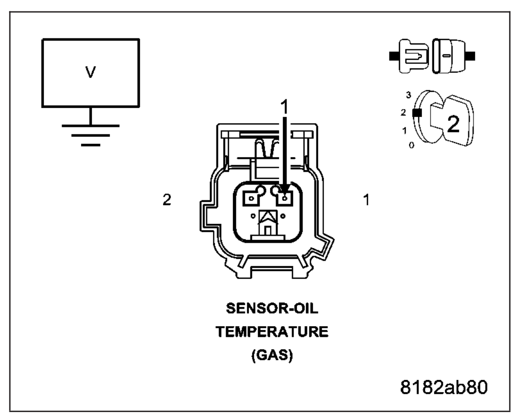
Turn the ignition off.

Disconnect the Engine Oil Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (G24) EOT Signal circuit in the Engine Oil Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (G24) EOT Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (G24) EOT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

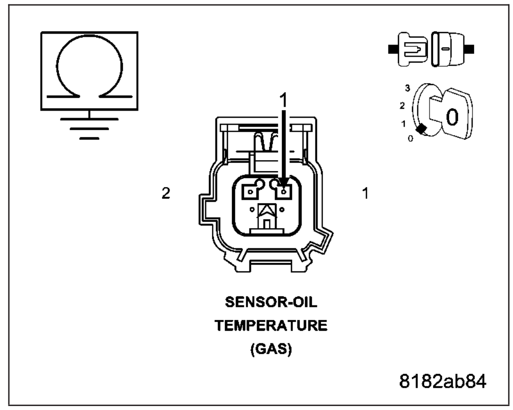
Measure the resistance between ground and the (G24) EOT Signal circuit in the Engine Oil Temperature Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (G24) EOT Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (G24) EOT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

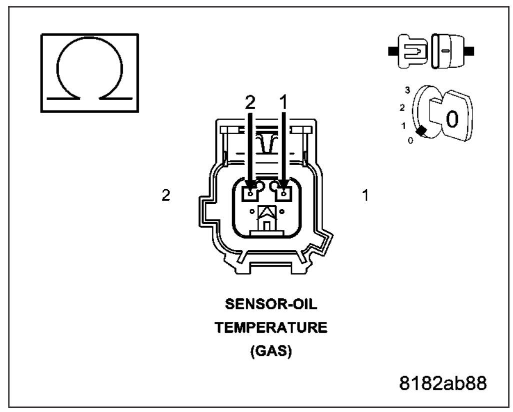
Measure the resistance between the (G24) EOT Signal circuit and the (K915) Sensor Ground circuit in the Engine Oil Temperature Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (G24) EOT Signal circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (G24) EOT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

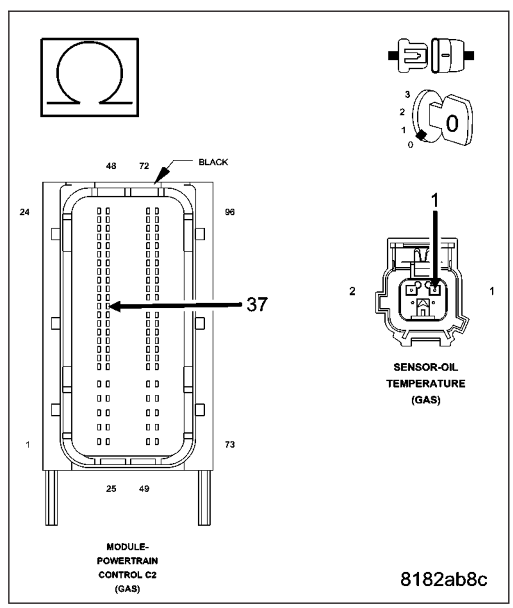
Measure the resistance of the (G24) EOT Signal circuit between the Engine Oil Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 6

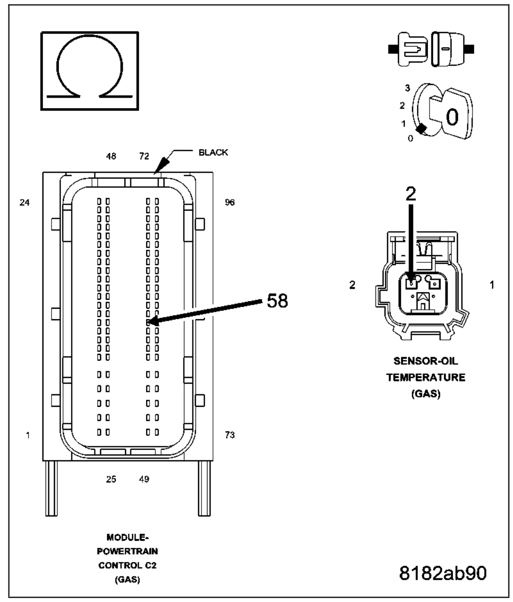
No >> Repair the (G24) EOT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Sensor Ground circuit between the Engine Oil Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K915) Sensor Ground for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. ENGINE OIL TEMPERATURE SENSOR

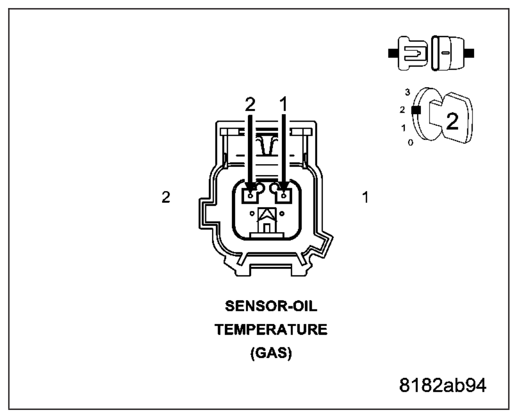
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K915) Sensor Ground circuit and the (G24) EOT Signal circuit in the Engine Oil Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Engine Oil Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Oil Temperature Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Oil Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

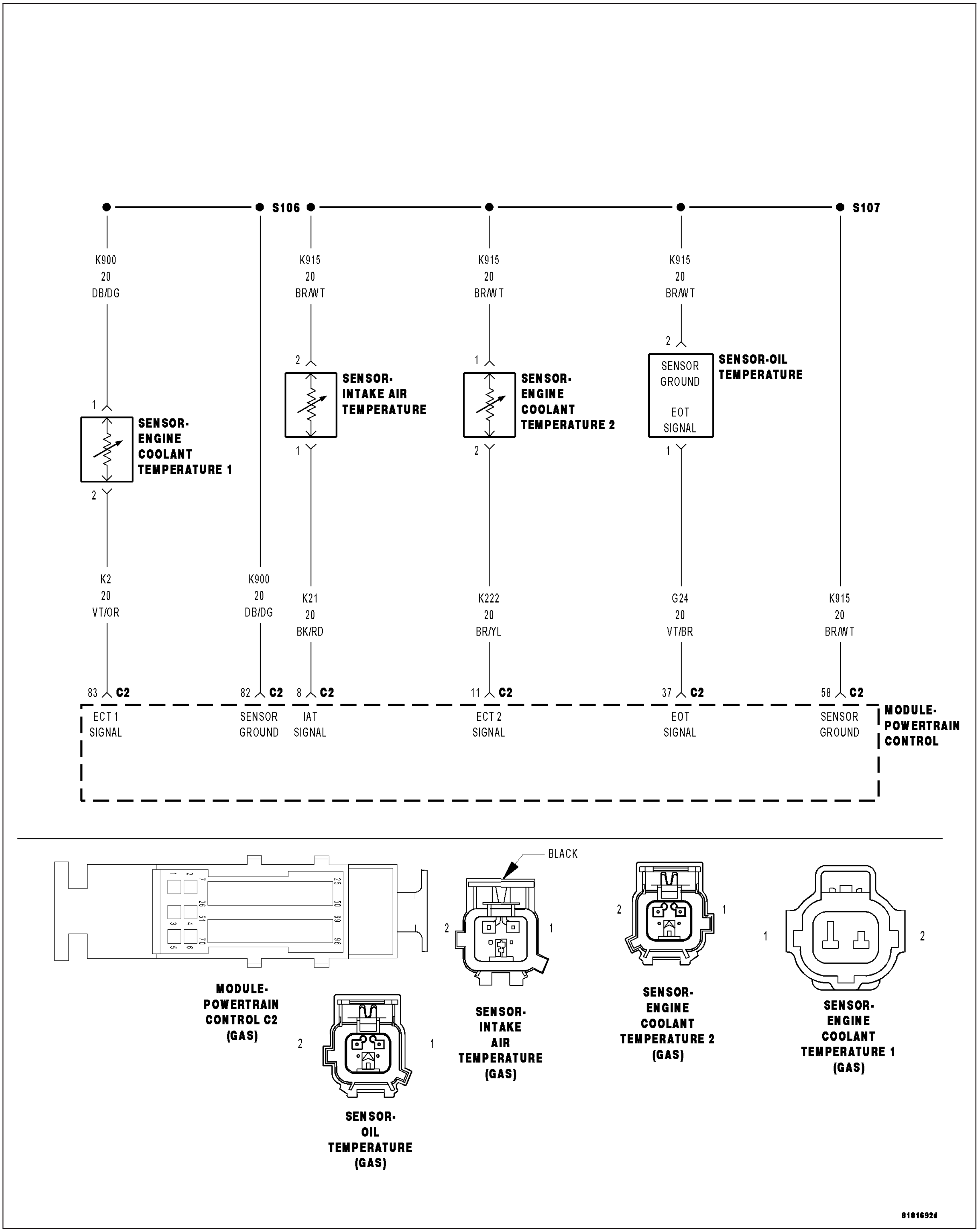
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0197-ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Engine Oil Temperature Sensor circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(G24) EOT SIGNAL CIRCUIT SHORTED TO GROUND
(G24) EOT SIGNAL CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT
(G24) EOT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE OIL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

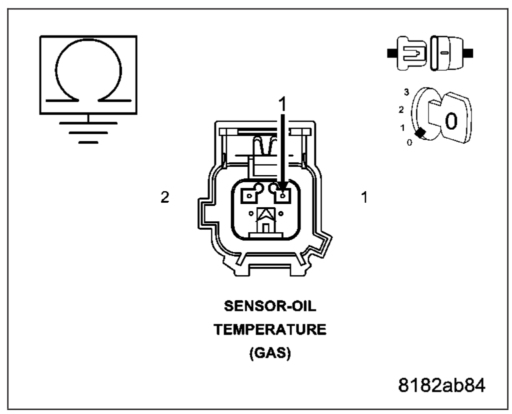
2. (G24) EOT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Oil Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (G24) EOT Signal circuit in the Engine Oil Temperature Sensor harness connector.



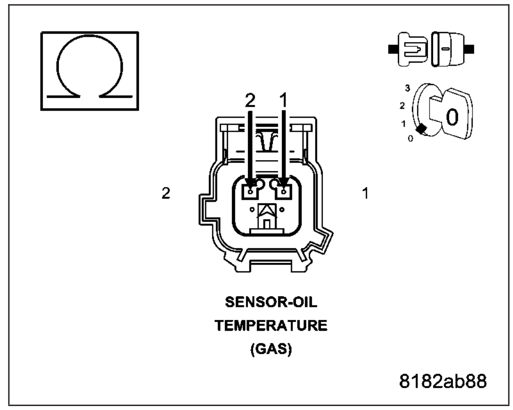
Is the resistance above 100 ohms?

Yes >> Go to 3

No >> Repair the (G24) EOT Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (G24) EOT SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (G24) EOT Signal circuit and the (K915) Sensor Ground circuit in the Engine Oil Temperature Sensor harness connector.



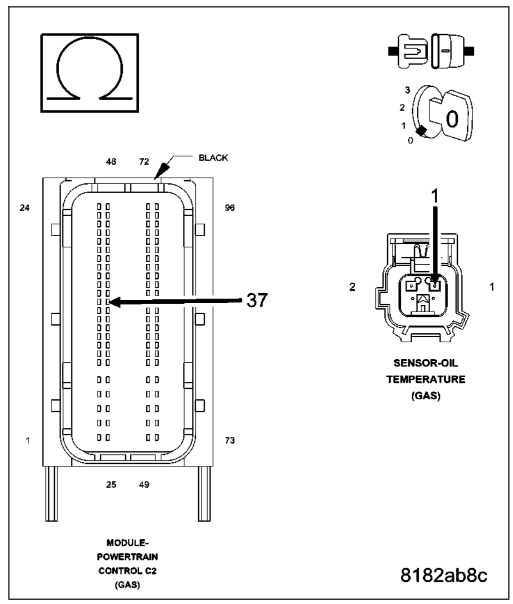
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (G24) EOT Signal circuit for a short to the (K915) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (G24) EOT SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (G24) EOT Signal circuit between the Engine Oil Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (G24) EOT Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE OIL TEMPERATURE SENSOR

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, read the Engine Oil Temperature Sensor signal voltage.

Is the voltage above 4.5 volts with the Engine Oil Temperature Sensor harness disconnected?

Yes >> Replace the Engine Oil Temperature Sensor in accordance with the service information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Oil Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

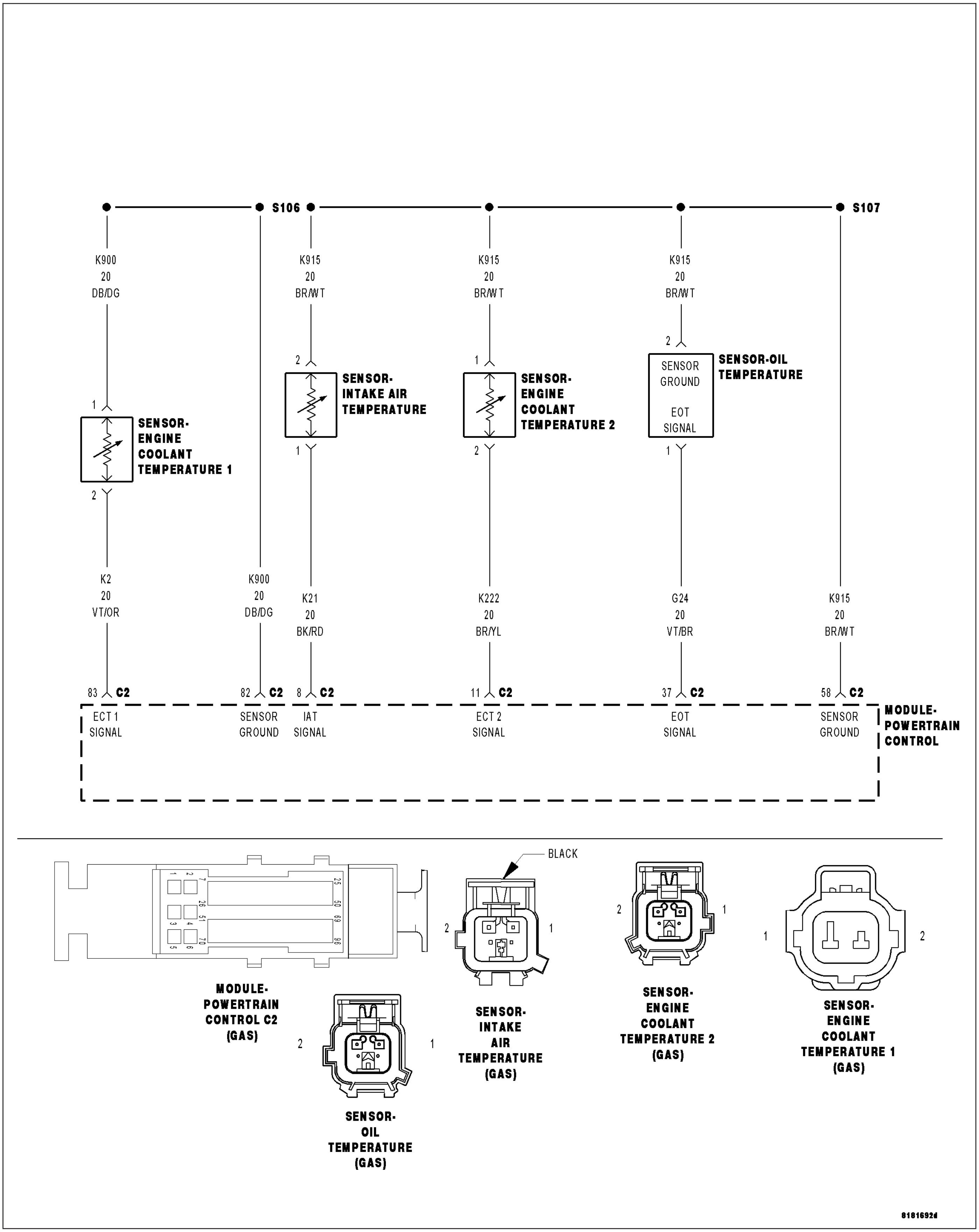
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (G24) EOT Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(G24) EOT SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G24) EOT SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE OIL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G24) EOT SIGNAL CIRCUIT SHORTED TO VOLTAGE

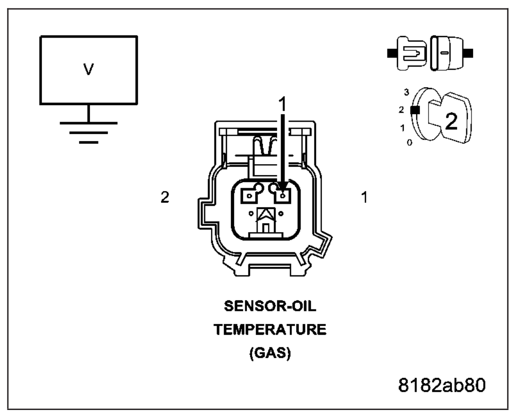
Turn the ignition off.

Disconnect the Engine Oil Temperature Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (G24) EOT Signal circuit in the Engine Oil Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (G24) EOT Signal circuit for a short to voltage.

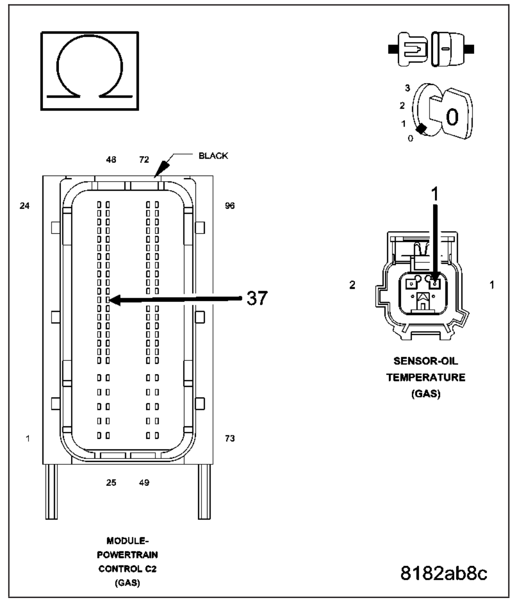
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (G24) ENGINE OIL TEMP SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (G24) EOT Signal circuit between the Engine Oil Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

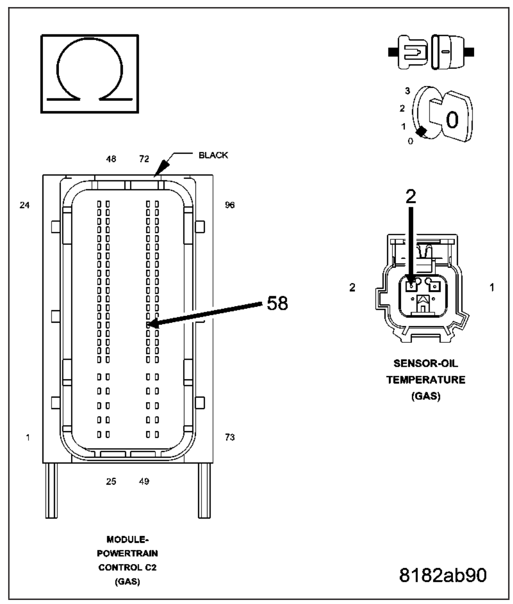
Yes >> Go to 4

No >> Repair the (G24) EOT Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Sensor Ground 3 circuit between the Engine Oil Temperature Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K915) Sensor Ground 3 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE OIL TEMPERATURE SENSOR

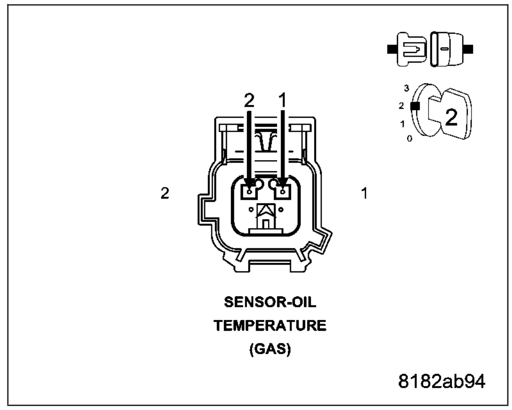
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (G24) EOT Signal circuit and the (K915) Sensor Ground 3 in the Engine Oil Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Engine Oil Temperature Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Oil Temperature Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Oil Temperature Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

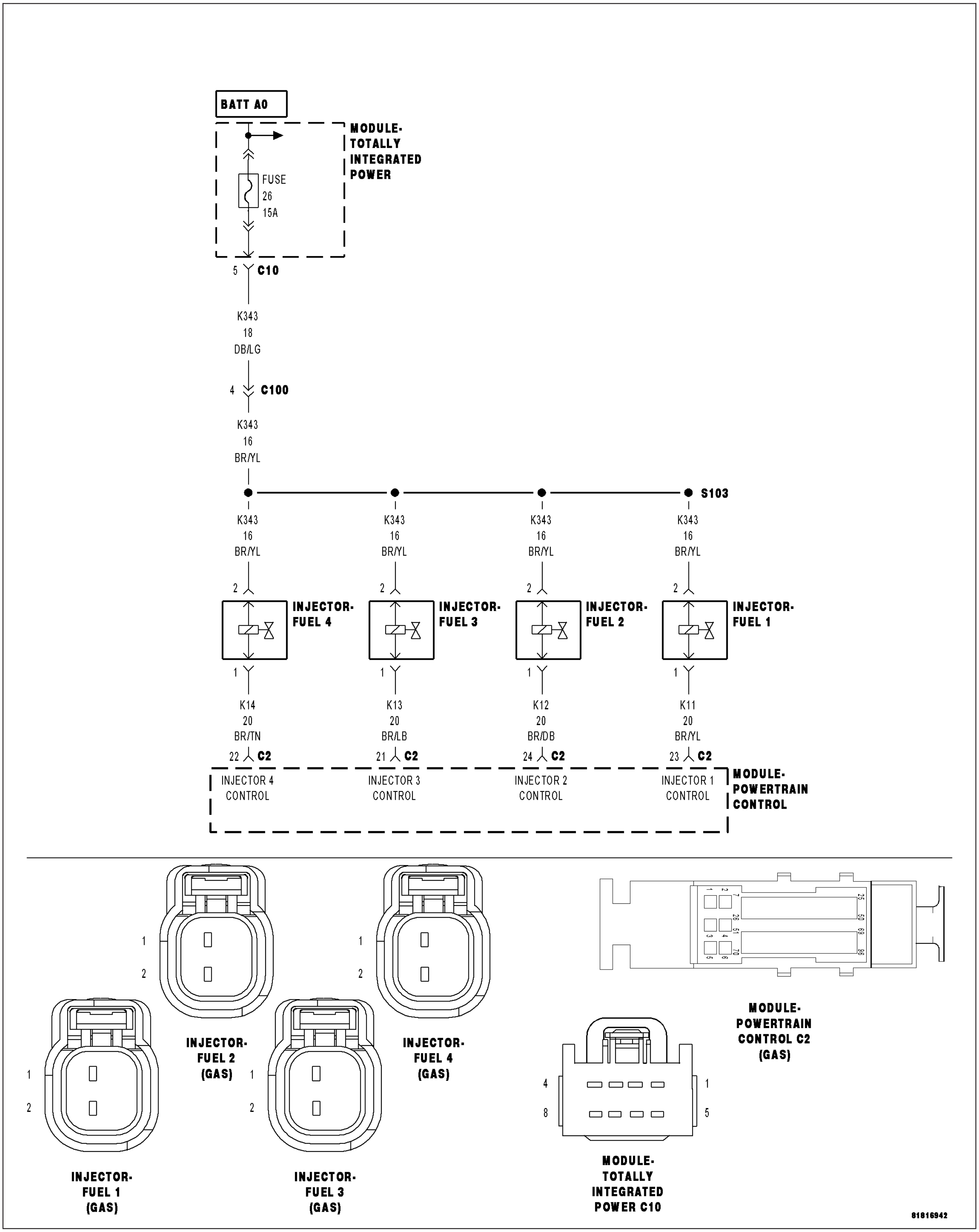
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0201-FUEL INJECTOR 1 CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, ASD relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects an open condition on the Fuel Injector 1 circuit.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

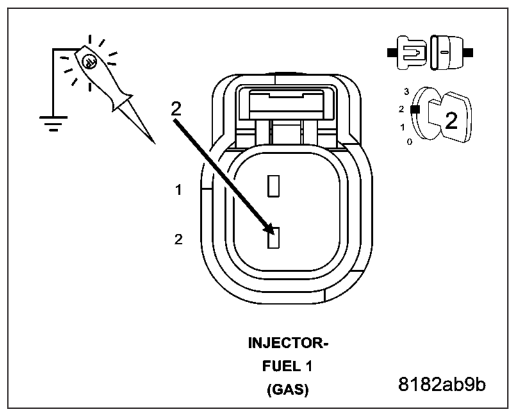
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 1 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

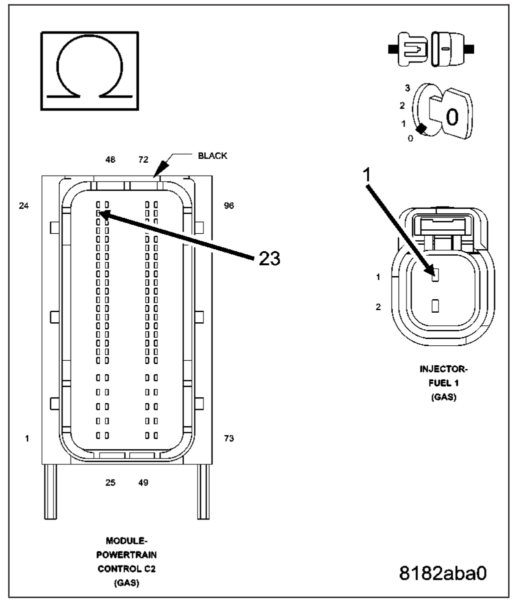
No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K11) Injector 1 Control circuit between the Fuel Injector 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K11) Injector 1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

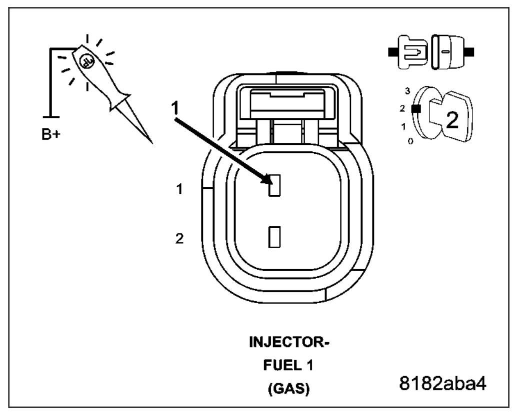
4. FUEL INJECTOR 1

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 1 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Fuel Injector 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between Fuel Injector 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

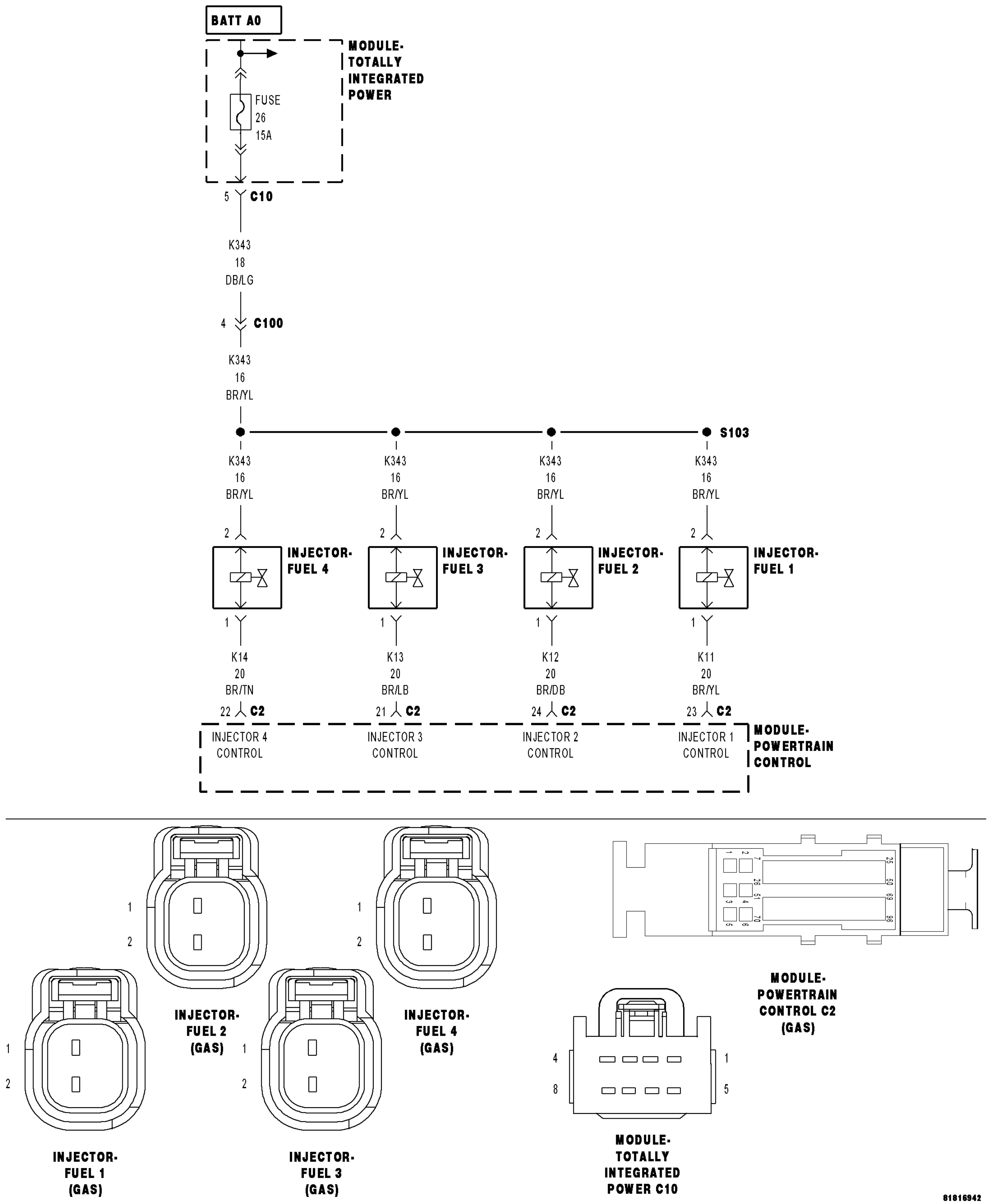
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0202-FUEL INJECTOR 2 CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, ASD relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects an open condition on the Fuel Injector 2 circuit.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

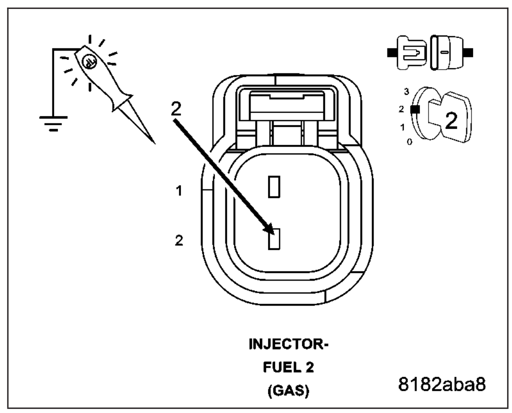
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 2 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

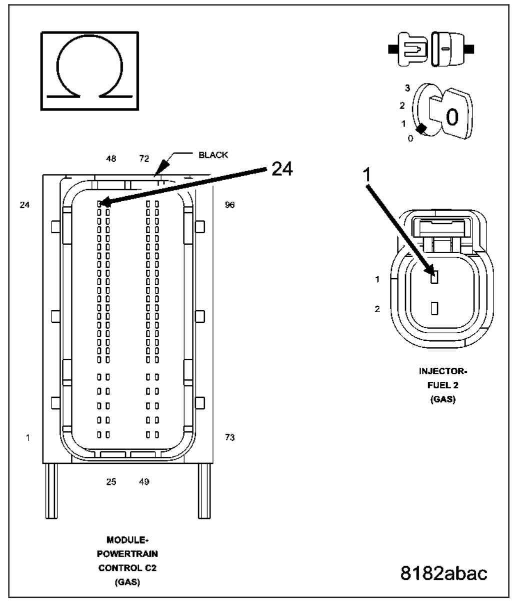
Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K12) Injector 2 Control circuit between the Fuel Injector 2 harness connector and the Powertrain Control Module (PCM) harness connector.

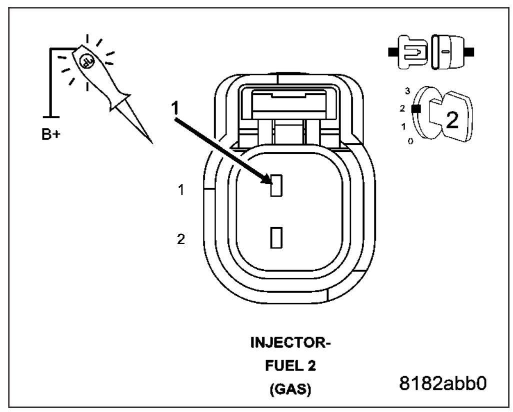
Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K12) Injector 2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. FUEL INJECTOR 2



Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 2 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Fuel Injector 2 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

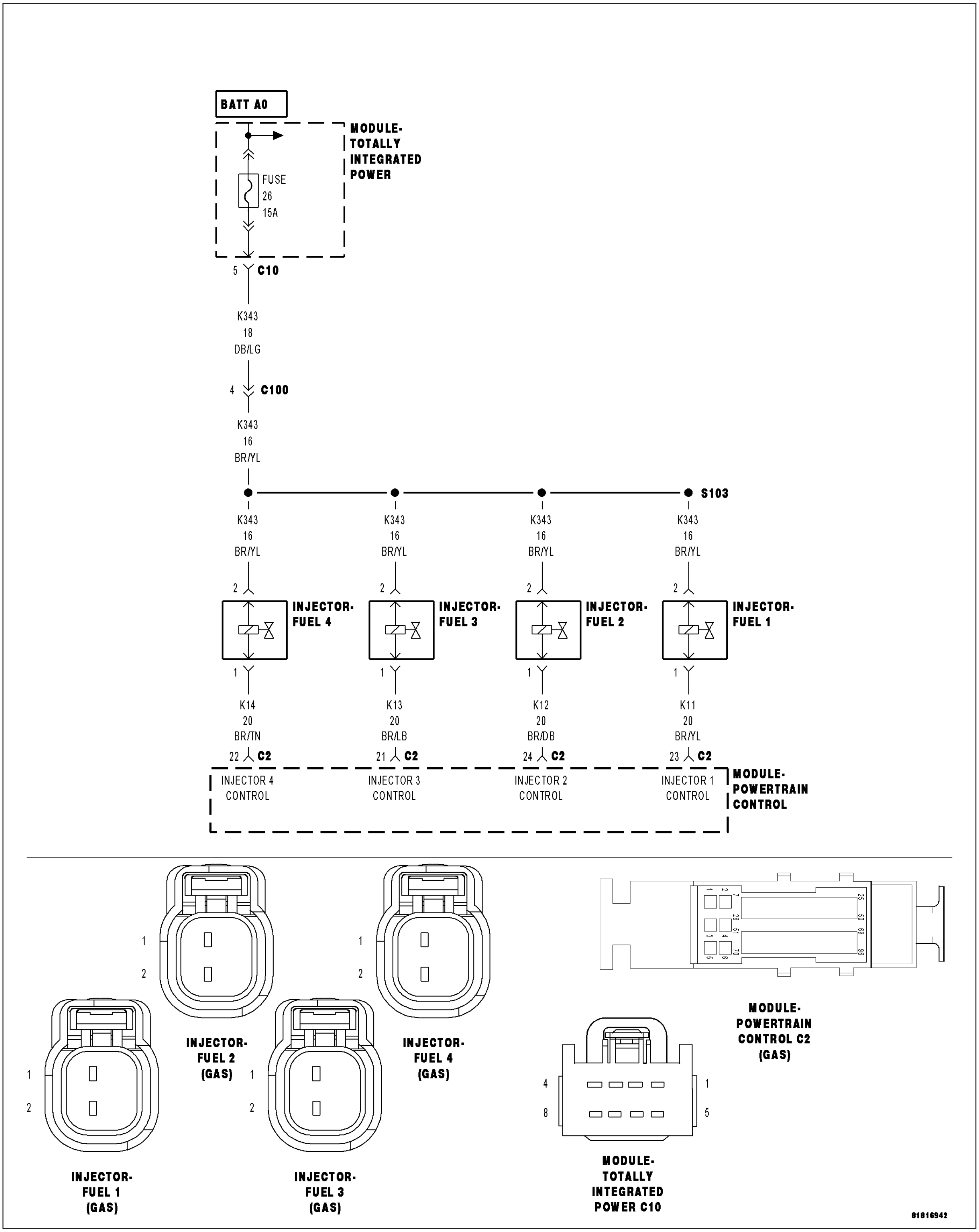
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0203-FUEL INJECTOR 3 CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, ASD relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects an open condition on the Fuel Injector 3 circuit.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

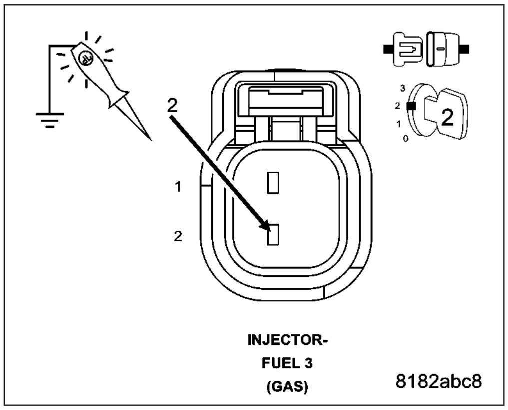
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 3 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

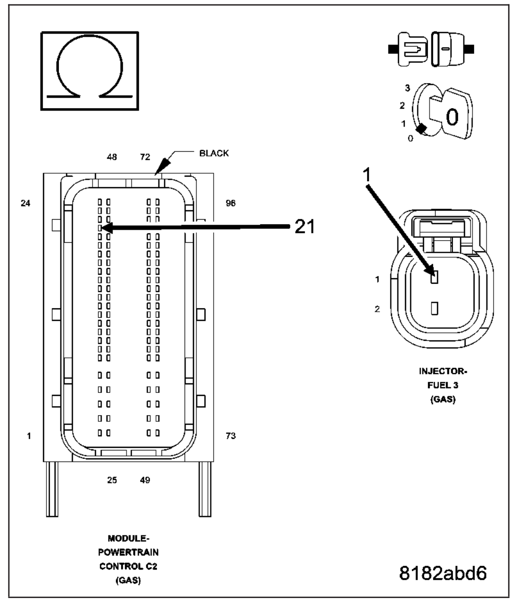
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K13) Injector 3 Control circuit between the Fuel Injector 3 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K13) Injector 3 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

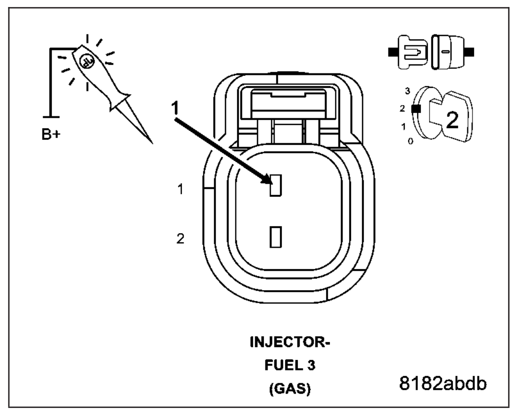
4. FUEL INJECTOR 3

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 3 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Fuel Injector 3 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

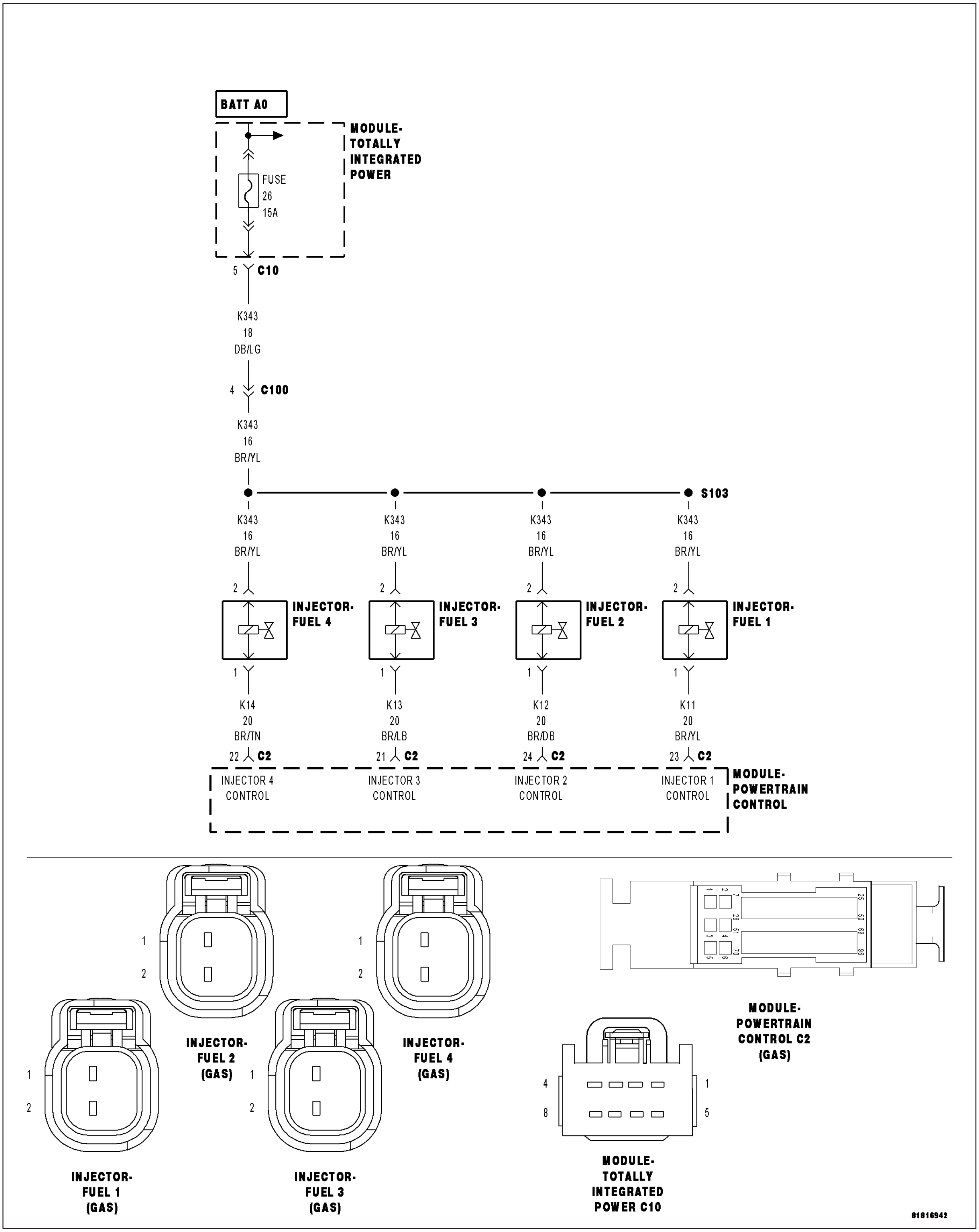
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0204-FUEL INJECTOR 4 CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, ASD relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects an open condition on the Fuel Injector 4 circuit.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 4 harness connector.

Turn the ignition on.

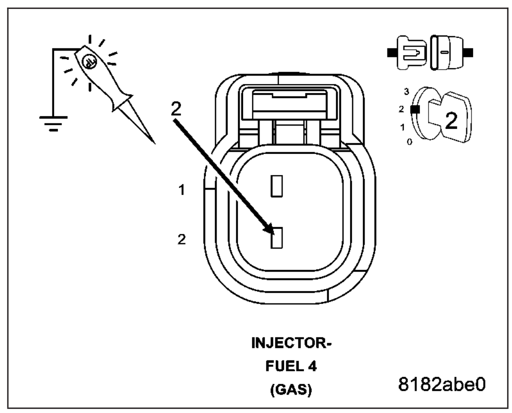
Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 4 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

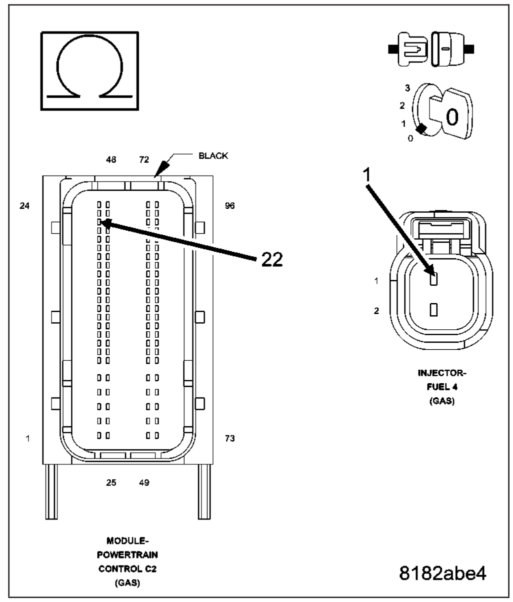


3. (K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Measure the resistance of the (K14) Injector 4 Control circuit between the Fuel Injector 4 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K14) Injector 4 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

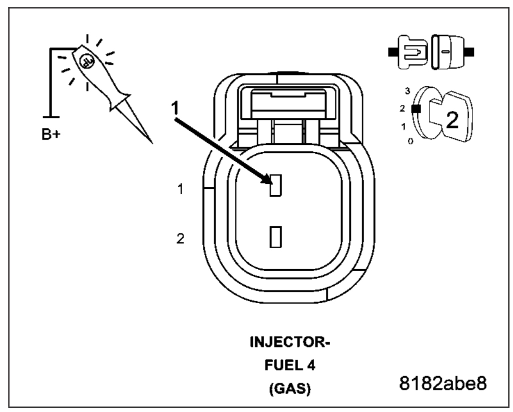
4. FUEL INJECTOR 4

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 4 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Fuel Injector 4 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

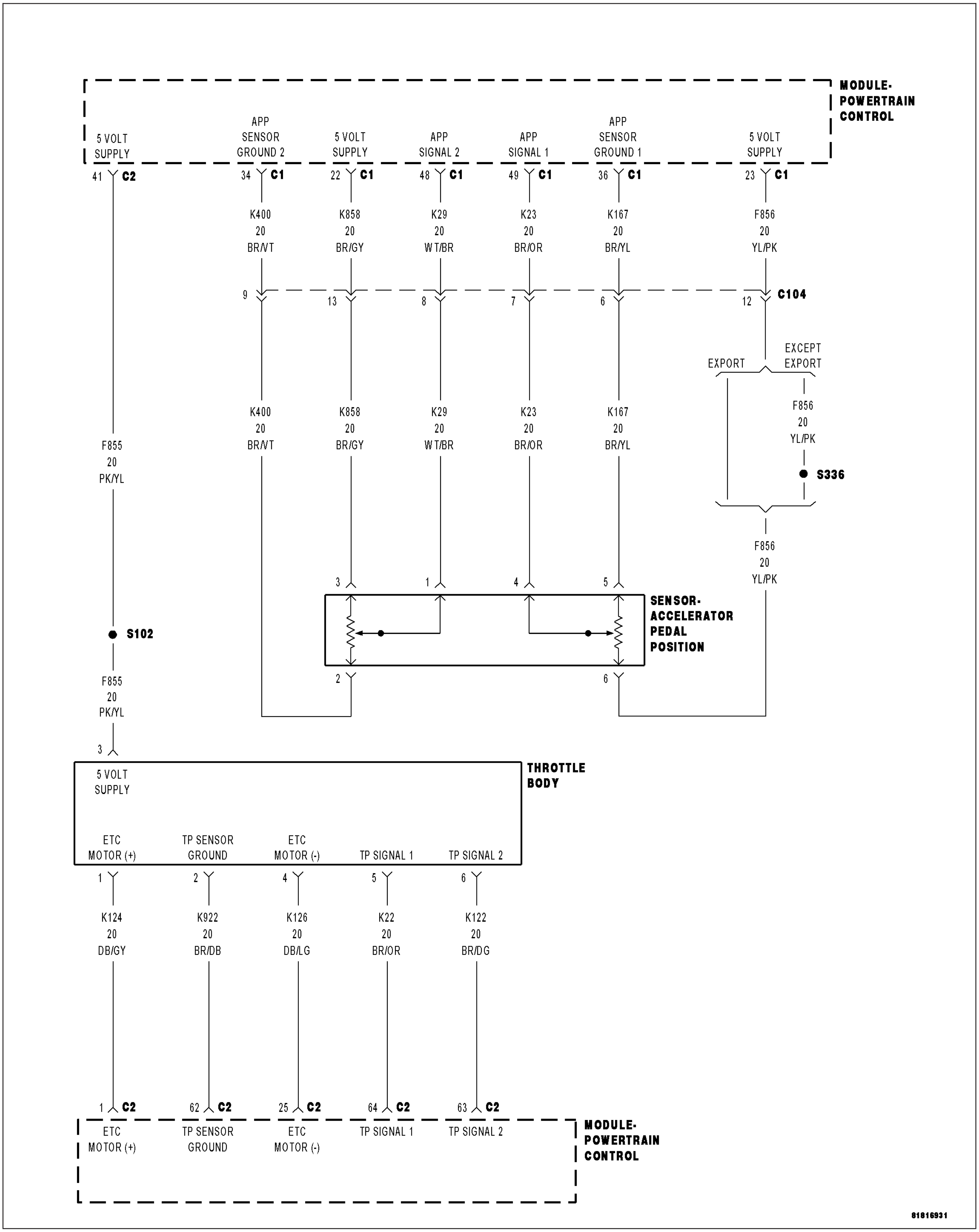
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0221-THROTTLE POSITION SENSOR 2 CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the Throttle Body circuit.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K122) TP SIGNAL 2 CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

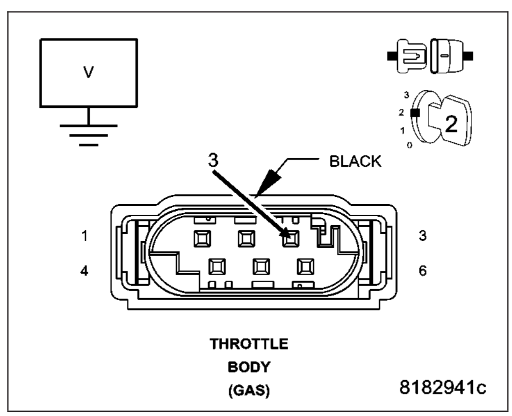
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

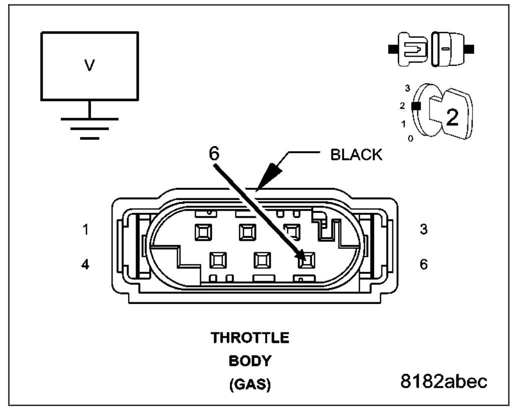
3. (K122) TP SIGNAL 2 CIRCUIT VOLTAGE

Measure the voltage of the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11



4. (K922) TP SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

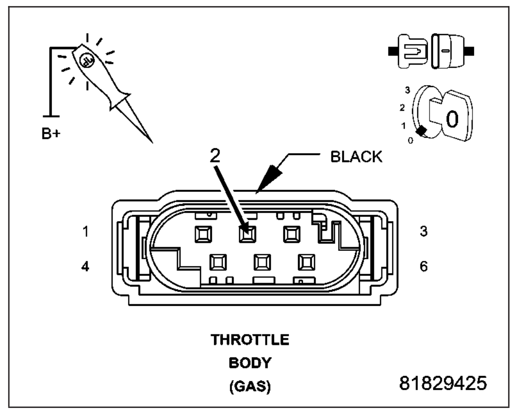
Using a 12 volt test light connected to 12 volts, check the (K922) TP Sensor Ground in the Throttle Body harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15



5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K122) TP SIGNAL 2 CIRCUIT

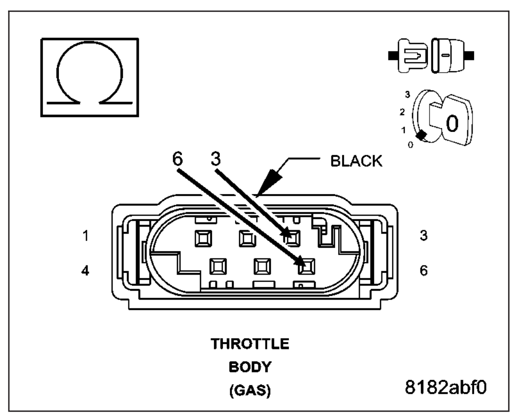
Measure the resistance between the (F855) 5 Volt Supply circuit and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K122) TP Signal 2 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. THROTTLE BODY

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Throttle Body for any condition that would result in an incorrect signal, such as damage or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

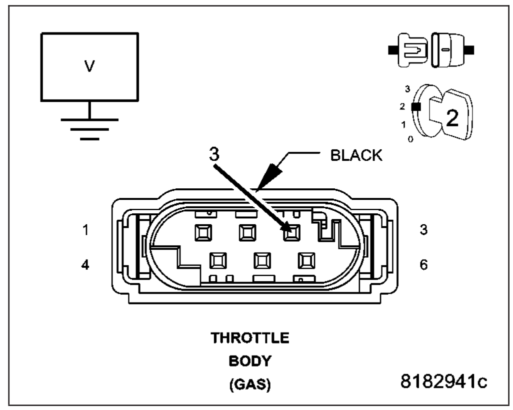
7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



Is there any voltage present?

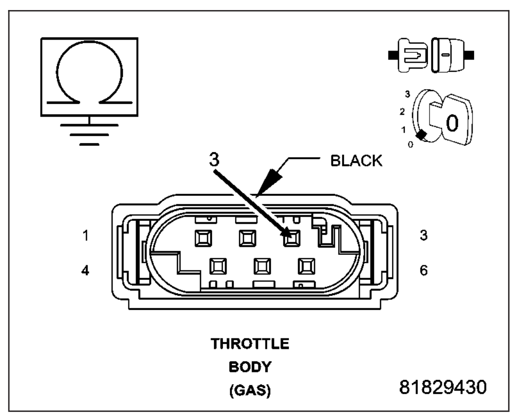
Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



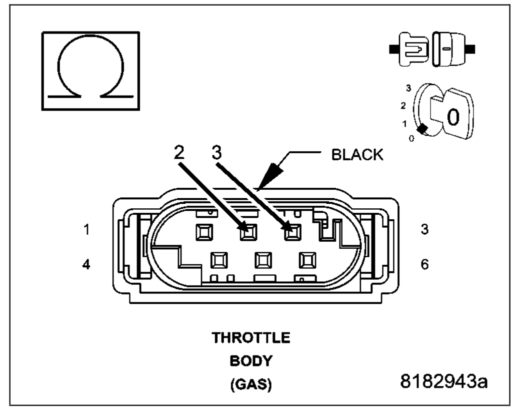
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



Is the resistance above 100 ohms?

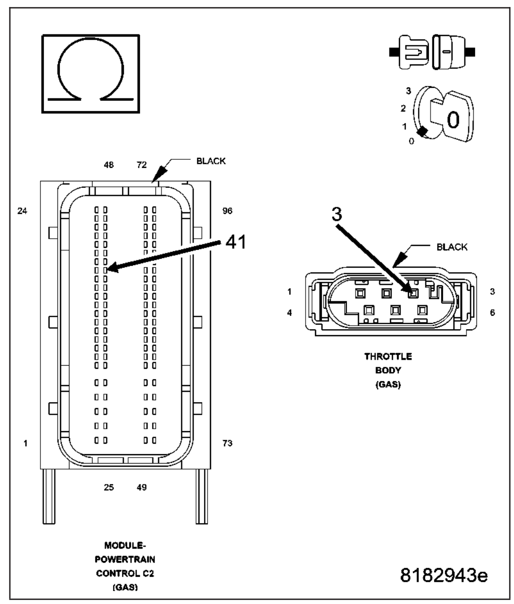
Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K922) TP Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

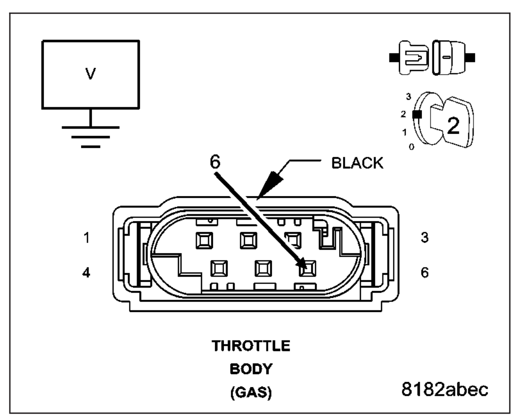
11. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K122) TP Signal 2 circuit in the Throttle Body harness connector.



Is there any voltage present?

Yes >> Repair the (K122) TP Signal 2 circuit for a short to voltage.

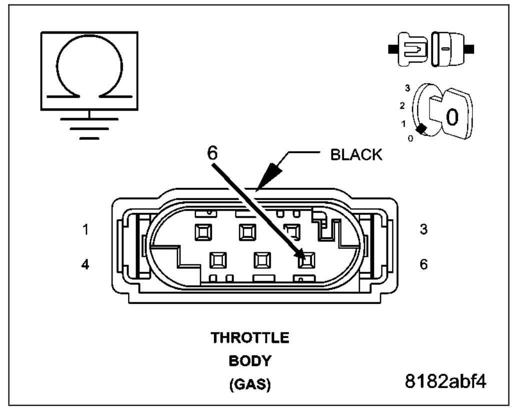
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.



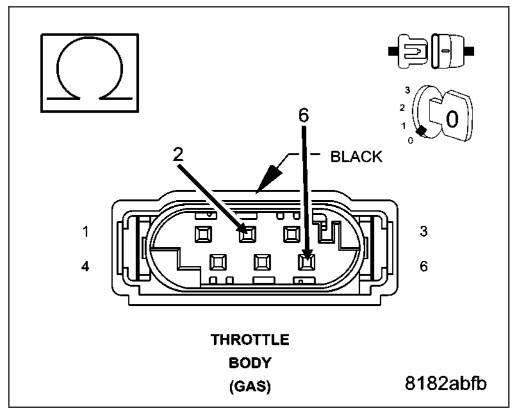
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K122) TP Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



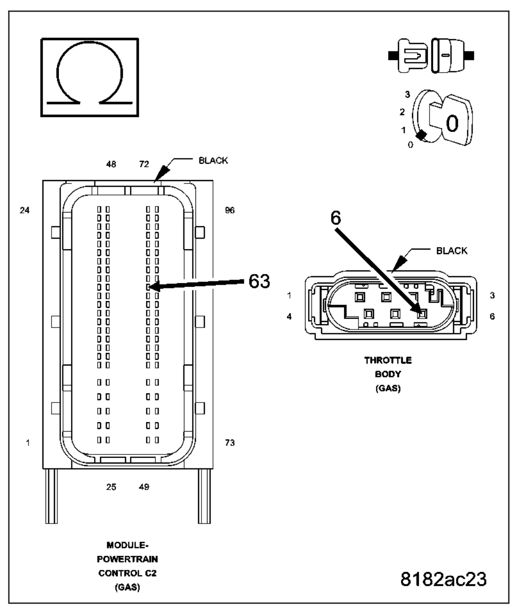
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K122) TP Signal 2 circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K122) TP Signal 2 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

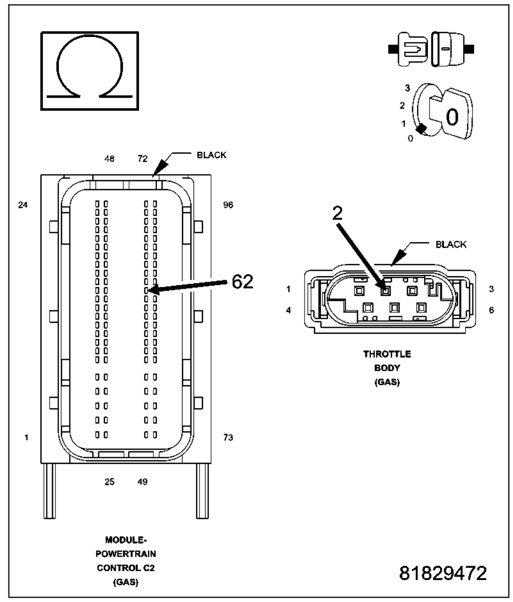
No >> Repair the (K122) TP Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K922) TP Sensor Ground circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

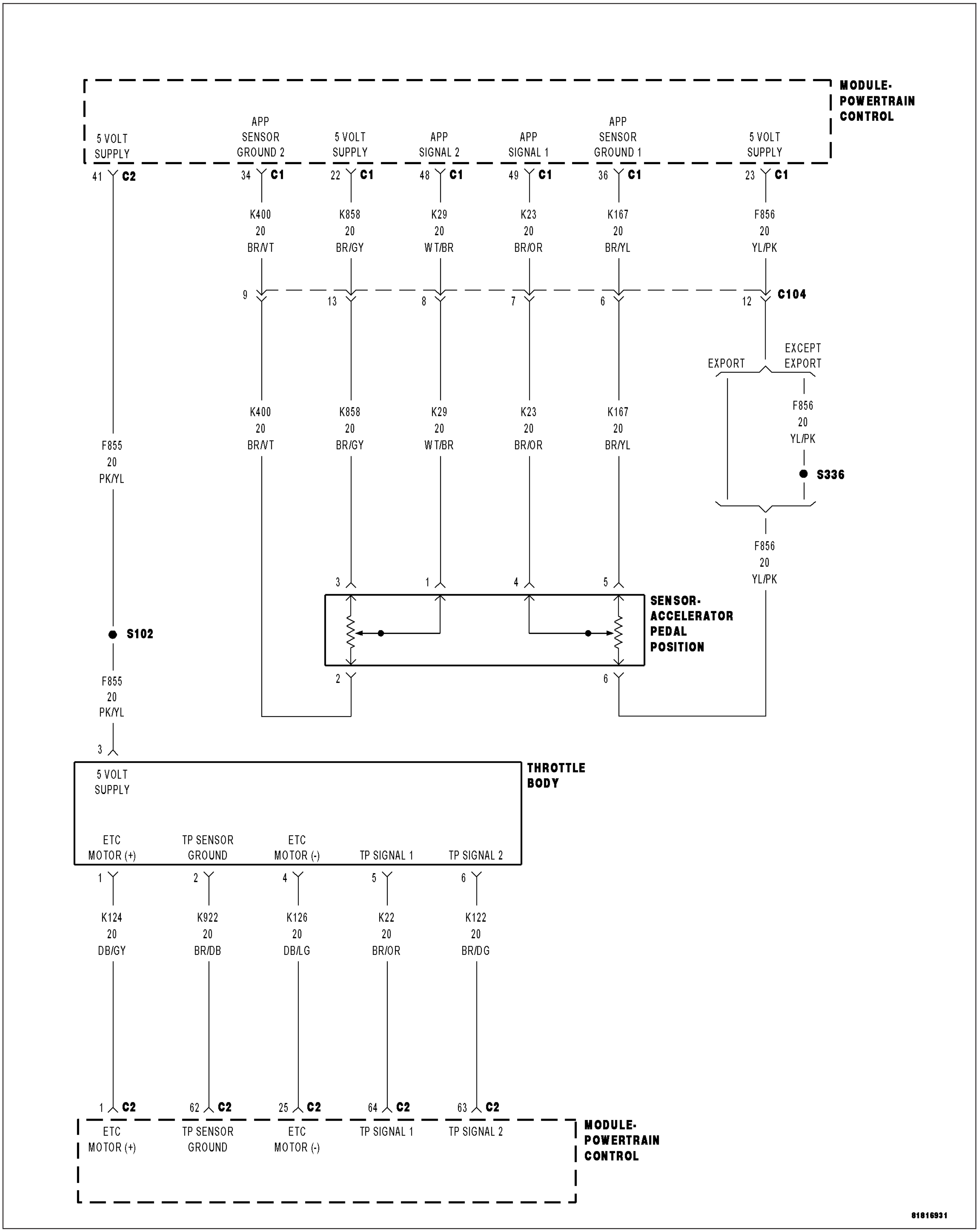
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K122) TP Signal 2 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body connector.

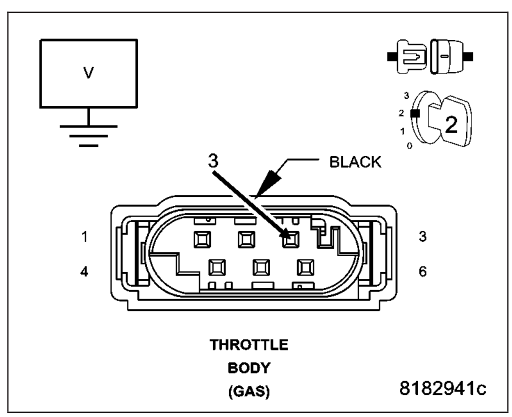
Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.

Is the voltage above 4.5 volts?

Yes >> Go to 6

No >> Go to 3

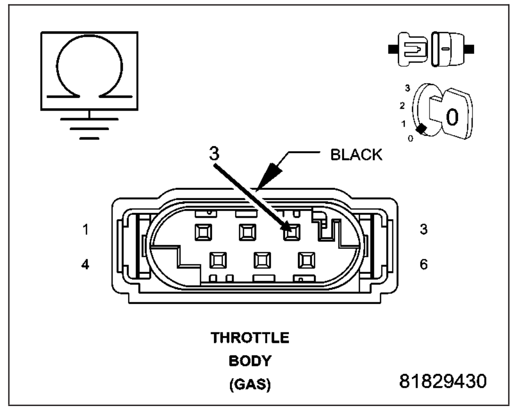


3. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



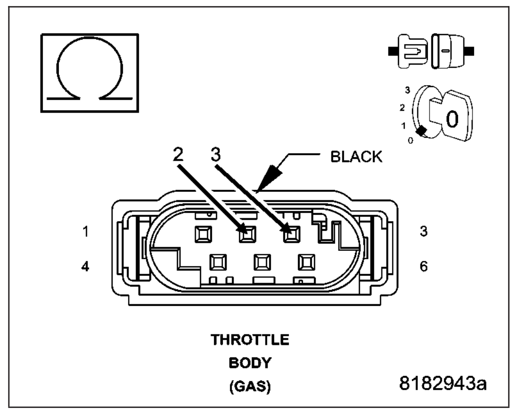
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



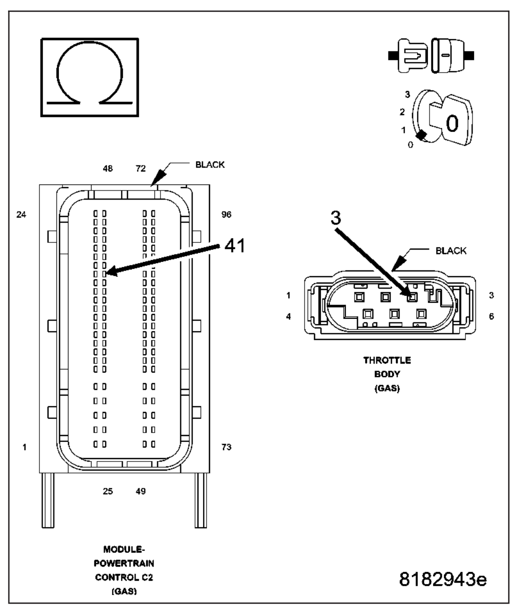
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 12

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

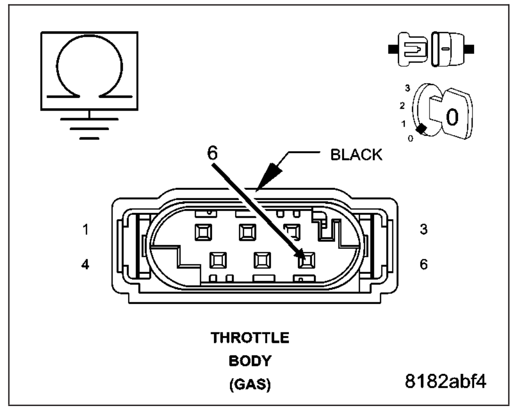
Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (K122) TP Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



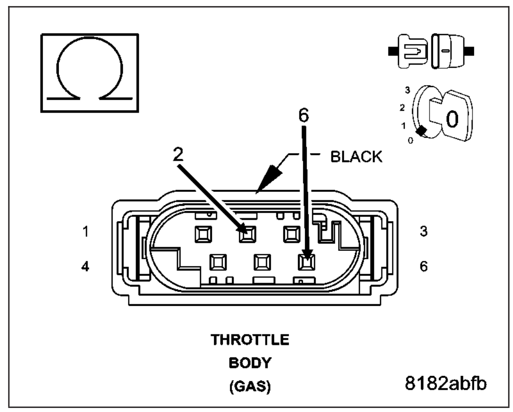
7. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (K122) TP Signal 2 circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



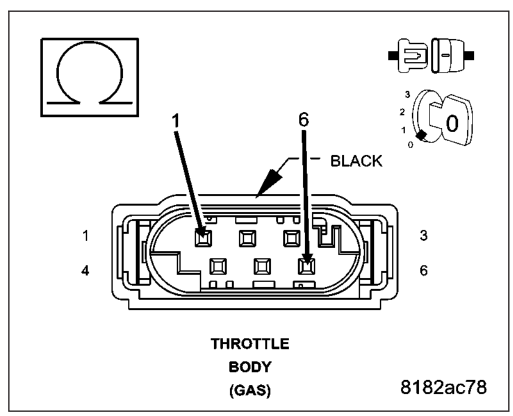
8. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K124) ETC Motor (+) in the Throttle Body harness connector.

Is the resistance below 100 ohms?

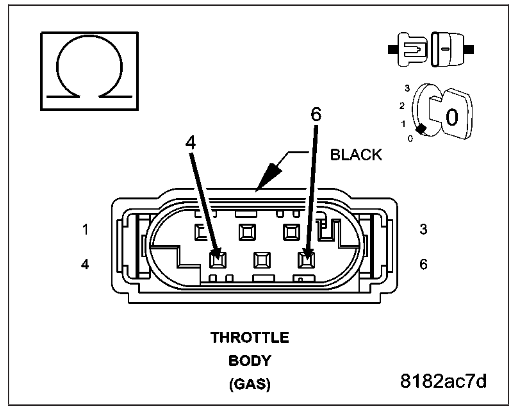
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9



9. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K126) ETC Motor (-) in the Throttle Body harness connector.



Is the resistance below 100 ohms?

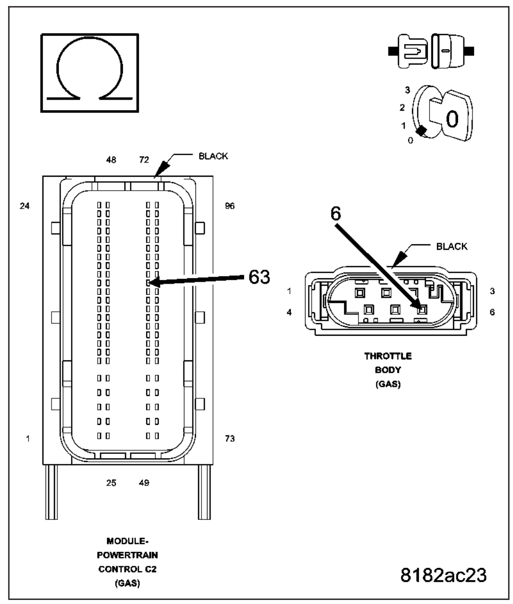
Yes >> Repair the (K122) TP Signal 2 circuit for a short to the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. (K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K122) TP Signal 2 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K122) TP Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. THROTTLE BODY

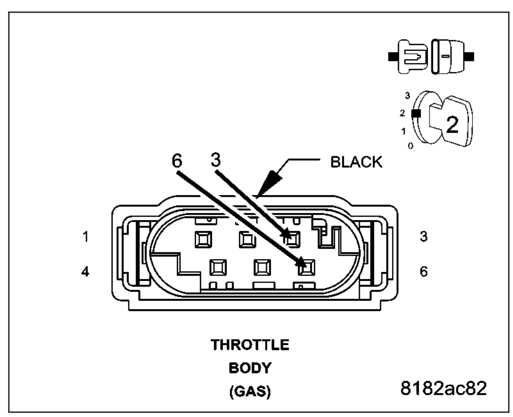
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (F855) 5 Volt Supply circuit and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Turn the ignition on.

With the scan tool, read the TP Signal 2 circuit voltage.



Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the Throttle Body in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

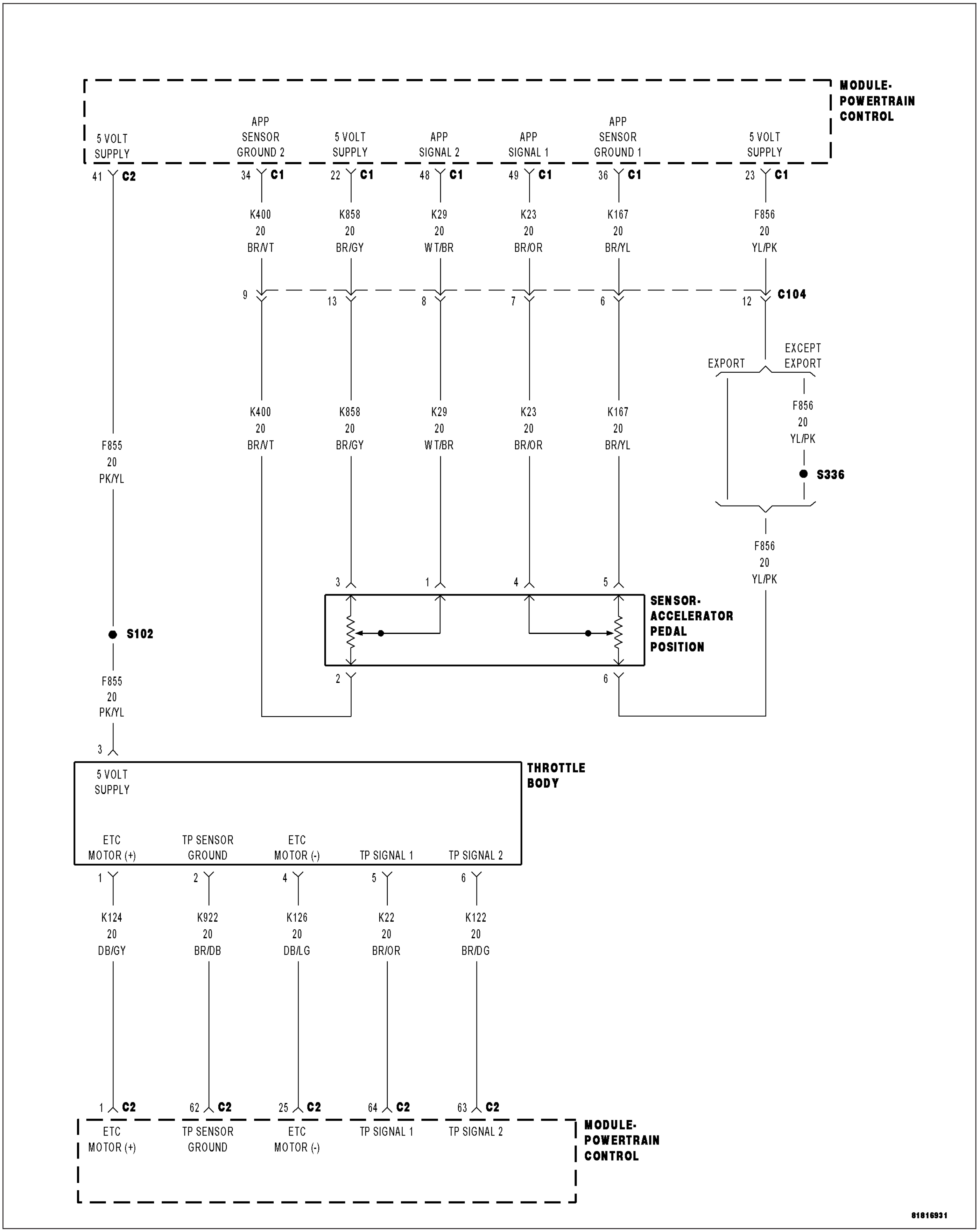
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K122) TP Signal 2 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (F855) 5 VOLT SUPPLY CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

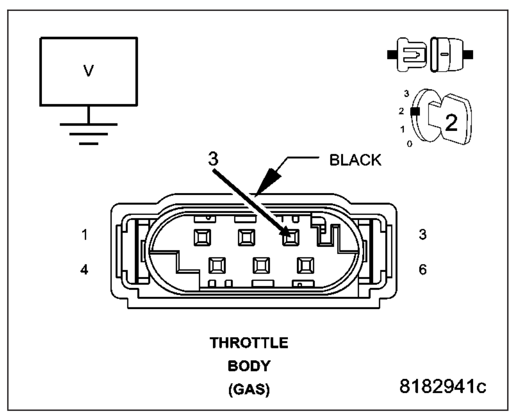
Turn the ignition off.

Disconnect the Throttle Body connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



Is there any voltage present?

Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

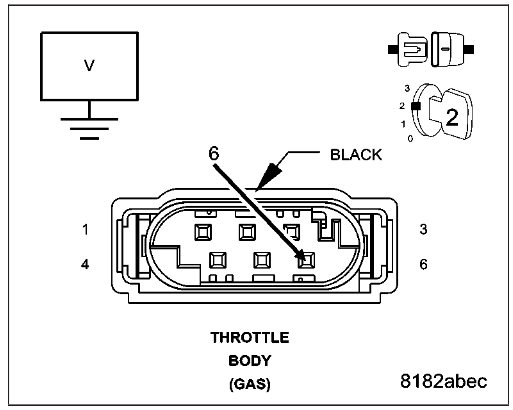
3. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Is there any voltage present?

Yes >> Repair the (K122) TP Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



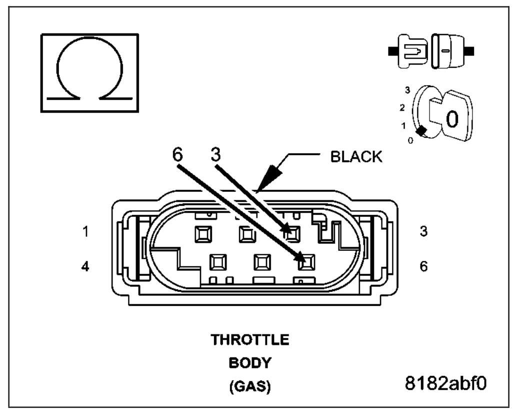
4. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (F855) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (F855) 5 Volt Supply in the Throttle Body harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K122) TP Signal 2 circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5



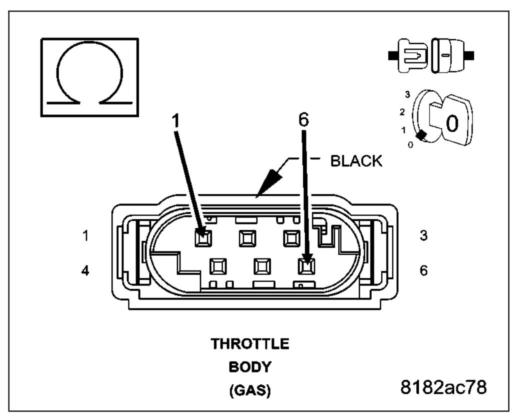
5. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K124) ETC MOTOR (+) CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K124) ETC Motor (+) in the Throttle Body harness connector.

Is the resistance below 100 ohms?

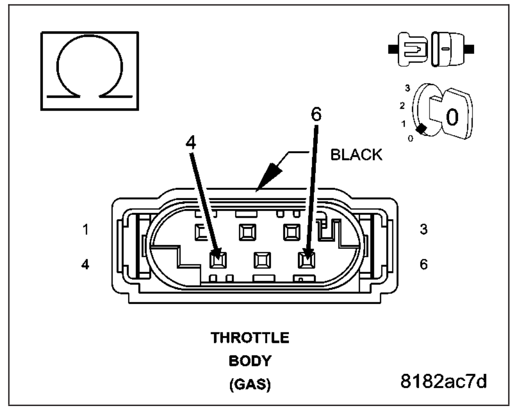
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to the (F855) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6



6. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K126) ETC Motor (-) in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the (K122) TP Signal 2 circuit for a short to the (K126) ETC Motor (-) circuit.

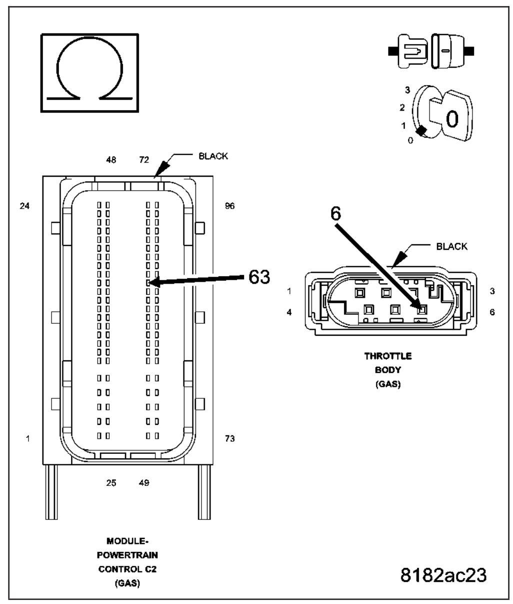
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K122) TP Signal 2 between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

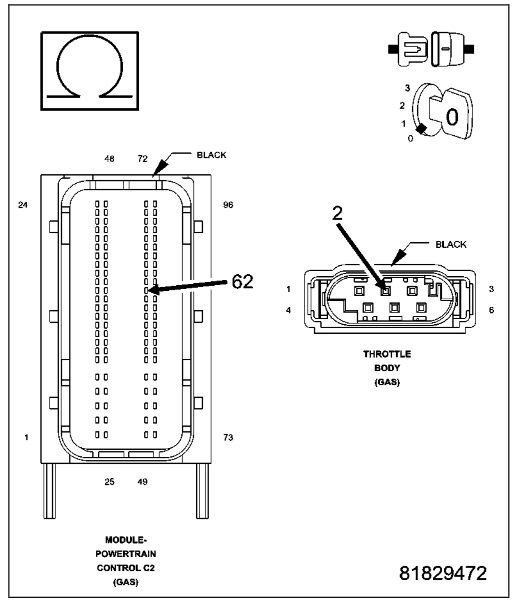
Yes >> Go to 8

No >> Repair the (K122) TP Signal 2 for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K922) TP Sensor Ground circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K922) TP Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. THROTTLE BODY

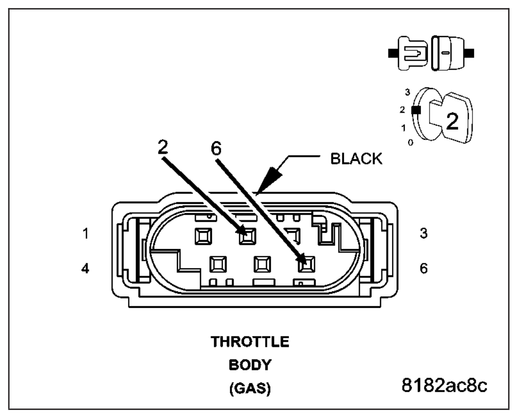
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K922) TP Sensor Ground circuit and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Turn the ignition on.

With the scan tool, read the TP Signal 2 circuit voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Throttle Body in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

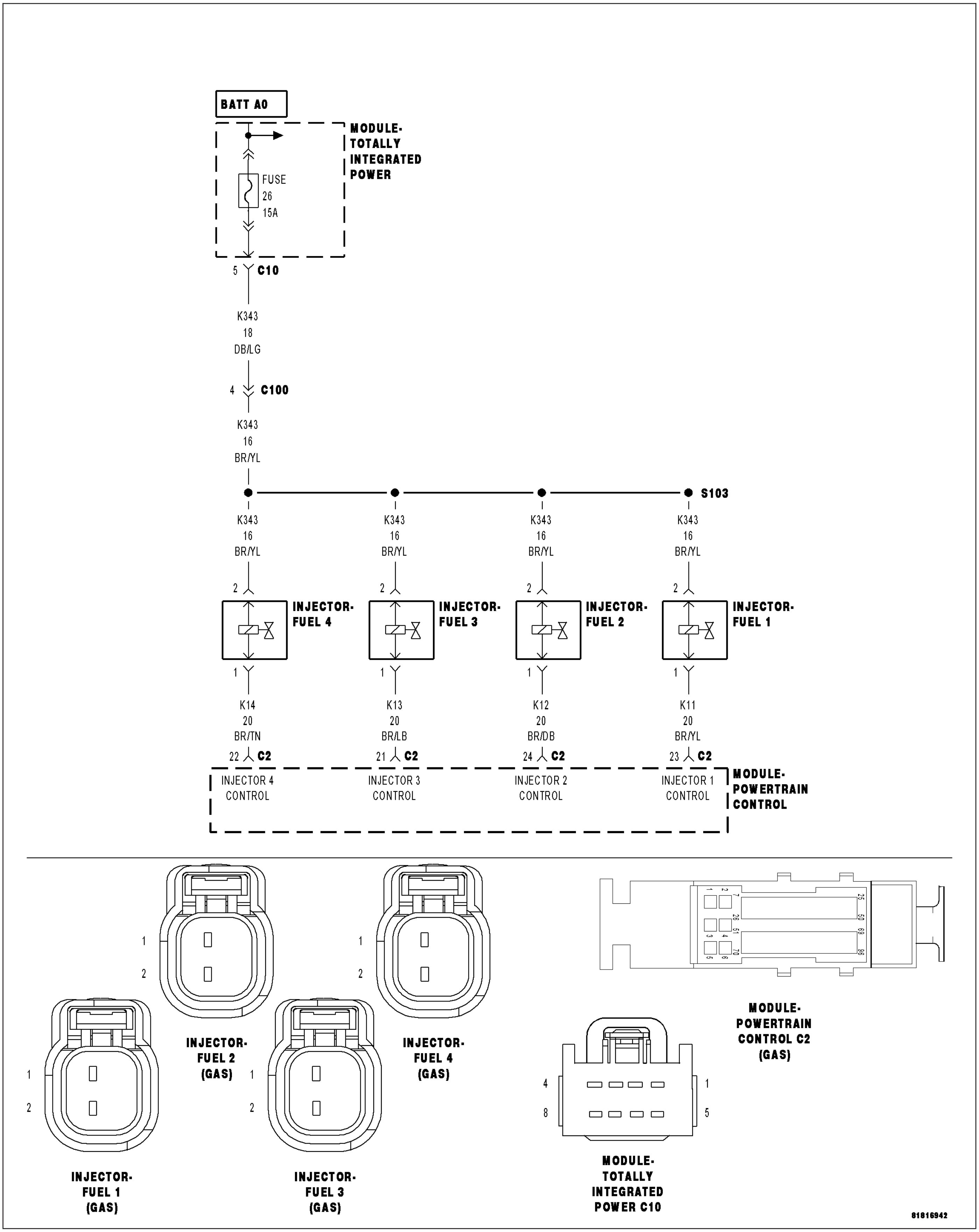
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0261-FUEL INJECTOR 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 1 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO GROUND
(K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

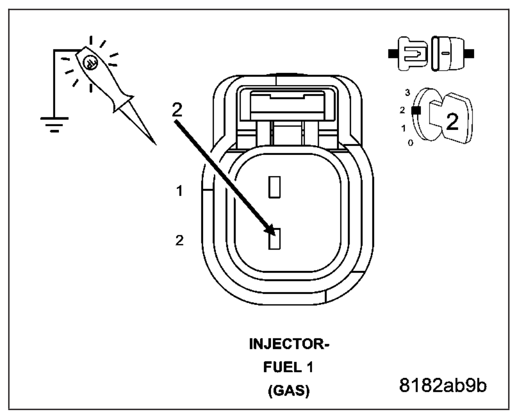
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 1 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

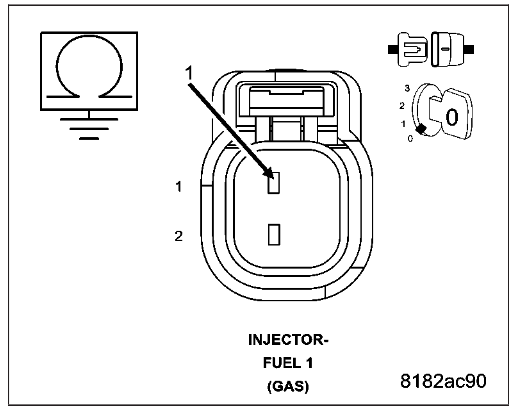
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



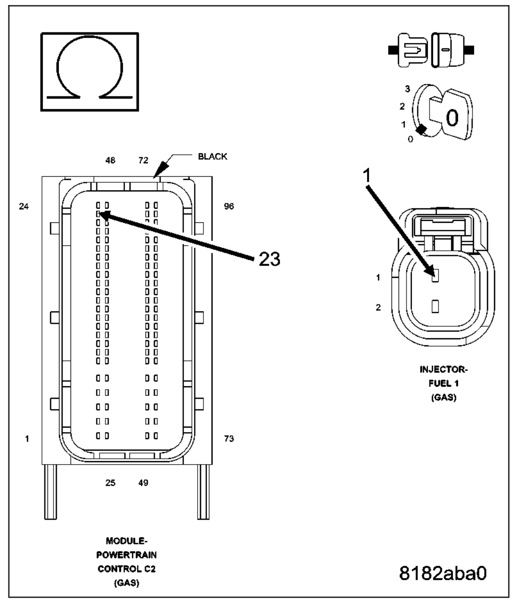
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K11) Injector 1 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K11) Injector 1 Control circuit between the Fuel Injector 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K11) Injector 1 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

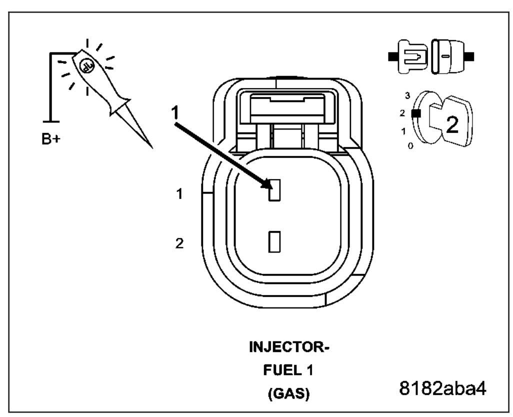
5. FUEL INJECTOR 1

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 1 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Fuel Injector 1 control to the OFF (0%) position.

Using a 12 volt test light connected to 12 volts, check the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the Fuel Injector 1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

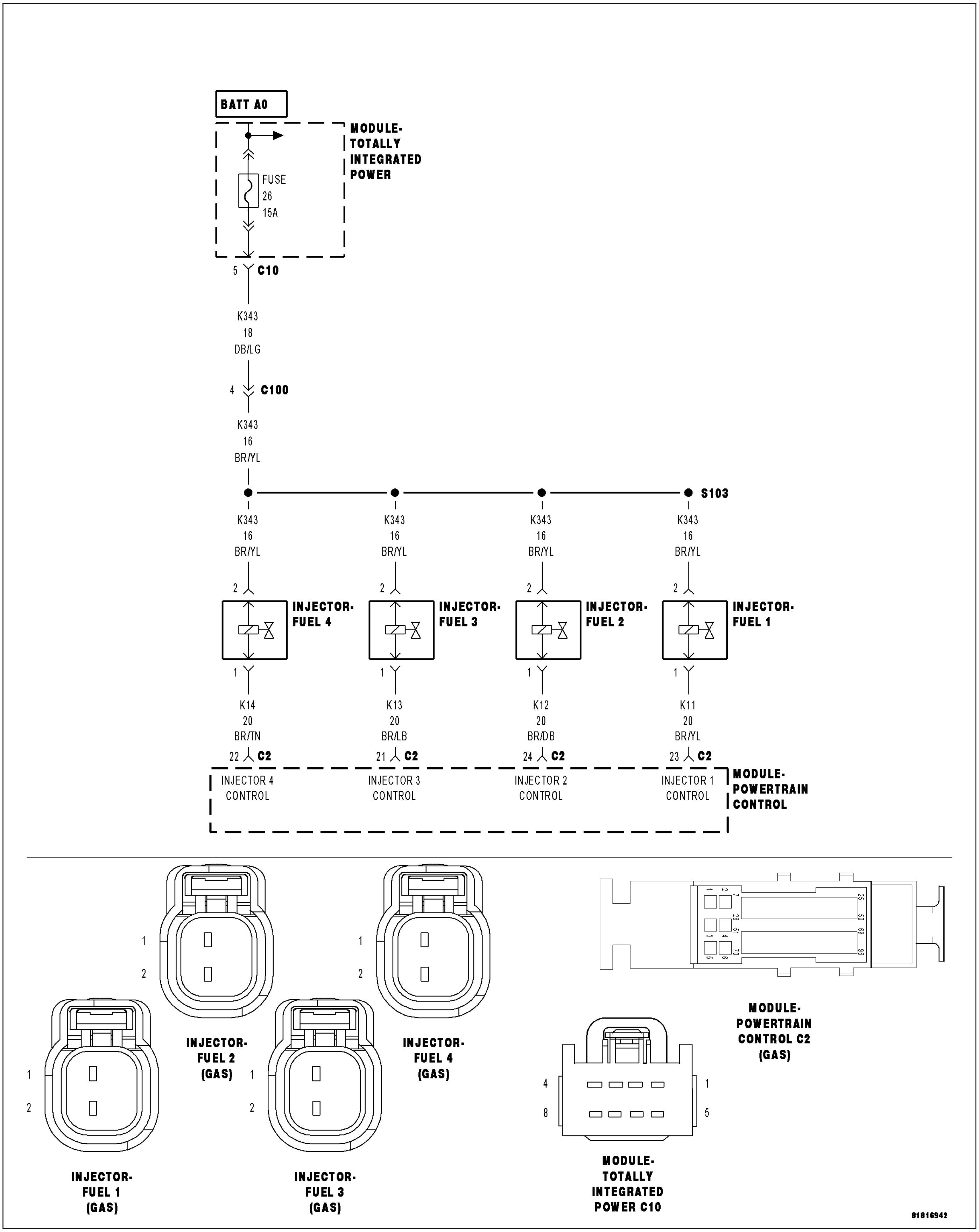
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0262-FUEL INJECTOR 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 1 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO VOLTAGE

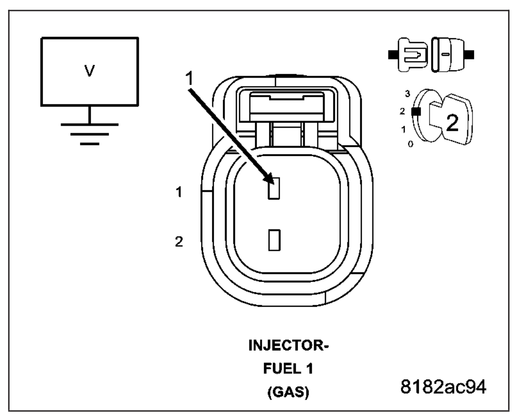
Turn the ignition off.

Disconnect the Fuel Injector 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



Is there any voltage present?

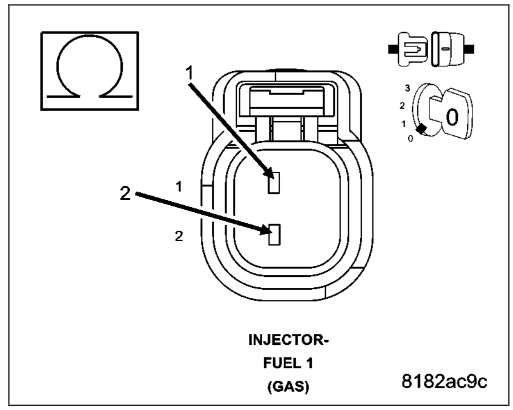
Yes >> Repair the (K11) Injector 1 Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K11) INJECTOR 1 CONTROL CIRCUIT SHORTED TO (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Measure the resistance between the (K11) Injector 1 Control circuit and the (K343) Fused Main Relay Output circuit in the Fuel Injector 1 harness connector.



Is the resistance above 100 ohms?

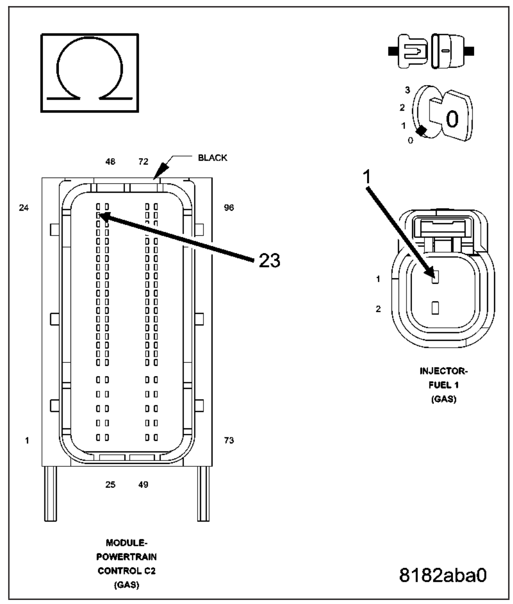
Yes >> Go to 4

No >> Repair the (K11) Injector 1 Control circuit for a short to the (K343) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K11) INJECTOR 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K11) Injector 1 Control circuit between the Fuel Injector 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K11) Injector 1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

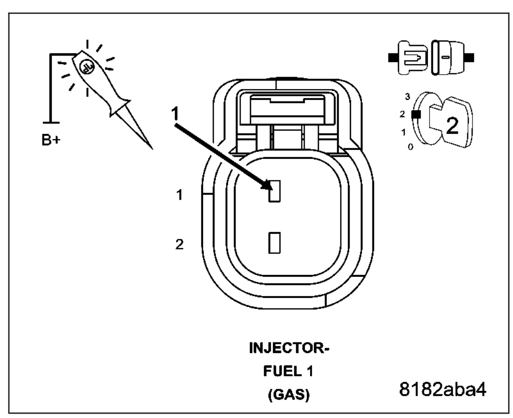
5. FUEL INJECTOR 1

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 1 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright with the actuation ON (100%)?

Yes >> Replace the Fuel Injector 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

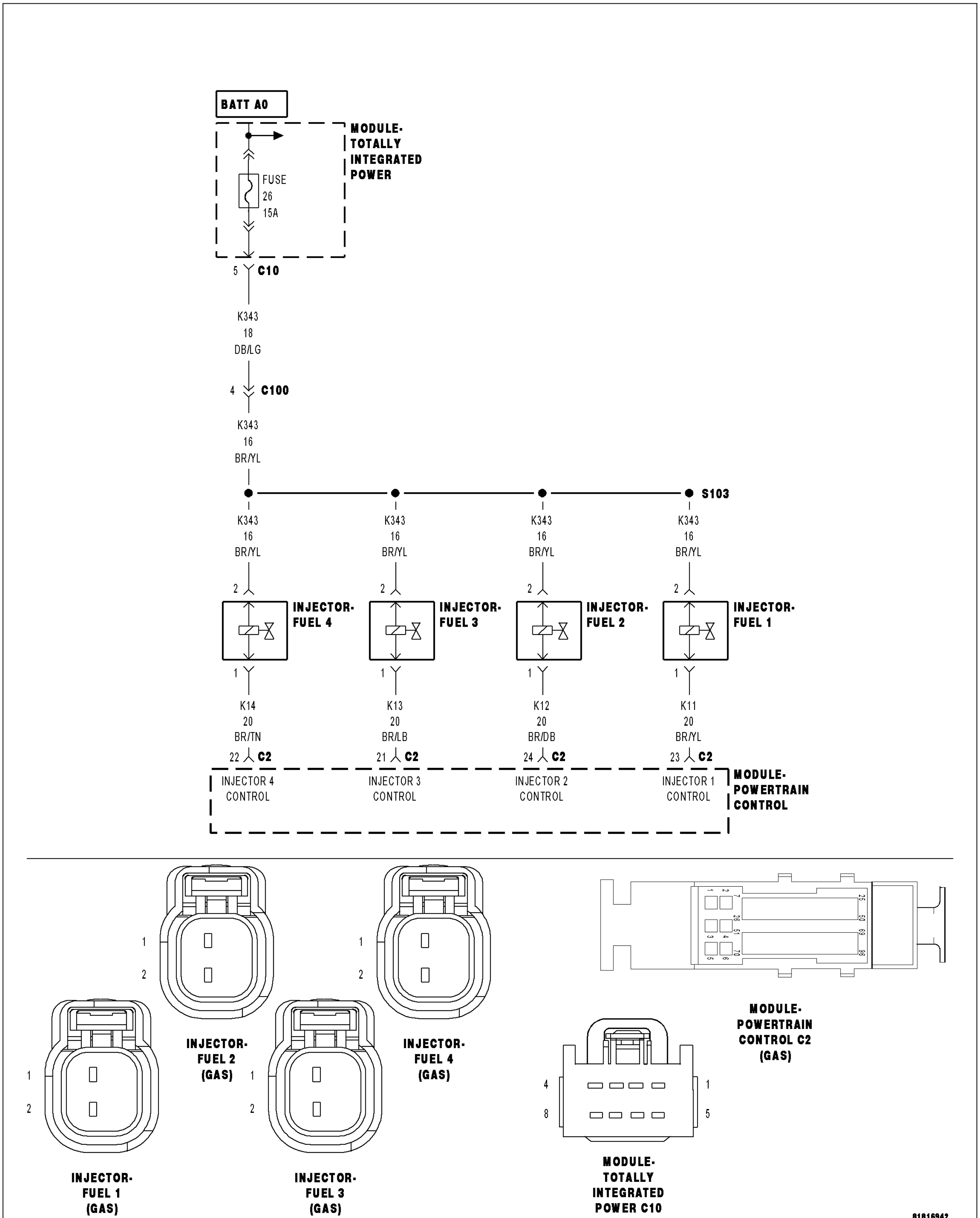
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0264-FUEL INJECTOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 2 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO GROUND
(K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

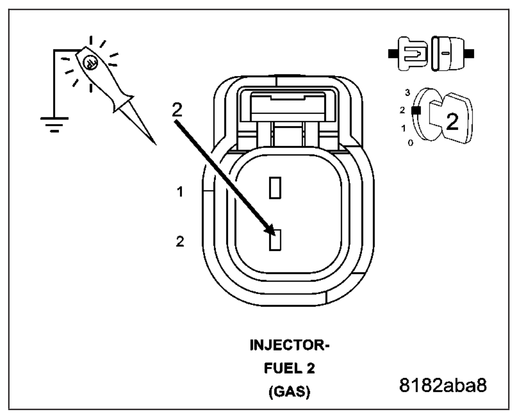
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 2 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

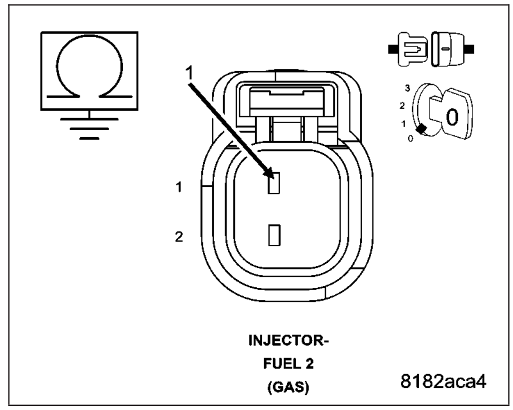
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.



Is the resistance above 100 ohms?

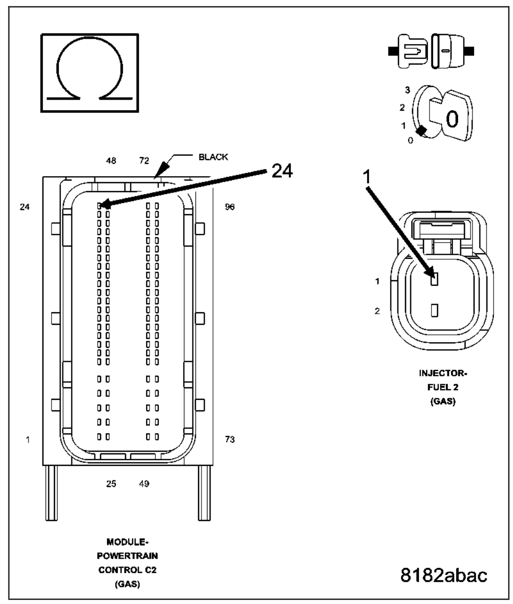
Yes >> Go to 4

No >> Repair the (K12) Injector 2 Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K12) Injector 2 Control circuit between the Fuel Injector 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K12) Injector 2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

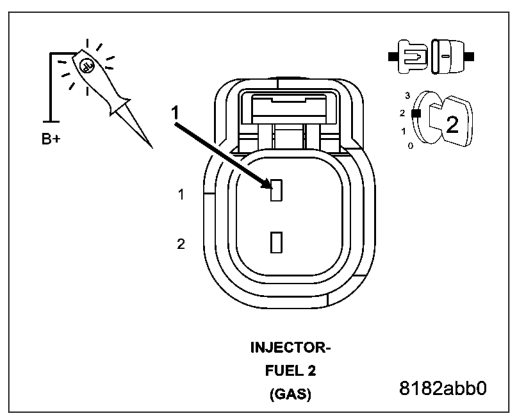
5. FUEL INJECTOR 2

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 2 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Fuel Injector 2 control to the OFF (0%) position.

Using a 12 volt test light connected to 12 volts, check the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the Fuel Injector 2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

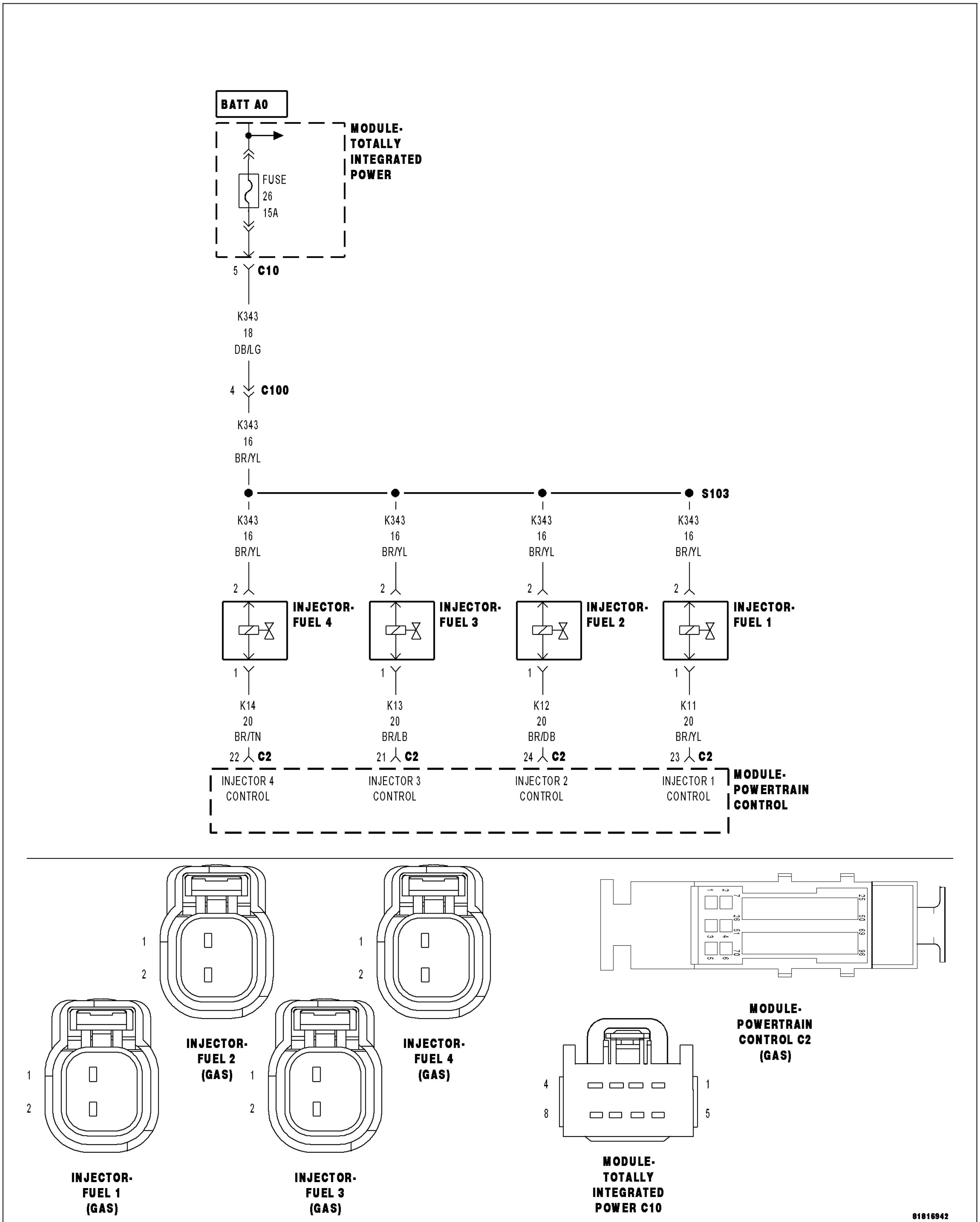
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0265-FUEL INJECTOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 2 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO VOLTAGE

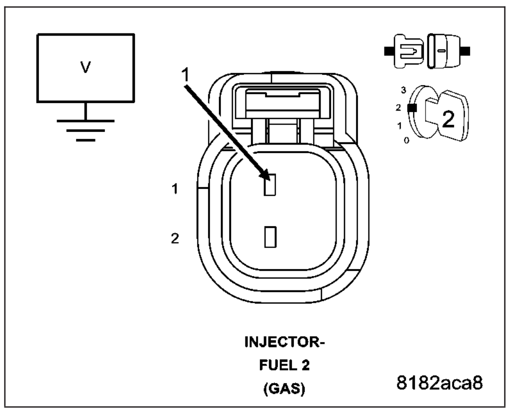
Turn the ignition off.

Disconnect the Fuel Injector 2 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.



Is there any voltage present?

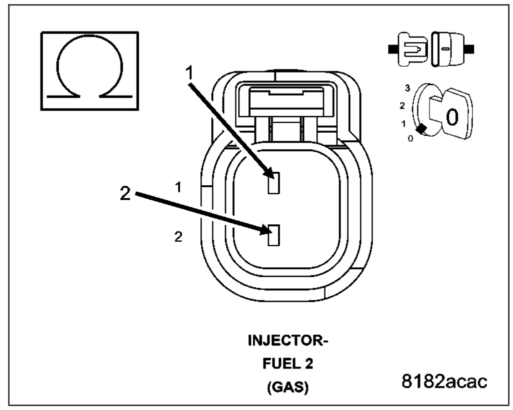
Yes >> Repair the (K12) Injector 2 Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K12) INJECTOR 2 CONTROL CIRCUIT SHORTED TO (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Measure the resistance between the (K12) Injector 2 Control circuit and the (K343) Fused Main Relay Output circuit in the Fuel Injector 2 harness connector.



Is the resistance above 100 ohms?

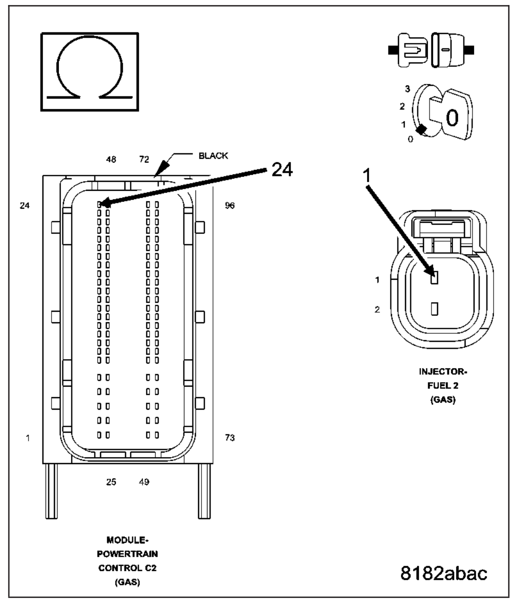
Yes >> Go to 4

No >> Repair the (K12) Injector 2 Control circuit for a short to the (K343) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K12) INJECTOR 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K12) Injector 2 Control circuit between the Fuel Injector 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K12) Injector 2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

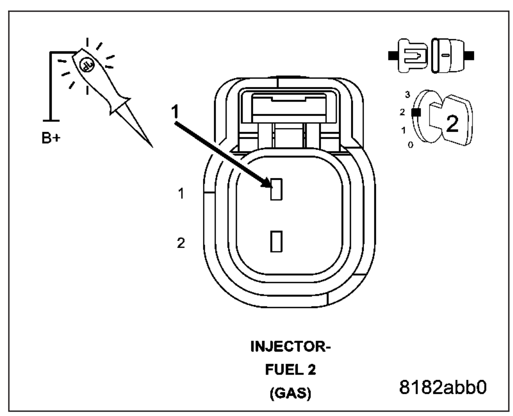
5. FUEL INJECTOR 2

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 2 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright with the actuation ON (100%)?

Yes >> Replace the Fuel Injector 2 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

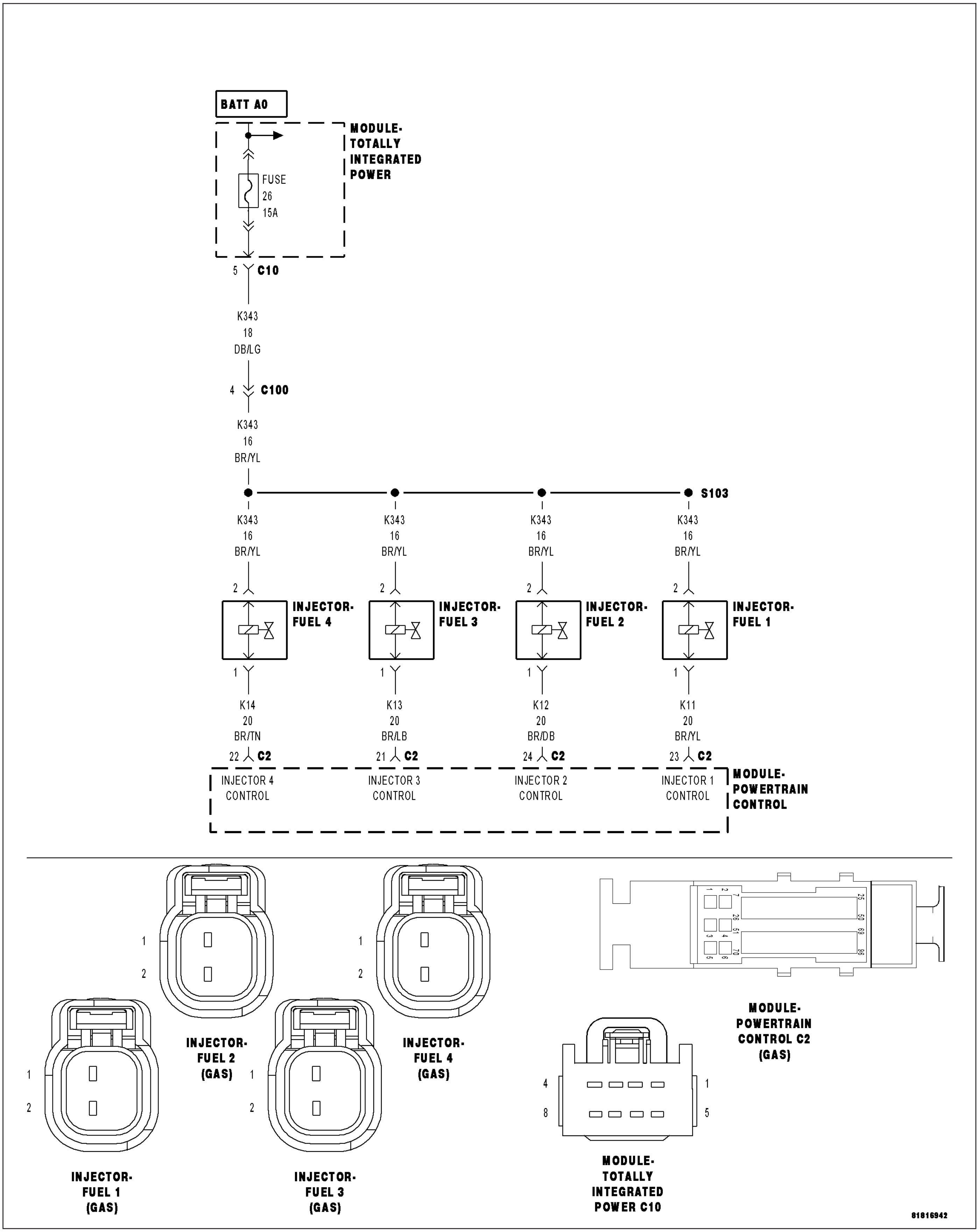
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0267-FUEL INJECTOR 3 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 3 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO GROUND
(K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

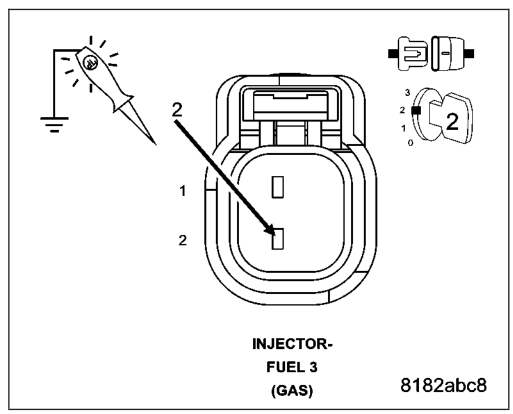
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 3 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

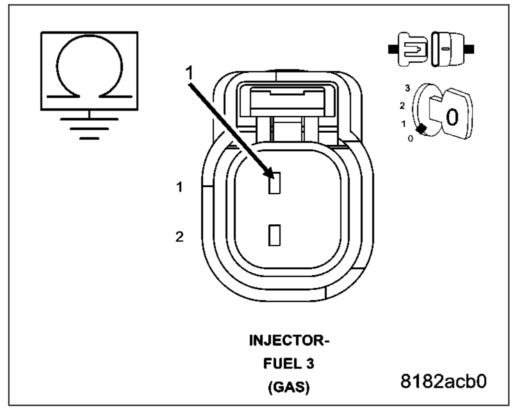
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



Is the resistance above 100 ohms?

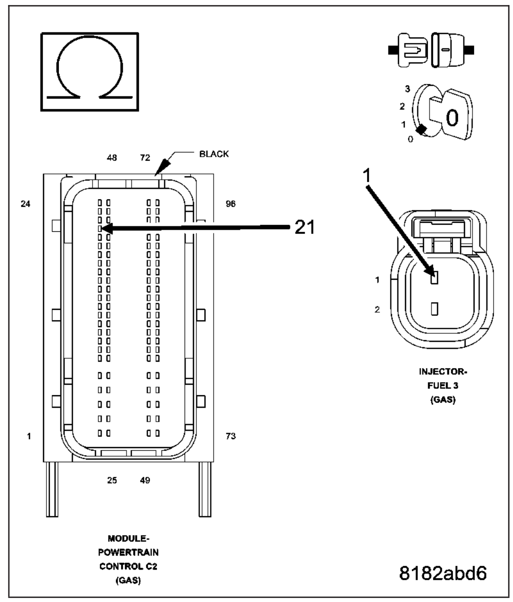
Yes >> Go to 4

No >> Repair the (K13) Injector 3 Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K13) Injector 3 Control circuit between the Fuel Injector 3 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K13) Injector 3 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

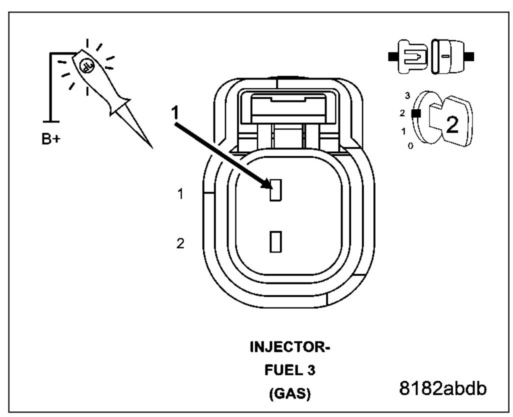
5. FUEL INJECTOR 3

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 3 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Fuel Injector 3 control to the OFF (0%) position.

Using a 12 volt test light connected to 12 volts, check the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the Fuel Injector 3 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

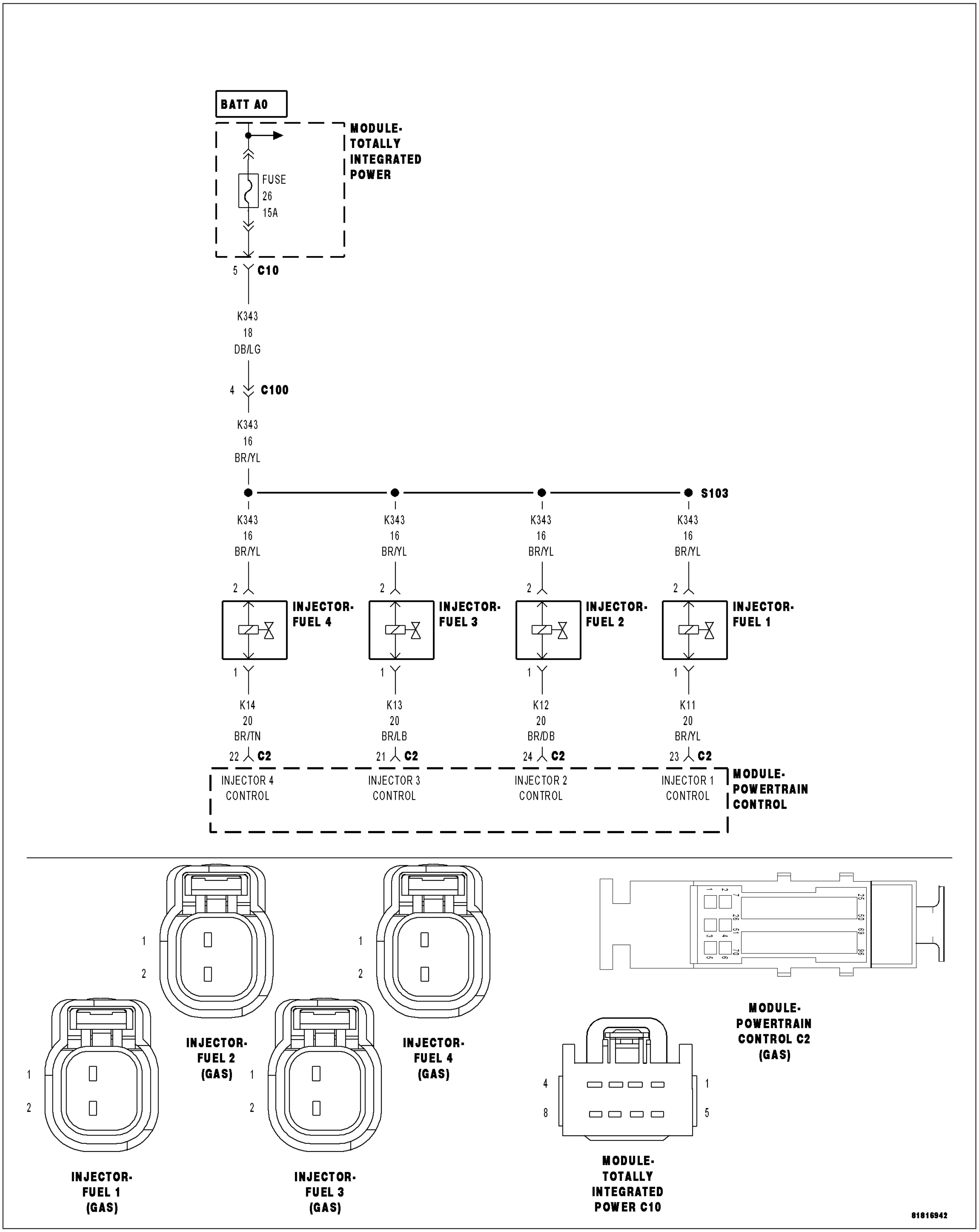
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0268-FUEL INJECTOR 3 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 3 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO VOLTAGE

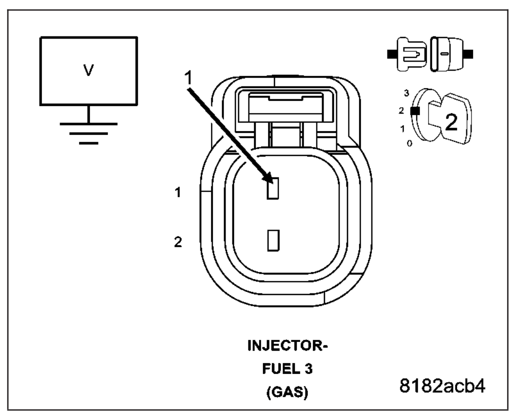
Turn the ignition off.

Disconnect the Fuel Injector 3 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



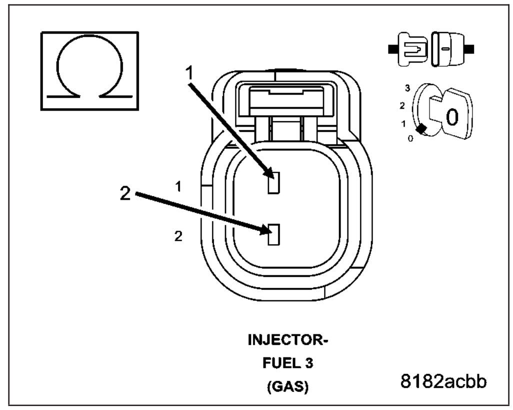
Is there any voltage present?

Yes >> Repair the (K13) Injector 3 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K13) INJECTOR 3 CONTROL CIRCUIT SHORTED TO (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Measure the resistance between the (K13) Injector 3 Control circuit and the (K343) Fused Main Relay Output circuit in the Fuel Injector 3 harness connector.



Is the resistance above 100 ohms?

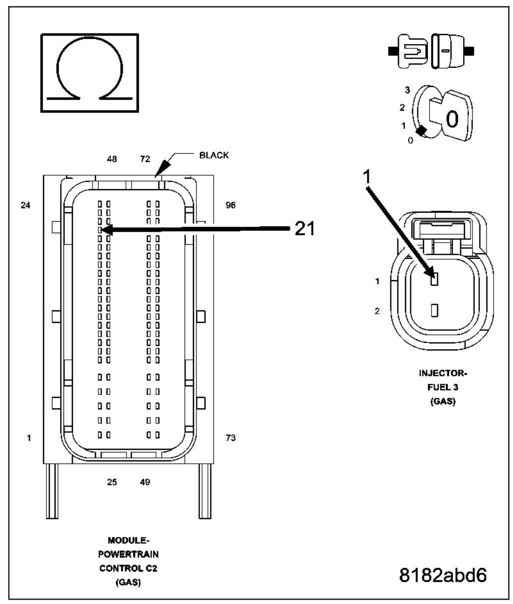
Yes >> Go to 4

No >> Repair the (K13) Injector 3 Control circuit for a short to the (K343) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K13) INJECTOR 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K13) Injector 3 Control circuit between the Fuel Injector 3 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K13) Injector 3 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

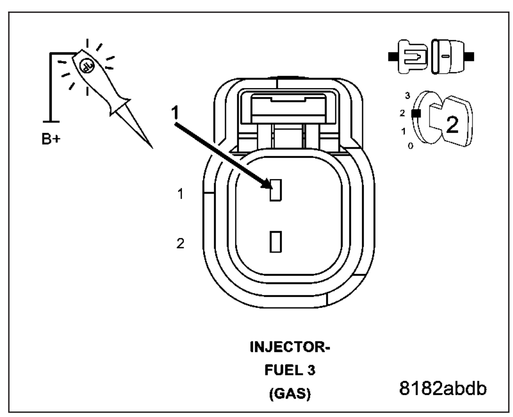
5. FUEL INJECTOR 3

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 3 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright with the actuation ON (100%)?

Yes >> Replace the Fuel Injector 3 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

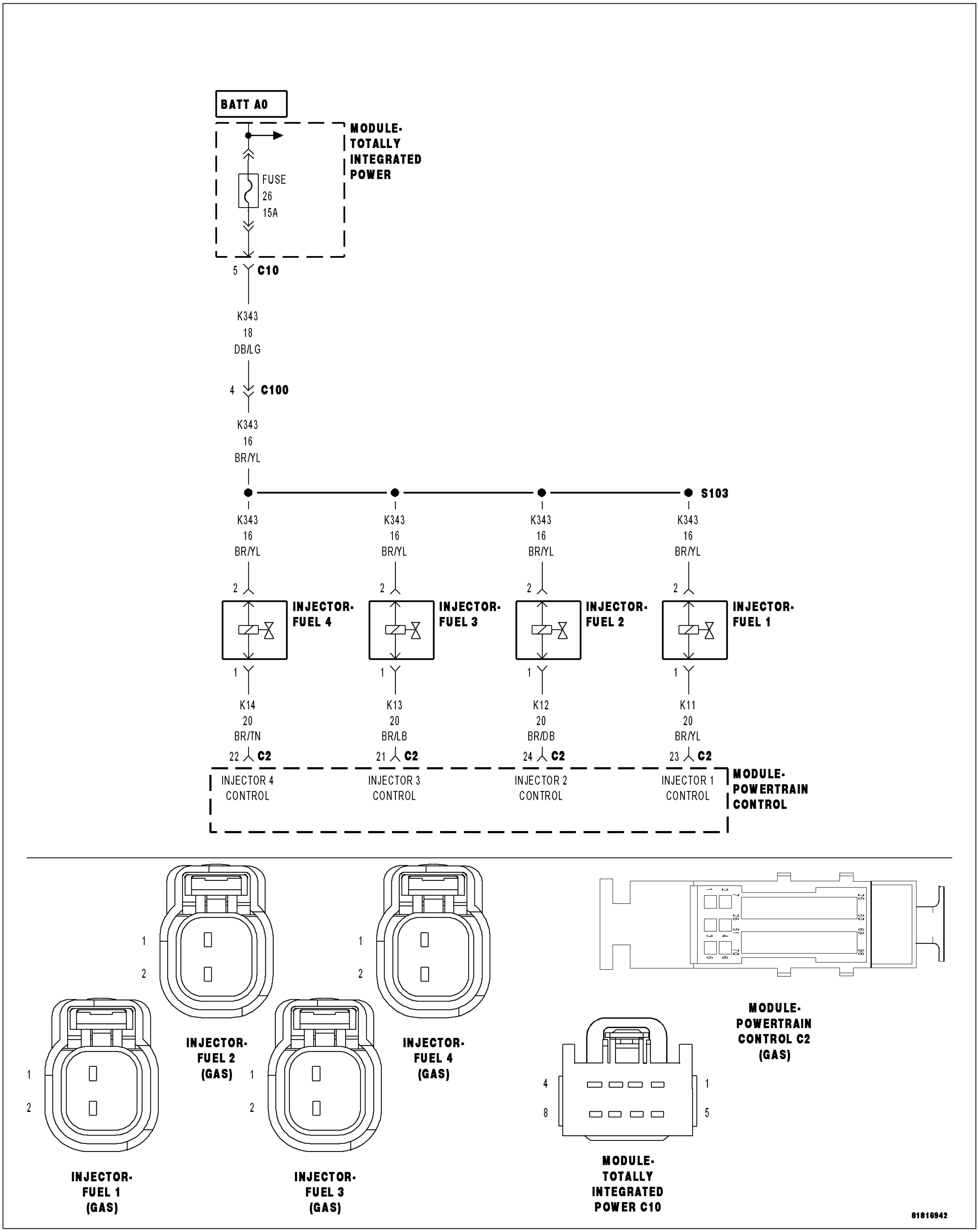
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0270-FUEL INJECTOR 4 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 4 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO GROUND
(K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

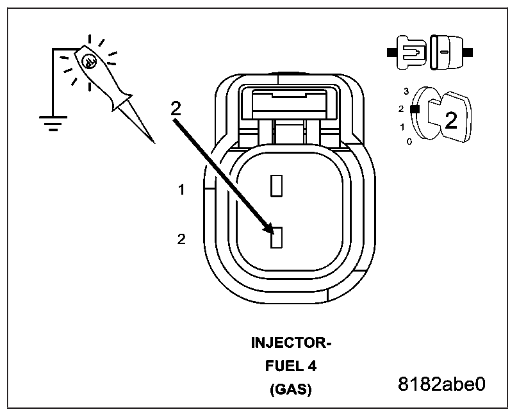
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Fuel Injector 4 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.

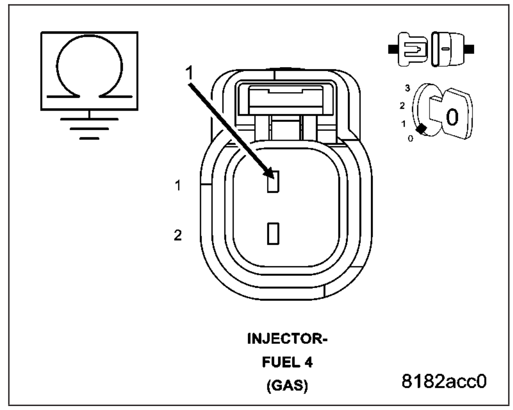
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



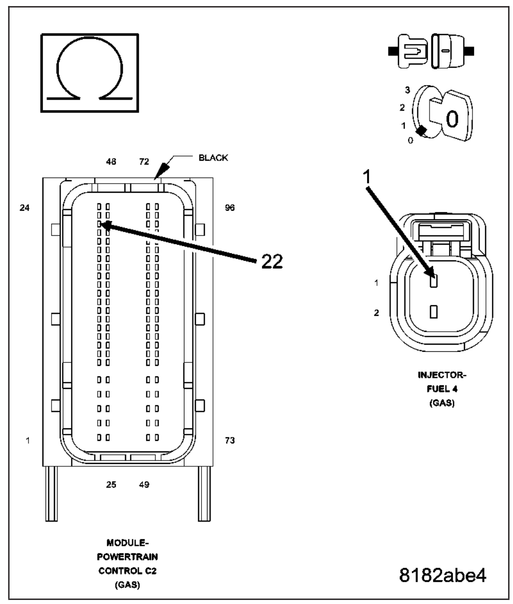
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K14) Injector 4 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K14) Injector 4 Control circuit between the Fuel Injector 4 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K14) Injector 4 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

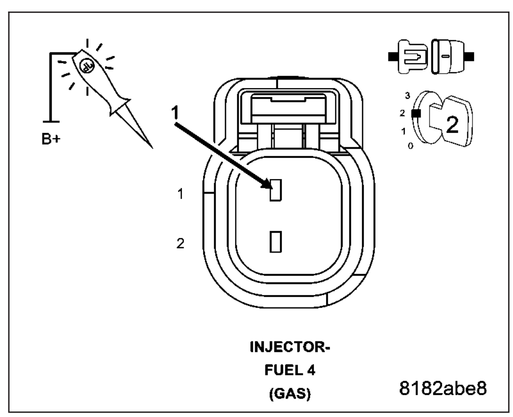
5. FUEL INJECTOR 4

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 4 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Fuel Injector 4 control to the OFF (0%) position.

Using a 12 volt test light connected to 12 volts, check the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the Fuel Injector 4 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

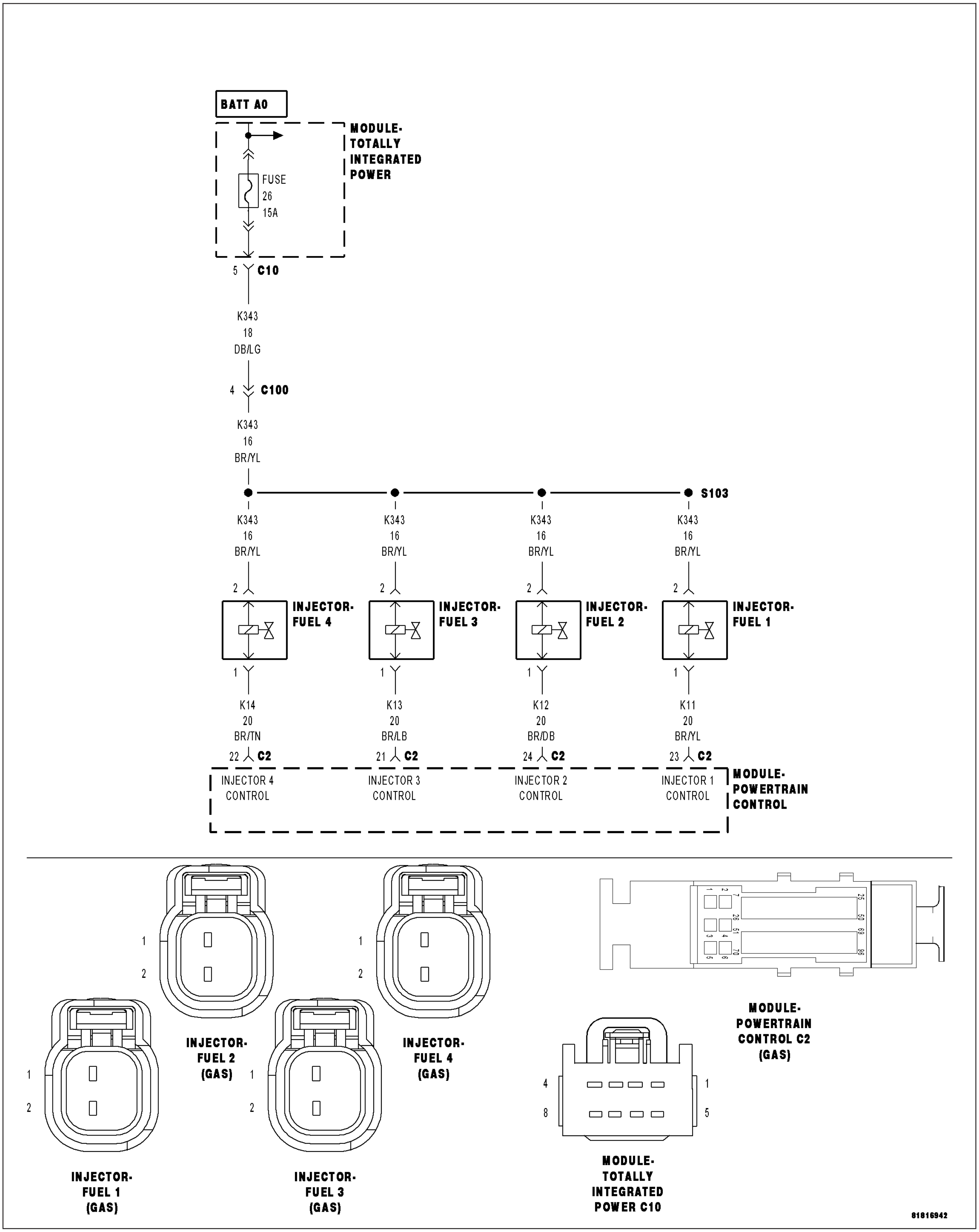
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0271-FUEL INJECTOR 4 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With battery voltage greater than 10 volts, Main relay energized, and engine speed less than 3000 rpm.
- **Set Condition:**
  The PCM detects that the Fuel Injector 4 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO (K343) FUSED Main OUTPUT 2 CIRCUIT
(K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K343) FUSED Main OUTPUT 2 CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO VOLTAGE

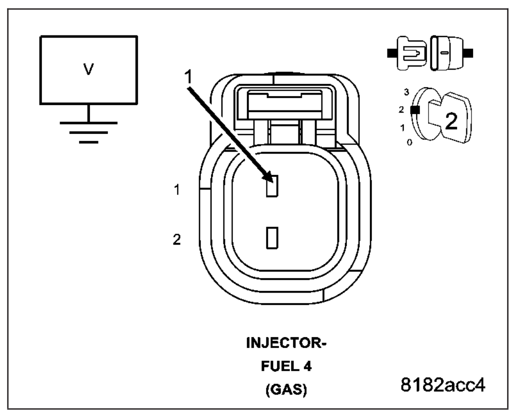
Turn the ignition off.

Disconnect the Fuel Injector 4 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



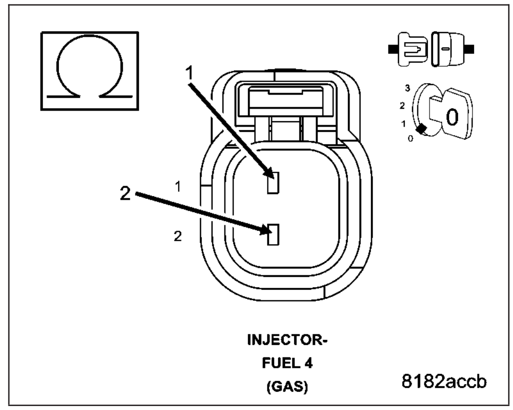
Is there any voltage present?

Yes >> Repair the (K14) Injector 4 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K14) INJECTOR 4 CONTROL CIRCUIT SHORTED TO (K343) FUSED Main OUTPUT 2 CIRCUIT

Measure the resistance between the (K14) Injector 4 Control circuit and the (K343) Fused Main Output 2 circuit in the Fuel Injector 4 harness connector.



Is the resistance above 100 ohms?

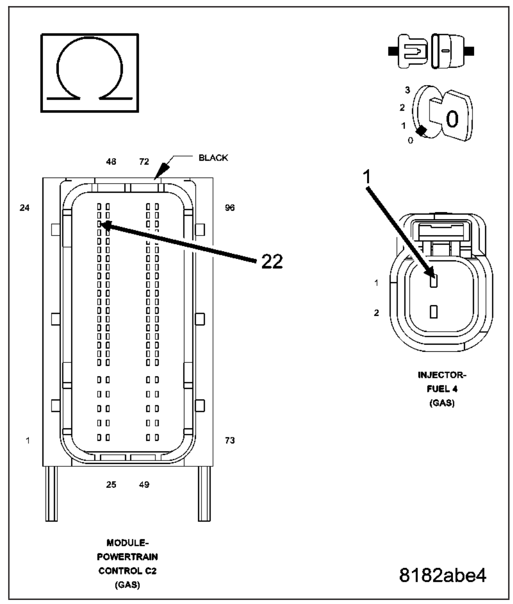
Yes >> Go to 4

No >> Repair the (K14) Injector 4 Control circuit for a short to the (K343) Fused Main Output 2 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K14) INJECTOR 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K14) Injector 4 Control circuit between the Fuel Injector 4 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K14) Injector 4 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

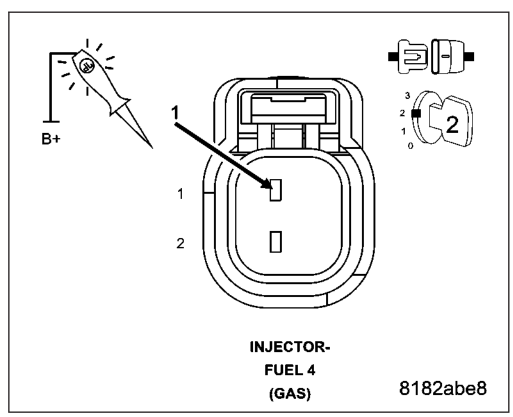
5. FUEL INJECTOR 4

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Fuel Injector 4 control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright with the actuation ON (100%)?

Yes >> Replace the Fuel Injector 4 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0300-MULTIPLE CYLINDER MISFIRE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than a 1% misfire rate is measured during two trips. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT
INJECTOR CONTROL CIRCUIT
COIL CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
FUEL PUMP INLET STRAINER PLUGGED
FUEL SUPPLY LINE RESTRICTED
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
IGNITION COIL
FUEL PUMP MODULE
INTERNAL ENGINE COMPONENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1.

NOTE: Check for any TSB's that apply to a Misfire condition. Review the vehicle repair history for any misfire condition repairs that have been performed.

Start the engine.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute on the scan tool.

Is there a misfire present?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC to set.

Visually inspect the engine for any of the following conditions:

- Worn serpentine belt
- Binding engine driven accessories: A/C compressor, P/S pump, water pump.
- Misalignment of the Water pump, P/S pump or A/C compressor pulleys
- Corroded PCM power or ground circuits.
- Improper CKP, CMP, MAP, or TP Sensor mounting.
- Poor connector/terminal to component connection for CKP, CMP, MAP, or TP sensor, fuel injector, ignition coil, etc.
- Vacuum leaks.

- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the fuel injector connector for the cylinder where a misfire is detected.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the fuel injector harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the ignition coil connector for the cylinder where a misfire is detected.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the ignition coil 4 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. IGNITION SYSTEM OPERATION

Turn the ignition off.

Remove the ignition coil for the cylinder where a misfire is detected.

Connect the ignition coil harness connector.

NOTE: Leave the fuel injector harness connector disconnected.

Install a spark tester on the ignition coil.

While cranking the engine, observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go to 6

No >> Go to 15

NOTE: Connect the fuel injector harness connector before continuing.

6. SPARK PLUG

Turn the ignition off.

Remove the spark plug for the cylinder where a misfire is detected.

Inspect the spark plug for the following conditions:

- Cracks
- Carbon tracking
- Foreign material
- Spark plug gap out of specifications
- Loose or broken electrode

NOTE: To check the electrode, lightly tap the bottom of the spark plug on a solid surface. The electrode should not move.

Were any problems found?

Yes >> Replace the spark plug.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. FUEL PRESSURE OUT OF SPECIFICATION

NOTE: Before continuing, install any components that were removed for testing, and connect all harness connectors.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: The fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Select the conclusion that best matches the fuel pressure reading:

Within Specification
Go to 8

Below Specification
Go to 13

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. FUEL INJECTOR LEAK DOWN

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

NOTE: Before continuing, inspect the fuel delivery system for external leaks or damage. Repair or replace any leaking parts in accordance with the Service Information.

Turn the ignition off.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not drop below 241 KPa (35 psi).

Does the pressure drop below the listed specification?

Yes >> Replace the leaking fuel injector(s).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each fuel injector actuation, start the engine to clear the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the fuel injector control for the cylinder where a misfire is detected.

Monitor the fuel pressure gauge.

Does the fuel pressure drop after the injector is actuated?

Yes >> Go to 10

No >> Go to 11

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

10. INTERNAL ENGINE COMPONENT

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - must not be weak or broken

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

11. FUEL INJECTOR

Turn the ignition off.

Disconnect the fuel injector harness connector for the cylinder where a misfire is detected.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the fuel injector control for the cylinder where a misfire is detected.

Using a 12-volt test light connected to 12-volts, check the control circuit in the fuel injector harness connector.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the fuel injector in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 12

12. INJECTOR CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Check the injector control circuit for an open circuit, short to ground, and short to voltage.

Were any problems found?

Yes >> Repair the injector control circuit for high resistance or a shorted condition.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

13. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (for 5/16) or #6631 (for 3/8) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Turn the ignition on.

With the scan tool, actuate the fuel pump to ON (100%) and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

NOTE: If the PCM detects a low fuel level, the fuel pump actuation will not be allowed.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 14

14. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the fuel pump module and inspect the fuel inlet strainer.

Is the fuel inlet strainer plugged?

Yes >> Replace the fuel pump inlet strainer.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Before continuing, check the fuel pump module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. If any problems are found, repair as necessary. Otherwise, replace the fuel pump module in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

15. IGNITION COIL

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Disconnect the ignition coil harness connector for the cylinder where a misfire is detected.

Using a 12 volt test light connected to 12 volts, check the coil control circuit in the ignition coil harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the ignition coil.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 16

16. COIL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Check the coil control circuit for an open circuit, short to ground, and short to voltage.

Were any problems found?

Yes >> Repair the coil control circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 17

17. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the fuel injector for the cylinder where a misfire is detected, the ignition coil for the cylinder where a misfire is detected, and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0301-CYLINDER 1 MISFIRE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 1% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K11) INJECTOR 1 CONTROL CIRCUIT
(K19) COIL 1 CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
FUEL PUMP INLET STRAINER PLUGGED
FUEL SUPPLY LINE RESTRICTED
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR 1
IGNITION COIL 1
FUEL PUMP MODULE
INTERNAL ENGINE COMPONENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature.

With the scan tool, monitor the View DTC screen.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC to set.

Visually inspect the engine for any of the following conditions:

- Worn serpentine belt
- Binding engine driven accessories: A/C compressor, P/S pump, water pump.
- Misalignment of the Water pump, P/S pump or A/C compressor pulleys
- Corroded PCM power or ground circuits.
- Improper CKP, CMP, MAP, or TP Sensor mounting.
- Poor connector/terminal to component connection for CKP, CMP, MAP, or TP sensor, fuel injector, ignition coil, etc.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.

- Internal engine component malfunction.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Fuel Injector 1 connector.

Turn the ignition on.

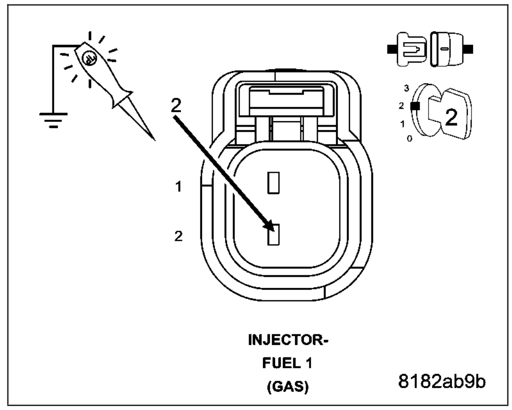
Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 1 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Ignition Coil 1 connector.

Turn the ignition on.

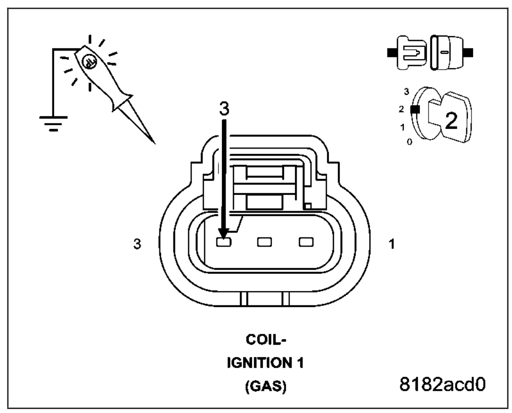
Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 1 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. IGNITION SYSTEM OPERATION

Turn the ignition off.

Remove the Ignition Coil 1.

Connect the Ignition Coil 1 harness connector.

NOTE: Leave the Fuel Injector 1 harness connector disconnected.

Install a spark tester on Ignition Coil 1.

While cranking the engine, observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go to 6

No >> Go to 15

NOTE: Connect the Fuel Injector 1 harness connector before continuing.

6. SPARK PLUG

Turn the ignition off.

Remove the spark plug.

Inspect the spark plug for the following conditions:

- Cracks
- Carbon tracking
- Foreign material
- Spark plug gap out of specifications
- Loose or broken electrode

NOTE: To check the electrode, lightly tap the bottom of the spark plug on a solid surface. The electrode should not move.

Were any problems found?

Yes >> Replace the spark plug.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. FUEL PRESSURE OUT OF SPECIFICATION

NOTE: Before continuing, install any components that were removed for testing, and connect all harness connectors.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: The fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Select the conclusion that best matches the fuel pressure reading:

Within Specification
Go to 8

Below Specification
Go to 13

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. FUEL INJECTOR LEAK DOWN

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

NOTE: Before continuing, inspect the fuel delivery system for external leaks or damage. Repair or replace any leaking parts in accordance with the Service Information.

Turn the ignition off.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not drop below 241 KPa (35 psi).

Does the pressure drop below the listed specification?

Yes >> Replace the leaking fuel injector(s).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each fuel injector actuation, start the engine to clear the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector 1 control.

Monitor the fuel pressure gauge.

Does the fuel pressure drop after the injector is actuated?

Yes >> Go to 10

No >> Go to 11

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

10. INTERNAL ENGINE COMPONENT

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - must not be weak or broken

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

11. FUEL INJECTOR 1

Turn the ignition off.

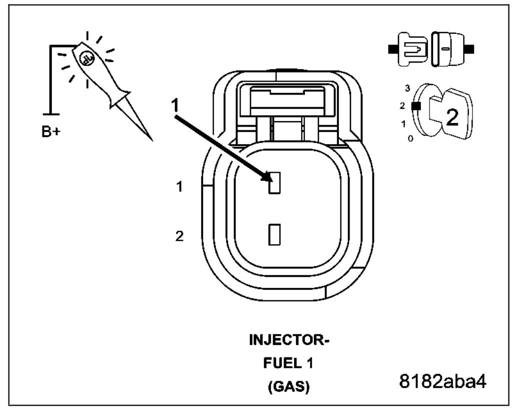
Disconnect the Fuel Injector 1 harness connector.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the Fuel Injector 1 control.

Using a 12 volt test light connected to 12 volts check the (K11) Injector 1 Control circuit in the Fuel Injector 1 harness connector.



NOTE: The test light should blink each time the circuit is actuated by the PCM.

Does the test light blink each time the circuit is actuated by the PCM?

Yes >> Replace the Fuel Injector 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

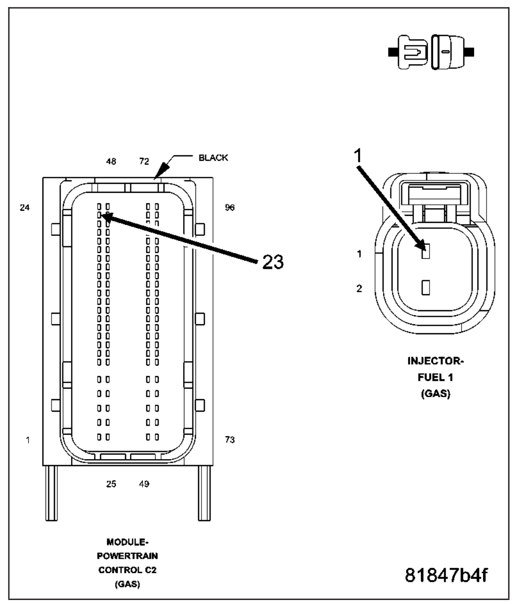
No >> Go to 12

12. (K11) INJECTOR 1 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Check the (K11) Injector 1 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K11) Injector 1 Control circuit for high resistance or a shorted condition.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

13. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (for 5/16) or #6631 (for 3/8) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Turn the ignition on.

With the scan tool, actuate the fuel pump to ON (100%) and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

NOTE: If the PCM detects a low fuel level, the fuel pump actuation will not be allowed.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 14

14. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the fuel pump module and inspect the fuel inlet strainer.

Is the fuel inlet strainer plugged?

Yes >> Replace the fuel pump inlet strainer.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Before continuing, check the fuel pump module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. If any problems are found, repair as necessary. Otherwise, replace the fuel pump module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

15. IGNITION COIL 1

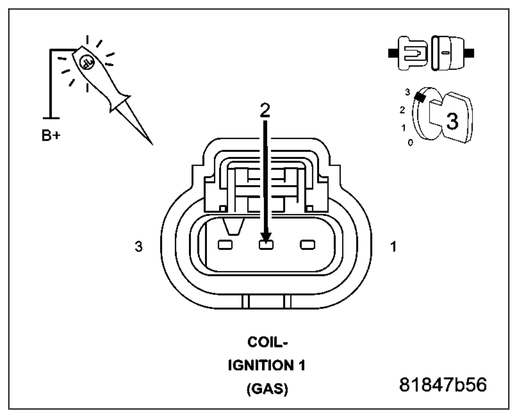
WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Disconnect the Ignition Coil 1 harness connector.

Using a 12 volt test light connected to 12 volts, check the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.

Crank the engine for 5 seconds.



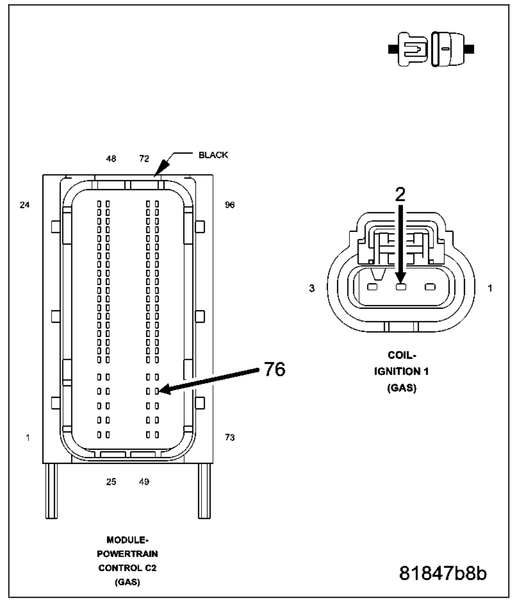
NOTE: The test light should blink each time the circuit is actuated by the PCM.

Does the test light blink each time the circuit is actuated by the PCM?

Yes >> Replace the Ignition Coil 1.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 16

16. (K19) COIL 1 CONTROL CIRCUIT



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Check the (K19) Coil 1 Control circuit for an open circuit, short to ground, and short to voltage.

Were any problems found?

Yes >> Repair the (K19) Coil 1 Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 17

17. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 1, the Ignition Coil 1, and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0302-CYLINDER 2 MISFIRE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 1% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K12) INJECTOR 2 CONTROL CIRCUIT
(K17) COIL 2 CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
FUEL PUMP INLET STRAINER PLUGGED
FUEL SUPPLY LINE RESTRICTED
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR 2
IGNITION COIL 2
FUEL PUMP MODULE
INTERNAL ENGINE COMPONENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature.
With the scan tool, monitor the View DTC screen.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC to set.
Visually inspect the engine for any of the following conditions:
- Worn serpentine belt
- Binding engine driven accessories: A/C compressor, P/S pump, water pump.
- Misalignment of the Water pump, P/S pump or A/C compressor pulleys
- Corroded PCM power or ground circuits.
- Improper CKP, CMP, MAP, or TP Sensor mounting.
- Poor connector/terminal to component connection for CKP, CMP, MAP, or TP sensor, fuel injector, ignition coil, etc.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.

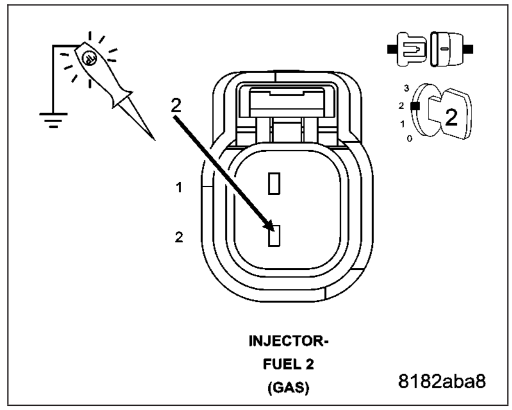
- Internal engine component malfunction.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT



Turn the ignition off.

Disconnect the Fuel Injector 2 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 2 harness connector.

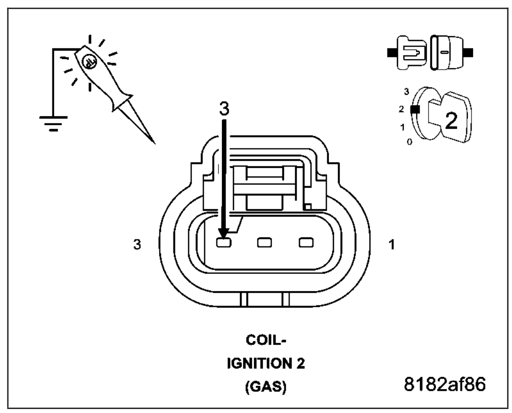
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT



Turn the ignition off.

Disconnect the Ignition Coil 2 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 2 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. IGNITION SYSTEM OPERATION

Turn the ignition off.

Remove the Ignition Coil 2.

Connect the Ignition Coil 2 harness connector.

NOTE: Leave the Fuel Injector 2 harness connector disconnected.

Install a spark tester on the Ignition Coil 2.

While cranking the engine, observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go to 6

No >> Go to 15

NOTE: Connect the Fuel Injector 2 harness connector before continuing.

6. SPARK PLUG

Turn the ignition off.

Remove the spark plug.

Inspect the spark plug for the following conditions:

- Cracks
- Carbon tracking
- Foreign material
- Spark plug gap out of specifications
- Loose or broken electrode

NOTE: To check the electrode, lightly tap the bottom of the spark plug on a solid surface. The electrode should not move.

Were any problems found?

Yes >> Replace the spark plug.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. FUEL PRESSURE OUT OF SPECIFICATION

NOTE: Before continuing, install any components that were removed for testing, and connect all harness connectors.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: The fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Select the conclusion that best matches the fuel pressure reading:

Within Specification
Go to 8

Below Specification
Go to 13

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. FUEL INJECTOR LEAK DOWN

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

NOTE: Before continuing, inspect the fuel delivery system for external leaks or damage. Repair or replace any leaking parts in accordance with the Service Information.

Turn the ignition off.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not drop below 241 KPa (35 psi).

Does the pressure drop below the listed specification?

Yes >> Replace the leaking fuel injector(s).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each fuel injector actuation, start the engine to clear the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector 2 control.

Monitor the fuel pressure gauge.

Does the fuel pressure drop after the injector is actuated?

Yes >> Go to 10

No >> Go to 11

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

10. INTERNAL ENGINE COMPONENT

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - must not be weak or broken

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

11. FUEL INJECTOR 2

Turn the ignition off.

Disconnect the Fuel Injector 2 harness connector.

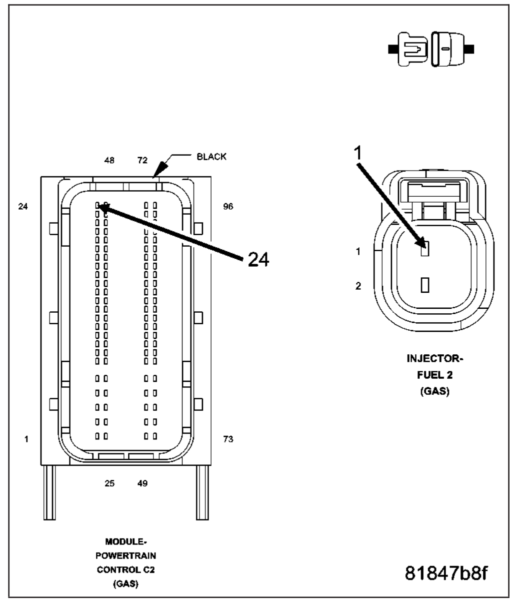
Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the Fuel Injector 2 control.

Using a 12 volt test light connected to 12 volts check the (K12) Injector 2 Control circuit in the Fuel Injector 2 harness connector.

NOTE: The test light should blink each time the circuit is actuated by the PCM.



Does the test light blink each time the circuit is actuated by the PCM?

Yes >> Replace the Fuel Injector 2 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

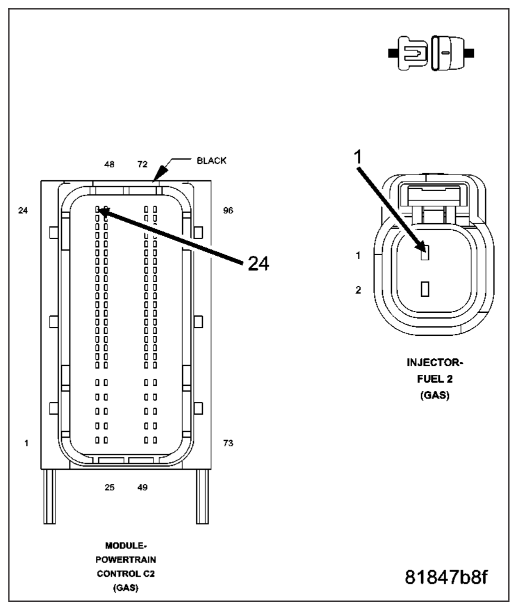
No >> Go to 12

12. (K12) INJECTOR 2 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Check the (K12) Injector 2 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K12) Injector 2 Control circuit for high resistance or a shorted condition.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

13. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (for 5/16) or #6631 (for 3/8) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Turn the ignition on.

With the scan tool, actuate the fuel pump to ON (100%) and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

NOTE: If the PCM detects a low fuel level, the fuel pump actuation will not be allowed.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 14

14. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the fuel pump module and inspect the fuel inlet strainer.

Is the fuel inlet strainer plugged?

Yes >> Replace the fuel pump inlet strainer.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Before continuing, check the fuel pump module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. If any problems are found, repair as necessary. Otherwise, replace the fuel pump module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

15. IGNITION COIL 2

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

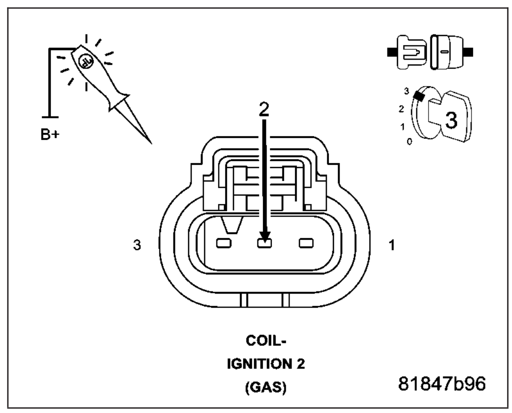
Disconnect the Ignition Coil 2 harness connector.

Remove the Fuel Pump Relay.

Using a 12 volt test light connected to 12 volts, check the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is actuated by the PCM.



Does the test light blink each time the circuit is actuated by the PCM?

Yes >> Replace the Ignition Coil 2.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 16

16. (K17) COIL 2 CONTROL CIRCUIT

Turn the ignition off.

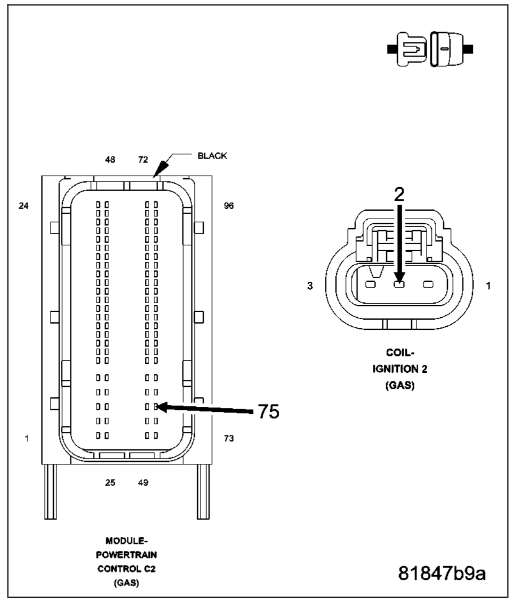
Disconnect the Powertrain Control Module (PCM) harness connector.

Check the (K17) Coil 2 Control circuit for an open circuit, short to ground, and short to voltage.

Were any problems found?

Yes >> Repair the (K17) Coil 2 Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 17



17. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 2, the Ignition Coil 2, and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0303-CYLINDER 3 MISFIRE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 1% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K13) INJECTOR 3 CONTROL CIRCUIT
(K18) COIL 3 CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
FUEL PUMP INLET STRAINER PLUGGED
FUEL SUPPLY LINE RESTRICTED
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR 3
IGNITION COIL 3
FUEL PUMP MODULE
INTERNAL ENGINE COMPONENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature.

With the scan tool, monitor the View DTC screen.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC to set.

Visually inspect the engine for any of the following conditions:

- Worn serpentine belt
- Binding engine driven accessories: A/C compressor, P/S pump, water pump.
- Misalignment of the Water pump, P/S pump or A/C compressor pulleys
- Corroded PCM power or ground circuits.
- Improper CKP, CMP, MAP, or TP Sensor mounting.
- Poor connector/terminal to component connection for CKP, CMP, MAP, or TP sensor, fuel injector, ignition coil, etc.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.

- Internal engine component malfunction.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

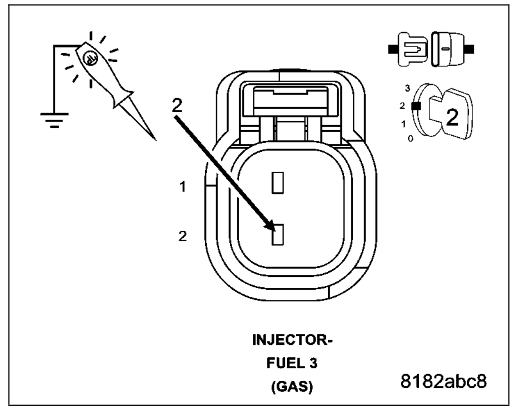
3. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Fuel Injector 3 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

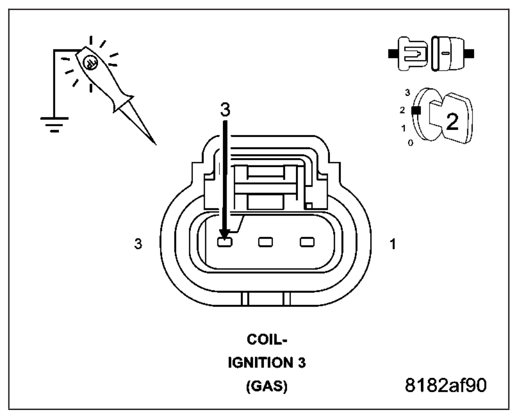
4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Ignition Coil 3 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. IGNITION SYSTEM OPERATION

Turn the ignition off.

Remove the Ignition Coil 3.

Connect the Ignition Coil 3 harness connector.

NOTE: Leave the Fuel Injector 3 harness connector disconnected.

Install a spark tester on the Ignition Coil 3.

While cranking the engine, observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go to 6

No >> Go to 15

NOTE: Connect the Fuel Injector 3 harness connector before continuing.

6. SPARK PLUG

Turn the ignition off.

Remove the spark plug.

Inspect the spark plug for the following conditions:

- Cracks
- Carbon tracking
- Foreign material
- Spark plug gap out of specifications
- Loose or broken electrode

NOTE: To check the electrode, lightly tap the bottom of the spark plug on a solid surface. The electrode should not move.

Were any problems found?

Yes >> Replace the spark plug.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. FUEL PRESSURE OUT OF SPECIFICATION

NOTE: Before continuing, install any components that were removed for testing, and connect all harness connectors.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: The fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Select the conclusion that best matches the fuel pressure reading:

Within Specification
Go to 8

Below Specification
Go to 13

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. FUEL INJECTOR LEAK DOWN

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

NOTE: Before continuing, inspect the fuel delivery system for external leaks or damage. Repair or replace any leaking parts in accordance with the Service Information.

Turn the ignition off.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not drop below 241 KPa (35 psi).

Does the pressure drop below the listed specification?

Yes >> Replace the leaking fuel injector(s).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each fuel injector actuation, start the engine to clear the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector 3 control.

Monitor the fuel pressure gauge.

Does the fuel pressure drop after the injector is actuated?

Yes >> Go to 10

No >> Go to 11

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

10. INTERNAL ENGINE COMPONENT

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - must not be weak or broken

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

11. FUEL INJECTOR 3

Turn the ignition off.

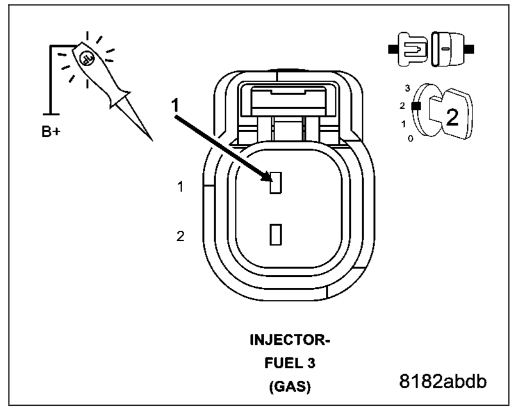
Disconnect the Fuel Injector 3 harness connector.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the Fuel Injector 3 control.

Using a 12 volt test light connected to 12 volts check the (K13) Injector 3 Control circuit in the Fuel Injector 3 harness connector.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Fuel Injector 3 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

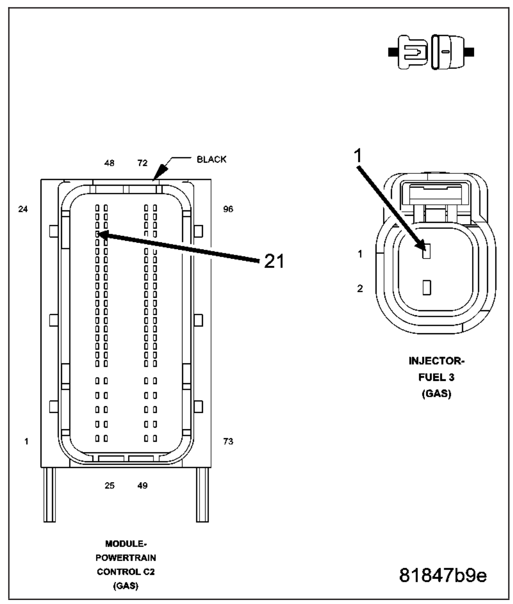
No >> Go to 12

12. (K13) INJECTOR 3 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Check the (K13) Injector 3 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K13) Injector 3 Control circuit for high resistance or a shorted condition.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

13. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (for 5/16) or #6631 (for 3/8) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Turn the ignition on.

With the scan tool, actuate the fuel pump to ON (100%) and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

NOTE: If the PCM detects a low fuel level, the fuel pump actuation will not be allowed.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 14

14. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the fuel pump module and inspect the fuel inlet strainer.

Is the fuel inlet strainer plugged?

Yes >> Replace the fuel pump inlet strainer.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Before continuing, check the fuel pump module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. If any problems are found, repair as necessary. Otherwise, replace the fuel pump module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

15. IGNITION COIL 3

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

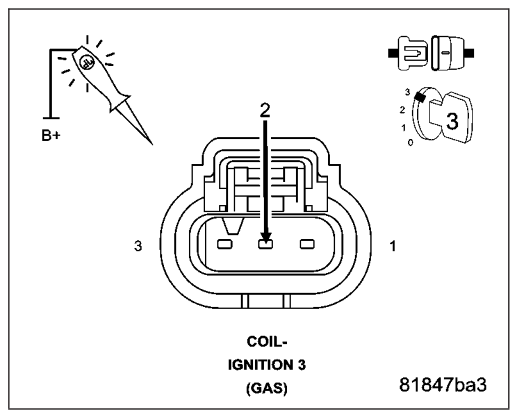
Disconnect the Ignition Coil 3 harness connector.

Remove the Fuel Pump Relay.

Using a 12 volt test light connected to 12 volts, check the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.



Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 3.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

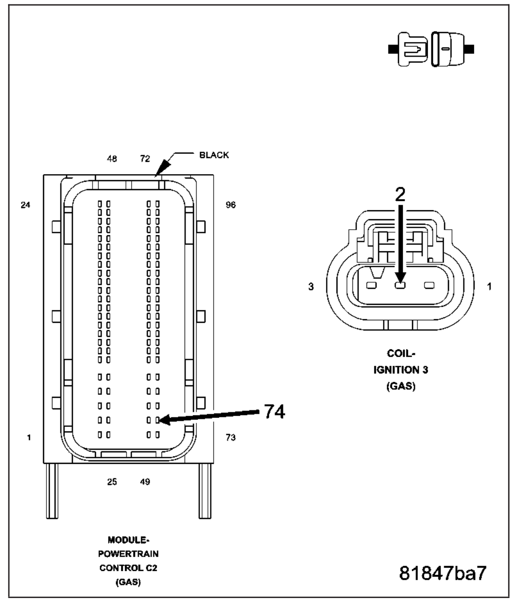
No >> Go to 16

16. (K18) COIL 3 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Check the (K18) Coil 3 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K18) Coil 3 Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 17

17. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 3, the Ignition Coil 3, and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0304-CYLINDER 4 MISFIRE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 1% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K14) INJECTOR 4 CONTROL CIRCUIT
(K15) COIL 4 CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
FUEL PUMP INLET STRAINER PLUGGED
FUEL SUPPLY LINE RESTRICTED
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR 4
IGNITION COIL 4
FUEL PUMP MODULE
INTERNAL ENGINE COMPONENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature.
With the scan tool, monitor the View DTC screen.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC to set.
Visually inspect the engine for any of the following conditions:
- Worn serpentine belt
- Binding engine driven accessories: A/C compressor, P/S pump, water pump.
- Misalignment of the Water pump, P/S pump or A/C compressor pulleys
- Corroded PCM power or ground circuits.
- Improper CKP, CMP, MAP, or TP Sensor mounting.
- Poor connector/terminal to component connection for CKP, CMP, MAP, or TP sensor, fuel injector, ignition coil, etc.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.

- Internal engine component malfunction.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

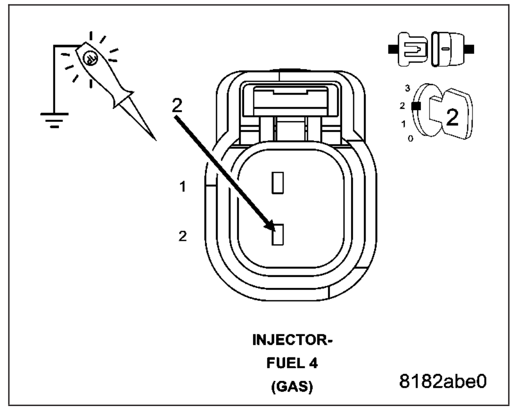
3. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Fuel Injector 4 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (K343) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

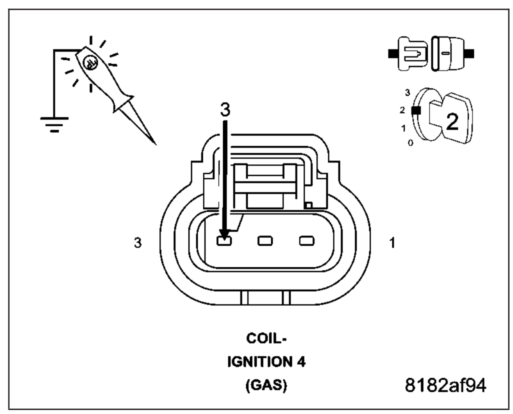
4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Ignition Coil 4 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for high resistance or a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. IGNITION SYSTEM OPERATION

Turn the ignition off.

Remove the Ignition Coil 4.

Connect the Ignition Coil 4 harness connector.

NOTE: Leave the Fuel Injector 4 harness connector disconnected.

Install a spark tester on the Ignition Coil 4.

While cranking the engine, observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go to 6

No >> Go to 15

NOTE: Connect the Fuel Injector 4 harness connector before continuing.

6. SPARK PLUG

Turn the ignition off.

Remove the spark plug.

Inspect the spark plug for the following conditions:

- Cracks
- Carbon tracking
- Foreign material
- Spark plug gap out of specifications
- Loose or broken electrode

NOTE: To check the electrode, lightly tap the bottom of the spark plug on a solid surface. The electrode should not move.

Were any problems found?

Yes >> Replace the spark plug.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. FUEL PRESSURE OUT OF SPECIFICATION

NOTE: Before continuing, install any components that were removed for testing, and connect all harness connectors.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: The fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Select the conclusion that best matches the fuel pressure reading:

Within Specification
Go to 8

Below Specification
Go to 13

Above Specification
Replace the fuel filter/pressure regulator.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. FUEL INJECTOR LEAK DOWN

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

NOTE: Before continuing, inspect the fuel delivery system for external leaks or damage. Repair or replace any leaking parts in accordance with the Service Information.

Turn the ignition off.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not drop below 241 KPa (35 psi).

Does the pressure drop below the listed specification?

Yes >> Replace the leaking fuel injector(s).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each fuel injector actuation, start the engine to clear the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector 4 control.

Monitor the fuel pressure gauge.

Does the fuel pressure drop after the injector is actuated?

Yes >> Go to 10

No >> Go to 11

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

10. INTERNAL ENGINE COMPONENT

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - must not be weak or broken

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

11. FUEL INJECTOR 4

Turn the ignition off.

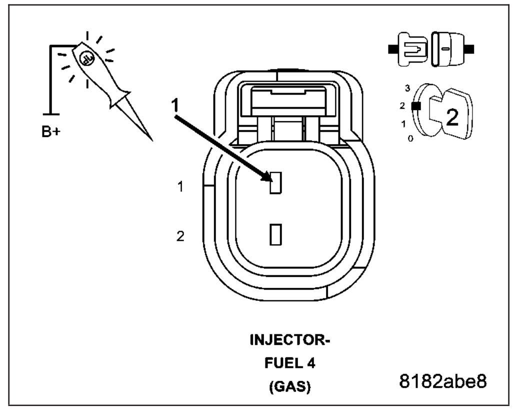
Disconnect the Fuel Injector 4 harness connector.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the Fuel Injector 4 control.

Using a 12 volt test light connected to 12 volts check the (K14) Injector 4 Control circuit in the Fuel Injector 4 harness connector.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Fuel Injector 4 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

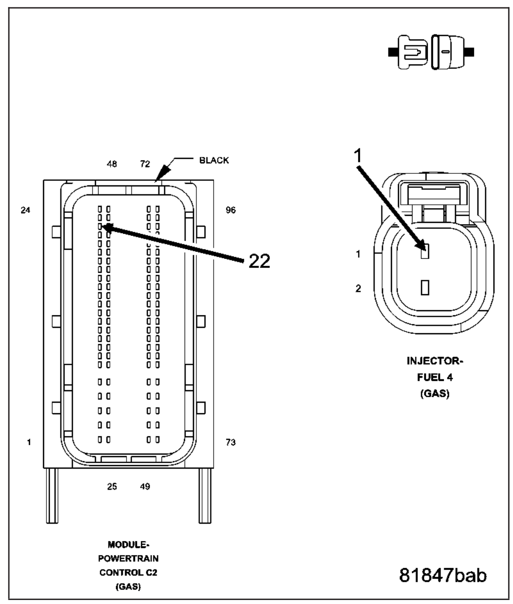
No >> Go to 12

12. (K14) INJECTOR 4 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Check the (K14) Injector 4 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K14) Injector 4 Control circuit for high resistance or a shorted condition.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 17

13. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (for 5/16) or #6631 (for 3/8) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Turn the ignition on.

With the scan tool, actuate the fuel pump to ON (100%) and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

NOTE: If the PCM detects a low fuel level, the fuel pump actuation will not be allowed.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 14

14. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

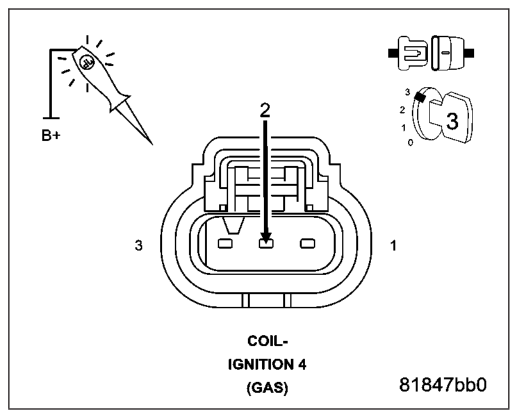
Remove the fuel pump module and inspect the fuel inlet strainer.

Is the fuel inlet strainer plugged?

Yes >> Replace the fuel pump inlet strainer.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Before continuing, check the fuel pump module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. If any problems are found, repair as necessary. Otherwise, replace the fuel pump module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

15. IGNITION COIL 4



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Disconnect the Ignition Coil 4 harness connector.

Remove the Fuel Pump Relay.

Using a 12 volt test light connected to 12 volts, check the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 4.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

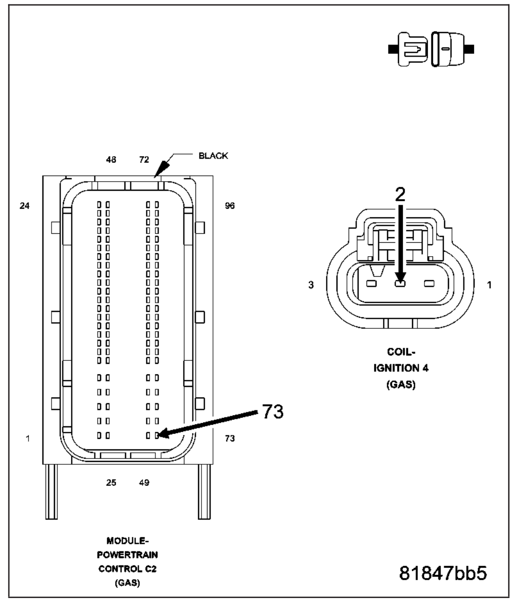
No >> Go to 16

16. (K15) COIL 4 CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Check the (K15) Coil 4 Control circuit for an open circuit, short to ground, and short to voltage.



Were any problems found?

Yes >> Repair the (K15) Coil 4 Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 17

17. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injector 4, the Ignition Coil 4, and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

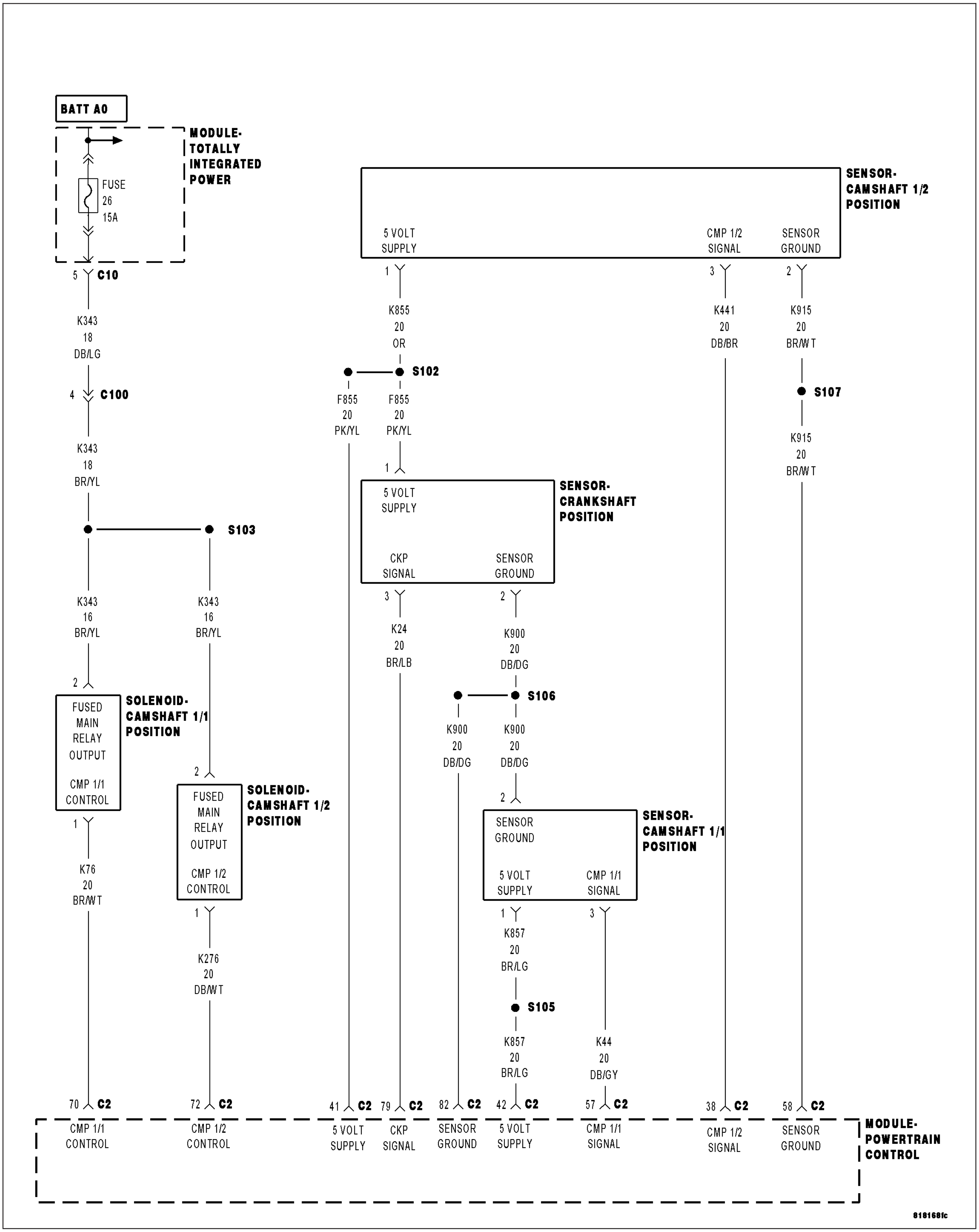
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0315-NO CRANK SENSOR LEARNED



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At closed throttle decel, with the A/C off, ECT greater than 75° C (167° F) and engine run time greater than 50 seconds.
- **Set Condition:**
  One of the CKP sensor target windows has more than 2.86% variance from the reference. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CRANKSHAFT POSITION SENSOR
CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

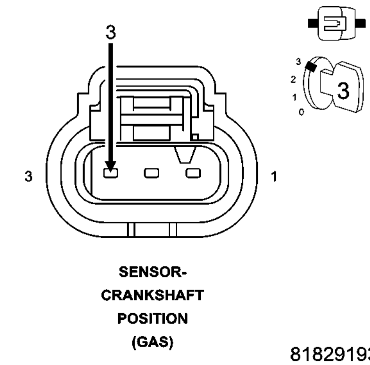
Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CRANKSHAFT POSITION SENSOR IRREGULAR SIGNAL



81829193

Turn the ignition off.

Using a lab scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Crankshaft Position Sensor signal on the lab scope screen.

Were any Crankshaft Position Sensor signals irregular or missing?

Yes >> Go to 4

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 5

5. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

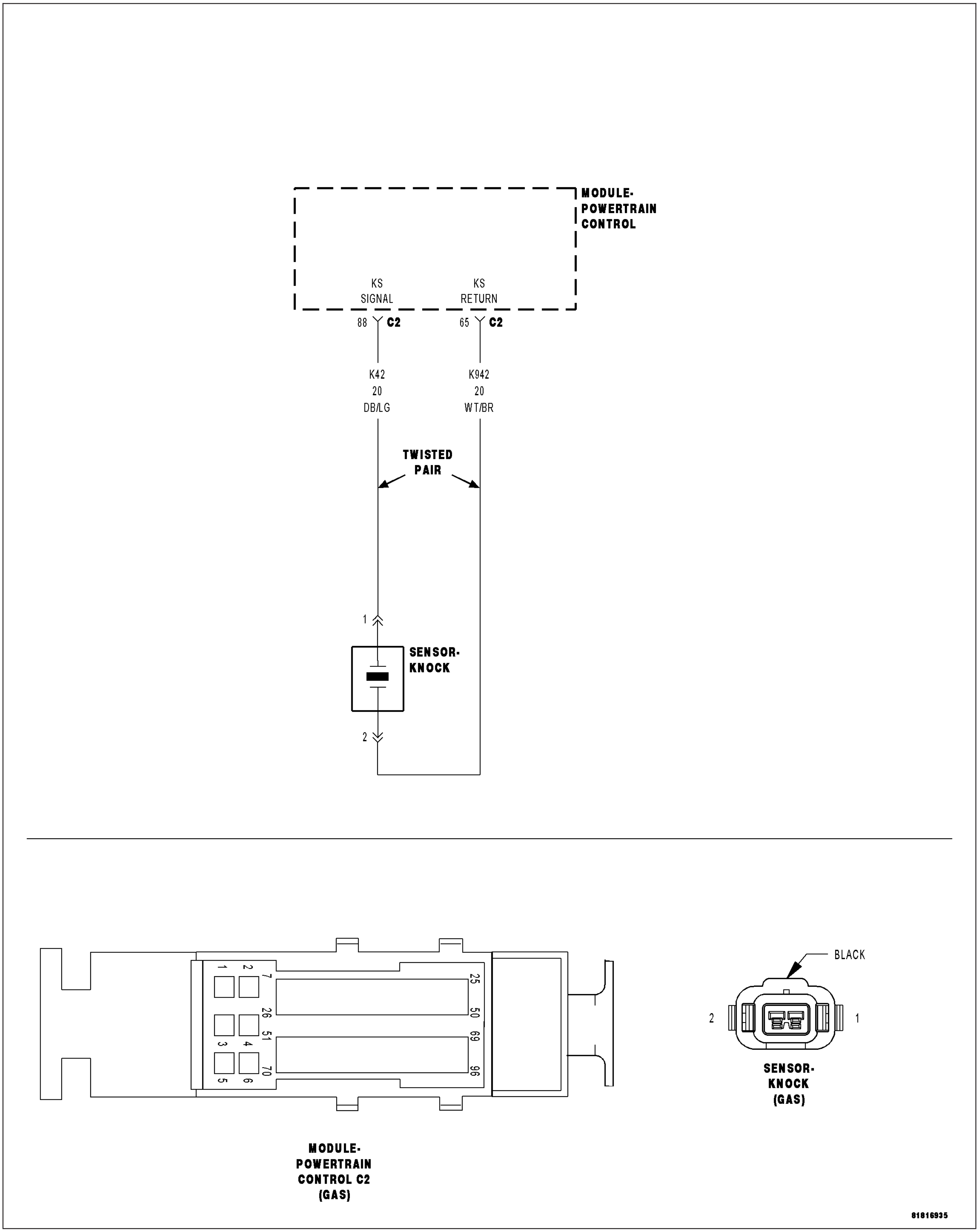
Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0325-KNOCK SENSOR 1 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Knock Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(K42) KS SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K42) KS SIGNAL CIRCUIT SHORTED TO GROUND
(K42) KS SIGNAL CIRCUIT SHORTED TO (K942) KS RETURN
(K42) KS SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K942) KS RETURN CIRCUIT OPEN OR HIGH RESISTANCE
KNOCK SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K42) KS SIGNAL CIRCUIT SHORTED TO VOLTAGE

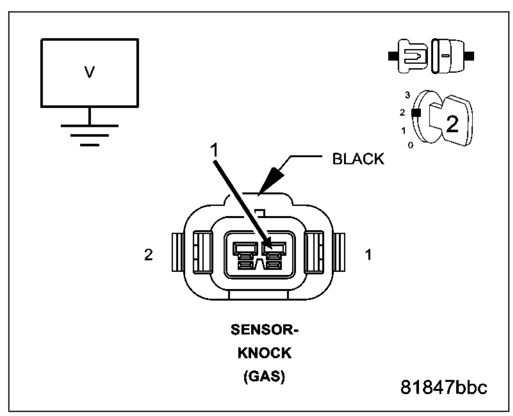
Turn the ignition off.

Disconnect the Knock Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K42) KS Signal circuit in the Knock Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K42) KS Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K42) KS SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

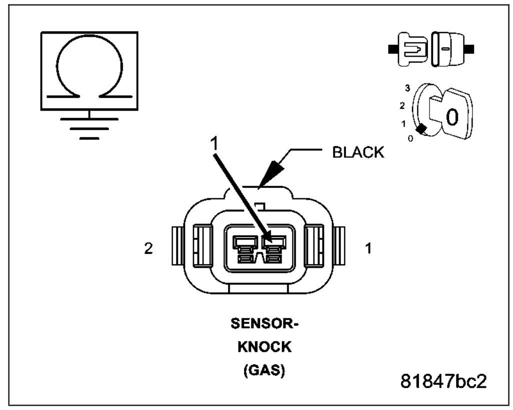
Measure the resistance between ground and the (K42) KS Signal circuit in the Knock Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K42) KS Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (K42) KS SIGNAL CIRCUIT SHORTED TO (K942) KS RETURN CIRCUIT

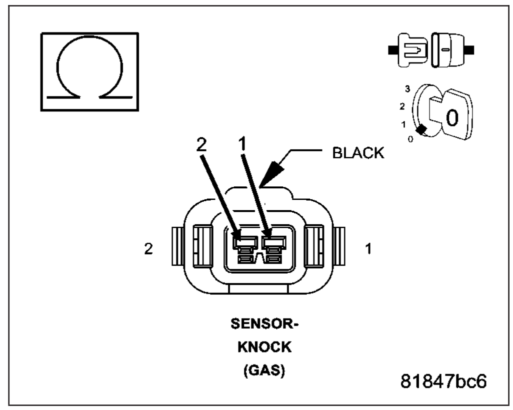
Measure the resistance between the (K42) KS Signal circuit and the (K942) KS Return circuit in the Knock Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K42) KS Signal circuit for a short to the (K942) KS Return circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (K42) KS SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

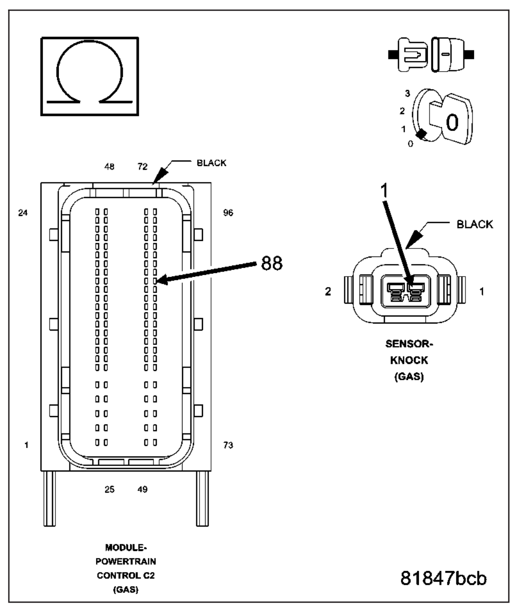
Measure the resistance of the (K42) KS Signal circuit between the Knock Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 6

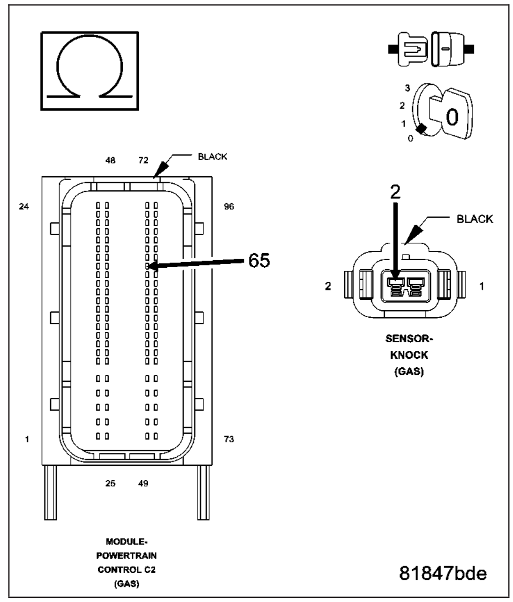
No >> Repair the (K42) KS Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (K942) KS RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K942) KS Return circuit between the Knock Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K942) KS Return for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. KNOCK SENSOR

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Replace the Knock Sensor in accordance with the Service Information.

Start the engine and allow it to reach normal operating temperature.

With the scan tool, select View DTCs.

Is status Active for this DTC?

Yes >> Go to 8

No >> Test Complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Knock Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

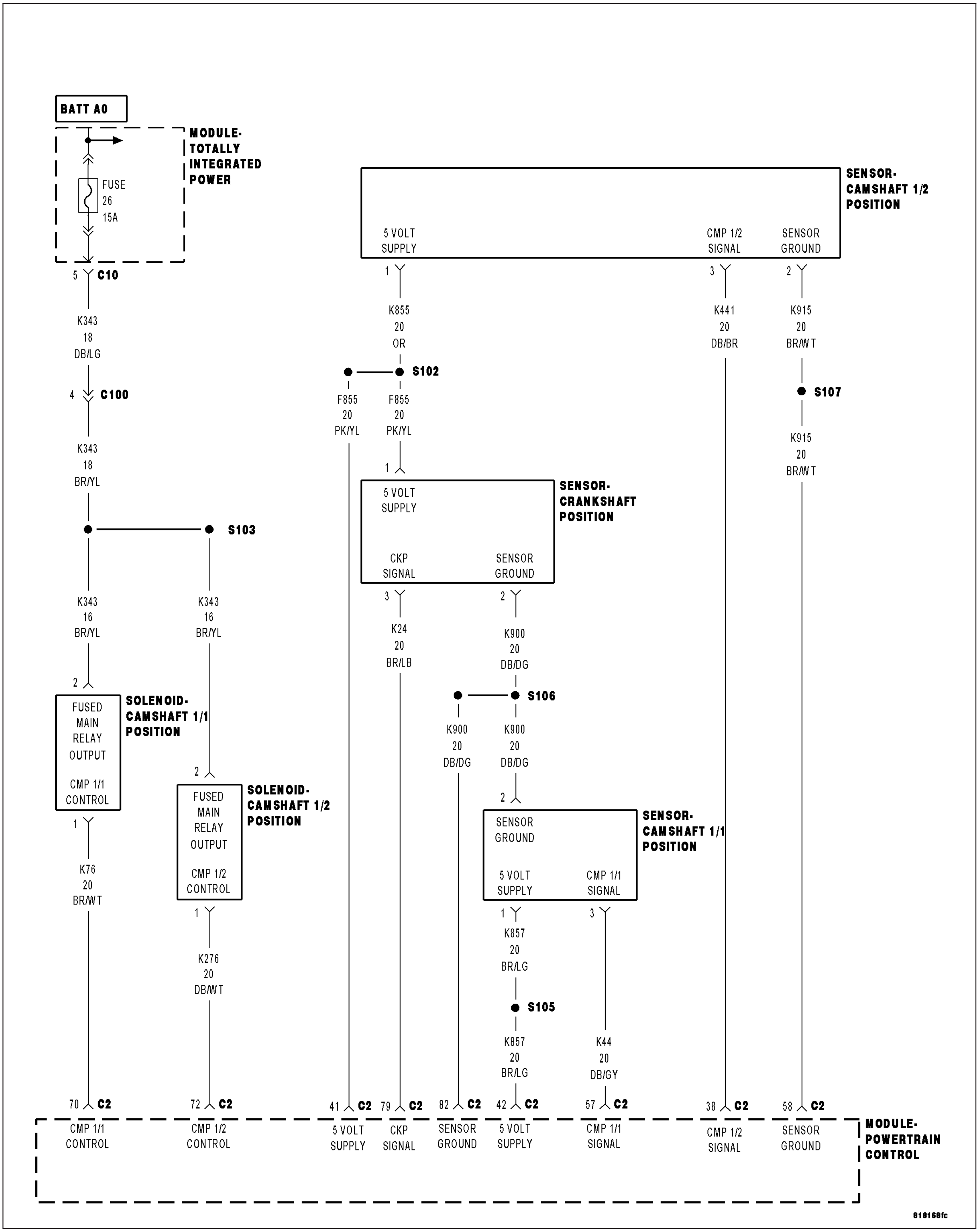
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Crankshaft Position Sensor.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K24) CKP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K24) CKP SIGNAL CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K24) CKP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K24) CKP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CRANKSHAFT POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Crankshaft Position Sensor connector.

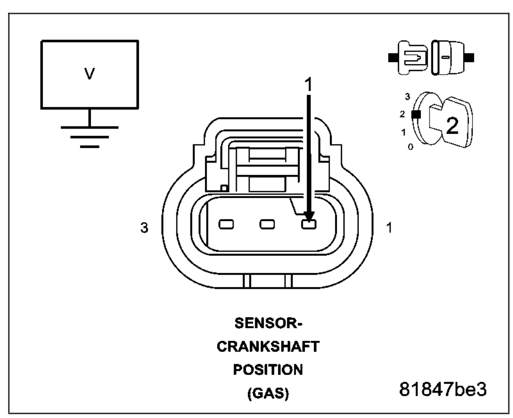
Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.

Is the voltage between 4.5 and 5.5 volts?

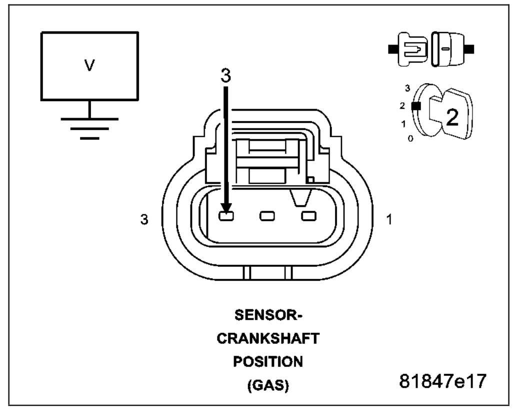
Yes >> Go to 3

No >> Go to 7



3. (K24) CKP SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

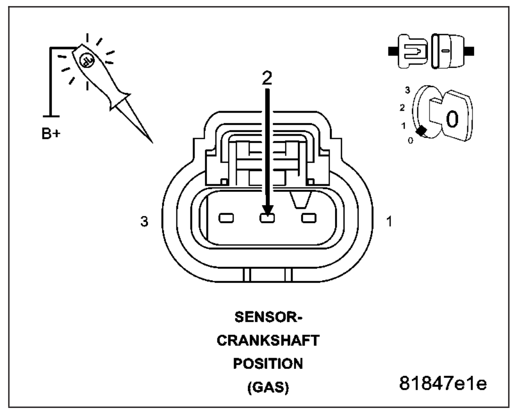
No >> Go to 11

4. (K900) SENSOR GROUND CIRCUIT

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the Crankshaft Position Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



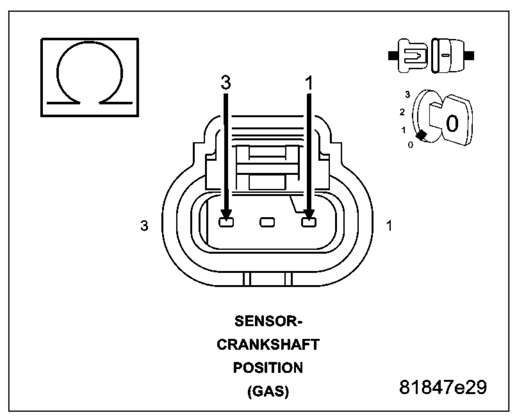
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K24) CKP SIGNAL CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K24) CKP Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

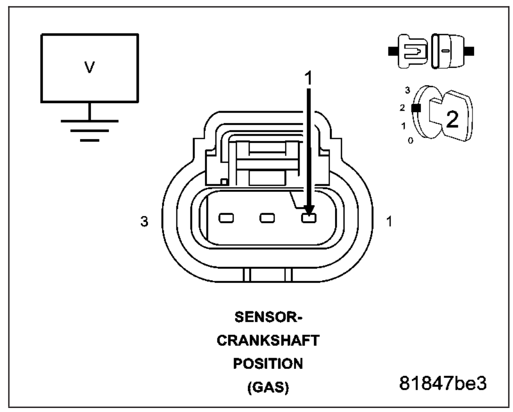
7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.



Is there any voltage present?

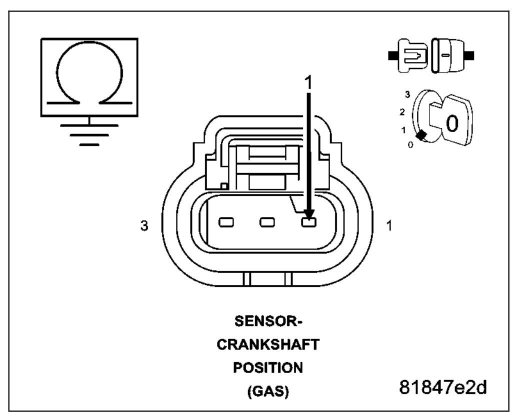
Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.



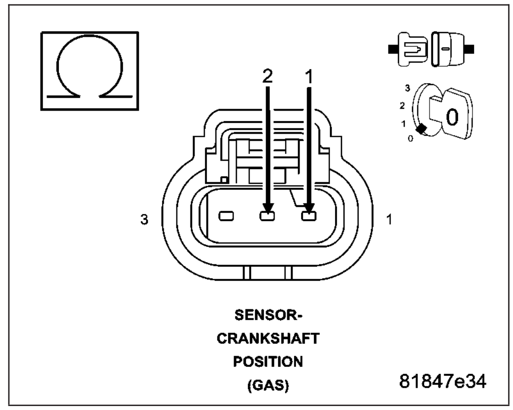
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

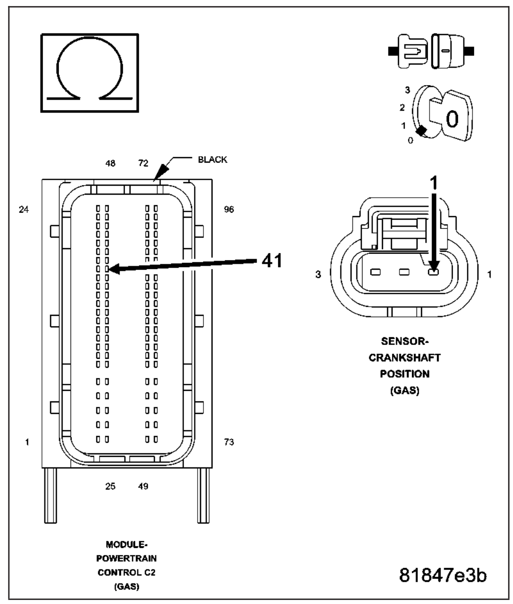
Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

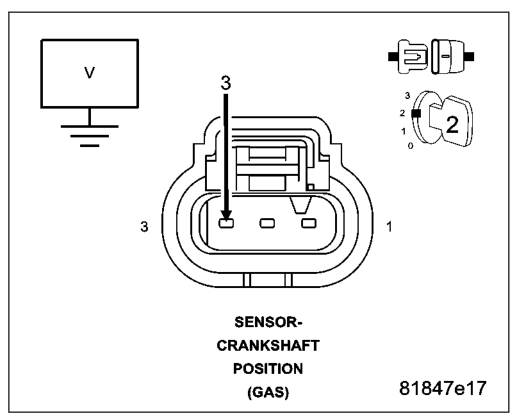
11. (K24) CKP SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K24) CKP Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

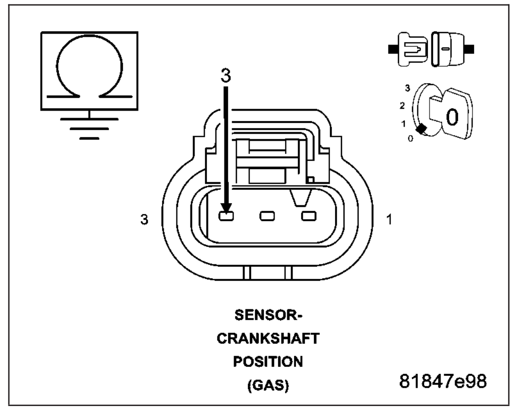
Measure the resistance between ground and the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K24) CKP Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



13. (K24) CKP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

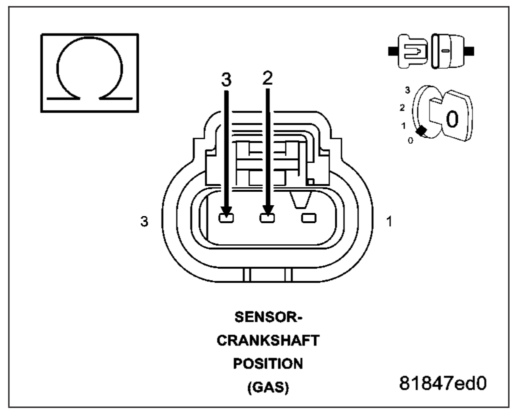
Measure the resistance between the (K24) CKP Signal circuit and the (K900) Sensor Ground circuit in the Crankshaft Position Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K24) CKP Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



14. (K24) CKP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

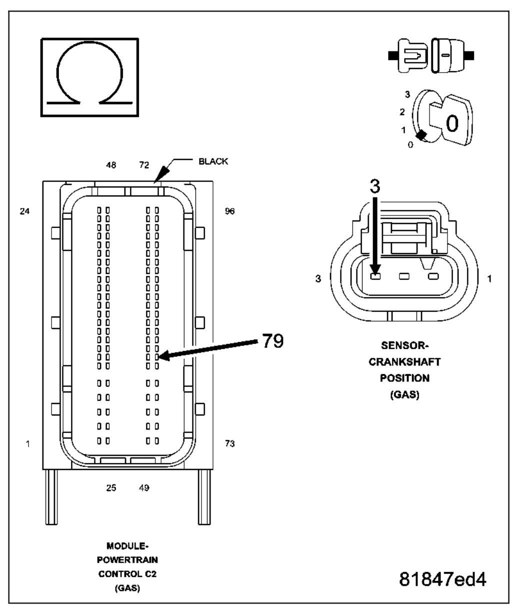
Measure the resistance of the (K24) CKP Signal circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K24) CKP Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

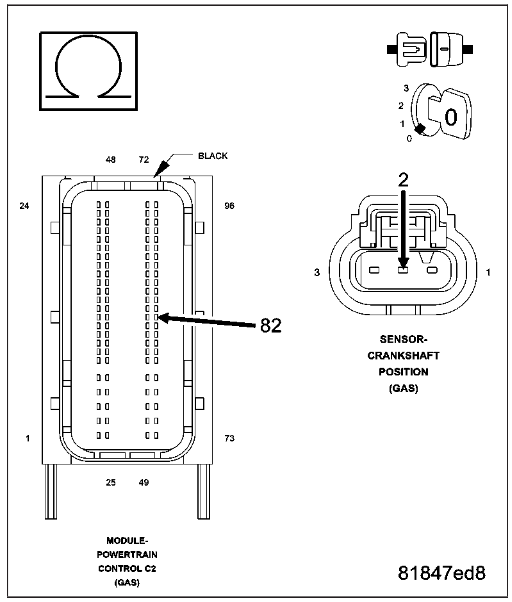


15. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

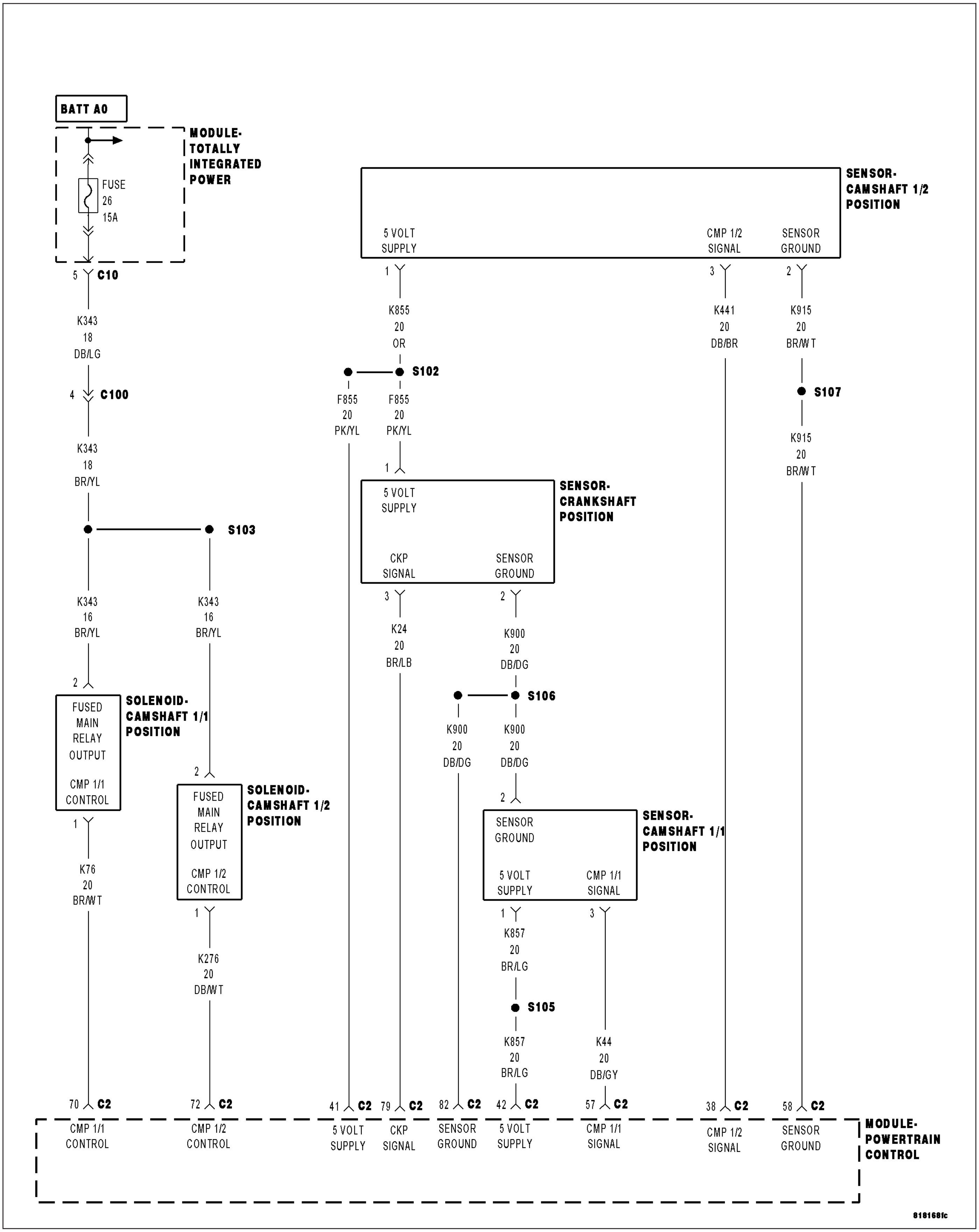
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0336-CRANKSHAFT POSITION SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Crankshaft Position Sensor.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K24) CKP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K24) CKP SIGNAL CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K24) CKP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K24) CKP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CRANKSHAFT POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

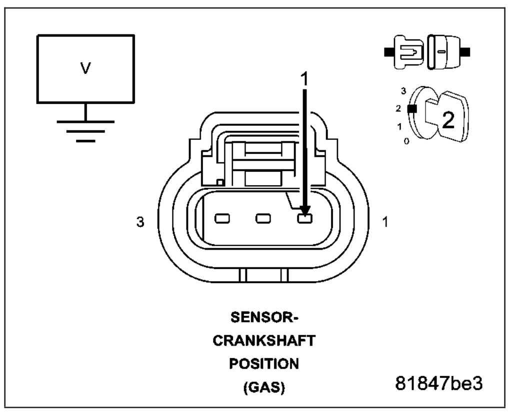
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Crankshaft Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.



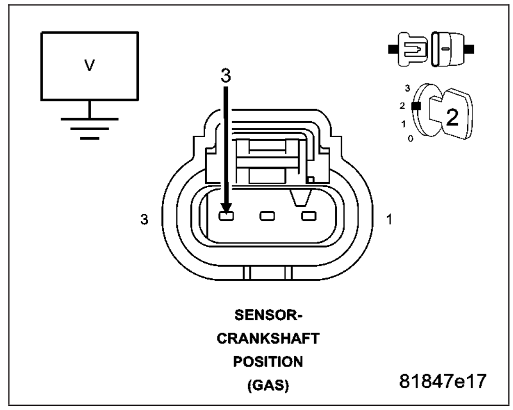
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K24) CKP SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

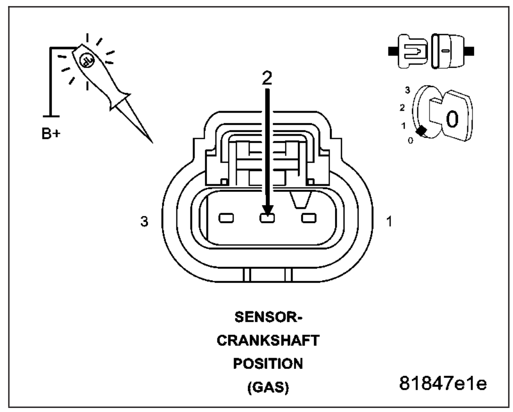
Yes >> Go to 4

No >> Go to 11

4. (K900) SENSOR GROUND CIRCUIT

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the Crankshaft Position Sensor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

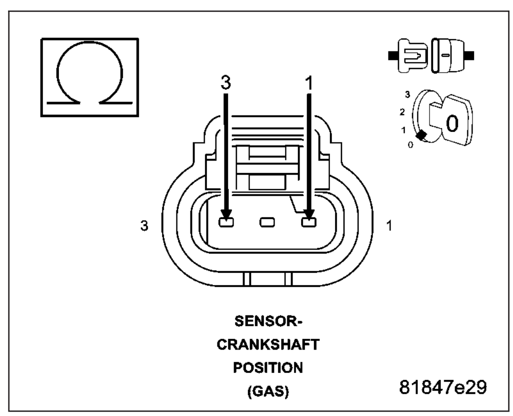
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K24) CKP SIGNAL CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K24) CKP Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

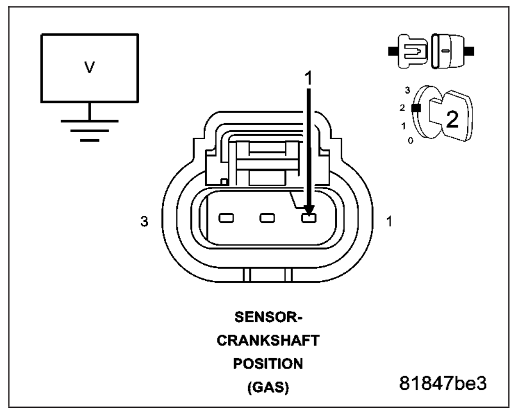
7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.



Is there any voltage present?

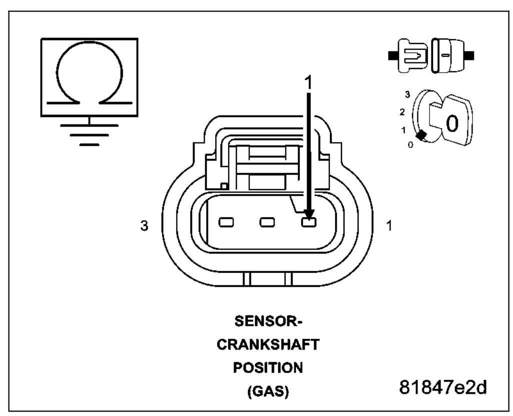
Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Crankshaft Position Sensor harness connector.



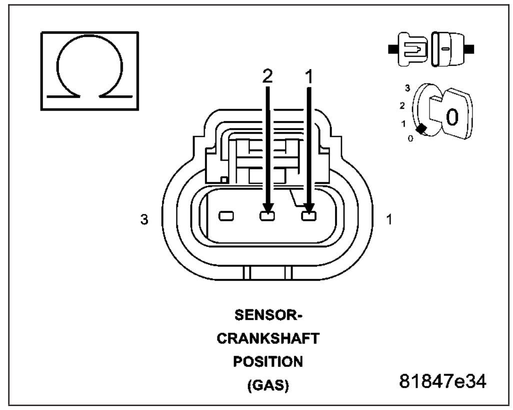
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

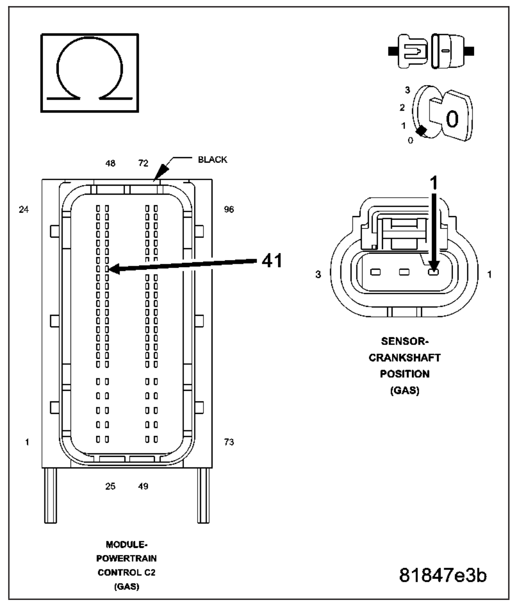
Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

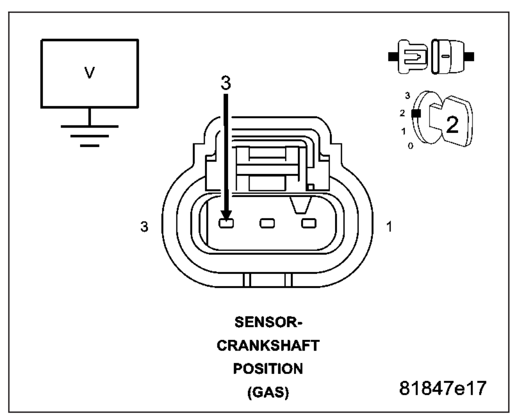
11. (K24) CKP SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K24) CKP Signal circuit for a short to voltage.

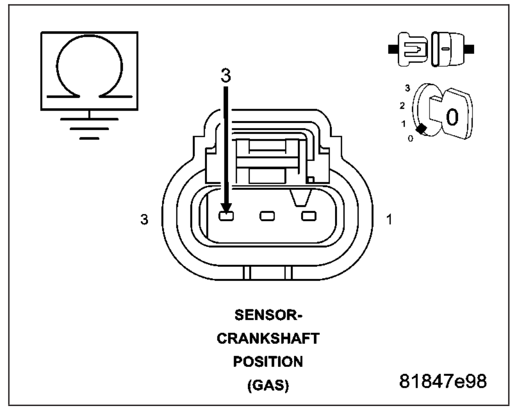
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

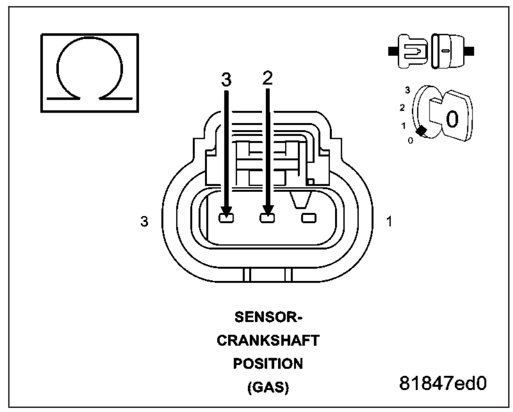
Yes >> Go to 13

No >> Repair the (K24) CKP Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K24) CKP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K24) CKP Signal circuit and the (K900) Sensor Ground circuit in the Crankshaft Position Sensor harness connector.



Is the resistance above 100 ohms?

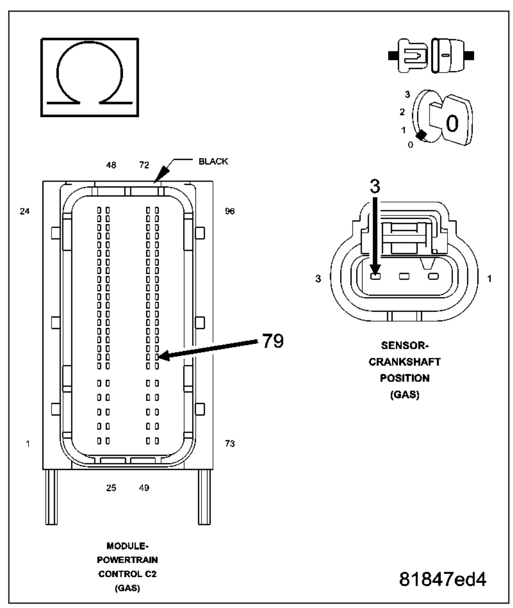
Yes >> Go to 14

No >> Repair the (K24) CKP Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K24) CKP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K24) CKP Signal circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K24) CKP Signal circuit for an open circuit or high resistance.

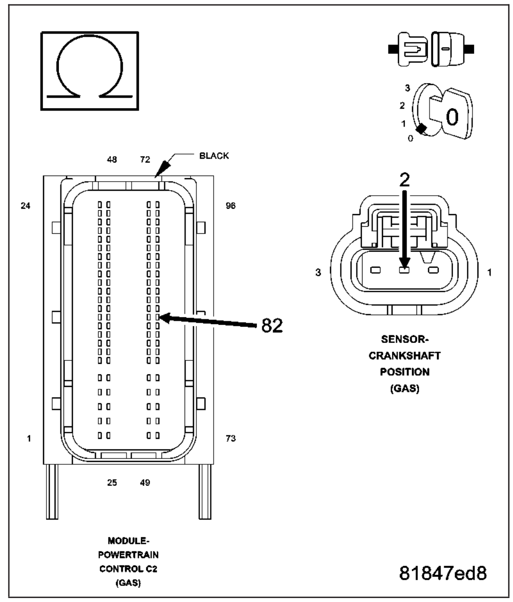
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the Crankshaft Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

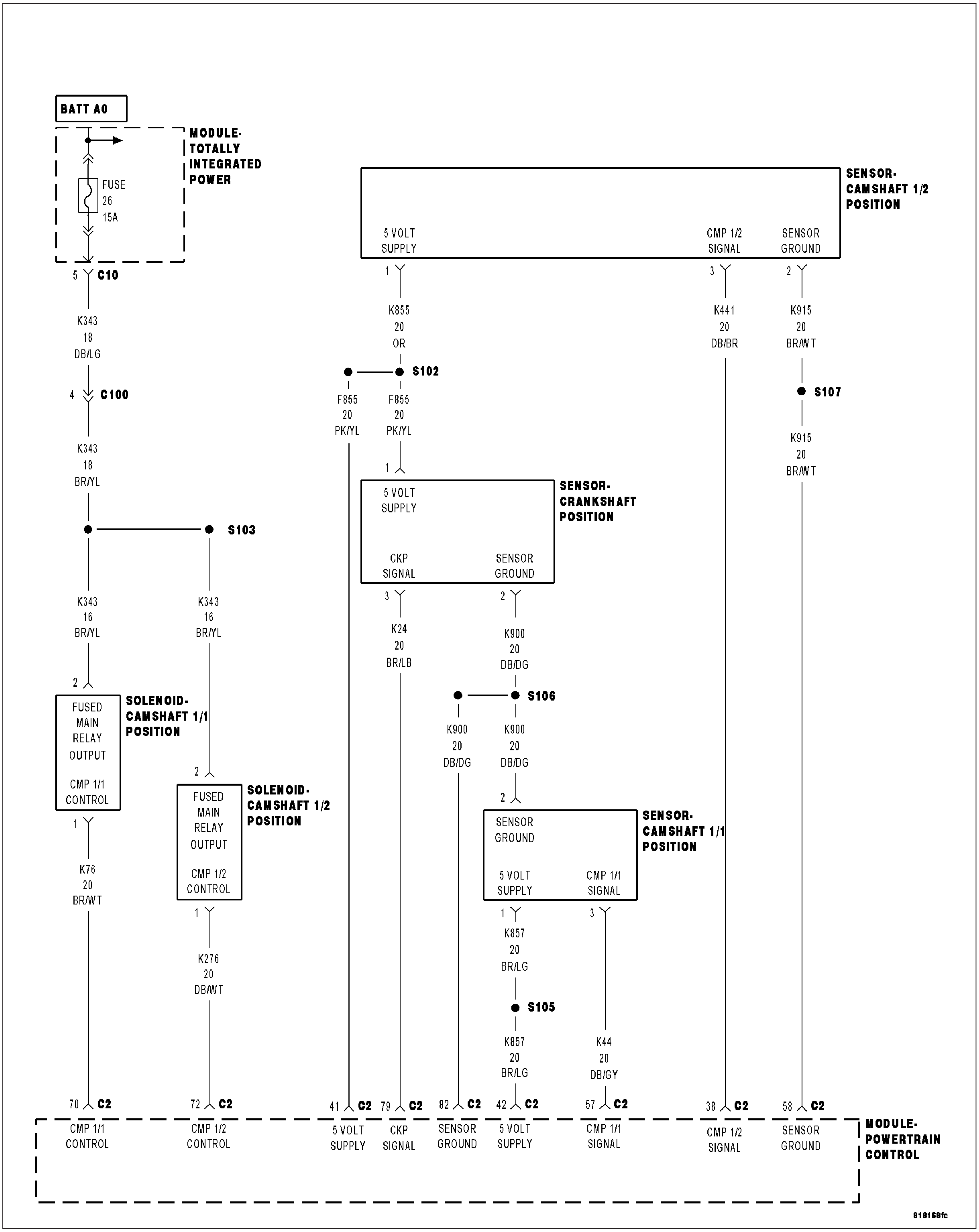
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM detects that CKP Sensor failure counter has reached 20. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CRANKSHAFT POSITION SENSOR
CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CRANKSHAFT POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CRANKSHAFT POSITION SENSOR IRREGULAR SIGNAL

Turn the ignition off.

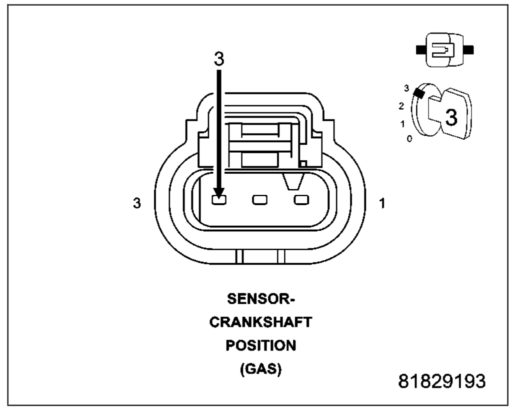
Using a lab scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crankshaft Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Crankshaft Position Sensor signal on the lab scope screen.



Were any Crankshaft Position Sensor signals irregular or missing?

Yes >> Go to 4

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. CRANKSHAFT, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Crankshaft Position Sensor.

Inspect the Crankshaft Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 5

5. CRANKSHAFT POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Crankshaft Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

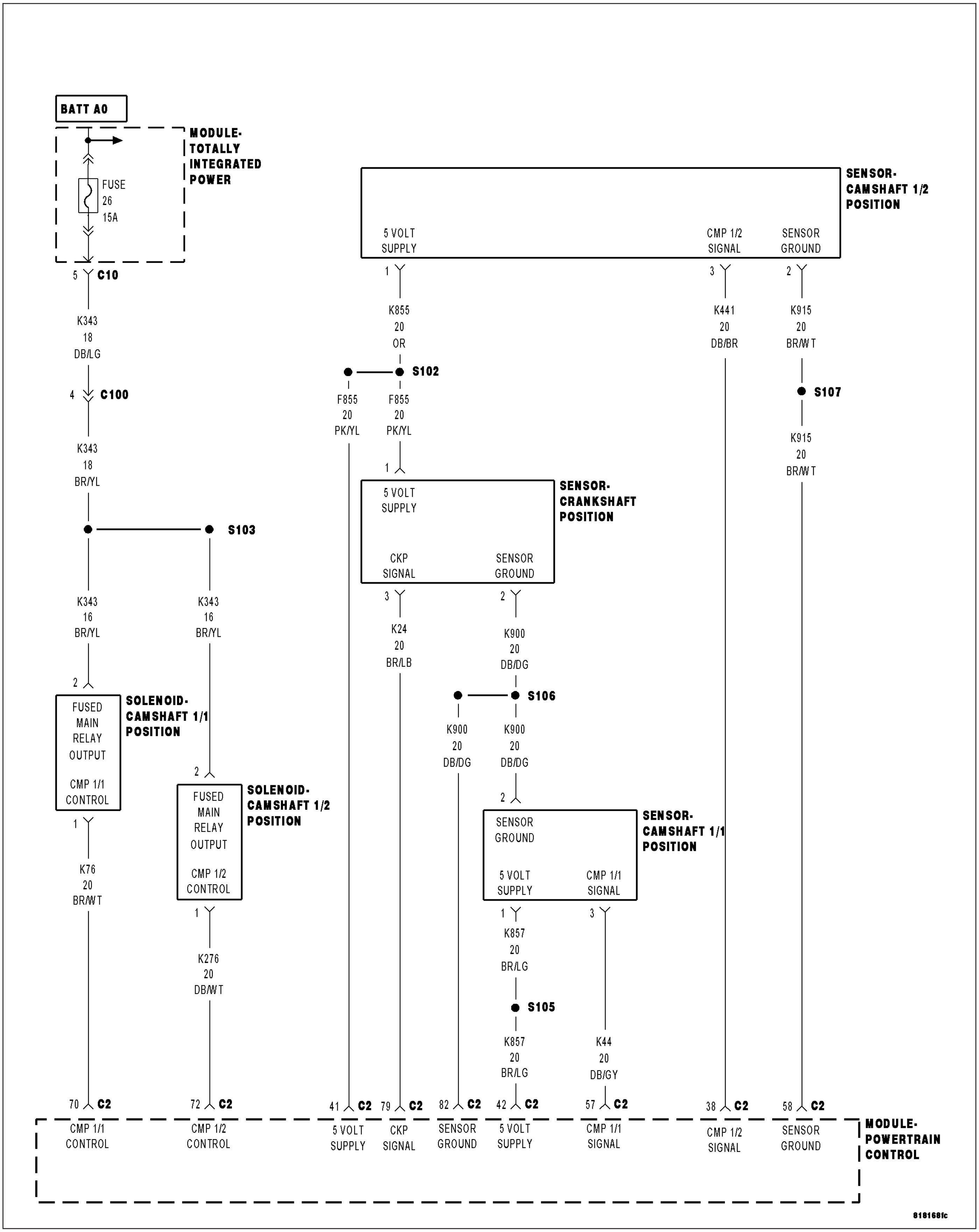
Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0340-CAMSHAFT POSITION SENSOR CIRCUIT-BANK 1 SENSOR 1



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Camshaft 1/1 Position Sensor.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K44) CMP 1/1 SIGNAL CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K44) CMP 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

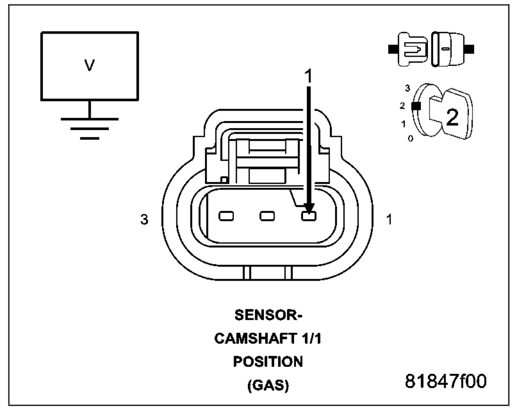
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



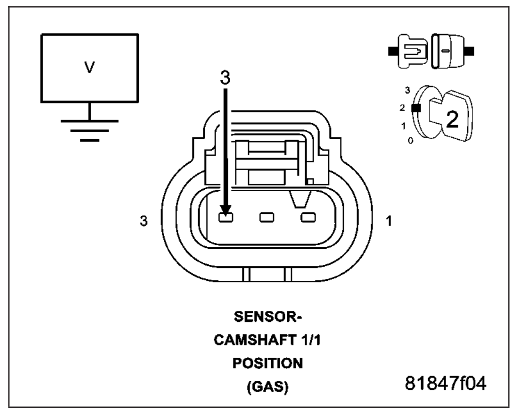
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K44) CMP 1/1 SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

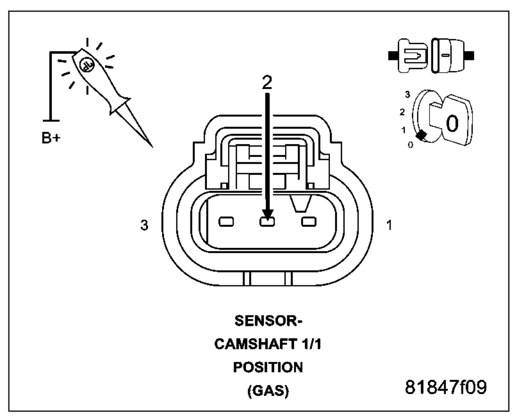
Yes >> Go to 4

No >> Go to 11

4. (K900) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the Camshaft 1/1 Position Sensor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

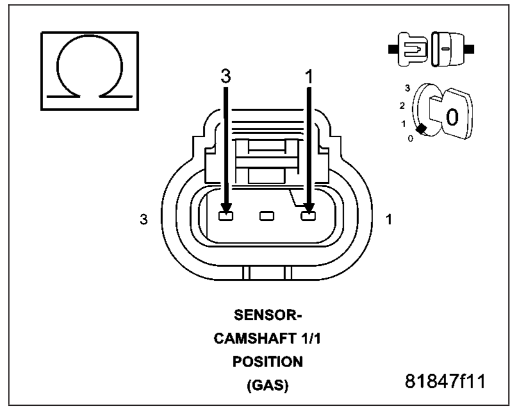
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K44) CMP 1/1 SIGNAL CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

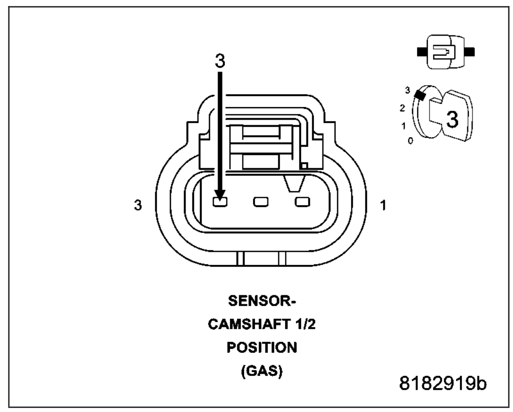
No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K44) CMP 1/1 Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/2 POSITION SENSOR IRREGULAR SIGNAL

Connect the Camshaft 1/1 Position Sensor connector.

Using a lab scope and the Miller special tool #6801, backprobe the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/2 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/2 Position Sensor signal on the lab scope screen.

Were any Camshaft 1/2 Position Sensor signals irregular or missing?

Yes >> Go to 17

No >> Go to 16

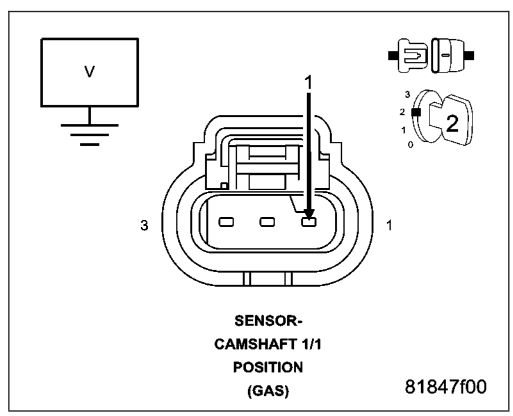
7. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.

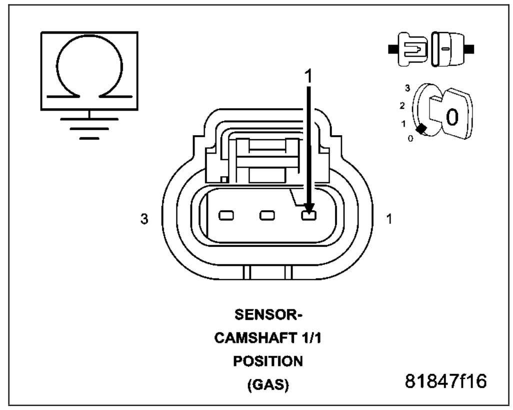
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

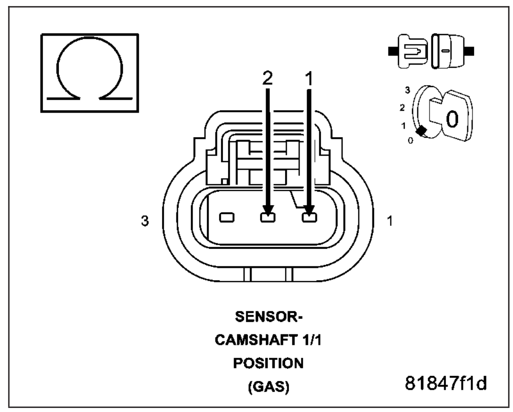
Yes >> Go to 9

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

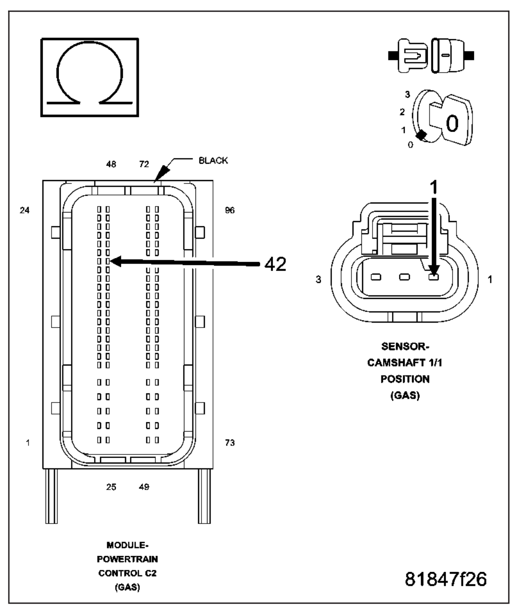
Yes >> Go to 10

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

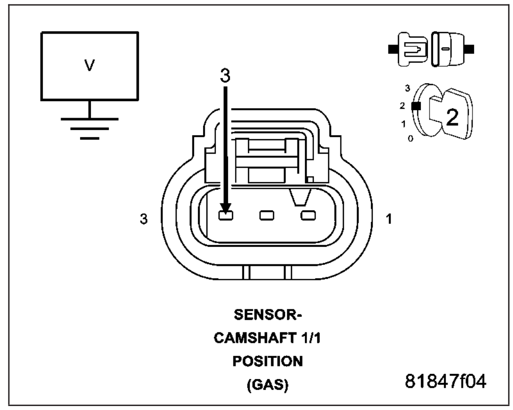
11. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is there any voltage present?

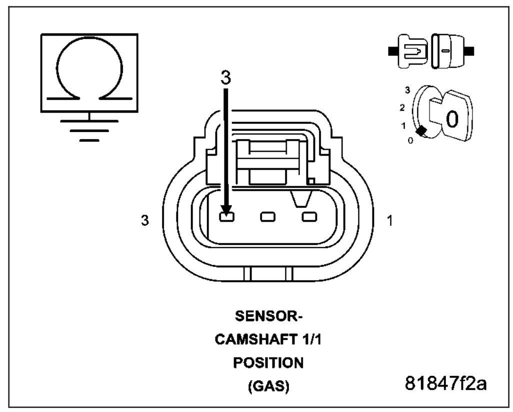
Yes >> Repair the (K44) CMP 1/1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



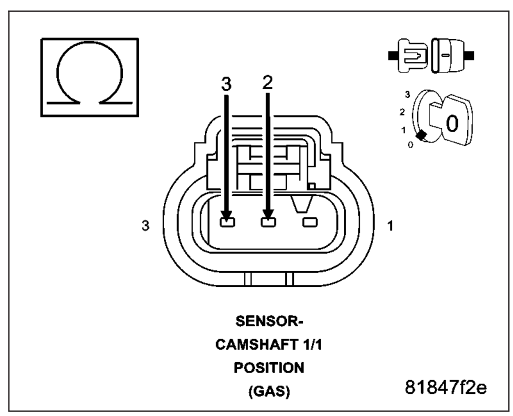
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K44) CMP 1/1 Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K44) CMP 1/1 Signal circuit and the (K900) Sensor Ground circuit in the Camshaft 1/1 Position Sensor harness connector.



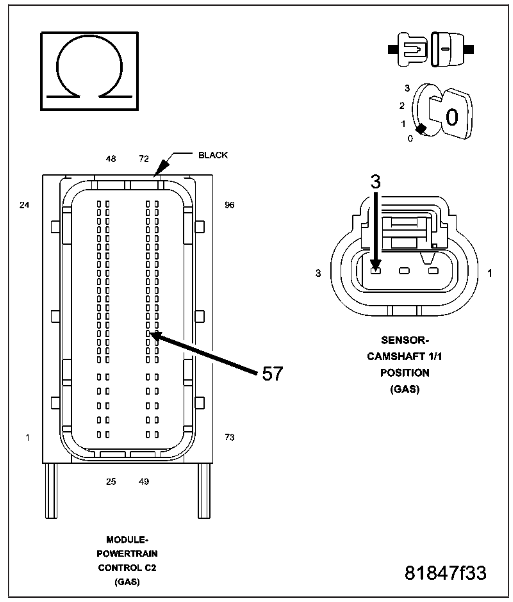
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K44) CMP 1/1 Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K44) CMP 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K44) CMP 1/1 Signal circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K44) CMP 1/1 Signal circuit for an open circuit or high resistance.

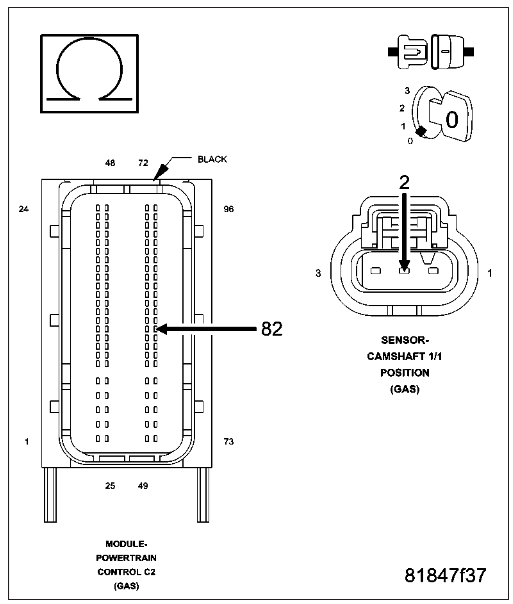
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

17. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

18. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

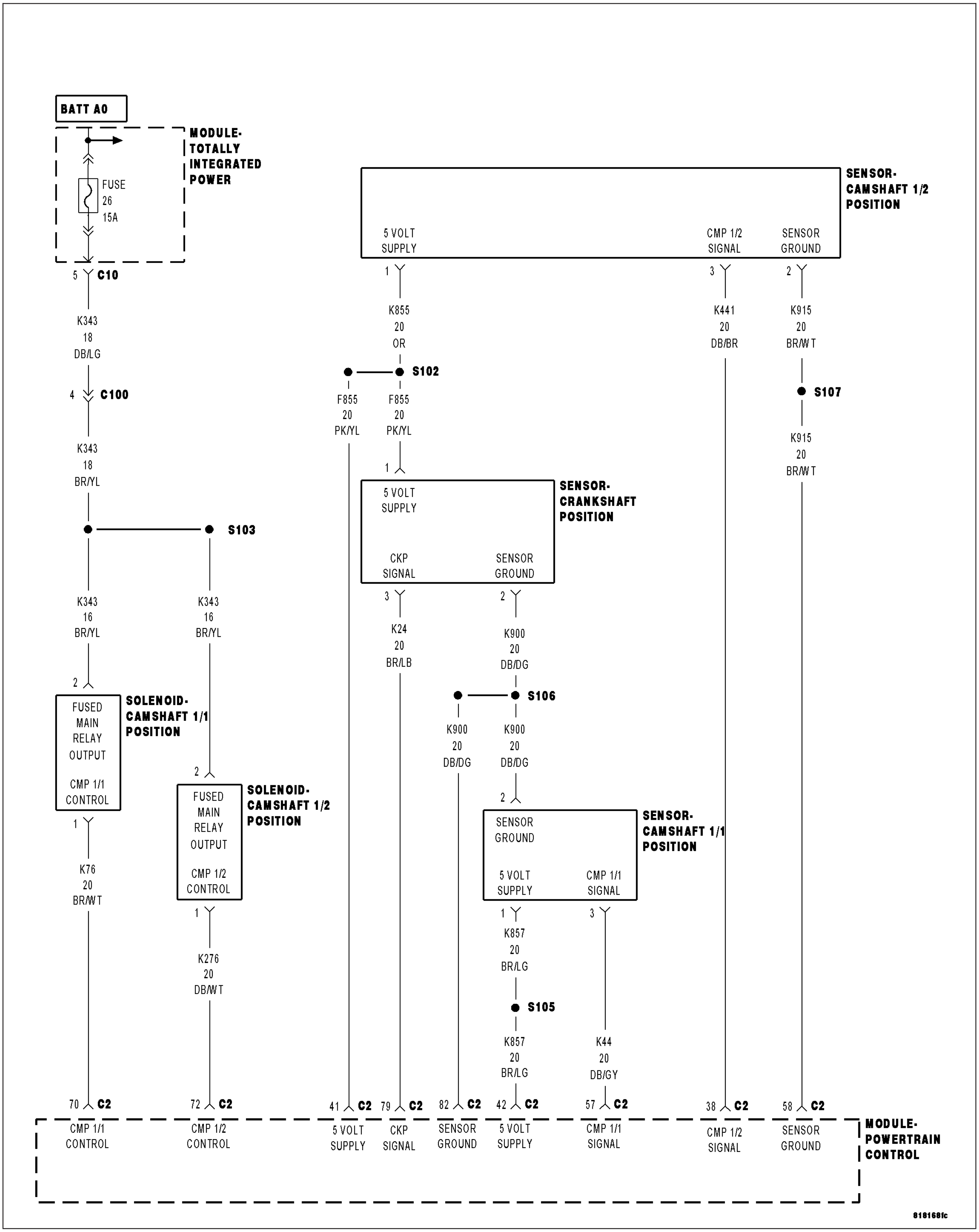
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0341-CAMSHAFT POSITION SENSOR PERFORMANCE-BANK 1 SENSOR 1



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Camshaft 1/1 Position Sensor.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K44) CMP 1/1 SIGNAL CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K44) CMP 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

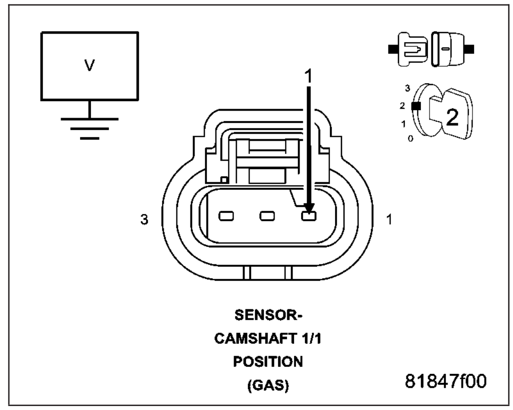
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



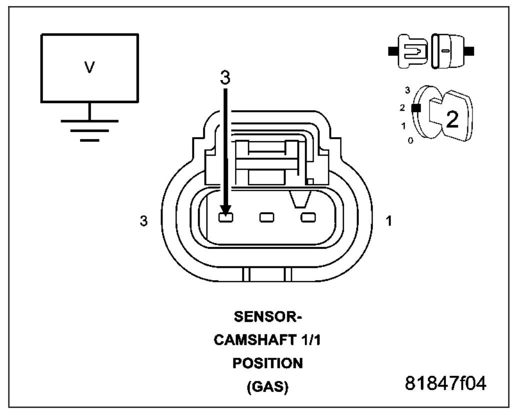
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K44) CMP 1/1 SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

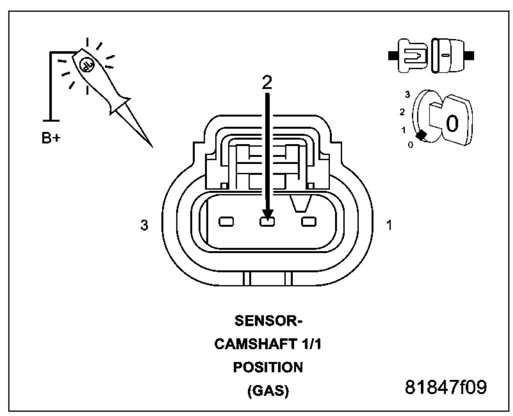
No >> Go to 11

4. (K900) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K900) Sensor Ground in the Camshaft 1/1 Position Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.



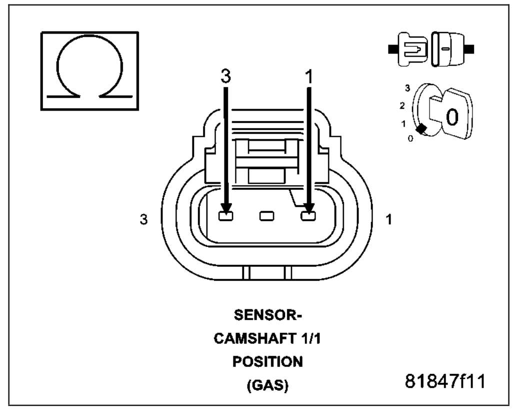
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K44) CMP 1/1 SIGNAL CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

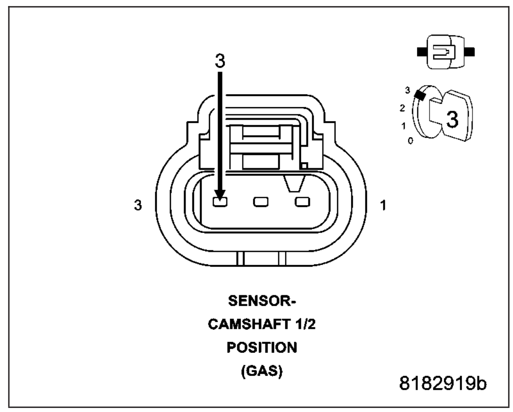
No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K44) CMP 1/1 Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/2 POSITION SENSOR IRREGULAR SIGNAL

Connect the Camshaft 1/1 Position Sensor connector.

Using a lab scope and the Miller special tool #6801, backprobe the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/2 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/2 Position Sensor signal on the lab scope screen.

Were any Camshaft 1/2 Position Sensor signals irregular or missing?

Yes >> Go to 17

No >> Go to 16

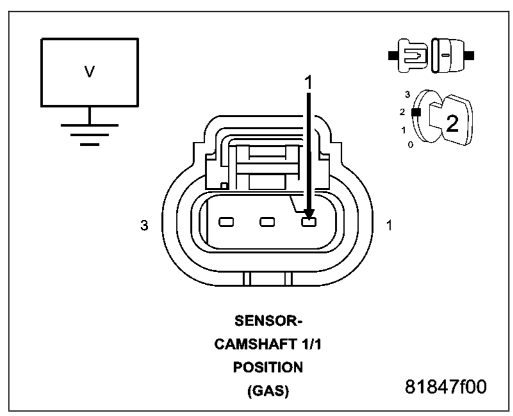
7. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.

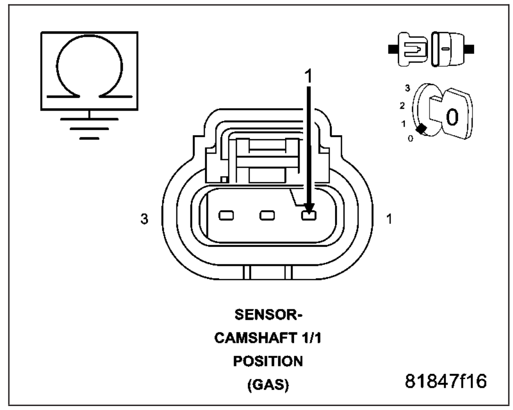
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

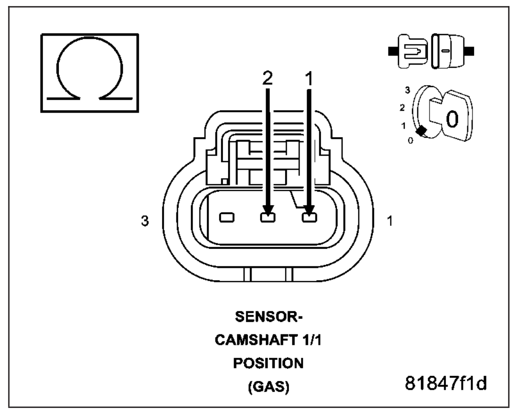
Yes >> Go to 9

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the resistance above 100 ohms?

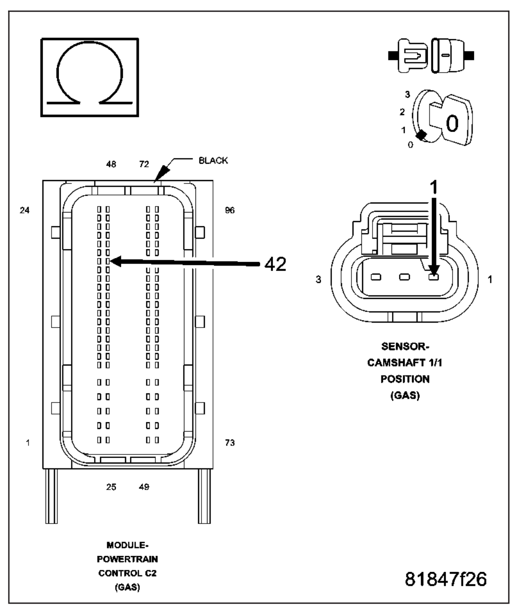
Yes >> Go to 10

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

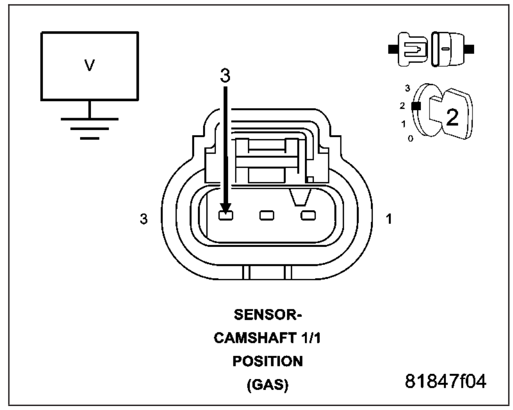
11. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



Is there any voltage present?

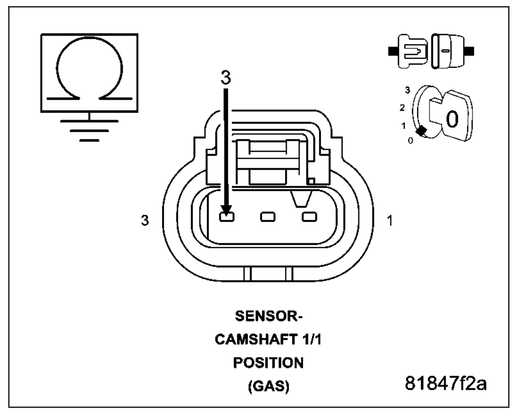
Yes >> Repair the (K44) CMP 1/1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.



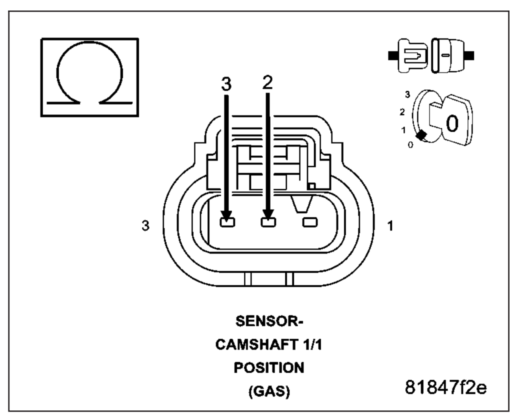
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K44) CMP 1/1 Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K44) CMP 1/1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K44) CMP 1/1 Signal circuit and the (K900) Sensor Ground circuit in the Camshaft 1/1 Position Sensor harness connector.



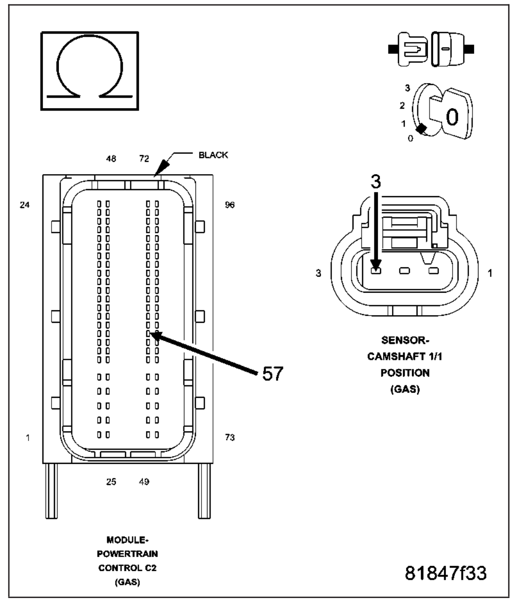
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K44) CMP 1/1 Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K44) CMP 1/1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K44) CMP 1/1 Signal circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K44) CMP 1/1 Signal circuit for an open circuit or high resistance.

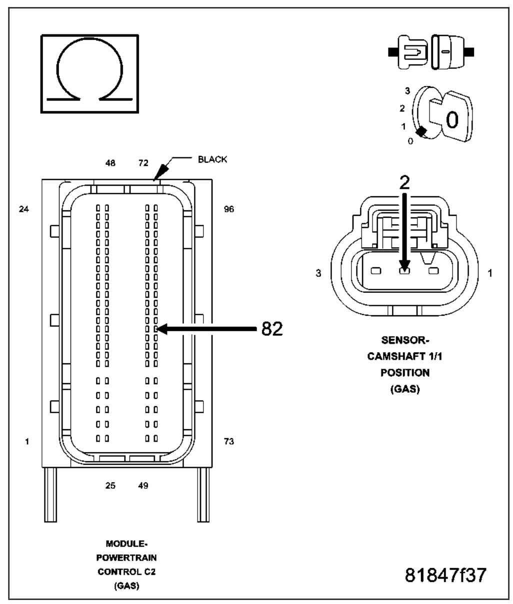
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K900) Sensor Ground circuit between the Camshaft 1/1 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

17. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

18. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

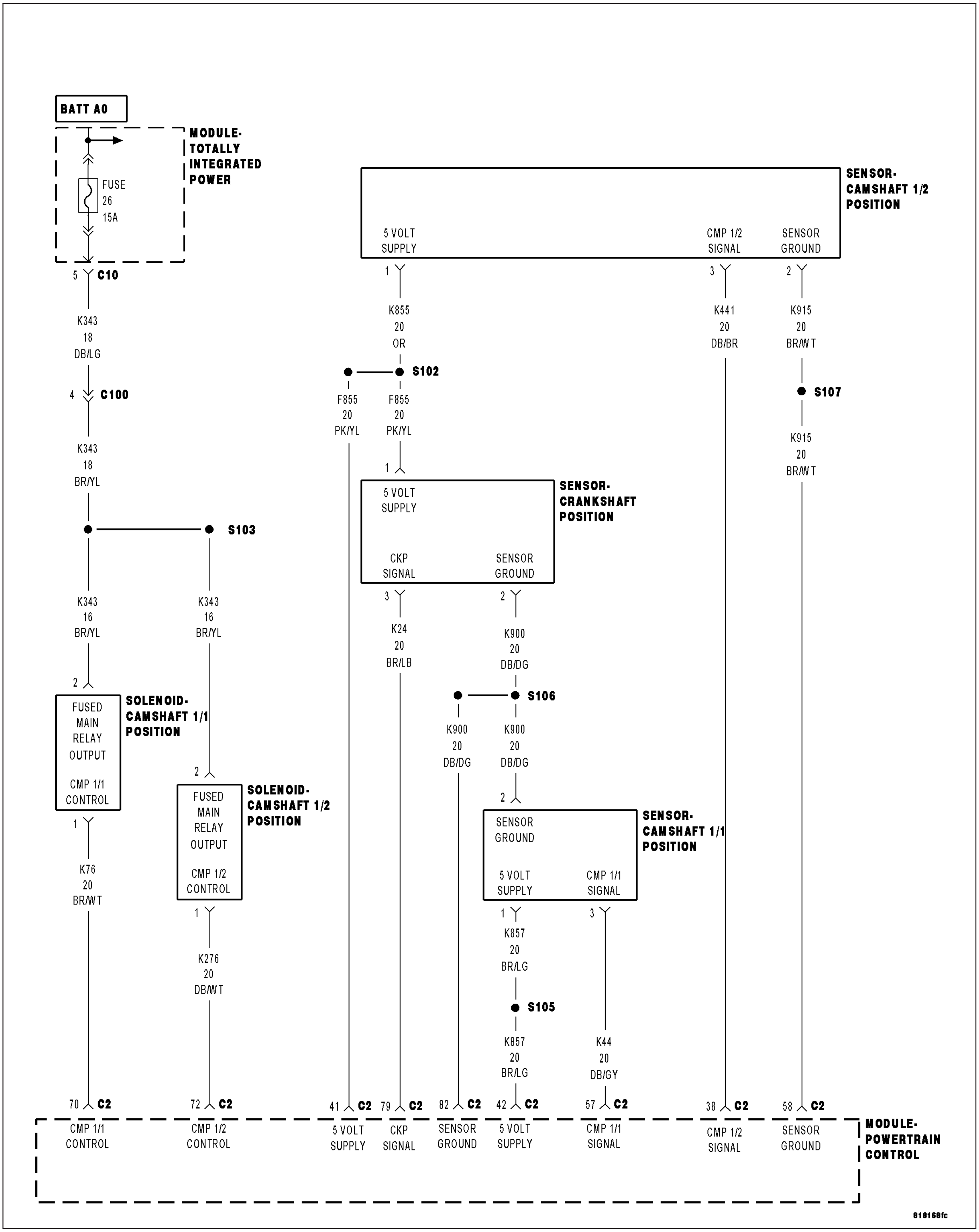
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT-BANK 1 SENSOR 1



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM detects an intermittent signal error from the Camshaft 1/1 Position Sensor. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/1, TONE WHEEL OR FLEX PLATE
CAMSHAFT 1/2, TONE WHEEL OR FLEX PLATE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CAMSHAFT 1/1 POSITION SENSOR IRREGULAR SIGNAL

Turn the ignition off.

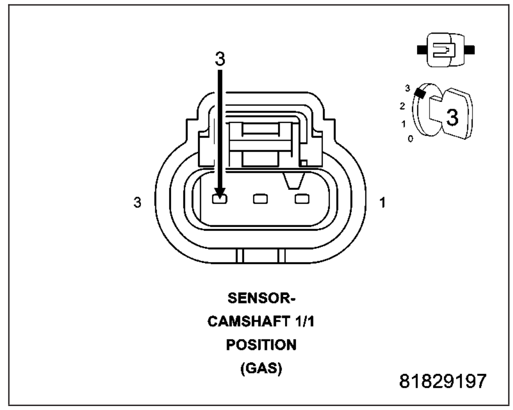
Using a lab scope and the Miller special tool #6801, backprobe the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/1 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/1 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/1 Position Sensor signals irregular or missing?

Yes >> Go to 4

No >> Go to 6

4. CAMSHAFT 1/1, TONE WHEEL OR PULSE RING

Turn the ignition off.

Remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. CAMSHAFT 1/2 POSITION SENSOR IRREGULAR SIGNAL

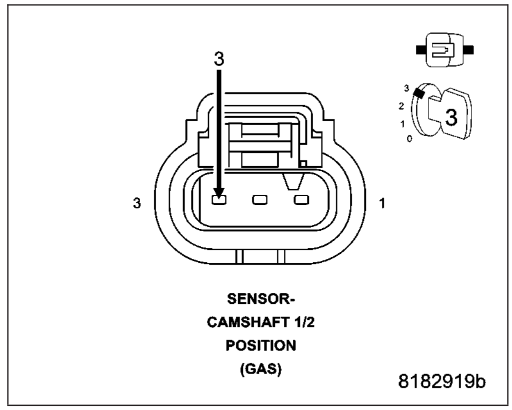
Using a lab scope and the Miller special tool #6801, backprobe the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/2 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/2 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/2 Position Sensor signals irregular or missing?

Yes >> Go to 8

No >> Go to 10

8. CAMSHAFT 1/2, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

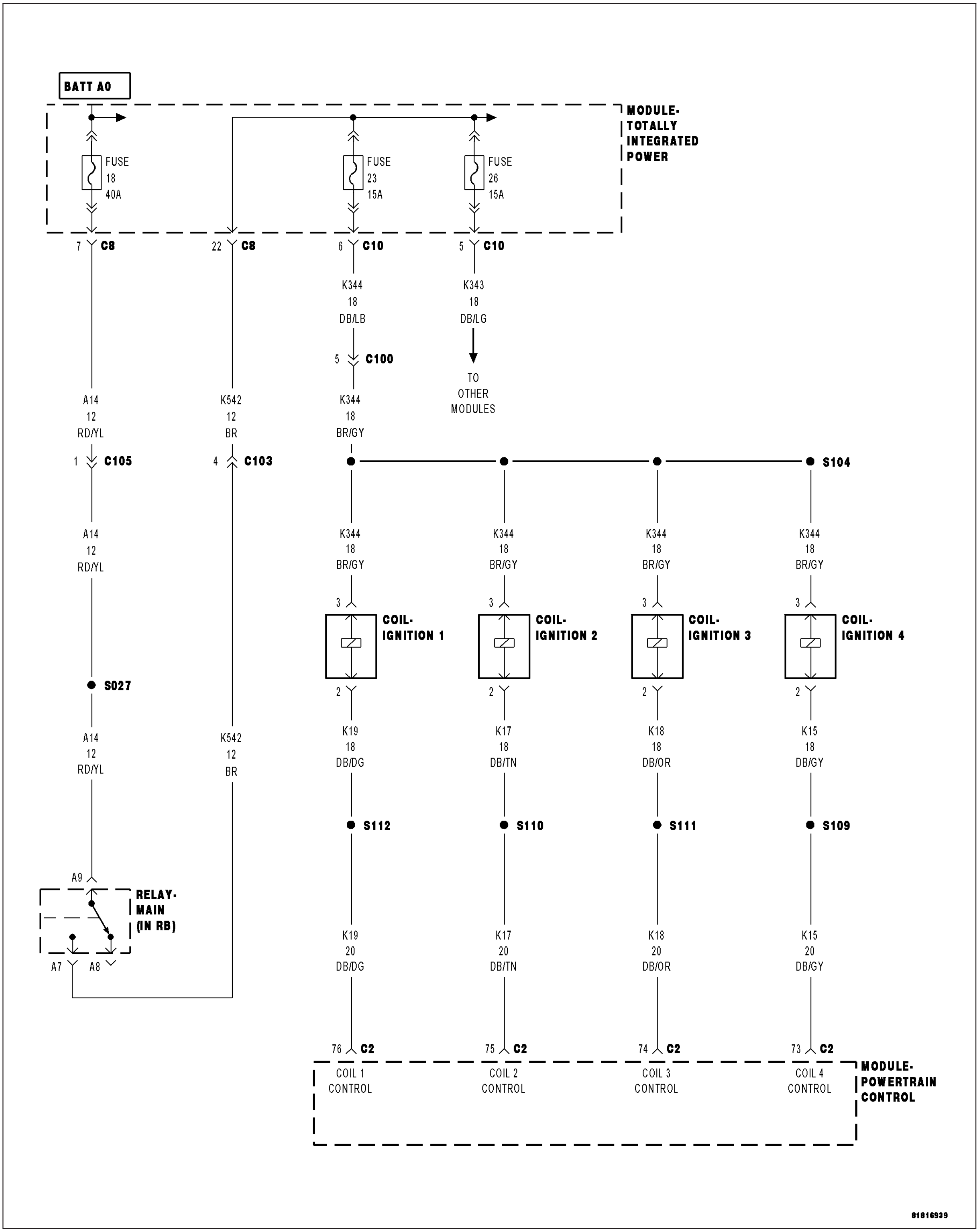
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0351-IGNITION COIL 1 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of Ignition Coil 1 does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

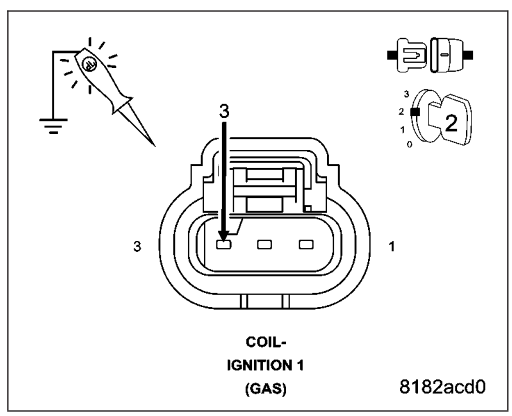
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 1 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

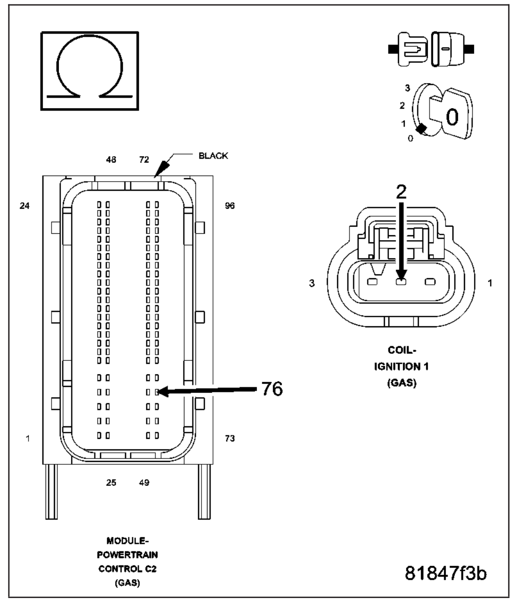
Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K19) Coil 1 Control circuit between the Ignition Coil 1 harness connector and the Powertrain Control Module (PCM) harness connector.

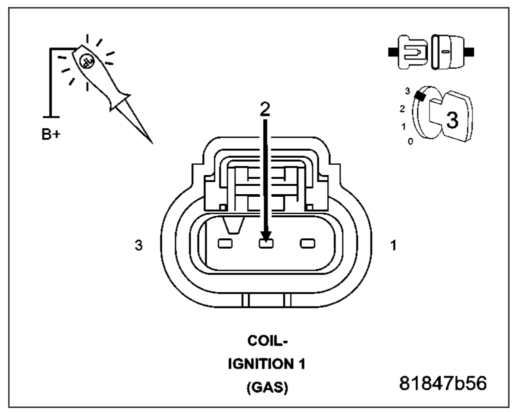
Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K19) Coil 1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. IGNITION COIL 1



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 1 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

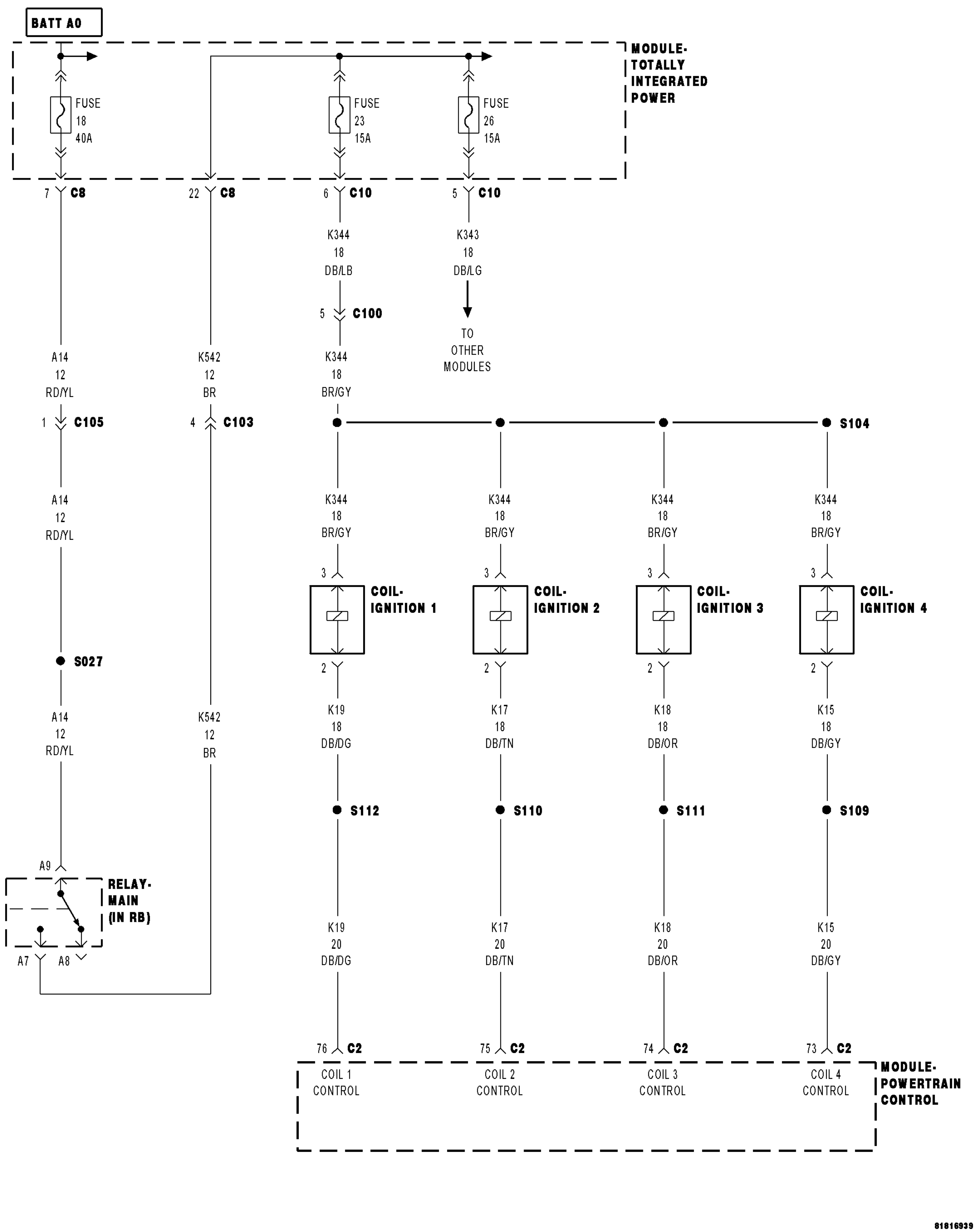
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0352-IGNITION COIL 2 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of Ignition Coil 2 does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

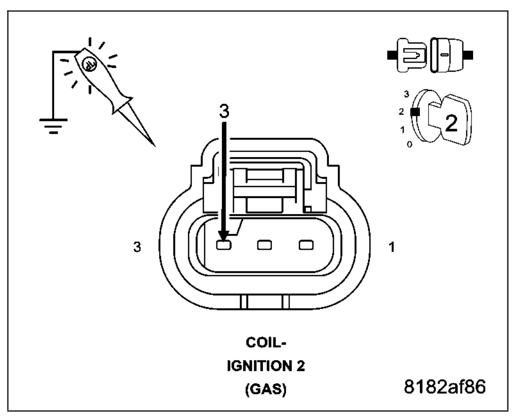
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 2 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

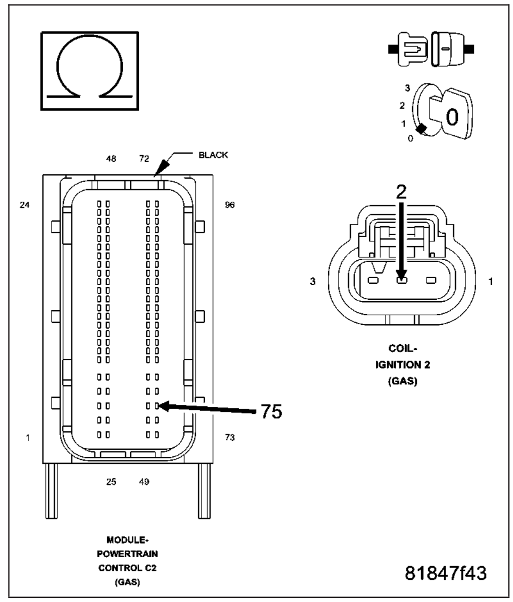
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K17) Coil 2 Control circuit between the Ignition Coil 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K17) Coil 2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

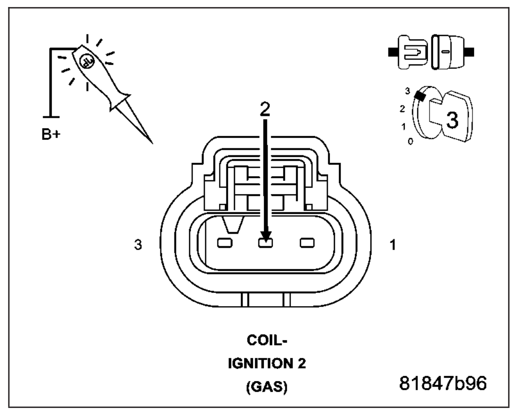
4. IGNITION COIL 2

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 2 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

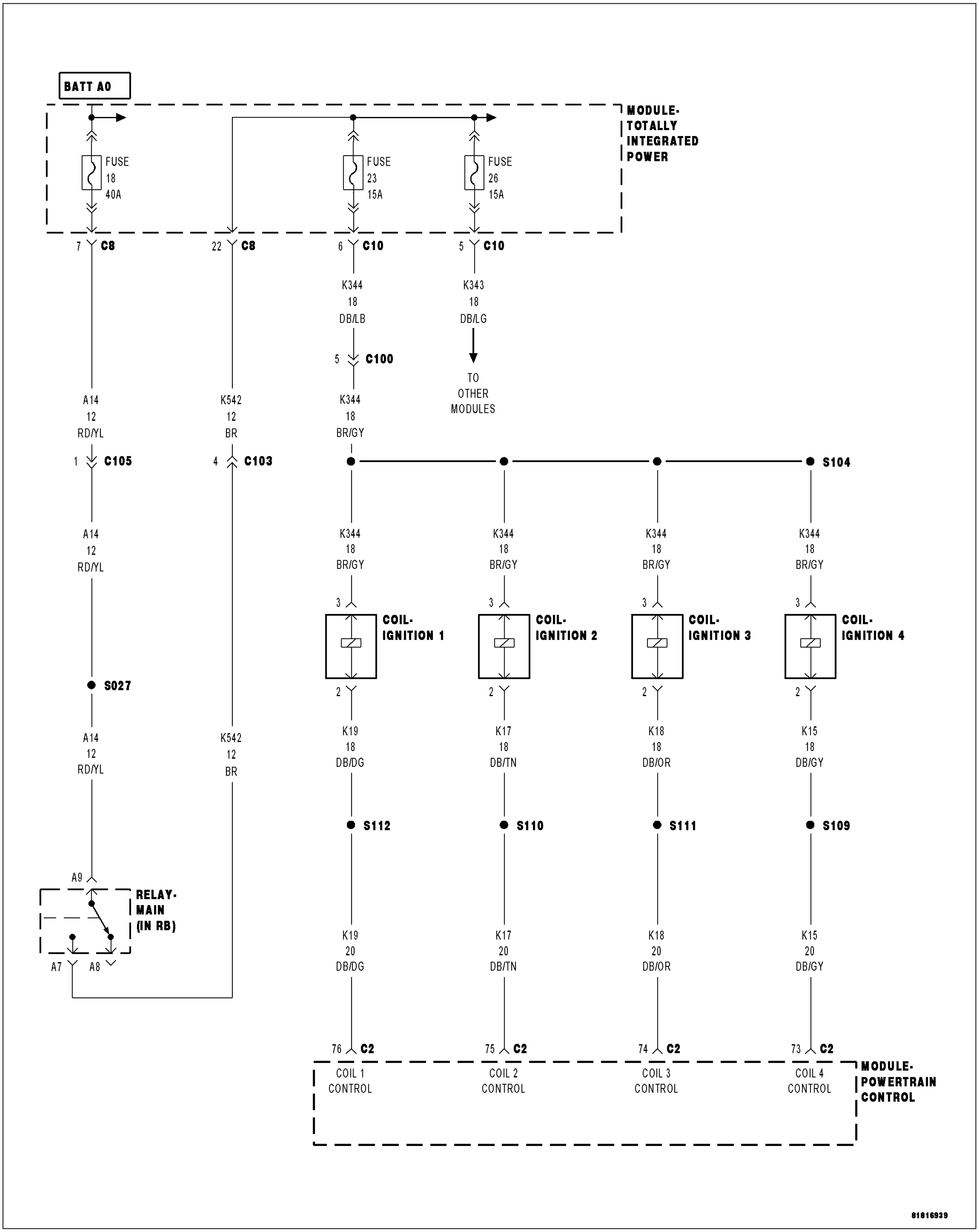
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0353-IGNITION COIL 3 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of Ignition Coil 3 does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

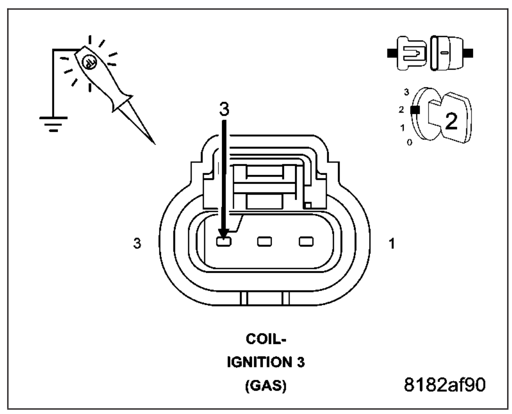
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 3 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

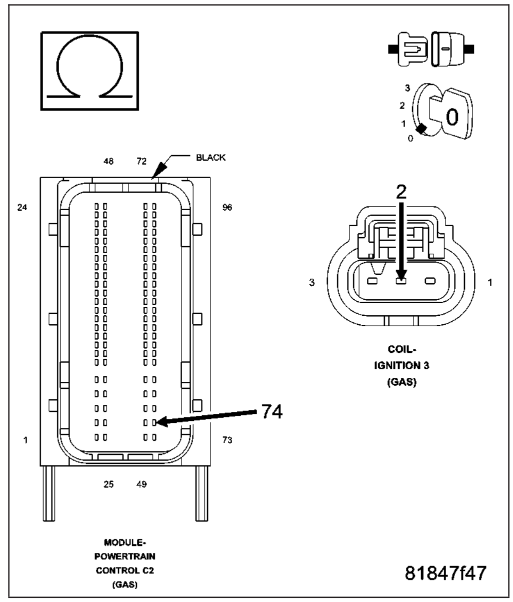
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K18) Coil 3 Control circuit between the Ignition Coil 3 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K18) Coil 3 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

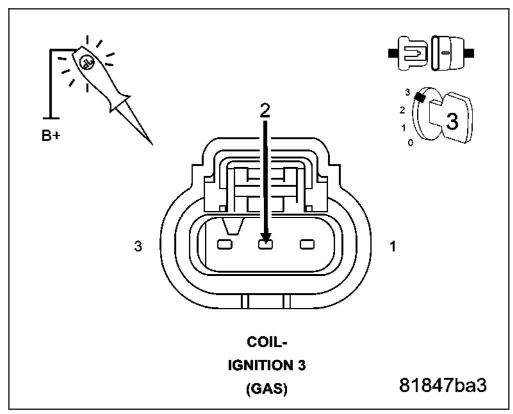
4. IGNITION COIL 3

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 3 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

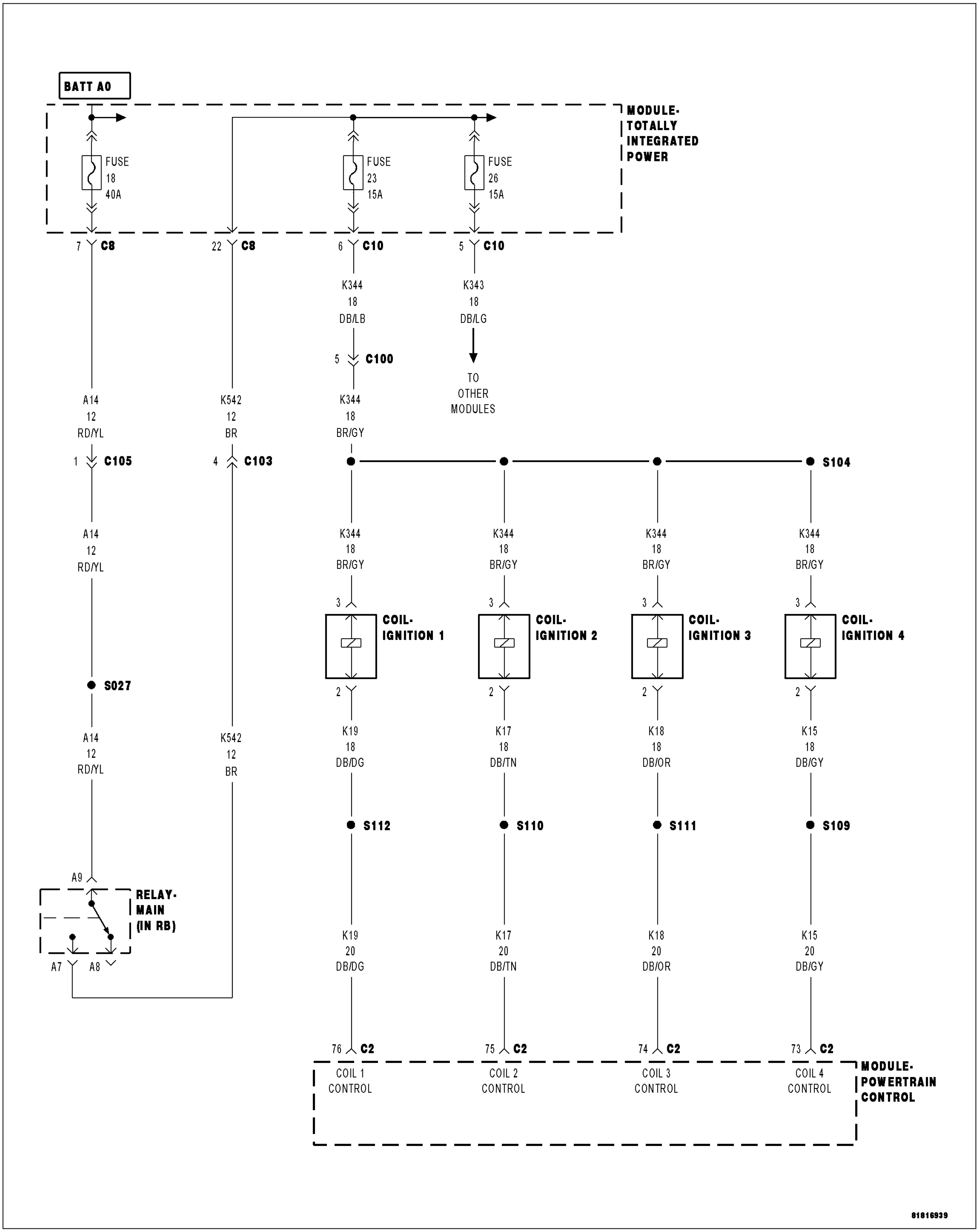
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0354-IGNITION COIL 4 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of Ignition Coil 4 does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

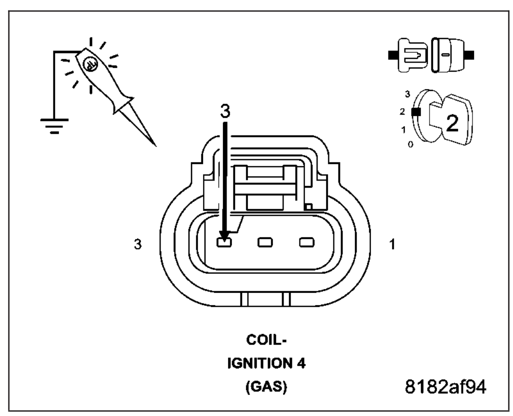
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 4 connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

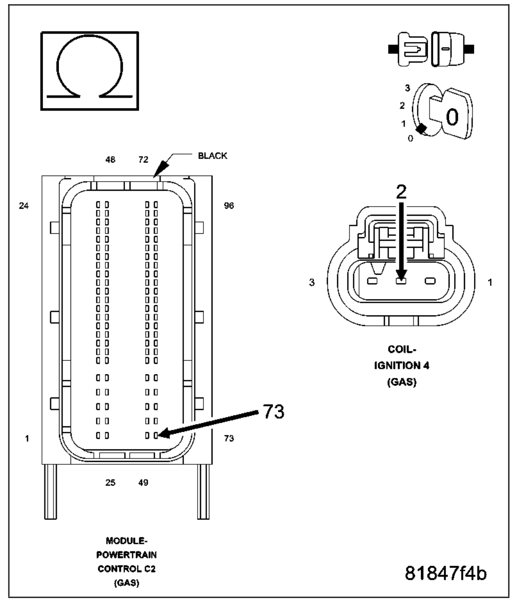
Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K15) Coil 4 Control circuit between the Ignition Coil 4 harness connector and the Powertrain Control Module (PCM) harness connector.

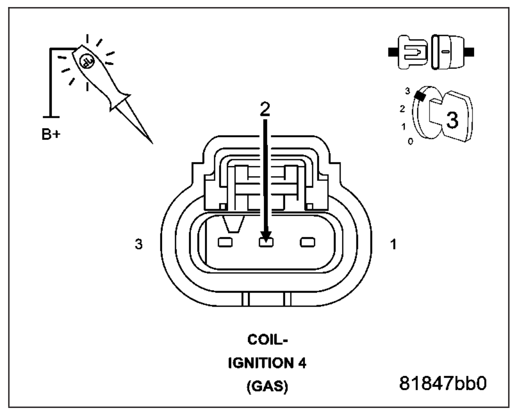
Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K15) Coil 4 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. IGNITION COIL 4



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by the PCM?

Yes >> Replace the Ignition Coil 4 in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

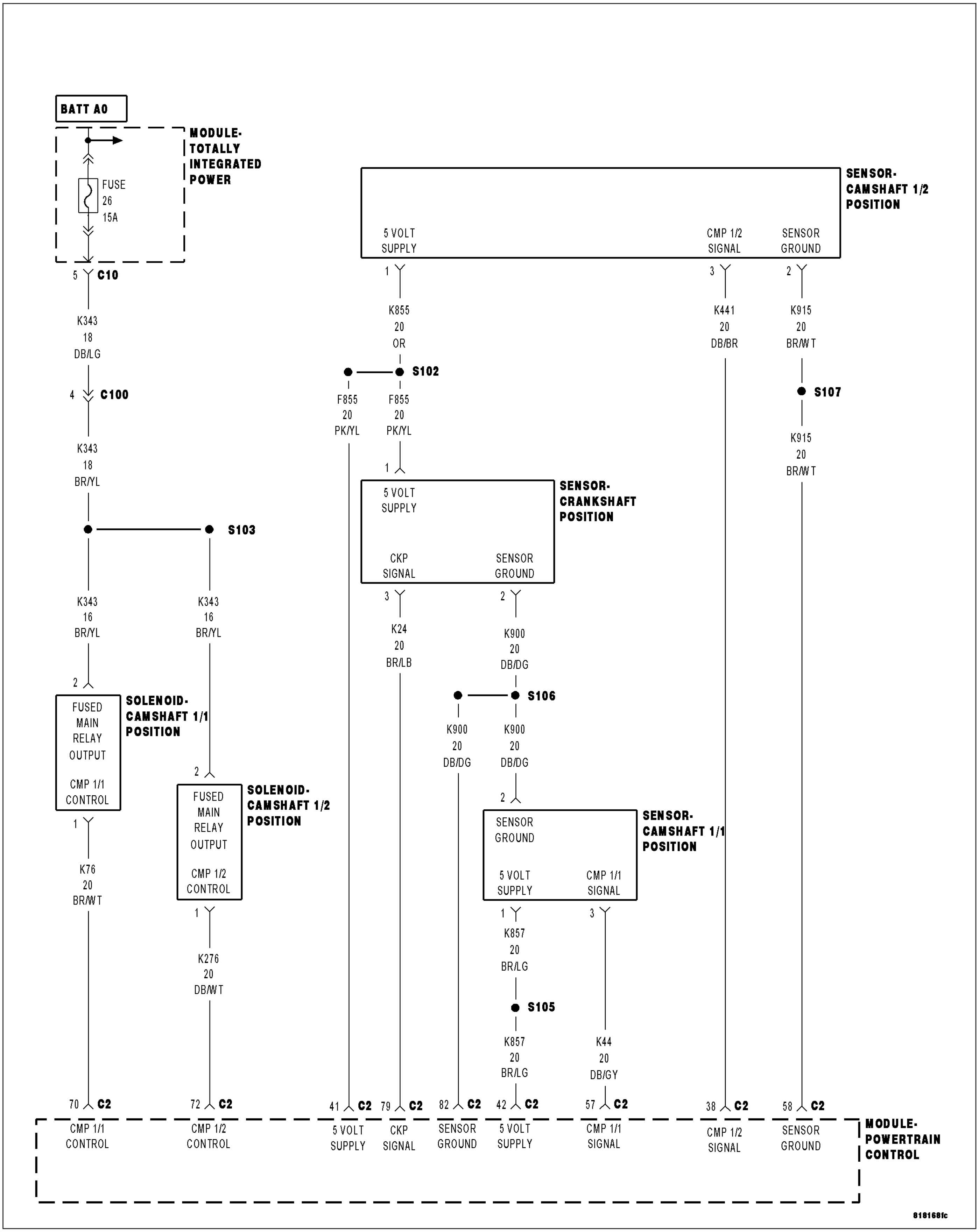
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0365-CAMSHAFT POSITION SENSOR CIRCUIT-BANK 1 SENSOR 2



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running or cranking.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Camshaft 1/2 Position Sensor.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K441) CMP 1/2 SIGNAL CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K441) CMP 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Sensor connector.

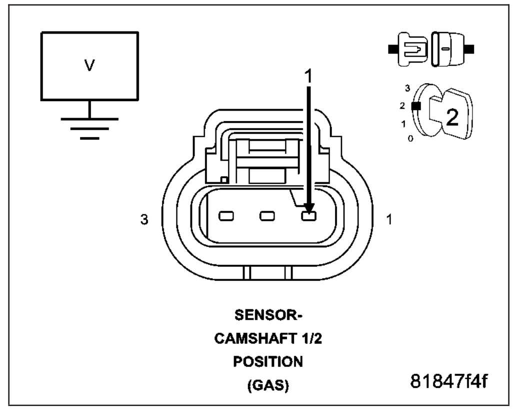
Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7



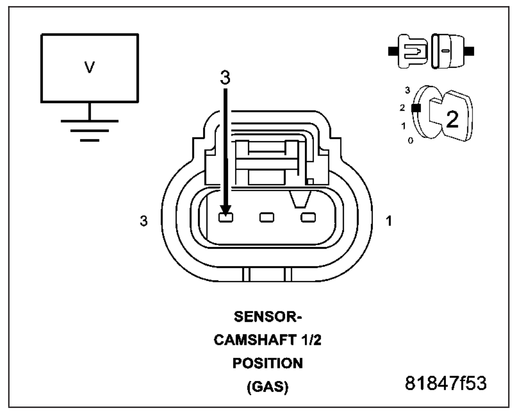
3. (K441) CMP 1/2 SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11



4. (K915) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

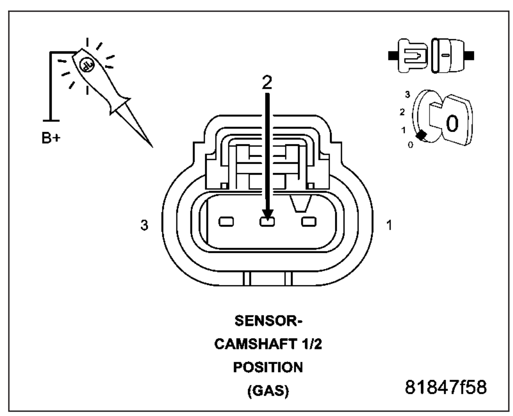
Using a 12 volt test light connected to 12 volts, check the (K915) Sensor Ground in the Camshaft 1/2 Position Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

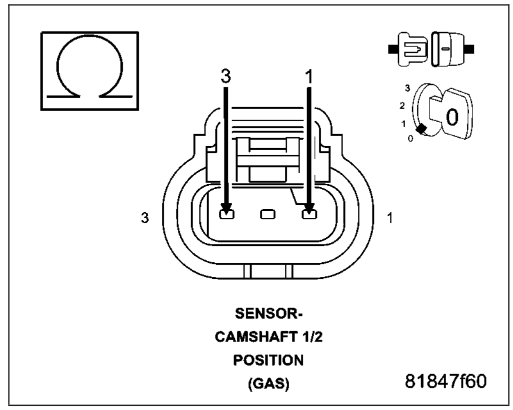
Yes >> Go to 5

No >> Go to 15



5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K441) CMP 1/2 SIGNAL CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K441) CMP 1/2 Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/1 POSITION SENSOR IRREGULAR SIGNAL

Connect the Camshaft 1/2 Position Sensor connector.

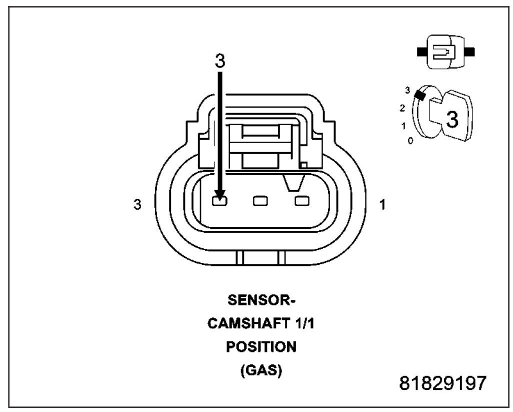
Using a lab scope and the Miller special tool #6801, backprobe the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/1 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/1 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/1 Position Sensor signals irregular or missing?

Yes >> Go to 16

No >> Go to 17

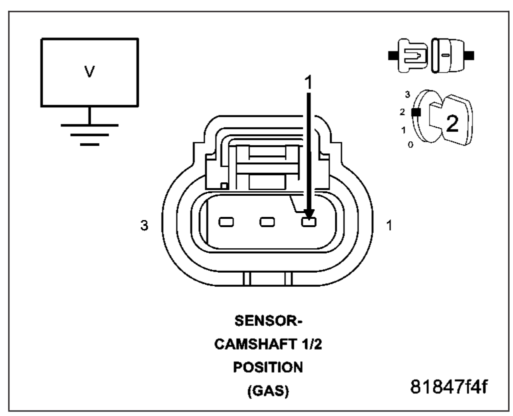
7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.

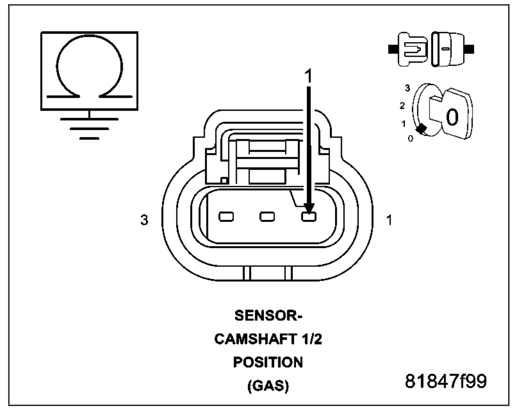
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

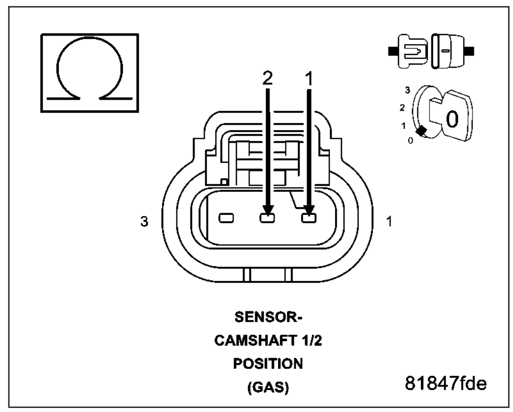
Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K915) Sensor Ground circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

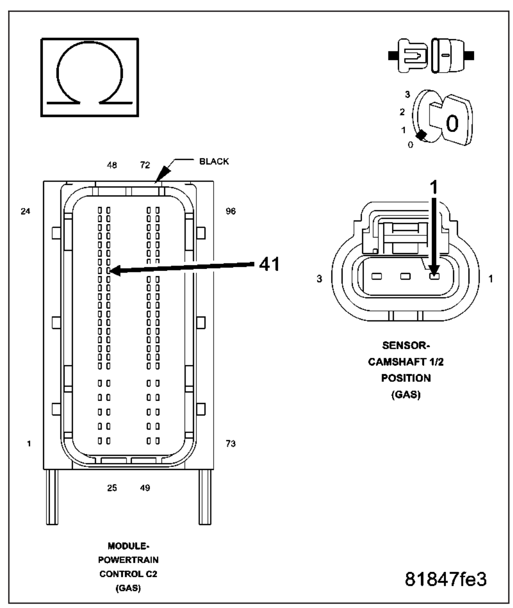
Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

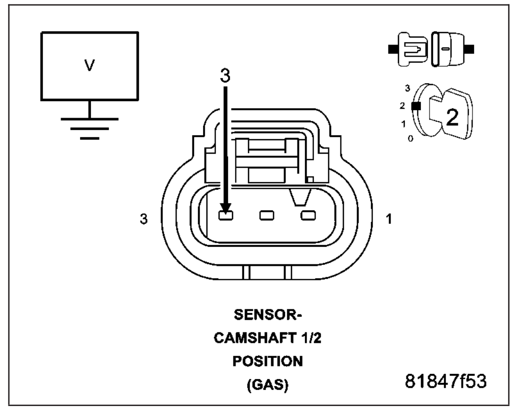
11. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K441) CMP 1/2 Signal circuit for a short to voltage.

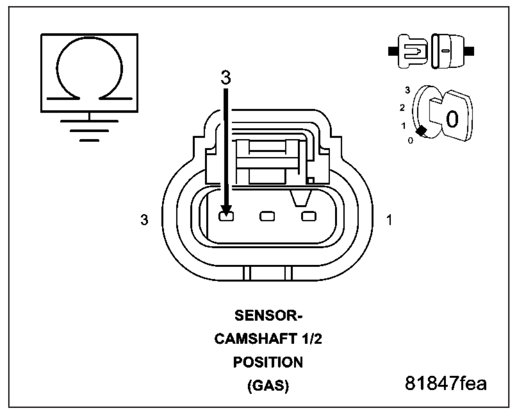
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

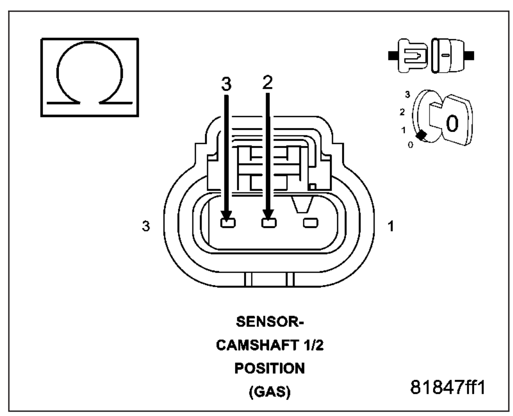
Yes >> Go to 13

No >> Repair the (K441) CMP 1/2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (K441) CMP 1/2 Signal circuit and the (K915) Sensor Ground circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

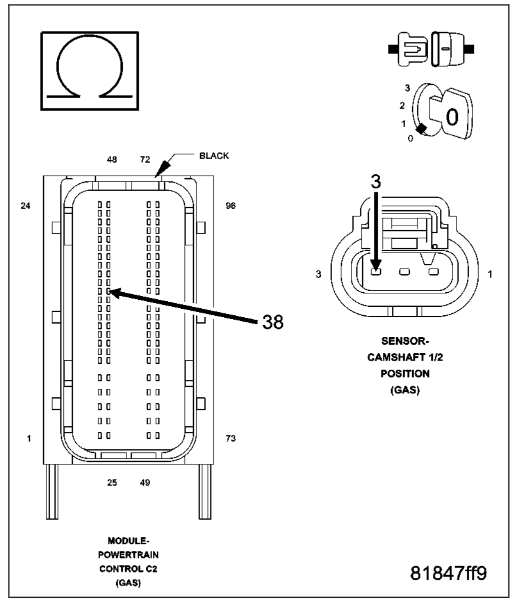
Yes >> Go to 14

No >> Repair the (K441) CMP 1/2 Signal circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K441) CMP 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K441) CMP 1/2 Signal circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K441) CMP 1/2 Signal circuit for an open circuit or high resistance.

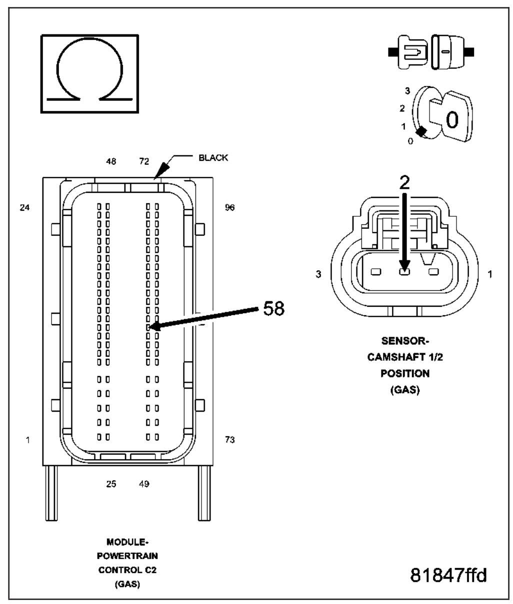
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K915) Sensor Ground circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the circuit for an (K915) Sensor Ground open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

17. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

18. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

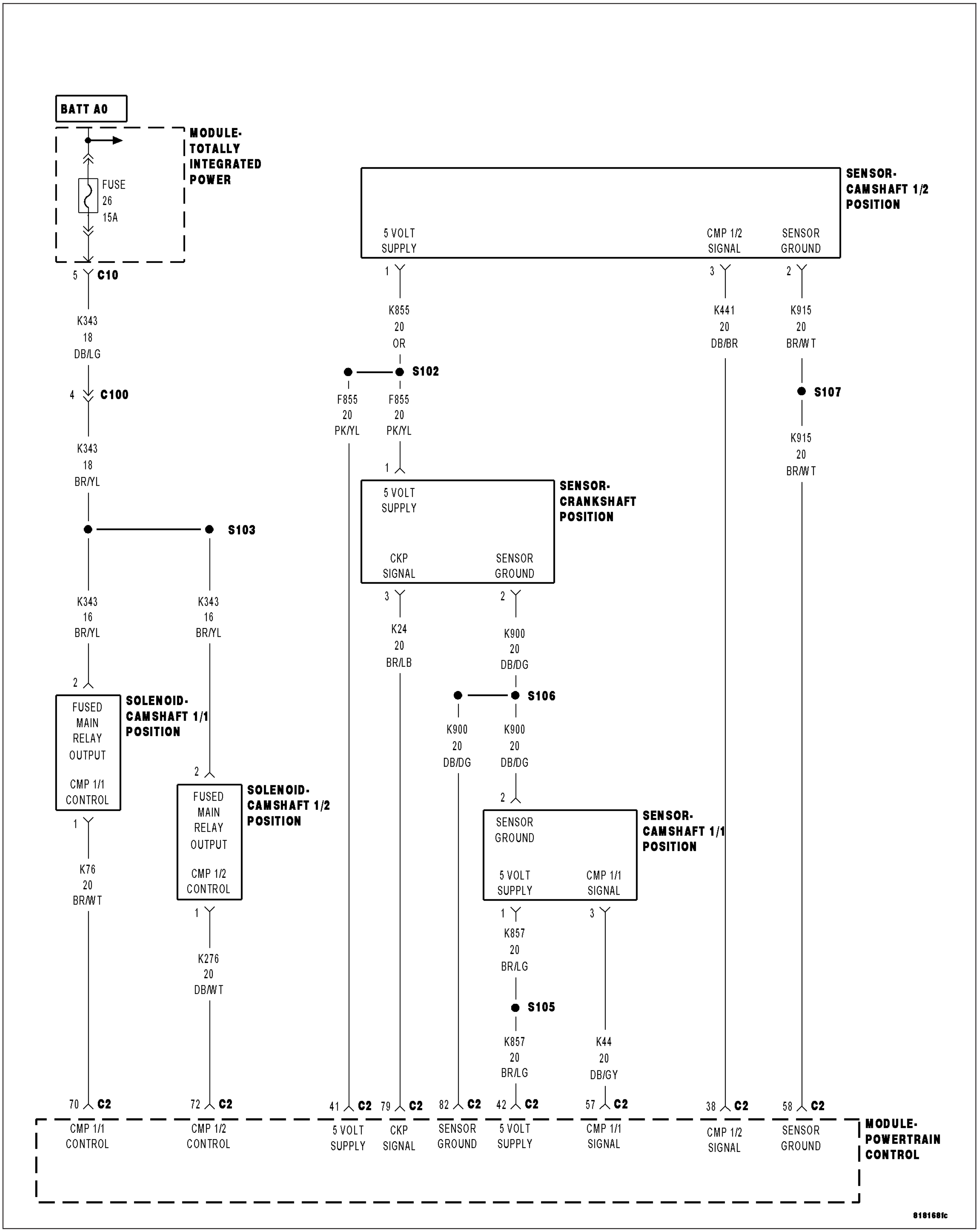
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0366-CAMSHAFT POSITION SENSOR PERFORMANCE-BANK 1 SENSOR 2



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM receives either no signal or an incorrect signal from the Camshaft 1/2 Position Sensor.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K441) CMP 1/2 SIGNAL CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT
(K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K441) CMP 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach operating temperature. If the engine will not start, crank the engine for several seconds.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

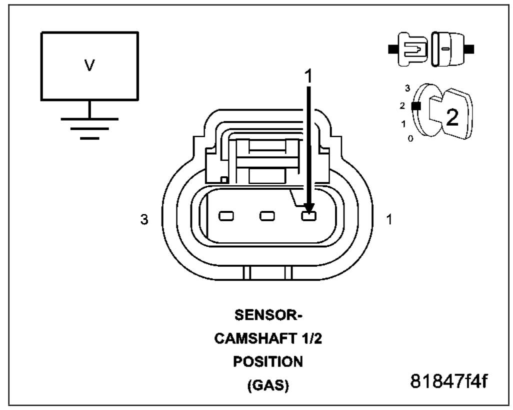
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



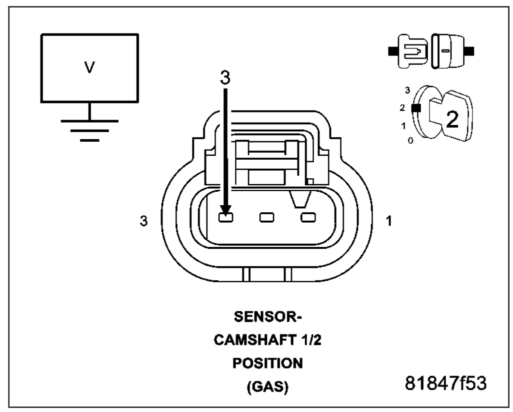
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K441) CMP 1/2 SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

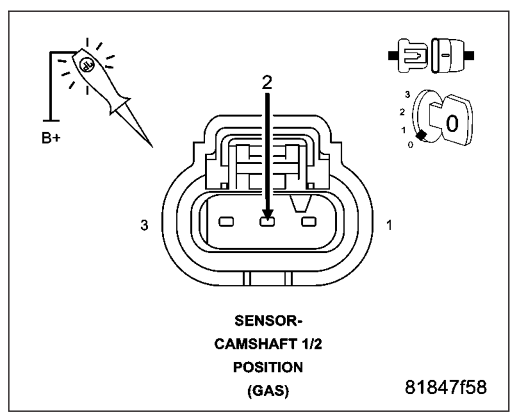
Yes >> Go to 4

No >> Go to 11

4. (K915) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K915) Sensor Ground in the Camshaft 1/2 Position Sensor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

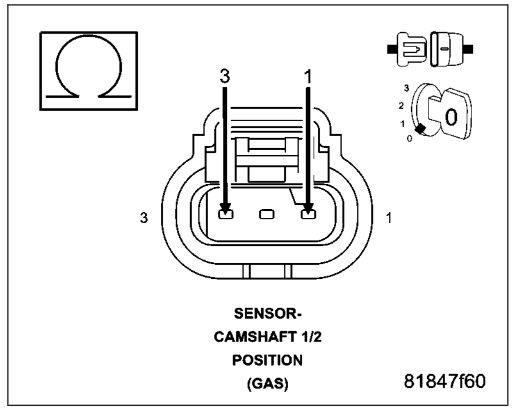
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Go to 15

5. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K441) CMP 1/2 SIGNAL CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K441) CMP 1/2 Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/1 POSITION SENSOR IRREGULAR SIGNAL

Connect the Camshaft 1/2 Position Sensor connector.

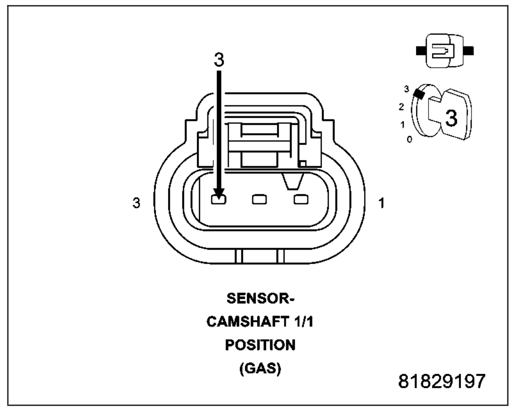
Using a lab scope and the Miller special tool #6801, backprobe the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/1 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/1 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/1 Position Sensor signals irregular or missing?

Yes >> Go to 16

No >> Go to 17

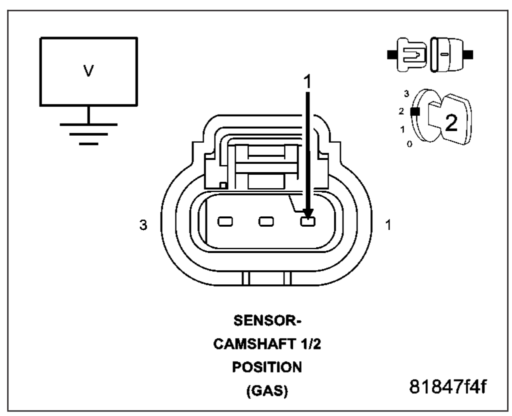
7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.

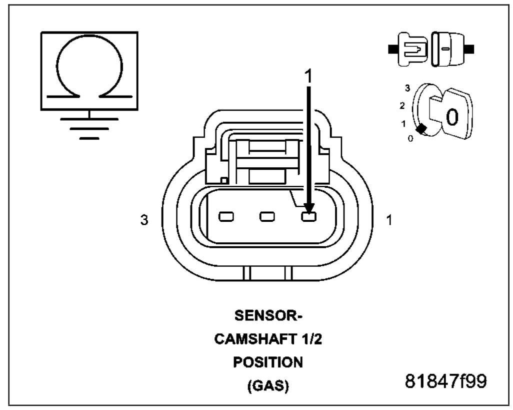
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



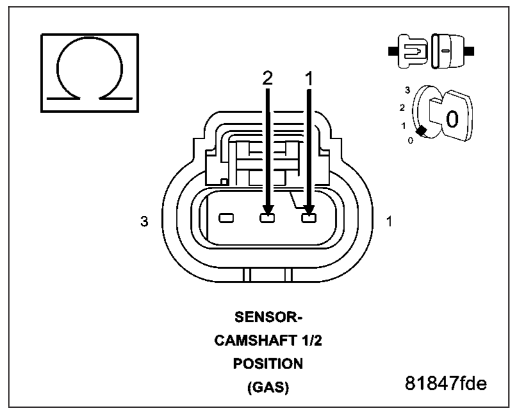
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K915) Sensor Ground circuit in the Camshaft 1/2 Position Sensor harness connector.



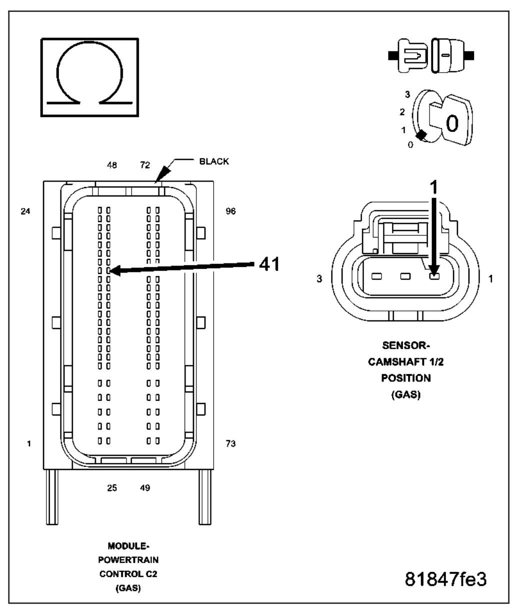
Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K915) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.

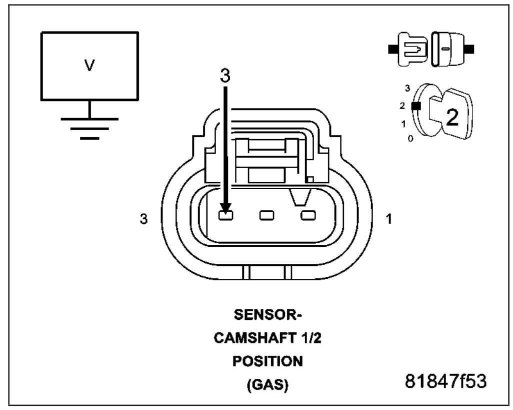


Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

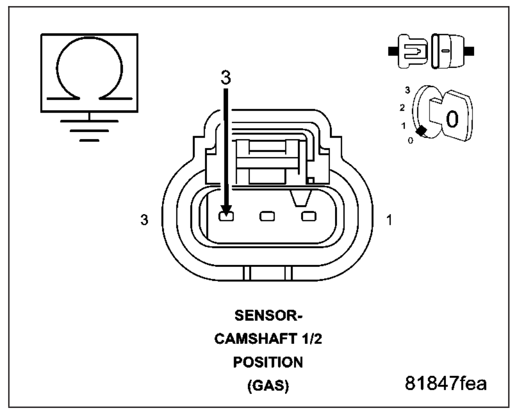
Is there any voltage present?

Yes >> Repair the (K441) CMP 1/2 Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Measure the resistance between ground and the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

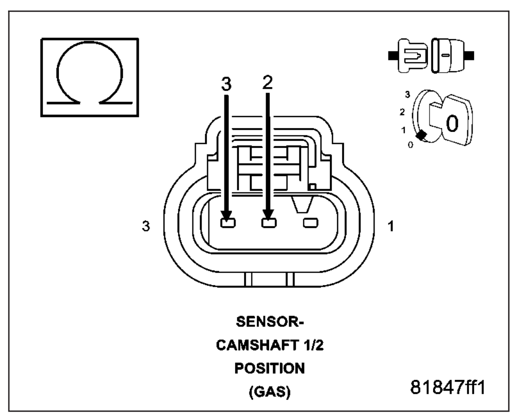
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K441) CMP 1/2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K441) CMP 1/2 SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT



Measure the resistance between the (K441) CMP 1/2 Signal circuit and the (K915) Sensor Ground circuit in the Camshaft 1/2 Position Sensor harness connector.

Is the resistance above 100 ohms?

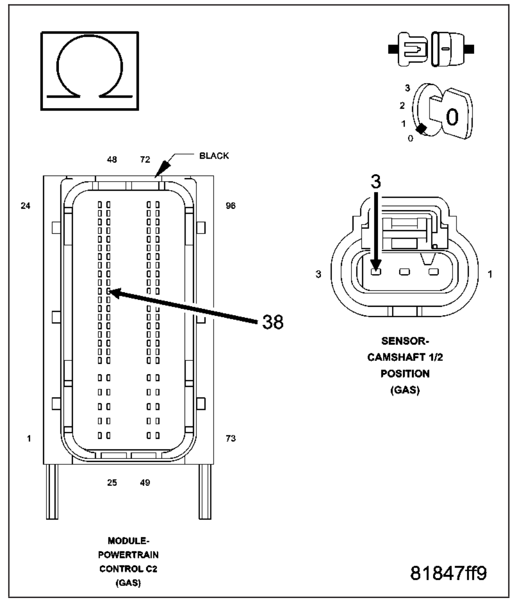
Yes >> Go to 14

No >> Repair the (K441) CMP 1/2 Signal circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K441) CMP 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K441) CMP 1/2 Signal circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K441) CMP 1/2 Signal circuit for an open circuit or high resistance.

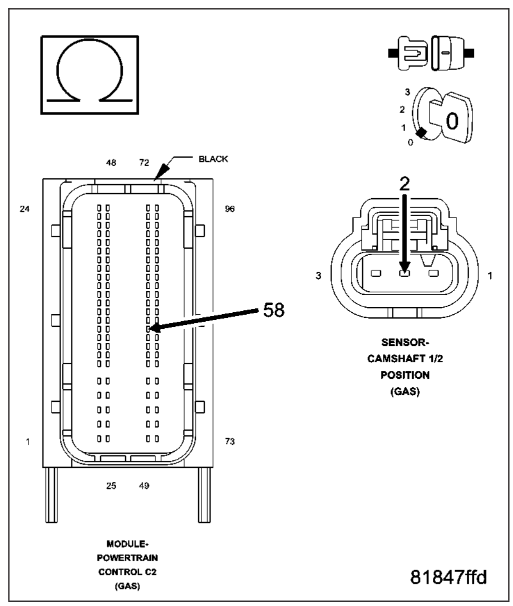
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K915) Sensor Ground circuit between the Camshaft 1/2 Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 18

No >> Repair the (K915) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

17. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

If no other problems are found, remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

18. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

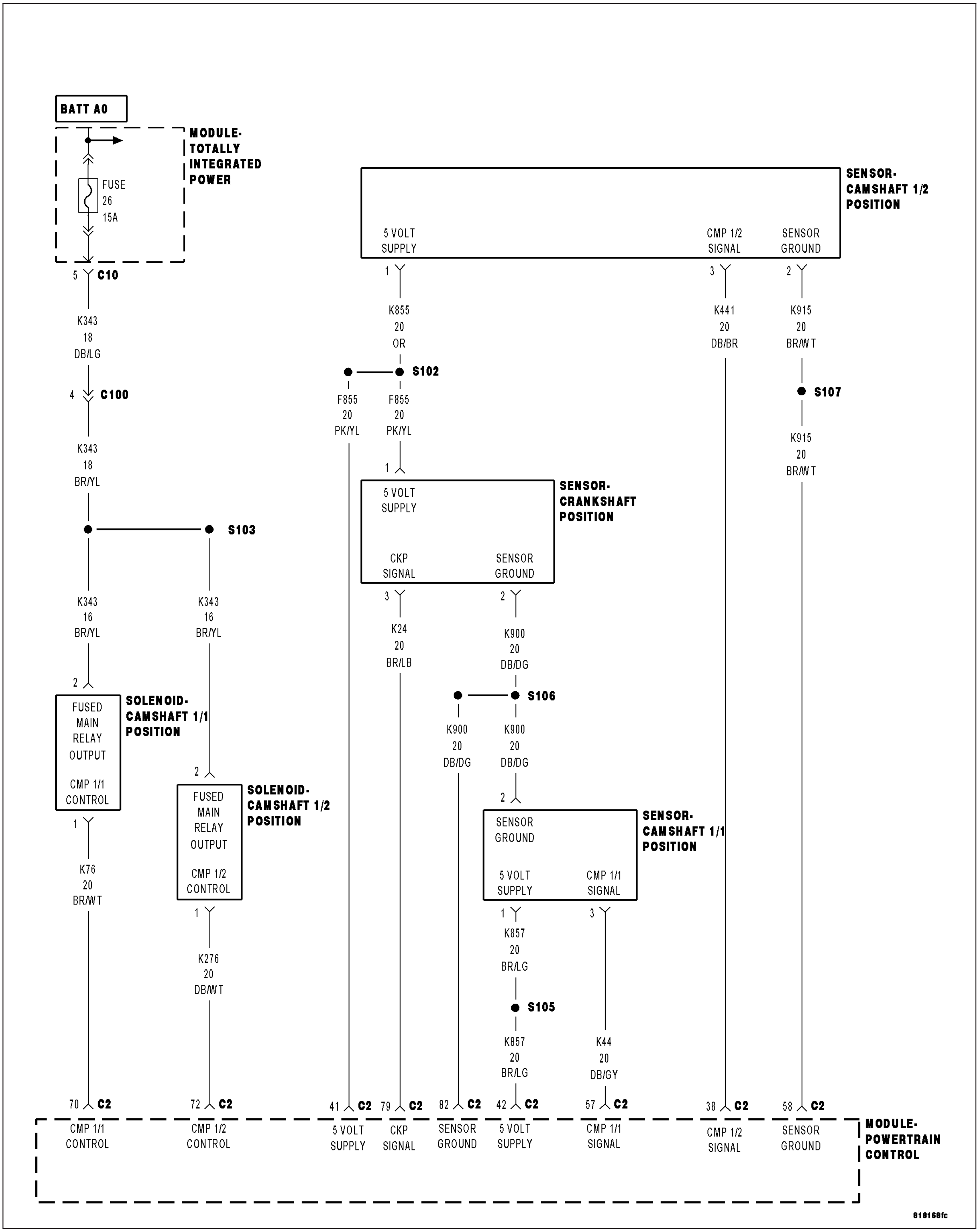
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0369-CAMSHAFT POSITION SENSOR INTERMITTENT-BANK 1 SENSOR 2



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine cranking or running.
- **Set Condition:**
  The PCM detects an intermittent signal error from the Camshaft 1/2 Position Sensor. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS
CAMSHAFT 1/1, TONE WHEEL OR FLEX PLATE
CAMSHAFT 1/2, TONE WHEEL OR FLEX PLATE
CAMSHAFT 1/1 POSITION SENSOR
CAMSHAFT 1/2 POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool select View DTCs.

Record the related Freeze Frame data.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: If the DTC does not reset it may be necessary to test drive the vehicle.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CAMSHAFT 1/2 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Camshaft 1/2 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CAMSHAFT 1/2 POSITION SENSOR IRREGULAR SIGNAL

Turn the ignition off.

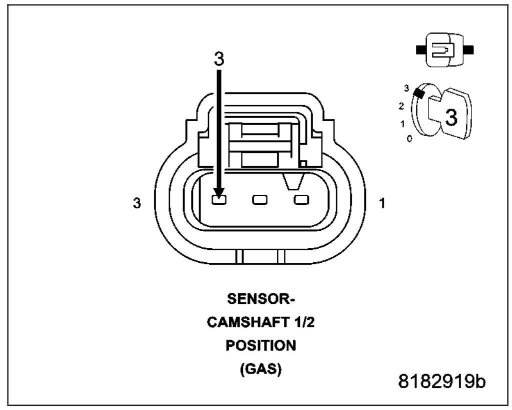
Using a lab scope and the Miller special tool #6801, backprobe the (K441) CMP 1/2 Signal circuit in the Camshaft 1/2 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/2 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/2 Position Sensor signal on the lab scope screen.



Were any Camshaft 1/2 Position Sensor signals irregular or missing?

Yes >> Go to 4

No >> Go to 6

4. CAMSHAFT 1/2, TONE WHEEL OR PULSE RING

Turn the ignition off.

Remove the Camshaft 1/2 Position Sensor.

Inspect the Camshaft 1/2 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. CAMSHAFT 1/2 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. CAMSHAFT 1/1 POSITION SENSOR CIRCUIT WIRING OR CONNECTORS

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

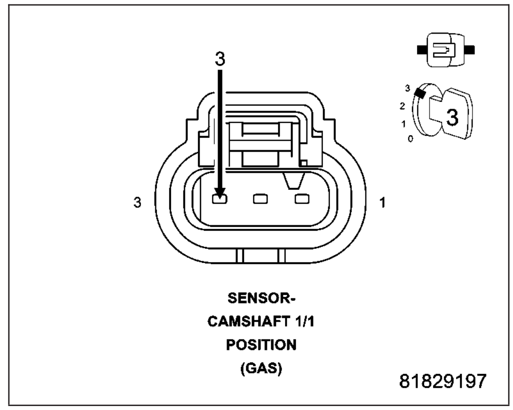
Inspect the Camshaft 1/1 Position Sensor for conditions such as loose mounting screws, damage, or cracks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. CAMSHAFT 1/1 POSITION SENSOR IRREGULAR SIGNAL



Using a lab scope and the Miller special tool #6801, backprobe the (K44) CMP 1/1 Signal circuit in the Camshaft 1/1 Position Sensor harness connector.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Camshaft 1/1 Position Sensor while monitoring the lab scope screen.

Start the engine.

Monitor the Camshaft 1/1 Position Sensor signal on the lab scope screen.

Were any Camshaft 1/1 Position Sensor signals irregular or missing?

Yes >> Go to 8

No >> Go to 10

8. CAMSHAFT 1/1, TONE WHEEL OR FLEX PLATE

Turn the ignition off.

Remove the Camshaft 1/1 Position Sensor.

Inspect the Camshaft 1/1 Position Sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. CAMSHAFT 1/1 POSITION SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0420-CATALYST 1/1 EFFICIENCY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After engine warm up, at medium throttle with vehicle speed between 35 and 60 mph.
- **Set Condition:**
  If the switch rate of the downstream O2 sensor is within the calibrated fail threshold during monitoring. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL CONDITION
AGING O2 SENSOR
CATALYTIC CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EXHAUST LEAK

NOTE: A thorough exhaust leak test must be completed before removing an O2 Sensor or any other part from the exhaust system. Do not remove any parts before an exhaust leak check has been completed.

NOTE: An exhaust leak may cause downstream fuel adaptives to rail out, resulting in a false O2 Sensor failure

Turn the ignition off.

Inspect the exhaust system for leaks between the engine and the 1/1 Oxygen Sensor.

Inspect the exhaust system for leaks between the engine and within 6 inches downstream of the 1/2 Oxygen Sensor.

Perform a leak test with Miller Tool #8404A Evaporative Emissions Leak Detector (EELD), even if an audible leak is not heard. Pay particular attention to the exhaust manifold to head surface, exhaust pipe to manifold connection, and the O2 sensor boss for leaks.

Connect the SMOKE supply tip (black hose) to the exhaust cone adapter (if equipped) and place it into the tail pipe.

Set the smoke/air control switch to SMOKE.

Press the remote smoke/air start button.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the exhaust system path and look for a leak, indicated by exiting smoke.

If a leak is concealed from view, release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Were any exhaust leaks found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. ACTIVE DTC

NOTE: A new downstream O2 Sensor and an aging upstream O2 Sensor may cause the DTC to set. Review the repair history of the vehicle before continuing.

NOTE: If an O2 Sensor DTC is set along with the Catalytic Converter Efficiency DTC, diagnose the O2 Sensor DTC(s) before continuing.

NOTE: Check for contaminants that may have damaged the O2 Sensor and Catalytic Converter: contaminated fuel, unapproved silicone, oil and coolant, repair necessary.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.
Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. CATALYTIC CONVERTER INSPECTION

NOTE: Thoroughly inspect the top and bottom of the Catalytic Converter.
Inspect the Catalytic Converter for the following:
— Damage including dents, holes, internal damage, or leaks.
— Severe discoloration caused by overheating.

Were any problems found?

Yes >> Replace the Catalytic Converter. If necessary, repair the condition that may have caused the failure.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. ENGINE MECHANICAL CONDITION

Check the exhaust for excessive smoke caused by an internal problem in the engine.

Is an engine mechanical condition present?

Yes >> Repair the engine mechanical condition as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. UPSTREAM O2 SENSOR

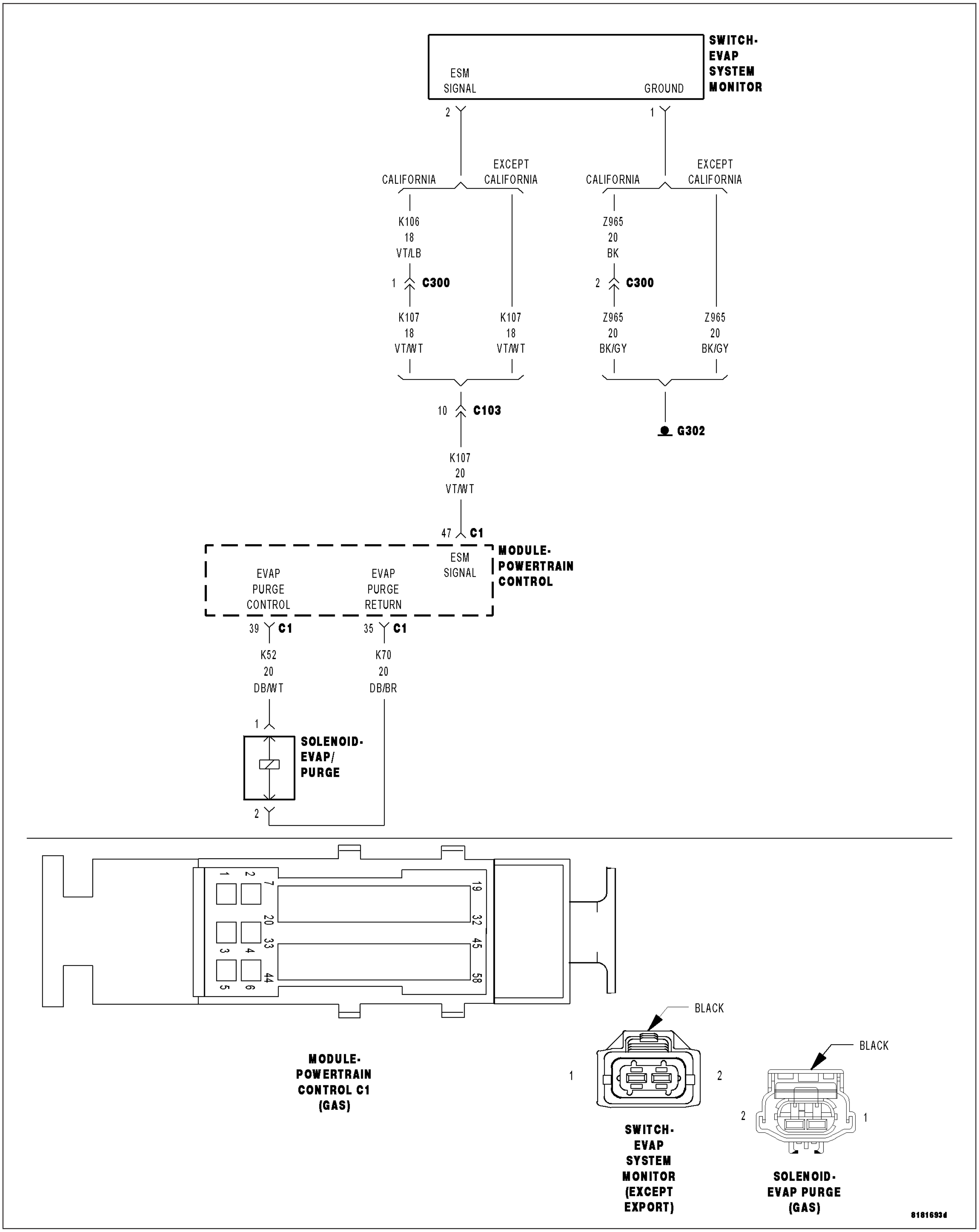
A new downstream O2 Sensor along with an aging upstream O2 Sensor may cause the DTC to set.
Review the vehicle repair history.

Has the downstream O2 Sensor been replaced without replacing the upstream O2 Sensor?

Yes >> Replace the upstream O2 Sensor as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Catalytic Converter.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0440-GENERAL EVAP SYSTEM FAILURE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running after a cold start, with the difference between ECT and AAT is less than 10° C (18 °F), fuel level between 12% and 88%, manifold vacuum greater than a minimum value, ambient temperature between 4° C and 37° C (39° F and 89° F) and altitude less than 8500 feet.
- **Set Condition:**
  When monitor conditions are met, the PCM will ramp in purge flow. If the PCM does not sense an ESM switch closure after a calculated amount of purge flow accumulation, an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
EVAP PURGE SOLENOID VACUUM SUPPLY
EVAP SYSTEM LEAK
EVAP PURGE HOSE/TUBE OBSTRUCTION
(Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K107) ESM SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
EVAP PURGE SOLENOID
EVAP SYSTEM MONITOR SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EVAP SYSTEM PRETEST

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the Freeze Frame data if any DTCs are present.

Review the vehicle repair history for items related to the current condition.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any related technical service bulletins (TSBs) and, if any apply, follow the recommended procedure.

Select the appropriate response from the list below:

A technical service bulletin (TSB) repaired the condition.
Test complete.

A DTC is present, no TSBs apply, or the TSB did not repair the condition.
Go to 2

2. DTC IS ACTIVE

NOTE: Allow the vehicle to cool to ambient temperature before continuing with this procedure.

NOTE: A loose gas cap may have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the ESIM FORCED MONITOR TEST. Allow the test to complete.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. EVAP SYSTEM INSPECTION

Inspect the EVAP System for any of the following conditions:

- Holes or cracks
- Loose seal points
- Damaged or missing components
- Incorrect routing of hoses and tubes
- Loose or missing Fuel Cap
- Damaged or missing Fuel Cap seal
- Improper installation of the Fuel Cap
- Damaged Locking tabs on the Fuel Cap and/or filler tube
- Damaged seal points on the Fuel Cap and/or filler tube

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. INSUFFICIENT VACUUM SUPPLY TO THE EVAP PURGE SOLENOID

Inspect the Evap Purge Solenoid vacuum supply hose for proper routing and installation.

Make sure the vacuum supply hose between the throttle body or intake manifold and the EVAP Purge Solenoid is free from any obstructions or blockage.

Make sure the vacuum port at the throttle body or intake manifold is free from any obstructions or blockage.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. EVAP PURGE SOLENOID

NOTE: After disconnecting the Evap Purge vacuum connections, inspect the lines and solenoid for signs of contamination.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ side of the EVAP Purge Solenoid.

NOTE: The solenoid should hold vacuum for a minimum of 15 seconds.

Turn the ignition on.

With the scan tool, actuate the EVAP Purge Solenoid to the ON position.

NOTE: The vacuum should drop when the solenoid is actuated.

Does the solenoid function as described above?

Yes >> Go to 6

No >> Replace the EVAP Purge Solenoid.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. ESIM SWITCH STATE

Turn the ignition off.

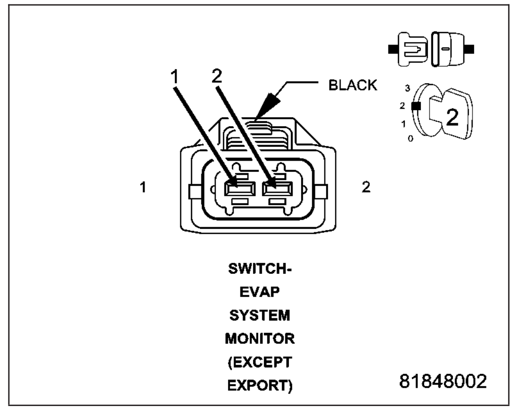
Disconnect the Evap System Monitor Switch harness connector.

Turn the ignition on.

Monitor the ESIM Switch state on the scan tool.

Carefully connect a jumper wire between the (K107) ESM Signal circuit and the (Z965) Ground circuit in the Evap System Monitor Switch harness connector.

Monitor the ESIM Switch state on the scan tool.



Does the Switch change from OPEN to CLOSED with the jumper in place?

Yes >> Go to 9

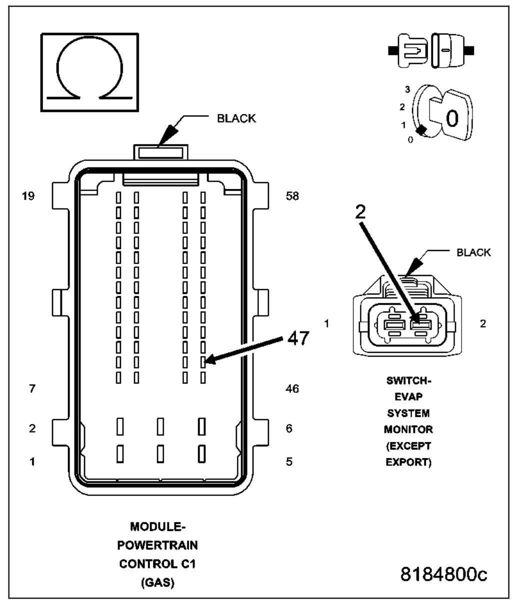
No >> Go to 7

7. (K107) ESM SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance of the (K107) ESM Signal circuit between the Evap System Monitor Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

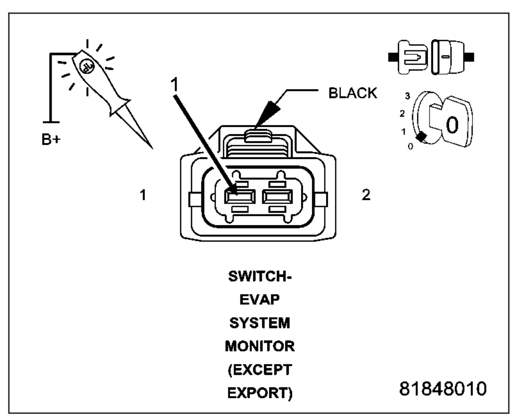
No >> Repair the (K107) ESM Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (Z965) Ground circuit in the Evap System Monitor Switch harness connector.



NOTE: The test light should be illuminate and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 13

No >> Repair the (Z965) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. VERIFY EVAPORATIVE EMISSION LEAK

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD).

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the EVAP Canister.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the .040 orifice on the tester's control panel.

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute.

Install the service port adapter #8404-14 on the vehicle's service port (if equipped) or install the #8404-ADP into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates that a leak is present.

BELOW the red flag indicates that the system is sealed.

Does the flow meter indicate that a leak is present?

Yes >> Go to 10

No >> Go to 11

10. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

Remove the Air supply hose from the service port or the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move at this point.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that are left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow when viewed with a UV light.

NOTE: The EVAP System is divided into three zones. A leak from any of these zones can cause this DTC to set. The lists below specify the possible leak points in the specific zones. For further assistance see the Zone Identification Charts below.

- — ZONE 1—

1 Fuel Cap

2 Recirculation Check Valve.

3 Vapor Recirculation Line.

4 Signal Vapor Line for FVM.

5 Flow Management Valve.

6 Fuel Tank to Canister Vapor Line.

7 Fuel Tank Vent (Check Valve).

8 Vapor Line to Canister.

9 Flow Control Orifice.

10 Control Valve.

11 Liquid Trap.

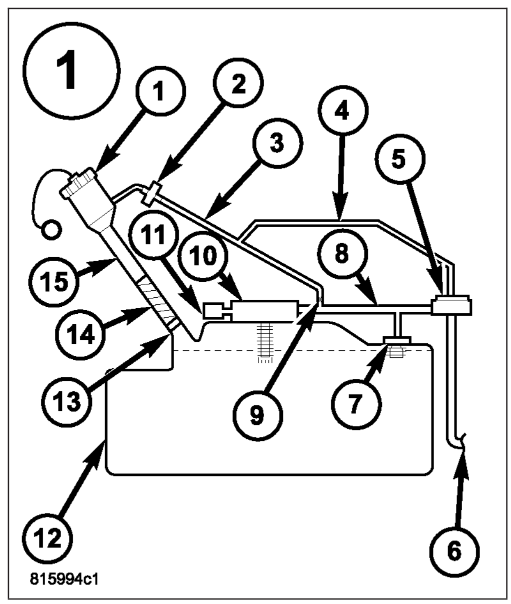
12 Fuel Tank.

13 Check valve.

14 Fuel Fill Tube to Tank connector.

15 Fuel Fill Tube

Damaged or disconnected components.



- — ZONE 2 —

1 Filter.

2 ESM.

3 Canister Vent Line.

4 Evap Canister.

5 Chassis Purge Valve.

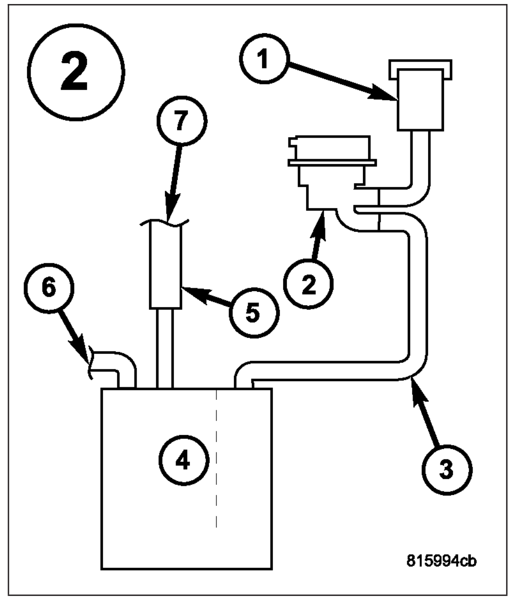
6 Fuel Tank to Canister Vapor Line connection.

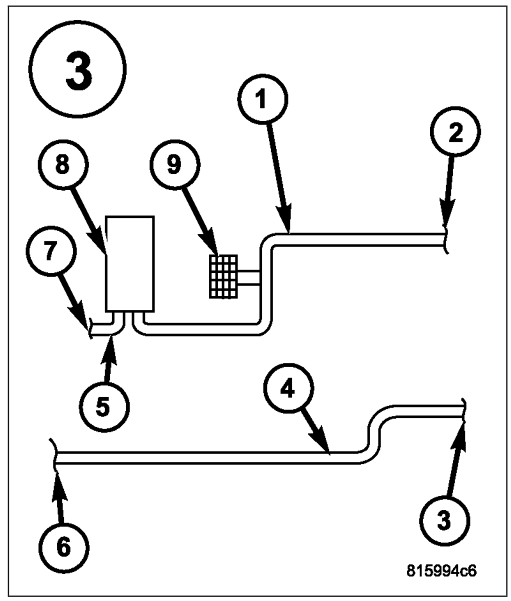
7 Evap Purge connection.

- — ZONE 3 —

1 Evap Purge Vacuum Line.

2 Connection to Chassis Line.
3 Connection to Canister.
4 Chassis Purge Line.
5 Evap Purge Vacuum Line.
6 Connection to Evap Purge Harness.
7 Chassis Evap Purge Line connection to Engine Vacuum.
8 Evap Purge Valve.
9 Service Port.





NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke or dye may or may not be visible. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 11

11. EVAP PURGE HOSE/TUBE OBSTRUCTION

Inspect the Evap Purge hose/tube for proper routing and installation between the EVAP Purge Solenoid and the Fuel Tank and between the Fuel Tank and the Evap Purge Canister.

Make sure the hose/tube is not damaged or kinked and is free from any obstructions or blockage.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. EVAP SYSTEM MONITOR SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap System Monitor Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Evap System Monitor Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap System Monitor Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

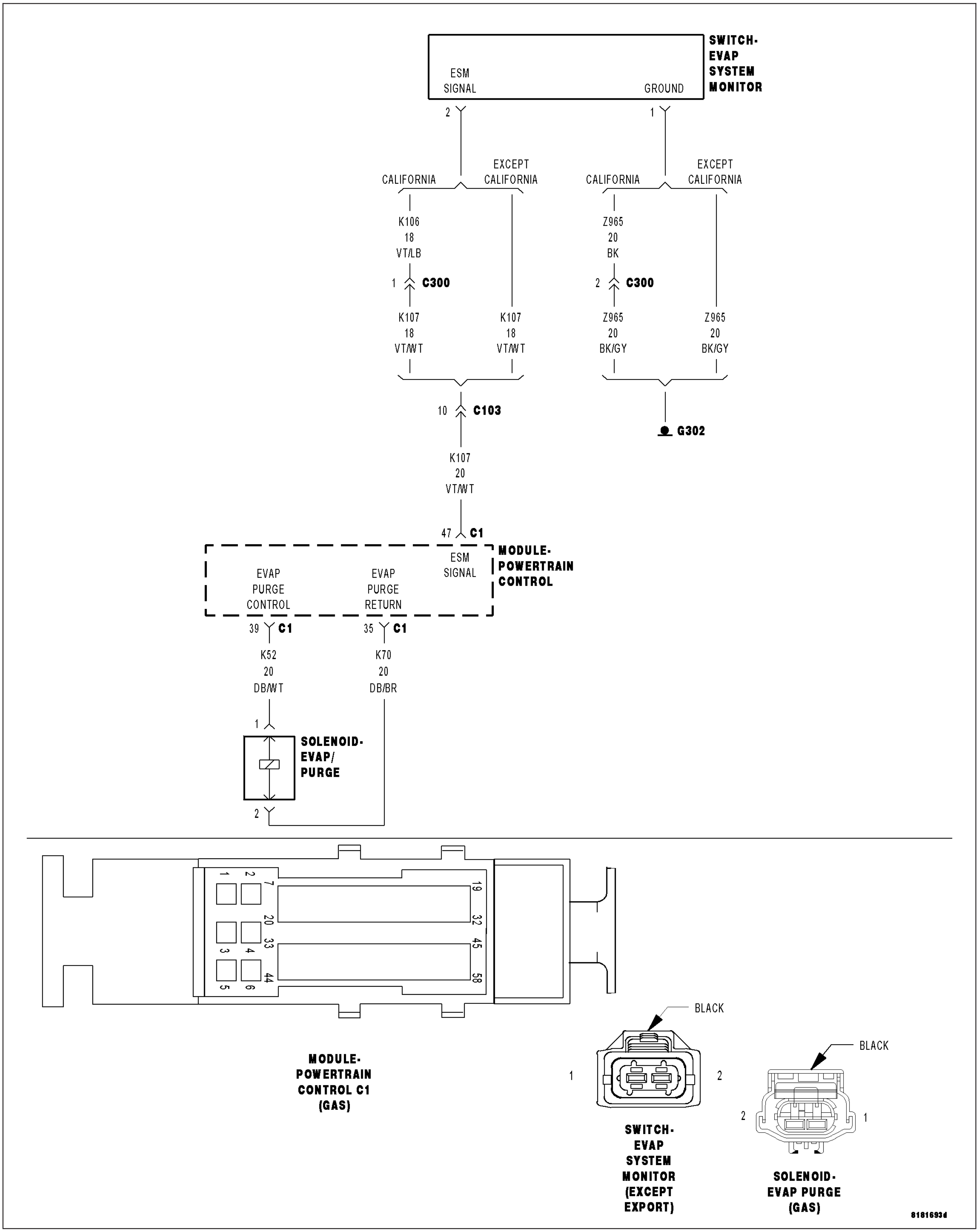
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0441-EVAP PURGE SYSTEM PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Evap Purge Monitor tests the integrity of the hoses/tube between the throttle body/intake and the fuel tank. The monitor is a two stage test and runs only after the Evap system passes the small leak test. Stage one is non-intrusive. The PCM monitors the purge vapor ratio and the ESM switch closed ratio. If the purge vapor ratio is above a calculated value, the monitor passes. If the ESM switch closed ratio is greater than calculated value when purge flow is greater than a minimum value, the monitor passes. Stage two is an intrusive test and runs only if stage one does not pass. The PCM commands the purge solenoid to flow at a specified rate to force the purge vapor ratio to update. The ratio is compared to a calibrated specification. If it is less than specified, a one trip failure is recorded. This test can detect if the purge hose is off, obstructed, or the purge valve is not operational.

- **When Monitored:**
  With the engine running, after the Evap System small leak test has passed.
- **Set Condition:**
  If the PCM detects that the purge vapor ratio and the ESM switch closed ratio are below a calculated value, the PCM commands the purge solenoid to flow at a specified rate to update the purge vapor ratio. If the ratio remains below a specified value, a one trip failure is recorded. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
EVAP PURGE SOLENOID VACUUM SUPPLY
EVAP PURGE HOSE/TUBE OBSTRUCTION
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EVAP SYSTEM PRETEST

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the Freeze Frame data if any DTCs are present.

Review the vehicle repair history for items related to the current condition.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any related technical service bulletins (TSBs) and, if any apply, follow the recommended procedure.

Select the appropriate response from the list below:

A technical service bulletin (TSB) repaired the condition.
Test complete.

A DTC is present, no TSBs apply, or the TSB did not repair the condition.
Go to 2

2. DTC IS ACTIVE

NOTE: If P0443 is set along with this DTC, perform the diagnostic procedure for P0443 before continuing with this test.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the ESIM FORCED MONITOR TEST. Allow the test to complete.

With a scan tool, select View DTCs.

NOTE: If any other DTC sets, active or pending, perform the diagnostic procedure for that DTC before proceeding with this test.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. EVAP SYSTEM INSPECTION

Inspect the EVAP System for any of the following conditions:

- Holes or cracks
- Loose seal points
- Damaged or missing components
- Incorrect routing of hoses and tubes
- Loose or missing Fuel Cap
- Damaged or missing Fuel Cap seal
- Improper installation of the Fuel Cap
- Damaged Locking tabs on the Fuel Cap and/or filler tube
- Damaged seal points on the Fuel Cap and/or filler tube

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. INSUFFICIENT VACUUM SUPPLY TO THE EVAP PURGE SOLENOID

Inspect the Evap Purge Solenoid vacuum supply hose for proper routing and installation.

Make sure the vacuum supply hose between the throttle body or intake manifold and the EVAP Purge Solenoid is free from any obstructions or blockage.

Make sure the vacuum port at the throttle body or intake manifold is free from any obstructions or blockage.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. EVAP PURGE HOSE/TUBE OBSTRUCTION

Inspect the Evap Purge hose/tube for proper routing and installation between the EVAP Purge Solenoid and the Fuel Tank and between the Fuel Tank and the Evap Purge Canister.

Make sure the hose/tube is not damaged or kinked and is free from any obstructions or blockage.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. EVAP PURGE SOLENOID

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for signs of contamination.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ side of the EVAP Purge Solenoid.

NOTE: The solenoid should hold vacuum for a minimum of 15 seconds.

Turn the ignition on.

With the scan tool, actuate the EVAP Purge Solenoid to the ON position.

NOTE: The vacuum should drop when the solenoid is actuated.

Does the solenoid function as described above?

Yes >> Go to 7

No >> Replace the EVAP Purge Solenoid.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EVAP Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

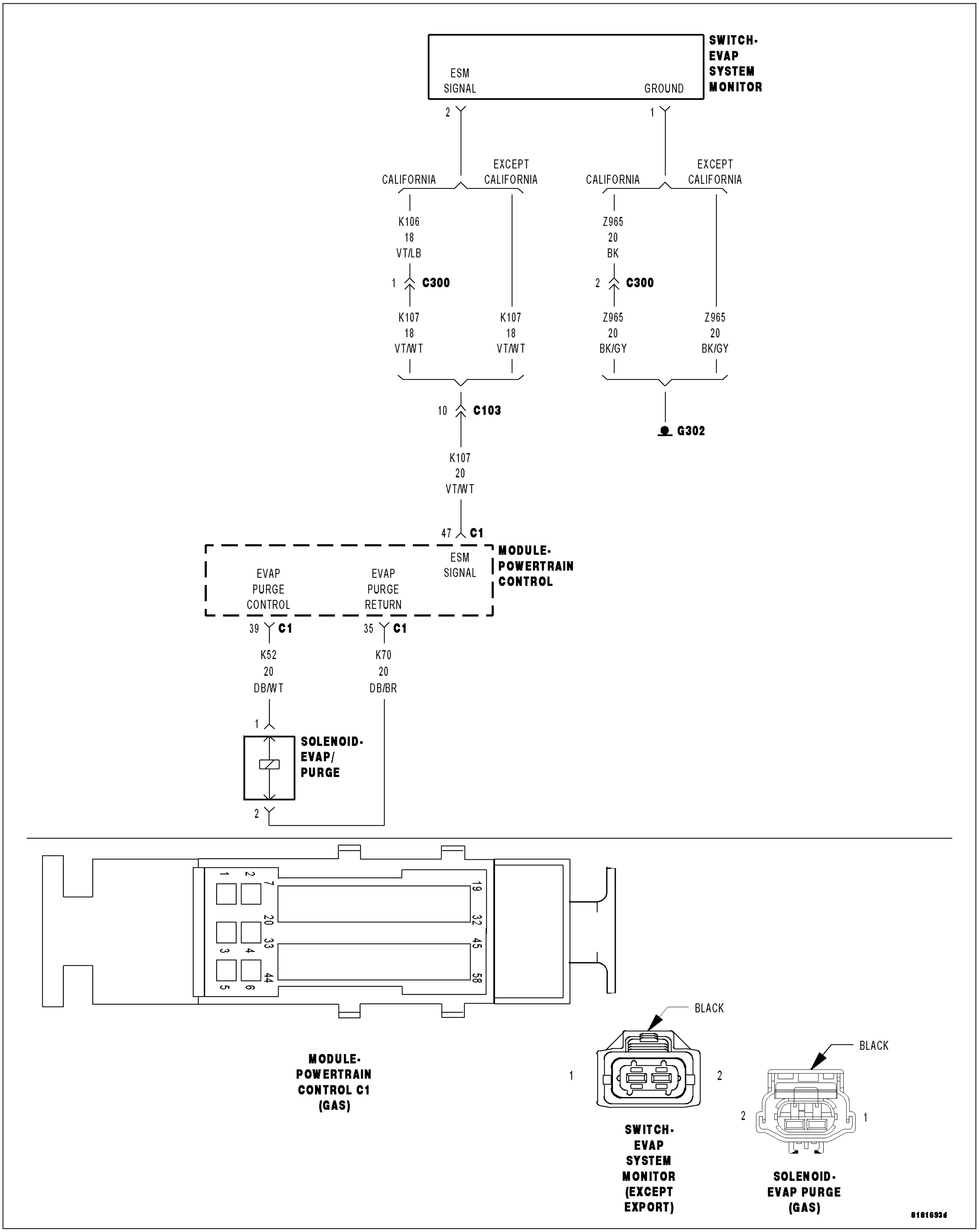
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0443-EVAP PURGE SOLENOID CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the Evap Purge Solenoid does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K70) EVAP PURGE RETURN CIRCUIT SHORTED TO VOLTAGE
(K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND
(K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO VOLTAGE

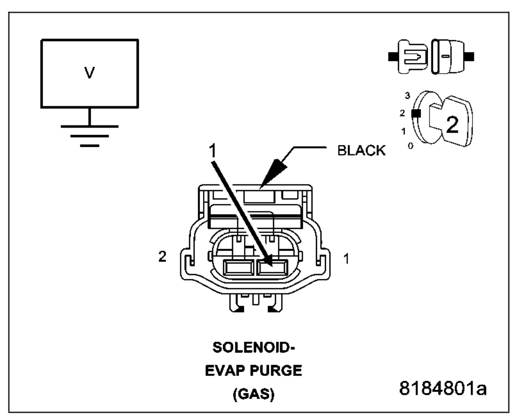
Turn the ignition off.

Disconnect the Evap Purge Solenoid connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.

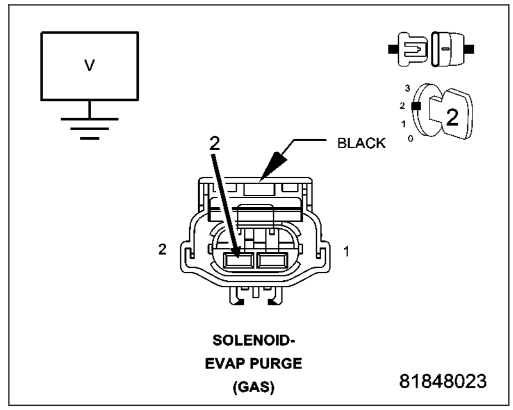


Is there any voltage present?

Yes >> Repair the (K52) Evap Purge Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K70) EVAP PURGE RETURN CIRCUIT SHORTED TO VOLTAGE



Measure the voltage of the (K70) Evap Purge Return circuit in the Evap Purge Solenoid harness connector.

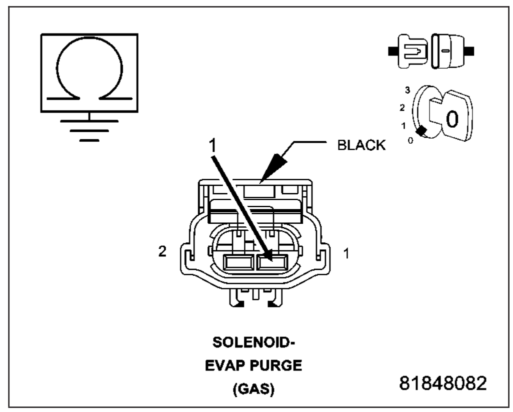
Is there any voltage present?

Yes >> Repair the (K70) Evap Purge Return circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Measure the resistance between ground and the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.

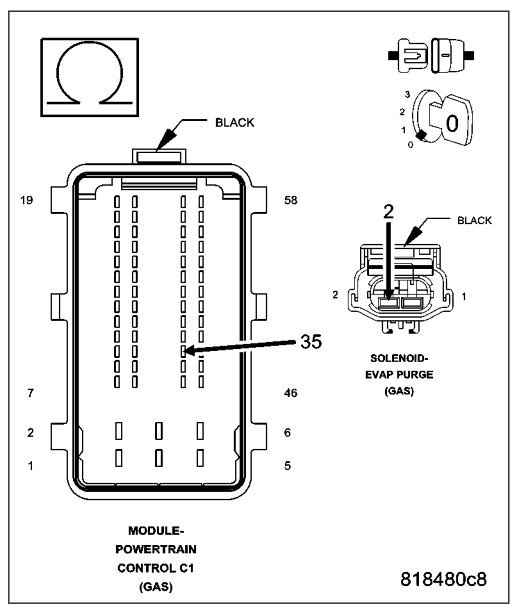
Is the resistance below 100 ohms?

Yes >> Repair the (K52) Evap Purge Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE



Using a 12 volt test light connected to 12 volts, check the (K70) Evap Purge Return circuit in the Evap Purge Solenoid harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

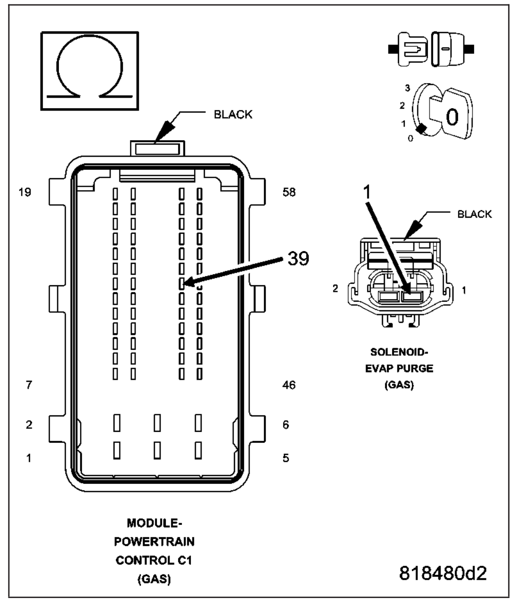
Yes >> Go to 6

No >> Repair the (K70) Evap Purge Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K52) Evap Purge Control circuit between the Evap Purge Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K52) Evap Purge Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

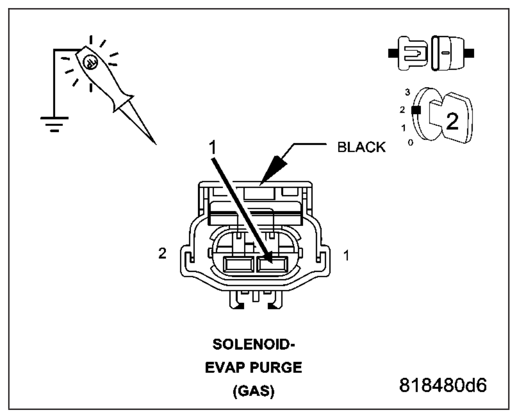
7. EVAP PURGE SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Evap Purge Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Evap Purge Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

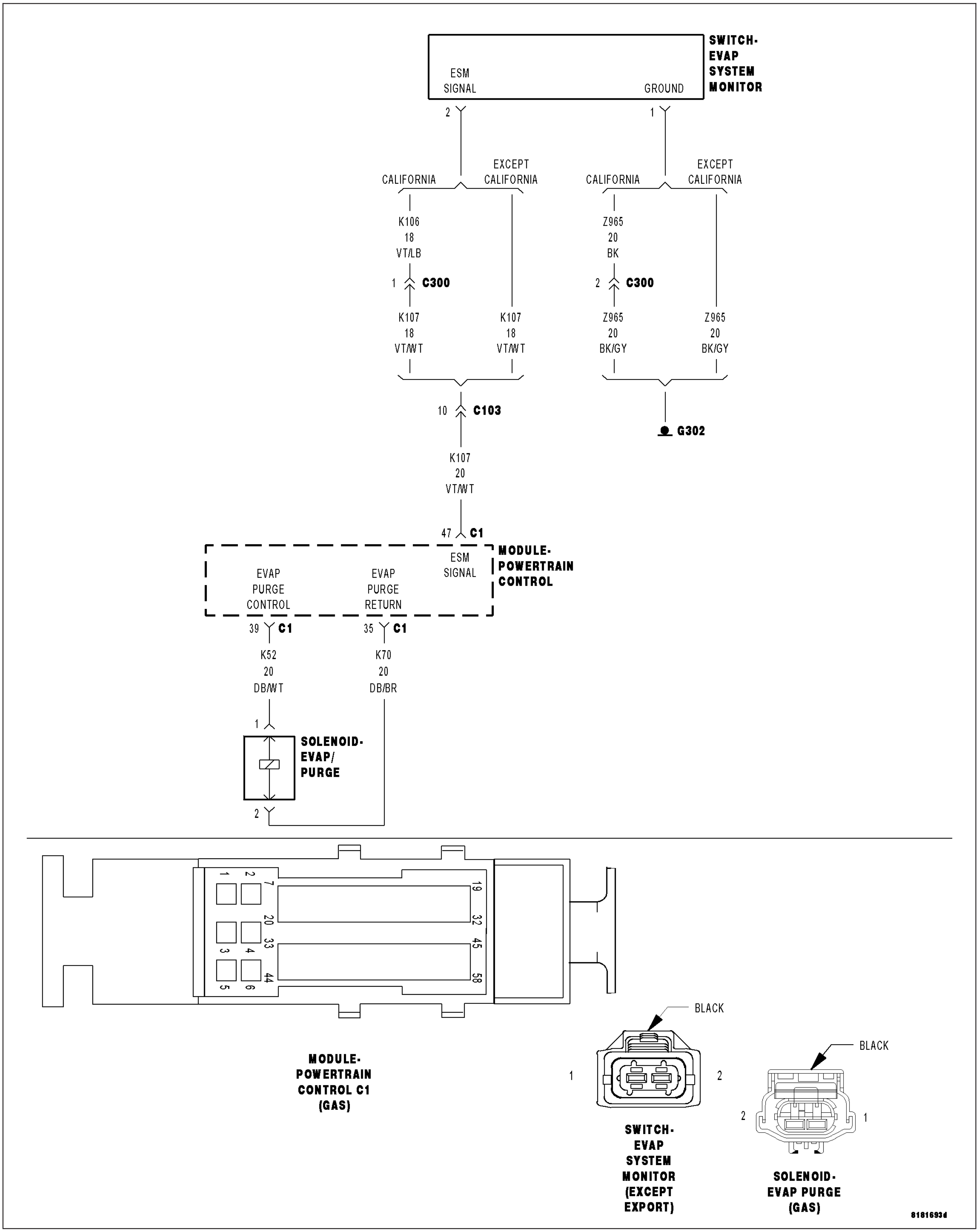
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0444-EVAP PURGE SOLENOID CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the Evap Purge Solenoid does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Evap Purge Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (K70) Evap Purge Return circuit in the Evap Purge Solenoid harness connector.

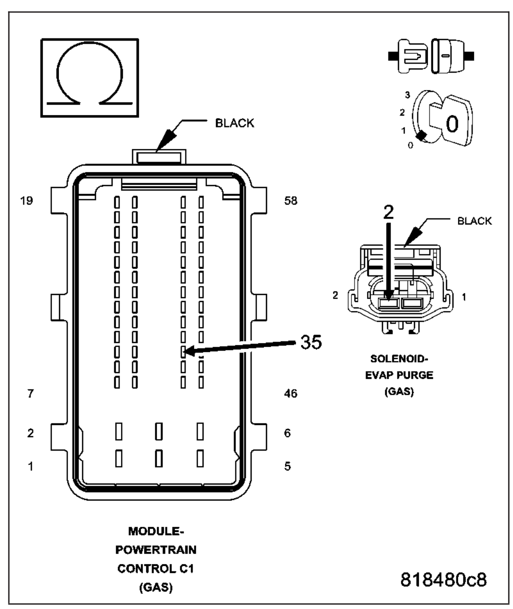
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K70) Evap Purge Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

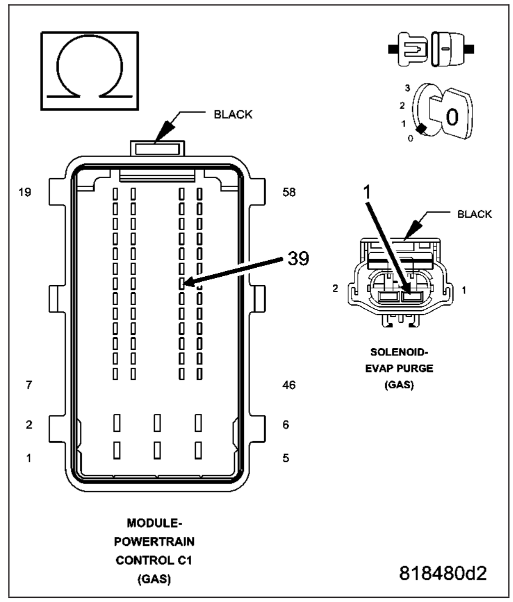


3. (K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K52) Evap Purge Control circuit between the Evap Purge Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K52) Evap Purge Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

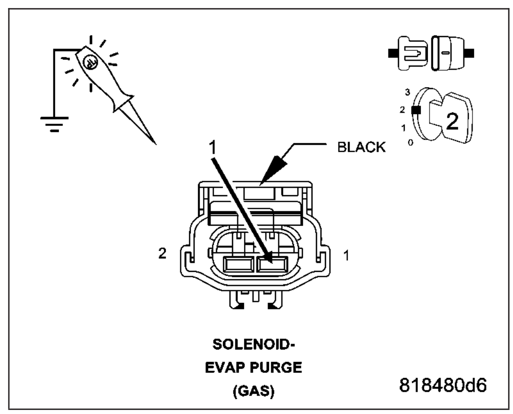
4. EVAP PURGE SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Evap Purge Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Evap Purge Solenoid in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

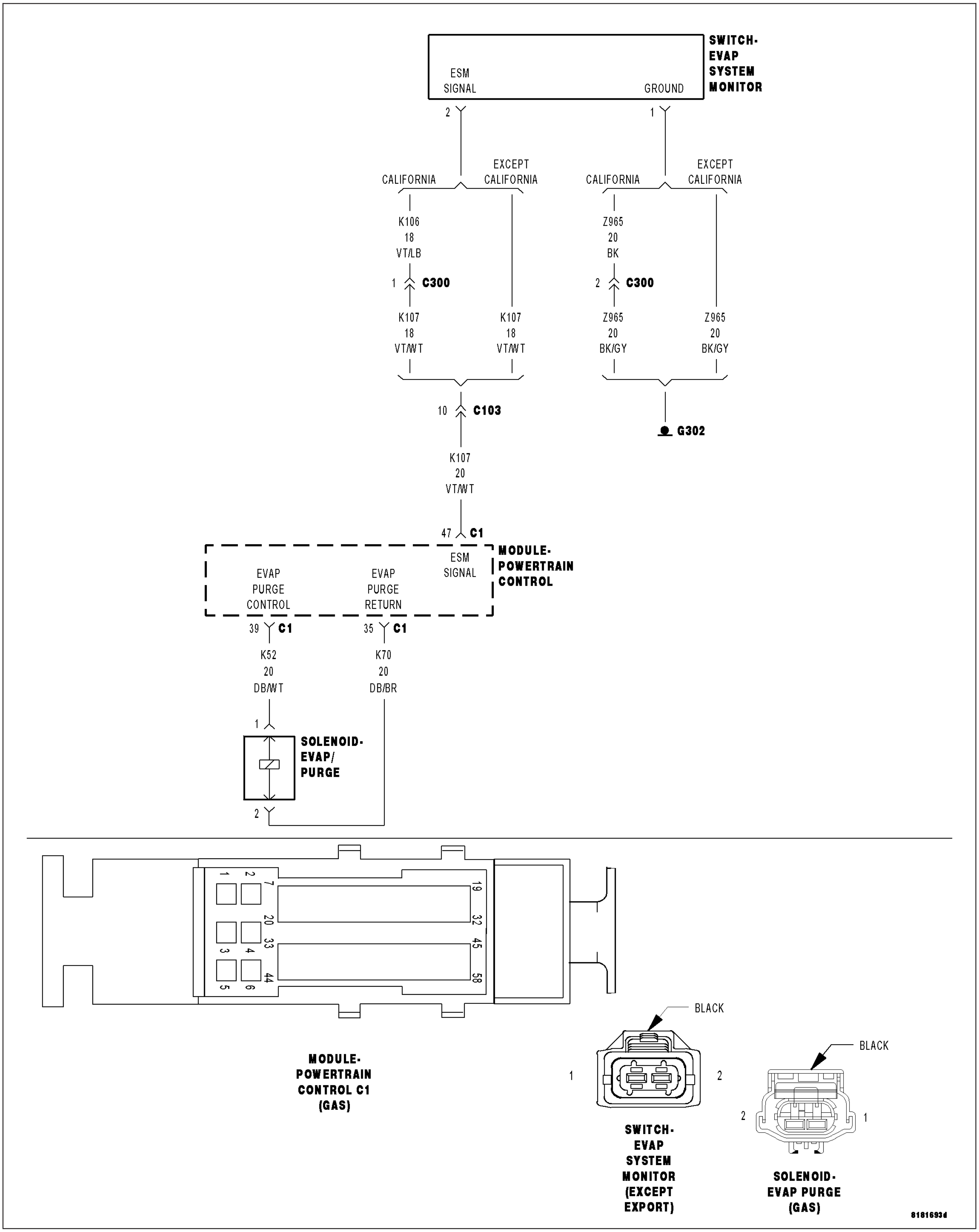
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0452-EVAP PRESSURE SWITCH STUCK CLOSED



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Immediately after key off.
- **Set Condition:**
  At key off, the PCM energizes the Purge Solenoid for a calibrated amount of time (30 seconds maximum) and stores the state of the ESIM switch. The state is evaluated again at the next key on. If the PCM does not detect that the ESIM switch is open, an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
EVAP PURGE HOSE/TUBE OBSTRUCTION
(K107) ESIM SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
(K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND
ESM SWITCH
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EVAP SYSTEM PRETEST

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the Freeze Frame data if any DTC(s) are present.

Review the vehicle repair history for items related to the current condition.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any related technical service bulletins (TSBs) and, if any apply, follow the recommended procedure.

Select the appropriate response from the list below:

A technical service bulletin (TSB) repaired the condition.
Test complete.

A DTC is present, no TSBs apply, or the TSB did not repair the condition.
Go to 2

2. DTC IS ACTIVE

Ignition on, engine not running.

With a scan tool, select Data Display and view the ESIM Switch state.

Is the ESIM Switch state ’Closed’?

Yes >> Go to 3

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. ESIM SWITCH STATE

With a scan tool, select Data Display and view the ESIM Switch state.

Disconnect the purge hose from the EVAP canister.

Is the ESIM Switch state change from ’Closed’ to ’Open’ when the purge hose was disconnected?

Yes >> Go to 4

No >> Go to 7

4. EVAP PURGE HOSE/TUBE OBSTRUCTION

Inspect the Evap Purge hose/tube for proper routing and installation between the EVAP Purge Solenoid and the Fuel Tank and between the Fuel Tank and the Evap Purge Canister.

Make sure the hose/tube is not damaged or kinked and is free from any obstructions or blockage.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

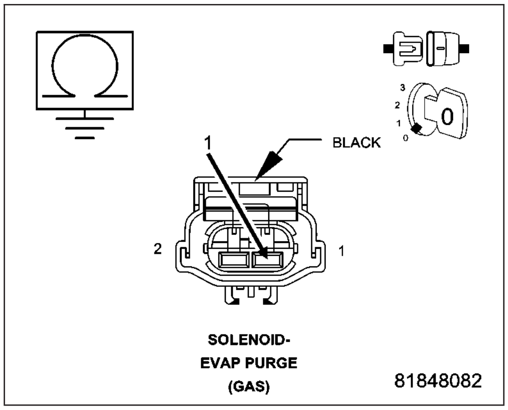
No >> Go to 5

5. (K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connector.

Measure the resistance between ground and the (K52) Evap Purge Control circuit in the EVAP Purge Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the (K52) Evap Purge Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. EVAP PURGE SOLENOID

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Evap Purge Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. ESIM ASSEMBLY

With a scan tool, select Data Display and view the ESIM Switch state.

Disconnect the Evap System Monitor Switch electrical connector.

Does the ESIM Switch state change from CLOSED to OPEN when the switch is disconnected?

Yes >> Replace the ESIM Assembly.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

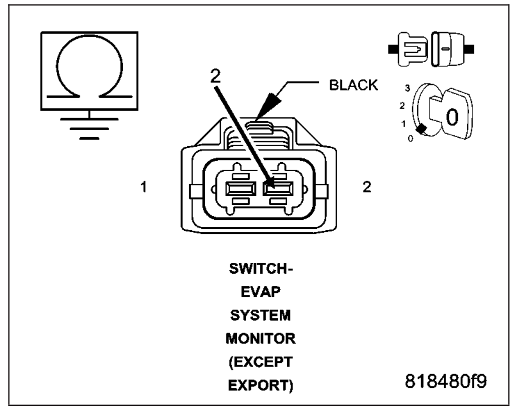
No >> Go to 8

8. (K107) SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connector.

Measure the resistance between ground and the (K107) ESIM Switch Signal circuit in the ESIM Assembly harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K107) ESIM Switch Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM) and between the Evap System Monitor Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0455-EVAP SYSTEM LARGE LEAK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running, during a cold start test with the fuel level above 12%, ambient temperature between 4° C and 32° C (39° F and 89° F) and the fuel system in closed loop. The test runs when the small leak test is maturing.
- **Set Condition:**
  The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the ESM switch. Once the ESM switch is closed, the PCM turns the EVAP Purge solenoid off to seal the EVAP system. If the ESM switch reopens before the calibrated amount of time, a large leak error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP SYSTEM LEAK
EVAP PURGE SOLENOID
EVAP SYSTEM MONITOR SWITCH

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EVAP SYSTEM PRETEST

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the Freeze Frame data if any DTC(s) are present.

Review the vehicle repair history for items related to the current condition.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any related technical service bulletins (TSBs) and, if any apply, follow the recommended procedure.

Select the appropriate response from the list below:

A technical service bulletin (TSB) repaired the condition.
Test complete.

A DTC is present, no TSBs apply, or the TSB did not repair the condition.
Go to 2

2. DTC IS ACTIVE

NOTE: Allow the vehicle to cool to ambient temperature before continuing with this procedure.

NOTE: A loose gas cap may have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the ESIM FORCED MONITOR TEST. Allow the test to complete.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. EVAPORATIVE SYSTEM INSPECTION

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Loose or missing Fuel Filler Cap
- Improper installation of the Fuel Fill Cap
- Damaged Locking tabs on Cap and/or fill tube
- Damaged seal points on Cap and/or fill tube
- Fuel cap gasket seal

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. EVAPORATIVE SYSTEM LEAKING

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated. Failure to follow these instructions can result in personal injury or death.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the EVAP system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels, vehicles equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go to 5

No >> Refer to the Freeze Frame data recorded in step 1. If the data indicates that the vehicle was in motion when the DTC was set, verify that all hoses are properly connected.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the EVAP system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: The EVAP System is divided into three zones. A leak from any of these zones can cause this DTC to set. The lists below specify the possible leak points in that specific zone. For further assistance see the Zone Identification Charts below.

- ZONE 1

1 Fuel Cap

2 Recirculation Check Valve.

3 Vapor Recirculation Line.

4 Signal Vapor Line for FVM.

5 Flow Management Valve.

6 Fuel Tank to Canister Vapor Line.

7 Fuel Tank Vent (Check Valve).

8 Vapor Line to Canister.

9 Flow Control Orifice.

10 Control Valve.

11 Liquid Trap.

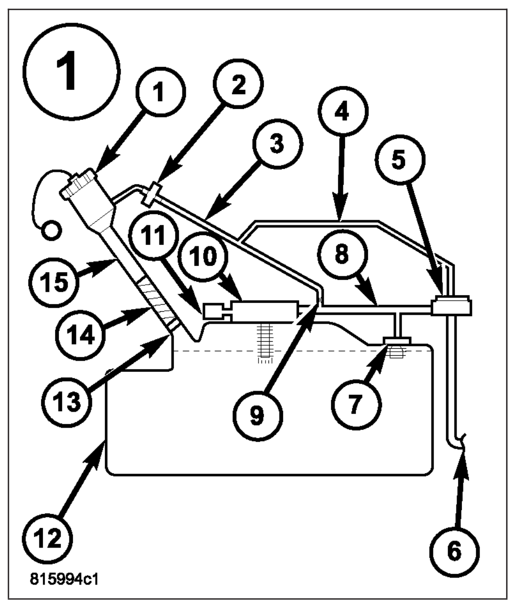
12 Fuel Tank.

13 Check valve.

14 Fuel Fill Tube to Tank connector.

15 Fuel Fill Tube

Damaged or disconnected EVAP system components.



- ZONE 2

1 Filter.

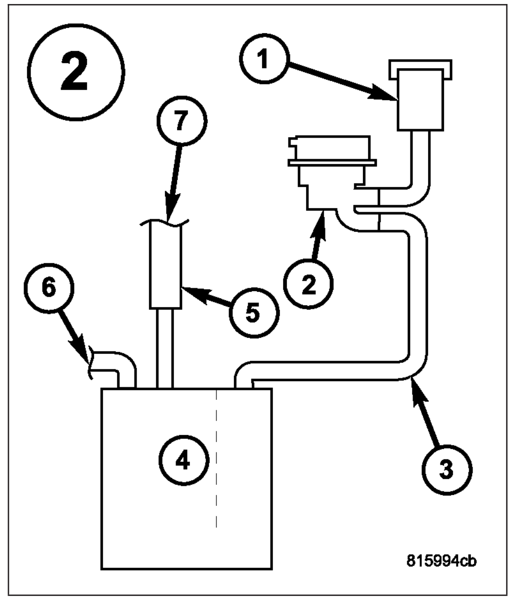
2 ESM.

3 Canister Vent Line.

4 EVAP Canister.

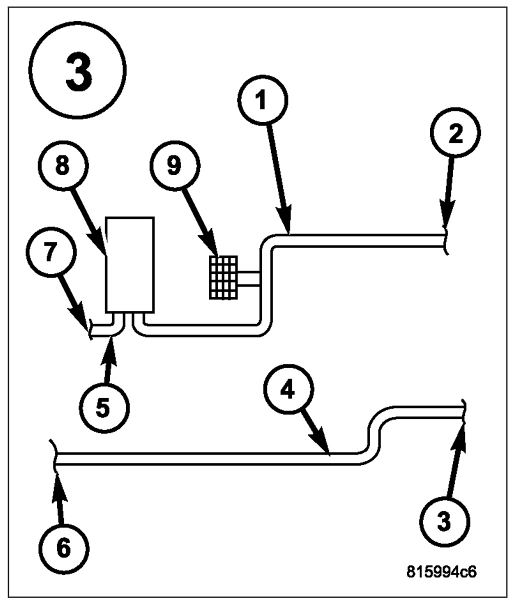
5 Chassis Purge Valve.

6 Fuel Tank to Canister Vapor Line connection.
7 EVAP Purge connection.



- ZONE 3

1 EVAP Purge Vacuum Line.
2 Connection to Chassis Line.
3 Connection to Canister.
4 Chassis Purge Line.
5 EVAP Purge Vacuum Line.
6 Connection to EVAP Purge Harness.
7 Chassis EVAP Purge Line connection to Engine Vacuum.
8 EVAP Purge Valve.
9 Service Port.



NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Select the appropriate response from the list below:

A leak was found in one or more of the EVAP System zones

Repair or replace the leaking component as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

A leak was found at the gas cap or fuel filler tube

Go to 6

No leaks were found

Go to 7

6. LEAK AT GAS CAP

Remove the SMOKE supply tip (black hose) from the service port (if equipped) or from the #8404–ADP adapter.

Install gas cap adapter, Miller Tool #8382 (1/4 turn cap) or #6922 (screw cap) and #8399* (secondary seal depressor) and repeat test 5.

Was a leak found at the gas cap adapter?

Yes >> Replace the Fuel Filler tube assembly.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the gas cap.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. EVAP PURGE SOLENOID

NOTE: After disconnecting the EVAP Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a problem with the check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the EVAP Purge Solenoid.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Connect the SMOKE supply tip (black hose) to the “CAN” port of the EVAP Purge Solenoid.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move with the EELD in the smoke mode.

Press the remote smoke/air start button on the EELD.

While holding the remote smoke/air start button, check to see if smoke is leaking through the EVAP Purge Solenoid port.

NOTE: Smoke should not pass through the solenoid.

Is smoke leaking from the EVAP Purge Solenoid port?

Yes >> Replace the EVAP Purge Solenoid.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. EVAP SYSTEM MONITOR SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap System Monitor Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Evap System Monitor Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0456-EVAP SYSTEM SMALL LEAK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition off, fuel level less than 88%, ambient temperature between 4° C and 43° C (39° F and 109° F), and the fuel system in closed loop.
- **Set Condition:**
  As temperatures change, a vacuum is created in the fuel tank and EVAP system. With the EVAP system sealed, the PCM monitors the ESM switch. If the ESM switch does not close within a calibrated time, an error is detected by the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP SYSTEM LEAK
EVAP PURGE SOLENOID
EVAP SYSTEM MONITOR SWITCH

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EVAP SYSTEM PRETEST

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the Freeze Frame data if any DTC(s) are present.

Review the vehicle repair history for items related to the current condition.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any related technical service bulletins (TSBs) and, if any apply, follow the recommended procedure.

Select the appropriate response from the list below:

A technical service bulletin (TSB) repaired the condition.
Test complete.

A DTC is present, no TSBs apply, or the TSB did not repair the condition.
Go to 2

2. DTC IS ACTIVE

NOTE: Allow the vehicle to cool to ambient temperature before continuing with this procedure.

NOTE: A loose gas cap may have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. EVAPORATIVE SYSTEM INSPECTION

Perform an inspection of the entire evaporative emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Loose or missing Fuel Filler Cap
- Improper installation of the Fuel Fill Cap
- Damaged Locking tabs on Cap and/or fill tube
- Damaged seal points on Cap and/or fill tube
- Fuel cap gasket seal

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. EVAPORATIVE SYSTEM LEAKING

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated. Failure to follow these instructions can result in personal injury or death.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the EVAP system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels, vehicles equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go to 5

No >> Refer to the Freeze Frame data recorded in step 1. If the data indicates that the vehicle was in motion when the DTC was set, verify that all hoses are properly connected.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the EVAP system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

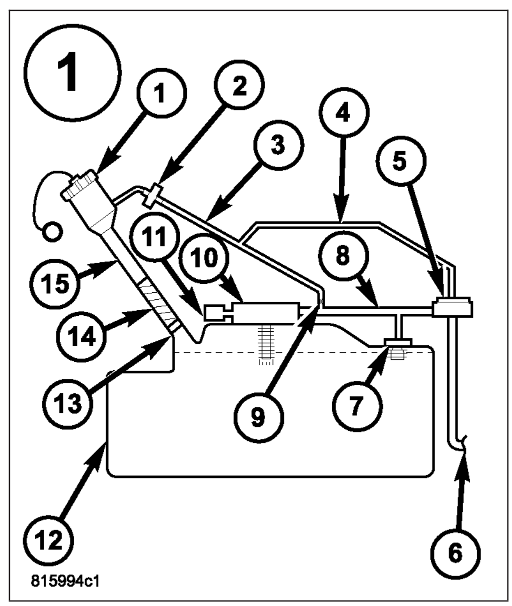
If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: The EVAP System is divided into three zones. A leak from any of these zones can cause this DTC to set. The lists below specify the possible leak points in that specific zone. For further assistance see the Zone Identification Charts below.

- ZONE 1

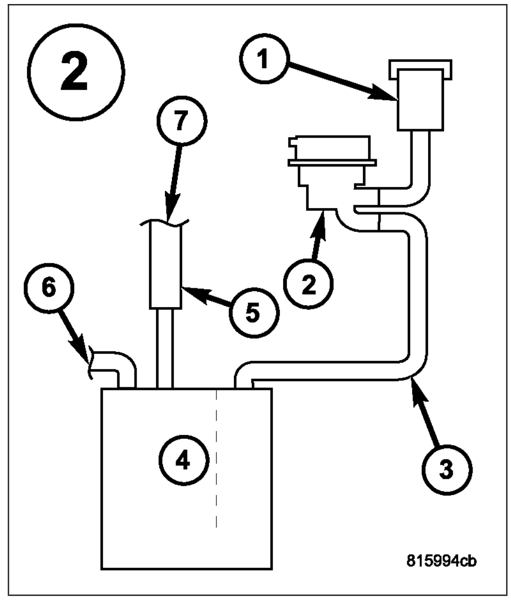
1 Fuel Cap
2 Recirculation Check Valve.
3 Vapor Recirculation Line.
4 Signal Vapor Line for FVM.
5 Flow Management Valve.
6 Fuel Tank to Canister Vapor Line.
7 Fuel Tank Vent (Check Valve).
8 Vapor Line to Canister.
9 Flow Control Orifice.
10 Control Valve.
11 Liquid Trap.
12 Fuel Tank.
13 Check valve.
14 Fuel Fill Tube to Tank connector.
15 Fuel Fill Tube
Damaged or disconnected EVAP system components.



- ZONE 2

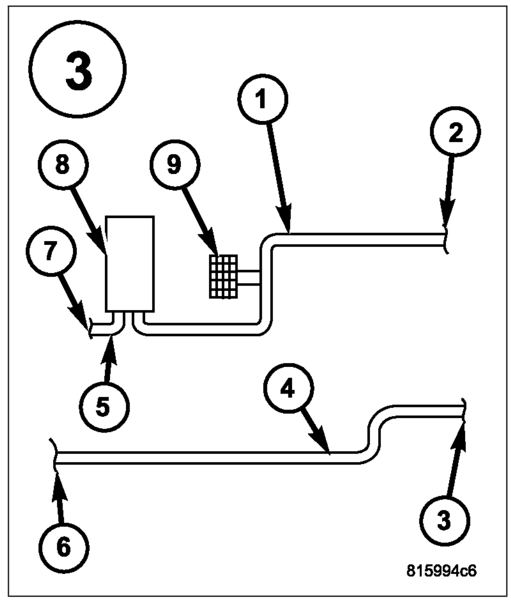
1 Filter.
2 ESM.
3 Canister Vent Line.
4 EVAP Canister.
5 Chassis Purge Valve.

6 Fuel Tank to Canister Vapor Line connection.
7 EVAP Purge connection.



- ZONE 3

1 EVAP Purge Vacuum Line.
2 Connection to Chassis Line.
3 Connection to Canister.
4 Chassis Purge Line.
5 EVAP Purge Vacuum Line.
6 Connection to EVAP Purge Harness.
7 Chassis EVAP Purge Line connection to Engine Vacuum.
8 EVAP Purge Valve.
9 Service Port.



NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Select the appropriate response from the list below:

A leak was found in one or more of the EVAP System zones

Repair or replace the leaking component as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

A leak was found at the gas cap or fuel filler tube

Go to 6

No leaks were found

Go to 7

6. LEAK AT GAS CAP

Remove the SMOKE supply tip (black hose) from the service port (if equipped) or from the #8404–ADP adapter.

Install gas cap adapter, Miller Tool #8382 (1/4 turn cap) or #6922 (screw cap) and #8399* (secondary seal depressor).

Connect the SMOKE supply tip (black hose) to the gas cap adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Was a leak found at the gas cap adapter?

Yes >> Replace the Fuel Filler tube assembly.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the gas cap.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. EVAP PURGE SOLENOID

NOTE: After disconnecting the EVAP Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a problem with the check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the EVAP Purge Solenoid.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Connect the SMOKE supply tip (black hose) to the “CAN” port of the EVAP Purge Solenoid.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move with the EELD in the smoke mode.

Press the remote smoke/air start button on the EELD.

While holding the remote smoke/air start button, check to see if smoke is leaking through the EVAP Purge Solenoid port.

NOTE: Smoke should not pass through the solenoid.

Is smoke leaking from the EVAP Purge Solenoid port?

Yes >> Replace the EVAP Purge Solenoid.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. EVAP SYSTEM MONITOR SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap System Monitor Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Evap System Monitor Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0457-EVAP SYSTEM — LOOSE FUEL CAP

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After the PCM detects a significant fuel level change.
- **Set Condition:**
  If a leak greater than .090” is detected by the PCM for two consecutive cold start trips after a significant fuel level change, this DTC will set. One good trip turns off the MIL.

Possible Causes
LOOSE OR MISSING FUEL FILLER CAP

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If DTC P0455-EVAP SYSTEM LARGE LEAK is set along with this DTC, perform the diagnostic procedure for P0455 before continuing with this test.

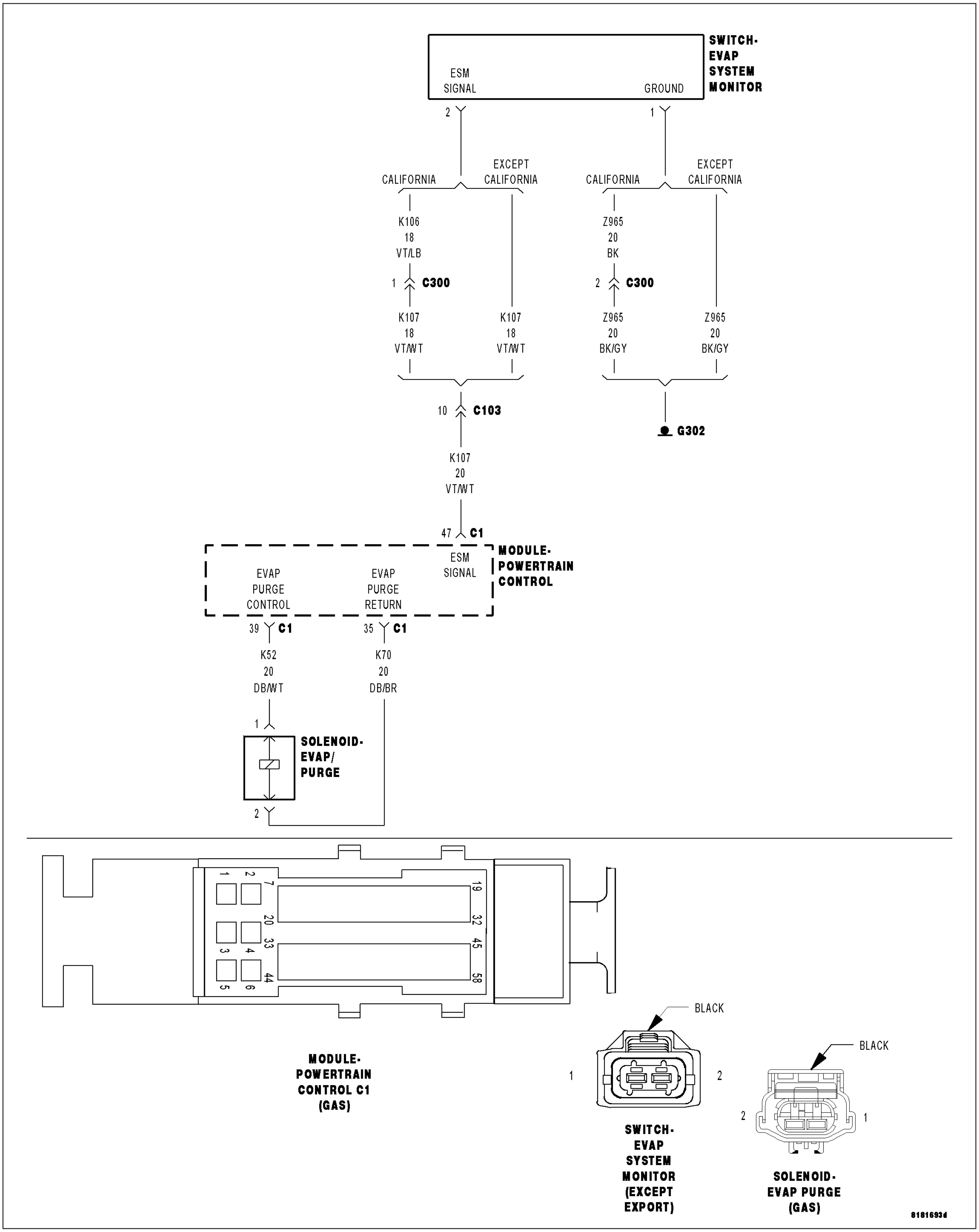
NOTE: Do not replace the gas cap for DTC P0457-EVAP SYSTEM - LOOSE FUEL CAP.
With a scan tool, select View DTCs.

Is the status Active for DTC P0455-EVAP SYSTEM LARGE LEAK along with this DTC?

Yes >> Perform the diagnostic procedure for P0455-EVAP SYSTEM LARGE LEAK.

No >> No repair is necessary. Verify that the gas cap is in place and tight. Clear DTCs and reset the odometer or message center display.

P0458-EVAP PURGE SOLENOID CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Evap Purge Solenoid circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND
(K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K70) EVAP PURGE RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Evap Purge Solenoid connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (K70) Evap Purge Return circuit in the Evap Purge Solenoid harness connector.

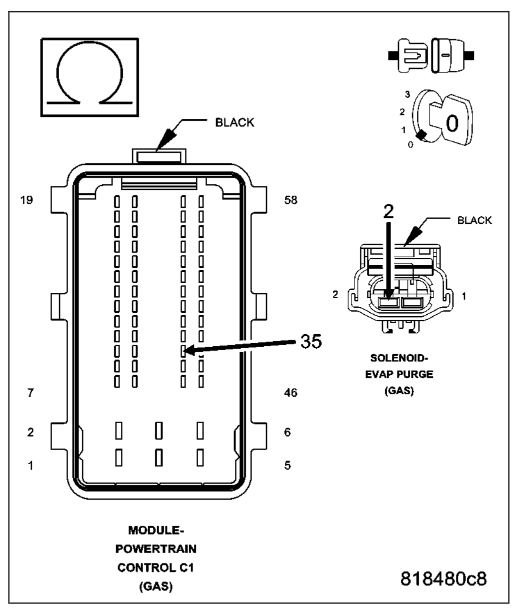
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K70) Evap Purge Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

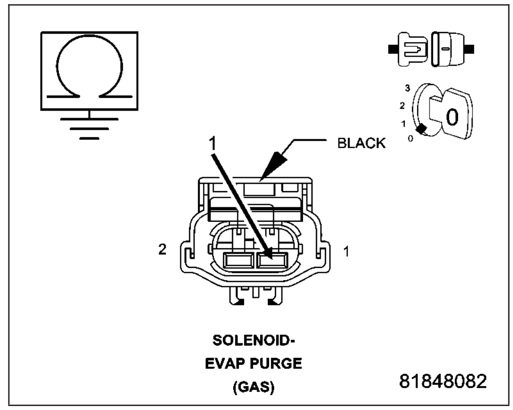


3. (K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.



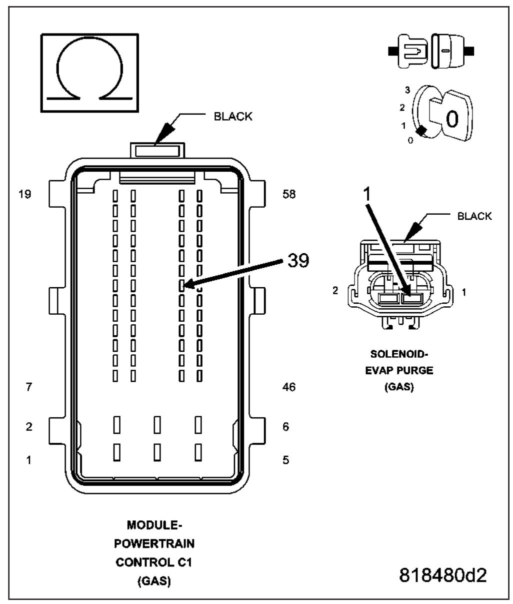
Is the resistance below 100 ohms?

Yes >> Repair the (K52) Evap Purge Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K52) Evap Purge Control circuit between the Evap Purge Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K52) Evap Purge Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

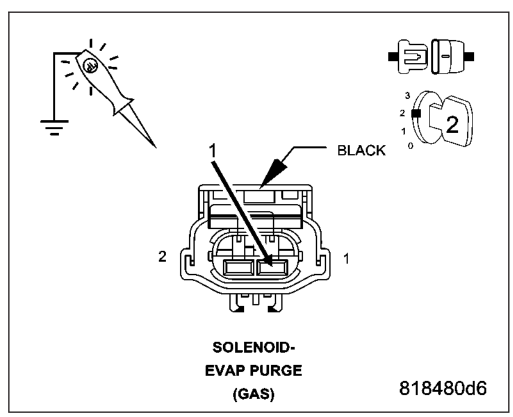
5. EVAP PURGE SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Evap Purge Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Evap Purge Solenoid control to OFF (0%).

Using a 12 volt test light connected to 12 ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Evap Purge Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

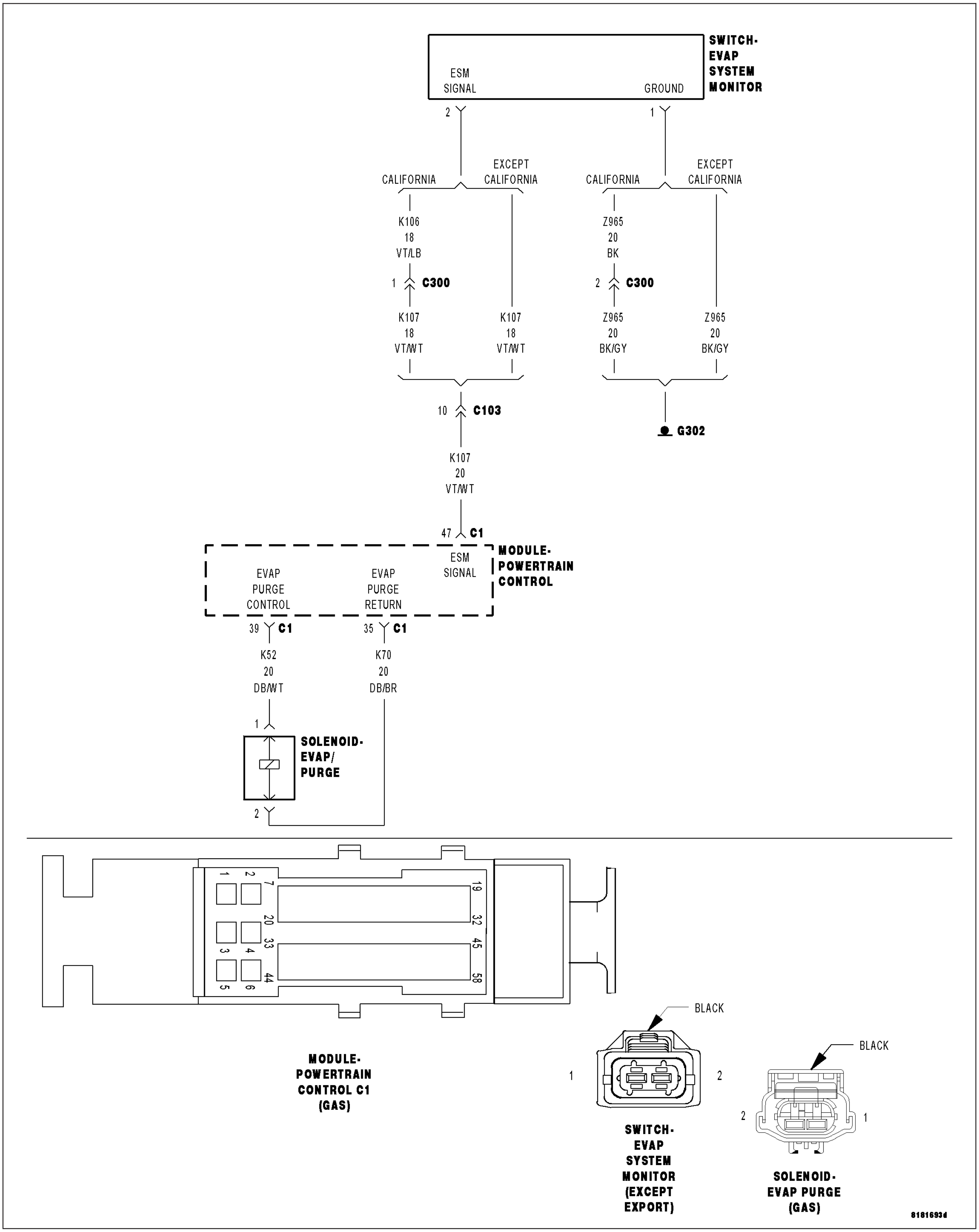
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0459-EVAP PURGE SOLENOID CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Evap Purge Solenoid circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K70) EVAP PURGE RETURN CIRCUIT SHORTED TO VOLTAGE
(K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EVAP PURGE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

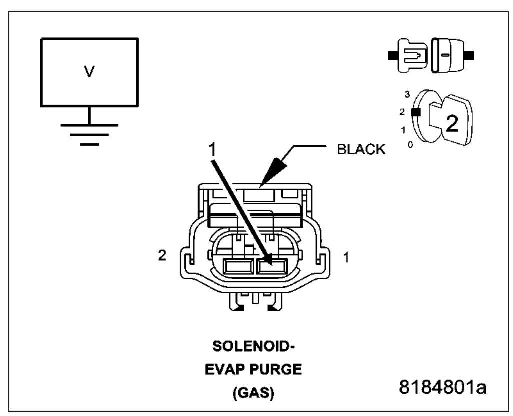
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K52) EVAP PURGE CONTROL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Evap Purge Solenoid connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.

Is there any voltage present?

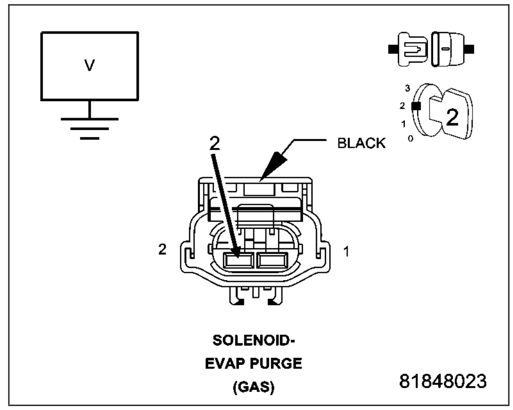
Yes >> Repair the (K52) Evap Purge Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K70) EVAP PURGE RETURN CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K70) Evap Purge Return circuit in the Evap Purge Solenoid harness connector.



Is there any voltage present?

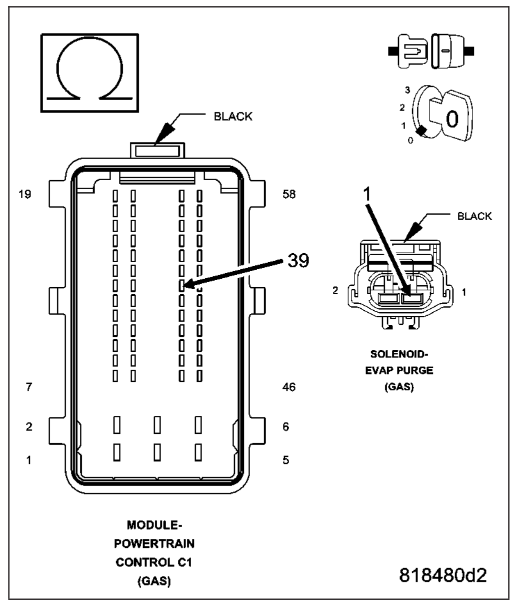
Yes >> Repair the (K70) Evap Purge Return circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K52) EVAP PURGE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K52) Evap Purge Control circuit between the Evap Purge Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K52) Evap Purge Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

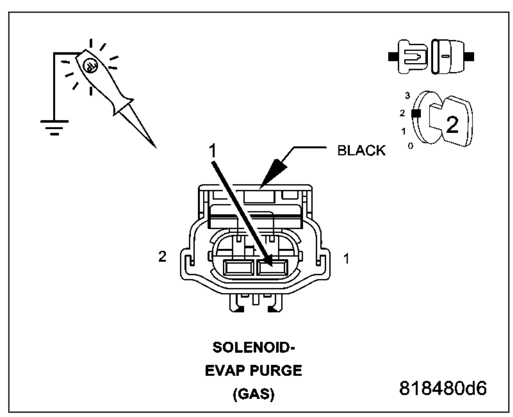
5. EVAP PURGE SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Evap Purge Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Evap Purge Solenoid control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K52) Evap Purge Control circuit in the Evap Purge Solenoid harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuator ON (100%) and not illuminated with the actua-

tor OFF (0%)?

Yes >> Replace the Evap Purge Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Evap Purge Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

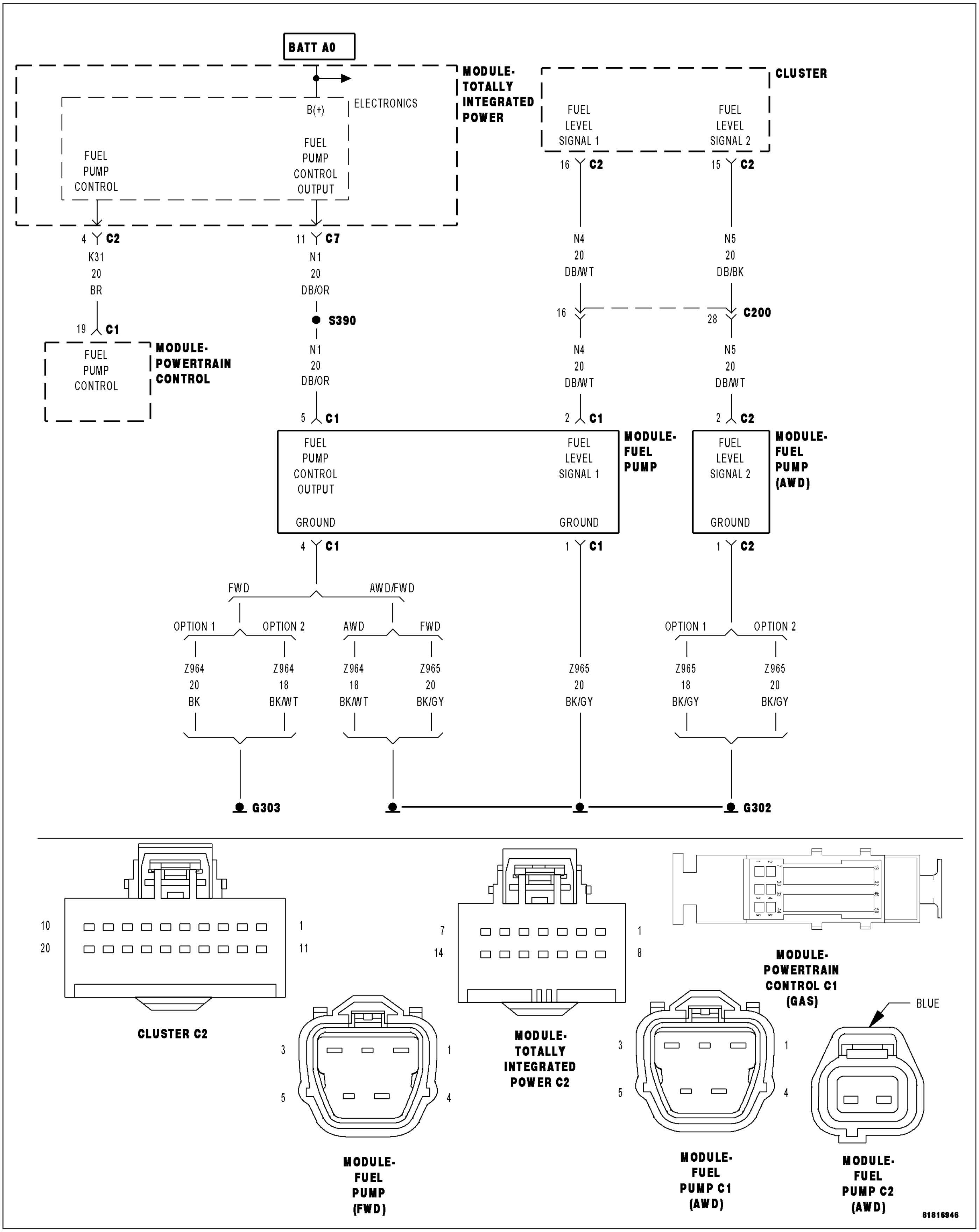
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0461-FUEL LEVEL SENSOR 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Fuel Level Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO GROUND
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO THE (Z965) GROUND CIRCUIT
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

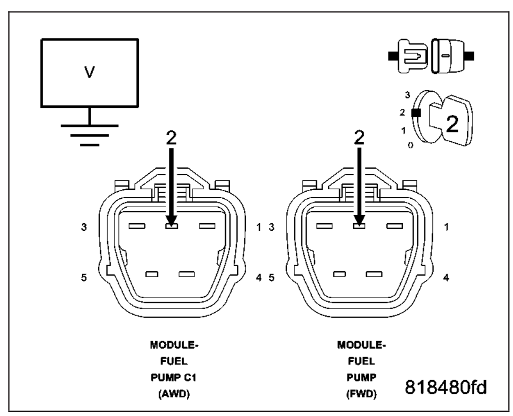
Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Turn the ignition on.

Measure the voltage of the (N4) Fuel Level Signal 1 circuit in the Fuel Level Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (N4) Fuel Level Signal 1 circuit for a short to voltage.

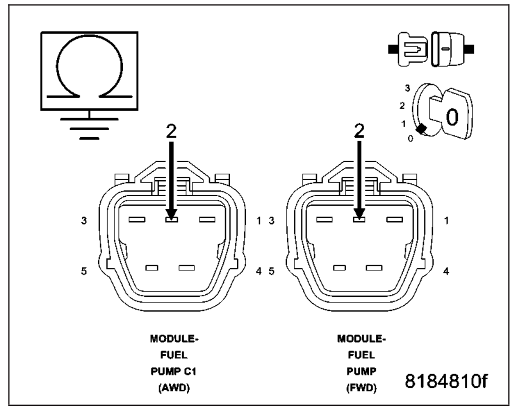
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (N4) Fuel Level Signal 1 circuit in the Fuel Level Sensor harness connector.



Is the resistance above 100 ohms?

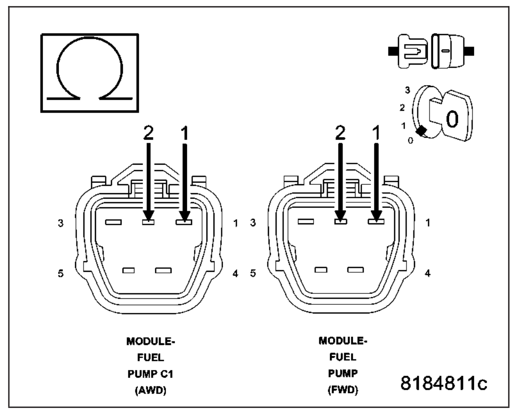
Yes >> Go to 4

No >> Repair the (N4) Fuel Level Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO THE (Z965) GROUND CIRCUIT

Measure the resistance between the (N4) Fuel Level Signal 1 circuit and the (Z965) Ground circuit in the Fuel Level Sensor harness connector.



Is the resistance above 100 ohms?

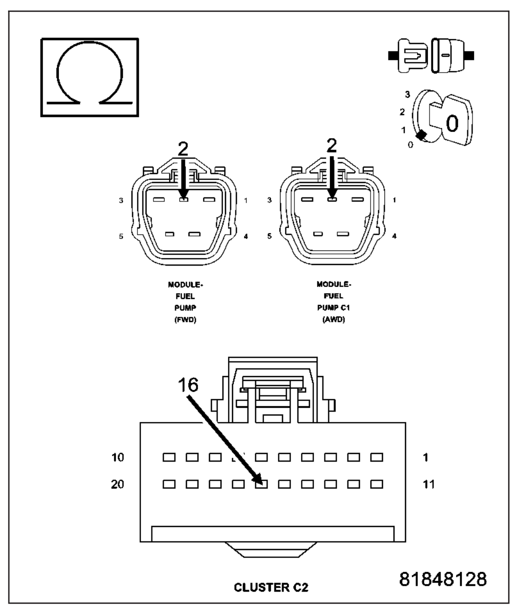
Yes >> Go to 5

No >> Repair the (N4) Fuel Level Signal 1 circuit for a short to the (Z965) Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (N4) Fuel Level Signal 1 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.



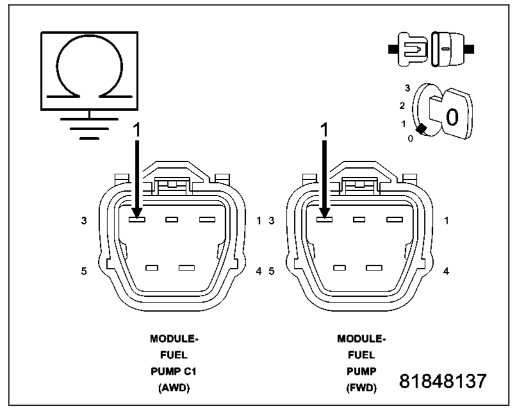
Is the resistance below 5.0 ohms?

Yes >> Go to 6

No >> Repair the (N4) Fuel Level Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance between ground and the (Z965) Ground circuit in the Fuel Level Sensor harness connector.

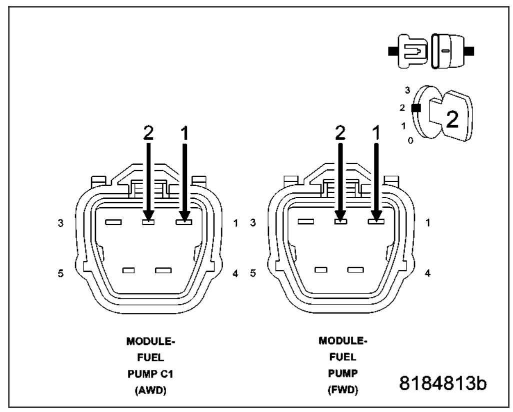
Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (Z965) Ground for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. FUEL LEVEL SENSOR



Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Connect a jumper wire between the (Z965) Ground circuit and the (N4) Fuel Level Signal 1 circuit in the Fuel Level Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 1 signal voltage.

Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Fuel Level Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

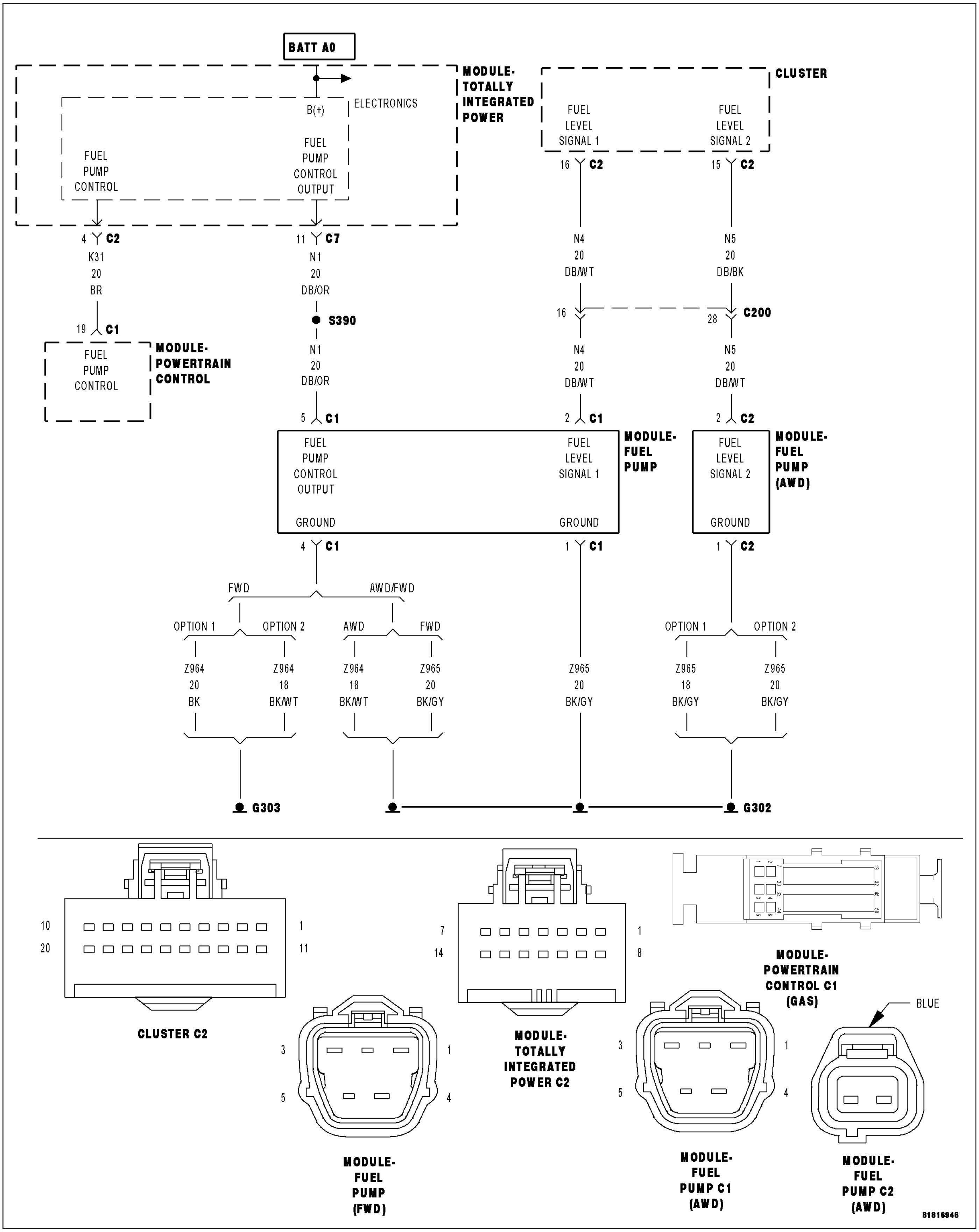
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0462-FUEL LEVEL SENSOR 1 LOW CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Fuel Level Sensor circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO GROUND
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

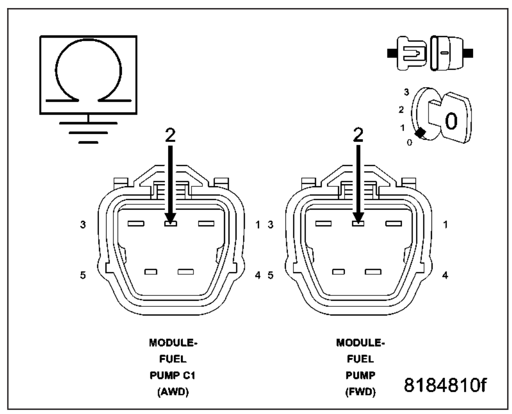
2. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Measure the resistance between ground and the (N4) Fuel Level Signal 1 circuit in the Fuel Level Sensor harness connector.



Is the resistance above 100 ohms?

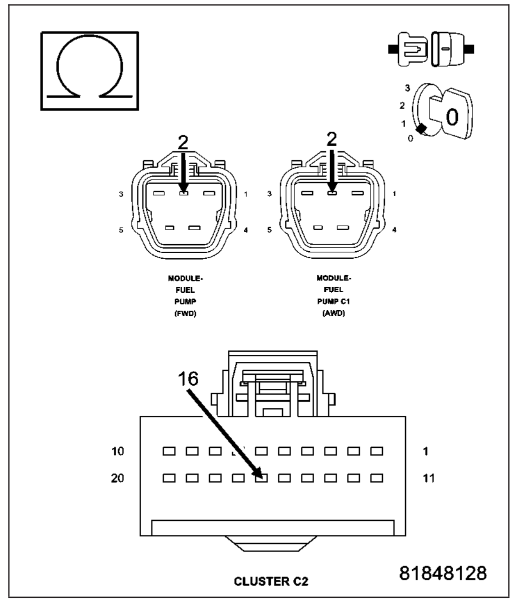
Yes >> Go to 3

No >> Repair the (N4) Fuel Level Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (N4) Fuel Level Signal 1 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (N4) Fuel Level Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. FUEL LEVEL SENSOR

Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 1 signal voltage.

Is the voltage above 4.5 volts with the Fuel Level Sensor harness disconnected?

Yes >> Replace the Fuel Level Sensor in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

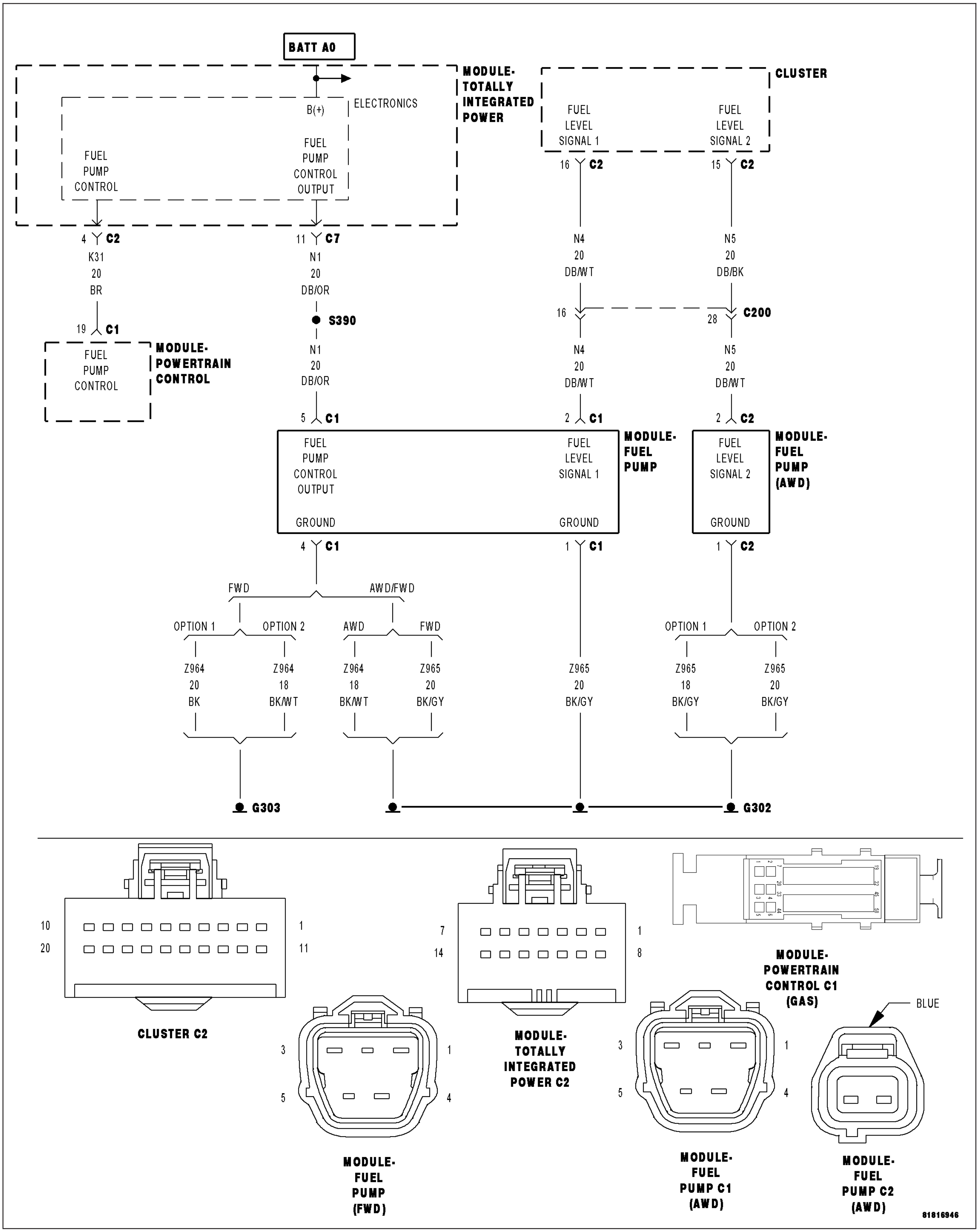
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0463-FUEL LEVEL SENSOR 1 HIGH CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (N4) Fuel Level Signal 1 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(N4) FUEL LEVEL SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (N4) FUEL LEVEL SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

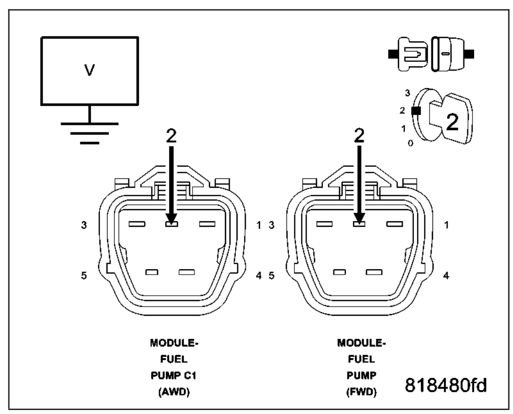
Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Turn the ignition on.

Measure the voltage of the (N4) Fuel Level Signal 1 circuit in the Fuel Level Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (N4) Fuel Level Signal 1 circuit for a short to voltage.

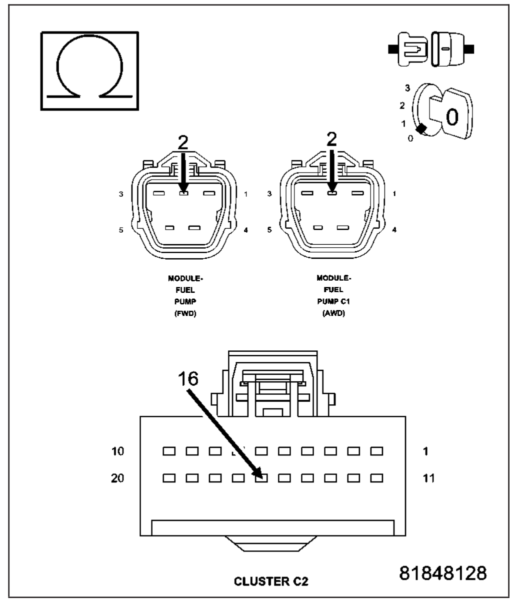
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (N4) FUEL LEVEL SIGNAL 1 OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (N4) Fuel Level Signal 1 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.



Is the resistance below 5.0 ohms?

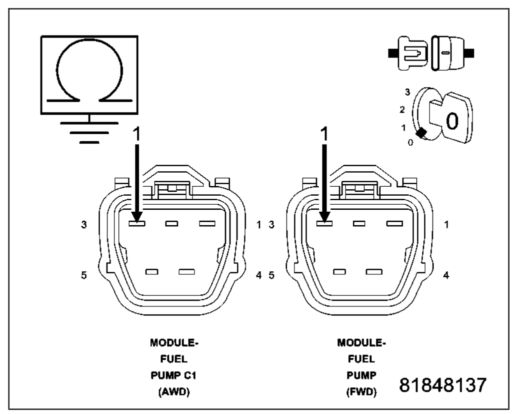
Yes >> Go to 4

No >> Repair the (N4) Fuel Level Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance between ground and the (Z965) Ground circuit in the Fuel Level Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (Z965) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL LEVEL SENSOR

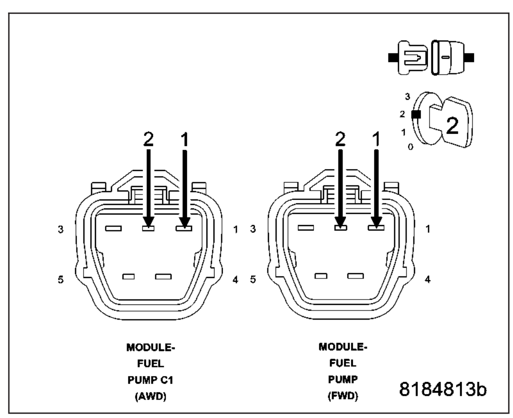
Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Connect a jumper wire between the (N4) Fuel Level Signal 1 circuit and the (Z965) Ground in the Fuel Level Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 1 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Fuel Level Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

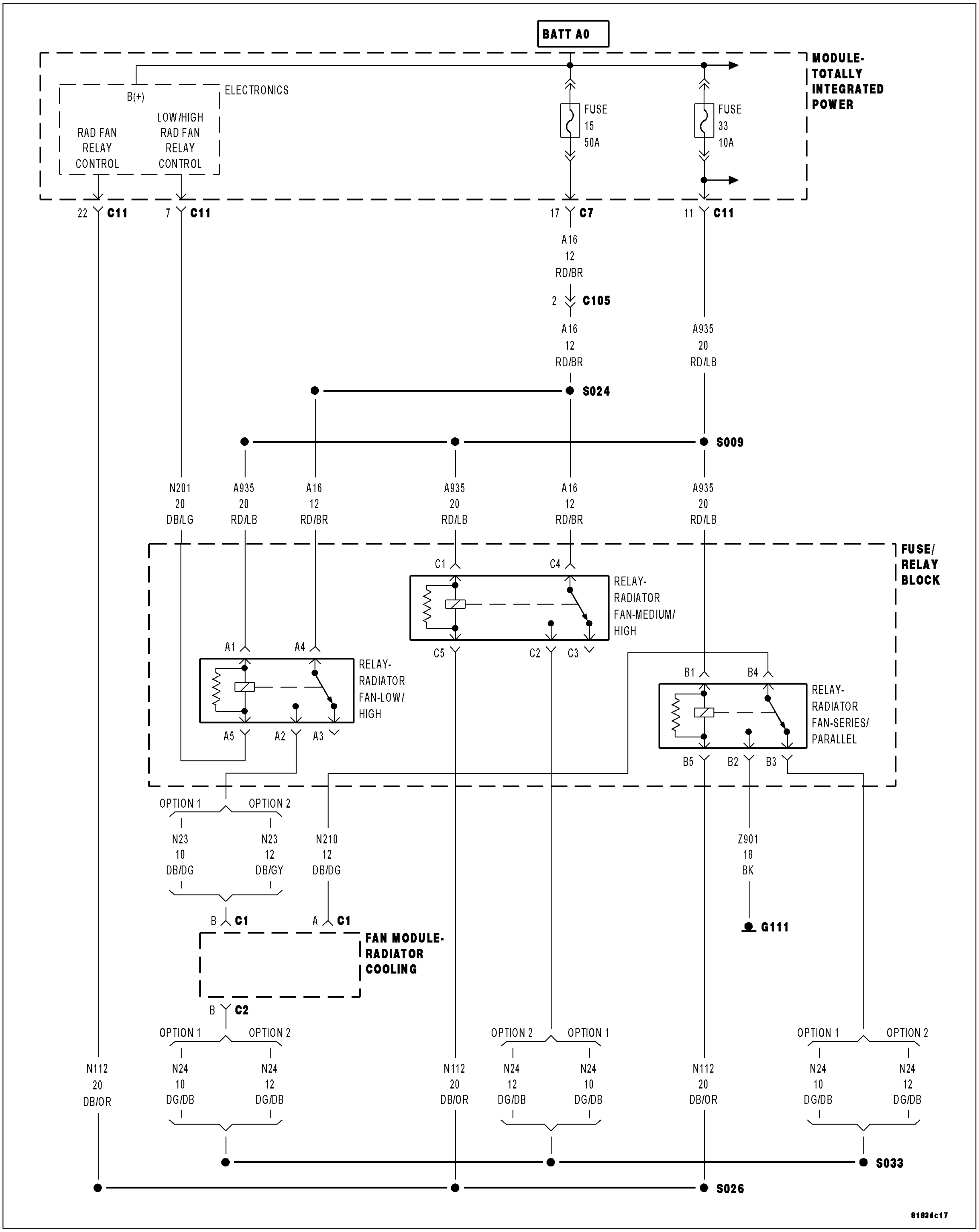
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0480-COOLING FAN 1 CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted circuit is detected in the Low/High Rad Fan Control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A16) FUSED (B+) CIRCUITS
(N201) LOW/HIGH/HIGH RAD FAN CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(N201) LOW/HIGH RAD FAN CONTROL CIRCUIT OPEN
(N201) LOW/HIGH RAD FAN CONTROL CIRCUIT SHORTED TO GROUND
LOW/HIGH RAD FAN RELAY
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. RADIATOR COOLING FAN MODULE OPERATION

Ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #1 Control State to actuate the Cooling Fan (Low/High).

Is the one Cooling Fan operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

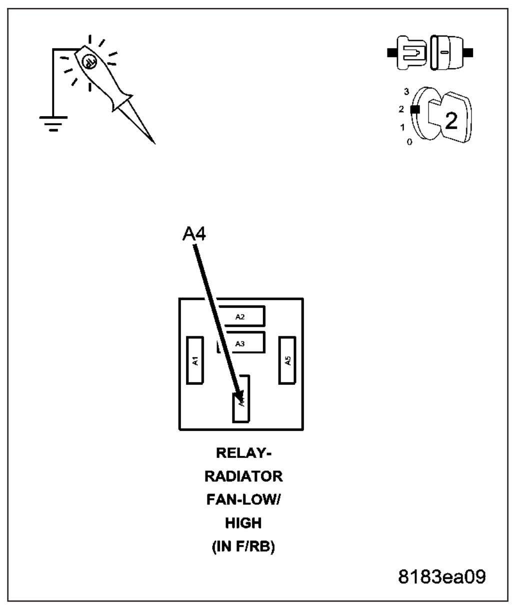
No >> Go To 2

2. (A16) FUSED B+ CIRCUIT

Ignition on.

Disconnect the Low/High Rad Relay harness connector.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuit in the Low/High Rad Relay harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

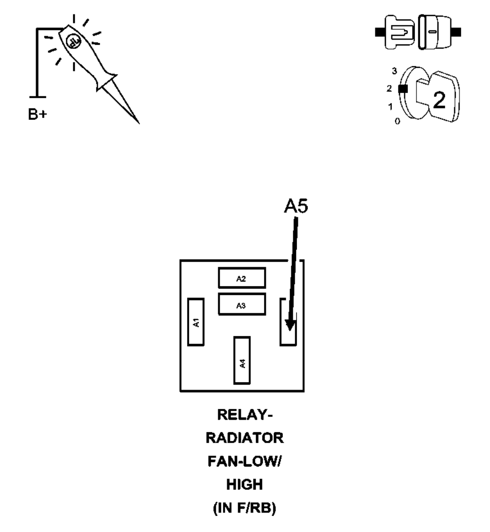
No >> Repair the (A16) Fused B+ circuit. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. LOW/HIGH RAD FAN CONTROL CIRCUIT

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #1 Control State, Toggle, to actuate the Cooling Fan (Low/High).

Using a 12-volt test light connected to battery voltage, probe the (N201) Low/High Rad Fan Control circuit in the Low/High Rad Relay harness connector.



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Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Low/High Rad Fan Relay.

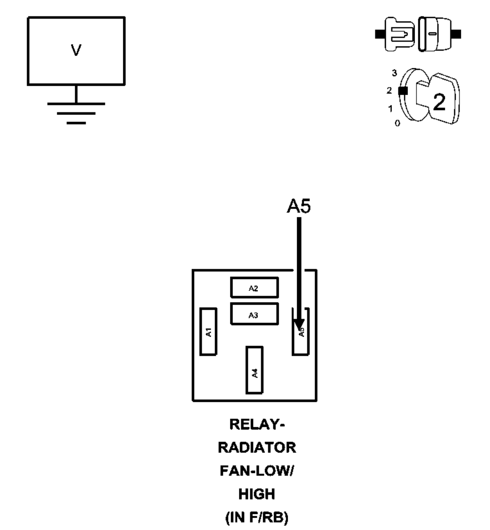
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (N201) LOW/HIGH RAD FAN CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the TIPM C11 harness connector.

Using a voltmeter, measure the voltage of the (N201) Low/High Rad Fan Control circuit in the Low/High Rad Relay harness connector.



8183ea12

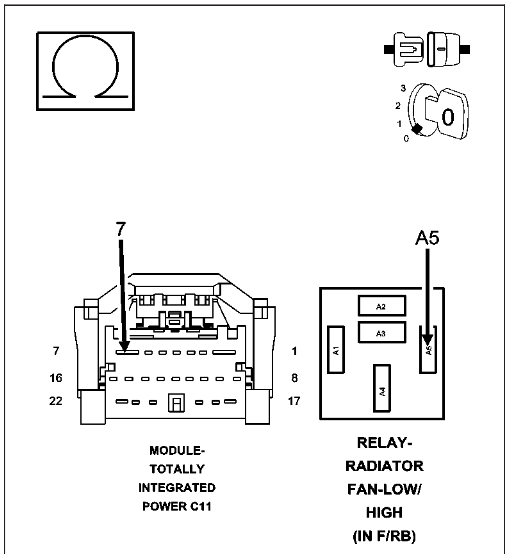
Is there voltage present?

Yes >> Repair the short to voltage in the (N201) Low/High Rad Fan Control circuit

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (N201) LOW/HIGH RAD FAN CONTROL CIRCUIT OPEN



8183ea16

Measure the resistance of the (N201) Low/High Fan Control circuit from the Low/High Rad Relay harness connector to the TIPM C11 harness connector.

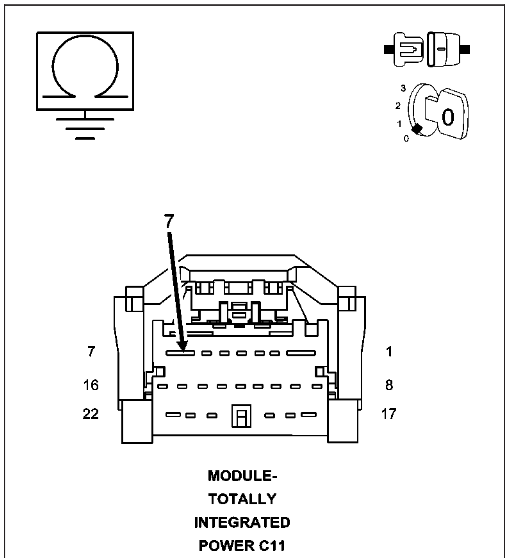
Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (N201) Low/High Fan Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (N201) LOW/HIGH RAD FAN CONTROL CIRCUIT SHORTED TO GROUND



8183ea1a

Measure the resistance between ground and the (N201) Low/High Fan Control circuit in the TIPM C11 harness connector.

Is the resistance below 100 ohms?

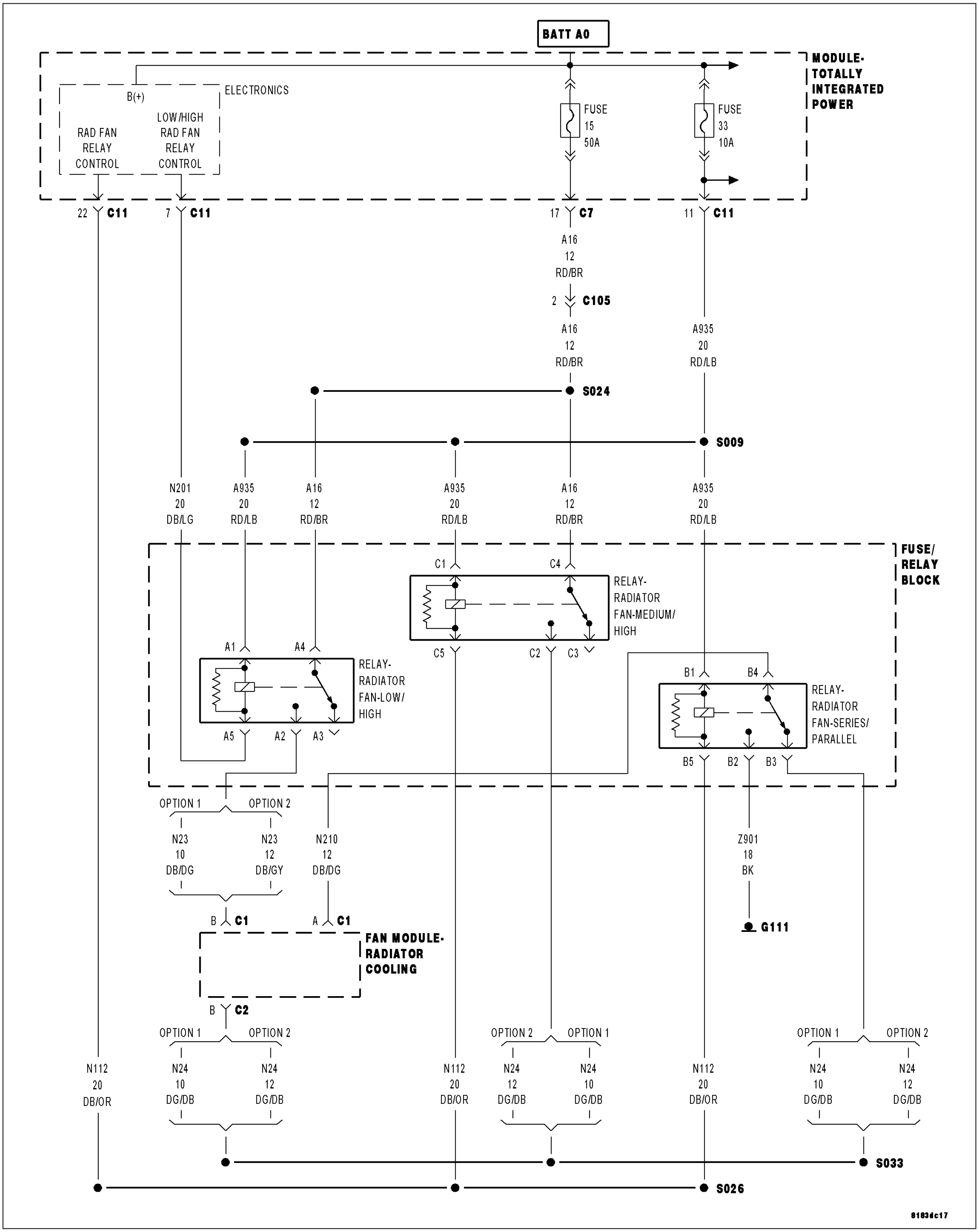
Yes >> Repair the short to ground in the (N201) Low/High Fan Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0481-COOLING FAN 2 CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted circuit is detected in the High Speed Rad Fan Control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A16) FUSED (B+) CIRCUITS
(N112) RAD FAN RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(N112) RAD FAN RELAY CONTROL CIRCUIT OPEN
(N112) RAD FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND
MED/HIGH RAD FAN RELAY
SERIES/PARALLEL RAD FAN RELAY
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. RADIATOR COOLING FAN MODULE OPERATION

Ignition on, engine not running.

With a scan tool, actuate both the Radiator Cooling Fan Relays #1 and #2.

Are both cooling fan operating at medium speed?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

2. (A16) FUSED B+ CIRCUIT

Ignition on.

Disconnect the Med/High Rad Fan Relay from the Fuse/Relay Block.

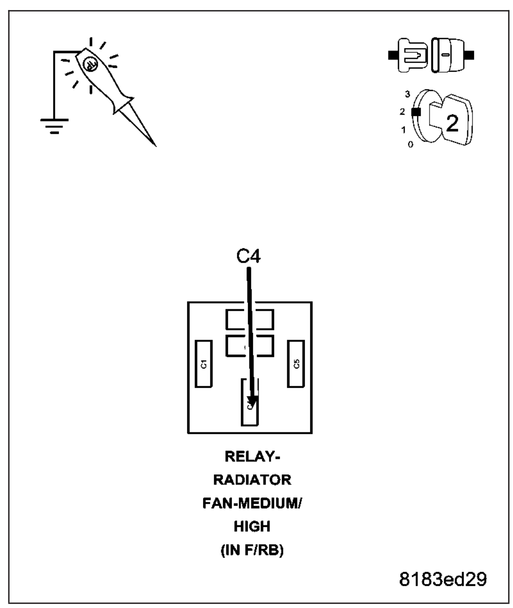
Disconnect the Series/Parallel Rad Fan Relay from the Fuse/Relay Block.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuit at both the Med/High Rad Fan Relay and the Series/Parallel Rad Fan Relay connectors.

Does the test light illuminate brightly at each terminal?

Yes >> Go To 3

No >> Repair the (A16) Fused B+ circuit. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



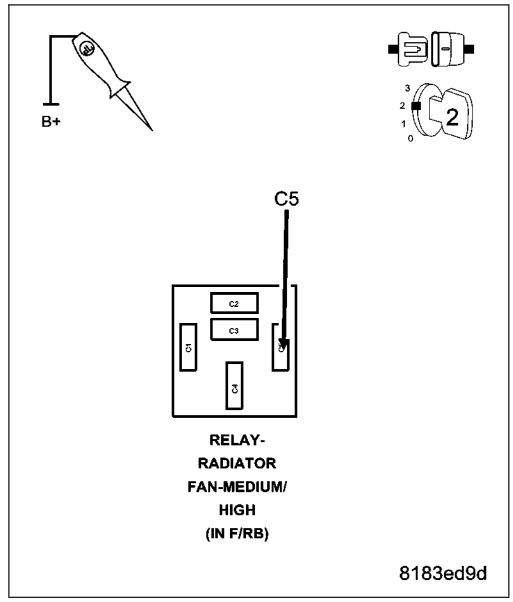
3. MED/HIGH RAD FAN RELAY

Install the Series/Parallel Rad Fan Relay.

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State, Toggle, to actuate the Cooling Fan (Med/High Rad Fan Relay).

Using a 12-volt test light connected to battery voltage, probe the (N112) Rad Fan Relay Control circuit at the Med/High Rad Fan Relay.



Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Med/High Rad Fan Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. SERIES/PARALLEL RAD FAN RELAY)

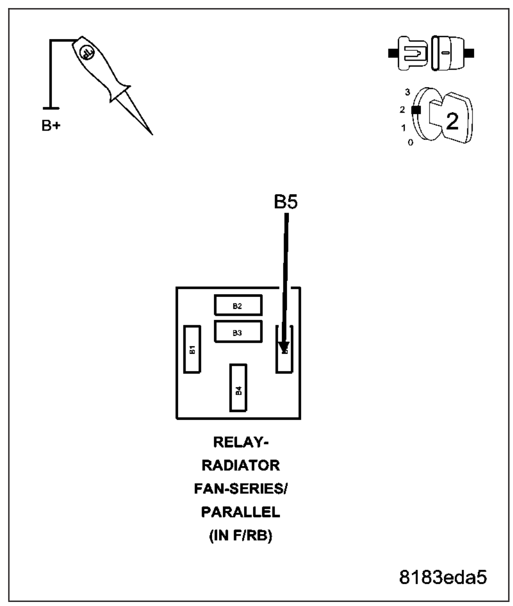
Remove the Series/Parallel Rad Fan Relay.

Install the Med/High Rad Fan Relay.

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State, Toggle, to actuate the Cooling Fan (Series/Parallel Rad Fan Relay).

Using a 12-volt test light connected to battery voltage, probe the (N112) Rad Fan Relay Control circuit at the Series/Parallel Rad Fan Relay.



Does the test light illuminate brightly and flash on and off?

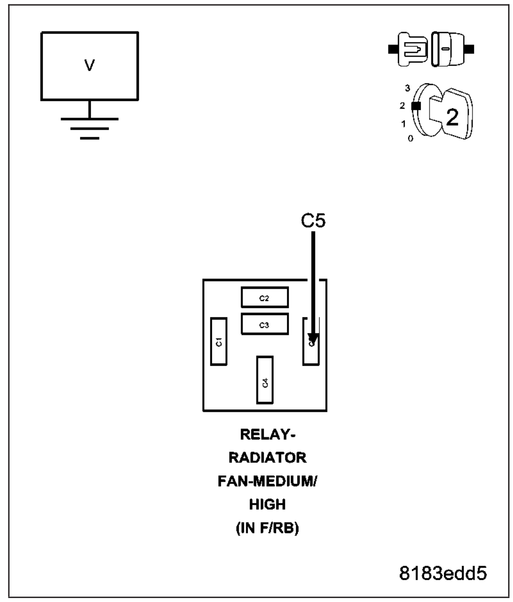
Yes >> Replace the Series/Parallel Rad Fan Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (N112) RAD FAN RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the TIPM C11 harness connector.

Using a voltmeter, measure the voltage of the (N112) Rad Fan Relay Control circuit in the Med/High Rad Fan Relay harness connector.



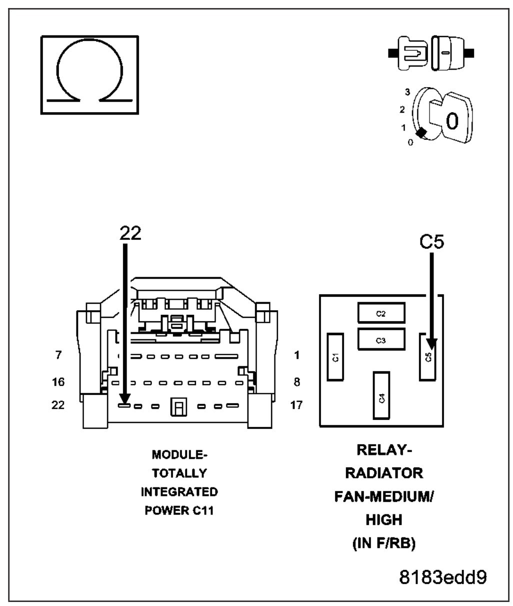
Is there voltage present?

Yes >> Repair the short to voltage in the (N112) Rad Fan Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (N112) RAD FAN RELAY CONTROL CIRCUIT OPEN

Measure the resistance of the (N112) Rad Fan Relay Control circuit from the Med/High Rad Fan Relay harness connector to the TIPM C11 harness connector.



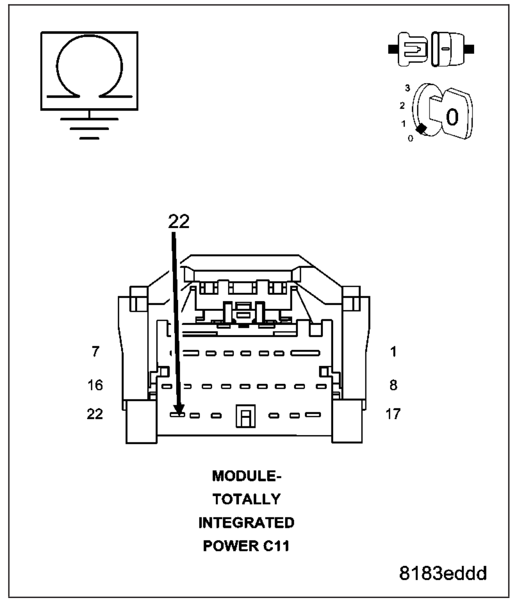
Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (N112) Rad Fan Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (N112) RAD FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N112) Rad Fan Relay Control circuit in the TIPM C11 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N112) Rad Fan Relay Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The vehicle speed sensor rationality is a continuous test that monitors the vehicle speed sensor for lack of activity. The rationality will not run if a limp-in exists for MAP, Throttle Position, and Engine Coolant Temperature. If vehicle speed sensor is below a minimum threshold for a period of time after the vehicle is operated at a sufficient load, a failure will be indicated.

- **When Monitored:**
  With the engine running, transmission not in park or neutral, brakes not applied, and engine RPM greater than 1500.
- **Set Condition:**
  This code will set if no vehicle speed signal is received from the ABS Module for more than 11 seconds for 2 consecutive trips. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active DTCs in the Anti-Lock Brake Module. Any bus, communication, or VSS DTCs in the Anti-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

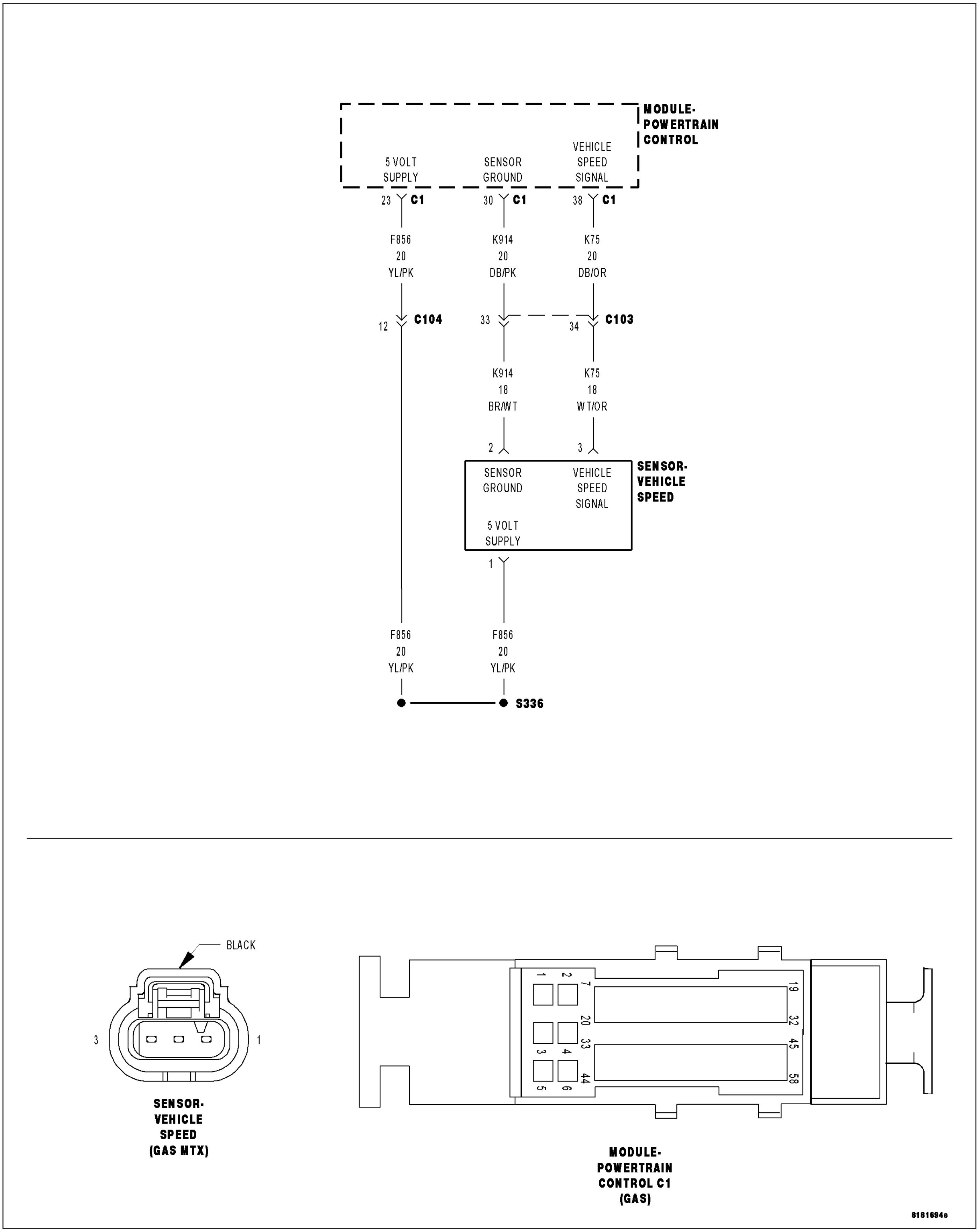
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors related to this circuit.
Look for any chafed, pierced, pinched, or partially broken wires.
Look for broken, bent, pushed out or corroded terminals.
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (MTX NON-ABS)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the Vehicle Speed Sensor circuit.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
VEHICLE SPEED SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

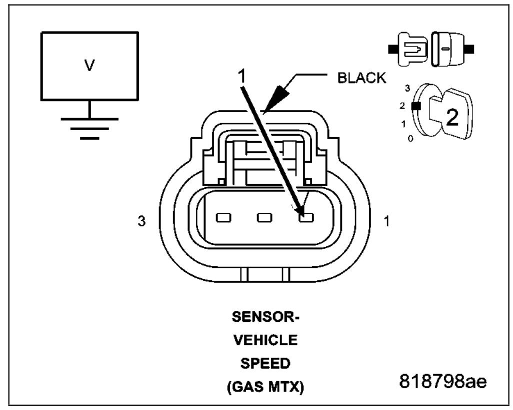
2. (F856) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Vehicle Speed Sensor connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



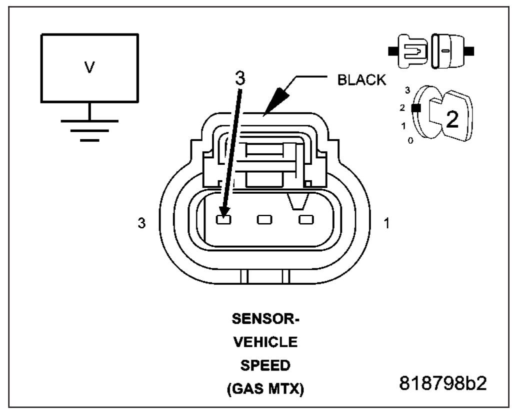
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K75) VEHICLE SPEED SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11

4. (K914) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K914) Sensor Ground in the Vehicle Speed Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

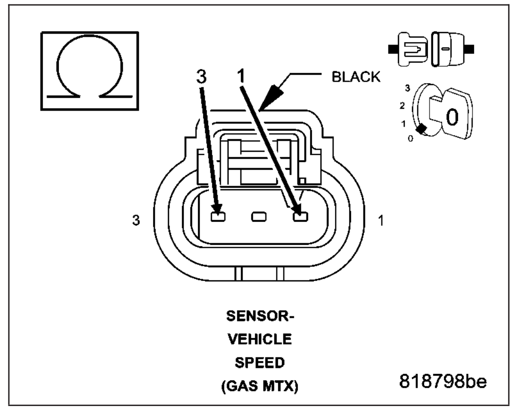
No >> Go to 15

5. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K75) Vehicle Speed Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VEHICLE SPEED SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Vehicle Speed Sensor for any condition that would result in an incorrect signal, such as damage, corrosion, or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Vehicle Speed Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

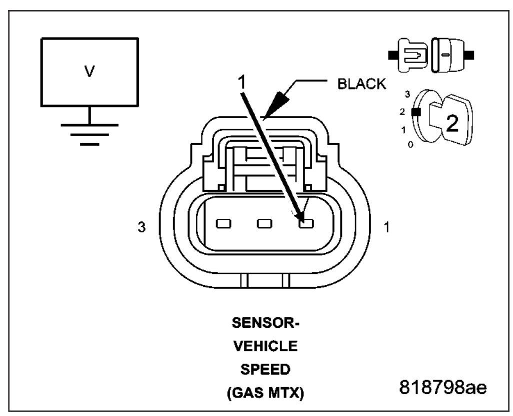
7. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

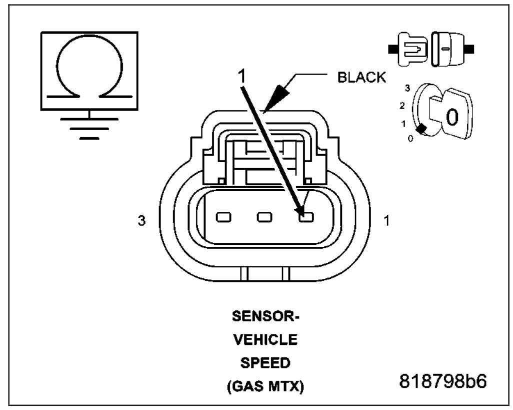
Yes >> Repair the (F856) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



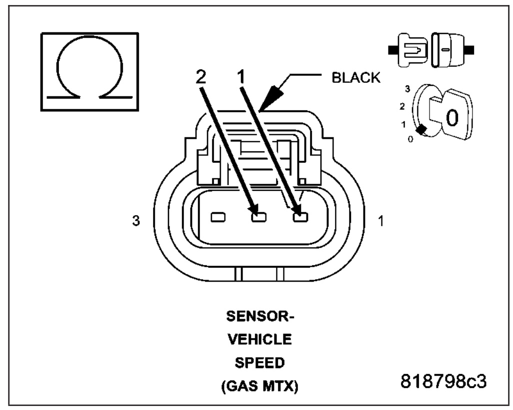
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (F856) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



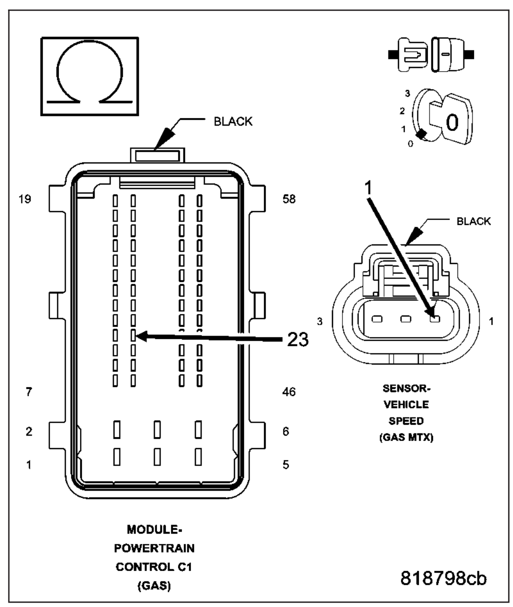
Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K914) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F856) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

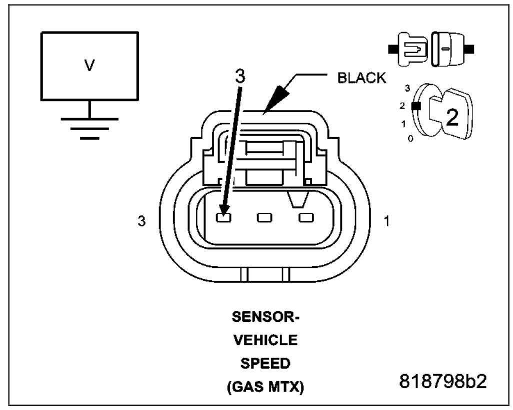
11. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

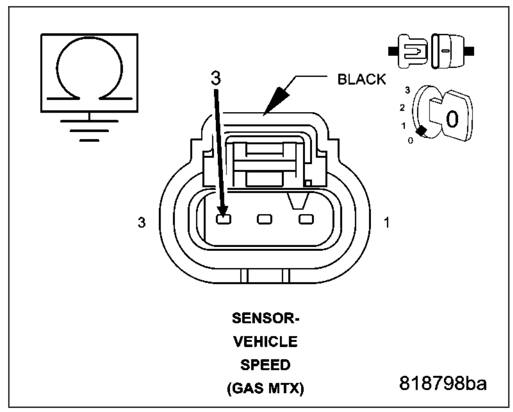
Yes >> Repair the (K75) Vehicle Speed Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



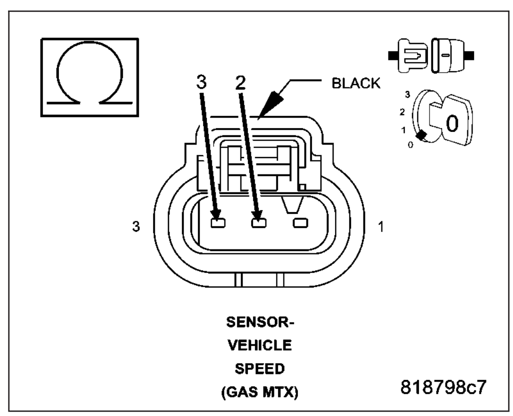
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (K75) Vehicle Speed Signal circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



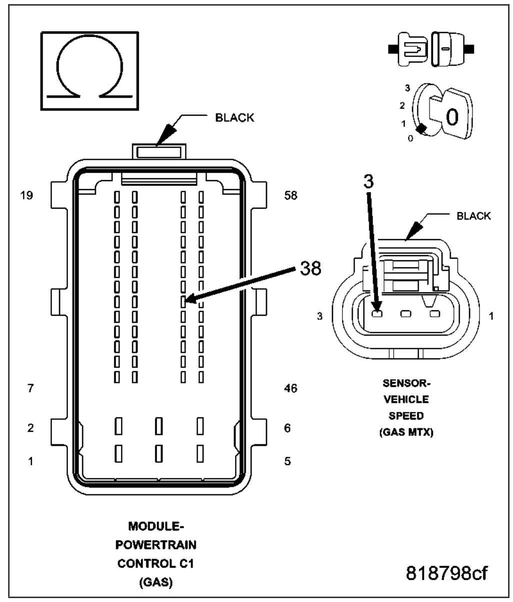
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to the (K914) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K75) Vehicle Speed Signal circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K75) Vehicle Speed Signal circuit for an open circuit or high resistance.

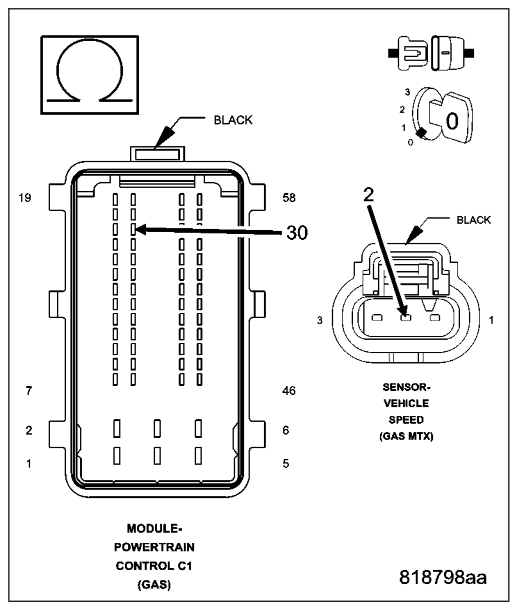
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K914) Sensor Ground circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The vehicle speed sensor rationality is a continuous test that monitors the vehicle speed sensor for lack of activity. The rationality will not run if a limp-in exists for MAP, Throttle Position, and Engine Coolant Temperature. If vehicle speed sensor is below a minimum threshold for a period of time after the vehicle is operated at a sufficient load, a failure will be indicated.

- **When Monitored:**
  With the engine running, transmission not in park or neutral, brakes not applied, and engine rpm greater than 1500.
- **Set Condition:**
  This code will set if no vehicle speed signal is received from the ABS Module for more than 11 seconds for 2 consecutive trips. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active DTCs in the Anti-Lock Brake Module. Any bus, communication, or VSS DTCs in the Anti-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

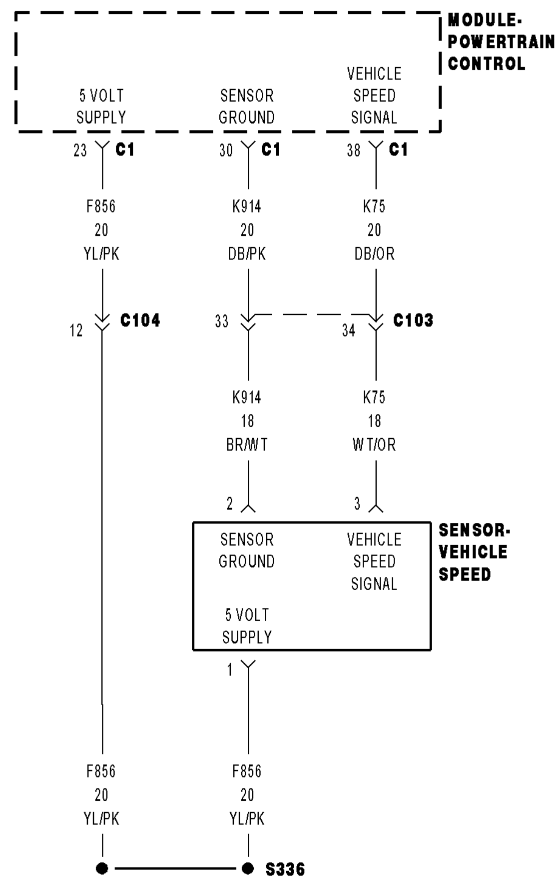
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors related to this circuit.
Look for any chafed, pierced, pinched, or partially broken wires.
Look for broken, bent, pushed out or corroded terminals.
Refer to any Technical Service Bulletins that may apply.

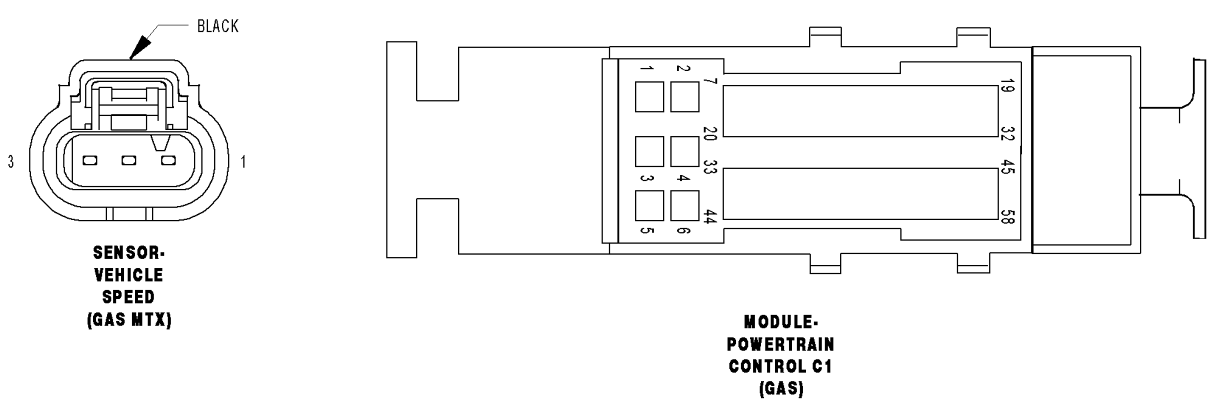
Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0503-VEHICLE SPEED SENSOR 1 ERRATIC (MTX NON-ABS)





For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the Vehicle Speed Sensor circuit.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
VEHICLE SPEED SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

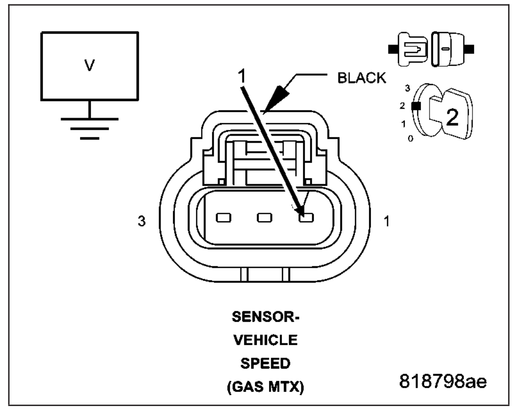
2. (F856) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Vehicle Speed Sensor connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



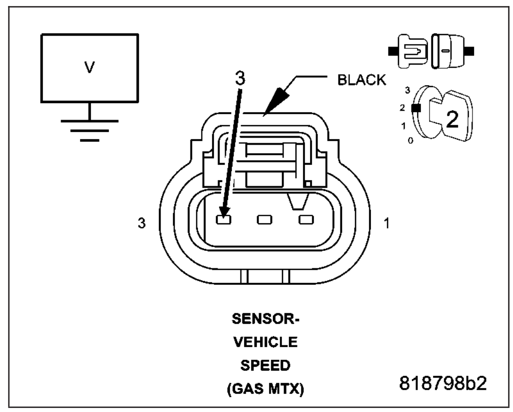
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K75) VEHICLE SPEED SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11

4. (K914) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K914) Sensor Ground in the Vehicle Speed Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

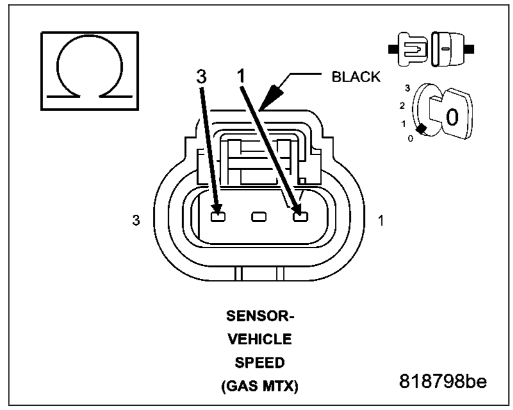
No >> Go to 15

5. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K75) Vehicle Speed Signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VEHICLE SPEED SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Vehicle Speed Sensor for any condition that would result in an incorrect signal, such as damage, corrosion, or contamination.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Vehicle Speed Sensor.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

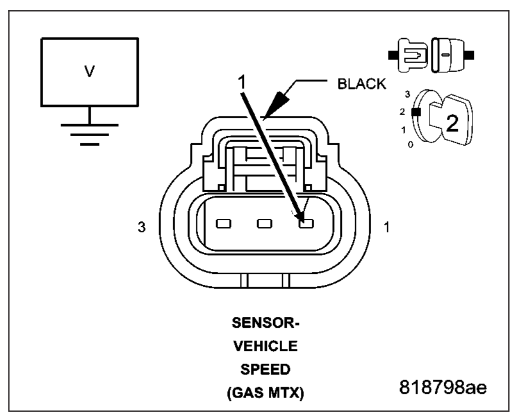
7. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (F856) 5 Volt Supply circuit for a short to voltage.

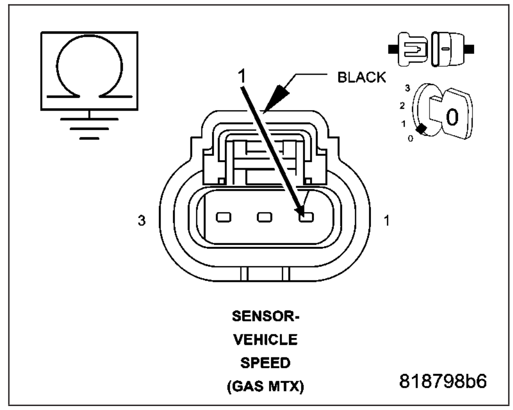
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

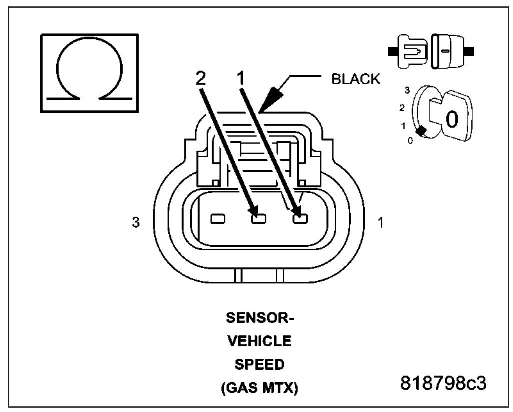
Yes >> Go to 9

No >> Repair the (F856) 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

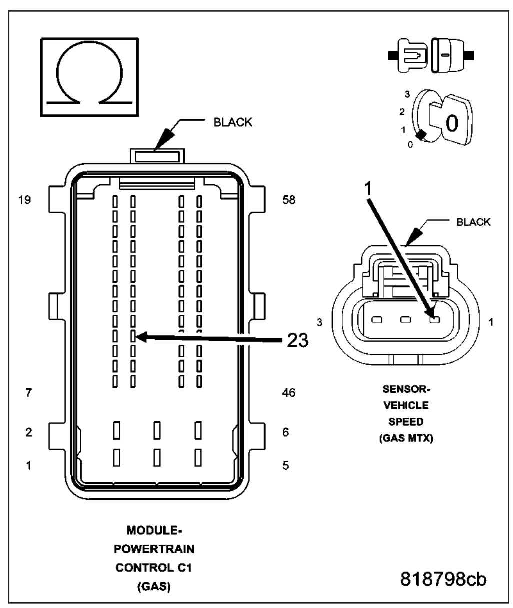
Yes >> Go to 10

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K914) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F856) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

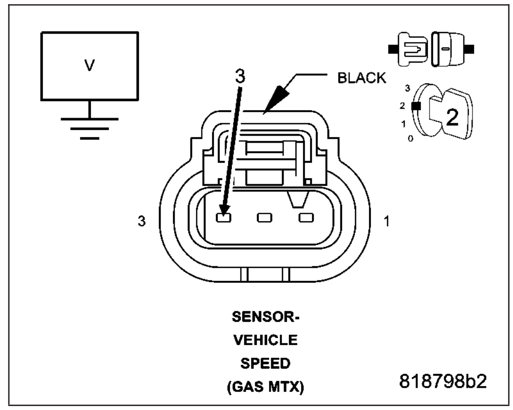
11. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

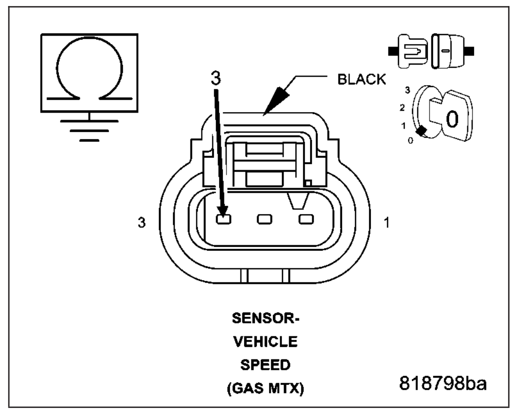
Yes >> Repair the (K75) Vehicle Speed Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



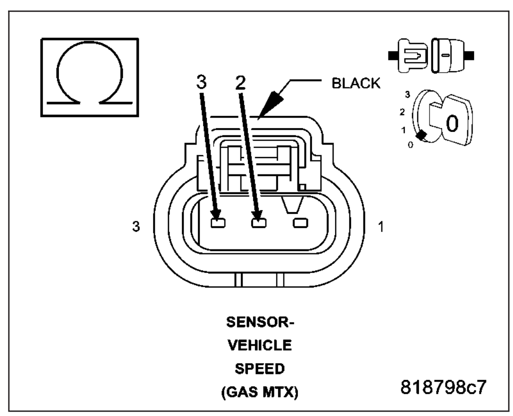
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (K75) Vehicle Speed Signal circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



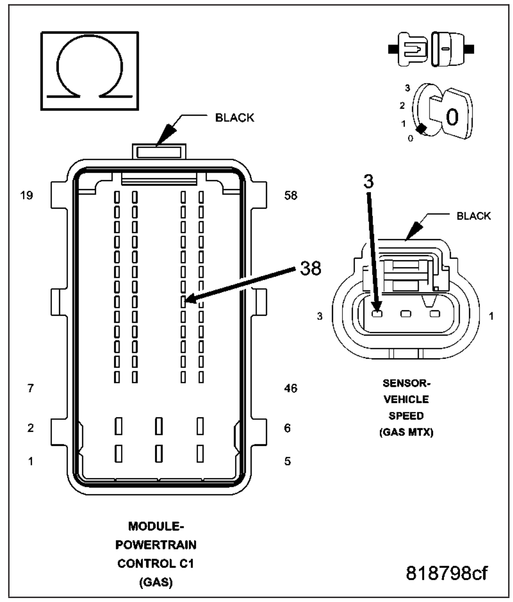
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to the (K914) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K75) Vehicle Speed Signal circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K75) Vehicle Speed Signal circuit for an open circuit or high resistance.

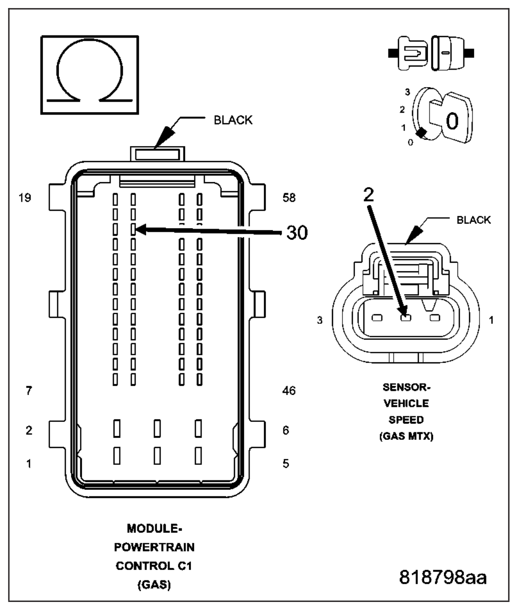
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K914) Sensor Ground circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0506-IDLE SPEED PERFORMANCE LOWER THAN EXCEPTED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The objective of the Idle Speed Rationality monitor is to evaluate the ability of the idle speed control system to achieve and maintain a steady idle, by monitoring engine RPM during idle. If engine RPM is not within a calibrated deadband of target idle speed, a timer is started. If the timer reaches a maximum threshold without any sign of the RPM trending towards control, a soft failure is generated.

- **When Monitored:**
  With the engine idling in drive (for CVT vehicles) with the brake applied, MAF < 250 mg/tdc, air temp > -17.8° C (0° F) enable after coolant temp > 70° C (158° F), canister purge < 100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CKP Sensor, fuel system, or injector DTCs present.
- **Set Condition:**
  Engine speed is 100 RPM or more below target idle speed for 30 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM LEAKS OR RESTRICTIONS
PCV SYSTEM LEAKS OR RESTRICTIONS
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: It is possible for ETC DTCs to be set at the same time as this DTC. Proceed with this test only if the other DTCs that are present are ETC related, but clear them before proceeding. If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. AIR INDUCTION SYSTEM

Inspect the air induction system for the following problems:

Restrictions - dirty air cleaner, foreign material trapped in the air intake tube, etc.

Leaks - air intake tube connection, air cleaner housing, etc.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. PCV SYSTEM

Inspect the PCV system for the following problems:

Restrictions - sticking valve, collapsed hoses or tubes, obstructed passages or ports, etc.

Leaks - cracked or damaged hoses or tubes, poor hose or tube connections, PCV valve stuck open, etc.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. THROTTLE BODY OPERATION

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Inspect the throttle body for carbon build up or other restrictions.

Using a straight edge, verify that the throttle plate is not bent. If the throttle plate is bent, the throttle body must be replaced.

Start the engine.

While the engine is running, lightly tap on the ETC Motor, and listen for the idle to change.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the throttle body and the PCM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXCEPTED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The objective of the Idle Speed Rationality monitor is to evaluate the ability of the idle speed control system to achieve and maintain a steady idle, by monitoring engine RPM during idle. If engine RPM is not within a calibrated deadband of target idle speed, a timer is started. If the timer reaches a maximum threshold without any sign of the RPM trending towards control, a soft failure is generated.

- **When Monitored:**
  With the engine idling in drive (for CVT vehicles) with the brake applied, MAF < 250 mg/tdc, air temp > -17.8° C (0° F) enable after coolant temp > 70° C (158° F), canister purge < 100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CKP Sensor, fuel system, or injector DTCs present.
- **Set Condition:**
  If the idle speed is 175 RPM or more above the target idle speed for 30 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM LEAKS OR RESTRICTIONS
PCV SYSTEM LEAKS OR RESTRICTIONS
VACUUM LEAKS
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: It is possible for ETC DTCs to be set at the same time as this DTC. Proceed with this test only if the other DTCs that are present are ETC related, but clear them before proceeding. If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. AIR INDUCTION SYSTEM LEAKS OR RESTRICTIONS

Inspect the air induction system for the following problems:

Restrictions - dirty air cleaner, foreign material trapped in the air intake tube, etc.

Leaks - air intake tube connection, air cleaner housing, etc.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. PCV SYSTEM

Inspect the PCV system for the following problems:

Restrictions - sticking valve, collapsed hoses or tubes, obstructed passages or ports, etc.

Leaks - cracked or damaged hoses or tubes, hose or tube connections disconnected at PCV valve or throttle body, PCV valve stuck open, etc.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. ENGINE VACUUM LEAKS

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Inspect the engine for external vacuum leaks.

Inspect the engine for internal leaks.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. THROTTLE BODY OPERATION

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Inspect the throttle body for carbon build up or other restrictions.

Using a straight edge, verify that the throttle plate is not bent. If the throttle plate is bent, the throttle body must be replaced.

Start the engine.

While the engine is running, lightly tap on ETC Motor, and listen for the idle to change.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the throttle body and the PCM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0513-INVALID SKIM KEY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM detects an invalid ignition key. One Trip Fault.

Possible Causes
INCORRECT VIN PROGRAMMED IN THE PCM
NO COMMUNICATION WITH SKREEM/WCM
NO VIN PROGRAMMED IN THE PCM
IGNITION KEY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Go to 6

2. NO COMMUNICATION WITH SKREEM/WCM

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

With the scan tool, attempt to communicate with the SKREEM/WCM.

Can the scan tool communicate with the SKREEM/WCM?

Yes >> Go to 3

No >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.

Perform the SKREEM/WCM VERIFICATION Test.

3. SKREEM/WCM TROUBLE CODES SET

With the scan tool, check for SKREEM/WCM DTCs.

Are any DTCs present in the SKREEM/WCM?

Yes >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.

Perform the SKREEM/WCM VERIFICATION Test.

No >> Go to 4

4. VIN PROGRAMMED INTO PCM

With the scan tool, display the VIN that is programmed in the PCM.

Has a VIN been programmed into the PCM?

Yes >> Go to 5

No >> Program the correct VIN into the PCM and retest.
Perform the SKREEM/WCM VERIFICATION Test.

5. POWERTRAIN CONTROL MODULE (PCM)

Turn the ignition off.

Replace and program the SKREEM/WCM in accordance with the Service Information.

Ignition on, engine not running.

With the scan tool, erase all SKREEM/WCM and PCM DTCs.

Attempt to start the engine.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform the SKREEM/WCM VERIFICATION Test.

No >> Test Complete.

6. IGNITION KEY

NOTE: This DTC could have been set if the SKREEM/WCM harness connector was disconnected, or if the SKREEM/WCM was replaced recently.

NOTE: All of the ignition keys for this vehicle must be tested to verify proper operation.

Ignition on, engine not running.

Verify that the correct VIN is programmed into the PCM and SKREEM/WCM.

Turn the ignition off.

Using each vehicle key, turn the ignition on and start the engine.

With a scan tool, View DTCs for each key.

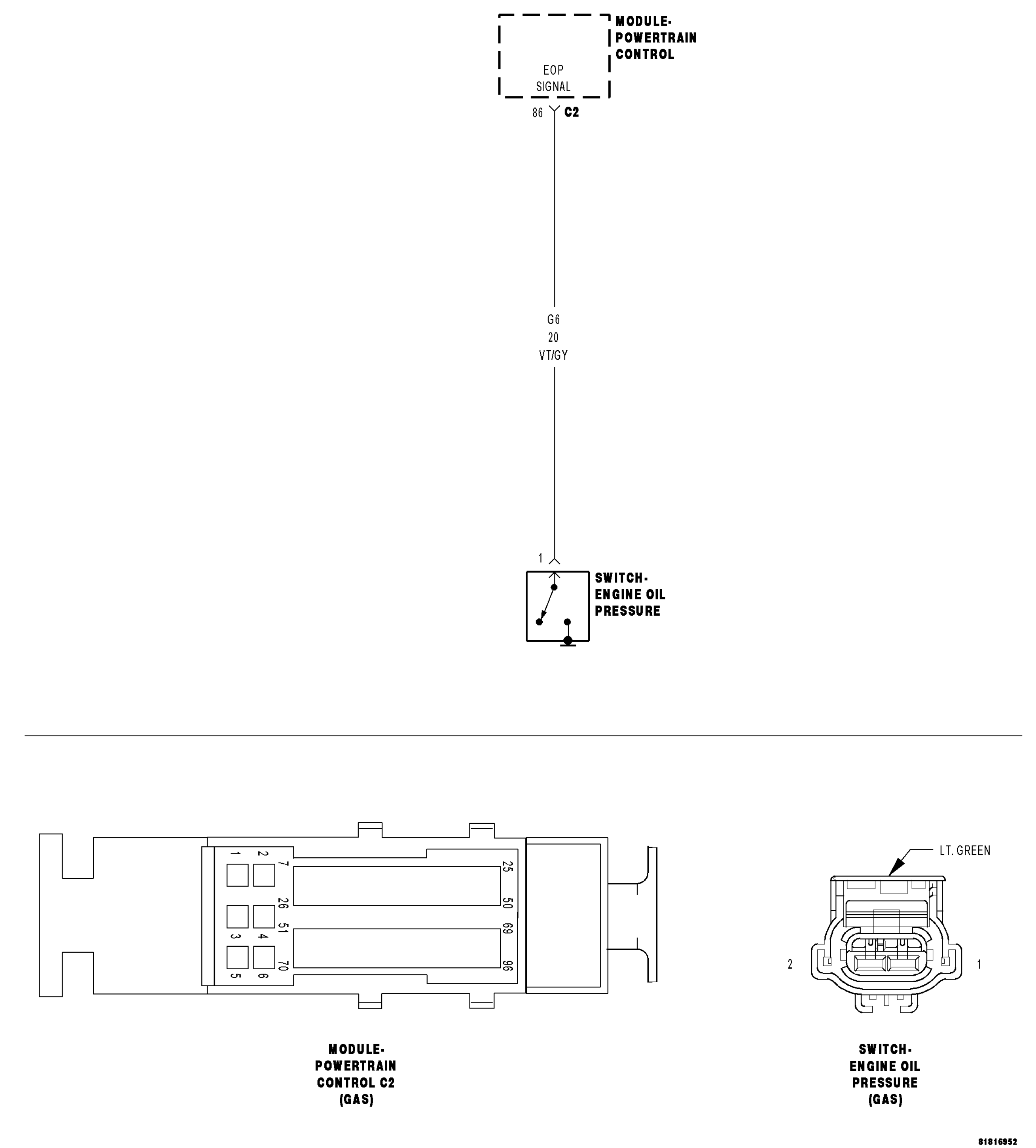
Is the status Active for this DTC?

Yes >> Replace the ignition key.
Perform the SKREEM/WCM VERIFICATION Test.

No >> Test Complete.

NOTE: If this DTC cannot be reset, it could have been an actual theft attempt.

P0522-ENGINE OIL PRESSURE SWITCH CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (G6) EOP Signal circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(G6) EOP SIGNAL CIRCUIT SHORTED TO GROUND
(G6) EOP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE OIL PRESSURE SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G6) EOP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Oil Pressure Switch connector.

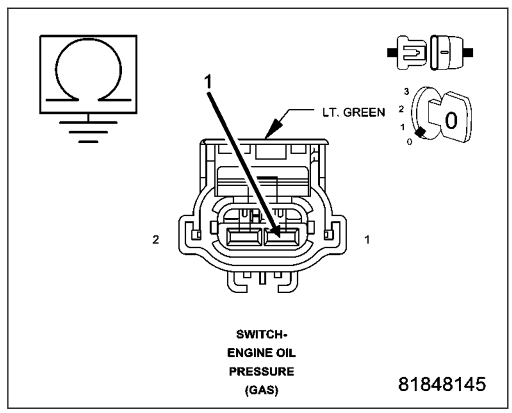
Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (G6) EOP Signal circuit in the Engine Oil Pressure Switch harness connector.

Is the resistance above 100 ohms?

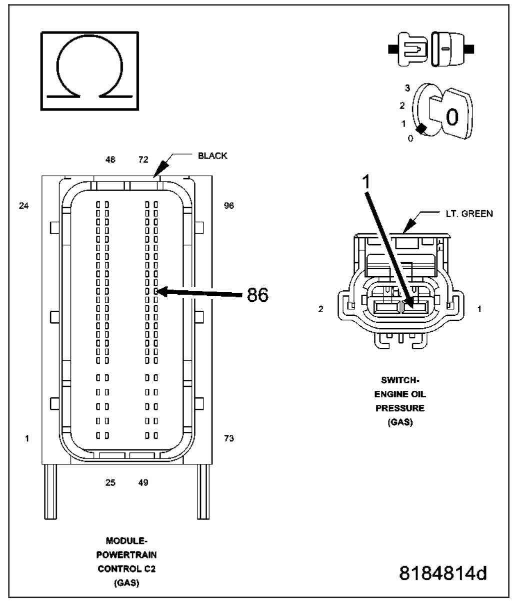
Yes >> Go to 3

No >> Repair the (G6) EOP Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



3. (G6) EOP SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (G6) EOP Signal circuit between the Engine Oil Pressure Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (G6) EOP Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. ENGINE OIL PRESSURE SWITCH

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, select View DTCs.

NOTE: The PCM should display an Engine Oil Pressure Sensor Circuit High DTC with the switch disconnected.

Is the status Active for an Engine Oil Pressure Sensor Circuit High DTC with the switch disconnected?

Yes >> Replace the Engine Oil Pressure Switch in accordance with the service information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Oil Pressure Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

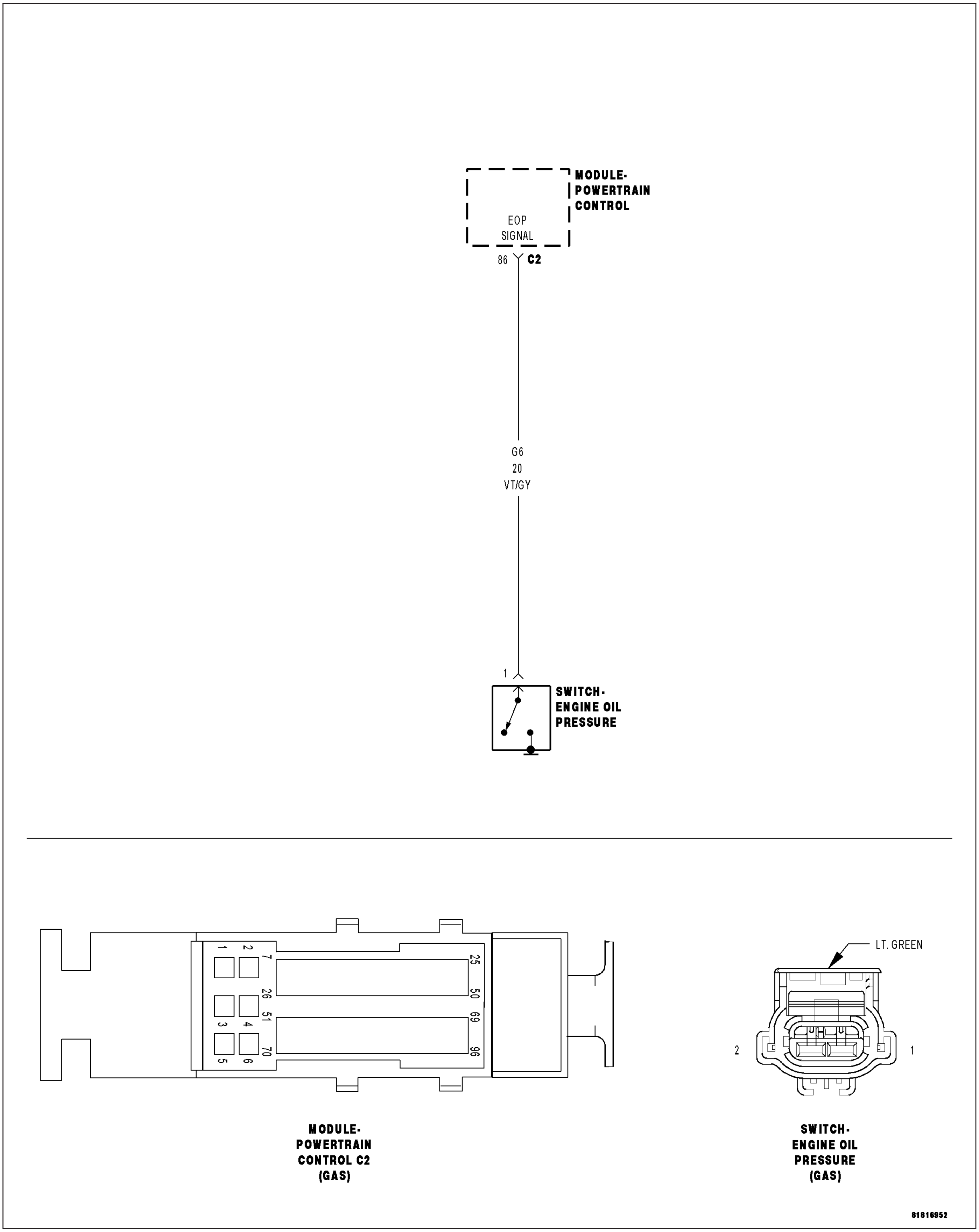
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0523-ENGINE OIL PRESSURE SWITCH CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (G6) EOP Signal circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(G6) EOP SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G6) EOP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE OIL PRESSURE SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G6) EOP SIGNAL CIRCUIT SHORTED TO VOLTAGE

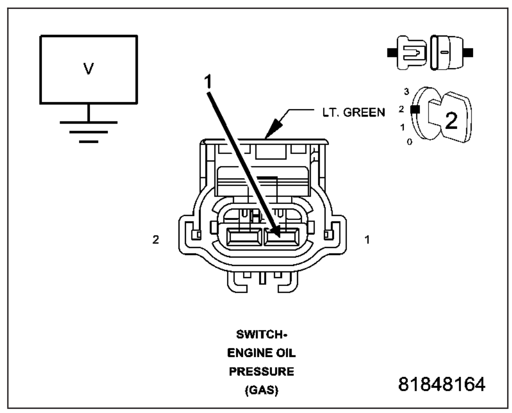
Turn the ignition off.

Disconnect the Engine Oil Pressure Switch connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (G6) EOP Signal circuit in the Engine Oil Pressure Switch harness connector.



Is there any voltage present?

Yes >> Repair the (G6) EOP Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (G6) EOP SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

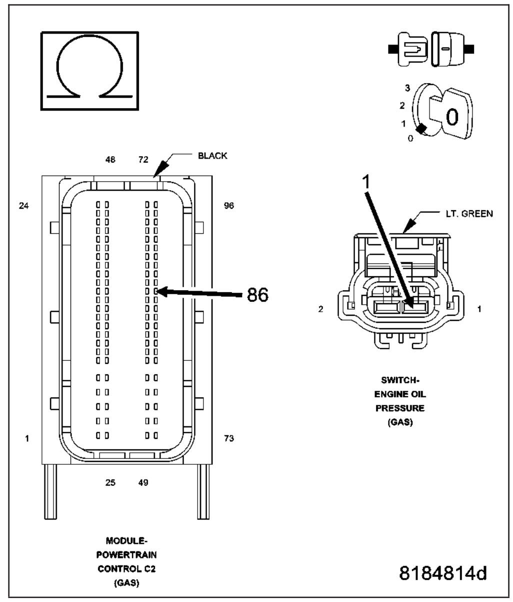
Measure the resistance of the (G6) EOP Signal circuit between the Engine Oil Pressure Switch harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (G6) EOP Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. ENGINE OIL PRESSURE SWITCH

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between ground and the (G6) EOP Signal circuit in the Engine Oil Pressure Switch harness connector.

Turn the ignition on.

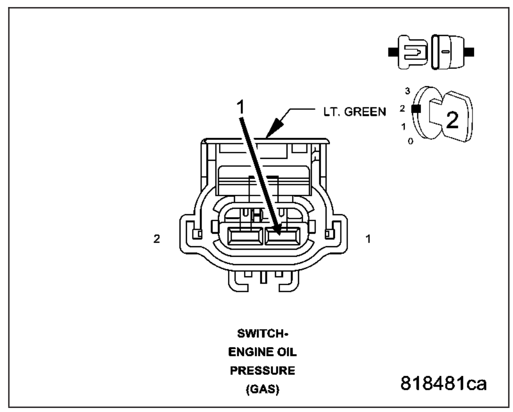
NOTE: The PCM should display an Engine Oil Pressure Sensor Circuit Low DTC with the jumper wire in place.

Is the status Active for an Engine Oil Pressure Sensor Circuit High DTC with the jumper wire in place?

Yes >> Replace the Engine Oil Pressure Switch in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5



5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Oil Pressure Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

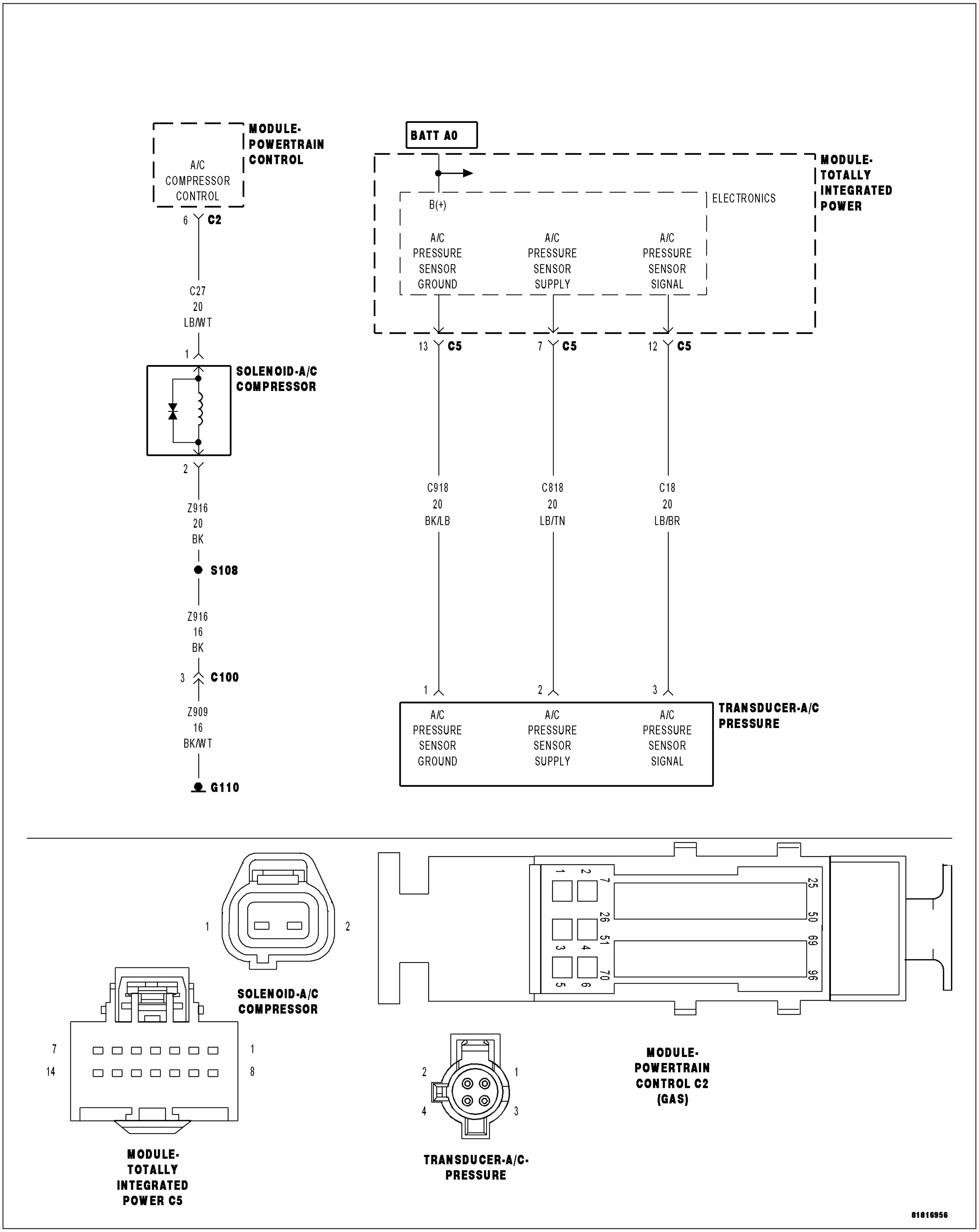
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0532-A/C PRESSURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (C18) A/C Pressure Sensor Signal circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO GROUND
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO (C918) A/C PRESSURE SENSOR GROUND CIRCUIT
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO (C918) A/C PRESSURE SENSOR GROUND CIRCUIT
(C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
A/C PRESSURE TRANSDUCER
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

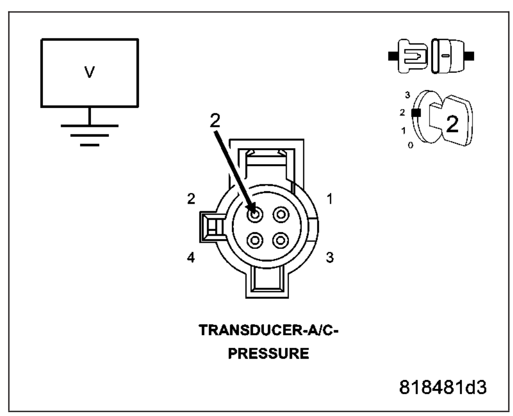
2. (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the A/C Pressure Transducer connector.

Turn the ignition on.

Measure the voltage of the (C818) A/C Pressure Sensor Supply circuit in the A/C Pressure Transducer harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

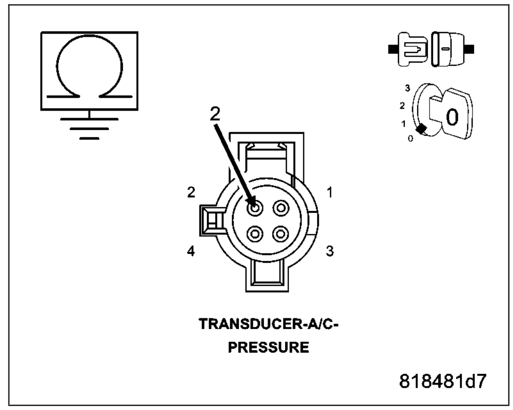
No >> Go to 3

3. (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Measure the resistance between ground and the (C818) A/C Pressure Sensor Supply circuit in the A/C Pressure Transducer harness connector.



Is the resistance above 1000 ohms?

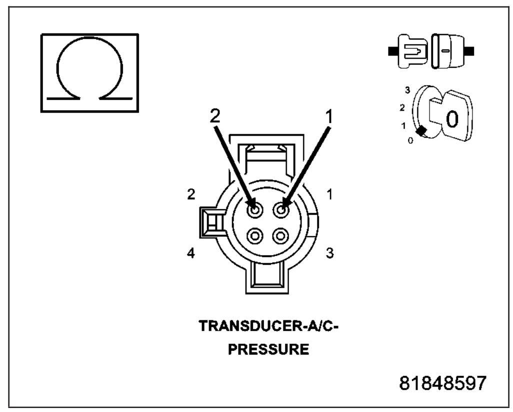
Yes >> Go to 4

No >> Repair the (C818) A/C Pressure Sensor Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO (C918) A/C PRESSURE SENSOR GROUND CIRCUIT

Measure the resistance between the (C818) A/C Pressure Sensor Supply circuit and the (C918) A/C Pressure Sensor Ground circuit in the A/C Pressure Transducer harness connector.



Is the resistance above 100 ohms?

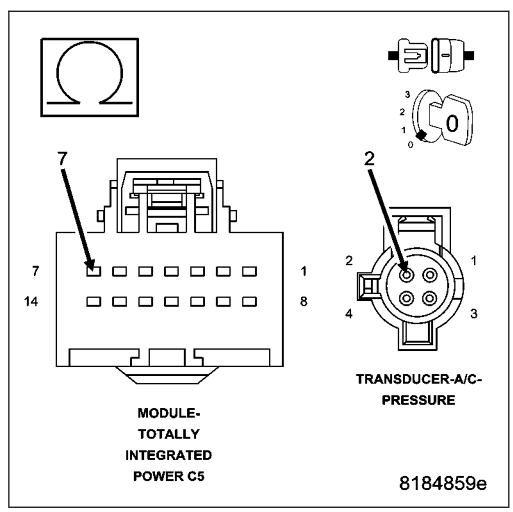
Yes >> Go to 5

No >> Repair the (C818) A/C Pressure Sensor Supply circuit for a short to the (C918) A/C Pressure Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C818) A/C Pressure Sensor Supply circuit between the A/C Pressure Transducer harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (C818) A/C Pressure Sensor Supply circuit for an open circuit or high resistance.

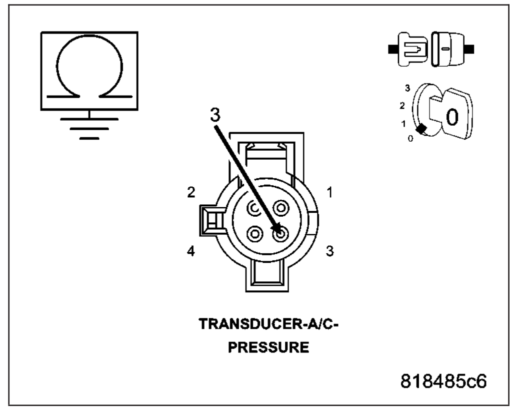
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Measure the resistance between ground and the (C18) A/C Pressure Sensor Signal circuit in the A/C Pressure Transducer harness connector.



Is the resistance above 100 ohms?

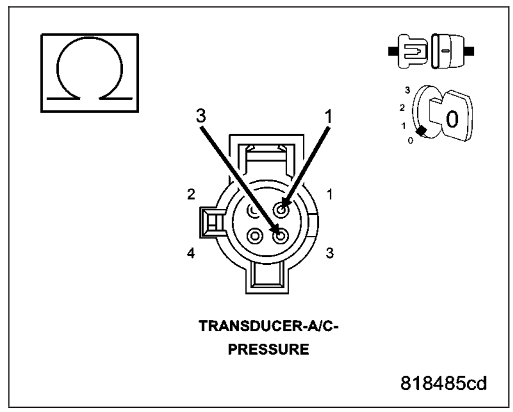
Yes >> Go to 7

No >> Repair the (C18) A/C Pressure Sensor Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO (C918) A/C PRESSURE SENSOR GROUND CIRCUIT

Measure the resistance between the (C18) A/C Pressure Sensor Signal circuit and the (C918) A/C Pressure Sensor Ground circuit in the A/C Pressure Transducer harness connector.



Is the resistance above 100 ohms?

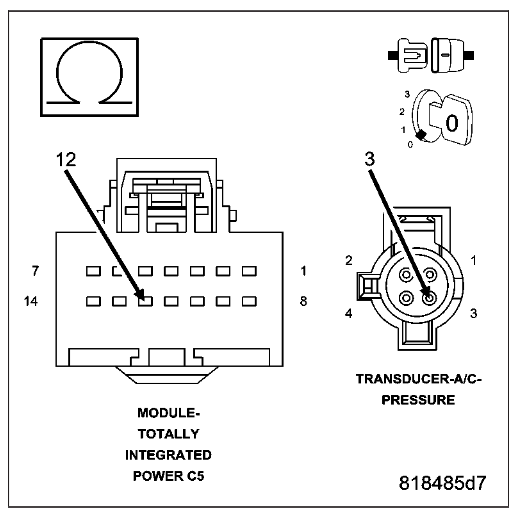
Yes >> Go to 8

No >> Repair the (C18) A/C Pressure Sensor Signal circuit for a short to the (C918) A/C Pressure Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C18) A/C Pressure Sensor Signal circuit between the A/C Pressure Transducer harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (C18) A/C Pressure Sensor Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. AC PRESSURE TRANSDUCER

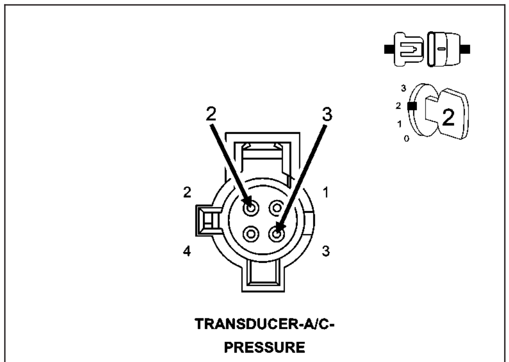
Turn the ignition off.

Connect the Totally Integrated Power Module (TIPM) connector.

Connect a jumper wire between the (C818) A/C Pressure Sensor Supply circuit and the (C18) A/C Pressure Sensor Signal circuit in the A/C Pressure Transducer harness connector.

Turn the ignition on.

With the scan tool, read the AC Pressure Transducer signal voltage.



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Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the A/C Pressure Transducer in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. TOTALLY INTEGRATED POWER MODULE (TIPM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Pressure Transducer and the Totally Integrated Power Module (TIPM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

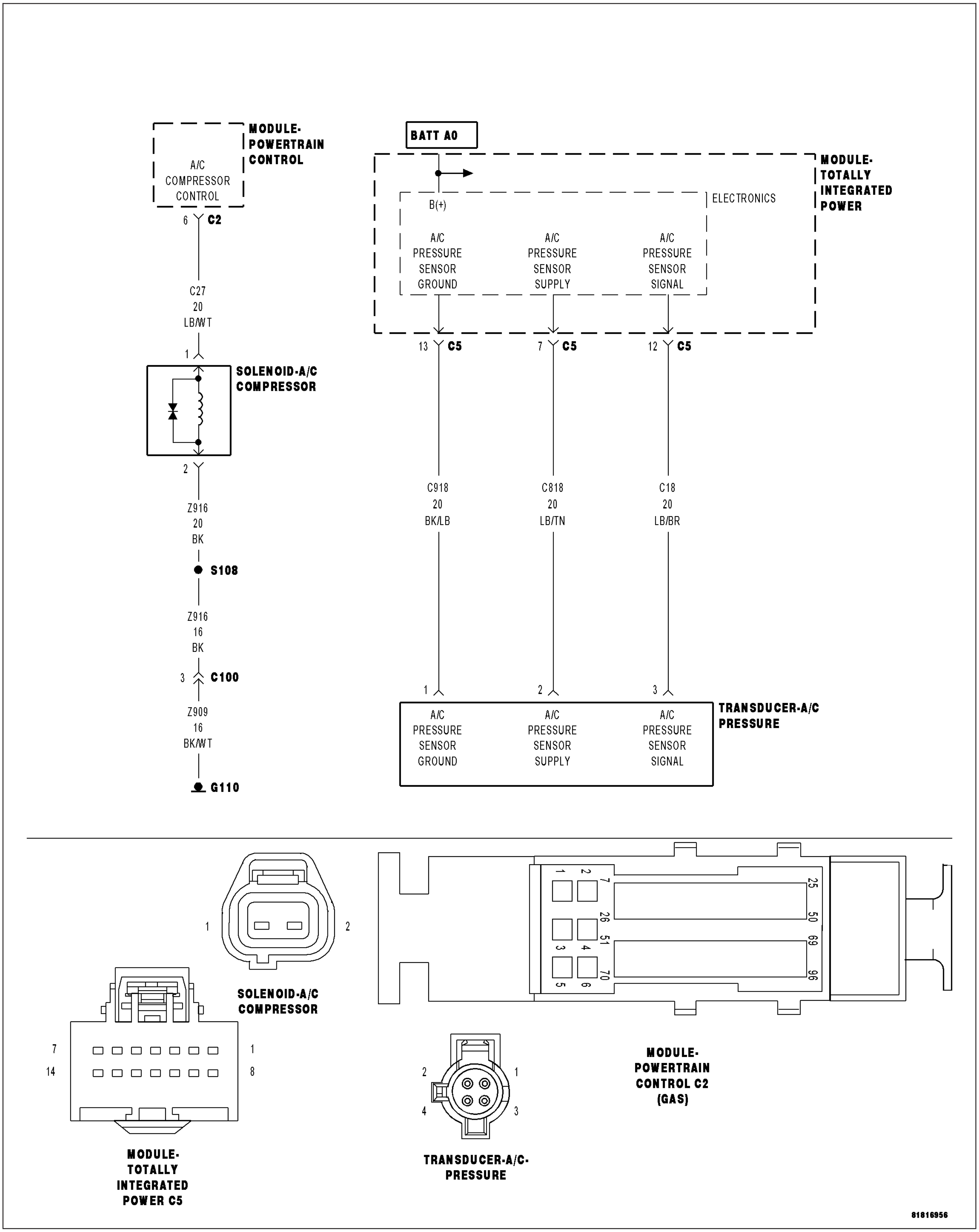
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0533-A/C PRESSURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (C18) A/C Pressure Sensor Signal circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT
(C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C918) A/C PRESSURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
A/C PRESSURE TRANSDUCER
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE

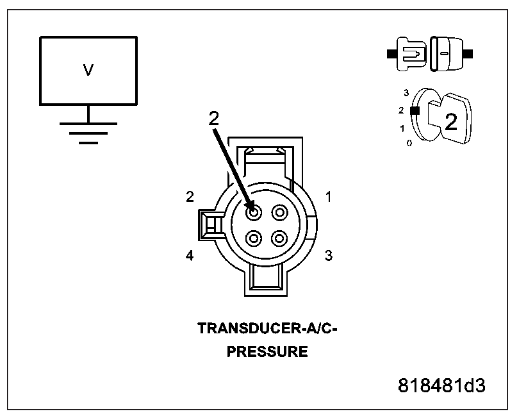
Turn the ignition off.

Disconnect the A/C Pressure Transducer connector.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Turn the ignition on.

Measure the voltage of the (C818) A/C Pressure Sensor Supply circuit in the A/C Pressure Transducer harness connector.



Is there any voltage present?

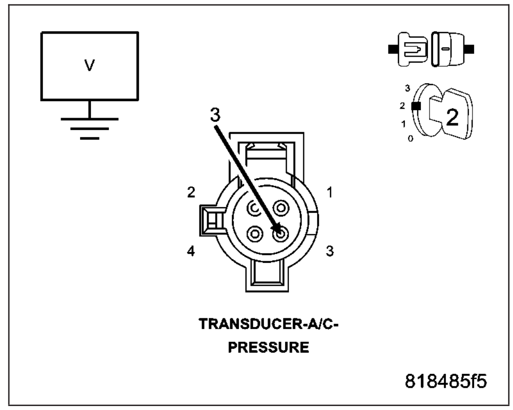
Yes >> Repair the (C818) A/C Pressure Sensor Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (C18) A/C Pressure Sensor Signal circuit in the A/C Pressure Transducer harness connector.



Is there any voltage present?

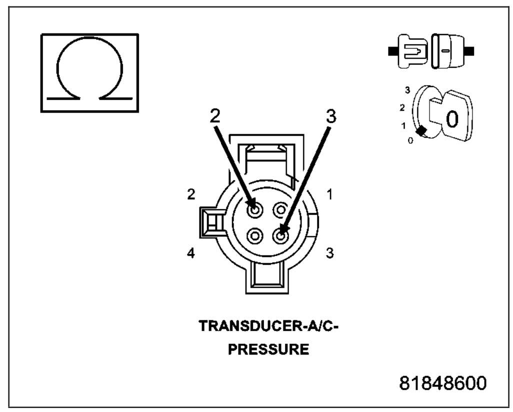
Yes >> Repair the (C18) A/C Pressure Sensor Signal circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE (C818) A/C PRESSURE SENSOR SUPPLY CIRCUIT

Measure the resistance between the (C18) A/C Pressure Sensor Signal circuit and the (C818) A/C Pressure Sensor Supply in the A/C Pressure Transducer harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the (C18) A/C Pressure Sensor Signal circuit for a short to the (C818) A/C Pressure Sensor Supply circuit.

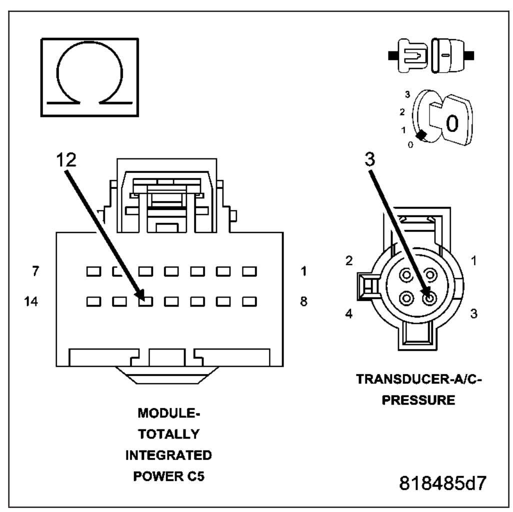
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (C18) A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (C18) A/C Pressure Sensor Signal between the A/C Pressure Transducer harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

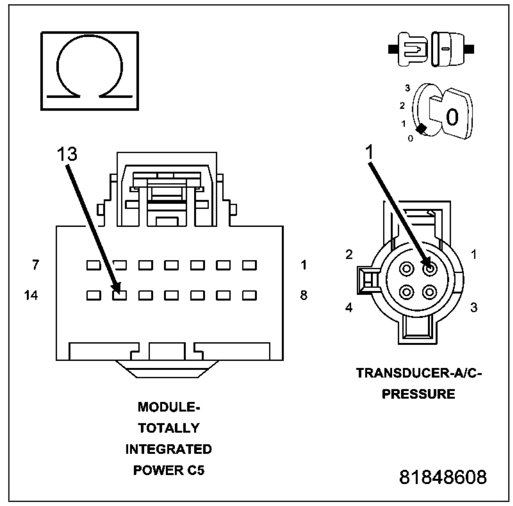
Yes >> Go to 6

No >> Repair the (C18) A/C Pressure Sensor Signal for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (C918) A/C PRESSURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C918) A/C Pressure Sensor Ground circuit between the A/C Pressure Transducer harness connector and the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (C918) A/C Pressure Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. A/C PRESSURE TRANSDUCER

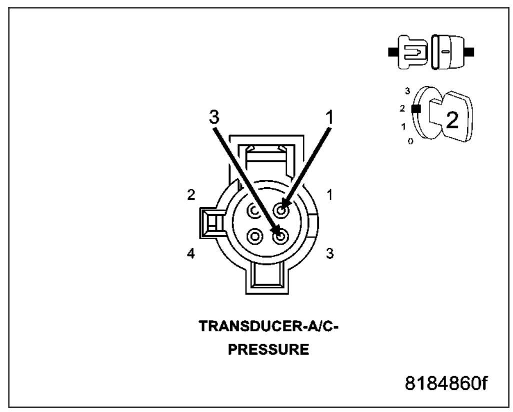
Turn the ignition off.

Connect the Totally Integrated Power Module (TIPM) connector.

Connect a jumper wire between the (C918) A/C Pressure Sensor Ground circuit and the (C18) A/C Pressure Sensor Signal circuit in the A/C Pressure Transducer harness connector.

Turn the ignition on.

With the scan tool, read the A/C Pressure Transducer signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the A/C Pressure Transducer in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. TOTALLY INTEGRATED POWER MODULE (TIPM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Pressure Transducer and the Totally Integrated Power Module (TIPM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

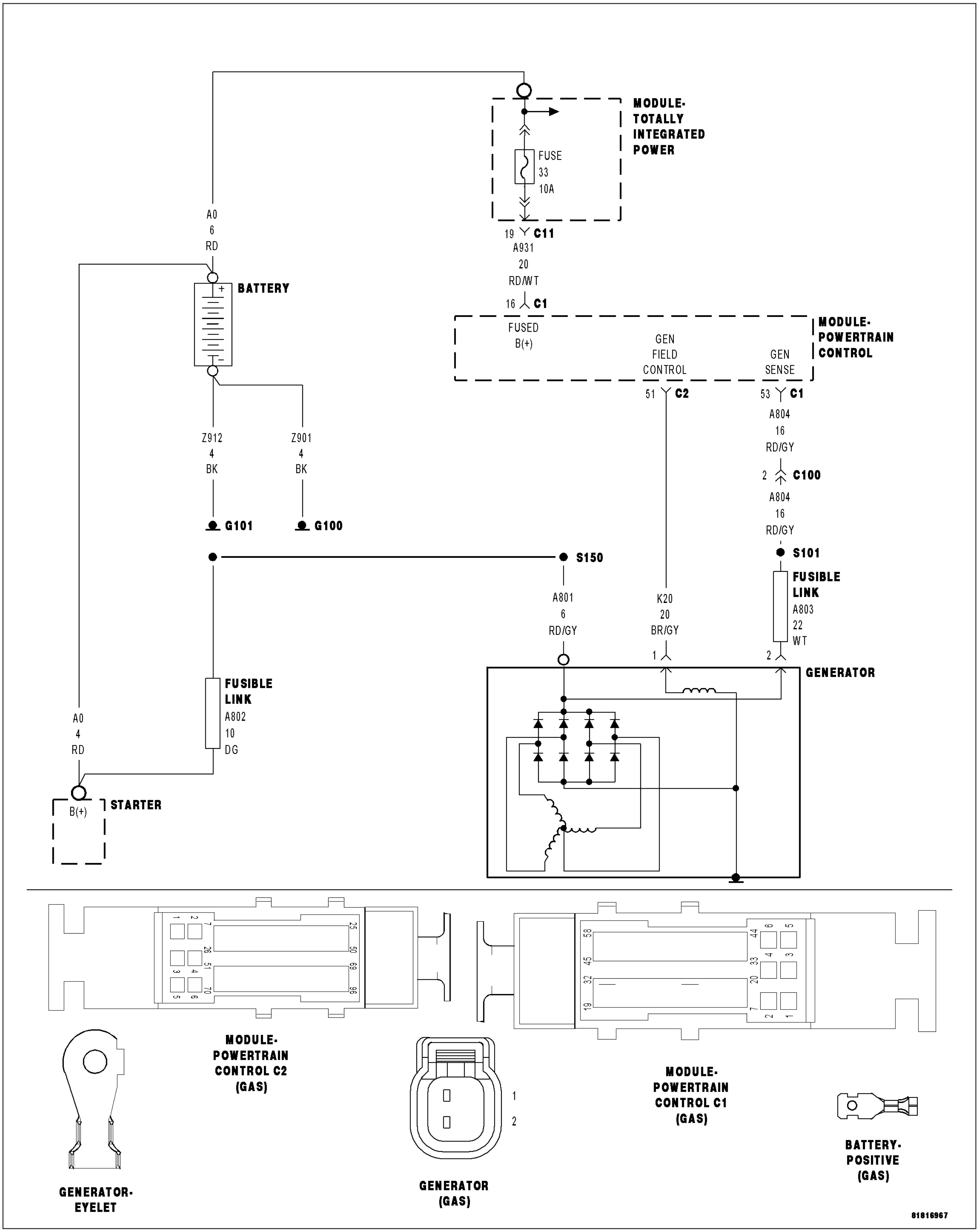
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0562-BATTERY VOLTAGE LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With engine running for more than 30 seconds.
- **Set Condition:**
  Battery voltage at the PCM is less than 11.7 volts for a set period of time. One Trip Fault.

Possible Causes
INTERMITTENT DTC
BATTERY POSITIVE CIRCUIT HIGH RESISTANCE
GENERATOR CASE GROUND HIGH RESISTANCE
(A931) FUSED B+ CIRCUIT HIGH RESISTANCE
(Z925) GROUND CIRCUIT(S) HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any charging system DTCs before proceeding with this test.

NOTE: Inspect and test the battery in accordance with the Service Information before continuing with this test.

NOTE: Inspect the generator drive belt before continuing with this test.

NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

NOTE: Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide and inspect the wiring and connectors for damage.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. BATTERY POSITIVE (+) CIRCUIT HIGH RESISTANCE

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: Make sure all testing equipment and cables are clear of any engine parts before starting the engine.

Start the engine.

Measure the voltage between the B (+) Terminal at the Generator and the Battery Positive (+) Post.

Is the voltage above 0.4 volts?

Yes >> Repair the Battery Positive (+) circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. GENERATOR CASE GROUND HIGH RESISTANCE

NOTE: Make sure all testing equipment and cables are clear of any engine parts before starting the engine.

Start the engine and allow it to reach operating temperature.

Measure the voltage between the Generator case and the Battery Negative (-) post.

Is the voltage above 0.1 volt?

Yes >> Repair the Generator Case ground for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (A931) FUSED B+ CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (A931) Fused B+ circuit in the Powertrain Control Module (PCM) harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (A931) Fused B+ circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (Z925) GROUND CIRCUIT(S) HIGH RESISTANCE

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (Z925) Ground circuits in the Powertrain Control Module (PCM) harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 6

No >> Repair the (Z925) Ground circuit(s) for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

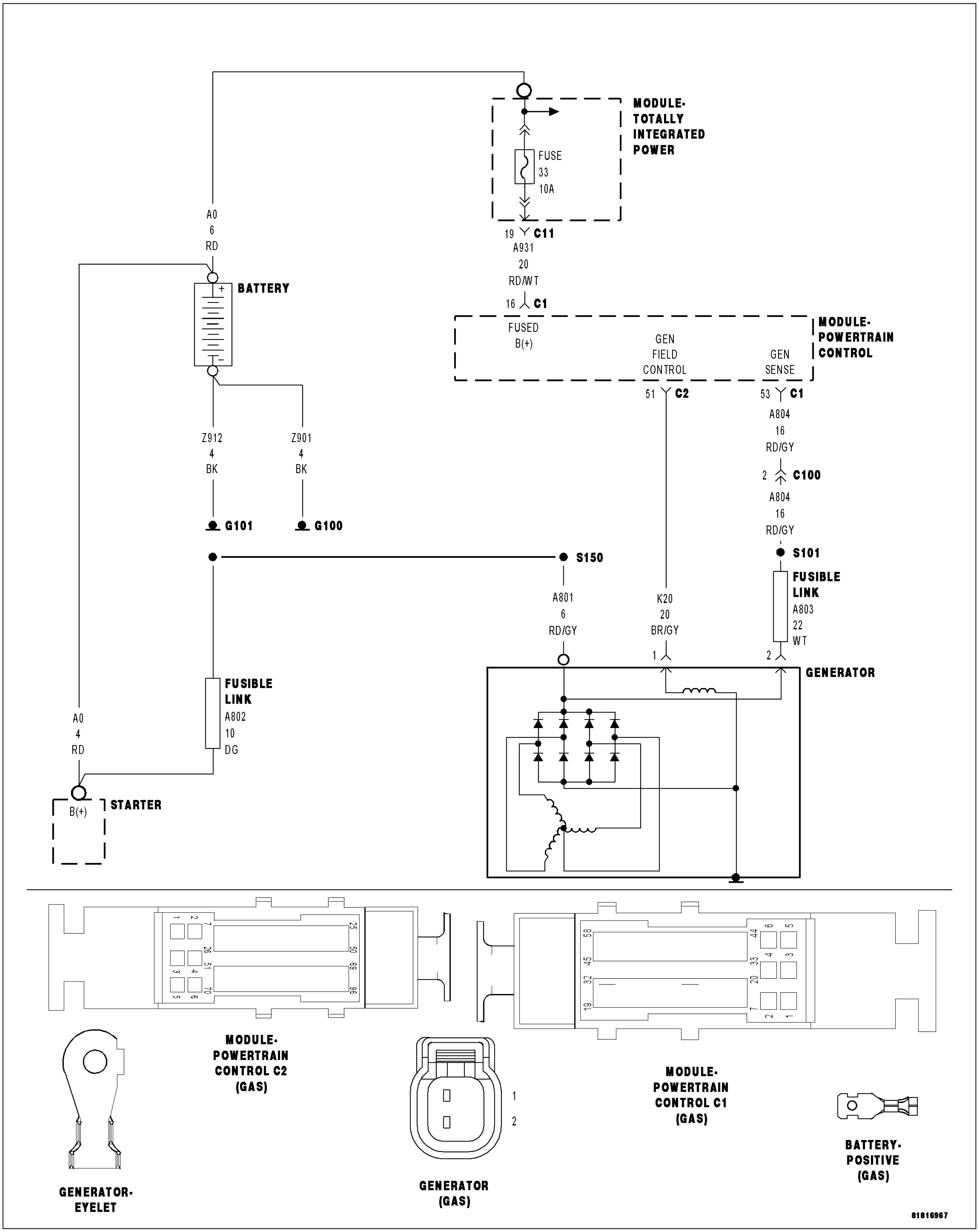
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0563-BATTERY VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running for more than 30 seconds.
- **Set Condition:**
  Battery voltage is 1 volt greater than desired voltage for more than 5 seconds. One Trip Fault.

Possible Causes
INTERMITTENT DTC
(A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any charging system or generator DTCs before continuing with this test.

NOTE: Inspect and test the battery in accordance with the Service Information before continuing with this test.

NOTE: Inspect the generator drive belt before continuing with this test.

NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

NOTE: Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide and inspect the wiring and connectors for damage.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (A804) Gen Sense circuit in the Generator harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (A804) Gen Sense circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K20) Gen Field Control circuit in the Generator harness connector.

Is there any voltage present?

Yes >> Repair the (K20) Gen Field Control for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

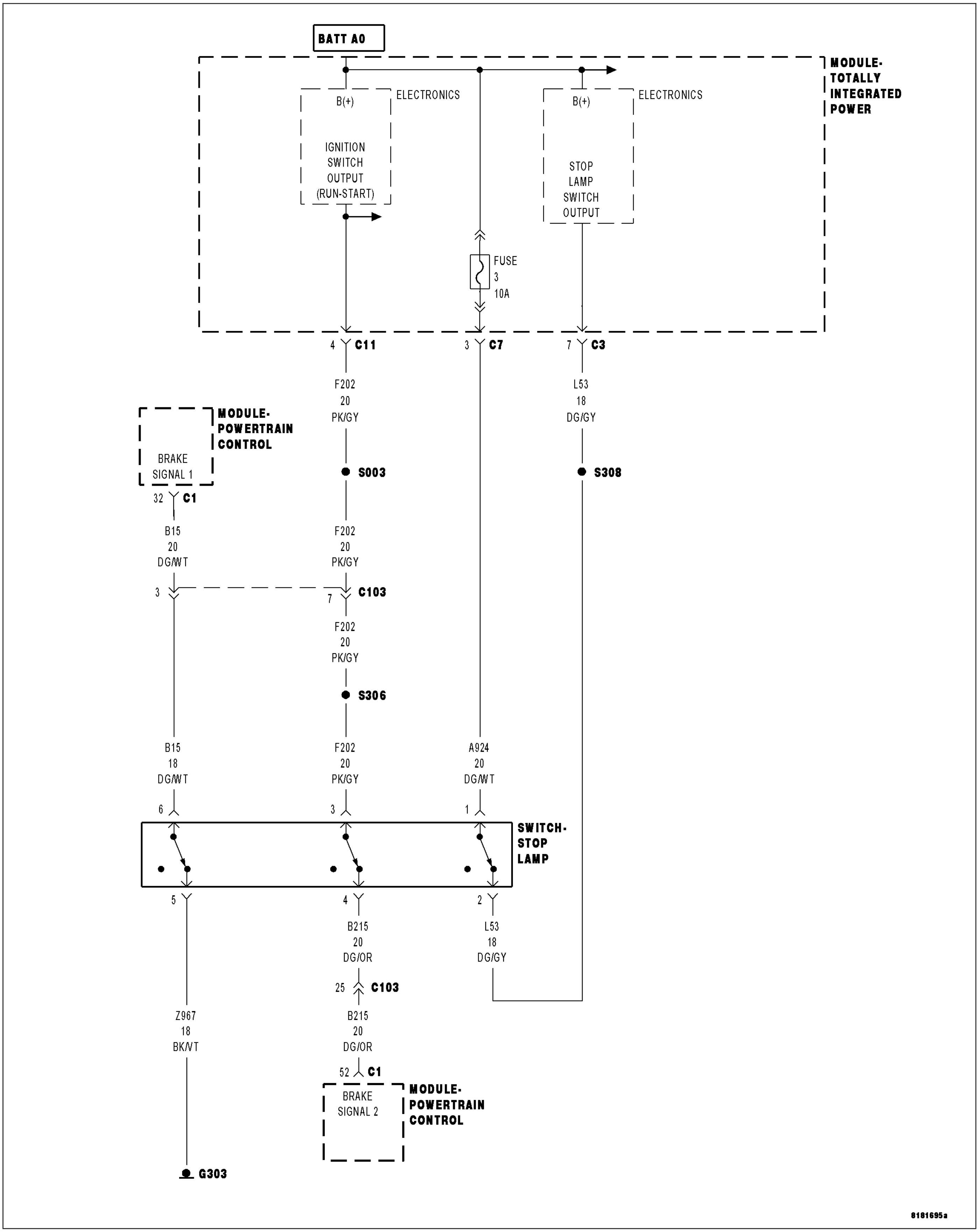
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0571-BRAKE SWITCH 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the states of Brake Signal 1 and Brake Signal 2 do not match for more than 50 ms.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the states change from Pressed when the pedal is pressed to Not Pressed when the pedal is released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

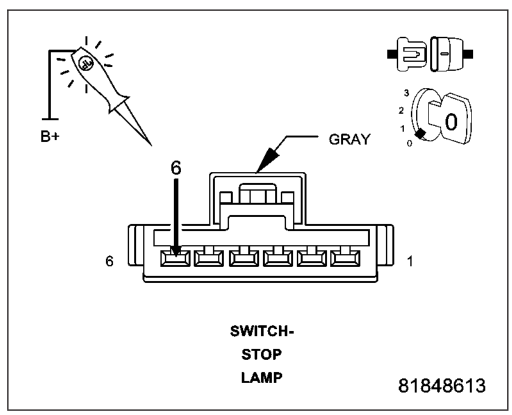
No >> Go to 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

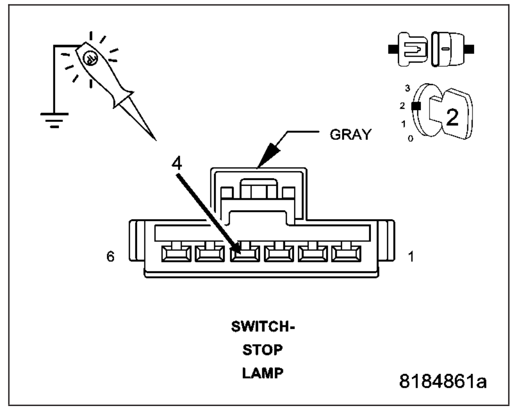
Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 11

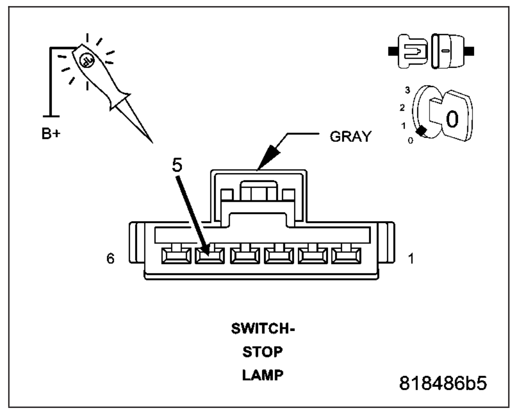
No >> Go to 7

4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

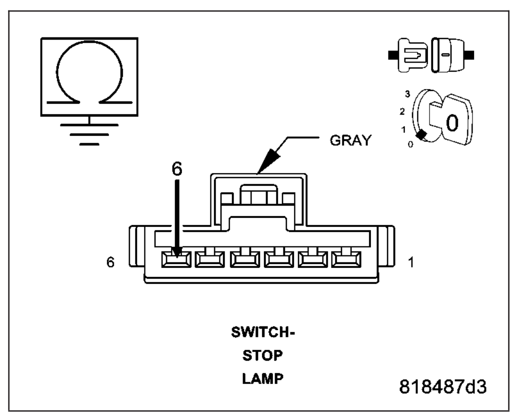
Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.



Is the resistance above 100 ohms?

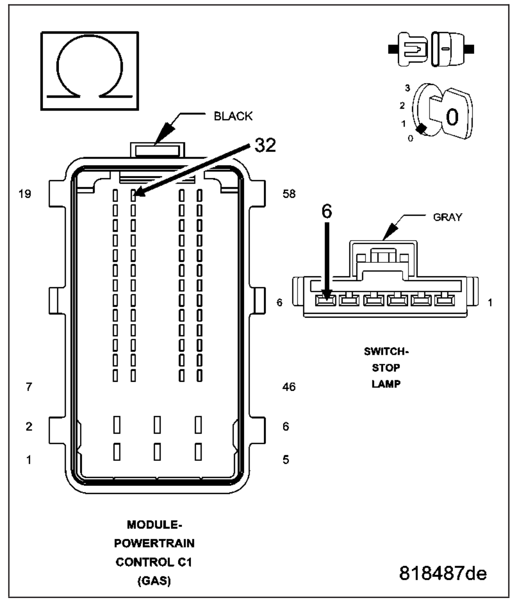
Yes >> Go to 6

No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

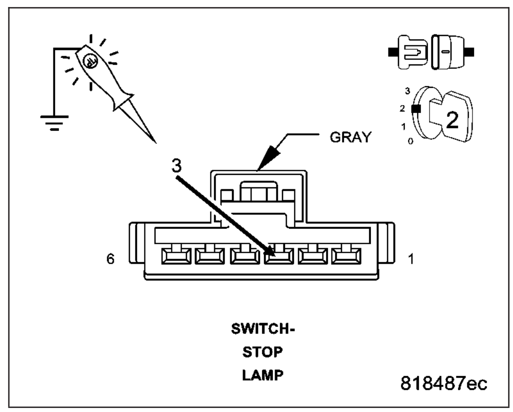
7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

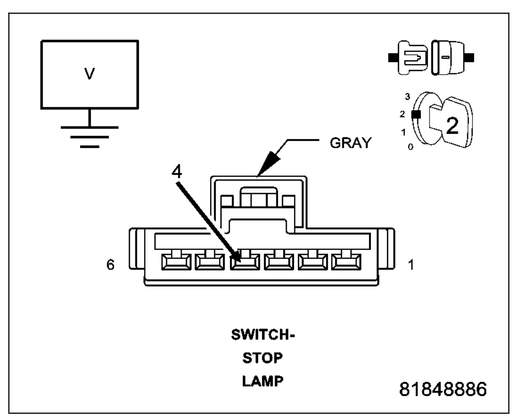
Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.



Is there any voltage present?

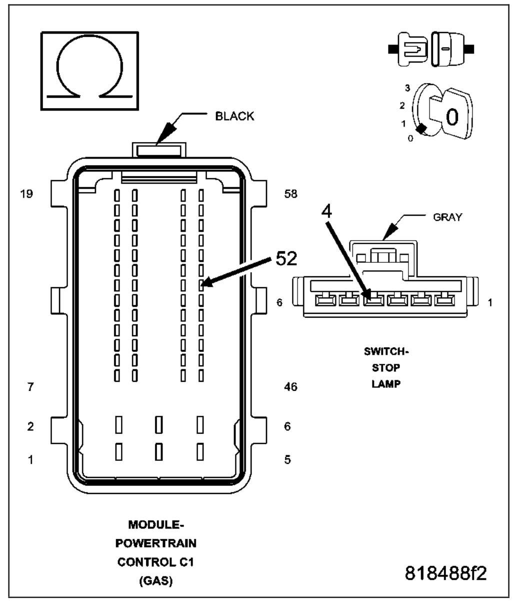
Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

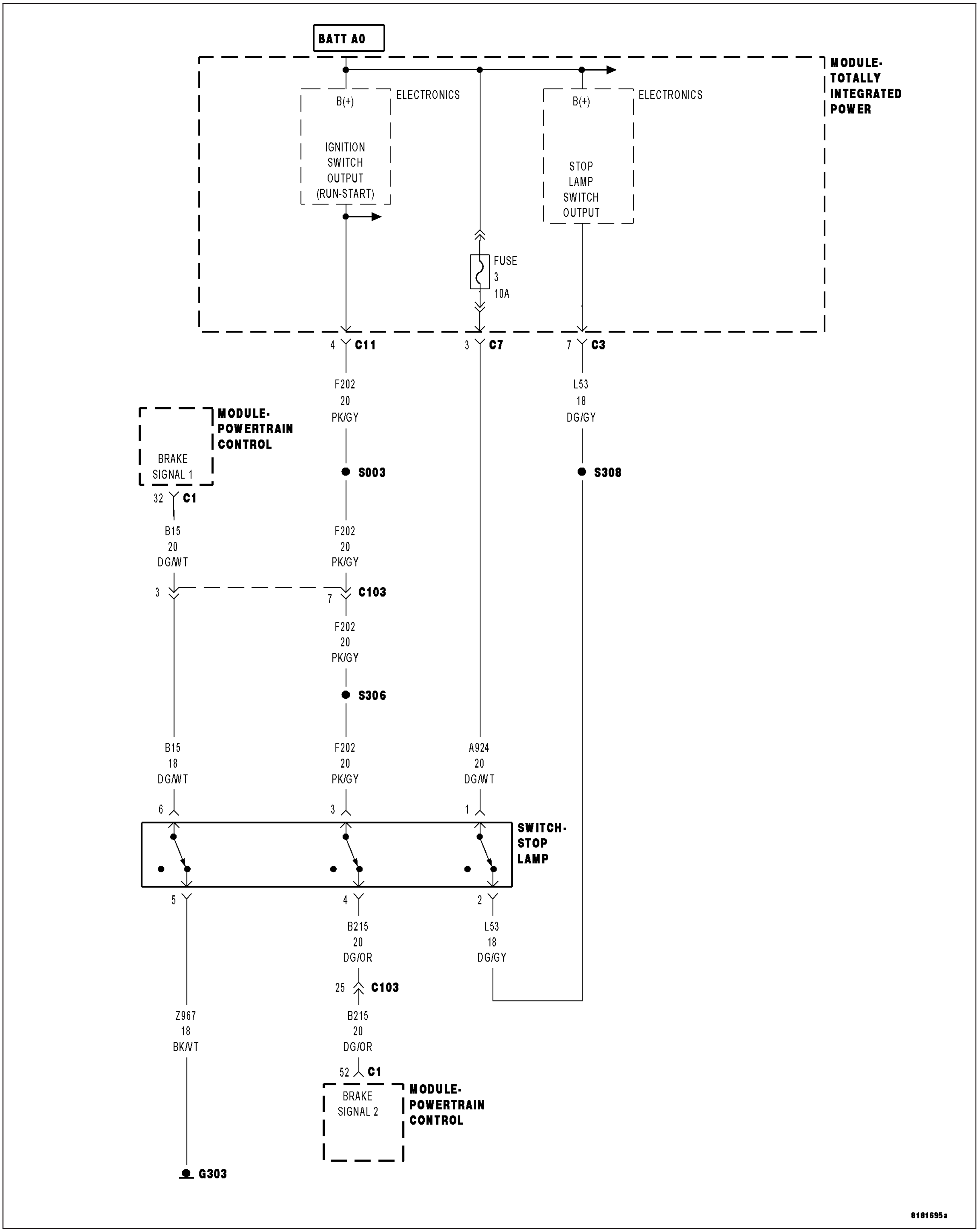
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0572-BRAKE SWITCH 1 STUCK ON



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, battery voltage greater than 10.4 volts, and ambient temperature above -23 C.
- **Set Condition:**
  The PCM detects that the state of Brake Signal 1 does not change as expected.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the states change from Pressed when the pedal is pressed to Not Pressed when the pedal is released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

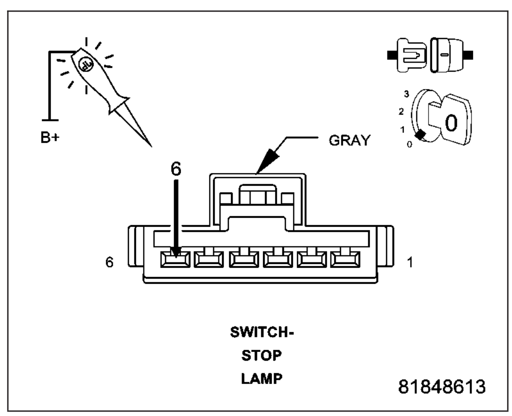
No >> Go to 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.

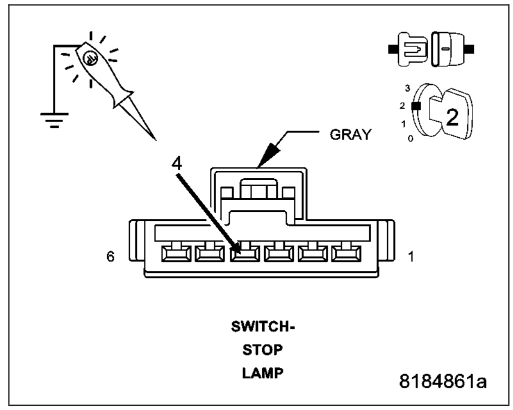


Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT



Turn the ignition on.

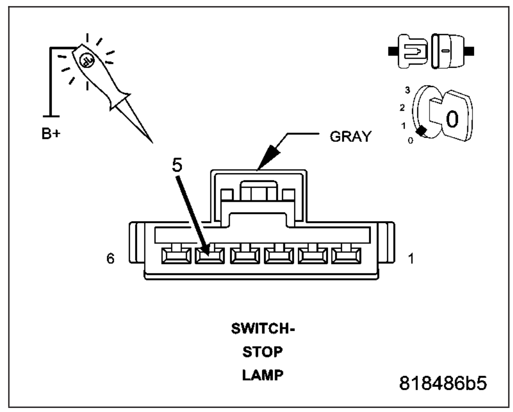
Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.

Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 11

No >> Go to 7

4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.

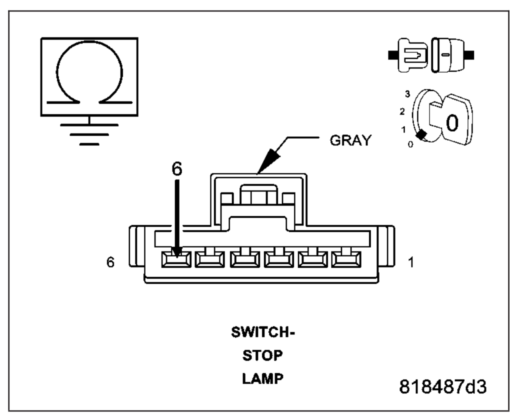
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.

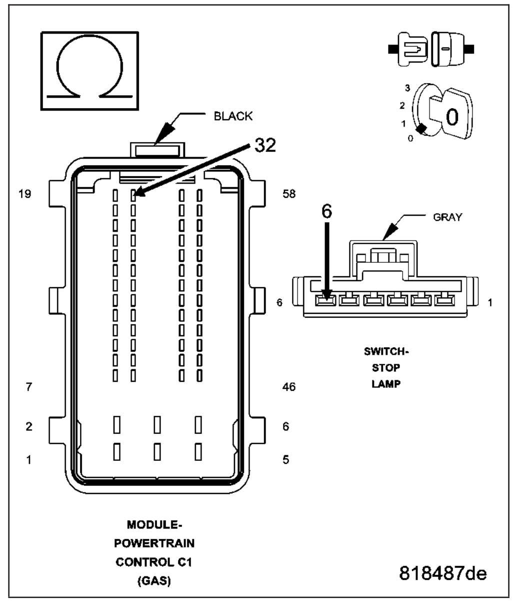
Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

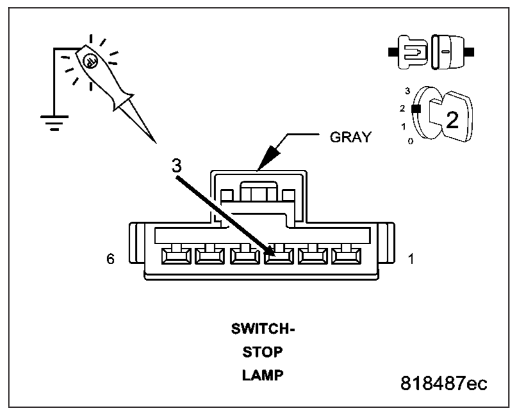
7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

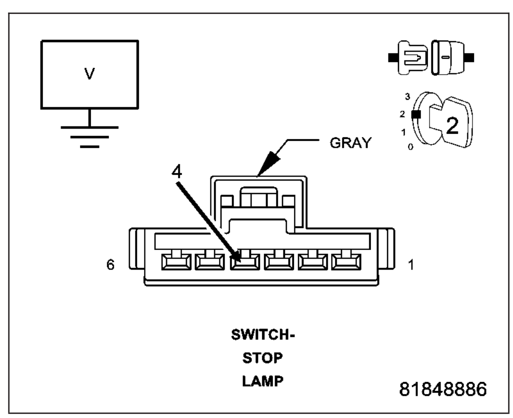
Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.



Is there any voltage present?

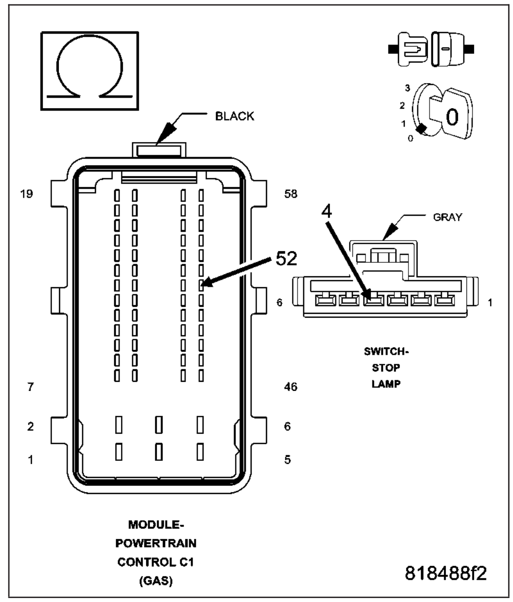
Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

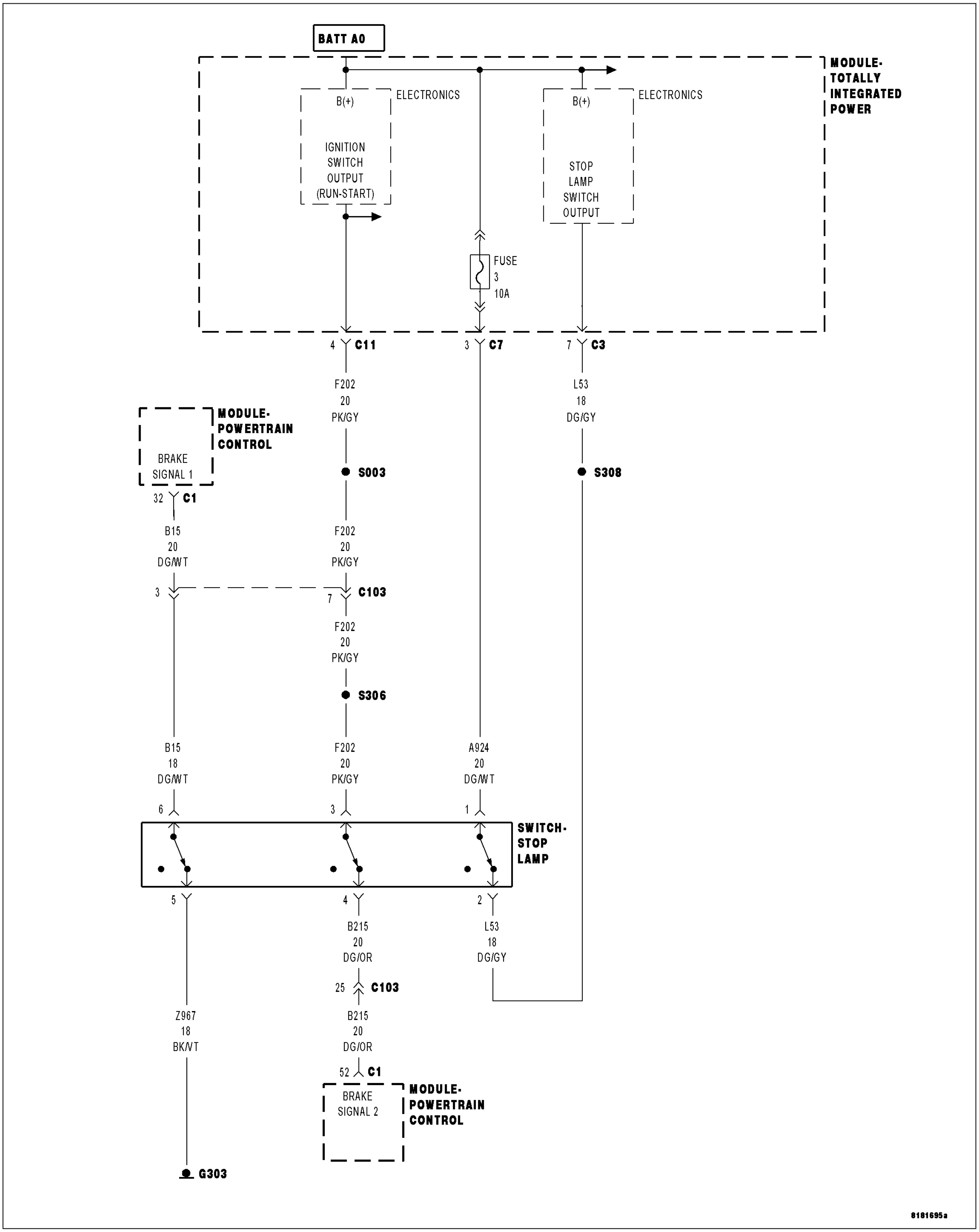
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0573-BRAKE SWITCH 1 STUCK OFF



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, battery voltage greater than 10.4 volts, ambient temperature above -23 C.
- **Set Condition:**
  The PCM detects that the state of Brake Signal 1 does not change as expected.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the Brake Signal states change appropriately as the pedal is pressed and released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

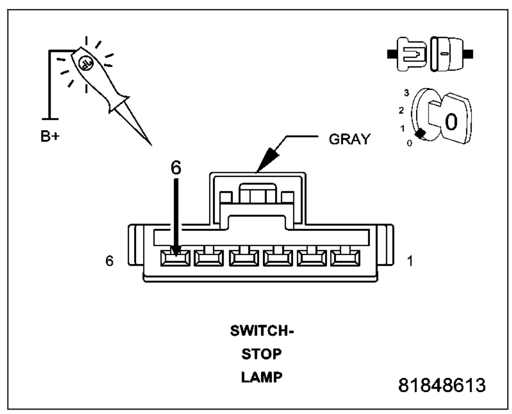
No >> Go To 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated to not illuminated as the brake pedal is pressed and released?

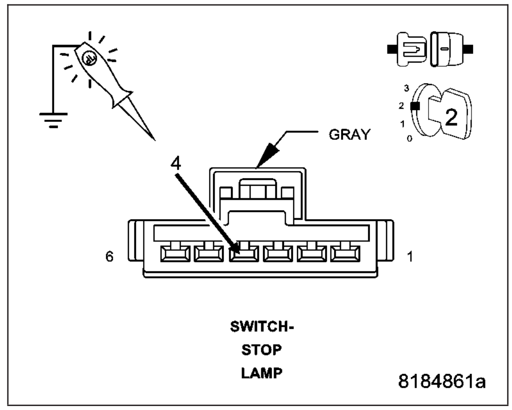
Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated to not illuminated as the brake pedal is pressed and released?

Yes >> Go to 11

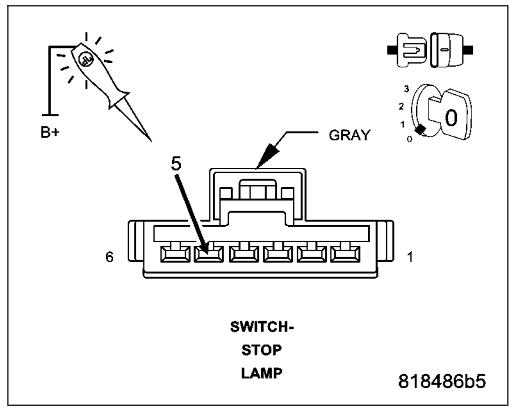
No >> Go to 7

4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

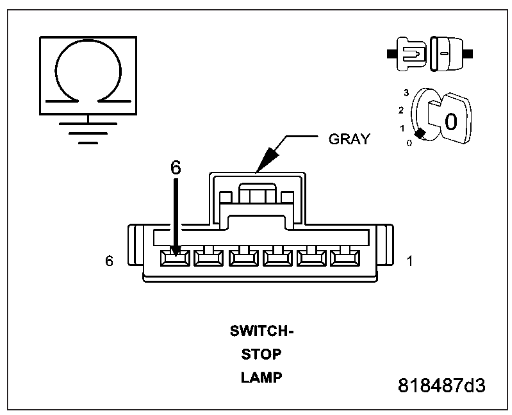
Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.



Is the resistance above 100 ohms?

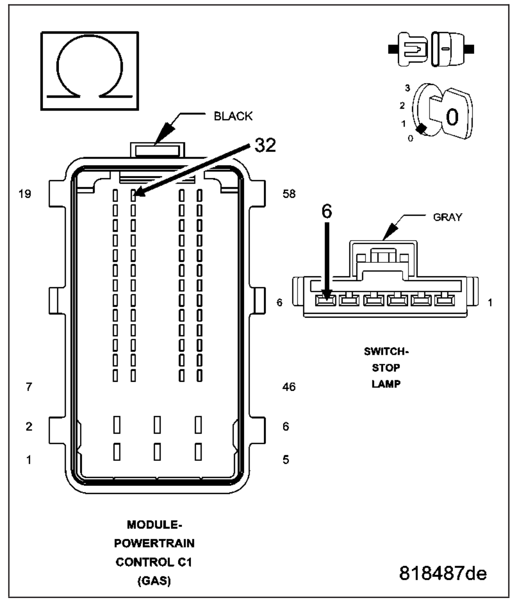
Yes >> Go to 6

No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

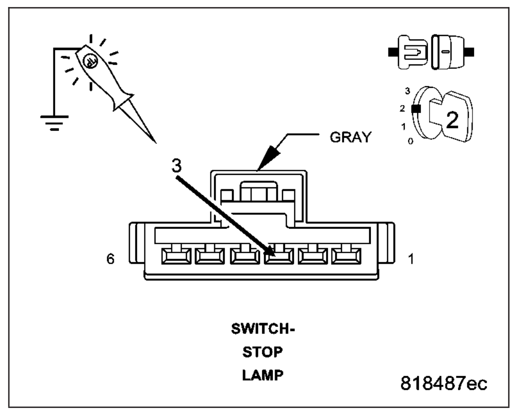
7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

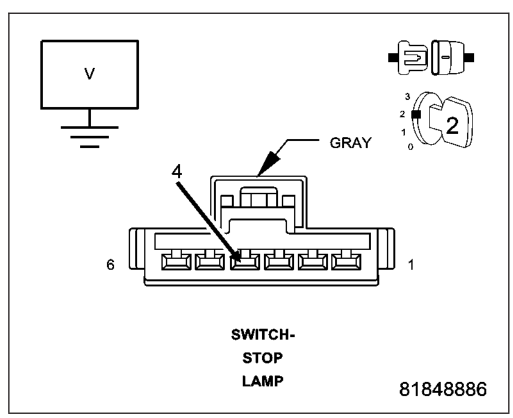
Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.



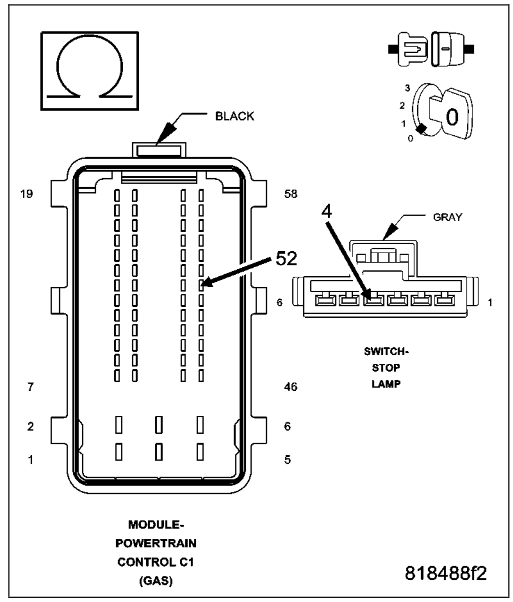
Is there any voltage present?

Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

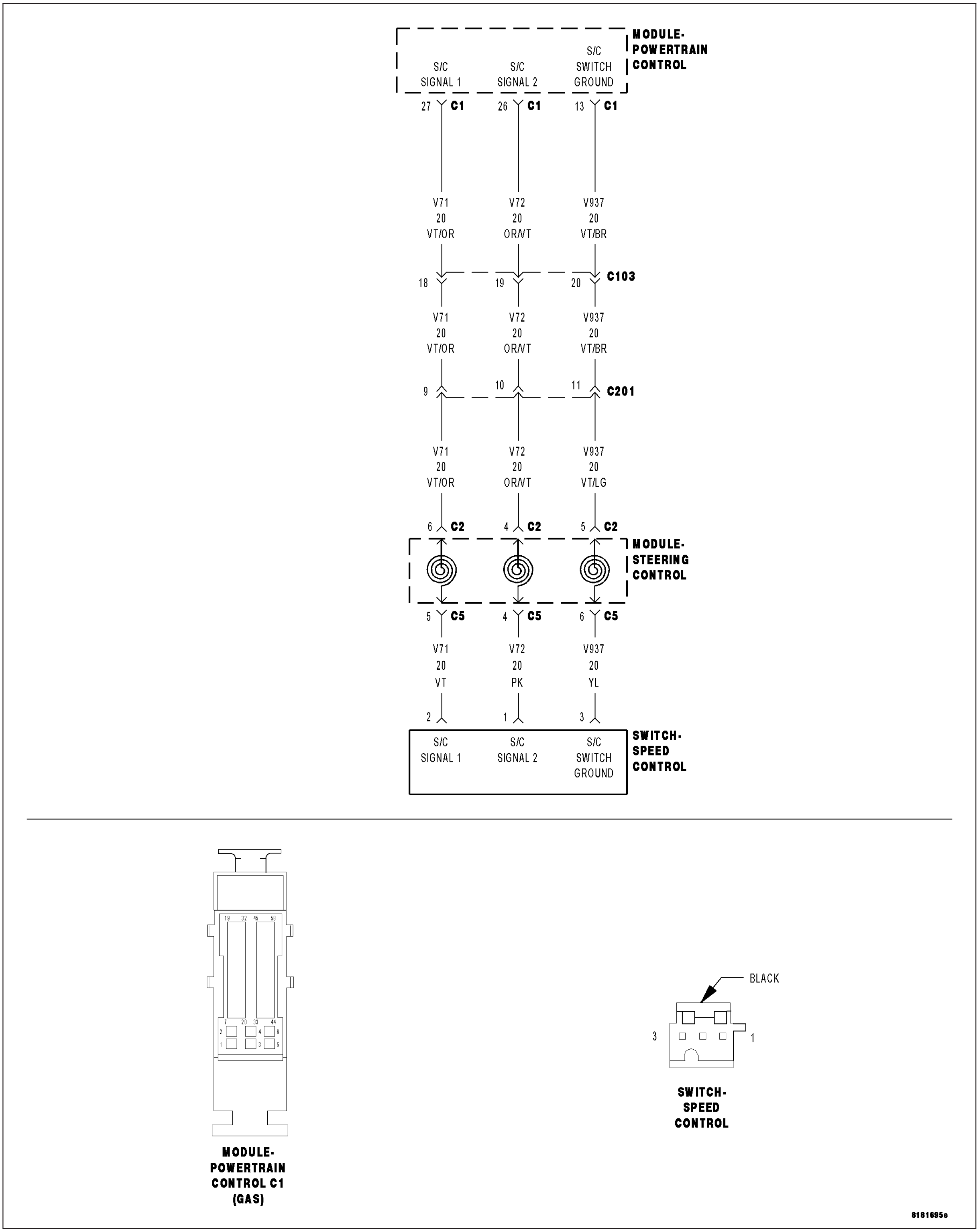
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

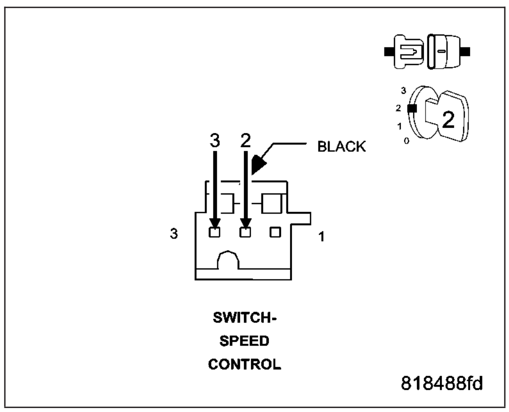
With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be above 4.8 volts with the Speed Control Switch removed.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.



Is the (V71) S/C Signal 1 voltage above 4.8 volts with the Speed Control Switch removed and below .2 volts with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The voltage should be above 4.8 volts with the Steering Control Module (SCM) C5 connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Turn the ignition on.

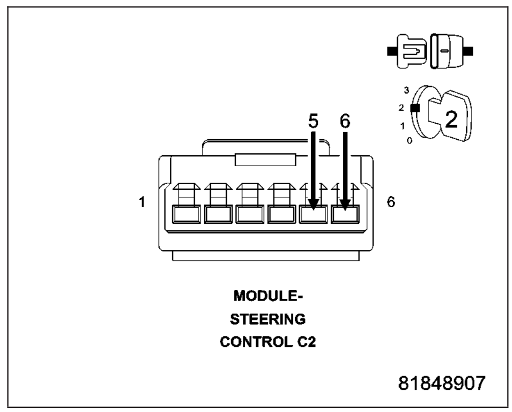
With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The voltage should be above 4.8 volts with the connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.



Are the Speed Control voltages displayed as described?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

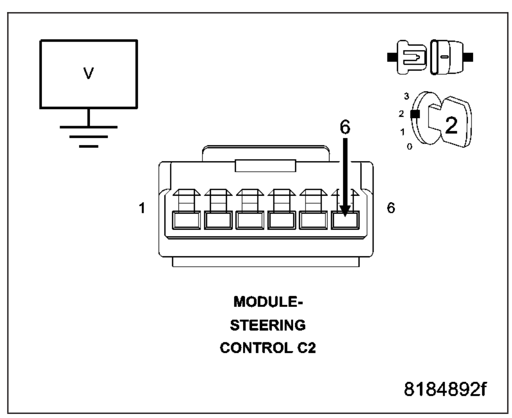
5. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) harness connector.



Is there any voltage present?

Yes >> Repair the (V71) S/C Signal 1 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

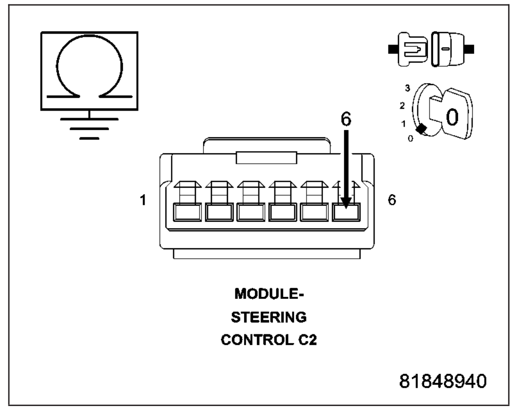
Measure the resistance between ground and the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (V71) S/C Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



7. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

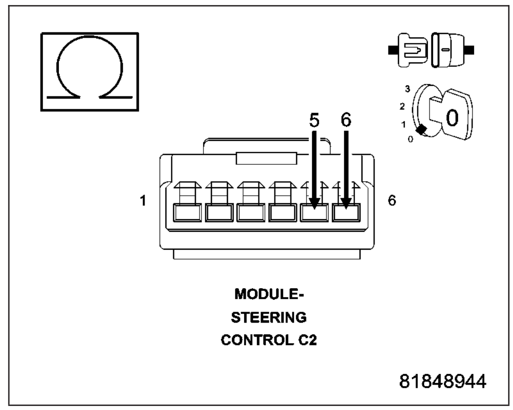
Measure the resistance between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (V71) S/C Signal 1 circuit for a short to the Steering Control Module (SCM) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



8. (V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

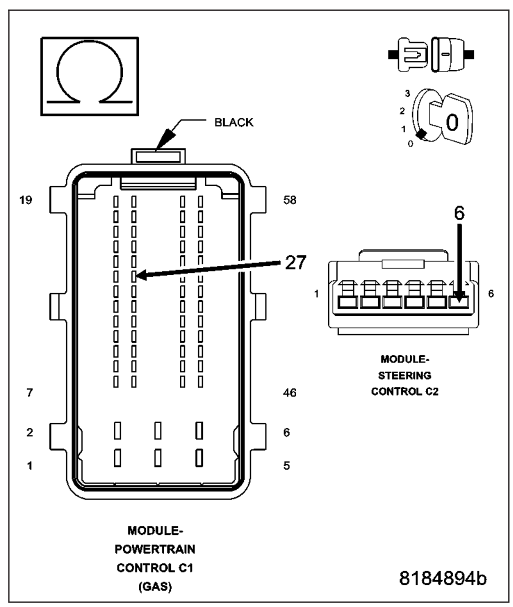
Measure the resistance of the (V71) S/C Signal 1 circuit between the Steering Control Module (SCM) harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 9

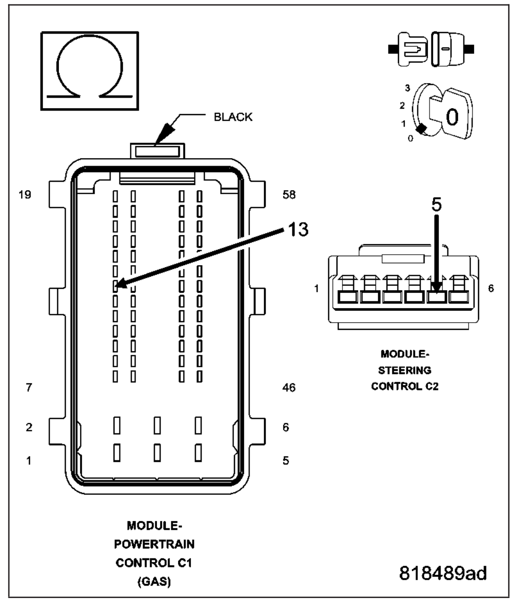
No >> Repair the (V71) S/C Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



9. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

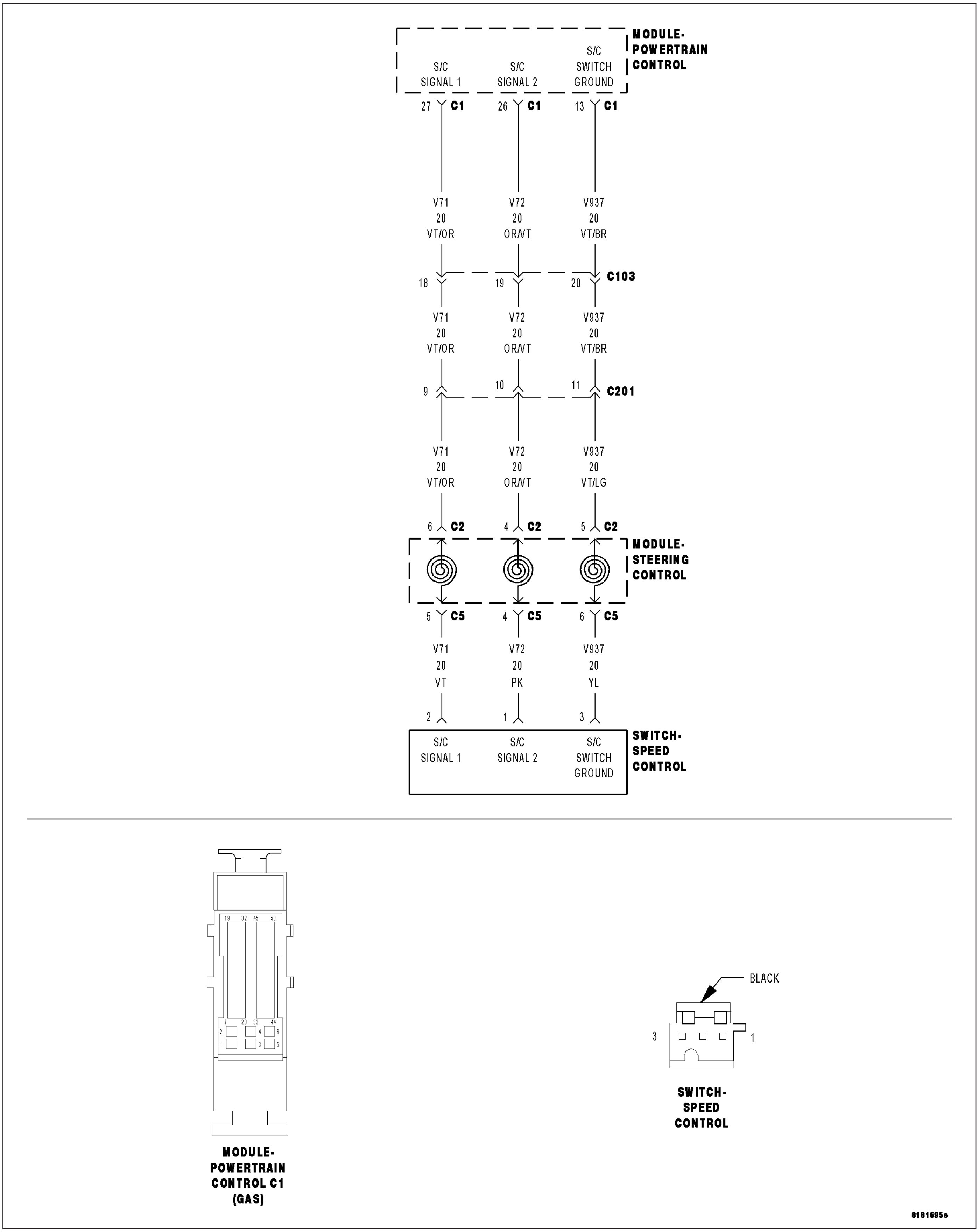
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be above 4.8 volts with the Speed Control Switch removed.

Is the (V71) S/C Signal 1 voltage above 4.8 volts with the Speed Control Switch removed?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.
Disconnect the Steering Control Module (SCM) C5 connector.
Turn the ignition on.
With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be above 4.8 volts with the connector disconnected.

Is the (V71) S/C Signal 1 voltage above 4.8 volts with the connector disconnected?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.
Disconnect the Steering Control Module (SCM) C2 connector.
Turn the ignition on.
With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be above 4.8 volts with the connector disconnected.

Is the (V71) S/C Signal 1 voltage above 4.8 volts with the connector disconnected?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

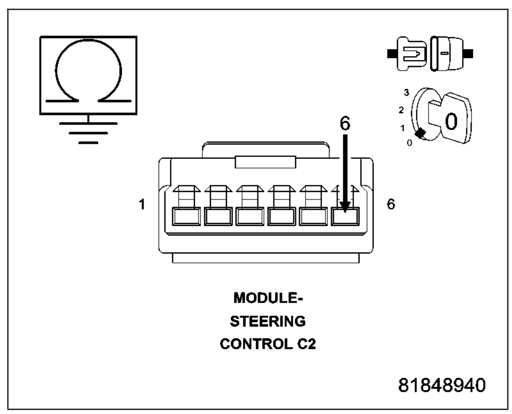
5. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Measure the resistance between ground and the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.

Is the resistance above 100 ohms?

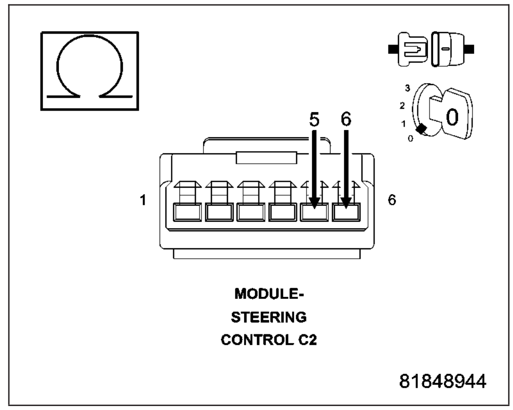
Yes >> Go to 6

No >> Repair the (V71) S/C Signal 1 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.



Is the resistance above 100 ohms?

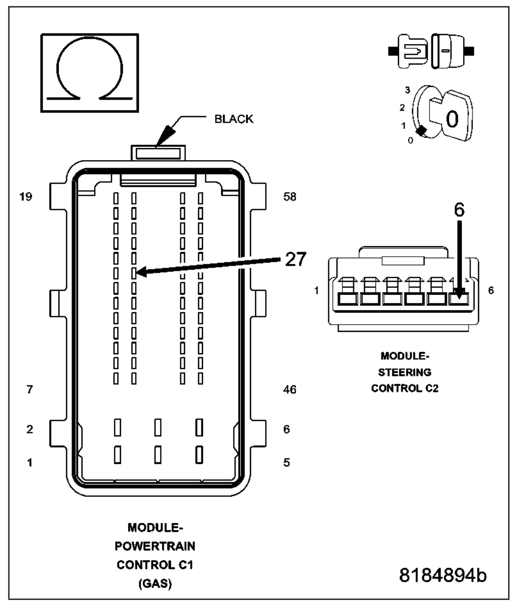
Yes >> Go to 7

No >> Repair the (V71) S/C Signal 1 circuit for a short to the Steering Control Module (SCM) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V71) S/C Signal 1 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

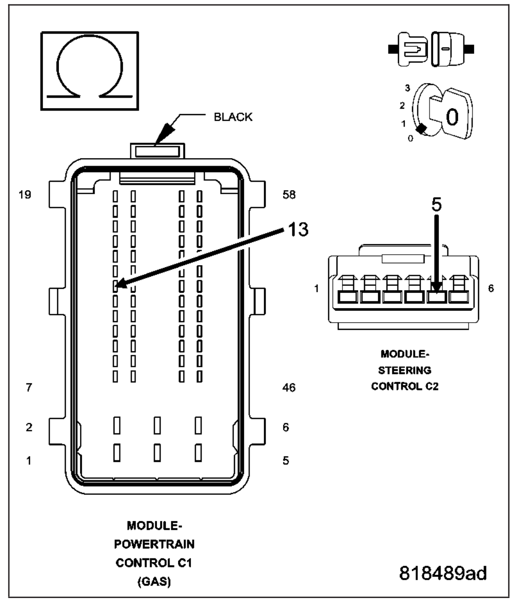
Yes >> Go to 8

No >> Repair the (V71) S/C Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

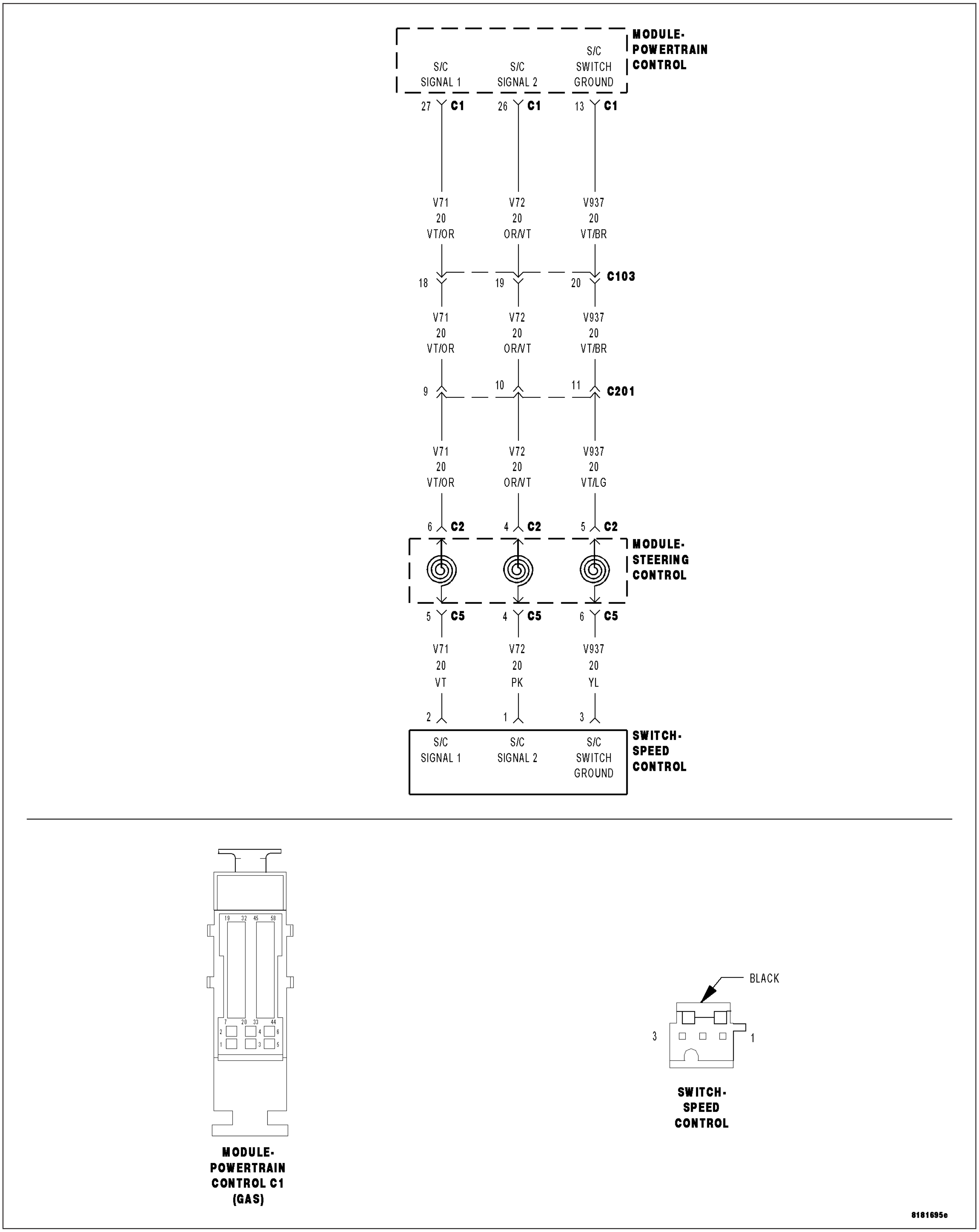
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

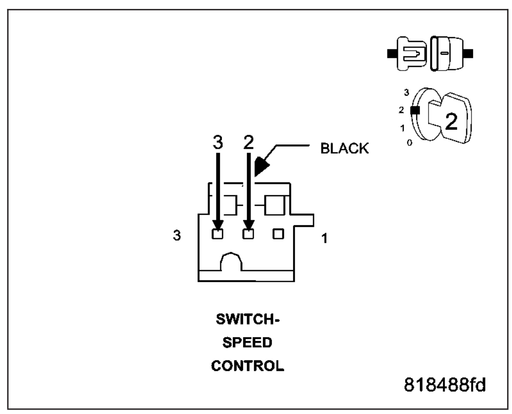
Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Is the (V71) S/C Signal 1 voltage below .2 volts with the jumper wire in place?



Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 connector.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C5 connector, not at the harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Is the (V71) S/C Signal 1 voltage below .2 volts with the jumper wire in place?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

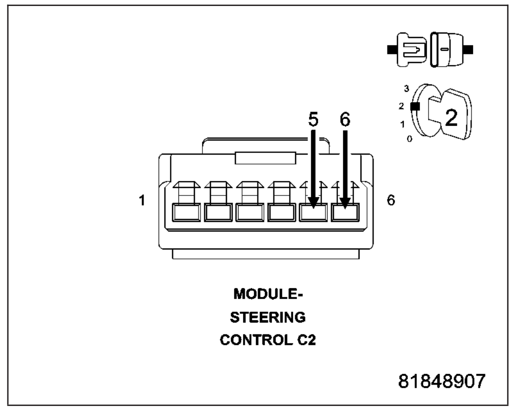
Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 voltage.



NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Is the (V71) S/C Signal 1 voltage below .2 volts with the jumper wire in place?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

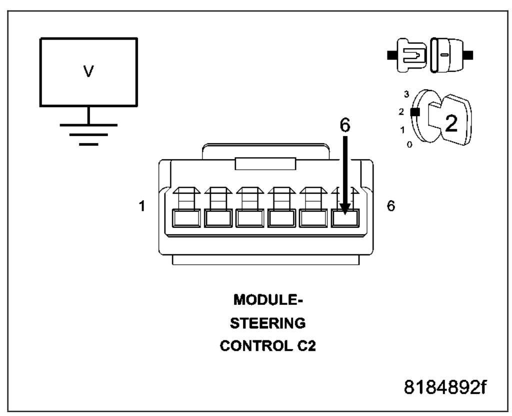
5. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.



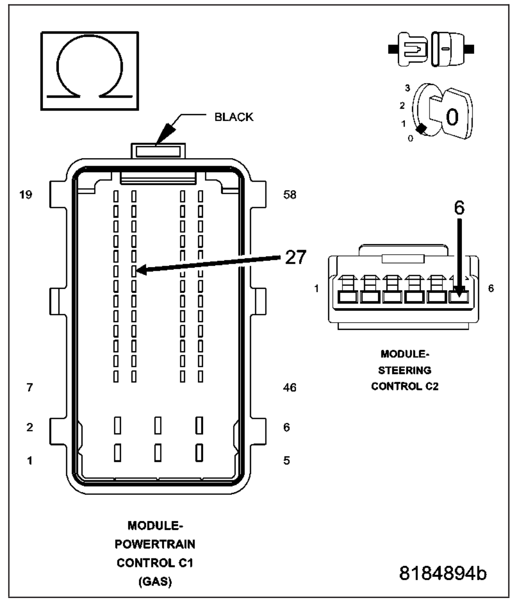
Is there any voltage present?

Yes >> Repair the (V71) S/C Signal 1 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V71) S/C Signal 1 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

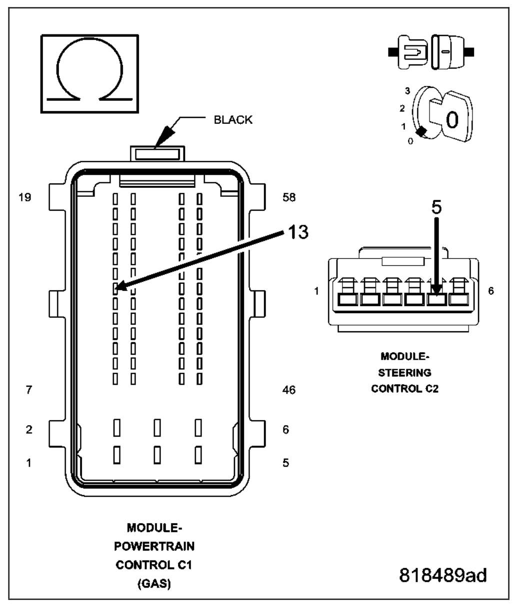
Yes >> Go to 7

No >> Repair the (V71) S/C Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

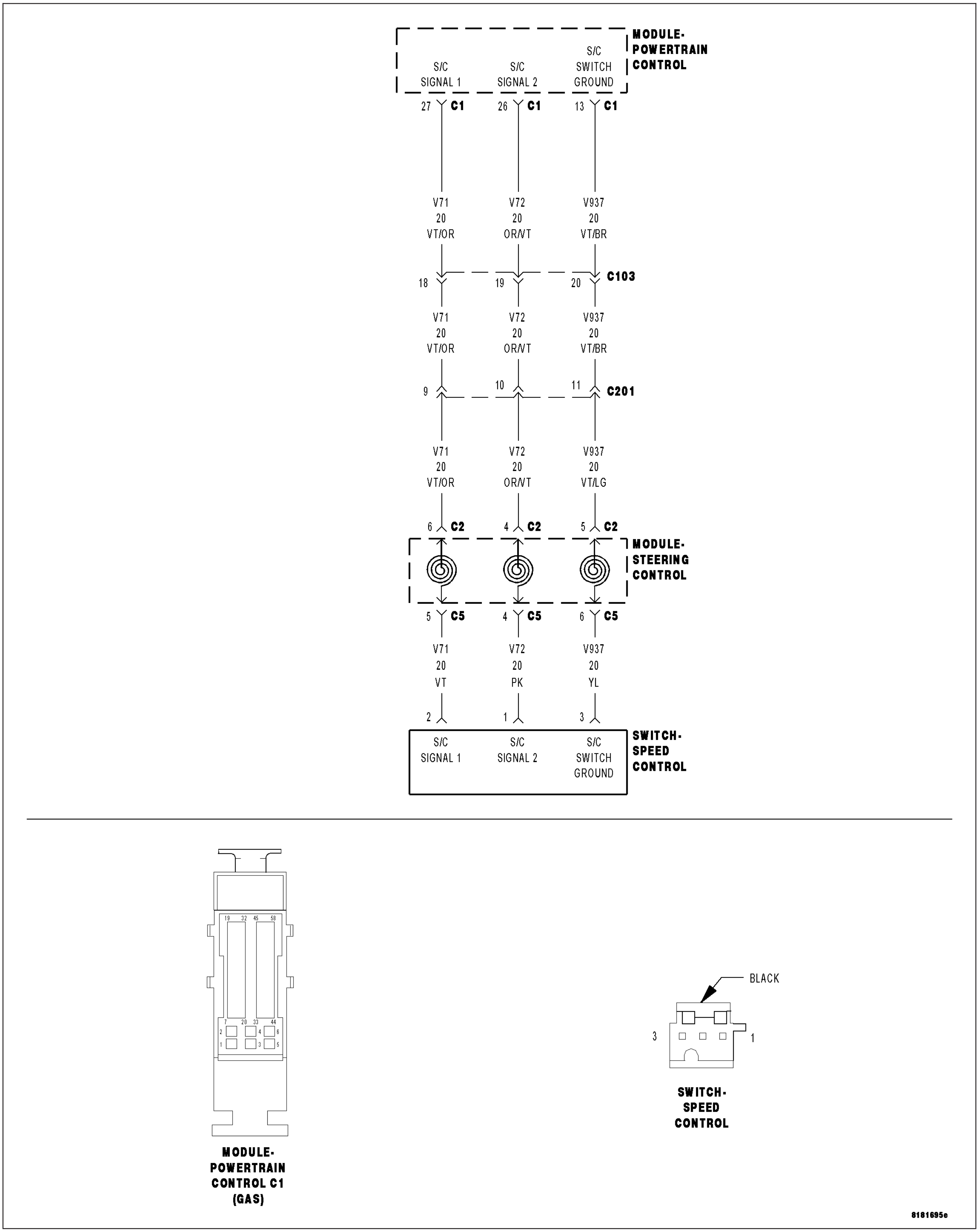
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0585-SPEED CONTROL SWITCH 1-2 CORRELATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the (V71) S/C Signal 1 voltage does not match the (V72) S/C Signal 2 voltage.

Possible Causes
INTERMITTENT DTC
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

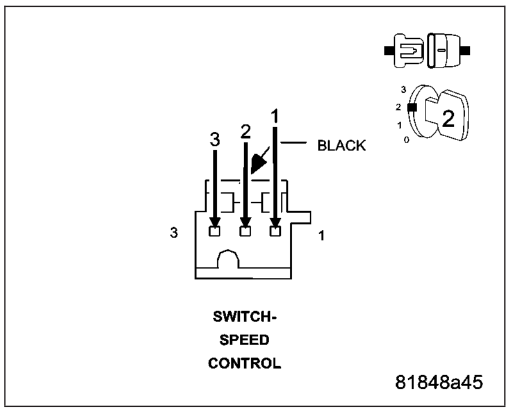
Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.

NOTE: The voltages should be above 4.8 volts with the Speed Control Switch connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.



NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.

NOTE: The voltages should be above 4.8 volts with the Steering Control Module (SCM) C5 connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

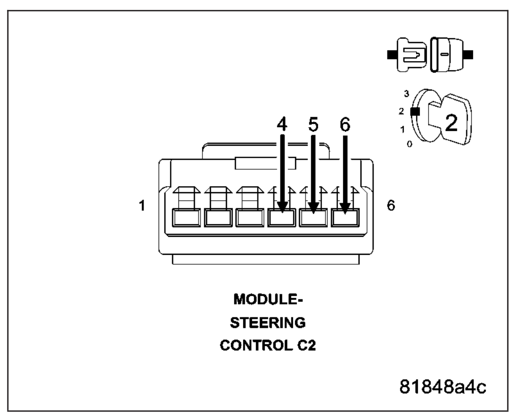
4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.



NOTE: The voltages should be above 4.8 volts with the connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

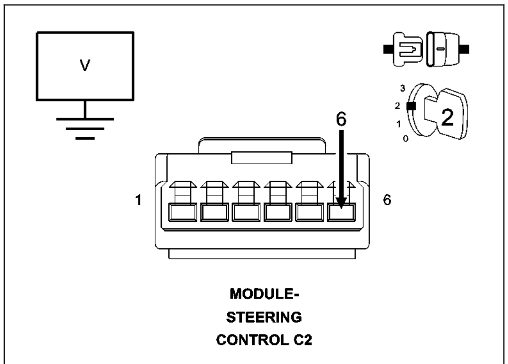
5. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.



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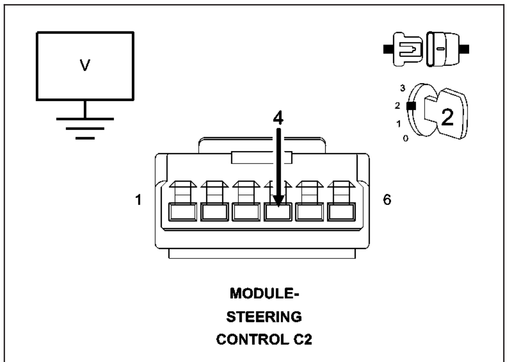
Is there any voltage present?

Yes >> Repair the (V71) S/C Signal 1 circuit for a short to voltage. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.



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Is there any voltage present?

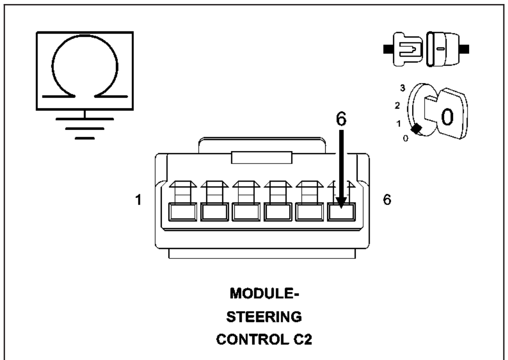
Yes >> Repair the (V72) S/C Signal 2 circuit for a short to voltage. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.



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Is the resistance above 100 ohms?

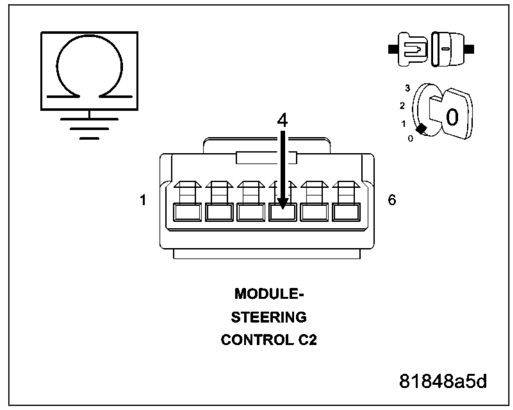
Yes >> Go to 8

No >> Repair the (V71) S/C Signal 1 circuit for a short to ground. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.



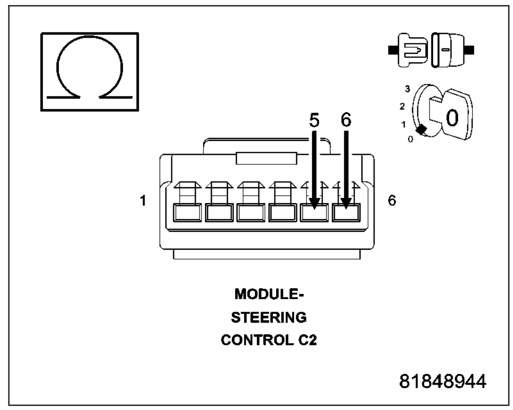
Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (V72) S/C Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the C2 Steering Control Module (SCM) harness connector.



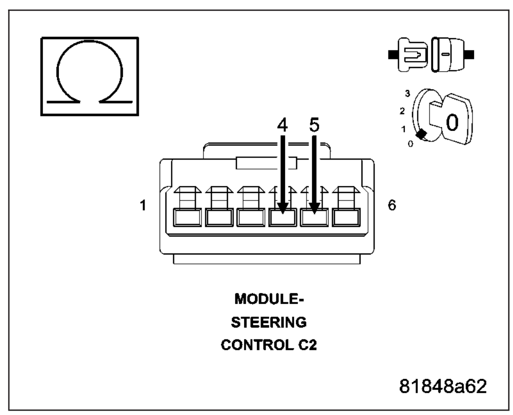
Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (V71) S/C Signal 1 circuit for a short to the Steering Control Module (SCM) circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (V72) S/C Signal 2 circuit for a short to the (V937) S/C Switch Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

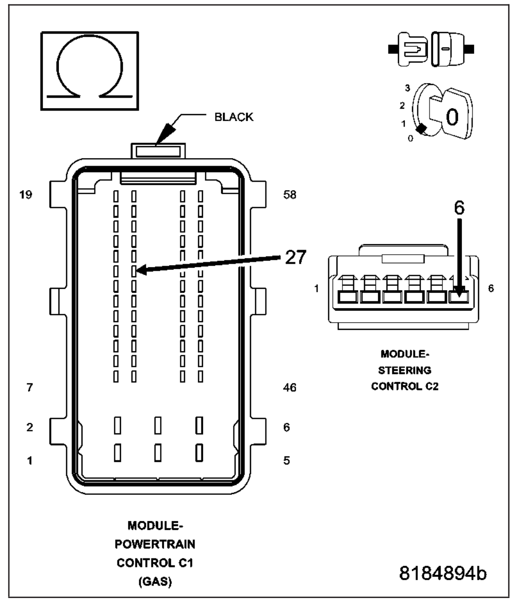
Measure the resistance of the (V71) S/C Signal 1 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 12

No >> Repair the (V71) S/C Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



12. (V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

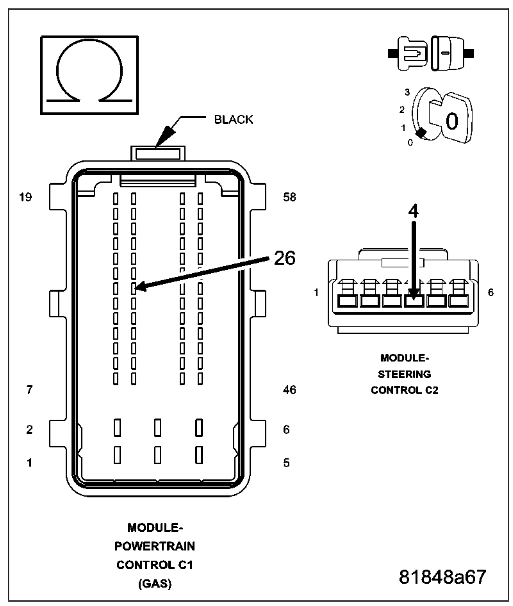
Measure the resistance of the (V72) S/C Signal 2 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 13

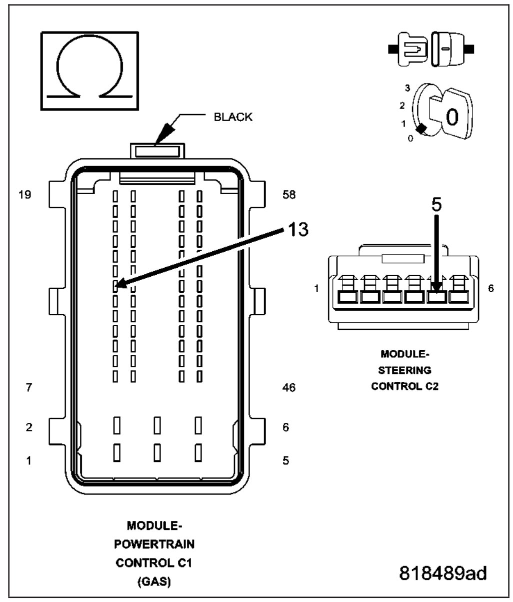
No >> Repair the (V72) S/C Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



13. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 14

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

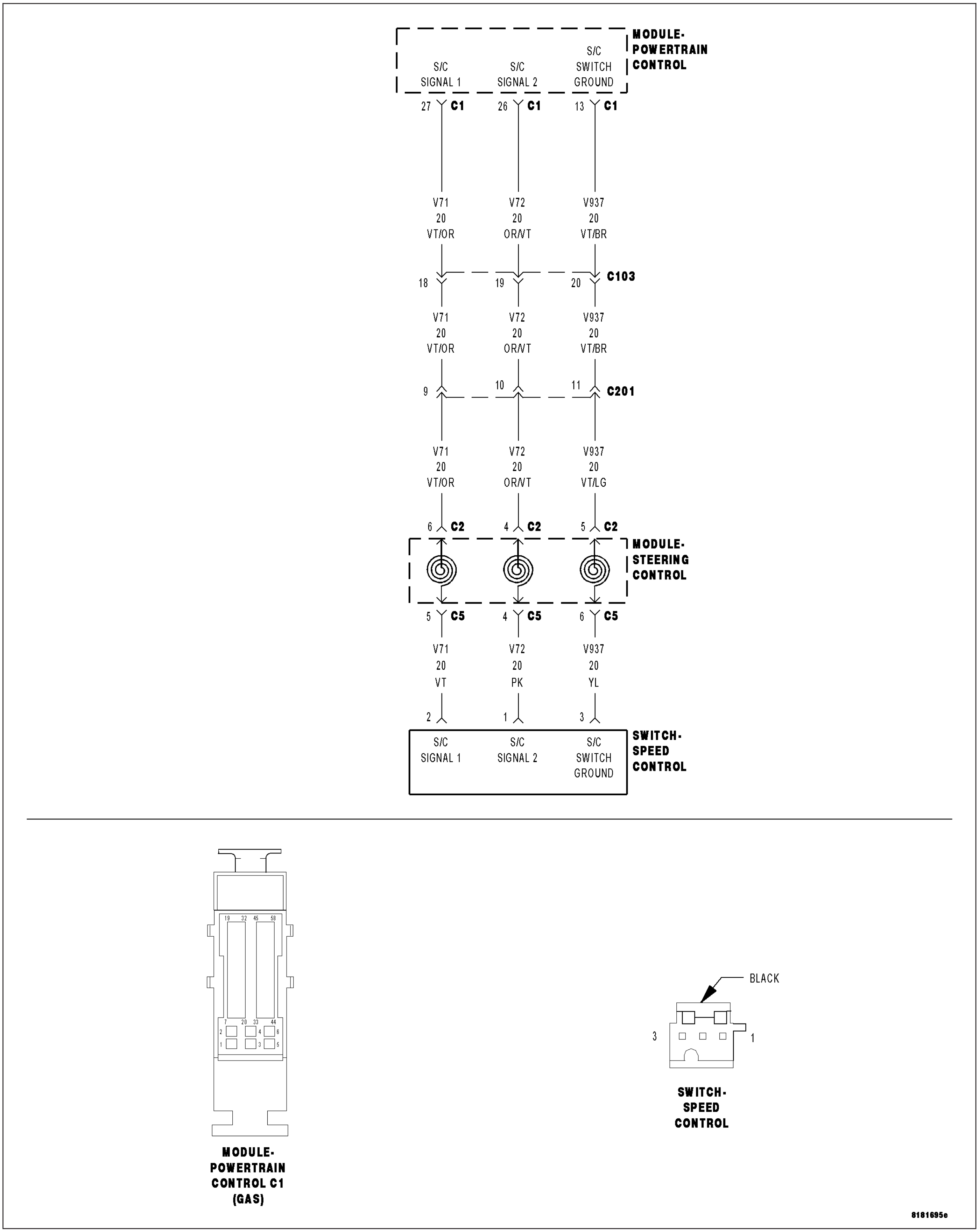
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

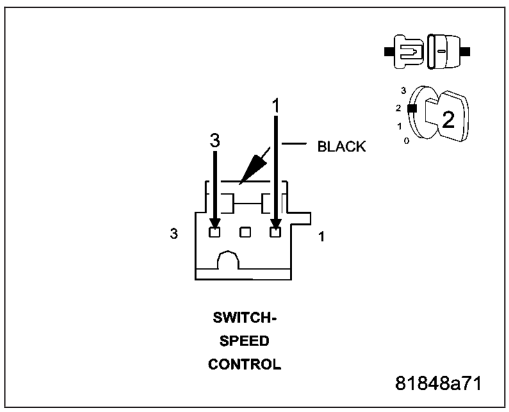
With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be above 4.8 volts with the Speed Control Switch removed.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.



Is the (V72) S/C Signal 2 voltage above 4.8 volts with the Speed Control Switch removed and below .2 volts with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 harness connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The voltage should be above 4.8 volts with the Steering Control Module (SCM) C5 connector disconnected.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Turn the ignition on.

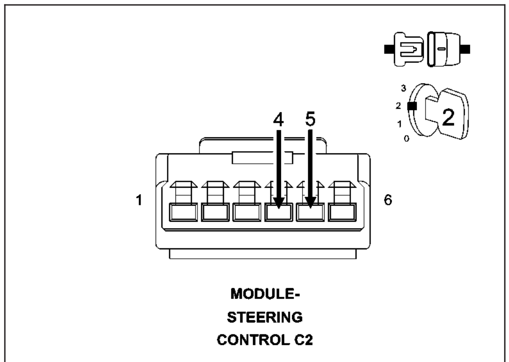
With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The voltage should be above 4.8 volts with the connector disconnected.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.



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Are the Speed Control voltages displayed as described?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

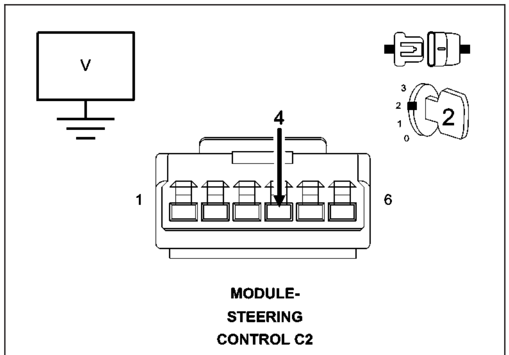
Turn the ignition on.

Measure the voltage of the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) harness connector.

Is there any voltage present?

Yes >> Repair the (V72) S/C Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

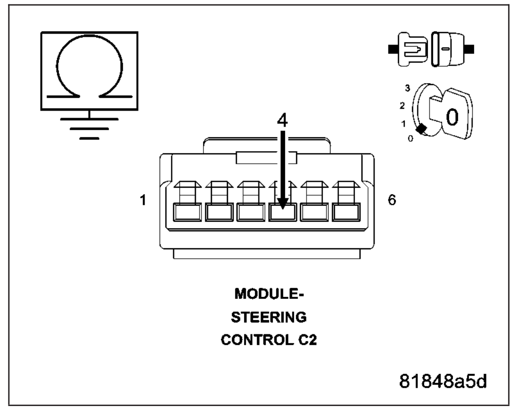


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6. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) harness connector.



Is the resistance above 100 ohms?

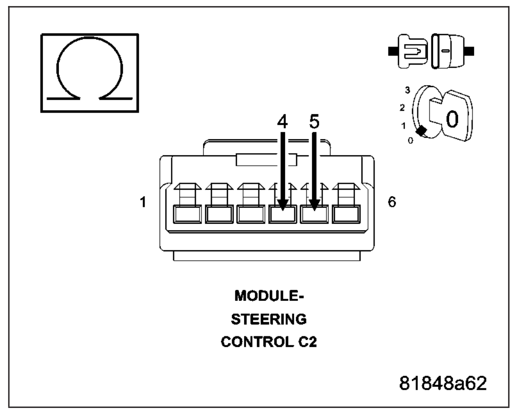
Yes >> Go to 7

No >> Repair the (V72) S/C Signal 2 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) harness connector.



Is the resistance above 100 ohms?

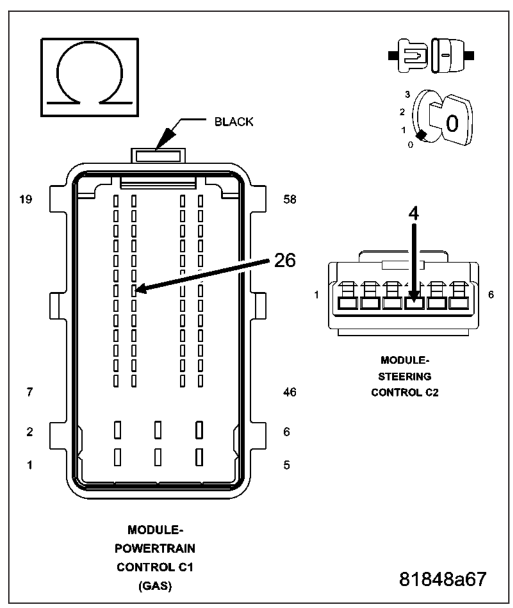
Yes >> Go to 8

No >> Repair the (V72) S/C Signal 2 circuit for a short to the Steering Control Module (SCM) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V72) S/C Signal 2 circuit between the Steering Control Module (SCM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

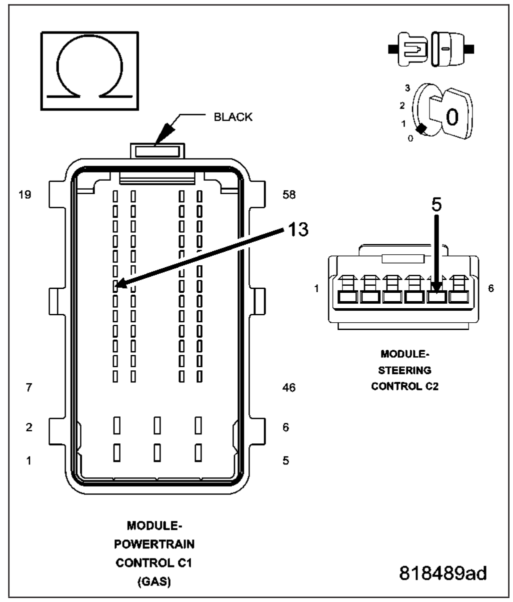
Yes >> Go to 9

No >> Repair the (V72) S/C Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

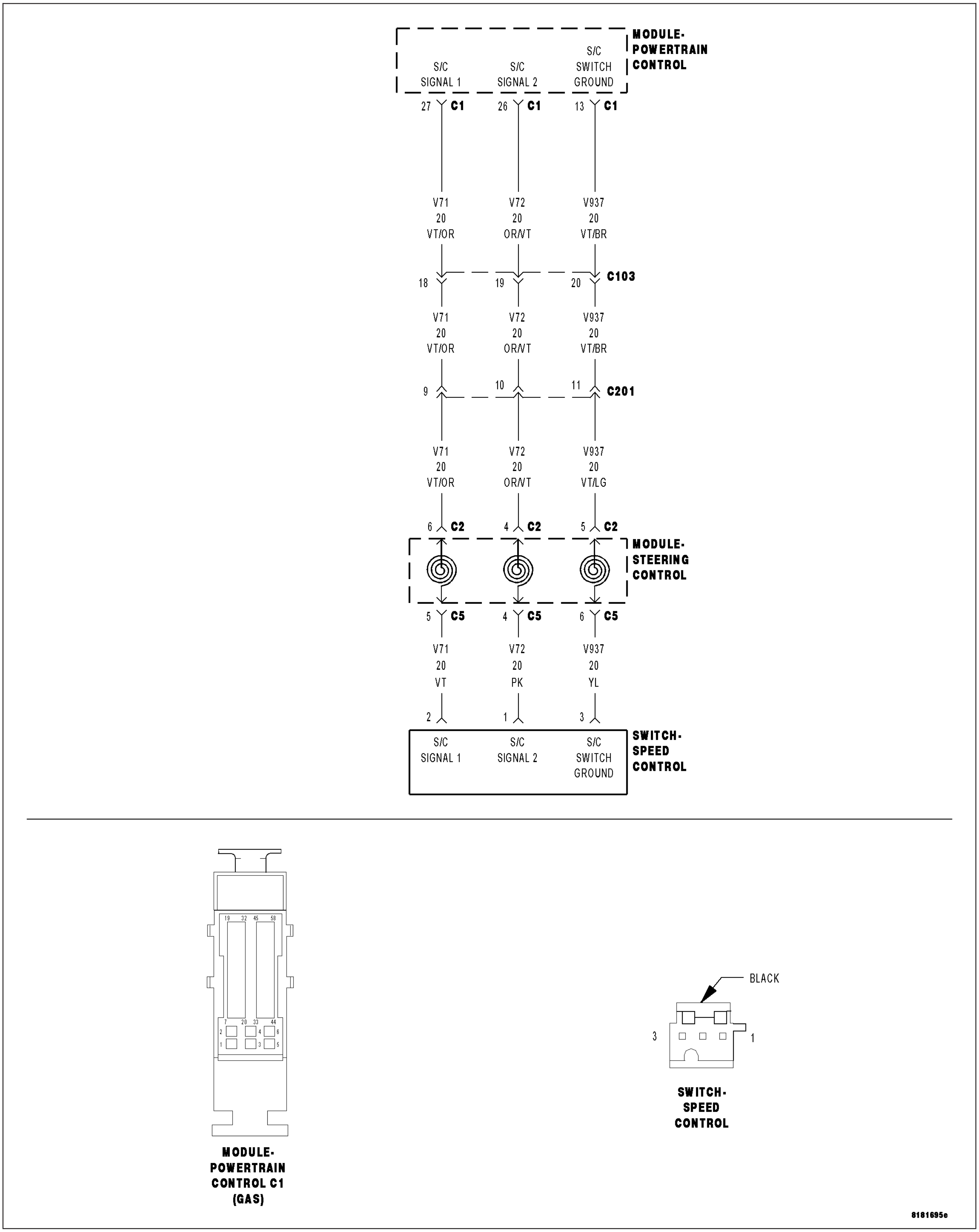
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be above 4.8 volts with the Speed Control Switch removed.

Is the (V72) S/C Signal 2 voltage above 4.8 volts with the Speed Control Switch removed?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be above 4.8 volts with the connector disconnected.

Is the (V72) S/C Signal 2 voltage above 4.8 volts with the connector disconnected?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be above 4.8 volts with the connector disconnected.

Is the (V72) S/C Signal 2 voltage above 4.8 volts with the connector disconnected?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND

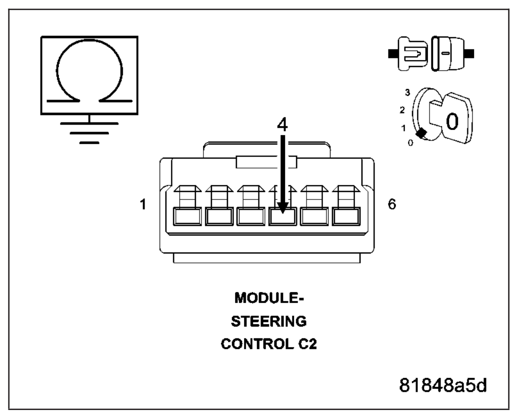
Turn the ignition off.

Measure the resistance between ground and the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.

Is the resistance above 100 ohms?

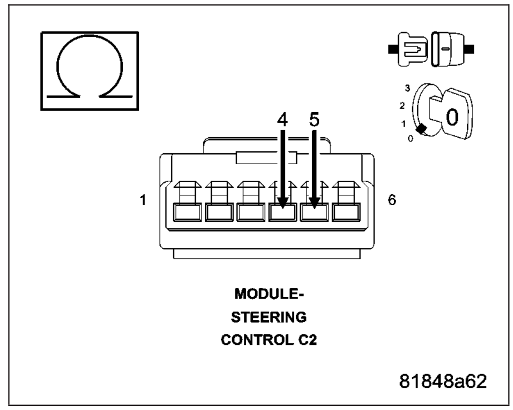
Yes >> Go to 6

No >> Repair the (V72) S/C Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.



Is the resistance above 100 ohms?

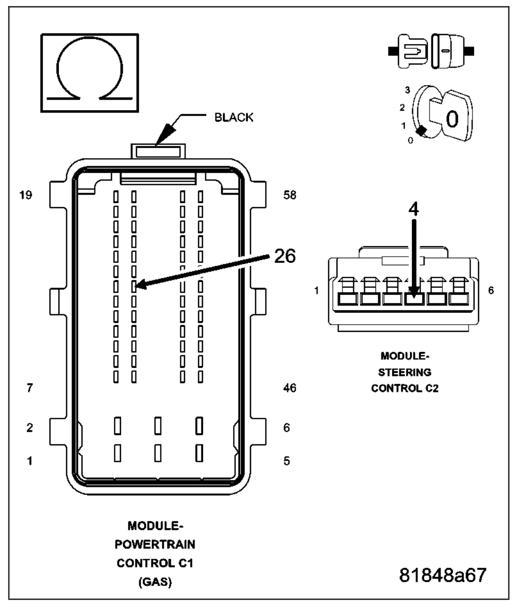
Yes >> Go to 7

No >> Repair the (V72) S/C Signal 2 circuit for a short to the Steering Control Module (SCM) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V72) S/C Signal 2 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

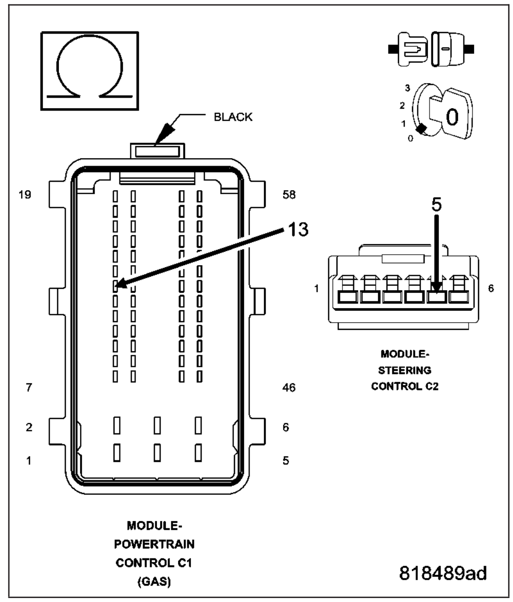
Yes >> Go to 8

No >> Repair the (V72) S/C Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

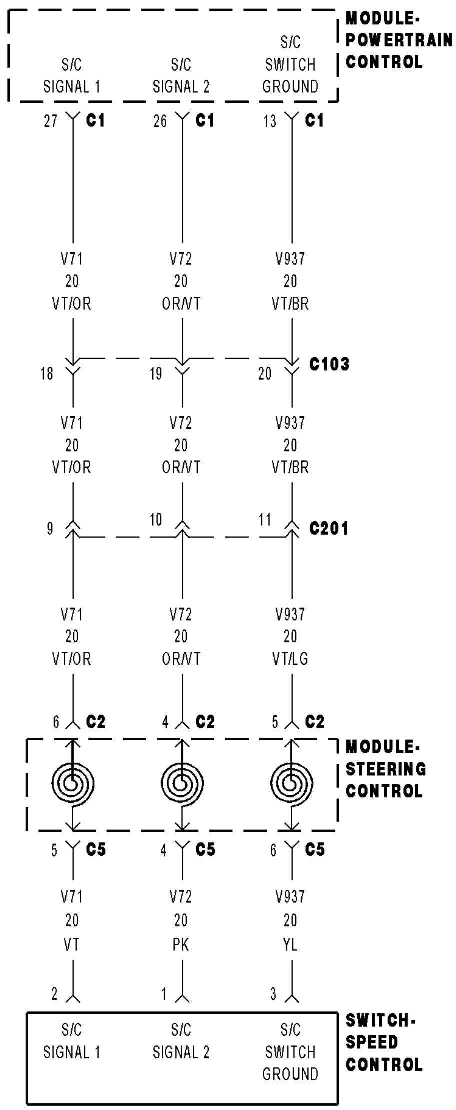
Refer to any Technical Service Bulletins that may apply.

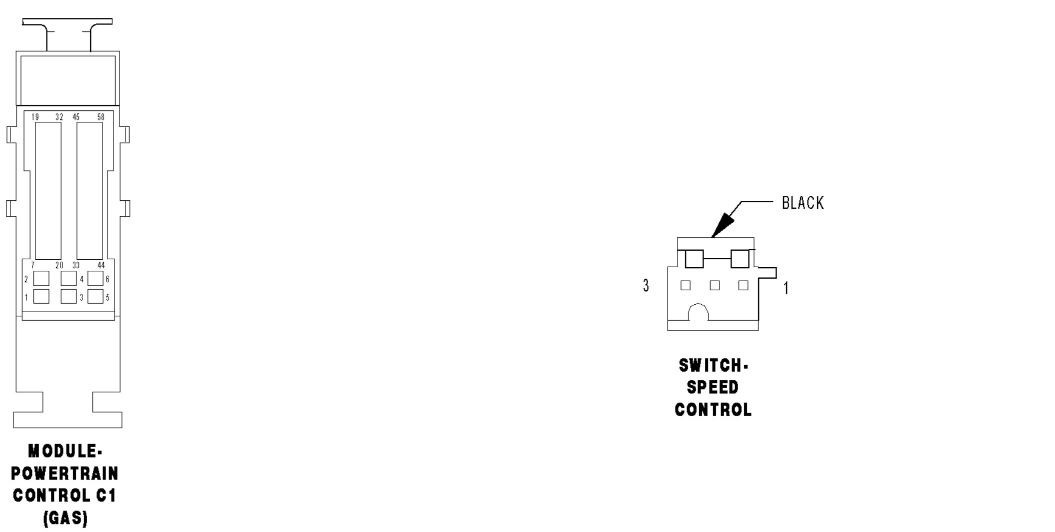
Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH





For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the Speed Control signal voltage is implausible.

Possible Causes
INTERMITTENT DTC
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

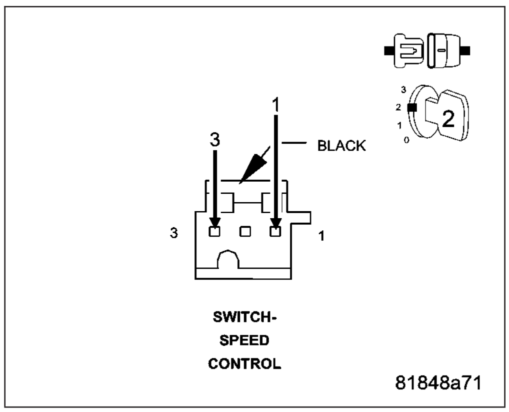
Remove the Speed Control Switch in accordance with the Service Information.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.



Is the (V72) S/C Signal 2 voltage below .2 volts with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 connector.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C5 connector, not at the harness connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Is the (V72) S/C Signal 2 voltage below .2 volts with the jumper wire in place?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

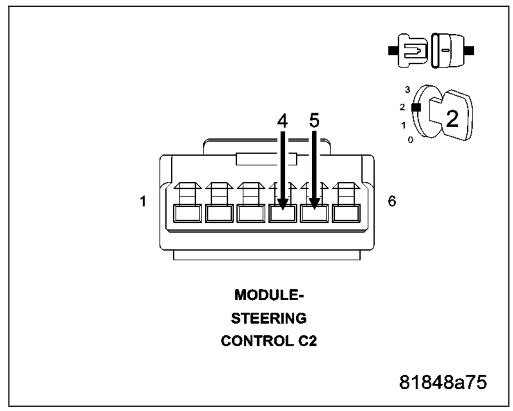
Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

Turn the ignition on.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Is the (V72) S/C Signal 2 voltage below .2 volts with the jumper wire in place?



Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

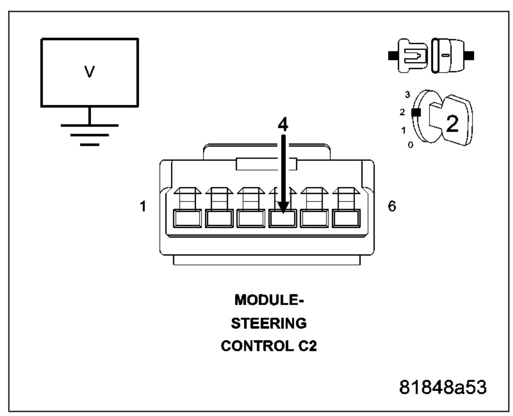
Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.

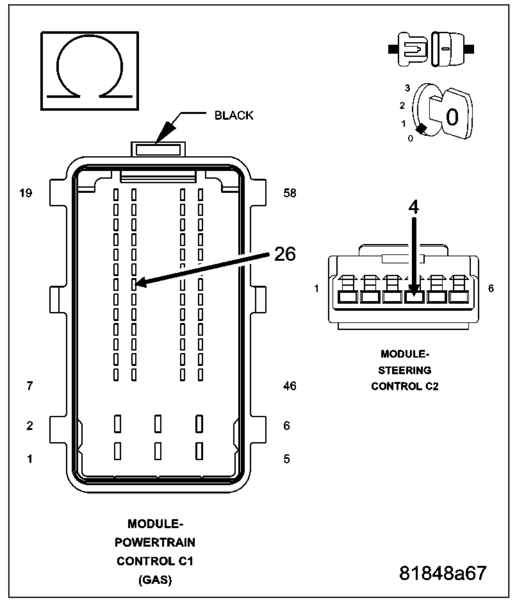
Is there any voltage present?



Yes >> Repair the (V72) S/C Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (V72) S/C Signal 2 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

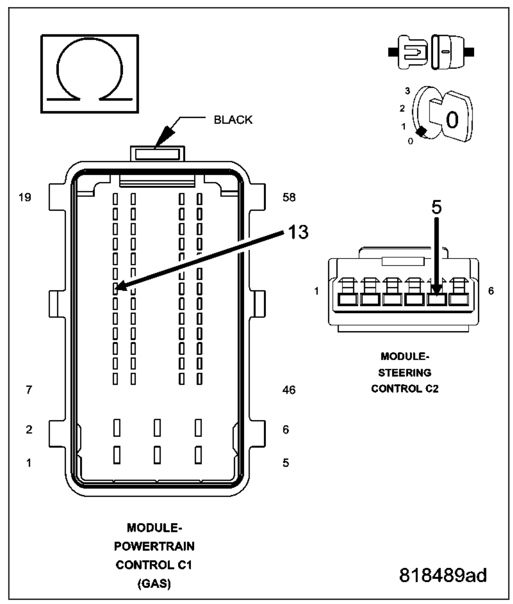
Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (V72) S/C Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0600-SERIAL COMMUNICATION LINK

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the Powertrain Control Module (PCM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0601-INTERNAL MEMORY CHECKSUM INVALID

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the Powertrain Control Module (PCM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0606-INTERNAL ECM PROCESSOR

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the Powertrain Control Module (PCM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P060B-ETC A/D GROUND PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the A/D reading does not return to ground within a set period of time during test activation, this DTC will set. Reprogramming the module may not fix this DTC. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P060D-ETC LEVEL 2 APP PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the APPS 1 and APPS 2 signals do not match for a period of time. ETC lamp will flash

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P060E-ETC LEVEL 2 TPS PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the TPS 1 and TPS 2 signals do not match for a period of time. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P060F-ETC LEVEL 2 ECT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the Coolant Temperature is implausible for a period of time. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

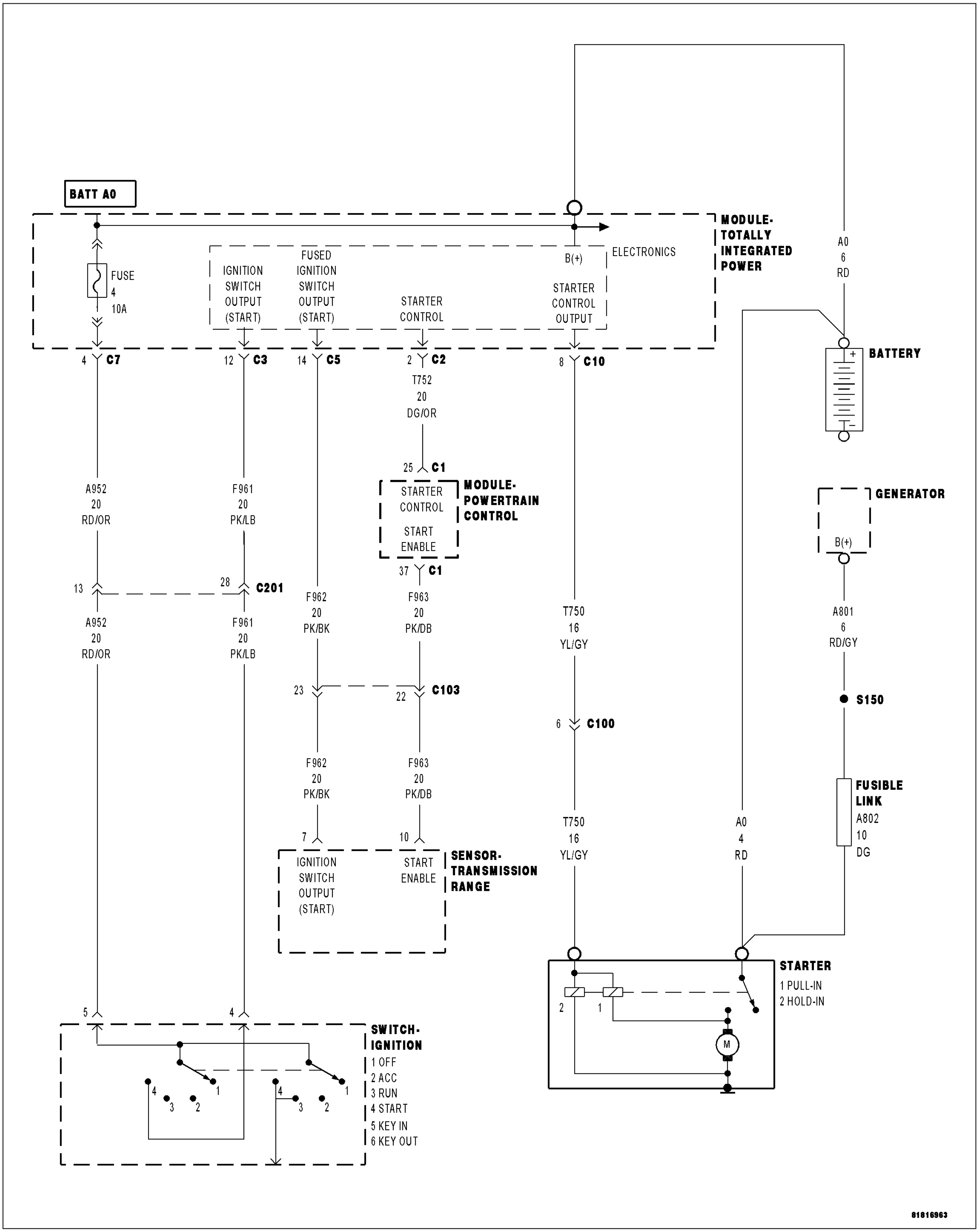
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0615-STARTER CONTROL CIRCUIT-OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the starter control does not match the intended state.

Possible Causes
INTERMITTENT DTC
(T752) STARTER CONTROL CIRCUIT SHORTED TO VOLTAGE
(T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND
(T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (T752) STARTER CONTROL CIRCUIT SHORTED TO VOLTAGE

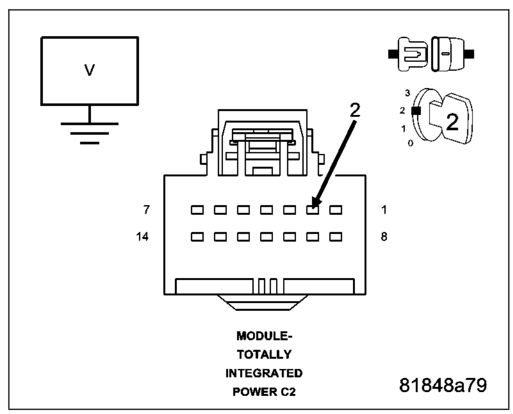
Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is there any voltage present?

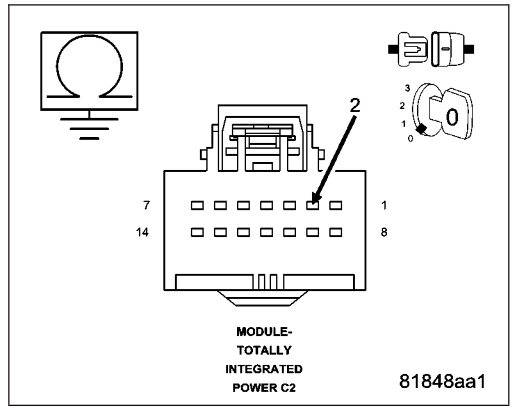
Yes >> Repair the (T752) Starter Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 100 ohms?

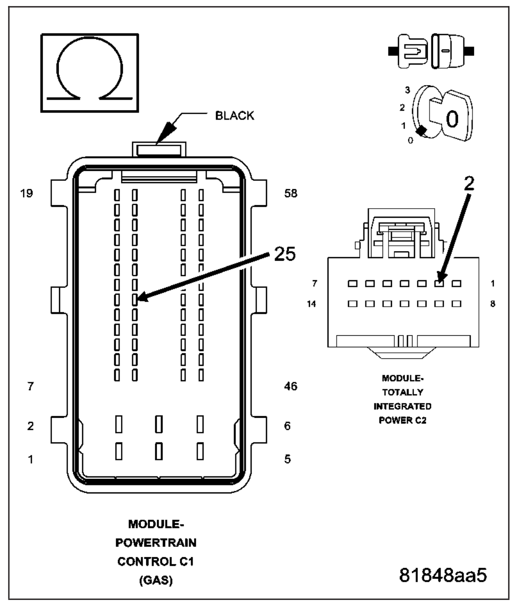
Yes >> Repair the (T752) Starter Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (T752) Starter Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

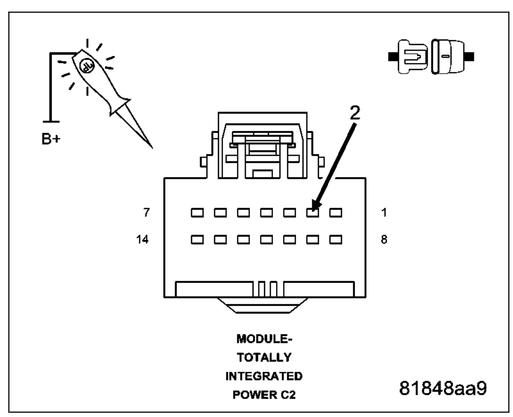
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



NOTE: The test light should not be illuminated.

While monitoring the test light, move the ignition to the start position.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light not illuminated with the ignition in the run position and illuminated and bright with the ignition in the start

position?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

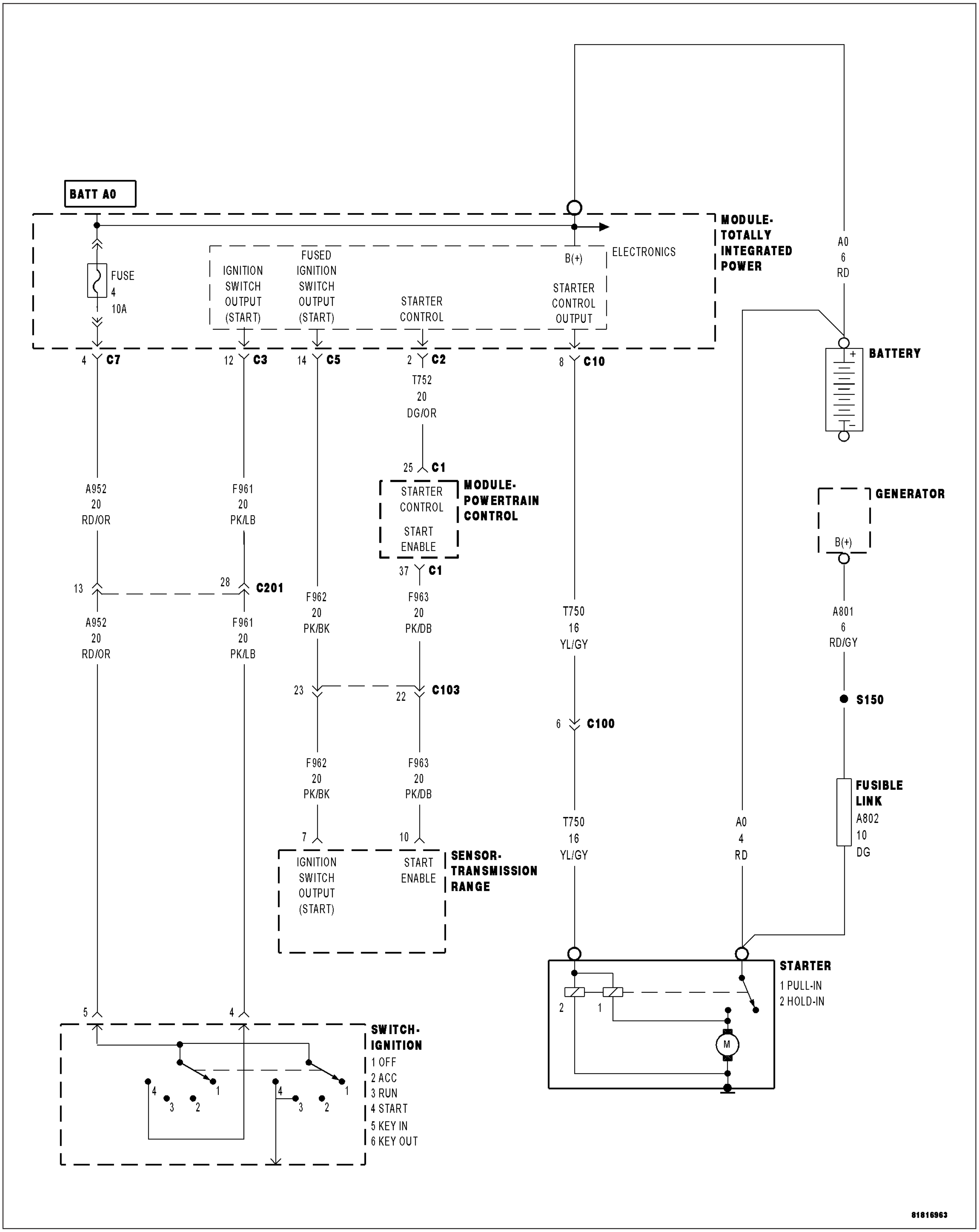
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0616-STARTER CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the starter control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND
(T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

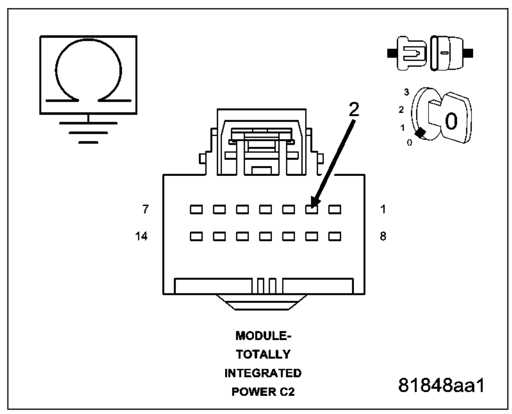
2. (T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is the resistance below 100 ohms?

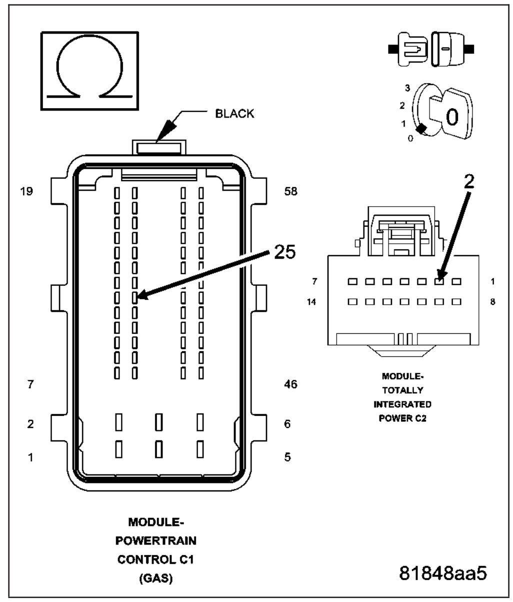
Yes >> Repair the (T752) Starter Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (T752) Starter Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

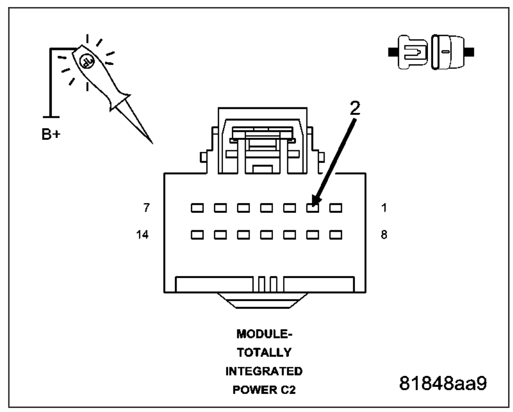
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



NOTE: The test light should not be illuminated.

While monitoring the test light, move the ignition to the start position.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light not illuminated with the ignition in the run position and illuminated and bright with the ignition in the start position?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

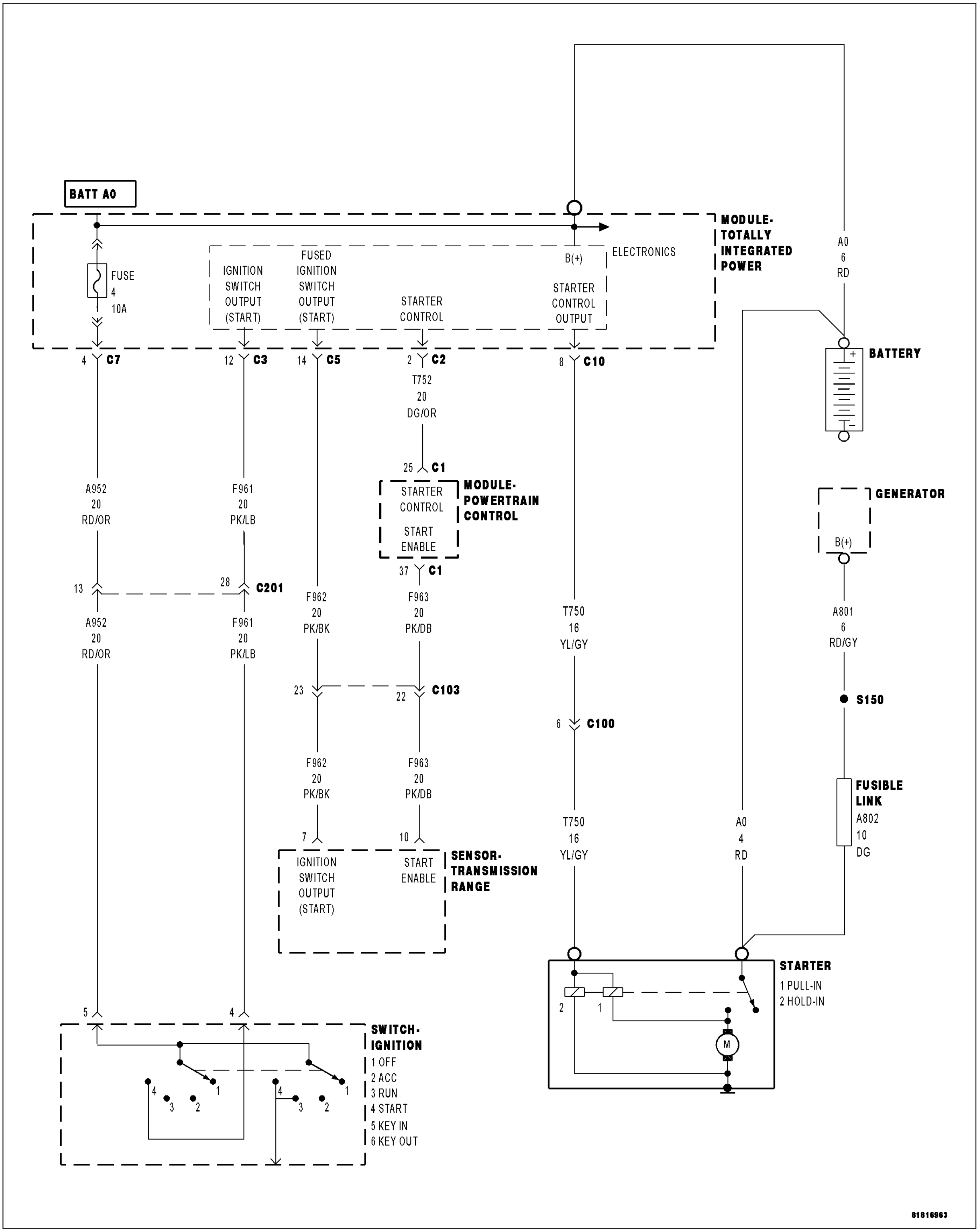
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0617-STARTER CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the starter control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(T752) STARTER CONTROL CIRCUIT SHORTED TO VOLTAGE
(T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (T752) STARTER CONTROL CIRCUIT SHORTED TO VOLTAGE

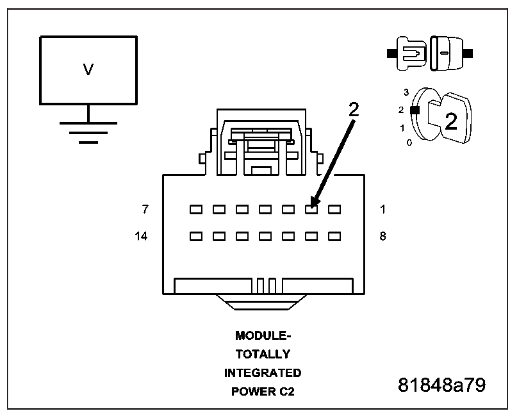
Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is there any voltage present?

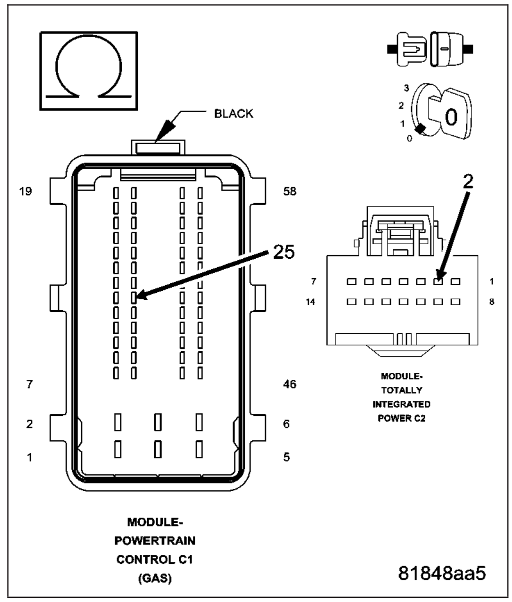
Yes >> Repair the (T752) Starter Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (T752) Starter Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

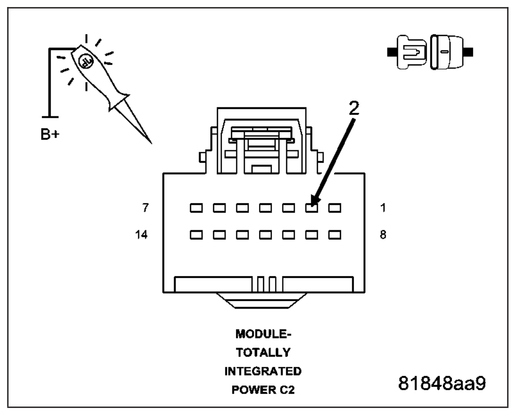
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (T752) Starter Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



NOTE: The test light should not be illuminated.

While monitoring the test light, move the ignition to the start position.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light not illuminated with the ignition in the run position and illuminated and bright with the ignition in the start position?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P061A-ETC LEVEL 2 TORQUE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the requested output is not being achieved by the engine for a period of time. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P061C-ETC LEVEL 2 RPM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the engine speed is implausible for a period of time. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

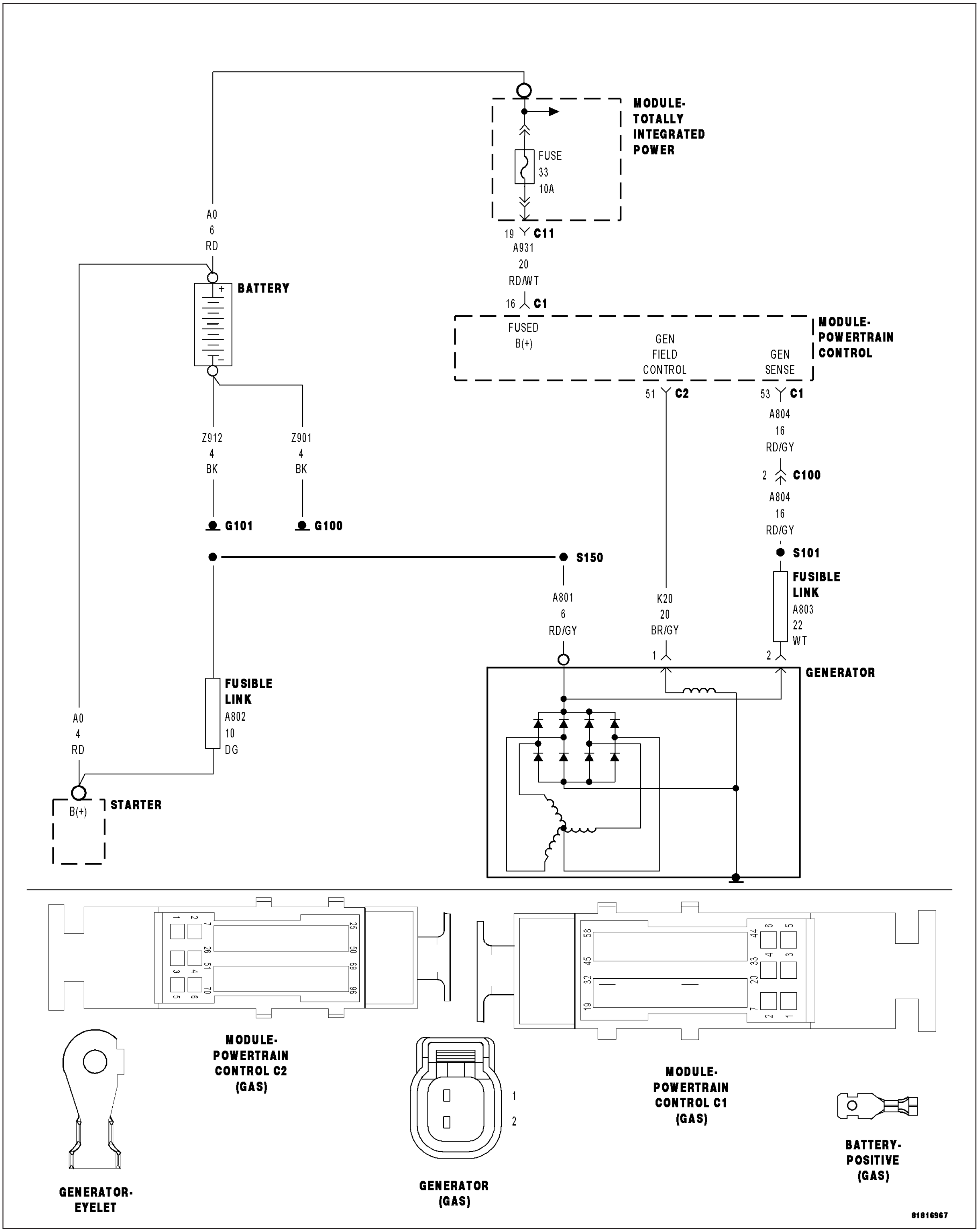
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0622-GENERATOR FIELD CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the generator field control does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE

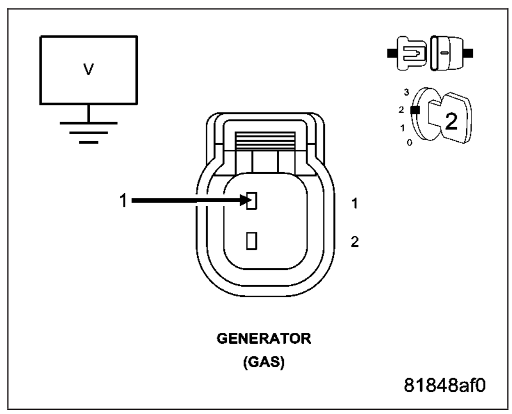
Turn the ignition off.

Disconnect the Generator connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K20) Gen Field Control circuit in the Generator harness connector.



Is there any voltage present?

Yes >> Repair the (K20) Gen Field Control circuit for a short to voltage.

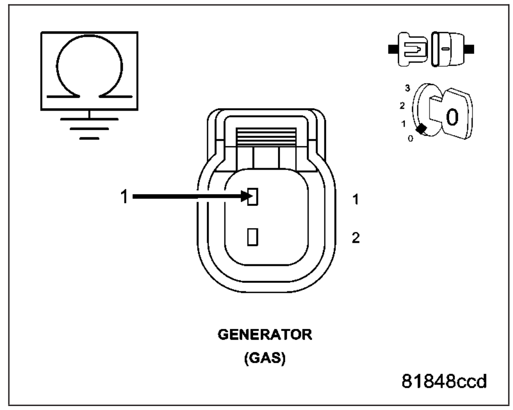
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator harness connector.



Is the resistance below 100 ohms?

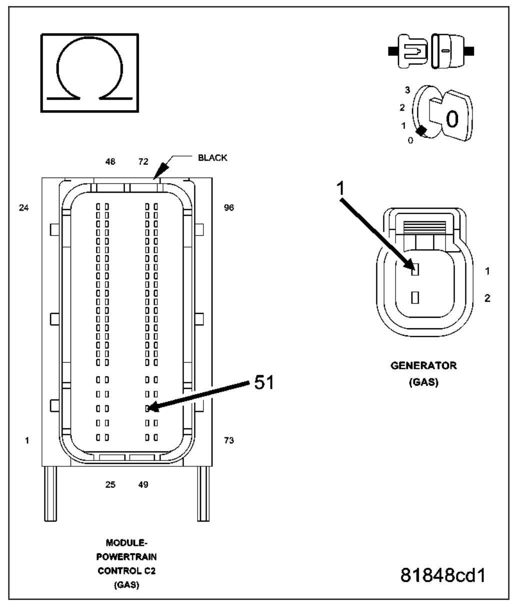
Yes >> Repair the (K20) Gen Field Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K20) Gen Field Control circuit between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K20) Gen Field Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

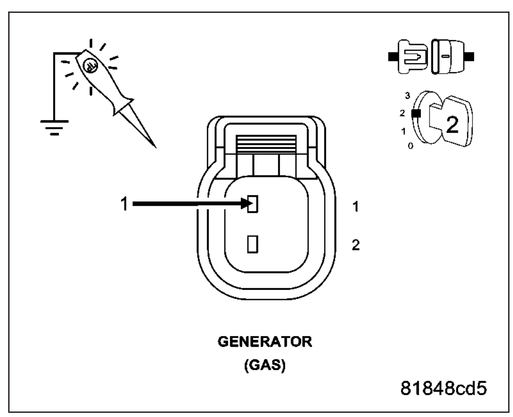
5. GENERATOR

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Generator field control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Generator field control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the Generator in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

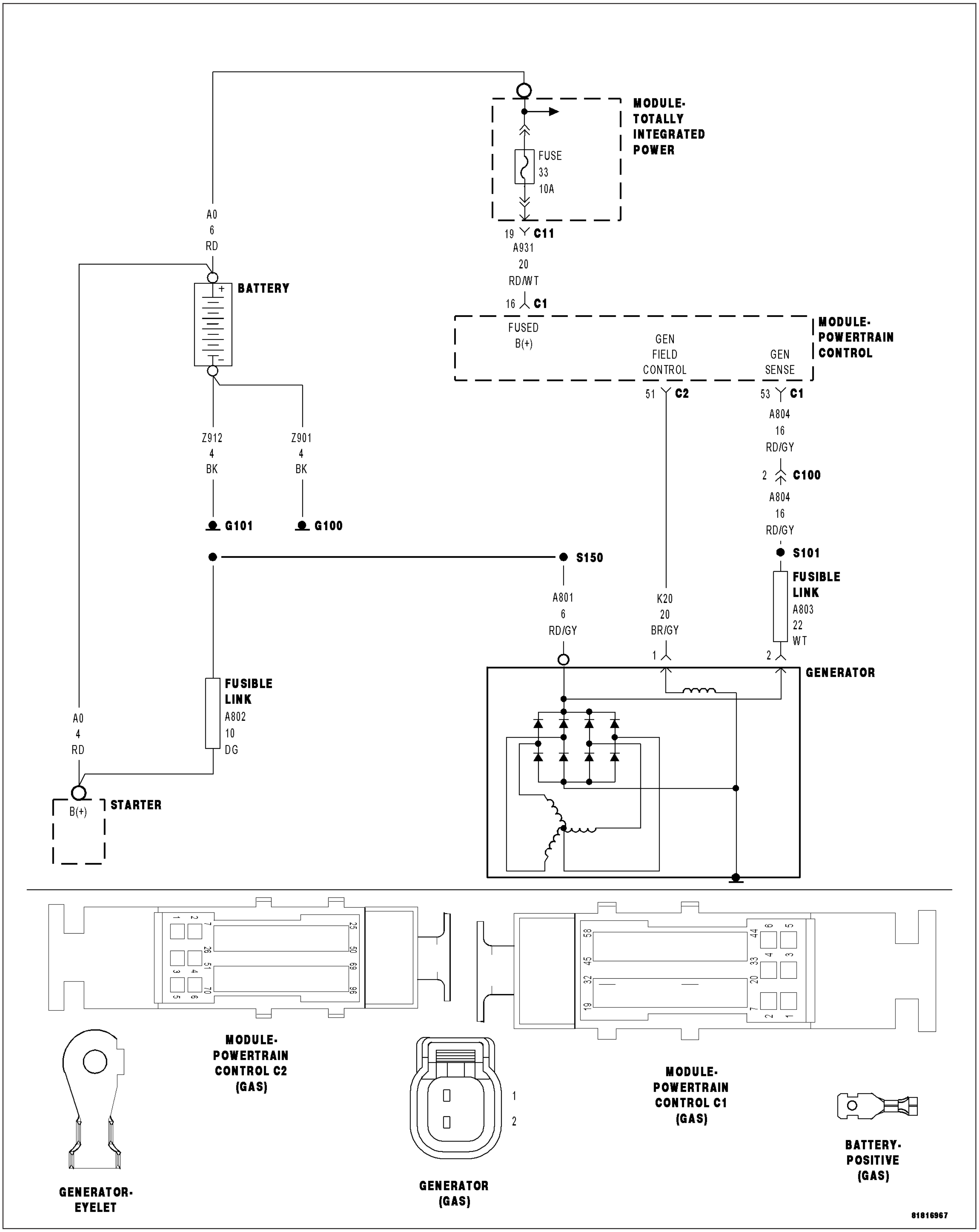
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0625-GENERATOR FIELD CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the generator field control is shorted low.

Possible Causes
INTERMITTENT DTC
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

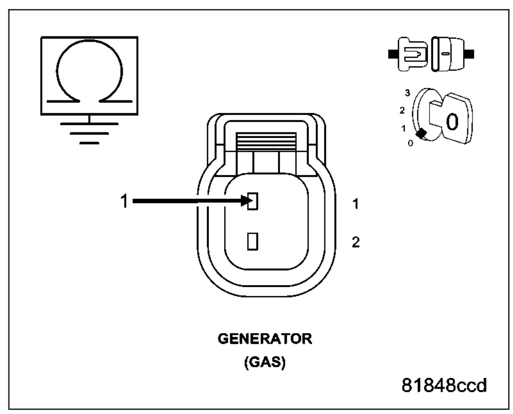
2. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Generator connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator harness connector.



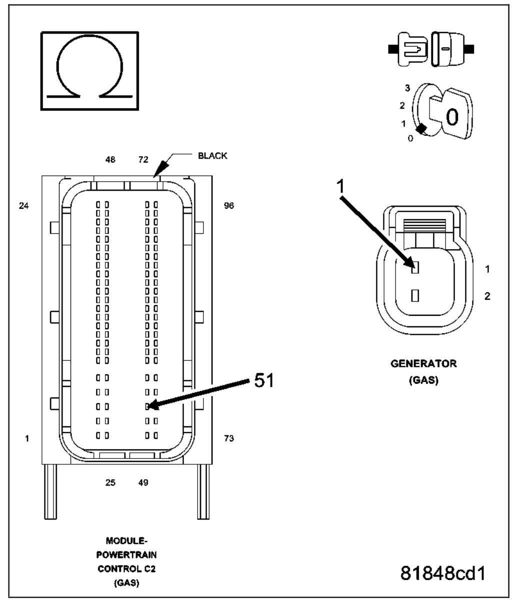
Is the resistance below 100 ohms?

Yes >> Repair the (K20) Gen Field Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (K20) Gen Field Control circuit between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.

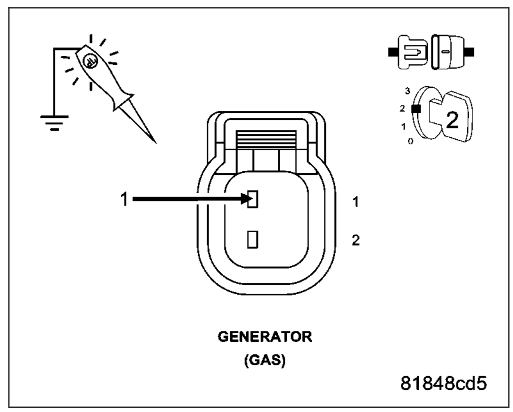
Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K20) Gen Field Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. GENERATOR



Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Generator field control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Generator field control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actuation OFF (0%)?

Yes >> Replace the Generator in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

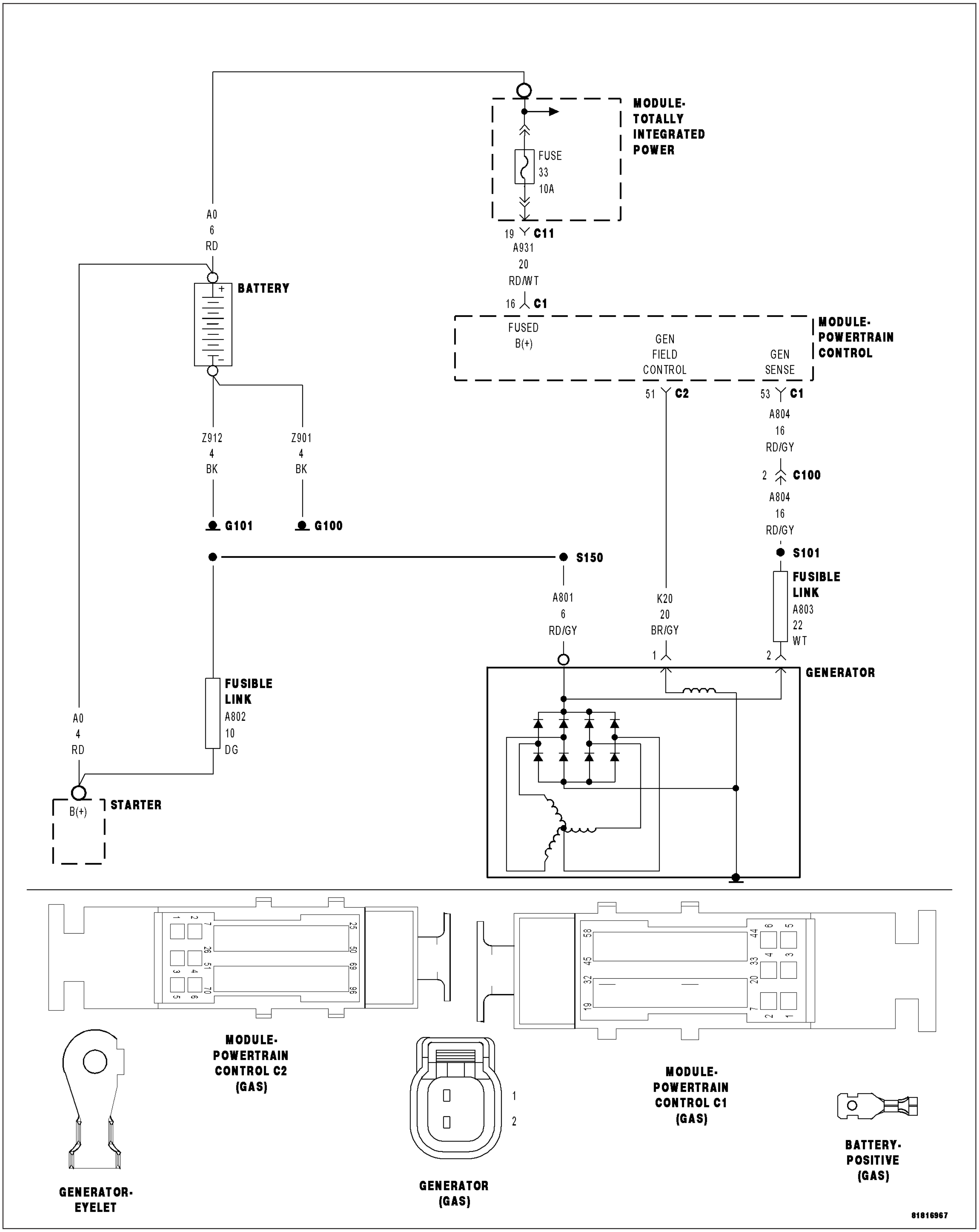
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0626-GENERATOR FIELD CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the generator field control is shorted high.

Possible Causes
INTERMITTENT DTC
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE

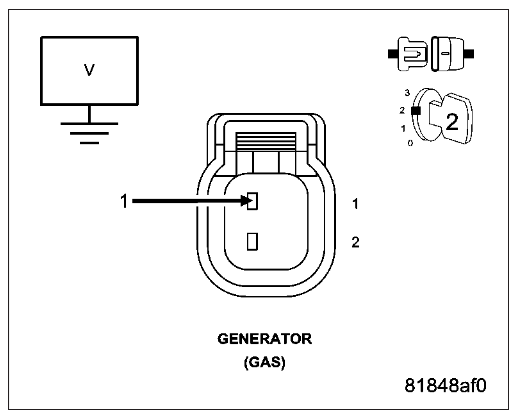
Turn the ignition off.

Disconnect the Generator connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K20) Gen Field Control circuit in the Generator harness connector.



Is there any voltage present?

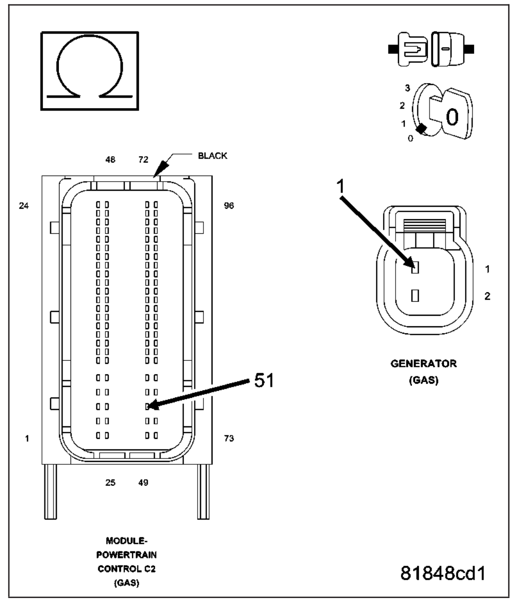
Yes >> Repair the (K20) Gen Field Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K20) Gen Field Control circuit between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

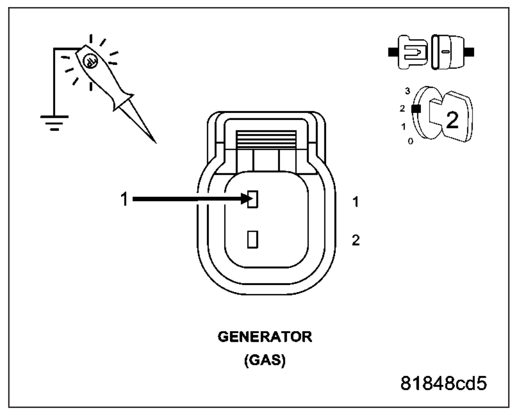
No >> Repair the (K20) Gen Field Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. GENERATOR

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.



With the scan tool, actuate the Generator field control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Generator field control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K20) Gen Field Control circuit in the Generator harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actuation OFF (0%)?

Yes >> Replace the Generator in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

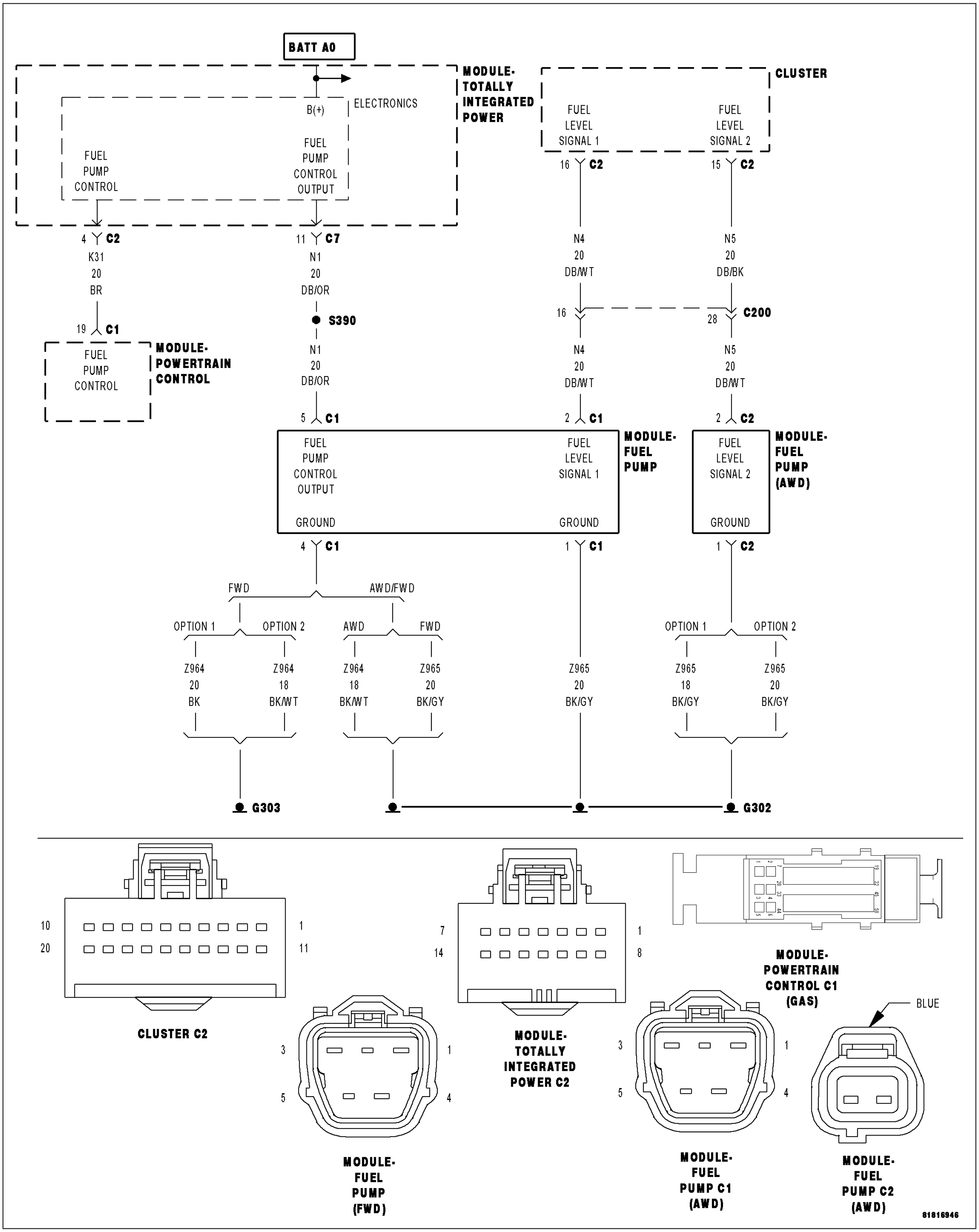
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0627-FUEL PUMP CONTROL CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the actual state of the fuel pump control does not match the intended state.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO VOLTAGE
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND
(K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO VOLTAGE

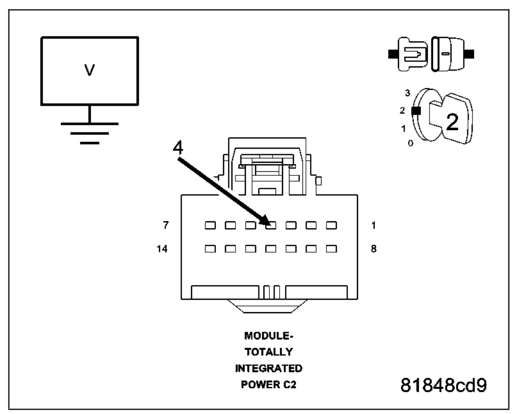
Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is there any voltage present?

Yes >> Repair the (K31) Fuel Pump Control circuit for a short to voltage.

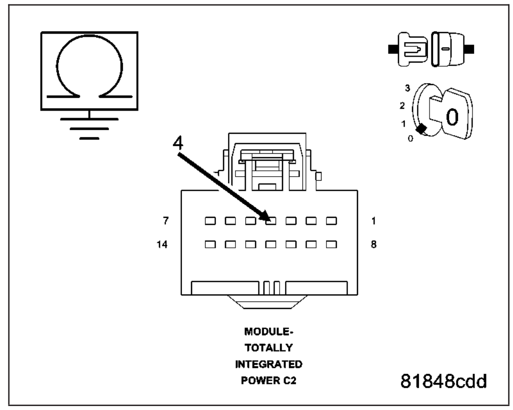
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



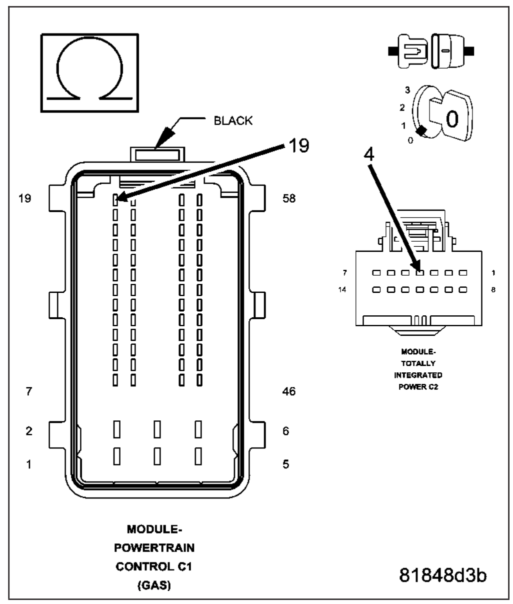
Is the resistance below 100 ohms?

Yes >> Repair the (K31) Fuel Pump Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between ground and the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for the Fuel Pump Control circuit shorted low DTC?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

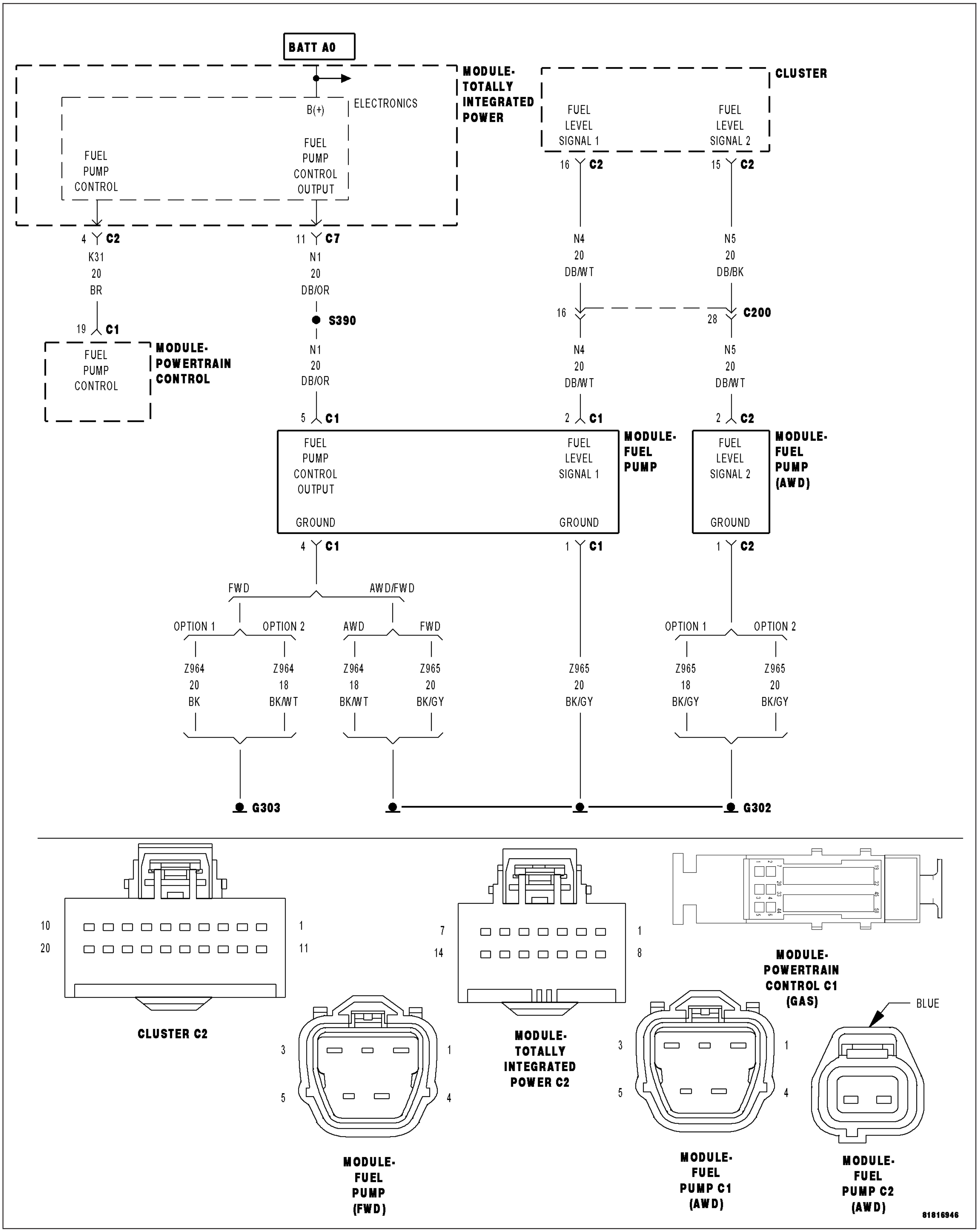
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0628-FUEL PUMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the fuel pump control is shorted low.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND
(K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

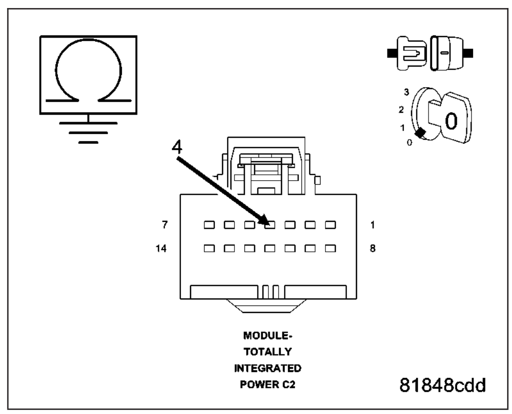
2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



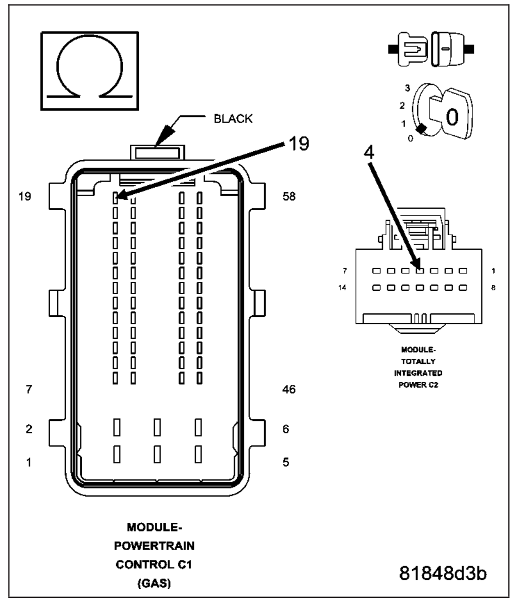
Is the resistance below 100 ohms?

Yes >> Repair the (K31) Fuel Pump Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, select View DTCs.

NOTE: With the TIPM connector disconnected, the PCM should display a Fuel Pump Control circuit open DTC.

Is the status Active for the Fuel Pump Control circuit open DTC?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

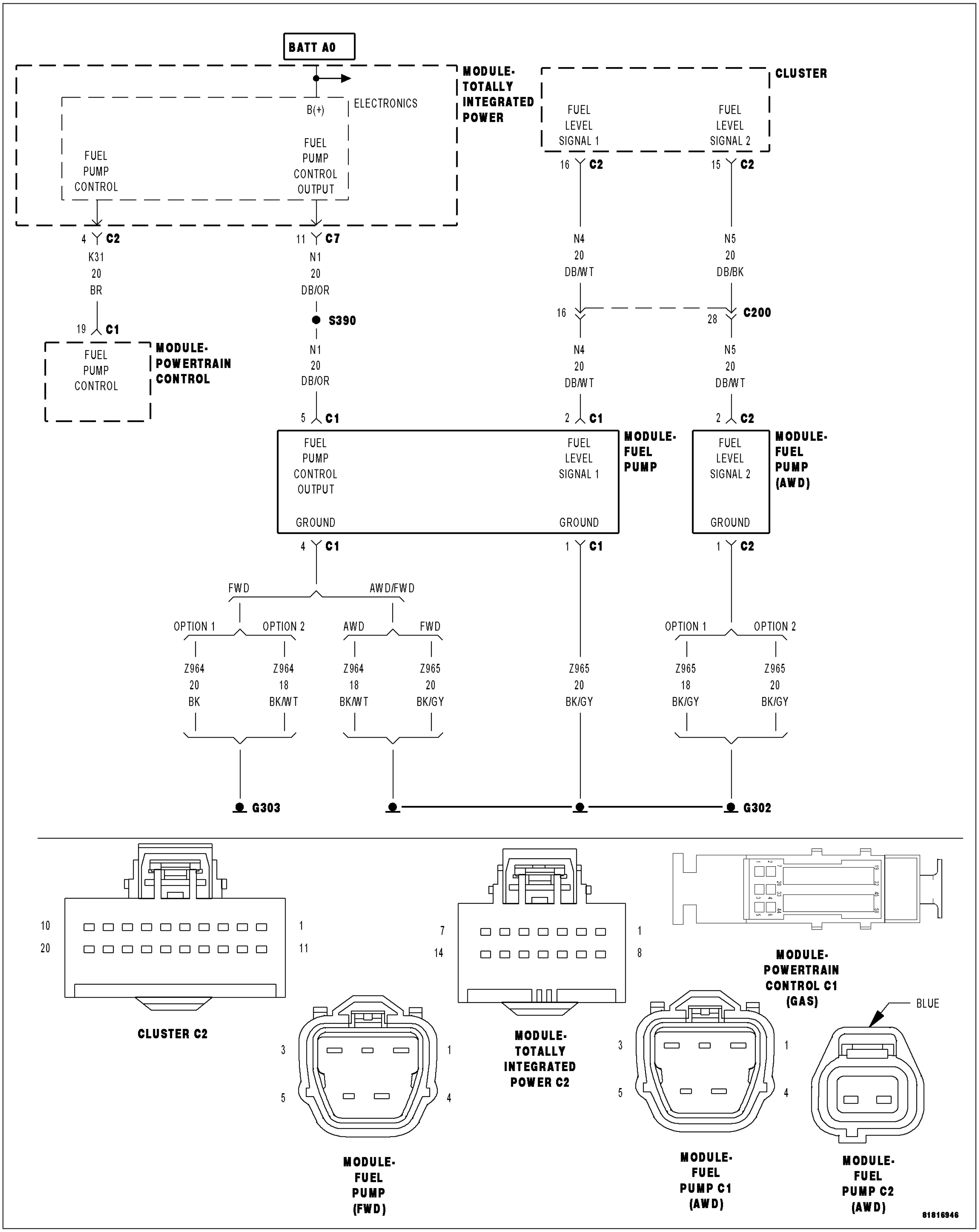
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0629-FUEL PUMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the fuel pump control is shorted high.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO VOLTAGE
(K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO VOLTAGE

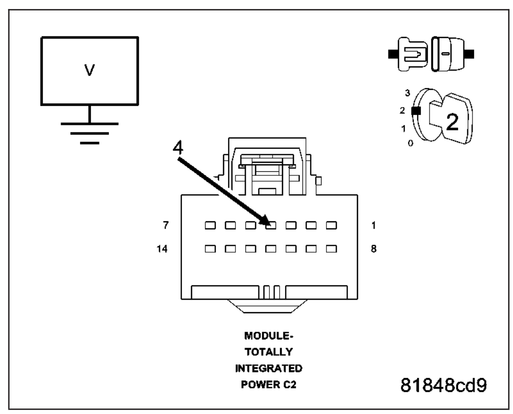
Turn the ignition off.

Disconnect the Totally Integrated Power Module (TIPM) connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.



Is there any voltage present?

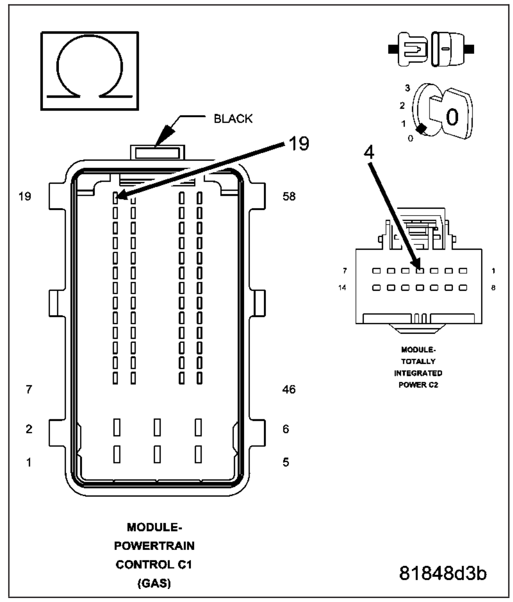
Yes >> Repair the (K31) Fuel Pump Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the Totally Integrated Power Module (TIPM) harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. TOTALLY INTEGRATED POWER MODULE (TIPM)

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between ground and the (K31) Fuel Pump Control circuit in the Totally Integrated Power Module (TIPM) harness connector.

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for the Fuel Pump Control circuit shorted low DTC?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Totally Integrated Power Module (TIPM) and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P062C-ETC LEVEL 2 MPH PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When secondary software determines that the vehicle speed is implausible for a period of time. ETC lamp will flash.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0630-VIN NOT PROGRAMMED IN PCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At initialization.
- **Set Condition:**
  The VIN has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
VIN NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. VIN NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)

Ignition on, engine not running.

Using the scan tool, program the VIN into the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

NOTE: If the engine will not start, crank the engine for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0632-ODOMETER NOT PROGRAMMED IN PCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The vehicle mileage is not programed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
MILEAGE NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. MILEAGE NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)

Ignition on, engine not running.
With a scan tool, Clear DTCs.
Using the scan tool, program the vehicle mileage into the Powertrain Control Module (PCM).
Start the engine and allow it to reach normal operating temperature.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0633-SKIM SECRET KEY NOT STORED IN PCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The Secret Key information has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
SECRET KEY INFORMATION NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SECRET KEY INFORMATION NOT PROGRAMMED IN THE POWERTRAIN CONTROL MODULE (PCM)

Ignition on, engine not running.

Using the scan tool, program the Secret Key information into the Powertrain Control Module (PCM) using the PCM Replaced function in the WCM.

Start the engine and allow it to reach normal operating temperature.

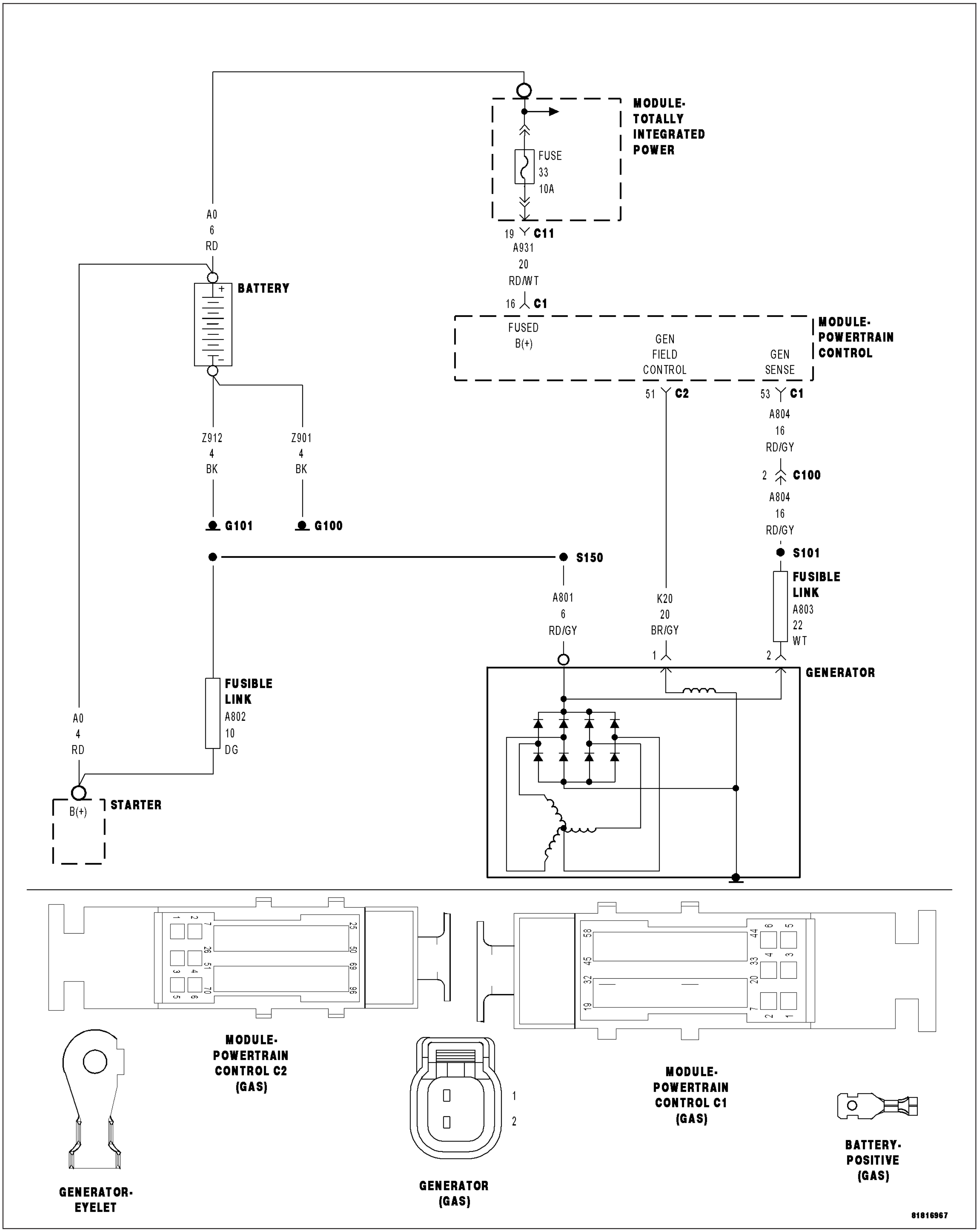
NOTE: If the engine will not start, crank the engine for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P063A-GENERATOR VOLTAGE SENSE CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects no change when attempting to regulate the generator output.

Possible Causes
INTERMITTENT DTC
(A804) GEN SENSE CIRCUIT SHORTED TO VOLTAGE
(A804) GEN SENSE CIRCUIT SHORTED TO GROUND
(A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (A804) GEN SENSE CIRCUIT SHORTED TO VOLTAGE

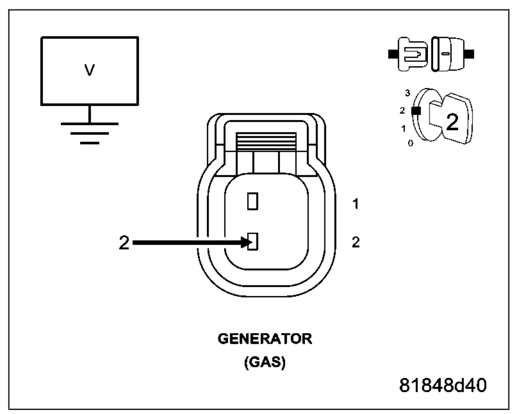
Turn the ignition off.

Disconnect the Generator connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (A804) Gen Sense circuit in the Generator harness connector.



Is there any voltage present?

Yes >> Repair the (A804) Gen Sense circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (A804) GEN SENSE CIRCUIT SHORTED TO GROUND

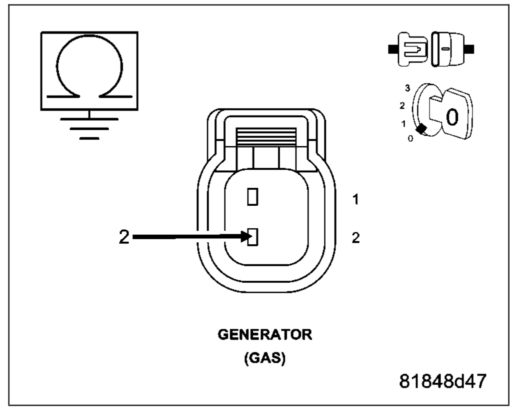
Turn the ignition off.

Measure the resistance between ground and the (A804) Gen Sense circuit in the Generator harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (A804) Gen Sense circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



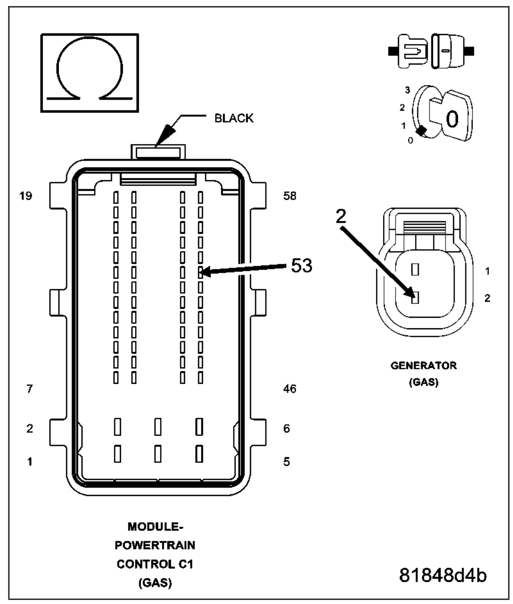
4. (A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (A804) Gen Sense circuit between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (A804) Gen Sense circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. GENERATOR

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Generator connector.

Connect the Powertrain Control Module (PCM) connector.

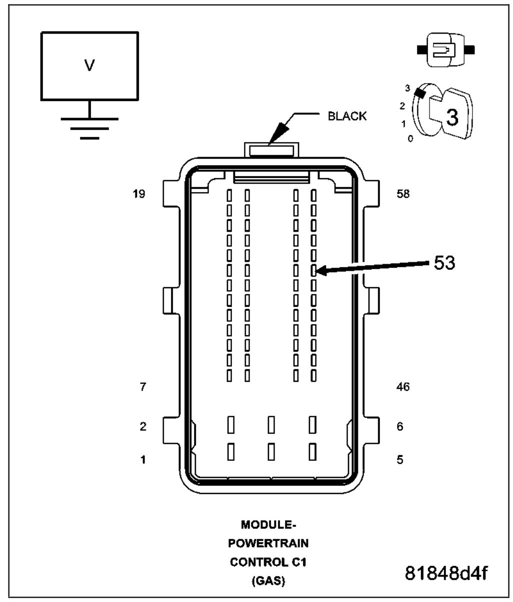
Turn the ignition on.

While backprobing, measure the voltage of the (K20) Gen Field Control circuit in the Powertrain Control Module (PCM) harness connector.

Start the engine.

With the scan tool, perform the Generator Full Field test.

Monitor the voltage of the (K20) Gen Field Control circuit with the Generator Full Field test actuated.



NOTE: The voltage should increase more than 1 volt.

Does the voltage increase by at least 1 volt with the Generator Full Field Test on?

Yes >> Go to 6

No >> Replace the Generator in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

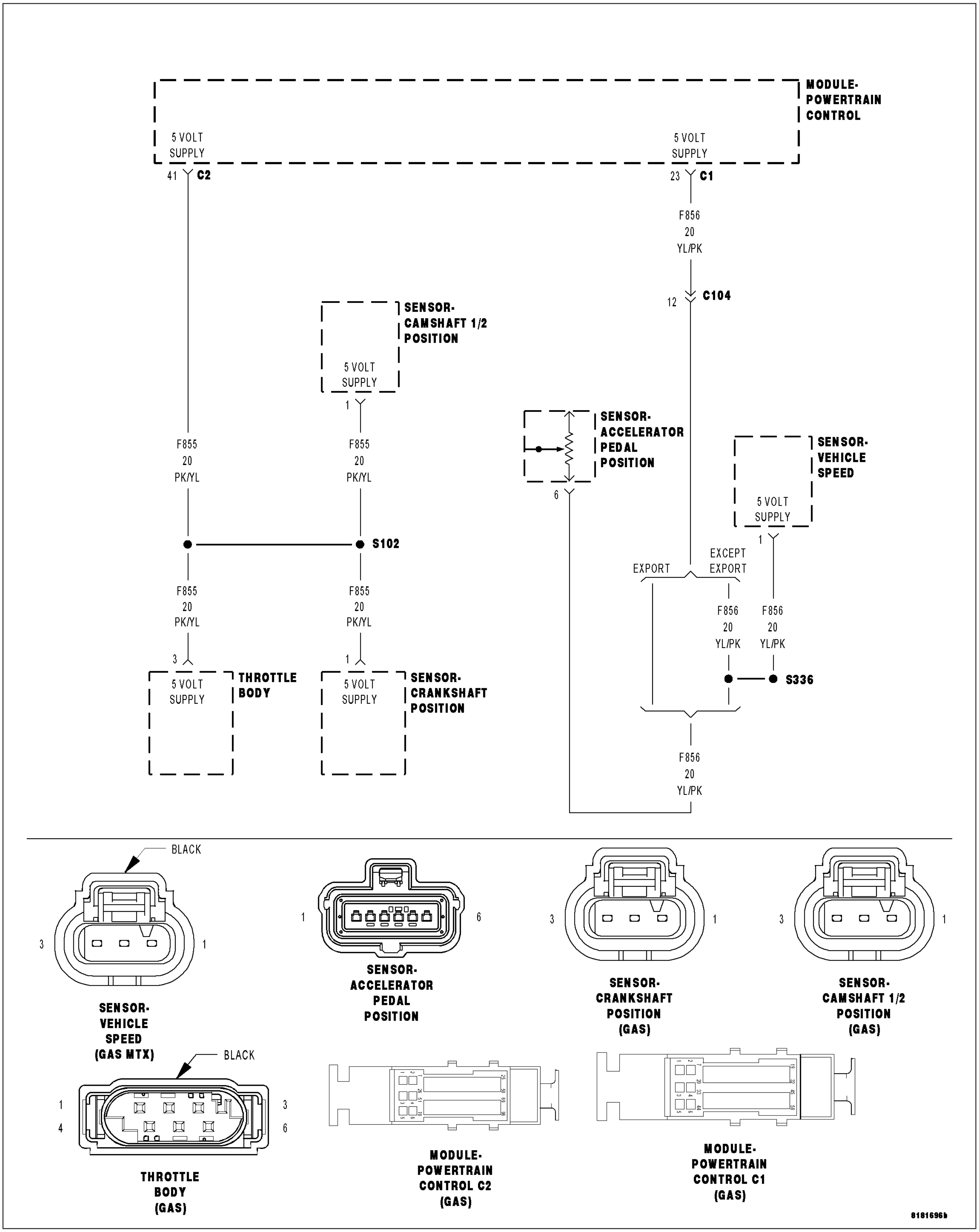
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects low voltage on the (F855) 5 volt supply circuit or the (F856) 5 volt supply circuit.

Possible Causes
INTERMITTENT DTC
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ACCELERATOR PEDAL POSITION SENSOR
CAMSHAFT 2 POSITION SENSOR
CRANKSHAFT POSITION SENSOR
THROTTLE POSITION SENSOR
VEHICLE SPEED SENSOR (MTX ONLY)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

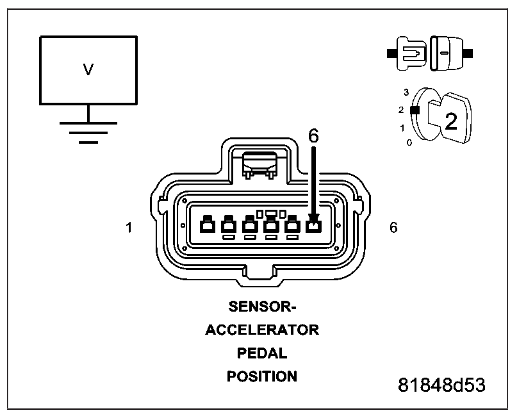
2. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the APP Sensor harness connector.



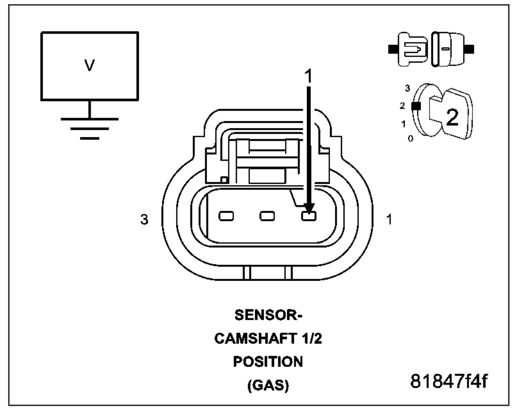
Is the voltage above 4.6 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. CAMSHAFT 1/2 POSITION SENSOR

Turn the ignition off.
Disconnect the Camshaft 1/2 Position Sensor harness connector.
Turn the ignition on.
Measure the voltage of the (F855) 5 Volt Supply circuit.



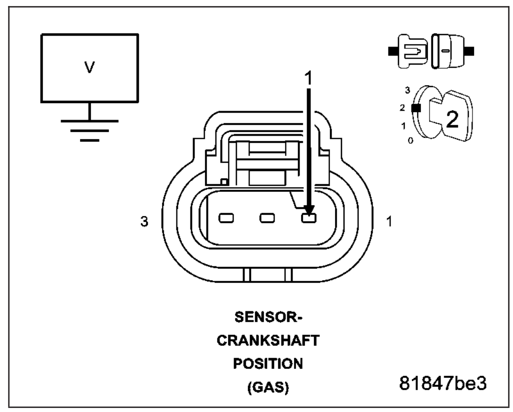
Is the voltage above 4.6 volts?

Yes >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. CRANKSHAFT POSITION SENSOR

Turn the ignition off.
Disconnect the Crankshaft Position Sensor harness connector.
Turn the ignition on.
Measure the voltage of the (F855) 5 Volt Supply circuit.



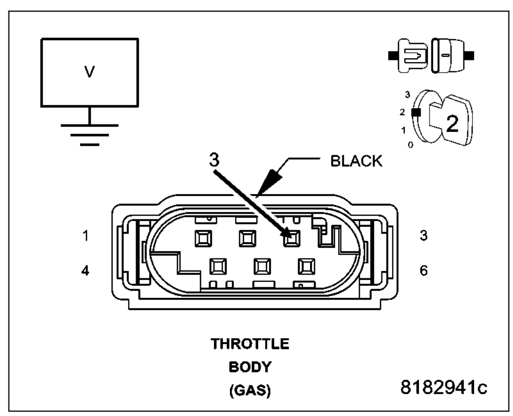
Is the voltage above 4.6 volts?

Yes >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. THROTTLE POSITION SENSOR

Turn the ignition off.
Disconnect the Throttle Body harness connector.
Turn the ignition on.
Measure the voltage of the (F855) 5 Volt Supply circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. VEHICLE EQUIPPED WITH MANUAL TRANSMISSION

Is the vehicle equipped with a manual transmission?

Yes >> Go to 7

No >> Go to 8

7. VEHICLE SPEED SENSOR

NOTE: Only vehicles equipped with a manual transmission will use a Vehicle Speed Sensor.

Turn the ignition off.

Disconnect the Vehicle Speed Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit.

Is the voltage above 4.6 volts?

Yes >> Replace the Vehicle Speed Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 8

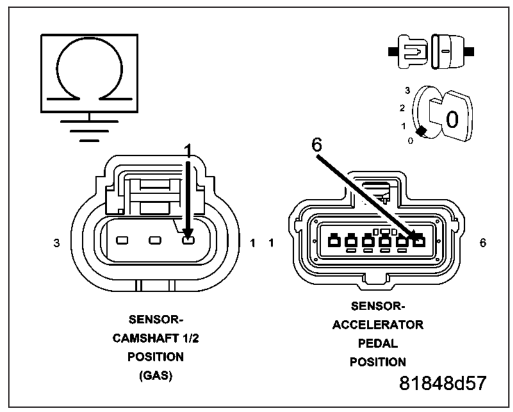
8. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit.



Is the resistance above 1000 ohms for both circuits?

Yes >> Go to 9

No >> Repair the 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. POWERTRAIN CONTROL MODULE (PCM)

Inspect the (F855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the PCM harness connector.

Inspect the (F855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the PCM harness connector.

Inspect the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the PCM harness connector.

Inspect the (F856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

If the vehicle is equipped with a manual transmission, inspect the (F856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the PCM harness connector.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

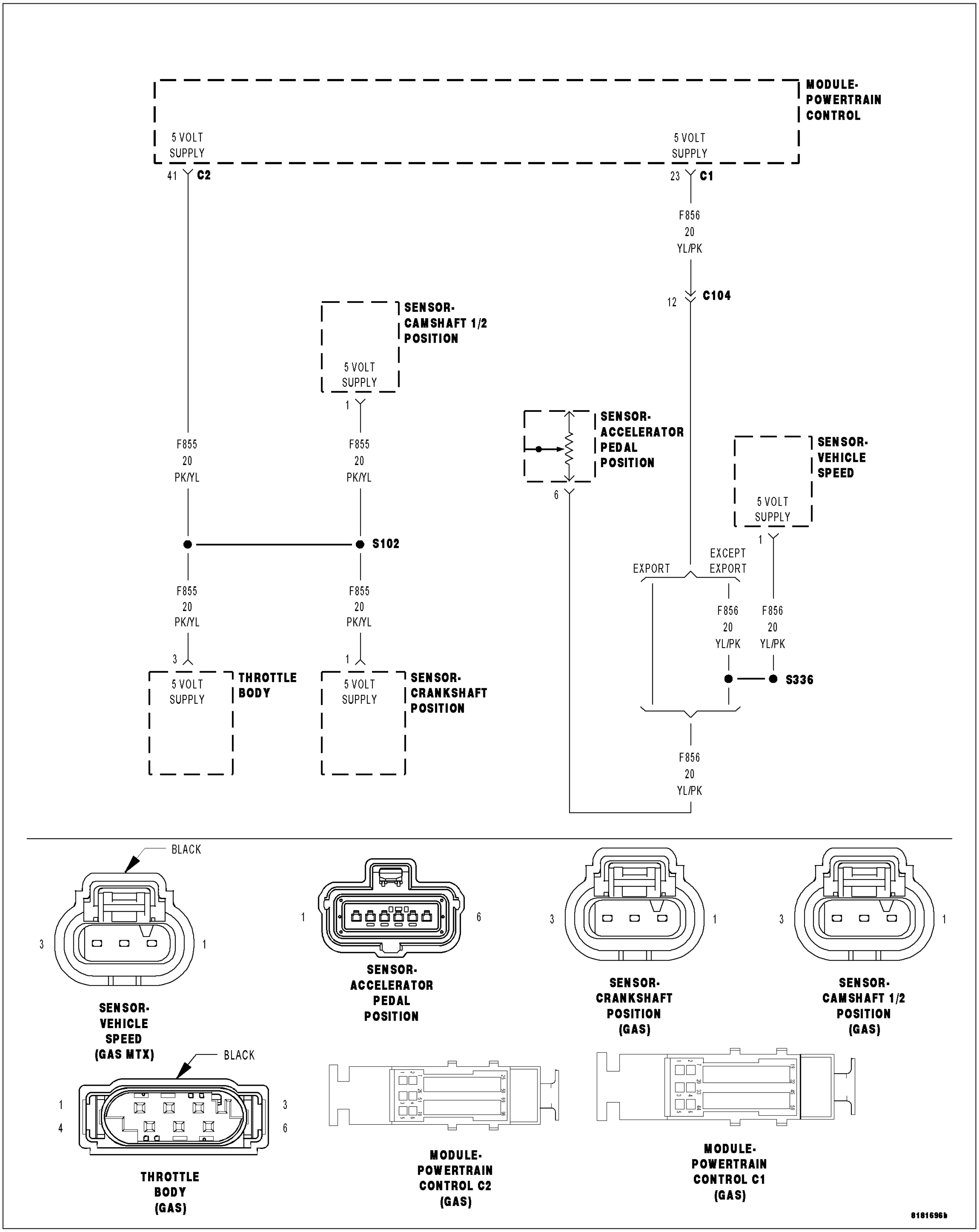
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0643-SENSOR REFERENCE VOLTAGE 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects a short to voltage on the (K855) 5 volt supply circuit or the (K856) 5 volt supply circuit.

Possible Causes
INTERMITTENT DTC
(K855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Disconnect the PCM harness connectors.

Measure the voltage on the (K856) 5 Volt Supply circuit.

Is there any voltage present?

Yes >> Repair the (K856) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Turn the ignition on.

Measure the voltage on the (K855) 5 Volt Supply circuit.

Is there any voltage present?

Yes >> Repair the (K855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. POWERTRAIN CONTROL MODULE (PCM)

Turn the ignition off.

Inspect the (K855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the PCM harness connector.

Inspect the (K855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the PCM harness connector.

Inspect the (K855) 5 Volt Supply circuit between the Throttle Body harness connector and the PCM harness connector.

Inspect the (K856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

If the vehicle is equipped with a manual transmission, inspect the (K856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the PCM harness connector.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

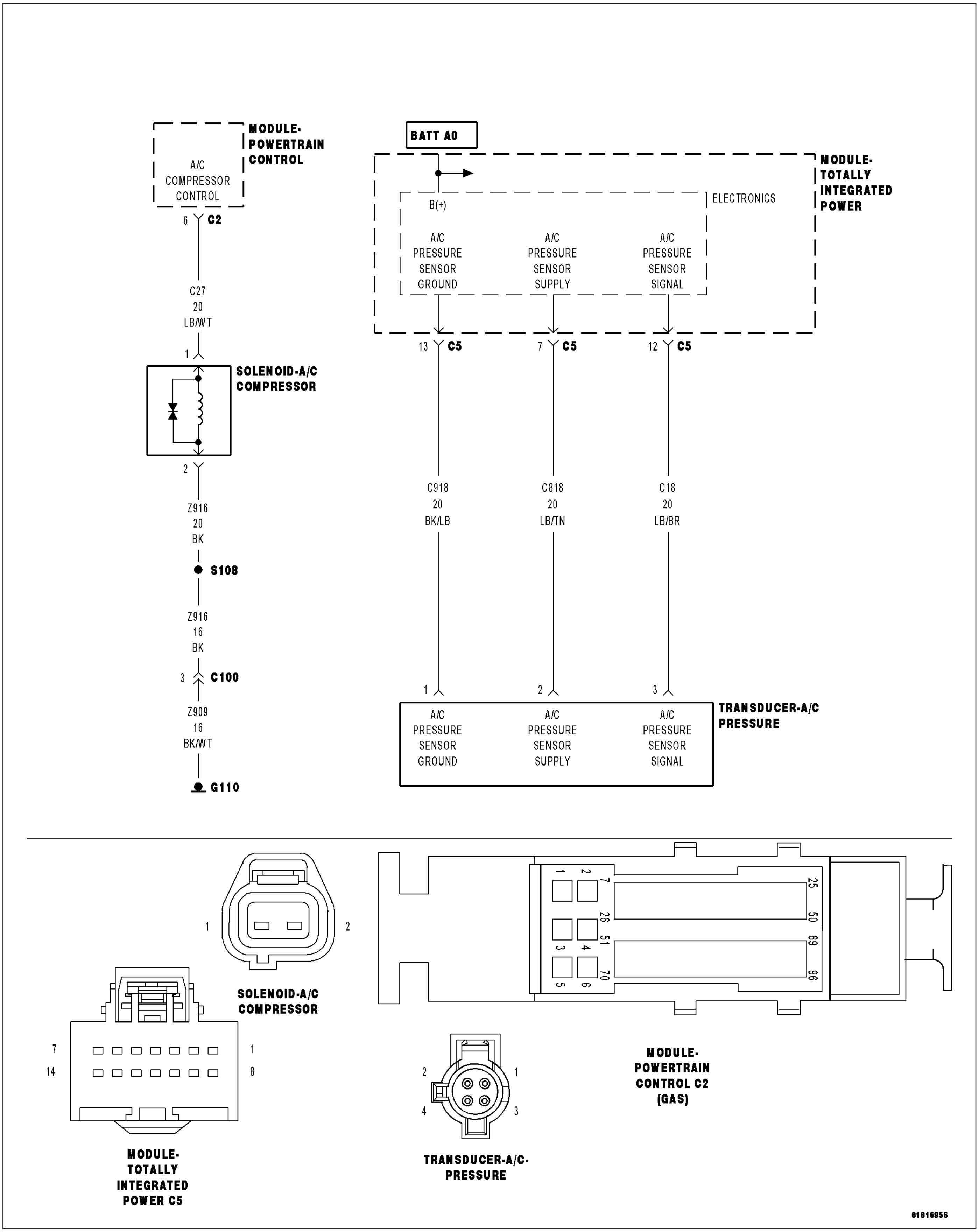
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0646-A/C CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the A/C Compressor control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

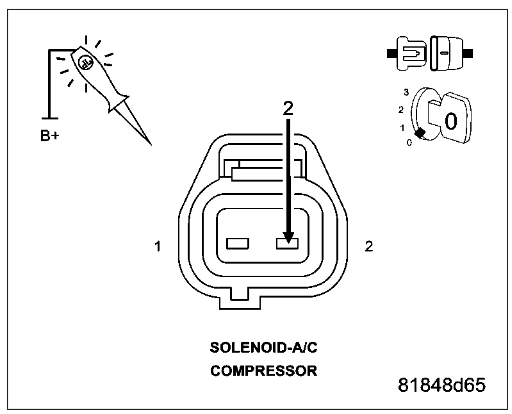
2. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the A/C Compressor connector.

Turn the ignition on.

Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the A/C Compressor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.

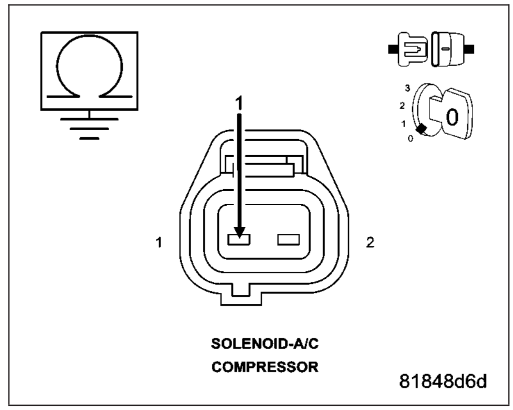
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.



Is the resistance below 100 ohms?

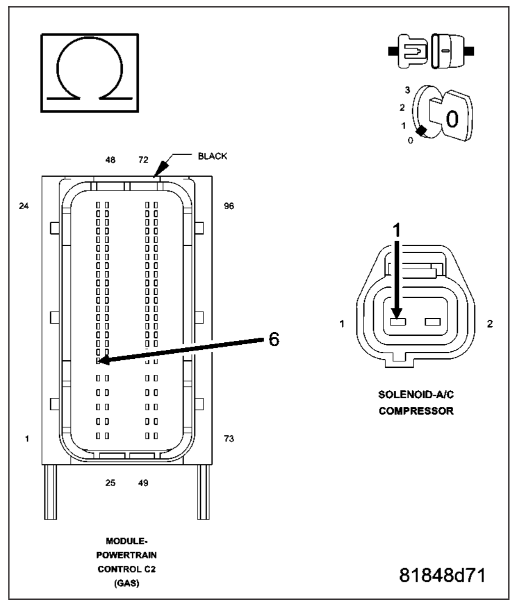
Yes >> Repair the (C27) A/C Compressor Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C27) A/C Compressor Control circuit between the A/C Compressor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (C27) A/C Compressor Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

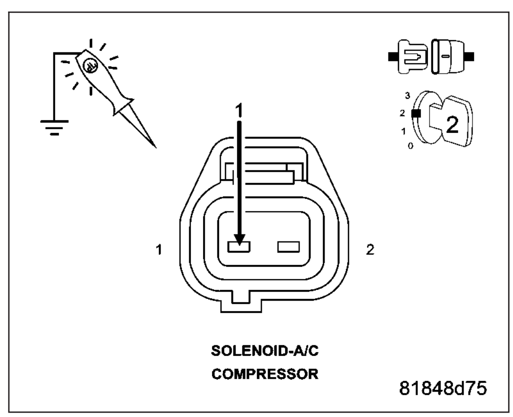
5. A/C COMPRESSOR

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the A/C Compressor control to the ON position.

Using a 12 volt test light connected to ground, check the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the A/C Compressor control to the OFF position.

Using a 12 volt test light connected to ground, check the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the A/C Compressor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Compressor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

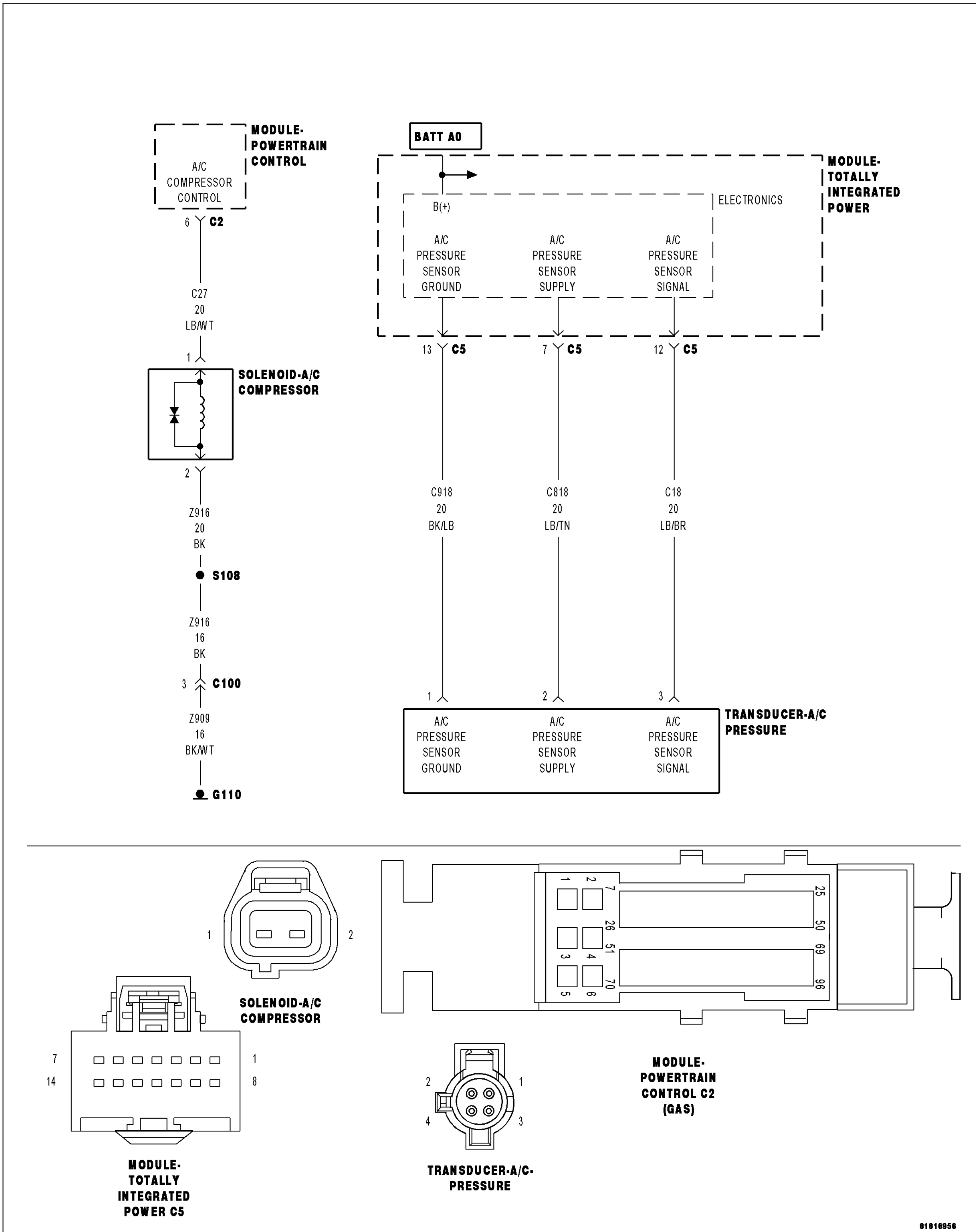
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0647-A/C CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the A/C Compressor control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO VOLTAGE
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO VOLTAGE

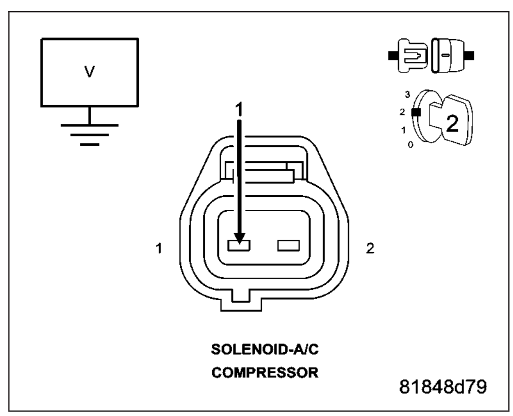
Turn the ignition off.

Disconnect the A/C Compressor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.



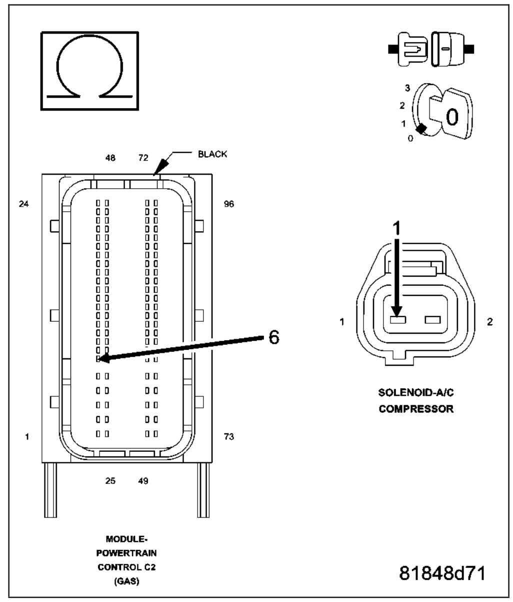
Is there any voltage present?

Yes >> Repair the (C27) A/C Compressor Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (C27) A/C Compressor Control circuit between the A/C Compressor harness connector and the Powertrain Control Module (PCM) harness connector.

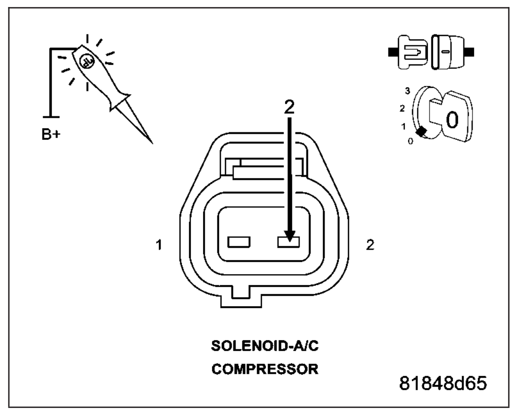
Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (C27) A/C Compressor Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the A/C Compressor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

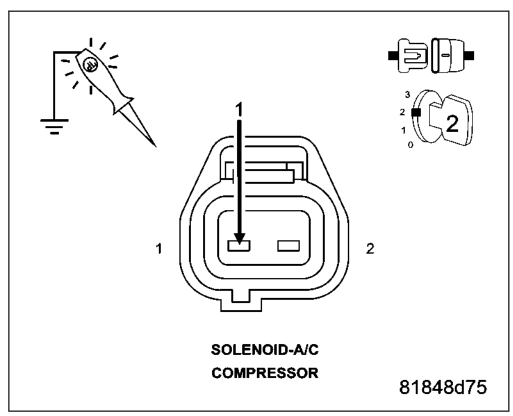
Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. A/C COMPRESSOR



Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the A/C Compressor control to the ON position.

Using a 12 volt test light connected to ground, check the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the A/C Compressor control to the OFF position.

Using a 12 volt test light connected to ground, check the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actua-

tion OFF (0%)?

Yes >> Replace the A/C Compressor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Compressor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

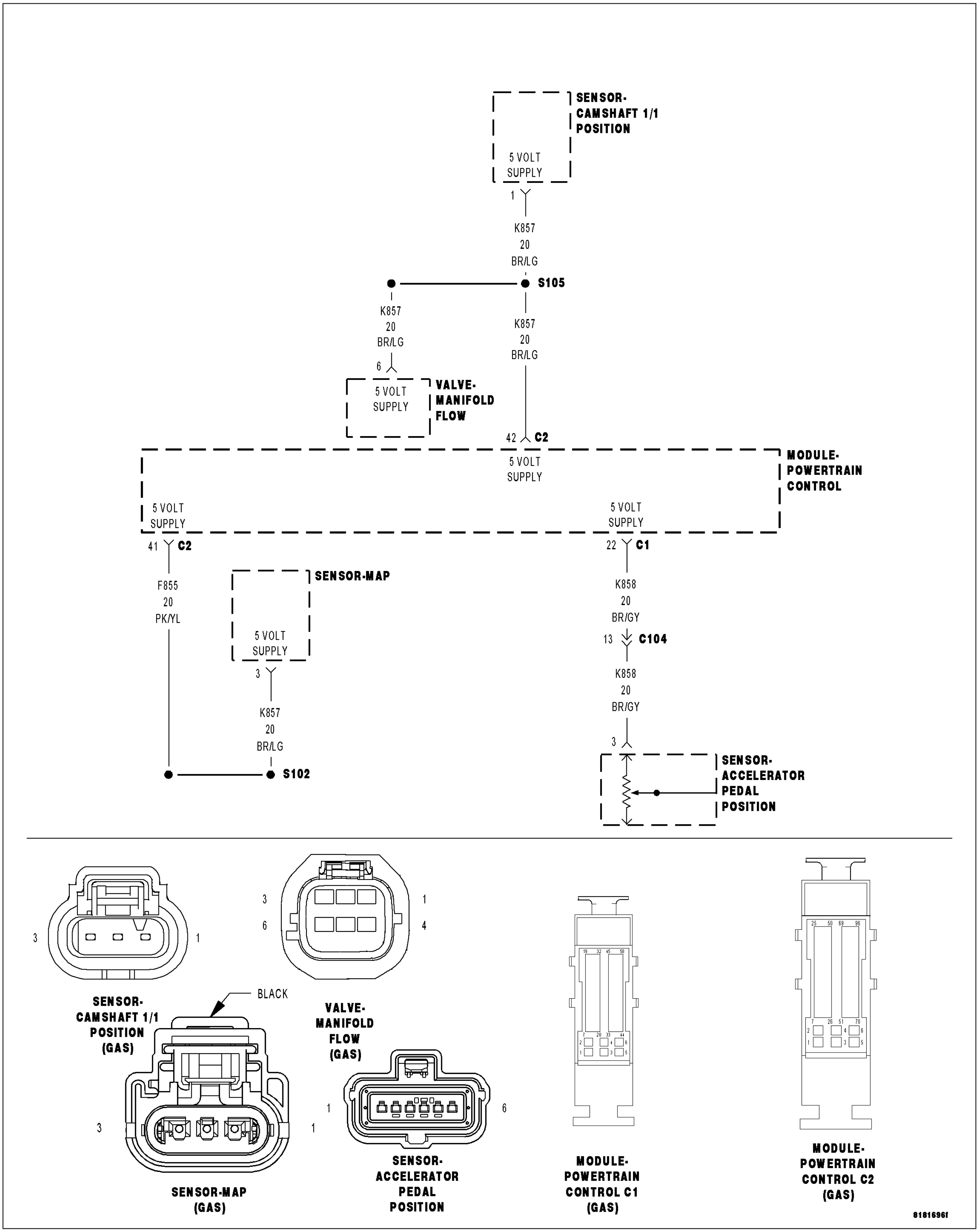
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects low voltage on the (F857) 5 volt supply circuit or the (F858) 5 volt supply circuit.

Possible Causes
INTERMITTENT DTC
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ACCELERATOR PEDAL POSITION SENSOR
CAMSHAFT 1/1 POSITION SENSOR
MANIFOLD FLOW VALVE
MAP SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

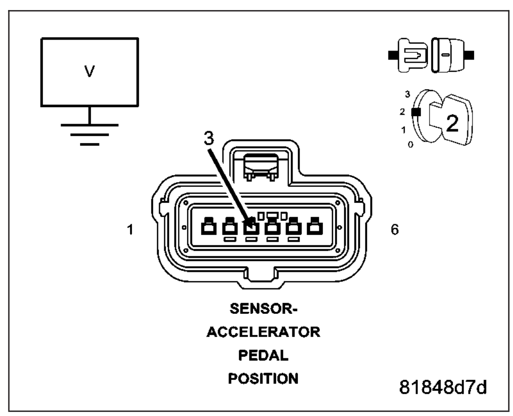
2. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit in the APP Sensor harness connector.



Is the voltage above 4.6 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

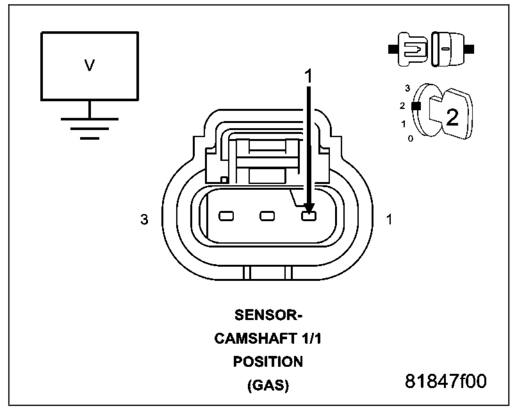
3. CAMSHAFT 1/1 POSITION SENSOR

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Camshaft 1/1 Position Sensor.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

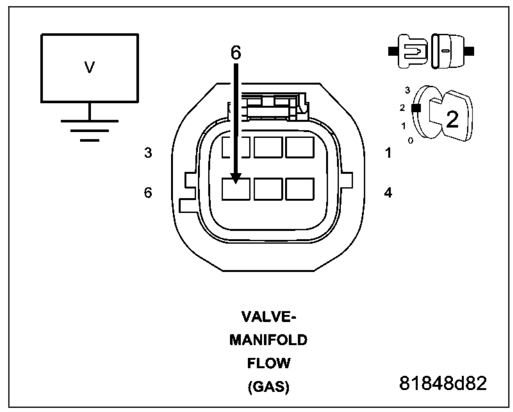
4. MANIFOLD FLOW VALVE

Turn the ignition off.

Disconnect the Manifold Flow Valve harness connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Manifold Flow Valve.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

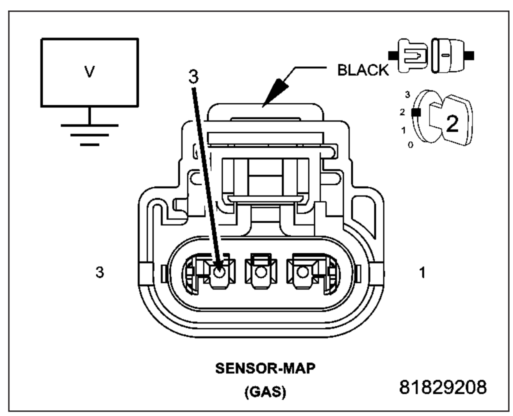
5. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit.



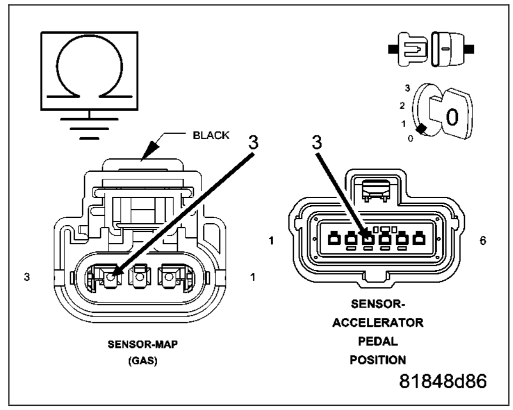
Is the voltage above 4.6 volts?

Yes >> Replace the MAP Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit.

Measure the resistance between ground and the (K858) 5 Volt Supply circuit.

Is the resistance above 1000 ohms for both circuits?

Yes >> Go to 7

No >> Repair the 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. POWERTRAIN CONTROL MODULE (PCM)

Inspect the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the PCM harness connector.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

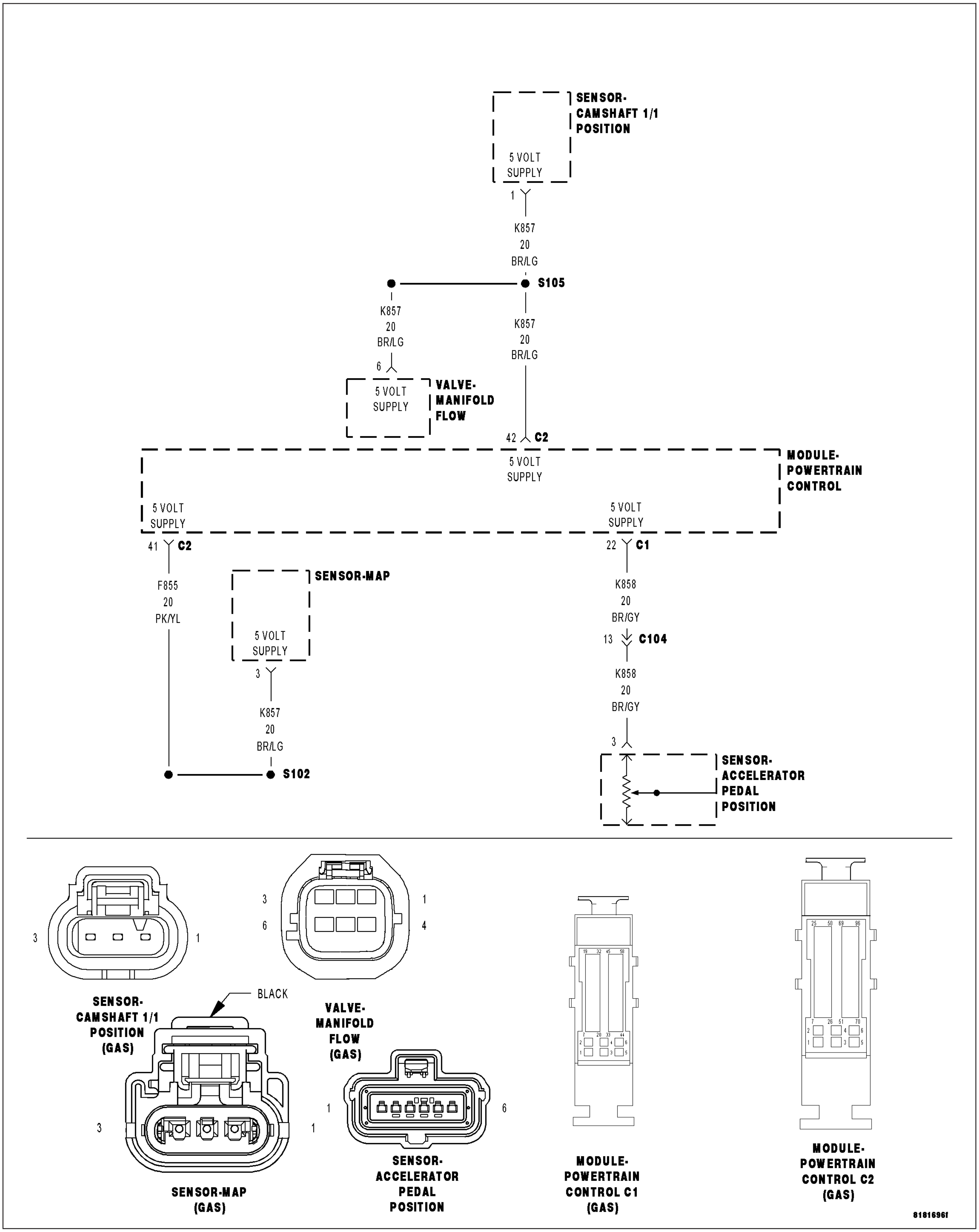
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects a short to voltage on the (K857) 5 volt supply circuit or the (K858) 5 volt supply.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.
With the scan tool, clear DTCs.
Turn the ignition on.
With the scan tool, select View DTCs.

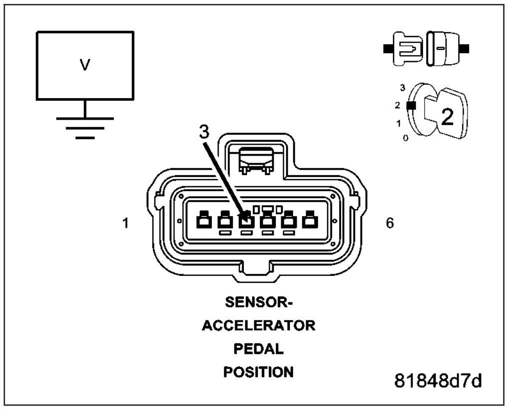
Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Accelerator Pedal Position Sensor harness connector.
Disconnect the PCM harness connectors.
Measure the voltage on the (K858) 5 Volt Supply circuit.



Is there any voltage present?

Yes >> Repair the (K858) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

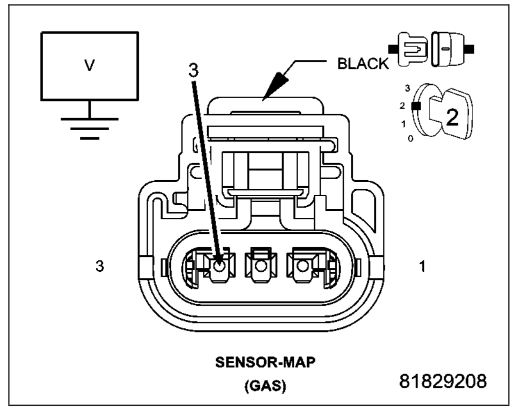
3. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Turn the ignition on.

Measure the voltage on the (K857) 5 Volt Supply circuit.



Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. POWERTRAIN CONTROL MODULE (PCM)

Turn the ignition off.

Inspect the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the PCM harness connector.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0700-TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM receives a CAN Bus message indicating that a DTC is present in the TCM.

Possible Causes
INTERMITTENT DTC
TRANSMISSION DTC(S) PRESENT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any other DTCs that are set in the PCM before continuing.

NOTE: This DTC will set in the PCM to indicate that a DTC is set in the TCM.

NOTE: When all repairs have been completed, clear DTCs in the PCM and TCM.

Ignition on, engine not running.

With the scan tool, select View DTCs in the PCM.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. DTCS PRESENT IN THE TRANSMISSION CONTROL MODULE (TCM)

NOTE: If the scan tool is unable to communicate with the TCM, or if there are related communication DTCs present, refer to the Communication Category and perform the appropriate diagnostic procedure.

Ignition on, engine not running.

With the scan tool, select View DTCs in the TCM.

Are there any DTCs present in the TCM?

Yes >> Refer to the Transmission Category and perform the appropriate diagnostic procedure.

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the TCM and the PCM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

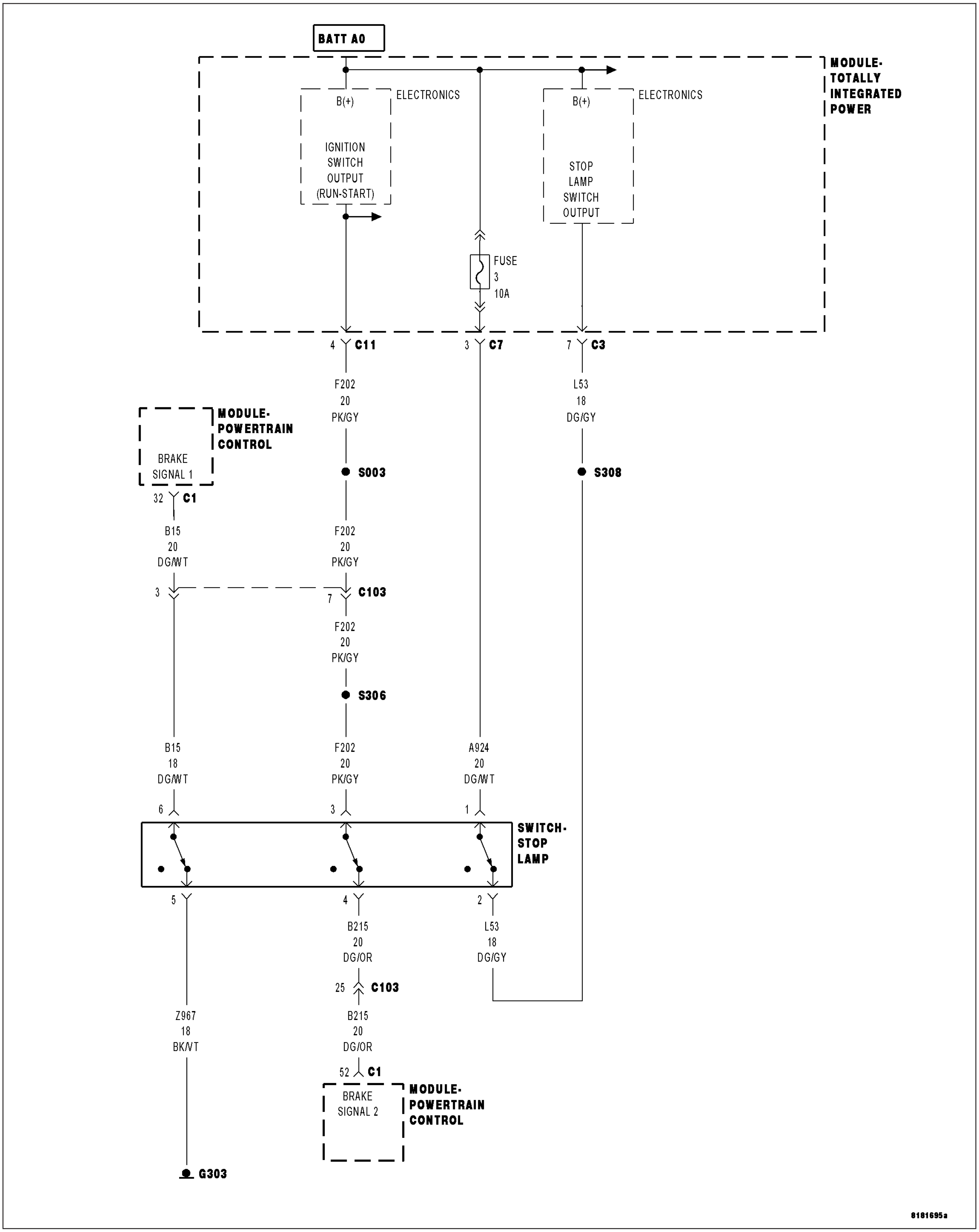
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0703-BRAKE SWITCH 2 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the states of Brake Signal 1 and Brake Signal 2 do not match for more than 50 ms.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the states change from Pressed when the pedal is pressed to Not Pressed when the pedal is released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

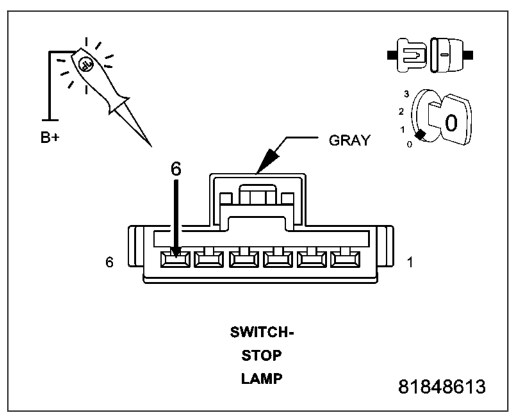
No >> Go to 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT

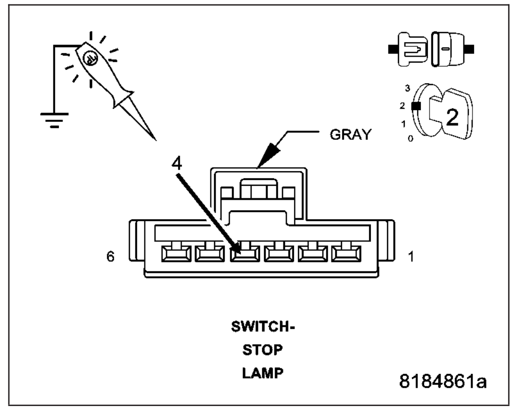
Turn the ignition on.

Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.

Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 11

No >> Go to 7



4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.

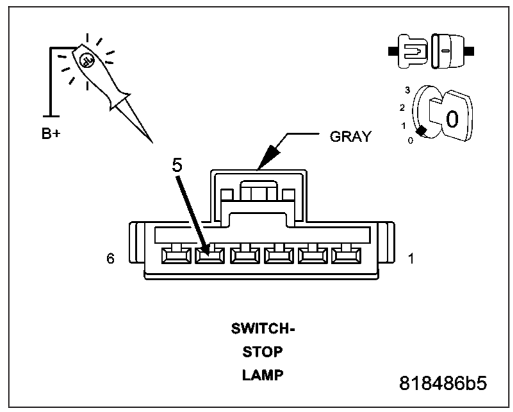
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND

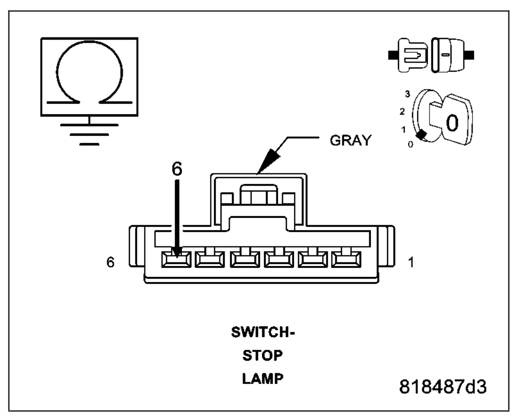
Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 6

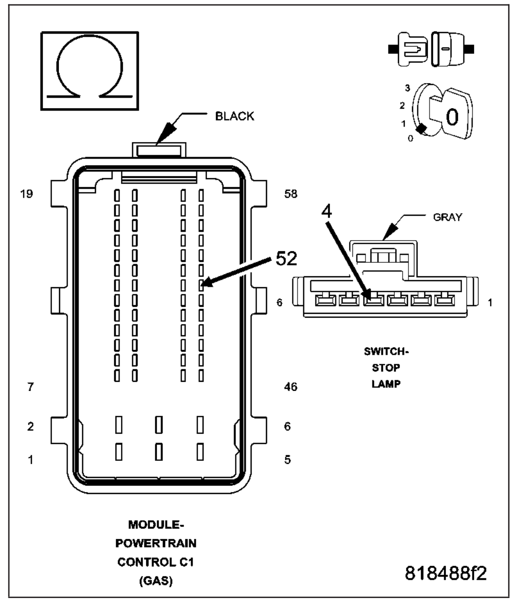
No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

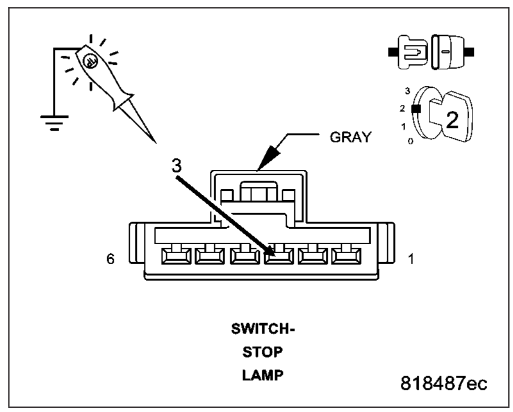
7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

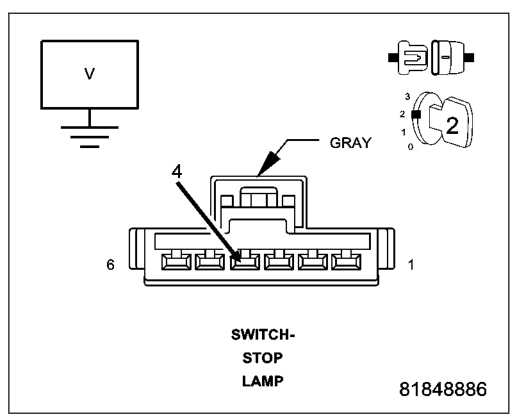
Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.



Is there any voltage present?

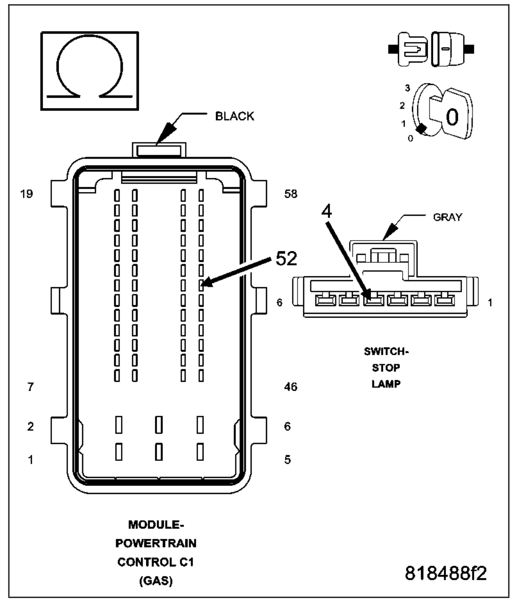
Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0850-PARK/NEUTRAL SWITCH PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the transmission in Park, Neutral, or Drive and not in Limp-in mode.
- **Set Condition:**
  This code will set if the PCM detects an irrational Park/Neutral switch state. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
INTERMITTENT DTC
P/N SIGNAL CIRCUIT SHORTED TO VOLTAGE OR GROUND
DTCS PRESENT IN THE TRANSMISSION CONTROL MODULE (TCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs in the PCM.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. DTCS PRESENT IN THE TRANSMISSION CONTROL MODULE (TCM)

NOTE: If the scan tool is unable to communicate with the TCM, or if there are related communication DTCs present, refer to the Communication Category and perform the appropriate diagnostic procedure.

Ignition on, engine not running.

With the scan tool, select View DTCs in the TCM.

Are there any DTCs present in the TCM?

Yes >> Refer to the Transmission Category and perform the appropriate diagnostic procedure.

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

Inspect the P/N signal circuit for a short to ground, or a short to voltage with the shifter in Drive or Reverse. Refer to the appropriate diagnostic procedures in the Transmission category.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Transmission Range Sensor, the TCM, and the PCM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1115-GENERAL TEMPERATURE RATIONALITY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  AAT, ECT, and IAT sensor inputs are compared during a cold start. After start up, the values are monitored. If one of the readings is not plausible for two consecutive trips, a DTC is stored. Three good trips turns off the MIL.

Possible Causes
SENSOR SIGNAL CIRCUIT HIGH RESISTANCE
SENSOR GROUND CIRCUIT HIGH RESISTANCE
TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, select View DTCs.

NOTE: Diagnose and repair any AAT, ECT, and IAT sensor DTCs before continuing with this test.

NOTE: Diagnose and repair P1607 PCM INTERNAL SHUTDOWN TIMER SLOW RATIONALITY or P2610 PCM INTERNAL SHUTDOWN TIMER FAST RATIONALITY if either code is set before continuing with this test.

NOTE: Using an unapproved block heater in cold temperatures may cause this DTC to set. No repair is required.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. TEMPERATURE SENSOR CIRCUIT VALUE IMPLAUSIBLE

NOTE: Allow the engine sit for 6 - 8 hours before testing.

With a scan tool, monitor the AAT, ECT, and IAT sensor values.

Start the engine.

Allow the engine to reach normal operating temperature.

Does the value for each of the sensors increase smoothly and as expected?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. TEMPERATURE SENSOR

NOTE: If it is necessary to replace the AAT sensor, be sure to drive the vehicle over 30 MPH for at least 5 minutes to update the AAT value.

Ignition on, engine not running.

Disconnect the harness connector for the sensor that had a value which did not increase smoothly and as expected.

With the scan tool, read the sensor voltage with the connected disconnected.

NOTE: The sensor voltage should be approximately 5.0 volts with the connector disconnected.

Connect a jumper wire between the sensor signal circuit and the sensor ground circuit in the harness connector.

With the scan tool, read the sensor voltage with the jumper wire in place.

NOTE: The sensor voltage should be approximately 0 volts with the jumper wire in place.

Does the sensor voltage change as described?

Yes >> Replace the sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. SENSOR SIGNAL CIRCUIT HIGH RESISTANCE

Turn the ignition off.

For the AAT sensor, disconnect the TIPM harness connector. Otherwise disconnect the PCM harness connector.

Measure the resistance of the sensor signal circuit from the sensor harness connector to the module harness connector.

Is the resistance above 5.0 ohms.

Yes >> Repair the sensor signal circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. SENSOR GROUND CIRCUIT HIGH RESISTANCE

Measure the resistance of the sensor ground circuit from the sensor harness connector to the module harness connector.

Is the resistance above 5.0 ohms.

Yes >> Repair the sensor ground circuit for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

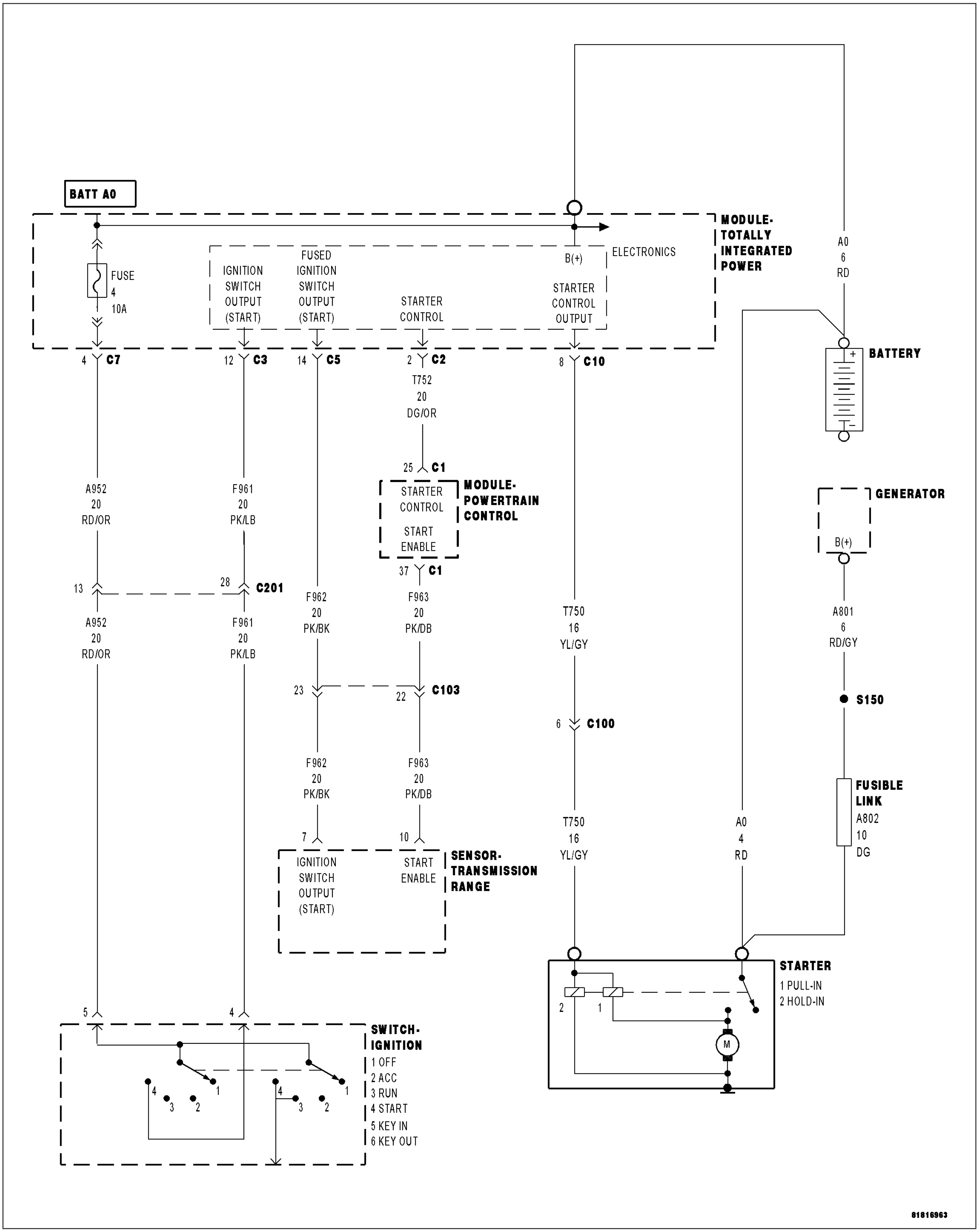
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1277-STARTER CONTROL CIRCUIT 2 LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and Main Relay is on. TIPM requesting Starter operation.
- **Set Condition:**
  Actual Starter state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(T750) STARTER CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
STARTER
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0615, P0616 or P0617 has set along with this DTC, diagnose those DTC(s) first before continuing.
Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. STARTER CONTROL OUTPUT OPERATION

Turn the ignition off.

Disconnect the Starter (1-way) harness connector.

With a 12-volt test light connected to ground, probe the (T750) Starter Control Output circuit in the Starter (1-way) harness connector

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
Crank the engine and monitor the test light.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Replace the Starter in accordance with the Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. (T750) STARTER CONTROL OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition off

Disconnect the TIPM C10 harness connector.

Measure the resistance between ground and the (T750) Starter Control Output circuit at the TIPM C10 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (T750) Starter Control Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

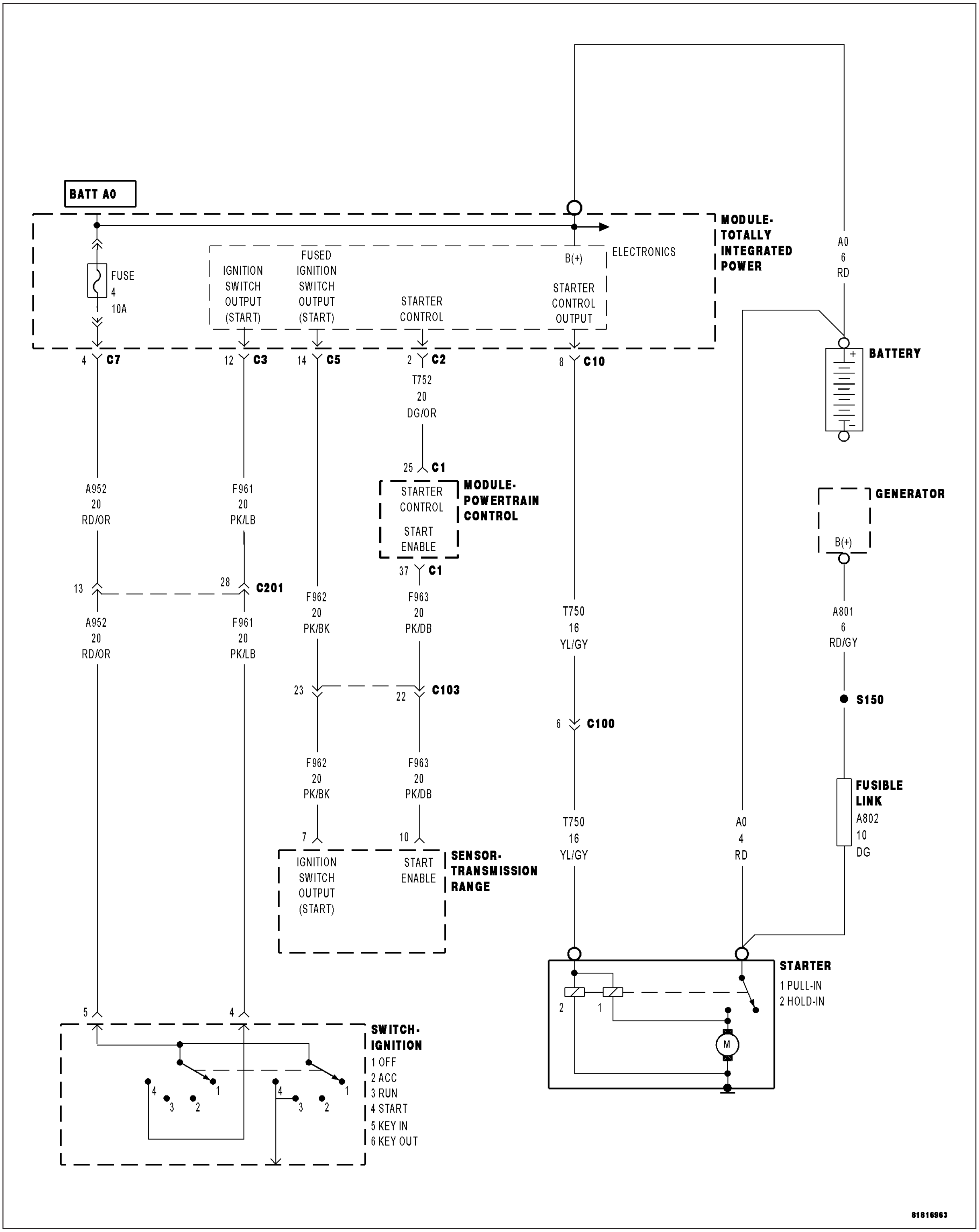
Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1278-STARTER CONTROL CIRCUIT 2 HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the Main Relay on. TIPM requesting Starter operation.
- **Set Condition:**
  Actual Starter state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(T750) STARTER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
STARTER MOTOR
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0615, P0616 or P0617 has set along with this DTC, diagnose those DTC(s) first before continuing.
Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. STARTER CONTROL OUTPUT VERIFICATION

Turn the ignition off.

Disconnect TIPM C10 harness connector.

Turn the ignition on.

Measure the voltage of the (T750) Starter Control Output circuit in the TIPM C10 harness connector.

Is voltage present?

Yes >> Go To 3

No >> Go To 4

3. (T750) STARTER CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off

Disconnect the Starter (1-way) harness connector.

Turn the ignition on.

Using a voltmeter, measure the voltage of the (T750) Starter Control Output circuit in the TIPM C10 harness connector.

Is voltage present?

Yes >> Repair the short to battery voltage in the (T750) Starter Control Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Starter in accordance with the Service information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

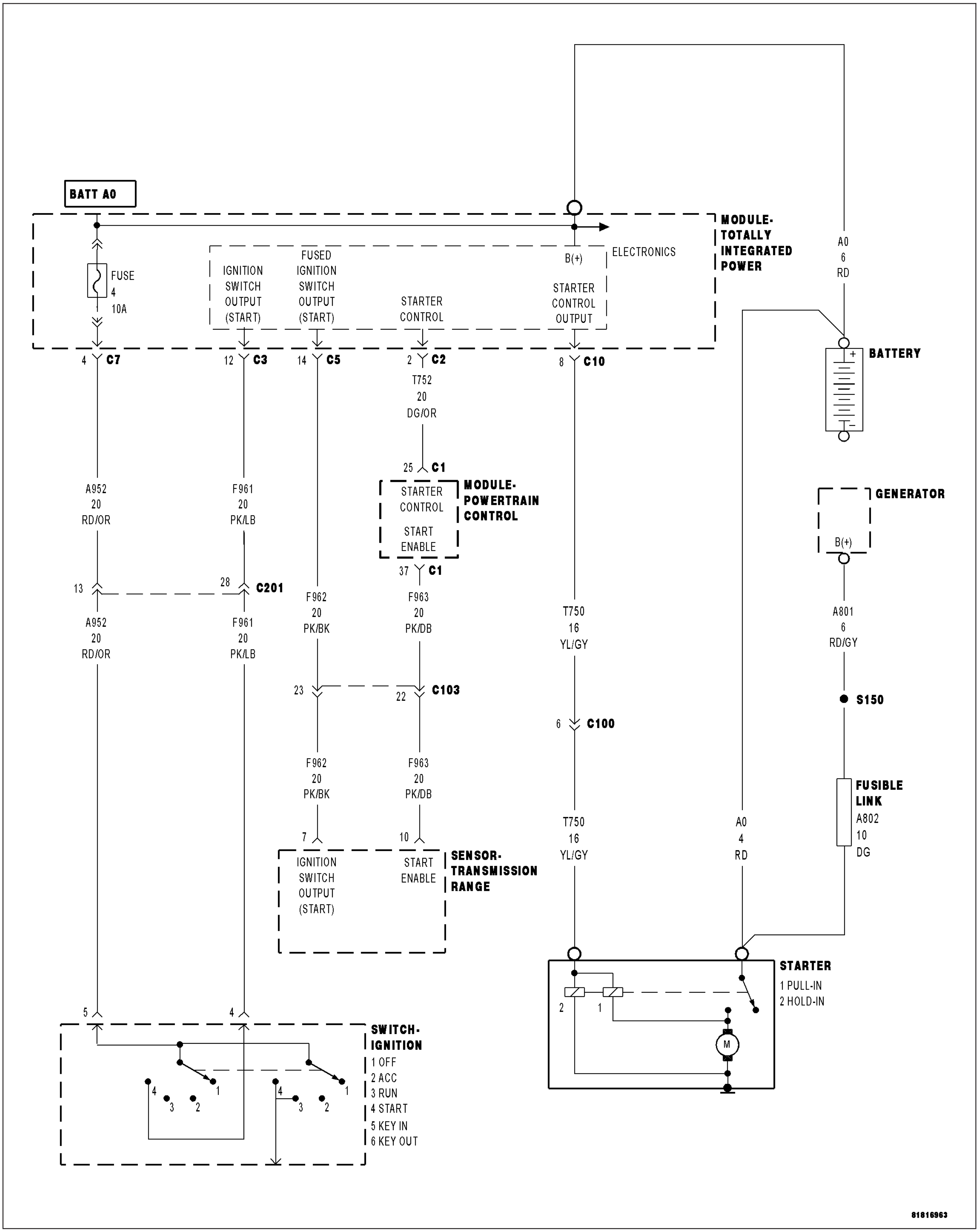
Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1279-STARTER CONTROL CIRCUIT 2 OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the Main Relay on. TIPM requesting Starter operation.
- **Set Condition:**
  Actual Starter state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(T750) STARTER CONTROL OUTPUT CIRCUIT OPEN
STARTER
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0615, P0616 or P0617 has set along with this DTC, diagnose those DTC(s) first before continuing.

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

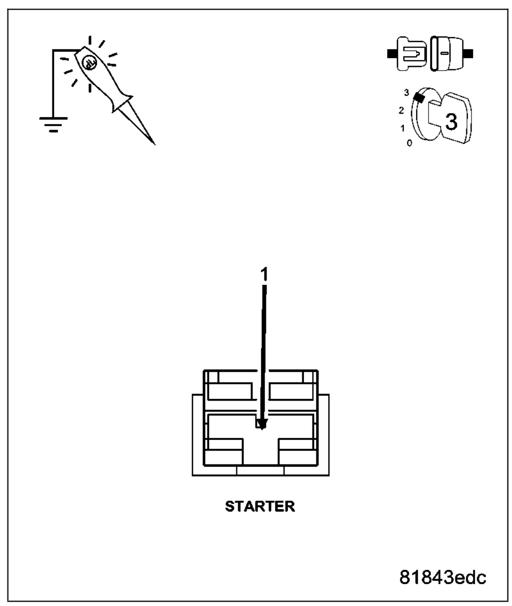
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. STARTER CONTROL OUTPUT OPERATION

Turn the ignition off.

Disconnect the Starter (1-way) harness connector.

With a 12-volt test light connected to ground, probe the (T750) Starter Control Output circuit in the Starter (1-way) harness connector



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Crank the engine and monitor the test light.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

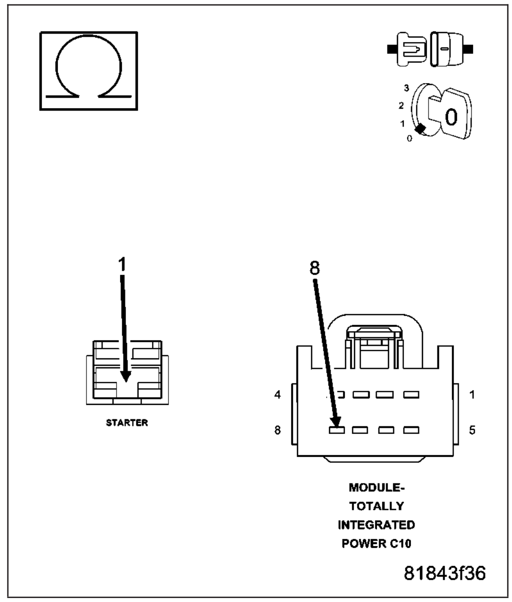
Does the test light illuminate brightly?

Yes >> Replace the Starter in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. (T750) STARTER CONTROL OUTPUT CIRCUIT OPEN



Turn the ignition off

Disconnect the TIPM 10 harness connector.

Measure the resistance of the (T750) Starter Control Output circuit between the TIPM C10 harness connector and the Starter harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the short to ground in the (T750) Starter Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

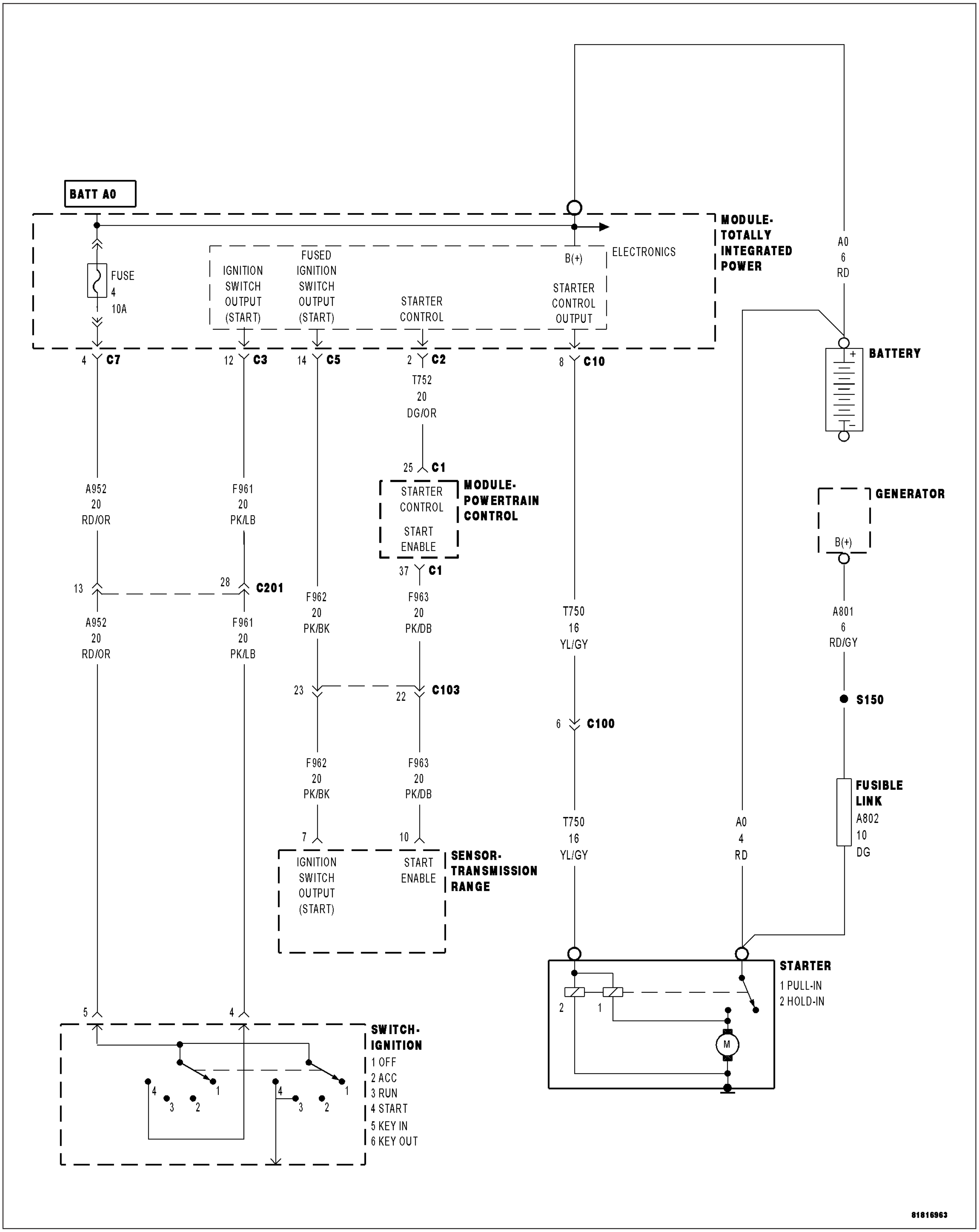
Yes >> Repair as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P127A-STARTER CONTROL CIRCUIT 2 OVERCURRENT (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts. TIPM requesting Stater operation.
- **Set Condition:**
  An overcurrent condition is detected in the Starter control output circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
TERMINAL DAMAGE OR CORROSION
(T750) STARTER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
STARTER
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0615, P0616 or P0617 has set along with this DTC, diagnose those DTC(s) first before continuing.
Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

NOTE: Ensure the Starter is bolted securely and is properly mounted.
Turn the ignition off.

Disconnect the TIPM C10 harness connector.

Disconnect the Starter (1-way) harness connector.

Inspect the terminal and connector condition. Check for signs of corrosion build up or damage that would compromise the terminal to controller pin connector.

NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.
Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. STARTER CONTROL OUTPUT OPERATION

Turn the ignition off.

Reconnect the TIPM C10 harness connector.

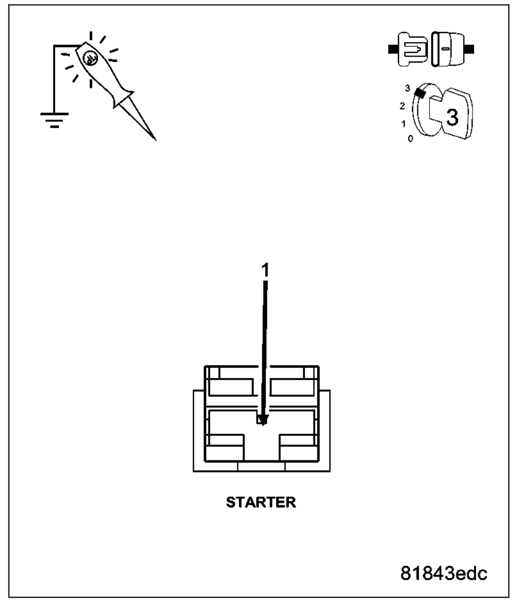
With a 12-volt test light connected to ground, probe the (T750) Starter Control Output circuit in the Starter (1-way) harness connector

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Crank the engine and monitor the test light.

NOTE: The test light should be illuminated only when cranking the engine. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly when cranking the engine and then turn off when it is not being cranked?



Yes >> Replace the Starter in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (T750) STARTER CONTROL OUTPUT CIRCUIT HIGH RESISTANCE

Turn the ignition off.

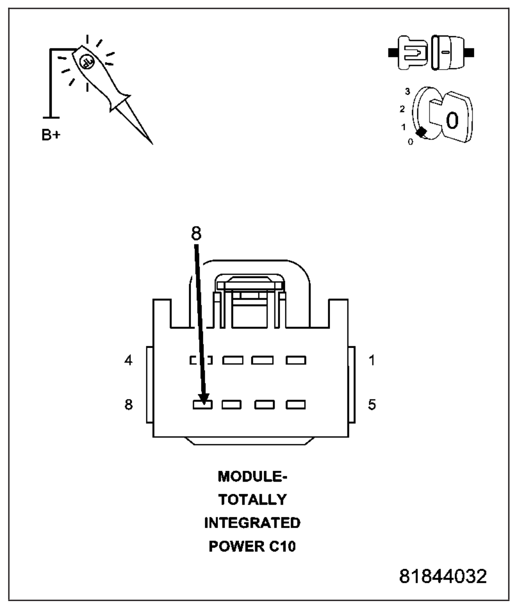
Disconnect the TIPM C10 harness connector.

With a jumper wire, connect one end to the (T750) Starter Control Output circuit in the Starter harness connector and the other to a clean chassis ground.

Using a 12-volt test light to battery voltage, probe the (T750) Starter Control Output circuit in the TIPM C7 harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly.



Yes >> Go To 5

No >> Repair the high resistance in the (T750) Starter Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

5. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

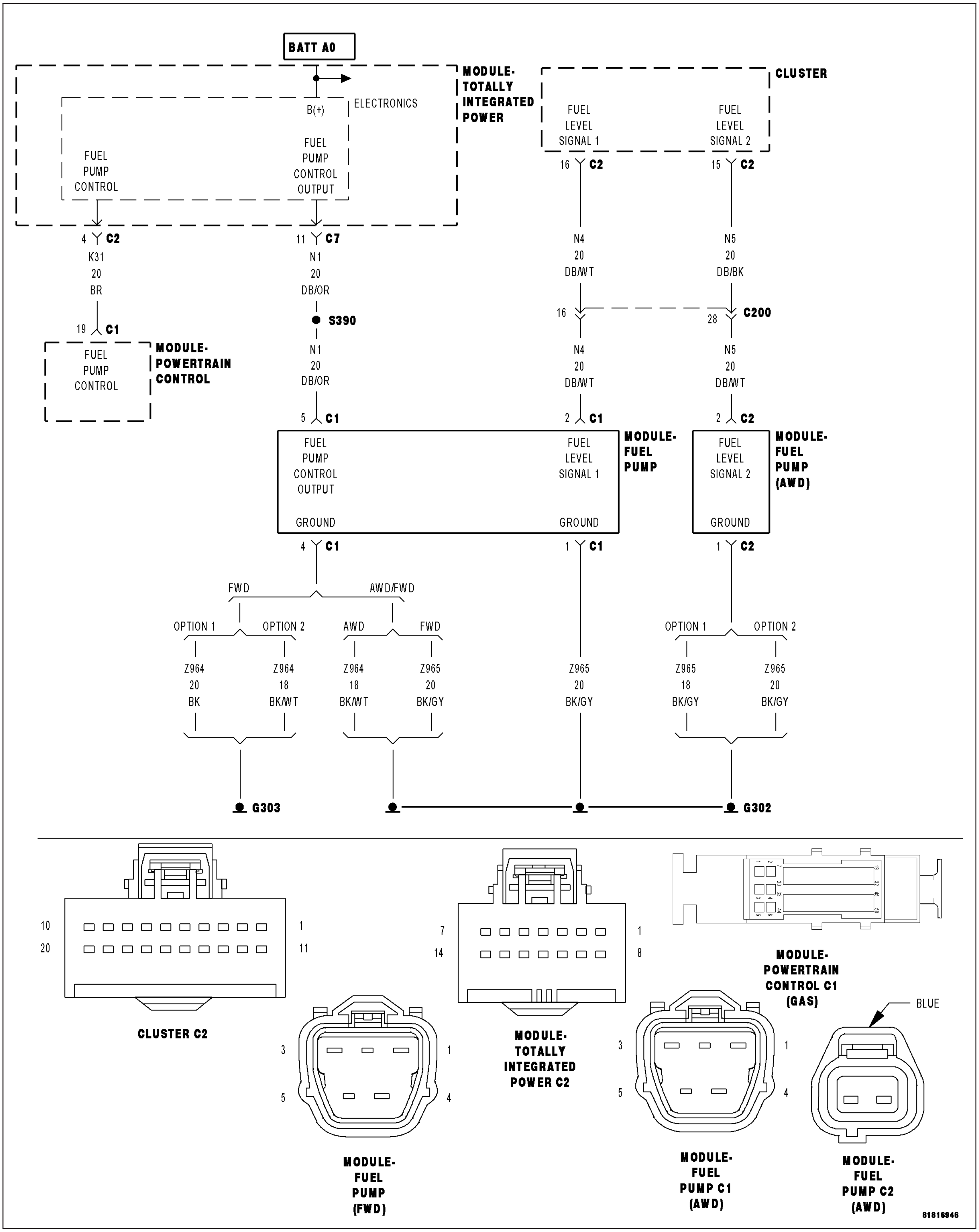
Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P127C-FUEL PUMP CONTROL CIRCUIT 2 LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the Main Relay on. TIPM requesting Fuel Pump operation.
- **Set Condition:**
  Actual Fuel Pump state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N1) FUEL PUMP CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
FUEL PUMP
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0627, P0628 or P0629 has set along with this DTC, diagnose those DTC(s) first before continuing.

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL PUMP MODULE

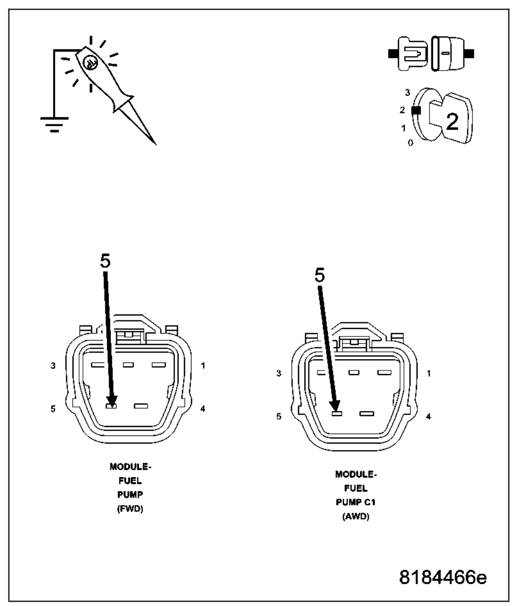
Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate the Fuel Pump.

With a 12-volt test light connected to ground, probe the (N1) Fuel Pump Control Output circuit at the Fuel Pump Module harness connector.



NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Fuel Pump Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

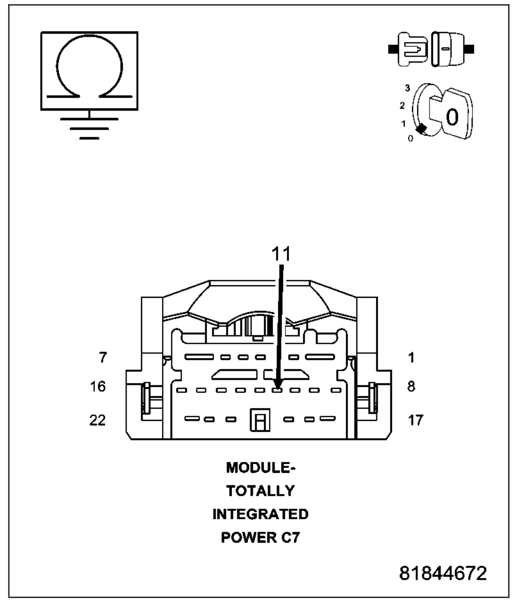
No >> Go To 3

3. (N1) FUEL PUMP CONTROL OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition off

Disconnect the TIPM C7 harness connector.

Measure the resistance between ground and the (N1) Fuel Pump Control Output circuit at the TIPM C7 harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N1) Fuel Pump Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

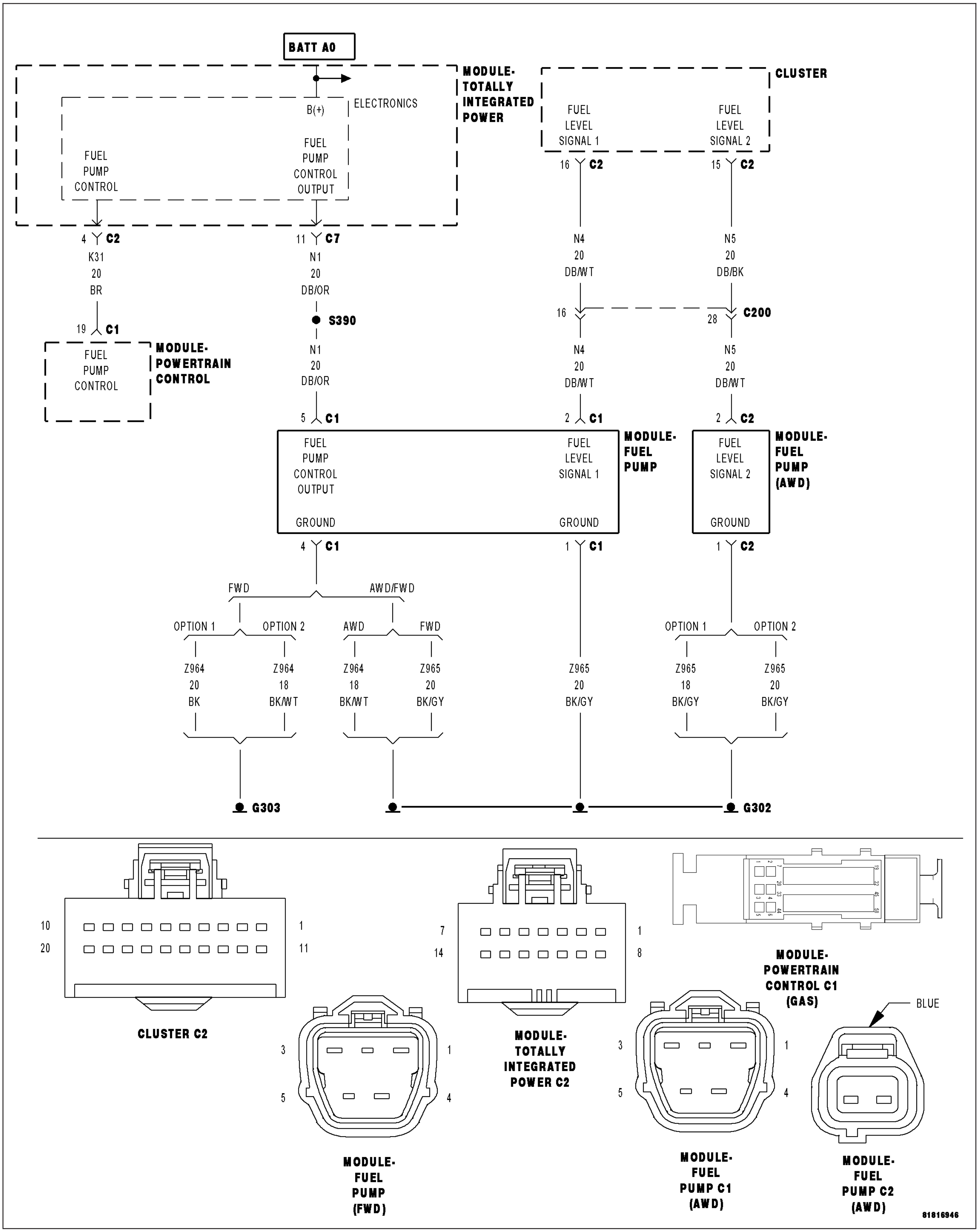
Yes >> Repair as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P127D-FUEL PUMP CONTROL CIRCUIT 2 HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the Main Relay on. TIPM requesting Fuel Pump operation.
- **Set Condition:**
  Actual Fuel Pump state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N1) FUEL PUMP CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
FUEL PUMP MOTOR GROUND CIRCUIT
FUEL PUMP MOTOR
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0627, P0628 or P0629 has set along with this DTC, diagnose those DTC(s) first before continuing.
Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

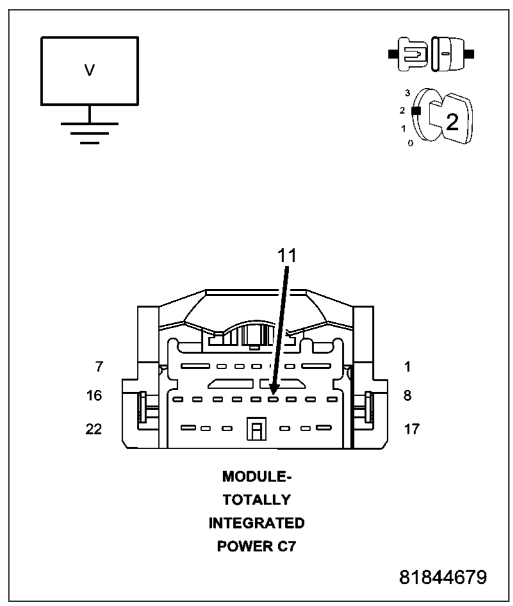
2. (N1) FUEL PUMP CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off

Disconnect the C7 TIPM harness connector.

Turn the ignition on.

Using a voltmeter, measure the voltage of the (N1) Fuel Pump Control Output circuit in the C7 TIPM harness connector.



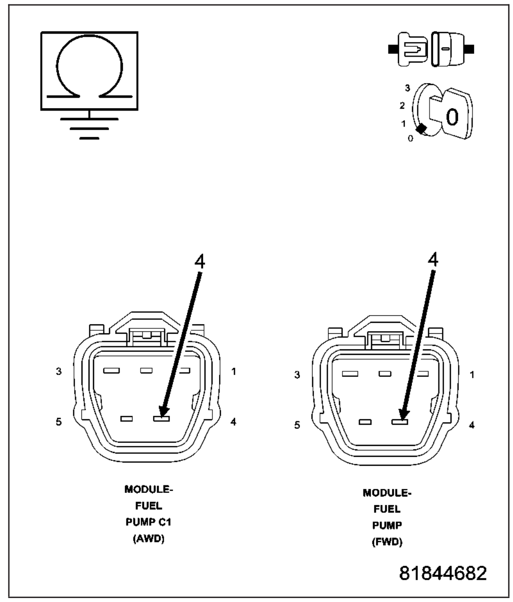
Does the voltmeter indicate voltage present?

Yes >> Repair the short to battery voltage in the (N1) Fuel Pump Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. FUEL PUMP MOTOR GROUND CIRCUIT



Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Using a 12-volt test light to battery voltage, probe the Fuel Pump Motor Ground circuit in the Fuel Pump Module harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

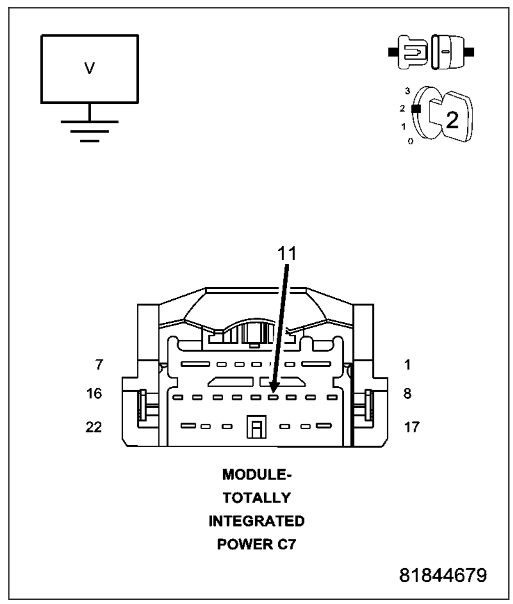
Does the test light illuminate brightly.

Yes >> Go To 4

No >> Repair the Fuel Pump Motor Ground circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. FUEL PUMP MODULE



Connect the C7 TIPM harness connectors.

Ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate (Toggle) the Fuel Pump.

With a 12-volt test light connected to ground, probe the (N1) Fuel Pump Control Output circuit at the Fuel Pump Module harness connector.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Fuel Pump Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

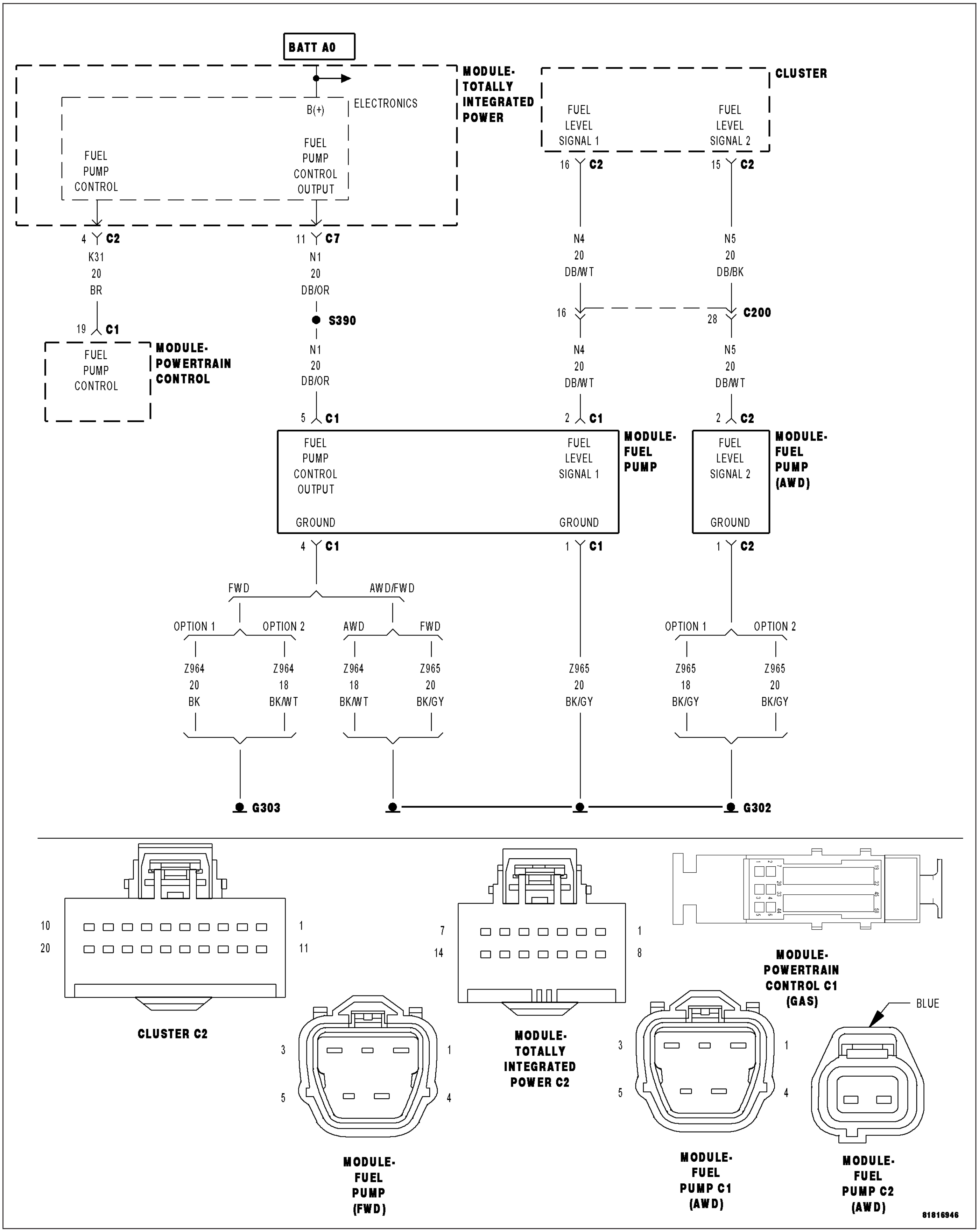
Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P127E-FUEL PUMP CONTROL CIRCUIT 2 OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the Main relay is on. TIPM requesting Fuel Pump operation.
- **Set Condition:**
  Actual Fuel Pump state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N1) FUEL PUMP CONTROL OUTPUT CIRCUIT OPEN
FUEL PUMP
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0627, P0628 or P0629 has set along with this DTC, diagnose those DTC(s) first before continuing.

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

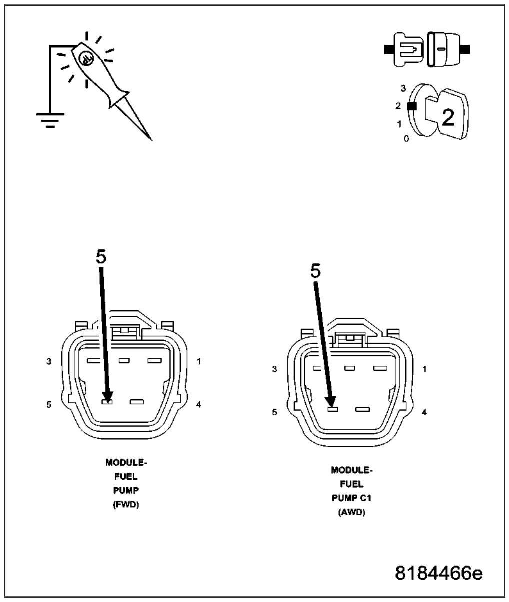
2. FUEL PUMP MODULE

Disconnect the Fuel Pump Module harness connector.

Ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate the Fuel Pump.

With a 12-volt test light connected to ground, probe the (N1) Fuel Pump Control Output circuit at the Fuel Pump Module harness connector.



Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Fuel Pump Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

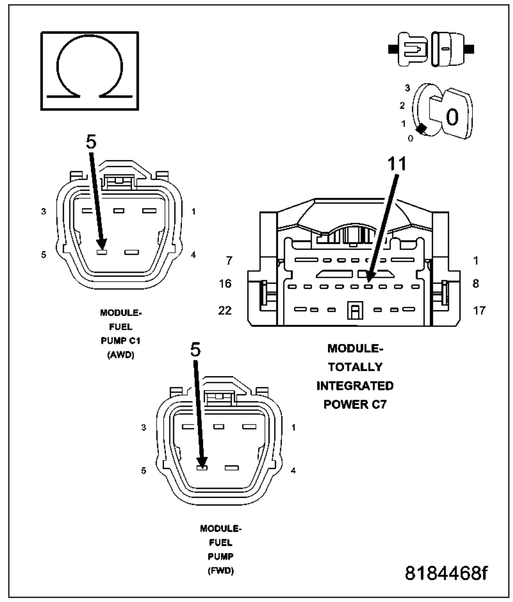
No >> Go To 3

3. (N1) FUEL PUMP CONTROL OUTPUT CIRCUIT OPEN

Turn the ignition off

Disconnect the TIPM C7 harness connector.

Measure the resistance of the (N1) Fuel Pump Control Output circuit between the TIPM C7 harness connector and the Fuel Pump Module harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the short to ground in the (N1) Fuel Pump Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. TOTALLY INTEGRATED POWER MODULE

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

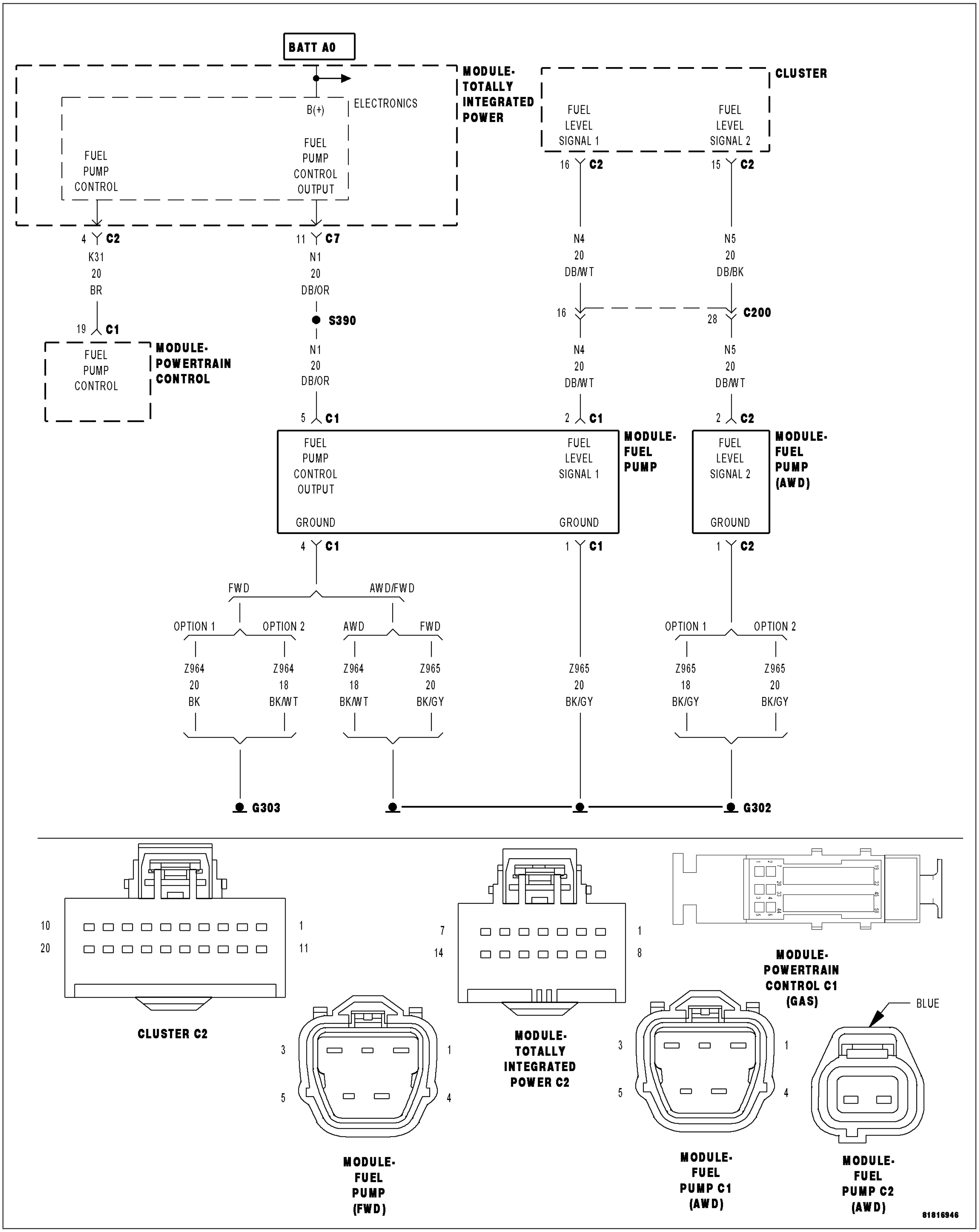
Yes >> Repair as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P127F-FUEL PUMP CONTROL CIRCUIT 2 OVERCURRENT (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts. TIPM requesting fuel pump operation.
- **Set Condition:**
  An overcurrent condition is detected in the Fuel Pump control output circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
TERMINAL DAMAGE OR CORROSION
(Z904) FUEL PUMP GROUND HIGH RESISTANCE
(N1) FUEL PUMP CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
FUEL PUMP
TIPM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If P0627, P0628 or P0629 has set along with this DTC, diagnose those DTC(s) first before continuing.
Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL AND PHYSICAL CONNECTOR AND TERMINAL INSPECTION

Turn the ignition off.

Disconnect the TIPM C7 harness connector.

Disconnect the Fuel Pump harness connector.

Inspect the terminal and connector condition. Check for signs of corrosion build up or damage the would compromise the terminal to controller pin connector.

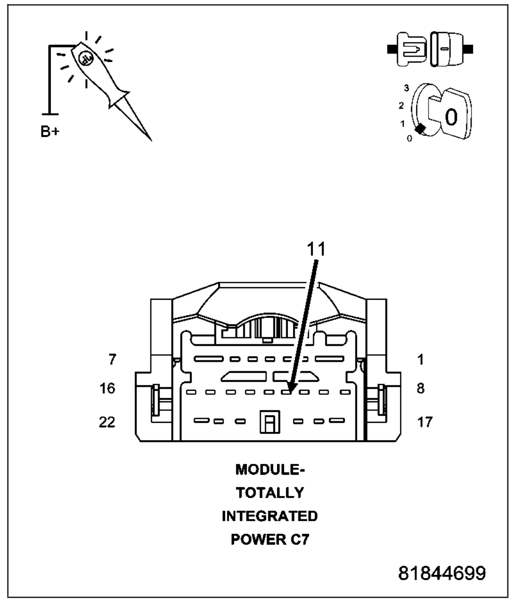
NOTE: Make sure that all in-line connectors are inspected for corrosion and/or damage.
Visually inspect the wiring harness. Look for any chafed, pierced, pinched or partially broken wires hidden in the wire insulation.

Were any of the above conditions found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. (N1) FUEL PUMP CONTROL OUTPUT CIRCUIT HIGH RESISTANCE



With a jumper wire, connect one end to the (N1) Fuel Pump Control Output circuit in the Fuel Pump harness connector and the other to a clean chassis ground.

Using a 12-volt test light to battery voltage, probe the (N1) Fuel Pump Control Output circuit in the TIPM C7 harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

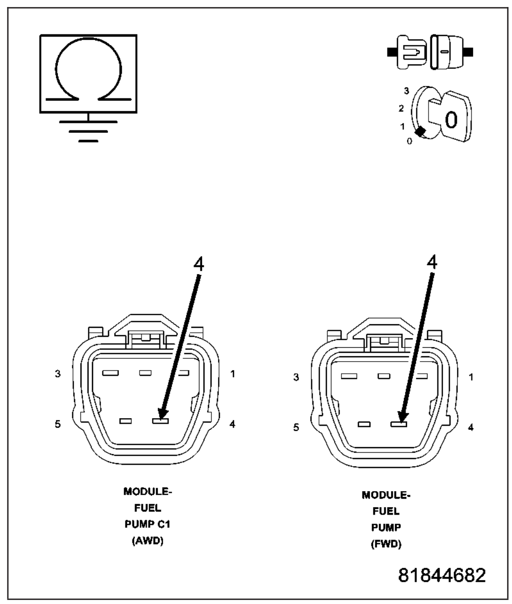
Does the test light illuminate brightly.

Yes >> Go To 4

No >> Repair the high resistance in the (N1) Fuel Pump Control Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

4. FUEL PUMP GROUND CIRCUIT



Using a 12-volt test light to battery voltage, probe the Fuel Pump Ground circuit in the Fuel Pump harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly.

Yes >> Go To 5

No >> Repair the excessive resistance in the (Z904) Fuel Pump Ground circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

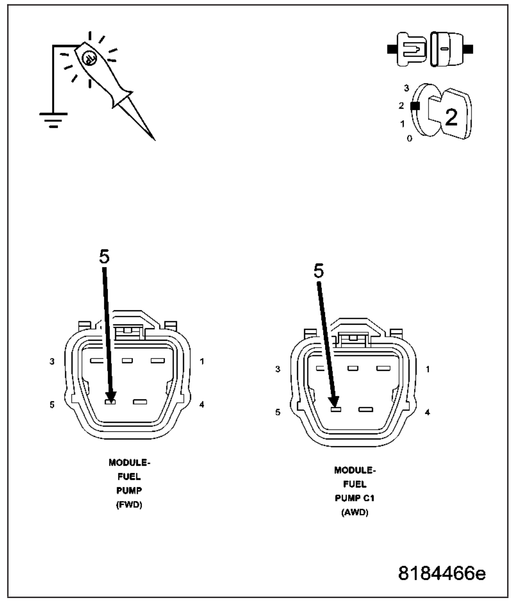
5. FUEL PUMP CONTROL OUTPUT FROM TIPM

Reconnect the TIPM C7 harness connector.

Ignition on, engine not running.

With a scan tool in the TIPM Actuators, actuate the Fuel Pump.

Using the 12-volt test light connected to ground, probe the (N1) Fuel Pump Control Output circuit in the Fuel Pump harness connector.



Does the test light illuminate brightly?

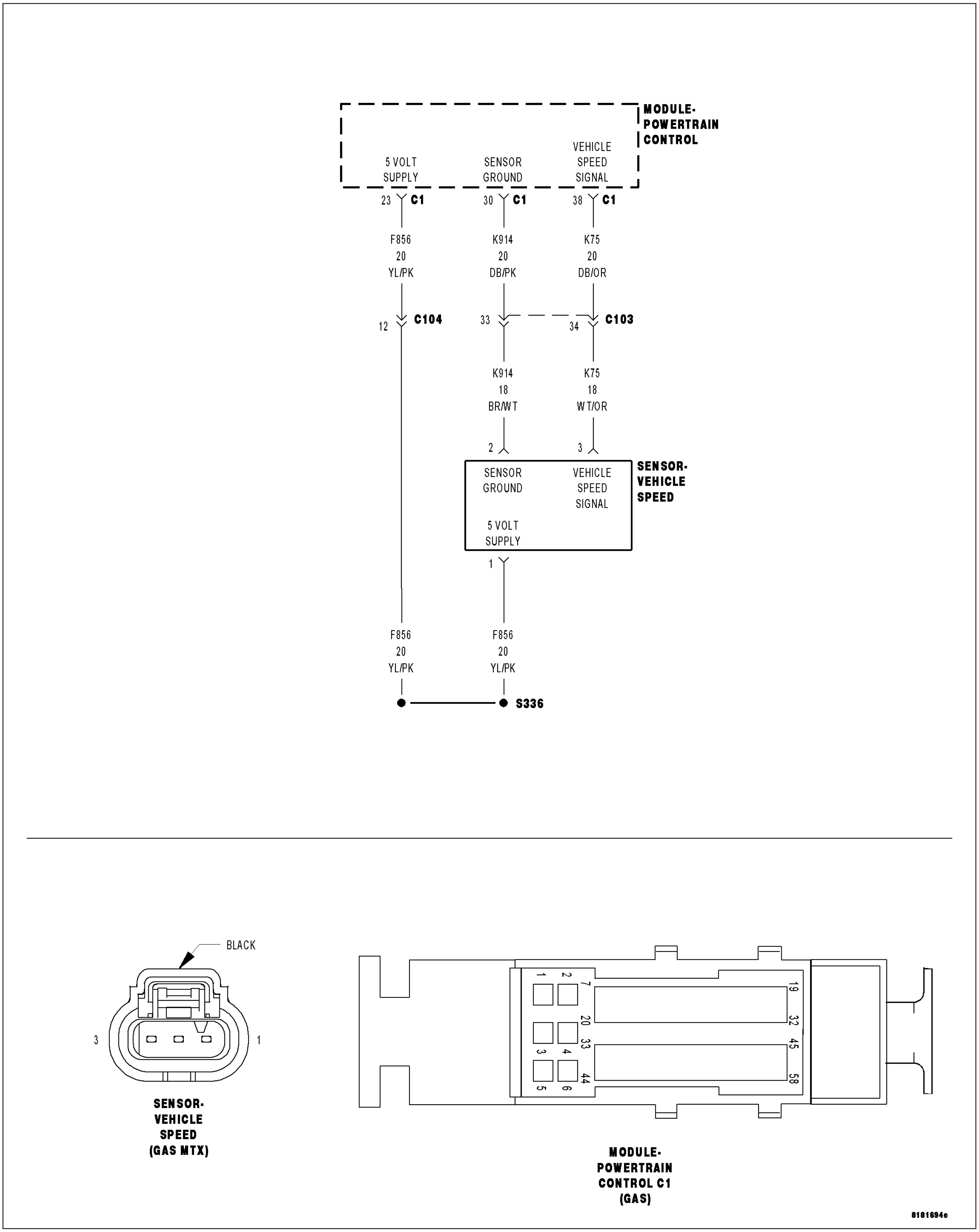
Yes >> Replace the Fuel Pump.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the TIPM in accordance with the Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects an implausible voltage on the Vehicle Speed Sensor circuit.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
VEHICLE SPEED SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active Vehicle Speed Sensor DTCs in the Totally Integrated Power Module. Any bus, communication, or VSS DTCs in the TIPM must be properly diagnosed before continuing.

NOTE: This code may set after a hard acceleration on loose gravel, during other off road driving conditions, or by any condition that causes a wheel speed difference between the front and rear wheels.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

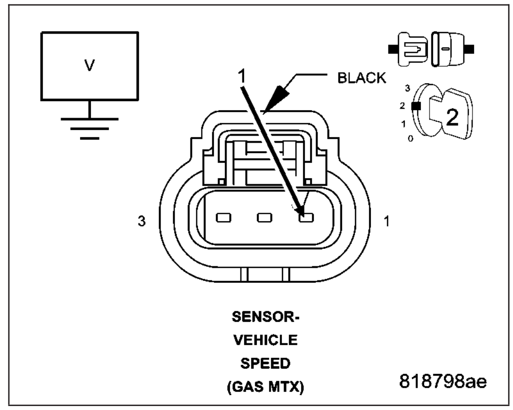
2. (F856) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Vehicle Speed Sensor connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



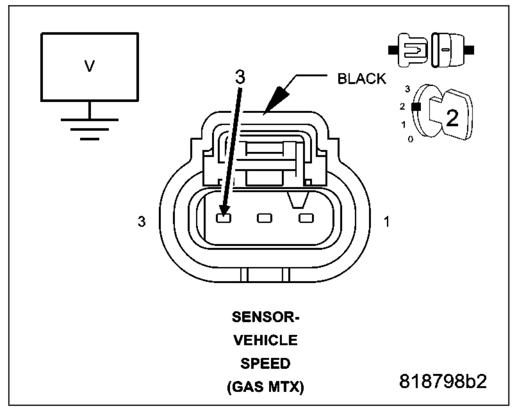
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 7

3. (K75) VEHICLE SPEED SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 11

4. (K914) SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

Using a 12 volt test light connected to 12 volts, check the (K914) Sensor Ground in the Vehicle Speed Sensor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

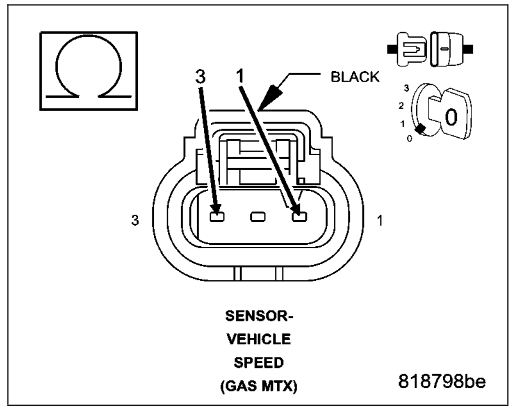
No >> Go to 15

5. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K75) VEHICLE SPEED SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K75) Vehicle Speed Signal circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VEHICLE SPEED SENSOR

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Inspect the Vehicle Speed Sensor for any condition that would result in an incorrect signal, such as damage, corrosion, or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Vehicle Speed Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

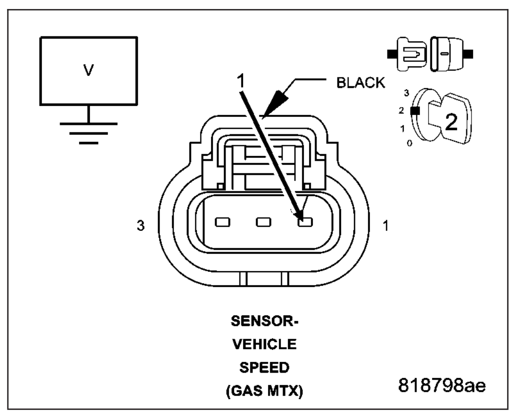
7. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

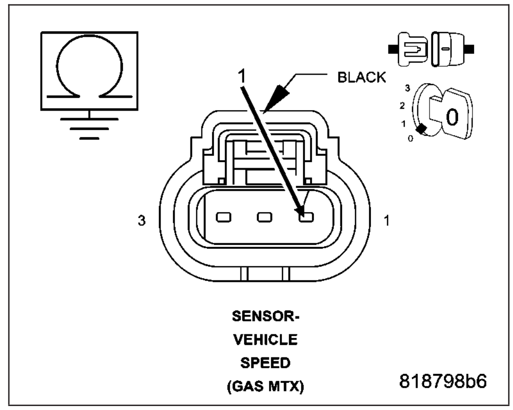
Yes >> Repair the (F856) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

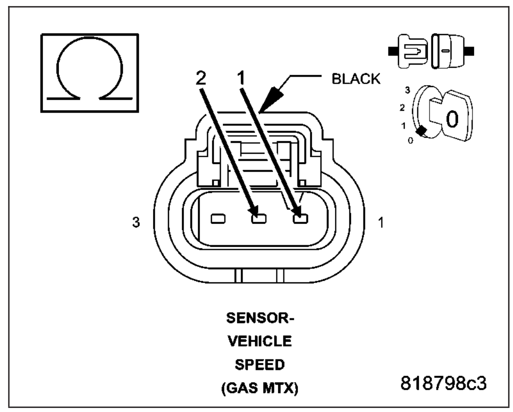
Yes >> Go to 9

No >> Repair the (F856) 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



Is the resistance above 100 ohms?

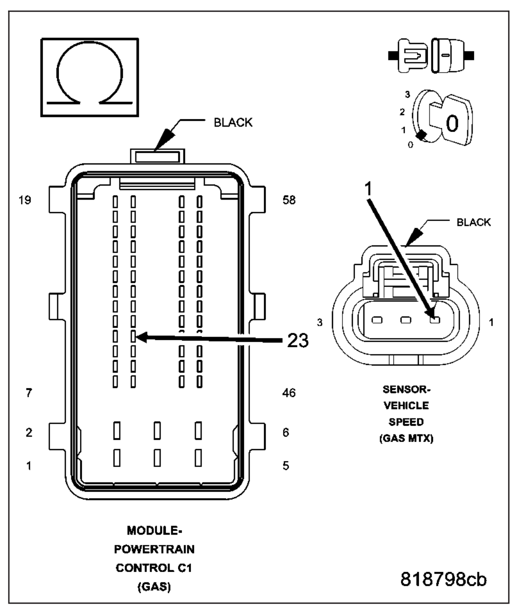
Yes >> Go to 10

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K914) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (F856) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

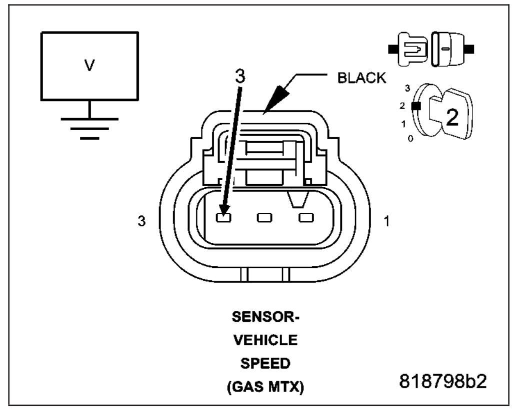
11. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



Is there any voltage present?

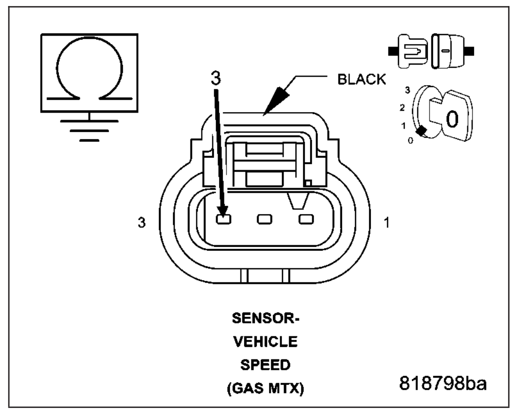
Yes >> Repair the (K75) Vehicle Speed Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K75) Vehicle Speed Signal circuit in the Vehicle Speed Sensor harness connector.



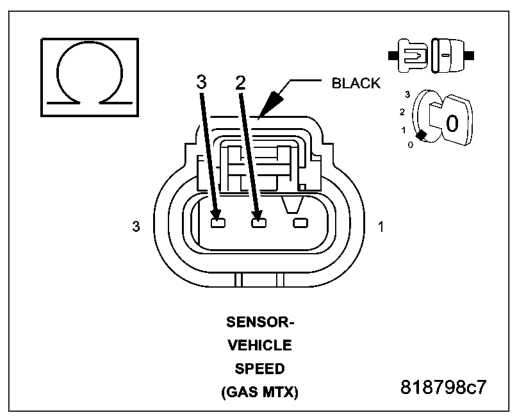
Is the resistance above 100 ohms?

Yes >> Go to 13

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K75) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO (K914) SENSOR GROUND CIRCUIT

Measure the resistance between the (K75) Vehicle Speed Signal circuit and the (K914) Sensor Ground circuit in the Vehicle Speed Sensor harness connector.



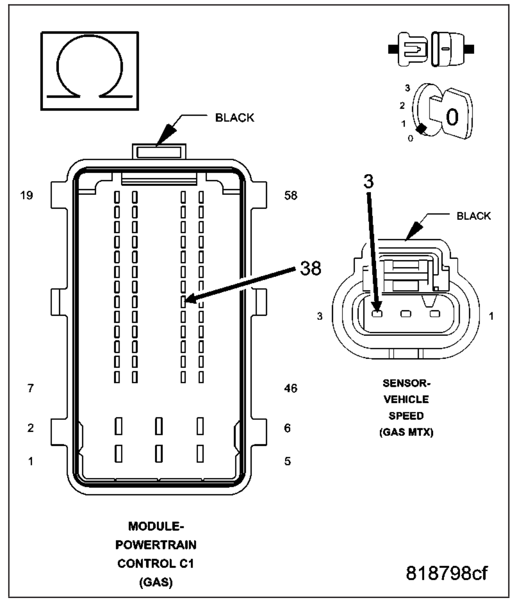
Is the resistance above 100 ohms?

Yes >> Go to 14

No >> Repair the (K75) Vehicle Speed Signal circuit for a short to the (K914) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. (K75) VEHICLE SPEED SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K75) Vehicle Speed Signal circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K75) Vehicle Speed Signal circuit for an open circuit or high resistance.

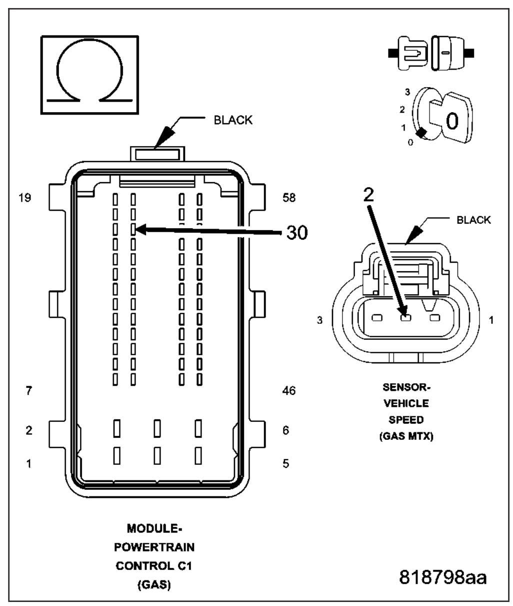
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. (K914) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K914) Sensor Ground circuit between the Vehicle Speed Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Vehicle Speed Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON-DRIVE WHEELS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running, transmission not neutral, brakes not applied, and engine RPM greater than 1500.
- **Set Condition:**
  This code will set if the PCM receives an implausible vehicle speed signal from the TIPM Module.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
DIFFERENCE IN TIRE CIRCUMFERENCE
WHEEL SPEED SENSOR, WIRING, CONNECTORS, OR HARDWARE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active Vehicle Speed Sensor DTCs in the Totally Integrated Power Module. Any bus, communication, or VSS DTCs in the TIPM must be properly diagnosed before continuing.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VISUAL INSPECTION

NOTE: This code may set after a hard acceleration on loose gravel, during other off road driving conditions, or by any condition that causes a wheel speed difference between the front and rear wheels.

Perform a thorough inspection of the rear Wheel Speed Sensor, wiring, connector, attaching hardware, and tone wheel.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair may be necessary. Perform a thorough road test to verify proper operation.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors related to this circuit.
Look for any chafed, pierced, pinched, or partially broken wires.
Look for broken, bent, pushed out or corroded terminals.
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1513-STARTER REQUEST SWITCH STUCK

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects voltage on the (F963) Start Enable circuit for a specified time after the engine is running.

Possible Causes
INTERMITTENT DTC
(F963) START ENABLE CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: This DTC can set by holding the ignition switch in the start position after the engine starts.
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F963) START ENABLE CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F963) Start Enable circuit in the Powertrain Control Module (PCM) harness connector.

Is there any voltage present?

Yes >> Repair the (F963) Start Enable circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the ignition switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

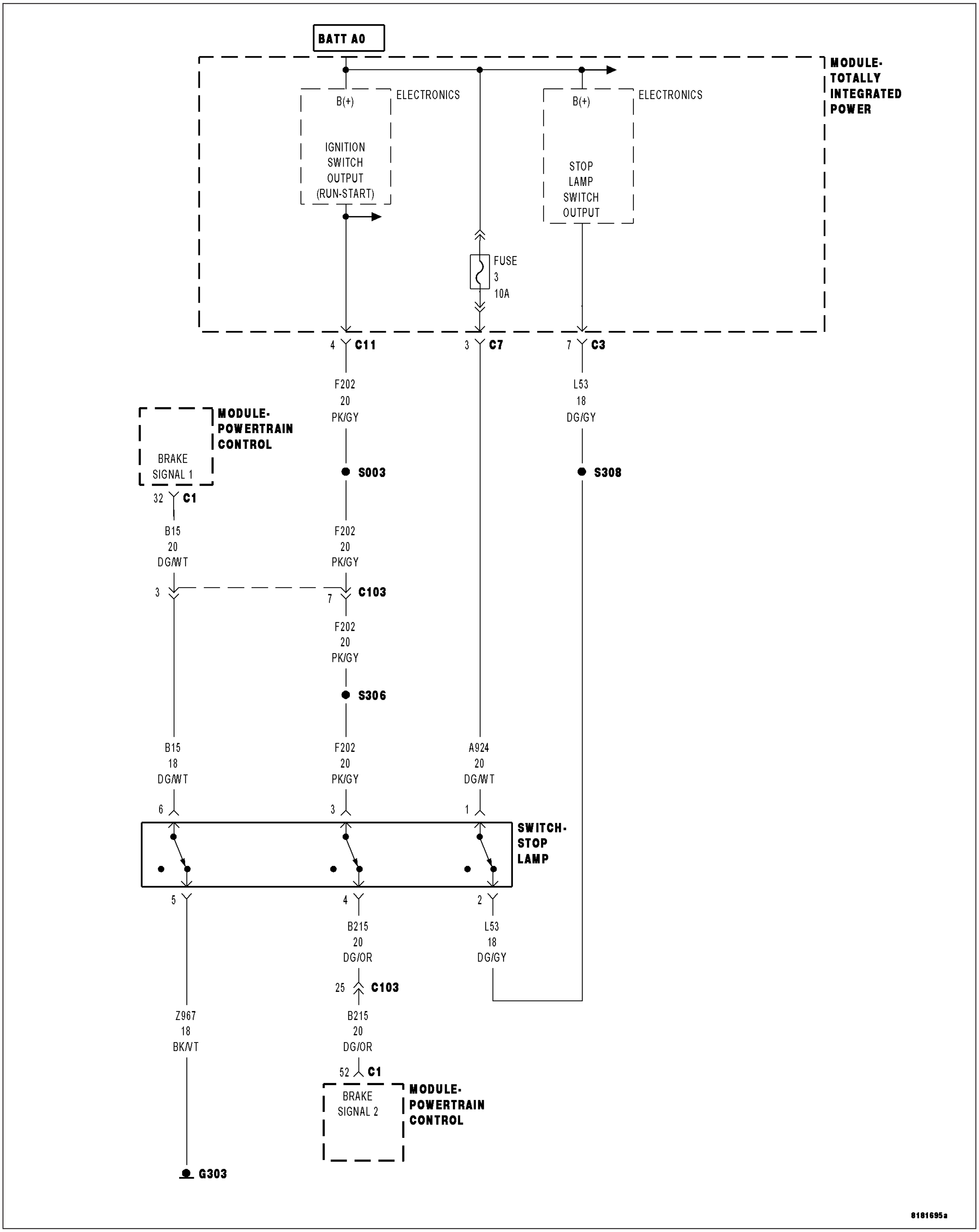
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1572-BRAKE PEDAL STUCK ON



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the state of brake switch does not change as expected.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the states change from Pressed when the pedal is pressed to Not Pressed when the pedal is released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

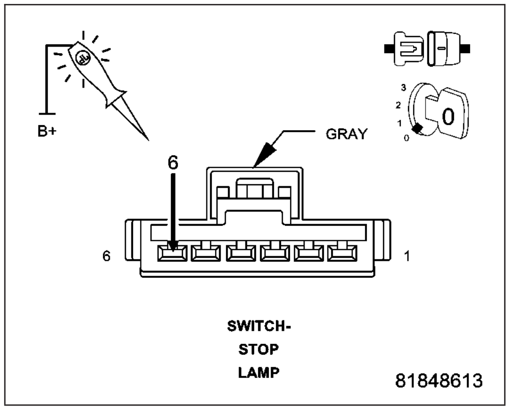
No >> Go to 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

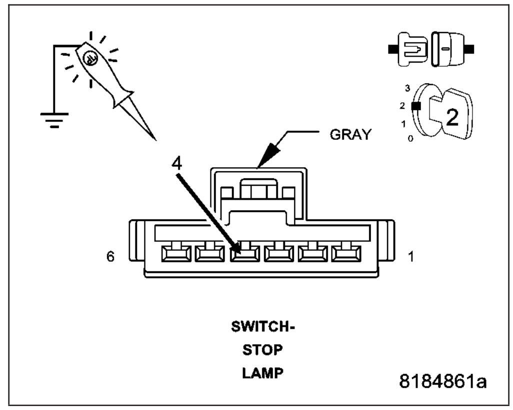
Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 11

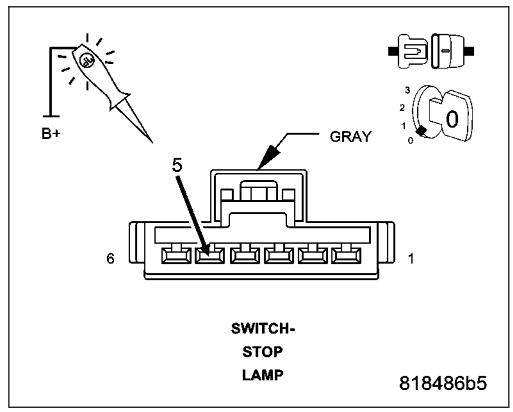
No >> Go to 7

4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

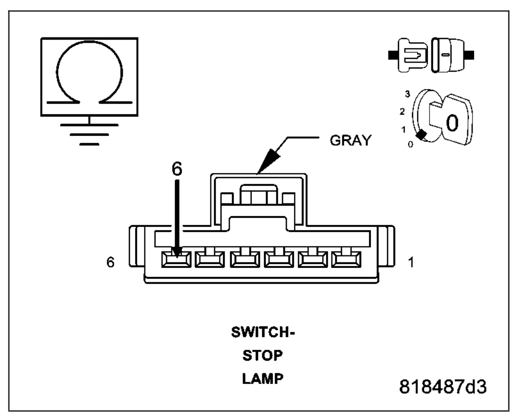
Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.



Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

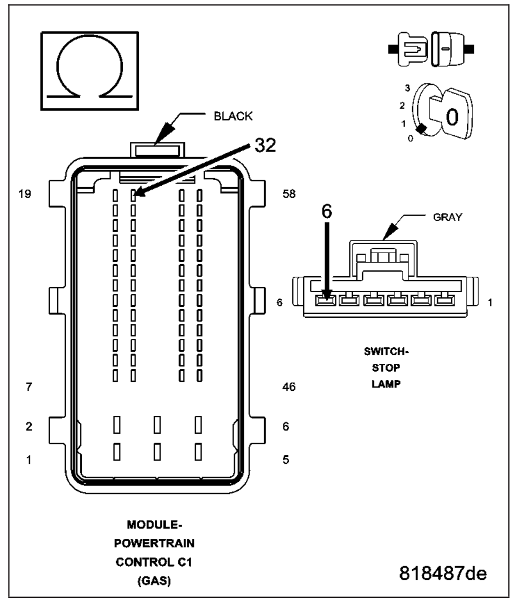
Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.

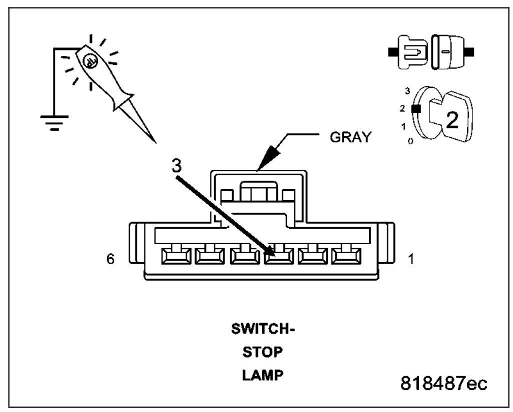
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

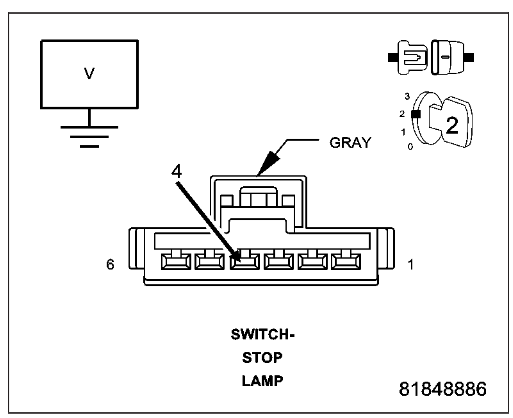
Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.

Is there any voltage present?

Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

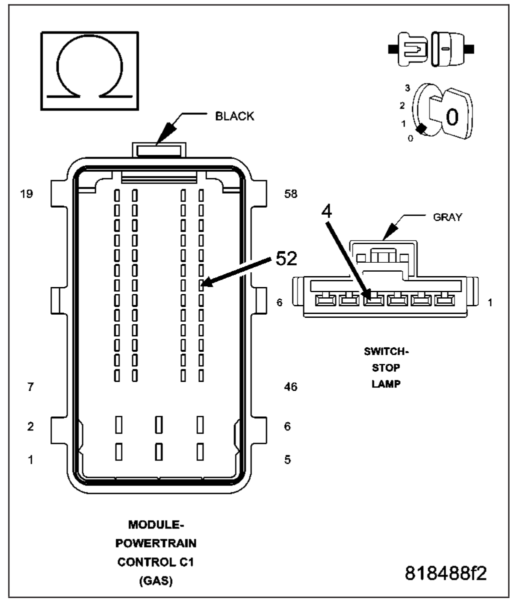
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9



9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

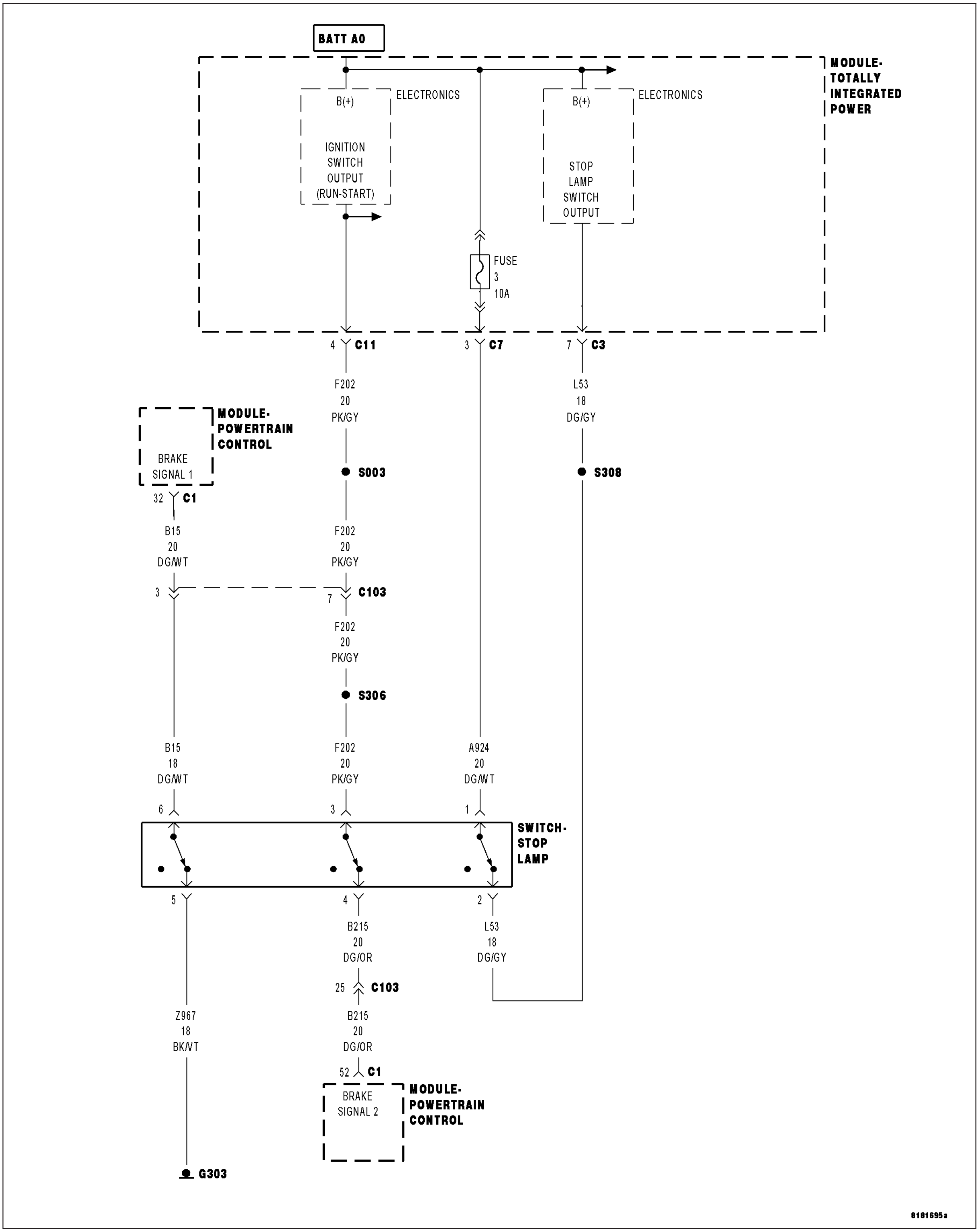
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1573-BRAKE PEDAL STUCK OFF



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the state of Brake Signal 2 does not change as expected.

Possible Causes
INTERMITTENT DTC
(B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND
(B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
STOP LAMP SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, monitor the states of Brake Signal 1 and Brake Signal 2 while pressing and releasing the brake pedal several times.

Do the states change from Pressed when the pedal is pressed to Not Pressed when the pedal is released?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

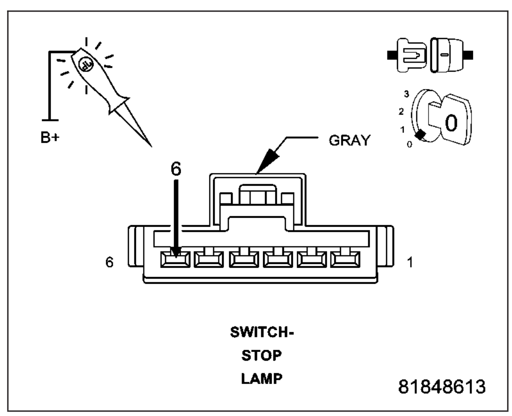
No >> Go to 2

2. (B15) BRAKE SIGNAL 1 CIRCUIT

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (B15) Brake Signal 1 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

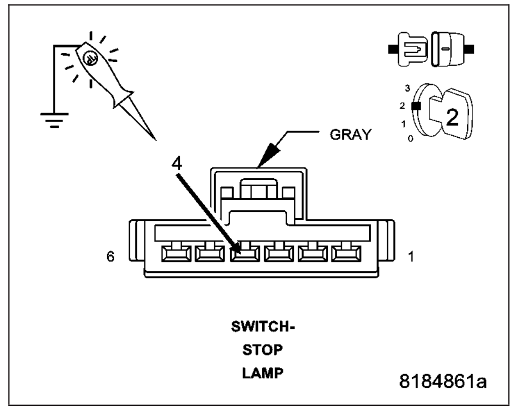
Yes >> Go to 3.

No >> Go to 4

3. (B16) BRAKE SIGNAL 2 CIRCUIT

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (B16) Brake Signal 2 circuit in the Powertrain Control Module (PCM) harness connector while pressing and releasing the brake pedal several times.



Does the test light change from illuminated when the pedal is pressed to not illuminated when the pedal is released?

Yes >> Go to 11

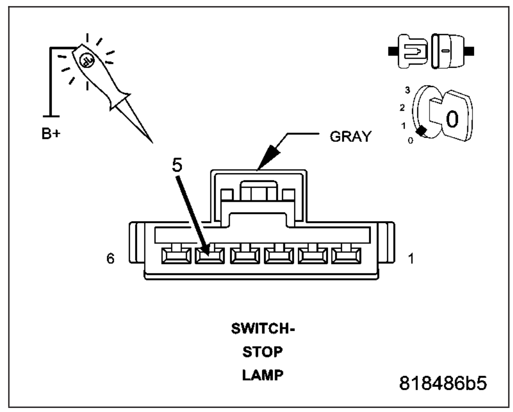
No >> Go to 7

4. (Z967) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Using a 12 volt test light connected to 12 volts, check the (Z967) Ground circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

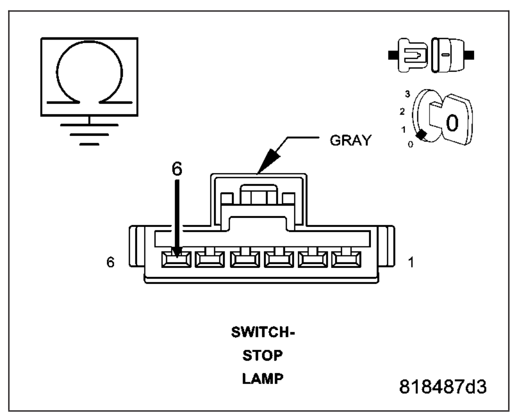
Yes >> Go to 5

No >> Repair the (Z967) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (B15) BRAKE SIGNAL 1 CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (B15) Brake Signal 1 circuit in the Stop Lamp Switch harness connector.



Is the resistance above 100 ohms?

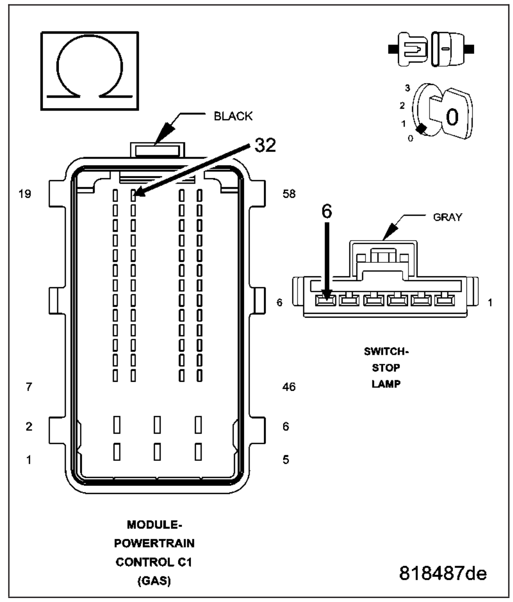
Yes >> Go to 6

No >> Repair the (B15) Brake Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (B15) BRAKE SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B15) Brake Signal 1 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B15) Brake Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

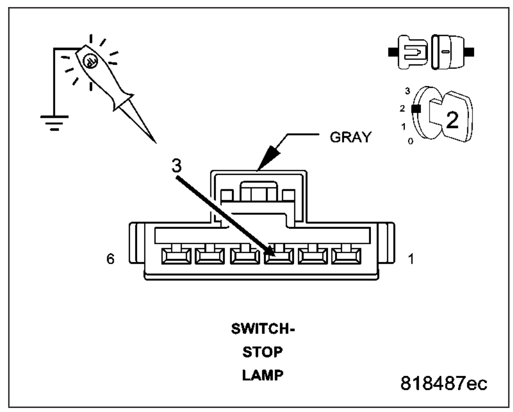
7. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Stop Lamp Switch connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Stop Lamp Switch harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

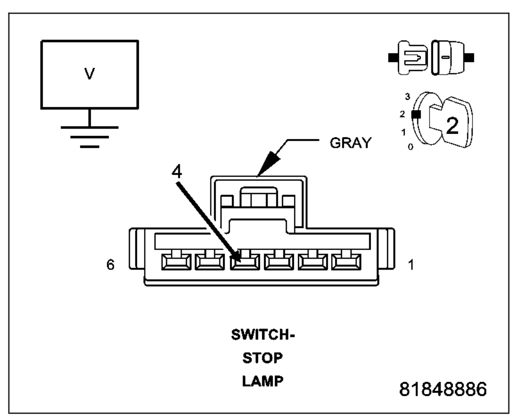
Yes >> Go to 8

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (B16) BRAKE SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (B16) Brake Signal 2 circuit in the Stop Lamp Switch harness connector.



Is there any voltage present?

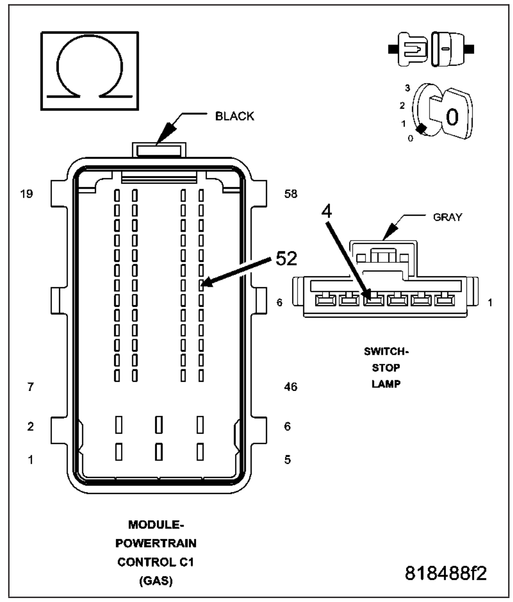
Yes >> Repair the (B16) Brake Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (B16) BRAKE SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (B16) Brake Signal 2 circuit between the Stop Lamp Switch harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (B16) Brake Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. STOP LAMP SWITCH

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Stop Lamp Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Stop Lamp Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1593-SPEED CONTROL SWITCH 1/2 STUCK

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The ECM detects that the (V71) S/C Signal 1 voltage does not match the (V72) S/C Signal 2 voltage.

Possible Causes
INTERMITTENT DTC
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND
(V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT
(V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLOCKSPRING
SPEED CONTROL SWITCH
STEERING CONTROL MODULE (SCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.

NOTE: The voltages should be above 4.8 volts with the Speed Control Switch connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Speed Control Switch harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. CLOCKSPRING

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C5 harness connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.

NOTE: The voltages should be above 4.8 volts with the Steering Control Module (SCM) C5 connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit at the Steering Control Module (SCM) C5 connector, not at the harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Clockspring in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. STEERING CONTROL MODULE (SCM)

Turn the ignition off.

Disconnect the Steering Control Module (SCM) C2 connector.

Turn the ignition on.

With a scan tool, read the (V71) S/C Signal 1 and (V72) S/C Signal 2 voltages.

NOTE: The voltages should be above 4.8 volts with the connector disconnected.

Connect a jumper wire between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V71) S/C Signal 1 voltage.

NOTE: The (V71) S/C Signal 1 voltage should be below .2 volts with the jumper wire in place.

Connect a jumper wire between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

With a scan tool, read the (V72) S/C Signal 2 voltage.

NOTE: The (V72) S/C Signal 2 voltage should be below .2 volts with the jumper wire in place.

Are the Speed Control voltages displayed as described?

Yes >> Replace the Steering Control Module (SCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.

Is there any voltage present?

Yes >> Repair the (V71) S/C Signal 1 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.

Is there any voltage present?

Yes >> Repair the (V72) S/C Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V71) S/C Signal 1 circuit in the Steering Control Module (SCM) C2 harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (V71) S/C Signal 1 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V72) S/C Signal 2 circuit in the Steering Control Module (SCM) C2 harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 9

No >> Repair the (V72) S/C Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (V71) S/C SIGNAL 1 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V71) S/C Signal 1 circuit and the (V937) S/C Switch Ground circuit in the C2 Steering Control Module (SCM) harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (V71) S/C Signal 1 circuit for a short to the Steering Control Module (SCM) circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (V72) S/C SIGNAL 2 CIRCUIT SHORTED TO THE (V937) S/C SWITCH GROUND CIRCUIT

Measure the resistance between the (V72) S/C Signal 2 circuit and the (V937) S/C Switch Ground circuit in the Steering Control Module (SCM) C2 harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (V72) S/C Signal 2 circuit for a short to the (V937) S/C Switch Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (V71) S/C SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V71) S/C Signal 1 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 12

No >> Repair the (V71) S/C Signal 1 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

12. (V72) S/C SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V72) S/C Signal 2 circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 13

No >> Repair the (V72) S/C Signal 2 circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (V937) S/C Switch Ground circuit between the Steering Control Module (SCM) C2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 14

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

14. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1602–PCM NOT PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  The PCM has not been programmed.

Possible Causes
PCM NOT PROGRAMMED
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM NOT PROGRAMMED

Ignition on, engine not running.

Program the PCM in accordance with the Service Information.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> The PCM has been successfully programmed. Test is complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1607-PCM INTERNAL SHUTDOWN TIMER SLOW RATIONALITY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  An internal PCM failure has been detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PENDING TEMPERATURE SENSOR DTCS
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(A931) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PENDING TEMPERATURE SENSOR DTCS

Turn the ignition on.

NOTE: If any temperature sensor DTCs are present, allow the vehicle to cool completely before proceeding with this test.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Are there any pending Engine Coolant Temperature sensor, Ambient Air Temperature sensor, or general temperature DTCs?

Yes >> Diagnose and repair any temperature sensor DTCs and retest.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. PCM IGNITION CIRCUITS OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the PCM harness connector.

With a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit.

With a 12-volt test light connected to ground, check the (A931) Fused B+ circuit.

Check the circuits with the ignition switch in the OFF, ON, and START positions.

NOTE: The test light should be illuminated and bright with the ignition switch in the ON and START positions. Compare the brightness to that of a direct connection to the battery.

Wiggle test the circuits while checking with the test light to check the circuit for an intermittent problem.

Does the test light illuminate, or not illuminate, as expected in each of the ignition switch positions?

Yes >> Go to 3

No >> Repair the circuit(s) as necessary. If an open fuse is found, inspect the circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. POWERTRAIN CONTROL MODULE (PCM)

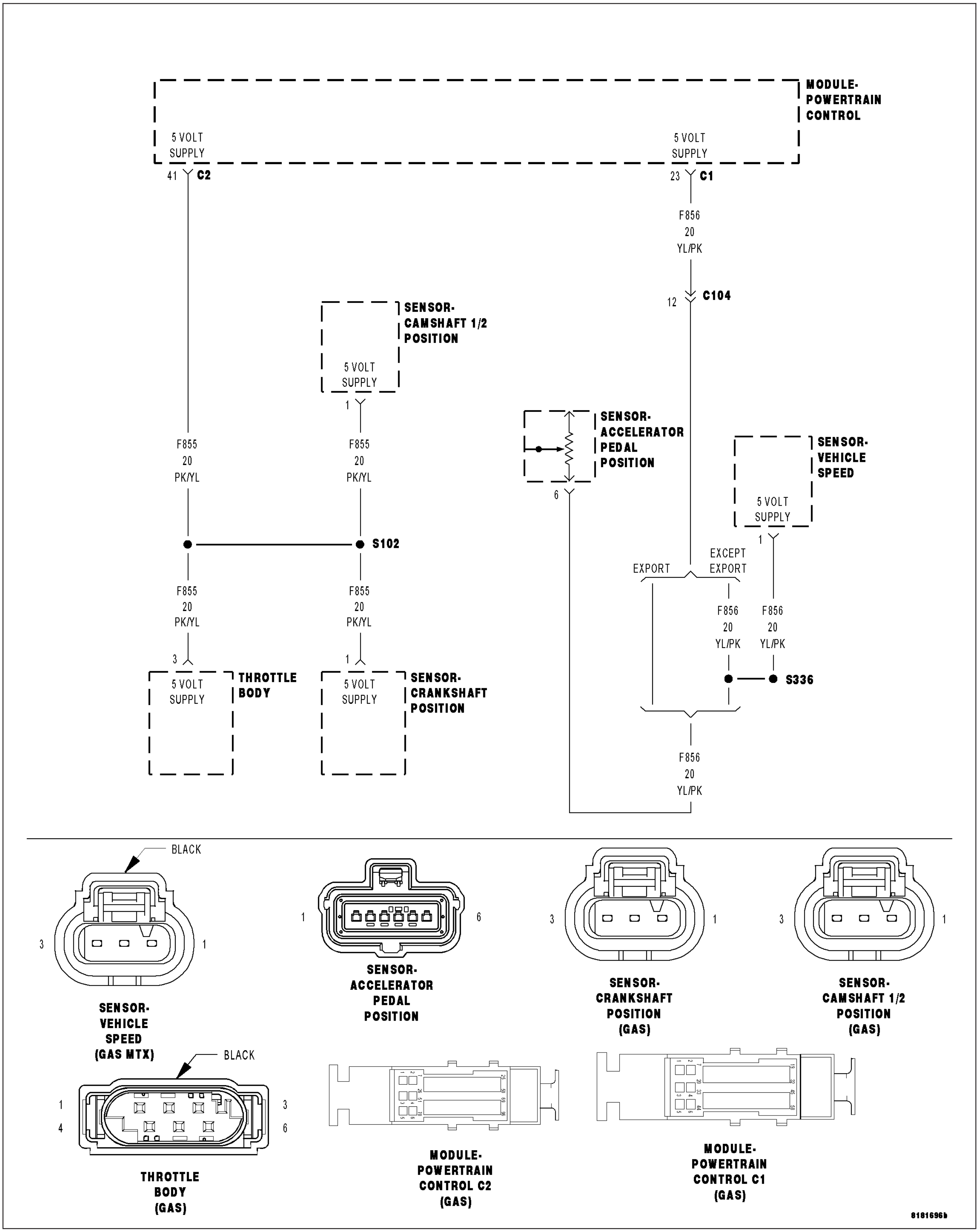
Using the wiring diagram/schematic as a guide, inspect Powertrain Control Module power and ground circuits.
Look for any chafed, pierced, pinched, or partially broken wires.
Look for broken, bent, pushed out or corroded terminals.
Monitor the scan tool data and wiggle test the wiring and connectors.
Look for the any data to change or for the DTC to reset during the wiggle test.
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects an excessive voltage variation on the (F855) 5 volt supply circuit or the (F856) 5 volt supply circuit.

Possible Causes
INTERMITTENT DTC
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
CAMSHAFT 2 POSITION SENSOR
THROTTLE POSITION SENSOR
CRANKSHAFT POSITION SENSOR
VEHICLE SPEED SENSOR (MTX ONLY)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

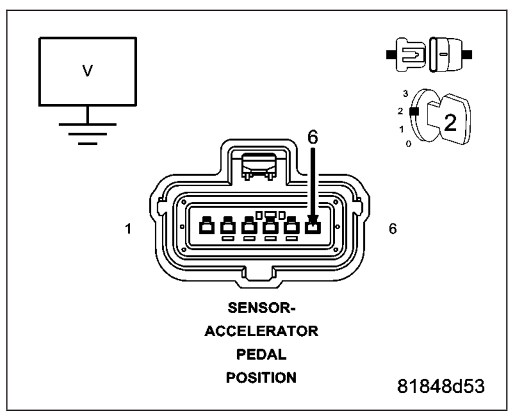
2. (F856) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit.



Select the appropriate response from the list below:

Voltage more than 5.2 volts
Repair the (F856) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Voltage between 4.8 and 5.2 volts
Go to 3

Voltage below 4.8 volts
Go to 4

3. ACCELERATOR PEDAL POSITION SENSOR

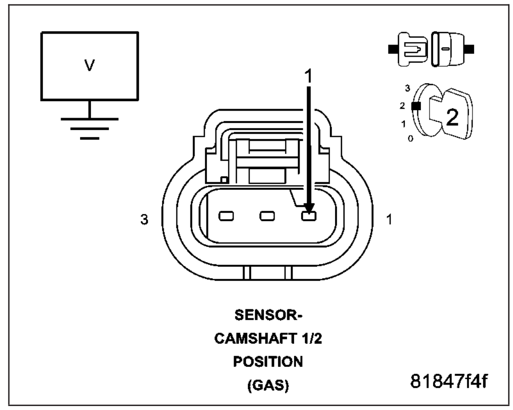
Turn the ignition off.

Connect the APP Sensor harness connector.

Disconnect the Camshaft 1/2 Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Camshaft 1/2 Position Sensor harness connector.



Is the voltage below 4.8 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 11

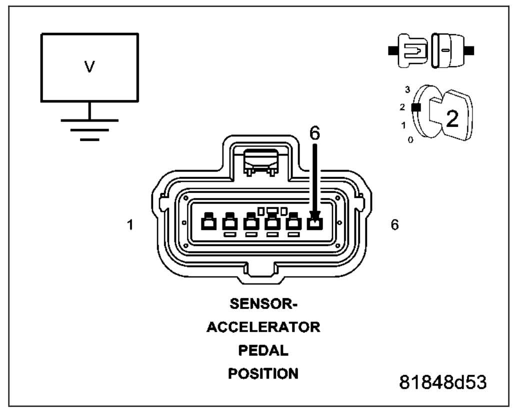
4. CAMSHAFT 1/2 POSITION SENSOR

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the APP Sensor harness connector.



Is the voltage above 4.8 volts?

Yes >> Replace the Camshaft 1/2 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

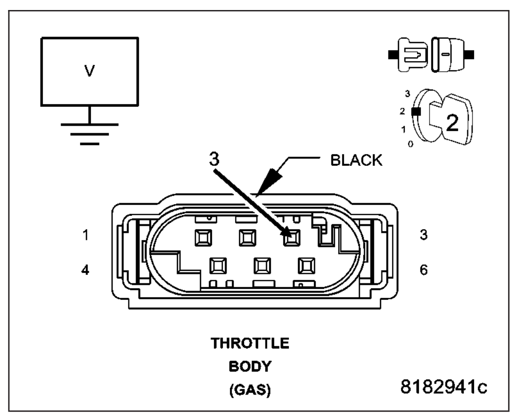
5. THROTTLE POSITION SENSOR

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit.



Is the voltage above 4.8 volts?

Yes >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

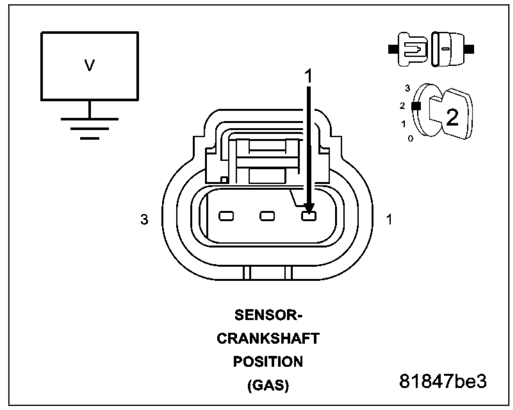
6. CRANKSHAFT POSITION SENSOR

Turn the ignition off.

Disconnect the Crankshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit.



Is the voltage above 4.8 volts?

Yes >> Replace the Crankshaft Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. VEHICLE EQUIPPED WITH MANUAL TRANSMISSION

NOTE: Only vehicles equipped with a manual transmission use a Vehicle Speed Sensor.

Is the vehicle equipped with a manual transmission?

Yes >> Go to 8

No >> Go to 9

8. VEHICLE SPEED SENSOR

NOTE: Only vehicles equipped with a manual transmission use a Vehicle Speed Sensor.

Turn the ignition off.

Disconnect the Vehicle Speed Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit.

Is the voltage above 4.8 volts?

Yes >> Replace the Vehicle Speed Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

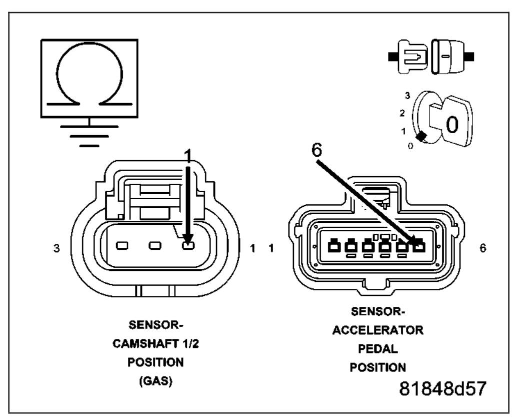
NOTE: All sensors connected to the (F855) 5 volt supply circuit and the (F856) 5 volt supply circuit must be disconnected.

Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit.



Is the resistance above 1000 ohms for both circuits?

Yes >> Go to 10

No >> Repair the 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. 5-VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: All sensors connected to the (F855) 5 volt supply circuit and the (F856) 5 volt supply circuit must be disconnected.

Turn the ignition off.

Measure the resistance of the (F855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the PCM harness connector.

Measure the resistance of the (F855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the PCM harness connector.

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the PCM harness connector.

Measure the resistance of the (F856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

If the vehicle is equipped with a manual transmission, measure the resistance of the (K856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the PCM harness connector.

Is the resistance below 5.0 ohms for all of the circuits?

Yes >> Go to 11

No >> Repair the 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. POWERTRAIN CONTROL MODULE (PCM)

Inspect the (F855) 5 Volt Supply circuit between the Camshaft 1/2 Position Sensor harness connector and the PCM harness connector.

Inspect the (F855) 5 Volt Supply circuit between the Crankshaft Position Sensor harness connector and the PCM harness connector.

Inspect the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the PCM harness connector.

Inspect the (F856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

If the vehicle is equipped with a manual transmission, inspect the (K856) 5 Volt Supply circuit between the Vehicle Speed Sensor harness connector and the PCM harness connector.

Inspect all PCM power and ground circuits.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

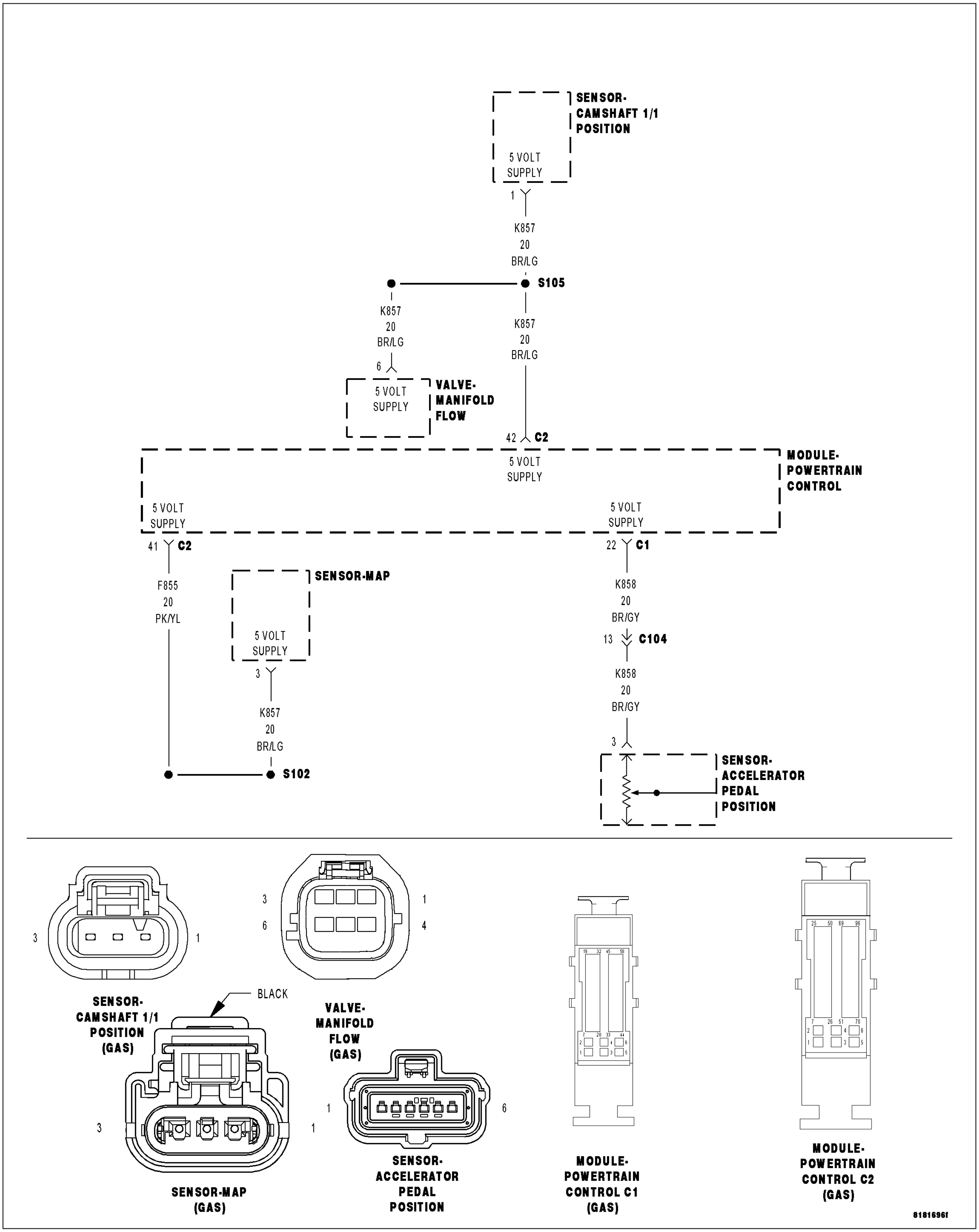
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P1628-SENSOR REFERENCE VOLTAGE CIRCUIT ERRATIC



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects an excessive voltage variation on the (K857) 5 volt supply circuit or the (K858) 5 volt supply circuit.

Possible Causes
INTERMITTENT DTC
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
CAMSHAFT 1/1 POSITION SENSOR
MAP SENSOR
MANIFOLD FLOW VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.

With the scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

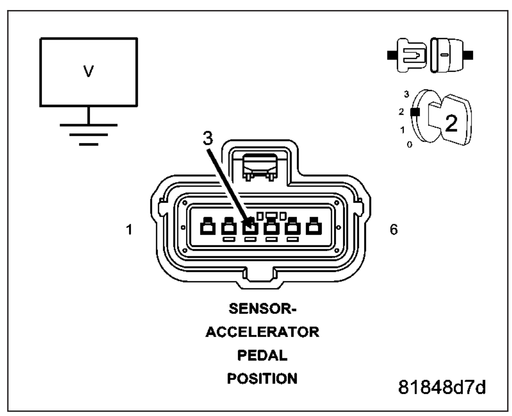
2. (K858) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit in the APP Sensor harness connector.



Select the appropriate response from the list below:

Voltage above 5.2 volts
Repair the (K858) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Voltage between 4.8 and 5.2 volts
Go to 3

Voltage below 4.8 volts
Go to 4

3. ACCELERATOR PEDAL POSITION SENSOR

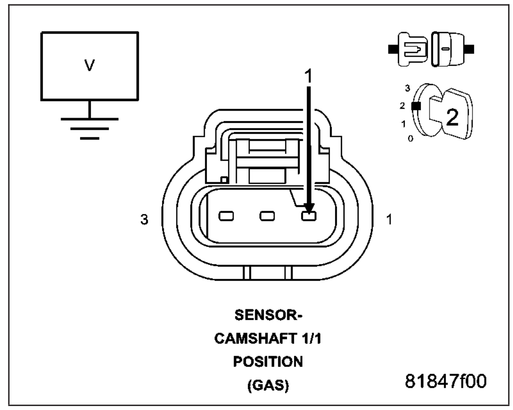
Turn the ignition off.

Connect the APP Sensor harness connector.

Disconnect the Camshaft 1/1 Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Camshaft 1/1 Position Sensor harness connector.



Is the voltage below 4.8 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

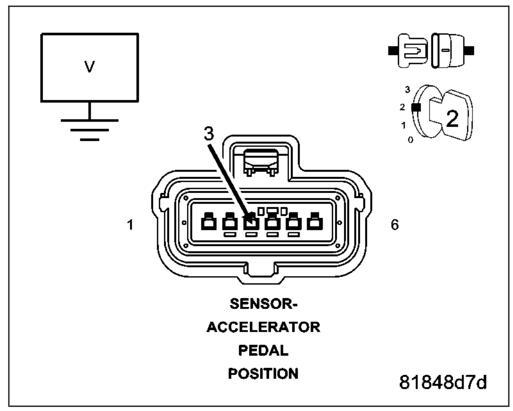
4. CAMSHAFT 1/1 POSITION SENSOR

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit in the APP Sensor harness connector.



Is the voltage above 4.8 volts?

Yes >> Replace the Camshaft 1/1 Position Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

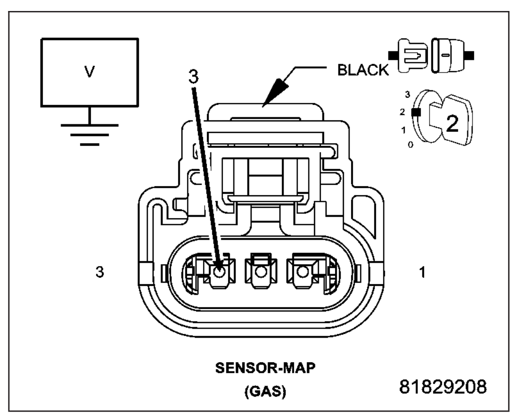
5. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit.



Is the voltage above 4.8 volts?

Yes >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. MANIFOLD FLOW VALVE

Turn the ignition off.

Disconnect the Manifold Flow Valve harness connector.

Turn the ignition on.

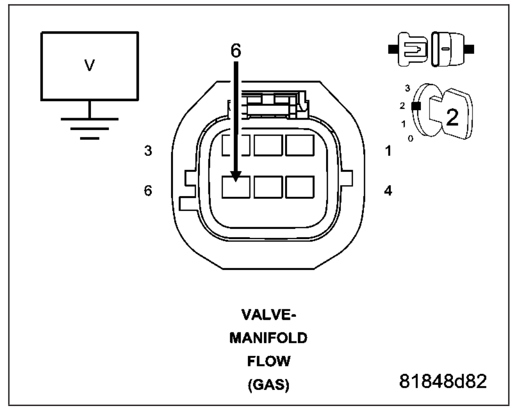
Measure the voltage of the (K857) 5 Volt Supply circuit.

Is the voltage above 4.8 volts?

Yes >> Replace the Manifold Flow Valve in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7



7. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

NOTE: All sensors connected to the (K857) 5 volt supply circuit and the (K858) 5 volt supply circuit must be disconnected.

Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit.

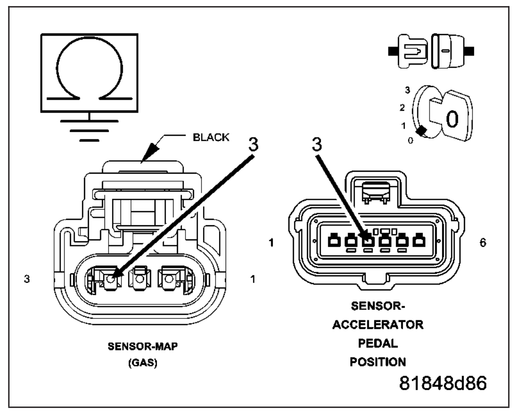
Measure the resistance between ground and the (K858) 5 Volt Supply circuit.

Is the resistance above 1000 ohms for both circuits?

Yes >> Go to 8

No >> Repair the 5 Volt Supply circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. 5-VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: All sensors connected to the (K857) 5 volt supply circuit and the (K858) 5 volt supply circuit must be disconnected.

Turn the ignition off.

Measure the resistance of the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the PCM harness connector.

Measure the resistance of the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the PCM harness connector.

Measure the resistance of the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the PCM harness connector.

Measure the resistance of the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

Is the resistance below 5.0 ohms for all of the circuits?

Yes >> Go to 9

No >> Repair the 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. POWERTRAIN CONTROL MODULE (PCM)

Inspect the (K857) 5 Volt Supply circuit between the Camshaft 1/1 Position Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the MAP Sensor harness connector and the PCM harness connector.

Inspect the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the PCM harness connector.

Inspect the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the PCM harness connector.

Inspect all PCM power and ground circuits.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the PCM in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P1696-EEPROM MEMORY WRITE DENIED/INVALID

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  An attempt to program/write to the internal EEPROM failed. Also checks at powerdown. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SCAN TOOL DISPLAYS A WRITE FAILURE

With a scan tool, perform the SRI Memory Test.

Does scan tool display Write Failure?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

2. SCAN TOOL DISPLAYS A WRITE REFUSED

With the a scan tool, perform the SRI Memory Test.

Does the scan tool display Write Refused?

Yes >> Go To 3

No >> Go To 4

3. PCM REFUSED 2ND TEST

With a scan tool, perform the SRI Memory Test a third time.

NOTE: Retest the SRI Memory two more times.

Does the scan tool display Write Refused again?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

4. SCAN TOOL DISPLAYS SRI MILEAGE INVALID

With a scan tool, perform the SRI Memory Test.

Does the scan tool display SRI Mileage Invalid?

Yes >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. COMPARE SRI MILEAGE WITH ODOMETER

Compare the SRI Mileage stored with the Instrument Panel Odometer.

Is the mileage within the specified range displayed on the scan tool?

Yes >> Test Complete.

No >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1697–EMR (SRI) MILEAGE NOT STORED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  The SRI Mileage has not been programmed into the PCM.

Possible Causes
SRI MILEAGE NOT PROGRAMMED INTO THE PCM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SRI MILEAGE NOT PROGRAMMED INTO THE PCM

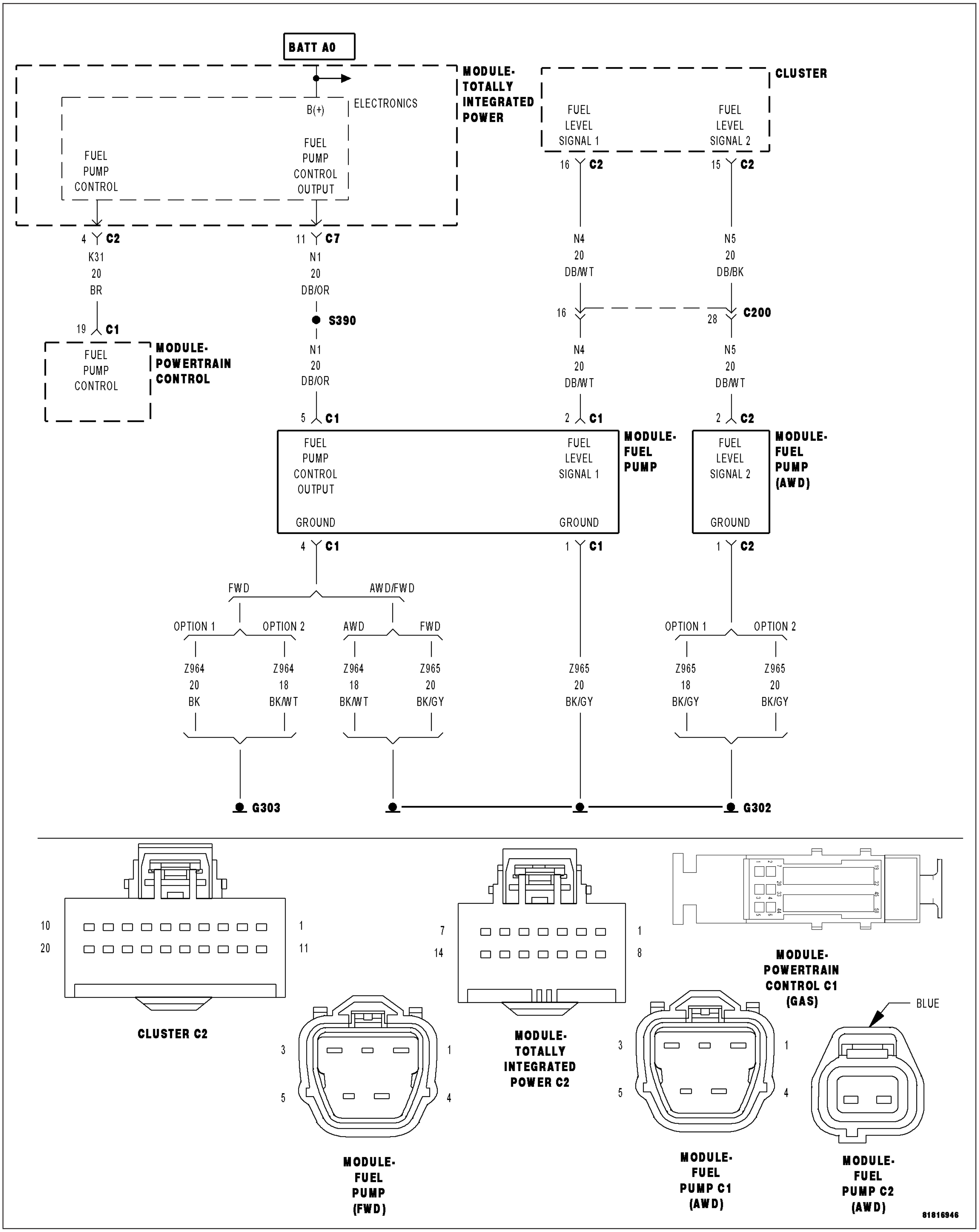
Ignition on, engine not running.
With the scan tool, attempt to program the SRI mileage into the PCM.
With the scan tool, clear DTCs in the PCM.
Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> The SRI mileage has been successfully programmed into the PCM. Test is complete.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1861-SIPHON LINE DISCONNECTED



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  PCM compares the primary tank level with the secondary tank level. If the PCM detects the primary side is lower than the secondary side by a calibrated amount the DTC will set.

Possible Causes
DTC IS ACTIVE
FUEL TANK DAMAGE
FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND
FUEL LEVEL SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT OPEN OF HIGH RESISTANCE
INTERNAL DAMAGE TO FUEL TANK OR SIPHON HOSE
FUEL LEVEL SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose any Fuel Level DTCs before proceeding with this test.

NOTE: The following test must be performed on both Fuel Level Sensors.

Inspect the Fuel Pump Module harness connectors for any corrosion or damage.

Ignition on, engine not running.

With the scan tool, select View DTCs. Record the related Freeze Frame data.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL TANK INSPECTION

Inspect both sides of the Fuel Tank for any damage that may restrict the Fuel Level Sensor float.

Were any problems found?

Yes >> Replace the Fuel Tank as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Measure the resistance between ground and each Fuel Level Signal circuit at the Fuel Pump Module harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the Fuel Level Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. FUEL LEVEL SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Disconnect the Cluster harness connector.

Measure the resistance of each Fuel Level Signal circuit from the Fuel Pump Module harness connector to the Cluster harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the Fuel Level Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance between ground and the (Z965) Ground circuit in the Fuel Pump Module harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 6

No >> Repair the (Z965) Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. FUEL TANK AND SIPHON HOSE INSPECTION

WARNING: The fuel system is under a constant pressure even with the engine off. Before opening the fuel system, the fuel pressure must be released in accordance with the service information. Failure to follow these instructions can result in personal injury or death.

Inspect the following components.

- Siphon hose for restrictions or being disconnected.
- Siphon Inlet and Outlet tube on the Fuel Modules for restrictions.
- Fuel Pump Inlet Strainers for restrictions.
- Fuel Tank for any obstructions or deformities.
- Fuel Pump Module Float arm for damage.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Fuel Level Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2004-INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running, when the valve closes, below a calibrated RPM, depending upon pedal position.
- **Set Condition:**
  The PCM detects that the position feedback of the Manifold Flow Valve Position Sensor is not within range of the adapted value learned during in-plant initialization or after a non volatile memory reset (adaptive memory clear).

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
INTAKE MANIFOLD
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

NOTE: It may be necessary to test drive the vehicle to get this DTC to reset.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Manifold Flow Valve connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 7

No >> Go to 3

3. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K602) MFV SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 12

No >> Go to 8

8. (K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is there any voltage present?

Yes >> Repair the (K602) MFV Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (K602) MFV Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (K602) MFV Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K602) MFV Signal circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K602) MFV Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

12. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 13

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K857) 5 Volt Supply in the Manifold Flow Valve harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K602) MFV Signal circuit for a short to the (K857) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 14

14. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the Manifold Flow Valve harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 15

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. MANIFOLD FLOW VALVE

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Remove the Manifold Flow Valve.

Inspect the return spring and the valve blade assembly for debris stuck in the path or for frozen/seized blades.

NOTE: Manifold Flow Valve over travel or under travel can cause this DTC to set.

NOTE: If the Manifold Flow Valve blades are seized in the intake manifold, the manifold will have to be replaced.

NOTE: If the Manifold Flow Valve is replaced, a non volatile memory reset must be performed to learn the new port flap adaptive values.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Manifold Flow Valve in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2006-INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running, when the valve opens, below a calibrated RPM depending upon pedal position.
- **Set Condition:**
  The PCM detects that the position feedback of the Manifold Flow Valve Position Sensor is not within range of the adapted value learned during in-plant initialization or after a non volatile memory reset (adaptive memory clear).

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
INTAKE MANIFOLD
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

NOTE: It may be necessary to test drive the vehicle to get this DTC to reset.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.
Disconnect the Manifold Flow Valve connector.
Turn the ignition on.
Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 7

No >> Go to 3

3. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Powertrain Control Module (PCM) connector.
Turn the ignition on.
Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K602) MFV SIGNAL CIRCUIT VOLTAGE

Measure the voltage of the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 12

No >> Go to 8

8. (K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is there any voltage present?

Yes >> Repair the (K602) MFV Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 10

No >> Repair the (K602) MFV Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (K602) MFV Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K602) MFV Signal circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 16

No >> Repair the (K602) MFV Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

12. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 13

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

13. (K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K857) 5 Volt Supply in the Manifold Flow Valve harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K602) MFV Signal circuit for a short to the (K857) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 14

14. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the Manifold Flow Valve harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 15

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

15. MANIFOLD FLOW VALVE

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Remove the Manifold Flow Valve.

Inspect the return spring and the valve blade assembly for debris stuck in the path or for frozen/seized blades.

NOTE: Manifold Flow Valve over travel or under travel can cause this DTC to set.

NOTE: If the Manifold Flow Valve blades are seized in the intake manifold, the manifold will have to be replaced.

NOTE: If the Manifold Flow Valve is replaced, a non volatile memory reset must be performed to learn the new port flap adaptive values.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Manifold Flow Valve in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

16. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

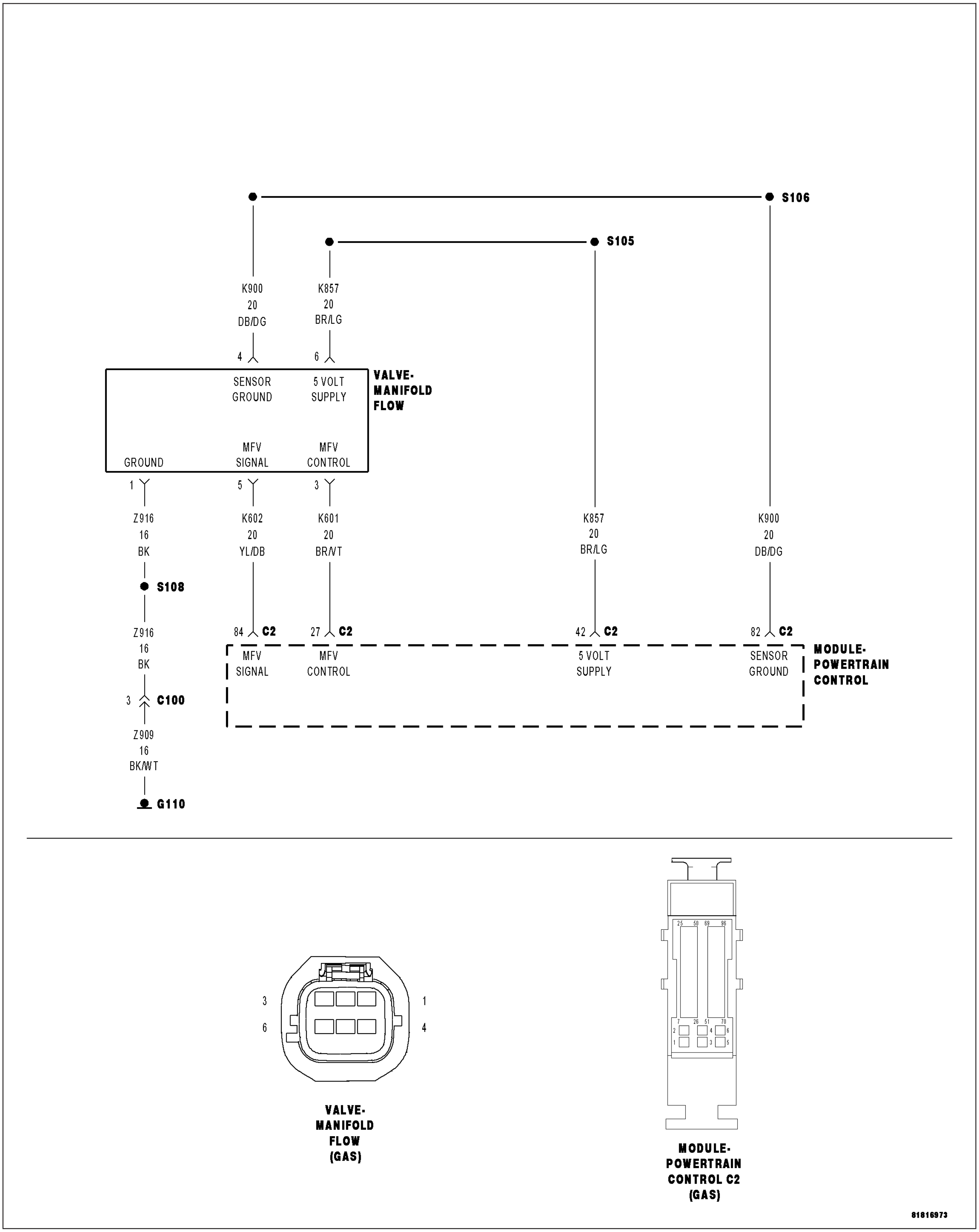
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2009-INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Manifold Flow Valve control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K601) MFV CONTROL CIRCUIT SHORTED TO GROUND
(K601) MFV CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

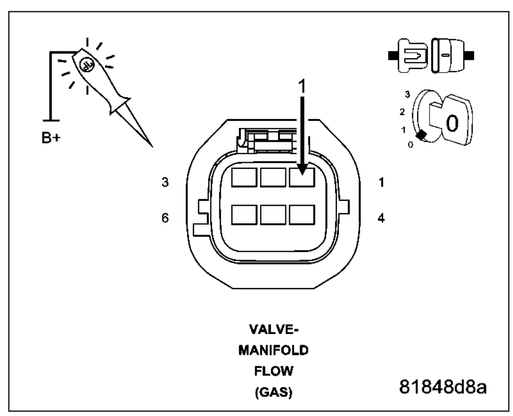
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (Z916) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Manifold Flow Valve connector.

Using a 12 volt test light connected to 12 volts, check the (Z916) Ground circuit in the Manifold Flow Valve harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (Z916) Ground circuit for an open circuit or high resistance.

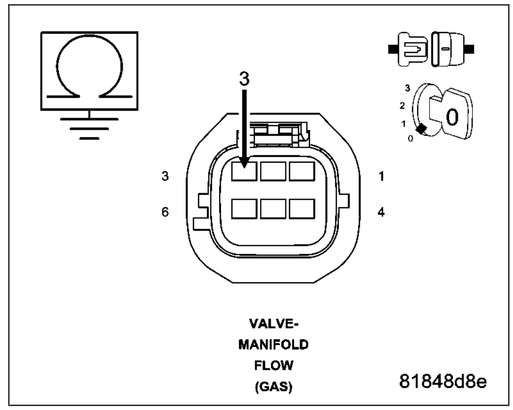
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K601) MFV CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.



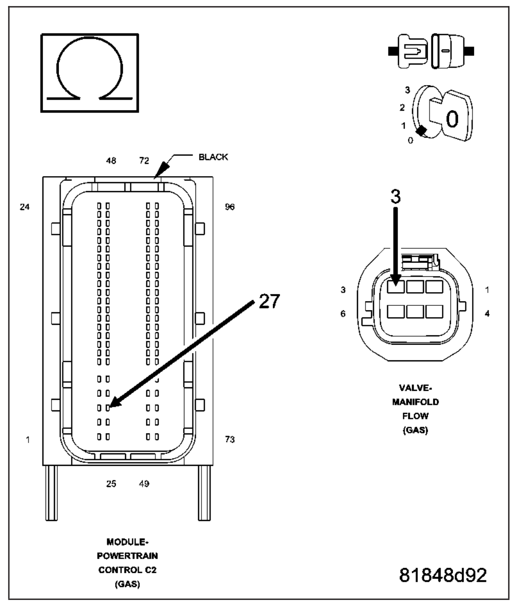
Is the resistance below 100 ohms?

Yes >> Repair the (K601) MFV Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K601) MFV CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K601) MFV Control circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K601) MFV Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

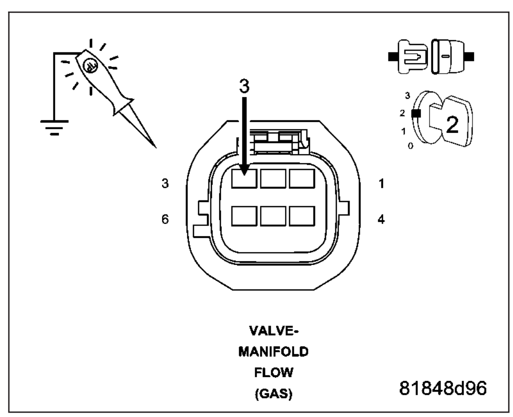
5. MANIFOLD FLOW VALVE

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Manifold Flow Valve control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Manifold Flow Valve control to OFF (0%).

Using a 12 volt test light connected to 12 ground, check the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Manifold Flow Valve in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

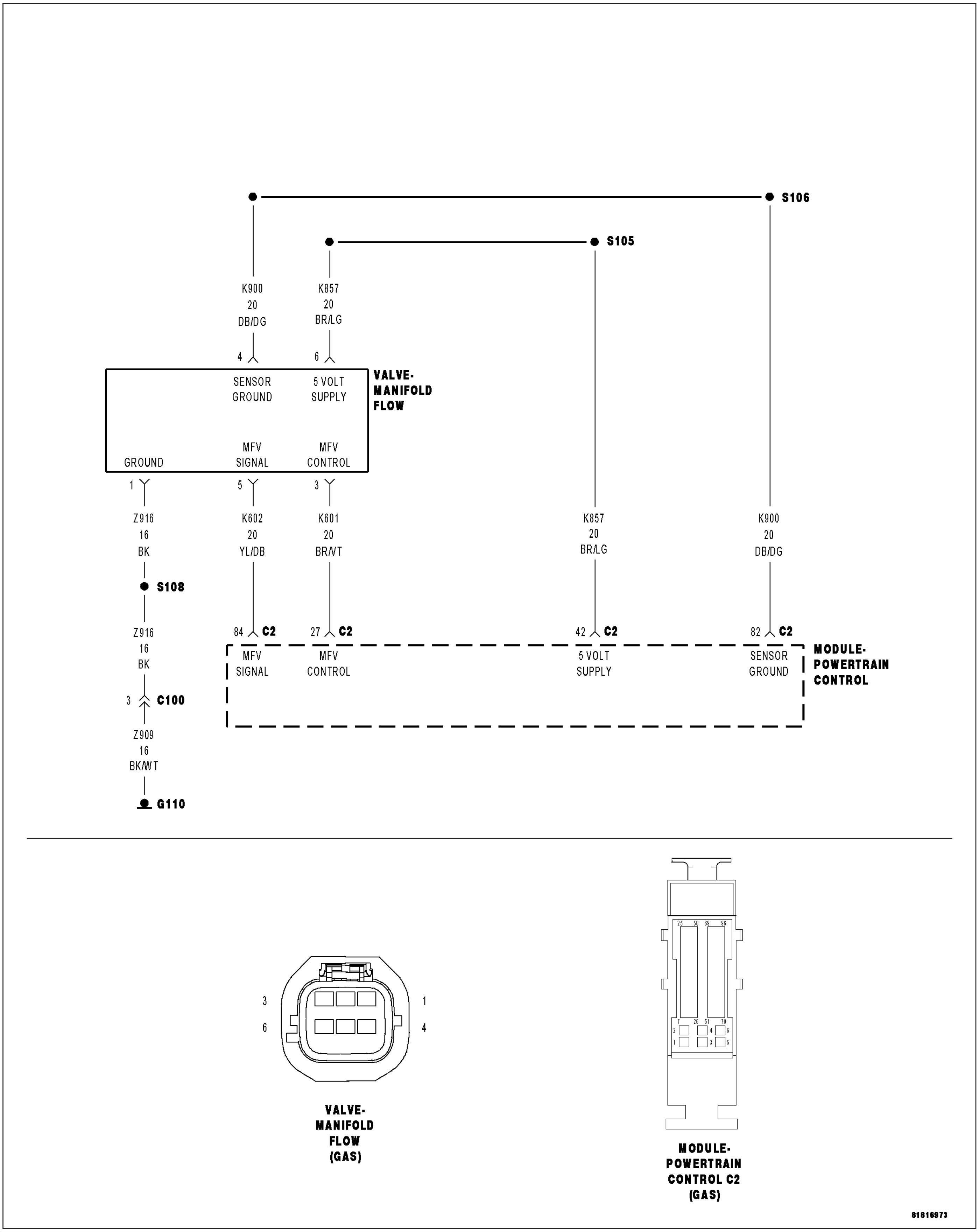
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2010-INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Manifold Flow Valve control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K601) MFV CONTROL CIRCUIT SHORTED TO VOLTAGE
(K601) MFV CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K601) MFV CONTROL CIRCUIT SHORTED TO VOLTAGE

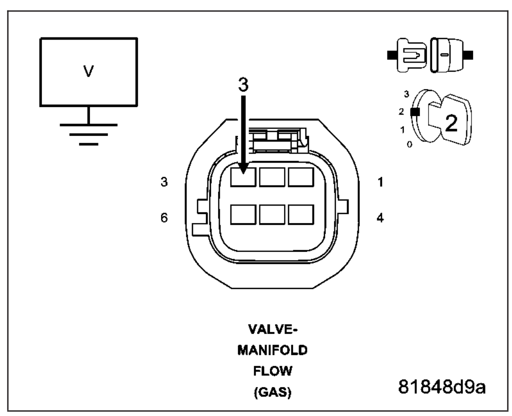
Turn the ignition off.

Disconnect the Manifold Flow Valve connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.



Is there any voltage present?

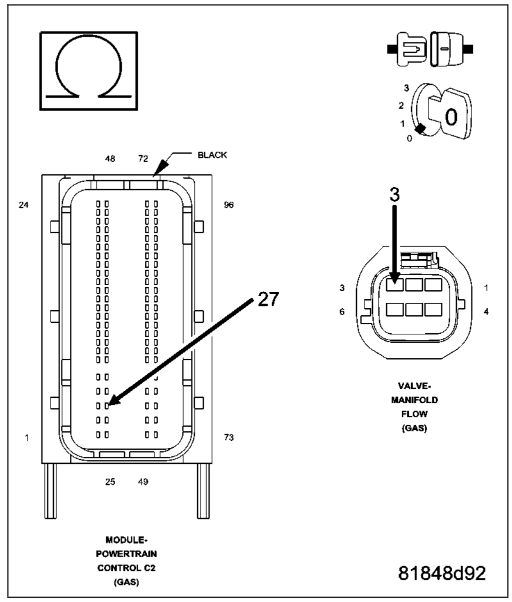
Yes >> Repair the (K601) MFV Control circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K601) MFV CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K601) MFV Control circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (K601) MFV Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

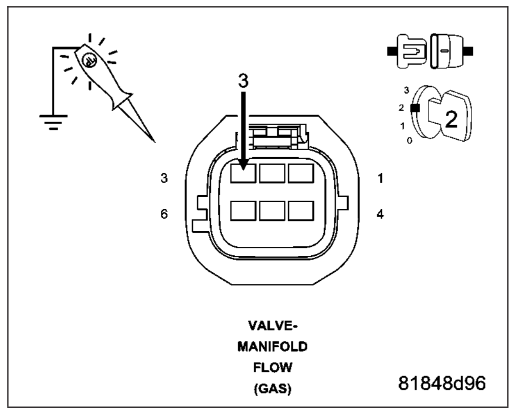
4. MANIFOLD FLOW VALVE

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Manifold Flow Valve control to the ON (100%) position.

Using a 12 volt test light connected to ground, check the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Manifold Flow Valve control to the OFF (0%) position.

Using a 12 volt test light connected to ground, check the (K601) MFV Control circuit in the Manifold Flow Valve harness connector.

NOTE: The test light should not be illuminated.

Is the test light illuminated and bright with the actuator ON (100%) and not illuminated with the actuator OFF (0%)?

Yes >> Replace the Manifold Flow Valve in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

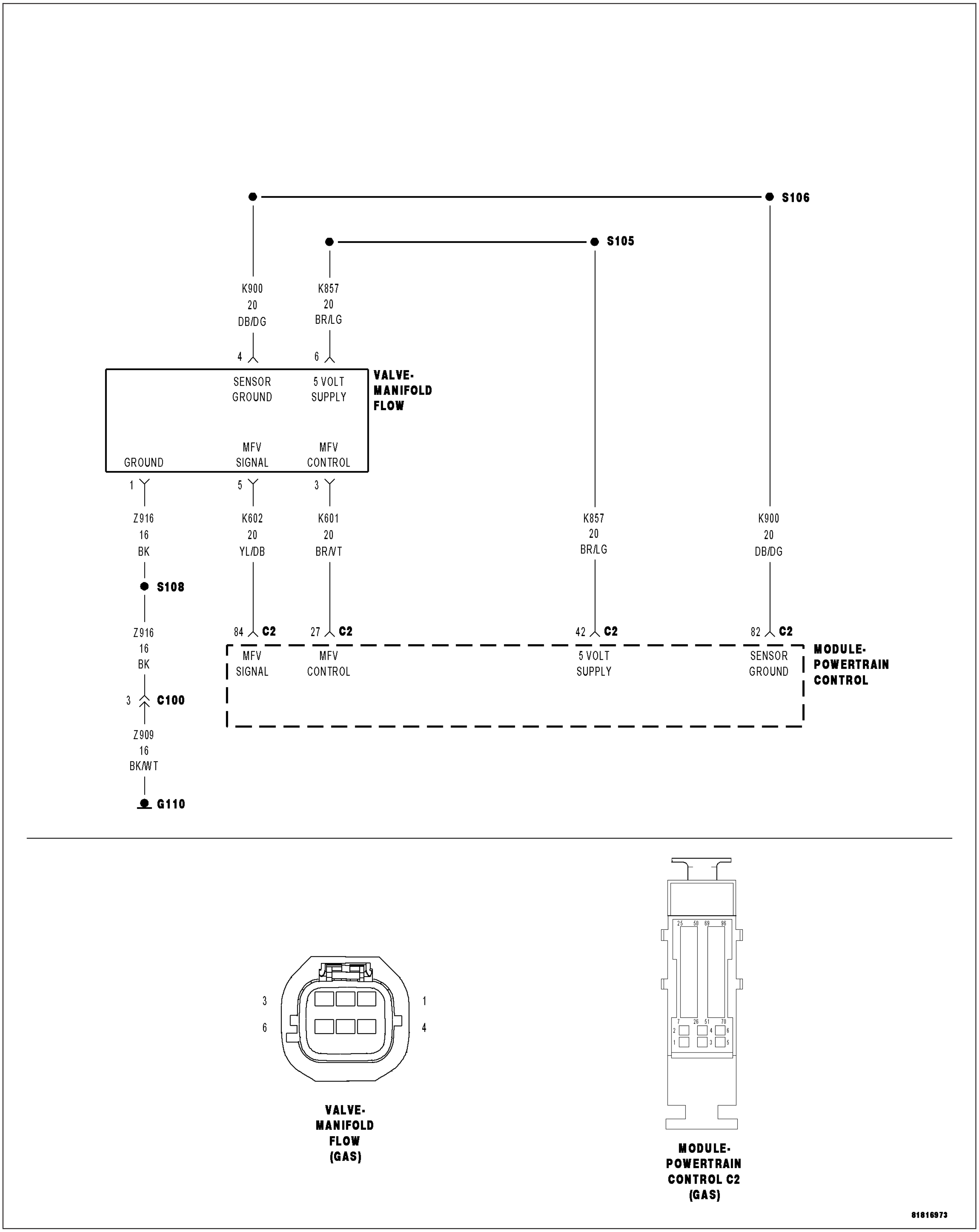
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2016-INTAKE MANIFOLD RUNNER POSITION SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K602) MFV Signal circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT
(K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

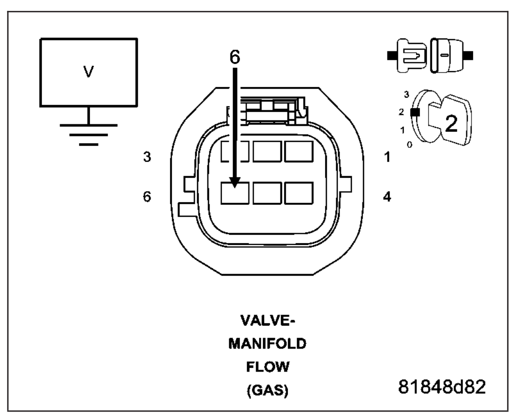
2. (K857) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Manifold Flow Valve connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

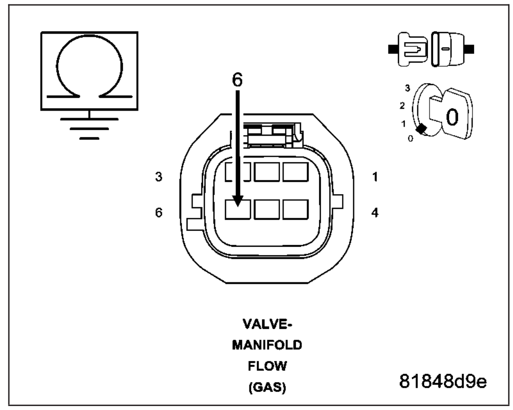
No >> Go to 3

3. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.



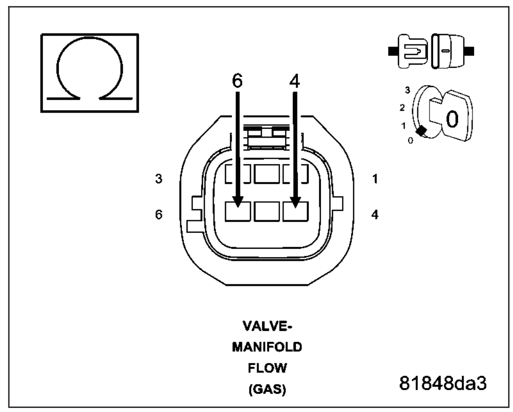
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K857) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K857) 5 Volt Supply circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.



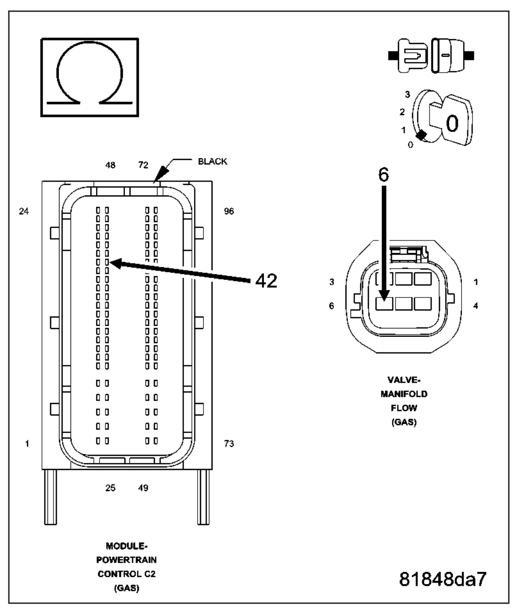
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K857) 5 Volt Supply circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K857) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K857) 5 Volt Supply circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

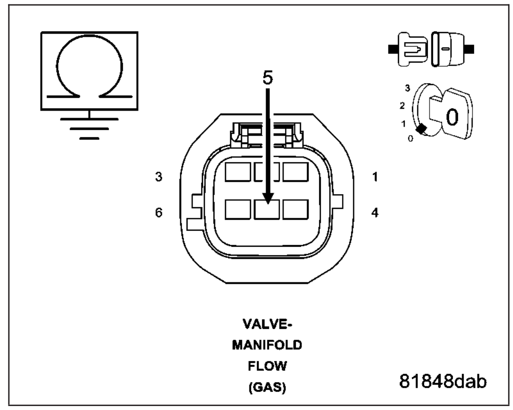
No >> Repair the (K857) 5 Volt Supply circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K602) MFV SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.



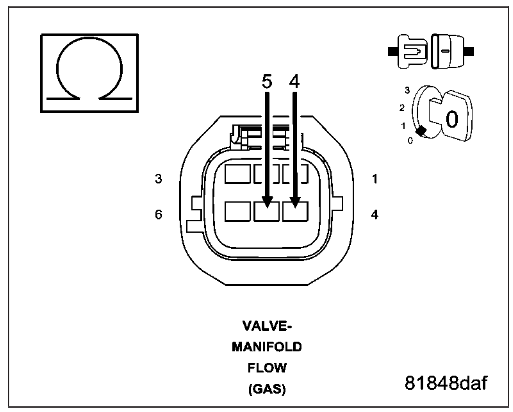
Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (K602) MFV Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K602) MFV SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K900) Sensor Ground circuit in the Manifold Flow Valve harness connector.



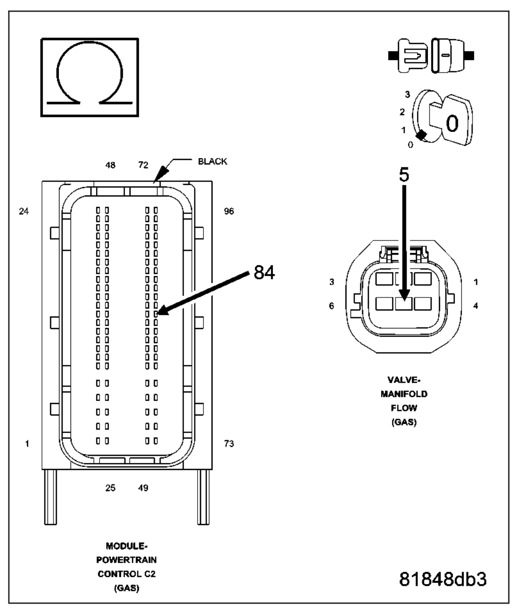
Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (K602) MFV Signal circuit for a short to the (K900) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K602) MFV Signal circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.

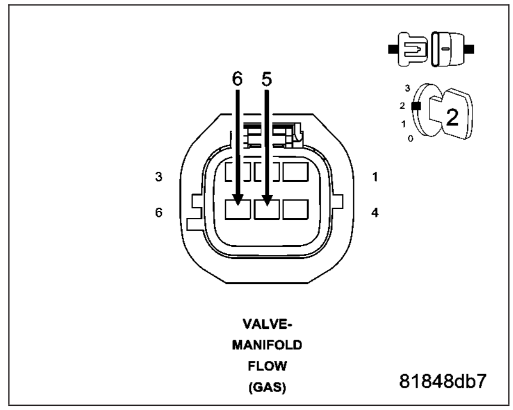


Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K602) MFV Signal circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. MANIFOLD FLOW VALVE



Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K857) 5 Volt Supply circuit and the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Turn the ignition on.

With the scan tool, read the Manifold Flow Valve signal voltage.

Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the Manifold Flow Valve in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

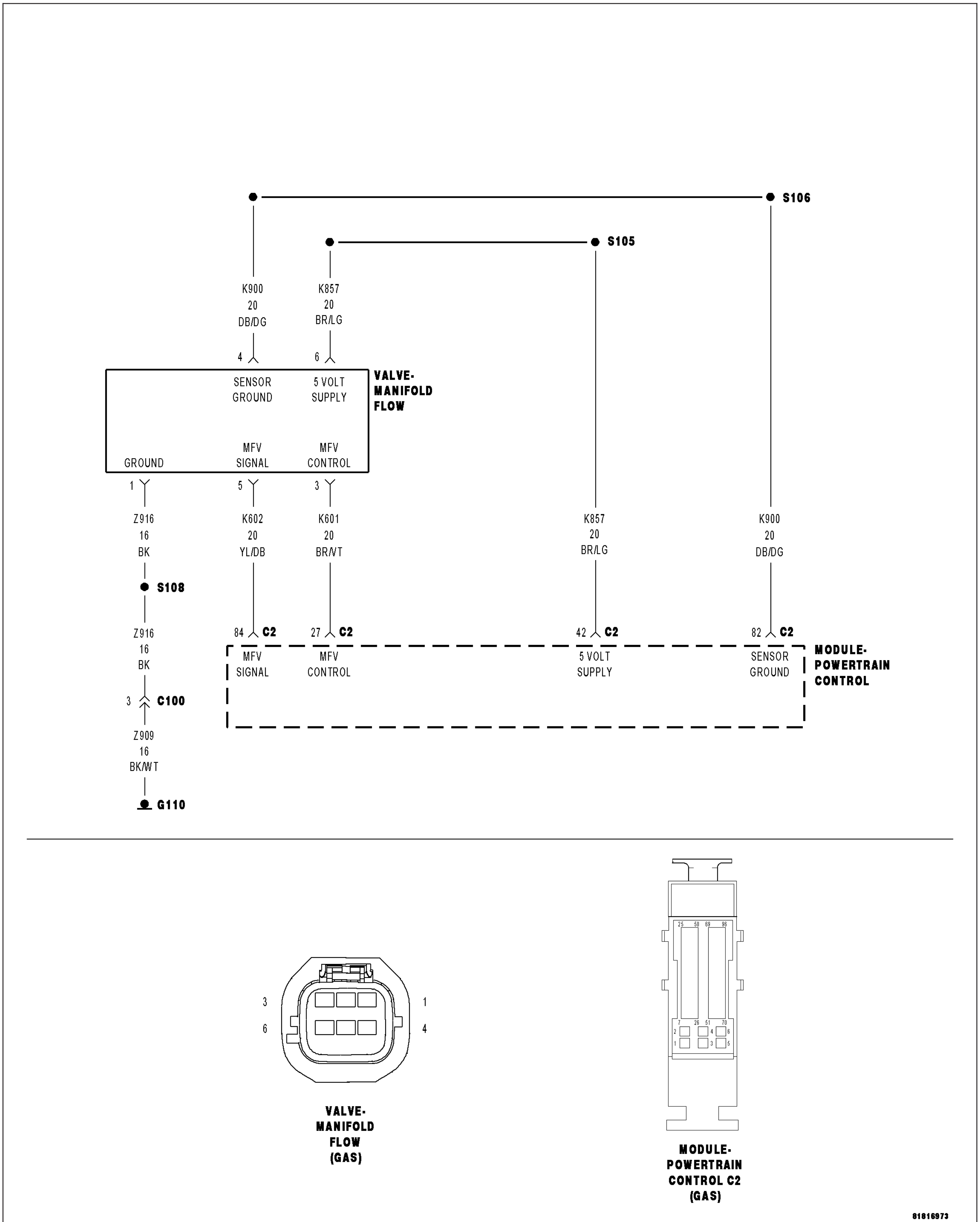
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2017-INTAKE MANIFOLD RUNNER POSITION SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K602) MFV Signal circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT
(K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MANIFOLD FLOW VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K857) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

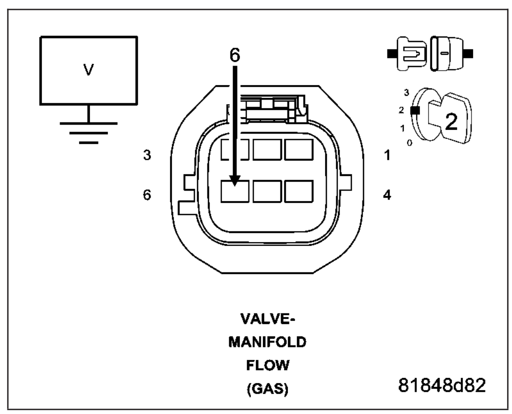
Turn the ignition off.

Disconnect the Manifold Flow Valve connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K857) 5 Volt Supply circuit in the Manifold Flow Valve harness connector.



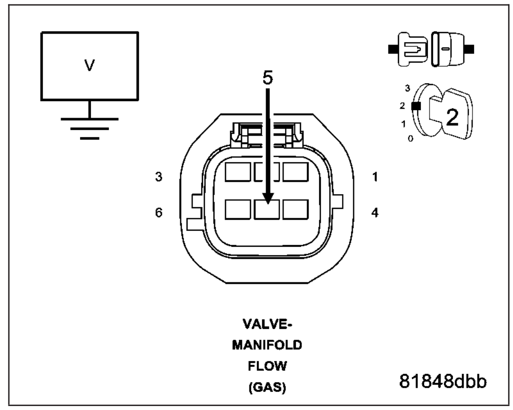
Is there any voltage present?

Yes >> Repair the (K857) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K602) MFV SIGNAL CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.



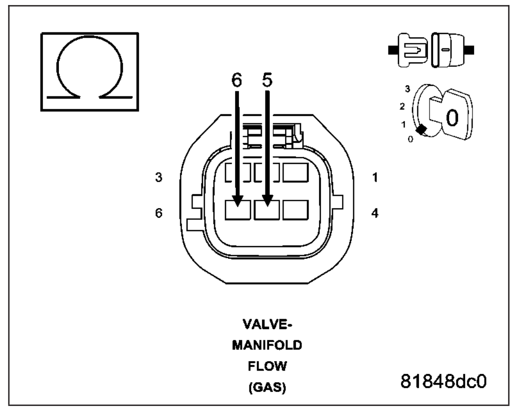
Is there any voltage present?

Yes >> Repair the (K602) MFV Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K602) MFV SIGNAL CIRCUIT SHORTED TO THE (K857) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K602) MFV Signal circuit and the (K857) 5 Volt Supply in the Manifold Flow Valve harness connector.



Is the resistance below 100 ohms?

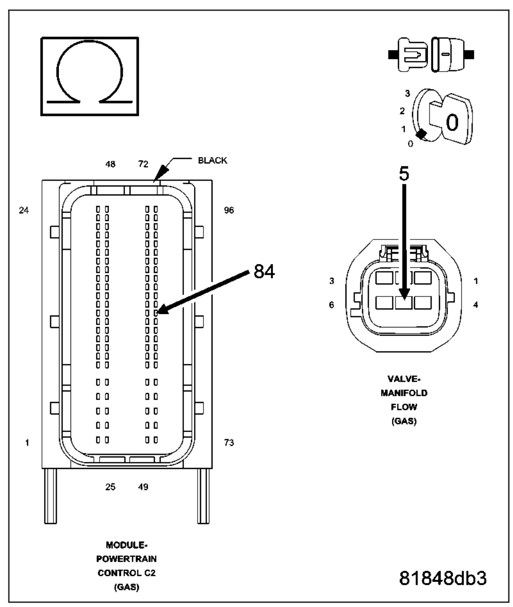
Yes >> Repair the (K602) MFV Signal circuit for a short to the (K857) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K602) MFV SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K602) MFV Signal between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.



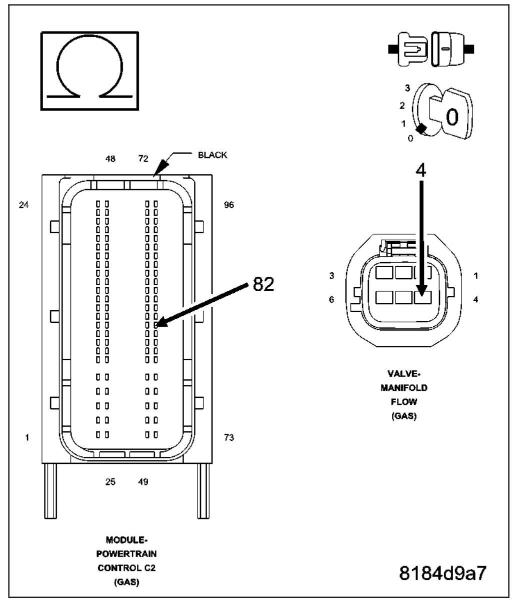
Is the resistance below 5.0 ohms?

Yes >> Go to 6

No >> Repair the (K602) MFV Signal for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K900) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground circuit between the Manifold Flow Valve harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K900) Sensor Ground circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. MANIFOLD FLOW VALVE

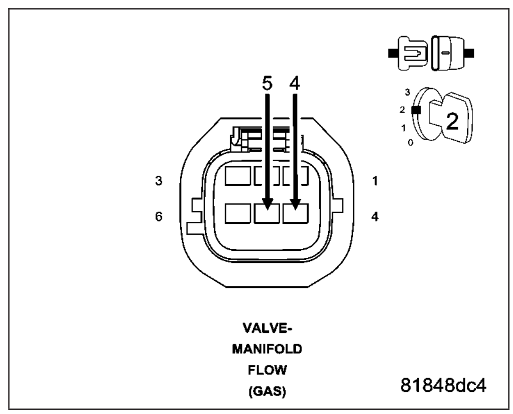
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (K602) MFV Signal circuit in the Manifold Flow Valve harness connector.

Turn the ignition on.

With the scan tool, read the Manifold Flow Valve signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Manifold Flow Valve in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Manifold Flow Valve and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

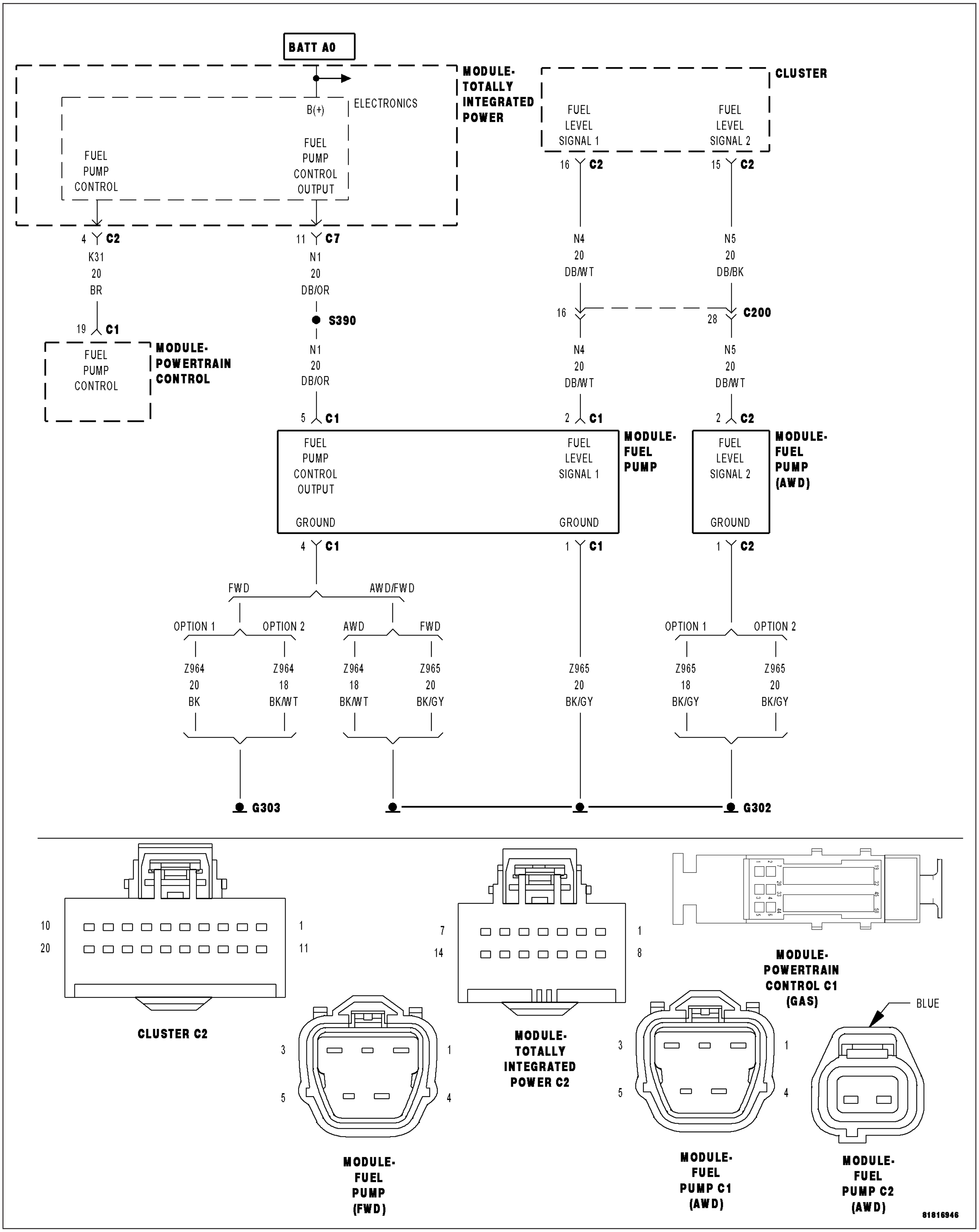
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2066-FUEL LEVEL SENSOR 2 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The PCM detects that the Fuel Level Sensor circuit voltage is implausible.

Possible Causes
INTERMITTENT DTC
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO GROUND
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO THE (Z965) GROUND CIRCUIT
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

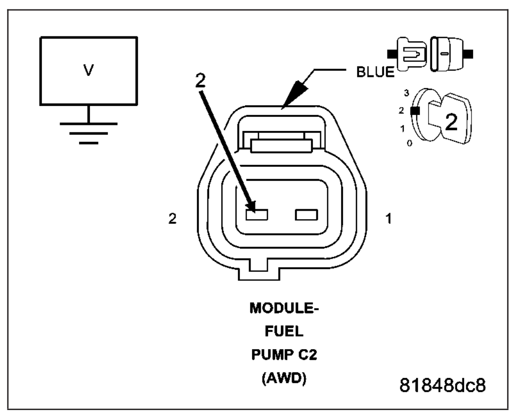
Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Turn the ignition on.

Measure the voltage of the (N5) Fuel Level Signal 2 circuit in the Fuel Level Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (N5) Fuel Level Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

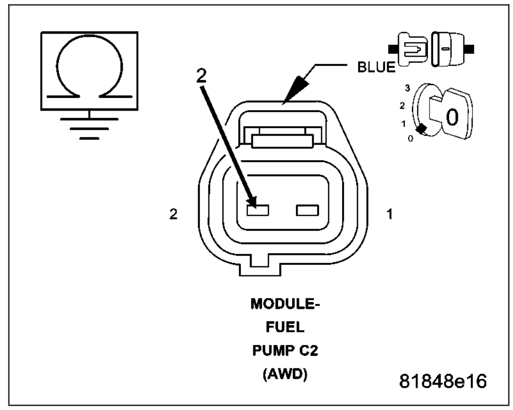
Measure the resistance between ground and the (N5) Fuel Level Signal 2 circuit in the Fuel Level Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (N5) Fuel Level Signal 2 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO THE (Z965) GROUND CIRCUIT

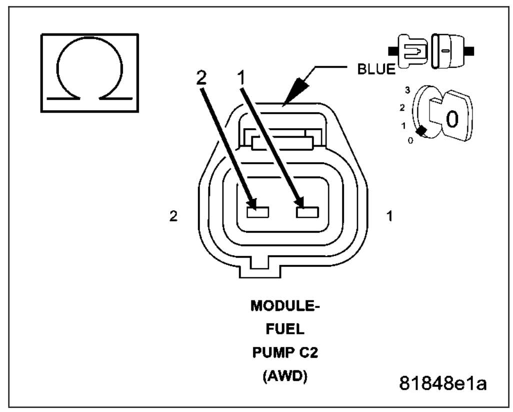
Measure the resistance between the (N5) Fuel Level Signal 2 circuit and the (Z965) Ground circuit in the Fuel Level Sensor harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (N5) Fuel Level Signal 2 circuit for a short to the (Z965) Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

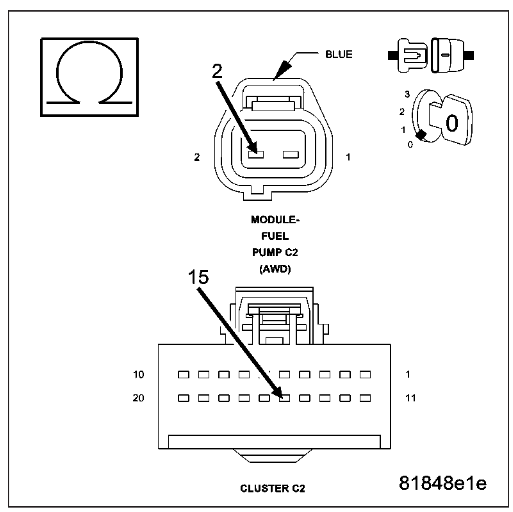
Measure the resistance of the (N5) Fuel Level Signal 2 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.

Is the resistance below 5.0 ohms?

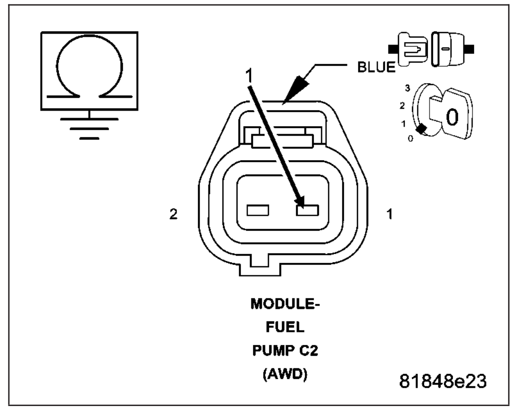
Yes >> Go to 6

No >> Repair the (N5) Fuel Level Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



6. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE



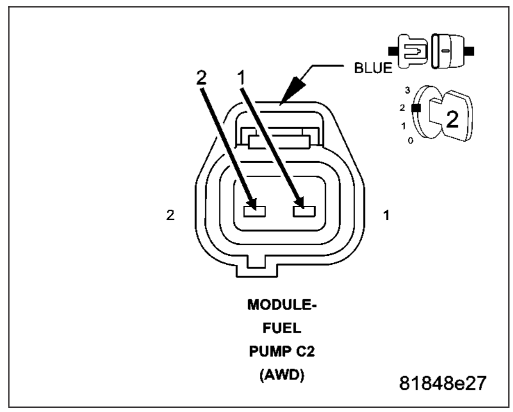
Measure the resistance between ground and the (Z965) Ground circuit in the Fuel Level Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (Z965) Ground for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. FUEL LEVEL SENSOR



Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Connect a jumper wire between the (Z965) Ground circuit and the (N5) Fuel Level Signal 2 circuit in the Fuel Level Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 2 signal voltage.

Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Fuel Level Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

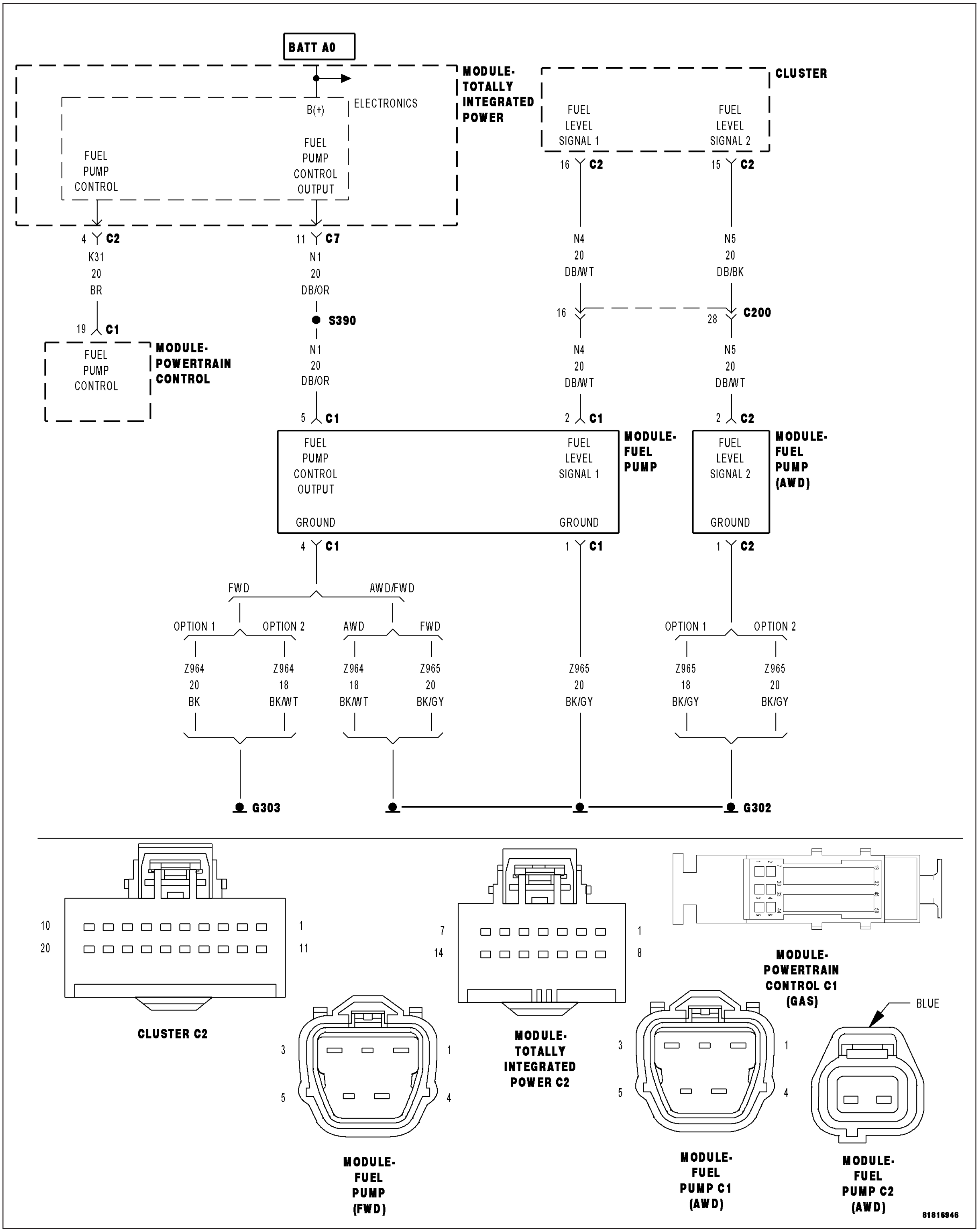
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2067-FUEL LEVEL SENSOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Fuel Level Sensor circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO GROUND
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

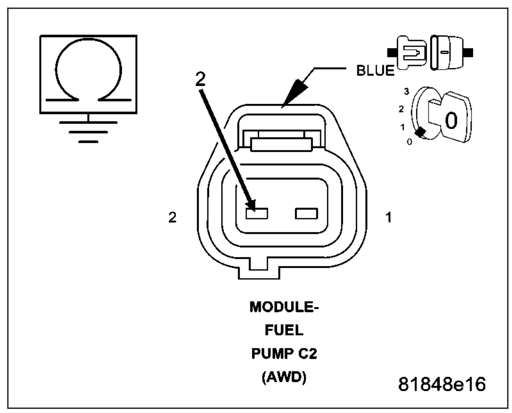
2. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Measure the resistance between ground and the (N5) Fuel Level Signal 2 circuit in the Fuel Level Sensor harness connector.



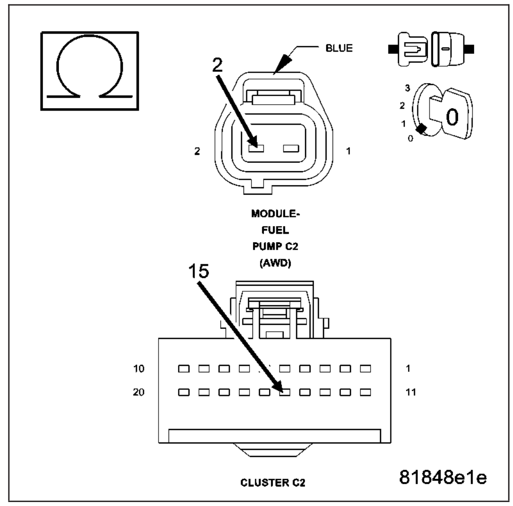
Is the resistance above 100 ohms?

Yes >> Go to 3

No >> Repair the (N5) Fuel Level Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (N5) Fuel Level Signal 2 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 4

No >> Repair the (N5) Fuel Level Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. FUEL LEVEL SENSOR

Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 2 signal voltage.

Is the voltage above 4.5 volts with the Fuel Level Sensor harness disconnected?

Yes >> Replace the Fuel Level Sensor in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

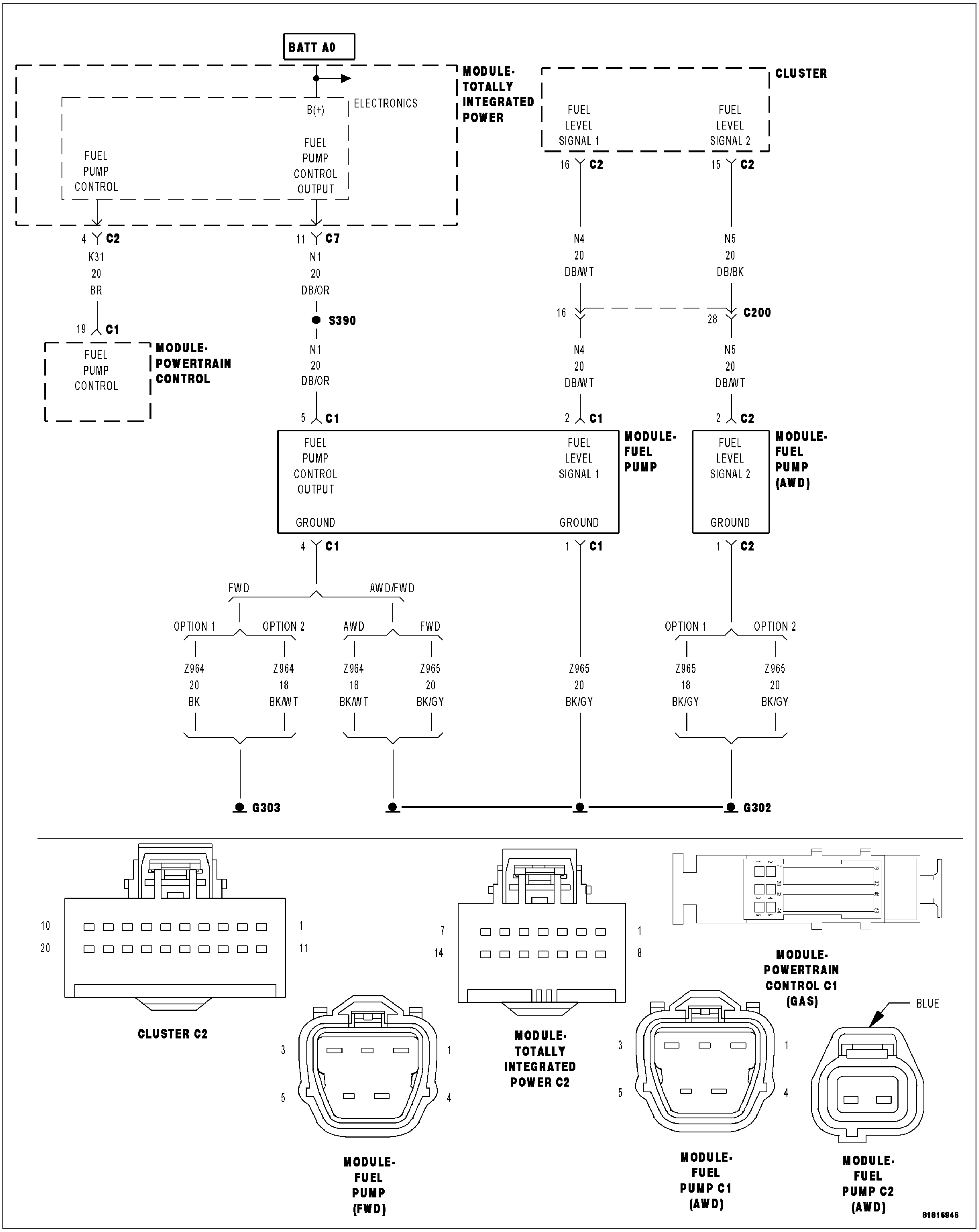
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (N5) Fuel Level Signal 2 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(N5) FUEL LEVEL SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER (CCN)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (N5) FUEL LEVEL SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

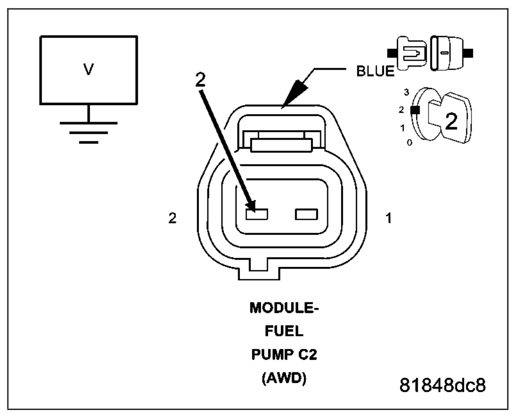
Turn the ignition off.

Disconnect the Fuel Level Sensor connector.

Disconnect the Instrument Cluster (CCN) connector.

Turn the ignition on.

Measure the voltage of the (N5) Fuel Level Signal 2 circuit in the Fuel Level Sensor harness connector.



Is there any voltage present?

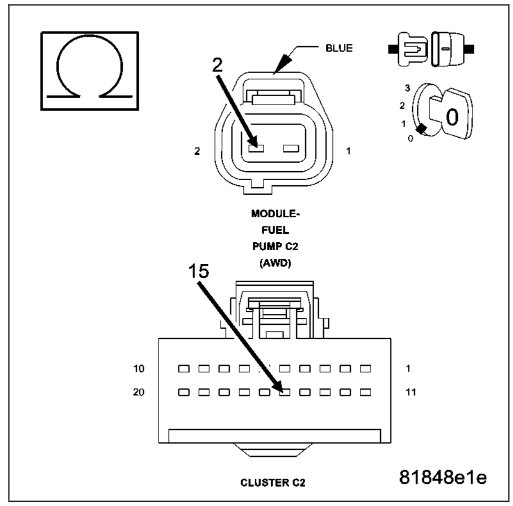
Yes >> Repair the (N5) Fuel Level Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (N5) FUEL LEVEL SIGNAL 2 OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (N5) Fuel Level Signal 2 circuit between the Fuel Level Sensor harness connector and the Instrument Cluster (CCN) harness connector.



Is the resistance below 5.0 ohms?

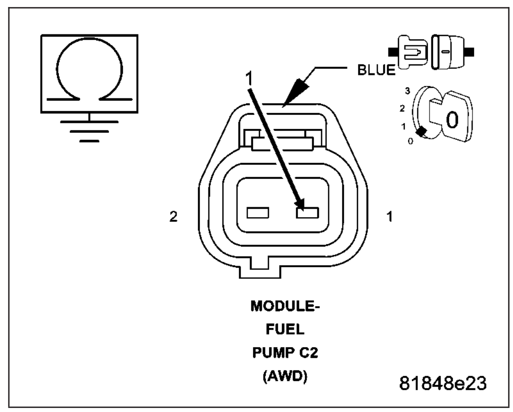
Yes >> Go to 4

No >> Repair the (N5) Fuel Level Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (Z965) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance between ground and the (Z965) Ground circuit at the Fuel Level Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (Z965) Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL LEVEL SENSOR

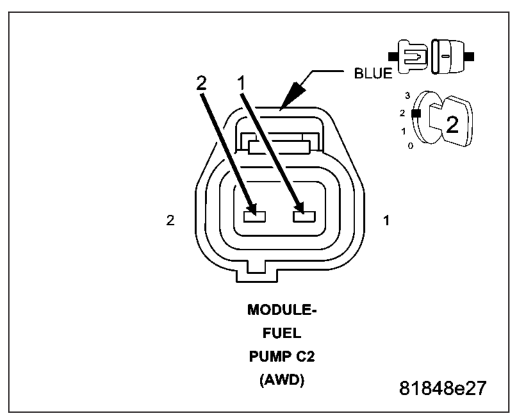
Turn the ignition off.

Connect the Instrument Cluster (CCN) connector.

Connect a jumper wire between the (N5) Fuel Level Signal 2 circuit and the (Z965) Ground in the Fuel Level Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Fuel Level Sensor 2 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Fuel Level Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. INSTRUMENT CLUSTER (CCN)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Level Sensor and the Instrument Cluster (CCN).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Instrument Cluster (CCN) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2072-ELECTRONIC THROTTLE CONTROL SYSTEM - ICE BLOCKAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the throttle plate is stuck during extremely cold ambient temperature operation. The PCM will initiate a throttle de-icing procedure, and if the throttle blade still doesn't move, this DTC will set. The MIL will not illuminate. The vehicle will be in Limp home condition, limiting rpm and vehicle speed.

Possible Causes
THROTTLE PLATE OBSTRUCTION

Diagnostic Test

1. THROTTLE BODY INSPECTION

Ignition on, engine not running.

With a scan tool, select View DTCs. Record the related Freeze Frame data.

NOTE: Diagnose any other DTCs before continuing.

NOTE: This DTC will set in extreme cold ambient temperatures when the PCM detects that the throttle plate is stuck. By the time the vehicle is serviced, the condition may be corrected.

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick.

Were any problems found?

Yes >> Repair as necessary. It the throttle blade is frozen, allow the throttle body to thaw naturally in a warm location.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.

P2074-MAP/TPS CORRELATION - HIGH AIRFLOW/VACUUM LEAK DETECTED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During all drive modes
- **Set Condition:**
  With engine vacuum below 1.5″ Hg, engine RPM greater than 2000 RPM, and a closed throttle. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
VACUUM LEAK
MAP SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
THROTTLE POSITION SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
MAP SENSOR
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose and repair any TP Sensor or MAP Sensor DTCs before continuing.

NOTE: Diagnose and repair any VSS or 5 Volt supply circuit DTCs before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VACUUM LEAK

NOTE: This code is enabled on engines equipped with a plastic intake manifold to limit engine operation if a large vacuum leak should occur.

NOTE: A large vacuum leak is the most probable cause of this DTC.

Inspect the intake manifold, power brake booster, and PCV system for any vacuum leaks.

Inspect the throttle plate. If the throttle blade is bent or will not close, the throttle body may need to be replaced.

Inspect the MAP Sensor and Throttle Body for proper installation.

Inspect the engine for any mechanical conditions that can cause low engine vacuum.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go to 5

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the MAP Sensor circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor 1 and TP Sensor 2 voltages.

Slowly press the throttle pedal down.

The voltage for TP Sensor 1 should start at approximately 0.3 volts and increase to above 4.7 volts.

The voltage for TP Sensor 2 should start at approximately 4.7 volts and decrease to approximately 0.3 volts.

Is the voltage within the range specified for each sensor?

Yes >> Go to 7

No >> Go to 6

6. THROTTLE BODY

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the Throttle Body circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM) and between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

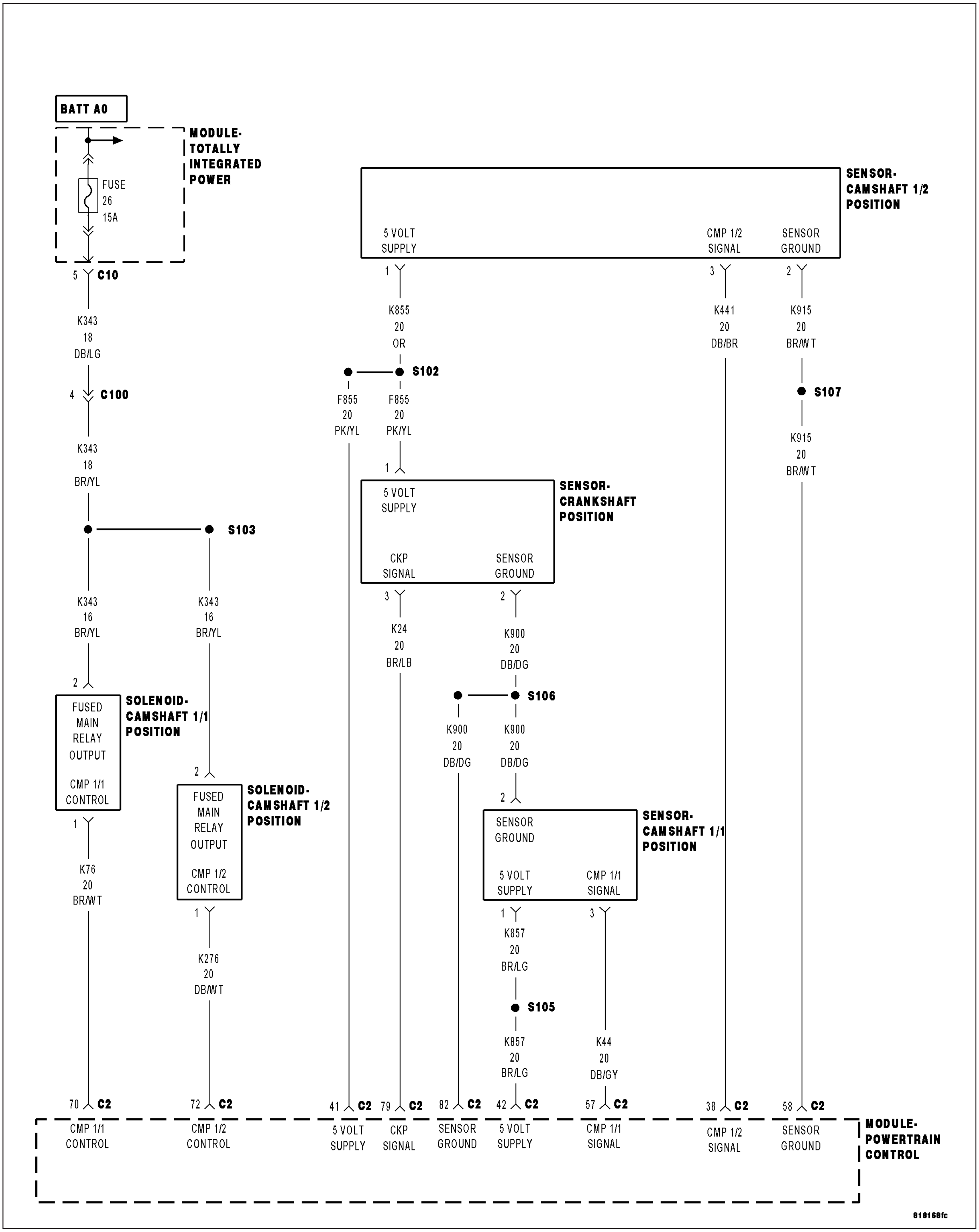
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2088-BANK 1 CAMSHAFT 1 POSITION ACTUATOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K76) CMP 1/1 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO GROUND
(K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

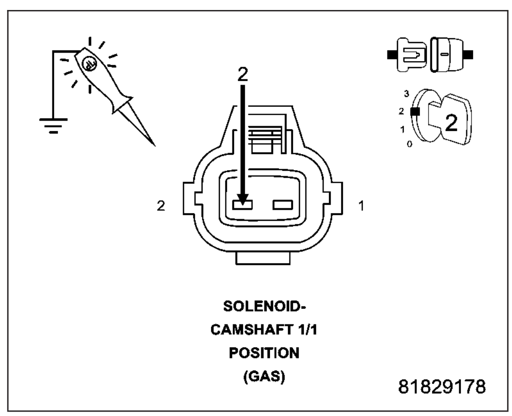
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/1 Position Solenoid harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

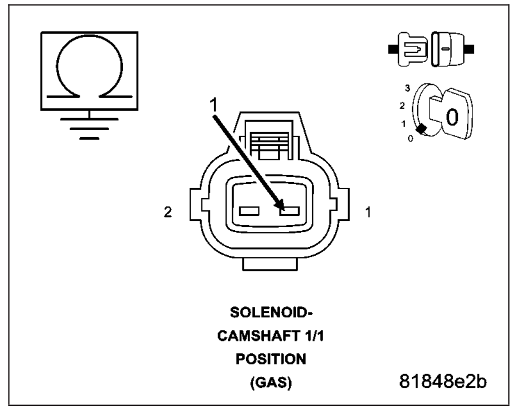
No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.



Is the resistance below 100 ohms?

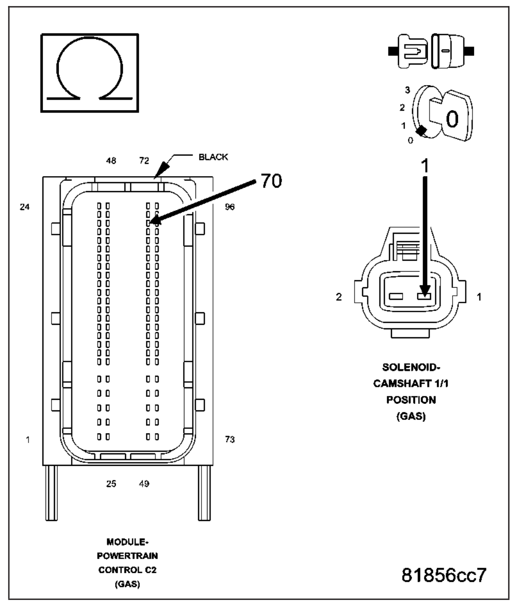
Yes >> Repair the (K76) CMP 1/1 Control circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K76) CMP 1/1 Control circuit between the Camshaft 1/1 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K76) CMP 1/1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

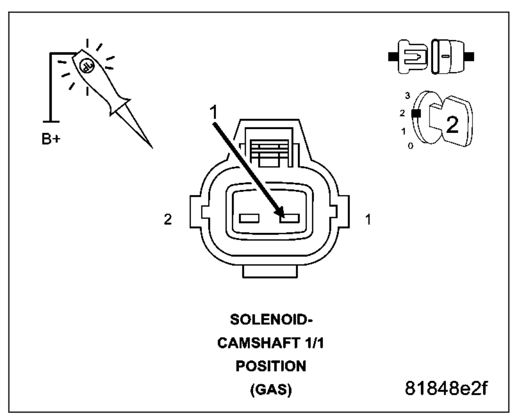
5. CAMSHAFT 1/1 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to OFF (0%).

Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Camshaft 1/1 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

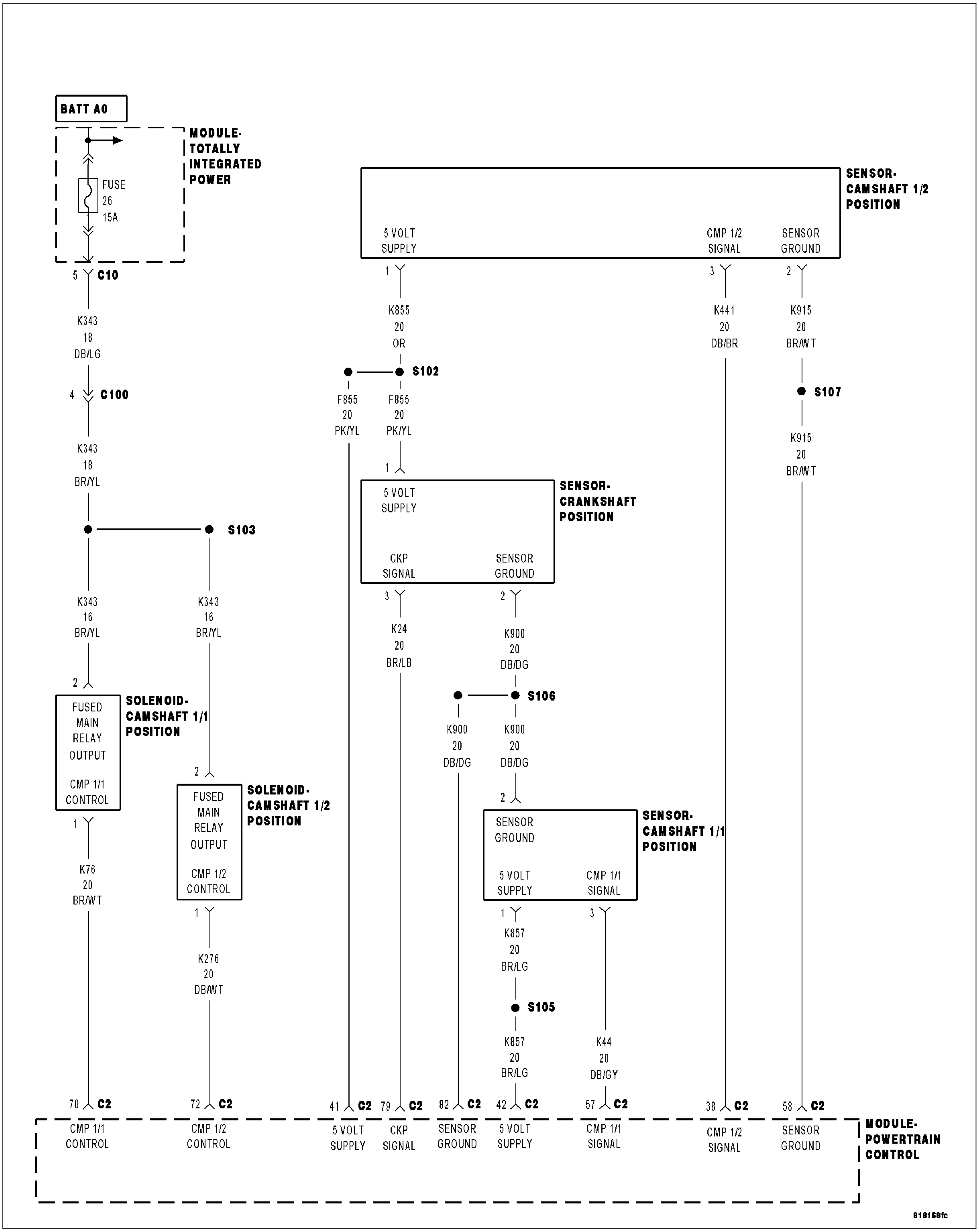
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2089-BANK 1 CAMSHAFT 1 POSITION ACTUATOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K76) CMP 1/1 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/1 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO VOLTAGE

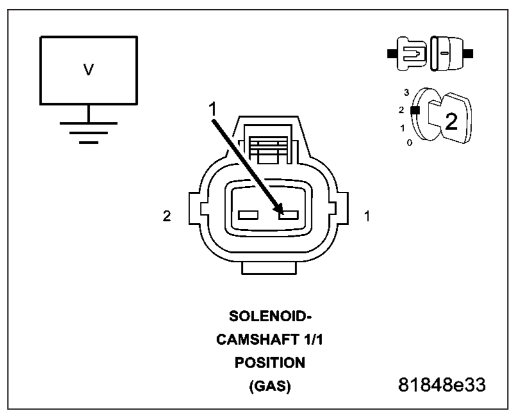
Turn the ignition off.

Disconnect the Camshaft 1/1 Position Solenoid connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.



Is there any voltage present?

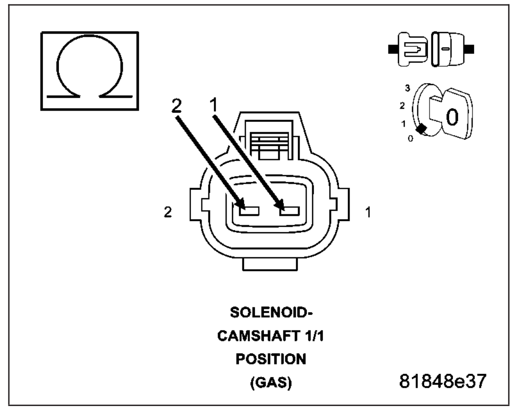
Yes >> Repair the (K76) CMP 1/1 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K76) CMP 1/1 CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (K76) CMP 1/1 Control circuit and the (K343) Fused Main Relay Output circuit in the Camshaft 1/1 Position Solenoid harness connector.



Is the resistance above 100 ohms?

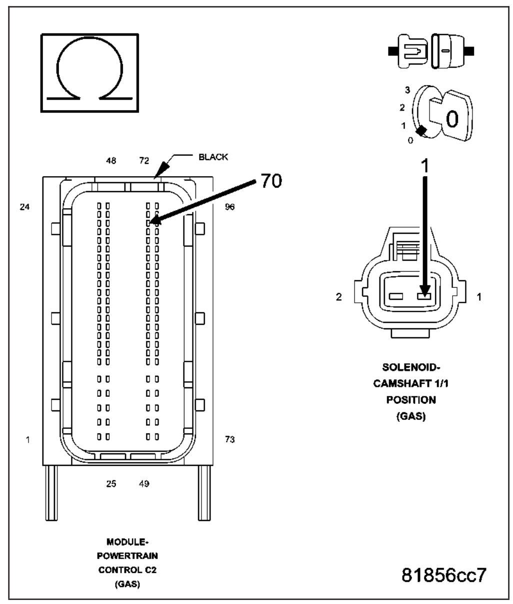
Yes >> Go to 4

No >> Repair the (K76) CMP 1/1 Control circuit for a short to the (K343) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K76) CMP 1/1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K76) CMP 1/1 Control circuit between the Camshaft 1/1 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K76) CMP 1/1 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

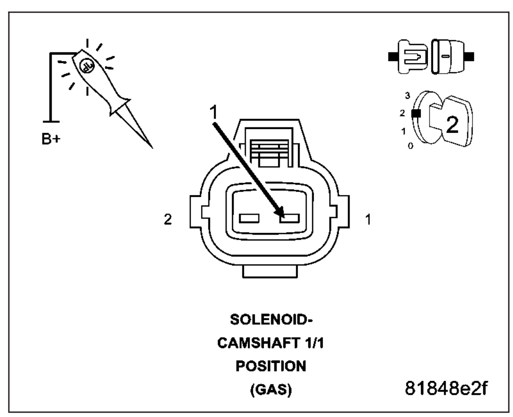
5. CAMSHAFT 1/1 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/1 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K76) CMP 1/1 Control circuit in the Camshaft 1/1 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Camshaft 1/1 Position Solenoid in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/1 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

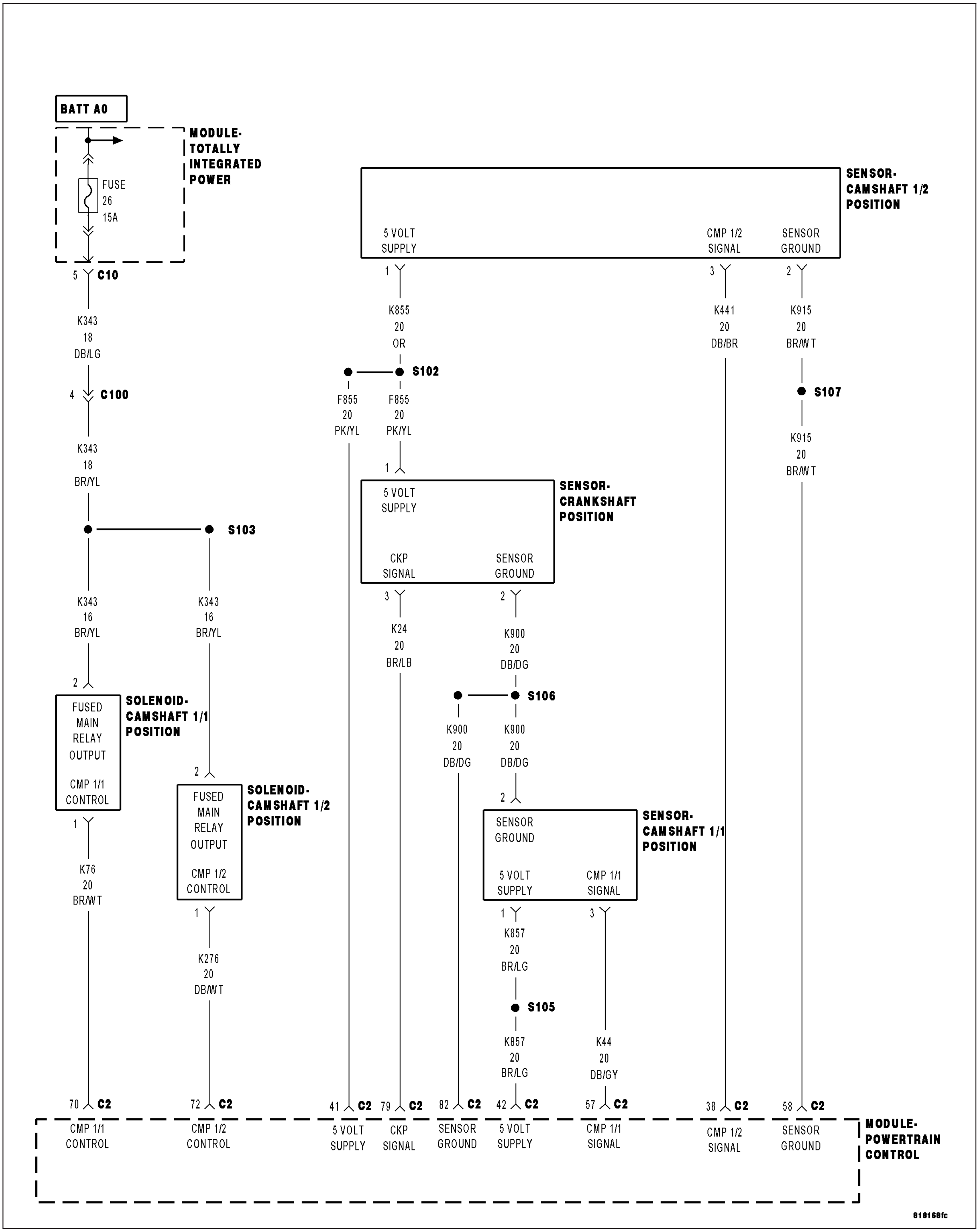
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2090-BANK 1 CAMSHAFT 2 POSITION ACTUATOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K276) CMP 1/2 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO GROUND
(K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/2 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

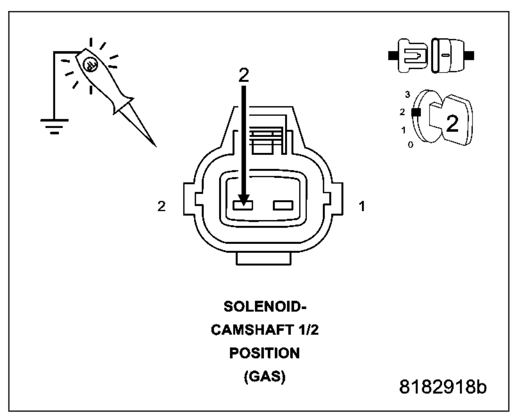
2. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Camshaft 1/2 Position Solenoid harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the Camshaft 1/2 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

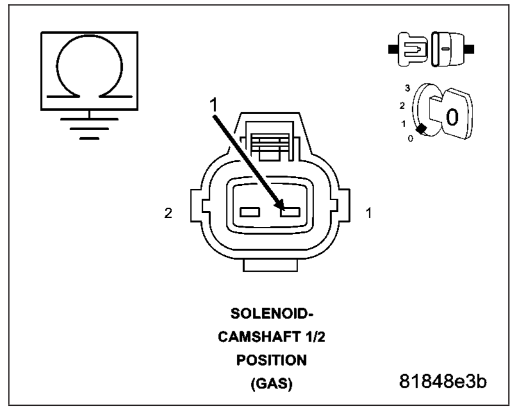
No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.



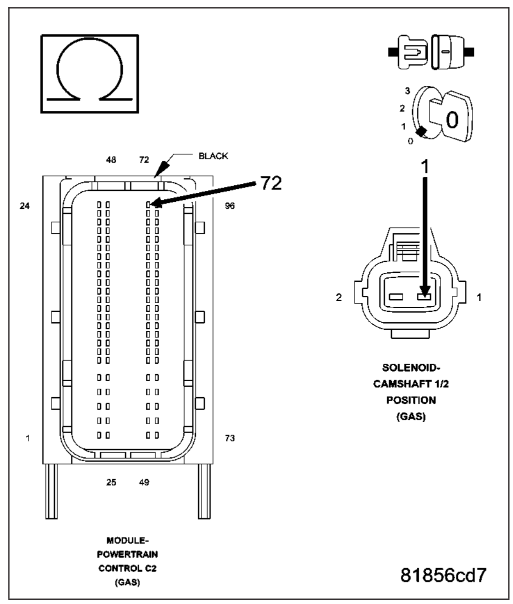
Is the resistance below 100 ohms?

Yes >> Repair the (K276) CMP 1/2 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K276) CMP 1/2 Control circuit between the Camshaft 1/2 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K276) CMP 1/2 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

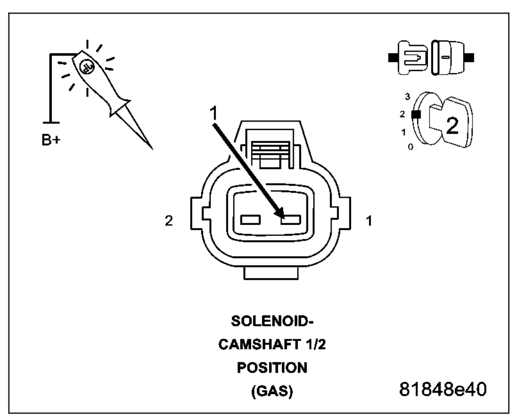
5. CAMSHAFT 1/2 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright with the control actuated ON (100%). Compare the brightness to that of a direct connection to the battery.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to OFF (0%).

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.

NOTE: The test light should not be illuminated with the control actuated OFF (0%).

Is the test light illuminated and bright with the control actuated ON and not illuminated with the control

actuated OFF?

Yes >> Replace the Camshaft 1/2 Position Solenoid in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

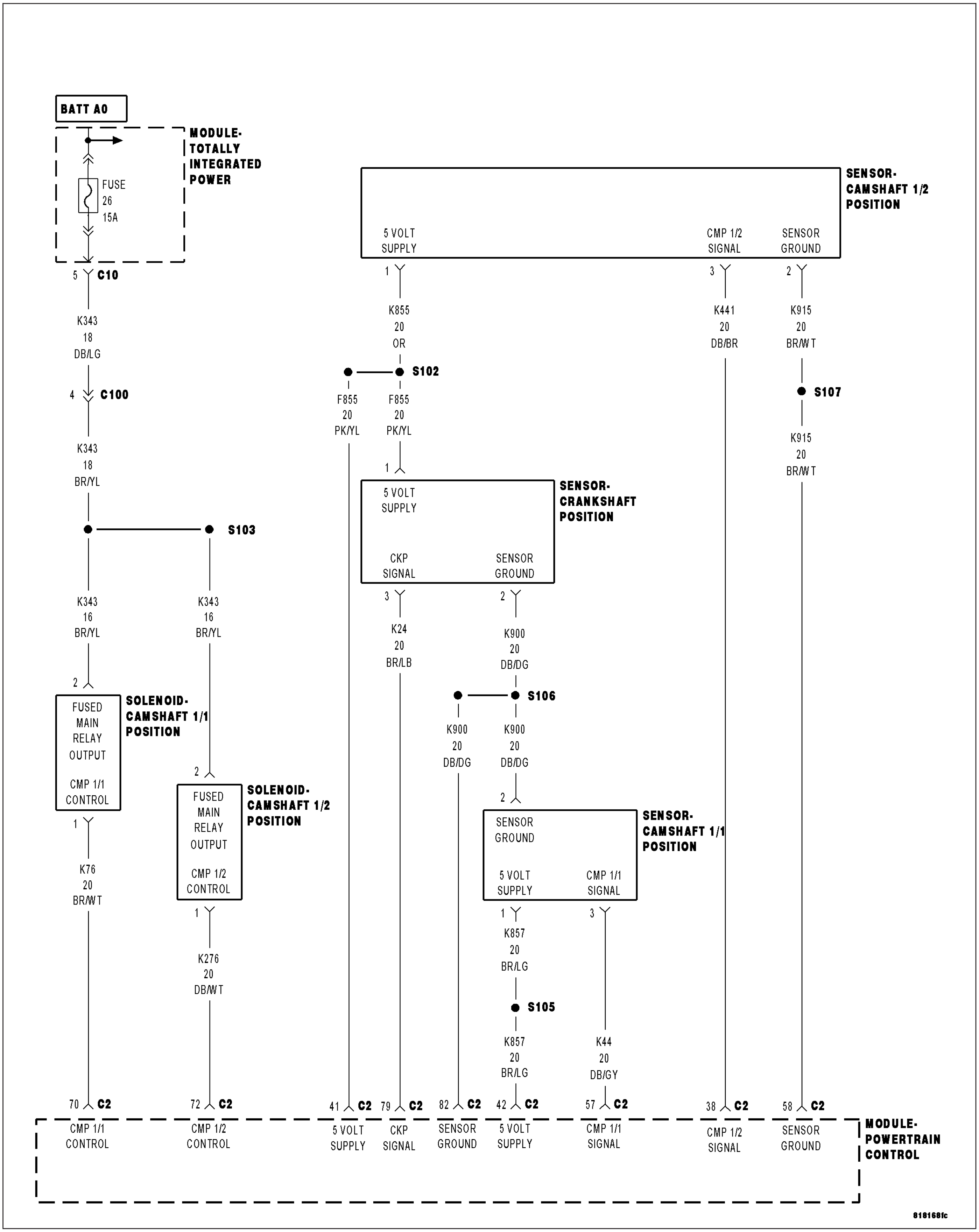
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2091-BANK 1 CAMSHAFT 2 POSITION ACTUATOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K276) CMP 1/2 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
CAMSHAFT 1/2 POSITION SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO VOLTAGE

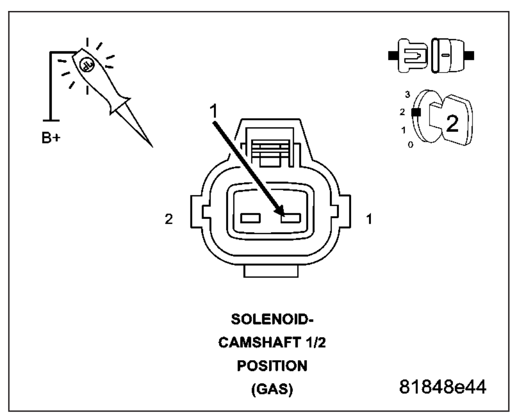
Turn the ignition off.

Disconnect the Camshaft 1/2 Position Solenoid connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.



Is there any voltage present?

Yes >> Repair the (K276) CMP 1/2 Control circuit for a short to voltage.

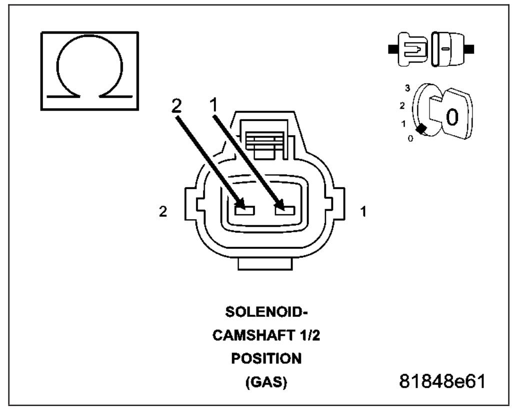
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K276) CMP 1/2 CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (K276) CMP 1/2 Control circuit and the (K343) Fused Main Relay Output circuit in the Camshaft 1/2 Position Solenoid harness connector.



Is the resistance above 100 ohms?

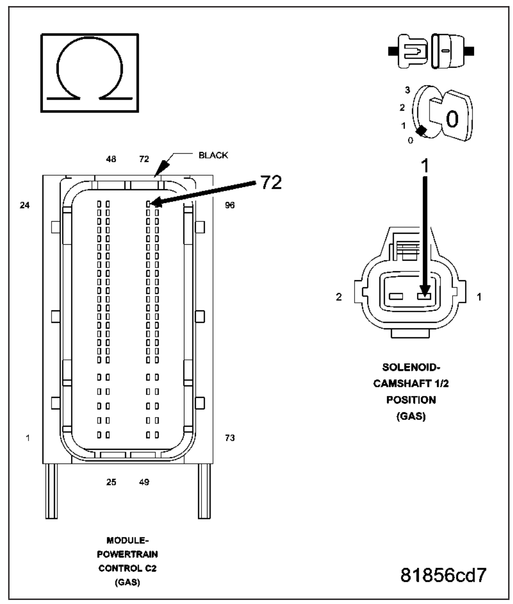
Yes >> Go to 4

No >> Repair the (K276) CMP 1/2 Control circuit for a short to the (K343) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K276) CMP 1/2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K276) CMP 1/2 Control circuit between the Camshaft 1/2 Position Solenoid harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K276) CMP 1/2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

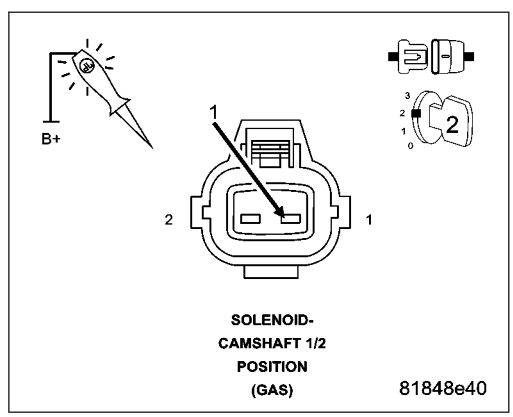
5. CAMSHAFT 1/2 POSITION SOLENOID

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, actuate the Camshaft 1/2 Position Solenoid control to the ON (100%) position.

Using a 12 volt test light connected to 12 volts, check the (K276) CMP 1/2 Control circuit in the Camshaft 1/2 Position Solenoid harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Camshaft 1/2 Position Solenoid in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Camshaft 1/2 Position Solenoid and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

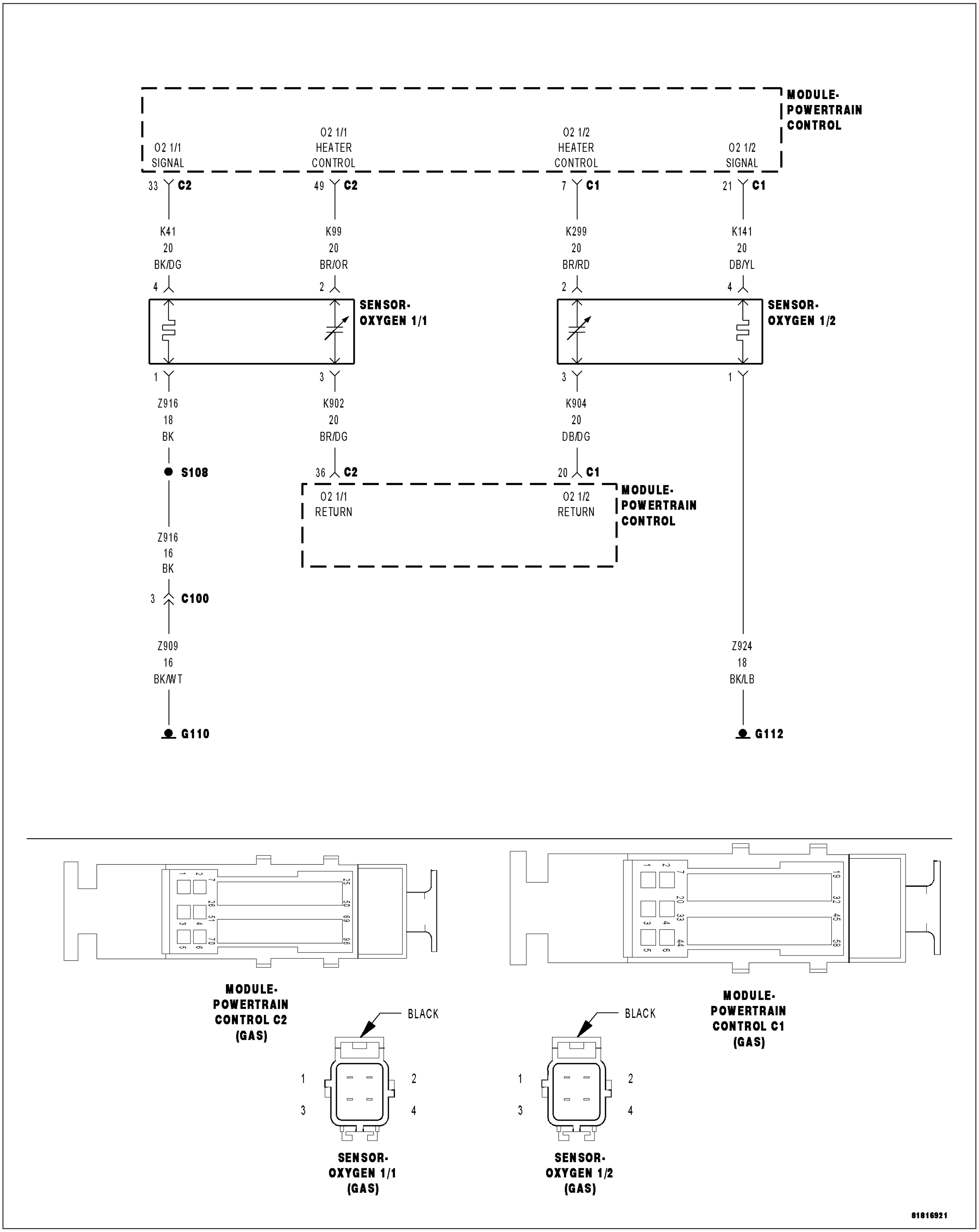
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Monitored constantly when the upstream and downstream O2 sensors are operating in closed loop.
- **Set Condition:**
  The purpose of the diagnostic for this DTC is to determine if the upstream O2 sensor has become biased due to an exhaust leak, sensor contamination, or some other extreme condition. The downstream O2 sensor is considered to be protected from extreme conditions by the catalyst. The downstream O2 sensor feedback control is used to diagnose whether the upstream O2 sensor has become biased. The value of the downstream fuel trim is monitored and compared for rich and lean conditions. Every time the value exceeds the calculated threshold, a timer increments. If the fail timer exceeds the fail threshold, the test fails and the diagnostic stops running for that trip. If the test fails on consecutive trips, a DTC is set.

Possible Causes
INTERMITTENT DTC
EXHAUST LEAK
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EXHAUST LEAK

NOTE: A thorough exhaust leak test must be completed before removing an O2 Sensor or any other part from the exhaust system. Do not remove any parts before an exhaust leak check has been completed.

NOTE: An exhaust leak may cause downstream fuel adaptives to rail out, resulting in a false 1/1 O2 Sensor failure

Turn the ignition off.

Inspect the exhaust system for leaks between the engine and the 1/1 Oxygen Sensor.

Perform a leak test with Miller Tool #8404A Evaporative Emissions Leak Detector (EELD), even if an audible leak is not heard. Pay particular attention to the exhaust manifold to head surface, exhaust pipe to manifold connection, and the O2 sensor boss for leaks.

Connect the SMOKE supply tip (black hose) to the exhaust cone adapter (if equipped) and place it into the tail pipe.

Set the smoke/air control switch to SMOKE.

Press the remote smoke/air start button.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the exhaust system path and look for a leak, indicated by exiting smoke.

If a leak is concealed from view, release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Were any exhaust leaks found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. DTC IS ACTIVE

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

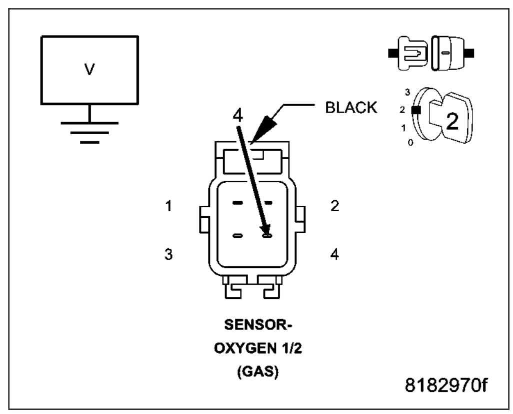
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/2 harness connector.

Measure the voltage on the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: Measure the voltage in reference to ground, not the (K904) O2 1/2 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

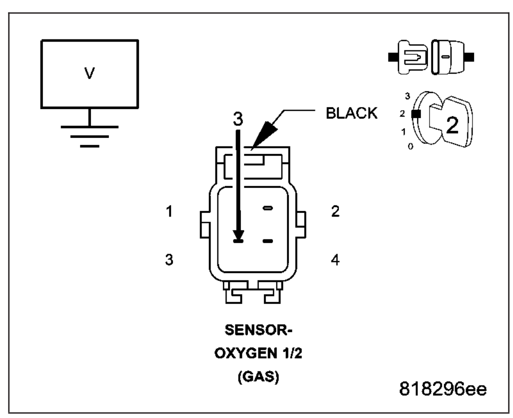
4. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is there any voltage present?

Yes >> Repair the (K904) O2 1/2 Return circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT

Turn the ignition off.

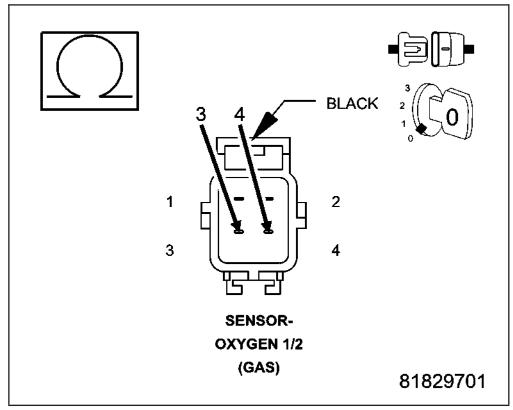
Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K904) O2 1/2 Return circuit the Oxygen Sensor 1/2 harness connector.

Is the resistance below 100.0 ohms?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to the (K904) O2 1/2 Return.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6



6. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

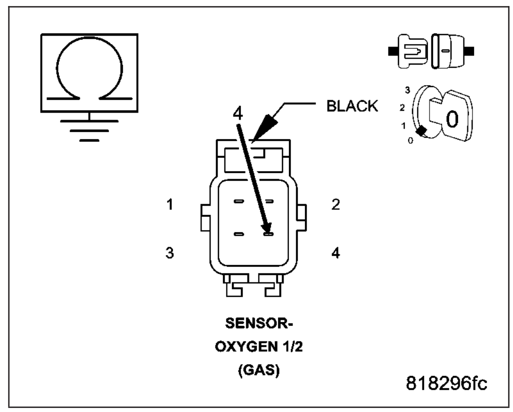
Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7



7. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND

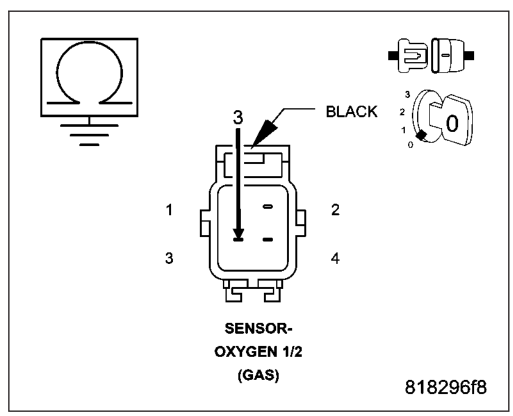
Measure the resistance between ground and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K904) O2 1/2 Return circuit for a short to ground.

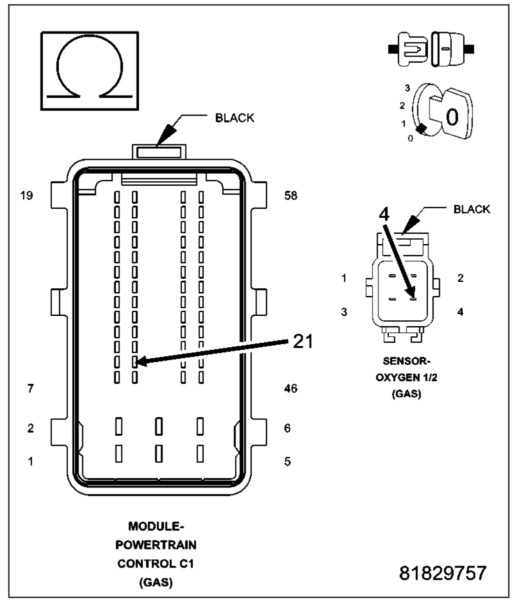
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



8. (K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K141) O2 1/2 Signal circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

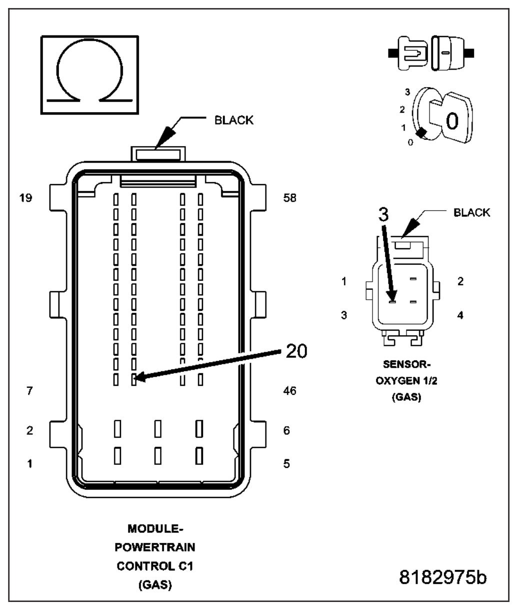
Yes >> Go to 9

No >> Repair the (K141) O2 1/2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K904) O2 1/2 Return circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K904) O2 1/2 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. OXYGEN SENSOR 1/2

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

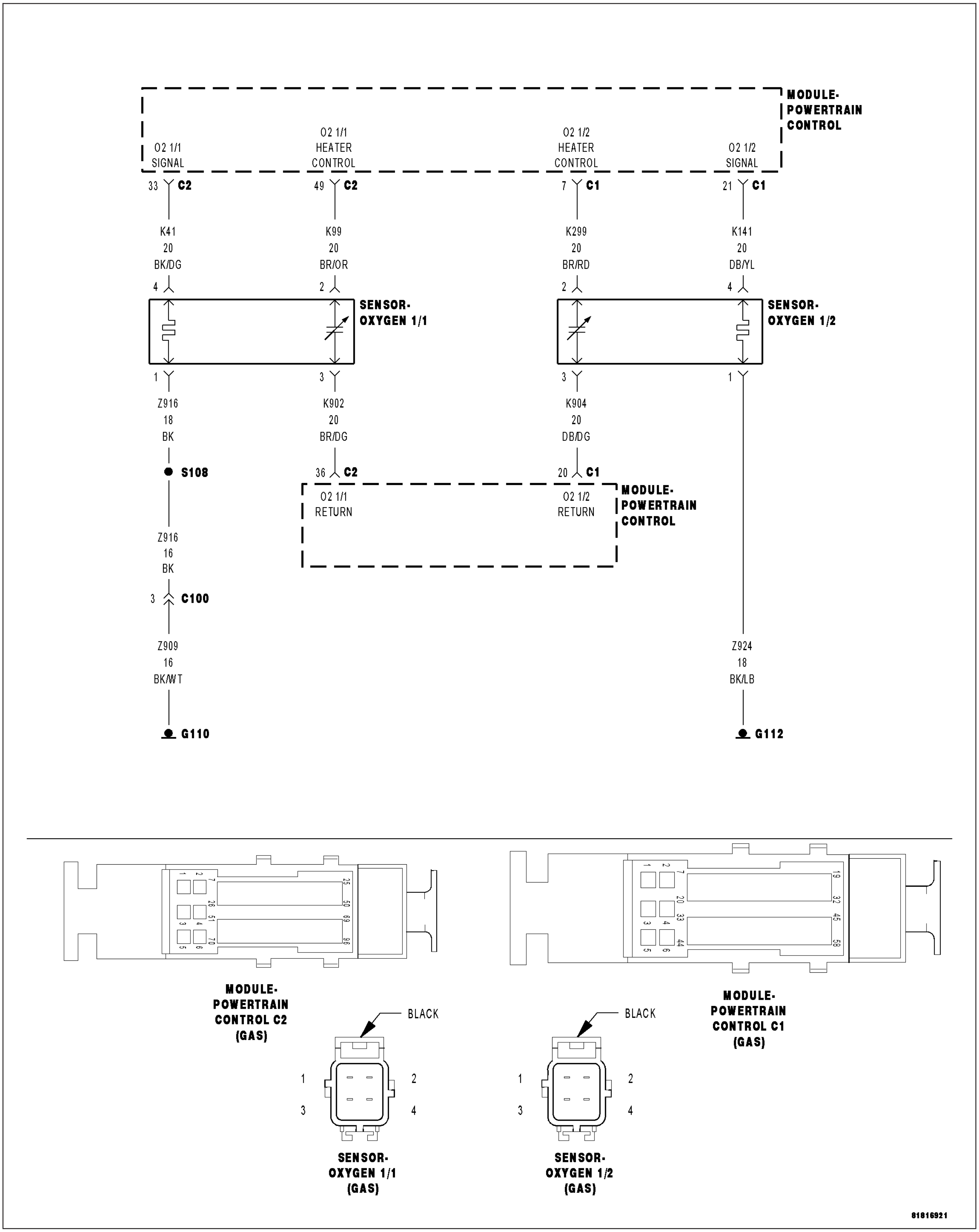
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Monitored constantly when the upstream and downstream O2 sensors are operating in closed loop.
- **Set Condition:**
  The purpose of the diagnostic for this DTC is to determine if the upstream O2 sensor has become biased due to an exhaust leak, sensor contamination, or some other extreme condition. The downstream O2 sensor is considered to be protected from extreme conditions by the catalyst. The downstream O2 sensor feedback control is used to diagnose whether the upstream O2 sensor has become biased. The value of the downstream fuel trim is monitored and compared for rich and lean conditions. Every time the value exceeds the calculated threshold, a timer increments. If the fail timer exceeds the fail threshold, the test fails and the diagnostic stops running for that trip. If the test fails on consecutive trips, a DTC is set.

Possible Causes
INTERMITTENT DTC
EXHAUST LEAK
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE
OXYGEN SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EXHAUST LEAK

NOTE: A thorough exhaust leak test must be completed before removing an O2 Sensor or any other part from the exhaust system. Do not remove any parts before an exhaust leak check has been completed.

NOTE: An exhaust leak may cause downstream fuel adaptives to rail out, resulting in a false 1/1 O2 Sensor failure

Turn the ignition off.

Inspect the exhaust system for leaks between the engine and the 1/1 Oxygen Sensor.

Perform a leak test with Miller Tool #8404A Evaporative Emissions Leak Detector (EELD), even if an audible leak is not heard. Pay particular attention to the exhaust manifold to head surface, exhaust pipe to manifold connection, and the O2 sensor boss for leaks.

Connect the SMOKE supply tip (black hose) to the exhaust cone adapter (if equipped) and place it into the tail pipe.

Set the smoke/air control switch to SMOKE.

Press the remote smoke/air start button.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the exhaust system path and look for a leak, indicated by exiting smoke.

If a leak is concealed from view, release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

Were any exhaust leaks found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. DTC IS ACTIVE

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

NOTE: It may be necessary to test drive the vehicle within the DTC monitoring conditions in order for this DTC to set.

Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

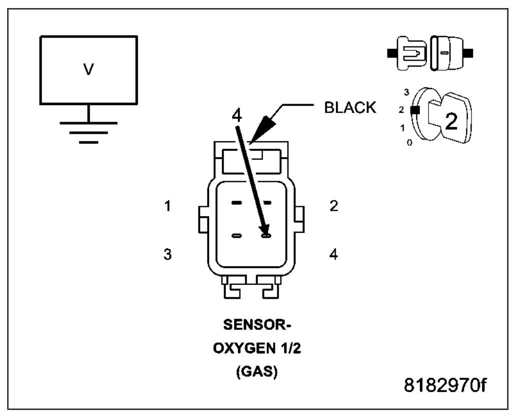
No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Start the engine and allow it to idle.

Disconnect the Oxygen Sensor 1/2 harness connector.

Measure the voltage on the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



NOTE: Measure the voltage in reference to ground, not the (K904) O2 1/2 Return circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

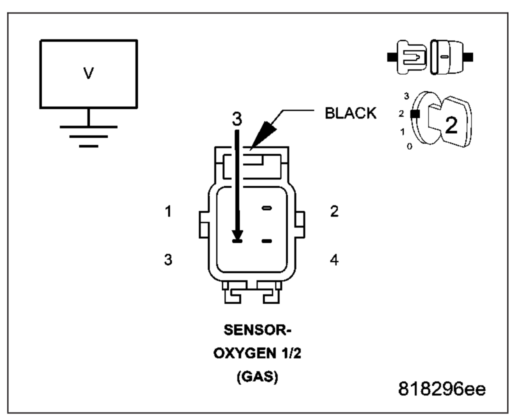
4. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage on the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is there any voltage present?

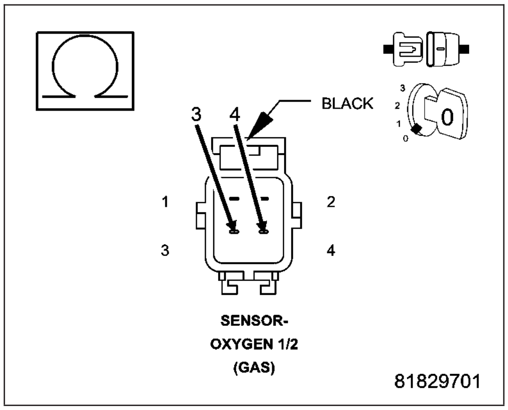
Yes >> Repair the (K904) O2 1/2 Return circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 1/2 RETURN CIRCUIT

Turn the ignition off.

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K904) O2 1/2 Return circuit the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100.0 ohms?

Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to the (K904) O2 1/2 Return.

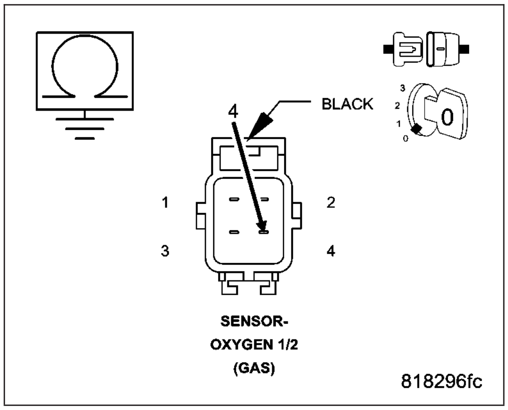
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

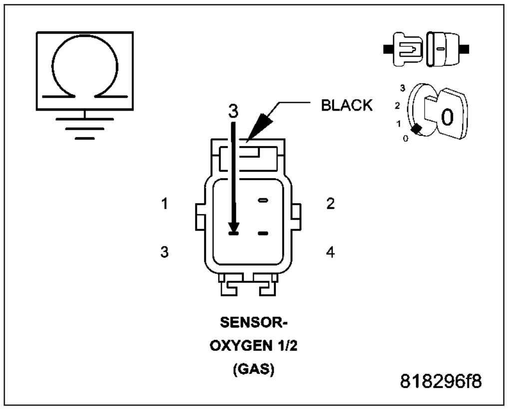
Yes >> Repair the (K141) O2 1/2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K904) O2 1/2 RETURN CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K904) O2 1/2 Return circuit in the Oxygen Sensor 1/2 harness connector.



Is the resistance below 100 ohms?

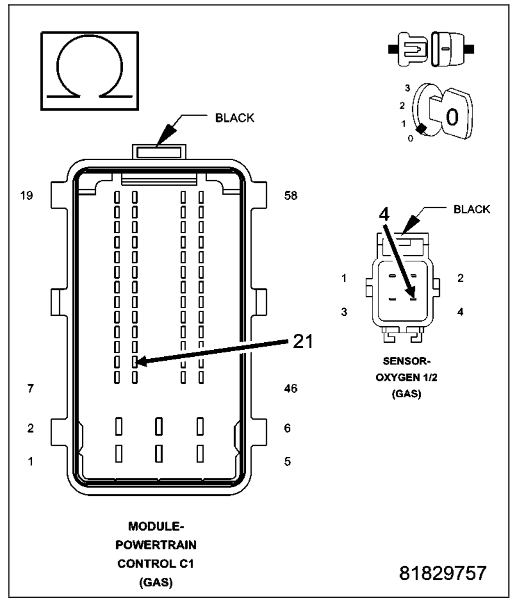
Yes >> Repair the (K904) O2 1/2 Return circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K141) O2 1/2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K141) O2 1/2 Signal circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

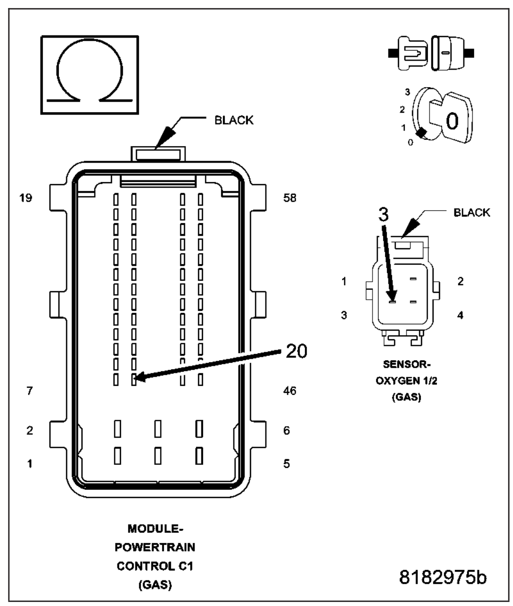
Yes >> Go to 9

No >> Repair the (K141) O2 1/2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K904) O2 1/2 RETURN CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K904) O2 1/2 Return circuit between the Oxygen Sensor 1/2 harness connector to the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K904) O2 1/2 Return circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. OXYGEN SENSOR 1/2

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Oxygen Sensor 1/2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

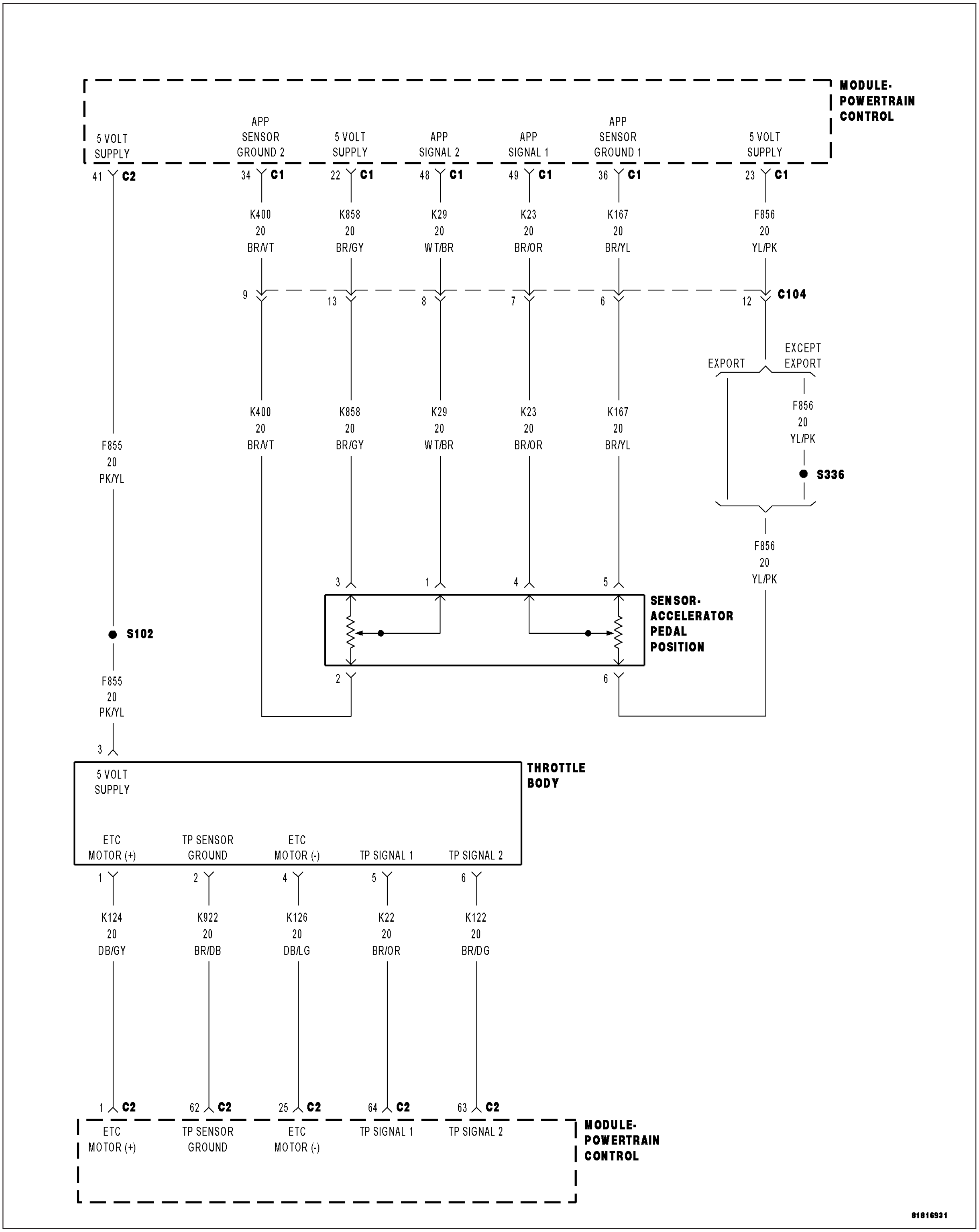
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Oxygen Sensor 1/2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the ETC Motor not in Limp Home mode.
- **Set Condition:**
  When the PCM detects an internal error or short between the ETC Motor (-) and ETC Motor (+) circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
LOW BATTERY VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE
(K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE
ETC MOTOR/THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: If this DTC sets intermittently, it is possible that the controller is overheating in extremely hot temperatures. This is considered a normal protection operation. No repair is necessary.

NOTE: Low battery voltage can cause excessive current draw in very hot and cold ambient temperatures. Make sure the battery can pass a load test before continuing. Review Freeze Frame information to determine the ambient temperature when the DTC set.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick.

Were any problems found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE

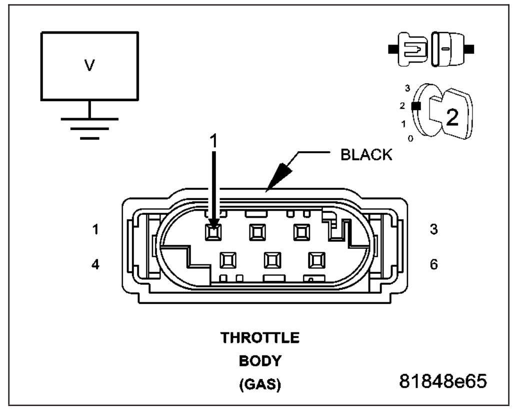
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K124) ETC Motor (+) circuit.



Is there any voltage present?

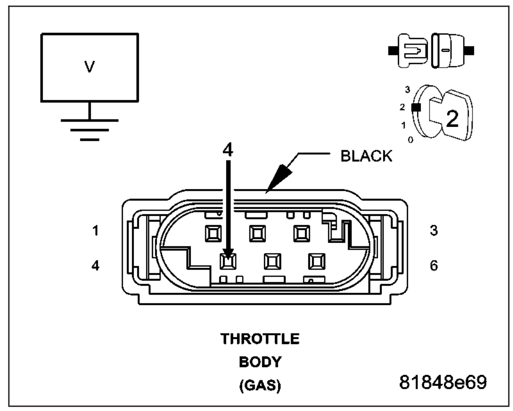
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K126) ETC Motor (-) circuit.



Is there any voltage present?

Yes >> Repair the (K126) ETC Motor (-) circuit for a short to voltage.

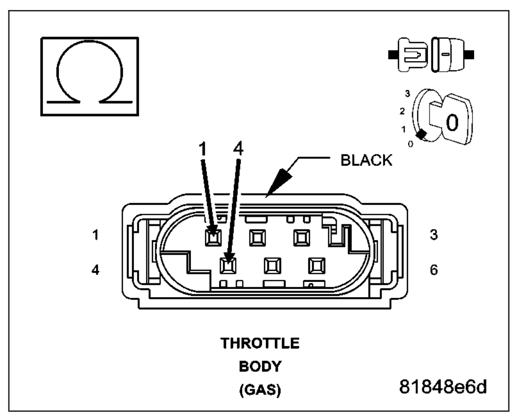
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Turn the ignition off.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.



Is the resistance below 100 ohms?

Yes >> Repair the short to between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND

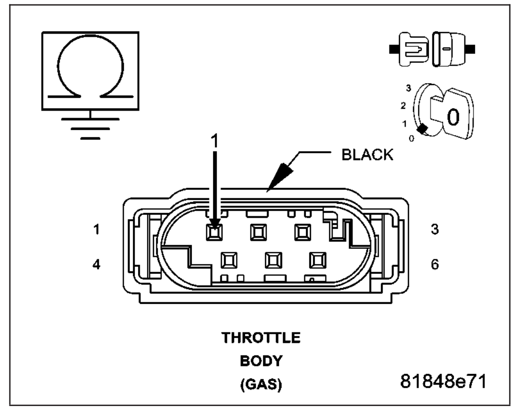
Measure the resistance between ground and the (K124) ETC Motor (+) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K124) ETC Motor (+) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7



7. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND

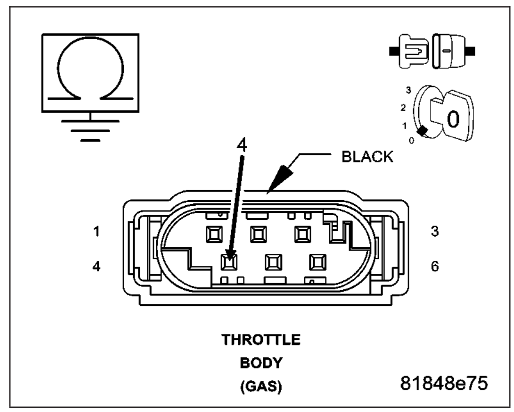
Measure the resistance between ground and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



8. (K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE

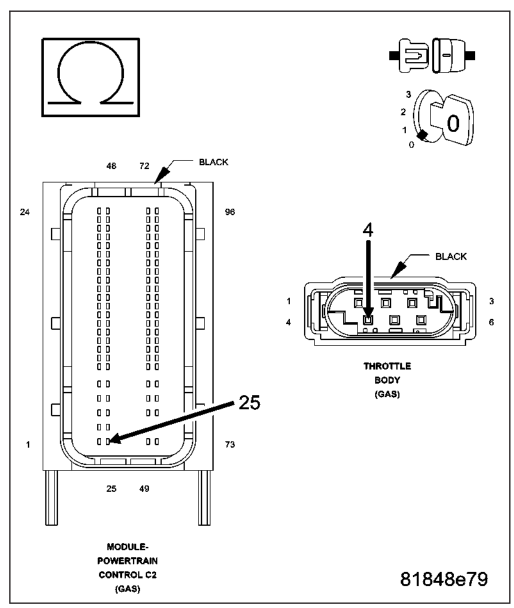
Measure the resistance of the (K126) ETC Motor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 9

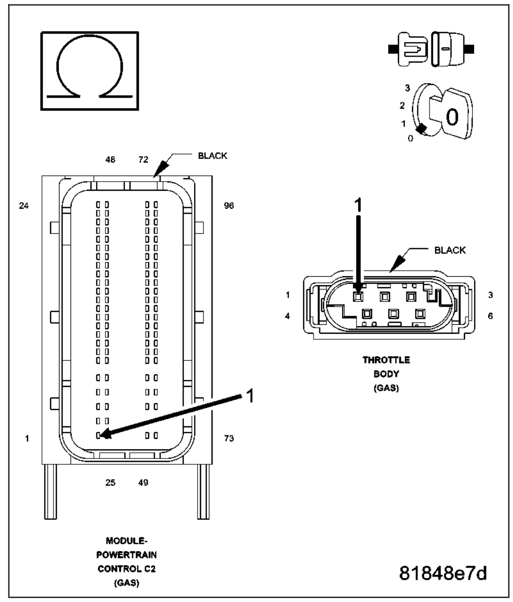
No >> Repair the (K126) ETC Motor (-) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



9. (K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K124) ETC Motor (+) circuit.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K124) ETC Motor (+) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. ETC MOTOR

Reconnect the Throttle Body harness connector.

NOTE: Measure the resistance at the PCM harness connector to avoid damaging throttle body connector terminals.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go to 11

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2101-ELECTRONIC THROTTLE CONTROL MOTOR PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running, ETC motor not in limp home mode, and TPS adaptation complete.
- **Set Condition:**
  The PCM detects too large of an error between the actual position of the throttle plate and the desired set point. One trip fault. The DTC will set within 5 seconds. Three good trips to turn off the MIL ETC light is flashing.

Possible Causes
INTERMITTENT DTC
LOW SYSTEM VOLTAGE
THROTTLE BODY ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: If this DTC sets intermittently, it is possible that the controller is overheating in extremely hot temperatures. This is considered a normal protection operation. No repair is necessary.

NOTE: Low system voltage can cause excessive current draw in very hot and cold ambient temperatures. Make sure the battery can pass a load test before continuing. Review Freeze Frame information to determine the ambient temperature when the DTC set.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE STICKING OR OBSTRUCTED

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick.

Were any problems found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. THROTTLE PLATE NOT WITHIN DESIRED POSITION

Start the engine and allow it to reach normal operating temperature.

With a scan tool, monitor the Actual Throttle Position and Desired Throttle Position.

Is the Actual Throttle Position within 2° degrees of the Desired Throttle Position?

Yes >> Go to 4

No >> Replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. ELECTRONIC THROTTLE CONTROL MOTOR

Ignition on, engine not running.

With a scan tool, actuate the Electronic Throttle Control Motor and observe the movement of the throttle blade.

NOTE: It may be necessary to use a mirror to see the throttle blade.

NOTE: Make sure the motion of the throttle blade is smooth and that it opens and closes.

Did the ETC motor operate properly?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2107-ELECTRONIC THROTTLE CONTROL MODULE PROCESSOR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Internal PCM failure. Module will attempt to reset, so you will be able to hear the throttle relearning. If the condition is continuous, the vehicle may not be drivable. One trip fault. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

Test drive the vehicle for 10 miles on a flat road surface.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2108-ELECTRONIC THROTTLE CONTROL MODULE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Internal PCM failure. Vehicle may exhibit an extended cranking condition, limited performance, and a rough idle. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any other DTCs are set, they must be diagnosed and repaired before continuing this test.

NOTE: An engine vacuum leak may cause this DTC to set. Thoroughly inspect the engine for a vacuum leak before continuing with this test. Repair as necessary.

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition on.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Verify the Powertrain Control Module (PCM) is at the latest calibration (flash level). If necessary, update the Powertrain Control Module (PCM) in accordance with the Service Information.

Start the engine and allow it to reach operating temperature.

Increase engine speed by pressing the accelerator pedal. Do not exceed 3500 rpm.

Test drive the vehicle for 10 miles on a flat road surface.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

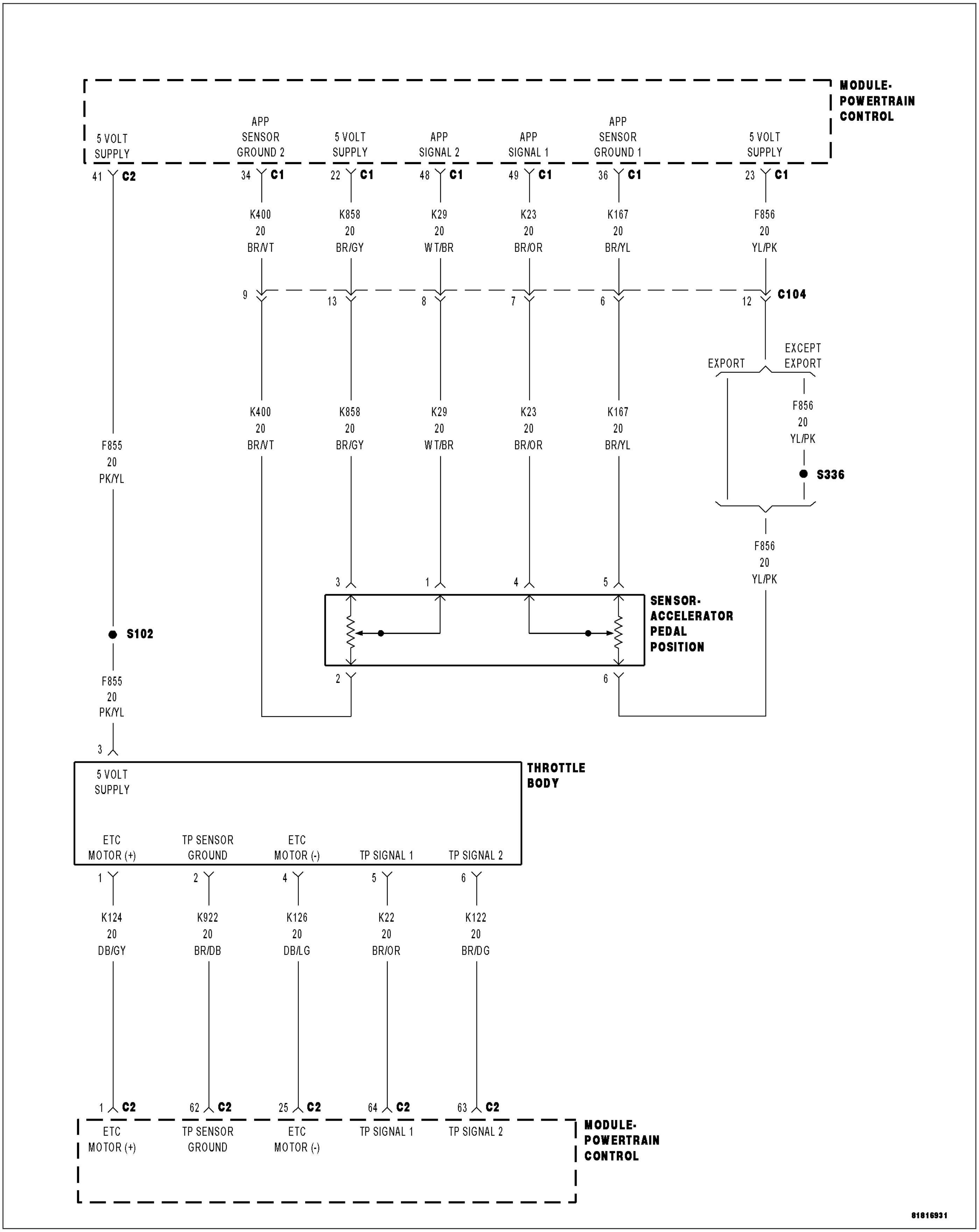
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and ETC motor is working.
- **Set Condition:**
  When the PCM requests to limit engine speed if PWM is too high for 20.5 seconds and before P2118 sets. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
THROTTLE PLATE STUCK OR OBSTRUCTED
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
(K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE
(K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE
ETC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: If this DTC sets intermittently, it is possible that the controller is overheating in extremely hot temperatures. This is considered a normal protection operation. No repair is necessary.

NOTE: Low battery voltage can cause excessive current draw in very hot and cold ambient temperatures. Make sure the battery can pass a load test before continuing. Review Freeze Frame information to determine the ambient temperature when the DTC set.

NOTE: Diagnose and repair any Throttle Position sensor, system voltage, or 5 volt supply DTCs before continuing with this test.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick.

Attempt to manually open the throttle plate. Use an appropriate tool that will not damage or mar the throttle body.

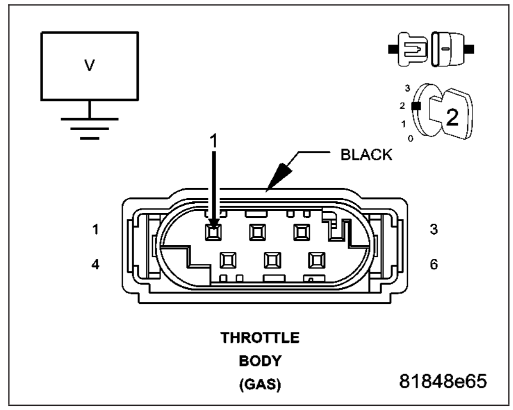
Were any problems found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K124) ETC Motor (+) circuit.

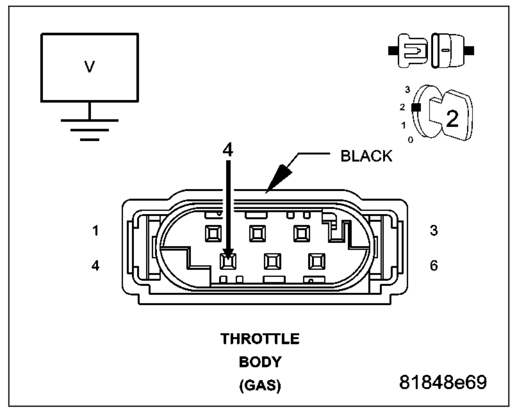
Is there any voltage present?

Yes >> Repair the (K124) ETC Motor (+) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE



Measure the voltage of the (K126) ETC Motor (-) circuit.

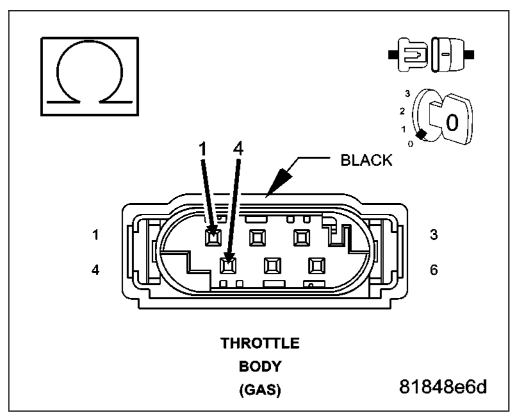
Is there any voltage present?

Yes >> Repair the (K126) ETC Motor (-) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT



Turn the ignition off.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?

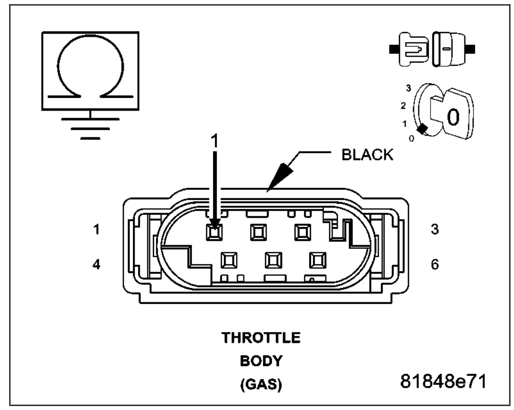
Yes >> Repair the short to between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K124) ETC Motor (+) circuit.



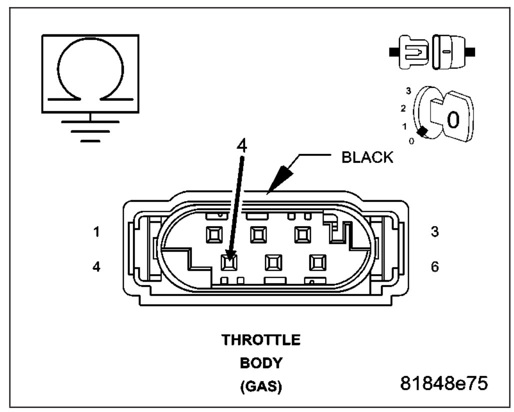
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K124) ETC Motor (+) circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K126) ETC Motor (-) circuit.



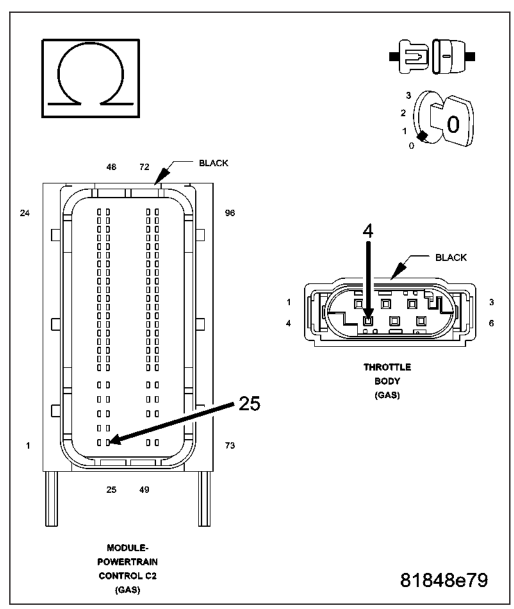
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K126) ETC Motor (-) circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K126) ETC Motor (-) circuit.



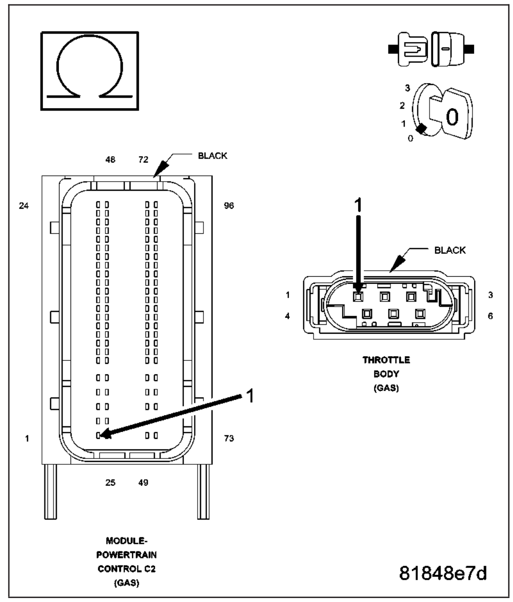
Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K126) ETC Motor (-) circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K124) ETC Motor (+) circuit.



Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K124) ETC Motor (+) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. ETC MOTOR

Reconnect the Throttle Body harness connector.

NOTE: Measure the resistance at the PCM harness connector to avoid damaging throttle body connector terminals.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go to 11

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

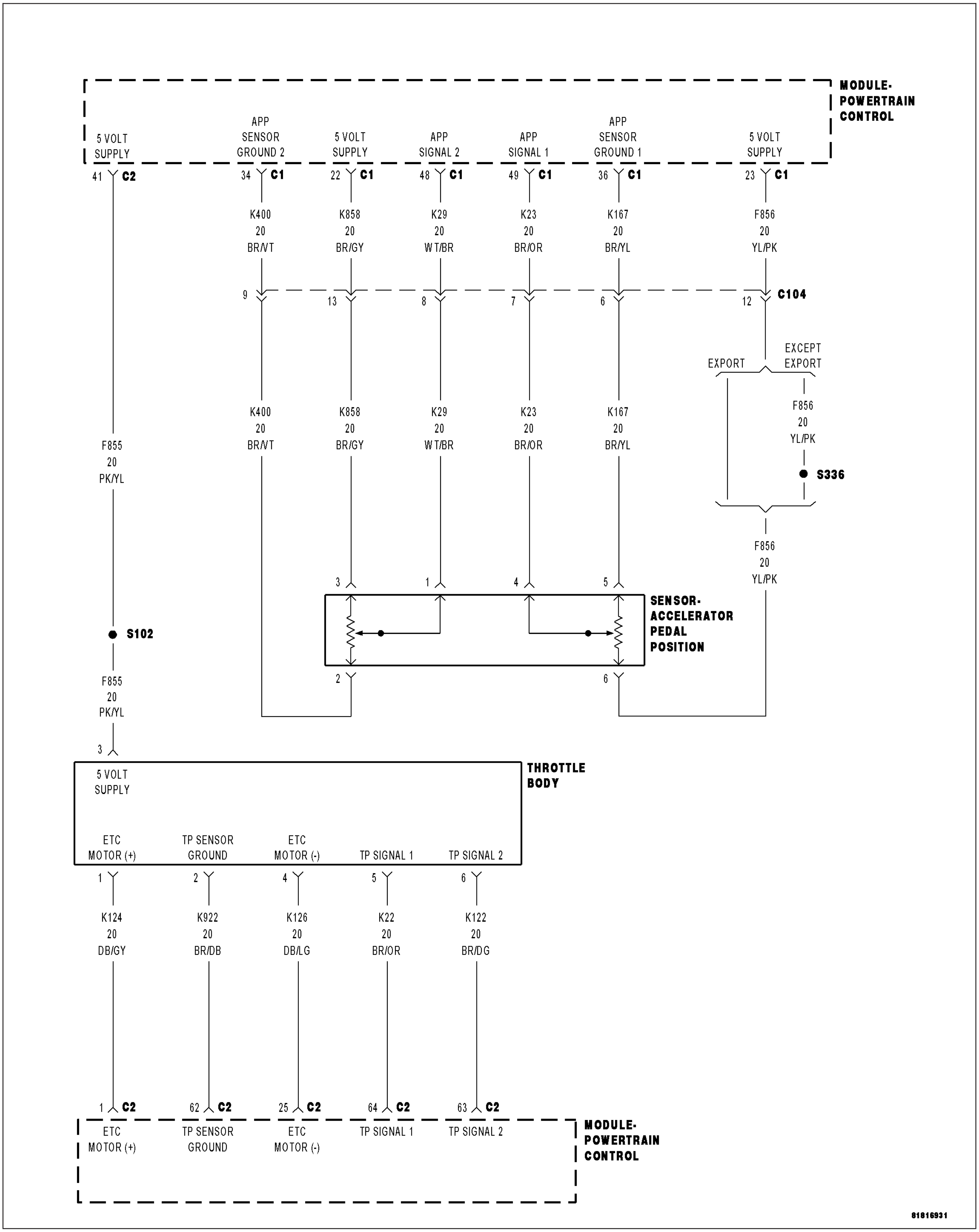
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Just after key on, the throttle is opened and closed to test the system. If the PCM detects that the TP Sensor does not return to Limp Home Position, this DTC will set. One trip fault. The DTC will set within 5 seconds. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
THROTTLE PLATE STICKING OR OBSTRUCTED
TP SENSOR CIRCUIT(S) HIGH RESISTANCE OR SHORTED
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE
(K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND
THROTTLE BODY ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any TP Sensor or 5-Volt Supply DTCs before continuing.

NOTE: Maximum engine speed could be reduced while this fault is active, based on where the throttle plate is stuck.

Ignition on, engine not running.

NOTE: The PCM tests the ETC Motor by opening and closing the throttle plate before starting the engine. If the throttle plate does not return to the closed position this DTC will set.

With a scan tool select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick or not fully close.

Attempt to manually open the throttle plate and allow it to close. Use an appropriate tool that will not damage or mar the throttle body.

Were any problems found?

Yes >> Repair as necessary or replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH EQUAL 2.5 VOLTS

With a scan tool, perform the Throttle Follower test and monitor both TP Sensor voltages.

Are both TP Sensor readings stuck at 2.5 volts?

Yes >> Check the TP Sensor Signal circuits for excessive resistance, being shorted together, or shorted to the Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE

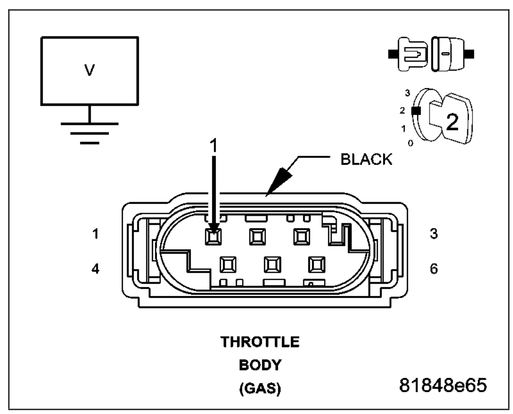
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K124) ETC Motor (+) circuit.



Is there any voltage present?

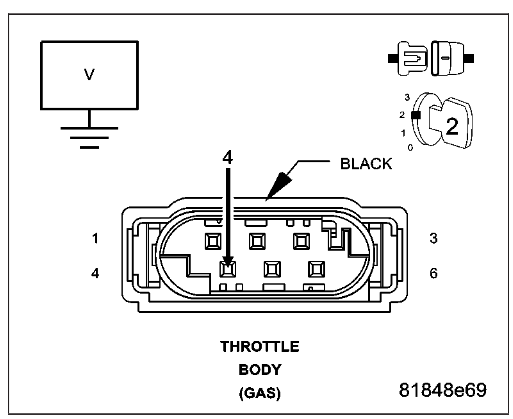
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K126) ETC Motor (-) circuit.



Is there any voltage present?

Yes >> Repair the (K126) ETC Motor (-) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

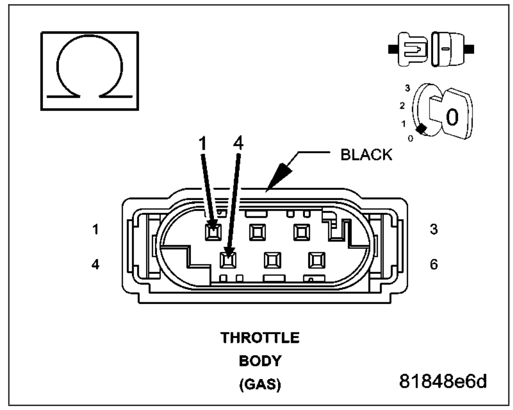
No >> Go to 6

6. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Turn the ignition off.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?



Yes >> Repair the short to between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

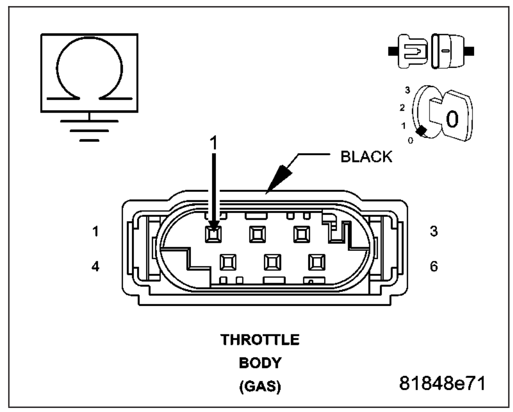
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K124) ETC Motor (+) circuit.

Is the resistance below 100 ohms?



Yes >> Repair the short to ground in the (K124) ETC Motor (+) circuit.

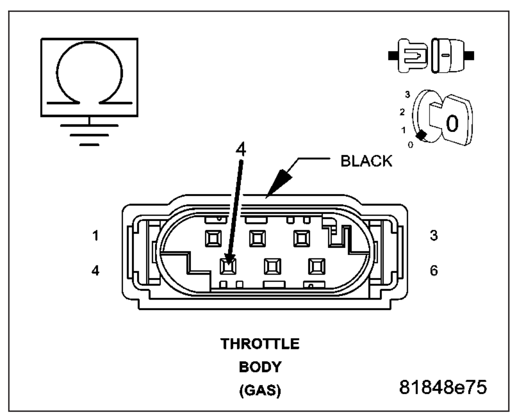
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

8. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?



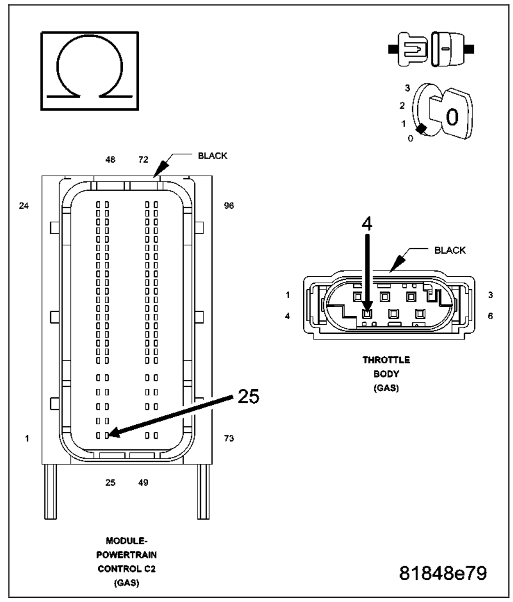
Yes >> Repair the short to ground in the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. (K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K126) ETC Motor (-) circuit.



Is the resistance below 5.0 ohms?

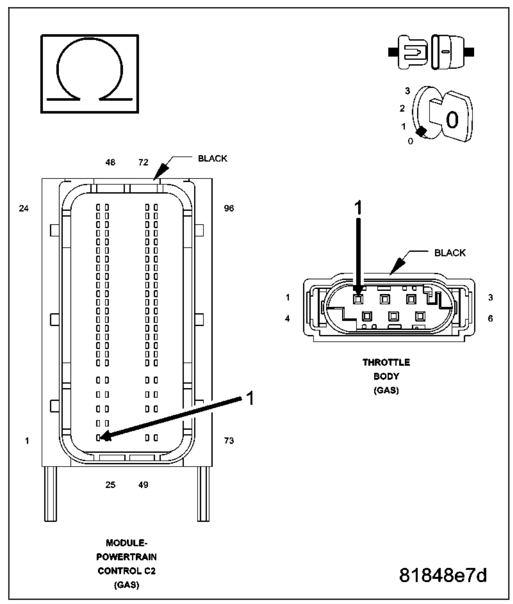
Yes >> Go to 10

No >> Repair the (K126) ETC Motor (-) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K124) ETC Motor (+) circuit.



Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K124) ETC Motor (+) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

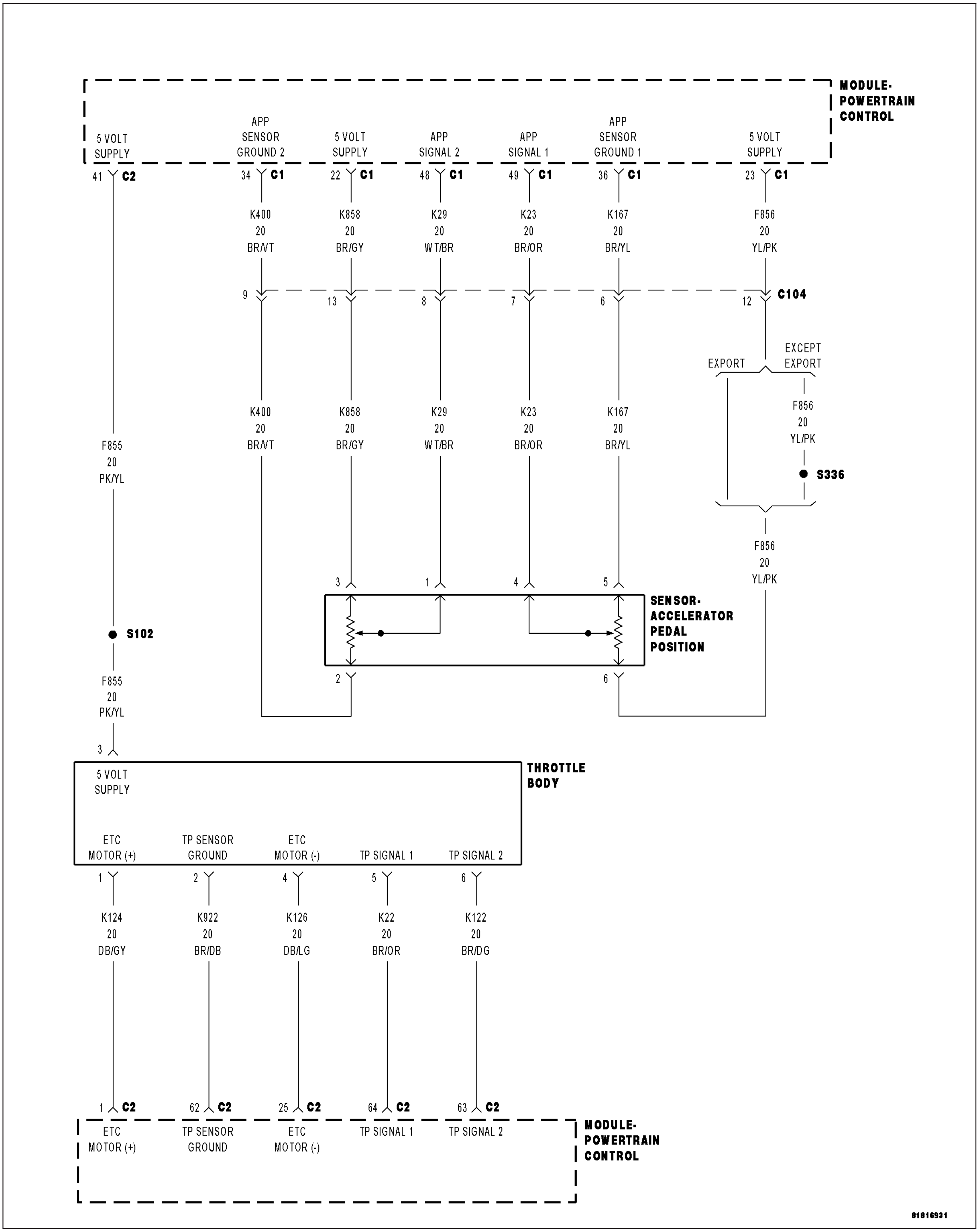
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Just after key on, the throttle is opened and closed to test the system. If the PCM detects that the TP Sensor does not move from Limp Home Position, this DTC will set. One trip fault. The DTC will set within 5 seconds. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
THROTTLE PLATE STICKING OR OBSTRUCTED
TP SENSOR CIRCUIT(S) HIGH RESISTANCE OR SHORTED
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE
(K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND
THROTTLE BODY ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any TP Sensor or 5-Volt Supply DTCs before continuing.

Ignition on, engine not running.

With a scan tool select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick or not open.

Attempt to manually open the throttle plate. Use an appropriate tool that will not damage or mar the throttle body.

Were any problems found?

Yes >> Repair as necessary or replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC Relearn function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH EQUAL 2.5 VOLTS

With a scan tool, perform the Throttle Follower test and monitor both TP Sensor voltages.

Are both TP Sensor readings stuck at 2.5 volts?

Yes >> Check the TP Sensor Signal circuits for excessive resistance, being shorted together, or being shorted to the Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE

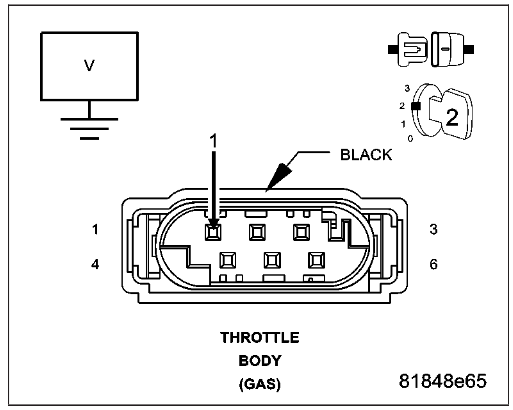
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K124) ETC Motor (+) circuit.



Is there any voltage present?

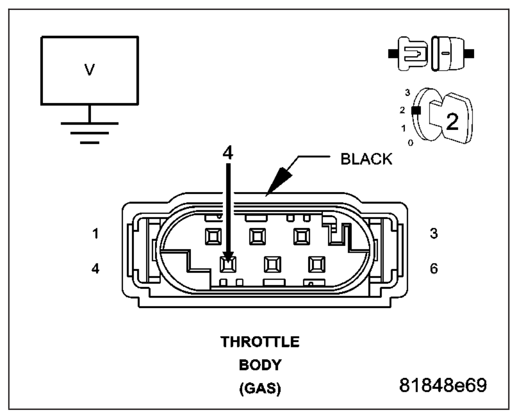
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K126) ETC Motor (-) circuit.



Is there any voltage present?

Yes >> Repair the (K126) ETC Motor (-) circuit for a short to voltage.

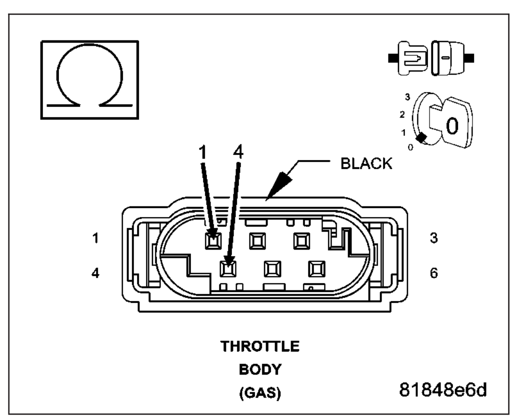
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Turn the ignition off.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.



Is the resistance below 100 ohms?

Yes >> Repair the short to between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7

7. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND

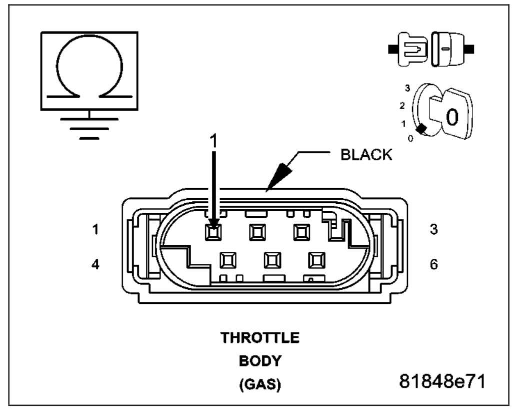
Measure the resistance between ground and the (K124) ETC Motor (+) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K124) ETC Motor (+) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



8. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND

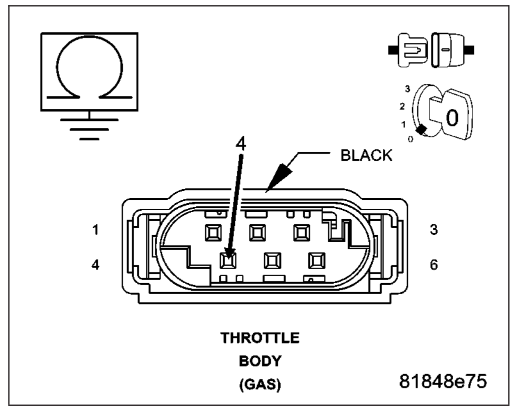
Measure the resistance between ground and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9



9. (K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE

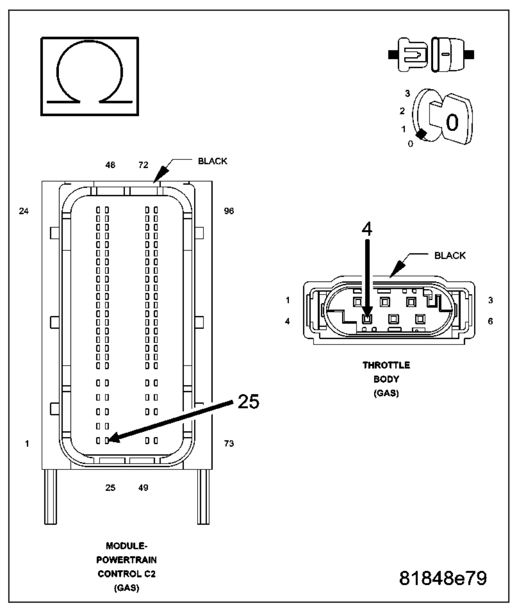
Measure the resistance of the (K126) ETC Motor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K126) ETC Motor (-) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



10. (K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE

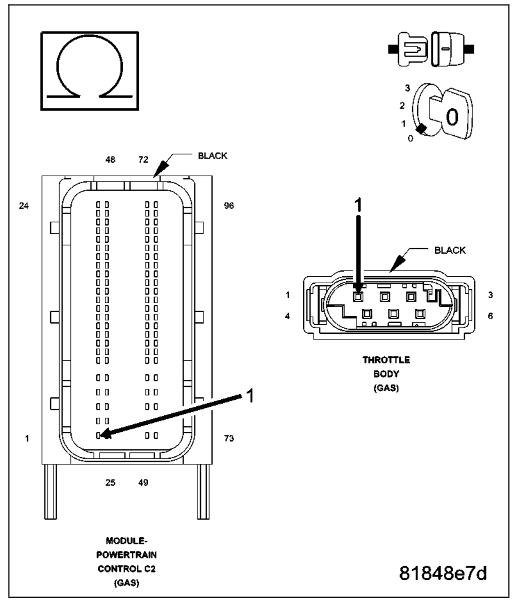
Measure the resistance of the (K124) ETC Motor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K124) ETC Motor (+) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2115-ACCELERATOR PEDAL POSITION SENSOR 1 MINIMUM STOP PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the igniting on. During in-plant testing, the APPS is checked to make sure the minimum and maximum values can be reached. The PCM performs the diagnostic test for this DTC after the diagnostic test for P2166 has passed.
- **Set Condition:**
  APPS 1 has failed to achieve the required minimum value during In-Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
INTERMITTENT DTC
ETC RELEARN
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: This DTC is set when the APPS values are learned in-plant but do not reach the minimum or maximum voltage range.

NOTE: Diagnose any APPS out of range and 5 volt supply DTCs before continuing.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR

With a scan tool perform the ETC RELEARN function.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. After installation is complete, perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test Complete.

P2116-ACCELERATOR PEDAL POSITION SENSOR 2 MINIMUM STOP PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the igniting on. During in-plant testing, the APPS is checked to make sure the minimum and maximum values can be reached. The PCM performs the diagnostic test for this DTC after the diagnostic test for P2167 has passed.
- **Set Condition:**
  APPS 2 has failed to achieve the required minimum value during In-Plant testing. One trip fault and the code will be stored within 5 seconds. Engine will only idle.

Possible Causes
INTERMITTENT DTC
ETC RELEARN
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: This DTC is set when the APPS values are learned in-plant but do not reach the minimum or maximum voltage range.

NOTE: Diagnose any APPS out of range and 5 volt supply DTCs before continuing.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR

With a scan tool perform the ETC RELEARN function.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

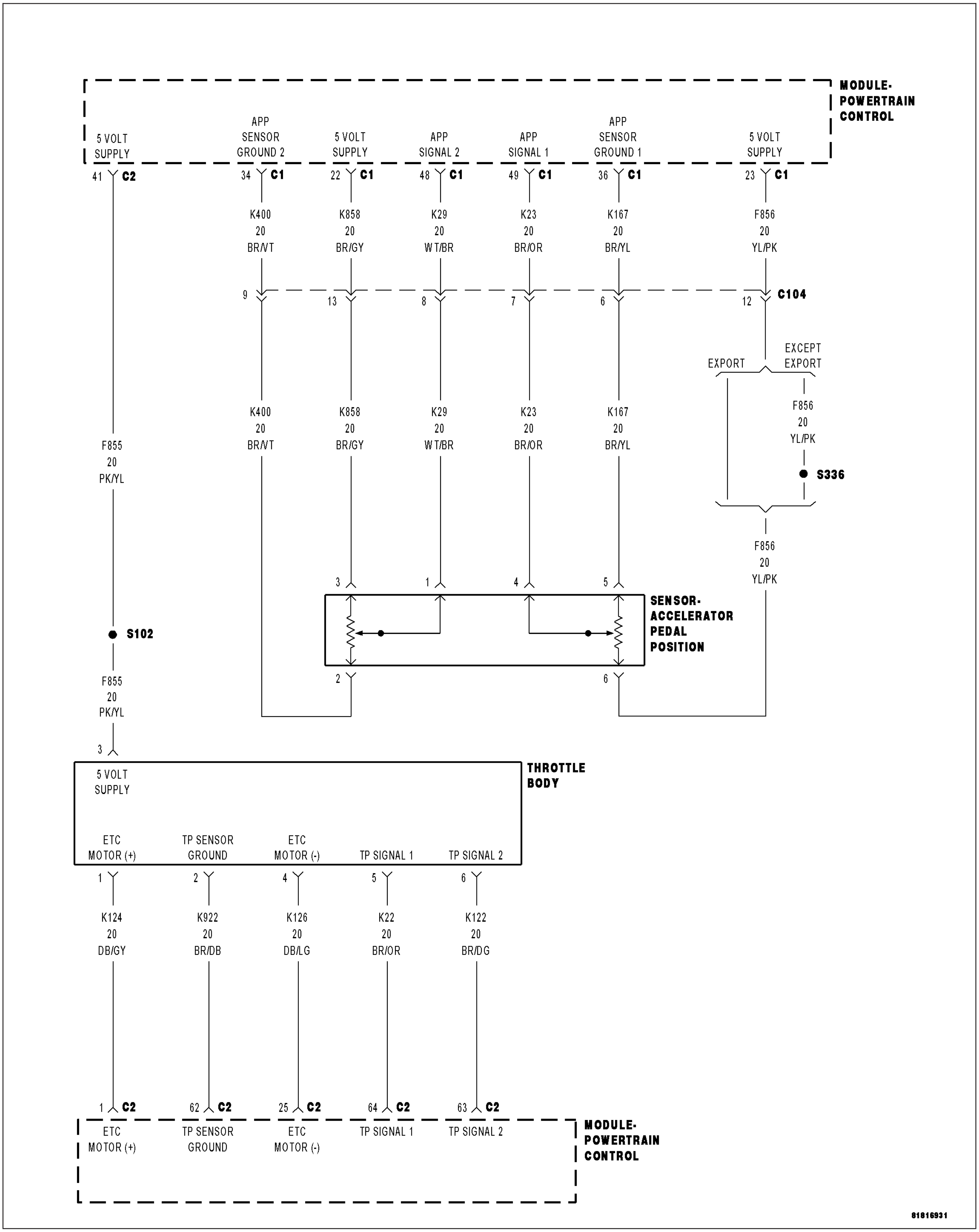
Is the status Active for this DTC?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. After installation is complete, perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test Complete.

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CURRENT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and ETC motor is not in the Limp Home Position.
- **Set Condition:**
  When the PCM detects an internal error or a short between the ETC Motor (-) and ETC Motor (+) circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
THROTTLE PLATE STUCK OR OBSTRUCTED
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE
(K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE
(K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT
(K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
(K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE
(K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE
ETC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: If this DTC sets intermittently, it is possible that the controller is overheating in extremely hot temperatures. This is considered a normal protection operation. No repair is necessary.

NOTE: Low battery voltage can cause excessive current draw in very hot and cold ambient temperatures. Make sure the battery can pass a load test before continuing. Review Freeze Frame information to determine the ambient temperature when the DTC set.

NOTE: Diagnose and repair any Throttle Position sensor, system voltage, or 5 volt supply DTCs before continuing with this test.
With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the air cleaner assembly.

Check for any signs of a foreign material (ice or dirt) on the throttle plate or in the throttle bore that can cause the throttle plate to stick.

Attempt to manually open the throttle plate. Use an appropriate tool that will not damage or mar the throttle body.

Were any problems found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC Relearn function.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO VOLTAGE

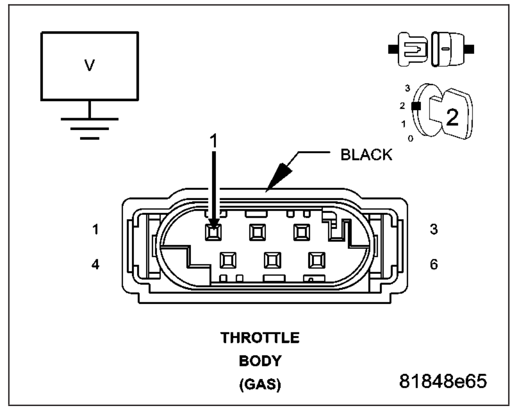
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K124) ETC Motor (+) circuit.



Is there any voltage present?

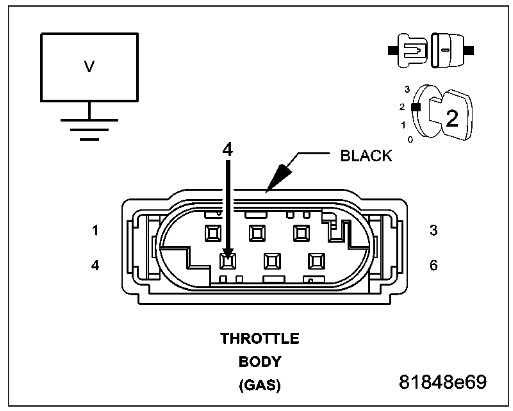
Yes >> Repair the (K124) ETC Motor (+) circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K126) ETC Motor (-) circuit.



Is there any voltage present?

Yes >> Repair the (K126) ETC Motor (-) circuit for a short to voltage.

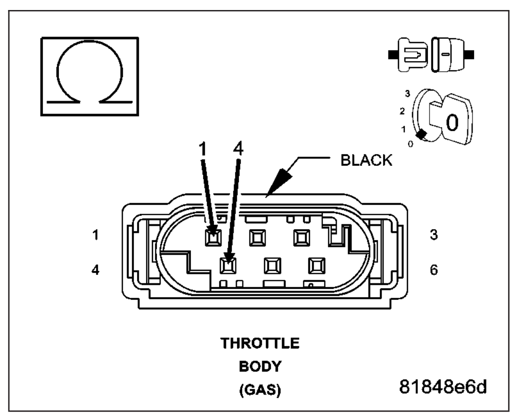
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO THE (K126) ETC MOTOR (-) CIRCUIT

Turn the ignition off.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.



Is the resistance below 100 ohms?

Yes >> Repair the short to between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K124) ETC MOTOR (+) CIRCUIT SHORTED TO GROUND

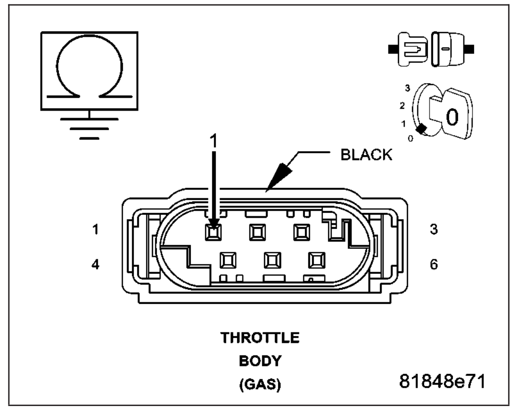
Measure the resistance between ground and the (K124) ETC Motor (+) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K124) ETC Motor (+) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 7



7. (K126) ETC MOTOR (-) CIRCUIT SHORTED TO GROUND

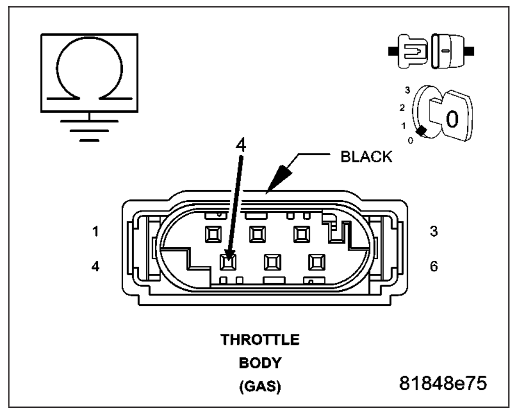
Measure the resistance between ground and the (K126) ETC Motor (-) circuit.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K126) ETC Motor (-) circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8



8. (K126) ETC MOTOR (-) CIRCUIT OPEN OR HIGH RESISTANCE

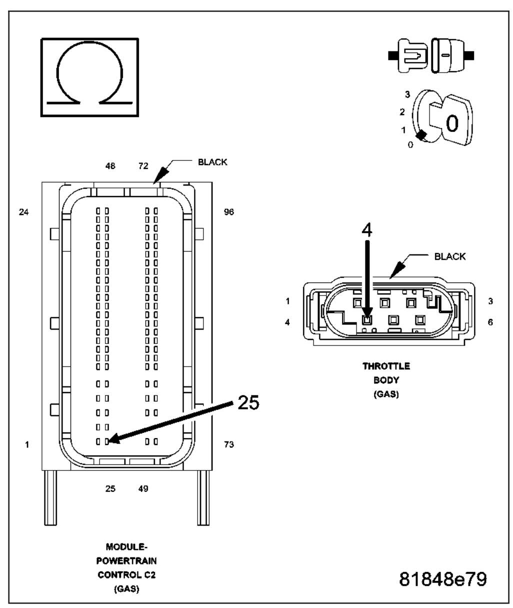
Measure the resistance of the (K126) ETC Motor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K126) ETC Motor (-) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



9. (K124) ETC MOTOR (+) CIRCUIT OPEN OR HIGH RESISTANCE

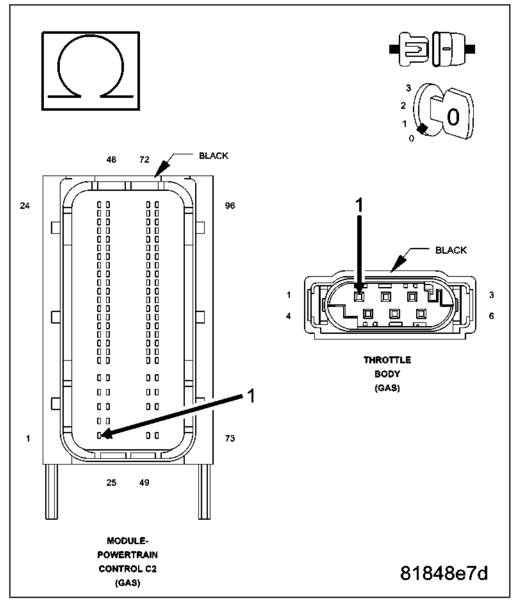
Measure the resistance of the (K124) ETC Motor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 10

No >> Repair the (K124) ETC Motor (+) circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



10. ETC MOTOR

Reconnect the Throttle Body harness connector.

NOTE: Measure the resistance at the PCM harness connector to avoid damaging throttle body connector terminals.

Measure the resistance between the (K124) ETC Motor (+) circuit and the (K126) ETC Motor (-) circuit.

Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go to 11

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

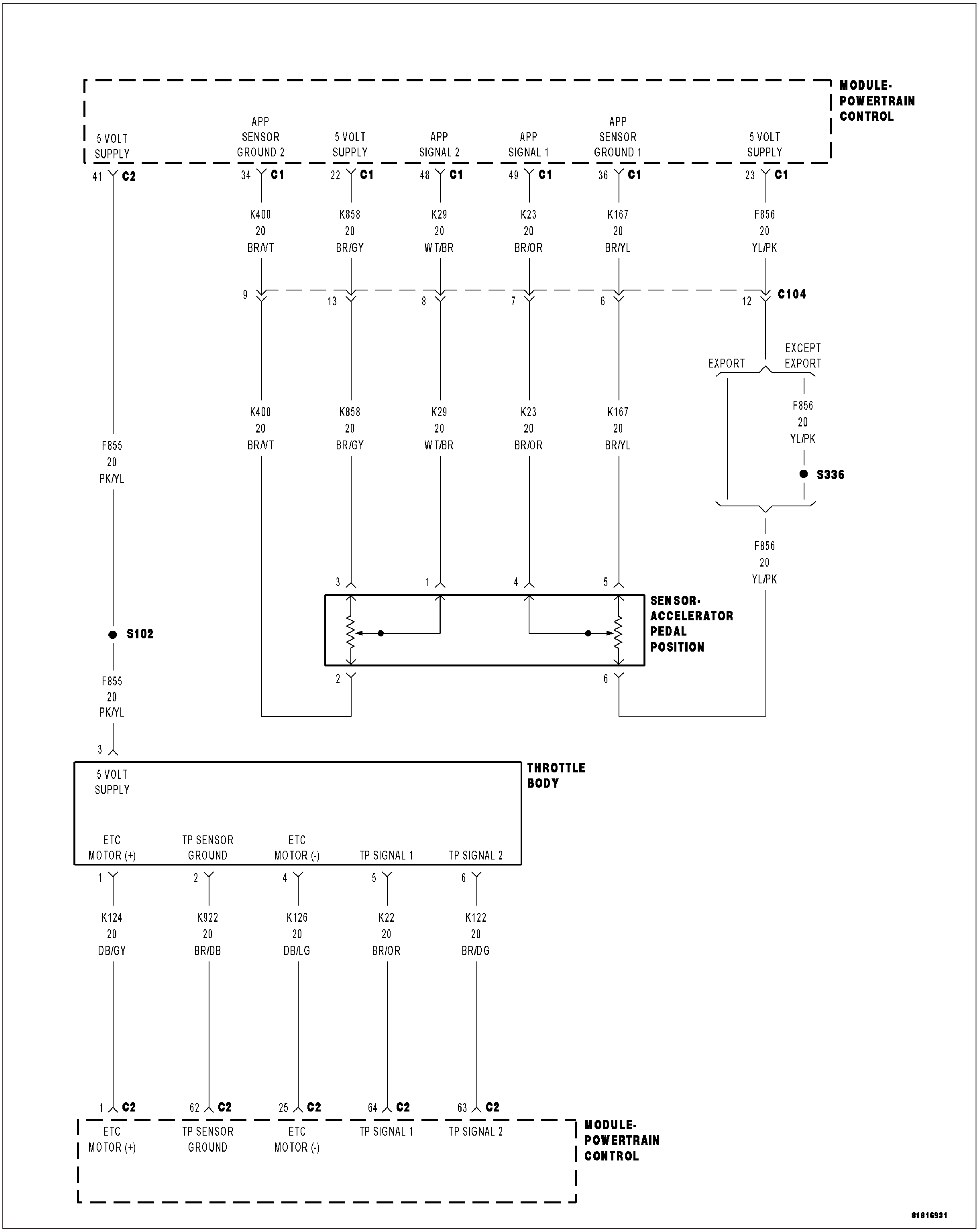
Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module per Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K23) APP Signal 1 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO GROUND
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

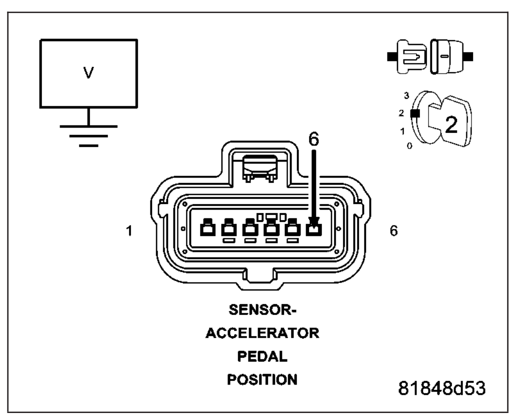
2. (F856) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

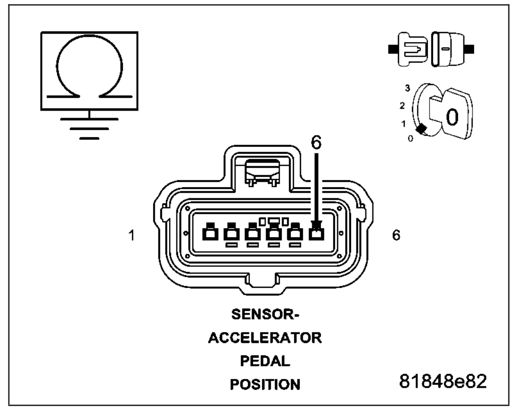
No >> Go to 3

3. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (F856) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



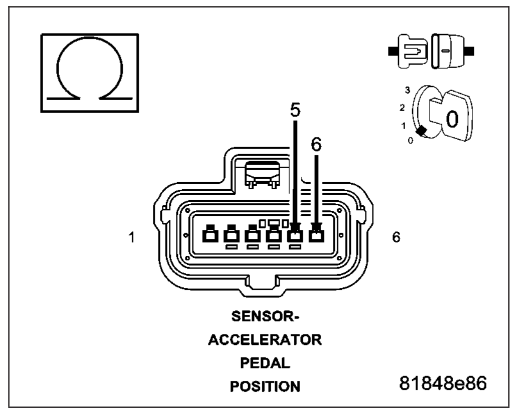
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (F856) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K167) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



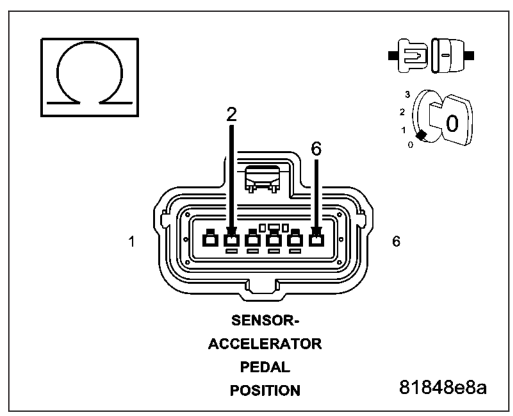
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K167) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT

Measure the resistance between the (F856) 5 Volt Supply circuit and the (K400) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



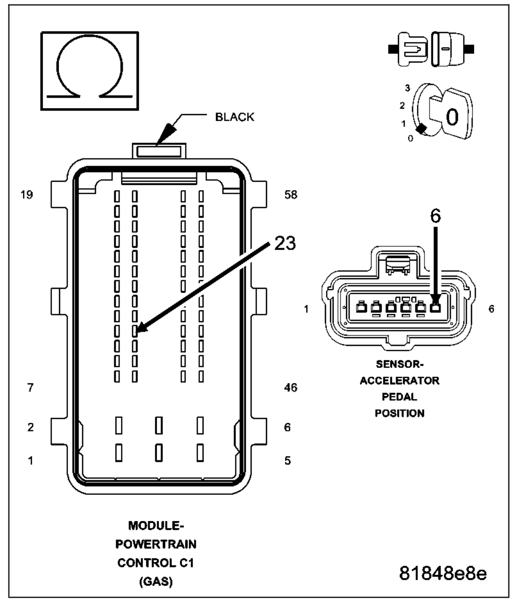
Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (F856) 5 Volt Supply circuit for a short to the (K400) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (F856) 5 Volt Supply circuit for an open circuit or high resistance.

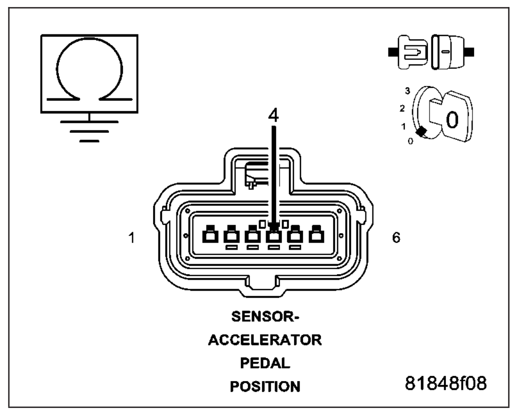
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K23) APP Signal 1 circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

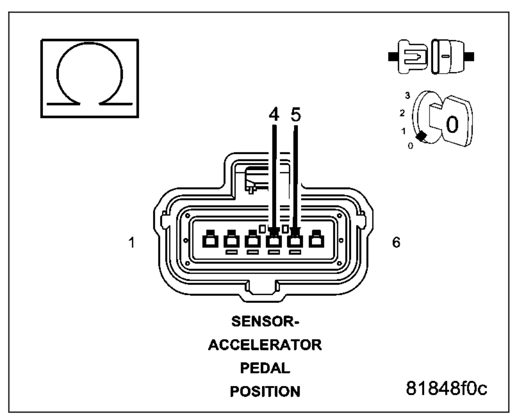
Yes >> Go to 8

No >> Repair the (K23) APP Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT

Measure the resistance between the (K23) APP Signal 1 circuit and the (K167) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

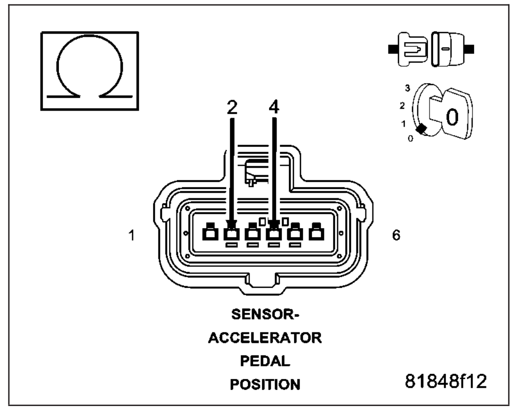
Yes >> Go to 9

No >> Repair the (K23) APP Signal 1 circuit for a short to the (K167) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT

Measure the resistance between the (K23) APP Signal 1 circuit and the (K400) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

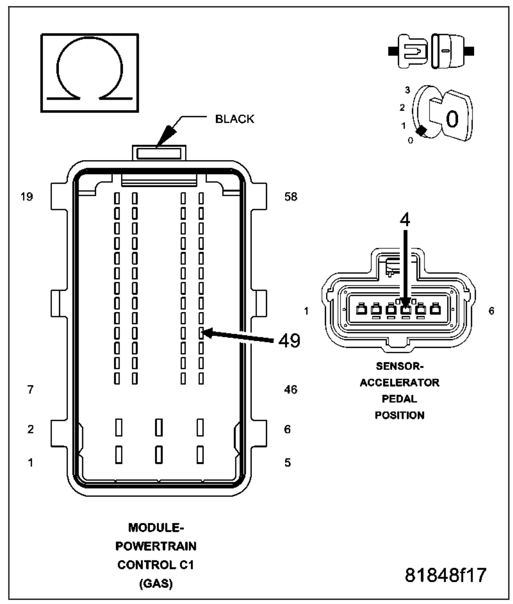
Yes >> Go to 10

No >> Repair the (K23) APP Signal 1 circuit for a short to the (K400) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K23) APP Signal 1 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K23) APP Signal 1 circuit for an open circuit or high resistance.

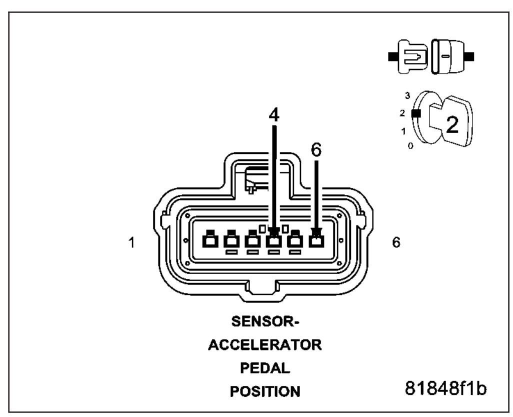
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (F856) 5 Volt Supply circuit and the (K23) APP Signal 1 circuit in the Accelerator Pedal Position Sensor harness connector.



Turn the ignition on.

With the scan tool, read the Accelerator Pedal Position Sensor signal voltage.

Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

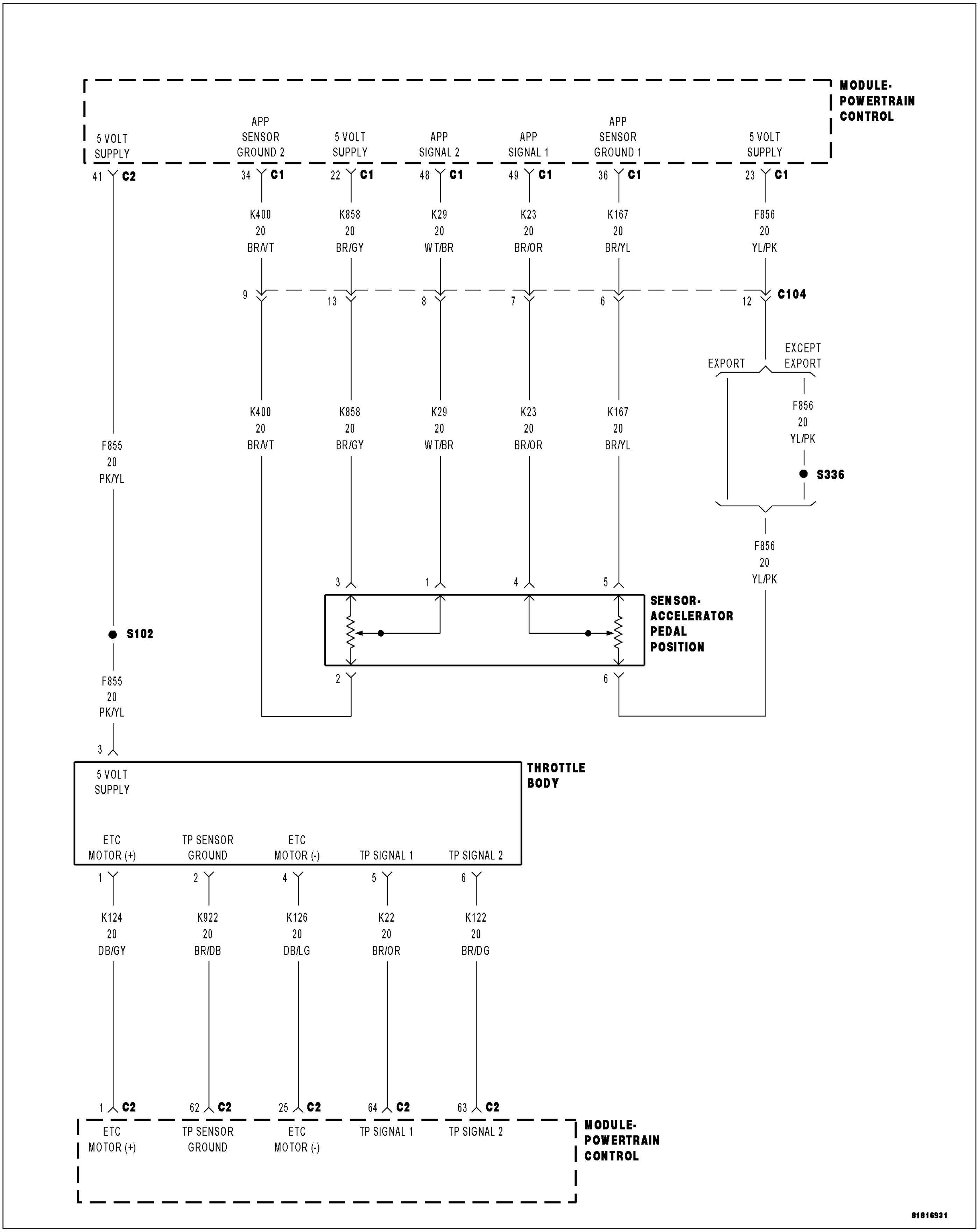
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K23) APP Signal 1 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO THE (F856) 5 VOLT SUPPLY CIRCUIT
(K23) APP SIGNAL 1 CIRCUIT SHORTED TO THE (K858) 5 VOLT SUPPLY CIRCUIT
(K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K167) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F856) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

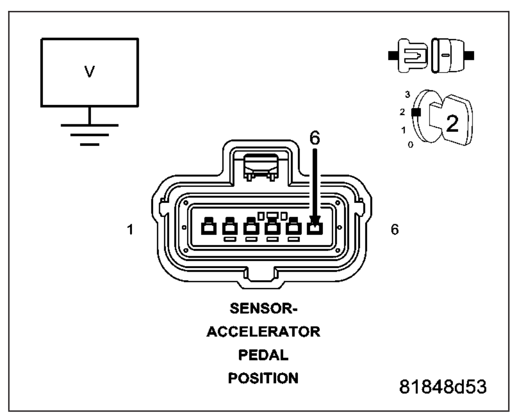
Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (F856) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



Is there any voltage present?

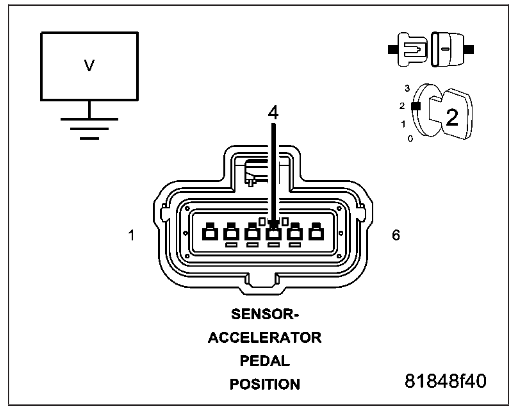
Yes >> Repair the (F856) 5 Volt Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K23) APP Signal 1 circuit in the Accelerator Pedal Position Sensor harness connector.



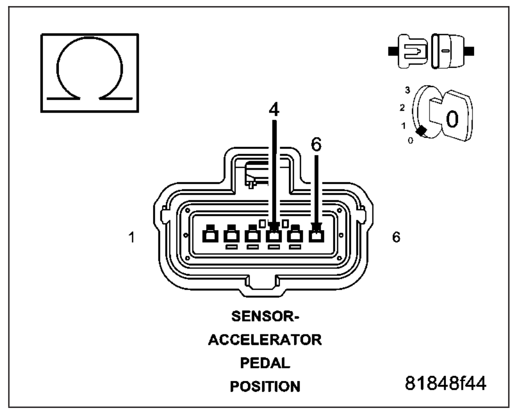
Is there any voltage present?

Yes >> Repair the (K23) APP Signal 1 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO THE (F856) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K23) APP Signal 1 circuit and the (F856) 5 Volt Supply in the Accelerator Pedal Position Sensor harness connector.



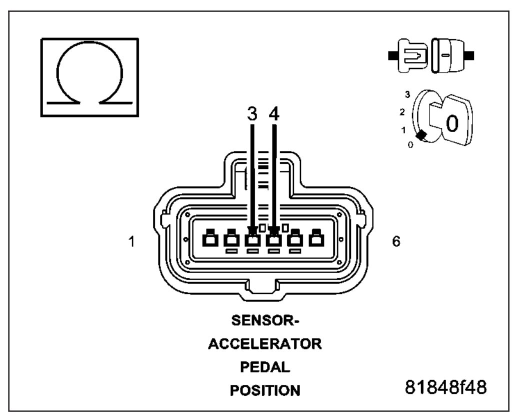
Is the resistance below 100 ohms?

Yes >> Repair the (K23) APP Signal 1 circuit for a short to the (F856) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K23) APP SIGNAL 1 CIRCUIT SHORTED TO THE (K858) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K23) APP Signal 1 circuit and the (K858) 5 Volt Supply in the Accelerator Pedal Position Sensor harness connector.



Is the resistance below 100 ohms?

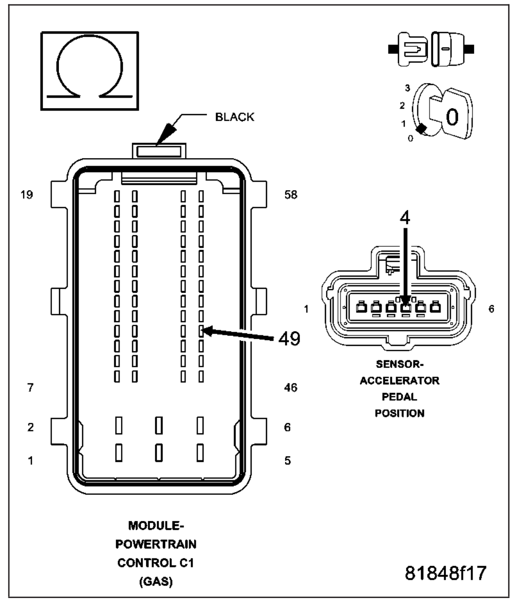
Yes >> Repair the (K23) APP Signal 1 circuit for a short to the (K858) 5 Volt Supply circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K23) APP Signal 1 between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

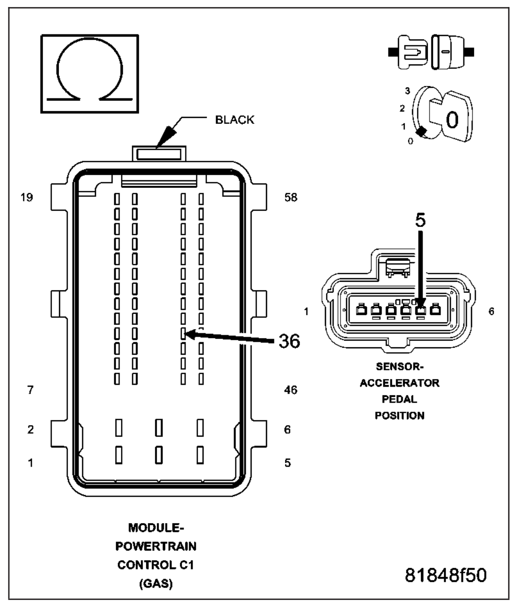
Yes >> Go to 7

No >> Repair the (K23) APP Signal 1 for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K167) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K167) Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



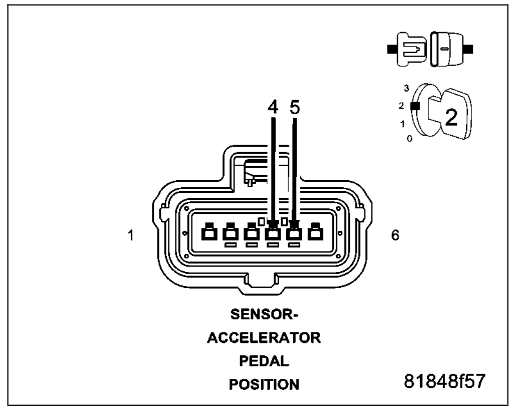
Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K167) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. ACCELERATOR PEDAL POSITION SENSOR



Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K167) Sensor Ground circuit and the (K23) APP Signal 1 circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Accelerator Pedal Position Sensor signal voltage.

Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

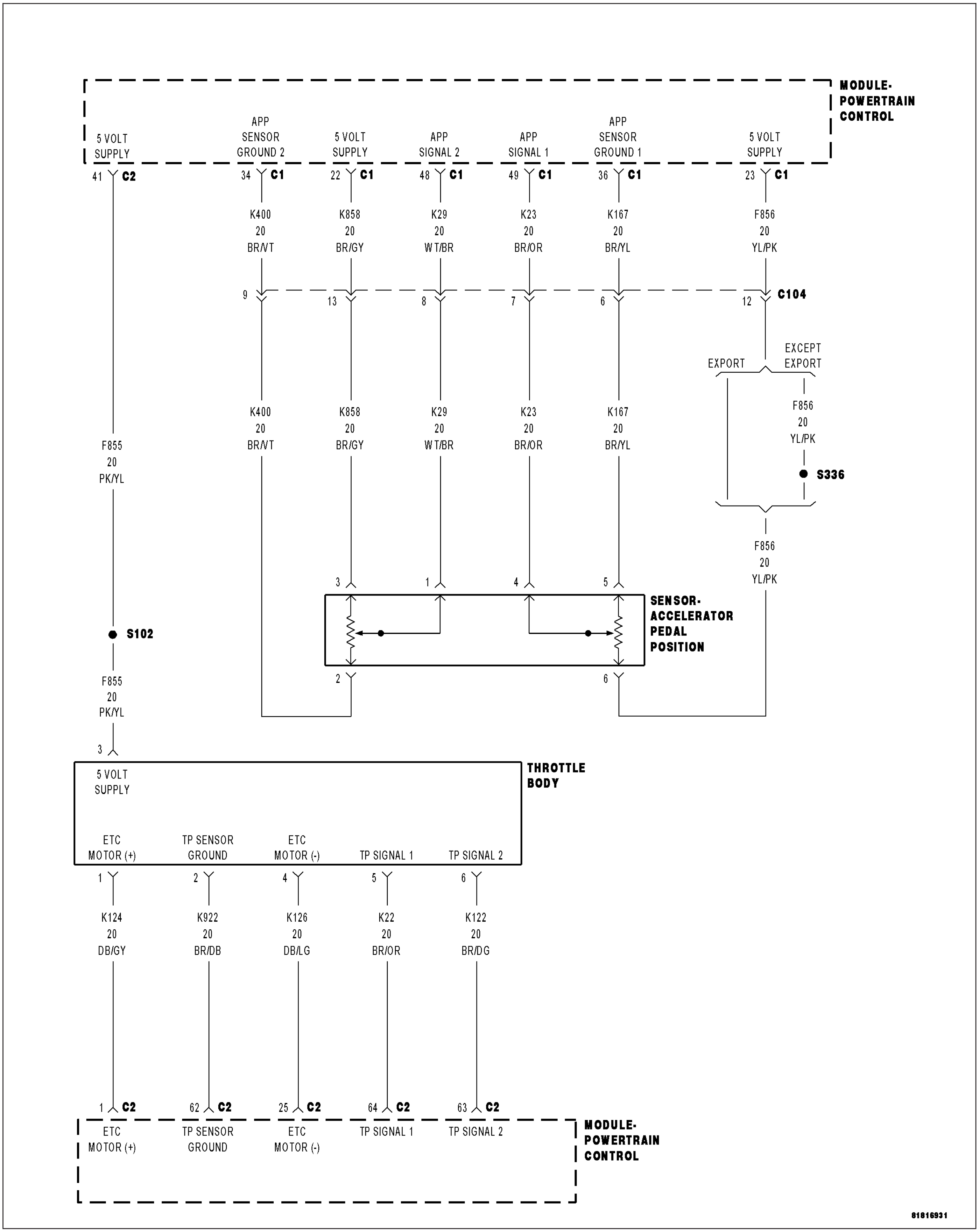
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K29) APP Signal 2 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO GROUND
(K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT
(K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT
(K858) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

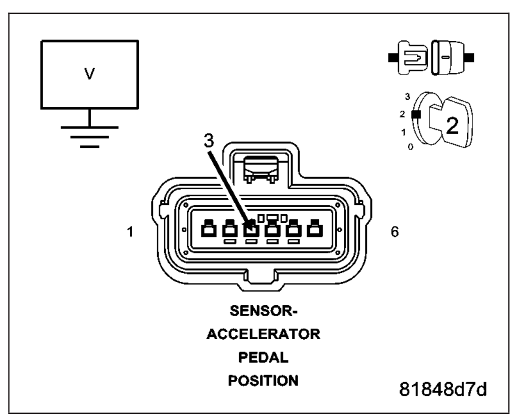
2. (K858) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



Is the voltage above 4.5 volts?

Yes >> Go to 6

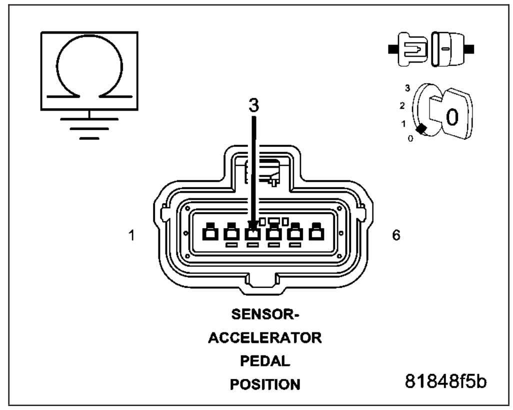
No >> Go to 3

3. (K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition on.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K858) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



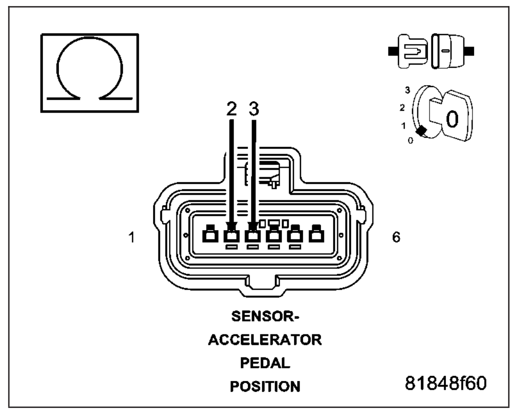
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K858) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT

Measure the resistance between the (K858) 5 Volt Supply circuit and the (K400) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



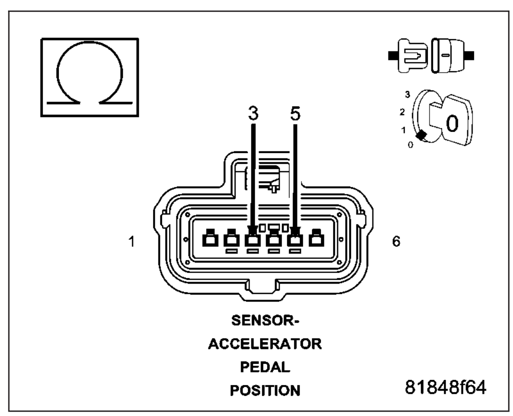
Is the resistance above 100 ohms?

Yes >> Go to 5

No >> Repair the (K858) 5 Volt Supply circuit for a short to the (K400) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT

Measure the resistance between the (K858) 5 Volt Supply circuit and the (K167) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



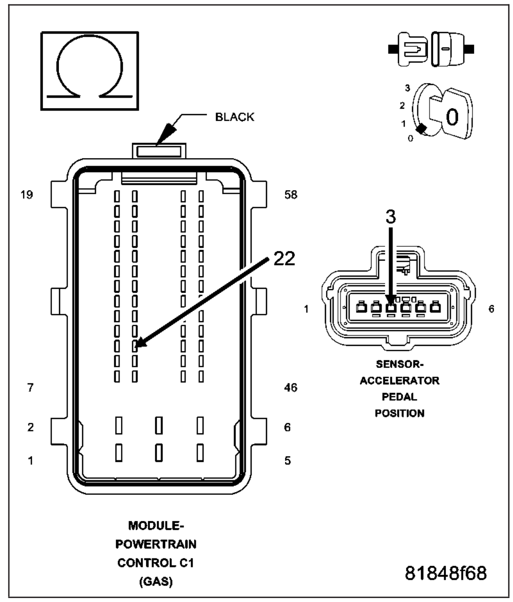
Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (K858) 5 Volt Supply circuit for a short to the (K167) Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K858) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the (K858) 5 Volt Supply circuit for an open circuit or high resistance.

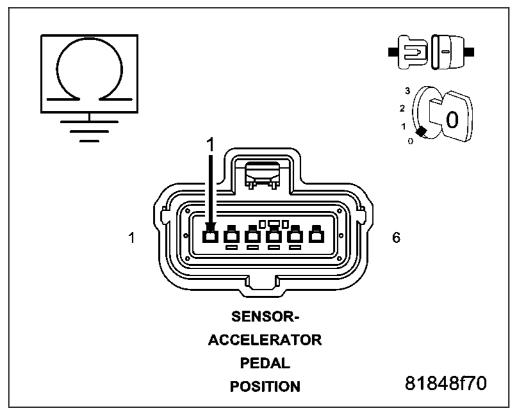
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K29) APP Signal 2 circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

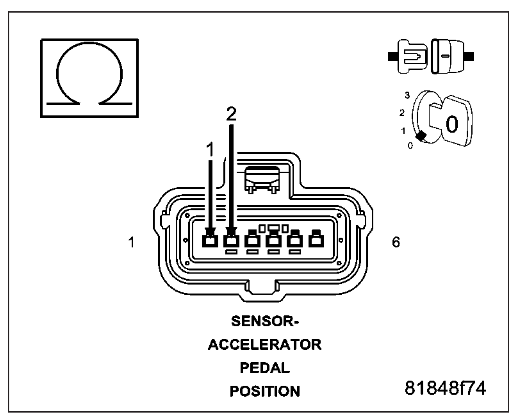
Yes >> Go to 8

No >> Repair the (K29) APP Signal 2 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO (K400) SENSOR GROUND CIRCUIT

Measure the resistance between the (K29) APP Signal 2 circuit and the (K400) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

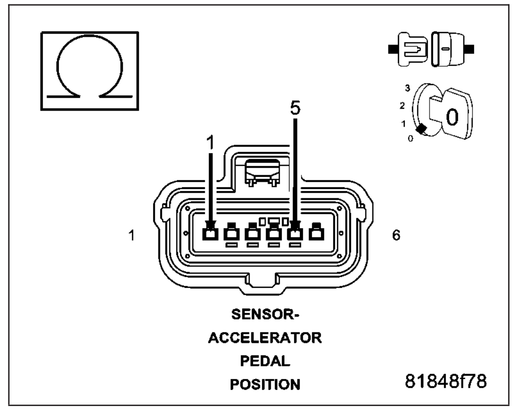
Yes >> Go to 9

No >> Repair the (K29) APP Signal 2 circuit for a short to the (K400) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO (K167) SENSOR GROUND CIRCUIT

Measure the resistance between the (K29) APP Signal 2 circuit and the (K167) Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance above 100 ohms?

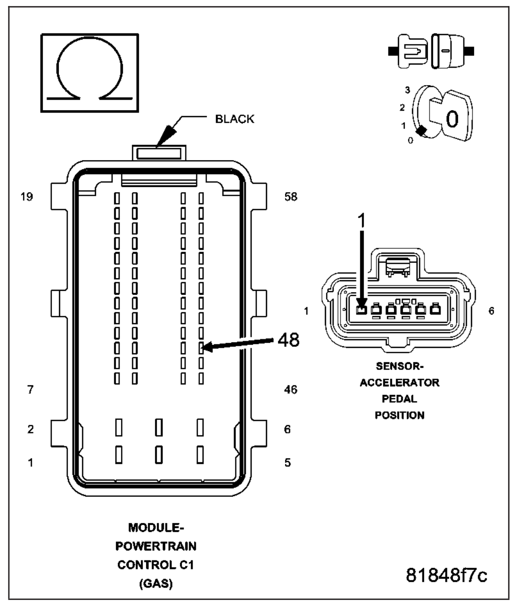
Yes >> Go to 10

No >> Repair the (K29) APP Signal 2 circuit for a short to the (K167) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

10. (K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K29) APP Signal 2 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 11

No >> Repair the (K29) APP Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. ACCELERATOR PEDAL POSITION SENSOR

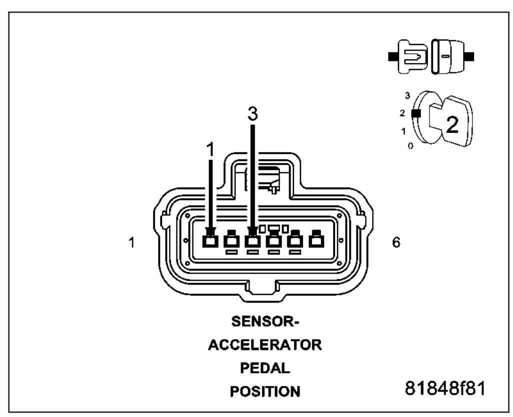
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K858) 5 Volt Supply circuit and the (K29) APP Signal 2 circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Accelerator Pedal Position Sensor signal voltage.



Is the voltage above 4.5 volts with the jumper wire in place?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 12

12. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

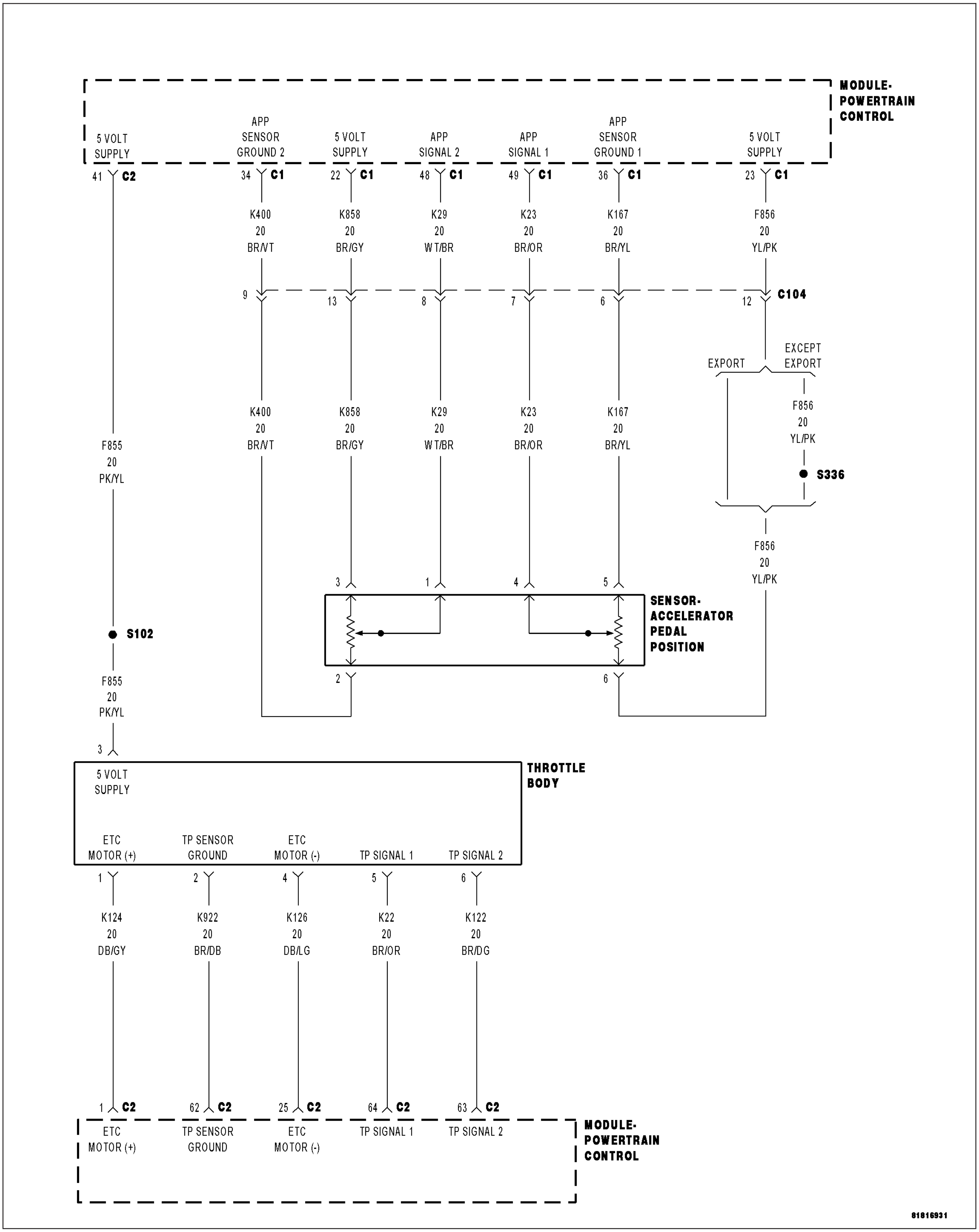
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K29) APP Signal 2 circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO THE (K858) 5 VOLT SUPPLY CIRCUIT
(K29) APP SIGNAL 2 CIRCUIT SHORTED TO THE (K856) 5 VOLT SUPPLY CIRCUIT
(K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(K400) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any system voltage or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K858) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

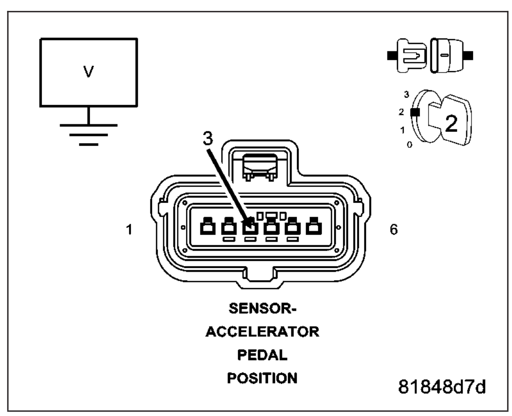
Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K858) 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.



Is there any voltage present?

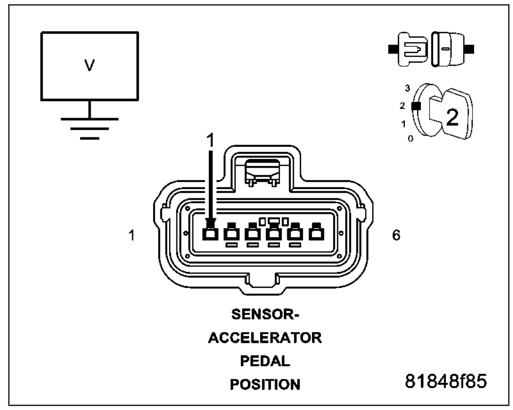
Yes >> Repair the (K858) 5 Volt Supply circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K29) APP Signal 2 circuit in the Accelerator Pedal Position Sensor harness connector.



Is there any voltage present?

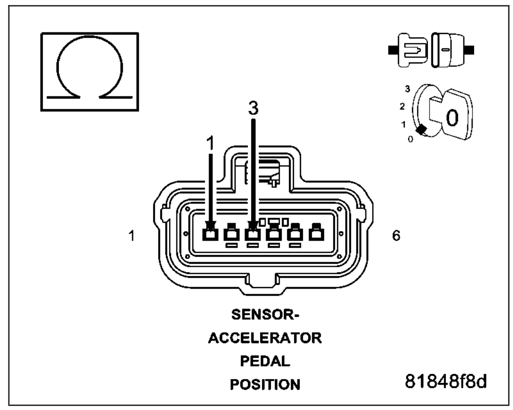
Yes >> Repair the (K29) APP Signal 2 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO THE (K858) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K29) APP Signal 2 circuit and the (K858) 5 Volt Supply in the Accelerator Pedal Position Sensor harness connector.



Is the resistance below 100 ohms?

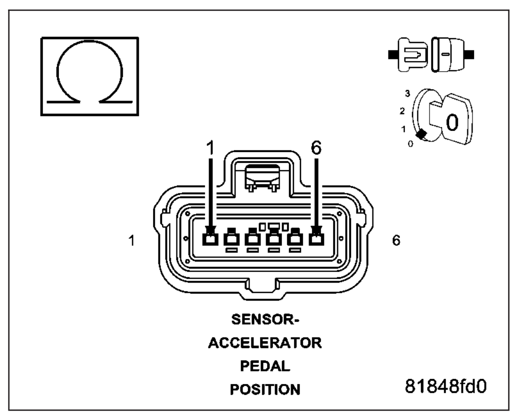
Yes >> Repair the (K29) APP Signal 2 circuit for a short to the (K858) 5 Volt Supply circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K29) APP SIGNAL 2 CIRCUIT SHORTED TO THE (K856) 5 VOLT SUPPLY CIRCUIT

Measure the resistance between the (K29) APP Signal 2 circuit and the (K856) 5 Volt Supply in the Accelerator Pedal Position Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the (K29) APP Signal 2 circuit for a short to the (K856) 5 Volt Supply circuit.

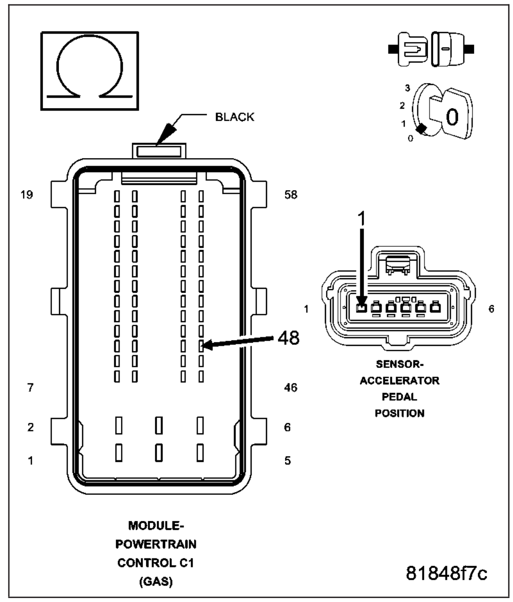
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K29) APP Signal 2 between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

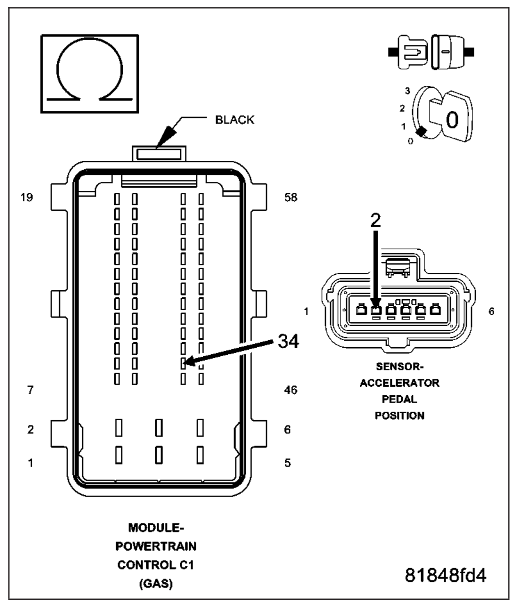
Yes >> Go to 7

No >> Repair the (K29) APP Signal 2 for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K400) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K400) Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K400) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. ACCELERATOR PEDAL POSITION SENSOR

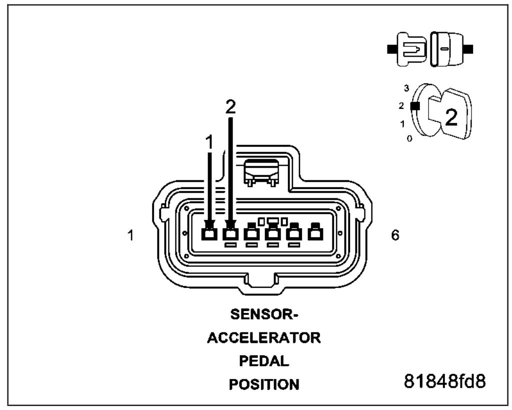
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K400) Sensor Ground circuit and the (K29) APP Signal 2 circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, read the Accelerator Pedal Position Sensor signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

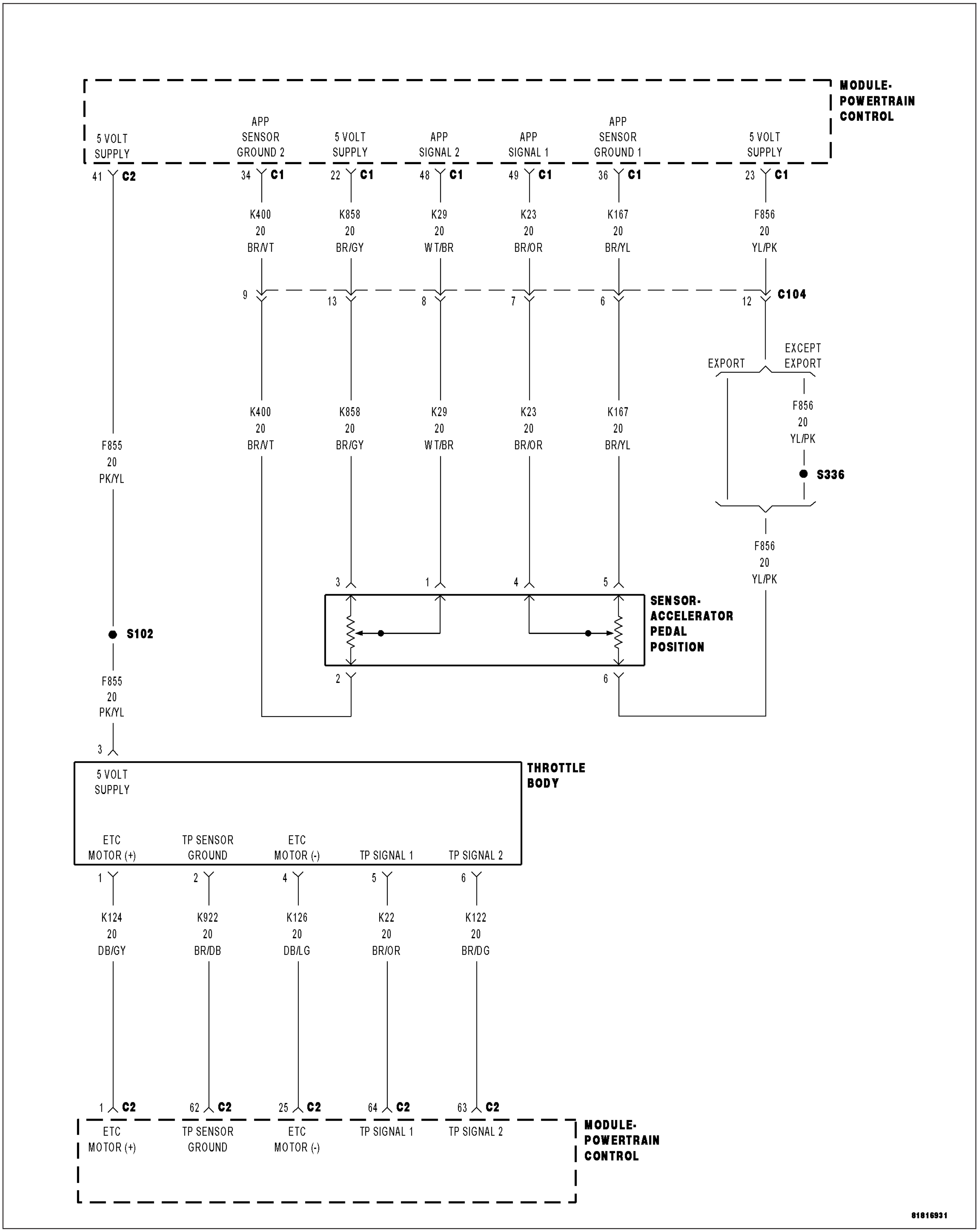
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2135-THROTTLE POSITION SENSOR 12 CORRELATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, battery voltage greater than 10.4 volts, and no other TP Sensor DTCs present.
- **Set Condition:**
  The PCM detects that the TP Sensor voltages are not plausible. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
INTERMITTENT DTC
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K22) TP SIGNAL 1 CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K122) TP SIGNAL 2 CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K22) TP SIGNAL 1 CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(K122) TP SIGNAL 2 CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT
(F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
THROTTLE BODY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Diagnose and repair any system voltage or sensor reference voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

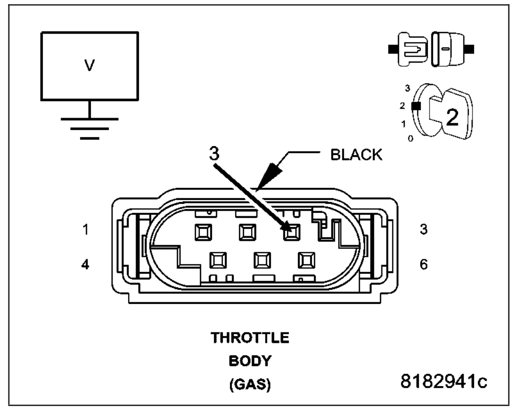
2. (F855) 5 VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Throttle Body connector.

Turn the ignition on.

Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.



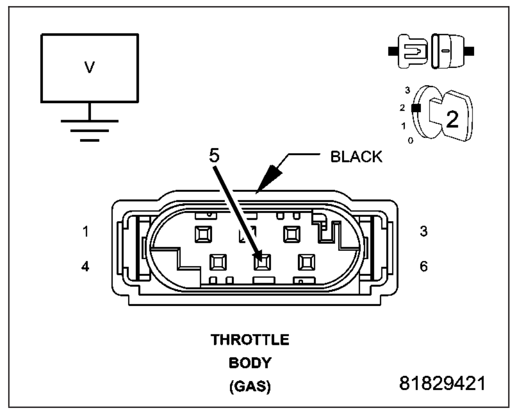
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 9

3. (K22) TP SIGNAL 1 CIRCUIT VOLTAGE

Measure the voltage of the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



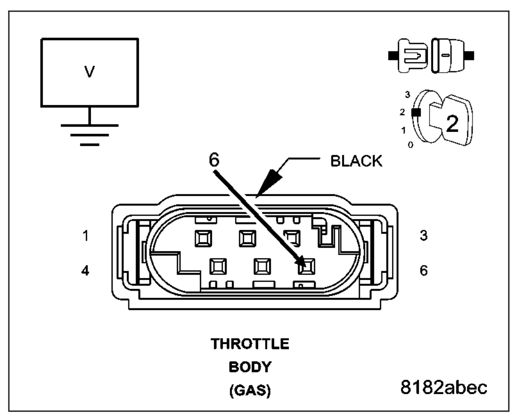
Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 4

No >> Go to 13

4. (K122) TP SIGNAL 2 CIRCUIT VOLTAGE

Measure the voltage of the (K122) TP Signal 2 circuit in the Throttle Body harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 5

No >> Go to 17

5. (K922) TP SENSOR GROUND CIRCUIT TEST

Turn the ignition off.

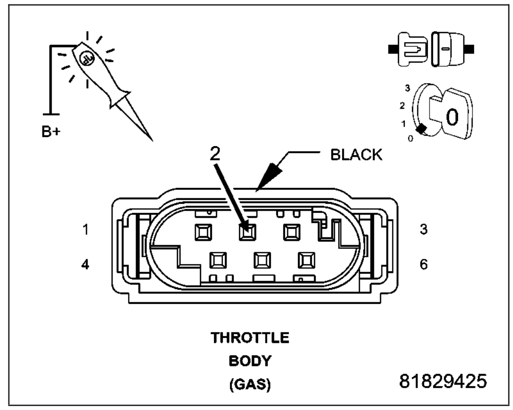
Using a 12 volt test light connected to 12 volts, check the (K922) TP Sensor Ground in the Throttle Body harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 6

No >> Go to 21



6. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K22) TP SIGNAL 1 CIRCUIT

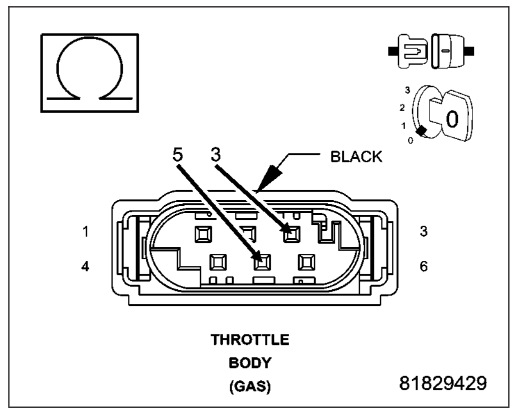
Measure the resistance between the (F855) 5 Volt Supply circuit and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 7

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K22) TP Signal 1 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



7. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K122) TP SIGNAL 2 CIRCUIT

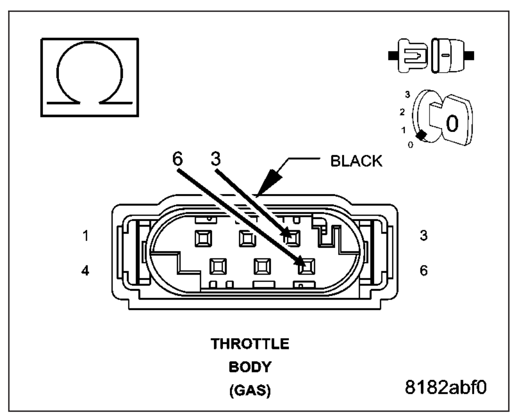
Measure the resistance between the (F855) 5 Volt Supply circuit and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 8

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K122) TP Signal 2 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



8. THROTTLE BODY

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

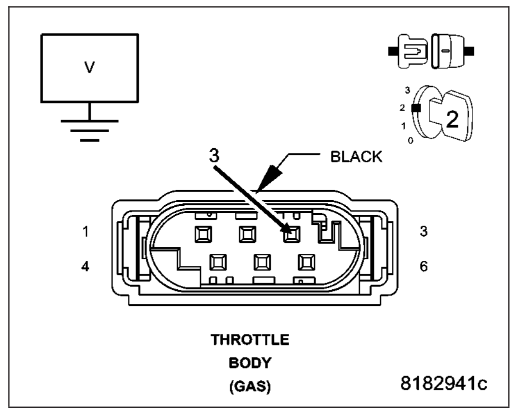
Inspect the Throttle Body for any condition that would result in an incorrect signal, such as damage or contamination.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

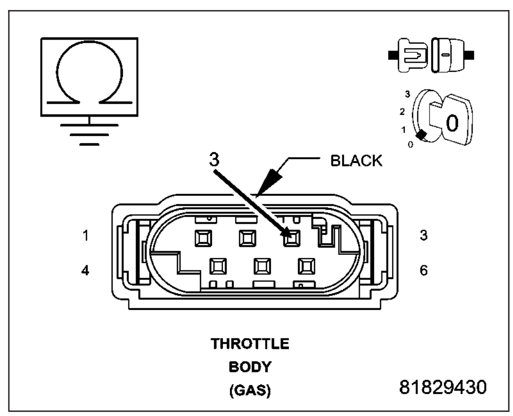
Measure the voltage of the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.

Is there any voltage present?

Yes >> Repair the (F855) 5 Volt Supply circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10

10. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Measure the resistance between ground and the (F855) 5 Volt Supply circuit in the Throttle Body harness connector.

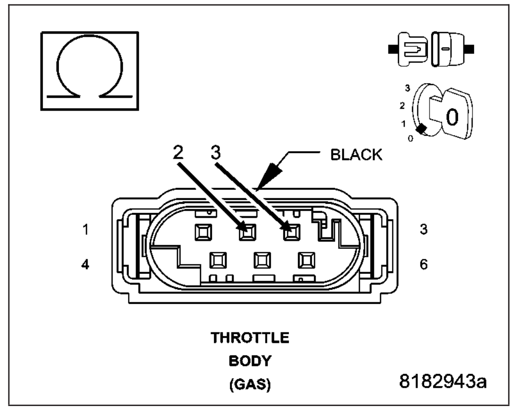
Is the resistance above 100 ohms?

Yes >> Go to 11

No >> Repair the (F855) 5 Volt Supply circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

11. (F855) 5 VOLT SUPPLY CIRCUIT SHORTED TO THE (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (F855) 5 Volt Supply circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



Is the resistance above 100 ohms?

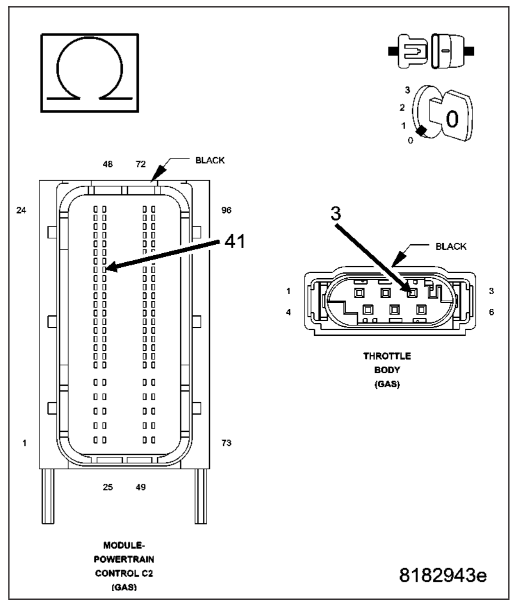
Yes >> Go to 12

No >> Repair the (F855) 5 Volt Supply circuit for a short to the (K922) TP Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

12. (F855) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (F855) 5 Volt Supply circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 22

No >> Repair the (F855) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

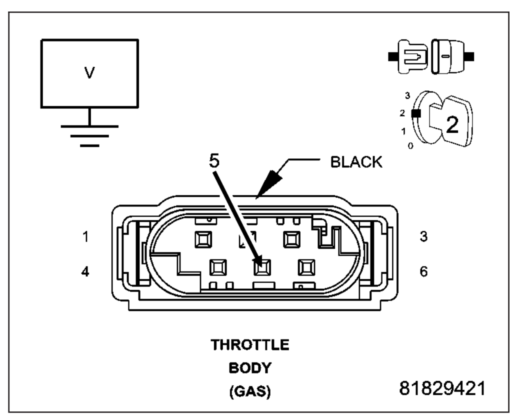
13. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K22) TP Signal 1 circuit in the Throttle Body harness connector.



Is there any voltage present?

Yes >> Repair the (K22) TP Signal 1 circuit for a short to voltage.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 14

14. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

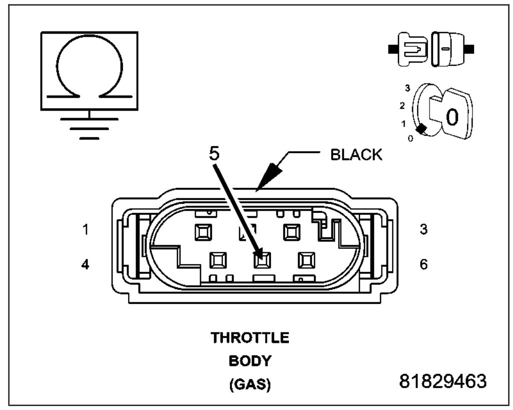
Measure the resistance between ground and the (K22) TP Signal 1 circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 15

No >> Repair the (K22) TP Signal 1 circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



15. (K22) TP SIGNAL 1 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

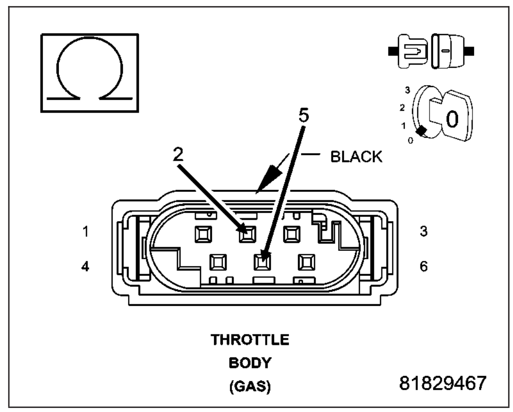
Measure the resistance between the (K22) TP Signal 1 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.

Is the resistance above 100 ohms?

Yes >> Go to 16

No >> Repair the (K22) TP Signal 1 circuit for a short to the (K922) TP Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



16. (K22) TP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

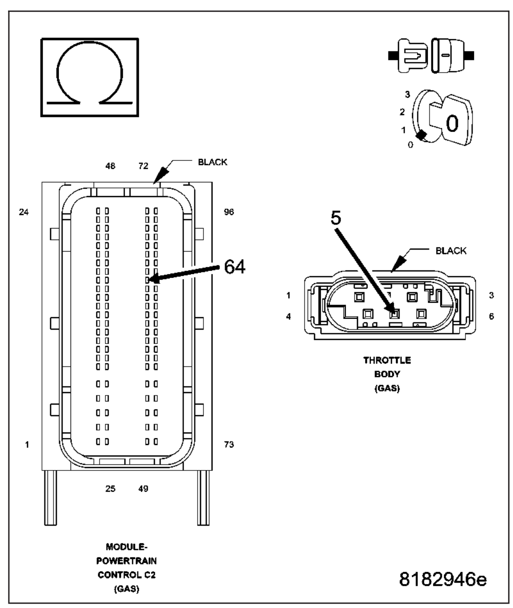
Measure the resistance of the (K22) TP Signal 1 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 22

No >> Repair the (K22) TP Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



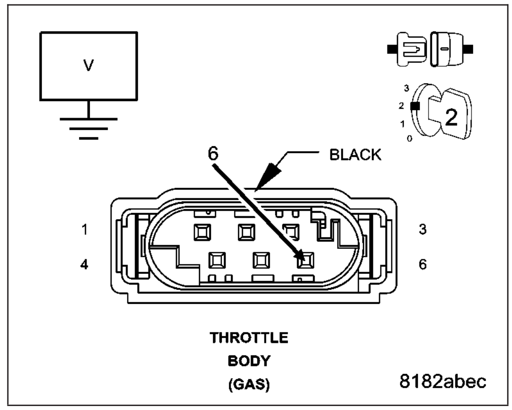
17. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K122) TP Signal 2 circuit in the Throttle Body harness connector.



Is there any voltage present?

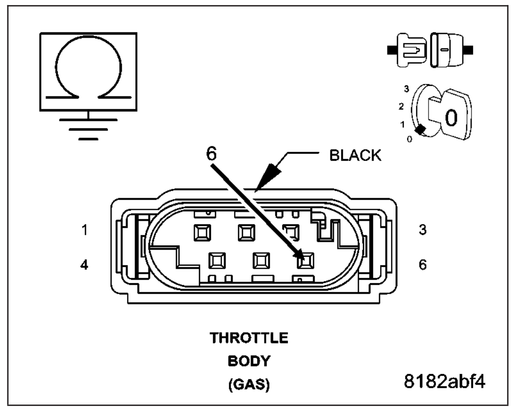
Yes >> Repair the (K122) TP Signal 2 circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 18

18. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K122) TP Signal 2 circuit in the Throttle Body harness connector.



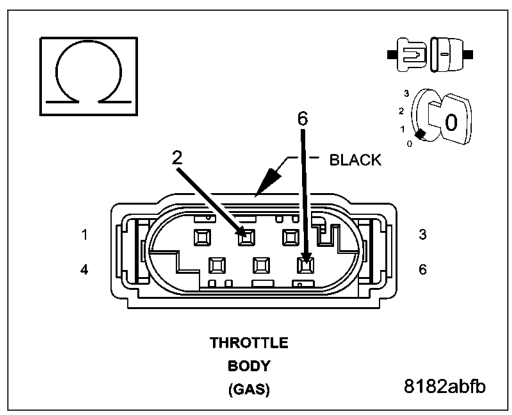
Is the resistance above 100 ohms?

Yes >> Go to 19

No >> Repair the (K122) TP Signal 2 circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

19. (K122) TP SIGNAL 2 CIRCUIT SHORTED TO (K922) TP SENSOR GROUND CIRCUIT

Measure the resistance between the (K122) TP Signal 2 circuit and the (K922) TP Sensor Ground circuit in the Throttle Body harness connector.



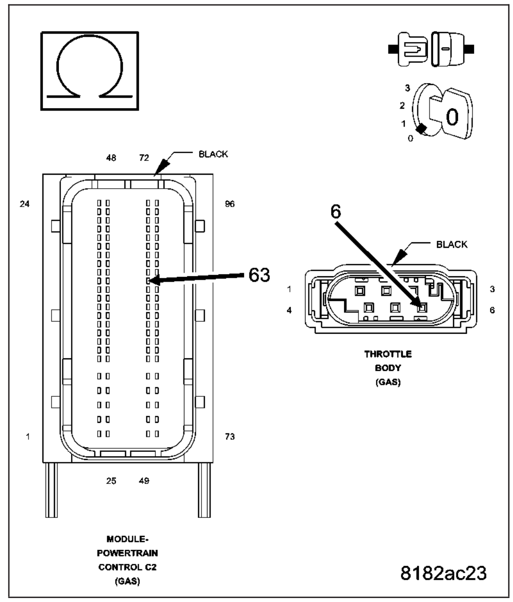
Is the resistance above 100 ohms?

Yes >> Go to 20

No >> Repair the (K122) TP Signal 2 circuit for a short to the (K922) TP Sensor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

20. (K122) TP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K122) TP Signal 2 circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 22

No >> Repair the (K122) TP Signal 2 circuit for an open circuit or high resistance.

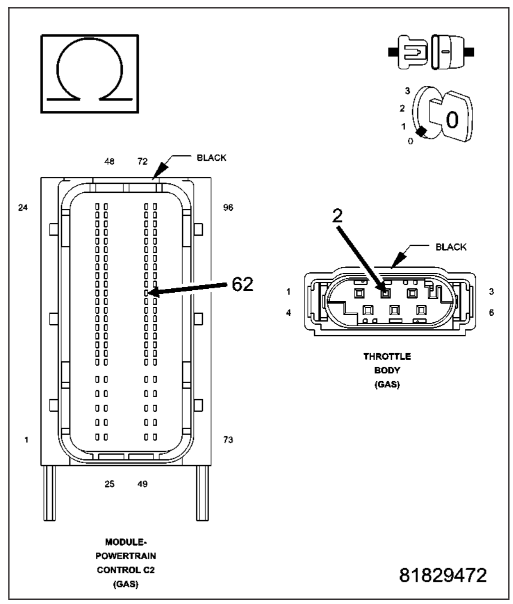
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

21. (K922) TP SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (K922) TP Sensor Ground circuit between the Throttle Body harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 22

No >> Repair the circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

22. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

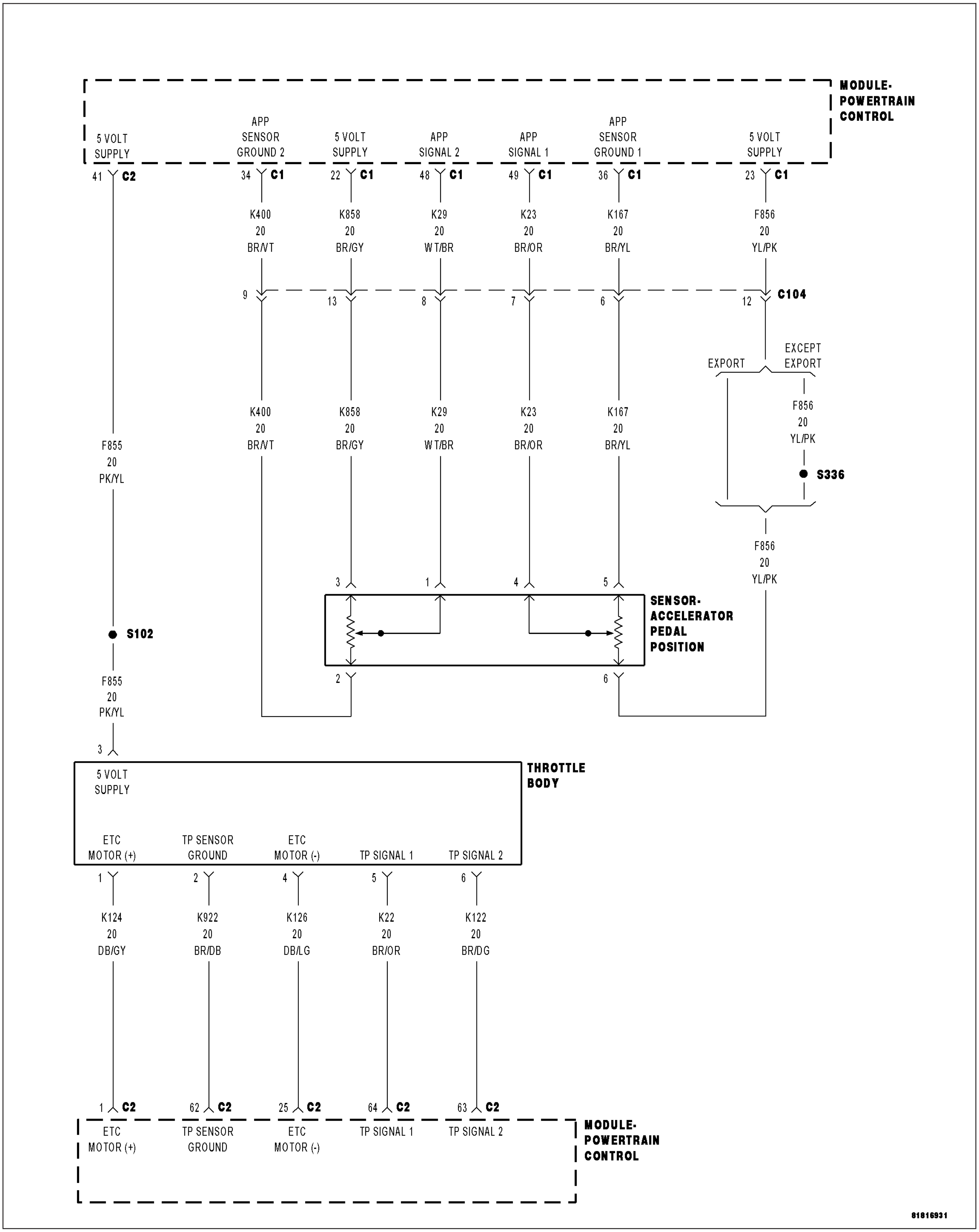
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, battery voltage greater than 10.4 volts, and no APPS 1 and APPS 2 DTCs present.
- **Set Condition:**
  The PCM detects that the correlation between APPS 1 and APPS 2 is not plausible. Idle may be affected when the brake pedal is pressed or if a brake switch circuit error is present. Acceleration rate and engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
INTERMITTENT DTC
(F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K167) APP SENSOR GROUND 1 CIRCUIT OPEN OR HIGH RESISTANCE
(K858) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(K400) APP SENSOR GROUND 2 CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Diagnose and repair any APPS, system voltage, or sensor supply voltage DTCs before continuing with this test.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

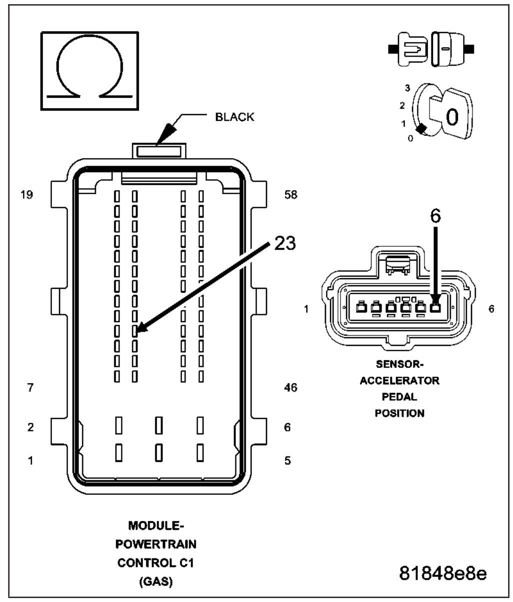
2. (F856) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance of the (F856) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

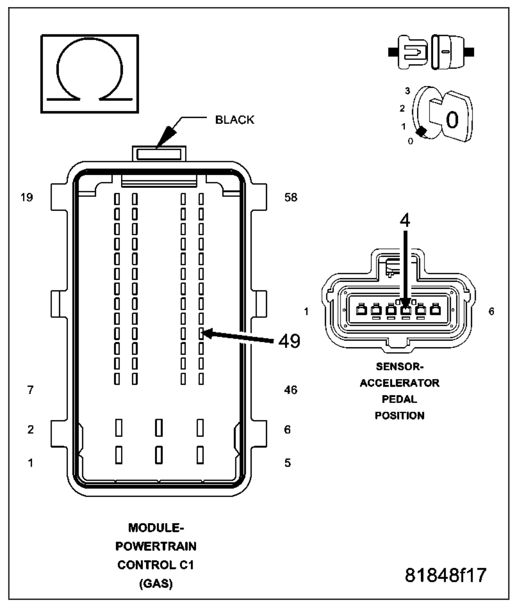
Yes >> Go to 3

No >> Repair the (F856) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K23) APP SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K23) APP Signal 1 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

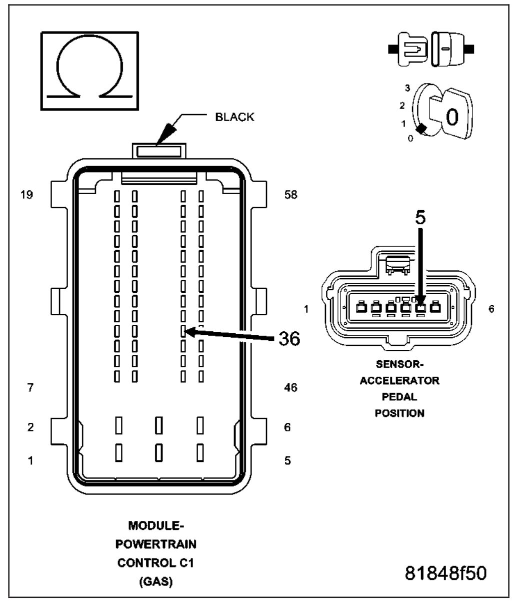
Yes >> Go to 4

No >> Repair the (K23) APP Signal 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K167) APP SENSOR GROUND 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K167) APP Sensor Ground 1 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

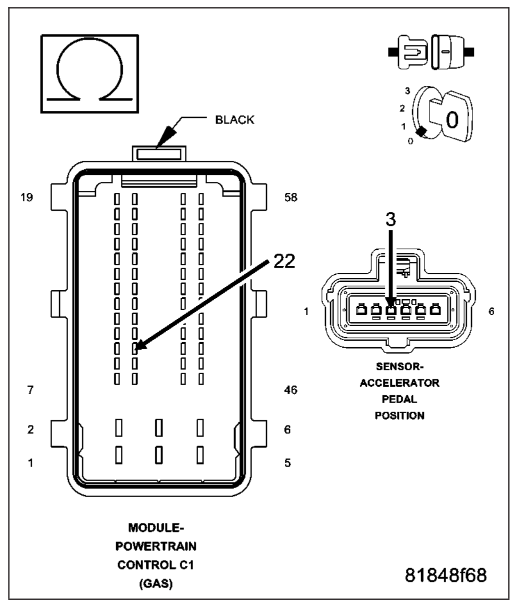
Yes >> Go to 5

No >> Repair the (K167) APP Sensor Ground 1 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K858) 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K858) 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

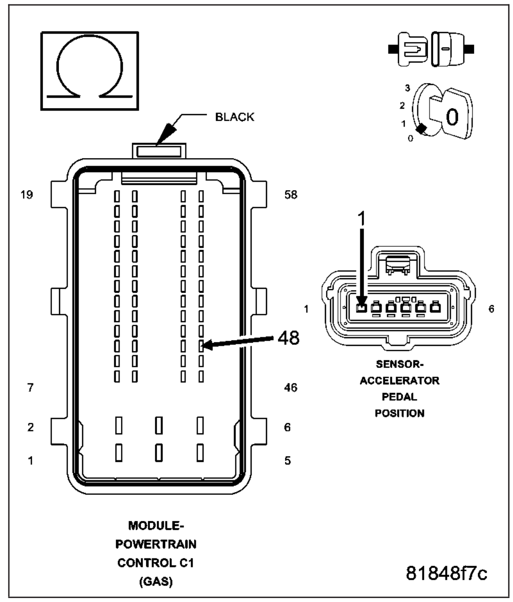
Yes >> Go to 6

No >> Repair the (K858) 5 Volt Supply circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K29) APP SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K29) APP Signal 2 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

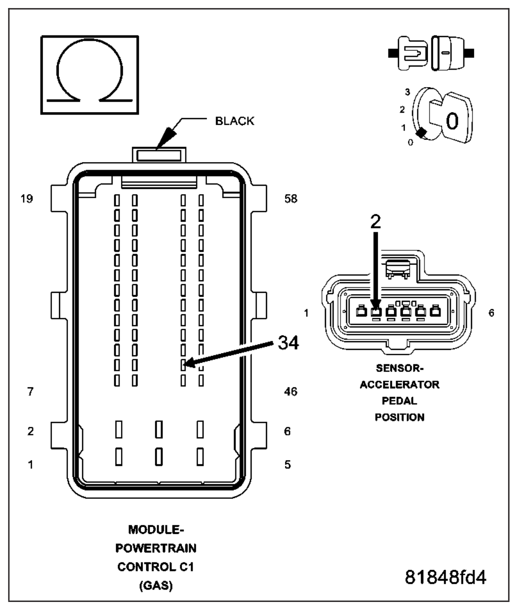
Yes >> Go to 7

No >> Repair the (K29) APP Signal 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K400) APP SENSOR GROUND 2 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K400) APP Sensor Ground 2 circuit between the Accelerator Pedal Position Sensor harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K400) APP Sensor Ground 2 circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Connect the Accelerator Pedal Position Sensor connector.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Set up a lab scope to view two graphs simultaneously.

Using one channel on the lab scope, backprobe the (K23) APP Signal 1 circuit at the APP Sensor harness connector.

Using the other channel on the lab scope, backprobe the (K29) APP Signal 2 circuit at the APP Sensor harness connector.

Slowly press and release the Accelerator Pedal while monitoring the lab scope screen.

Does the scope pattern show any missing or erratic signals?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 9

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2166-ACCELERATOR PEDAL POSITION SENSOR 1 MAXIMUM STOP PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the igniting on. During in-plant testing, the APP Sensor is checked to make sure the minimum and maximum values can be reached.
- **Set Condition:**
  APPS 1 has failed to achieve the required maximum value during In-Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
INTERMITTENT DTC
ETC RELEARN
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: This DTC is set when the APPS values are learned in-plant but do not reach the minimum or maximum voltage range.

NOTE: Diagnose any APPS out of range and 5 volt supply DTCs before continuing.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR

With a scan tool perform the ETC RELEARN function.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. After installation is complete, perform the ETC RELEARN function.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test Complete.

P2167-ACCELERATOR PEDAL POSITION SENSOR 2 MAXIMUM STOP PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the igniting on. During in-plant testing, the APP Sensors need to be checked to make sure the minimum and maximum values can be reached.
- **Set Condition:**
  APPS 2 has failed to achieve the required maximum value during In-Plant testing. One trip fault and the code will be stored within 5 seconds. Engine will only idle.

Possible Causes
INTERMITTENT DTC
ETC RELEARN
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: This DTC is set when the APP Sensor values are learned in-plant but do not reach the minimum or maximum voltage range.

NOTE: Diagnose any APPS out of range and 5 volt supply DTCs before continuing.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR

With a scan tool perform the ETC RELEARN function.

With the scan tool, clear DTCs.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. After installation is complete, perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Test complete.

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  A large vacuum leak has been detected or the signal voltage for both TP Sensors is stuck at 2.5 volts and calculated MAP is less than actual MAP minus an offset value. One trip fault and the code will set within 5 seconds. ETC light will flash.

Possible Causes
VACUUM LEAK
MAP SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
THROTTLE POSITION SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
MAP SENSOR
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose and repair any TP Sensor or MAP Sensor DTCs before continuing.

NOTE: Diagnose and repair any VSS or 5 Volt supply circuit DTCs before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VACUUM LEAK

NOTE: This code is enabled on engines equipped with a plastic intake manifold to limit engine operation if a large vacuum leak should occur.

NOTE: A large vacuum leak is the most probable cause of this DTC.

Inspect the intake manifold, power brake booster, and PCV system for any vacuum leaks.

Inspect the throttle plate. If the throttle blade is bent or will not close, the throttle body may need to be replaced.

Inspect the MAP Sensor and Throttle Body for proper installation.

Inspect the engine for any mechanical conditions that can cause low engine vacuum.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go to 5

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the MAP Sensor circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor 1 and TP Sensor 2 voltages.

Slowly press the throttle pedal down.

The voltage for TP Sensor 1 should start at approximately 0.3 volts and increase to above 4.7 volts.

The voltage for TP Sensor 2 should start at approximately 4.7 volts and decrease to approximately 0.3 volts.

Is the voltage within the range specified for each sensor?

Yes >> Go to 7

No >> Go to 6

6. THROTTLE BODY

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the Throttle Body circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM) and between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  A large vacuum leak has been detected or the signal voltage for both TP Sensors is stuck at 2.5 volts and calculated MAP is less than the Gas Flow Adaptation value. One trip fault the code will set within 5 seconds. ETC light will flash.

Possible Causes
VACUUM LEAK
MAP SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
THROTTLE POSITION SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
MAP SENSOR
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose and repair any TP Sensor or MAP Sensor DTCs before continuing.

NOTE: Diagnose and repair any VSS or 5 Volt supply circuit DTCs before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VACUUM LEAK

NOTE: This code is enabled on engines equipped with a plastic intake manifold to limit engine operation if a large vacuum leak should occur.

NOTE: A large vacuum leak is the most probable cause of this DTC.

Inspect the intake manifold, power brake booster, and PCV system for any vacuum leaks.

Inspect the throttle plate. If the throttle blade is bent or will not close, the throttle body may need to be replaced.

Inspect the MAP Sensor and Throttle Body for proper installation.

Inspect the engine for any mechanical conditions that can cause low engine vacuum.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go to 5

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the MAP Sensor circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor 1 and TP Sensor 2 voltages.

Slowly press the throttle pedal down.

The voltage for TP Sensor 1 should start at approximately 0.3 volts and increase to above 4.7 volts.

The voltage for TP Sensor 2 should start at approximately 4.7 volts and decrease to approximately 0.3 volts.

Is the voltage within the range specified for each sensor?

Yes >> Go to 7

No >> Go to 6

6. THROTTLE BODY

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the Throttle Body circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM) and between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  The PCM detects that calculated MAP is greater than actual MAP plus an offset value. One trip fault and the code will set within 5 seconds. Three good trips to turn of the MIL. ETC light will flash.

Possible Causes
AIR INTAKE SYSTEM OBSTRUCTION
VACUUM LEAK
MAP SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
THROTTLE POSITION SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
MAP SENSOR
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose and repair any TP Sensor or MAP Sensor DTCs before continuing.

NOTE: Diagnose and repair any VSS or 5 Volt supply circuit DTCs before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VACUUM LEAK

Inspect the intake manifold, power brake booster, and PCV system for any vacuum leaks.

Inspect the throttle plate. If the throttle blade is bent or will not close, the throttle body may need to be replaced.

Inspect the MAP Sensor and Throttle Body for proper installation.

Inspect the air intake system for any restrictions or obstructions.

Inspect the engine for any mechanical conditions that can cause low engine vacuum.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go to 5

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the MAP Sensor circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor 1 and TP Sensor 2 voltages.

Slowly press the throttle pedal down.

The voltage for TP Sensor 1 should start at approximately 0.3 volts and increase to above 4.7 volts.

The voltage for TP Sensor 2 should start at approximately 4.7 volts and decrease to approximately 0.3 volts.

Is the voltage within the range specified for each sensor?

Yes >> Go to 7

No >> Go to 6

6. THROTTLE BODY

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the Throttle Body circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM) and between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  The PCM detects that calculated MAP is greater than actual MAP plus an offset value. One trip fault and the code will set within 5 seconds. Three good trips to turn off the MIL. ETC light will flash.

Possible Causes
AIR INTAKE SYSTEM OBSTRUCTION
VACUUM LEAK
MAP SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
THROTTLE POSITION SENSOR CIRCUIT(S) OPEN, SHORTED, OR HIGH RESISTANCE
MAP SENSOR
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose and repair any TP Sensor or MAP Sensor DTCs before continuing.

NOTE: Diagnose and repair any VSS or 5 Volt supply circuit DTCs before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. VACUUM LEAK

Inspect the intake manifold, power brake booster, and PCV system for any vacuum leaks.

Inspect the throttle plate. If the throttle blade is bent or will not close, the throttle body may need to be replaced.

Inspect the MAP Sensor and Throttle Body for proper installation.

Inspect the air intake system for any restrictions or obstructions.

Inspect the engine for any mechanical conditions that can cause low engine vacuum.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go to 5

No >> Go to 4

4. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the MAP Sensor circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the MAP Sensor.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor 1 and TP Sensor 2 voltages.

Slowly press the throttle pedal down.

The voltage for TP Sensor 1 should start at approximately 0.3 volts and increase to above 4.7 volts.

The voltage for TP Sensor 2 should start at approximately 4.7 volts and decrease to approximately 0.3 volts.

Is the voltage within the range specified for each sensor?

Yes >> Go to 7

No >> Go to 6

6. THROTTLE BODY

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Check each of the Throttle Body circuits for high resistance or a shorted condition.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Throttle Body in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Throttle Body and the Powertrain Control Module (PCM) and between the MAP Sensor and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

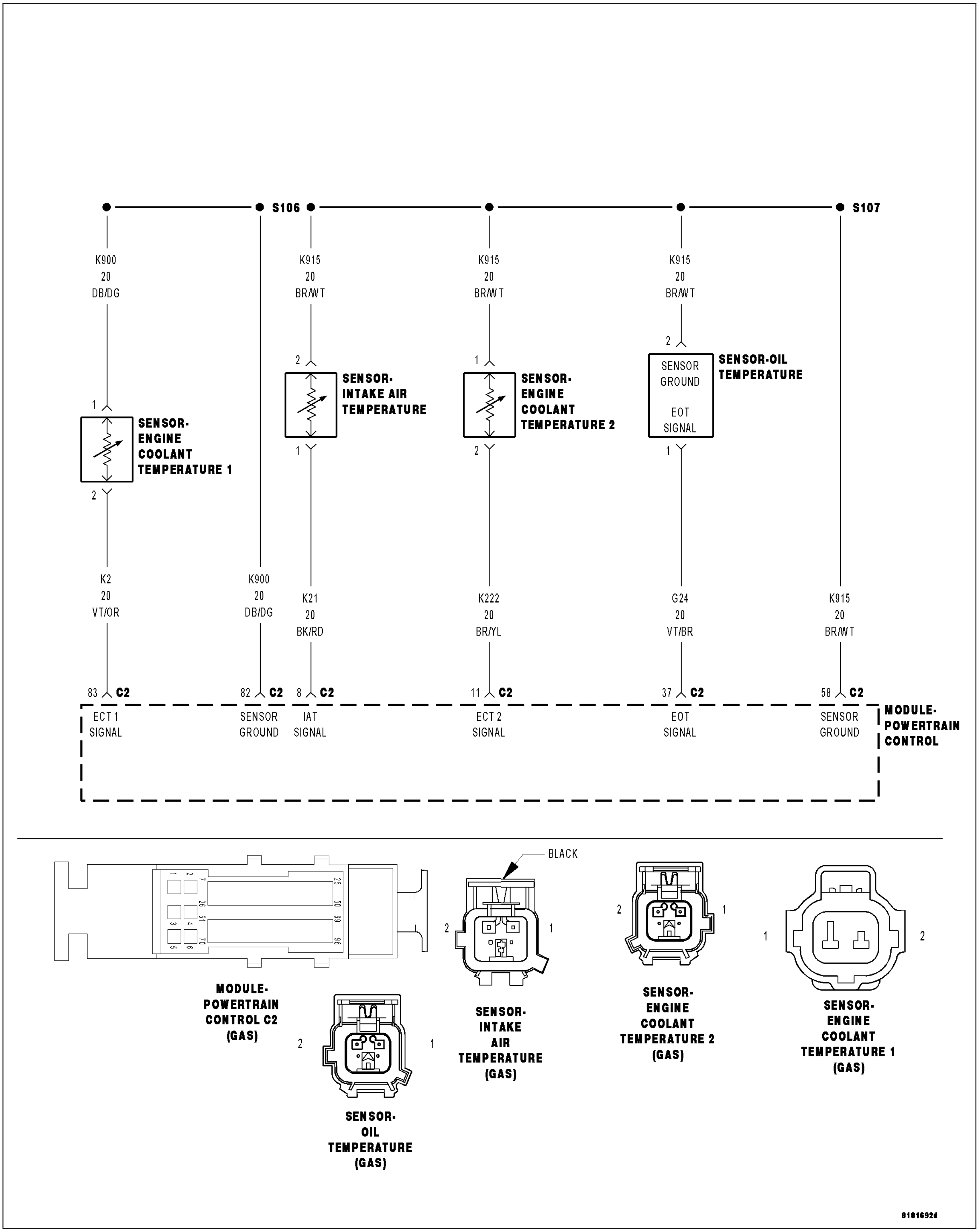
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2181-COOLING SYSTEM PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, engine running, and no ECT DTCs present.
- **Set Condition:**
  The coolant temperature should change at a specific rate. If this rate is too slow or too fast this fault will set. Two trip fault. Three good trips to clear MIL. ETC light will illuminate on first trip failure.

Possible Causes
INTERMITTENT DTC
LOW COOLANT LEVEL
THERMOSTAT
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND 1 CIRCUIT
(K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) SENSOR GROUND 1 CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With a scan tool, select View DTCs.

NOTE: Diagnose and repair any Engine Coolant Temperature (ECT) sensor DTCs before proceeding with this test.

NOTE: Inspect the ECT sensor and related PCM connector terminals for corrosion or damage.

NOTE: Extremely cold ambient temperatures may cause this DTC to set.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. LOW ENGINE COOLANT LEVEL

Ignition on, engine not running.

WARNING: Allow the engine to cool before opening the cooling system. The system may be under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in personal injury or death.

Inspect the cooling system for proper coolant level and condition.

Were any problems found?

Yes >> Inspect the vehicle for a coolant leak. Repair as necessary in accordance with the Service Information. Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. THERMOSTAT

Ignition on, engine not running.

NOTE: Allow the engine to cool to ambient temperature before proceeding with this test.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

With a scan tool, read the ECT sensor value. If the engine was allowed to cool completely, the value should be approximately equal to the ambient temperature.

Start the engine and allow it to reach operating temperature while monitoring the ECT sensor value. The sensor value change should be a smooth transition from start up to normal operating temperature. Monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the coolant temperature value on the scan tool should be relatively close. The thermostat should not open until the engine reaches the temperature specified in the Service Information.

Does the thermostat open at the temperature specified in the Service Information?

Yes >> Go to 4

No >> Replace the thermostat in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

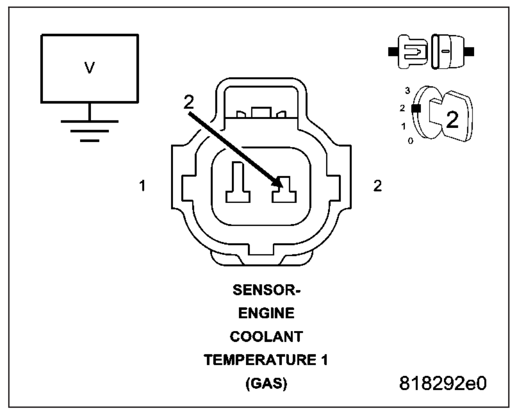
Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is there any voltage present?

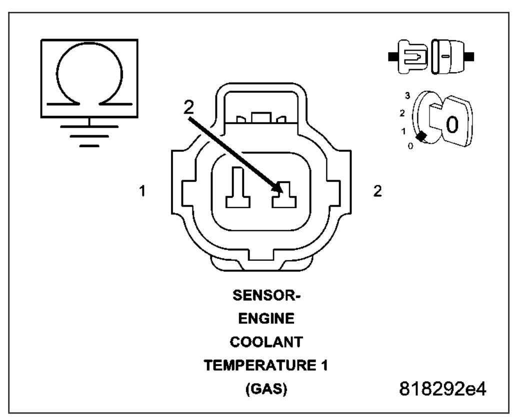
Yes >> Repair the (K2) ECT 1 Signal circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.



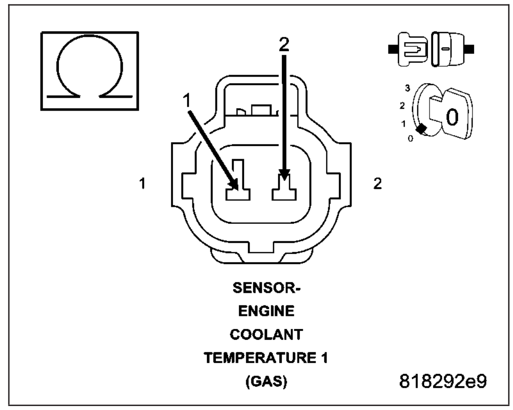
Is the resistance above 100 ohms?

Yes >> Go to 6

No >> Repair the (K2) ECT 1 Signal circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. (K2) ECT 1 SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND 1 CIRCUIT

Measure the resistance between the (K2) ECT 1 Signal circuit and the (K900) Sensor Ground 1 circuit in the Engine Coolant Temperature Sensor 1 harness connector.



Is the resistance above 100 ohms?

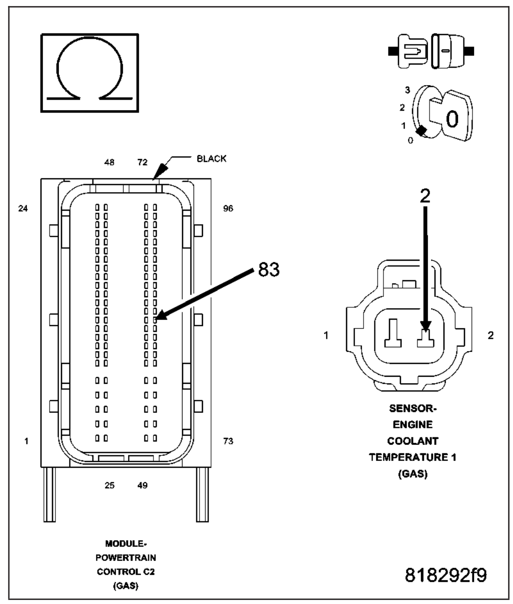
Yes >> Go to 7

No >> Repair the (K2) ECT 1 Signal circuit for a short to the (K900) Sensor Ground 1 circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (K2) ECT 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K2) ECT 1 Signal circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 8

No >> Repair the (K2) ECT 1 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

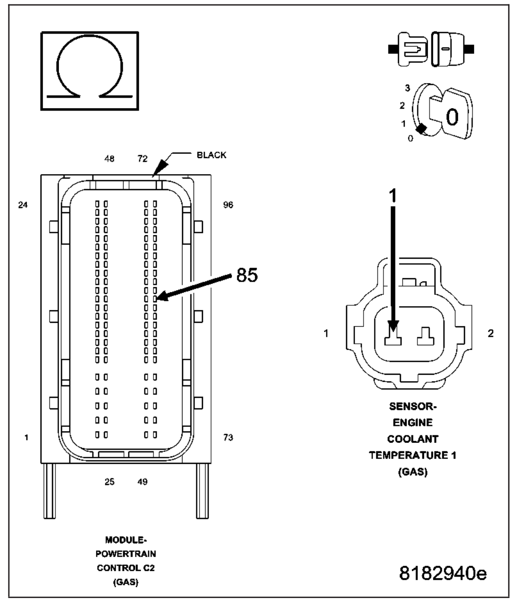
8. (K900) SENSOR GROUND 1 CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Sensor Ground 1 circuit between the Engine Coolant Temperature Sensor 1 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 9

No >> Repair the (K900) Sensor Ground 1 for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



9. ENGINE COOLANT TEMPERATURE SENSOR 1

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K900) Sensor Ground 1 circuit and the (K2) ECT 1 Signal circuit in the Engine Coolant Temperature Sensor 1 harness connector.

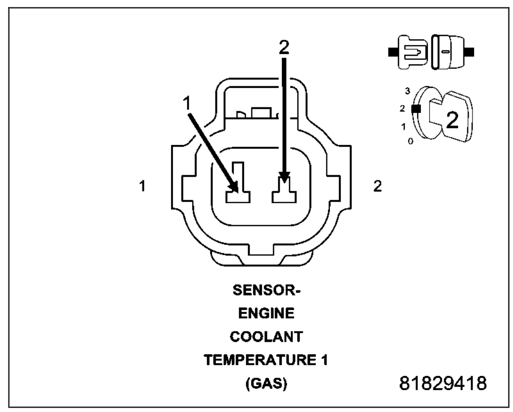
Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 1 signal voltage.

Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Coolant Temperature Sensor 1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 10



10. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

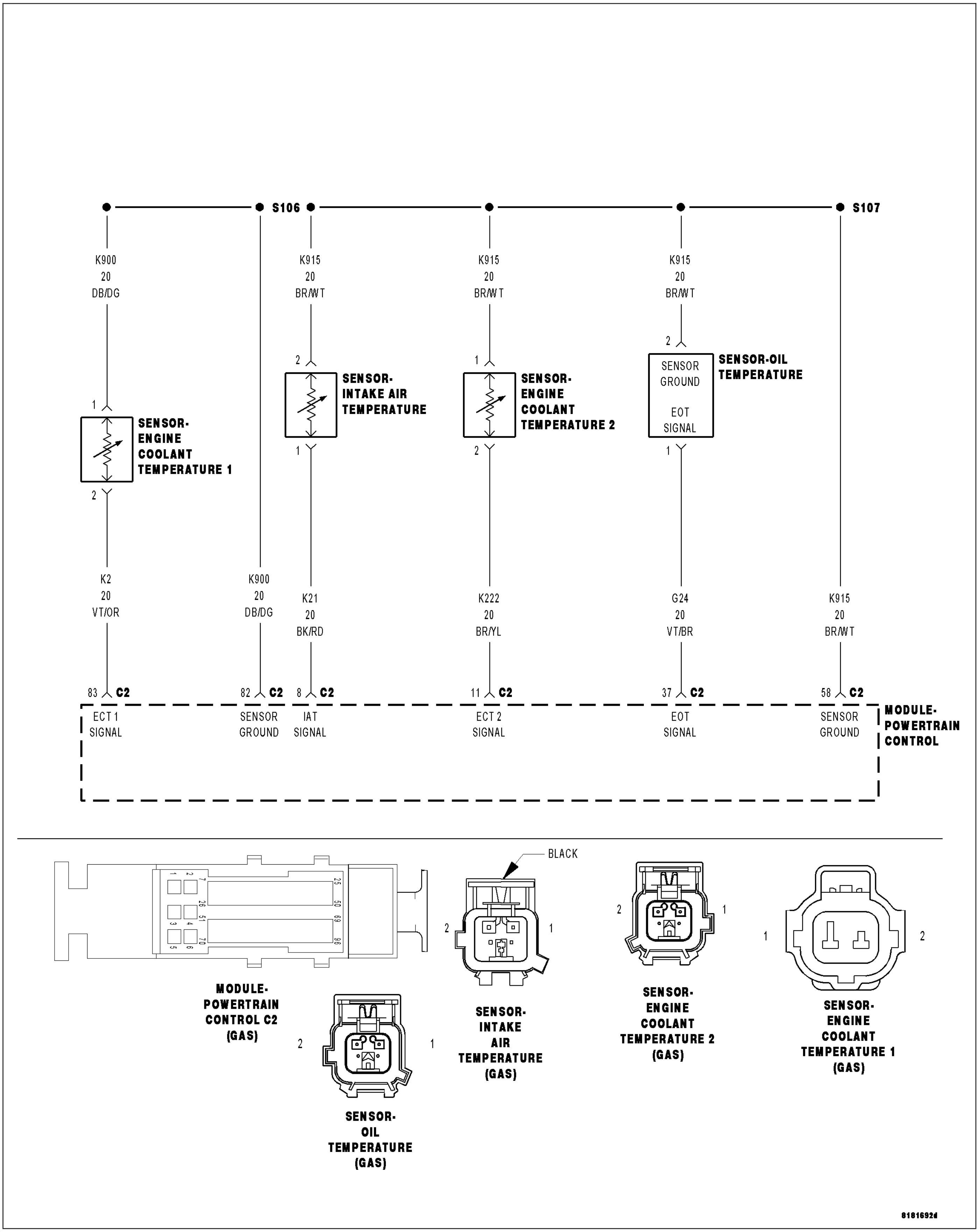
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2184-ENGINE COOLANT TEMPERATURE SENSOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the Engine Coolant Temperature Sensor 2 circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K222) ECT 2 SIGNAL CIRCUIT SHORTED TO GROUND
(K222) ECT 2 SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND
(K222) ECT 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

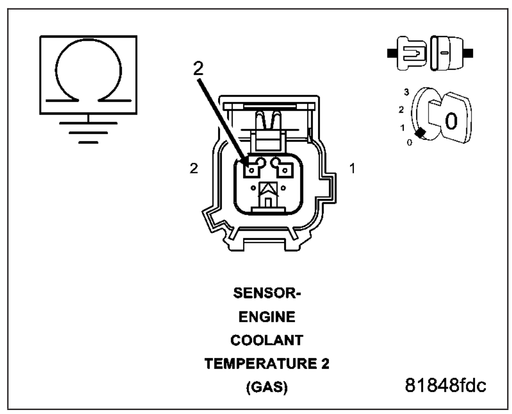
2. (K222) ECT 2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 2 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K222) ECT 2 Signal circuit in the Engine Coolant Temperature Sensor 2 harness connector.



Is the resistance above 100 ohms?

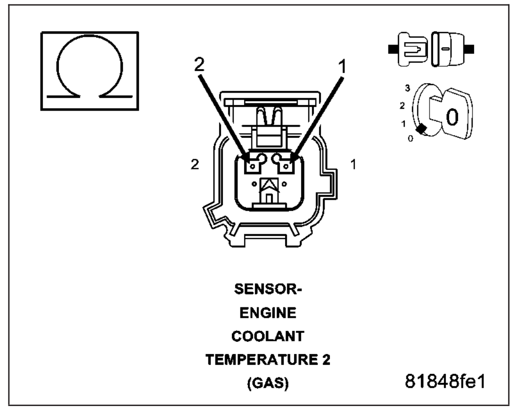
Yes >> Go to 3

No >> Repair the (K222) ECT 2 Signal circuit for a short to ground.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K222) ECT 2 SIGNAL CIRCUIT SHORTED TO (K915) SENSOR GROUND CIRCUIT

Measure the resistance between the (K222) ECT 2 Signal circuit and the (K915) Sensor Ground circuit in the Engine Coolant Temperature Sensor 2 harness connector.



Is the resistance above 100 ohms?

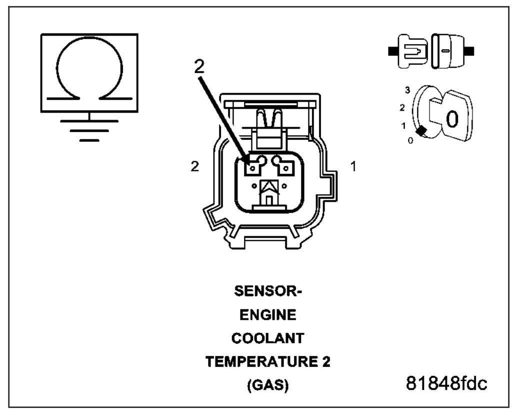
Yes >> Go to 4

No >> Repair the (K222) ECT 2 Signal circuit for a short to the (K915) Sensor Ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K222) ECT 2 SIGNAL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (K222) ECT 2 Signal circuit between the Engine Coolant Temperature Sensor 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K222) ECT 2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE COOLANT TEMPERATURE SENSOR 2

Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 2 signal voltage.

Is the voltage above 4.5 volts with the Engine Coolant Temperature Sensor 2 harness disconnected?

Yes >> Replace the Engine Coolant Temperature Sensor 2 in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

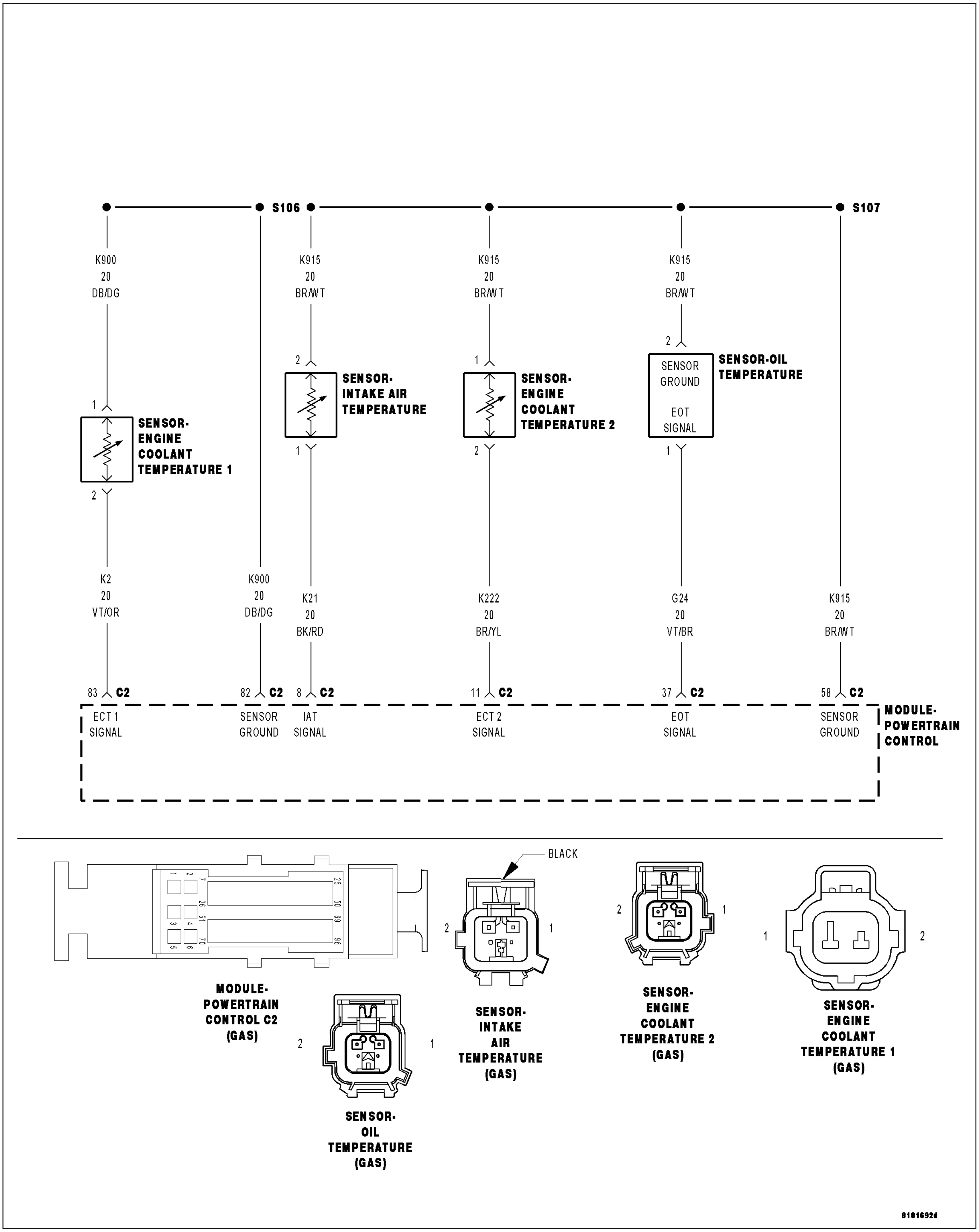
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2185-ENGINE COOLANT TEMPERATURE SENSOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K222) ECT 2 Signal circuit shorted high.

Possible Causes
INTERMITTENT DTC
(K222) ECT 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K222) ECT 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K222) ECT 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

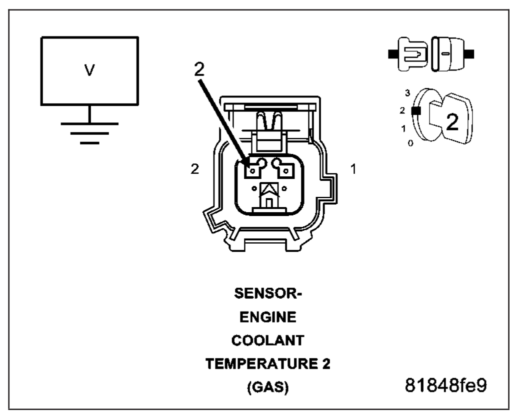
Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor 2 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K222) ECT 2 Signal circuit in the Engine Coolant Temperature Sensor 2 harness connector.



Is there any voltage present?

Yes >> Repair the (K222) ECT 2 Signal circuit for a short to voltage.

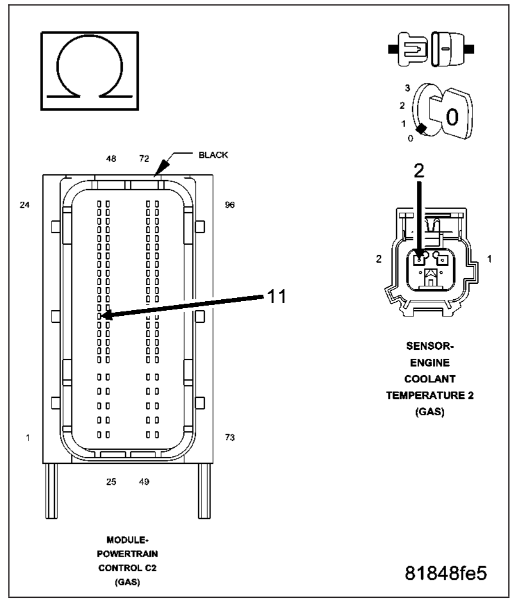
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K222) ECT 2 SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of the (K222) ECT 2 Signal circuit between the Engine Coolant Temperature Sensor 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

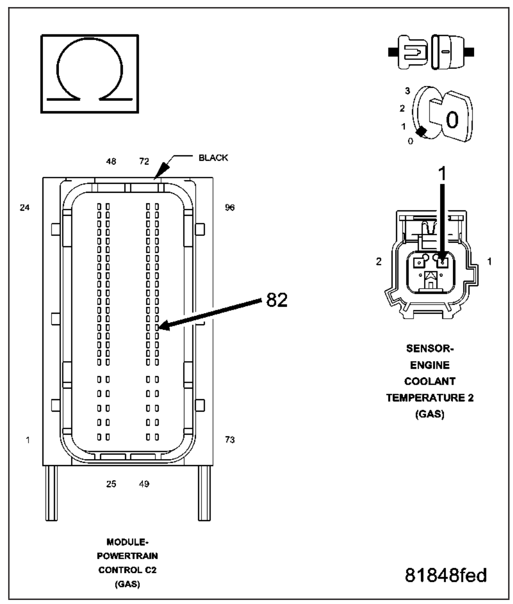
Yes >> Go to 4

No >> Repair the (K222) ECT 2 Signal circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K915) SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Sensor Ground circuit between the Engine Coolant Temperature Sensor 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K915) Sensor Ground circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. ENGINE COOLANT TEMPERATURE SENSOR 2

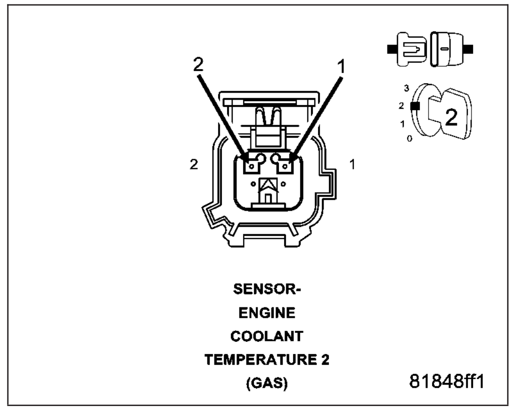
Turn the ignition off.

Connect the Powertrain Control Module (PCM) connector.

Connect a jumper wire between the (K222) ECT 2 Signal circuit and the (K915) Sensor Ground in the Engine Coolant Temperature Sensor 2 harness connector.

Turn the ignition on.

With the scan tool, read the Engine Coolant Temperature Sensor 2 signal voltage.



Is the voltage below 1.0 volt with the jumper wire in place?

Yes >> Replace the Engine Coolant Temperature Sensor 2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no brake or APPS DTCs present.
- **Set Condition:**
  The PCM detects that the Brake Switch and the Accelerator Pedal are both pressed for a calculated amount of time. One trip fault and the code will be set within 5 seconds. ETC light will illuminate, the light will only stay illuminated while DTC is active.

Possible Causes
INTERMITTENT DTC
BRAKE SWITCH AND ACCELERATOR PEDAL PRESSED AT THE SAME TIME
STOP LAMP SWITCH
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If a accelerator pedal assembly becomes mechanically stuck, the output voltage will stay fixed. If this is followed by a long application of the brakes, this DTC will set.

NOTE: Diagnose any stop lamp switch or APPS DTCs before continuing with this test.

NOTE: This DTC will set if the PCM detects that the accelerator pedal and the brake switch are both pressed for a specific amount of time.
With a scan tool, select View DTCs. Record the related Freeze Frame data.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. STOP LAMP SWITCH

With a scan tool, monitor the status of brake switch 1 and brake switch 2.

Pressed and release the brake pedal.

NOTE: The status for each switch should change from Not Pressed to Pressed when the brake switch is pressed.

Does the status change as described above?

Yes >> Go To 3

No >> Check the Stop Lamp Switch for proper adjustment and installation. Check all related circuits for an open or shorted condition using the appropriate wiring diagram. If no other problems are found, replace the Stop Lamp Switch in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. ACCELERATOR PEDAL POSITION SENSOR

Ignition on, engine not running.

With a scan tool, monitor both APP Sensor voltage readings.

Slowly press the accelerator pedal from idle until it reaches the end stop near the floor.

The APPS 1 voltage should start at approximately 0.875 volts and increase to approximately 4.5 volts with a smooth transition.

The APPS 2 voltage should start at approximately 0.45 volts and increase to approximately 2.3 volts with a smooth transition.

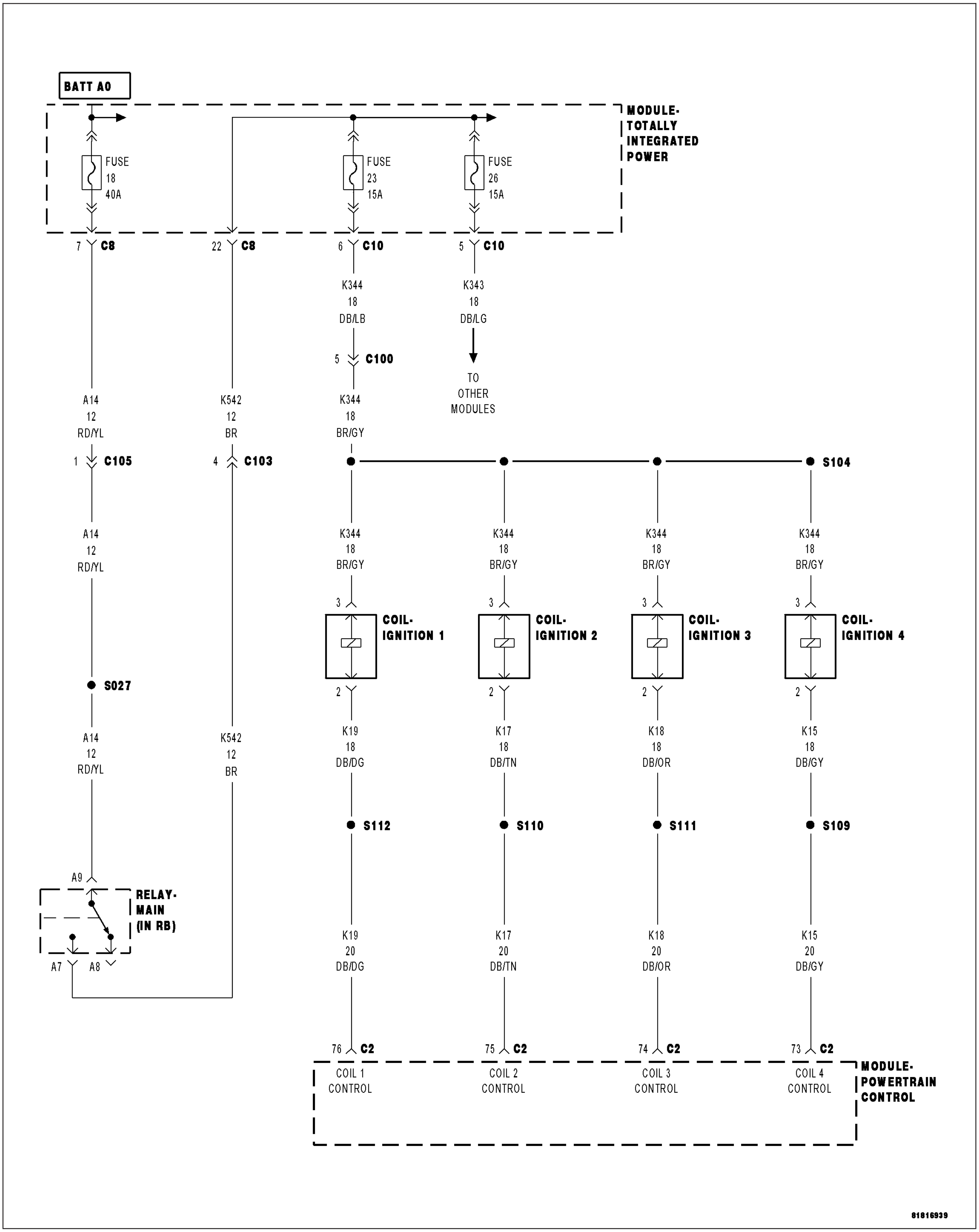
Does the sensor voltage change as described above when the accelerator pedal was pressed.

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Check the appropriate APPS circuits for an open and shorted condition. If no problems are found, replace the APP Sensor Assembly in accordance with the Service Information. After installation, with a scan tool, perform the ETC RELEARN function.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2301-IGNITION COIL 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K19) Coil 1 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K19) COIL 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K19) COIL 1 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K19) COIL 1 CONTROL CIRCUIT SHORTED TO VOLTAGE

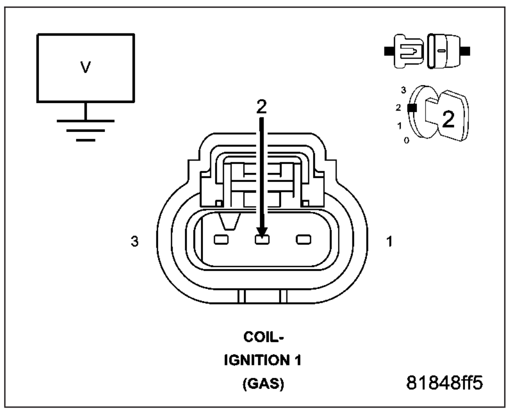
Turn the ignition off.

Disconnect the Ignition Coil 1 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.



Is there any voltage present?

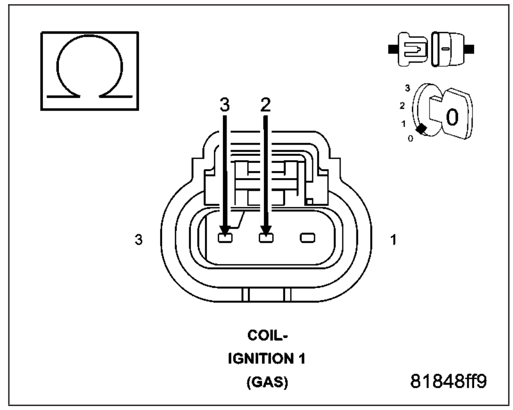
Yes >> Repair the (K19) Coil 1 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K19) COIL 1 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (K19) Coil 1 Control circuit and the (K344) Fused Main Relay Output circuit in the Ignition Coil 1 harness connector.



Is the resistance above 100 ohms?

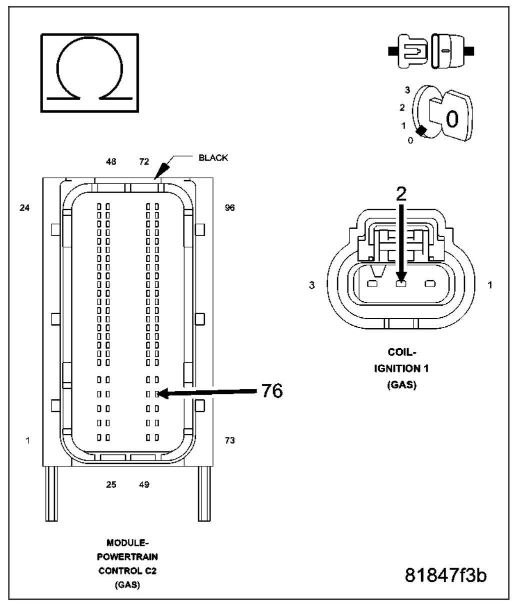
Yes >> Go to 4

No >> Repair the (K19) Coil 1 Control circuit for a short to the (K344) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K19) Coil 1 Control circuit between the Ignition Coil 1 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K19) Coil 1 Control circuit for an open circuit or high resistance.

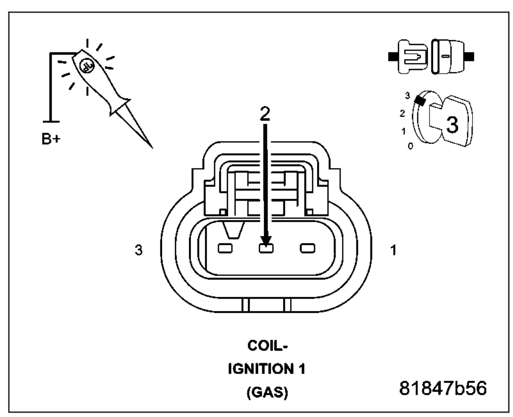
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. IGNITION COIL 1

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.



Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

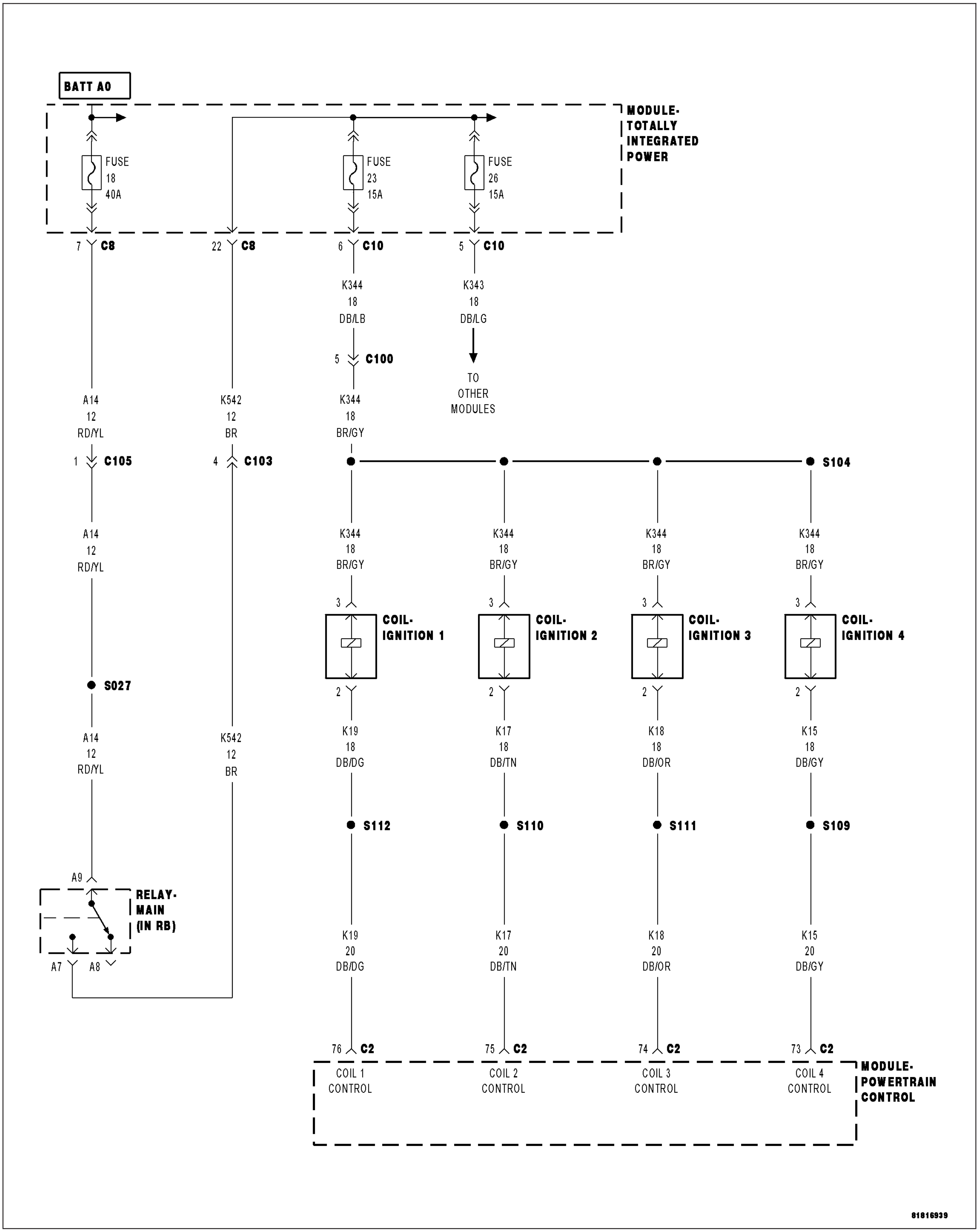
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2302-IGNITION COIL 1 SECONDARY CIRCUIT-INSUFFICIENT IONIZATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K19) Coil 1 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K19) COIL 1 CONTROL CIRCUIT SHORTED TO GROUND
(K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

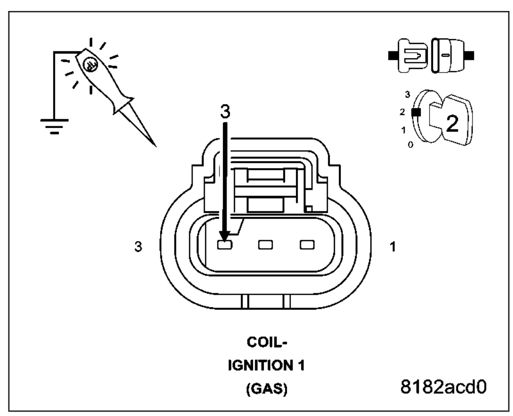
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 1 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 1 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K19) COIL 1 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

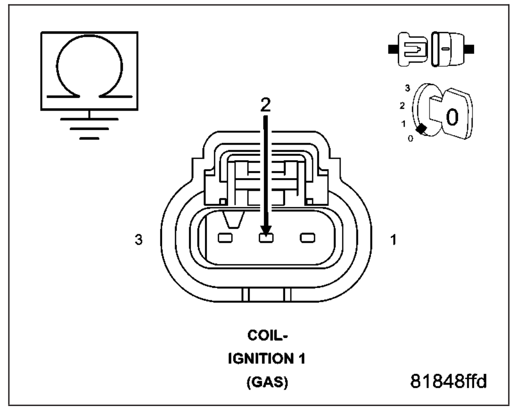
Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K19) Coil 1 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



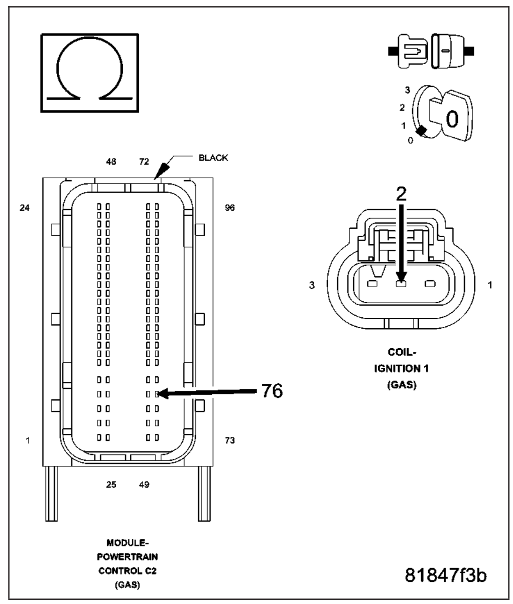
4. (K19) COIL 1 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K19) Coil 1 Control circuit between the Ignition Coil 1 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K19) Coil 1 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. IGNITION COIL 1

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

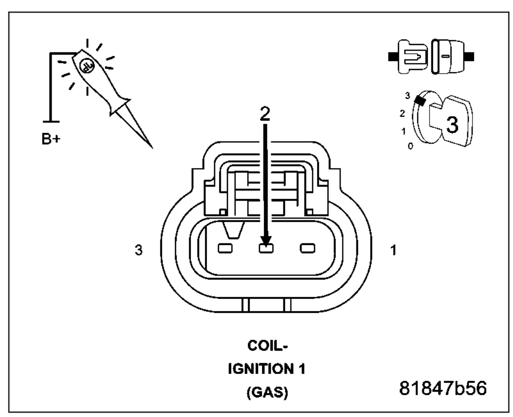
Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K19) Coil 1 Control circuit in the Ignition Coil 1 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by



the PCM?

Yes >> Replace the Ignition Coil 1 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 1 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

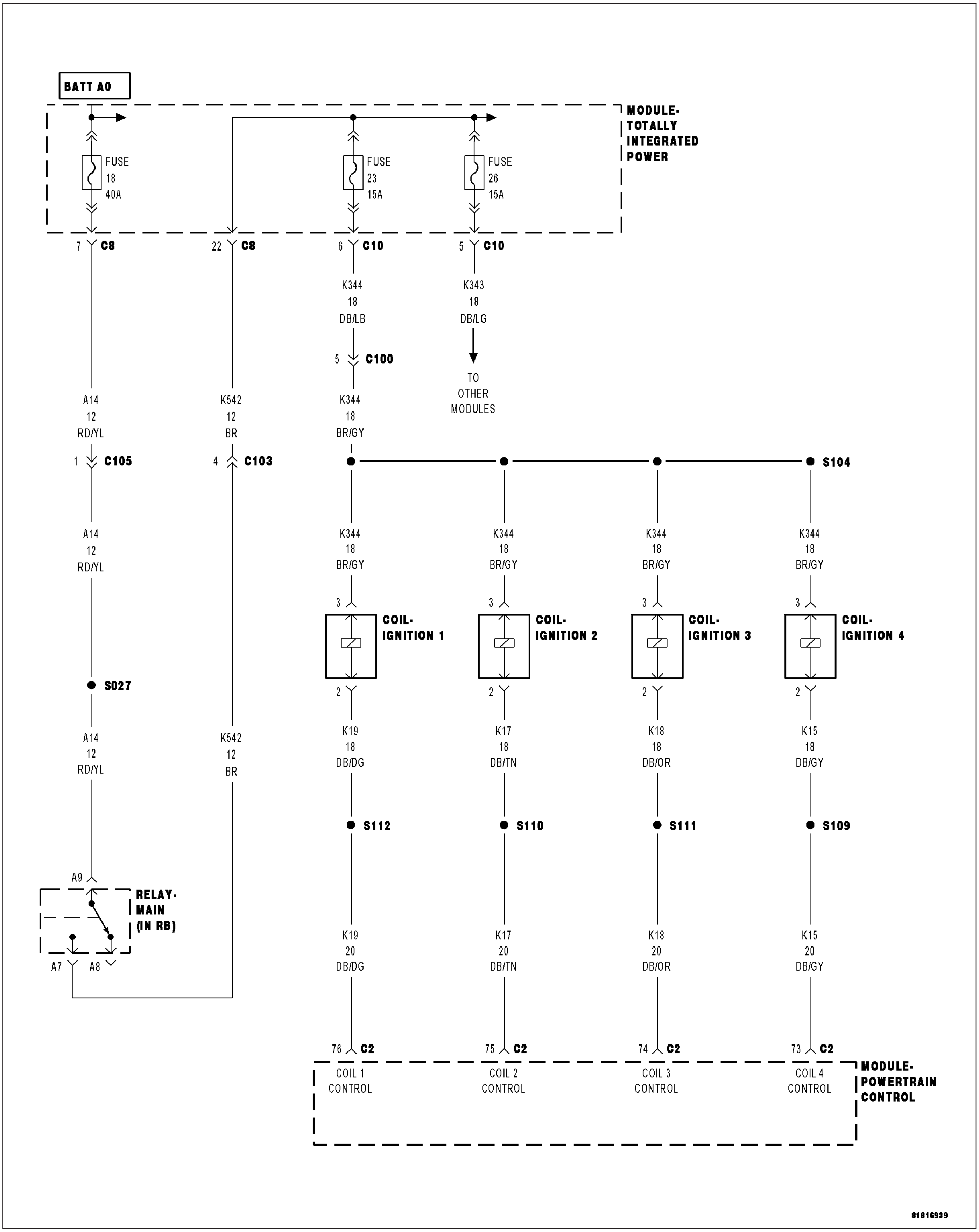
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2304-IGNITION COIL 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K17) Coil 2 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K17) COIL 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K17) COIL 2 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K17) COIL 2 CONTROL CIRCUIT SHORTED TO VOLTAGE

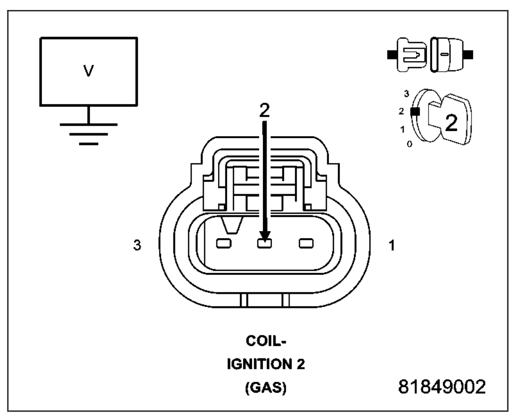
Turn the ignition off.

Disconnect the Ignition Coil 2 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.



Is there any voltage present?

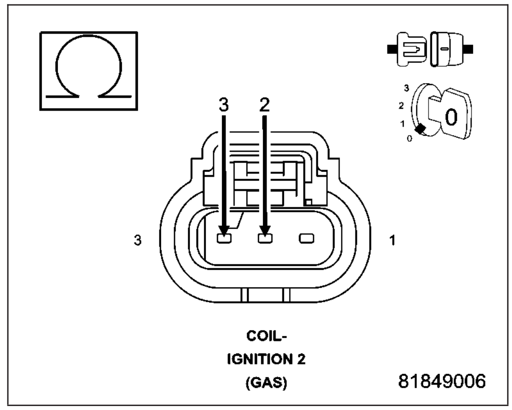
Yes >> Repair the (K17) Coil 2 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K17) COIL 2 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (K17) Coil 2 Control circuit and the (K344) Fused Main Relay Output circuit in the Ignition Coil 2 harness connector.



Is the resistance above 100 ohms?

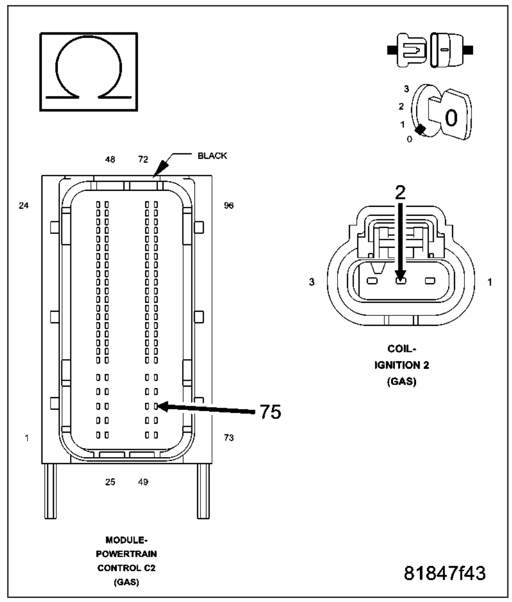
Yes >> Go to 4

No >> Repair the (K17) Coil 2 Control circuit for a short to the (K344) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K17) Coil 2 Control circuit between the Ignition Coil 2 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K17) Coil 2 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

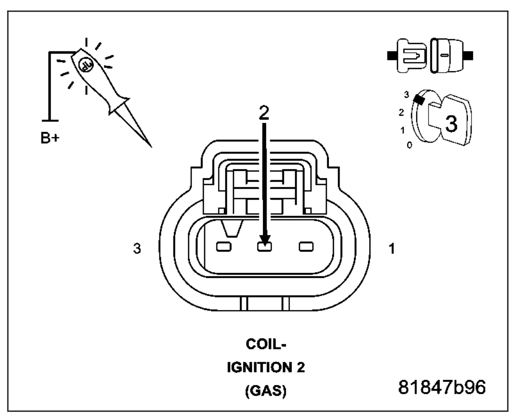
5. IGNITION COIL 2

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

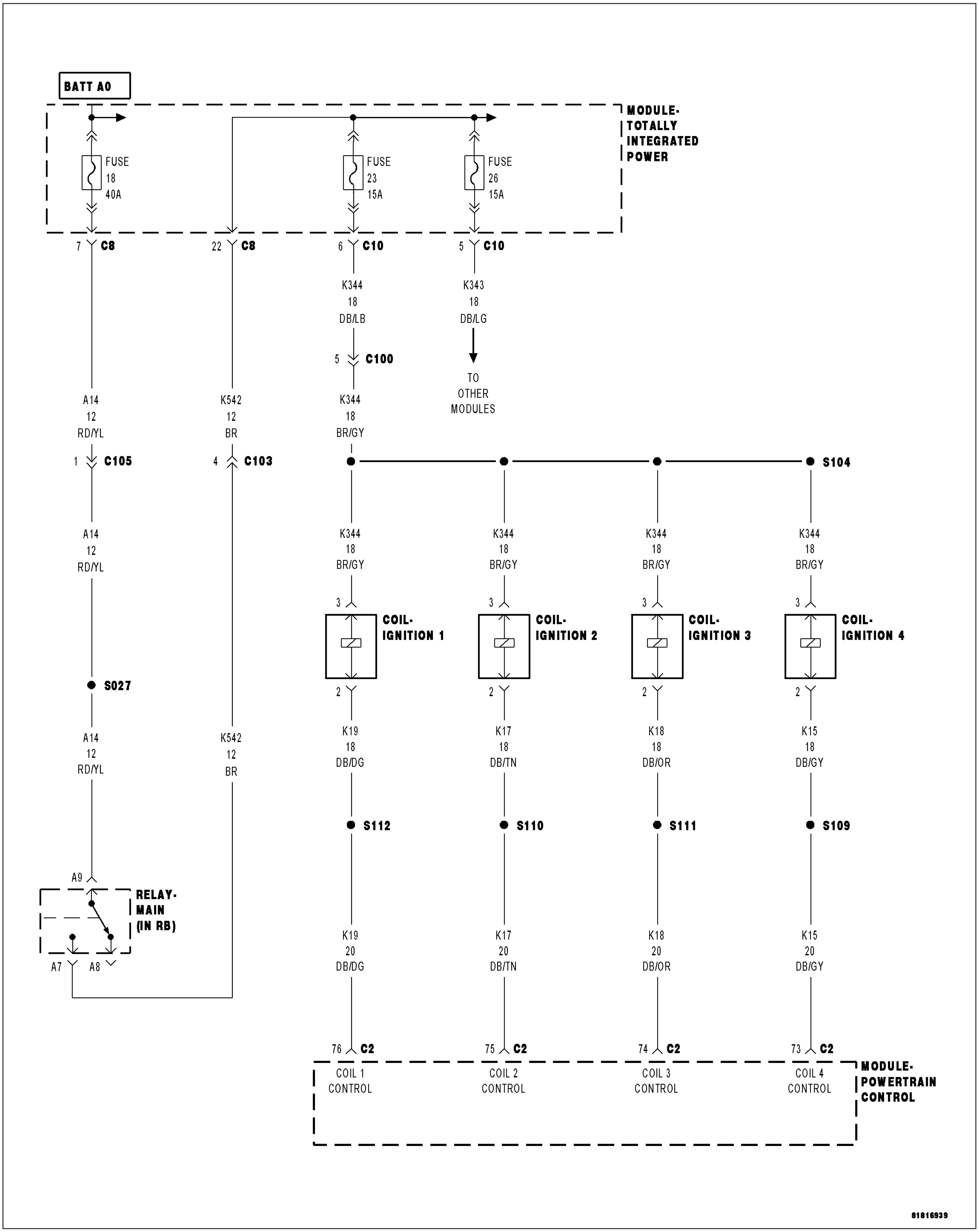
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2305-IGNITION COIL 2 SECONDARY CIRCUIT-INSUFFICIENT IONIZATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K17) Coil 2 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K17) COIL 2 CONTROL CIRCUIT SHORTED TO GROUND
(K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

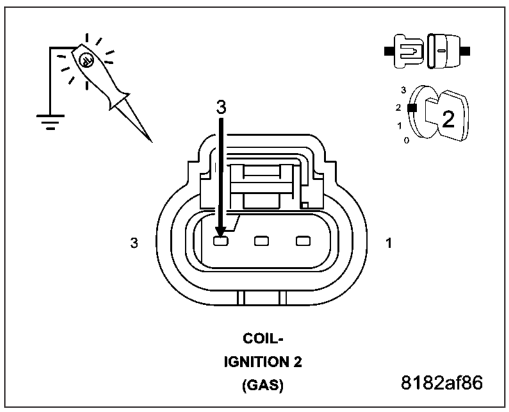
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 2 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 2 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K17) COIL 2 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

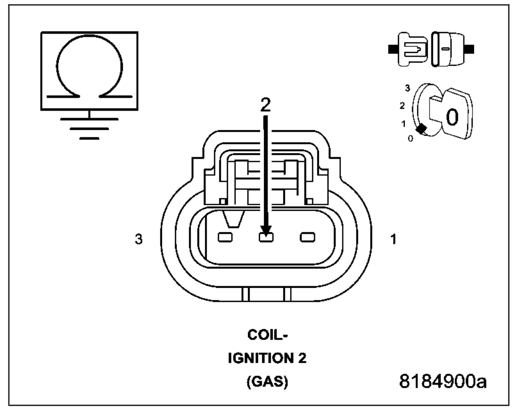
Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (K17) Coil 2 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4



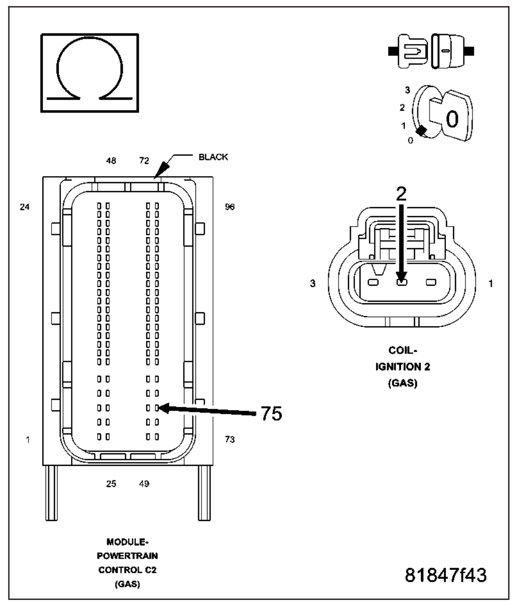
4. (K17) COIL 2 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K17) Coil 2 Control circuit between the Ignition Coil 2 harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K17) Coil 2 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. IGNITION COIL 2

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

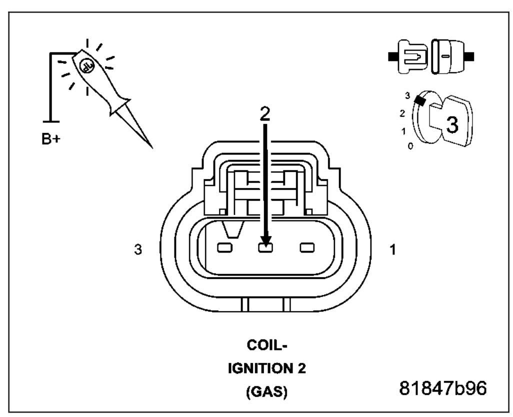
Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K17) Coil 2 Control circuit in the Ignition Coil 2 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by



the PCM?

Yes >> Replace the Ignition Coil 2 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 2 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

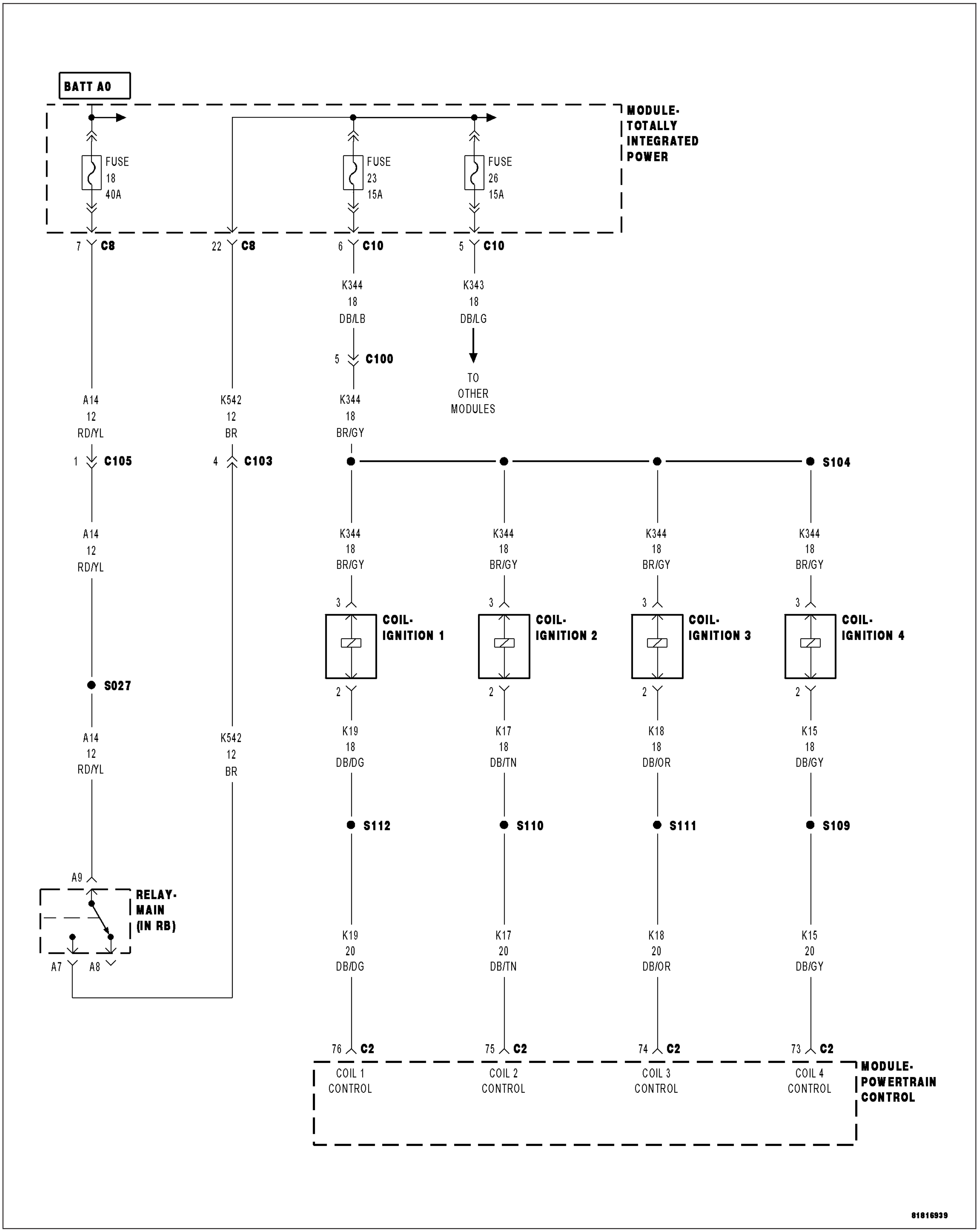
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2307-IGNITION COIL 3 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K18) Coil 3 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K18) COIL 3 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K18) COIL 3 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K18) COIL 3 CONTROL CIRCUIT SHORTED TO VOLTAGE

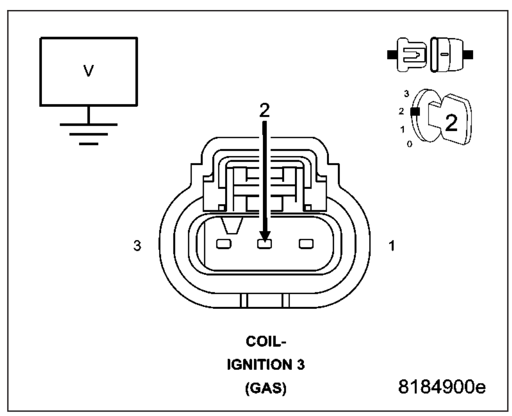
Turn the ignition off.

Disconnect the Ignition Coil 3 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.

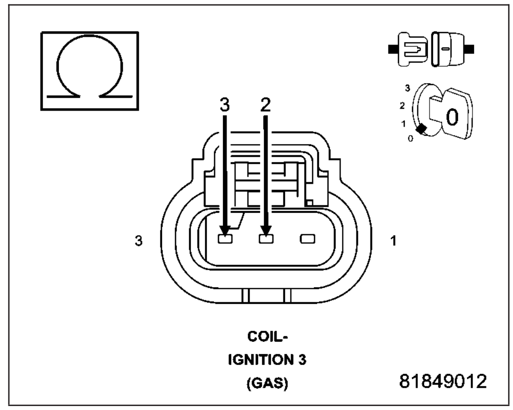


Is there any voltage present?

Yes >> Repair the (K18) Coil 3 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K18) COIL 3 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT



Turn the ignition off.

Measure the resistance between the (K18) Coil 3 Control circuit and the (K344) Fused Main Relay Output circuit in the Ignition Coil 3 harness connector.

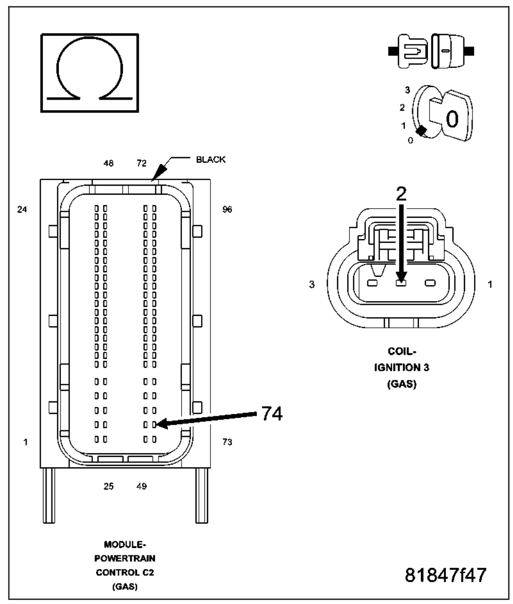
Is the resistance above 100 ohms?

Yes >> Go to 4

No >> Repair the (K18) Coil 3 Control circuit for a short to the (K344) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE



Measure the resistance of the (K18) Coil 3 Control circuit between the Ignition Coil 3 harness connector and the Powertrain Control Module (PCM) harness connector.

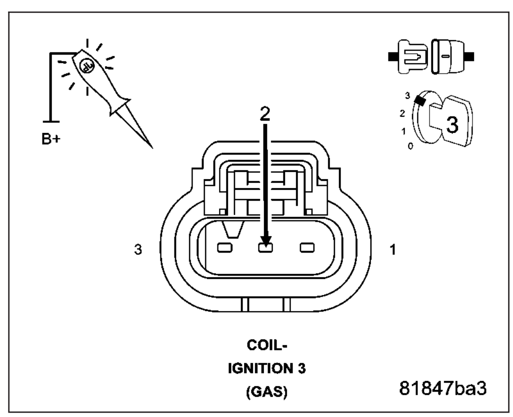
Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K18) Coil 3 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. IGNITION COIL 3



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.

Crank the engine for 5 seconds.

NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 3 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

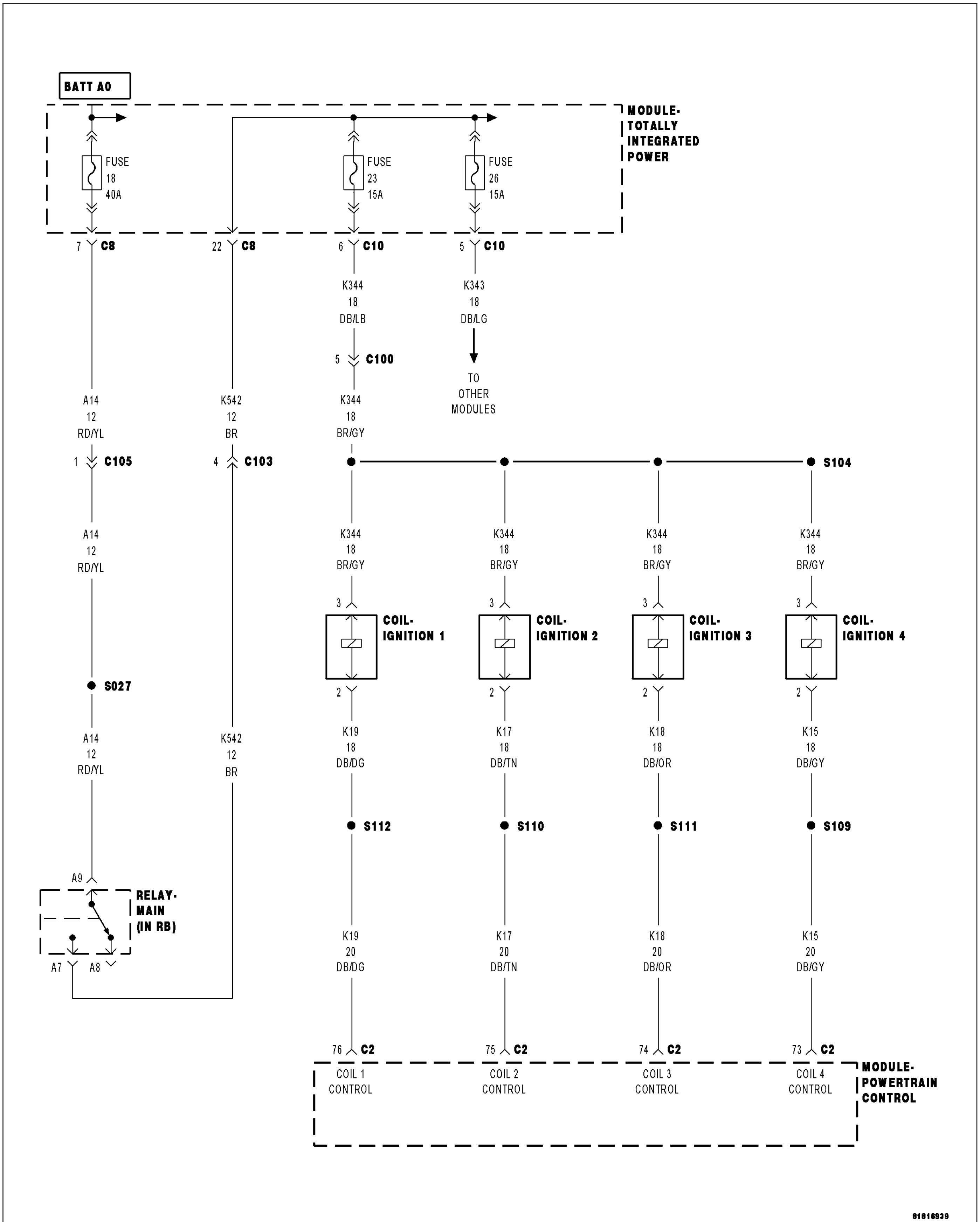
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2308-IGNITION COIL 3 SECONDARY CIRCUIT-INSUFFICIENT IONIZATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K18) Coil 3 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K18) COIL 3 CONTROL CIRCUIT SHORTED TO GROUND
(K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

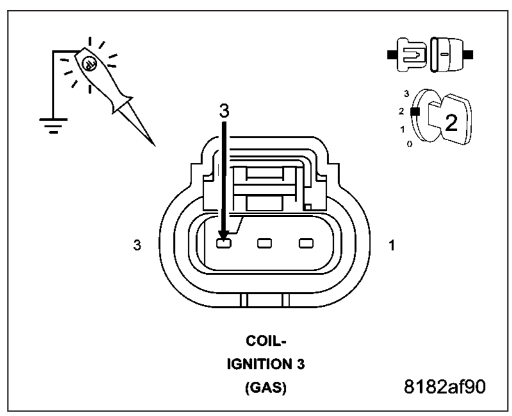
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 3 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 3 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

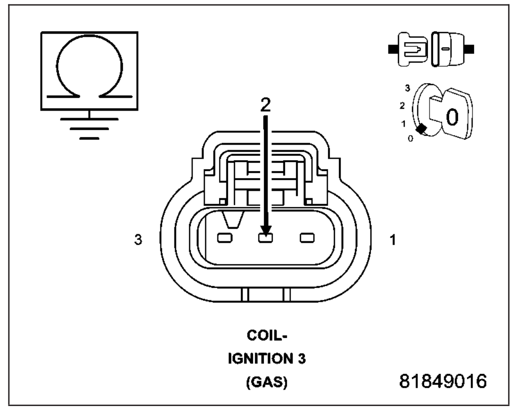
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K18) COIL 3 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.



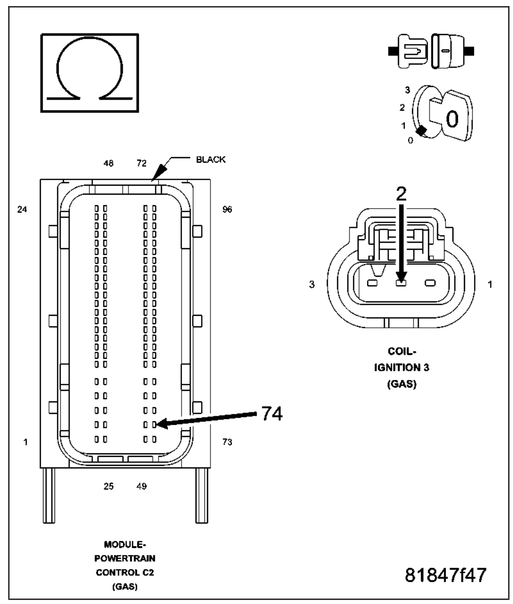
Is the resistance below 100 ohms?

Yes >> Repair the (K18) Coil 3 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K18) COIL 3 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K18) Coil 3 Control circuit between the Ignition Coil 3 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K18) Coil 3 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

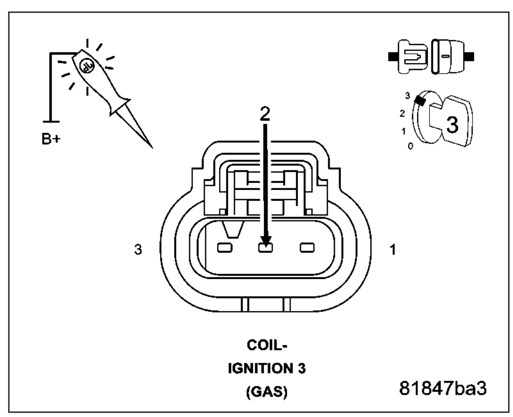
5. IGNITION COIL 3

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K18) Coil 3 Control circuit in the Ignition Coil 3 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 3 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 3 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

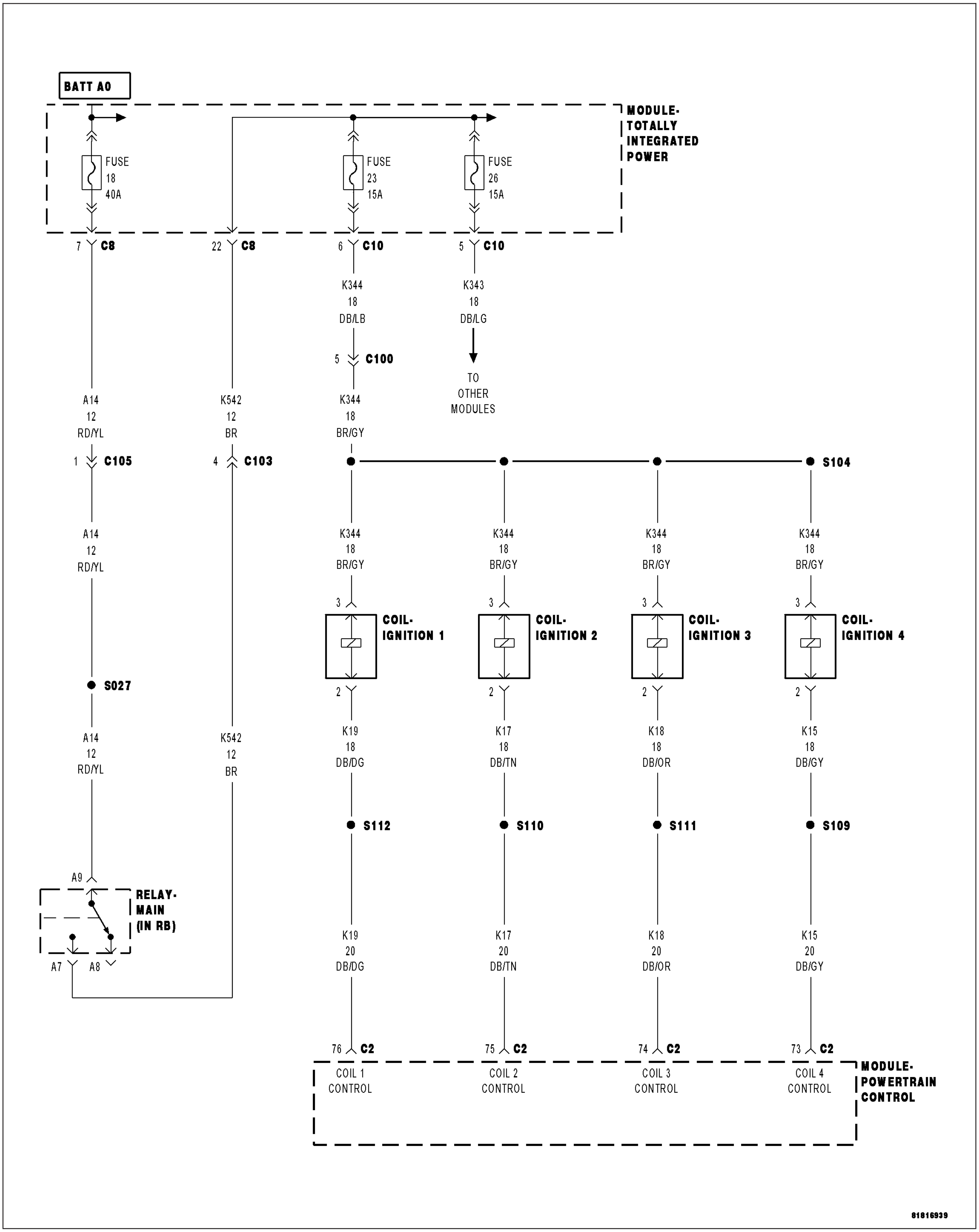
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2310-IGNITION COIL 4 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Powertrain Control Module (PCM) detects that the (K15) Coil 4 Control circuit is shorted high.

Possible Causes
INTERMITTENT DTC
(K15) COIL 4 CONTROL CIRCUIT SHORTED TO VOLTAGE
(K15) COIL 4 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT
(K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K15) COIL 4 CONTROL CIRCUIT SHORTED TO VOLTAGE

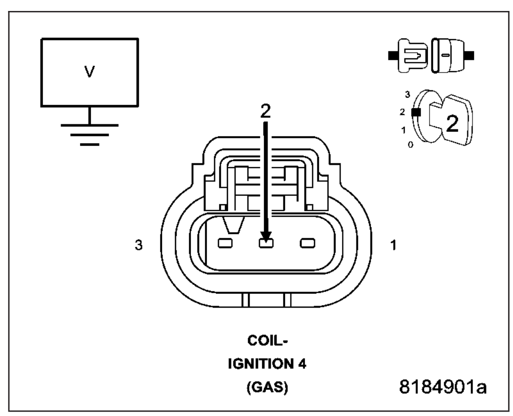
Turn the ignition off.

Disconnect the Ignition Coil 4 connector.

Disconnect the Powertrain Control Module (PCM) connector.

Turn the ignition on.

Measure the voltage of the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.



Is there any voltage present?

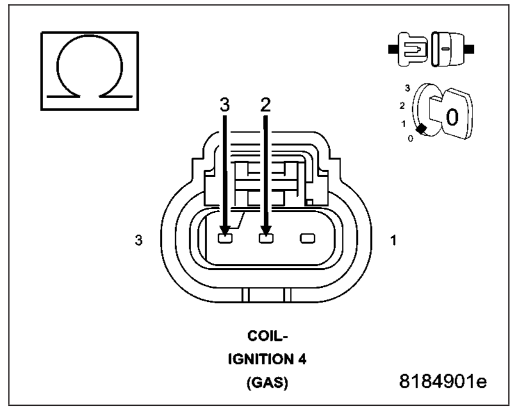
Yes >> Repair the (K15) Coil 4 Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 3

3. (K15) COIL 4 CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (K15) Coil 4 Control circuit and the (K344) Fused Main Relay Output circuit in the Ignition Coil 4 harness connector.



Is the resistance above 100 ohms?

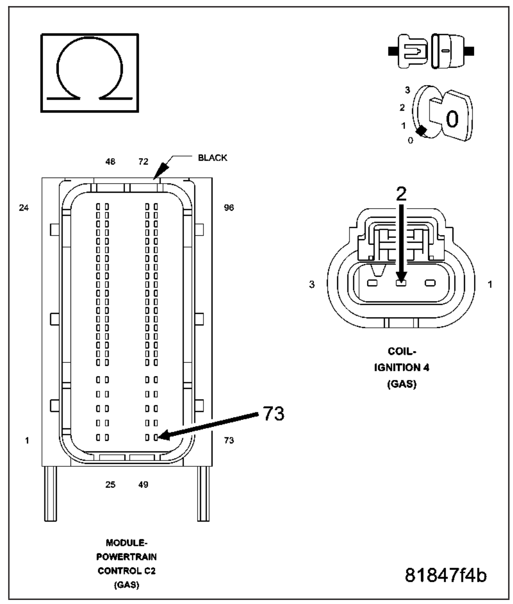
Yes >> Go to 4

No >> Repair the (K15) Coil 4 Control circuit for a short to the (K344) Fused Main Relay Output circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K15) Coil 4 Control circuit between the Ignition Coil 4 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K15) Coil 4 Control circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

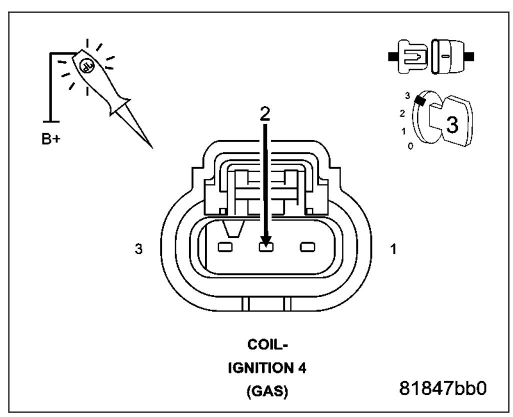
5. IGNITION COIL 4

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 4 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

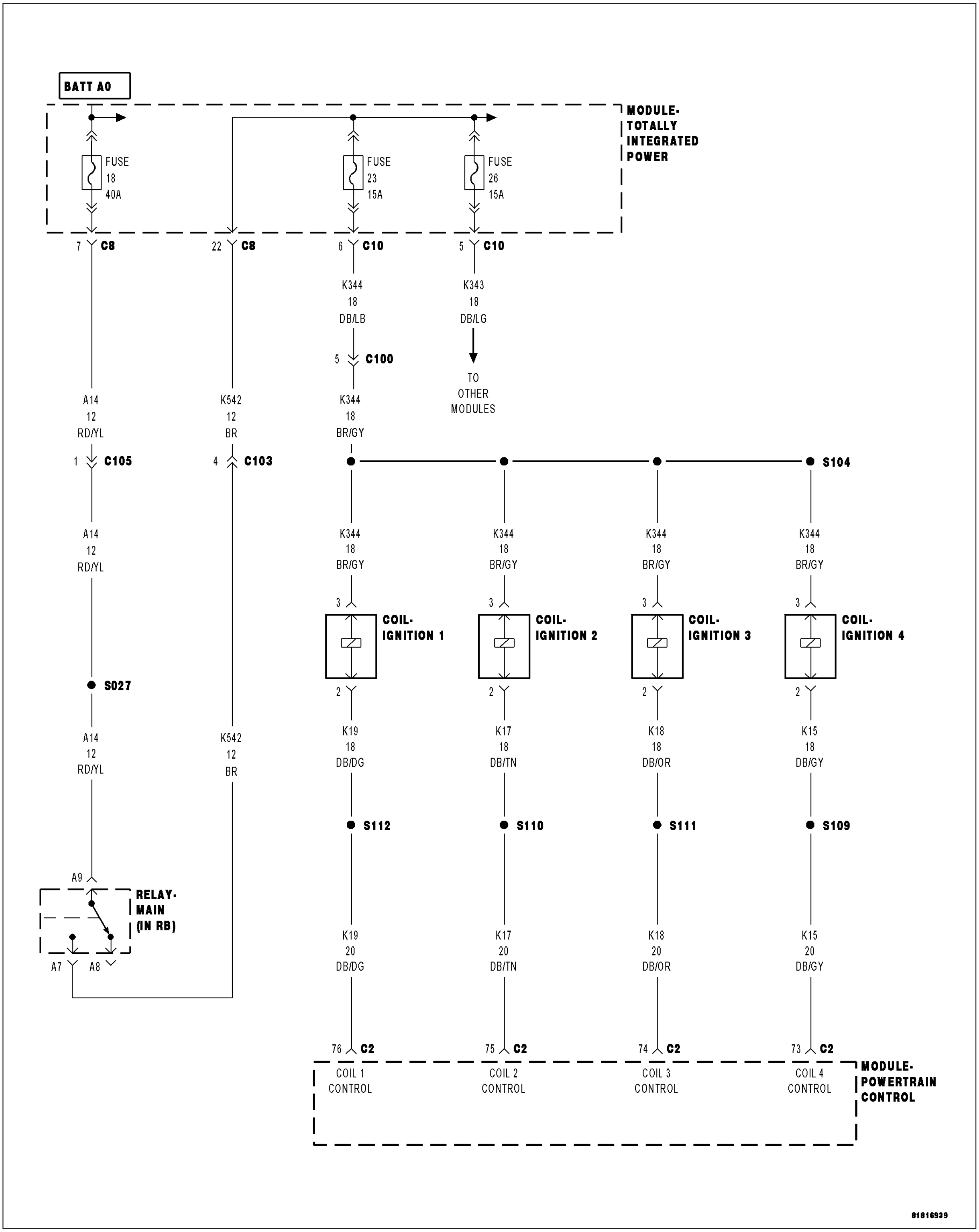
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2311-IGNITION COIL 4 SECONDARY CIRCUIT-INSUFFICIENT IONIZATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The PCM detects that the (K15) Coil 4 Control circuit is shorted low.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K15) COIL 4 CONTROL CIRCUIT SHORTED TO GROUND
(K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
IGNITION COIL 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Powertrain Control Module (PCM).

Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

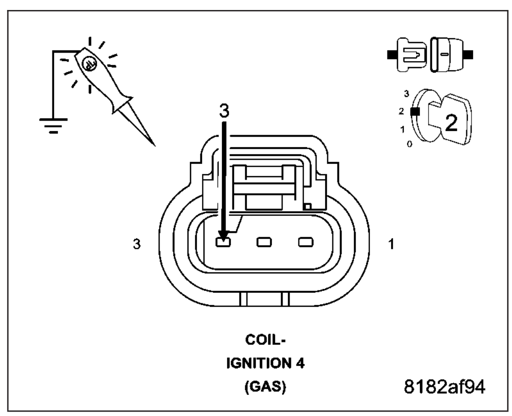
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Ignition Coil 4 harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Ignition Coil 4 harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

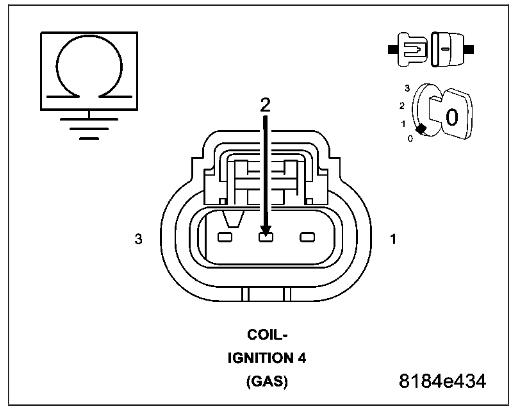
No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K15) COIL 4 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Powertrain Control Module (PCM) connector.

Measure the resistance between ground and the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.



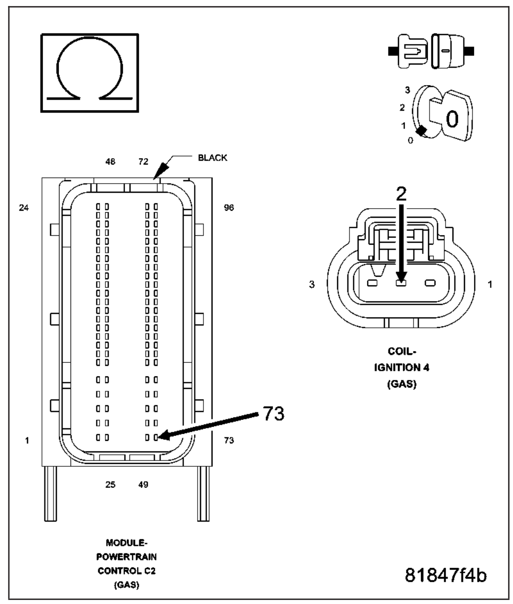
Is the resistance below 100 ohms?

Yes >> Repair the (K15) Coil 4 Control circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 4

4. (K15) COIL 4 CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K15) Coil 4 Control circuit between the Ignition Coil 4 harness connector and the Powertrain Control Module (PCM) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go to 5

No >> Repair the (K15) Coil 4 Control circuit for an open circuit or high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

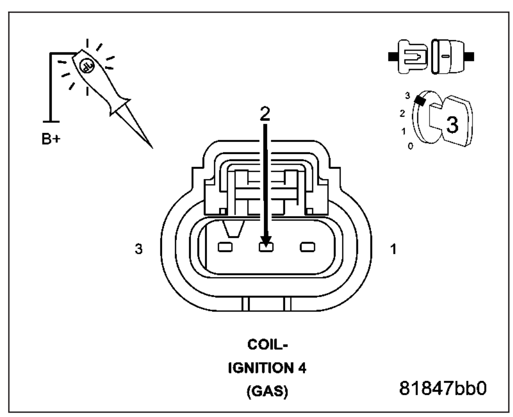
5. IGNITION COIL 4

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Connect the Powertrain Control Module (PCM) connector.

Using a 12 volt test light connected to 12 volts, check the (K15) Coil 4 Control circuit in the Ignition Coil 4 harness connector.

Crank the engine for 5 seconds.



NOTE: The test light should blink each time the circuit is activated by the PCM.

Does the test light blink each time the circuit is activated by

the PCM?

Yes >> Replace the Ignition Coil 4 in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Ignition Coil 4 and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

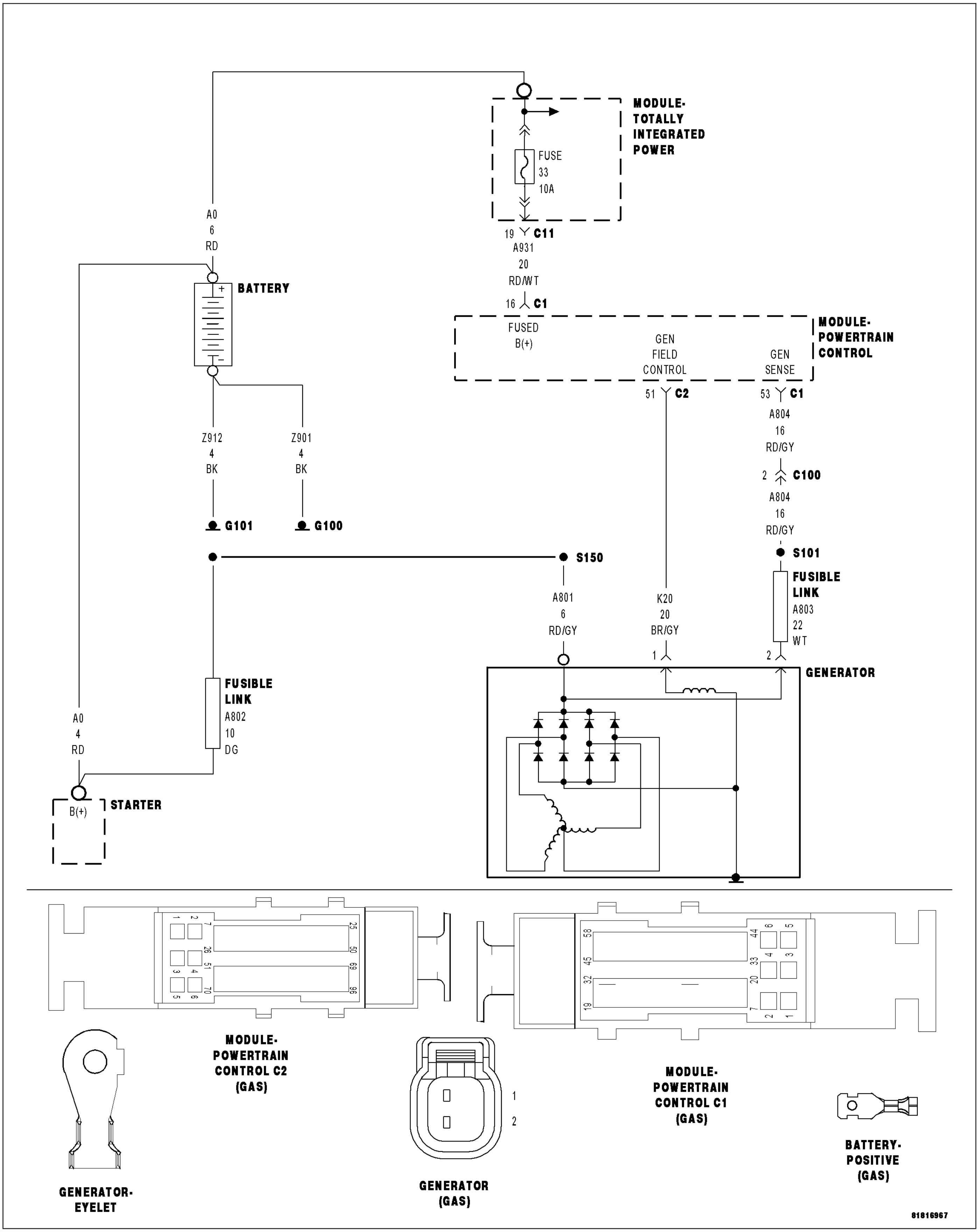
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2503-CHARGING SYSTEM OUTPUT LOW



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine speed greater than 1157 RPM.
- **Set Condition:**
  The PCM detects that battery voltage is 1 volt below charging goal voltage for 13.47 seconds. The PCM compares sensed battery voltage with the field driver on and off. If the voltages are the same, this code will set. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE B(+) CIRCUIT BETWEEN THE GENERATOR AND THE BATTERY
EXCESSIVE RESISTANCE BETWEEN THE GENERATOR CASE AND GROUND
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Inspect the vehicle for aftermarket accessories that may exceed the generator system output.

NOTE: Inspect the condition and tension of the generator belt before continuing.

NOTE: Inspect the battery before continuing.

Ignition on, engine not running.

With a scan tool, select View DTCs. Record DTC and Freeze Frame information

With a scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. EXCESSIVE RESISTANCE IN THE B(+) CIRCUIT

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: Make sure all test equipment and cables are clear of any belts, pulleys, or other moving parts.

Monitor the voltage between the generator B(+) output terminal and the battery positive (+) post.

Start the engine.

Is the voltage above 0.4 volts?

Yes >> Repair the battery positive (+) circuit between the generator and battery for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. EXCESSIVE RESISTANCE BETWEEN THE GENERATOR CASE AND GROUND

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: Make sure all test equipment and cables are clear of any belts, pulleys, or other moving parts.

Monitor the voltage between the generator case and battery ground (-) post.

Start the engine and allow it to reach operating temperature.

Is the voltage above 0.1 volts?

Yes >> Repair the excessive resistance in the Generator Case Ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE

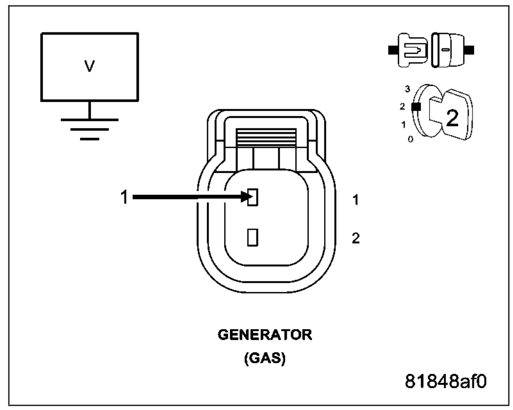
Turn the ignition off.

Disconnect the Generator harness connector.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage of the (K20) Gen Field Control circuit.



Is there any voltage present?

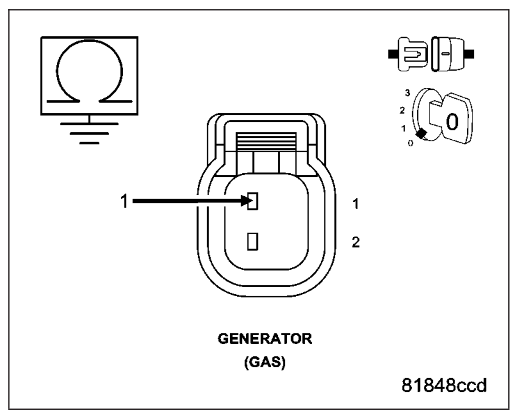
Yes >> Repair the (K20) Gen Field Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K20) Gen Field Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. (K20) GEN FIELD CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

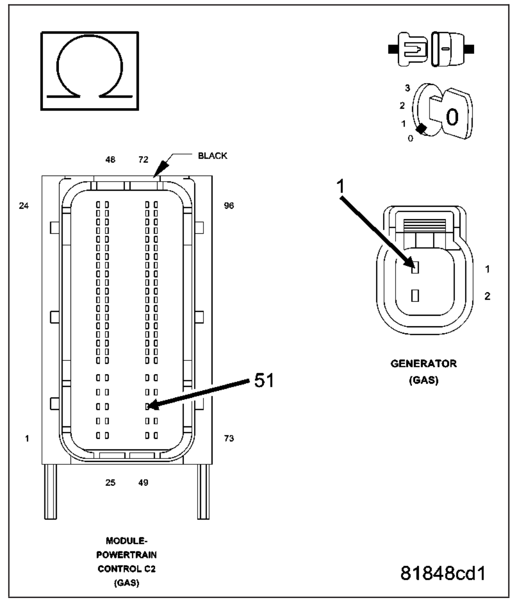
Measure the resistance of the (K20) Gen Field Control circuit between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go to 7

No >> Repair the open in the (K20) Gen Field Control circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



7. (A804) GEN SENSE CIRCUIT OPEN OR HIGH RESISTANCE

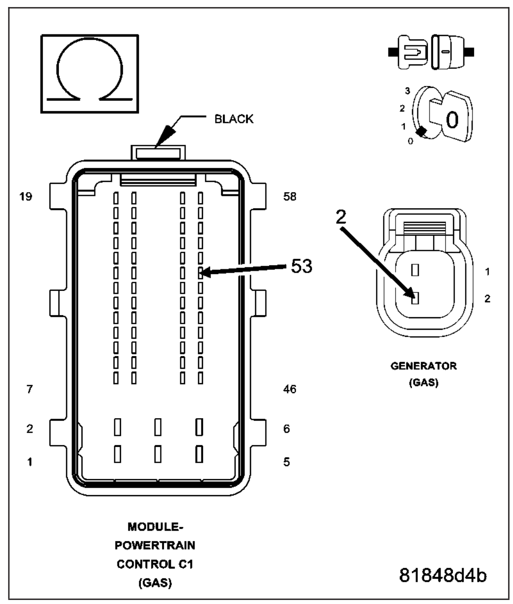
Measure the resistance of the (A804) Gen Sense between the Generator harness connector and the Powertrain Control Module (PCM) harness connector.

Is the resistance above 5.0 ohms?

Yes >> Go to 8

No >> Repair the (A804) Gen Sense circuit for an open circuit or high resistance.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. GENERATOR

Turn the ignition off.

Connect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

With a scan tool, actuate the Generator Field to toggle on and off.

Using a 12-volt test light connected to ground, check the (K20) Gen Field Control in the Generator harness connector.

NOTE: The test light should be illuminated and bright when toggled on. Compare the brightness to that of a direct connection to the battery.

Does the test light toggle on and off correctly during the actuator test?

Yes >> Replace the Generator in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

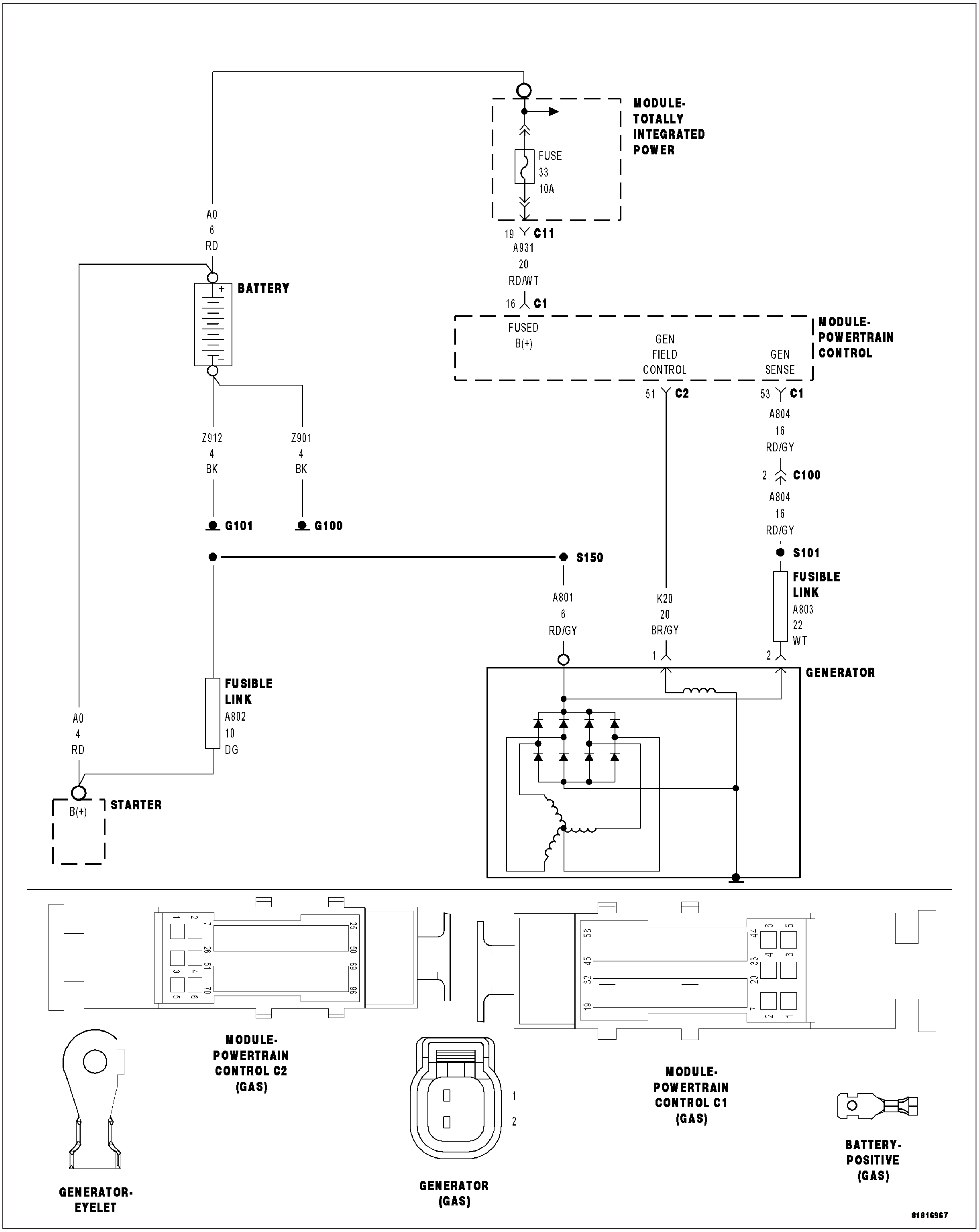
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2504-CHARGING SYSTEM OUTPUT HIGH



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine speed greater than 1157 RPM.
- **Set Condition:**
  The PCM compares sensed battery voltage with the Gen Sense circuit voltage. If the Gen Sense circuit voltage if greater than sensed battery voltage, this DTC will set. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE B(+) CIRCUIT BETWEEN THE GENERATOR AND THE BATTERY
EXCESSIVE RESISTANCE BETWEEN THE GENERATOR CASE AND GROUND
(A804) GEN SENSE CIRCUIT SHORTED TO VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator system output.

NOTE: Inspect the Generator harness connector and the Generator eyelet for corrosion or damage before continuing.

NOTE: Inspect the condition and tension of the Generator belt before continuing.

NOTE: Inspect the battery before continuing.

Ignition on, engine not running.

With a scan tool, select View DTCs. Record DTC and Freeze Frame information

With a scan tool, clear DTCs.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. EXCESSIVE RESISTANCE IN THE B(+) CIRCUIT

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: Make sure all test equipment and cables are clear of any belts, pulleys, or other moving parts.

Monitor the voltage between the generator B(+) output terminal and the battery positive (+) post.

Start the engine.

Is the voltage above 0.4 volts?

Yes >> Repair the battery positive (+) circuit between the generator and battery for high resistance.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. EXCESSIVE RESISTANCE BETWEEN THE GENERATOR CASE AND GROUND

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

NOTE: Make sure all test equipment and cables are clear of any belts, pulleys, or other moving parts.

Monitor the voltage between the generator case and battery ground (-) post.

Start the engine and allow it to reach operating temperature.

Is the voltage above 0.1 volts?

Yes >> Repair the excessive resistance in the Generator case ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (A804) GEN SENSE CIRCUIT SHORTED TO VOLTAGE

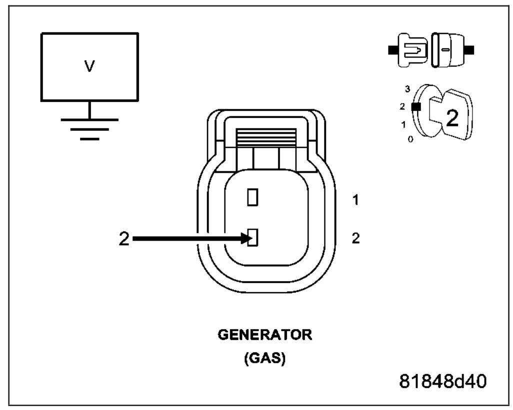
Turn the ignition off.

Disconnect the Generator harness connector.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage of the (A804) Gen Sense circuit.



Is there any voltage present?

Yes >> Repair the (A804) Gen Sense circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE

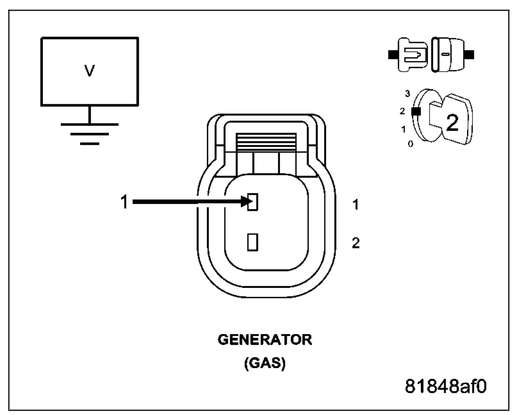
Turn the ignition off.

Disconnect the Generator harness connector.

Disconnect the Powertrain Control Module (PCM) harness connector.

Turn the ignition on.

Measure the voltage of the (K20) Gen Field Control circuit.



Is there any voltage present?

Yes >> Repair the (K20) Gen Field Control circuit for a short to voltage.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. GENERATOR

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Connect the Generator harness connector.

Connect the Powertrain Control Module (PCM) harness connector.

NOTE: Make sure all test equipment and cables are clear of any belts, pulleys, or other moving parts.

Measure the voltage between the Generator Eyelet terminal and the (A804) Gen Sense circuit in the Generator harness connector.

Start the engine and allow it to reach operating temperature.

Is the voltage above 0.1 volts?

Yes >> Replace the Generator in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 7

7. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1607-PCM INTERNAL SHUTDOWN TIMER SLOW RATIONALITY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  An internal PCM failure has been detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PENDING TEMPERATURE SENSOR DTCS
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
(A931) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PENDING TEMPERATURE SENSOR DTCS

Turn the ignition on.

NOTE: If any temperature sensor DTCs are present, allow the vehicle to cool completely before proceeding with this test.

Start the engine and allow it to reach operating temperature.

With the scan tool, select View DTCs.

Are there any pending Engine Coolant Temperature sensor, Ambient Air Temperature sensor, or general temperature DTCs?

Yes >> Diagnose and repair any temperature sensor DTCs and retest.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 2

2. PCM IGNITION CIRCUITS OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the PCM harness connector.

With a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit.

With a 12-volt test light connected to ground, check the (A931) Fused B+ circuit.

Check the circuits with the ignition switch in the OFF, ON, and START positions.

NOTE: The test light should be illuminated and bright with the ignition switch in the ON and START positions. Compare the brightness to that of a direct connection to the battery.

Wiggle test the circuits while checking with the test light to check the circuit for an intermittent problem.

Does the test light illuminate, or not illuminate, as expected in each of the ignition switch positions?

Yes >> Go to 3

No >> Repair the circuit(s) as necessary. If an open fuse is found, inspect the circuit for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. POWERTRAIN CONTROL MODULE (PCM)

Using the wiring diagram/schematic as a guide, inspect Powertrain Control Module power and ground circuits.
Look for any chafed, pierced, pinched, or partially broken wires.
Look for broken, bent, pushed out or corroded terminals.
Monitor the scan tool data and wiggle test the wiring and connectors.
Look for the any data to change or for the DTC to reset during the wiggle test.
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

U0001-CAN C BUS

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM loses communication over the CAN C Bus circuit. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0101-LOST COMMUNICATION WITH TCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive a Bus Message from the Transmission Control Module for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE

For a complete wiring diagram**Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive an ABS message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
ANTI-LOCK BRAKE (ABS) MODULE
FRONT CONTROL MODULE (FCM)
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0140-LOST COMMUNICATION WITH BODY CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  The PCM doesn't receive a FCM message over the CAN C bus for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
BODY CONTROL MODULE (BCM)
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  The PCM doesn't receive a message from the TIPM over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0155-LOST COMMUNICATION WITH CLUSTER

For a complete wiring diagram**Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive a Cluster message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
INSTRUMENT CLUSTER (CCN)
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY MODULE (SKREEM/ WCM)

For a complete wiring diagram**Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive a SKREEM message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
SKREEM/WCM
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U110C-LOST FUEL LEVEL MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM does not receive a fuel level signal over the CAN C circuit. The circuit is constantly monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The fuel level signal is a direct input to the Cluster. The fuel level signal is sent to the TIPM over the CAN B bus circuit. The PCM receives the fuel level signal from the TIPM over the CAN C bus circuit.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) ALSO ACTIVE

With the scan tool read DTCs.

Is the DTC U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) also set?

Yes >> Perform the diagnostic procedure for U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U110E-LOST AMBIENT TEMPERATURE MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive the ambient temperature signal over the CAN C bus from the TIPM. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ambient temperature sensor signal is a direct input to the TIPM. The TIPM sends the PCM the ambient temperature signal over the CAN C bus.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) ALSO ACTIVE

With the scan tool read DTCs.

Is the DTC U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) also set?

Yes >> Perform the diagnostic procedure for DTC U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U110F-LOST FUEL VOLUME MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM does not receive a fuel volume signal from the TIPM over the CAN C circuit. The circuit is constantly monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The fuel level signal is a direct input to the Cluster. The fuel level signal is sent to the TIPM over the CAN B bus circuit. The PCM receives the fuel level signal from the TIPM over the CAN C bus circuit.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) ALSO ACTIVE

With the scan tool read DTCs.

Is the DTC U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) also set?

Yes >> Perform the diagnostic procedure for U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1110-LOST VEHICLE SPEED MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive a vehicle speed signal from the Anti-Lock Brake Module over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE (ABS) MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE ALSO SET

With a scan tool, select View DTCs.

Is the DTC U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE also set?

Yes >> Perform the diagnostic procedure for U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1113-LOST A/C PRESSURE MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive the A/C Pressure signal over the CAN C bus from the TIPM. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The A/C Pressure Transducer signal is a direct input to the TIPM. The TIPM sends the PCM the A/C pressure signal over the CAN C bus.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) ALSO ACTIVE

With the scan tool read DTCs.

Is the DTC U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM) also set?

Yes >> Perform the diagnostic procedure for U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM).
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1120-LOST WHEEL DISTANCE MESSAGE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive a vehicle speed signal from the Anti-lock brake Module over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE (ABS) MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE ALSO SET

With a scan tool, select View DTCs.

Is the DTC U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE also set?

Yes >> Perform the diagnostic procedure for U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The fuel level message that the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED
INSTRUMENT CLUSTER (CCN)
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The TIPM receives a fuel level signal over CAN B from the Cluster. The TIPM transmits the fuel level message to the PCM over the CAN C bus.

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose all CAN B and C communication DTCs before continuing.

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CAN B BUS COMMUNICATION DTCS ALSO ACTIVE

With a scan tool select View DTCs in the TIPM.

Are any CAN B Bus DTCs active?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and perform the appropriate diagnostic procedure.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The fuel volume message the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED
INSTRUMENT CLUSTER (CCN)
TOTALLY INTEGRATED POWER MODULE (TIPM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The Front Control Module isn't receiving a fuel volume signal over CAN B from the Cluster Module. The TIPM has to send the PCM a fuel volume signal over CAN C. The signal the TIPM sends over CAN C is implausible.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CAN B BUS HARDWARE DTCS ALSO ACTIVE

With a scan tool, select View DTCs in the TIPM.

Are any CAN B Hardware related DTCs active?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and perform the appropriate diagnostic procedure.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ANTI-LOCK BRAKE (ABS) MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends vehicle speed information over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. DTC U0001-CAN C BUS IS ACTIVE IN THE PCM

With a scan tool, select View DTCs.

Is the DTC U0001-CAN C BUS Active in the PCM?

Yes >> Refer to the Diagnostic Procedure for the U0001-CAN C BUS.

No >> Go To 3

3. ABS MODULE IS ACTIVE ON THE CAN C BUS

Using the Network Review Screen on the scan tool, verify that the ABS Module is active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 4

No >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

4. DTC U0001-CAN C BUS ACTIVE IN THE FCM

With the scan tool, select View DTCs in the FCM.

Is the DTC U0001-CAN C BUS Active in the FCM?

Yes >> Replace the ABS Module in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR DTC ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ANTI-LOCK BRAKE (ABS) MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends an implausible distance signal over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ABS MODULE IS ACTIVE ON THE CAN C BUS

Using the Network Review Screen on the scan tool, verify that the ABS Module is active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 3

No >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for No Response diagnostic procedures.

Perform BODY VERIFICATION TEST – VER 1.

3. DTCS STORED OR ACTIVE IN THE ABS MODULE

With the scan tool, select View DTCs in the ABS Module.

Are any DTCs active or stored in the ABS Module?

Yes >> Refer to section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.
Perform ABS VERIFICATION TEST – VER 1

No >> Go to 4

4. ACTIVE DTCS IN THE TIPM

With the scan tool, select ECU View and select the TIPM.
With the scan tool, select View DTCs in the TIPM.

Are any ABS related DTCs active or stored in the TIPM?

Yes >> Replace the ABS Module in accordance with the Service Information
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR DTC ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ANTI-LOCK BRAKE (ABS) MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends an implausible distance signal over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

Ignition on, engine not running.

With a scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ABS MODULE IS ACTIVE ON THE CAN C BUS

Using the Network Review Screen on the scan tool, verify that the ABS Module is active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 3

No >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for No Response diagnostic procedures.

Perform BODY VERIFICATION TEST – VER 1.

3. DTCS STORED OR ACTIVE IN THE ABS MODULE

With the scan tool, select View DTCs in the ABS Module.

Are any DTCs active or stored in the ABS Module?

Yes >> Refer to section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.
Perform ABS VERIFICATION TEST – VER 1

No >> Go to 4

4. ACTIVE DTCS IN THE TIPM

With the scan tool, select ECU View and select the TIPM.

With the scan tool, select View DTCs in the TIPM.

Are any ABS related DTCs active or stored in the TIPM?

Yes >> Replace the ABS Module in accordance with the Service Information
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. NO RESPONSE

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red.

Does the scan tool display a Vehicle Network problem or NO RESPONSE condition?

Yes >> Refer to the appropriate BUS Communication test in Section 8 ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS.

No >> Go To 2

2. NO START

Does the vehicle have a NO START condition?

Yes >> Check the vehicle for any DTC(s), including Vehicle Theft Security related DTC(s), that may cause a no-start condition.

If no DTC(s) are present that relate to a no-start condition, refer to the Non DTC Diagnostic Procedures that relate to Fuel and Starting.

No >> Go To 3

3. VEHICLE REPAIR HISTORY AND TSB(s)

Check the vehicle repair history for repairs that may relate to the current condition.

Inspect the vehicle for aftermarket accessories that may have been installed incorrectly.

Check for any TSB(s) related to the condition or DTC(s).

If a TSB applies, follow the procedure outlined in the TSB.

Select the appropriate response for the condition that applies:

Performing a TSB procedure repaired the condition.

Test Complete.

Perform the PCM Verification Test Ver. 1.

A DTC is present, no TSB applies, or the TSB didn't repair the condition.

Go To 4

No DTC(s) or conditions are present.

Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

4. VEHICLE INSPECTION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

Based on the diagnostic condition that applies, review the following list and perform any tests that relate to the condition:

If multiple DTCs are set in the PCM, review the wiring schematics for problems in any shared supply or ground circuits. Refer to the diagnostic procedure for Checking the PCM Power and Ground Circuits.

Inspect the air intake system and related tubes for damage, restriction, or poor connection.

Inspect the exhaust system and related tubes for damage, restriction, or poor connection.

Remove and inspect the Air Filter for excessive dirt and debris which may cause an air flow restriction.

If the PCM detects and stores a DTC, the PCM also stores the environmental conditions under which the DTC was set.

Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, Clear the stored DTC(s).

Attempt to duplicate the environmental conditions under which the DTC was set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the vehicle conditions under which the DTC conditions will be monitored. Operate the vehicle under those conditions.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the component and the module.

If the DTC(s) are fuel or air related, check the fuel level and quality.

Were any repairs made that corrected the DTC or condition?

Yes >> Test complete.
Perform the PCM Verification Test Ver. 1.

No >> Refer to the diagnostic test procedure related to the DTC.

*INTERMITTENT DTC

For a complete wiring diagram **Refer to Section 8W**

Diagnostic Test

1. INTERMITTENT DTC

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

The conditions necessary to set this DTC are not present at this time.

Review the scan tool environmental data. If possible, try to duplicate the conditions under which the DTC set.

If applicable, actuate the component with the scan tool.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change, the actuation to be interrupted, or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Turn the ignition off.

Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected component and the PCM.

Inspect and clean all PCM, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a schematic and inspect any common ground or supply circuits.

For intermittent Misfire DTCs check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt.

Use the scan tool to perform a System Test if one applies to the component.

A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

Were any problems found during the above inspections?

Yes >> Perform the necessary repairs.
Perform the PCM Verification Test Ver. 1.

No >> Test Complete.

*CHECKING THE FUEL DELIVERY SYSTEM

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP GROUND CIRCUIT
PLUGGED FUEL PUMP INLET
FUEL PUMP MODULE

Diagnostic Test

1. FUEL PUMP OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Fuel System test.

NOTE: It may be necessary to use a mechanics stethoscope in the next step.

Listen for fuel pump operation at the fuel tank. The fuel pump should operate smoothly with no excessive noise. If the pump has excessive noise such as grinding, the pump should be replaced.

CAUTION: Stop All Actuations.

Does the Fuel Pump sound to be operate normally?

Yes >> Go to 2

No >> Go to 7

2. FUEL PRESSURE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge.

Ignition on, engine not running.

With the scan tool, actuate the Fuel Pump and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Below Specification

Go to 3

Within Specification

Test Complete.

Above Specification

Replace the Fuel Pump Module in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. RESTRICTED FUEL SUPPLY LINE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) or #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the Fuel Pump and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Is the fuel pressure within specification now?

Yes >> Repair/replace fuel supply line as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. SADDLE FUEL TANK

Is the vehicle equipped with a saddle type fuel tank?

Yes >> Go to 5

No >> Go to 6

5. CHECKING FUEL TANK SIPHON HOSE AND FUEL LINE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Gain access to the Fuel Pump Module and the Fuel Tank Module.

Inspect the following fuel components:

- Fuel line and siphon hose between the Fuel Pump Module and the Fuel Tank Module. Look for disconnected and/or damaged lines or hoses.
- Fuel Pressure Regulator not properly seated in the module.

Were the above items in good working condition?

Yes >> Go to 6

No >> Repair or replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. CHECKING THE FUEL PUMP INLET

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and Fuel Tank Module (if equipped), inspect the Fuel Inlet and the bottom of the fuel tank for debris that could cause the fuel pump inlet to be plugged.

Is the Fuel Pump Inlet plugged?

Yes >> Repair/Replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Fuel Pump Module.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. FUEL PUMP MOTOR GROUND CIRCUIT

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

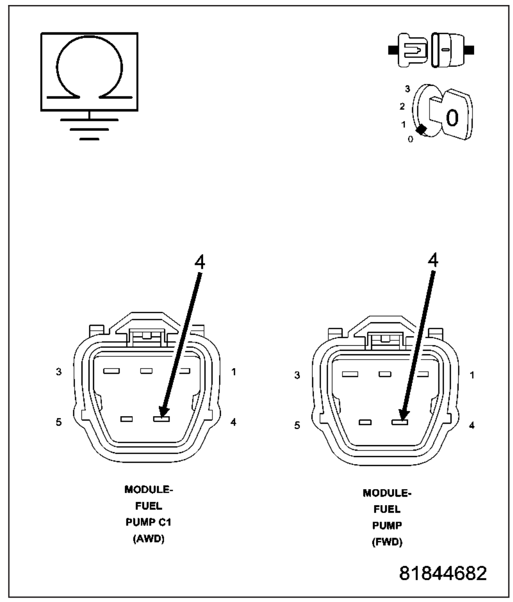
Using a 12-volt test light to battery voltage, probe the Fuel Pump Motor Ground circuit in the Fuel Pump Module harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly.

Yes >> Replace the Fuel Pump Module in accordance with the Service information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the Fuel Pump Motor Ground circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



*ENGINE CRANKS BUT DOES NOT START

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
NO START PRE-TEST
POWERTRAIN FUSES OPEN
SECONDARY INDICATORS PRESENT
ENGINE MECHANICAL PROBLEM
FUEL CONTAMINATION

Diagnostic Test

1. NO START PRE-TEST

NOTE: The following list of items must be checked before continuing with any no start tests.

The battery must be fully charged and in good condition. A low charged battery may produce invalid test results. If the battery is low, charge the battery and then attempt to start the vehicle by cranking the engine for 15 seconds, 3 consecutive times. This will allow any DTCs to set that may have been erased due to a dead battery.

Attempt to communicate with the PCM using the scan tool. If the PCM is experiencing a no response condition, refer to section 8 Electrical Electronic Control Module Electrical Diagnostics for the proper tests.

Read the PCM DTCs with the scan tool. If any DTCs are present, they must be repaired before continuing with any other No Start diagnostic tests. Refer to the Table of Contents for the related P-code that is reported by the PCM.

Inspect all fuses in the TIPM and the Junction Box. If an open fuse(s) is found, check the related circuit(s) for a short to ground or high resistance.

Using a test light, check the Powers and Ground to the PCM. The test light must illuminate brightly as if jumpered across a battery.

Attempt to communicate with the Instrument Cluster and VTSS. If you are unable to establish communications refer to 8 Electrical Electronic Control Module Electrical Diagnostics for the proper Diagnostic procedures.

The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the scan tool and check for DTCs that may be stored in the Sentry Key Immobilizer Module (SKREEM). Repair the DTC(s) before continuing.

If no DTCs are found, using the scan tool, select Clear PCM (BATT Disconnect).

Crank the engine several times. Using the scan tool, read DTCs. If a DTC is present perform the DTC diagnostics before continuing.

Were any problems found?

Yes >> Repair as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 2

2. OPEN FUSE

Check for any open fuses in both TIPM or Junction Block that may be related to the no start condition.

NOTE: If an open fuse is found, inspect the related circuit(s) for a short to ground or high resistance.

Are any of the fuses open?

Yes >> Replace the open fuse and check the related circuit(s) for a short to ground.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. SECONDARY INDICATORS PRESENT

NOTE: Diagnose only the Secondary Indicators that would cause a no start.

Ignition on, engine not running.

With the scan tool, check the Secondary Indicators while cranking the engine that would cause a no start condition.

Are there any Secondary Indicators present while cranking the engine?

Yes >> Refer to the Engine Electrical Diagnostics group and perform the tests related to the no start secondary indicator that is reported by the scan tool.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. POSSIBLE MECHANICAL PROBLEMS

Check for any of the following conditions/mechanical problems.

ENGINE VALVE TIMING - must be within specifications, check for broken timing components

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

Are there any engine mechanical problems?

Yes >> Repair as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. FUEL PUMP DELIVERY

Verify that the Fuel tank is not empty before continuing.

Follow the diagnostics for Checking Fuel Delivery in the Driveability section of this section.

Was the No Start condition solved after following the above diagnostic test?

Yes >> Test Complete.

No >> Check for contamination/water in the fuel. Make sure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*FUEL PRESSURE LEAK DOWN

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
FUEL PUMP MODULE
FUEL INJECTOR(S)

Diagnostic Test

1. FUEL PUMP MODULE

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi). If the fuel pressure is not within specification refer to Checking The Fuel Delivery System.

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace Fuel Pump Module.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 2

2. FUEL INJECTOR(S)

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace the leaking fuel injectors.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

*HARD START FUEL SYSTEM

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
FUEL CONTAMINATION
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
FAULTY FUEL PUMP MODULE
FUEL INJECTOR(S)

Diagnostic Test

1. CHECKING FUEL PRESSURE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge at the engine.

Ignition on, engine not running.

With a scan tool, actuate the Fuel Pump and observe the fuel pressure gauge.

NOTE: NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Below Specification
Go to 2

Within Specification
Go to 4

2. RESTRICTED FUEL SUPPLY LINE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel supply line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the Fuel Pump and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Visually and physically inspect the fuel supply lines between the fuel tank and the fuel rail. Repair/replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. CHECKING THE FUEL PUMP INLET

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and Fuel Tank Module (if equipped), inspect the Fuel Pump Inlet and the bottom of the fuel tank for debris that could cause the fuel pump inlet to be plugged.

Is the Fuel Inlet Strainer plugged?

Yes >> Repair/Replace as necessary.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Fuel Pump Module.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. FUEL PUMP MODULE

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the fuel pressure drop below 241 KPa (35 psi)?

Yes >> Replace Fuel Pump Module.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. FUEL INJECTOR(S)

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop below 241 KPa (35 psi)?

Yes >> Replace the leaking fuel injectors.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Check the fuel for contaminants.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*NO CRANK CONDITION

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
MECHANICAL CONDITION
BATTERY CIRCUIT RESISTANCE TOO HIGH
START ENABLE CIRCUITS
TRANSMISSION RANGE SENSOR
FUSED IGNITION SWITCH OUT (START)
CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT
CLUTCH INTERLOCK SWITCH GROUND CIRCUIT
CLUTCH INTERLOCK SWITCH
STARTER

Diagnostic Test

1. MECHANICAL CONDITION

NOTE: Check and diagnose all the TIPM DTC(s) before continuing.

NOTE: Ensure the Gear selector is in Park or Neutral.

NOTE: Verify the battery is fully charged and capable of passing a load test before continuing.

WARNING: Make sure the battery is disconnected, then wait two minutes before proceeding. Failure to do so may result in personal injury or possible death.

Turn the engine over by hand to make sure the engine is not seized.

Is the engine able to turn over?

Yes >> Go to 2

No >> Repair the mechanical condition preventing the starter motor from cranking.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. EXCESSIVE RESISTANCE IN THE BATTERY CIRCUIT

Connect the battery cables.

Turn the ignition off.

Check the Battery Cables for excessive resistance using the service information procedure.

Did either Battery Cable have a voltage drop greater than 0.2 of a volt?

Yes >> Repair the excessive resistance in the Battery circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. MANUAL TRANSMISSION

Is this vehicle equipped with a Manual transmission?

Yes >> Go to 8

No >> Go to 4

4. START ENABLE OPERATION (ATX)

Turn ignition on.

Using a scan tool, monitor the Ignition Start Switch Sense.

Turn the ignition switch to the crank position.

Does the Ignition Start Switch Sense state change from Low to High?

Yes >> Ensure the battery connection is clean and fastened tightly to the Starter. If OK, replace the Starter in accordance with the Service Information.

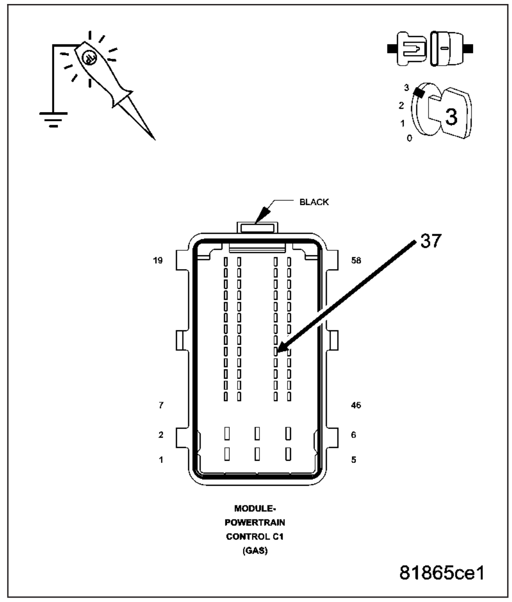
No >> Go to 5

5. START ENABLE CIRCUIT (ATX)

Turn the ignition off.

Disconnect the PCM harness connector.

Using a 12-volt test light connected to ground, probe the Start Enable circuit in the PCM harness connector while holding the ignition key in the start position.



Does the test light illuminate brightly?

Yes >> Replace the PCM in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. TRANSMISSION RANGE SENSOR (ATX)

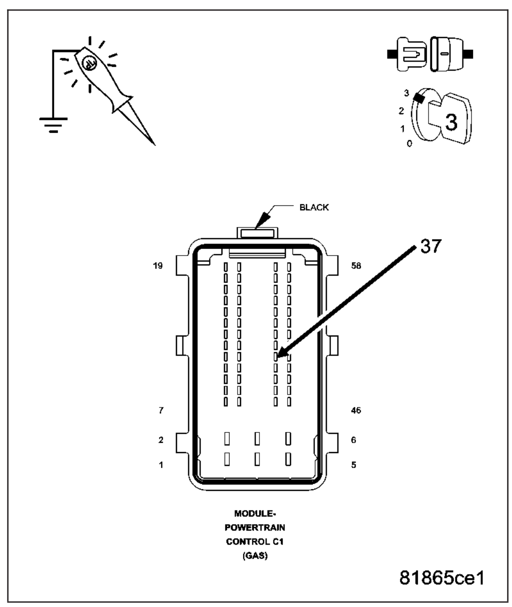
Turn the ignition off.

Test light still in the above position.

Disconnect the Transmission Range Sensor harness connector.

Using a jumper wire, connect one end to the Start Enable circuit and the other to the Fused Ignition Switch Output (Start) circuit in the Transmission Range Sensor harness connector.

Turn the ignition to the crank position.



Does the test light illuminate brightly?

Yes >> Replace Transmission Range Sensor harness.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

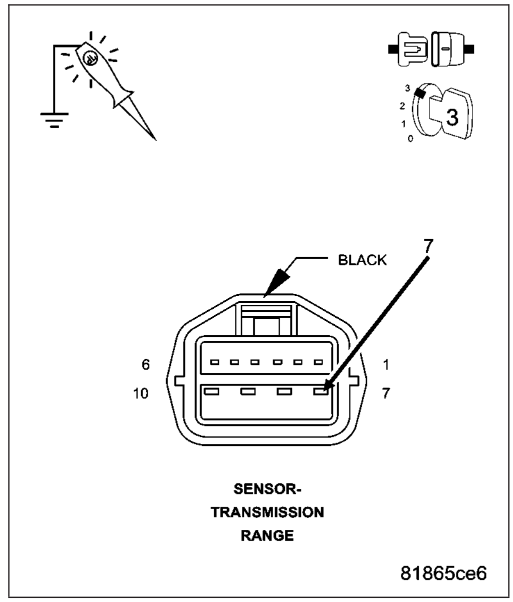
No >> Go to 7

7. FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT (ATX)

Turn the ignition off.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output (Start) circuit in the Transmission Range Sensor harness connector.

Turn the ignition to the crank position.



Does the test light illuminate brightly?

Yes >> Repair the Start Enable circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Check the Fused Ignition Switch Output (Start) circuit for an open. If OK, replace the TIPM in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. START ENABLE OPERATION (MTX)

Turn ignition on.

Using a scan tool, monitor the Ignition Start Switch Sense.

Turn the ignition switch to the crank position.

Does the Ignition Start Switch Sense state change from Low to High?

Yes >> Go to 10

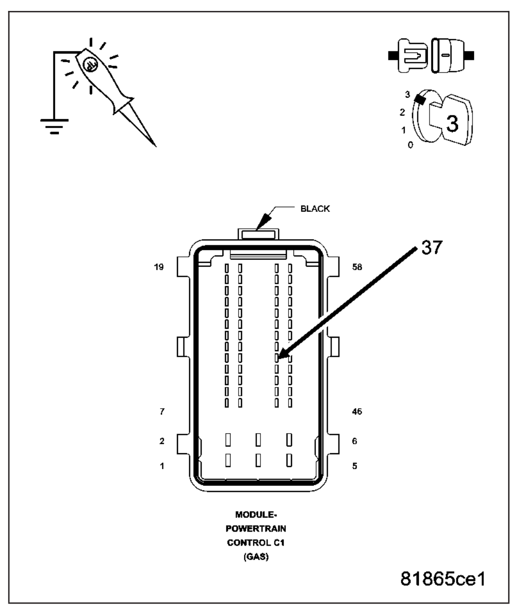
No >> Go to 9

9. STATER ENABLE CIRCUIT (MTX)

Turn the ignition off.

Disconnect the PCM harness connector.

Using a 12-volt test light connected to ground, probe the Start Enable circuit in the PCM harness connector while holding the ignition key in the start position.



Does the test light illuminate brightly?

Yes >> Replace the PCM in accordance with the Service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Check the Start Enable circuit. If OK, replace the TIPM in accordance with the Service Information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. CLUTCH INTERLOCK OPERATION (MTX)

Turn ignition on.

Using a scan tool, monitor the Clutch Switch.

Press the Clutch in and out.

Does Clutch Switch display Released and then Pressed?

Yes >> Replace the Starter in accordance with the Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 11

11. CLUTCH INTERLOCK OPERATION (MTX)

Turn the ignition off.

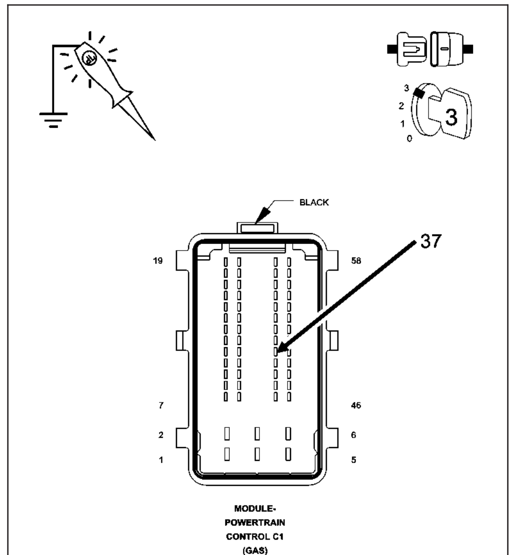
Disconnect the PCM harness connector.

Using a 12-volt test light connected to battery voltage, probe the Clutch interlock Signal circuit in the PCM harness connector while pressing the clutch pedal in.

Does the test light illuminate brightly?

Yes >> Replace the PCM in accordance with the Service information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 12



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12. CLUTCH INTERLOCK SWITCH (MTX)

Turn the ignition off.

Test light still in the above position.

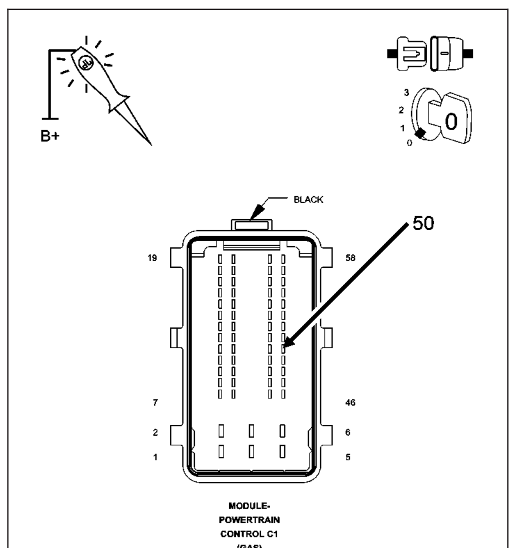
Disconnect the Clutch Interlock Switch harness connector.

Using a jumper wire, connect one end to the Clutch Interlock Switch Signal circuit and the other to the Clutch Interlock Switch ground circuit in the Clutch Interlock Switch harness connector.

Does the test light illuminate brightly?

Yes >> Replace Clutch Interlock Switch.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 13

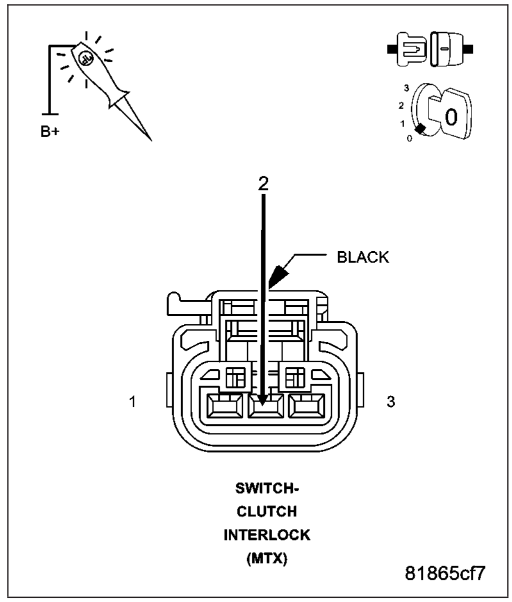


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13. CLUTCH INTERLOCK OPERATION (MTX)

Remove the jumper wire.

Using a 12-volt test light connected to battery voltage, probe the Clutch Interlock Switch ground circuit.



Does the test light illuminate brightly?

Yes >> Repair the Clutch Interlock Switch ground circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the Clutch Interlock Switch signal circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*NO RESPONSE WITH A NO START CONDITION

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A931) FUSED B+ CIRCUIT (PCM)
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUITS (PCM)
(Z925) PCM GROUND CIRCUITS (PCM)
(K51) MAIN RELAY CONTROL CIRCUIT
(A14) FUSED B+ CIRCUIT (MAIN RELAY)
(A935) FUSED B+ CIRCUIT (MAIN RELAY)
(K542) MAIN RELAY OUTPUT CIRCUIT (TO TIPM)
(F342/F343/344) MAIN RELAY OUTPUT CIRCUIT (TO PCM)
TIPM
PCM

Diagnostic Test

1. (A931) FUSED B+ CIRCUIT (PCM)

NOTE: The scan tool and cable must be operating properly for the results of this test to be valid.

NOTE: Make sure the ignition switch was on while trying to communicate with the PCM.

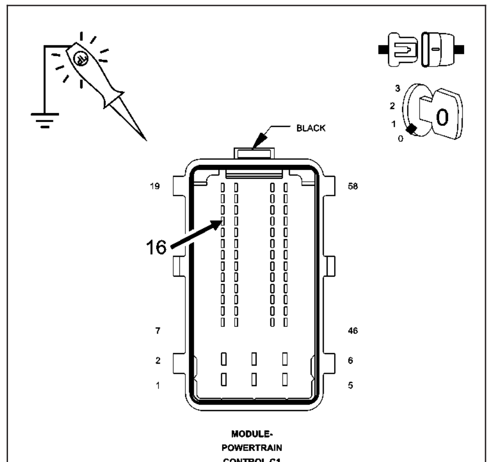
Turn the ignition off.

Disconnect the C1 PCM harness connectors.

Using a 12-volt test light connected to ground, probe the (A931) Fused B+ circuit in the PCM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?



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Yes >> Go to 2

No >> Repair the open or short to ground in the (A931) Fused B+ circuit. Inspect and replace fuses as necessary.

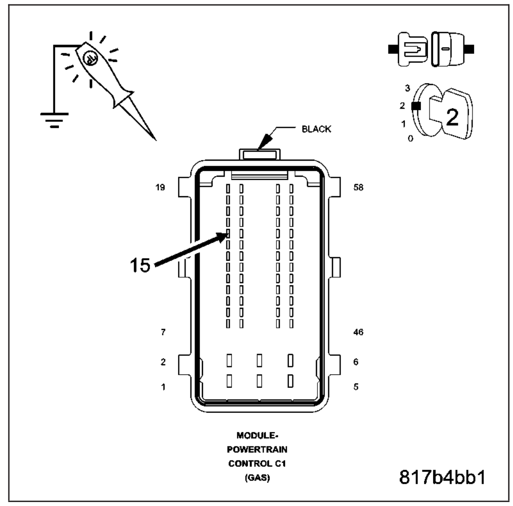
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (F202) IGNITION SWITCH OUTPUT (RUN-START) CIRCUITS (PCM)

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit in the PCM harness connector.

Turn the ignition to run.



NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 3

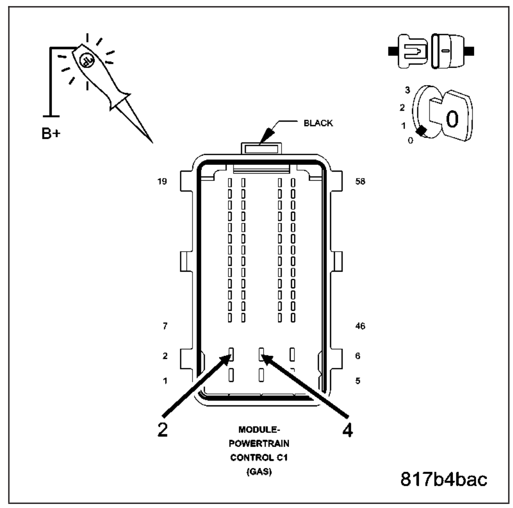
No >> Repair the (F202) Ignition Switch Output circuits. Inspect and replace fuses as necessary.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (Z925) GROUND CIRCUITS (PCM)

Turn the ignition off.

Using a 12-volt test light connected to battery voltage, probe both the (Z925) PCM ground circuits



NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly at both terminals?

Yes >> Go to 4

No >> Repair the Ground circuit(s).

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (A14) FUSED B+ CIRCUIT (MAIN RELAY)

Turn the ignition off.

Remove the Main Relay.

Using a 12-volt test light connected to ground, probe the (A14) Fused B+ circuit at the Main Relay terminal.

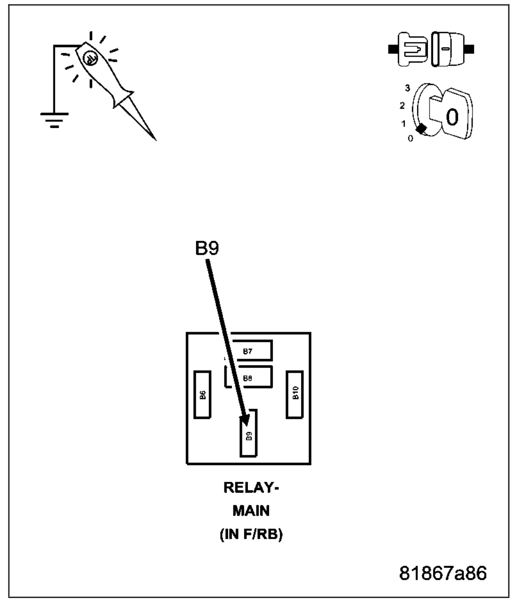
NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 5

No >> Repair the (A14) Fused B+ circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. (A935) FUSED B+ CIRCUIT (MAIN RELAY)

Using a 12-volt test light connected to ground, probe the (A935) Fused B+ circuit at the Main Relay terminal.

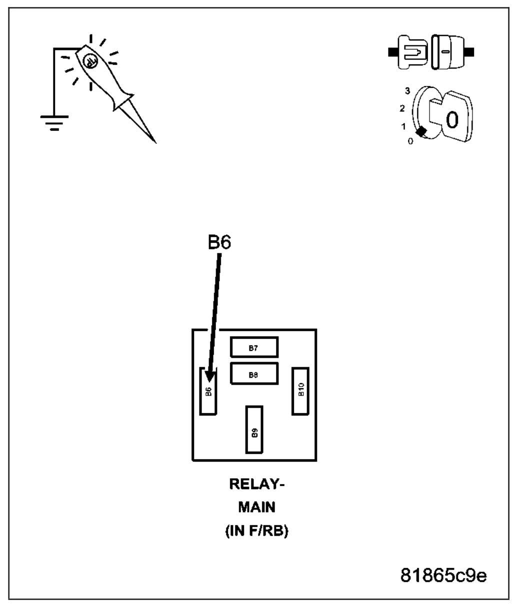
NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 6

No >> Repair the (A935) Fused B+ circuit.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



6. (F342) MAIN RELAY OUTPUT CIRCUITS

Turn the ignition on.

Using a jumper wire, jumper across the Main Relay from (K542) Main Relay Output circuit and the (A14) Fused B+ circuit.

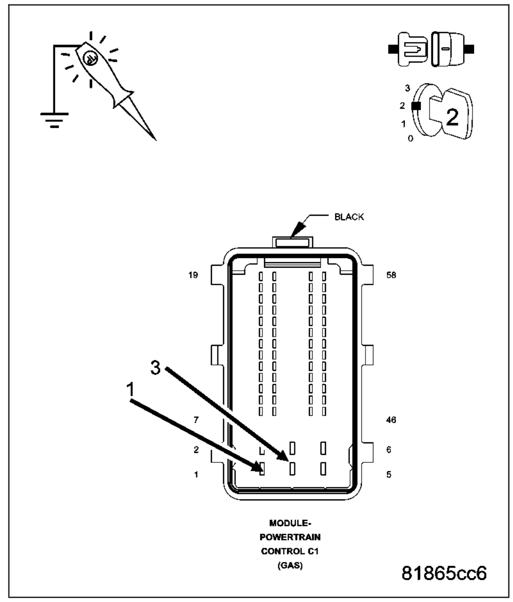
With a 12-volt test light connected to ground, probe the (F342) Main Relay Output circuits in the PCM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly at both terminals?

Yes >> Go to 8

No >> Go to 7



7. (K542) MAIN RELAY OUTPUT CIRCUIT

Jumper wire still installed.

Disconnect the C8 TIPM harness connector.

Using a 12-volt test light connected to ground, probe the (K542) Main Relay Output circuit in the TIPM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

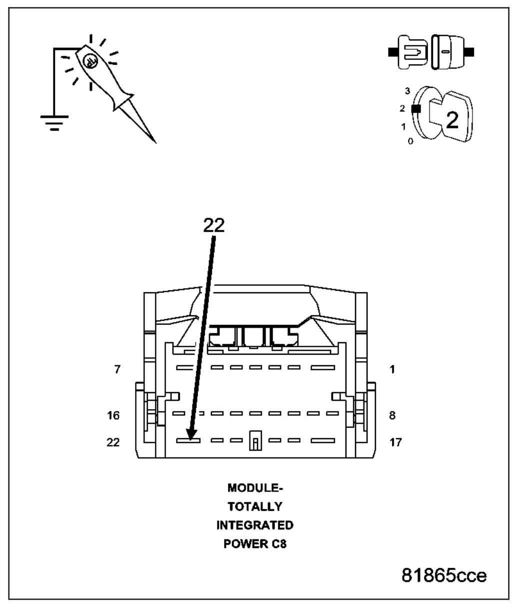
Does the test light illuminate brightly?

Yes >> Repair the (K542) Main Relay Output circuit between the TIPM and the Main Relay. Inspect the related fuses.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (F342) Main Relay Output circuit(s).

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. MAIN RELAY OUTPUT

Turn the ignition off.

Remove one end of the jumper wire.

Connect the PCM harness connector.

Turn the ignition on.

Return the jumper wire across the Main Relay.

Using a scan tool, attempt to communication with the PCM.

Were you able to communication with the PCM?

Yes >> Go to 9

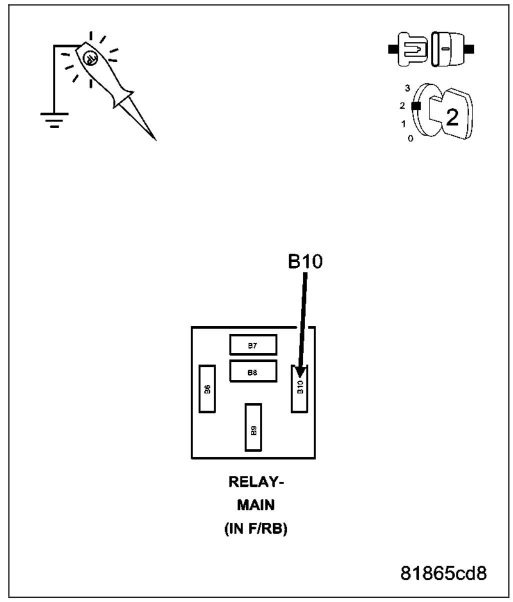
No >> Go to 11

9. MAIN RELAY

NOTE: To continue the following test, leave the jumper wire in place with the ignition on.

Using the scan tool, actuate the Main Relay.

Using a 12-volt test light connected to battery voltage, probe the (K51) Main Relay Control circuit in the Main Relay connector.



Does the test light illuminate and flash on and off?

Yes >> Replace the Main Relay.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 10

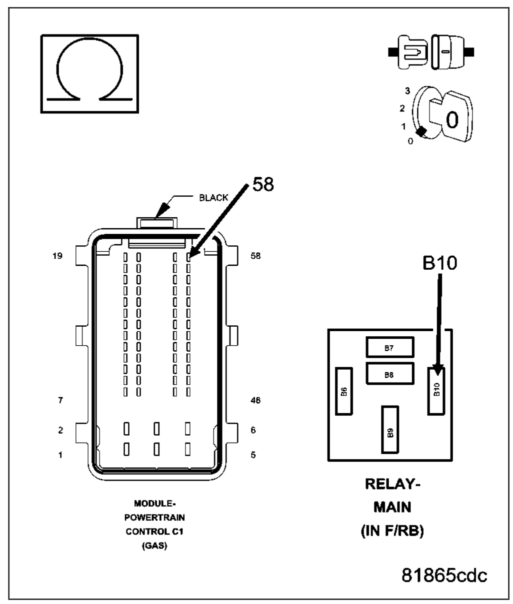
10. (K51) MAIN RELAY CONTROL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connector.

Disconnect the C1 PCM harness connector.

Measure the resistance of the (K51) Main Relay Control circuit between the PCM harness connector and the Main relay connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the open in the (K51) Main Relay Control circuit.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

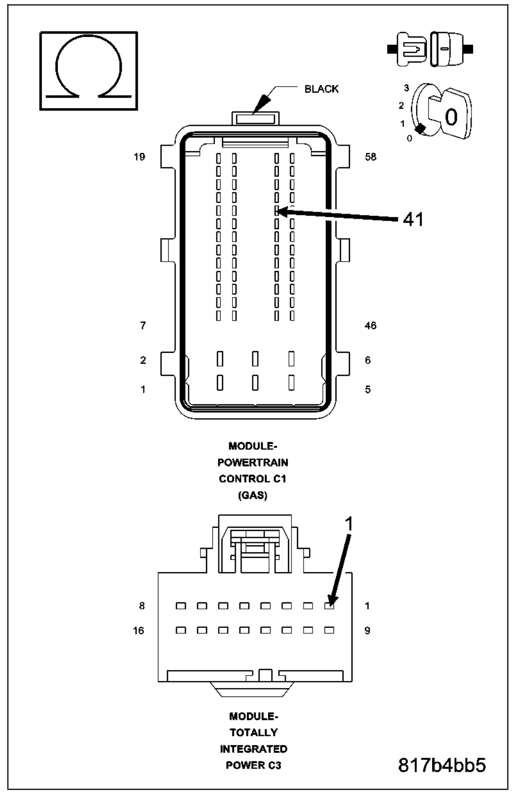
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the TIPM connector and the PCM harness connector.



Is the resistance below 5.0 ohms?

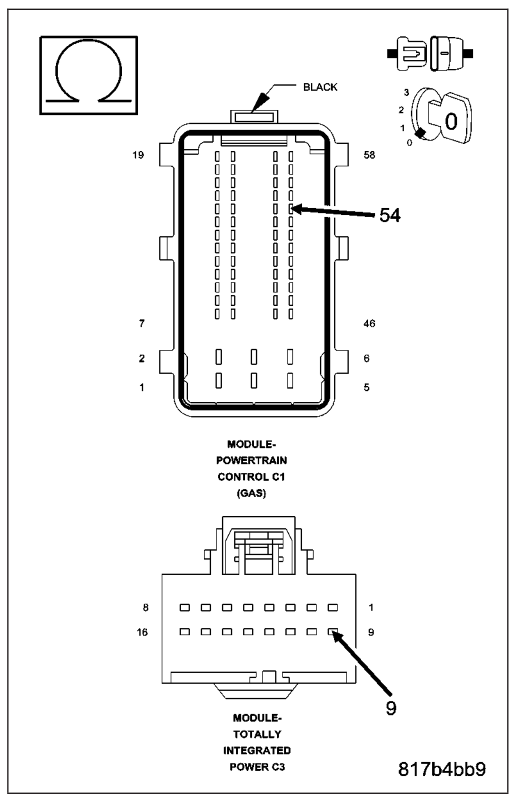
Yes >> Go to 12

No >> Repair the (D65) CAN C Bus (+) circuit for an open.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

12. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the TIPM connector and the PCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace and program the Powertrain Control Module in accordance with the service information.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (D64) CAN C Bus (-) circuit for an open.

Perform the PCM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

VERIFICATION TEST

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SELECT THE PROPER VERIFICATION TEST

Select the verification test for the repair that has been completed:

Speed Control repair
Go To 2

Charging System repair
Go To 3

No Start repair
Go To 4

All other repairs
Go To 5

2. SPEED CONTROL VERIFICATION TEST

1. Inspect the vehicle to verify that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. With the scan tool, erase all diagnostic trouble codes (DTCs).
3. Road test the vehicle at a speed above 60 km/h (35 MPH).
4. Press the Cruise On/Off switch to turn the speed control on.
5. Move the speed control switch to the Set/Decel position. If the speed control does not engage, the repair is not complete, continue with step 12.
6. Move the speed control switch to the Resume/Accel position. If the vehicle speed does not increase by 3 km/h (2 MPH), the repair is not complete, continue with step 12.
7. Using caution, press and release the brake pedal. If the speed control does not disengage, the repair is not complete, continue with step 12.
8. With the vehicle speed at least 60 km/h (35 MPH), move the speed control switch to the Resume/Accel position. If the speed control does not resume at the previously set speed, the repair is not complete, continue with step 12.
9. Move the speed control switch to the Set/Decel position. If the vehicle does not decelerate, the repair is not complete, continue with step 12.
10. Hold the speed control switch in the Set/Decel position and release the switch with the vehicle speed above 60 km/h (35 MPH). If the vehicle speed does not adjust and set a new vehicle speed, the repair is not complete, continue with step 12.
11. With the speed control engaged, press the Cruise On/Off switch. If the speed control does not disengage, the repair is not complete, continue with step 12.
12. If the vehicle did not successfully perform all of the previous steps, check for Technical Service Bulletins (TSBs) that pertain to this speed control problem and then, if necessary, return to the Symptom List.
13. If the vehicle successfully performed all of the previous steps, the speed control system is now functioning as designed. The repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

3. CHARGING SYSTEM VERIFICATION TEST

1. Inspect the vehicle to verify that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. With the scan tool, erase all diagnostic trouble codes (DTCs).
3. Start the engine.
4. Raise the engine speed to 2000 RPM for at least 30 seconds.
5. Allow the engine to idle.
6. Turn the ignition off for 20 seconds.
7. Turn the ignition on.
8. With the scan tool, read PCM DTCs.
9. If this DTC has set again, or another DTC has set, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary.
10. If the charging system is functioning correctly and there are no DTCs, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

4. NO START VERIFICATION TEST

NOTE: IMPORTANT! If the Powertrain Control Module or Sentry Key Immobilizer Module has been replaced, verify the programming procedure for the module has been performed in accordance with the Service Information.

2. Inspect the vehicle to verify that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
3. Inspect the engine oil for contamination. If it is contaminated, change the oil and filter.
4. With the scan tool, erase all diagnostic trouble codes (DTCs).
5. Turn the ignition off for at least 10 seconds.
6. Attempt to start the engine.
7. If the engine will not start, refer to any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary.
8. If the engine starts and continues to run, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

5. ROAD TEST VERIFICATION TEST

1. Inspect the vehicle to verify that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. If not, proceed to step 5.
3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete.
4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary.
5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue.
6. If the Powertrain Control Module (PCM) has been replaced, continue with step 9.
7. With the scan tool, erase all diagnostic trouble codes (DTCs), then disconnect the scan tool.
8. Turn the ignition off for at least 10 seconds.
9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11.
10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position.
11. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Control condition, drive the vehicle for at least 5 minutes with the A/C on.
12. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue.
13. Upon completion of the road test, turn the engine off and check for DTCs with the scan tool.
14. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

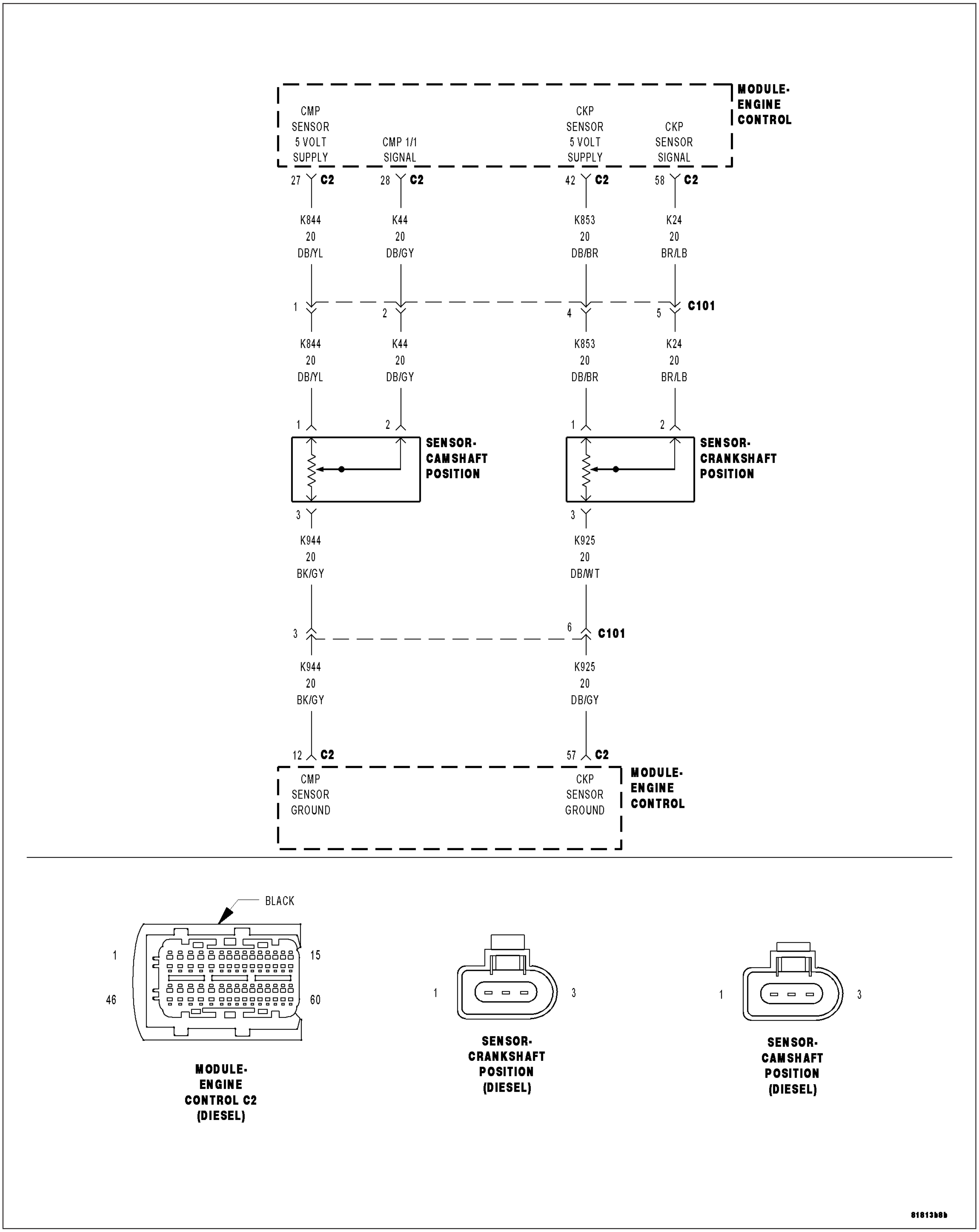
ENGINE ELECTRICAL DIAGNOSTICS - DIESEL

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ENGINE ELECTRICAL DIAGNOSTICS - DIESEL

DIAGNOSIS AND TESTING

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine cranking and Engine running
- **Set Condition:**
  Engine Control Module detects an error when the camshaft position is out of phase with the crankshaft position.

Possible Causes
(K44) ERRATIC CAM POSITION SENSOR 1 SIGNAL
CAMSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
(K24) ERRATIC CRANKSHAFT POSITION SENSOR SIGNAL
CRANKSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool clear the DTC(s).

Start the engine and run until operating temp is reached.

If the DTC does not reset it may be necessary to test drive the vehicle.

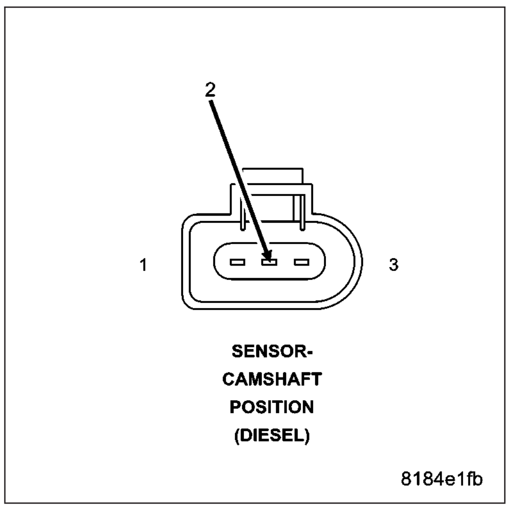
Did this DTC set again?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECKING THE (K44) CMP SIGNAL WITH A LAB SCOPE

With a lab scope, backprobe the (K44) CMP Signal circuit at the CMP Sensor harness connector.



WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Go To 3

No >> Go To 6

3. CMP WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. TONE WHEEL/PULSE RING INSPECTION

Remove the Camshaft Position Sensor.

Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Pulse Ring as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. CAMSHAFT POSITION SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Camshaft Position Sensor.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. ERRATIC CMP SIGNAL

Turn the ignition off.

Remove the lab scope probe.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

With scan tool, erase DTCs.

Start the engine.

Gently tap on and wiggle the Cam Position Sensor.

Ignition on, engine not running.

Inspect the Sensor connector and harness connector, and inspect the ECM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

Inspect the related wire harness and the splices in the CMP circuit.

Did this DTC set again?

Yes >> Repair the wiring/connector concerns as needed or replace the Camshaft Position Sensor.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 7

7. CHECKING THE (K24) CKP SIGNAL WITH A LAB SCOPE

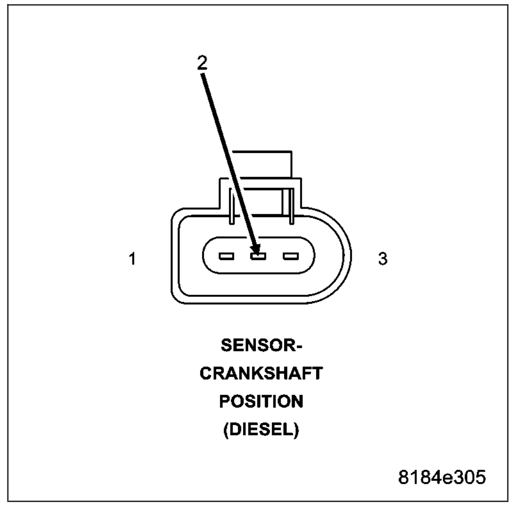
Turn the ignition off.

With a lab scope, backprobe the (K24) CKP Signal circuit at the CKP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Observe the lab scope screen.



Are there any irregular or missing signals?

Yes >> Go To 8

No >> Go To 10

8. CKP WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 9

9. TONE WHEEL/FLEX PLATE INSPECTION

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Flex Plate as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Crankshaft Position Sensor.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. ERRATIC CKP SIGNAL

NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Gently tap on and wiggle the Crank Position Sensor.

Turn the ignition off.

Inspect the Sensor connector and harness connector, and inspect the ECM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

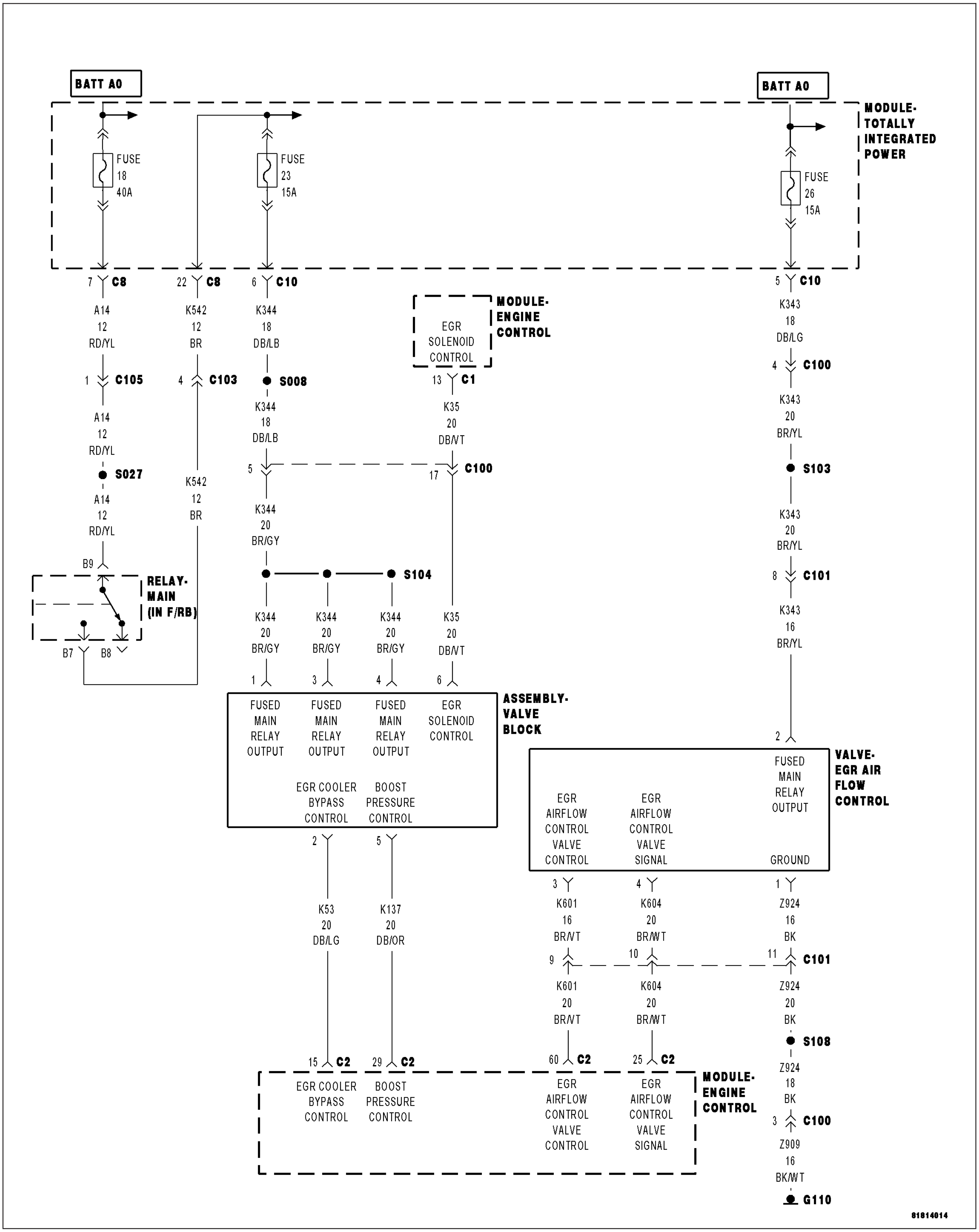
Inspect the related wire harness and the splices in the CKP circuits.

Were any problems found?

Yes >> Repair the wiring/connector concerns as needed or replace the Crankshaft Position Sensor. Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

P0045 - TURBOCHARGER BOOST CONTROL CIRCUIT/OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Boost Pressure command off.
- **Set Condition:**
  The ECM detects that the (K137) Boost Pressure Control circuit is open for 2.0 seconds.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO GROUND
(K137) BOOST PRESSURE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Boost Pressure at 100%.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

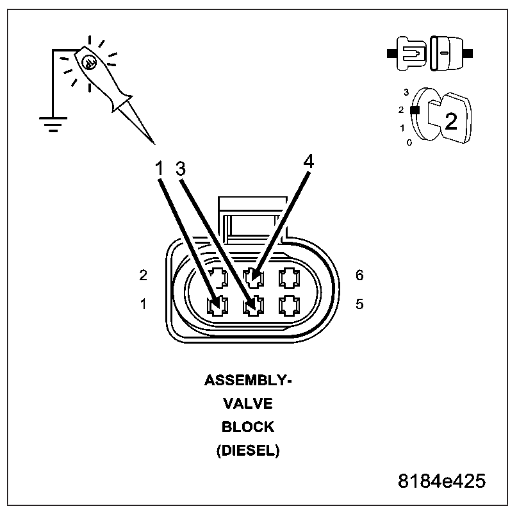
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuits in the Valve Block Assembly harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright for each circuit?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit(s) for an open circuit or high resistance.

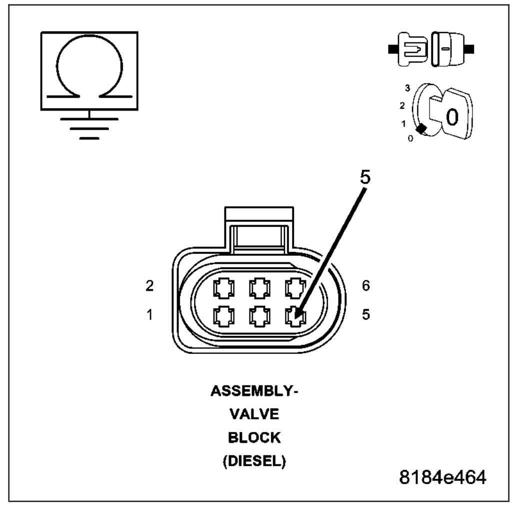
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.



Is the resistance above 10.0 ohms?

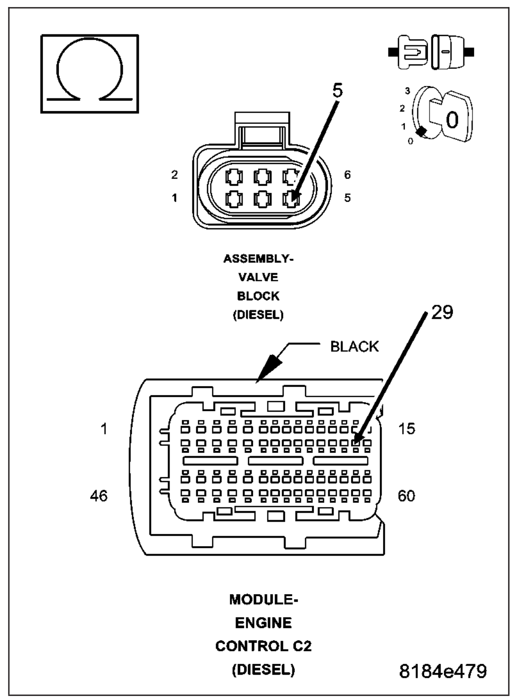
Yes >> Go to 4

No >> Repair the (K137) Boost Pressure Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K137) BOOST PRESSURE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K137) Boost Pressure Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (K137) Boost Pressure Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. VALVE BLOCK ASSEMBLY

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Boost Pressure (Boost Pressure Actuator) to 100%.

Using a 12 volt test light connected to 12 volts, check the (K137) Boost Pressure Control circuit in Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

With the scan tool, actuate the Boost Pressure (Boost Pressure Actuator) to 0%.

Using a 12 volt test light connected to 12 volts, check the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should not be illuminated.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright with the actuation at 100% and not illuminated with the actuation at 0%?

Yes >> Replace the Valve Block Assembly in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Valve Block Assembly and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

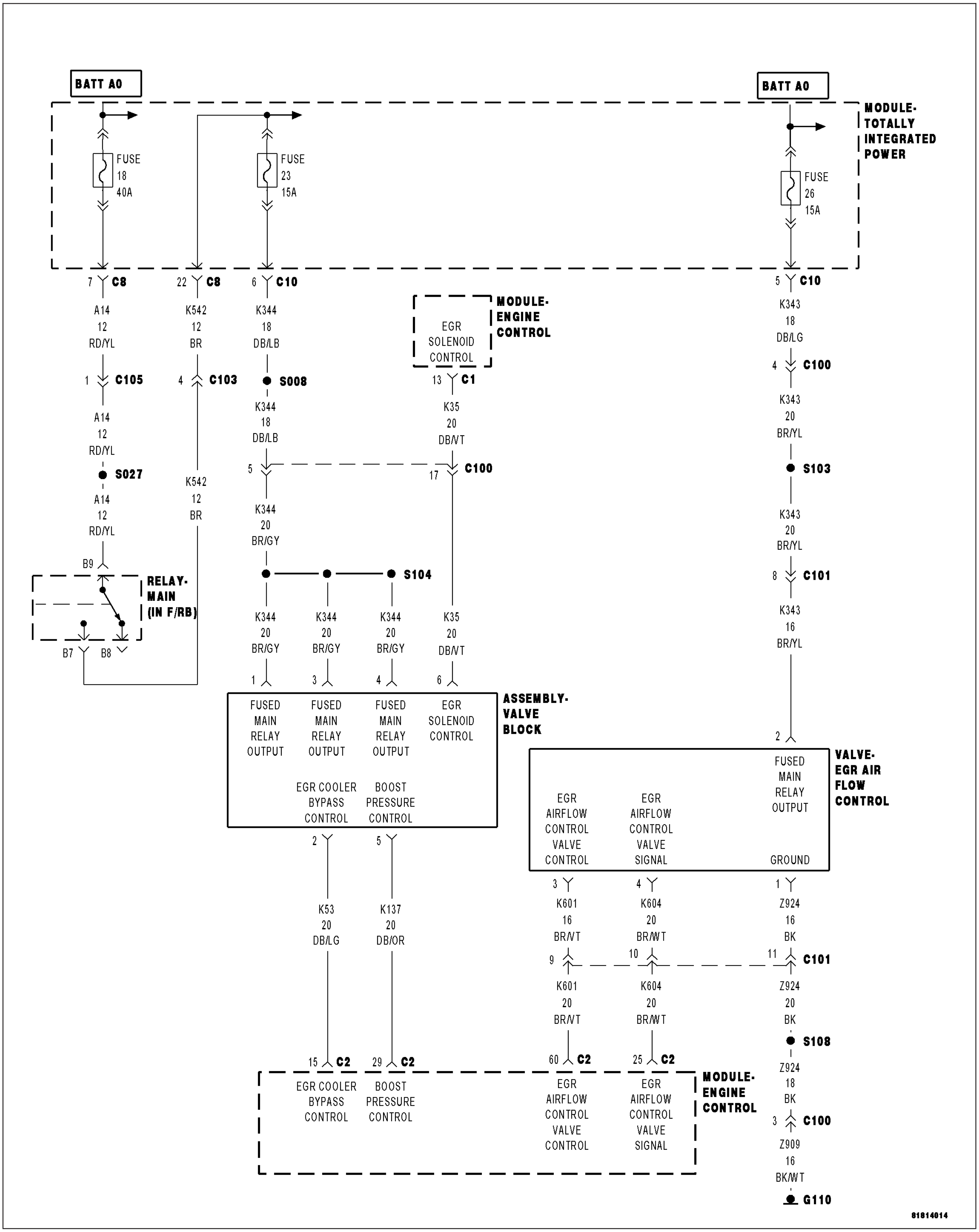
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0047 - TURBOCHARGER BOOST CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Boost Pressure command off.
- **Set Condition:**
  The ECM detects that the (K137) Boost Pressure Control circuit is shorted to ground for 5.3 seconds.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO GROUND
(K137) BOOST PRESSURE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Boost Pressure at 100%.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

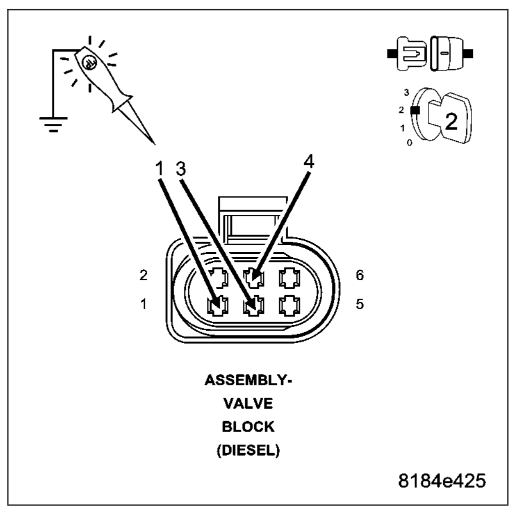
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuits in the Valve Block Assembly harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright for each circuit?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit(s) for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

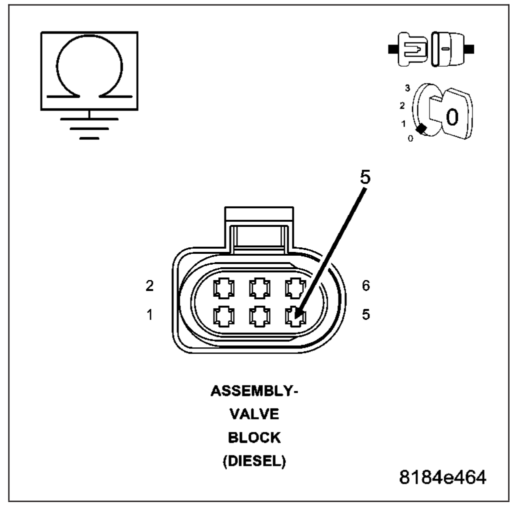
Measure the resistance between ground and the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.

Is the resistance above 1000.0 ohms?

Yes >> Go to 4

No >> Repair the (K137) Boost Pressure Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



4. (K137) BOOST PRESSURE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

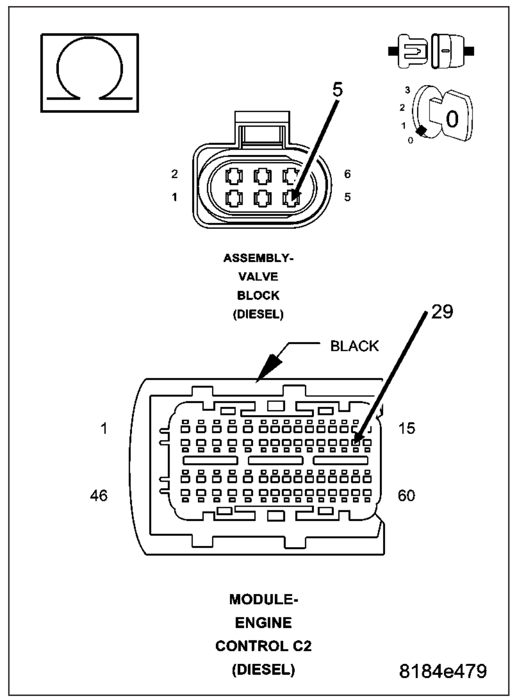
Measure the resistance of the (K137) Boost Pressure Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (K137) Boost Pressure Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. VALVE BLOCK ASSEMBLY

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Boost Pressure (Boost Pressure Actuator) to 100%.

Using a 12 volt test light connected to 12 volts, check the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

With the scan tool, actuate the Boost Pressure (Boost Pressure Actuator) to 0%.

Using a 12 volt test light connected to 12 volts, check the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should not be illuminated.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright with the actuation at 100% and not illuminated with the actuation at 0%?

Yes >> Replace the Valve Block Assembly in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Valve Block Assembly and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

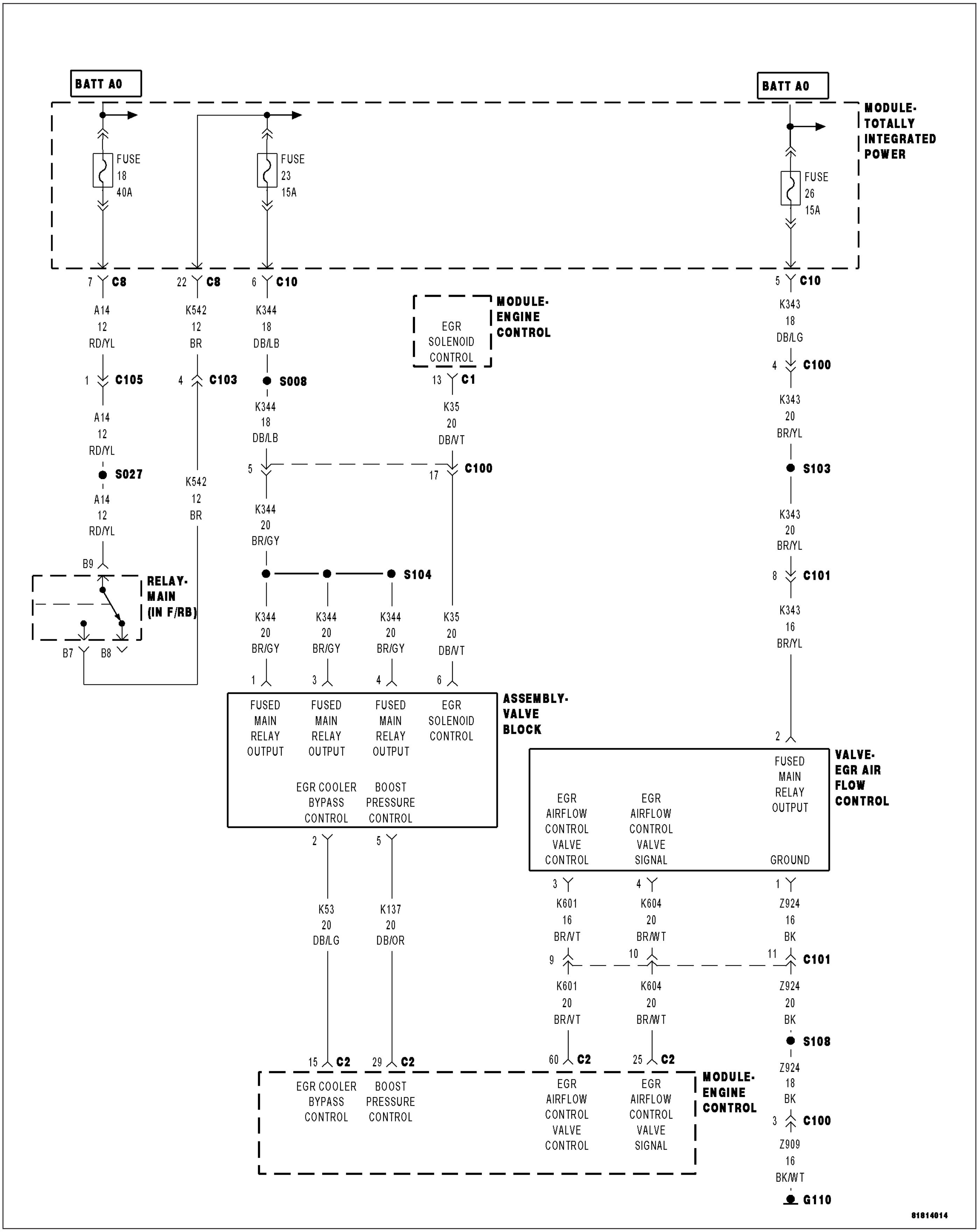
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0048 - TURBOCHARGER BOOST CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Boost Pressure command on.
- **Set Condition:**
  The ECM detects that the (K137) Boost Pressure Control circuit is shorted to voltage for 2.0 seconds.

Possible Causes
INTERMITTENT DTC
(K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K137) BOOST PRESSURE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Boost Pressure at 100%.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K137) BOOST PRESSURE CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

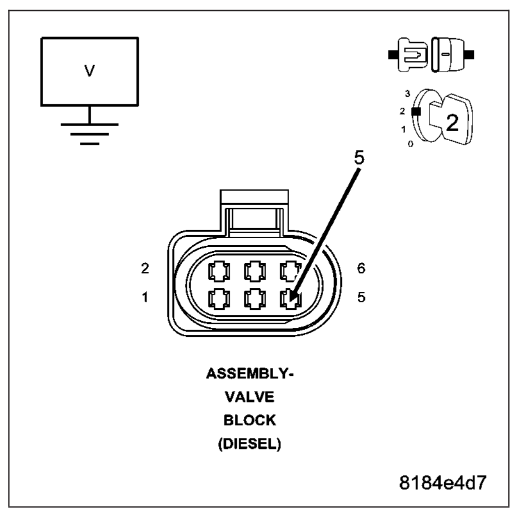
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.



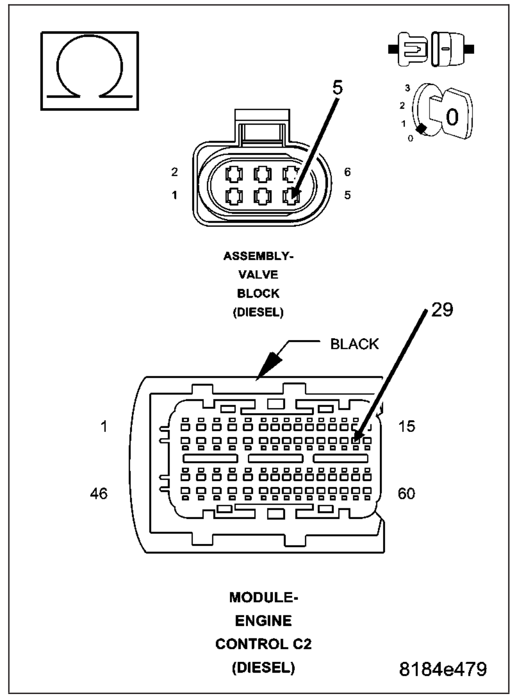
Is there any voltage present?

Yes >> Repair the (K137) Boost Pressure Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K137) BOOST PRESSURE CONTROL OPEN OR HIGH RESISTANCE



Turn the ignition off.

Measure the resistance of the (K137) Boost Pressure Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (K137) Boost Pressure Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. VALVE BLOCK ASSEMBLY

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Boost Pressure (Boost Pressure Actuator) to 100%.

Using a 12 volt test light connected to 12 volts, check the (K137) Boost Pressure Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright with the actuation at 100%?

Yes >> Replace the Valve Block Assembly in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Valve Block Assembly and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

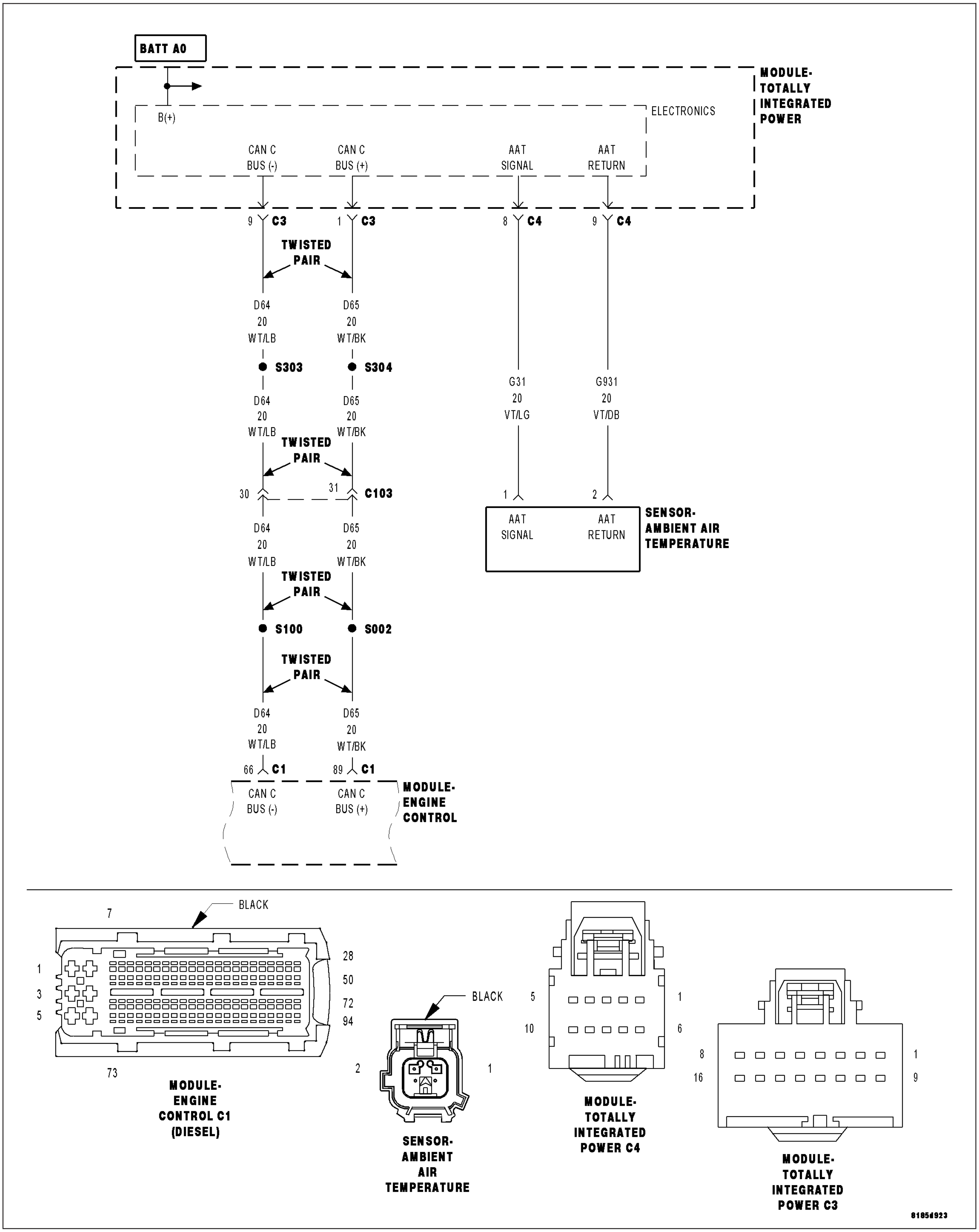
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFROMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Ambient Air Temperature Sensor signal is implausible for 0.5 second.

Possible Causes
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(G931) AMBIENT AIR TEMP SENSOR GROUND CIRCUIT OPEN
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT OPEN
AMBIENT TEMPERATURE SENSOR
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase TIPM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

Monitor the scan tool for TIPM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

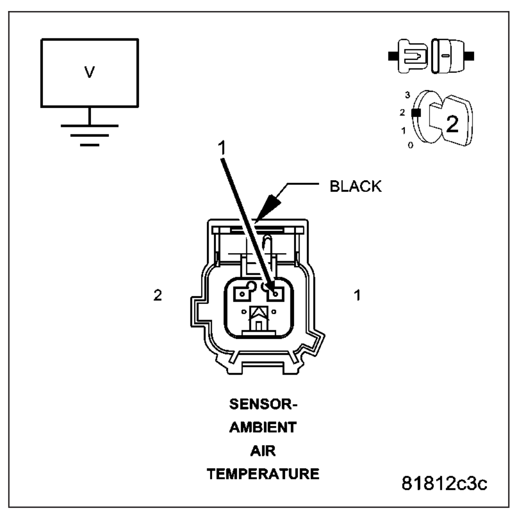
Disconnect the TIPM C4 harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage on the (G31) Ambient Air Temperature Sensor Signal circuit at the AAT Sensor harness connector.



NOTE: Remove the jumper wire.

Is the voltage below 1.0 volt?

Yes >> Go To 3

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

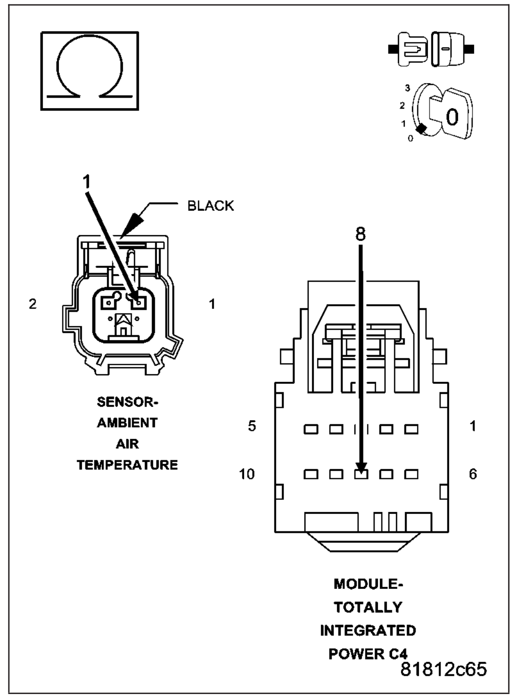
Measure the resistance of the (G31) Ambient Air Temperature Sensor Signal circuit between the AAT Sensor harness connector and Totally Integrated Power Module C4 harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

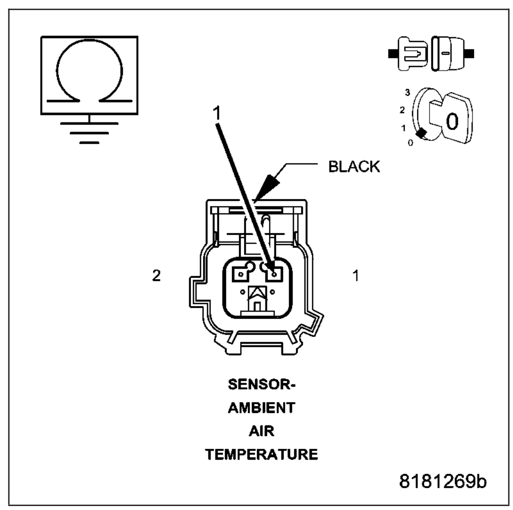
Measure the resistance between ground and the (G31) Ambient Air Temperature Sensor Signal circuit at the AAT Sensor harness connector.

Is the resistance above 1000 ohms?

Yes >> Go To 5

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



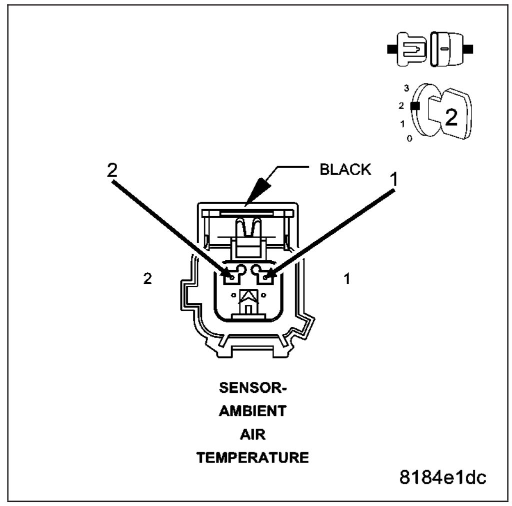
5. AMBIENT AIR TEMPERATURE SENSOR

Turn the ignition off.

Connect a jumper wire between the (G31) Ambient Air Temperature Sensor Signal and the (G931) Sensor Ground circuit in the Ambient Air Temperature Sensor harness connector.

Turn the ignition on.

Monitor the scan tool for TIPM DTCs.



Does the scan tool display P0072 AMB TEMP. SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW?

Yes >> Replace the Ambient Air Temperature Sensor.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

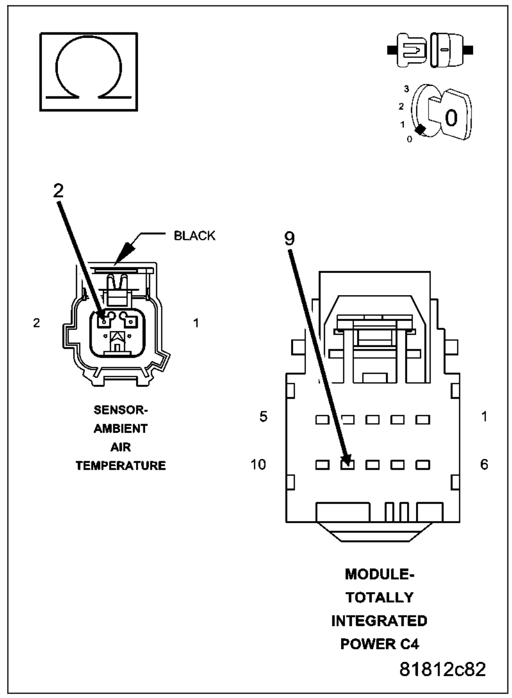
No >> Go To 6

6. (G931) AMBIENT AIR TEMP SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM harness connectors.

Measure the resistance of the (G931) Ambient Air Temp Sensor Ground circuit between the TIPM harness connector and the Ambient Air Temperature Sensor harness connector.



Is the resistance below 10.0 ohms?

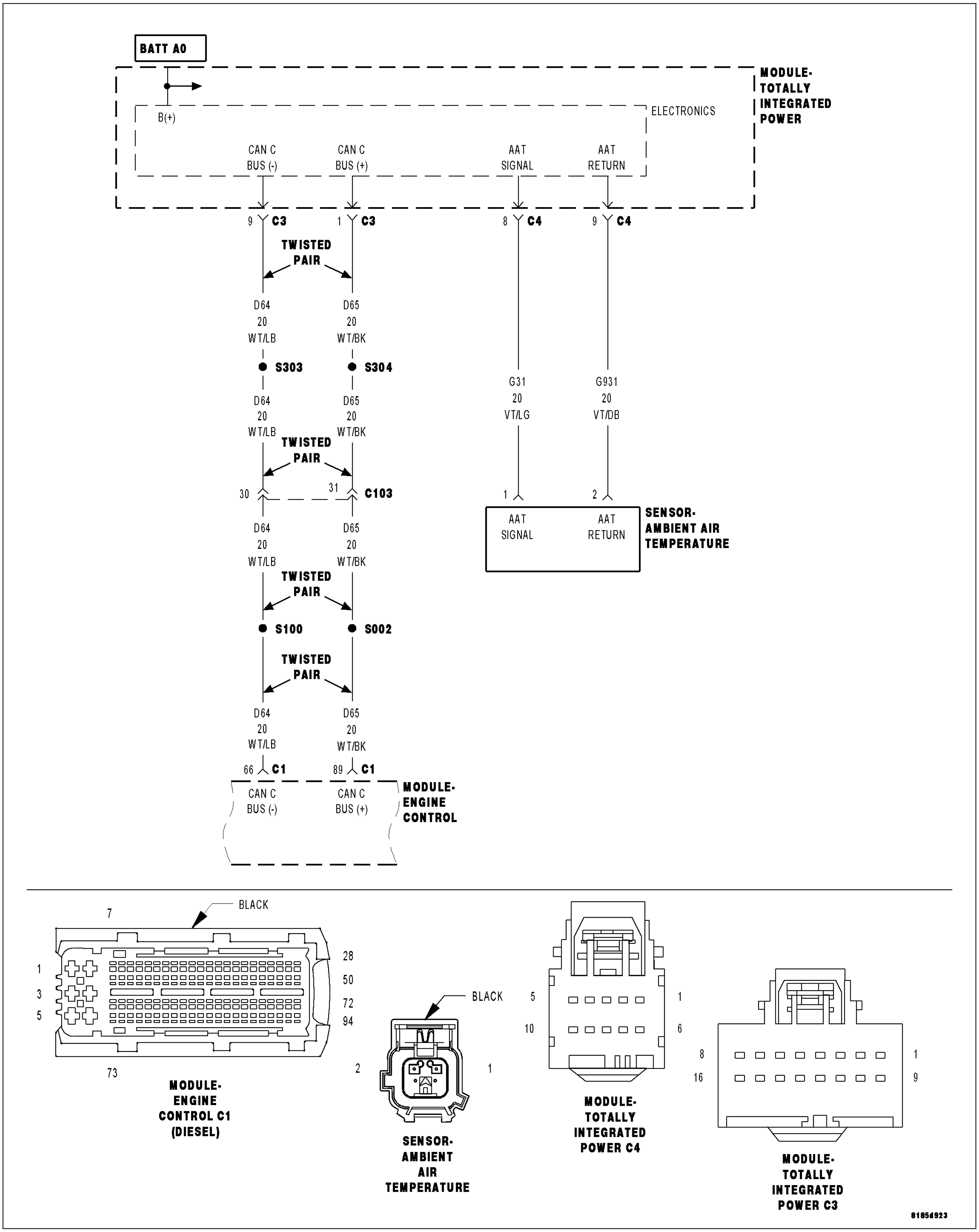
Yes >> Replace and program the Totally Integrated Power Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the (G931) Ambient Air Temperature Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0072-AMBIENT AIR TEMPERATURE SIGNAL VOLTAGE TOO LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Ambient Air Temperature Sensor signal is below 0.20 volts.

Possible Causes
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO (G931) SENSOR GROUND
AMBIENT AIR TEMPERATURE SENSOR
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase TIPM DTCs.

Monitor the scan tool for TIPM DTCs for at least 2 minutes.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. AMBIENT AIR TEMPERATURE SENSOR

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

Turn the ignition on.

Monitor the scan tool for TIPM DTCs for at least 2 minutes.

Does the scan tool display P0073 AMB AIR TEMP SENSOR SIGNAL VOLTAGE TOO HIGH?

Yes >> Replace the Ambient Air Temperature Sensor.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

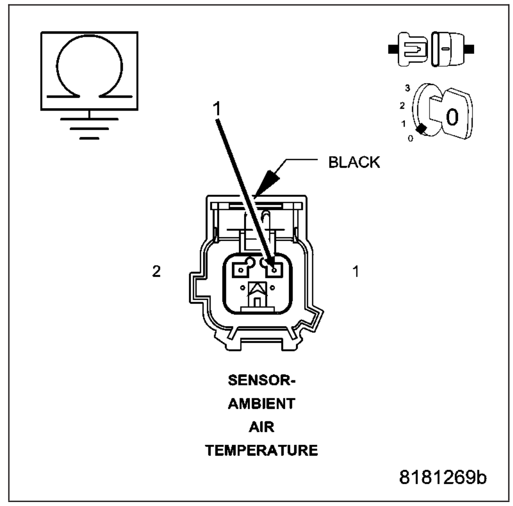
No >> Go To 3

3. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM harness connectors.

Measure the resistance between ground and the (G31) Ambient Air Temperature Sensor Signal circuit.



Is the resistance above 1000 ohms?

Yes >> Go To 4

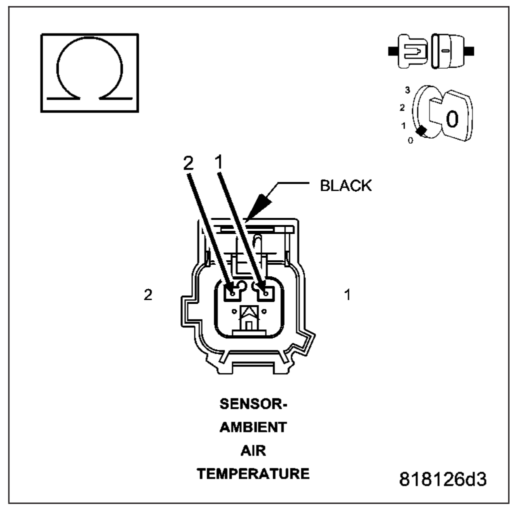
No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO (G931) SENSOR GROUND

Turn the ignition off.

Measure the resistance between the (G31) Ambient Air Temperature Sensor Signal circuit and the (G931) Sensor Ground circuit.



Is the resistance above 1000 ohms?

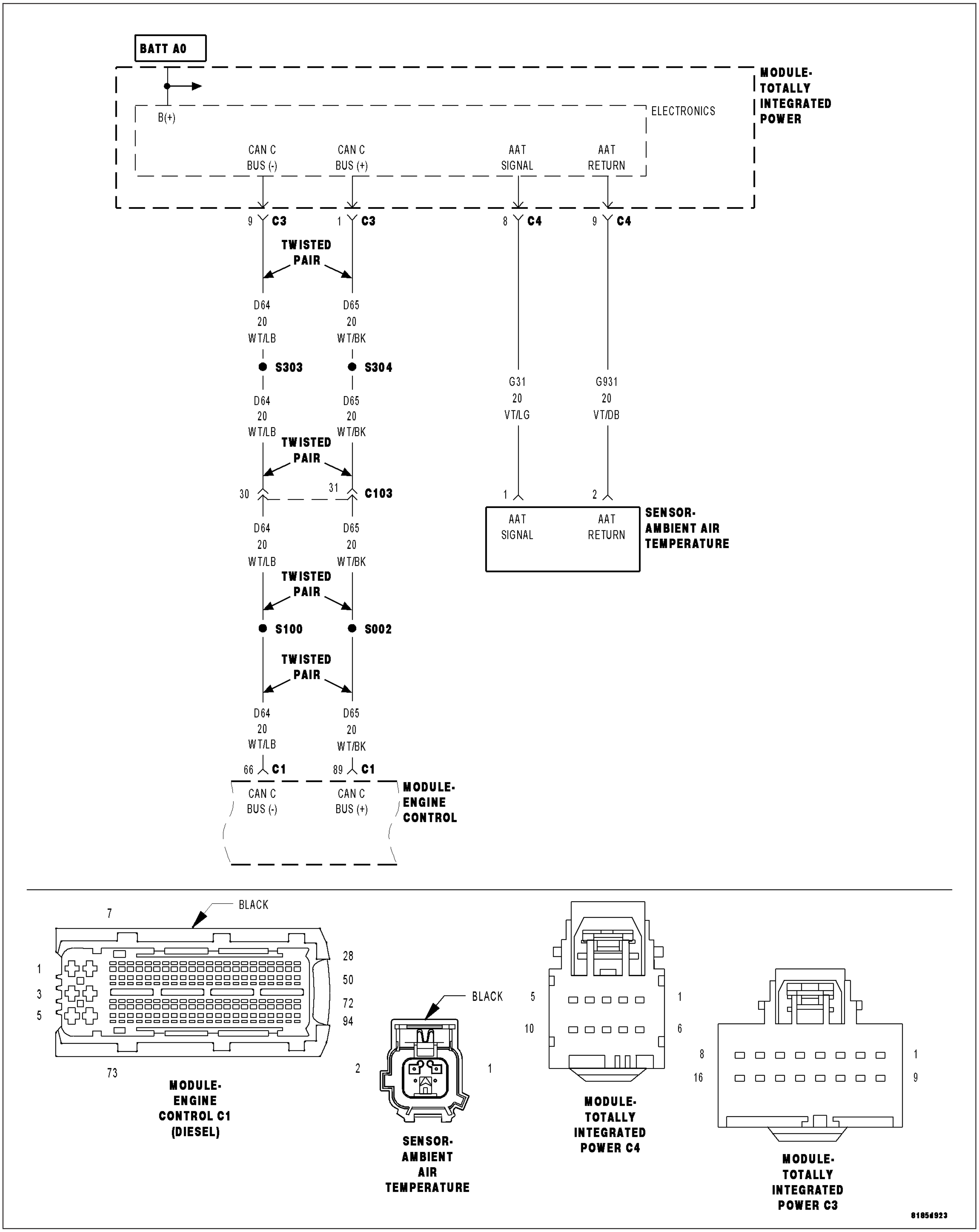
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for a short to the (G931) Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0073-AMBIENT AIR TEMPERATURE SIGNAL VOLTAGE TOO HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Ambient Air Temperature Sensor signal is above 5.0 volts.

Possible Causes
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G931) AMBIENT AIR TEMP SENSOR GROUND CIRCUIT OPEN
(G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT OPEN
AMBIENT AIR TEMPERATURE SENSOR
TOTALLY INTEGRATED POWER MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase TIPM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

Monitor the scan tool for TIPM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

Disconnect the TIPM C4 harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage on the (G31) Ambient Air Temperature Sensor Signal circuit.

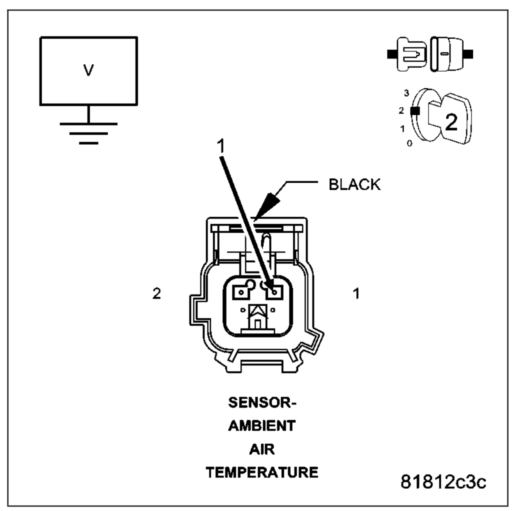
NOTE: Remove the jumper wire.

Is the voltage below 1.0 volt?

Yes >> Go To 3

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



3. (G31) AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

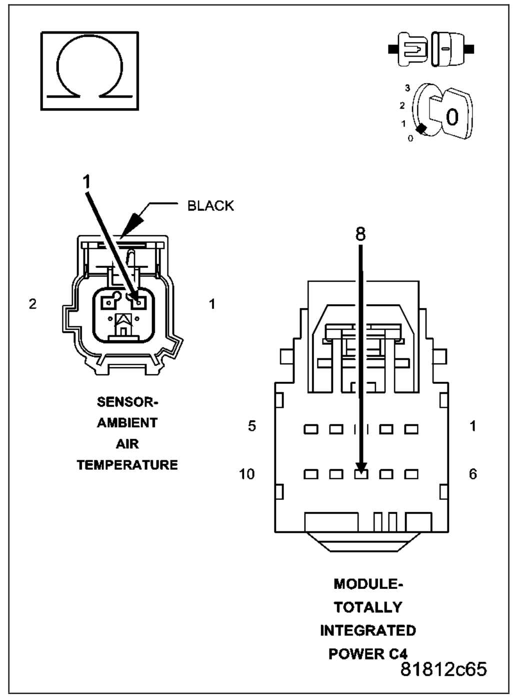
Measure the resistance of the (G31) Ambient Air Temperature Sensor Signal circuit between TIPM C4 harness connector and the Ambient Air Temperature Sensor harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (G31) Ambient Air Temperature Sensor Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



4. AMBIENT AIR TEMPERATURE SENSOR

Connect a jumper wire between the (G31) Ambient Temperature Sensor Signal and the (G931) Sensor Ground circuit in the Ambient Temperature Sensor harness connector.

Turn the ignition on.

Monitor the scan tool for TIPM DTCs.

Does the scan tool display P0070 AMB TEMP. SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW?

Yes >> Replace the Ambient Air Temperature Sensor.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 5

5. (G931) AMBIENT AIR TEMP SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (G931) Ambient Air Temperature Sensor Ground circuit between the TIPM C4 harness connector and the Ambient Air Temperature Sensor harness connector.

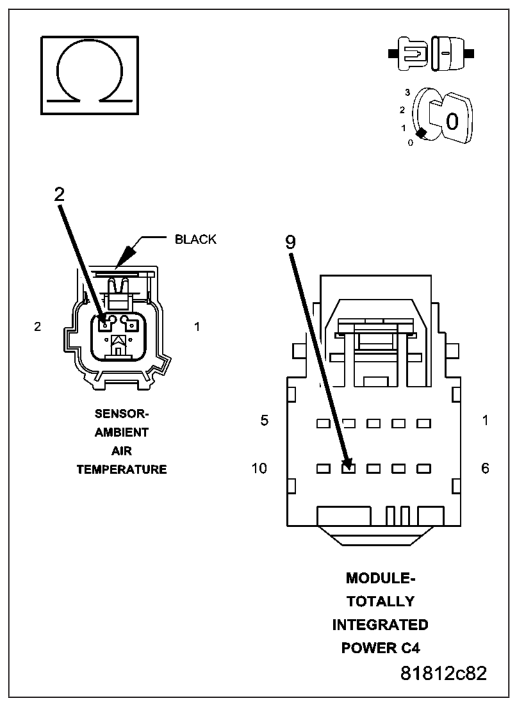
Is the resistance below 10.0 ohms?

Yes >> Replace and program the TIPM in accordance with the Service Information.

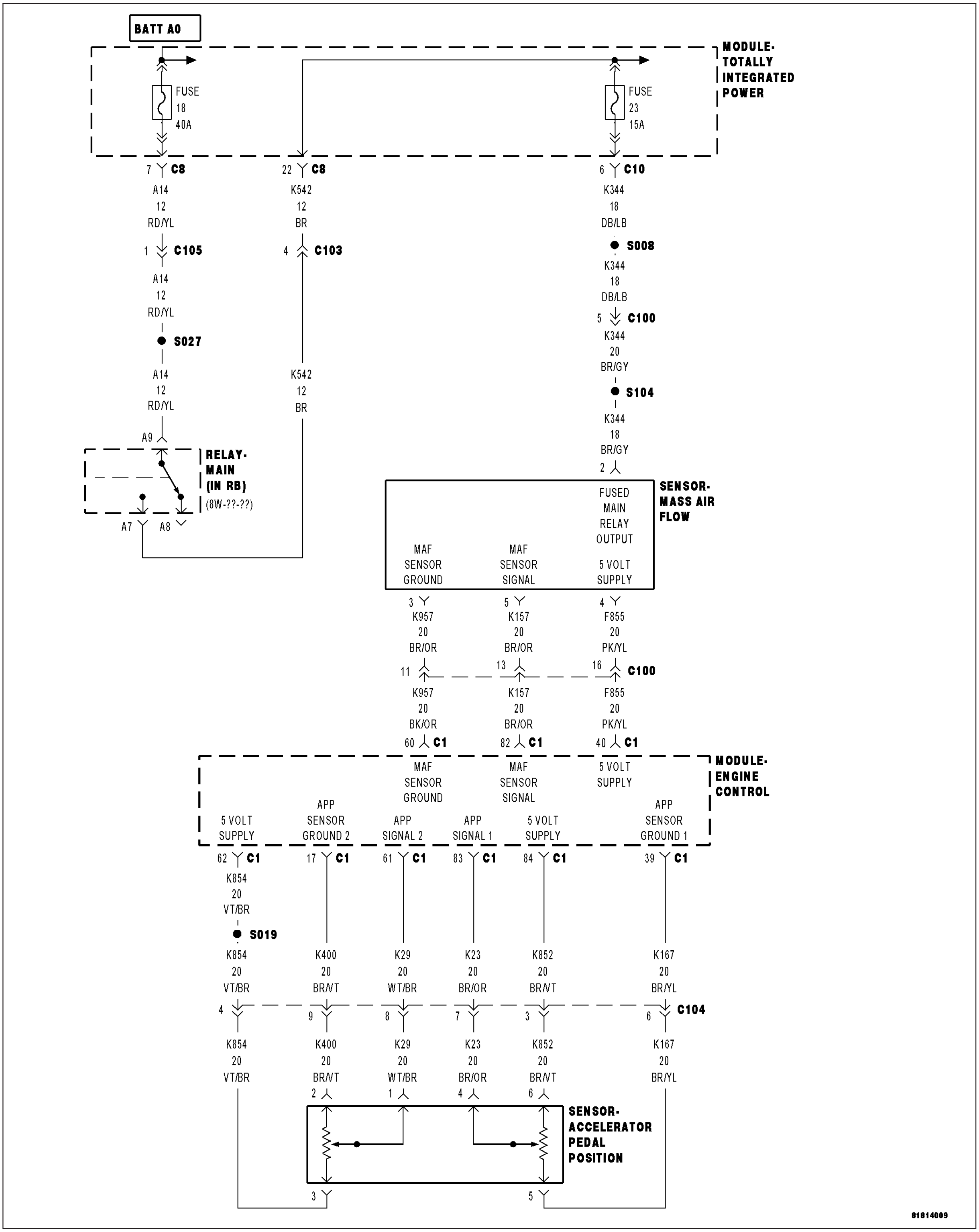
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the (G931) Ambient Air Temperature Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



P0101-MASS AIR FLOW SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects that the (K157) Mass Air Flow Sensor Signal circuit is not within a valid range.

Possible Causes
INTERMITTENT DTC
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K957) MASS AIR FLOW SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO THE (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT
MASS AIR FLOW SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Start the engine and allow it to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

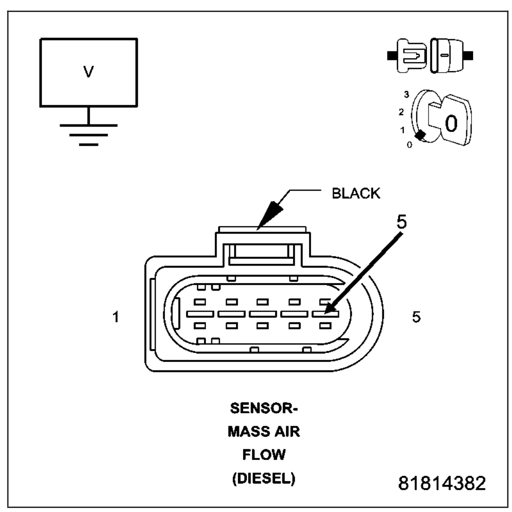
2. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Mass Air Flow Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K157) Mass Air Flow Sensor Signal circuit in the Mass Air Flow Sensor harness connector.



Is there any voltage present?

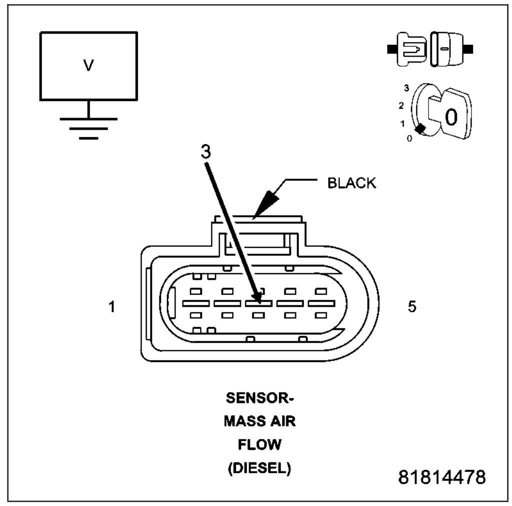
Yes >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K957) Mass Air Flow Sensor Ground circuit in the Mass Air Flow Sensor harness connector.



Is there any voltage present?

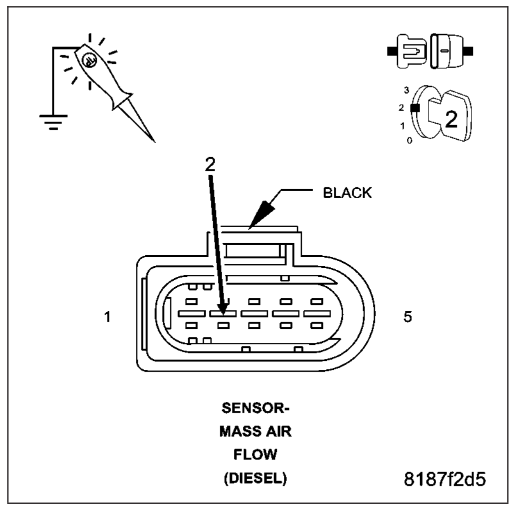
Yes >> Repair the (K957) Mass Air Flow Sensor Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Mass Air Flow Sensor harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

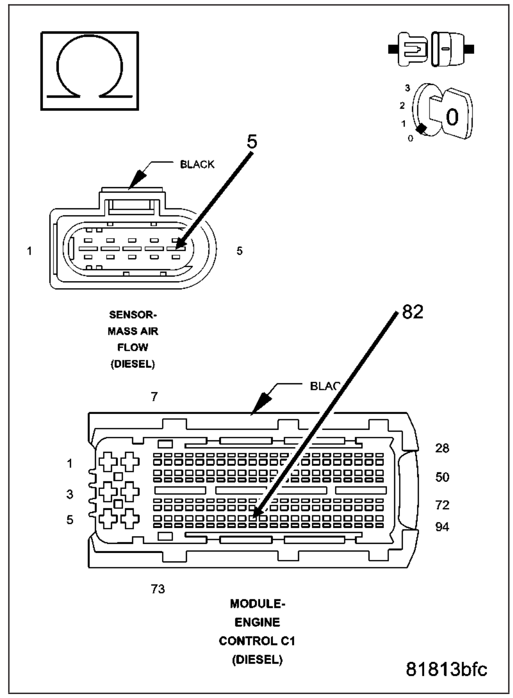
Measure the resistance of the (K157) Mass Air Flow Sensor Signal circuit between the Mass Air Flow Sensor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 6

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



6. (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

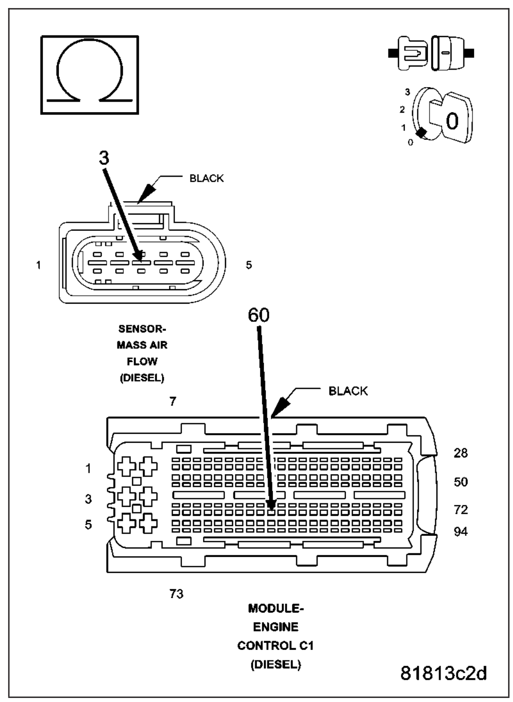
Measure the resistance of the (K957) Mass Air Flow Sensor Ground circuit between the Mass Air Flow Sensor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 7

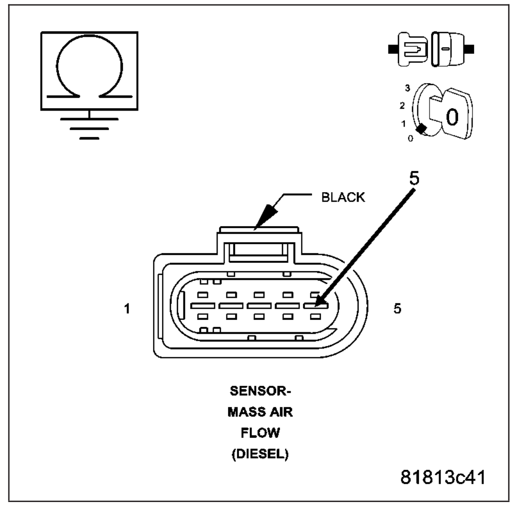
No >> Repair the (K957) Mass Air Flow Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



7. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K157) Mass Air Flow Sensor Signal circuit in the Mass Air Flow Sensor harness connector.



Is the resistance above 10.0 ohms?

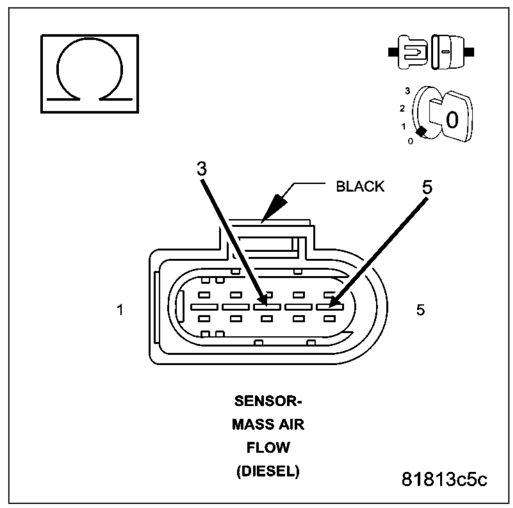
Yes >> Go to 8

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO THE (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT

Measure the resistance between the (K157) Mass Air Flow Sensor Signal circuit and the (K957) Mass Air Flow Sensor Ground circuit in the Mass Air Flow Sensor harness connector.



Is the resistance above 10.0 ohms?

Yes >> Go to 9

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to the (K957) Mass Air Flow Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. MASS AIR FLOW SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) connector.

Replace the Mass Air Flow Sensor in accordance with the Service Information.

Turn the ignition on.

With the scan tool, Clear DTCs.

Start the engine and allow it to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 10

No >> Test Complete.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Mass Air Flow Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

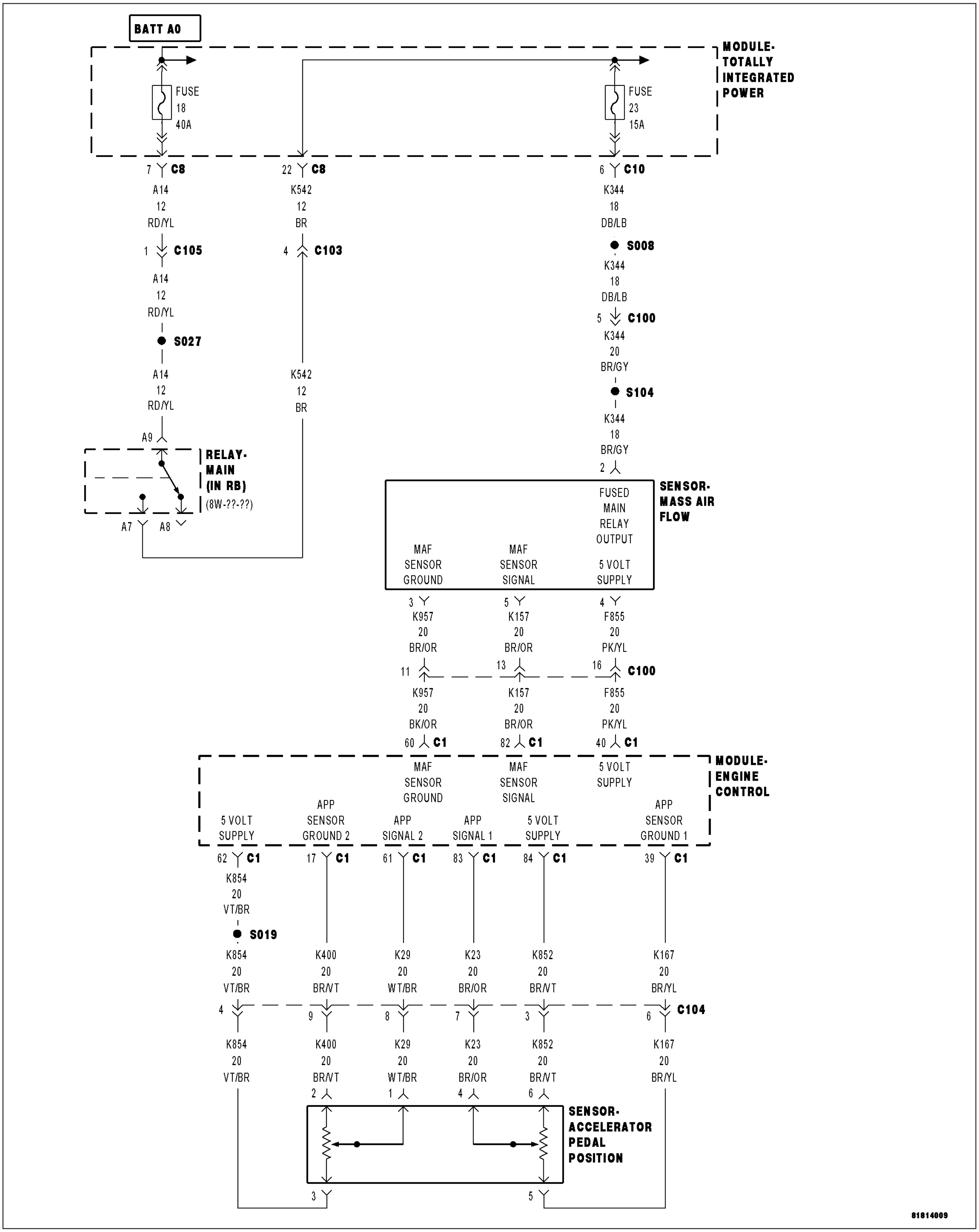
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0102-MASS AIR FLOW SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  No reference Voltage DTC's present. With the engine running and engine speed below 5100 rpm..
- **Set Condition:**
  The (K157) Mass Air Flow Sensor Signal is below the valid operating range for 1.0 second.

Possible Causes
INTERMITTENT DTC
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F855) MASS AIR FLOW SENSOR 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO THE (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT
MASS AIR FLOW SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
Start the engine and allow it to reach normal operating temperature.
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure.

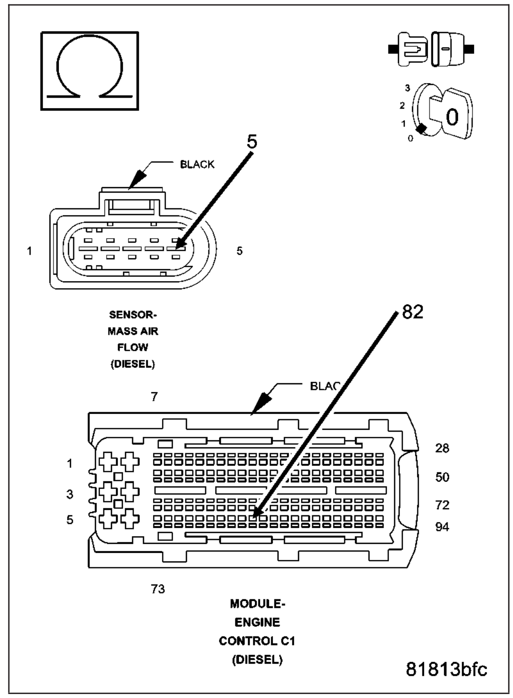
2. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Mass Air Flow Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K157) Mass Air Flow Sensor Signal circuit between the Mass Air Flow Sensor connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

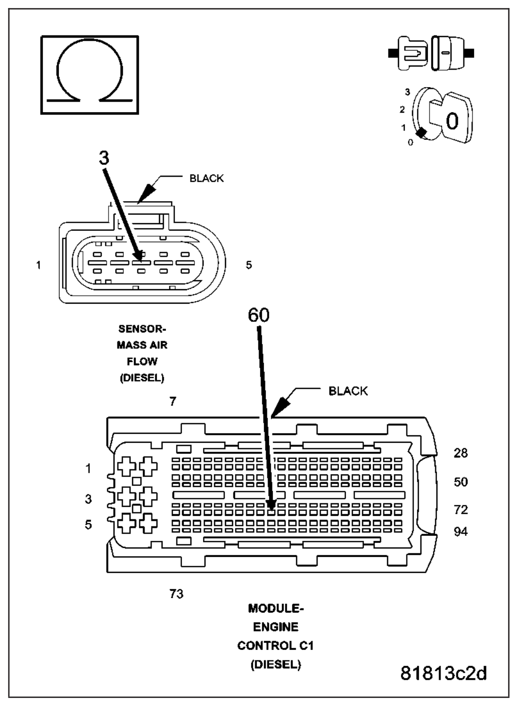
Yes >> Go to 3

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K957) Mass Air Flow Sensor Ground circuit between the Mass Air Flow Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (K957) Mass Air Flow Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (F855) MASS AIR FLOW SENSOR 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

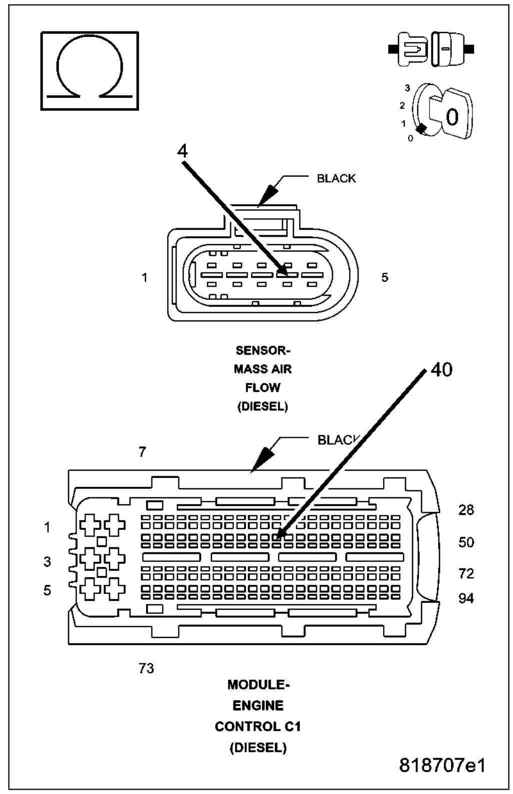
Measure the resistance of the (F855) Mass Air Flow Sensor 5 Volt Supply circuit between the Mass Air Flow Sensor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (F855) Mass Air Flow Sensor 5 Volt Supply circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

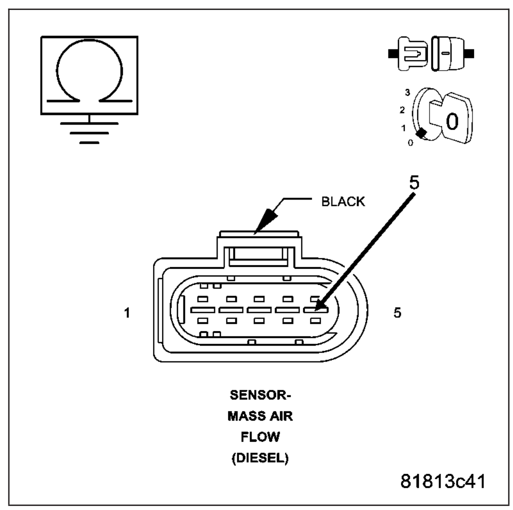
Measure the resistance between ground and the (K157) Mass Air Flow Sensor Signal circuit in the Mass Air Flow Sensor harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 6

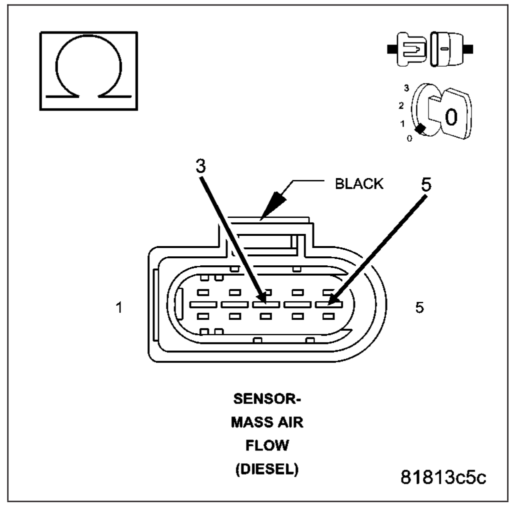
No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



6. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO THE (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT

Measure the resistance between the (K157) Mass Air Flow Sensor Signal circuit and the (K957) Mass Air Flow Sensor Ground circuit in the Mass Air Flow Sensor harness connector.



Is the resistance above 1000.0 ohms?

Yes >> Go to 7

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to the (K957) Mass Air Flow Sensor Ground circuit.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. MASS AIR FLOW SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) connector.

Replace the Mass Air Flow Sensor in accordance with the Service Information.

Turn the ignition on.

With the scan tool, Clear DTCs.

Start the engine and allow it to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 8

No >> Test Complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Mass Air Flow Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

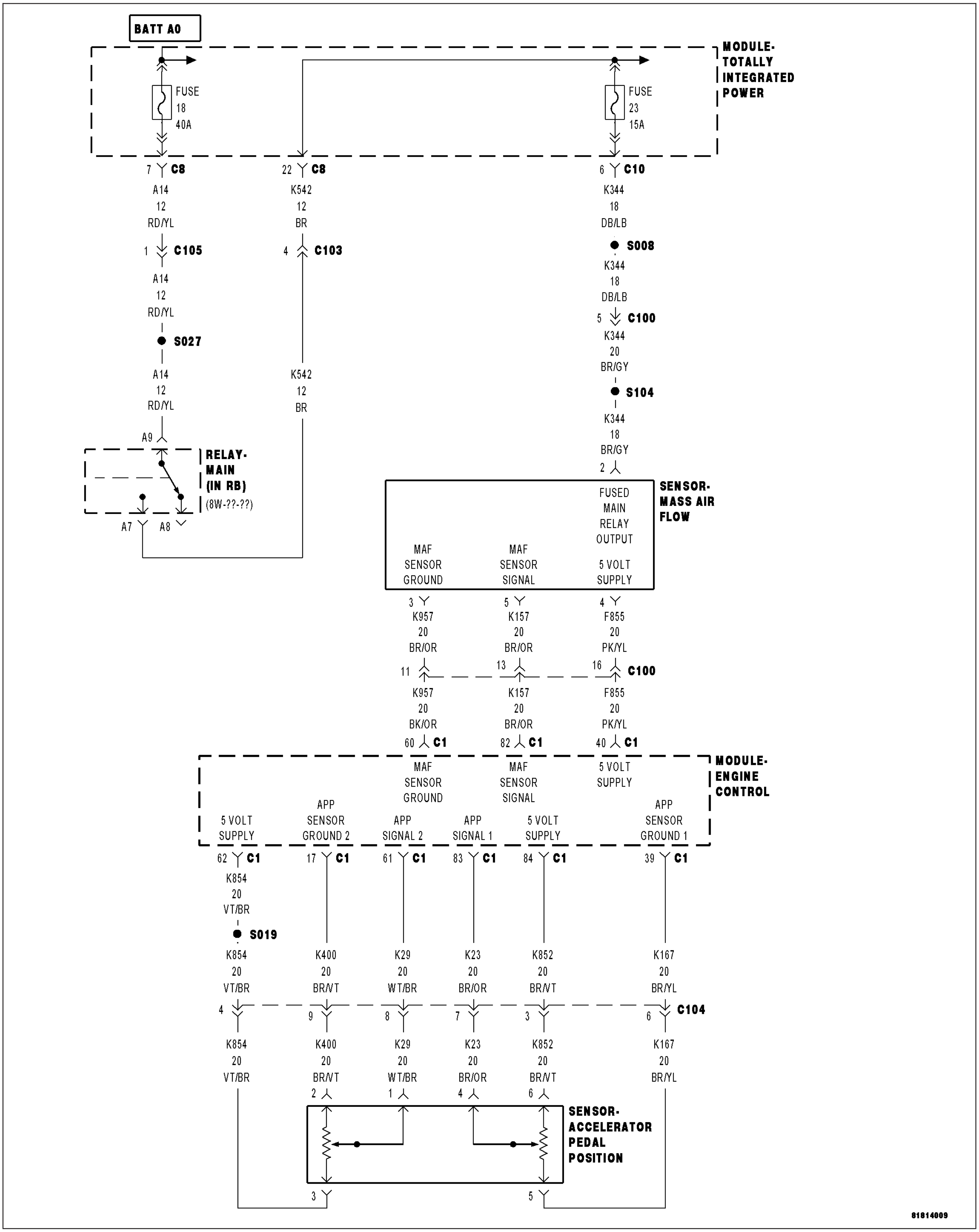
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0103-MASS AIR FLOW SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  No reference Voltage DTC’s present. With the engine running and engine speed below 5100 rpm..
- **Set Condition:**
  The (K157) Mass Air Flow Sensor Signal is above the valid operating range for 1.0 second.

Possible Causes
INTERMITTENT DTC
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K957) MASS AIR FLOW SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
MASS AIR FLOW SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
Start the engine and allow it to reach normal operating temperature.
With the scan tool, select View DTCs.

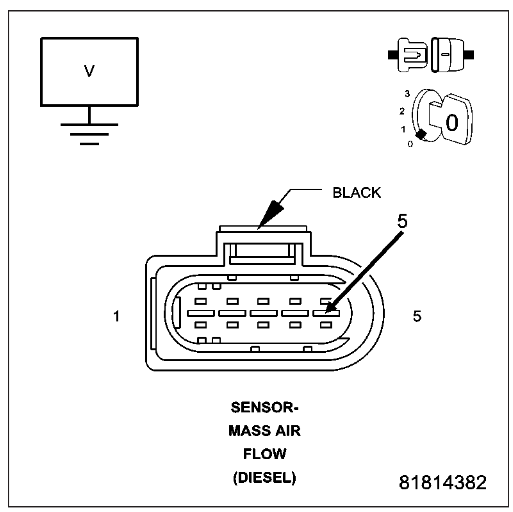
Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure.

2. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Mass Air Flow Sensor harness connector.
Turn the ignition on.
Measure the voltage of the (K157) Mass Air Flow Sensor Signal circuit in the Mass Air Flow Sensor harness connector.



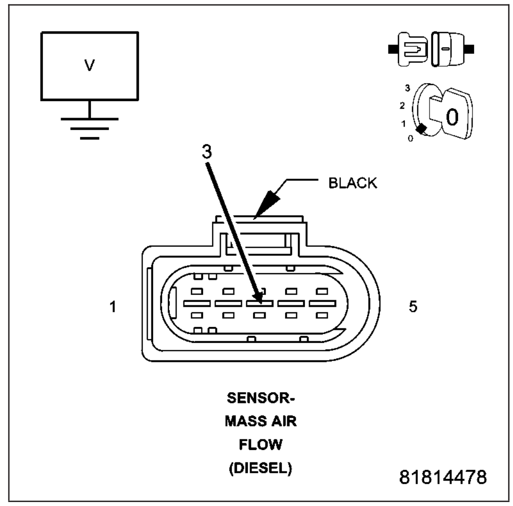
Is there any voltage present?

Yes >> Repair the (K157) Mass Air Flow Sensor Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K957) Mass Air Flow Sensor Ground circuit in the Mass Air Flow Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K957) Mass Air Flow Sensor Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

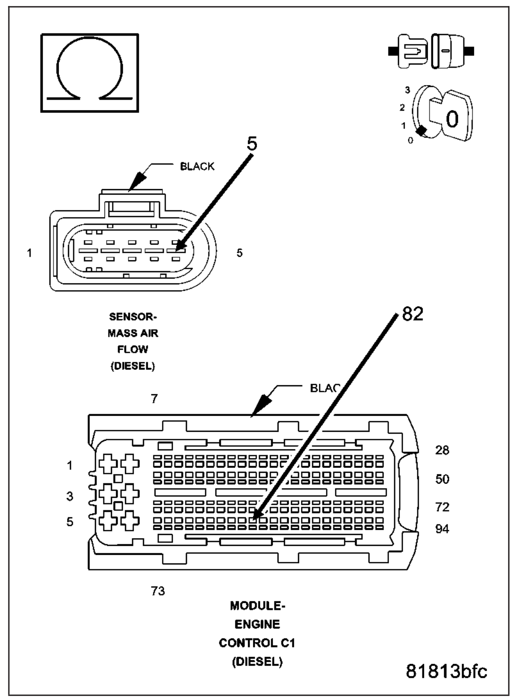
No >> Go to 4

4. (K157) MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K157) Mass Air Flow Sensor Signal circuit between the Mass Air Flow Sensor connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

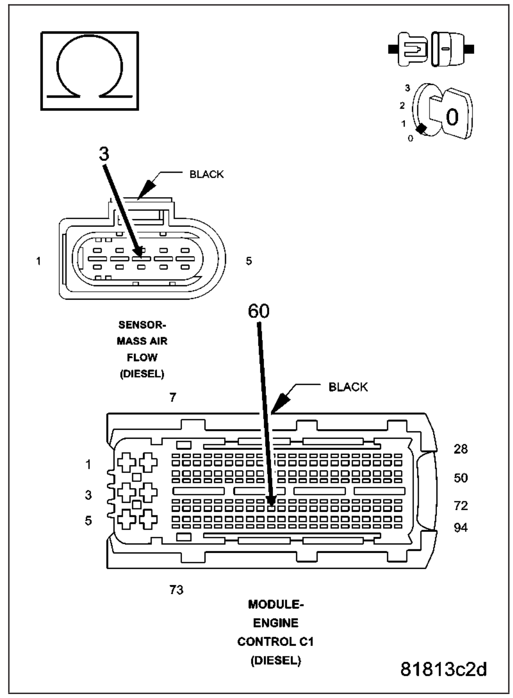
Yes >> Go to 5

No >> Repair the (K157) Mass Air Flow Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K957) MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K957) Mass Air Flow Sensor Ground circuit between the Mass Air Flow Sensor connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 6

No >> Repair the (K957) Mass Air Flow Sensor Ground circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. MASS AIR FLOW SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) connector.

Replace the Mass Air Flow Sensor in accordance with the Service Information.

Turn the ignition on.

With the scan tool, Clear DTCs.

Start the engine and allow it to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 7

No >> Test Complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Mass Air Flow Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

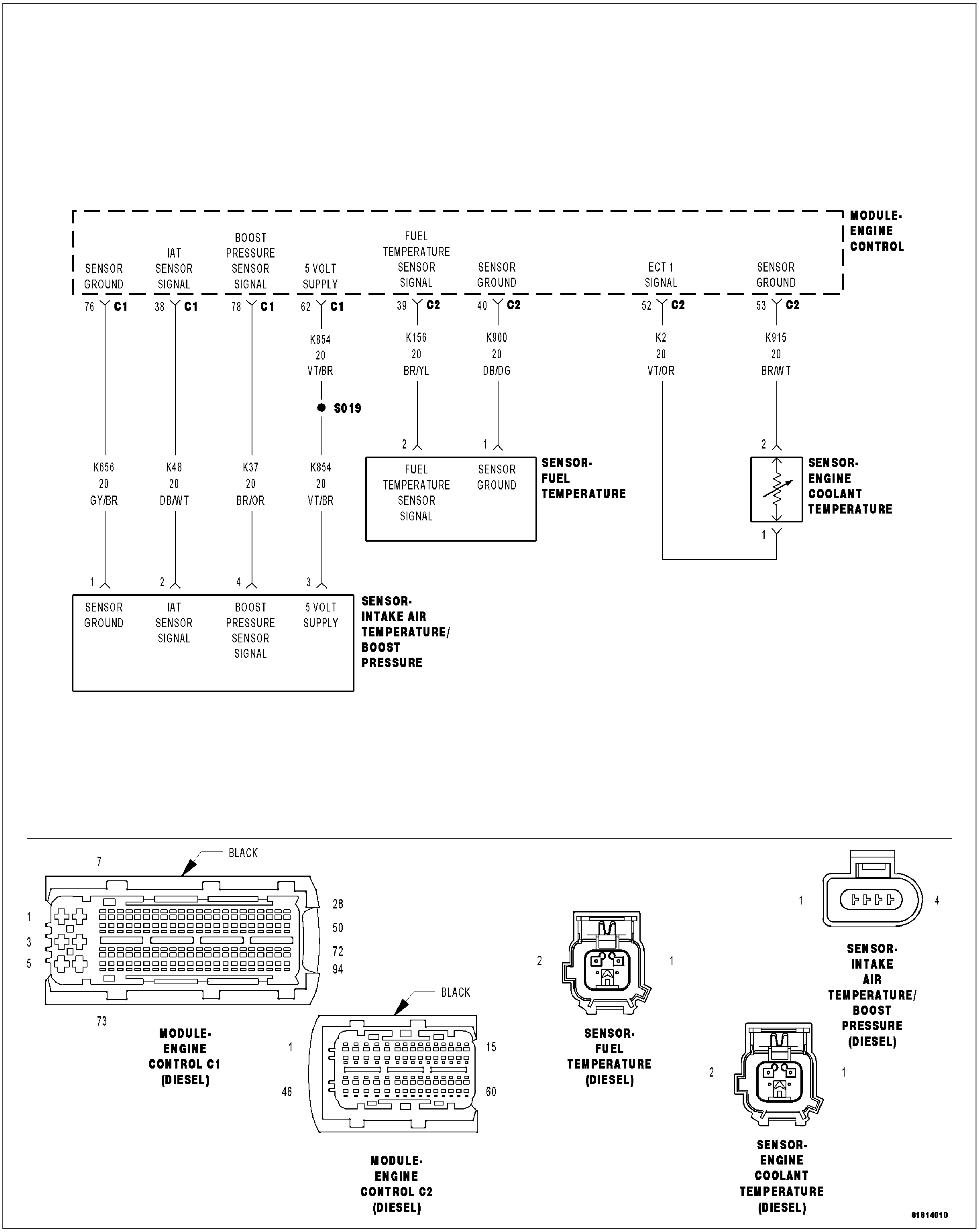
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K48) Intake Air Temperature Sensor Signal circuit voltage is below 1.51 volts for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K656) INTAKE AIR TEMPERATURE SENSOR GROUND
INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

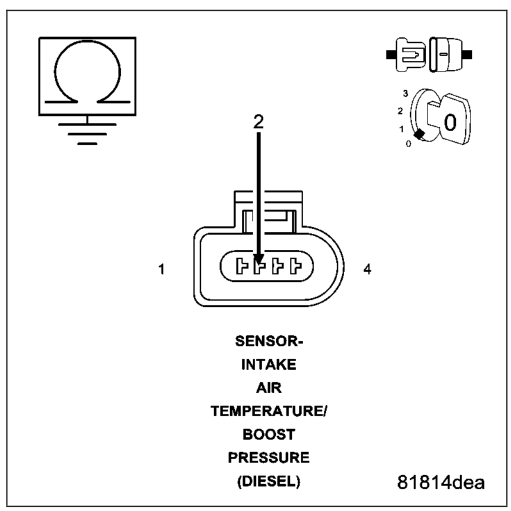
2. (K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Intake Air Temperature/Boost Pressure Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K48) Intake Air Temperature Sensor Signal circuit in the Intake Air Temperature/Boost Pressure Sensor harness connector.



Is the resistance above 1000 ohms?

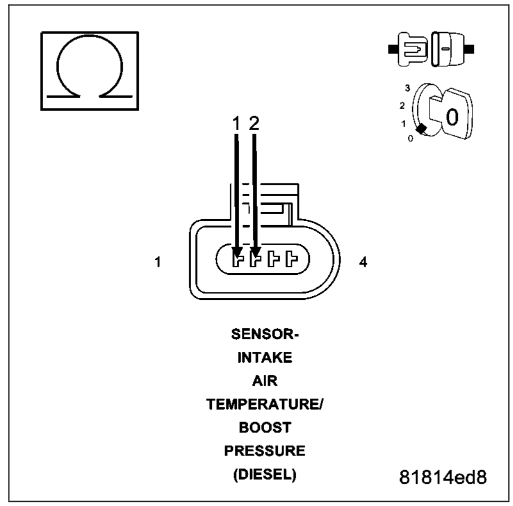
Yes >> Go to 3

No >> Repair the (K48) Intake Air Temperature Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K656) INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT

Measure the resistance between the (K48) Intake Air Temperature Sensor Signal circuit and the (K656) Intake Air Temperature Sensor Ground circuit in the Intake Air Temperature/Boost Pressure Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K48) Intake Air Temperature Sensor Signal circuit for a short to the (K656) Intake Air Temperature Sensor Ground circuit.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) connector.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, select View DTCs.

NOTE: The scan tool should display an Intake Air Temperature Sensor high voltage or open circuit DTC with the Intake Air Temperature Sensor connector disconnected.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Intake Air Temperature/Boost Pressure Sensor in accordance with the service information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Intake Air Temperature Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

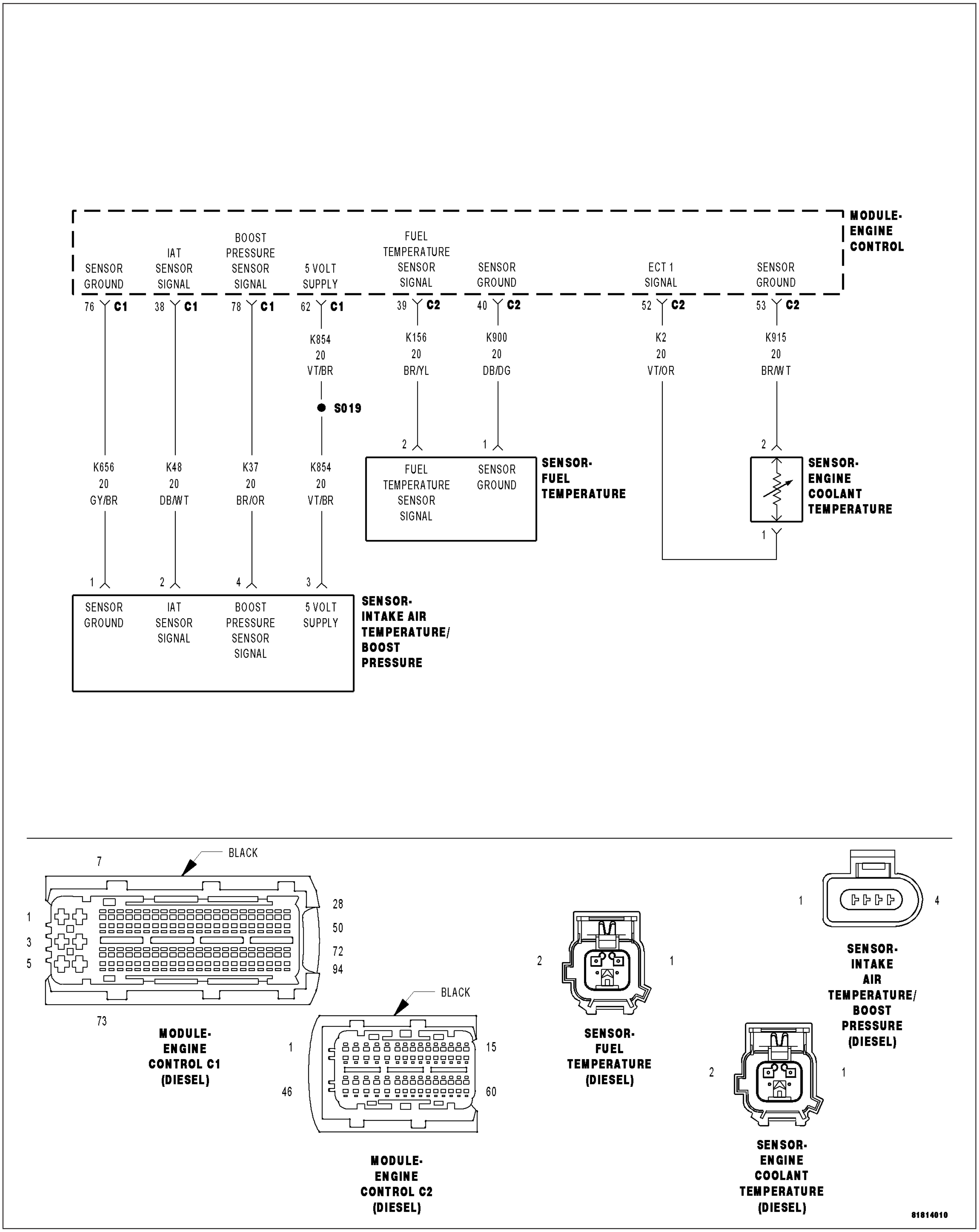
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K48) Intake Air Temperature Sensor Signal circuit voltage is above 4.82 volts for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K656) INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K656) INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
INTAKE AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Intake Air Temperature/Boost Pressure Sensor harness connector.

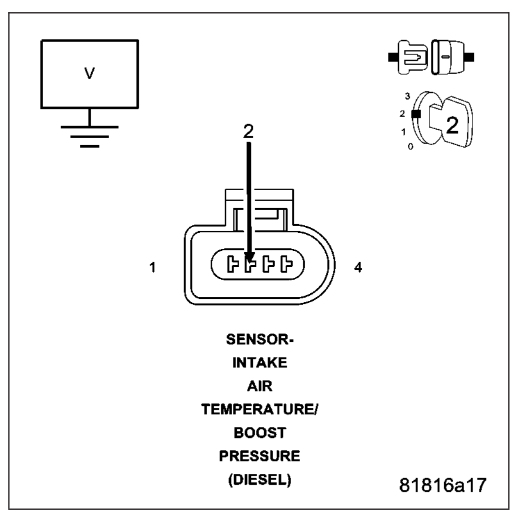
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K48) Intake Air Temperature Sensor Signal circuit in the Intake Air Temperature/Boost Pressure Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K48) Intake Air Temperature Sensor Signal circuit for a short to voltage.

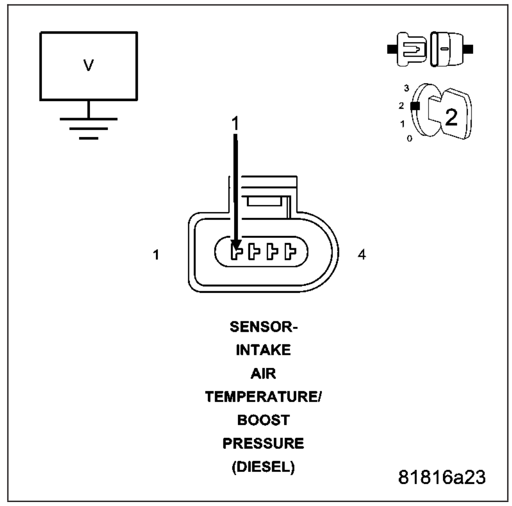
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K656) INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K656) Intake Air Temperature Sensor Ground circuit in the Intake Air Temperature/Boost Pressure Sensor harness connector.



81816a23

Is there any voltage present?

Yes >> Repair the (K656) Intake Air Temperature Sensor Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR

Turn the ignition off.

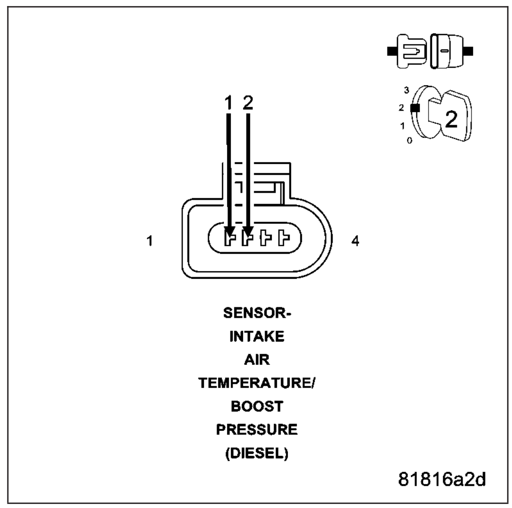
Connect the Engine Control Module (ECM) harness connector.

Connect a jumper wire between the (K656) Intake Air Temperature Sensor Ground circuit and the (K48) Intake Air Temperature Sensor Signal circuit in the Intake Air Temperature/Boost Pressure Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.



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NOTE: The scan tool should display an Intake Air Temperature Sensor low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Intake Air Temperature/Boost Pressure Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

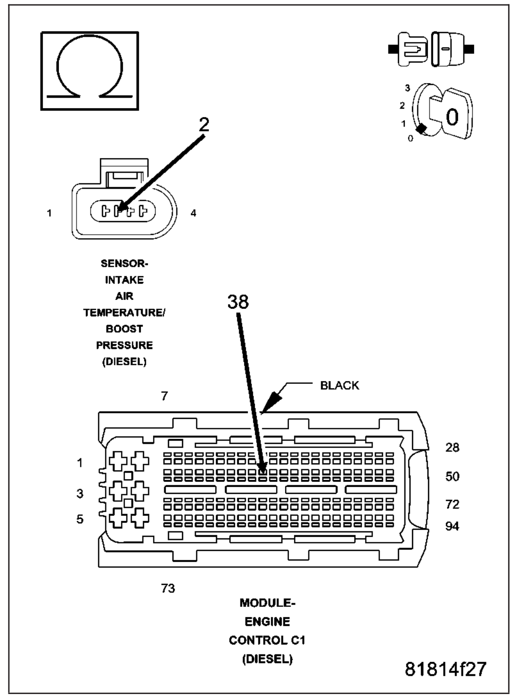
No >> Go to 5

5. (K48) INTAKE AIR TEMPERATURE SENSOR SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K48) Intake Air Temperature Sensor Signal circuit between the Intake Air Temperature/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

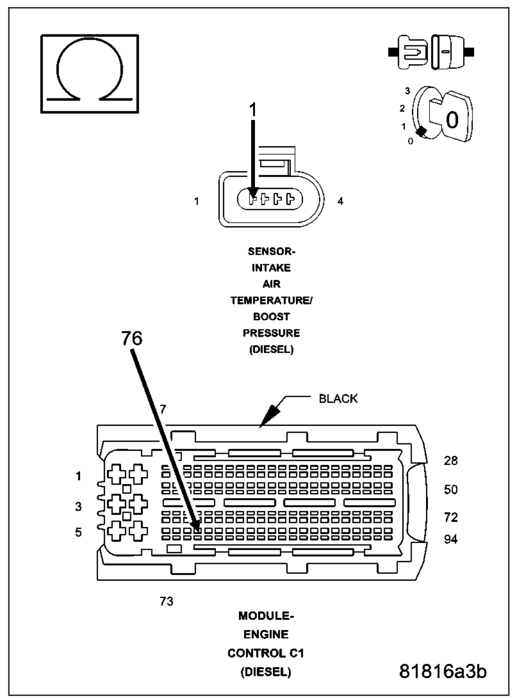
Yes >> Go to 6

No >> Repair the (K48) Intake Air Temperature Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K656) INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K656) Intake Air Temperature Sensor Ground circuit between the Intake Air Temperature/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 7

No >> Repair the (K656) Intake Air Temperature Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Intake Air Temperature/Boost Pressure Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

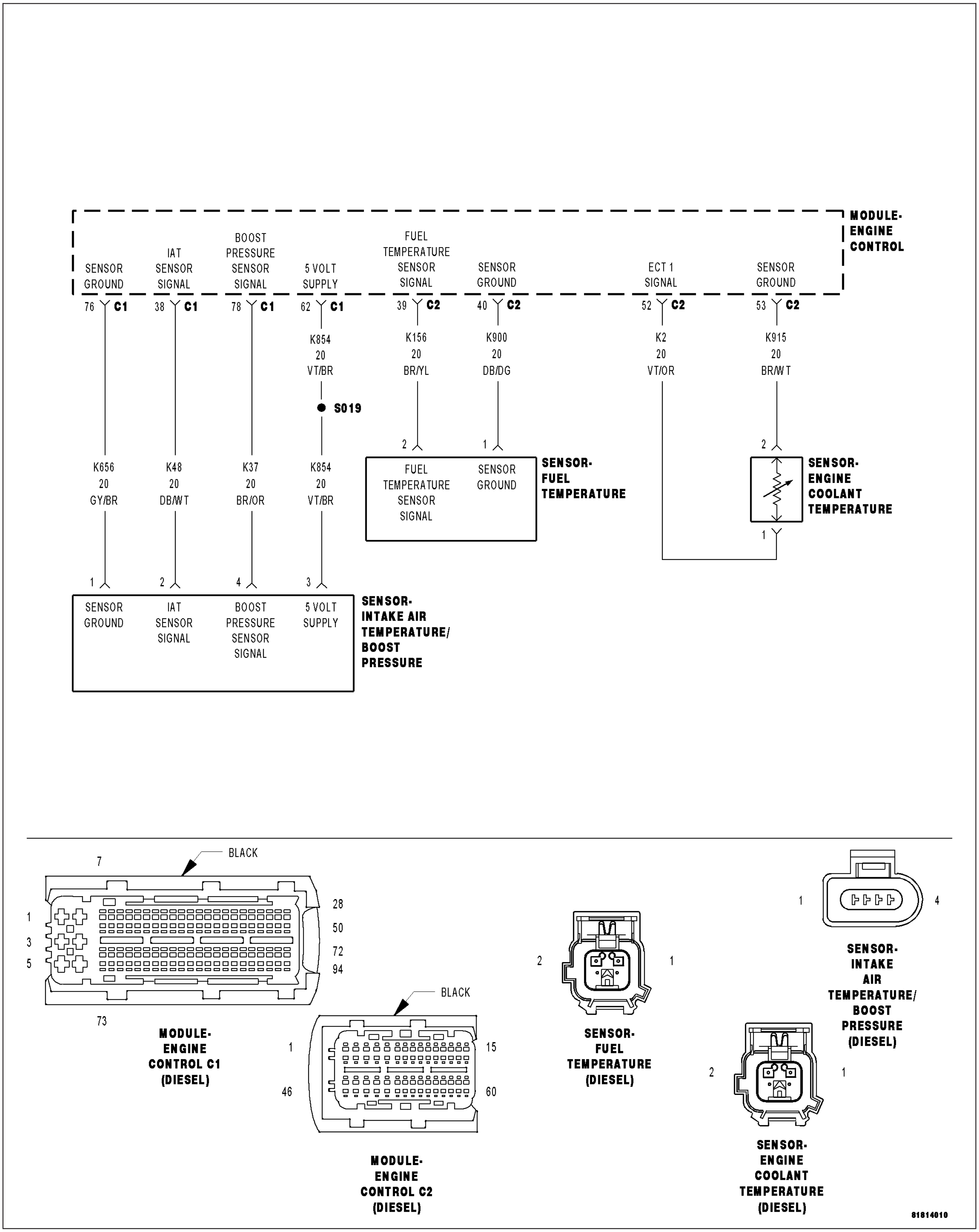
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K2) Engine Coolant Temperature Sensor Signal circuit voltage is below 0.68 volt for 0.48 second.

Possible Causes
INTERMITTENT DTC
(K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT
ENGINE COOLANT TEMPERATURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

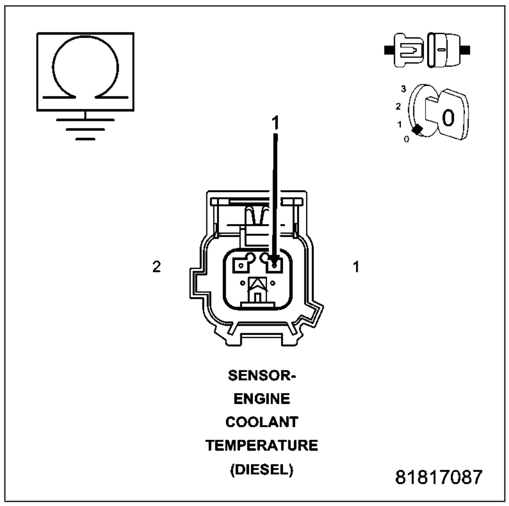
2. (K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K2) Engine Coolant Temperature Sensor Signal circuit in the Engine Coolant Temperature Sensor harness connector.



Is the resistance above 1000 ohms?

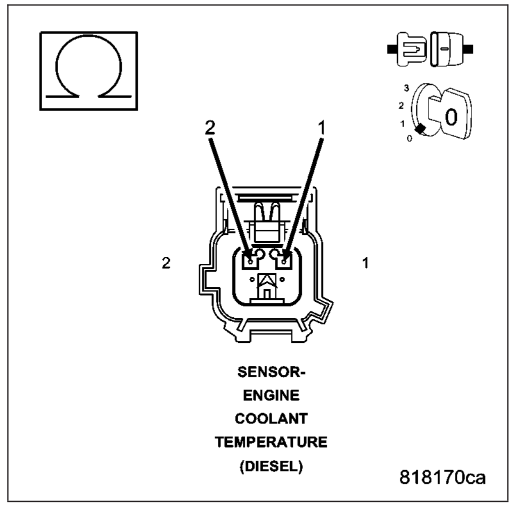
Yes >> Go to 3

No >> Repair the (K2) Engine Coolant Temperature Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT

Measure the resistance between the (K2) Engine Coolant Temperature Sensor Signal circuit and the (K915) Engine Coolant Temperature Sensor Ground circuit in the Engine Coolant Temperature Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K2) Engine Coolant Temperature Sensor Signal circuit for a short to the (K915) Engine Coolant Temperature Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ENGINE COOLANT TEMPERATURE SENSOR

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.

NOTE: The scan tool should display an Engine Coolant Temperature Sensor high voltage or open circuit DTC with the connector disconnected.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

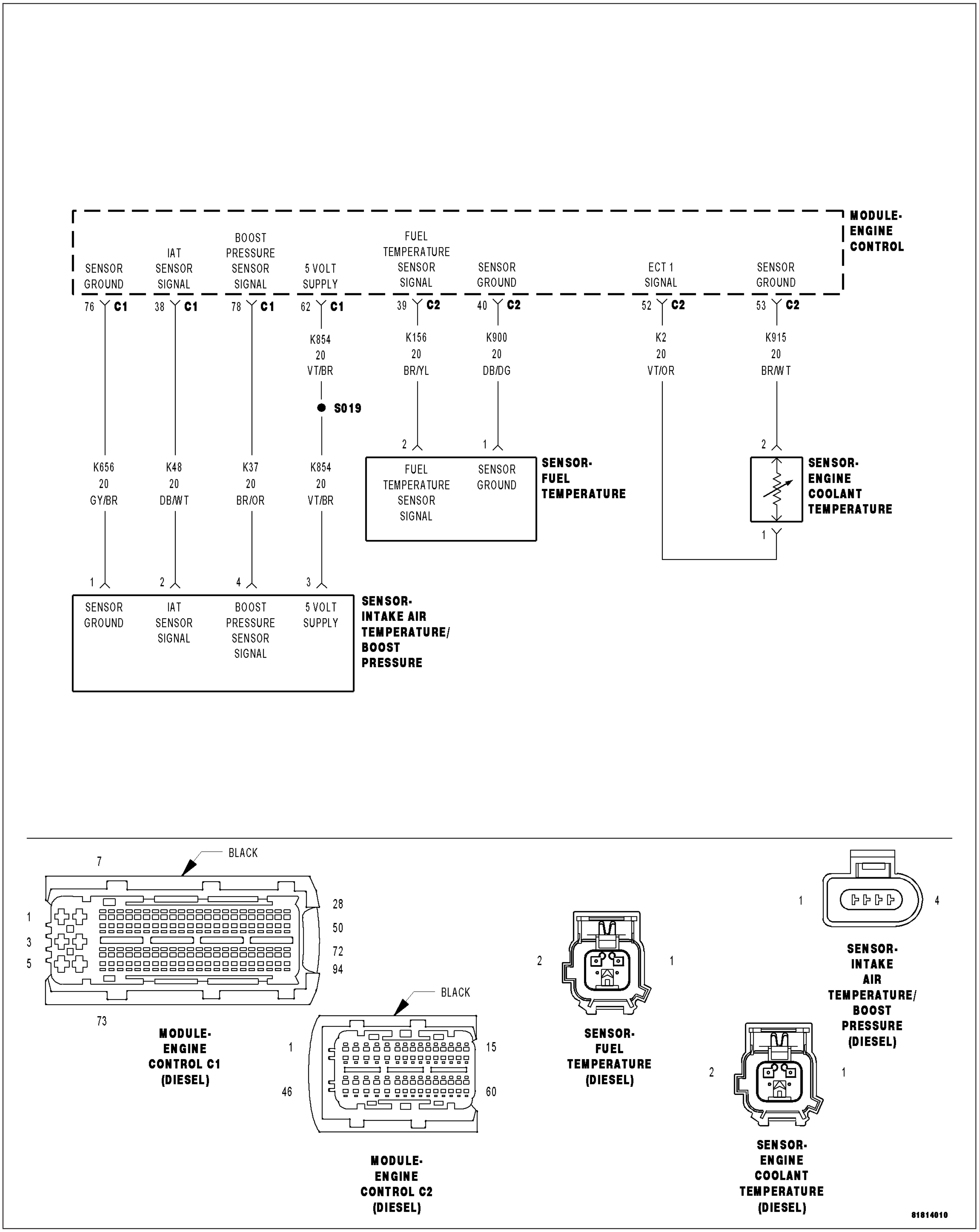
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K2) Engine Coolant Temperature Sensor Signal circuit voltage is above 4.75 volts for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Engine Coolant Temperature Sensor connector.

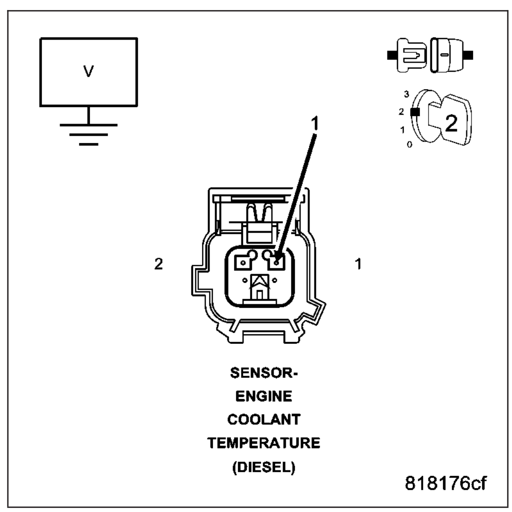
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K2) Engine Coolant Temperature Sensor Signal circuit in the Engine Coolant Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K2) Engine Coolant Temperature Sensor Signal circuit for a short to voltage.

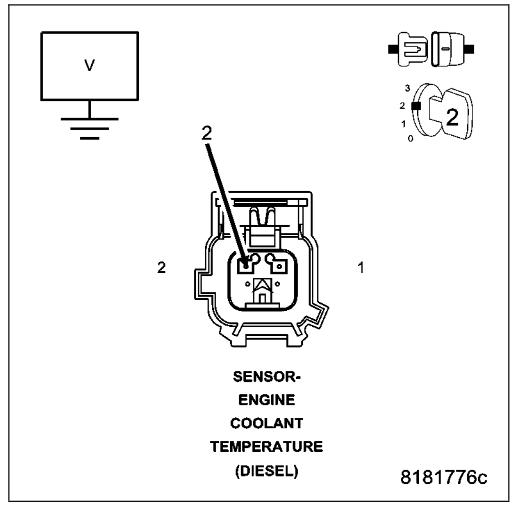
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K915) Engine Coolant Temperature Sensor Ground circuit in the Engine Coolant Temperature Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K915) Engine Coolant Temperature Sensor Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. ENGINE COOLANT TEMPERATURE SENSOR

NOTE: Remove the jumper wire.

Turn the ignition off.

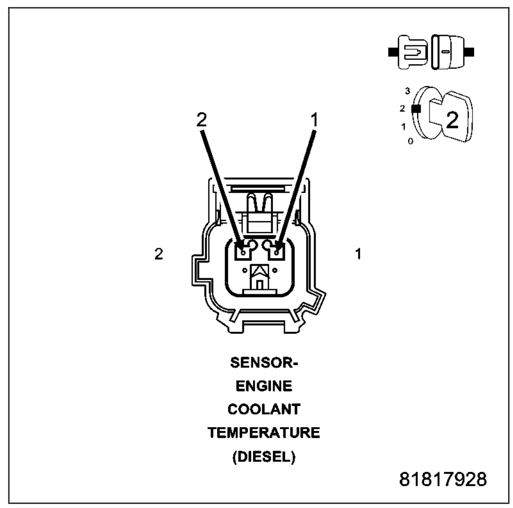
Connect the Engine Control Module (ECM) connector.

Connect a jumper wire between the (K915) Engine Coolant Temperature Sensor Ground circuit and the (K2) Engine Coolant Temperature Sensor Signal circuit in the Engine Coolant Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.



NOTE: The scan tool should display an Engine Coolant Temperature Sensor low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

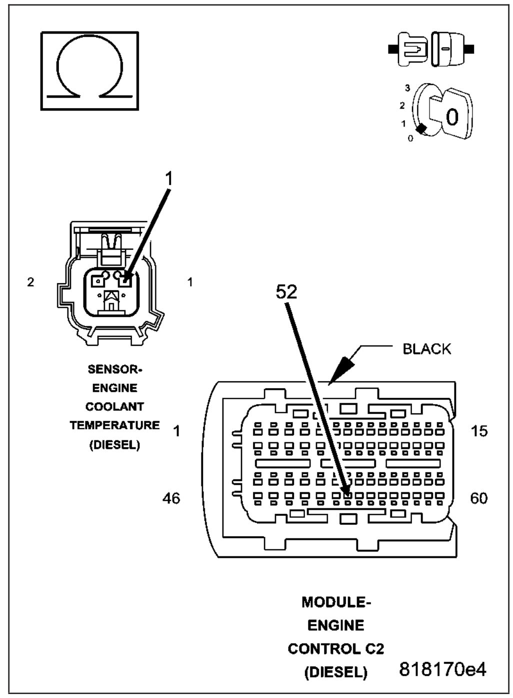
No >> Go to 5

5. (K2) ENGINE COOLANT TEMPERATURE SENSOR SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K2) Engine Coolant Temperature Sensor Signal circuit between the Engine Coolant Temperature Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

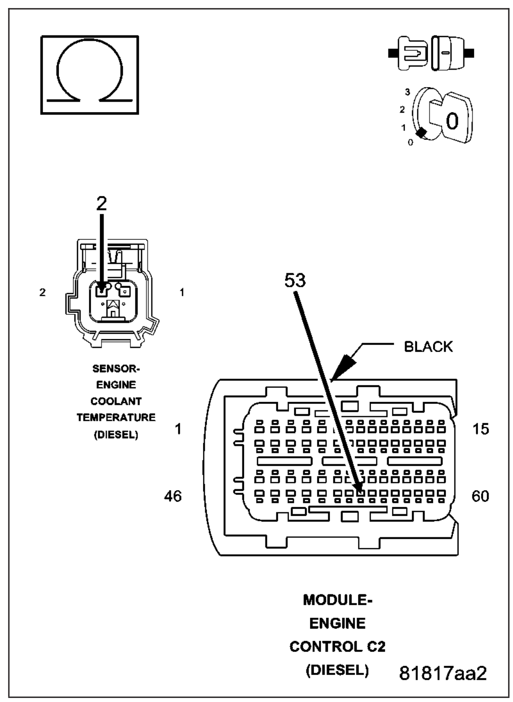
Yes >> Go to 6

No >> Repair the (K2) Engine Coolant Temperature Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K915) ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K915) Engine Coolant Temperature Sensor Ground circuit between the Engine Coolant Temperature Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 7

No >> Repair the (K915) Engine Coolant Temperature Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Engine Coolant Temperature Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0128-THERMOSTAT RATIONALITY

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Engine temperature is at or below 19.9°C. With the engine running and no other ECT Sensor related DTC's present.
- **Set Condition:**
  Engine temperature does not increase by 10°C within 5 minutes.

Possible Causes
ENGINE COLD TOO LONG

Diagnostic Test

1. CHECK COOLING SYSTEM PERFORMANCE

NOTE: The best way to diagnose this DTC is to allow the vehicle to remain outside overnight in order to have a completely cold soaked engine.

NOTE: Extremely cold outside ambient temperatures may cause this DTC to set.

Verify that the coolant level is correct.

Start the engine.

With the scan tool, set the engine RPM to 1500 and allow the engine to warm up for 10-15 minutes.

With the scan tool, monitor the Engine Coolant Temperature value during the warm up cycle. Make sure the transition of temperature change is smooth.

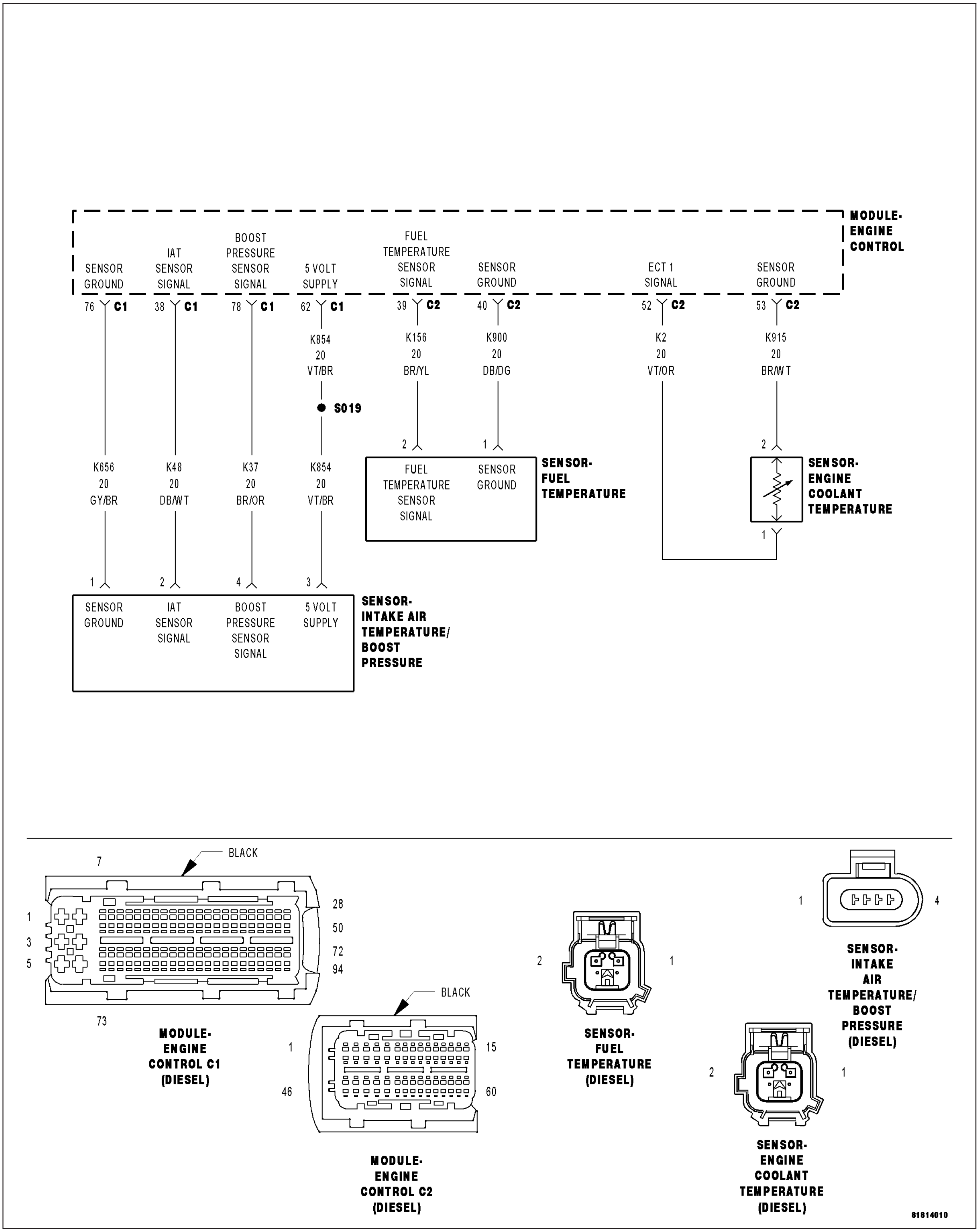
Did the engine temperature reach a minimum of 80° C (176° F)?

Yes >> Test Complete.

No >> Refer to the Service Information for cooling system performance diagnosis. The most probable cause is a Thermostat problem. Also, refer to any related TSBs.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0181–FUEL TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

Possible Causes
FUEL TEMPERATURE SENSOR - COLD
FUEL TEMPERATURE SENSOR - HOT
FUEL TEMPERATURE SENSOR CIRCUIT OPEN OR HIGH RESISTANCE
CONNECTOR OR TERMINAL PROBLEM
INTERMITTENT CONDITION

Diagnostic Test

1. CHECKING FUEL TEMPERATURE SENSOR CONNECTOR

Turn the ignition off.

Disconnect the Fuel Temperature Sensor harness connector.

Inspect the connector for poor terminal contact, corrosion, damage or other problems.

Is there any evidence of connector problems?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. FUEL TEMPERATURE SENSOR CIRCUITS OPEN OR HIGH RESISTANCE

Disconnect the ECM harness connectors.

Measure the resistance of both Fuel Temperature Sensor circuits between the Fuel Temperature Sensor harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms for both measurements?

Yes >> Go To 3

No >> Repair the Fuel Temperature Sensor circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. FUEL TEMPERATURE SENSOR - COLD

NOTE: Allow the engine to completely cool to ambient temperature.

Connect the ECM harness connector.

Connect the Fuel Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, read and note the engine coolant temperature.

With the scan tool, read the Fuel Temperature and compare it to the engine coolant temperature reading.

Are the readings within 7°C (13°F) of each other?

Yes >> Go To 4

No >> Check the wiring and connectors associated with the Fuel Temperature Sensor for corrosion, damage or other problems. Repair as necessary. If no problems are found, replace the Fuel Temperature Sensor.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. FUEL TEMPERATURE SENSOR - HOT

Start the engine and bring the engine to operating temperature (thermostat open).

Turn the engine off and wait 15 minutes to allow the engine temperature to stabilize.

With the scan tool, read and note the engine coolant temperature.

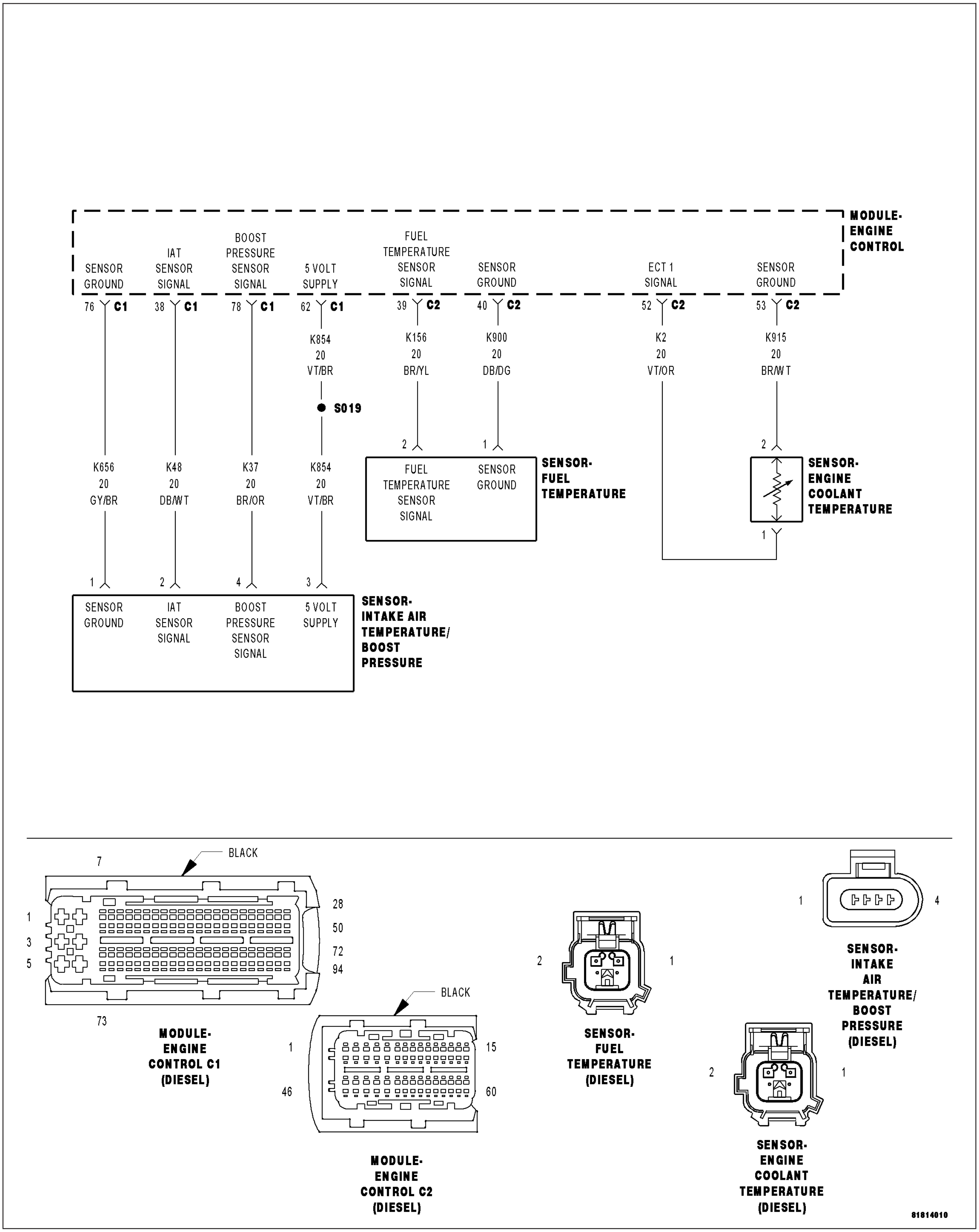
With the scan tool, read the Fuel Temperature.

Are the readings within 7°C (13°F) of each other?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Check the wiring and connectors associated with the Fuel Temperature Sensor for corrosion, damage or other problems. Repair as necessary. If no problems are found, replace the Fuel Temperature Sensor. Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0182-FUEL TEMPERATURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K156) Fuel Temperature Sensor Signal circuit voltage is below 0.41 volts.

Possible Causes
INTERMITTENT DTC
(K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K900) FUEL TEMPERATURE SENSOR GROUND
FUEL TEMPERATURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL TEMPERATURE SENSOR

Turn the ignition off.

Disconnect the Fuel Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, select View DTCs.

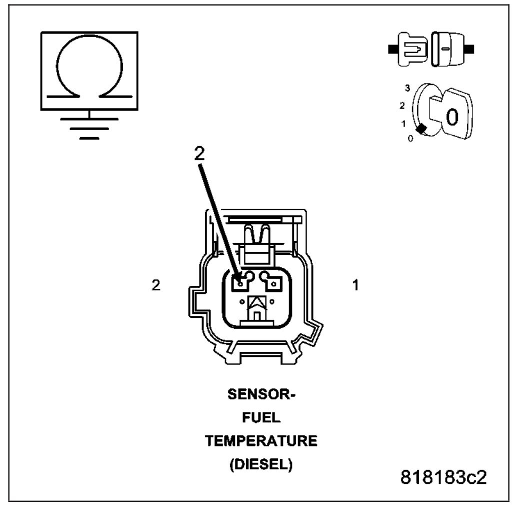
NOTE: The scan tool should display a Fuel Temperature Sensor High voltage or open circuit DTC with the Fuel Temperature Sensor connector disconnected.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Fuel Temperature Sensor in accordance with the service information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K156) Fuel Temperature Sensor Signal circuit in the Fuel Temperature Sensor harness connector.

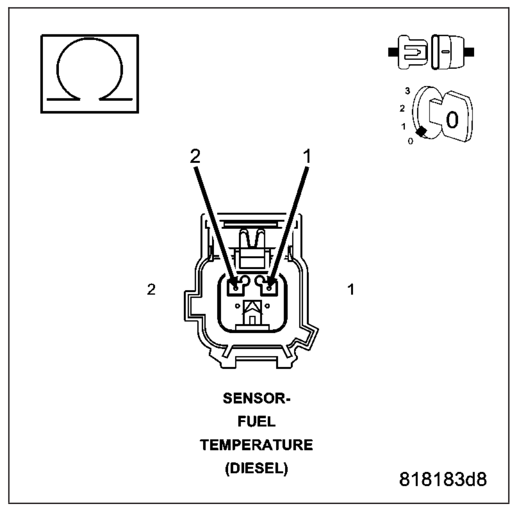
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K156) Fuel Temperature Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (K900) FUEL TEMPERATURE SENSOR GROUND CIRCUIT



Measure the resistance between the (K156) Fuel Temperature Sensor Signal circuit and the (K900) Fuel Temperature Sensor Ground circuit in the Fuel Temperature Sensor harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K156) Fuel Temperature Sensor Signal circuit for a short to the (K900) Fuel Temperature Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Temperature Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

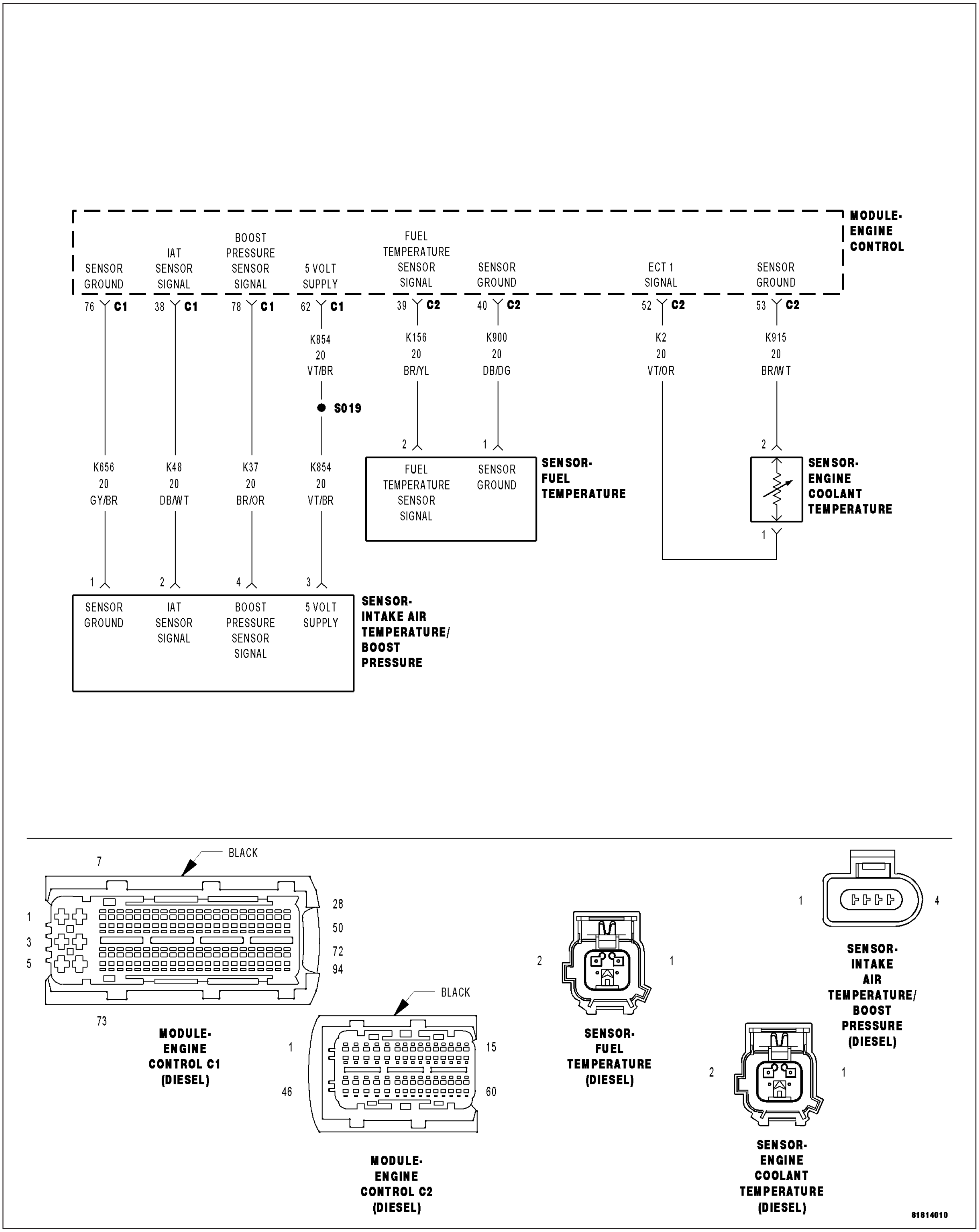
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0183-FUEL TEMPERATURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K156) Fuel Temperature Sensor Signal circuit voltage is above 4.98 volts.

Possible Causes
INTERMITTENT DTC
(K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K900) FUEL TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K900) FUEL TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
FUEL TEMPERATURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K156) FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Fuel Temperature Sensor harness connector.

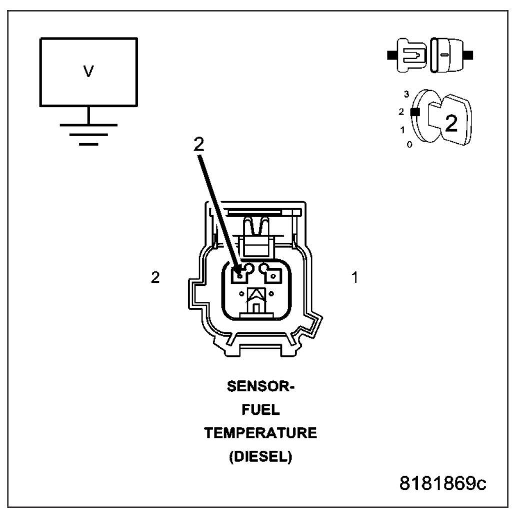
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K156) Fuel Temperature Sensor Signal circuit in the Fuel Temperature Sensor harness connector.



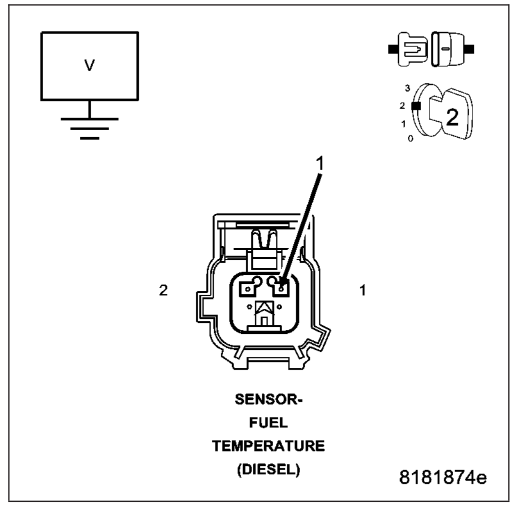
Is there any voltage present?

Yes >> Repair the (K156) Fuel Temperature Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K900) FUEL TEMPERATURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE



NOTE: The jumper wire should still be in place.

Measure the voltage of the (K900) Fuel Temperature Sensor Ground circuit in the Fuel Temperature Sensor harness connector.

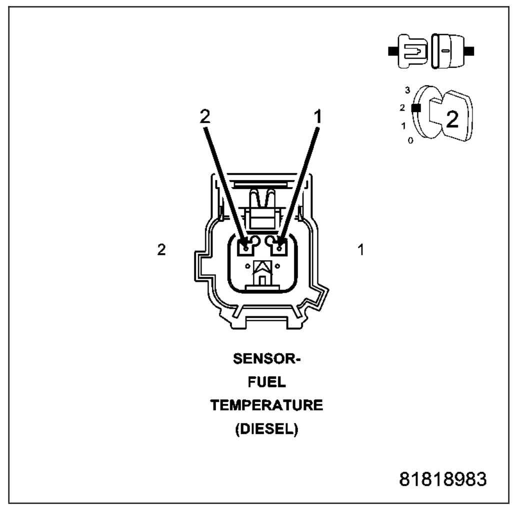
Is there any voltage present?

Yes >> Repair the (K900) Fuel Temperature Sensor Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. FUEL TEMPERATURE SENSOR



NOTE: Remove the jumper wire.

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Connect a jumper wire between the (K900) Fuel Temperature Sensor Ground circuit and the (K156) Fuel Temperature Sensor Signal circuit in the Fuel Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.

NOTE: The scan tool should display a Fuel Temperature Sensor Low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Fuel Temperature Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

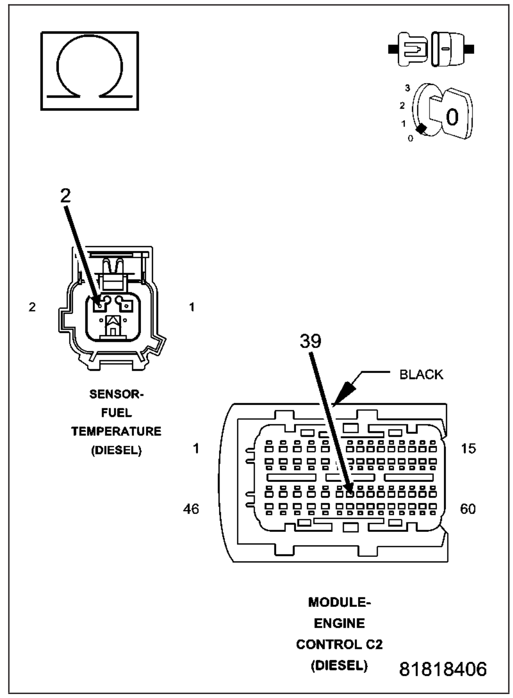
No >> Go to 5

5. (K156) FUEL TEMPERATURE SENSOR SIGNAL OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) connector.

Measure the resistance of the (K156) Fuel Temperature Sensor Signal circuit between the Fuel Temperature Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

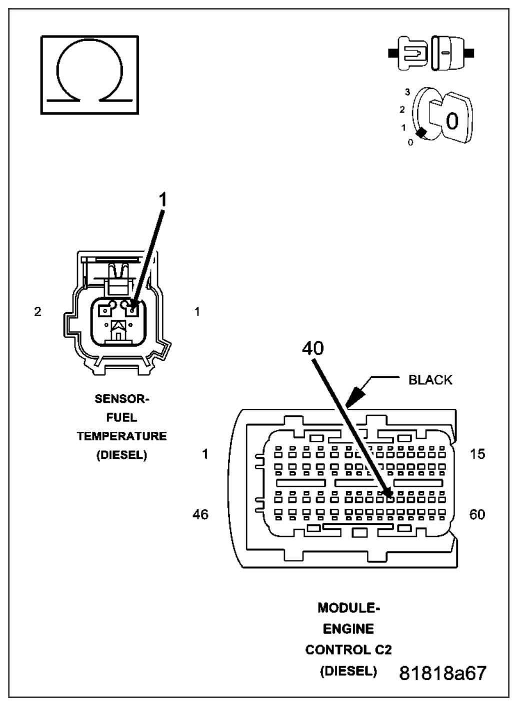
Yes >> Go to 6

No >> Repair the (K156) Fuel Temperature Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K900) FUEL TEMPERATURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K900) Fuel Temperature Sensor Ground circuit between the Fuel Temperature Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 7

No >> Repair the (K900) Fuel Temperature Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Temperature Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

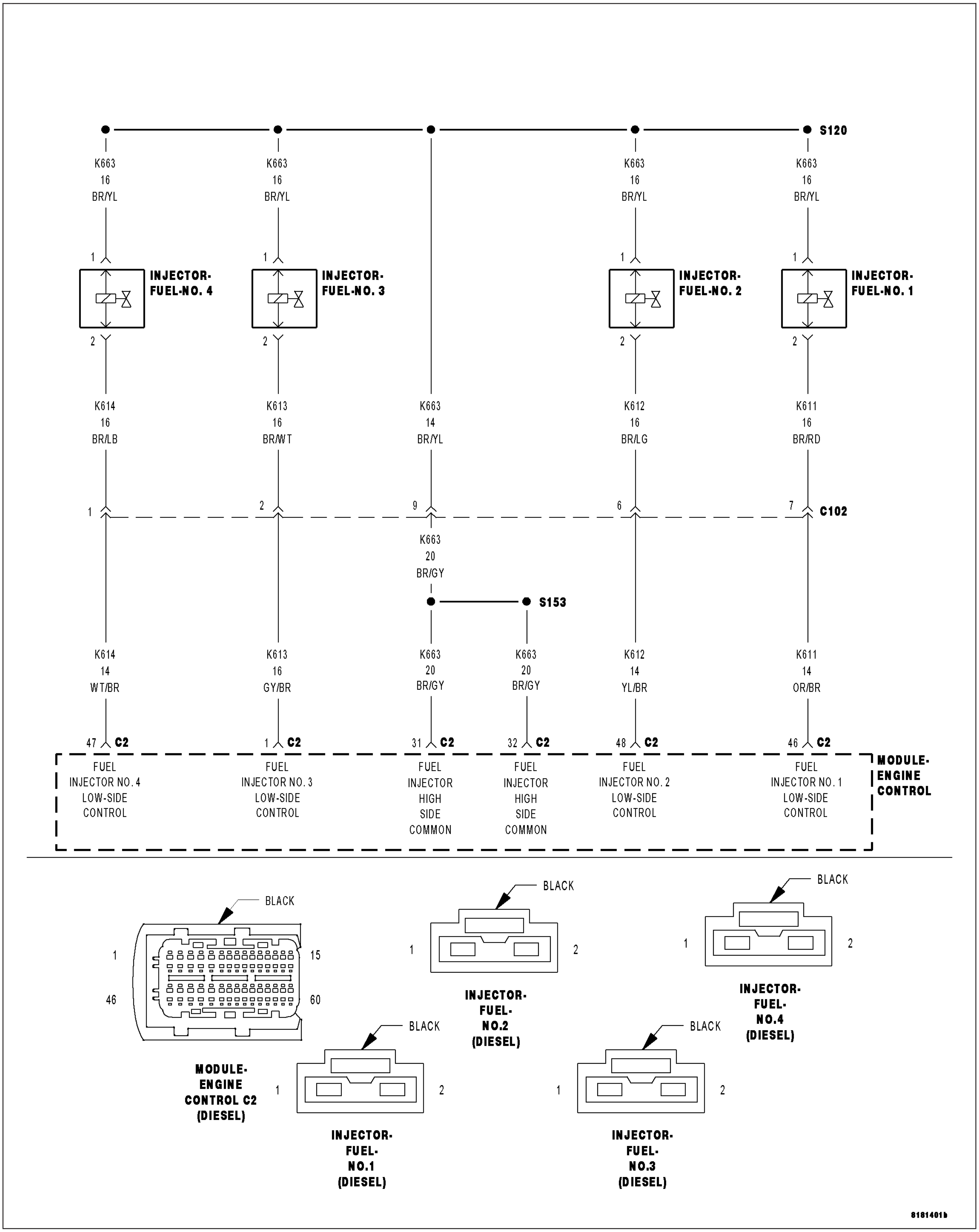
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0201-FUEL INJECTOR 1 CIRCUIT / OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects an open or short in the Fuel Injector 1 circuit.

Possible Causes
INTERMITTENT DTC
(K663) FUEL INJECTOR 1 HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K663) FUEL INJECTOR 1 HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K663) FUEL INJECTOR 1 HIGH-SIDE CONTROL CIRCUIT SHORTED TO (K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT
(K663) FUEL INJECTOR 1 HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 1

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module.

Attempt to start the engine and test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Fuel Injector 1 harness connector.

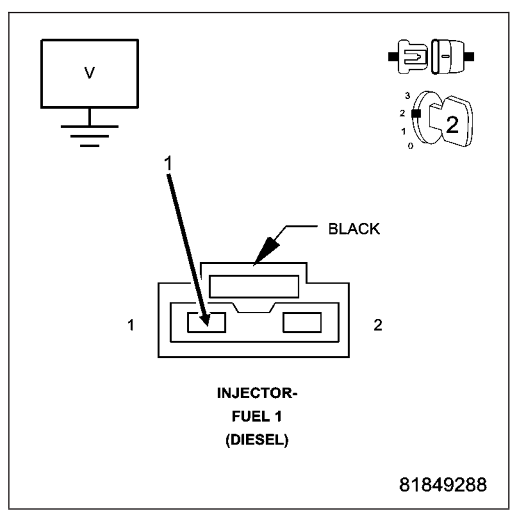
Disconnect the Engine Control Module harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 1 harness connector.



Is there any voltage present?

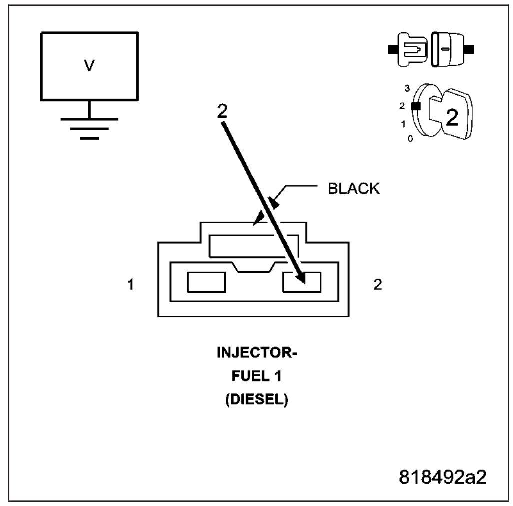
Yes >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K611) Fuel Injector 1 Low-Side Control circuit in the Fuel Injector 1 harness connector.



Is there any voltage present?

Yes >> Repair the (K611) Fuel Injector 1 Low-Side Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

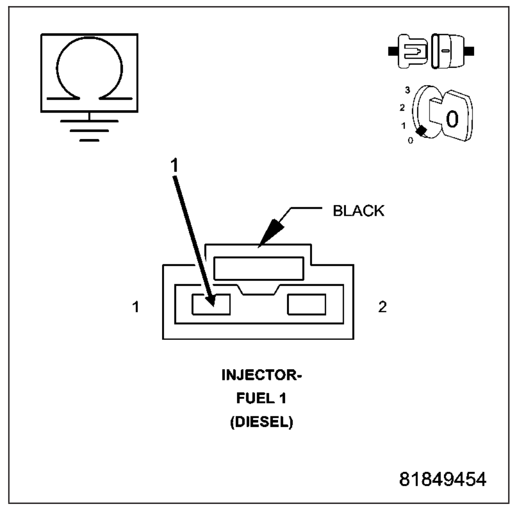
No >> Go to 4

4. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Remove the jumper wire in the Main Relay Connector.

Measure the resistance between ground and the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 1 harness connector.



Is the resistance above 1000 ohms?

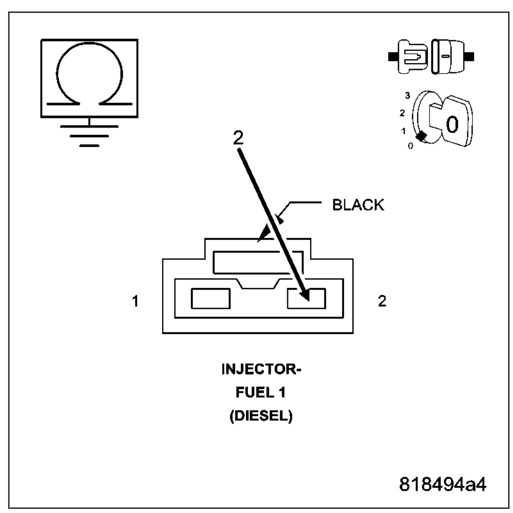
Yes >> Go to 5

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K611) Fuel Injector 1 Low-Side Control circuit in the Fuel Injector 1 harness connector.



Is the resistance above 1000 ohms?

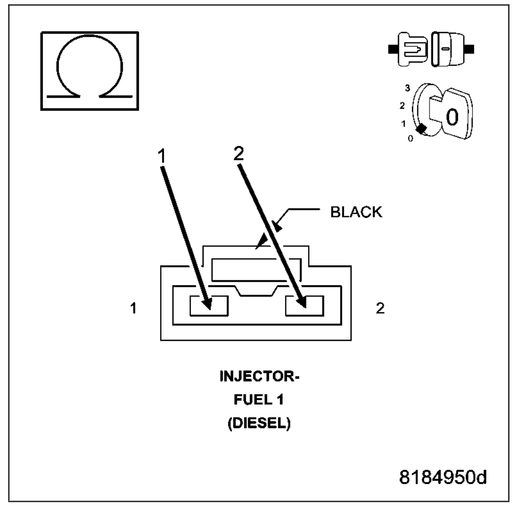
Yes >> Go to 6

No >> Repair the (K611) Fuel Injector 1 Low-Side Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO (K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT

Measure the resistance between the (K663) Fuel Injector High-Side Common circuit and the (K611) Fuel Injector 1 Low-Side Control circuit in the Fuel Injector 1 harness connector.



Is the resistance above 1000 ohms?

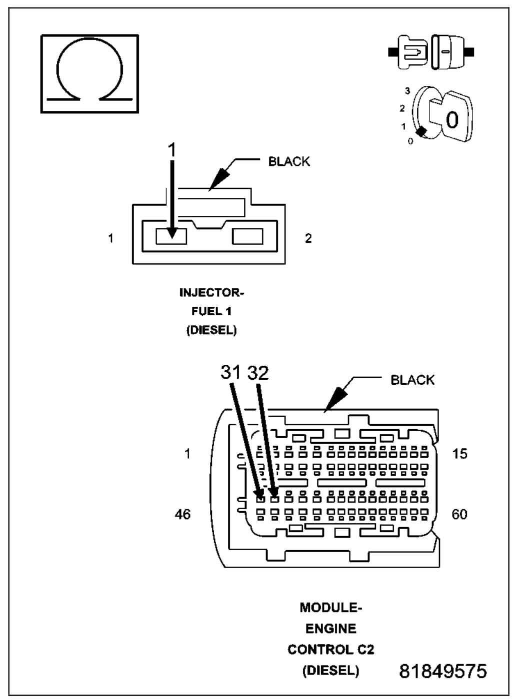
Yes >> Go to 7

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to the (K611) Fuel Injector 1 Low-Side Control circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K663) Fuel Injector High-Side Common circuit between the Fuel Injector 1 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

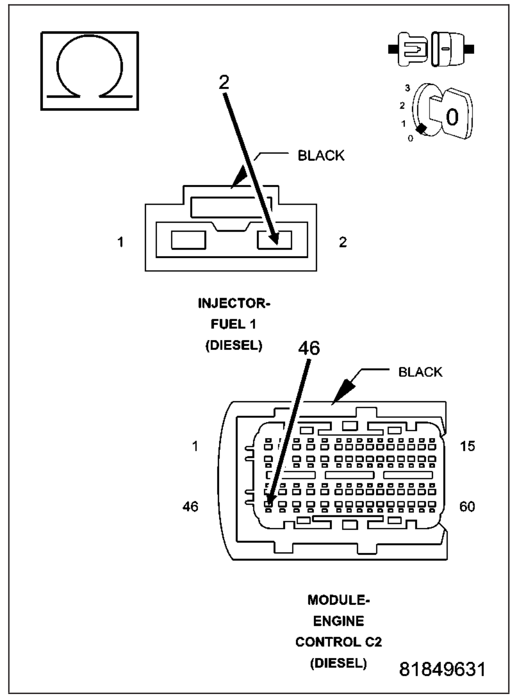
Yes >> Go to 8

No >> Repair the (K663) Fuel Injector High-Side Common circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K611) FUEL INJECTOR 1 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K611) Fuel Injector 1 Low-Side Control circuit between the Fuel Injector 1 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

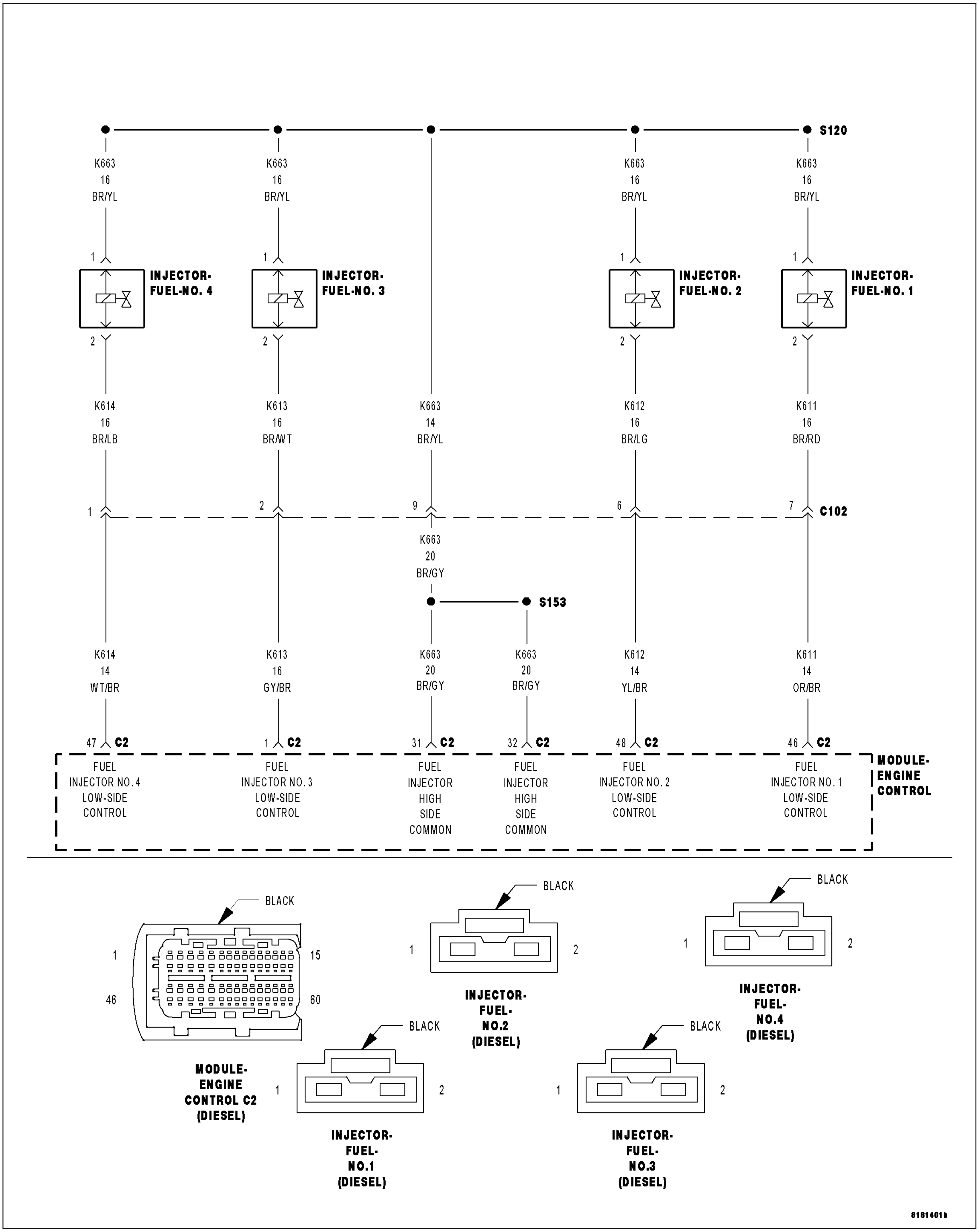
Yes >> Replace Fuel Injector 1 in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K611) Fuel Injector 1 Low-Side Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0202-FUEL INJECTOR 2 CIRCUIT / OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects an open or short in the Fuel Injector 2 circuit.

Possible Causes
INTERMITTENT DTC
(K663) FUEL INJECTOR 2 HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K663) FUEL INJECTOR 2 HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K663) FUEL INJECTOR 2 HIGH-SIDE CONTROL CIRCUIT SHORTED TO (K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT
(K663) FUEL INJECTOR 2 HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 2

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module.

Attempt to start the engine and test drive the vehicle.

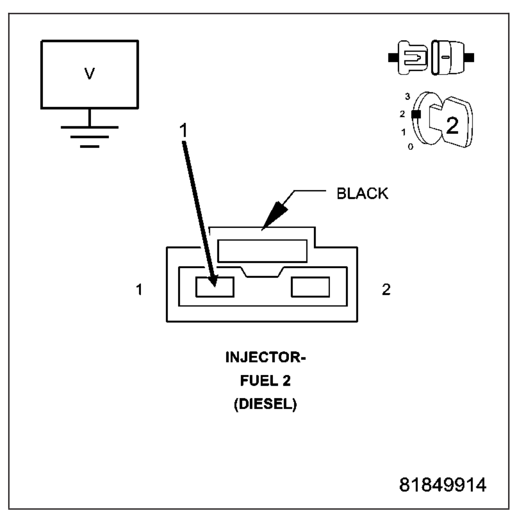
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Fuel Injector 2 harness connector.

Disconnect the Engine Control Module harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 2 harness connector.

Is there any voltage present?

Yes >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to voltage.

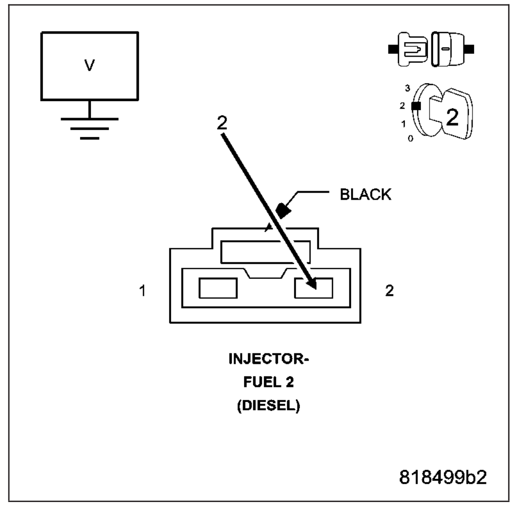
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K612) Fuel Injector 2 Low-Side Control circuit in the Fuel Injector 2 harness connector.



Is there any voltage present?

Yes >> Repair the (K612) Fuel Injector 2 Low-Side Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

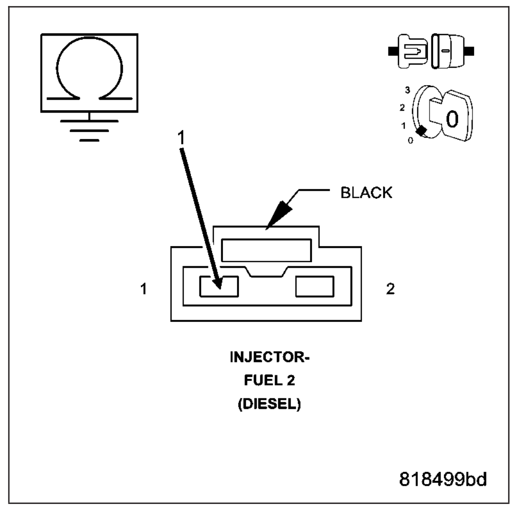
No >> Go to 4

4. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Remove the jumper wire in the Main Relay Connector.

Measure the resistance between ground and the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 2 harness connector.



Is the resistance above 1000 ohms?

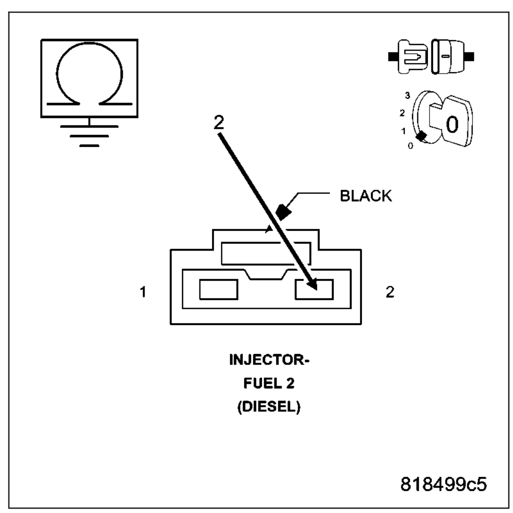
Yes >> Go to 5

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K612) Fuel Injector 2 Low-Side Control circuit in the Fuel Injector 2 harness connector.



Is the resistance above 1000 ohms?

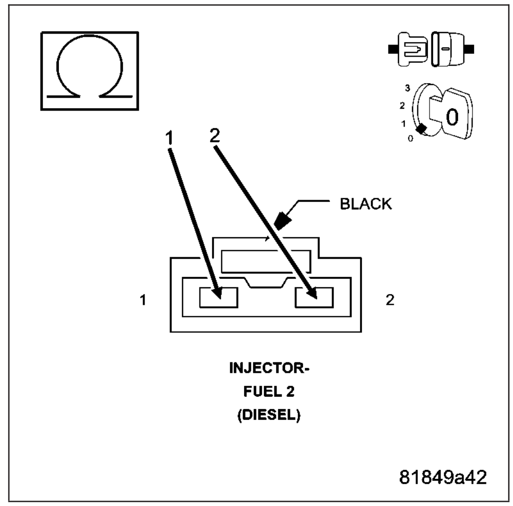
Yes >> Go to 6

No >> Repair the (K612) Fuel Injector 2 Low-Side Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO (K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT

Measure the resistance between the (K663) Fuel Injector High-Side Common circuit and the (K612) Fuel Injector 2 Low-Side Control circuit in the Fuel Injector 2 harness connector.



Is the resistance above 1000 ohms?

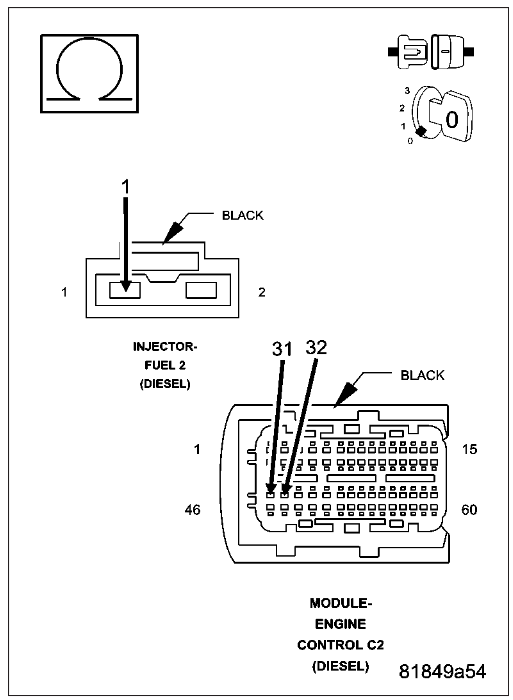
Yes >> Go to 7

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to the (K612) Fuel Injector 2 Low-Side Control circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K663) Fuel Injector High-Side Common circuit between the Fuel Injector 2 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

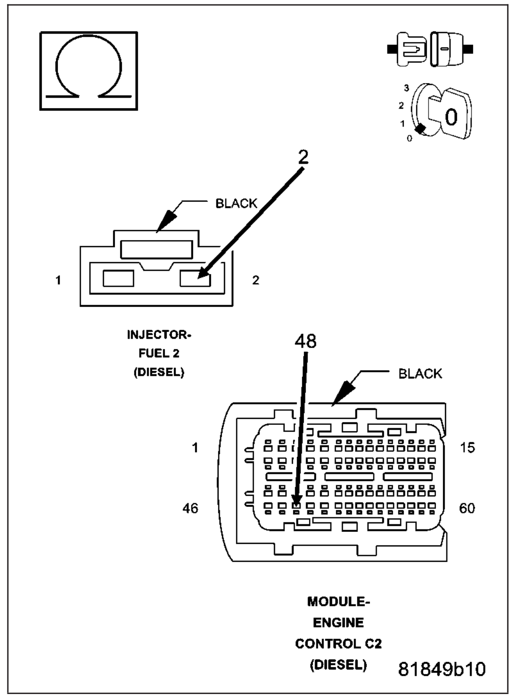
Yes >> Go to 8

No >> Repair the (K663) Fuel Injector High-Side Common circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K612) FUEL INJECTOR 2 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K612) Fuel Injector 2 Low-Side Control circuit between the Fuel Injector 2 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

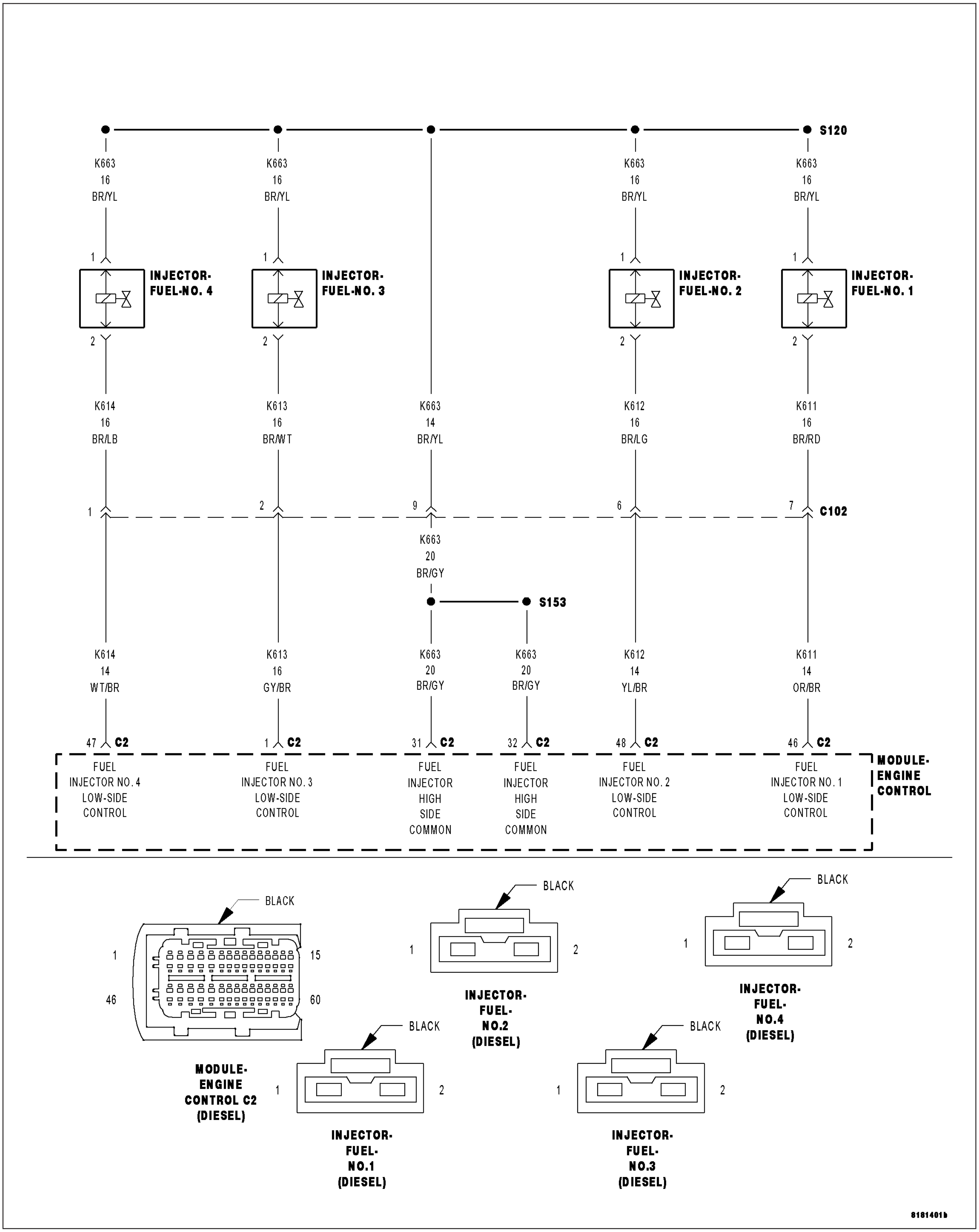
Yes >> Replace Fuel Injector 2 in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K612) Fuel Injector 2 Low-Side Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0203-FUEL INJECTOR 3 CIRCUIT / OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects an open or short in the Fuel Injector 3 circuit.

Possible Causes
INTERMITTENT DTC
(K663) FUEL INJECTOR 3 HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K663) FUEL INJECTOR 3 HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K663) FUEL INJECTOR 3 HIGH-SIDE CONTROL CIRCUIT SHORTED TO (K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT
(K663) FUEL INJECTOR 3 HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module.

Attempt to start the engine and test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Fuel Injector 3 harness connector.

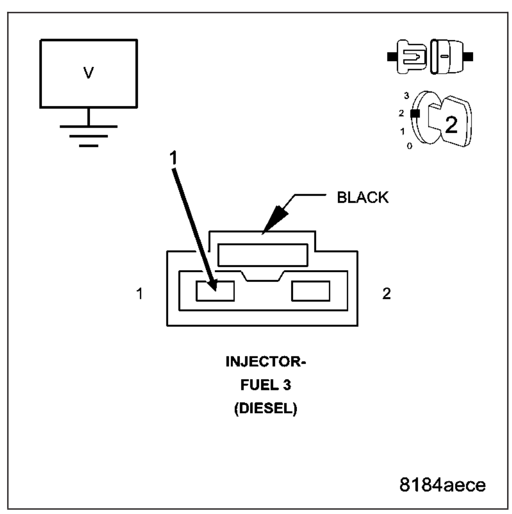
Disconnect the Engine Control Module harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 3 harness connector.



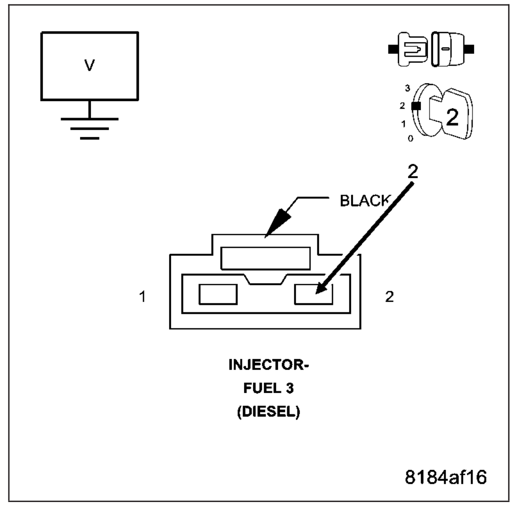
Is there any voltage present?

Yes >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE



NOTE: The jumper wire should still be in place.

Measure the voltage of the (K613) Fuel Injector 3 Low-Side Control circuit in the Fuel Injector 3 harness connector.

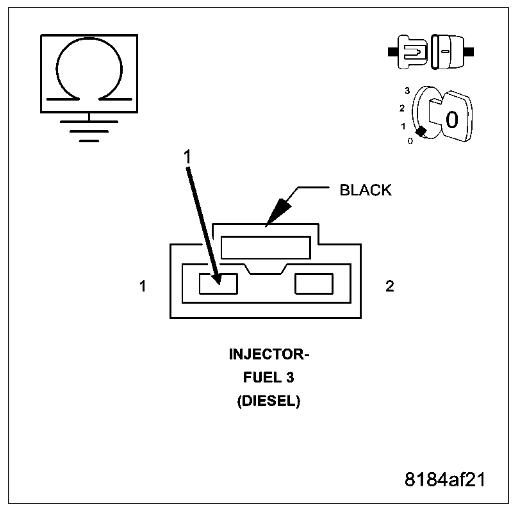
Is there any voltage present?

Yes >> Repair the (K613) Fuel Injector 3 Low-Side Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Remove the jumper wire in the Main Relay Connector.

Measure the resistance between ground and the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 3 harness connector.

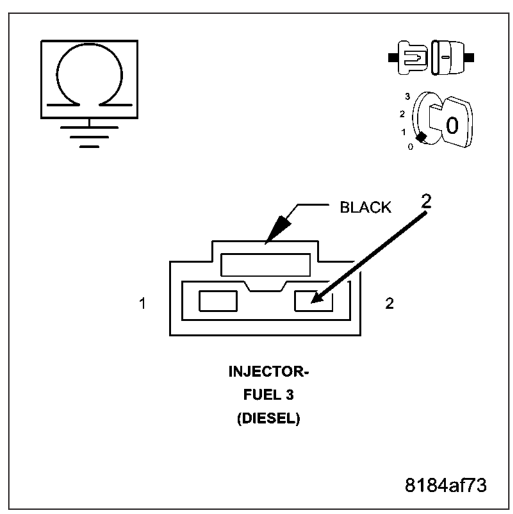
Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (K613) Fuel Injector 3 Low-Side Control circuit in the Fuel Injector 3 harness connector.

Is the resistance above 1000 ohms?

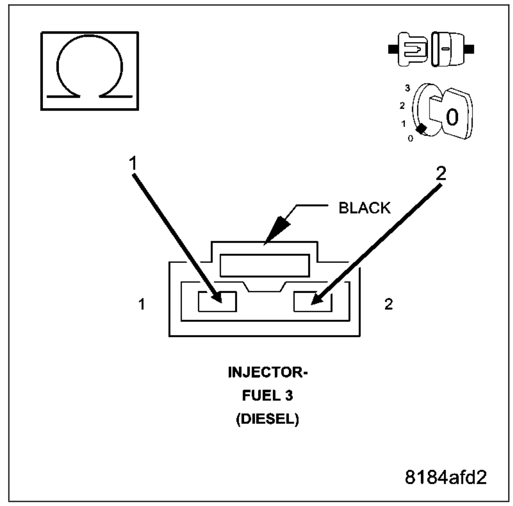
Yes >> Go to 6

No >> Repair the (K613) Fuel Injector 3 Low-Side Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO (K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT

Measure the resistance between the (K663) Fuel Injector High-Side Common circuit and the (K613) Fuel Injector 3 Low-Side Control circuit in the Fuel Injector 3 harness connector.



Is the resistance above 1000 ohms?

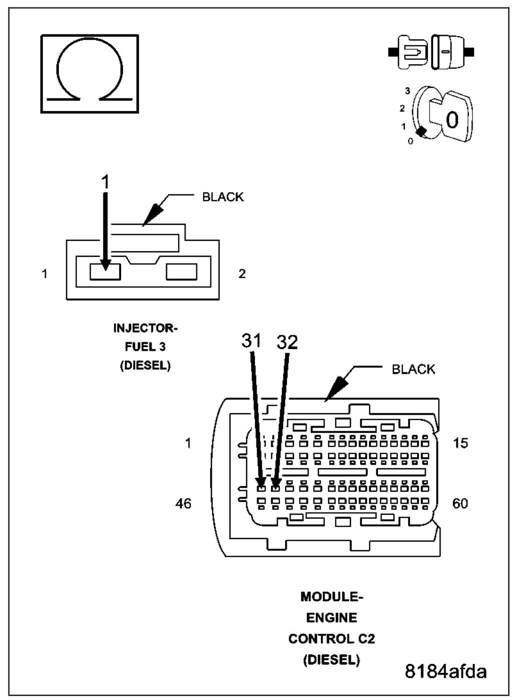
Yes >> Go to 7

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to the (K613) Fuel Injector 3 Low-Side Control circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K663) Fuel Injector High-Side Common circuit between the Fuel Injector 3 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

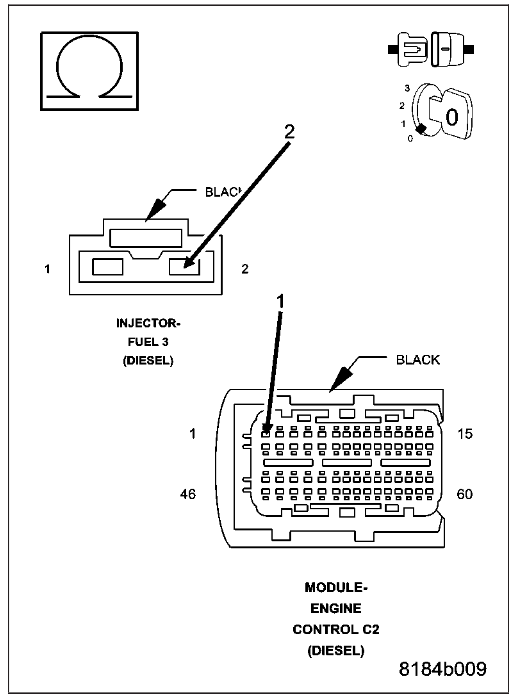
Yes >> Go to 8

No >> Repair the (K663) Fuel Injector High-Side Common circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K613) FUEL INJECTOR 3 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K613) Fuel Injector 3 Low-Side Control circuit between the Fuel Injector 3 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

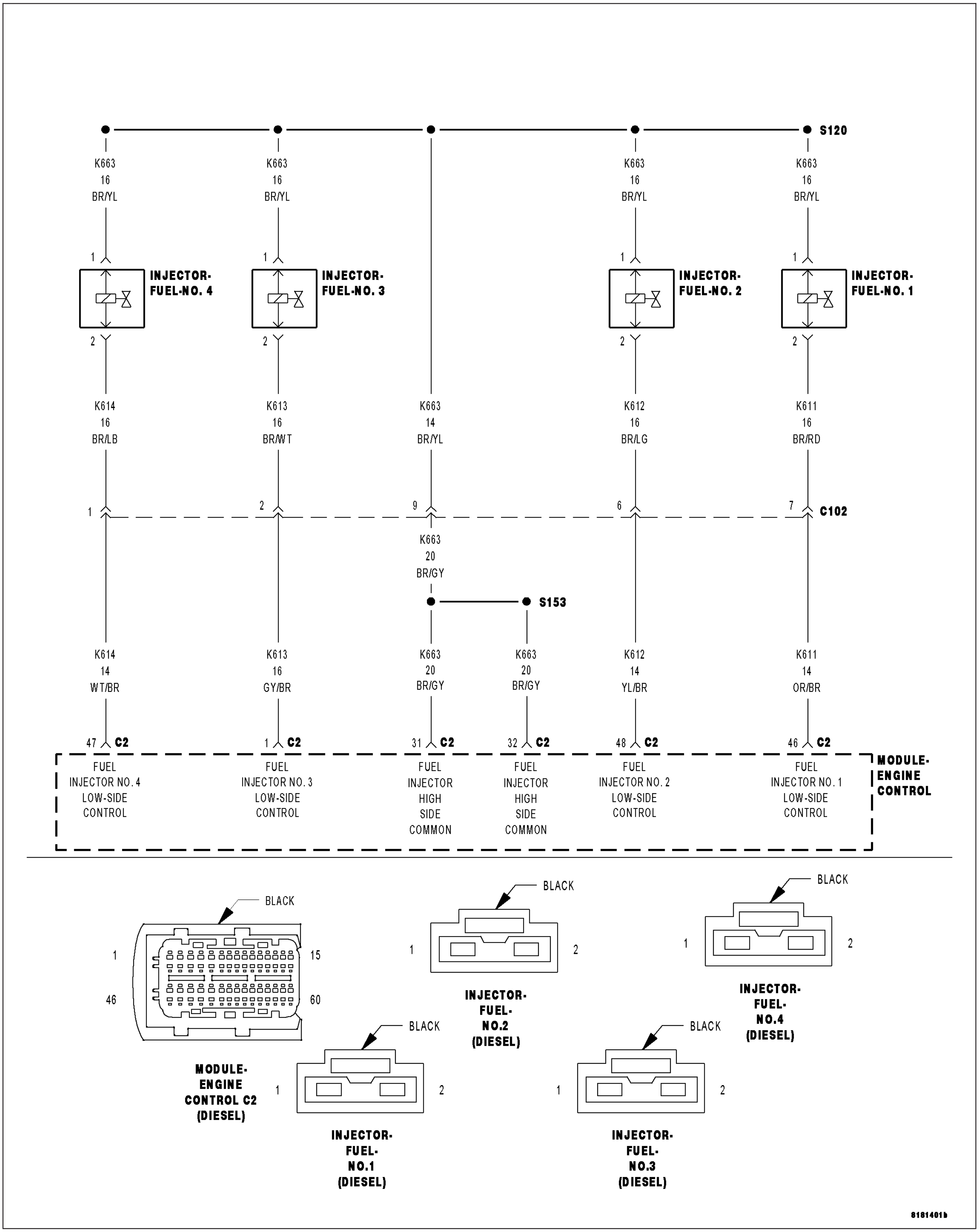
Yes >> Replace Fuel Injector 3 in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K613) Fuel Injector 3 Low-Side Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0204-FUEL INJECTOR 4 CIRCUIT / OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects an open or short in the Fuel Injector 4 circuit.

Possible Causes
INTERMITTENT DTC
(K663) FUEL INJECTOR 4 HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K663) FUEL INJECTOR 4 HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND
(K663) FUEL INJECTOR 4 HIGH-SIDE CONTROL CIRCUIT SHORTED TO (K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT
(K663) FUEL INJECTOR 4 HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 4

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module.

Attempt to start the engine and test drive the vehicle.

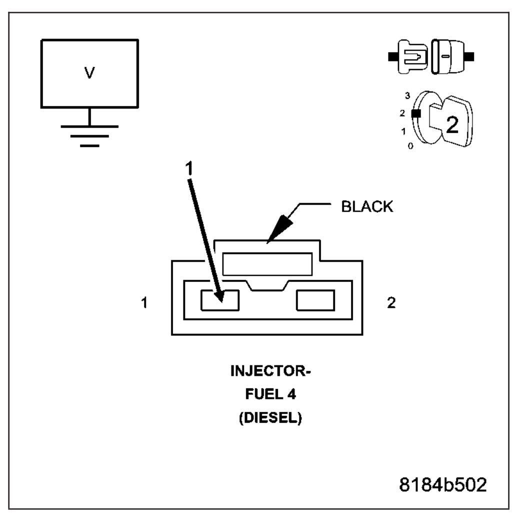
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Fuel Injector 4 harness connector.

Disconnect the Engine Control Module harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 4 harness connector.

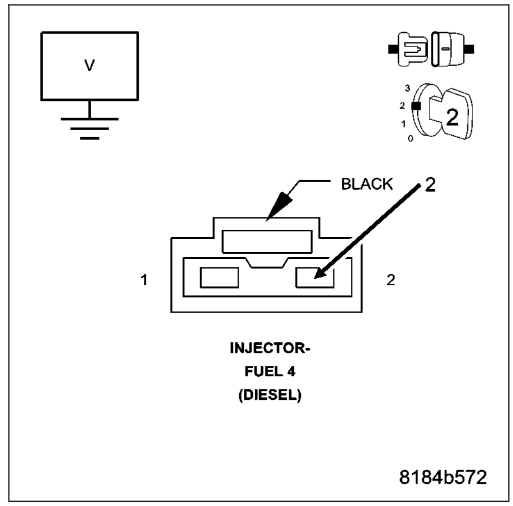
Is there any voltage present?

Yes >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE



NOTE: The jumper wire should still be in place.

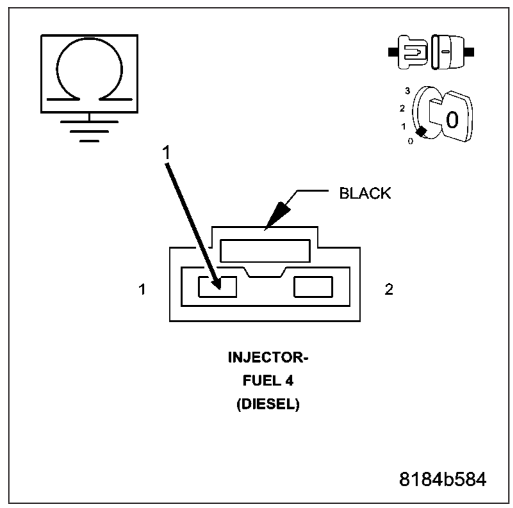
Measure the voltage of the (K614) Fuel Injector 4 Low-Side Control circuit in the Fuel Injector 4 harness connector.

Is there any voltage present?

Yes >> Repair the (K614) Fuel Injector 4 Low-Side Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Remove the jumper wire in the Main Relay Connector.

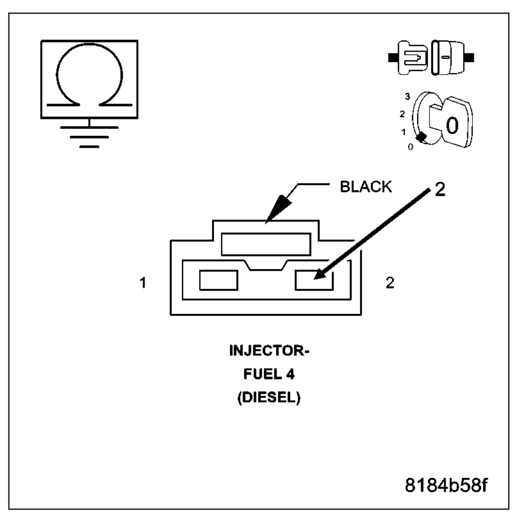
Measure the resistance between ground and the (K663) Fuel Injector High-Side Common circuit in the Fuel Injector 4 harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (K614) Fuel Injector 4 Low-Side Control circuit in the Fuel Injector 4 harness connector.

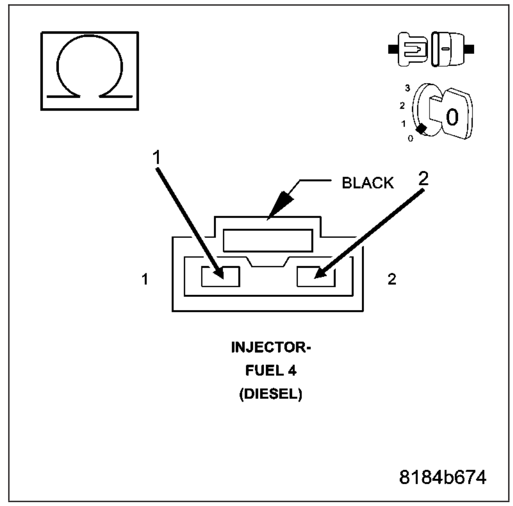
Is the resistance above 1000 ohms?

Yes >> Go to 6

No >> Repair the (K614) Fuel Injector 4 Low-Side Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT SHORTED TO (K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT

Measure the resistance between the (K663) Fuel Injector High-Side Common circuit and the (K614) Fuel Injector 4 Low-Side Control circuit in the Fuel Injector 4 harness connector.



Is the resistance above 1000 ohms?

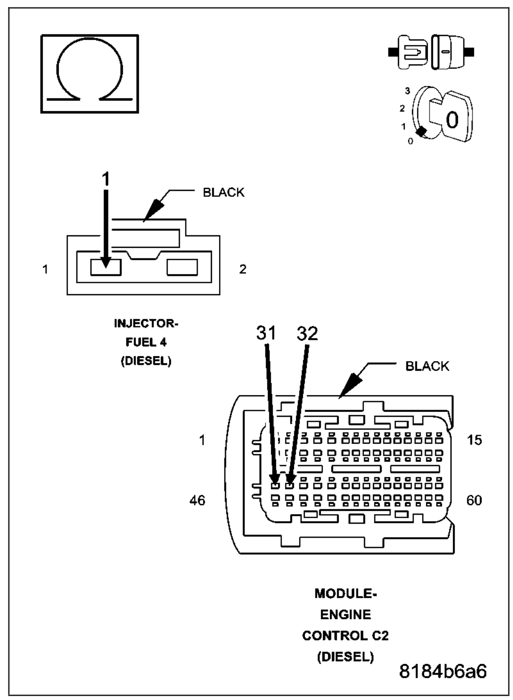
Yes >> Go to 7

No >> Repair the (K663) Fuel Injector High-Side Common circuit for a short to the (K614) Fuel Injector 4 Low-Side Control circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K663) FUEL INJECTOR HIGH-SIDE COMMON CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K663) Fuel Injector High-Side Common circuit between the Fuel Injector 4 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

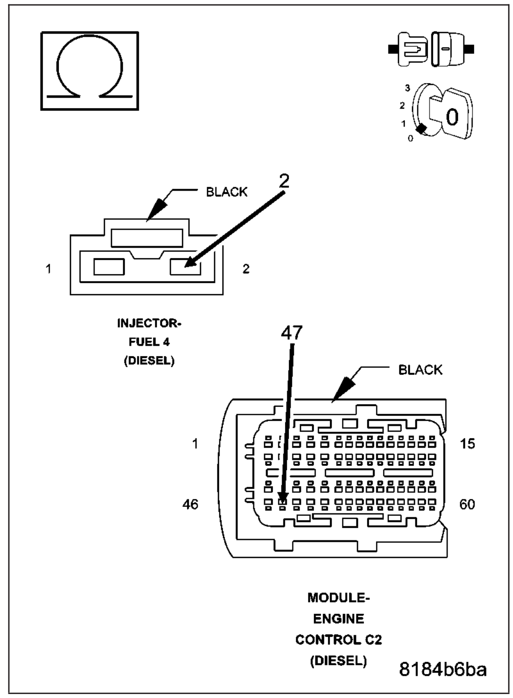
Yes >> Go to 8

No >> Repair the (K663) Fuel Injector High-Side Common circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K614) FUEL INJECTOR 4 LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K614) Fuel Injector 4 Low-Side Control circuit between the Fuel Injector 4 harness connector and the Engine Control Module harness connector.



Is the resistance below 10.0 ohms?

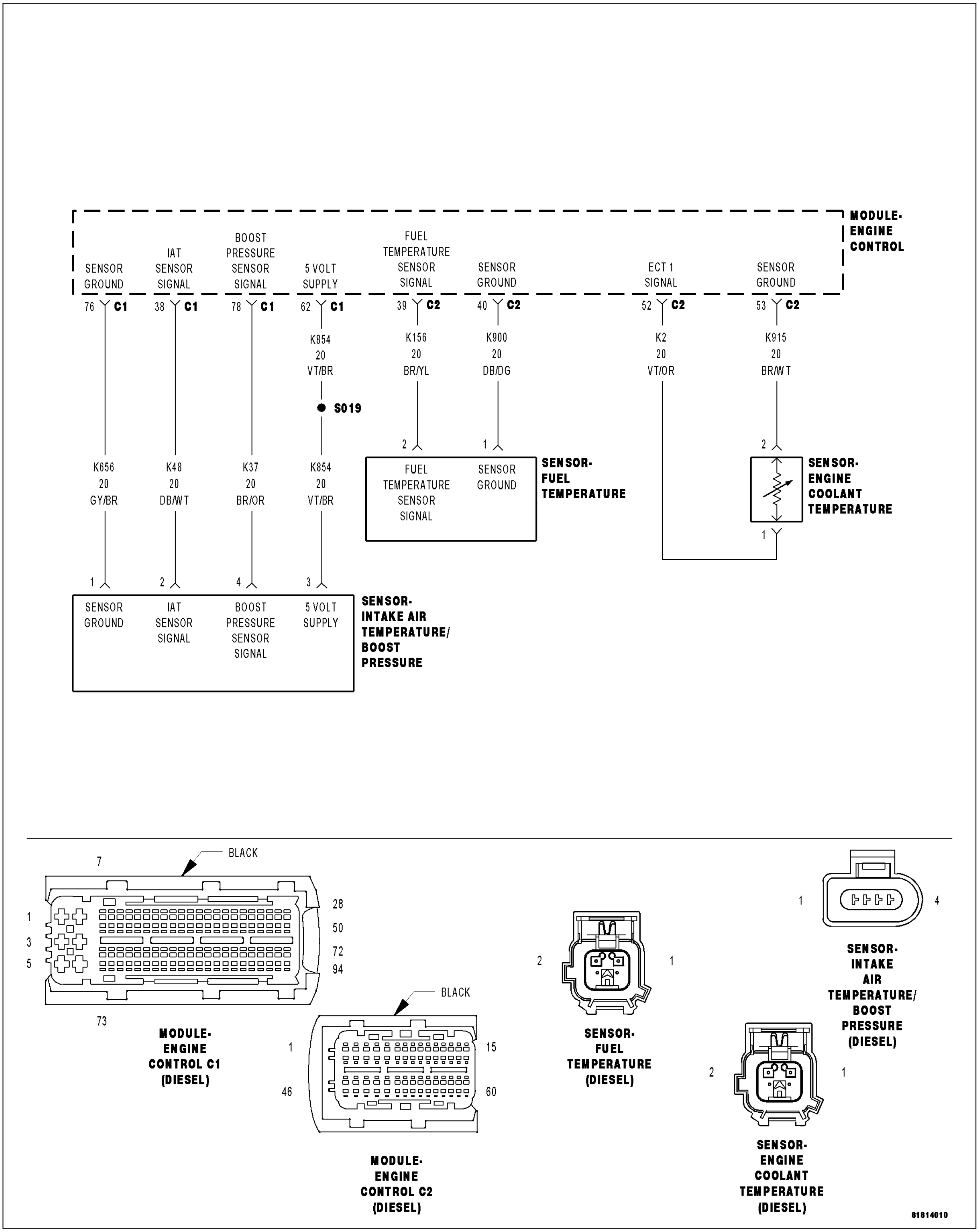
Yes >> Replace Fuel Injector 4 in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K614) Fuel Injector 4 Low-Side Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0234-TURBOCHARGER OVERBOOST CONDITION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the ECM attempting to govern turbocharger boost pressure.
- **Set Condition:**
  The Intake Air Temperature/Boost Pressure Sensor indicates actual turbocharger boost is greater than the ECM setpoint for 6.5 seconds.

Possible Causes
INTERMITTENT DTC
INTAKE AIR RESTRICTION
INTAKE AIR LEAK
VACUUM HOSES/TUBES
BOOST PRESSURE ACTUATOR
TURBOCHARGER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECK FOR INTAKE AND EXHAUST SYSTEM RESTRICTIONS

NOTE: Damaged, restricted or poorly connected intake and turbocharger related tubes can cause this DTC to set.

Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections.

Inspect the complete exhaust system for damaged, bent or clogged pipes that can cause exhaust system restrictions and excessive backpressure.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect the Intake Air Temp/Boost Pressure Sensor harness connector.

Measure the resistance of the each of the Boost Pressure Sensor circuits (3 circuits) between the Intake Air Temp/Boost Pressure Sensor and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> 4

No >> Repair the Boost Pressure Sensor circuit(s) that measure above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. CHECK THE BOOST PRESSURE SYSTEM

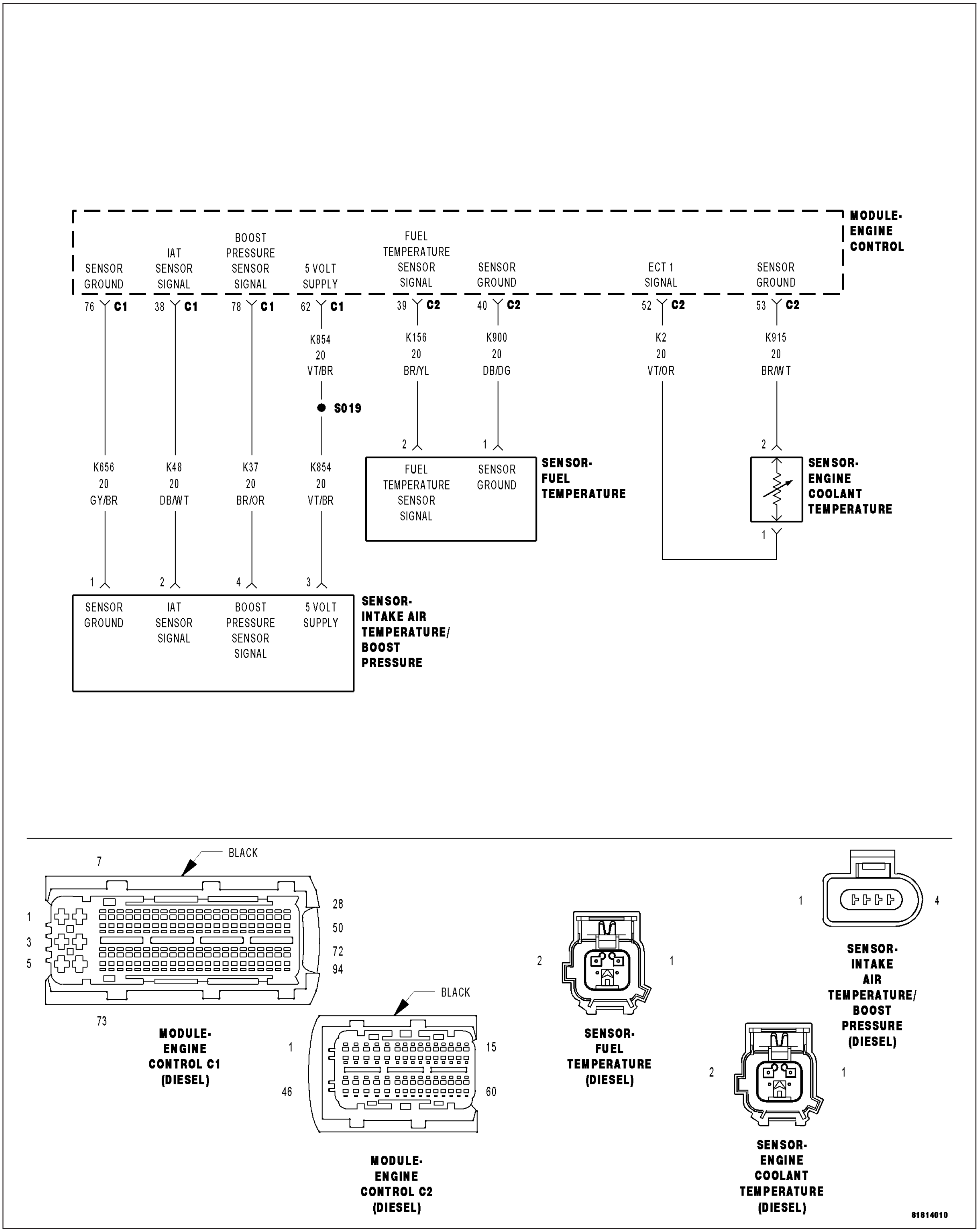
Refer to the CHECKING THE BOOST PRESSURE SYSTEM to check the boost pressure supply hoses, Boost Actuator and Turbocharger boost output.

With the scan tool, select View DTCs.

View repair.

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0236-BOOST PRESSURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Once per ignition cycle before engine crank. No other Atmospheric Pressure Sensor DTC's present. No other Boost Pressure Sensor DTC's present.
- **Set Condition:**
  The Intake Air Temperature/Boost Pressure Sensor signal differs from the Atmospheric Pressure Sensor signal by 150 hpa or greater.

Possible Causes
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(K656) BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN
(K854) BOOST PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN
INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off, wait 30 seconds, then start and idle the engine for at least 30 seconds.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

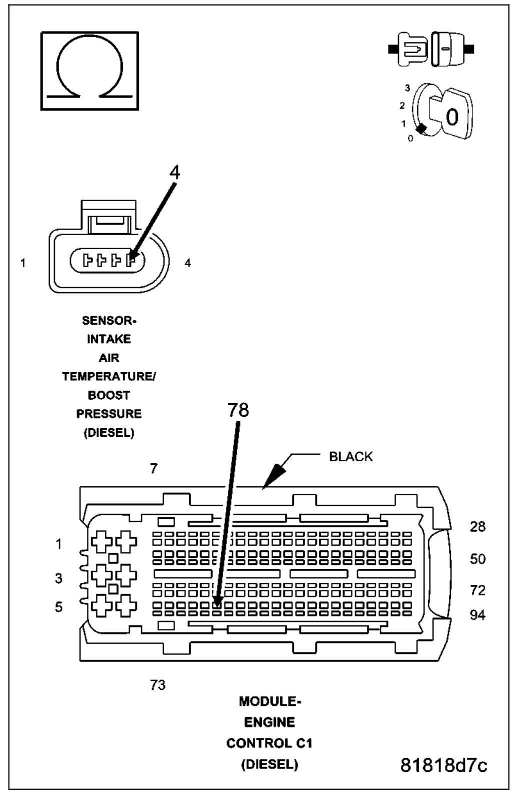
2. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Intake Air Temp/Boost Pressure Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K37) Boost Pressure Sensor Signal circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

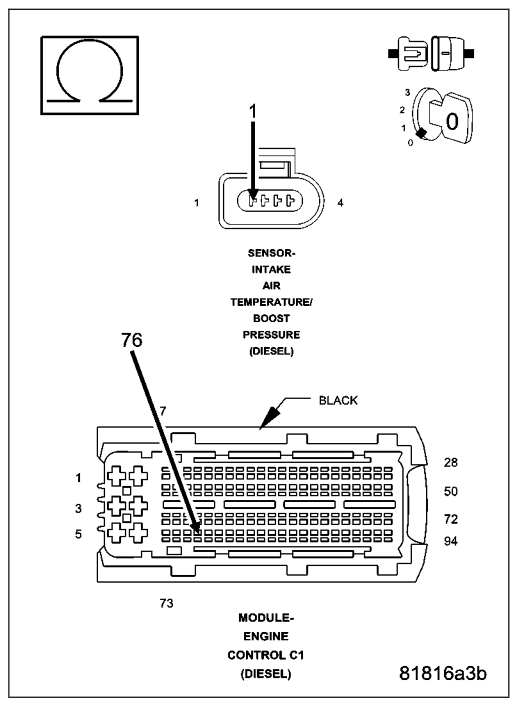
Yes >> Go To 3

No >> Repair the (K37) Boost Pressure Sensor Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (K656) BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K656) Boost Pressure Sensor Ground circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the Boost Pressure Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

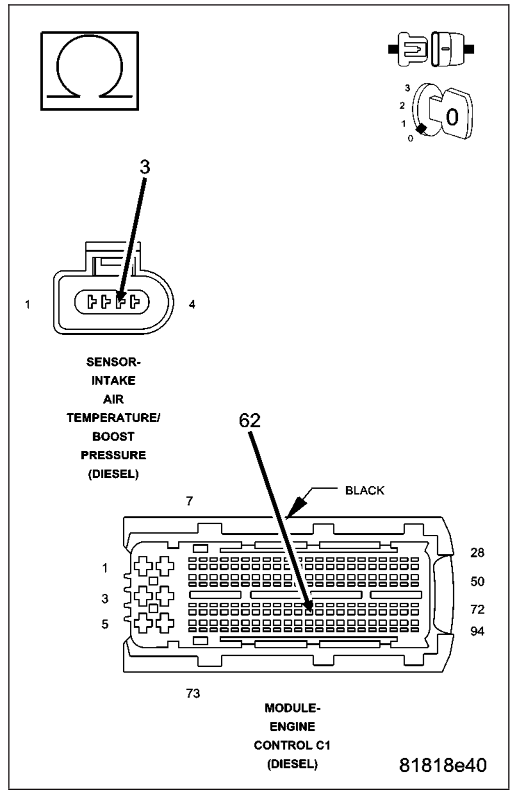
4. (K854) BOOST PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN

Measure the resistance of the (K854) Boost Pressure Sensor 5-Volt Supply circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 5

No >> Repair the (K854) Boost Pressure Sensor 5-Volt Supply circuit for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR

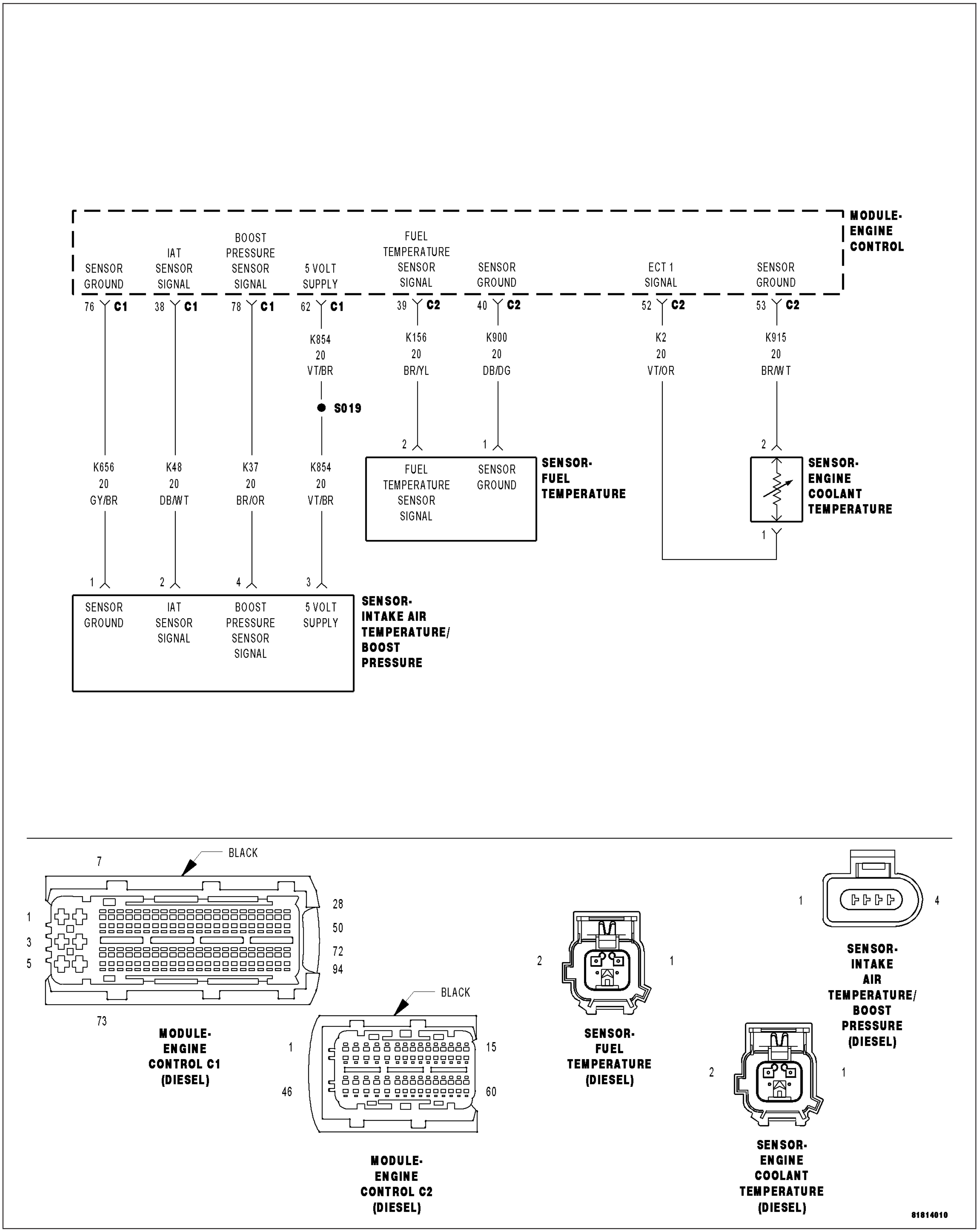
Replace the Intake Air Temperature/Boost Pressure Sensor.
Turn the ignition on.
With the scan tool, erase ECM DTCs.
Test drive the vehicle, pausing several times to cycle the ignition.
Monitor the scan tool for ECM DTCs.

Did this DTC set again?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> The repair is complete.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0237-TURBO BOOST PRESSURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K37) Boost Pressure Sensor Signal circuit voltage is below 0.68 volt for 0.48 second.

Possible Causes
INTERMITTENT DTC
(K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO (K656) BOOST PRESSURE SENSOR GROUND
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO (K656) BOOST PRESSURE SENSOR GROUND
(K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

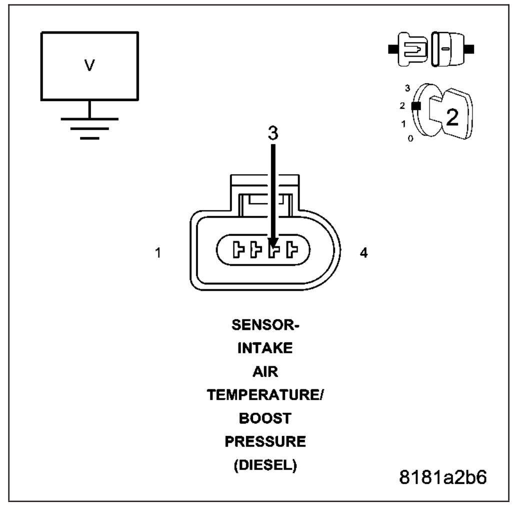
Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
Monitor the scan tool for at least two minutes.
Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
Start the engine.
Allow the engine to reach normal operating temperature.
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT VOLTAGE



Turn the ignition off.

Disconnect the Intake Air Temp/Boost Pressure Sensor harness connector.

Turn the ignition on.

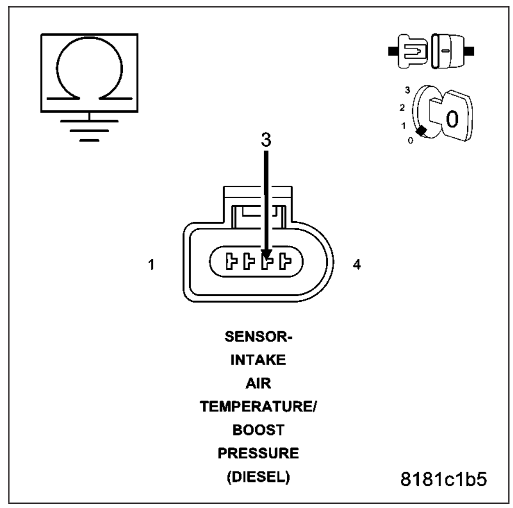
Measure the voltage of the (K854) Boost Pressure Sensor 5 Volt Supply circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.

Is the voltage above 4.5 volts?

Yes >> Go to 6

No >> Go to 3

3. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K854) Boost Pressure Sensor 5 Volt Supply circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.

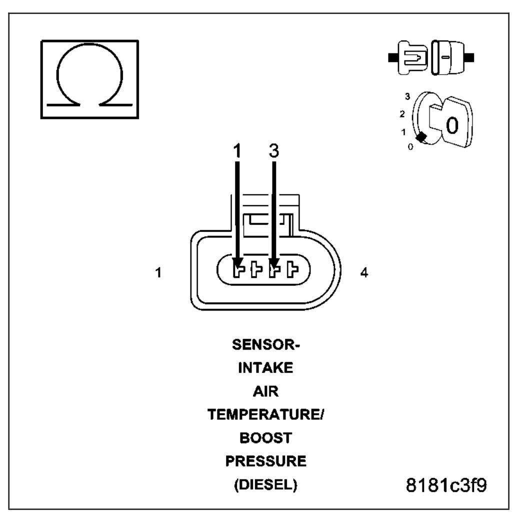
Is the resistance above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K854) Boost Pressure Sensor 5 Volt Supply circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO (K656) BOOST PRESSURE SENSOR GROUND CIRCUIT



Measure the resistance between the (K854) Boost Pressure Sensor 5 Volt Supply circuit and the (K656) Boost Pressure Sensor Ground circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.

Is the resistance above 1000 ohms?

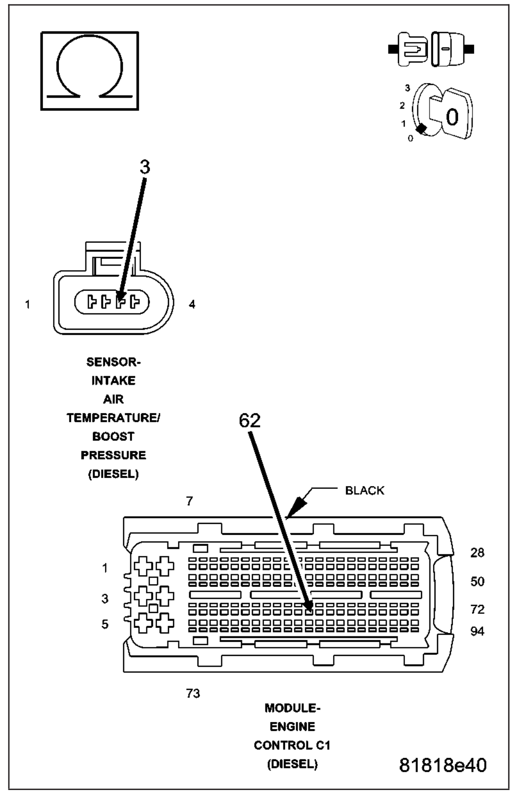
Yes >> Go to 5

No >> Repair the (K854) Boost Pressure Sensor 5 Volt Supply circuit for a short to the (K656) Boost Pressure Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K854) Boost Pressure Sensor 5 Volt Supply circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 10

No >> Repair the (K854) Boost Pressure Sensor 5 Volt Supply circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.

NOTE: The scan tool should display a Boost Pressure Sensor high voltage or open DTC with the Boost Pressure Sensor connector disconnected.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Intake Air Temp/Boost Pressure Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

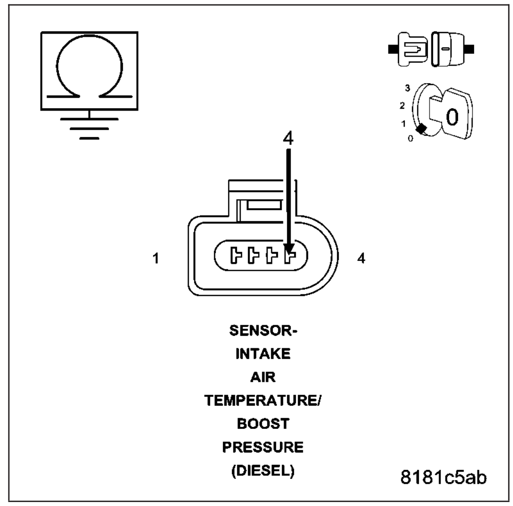
No >> Go to 7

7. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K37) Boost Pressure Sensor Signal circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.



Is the resistance above 1000 ohms?

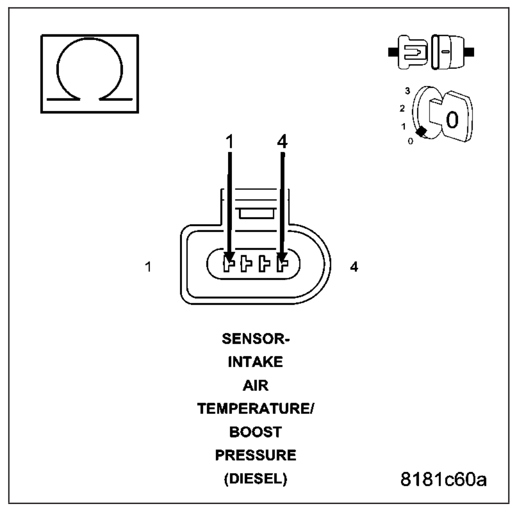
Yes >> Go to 8

No >> Repair the (K37) Boost Pressure Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO (K656) BOOST PRESSURE SENSOR GROUND CIRCUIT

Measure the resistance between the (K37) Boost Pressure Sensor Signal circuit and the (K656) Boost Pressure Sensor Ground circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.



Is the resistance above 1000 ohms?

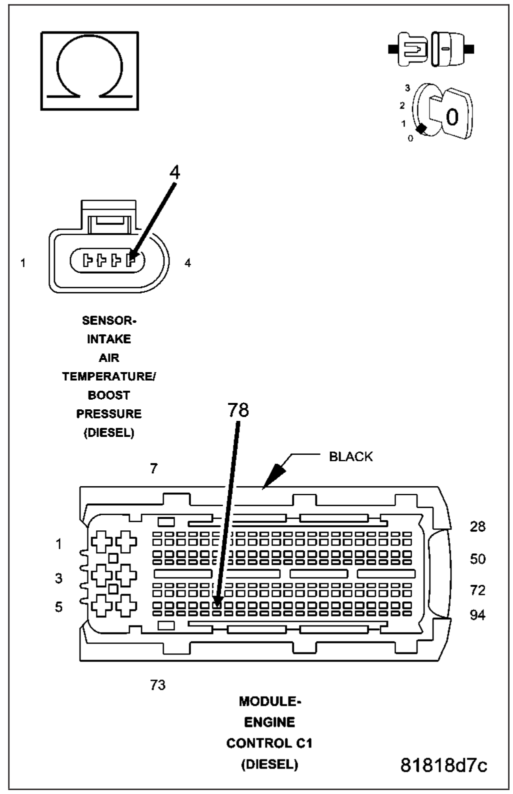
Yes >> Go to 9

No >> Repair the (K37) Boost Pressure Sensor Signal circuit for a short to the (K656) Boost Pressure Sensor Ground circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K37) Boost Pressure Sensor Signal circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 10

No >> Repair the (K37) Boost Pressure Sensor Signal circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Boost Pressure Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

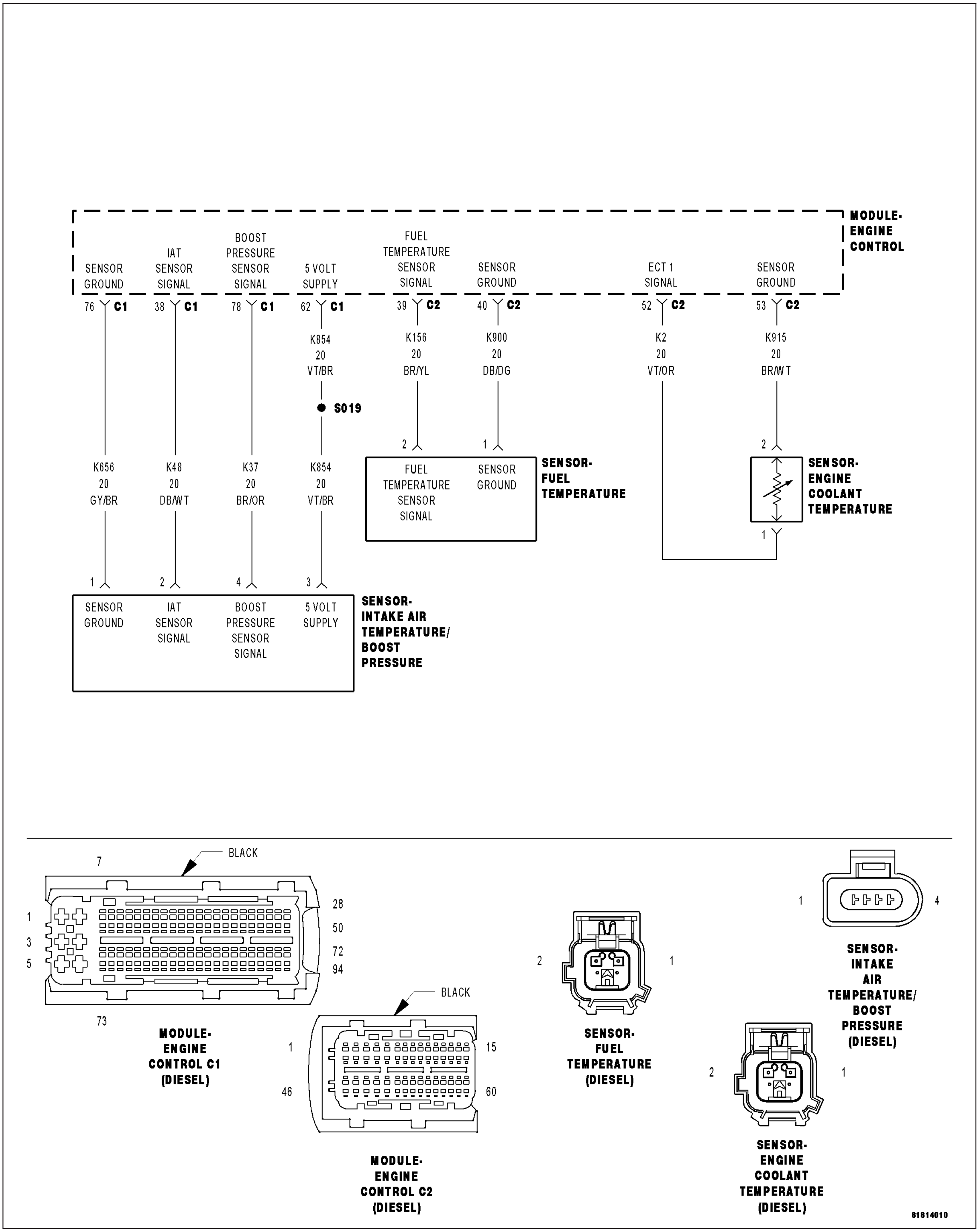
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0238-TURBO BOOST PRESSURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The (K37) Boost Pressure Sensor Signal circuit voltage is above 4.85 volts for 0.5 second.

Possible Causes
INTERMITTENT DTC
(K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K656) BOOST PRESSURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K656) BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Intake Air Temp/Boost Pressure Sensor harness connector.

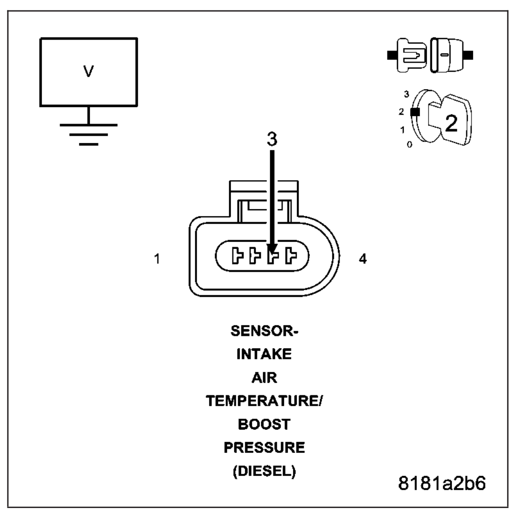
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K854) Boost Pressure Sensor 5 Volt Supply circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K854) Boost Pressure Sensor 5 Volt Supply circuit for a short to voltage.

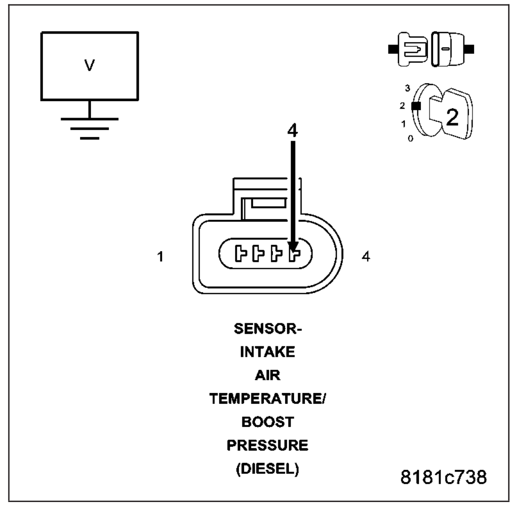
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K37) Boost Pressure Sensor Signal circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.



Is there any voltage present?

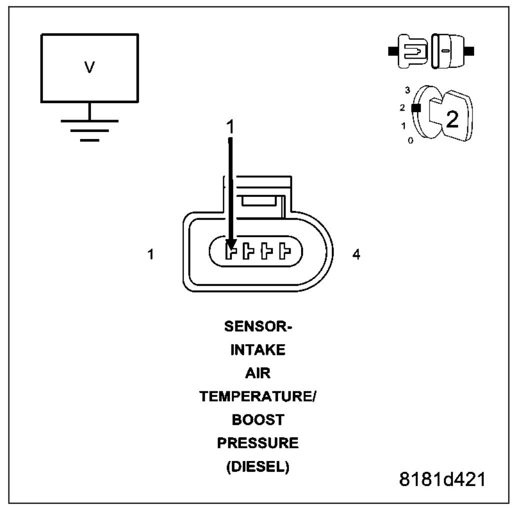
Yes >> Repair the (K37) Boost Pressure Sensor Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K656) BOOST PRESSURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of the (K656) Boost Pressure Sensor Ground circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K656) Boost Pressure Sensor Ground circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. BOOST PRESSURE SENSOR

Turn the ignition off.

Remove the jumper wire and install the Main Relay.

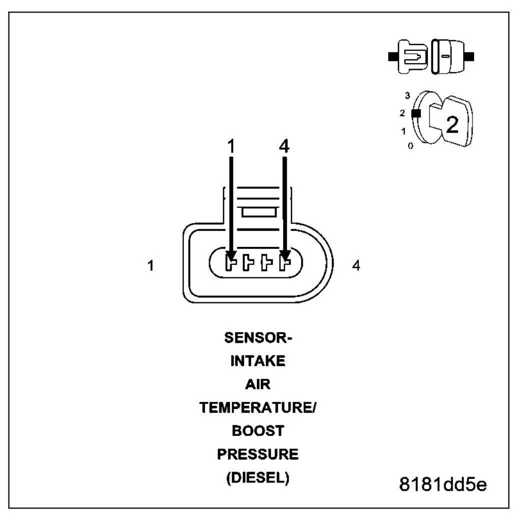
Connect the Engine Control Module (ECM) harness connector.

Connect a jumper wire between the (K656) Boost Pressure Sensor Ground circuit and the (K37) Boost Pressure Sensor Signal circuit in the Intake Air Temp/Boost Pressure Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, select View DTCs.



NOTE: The scan tool should display a Boost Pressure Sensor low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC(s) as described above?

Yes >> Replace the Intake Air Temp/Boost Pressure Sensor in accordance with the Service Information. Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

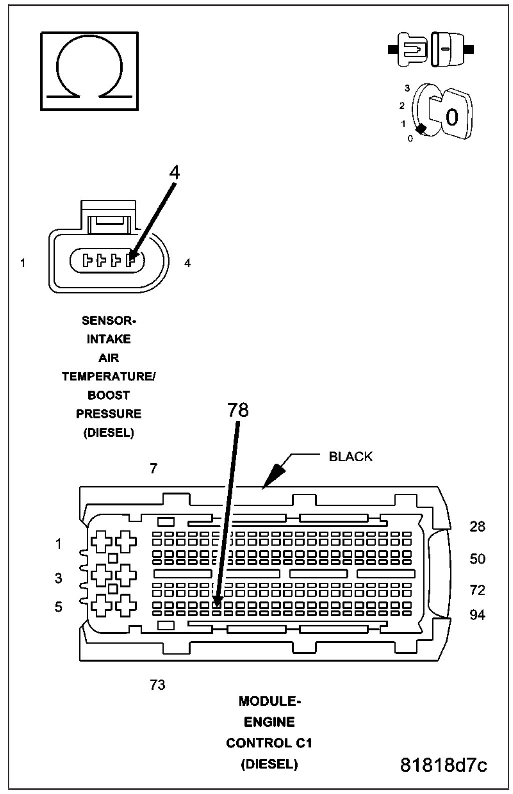
No >> Go to 6

6. (K37) BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K37) Boost Pressure Sensor Signal circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

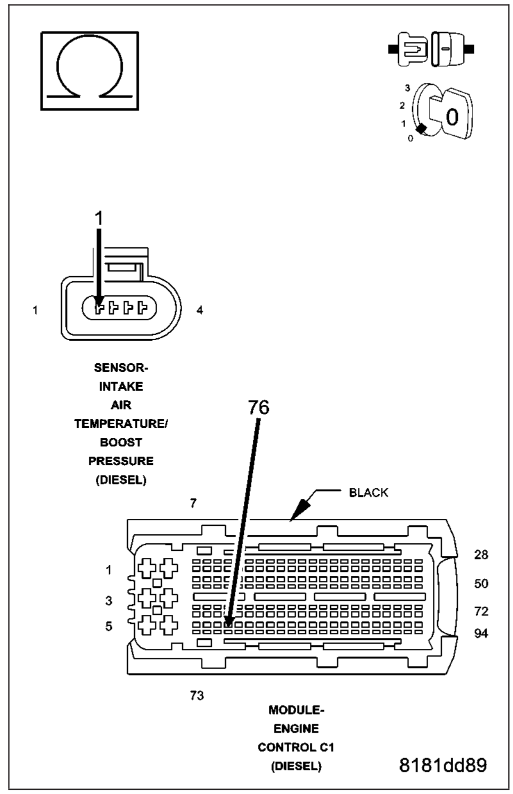
Yes >> Go to 7

No >> Repair the (K37) Boost Pressure Sensor Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K656) BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K656) Boost Pressure Sensor Ground circuit between the Intake Air Temp/Boost Pressure Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 8

No >> Repair the (K656) Boost Pressure Sensor Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Boost Pressure Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0263-CYLINDER 1 CONTRIBUTION/BALANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The Engine Control Module (ECM) detects multiple misfires from cylinder #1.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0266-CYLINDER 2 CONTRIBUTION/BALANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #2.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0269-CYLINDER 3 CONTRIBUTION/BALANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #3.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0272-CYLINDER 4 CONTRIBUTION/BALANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #4.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

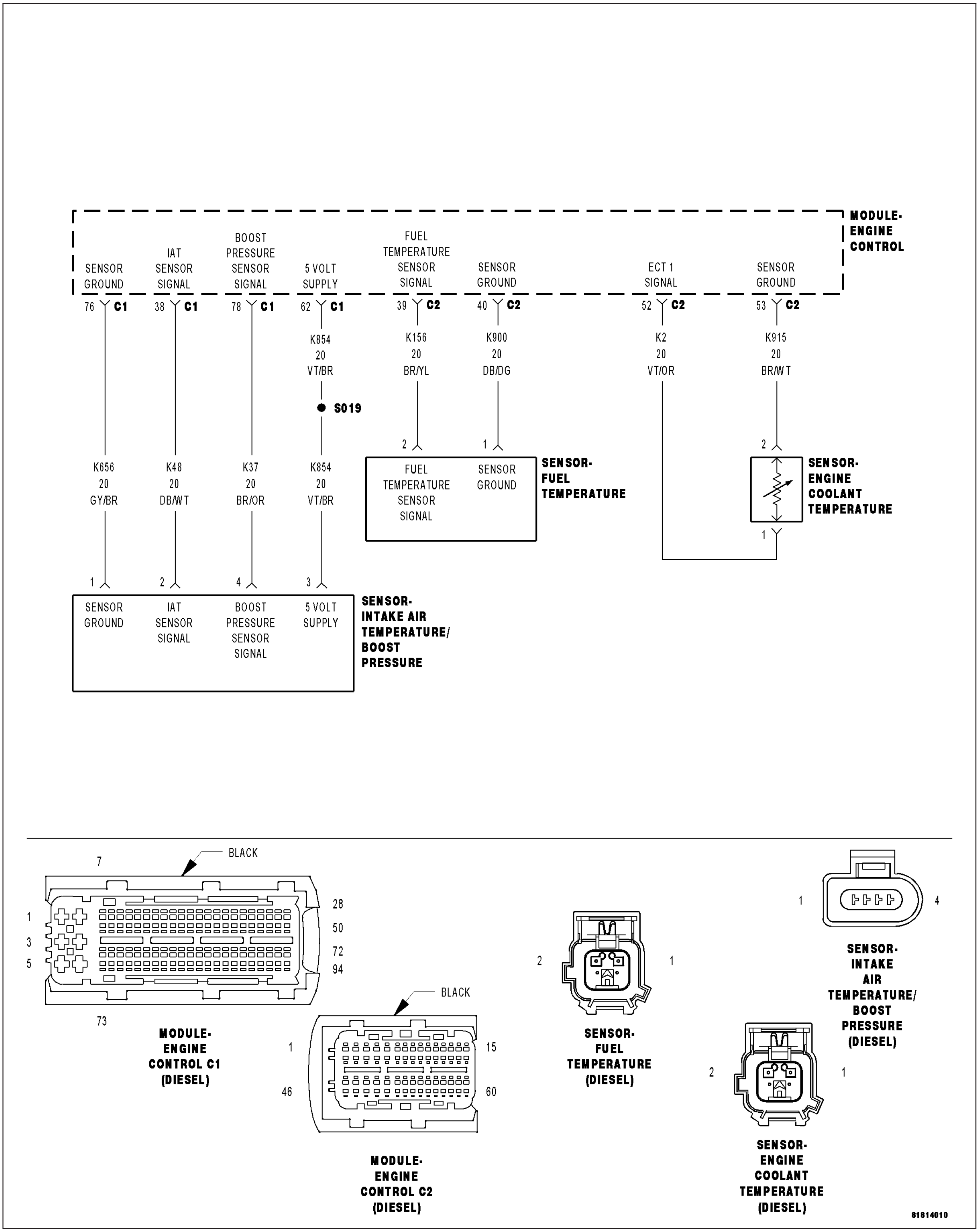
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0299-TURBOCHARGER UNDERBOOST CONDITION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the ECM attempting to govern turbocharger boost pressure.
- **Set Condition:**
  The Intake Air Temperature/Boost Pressure Sensor indicates actual turbocharger boost is less than the ECM setpoint for 6.5 seconds.

Possible Causes
INTERMITTENT DTC
CLOGGED AIR FILTER
INTAKE AIR RESTRICTION
INTAKE AIR LEAK
VACUUM HOSES/TUBES
BOOST PRESSURE ACTUATOR
TURBOCHARGER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECK THE AIR FILTER

Turn the ignition off.

Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes >> Replace the Air Filter element
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. CHECK FOR INTAKE AND EXHAUST SYSTEM RESTRICTIONS

NOTE: Damaged, restricted or poorly connected intake and turbocharger related tubes can cause this DTC to set.

Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections.

Inspect the complete exhaust system for damaged, bent or clogged pipes that can cause exhaust system restrictions and excessive backpressure.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect the Intake Air Temp/Boost Pressure Sensor harness connector.

Measure the resistance of the each of the Boost Pressure Sensor circuits (3 circuits) between the Intake Air Temp/Boost Pressure Sensor and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> 5

No >> Repair the Boost Pressure Sensor circuit(s) that measure above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECK THE BOOST PRESSURE SYSTEM

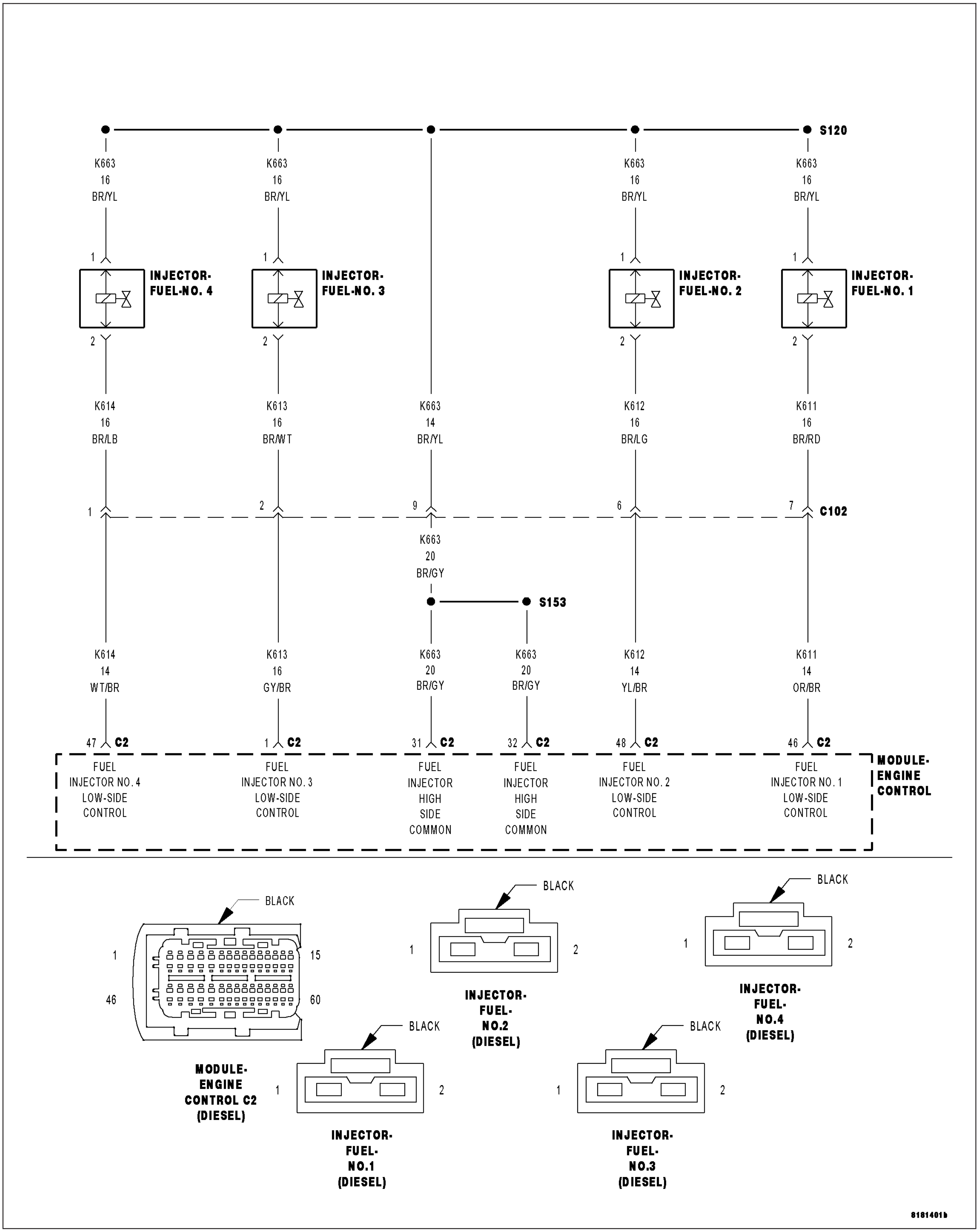
Refer to the CHECKING THE BOOST PRESSURE SYSTEM to check the boost pressure supply hoses, Boost Actuator and Turbocharger boost output.

With the scan tool, select View DTCs.

View repair.

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0300-MISFIRE DETECTED



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from one or more cylinders.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR
FUEL SUPPLY CONTAMINATION
LOW SIDE FUEL PRESSURE
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

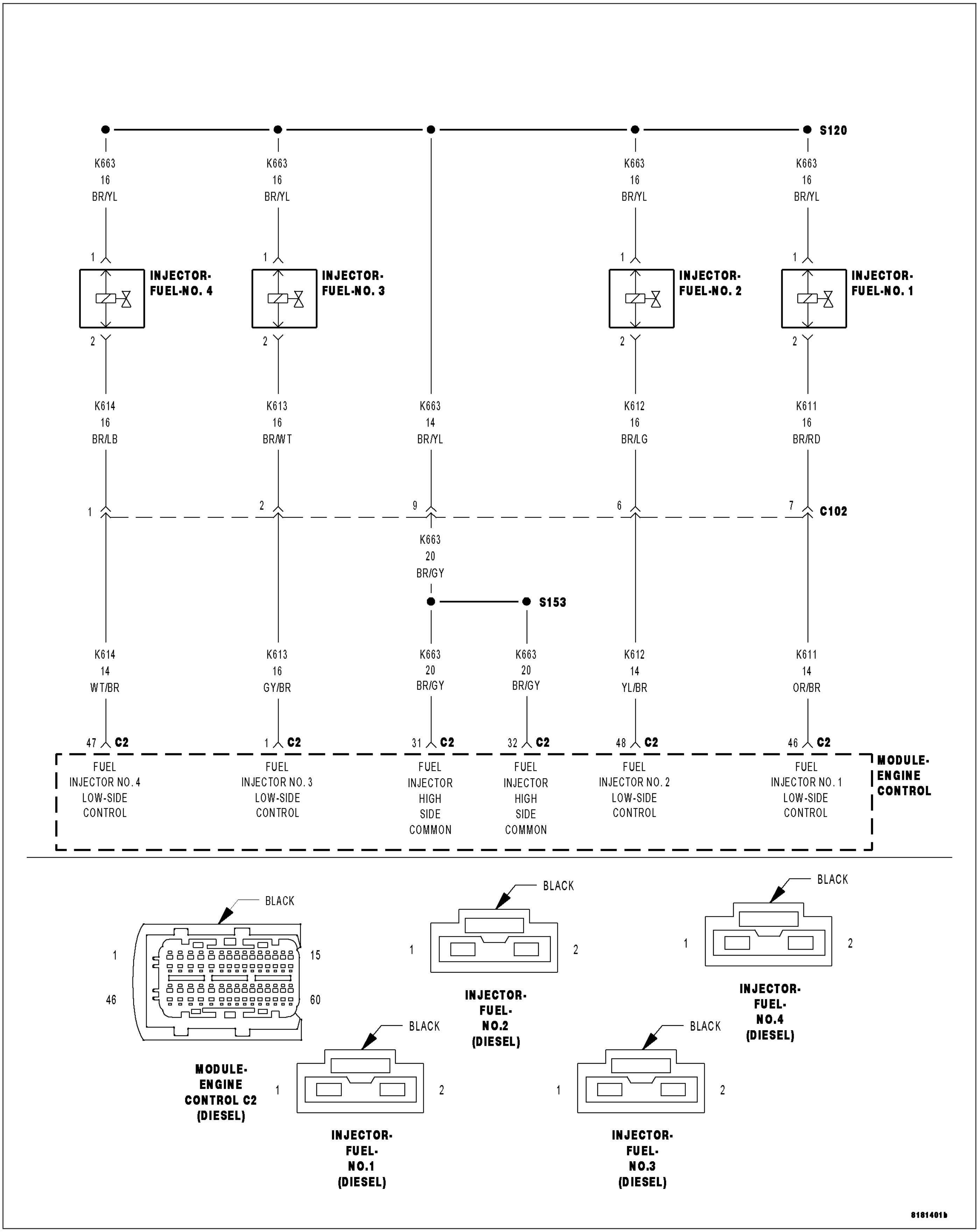
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0301-MISFIRE DETECTED CYLINDER #1



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #1.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

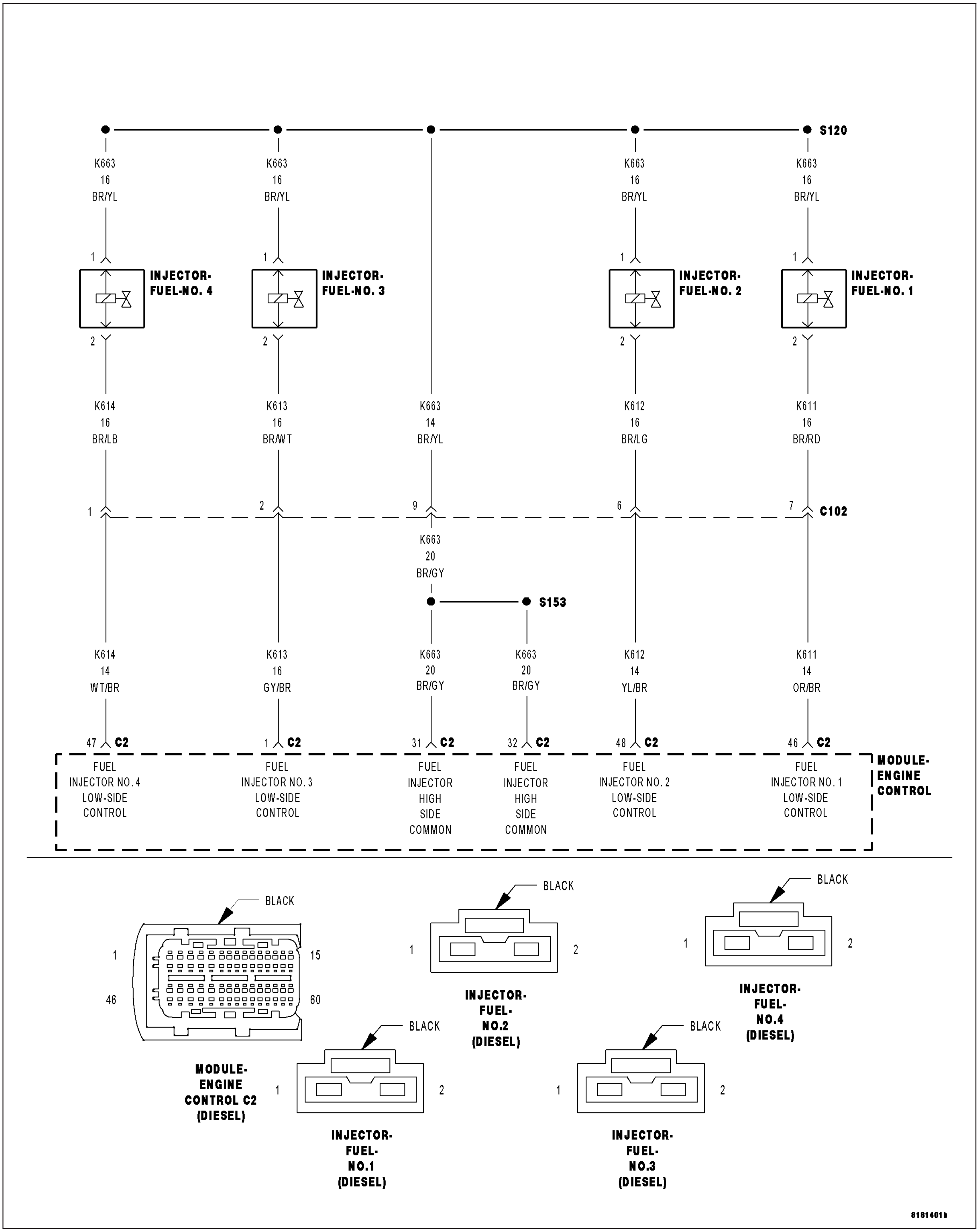
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0302-MISFIRE DETECTED CYLINDER #2



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #2.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

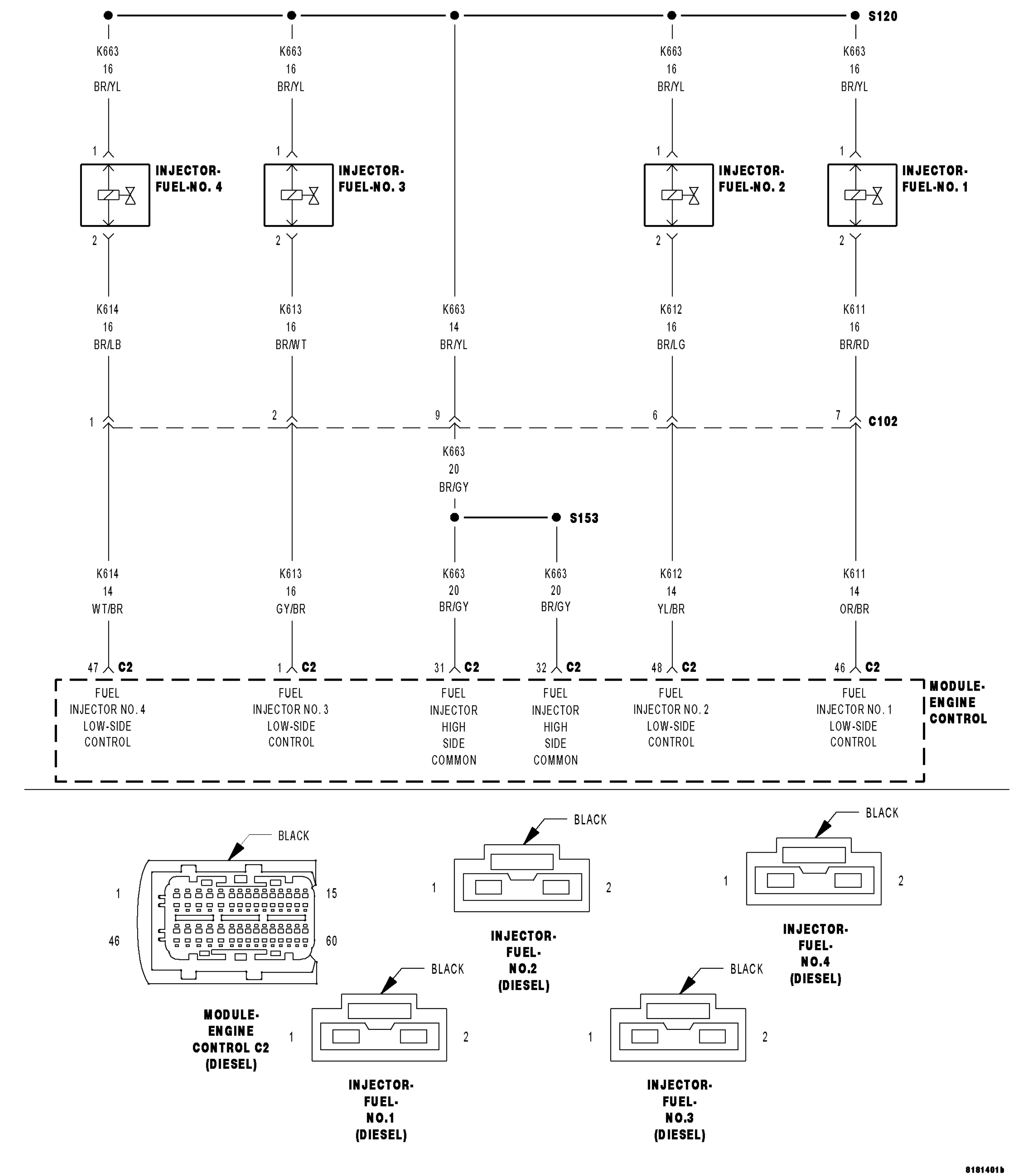
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0303-MISFIRE DETECTED CYLINDER #3



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #3.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

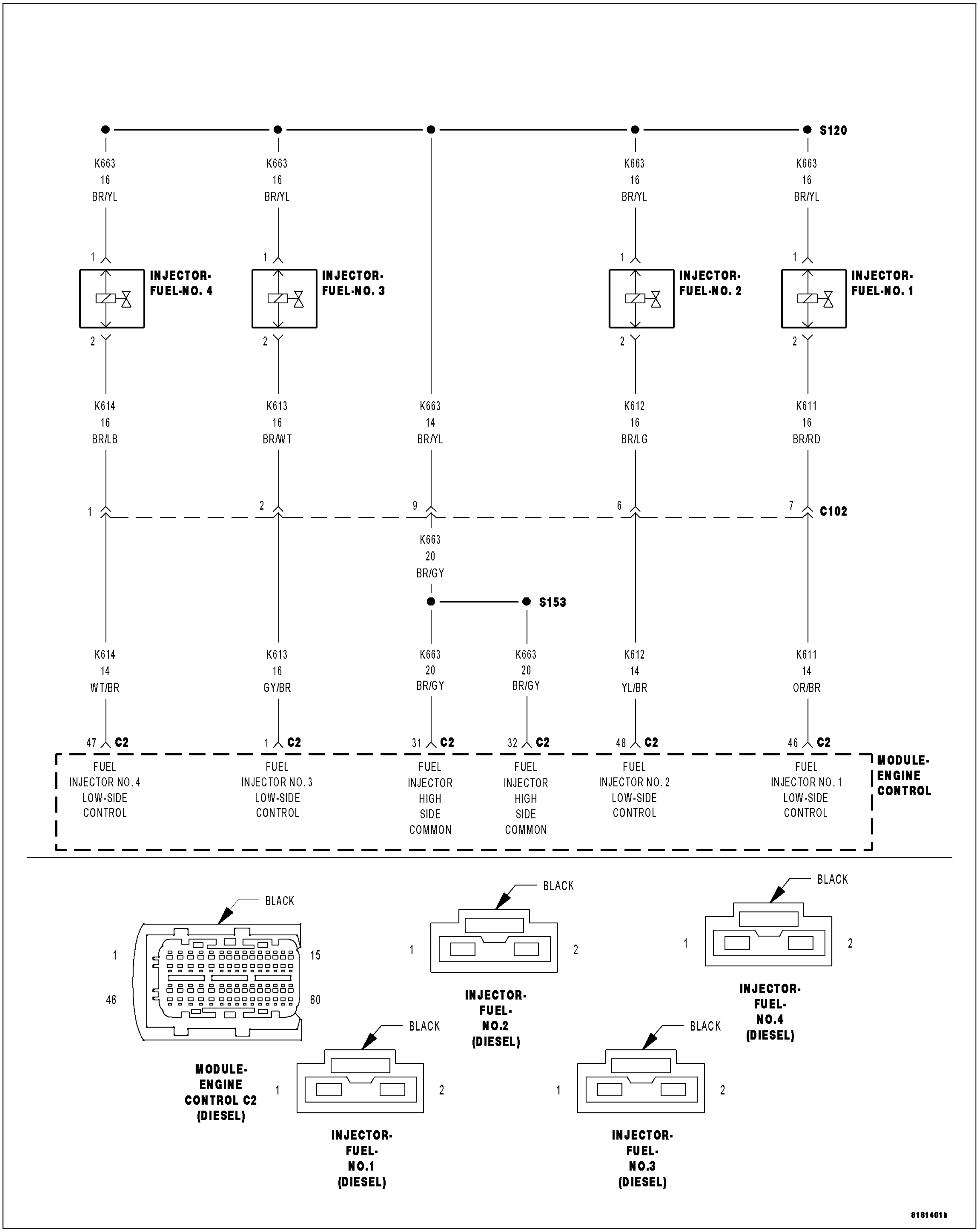
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0304-MISFIRE DETECTED CYLINDER #4



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects multiple misfires from cylinder #4.

Possible Causes
ENGINE COMPRESSION
FUEL INJECTOR QUANTITY
FUEL SUPPLY CONTAMINATION
INJECTOR LEAKAGE
INTERMITTENT CONDITION

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, erase ECM DTCs.

Test drive the vehicle and attempt to duplicate the problem.

With the scan tool, read ECM DTC's.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL CONTAMINATION

Refer to the Service Information and inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. ENGINE COMPRESSION

Ignition on, engine off.

Refer to the Service Information and perform the Cylinder Compression Test.

Is the cylinder compression within specification for all cylinders?

Yes >> Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. FUEL INJECTOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the ECM harness connectors.

Disconnect each Fuel Injector harness connector.

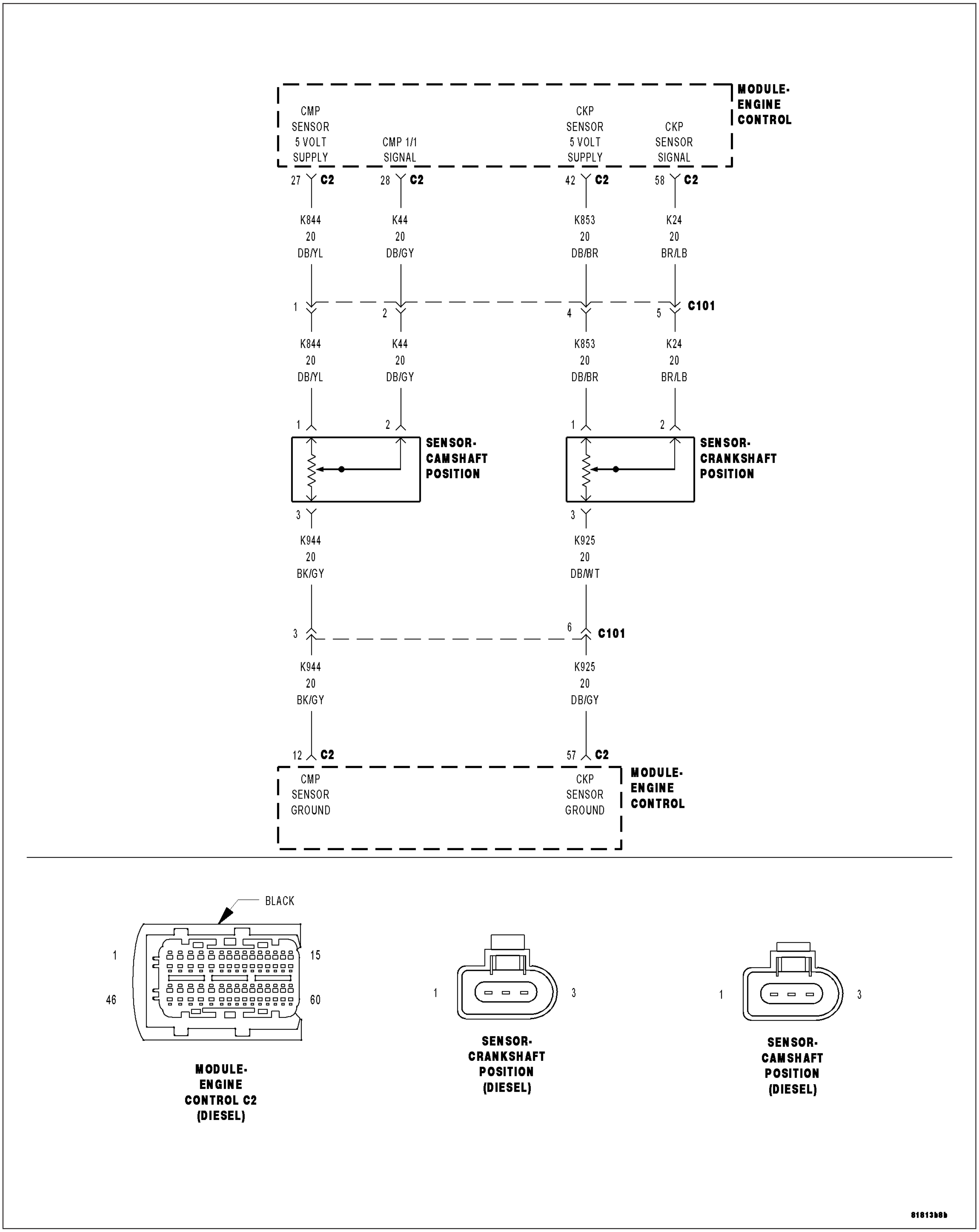
Measure the resistance of each of the Fuel Injector Control circuits between the Fuel Injector and ECM harness connectors.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Replace the Fuel Injector(s) as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the Fuel Injector circuit(s) that measured above 10.0 ohms for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running. Engine speed above 50 rpm. No Sensor Supply DTC's present.
- **Set Condition:**
  The Engine Control Module (ECM) does not receive a signal from the Crankshaft Position Sensor when the Camshaft Position Sensor indicates engine rpm.

Possible Causes
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT OPEN
(K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K925) CRANKSHAFT POSITION SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
CHECKING (K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT
DAMAGED CKP SENSOR OR CRANKSHAFT
ECM
(K925) CKP SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
(K24) CKP SENSOR SIGNAL CIRCUIT OPEN
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CRANKSHAFT POSITION SENSOR
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

NOTE: If DTC P0652 or P0653 is present with this DTC, diagnose DTCs P0652 or P0653 before diagnosing this DTC.

NOTE: The Timing Belt/Chain must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Attempt to start the engine cranking the engine for at least 7 seconds.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Go To 2

2. TEST DRIVE

With the scan tool, erase the ECM DTCs.

Test drive the vehicle.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

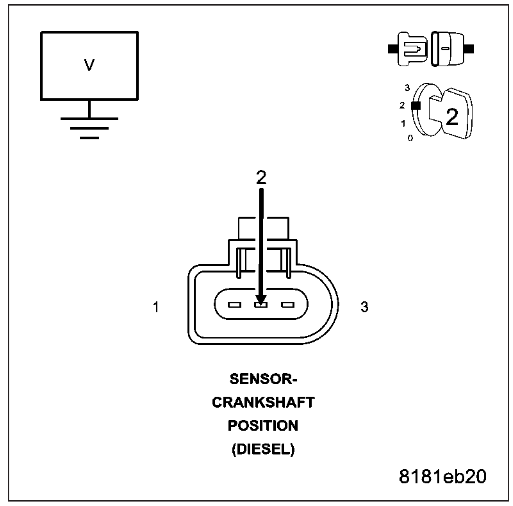
3. CHECKING (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Crankshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Sensor Signal circuit at the CKP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.
Go To 4

Voltage is between 4.7 and 5.4 volts.
Go To 5

Voltage is below 4.7 volts.
Go To 12

4. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the ECM harness connectors.

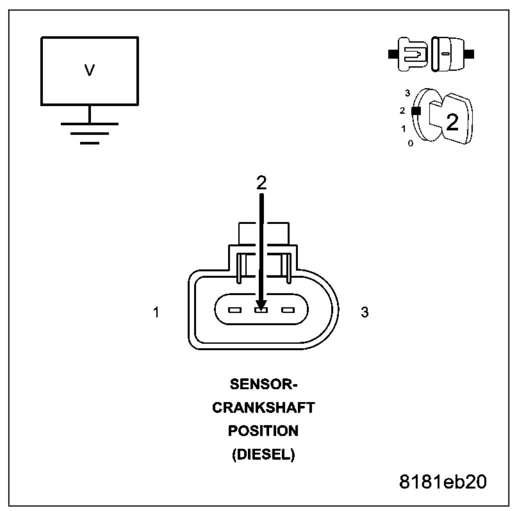
Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Sensor Signal circuit at the CKP Sensor harness connector.

Measure the voltage of the (K925) CKP Sensor Ground circuit at the CKP Sensor harness connector.



Is the voltage below 1.0 volt for each measurement?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

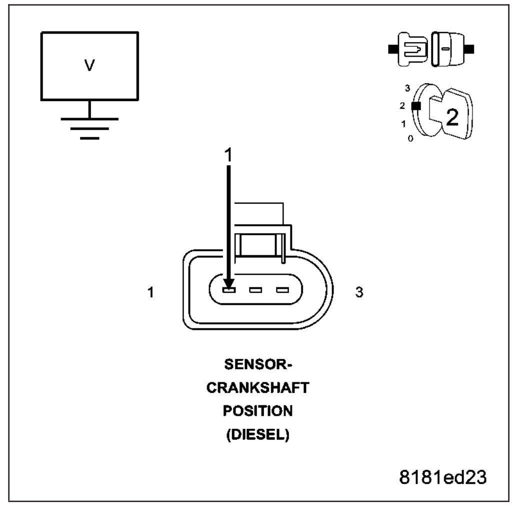
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the CKP Sensor circuit(s) that measured above 1.0 volt for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECKING (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT

Measure the voltage of the (K853) CKP Sensor 5-Volt Supply circuit at the CKP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.
Repair the (K853) CKP 5-Volt Supply circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Voltage is between 4.7 and 5.4 volts.
Go To 6

Voltage is below 4.7 volts.
Go To 9

6. (K925) CRANKSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

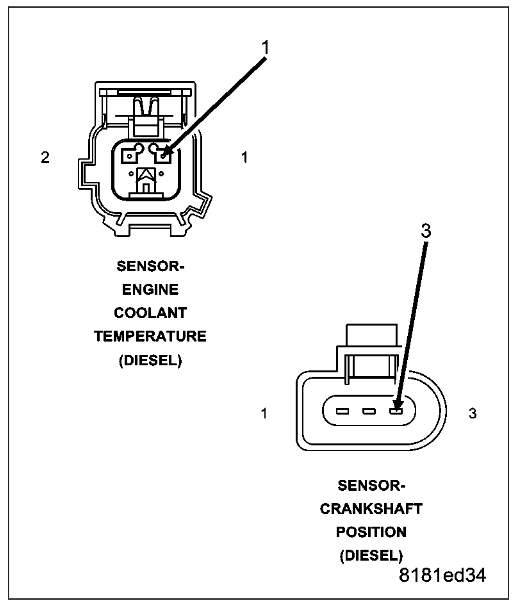
Turn the ignition off.

Connect one end of a jumper wire to the (K2) ECT Sensor signal circuit in the ECT Sensor harness connector.

Connect the other end of the jumper wire to the (K925) CKP Sensor Ground circuit in the Crankshaft Position Sensor harness connector.

Turn the ignition on.

With the scan tool in Engine, Sensors, read the Engine Coolant Temp volts.

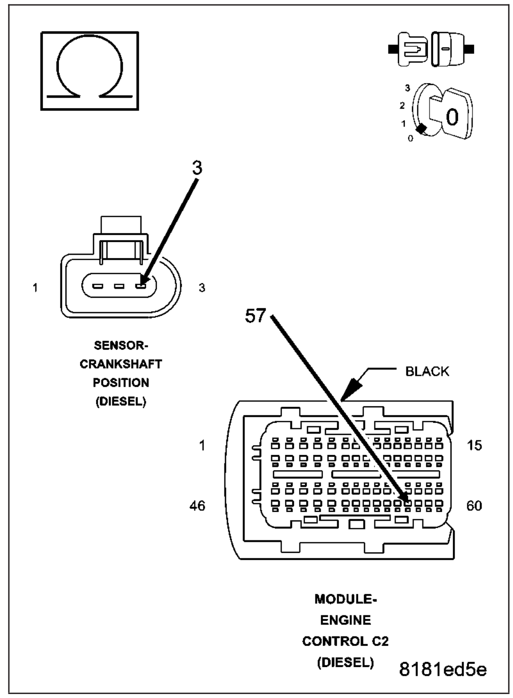


Is the voltage below 0.5 volt?

Yes >> Go To 8

No >> Go To 7

7. (K925) CRANKSHAFT POSITION SENSOR GROUND CIRCUIT OPEN



Turn the ignition off.

Disconnect the ECM harness connector.

Measure the resistance of the (K925) CKP Sensor Ground circuit between the CKP Sensor harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms?

Yes >> Replace and program the ECM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K925) CKP Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. DAMAGED CRANKSHAFT POSITION SENSOR OR CRANKSHAFT

Remove the CKP Sensor.

Inspect the CKP Sensor for conditions such as loose mounting screws, damage, or cracks.

Inspect the Crankshaft for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Crankshaft Position Sensor in accordance with the Service Information.

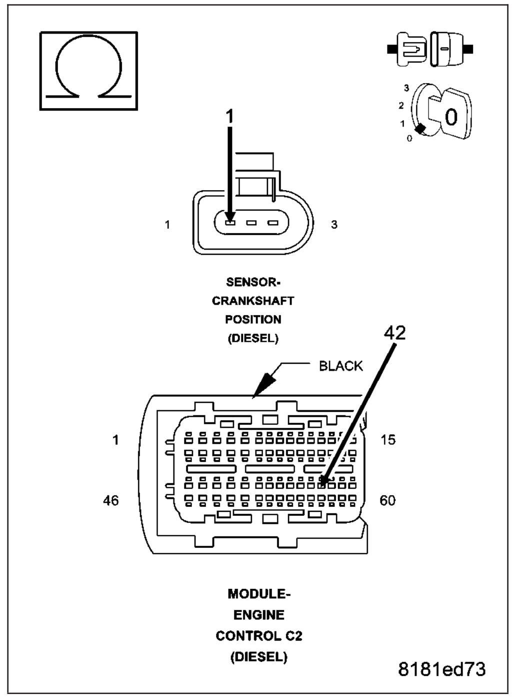
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the ECM harness connector.

Measure the resistance of the (K853) CKP Sensor 5-Volt Supply circuit between the ECM harness connector and the CKP Sensor harness connector.



Is the resistance below 10.0 ohms?

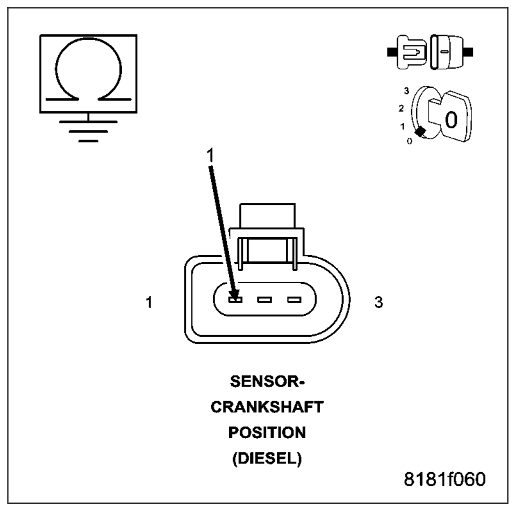
Yes >> Go To 10

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K853) CKP Sensor 5-Volt Supply circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

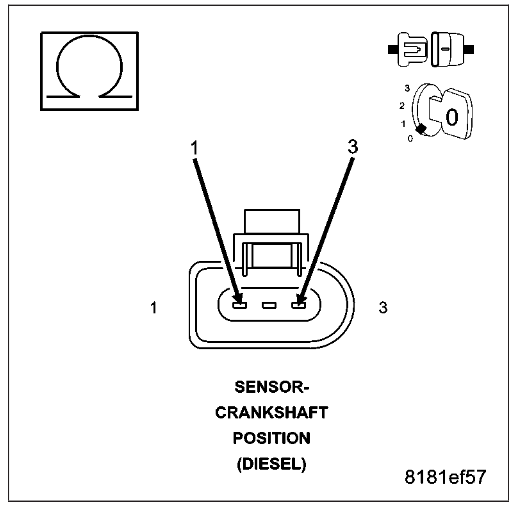
Yes >> Go To 11

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Measure the resistance between the (K853) CKP Sensor 5-Volt Supply circuit and the (K925) CKP Sensor Ground circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit and (K925) CKP Sensor Ground circuits for a short together.

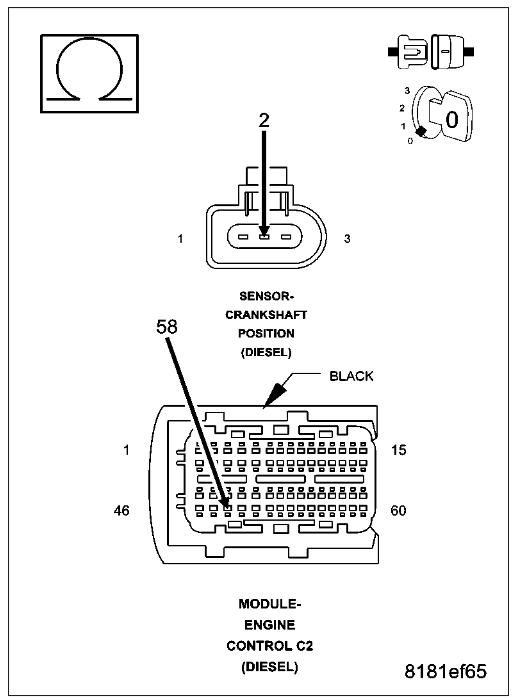
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

12. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off

Disconnect the ECM harness connector.

Measure the resistance of the (K24) CKP Sensor Signal circuit between the ECM harness connector and the CKP Sensor harness connector.



Is the resistance below 10.0 ohms?

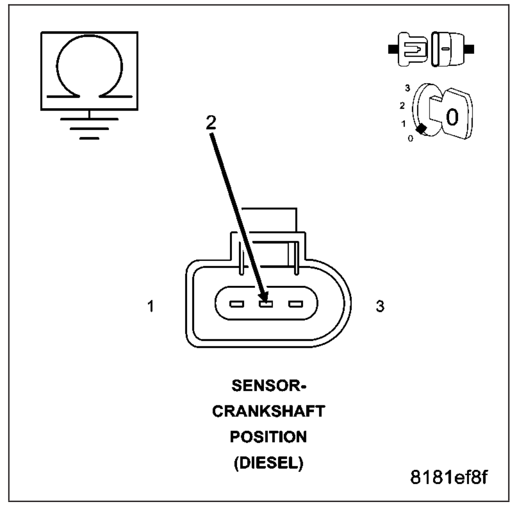
Yes >> Go To 13

No >> Repair the (K24) CKP Sensor Signal circuit for an open

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

13. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K24) CKP Sensor Signal circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

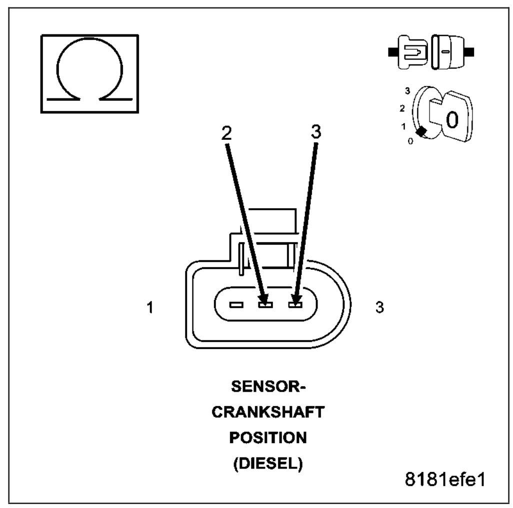
Yes >> Go To 14

No >> Repair the (K24) CKP Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

14. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Measure the resistance between the (K24) CKP Sensor Signal circuit and the (K925) CKP Sensor Ground circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

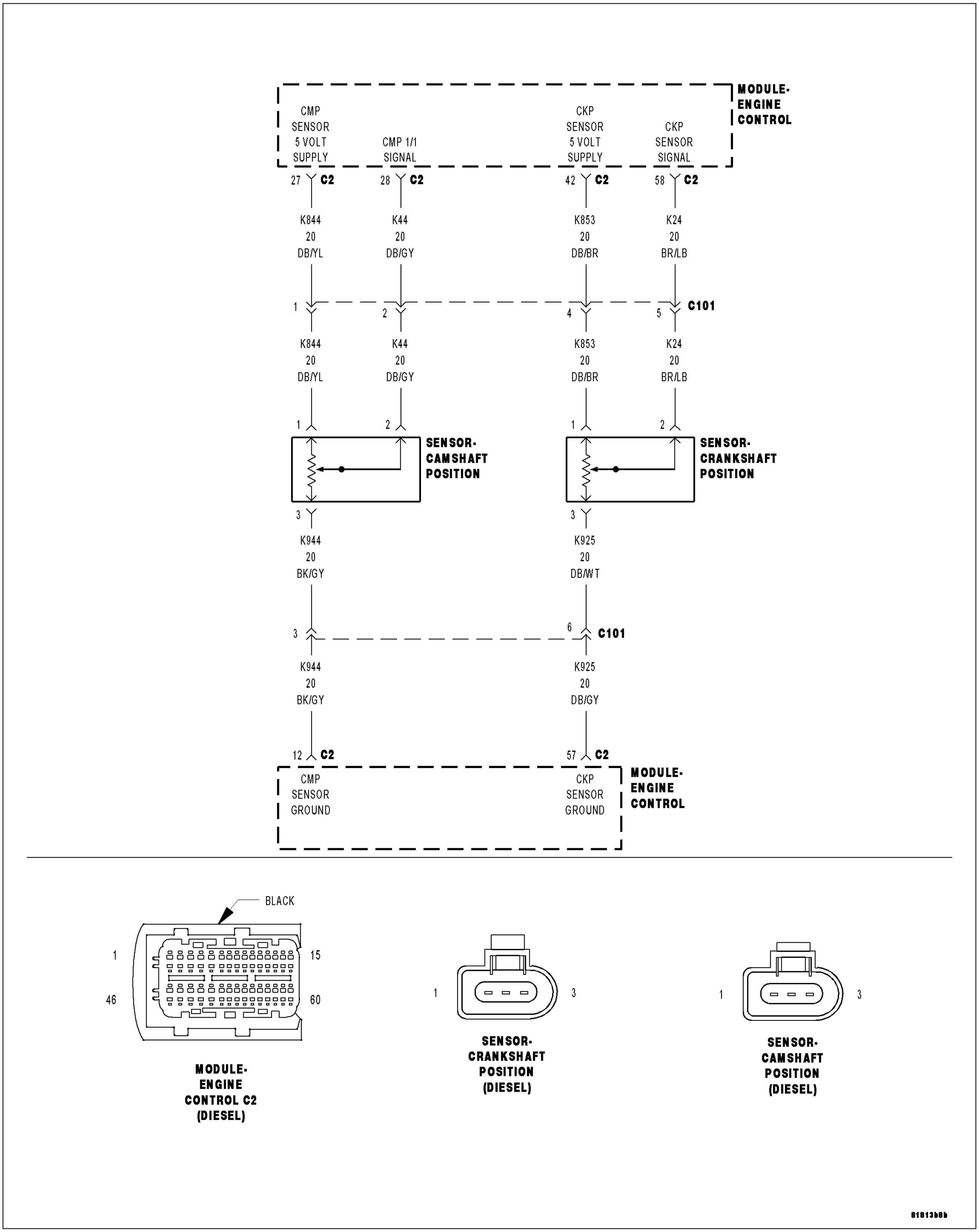
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K24) CKP Sensor Signal circuit and the (K925) CKP Sensor Ground circuit for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running. Engine speed above 50 rpm. No Sensor Supply DTC's present.
- **Set Condition:**
  The Engine Control Module (ECM) does not receive a signal from the Crankshaft Position Sensor when the Camshaft Position Sensor indicates engine rpm.

Possible Causes
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT OPEN
(K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CHECKING (K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT
DAMAGED CKP SENSOR OR CRANKSHAFT
ECM
(K925) CKP SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
(K24) CKP SENSOR SIGNAL CIRCUIT OPEN
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CRANKSHAFT POSITION SENSOR
(K853) CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT
(K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

NOTE: If DTC P0652 or P0653 is present with this DTC, diagnose DTCs P0652 or P0653 before diagnosing this DTC.

NOTE: The Timing Belt/Chain must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Attempt to start the engine cranking the engine for at least 7 seconds.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Go To 2

2. TEST DRIVE

With the scan tool, erase the ECM DTCs.

Test drive the vehicle.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

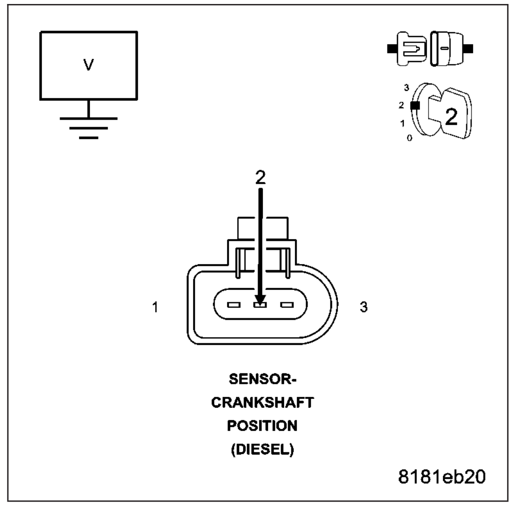
3. CHECKING (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Crankshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Sensor Signal circuit at the CKP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.
Go To 4

Voltage is between 4.7 and 5.4 volts.
Go To 5

Voltage is below 4.7 volts.
Go To 12

4. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

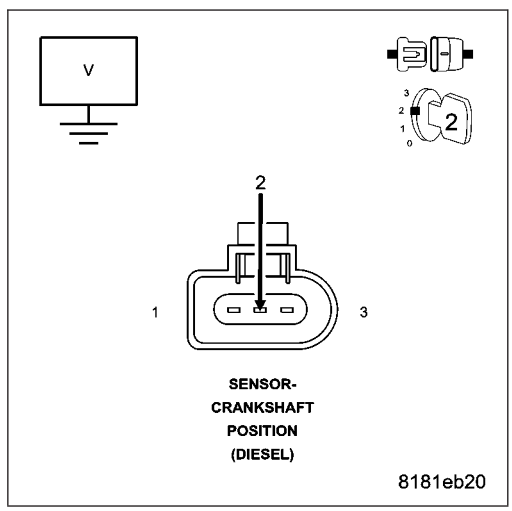
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K24) CKP Position Sensor Signal circuit at the CKP Sensor harness connector.



Is the voltage below 1.0 volt?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

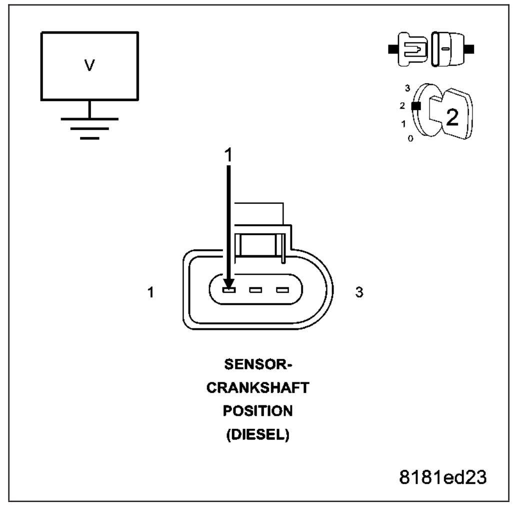
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K24) Crankshaft Position Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECKING (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT

Measure the voltage of the (K853) CKP Sensor 5-Volt Supply circuit at the CKP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.

Repair the (K853) CKP 5-Volt Supply circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Voltage is between 4.7 and 5.4 volts.

Go To 6

Voltage is below 4.7 volts.

Go To 9

6. (K925) CRANKSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

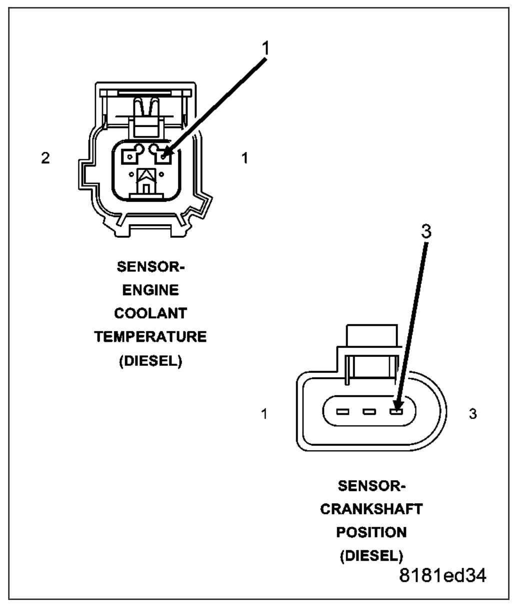
Disconnect the ECT Sensor harness connector.

Connect one end of a jumper wire to the (K2) ECT Sensor signal circuit in the ECT Sensor harness connector.

Connect the other end of the jumper wire to the (K925) CKP Sensor Ground circuit in the Crankshaft Position Sensor harness connector.

Turn the ignition on.

With the scan tool in Engine, Sensors, read the Engine Coolant Temp volts.



Is the voltage below 0.5 volt?

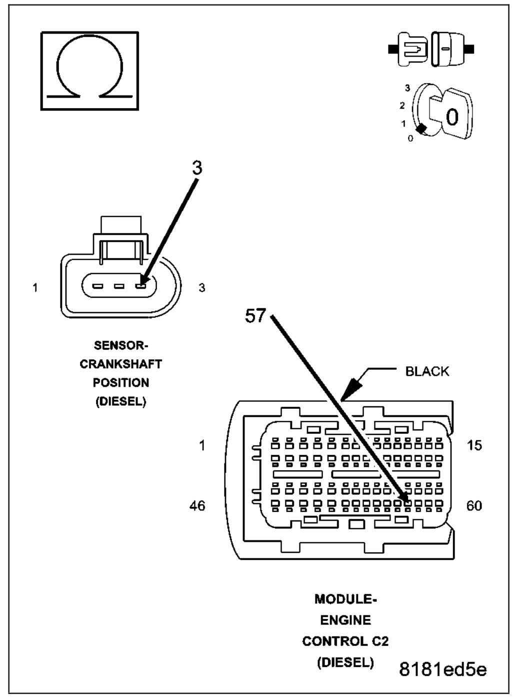
Yes >> Go To 8

No >> Go To 7

7. (K925) CRANKSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (K925) CKP Sensor Ground circuit between the CKP Sensor harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace and program the ECM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K925) CKP Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. DAMAGED CRANKSHAFT POSITION SENSOR OR CRANKSHAFT

Turn the ignition off.

Remove the CKP Sensor.

Inspect the CKP Sensor for conditions such as loose mounting screws, damage, or cracks.

Inspect the Crankshaft for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

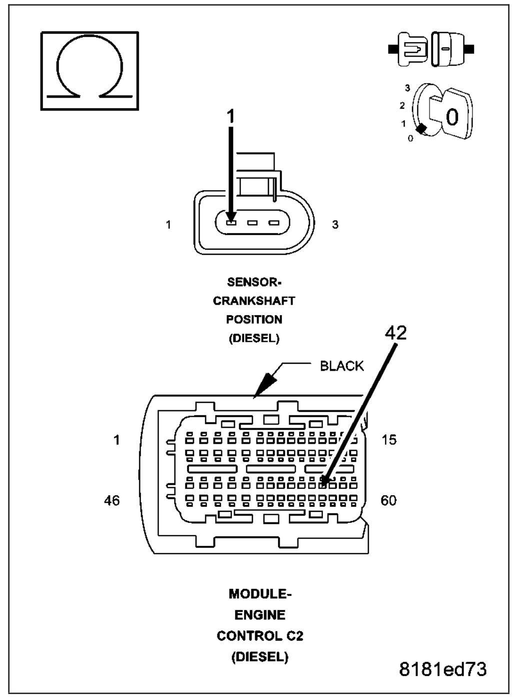
No >> Replace the Crankshaft Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (K853) CKP Sensor 5-Volt Supply circuit between the ECM harness connector and the CKP Sensor harness connector.



Is the resistance below 10.0 ohms?

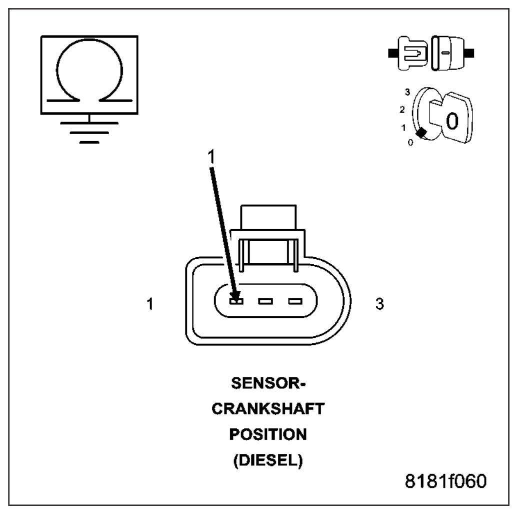
Yes >> Go To 10

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K853) CKP Sensor 5-Volt Supply circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

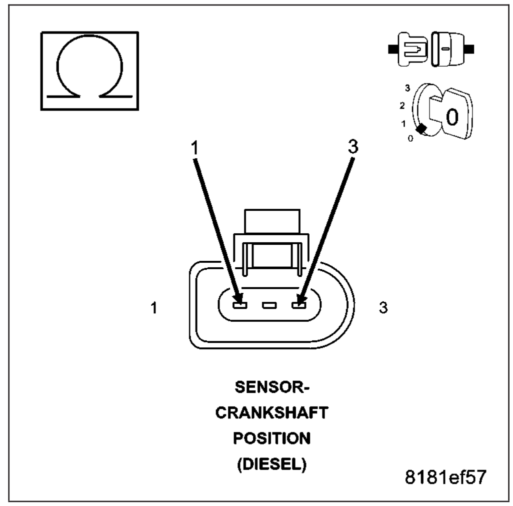
Yes >> Go To 11

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (K853) CRANKSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Measure the resistance between the (K853) CKP Sensor 5-Volt Supply circuit and the (K925) CKP Sensor Ground circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K853) CKP Sensor 5-Volt Supply circuit and (K925) CKP Sensor Ground circuits for a short together.

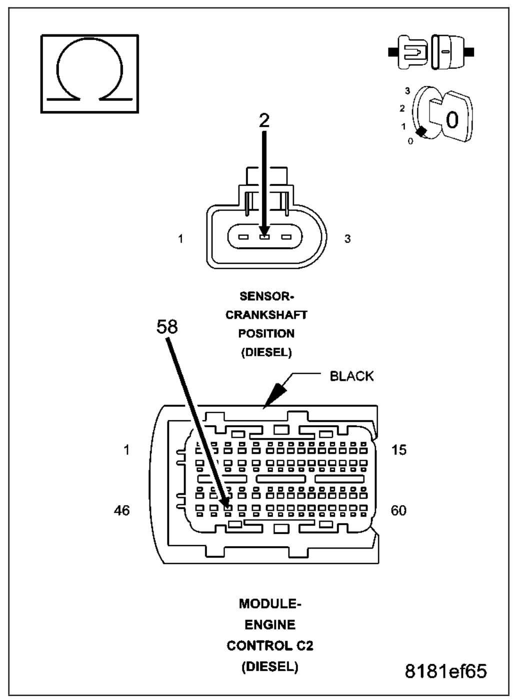
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

12. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the ECM harness connector.

Measure the resistance of the (K24) CKP Sensor Signal circuit between the ECM harness connector and the CKP Sensor harness connector.



Is the resistance below 10.0 ohms?

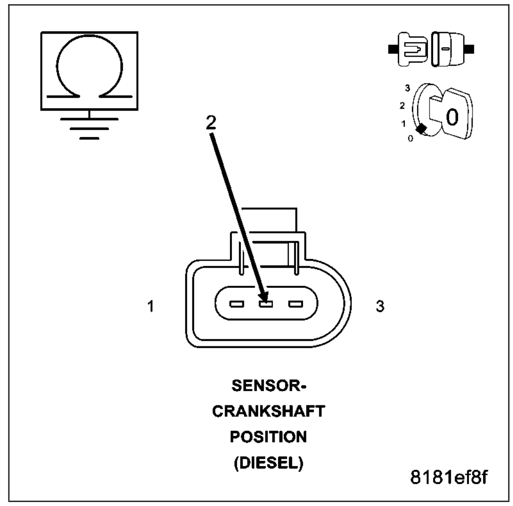
Yes >> Go To 13

No >> Repair the (K24) CKP Sensor Signal circuit for an open

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

13. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K24) CKP Sensor Signal circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

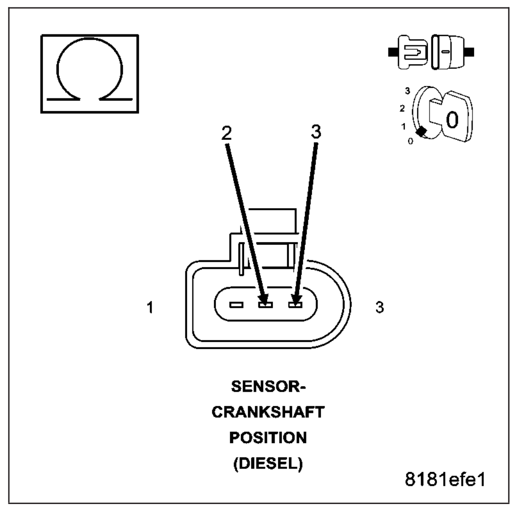
Yes >> Go To 14

No >> Repair the (K24) CKP Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

14. (K24) CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K925) CKP SENSOR GROUND CIRCUIT

Measure the resistance between the (K24) CKP Sensor Signal circuit and the (K925) CKP Sensor Ground circuit at the CKP Sensor harness connector.



Is the resistance above 1000 ohms?

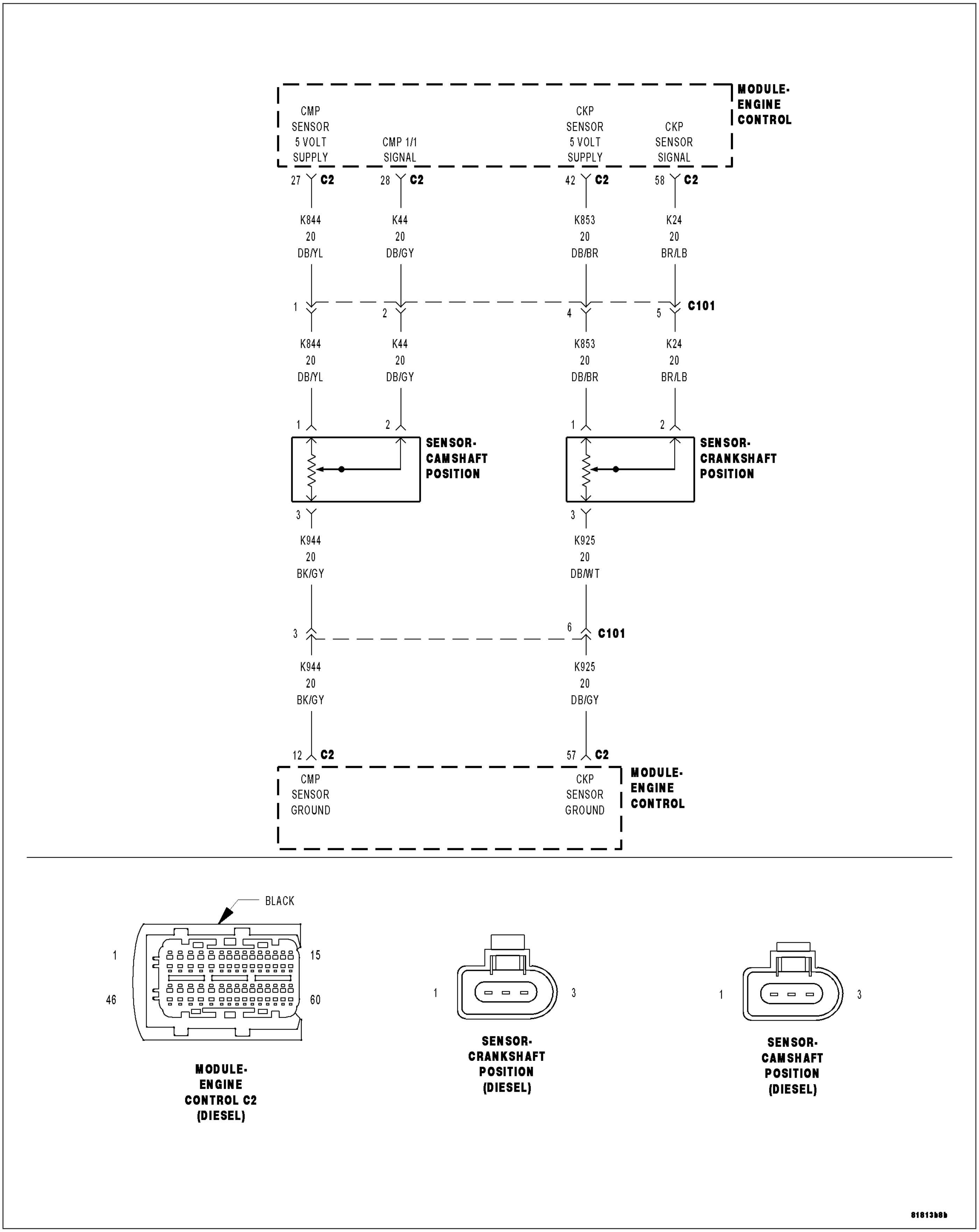
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K24) CKP Sensor Signal circuit and the (K925) CKP Sensor Ground circuit for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0340-CAMSHAFT POSITION SENSOR CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running. Engine speed above 50 rpm. No Sensor Supply DTC's present.
- **Set Condition:**
  The Engine Control Module (ECM) does not receive a signal from the Camshaft Position Sensor when the Crankshaft Position Sensor indicates engine rpm.

Possible Causes
(K844) CMP 5-VOLT SUPPLY CIRCUIT OPEN
(K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
CHECKING (K844) CMP 5-VOLT SUPPLY CIRCUIT
DAMAGED CMP SENSOR OR CAMSHAFT
ECM
(K944) CMP SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
(K44) CMP SENSOR SIGNAL CIRCUIT OPEN
(K844) CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CAMSHAFT POSITION SENSOR
(K844) CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

NOTE: If DTC P0642 or P0643 is present with this DTC, diagnose DTCs P0642 or P0643 before diagnosing this DTC.

NOTE: The Timing Belt/Chain must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Attempt to start the engine cranking the engine for at least 7 seconds.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Go To 2

2. TEST DRIVE

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Test drive the vehicle.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

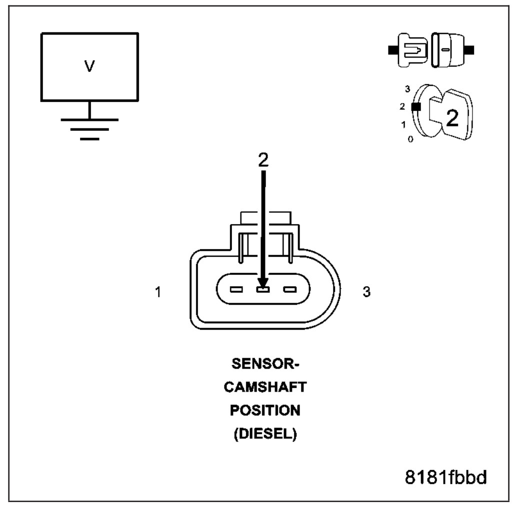
3. CHECKING (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Camshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.
Go To 4

Voltage is between 4.7 and 5.4 volts.
Go To 5

Voltage is below 4.7 volts.
Go To 12

4. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the ECM harness connectors.

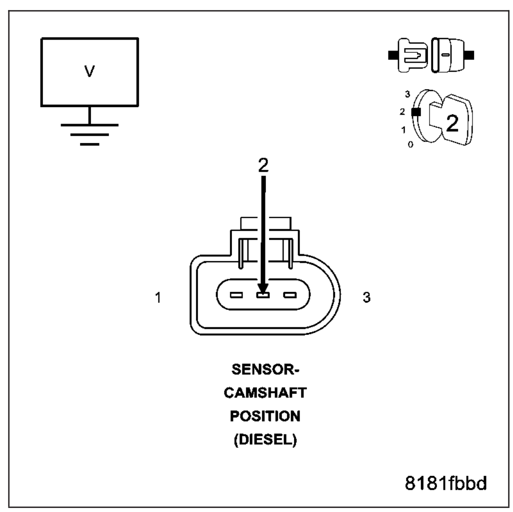
Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP Position Sensor Signal circuit at the CMP Sensor harness connector.

Measure the voltage of the (K944) CMP Position Sensor Ground circuit at the CMP Sensor harness connector.



Is the voltage below 1.0 volt for each measurement?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

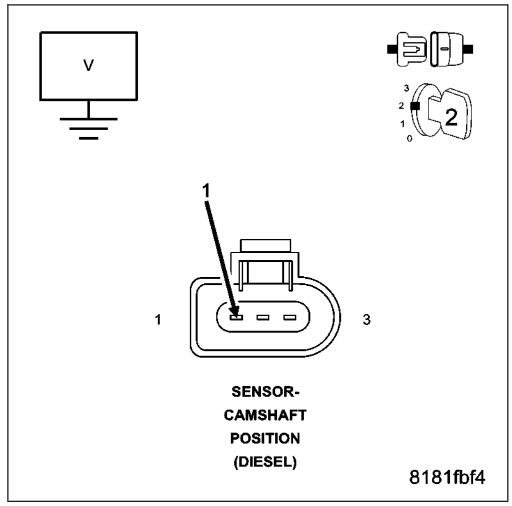
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the CKP Sensor circuit(s) that measured above 1.0 volt for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECKING (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT

Measure the voltage of the (K844) CMP Sensor 5-Volt Supply circuit at the CMP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.

Repair the (K844) CMP 5-Volt Supply circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Voltage is between 4.7 and 5.4 volts.

Go To 6

Voltage is below 4.7 volts.

Go To 9

6. (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

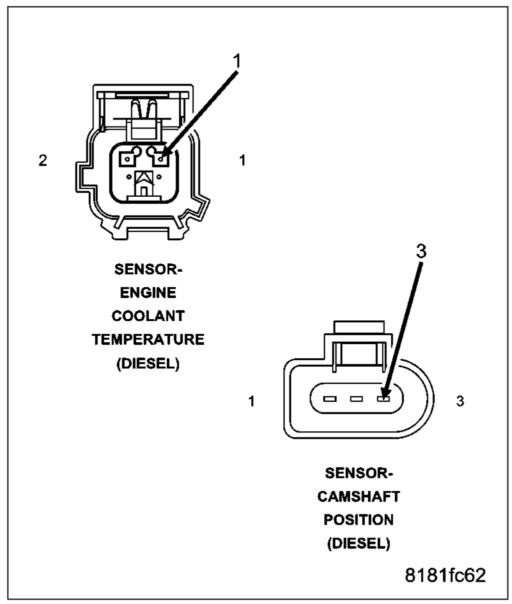
Turn the ignition on.

Disconnect the ECT Sensor harness connector.

Connect one end of a jumper wire to the (K2) ECT Sensor signal circuit in the ECT Sensor harness connector.

Connect the other end of the jumper wire to the (K944) CMP Sensor Ground circuit in the Camshaft Position Sensor harness connector.

With the scan tool in Engine, Sensors, read the Engine Coolant Temp volts.



Is the voltage below 0.5 volt?

Yes >> Go To 8

No >> Go To 7

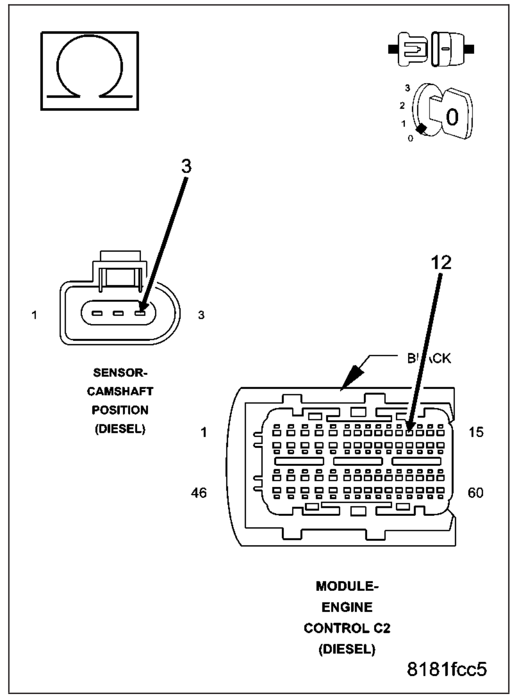
7. (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K944) CMP Sensor Ground circuit between the CMP Sensor harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace and program the ECM in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K944) CMP Sensor Ground circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. DAMAGED CAMSHAFT POSITION SENSOR OR CAMSHAFT

Turn the ignition off.

Remove the CMP Sensor.

Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks.

Inspect the camshaft for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

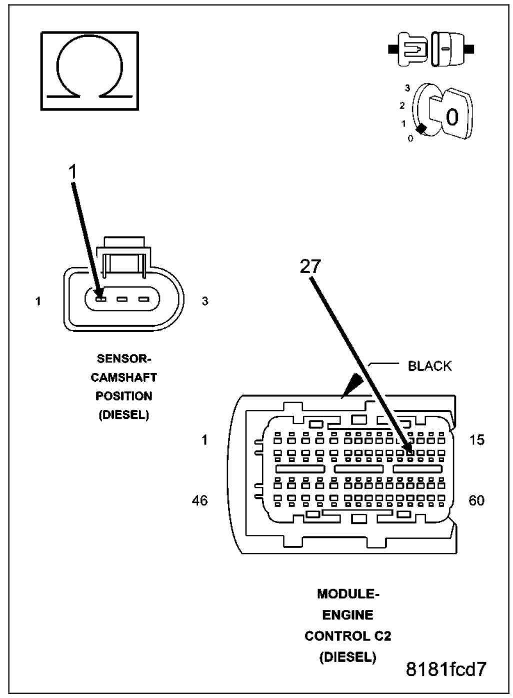
No >> Replace the Camshaft Position Sensor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance of the (K844) CMP 5-Volt Supply circuit between the ECM harness connector and the CMP Sensor harness connector.



Is the resistance below 10.0 ohms?

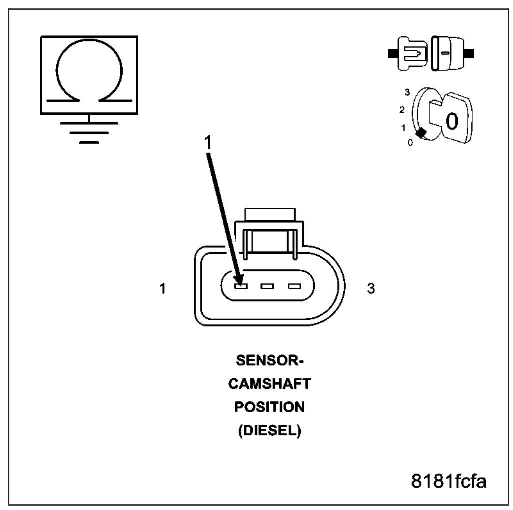
Yes >> Go To 10

No >> Repair the (K844) CMP 5-Volt Supply circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K844) CMP Sensor 5-Volt Supply circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

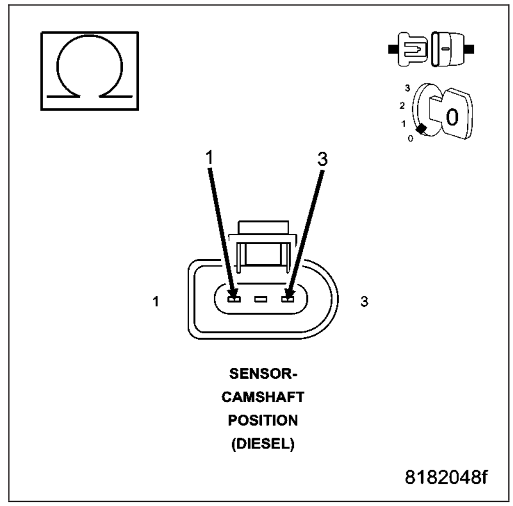
Yes >> Go To 11

No >> Repair the (K844) CMP Sensor 5-Volt Supply circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT

Measure the resistance between the (K844) CMP Sensor 5-Volt Supply circuit and the (K944) CMP Sensor Ground circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K844) CMP Sensor 5-Volt Supply circuit and (K944) CMP Sensor Ground circuits for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

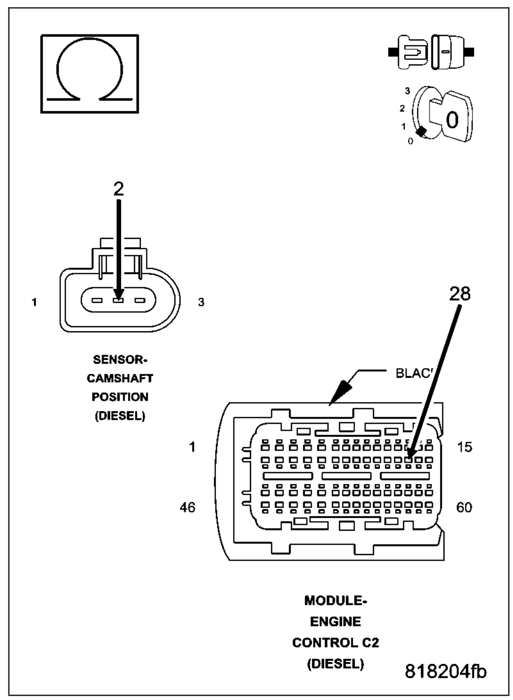
12. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K44) CMP Sensor Signal circuit between the ECM harness connector and the CMP Sensor harness connector.



Is the resistance below 10.0 ohms?

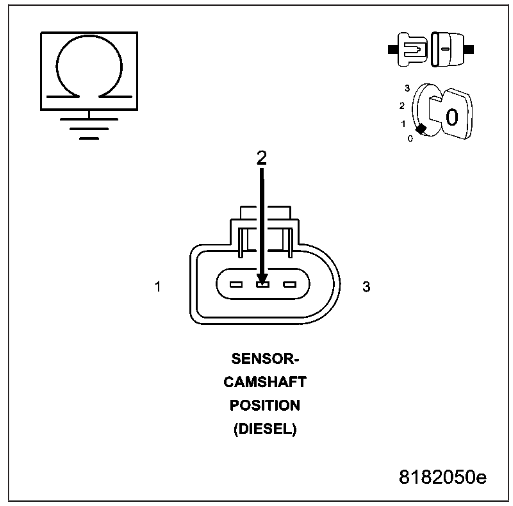
Yes >> Go To 13

No >> Repair the (K44) CMP Sensor Signal circuit for an open

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

13. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

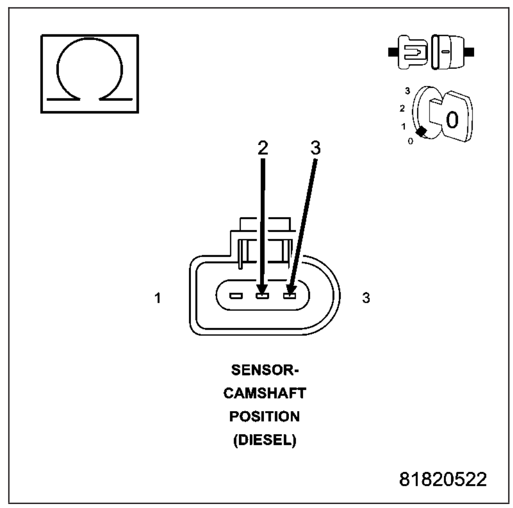
Yes >> Go To 14

No >> Repair the (K44) CMP Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

14. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT

Measure the resistance between the (K44) CMP Sensor Signal circuit and the (K944) CMP Sensor Ground circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

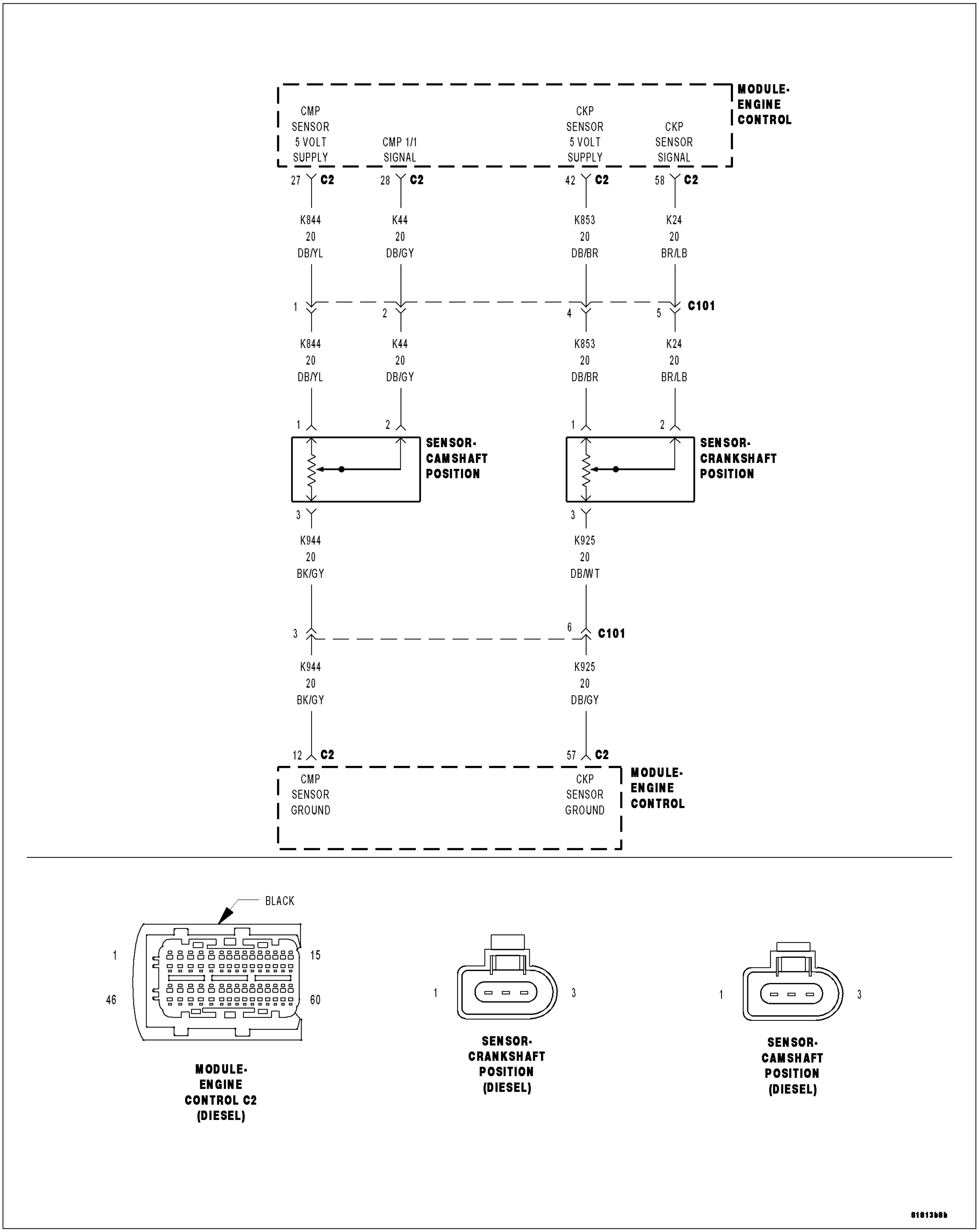
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K44) CMP Sensor Signal circuit and the (K944) CMP Sensor Ground circuit for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT — BANK 1 SENSOR 1



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine cranking or running. Engine speed above 50 rpm. No Sensor Supply DTC's present.
- **Set Condition:**
  The Engine Control Module (ECM) does not receive a signal from the Camshaft Position Sensor when the Crankshaft Position Sensor indicates engine rpm.

Possible Causes
(K844) CMP 5-VOLT SUPPLY CIRCUIT OPEN
(K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CHECKING (K844) CMP 5-VOLT SUPPLY CIRCUIT
DAMAGED CMP SENSOR OR CAMSHAFT
ECM
(K944) CMP SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
(K44) CMP SENSOR SIGNAL CIRCUIT OPEN
(K844) CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CAMSHAFT POSITION SENSOR
(K844) CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT
(K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

NOTE: If DTC P0642 or P0643 is present with this DTC, diagnose DTCs P0642 or P0643 before diagnosing this DTC.

NOTE: The Timing Belt/Chain must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Attempt to start the engine cranking the engine for at least 7 seconds.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Go To 2

2. TEST DRIVE

Turn the ignition on.

With the scan tool, erase the ECM DTCs.

Test drive the vehicle.

With the scan tool, read the ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go To 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

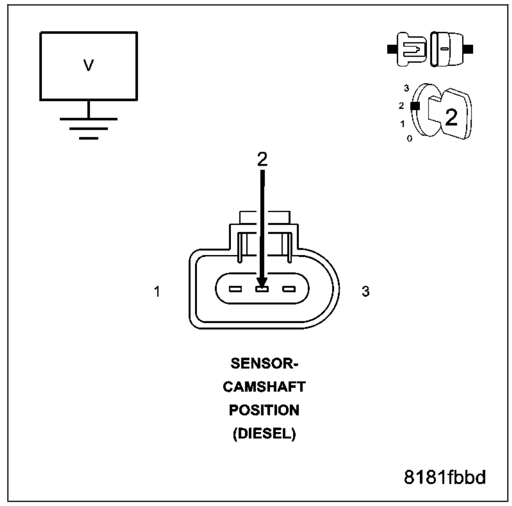
3. CHECKING (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the Camshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.



Select the appropriate voltage reading.

Voltage is above 5.4 volts.
Go To 4

Voltage is between 4.7 and 5.4 volts.
Go To 5

Voltage is below 4.7 volts.
Go To 12

4. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

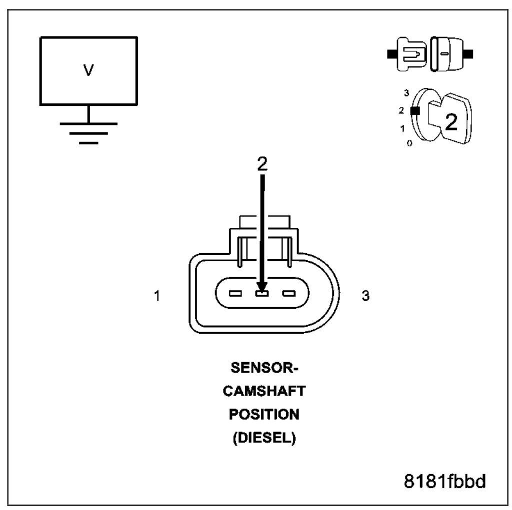
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K44) CMP Position Sensor Signal circuit at the CMP Sensor harness connector.



Is the voltage below 1.0 volt?

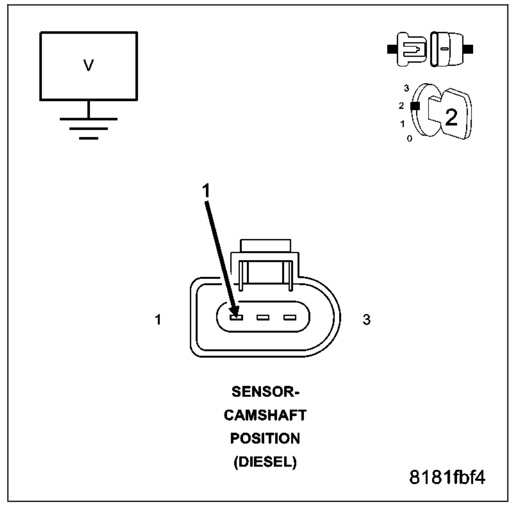
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K44) Camshaft Position Sensor Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECKING (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT



Measure the voltage of the (K844) CMP Sensor 5-Volt Supply circuit at the CMP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.4 volts.

Repair the (K844) CMP 5-Volt Supply circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

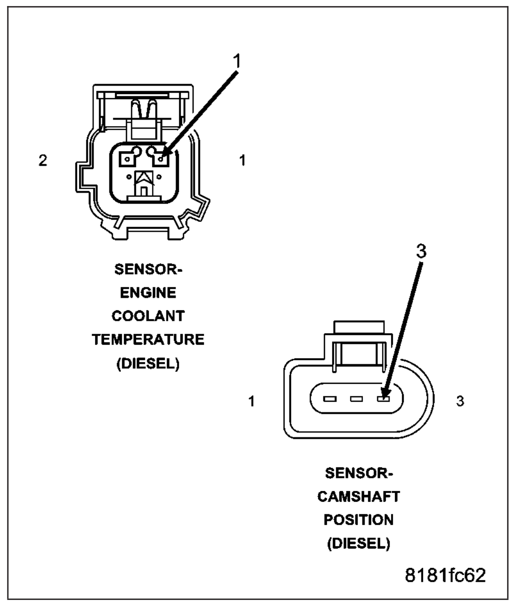
Voltage is between 4.7 and 5.4 volts.

Go To 6

Voltage is below 4.7 volts.

Go To 9

6. (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT OPEN



Turn the ignition off.

Disconnect the ECT Sensor harness connector.

Connect one end of a jumper wire to the (K2) ECT Sensor signal circuit in the ECT Sensor harness connector.

Connect the other end of the jumper wire to the (K944) CMP Sensor Ground circuit in the Camshaft Position Sensor harness connector.

Turn the ignition on.

With the scan tool in Engine, Sensors, read the Engine Coolant Temp volts.

Is the voltage below 0.5 volt?

Yes >> Go To 8

No >> Go To 7

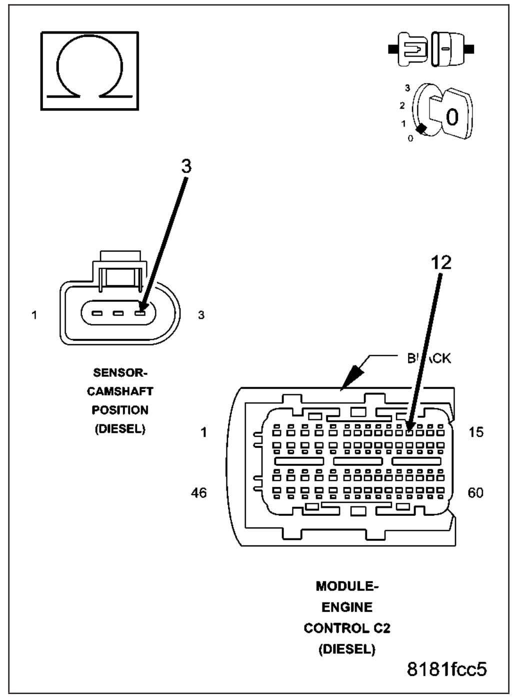
7. (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K944) CMP Sensor Ground circuit between the CMP Sensor harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace and program the ECM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K944) CMP Sensor Ground circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. DAMAGED CAMSHAFT POSITION SENSOR OR CAMSHAFT

Turn the ignition off.

Remove the CMP Sensor.

Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks.

Inspect the camshaft for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

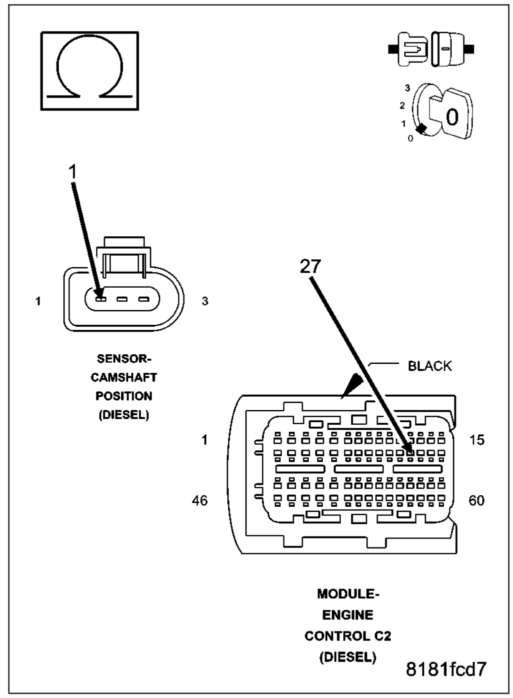
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Camshaft Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT OPEN



Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance of the (K844) CMP 5-Volt Supply circuit between the ECM harness connector and the CMP Sensor harness connector.

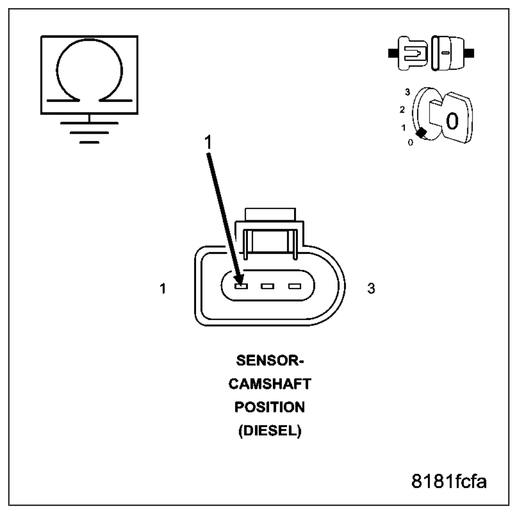
Is the resistance below 10.0 ohms?

Yes >> Go To 10

No >> Repair the (K844) CMP 5-Volt Supply circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (K844) CMP Sensor 5-Volt Supply circuit at the CMP Sensor harness connector.

Is the resistance above 1000 ohms?

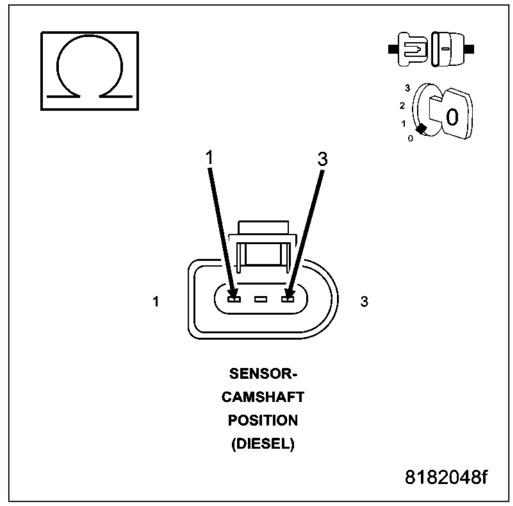
Yes >> Go To 11

No >> Repair the (K844) CMP Sensor 5-Volt Supply circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT

Measure the resistance between the (K844) CMP Sensor 5-Volt Supply circuit and the (K944) CMP Sensor Ground circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K844) CMP Sensor 5-Volt Supply Circuit and (K944) CMP Sensor Ground circuits for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

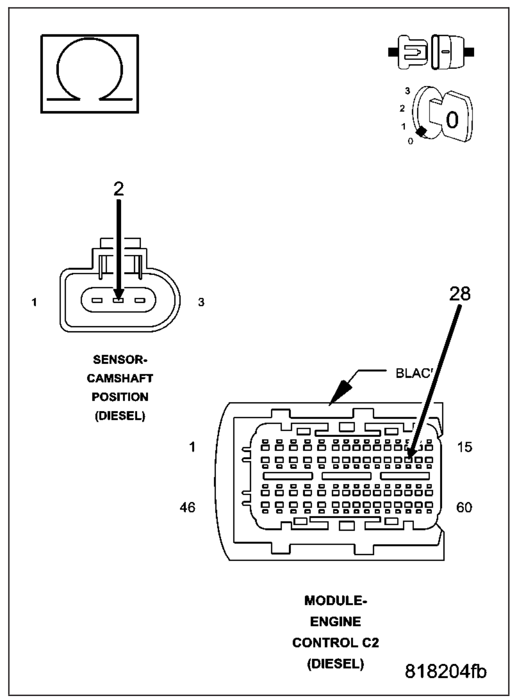
12. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K44) CMP Sensor Signal circuit between the ECM harness connector and the CMP Sensor harness connector.



Is the resistance below 10.0 ohms?

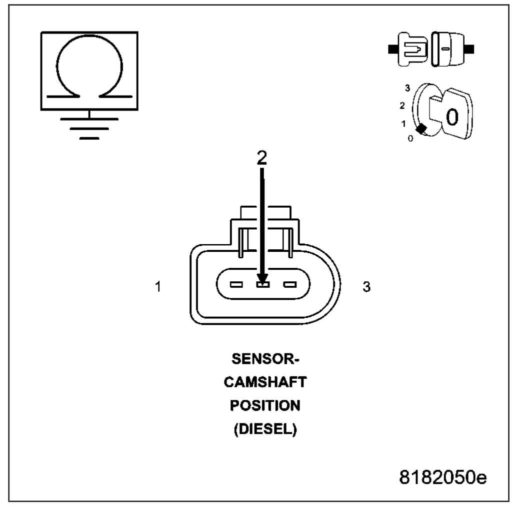
Yes >> Go To 13

No >> Repair the (K44) CMP Sensor Signal circuit for an open

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

13. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

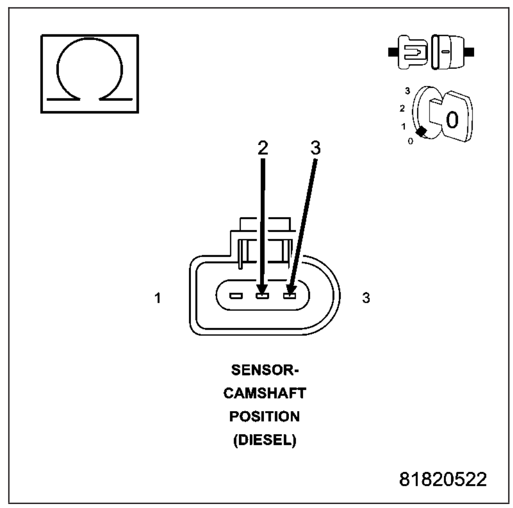
Yes >> Go To 14

No >> Repair the (K44) CMP Sensor Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

14. (K44) CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) CAMSHAFT POSITION SENSOR GROUND CIRCUIT

Measure the resistance between the (K44) CMP Sensor Signal circuit and the (K944) CMP Sensor Ground circuit at the CMP Sensor harness connector.



Is the resistance above 1000 ohms?

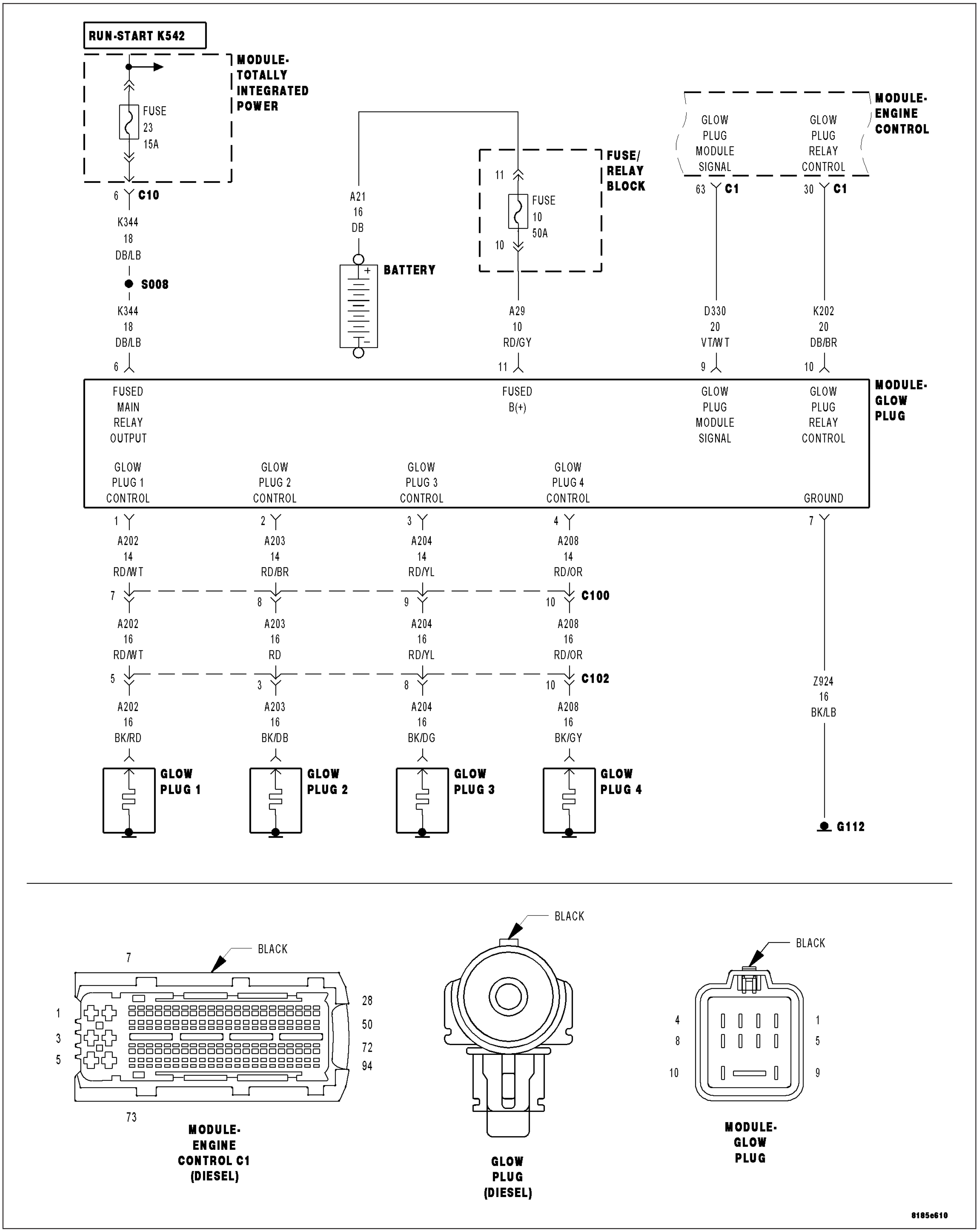
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K44) CMP Sensor Signal circuit and the (K944) CMP Sensor Ground circuit for a short together.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0383-GLOW PLUG CONTROL MODULE CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects an open or short to ground on the (K202) Glow Plug Module Control circuit for 0.5 second.

Possible Causes
INTERMITTENT DTC
(K202) GLOW PLUG MODULE CONTROL CIRCUIT SHORTED TO GROUND
(K202) GLOW PLUG MODULE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GLOW PLUG MODULE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Glow Plugs.

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

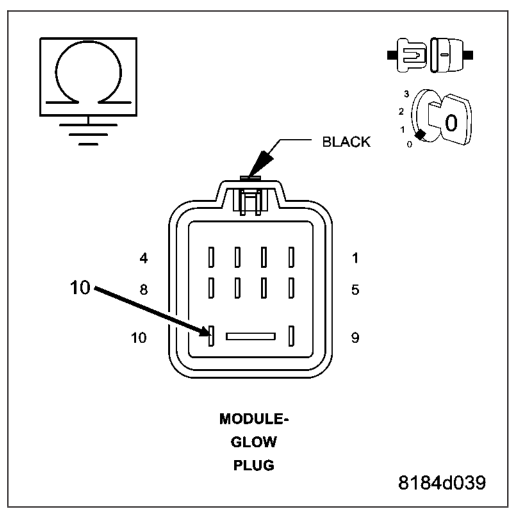
2. (K202) GLOW PLUG MODULE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Glow Plug Module harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K202) Glow Plug Module Control circuit in the Glow Plug Module harness connector.



Is the resistance below 1000.0 ohms?

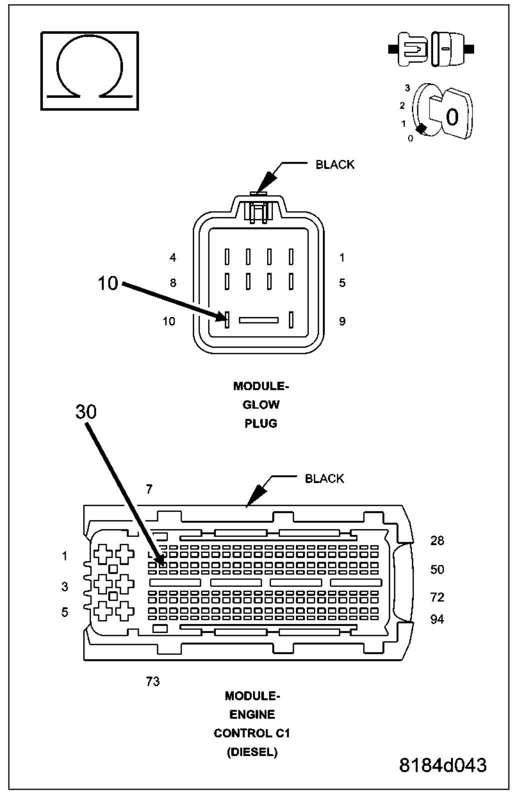
Yes >> Repair the (K202) Glow Plug Module Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K202) GLOW PLUG MODULE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K202) Glow Plug Module Control circuit between the Glow Plug Module harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace the Glow Plug Control Module.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K202) Glow Plug Module Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0401- EGR SYSTEM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects and EGR flow problem for 8.0 seconds

Possible Causes
INTERMITTENT CONDITION
EGR VALVE
INTAKE OR EXHAUST SYSTEM PROBLEM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

With the scan tool, erase ECM DTC's

Test drive the vehicle.

With the scan tool, read ECM DTC's

Did this DTC set again?

Yes >> Refer to symptom CHECKING THE EGR SYSTEM for further diagnosis.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0402- EGR EXCESSIVE FLOW DETECTED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects an EGR flow problem for 8.0 seconds

Possible Causes
INTERMITTENT CONDITION
EGR VALVE
INTAKE OR EXHAUST SYSTEM PROBLEM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. VERIFY ACTIVE DTC

With the scan tool, erase ECM DTC's

Test drive the vehicle.

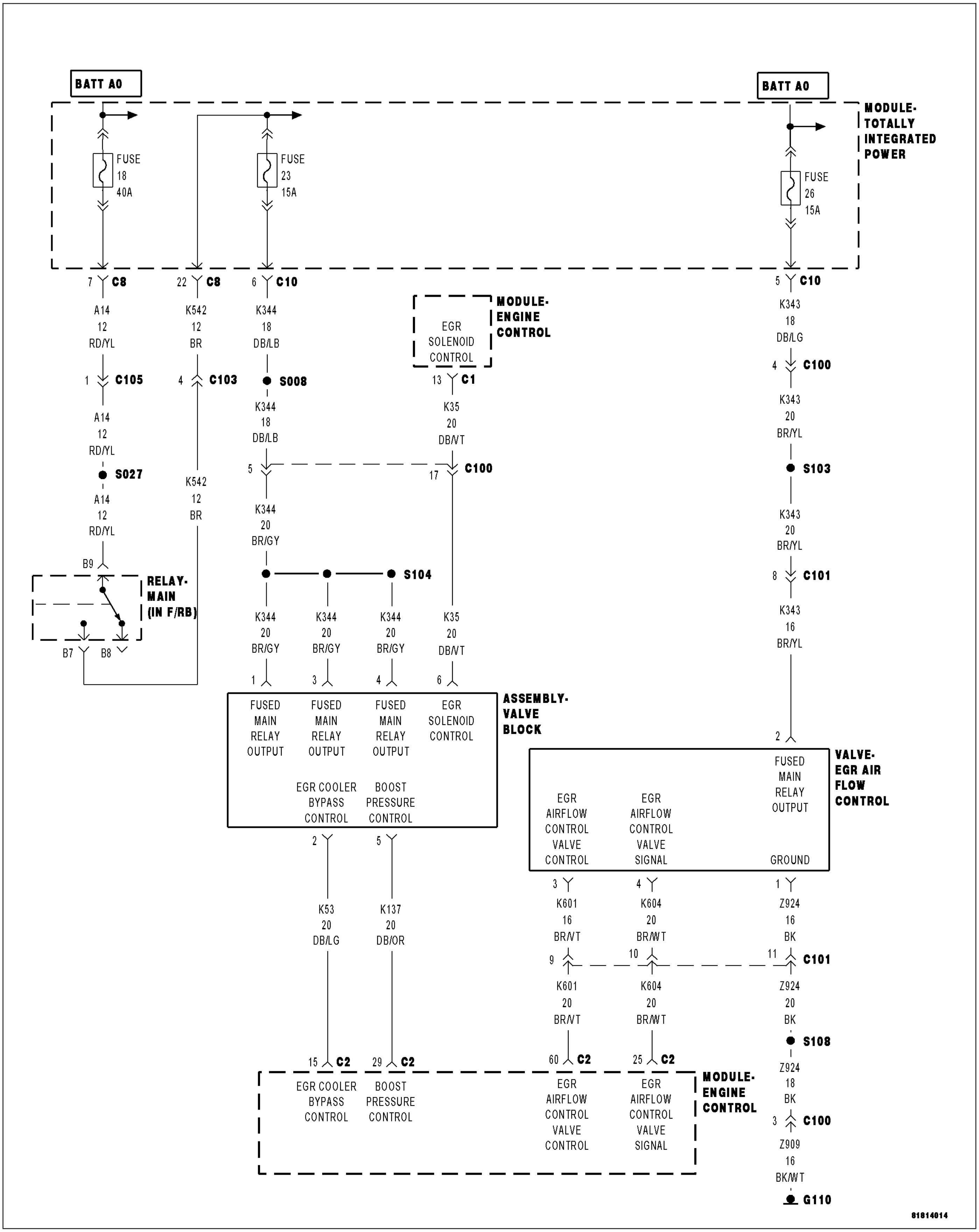
With the scan tool, read ECM DTC's

Did this DTC set again?

Yes >> Refer to symptom CHECKING THE EGR SYSTEM for further diagnosis.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0403-EGR SOLENOID CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the EGR Solenoid command off.
- **Set Condition:**
  The ECM does not detect voltage on the (K35) EGR Solenoid Control circuit for 2.0 seconds.

Possible Causes
INTERMITTENT DTC
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
EGR VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Exhaust Gas Recirc Positioner.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

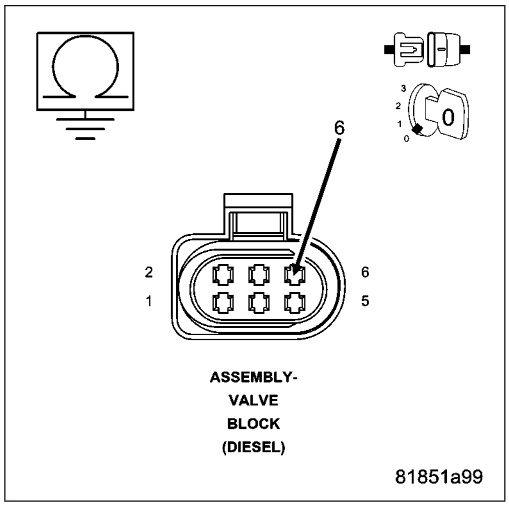
2. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Disconnect the Engine Control Module (ECM) connector.

Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.



Is the resistance above 1000 ohms?

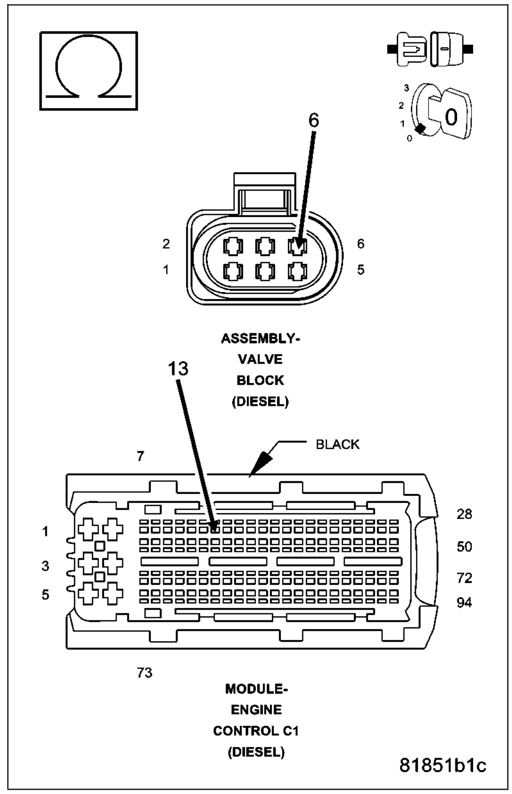
Yes >> Go to 3

No >> Repair the (K35) EGR Solenoid Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K35) EGR Solenoid Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (K35) EGR Solenoid Control circuit for an open circuit or high resistance.

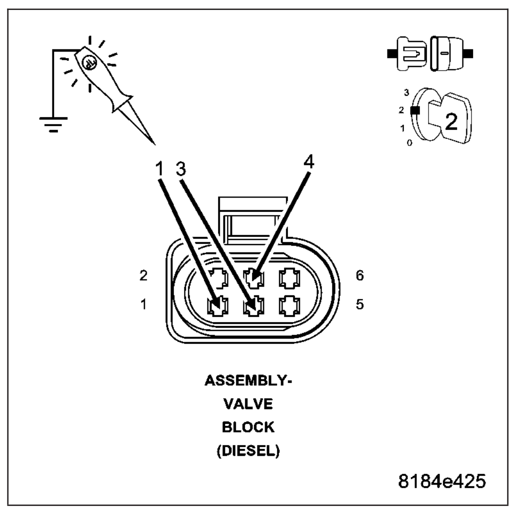
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Connect the Engine Control Module (ECM) connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Outputs circuit at the Valve Block Assembly harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright for each circuit?

Yes >> Go to 5

No >> Repair the (K344) Fused Main Relay Output circuit(s) for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. EGR VALVE

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Exhaust Gas Recirc Positioner to 100%.

Using a 12 volt test light connected to 12 volts, check the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright?

Yes >> Replace the EGR Valve in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

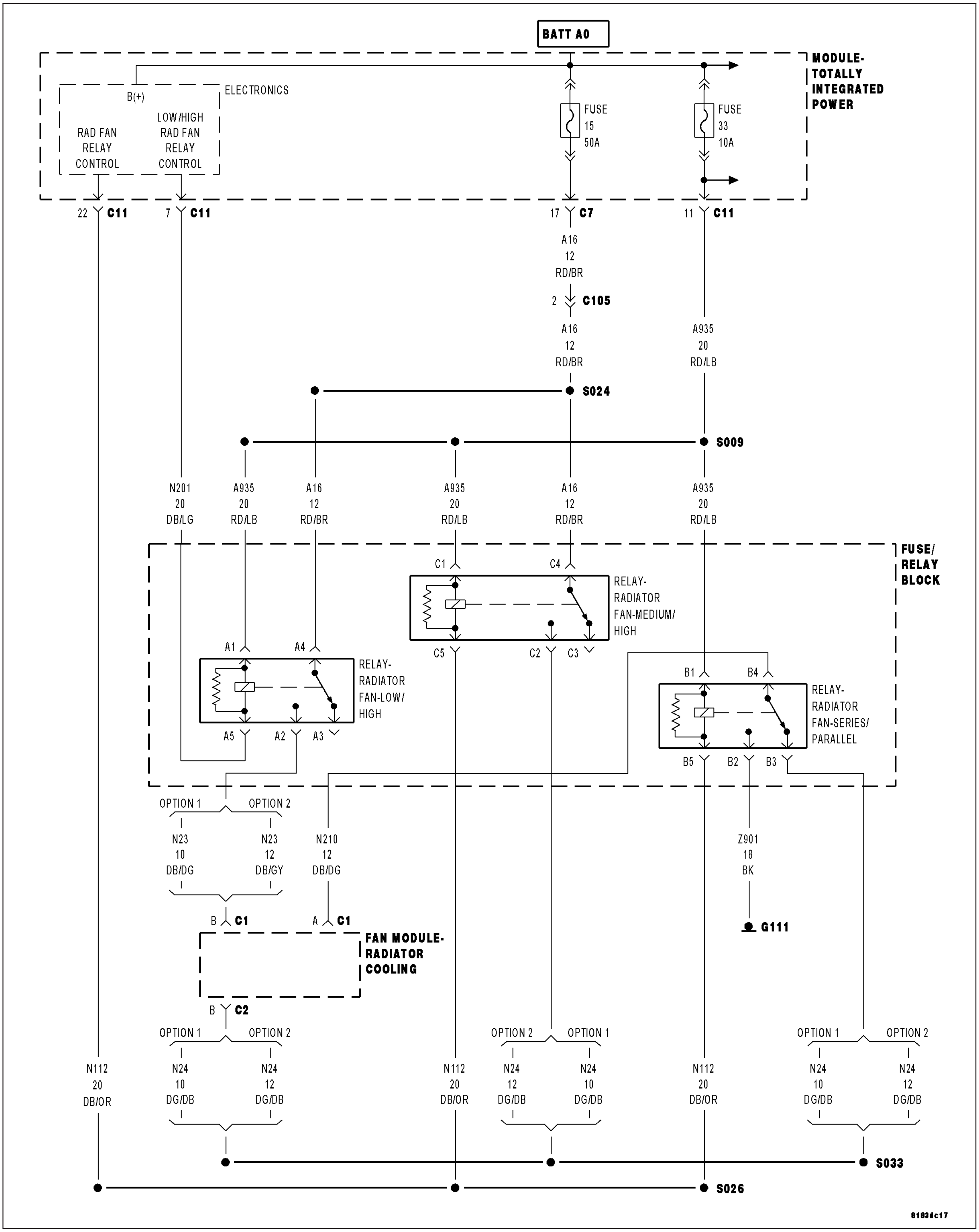
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0480-COOLING FAN 1 CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  The ECM receives a CAN Bus message from the TIPM indicating an open or shorted circuit on the Radiator Fan Relay Control circuit.

Possible Causes
(A935) FUSED (B+) FEED CIRCUIT
(N112) RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT
(N201) LOW/HIGH RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT OPEN
(N201) LOW/HIGH RADIATOR FAN CONTROL RELAY CIRCUIT SHORT TO GROUND
RADIATOR FAN CONTROL RELAY
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. RADIATOR FAN CONTROL RELAY OPERATION

NOTE: When actuating the radiator fan relays, the Radiator Fan(s) may have a delay in operation and ramp up slowly.

Ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #1 Control State to actuate the Radiator Fan Control Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

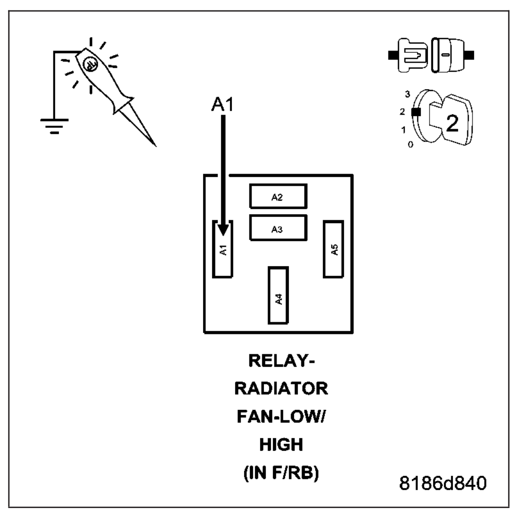
2. (A935) FUSED B+ CIRCUIT

Turn the ignition off.

Remove the Radiator Fan Control Relay #1.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Radiator Fan Control Relay #1 connector.



Is the voltage above 11.0 volts?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A935) Fused B+ circuit. Inspect the related fuse and repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

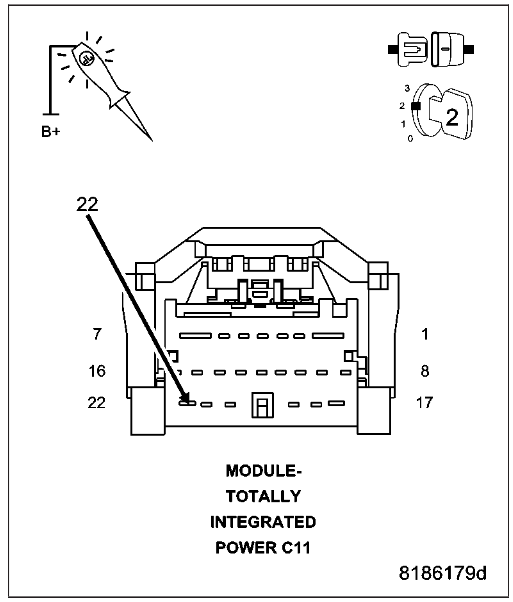
3. (N112) RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT

Disconnect the TIPM C-11 harness connector.

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #1 Control State, Toggle, to actuate the Radiator Fan Control Relay.

Using a 12–volt test light connected to battery voltage, probe the (N112) Radiator Control Relay Control circuit in the TIPM C-11 harness connector.



Does the test light illuminate and flash on and off?

Yes >> Replace the Radiator Fan Control Relay.

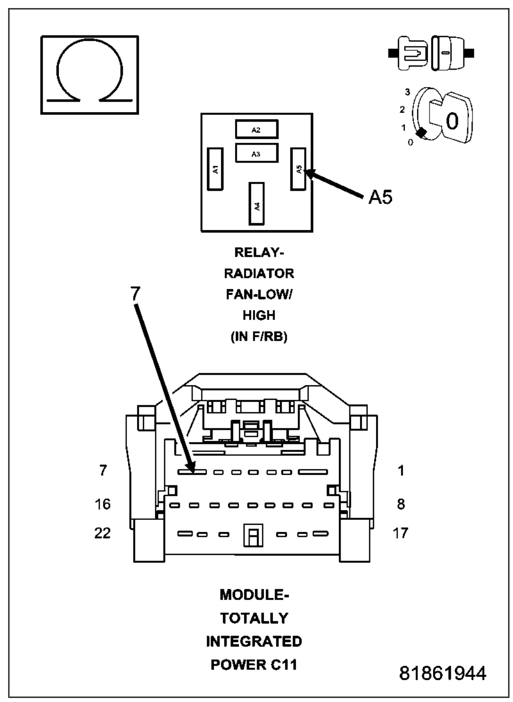
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 4

4. (N201) LOW/HIGH RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (N201) Low/High Radiator Fan Control Relay Control circuit between the Rad Fan Control Relay #1 connector and the TIPM C11 harness connector.



Is the resistance below 10.0 ohms?

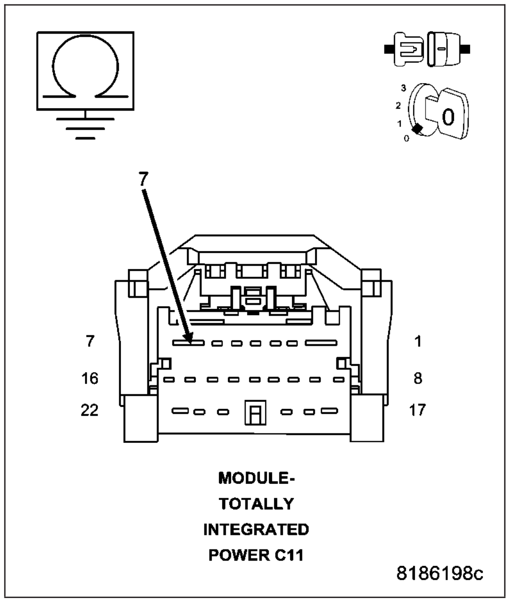
Yes >> Go To 5

No >> Replace the PDM in accordance with the Service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

5. (N201) LOW/HIGH RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N201) Low/High Radiator Fan Control Relay #1 Control circuit at the TIPM C11 harness connection.



Is the resistance below 1000 ohms?

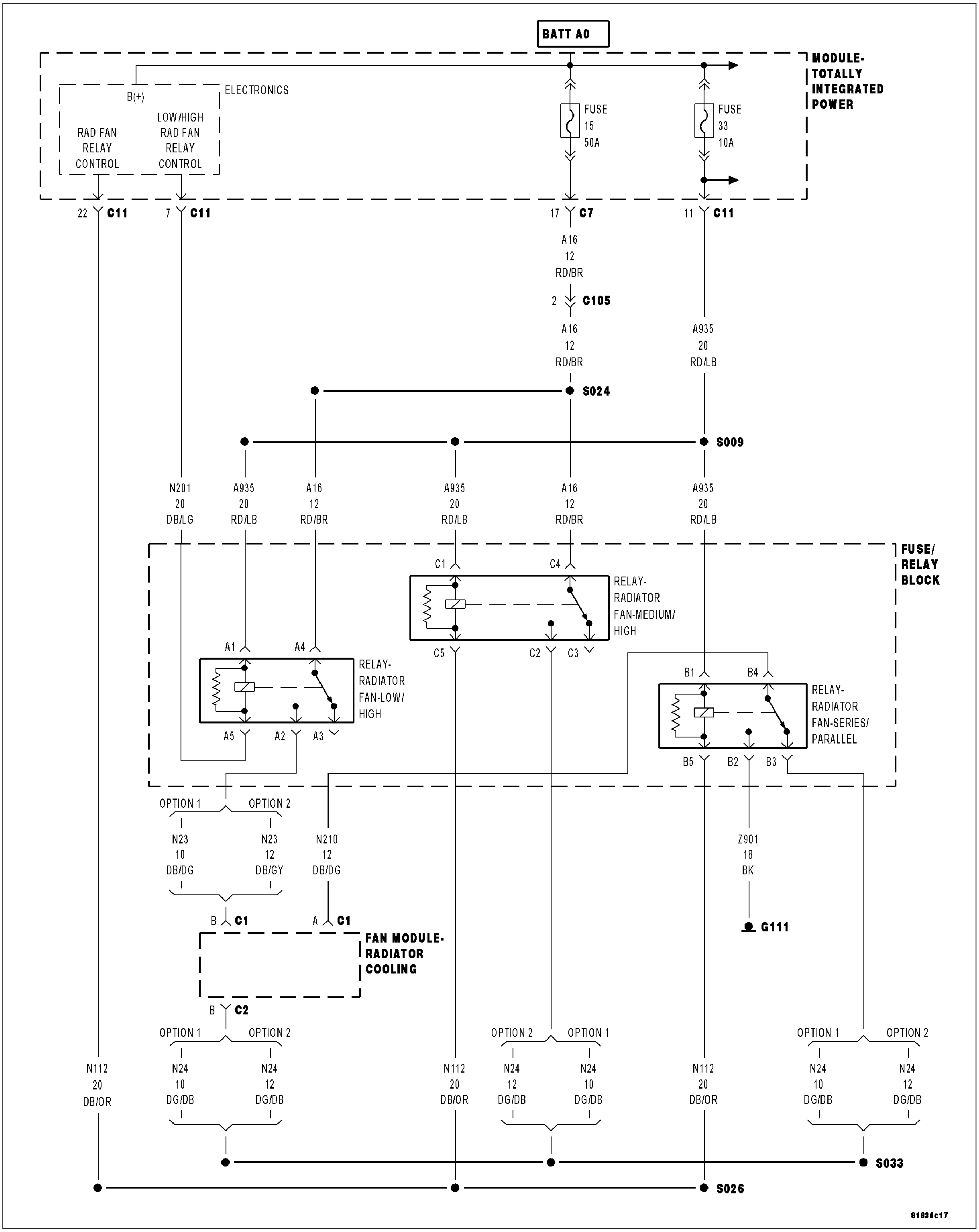
Yes >> Replace the TIPM in accordance with the Service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace Front Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

P0481-COOLING FAN 2 CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  The ECM receives a CAN Bus message from the TIPM indicating an open or shorted circuit on the Radiator Fan Medium/High Relay Control circuit.

Possible Causes
FUSED B+ CIRCUITS
(N112) RADIATOR FAN RELAY CONTROL CIRCUIT OPEN
(N112) RADIATOR FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND
RADIATOR FAN MEDIUM/HIGH RELAY
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. RADIATOR FAN MEDIUM/HIGH RELAY OPERATION

Ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State, to actuate the Radiator Fan Medium/High Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

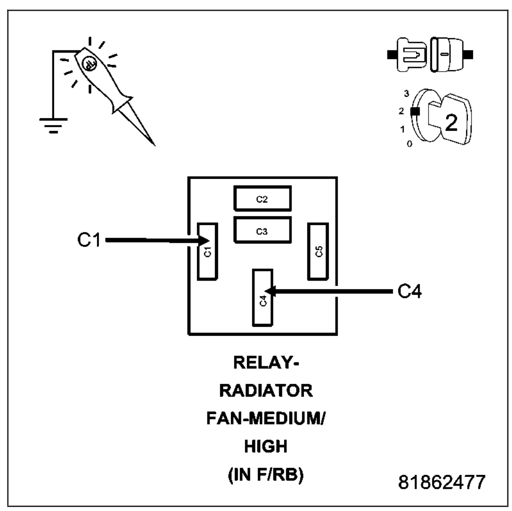
2. FUSED B+ CIRCUITS

Turn the ignition off.

Remove the Radiator Medium/High Fan Relay.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the (A935) and (A16) Fused B+ circuits in the Relay connection.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Go To 3

3. RADIATOR FAN LOW/HIGH CONTROL RELAY SHORTED INTERNALLY

With the test light still at the Fused B+ circuits (Radiator Medium/High Fan Relay), remove the Radiator Fan Low/High Control Relay.

When the relay is removed, does the test light illuminate brightly?

Yes >> Replace the Radiator Fan Low/High Control Relay.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Repair the open or short to ground in the Fused B+ circuits. Inspect the related fuse and repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

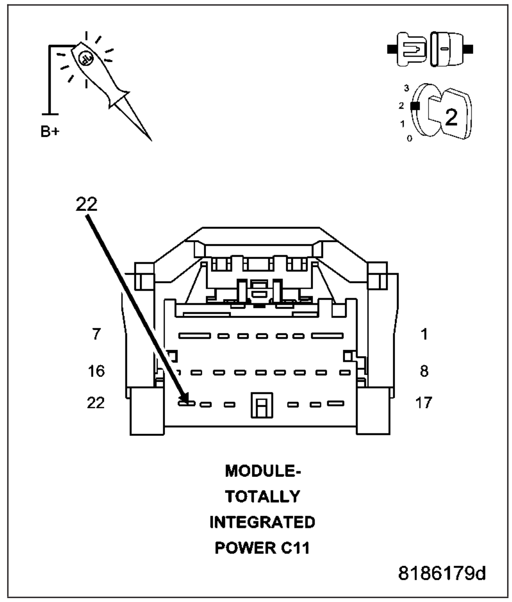
4. (N112) RADIATOR FAN RELAY CONTROL CIRCUIT

Disconnect the TIPM C-11 harness connector.

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State and then Toggle, to actuate the Radiator Fan Medium/High Relay.

Using a 12–volt test light connected to battery voltage, probe the (N112) Radiator Fan High Relay Control circuit in the TIPM C-11 harness connector.



Does the test light illuminate and flash on and off?

Yes >> Replace the Radiator Fan Medium/High Relay.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Go To 5

5. (N112) RADIATOR FAN RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

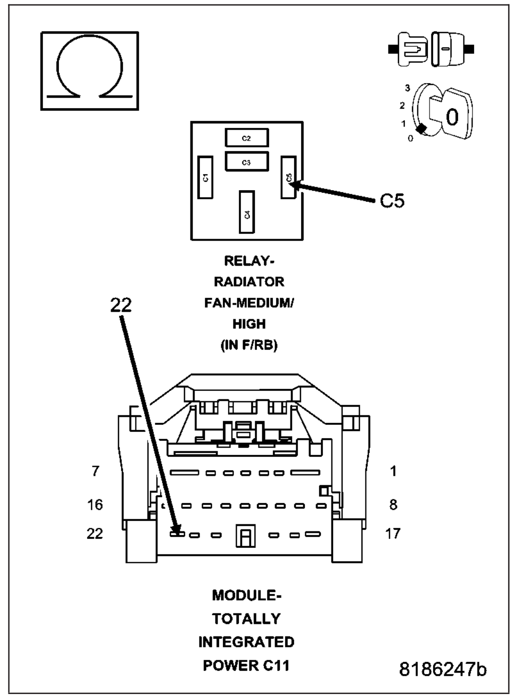
Measure the resistance of the (N112) Radiator Fan Relay Control circuit from the Relay connection to the TIPM C-11 harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 6

No >> Replace the PDM in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



6. (N112) RADIATOR FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND

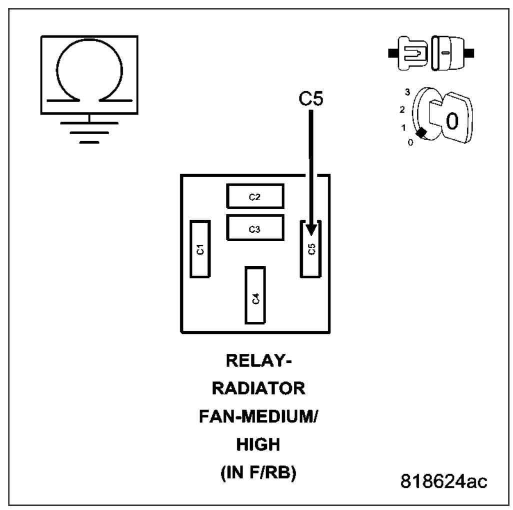
Measure the resistance between ground and the (N112) Radiator Fan Relay Control circuit at the Relay connection.

Is the resistance below 100 ohms?

Yes >> Go To 7

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)



7. RADIATOR FAN LOW/HIGH CONTROL RELAY SHORTED INTERNALLY

With the probe still at the (N112) Radiator Fan Control circuit, remove the Radiator Fan Low/High Control Relay.

Is the resistance still below 10 ohms?

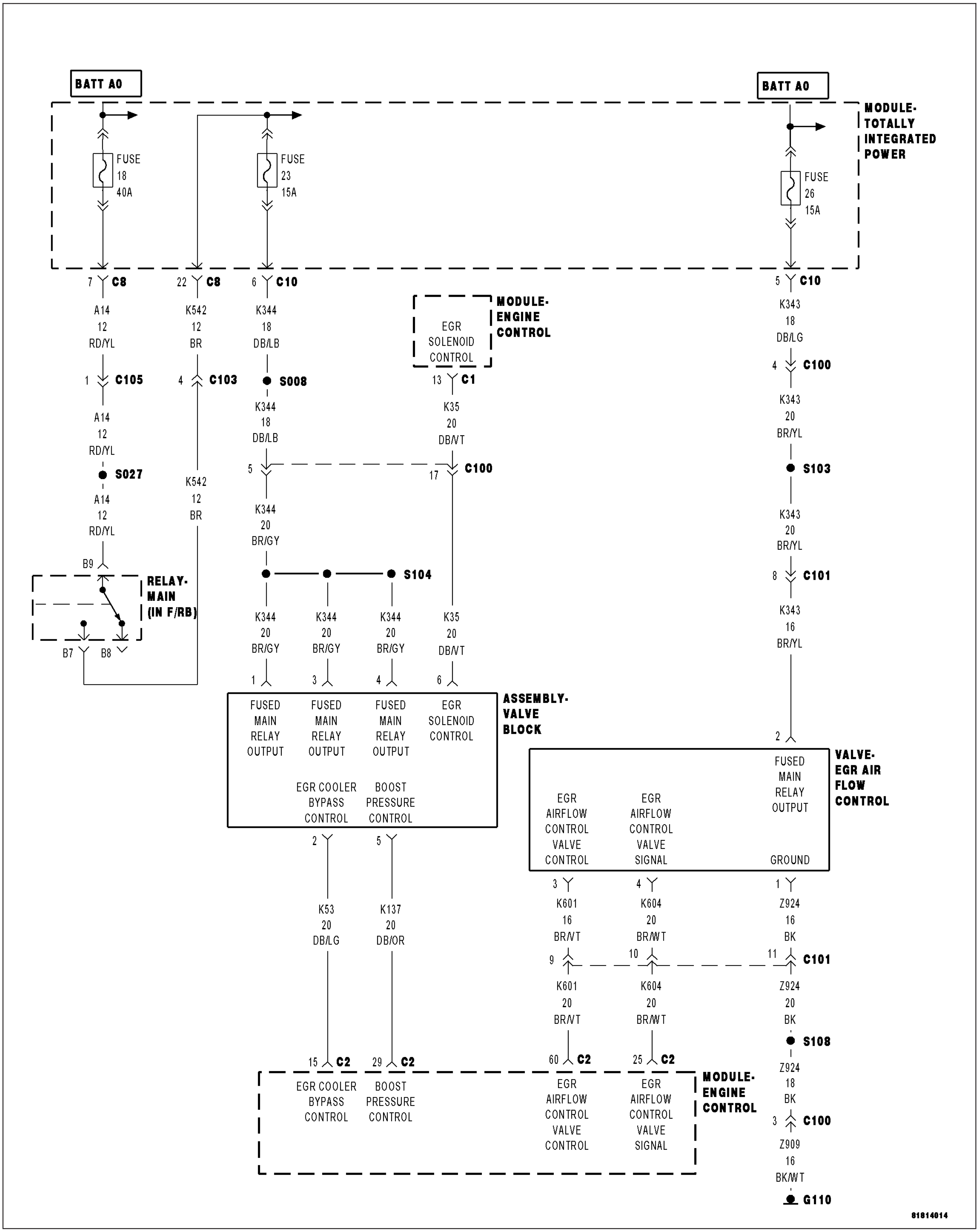
Yes >> Repair the open or short to ground in the (N112) Radiator Fan High Control circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace the Radiator Fan Low/High Control Relay.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

P0487-EGR AIRFLOW THROTTLE CONTROL CIRCUIT A OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the EGR Airflow Control Valve Motor command off.
- **Set Condition:**
  The Engine Control Module (ECM) detects an open (K601) EGR Airflow Control Valve Control circuit for 0.5 second.

Possible Causes
INTERMITTENT DTC
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND
(K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO GROUND
EGR AIRFLOW CONTROL VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve at 100%.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

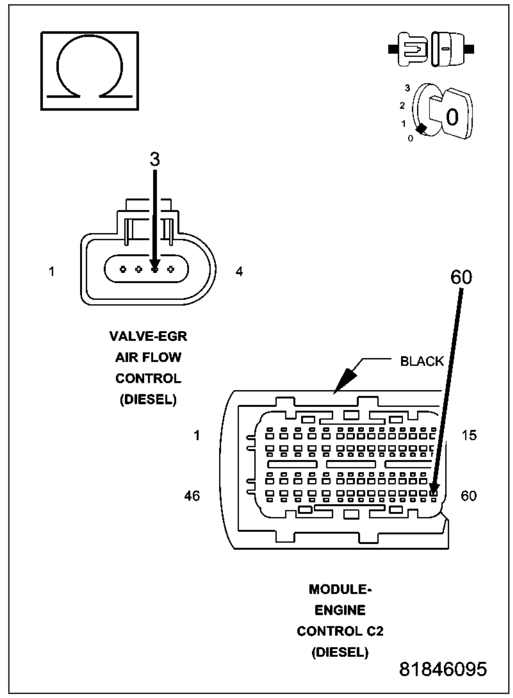
2. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the EGR Airflow Control Valve connector.

Disconnect the Engine Control Module (ECM) connector.

Measure the resistance of the (K601) EGR Airflow Control Valve Control circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

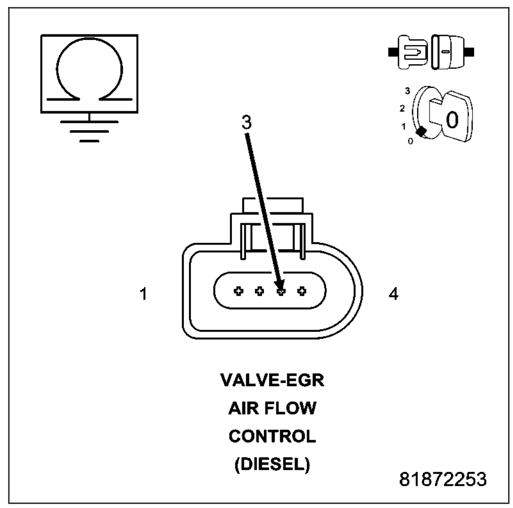
Yes >> Go to 3

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K601) EGR Airflow Control Valve Control circuit.



Is the resistance below above 1000 ohms?

Yes >> Go to 4

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO GROUND

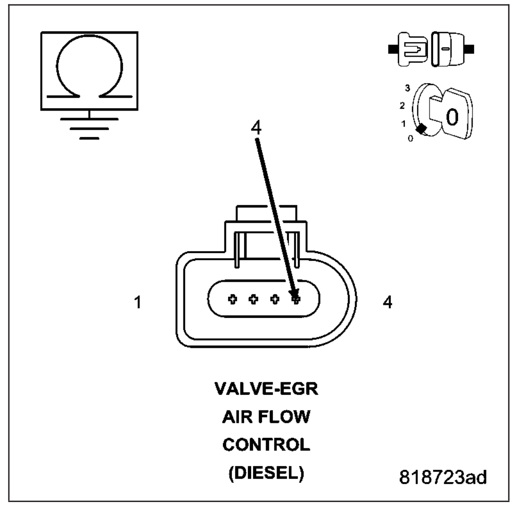
Measure the resistance between ground and the (K604) EGR Airflow Control Valve Signal circuit.

Is the resistance below above 1000 ohms?

Yes >> Go to 5

No >> Repair the (K604) EGR Airflow Control Valve Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

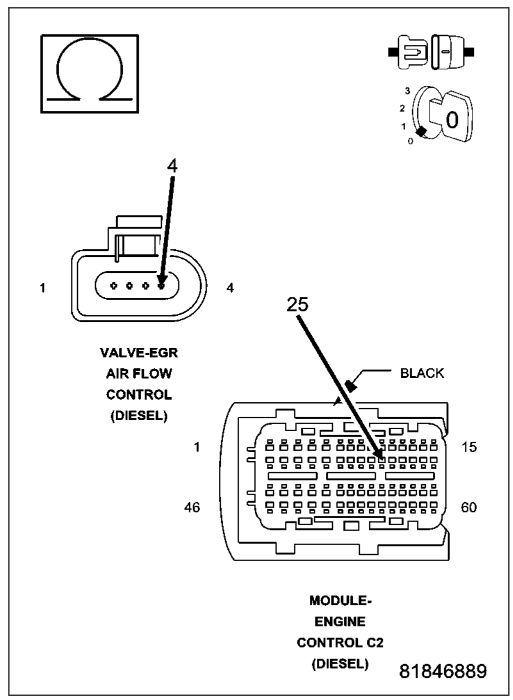
Measure the resistance of the (K604) EGR Airflow Control Valve Signal circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 6

No >> Repair the (K604) EGR Airflow Control Valve Signal for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



6. EGR AIRFLOW CONTROL VALVE

Turn the ignition off.

Connect the Engine Control Module (ECM) connector.

Replace the EGR Airflow Control Valve in accordance with the Service Information.

Turn the ignition on.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 7

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Airflow Control Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

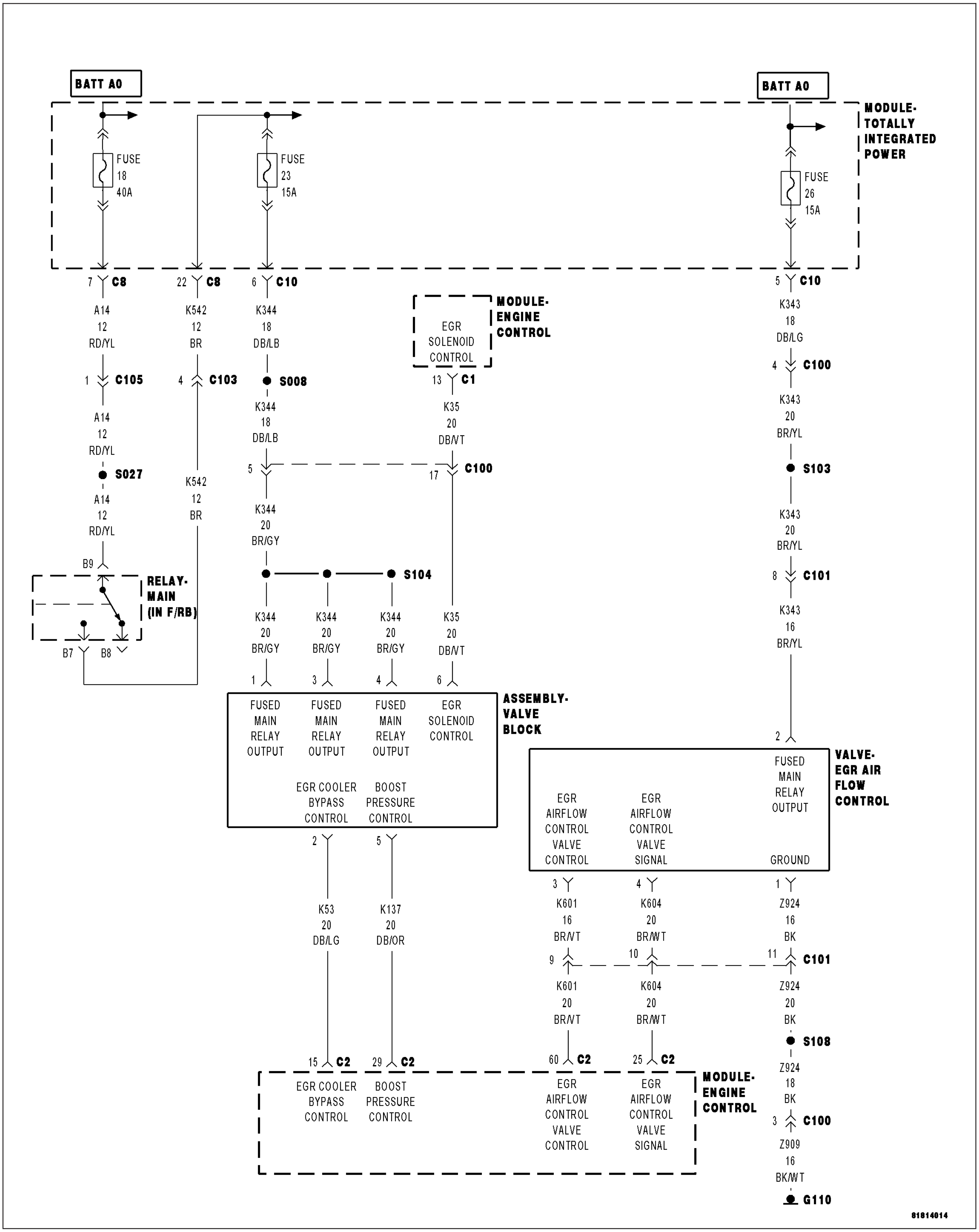
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0488-EGR AIRFLOW THROTTLE CONTROL CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the EGR Airflow Control Valve Motor command on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an implausible voltage on the (K601) EGR Airflow Control Valve Control circuit for 0.5 second.

Possible Causes
INTERMITTENT DTC
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE
(k604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO (K604) EGR AIRFLOW CONTROL VALVE SIGNAL
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(k604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
EGR AIRFLOW CONTROL VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve at 100%.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the EGR Airflow Control Valve harness connector.

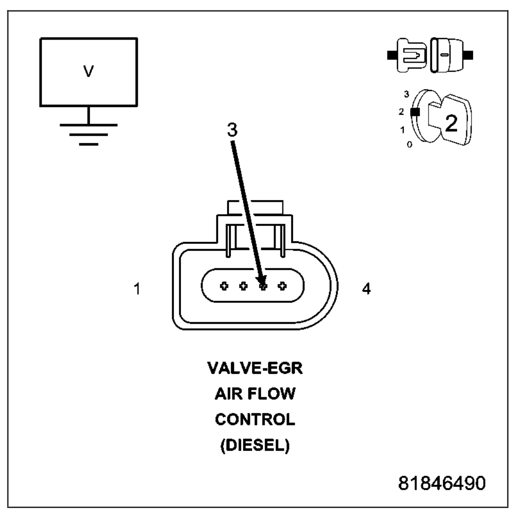
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K601) EGR Airflow Control Valve Control circuit in the EGR Airflow Control Valve harness connector.



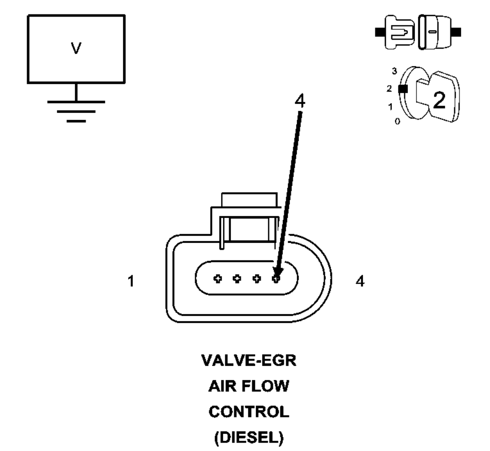
Is there any voltage present?

Yes >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K604) EGR Airflow Control Valve Signal circuit.



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Is there any voltage present?

Yes >> Repair the (K604) EGR Airflow Control Valve Signal circuit for a short to voltage.

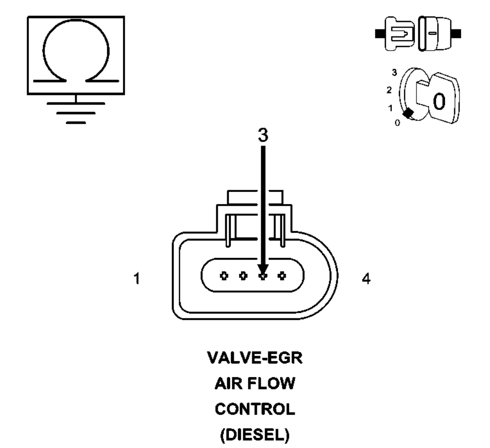
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (K601) EGR Airflow Control Valve Control circuit in the EGR Airflow Control Valve harness connector.



818451ab

Is the resistance above 1000 ohms?

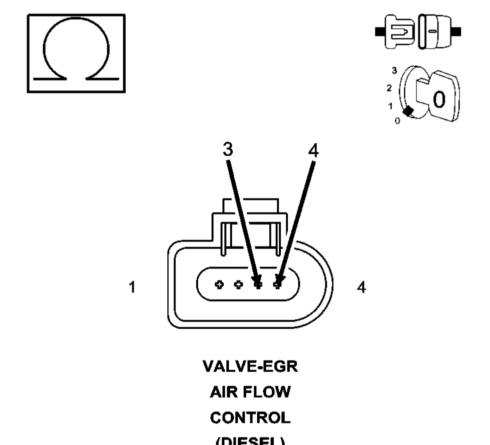
Yes >> Go to 5

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT

Measure the resistance between the (K601) EGR Airflow Control Valve Control circuit and the (K604) EGR Airflow Control Valve Signal circuit in the EGR Airflow Control Valve harness connector.



8184605b

Is the resistance above 1000 ohms?

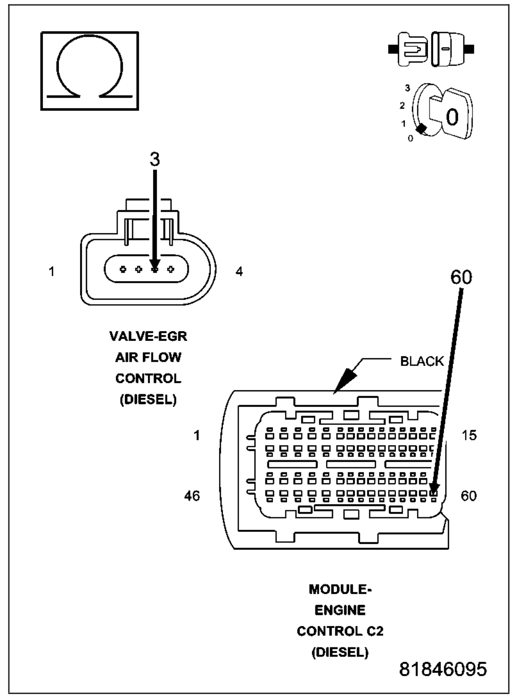
Yes >> Go to 6

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to the (K604) EGR Airflow Control Valve Signal circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K601) EGR Airflow Control Valve Control circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

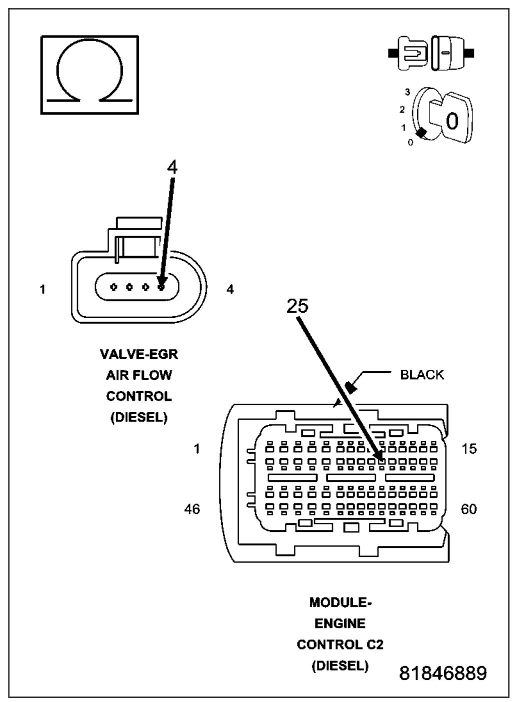
Yes >> Go to 7

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K604) EGR Airflow Control Valve Signal circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 8

No >> Repair the (K604) EGR Airflow Control Valve Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. EGR AIRFLOW CONTROL VALVE

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Replace the EGR Airflow Control Valve in accordance with the Service Information.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 9

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Airflow Control Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

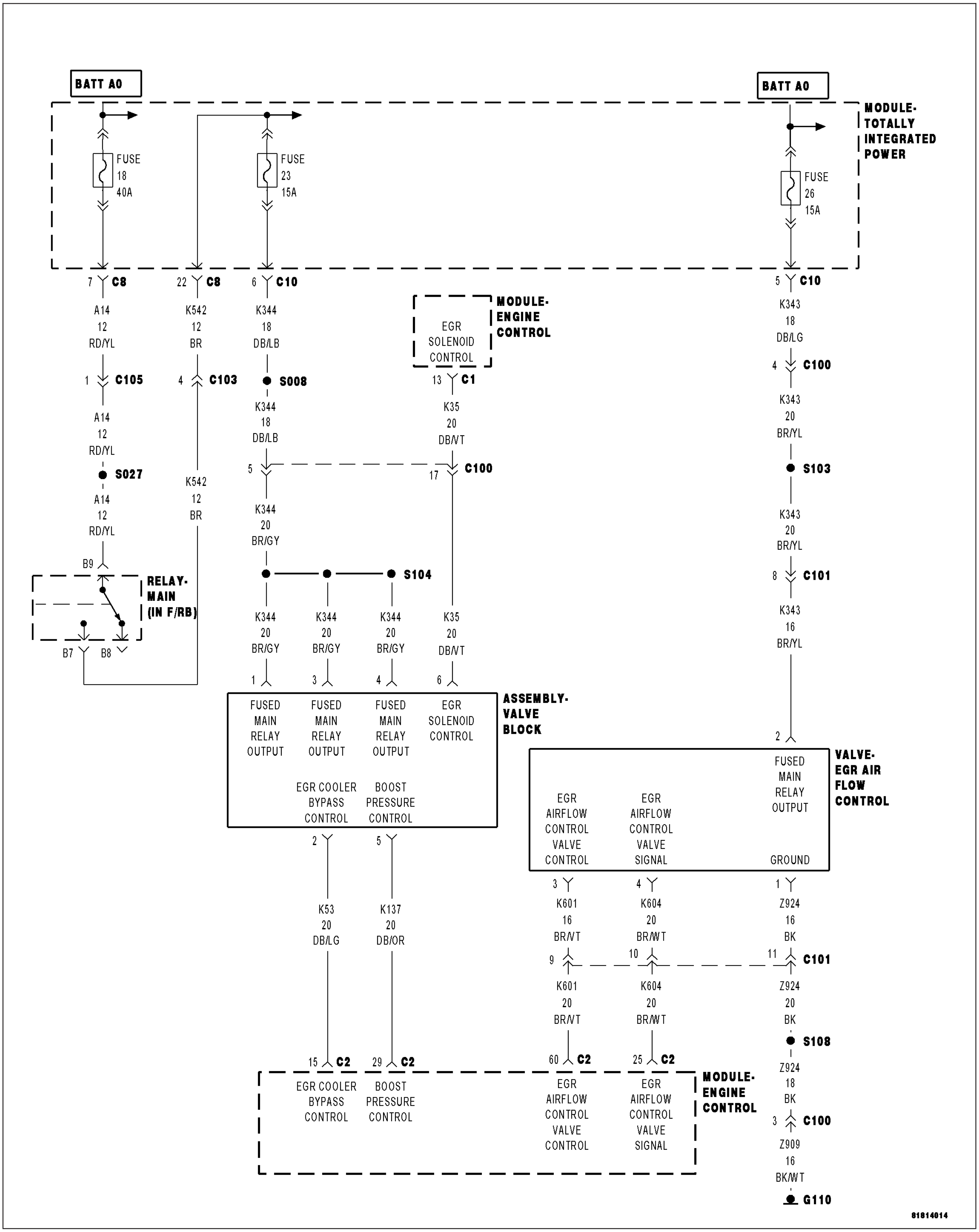
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0489-EGR CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the EGR Solenoid command off.
- **Set Condition:**
  The ECM detects a short to ground on the (K35) EGR Solenoid Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EGR VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
With the scan tool, actuate the EGR Solenoid at 100%.
Monitor the scan tool for at least two minutes.
With the scan tool, select View DTCs.

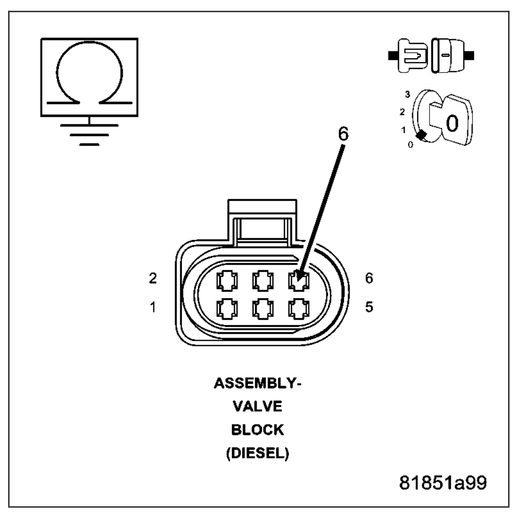
Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Disconnect the Valve Block Assembly harness connector.
Disconnect the Engine Control Module (ECM) harness connector.
Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.



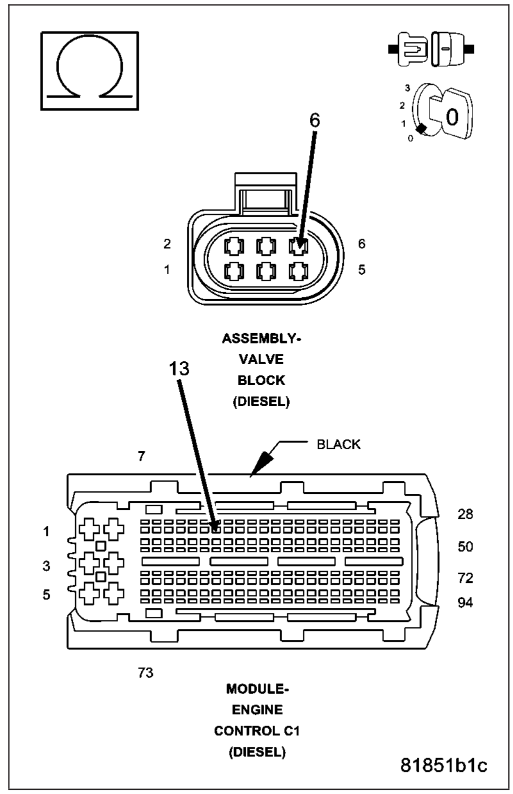
Is the resistance below 1000 ohms?

Yes >> Repair the (K35) EGR Solenoid Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K35) EGR Solenoid Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (K35) EGR Solenoid Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. EGR VALVE

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Exhaust Gas Recirc Positioner to 100%.

Using a 12 volt test light connected to 12 volts, check the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

With the scan tool, actuate the Exhaust Gas Recirc Positioner to 0%.

Using a 12 volt test light connected to 12 volts, check the (K35) EGR Solenoid Control circuit in the EGR Valve harness connector.

NOTE: The test light should not be illuminated.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright with the actuation at 100% and not illuminated with the actuation at 0%?

Yes >> Replace the EGR Valve in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 5

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

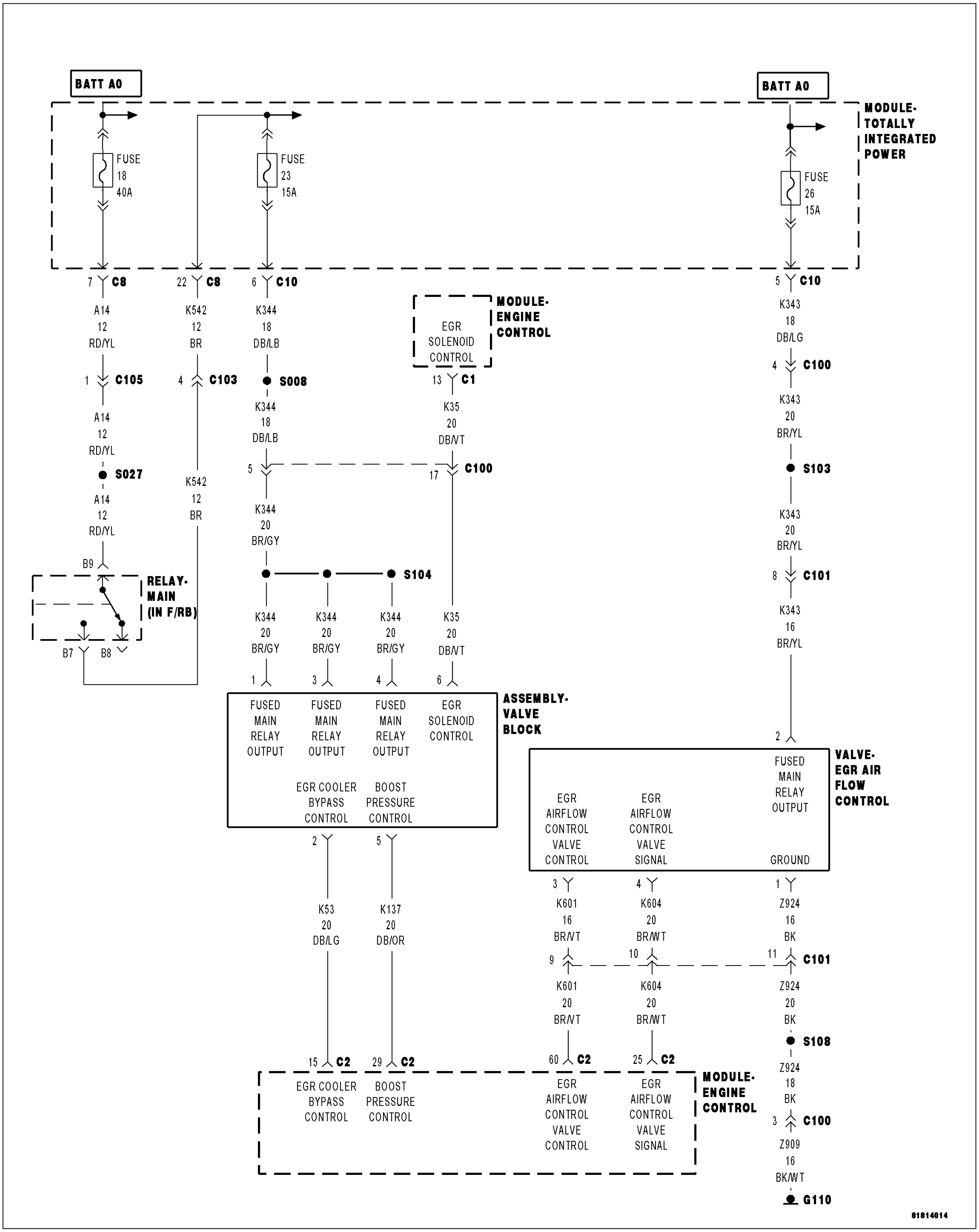
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0490-EGR CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the EGR Solenoid command on.
- **Set Condition:**
  The ECM detects excessive current on the (K35) EGR Solenoid Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO VOLTAGE
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT 2 CIRCUIT
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EGR VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Solenoid at 100%.

Monitor the scan tool for at least two minutes.

Start the engine.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Valve Block Assembly connector.

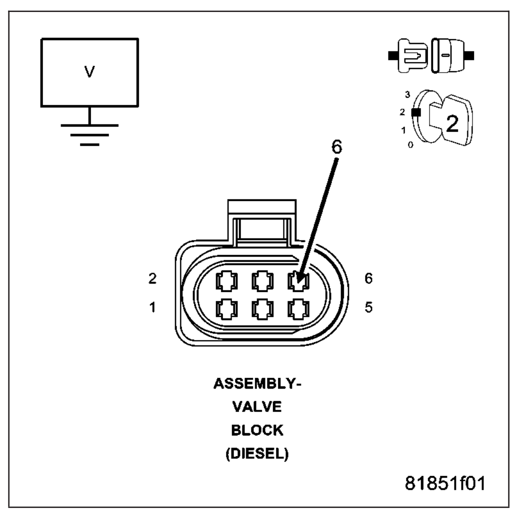
Disconnect the Engine Control Module connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.



Is there any voltage present?

Yes >> Repair the (K35) EGR Solenoid Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

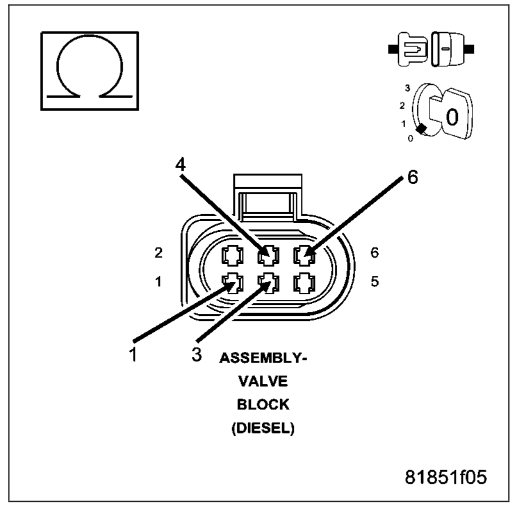
No >> Go to 3

3. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K344) FUSED MAIN RELAY OUTPUT CIRCUIT

NOTE: Remove the jumper wire.

Turn the ignition off.

Measure the resistance between the (K35) EGR Solenoid Control circuit, terminal 6, and the (K344) Fused Main Relay Output circuits, terminals 1, 3, 4, in the Valve Block Assembly harness connector.



Is the resistance above 1000 ohms for each measurement?

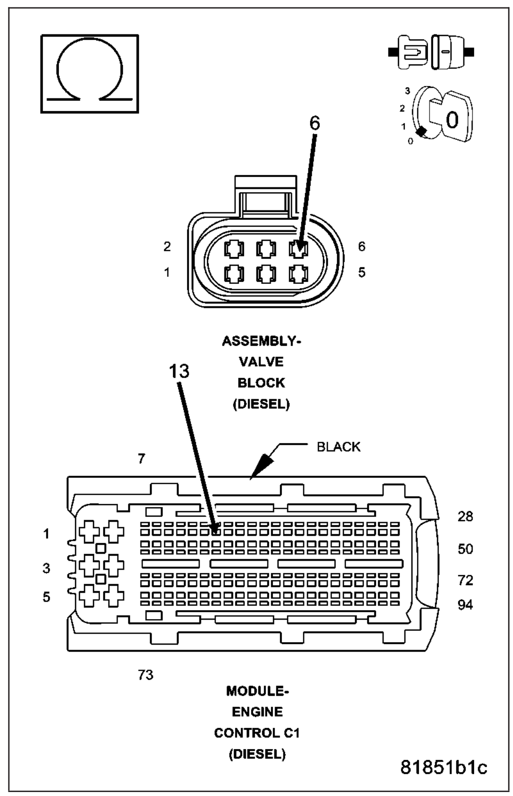
Yes >> Go to 4

No >> Repair the (K35) EGR Solenoid Control circuit for a short to the (K344) Fused Main Relay Output circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K35) EGR Solenoid Control circuit between the Valve Block Assembly harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (K35) EGR Solenoid Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. EGR VALVE

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, actuate the Exhaust Gas Recirc Positioner to 100%.

Using a 12 volt test light connected to 12 volts, check the (K35) EGR Solenoid Control circuit in the Valve Block Assembly harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

NOTE: The circuit will remain actuated by the controller for 30 seconds. Be certain the actuation is active when checking the circuit.

Is the test light illuminated and bright?

Yes >> Replace the EGR Valve in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Solenoid and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

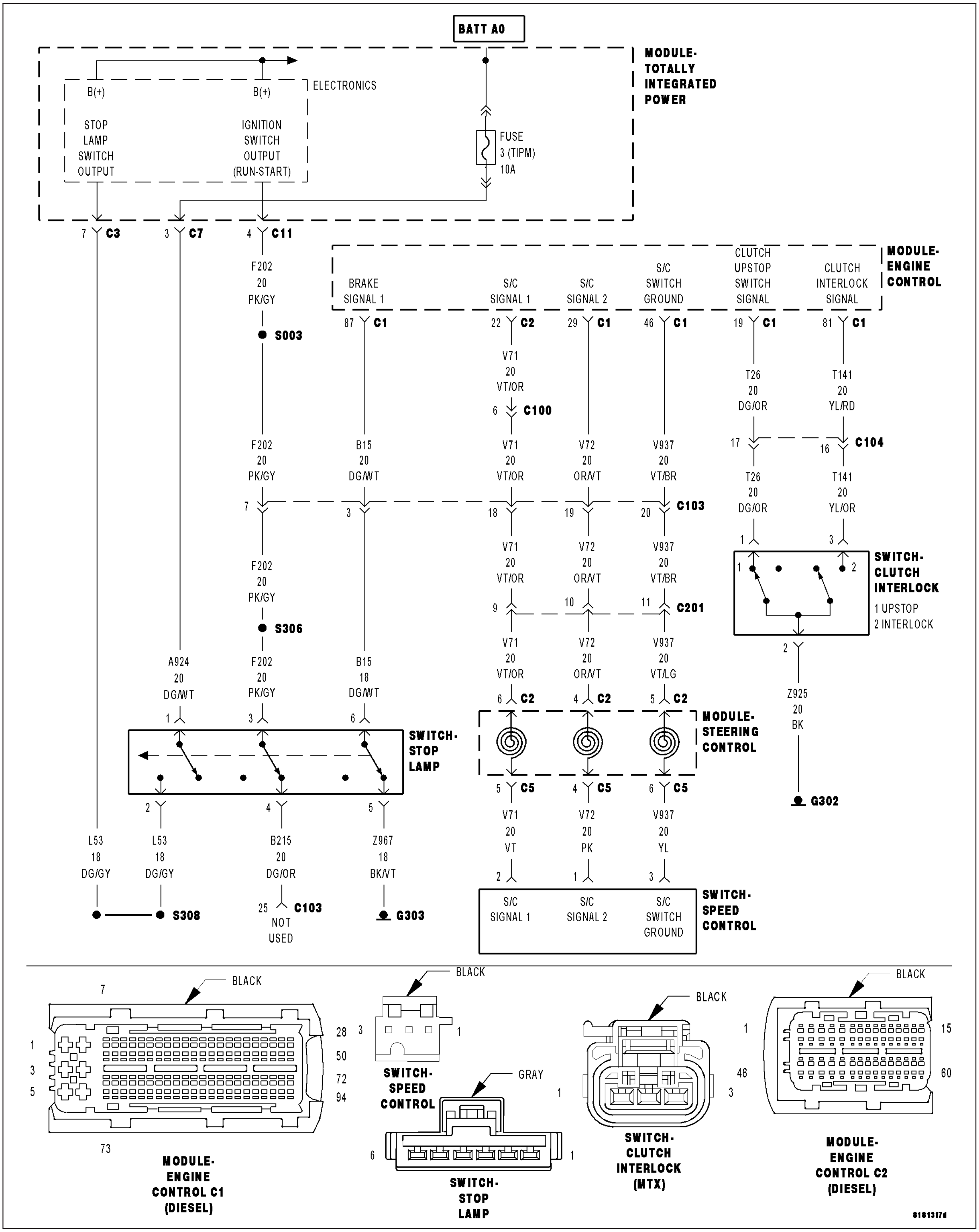
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0501–VEHICLE SPEED SENSOR #1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while the system is active.
- **Set Condition:**
  There is an error in the vehicle speed message received over the CAN Bus from the Anti-lock Brake Module.

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
ANTI-LOCK BRAKE MODULE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose all CAN B and C communication DTCs before continuing.

Test drive the vehicle

With a scan tool, view DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the ECM Verification Test Ver. 1.

2. DTCS PRESENT IN THE ANTI-LOCK BRAKE MODULE

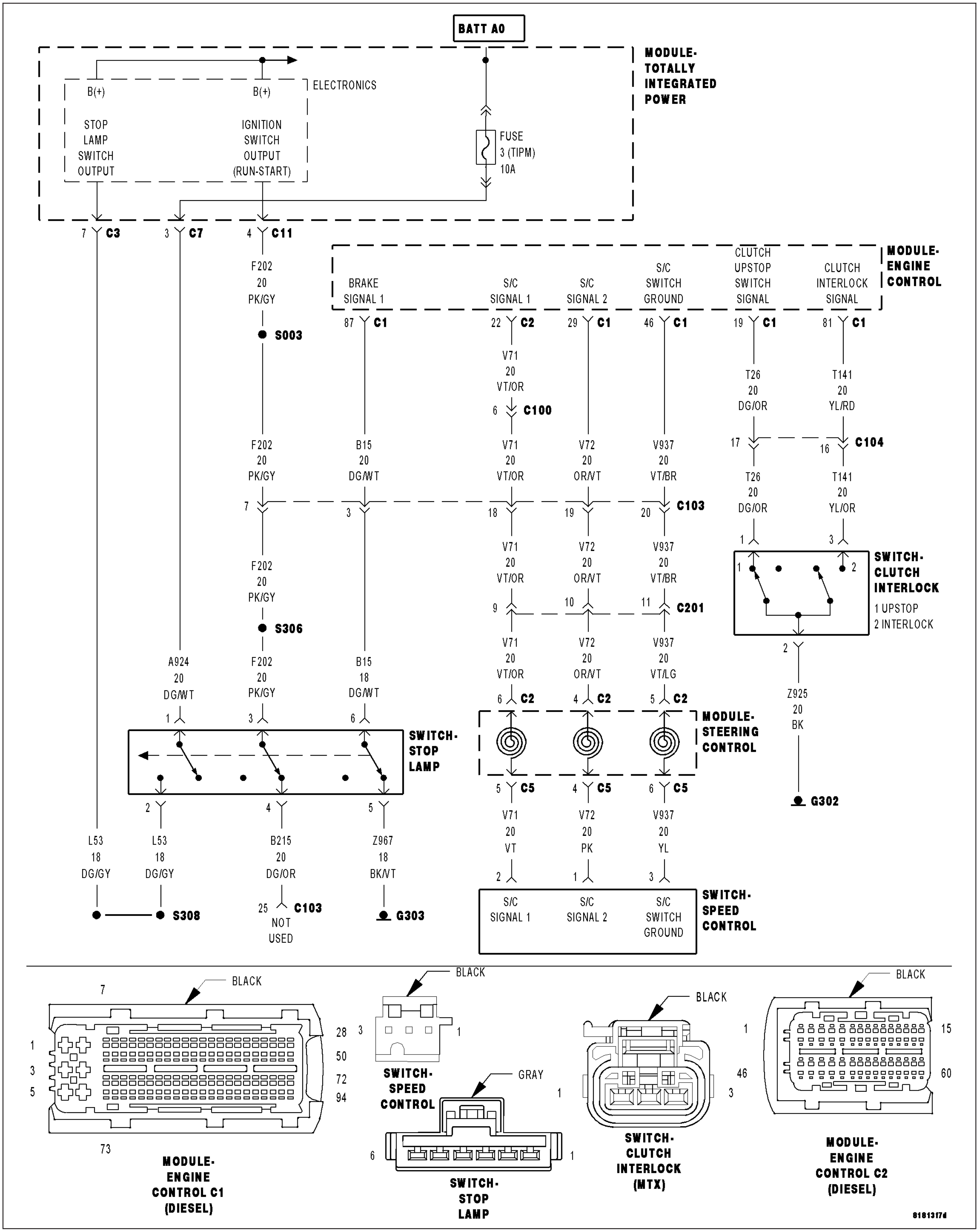
With a scan tool check for DTCs in the Anti-lock Brake Module.

Are there any DTCs active in the Anti-lock Brake Module at this time?

Yes >> Repair Anti-Lock Brake Module DTC’s.

No >> Replace and program the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0504-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Brake Switch Signal 1 and Brake Switch Signal 2 inputs to the ECM do not agree for 2 minutes.

Possible Causes
INTERMITTENT CONDITION
BRAKE SWITCH SIGNAL 2 - SWITCH 2 CKT OPEN
(A924) FUSED B+ CIRCUIT OPEN
(B215) BRAKE SWITCH SIGNAL 2 CIRCUIT SHORTED TO GROUND
BRAKE SWITCH SIGNAL 1 - SWITCH 1 CKT OPEN
(B215) BRAKE SWITCH SIGNAL 2 CIRCUIT OPEN
(Z967) STOP LAMP SWITCH GROUND CIRCUIT OPEN
(B15) BRAKE SWITCH SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(B15) BRAKE SWITCH SIGNAL 1 CIRCUIT OPEN
ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 2
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 1

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK THE BRAKE SWITCH SIGNAL 1 STATUS

Turn the ignition on.

While observing the BRAKE SWITCH SIGNAL 1 status on the scan tool display, press and release the brake pedal several times.

Does the scan tool display BRAKE SWITCH SIGNAL1: PRESSED and RELEASED for the appropriate pedal position?

Yes >> Go To 2

No >> Go To 11

2. CHECK THE BRAKE SWITCH SIGNAL 2 STATUS

While observing the BRAKE SWITCH SIGNAL 2 status on the scan tool display, press and release the brake pedal several times.

Does the scan tool display BRAKE SWITCH SIGNAL 2: PRESSED and RELEASED for the appropriate pedal position

Yes >> Go To 3

No >> Go To 4

3. INTERMITTENT CONDITION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set.

Refer to any Technical Service Bulletins (TSB) that may apply.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

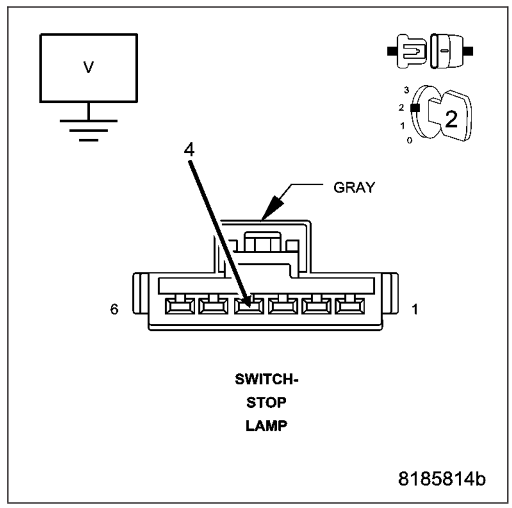
4. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Turn the ignition on.

Measure the voltage between the (B215) Brake Switch Signal 2 circuit and ground at the Stop Lamp Switch harness connector.



Is the voltage above 9.0 volts?

Yes >> Go To 5

No >> Go To 8

5. STOP LAMP SWITCH - BRAKE SWITCH SIGNAL 2 CKT OPEN

While monitoring the BRAKE SWITCH 2 status with the scan tool, connect a jumper wire between ground and the (B215) Brake Switch Signal 2 circuit.

Does the scan tool display change from PRESSED to RELEASED?

Yes >> Adjust or replace the Stop Lamp Switch in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

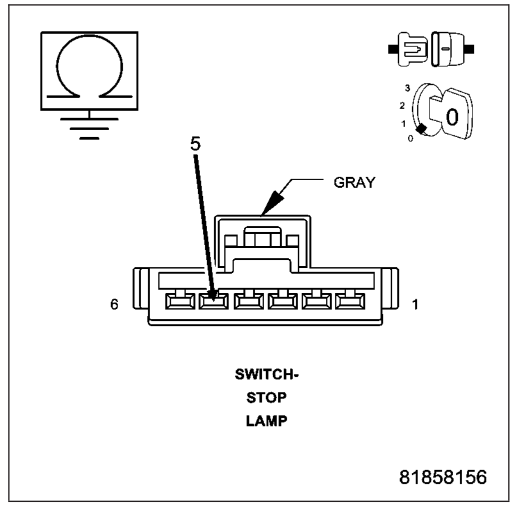
No >> Go To 6

6. (Z967) STOP LAMP SWITCH GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Measure the resistance between ground and the (Z967) Stop Lamp Switch Ground circuit at the Stop Lamp Switch harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (Z967) Stop Lamp Switch Ground circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE - INTERNAL

If there are no possible causes remaining, view repair.

Repair

Replace and program the Engine Control Module in accordance with the Service Information.

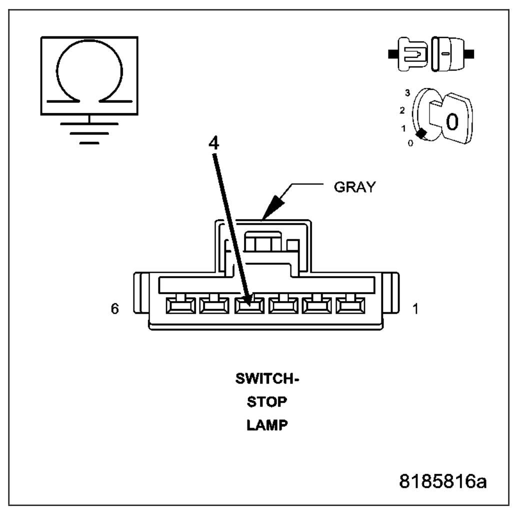
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (B215) Brake Switch Signal 2 circuit at the Stop Lamp Switch harness connector.



Is the resistance above 1000 ohms?

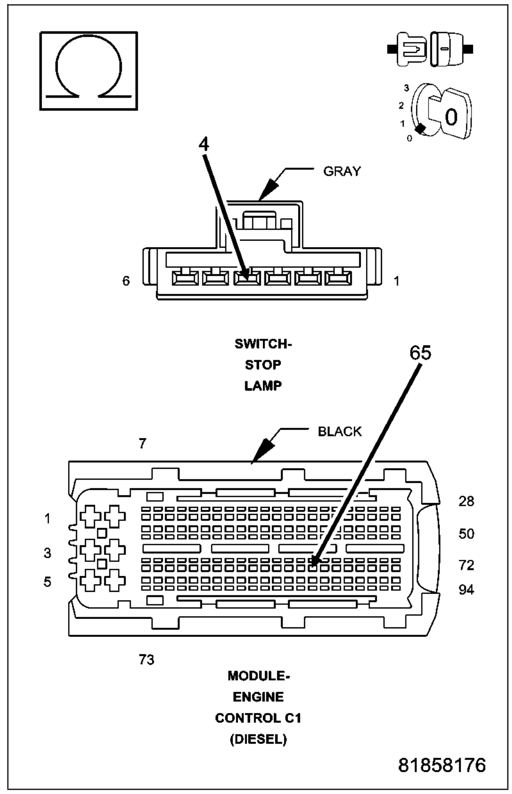
Yes >> Go To 9

No >> Repair the (B215) Brake Switch Signal 2 circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT OPEN

Measure the resistance of the (B215) Brake Switch Signal 2 circuit between the Stop Lamp Switch harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 10

No >> Repair the (B215) Brake Switch Signal 2 circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 2

If there are no possible causes remaining, view repair.

Repair

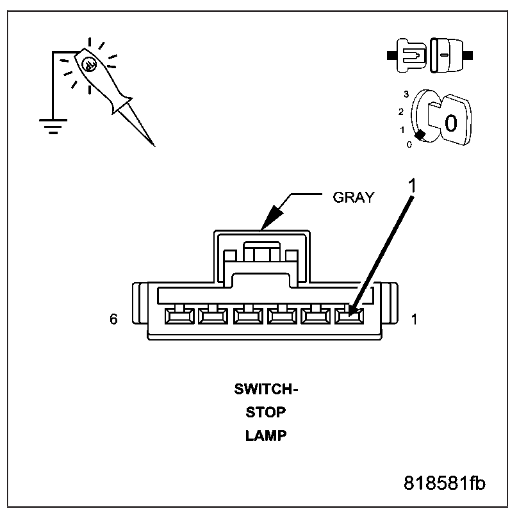
Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (A924) FUSED B+ CIRCUIT OPEN

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Using a 12-volt test light connected to ground, check the (A924) Fused B+ circuit.



Does the test light illuminate brightly?

Yes >> Go To 12

No >> Repair the (A924) Fused B+ circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

12. STOP LAMP SWITCH - BRAKE SWITCH SIGNAL 1 OPEN

Turn the ignition on.

While monitoring the BRAKE SWITCH SIGNAL 1 status with the scan tool, connect a jumper wire between the Brake Switch Signal 1 circuit and the Fused B(+) circuit.

Does the scan tool display change from RELEASED to PRESSED?

Yes >> Adjust or replace the Stop Lamp Switch in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 13

13. (B15) BRAKE SWITCH SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

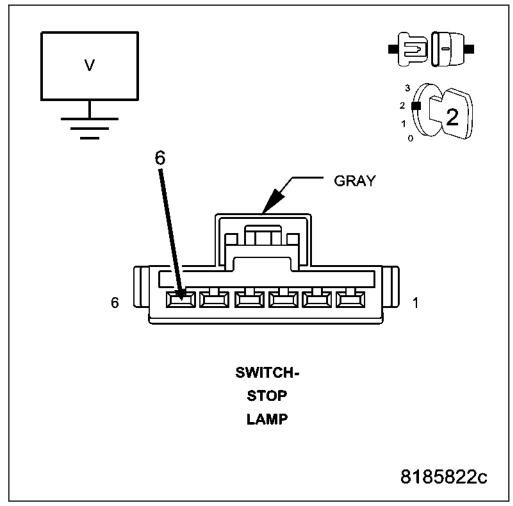
Turn the ignition on.

Measure the voltage between the (B15) Brake Switch Signal 1 circuit and ground.

Is the voltage above 1.0 volt?

Yes >> Repair the (B15) Brake Switch Signal 1 circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 14



14. (B15) BRAKE SWITCH SIGNAL 1 CIRCUIT OPEN

NOTE: Remove the jumper wire.

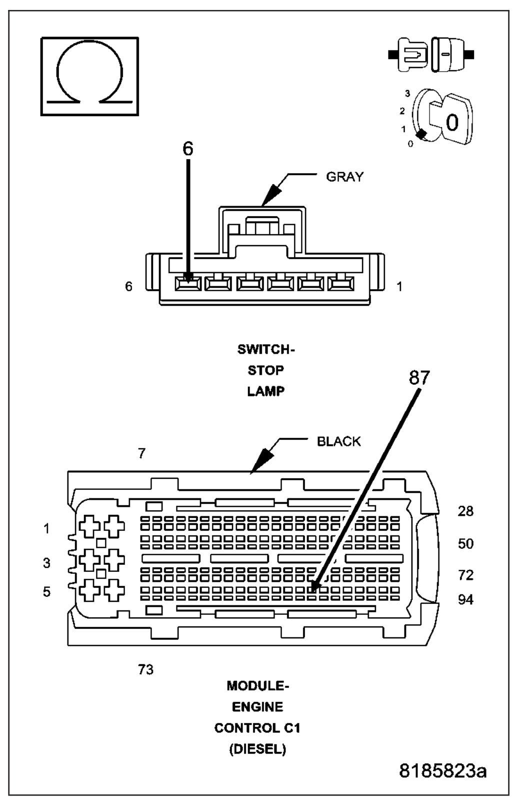
Turn the ignition off.

Measure the resistance of the (B15) Brake Switch Signal 1 circuit between the Stop Lamp Switch harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (B15) Brake Switch Signal 1 circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



P0513-INVALID SKIM KEY

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM receives and invalid SKIM Key message from the SKREEM.

Possible Causes
INTERMITTENT DTC
UNPROGRAMMED IGNITION KEYS
SKREEM
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR SKREEM COMMUNICATION AND DTCS

Ignition on, engine not running.

With the scan tool, check for proper communication and active DTCs in the SKREEM.

Are any SKREEM communication problems or DTCs present?

Yes >> Refer to the symptom list for problems related to SKREEM Communication and DTCs before continuing.

No >> Go To 2

2. CHECK FOR ACTIVE DTC

With the scan tool, clear all ECM DTCs.

Turn the ignition on and off several times pausing 10 seconds between key cycles leaving the ignition on.

With the scan tool, select View DTCs in the ECM.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to *CHECKING FOR INTERMITTENT DTC in the symptom list. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. REPROGRAM IGNITION KEYS AND RETEST

With the scan tool, clear all ignition keys out of SKREEM memory.

With the scan tool, reprogram all ignition keys to the SKREEM.

Turn the ignition on and off several times pausing 10 seconds between key cycles leaving the ignition on.

With the scan tool, select View DTCs in the ECM.

Is the status Active for this DTC?

Yes >> 4

No >> Test complete.

4. REPLACE THE SKREEM AND RETEST

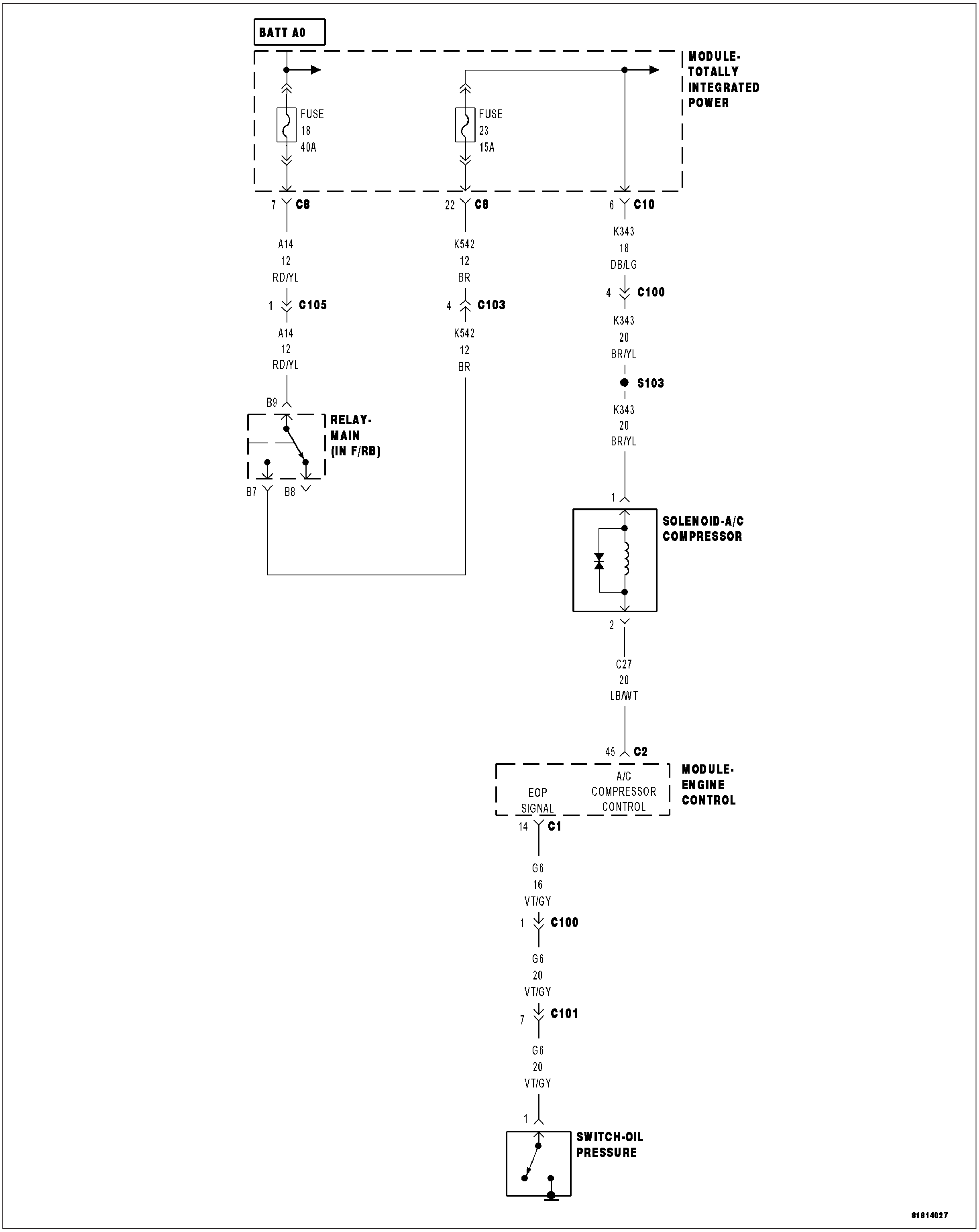
Replace and program the SKREEM in accordance with the Service Information.
Turn the ignition on.
With the scan tool, clear all ECM DTCs.
Turn the ignition on and off several times pausing 10 seconds between key cycles leaving the ignition on.
With the scan tool, select View DTCs in the ECM.

Is the status Active for this DTC?

Yes >> Replace and program the Engine Control Module in accordance the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test complete.

P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running
- **Set Condition:**
  The Engine Control Module (ECM) detects an implausible Engine Oil Pressure Switch signal.

Possible Causes
(G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN
(G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORT TO GROUND
(G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE
ENGINE OIL PRESSURE SWITCH
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Incorrect engine oil level may cause this DTC to set. Check and verify that the engine oil level is filled to the proper specification.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off, wait 30 seconds, then start and idle the engine for at least 2 minutes.

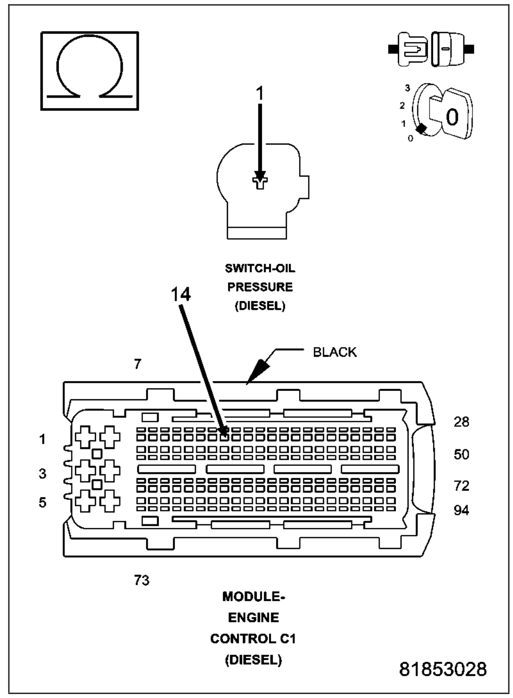
With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN



Turn the ignition off.

Disconnect the Engine Oil Pressure Switch harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (G6) Engine Oil Pressure Switch Signal circuit.

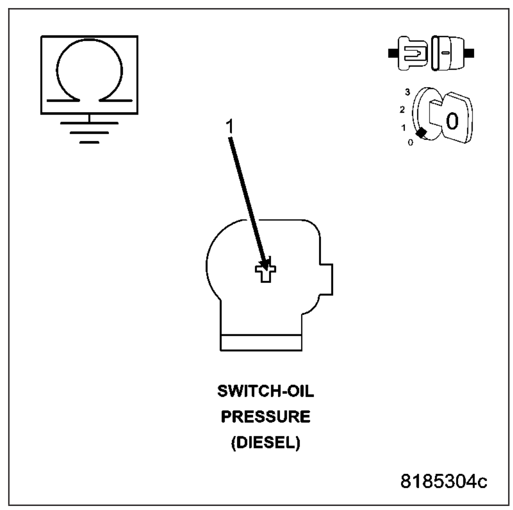
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (G6) Engine Oil Pressure Switch Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (G6) Engine Oil Pressure Switch Signal circuit.

Is the resistance above 1000 ohms?

Yes >> Go To 4

No >> Repair the (G6) Engine Oil Pressure Switch Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (G6) Engine Oil Pressure Switch Signal circuit.

Is the voltage above 1.0 volt?

Yes >> Repair the (G6) Engine Oil Pressure Switch Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

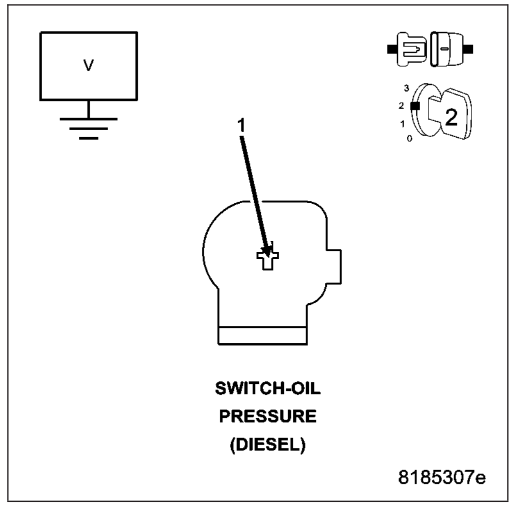
No >> Go To 5

5. CHECKING THE (G6) ENGINE OIL PRESSURE SWITCH SIGNAL VOLTAGE

Reconnect the ECM harness connectors.

Turn the ignition on.

With a voltmeter, measure the voltage of the (G6) Engine Oil Pressure Switch Signal circuit at the Engine Oil Pressure Switch harness connector.



Is the voltage above 10.0 volts?

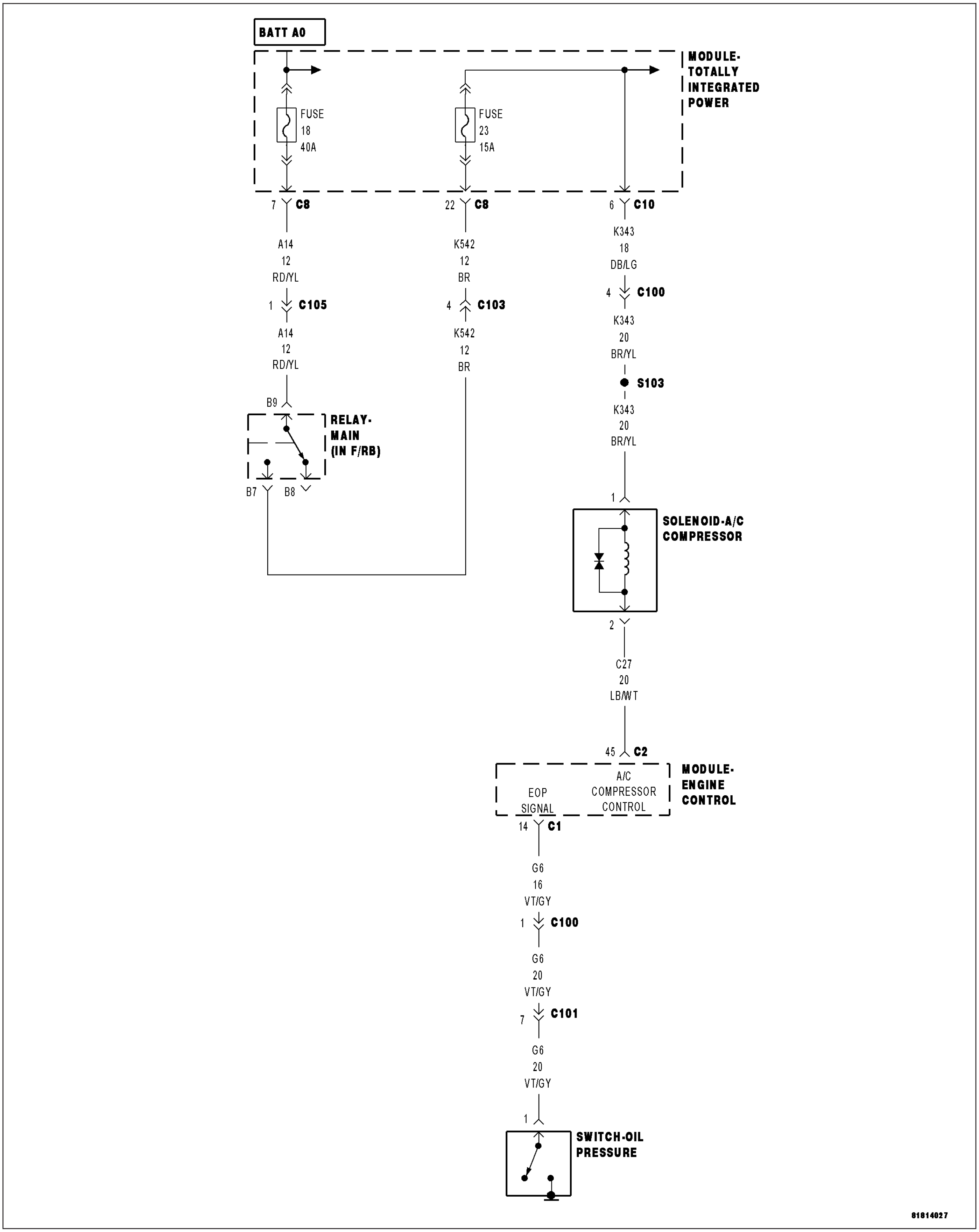
Yes >> Replace the Engine Oil Pressure Switch.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the ECM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0524- ENGINE OIL PRESSURE IS TOO LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The Engine Oil Pressure Switch indicates low oil level for 5 seconds.

Possible Causes
(G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN
(G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORT TO GROUND
ENGINE OIL PRESSURE SWITCH
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Incorrect engine oil level may cause this DTC to set. Check and verify that the engine oil level is filled to the proper specification.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off, wait 30 seconds, then start and idle the engine for at least 2 minutes.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

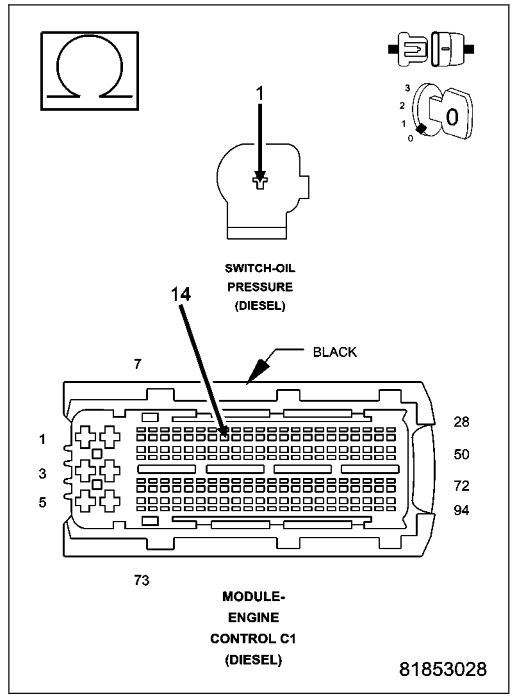
2. (G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Engine Oil Pressure Switch harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (G6) Engine Oil Pressure Switch Signal circuit.



Is the resistance below 10.0 ohms?

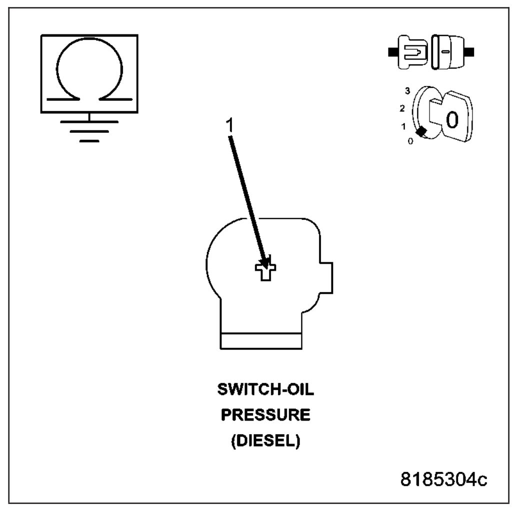
Yes >> Go To 3

No >> Repair the (G6) Engine Oil Pressure Switch Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

3. (G6) ENGINE OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (G6) Engine Oil Pressure Switch Signal circuit.



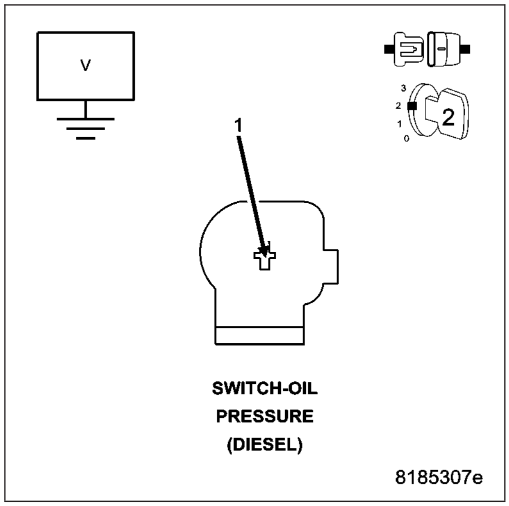
Is the resistance above 1000 ohms?

Yes >> Go To 4

No >> Repair the (G6) Engine Oil Pressure Switch Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. CHECKING THE (G6) ENGINE OIL PRESSURE SWITCH SIGNAL VOLTAGE



Reconnect the ECM harness connectors.

Turn the ignition on.

With a voltmeter, measure the voltage of the (G6) Engine Oil Pressure Switch Signal circuit at the Engine Oil Pressure Switch harness connector.

Is the voltage above 10.0 volts?

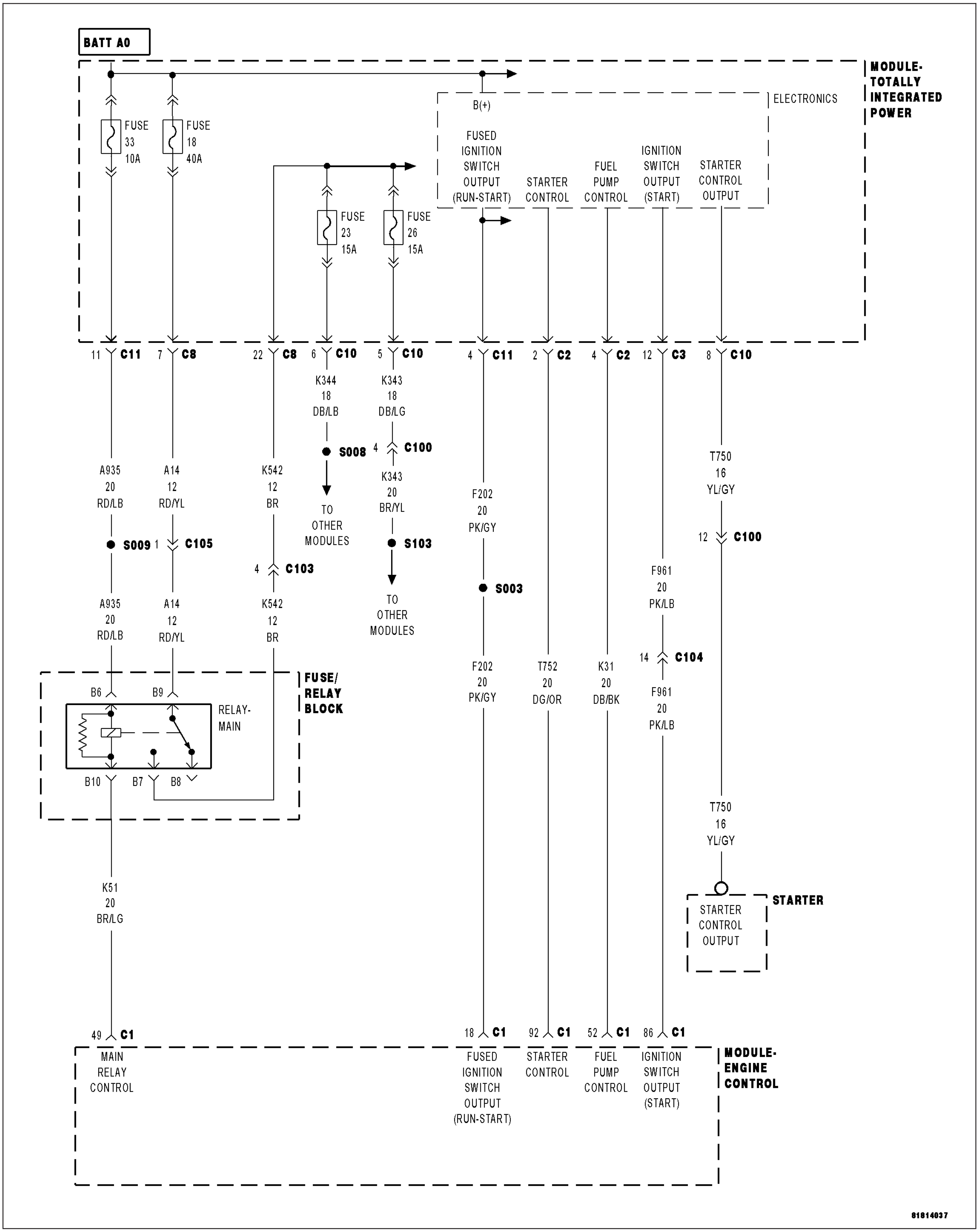
Yes >> Replace the Engine Oil Pressure Switch.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the ECM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P0562-ECM VOLTAGE TOO LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on or the engine running.
- **Set Condition:**
  The ECM detects battery voltage of 9.9 volts or less for 0.48 seconds.

Possible Causes
CHECKING ECM POWER AND GROUNDS
ECM
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

NOTE: This DTC may be caused by a charging system problem. Refer to the Service Information and verify proper charging system operation before continuing.

Test drive the vehicle.

Turn the ignition on.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Go To 3

2. CHECK POWER AND GROUNDS

Refer to the symptom list and perform the Checking the ECM Power and Ground test.

Were any problem found with the ECM powers and grounds?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. INTERMITTENT CONDITION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set.

Refer to any Technical Service Bulletins (TSB) that may apply.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

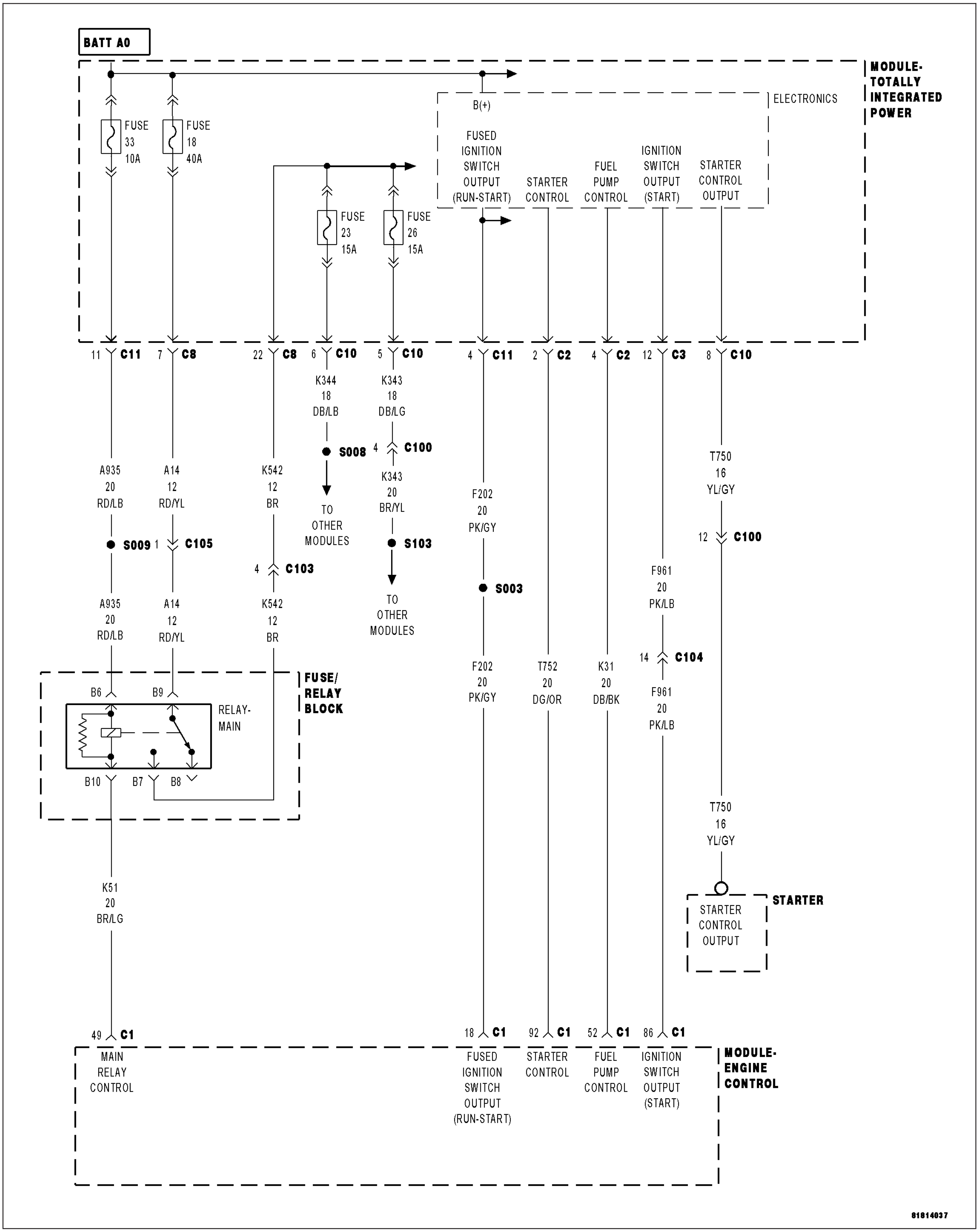
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

P0563-ECM VOLTAGE TOO HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on or the engine running.
- **Set Condition:**
  The ECM detects battery voltage of 17.0 volts or greater for 0.48 seconds

Possible Causes
CHECKING ECM POWER AND GROUNDS
ECM
INTERMITTENT CONDITION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

NOTE: This DTC may be caused by a charging system problem. Refer to the Service Information and verify proper charging system operation before continuing.

Test drive the vehicle.

Turn the ignition on.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Go To 3

2. CHECK POWER AND GROUNDS

Refer to the symptom list and perform the Checking the ECM Power and Ground test.

Were any problem found with the ECM powers and grounds?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. INTERMITTENT CONDITION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set.

Refer to any Technical Service Bulletins (TSB) that may apply.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

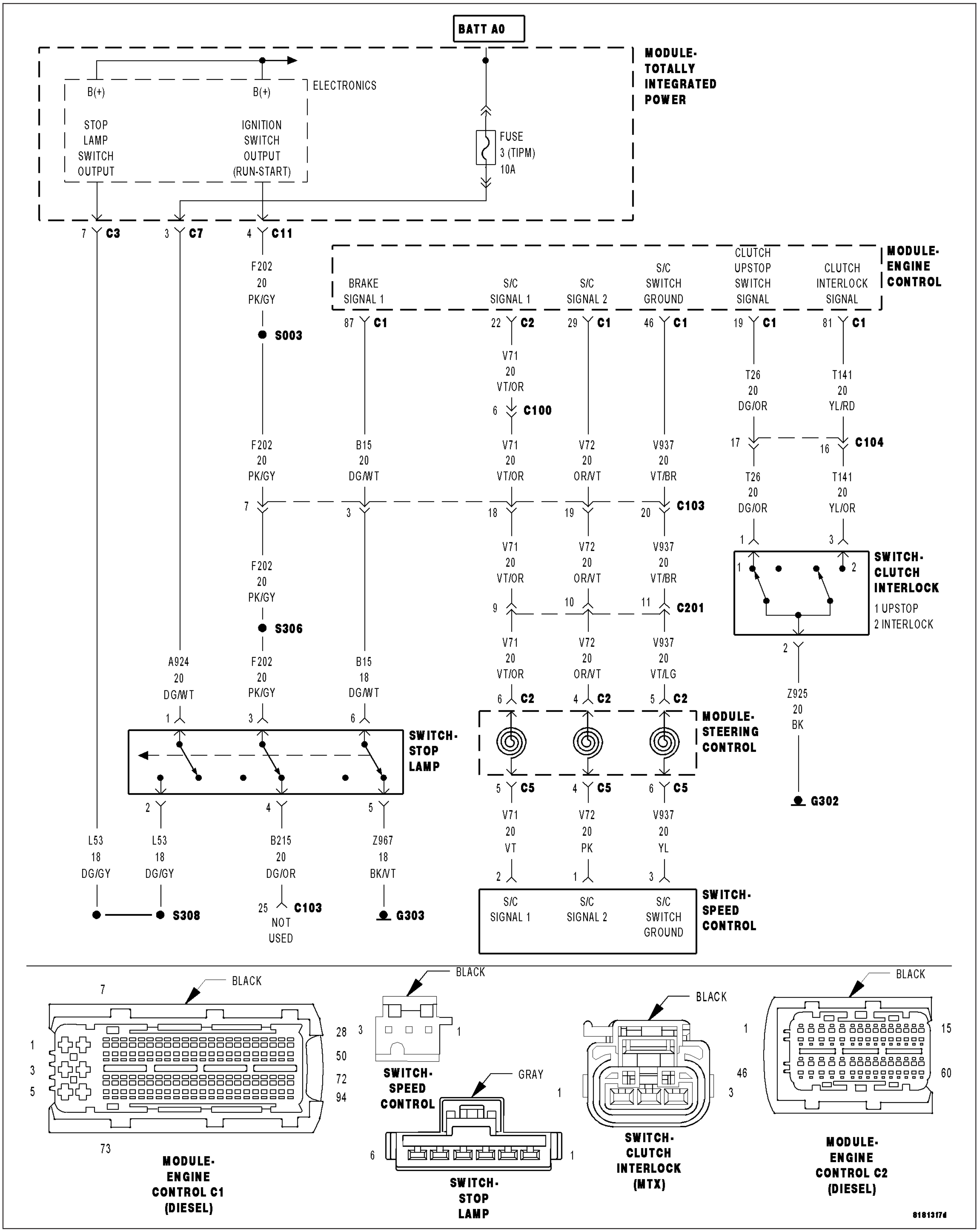
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

P0573 BRAKE SWITCH 1 STUCK OFF



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects that the vehicle has stopped and no brake switch signal was received.

Possible Causes
INTERMITTENT CONDITION
BRAKE SWITCH SIGNAL 2 - SWITCH 2 CKT OPEN
(A924) FUSED B+ CIRCUIT OPEN
(B215) BRAKE SWITCH SIGNAL 2 CIRCUIT SHORTED TO GROUND
BRAKE SWITCH SIGNAL 1 - SWITCH 1 CKT OPEN
(B215) BRAKE SWITCH SIGNAL 2 CIRCUIT OPEN
(Z967) STOP LAMP SWITCH GROUND CIRCUIT OPEN
(B15) BRAKE SWITCH SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE
(B15) BRAKE SWITCH SIGNAL 1 CIRCUIT OPEN
ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 2
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 1

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK THE BRAKE SWITCH SIGNAL 1 STATUS

Turn the ignition on.

While observing the BRAKE SWITCH SIGNAL 1 status on the scan tool display, press and release the brake pedal several times.

Does the scan tool display BRAKE SWITCH SIGNAL1: PRESSED and RELEASED for the appropriate pedal position?

Yes >> Go To 2

No >> Go To 11

2. CHECK THE BRAKE SWITCH SIGNAL 2 STATUS

While observing the BRAKE SWITCH SIGNAL 2 status on the scan tool display, press and release the brake pedal several times.

Does the scan tool display BRAKE SWITCH SIGNAL 2: PRESSED and RELEASED for the appropriate pedal position

Yes >> Go To 3

No >> Go To 4

3. INTERMITTENT CONDITION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set.

Refer to any Technical Service Bulletins (TSB) that may apply.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

4. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

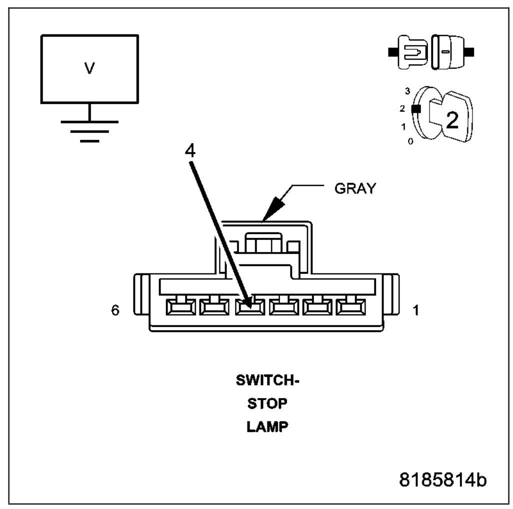
Turn the ignition on.

Measure the voltage between the (B215) Brake Switch Signal 2 circuit and ground at the Stop Lamp Switch harness connector.

Is the voltage above 9.0 volts?

Yes >> Go To 5

No >> Go To 8



5. STOP LAMP SWITCH - BRAKE SWITCH SIGNAL 2 CKT OPEN

While monitoring the BRAKE SWITCH 2 status with the scan tool, connect a jumper wire between ground and the (B215) Brake Switch Signal 2 circuit.

Does the scan tool display change from PRESSED to RELEASED?

Yes >> Adjust or replace the Stop Lamp Switch in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

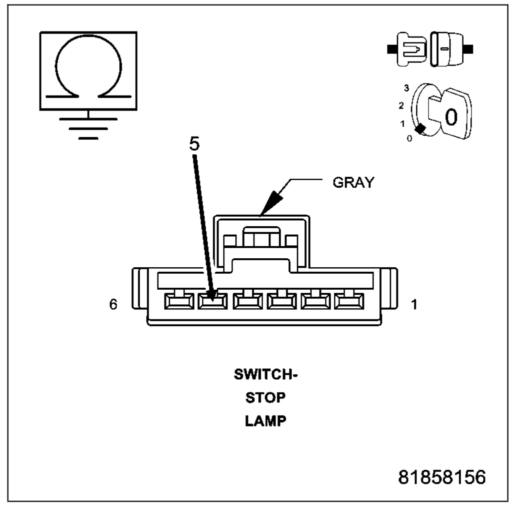
No >> Go To 6

6. (Z967) STOP LAMP SWITCH GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Measure the resistance between ground and the (Z967) Stop Lamp Switch Ground circuit at the Stop Lamp Switch harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (Z967) Stop Lamp Switch Ground circuit for an open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE - INTERNAL

If there are no possible causes remaining, view repair.

Repair

Replace and program the Engine Control Module in accordance with the Service Information.

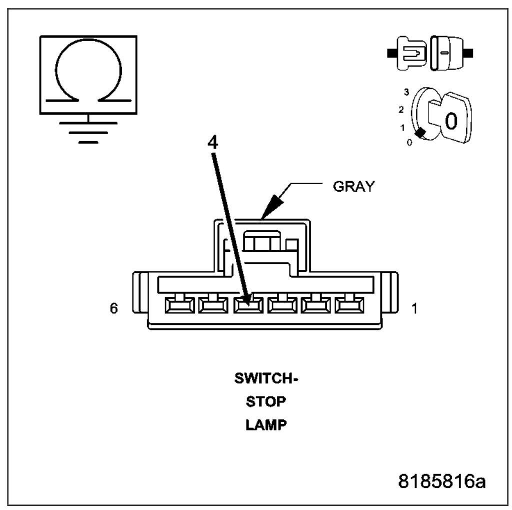
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (B215) Brake Switch Signal 2 circuit at the Stop Lamp Switch harness connector.



Is the resistance above 1000 ohms?

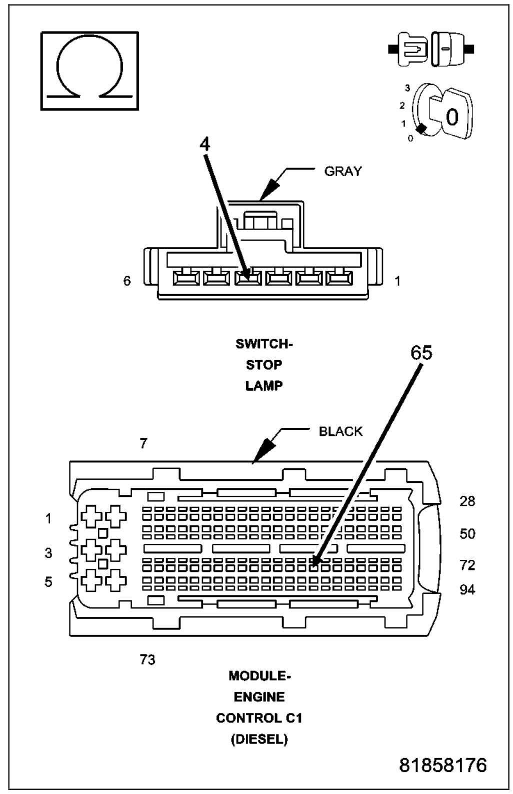
Yes >> Go To 9

No >> Repair the (B215) Brake Switch Signal 2 circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. (B215) BRAKE SWITCH SIGNAL 2 CIRCUIT OPEN

Measure the resistance of the (B215) Brake Switch Signal 2 circuit between the Stop Lamp Switch harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 10

No >> Repair the (B215) Brake Switch Signal 2 circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

10. ENGINE CONTROL MODULE - BRAKE SWITCH SIGNAL 2

If there are no possible causes remaining, view repair.

Repair

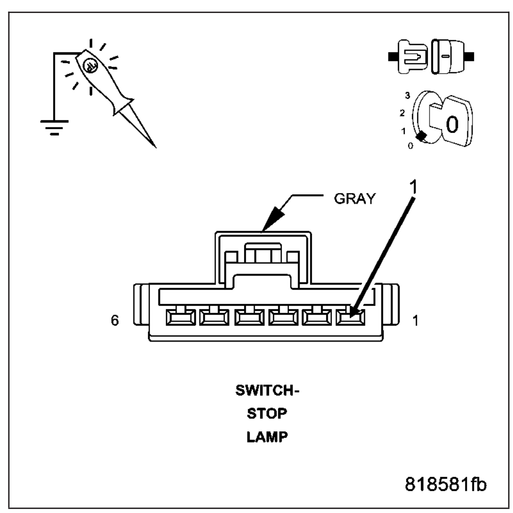
Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

11. (A924) FUSED B+ CIRCUIT OPEN

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Using a 12-volt test light connected to ground, check the (A924) Fused B+ circuit.



Does the test light illuminate brightly?

Yes >> Go To 12

No >> Repair the (A924) Fused B+ circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

12. STOP LAMP SWITCH - BRAKE SWITCH SIGNAL 1 OPEN

Turn the ignition on.

While monitoring the BRAKE SWITCH SIGNAL 1 status with the scan tool, connect a jumper wire between the Brake Switch Signal 1 circuit and the Fused B(+) circuit.

Does the scan tool display change from RELEASED to PRESSED?

Yes >> Adjust or replace the Stop Lamp Switch in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 13

13. (B15) BRAKE SWITCH SIGNAL 1 CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

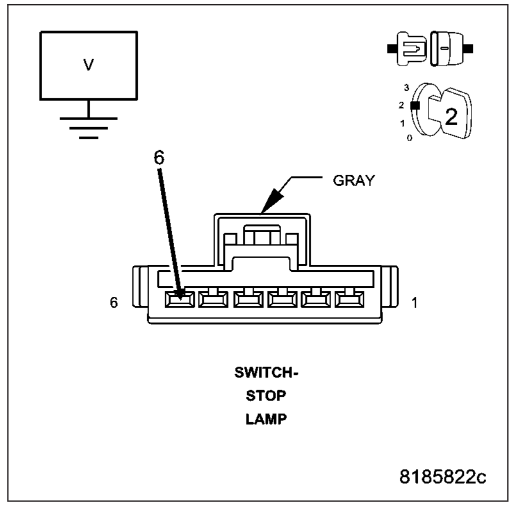
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage between the (B15) Brake Switch Signal 1 circuit and ground.



Is the voltage above 1.0 volt?

Yes >> Repair the (B15) Brake Switch Signal 1 circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

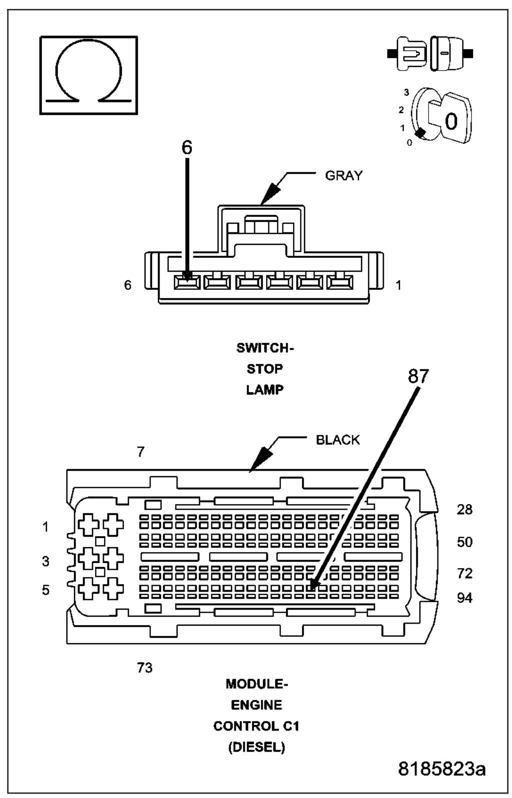
No >> Go To 14

14. (B15) BRAKE SWITCH SIGNAL 1 CIRCUIT OPEN

NOTE: Remove the jumper wire.

Turn the ignition off.

Measure the resistance of the (B15) Brake Switch Signal 1 circuit between the Stop Lamp Switch harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (B15) Brake Switch Signal 1 circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0574–CRUISE CONTROL SYSTEM-VEHICLE SPEED TOO HIGH

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The vehicle speed is above 250 kph for 0.5 second.

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

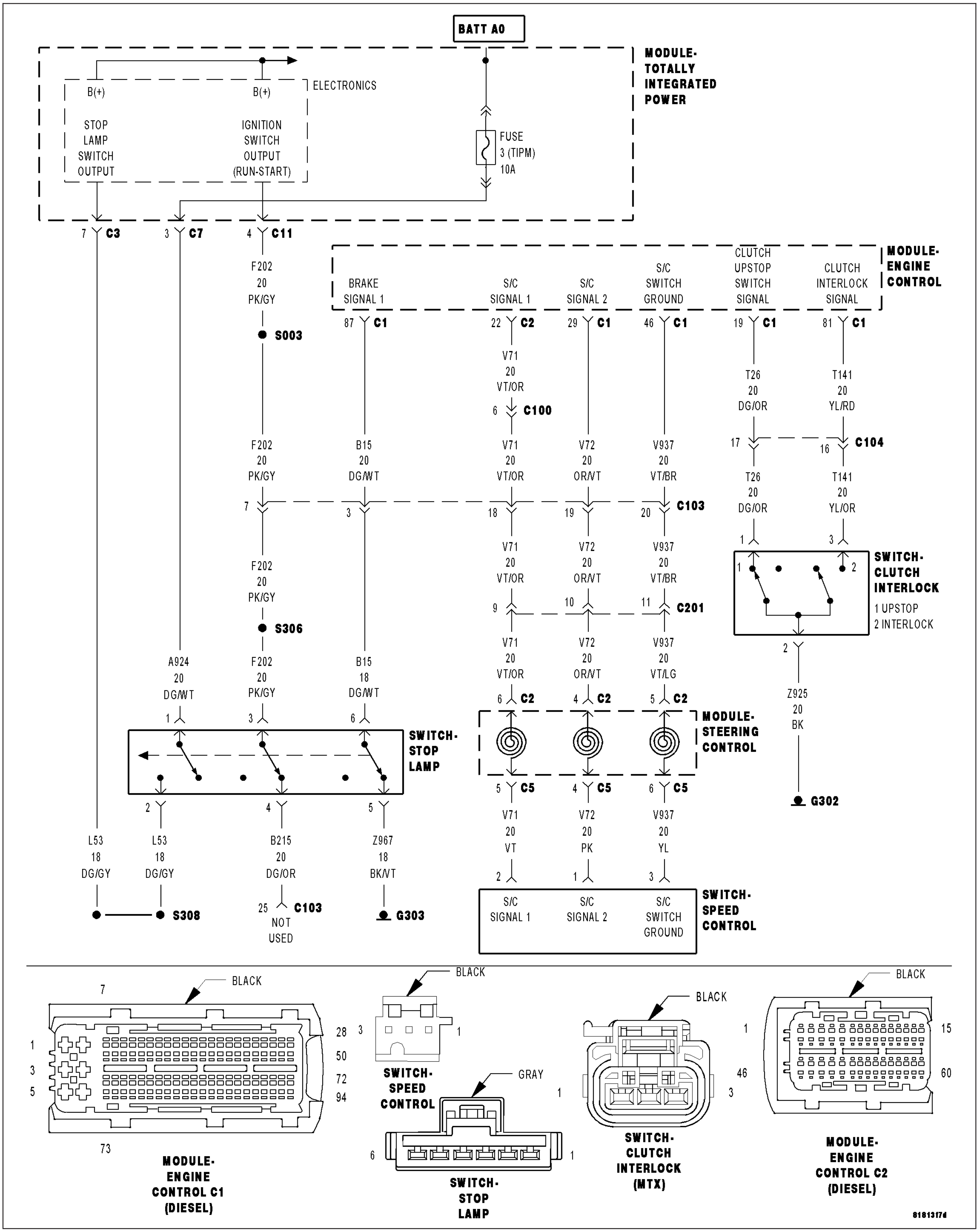
1. DTC EXPLANATION

NOTE: This DTC indicates that the vehicle speed has gone above the upper limit of speed control function.

View Repair.

Yes >> Test Complete.

P0578-SPEED CONTROL SWITCH 1 STUCK



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no other S/C Switch DTCs present.
- **Set Condition:**
  The S/C Switch #1 signal indicates that a switch is pressed continuously for 60 seconds.

Possible Causes
INTERMITTENT DTC
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

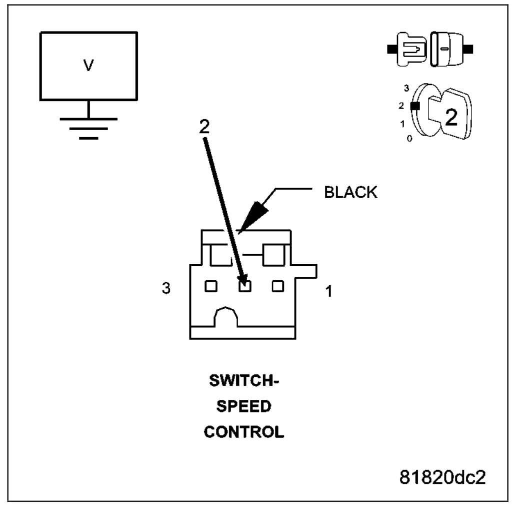
2. (V71) S/C SWITCH 1 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

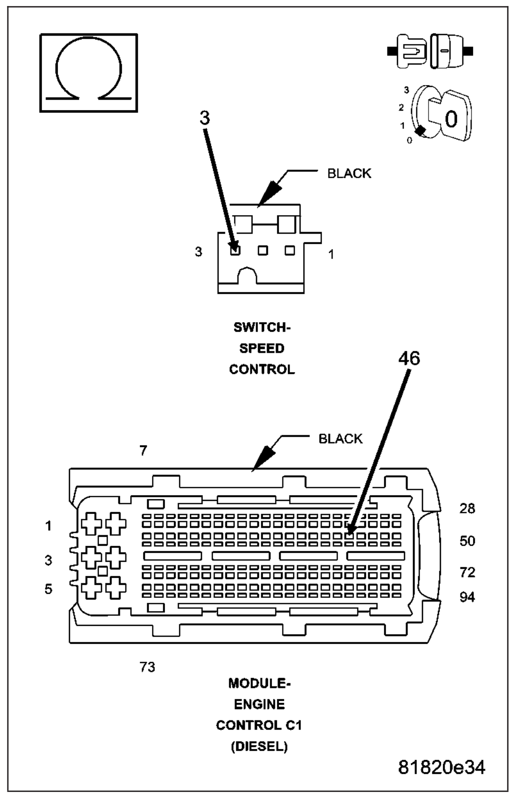
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



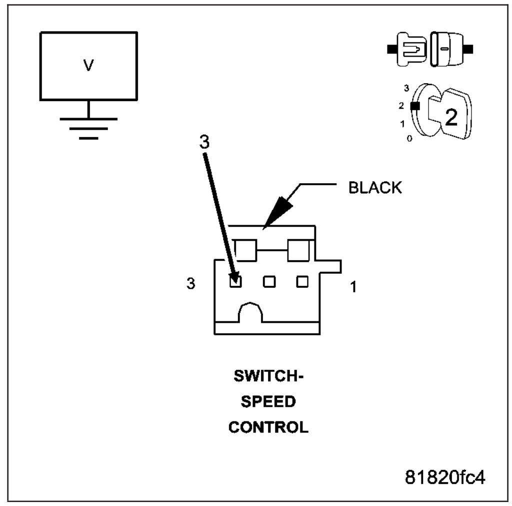
Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.

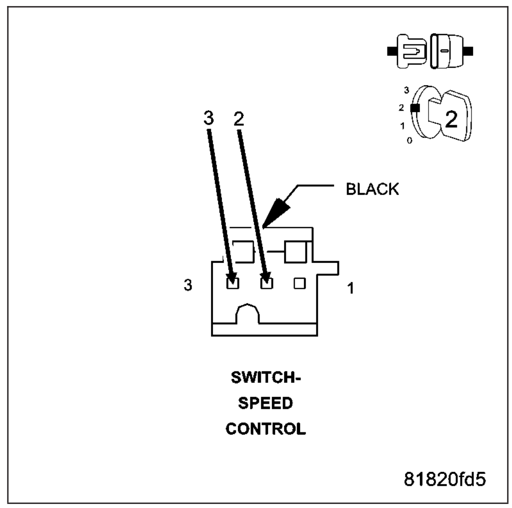
Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH



Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V71) S/C Switch 1 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

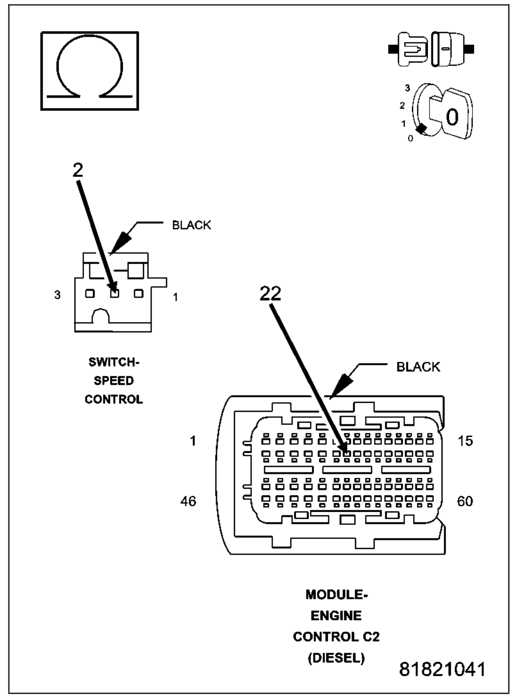
No >> Go to 9

6. (V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) connector.

Measure the resistance of the (V71) S/C Switch 1 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

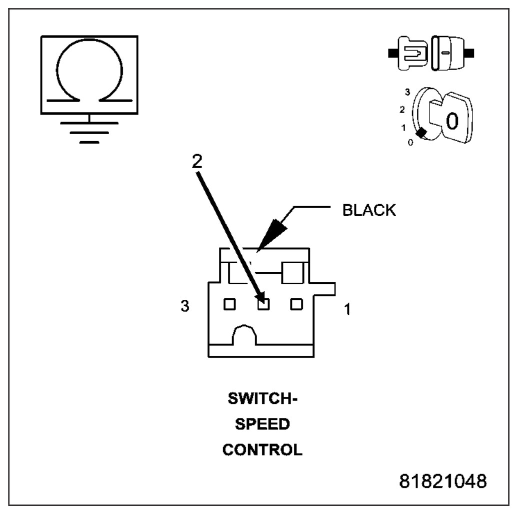
Yes >> Go To 7

No >> Repair the (V71) S/C Switch 1 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V71) S/C Switch 1 Signal circuit.



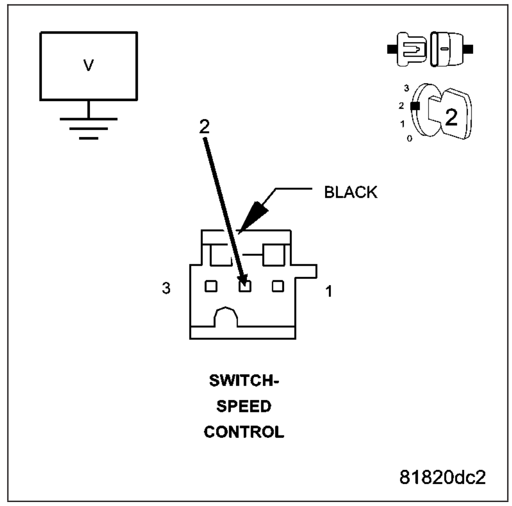
Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V71) S/C Switch 1 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal circuit.

Is there any voltage present?

Yes >> Repair the (V71) S/C Switch 1 Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

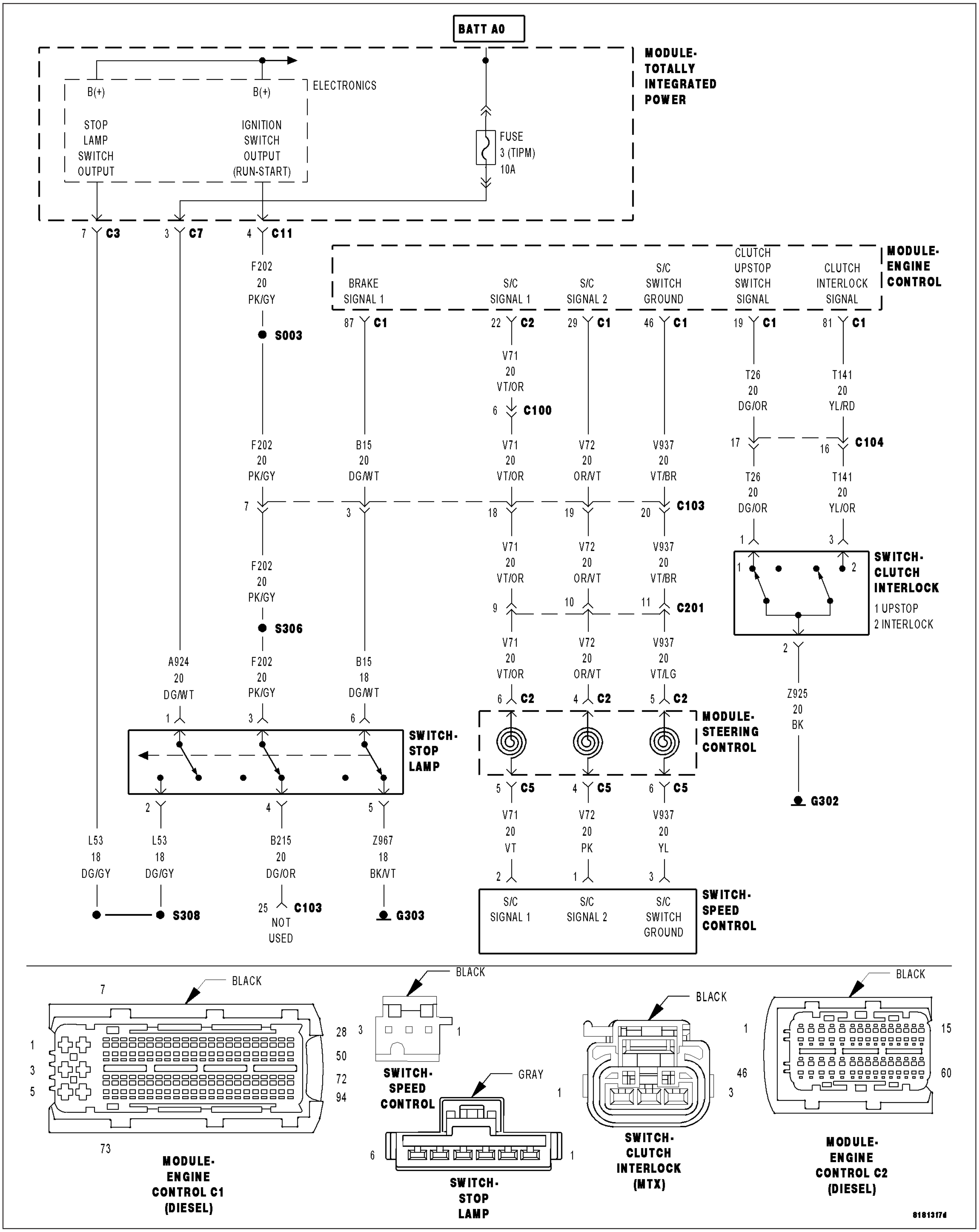
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #1 Signal voltage is not within a valid switch signal window for 0.7 seconds.

Possible Causes
INTERMITTENT DTC
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

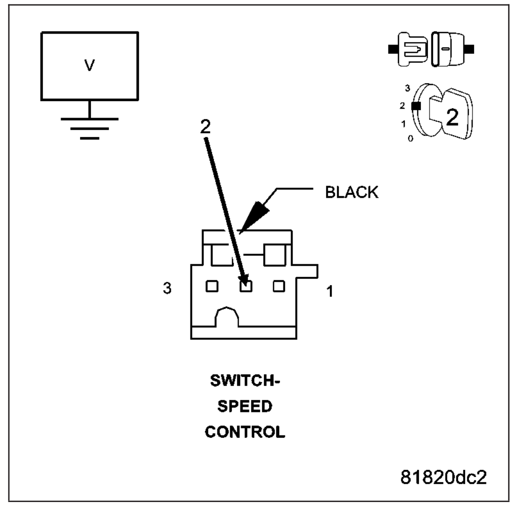
2. (V71) S/C SWITCH 1 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

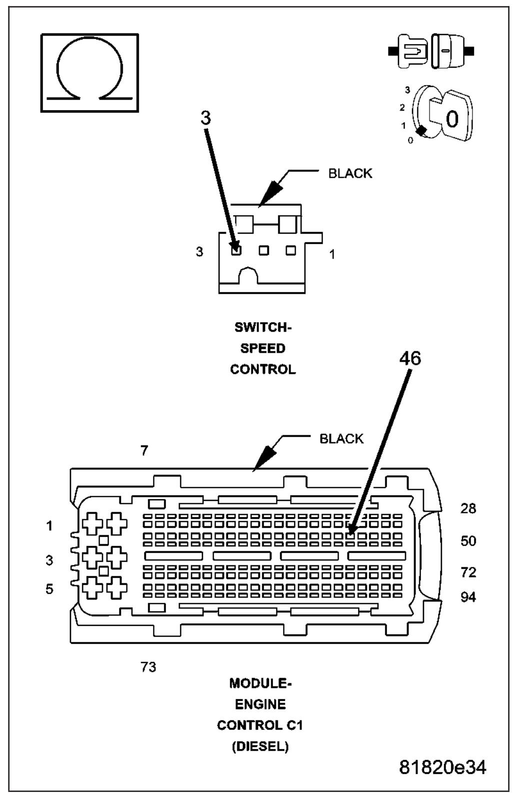
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE

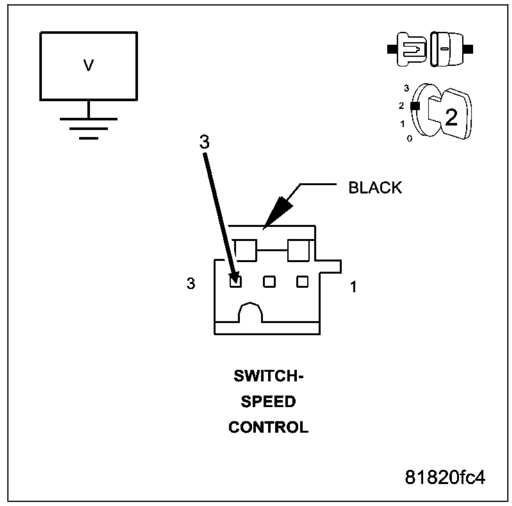
Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.



Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH

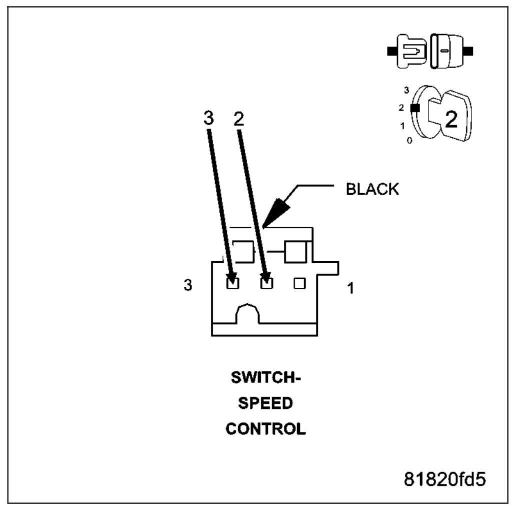
Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V71) S/C Switch 1 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.



Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

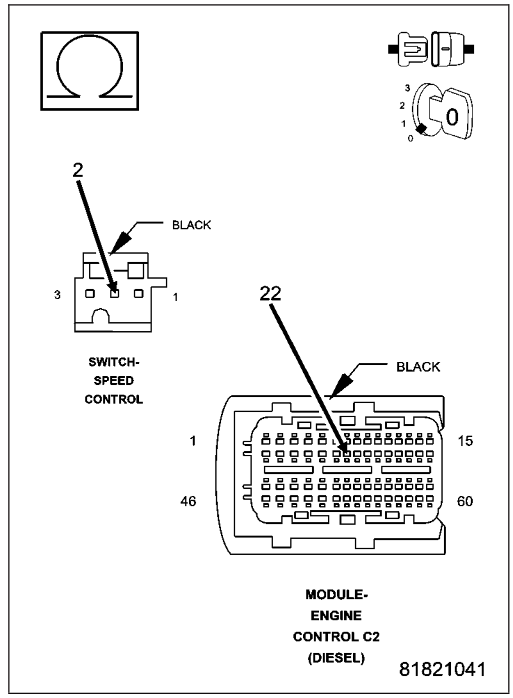
No >> Go to 9

6. (V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V71) S/C Switch 1 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

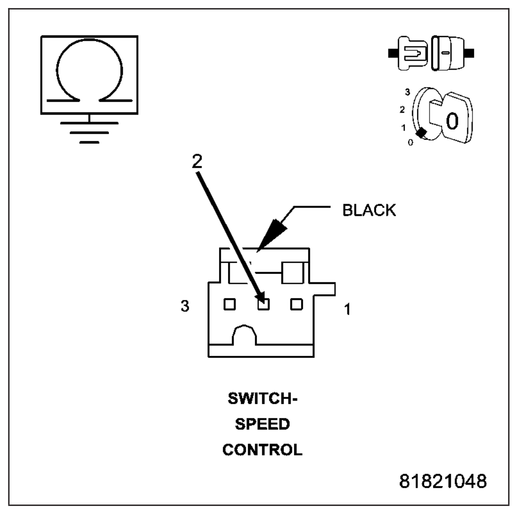
Yes >> Go To 7

No >> Repair the (V71) S/C Switch 1 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V71) S/C Switch 1 Signal circuit.



Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V71) S/C Switch 1 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

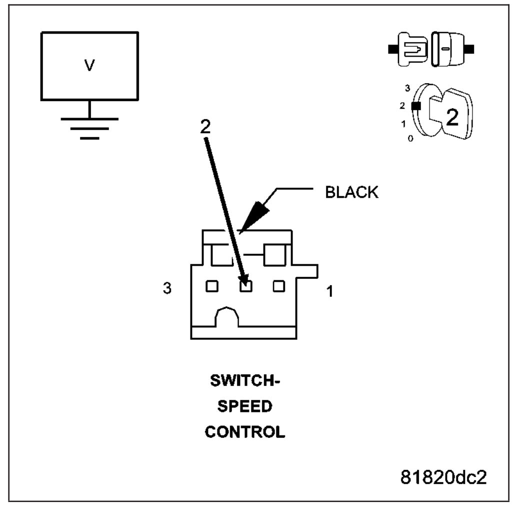
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal circuit.



Is there any voltage present?

Yes >> Repair the (V71) S/C Switch 1 Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

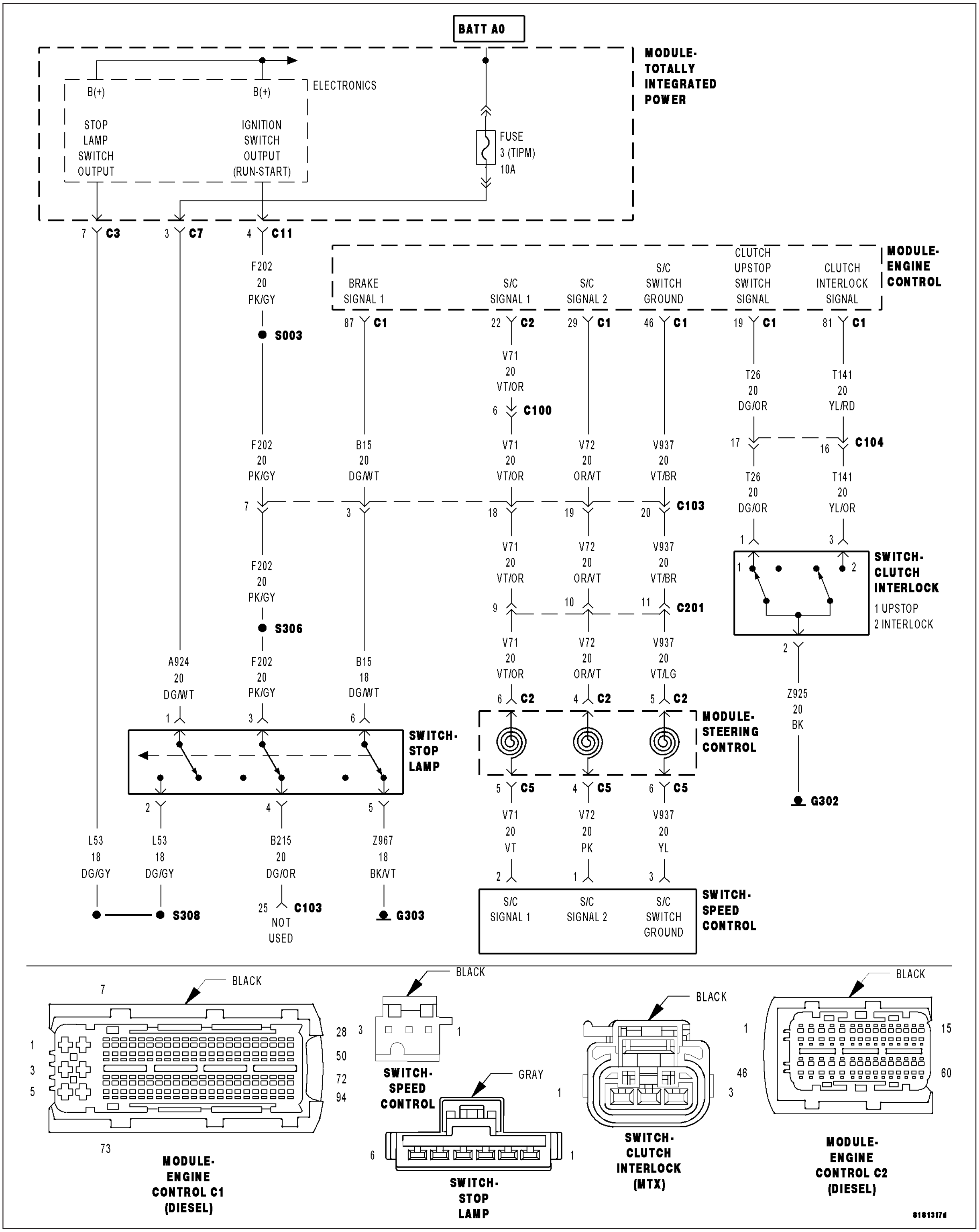
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #1 Signal is below 0.39 volt for 0.06 seconds.

Possible Causes
INTERMITTENT DTC
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

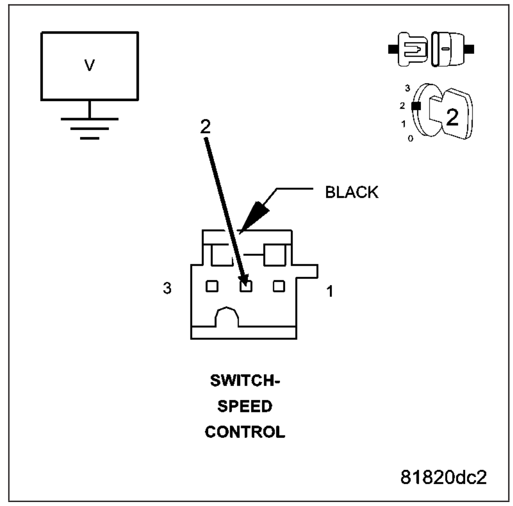
2. (V71) S/C SWITCH 1 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

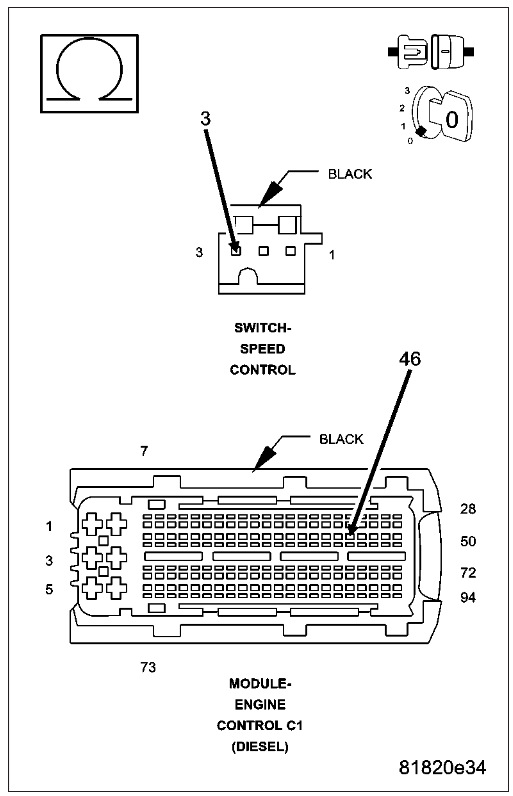
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE

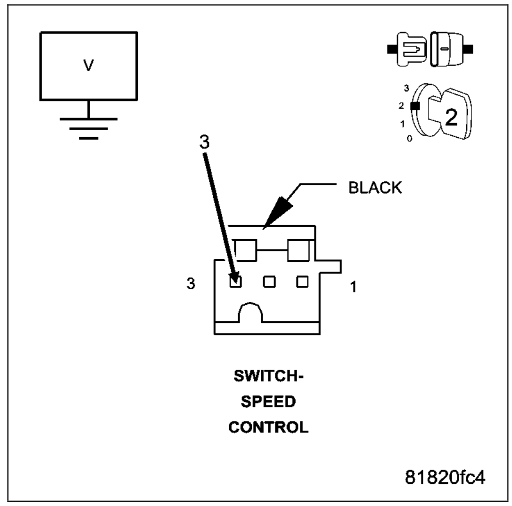
Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.



Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH

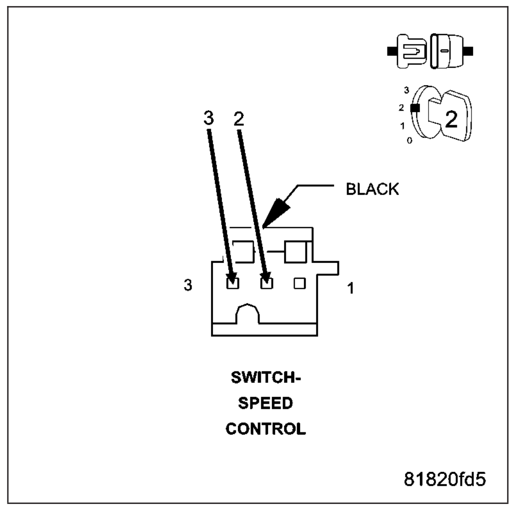
Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V71) S/C Switch 1 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.



Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

6. (V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

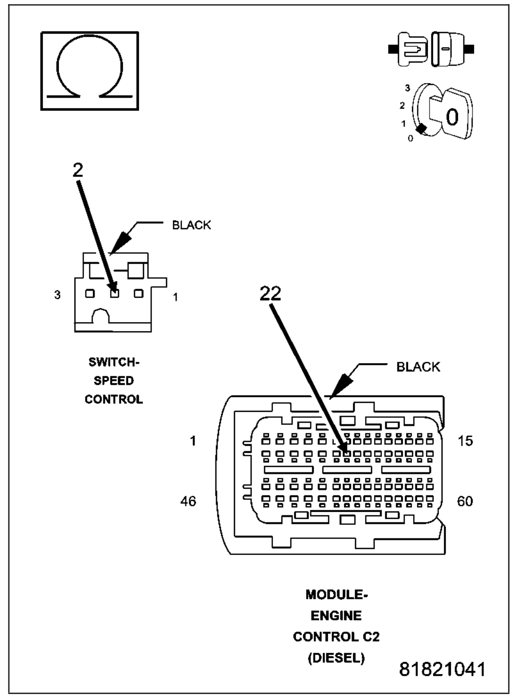
Measure the resistance of the (V71) S/C Switch 1 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (V71) S/C Switch 1 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



7. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND

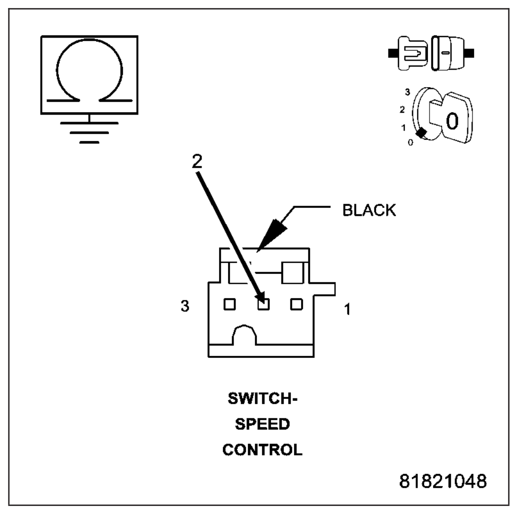
Measure the resistance between ground and the (V71) S/C Switch 1 Signal circuit.

Is the resistance above 1000 ohms?

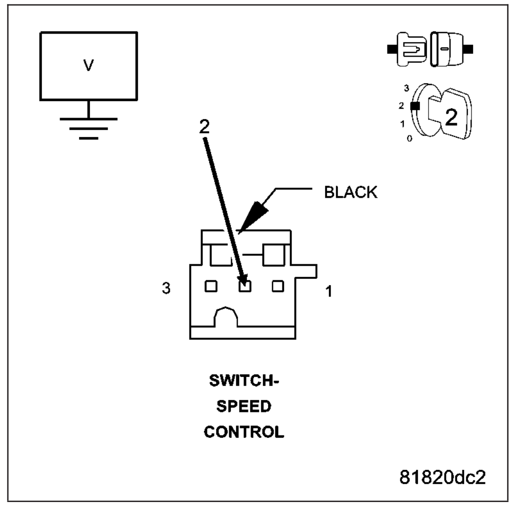
Yes >> Go to 9

No >> Repair the (V71) S/C Switch 1 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal circuit.

Is there any voltage present?

Yes >> Repair the (V71) S/C Switch 1 Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

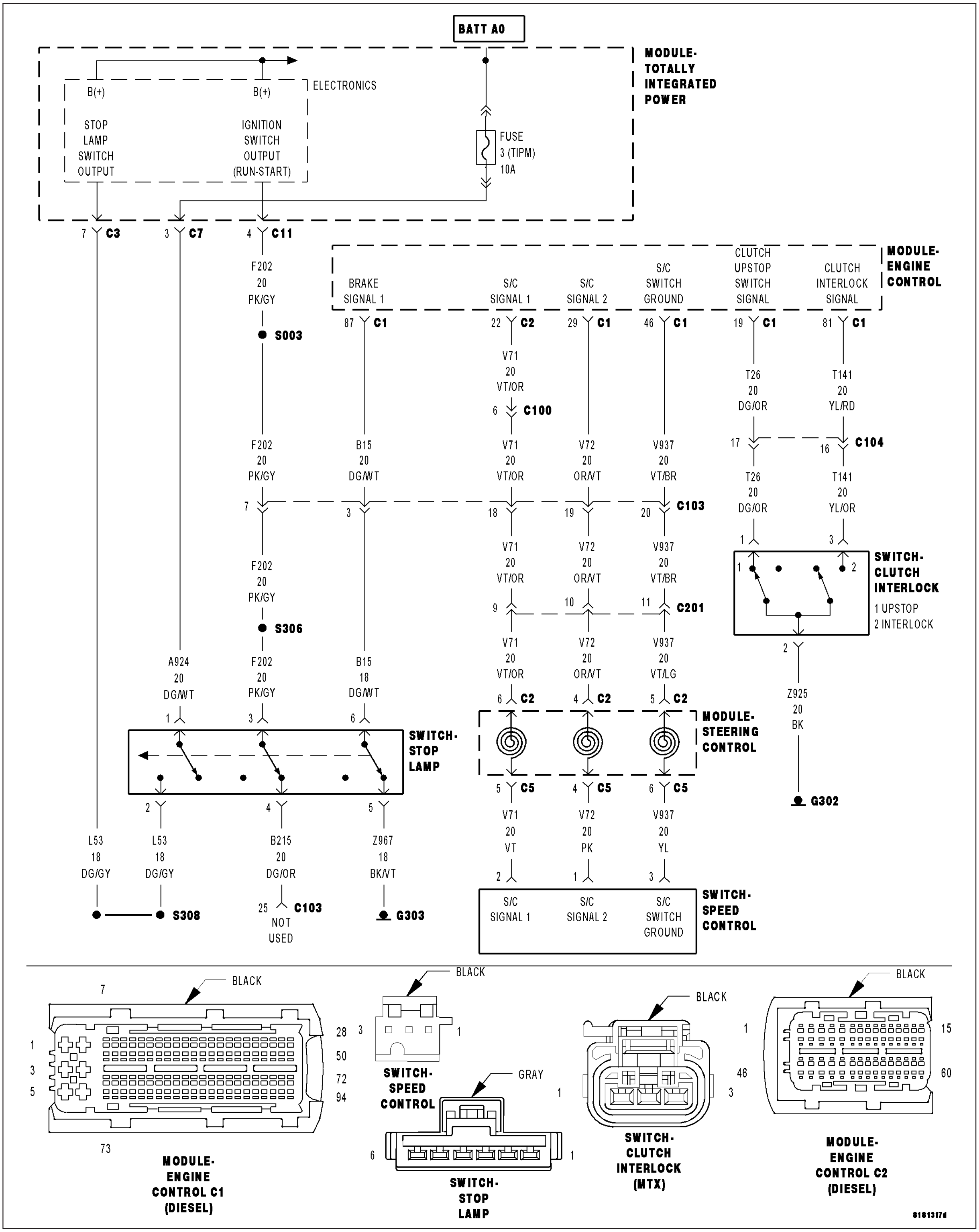
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #1 Signal is above 4.78 volts for 0.06 seconds.

Possible Causes
INTERMITTENT DTC
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

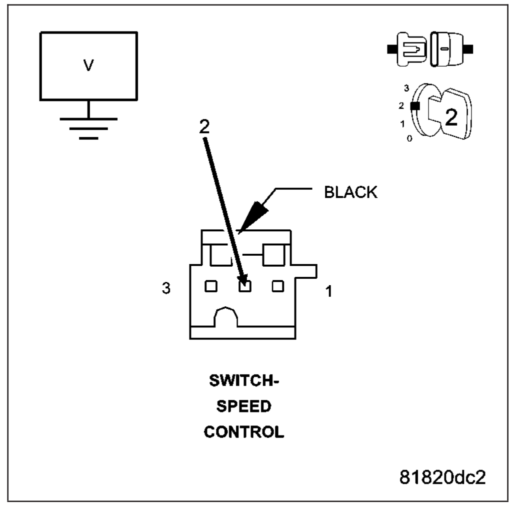
2. (V72) S/C SWITCH 1 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

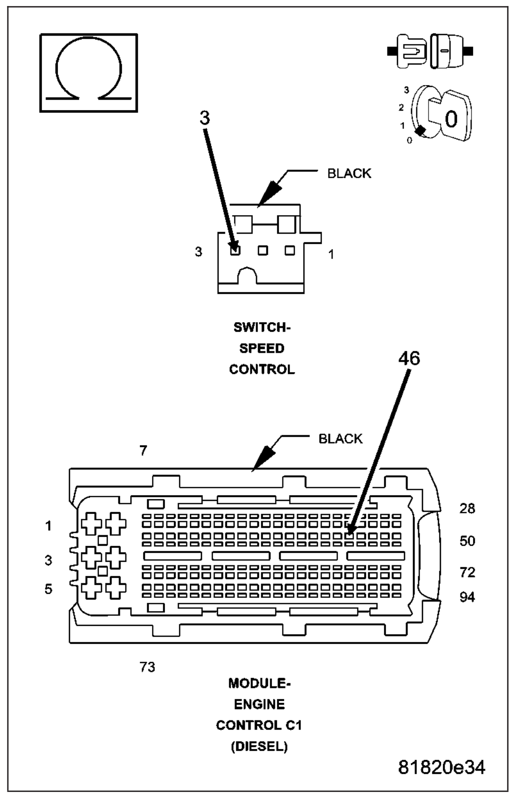
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

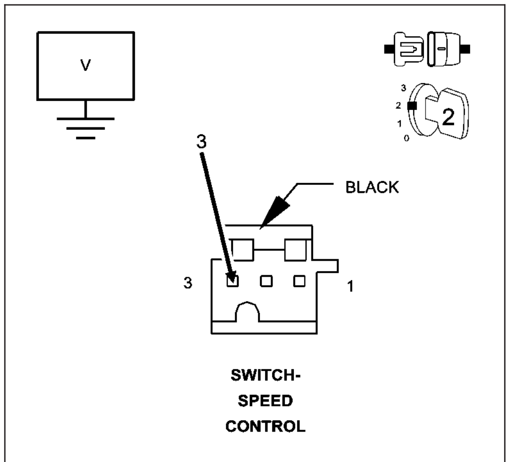
Measure the voltage of the (V937) S/C Switch Ground circuit.

Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5



81820fc4

5. S/C SWITCH

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

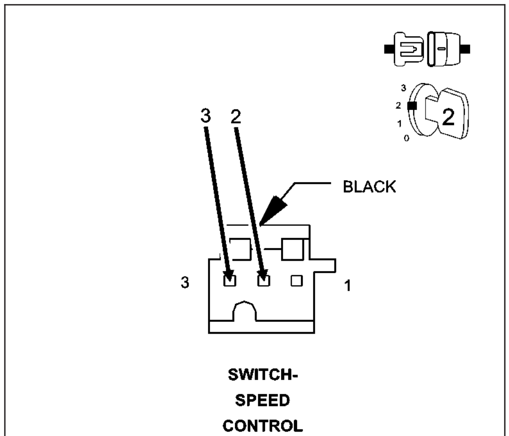
While monitoring the scan tool, connect a jumper wire between the (V71) S/C Switch 1 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switches in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9



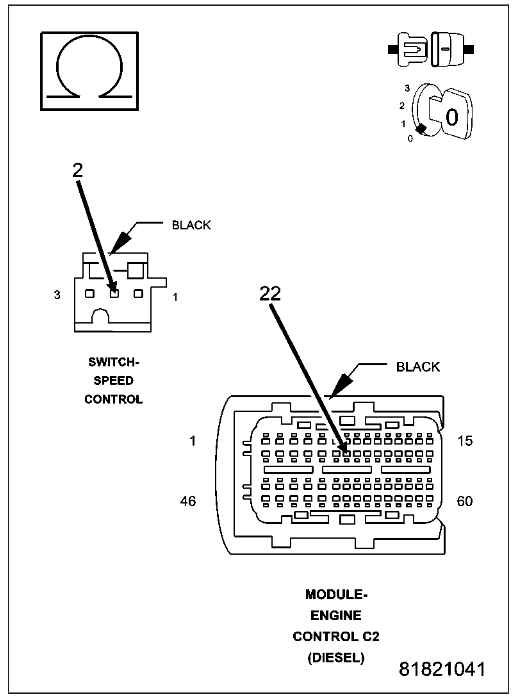
81820fd5

6. (V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V71) S/C Switch 1 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

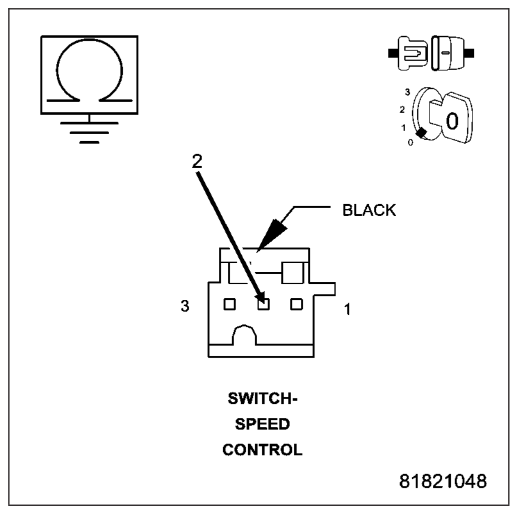
Yes >> Go To 7

No >> Repair the (V71) S/C Switch 1 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V71) S/C Switch 1 Signal circuit.



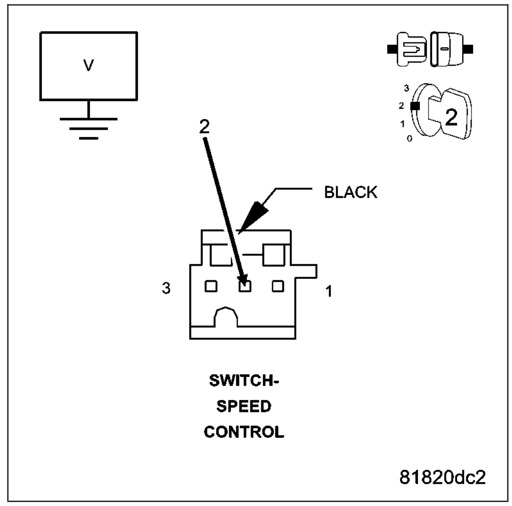
Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V71) S/C Switch 1 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal circuit.

Is there any voltage present?

Yes >> Repair the (V71) S/C Switch 1 Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

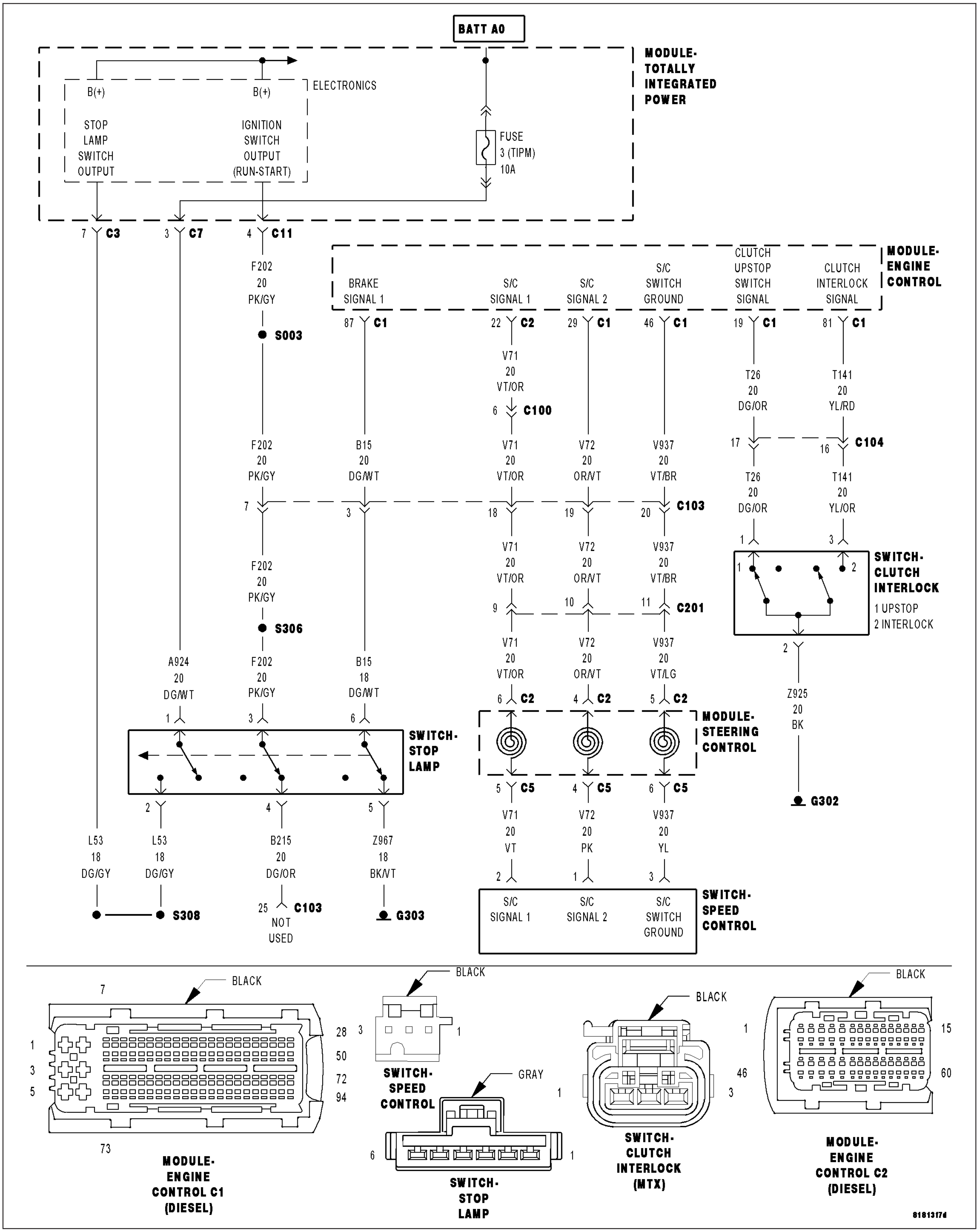
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0585-SPEED CONTROL SWITCH 1 2 CORRELATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no other S/C Switch DTCs present.
- **Set Condition:**
  The (V71) S/C Switch 1 Signal and (V72) S/C Switch 2 Signal do not indicate the same S/C Switch position for 5.0 seconds.

Possible Causes
INTERMITTENT DTC
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V71) S/C SWITCH 1 SIGNAL CIRCUIT SHORTED TO GROUND
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Do the S/C Switch voltages fall within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

2. SPEED CONTROL SWITCH CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

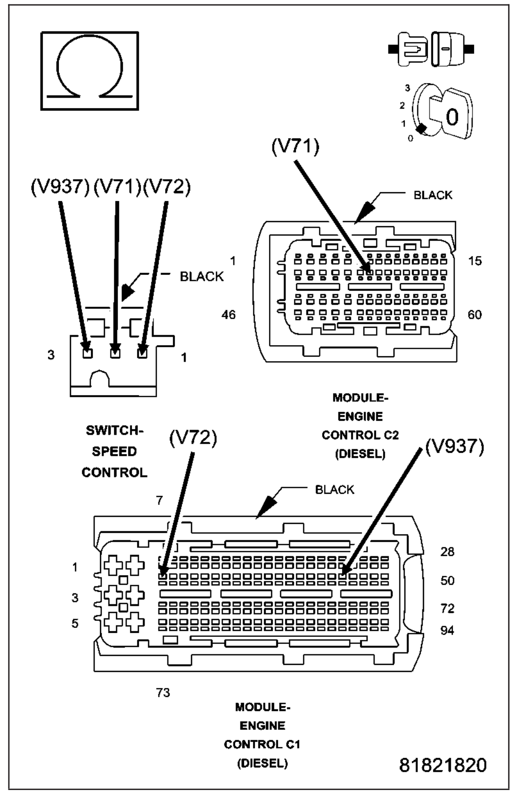
Disconnect the Speed Control Switch harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V71) S/C Switch 1 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V72) S/C Switch 2 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms for ALL measurements?

Yes >> Go To 3

No >> Repair the Speed Control Switch circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. SPEED CONTROL SWITCH CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Remove the Main Relay.

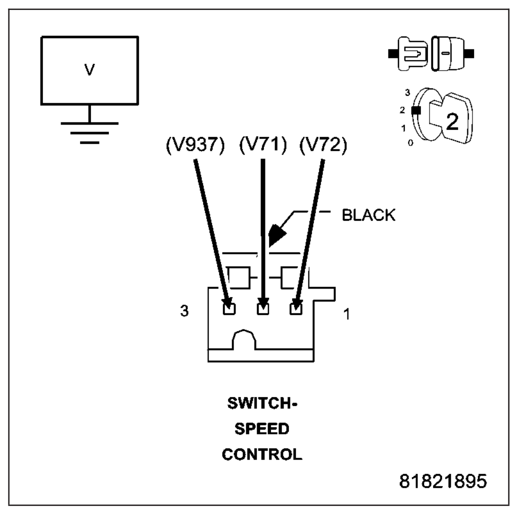
Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V71) S/C Switch 1 Signal circuit.

Measure the voltage of the (V72) S/C Switch 2 Signal circuit.

Measure the voltage of the (V937) S/C Switch Ground circuit.



Is there any voltage present on any of the circuits?

Yes >> Repair the Speed Control Switch circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. SPEED CONTROL SWITCH CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (V71) S/C Switch 1 Signal circuit.

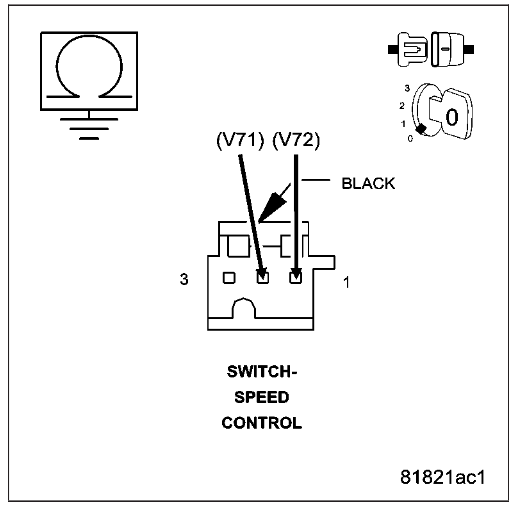
Measure the resistance between ground and the (V72) S/C Switch 2 Signal circuit.

Is the resistance above 1000 ohms?

Yes >> Go to 5

No >> Repair the Speed Control Switch circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



5. SPEED CONTROL SWITCHES

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V71) S/C Switch 1 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

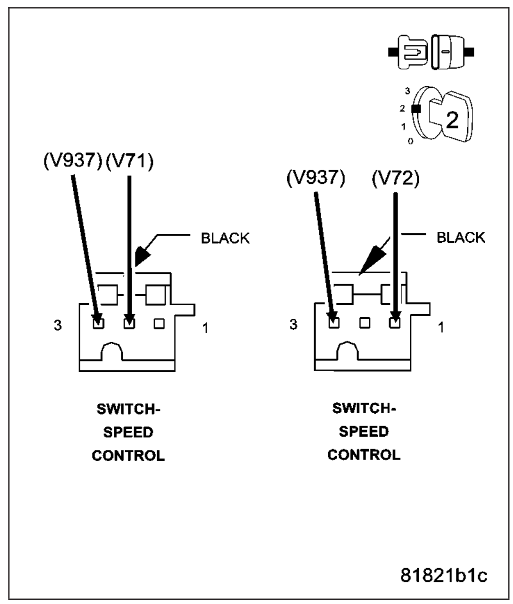
While monitoring the scan tool, connect a jumper wire between the (V72) S/C Switch 2 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

Does the scan tool display below 0.1 volt for each circuit with the jumper wire in place?

Yes >> Replace the Speed Control Switches in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6



6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

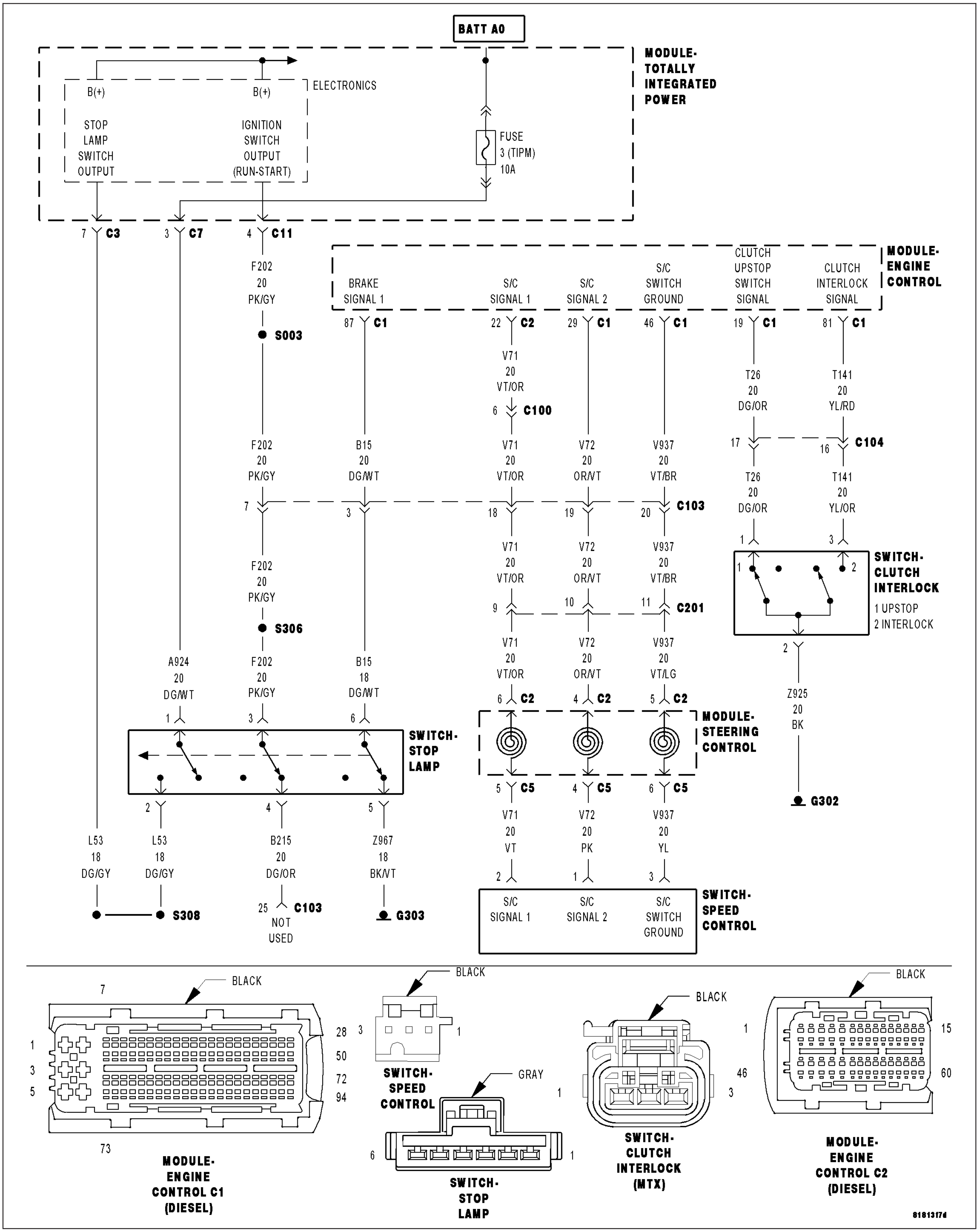
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0590-SPEED CONTROL SWITCH 2 STUCK



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no other S/C Switch DTCs present.
- **Set Condition:**
  The S/C Switch #2 Signal indicates that a switch is pressed for more than 60 seconds.

Possible Causes
INTERMITTENT DTC
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

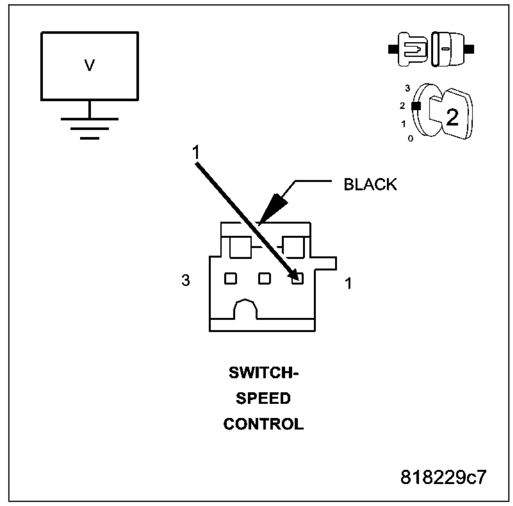
2. (V72) S/C SWITCH 2 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

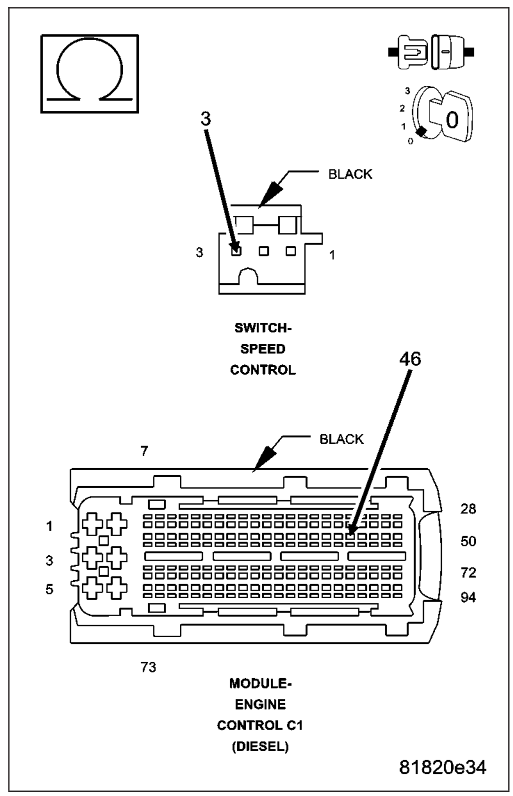
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



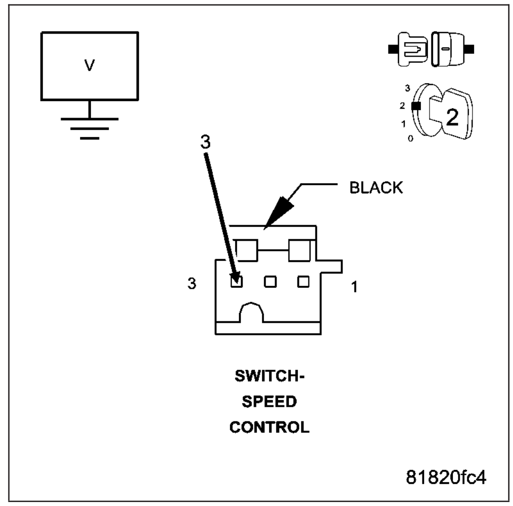
Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.

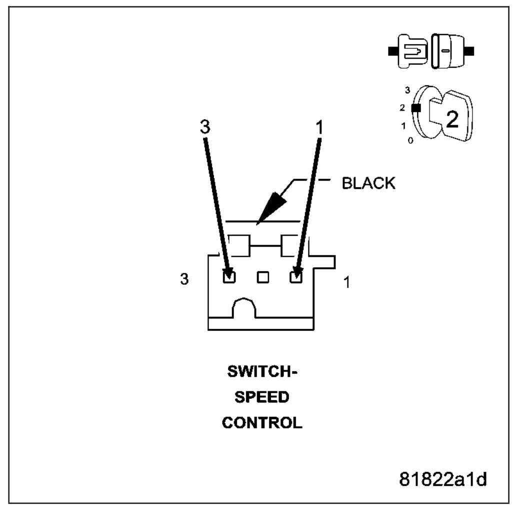
Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH



Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V72) S/C Switch 2 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

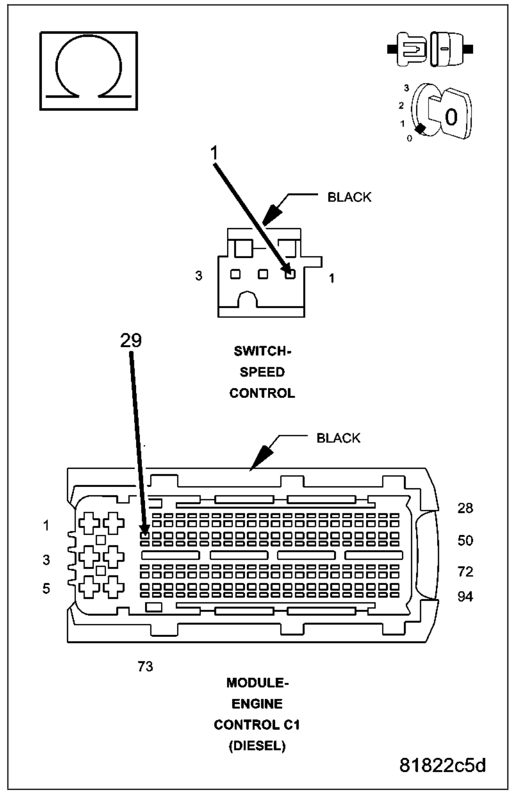
Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

6. (V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V72) S/C Switch 2 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

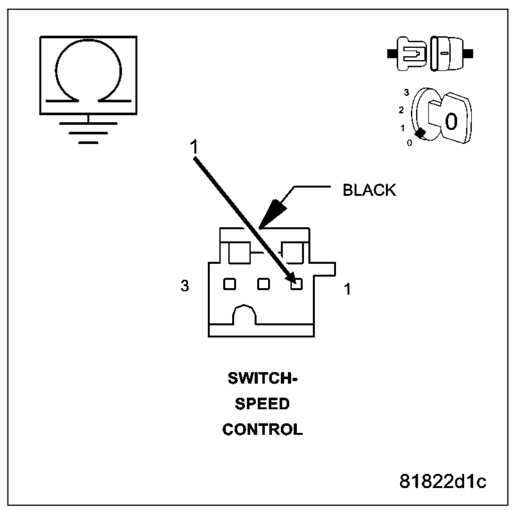
Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (V71) S/C Switch 2 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (V72) S/C Switch 2 Signal circuit.

Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V72) S/C Switch 2 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

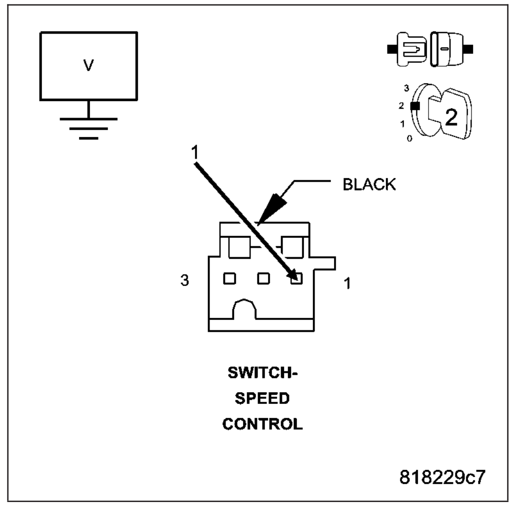
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal circuit.



Is there any voltage present?

Yes >> Repair the (V72) S/C Switch 2 Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

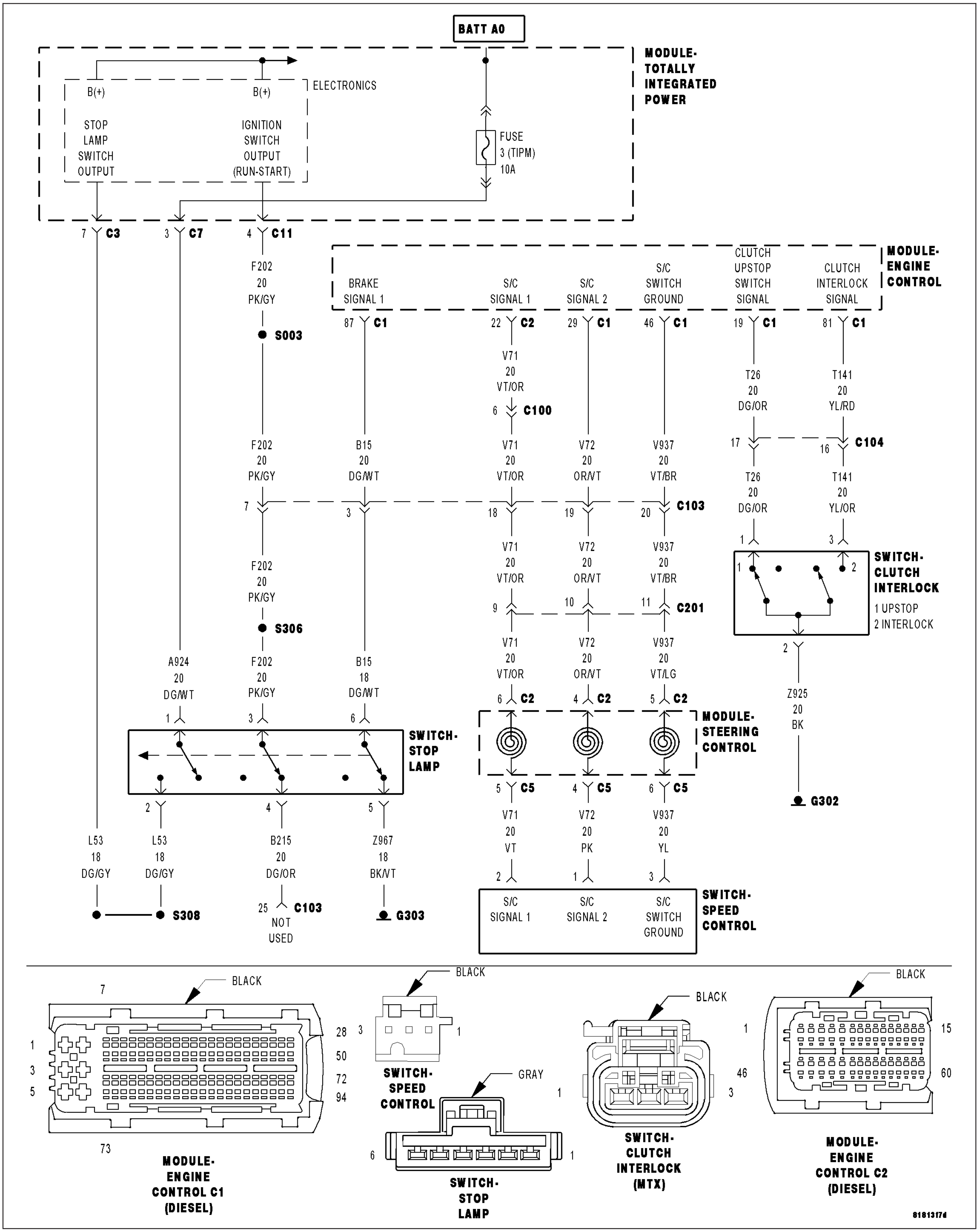
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #2 Signal voltage is not within a valid switch signal window for 3.0 seconds.

Possible Causes
INTERMITTENT DTC
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

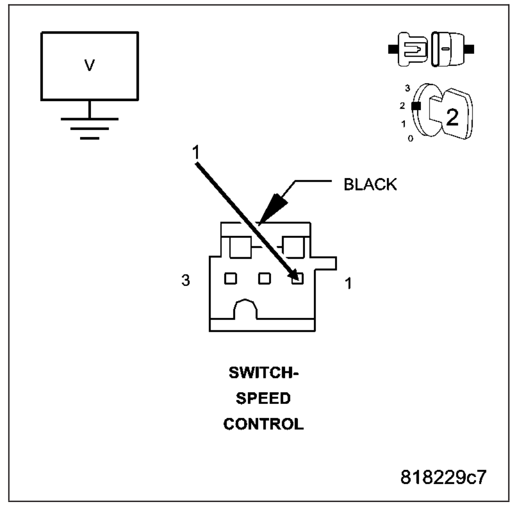
2. (V72) S/C SWITCH 2 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

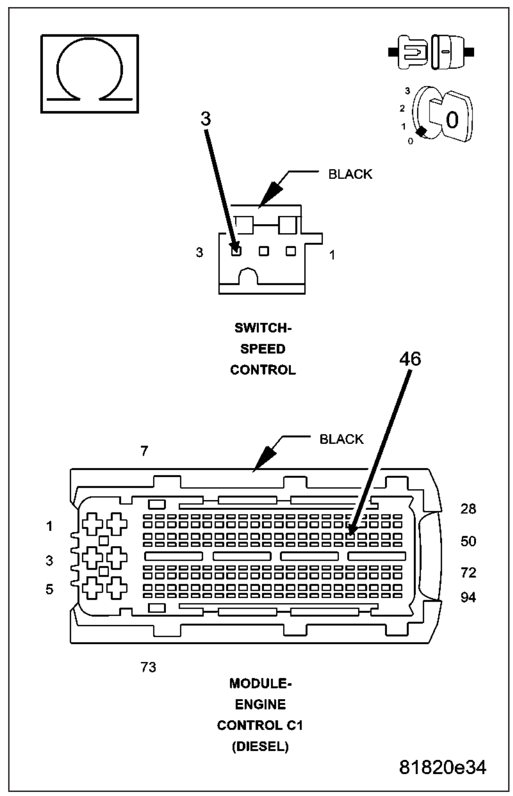
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



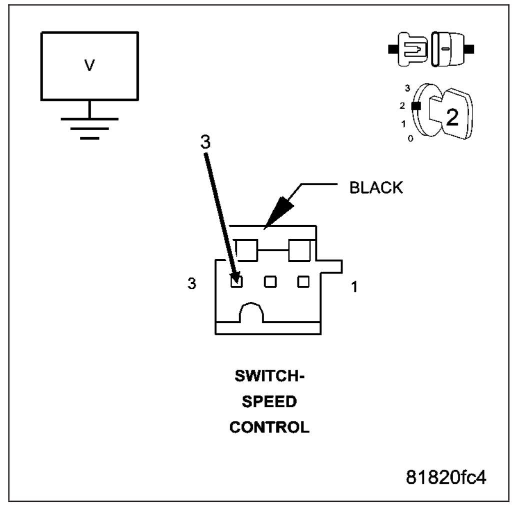
Is the resistance below 10.0 ohms for both circuits?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.

Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V72) S/C Switch 2 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.

Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

6. (V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

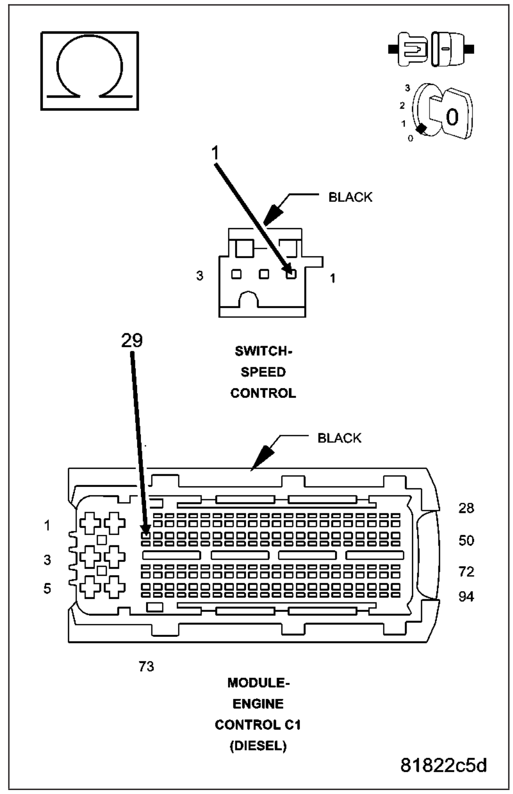
Measure the resistance of the (V72) S/C Switch 2 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (V72) S/C Switch 2 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



7. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND

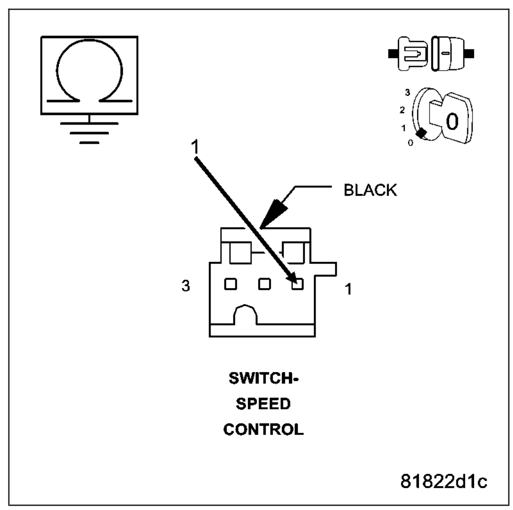
Measure the resistance between ground and the (V72) S/C Switch 2 Signal circuit.

Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V72) S/C Switch 2 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

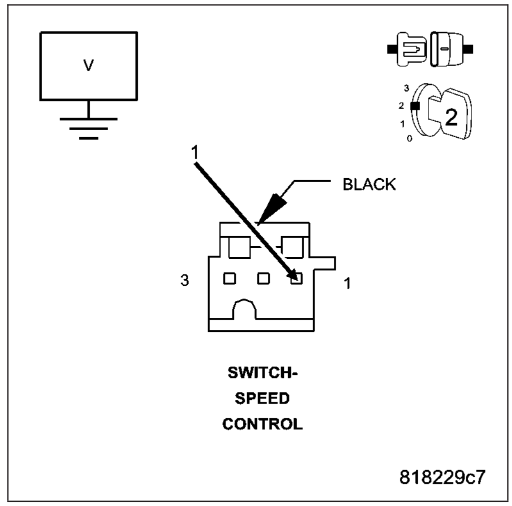
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal circuit.



Is there any voltage present?

Yes >> Repair the (V72) S/C Switch 2 Signal circuit for a short to voltage.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

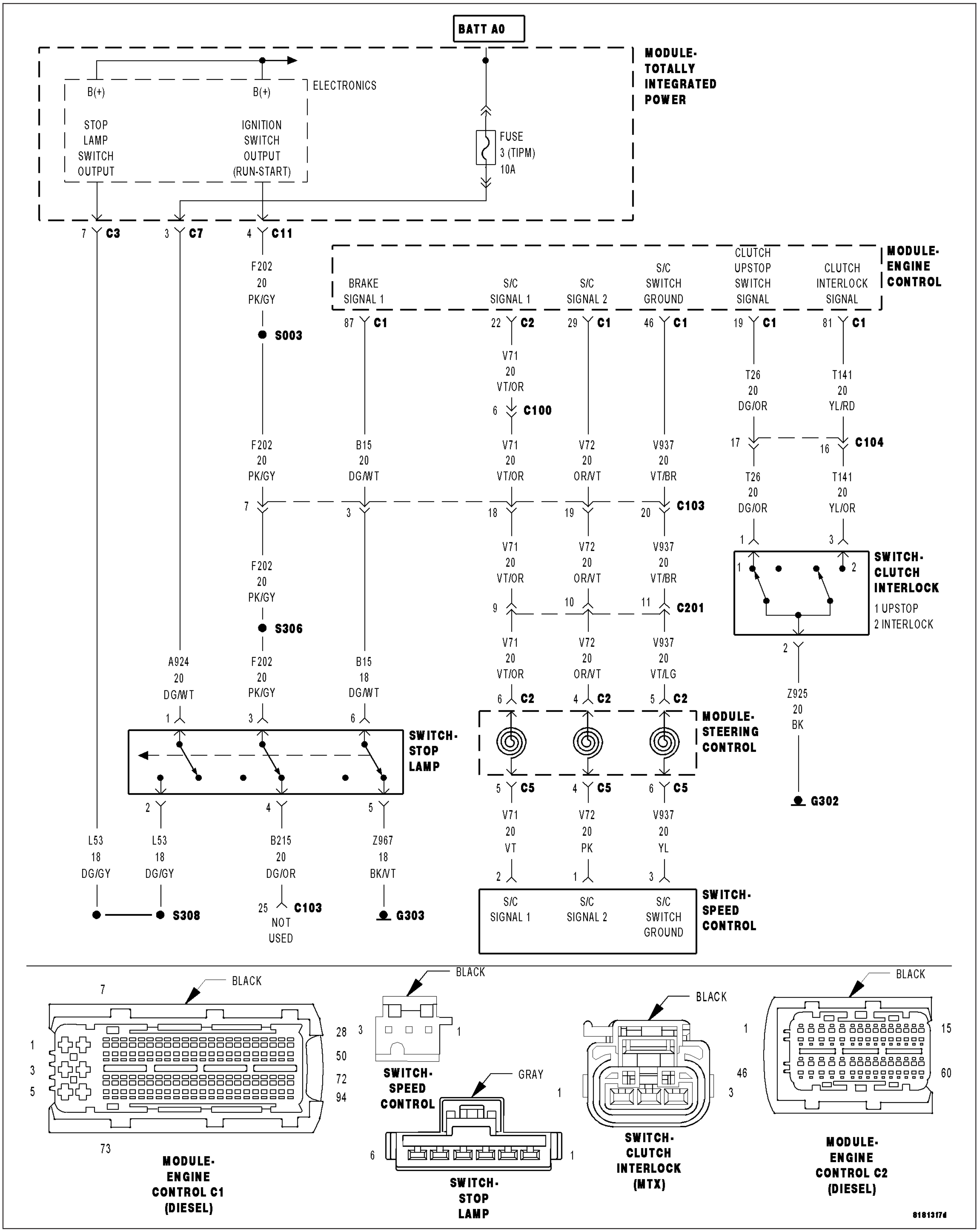
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #2 Signal is below 0.39 volt for 0.06 seconds.

Possible Causes
INTERMITTENT DTC
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

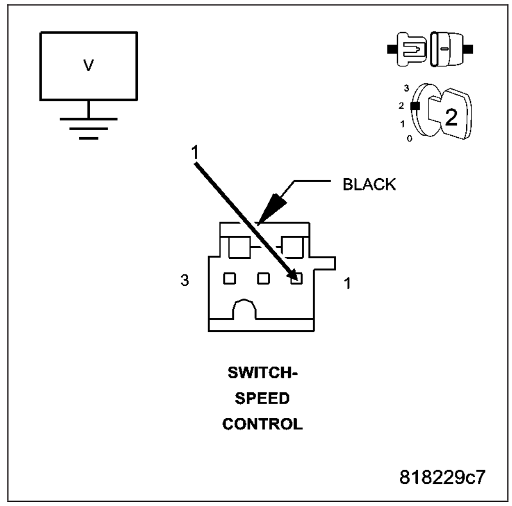
2. (V72) S/C SWITCH 2 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

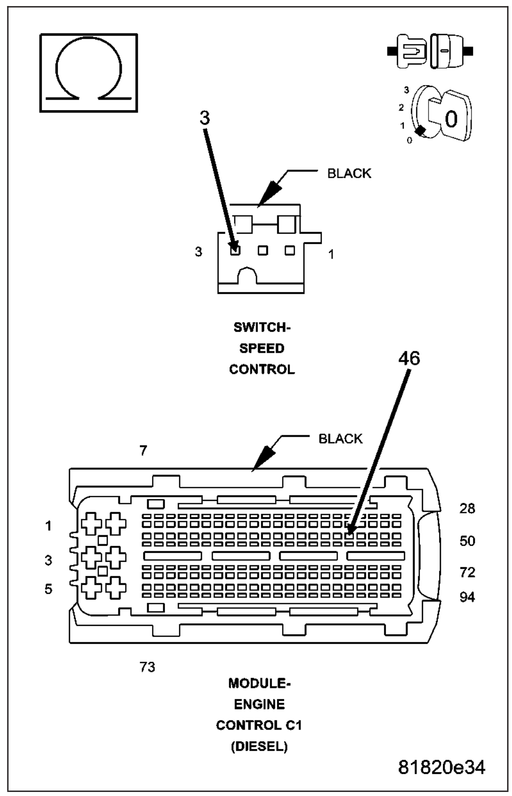
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE

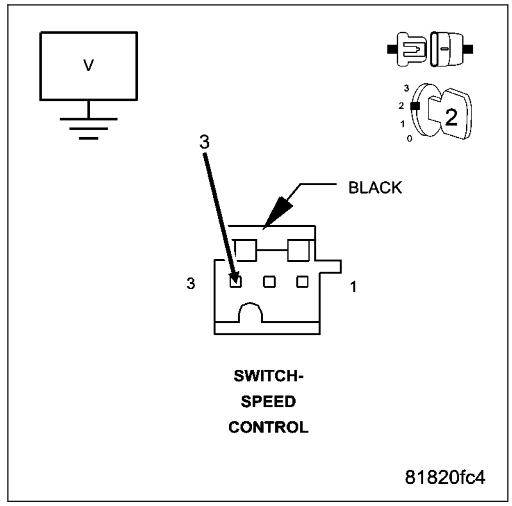
Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.



Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH

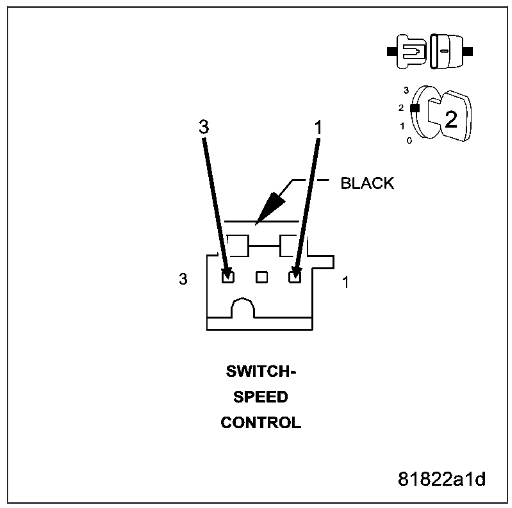
Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V72) S/C Switch 2 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.



Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

6. (V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

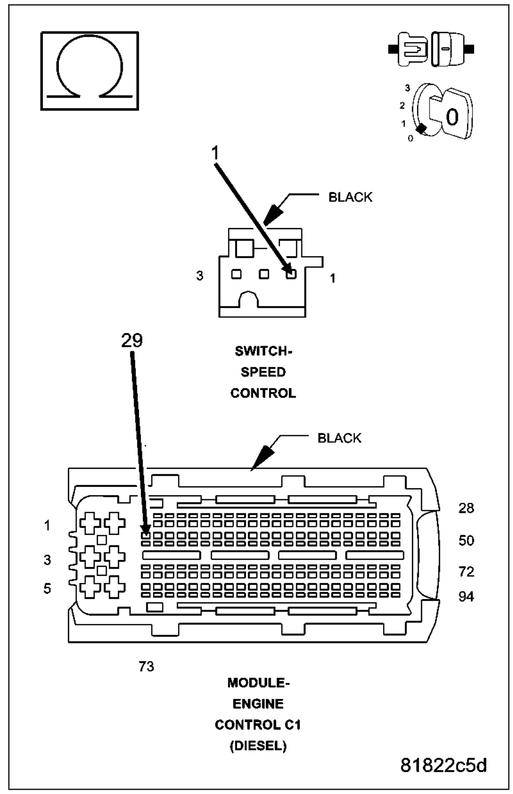
Measure the resistance of the (V72) S/C Switch 2 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 7

No >> Repair the (V72) S/C Switch 2 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



7. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND

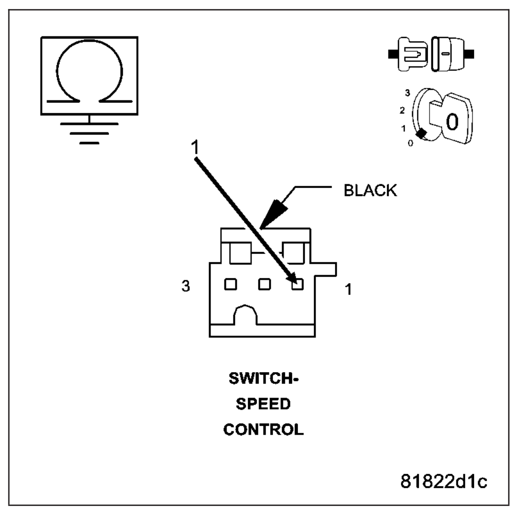
Measure the resistance between ground and the (V72) S/C Switch 2 Signal circuit.

Is the resistance above 1000 ohms?

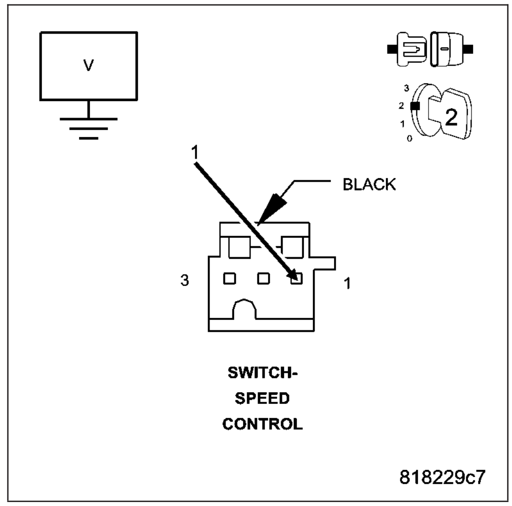
Yes >> Go to 9

No >> Repair the (V72) S/C Switch 2 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



8. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal circuit.

Is there any voltage present?

Yes >> Repair the (V72) S/C Switch 2 Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

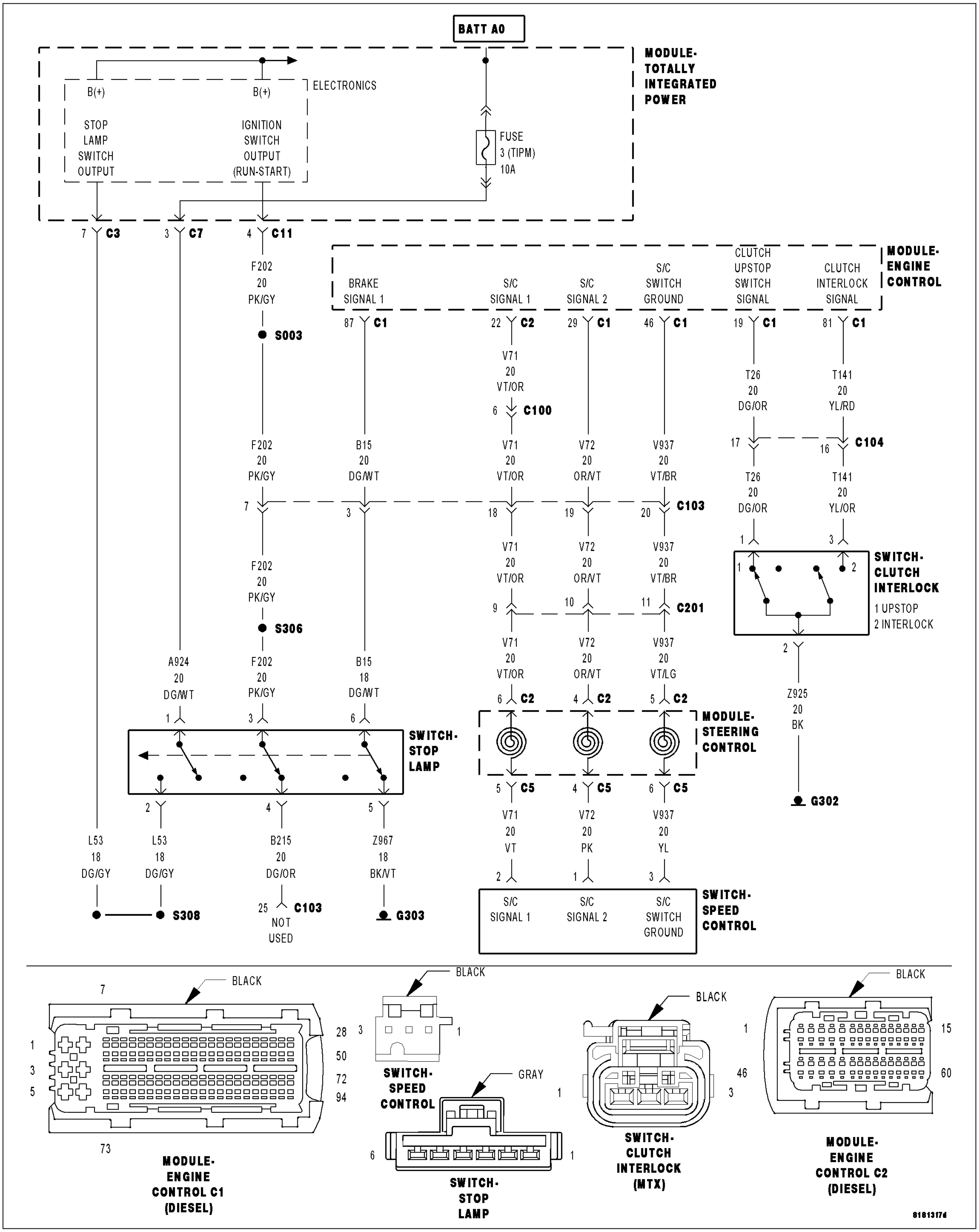
Yes >> Repair as necessary.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver.1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The S/C Switch #2 Signal is above 4.78 volts for 0.06 seconds.

Possible Causes
INTERMITTENT DTC
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(V937) S/C SWITCH GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND
SPEED CONTROL SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. S/C SWITCH VOLTAGES OUT OF RANGE

KEY	SIGNAL 1		SIGNAL 2	
	LO LIMIT	HI LIMIT	LO LIMIT	HI LIMIT
RELEASED	4.36	4.69	4.36	4.69
ON-OFF	0.50	1.10	3.53	3.90
SET	3.16	3.53	1.56	1.18
RESUME-ACCEL	3.84	4.19	1.70	2.43
CANCEL	1.59	1.97	2.43	3.22

Turn the ignition on.

With the scan tool, monitor the S/C Switch signal voltages.

Press each button while noting the voltage readings for each circuit.

Are the S/C Switch voltages within the ranges specified in the table when each button is pressed?

Yes >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

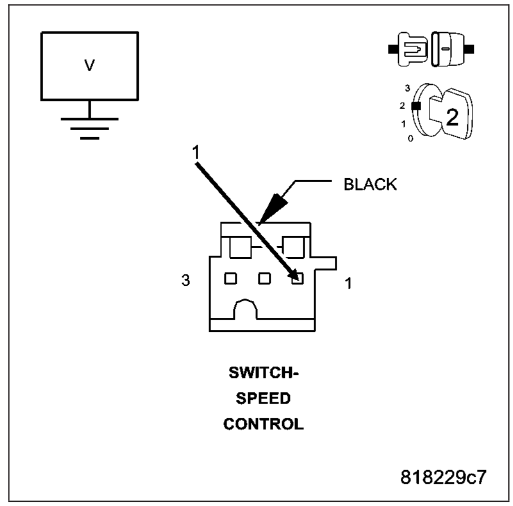
2. (V72) S/C SWITCH 2 SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Speed Control Switch harness connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal Circuit at the Speed Control Switch.



Select the appropriate voltage reading.

4.5 to 5.5 volts
Go To 3

Below 4.5 volts
Go To 6

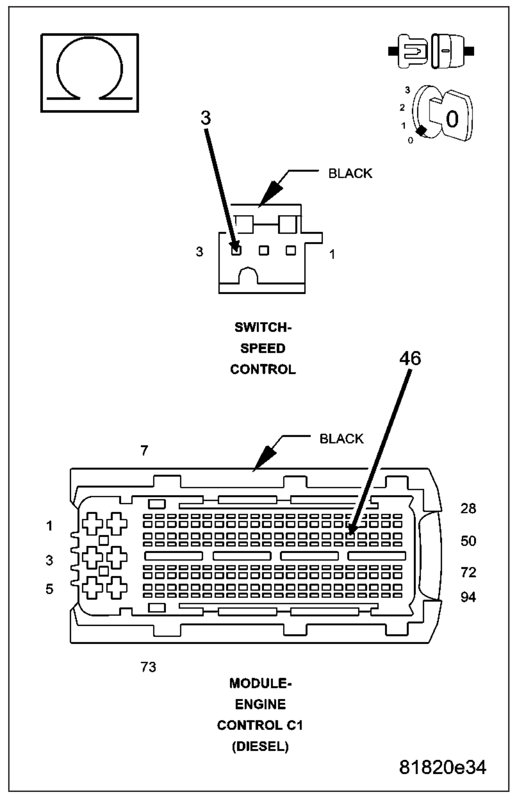
Above 5.5 volts
Go To 8

3. (V937) S/C SWITCH GROUND CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V937) S/C Switch Ground circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (V937) S/C Switch Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (V937) S/C SWITCH GROUND CIRCUIT SHORTED TO VOLTAGE

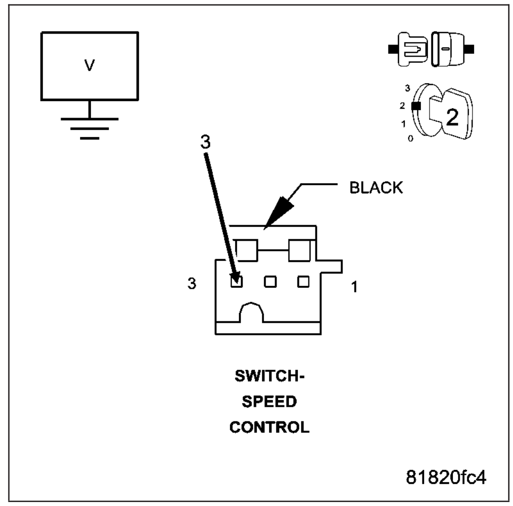
Turn the ignition off.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V937) S/C Switch Ground circuit.



Is there any voltage present?

Yes >> Repair the (V937) S/C Switch Ground circuit for a short to voltage.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. S/C SWITCH

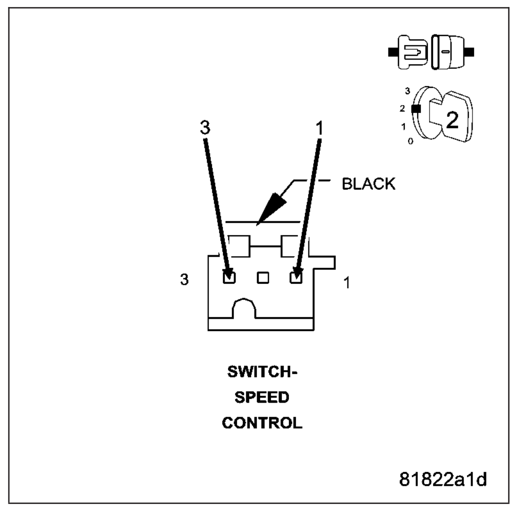
Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, monitor the S/C Switch Voltage.

While monitoring the scan tool, connect a jumper wire between the (V72) S/C Switch 2 Signal circuit and the (V937) S/C Switch Ground circuit in the S/C Switch harness connector.



Does the scan tool display below 0.1 volt with the jumper wire in place?

Yes >> Replace the Speed Control Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

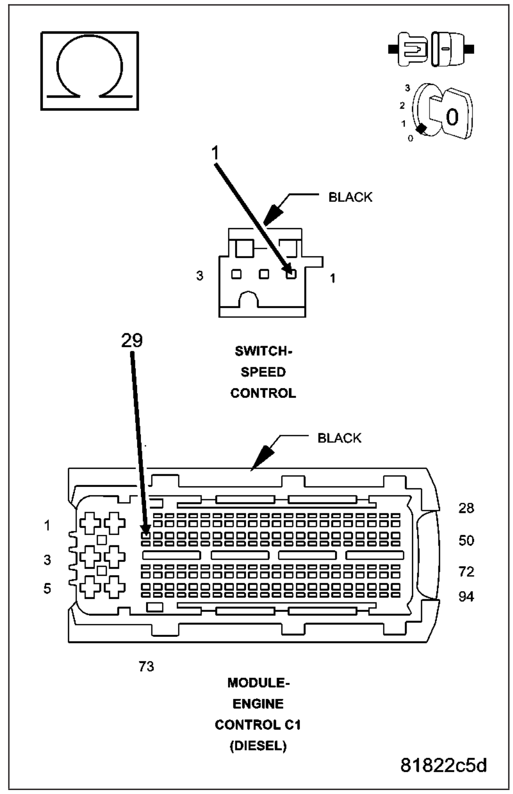
No >> Go to 9

6. (V72) S/C SWITCH 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (V72) S/C Switch 2 Signal circuit between the Speed Control Switch harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

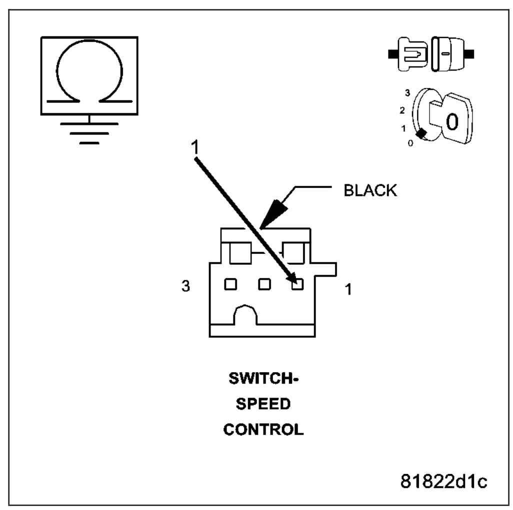
Yes >> Go To 7

No >> Repair the (V72) S/C Switch 2 Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V72) S/C Switch 2 Signal circuit.



Is the resistance above 1000 ohms?

Yes >> Go to 9

No >> Repair the (V72) S/C Switch 2 Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. (V72) S/C SWITCH 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

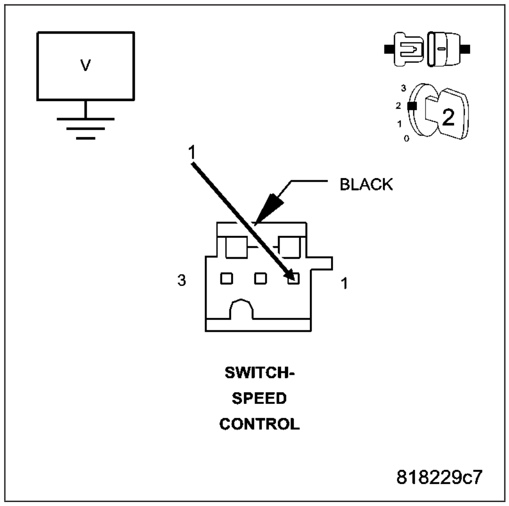
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (V72) S/C Switch 2 Signal circuit.



Is there any voltage present?

Yes >> Repair the (V72) S/C Switch 2 Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 9

9. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Speed Control Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0606-INTERNAL ECM PROCESSOR

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle leaving the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Check for proper ECM power supply from the ignition switch and the Main relay. Check the ECM for proper ground supply.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0606-INTERNAL ECM PROCESSOR

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle leaving the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Check for proper ECM power supply from the ignition switch and the Main relay. Check the ECM for proper ground supply.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0607-ECU INTERNAL PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle leaving the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Check for proper ECM power supply from the ignition switch and the Main relay. Check the ECM for proper ground supply.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0610-ECU VEHICLE OPTIONS MISMATCH

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle leaving the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

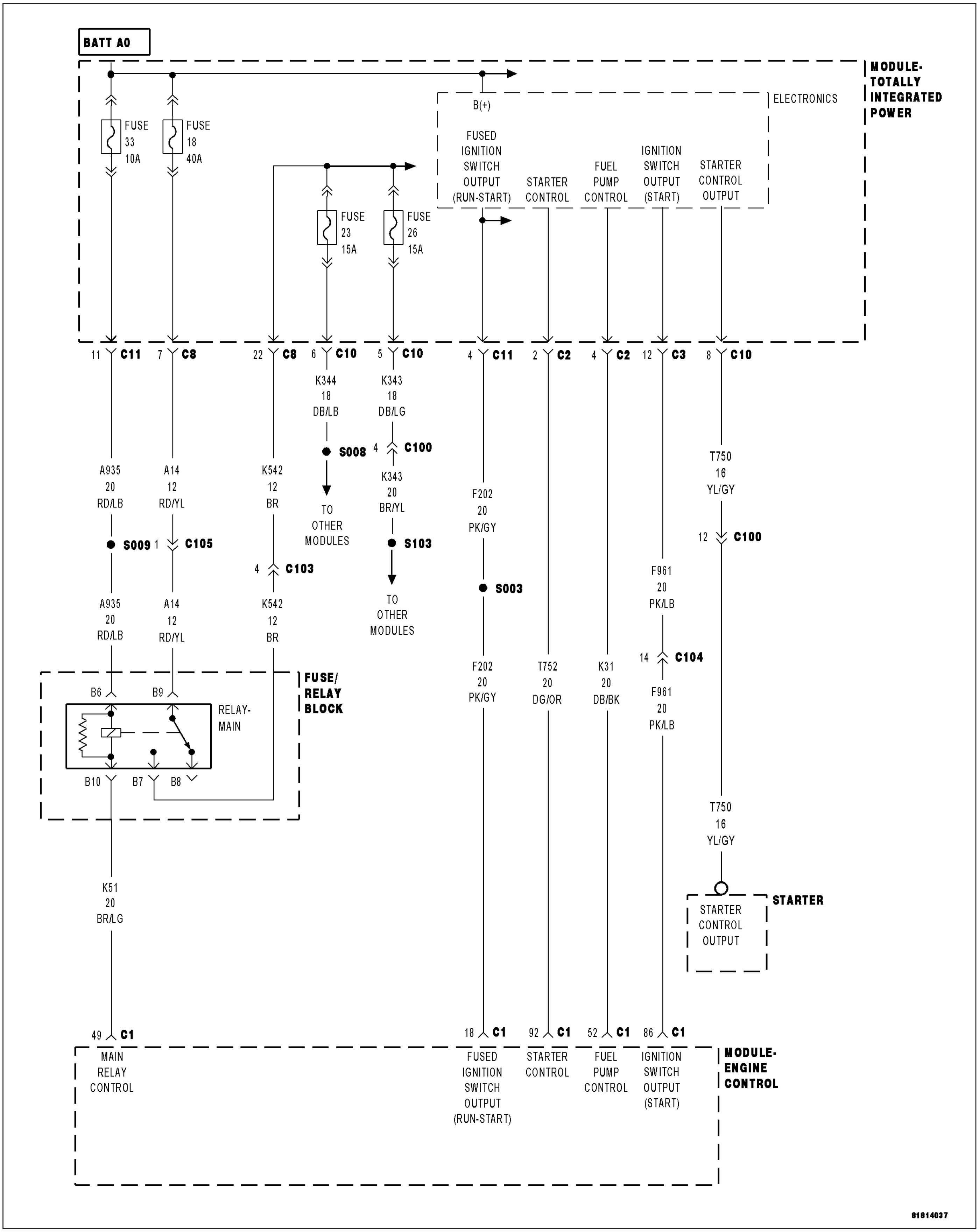
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0615-STARTER CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Starter command off.
- **Set Condition:**
  The ECM does not detect voltage on the (T752) Engine Starter Control circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND
(T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Attempt to start the engine several times.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Disconnect the Engine Control Module (ECM) harness connectors.

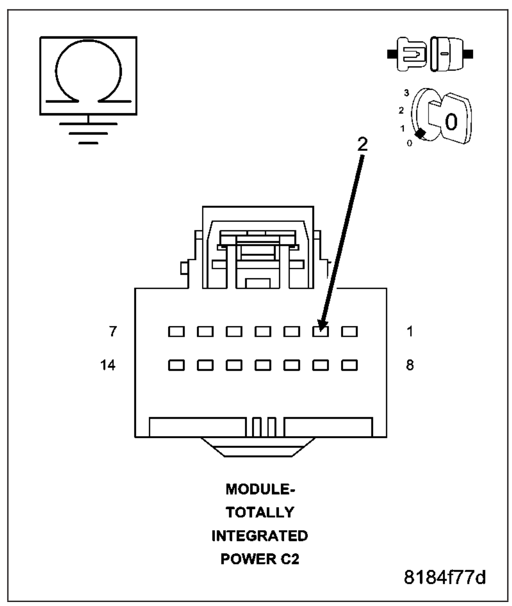
Measure the resistance between ground and the (T752) Starter Control circuit in the TIPM C2 harness connector.

Is the resistance above 10k ohms?

Yes >> Go to 3

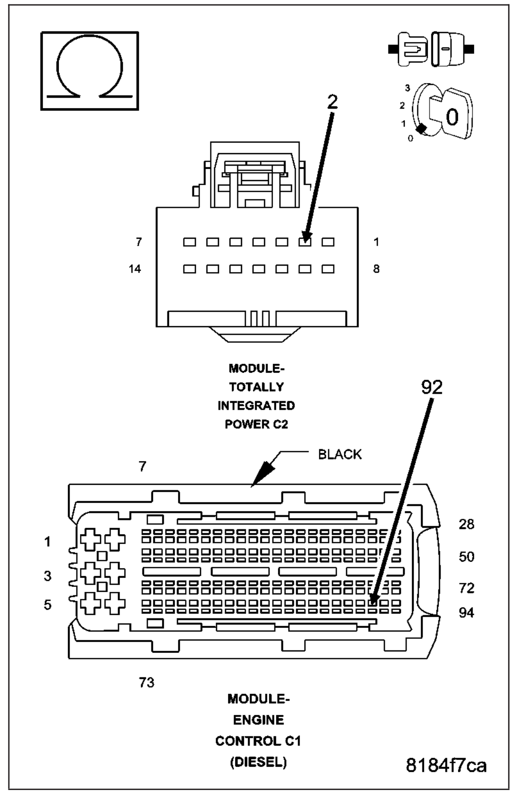
No >> Repair the (T752) Starter Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



3. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (T752) Starter Control circuit between the TIPM C2 harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

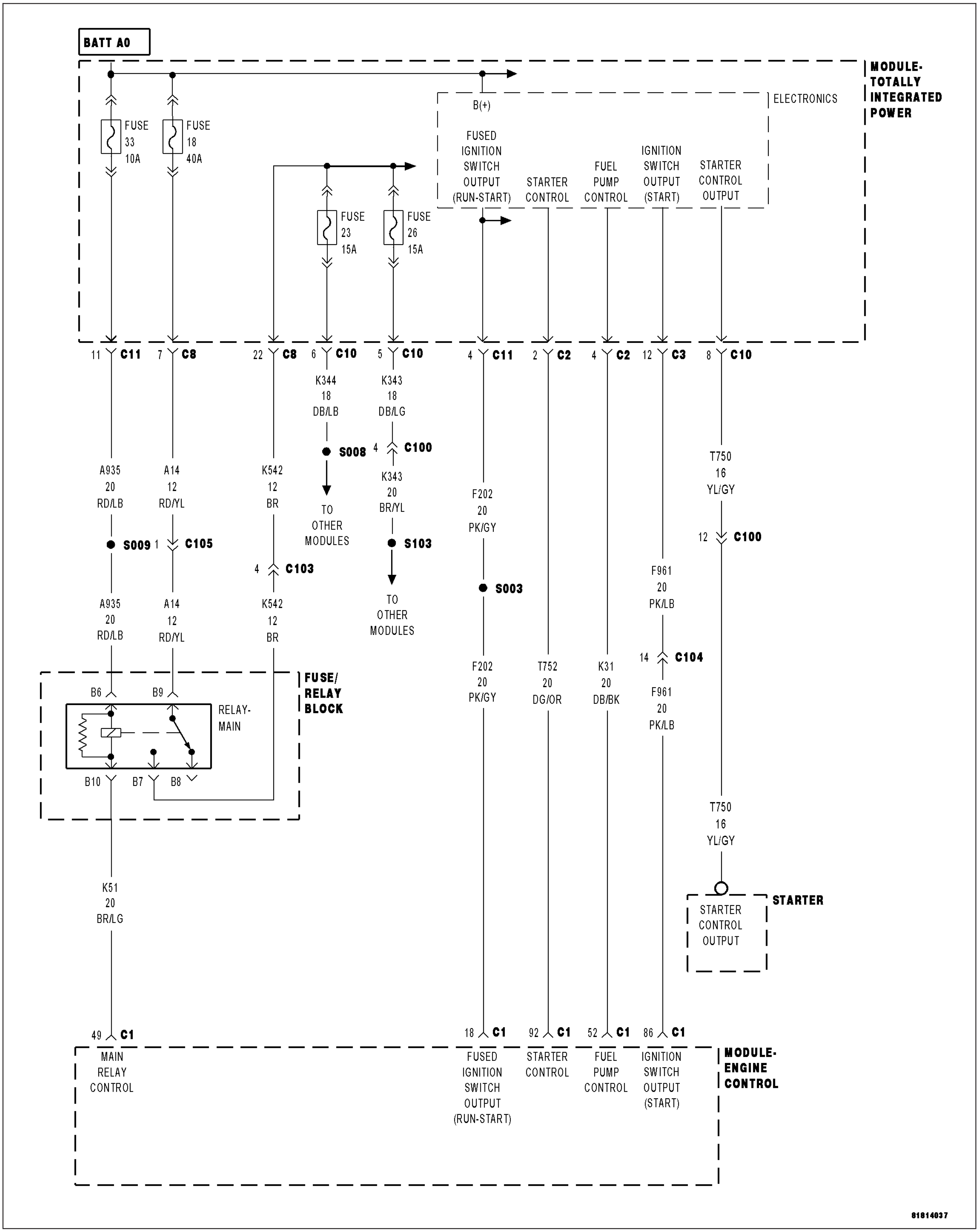
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0616-STARTER CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Starter command off.
- **Set Condition:**
  The ECM detects a short to ground on the (T752) Engine Starter Control circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND
(T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Attempt to start the engine several times.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

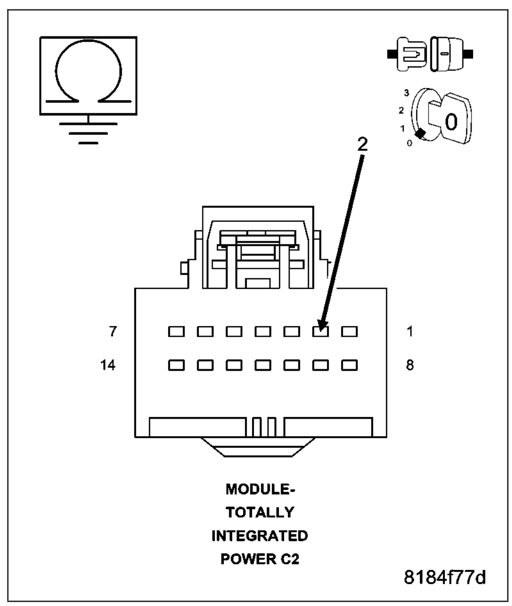
2. (T752) STARTER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Disconnect the Engine Control Module (ECM) harness connectors.

Measure the resistance between ground and the (T752) Starter Control circuit in the TIPM harness connector.



Is the resistance above 10k ohms?

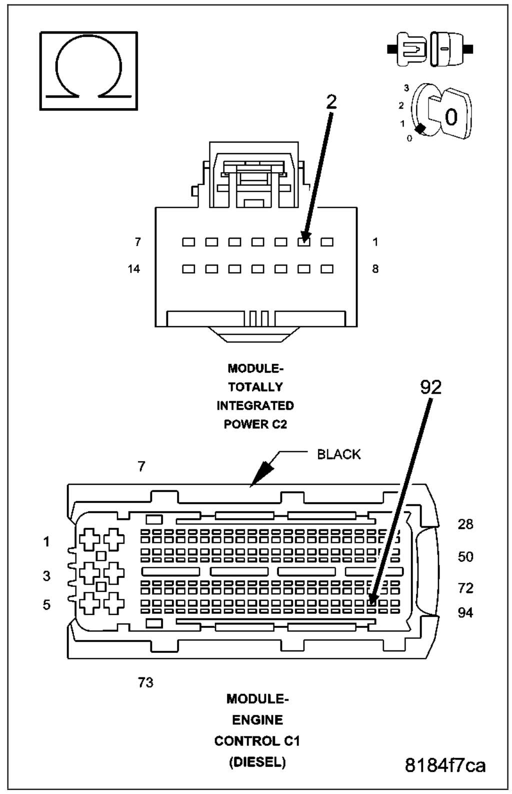
Yes >> Go to 3

No >> Repair the (T752) Starter Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (T752) Starter Control circuit between the TIPM harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

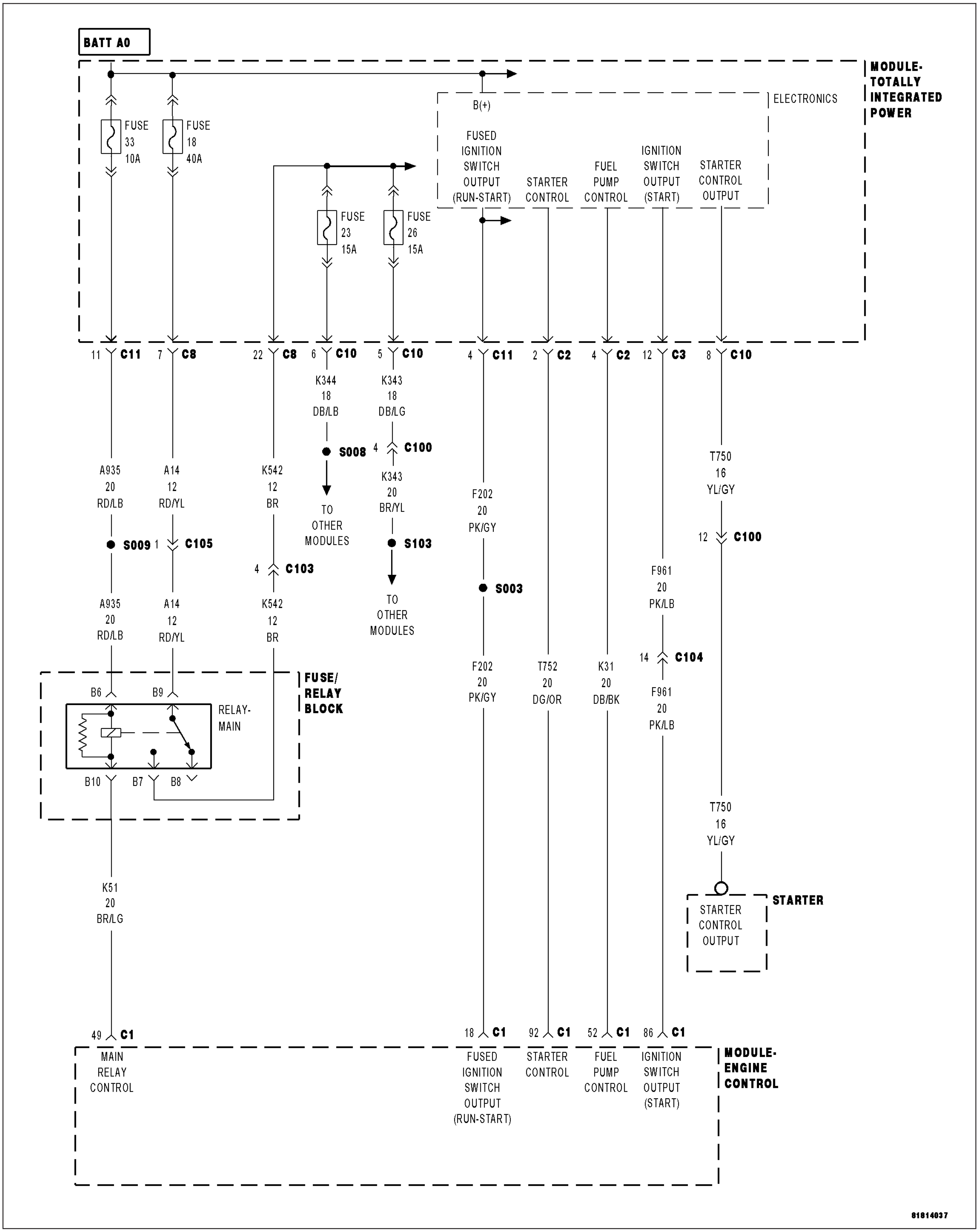
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0617-STARTER CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Starter command on.
- **Set Condition:**
  The ECM detects a short circuit on the (T752) Engine Starter Control circuit for at 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(T752) STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
(T752) STARTER RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Attempt to start the engine several times.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (T752) STARTER CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

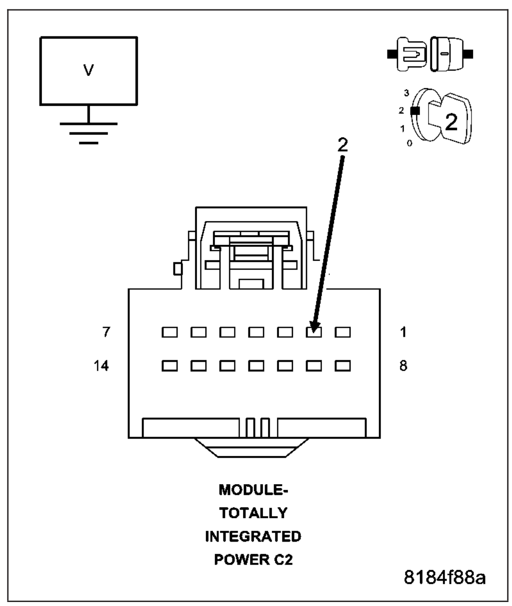
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (T752) Starter Control circuit in the TIPM harness connector.



Is there any voltage present?

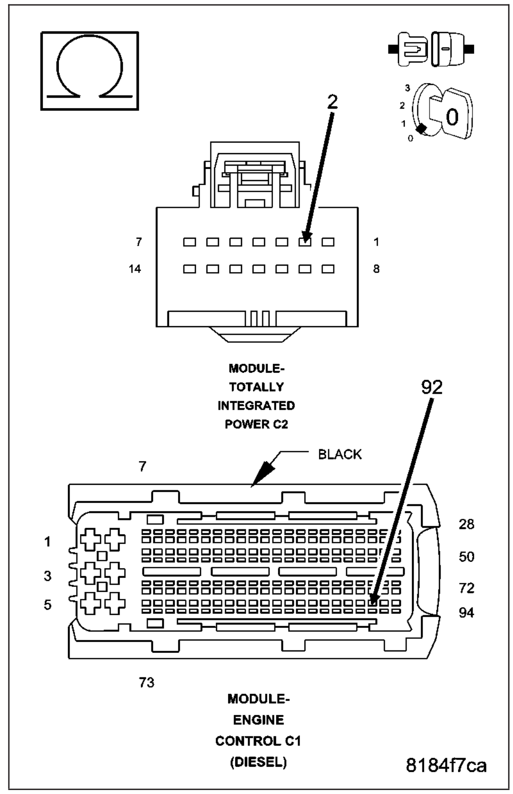
Yes >> Repair the (T752) Starter Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (T752) STARTER CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (T752) Starter Control circuit between the TIPM harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

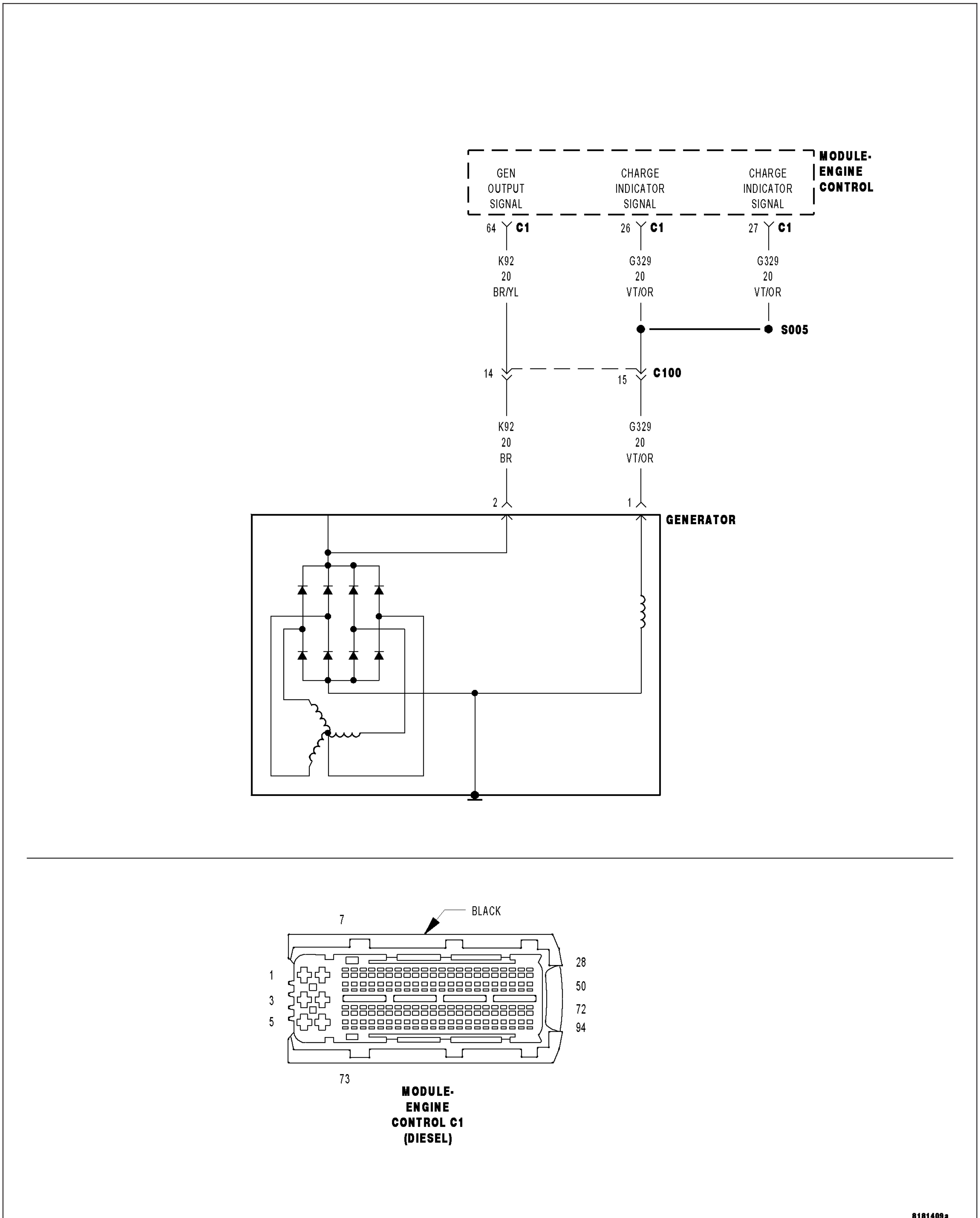
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (T752) Starter Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0621-GENERATOR LAMP/L-TERMINAL CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects an open or short to ground on the Charge Indicator Signal circuit.

Possible Causes
INTERMITTENT DTC
(G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO GROUND
(G329) CHARGE INDICATOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Test drive the vehicle

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Generator harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

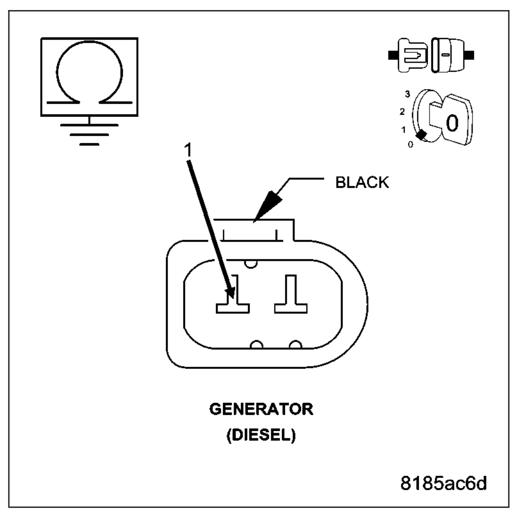
Measure the resistance between ground and the (G329) Charge Indicator Signal circuit in the Generator harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 3

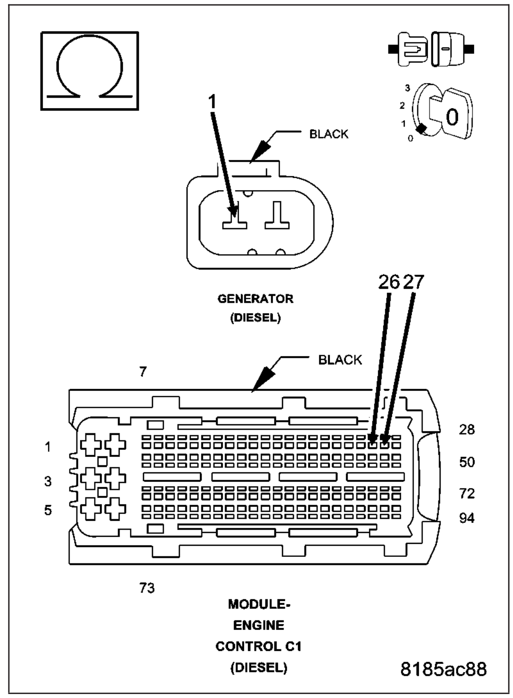
No >> Repair the (G329) Charge Indicator Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



3. (G329) CHARGE INDICATOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (G329) Charge Indicator Signal circuit between the Generator harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (G329) Charge Indicator Signal circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. GENERATOR

Turn the ignition off.

Replace the Generator.

With the scan tool, Clear DTCs.

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 5

No >> Test complete
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

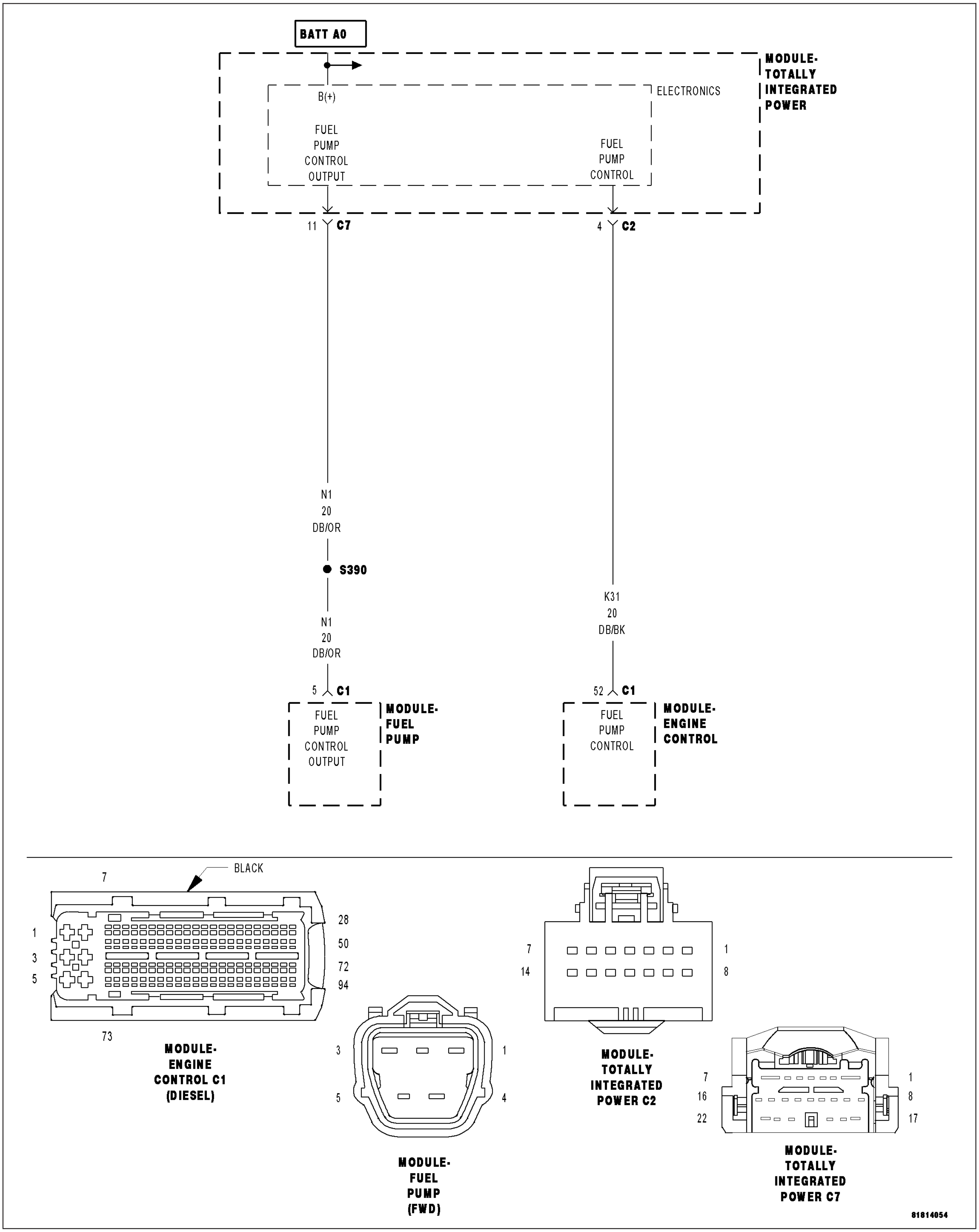
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0627-FUEL PUMP CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Fuel Pump command off.
- **Set Condition:**
  The ECM does not detect voltage on the (K31) Fuel Pump Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND
(K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Fuel Pump.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

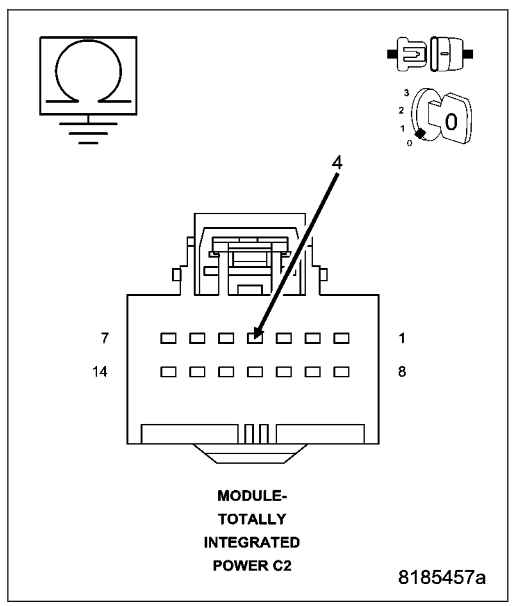
2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Disconnect the Engine Control Module (ECM) harness connectors.

Measure the resistance between ground and the (K31) Fuel Pump Control circuit in the TIPM harness connector.



Is the resistance above 10k ohms?

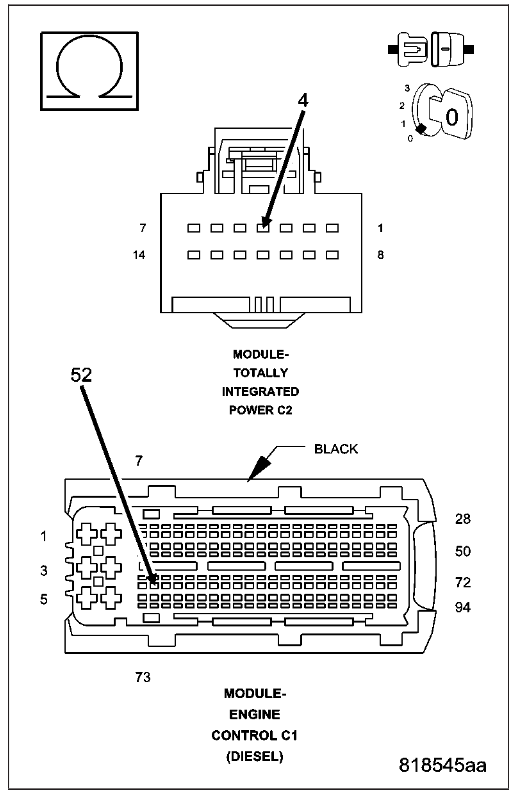
Yes >> Go to 3

No >> Repair the (K31) Fuel Pump Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the TIPM harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

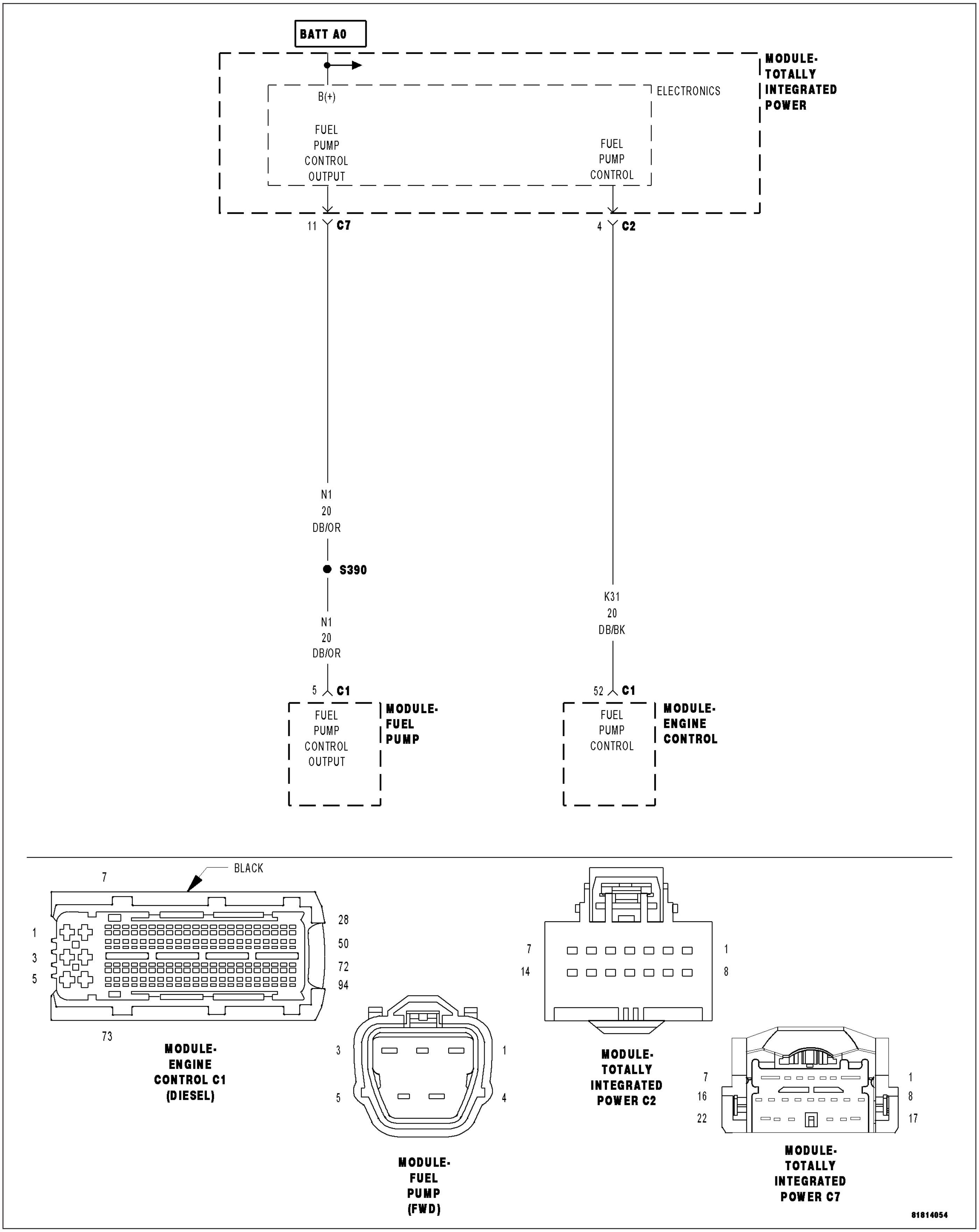
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0628-FUEL PUMP CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Fuel Pump command off.
- **Set Condition:**
  The ECM detects a short to ground on the (K31) Fuel Pump Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND
(K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Fuel Pump.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

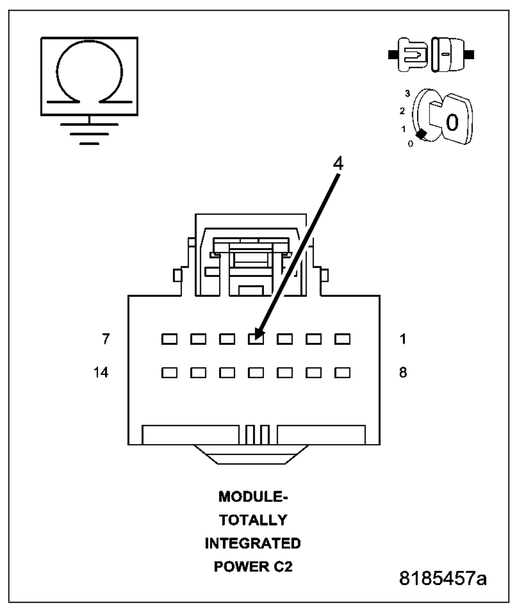
2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

Disconnect the Engine Control Module (ECM) harness connectors.

Measure the resistance between ground and the (K31) Fuel Pump Control circuit in the TIPM harness connector.



Is the resistance above 10k ohms?

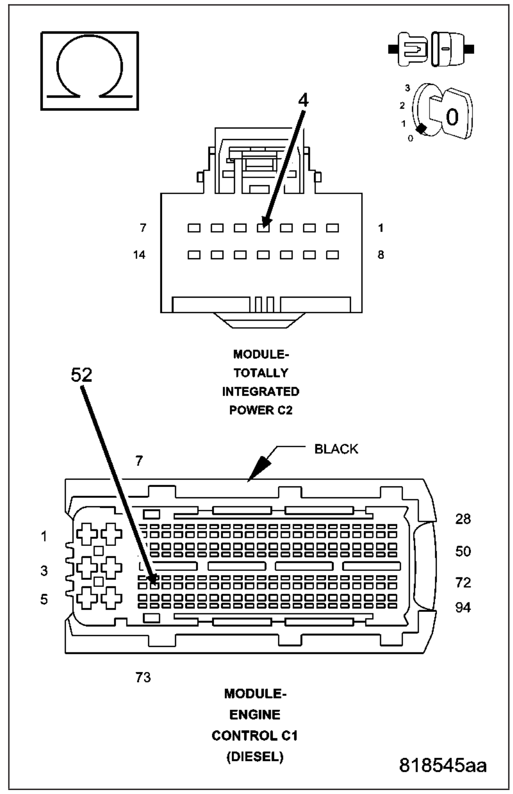
Yes >> Go to 3

No >> Repair the (K31) Fuel Pump Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the TIPM harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

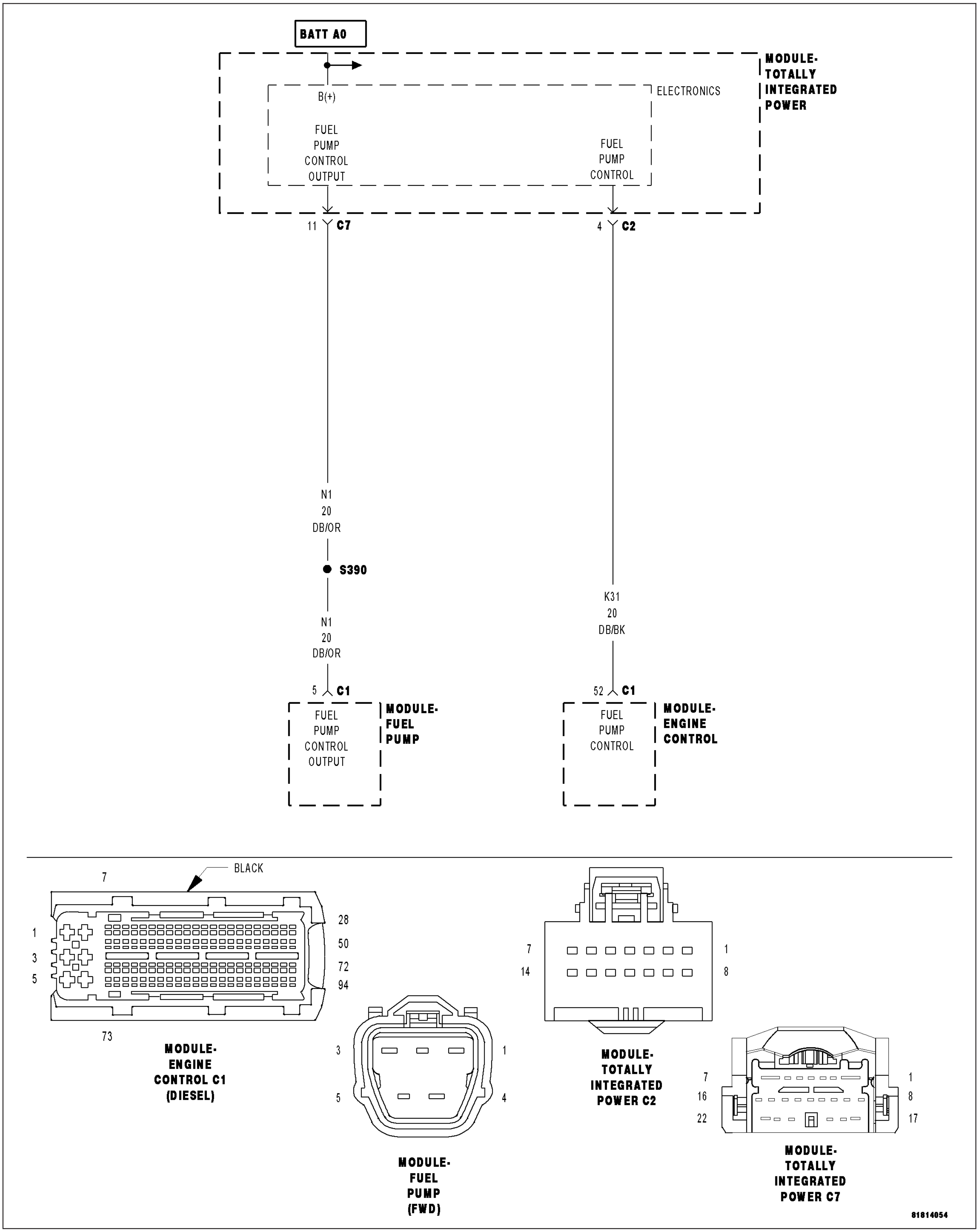
Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0629-FUEL PUMP CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Fuel Pump Relay command on.
- **Set Condition:**
  The ECM detects a short circuit on the (K31) Fuel Pump Relay Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
(K31) FUEL PUMP RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
TOTALLY INTEGRATED POWER MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K31) FUEL PUMP CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the TIPM C2 harness connector.

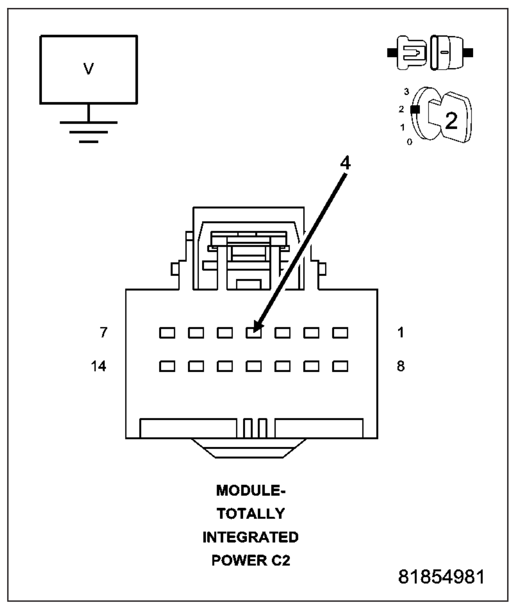
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K31) Fuel Pump Control circuit in the TIPM harness connector.



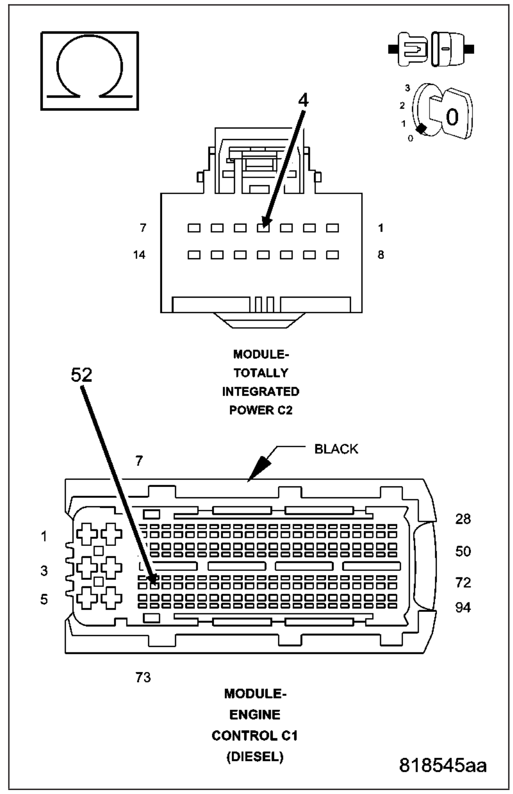
Is there any voltage present?

Yes >> Repair the (K31) Fuel Pump Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K31) FUEL PUMP CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K31) Fuel Pump Control circuit between the TIPM harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Replace and program the TIPM in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K31) Fuel Pump Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P062F — INTERNAL CONTROL MODULE EEPROM ERROR

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Check for proper ECM power supply from the ignition switch and the Main relay. Check the ECM for proper ground supply.

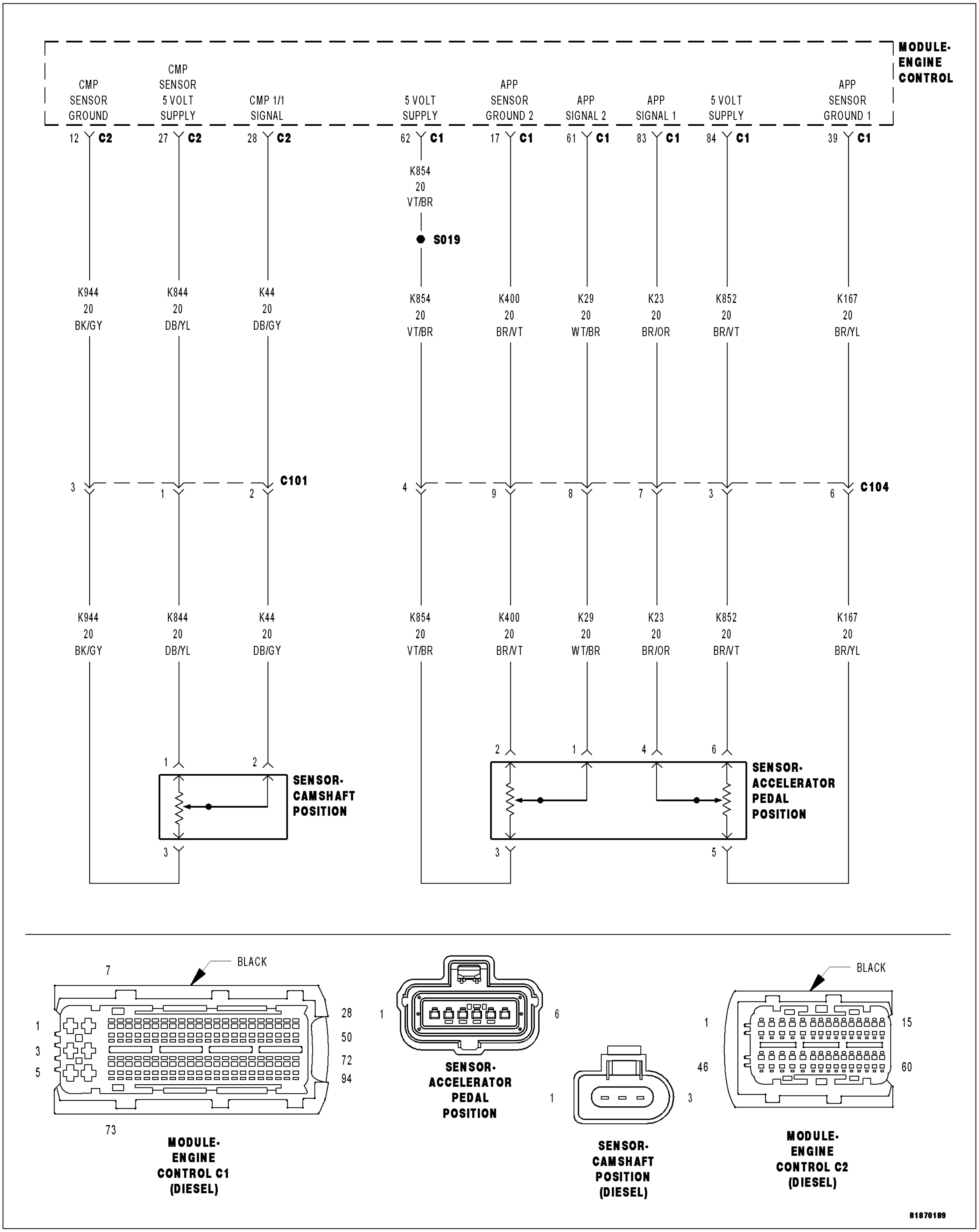
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects a low voltage on the Sensor Supply #1 circuit for 0.16 second

Possible Causes
INTERMITTENT DTC
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
CAMSHAFT POSITION SENSOR
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

The ECM contains 3 internal 5–Volt Sensor Supply sources. Each 5–Volt Supply source is split into parallel circuits to provide 5 volts to multiple sensors. Sensor Supply 1 provides 5 volts to the Camshaft Position Sensor and the Accelerator Pedal Position Sensor No. 1.

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

With the scan tool, View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

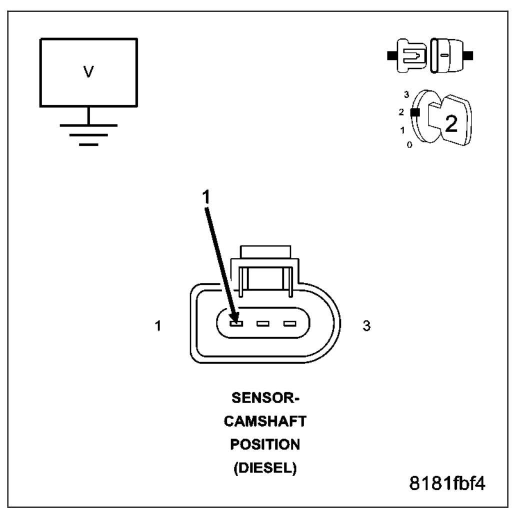
2. CAMSHAFT POSITION SENSOR

Turn the ignition off.

Disconnect the Camshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K844) Camshaft Position Sensor 5 Volt Supply circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Camshaft Position Sensor.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 3

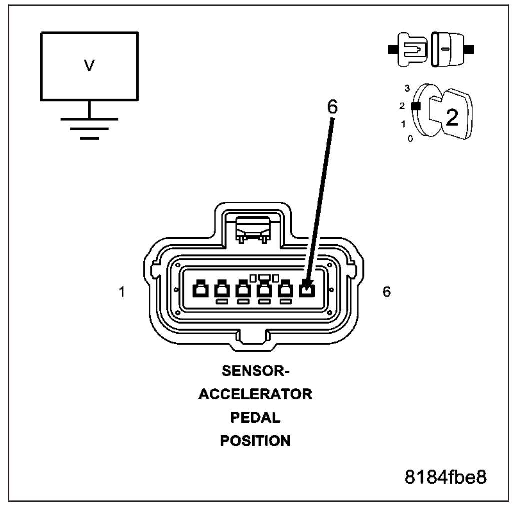
3. ACCELERATOR PEDAL POSITION SENSOR NO. 1

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K852) Accelerator Pedal Position Sensor No. 1 5 Volt Supply circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

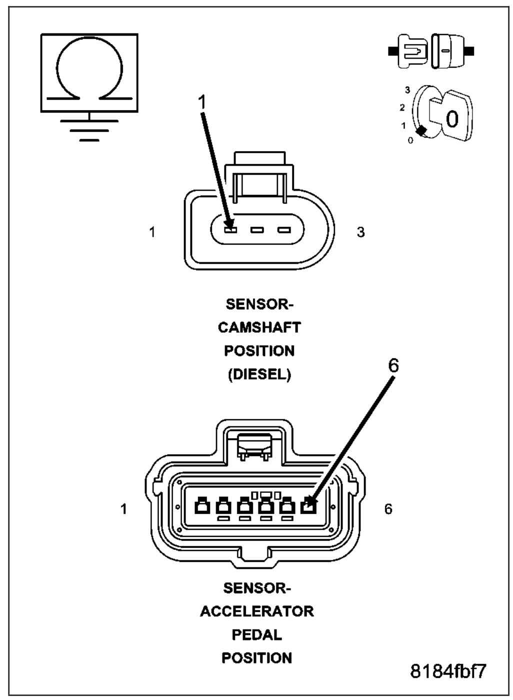
4. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (K844) Camshaft Position Sensor 5 Volt Supply circuit.

Measure the resistance between ground and the (K852) Accelerator Pedal Position Sensor No. 1 5 Volt Supply circuit.



Is the resistance above 1000 ohms for each circuit?

Yes >> Go To 5

No >> Repair the 5-Volt Supply circuit that measures below 1000 ohms for a short to ground.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ENGINE CONTROL MODULE (ECM)

Turn the ignition off.

Inspect the (K844) Camshaft Position Sensor 5 Volt Supply circuit between the Camshaft Position Sensor and the ECM.

Inspect the (K852) Accelerator Pedal Position Sensor No. 1 5 Volt Supply circuit between the Accelerator Pedal Position Sensor and the ECM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

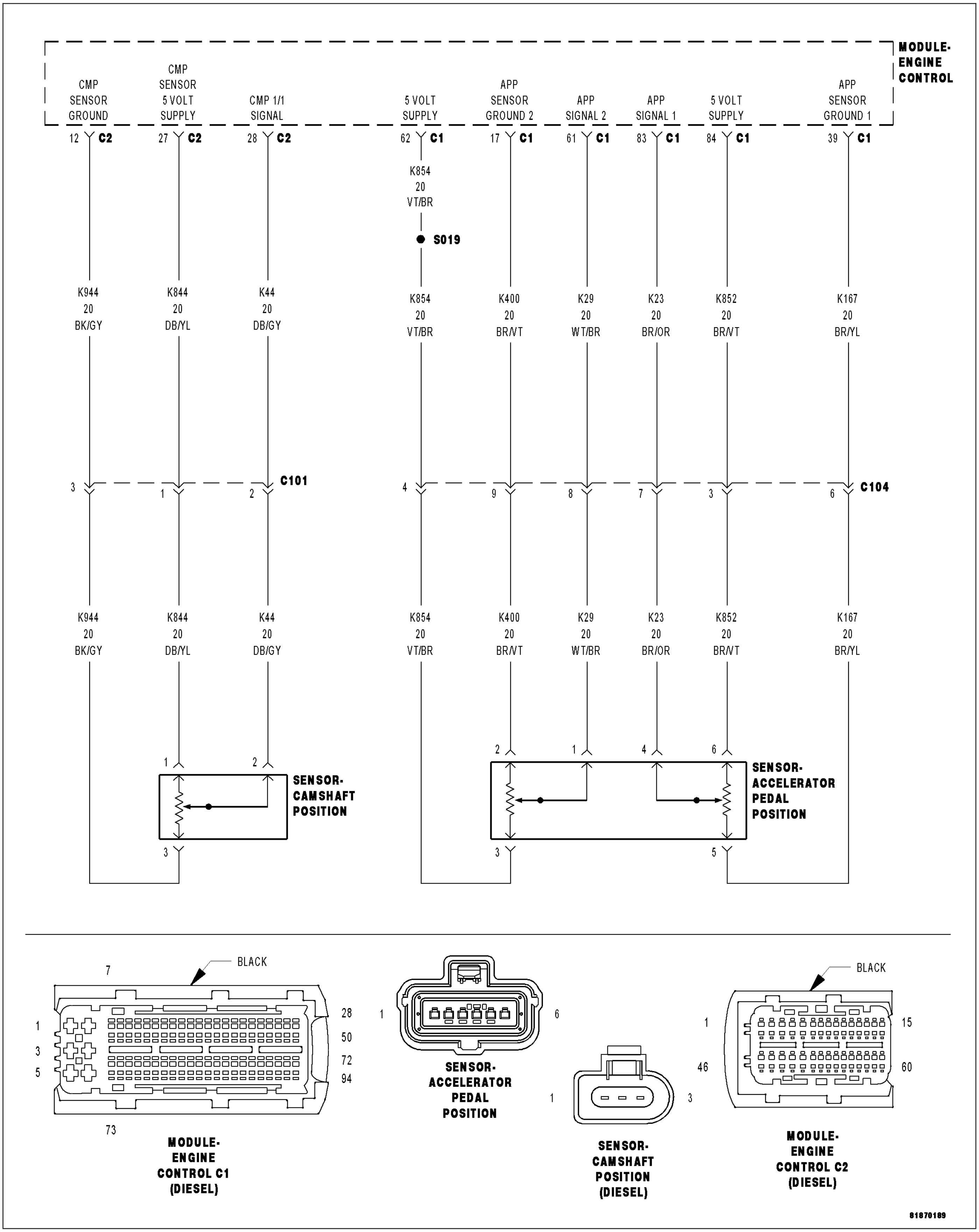
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0643-SENSOR REFERENCE VOLTAGE 1 TOO HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects a short to voltage on the Sensor Supply #1 circuit for 0.16 second.

Possible Causes
INTERMITTENT DTC
(K852) ACCELERATOR PEDAL POSITION NO. 1 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K844) CAMSHAFT POSITION SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

The ECM contains 3 internal 5–Volt Sensor Supply sources. Each 5–Volt Supply source is split into parallel circuits to provide 5 volts to multiple sensors. Sensor Supply 2 provides 5 volts to the Accelerator Pedal Position Sensor No. 1 and the Camshaft Position Sensor.

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K852) ACCELERATOR PEDAL POSITION SENSOR NO. 1 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

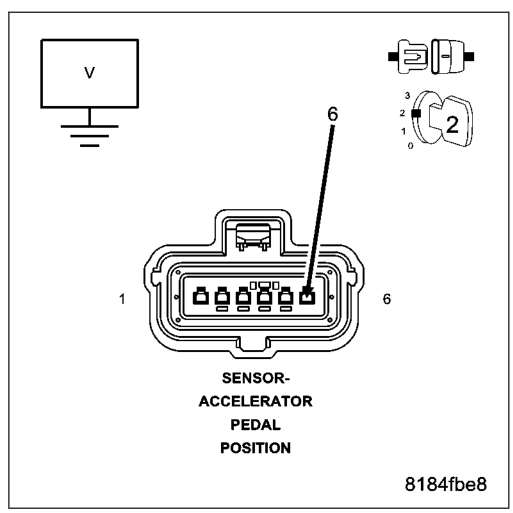
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage on the (K852) Accelerator Pedal Position Sensor No. 1 5-Volt Supply circuit.



Is the voltage below 1.0 volt?

Yes >> Go To 3

No >> Repair the (K852) Accelerator Pedal Position Sensor No. 1 5 Volt Supply circuit for a short to voltage.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

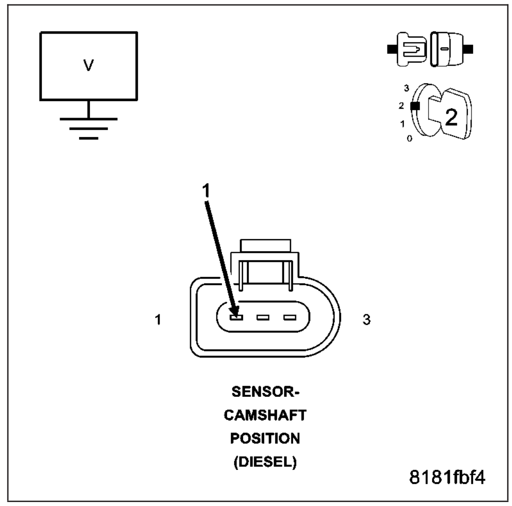
3. (K844) CAMSHAFT POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Camshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage on the (K844) Camshaft Position Sensor 5 Volt Supply circuit.



Is the voltage below 1.0 volt?

Yes >> Go To 4

No >> Repair the (K844) Camshaft Position Sensor 5 Volt Supply circuit for a short to voltage.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ENGINE CONTROL MODULE (ECM)

Turn the ignition off.

Inspect the (K852) Accelerator Pedal Position Sensor No. 1 5 Volt Supply circuit between the Accelerator Pedal Position Sensor and the ECM.

Inspect the (K844) Camshaft Position Sensor 5 Volt Supply circuit between the Camshaft Position Sensor and the ECM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

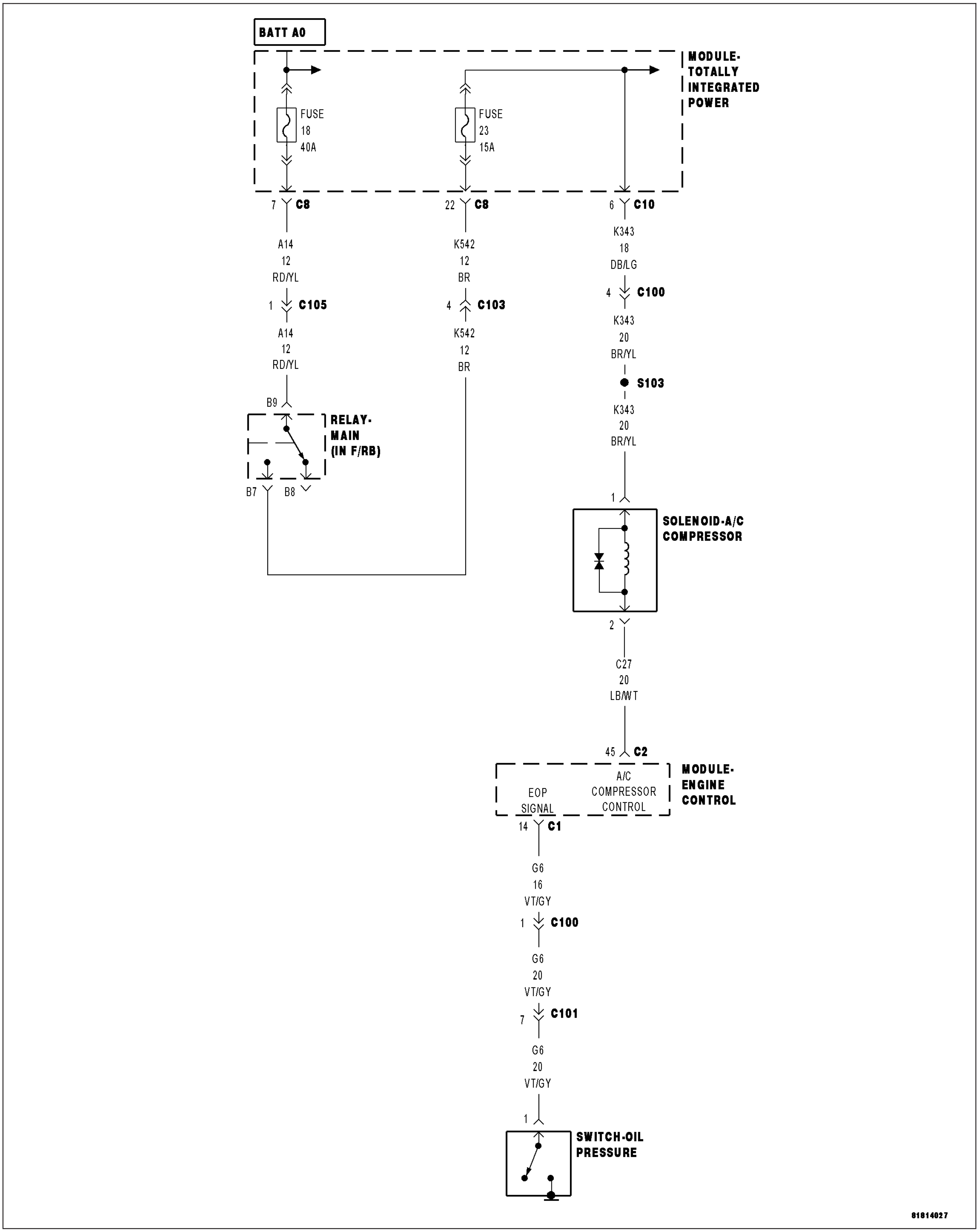
Yes >> Repair as necessary.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0645-A/C CLUTCH CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the A/C compressor command off.
- **Set Condition:**
  The ECM does not detect voltage on the (C27) A/C Compressor Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the A/C Compressor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

Is the resistance above 10.0 ohms?

Yes >> Go to 3

No >> Repair the (C27) A/C Compressor Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C27) A/C Compressor Control circuit between the A/C Compressor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (C27) A/C Compressor Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K343) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K343) Fused Main Relay Output circuit in the A/C Compressor harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the (K343) Fused Main Relay Output circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. A/C COMPRESSOR

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 6

No >> Replace the A/C Compressor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Clutch Relay and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

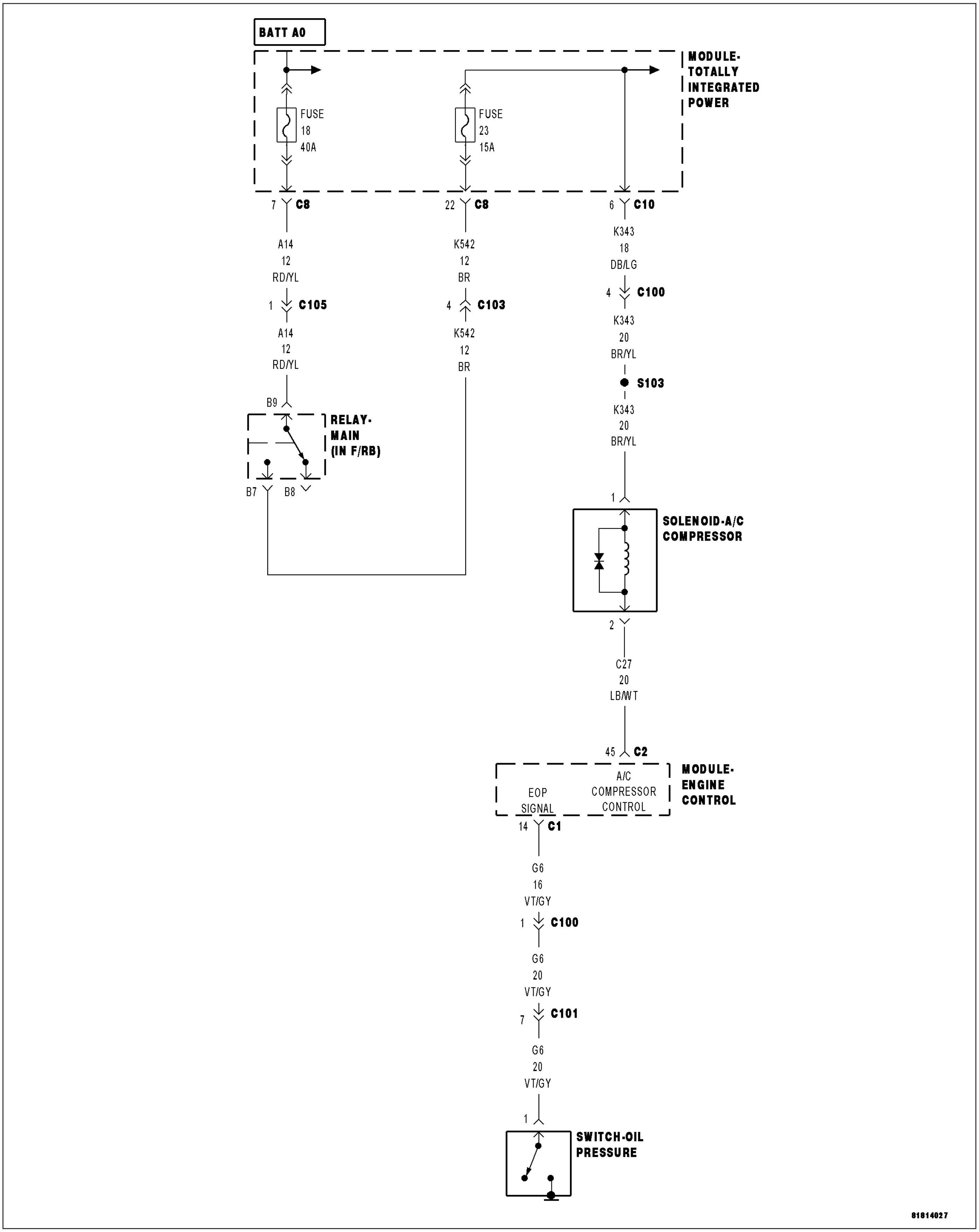
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0646-A/C CLUTCH CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the A/C Compressor command off.
- **Set Condition:**
  The ECM detects a short to ground on the (C27) A/C Compressor Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the A/C Compressor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

Is the resistance below 1000.0 ohms?

Yes >> Repair the (C27) A/C Compressor Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C27) A/C Compressor Control circuit between the A/C Compressor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (C27) A/C Compressor Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. A/C COMPRESSOR

Connect the Engine Control Module (ECM) harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 5

No >> Replace the A/C Compressor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Compressor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

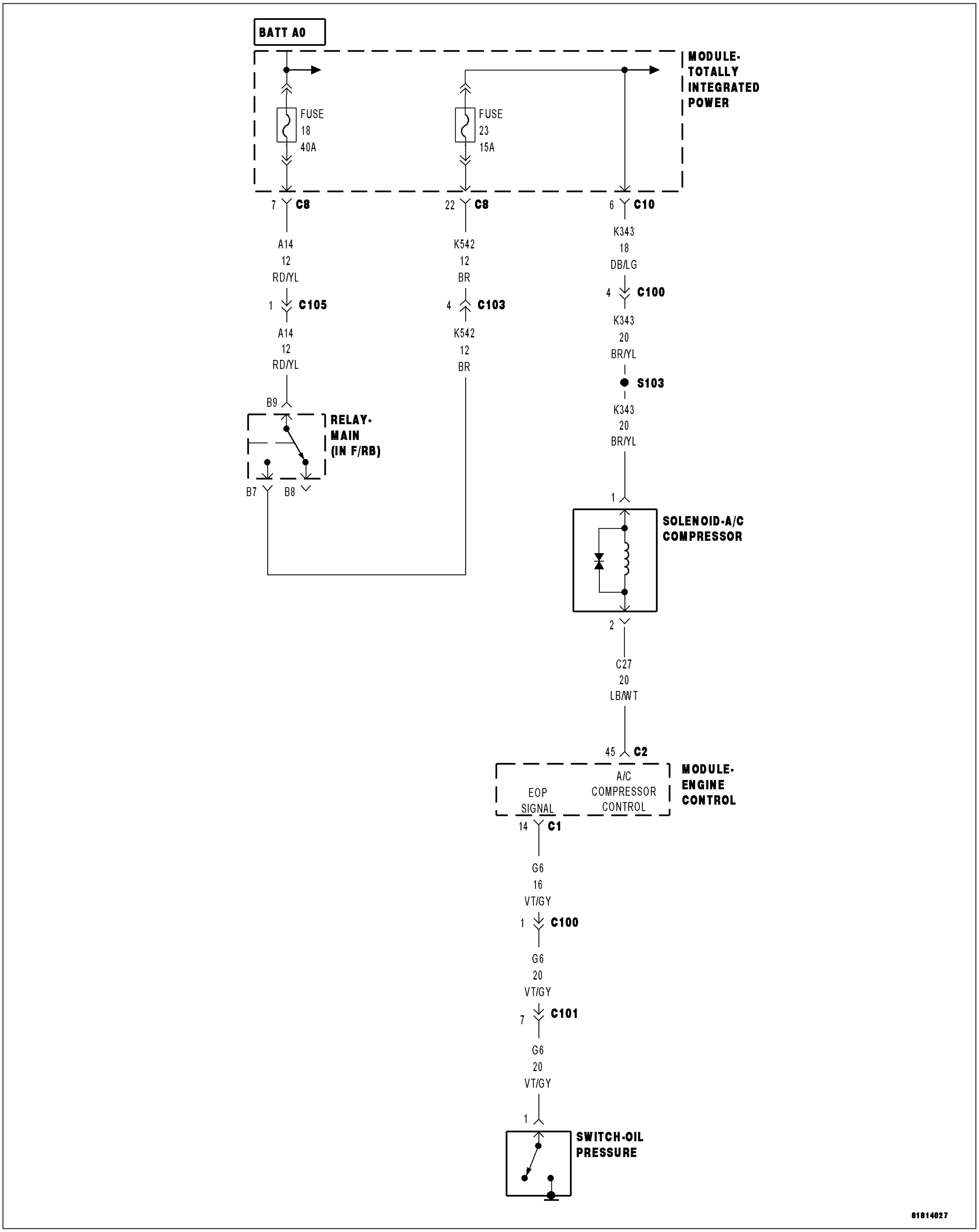
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0647-A/C CLUTCH CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the A/C Compressor command on.
- **Set Condition:**
  The ECM detects a short circuit on the (C27) A/C Compressor Control circuit for 0.48 seconds.

Possible Causes
INTERMITTENT DTC
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO VOLTAGE
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Compressor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (C27) A/C Compressor Control circuit in the A/C Compressor harness connector.

Is there any voltage present?

Yes >> Repair the (C27) A/C Compressor Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO THE (K343) FUSED MAIN RELAY OUTPUT CIRCUIT

Turn the ignition off.

Measure the resistance between the (C27) A/C Compressor Control circuit and the (K343) Fused Main Relay Output circuit in the A/C Compressor harness connector.

Is the resistance above 10.0 ohms?

Yes >> Go to 4

No >> Repair the (C27) A/C Compressor Control circuit for a short to the (K343) Fused Main Relay Output circuit.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (C27) A/C Compressor Control circuit between the A/C Compressor harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (C27) A/C Compressor Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. A/C COMPRESSOR

Connect the Engine Control Module (ECM) harness connector.

Install a known good relay in place of the vehicle's A/C Compressor.

Turn the ignition on.

With the scan tool, Clear DTCs.

With the scan tool, actuate the A/C Compressor.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 6

No >> Replace the A/C Compressor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the A/C Compressor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

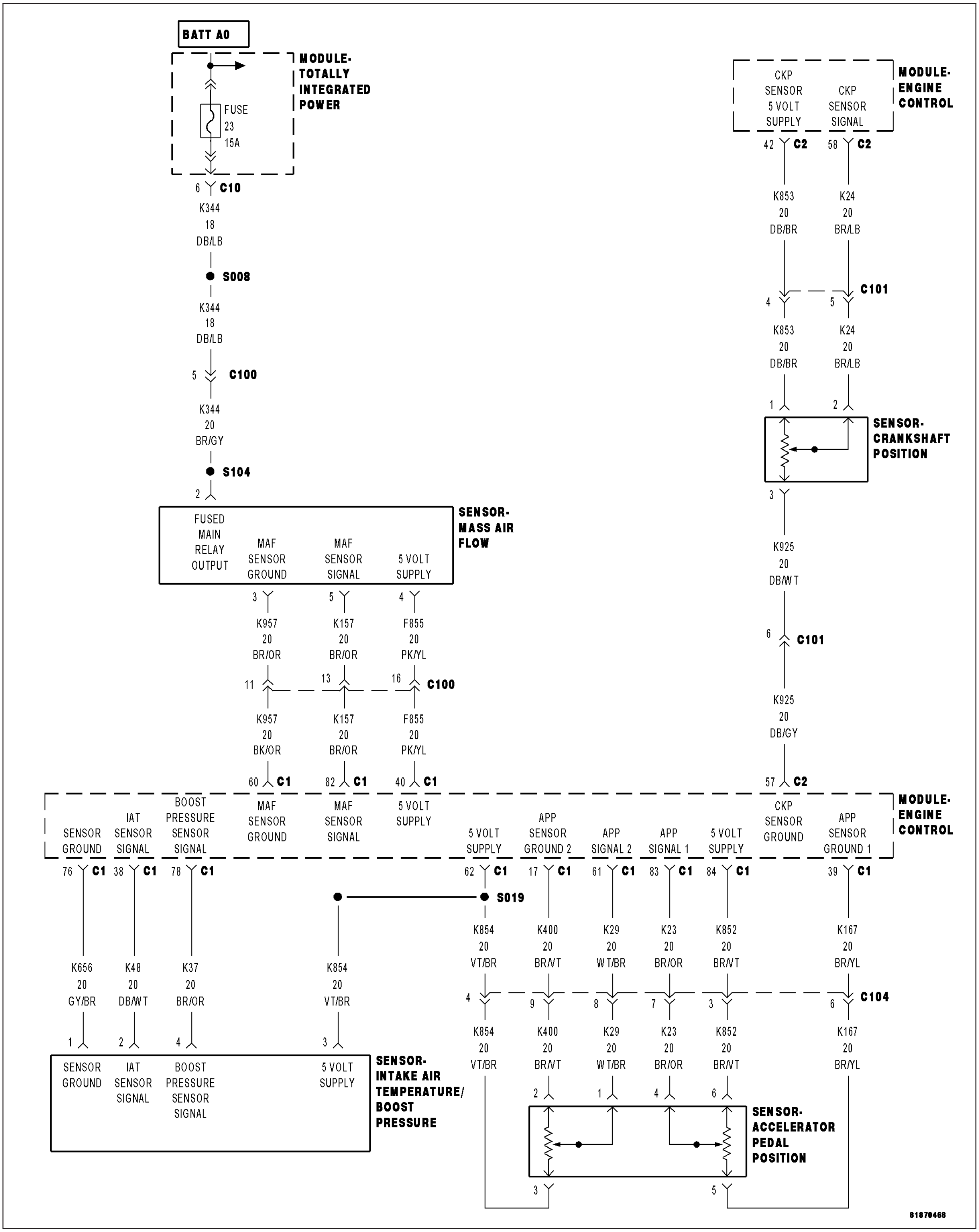
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0652-SENSOR REFERENCE VOLTAGE 2 TOO LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects low voltage on the Sensor Supply #2 circuit for 0.16 second

Possible Causes
INTERMITTENT DTC
CRANKSHAFT POSITION SENSOR
INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR
ACCELERATOR PEDAL POSITION SENSOR
MASS AIRFLOW SENSOR
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

The ECM contains 2 internal 5–Volt Sensor Supply sources. Each 5–Volt Supply source is split into parallel circuits to provide 5 volts to multiple sensors. Sensor Supply 2 provides 5 volts to the Crankshaft Position Sensor, the Boost Pressure Sensor, Accelerator Pedal Position Sensor No. 2, and the Mass Airflow Sensor.

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

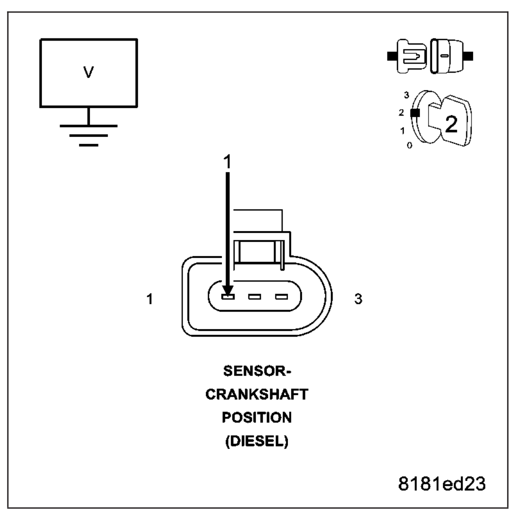
2. CRANKSHAFT POSITION SENSOR

Turn the ignition off.

Disconnect the Crankshaft Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K853) Crankshaft Position Sensor 5 Volt Supply circuit at the Crankshaft Position Sensor harness connector.



Is the voltage above 4.6 volts?

Yes >> Replace the Crankshaft Position Sensor.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 3

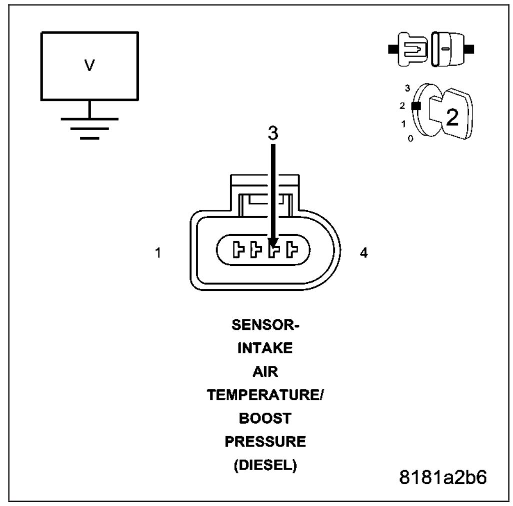
3. INTAKE AIR TEMPERATURE/BOOST PRESSURE SENSOR

Turn the ignition off.

Disconnect the Intake Air Temperature/Boost Pressure Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K854) Boost Pressure Sensor 5 Volt Supply circuit at the Intake Air Temperature/Boost Pressure Sensor harness connector.



Is the voltage above 4.6 volts?

Yes >> Replace the Intake Air Temperature/Boost Pressure Sensor.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

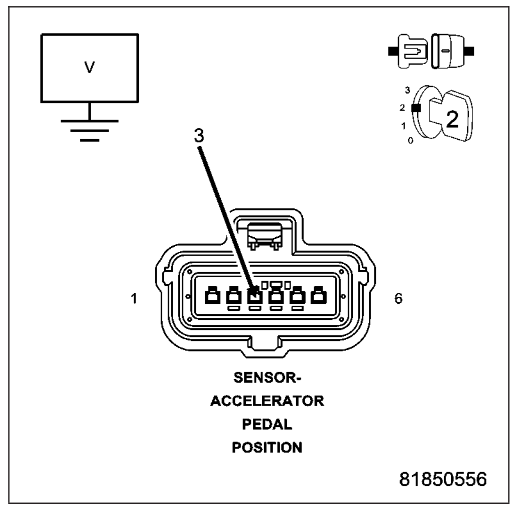
4. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Disconnect the Accelerator Pedal Position harness connector.

Turn the ignition on.

Measure the voltage of the (K854) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit at the Accelerator Pedal Position Sensor harness connector.



Is the voltage above 4.6 volts?

Yes >> Replace the Accelerator Pedal Position Sensor.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

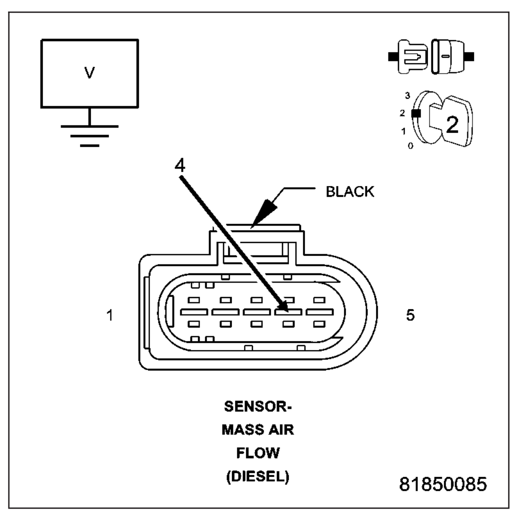
5. MASS AIRFLOW SENSOR

Turn the ignition off.

Disconnect the Mass Airflow Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F855) Mass Airflow Sensor 5 Volt Supply circuit at the Mass Air Flow Sensor harness connector.



Is the voltage above 4.6 volts?

Yes >> Replace the Mass Airflow Sensor.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (K853) Crankshaft Position Sensor 5 Volt Supply circuit.

Measure the resistance between ground and the (K854) Boost Pressure Sensor 5 Volt Supply circuit.

Measure the resistance between ground and the (K854) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit.

Measure the resistance between ground and the (F855) Mass Airflow Sensor 5 Volt Supply circuit.

Is the resistance above 1000 ohms for each circuit?

Yes >> Go To 7

No >> Repair the 5-Volt Supply circuit that measured below 1000 ohms for a short to ground.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Turn the ignition off.

Inspect the (K853) Crankshaft Position Sensor 5 Volt Supply circuit between the Crankshaft Position Sensor and the ECM.

Inspect the (K854) Boost Pressure Sensor 5 Volt Supply circuit between the Intake Air Temperature/Boost Pressure Sensor and the ECM.

Inspect the (K854) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit between the Accelerator Pedal Position Sensor and the ECM.

Inspect the (F855) Mass Airflow Sensor 5 Volt Supply circuit between the Mass Airflow Sensor and the ECM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

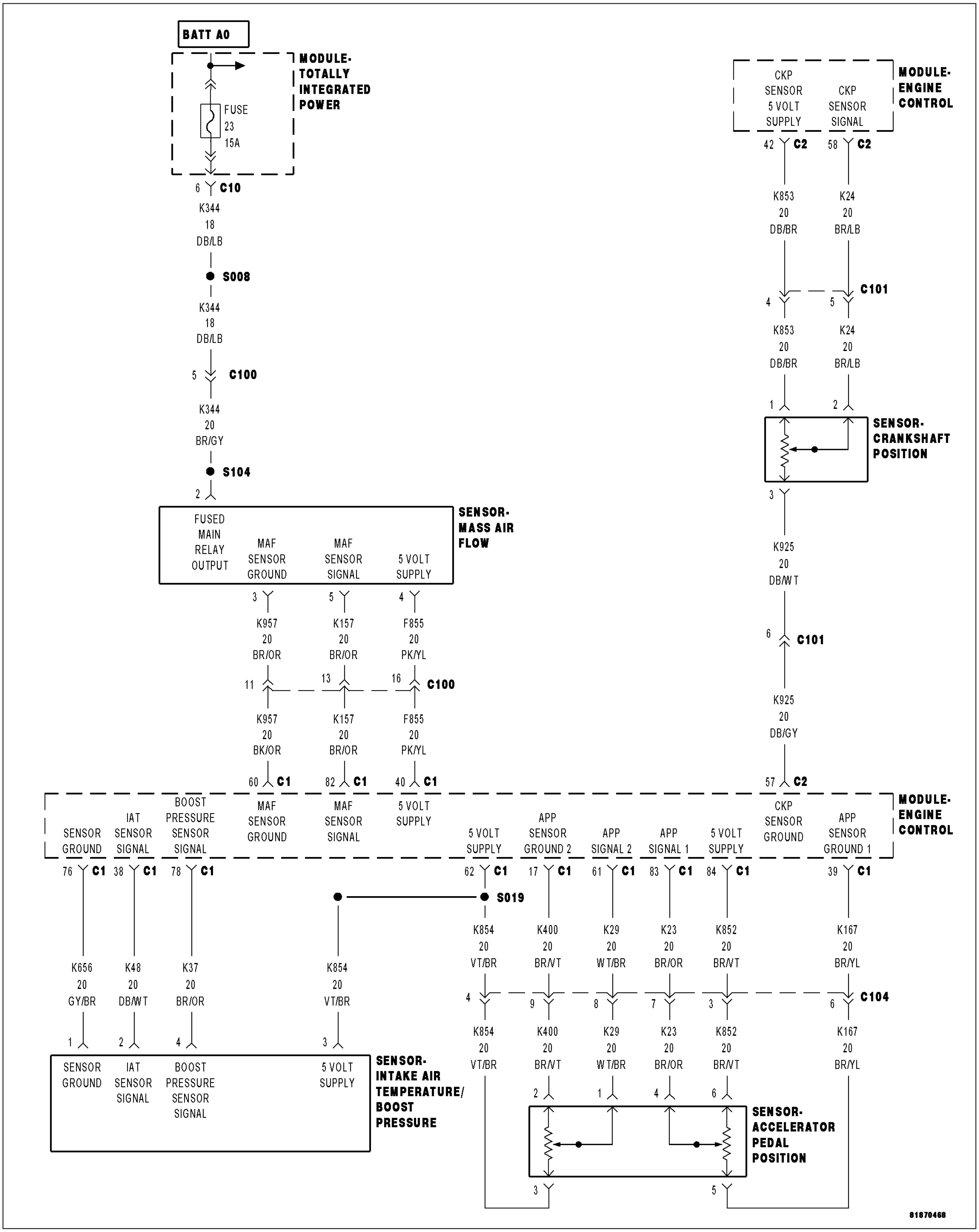
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0653-SENSOR REFERENCE VOLTAGE 2 TOO HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects a short to voltage on the Sensor Supply #2 circuit for 0.16 second.

Possible Causes
INTERMITTENT CONDITION
(K853) CRANKSHAFT POSITION SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K854) ACCELERATOR PEDAL POSITION SENSOR NO. 2 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(F855) MASS AIRFLOW SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Theory of Operation

The ECM contains 2 internal 5–Volt Sensor Supply sources. Each 5–Volt Supply source is split into parallel circuits to provide 5 volts to multiple sensors. Sensor Supply 2 provides 5 volts to the Crankshaft Position Sensor, the Boost Pressure Sensor, Accelerator Pedal Position Sensor No. 2, and the Mass Airflow Sensor.

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Turn the ignition off for 10 seconds.

Turn the ignition on.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K853) CRANKSHAFT POSITION SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Crankshaft Position Sensor harness connector.

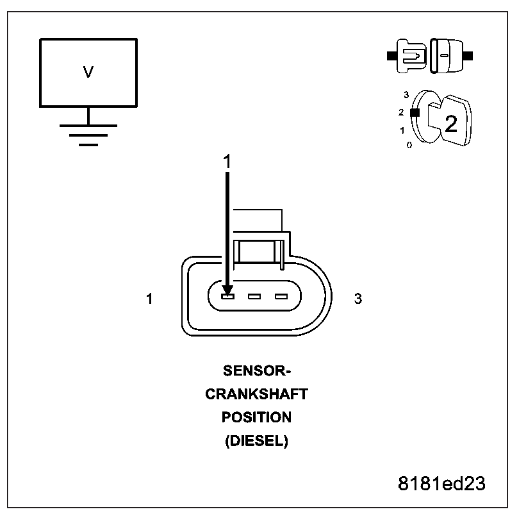
Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K853) Crankshaft Position Sensor 5 Volt Supply circuit at the Crankshaft Position Sensor harness connector.



Is there any voltage present?

Yes >> Repair the (K853) Crankshaft Position Sensor 5 Volt Supply circuit for a short to voltage.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 3

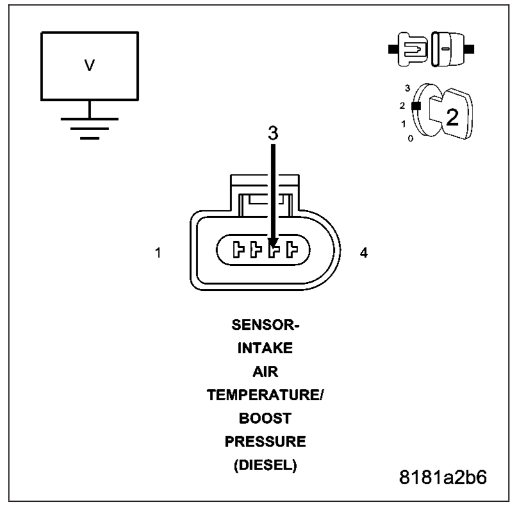
3. (K854) BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Intake Air Temperature/Boost Pressure Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K854) Boost Pressure Sensor 5 Volt Supply circuit.



Is there any voltage present?

Yes >> Repair the (K854) Boost Pressure Sensor 5 Volt Supply circuit for a short to voltage at the Intake Air Temperature/ Boost Pressure Sensor harness connector.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

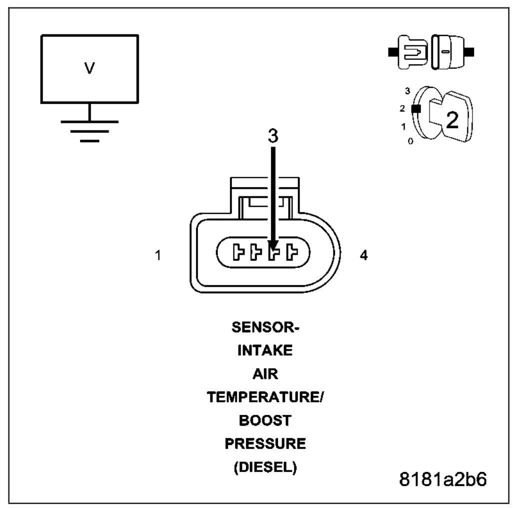
4. (K854) ACCELERATOR PEDAL POSITION SENSOR NO. 2 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (K854) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit.



Is there any voltage present?

Yes >> Repair the (K854) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit for a short to voltage at the Accelerator Pedal Position Sensor harness connector.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

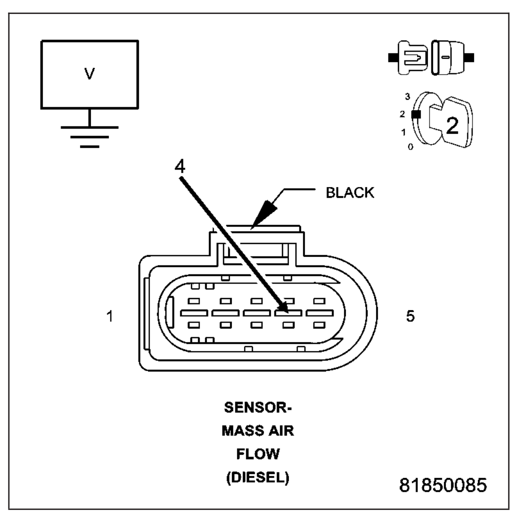
5. (F855) MASS AIRFLOW SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Mass Airflow Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (F855) Mass Airflow Sensor 5 Volt Supply circuit.



Is there any voltage present?

Yes >> Repair the (F855) Mass Airflow Sensor 5 Volt Supply circuit for a short to voltage at the Mass Air Flow Sensor harness connector.

Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. ENGINE CONTROL MODULE (ECM)

Turn the ignition off.

Inspect the (K853) Crankshaft Position Sensor 5 Volt Supply circuit between the Crankshaft Position Sensor and the ECM.

Inspect the (K854) Boost Pressure Sensor 5 Volt Supply circuit between the Intake Air Temperature/Boost Pressure Sensor and the ECM.

Inspect the (F855) Accelerator Pedal Position Sensor No. 2 5 Volt Supply circuit between the Accelerator Pedal Position Sensor and the ECM.

Inspect the (F851) Mass Airflow Sensor 5 Volt Supply circuit between the Mass Airflow Sensor and the ECM.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

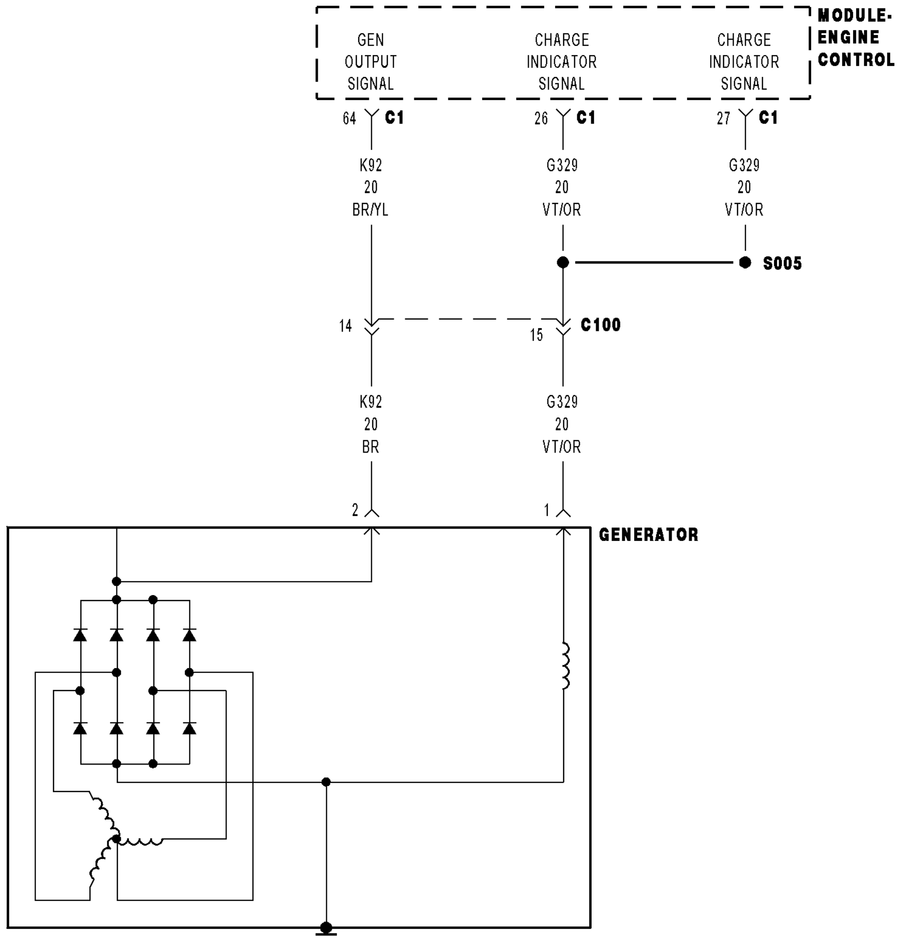
Refer to any Technical Service Bulletins that may apply.

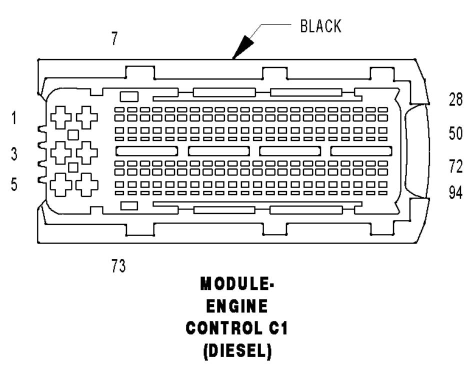
Were any problems found?

Yes >> Repair as necessary.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM VERIFICATION TEST. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P065A- GENERATOR PERFORMANCE





For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects that the Generator output is not within specifications.

Possible Causes
GENERATOR BELT
GENERATOR BELT TENSIONER
(k92) GENERATOR OUTPUT SIGNAL CIRCUIT SHORT TO VOLTAGE
(k92) GENERATOR OUTPUT SIGNAL CIRCUIT OPEN
(A801) GENERATOR B+ CIRCUIT OPEN

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR OTHER DTC'S

Turn the ignition on.
With the scan tool, check the ECM for Generator Lamp/L Terminal related DTC's.

Are there any Generator Lamp/L Terminal related DTCs?

Yes >> Repair other DTCs before continuing.

No >> Go To 2

2. (A801) GENERATOR B+ CIRCUIT

Turn the ignition off.
Using a test light connected to ground, probe the (A801) B+ circuit at the generator.

Does the test tight illuminate brightly?

Yes >> Go To 3

No >> Repair the (A801) Generator B+ circuit for an open.

3. CHECK GENERATOR DRIVE BELT

Visually inspect the generator drive belt for glazing, cracks and other problems.
Inspect the generator drive belt and tensioner for proper tension.

Were any problems found?

Yes >> Repair or replace as necessary.

No >> Go To 4

4. (K92) GENERATOR OUTPUT SIGNAL CIRCUIT OPEN

Disconnect the Generator harness connector.

Disconnect the ECM harness connectors.

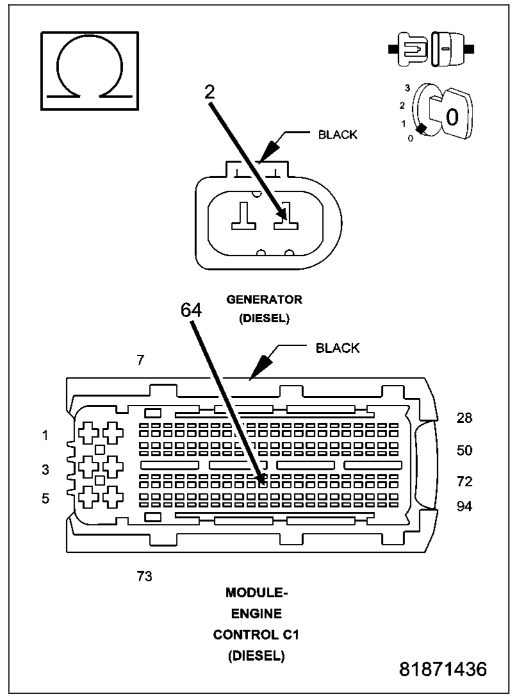
Measure the resistance of the (K92) Generator Output Signal circuit.

Is the resistance below 10.0 ohms?

Yes >> Go To 5

No >> Repair the (K92) Generator Output Signal circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



5. (K92) GENERATOR OUTPUT SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

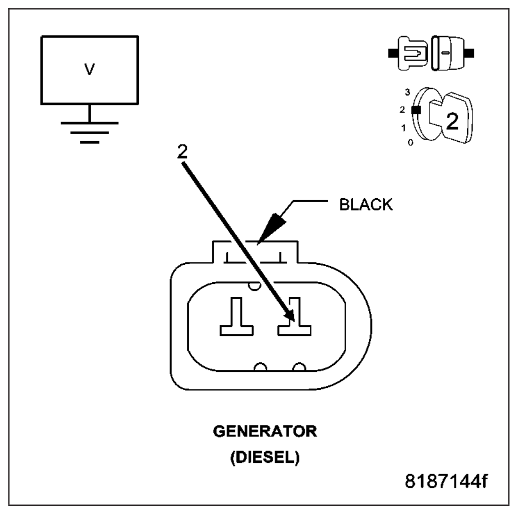
Measure the voltage of the (K92) Generator Output Signal circuit.

Is the voltage above 1.0 volt?

Yes >> Repair the (K92) Generator Output Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 6



6. TEST DRIVE THE VEHICLE

With the scan tool, erase DTC's.

Test drive the vehicle.

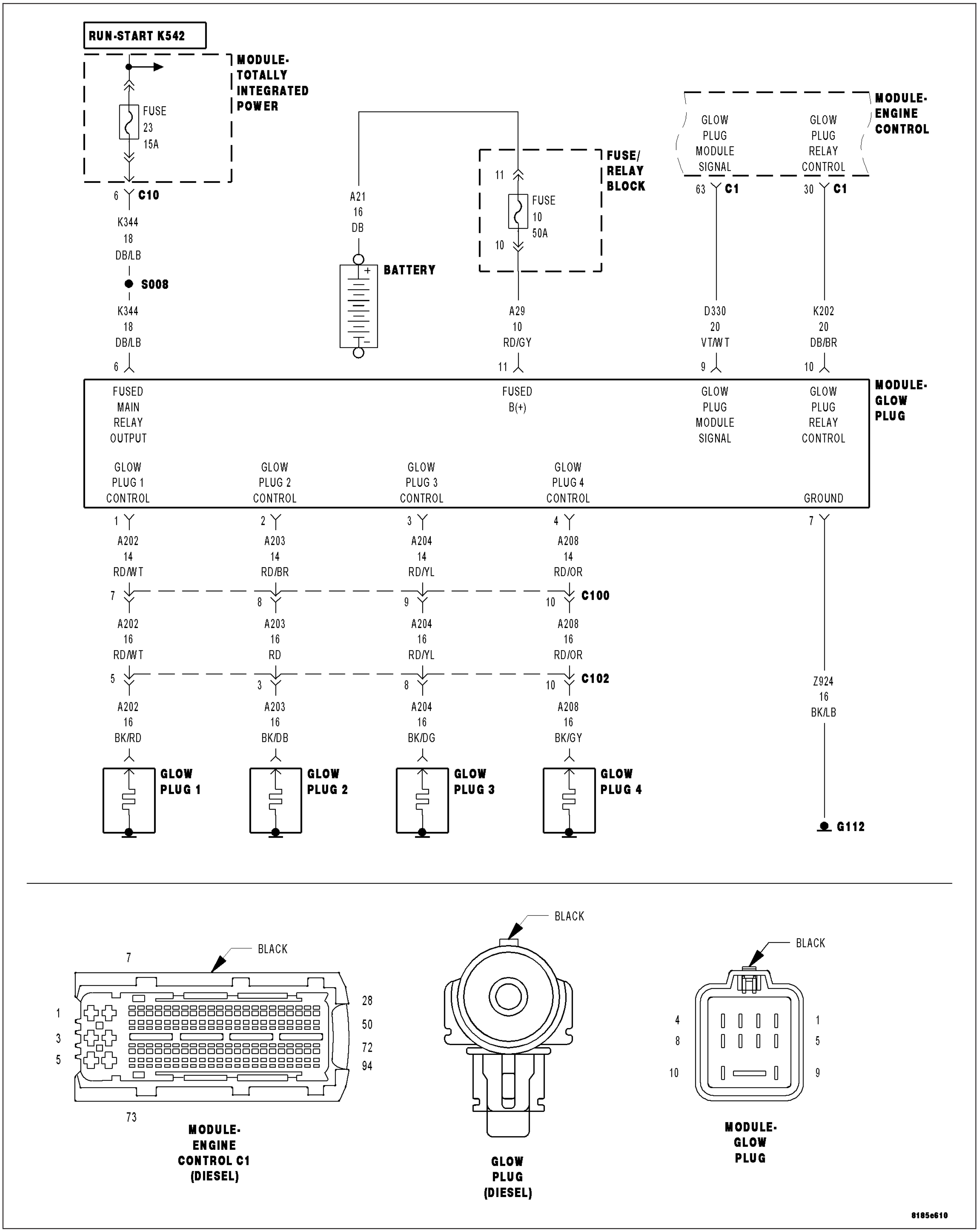
With the scan tool, read DTC's.

Does the scan tool display this DTC?

Yes >> Replace the Generator.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P066A-CYLINDER 1 GLOW PLUG CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command off.
- **Set Condition:**
  The ECM detects an open or shorted to ground on the Cylinder 1 Glow Plug circuit.

Possible Causes
INTERMITTENT DTC
(A202) GLOW PLUG 1 CONTROL CIRCUIT OPEN
(A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO GROUND
(A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 1
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

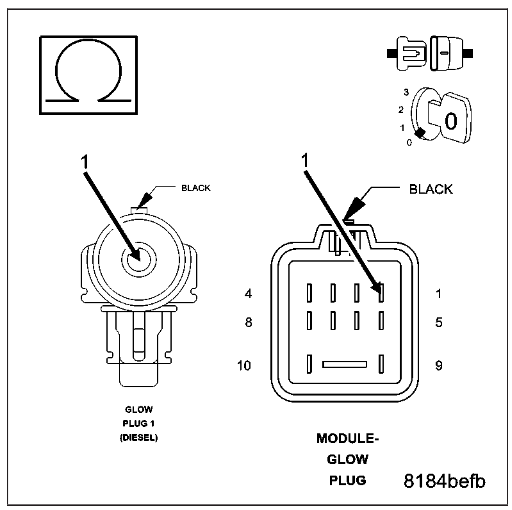
2. (A202) GLOW PLUG 1 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 1 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A202) Glow Plug 1 Control circuit between the Glow Plug 1 harness connector and the Glow Plug Module harness connector..



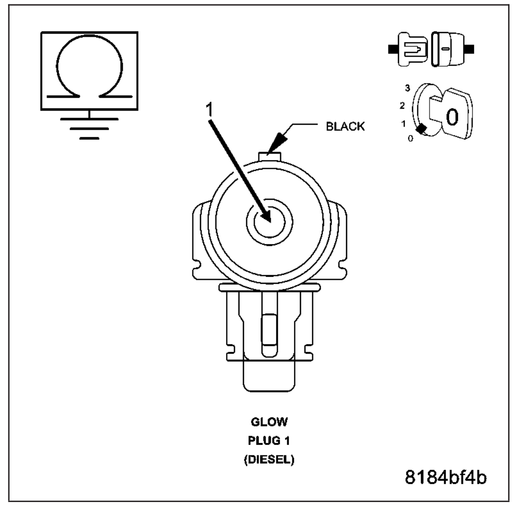
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A202) Glow Plug 1 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A202) Glow Plug 1 Control circuit at the Glow Plug 1 harness connector.



Is the resistance below 1000 ohms?

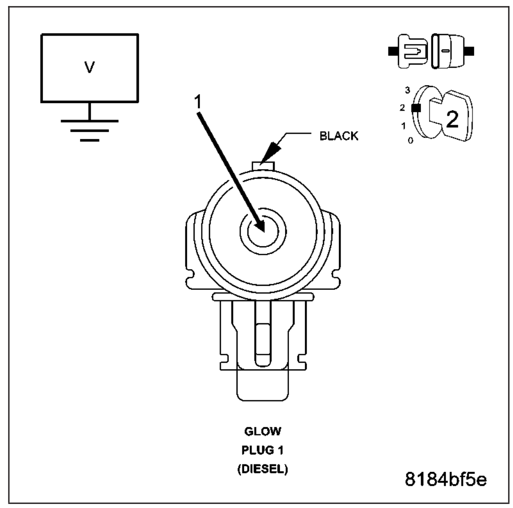
Yes >> Repair the (A202) Glow Plug 1 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A202) Glow Plug 1 Control circuit at the Glow Plug 1 harness connector.



Is there voltage present on the (A202) Glow Plug 1 Control circuit?

Yes >> Repair the (A202) Glow Plug 1 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 1

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 1.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

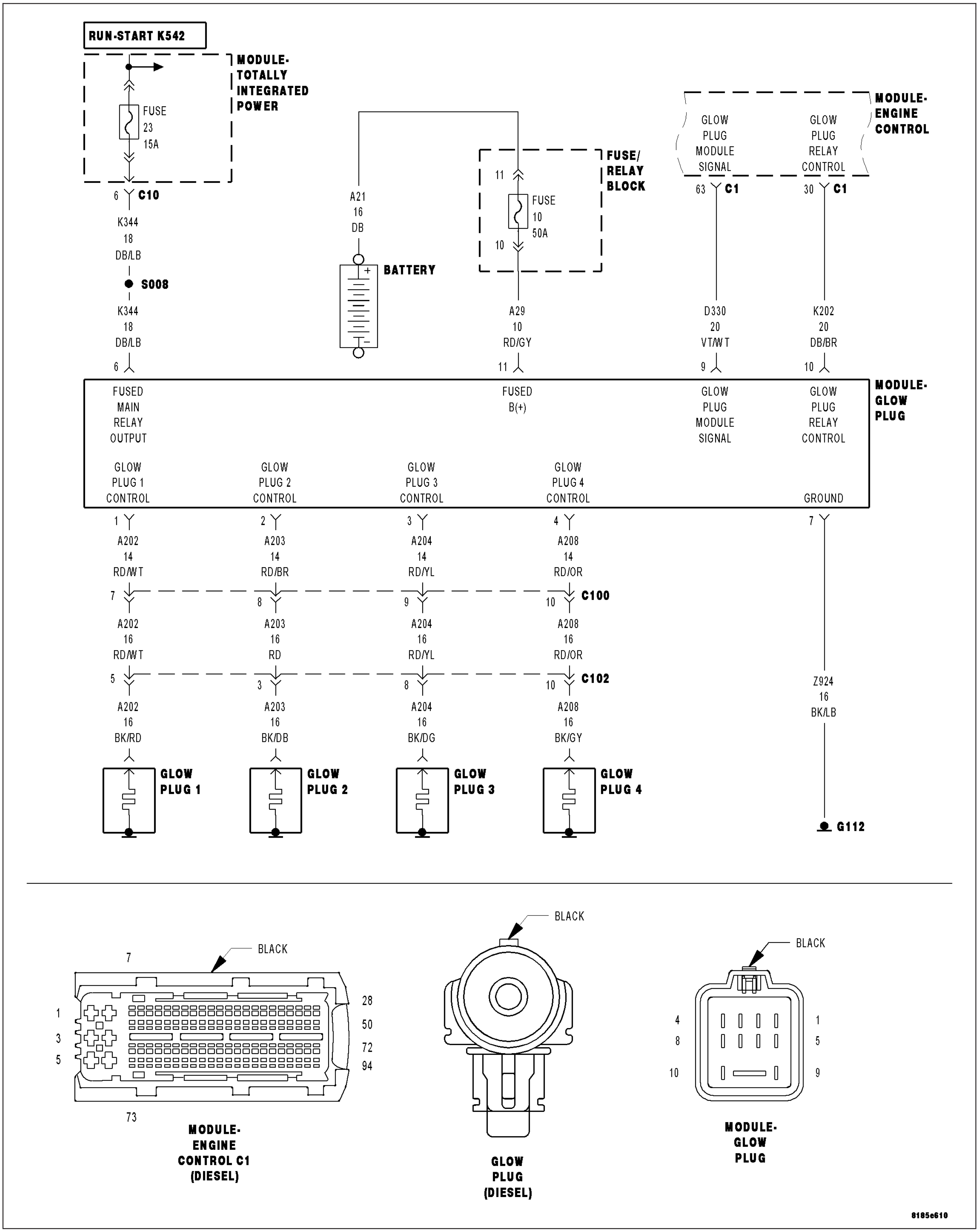
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P066C-CYLINDER 2 GLOW PLUG CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command off.
- **Set Condition:**
  The ECM detects an open or shorted to ground on the Cylinder 2 Glow Plug circuit.

Possible Causes
INTERMITTENT DTC
(A203) GLOW PLUG 2 CONTROL CIRCUIT OPEN
(A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO GROUND
(A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 2
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

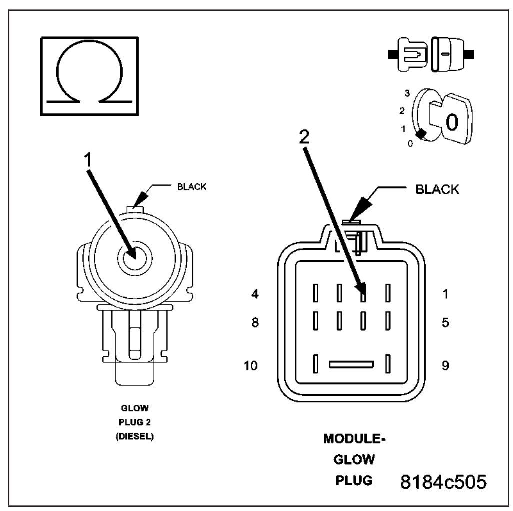
2. (A203) GLOW PLUG 2 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 2 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A203) Glow Plug 2 Control circuit between the Glow Plug 2 harness connector and the Glow Plug Module harness connector.



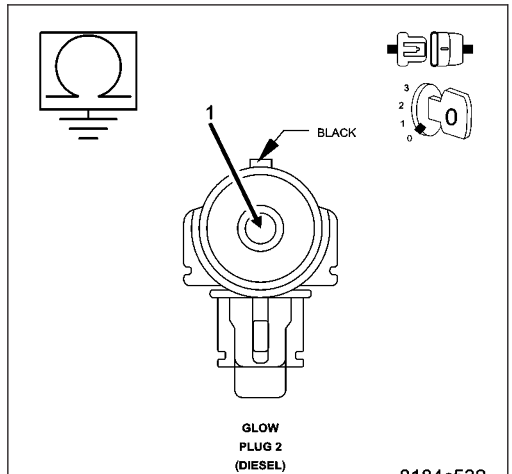
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A203) Glow Plug 2 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A203) Glow Plug 2 Control circuit at the Glow Plug 2 harness connector.



8184c532

Is the resistance below 1000 ohms?

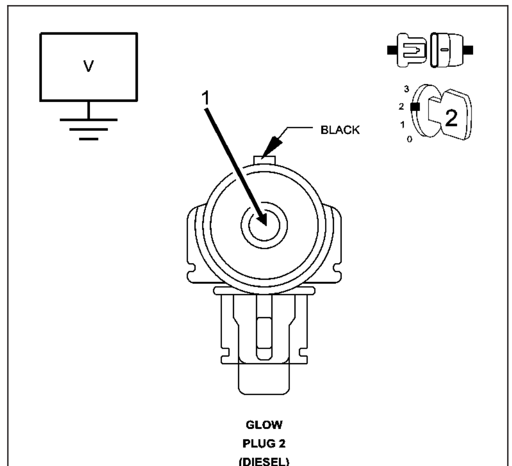
Yes >> Repair the (A203) Glow Plug 2 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A203) Glow Plug 2 Control circuit at the Glow Plug 2 harness connector.



8184c54e

Is there voltage present on the (A203) Glow Plug 2 Control circuit?

Yes >> Repair the (A203) Glow Plug 2 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 2

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 2.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

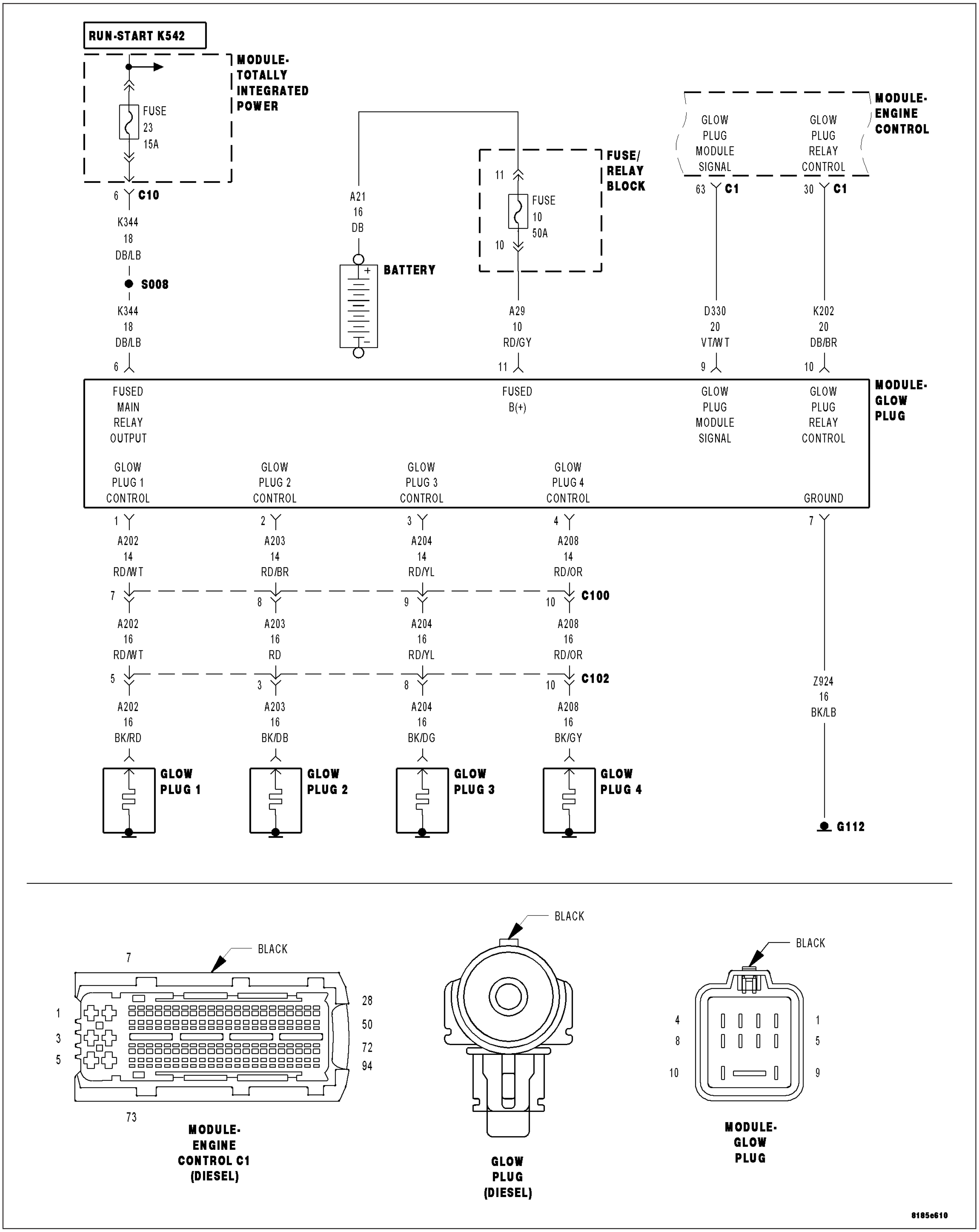
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P066E-CYLINDER 3 GLOW PLUG CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command off.
- **Set Condition:**
  The ECM detects an open or shorted to ground on the Cylinder 3 Glow Plug circuit.

Possible Causes
INTERMITTENT DTC
(A204) GLOW PLUG 3 CONTROL CIRCUIT OPEN
(A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO GROUND
(A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 3
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

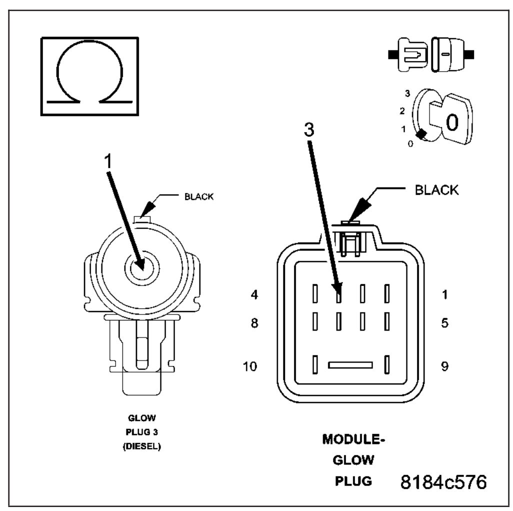
2. (A204) GLOW PLUG 3 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 3 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A204) Glow Plug 3 Control circuit between the Glow Plug 3 harness connector and the Glow Plug Module harness connector..



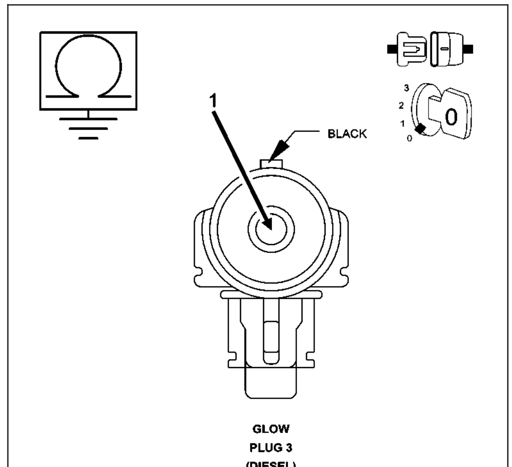
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A204) Glow Plug 3 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A204) Glow Plug 3 Control circuit at the Glow Plug 3 harness connector.



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Is the resistance below 1000 ohms?

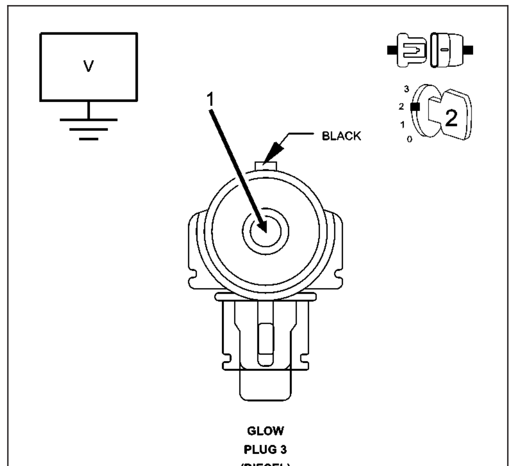
Yes >> Repair the (A204) Glow Plug 3 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A204) Glow Plug 3 Control circuit at the Glow Plug 3 harness connector.



8184c589

Is there voltage present on the (A204) Glow Plug 3 Control circuit?

Yes >> Repair the (A204) Glow Plug 3 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 3

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 3.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

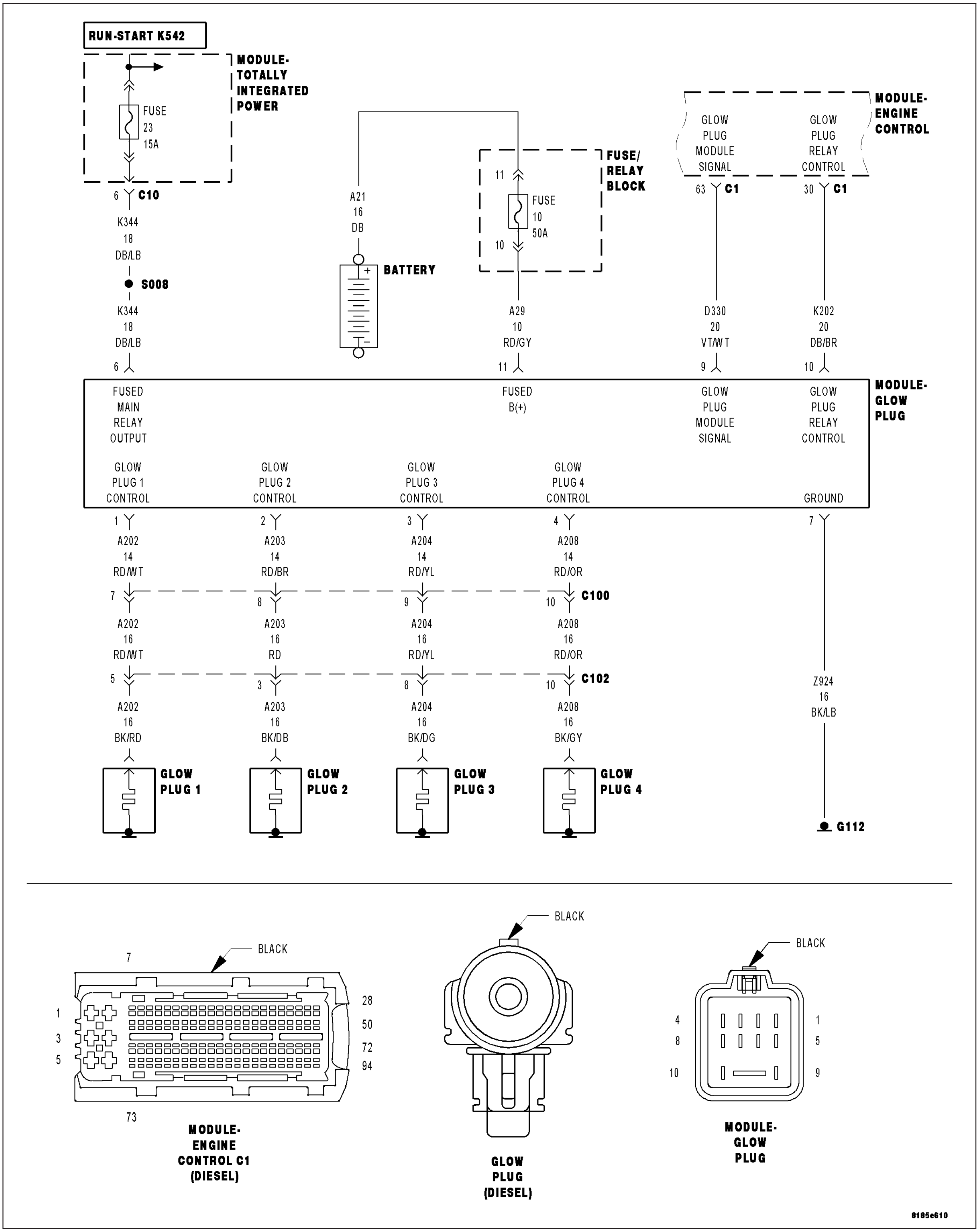
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0383-GLOW PLUG CONTROL MODULE CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

A

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects an open on the (K202) Glow Plug Module Control circuit for 0.5 second.

Possible Causes
INTERMITTENT DTC
(K202) GLOW PLUG MODULE CONTROL CIRCUIT SHORTED TO GROUND
(K202) GLOW PLUG MODULE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Glow Plugs.

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

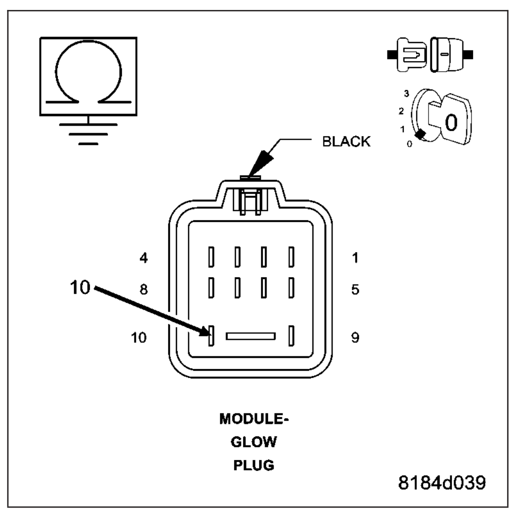
2. (K202) GLOW PLUG MODULE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Glow Plug Module harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K202) Glow Plug Module Control circuit in the Glow Plug Module harness connector.



Is the resistance below 1000.0 ohms?

Yes >> Repair the (K202) Glow Plug Module Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K202) GLOW PLUG MODULE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K202) Glow Plug Module Control circuit between the Glow Plug Module harness connector and the Engine Control Module (ECM) harness connector.

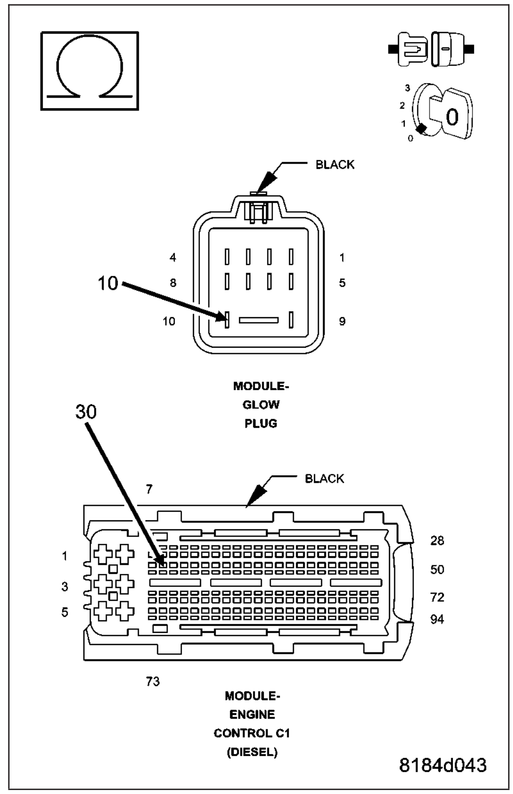
Is the resistance below 10.0 ohms?

Yes >> Replace the Glow Plug Control Module.

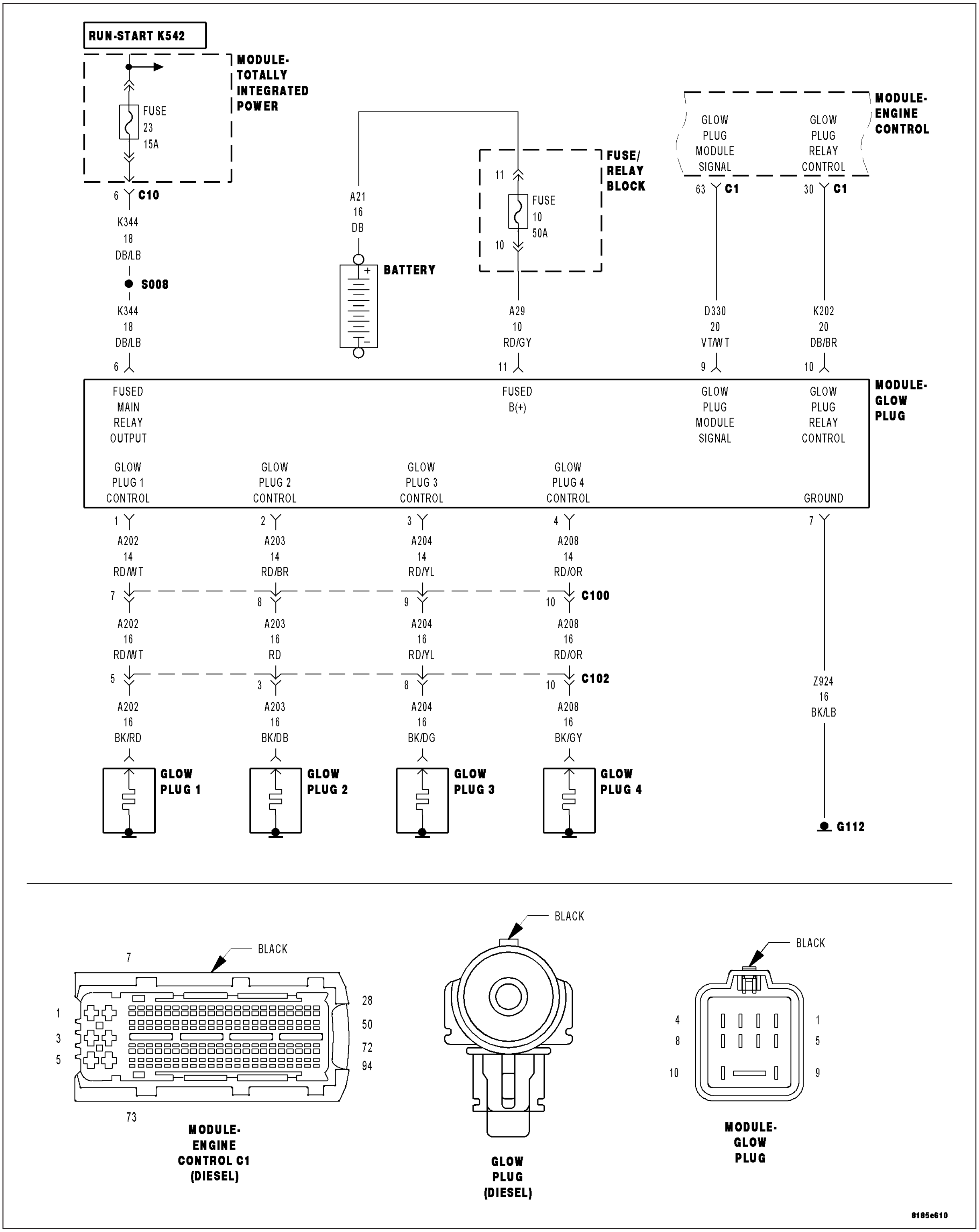
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K202) Glow Plug Module Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



P0671-CYLINDER 1 GLOW PLUG CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command on.
- **Set Condition:**
  The ECM detects an open or short on the Cylinder 1 Glow Plug circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(A202) GLOW PLUG 1 CONTROL CIRCUIT OPEN
(A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO GROUND
(A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 1
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

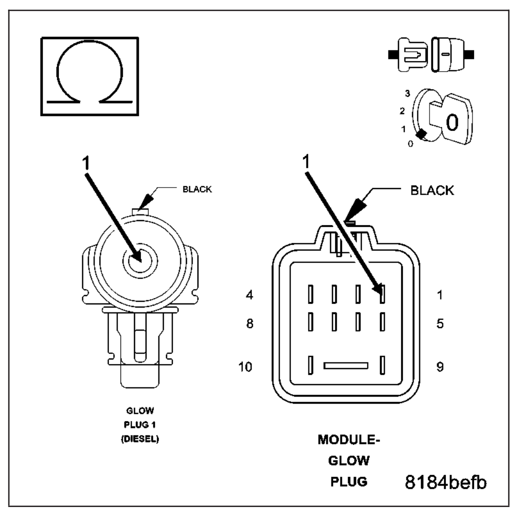
2. (A202) GLOW PLUG 1 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 1 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A202) Glow Plug 1 Control circuit between the Glow Plug 1 harness connector and the Glow Plug Module harness connector.



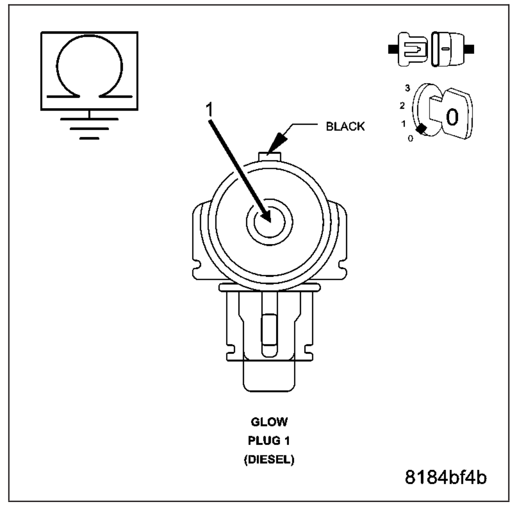
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A202) Glow Plug 1 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A202) Glow Plug 1 Control circuit at the Glow Plug 1 harness connector.



Is the resistance below 1000 ohms?

Yes >> Repair the (A202) Glow Plug 1 Control circuit for a short to ground.

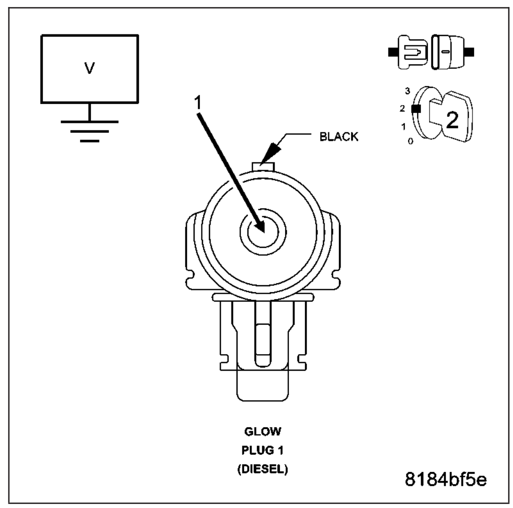
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A202) GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A202) Glow Plug 1 Control circuit at the Glow Plug 1 harness connector.



Is there voltage present on the (A202) Glow Plug 1 Control circuit?

Yes >> Repair the (A202) Glow Plug 1 Control circuit for a short to voltage

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 1

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 1.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

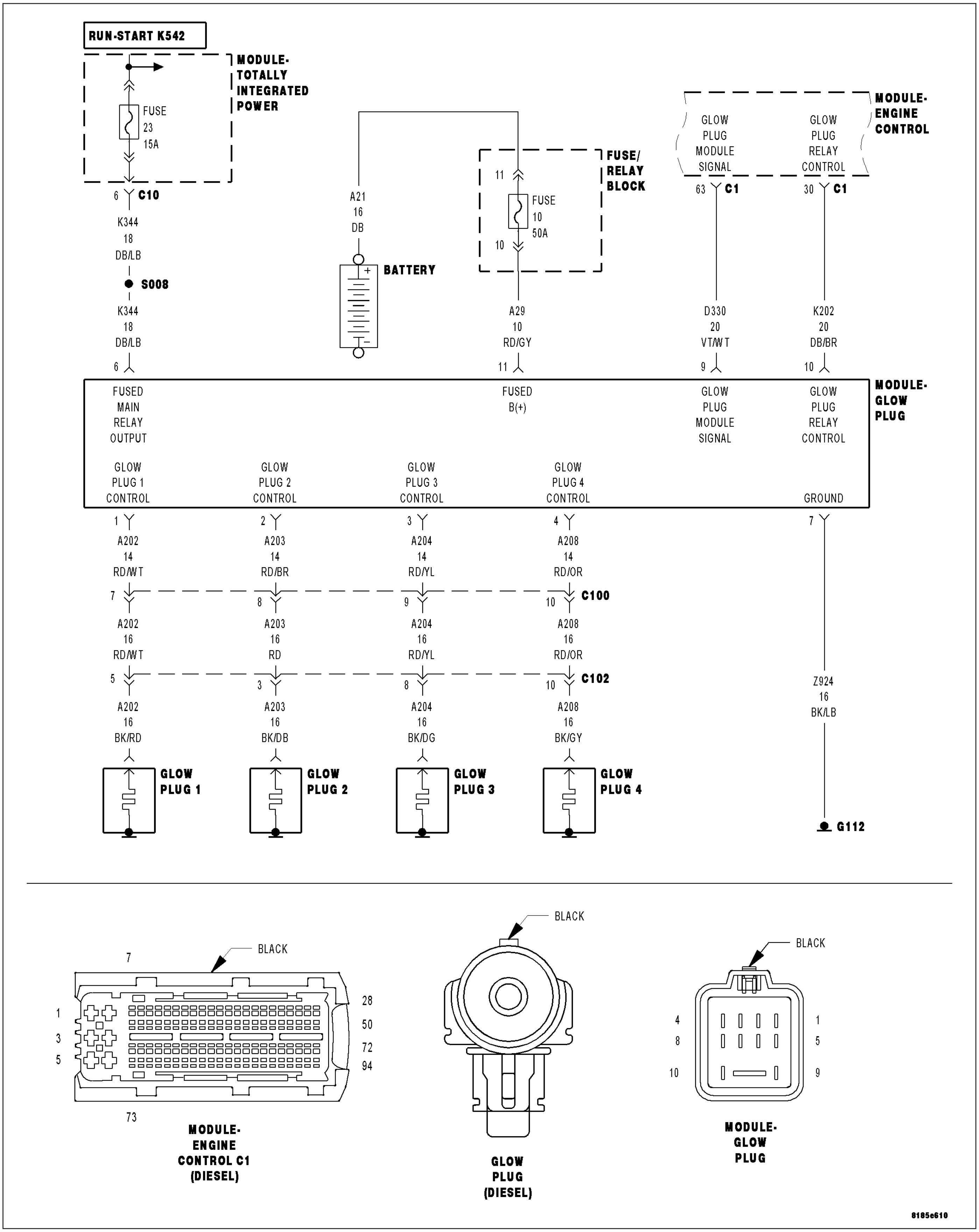
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0672-CYLINDER 2 GLOW PLUG CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command on.
- **Set Condition:**
  The ECM detects an open or short on the Cylinder 2 Glow Plug circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(A203) GLOW PLUG 2 CONTROL CIRCUIT OPEN
(A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO GROUND
(A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 2
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

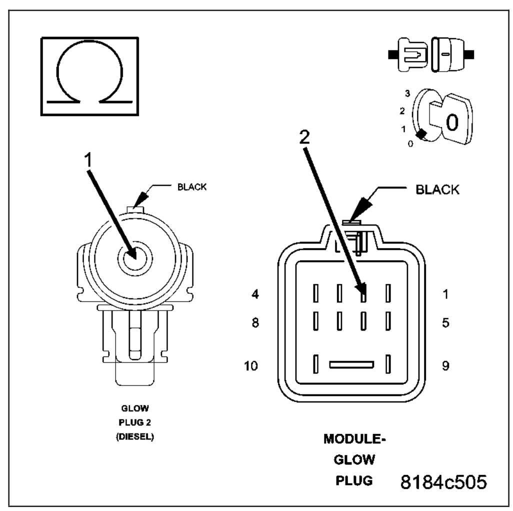
2. (A203) GLOW PLUG 2 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 2 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A203) Glow Plug 2 Control circuit between the Glow Plug 2 harness connector and the Glow Plug Module harness connector.



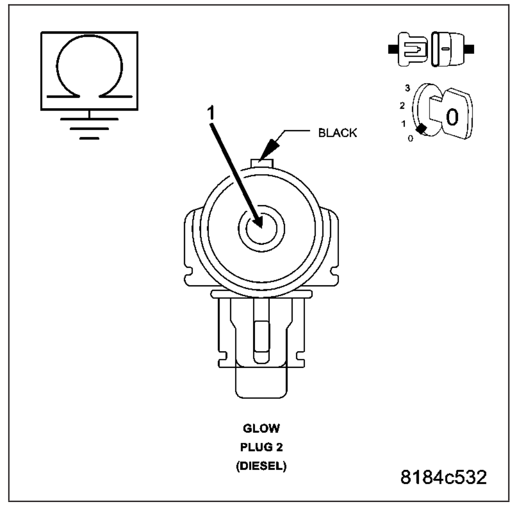
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A203) Glow Plug 2 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A203) Glow Plug 2 Control circuit at the Glow Plug 2 harness connector.



Is the resistance below 1000 ohms?

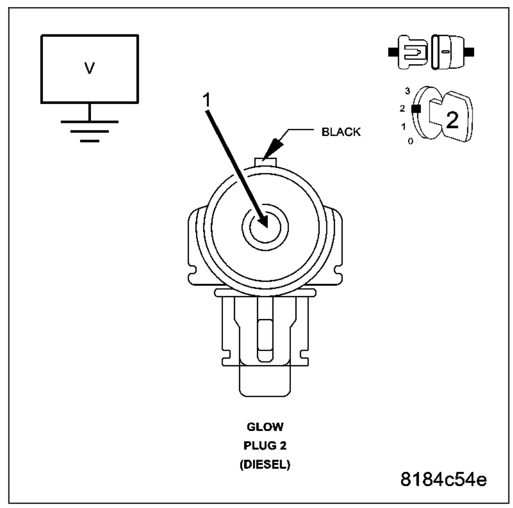
Yes >> Repair the (A203) Glow Plug 2 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A203) GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A203) Glow Plug 2 Control circuit at the Glow Plug 2 harness connector.



Is there voltage present on the (A203) Glow Plug 2 Control circuit?

Yes >> Repair the (A203) Glow Plug 2 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 2

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 2.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

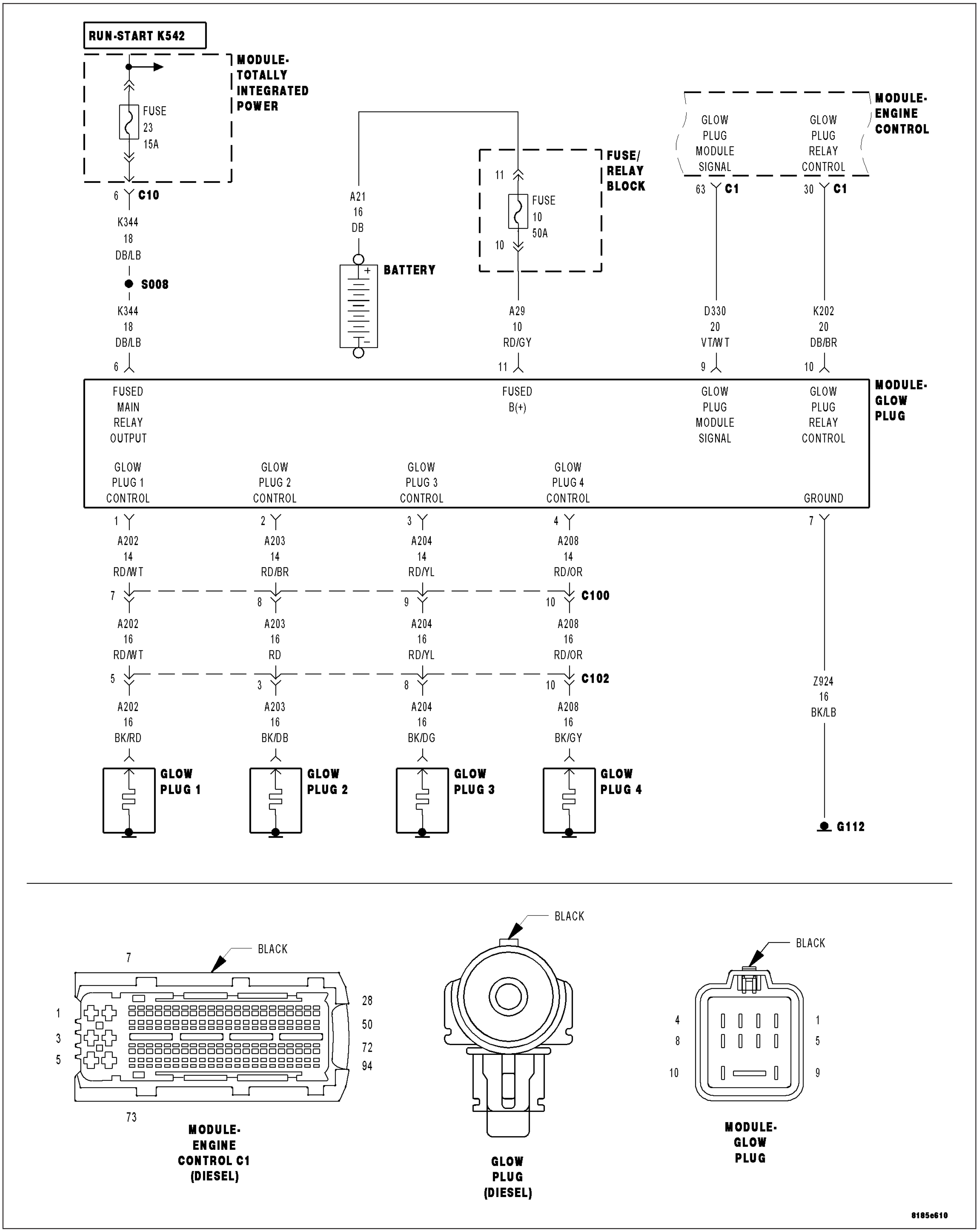
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0673-CYLINDER 3 GLOW PLUG CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command on.
- **Set Condition:**
  The ECM detects an open or short on the Cylinder 3 Glow Plug circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(A204) GLOW PLUG 3 CONTROL CIRCUIT OPEN
(A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO GROUND
(A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 3
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

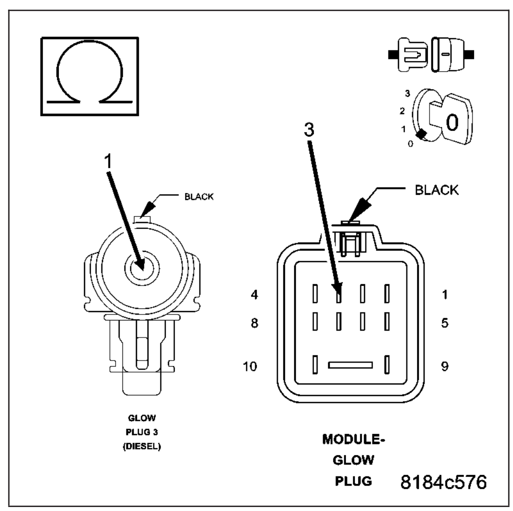
2. (A204) GLOW PLUG 3 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 3 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A204) Glow Plug 3 Control circuit between the Glow Plug 3 harness connector and the Glow Plug Module harness connector.



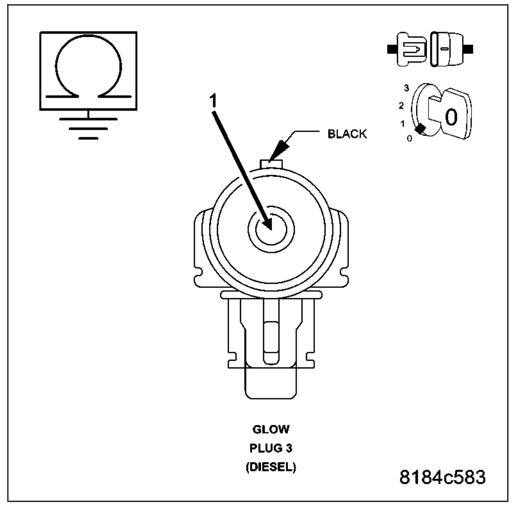
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A204) Glow Plug 3 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A204) Glow Plug 3 Control circuit at the Glow Plug 3 harness connector.



Is the resistance below 1000 ohms?

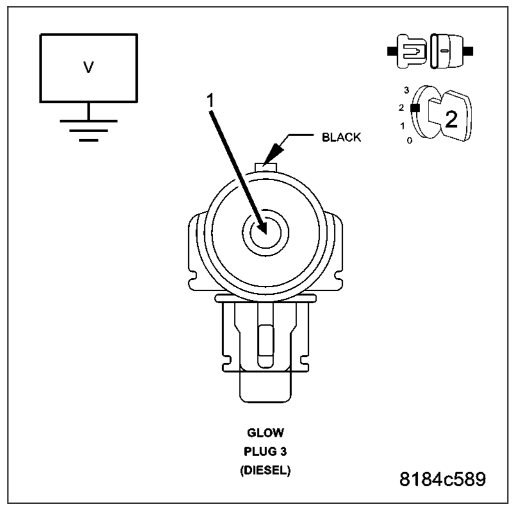
Yes >> Repair the (A204) Glow Plug 3 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A204) GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A204) Glow Plug 3 Control circuit at the Glow Plug 3 harness connector.



Is there voltage present on the (A204) Glow Plug 3 Control circuit?

Yes >> Repair the (A204) Glow Plug 3 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 3

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 3.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

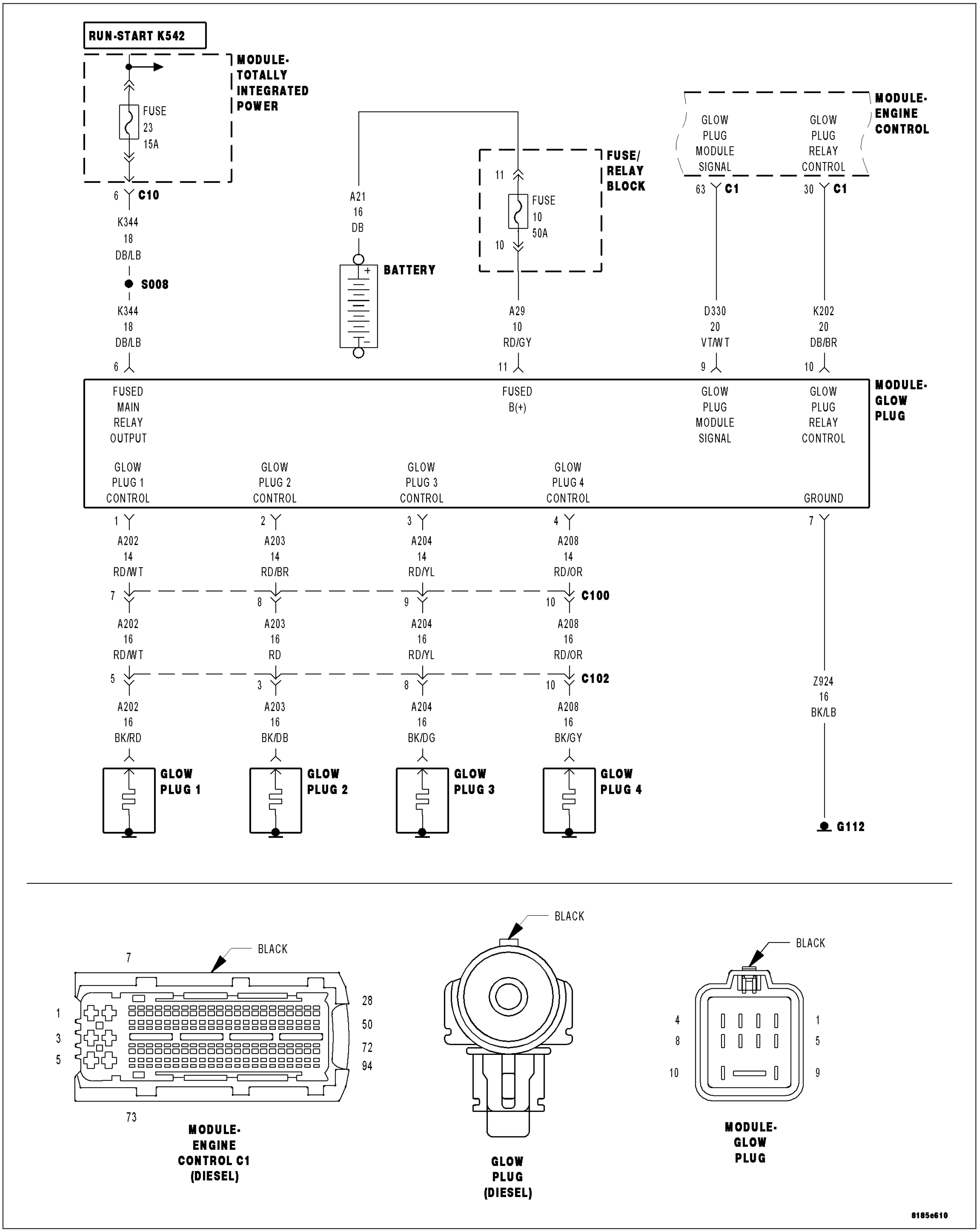
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0674-CYLINDER 4 GLOW PLUG CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command on.
- **Set Condition:**
  The ECM detects an open or short on the Cylinder 4 Glow Plug circuit for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(A208) GLOW PLUG 4 CONTROL CIRCUIT OPEN
(A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO GROUND
(A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 4
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

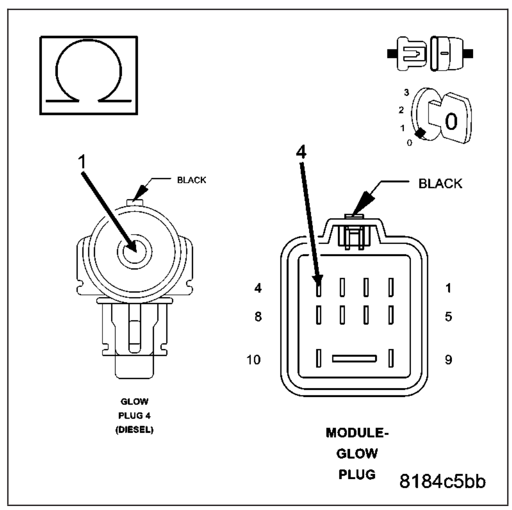
2. (A208) GLOW PLUG 4 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect Glow Plug 4 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A208) Glow Plug Control circuit between the Glow Plug 4 harness connector and the Glow Plug Module harness connector.



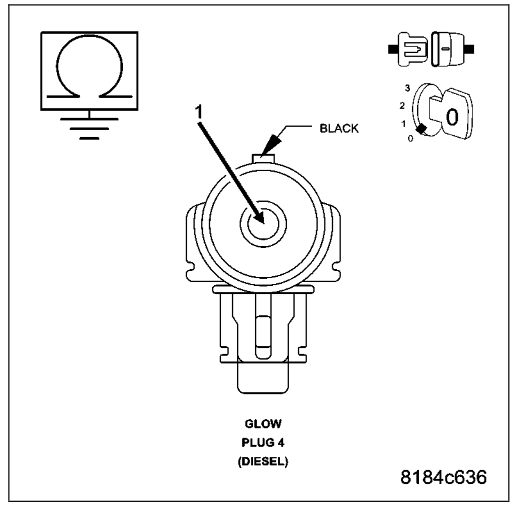
Is the resistance below 10.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the (A208) Glow Plug 4 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A208) Glow Plug Control circuit at the Glow Plug 4 harness connector.



Is the resistance below 1000 ohms for any of the measurements?

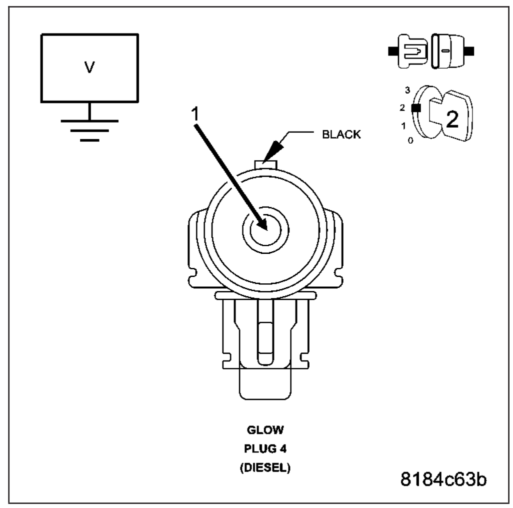
Yes >> Repair the (A208) Glow Plug 4 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A208) Glow Plug 4 Control circuit at the Glow Plug 4 harness connector.



Is there voltage present on any of the Glow Plug Control circuits?

Yes >> Repair the (A208) Glow Plug 4 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG

Turn the ignition off.

Connect each Glow Plug connector.

Connect the Glow Plug Module connector.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Refer to the Service Information and perform the Glow Plug Test on each Glow plug.

Did each Glow Plug pass the test?

Yes >> Go to 6

No >> Replace the appropriate Glow Plug in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

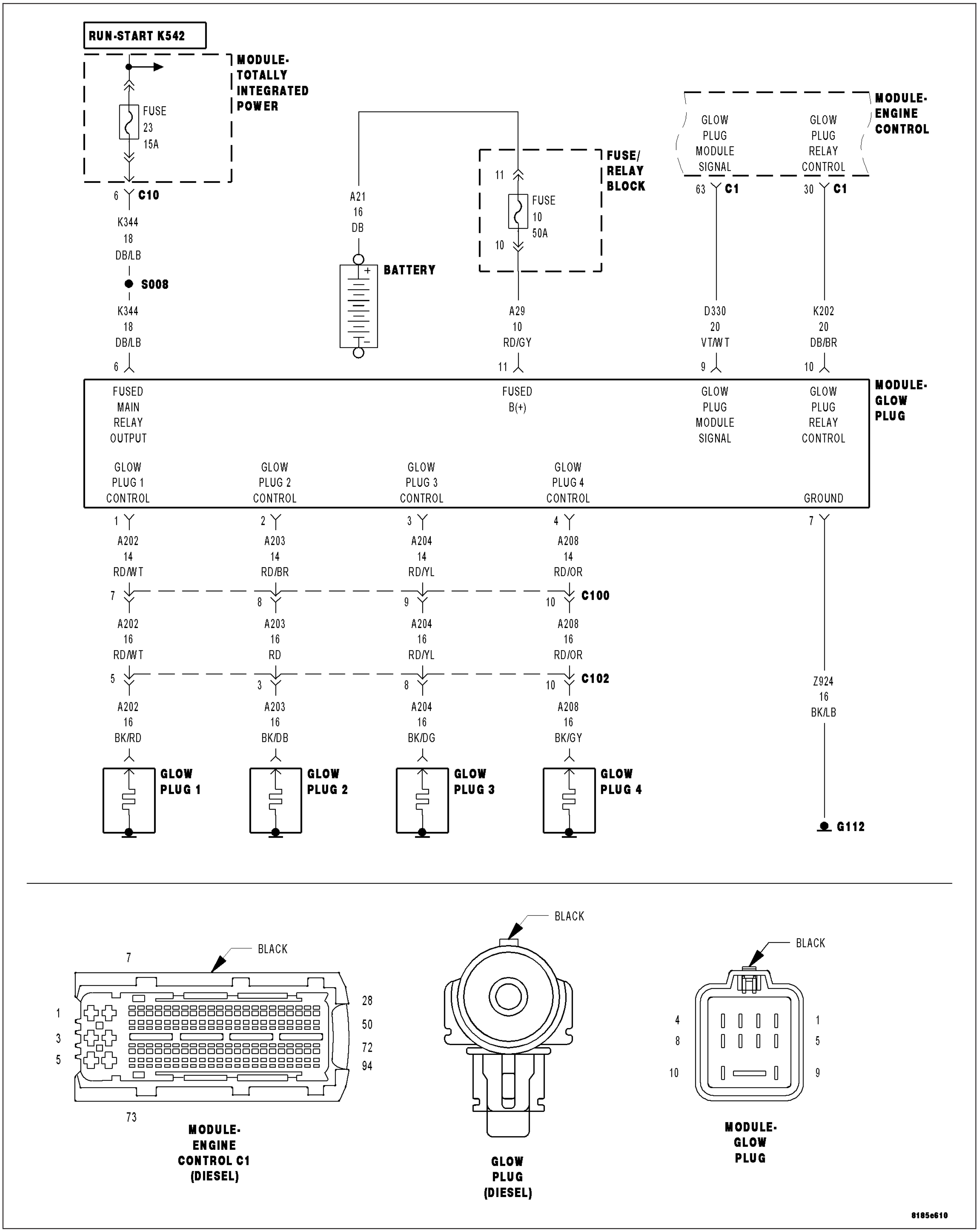
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P067A-CYLINDER 4 GLOW PLUG CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the Glow Plug Module Glow Plug command off.
- **Set Condition:**
  The ECM detects an open or shorted to ground on the Cylinder 4 Glow Plug circuit.

Possible Causes
INTERMITTENT DTC
(A208) GLOW PLUG 4 CONTROL CIRCUIT OPEN
(A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO GROUND
(A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 4
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

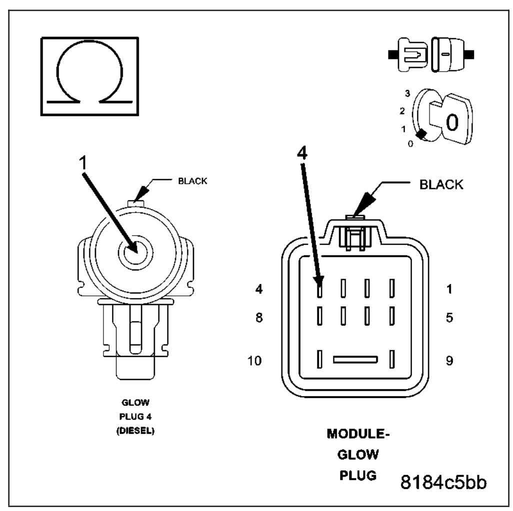
2. (A208) GLOW PLUG 4 CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Glow Plug 4 harness connector.

Disconnect the Glow Plug Module harness connector.

Measure the resistance of the (A208) Glow Plug 4 Control circuit between the Glow Plug 4 harness connector and the Glow Plug Module harness connector.



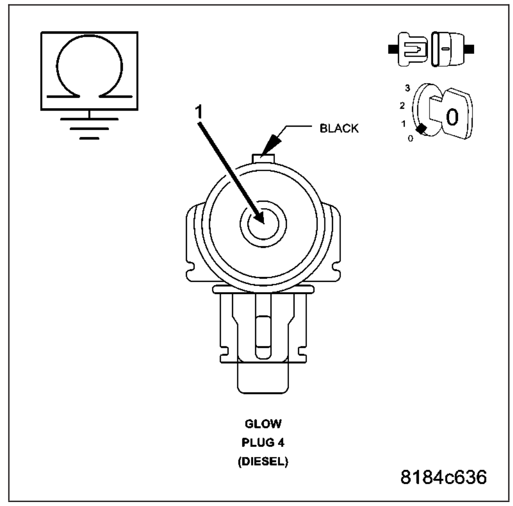
Is the resistance below 10.0 ohms?

Yes >> Go To 3

No >> Repair the (A208) Glow Plug 4 Control circuit for an open. Perform ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A208) Glow Plug 4 Control circuit at the Glow Plug 4 harness connector.



Is the resistance below 1000 ohms?

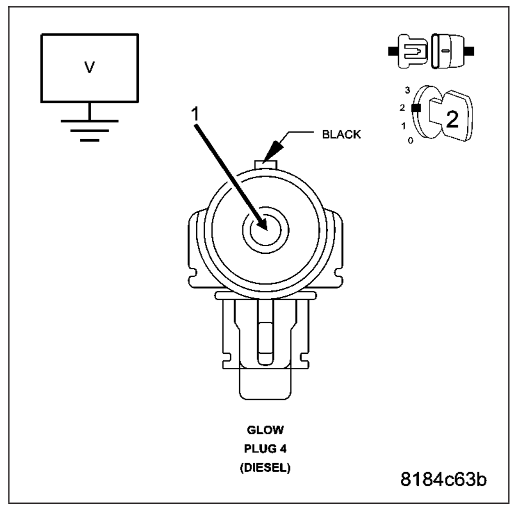
Yes >> Repair the (A208) Glow Plug 4 Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (A208) GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (A208) Glow Plug 4 Control circuit at the Glow Plug 4 harness connector.



Is there voltage present on the (A208) Glow Plug 4 Control circuit?

Yes >> Repair the (A208) Glow Plug 4 Control circuit for a short to voltage
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. GLOW PLUG 4

Turn the ignition off.

Refer to the Service Information and replace the Glow Plug 4.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.

With the scan tool, read ECM DTCs.

Does the scan tool display this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. GLOW PLUG MODULE

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

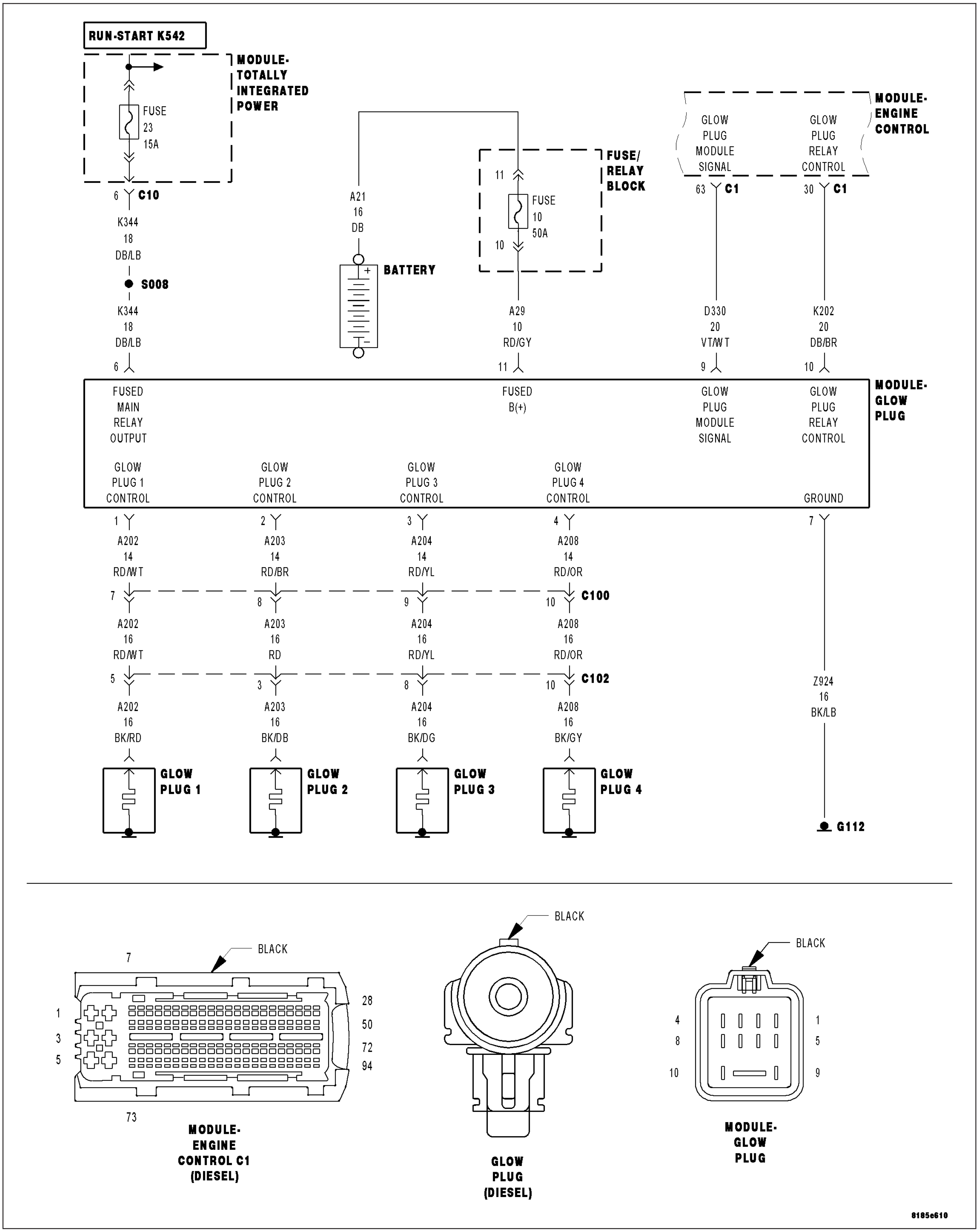
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P0683-GLOW PLUG CONTROL MODULE TO PCM COMMUNICATION



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects a fault on the (D330) Glow Plug Module Signal circuit for 0.5 second.

Possible Causes
INTERMITTENT DTC
(D330) GLOW PLUG MODULE SIGNAL CIRCUIT SHORTED TO GROUND
(D330) GLOW PLUG MODULE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K202) GLOW PLUG RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(D330) GLOW PLUG MODULE SIGNAL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
With the scan tool, actuate the Glow Plugs.
Monitor the scan tool for at least two minutes.
Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
Start the engine.
Allow the engine to reach normal operating temperature.
Test drive the vehicle.
With the scan tool, select View DTCs.

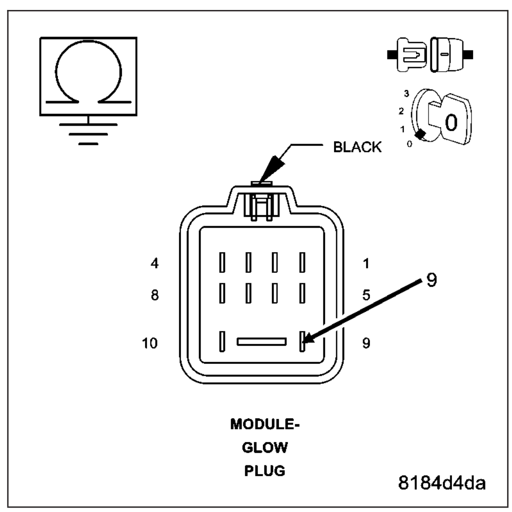
Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (D330) GLOW PLUG MODULE SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Disconnect the Glow Plug Module harness connector.
Disconnect the Engine Control Module (ECM) harness connector.
Measure the resistance between ground and the (D330) Glow Plug Module Signal circuit in the Glow Plug Module harness connector.



Is the resistance below 1000 ohms?

Yes >> Repair the (D330) Glow Plug Module Signal circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (D330) GLOW PLUG MODULE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

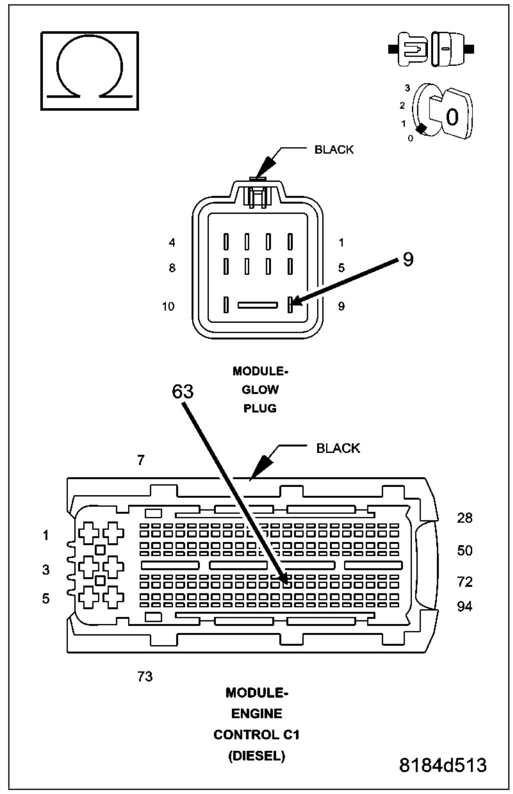
Measure the resistance of the (D330) Glow Plug Module Signal circuit between the Glow Plug Module harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 4

No >> Repair the (D330) Glow Plug Module Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



4. (K202) GLOW PLUG RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

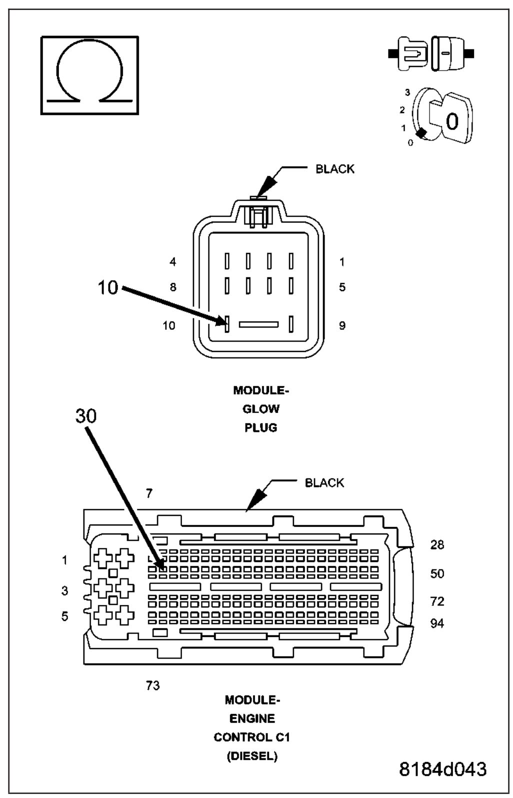
Measure the resistance of the (K202) Glow Plug Relay Control circuit between the Glow Plug Module harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 5

No >> Repair the (K202) Glow Plug Relay Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



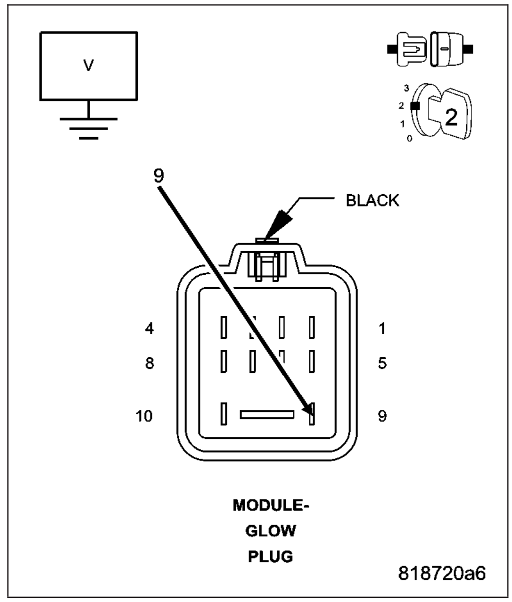
5. (D330) GLOW PLUG MODULE SIGNAL CIRCUIT SHORTED TO VOLTAGE

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (D330) Glow Plug Module Signal circuit.



Is the voltage above 1.0 volt?

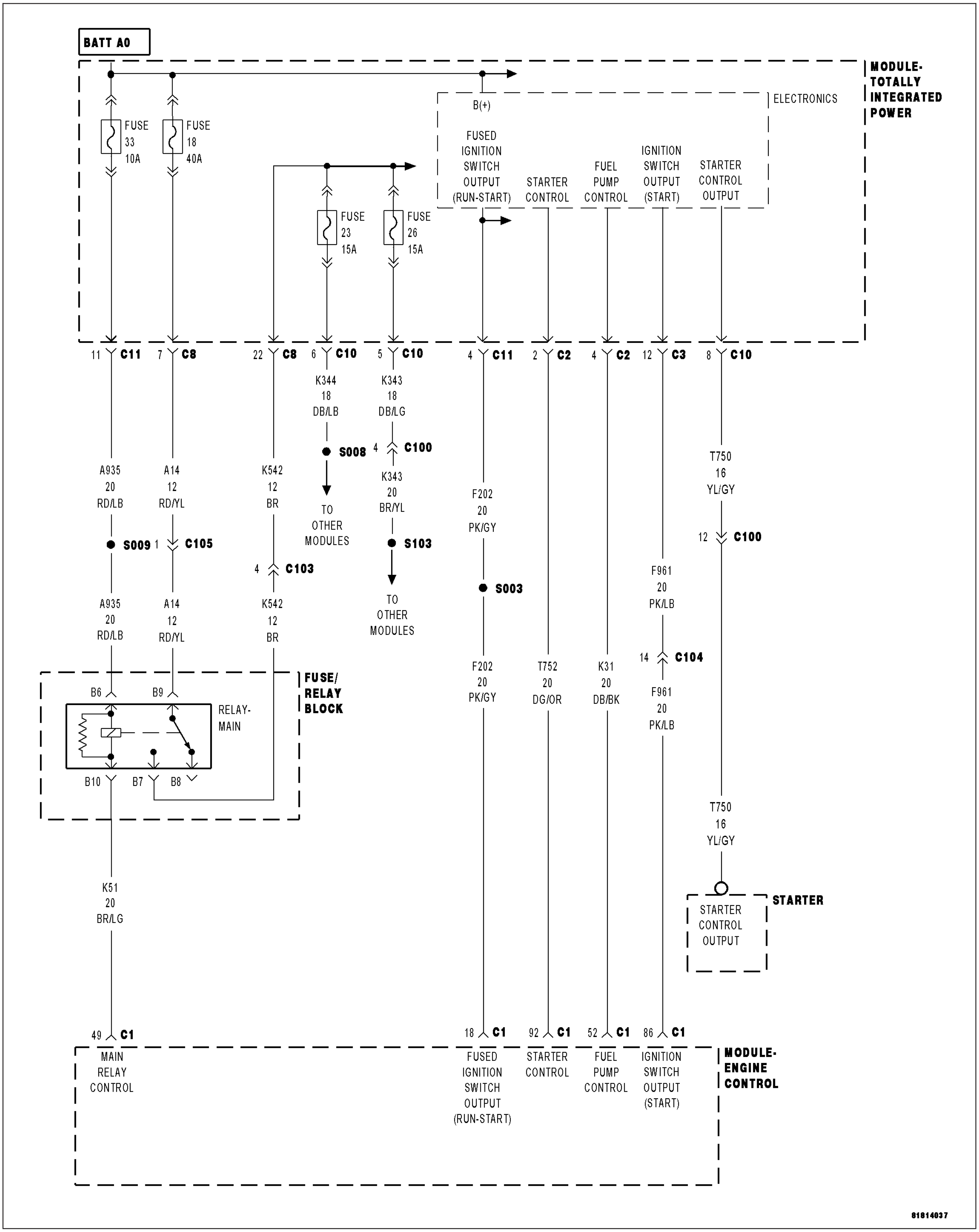
Yes >> Repair the (D330) Glow Plug Module Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Glow Plug Control Module.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P068A-ASD/MAIN RELAY OFF TOO EARLY



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  When the ignition is turned off, during after-run mode of operation.
- **Set Condition:**
  The internal ECM timer determines that the Main Relay has shut off before the AFTER-RUN mode of operation has been completed.

Possible Causes
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE MAIN RELAY
(K51) MAIN RELAY CONTROL CIRCUIT OPEN INTERMITTENTLY
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR OTHER DTCS

Turn the ignition on.

With the scan tool, check for additional DTCs.

Are other DTCs present?

Yes >> Refer to the Symptom List for diagnosis of the other DTCs before continuing.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

2. CLEAR CODE AND CHECK IF THE DTC RESETS

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles, pausing for at least 10 seconds between each cycle.

Turn the ignition on.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 3

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. MAIN RELAY

Turn the ignition off.

Install a known good relay in place of the Main Relay.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition key cycles, pausing for at least 10 seconds between each cycle.

Turn the ignition on.

With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 4

No >> Replace the Main Relay.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

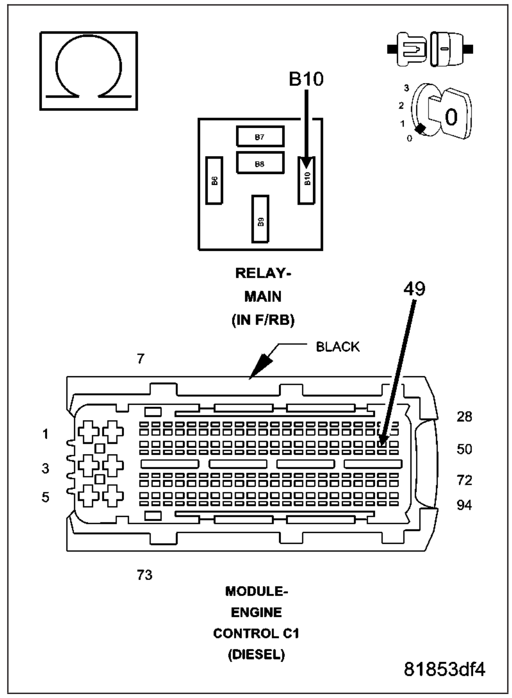
4. (K51) MAIN RELAY CONTROL CIRCUIT OPEN INTERMITTENTLY

Turn the ignition off.

Remove the Main Relay.

Disconnect the ECM harness connectors.

Measure the resistance of the Main Relay Control circuit while wiggling the wiring harness and connectors between the ECM and Main Relay connector.



Was the resistance above 10.0 ohms at any time while wiggling the wiring harness and connectors?

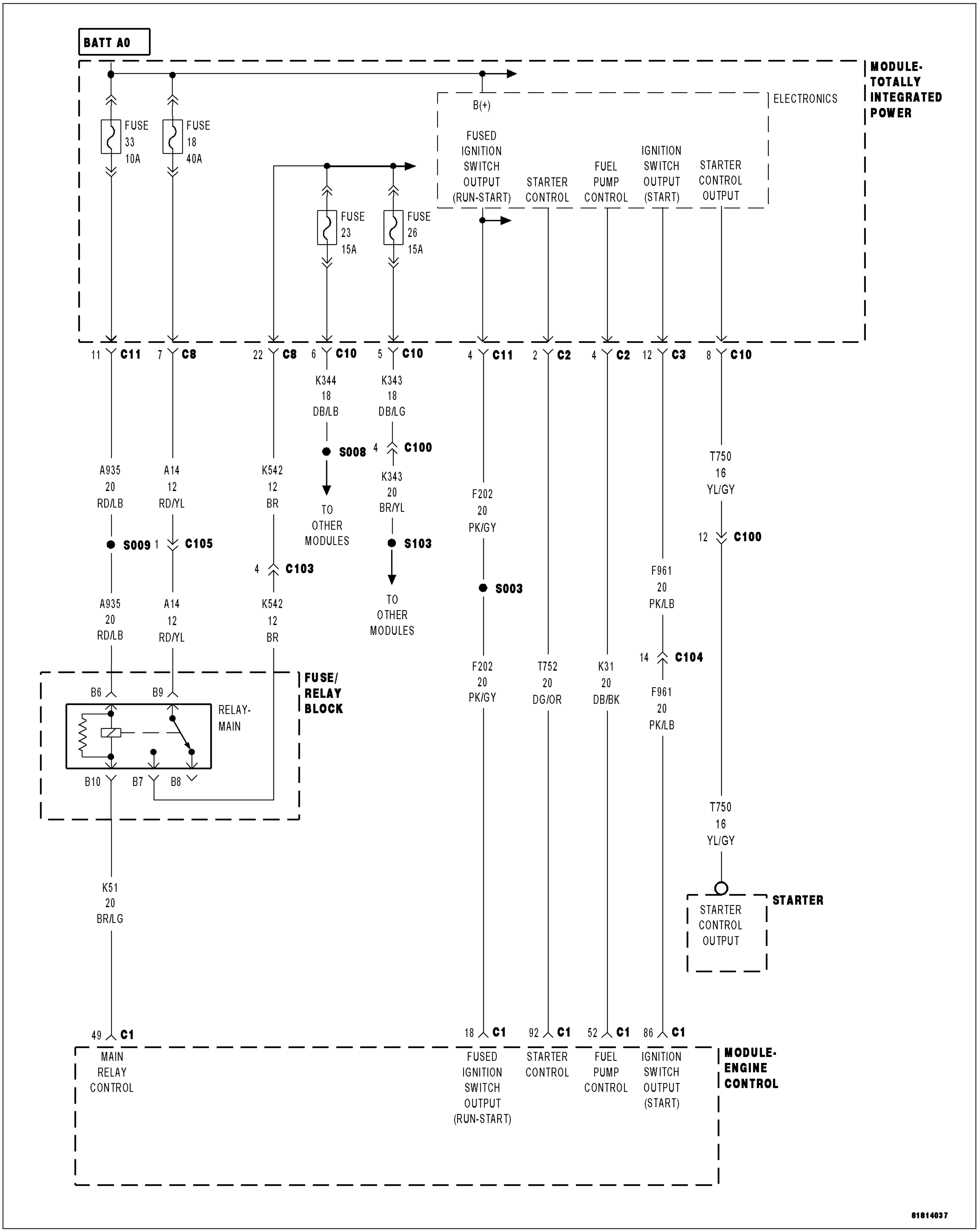
Yes >> Repair the Main Relay Control circuit for an intermittent open.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P068B-ASD/MAIN RELAY OFF TOO LATE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  When the ignition is turned off, during AFTER-RUN mode of operation.
- **Set Condition:**
  The internal ECM timer determines that the Main Relay remained on too long once AFTER-RUN mode of operation has been completed.

Possible Causes
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE MAIN RELAY
(K51) MAIN RELAY CONTROL CIRCUIT SHORTED TO GROUND INTERMITTENTLY
(K542) MAIN RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR OTHER DTCS

Turn the ignition on.
With the scan tool, check for additional DTCs.

Are other DTCs present?

Yes >> Refer to the Symptom List for diagnosis of the other DTCs before continuing.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

2. CLEAR CODE AND CHECK IF THE DTC RESETS

Perform several ignition key cycles, pausing for at least 10 seconds between each cycle.
Turn the ignition on.
With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 3

No >> Go To 6

3. MAIN RELAY

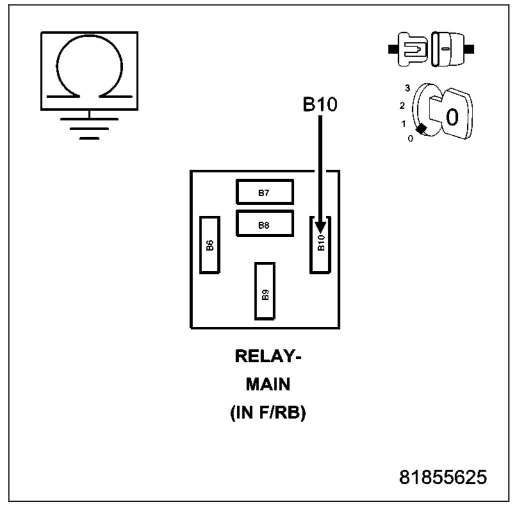
Turn the ignition off.
Install a known good relay in place of the Main Relay.
Turn the ignition on.
With the scan tool, erase DTCs.
Perform several ignition key cycles, pausing for at least 10 seconds between each cycle.
Turn the ignition on.
With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes >> Go To 4

No >> Replace the Main Relay.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K51) MAIN RELAY CONTROL CIRCUIT SHORTED TO GROUND INTERMITTENTLY



Turn the ignition off.

Remove the Main Relay.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (K51) Main Relay Control circuit while wiggling the wiring harness and connectors between the ECM and Main connector.

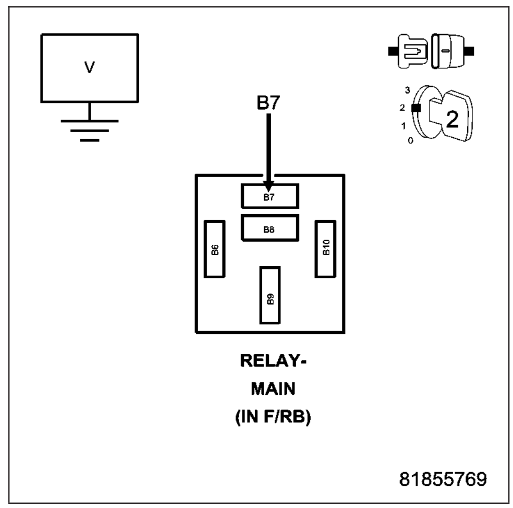
Was the resistance below 1000 ohms at any time while wiggling the wiring harness and connectors?

Yes >> Repair the (K51) Main Relay Control circuit for an intermittent short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. (K542) MAIN RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE



Turn the ignition on.

Measure the voltage of the (K542) Main Relay Output circuit at the Main Relay connector.

Is the voltage below 1.0 volt?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (K542) Main Relay Output circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. INTERMITTENT CONDITION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set.

Refer to any Technical Service Bulletins (TSB) that may apply.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

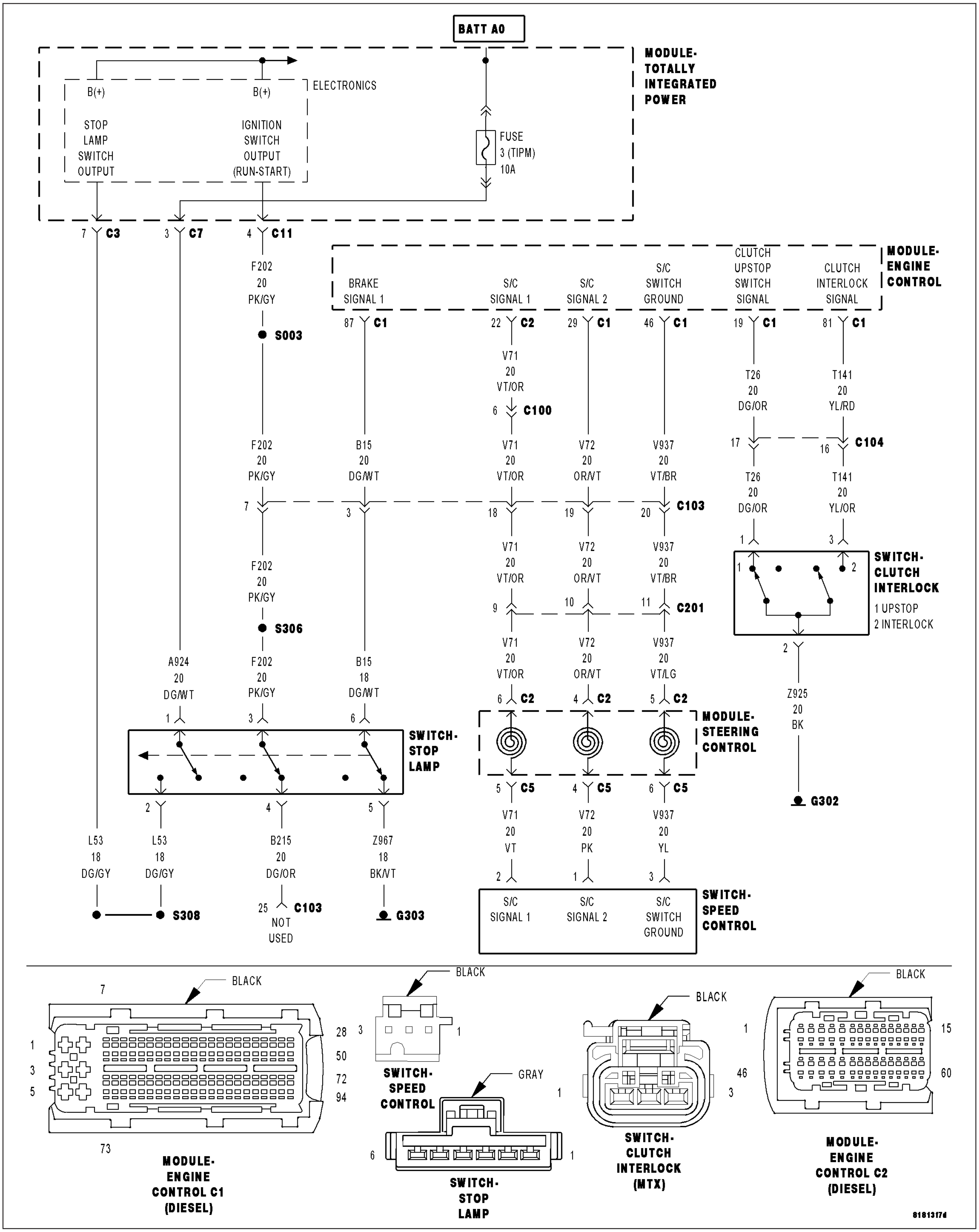
Were any of the above conditions present?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

P0830-CLUTCH PEDAL SWITCH CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  While driving the vehicle and shifting gears.
- **Set Condition:**
  The Engine Control Module (ECM) does not detect changes in the (T141) Clutch Interlock Switch Signal circuit voltage while CAN messages from the Transmission Control Module indicate transmission gear changes.

Possible Causes
INTERMITTENT DTC
(T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
(T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
(T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(Z925) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
CLUTCH INTERLOCK SWITCH
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Press and release the clutch pedal several times.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Clutch Interlock Switch harness connector.

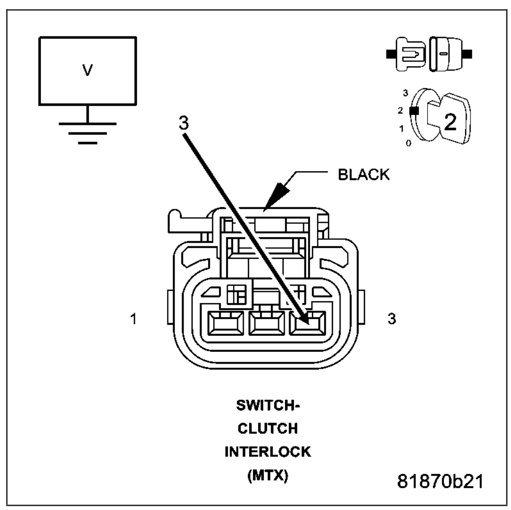
Turn the ignition on.

Measure the voltage of the (T141) Clutch Interlock Switch Signal circuit in the Clutch Interlock Switch harness connector.

Is the voltage between 4.5 and 5.5 volts?

Yes >> Go to 3

No >> Go to 5

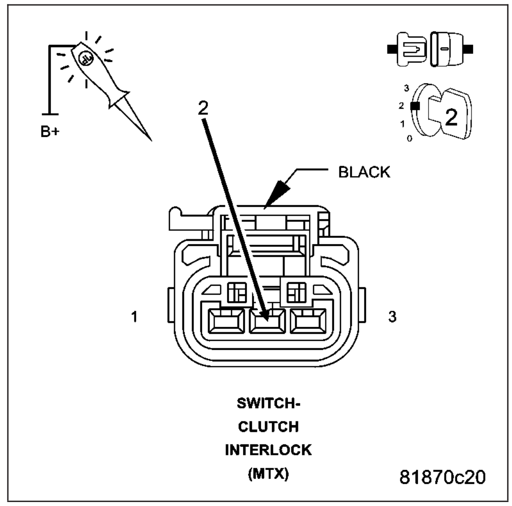


3. (Z925) GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12 volt test light connected to 12 volts, check the (Z925) Ground circuit between the Clutch Interlock Switch harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?



Yes >> Go to 4

No >> Repair the (Z925) Ground for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. CLUTCH INTERLOCK SWITCH

Turn the ignition off.

Connect a jumper wire between the (Z925) Ground circuit and the (T141) Clutch Interlock Switch Signal circuit in the Clutch Interlock Switch harness connector.

Turn the ignition on.

With the scan tool, monitor the Clutch Interlock status.

NOTE: The scan tool should display the Clutch Interlock status as pressed with the jumper wire in place and not pressed with the jumper wire removed.

Does the scan tool display the status as described above?

Yes >> Replace the Clutch Interlock Switch in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 8

5. (T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

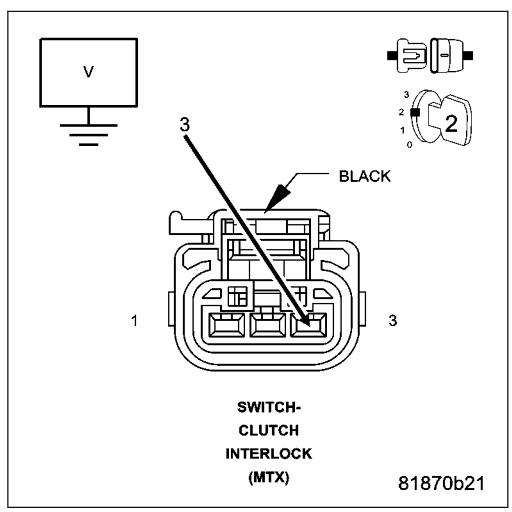
Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (T141) Clutch Interlock Switch Signal circuit in the Clutch Interlock Switch harness connector.

Is there any voltage present?



Yes >> Repair the (T141) Clutch Interlock Switch Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go to 6

6. (T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

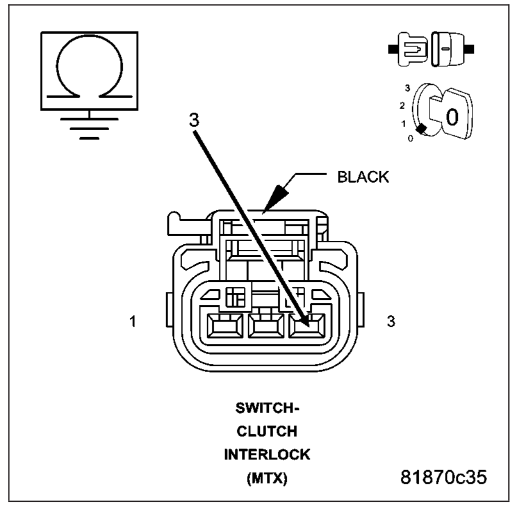
Measure the resistance between ground and the (T141) Clutch Interlock Switch Signal circuit in the Clutch Interlock Switch harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 7

No >> Repair the (T141) Clutch Interlock Switch Signal circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



7. (T141) CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

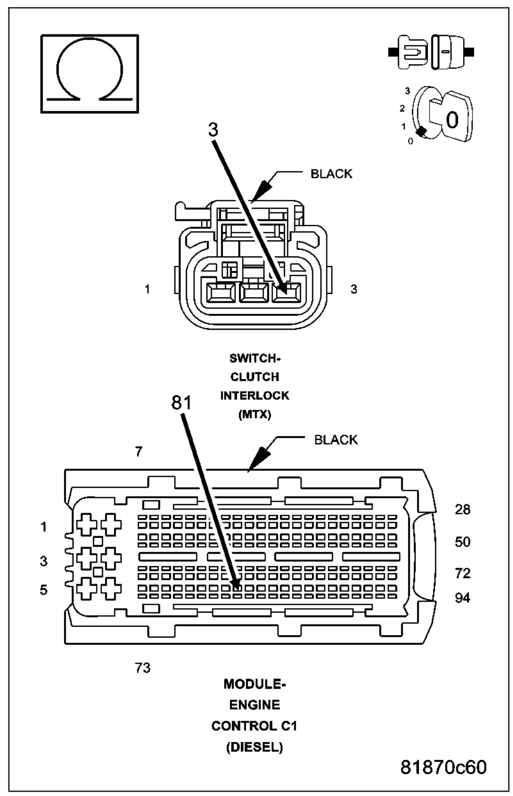
Measure the resistance of the (T141) Clutch Interlock Switch Signal circuit between the Clutch Interlock Switch harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go to 8

No >> Repair the (T141) Clutch Interlock Switch Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



8. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Clutch Interlock Switch and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

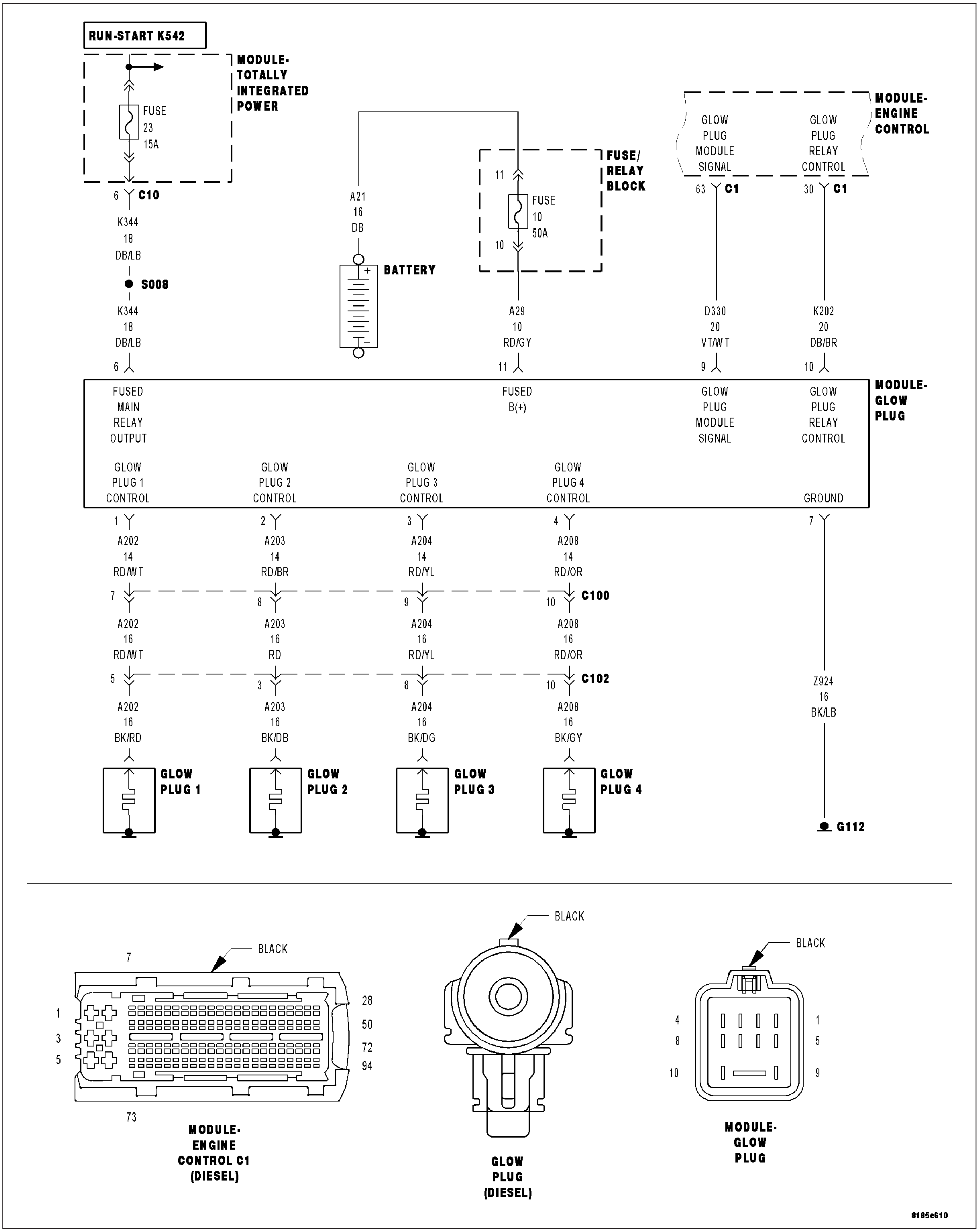
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P1649-GLOW PLUG MODULE POWER SUPPLY CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Glow Plug Control Module reports a power supply circuit fault to the ECM.

Possible Causes
INTERMITTENT DTC
(K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
(A29) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
(Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: Diagnose and repair any system voltage or Main Relay DTCs before continuing with this test.
Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the Glow Plugs.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

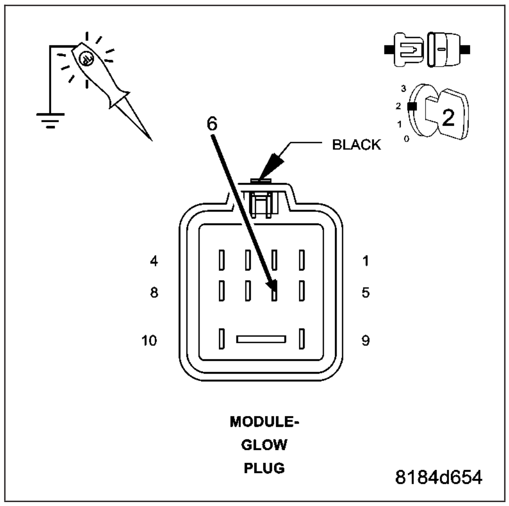
2. (K344) FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Glow Plug Module harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, check the (K344) Fused Main Relay Output circuit in the Glow Plug Module harness connector.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

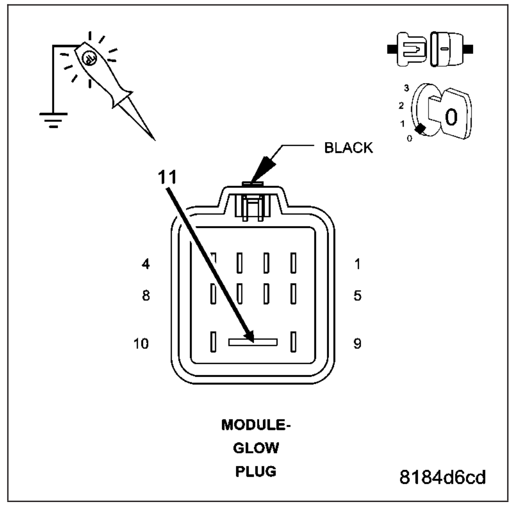
Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (K344) Fused Main Relay Output circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (A29) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Using a 12 volt test light connected to ground, check the (A29) Fused B+ circuit in the Glow Plug Module harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

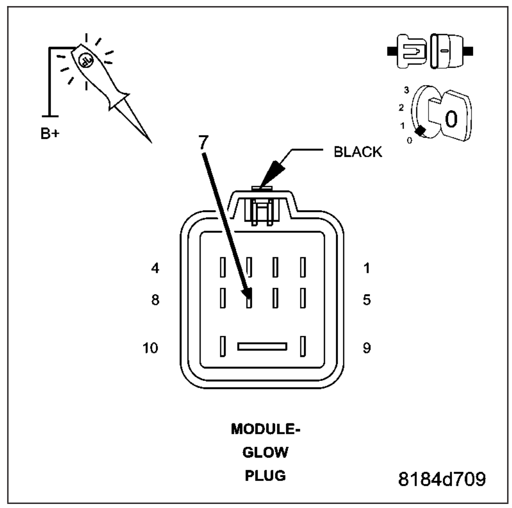
Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the (A29) Fused B+ circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (Z924) GROUND CIRCUIT OPEN OR HIGH RESISTANCE



Using a 12 volt test light connected to B+, check the (Z924) Ground circuit in the Glow Plug Module harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Replace the Glow Plug Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Repair the (Z924) Ground circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P1670-TORQUE CURVE CALIBRATION

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Engine Control Module (ECM) detects an internal programming failure.

Possible Causes
INTERMITTENT DTC
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the Engine Control Module (ECM) wiring and connectors.

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Check for proper ECM power supply from the ignition switch and the Main relay. Check the ECM for proper ground supply.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P1685-SKIM SYSTEM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  A communication error occurs between the ECM and SKREEM.

Possible Causes
INTERMITTENT DTC
SKREEM
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR SKREEM COMMUNICATION AND DTCS

Ignition on, engine not running.

With the scan tool, check for proper communication and active DTCs in the SKREEM.

Are any SKREEM communication problems or DTCs present?

Yes >> Refer to the symptom list for problems related to SKREEM Communication and DTCs before continuing.

No >> Go To 2

2. CHECK FOR ACTIVE DTC

Turn the ignition on.

With the scan tool, clear all ECM DTCs.

Turn the ignition on and off several times pausing 10 seconds between key cycles leaving the ignition on.

With the scan tool, select View DTCs in the ECM.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Refer to *CHECKING FOR INTERMITTENT DTC in the symptom list. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. REPLACE THE SKREEM AND RETEST

Turn the ignition off.

Replace and program the SKREEM in accordance with the Service Information.

Turn the ignition on.

With the scan tool, clear all ECM DTCs.

Turn the ignition on and off several times pausing 10 seconds between key cycles leaving the ignition on.

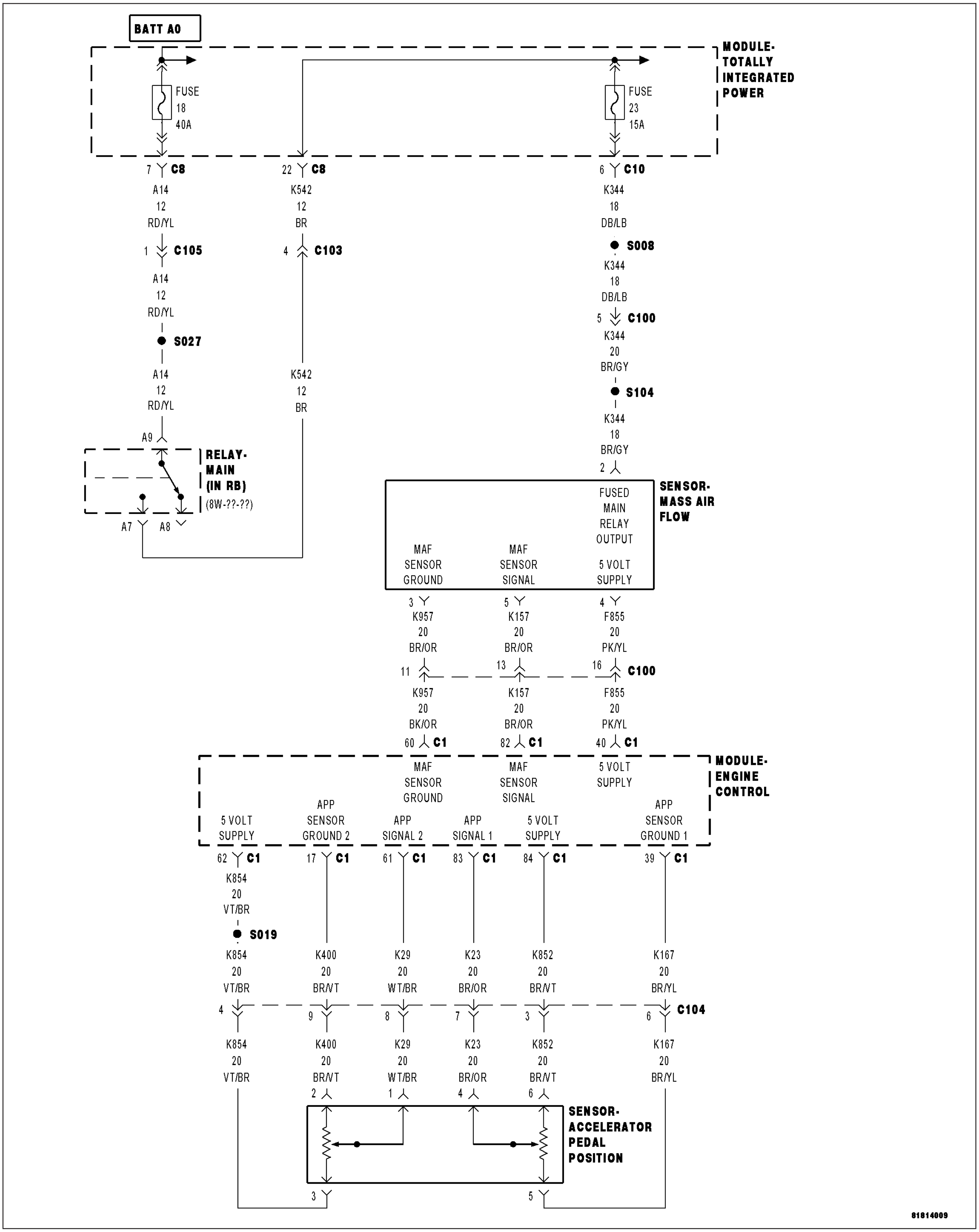
With the scan tool, select View DTCs in the ECM.

Is the status Active for this DTC?

Yes >> Replace and program the Engine Control Module in accordance the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test complete.

P2121-ACCELERATOR PEDAL POSITION SENSOR 1 PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  APP Sensor #1 and APP Sensor #2 signals do not agree.

Possible Causes
INTERMITTENT DTC
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO GROUND
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any Sensor reference or supply voltage DTCs are present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.
Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Fully depress and release the Accelerator Pedal several times.

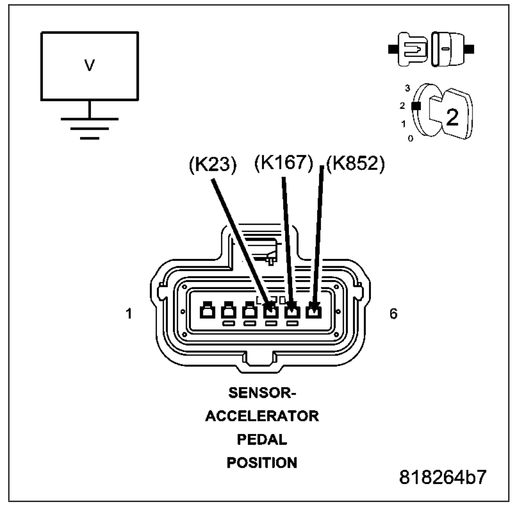
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUITS SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the voltage of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the voltage of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

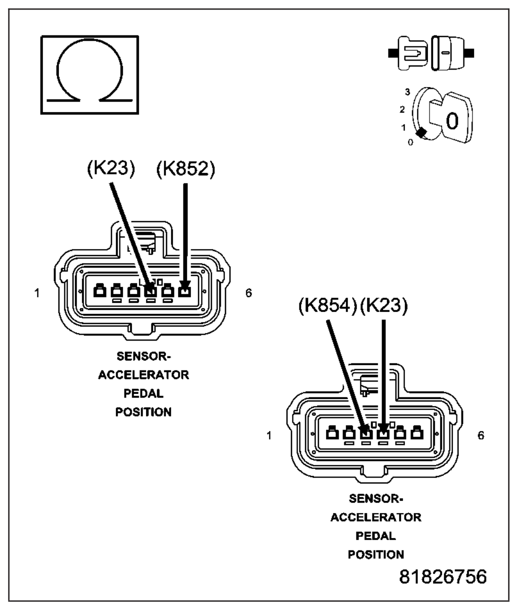
Is there voltage present on any of the circuits?

Yes >> Repair the appropriate circuit that has voltage present.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO 5 VOLT SUPPLY CIRCUIT



Turn the ignition off.

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

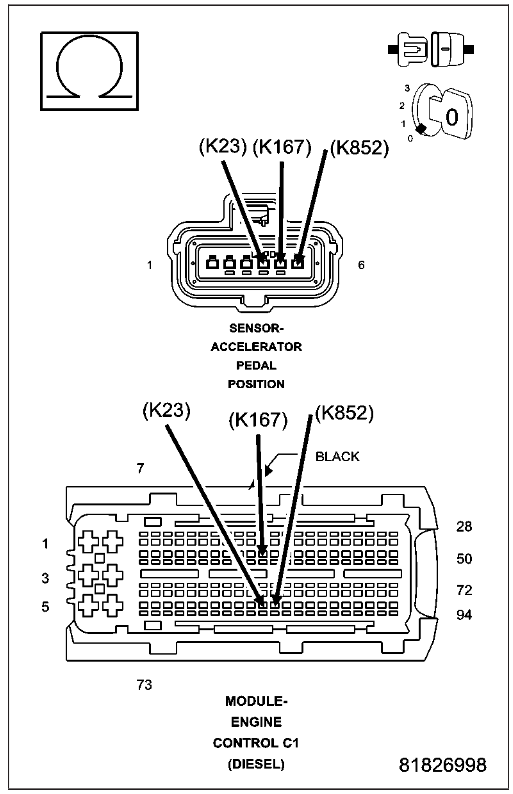
Is the resistance above 1000.0 ohms for both of the circuits?

Yes >> Go to 4

No >> Repair the shorted (K23) Accelerator Pedal Position Sensor 1 Signal circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE



Turn the ignition off.

Measure the resistance of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

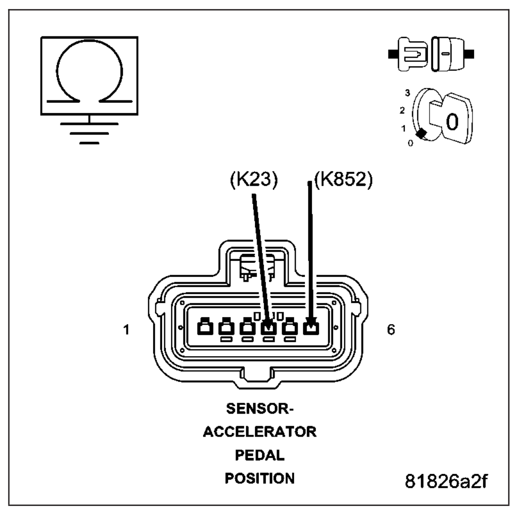
Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Go to 5

No >> Repair the appropriate circuit that has a resistance greater than 10.0 ohms.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT SHORTED TO GROUND



Measure the resistance between ground and the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between ground and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

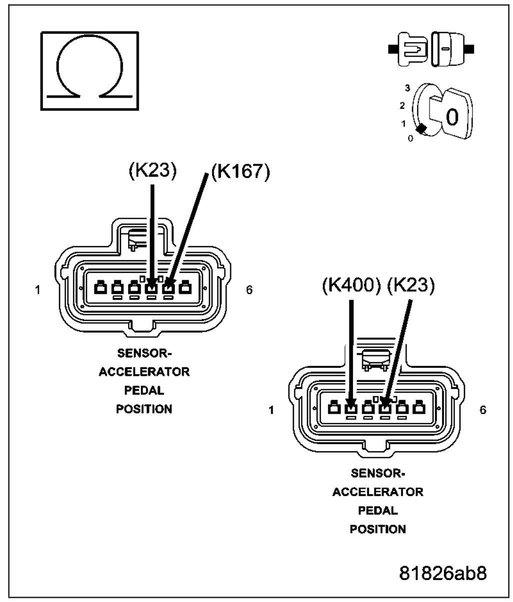
Is the resistance between ground and both of the circuits above 1000.0 ohms?

Yes >> Go to 6

No >> Repair the appropriate circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. (K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT



Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

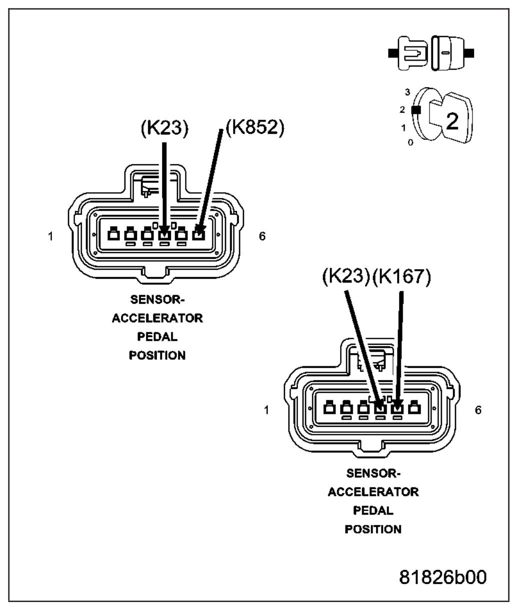
Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

Is the resistance between ground and both of the circuits above 1000.0 ohms?

Yes >> Go to 7

No >> Repair the appropriate circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ACCELERATOR PEDAL POSITION SENSOR



Turn the ignition off.

Remove the jumper wire and install the Main Relay.

Connect the Engine Control Module (ECM) harness connector.

Connect a jumper wire between the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.

NOTE: The scan tool should display an Accelerator Pedal Position Sensor 1 low voltage or short to ground DTC with the jumper wire in place.

Turn the ignition off.

Connect a jumper wire between the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.

NOTE: The scan tool should display an Accelerator Pedal Position Sensor 1 high voltage or open DTC with the Accelerator Pedal Position Sensor connector disconnected.

Does the scan tool display the DTCs as described in BOTH cases listed above?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 8

8. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

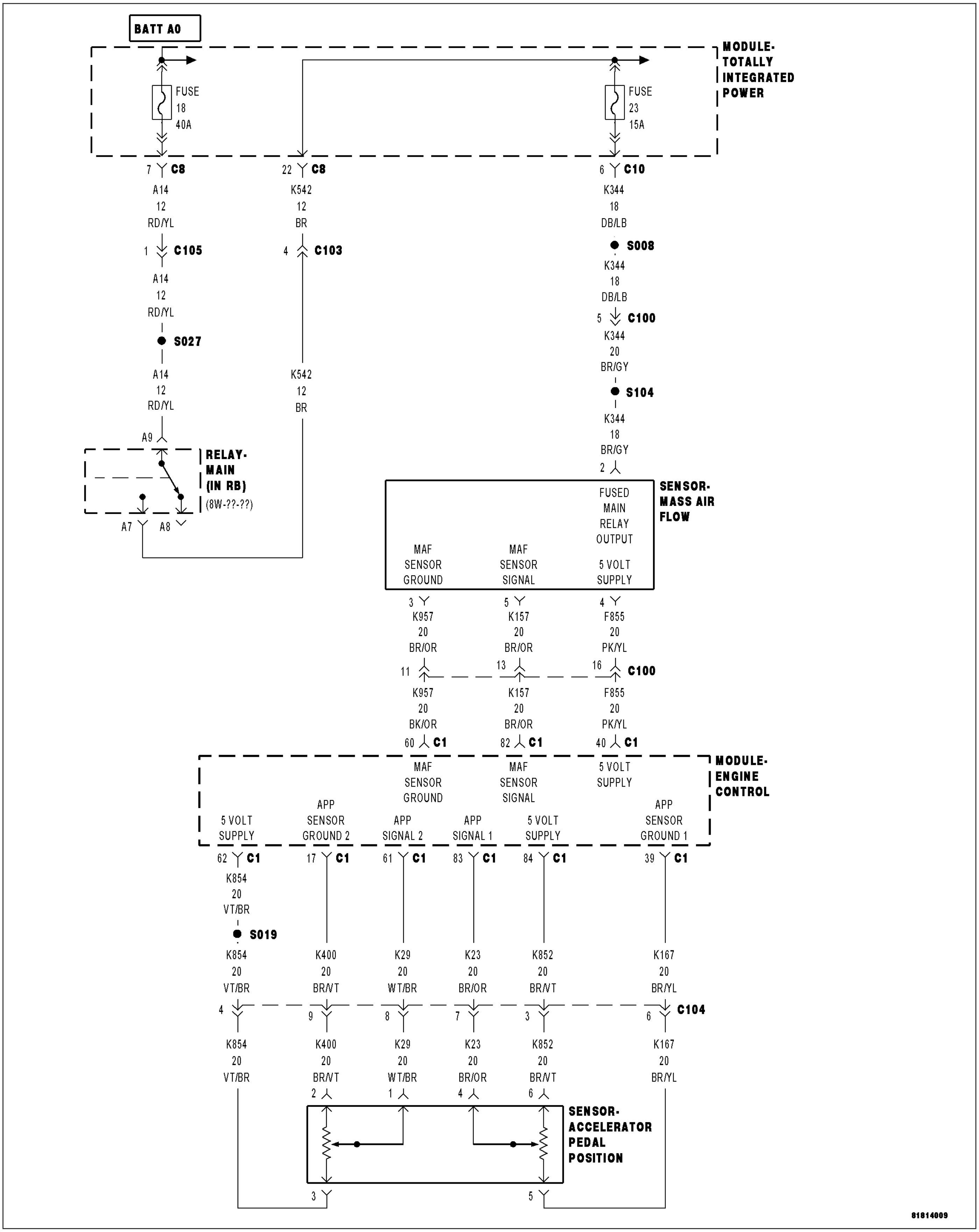
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The APP Sensor #1 Signal circuit is below 0.5 volts for 0.32 seconds.

Possible Causes
INTERMITTENT DTC
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO GROUND
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If a Sensor reference or supply voltage DTC is also present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE

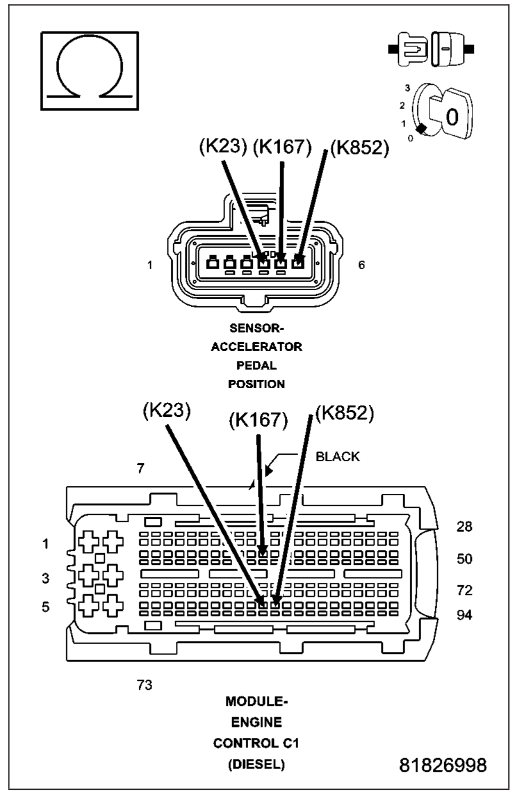
Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Go to 3

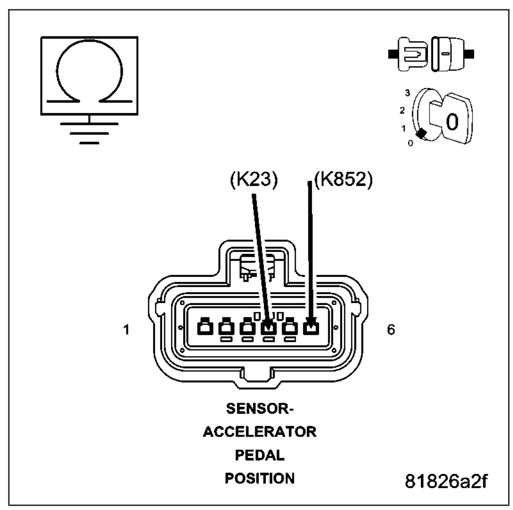
No >> Repair the appropriate circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between ground and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance between ground and both of the circuits above 1000 ohms?

Yes >> Go to 4

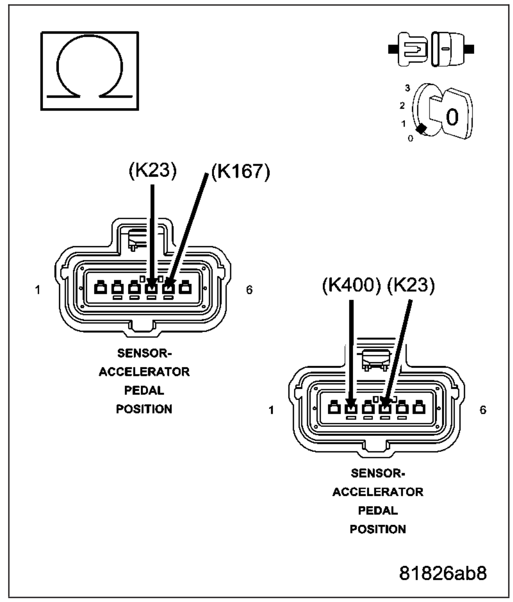
No >> Repair the appropriate circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance between ground and both of the circuits above 1000 ohms?

Yes >> Go to 5

No >> Repair the appropriate circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

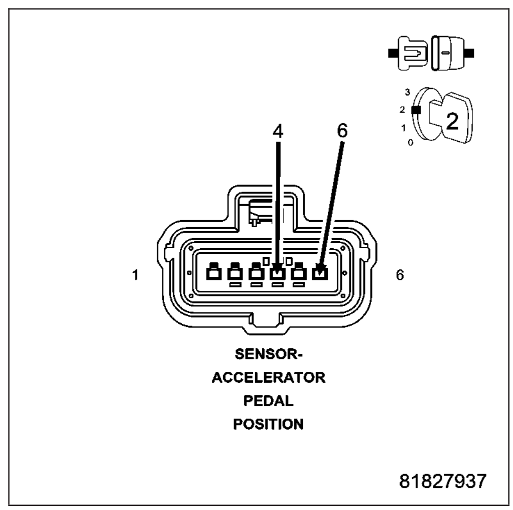
Connect a jumper wire between the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.



NOTE: The scan tool should display an Accelerator Pedal Position Sensor 1 high voltage or open DTC with the Accelerator Pedal Position Sensor connector disconnected.

Does the scan tool display the DTC as described above?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

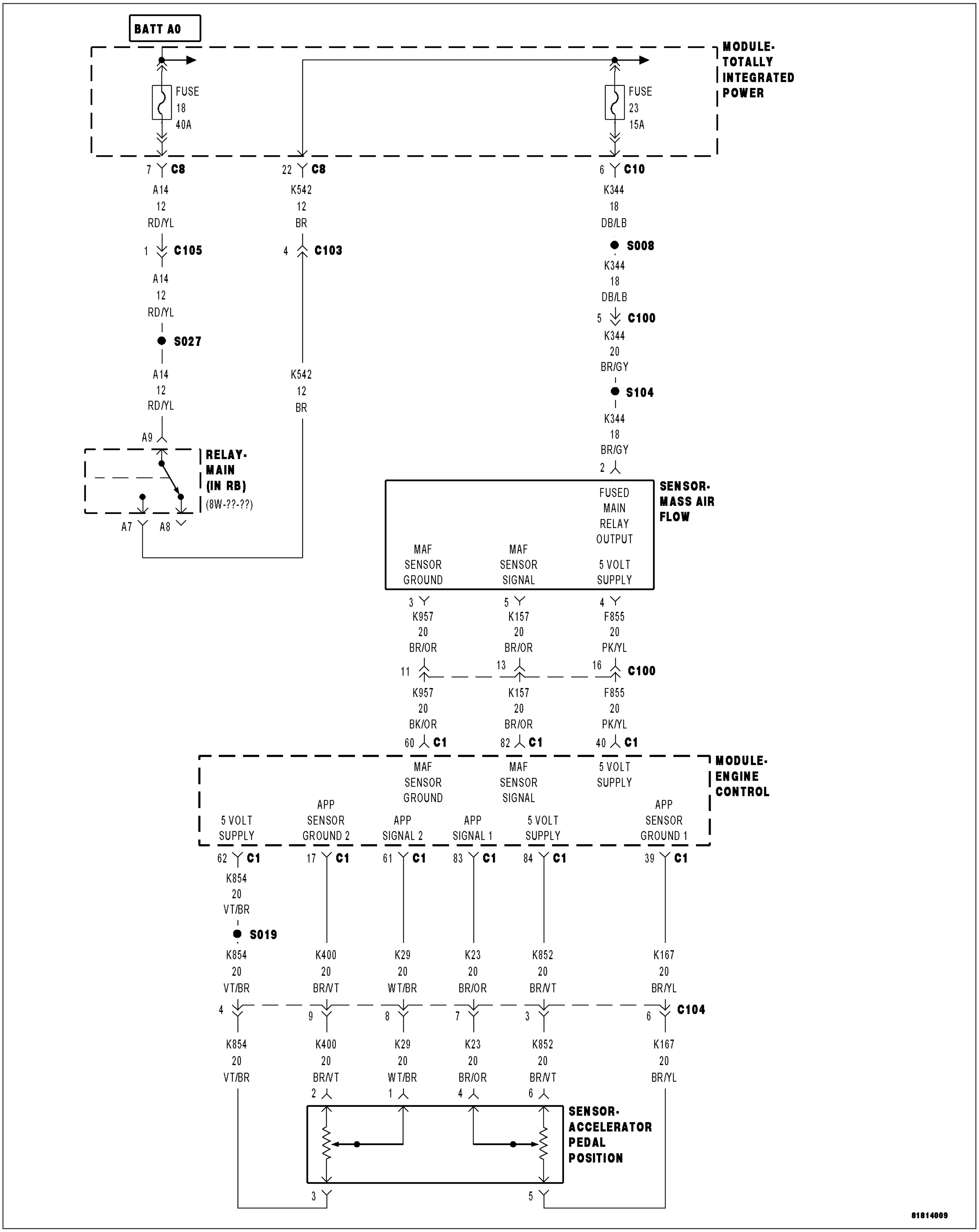
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The APP Sensor #1 signal circuit is above 4.6 volts for 0.32 seconds.

Possible Causes
INTERMITTENT DTC
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE (K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT OR (F856) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any Sensor reference or supply voltage DTCs are present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Fully depress and release the Accelerator Pedal several times.

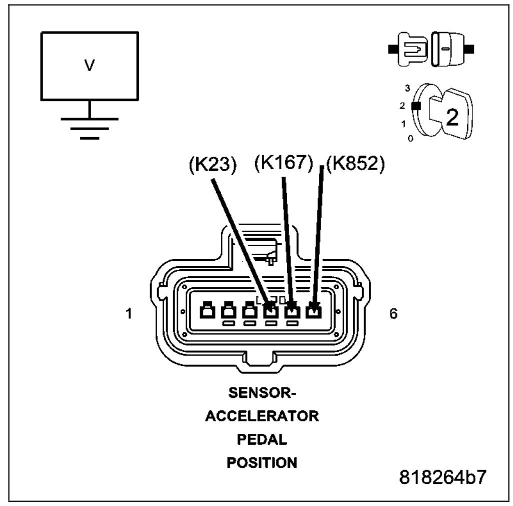
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the voltage of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

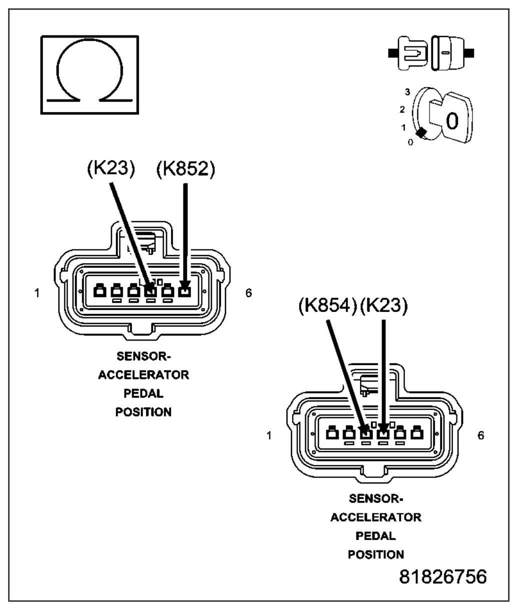
Measure the voltage of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

Is there voltage present on any of the circuits?

Yes >> Repair the appropriate circuit that has voltage present.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE 5 VOLT SUPPLY CIRCUIT



Turn the ignition off.

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between the (K23) Accelerator Pedal Position Sensor 1 Signal circuit and the (F856) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Is the resistance above 10.0 ohms for both of the circuits?

Yes >> Go to 4

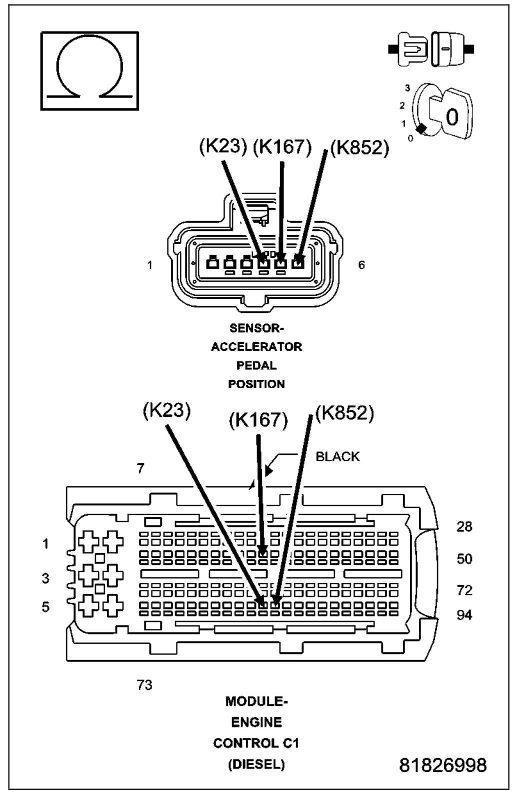
No >> Repair the shorted (K23) Accelerator Pedal Position Sensor 1 Signal circuit.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Go to 5

No >> Repair the appropriate circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ACCELERATOR PEDAL POSITION SENSOR

Remove the jumper wire and install the Main Relay.

Connect the Engine Control Module (ECM) harness connector.

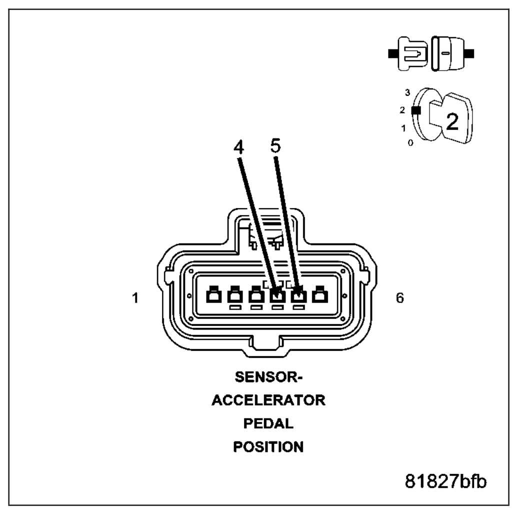
Connect a jumper wire between the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit and the (K23) Accelerator Pedal Position Sensor 1 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.



NOTE: The scan tool should display an Accelerator Pedal Position Sensor 1 low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

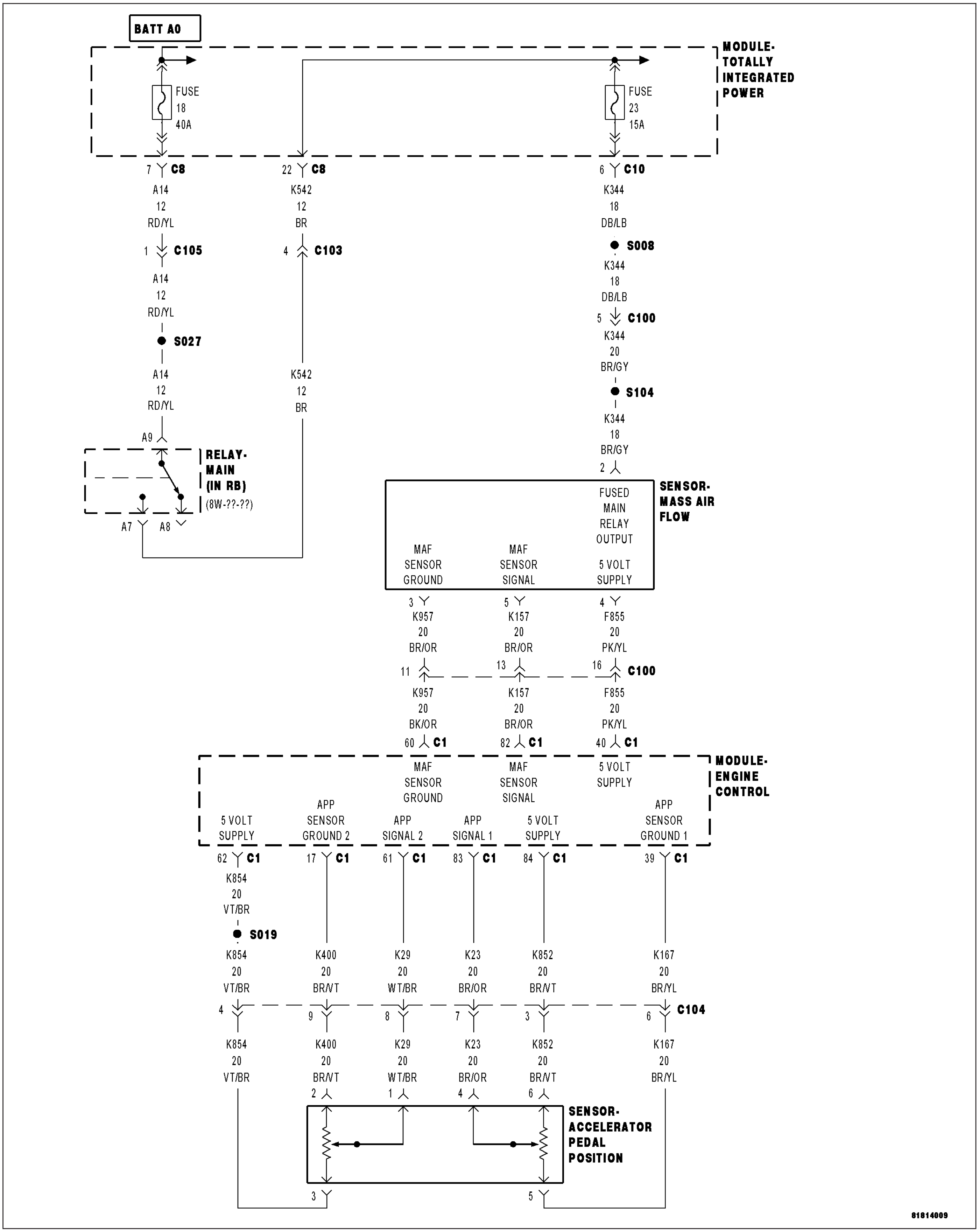
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The APP Sensor #2 Signal circuit is below 0.2 volts for 0.32 seconds.

Possible Causes
INTERMITTENT DTC
(K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO GROUND
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE (K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE (K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If a Sensor reference or supply voltage DTC is also present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE

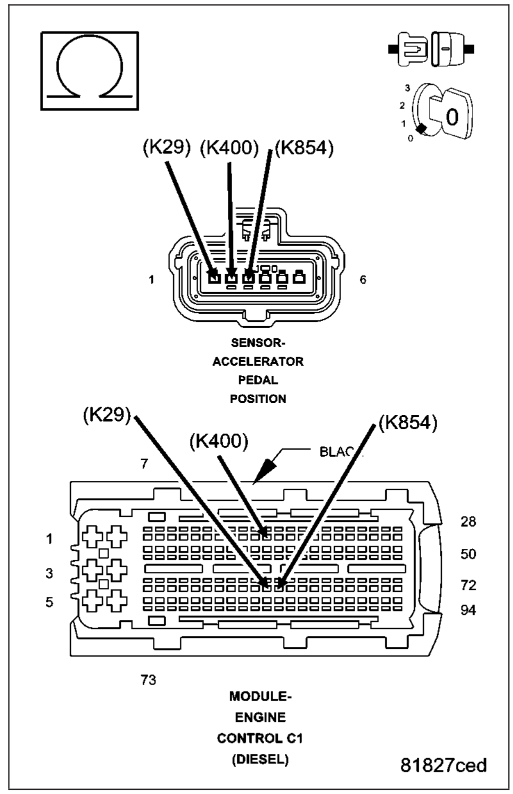
Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K29) Accelerator Pedal Position Sensor 2 Signal circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Go to 3

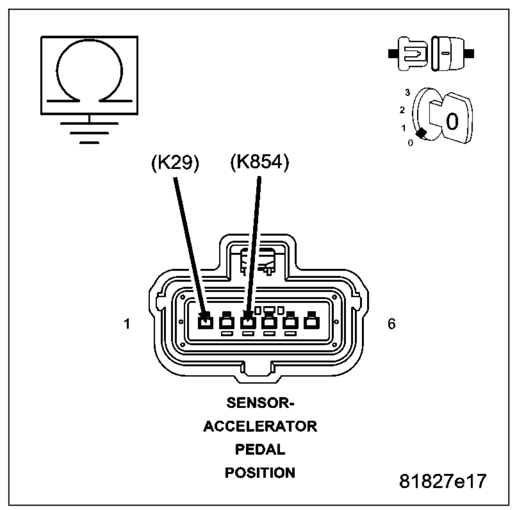
No >> Repair the appropriate circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between ground and the (K29) Accelerator Pedal Position Sensor 2 Signal circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance between ground and both of the circuits above 1000 ohms?

Yes >> Go to 4

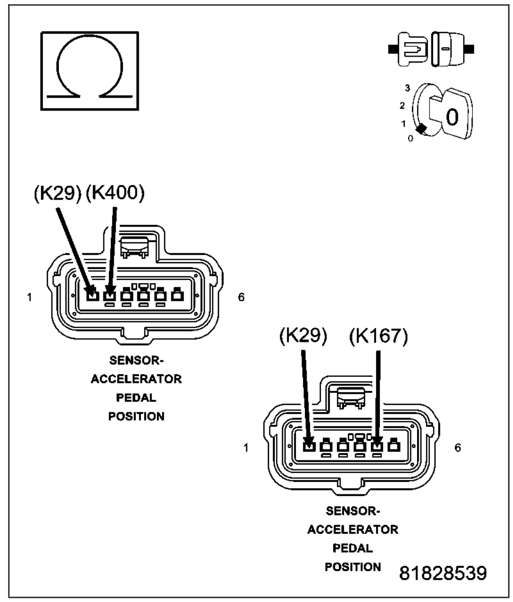
No >> Repair the appropriate circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT

Measure the resistance between the (K29) Accelerator Pedal Position Sensor 2 Signal circuit and the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between the (K29) Accelerator Pedal Position Sensor 2 Signal circuit and the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.



Is the resistance between ground and both of the circuits above 1000 ohms?

Yes >> Go to 5

No >> Repair the appropriate circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

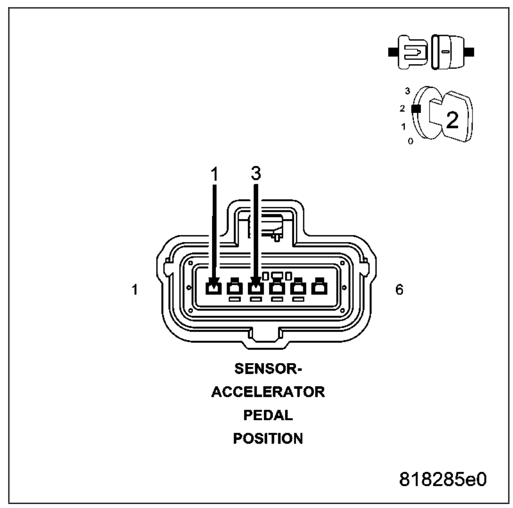
Connect a jumper wire between the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit and the (K29) Accelerator Pedal Position Sensor 2 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.



NOTE: The scan tool should display an Accelerator Pedal Position Sensor 2 high voltage or open DTC with the Accelerator Pedal Position Sensor connector disconnected and the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

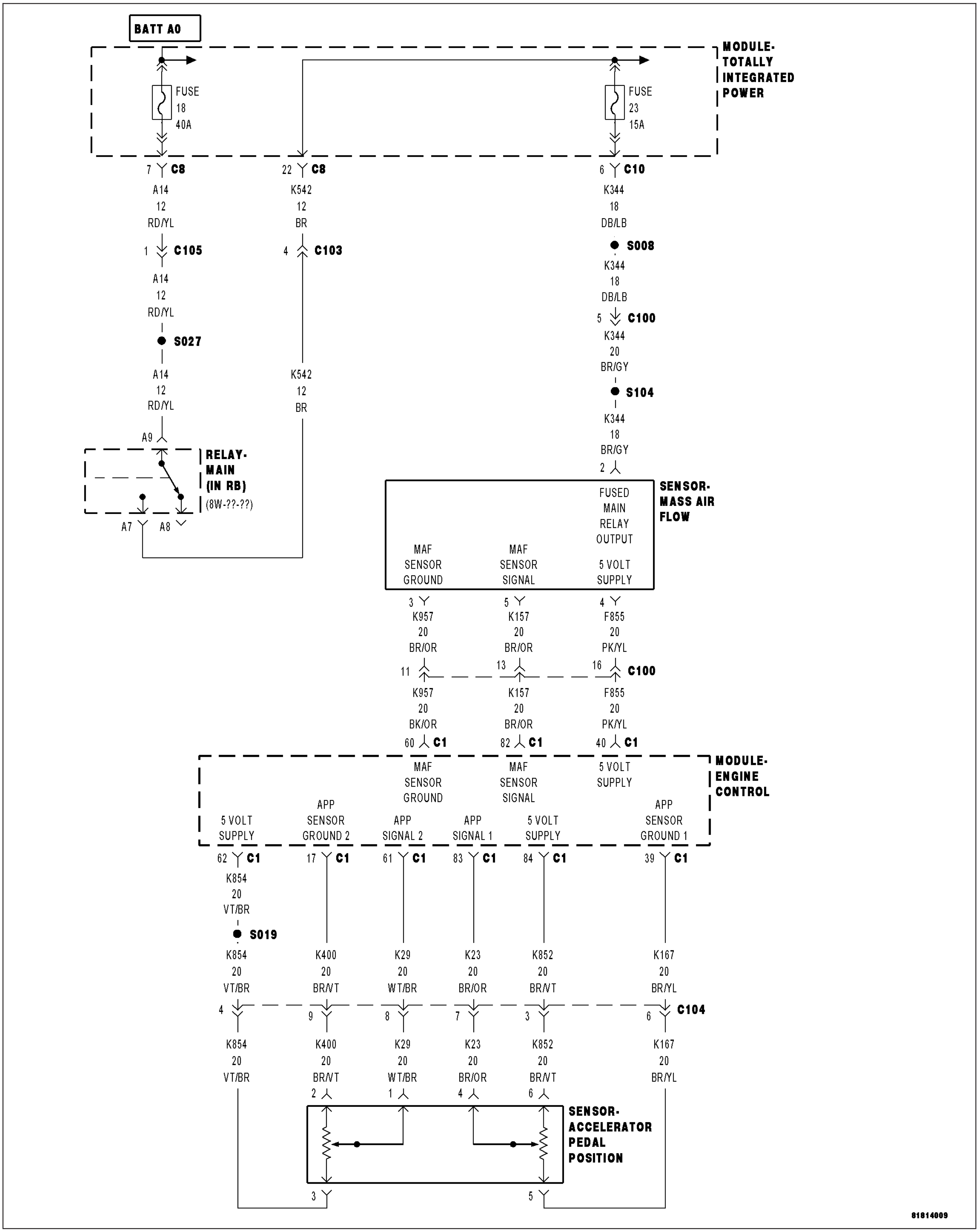
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The APP Sensor #2 signal circuit is above 2.5 volts for 0.32 seconds.

Possible Causes
INTERMITTENT DTC
(K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE (K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT OR (K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT
(K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any Sensor reference or supply voltage DTCs are present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Fully depress and release the Accelerator Pedal several times.

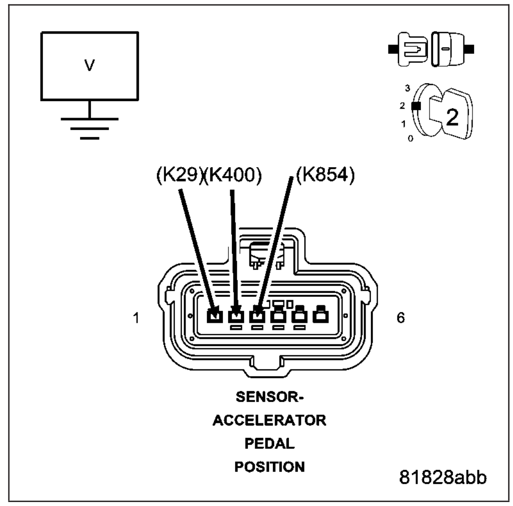
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Accelerator Pedal Position Sensor harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the voltage of the (K29) Accelerator Pedal Position Sensor 2 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the voltage of the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit in the Accelerator Pedal Position Sensor harness connector.

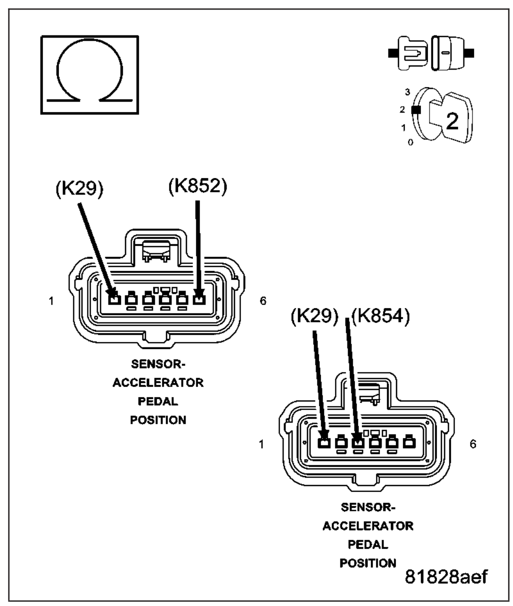
Is there voltage present on any of the circuits?

Yes >> Repair the appropriate circuit that has voltage present.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K29) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE 5 VOLT SUPPLY CIRCUIT



Turn the ignition off.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between the (K29) Accelerator Pedal Position Sensor 2 Signal circuit and the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

Measure the resistance between the (K29) Accelerator Pedal Position Sensor 2 Signal circuit and the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit in the Accelerator Pedal Position Sensor harness connector.

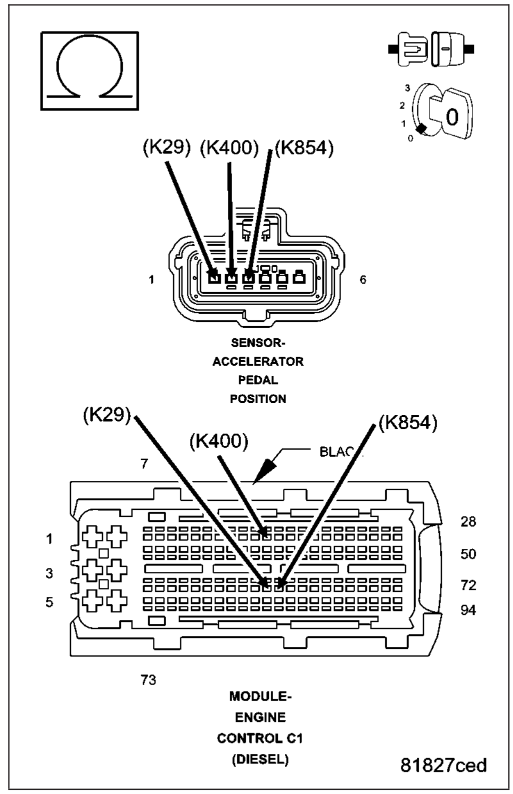
Is the resistance above 1000.0 ohms for both of the circuits?

Yes >> Go to 4

No >> Repair the shorted (K29) Accelerator Pedal Position Sensor 2 Signal circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE



Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K29) Accelerator Pedal Position Sensor 2 Signal circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

Measure the resistance of the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit between the Accelerator Pedal Position Sensor harness connector and the Engine Control Module (ECM) harness connector.

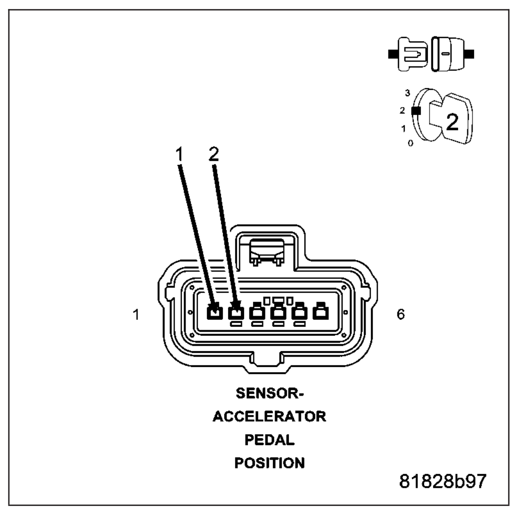
Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Go to 5

No >> Repair the appropriate circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ACCELERATOR PEDAL POSITION SENSOR



Remove the jumper wire and install the Main Relay.

Connect the Engine Control Module (ECM) harness connector.

Connect a jumper wire between the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit and the (K29) Accelerator Pedal Position Sensor 2 Signal circuit in the Accelerator Pedal Position Sensor harness connector.

Turn the ignition on.

With the scan tool, Clear DTCs.

Fully depress and release the Accelerator Pedal several times.

With the scan tool, select View DTCs.

NOTE: The scan tool should display an Accelerator Pedal Position Sensor 2 low voltage or short to ground DTC with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 6

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

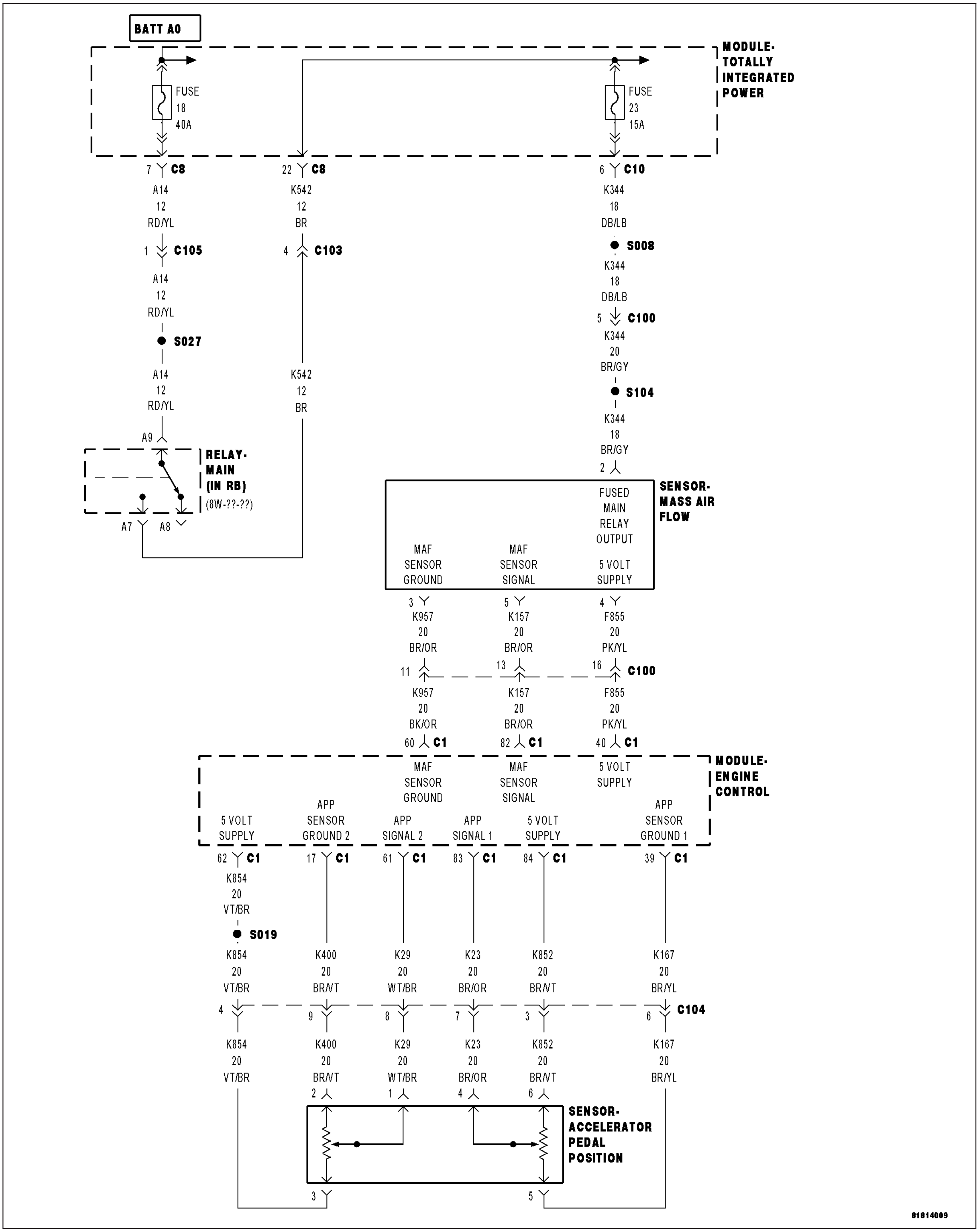
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2138-ACCELERATOR PEDAL POSITION SENSOR 1 / 2 CORRELATION



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Accelerator Pedal Position Sensor contains two independent three wire sensors. Each sensor provides independent pedal position signals to the ECM. The raw voltage signal from APP #1 sensor is 2 times the raw voltage signal from APP #2. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

- **When Monitored:**
  With the ignition on. No other APP DTC's set. No Sensor Reference Voltage DTC's set.
- **Set Condition:**
  APP Sensor #1 and APP Sensor #2 signals do not agree for 0.26 seconds.

Possible Causes
INTERMITTENT DTC
(K852) ACCELERATOR PEDAL POSITION SENSOR 1 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K23) ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K167) ACCELERATOR PEDAL POSITION SENSOR 1 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(K854) ACCELERATOR PEDAL POSITION SENSOR 2 5 VOLT SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(K12) ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(K400) ACCELERATOR PEDAL POSITION SENSOR 2 SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ACCELERATOR PEDAL POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: If any Sensor reference or supply voltage DTCs are present, perform the applicable diagnostic procedure before continuing with this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.
Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ACCELERATOR PEDAL POSITION SENSOR CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Disconnect the ECM harness connectors.

Measure the resistance of the (K852) Accelerator Pedal Position Sensor 1 5 Volt Supply circuit between the APP Sensor harness connector and the ECM harness connector.

Measure the resistance of the (K23) Accelerator Pedal Position Sensor 1 Signal circuit between the APP Sensor harness connector and the ECM harness connector.

Measure the resistance of the (K167) Accelerator Pedal Position Sensor 1 Sensor Ground circuit between the APP Sensor harness connector and the ECM harness connector.

Measure the resistance of the (K854) Accelerator Pedal Position Sensor 2 5 Volt Supply circuit between the APP Sensor harness connector and the ECM harness connector.

Measure the resistance of the (K29) Accelerator Pedal Position Sensor 2 Signal circuit between the APP Sensor harness connector and the ECM harness connector.

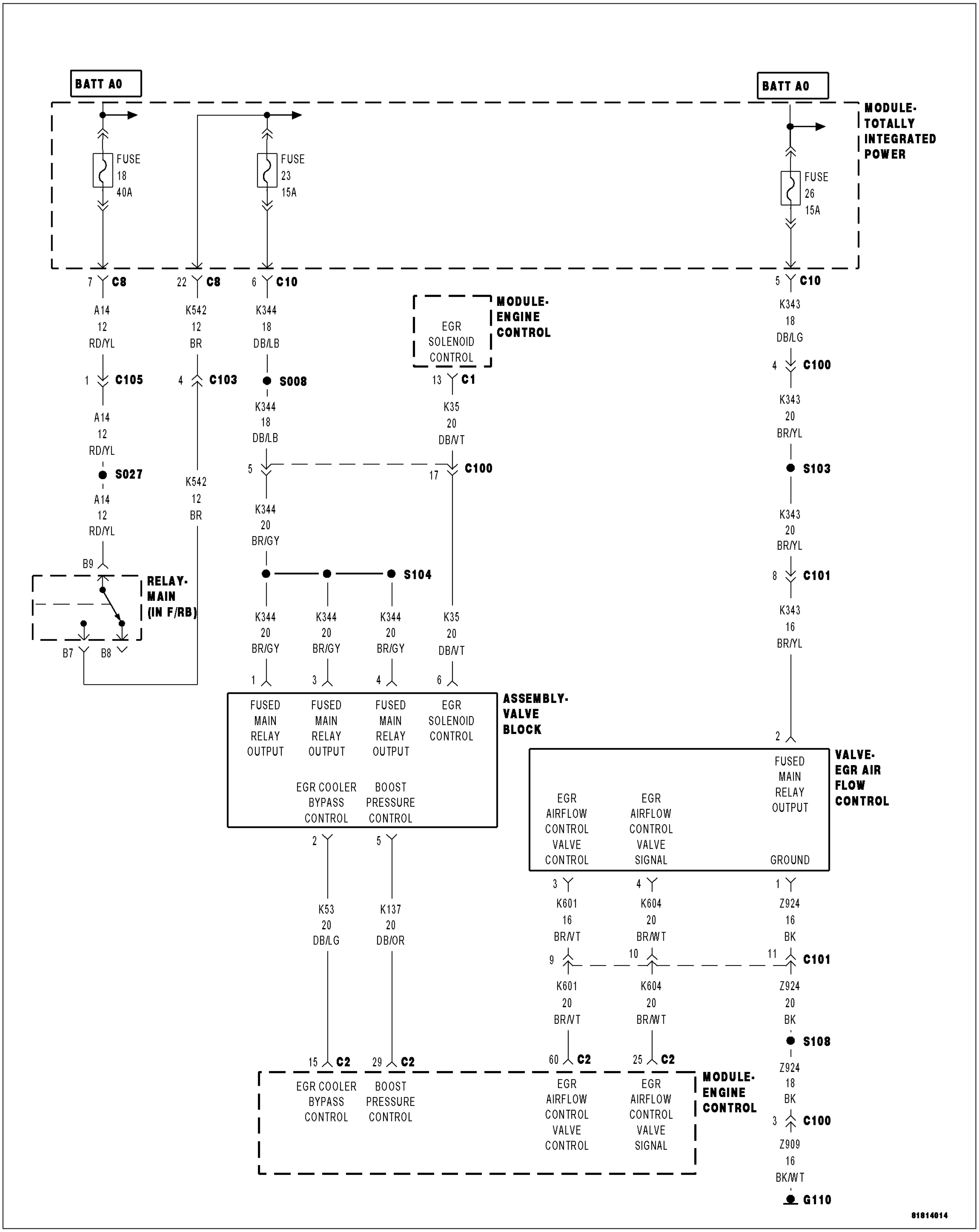
Measure the resistance of the (K400) Accelerator Pedal Position Sensor 2 Sensor Ground circuit between the APP Sensor harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms for each of the circuits?

Yes >> Replace the Accelerator Pedal Position Sensor.

No >> Repair the circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2141-EGR AIRFLOW THROTTLE CONTROL CIRCUIT A LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the EGR Airflow Control Valve Motor command off.
- **Set Condition:**
  The (K601) EGR Airflow Control Valve Control circuit is shorted to ground for 0.5 seconds.

Possible Causes
INTERMITTENT DTC
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO (K604) EGR AIRFLOW CONTROL VALVE SIGNAL
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
EGR AIRFLOW CONTROL VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

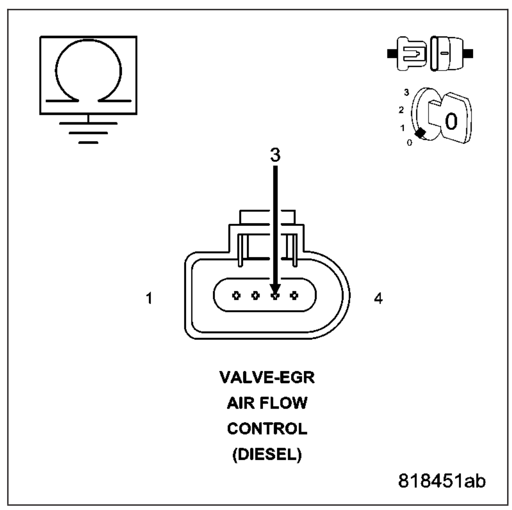
2. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the EGR Airflow Control Valve harness connector.

Disconnect the Engine Control Module (ECM) harness connector.

Measure the resistance between ground and the (K601) EGR Airflow Control Valve Control circuit in the EGR Airflow Control Valve harness connector.



Is the resistance above 1000 ohms?

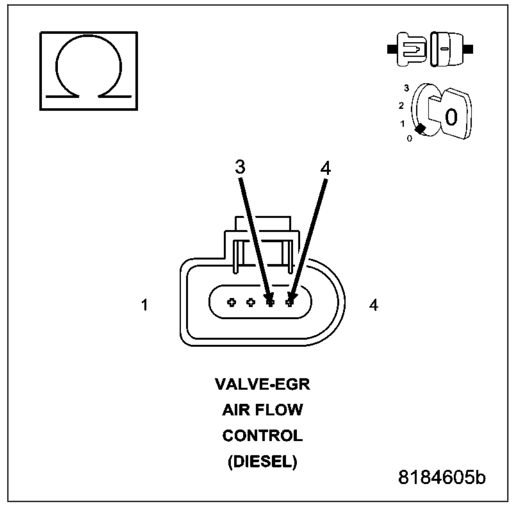
Yes >> Go to 3

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT

Measure the resistance between the (K601) EGR Airflow Control Valve Control circuit and the (K604) EGR Airflow Control Valve Signal circuit in the EGR Airflow Control Valve harness connector.



Is the resistance above 1000 ohms?

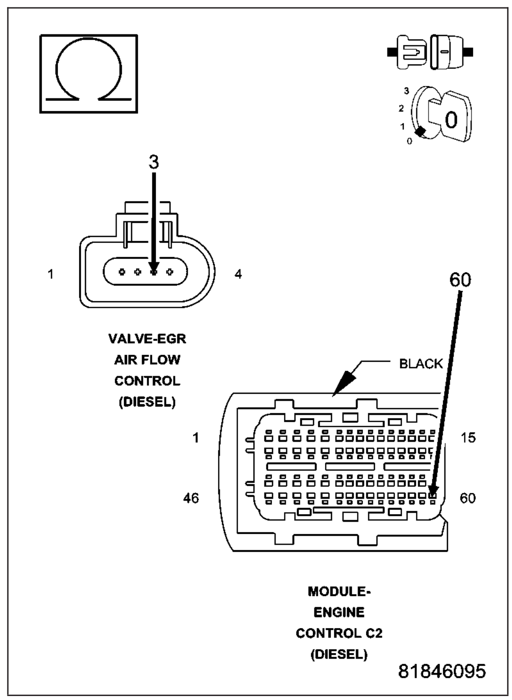
Yes >> Go to 4

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to the (K604) EGR Airflow Control Valve Signal circuit.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN CIRCUIT OR HIGH RESISTANCE

Measure the resistance of the (K601) EGR Airflow Control Valve Control circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 5

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. EGR AIRFLOW CONTROL VALVE

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Replace the EGR Airflow Control Valve in accordance with the service information.

Turn the ignition on.

With the scan tool, clear DTCs.

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 6

No >> Test complete.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Airflow Control Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

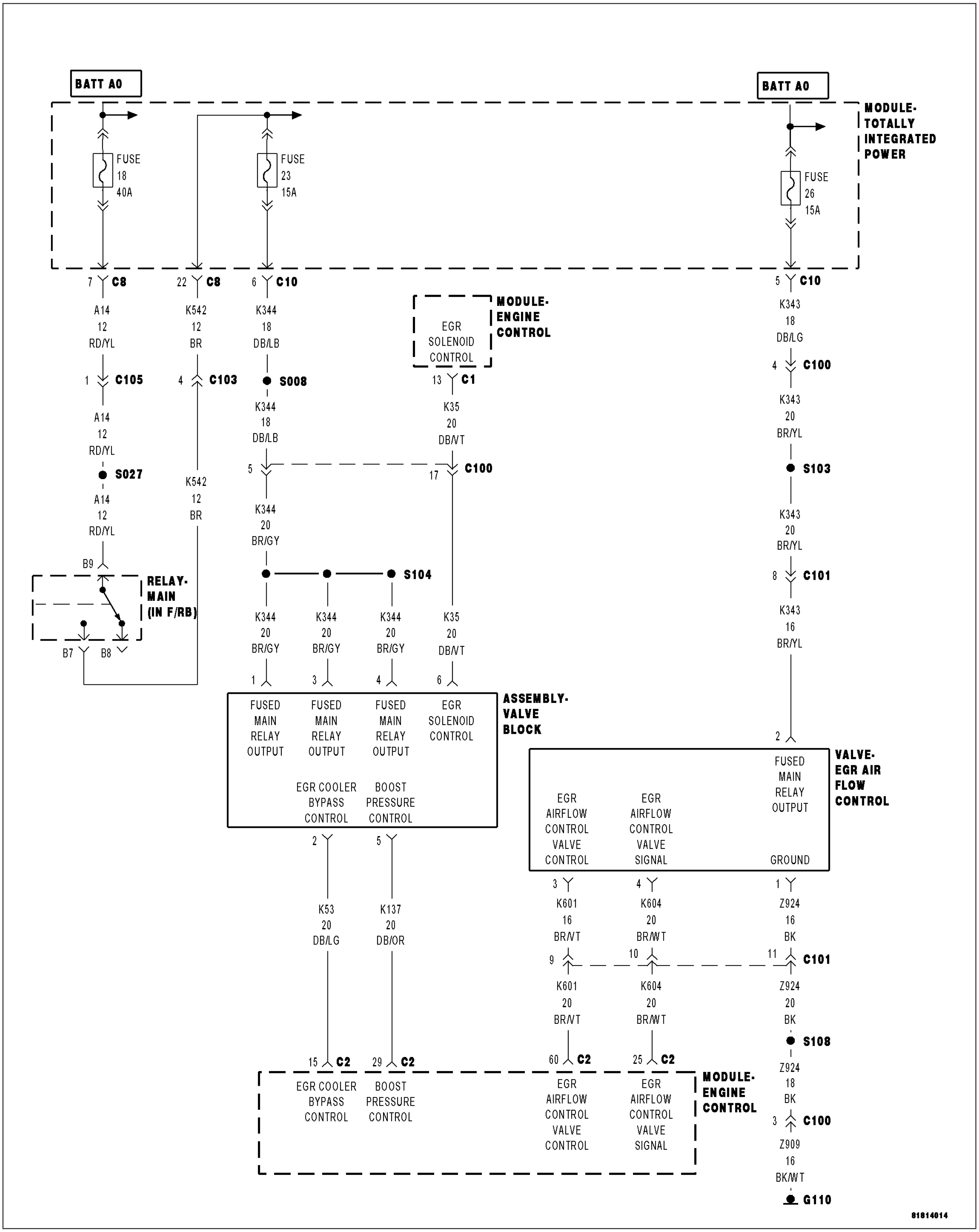
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2142-EGR AIRFLOW THROTTLE CONTROL CIRCUIT A HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running and the EGR Airflow Control Valve Motor command on.
- **Set Condition:**
  The (K601) EGR Airflow Control Valve Motor (+) circuit is shorted to voltage for 0.2 second.

Possible Causes
INTERMITTENT DTC
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE
(K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO VOLTAGE
(K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
EGR AIRFLOW CONTROL VALVE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (K601) EGR AIRFLOW CONTROL VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the EGR Airflow Control Valve harness connector.

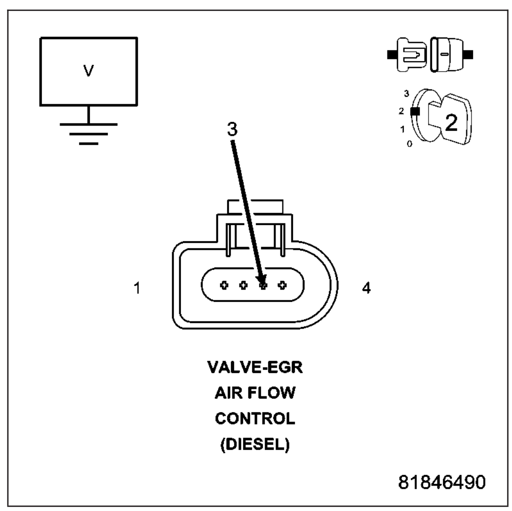
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the (K601) EGR Airflow Control Valve Control circuit in the EGR Airflow Control Valve harness connector.

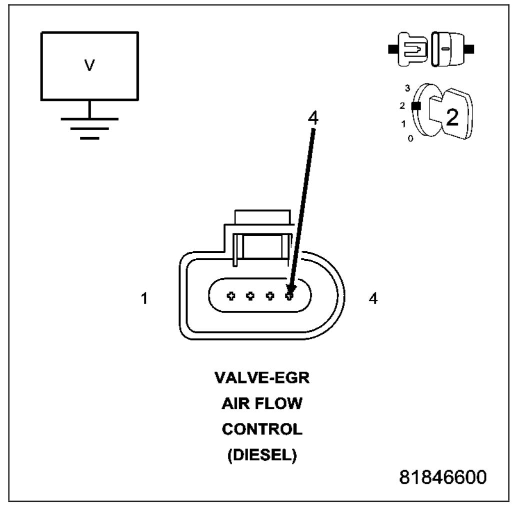


Is there any voltage present?

Yes >> Repair the (K601) EGR Airflow Control Valve Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT SHORTED TO VOLTAGE



Measure the voltage of the (K604) EGR Airflow Control Valve Signal circuit in the EGR Airflow Control Valve harness connector.

Is there any voltage present?

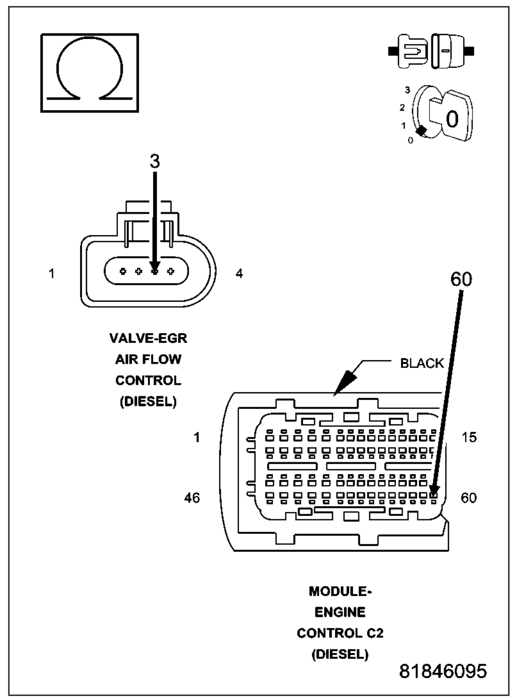
Yes >> Repair the (K604) EGR Airflow Control Valve Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. (K601) EGR AIRFLOW CONTROL VALVE CONTROL OPEN OR HIGH RESISTANCE

Turn the ignition off.



Measure the resistance of the (K601) EGR Airflow Control Valve Control circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.

Is the resistance below 10.0 ohms?

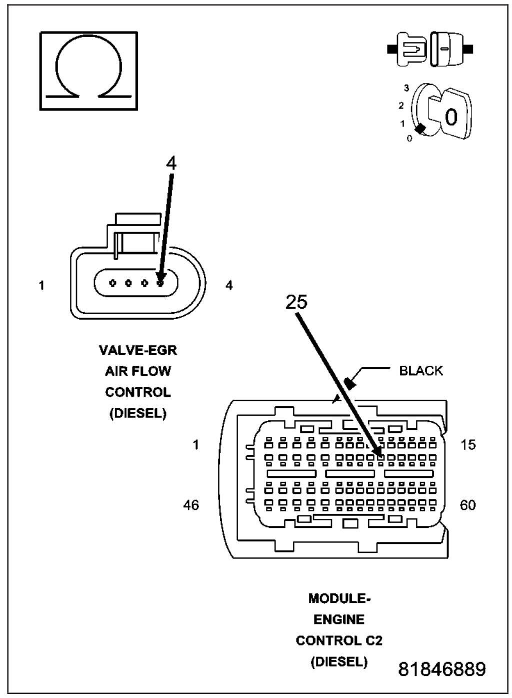
Yes >> Go to 5

No >> Repair the (K601) EGR Airflow Control Valve Control circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. (K604) EGR AIRFLOW CONTROL VALVE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (K604) EGR Airflow Control Valve Signal circuit between the EGR Airflow Control Valve harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 6

No >> Repair the (K604) EGR Airflow Control Valve Signal circuit for an open circuit or high resistance.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. EGR AIRFLOW CONTROL VALVE

Turn the ignition off.

Connect the Engine Control Module (ECM) harness connector.

Replace the EGR Airflow Control Valve in accordance with the Service Information.

Turn the ignition on.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the EGR Airflow Control Valve.

Monitor the scan tool for at least two minutes.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 7

No >> Test complete.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Airflow Control Valve and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

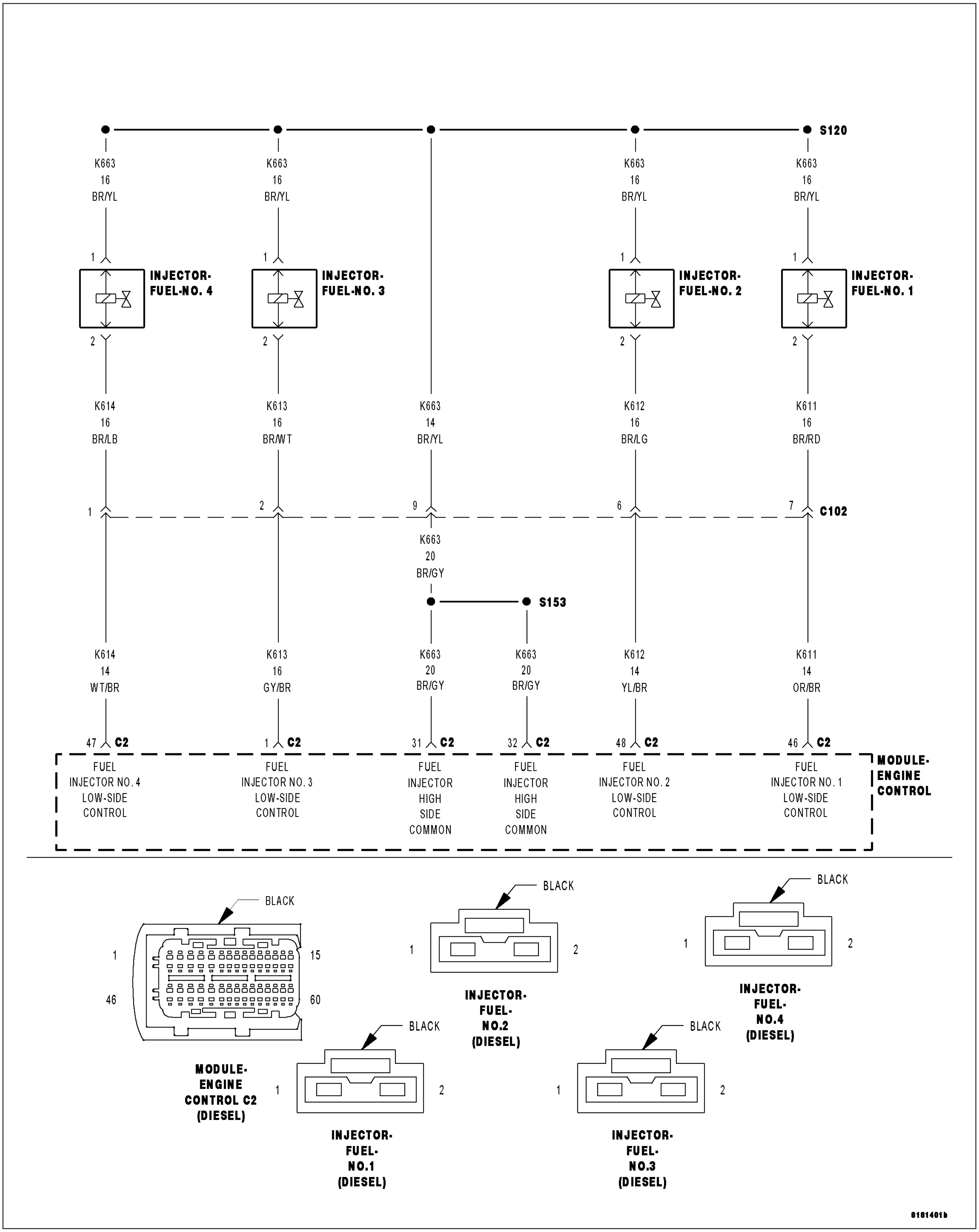
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2147-FUEL INJECTOR GROUP 1 SUPPLY VOLTAGE CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects a short to ground in the fuel injector circuitry.

Possible Causes
INTERMITTENT DTC
FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND
FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND
FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT
FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Attempt to start the engine and test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect all Fuel Injector harness connectors.

Disconnect the Engine Control Module harness connectors.

Measure the resistance between ground and the Fuel Injector High-Side Control circuit in any Fuel Injector harness connector.

Is the resistance above 1000 ohms?

Yes >> Go to 3

No >> Repair the Fuel Injector High-Side Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the Fuel Injector Low-Side Control circuit in each Fuel Injector harness connector.

Is the resistance above 1000 ohms for each measurement?

Yes >> Go to 4

No >> Repair the Fuel Injector Low-Side Control circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT

Measure the resistance between the Fuel Injector High-Side Control circuit and the Fuel Injector Low-Side Control circuit in each Fuel Injector harness connector.

Is the resistance above 1000 ohms between the circuits in each harness connector?

Yes >> Go to 5

No >> Repair the Fuel Injector High-Side Control circuit for a short to the Fuel Injector Low-Side Control circuit.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of each Fuel Injector High-Side Control circuit between the Fuel Injector harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Go to 6

No >> Repair the Fuel Injector High-Side Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of each Fuel Injector Low-Side Control circuit between the Fuel Injector harness connector and the ECM harness connector.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Go to 7

No >> Repair the Fuel Injector Low-Side Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. FUEL INJECTOR

Measure the resistance between the terminals of each Fuel Injector.

Is the resistance approximately 185k ohms (+/- 0.5%) for each injector?

Yes >> Go to 8

No >> Replace Fuel Injector in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between each Fuel Injector and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

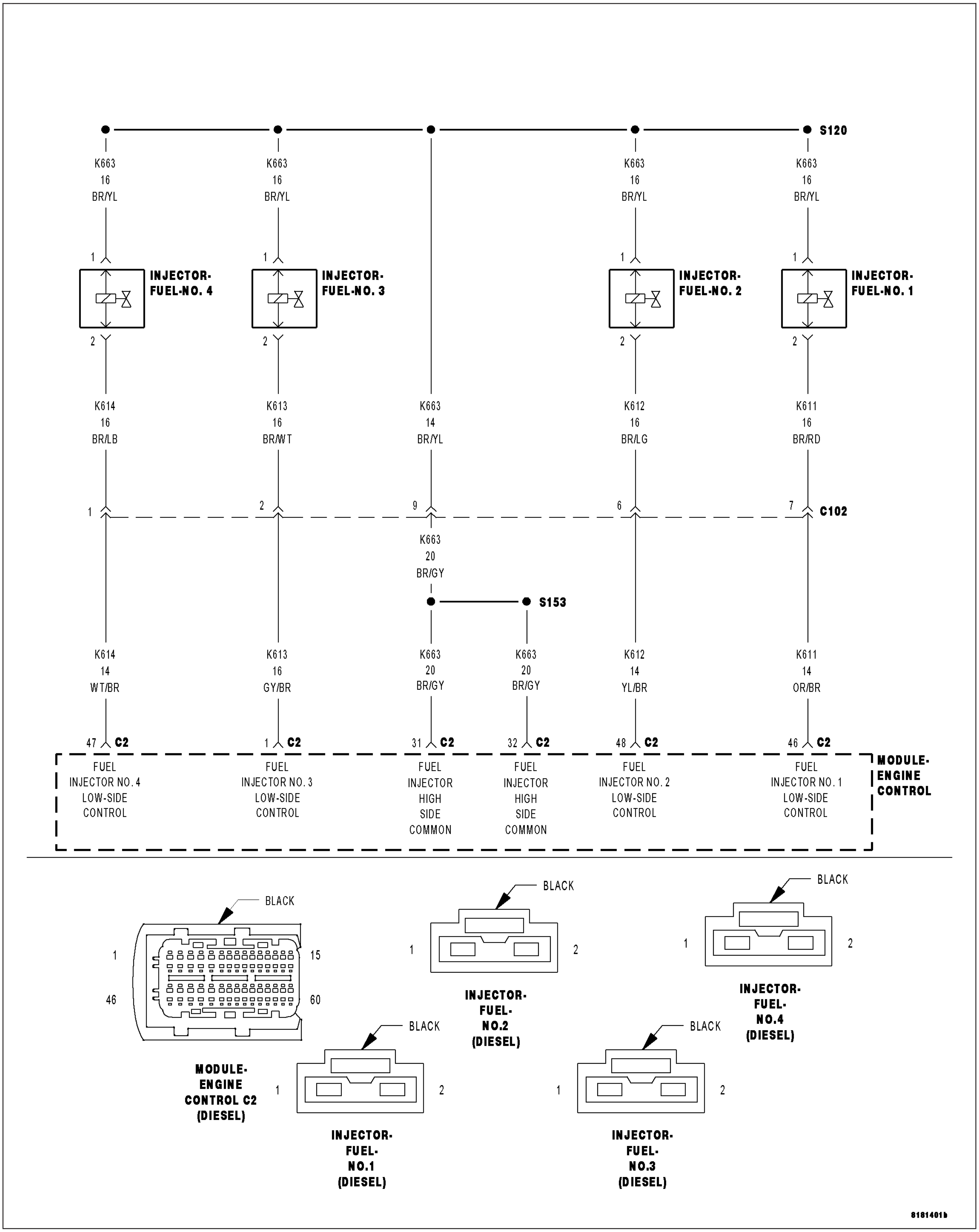
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2148-FUEL INJECTOR GROUP 1 SUPPLY VOLTAGE CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the engine running.
- **Set Condition:**
  The ECM detects a short to voltage in the fuel injector circuitry.

Possible Causes
INTERMITTENT DTC
FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE
FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC can set as a result of a fault in any of the injector circuits. Be sure to check all injector circuits before replacing an injector and all injectors before replacing a module.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Attempt to start the engine and test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect each Fuel Injector connector.

Disconnect the ECM harness connectors.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay Connector.

Turn the ignition on.

Measure the voltage of the Fuel Injector High-Side Control circuit in any Fuel Injector harness connector.

Is there voltage present?

Yes >> Repair the Fuel Injector High-Side Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT SHORTED TO VOLTAGE

NOTE: The jumper wire should still be in place.

Measure the voltage of each Fuel Injector Low-Side Control circuit.

Is there voltage present on any of the circuits?

Yes >> Repair the Fuel Injector Low-Side Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. FUEL INJECTOR HIGH-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Measure the resistance of each Fuel Injector High-Side Control circuit between the Fuel Injector harness connector and the ECM connector.

Is the resistance below 10.0 ohms for each measurement?

Yes >> Go to 5

No >> Repair the Fuel Injector High-Side Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. FUEL INJECTOR LOW-SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of each Fuel Injector Low-Side Control circuit between the Fuel Injector harness connector and the ECM connector.

Is the resistance below 10.0 ohms for each circuit?

Yes >> Go to 6

No >> Repair the Fuel Injector Low-Side Control circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. FUEL INJECTOR

Measure the resistance between the terminals of each Fuel Injector.

Is the resistance approximately 185k ohms (+/- 0.5%) for all injectors?

Yes >> Go to 7

No >> Replace Fuel Injector in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Fuel Injectors and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

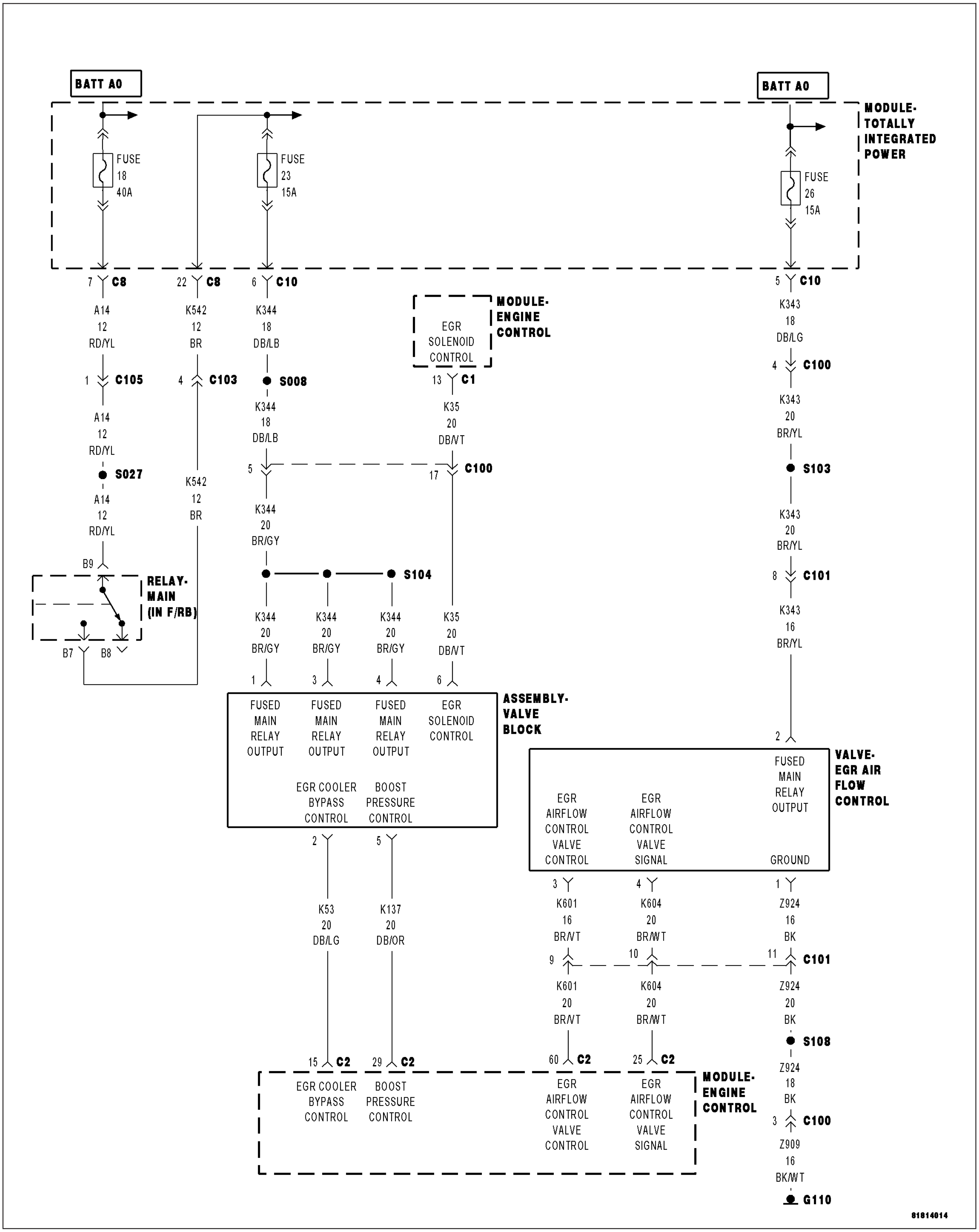
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2425-EGR COOLING VALVE CONTROL CIRCUIT OPEN



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the ECM EGR Cooler Bypass command off.
- **Set Condition:**
  The ECM does not detect voltage on the EGR Cooler Bypass Control circuit.

Possible Causes
INTERMITTENT CONDITION
(K344) MAIN RELAY OUTPUT CIRCUITS OPEN
(K53) EGR COOLER BYPASS CONTROL CIRCUIT SHORTED TO GROUND
(K53) EGR COOLER BYPASS CONTROL CIRCUIT OPEN
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle.

Monitor the scan tool for ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECKING FOR OTHER DTCS

NOTE: An open MAIN Relay power supply to the ECM will cause multiple DTC's including this DTC to set.

NOTE: Check the ECM for other DTC's. If other DTC's are set with this DTC refer to the symptom list and perform the CHECKING THE ECM POWER AND GROUND CIRCUITS test before continuing.

If the ECM power and ground circuits are functioning properly continue with this test.

Yes >> Go To 3

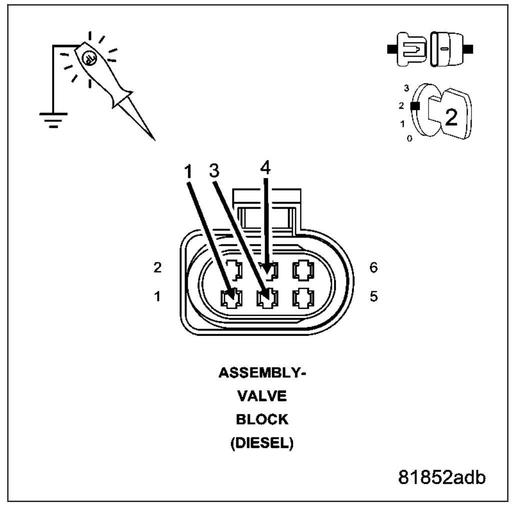
3. (K344) MAIN RELAY OUTPUT CKTS OPEN

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check all the (K344) Main Relay Output circuits at the Valve Block Assembly harness connector.



Does the test light illuminate brightly on all circuits?

Yes >> Go To 4

No >> Repair the (K344) Main Relay Output circuit for an open.

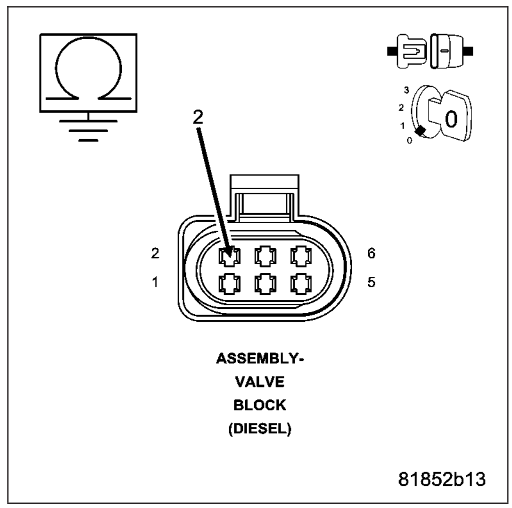
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K53) EGR COOLER BYPASS CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (K53) EGR Cooler Bypass Control circuit at the Valve Block Assembly harness connector.



Is the resistance above 1000 ohms?

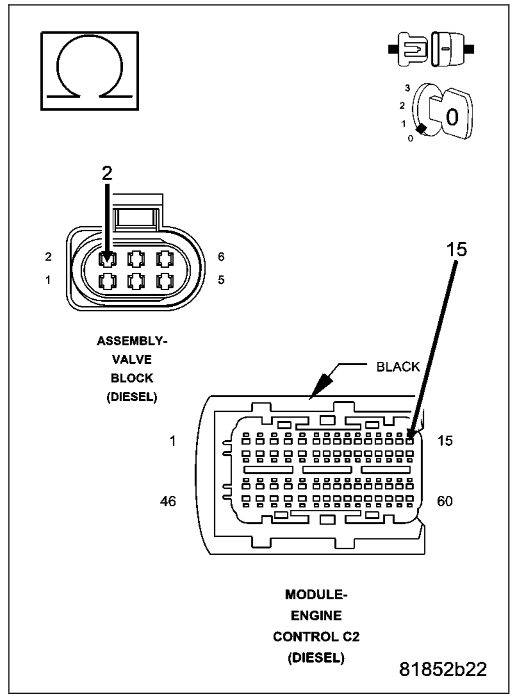
Yes >> Go To 5

No >> Repair the (K53) EGR Cooler Bypass Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K53) EGR COOLER BYPASS CONTROL CIRCUIT OPEN

Measure the resistance of the (K53) EGR Cooler Bypass Control circuit between the Valve Block Assembly harness connector and the ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 6

No >> Repair the (K53) EGR Cooler Bypass Control circuit for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VALVE BLOCK ASSEMBLY

Install a substitute Valve Block Assembly in place of the vehicle's Valve Block Assembly.

NOTE: Ensure the ECM and Valve Block Assembly harness connectors are connected.

Turn the ignition on.

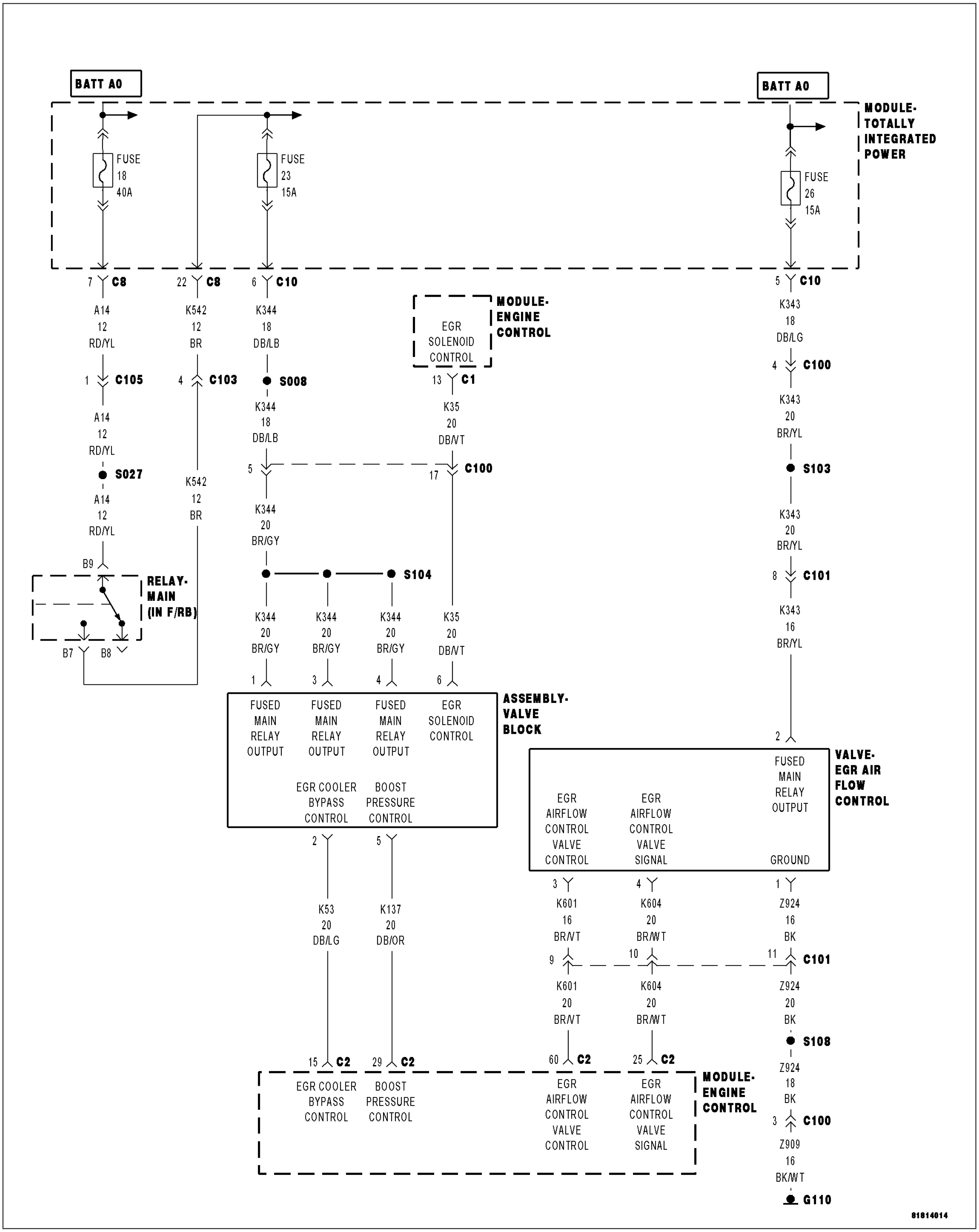
With the scan tool, check for this DTC to set again.

Did this DTC set again?

Yes >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Valve Block Assembly.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2426-EGR COOLING VALVE CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the ECM EGR Cooler Bypass command off.
- **Set Condition:**
  The ECM detects a short to ground on the EGR Cooler Bypass Control circuit.

Possible Causes
INTERMITTENT CONDITION
(K344) MAIN RELAY OUTPUT CIRCUITS OPEN
(K53) EGR COOLER BYPASS CONTROL CIRCUIT SHORTED TO GROUND
(K53) EGR COOLER BYPASS CONTROL CIRCUIT OPEN
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle.

Monitor the scan tool for ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECKING FOR OTHER DTCS

NOTE: An open Main Relay power supply to the ECM will cause multiple DTC's including this DTC to set.

NOTE: Check the ECM for other DTC's. If other DTC's are set with this DTC refer to the symptom list and perform the CHECKING THE ECM POWER AND GROUND CIRCUITS test before continuing.

If the ECM power and ground circuits are functioning properly continue with this test.

Yes >> Go To 3

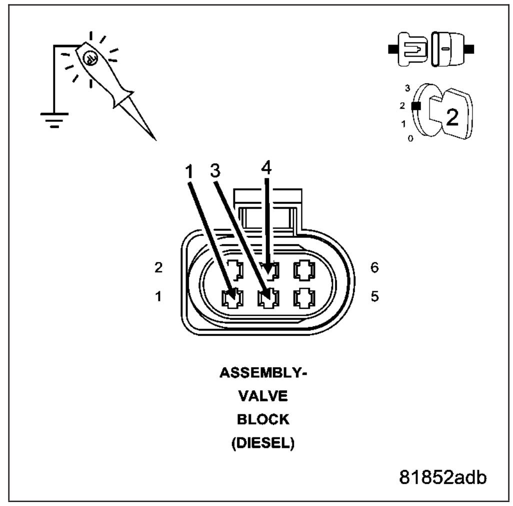
3. (K344) MAIN RELAY OUTPUT CIRCUITS OPEN

Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (K344) Main Relay Output circuits at the Valve Block Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (K344) Main Relay Output circuit for an open.

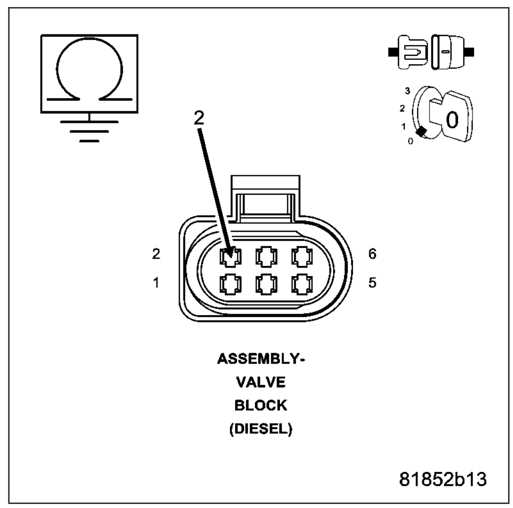
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

4. (K53) EGR COOLER BYPASS CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the ECM harness connectors.

Measure the resistance between ground and (K53) EGR Cooler Bypass Control circuit at Valve Block Assembly harness connector.



Is the resistance above 1000 ohms?

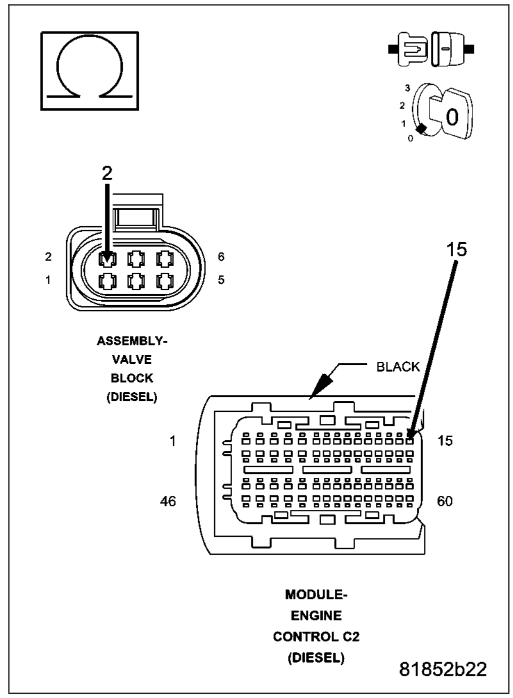
Yes >> Go To 5

No >> Repair (K53) EGR Cooler Bypass Control circuit for a short to ground.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

5. (K53) EGR COOLER BYPASS CONTROL CIRCUIT OPEN

Measure the resistance of (K53) EGR Cooler Bypass Control circuit between Valve Block Assembly harness connector and ECM harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go To 6

No >> Repair (K53) EGR Cooler Bypass Control circuit for an open.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VALVE BLOCK ASSEMBLY

Install a substitute Valve Block Assembly in place of the vehicle's Valve Block Assembly.

NOTE: Ensure the ECM and Valve Block Assembly harness connectors are connected.

Turn the ignition on.

With the scan tool, check for this DTC to set again.

Did this DTC set again?

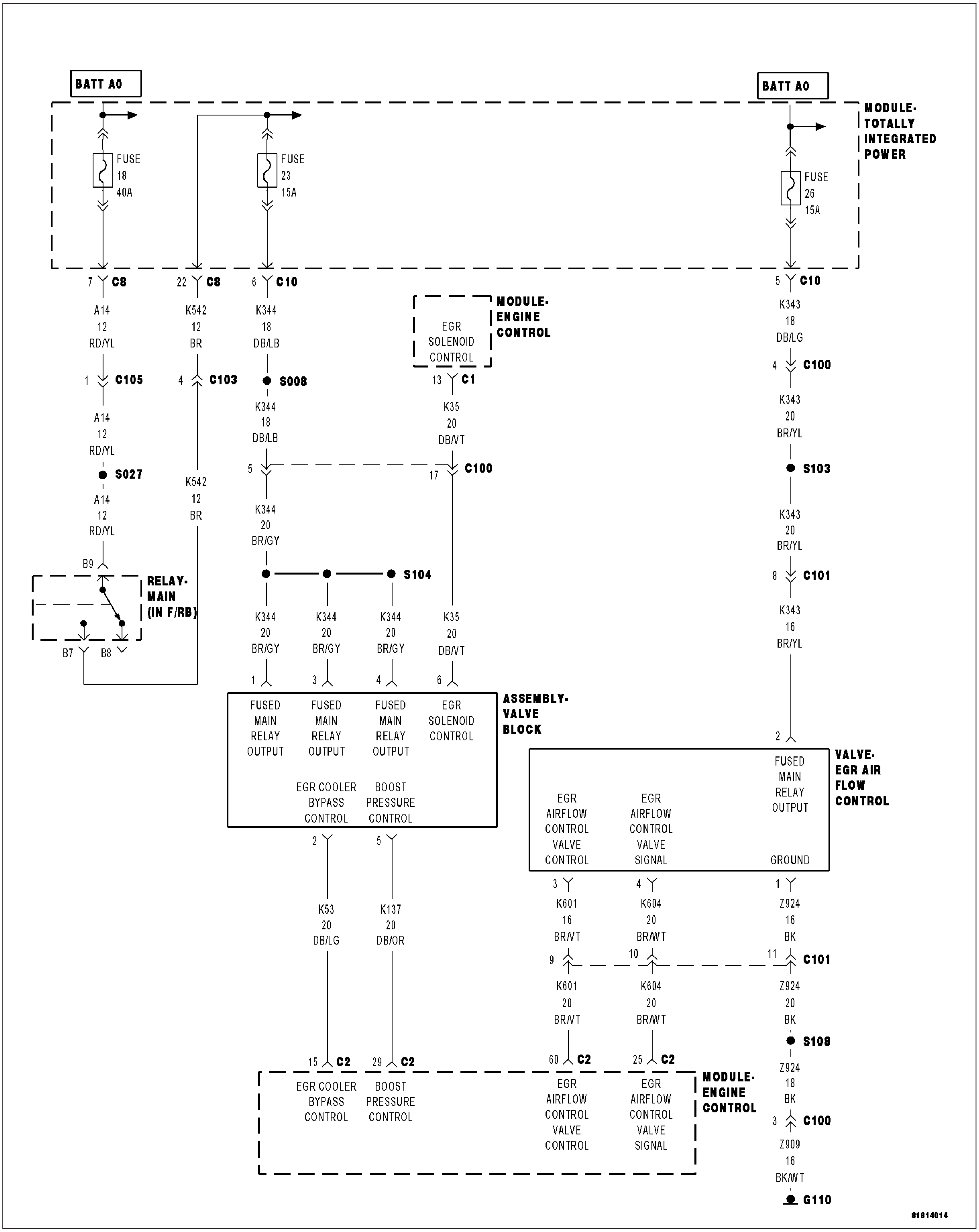
Yes >> Replace and program the Engine Control Module in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Valve Block Assembly.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2427-EGR EGR COOLING VALVE CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and the ECM EGR Cooler Bypass command on.
- **Set Condition:**
  The ECM detects excessive current on the EGR Cooler Bypass Control circuit.

Possible Causes
INTERMITTENT CONDITION
(K53) EGR COOLER BYPASS CONTROL CIRCUIT SHORTED TO VOLTAGE
VALVE BLOCK ASSEMBLY
ENGINE CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the scan tool at the same time the DTC is displayed.

NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle.

Monitor the scan tool for ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECKING FOR OTHER DTCS

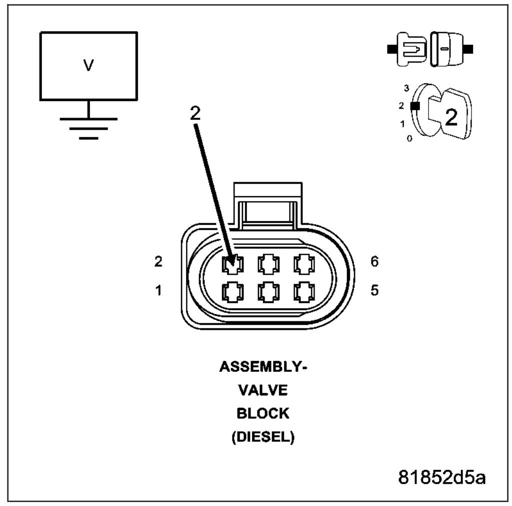
NOTE: An open Main Relay power supply to the ECM will cause multiple DTC's including this DTC to set.

NOTE: Check the ECM for other DTC's. If other DTC's are set with this DTC refer to the symptom list and perform the CHECKING THE ECM POWER AND GROUND CIRCUITS test before continuing.

If the ECM power and ground circuits are functioning properly continue with this test.

Yes >> Go To 3

3. (K53) EGR COOLING VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE



Turn the ignition off.

Disconnect the Valve Block Assembly harness connector.

Disconnect the ECM harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (K53) EGR Cooler Bypass Control circuit at the Valve Block Assembly harness connector.

Is the voltage above 1.0 volt?

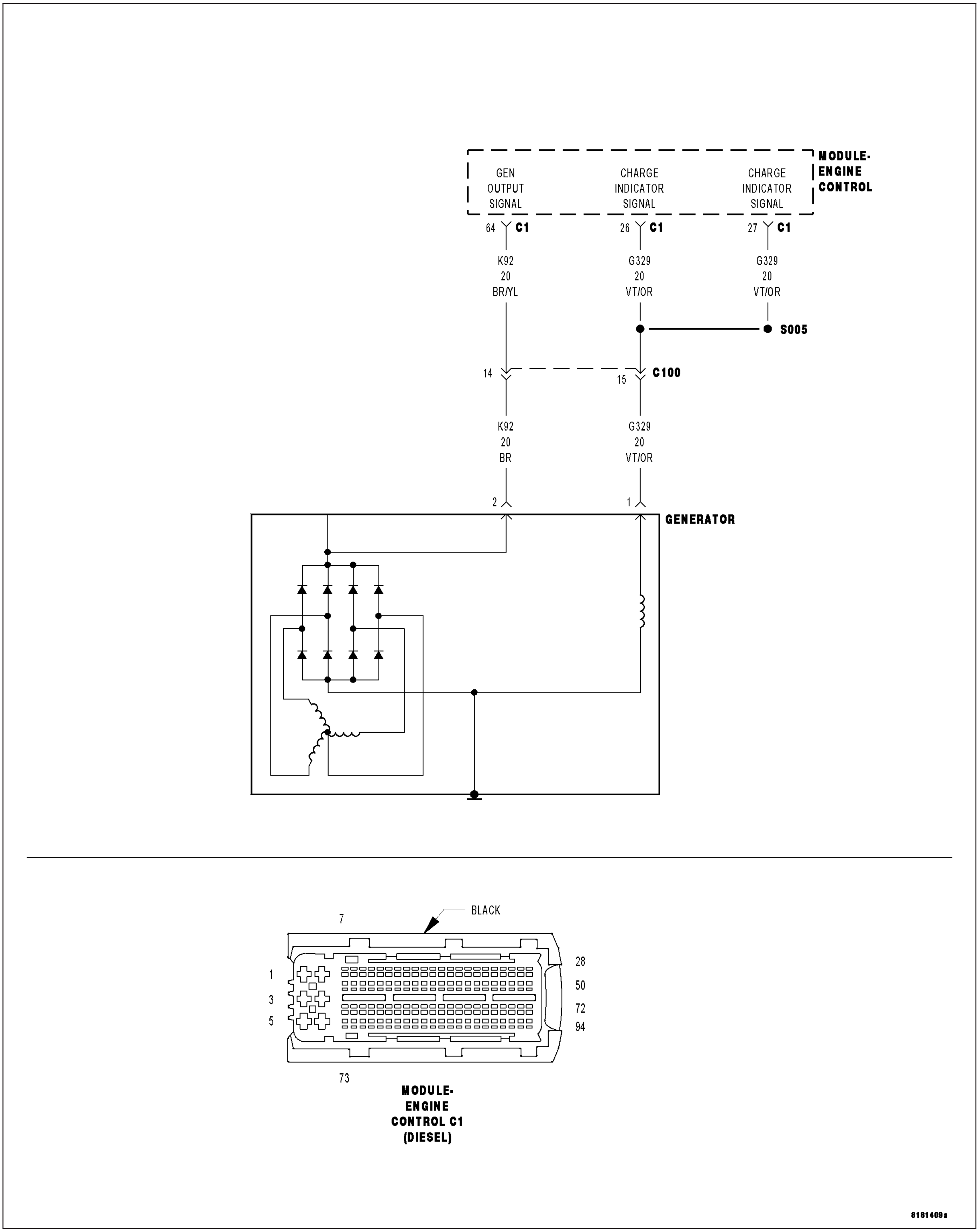
Yes >> Repair the (K53) EGR Cooler Bypass Control circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Valve Block Assembly in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2500-GENERATOR LAMP/L-TERMINAL CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects an open or short to ground on the Charge Indicator Signal circuit.

Possible Causes
INTERMITTENT DTC
(G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO GROUND
(G329) CHARGE INDICATOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
Test drive the vehicle
With the scan tool, select View DTCs.

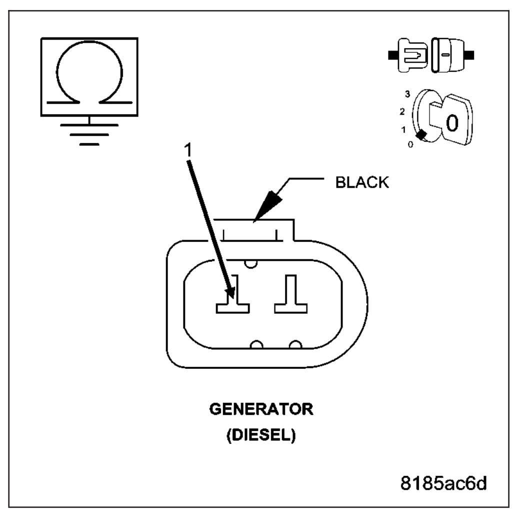
Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Disconnect the Generator harness connector.
Disconnect the Engine Control Module (ECM) harness connector.
Measure the resistance between ground and the (G329) Charge Indicator Signal circuit in the Generator harness connector.



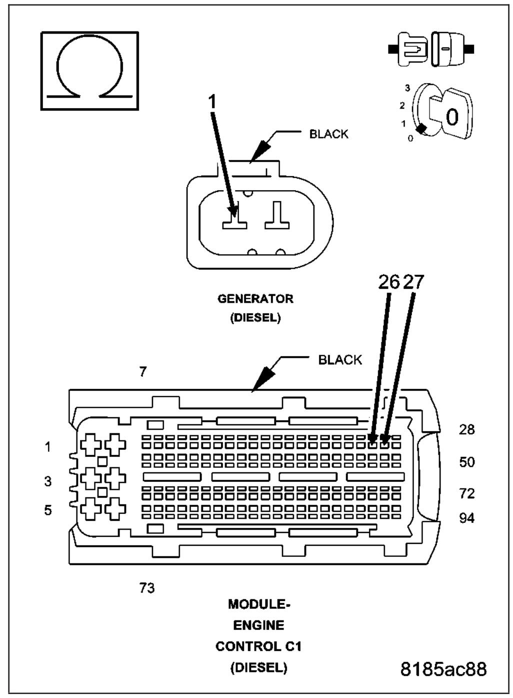
Is the resistance above 1000 ohms?

Yes >> Go to 3

No >> Repair the (G329) Charge Indicator Signal circuit for a short to ground.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. (G329) CHARGE INDICATOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Measure the resistance of the (G329) Charge Indicator Signal circuit between the Generator harness connector and the Engine Control Module (ECM) harness connector.



Is the resistance below 10.0 ohms?

Yes >> Go to 4

No >> Repair the (G329) Charge Indicator Signal circuit for an open circuit or high resistance.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. GENERATOR

Turn the ignition off.

Replace the Generator.

With the scan tool, Clear DTCs.

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 5

No >> Test complete
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

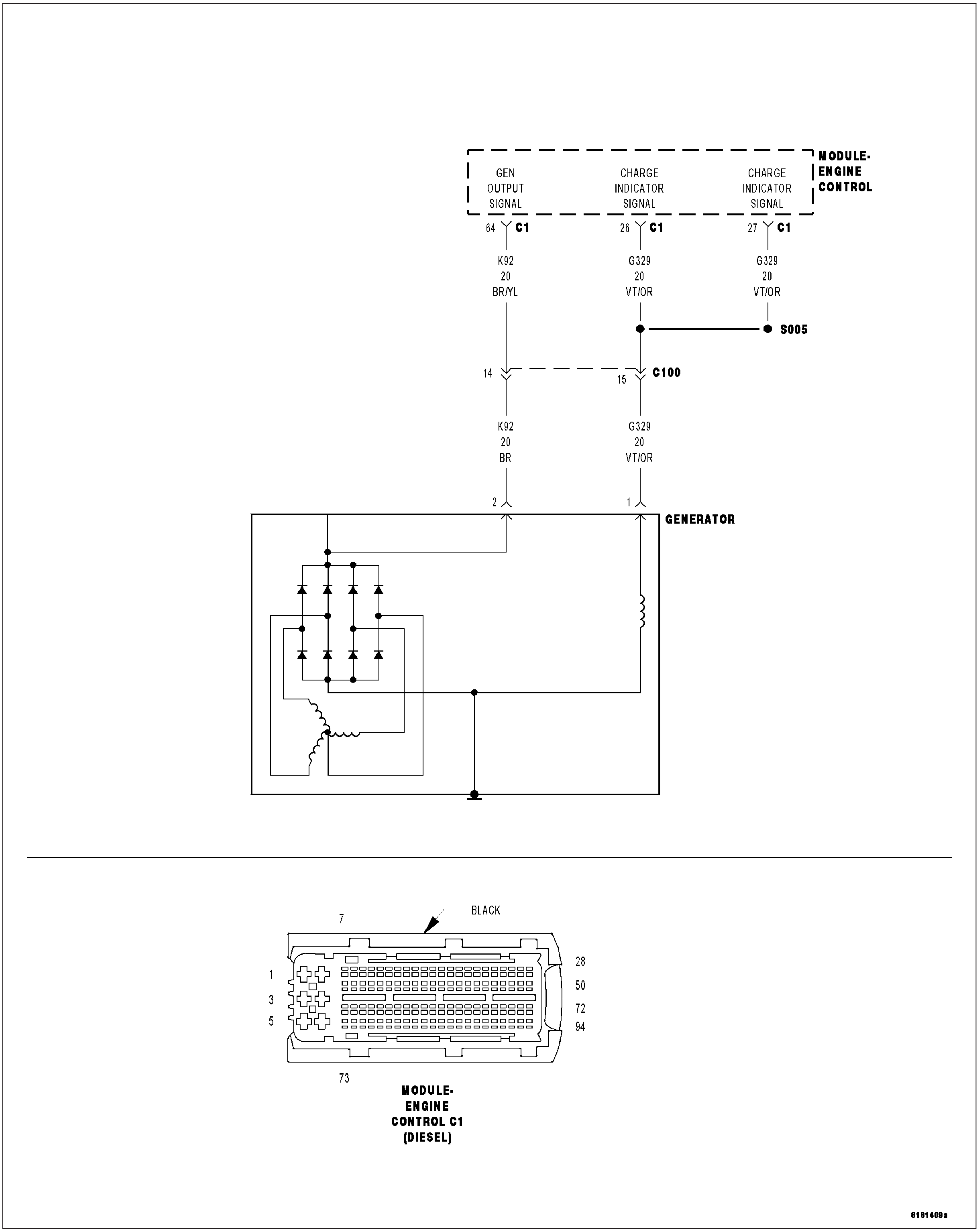
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2501-GENERATOR LAMP/L-TERMINAL CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ECM detects a short to voltage on the Charge Indicator Signal circuit.

Possible Causes
INTERMITTENT DTC
(G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
GENERATOR
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Test drive the vehicle

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. (G329) CHARGE INDICATOR SIGNAL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Generator harness connector.

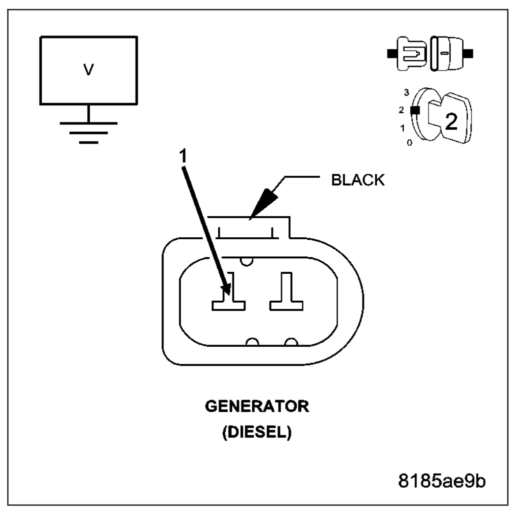
Disconnect the Engine Control Module (ECM) harness connector.

Remove the Main Relay.

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage of the (G329) Charge Indicator Signal circuit at the Generator harness connector.



Is the voltage below 1.0 volt?

Yes >> Go to 3

No >> Repair the (G329) Charge Indicator Signal circuit for a short to voltage.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. GENERATOR

Turn the ignition off.

Replace the Generator.

With the scan tool, Clear DTCs.

Test drive the vehicle.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 4

No >> Test complete
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. ENGINE CONTROL MODULE (ECM)

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Engine Control Module (ECM).

Look for any chafed, pierced, pinched, or partially broken wires.

Look for broken, bent, pushed out or corroded terminals.

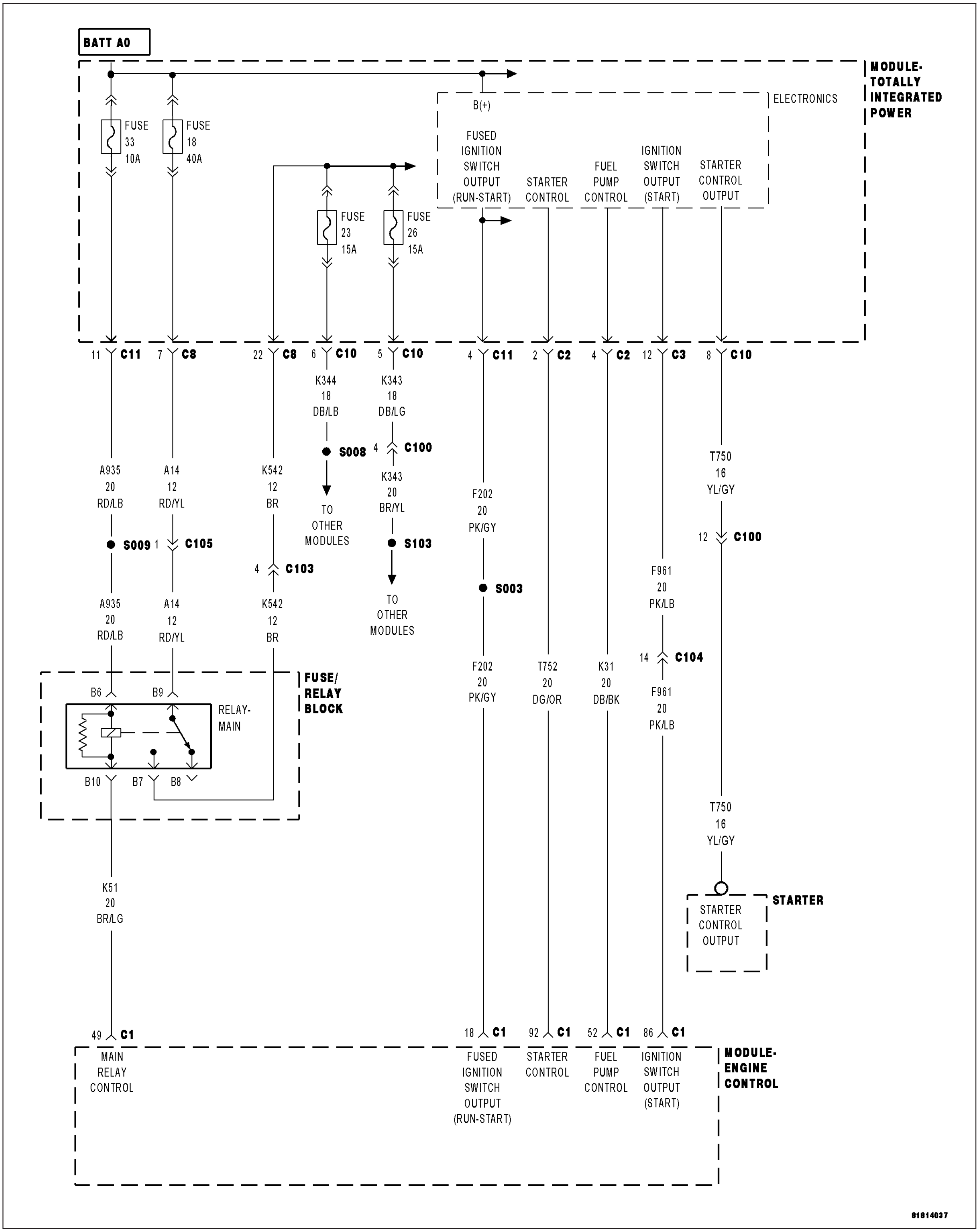
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

P2533-IGNITION SWITCH RUN/START POSITION CIRCUIT



For a complete wiring diagram **Refer to Section 8W**

Possible Causes
CHECK THE ECM POWER AND GROUNDS
ENGINE CONTROL MODULE

Diagnostic Test

1. VERIFY CURRENT DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECK POWER AND GROUNDS

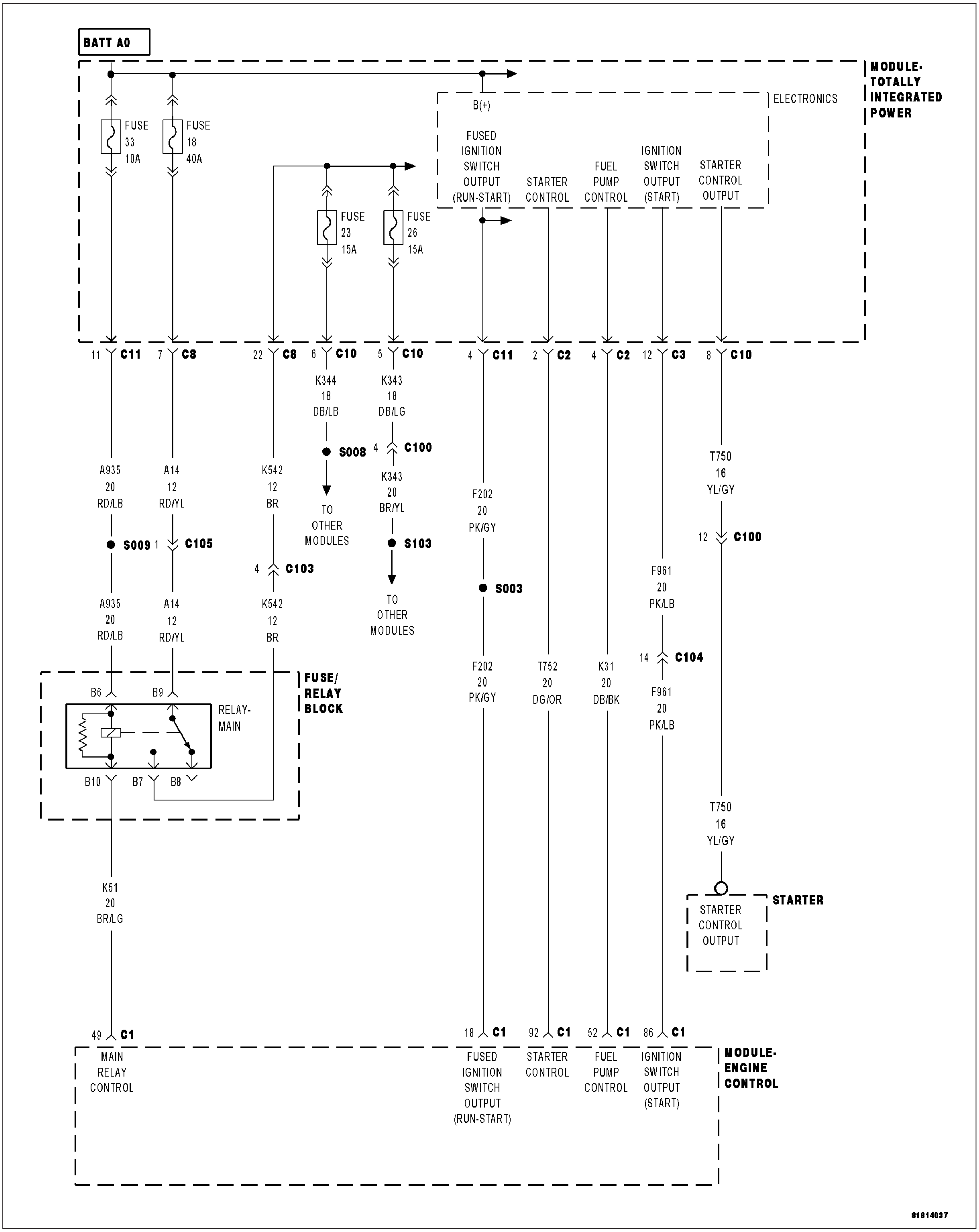
Refer to symptom Checking the ECM Power and Grounds.

Are the ECM Power and Ground circuits o.k.?

Yes >> Replace the ECM in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2534-IGNITION SWITCH RUN/START POSITION CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**

Possible Causes
CHECK THE ECM POWER AND GROUNDS
ENGINE CONTROL MODULE

Diagnostic Test

1. VERIFY CURRENT DTC

Turn the ignition on.

With the scan tool, erase ECM DTCs.

Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.

With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECK POWER AND GROUNDS

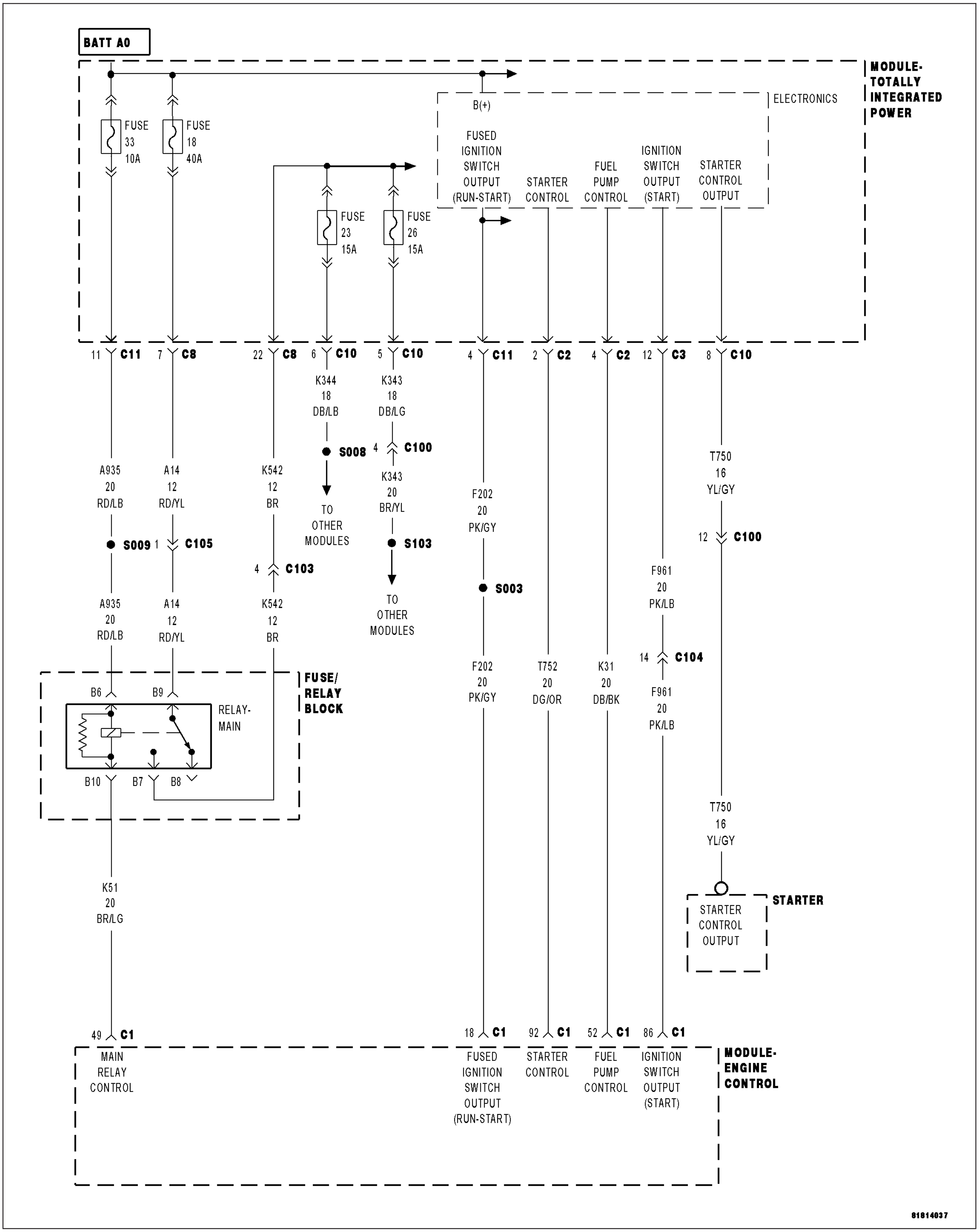
Refer to symptom Checking the ECM Power and Grounds.

Are the ECM Power and Ground circuits o.k.?

Yes >> Replace the ECM in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

P2535-IGNITION SWITCH RUN/START POSITION CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**

Possible Causes
CHECK THE ECM POWER AND GROUNDS
ENGINE CONTROL MODULE

Diagnostic Test

1. VERIFY CURRENT DTC

Turn the ignition on.
With the scan tool, erase ECM DTCs.
Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.
With the scan tool, read the ECM DTCs.

Did this DTC set again?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. CHECK POWER AND GROUNDS

Refer to symptom Checking the ECM Power and Grounds.

Are the ECM Power and Ground circuits o.k.?

Yes >> Replace the ECM in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

B10B3 - CABIN HEATER 1 CONTROL CIRCUIT

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  A Cabin Heater (PTC) #1 error message has been received over the CAN bus from the TIPM.

Possible Causes
INTERMITTENT DTC
DTC SET IN TOTALLY INTEGRATED POWER MODULE (TIPM)
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC will set if the Engine Control Module (ECM) receives a message from the TIPM indicating that a PTC Heater Relay DTC is present.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the PTC Heater Relay 1.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

With the scan tool, select View DTCs in the Totally Integrated Power Module.

Is there a stored or active PTC Heater Relay DTC present in the TIPM?

Yes >> Refer to 24 - HVAC — ELECTRICAL DIAGNOSTICS for diagnostic procedures and for further possible causes.

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

B10B7 - CABIN HEATER 2 CONTROL CIRCUIT

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  A Cabin Heater (PTC) #2 error message has been received over the CAN bus from the Totally Integrated Power Module.

Possible Causes
INTERMITTENT DTC
DTC SET IN TOTALLY INTEGRATED POWER MODULE (TIPM)
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

NOTE: This DTC will set if the Engine Control Module (ECM) receives a message from the Totally Integrated Power Module indicating that a PTC Heater Relay DTC is present.

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

With the scan tool, actuate the PTC Heater Relay 2.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ENGINE CONTROL MODULE (ECM)

With the scan tool, select View DTCs in the Totally Integrated Power Module.

Is there a stored or active PTC Heater Relay DTC present in the Totally Integrated Power Module?

Yes >> Refer to 24 - HVAC — ELECTRICAL DIAGNOSTICS for diagnostic procedures and for further possible causes.

No >> Replace the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

B1C32- AIRBAG DEPLOYMENT DETECTED

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The ACM sends a CAN Bus message to the ECM indicating that the airbags have been deployed.

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DTC EXPLANATION

NOTE: This DTC indicates that the vehicle has been in an accident and the airbag module has deployed the airbags.

View Repair.

Yes >> Test Complete.

B2189-IGNITION START CONTROL CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The TIPM detects a short to voltage condition in the Fused Ignition Switch Output (Start) circuit.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (START) CIRCUIT SHORT TO VOLTAGE
ENGINE CONTROL MODULE
TIPM

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 10 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Using the wiring diagram/schematic as a guide, visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. ENGINE CONTROL MODULE

Turn the ignition off.

Disconnect the Engine Control Module harness connectors.

Turn the ignition on, wait 10 seconds.

With the scan tool, read TIPM DTCs.

Did DTC B2188-IGNITION START CONTROL CIRCUIT HIGH change from active to stored?

Yes >> Replace the Engine Control Module in accordance with the service information.

No >> Check the Fused Ignition Switch Output (START) circuit for a short to voltage. If this circuit is not shorted to voltage, replace the TIPM.

U0002–CAN C BUS OFF PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
TOTALLY INTEGRATED POWER MODULE (TIPM)
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs in the Engine Control Module (ECM).
Monitor the scan tool for at least two minutes.
Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
Start the engine.
Allow the engine to reach normal operating temperature.
With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while the system is active.
- **Set Condition:**
  The ECM doesn't receive a Bus Message from the Anti-lock Brake Module.

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
ANTI-LOCK BRAKE MODULE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (TIPM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while the system is active.
- **Set Condition:**
  The ECM doesn't receive a Bus Message from the Totally Integrated Power Module.

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
TOTALLY INTEGRATED POWER MODULE (TIPM)
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, Clear DTCs in the Engine Control Module (ECM).

Monitor the scan tool for at least two minutes.

Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the *CHECKING FOR AN INTERMITTENT DTC Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0415-IMPLAUSIBLE DATA RECEIVED FROM ABS

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while the system is active.
- **Set Condition:**
  An error message has been received over the bus from the Anti-lock Brake Module.

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
ANTI-LOCK BRAKE MODULE
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose all CAN B and C communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, view DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. COMMUNICATION DTCS PRESENT IN THE ANTI-LOCK BRAKE MODULE

With a scan tool check for DTCs in the Anti-lock Brake Module.

Are there any CAN bus DTCs active in the Anti-lock Brake Module at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for additional vehicle communication diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace and program the Engine Control Module (ECM) in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

U0431-IMPLAUSIBLE DATA RECEIVED FROM TIPM

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while the system is active.
- **Set Condition:**
  An error message has been received over the bus from the Totally Integrated Power Module (TIPM).

Possible Causes
INTERMITTENT DTC
CAN BUS OPEN OR SHORTED CONDITION
TOTALLY INTEGRATED POWER MODULE (TIPM)
ENGINE CONTROL MODULE (ECM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose all CAN B and C communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, view DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. COMMUNICATION DTCS PRESENT IN THE TOTALLY INTEGRATED POWER MODULE (TIPM)

With a scan tool check for DTCs in the Transmission Control Module (TIPM).

Are there any CAN bus DTCs active in the Totally Integrated Power Module (TIPM) at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for additional vehicle communication diagnostic procedures.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

No >> Replace and program the Engine Control Module (ECM) in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*ENGINE CRANKS BUT WILL NOT START

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
INTAKE SYSTEM RESTRICTION
ECM CODES PRESENT
ECT SENSOR
ENGINE CONTROL MODULE
ENGINE DRIVE CHAIN/BELT
FUEL SUPPLY CONTAMINATION
SUPPLY SIDE FUEL SYSTEM PRESSURE
FUEL SYSTEM RESTRICTION
GLOW PLUGS
SKREEM CODES PRESENT

Diagnostic Test

1. ECM CODES PRESENT

NOTE: The ECM must have proper power and ground connections for the following tests to be valid. Refer to Checking the ECM Power and Grounds in the symptom list.

Turn the ignition on.

With the scan tool, read the ECM DTCs.

Does the scan tool display any ECM DTCs?

Yes >> Refer to symptom list for problems related to ECM DTC.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

2. SKREEM CODES PRESENT

With the scan tool, read the SKREEM DTCs.

Does the scan tool display any SKREEM DTCs?

Yes >> Refer to symptom list for problems related to SKREEM DTC.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 3

3. CHECK FOR INTAKE SYSTEM RESTRICTIONS

Turn the ignition off.

Ensure vehicle has adequate fuel supply in fuel tank.

Inspect all air intake and turbocharger related hoses/tubes and connections.

Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 4

4. ECT SENSOR

Using a temperature probe, check the vehicle temperature near the ECT Sensor.
Turn the ignition on.
With the scan tool in Sensors, read the ECT Sensor temperature.
Compare the temperature probe reading with the scan tool reading.

Are the two readings within 10°C of each other?

Yes >> Go To 5

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. GLOW PLUGS

NOTE: Prior to performing this test, be sure to check the Glow Plug Relay operation. Refer to CHECKING GLOW PLUG OPERATION for the related symptom(s).
Refer to the Service Information and check the Glow Plugs for proper operation.

Are the Glow Plugs operating properly?

Yes >> Go To 6

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. FUEL SYSTEM RESTRICTION

Inspect the fuel system lines for restrictions, leaks or other problems.

NOTE: Refer to the Service Information to ensure that the fuel system is properly primed. An unprimed system or excessive air in the supply system will cause a no-start condition.

Is there any evidence of problems?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 7

7. FUEL CONTAMINATION

Inspect the fuel supply for contamination.

Is the fuel contaminated?

Yes >> Refer to the Service Information to remove and replace fuel throughout the fuel system.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 8

8. SUPPLY SIDE FUEL SYSTEM PRESSURE

Refer to the Service Information and perform the Supply Side Fuel System Pressure Test.

Is the fuel pressure within specification?

Yes >> Go To 9

No >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. ENGINE DRIVE CHAINS

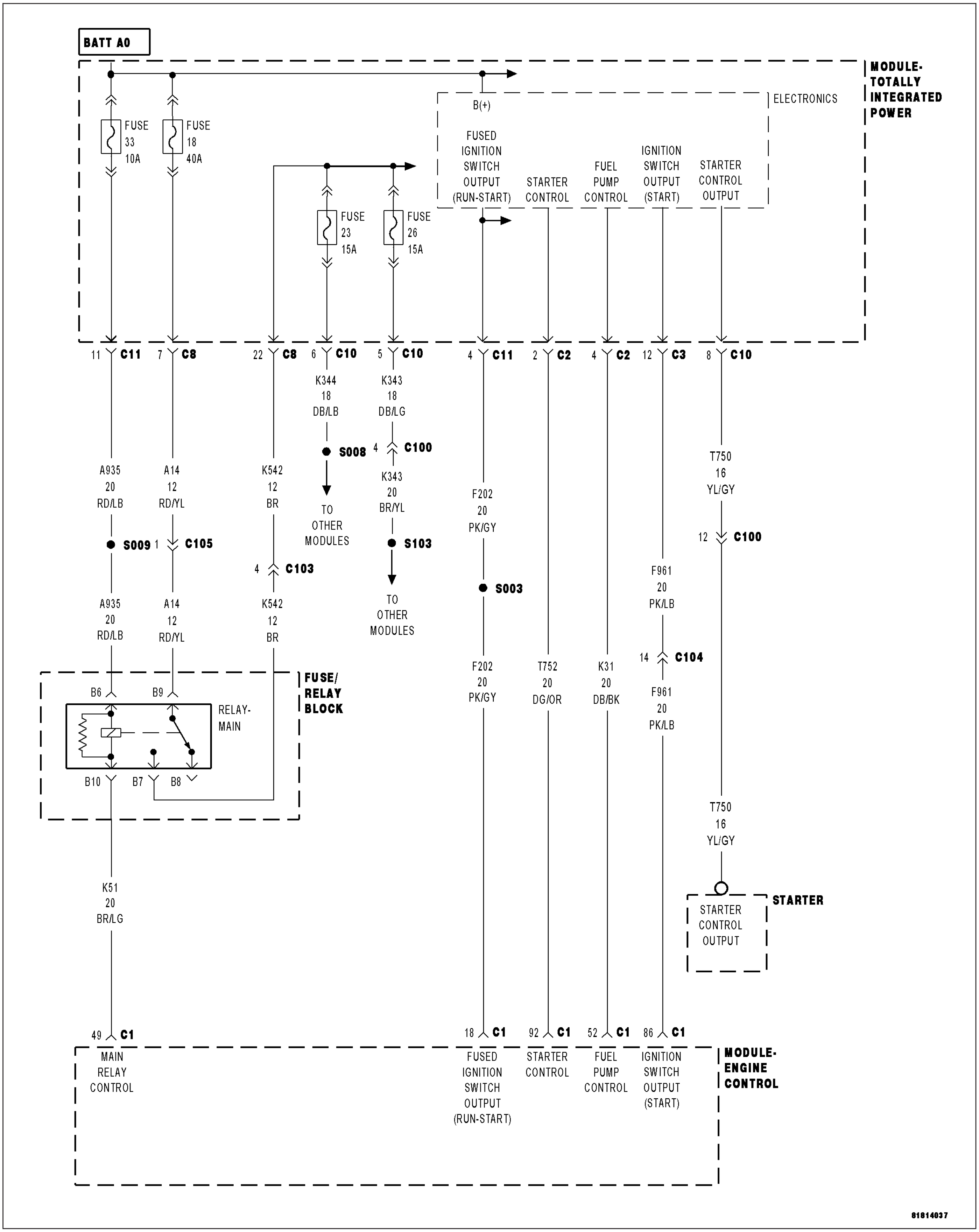
Refer to the Service Information to ensure the Engine Drive Chains are installed correctly and the camshaft and crankshaft gears are timed correctly.

Were any problems found?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace and program the Engine Control Module in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*ENGINE WILL NOT CRANK



For a complete wiring diagram **Refer to Section 8W**

Possible Causes
BATTERY CABLES
LOW BATTERY/POOR BATTERY CONNECTION
CLUTCH INTERLOCK SWITCH INPUT
MECHANICAL PROBLEM
SKIM CODES PRESENT
STARTER MOTOR
TOTALLY INTEGRATED POWER MODULE
(T750) STARTER CONTROL OUTPUT CIRCUIT SHORT TO GROUND
(T750) STARTER CONTROL OUTPUT CIRCUIT OPEN

Diagnostic Test

1. BATTERY CABLES

NOTE: Ensure there are no Active DTC's in the ECM or TIPM. If the ECM or TIPM have Active DTC's, repair these DTC's before continuing with No Crank diagnosis.
Turn the ignition off.

NOTE: The battery must be fully charged before diagnosing a no crank condition.
Inspect the battery cables for corrosion, looseness or other problems.

Is there evidence of problems?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. ECM POWER AND GROUND CIRCUITS

Refer to CHECKING THE ECM POWER AND GROUNDS to check for proper ignition, battery and ground supply to the ECM.

Are the Ignition, Battery and Ground supply circuits functioning properly at the ECM?

Yes >> Go To 3
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair as necessary.

3. SKIM CODES PRESENT

Turn the ignition on.
With the scan tool, read the SKIM DTCs.

Does the scan tool display any SKIM DTCs?

Yes >> Refer to symptom list for problems related to SKIM.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Go To 4

4. CHECKING STARTER OPERATION

NOTE: The Starter Motor Fuse in the TIPM must not be open for this test to be valid. Check the condition of the Starter Motor Fuse in the TIPM. If the fuse is open, replace and attempt to crank the engine.

Turn the ignition off.

Disconnect the (T750) Starter Control Output circuit at the Starter Motor.

With a 12–volt test light connected to ground, probe the (T750) Starter Control Output circuit.

Fully depress the clutch pedal.

While observing the test light, turn the ignition switch to the Crank/Start position.

Is the test light illuminated brightly?

Yes >> Go To 5

No >> Go To 6

5. MECHANICAL PROBLEM

Turn the ignition off.

Attempt to manually rotate the crankshaft 360°.

Is the crankshaft able to rotate 360°?

Yes >> Replace the Starter Motor.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Repair the engine mechanical problem.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

6. VERIFY CLUTCH SWITCH INPUTS

Turn the ignition on.

With the scan tool, read the Clutch Upstop Switch and Clutch Interlock Switch inputs while fully depressing and releasing the clutch pedal.

Does the input for both switched change state while fully depressing and releasing the clutch pedal?

Yes >> Go To 7

No >> Refer to the Service Information related to the Clutch Switch. Repair or replace Clutch Switch or Clutch Switch circuitry as necessary to correct Clutch Switch input to the ECM.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

7. (T750) STARTER CONTROL OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Connect the (T750) Starter Control Output wire (at the Starter) to ground.

Using a 12-volt test light connected to 12-volts, check the (T750) Starter Relay Output circuit at the TIPM C8 harness connector.

Does the test light illuminate brightly?

Yes >> Go To 8

No >> Repair the (T750) Starter Relay Output circuit for an open.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

8. (T750) STARTER CONTROL OUTPUT CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T750) Starter Control Output circuit.

Is the resistance above 1000 ohms?

Yes >> Go To 9

No >> Repair the (T750) Starter Control Output circuit for a short to ground.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

9. CHECK WIRING, CONNECTORS AND TERMINALS

Turn the ignition off.

Check the wiring, connectors and terminals associated with the Starter Relay, Main Relay and Clutch Switch circuits. Check for poor terminal contact, corrosion, spread terminals, improper connections or other problems that could cause an intermittent condition.

Were any problems found?

Yes >> Repair or replace wiring, connector or terminals as necessary.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the TIPM in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1 (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

*LACK OF ENGINE POWER

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
AIR IN FUEL SYSTEM
FUEL INJECTOR CLASSIFICATION
BRAKE SWITCH PROBLEM
EGR SYSTEM PROBLEM
BOOST PRESSURE PROBLEM
LOW ENGINE COMPRESSION
FUEL DELIVERY SYSTEM RESTRICTION
ENGINE DRIVE BELT/CHAIN
FUEL INJECTOR(S)
FUEL INJECTION PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
TURBOCHARGER

Diagnostic Test

1. CHECKING FOR ECM DTCS

WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.

WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.

Turn the ignition on.

With the scan tool, read the ECM DTCs.

Are there any DTCs present?

Yes >> Refer to symptom list for problems related to this DTC.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 2

2. CHECKING THE BRAKE SWITCH ADJUSTMENT

Refer to the Service Information and check for proper Brake Switch adjustment.

Is the Brake Switch adjusted correctly?

Yes >> go to 3

No >> Adjust or replace the Brake Switch as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. EGR SYSTEM

Refer to the symptom list and perform the CHECKING THE EGR SYSTEM test.

Were any problems found during the EGR System test?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> 4

4. FUEL SYSTEM LEAK

Turn the ignition off.

WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.

WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.

Inspect the entire fuel system for leakage.

Is there any evidence of leakage?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. FUEL SYSTEM CONTAMINATION

NOTE: Mixing any other fuels such as gasoline or kerosine can cause this symptom to occur.

Turn the ignition off.

WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.

WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.

Inspect the fuel system for contamination.

Is the fuel contaminated?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. CHECKING BOOST PRESSURE

Turn the ignition on.

NOTE: This test requires two people. One person to test drive the vehicle while a technician observes the scan tool readings.

With the scan tool in Sensors, read and compare the Boost Pressure (PSI) with the Boost Pressure Desired/Setpoint (PSI) while test driving the vehicle under various load conditions such as idle, hard acceleration, and cruise.

NOTE: The Boost Pressure reading should directionally follow (trail) the Boost Pressure Desired/Setpoint reading.

Does the Boost Pressure reading follow the Boost Pressure Desired/Setpoint reading?

Yes >> Go To 7

No >> Refer to the symptom CHECKING THE BOOST PRESSURE.

7. FUEL INJECTOR CLASSIFICATION

NOTE: Each Fuel Injector is labeled with a code. This code determines the injector classification. Each Injector classification must be programmed into the ECM using the scan tool.

Turn the ignition off.

Refer to the Service Information to locate each fuel injector label and check for the correct classification for each fuel injector in the ECM.

Are all of the injectors classified correctly?

Yes >> Go To 8

No >> Using the scan tool, program the correct Fuel Injector classifications into the ECM.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

8. ENGINE COMPRESSION

Start and idle the engine.

With the scan tool, perform the Cylinder Compression Test.

Does the Cylinder Compression Test indicate low compression in any of the cylinders?

Yes >> Using the Service Information, repair the engine as necessary to regain proper cylinder compression.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 9

9. FUEL INJECTOR

NOTE: An injector that sticks open can cause this symptom. A sticking injector will cause the engine to misfire and emit excessive black smoke from the exhaust system.

Start and idle the engine.

With the scan tool, perform the Cylinder Fuel Quantity Correction Test.

NOTE: A problem injector will be indicated by a significant change in correction quantity as compared to the rest of the injectors.

Are any of the injectors displaying a significant amount of injection quantity correction?

Yes >> Using the Service Information, remove and inspect the Fuel Injectors for signs of damage or debris that may cause the injector to stick. Sticking injectors may cause the combustion chamber to become black and oil soaked. Replace Injector(s) as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 10

10. ENGINE DRIVE BELT/CHAIN

Refer to the Service Information to ensure the Engine Drive Belt/Chain is installed correctly and the camshaft and crankshaft gears are timed correctly.

Were any problems found?

Yes >> Repair as necessary.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

11. CHECKING THE SUPPLY SIDE FUEL DELIVERY SYSTEM

Refer to the appropriate Service Information and test for proper Fuel pressure and volume from the fuel tank to the high pressure Fuel Injection Pump.

NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, air in fuel system, failed fuel sending unit, contaminated fuel.

Were there any problems with the Fuel Delivery System?

Yes >> Repair as necessary in accordance with the Service Information.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete

*CHECKING THE ACCELERATOR PEDAL POSITION SENSOR CALIBRATION

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
APP SENSOR 1
APP SENSOR 2

Diagnostic Test

1. APP SENSOR IDLE VOLTAGE

NOTE: If there are any Accelerator Pedal Position Sensor DTC's active in the ECM, diagnose DTC's before continuing this test.

NOTE: The APP Sensor is a device that contains two separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.

NOTE: The APP Sensor 1 signal should always be double the voltage of the APP Sensor 2 signal.

NOTE: Ensure the accelerator pedal is free from any restriction or binding before continuing.

Turn the ignition on.

With the scan tool, read the APP Sensor 1 and APP Sensor 2 Volts with the accelerator pedal in the at rest position.

Does the scan tool display between 0.79 and 0.95 volt for sensor 1 and 0.39 and 0.48 volt for sensor 2?

Yes >> Go To 2

No >> Check the APP Sensor circuits for proper resistance. If o.k., replace the APP Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. APP SENSOR 1

While back probing, measure the voltage of the APP Sensor 1 Signal circuit at the ECM.

Monitor the voltmeter while slowly pressing the accelerator pedal completely down.

NOTE: APP signals are displayed in voltage and percentage on the scan tool. Although APP 1 voltage is double APP 2 voltage, the percentage display of APP 1 and APP 2 should be within 2.5% of each other during all phases of accelerator pedal travel.

Did the voltage increase smoothly with pedal travel?

Yes >> Go To 3

No >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. APP SENSOR 2

While back probing, measure the voltage of the APP Sensor 2 Signal circuit at the ECM.

Monitor the voltmeter while slowly pressing the accelerator pedal completely down.

NOTE: APP signals are displayed in voltage and percentage on the scan tool. Although APP 1 voltage is double APP 2 voltage, the percentage display of APP 1 and APP 2 should be equal during all phases of accelerator pedal travel.

Did the voltage increase smoothly with pedal travel?

Yes >> Go To 4

No >> Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. APP SENSOR WIDE OPEN THROTTLE VOLTAGE

Fully depress the accelerator pedal.

With the scan tool, read the voltage for APP Sensor 1 and APP Sensor 2.

Does the scan tool display between 4.28 and 4.70 volts for sensor 1 and 2.14 and 2.35 volts for sensor 2?

Yes >> Test Complete.

No >> Check the APP Sensor circuits for proper resistance. If o.k., replace the APP Sensor in accordance with the Service Information.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*CHECKING THE BOOST PRESSURE SENSOR CALIBRATION

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
TURBOCHARGER BOOST PRESSURE SENSOR CALIBRATION

Diagnostic Test

1. BOOST PRESSURE SENSOR CALIBRATION

Turn the ignition on.

With the scan tool, read the Boost Pressure Voltage and Boost Pressure hpa.

NOTE: The Boost Pressure hpa and Intake/Inlet Air Pressure hpa readings should both match closely to the Atmoshperic Pressure hpa reading. These readings will change depending on altitude.

Is the Boost Pressure hpa within 2% or the Atmospheric pressure hpa?

Yes >> Test Complete.

No >> Replace the Turbocharger Boost Pressure Sensor.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*CHECKING THE BOOST PRESSURE SYSTEM

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
TURBOCHARGER ASSEMBLY
BOOST PRESSURE ACTUATOR SUPPLY HOSE
BOOST PRESSURE ACTUATOR
INTAKE OR EXHAUST SYSTEM PROBLEM

1. CHECKING THE BOOST PRESSURE ACTUATOR OPERATION

Turn the ignition off.

Disconnect the Valve Block vacuum hose connector.

Connect a vacuum pump to the Boost Pressure Actuator supply port of the disconnected Valve Block vacuum hose connector. This port is attached to the Gray colored vacuum tube at the Valve Block vacuum hose connector.

While standing at the right front of the vehicle (front of engine side), observe the position of the Boost Pressure Actuator armature.

NOTE: The armature should be in the 10 o'clock position with the ignition off (armature in rest position).
While observing the armature, apply 20 inches of vacuum.

NOTE: The armature should move counterclockwise from the 10 o'clock position to the 9 o'clock position.

Is the Boost Pressure Actuator operating from the 10 o'clock to the 9 o'clock position when 20 inches of vacuum is applied?

Yes >> Go to 4

No >> Go To 2

2. CHECKING THE BOOST PRESSURE ACTUATOR SUPPLY HOSE

Check the Gray colored vacuum hose between the Valve Block hose connector and the Boost Pressure Actuator for leaks, kinks, debris or other restrictions.

NOTE: Problems with this hose will cause incorrect vacuum to the EGR Valve resulting in driveability problems.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 3

3. CHECK FOR BOOST PRESSURE ACTUATOR LINKAGE PROBLEM

Disconnect the linkage from the Boost Pressure Actuator and inspect the linkage for foreign debris, binding or damage that could cause restricted movement.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Refer to the Service Information and replace the Boost Pressure Actuator or Turbocharger Assembly as necessary.

4. CHECK FOR INTAKE AND EXHAUST SYSTEM RESTRICTIONS

Inspect the exhaust system for damaged components that could cause exhaust flow blockage.

Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections for damage, air leaks or blockage.

Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go to 5

5. CHECKING THE BOOST PRESSURE ACTUATOR OPERATION

NOTE: The engine temperature must be above 160°F for this test to be valid.

Turn the ignition off.

Disconnect the Valve Block vacuum hose connector.

Connect a vacuum pump to the Boost Pressure Actuator supply port of the disconnected Valve Block vacuum hose connector. This port is attached to the Gray colored vacuum tube at the valve Block vacuum hose connector.

Set the engine speed to 1,500 rpm.

With the scan tool, observe and note the Boost Pressure hpa reading.

While observing the scan tool, apply 15 inches of vacuum.

NOTE: The Boost Pressure hpa reading should increase more than 100 hpa as well as an audible engine tone change when 15 inches of vacuum is applied.

Does the Boost Pressure hpa reading increase more than 100 hpa when 15 inches of vacuum is applied?

Yes >> Test complete.

No >> Refer to the Service Information and replace the Turbocharger assembly.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR CALIBRATION

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
ECT SENSOR - COLD
ECT SENSOR - HOT

Diagnostic Test

1. ECT SENSOR - COLD

NOTE: The thermostat must be operating correctly for this test to be valid.

With the scan tool in Sensors, read and note the engine coolant temperature.

Using a temperature probe, measure the engine block temperature near the ECT Sensor.

NOTE: The engine temperature should be below 50°C (120°F).

Are the readings within 7°C (13°F) of each other?

Yes >> Go To 2

No >> Check the wiring and connectors associated with the ECT Sensor for corrosion, damage or other problems. Repair as necessary. If wiring and connectors are o.k., replace the Engine Coolant Temperature Sensor.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. ECT SENSOR - HOT

NOTE: The thermostat must be operating correctly for this test to be valid.

Start the engine and bring the engine to operating temperature (thermostat open).

Turn the engine off and wait 10 minutes to allow the engine temperature to stabilize.

Using a temperature probe, measure the engine block temperature near the ECT Sensor.

With the scan tool, select Engine, then Sensors and read the engine coolant temperature.

Are the readings within 7°C (13°F) of each other?

Yes >> Test Complete.

No >> Check the wiring and connectors associated with the ECT Sensor for corrosion, damage or other problems. Repair as necessary. If wiring and connectors are o.k., replace the Engine Coolant Temperature Sensor.

Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*CHECKING THE EGR SYSTEM

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
VACUUM HOSES/TUBES
VACUUM SUPPLY SYSTEM
EGR VALVE
VALVE BLOCK ASSEMBLY

1. CHECKING VACUUM AT EGR VALVE

NOTE: Ensure there are no EGR hardwire/circuit related DTC's before continuing. Existing EGR circuit related faults will cause misdiagnosis during this test.

Turn the ignition off.

Disconnect the EGR Valve vacuum supply hose.

Connect a vacuum gauge to the disconnected EGR Valve vacuum supply hose.

While observing the vacuum gauge, start and idle the engine

NOTE: The vacuum reading should be above 16 inches for 2 minutes after engine start then drop to below 2 inches.

Does the vacuum read above 16 inches for 2 minutes then drop to below 2 inches?

Yes >> Go to 2

No >> Go to 3
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. EGR VALVE

INCHES OF VACUUM APPLIED TO EGR VALVE	MAF PER CYLINDER MG/HU
10	435 — 475
15	255 — 295
20	165 — 215

NOTE: The engine temperature must be above 160°F for this test to be valid.

Turn the ignition off.

Disconnect the vacuum supply hose from the EGR Valve.

Connect a vacuum pump to the EGR Valve vacuum port.

Start the engine.

NOTE: Engine must be idling in park.

Apply 10 inches, 15 inches and 20 inches of vacuum to the EGR Valve and note the MAF readings at each of the applied vacuum steps.

NOTE: An engine tone change should also be heard when 15 inches or more vacuum is applied to the EGR Valve.

Refer to the chart and compare each of the MAF readings for each of the applied vacuum steps

Are the MAF Per Cyl mg/hu within the chart specifications for applied vacuum step?

Yes >> EGR system functioning properly. Test complete.

No >> Replace the EGR Valve.

3. CHECKING VACUUM AT VALVE BLOCK ASSEMBLY

Turn the ignition off.

Disconnect the Valve Block vacuum hose connector.

Connect a vacuum gauge to the vacuum supply port of the disconnected Valve Block vacuum hose connector. Vacuum supply is provided via the Blue colored vacuum tube at the valve Block vacuum hose connector.

While observing the vacuum gauge, start and idle the engine

NOTE: The vacuum reading should be above 22 inches with the engine idling.

Does the vacuum read above 22 inches with the engine idling?

Yes >> Go To 4

No >> Repair vacuum supply system for insufficient vacuum.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. CHECKING THE AIR CLEANER VENT HOSE

Turn the ignition off.

Disconnect the Valve Block vacuum hose connector.

Check the Black colored vacuum hose between the Valve Block hose connector and the air cleaner for kinks, debris or other restrictions.

NOTE: Problems with this hose will cause incorrect vacuum to the EGR Valve resulting in driveability problems.

Were any problems found?

Yes >> Repair or replace as necessary.

No >> Go to 5
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

5. CHECKING THE EGR VACUUM SUPPLY HOSE

Turn the ignition off.

Disconnect the Valve Block vacuum hose connector.

Check the Tan colored vacuum hose between the Valve Block hose connector and the EGR Valve for kinks, debris or other restrictions.

NOTE: Problems with this hose will cause incorrect vacuum to the EGR Valve resulting in driveability problems.

Were any problems found?

Yes >> Repair or replace as necessary.

No >> Replace the Valve Block Assembly.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

*CHECKING THE ENGINE MECHANICAL SYSTEMS

For a complete wiring diagram **Refer to Section 8W**

Possible Causes
CHECKING ENGINE MECHANICAL SYSTEMS

Diagnostic Test

1. CHECKING ENGINE MECHANICAL

NOTE: The following items should be checked as a possible cause of a Driveability or No-Start problem.

WARNING: Do not attempt to remove or separate high pressure fuel line. Attempting to do so could result in severe bodily injury or death.

Engine Valve Timing - must be within specification

Engine Compression - must be within specifications

Camshaft Lobes - check for abnormal wear

Camshaft Position Sensor - check the camshaft position sensor tooth for debris and deterioration

Crankshaft Position Sensor - check the crankshaft tone wheel for debris and deterioration

Engine Exhaust System - must be free of any restriction

Engine Drive Chains and Sprockets - must be properly positioned

Vacuum System - must operate properly and be free of any vacuum leaks

Fuel - must have adequate supply and must be free of contamination (ie. debris, water and gasoline)

Fuel Injectors - must not be plugged or restricted

Fuel Lift Pump - must operate properly (where applicable)

Fuel Injection Pump - must be producing the correct output volume and pressure

Inspect the Fuel Lines, Fuel Filter and Fuel Pressure Relief Valve for signs of restriction and leaks

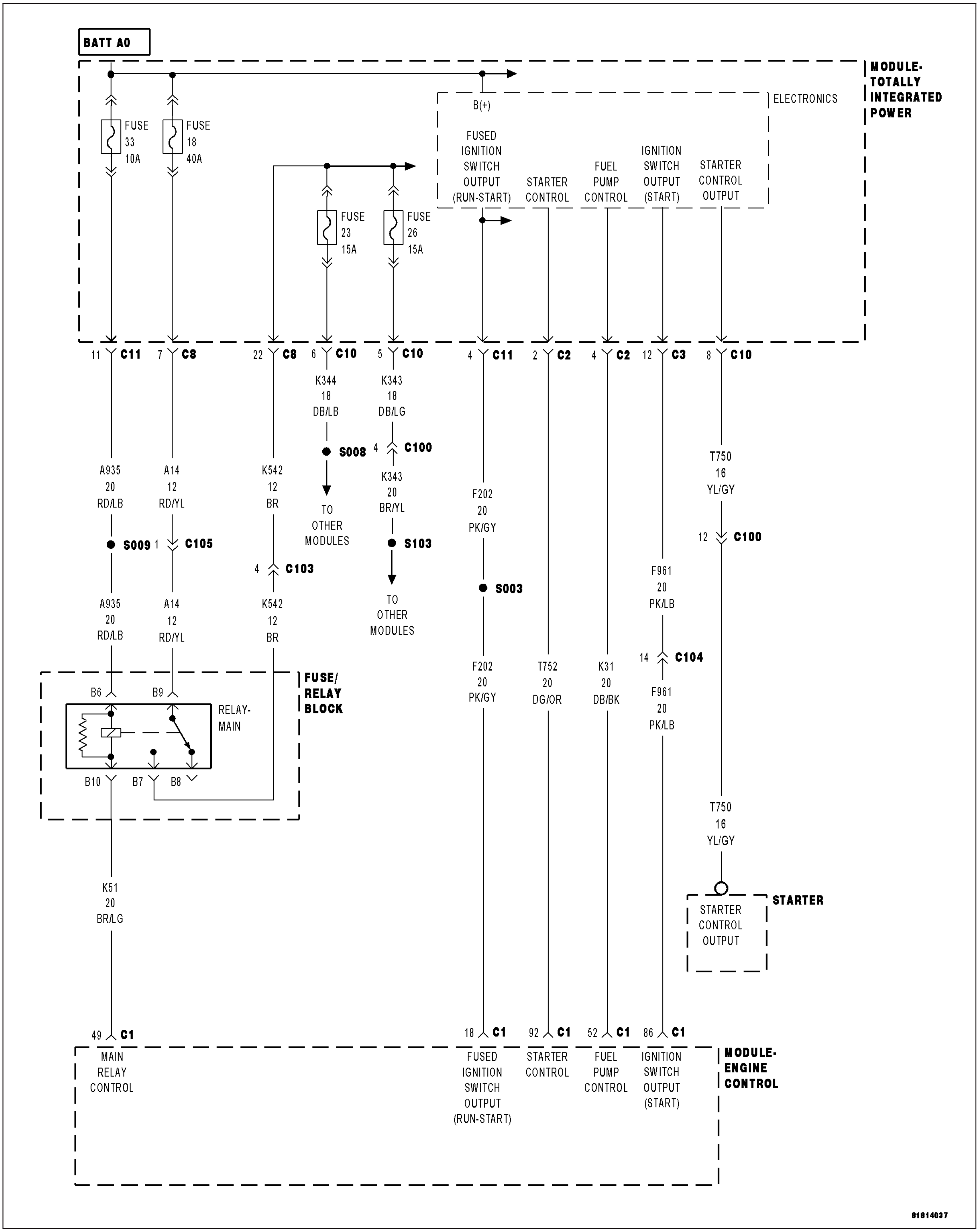
NOTE: Check for any Technical Service Bulletins that may relate to the problem.

Are there any problems evident?

Yes >> Repair as necessary.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

*CHECKING THE ECM POWER AND GROUND CIRCUITS



Possible Causes
MAIN RELAY CONTROL CIRCUIT OPEN
MAIN RELAY OUTPUT CIRCUIT(S) OPEN
CHECKING THE MAIN RELAY SYSTEM
ECM GROUND CIRCUIT(S) OPEN
FUSED MAIN RELAY BATTERY SUPPLY CIRCUIT OPEN
FUSED IGNITION SWITCH (START) OUTPUT CIRCUIT OPEN
FUSED IGNITION SWITCH (START/RUN) OUTPUT CIRCUIT OPEN
SUBSTITUTE MAIN RELAY
MAIN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE

Diagnostic Test

1. ECM GROUND CIRCUIT(S) OPEN

NOTE: Before checking the ECM Power and Grounds, check the Totally Integrated Power Module (TTIPM) for DTC's. Repair all TTIPM ignition switch or power supply related DTC's before continuing with this test.

Turn the ignition off.

Disconnect the ECM harness connectors.

Using a 12-volt test light connected to 12-volts, check each of the ECM ground circuits in ECM harness connector C1 cavities 1, 2 and 4.

Did the test light illuminate for each cavity?

Yes >> Go To 2

No >> Repair the ECM Ground circuit(s) for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

2. FUSED IGNITION SWITCH START OUTPUT CIRCUIT OPEN

Turn the ignition to the Start position.

Using a 12-volt test light connected to ground, check the Fused Ignition Switch Start Output circuit in ECM harness connector C1 cavity 86.

Is the test light on?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Start Output circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

3. FUSED IGNITION SWITCH START/RUN OUTPUT CIRCUIT OPEN

Turn the ignition to the Start position.

Using a 12-volt test light connected to ground, check the Fused Ignition Switch Start/Run Output circuit in ECM harness connector C1 cavity 18.

Turn the ignition to the Run position.

Using a 12-volt test light connected to ground, check the Fused Ignition Switch Start/Run Output circuit in ECM harness connector C1 cavity 18.

Is the test light on for both ignition switch positions?

Yes >> Go To 4

No >> Repair the Fused Ignition Switch Start/Run Output circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

4. CHECKING THE MAIN RELAY SYSTEM

Turn the ignition off.

Connect a jumper wire between ground and the Main Relay Control circuit in ECM C1 harness connector cavity 49.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the Fused Main Relay Output circuits at the ECM C1 harness connector cavities 3, 5 and 6.

Does the test light illuminate brightly for each circuit?

Yes >> Test Complete.

No >> Go To 5

5. FUSED MAIN RELAY BATTERY SUPPLY CIRCUIT OPEN

Turn the ignition off.

Remove the Main Relay.

Using a 12-volt test light connected to ground, check both Fused Main Relay Battery Supply circuits in Main Relay connector.

Is the test light on?

Yes >> Go To 6

No >> Repair the Fused Main Relay Battery Supply circuit(s) for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

6. MAIN RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between cavity B7 and cavity B9 in the Main Relay connector.

Using a 12-volt test light connected to ground, check the Main Relay Output circuit in ECM harness connector C1 cavities 3, 5 and 6.

Did the test light illuminate for each circuit?

Yes >> Go To 7

No >> Repair the Main Relay Output circuit(s) for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

7. MAIN RELAY

Turn the ignition off.

Install a known good relay in place of the Main Relay.

Connect a jumper wire between ground and the Main Relay Control circuit in ECM C1 harness connector cavity 49.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the Fused Main Relay Output circuits at the ECM C1 harness connector cavities 3, 5 and 6.

Did the test light illuminate brightly for each circuit?

Yes >> Replace the Main Relay.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Go To 8

8. MAIN RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Remove the Main Relay.

Measure the resistance of the Main Relay Control circuit between the Main Relay connector and the ECM harness connector.

Is the resistance below 10.0 ohms?

Yes >> Go To 9

No >> Repair the Main Relay Control circuit for an open.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

9. MAIN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE

Connect a jumper wire between cavity B7 and cavity B9 of the Main Relay connector.

Turn the ignition on.

Measure the voltage on the Main Relay Control circuit.

Is the voltage above 1.0 volt?

Yes >> Repair the Main Relay Control circuit for a short to voltage.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

*INTERMITTENT DTC

For a complete wiring diagram **Refer to Section 8W**

Diagnostic Test

1. INTERMITTENT DTC

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

The conditions necessary to set this DTC are not present at this time.

Review the scan tool environmental data. If possible, try to duplicate the conditions under which the DTC set.

If applicable, actuate the component with the scan tool.

Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

Look for the data to change, the actuation to be interrupted, or for the DTC to reset during the wiggle test.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Turn the ignition off.

Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected component and the ECM.

Inspect and clean all ECM, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a schematic and inspect any common ground or supply circuits.

For intermittent Misfire DTCs check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt.

Use the scan tool to perform a System Test if one applies to the component.

A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

Were any problems found during the above inspections?

Yes >> Perform the necessary repairs.
Perform the ECM Verification Test Ver. 1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Test Complete.

PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. NO RESPONSE

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red.

Does the scan tool display a Vehicle Network problem or NO RESPONSE condition?

Yes >> Refer to the appropriate BUS Communication test in Section 8 ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS.

No >> Go To 2

2. NO START

Does the vehicle have a NO START condition?

Yes >> Check the vehicle for any DTC(s), including Vehicle Theft Security related DTC(s), that may cause a no-start condition.

If no DTC(s) are present that relate to a no-start condition, refer to the Non DTC Diagnostic Procedures that relate to Fuel and Starting.

No >> Go To 3

3. VEHICLE REPAIR HISTORY AND TSB(s)

Check the vehicle repair history for repairs that may relate to the current condition.

Inspect the vehicle for aftermarket accessories that may have been installed incorrectly.

Check for any TSB(s) related to the condition or DTC(s).

If a TSB applies, follow the procedure outlined in the TSB.

Select the appropriate response for the condition that applies:

Performing a TSB procedure repaired the condition.
Test Complete.

Perform the ECM Verification Test Ver. 1.

A DTC is present, no TSB applies, or the TSB didn't repair the condition.
Go To 4

No DTC(s) or conditions are present.
Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

4. VEHICLE INSPECTION

WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

Based on the diagnostic condition that applies, review the following list and perform any tests that relate to the condition:

If multiple DTCs are set in the ECM, review the wiring schematics for problems in any shared supply or ground circuits. Refer to the diagnostic procedure for Checking the ECM Power and Ground Circuits.

Inspect the air intake system and turbocharger related tubes for damage, restriction, or poor connection.

Inspect the exhaust system and related tubes for damage, restriction, or poor connection.

Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause an air flow restriction.

If the ECM detects and stores a DTC, the ECM also stores the environmental conditions under which the DTC was set.

Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.

With the scan tool, Clear the stored DTC(s).

Attempt to duplicate the environmental conditions under which the DTC was set.

Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the vehicle conditions under which the DTC conditions will be monitored. Operate the vehicle under those conditions.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the component and the module.

If the DTC(s) are fuel or air related, check the fuel level and quality.

Were any repairs made that corrected the DTC or condition?

Yes >> Test complete.
Perform the ECM Verification Test Ver. 1.

No >> Refer to the diagnostic test procedure related to the DTC.

STANDARD PROCEDURE

ECM VERIFICATION TEST

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SELECT THE PROPER VERIFICATION TEST

Select the verification test for the repair that has been completed:

Speed Control repair
Go To 2

Charging System repair
Go To 3

No Start repair
Go To 4

DTC and all other repairs
Go To 5

2. SPEED CONTROL VERIFICATION TEST

1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.

2. With the scan tool, erase all diagnostic trouble codes (DTCs).

3. Road test the vehicle at a speed above 60 km/h (35 MPH).

4. Turn the speed control ON/OFF switch on.

5. Depress and release the SET switch. If the speed control does not engage, the repair is not complete, continue with step 12.

6. Quickly depress and release the RESUME/ACCEL switch. If the vehicle speed does not increase by 3 km/h (2 MPH), the repair is not complete, continue with step 12.

7. Using caution, depress and release the brake pedal. If the speed control does not disengage, the repair is not complete, continue with step 12.

8. With the vehicle speed at least 60 km/h (35 MPH), depress the RESUME/ACCEL switch. If the speed control does not resume at the previously set speed, the repair is not complete, continue with step 12.

9. Hold down the COAST switch. If the vehicle does not decelerate, the repair is not complete, continue with step 12.

10. While still holding down the COAST switch, ensure the vehicle speed is at least 60 km/h (35 MPH) and release the COAST switch. If the vehicle does not adjust and set a new vehicle speed, the repair is not complete, continue with step 12.

11. With the speed control engaged, depress the ON/OFF switch. If the speed control does not disengage, the repair is not complete, continue with step 12.

12. If the vehicle did not successfully perform all of the previous steps, check for Technical Service Bulletins (TSBs) that pertain to this speed control problem and then, if necessary, return to the Symptom List.

13. If the vehicle successfully performed all of the previous steps, the speed control system is now functioning as designed. The repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

3. CHARGING SYSTEM VERIFICATION TEST

1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. With the scan tool, erase all diagnostic trouble codes (DTCs).
3. Start the engine.
4. Raise the engine speed to 2000 RPM for at least 30 seconds.
5. Allow the engine to idle.
6. Turn the ignition off for 20 seconds.
7. Turn the ignition on.
8. With the scan tool, read ECM DTCs.
9. If this DTC has set again, or another DTC has set, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary.
10. If the charging system is functioning correctly and there are no DTCs, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

4. NO START VERIFICATION TEST

NOTE: IMPORTANT! If the Engine Control Module or Sentry Key Immobilizer Module has been replaced, ensure the programming procedure for the module has been performed in accordance with the Service Information.

2. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
3. Inspect the engine oil for contamination. If it is contaminated, change the oil and filter.
4. With the scan tool, erase all diagnostic trouble codes (DTCs).
5. Turn the ignition off for at least 10 seconds.
6. Attempt to start the engine.
7. If the engine is unable to start, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary.
8. If the engine starts and continues to run, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

5. ROAD TEST VERIFICATION TEST

1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. If not, proceed to step 5.
3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete.
4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary.
5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue.
6. If the Engine Control Module (ECM) has been replaced, continue with step 9.
7. With the scan tool, erase all diagnostic trouble codes (DTCs), then disconnect the scan tool.
8. Turn the ignition off for at least 10 seconds.
9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11.
10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position.
11. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Relay Control Circuit, drive the vehicle for at least 5 minutes with the A/C on.
12. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue.
13. Upon completion of the road test, turn the engine off and check for DTCs with the scan tool.
14. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete.

Are any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to the appropriate diagnostic procedure.

No >> Repair is complete.

ENGINE 1.8L WORLD

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ENGINE 1.8L WORLD

DESCRIPTION

The 1.8 Liter (110 cu. in.) in-line four cylinder engine is a double over head camshaft with mechanical lash buckets and four valves per cylinder design. This engine is NOT free-wheeling; meaning that the pistons will contact the valves in the event of a timing chain failure.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the rear of the cylinder block.

DIAGNOSIS AND TESTING

INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to the Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Engine Cylinder Head Gasket Failure Diagnosis
- Lash Adjuster Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing chain.
ENGINE STALLS OR IDLES ROUGH	1. Incorrect fuel mixture.	1. (Refer to Appropriate Diagnostic Information)
	2. Intake manifold leakage.	2. Inspect intake manifold, manifold gasket, and vacuum hoses.
	3. Faulty ignition coil(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
VALVETRAIN NOISE	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Dirt in lash adjusters.	5. Replace rocker arm/hydraulic lash adjuster assembly.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn lash adjusters.	7. Install new rocker arm/hydraulic lash adjuster assembly.
	8. Worn valve guides.	8. Replace cylinder head.
	9. Excessive runout of valve seats on valve faces.	9. Grind valves, replace cylinder head.
	10. Missing adjuster pivot.	10. Replace rocker arm/hydraulic lash adjuster assembly.

CONDITION	POSSIBLE CAUSES	CORRECTION
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Misaligned connecting rods.	7. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level.	1. Check engine oil level.
	2. Faulty oil pressure switch.	2. Install new oil pressure switch.
	3. Low oil pressure.	3. Check sending unit and main bearing oil clearance.
	4. Clogged oil filter.	4. Install new oil filter.
	5. Worn parts in oil pump.	5. Replace worn parts or pump.
	6. Thin or diluted oil.	6. Change oil to correct viscosity.
	7. Oil pump relief valve stuck.	7. Remove valve and inspect, clean, or replace.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	2. Loose fastener, broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Misaligned or deteriorated cup or threaded plug.	3. Replace as necessary.
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Replace cylinder head.
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.
3. Remove engine cover.
4. Disconnect coil electrical connectors and remove coils.
5. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
6. Disconnect injector electrical connectors.
7. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).
8. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
9. Repeat the previous step for all remaining cylinders.
10. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
11. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
12. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders, between a cylinder and the adjacent water jacket or from an oil passage to the exterior of the engine.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:
   - Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
   - Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
   - Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

   - Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
   - If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.

3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
    a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    b. Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as previously described.

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

STANDARD PROCEDURE

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).
6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.

13. Start engine and check for any leaks.

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces.

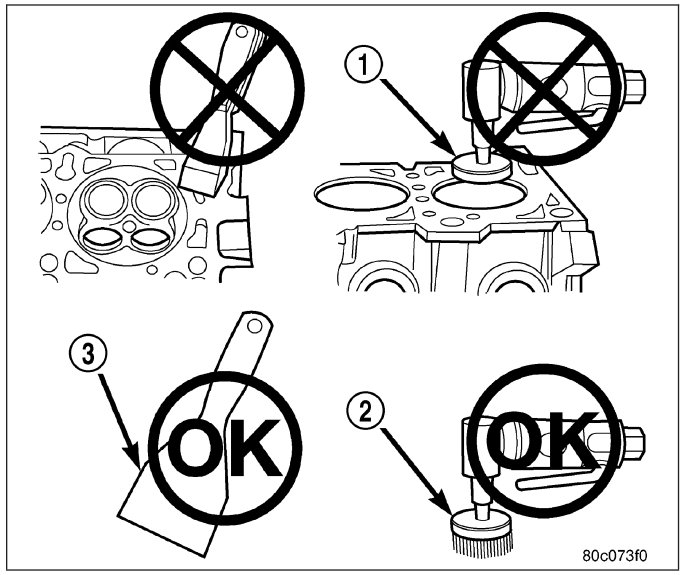
ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.



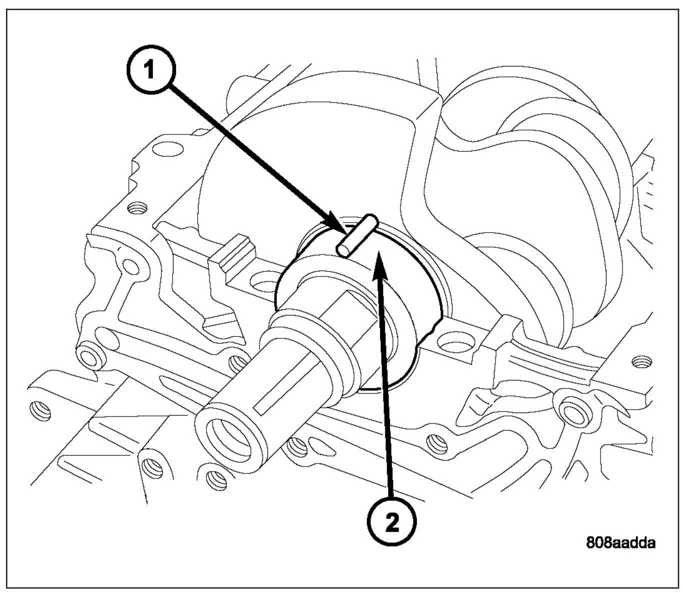
Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:



1. Remove oil film from surface to be checked. Plastigage is soluble in oil.
2. Place a piece of Plastigage across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes. (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.
3. Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Compare clearance measurements to specs found in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

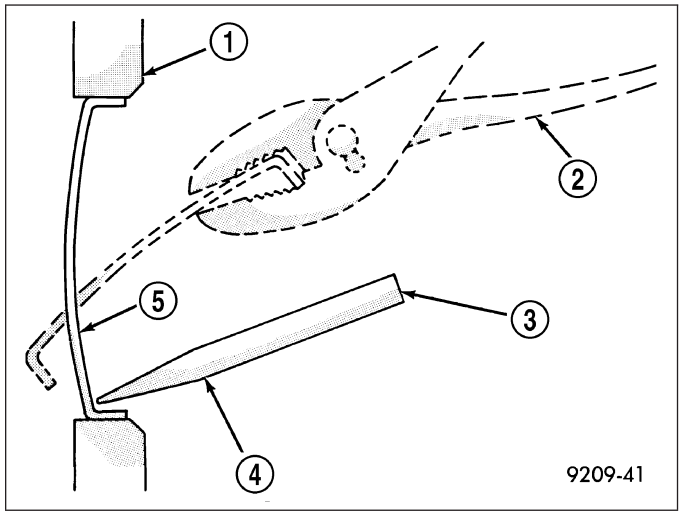
NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

4. Install the proper crankshaft bearings to achieve the specified bearing clearances.

CYLINDER HEAD CORE PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug.

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

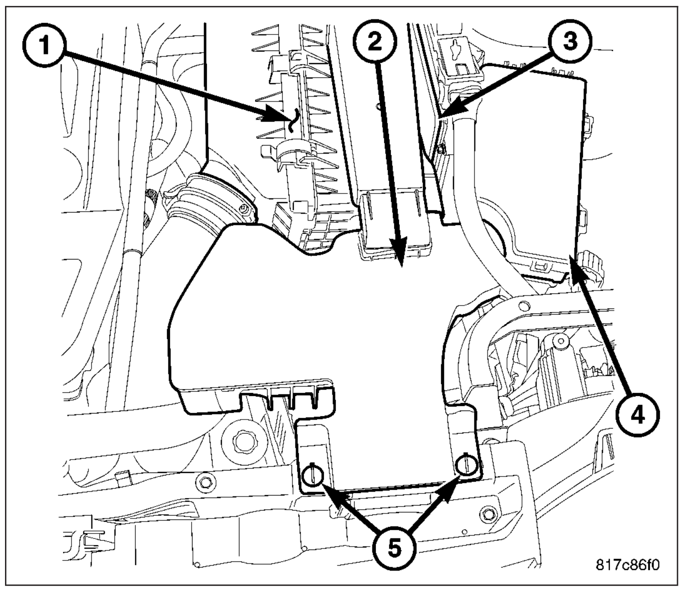


Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

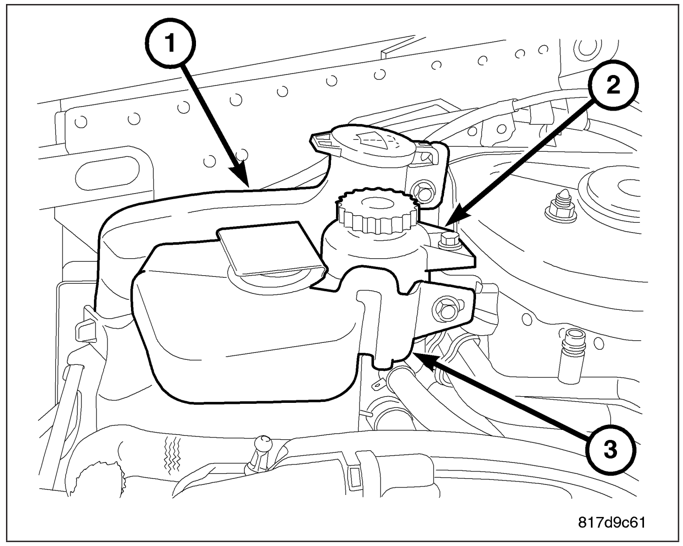
It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

REMOVAL - ENGINE ASSEMBLY

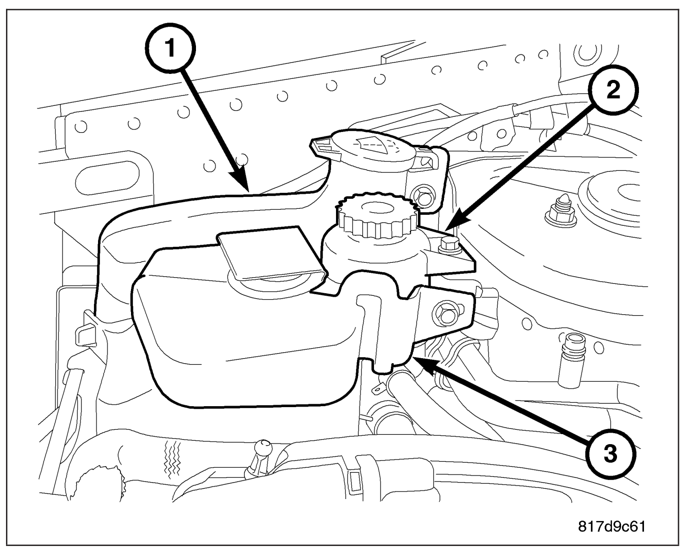
1. Perform fuel pressure release procedure, then disconnect and remove fuel line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Remove air cleaner housing assembly (1) and clean air hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect both cables from battery.
4. Remove battery and battery tray.
5. Discharge air conditioning system, if equipped (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).
6. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



7. Remove coolant reservoir (3).
8. Remove grill trim panel.
9. Remove upper radiator hose from radiator and coolant manifold.
10. Remove upper radiator hose support.
11. Remove lower radiator hose at coolant manifold.
12. Remove coolant hose from coolant manifold.
13. Disconnect the following electrical connectors, Variable Valve Timing Solenoids, oil temperature sensor, injectors, map, coils, cam position sensors, coolant temperature sensors, capacitor, oxygen sensor, intake air temperature sensor.
14. Remove air intake tube from throttle body.
15. Remove vacuum lines from throttle body.
16. Unclip harness from intake.

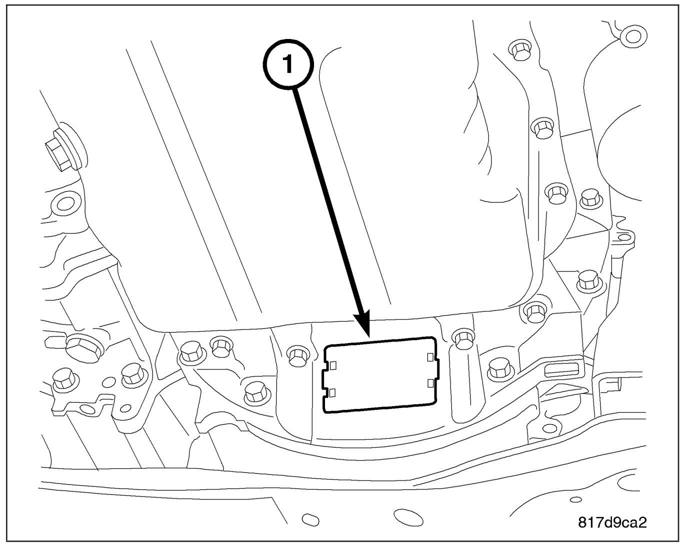


17. Disconnect electronic throttle control and manifold flow control valve electrical connectors.
18. Remove PCV hose from valve cover.
19. Remove dipstick.
20. Remove throttle body support bracket.
21. Remove intake bolts and remove intake.
22. Disconnect coolant temperature sensor at block, Knock sensor, oil pressure sensor, generator, starter, block heater, A/C compressor, and block ground.
23. Remove accessory drive belt.
24. Remove power steering reservoir (2).
25. Remove power steering line support.
26. Remove power steering pump and set aside.
27. Remove upper idler pulley.
28. Remove transaxle filler tube.
29. Disconnect transmission linkage and electrical connectors.
30. Remove transmission vent hose.
31. Remove ground strap near right tower.
32. Remove rear heat shield.
33. Remove maniverter heat shields.
34. Raise vehicle.
35. Remove wheels.
36. Remove right front splash shield.
37. Remove axle nuts.

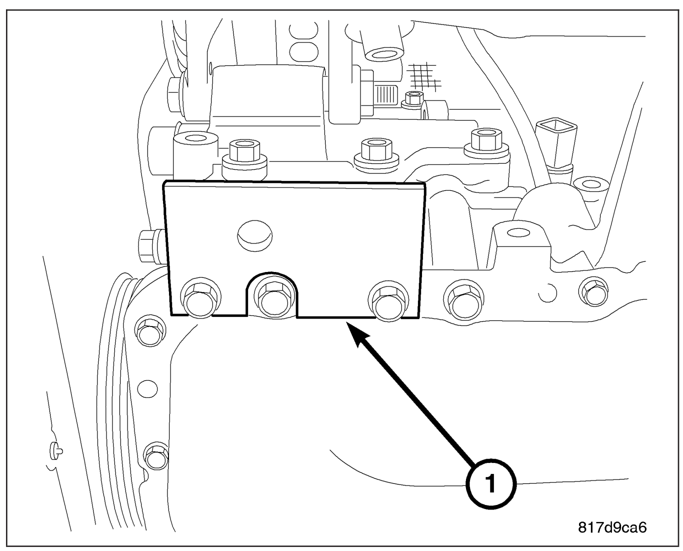


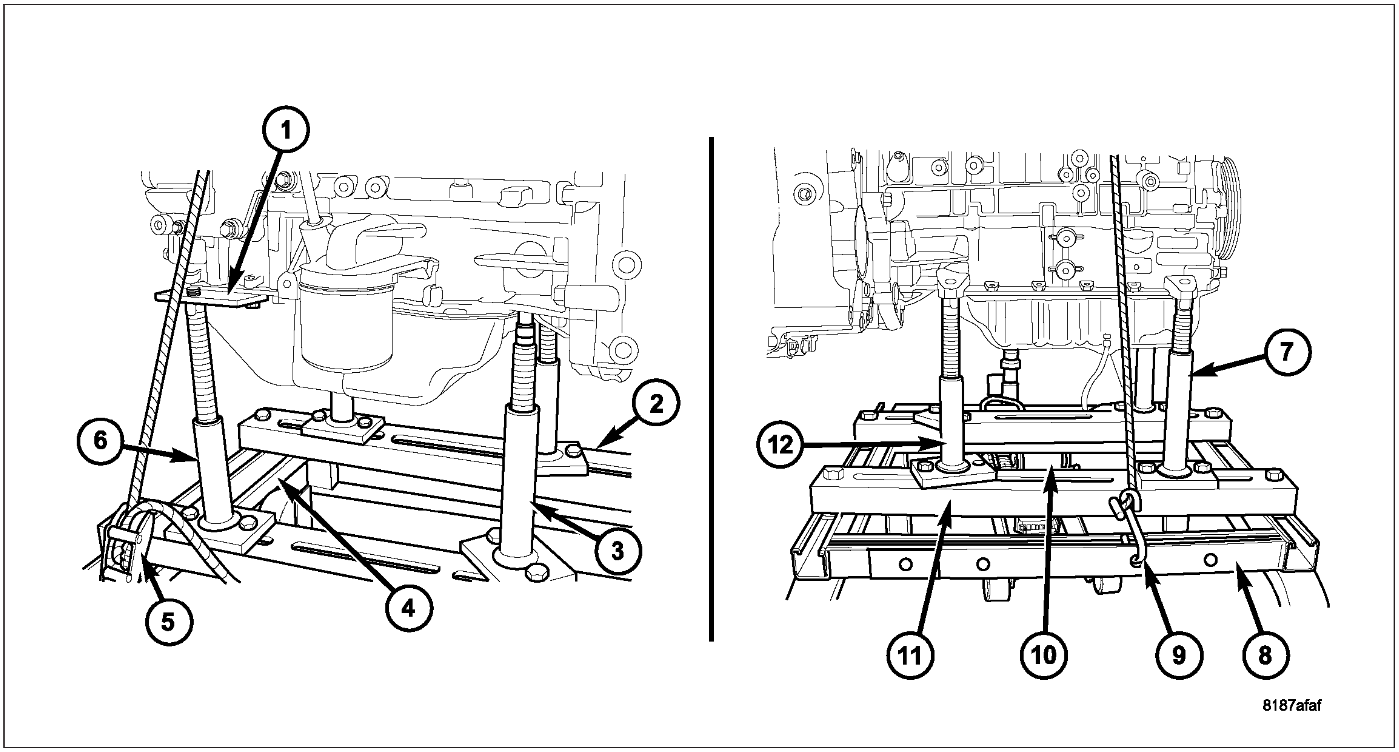
38. Remove ball joint pinch bolts and separate steering knuckle from ball joint.
39. Remove axles.
40. Drain oil.
41. Mark drive shaft and flange.
42. Remove carrier bearing and heat shield.
43. Remove driveshaft.
44. Remove exhaust pipe to maniverter bolts.
45. Remove maniverter support bracket.
46. Lower vehicle.
47. Remove coolant manifold.
48. Remove maniverter bolts.

49. Remove maniverter to left of engine.
50. Hoist up.
51. Remove front mount through bolt.
52. Remove crossmember.
53. Remove front mount bracket.
54. Remove rear mount through bolt.
55. Remove rear mount.
56. Remove rear mount bracket.
57. Pull engine forward and support.
58. Remove PTU assembly (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).
59. Remove inspection cover and mark torque converter to flywheel.
60. Remove torque converter bolts.
61. Remove lower bell housing bolts.
62. Remove A/C lines from compressor and remove A/C compressor.
63. Remove A/C mounting bracket.



64. Install Adapter 9704.
65. Remove generator and lower idler pulley.
66. Disconnect transmission electrical connector.
67. Disconnect CKP electrical connector.
68. Remove coolant hoses at transaxle cooler.
69. Remove transaxle cooler lines from cooler.

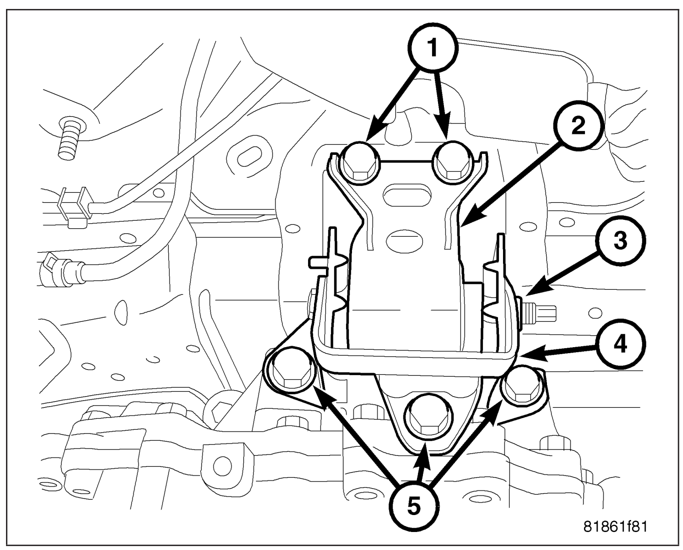




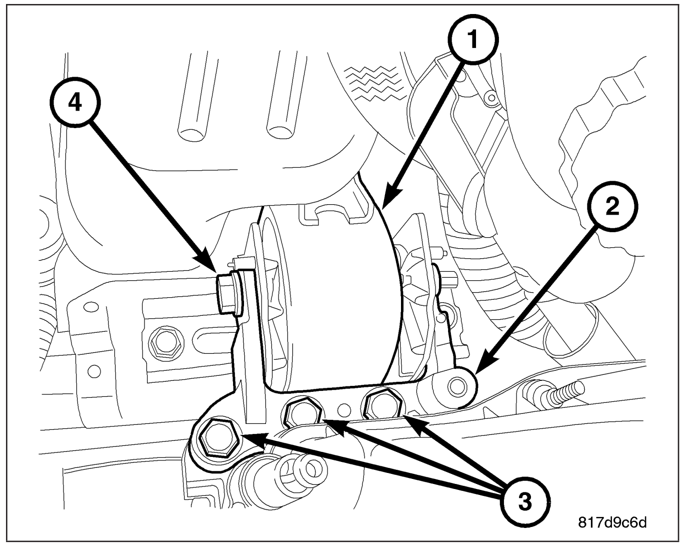
70. Position dolly under engine and lower vehicle.

WARNING: Safety straps MUST be used.

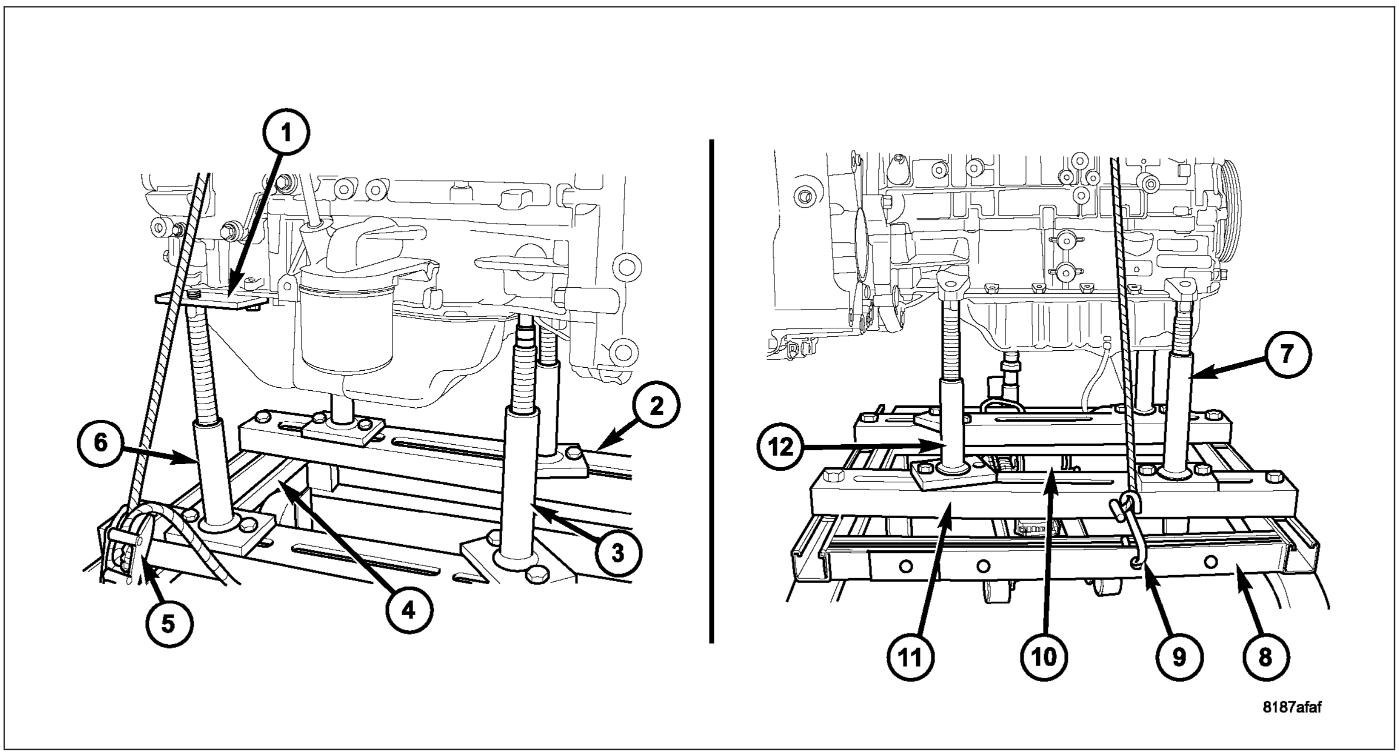
71. Install safety straps.
72. Remove PCM bracket and set aside.
73. Remove left engine mount through bolt (3).



74. Remove right engine mount through bolt (4).
75. Raise vehicle away from engine and transaxle.
76. Separate engine from transaxle.



INSTALLATION - ENGINE ASSEMBLY



1. Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.
2. Continue lowering vehicle until engine/transaxle aligns to mounting locations.
3. Install mounting bolts at the right and left engine/transaxle mount bolts and Tighten bolts to 118 N·m (87 ft. lbs.).
4. Install mounting bolts at the right and left engine/transaxle mount bolts and Tighten bolts to 118 N·m (87 ft. lbs.).
5. Remove safety straps from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly and cradle.
6. Remove Adapter 9704.
7. Install pcm bracket.
8. Install maniverter assembly and upper lower heat shields.
9. Install oxygen sensor and connect electrical connector.
10. Install coolant manifold assembly.

11. Install transaxle linkage and adjust as necessary.
12. Install transaxle vent hose.
13. Connect transaxle range sensor electrical connector.
14. Connect TIS and TOS electrical connectors.
15. Install Ground strap near right strut tower.
16. Raise vehicle.
17. Pull engine forward and restrain engine.

NOTE: Be sure to install O-ring prior to installing PTU assembly.

18. Install PTU.
19. Remove engine restraint.
20. Install front mount bracket and tighten bolts.
21. Install frame cross member.
22. Install front engine mount.
23. Install rear mount bracket.
24. Install rear mount and tighten bolts.
25. Connect CKP electrical connector.
26. Install maniverter to exhaust pipe bolts and tighten.
27. Align driveshaft marks and install and heat shield.
28. Install generator
29. Install A/C bracket.
30. Install A/C lines on compressor and install compressor.
31. Install lower bell housing bolts and tighten.
32. Align torque converter and flex plate mark and install torque converter bolts and tighten.
33. Install inspection cover.
34. Install transaxle connector.
35. Connect trans cooler lines.
36. Install coolant hoses at transmission cooler.
37. Install axles.
38. Install ball joint pinch bolts and tighten.
39. Install axle nuts and tighten.
40. Install splash shields.
41. Install wheels.
42. Install new oil filter.
43. Lower vehicle.
44. Install transaxle filler tube.
45. Install upper idler pulley.
46. Install power steering pump.
47. Install power steering line support bracket.
48. Install power steering pump.
49. Install accessory drive belt.
50. Connect electrical connectors at block ground, starter, A/C compressor, knock sensor, Oil pressure sensor, generator, Coolant temperature sensor at block, and block heater.
51. Install intake manifold. Install intake manifold retaining bolts and tighten.
52. Install throttle body support bracket.
53. Install engine oil dip stick.
54. Install PCV hose to valve cover.

55. Connect manifold flow control valve and electronic throttle control electrical connectors and fasten harness to intake.
56. Install vacuum lines at throttle body.
57. Install intake air tube on throttle body.
58. Connect variable valve timing solenoids, oil temperature sensor, coolant temperature sensor, intake air temperature sensor, injectors, coils, manifold absolute pressure sensor, cam position sensors, oxygen sensor, and capacitor electrical connectors.
59. Install upper radiator support bracket.
60. Install coolant hoses at coolant manifold.
61. Install grill trim panel.
62. Install coolant reservoir and connect hose.
63. Connect fuel line to fuel rail.
64. Install battery tray and battery.
65. Connect battery cables.
66. Install air cleaner housing and connect inlet air hose.
67. Install fresh air inlet.
68. Fill with coolant.
69. Fill with oil.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

70. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
71. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).
72. Start engine and check for leaks.

SPECIFICATIONS

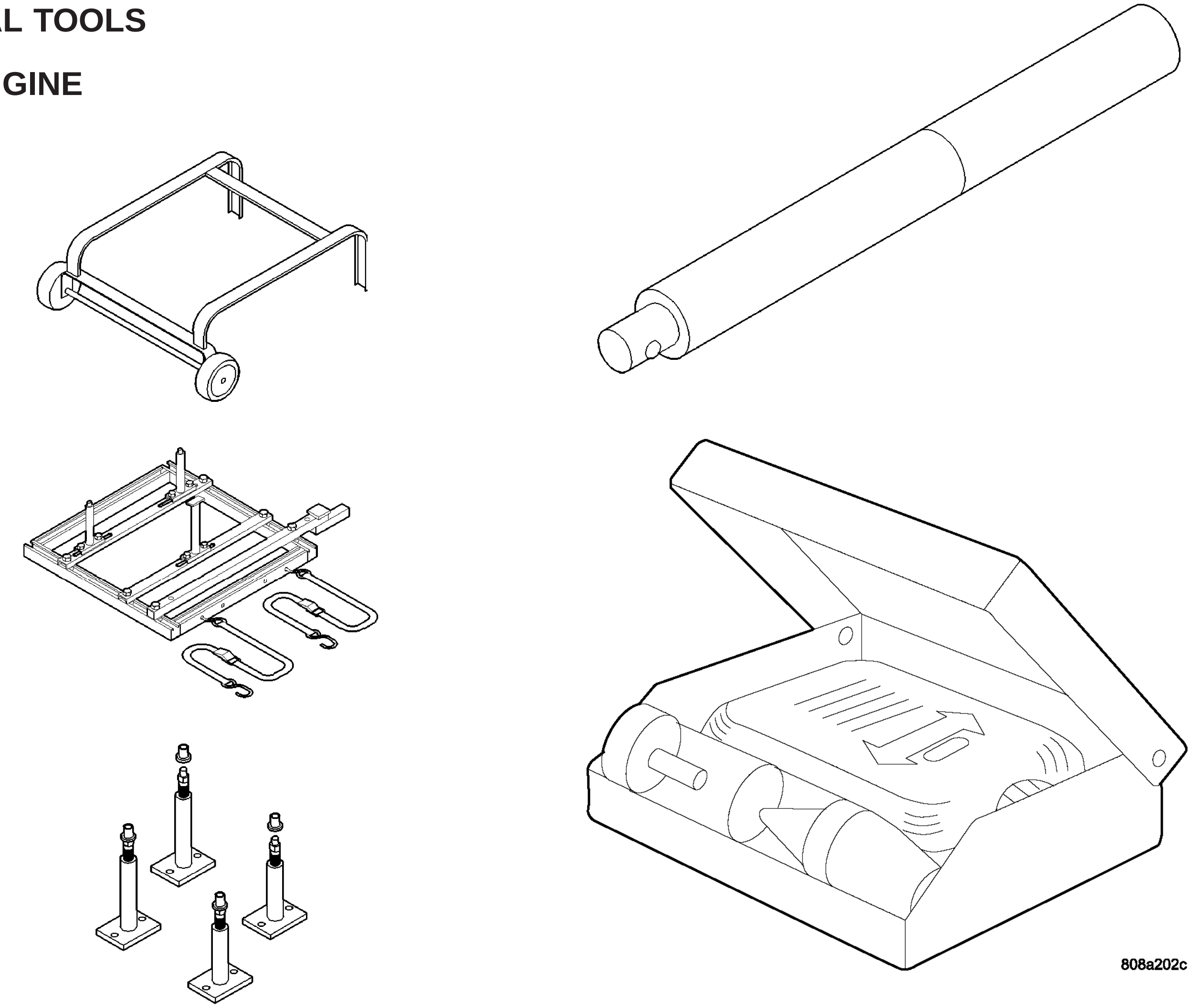
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Balance Shaft Module	22 +90°	16 +90°	-
Camshaft Sprocket-Bolt	40	30	-
Camshaft Bearing Cap-Bolts			
Front Bearing Cap-Bolts	34	25	-
Bearing Cap-Bolts	12	-	105
Connecting Rod Cap-Bolts	20 +90°	15 +90°	-
Crankshaft Main Bearing Cap-Bolts	27 + 45°	20 + 45°	-
Crankshaft Damper-Bolt	210°	155	-
Cylinder Head-Bolts	Refer to Procedure		
Cylinder Head Cover-Bolts	10	-	90
Engine Support Bracket-Bolts	40	30	-
Exhaust Manifold-Bolts	34	25	-
Exhaust Manifold Heat Shield-Bolts	9	-	80
Flex Plate to Crankshaft-Bolts	95	70	-
Intake Manifold	24	18	-
Ladder Frame	28	21	-

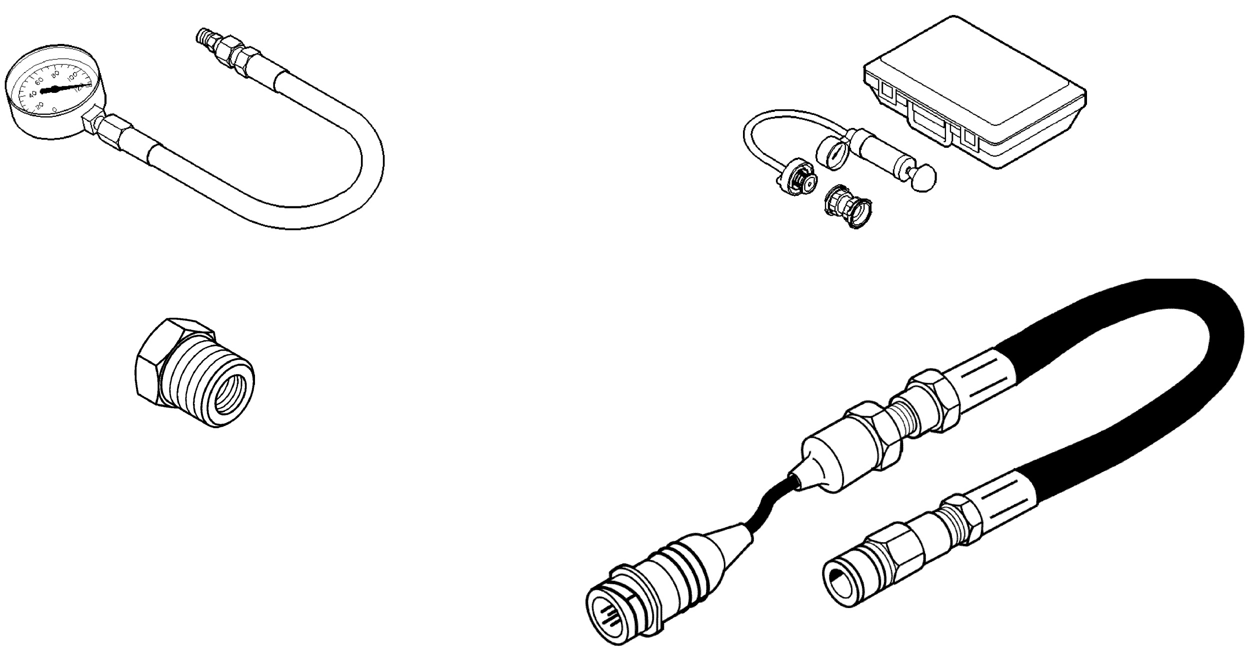
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Oil Cooler Connector Bolt	49	36	-
Oil Filter	14	10	-
Oil Filter Nipple	49	36	-
Oil Jet Fastener	12	-	105
Oil Pan-Bolts			
M6 Bolts	12	-	105
M8 Bolts	24	18-	-0
Oil Pan Drain-Plug	40	30	-
PCV Valve	5	-	40
Spark Plugs	27	20	-
Timing Chain Cover			
M6 Bolts	12 N·m	-	105
M8 Bolts	23 N·m	17	-
Timing Chain Tensioner Assembly-Bolts	12 N·m	-	105
Timing Chain Guides	12 N·m	-	105

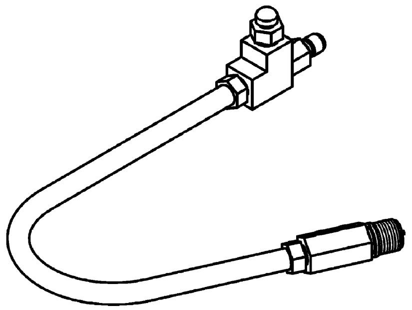
SPECIAL TOOLS

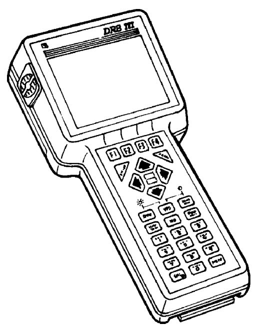
2.4L ENGINE

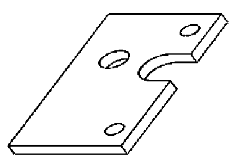


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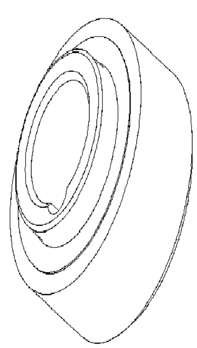




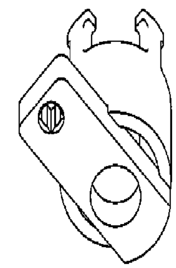




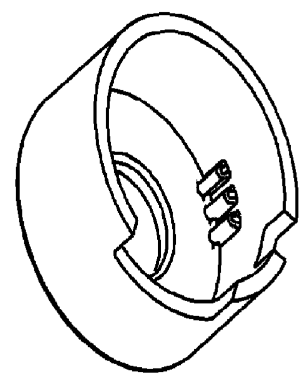
ENGINE LIFT FIXTURE 9704



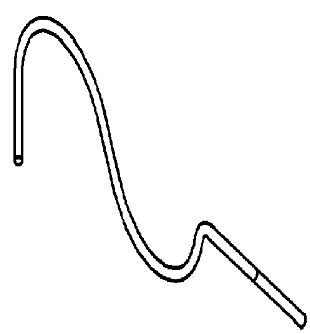
FRONT SEAL INSTALLER 9506



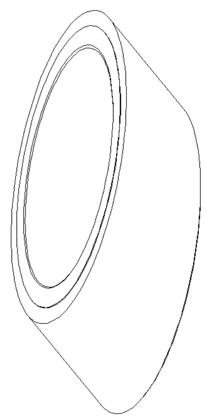
HOLDING FIXTURE 9707



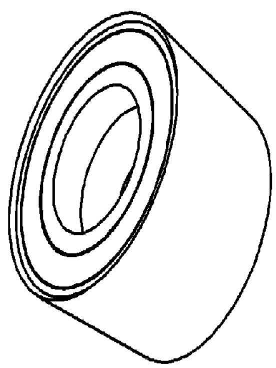
1.8L SPROCKET HOLDER 9711



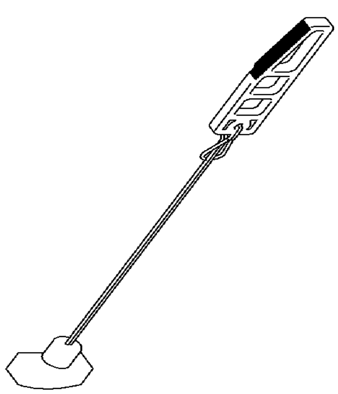
TENSIONER PIN 9703



REAR MAIN SEAL DRIVER 9706



REAR CRANKSHAFT SEAL GUIDE 9509

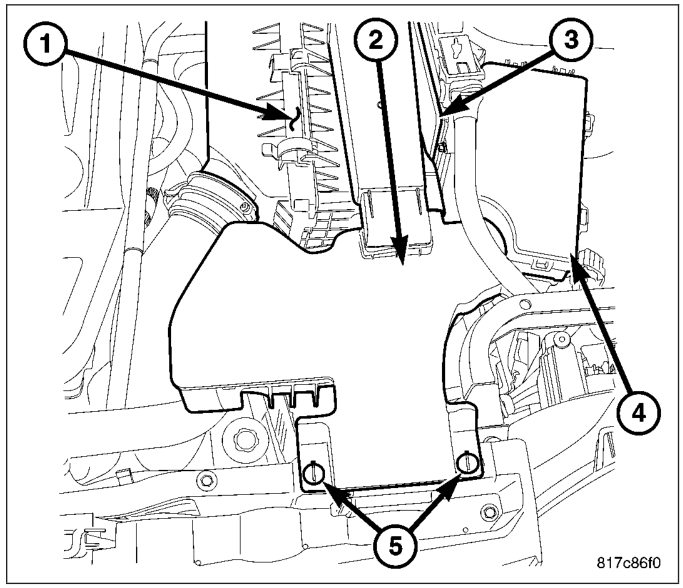


LOCKING WEDGE 9701

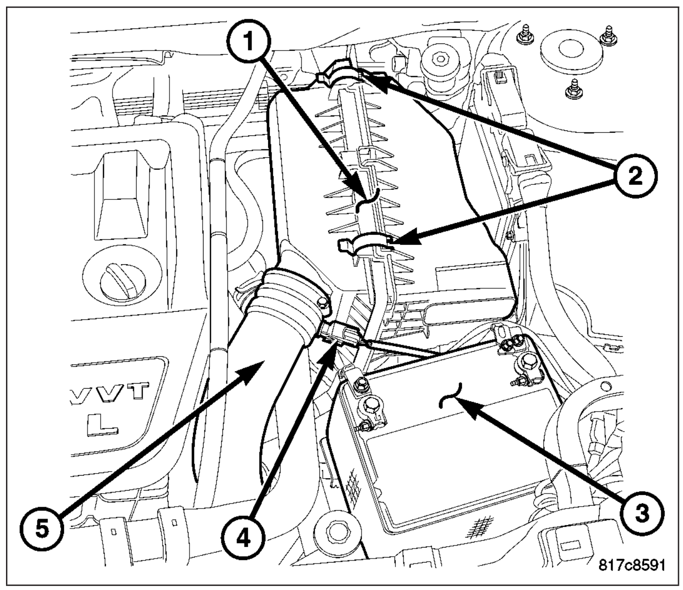
ELEMENT-AIR CLEANER

REMOVAL

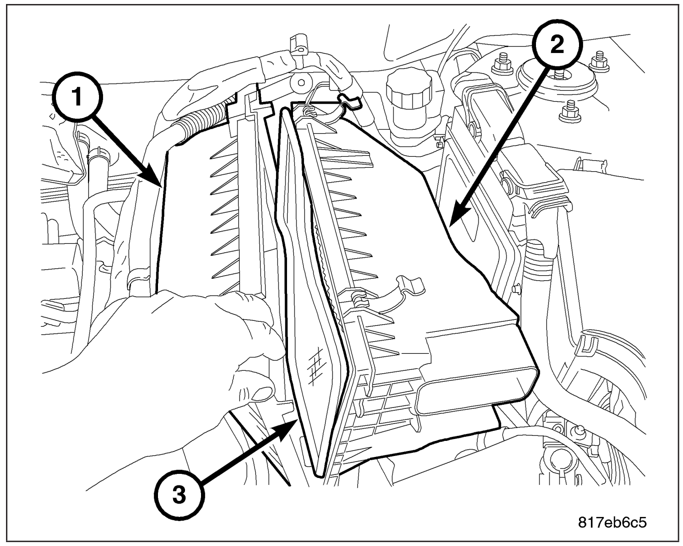
1. Turn Lock Retainers (5) and remove fresh air inlet (2) from air cleaner housing (1).



2. Disconnect intake air temperature sensor connector (4).
3. Remove Air inlet tube (5) from air cleaner housing (1).
4. Unfasten clasps (2) on sides of air cleaner housing cover (1).

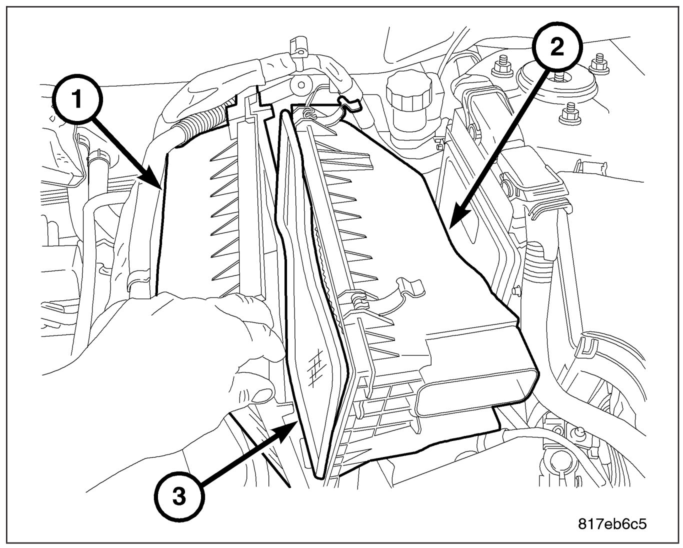


5. Pull air cleaner cover (1) aside.
6. Remove filter element (3).
7. If necessary, clean the inside of the air cleaner housing (2).

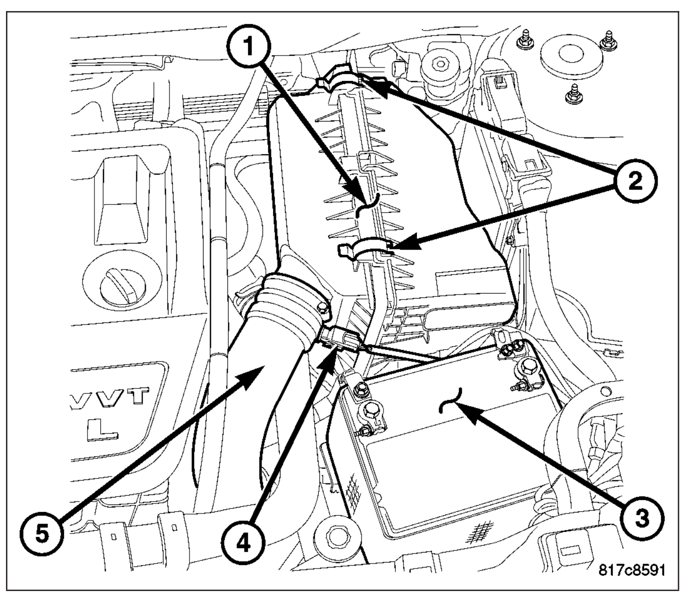


INSTALLATION

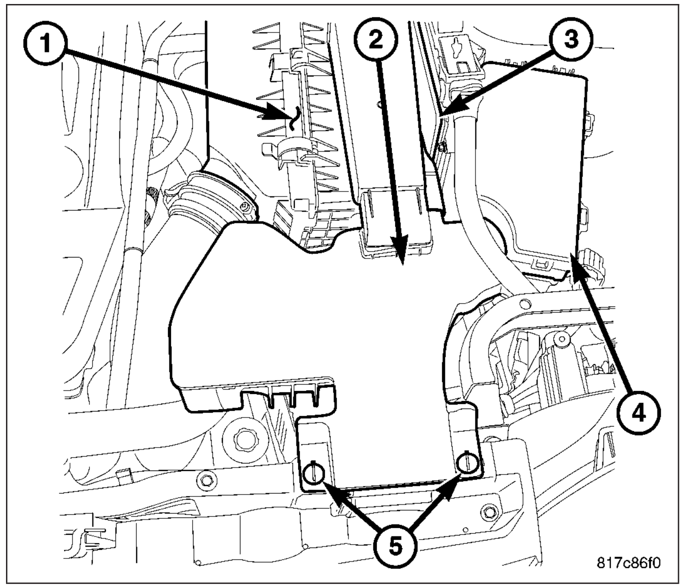
1. Install new filter element.



2. Place cover over air cleaner housing. Snap clasps (2) in place.
3. Install air inlet tube (5).
4. Connect intake air temperature sensor connector (4).



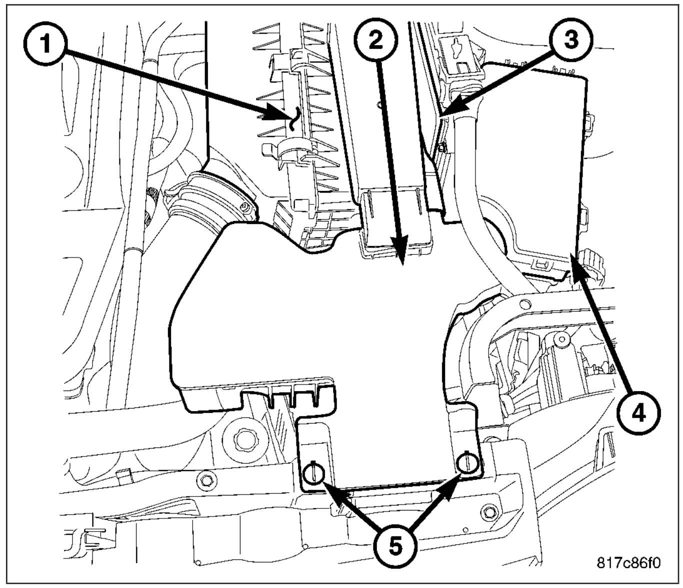
5. Install fresh air inlet (2) on air cleaner housing (1) and lock retainers (5).



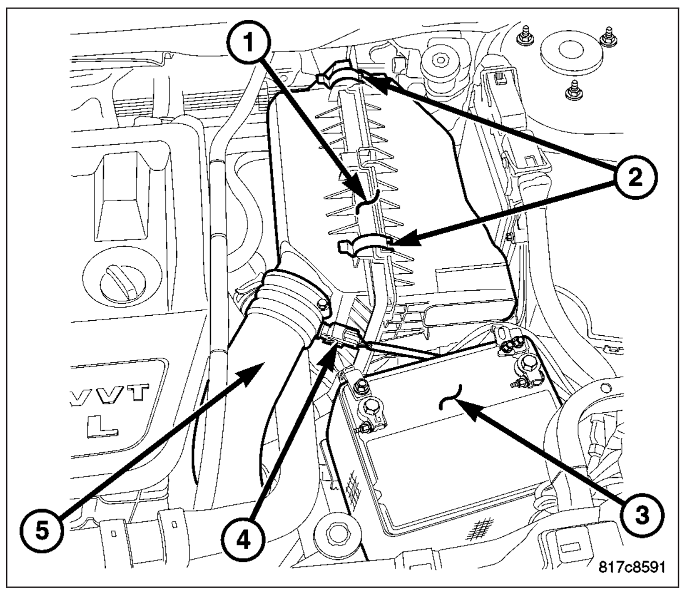
HOUSING-AIR CLEANER

REMOVAL

1. Remove fresh air inlet (2) from air cleaner housing (1).

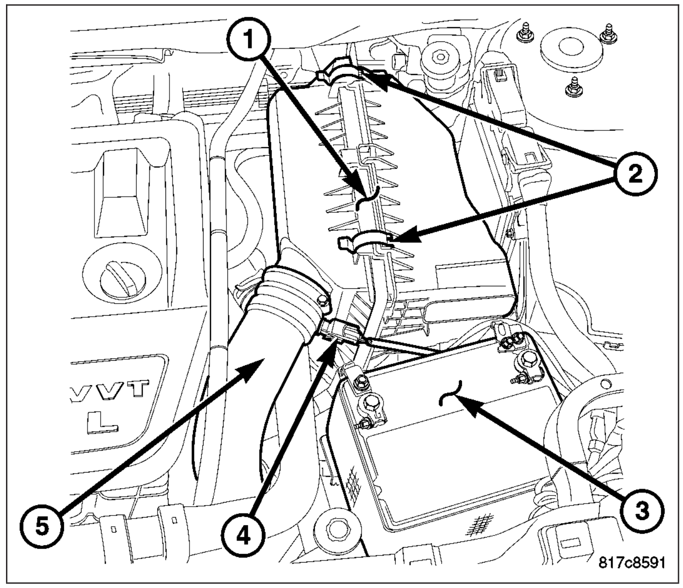


2. Remove intake air temperature sensor electrical connector (4).
3. Remove air inlet tube (5) from housing (1).
4. Pull housing (1) upward to remove.

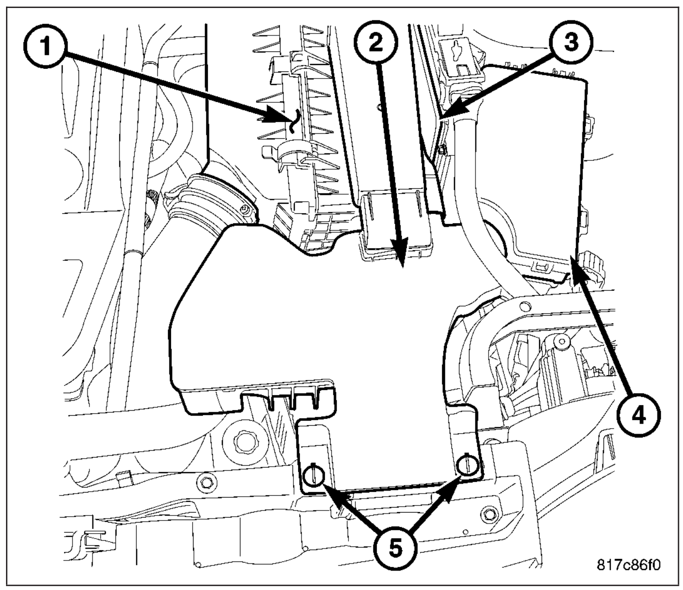


INSTALLATION

1. Make sure the rubber grommets, for the air cleaner housing lower pins, are in place when reinstalling the air cleaner housing. The rubber grommets mount to the PDC bracket.
2. Push air cleaner housing (1) down while aligning pins into the grommets.
3. Connect the throttle body air inlet hose (5) to the air cleaner housing (1).
4. Connect intake air temperature sensor connector (4).



5. Install fresh air inlet (2) and lock retainers (5).



CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains dual over-head camshafts with four valves per cylinder. The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries provide lubrication passages to the variable camshaft timing phasers, camshafts, and valve mechanisms.

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders, between a cylinder and the adjacent water jacket or from an oil passage to the exterior of the engine.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

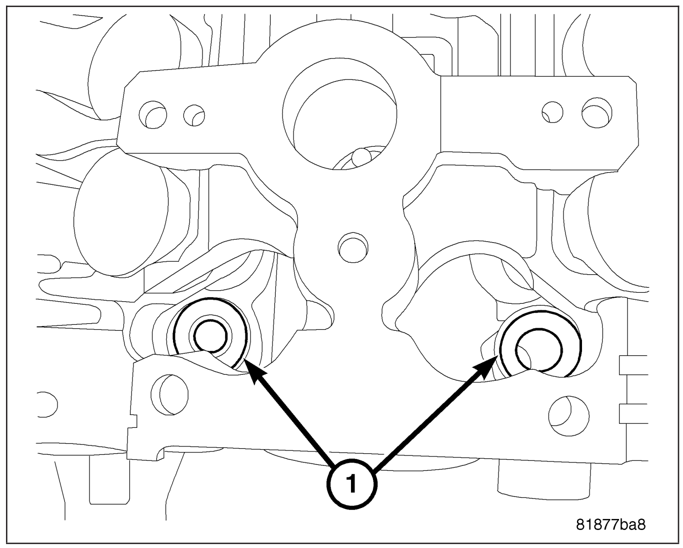
Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

1. Perform fuel system pressure release procedure **before attempting any repairs**
2. Remove clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect negative cable from battery.
4. Drain cooling system.
5. Remove engine cover.
6. Remove coolant recovery bottle.
7. Remove power steering pump and reposition.
8. Remove windshield washer bottle.
9. Disconnect breather hose.
10. Disconnect PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove valve cover.
13. Raise vehicle.
14. Remove right splash shield.
15. Set engine to TDC.
16. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor bolts if equiped.
18. Remove lower A/C compressor mount.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft and water pump pulleys.
21. Remove right side engine mount bracket lower bolt.
22. Remove timing chain cover lower bolts.
23. Disconnect oxygen sensor electrical connectors.
24. Remove exhaust pipe at manaverter (AWD).
25. Remove manaverter support bracket retaining bolts (AWD).
26. Lower vehicle.
27. Remove power steering pump and set aside.
28. Support engine with suitable jack.
29. Remove right engine mount.
30. Remove accessory drive upper idler pulley.
31. Remove right upper engine mount bracket.
32. Remove accessory drive belt tensioner.
33. Remove upper timing chain cover retaining bolts.
34. Remove timing chain cover.
35. Remove timing chain tensioner.
36. Remove timing chain.
37. Remove timing chain guides.
38. Disconnect fuel line at the fuel rail.
39. Disconnect fuel injector electrical connectors.
40. Disconnect top engine electrical connectors and reposition harness.
41. Remove fuel rail.
42. Remove lower intake manifold support bracket retaining bolt.

43. Disconnect electronic throttle control electrical connector.
44. Disconnect map sensor electrical connector.
45. Disconnect vacuum lines at intake.
46. Remove intake manifold retaining bolts.
47. Remove upper radiator hose retaining bolts.
48. Remove intake manifold.
49. Remove coolant outlet manifold and set aside.
50. Remove ground strap at right rear of cylinder head.
51. Remove oxygen sensor from maniverter (AWD).
52. Remove maniverter heat shields (AWD).
53. Remove maniverter retaining bolts (AWD).
54. Remove maniverter from cylinder head and reposition out of the way (AWD).
55. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

NOTE: All of the cylinder head bolts have captured washersEXCEPTthe front two (1).



56. Remove cylinder head bolts.
57. Remove cylinder head from engine block.
58. Inspect and clean cylinder head and block sealing surfaces. Refer to Cleaning and Inspection in this section for procedures.

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

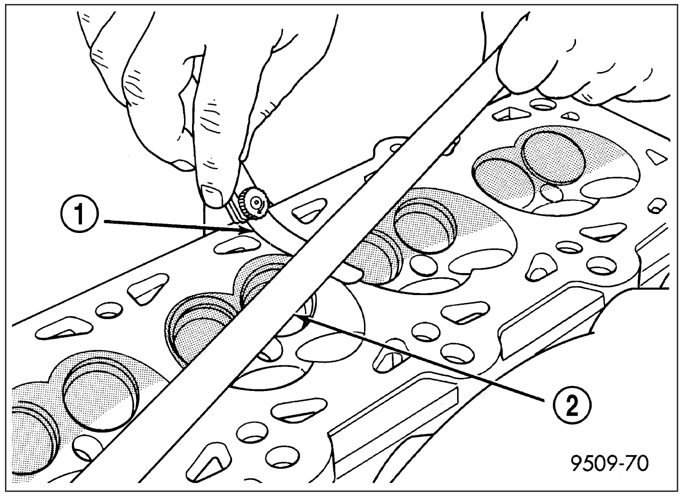
Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

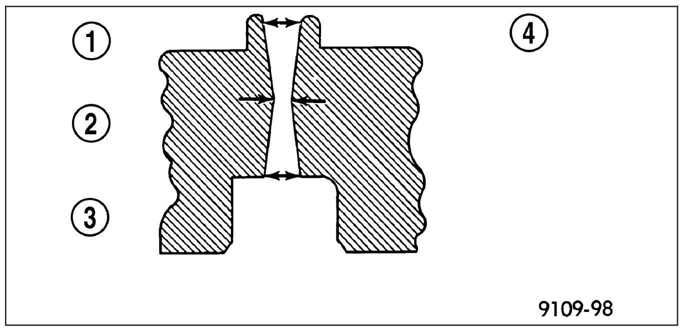
INSPECTION

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

1. Cylinder head must be flat within 0.1 mm (0.004 in.).



2. Inspect camshaft bearing journals for scoring.
3. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
4. Using a small hole gauge and a micrometer, measure valve guides in 3 places top (1), middle (2), and bottom (3). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.
5. Check valve guide height.
6. Prior to installing cylinder head, the cylinder block should be checked for flatness (Refer to 9 - ENGINE/ENGINE BLOCK - INSPECTION).

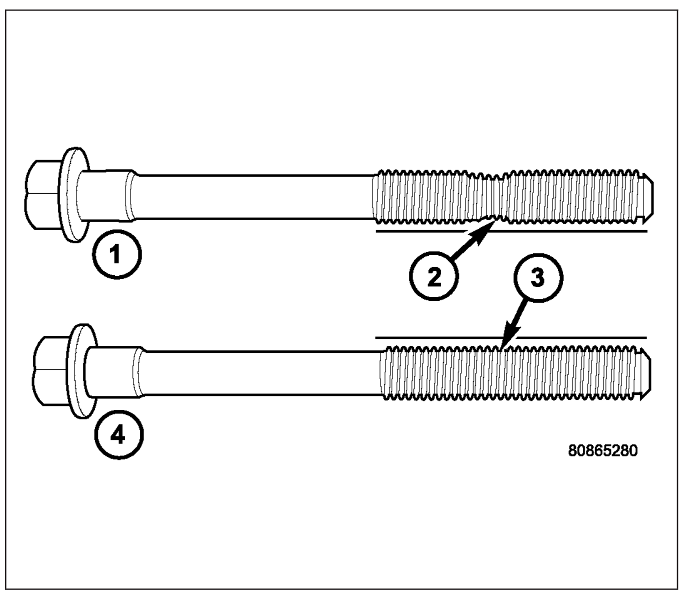


INSTALLATION - CYLINDER HEAD

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

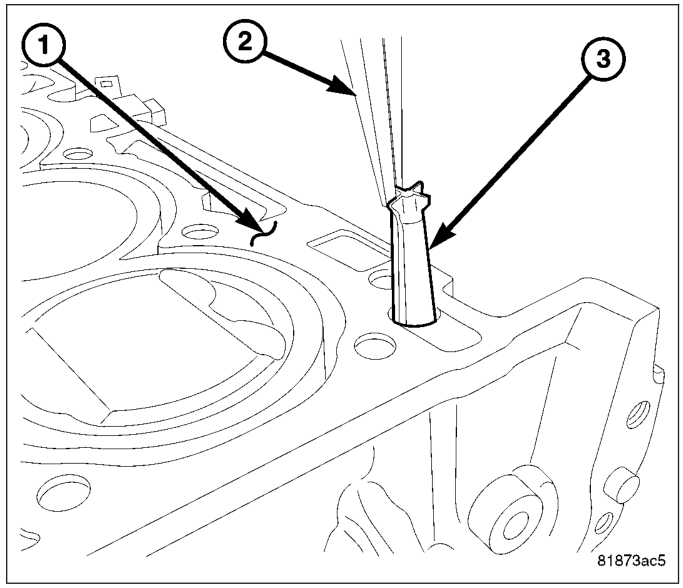
NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced.

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2), the bolt should be replaced.

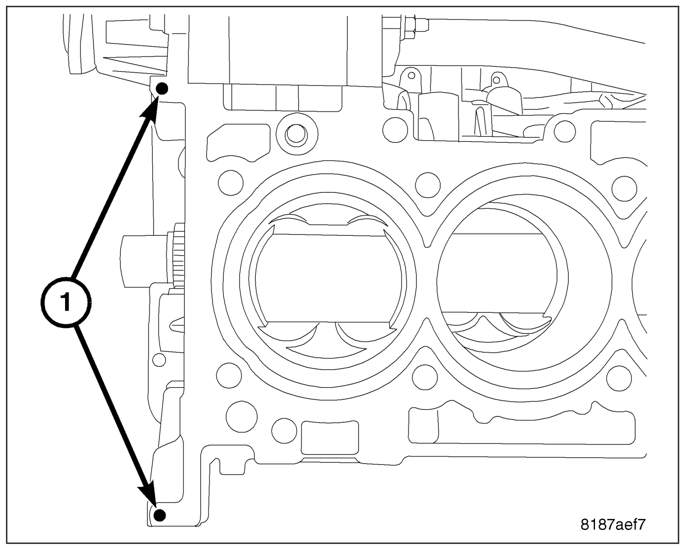


CAUTION: Always replace the variable valve timing filter screen (3) when servicing the head gasket or engine damage could result.

1. Replace the variable valve timing filter screen (3).



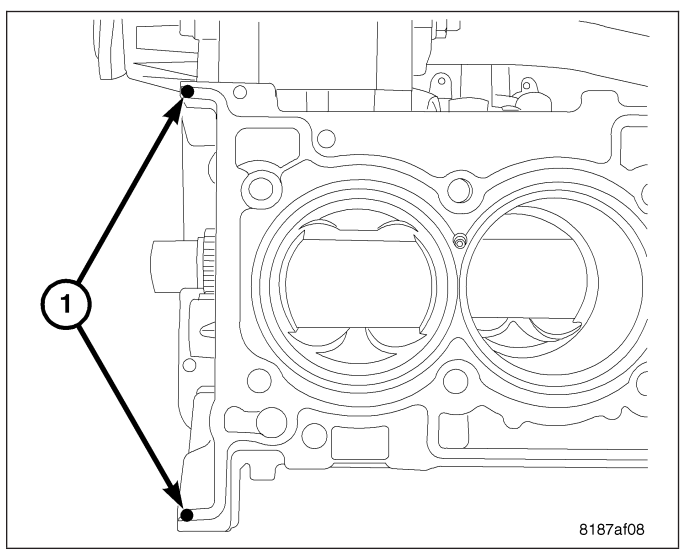
2. Place two pea size dots of RTV (1) on cylinder block as shown.



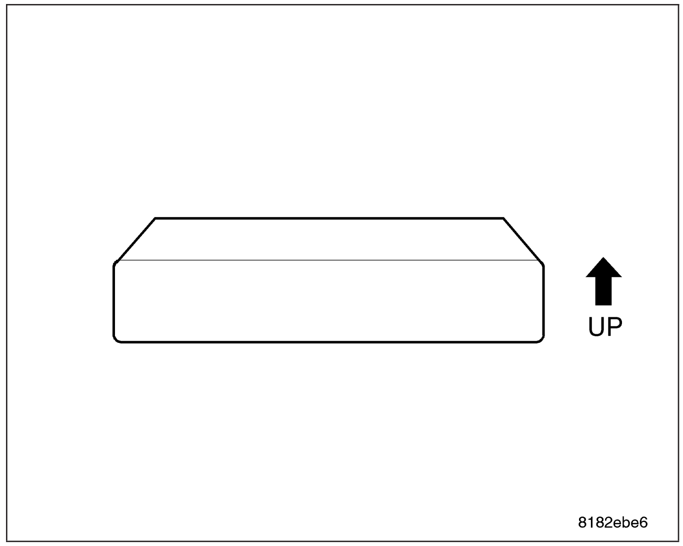
3. Position the new cylinder head gasket on engine block with the part number facing up. Ensure gasket is seated over the locating dowels in block.
4. Place two pea size dots of RTV (1) on cylinder head gasket as shown.

NOTE: The head must be installed within 15 minutes before the RTV skins.

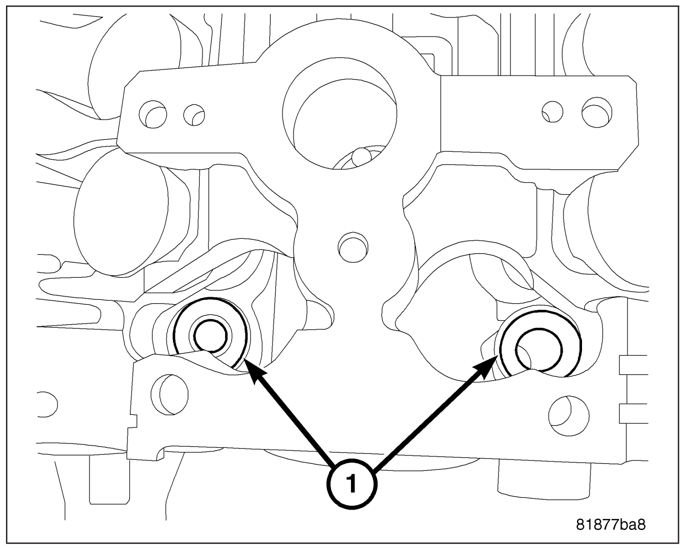
5. Position cylinder head onto engine block.



NOTE: The front two cylinder head bolts do not have captured washers. The washers must be installed with the bevel up towards the bolt head.

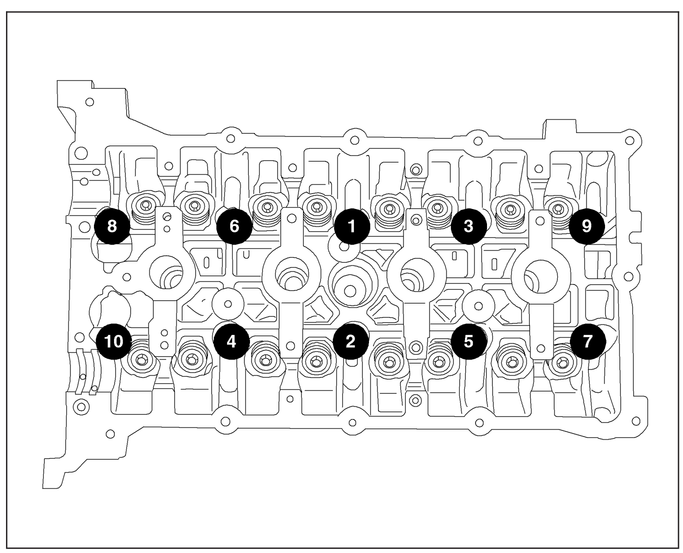


6. Install washers (1) for the front two cylinder head bolts.



7. Before installing the bolts, the threads should be lightly coated with engine oil.
8. Install the cylinder head bolts and torque in the sequence shown above.
   - First: All to 30 N·m (25 ft. lbs.)
   - Second: All to 61 N·m (50 ft. lbs.)
   - Third: All to 61 N·m (45 ft. lbs.)
   - Fourth: All an additional 90°

CAUTION: Do not use a torque wrench for the Fourth step.



9. Install camshafts. (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
10. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).
11. Install maniverter/exhaust manifold to cylinder head. Torque fasteners to 34 N·m (25 ft.lbs.).
12. Install heat shields.Torque fasteners to 9 N·m ( ).
13. Install oxygen sensor in maniverter.
14. Install ground strap at right rear of cylinder head.

15. Install coolant manifold.
16. Install intake manifold.
17. Install intake manifold bolts and torque to 24 N·m (18 ft.lbs.).
18. Install upper radiator hose retaining bracket.
19. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
20. Install timing chain cover, torque m6 bolts to 12 N·m (105 in.lbs.) and m8 bolts to 23 N·m (17 ft.lbs.).
21. Connect cam sensor wiring connector.
22. Install spark plugs and torque to 27 N·m (20 ft.lbs.).
23. Install ignition coils and torque to 8 N·m (70 in.lbs.).
24. Install power steering pump reservoir/bracket to cylinder head.
25. Install exhaust pipe to manifold. Torque fasteners to 28 N·m (20 ft. lbs.).
26. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
27. Connect engine coolant temperature sensor connector.
28. Connect upper radiator hose. Connect heater hoses to thermostat housing.
29. Install heater tube support bracket to cylinder head.
30. Install fastener attaching dipstick tube to lower intake manifold
31. Connect fuel supply line quick-connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
32. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
33. Connect negative cable to battery.
34. Install clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

CAMSHAFT(S)

DESCRIPTION

Both camshafts have six bearing journal surfaces and two cam lobes per cylinder. Flanges on the third journal control camshaft end play. Cam position sensors are located on the intake and exhaust camshafts on the rear of the cylinder head.

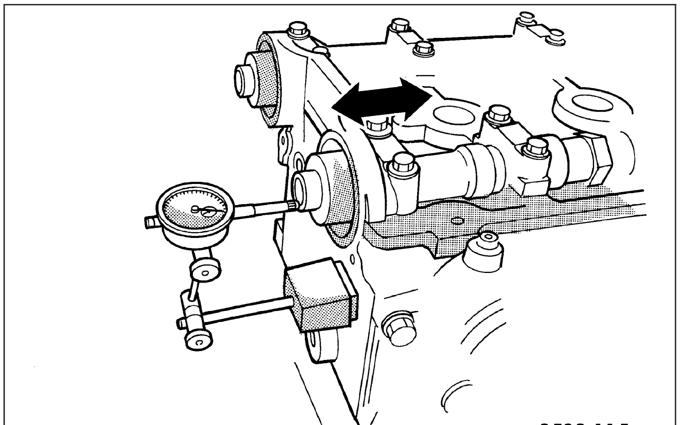
OPERATION

The camshaft is driven by the crankshaft via drive sprockets and a chain. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE

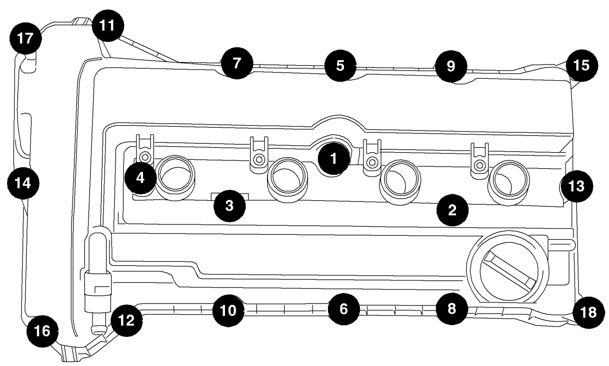
MEASURING CAMSHAFT END PLAY

1. Using a suitable tool, move camshaft as far rearward as it will go.
2. Zero dial indicator.
3. Move camshaft as far forward as it will go.
4. Record reading on dial indicator. For end play specification, (Refer to 9 - ENGINE - SPECIFICATIONS).
5. If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

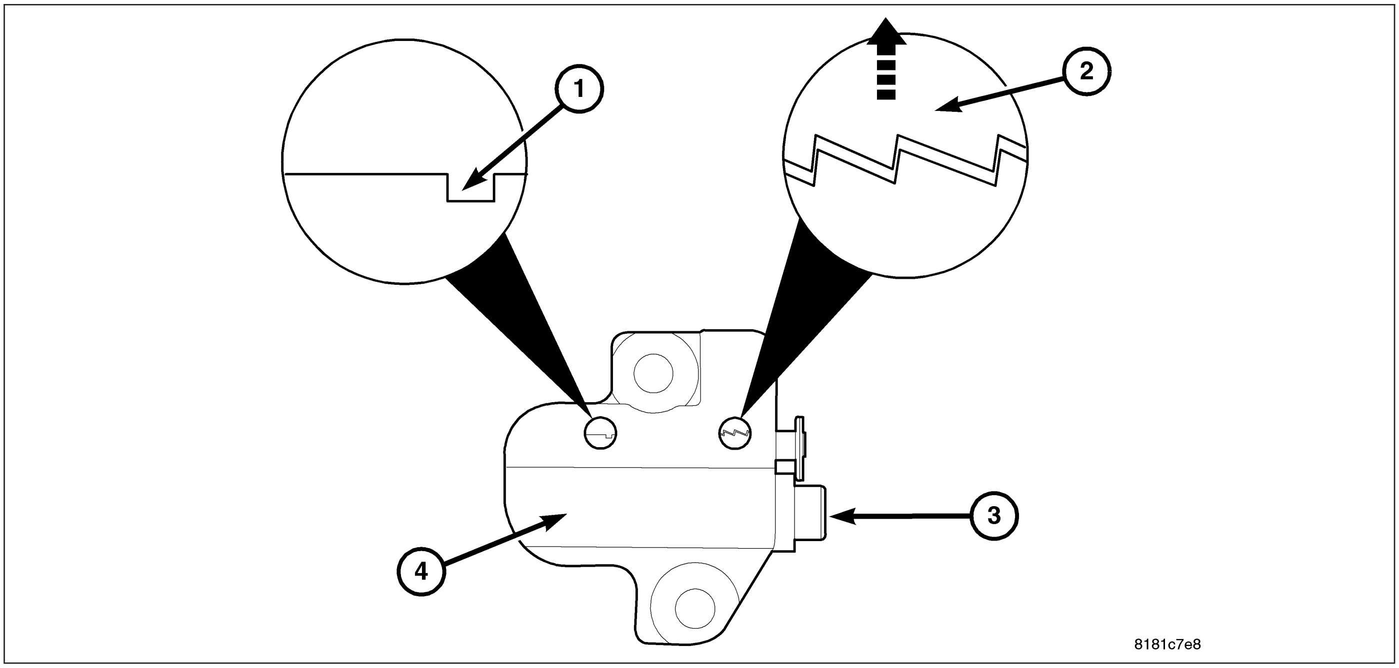

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REMOVAL

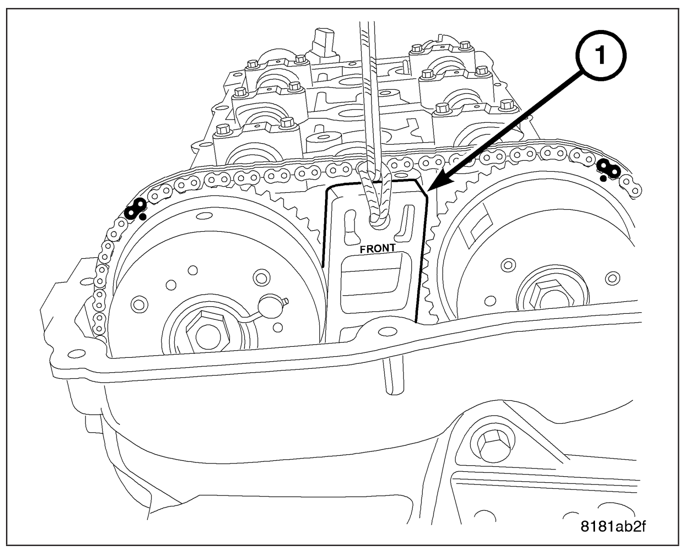
1. Remove engine cover by pulling upward.
2. Disconnect negative battery cable.
3. Remove cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Raise vehicle.
5. Remove right splash shield.



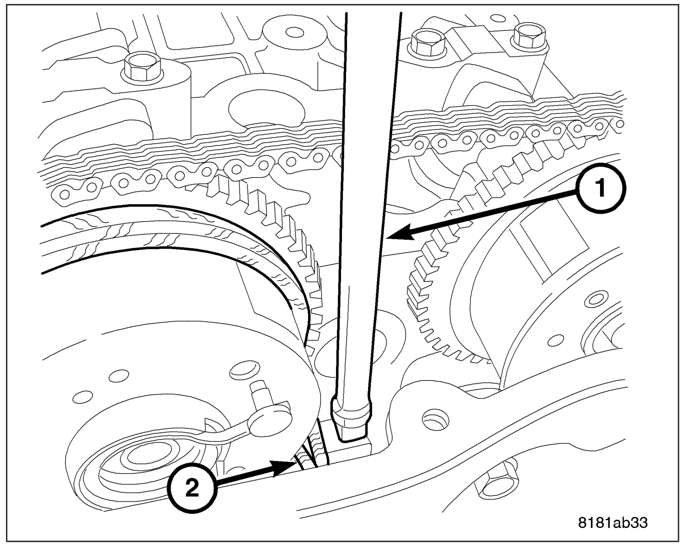
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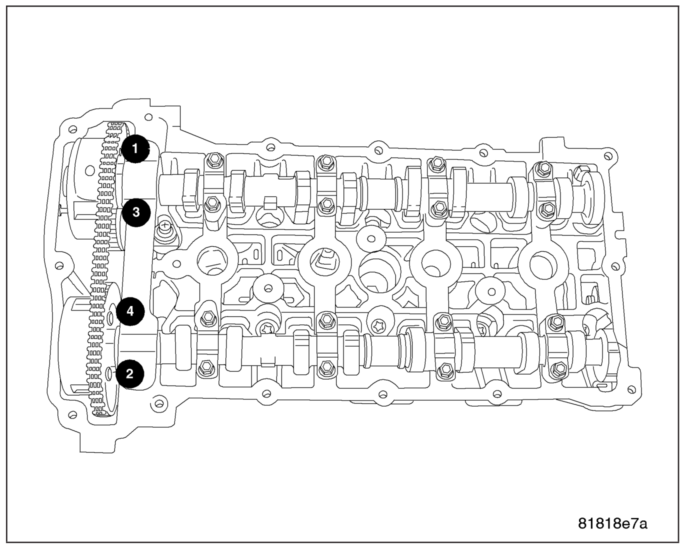
6. Remove timing tensioner plug from front cover.
7. Insert small allen wrench and lift ratchet (2) upward to release the tensioner. Leave the allen wrench installed during the remainder of this procedure.
8. Insert wedge 9701 (1).



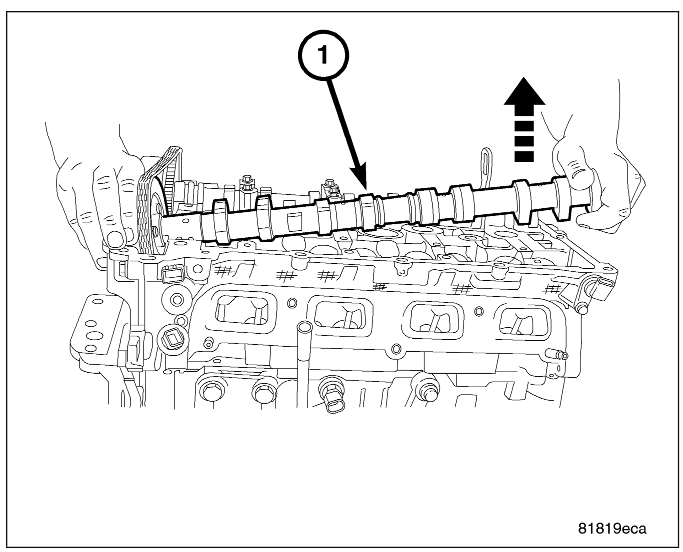
9. Lightly tap Wedge 9701(2) into place.



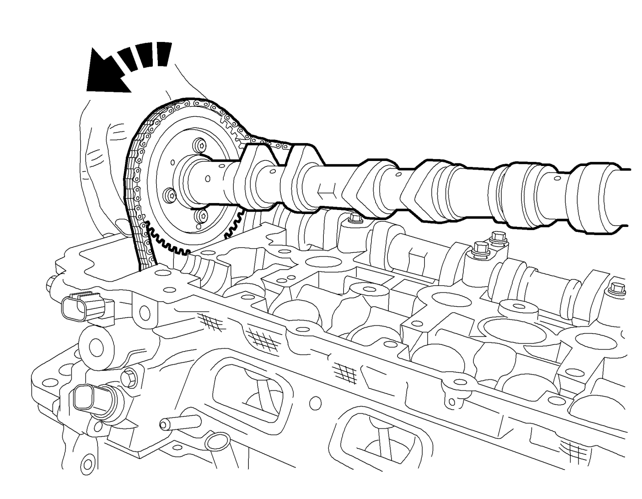
10. Remove the front camshaft bearing cap.
11. Slowly remove the remaining camshaft bearing bolts one turn at a time following the above sequence.



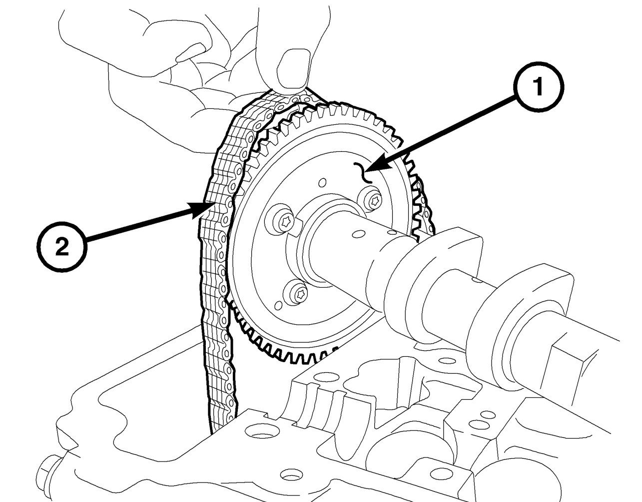
12. Remove intake camshaft (1) by lifting the rear of the camshaft upward.



13. Rotate the camshaft while lifting out of the front bearing cradle.


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14. Lift the timing chain (2) off the sprocket (1).
15. Remove exhaust camshaft.



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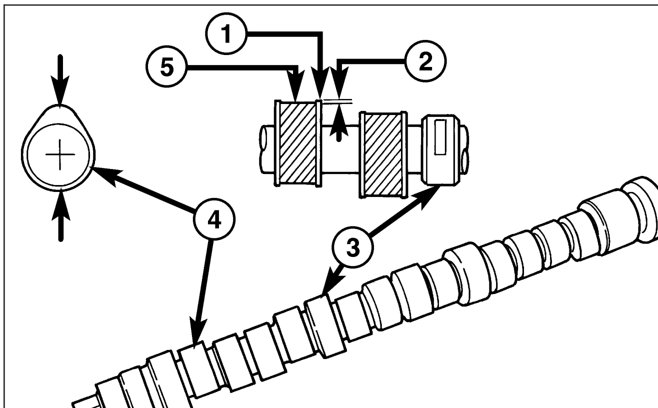
CLEANING

Clean camshafts with a suitable solvent.

INSPECTION

1. Inspect camshaft bearing journals for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

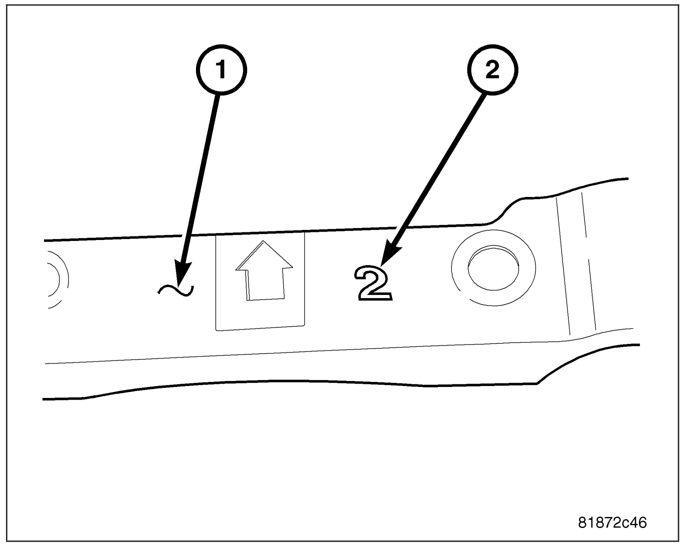
NOTE: If camshaft is replaced due to lobe wear or damage, always replace the lash buckets.



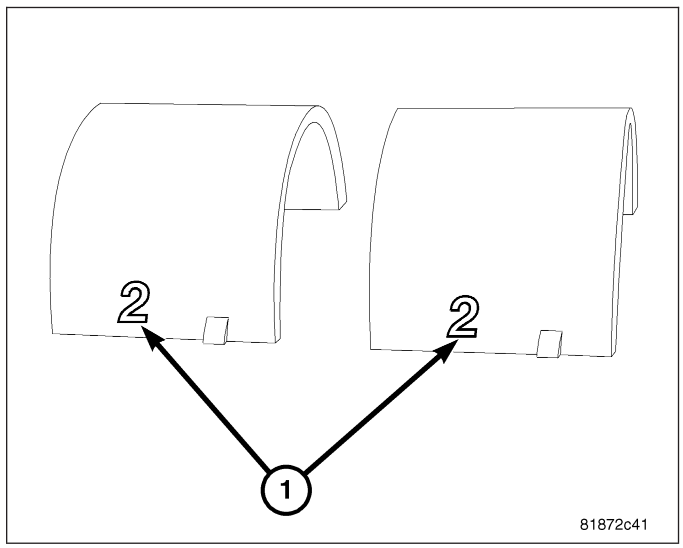
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INSTALLATION

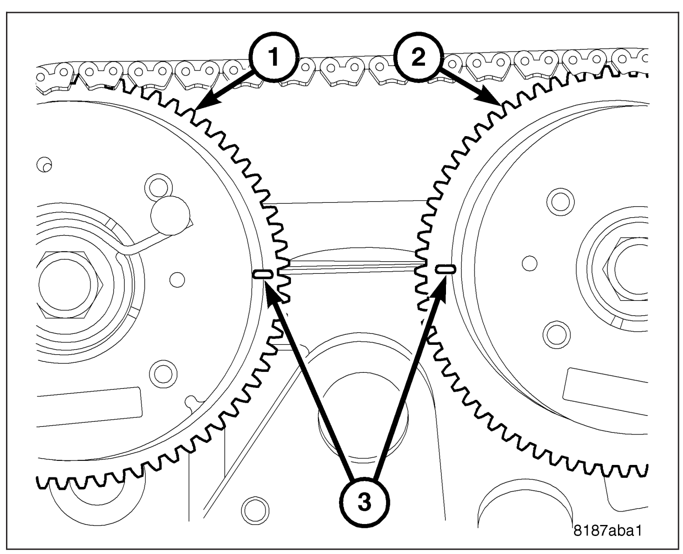
1. Identify which front cam cap (1) is installed on the engine you are working on.
2. The cam cap (1) is numbered (2) either one, two, or three, this corresponds to the select fit bearing to use.



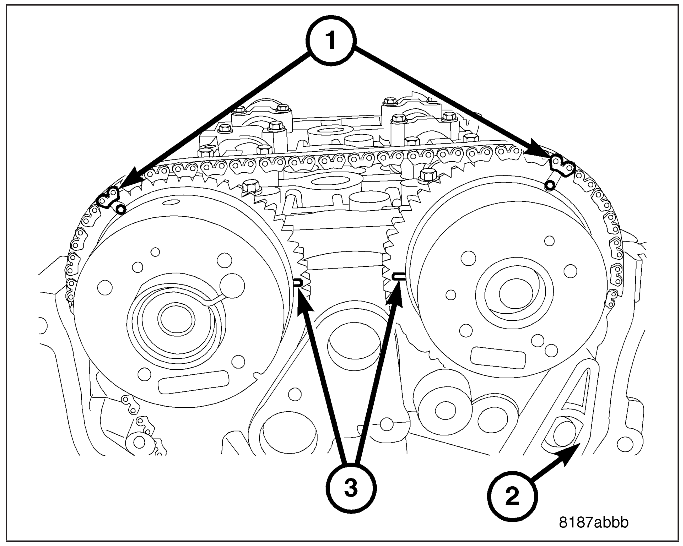
3. Install the corresponding select fit bearing that will also be numbered (1) one, two, or three.
4. Oil all of the camshaft journals with clean engine oil.
5. Install exhaust camshaft and position on bearing journals in the cylinder head.



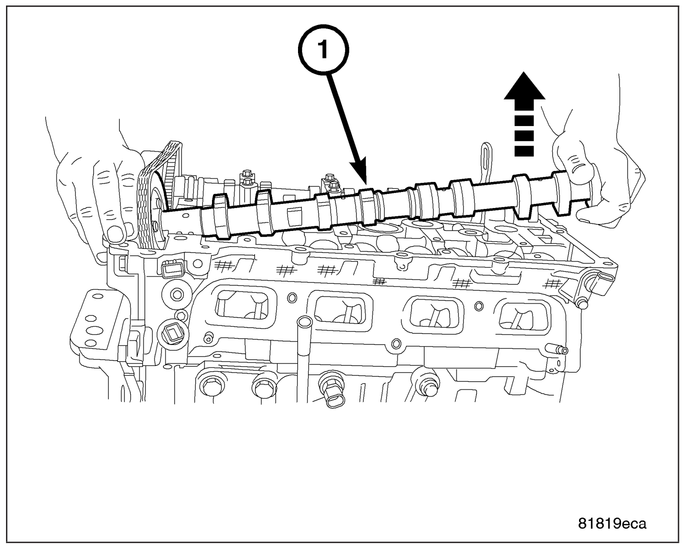
6. Align exhaust cam timing mark so it is parallel to the cylinder head as shown.



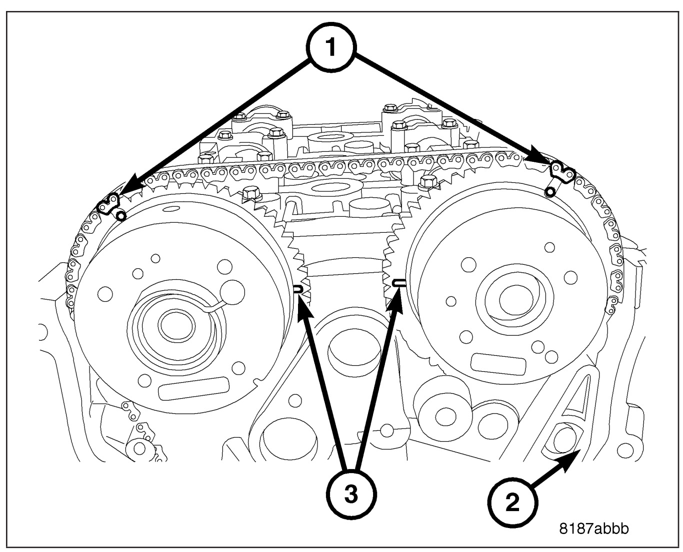
7. Install timing chain onto exhaust cam sprocket making sure that the timing marks (1) on the sprocket and chain are aligned.



8. Install intake camshaft by raising the rear of the camshaft upward and roll the sprocket into the chain.



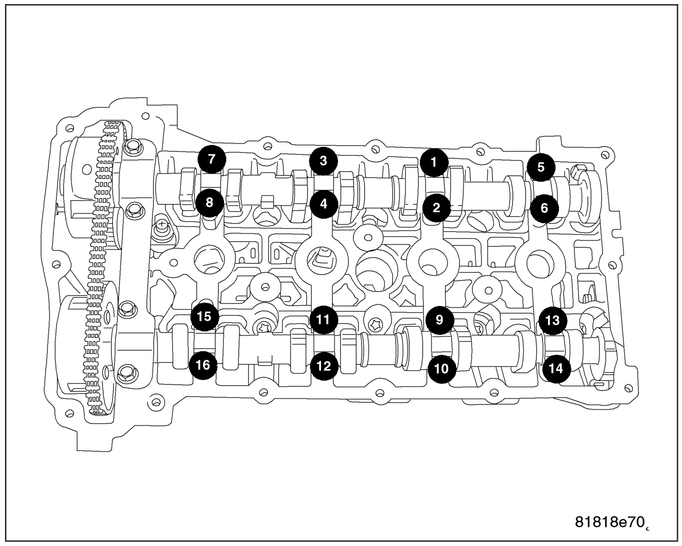
9. Align the timing marks (1) on the intake cam sprocket with the mark in the chain.
10. Position the intake camshaft into the bearing journals in the cylinder head.
11. Verify that the timing marks (1) are aligned on both camshafts and that the timing marks (3) are parallel with the cylinder head.



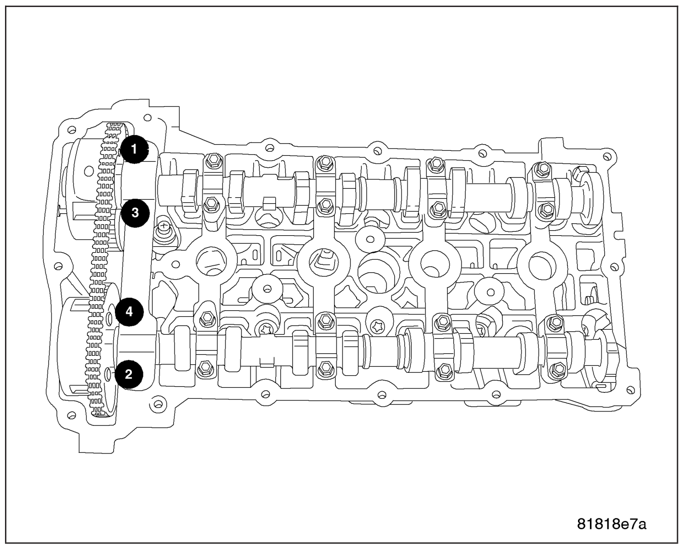
CAUTION: Install the front intake and exhaust camshaft bearing cap last. Ensure that the dowels are seated and follow torque sequence or damage to engine could result.

NOTE: If the front camshaft bearing cap is broken, the cylinder head MUST be replaced.

12. Install intake and exhaust camshaft bearing caps slowly torque bolts in the sequence shown.



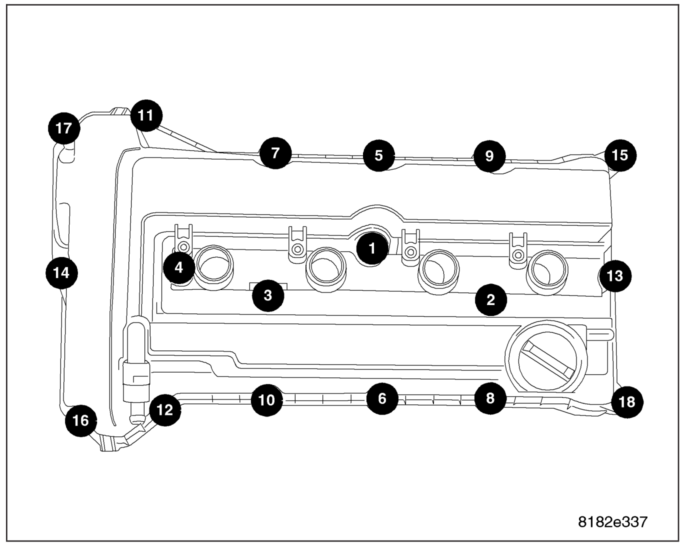
13. Install the front intake and exhaust bearing cap and torque bolts in the sequence shown.
14. Verify that all timing marks are aligned.
15. Remove allen wrench from timing chain tensioner.
16. Remove locking wedge 9701.
17. Apply MOPAR® thread sealant to timing tensioner plug and Install.
18. Install right splash shield.
19. Install cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
20. Install engine cover.
21. Connect negative battery cable.
22. Fill cooling system.
23. Fill with oil.
24. Start engine and check for leaks.



COVER-CYLINDER HEAD

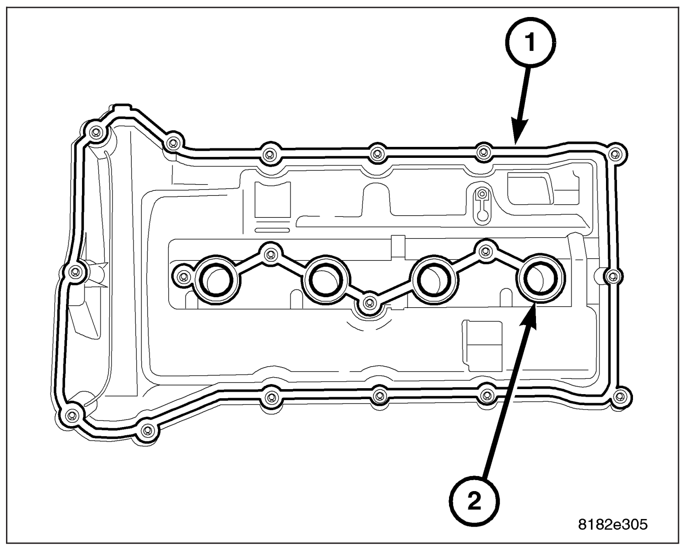
REMOVAL

1. Remove engine cover.
2. Disconnect ignition coil electrical connectors.
3. Disconnect PCV and make-up air hoses from cylinder head cover.
4. Use compressed air to blow dirt and debris off the cylinder head cover prior to removal.
5. Remove cylinder head cover bolts.
6. Remove cylinder head cover from cylinder head.

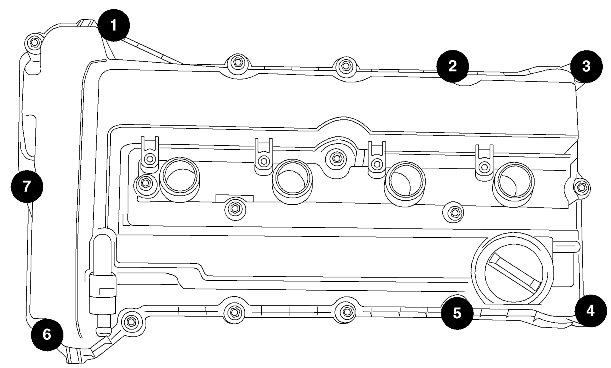


INSTALLATION

1. Install new cylinder head cover gaskets (1,2).

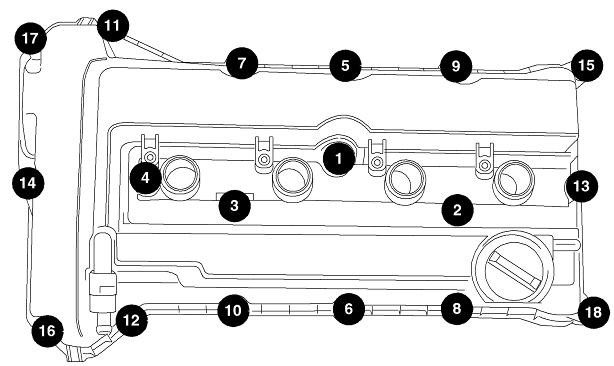


2. Install studs in cover as shown.



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3. Clean all RTV from cylinder head.
4. Apply RTV to cylinder head/front cover joint.
5. Install cylinder head cover assembly to cylinder head and install all bolts, ensuring the studs are located as shown.
6. Tighten bolts in sequence shown in Using a 2 step torque method as follows:
   a. Tighten all bolts to 4.5 N·m (40 in. lbs.)
   b. Tighten all bolts to 10 N·m (90 in. lbs.).
7. Install ignition coils. Tighten fasteners to 8 N·m (70 in. lbs.).
8. If the PCV valve was removed, tighten PCV valve to 4.5 N·m (40 in. lbs.).
9. Connect PCV and make-up air hoses to cylinder head cover.
10. Install engine cover.



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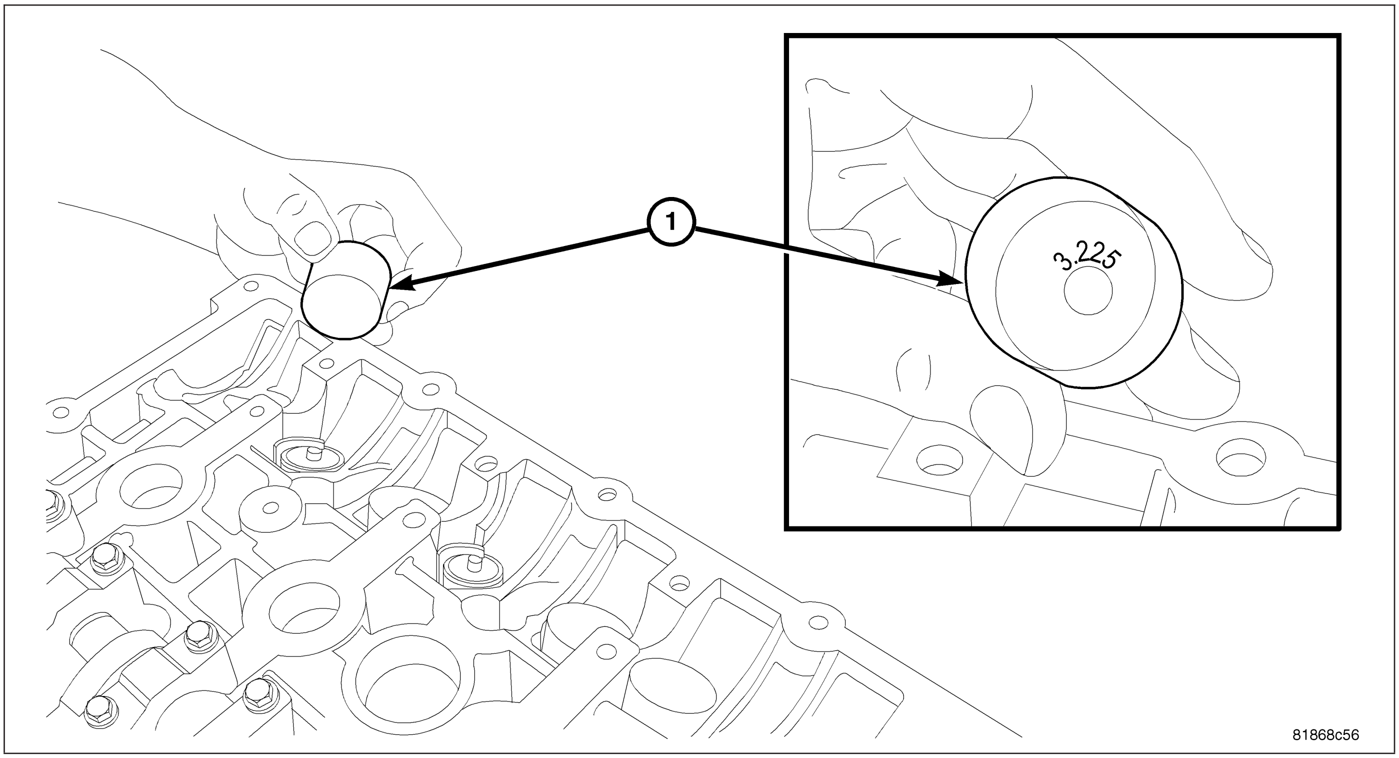
TAPPETS-VALVE

DIAGNOSIS AND TESTING

MECHANICAL VALVE TAPPET NOISE DIAGNOSIS

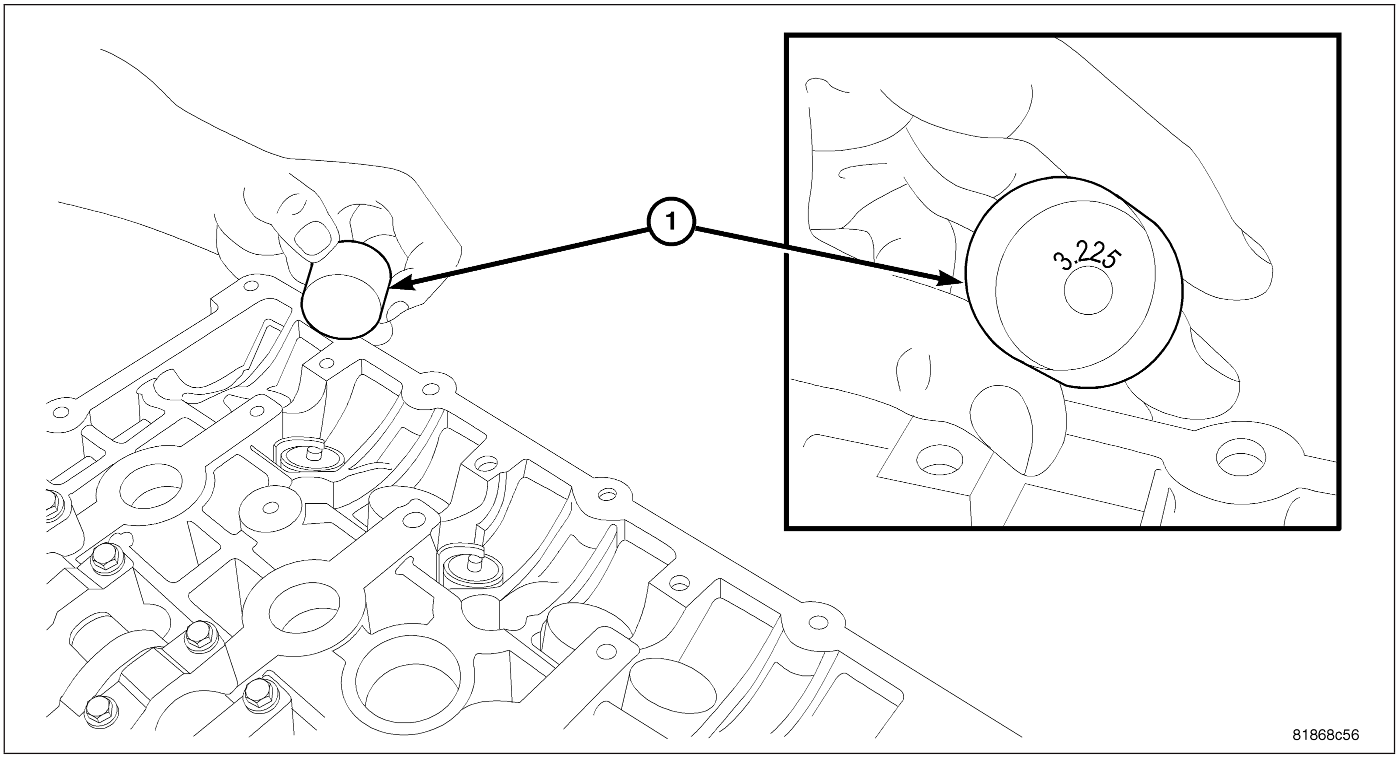
A tappet-like noise may be produced from several items. Check the following items.

STANDARD PROCEDURE - MEASURING VALVE LASH



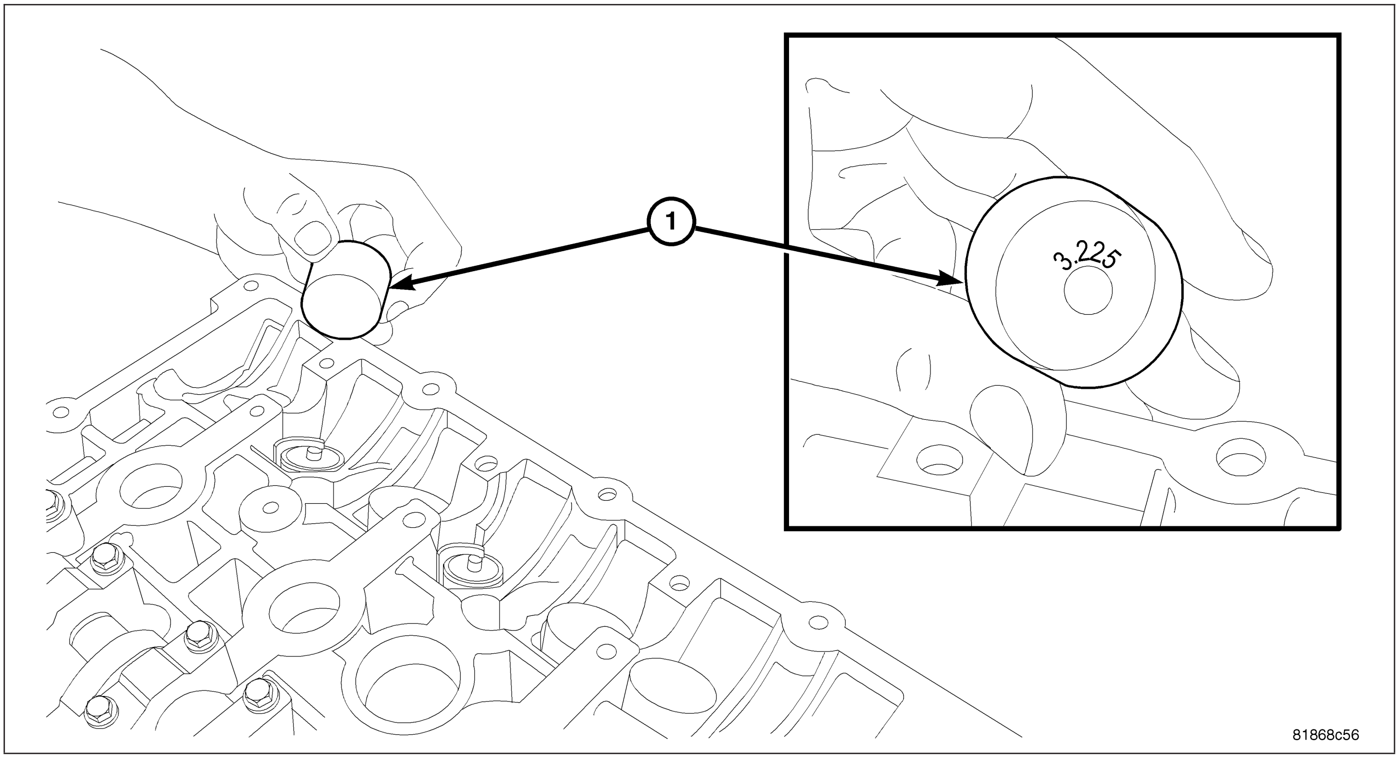
1. Remove engine cover.
2. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
3. Rotate camshaft so lobes are vertical.
4. Check clearance using feeler gauges.
5. Repeat for all tappets.
6. If clearance was too small Clearance too Small .
7. If clearance was too large Clearance too Large .

Clearance too Small



1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. spec – measured = delta
3. Decrease bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

Clearance too Large



1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Measured – spec = delta
3. Increase bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

NOTE: Camshaft buckets must be replaced if cylinder head or camshafts are replaced.

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Remove camshaft buckets.
4. Repeat removal procedure for each camshaft bucket.
5. If reusing, mark each camshaft bucket for reassembly in original position.

INSTALLATION

NOTE: If reinstalling original buckets they must go back in their original location or engine damage could result.

1. Apply a light coat of clean engine oil to camshafts buckets prior to assembly.
2. Install camshaft bucket into cylinder head.
3. Repeat installation procedure for each camshaft bucket.

NOTE: If installing new buckets, the valve lash procedure must be performed.

4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVES & SEATS-INTAKE/EXHAUST

DESCRIPTION

The valves are made of heat resistant steel. They have nitrided stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves have a single bead lock keepers to retain the springs.

OPERATION

The four valves per cylinder (two intake and two exhaust) are opened by using direct acting buckets which are actuated by the camshaft.

CLEANING

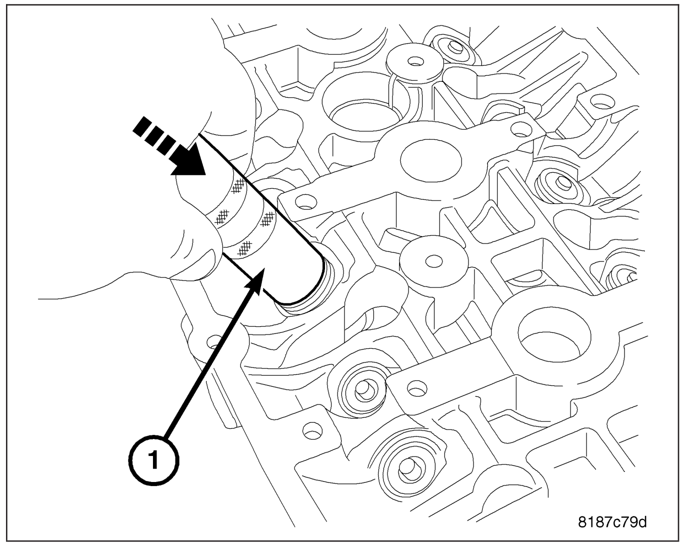
1. Clean all valves thoroughly and discard burned, warped and cracked valves.

SPRINGS & SEALS-VALVE

REMOVAL

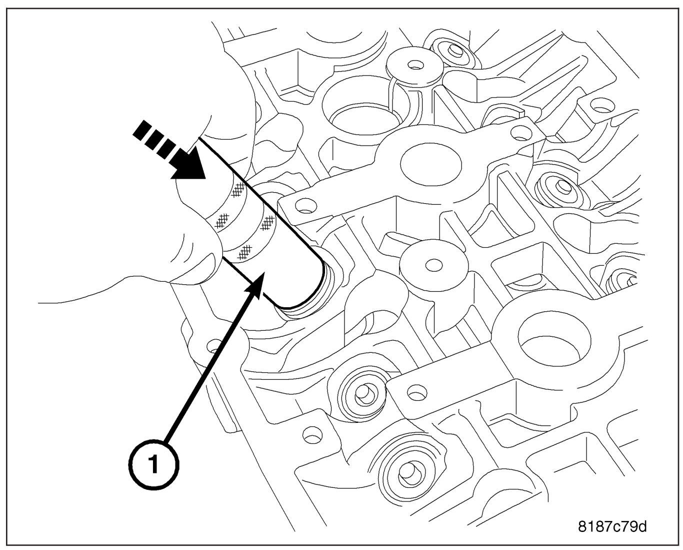
CYLINDER HEAD ON

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Rotate crankshaft until piston is at TDC on compression.
4. With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.
5. Using metric valve keeper remover (1), and remove valve spring keepers and retainer.
6. Remove valve spring(s).
7. Remove valve stem seal(s) by a using valve stem seal tool.



CYLINDER HEAD OFF

1. With cylinder head removed from cylinder block, place a ball of rags in the combustion chamber.
2. Using Snap On metric valve keeper remover (1) or equivalent, remove valve keepers with a downward push.
3. Remove retainer and springs.
4. Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves, locks and retainers to insure installation in original location.
5. Inspect the valves. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSPECTION).



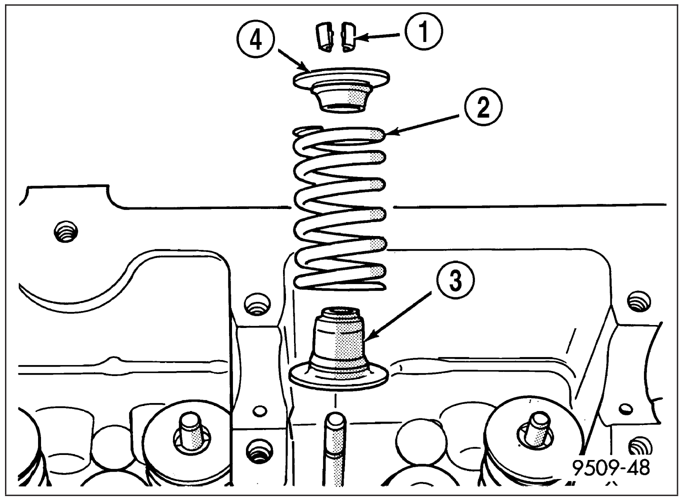
INSPECTION

1. Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:
   - Valve Closed Nominal Tension—75 lbs. @ 38.0 mm (1.50 in.)
   - Valve Open Nominal Tension—134 lbs. @ 29.75 mm (1.17 in.)
2. Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

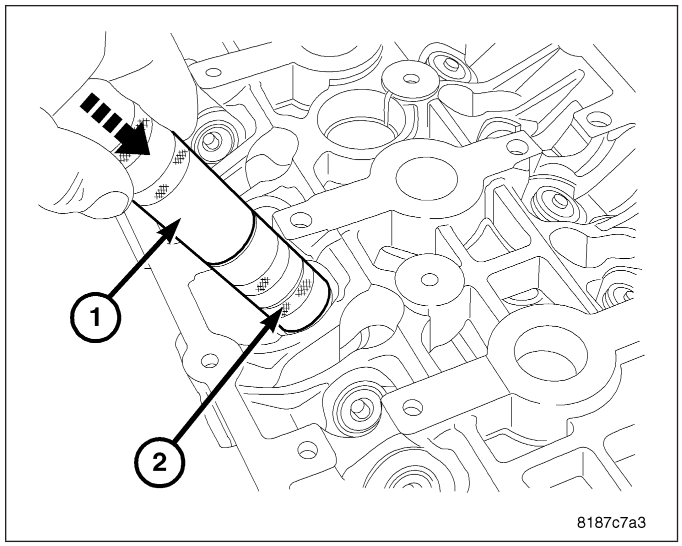
INSTALLATION

CYLINDER HEAD ON

1. Install valve seal/valve spring seat (3) assembly. Push the assembly down with appropriate size socket to seat it onto the valve guide.
2. Install valve spring (2) and retainer (4) with keepers (1).

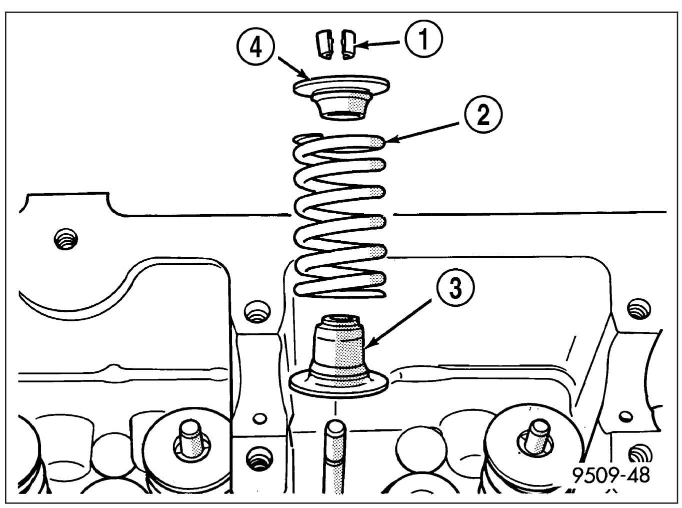


3. Place the valve keepers in the retainer. Using Snap On metric valve keeper installer (2) and remover (1) as a handle, install valve keepers with a downward push.
4. Remove air hose and install spark plugs.
5. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
6. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

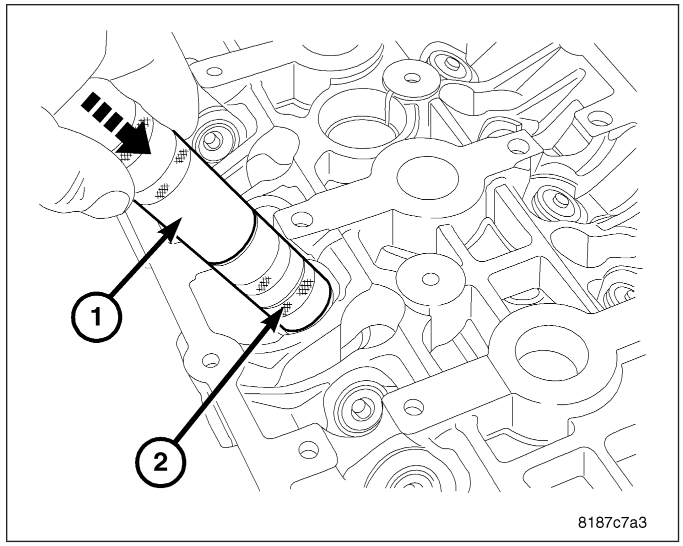


CYLINDER HEAD OFF

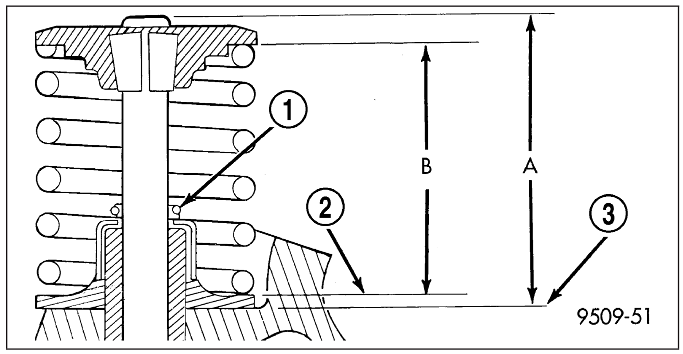
1. Coat valve stems with clean engine oil and insert in cylinder head.
2. Install new valve stem seals (3) on all valves using an appropriate sized socket to seat the seal/spring seat. The valve stem seals should be pushed firmly and squarely over valve guide.
3. Install valve springs (2), retainers (4), and keepers (1) in place.



4. Using Snap-on metric valve keeper installer (2) and remover (1) as a handle, push downward to install keepers.



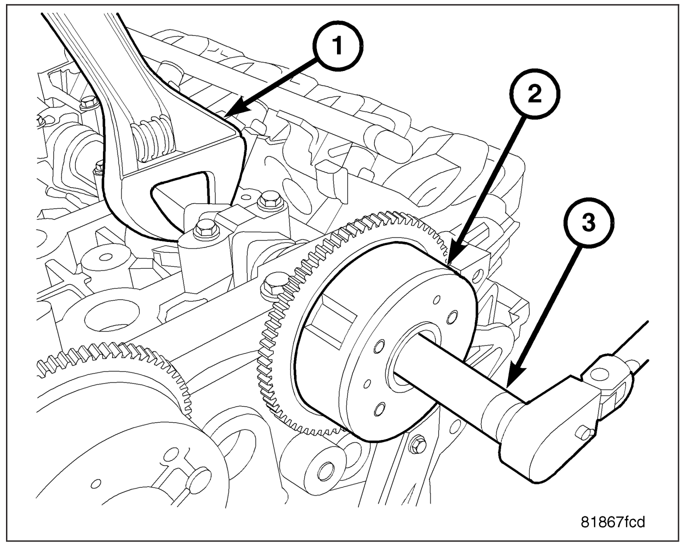
5. Check the valve spring installed height B after refacing the valve and seat. Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.



PHASERS-CAMSHAFT

REMOVAL

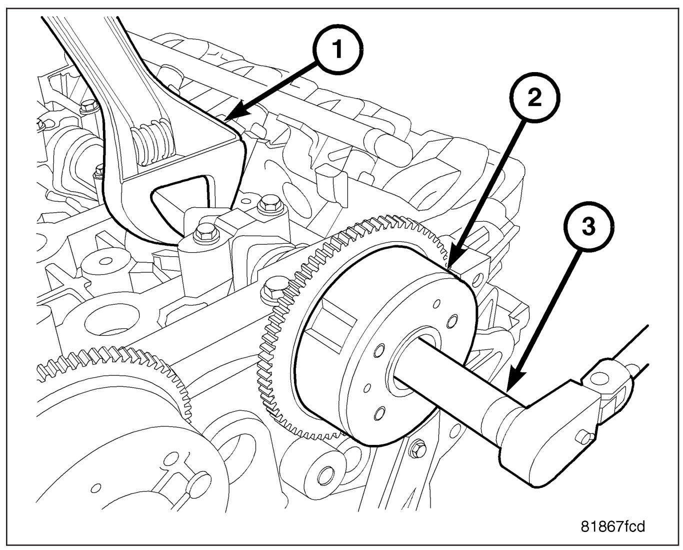
1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Remove camshaft phaser (2) retaining bolt while holding the camshaft in place with a wrench (1).
3. Remove phaser (2) assembly from camshaft.



INSTALLATION

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin and camshaft phaser may occur.

1. Install phaser (2) assembly on camshaft.
2. Install phaser retaining bolt and torque while holding camshaft in place with a wrench (1).
3. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

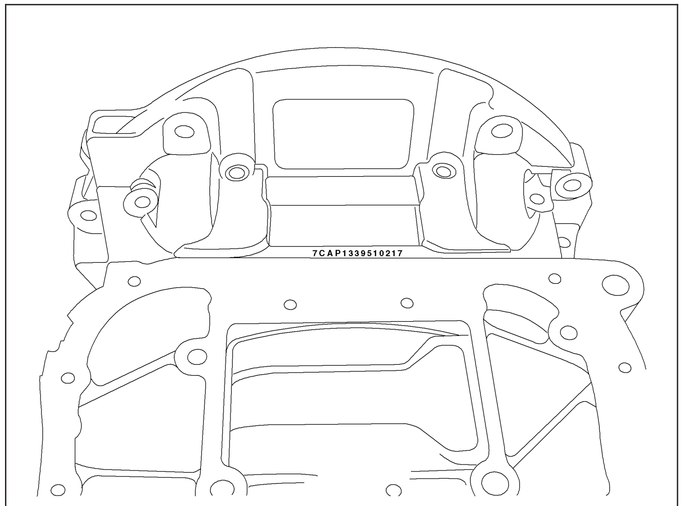


ENGINE BLOCK

DESCRIPTION

The die cast aluminum cylinder block is a two-piece assembly, consisting of the cylinder block and ladder frame. The block is an open deck design with cast in place cast iron cylinder liners. The cast iron cylinder liners are recessed below the aluminum deck surface. The ladder frame bolts to the cylinder block and does not incorporate the main bearing caps. This design offers a much stronger lower end and increased cylinder block and transaxle rigidity. The rear oil seal retainer is integral with the block and ladder frame. The ladder frame and block are serviced as an assembly.

The engine build date is located on the bottom of the ladder frame just behind the oil pan. The date can be seen with the oil pan in place.

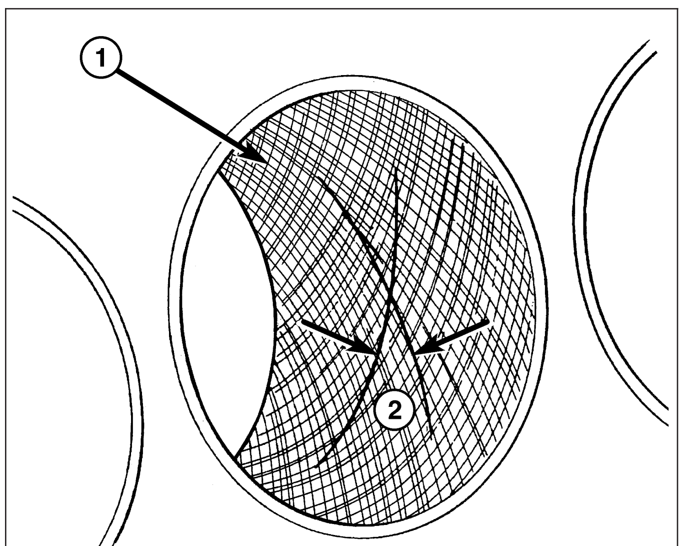


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STANDARD PROCEDURE

CYLINDER BORE HONING

1. Used carefully, a quality commercially available cylinder bore resizing hone equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.
2. Deglazing of the cylinder walls may be done using a quality commercially available cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20–60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.
3. Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 30-50 degrees, the cross hatch angle is most satisfactory for proper seating of rings.



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4. A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 degree angle. Faster up and down strokes increase the cross-hatch angle.
5. After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

CAUTION: Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

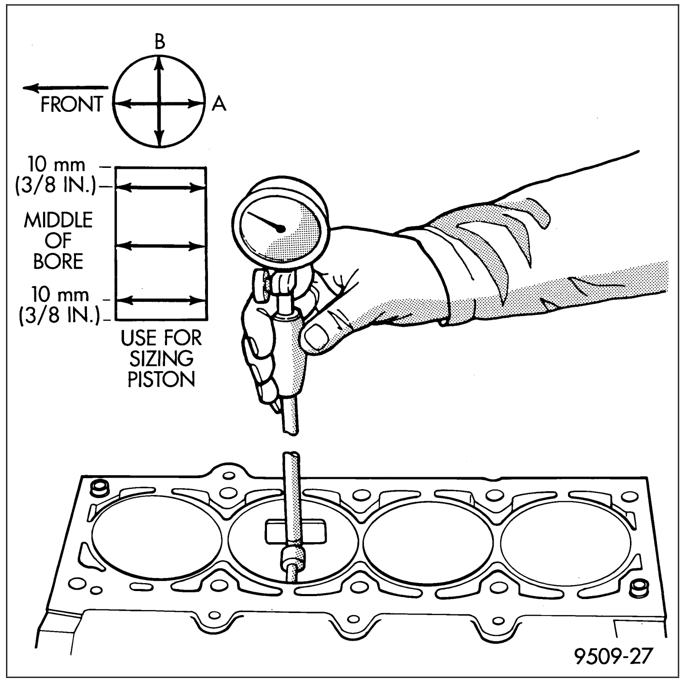
CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.050 mm (0.002 in.).



CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

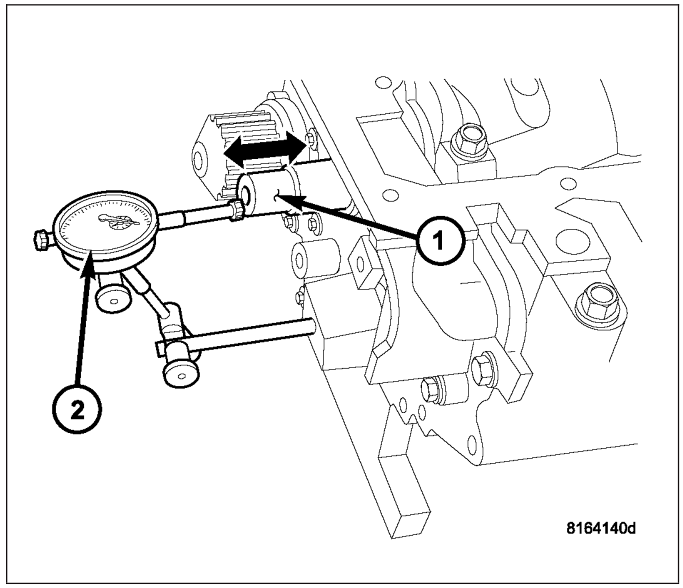
Measure the cylinder bore at three levels in directions A and B. Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT

STANDARD PROCEDURE

MEASURING CRANKSHAFT END PLAY

1. Mount a dial indicator (2) to front of engine with the locating probe on nose of crankshaft (1).
2. Move crankshaft all the way to the rear of its travel.
3. Zero the dial indicator.
4. Move crankshaft all the way to the front and read the dial indicator. (Refer to 9 - ENGINE - SPECIFICATIONS) for end play specification.



REMOVAL - CRANKSHAFT

NOTE: Crankshaft can not be removed when engine is in vehicle.

1. Remove engine assembly from vehicle (Refer to 9 - ENGINE - REMOVAL).
2. Separate transaxle from engine.
3. Remove drive plate/flex plate.
4. Remove crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).
5. Mount engine on a suitable repair stand.
6. Drain engine oil and remove oil filter.
7. Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
8. Remove engine mount support bracket.
9. Remove timing chain cover.
10. Remove the timing chain
11. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
12. Remove balance shaft module.
13. Remove the crankshaft sprocket.
14. Remove crankshaft position sensor.
15. Remove all ladder frame bolts from the engine block.
16. Using a pry bar gently pry the ladder frame loose from the engine block dowel pins using the pry points cast into the block and ladder frame.
17. Ladder frame should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins.

NOTE: If piston/connecting rod replacement is necessary, remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

18. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

19. Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

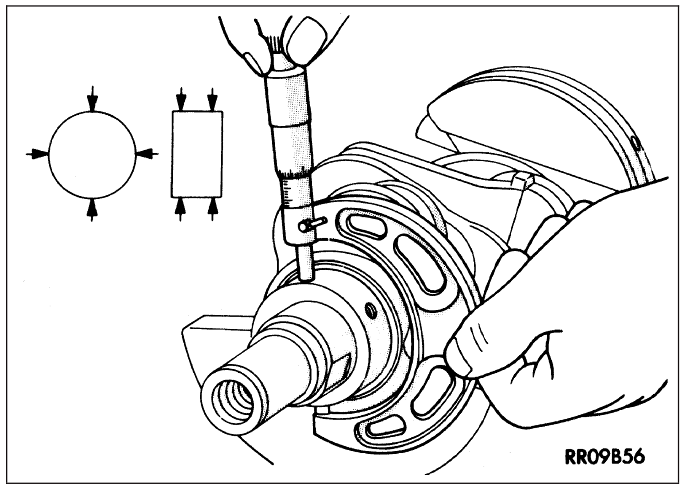
20. Remove main bearing caps.

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mishandled.

21. Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.



INSTALLATION - CRANKSHAFT

The crankshaft is supported in five main bearings. All upper bearing shells in the crankcase have oil grooves and holes. All lower bearing shells are smooth. Crankshaft end play is controlled by a two piece thrust bearing on the number three main bearing journal.

1. Install the main bearing upper shells with the lubrication groove and oil hole in the engine block.
2. Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

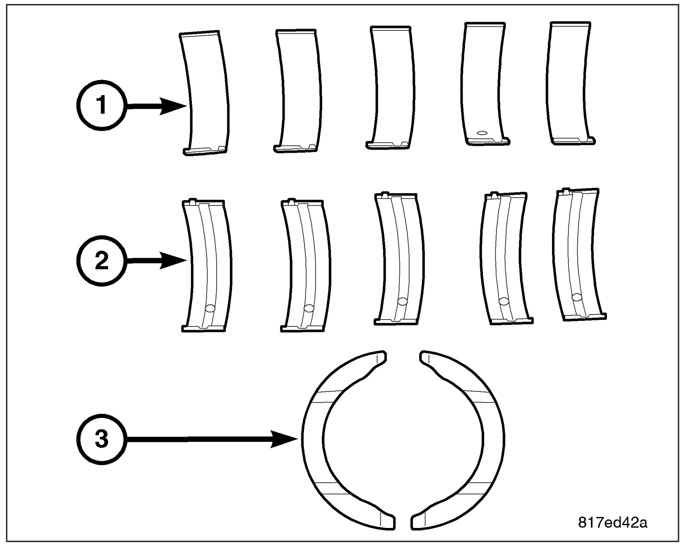
NOTE: If the crankshaft is sent out for machine work, it must be balanced as an assembly with the target ring installed.

3. Clean crankshaft and target ring with MOPAR® Brake Parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

4. Install **NEW**mounting screws finger tight starting with the #1 location. Make sure engagement occurs with the shoulder of the screws and mounting hole before starting all other screws.
5. Torque all mounting screws with T30 torx bit to 13 Nm (110 in-lbs) following the torque sequence.

NOTE: Lightly apply trans gel to thrust bearings to hold bearings in block.



6. Install thrust bearings (3) in block.

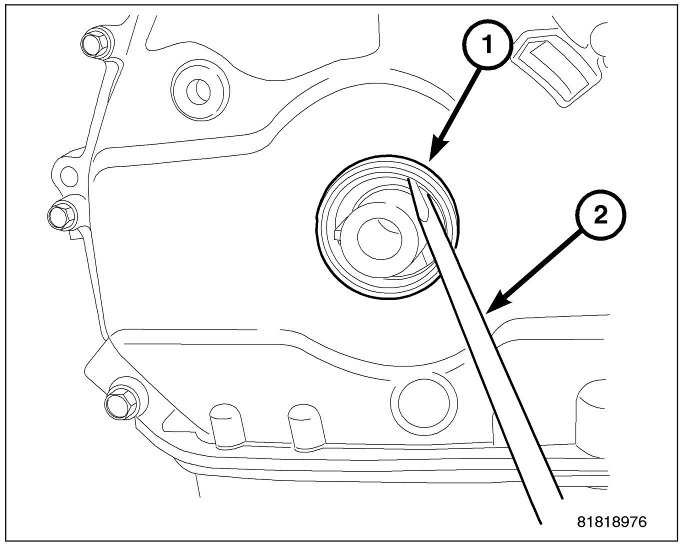
CAUTION: Do not get oil on the ladder frame mating surface. It will affect the ability of the RTV to seal the ladder frame to cylinder block.

7. Oil the bearings and journals. Install crankshaft in engine block.
8. Install lower main bearings (1) into main bearing cap. Make certain the bearing tabs are seated into the bearing cap slots.
9. Before installing the bolts the threads should be clean and dry.
10. Install main bearing caps to engine block, install bolts finger tight.
11. To ensure correct thrust bearing alignment, perform the following steps:
    - Step 1: Rotate crankshaft until number 4 piston is at TDC.
    - Step 2: Move crankshaft rearward to limits of travel.
    - Step 3: Then, move crankshaft forward to limits of travel.
    - Step 4: Wedge an appropriate tool between the rear of the cylinder block and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
12. Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) in sequence shown.
13. Remove wedge tool used to hold crankshaft.
14. Check the crankshaft turning torque, it should not exceed 5.6 N·m (50 in. lbs.).
15. Check crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).
16. Install connecting rod bearings and caps. **Do Not Reuse Connecting Rod Bolts.** Torque connecting rod bolts to 27 N·m (20 ft. lbs.) plus 1/4 turn.
17. Install the ladder frame assembly (Refer to 9 - ENGINE/ENGINE BLOCK/LADDER FRAME - INSTALLATION).
18. Install the balance shaft module (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
19. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
20. Install crankshaft position sensor.
21. Install cylinder head if it was removed (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
22. Install front crankshaft sprocket.
23. Install the timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
24. Install the timing chain front cover.
25. Install front crankshaft oil seal.
26. Install engine mount support bracket.
27. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
28. Remove engine from repair stand and position on Special Tools 6135 and 6710 Engine Dolly and Cradle. Install safety straps around the engine to cradle and tighten and lock them into position.
29. Install crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).
30. Install drive plate/flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).
31. Attach transaxle to engine. Tighten attaching bolts to 101 N·m (75 ft. lbs.).
32. Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).
33. Install new oil filter and fill with oil.
34. Start engine and check for leaks.

SEAL-CRANKSHAFT OIL FRONT

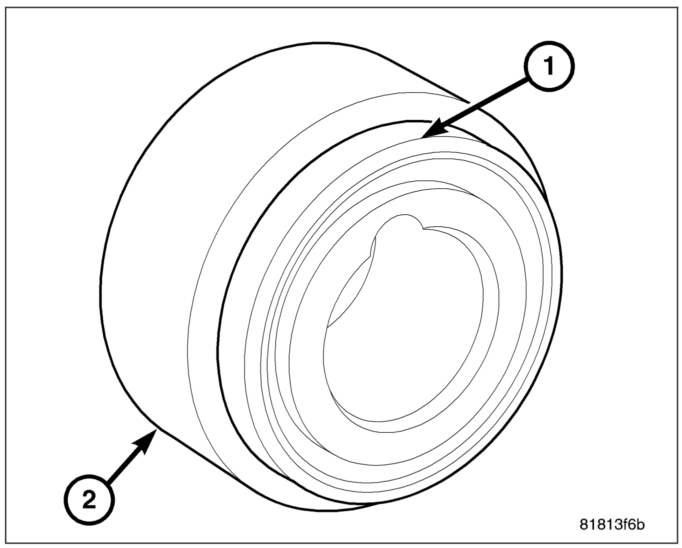
REMOVAL

1. Remove the crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove front crankshaft oil seal (1) by prying out with a screw driver (2). Be careful not to damage the cover seal surface.

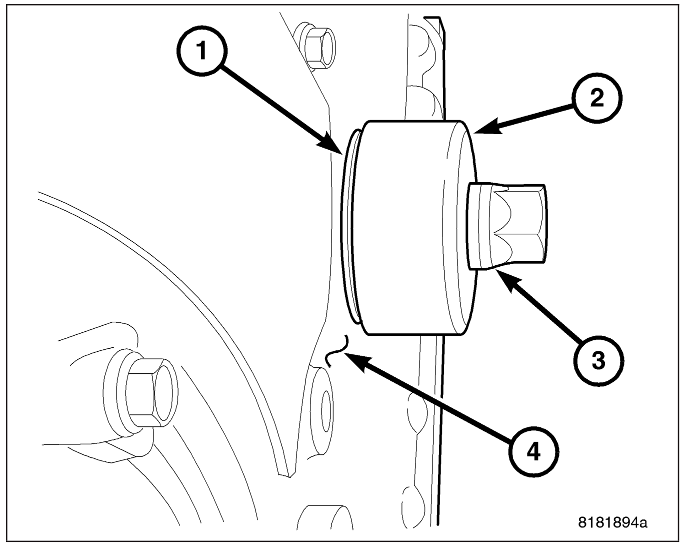


INSTALLATION

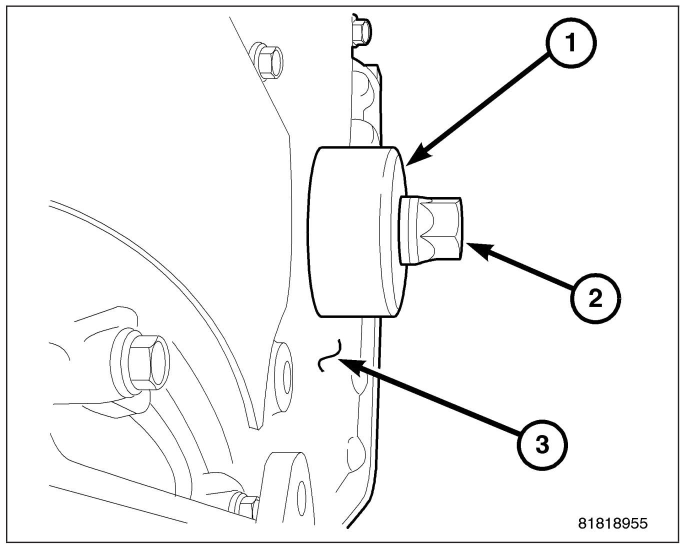
1. Place seal (1) onto Seal installer 9506 (2) with seal spring towards the inside of engine.



2. Install new seal (1) by using Seal installer 9506 (2) and crankshaft damper bolt (3).



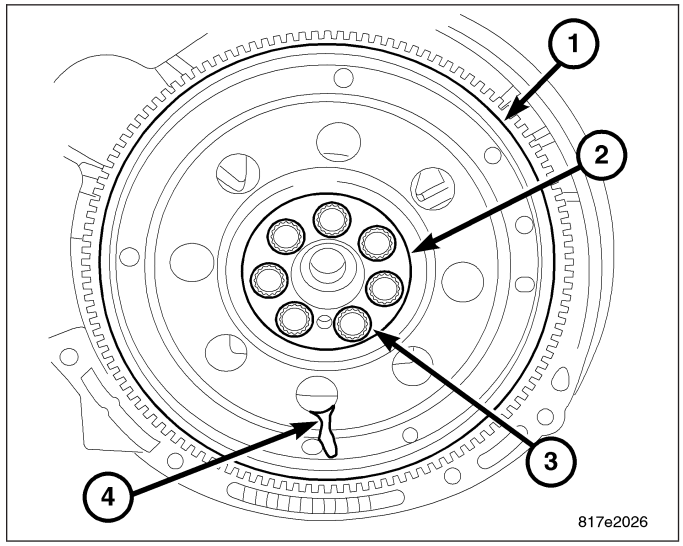
3. Press seal into front cover until Seal Installer 9506 (1) seats against timing chain cover (3).
4. Remove seal installer 9506 (1).
5. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION.



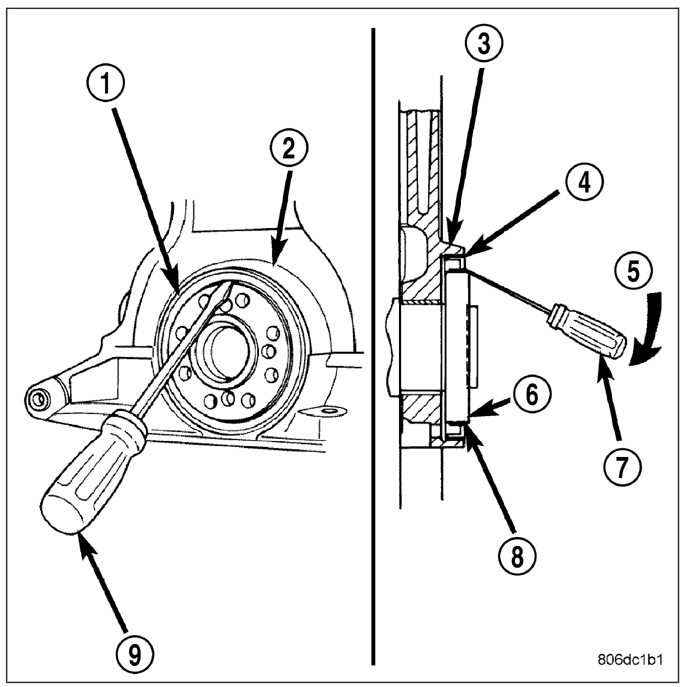
SEAL-CRANKSHAFT OIL REAR

REMOVAL

1. Remove transaxle
2. Remove flex plate bolts and discard.
3. Remove flex plate (1).



4. Insert a 3/16 flat bladed screwdriver (7) between the dust lip (8) and the metal case (4) of the crankshaft seal (1). Angle the screwdriver through the dust lip against metal case of the seal. Pry out seal.



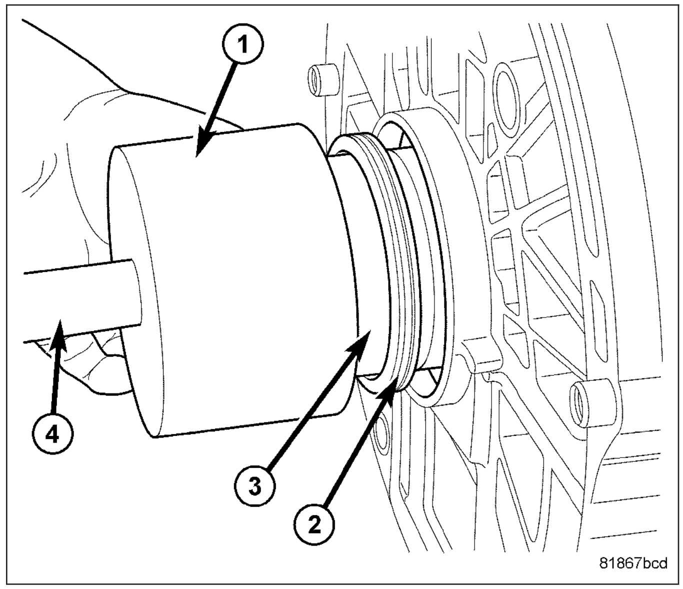
CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

INSTALLATION

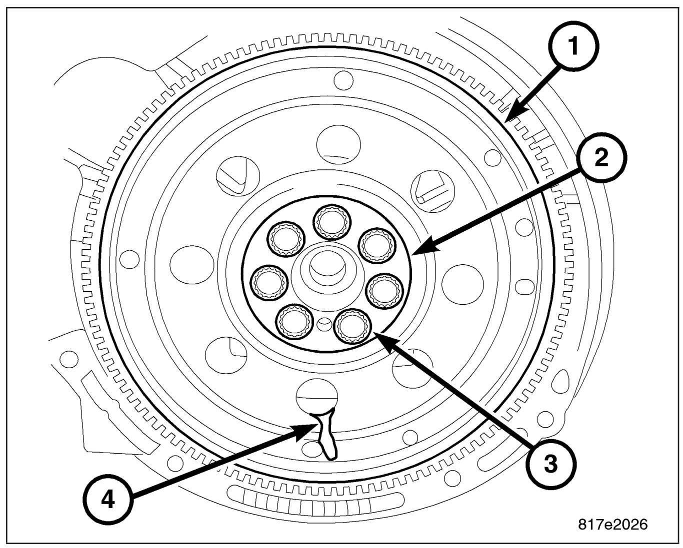
CAUTION: If a burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

NOTE: When installing seal, no lube on seal is needed.

1. Place Special Tool 9509 (3) Seal Guide on crankshaft.
2. Position seal (2) over guide tool. Guide tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.
3. Drive the seal into the block using Special Tool 9706 (1) and handle C-4171 (4) until the tool bottoms out against the block.



4. Install flex plate (1). Install new flex plate bolts and torque to 95 N·m (70 ft. lbs.).
5. Install transaxle. Refer to TRANSMISSION/TRANSAXLE - INSTALLATION for procedure.



ROD-PISTON & CONNECTING

DESCRIPTION

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged connecting rods. The pistons pin is offset 0.8 mm (0.0314 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. The pistons with rings and connecting rods are serviced as an assembly.

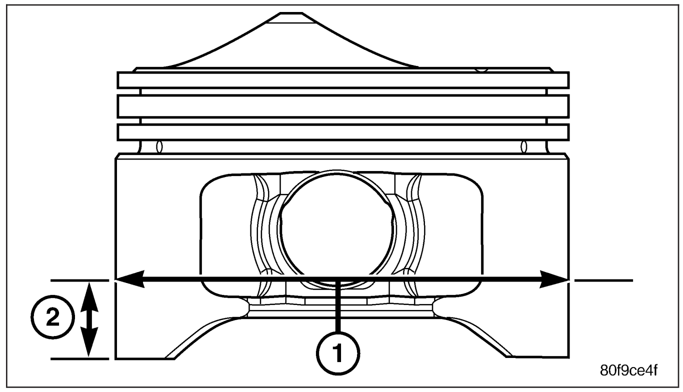
STANDARD PROCEDURE

PISTON TO CYLINDER BORE FITTING

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

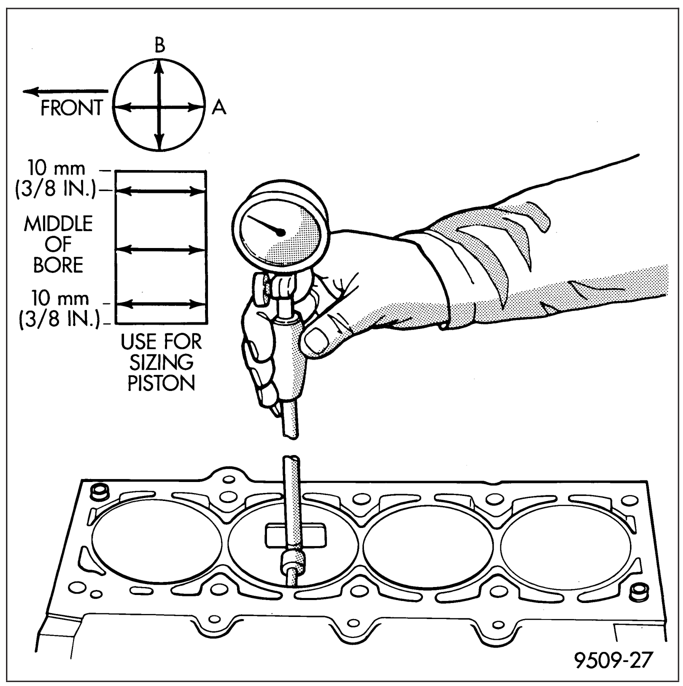
Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin (1).

1. Measurement should be taken approximately 16 mm (0.629 in.) from the bottom of the skirt (2) as shown in.



NOTE: Correct piston to bore clearance must be established in order to assure quiet and economical operation.

2. Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in. Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS).



REMOVAL

NOTE: Pistons, rings, and rods are serviced as an assembly.

CAUTION: All four piston/rod assemblies must be replaced as a set or engine damage may result.

1. Remove engine (Refer to 9 - ENGINE - REMOVAL).
2. Separate engine from transaxle.
3. Remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

4. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove balance shaft assembly.

NOTE: Remove any carbon build up prior to piston removal.

6. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation**.
7. Rotate crankshaft so that each connecting rod is centered in cylinder bore.
8. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods, as damage to connecting rod could occur.

CAUTION: Care must be taken not to damage the fractured rod and cap joint surfaces, as engine damage many occur.

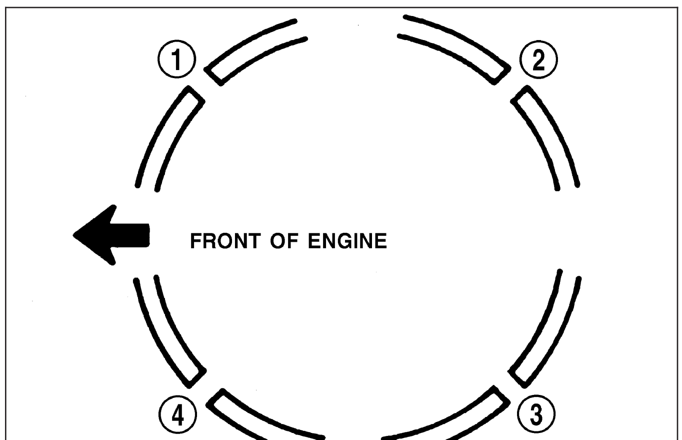
9. Remove connecting rod bolts and cap.

NOTE: Do not reuse connecting rod bolts.

10. Carefully push each piston and rod assembly out of cylinder bore. Re-install bearing cap on the mating rod.
11. Repeat procedure for each piston and connecting rod assembly.

INSTALLATION

1. Install piston rings on piston (Refer to 9 - ENGINE/ ENGINE BLOCK/PISTON RINGS - INSTALLATION).
2. Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.
3. Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown above. As viewed from the top of the piston.
4. Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston. **Be sure position of rings does not change during this operation**.



9509-46

5. The directional arrow stamped on the piston should face toward the front of the engine.
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

NOTE: There are three different size rod bearings, perform rod bearing selection procedure.

7. The rod bearing sizes are indicated on the nose of the crankshaft.
8. Install connecting rod upper bearing half into connecting rod.
9. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

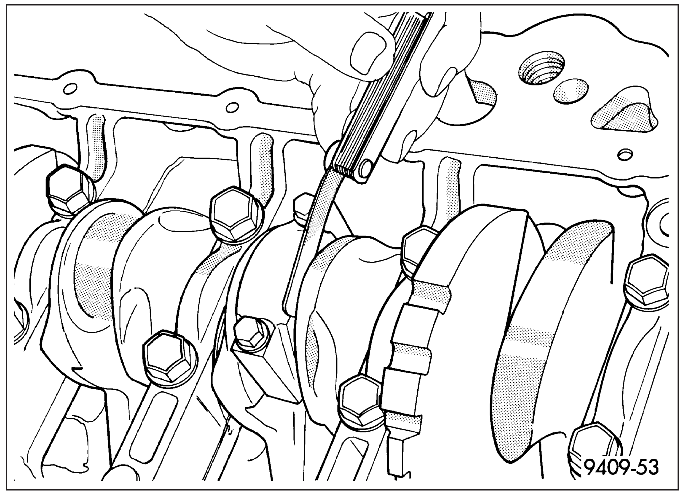
NOTE: The connecting rod cap bolts should NOT be reused.

10. Before installing the **NEW** bolts, the threads should be coated with clean engine oil.
11. Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.
12. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
13. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

14. Using a feeler gauge, check connecting rod side clearance. (Refer to 9 - ENGINE - SPECIFICATIONS) for connecting rod side clearance.
15. Install the ladder frame.
16. Install oil pump/Balance Shaft Carrier Assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT CARRIER - INSTALLATION).
17. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
18. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).



BEARINGS-CRANKSHAFT MAIN

STANDARD PROCEDURE - MAIN BEARING SELECTION

NOTE: There are three different possibilities for the upper main bearings and five different lower main bearings. The upper and lower bearing shells are not interchangeable.

The lower main bearing identification is stamped in the nose of the crankshaft (1). There are 5 different bearing sizes available 0 through 4.

CRANKSHAFT IDENTIFICATION		LOWER CRANKSHAFT BEARING SELECTION	
JOURNAL DIAMETER GRADE	DIMENSION	LOWER MAIN BEARING SIZE CLASSIFICATION	LOWER MAIN BEARING DIMENSION
0	52 mm	0 (Pink or Red)	2 mm
1	52 mm	1 (Black)	2 mm
2	52 mm	2 (No Color)	2 mm
3	52 mm	3 (Green)	2 mm
4	52 mm	4 (Blue)	2 mm

The upper main bearing shell identification is located in the middle of cylinder block on the right side of the engine when viewing from the flywheel. There are three different size bearings available.

UPPER MAIN BEARING SELECTION

CYLINDER BLOCK IDENTIFICATION		UPPER CRANKSHAFT BEARING SELECTION	
MAIN BEARING GRADE	DIMENSION	UPPER MAIN BEARING SIZE CLASSIFICATION	UPPER MAIN BEARING DIMENSION
1	56 mm	1 (Black)	2 mm
2	56 mm	2 (No Color)	2 mm
3	56 mm	3 (Green)	2 mm

BEARINGS-CONNECTING ROD

STANDARD PROCEDURE

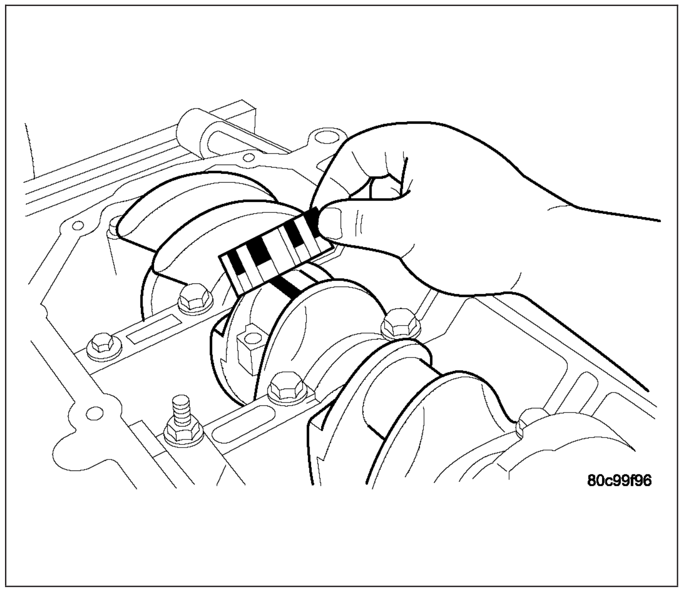
CONNECTING ROD - FITTING

There are three different sizes of rod bearings available. Connecting rod bearing identification can be found on the nose of the crankshaft. Use the table below for proper bearing selection.

CONNECTING ROD BEARING SELECTION

CRANKSHAFT PIN DIAMETER GRADE	DIMENSION	CONNECTING ROD BEARING CLASSIFICATION	CONNECTING ROD BEARING DIMENSION
1	48 mm	1 (Black)	1.5 mm
2	48 mm	2 (No Color)	1.5 mm
3	48 mm	3 (Green)	1.5 mm

1. For measuring connecting rod bearing clearance procedure and use of Plastigage (Refer to 9 - ENGINE - STANDARD PROCEDURE) For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS).

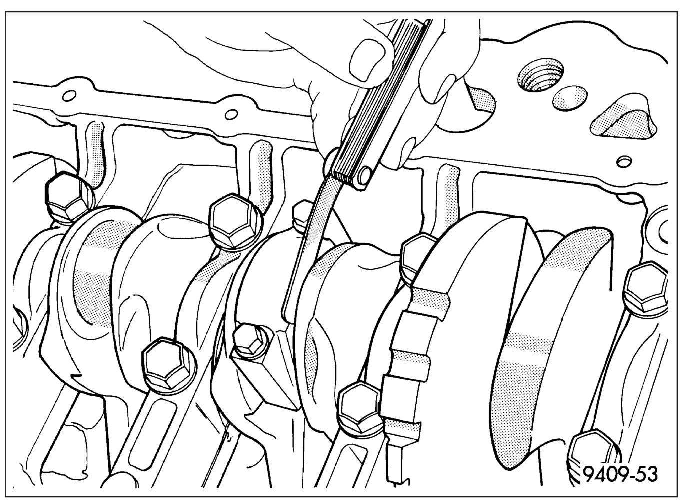


NOTE: The rod bolts should not be reused.

2. Before installing the **NEW** rod bolts the threads and under the bolt head should be oiled with clean engine oil.
3. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

   1. Tighten the bolts to 27 N·m (20 ft. lbs.).
   2. Tighten the connecting rod bolts an additional 90°.
5. Using a feeler gauge, check connecting rod side clearance. Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

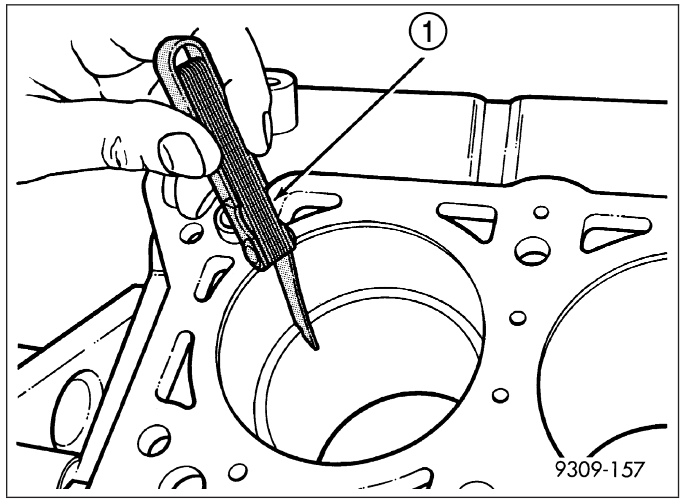


RINGS-PISTON

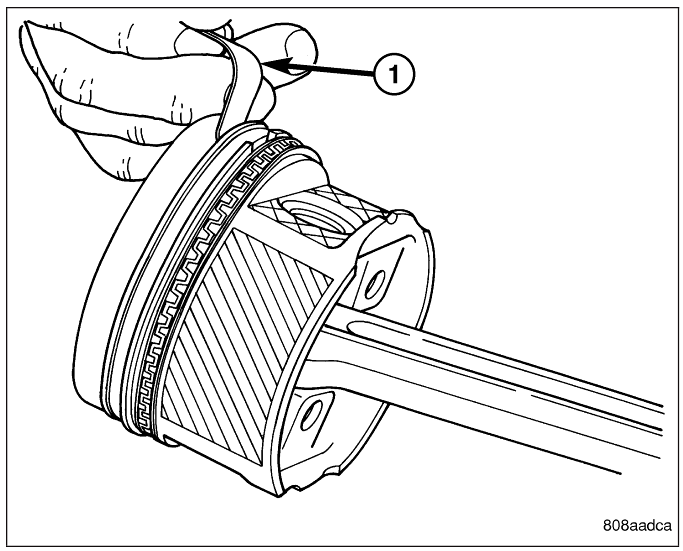
STANDARD PROCEDURE

PISTON RING - FITTING

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge. Refer to Engine Specifications.

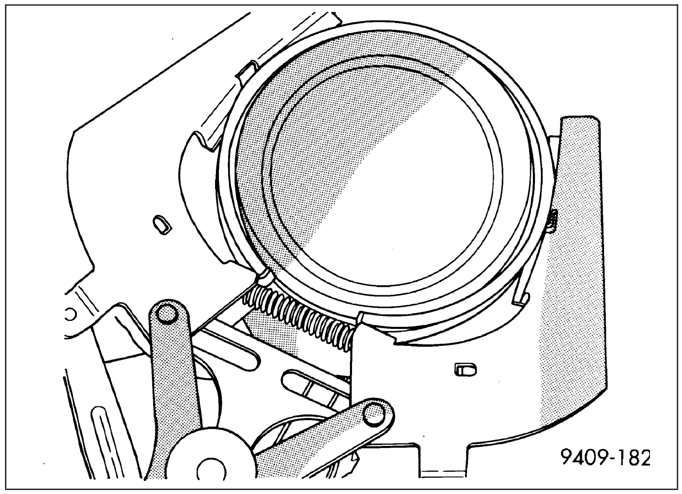


2. Check piston ring to groove side clearance. Refer to Engine Specifications.



REMOVAL

1. Using a suitable ring expander, remove upper and intermediate piston rings.
2. Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.
3. Clean ring grooves of any carbon deposits.



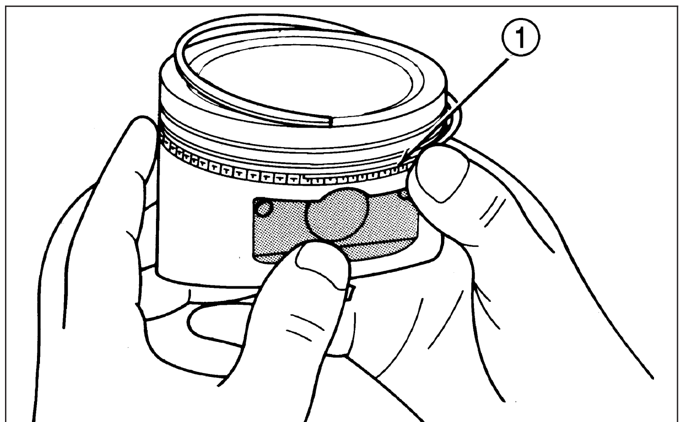
9409-182

INSTALLATION

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.

CAUTION: Install piston rings in the following order:

1. Oil ring expander.
2. Upper oil ring side rail.
3. Lower oil ring side rail.
4. No. 2 Intermediate piston ring.
5. No. 1 Upper piston ring.

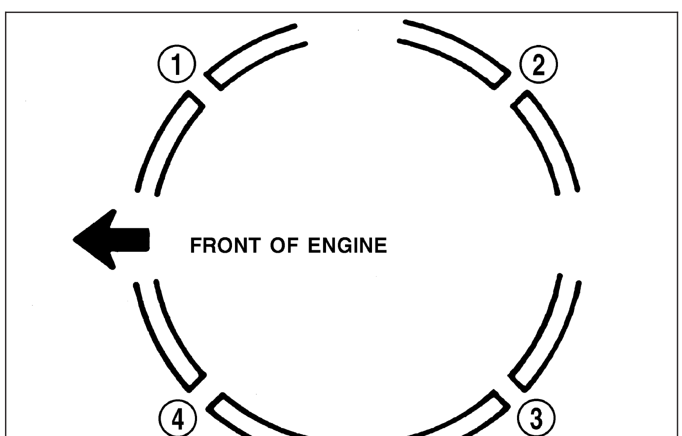


9409-184

1. Install oil ring expander.
2. Install upper side rail first and then the lower side rail. Install the side rails by placing one end between the piston ring groove and the oil ring expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander.**

NOTE: The compression rings are marked Y1 for the upper compression ring and Y2 for the second compression ring. These markings must face upward.

3. Install No. 2 piston ring and then No. 1 piston ring.
4. Position piston ring end gaps as shown in.
5. Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.

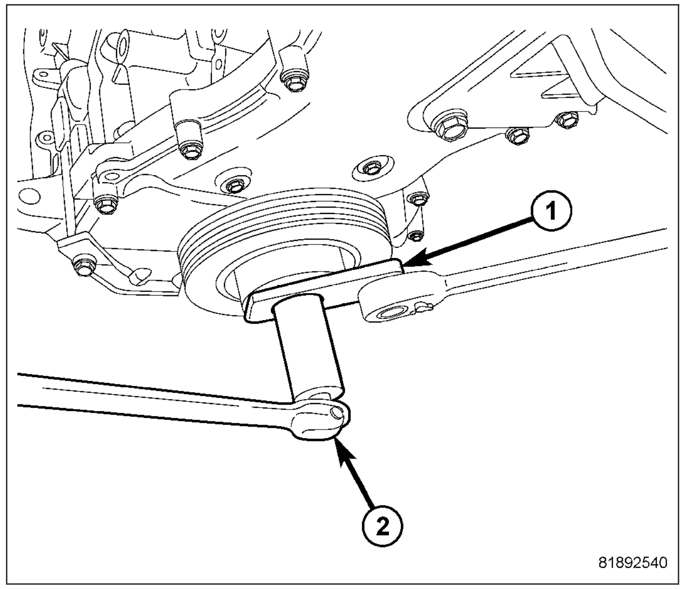


9509-46

DAMPER-VIBRATION

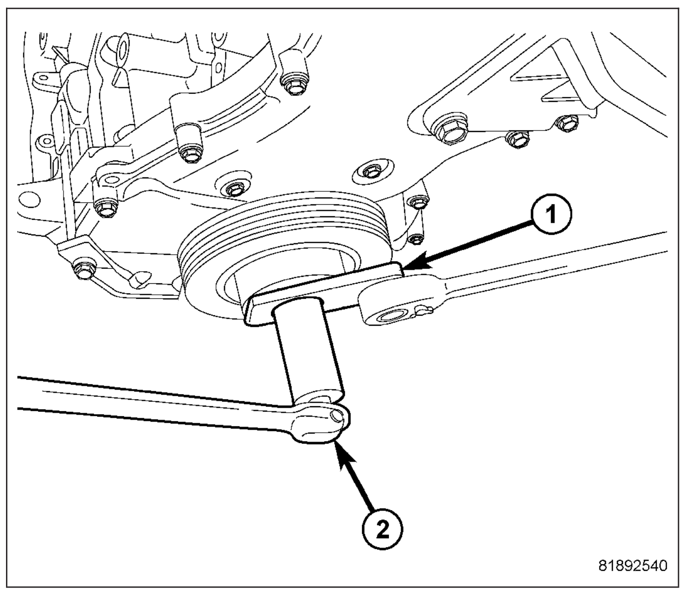
REMOVAL

1. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Install Damper holder 9707 (1).
3. Remove crankshaft damper bolt.
4. Pull damper off crankshaft.



INSTALLATION

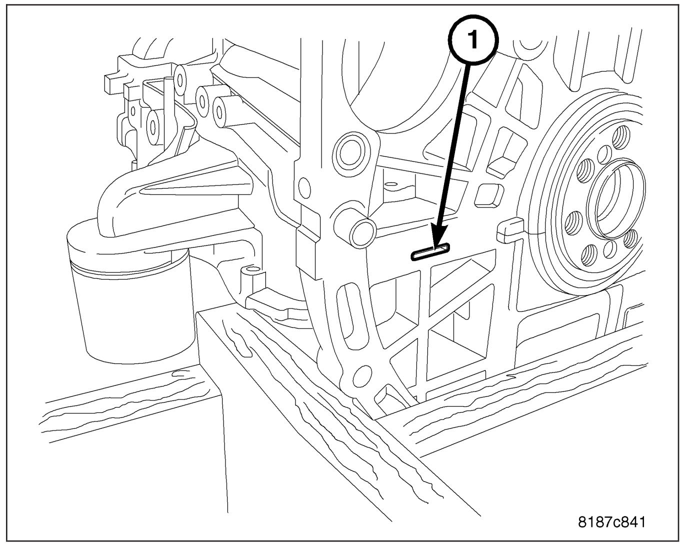
1. Install crankshaft damper.
2. Apply clean engine oil crankshaft damper bolt threads and between bolt head and washer. Torque bolt to 210 N·m (155 ft. lbs.).
3. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



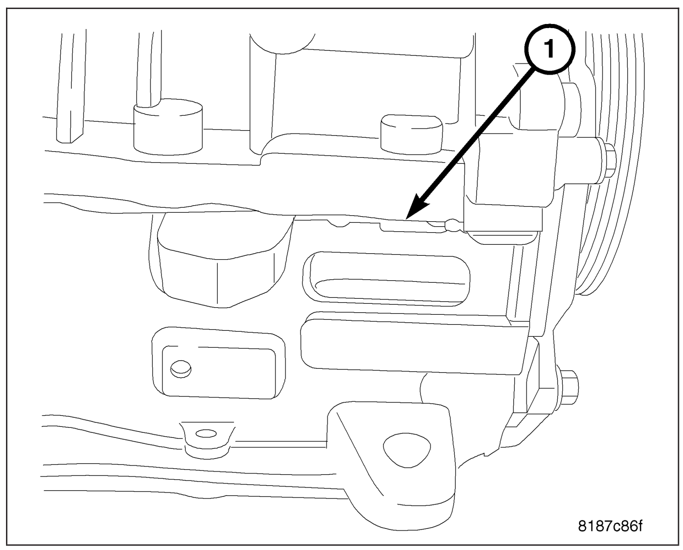
FRAME-LADDER

REMOVAL

1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove oil pump/balance shaft assembly (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
3. Remove ladder frame retaining bolts.
4. Remove ladder frame using pry points cast in the rear of the block (1).



5. To assist in removing the ladder frame another (1) pry points cast in the left side of the block.

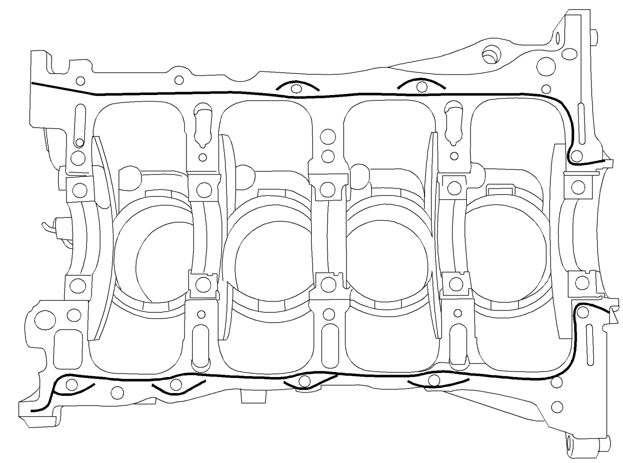


CLEANING

Clean ladder frame with a plastic or wooden scraper and a suitable solvent.

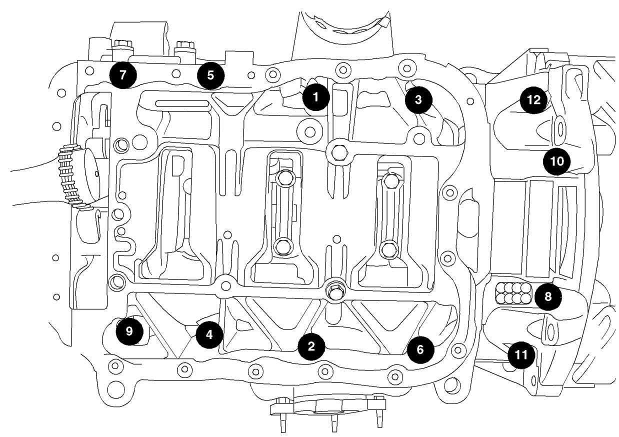
INSTALLATION

1. Apply a 2 mm bead of sealant as shown.



8186540e

2. Install bolts and torque shown following a three step method.
   - First: All to 20 N·m (15 ft. lbs.)
   - Second: All to 49 N·m (36 ft. lbs.)
   - Third: All to 49 N·m (36 ft. lbs.)
3. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/ OIL PAN - INSTALLATION).

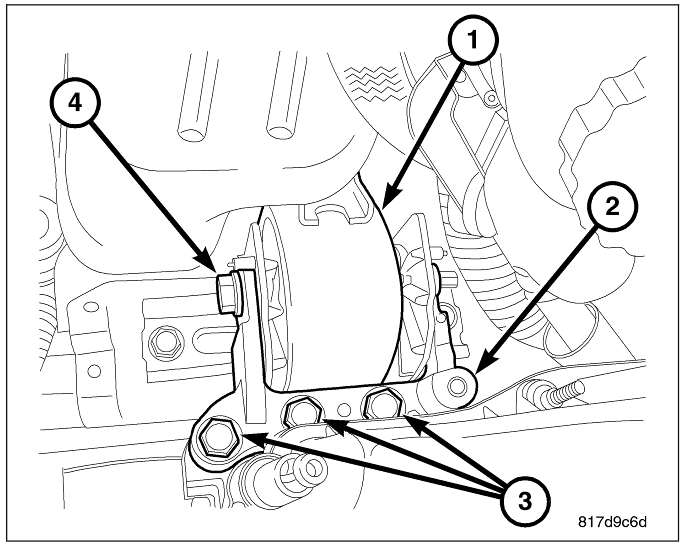


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MOUNT-RIGHT

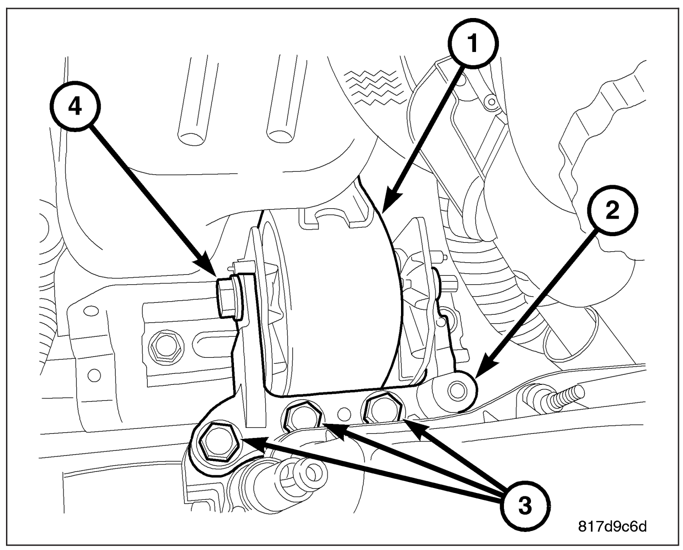
REMOVAL

1. Remove coolant reservoir and set aside.
2. Remove power steering reservoir and set aside.
3. Remove windshield washer bottle.
4. Remove power steering line support bracket from engine mount.
5. Support transaxle with a block of wood and a suitable jack.
6. Remove engine mount through bolt (4).
7. Remove engine mount bracket bolts (3).
8. Remove engine mount retaining bolts.
9. Remove engine mount.



INSTALLATION

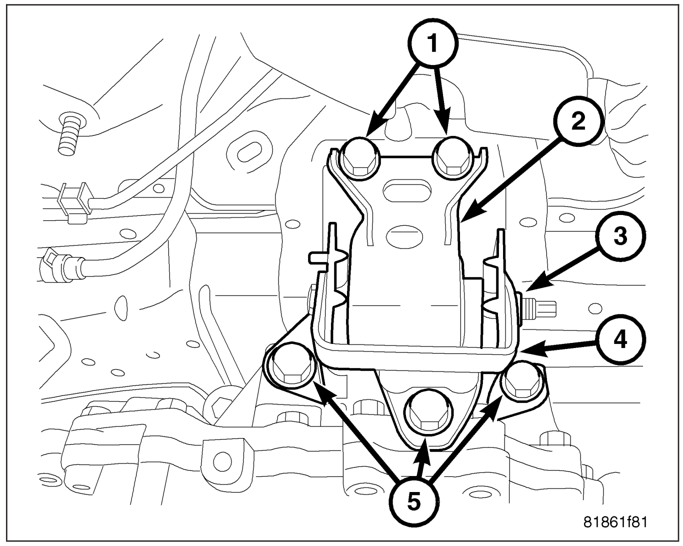
1. Install engine mount.
2. Install engine mount retaining bolts and torque to 28 N·m (250 in. lbs.).
3. Install engine mount bracket and torque bolts (3) to 68 N·m (50 ft. lbs.).
4. Install engine mount through bolt (4) and torque to 115 N·m (85 ft. lbs.).
5. Remove jack.
6. Install power steering line support bracket at engine mount.
7. Install windshield washer bottle.
8. Install power steering reservoir.
9. Install coolant reservoir.



MOUNT-LEFT

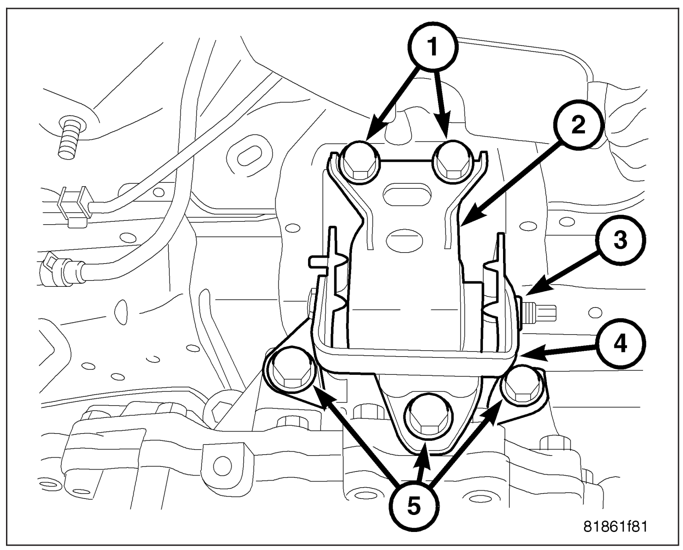
REMOVAL

1. Remove air cleaner assembly.
2. Disconnect negative cable from battery.
3. Remove PCM.
4. Remove PCM mounting bracket.
5. Support transaxle with a suitable jack.
6. Remove left mount through bolt (3).
7. Remove mount to transaxle bolts (5).
8. Remove left mount bracket (4).
9. Remove left mount bracket to body frame rail fasteners.
10. Remove mount.



INSTALLATION

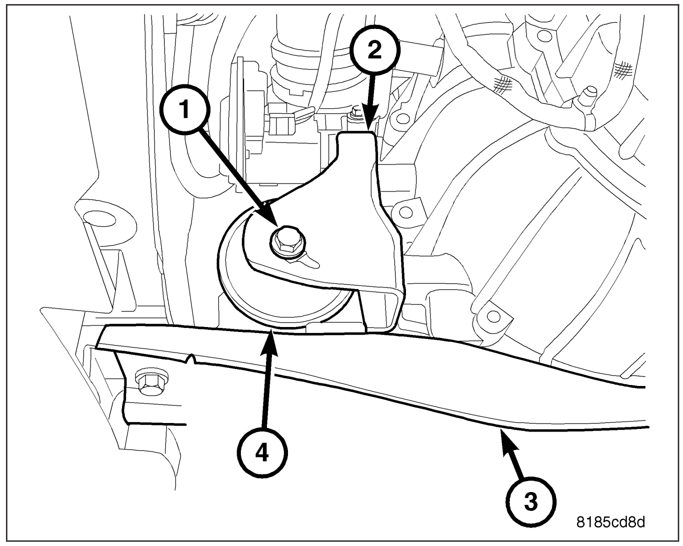
1. Install mount.
2. Install left mount to frame rail bolts and torque to 28N·m (250 in. lbs.).
3. Install left mount bracket (4).
4. Install mount to transaxle bolts (5) and torque to 68 N·m (50 ft.lbs.).
5. Install mount through bolt (3) and torque to 115 N·m (85 ft.lbs.).
6. Remove jack.
7. Install PCM mounting bracket.
8. Install PCM.
9. Connect negative battery cable.
10. Install air cleaner assembly.



MOUNT-FRONT

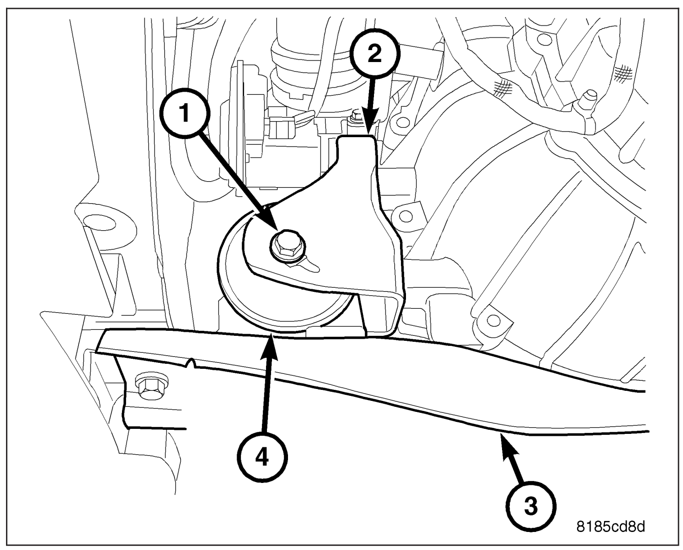
REMOVAL

1. Raise vehicle.
2. Remove fore aft member (3) to mount (4) bolts.
3. Remove mount through bolt (1).
4. Remove fore aft member (3) mounting bolts and remove.
5. Remove front mount (4).



INSTALLATION

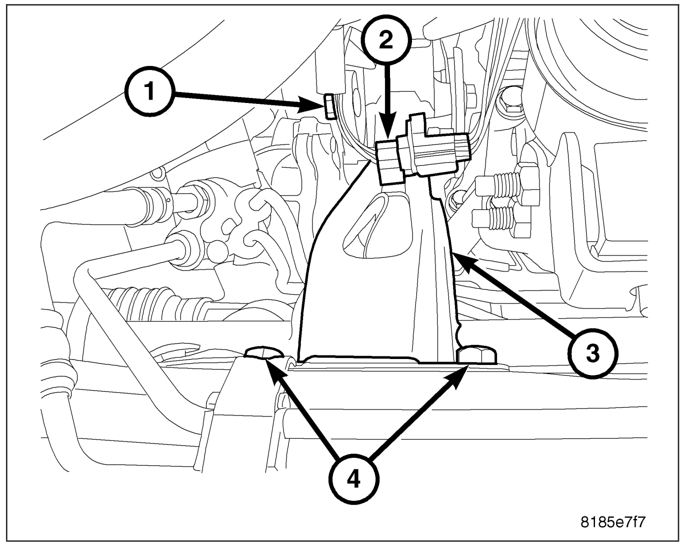
1. Install mount (4) and tighten bolts.
2. Install fore aft member (3) and tighten bolts.
3. Install mount through bolt (1) and tighten.
4. Lower vehicle.



MOUNT-REAR

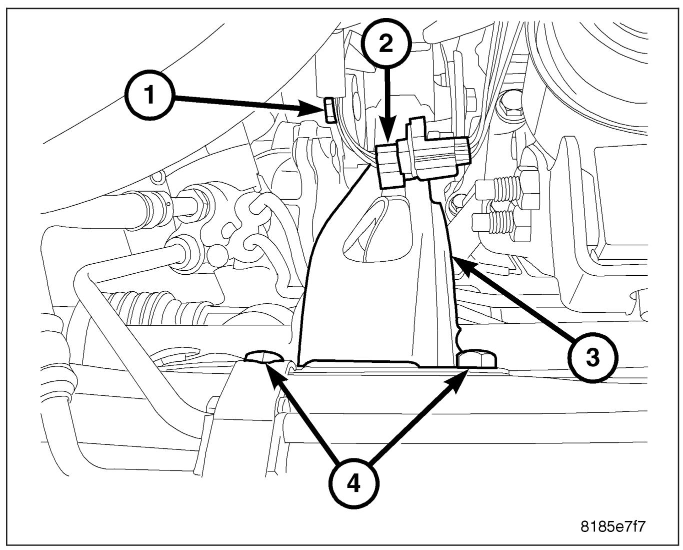
REMOVAL

1. Remove rear mount retaining bolts (4).
2. Remove rear mount through bolt (1).
3. Remove oxygen sensor connector (2) from mount.
4. Remove rear mount (3).



INSTALLATION

1. Install rear mount (3).
2. Install rear mount retaining bolts (4) and tighten.
3. Install rear mount through bolt (1) and tighten.
4. Install oxygen sensor connector (2) retainer to mount (3).



LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is chain driven by the crankshaft. Oil pressure is controlled by a relief valve mounted inside the oil pump housing.

OPERATION

Engine oil is drawn up through the pickup tube and is pressurized by the oil pump and routed through the oil filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from the main bearing journals to the connecting rod journals. The main oil gallery also feeds oil pressure to the timing chain tensioner. A vertical hole at the number three main bearing area routes pressurized oil through a restrictor up into the cylinder head. The restrictor that is integral to the cylinder head gasket, provides increased oil flow to the main gallery. Upper engine lubrication is provided by one main feed to the number three camshaft bearing cap. Oil is then routed through the rocker shafts to the remaining camshaft bearing caps and rocker arms/hydraulic lash adjusters. Oil returning to the oil pan from the pressurized components supplies lubrication to the valve stems. The cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collar.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

Check oil pressure using a gauge at oil pressure switch location.

1. If equipped with A/C remove accessory drive belt and A/C compressor.
2. Remove pressure sending unit.
3. Install oil pressure test gauge, Special Tool C-3292 with Adapter 8406.

CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM.

4. Warm engine to normal operating temperature.
5. Monitor gauge readings at idle and 3000 rpm. For specifications (Refer to 9 - ENGINE - SPECIFICATIONS).
6. If oil pressure is low (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSPECTION).

FILTER-OIL

REMOVAL

1. Turn oil filter cap counterclockwise 2 ½ turns and wait one minute.

NOTE: A drain back valve incorporated into the oil filter cartridge housing allows oil to drain back into the crankcase as the oil filter cartridge is removed.

2. Continue turning the oil filter cap counterclockwise. Remove cap slowly to avoid spill of oil.
3. Remove oil filter cartridge from the cap.

NOTE: If the center tube separates from the cap and stays inside the filter cartridge, you must remove the center tube from the filter element and snap it back onto the cap with the spring.

4. Remove and discard o-ring from cap.

INSTALLATION

1. Install new o-ring on cap.
2. Install new oil filter cartridge over center tube of cap.

NOTE: Before installation, make sure no grommet is left on the center post of the oil filter housing from the previous filter.

3. Align the grommet hole of the oil filter cartridge with the center post of the filter housing.
4. Press in and turn oil filter cap clockwise. Tighten cap to 25 N·m (18 ft. lbs). Cap flange should sit tightly on the housing flange.
5. Fill oil to proper level.
6. Start engine. Check for leaks.

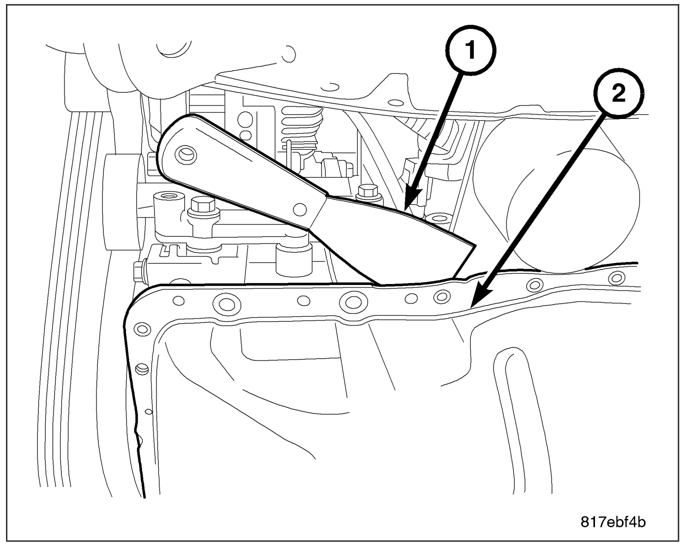
PAN-OIL

REMOVAL

1. Raise vehicle on hoist.
2. Drain engine oil.
3. Remove accessory drive belt splash shield.
4. Remove lower A/C compressor mounting bolt (if equipped).
5. Remove A/C mounting bracket.

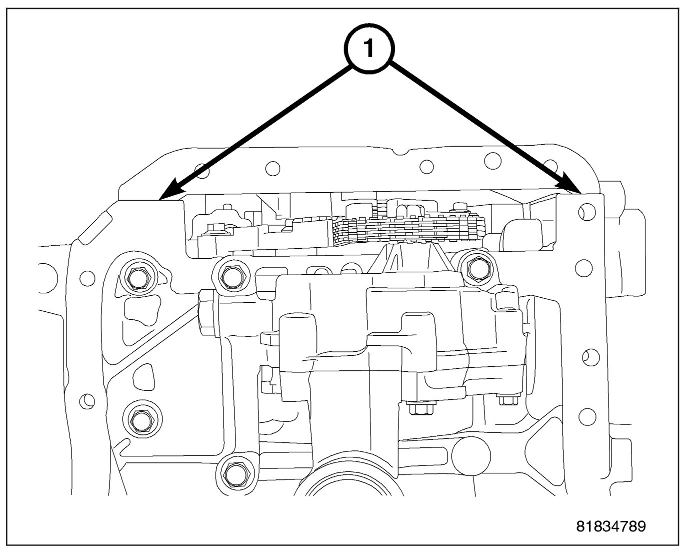
NOTE: Do not use pry points in block to remove oil pan.

6. Remove oil pan retaining bolts.
7. Using a putty knife (1), loosen seal around oil pan (2).
8. Remove oil pan (2).

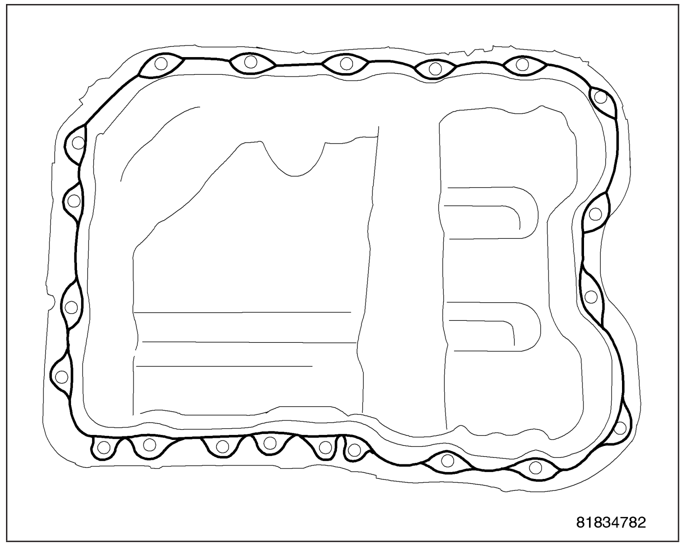


INSTALLATION

1. Apply Mopar® Engine RTV GEN II at the front cover to engine block parting lines (1).



2. Apply a 2 mm bead of Mopar® Engine RTV GEN II around the oil pan as shown.



3. Tighten screws to 12 N·m (105 in. lbs.).
4. Install oil drain plug.
5. Lower vehicle and fill engine crankcase with proper oil to correct level.
6. Start engine and check for leaks.

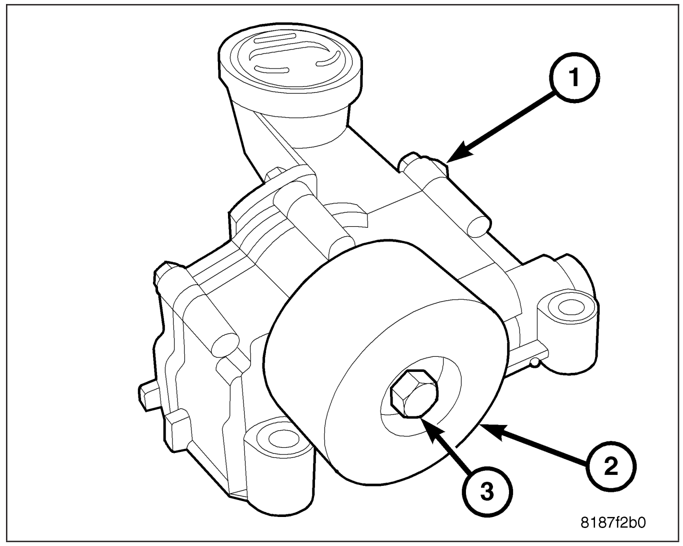
PUMP-OIL

REMOVAL

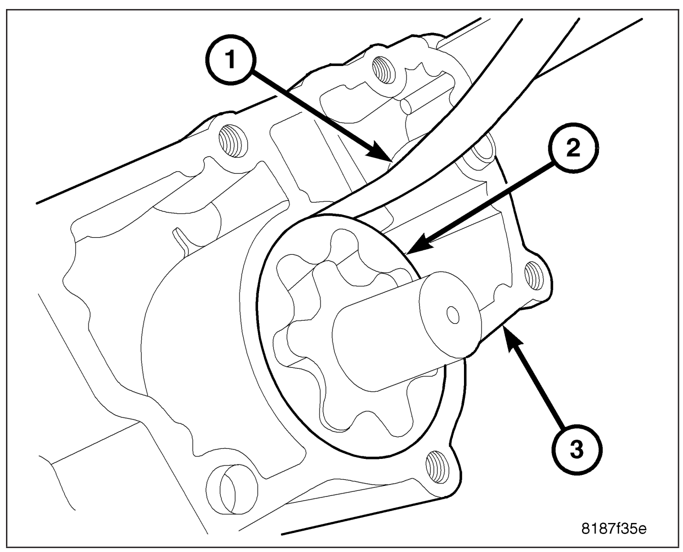
1. Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER - REMOVAL).

INSPECTION

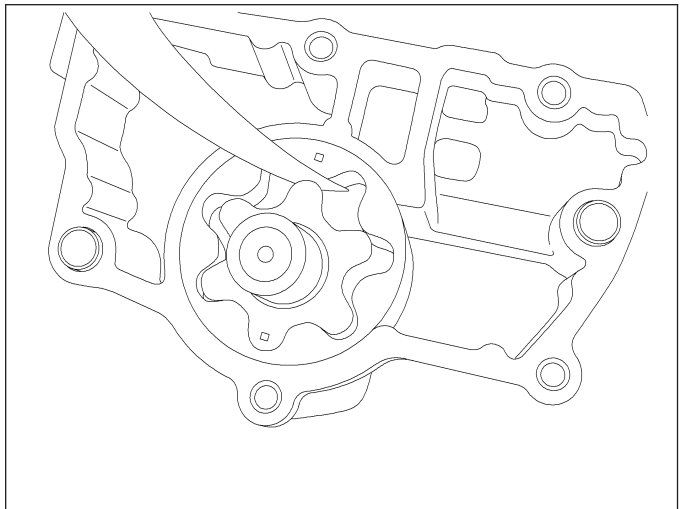
1. Remove pressure relief valve.
2. Inspect pressure relief valve for scoring or damage. If scored or damaged, replace valve.
3. Inspect oil pump housing bore for damage or scoring, if found replace pump.
4. Remove oil pump drive sprocket using holder 9711 (2).
5. Remove oil pump housing retaining bolts.
6. Remove oil pump housing.



7. Measure outer rotor (2) to housing (3) clearance with feeler gauge (1).

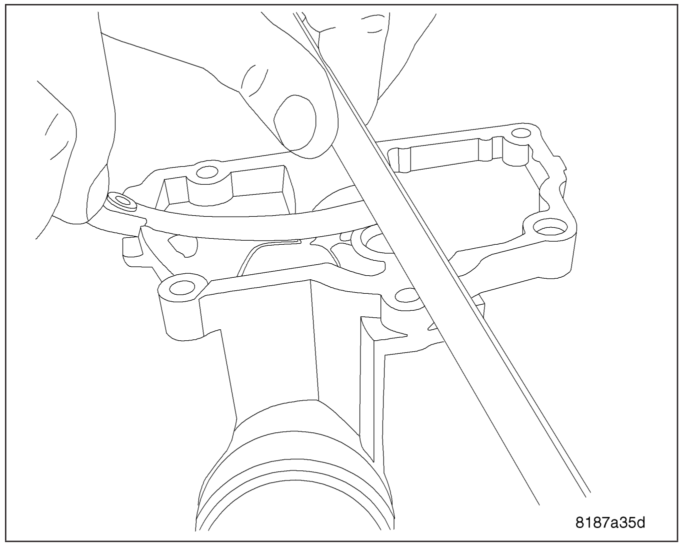


8. Measure tip clearance between outer and inner rotor.



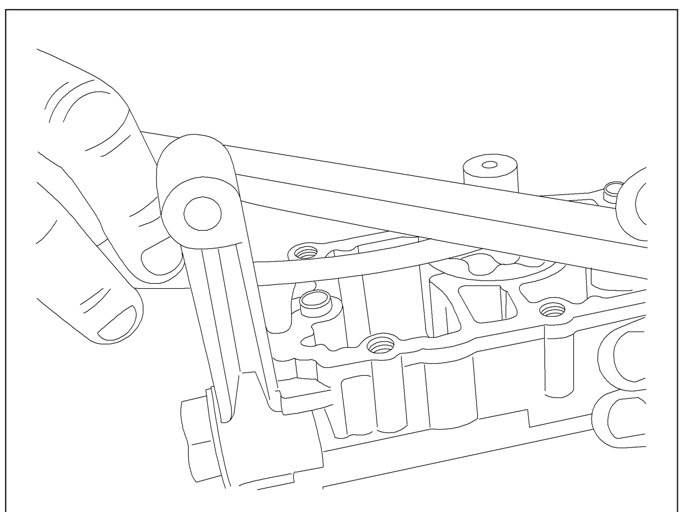
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9. Measure pump cover flatness with a straight edge and feeler gauge.



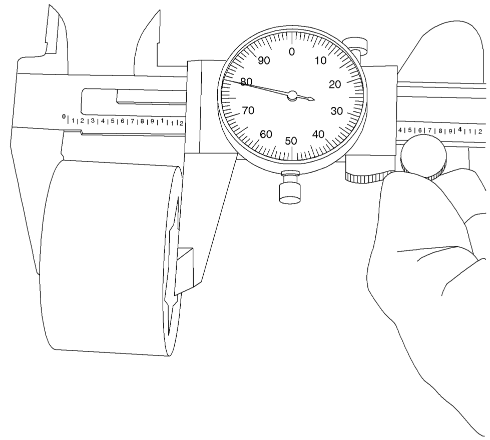
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10. Measure clearance over rotors with a straight edge and feeler gauge.



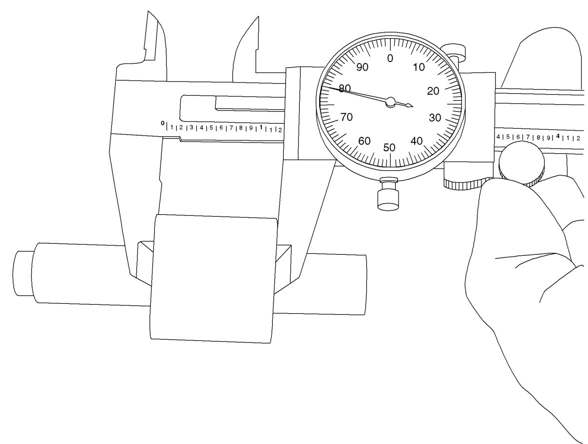
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11. Measure outer rotor thickness.



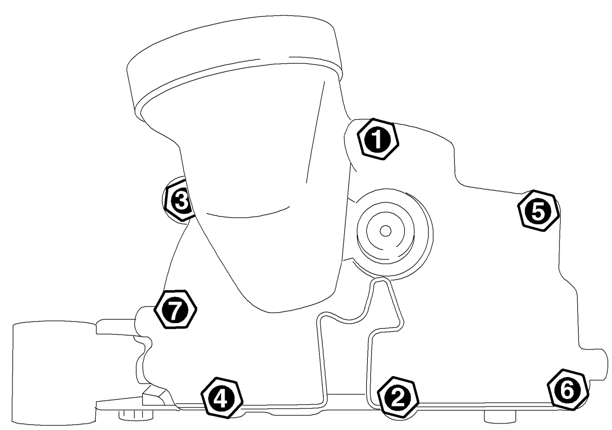
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12. Measure inner rotor thickness.



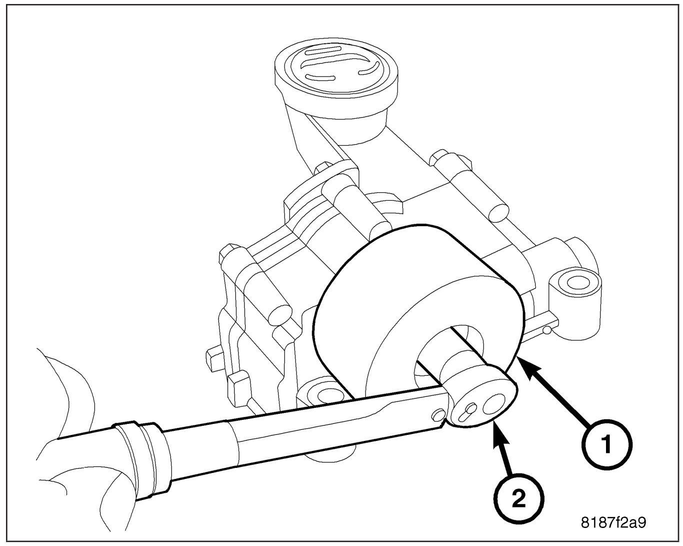
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13. Inspect pump housing for scoring, replace as needed.
14. If pump passes inspections, install pump cover.
15. Install retaining bolts and tighten.



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16. Install pump drive sprocket using holder 9711 (1) and tighten.



INSTALLATION

1. Install timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER - INSTALLATION).

SENSOR/SWITCH-ENGINE OIL PSI

DESCRIPTION

The oil pressure switch is located on the left front side of the engine block. The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

OPERATION

The oil pressure switch is normally "Closed." The switch changes from a ″Closed″ circuit to an ″Open″ circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an ″Open″ circuit to a ″Closed″ circuit, on decreasing pressure, between 2 psig and 4 psig.

REMOVAL

1. Raise vehicle.
2. Disconnect electrical connector.
3. Remove oil pressure sending unit using oil pressure socket C-4597.

INSTALLATION

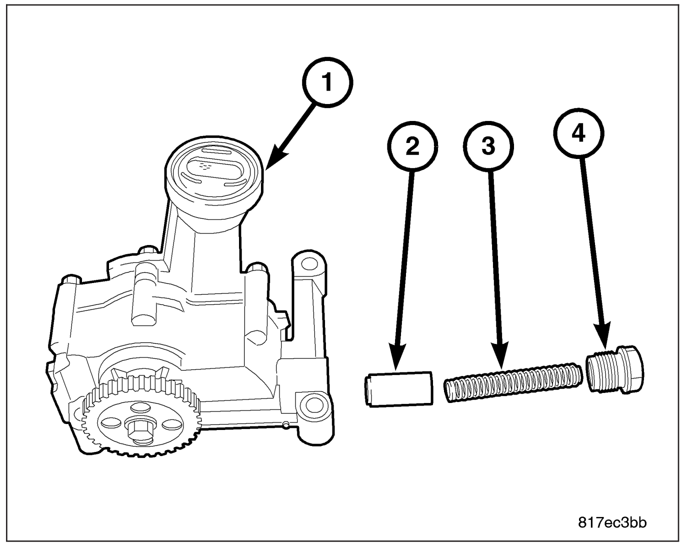
1. Install oil pressure sending unit using oil pressure socket C-4597.
2. Connect electrical connector.

VALVE-OIL PRESSURE RELIEF

REMOVAL

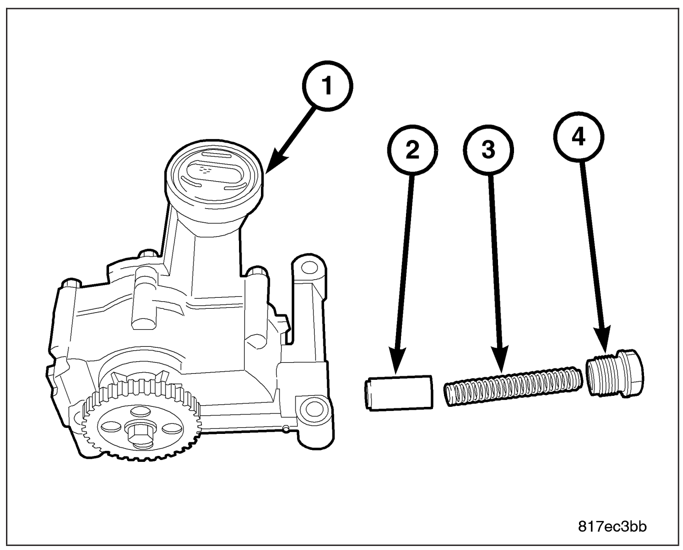
NOTE: Oil pressure relief valve can be serviced without removing oil pump from the engine.

1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove cap (4).
3. Remove spring (3) and valve (2).
4. Inspect valve (2) and pump (1) bore seizure or scoring. Replace as needed.



INSTALLATION

1. Lubricate valve (2) and pump (1) bore with clean engine oil.
2. Install valve (2) and spring (3).
3. Install cap (4) and tighten.
4. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).



MANIFOLD-INTAKE

DIAGNOSIS AND TESTING

INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water (Spray Bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

LOWER INTAKE MANIFOLD

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

1. Remove engine cover.
2. Perform fuel system pressure release procedure **before attempting any repairs (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY - STANDARD PROCEDURE).**
3. Remove air cleaner housing.
4. Disconnect negative battery cable.
5. Disconnect fuel line at rail.
6. Remove fuel injector electrical connectors.
7. Remove fuel rail retaining bolts and remove fuel rail.
8. Disconnect oil temperature sensor.
9. Disconnect variable valve timing solenoid electrical connector.
10. Disconnect intake camshaft position sensor electrical connector.
11. Position harness out of the way.
12. Remove throttle body support bracket.
13. Disconnect electronic throttle control electrical connector.
14. Remove wiring harness retainer from the intake manifold.
15. Disconnect MAP sensor electrical connector.
16. Disconnect vacuum lines at intake.
17. Remove upper radiator hose retaining bracket.
18. Remove intake manifold retaining bolts.
19. Remove intake manifold.

CLEANING

1. Discard gasket(s).
2. Clean all sealing surfaces.

INSPECTION

1. Inspect manifold for cracks, distortion, or mounting surface warpage. Replace manifold if necessary.
2. Inspect manifold gasket for surface damage or excessive swelling. Replace gaskets as necessary.

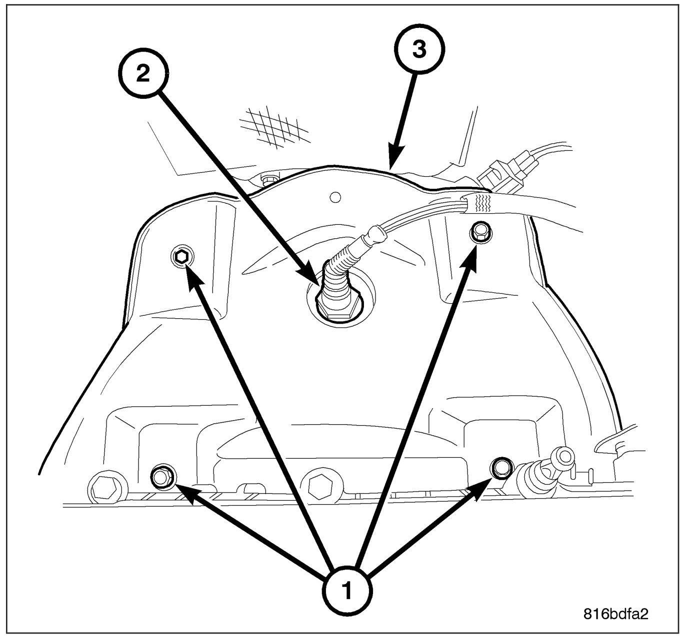
INSTALLATION

LOWER INTAKE MANIFOLD

1. Clean all gasket surfaces.
2. Replace intake manifold gasket.
3. Install intake manifold, torque bolts to 25 N·m (220 in. lbs.).
4. Install the fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).
5. Connect fuel injector electrical connectors.
6. Inspect quick connect fittings for damage, replace if necessary (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE). Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.
7. Connect negative cable to battery.
8. Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

MANIFOLD-EXHAUST

REMOVAL



1. Remove engine cover.
2. Remove clean air hose and air cleaner housing.
3. Disconnect negative cable from battery.
4. Disconnect throttle and speed control cables from the throttle lever and bracket.
5. Disconnect MAP sensor electrical connector.
6. Remove fasteners securing power steering fluid reservoir to cylinder head.
7. Remove coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL).
8. Remove bolts attaching upper heat shield.
9. Remove upper heat shield.
10. Raise vehicle.
11. Disconnect exhaust pipe from manifold.
12. Remove engine wiring heat shield.
13. Remove manifold support bracket.
14. Remove lower exhaust manifold heat shield.
15. Disconnect oxygen sensor electrical connector.
16. Remove exhaust manifold lower retaining fasteners.
17. Lower vehicle and remove the upper exhaust manifold retaining fasteners.
18. Remove exhaust manifold from above/between the engine and cowl panel.
19. Remove and discard manifold gasket.
20. Mark prop shaft and differential for proper installation (if equipped).
21. Remove the rear prop shaft (if equipped) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
22. Remove the two exhaust to maniverter (exhaust manifold with catalytic converter) bolts.
23. Unplug the down - stream O2 sensor connector.
24. Remove the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
25. Lower the vehicle on the hoist.
26. Unplug the up - stream O2 sensor connector.
27. Remove up - stream O2 sensor from the maniverter (exhaust manifold with catalytic converter) using o2 sensor socket 8439 (2).
28. Remove the four maniverter heat shield bolts (1).
29. Remove the two retaining bolts and one nut from the maniverter side heat shield (3).
30. Remove the seven maniverter to head retaining bolts.
31. Slide the maniverter up and to the right, The support the maniverter (1) with the help of a bungie cord.
32. Raise the vehicle on the hoist.
33. Remove the four (1) engine to maniverter bracket bolts.
34. Remove the rear engine mount through bolt (2).
35. Remove the three front engine mount to frame bolts and the mount through bolt.
36. Remove the PTU mounting bolts.
37. Install a screw jack (2)on front engine mount bracket (1).
38. Raise the front of the engine until the rear mount has dropped (1,2).
39. Separate the PTU from the transaxle.

40. Remove and discard old O-ring between Transmission and PTU
41. Roll the PTU (1) forward and down to remove.

CLEANING

1. Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

1. Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
2. Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

1. Install a new exhaust manifold gasket. **DO NOT APPLY SEALER**.
2. Position exhaust manifold in place. Tighten fasteners, starting at center and progressing outward in both directions to 23 N·m (200 in. lbs.). Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.
3. Install exhaust manifold heat shields. Tighten bolts to 12 N·m (105 in. lbs.).
4. Install exhaust manifold support bracket.
5. Install engine wiring heat shield.
6. Connect oxygen sensor electrical connector.
7. Install exhaust pipe to manifold. Tighten fasteners to 28 N·m (250 in. lbs.).
8. Install coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION).
9. Install fasteners securing power steering fluid reservoir to cylinder head.
10. Connect MAP sensor electrical connector.
11. Connect throttle and speed control cables to the throttle lever and bracket.
12. Connect negative cable to battery.
13. Install clean air hose and air cleaner housing.
14. Roll the PTU in moving from front to back.
15. Rest the PTU on the frame while the engine and transaxle are raised back into position.
16. Lower screw jack until rear mount through bolt can be installed.
17. Install rear mount through bolt and torque bolt to 75 Nm (55 ft. lbs.).
18. Install the transmission crossmember and bolts, torque to 75 Nm (55 ft. lbs.).
19. Install the through bolt at the front transmission mount and torque to 75 Nm (55 ft. lbs.)
20. Insure that the O-ring between the PTU and transaxle is in place.
21. Slide the PTU into place.
22. Install and torque PTU mounting bolts to 58 N-m (43 lbf-ft).
23. Lower the hoist.
24. Place the maniverter back into place and install the seven bolts.
25. Torque the maniverter bolts.
26. Install the maniverter side heat shield into place.
27. Install the two retaining bolts and one retaining nut.
28. Install the maniverter heat shield and the four retaining bolts.
29. Torque the maniverter heat shield bolts.
30. Using tool 8439 install the O2 sensor.
31. Install the air box.
32. Install engine trim cover.
33. Raise the vehicle on the hoist.
34. Install the maniverter to block bracket and four mounting bolts.

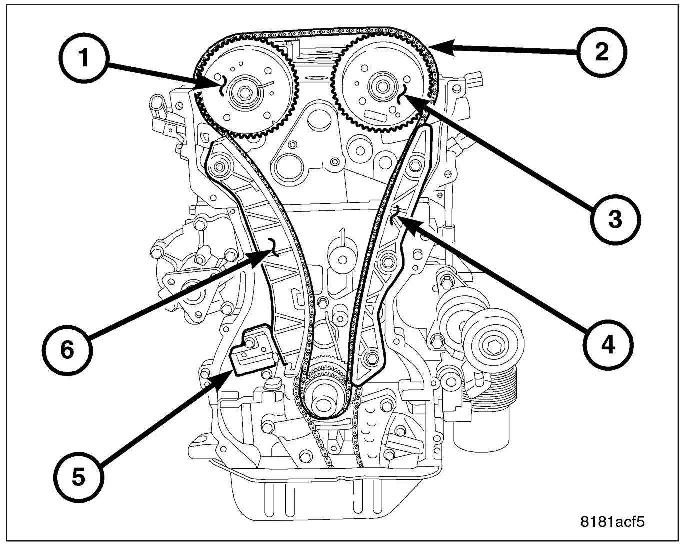
35. Torque maniverter to block bracket mounting bolts.
36. Install the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
37. Install the Prop shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
38. install the right axle shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
39. Install the right front tire.
40. Fill PTU. (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).
41. lower hoist
42. Connect battery cables.
43. Top off the fluids.

VALVE TIMING

DESCRIPTION

The timing drive system consists of the following:

- Timing Chain (2)
- Camshaft Sprockets (1,3)
- Crankshaft Sprocket
- Right Timing Chain Guide (Moveable) (6)
- Left Timing Chain Guide (Fixed) (4)
- Timing Chain Tensioner (5)



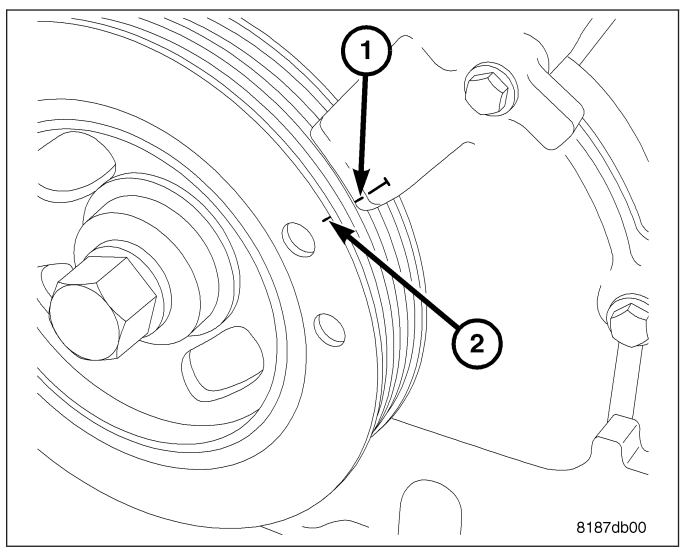
The camshaft sprockets are attached to the cam phasers which are attached to the front of the camshafts and is used with the timing chain and crankshaft sprocket to turn the camshafts. The camshaft position sensors target is part of the camshafts and is used with the camshaft position sensors to provide the PCM with valvetrain position information.

The timing chain tensioner is installed in the right side of the engine block. Using engine oil pressure, the tensioner applies constant pressure to the right side (movable) timing chain guide, which in turn applies pressure to the timing chain. Also as the tensioner extends, it rachet locks in position to provide constant timing chain tension.

STANDARD PROCEDURE

VALVE TIMING VERIFICATION

1. Remove engine cover.
2. Remove cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER - REMOVAL).
3. Set engine to TDC.
4. Using a dial indicator, set number one cylinder to TDC on the compression stroke.
5. The mark on the camshaft sprocket should be in line with the cylinder head cover sealing surface.
6. Using a suitable light, look down into the timing chain cavity at the crankshaft sprocket. A paint mark on the crankshaft sprocket should align with the edge of the engine block boss indicated in.
7. Install cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).



COVER-TIMING CHAIN

REMOVAL

1. Remove engine cover.
2. Perform fuel pressure bleed procedure.
3. Remove air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Disconnect negative battery cable.
5. Drain cooling system
6. Remove coolant recovery bottle.
7. Remove windshield washer bottle.
8. Remove power steering reservoir and set aside.
9. Remove make up air hose.
10. Remove PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
13. Raise vehicle.
14. Remove right lower splash shield.
15. Set engine to TDC.
16. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor retaining bolts.
18. Remove A/C compressor lower bracket.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft pulley.
21. Remove water pump pulley.
22. Remove timing chain cover lower bolts.
23. Lower vehicle.
24. Remove power steering pump and set aside.
25. Support engine with a suitable jack.
26. Remove right engine mount.
27. Remove accessory drive belt upper idler pulley.
28. Remove right engine mount bracket.
29. Remove accessory drive belt tensioner.
30. Remove timing chain cover upper retaining bolts.
31. Remove timing chain cover.

INSTALLATION

1. Clean all sealing surfaces.
2. Apply RTV as shown at the cylinder head to block parting line.
3. Apply RTV as shown in the corner of the oil pan and block.
4. Apply 2mm bead of RTV as shown.
5. Install timing chain cover.
6. Install timing chain cover upper retaining bolts and torque bolts.
7. Install accessory drive belt tensioner.
8. Install right engine mount bracket and torque.
9. Install accessory drive belt upper idler pulley.
10. Install right engine mount and torque bolts.

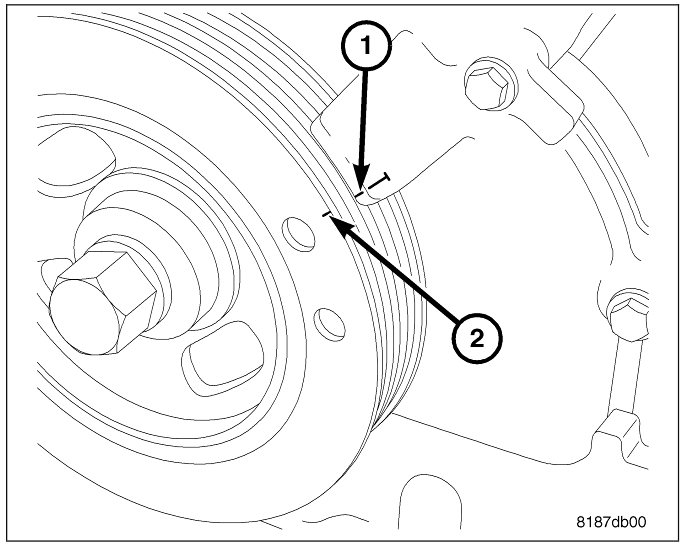
11. Remove jack from under engine.
12. Install power steering pump.
13. Raise vehicle.
14. Install timing chain cover lower retaining bolts and torque bolts.
15. Install oil pan to timing chain cover lower retaining bolts and torque bolts.
16. Install water pump pulley.
17. Install crankshaft pulley and torque bolt.
18. Install accessory drive belt lower idler pulley.
19. Install lower A/C compressor mounting bracket.
20. Install A/C compressor.
21. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
22. Install right lower splash shield.
23. Lower vehicle.
24. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)
25. Connect coil electrical connector,
26. Connect PCV hose to PCV valve.
27. Connect make up air hose.
28. Install power steering reservoir.
29. Install windshield washer bottle.
30. Install coolant recovery bottle.
31. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
32. Connect negative battery cable.
33. Install air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
34. Install engine cover.

CHAIN AND SPROCKETS-TIMING

REMOVAL

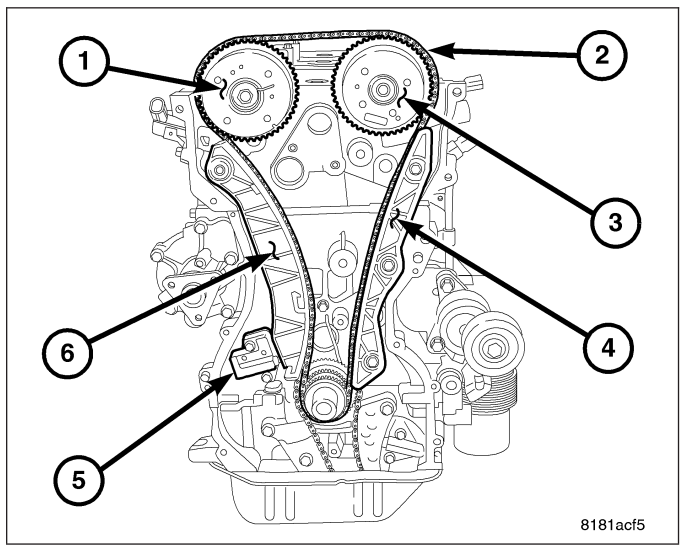
TIMING CHAIN

1. Perform fuel pressure bleed procedure.
2. Remove air cleaner housing.
3. Set engine to TDC.
4. Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



NOTE: If the timing chain plated links can no longer be seen, the timing chain links corresponding the timing marks must be marked prior to removal if the chain is to be reused.

5. Remove timing chain tensioner (5) (Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - REMOVAL).
6. Remove timing chain (2).

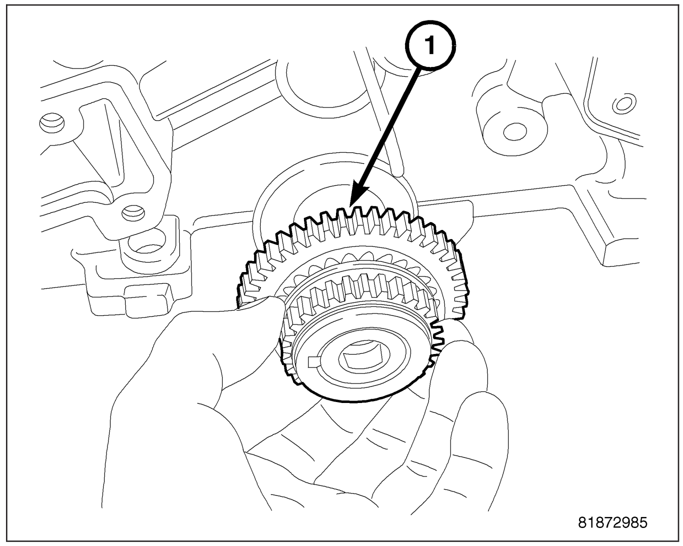


CAMSHAFT SPROCKET(S)

Refer to camshaft phasor removal (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

CRANKSHAFT SPROCKET

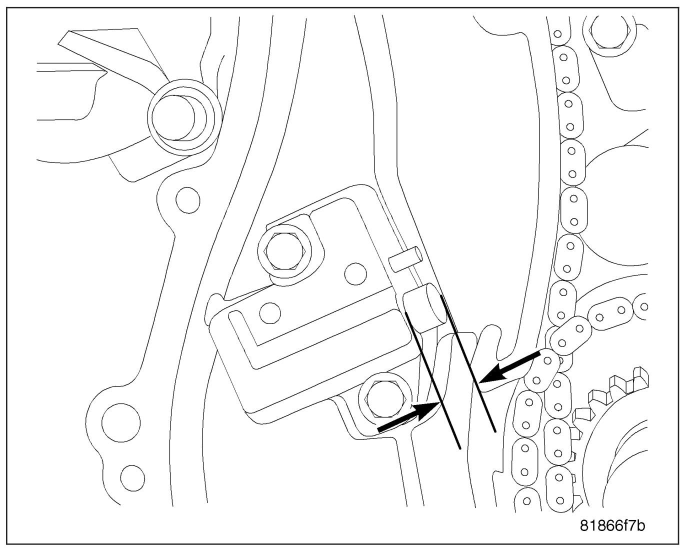
1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove oil pump drive chain tensioner.
4. Remove oil pump drive chain.
5. Remove crankshaft sprocket (1).



INSPECTION

Inspect timing chain for stretching prior to removal.

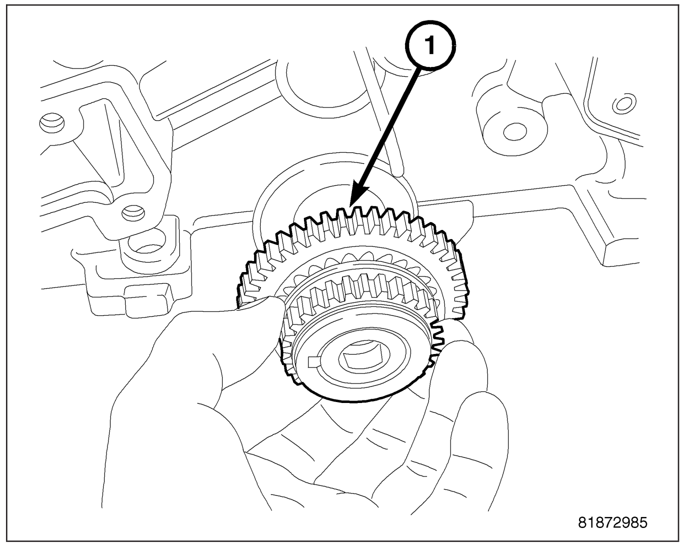
1. Rotate engine while watching timing chain tensioner plunger. When the plunger reaches its maximum travel stop rotating engine.
2. Measure the distance from the tensioner body and the edge of the chain guide as shown.
3. If the distance is greater than 20.5 mm (0.81 in.) inspect guide shoes for excessive wear.
4. If guides are okay, replace timing chain.



INSTALLATION

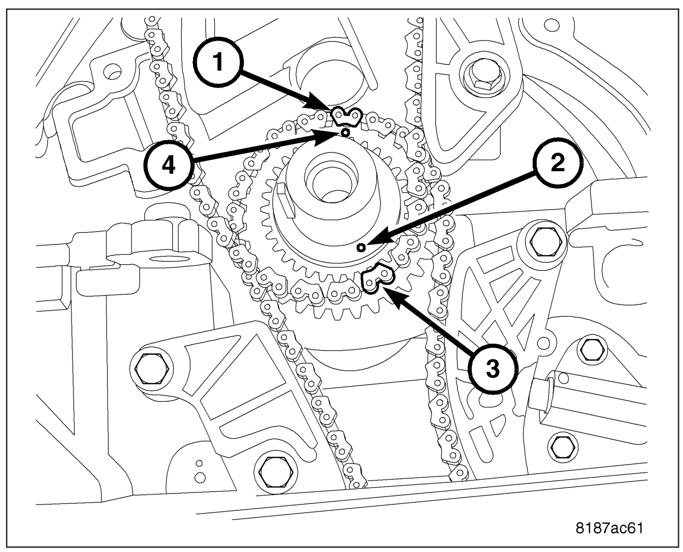
CRANKSHAFT SPROCKET

1. Install crankshaft sprocket (1) onto crankshaft.
2. Install oil pump drive chain. Verify that Oil pump is correctly timed.
3. Reset oil pump drive chain tensioner by pushing plunger inward and install Tensioner Pin 8514.
4. Install oil pump drive chain tensioner and remove Tensioner Pin 8514.
5. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
6. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/ OIL PAN - INSTALLATION).
7. Fill engine with oil (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE).
8. Start engine and check for leaks.

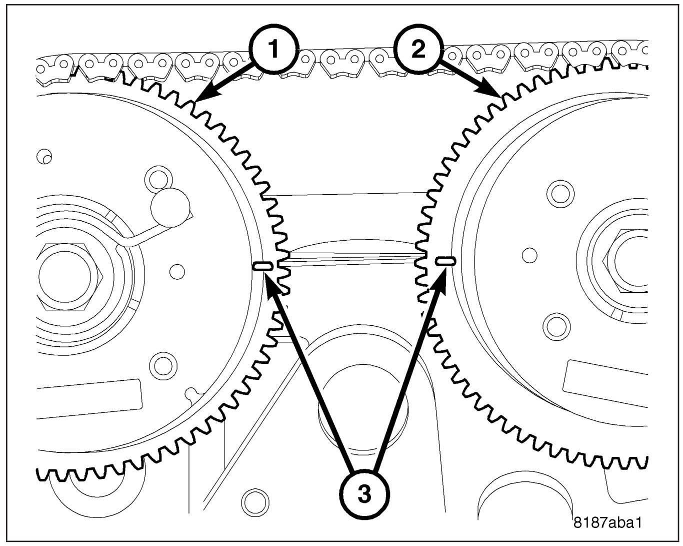


TIMING CHAIN

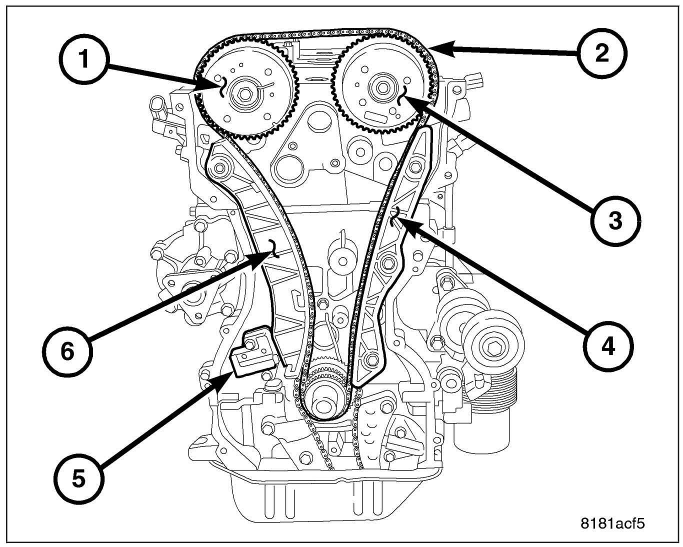
1. Verify that the crankshaft sprocket keyway is at the 9 o'clock position.



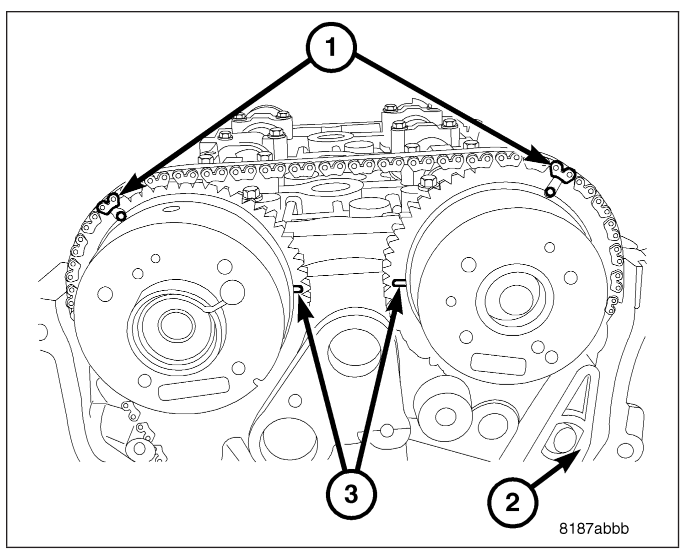
2. Align camshaft timing marks (3) so they are parallel to the cylinder head as shown.



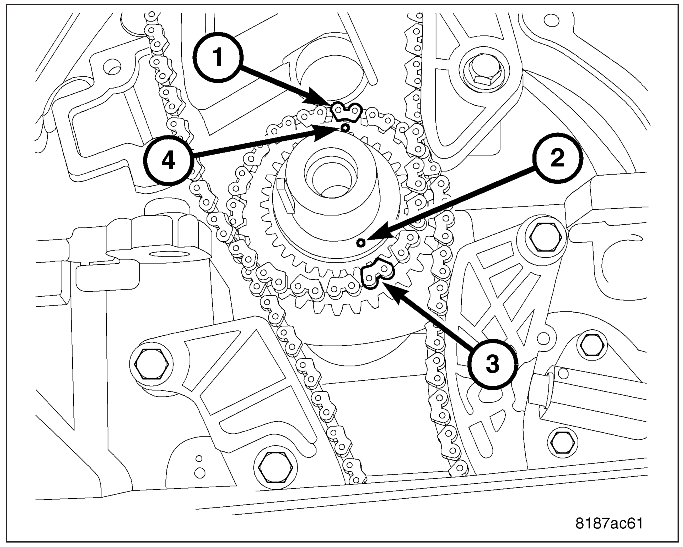
3. Install timing chain guide (4) and torque bolts.

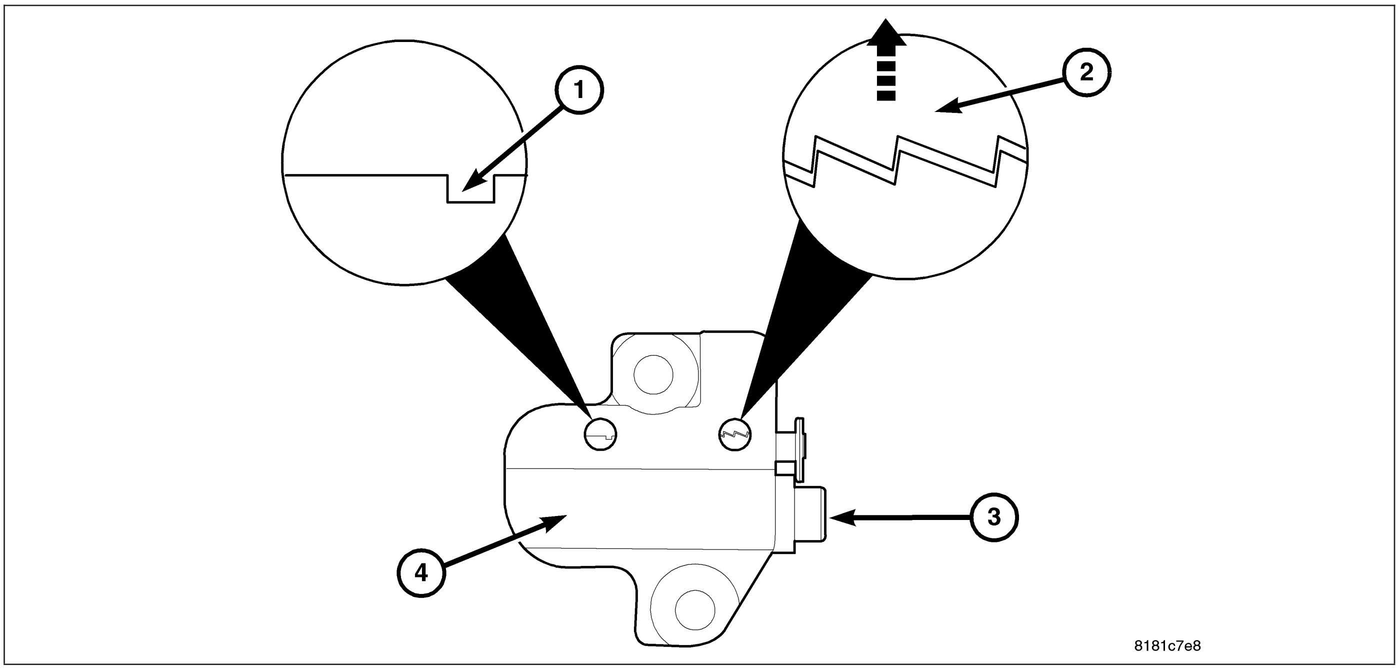


4. Install timing chain so plated links on chain align with timing marks on camshaft sprockets (1).



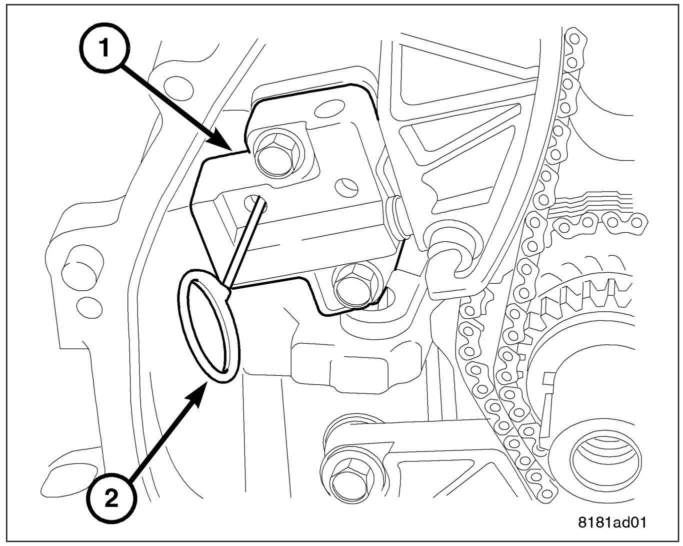
5. Align timing mark on the crankshaft sprocket (2) with the plated link (3) on the timing chain. Position chain so slack will be on the tensioner side.





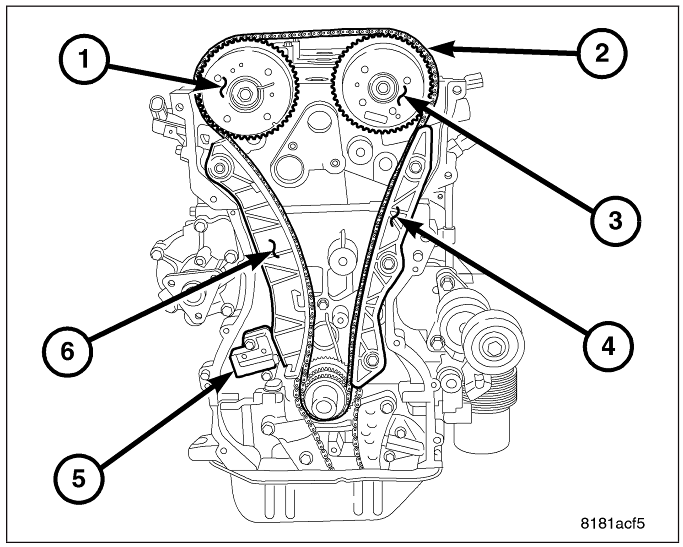
6. Reset timing chain tensioner (4) by lifting up on ratchet (2) and pushing plunger (3) inward towards the tensioner body (4). Insert tensioner pin 8514 into slot (1) to hold tensioner plunger in the retracted position.

7. Install timing chain tensioner (1) and torque bolts to 12 N·m (105 in. lbs.).

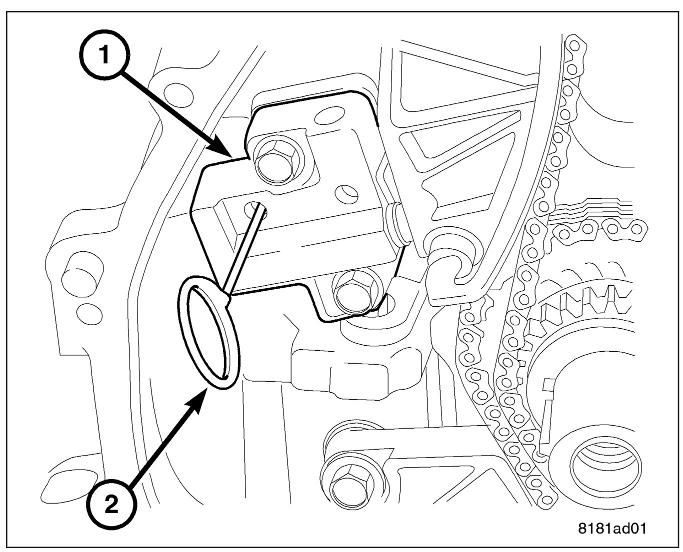


NOTE: Keep the slack in the timing chain on the tensioner side.

8. Install the moveable timing chain pivot guide (6) and torque bolt to 12 N·m (105 in. lbs.).



9. Remove timing tensioner pin 8514 (2).
10. Rotate the crankshaft CLOCKWISE two complete revolutions until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position.
11. Install front timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Connect negative battery cable.
13. Fill with oil, start engine and check for leaks.



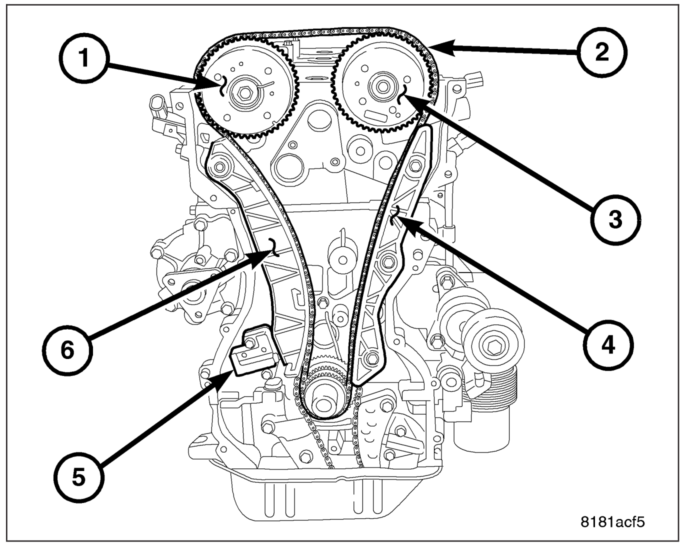
TIMING-CHAIN TENSIONER

REMOVAL

1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

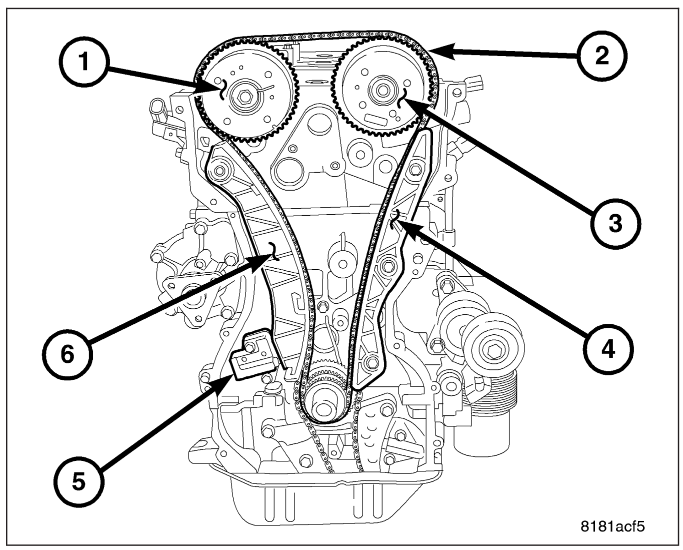
NOTE: Tensioner will not come apart during removal.

2. Remove timing chain tensioner retaining bolts and remove tensioner.



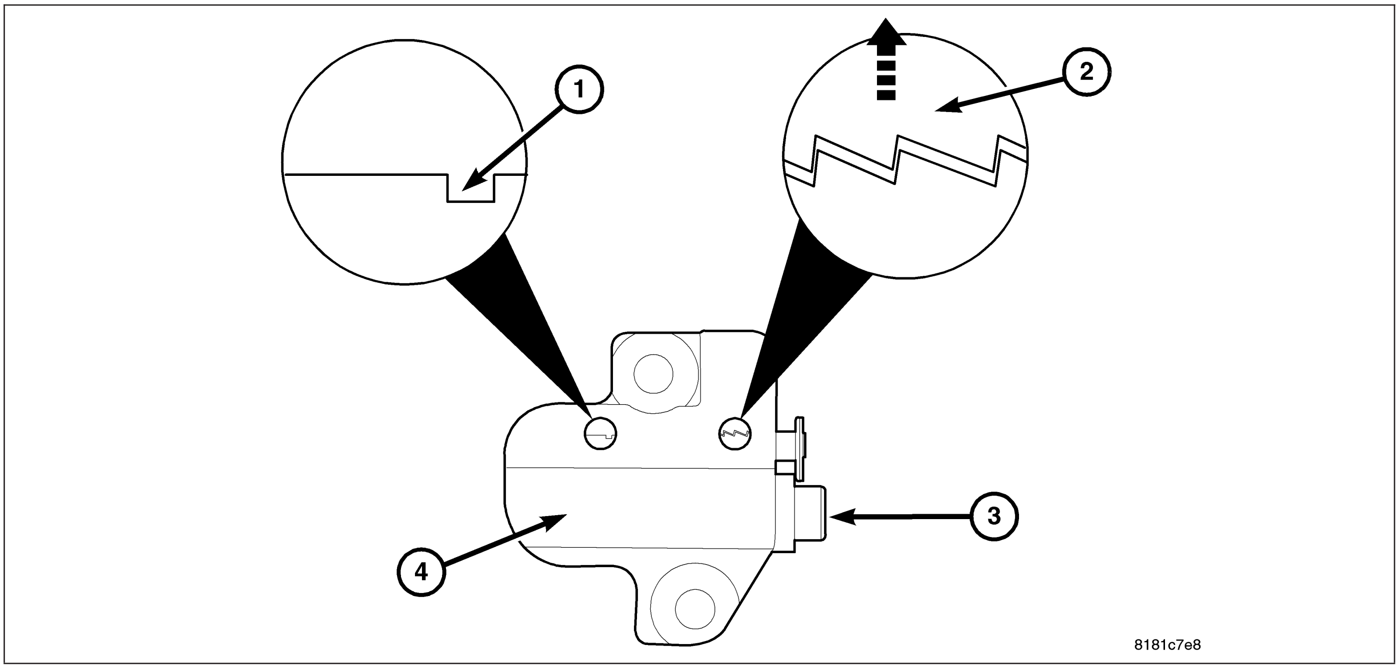
INSTALLATION

1. Reset tensioner.
2. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



ADJUSTMENTS

ADJUSTMENT



1. Raise ratchet (2) with small screw driver.
2. Push plunger (3) towards tensioner body (4).
3. Insert tensioner pin 8514 into slot (1). This will hold the tensioner in the retracted position.

ENGINE 2.0L WORLD

TABLE OF CONTENTS

ENGINE 2.0L WORLD

DESCRIPTION

The 2.0 Liter (122 cu. in.) in-line four cylinder engine is a double over head camshaft with mechanical lash buckets and four valves per cylinder design. This engine is NOT free-wheeling; meaning that the pistons will contact the valves in the event of a timing chain failure.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the rear of the cylinder block.

DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to the Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Engine Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis
- Mechanical Valve Tappet Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
VALVETRAIN NOISE	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Worn cam lobe.	5. Install new camshaft.
	6. Worn tappet bucket.	6. Install new select fit tappet bucket.
	7. Worn valve guides.	7. Ream guides and install new valves with oversize stems.
	8. Excessive runout of valve seats on valve faces.	8. Grind valve seats and valves.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Connecting rod out-of-round.	7. Replace connecting rod.
	8. Misaligned connecting rods.	8. Replace bent connecting rods.

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level.	1. Check engine oil level.
	2. Faulty oil pressure sending unit.	2. Install new sending unit.
	3. Low oil pressure.	3. Check sending unit and main bearing oil clearance.
	4. Clogged oil filter.	4. Install new oil filter.
	5. Worn parts in oil pump.	5. Replace worn parts or pump.
	6. Thin or diluted oil.	6. Change oil to correct viscosity.
	7. Oil pump relief valve stuck.	7. Remove valve and inspect, clean, or replace.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	2. Loose fastener, broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Misaligned or deteriorated cup or threaded plug.	3. Replace as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Ream guide(s) and replace valve(s) with oversize valve(s) and seal(s).
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.

3. Remove engine cover.
4. Disconnect coil electrical connectors and remove coils.
5. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
6. Disconnect injector electrical connectors.
7. Be sure throttle blade is fully open during the compression check.
8. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).
9. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
10. Repeat the previous step for all remaining cylinders.
11. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
12. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
13. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:
   - Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
   - Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
   - Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

   - Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
   - If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
    a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    b. Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as previously described.

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

STANDARD PROCEDURE

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).

6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.
13. Start engine and check for any leaks.

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces.

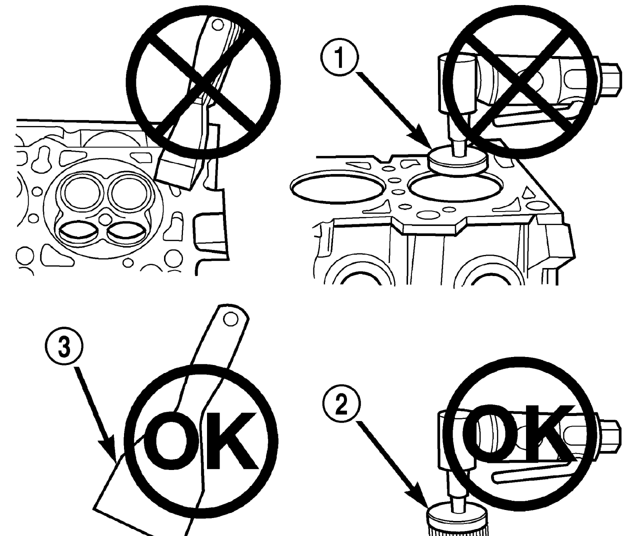
ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.



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Only use the following for cleaning gasket surfaces:

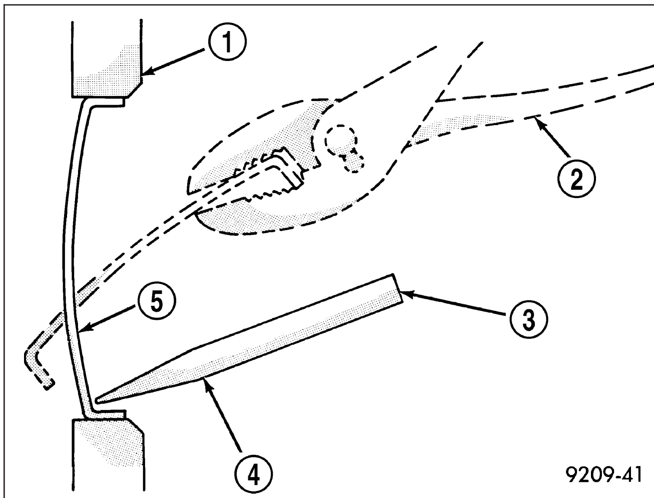
- Solvent or a commercially available gasket remover
- Plastic or wood scraper
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

CYLINDER HEAD CORE PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug.

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.



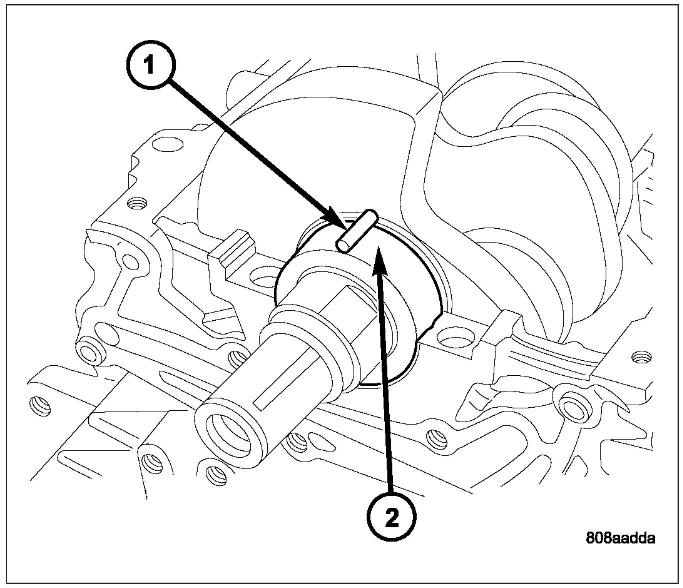
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Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

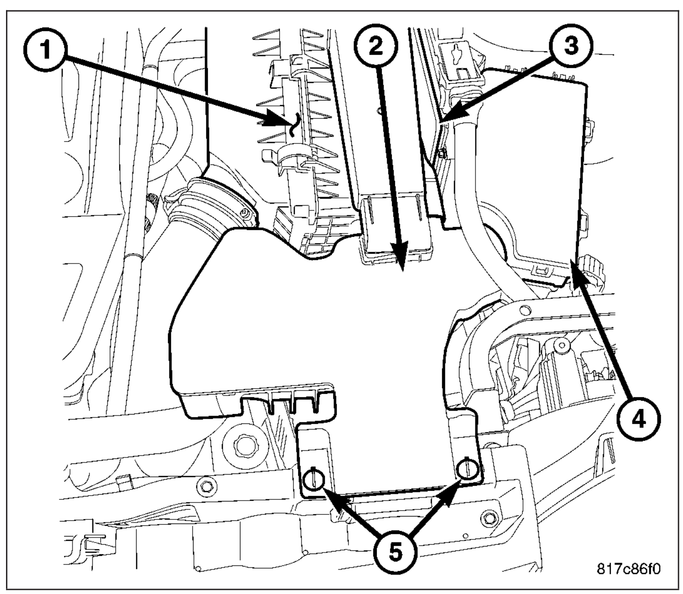


1. Remove oil film from surface to be checked. Plastigage is soluble in oil.
2. Place a piece of Plastigage across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes. (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.
3. Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Compare clearance measurements to specs found in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

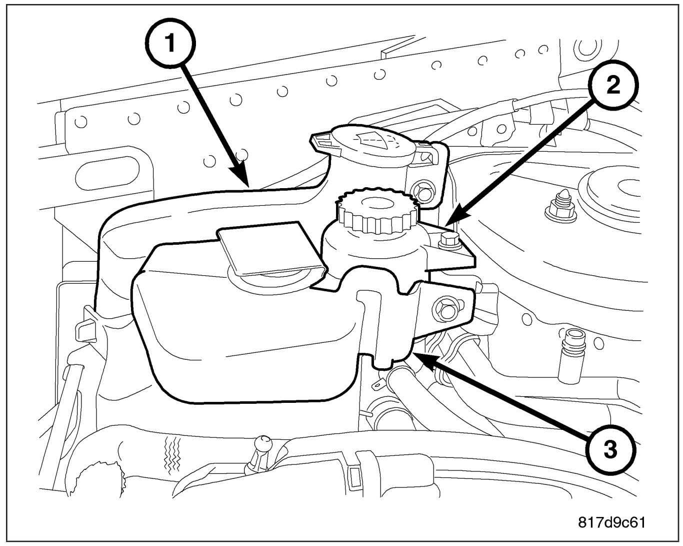
4. Install the proper crankshaft bearings to achieve the specified bearing clearances.

REMOVAL - ENGINE ASSEMBLY



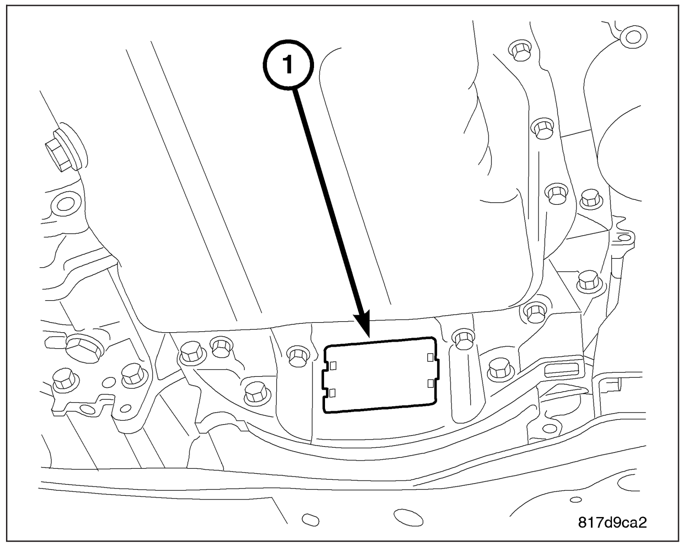
1. Perform fuel pressure release procedure, then disconnect and remove fuel line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Remove air cleaner housing assembly (1) and clean air hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect both cables from battery.
4. Remove battery and battery tray.
5. Discharge air conditioning system, if equipped (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).
6. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

7. Remove coolant reservoir (3).
8. Remove grill trim panel.
9. Remove upper radiator hose from radiator and coolant manifold.
10. Remove upper radiator hose support.
11. Remove lower radiator hose at coolant manifold.
12. Remove coolant hose from coolant manifold.
13. Disconnect the following electrical connectors, variable valve timing solenoids, oil temperature sensor, injectors, map, coils, cmp's, coolant temperature sensors, capacitor, oxygen sensor, intake air temperature sensor.
14. Remove air intake tube from throttle body.
15. Remove vacuum lines from throttle body and intake manifold.

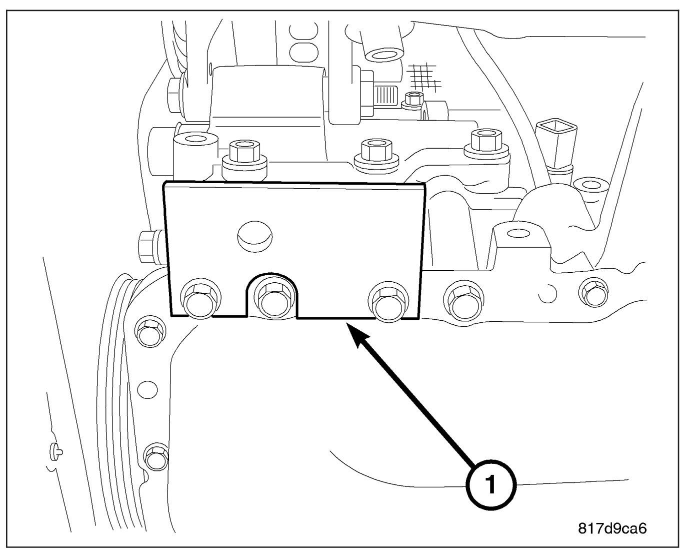


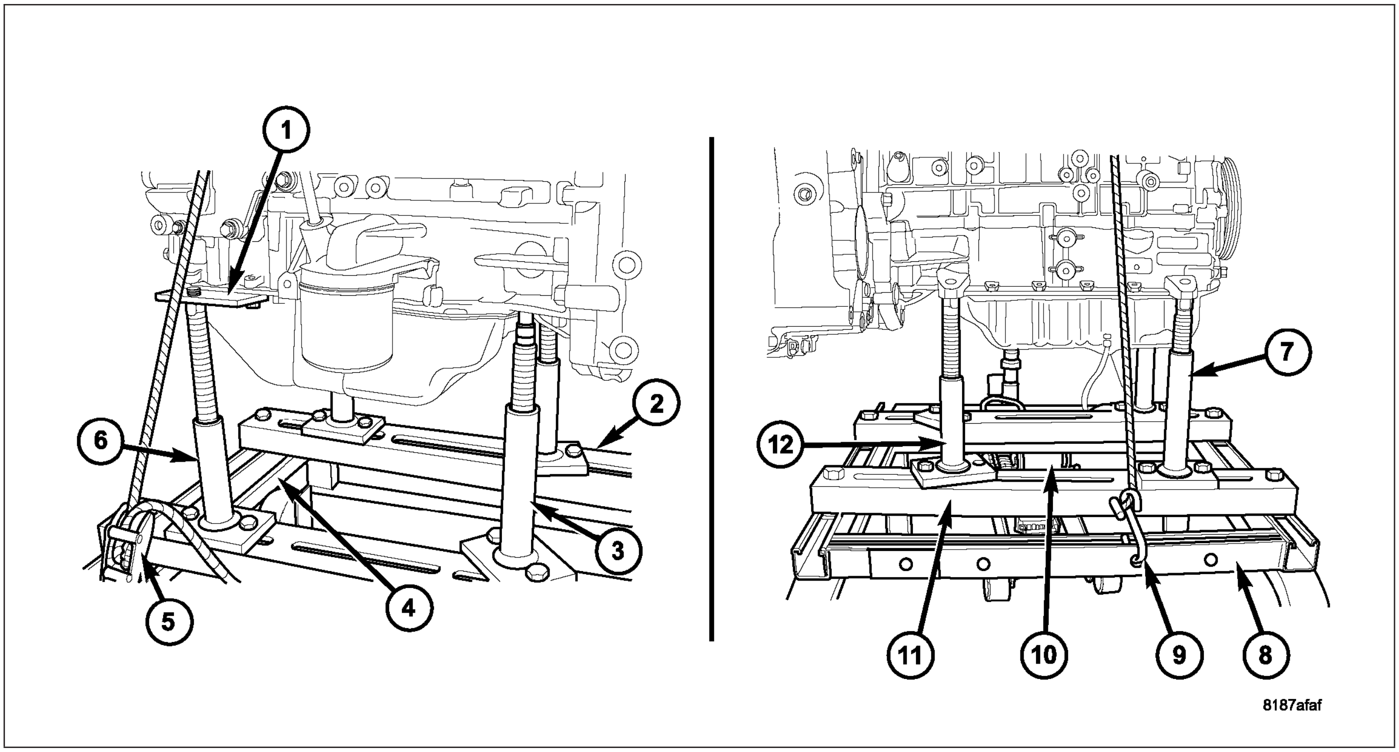
16. Unclip harness from intake.
17. Disconnect electronic throttle control and manifold flow control valve electrical connectors.
18. Remove PCV hose from valve cover.
19. Remove dipstick.
20. Remove throttle body support bracket.
21. Remove intake bolts and remove intake.
22. Disconnect coolant temperature sensor at block, Knock sensor, oil pressure sensor, generator, starter, block heater, A/C compressor, and block ground.
23. Remove accessory drive belt.
24. Remove power steering reservoir.
25. Remove power steering line support.
26. Remove power steering pump and set aside.
27. Remove upper idler pulley.
28. Remove transaxle filler tube.
29. Disconnect transmission linkage.
30. Disconnect transmission range sensor, TIS and TOS.
31. Remove transmission vent hose.
32. Remove ground strap near right tower.
33. Remove rear heat shield.
34. Remove maniverter heat shields.
35. Raise vehicle.
36. Remove wheels.
37. Remove right front splash shield.
38. Remove axle nuts.
39. Remove ball joint pinch bolts and separate steering knuckle from ball joint.
40. Remove axles.
41. Drain oil.
42. Mark drive shaft and flange.
43. Remove carrier bearing and heat shield.
44. Remove driveshaft.
45. Remove exhaust pipe to maniverter/exhaust manifold bolts.
46. Remove maniverter/exhaust manifold support bracket.
47. Lower vehicle.
48. Remove coolant manifold.

49. Remove maniverter/exhaust manifold bolts.
50. Remove maniverter/exhaust manifold to left of engine.
51. Hoist up.
52. Remove front mount through bolt.
53. Remove crossmember.
54. Remove front mount bracket.
55. Remove rear mount through bolt.
56. Remove rear mount.
57. Remove rear mount bracket.
58. Pull engine forward and support.
59. Remove PTU assembly if equiped (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).
60. Remove inspection cover (1) and mark torque converter to flywheel.
61. Remove torque converter bolts.
62. Remove lower bellhousing bolts.
63. Remove A/C lines from compressor and remove A/C compressor.
64. Remove A/C mounting bracket.



65. Install Adapter 9704 (1).
66. Remove generator and lower idler pulley.
67. Disconnect transmission electrical connector.
68. Disconnect CKP electrical connector.
69. Remove coolant hoses at transaxle cooler.
70. Remove transaxle cooler lines from cooler.

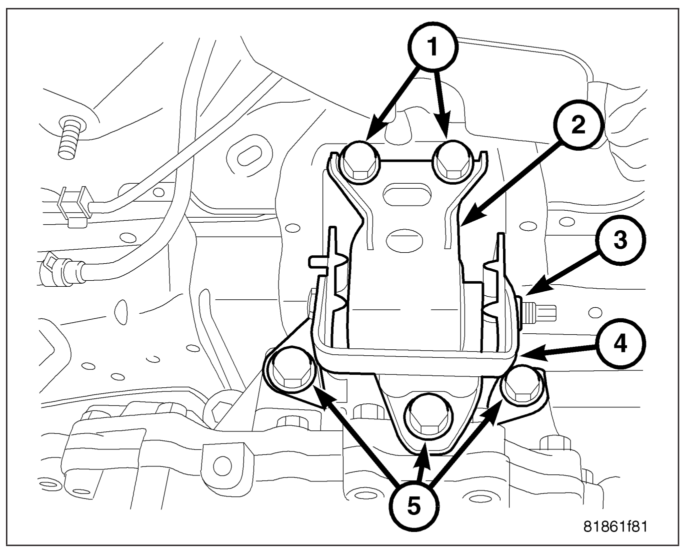




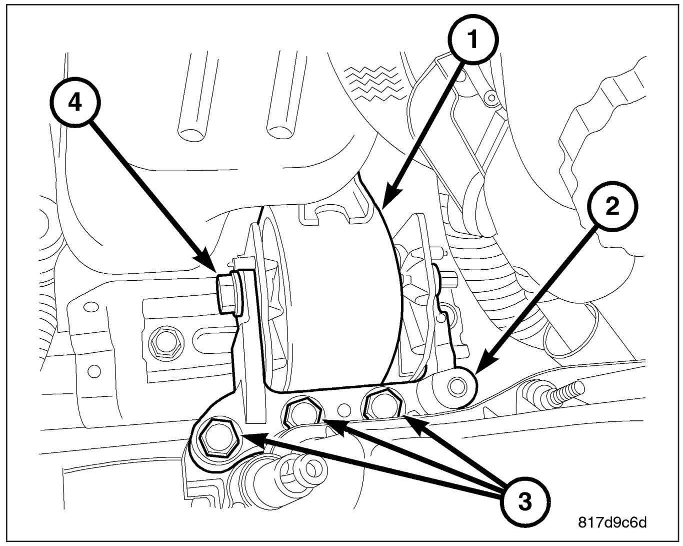
71. Position dolly (4,8) under engine and lower vehicle.

WARNING: Safety straps MUST be used.

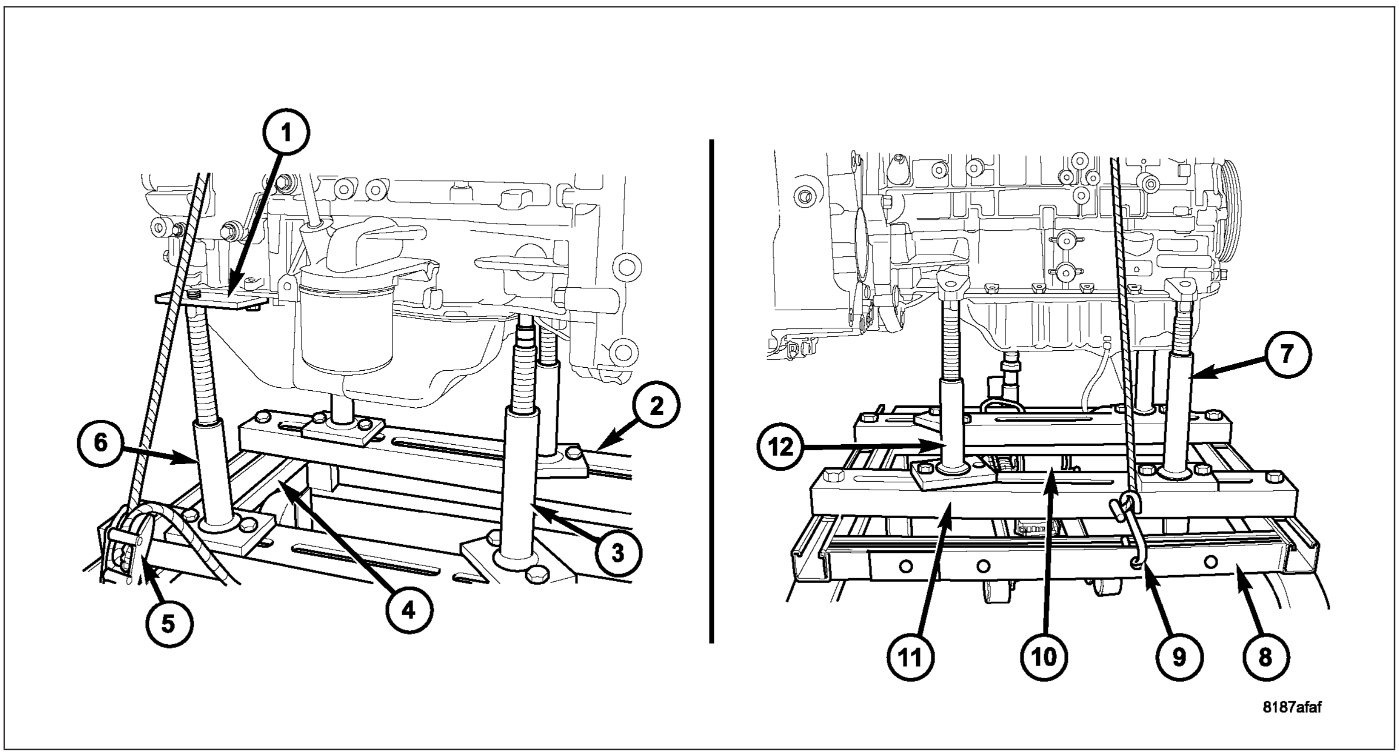
72. Install safety straps (6,9).
73. Remove PCM bracket and set aside.
74. Remove left engine mount through bolt (3).



75. Remove right engine mount through bolt (4).
76. Raise vehicle away from engine and transaxle.
77. Separate engine from transaxle.

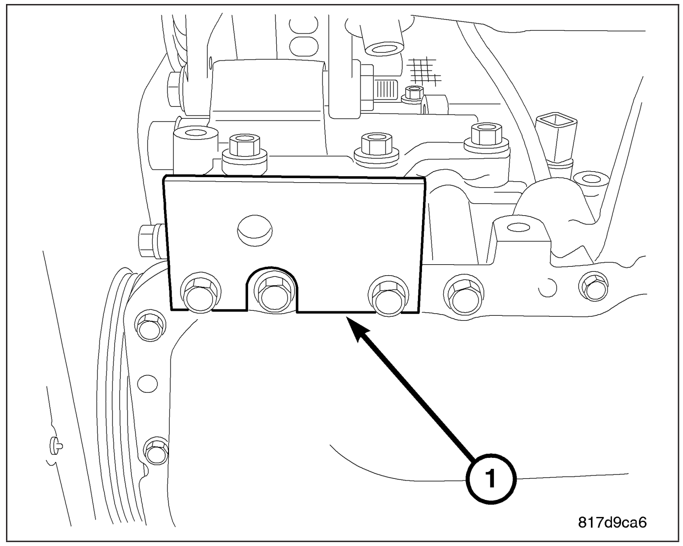


INSTALLATION - ENGINE ASSEMBLY



1. Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.
2. Continue lowering vehicle until engine/transaxle aligns to mounting locations. Install mounting bolts at the right and left engine/transaxle mount bolts and Tighten bolts to 118 N·m (87 ft. lbs.).
3. Remove safety straps from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly and cradle.

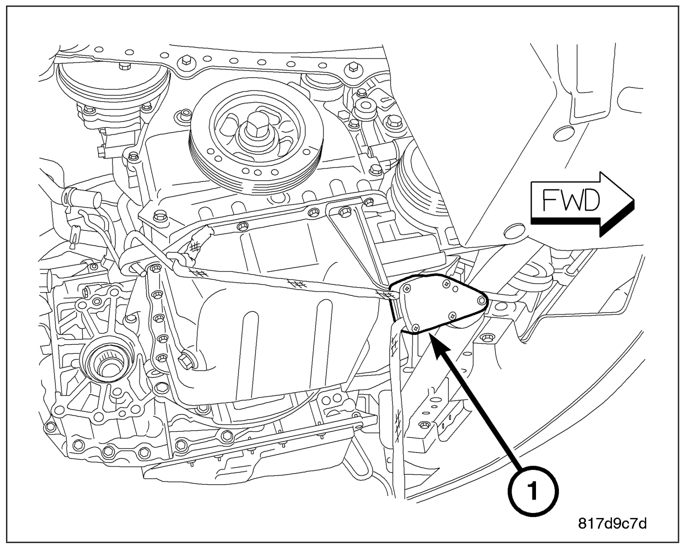
4. Remove Adapter 9704 (1).
5. Install pcm bracket.
6. Install maniverter assembly and upper lower heat shields.
7. Install oxygen sensor and connect electrical connector.
8. Install coolant manifold assembly.
9. Install transaxle linkage and adjust as necessary.
10. Install transaxle vent hose.
11. Connect transaxle electrical connectors.
12. Install Ground strap near right strut tower.
13. Raise vehicle.



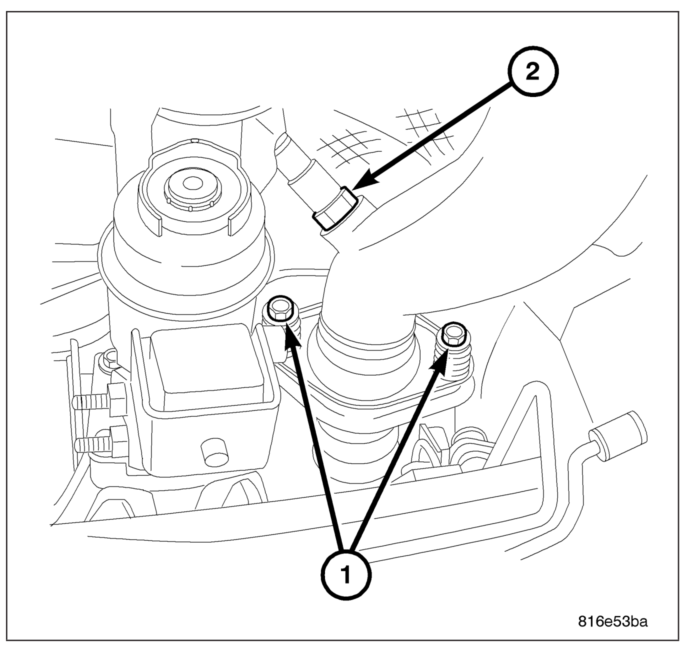
14. Pull engine forward and restrain engine.

NOTE: Be sure to install O-ring prior to installing PTU assembly.

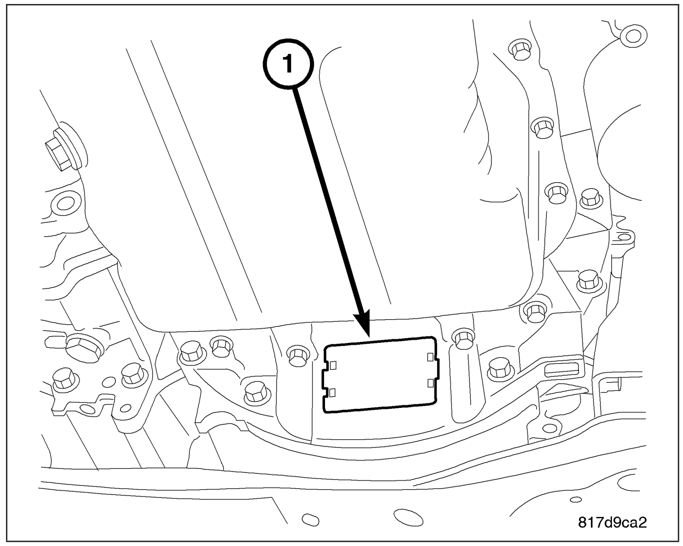
15. Install PTU.
16. Remove engine restraint.
17. Install front mount bracket and tighten bolts.
18. Install frame cross member.
19. Install front engine mount.
20. Install rear mount bracket.
21. Install rear mount and tighten bolts.
22. Connect CKP electrical connector.



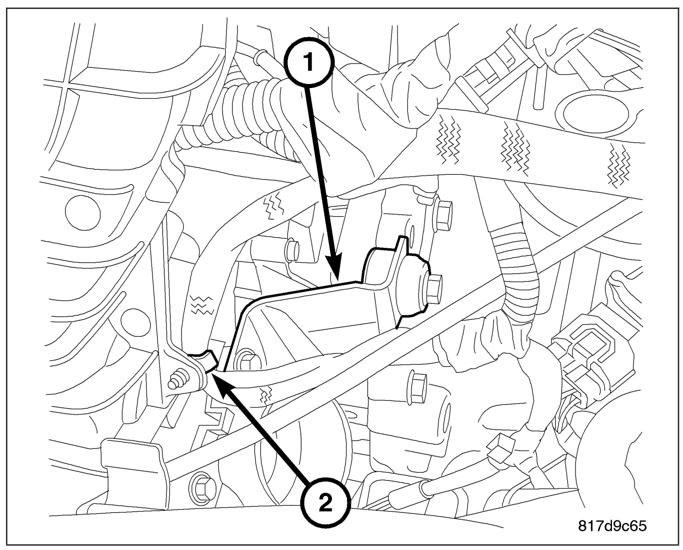
23. Install maniverter to exhaust pipe bolts (1) and tighten bolts.
24. Align driveshaft marks and install and heat shield.
25. Install generator
26. Install A/C bracket.
27. Install A/C lines on compressor and install compressor.
28. Install lower bell housing bolts and tighten bolts.
29. Align torque converter and flex plate mark. Install torque converter bolts and tighten.



30. Install inspection cover (1).



31. Install transaxle electrical connectors.
32. Connect trans cooler lines.
33. Install coolant hoses at transmission cooler.
34. Install axles.
35. Install ball joint pinch bolts and tighten.
36. Install axle nuts and tighten.
37. Install splash shields.
38. Install wheels.
39. Install new oil filter.
40. Lower vehicle.
41. Install transaxle filler tube.
42. Install upper idler pulley.
43. Install power steering pump.
44. Install power steering line support bracket.
45. Install power steering pump.
46. Install accessory drive belt.
47. Connect electrical connectors at block ground, starter, A/C compressor, knock sensor, Oil pressure sensor, generator, Coolant temperature sensor at block, and block heater.
48. Install intake manifold and tighten bolts.
49. Install throttle body support bracket (1).



50. Install engine oil dip stick.
51. Install PCV hose to valve cover.
52. Connect manifold flow control valve and electronic throttle control electrical connectors and fasten harness to intake.
53. Install vacuum lines at throttle body and intake manifold.
54. Install intake air tube on throttle body.
55. Connect engine harness electrical connectors.
56. Install upper radiator support bracket.
57. Install coolant hoses at coolant manifold.
58. Install grill trim panel.
59. Install coolant reservoir and connect hose.
60. Connect fuel line to fuel rail.
61. Install battery tray and battery.
62. Connect battery cables.
63. Install air cleaner housing and connect inlet air hose.
64. Install fresh air inlet.
65. Fill with coolant.
66. Fill with oil.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

67. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
68. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).
69. Start engine and check for leaks.

SPECIFICATIONS

2.4L ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, DOHC	
Number of Cylinders	4	
Firing Order	1-3-4-2	
Compression Ratio	9.5:1	
Max. Variation Between Cylinders	25%	
Displacement	2.4 Liters	148 cu. in.
Bore	88 mm	3.465 in.
Stroke	97 mm	3.819 in.
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Cylinder Bore Diameter	87.4924-87.5076 mm	3.4446-3.4452 in.
A	88.0-88.010	3.4645-3.4649 in.
B	88.010-88.020	3.4649-3.4653 in.
C	88.020-88.030	3.4653-3.4657 in.
Out-of-Round (Max.)	0.051 mm	0.002 in.
Taper (Max.)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter	87.456-87.474 mm	3.4431-3.4439 in.
Clearance @ 24.6 mm (0.551 in.) from bottom of skirt (Non-Turbo)	0.018-0.0516 mm	0.0007-0.0020 in.
Clearance @ 22 mm (0.866 in.) from bottom of skirt (Turbo)	0.046-0.064 mm	0.0018-0.0025 in.
Weight	345-355 grams	12.17-12.52 oz.
Land Clearance (Diametrical)	0.563-0.621 mm	0.022-0.024 in.
Piston Length	66.25 mm	2.608 in.
Piston Ring Groove Depth No. 1	3.946-4.045 mm	0.155-0.159 in.
Piston Ring Groove Depth No. 2	4.555-4.680 mm	0.179-0.184 in.

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Ring Groove Depth No. 3	4.108-4.220 mm	0.162-0.166 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap-Top Compression Ring	0.25-0.51 mm	0.0098-0.020 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-2nd Compression Ring	0.23-0.48 mm	0.009-0.018 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-Oil Control Steel Rails	0.25-0.64 mm	0.009-0.025 in.
Wear Limit	1.0 mm	0.039 in.
Ring Side Clearance-Compression Rings	0.030-0.080 mm	0.0011-0.0031 in.
Wear Limit	0.10 mm	0.004 in.
Ring Side Clearance-Oil Ring Pack	0.012-0.178 mm	0.0004-0.0070 in.
Ring Width-Compression Rings	1.47-1.50 mm	0.057-0.059 in.
Ring Width-Oil Ring Pack	2.72–2.88 mm	0.107–0.1133 in.

CONNECTING ROD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.025–0.071 mm	0.0009–0.0027 in.
Wear Limit	0.075 mm	0.003 in.
Bore Diameter-Piston Pin	20.96–20.98 mm	0.8252–0.8260 in.
Bore Diameter-Crankshaft End	52.993-53.007 mm	2.0863-2.0868 in.
Side Clearance	0.13–0.38 mm	0.005–0.015 in.
Wear Limit	0.40 mm	0.016 in.
Weight-Total (Less Bearing)	565.8 grams	19.96 oz.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	49.984 - 50.000 mm	1.968 - 1.9685 in.
Main Bearing Journal Diameter	59.992 - 60.008 mm	2.362 - 2.3625 in.
Journal Out-of-Round (Max.)	0.0035 mm	0.0003 in.
Journal Taper (Max.)	0.007 mm	0.0001 in.

DESCRIPTION	SPECIFICATION	
	Metric	Standard
End Play	0.09 - 0.24 mm	0.0035 - 0.0094 in.
Wear Limit	0.38 mm	0.015 in.
Main Bearing Diametrical Clearance	0.018 - 0.062 mm	0.0007 - 0.0024 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DSECRIPTION	SPECIFICATION	
	Metric	Standard
Front Journal		
Intake	30.000 - 30.021 mm	1.1810 - 1.1819 in.
Exhaust	40.000 - 40.021 mm	1.5747 - 1.5756 in.
Journals No. 1-4	24.000 - 24.021 mm	0.9448 - 0.9457 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journal Diameter No. 1	29.964 - 29.980 mm	1.179 - 1.180 in.
Journal Diameter No. 2-5	23.954 - 23.970 mm	0.943 - 0.944 in.
Bearing Clearance - Diametrical	0.030 - 0.067 mm	0.0011 - 0.0026 in.
End Play	0.11 - 0.25 mm	0.004 - 0.009 in.
Max Lift @ 0.2mm (0.007 in.) lash		
Intake	9.2 mm	(0.362 in.)
Max Lift @ 0.28mm (0.011 in.) lash		
Exhaust	8.42 mm	(0.331 mm)
Intake Valve Timing*		
Closes (ABDC)	49.3°	
Opens (ATDC)	10.3°	
Duration	219°	
Exhaust Valve Timing*		
Closes (BTDC)	8.45°	
Opens (BBDC)	45°	
Duration	216.55°	
Valve Overlap @ 0.5mm (0.019 in.) w/ VVT in lock-pin position	18.75°	
* All reading in crankshaft degrees at 0.5 mm (0.019 in.) valve lift.		

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum - Heat treated	
Gasket Thickness (Compressed)	0.54 mm	0.021 in.

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Angle	44.75° - 45.10°	
Seat Diameter - Intake	34.45 - 34.61mm	1.3562 - 1.3625 in.
Seat Diameter - Exhaust	28.04 - 28.20 mm	1.1039 - 1.1102 in.
Runout (Max.)	0.05 mm	0.002 in.
Valve Seat Width		
Intake	1.16 - 1.46 mm	0.0456 - 0.0574 in.
Exhaust	1.35 - 1.65 mm	0.0531 - 0.0649 in.
Service Limit - Intake	2.0 mm	0.079 in.
Service Limit - Exhaust	2.5 mm	0.098 in.

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter I.D.	5.500 - 5.512 mm	0.2165 -0.2170 in.
Guide Bore Diameter	10.983 - 11.001 mm	0.432 - 0.4331 in.
Guide Height (spring seat to guide tip)	14.6 - 15.2 mm	0.5748 - 0.5984 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle - Intake and Exhaust	45.25° - 45.75°	
Head Diameter - Intake	34.9 - 35.1 mm	1.374 -1.3818 in.
Head Diameter - Exhaust	28.9 - 29.1 mm	1.1377 - 1.1456 in.
Valve Length (Overall)		
Intake	112.76 - 113.32 mm	4.439 - 4.461 in.
Exhaust	110.89 - 111.69 mm	4.365 - 4.397 in.
Valve Stem Diameter		
Intake	5.465 - 5.480 mm	0.2151 - 0.2157 in.
Exhaust	5.458 - 5.470 mm	0.2148 - 0.2153 in.

VALVE MARGIN

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.672 mm	0.0264 in.
Service Limit	0.95 mm	0.0037 in.
Exhaust	0.744 mm	0.02929 in.
Service Limit	1.05 mm	0.039 in.

VALVE STEM TIP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	48.04 mm	1.891 in.
Exhaust	47.99 mm	1.889 in.

VALVE STEM TO GUIDE CLEARANCE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.048 - 0.066 mm	0.0018 - 0.0025 in.
Max. Allowable	0.076 mm	0.003 in.
Service Limit	0.25 mm	0.010 in.
Exhaust	0.0736 - 0.094 mm	0.0029 - 0.0037 in.
Max. Allowable	0.101 mm	0.004 in.
Service Limit	0.25 mm	0.010 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length (Approx.)	47.0 mm	1.850 in.
Nominal Force (Valve Closed)	179.5 N ± 9 @ 35.0 mm	40.35 lbs. @ 2.023 in.
Nominal Force (Valve Open)	364.8 N ± 17 N @ 29.25 mm	82.01 lbs. ± 3.82 lbs. @ 1.152 in.
Installed Height	35.00 mm	1.378 in.
Number of Coils	8.5 ± 0.1	
Wire Diameter	2.90 mm ± 0.03	0.114 in ± 0.001 in.

OIL PRESSURE

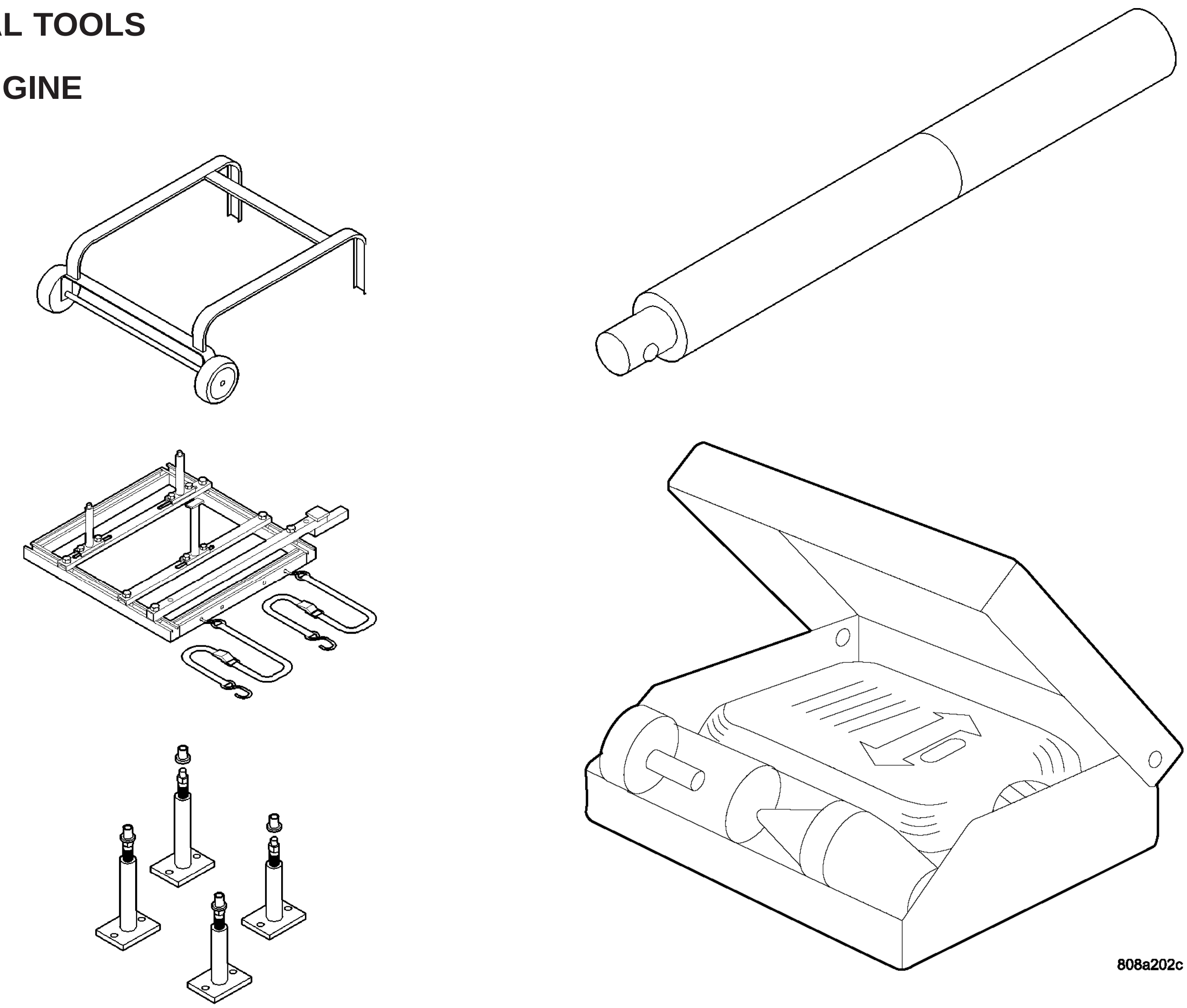
DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed*	25 kPa	4 psi
At 3000 rpm	170 - 550 kPa	25 - 80 psi
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 rpm.		

TORQUE

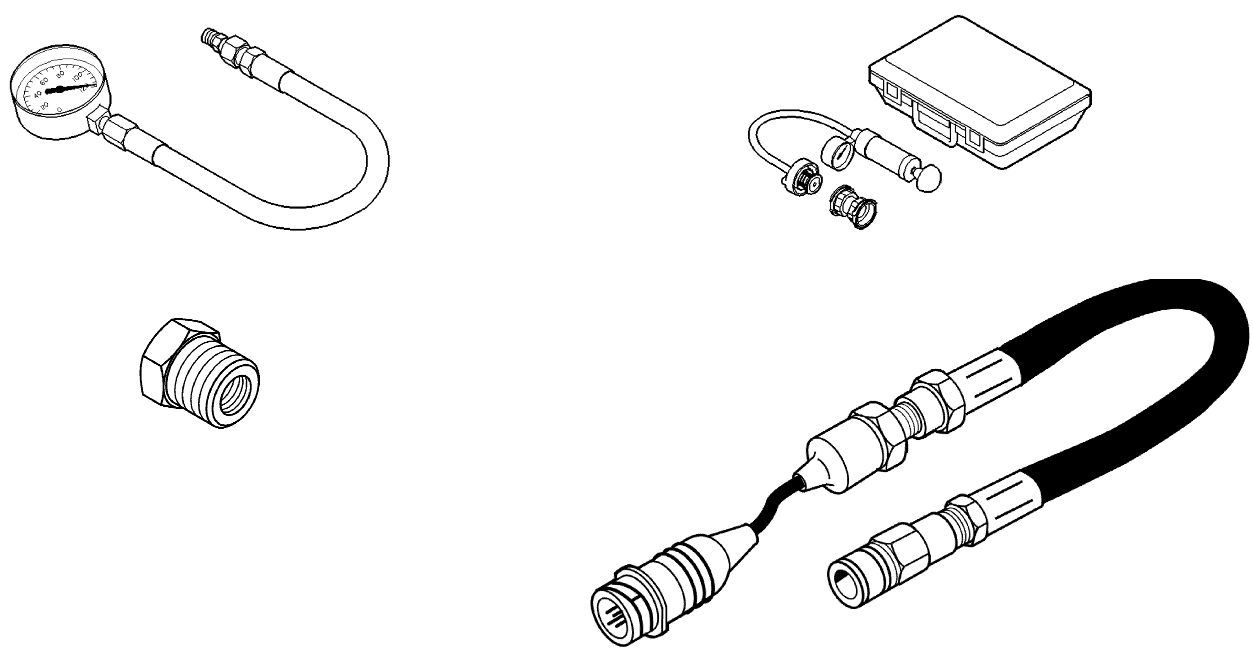
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Balance Shaft Module	22N·m +90°	16 +90°	-
Camshaft Sprocket-Bolt	40	30	-
Camshaft Bearing Cap-Bolts			
Front Bearing Cap-Bolts	34	25	-
Bearing Cap-Bolts	12	-	105
Connecting Rod Cap-Bolts	20 +90°	15 +90°	-
Crankshaft Main Bearing Cap-Bolts	27 + 45°	20 + 45°	-
Crankshaft Damper-Bolt	50 +68°	37 +68°	-
Cylinder Head-Bolts	Refer to Procedure		
Cylinder Head Cover-Bolts	10	-	90
Engine Support Bracket-Bolts	40	30	-
Exhaust Manifold-Bolts	34	25	-
Exhaust Manifold Heat Shield-Bolts	9	-	80
Flex Plate to Crankshaft-Bolts	95	70	-
Intake Manifold	24	18	-
Ladder Frame	28	21	-
Oil Cooler Connector Bolt	49	36	-
Oil Filter	14	10	-
Oil Filter Nipple	49	36	-
Oil Jet Fastener	12	-	105
Oil Pan-Bolts			
M6 Bolts	12 N·m	-	105
M8 Bolts	24 N·m	18-	-0
Oil Pan Drain-Plug	40	30	-
PCV Valve	5	-	40
Spark Plugs	27	20	-
Timing Chain Cover			
M6 Bolts	12 N·m	-	105
M8 Bolts	23 N·m	17	250?
Timing Chain Tensioner Assembly-Bolts	12 N·m	-	105
Timing Chain Guides	12 N·m	-	105

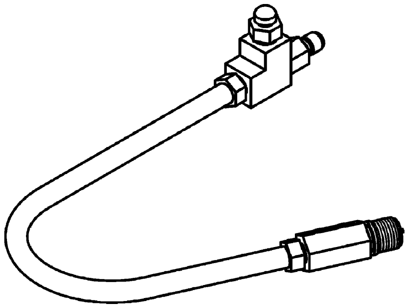
SPECIAL TOOLS

2.4L ENGINE

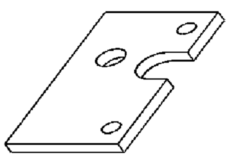


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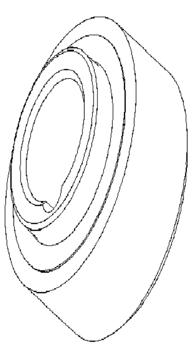




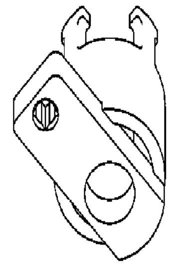




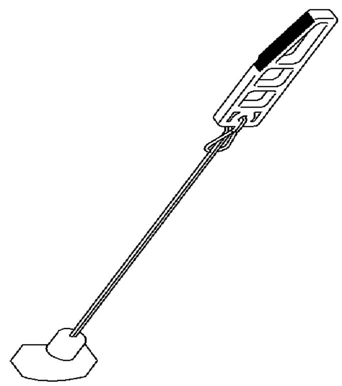
ENGINE LIFT FIXTURE 9704



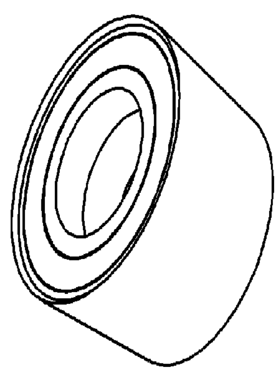
FRONT SEAL INSTALLER 9506



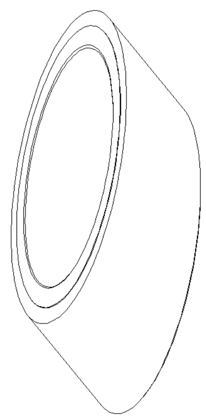
HOLDING FIXTURE 9707



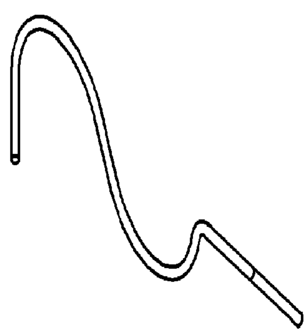
LOCKING WEDGE 9701



REAR CRANKSHAFT SEAL GUIDE 9509



REAR MAIN SEAL DRIVER 9706

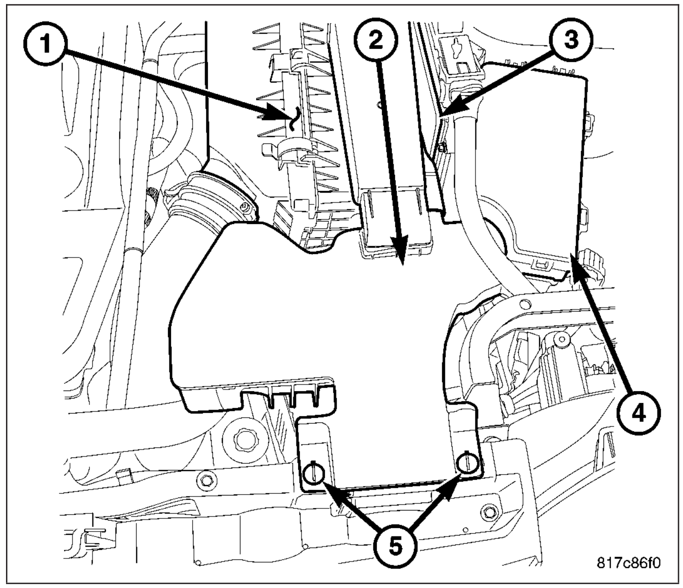


TENSIONER PIN 9703

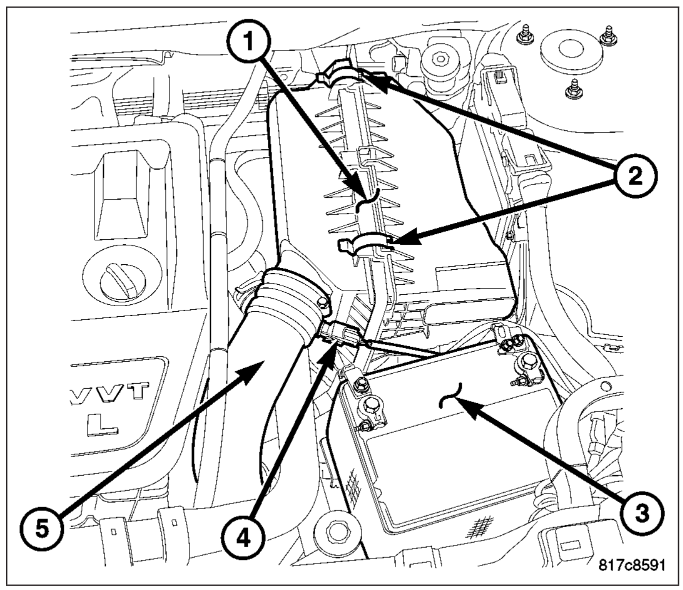
ELEMENT-AIR CLEANER

REMOVAL

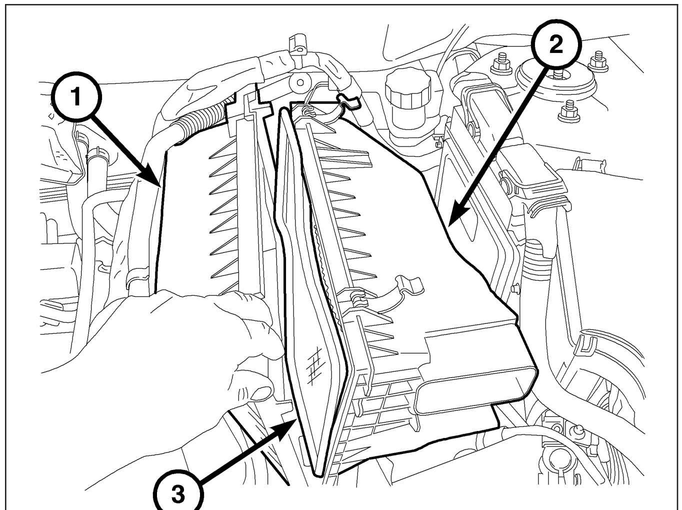
1. Turn Lock Retainers (5) and remove fresh air inlet (2) from air cleaner housing (1).



2. Disconnect intake air temperature sensor connector (4).
3. Remove Air inlet tube (5) from air cleaner housing (1).
4. Unfasten clasps (2) on sides of air cleaner housing cover (1).



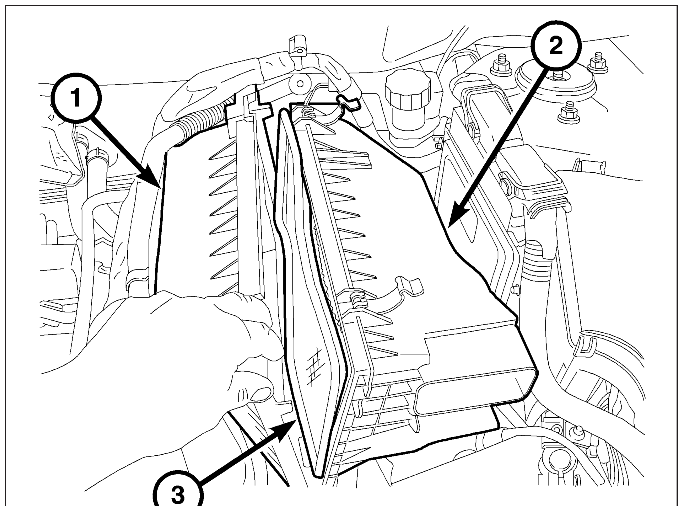
5. Pull air cleaner cover (1) aside.
6. Remove filter element (3).
7. If necessary, clean the inside of the air cleaner housing (2).



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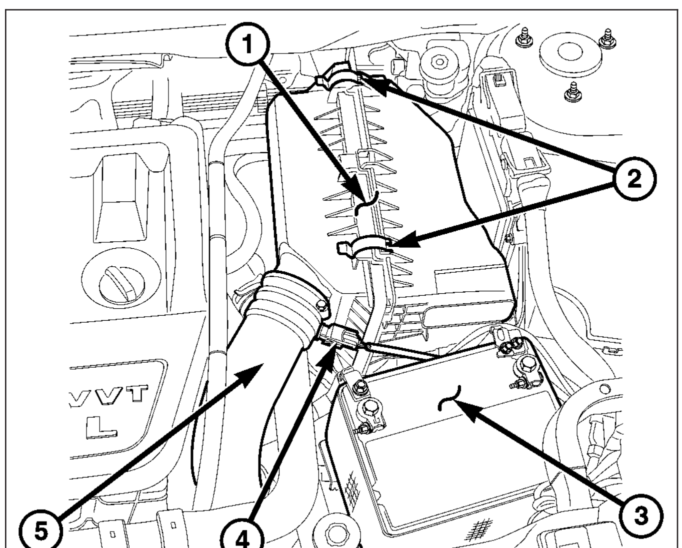
INSTALLATION

1. Install new filter element.



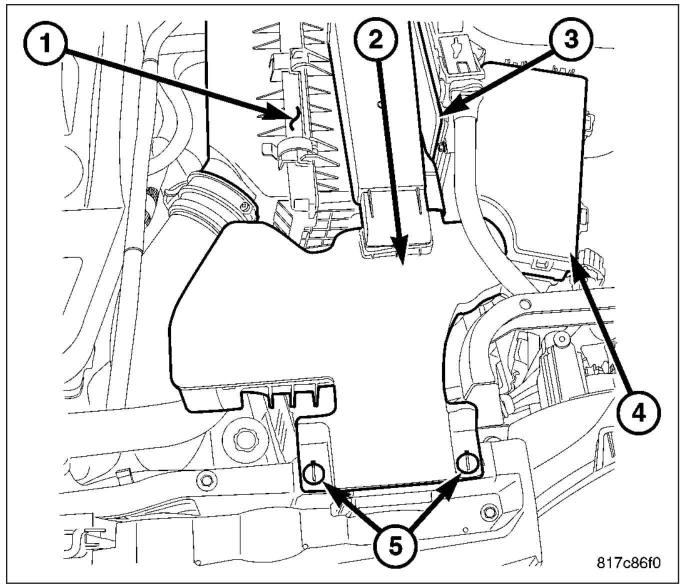
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2. Place cover over air cleaner housing. Snap clasps (2) in place.
3. Install air inlet tube (5).
4. Connect intake air temperature sensor connector (4).



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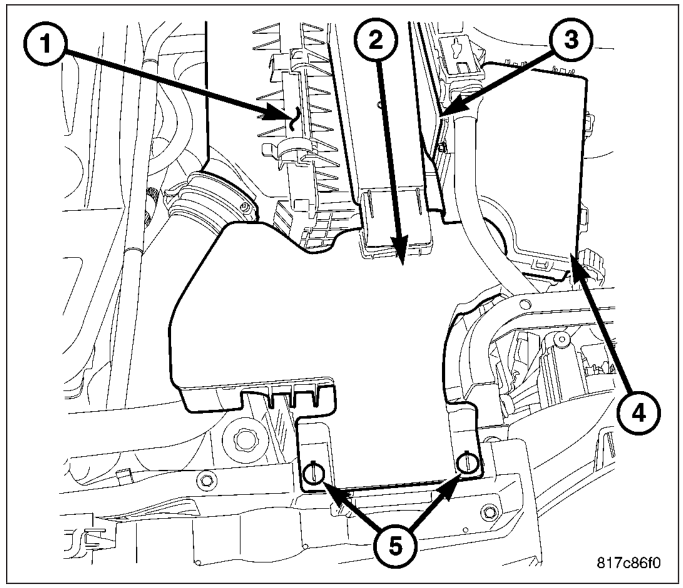
5. Install fresh air inlet (2) on air cleaner housing (1) and lock retainers (5).



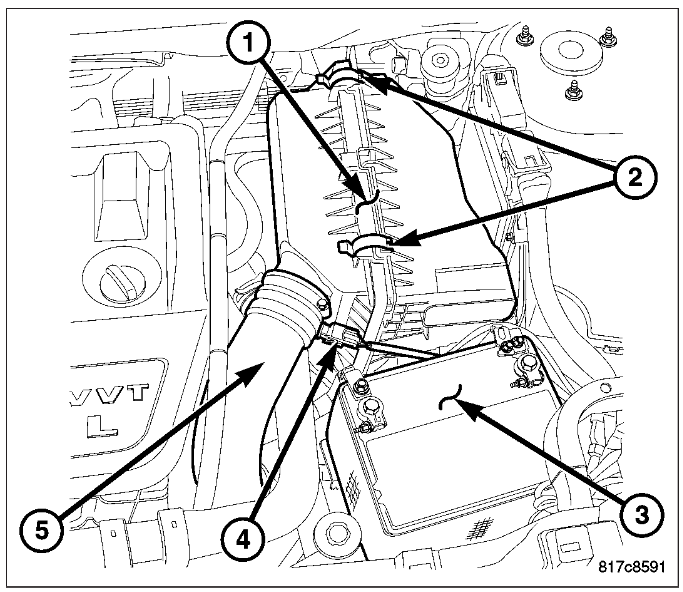
HOUSING-AIR CLEANER

REMOVAL

1. Remove fresh air inlet (2) from air cleaner housing (1).

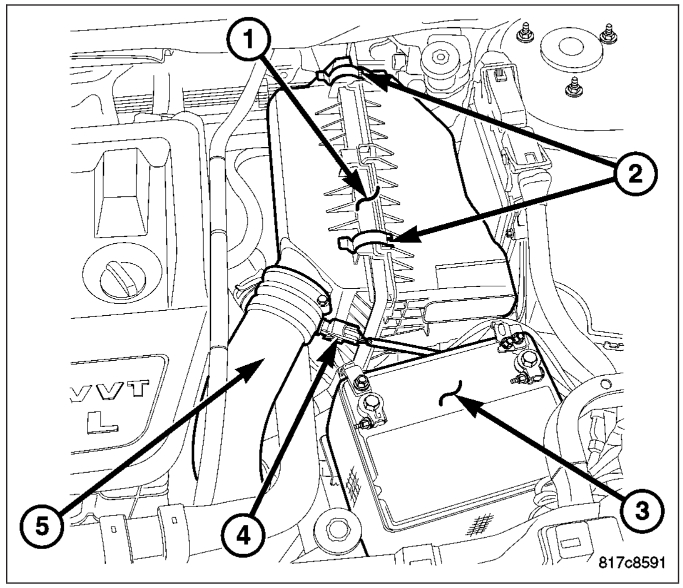


2. Remove intake air temperature sensor electrical connector (4).
3. Remove air inlet tube (5) from housing (1).
4. Pull housing (1) upward to remove.

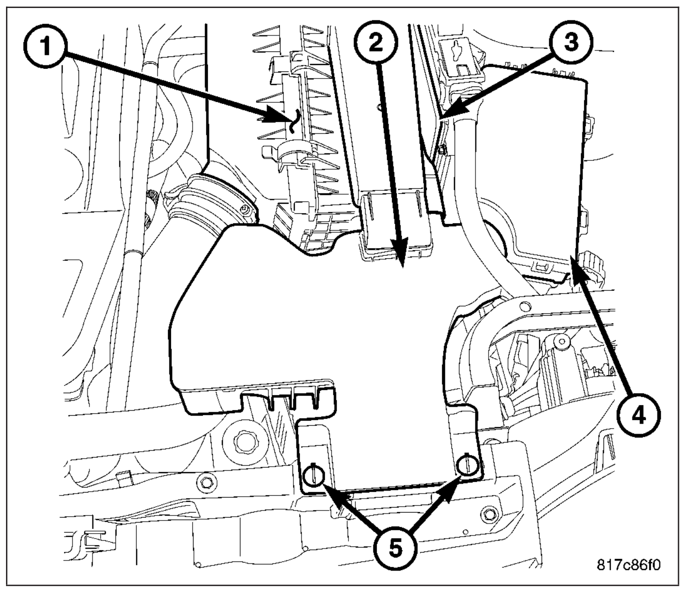


INSTALLATION

1. Make sure the rubber grommets, for the air cleaner housing lower pins, are in place when reinstalling the air cleaner housing. The rubber grommets mount to the PDC bracket.
2. Push air cleaner housing (1) down while aligning pins into the grommets.
3. Connect the throttle body air inlet hose (5) to the air cleaner housing (1).
4. Connect intake air temperature sensor connector (4).



5. Install fresh air inlet (2) and lock retainers (5).



CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains dual over-head camshafts with four valves per cylinder. The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries provide lubrication passages to the variable camshaft timing phasers, camshafts, and valve mechanisms.

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders, between a cylinder and the adjacent water jacket or from an oil passage to the exterior of the engine.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

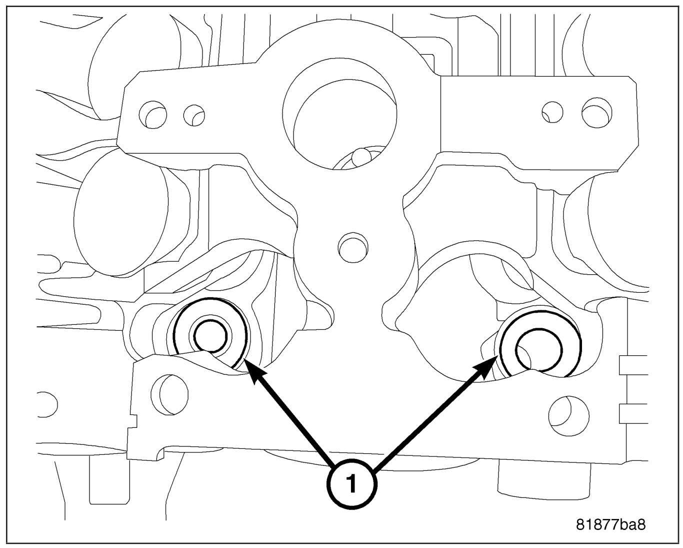
Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

1. Perform fuel system pressure release procedure **before attempting any repairs**
2. Remove clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect negative cable from battery.
4. Drain cooling system.
5. Remove engine cover.
6. Remove coolant recovery bottle.
7. Remove power steering pump and reposition.
8. Remove windshield washer bottle.
9. Disconnect breather hose.
10. Disconnect PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove valve cover.
13. Raise vehicle.
14. Remove right splash shield.
15. Set engine to TDC.
16. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor bolts if equiped.
18. Remove lower A/C compressor mount.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft and water pump pulleys.
21. Remove right side engine mount bracket lower bolt.
22. Remove timing chain cover lower bolts.
23. Disconnect oxygen sensor electrical connectors.
24. Remove exhaust pipe at manaverter (AWD).
25. Remove manaverter support bracket retaining bolts (AWD).
26. Lower vehicle.
27. Remove power steering pump and set aside.
28. Support engine with suitable jack.
29. Remove right engine mount.
30. Remove accessory drive upper idler pulley.
31. Remove right upper engine mount bracket.
32. Remove accessory drive belt tensioner.
33. Remove upper timing chain cover retaining bolts.
34. Remove timing chain cover.
35. Remove timing chain tensioner.
36. Remove timing chain.
37. Remove timing chain guides.
38. Disconnect fuel line at the fuel rail.
39. Disconnect fuel injector electrical connectors.
40. Disconnect top engine electrical connectors and reposition harness.
41. Remove fuel rail.
42. Remove lower intake manifold support bracket retaining bolt.

43. Disconnect electronic throttle control electrical connector.
44. Disconnect map sensor electrical connector.
45. Disconnect vacuum lines at intake.
46. Remove intake manifold retaining bolts.
47. Remove upper radiator hose retaining bolts.
48. Remove intake manifold.
49. Remove coolant outlet manifold and set aside.
50. Remove ground strap at right rear of cylinder head.
51. Remove oxygen sensor from maniverter (AWD).
52. Remove maniverter heat shields (AWD).
53. Remove maniverter retaining bolts (AWD).
54. Remove maniverter from cylinder head and reposition out of the way (AWD).
55. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

NOTE: All of the cylinder head bolts have captured washersEXCEPTthe front two (1).



56. Remove cylinder head bolts.
57. Remove cylinder head from engine block.
58. Inspect and clean cylinder head and block sealing surfaces. Refer to Cleaning and Inspection in this section for procedures.

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

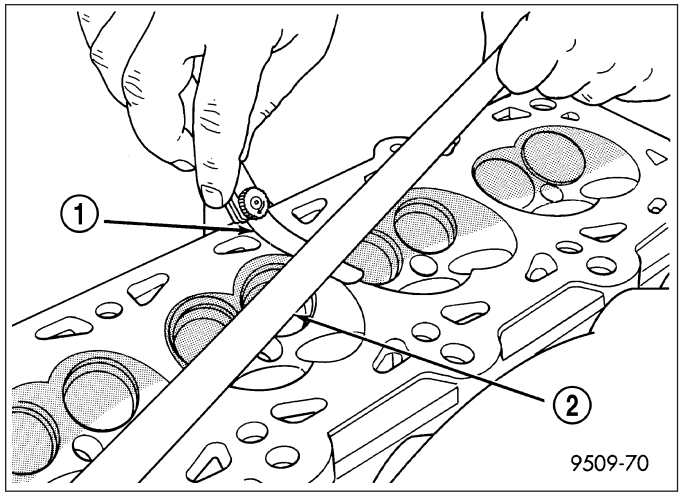
Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

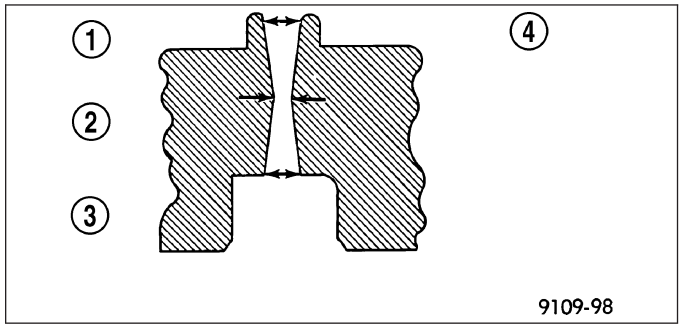
INSPECTION

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

1. Cylinder head must be flat within 0.1 mm (0.004 in.).



2. Inspect camshaft bearing journals for scoring.
3. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
4. Using a small hole gauge and a micrometer, measure valve guides in 3 places top (1), middle (2), and bottom (3). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.
5. Check valve guide height.
6. Prior to installing cylinder head, the cylinder block should be checked for flatness (Refer to 9 - ENGINE/ENGINE BLOCK - INSPECTION).

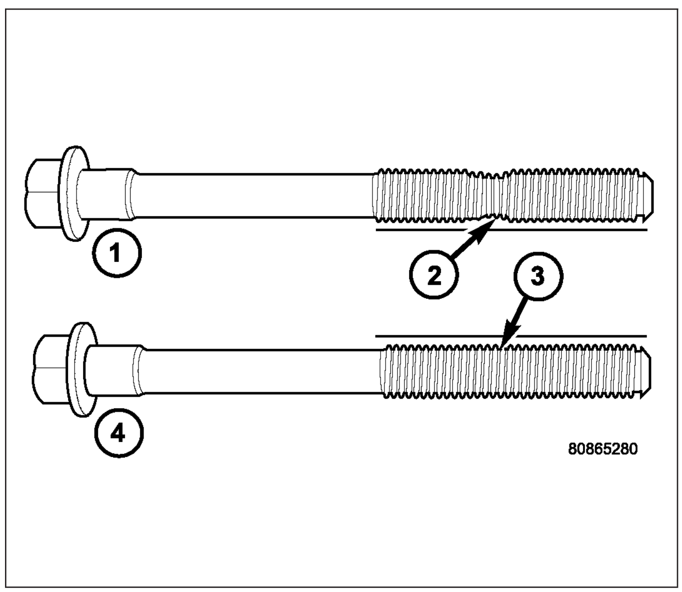


INSTALLATION - CYLINDER HEAD

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

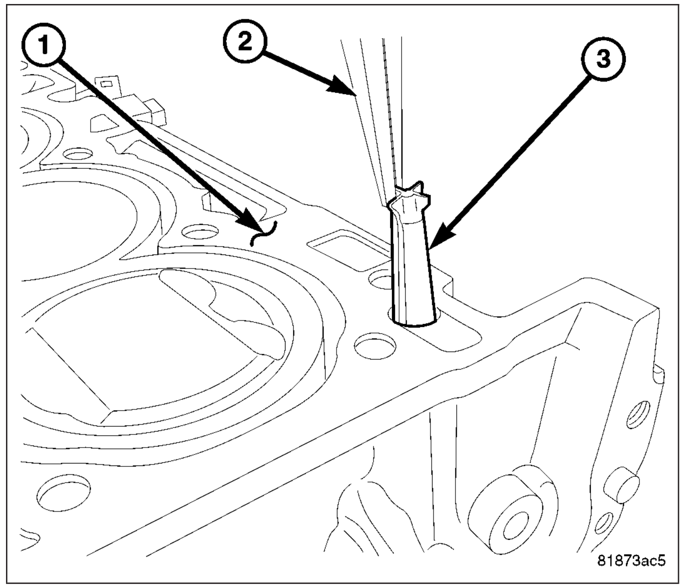
NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced.

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2), the bolt should be replaced.

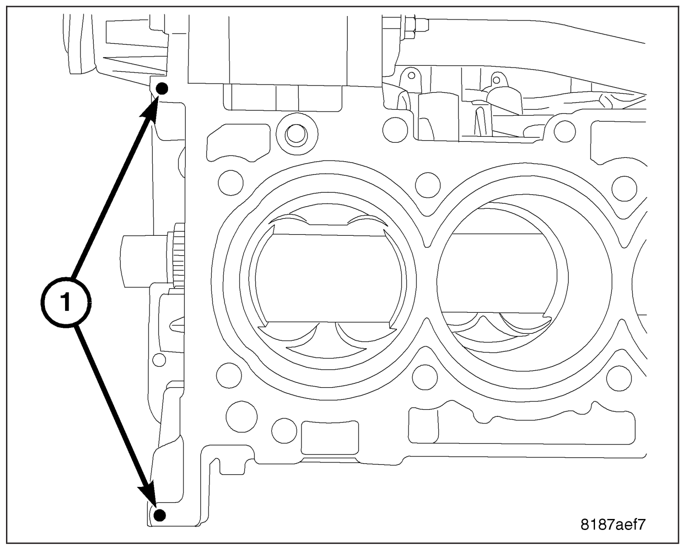


CAUTION: Always replace the variable valve timing filter screen (3) when servicing the head gasket or engine damage could result.

1. Replace the variable valve timing filter screen (3).



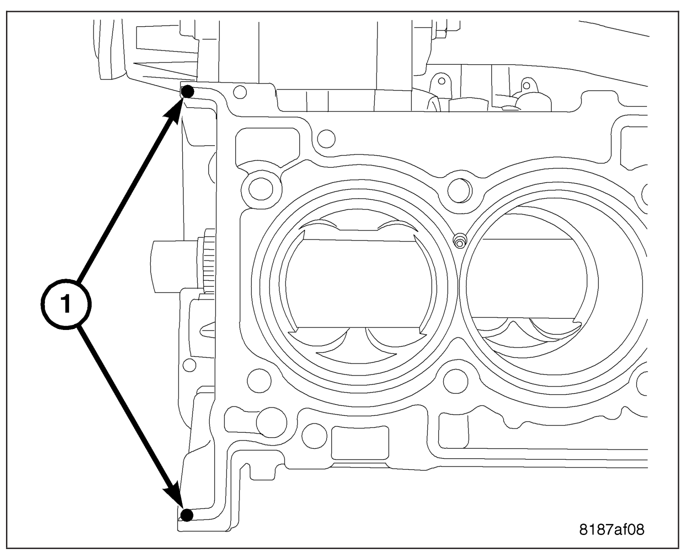
2. Place two pea size dots of RTV (1) on cylinder block as shown.



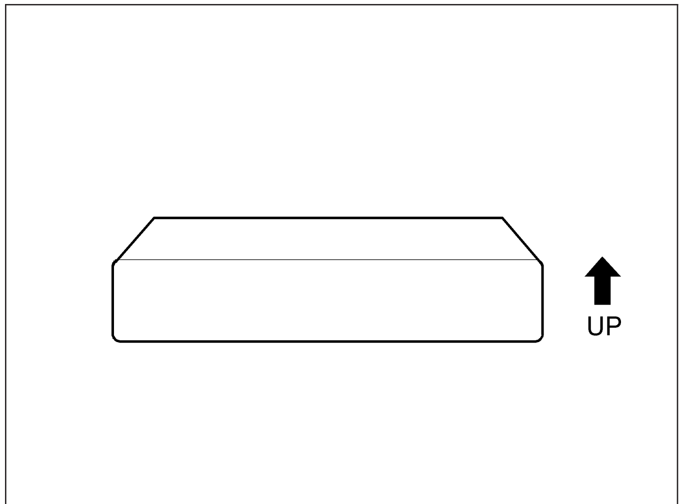
3. Position the new cylinder head gasket on engine block with the part number facing up. Ensure gasket is seated over the locating dowels in block.
4. Place two pea size dots of RTV (1) on cylinder head gasket as shown.

NOTE: The head must be installed within 15 minutes before the RTV skins.

5. Position cylinder head onto engine block.

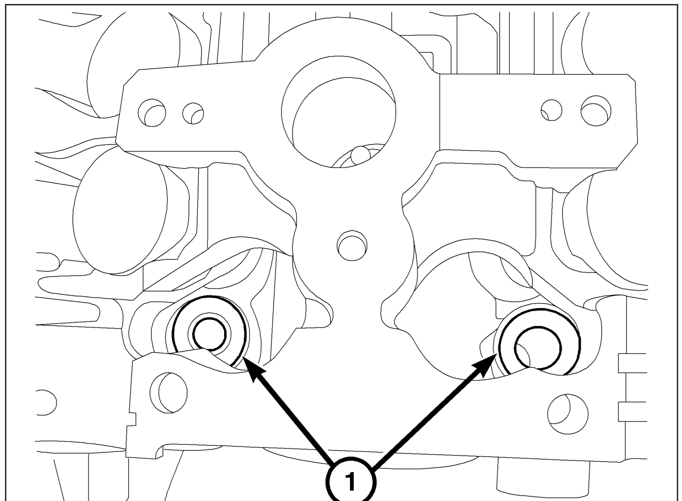


NOTE: The front two cylinder head bolts do not have captured washers. The washers must be installed with the bevel up towards the bolt head.



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6. Install washers (1) for the front two cylinder head bolts.

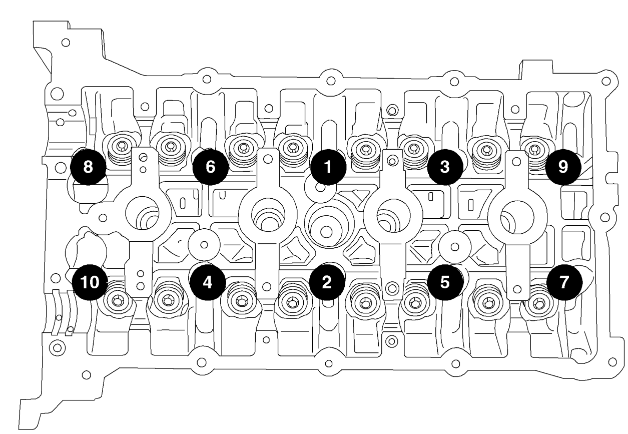


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7. Before installing the bolts, the threads should be lightly coated with engine oil.
8. Install the cylinder head bolts and torque in the sequence shown above.
   - First: All to 30 N·m (25 ft. lbs.)
   - Second: All to 61 N·m (50 ft. lbs.)
   - Third: All to 61 N·m (45 ft. lbs.)
   - Fourth: All an additional 90°

CAUTION: Do not use a torque wrench for the Fourth step.

9. Install camshafts. (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).



10. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).
11. Install maniverter/exhaust manifold to cylinder head. Torque fasteners to 34 N·m (25 ft.lbs.).
12. Install heat shields.Torque fasteners to 9 N·m ( ).

13. Install oxygen sensor in maniverter.
14. Install ground strap at right rear of cylinder head.
15. Install coolant manifold.
16. Install intake manifold.
17. Install intake manifold bolts and torque to 24 N·m (18 ft.lbs.).
18. Install upper radiator hose retaining bracket.
19. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
20. Install timing chain cover, torque m6 bolts to 12 N·m (105 in.lbs.) and m8 bolts to 23 N·m (17 ft.lbs.).
21. Connect cam sensor wiring connector.
22. Install spark plugs and torque to 27 N·m (20 ft.lbs.).
23. Install ignition coils and torque to 8 N·m (70 in.lbs.).
24. Install power steering pump reservoir/bracket to cylinder head.
25. Install exhaust pipe to manifold. Torque fasteners to 28 N·m (20 ft. lbs.).
26. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
27. Connect engine coolant temperature sensor connector.
28. Connect upper radiator hose. Connect heater hoses to thermostat housing.
29. Install heater tube support bracket to cylinder head.
30. Install fastener attaching dipstick tube to lower intake manifold
31. Connect fuel supply line quick-connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
32. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
33. Connect negative cable to battery.
34. Install clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

CAMSHAFT(S)

DESCRIPTION

Both camshafts have six bearing journal surfaces and two cam lobes per cylinder. Flanges on the third journal control camshaft end play. Cam position sensors are located on the intake and exhaust camshafts on the rear of the cylinder head.

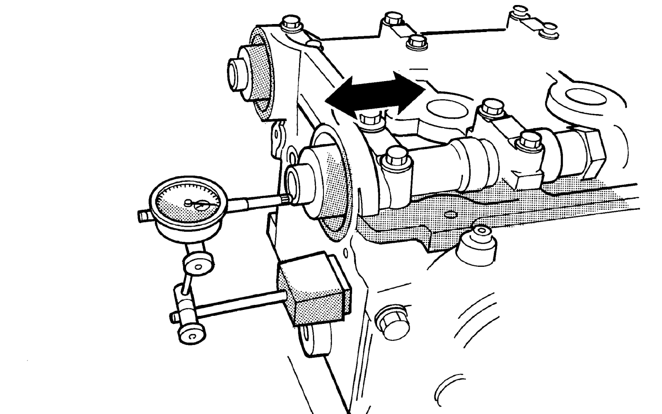
OPERATION

The camshaft is driven by the crankshaft via drive sprockets and a chain. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE

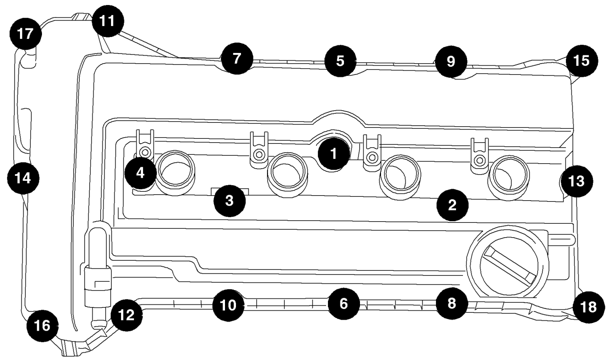
MEASURING CAMSHAFT END PLAY

1. Using a suitable tool, move camshaft as far rearward as it will go.
2. Zero dial indicator.
3. Move camshaft as far forward as it will go.
4. Record reading on dial indicator. For end play specification, (Refer to 9 - ENGINE - SPECIFICATIONS).
5. If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

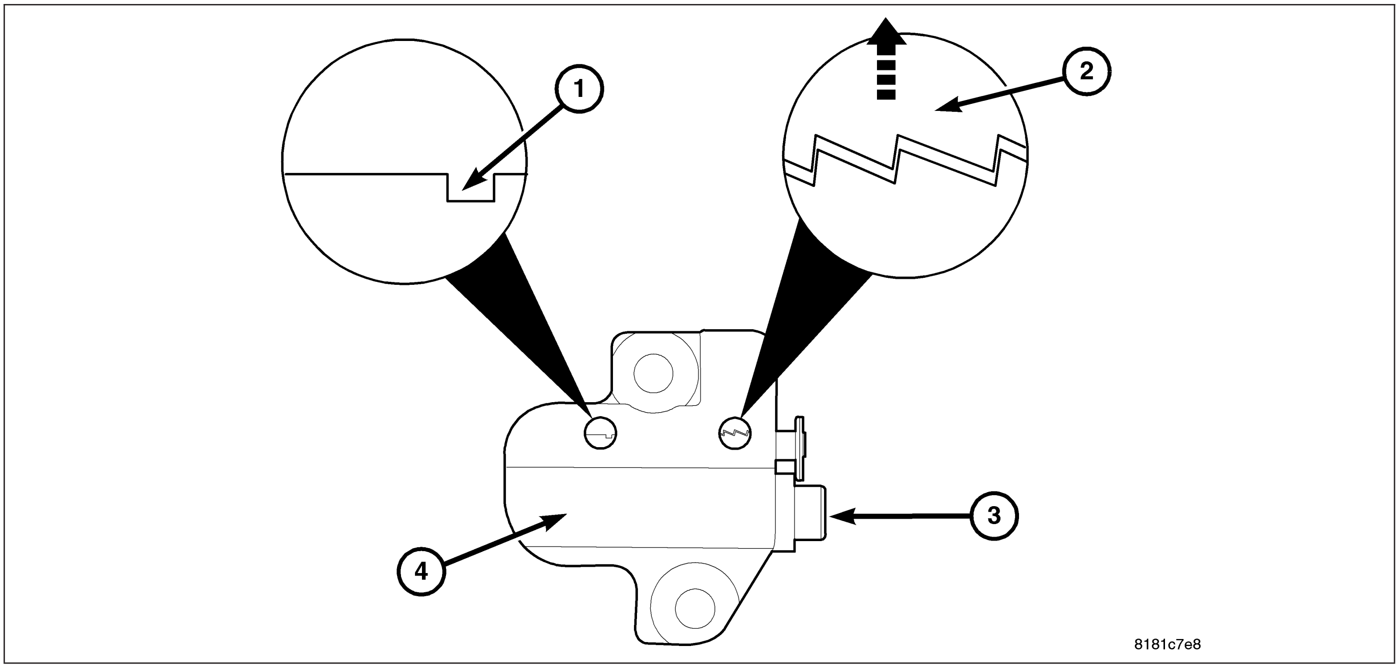

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REMOVAL

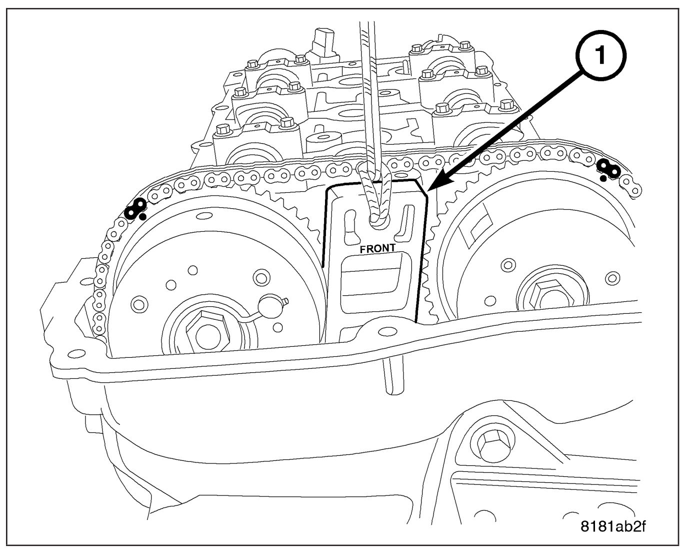
1. Remove engine cover by pulling upward.
2. Disconnect negative battery cable.
3. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Raise vehicle.
5. Remove right splash shield.



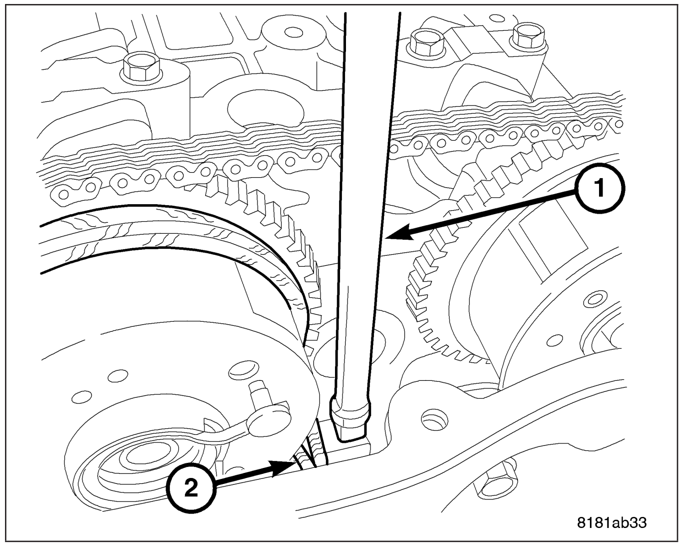
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6. Remove timing tensioner plug from front cover.
7. Insert small allen wrench and lift ratchet (2) upward to release the tensioner. Leave the allen wrench installed during the remainder of this procedure.
8. Insert wedge 9701 (1).

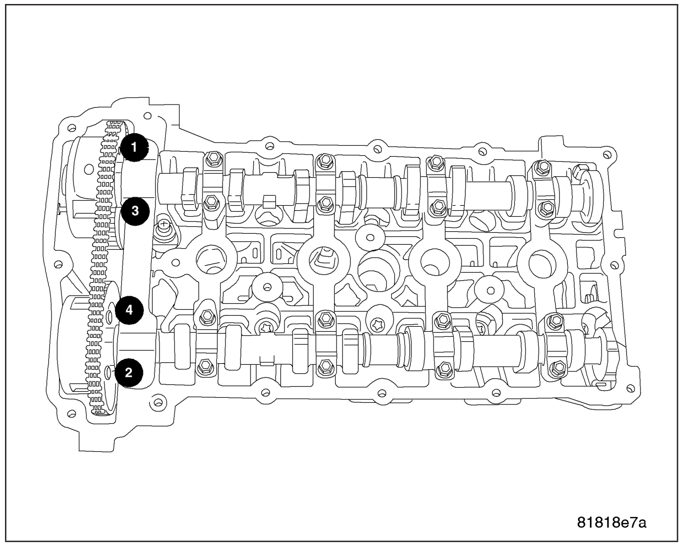


9. Lightly tap Wedge 9701(2) into place.



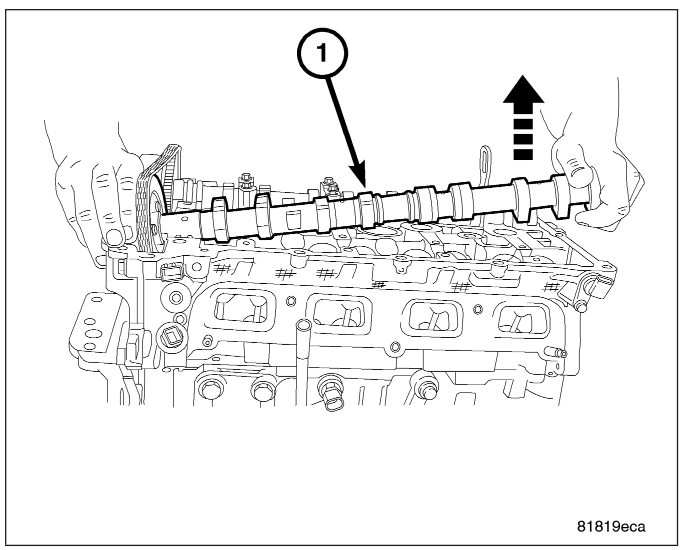
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10. Remove the front camshaft bearing cap.
11. Slowly remove the remaining camshaft bearing bolts one turn at a time following the above sequence.



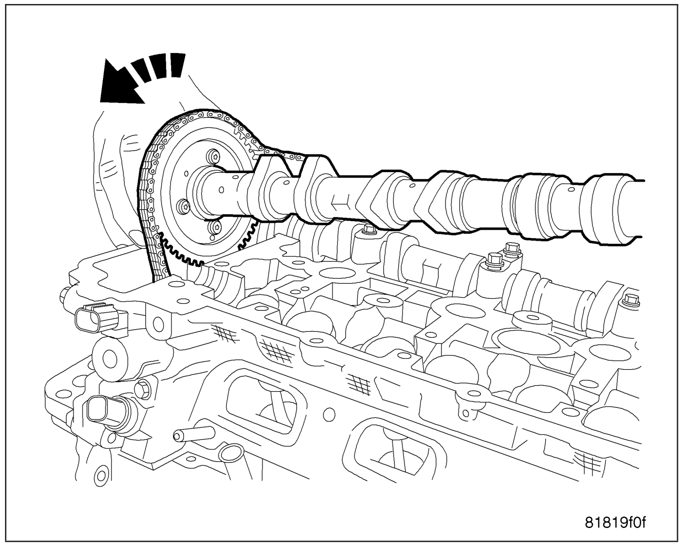
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12. Remove intake camshaft (1) by lifting the rear of the camshaft upward.

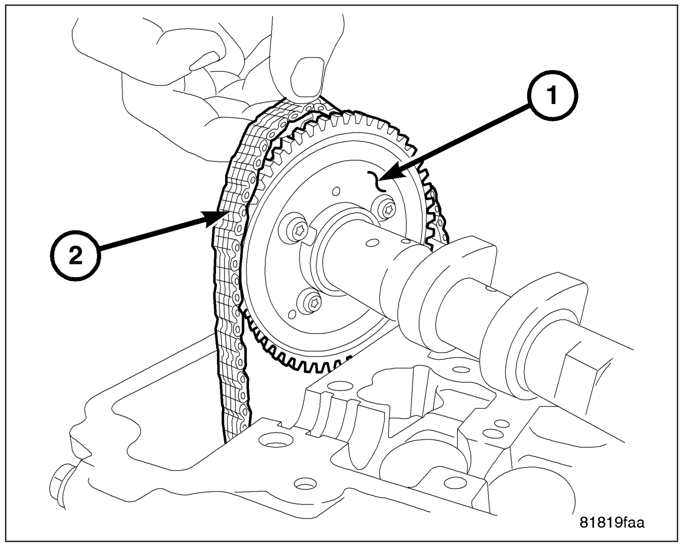


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13. Rotate the camshaft while lifting out of the front bearing cradle.



14. Lift the timing chain (2) off the sprocket (1).
15. Remove exhaust camshaft.



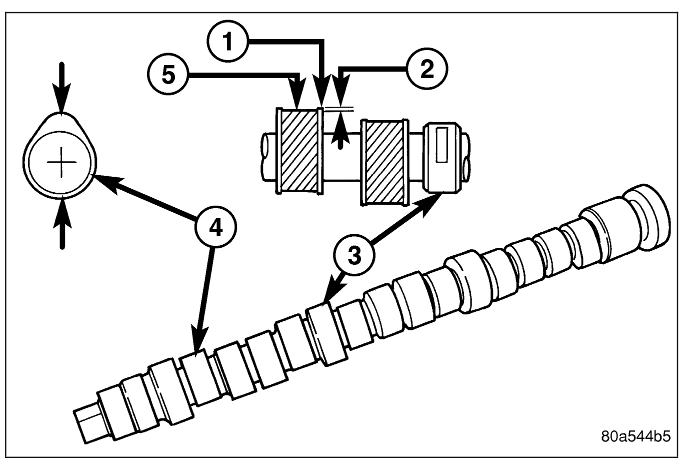
CLEANING

Clean camshafts with a suitable solvent.

INSPECTION

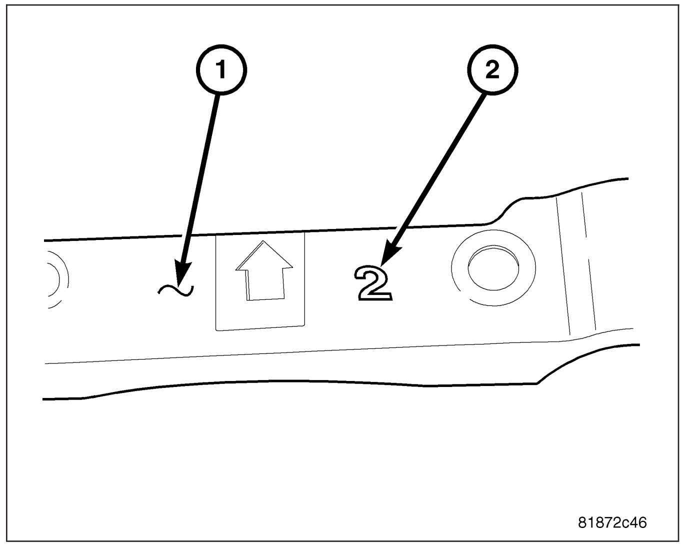
1. Inspect camshaft bearing journals for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the lash buckets.

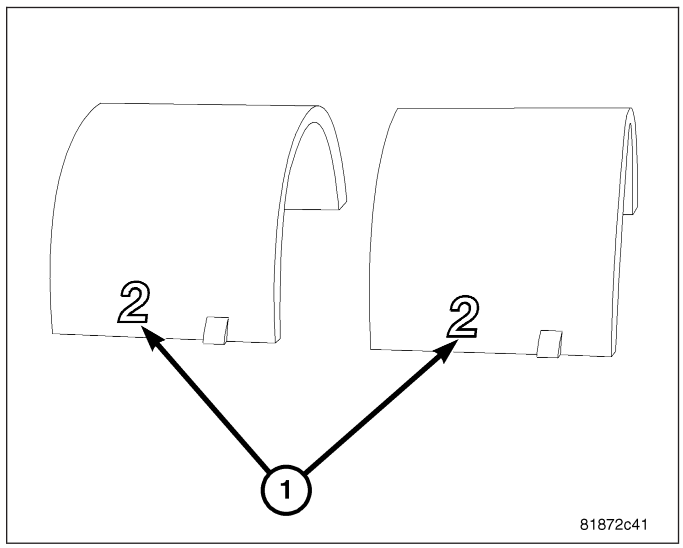


INSTALLATION

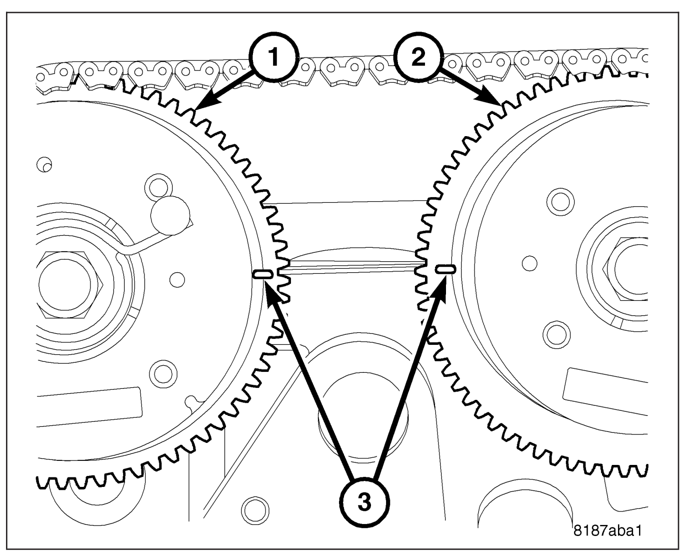
1. Identify which front cam cap (1) is installed on the engine you are working on.
2. The cam cap (1) is numbered (2) either one, two, or three, this corresponds to the select fit bearing to use.



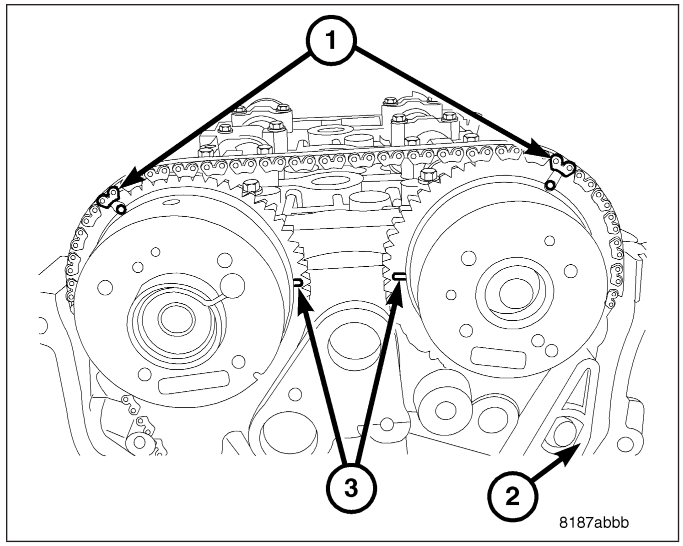
3. Install the corresponding select fit bearing that will also be numbered (1) one, two, or three.
4. Oil all of the camshaft journals with clean engine oil.
5. Install exhaust camshaft and position on bearing journals in the cylinder head.



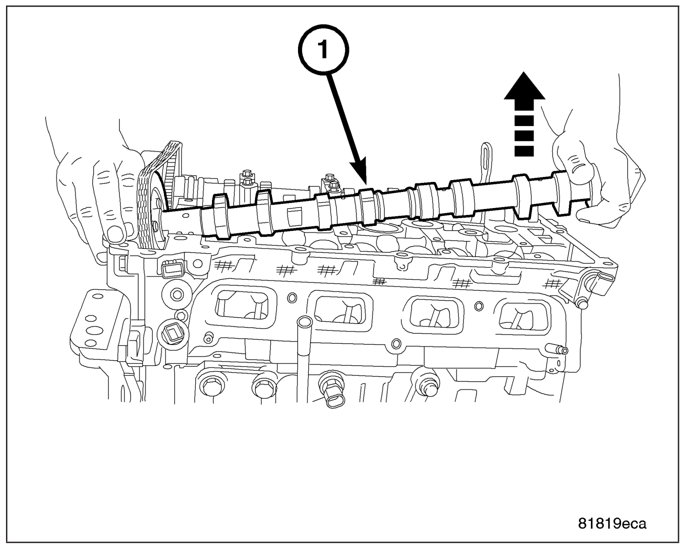
6. Align exhaust cam timing mark so it is parallel to the cylinder head as shown.



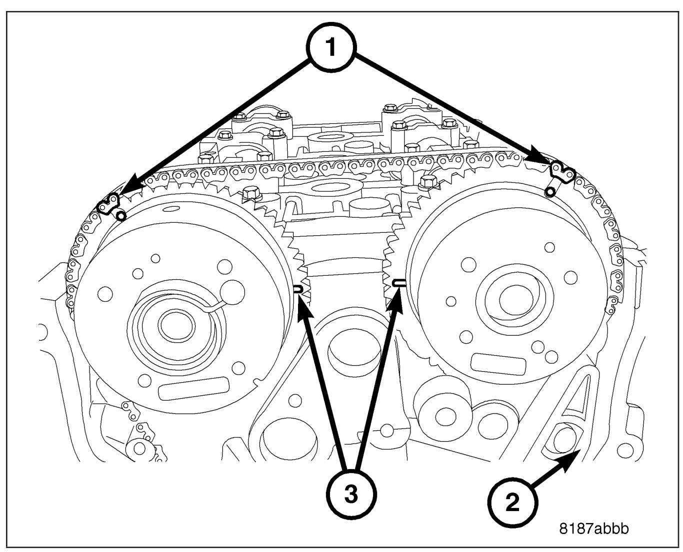
7. Install timing chain onto exhaust cam sprocket making sure that the timing marks (1) on the sprocket and chain are aligned.



8. Install intake camshaft by raising the rear of the camshaft upward and roll the sprocket into the chain.



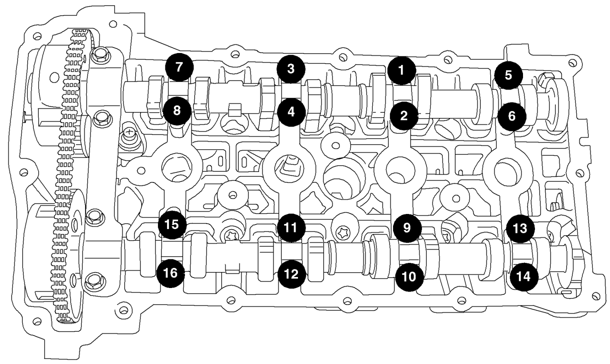
9. Align the timing marks (1) on the intake cam sprocket with the mark in the chain.
10. Position the intake camshaft into the bearing journals in the cylinder head.
11. Verify that the timing marks (1) are aligned on both camshafts and that the timing marks (3) are parallel with the cylinder head.



CAUTION: Install the front intake and exhaust camshaft bearing cap last. Ensure that the dowels are seated and follow torque sequence or damage to engine could result.

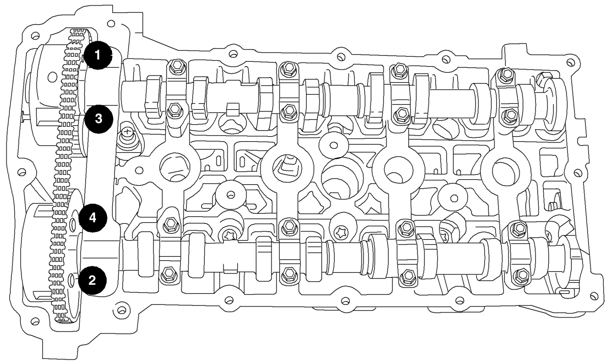
NOTE: If the front camshaft bearing cap is broken, the cylinder head MUST be replaced.

12. Install intake and exhaust camshaft bearing caps slowly torque bolts in the sequence shown.



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13. Install the front intake and exhaust bearing cap and torque bolts in the sequence shown.



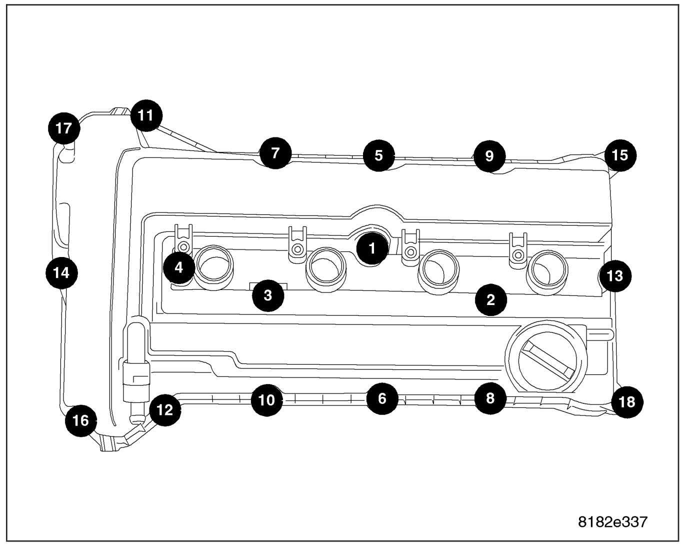
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14. Verify that all timing marks are aligned.
15. Remove allen wrench from timing chain tensioner.
16. Remove locking wedge 9701.
17. Apply MOPAR® thread sealant to timing tensioner plug and Install.
18. Install right splash shield.
19. Install cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
20. Install engine cover.
21. Connect negative battery cable.
22. Fill cooling system.
23. Fill with oil.
24. Start engine and check for leaks.

COVER-CYLINDER HEAD

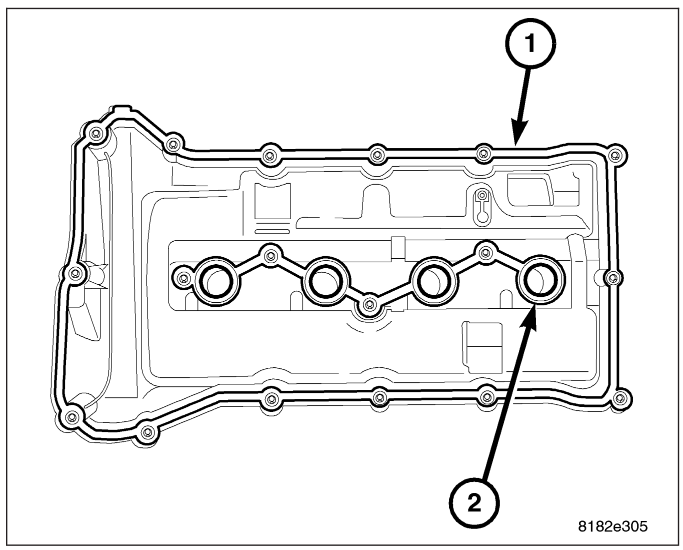
REMOVAL

1. Remove engine cover.
2. Disconnect ignition coil electrical connectors.
3. Disconnect PCV and make-up air hoses from cylinder head cover.
4. Use compressed air to blow dirt and debris off the cylinder head cover prior to removal.
5. Remove cylinder head cover bolts.
6. Remove cylinder head cover from cylinder head.

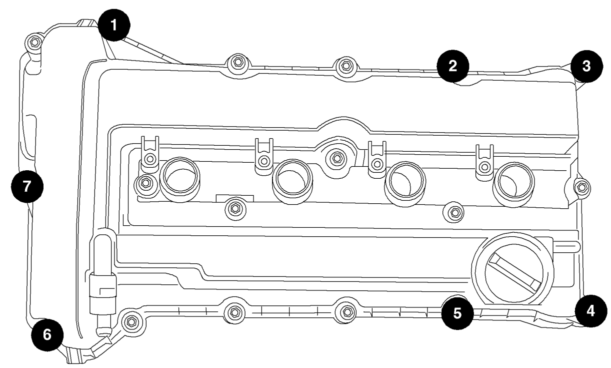


INSTALLATION

1. Install new cylinder head cover gaskets (1,2).

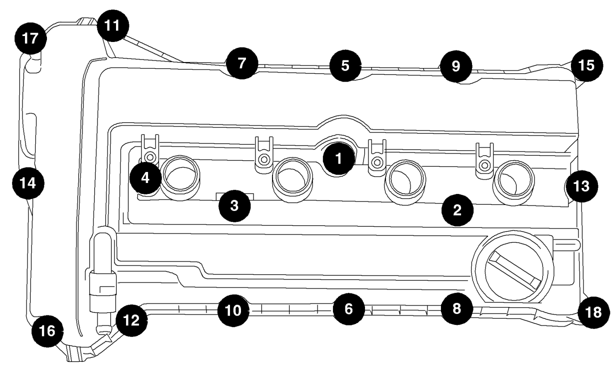


2. Install studs in cover as shown.



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3. Clean all RTV from cylinder head.
4. Apply RTV to cylinder head/front cover joint.
5. Install cylinder head cover assembly to cylinder head and install all bolts, ensuring the studs are located as shown.
6. Tighten bolts in sequence shown in Using a 2 step torque method as follows:
   a. Tighten all bolts to 4.5 N·m (40 in. lbs.)
   b. Tighten all bolts to 10 N·m (90 in. lbs.).
7. Install ignition coils. Tighten fasteners to 8 N·m (70 in. lbs.).
8. If the PCV valve was removed, tighten PCV valve to 4.5 N·m (40 in. lbs.).
9. Connect PCV and make-up air hoses to cylinder head cover.
10. Install engine cover.



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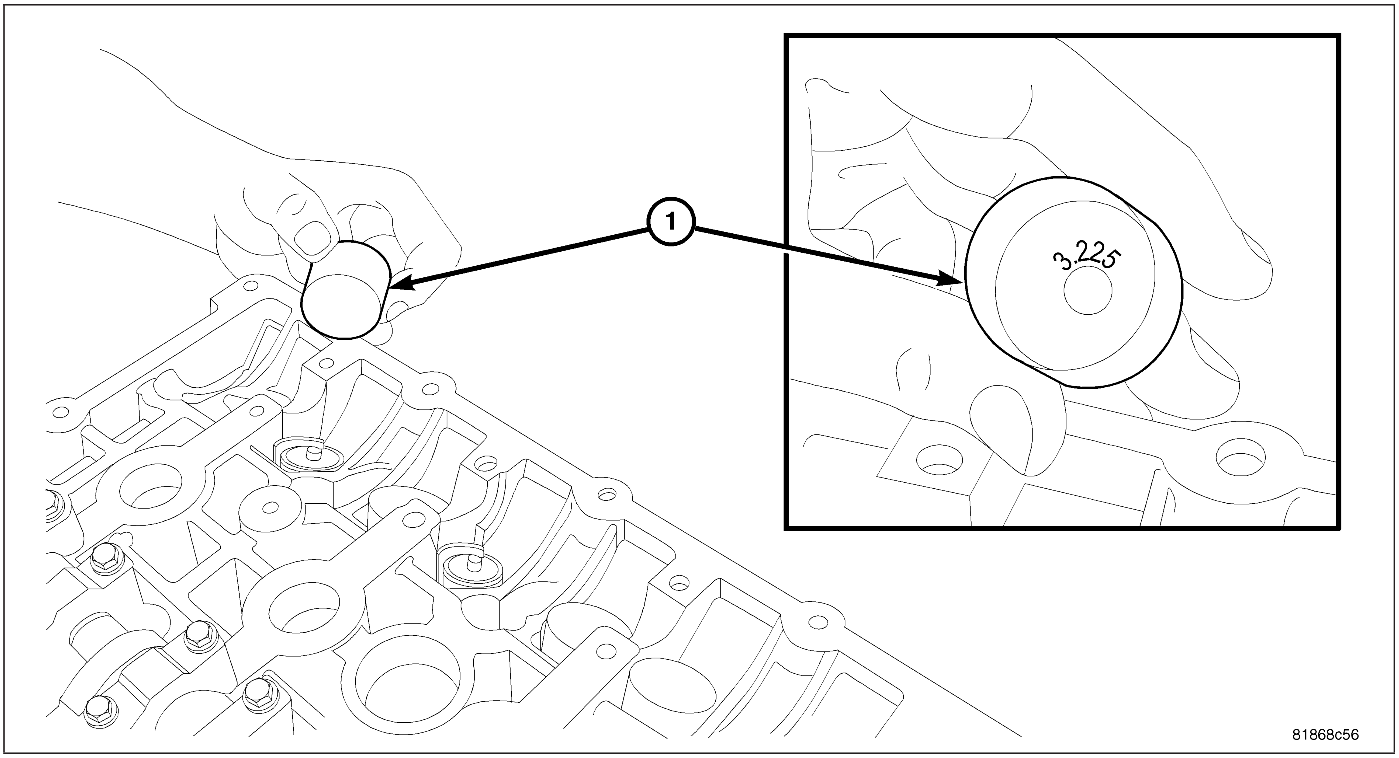
TAPPETS-VALVE

DIAGNOSIS AND TESTING

MECHANICAL VALVE TAPPET NOISE DIAGNOSIS

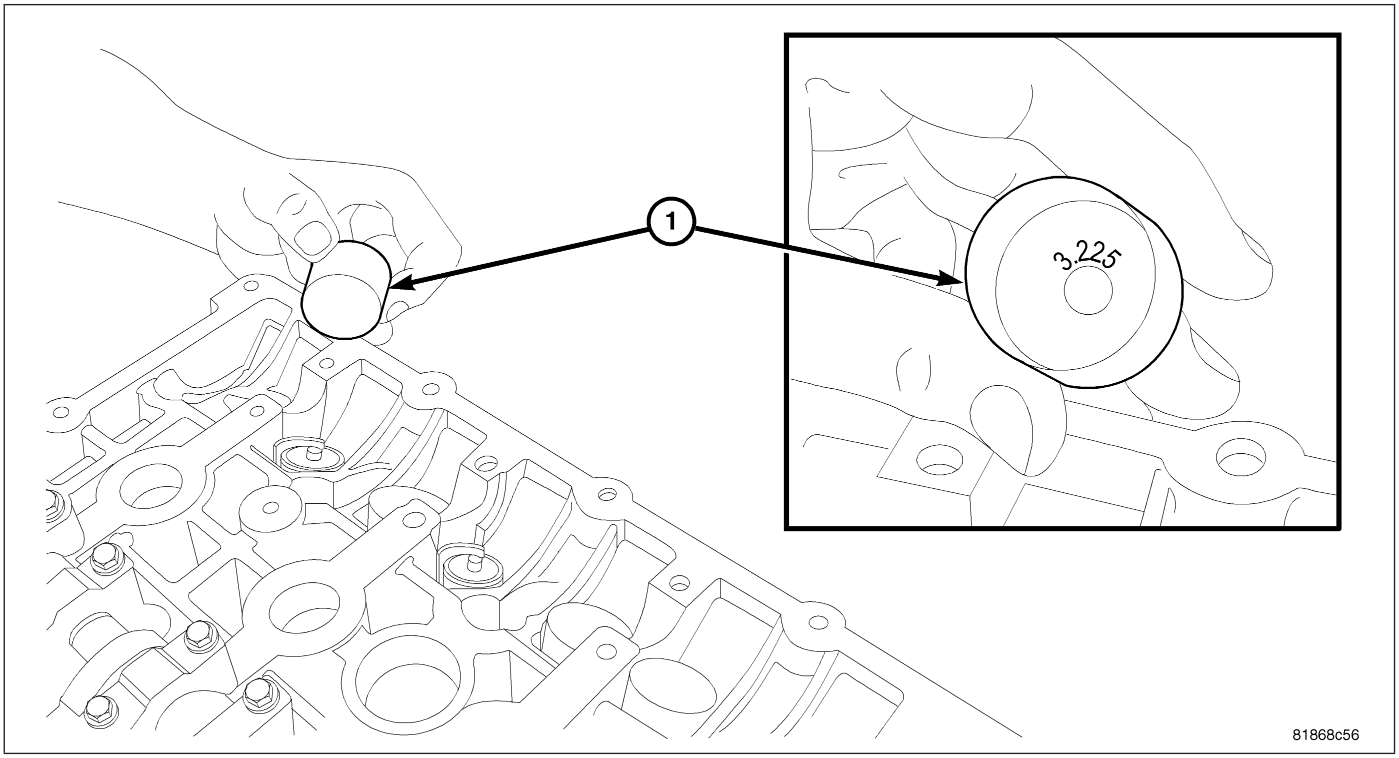
A tappet-like noise may be produced from several items. Check the following items.

STANDARD PROCEDURE - MEASURING VALVE LASH



1. Remove engine cover.
2. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
3. Rotate camshaft so lobes are vertical.
4. Check clearance using feeler gauges.
5. Repeat for all tappets.
6. If clearance was too small Clearance too Small .
7. If clearance was too large Clearance too Large .

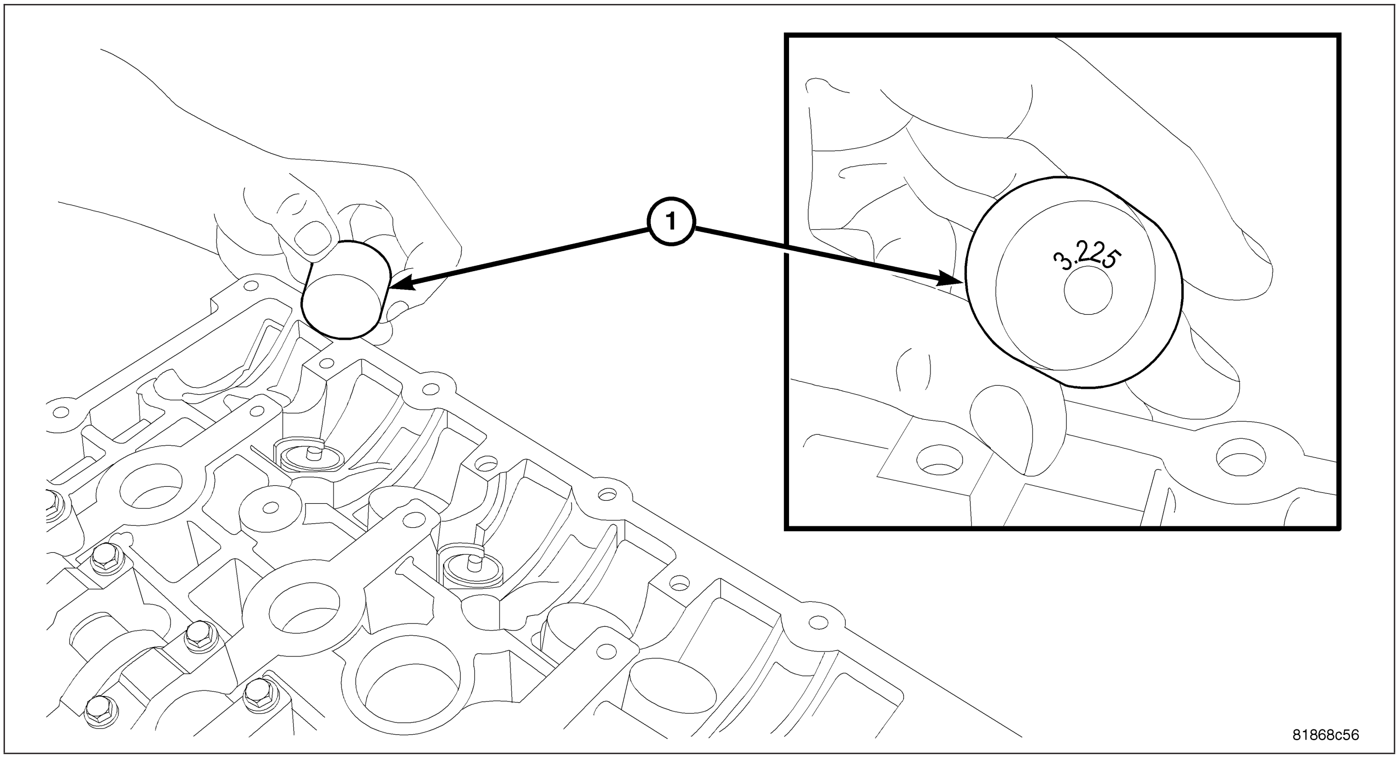
Clearance too Small



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1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. spec – measured = delta
3. Decrease bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

Clearance too Large



1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Measured – spec = delta
3. Increase bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

NOTE: Camshaft buckets must be replaced if cylinder head or camshafts are replaced.

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Remove camshaft buckets.
4. Repeat removal procedure for each camshaft bucket.
5. If reusing, mark each camshaft bucket for reassembly in original position.

INSTALLATION

NOTE: If reinstalling original buckets they must go back in their original location or engine damage could result.

1. Apply a light coat of clean engine oil to camshafts buckets prior to assembly.
2. Install camshaft bucket into cylinder head.
3. Repeat installation procedure for each camshaft bucket.

NOTE: If installing new buckets, the valve lash procedure must be performed.

4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVES & SEATS-INTAKE/EXHAUST

DESCRIPTION

The valves are made of heat resistant steel. They have nitrided stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves have a single bead lock keepers to retain the springs.

OPERATION

The four valves per cylinder (two intake and two exhaust) are opened by using direct acting buckets which are actuated by the camshaft.

CLEANING

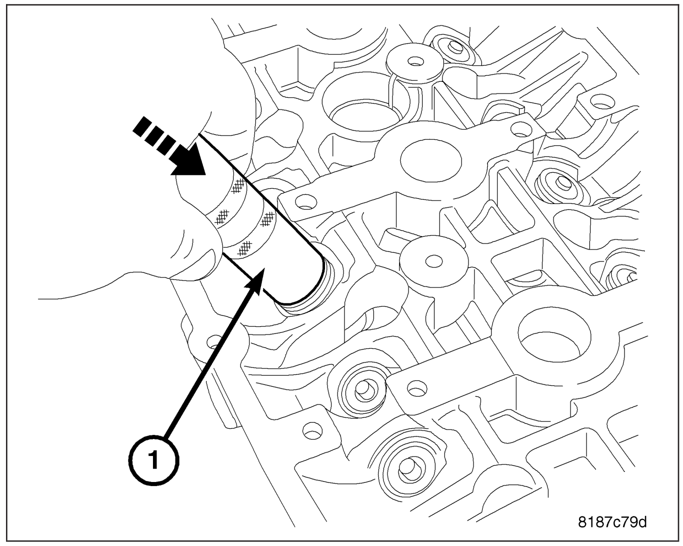
1. Clean all valves thoroughly and discard burned, warped and cracked valves.

SPRINGS & SEALS-VALVE

REMOVAL

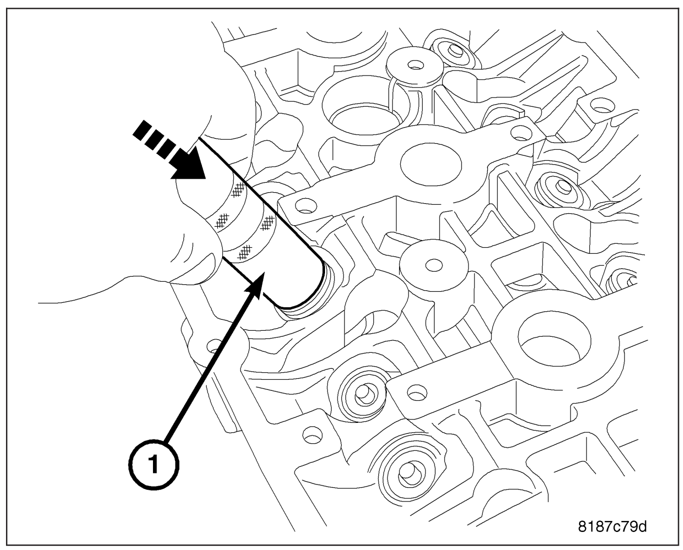
CYLINDER HEAD ON

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Rotate crankshaft until piston is at TDC on compression.
4. With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.
5. Using metric valve keeper remover (1), and remove valve spring keepers and retainer.
6. Remove valve spring(s).
7. Remove valve stem seal(s) by a using valve stem seal tool.



CYLINDER HEAD OFF

1. With cylinder head removed from cylinder block, place a ball of rags in the combustion chamber.
2. Using Snap On metric valve keeper remover (1) or equivalent, remove valve keepers with a downward push.
3. Remove retainer and springs.
4. Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves, locks and retainers to insure installation in original location.
5. Inspect the valves. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSPECTION).



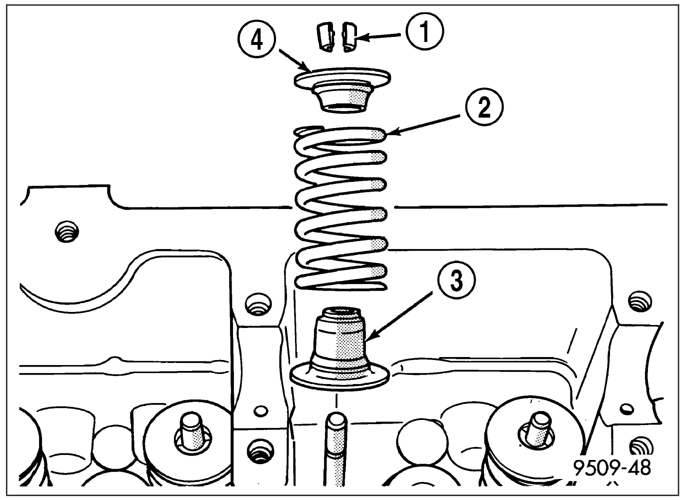
INSPECTION

1. Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:
   - Valve Closed Nominal Tension—75 lbs. @ 38.0 mm (1.50 in.)
   - Valve Open Nominal Tension—134 lbs. @ 29.75 mm (1.17 in.)
2. Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

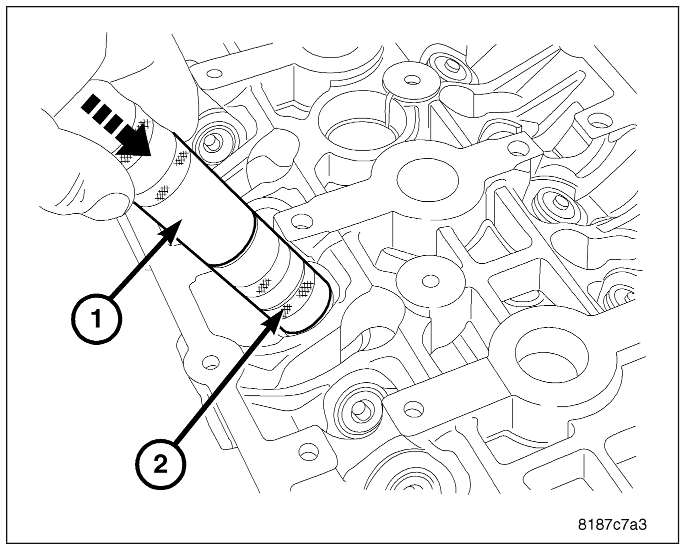
INSTALLATION

CYLINDER HEAD ON

1. Install valve seal/valve spring seat (3) assembly. Push the assembly down with appropriate size socket to seat it onto the valve guide.
2. Install valve spring (2) and retainer (4) with keepers (1).

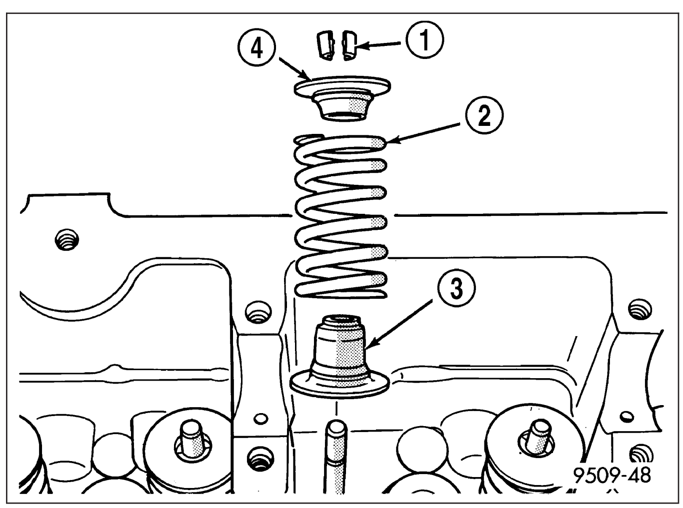


3. Place the valve keepers in the retainer. Using Snap On metric valve keeper installer (2) and remover (1) as a handle, install valve keepers with a downward push.
4. Remove air hose and install spark plugs.
5. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
6. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

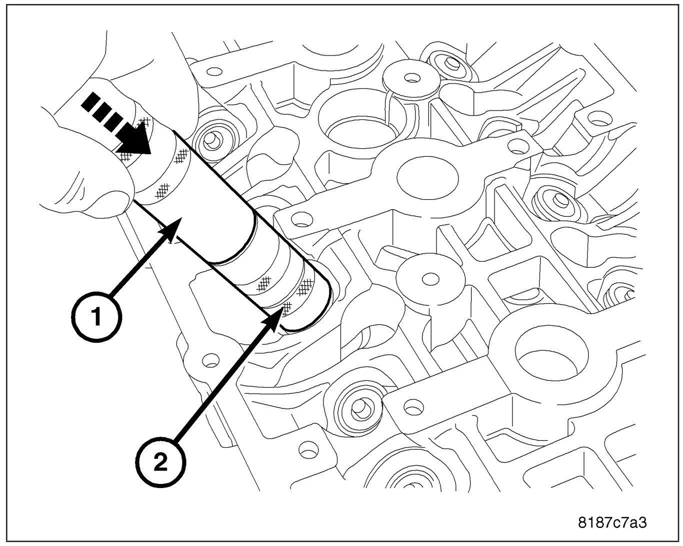


CYLINDER HEAD OFF

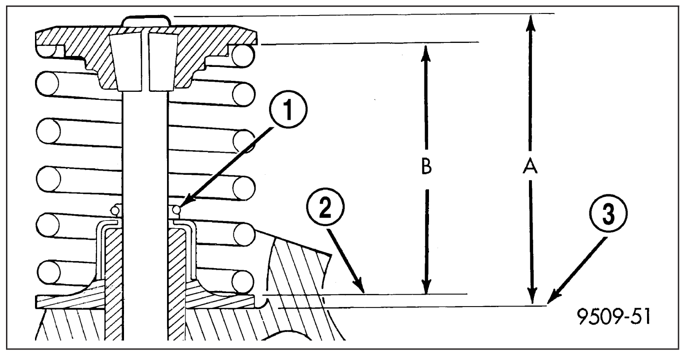
1. Coat valve stems with clean engine oil and insert in cylinder head.
2. Install new valve stem seals (3) on all valves using an appropriate sized socket to seat the seal/spring seat. The valve stem seals should be pushed firmly and squarely over valve guide.
3. Install valve springs (2), retainers (4), and keepers (1) in place.



4. Using Snap-on metric valve keeper installer (2) and remover (1) as a handle, push downward to install keepers.



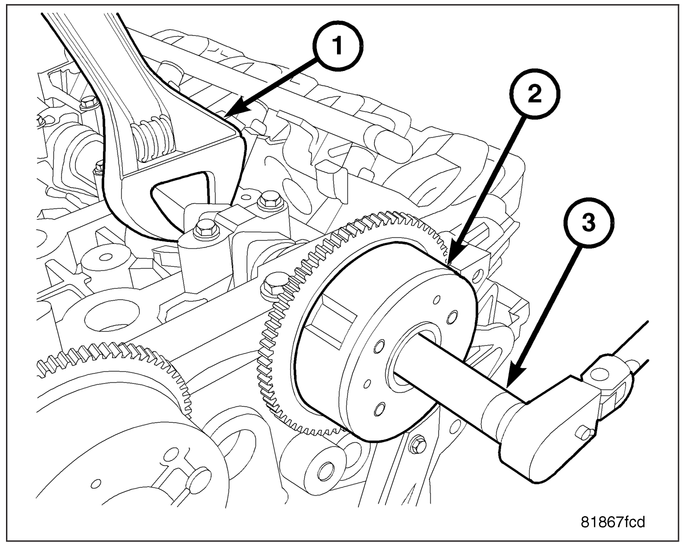
5. Check the valve spring installed height B after refacing the valve and seat. Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.



PHASERS-CAMSHAFT

REMOVAL

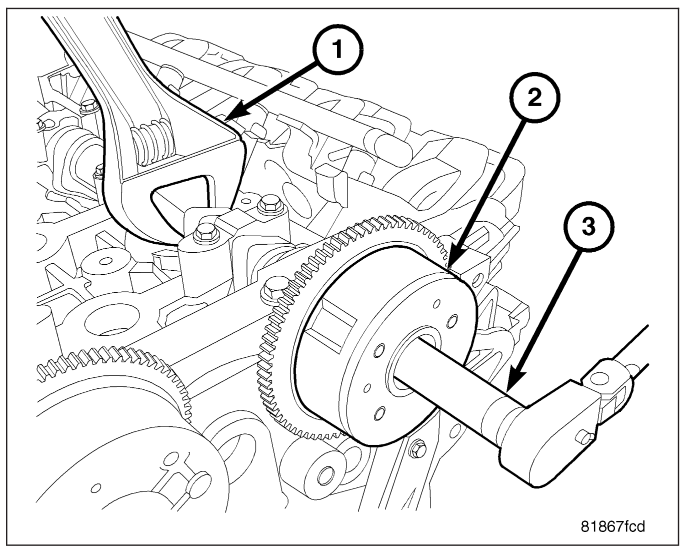
1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Remove camshaft phaser (2) retaining bolt while holding the camshaft in place with a wrench (1).
3. Remove phaser (2) assembly from camshaft.



INSTALLATION

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin and camshaft phaser may occur.

1. Install phaser (2) assembly on camshaft.
2. Install phaser retaining bolt and torque while holding camshaft in place with a wrench (1).
3. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

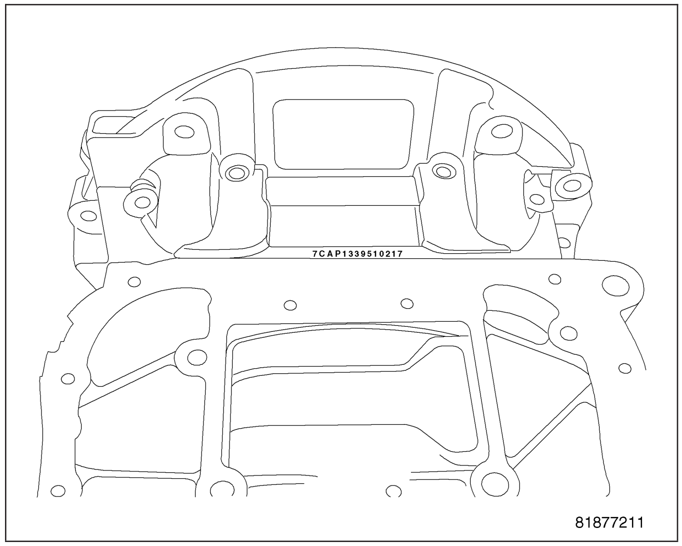


ENGINE BLOCK

DESCRIPTION

The die cast aluminum cylinder block is a two-piece assembly, consisting of the cylinder block and ladder frame. The block is an open deck design with cast in place cast iron cylinder liners. The cast iron cylinder liners are recessed below the aluminum deck surface. The ladder frame bolts to the cylinder block and does not incorporate the main bearing caps. This design offers a much stronger lower end and increased cylinder block and transaxle rigidity. The rear oil seal retainer is integral with the block and ladder frame. The ladder frame and block are serviced as an assembly.

The engine build date is located on the bottom of the ladder frame just behind the oil pan. The date can be seen with the oil pan in place.

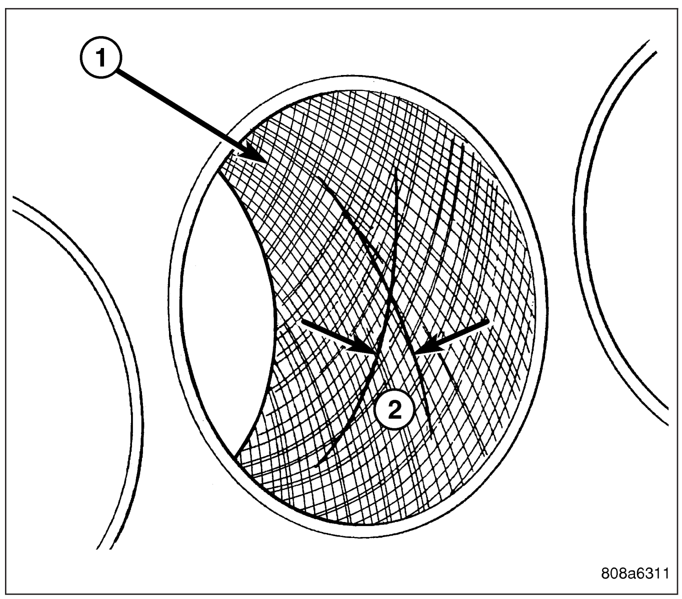


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STANDARD PROCEDURE

CYLINDER BORE HONING

1. Used carefully, a quality commercially available cylinder bore resizing hone equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.
2. Deglazing of the cylinder walls may be done using a quality commercially available cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20–60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.



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3. Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 30-50 degrees, the cross hatch angle is most satisfactory for proper seating of rings.
4. A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 degree angle. Faster up and down strokes increase the cross-hatch angle.
5. After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

CAUTION: Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

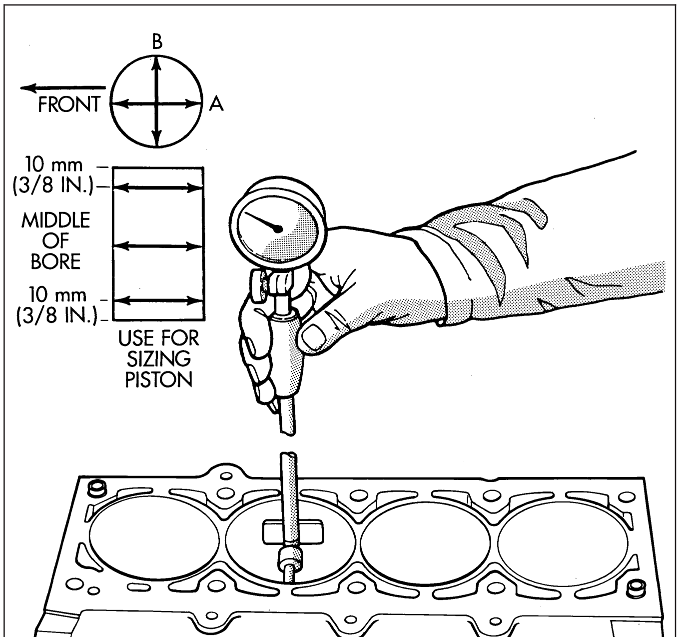
ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.050 mm (0.002 in.).

CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.



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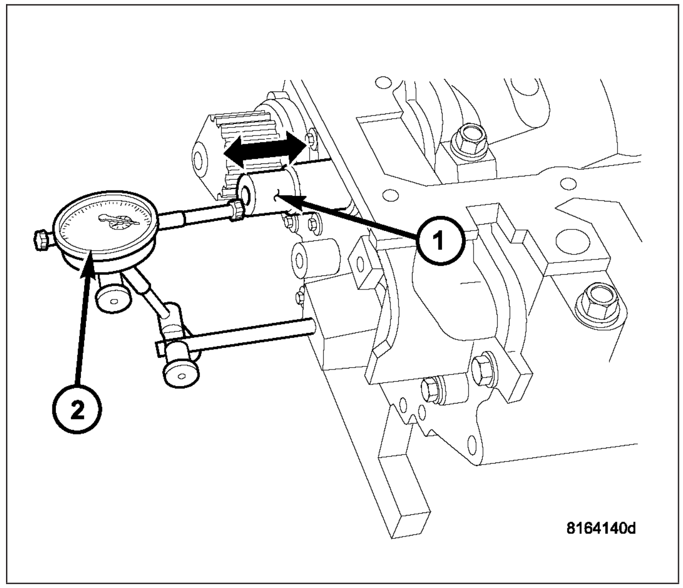
Measure the cylinder bore at three levels in directions A and B. Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT

STANDARD PROCEDURE

MEASURING CRANKSHAFT END PLAY

1. Mount a dial indicator (2) to front of engine with the locating probe on nose of crankshaft (1).
2. Move crankshaft all the way to the rear of its travel.
3. Zero the dial indicator.
4. Move crankshaft all the way to the front and read the dial indicator. (Refer to 9 - ENGINE - SPECIFICATIONS) for end play specification.



REMOVAL - CRANKSHAFT

NOTE: Crankshaft can not be removed when engine is in vehicle.

1. Remove engine assembly from vehicle (Refer to 9 - ENGINE - REMOVAL).
2. Separate transaxle from engine.
3. Remove drive plate/flex plate.
4. Remove crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).
5. Mount engine on a suitable repair stand.
6. Drain engine oil and remove oil filter.
7. Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
8. Remove engine mount support bracket.
9. Remove timing chain cover.
10. Remove the timing chain
11. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
12. Remove balance shaft module.
13. Remove the crankshaft sprocket.
14. Remove crankshaft position sensor.
15. Remove all ladder frame bolts from the engine block.
16. Using a pry bar gently pry the ladder frame loose from the engine block dowel pins using the pry points cast into the block and ladder frame.
17. Ladder frame should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins.

NOTE: If piston/connecting rod replacement is necessary, remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

18. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

19. Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

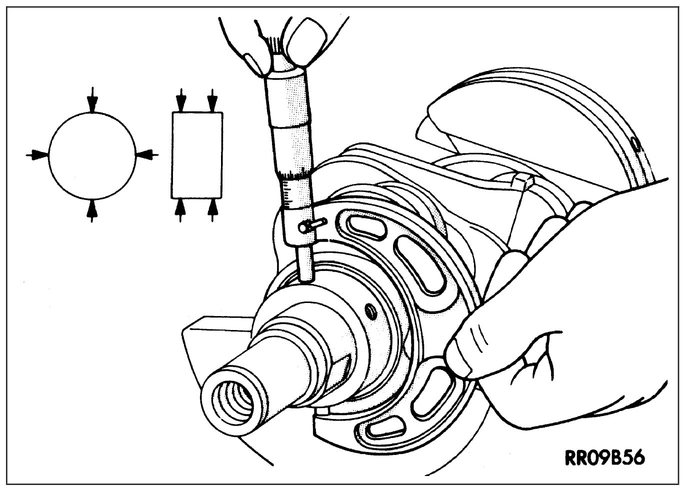
20. Remove main bearing caps.

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mishandled.

21. Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.



INSTALLATION - CRANKSHAFT

The crankshaft is supported in five main bearings. All upper bearing shells in the crankcase have oil grooves and holes. All lower bearing shells are smooth. Crankshaft end play is controlled by a two piece thrust bearing on the number three main bearing journal.

1. Install the main bearing upper shells with the lubrication groove and oil hole in the engine block.
2. Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

NOTE: If the crankshaft is sent out for machine work, it must be balanced as an assembly with the target ring installed.

3. Clean crankshaft and target ring with MOPAR® Brake Parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

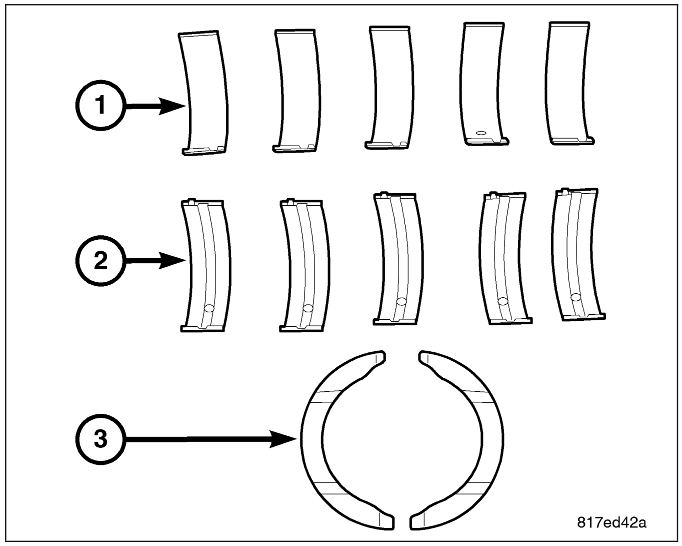
4. Install **NEW**mounting screws finger tight starting with the #1 location. Make sure engagement occurs with the shoulder of the screws and mounting hole before starting all other screws.
5. Torque all mounting screws with T30 torx bit to 13 Nm (110 in-lbs) following the torque sequence.

NOTE: Lightly apply trans gel to thrust bearings to hold bearings in block.

6. Install thrust bearings (3) in block.

CAUTION: Do not get oil on the ladder frame mating surface. It will affect the ability of the RTV to seal the ladder frame to cylinder block.

7. Oil the bearings and journals. Install crankshaft in engine block.
8. Install lower main bearings (1) into main bearing cap. Make certain the bearing tabs are seated into the bearing cap slots.
9. Before installing the bolts the threads should be clean and dry.
10. Install main bearing caps to engine block, install bolts finger tight.
11. To ensure correct thrust bearing alignment, perform the following steps:
    - Step 1: Rotate crankshaft until number 4 piston is at TDC.
    - Step 2: Move crankshaft rearward to limits of travel.
    - Step 3: Then, move crankshaft forward to limits of travel.
    - Step 4: Wedge an appropriate tool between the rear of the cylinder block and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.

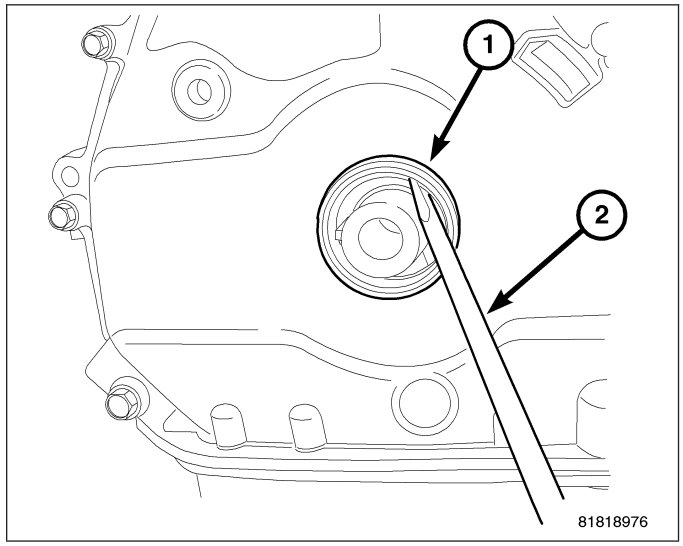


12. Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) in sequence shown.
13. Remove wedge tool used to hold crankshaft.
14. Check the crankshaft turning torque, it should not exceed 5.6 N·m (50 in. lbs.).
15. Check crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).
16. Install connecting rod bearings and caps. **Do Not Reuse Connecting Rod Bolts.** Torque connecting rod bolts to 27 N·m (20 ft. lbs.) plus 1/4 turn.
17. Install the ladder frame assembly (Refer to 9 - ENGINE/ENGINE BLOCK/LADDER FRAME - INSTALLATION).
18. Install the balance shaft module (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
19. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
20. Install crankshaft position sensor.
21. Install cylinder head if it was removed (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
22. Install front crankshaft sprocket.
23. Install the timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
24. Install the timing chain front cover.
25. Install front crankshaft oil seal.
26. Install engine mount support bracket.
27. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
28. Remove engine from repair stand and position on Special Tools 6135 and 6710 Engine Dolly and Cradle. Install safety straps around the engine to cradle and tighten and lock them into position.
29. Install crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).
30. Install drive plate/flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).
31. Attach transaxle to engine. Tighten attaching bolts to 101 N·m (75 ft. lbs.).
32. Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).
33. Install new oil filter and fill with oil.
34. Start engine and check for leaks.

SEAL-CRANKSHAFT OIL FRONT

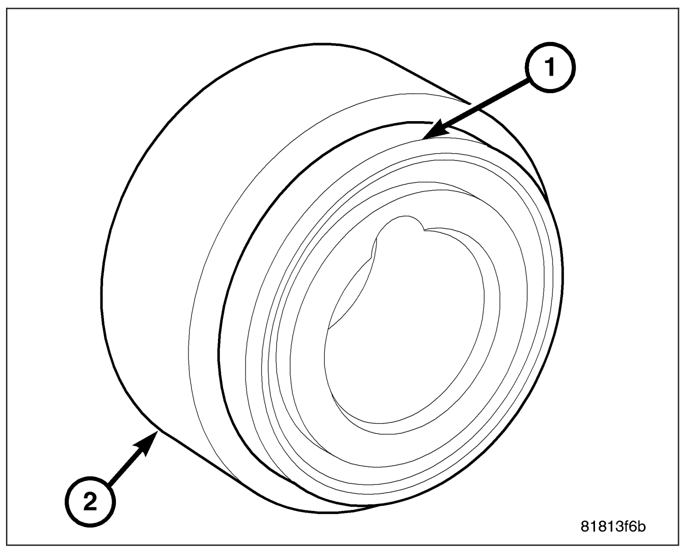
REMOVAL

1. Remove the crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove front crankshaft oil seal (1) by prying out with a screw driver (2). Be careful not to damage the cover seal surface.

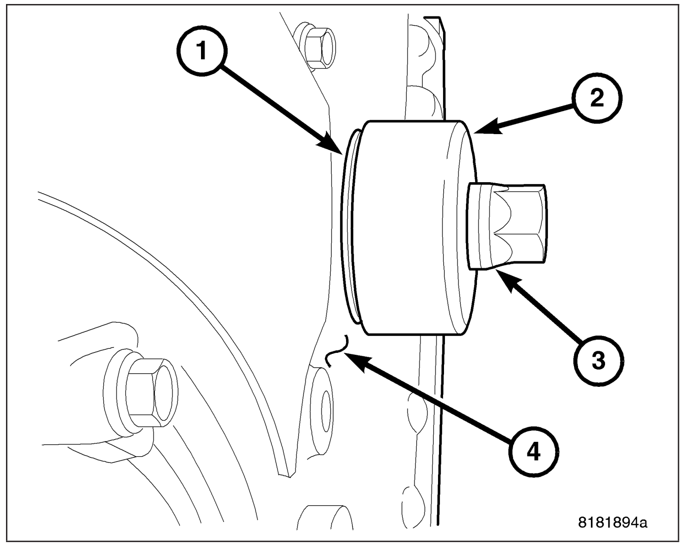


INSTALLATION

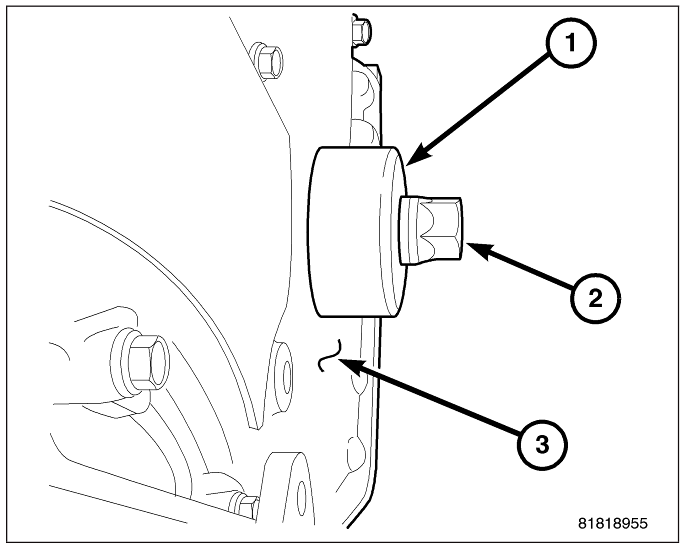
1. Place seal (1) onto Seal installer 9506 (2) with seal spring towards the inside of engine.



2. Install new seal (1) by using Seal installer 9506 (2) and crankshaft damper bolt (3).



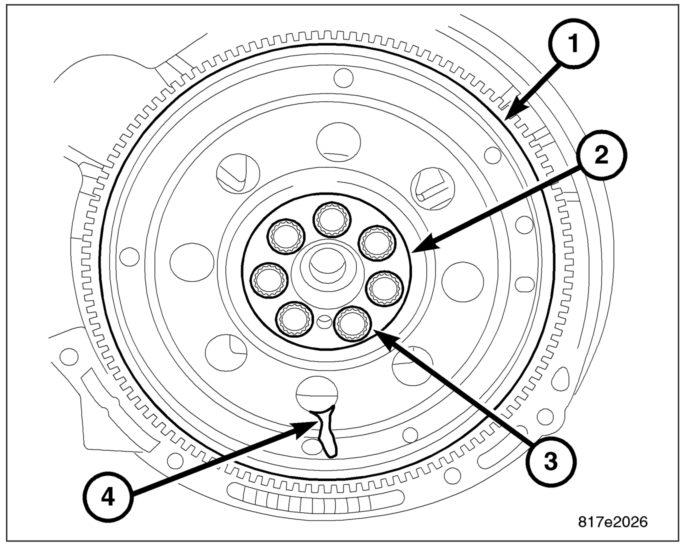
3. Press seal into front cover until Seal Installer 9506 (1) seats against timing chain cover (3).
4. Remove seal installer 9506 (1).
5. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION.



SEAL-CRANKSHAFT OIL REAR

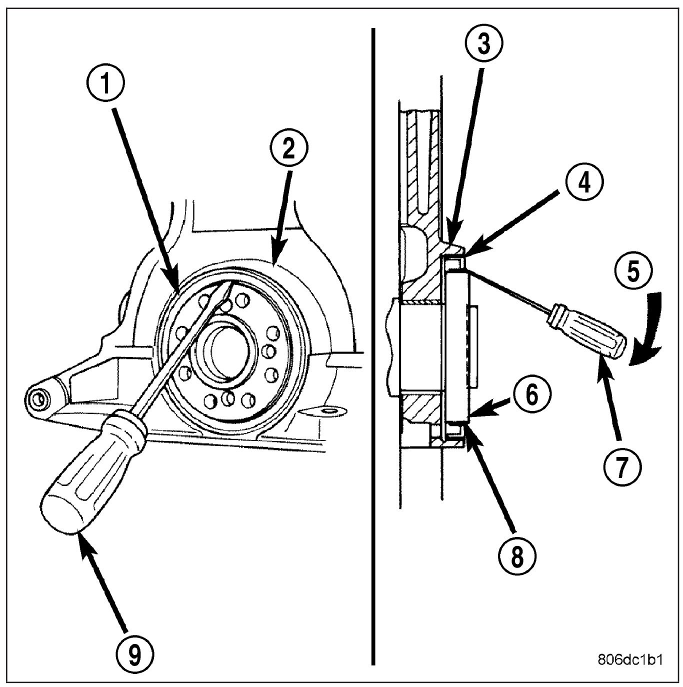
REMOVAL

1. Remove transaxle
2. Remove flex plate bolts and discard.
3. Remove flex plate (1).



4. Insert a 3/16 flat bladed screwdriver (7) between the dust lip (8) and the metal case (4) of the crankshaft seal (1). Angle the screwdriver through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

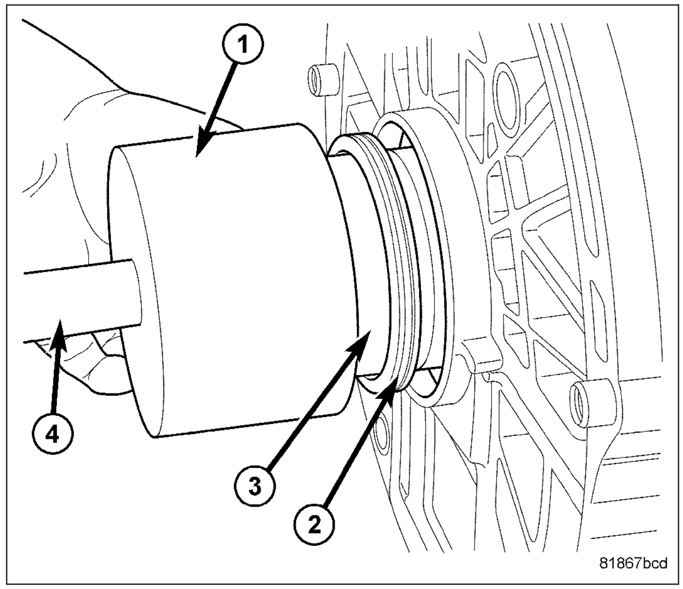


INSTALLATION

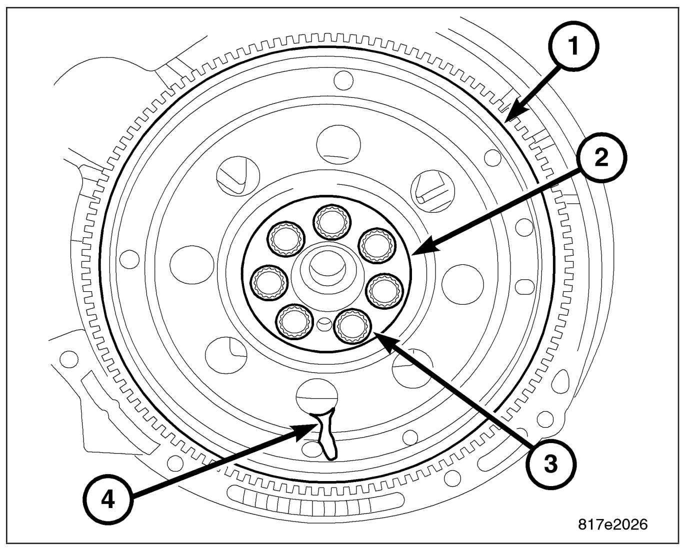
CAUTION: If a burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

NOTE: When installing seal, no lube on seal is needed.

1. Place Special Tool 9509 (3) Seal Guide on crankshaft.
2. Position seal (2) over guide tool. Guide tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.
3. Drive the seal into the block using Special Tool 9706 (1) and handle C-4171 (4) until the tool bottoms out against the block.



4. Install flex plate (1). Install new flex plate bolts and torque to 95 N·m (70 ft. lbs.).
5. Install transaxle. Refer to TRANSMISSION/TRANSAXLE - INSTALLATION for procedure.



PISTON & ROD-CONNECTING

DESCRIPTION

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged connecting rods. The pistons pin is offset 0.8 mm (0.0314 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. The pistons with rings and connecting rods are serviced as an assembly.

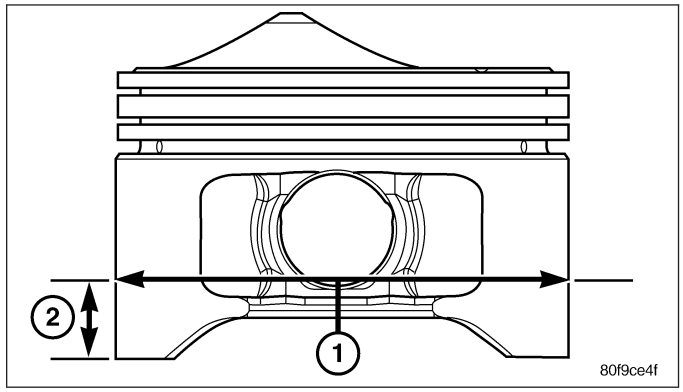
STANDARD PROCEDURE

PISTON TO CYLINDER BORE FITTING

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

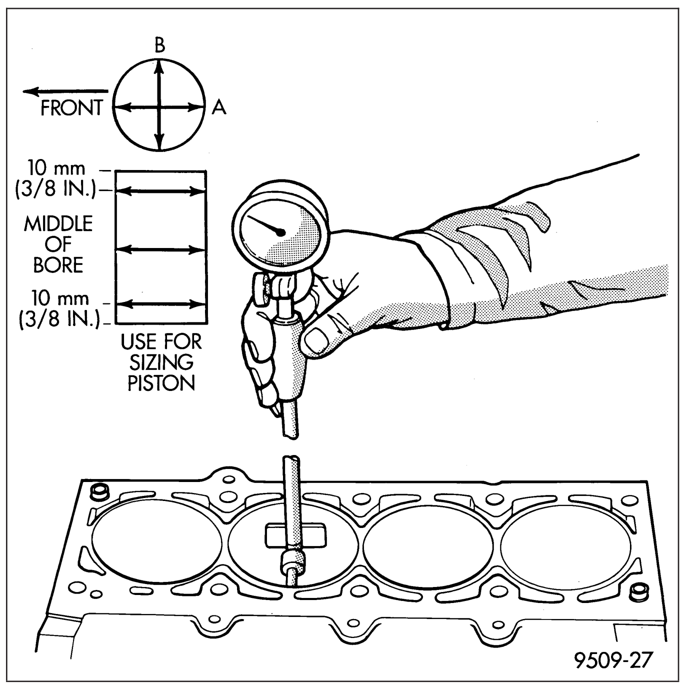
Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin (1).

1. Measurement should be taken approximately 16 mm (0.629 in.) from the bottom of the skirt (2) as shown in.



NOTE: Correct piston to bore clearance must be established in order to assure quiet and economical operation.

2. Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in. Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS).



REMOVAL

NOTE: Pistons, rings, and rods are serviced as an assembly.

CAUTION: All four piston/rod assemblies must be replaced as a set or engine damage may result.

1. Remove engine (Refer to 9 - ENGINE - REMOVAL).
2. Separate engine from transaxle.
3. Remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

4. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove balance shaft assembly.

NOTE: Remove any carbon build up prior to piston removal.

6. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation**.
7. Rotate crankshaft so that each connecting rod is centered in cylinder bore.
8. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods, as damage to connecting rod could occur.

CAUTION: Care must be taken not to damage the fractured rod and cap joint surfaces, as engine damage many occur.

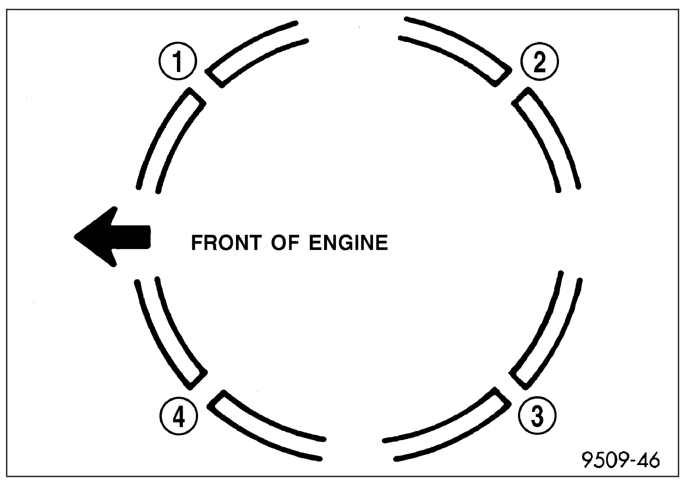
9. Remove connecting rod bolts and cap.

NOTE: Do not reuse connecting rod bolts.

10. Carefully push each piston and rod assembly out of cylinder bore. Re-install bearing cap on the mating rod.
11. Repeat procedure for each piston and connecting rod assembly.

INSTALLATION

1. Install piston rings on piston (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - INSTALLATION).
2. Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.
3. Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown above. As viewed from the top of the piston.
4. Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston. **Be sure position of rings does not change during this operation**.



5. The directional arrow stamped on the piston should face toward the front of the engine.
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

NOTE: There are three different size rod bearings, perform rod bearing selection procedure.

7. The rod bearing sizes are indicated on the nose of the crankshaft.
8. Install connecting rod upper bearing half into connecting rod.
9. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

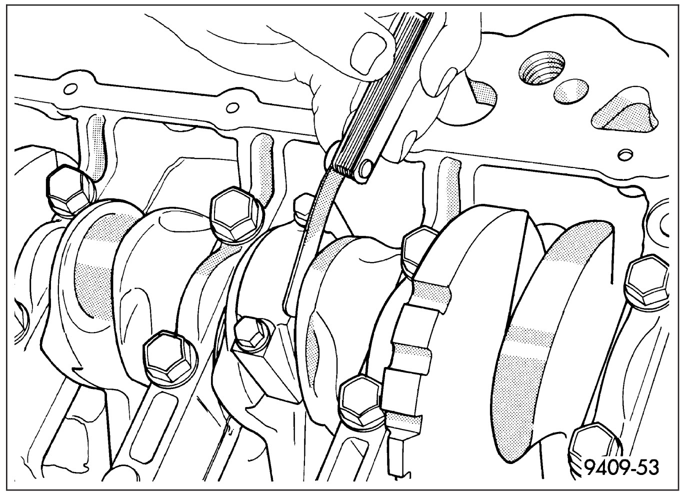
NOTE: The connecting rod cap bolts should NOT be reused.

10. Before installing the **NEW** bolts, the threads should be coated with clean engine oil.
11. Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.
12. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
13. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

14. Using a feeler gauge, check connecting rod side clearance. (Refer to 9 - ENGINE - SPECIFICATIONS) for connecting rod side clearance.
15. Install the ladder frame.
16. Install oil pump/Balance Shaft Carrier Assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT CARRIER - INSTALLATION).
17. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
18. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).



BEARINGS-MAIN

STANDARD PROCEDURE - MAIN BEARING SELECTION

NOTE: There are three different possibilities for the upper main bearings and five different lower main bearings. The upper and lower bearing shells are not interchangeable.

The lower main bearing identification is stamped in the nose of the crankshaft (1). There are 5 different bearing sizes available 0 through 4.

CRANKSHAFT IDENTIFICATION		LOWER CRANKSHAFT BEARING SELECTION	
JOURNAL DIAMETER GRADE	DIMENSION	LOWER MAIN BEARING SIZE CLASSIFICATION	LOWER MAIN BEARING DIMENSION
0	52 mm	0 (Pink or Red)	2 mm
1	52 mm	1 (Black)	2 mm
2	52 mm	2 (No Color)	2 mm
3	52 mm	3 (Green)	2 mm
4	52 mm	4 (Blue)	2 mm

The upper main bearing shell identification is located in the middle of cylinder block on the right side of the engine when viewing from the flywheel. There are three different size bearings available.

UPPER MAIN BEARING SELECTION

CYLINDER BLOCK IDENTIFICATION		UPPER CRANKSHAFT BEARING SELECTION	
MAIN BEARING GRADE	DIMENSION	UPPER MAIN BEARING SIZE CLASSIFICATION	UPPER MAIN BEARING DIMENSION
1	56 mm	1 (Black)	2 mm
2	56 mm	2 (No Color)	2 mm
3	56 mm	3 (Green)	2 mm

BEARINGS-CONNECTING ROD

STANDARD PROCEDURE

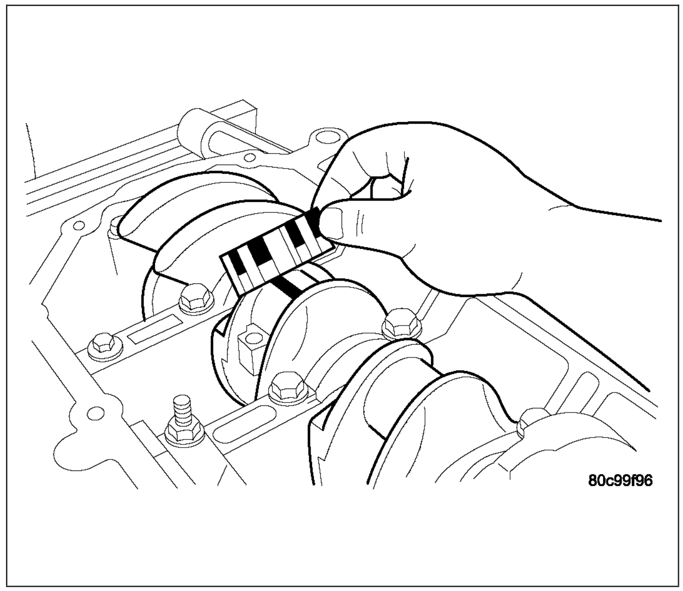
CONNECTING ROD - FITTING

There are three different sizes of rod bearings available. Connecting rod bearing identification can be found on the nose of the crankshaft. Use the table below for proper bearing selection.

CONNECTING ROD BEARING SELECTION

CRANKSHAFT PIN DIAMETER GRADE	DIMENSION	CONNECTING ROD BEARING CLASSIFICATION	CONNECTING ROD BEARING DIMENSION
1	48 mm	1 (Black)	1.5 mm
2	48 mm	2 (No Color)	1.5 mm
3	48 mm	3 (Green)	1.5 mm

1. For measuring connecting rod bearing clearance procedure and use of Plastigage (Refer to 9 - ENGINE - STANDARD PROCEDURE) For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS).



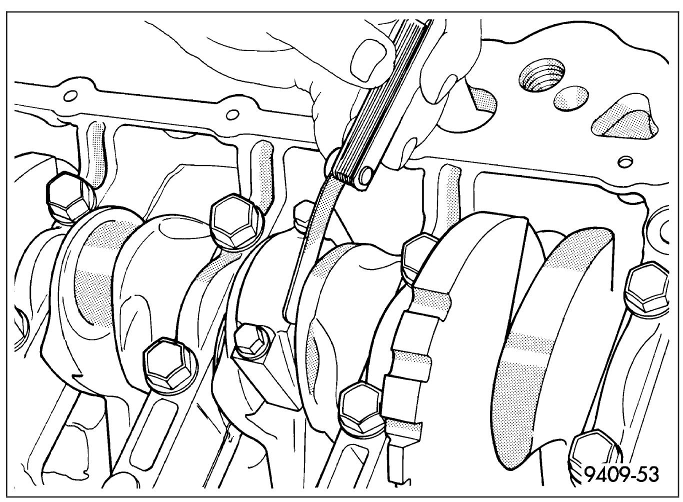
NOTE: The rod bolts should not be reused.

2. Before installing the **NEW** rod bolts the threads and under the bolt head should be oiled with clean engine oil.
3. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

   1. Tighten the bolts to 27 N·m (20 ft. lbs.).
   2. Tighten the connecting rod bolts an additional 90°.

5. Using a feeler gauge, check connecting rod side clearance. Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

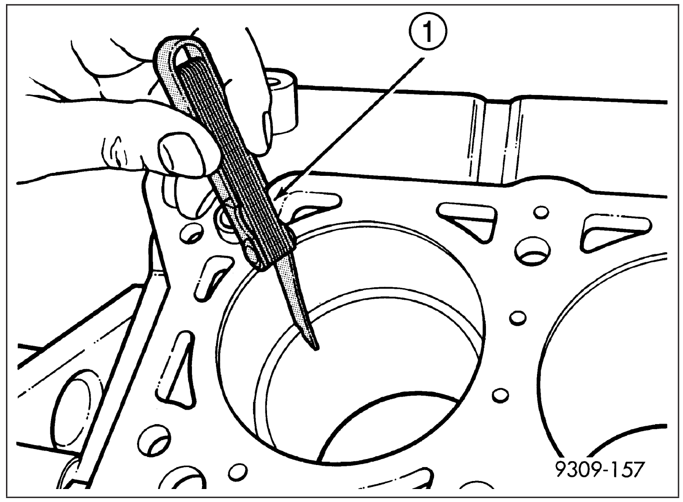


RINGS-PISTON

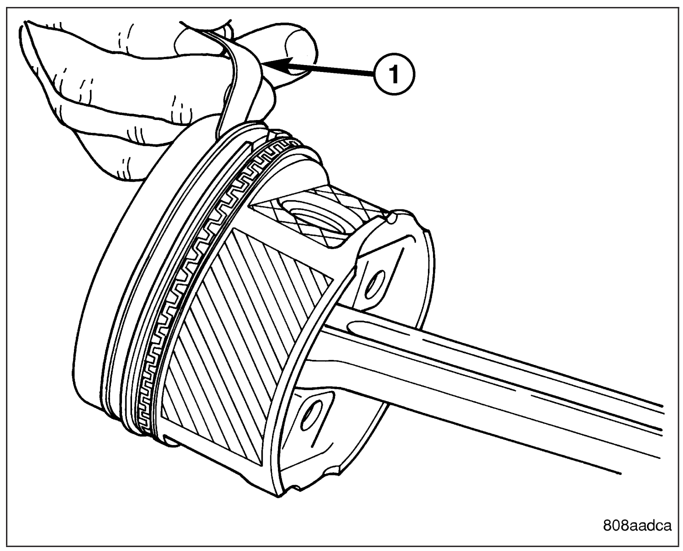
STANDARD PROCEDURE

PISTON RING - FITTING

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge. Refer to Engine Specifications.

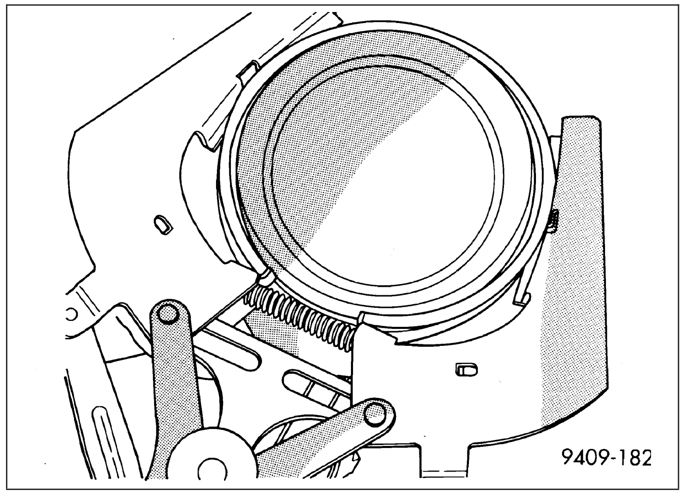


2. Check piston ring to groove side clearance. Refer to Engine Specifications.



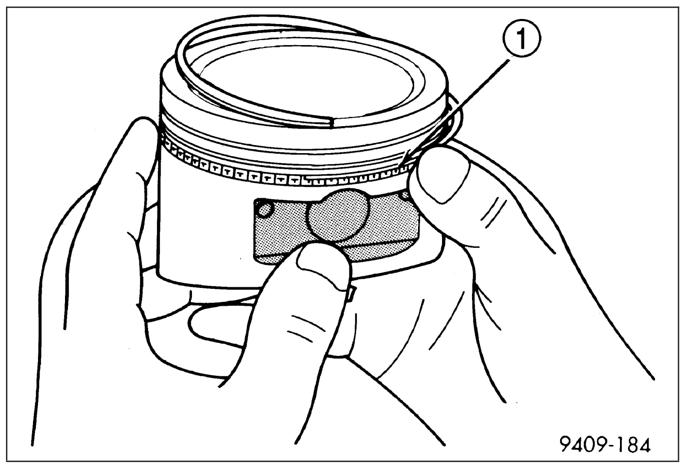
REMOVAL

1. Using a suitable ring expander, remove upper and intermediate piston rings.
2. Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.
3. Clean ring grooves of any carbon deposits.



INSTALLATION

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.



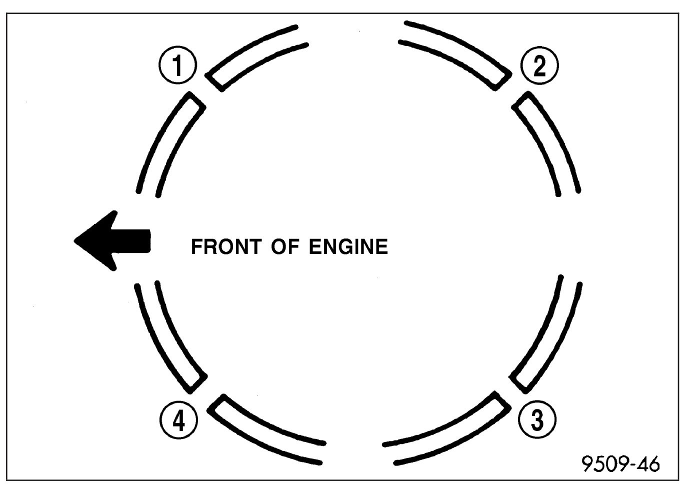
CAUTION: Install piston rings in the following order:

1. Oil ring expander.
2. Upper oil ring side rail.
3. Lower oil ring side rail.
4. No. 2 Intermediate piston ring.
5. No. 1 Upper piston ring.

1. Install oil ring expander.
2. Install upper side rail first and then the lower side rail. Install the side rails by placing one end between the piston ring groove and the oil ring expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander.**

NOTE: The compression rings are marked Y1 for the upper compression ring and Y2 for the second compression ring. These markings must face upward.

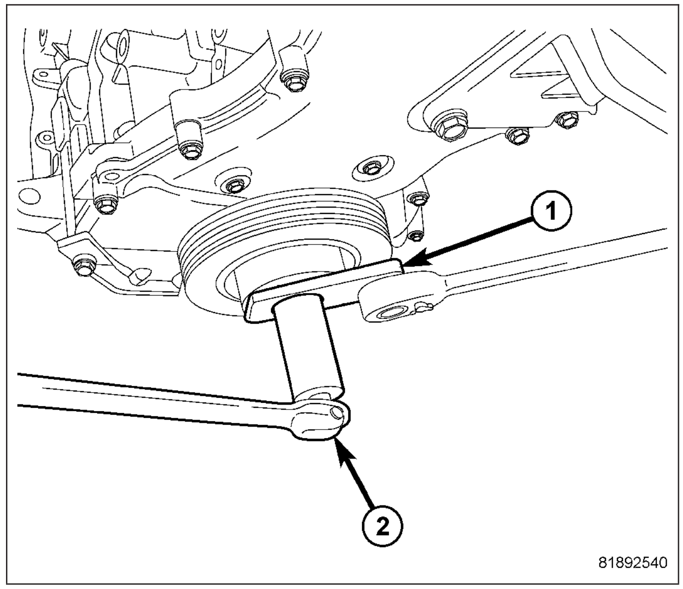
3. Install No. 2 piston ring and then No. 1 piston ring.
4. Position piston ring end gaps as shown in.
5. Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.



DAMPER-VIBRATION

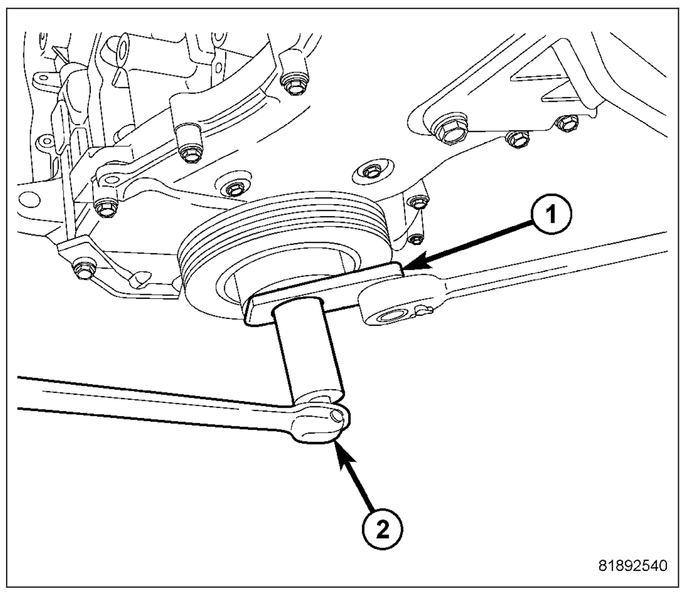
REMOVAL

1. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Install Damper holder 9707 (1).
3. Remove crankshaft damper bolt.
4. Pull damper off crankshaft.



INSTALLATION

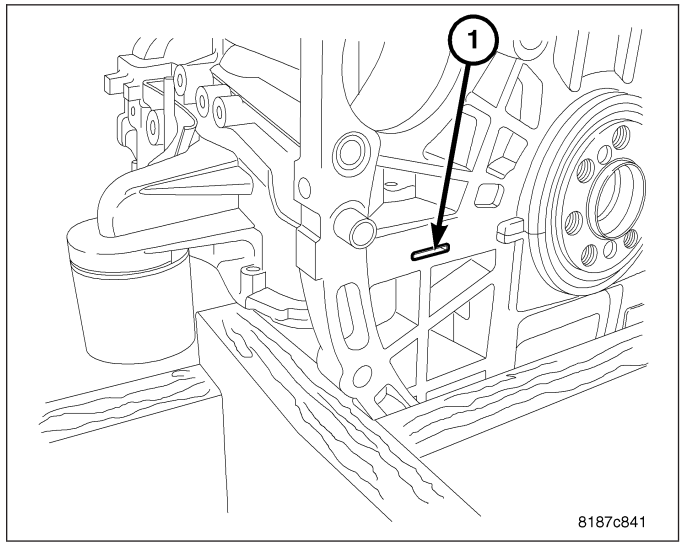
1. Install crankshaft damper.
2. Apply clean engine oil crankshaft damper bolt threads and between bolt head and washer. Torque bolt to 210 N·m (155 ft. lbs.).
3. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



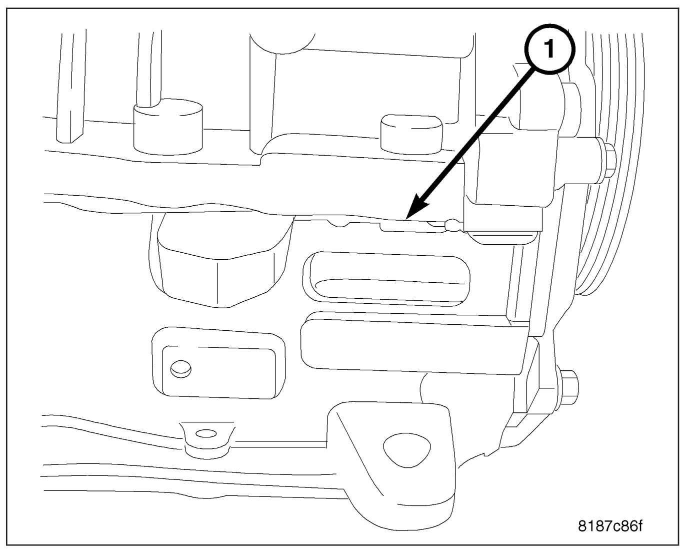
FRAME-LADDER

REMOVAL

1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove oil pump/balance shaft assembly (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
3. Remove ladder frame retaining bolts.
4. Remove ladder frame using pry points cast in the rear of the block (1).



5. To assist in removing the ladder frame another (1) pry points cast in the left side of the block.

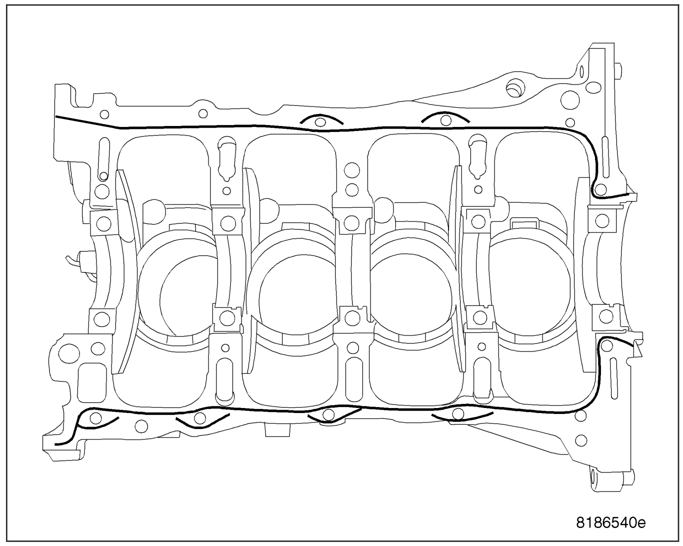


CLEANING

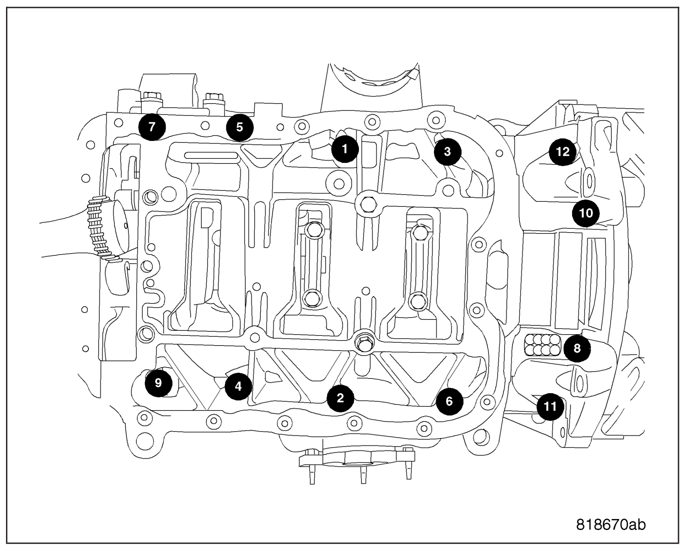
Clean ladder frame with a plastic or wooden scraper and a suitable solvent.

INSTALLATION

1. Apply a 2 mm bead of sealant as shown.



2. Install bolts and torque shown following a three step method.
   - First: All to 20 N·m (15 ft. lbs.)
   - Second: All to 49 N·m (36 ft. lbs.)
   - Third: All to 49 N·m (36 ft. lbs.)
3. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).



ENGINE MOUNTING

DESCRIPTION

The engine mounting system consists of a four-point system utilizing two load-carrying mounts and two torque controlling mounts. The load-carrying mounts are located on each frame rail. The right mount is a hydro-elastic mount and left mount is a conventional elastomeric isolator. The two torque controlling mounts are attached to a fore/aft member and the front and rear of the engine.

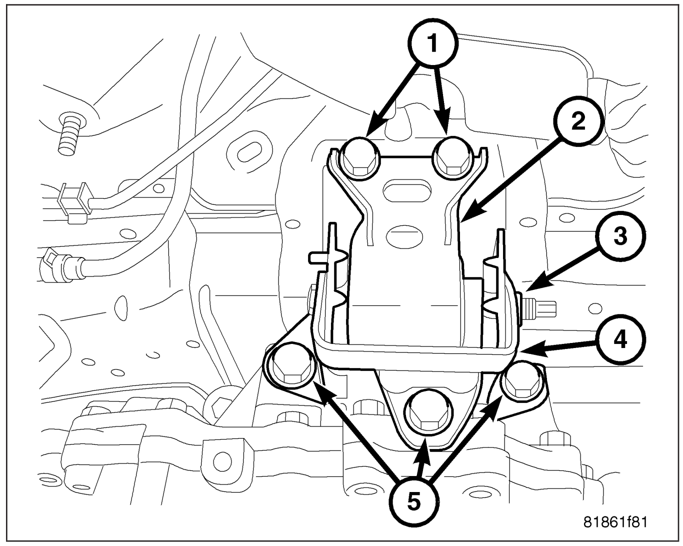
OPERATION

The four-point engine mounting system minimizes the transmission of structure-borne engine noise to the passenger compartment. The load-carrying right and left mounts dampen and isolate vertical motion and vibration. The front and rear mount absorb torque reaction forces and torsional vibrations.

MOUNT-LEFT

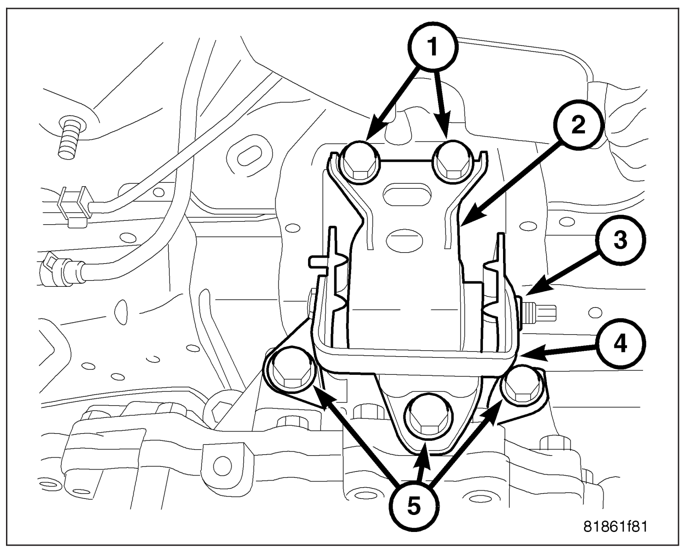
REMOVAL

1. Remove air cleaner assembly.
2. Disconnect negative cable from battery.
3. Remove PCM.
4. Remove PCM mounting bracket.
5. Support transaxle with a suitable jack.
6. Remove left mount through bolt (3).
7. Remove mount to transaxle bolts (5).
8. Remove left mount bracket (4).
9. Remove left mount bracket to body frame rail fasteners.
10. Remove mount.



INSTALLATION

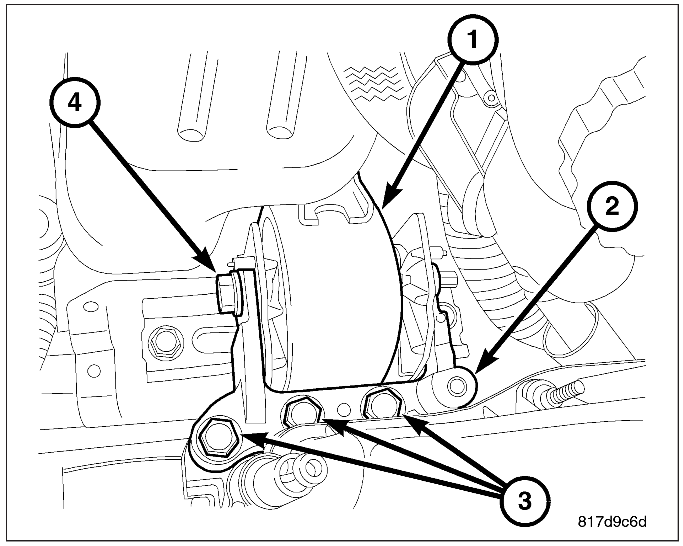
1. Install mount.
2. Install left mount to frame rail bolts and torque to 28N·m (250 in. lbs.).
3. Install left mount bracket (4).
4. Install mount to transaxle bolts (5) and torque to 68 N·m (50 ft.lbs.).
5. Install mount through bolt (3) and torque to 115 N·m (85 ft.lbs.).
6. Remove jack.
7. Install PCM mounting bracket.
8. Install PCM.
9. Connect negative battery cable.
10. Install air cleaner assembly.



MOUNT-RIGHT

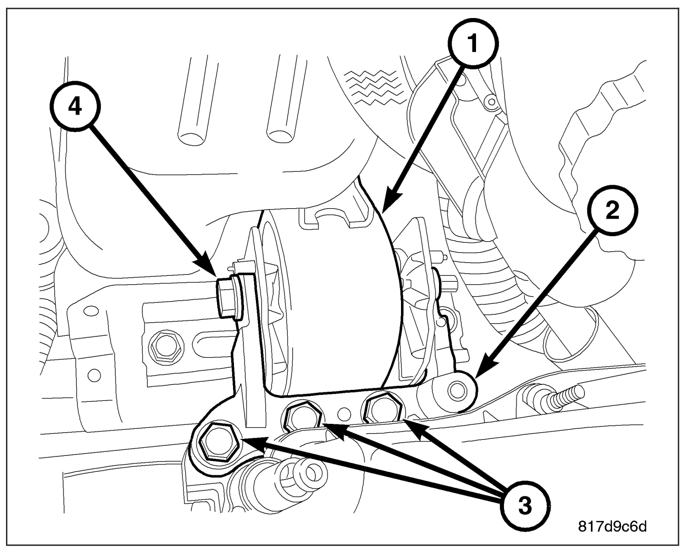
REMOVAL

1. Remove coolant reservoir and set aside.
2. Remove power steering reservoir and set aside.
3. Remove windshield washer bottle.
4. Remove power steering line support bracket from engine mount.
5. Support transaxle with a block of wood and a suitable jack.
6. Remove engine mount through bolt (4).
7. Remove engine mount bracket bolts (3).
8. Remove engine mount retaining bolts.
9. Remove engine mount.



INSTALLATION

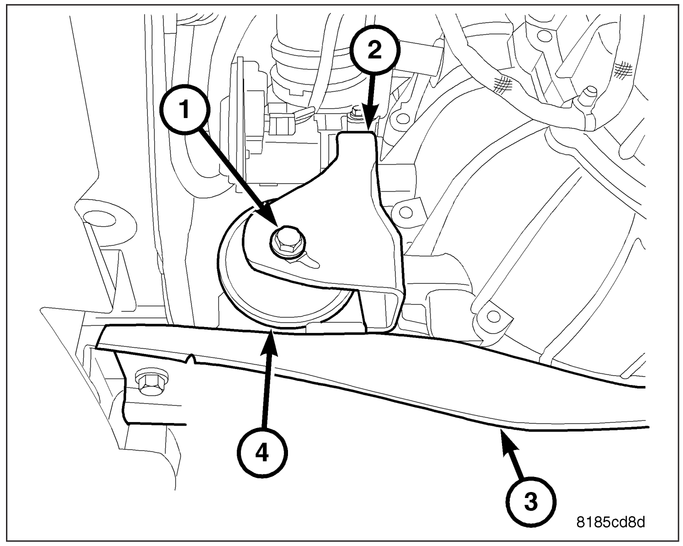
1. Install engine mount.
2. Install engine mount retaining bolts and torque to 28 N·m (250 in. lbs.).
3. Install engine mount bracket and torque bolts (3) to 68 N·m (50 ft. lbs.).
4. Install engine mount through bolt (4) and torque to 115 N·m (85 ft. lbs.).
5. Remove jack.
6. Install power steering line support bracket at engine mount.
7. Install windshield washer bottle.
8. Install power steering reservoir.
9. Install coolant reservoir.



MOUNT-FRONT

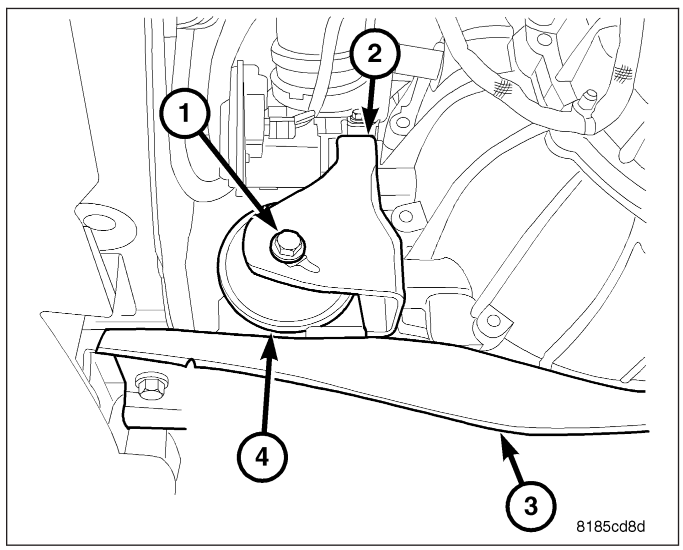
REMOVAL

1. Raise vehicle.
2. Remove fore aft member (3) to mount (4) bolts.
3. Remove mount through bolt (1).
4. Remove fore aft member (3) mounting bolts and remove.
5. Remove front mount (4).



INSTALLATION

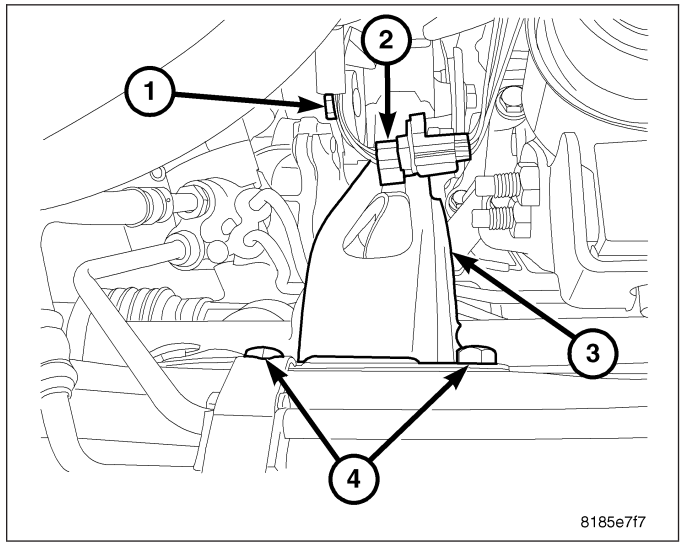
1. Install mount (4) and tighten bolts.
2. Install fore aft member (3) and tighten bolts.
3. Install mount through bolt (1) and tighten.
4. Lower vehicle.



MOUNT-REAR

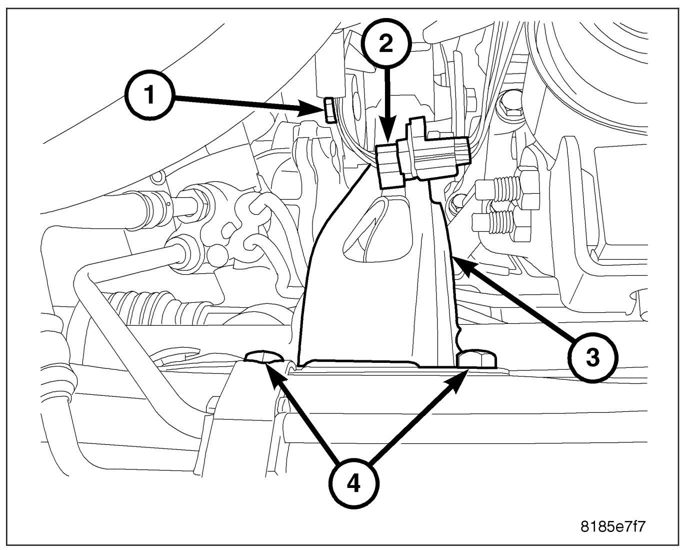
REMOVAL

1. Remove rear mount retaining bolts (4).
2. Remove rear mount through bolt (1).
3. Remove oxygen sensor connector (2) from mount.
4. Remove rear mount (3).



INSTALLATION

1. Install rear mount (3).
2. Install rear mount retaining bolts (4) and tighten.
3. Install rear mount through bolt (1) and tighten.
4. Install oxygen sensor connector (2) retainer to mount (3).



LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is mounted in the ladder frame and chain driven by the crankshaft.

OPERATION

Engine oil drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals. Balance shaft lubrication is provided through an internal oil passage. A vertical hole at the number one bulkhead routes pressurized oil through a filter screen and head gasket up to the cylinder head. The oil then divides into three passages; one to the intake cam phaser, one to the exhaust cam phaser and one to the camshafts. The passage to the camshafts divides to feed both of the hollow camshafts at the second cam journal.The rest of cam journals are feed oil through the hollow camshafts. The #1 cam journals are feed oil through the VVT oil passages. Oil passages to the phasers are directed through the OCV (oil control valves) to the #1 journals. The oil then flows through the camshafts then to the cam phasers. Oil returning to the pan from pressurized components supplies lubrication to the valve stems, cam lobes, and tappets. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

1. Disconnect and remove oil pressure switch. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL)
2. Install Special Tools C-3292 Gauge with 8406 Adaptor fitting.
3. Start engine and record oil pressure. Refer to Specifications for correct oil pressure requirements. (Refer to 9 - ENGINE - SPECIFICATIONS)

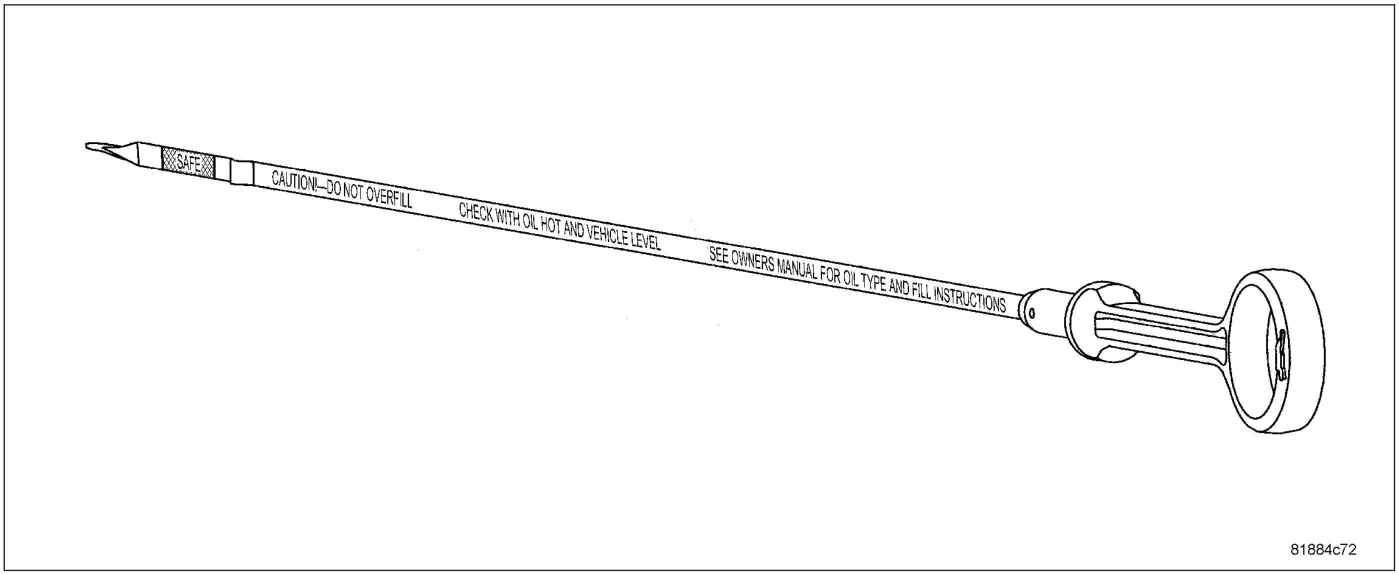
CAUTION: If oil pressure is 0 at idle, do not perform the 3000 RPM test

4. If oil pressure is 0 at idle, shut off engine. check for pressure relief valve stuck open, a clogged oil pick-up screen or a damaged oil pick-up tube O-ring.
5. Remove oil pan and inspect for debris.
6. Remove pressure relief valve and inspect, if damaged replace pressure relief valve.
7. If pressure relief valve is ok, replace balance shaft module assembly.
8. After test is complete, remove test gauge and fitting.
9. Install oil pressure switch and connector. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - INSTALLATION).

OIL

STANDARD PROCEDURE

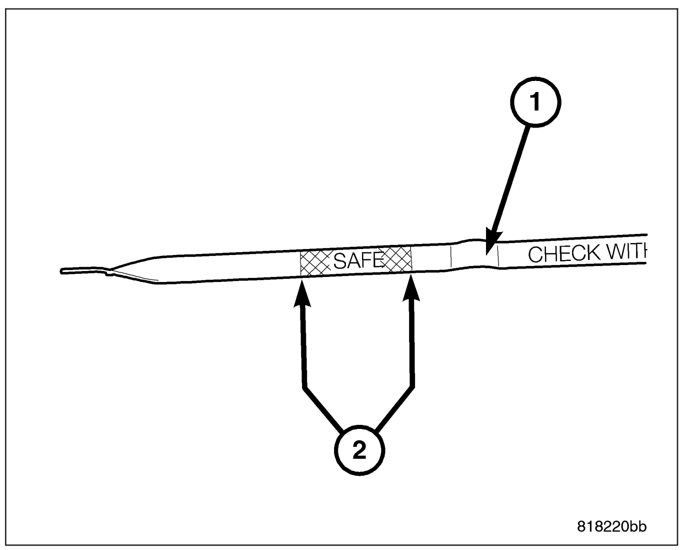
ENGINE OIL LEVEL CHECK



NOTE: The engine must be HOT when checking oil level.

The best time to check engine oil level is after the engine is at operating temperature. Allow the engine to be shut off for at least 5 minutes before checking oil level.

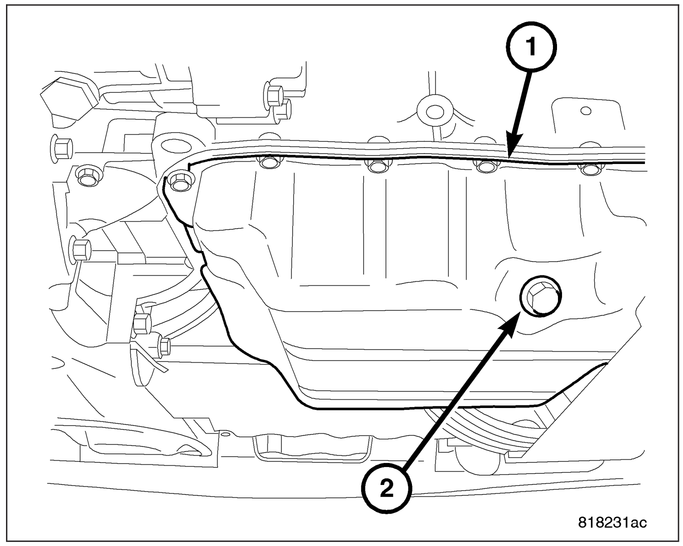
Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Remove dipstick (1), and observe oil level. Add oil only when the level is at or below the SAFE mark. If the oil level is in the safe (2) range, do not add oil.



CAUTION: Do not operate engine if the oil level is above the MAX mark on the dipstick. Excessive oil volume can cause oil aeration which can lead to engine failure due to loss of oil pressure or increase in oil temperature.

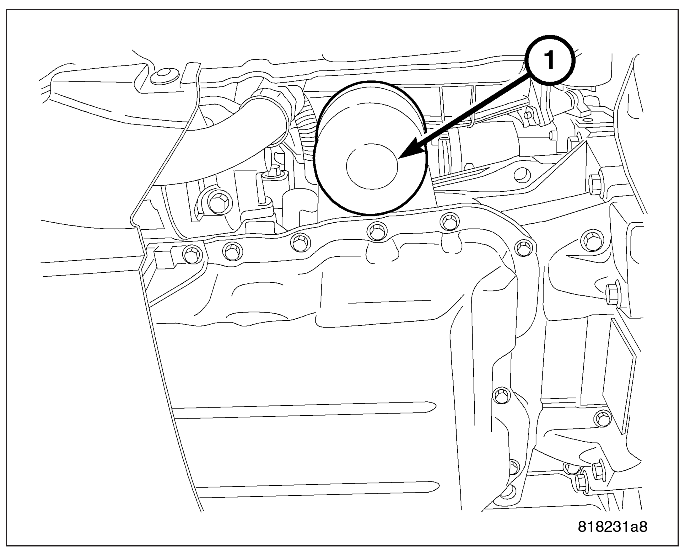
ENGINE OIL AND FILTER CHANGE

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

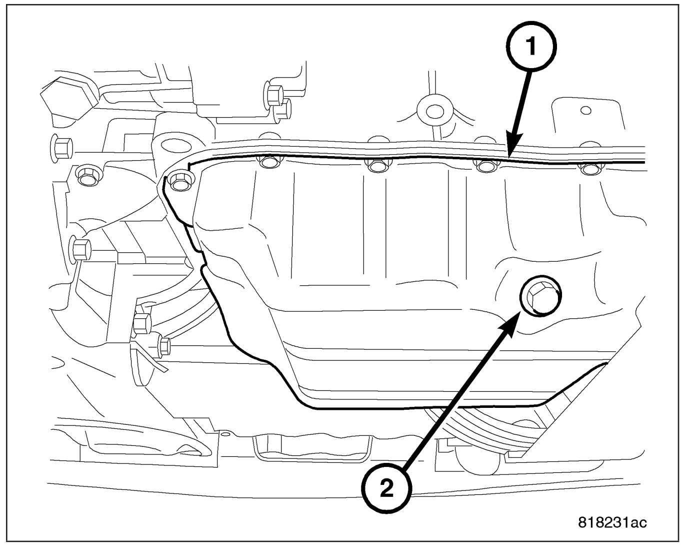


Change engine oil at mileage and time intervals described in the Maintenance Schedule (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

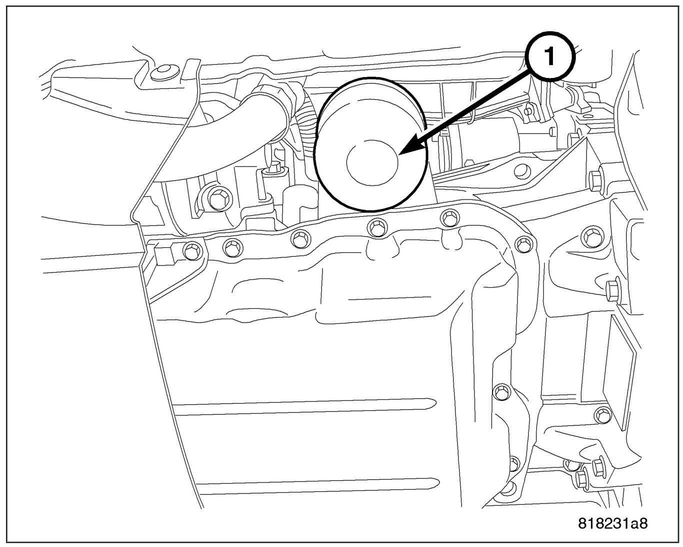
1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Remove oil fill cap.
4. Raise vehicle on hoist.
5. Place a suitable oil collecting container under oil pan drain plug (2).
6. Remove oil pan drain plug (2) or and allow oil to drain into collecting container. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.
7. Remove oil filter (1) (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).



8. Install oil pan drain plug (2). Torque drain plug to 28 N·m (20 ft. lbs.).



9. Install new oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).
10. Lower vehicle and fill crankcase with specified type and amount of engine oil (Refer to LUBRICATION & MAINTENANCE/SPECIFICATIONS - FLUID CAPACITIES) and (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).
11. Install oil fill cap.
12. Start engine and inspect for leaks.
13. Stop engine and inspect oil level.



OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. Replace oil filter with a Mopar® or the equivalent.

USED ENGINE OIL DISPOSAL

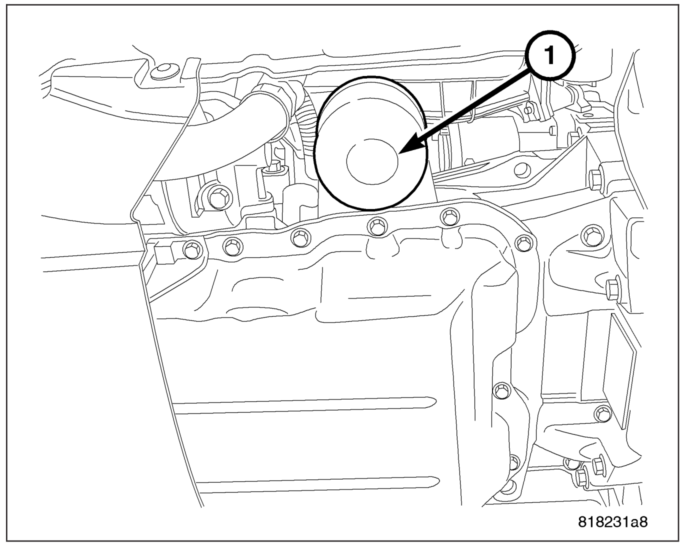
Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

FILTER-OIL

REMOVAL

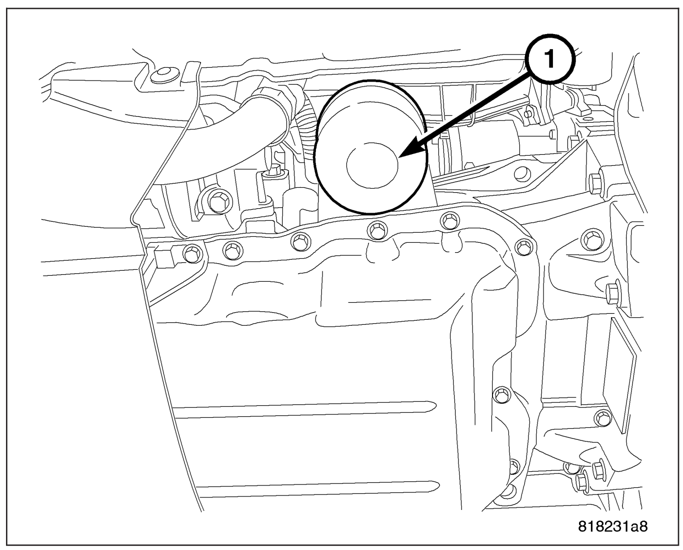
CAUTION: When servicing the oil filter avoid deforming the filter can by installing the remove/ install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

1. Using a suitable filter wrench, turn oil filter (1) counterclockwise to remove.



INSTALLATION

1. Clean and check filter mounting surface. The surface must be smooth, flat and free of debris or pieces of gasket.
2. Lubricate new oil filter gasket.
3. Screw oil filter (1) on until the gasket contacts base. Tighten to 21 N·m (15 ft. lbs.).



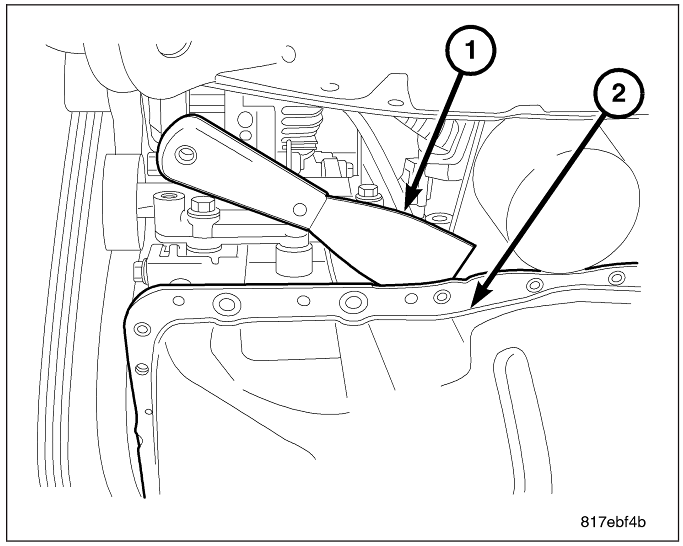
PAN-OIL

REMOVAL

1. Raise vehicle on hoist.
2. Drain engine oil.
3. Remove accessory drive belt splash shield.
4. Remove lower A/C compressor mounting bolt (if equipped).
5. Remove A/C mounting bracket.

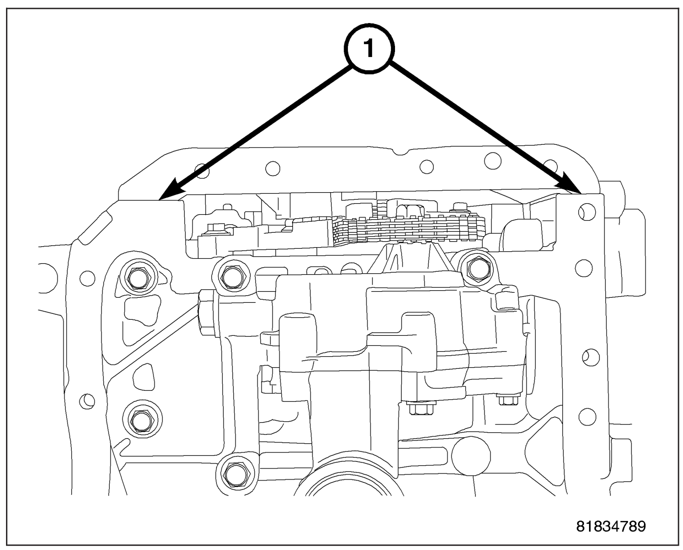
NOTE: Do not use pry points in block to remove oil pan.

6. Remove oil pan retaining bolts.
7. Using a putty knife (1), loosen seal around oil pan (2).
8. Remove oil pan (2).

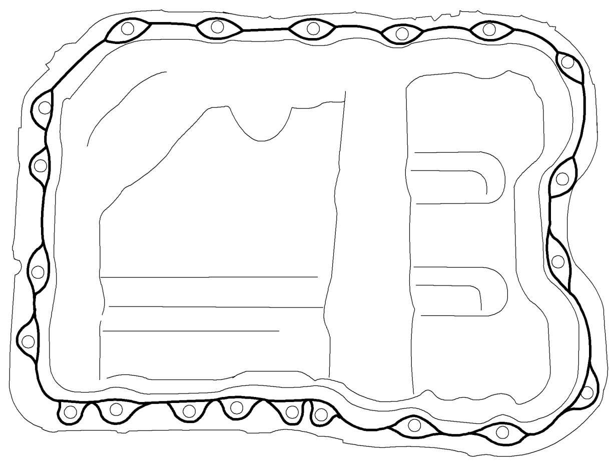


INSTALLATION

1. Apply Mopar® Engine RTV GEN II at the front cover to engine block parting lines (1).



2. Apply a 2 mm bead of Mopar® Engine RTV GEN II around the oil pan as shown.

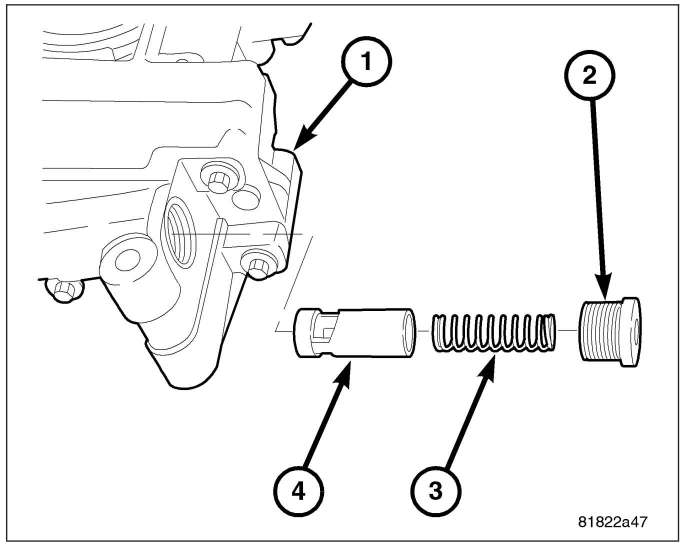

81834782

3. Tighten screws to 12 N·m (105 in. lbs.).
4. Install oil drain plug.
5. Lower vehicle and fill engine crankcase with proper oil to correct level.
6. Start engine and check for leaks.

VALVE-OIL PRESSURE RELIEF

REMOVAL

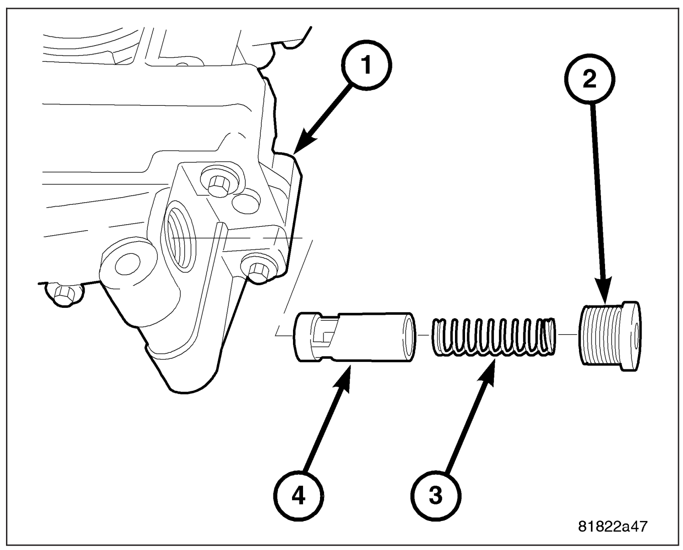
1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)
2. Remove pressure regulating valve cap (2).
3. Remove pressure regulating valve spring (3) and valve (4).



INSPECTION

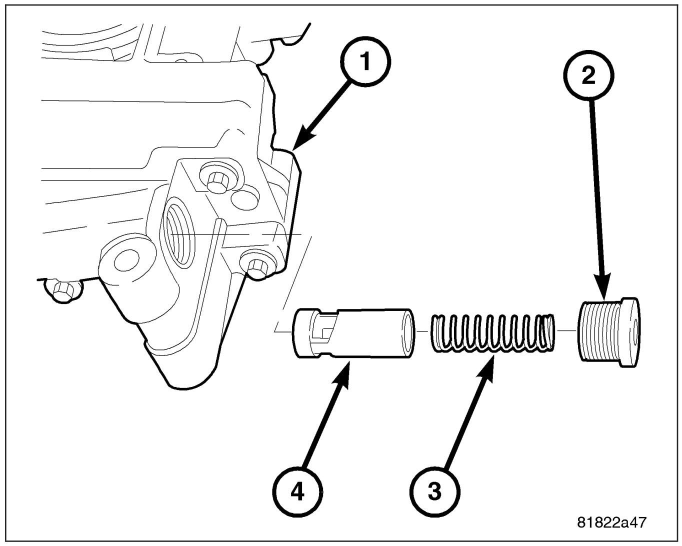
NOTE: Pressure regulating valve (4) can be service separately from the oil pump assembly.

1. Inspect pressure relief valve (4) scoring, gouging, or debris. Replace as needed.
2. Inspect the pressure relief valve bore in the pump for scoring, gouging, or debris.
3. If pump bore is damaged, replace balance shaft module.



INSTALLATION

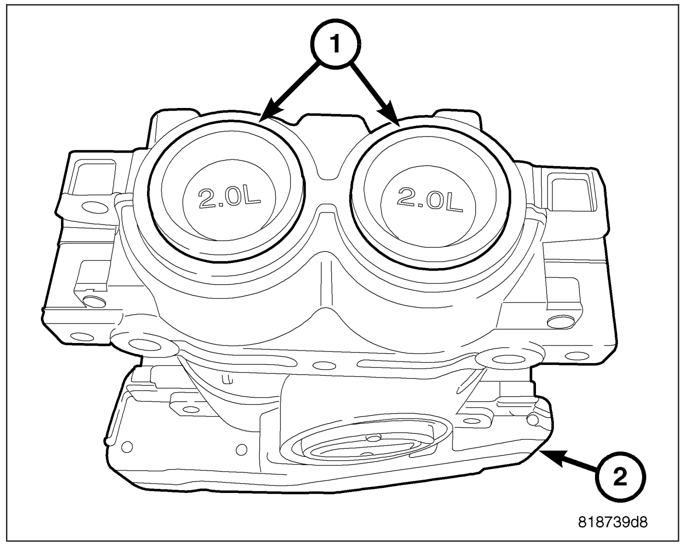
1. Lightly coat pressure regulating valve with clean engine oil and install valve (4).
2. Install spring (3) and cap (2).
3. Torque cap to 42 N·m (31 lbs.ft.).



PUMP-OIL

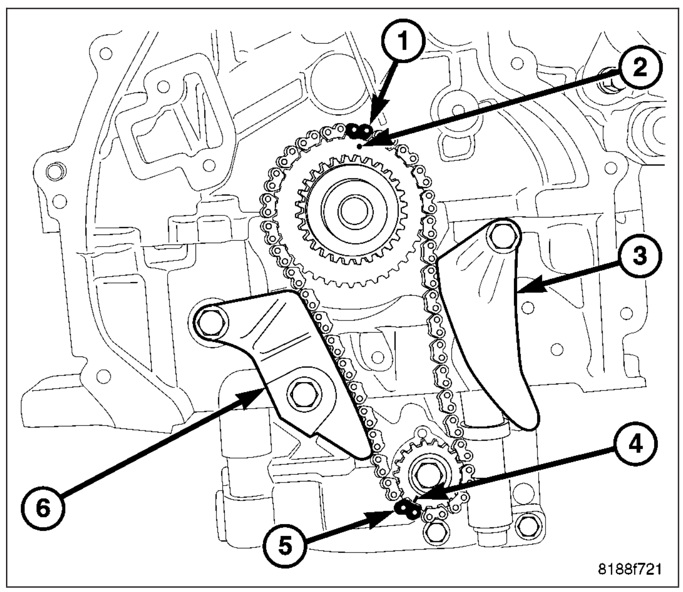
DESCRIPTION

The oil pump is integral to the balance shaft module (BSM) (2). The oil pump cannot be disassembled for inspection. The pressure relief valve is serviceable and can be removed and inspected. The BSM can be identified by the plastic end caps (1).

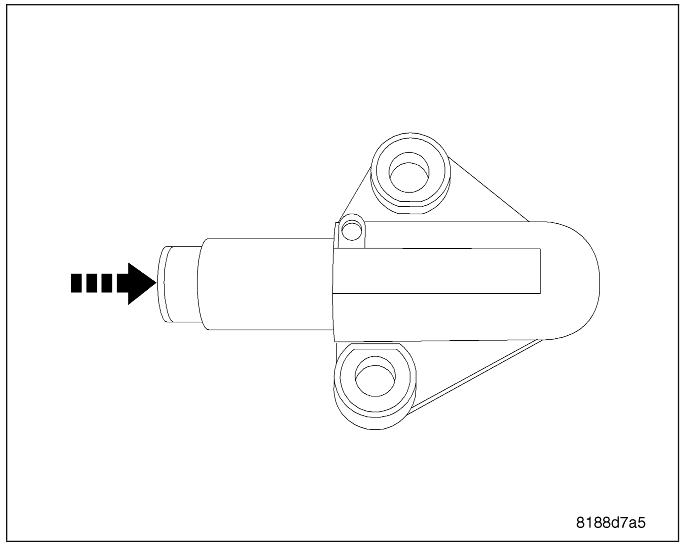


REMOVAL

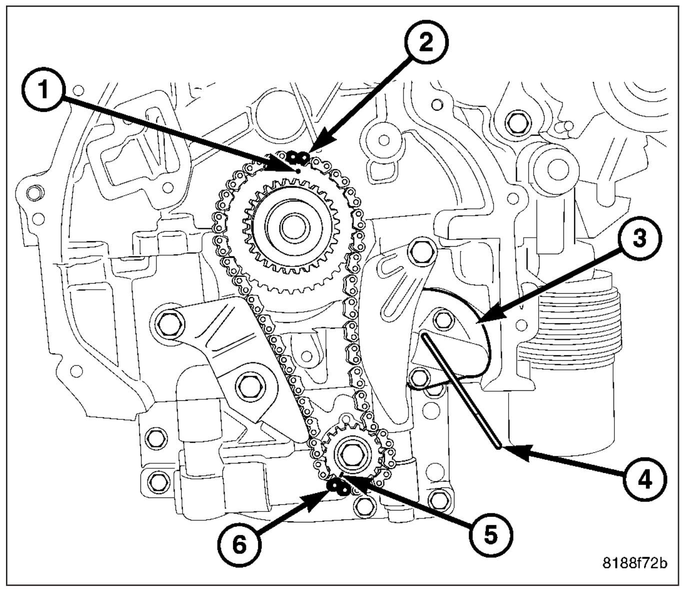
1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Mark the chain (4) and the sprocket (5) for reassembly.



3. Push tensioner toward the front of the vehicle.



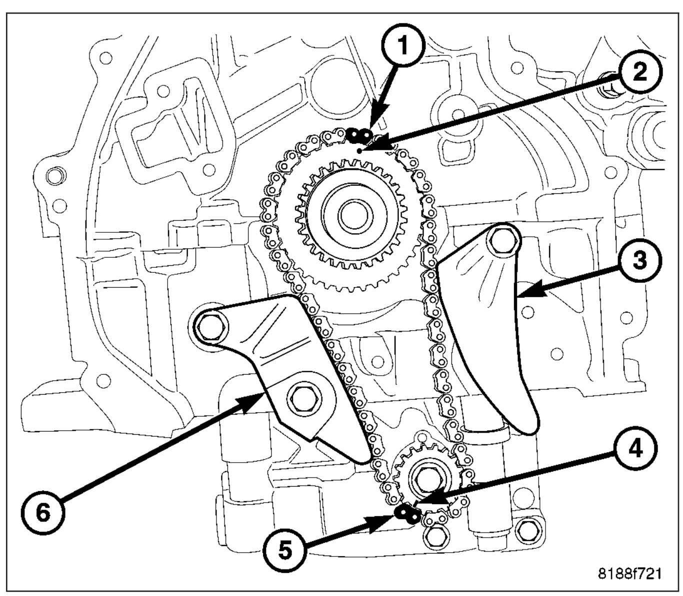
4. Install 9703 (4).
5. Remove BSM mounting bolts and discard.
6. Lower the back of the BSM and remove sprocket from chain.
7. Remove BSM from the engine.



INSTALLATION

CAUTION: Do not reuse Balance Shaft Module (BSM) to engine block bolts. Always discard bolts after removing. Failure to replace bolts can result in engine damage.

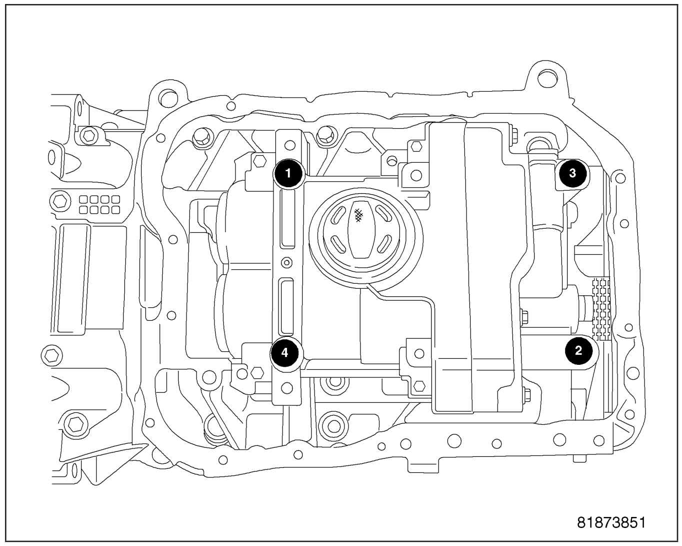
1. Align marks on oil pump sprocket (5) and chain (4).
2. Install chain on sprocket.
3. Pivot BSM assembly upwards toward the engine block.



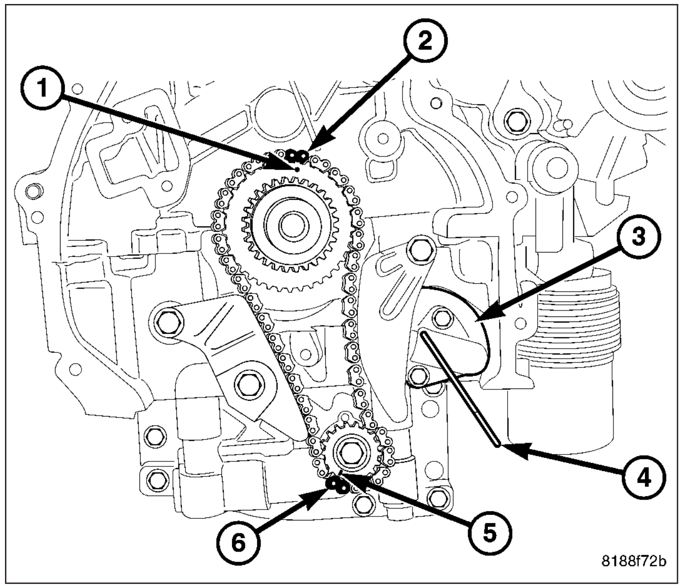
4. Start **new** BSM mounting bolts by hand.

NOTE: Use a three step procedure when torqueing BSM mounting bolts.

5. Torque BSM mounting bolts to 15 N·m (11 ft. lbs.) as shown.
6. Torque BSM mounting bolts to 29 N·m (22 ft. lbs.) as shown.
7. Rotate bolts an additional 90° as shown.



8. Remove tensioner pin 9703 (4).
9. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/ OIL PAN - INSTALLATION).
10. Fill with oil.
11. Start engine and check for leaks.



SENSOR/SWITCH-ENGINE OIL PSI

DESCRIPTION

The oil pressure switch is located on the left front side of the engine block. The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

OPERATION

The oil pressure switch is normally “Closed.” The switch changes from a ″Closed″ circuit to an ″Open″ circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an ″Open″ circuit to a ″Closed″ circuit, on decreasing pressure, between 2 psig and 4 psig.

REMOVAL

1. Raise vehicle.
2. Disconnect electrical connector.
3. Remove oil pressure sending unit using oil pressure socket C-4597.

INSTALLATION

1. Install oil pressure sending unit using oil pressure socket C-4597.
2. Connect electrical connector.

COOLER-OIL

DESCRIPTION

An engine oil cooler is used on some 2.4L engine packages. The cooler is a coolant-to-oil type and mounted between the oil filter and oil filter adapter.

REMOVAL

1. Raise vehicle on hoist.
2. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
3. Disconnect oil cooler coolant hoses.
4. Remove oil filter.
5. Remove oil cooler connector bolt.
6. Remove oil cooler.

INSTALLATION

1. Replace oil cooler seal.
2. Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab.
3. Install oil cooler connector bolt. Torque connector bolt to 55 N·m (41 ft. lbs.).
4. Install oil filter.
5. Connect oil cooler coolant hose.
6. Lower vehicle.
7. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

MANIFOLD-INTAKE

DIAGNOSIS AND TESTING

INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water (Spray Bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

LOWER INTAKE MANIFOLD

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

1. Remove engine cover.
2. Perform fuel system pressure release procedure **before attempting any repairs (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY - STANDARD PROCEDURE).**
3. Remove air cleaner housing.
4. Disconnect negative battery cable.
5. Disconnect fuel line at rail.
6. Remove fuel injector electrical connectors.
7. Remove fuel rail retaining bolts and remove fuel rail.
8. Disconnect oil temperature sensor.
9. Disconnect variable valve timing solenoid electrical connector.
10. Disconnect intake camshaft position sensor electrical connector.
11. Position harness out of the way.
12. Remove throttle body support bracket.
13. Disconnect electronic throttle control electrical connector.
14. Remove wiring harness retainer from the intake manifold.
15. Disconnect MAP sensor electrical connector.
16. Disconnect vacuum lines at intake.
17. Remove upper radiator hose retaining bracket.
18. Remove intake manifold retaining bolts.
19. Remove intake manifold.

CLEANING

1. Discard gasket(s).
2. Clean all sealing surfaces.

INSPECTION

1. Inspect manifold for cracks, distortion, or mounting surface warpage. Replace manifold if necessary.
2. Inspect manifold gasket for surface damage or excessive swelling. Replace gaskets as necessary.

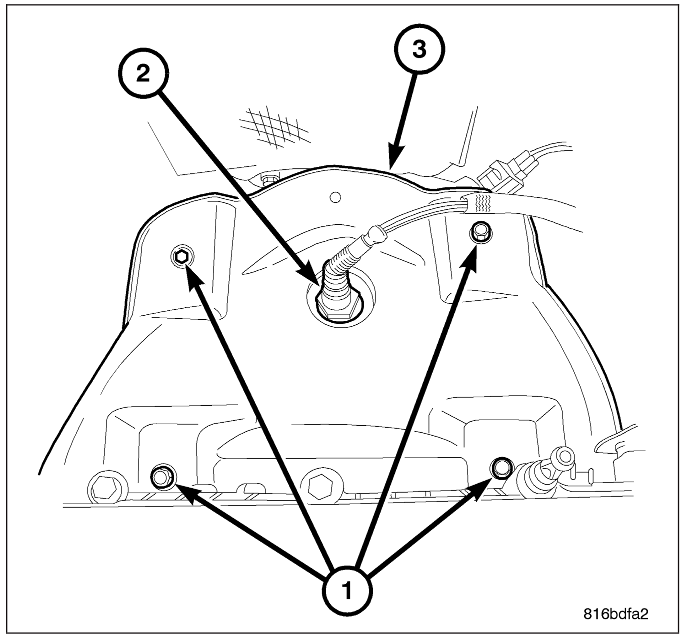
INSTALLATION

LOWER INTAKE MANIFOLD

1. Clean all gasket surfaces.
2. Replace intake manifold gasket.
3. Install intake manifold, torque bolts to 25 N·m (220 in. lbs.).
4. Install the fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).
5. Connect fuel injector electrical connectors.
6. Inspect quick connect fittings for damage, replace if necessary (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE). Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.
7. Connect negative cable to battery.
8. Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

MANIFOLD-EXHAUST

REMOVAL



1. Remove engine cover.
2. Remove clean air hose and air cleaner housing.
3. Disconnect negative cable from battery.
4. Disconnect throttle and speed control cables from the throttle lever and bracket.
5. Disconnect MAP sensor electrical connector.
6. Remove fasteners securing power steering fluid reservoir to cylinder head.
7. Remove coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL).
8. Remove bolts attaching upper heat shield.
9. Remove upper heat shield.
10. Raise vehicle.
11. Disconnect exhaust pipe from manifold.
12. Remove engine wiring heat shield.
13. Remove manifold support bracket.
14. Remove lower exhaust manifold heat shield.
15. Disconnect oxygen sensor electrical connector.
16. Remove exhaust manifold lower retaining fasteners.
17. Lower vehicle and remove the upper exhaust manifold retaining fasteners.
18. Remove exhaust manifold from above/between the engine and cowl panel.
19. Remove and discard manifold gasket.
20. Mark prop shaft and differential for proper installation (if equipped).
21. Remove the rear prop shaft (if equipped) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
22. Remove the two exhaust to maniverter (exhaust manifold with catalytic converter) bolts.
23. Unplug the down - stream O2 sensor connector.
24. Remove the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
25. Lower the vehicle on the hoist.
26. Unplug the up - stream O2 sensor connector.
27. Remove up - stream O2 sensor from the maniverter (exhaust manifold with catalytic converter) using o2 sensor socket 8439 (2).
28. Remove the four maniverter heat shield bolts (1).
29. Remove the two retaining bolts and one nut from the maniverter side heat shield (3).
30. Remove the seven maniverter to head retaining bolts.
31. Slide the maniverter up and to the right, The support the maniverter (1) with the help of a bungie cord.
32. Raise the vehicle on the hoist.
33. Remove the four (1) engine to maniverter bracket bolts.
34. Remove the rear engine mount through bolt (2).
35. Remove the three front engine mount to frame bolts and the mount through bolt.
36. Remove the PTU mounting bolts.
37. Install a screw jack (2)on front engine mount bracket (1).
38. Raise the front of the engine until the rear mount has dropped (1,2).
39. Separate the PTU from the transaxle.

40. Remove and discard old O-ring between Transmission and PTU
41. Roll the PTU (1) forward and down to remove.

CLEANING

1. Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

1. Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
2. Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

1. Install a new exhaust manifold gasket. **DO NOT APPLY SEALER**.
2. Position exhaust manifold in place. Tighten fasteners, starting at center and progressing outward in both directions to 23 N·m (200 in. lbs.). Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.
3. Install exhaust manifold heat shields. Tighten bolts to 12 N·m (105 in. lbs.).
4. Install exhaust manifold support bracket.
5. Install engine wiring heat shield.
6. Connect oxygen sensor electrical connector.
7. Install exhaust pipe to manifold. Tighten fasteners to 28 N·m (250 in. lbs.).
8. Install coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION).
9. Install fasteners securing power steering fluid reservoir to cylinder head.
10. Connect MAP sensor electrical connector.
11. Connect throttle and speed control cables to the throttle lever and bracket.
12. Connect negative cable to battery.
13. Install clean air hose and air cleaner housing.
14. Roll the PTU in moving from front to back.
15. Rest the PTU on the frame while the engine and transaxle are raised back into position.
16. Lower screw jack until rear mount through bolt can be installed.
17. Install rear mount through bolt and torque bolt to 75 Nm (55 ft. lbs.).
18. Install the transmission crossmember and bolts, torque to 75 Nm (55 ft. lbs.).
19. Install the through bolt at the front transmission mount and torque to 75 Nm (55 ft. lbs.)
20. Insure that the O-ring between the PTU and transaxle is in place.
21. Slide the PTU into place.
22. Install and torque PTU mounting bolts to 58 N-m (43 lbf-ft).
23. Lower the hoist.
24. Place the maniverter back into place and install the seven bolts.
25. Torque the maniverter bolts.
26. Install the maniverter side heat shield into place.
27. Install the two retaining bolts and one retaining nut.
28. Install the maniverter heat shield and the four retaining bolts.
29. Torque the maniverter heat shield bolts.
30. Using tool 8439 install the O2 sensor.
31. Install the air box.
32. Install engine trim cover.
33. Raise the vehicle on the hoist.
34. Install the maniverter to block bracket and four mounting bolts.

35. Torque maniverter to block bracket mounting bolts.
36. Install the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
37. Install the Prop shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
38. install the right axle shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
39. Install the right front tire.
40. Fill PTU. (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).
41. lower hoist
42. Connect battery cables.
43. Top off the fluids.

COVER-TIMING CHAIN

REMOVAL

1. Remove engine cover.
2. Perform fuel pressure bleed procedure.
3. Remove air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Disconnect negative battery cable.
5. Drain cooling system
6. Remove coolant recovery bottle.
7. Remove windshield washer bottle.
8. Remove power steering reservoir and set aside.
9. Remove make up air hose.
10. Remove PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
13. Raise vehicle.
14. Remove right lower splash shield.
15. Set engine to TDC.
16. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor retaining bolts.
18. Remove A/C compressor lower bracket.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft pulley.
21. Remove water pump pulley.
22. Remove timing chain cover lower bolts.
23. Lower vehicle.
24. Remove power steering pump and set aside.
25. Support engine with a suitable jack.
26. Remove right engine mount.
27. Remove accessory drive belt upper idler pulley.
28. Remove right engine mount bracket.
29. Remove accessory drive belt tensioner.
30. Remove timing chain cover upper retaining bolts.
31. Remove timing chain cover.

INSTALLATION

1. Clean all sealing surfaces.
2. Apply RTV as shown at the cylinder head to block parting line.
3. Apply RTV as shown in the corner of the oil pan and block.
4. Apply 2mm bead of RTV as shown.
5. Install timing chain cover.
6. Install timing chain cover upper retaining bolts and torque bolts.
7. Install accessory drive belt tensioner.
8. Install right engine mount bracket and torque.
9. Install accessory drive belt upper idler pulley.
10. Install right engine mount and torque bolts.

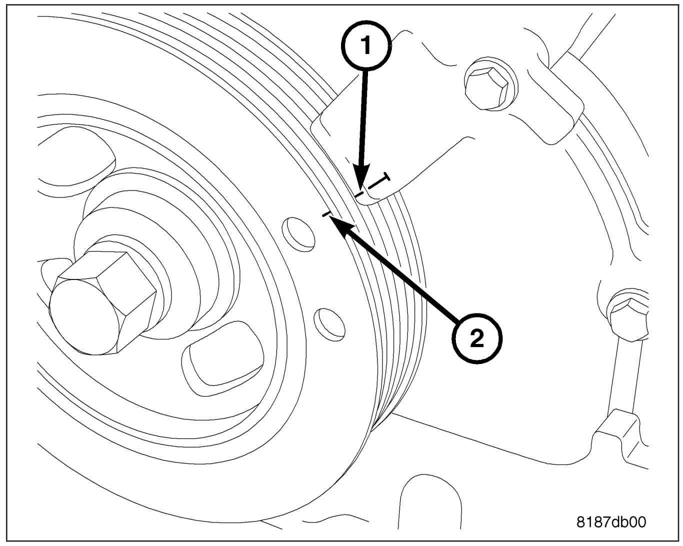
11. Remove jack from under engine.
12. Install power steering pump.
13. Raise vehicle.
14. Install timing chain cover lower retaining bolts and torque bolts.
15. Install oil pan to timing chain cover lower retaining bolts and torque bolts.
16. Install water pump pulley.
17. Install crankshaft pulley and torque bolt.
18. Install accessory drive belt lower idler pulley.
19. Install lower A/C compressor mounting bracket.
20. Install A/C compressor.
21. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
22. Install right lower splash shield.
23. Lower vehicle.
24. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)
25. Connect coil electrical connector,
26. Connect PCV hose to PCV valve.
27. Connect make up air hose.
28. Install power steering reservoir.
29. Install windshield washer bottle.
30. Install coolant recovery bottle.
31. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
32. Connect negative battery cable.
33. Install air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
34. Install engine cover.

CHAIN AND SPROCKETS-TIMING

REMOVAL

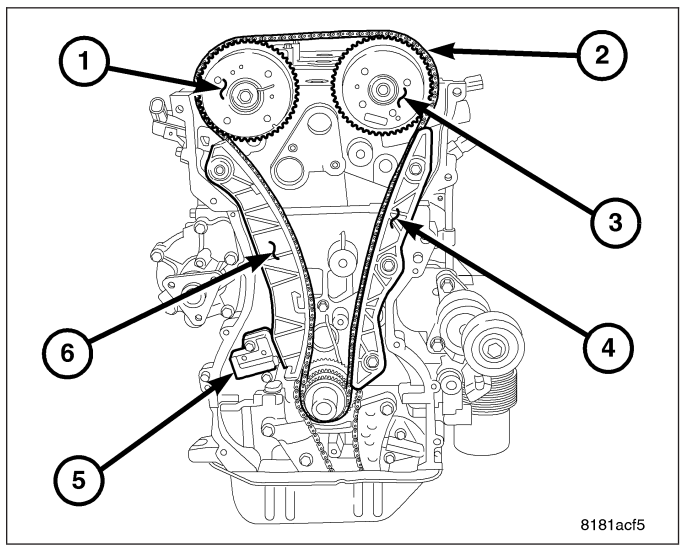
TIMING CHAIN

1. Perform fuel pressure bleed procedure.
2. Remove air cleaner housing.
3. Set engine to TDC.
4. Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



NOTE: If the timing chain plated links can no longer be seen, the timing chain links corresponding the timing marks must be marked prior to removal if the chain is to be reused.

5. Remove timing chain tensioner (5) (Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - REMOVAL).
6. Remove timing chain (2).

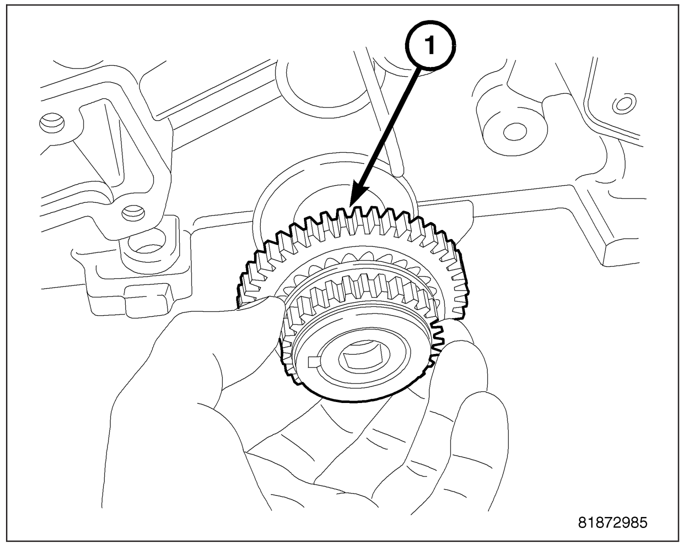


CAMSHAFT SPROCKET(S)

Refer to camshaft phasor removal (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

CRANKSHAFT SPROCKET

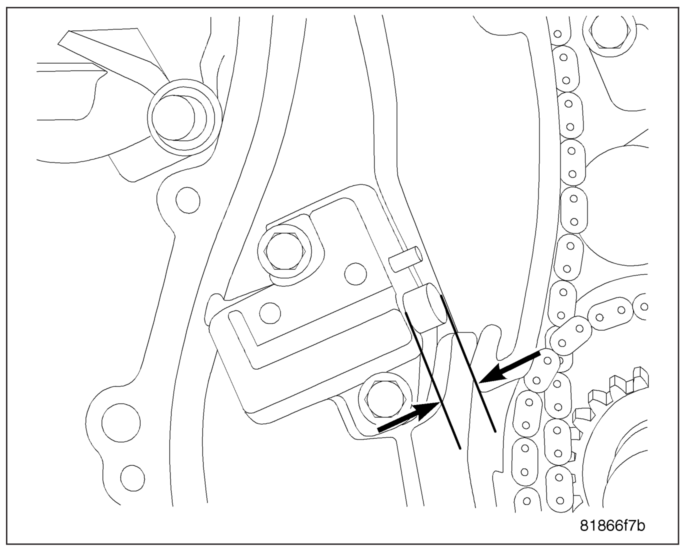
1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove oil pump drive chain tensioner.
4. Remove oil pump drive chain.
5. Remove crankshaft sprocket (1).



INSPECTION

Inspect timing chain for stretching prior to removal.

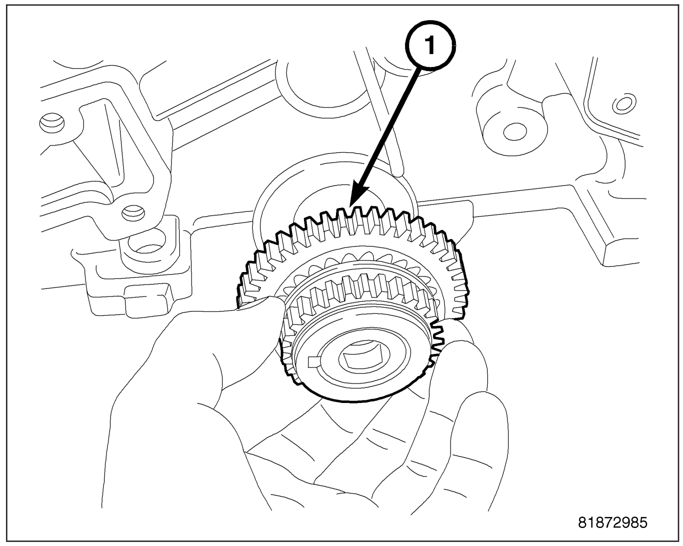
1. Rotate engine while watching timing chain tensioner plunger. When the plunger reaches its maximum travel stop rotating engine.
2. Measure the distance from the tensioner body and the edge of the chain guide as shown.
3. If the distance is greater than 20.5 mm (0.81 in.) inspect guide shoes for excessive wear.
4. If guides are okay, replace timing chain.



INSTALLATION

CRANKSHAFT SPROCKET

1. Install crankshaft sprocket (1) onto crankshaft.
2. Install oil pump drive chain. Verify that Oil pump is correctly timed.
3. Reset oil pump drive chain tensioner by pushing plunger inward and install Tensioner Pin 8514.
4. Install oil pump drive chain tensioner and remove Tensioner Pin 8514.
5. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
6. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
7. Fill engine with oil (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE).
8. Start engine and check for leaks.



CAMSHAFT SPROCKET(S)

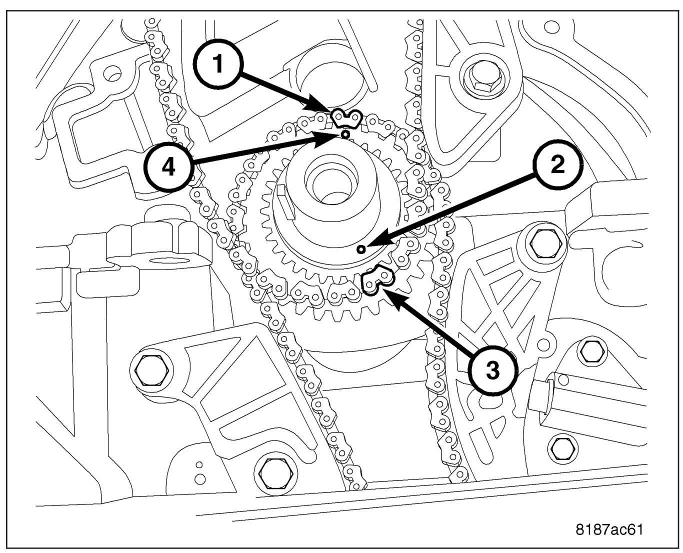
NOTE: The camshaft sprockets and the camshaft phasers are an assembly and cannot be serviced separately.

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin and camshaft phaser may occur.

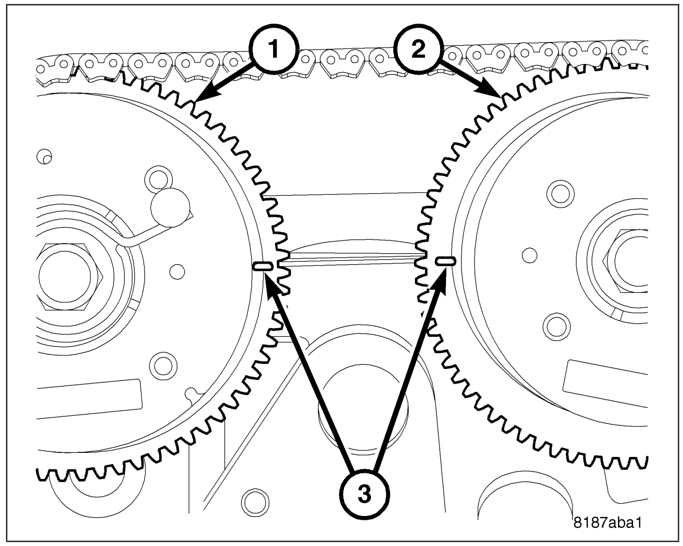
1. Refer to Camshaft phaser installation (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

TIMING CHAIN

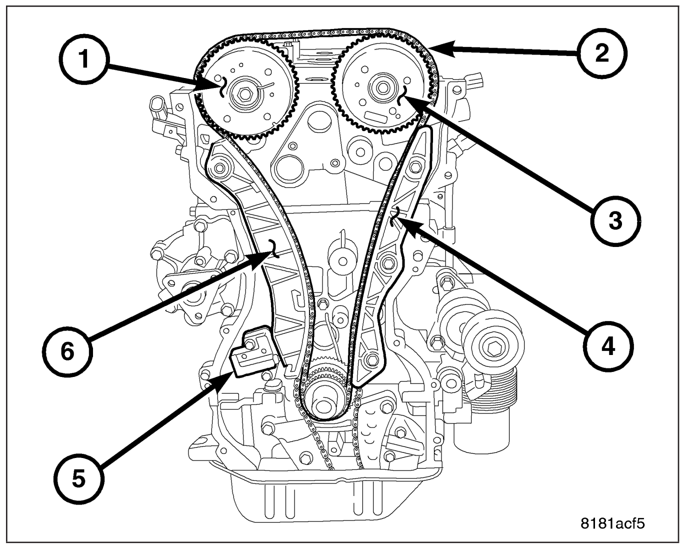
1. Verify that the crankshaft sprocket keyway is at the 9 o’clock position.



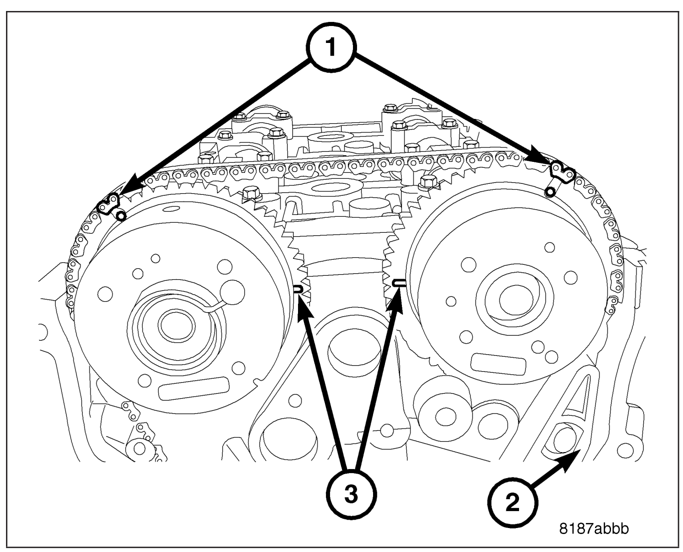
2. Align camshaft timing marks (3) so they are parallel to the cylinder head as shown.



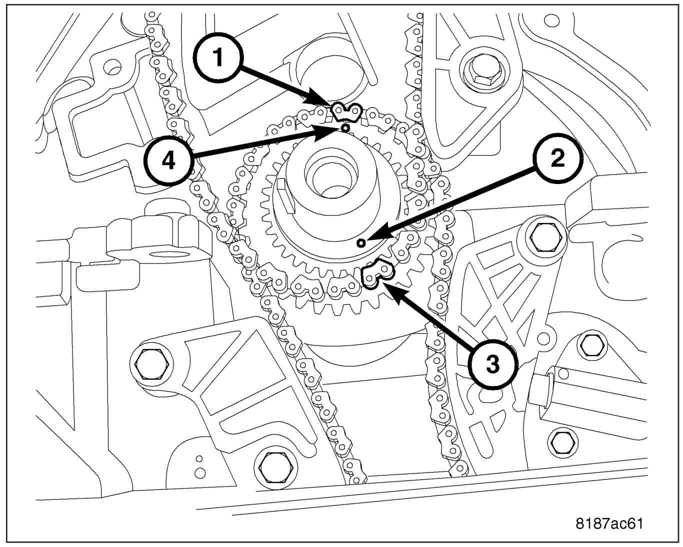
3. Install timing chain guide (4) and torque bolts.

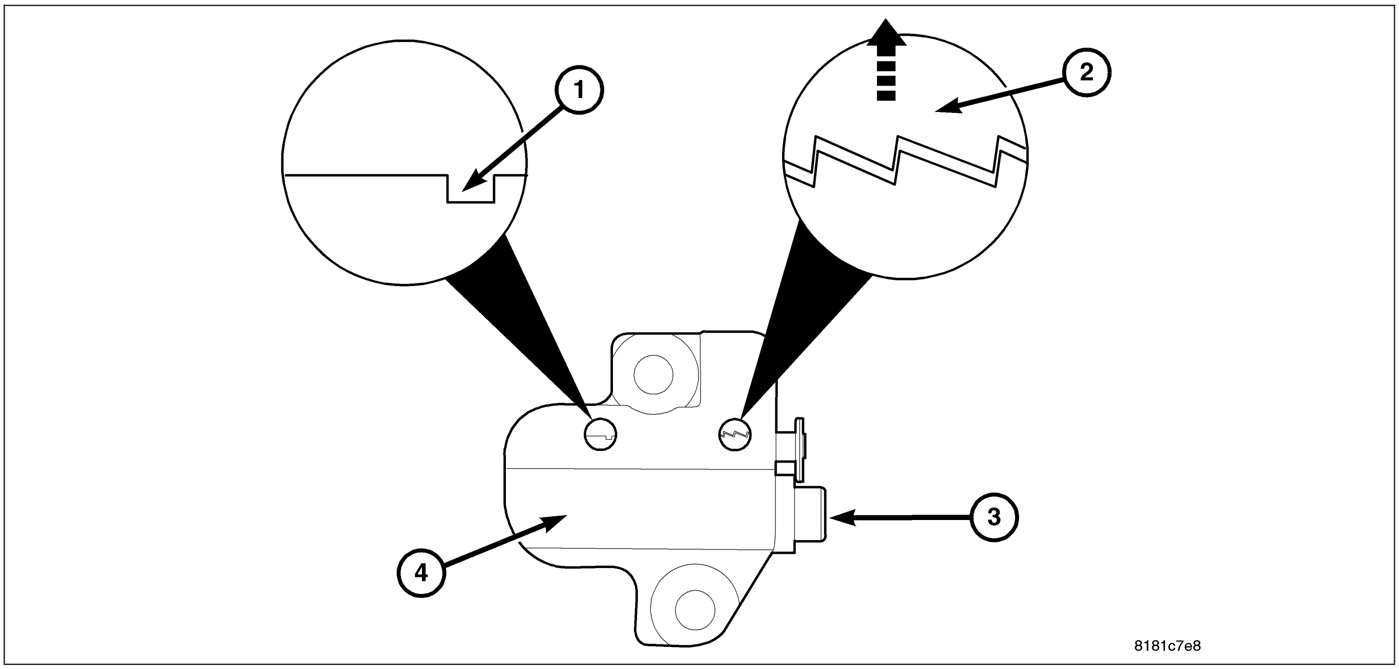


4. Install timing chain so plated links on chain align with timing marks on camshaft sprockets (1).



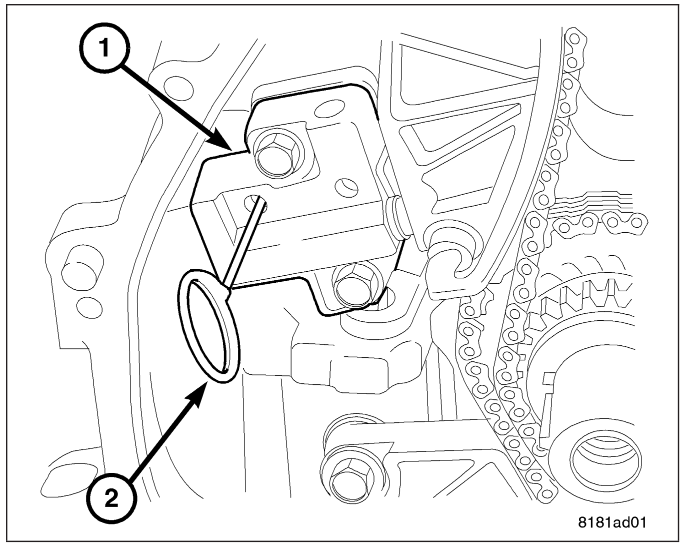
5. Align timing mark on the crankshaft sprocket (2) with the plated link (3) on the timing chain. Position chain so slack will be on the tensioner side.





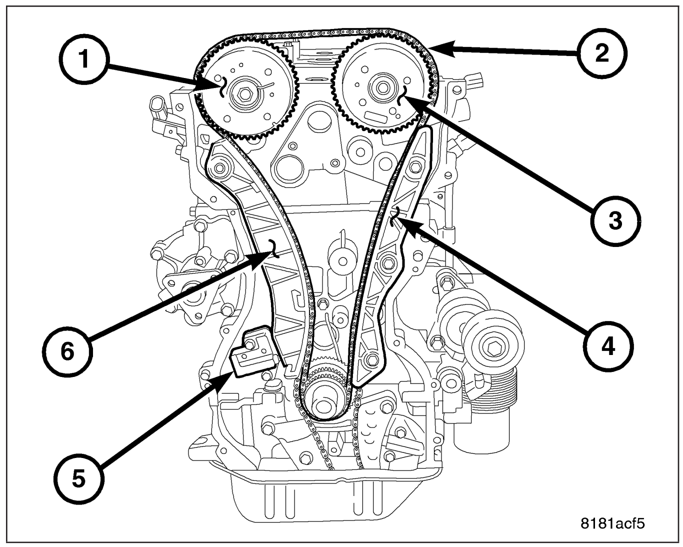
6. Reset timing chain tensioner (4) by lifting up on ratchet (2) and pushing plunger (3) inward towards the tensioner body (4). Insert tensioner pin 8514 into slot (1) to hold tensioner plunger in the retracted position.

7. Install timing chain tensioner (1) and torque bolts to 12 N·m (105 in. lbs.).

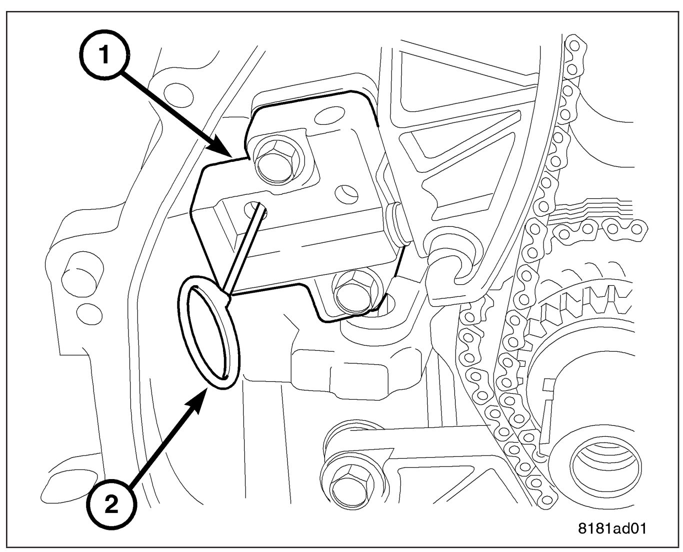


NOTE: Keep the slack in the timing chain on the tensioner side.

8. Install the moveable timing chain pivot guide (6) and torque bolt to 12 N·m (105 in. lbs.).



9. Remove timing tensioner pin 8514 (2).
10. Rotate the crankshaft CLOCKWISE two complete revolutions until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position.
11. Install front timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Connect negative battery cable.
13. Fill with oil, start engine and check for leaks.



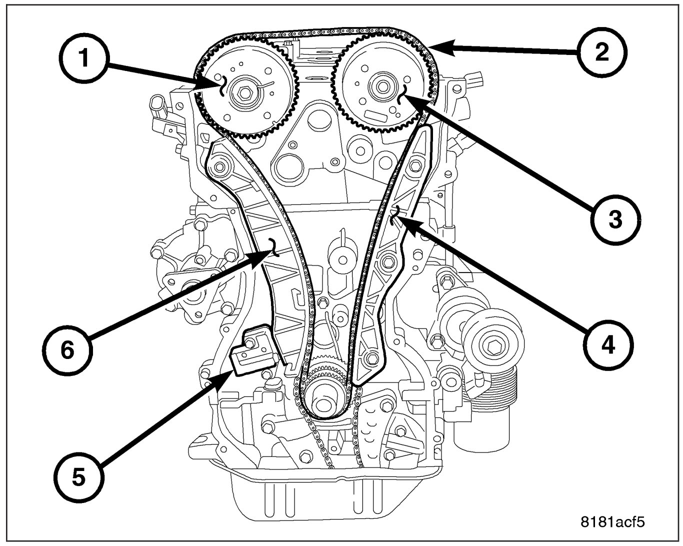
TENSIONER-TIMING CHAIN

REMOVAL

1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

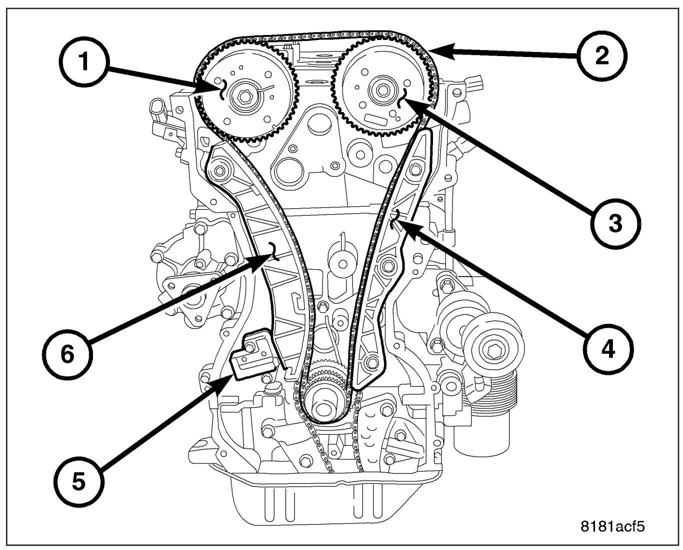
NOTE: Tensioner will not come apart during removal.

2. Remove timing chain tensioner retaining bolts and remove tensioner.



INSTALLATION

1. Reset tensioner.
2. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



ENGINE 2.4L WORLD

TABLE OF CONTENTS

ENGINE 2.4L WORLD

DESCRIPTION

The 2.4 Liter (148 cu. in.) in-line four cylinder engine is a double over head camshaft with mechanical lash buckets and four valves per cylinder design. This engine is NOT free-wheeling; meaning that the pistons will contact the valves in the event of a timing chain failure.

The cylinders are numbered from front of the engine to the rear. The firing order is 1–3–4–2.

The engine identification number is located on the rear of the cylinder block.

DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to the Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - MECHANICAL) (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - PERFORMANCE).

For fuel system diagnosis, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING).

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Engine Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis
- Mechanical Valve Tappet Noise Diagnosis
- Engine Oil Leak Inspection

ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Clean plugs and set gap.
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Perform exhaust restriction test. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Install new parts, as necessary.
	9. Faulty ignition coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Clean spark plugs and set gap.
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.
	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty ignition coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Clean spark plugs and set gap.
	2. Faulty ignition coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
VALVETRAIN NOISE	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Worn cam lobe.	5. Install new camshaft.
	6. Worn tappet bucket.	6. Install new select fit tappet bucket.
	7. Worn valve guides.	7. Ream guides and install new valves with oversize stems.
	8. Excessive runout of valve seats on valve faces.	8. Grind valve seats and valves.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Connecting rod journal out-of-round.	6. Replace crankshaft or grind surface.
	7. Connecting rod out-of-round.	7. Replace connecting rod.
	8. Misaligned connecting rods.	8. Replace bent connecting rods.

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Thick oil	4. (a) Change engine oil and filter.
		(b) Run engine to operating temperature.
		(c) Change engine oil and filter again.
	5. Excessive bearing clearance.	5. Measure bearings for correct clearance. Repair as necessary.
	6. Excessive end play.	6. Check thrust bearing for wear on flanges.
	7. Crankshaft journal out-of-round or worn.	7. Replace crankshaft or grind journals.
	8. Loose flywheel or torque converter.	8. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level.	1. Check engine oil level.
	2. Faulty oil pressure sending unit.	2. Install new sending unit.
	3. Low oil pressure.	3. Check sending unit and main bearing oil clearance.
	4. Clogged oil filter.	4. Install new oil filter.
	5. Worn parts in oil pump.	5. Replace worn parts or pump.
	6. Thin or diluted oil.	6. Change oil to correct viscosity.
	7. Oil pump relief valve stuck.	7. Remove valve and inspect, clean, or replace.
	8. Oil pump suction tube loose.	8. Remove oil pan and install new tube or clean, if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Excessive bearing clearance.	10. Measure bearings for correct clearance.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket(s).
	2. Loose fastener, broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Misaligned or deteriorated cup or threaded plug.	3. Replace as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Ream guide(s) and replace valve(s) with oversize valve(s) and seal(s).
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.

3. Remove engine cover.
4. Disconnect coil electrical connectors and remove coils.
5. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
6. Disconnect injector electrical connectors.
7. Be sure throttle blade is fully open during the compression check.
8. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).
9. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
10. Repeat the previous step for all remaining cylinders.
11. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
12. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
13. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:
   - Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
   - Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
   - Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

   - Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
   - If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

NOTE: If oil leakage is observed at the dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
    a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    b. Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as previously described.

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

STANDARD PROCEDURE

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).

6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.
13. Start engine and check for any leaks.

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

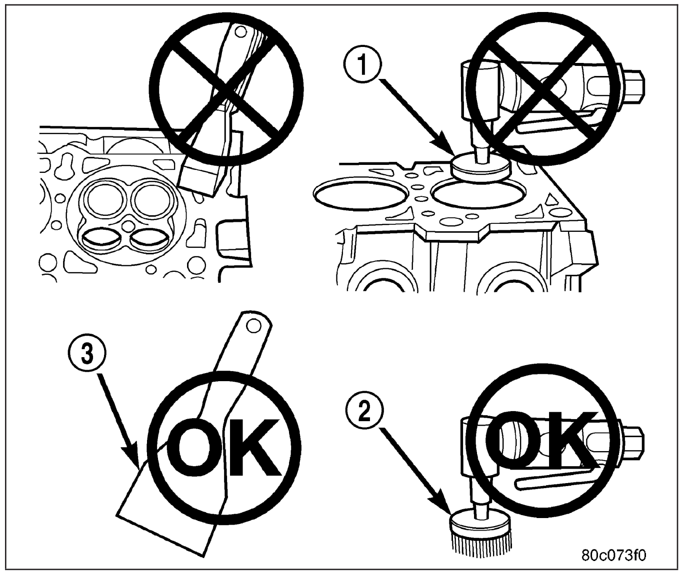
Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces.

ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.



Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

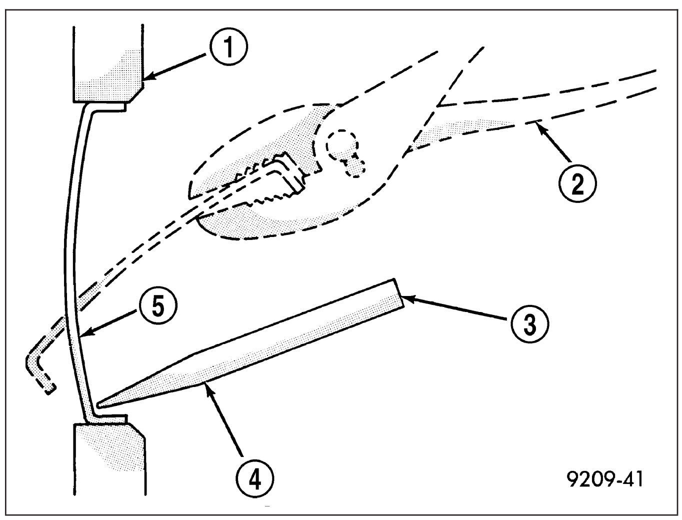
- Solvent or a commercially available gasket remover
- Plastic or wood scraper
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

CYLINDER HEAD CORE PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug.

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

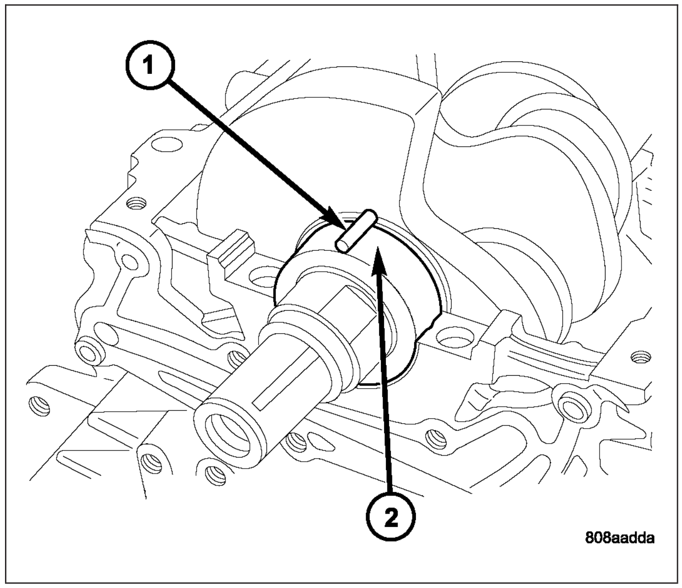


Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

MEASURING BEARING CLEARANCE USING PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

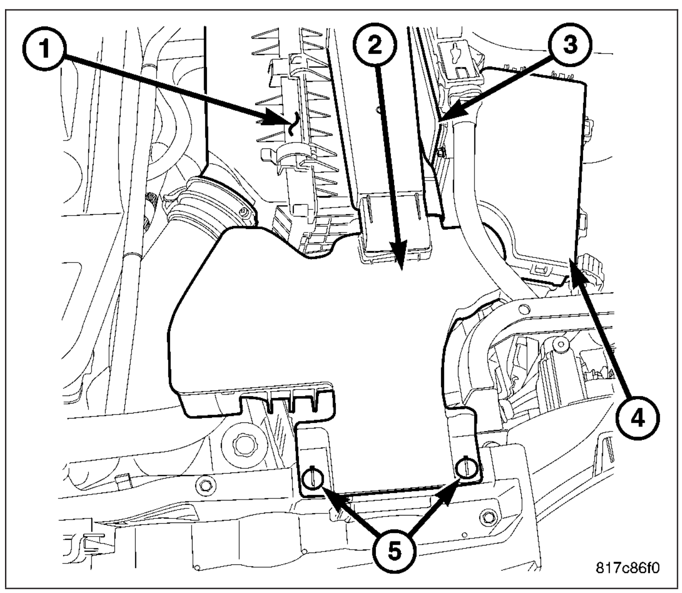


1. Remove oil film from surface to be checked. Plastigage is soluble in oil.
2. Place a piece of Plastigage across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes. (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.
3. Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Compare clearance measurements to specs found in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). **Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.**

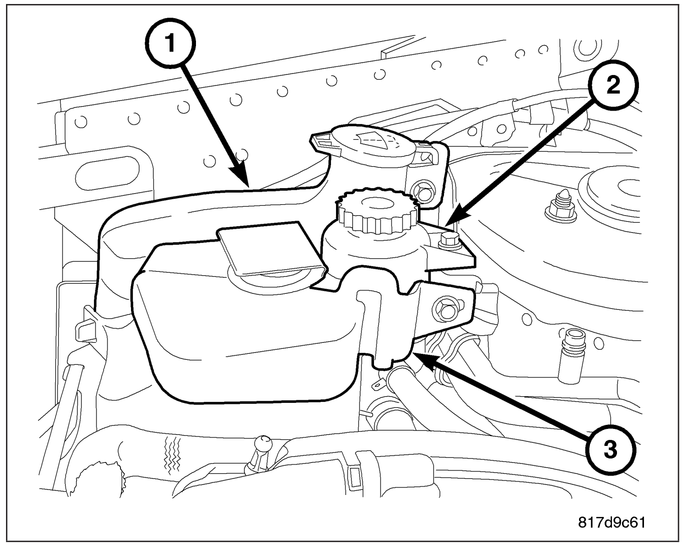
NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

4. Install the proper crankshaft bearings to achieve the specified bearing clearances.

REMOVAL - ENGINE ASSEMBLY

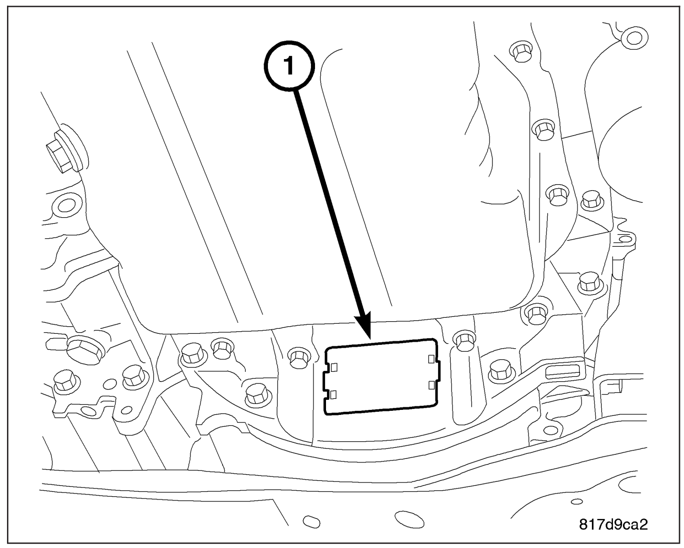


1. Perform fuel pressure release procedure, then disconnect and remove fuel line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Remove air cleaner housing assembly (1) and clean air hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect both cables from battery.
4. Remove battery and battery tray.
5. Discharge air conditioning system, if equipped (Refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE).
6. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

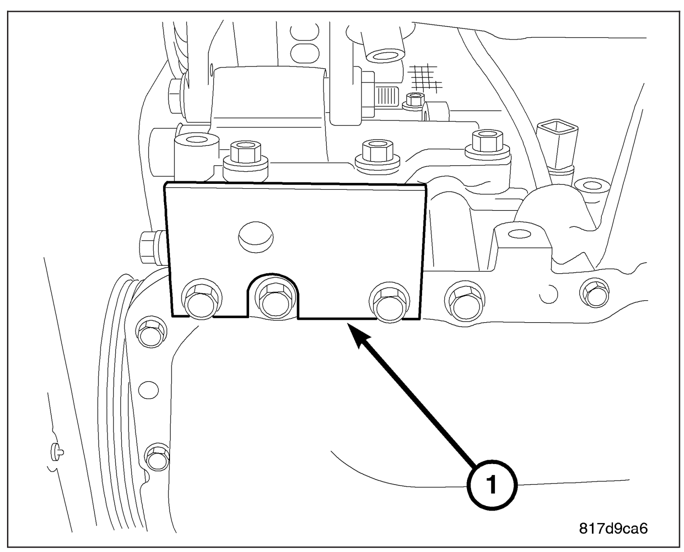


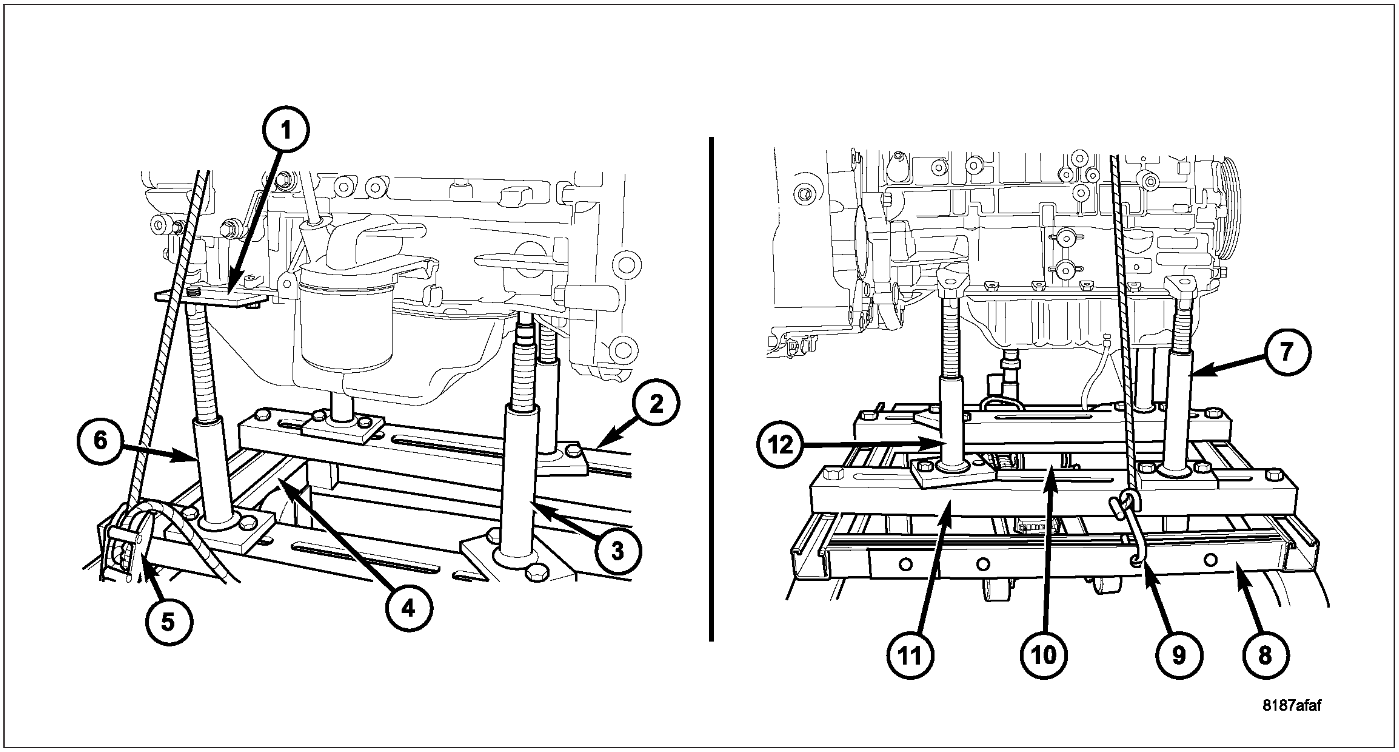
7. Remove coolant reservoir (3).
8. Remove grill trim panel.
9. Remove upper radiator hose from radiator and coolant manifold.
10. Remove upper radiator hose support.
11. Remove lower radiator hose at coolant manifold.
12. Remove coolant hose from coolant manifold.
13. Disconnect the following electrical connectors, variable valve timing solenoids, oil temperature sensor, injectors, map, coils, cmp's, coolant temperature sensors, capacitor, oxygen sensor, intake air temperature sensor.
14. Remove air intake tube from throttle body.
15. Remove vacuum lines from throttle body and intake manifold.
16. Unclip harness from intake.
17. Disconnect electronic throttle control and manifold flow control valve electrical connectors.
18. Remove PCV hose from valve cover.
19. Remove dipstick.
20. Remove throttle body support bracket.
21. Remove intake bolts and remove intake.
22. Disconnect coolant temperature sensor at block, Knock sensor, oil pressure sensor, generator, starter, block heater, A/C compressor, and block ground.
23. Remove accessory drive belt.
24. Remove power steering reservoir.
25. Remove power steering line support.
26. Remove power steering pump and set aside.
27. Remove upper idler pulley.
28. Remove transaxle filler tube.
29. Disconnect transmission linkage.
30. Disconnect transmission range sensor, TIS and TOS.
31. Remove transmission vent hose.
32. Remove ground strap near right tower.
33. Remove rear heat shield.
34. Remove maniverter heat shields.
35. Raise vehicle.
36. Remove wheels.
37. Remove right front splash shield.
38. Remove axle nuts.
39. Remove ball joint pinch bolts and separate steering knuckle from ball joint.
40. Remove axles.
41. Drain oil.
42. Mark drive shaft and flange.
43. Remove carrier bearing and heat shield.
44. Remove driveshaft.
45. Remove exhaust pipe to maniverter/exhaust manifold bolts.
46. Remove maniverter/exhaust manifold support bracket.
47. Lower vehicle.
48. Remove coolant manifold.

49. Remove maniverter/exhaust manifold bolts.
50. Remove maniverter/exhaust manifold to left of engine.
51. Hoist up.
52. Remove front mount through bolt.
53. Remove crossmember.
54. Remove front mount bracket.
55. Remove rear mount through bolt.
56. Remove rear mount.
57. Remove rear mount bracket.
58. Pull engine forward and support.
59. Remove PTU assembly if equiped (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).
60. Remove inspection cover (1) and mark torque converter to flywheel.
61. Remove torque converter bolts.
62. Remove lower bellhousing bolts.
63. Remove A/C lines from compressor and remove A/C compressor.
64. Remove A/C mounting bracket.



65. Install Adapter 9704 (1).
66. Remove generator and lower idler pulley.
67. Disconnect transmission electrical connector.
68. Disconnect CKP electrical connector.
69. Remove coolant hoses at transaxle cooler.
70. Remove transaxle cooler lines from cooler.

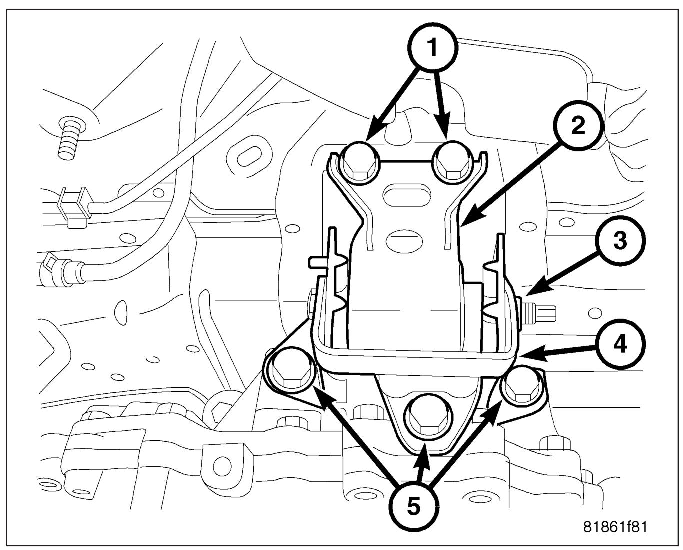




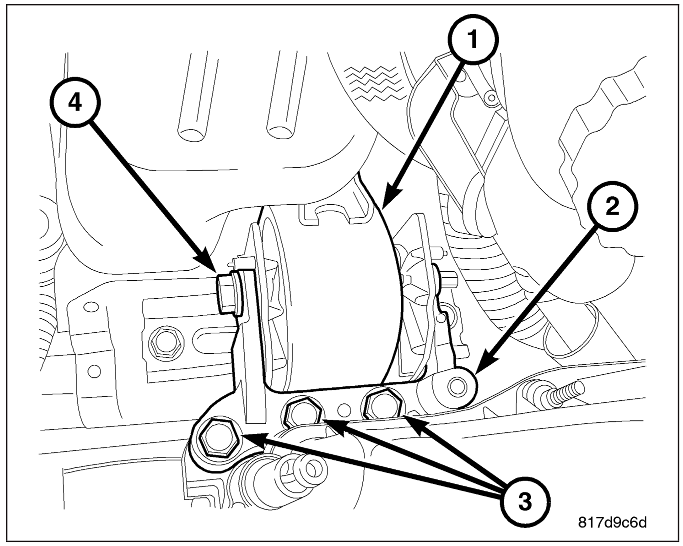
71. Position dolly (4,8) under engine and lower vehicle.

WARNING: Safety straps MUST be used.

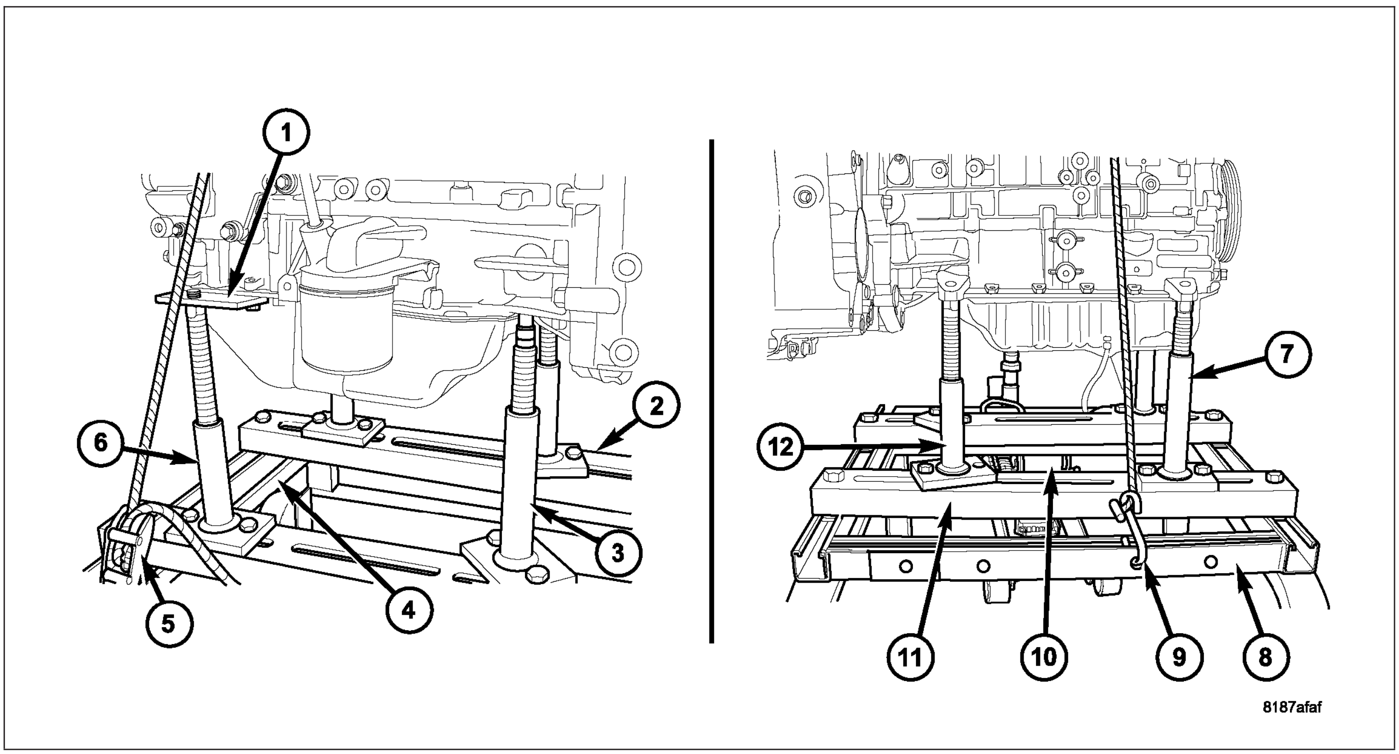
72. Install safety straps (6,9).
73. Remove PCM bracket and set aside.
74. Remove left engine mount through bolt (3).



75. Remove right engine mount through bolt (4).
76. Raise vehicle away from engine and transaxle.
77. Separate engine from transaxle.

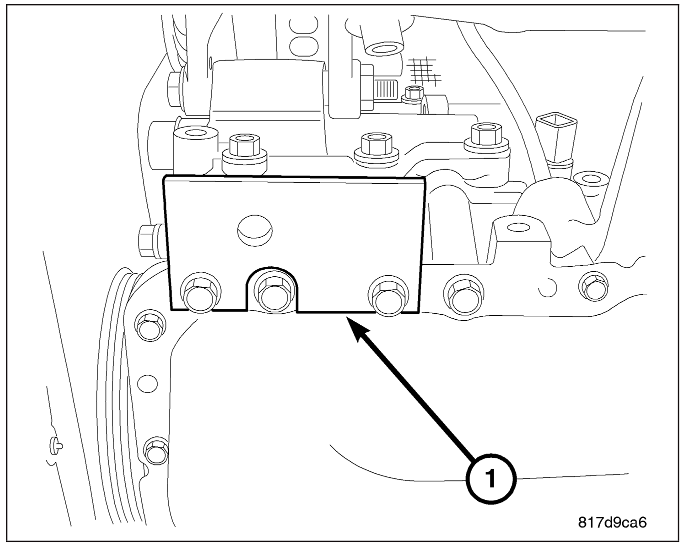


INSTALLATION - ENGINE ASSEMBLY



1. Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.
2. Continue lowering vehicle until engine/transaxle aligns to mounting locations. Install mounting bolts at the right and left engine/transaxle mount bolts and Tighten bolts to 118 N·m (87 ft. lbs.).
3. Remove safety straps from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly and cradle.

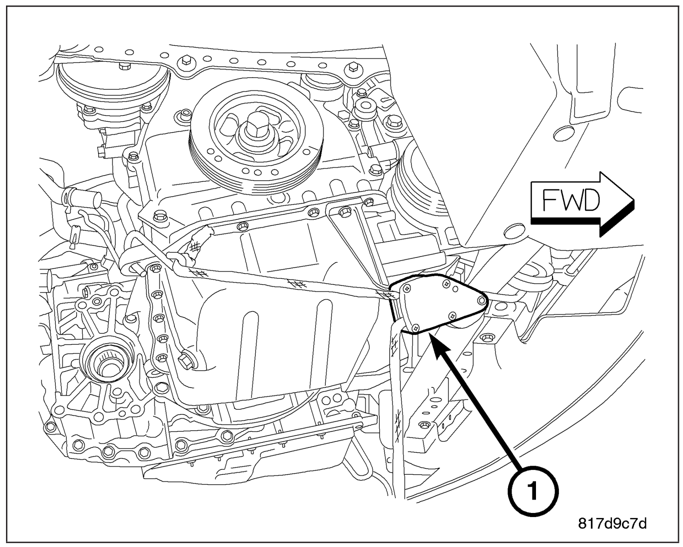
4. Remove Adapter 9704 (1).
5. Install pcm bracket.
6. Install maniverter assembly and upper lower heat shields.
7. Install oxygen sensor and connect electrical connector.
8. Install coolant manifold assembly.
9. Install transaxle linkage and adjust as necessary.
10. Install transaxle vent hose.
11. Connect transaxle electrical connectors.
12. Install Ground strap near right strut tower.
13. Raise vehicle.



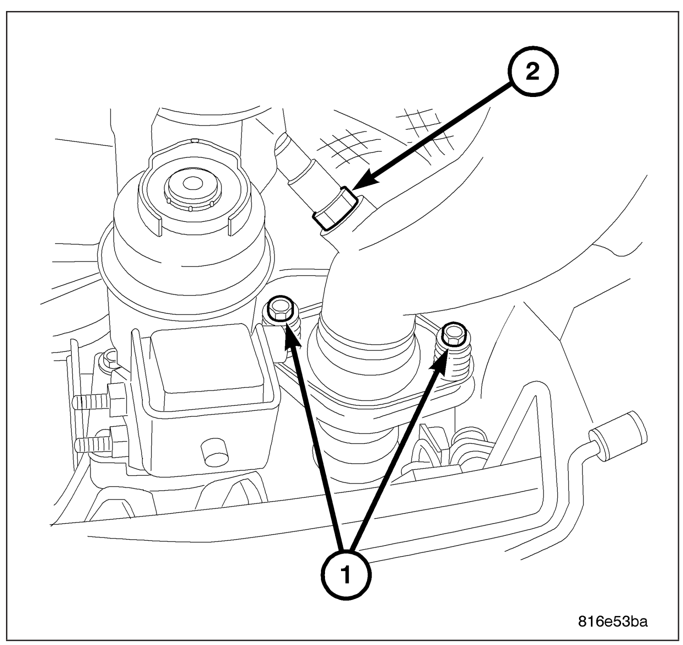
14. Pull engine forward and restrain engine.

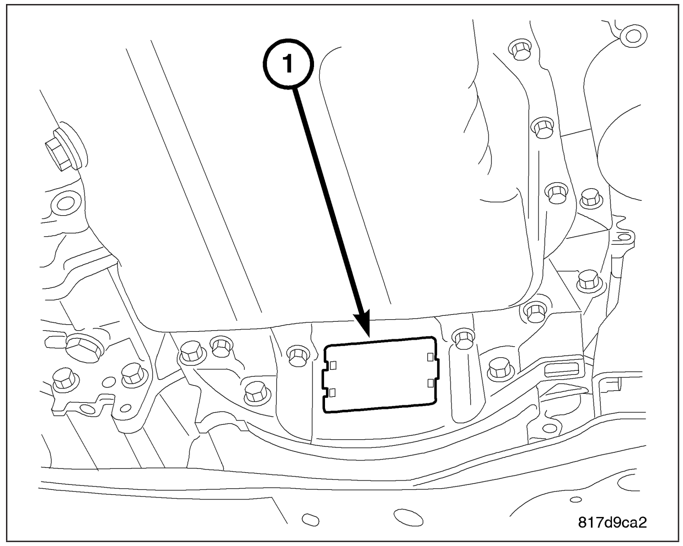
NOTE: Be sure to install O-ring prior to installing PTU assembly.

15. Install PTU.
16. Remove engine restraint.
17. Install front mount bracket and tighten bolts.
18. Install frame cross member.
19. Install front engine mount.
20. Install rear mount bracket.
21. Install rear mount and tighten bolts.
22. Connect CKP electrical connector.

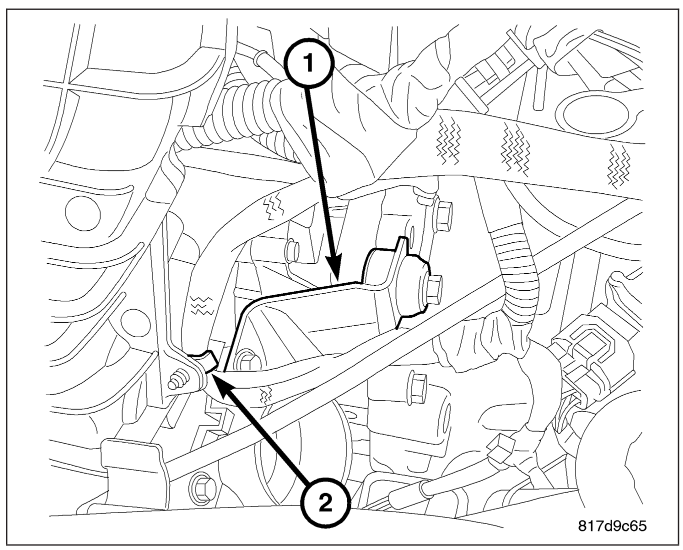


23. Install maniverter to exhaust pipe bolts (1) and tighten bolts.
24. Align driveshaft marks and install and heat shield.
25. Install generator
26. Install A/C bracket.
27. Install A/C lines on compressor and install compressor.
28. Install lower bell housing bolts and tighten bolts.
29. Align torque converter and flex plate mark. Install torque converter bolts and tighten.





30. Install inspection cover (1).
31. Install transaxle electrical connectors.
32. Connect trans cooler lines.
33. Install coolant hoses at transmission cooler.
34. Install axles.
35. Install ball joint pinch bolts and tighten.
36. Install axle nuts and tighten.
37. Install splash shields.
38. Install wheels.
39. Install new oil filter.
40. Lower vehicle.
41. Install transaxle filler tube.
42. Install upper idler pulley.
43. Install power steering pump.
44. Install power steering line support bracket.
45. Install power steering pump.
46. Install accessory drive belt.
47. Connect electrical connectors at block ground, starter, A/C compressor, knock sensor, Oil pressure sensor, generator, Coolant temperature sensor at block, and block heater.
48. Install intake manifold and tighten bolts.
49. Install throttle body support bracket (1).



50. Install engine oil dip stick.
51. Install PCV hose to valve cover.
52. Connect manifold flow control valve and electronic throttle control electrical connectors and fasten harness to intake.
53. Install vacuum lines at throttle body and intake manifold.
54. Install intake air tube on throttle body.
55. Connect engine harness electrical connectors.
56. Install upper radiator support bracket.
57. Install coolant hoses at coolant manifold.
58. Install grill trim panel.
59. Install coolant reservoir and connect hose.
60. Connect fuel line to fuel rail.
61. Install battery tray and battery.
62. Connect battery cables.
63. Install air cleaner housing and connect inlet air hose.
64. Install fresh air inlet.
65. Fill with coolant.
66. Fill with oil.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

67. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
68. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).
69. Start engine and check for leaks.

SPECIFICATIONS

2.4L ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, DOHC	
Number of Cylinders	4	
Firing Order	1-3-4-2	
Compression Ratio	9.5:1	
Max. Variation Between Cylinders	25%	
Displacement	2.4 Liters	148 cu. in.
Bore	88 mm	3.465 in.
Stroke	97 mm	3.819 in.
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Cylinder Bore Diameter	87.4924-87.5076 mm	3.4446-3.4452 in.
A	88.0-88.010	3.4645-3.4649 in.
B	88.010-88.020	3.4649-3.4653 in.
C	88.020-88.030	3.4653-3.4657 in.
Out-of-Round (Max.)	0.051 mm	0.002 in.
Taper (Max.)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter	87.456-87.474 mm	3.4431-3.4439 in.
Clearance @ 24.6 mm (0.551 in.) from bottom of skirt (Non-Turbo)	0.018-0.0516 mm	0.0007-0.0020 in.
Clearance @ 22 mm (0.866 in.) from bottom of skirt (Turbo)	0.046-0.064 mm	0.0018-0.0025 in.
Weight	345-355 grams	12.17-12.52 oz.
Land Clearance (Diametrical)	0.563-0.621 mm	0.022-0.024 in.
Piston Length	66.25 mm	2.608 in.
Piston Ring Groove Depth No. 1	3.946-4.045 mm	0.155-0.159 in.
Piston Ring Groove Depth No. 2	4.555-4.680 mm	0.179-0.184 in.

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Ring Groove Depth No. 3	4.108-4.220 mm	0.162-0.166 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap-Top Compression Ring	0.25-0.51 mm	0.0098-0.020 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-2nd Compression Ring	0.23-0.48 mm	0.009-0.018 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-Oil Control Steel Rails	0.25-0.64 mm	0.009-0.025 in.
Wear Limit	1.0 mm	0.039 in.
Ring Side Clearance-Compression Rings	0.030-0.080 mm	0.0011-0.0031 in.
Wear Limit	0.10 mm	0.004 in.
Ring Side Clearance-Oil Ring Pack	0.012-0.178 mm	0.0004-0.0070 in.
Ring Width-Compression Rings	1.47-1.50 mm	0.057-0.059 in.
Ring Width-Oil Ring Pack	2.72–2.88 mm	0.107–0.1133 in.

CONNECTING ROD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.025–0.071 mm	0.0009–0.0027 in.
Wear Limit	0.075 mm	0.003 in.
Bore Diameter-Piston Pin	20.96–20.98 mm	0.8252–0.8260 in.
Bore Diameter-Crankshaft End	52.993-53.007 mm	2.0863-2.0868 in.
Side Clearance	0.13–0.38 mm	0.005–0.015 in.
Wear Limit	0.40 mm	0.016 in.
Weight-Total (Less Bearing)	565.8 grams	19.96 oz.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	49.984 - 50.000 mm	1.968 - 1.9685 in.
Main Bearing Journal Diameter	59.992 - 60.008 mm	2.362 - 2.3625 in.
Journal Out-of-Round (Max.)	0.0035 mm	0.0003 in.
Journal Taper (Max.)	0.007 mm	0.0001 in.

DESCRIPTION	SPECIFICATION	
	Metric	Standard
End Play	0.09 - 0.24 mm	0.0035 - 0.0094 in.
Wear Limit	0.38 mm	0.015 in.
Main Bearing Diametrical Clearance	0.018 - 0.062 mm	0.0007 - 0.0024 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DSECRIPTION	SPECIFICATION	
	Metric	Standard
Front Journal		
Intake	30.000 - 30.021 mm	1.1810 - 1.1819 in.
Exhaust	40.000 - 40.021 mm	1.5747 - 1.5756 in.
Journals No. 1-4	24.000 - 24.021 mm	0.9448 - 0.9457 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journal Diameter No. 1	29.964 - 29.980 mm	1.179 - 1.180 in.
Journal Diameter No. 2-5	23.954 - 23.970 mm	0.943 - 0.944 in.
Bearing Clearance - Diametrical	0.030 - 0.067 mm	0.0011 - 0.0026 in.
End Play	0.11 - 0.25 mm	0.004 - 0.009 in.
Max Lift @ 0.2mm (0.007 in.) lash		
Intake	9.2 mm	(0.362 in.)
Max Lift @ 0.28mm (0.011 in.) lash		
Exhaust	8.42 mm	(0.331 mm)
Intake Valve Timing*		
Closes (ABDC)	49.3°	
Opens (ATDC)	10.3°	
Duration	219°	
Exhaust Valve Timing*		
Closes (BTDC)	8.45°	
Opens (BBDC)	45°	
Duration	216.55°	
Valve Overlap @ 0.5mm (0.019 in.) w/ VVT in lock-pin position	18.75°	
* All reading in crankshaft degrees at 0.5 mm (0.019 in.) valve lift.		

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum - Heat treated	
Gasket Thickness (Compressed)	0.54 mm	0.021 in.

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Angle	44.75° - 45.10°	
Seat Diameter - Intake	34.45 - 34.61mm	1.3562 - 1.3625 in.
Seat Diameter - Exhaust	28.04 - 28.20 mm	1.1039 - 1.1102 in.
Runout (Max.)	0.05 mm	0.002 in.
Valve Seat Width		
Intake	1.16 - 1.46 mm	0.0456 - 0.0574 in.
Exhaust	1.35 - 1.65 mm	0.0531 - 0.0649 in.
Service Limit - Intake	2.0 mm	0.079 in.
Service Limit - Exhaust	2.5 mm	0.098 in.

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter I.D.	5.500 - 5.512 mm	0.2165 -0.2170 in.
Guide Bore Diameter	10.983 - 11.001 mm	0.432 - 0.4331 in.
Guide Height (spring seat to guide tip)	14.6 - 15.2 mm	0.5748 - 0.5984 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle - Intake and Exhaust	45.25° - 45.75°	
Head Diameter - Intake	34.9 - 35.1 mm	1.374 -1.3818 in.
Head Diameter - Exhaust	28.9 - 29.1 mm	1.1377 - 1.1456 in.
Valve Length (Overall)		
Intake	112.76 - 113.32 mm	4.439 - 4.461 in.
Exhaust	110.89 - 111.69 mm	4.365 - 4.397 in.
Valve Stem Diameter		
Intake	5.465 - 5.480 mm	0.2151 - 0.2157 in.
Exhaust	5.458 - 5.470 mm	0.2148 - 0.2153 in.

VALVE MARGIN

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.672 mm	0.0264 in.
Service Limit	0.95 mm	0.0037 in.
Exhaust	0.744 mm	0.02929 in.
Service Limit	1.05 mm	0.039 in.

VALVE STEM TIP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	48.04 mm	1.891 in.
Exhaust	47.99 mm	1.889 in.

VALVE STEM TO GUIDE CLEARANCE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.048 - 0.066 mm	0.0018 - 0.0025 in.
Max. Allowable	0.076 mm	0.003 in.
Service Limit	0.25 mm	0.010 in.
Exhaust	0.0736 - 0.094 mm	0.0029 - 0.0037 in.
Max. Allowable	0.101 mm	0.004 in.
Service Limit	0.25 mm	0.010 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length (Approx.)	47.0 mm	1.850 in.
Nominal Force (Valve Closed)	179.5 N ± 9 @ 35.0 mm	40.35 lbs. @ 2.023 in.
Nominal Force (Valve Open)	364.8 N ± 17 N @ 29.25 mm	82.01 lbs. ± 3.82 lbs. @ 1.152 in.
Installed Height	35.00 mm	1.378 in.
Number of Coils	8.5 ± 0.1	
Wire Diameter	2.90 mm ± 0.03	0.114 in ± 0.001 in.

OIL PRESSURE

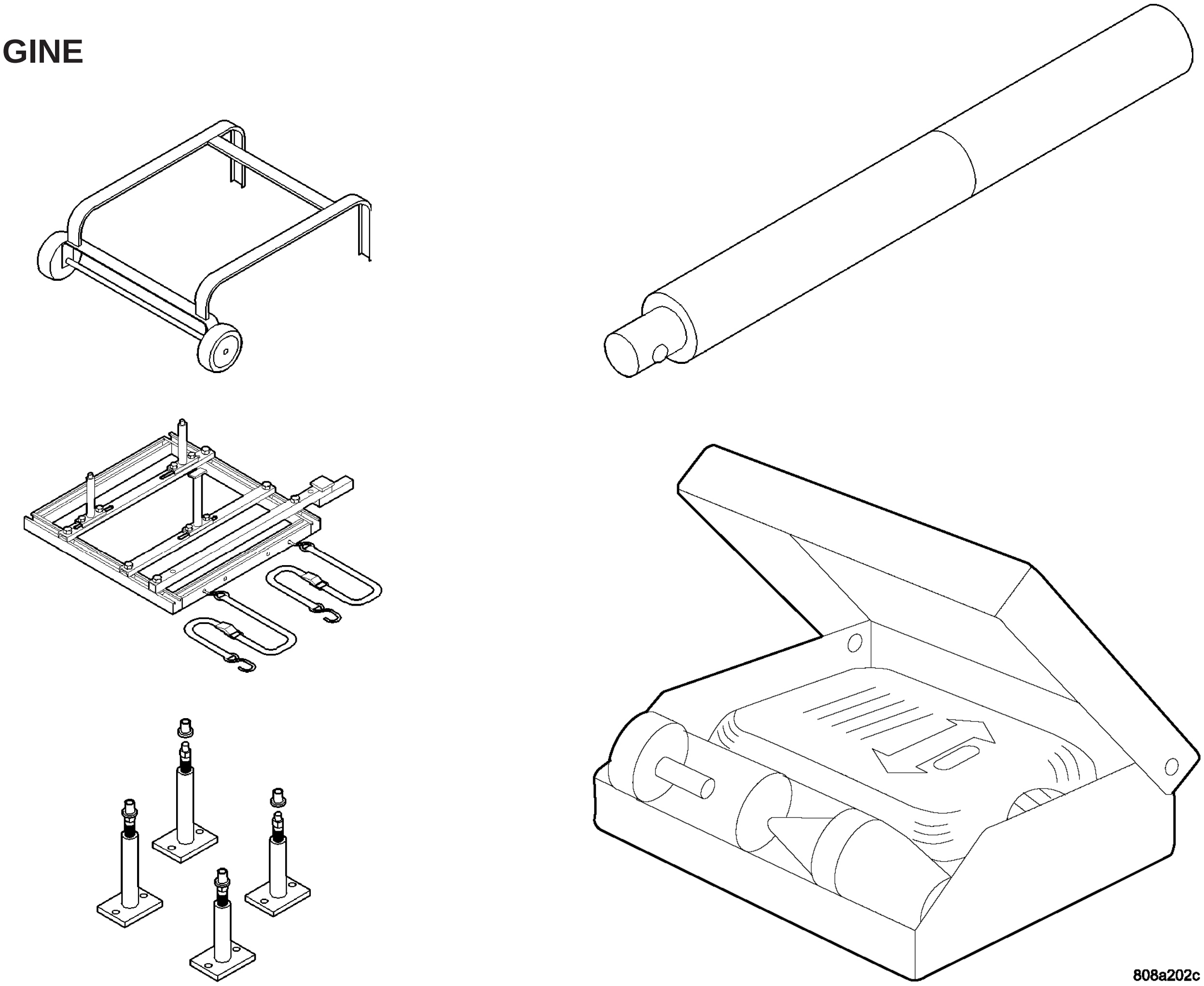
DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed*	25 kPa	4 psi
At 3000 rpm	170 - 550 kPa	25 - 80 psi
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 rpm.		

TORQUE

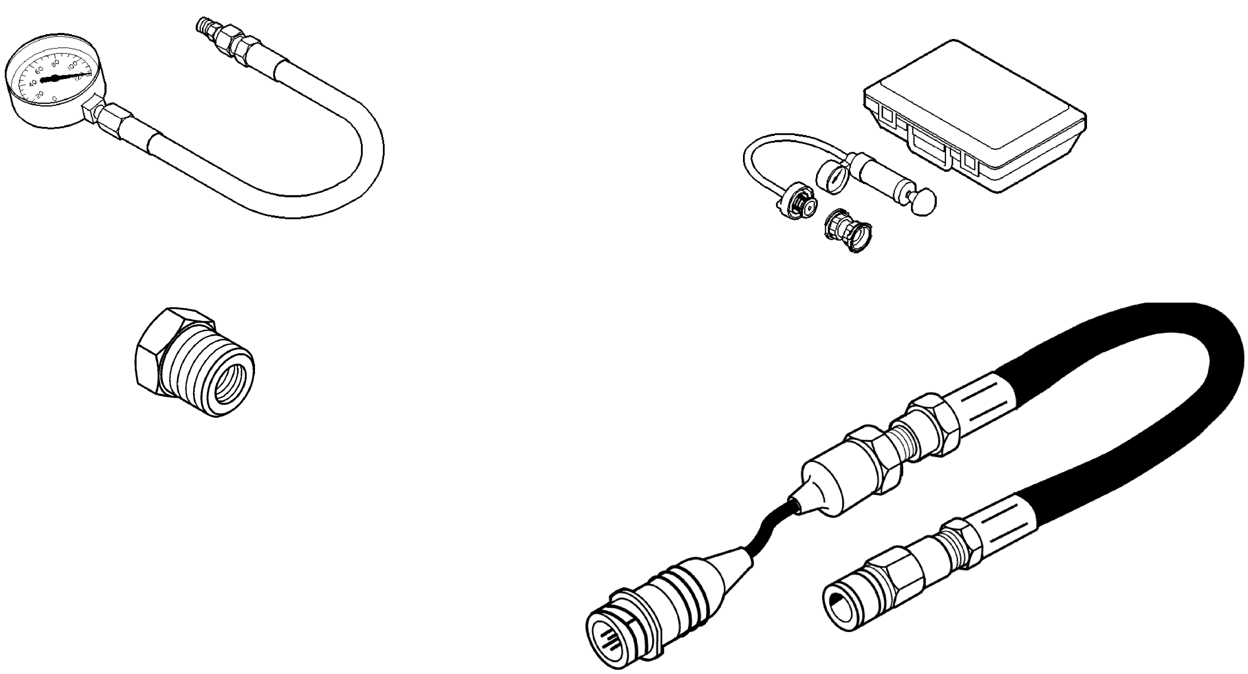
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Balance Shaft Module	22N·m +90°	16 +90°	-
Camshaft Sprocket-Bolt	40	30	-
Camshaft Bearing Cap-Bolts			
Front Bearing Cap-Bolts	34	25	-
Bearing Cap-Bolts	12	-	105
Connecting Rod Cap-Bolts	20 +90°	15 +90°	-
Crankshaft Main Bearing Cap-Bolts	27 + 45°	20 + 45°	-
Crankshaft Damper-Bolt	50 +68°	37 +68°	-
Cylinder Head-Bolts	Refer to Procedure		
Cylinder Head Cover-Bolts	10	-	90
Engine Support Bracket-Bolts	40	30	-
Exhaust Manifold-Bolts	34	25	-
Exhaust Manifold Heat Shield-Bolts	9	-	80
Flex Plate to Crankshaft-Bolts	95	70	-
Intake Manifold	24	18	-
Ladder Frame	28	21	-
Oil Cooler Connector Bolt	49	36	-
Oil Filter	14	10	-
Oil Filter Nipple	49	36	-
Oil Jet Fastener	12	-	105
Oil Pan-Bolts			
M6 Bolts	12 N·m	-	105
M8 Bolts	24 N·m	18-	-0
Oil Pan Drain-Plug	40	30	-
PCV Valve	5	-	40
Spark Plugs	27	20	-
Timing Chain Cover			
M6 Bolts	12 N·m	-	105
M8 Bolts	23 N·m	17	250?
Timing Chain Tensioner Assembly-Bolts	12 N·m	-	105
Timing Chain Guides	12 N·m	-	105

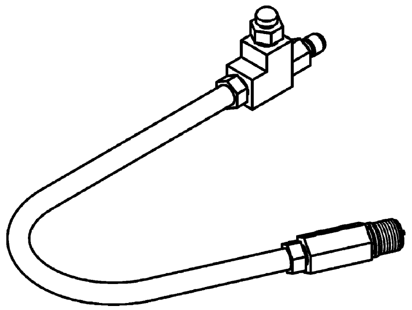
SPECIAL TOOLS

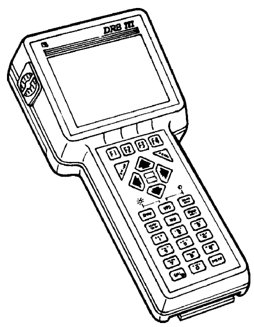
2.4L ENGINE

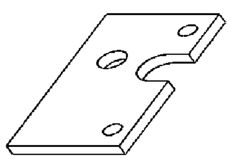


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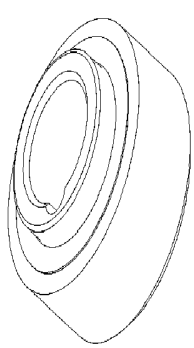




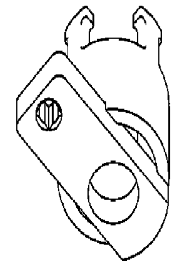




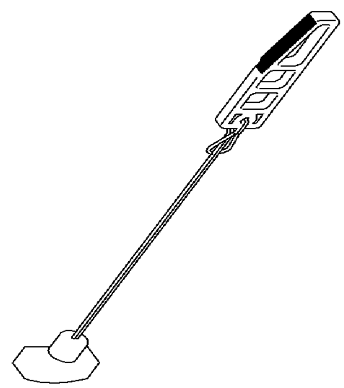
ENGINE LIFT FIXTURE 9704



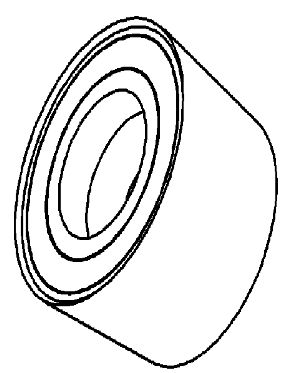
FRONT SEAL INSTALLER 9506



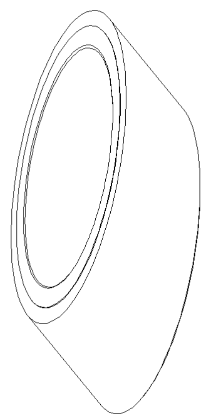
HOLDING FIXTURE 9707



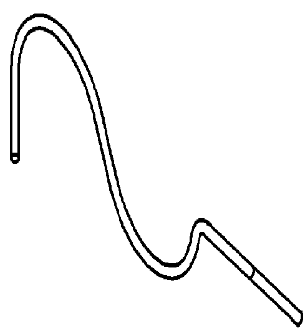
LOCKING WEDGE 9701



REAR CRANKSHAFT SEAL GUIDE 9509



REAR MAIN SEAL DRIVER 9706

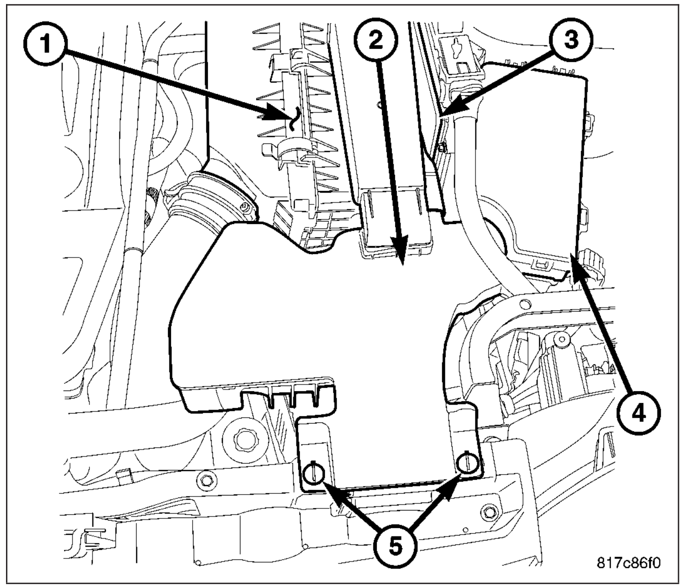


TENSIONER PIN 9703

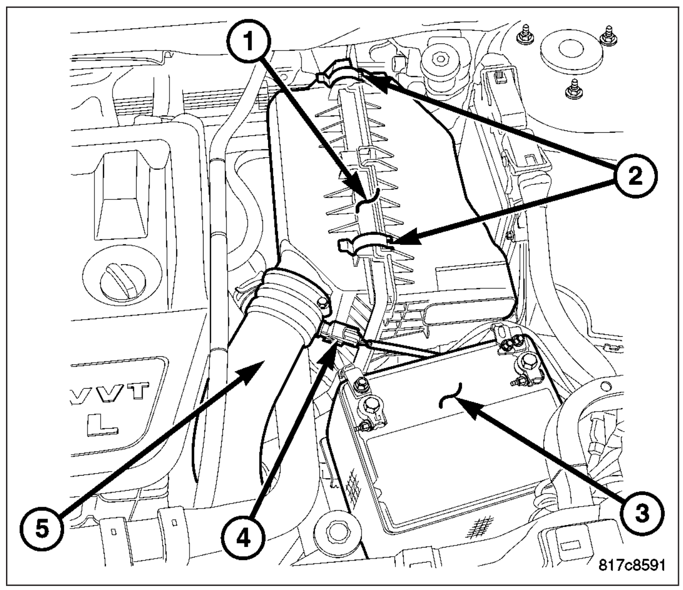
ELEMENT-AIR CLEANER

REMOVAL

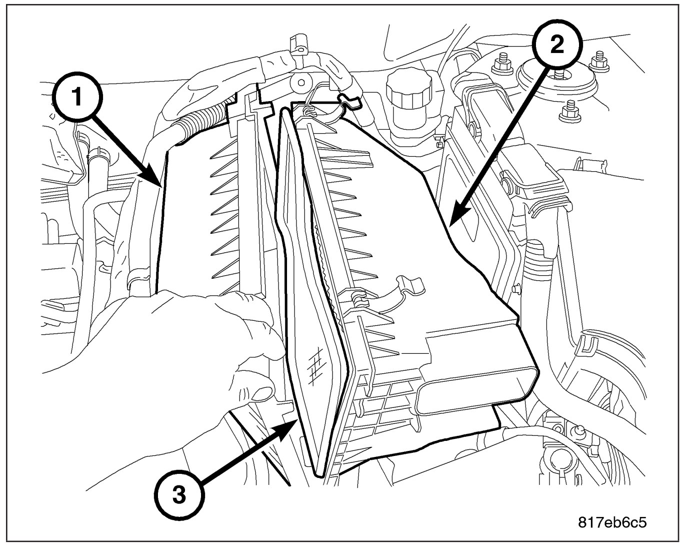
1. Turn Lock Retainers (5) and remove fresh air inlet (2) from air cleaner housing (1).



2. Disconnect intake air temperature sensor connector (4).
3. Remove Air inlet tube (5) from air cleaner housing (1).
4. Unfasten clasps (2) on sides of air cleaner housing cover (1).

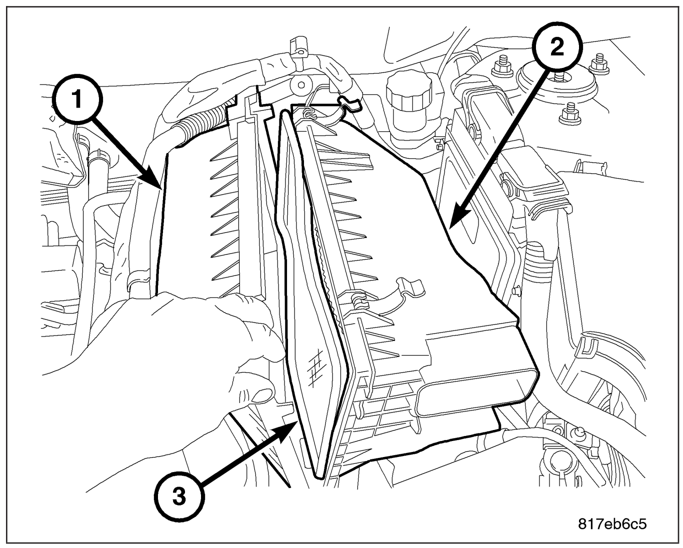


5. Pull air cleaner cover (1) aside.
6. Remove filter element (3).
7. If necessary, clean the inside of the air cleaner housing (2).

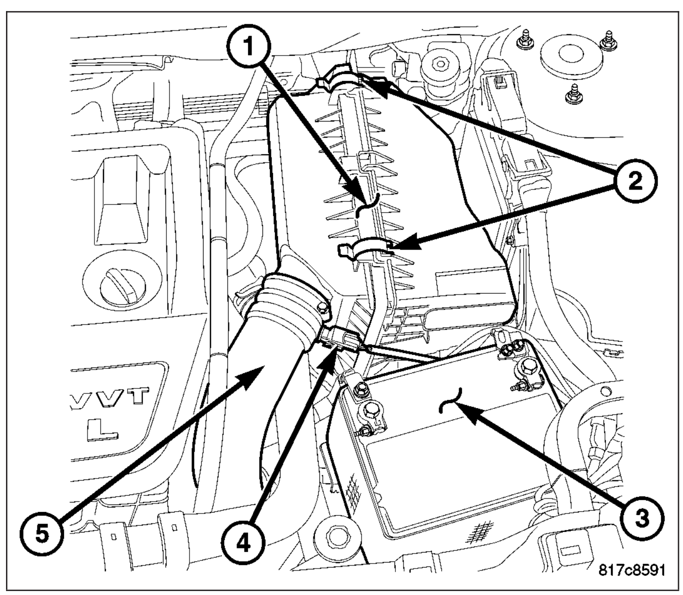


INSTALLATION

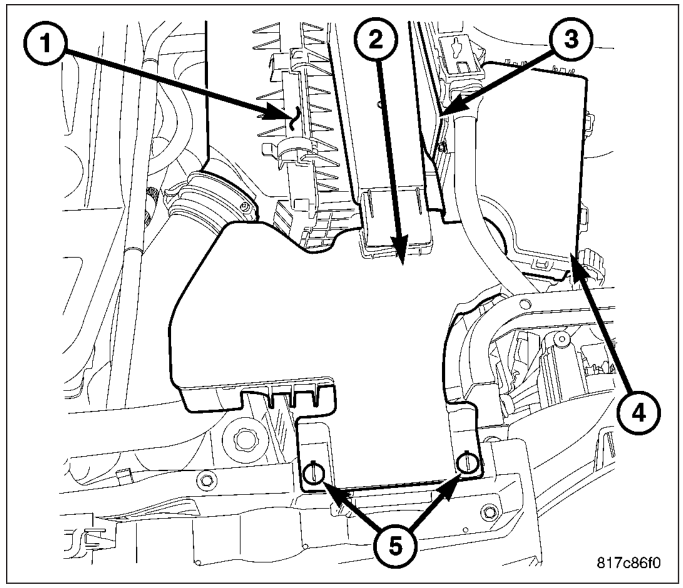
1. Install new filter element.



2. Place cover over air cleaner housing. Snap clasps (2) in place.
3. Install air inlet tube (5).
4. Connect intake air temperature sensor connector (4).



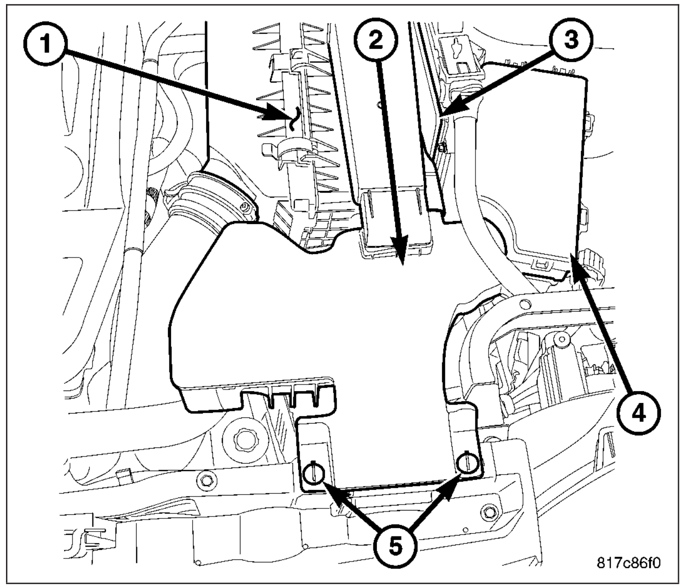
5. Install fresh air inlet (2) on air cleaner housing (1) and lock retainers (5).



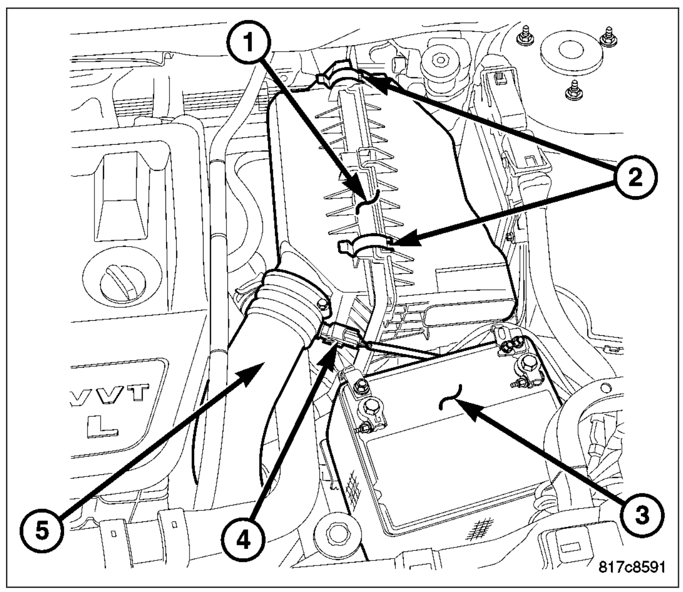
HOUSING-AIR CLEANER

REMOVAL

1. Remove fresh air inlet (2) from air cleaner housing (1).

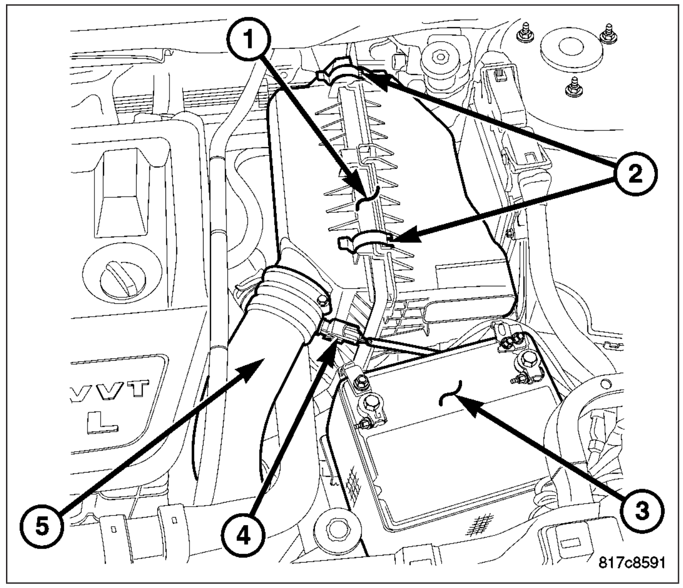


2. Remove intake air temperature sensor electrical connector (4).
3. Remove air inlet tube (5) from housing (1).
4. Pull housing (1) upward to remove.

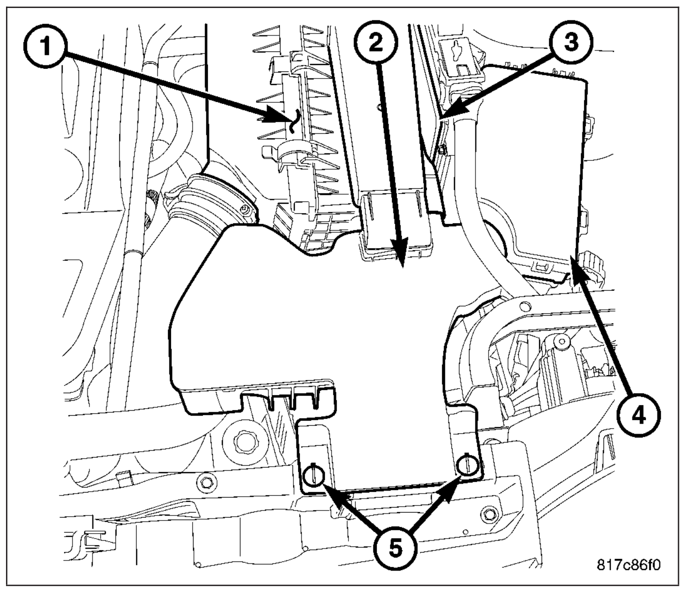


INSTALLATION

1. Make sure the rubber grommets, for the air cleaner housing lower pins, are in place when reinstalling the air cleaner housing. The rubber grommets mount to the PDC bracket.
2. Push air cleaner housing (1) down while aligning pins into the grommets.
3. Connect the throttle body air inlet hose (5) to the air cleaner housing (1).
4. Connect intake air temperature sensor connector (4).



5. Install fresh air inlet (2) and lock retainers (5).



CYLINDER HEAD

DESCRIPTION

The cross flow designed, aluminum cylinder head contains dual over-head camshafts with four valves per cylinder. The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries provide lubrication passages to the variable camshaft timing phasers, camshafts, and valve mechanisms.

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders, between a cylinder and the adjacent water jacket or from an oil passage to the exterior of the engine.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester’s pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

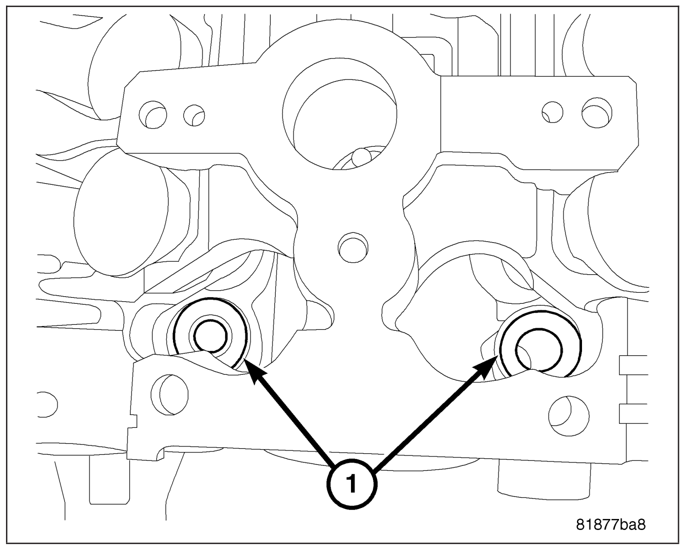
Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL - CYLINDER HEAD

1. Perform fuel system pressure release procedure **before attempting any repairs**
2. Remove clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect negative cable from battery.
4. Drain cooling system.
5. Remove engine cover.
6. Remove coolant recovery bottle.
7. Remove power steering pump and reposition.
8. Remove windshield washer bottle.
9. Disconnect breather hose.
10. Disconnect PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove valve cover.
13. Raise vehicle.
14. Remove right splash shield.
15. Set engine to TDC.
16. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor bolts if equiped.
18. Remove lower A/C compressor mount.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft and water pump pulleys.
21. Remove right side engine mount bracket lower bolt.
22. Remove timing chain cover lower bolts.
23. Disconnect oxygen sensor electrical connectors.
24. Remove exhaust pipe at manaverter (AWD).
25. Remove manaverter support bracket retaining bolts (AWD).
26. Lower vehicle.
27. Remove power steering pump and set aside.
28. Support engine with suitable jack.
29. Remove right engine mount.
30. Remove accessory drive upper idler pulley.
31. Remove right upper engine mount bracket.
32. Remove accessory drive belt tensioner.
33. Remove upper timing chain cover retaining bolts.
34. Remove timing chain cover.
35. Remove timing chain tensioner.
36. Remove timing chain.
37. Remove timing chain guides.
38. Disconnect fuel line at the fuel rail.
39. Disconnect fuel injector electrical connectors.
40. Disconnect top engine electrical connectors and reposition harness.
41. Remove fuel rail.
42. Remove lower intake manifold support bracket retaining bolt.

43. Disconnect electronic throttle control electrical connector.
44. Disconnect map sensor electrical connector.
45. Disconnect vacuum lines at intake.
46. Remove intake manifold retaining bolts.
47. Remove upper radiator hose retaining bolts.
48. Remove intake manifold.
49. Remove coolant outlet manifold and set aside.
50. Remove ground strap at right rear of cylinder head.
51. Remove oxygen sensor from maniverter (AWD).
52. Remove maniverter heat shields (AWD).
53. Remove maniverter retaining bolts (AWD).
54. Remove maniverter from cylinder head and reposition out of the way (AWD).
55. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

NOTE: All of the cylinder head bolts have captured washersEXCEPTthe front two (1).



56. Remove cylinder head bolts.
57. Remove cylinder head from engine block.
58. Inspect and clean cylinder head and block sealing surfaces. Refer to Cleaning and Inspection in this section for procedures.

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

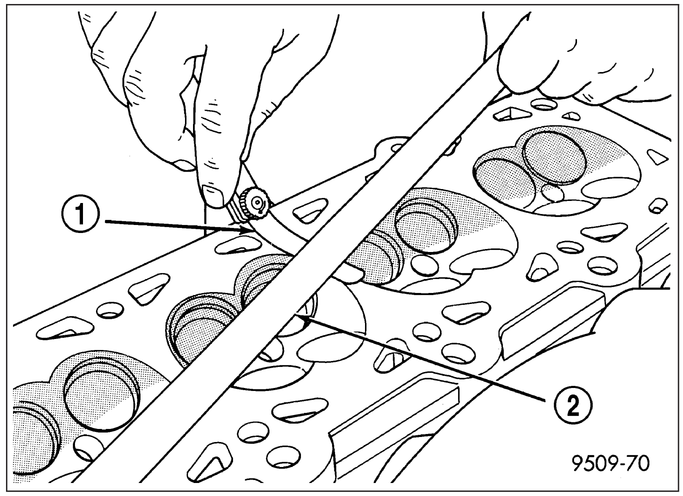
Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

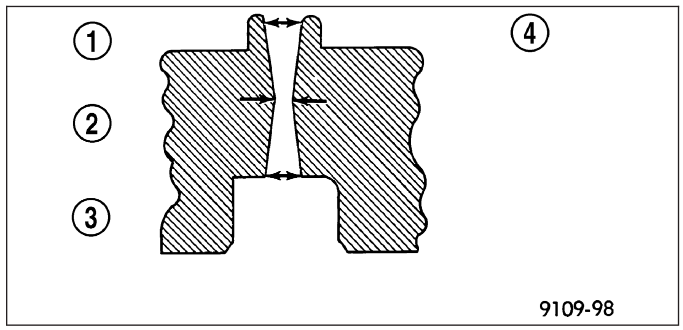
INSPECTION

NOTE: Replacement cylinder heads will come complete with valves, seals, springs, retainers, keepers, lash buckets, and camshafts.

1. Cylinder head must be flat within 0.1 mm (0.004 in.).



2. Inspect camshaft bearing journals for scoring.
3. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
4. Using a small hole gauge and a micrometer, measure valve guides in 3 places top (1), middle (2), and bottom (3). (Refer to 9 - ENGINE - SPECIFICATIONS) Replace guides if they are not within specification.
5. Check valve guide height.
6. Prior to installing cylinder head, the cylinder block should be checked for flatness (Refer to 9 - ENGINE/ENGINE BLOCK - INSPECTION).

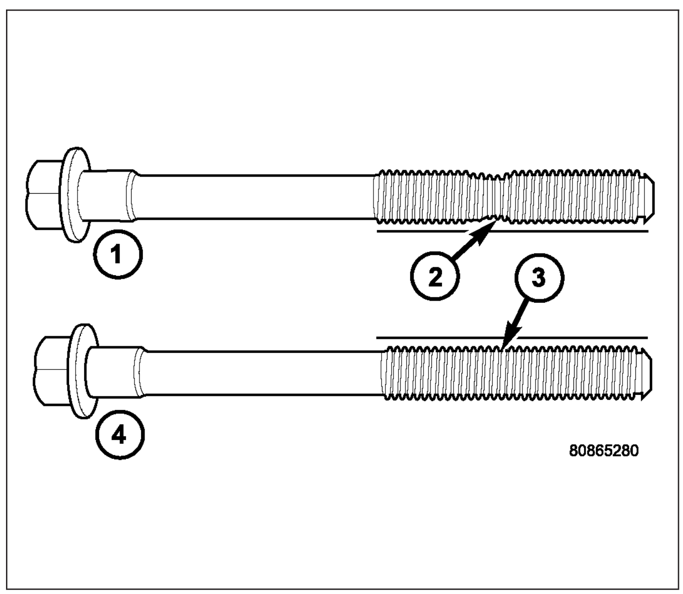


INSTALLATION - CYLINDER HEAD

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

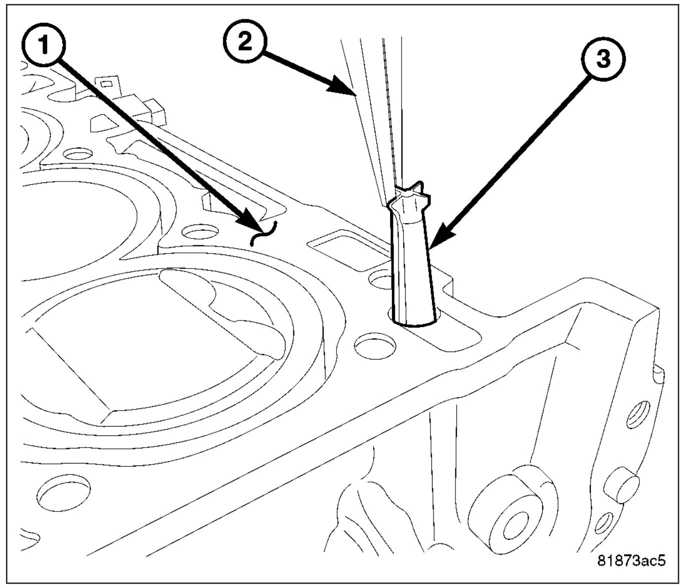
NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced.

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2), the bolt should be replaced.

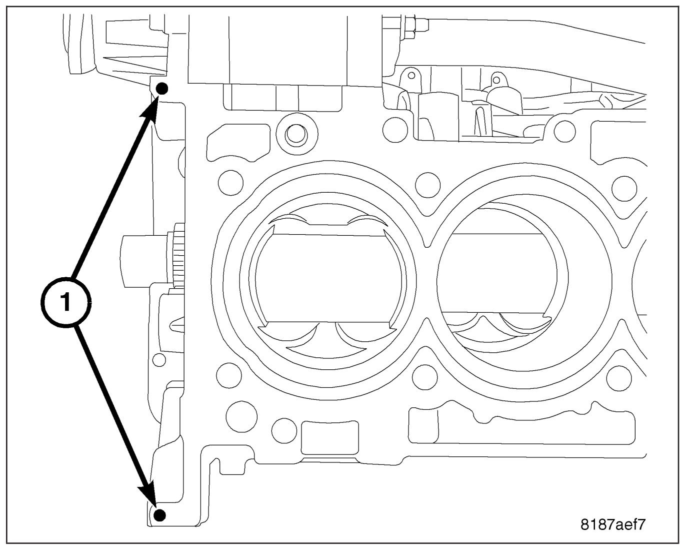


CAUTION: Always replace the variable valve timing filter screen (3) when servicing the head gasket or engine damage could result.

1. Replace the variable valve timing filter screen (3).



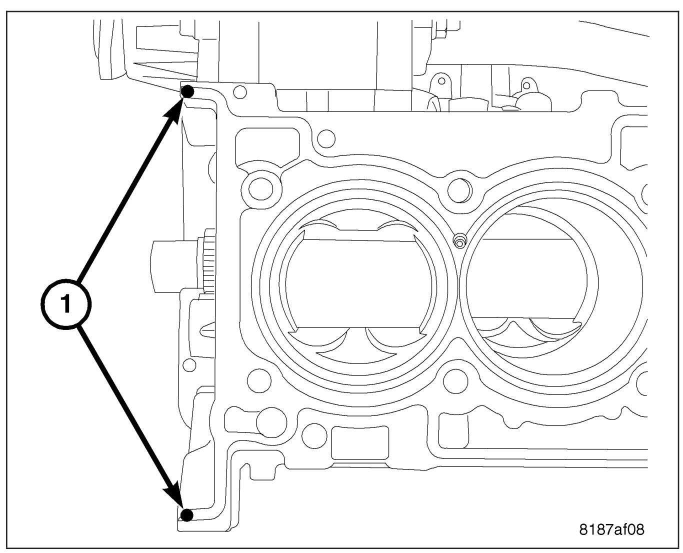
2. Place two pea size dots of RTV (1) on cylinder block as shown.



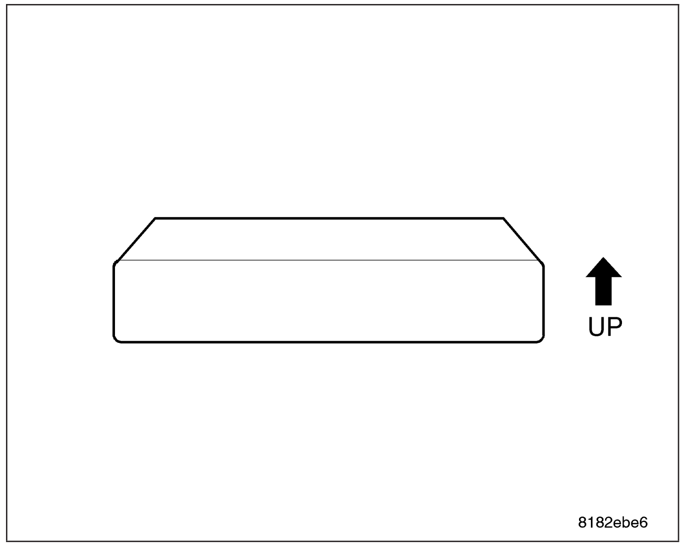
3. Position the new cylinder head gasket on engine block with the part number facing up. Ensure gasket is seated over the locating dowels in block.
4. Place two pea size dots of RTV (1) on cylinder head gasket as shown.

NOTE: The head must be installed within 15 minutes before the RTV skins.

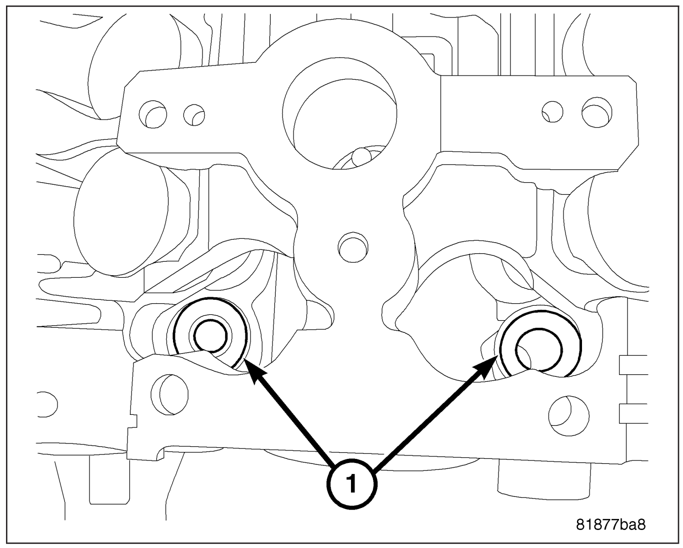
5. Position cylinder head onto engine block.



NOTE: The front two cylinder head bolts do not have captured washers. The washers must be installed with the bevel up towards the bolt head.



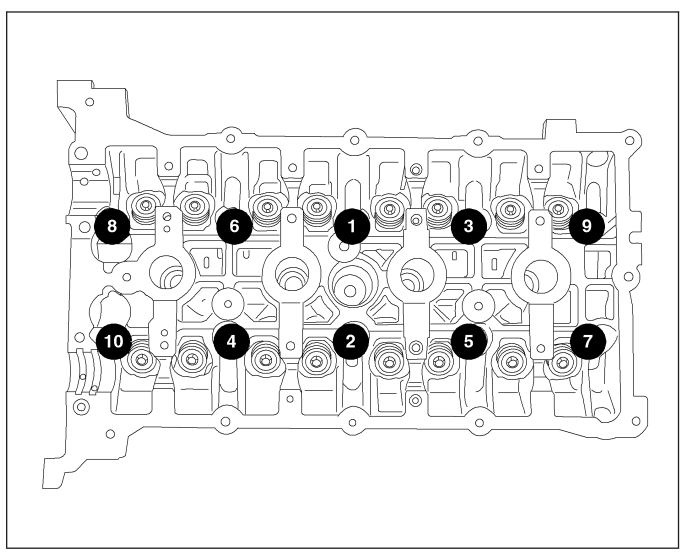
6. Install washers (1) for the front two cylinder head bolts.



7. Before installing the bolts, the threads should be lightly coated with engine oil.
8. Install the cylinder head bolts and torque in the sequence shown above.
   - First: All to 30 N·m (25 ft. lbs.)
   - Second: All to 61 N·m (50 ft. lbs.)
   - Third: All to 61 N·m (45 ft. lbs.)
   - Fourth: All an additional 90°

CAUTION: Do not use a torque wrench for the Fourth step.

9. Install camshafts. (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).



10. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER - INSTALLATION).
11. Install maniverter/exhaust manifold to cylinder head. Torque fasteners to 34 N·m (25 ft.lbs.).
12. Install heat shields.Torque fasteners to 9 N·m ( ).

13. Install oxygen sensor in maniverter.
14. Install ground strap at right rear of cylinder head.
15. Install coolant manifold.
16. Install intake manifold.
17. Install intake manifold bolts and torque to 24 N·m (18 ft.lbs.).
18. Install upper radiator hose retaining bracket.
19. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
20. Install timing chain cover, torque m6 bolts to 12 N·m (105 in.lbs.) and m8 bolts to 23 N·m (17 ft.lbs.).
21. Connect cam sensor wiring connector.
22. Install spark plugs and torque to 27 N·m (20 ft.lbs.).
23. Install ignition coils and torque to 8 N·m (70 in.lbs.).
24. Install power steering pump reservoir/bracket to cylinder head.
25. Install exhaust pipe to manifold. Torque fasteners to 28 N·m (20 ft. lbs.).
26. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
27. Connect engine coolant temperature sensor connector.
28. Connect upper radiator hose. Connect heater hoses to thermostat housing.
29. Install heater tube support bracket to cylinder head.
30. Install fastener attaching dipstick tube to lower intake manifold
31. Connect fuel supply line quick-connect at the fuel rail assembly (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
32. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
33. Connect negative cable to battery.
34. Install clean air hose and air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

CAMSHAFT(S)

DESCRIPTION

Both camshafts have six bearing journal surfaces and two cam lobes per cylinder. Flanges on the third journal control camshaft end play. Cam position sensors are located on the intake and exhaust camshafts on the rear of the cylinder head.

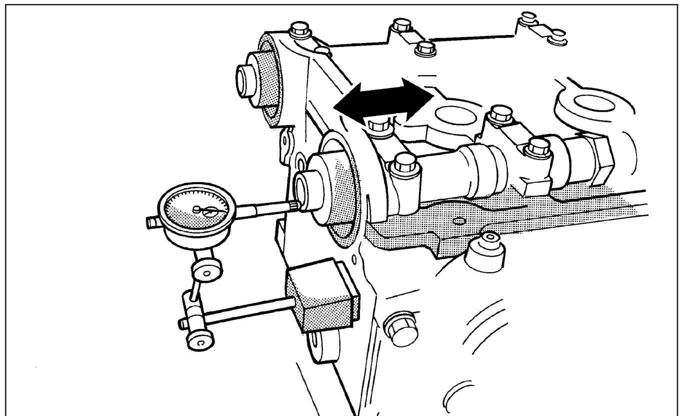
OPERATION

The camshaft is driven by the crankshaft via drive sprockets and a chain. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

STANDARD PROCEDURE

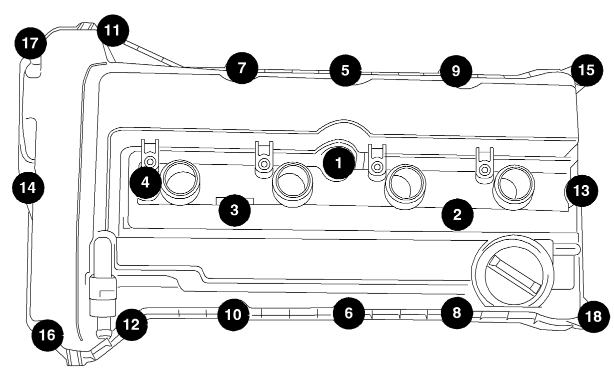
MEASURING CAMSHAFT END PLAY

1. Using a suitable tool, move camshaft as far rearward as it will go.
2. Zero dial indicator.
3. Move camshaft as far forward as it will go.
4. Record reading on dial indicator. For end play specification, (Refer to 9 - ENGINE - SPECIFICATIONS).
5. If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

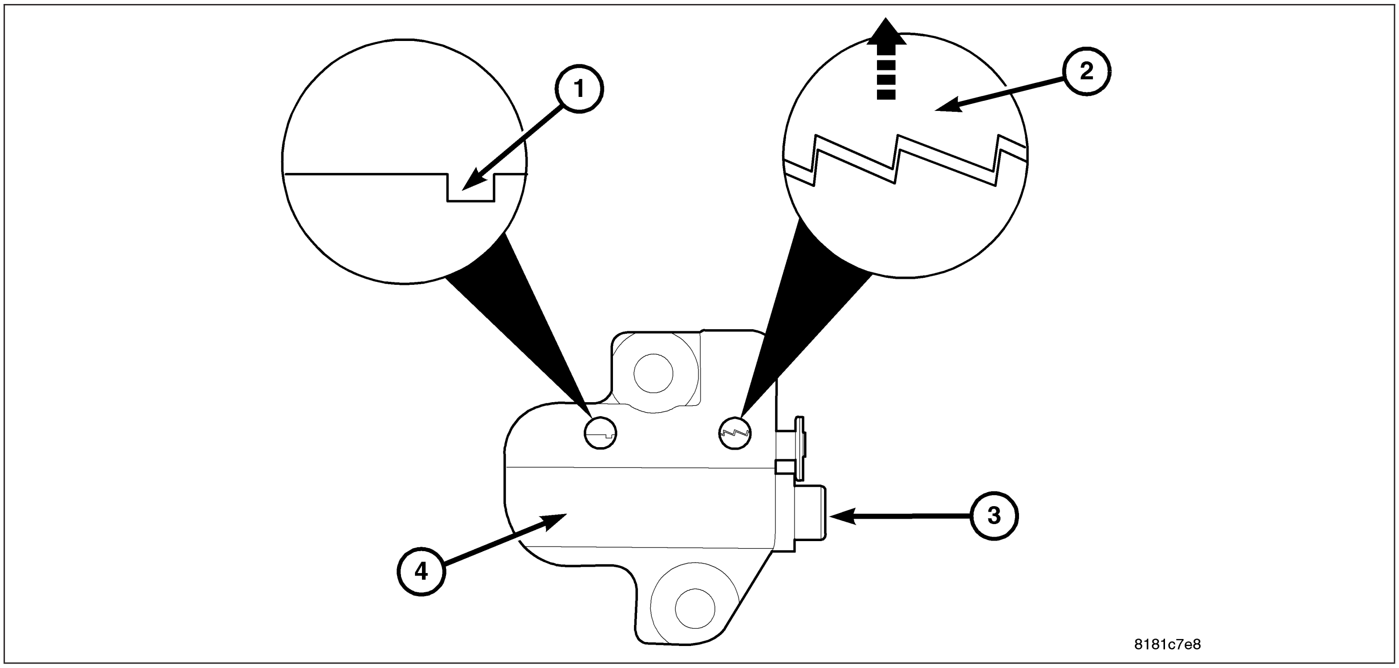

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REMOVAL

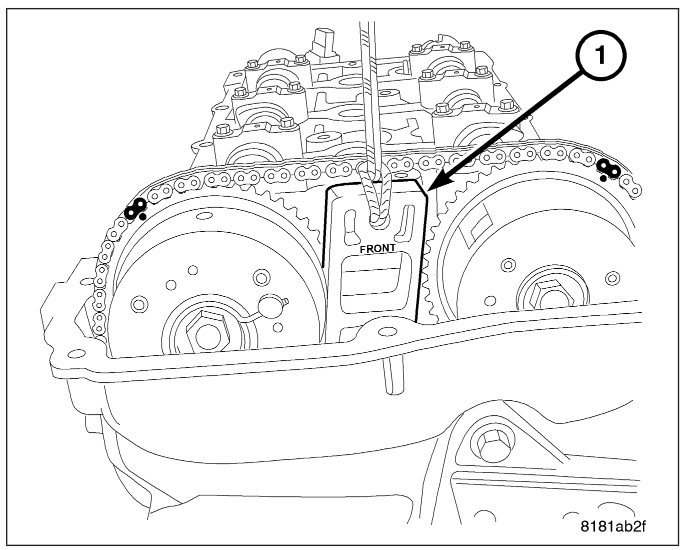
1. Remove engine cover by pulling upward.
2. Disconnect negative battery cable.
3. Remove cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Raise vehicle.
5. Remove right splash shield.



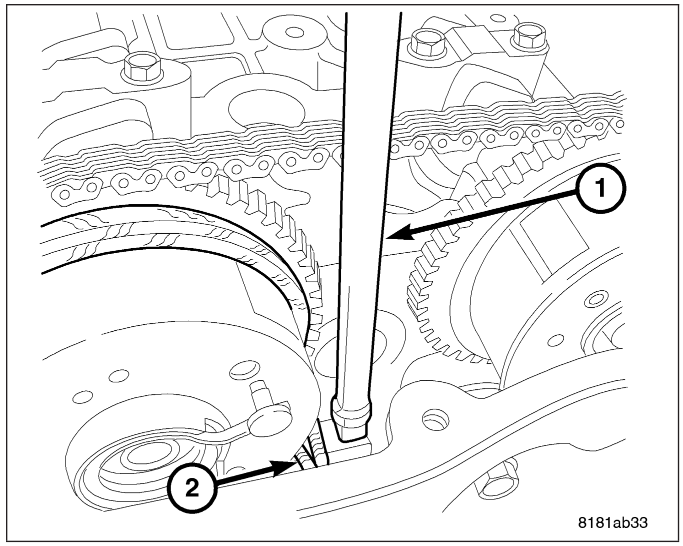
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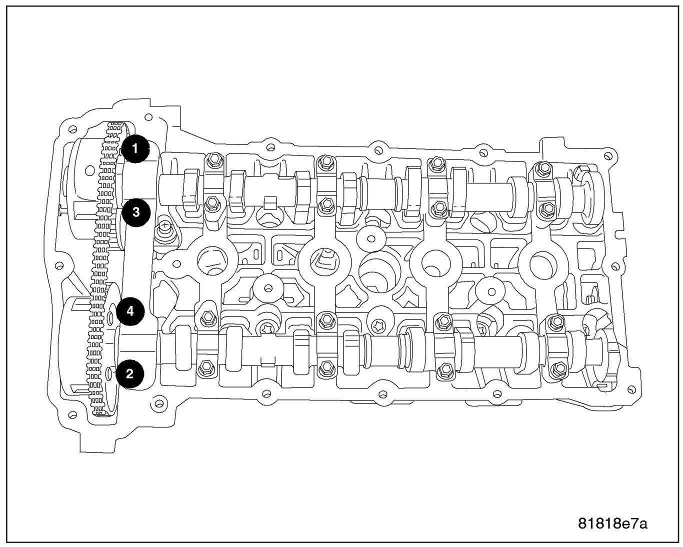
6. Remove timing tensioner plug from front cover.
7. Insert small allen wrench and lift ratchet (2) upward to release the tensioner. Leave the allen wrench installed during the remainder of this procedure.
8. Insert wedge 9701 (1).



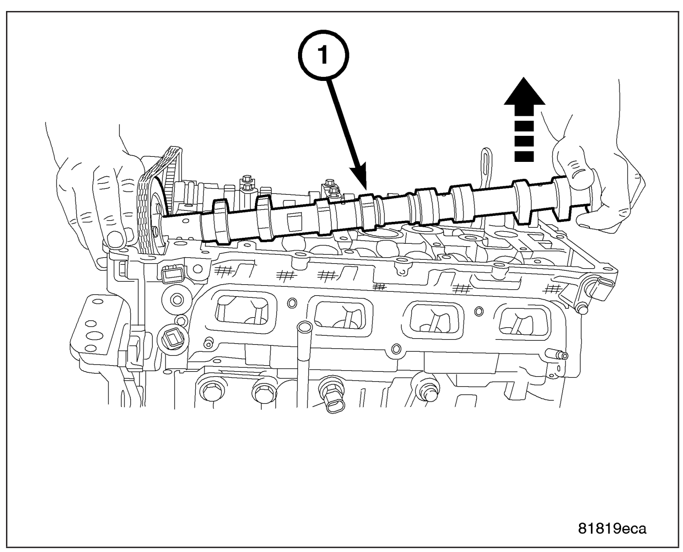
9. Lightly tap Wedge 9701(2) into place.



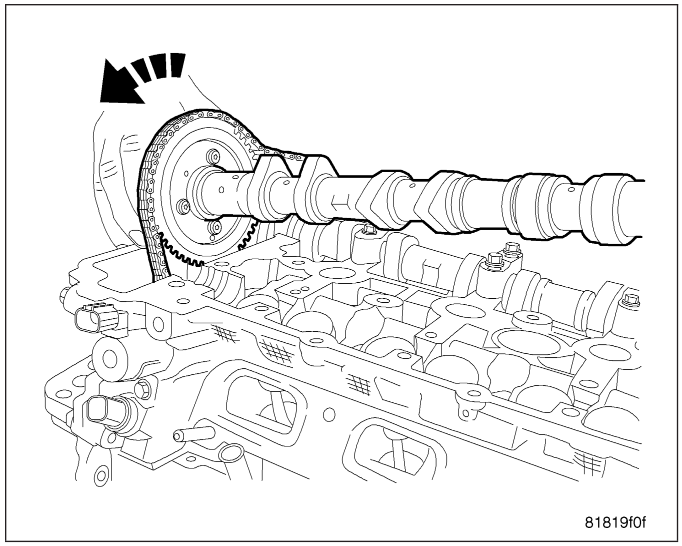
10. Remove the front camshaft bearing cap.
11. Slowly remove the remaining camshaft bearing bolts one turn at a time following the above sequence.



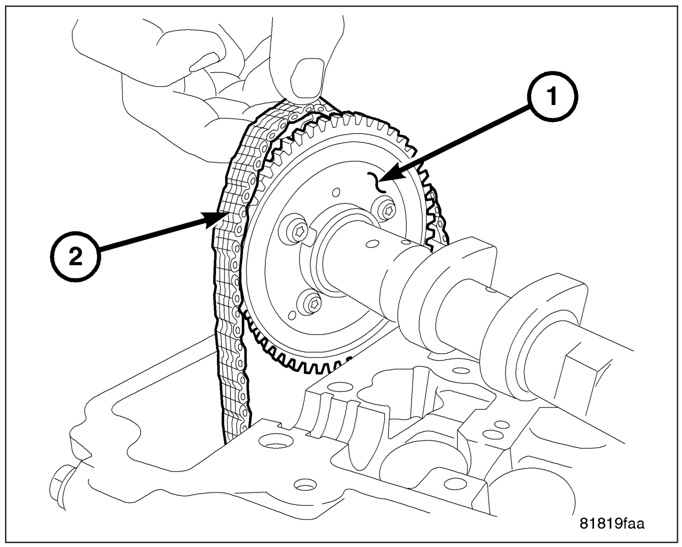
12. Remove intake camshaft (1) by lifting the rear of the camshaft upward.



13. Rotate the camshaft while lifting out of the front bearing cradle.



14. Lift the timing chain (2) off the sprocket (1).
15. Remove exhaust camshaft.



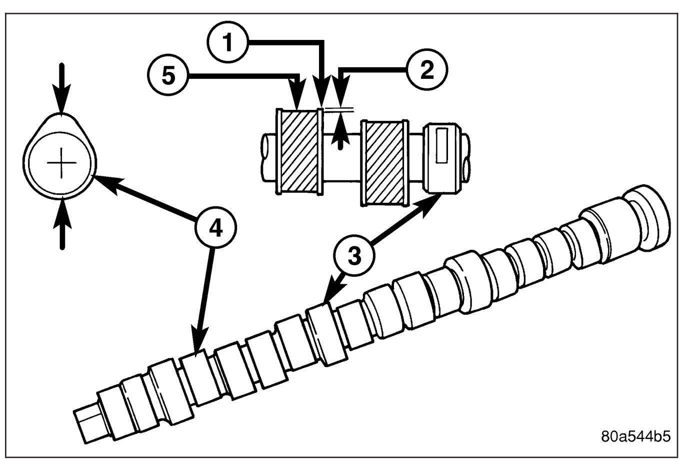
CLEANING

Clean camshafts with a suitable solvent.

INSPECTION

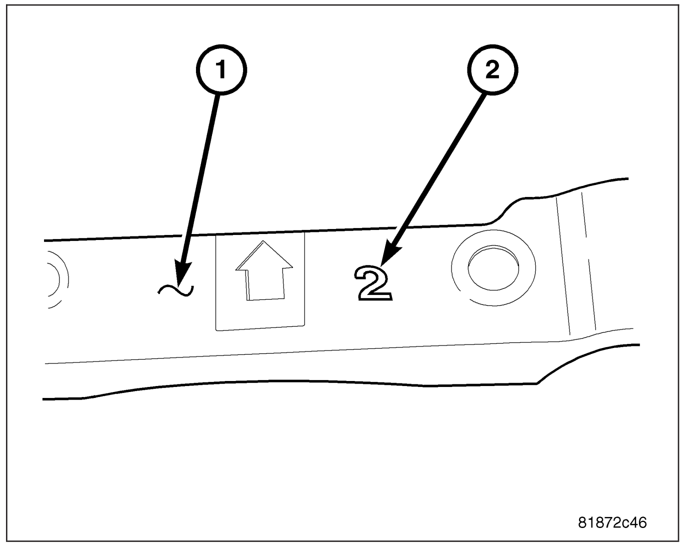
1. Inspect camshaft bearing journals for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Check the cam lobe and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the lash buckets.

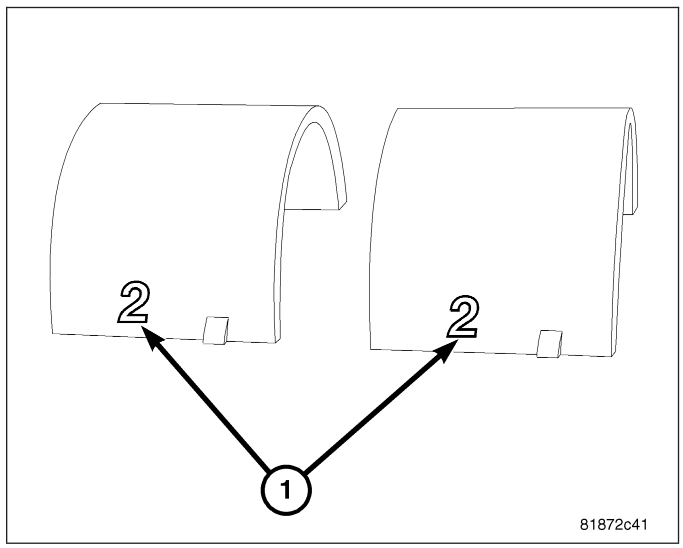


INSTALLATION

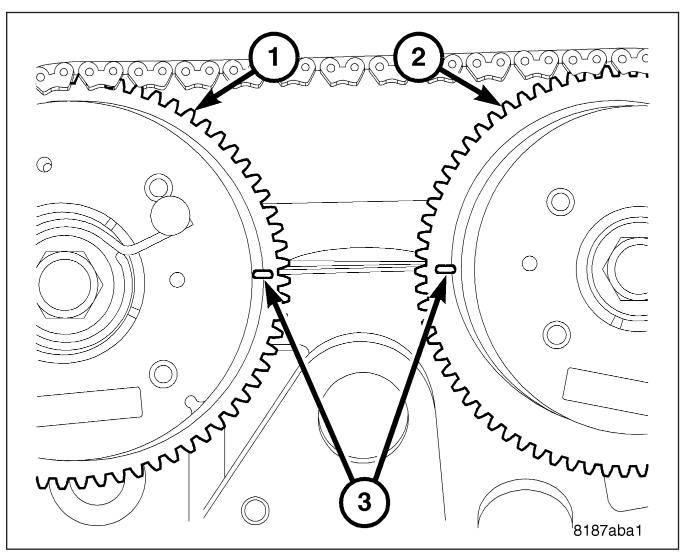
1. Identify which front cam cap (1) is installed on the engine you are working on.
2. The cam cap (1) is numbered (2) either one, two, or three, this corresponds to the select fit bearing to use.



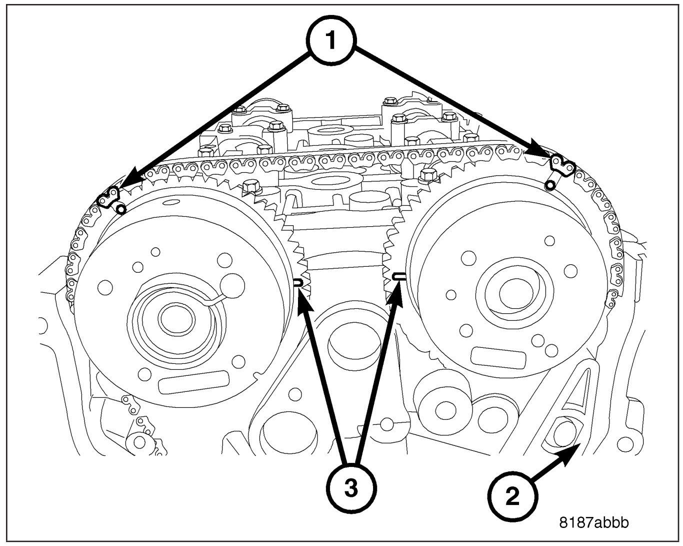
3. Install the corresponding select fit bearing that will also be numbered (1) one, two, or three.
4. Oil all of the camshaft journals with clean engine oil.
5. Install exhaust camshaft and position on bearing journals in the cylinder head.



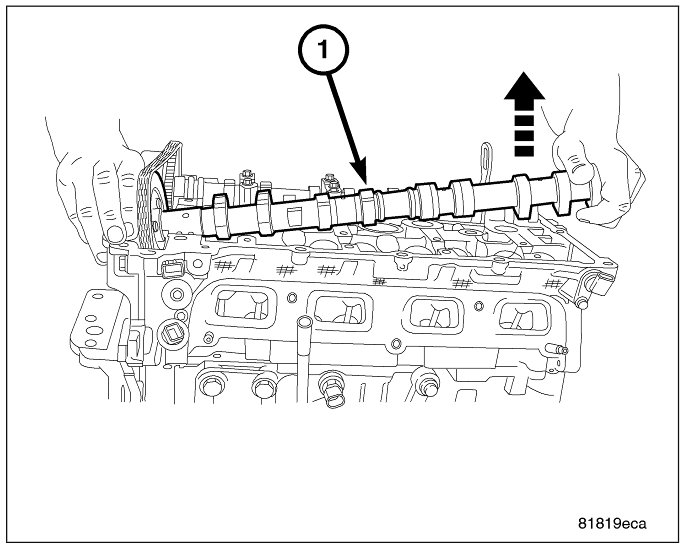
6. Align exhaust cam timing mark so it is parallel to the cylinder head as shown.



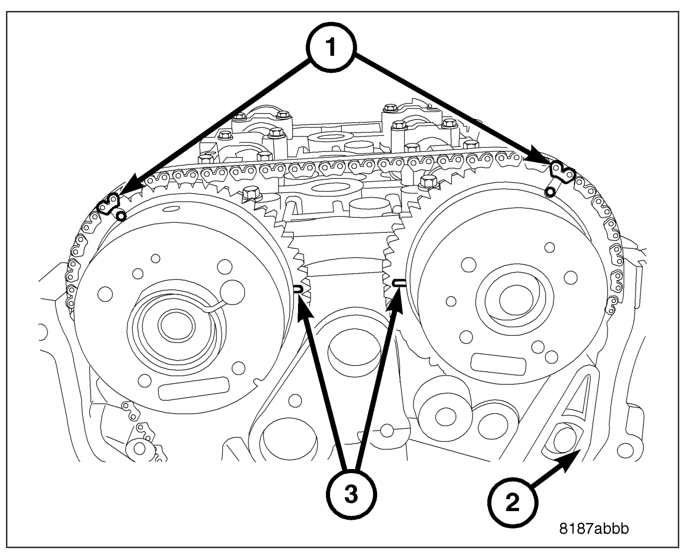
7. Install timing chain onto exhaust cam sprocket making sure that the timing marks (1) on the sprocket and chain are aligned.



8. Install intake camshaft by raising the rear of the camshaft upward and roll the sprocket into the chain.



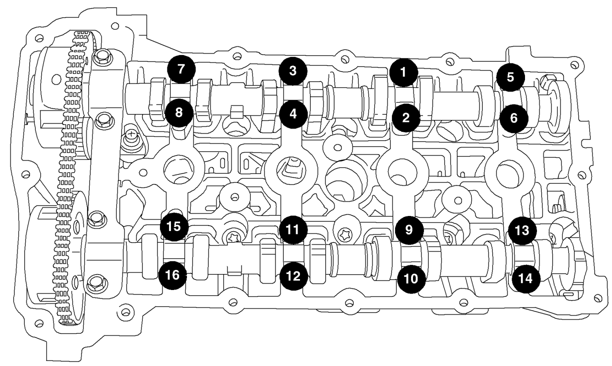
9. Align the timing marks (1) on the intake cam sprocket with the mark in the chain.
10. Position the intake camshaft into the bearing journals in the cylinder head.
11. Verify that the timing marks (1) are aligned on both camshafts and that the timing marks (3) are parallel with the cylinder head.



CAUTION: Install the front intake and exhaust camshaft bearing cap last. Ensure that the dowels are seated and follow torque sequence or damage to engine could result.

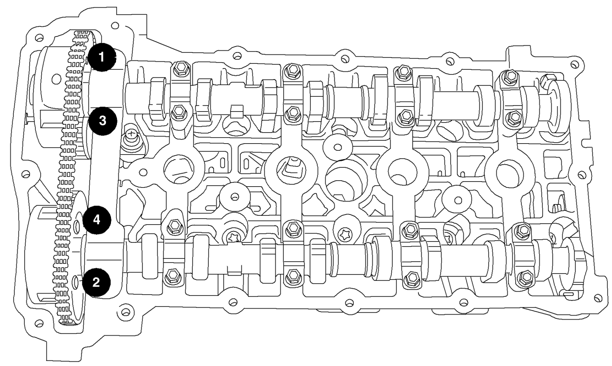
NOTE: If the front camshaft bearing cap is broken, the cylinder head MUST be replaced.

12. Install intake and exhaust camshaft bearing caps slowly torque bolts in the sequence shown.



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13. Install the front intake and exhaust bearing cap and torque bolts in the sequence shown.
14. Verify that all timing marks are aligned.
15. Remove allen wrench from timing chain tensioner.
16. Remove locking wedge 9701.
17. Apply MOPAR® thread sealant to timing tensioner plug and Install.
18. Install right splash shield.
19. Install cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
20. Install engine cover.
21. Connect negative battery cable.
22. Fill cooling system.
23. Fill with oil.
24. Start engine and check for leaks.

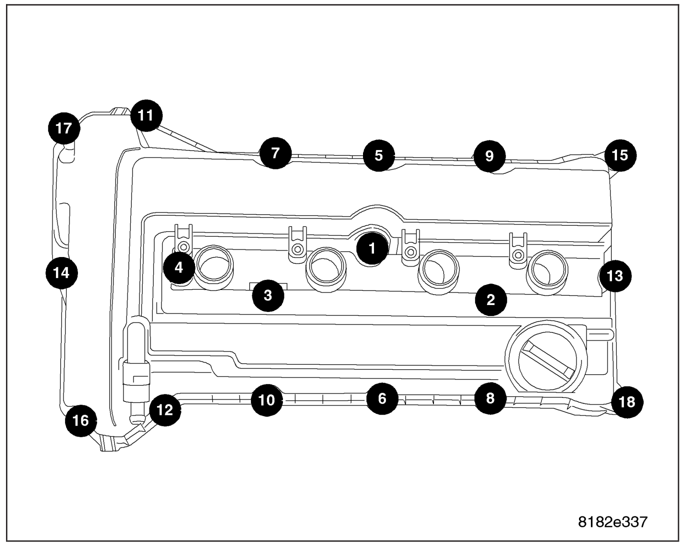


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COVER-CYLINDER HEAD

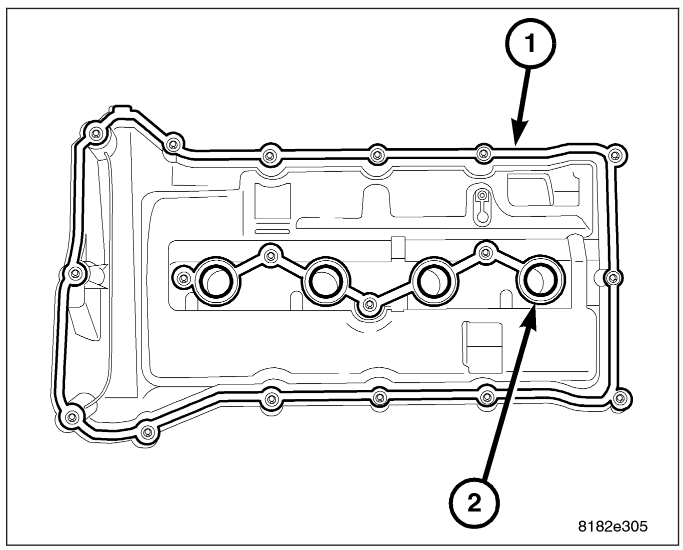
REMOVAL

1. Remove engine cover.
2. Disconnect ignition coil electrical connectors.
3. Disconnect PCV and make-up air hoses from cylinder head cover.
4. Use compressed air to blow dirt and debris off the cylinder head cover prior to removal.
5. Remove cylinder head cover bolts.
6. Remove cylinder head cover from cylinder head.

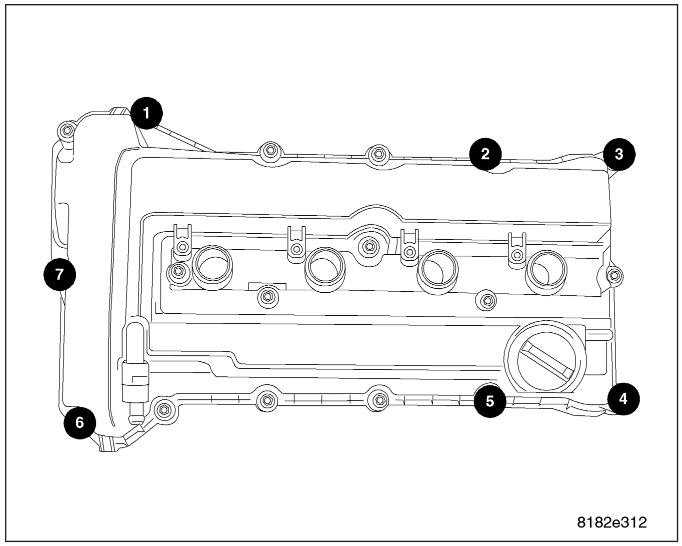


INSTALLATION

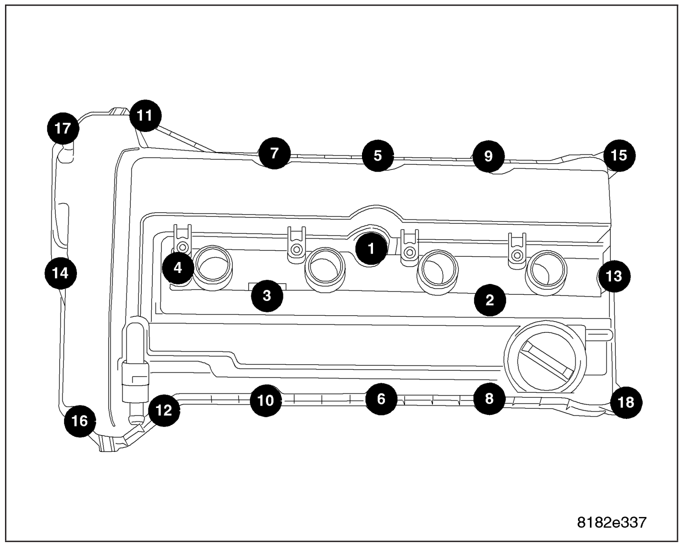
1. Install new cylinder head cover gaskets (1,2).



2. Install studs in cover as shown.



3. Clean all RTV from cylinder head.
4. Apply RTV to cylinder head/front cover joint.
5. Install cylinder head cover assembly to cylinder head and install all bolts, ensuring the studs are located as shown.
6. Tighten bolts in sequence shown in Using a 2 step torque method as follows:
   a. Tighten all bolts to 4.5 N·m (40 in. lbs.)
   b. Tighten all bolts to 10 N·m (90 in. lbs.).
7. Install ignition coils. Tighten fasteners to 8 N·m (70 in. lbs.).
8. If the PCV valve was removed, tighten PCV valve to 4.5 N·m (40 in. lbs.).
9. Connect PCV and make-up air hoses to cylinder head cover.
10. Install engine cover.



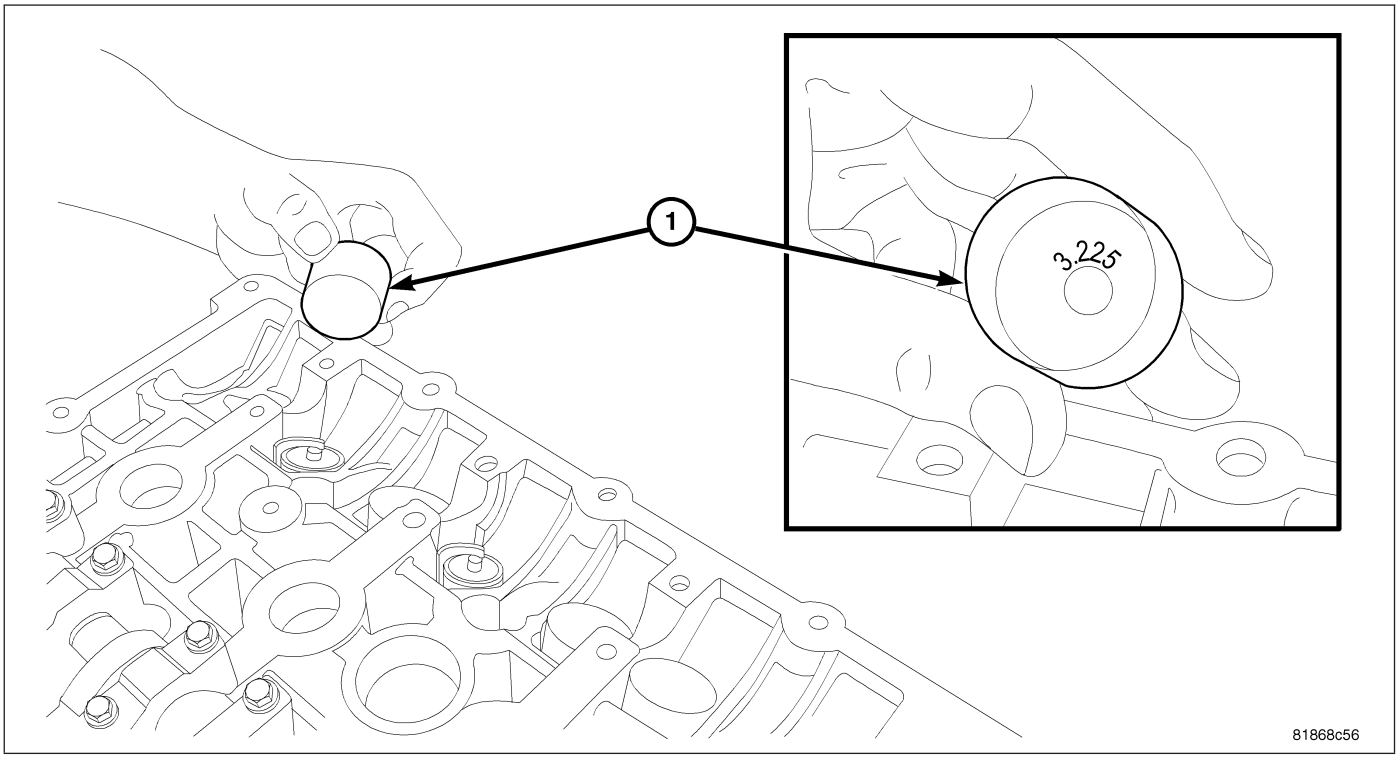
TAPPETS-VALVE

DIAGNOSIS AND TESTING

MECHANICAL VALVE TAPPET NOISE DIAGNOSIS

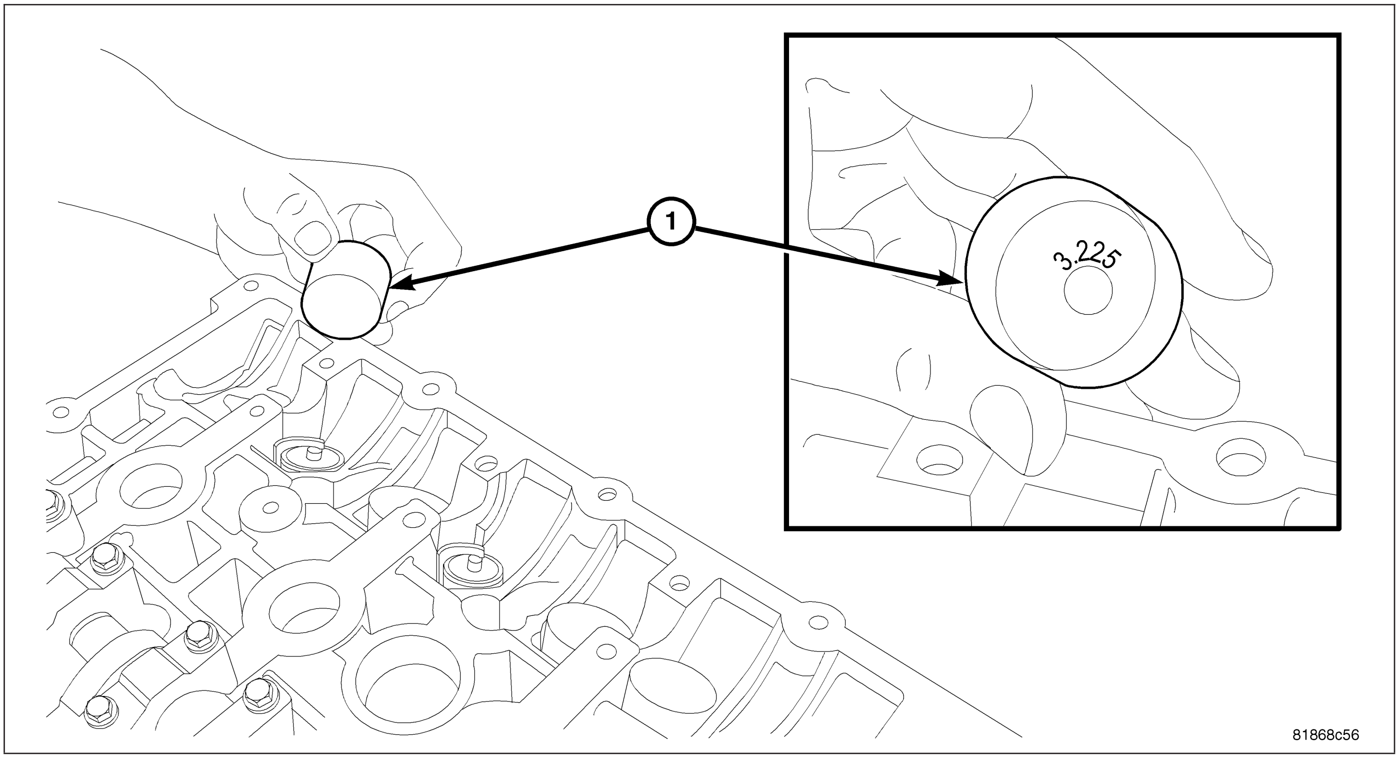
A tappet-like noise may be produced from several items. Check the following items.

STANDARD PROCEDURE - MEASURING VALVE LASH



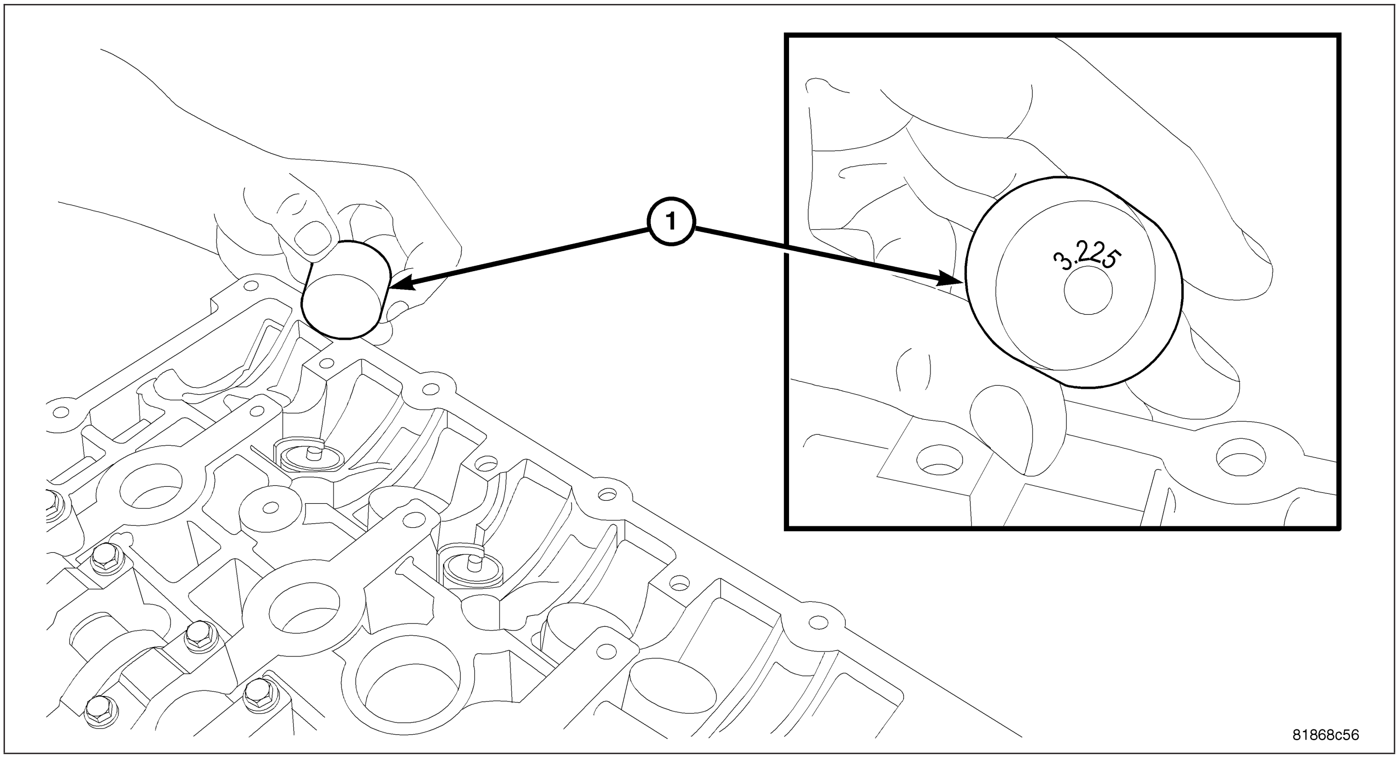
1. Remove engine cover.
2. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
3. Rotate camshaft so lobes are vertical.
4. Check clearance using feeler gauges.
5. Repeat for all tappets.
6. If clearance was too small Clearance too Small .
7. If clearance was too large Clearance too Large .

Clearance too Small



1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. spec – measured = delta
3. Decrease bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

Clearance too Large



1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Measured – spec = delta
3. Increase bucket thickness by delta.
4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Verify that valve lash is correct.

REMOVAL

NOTE: This procedure is for in-vehicle service with camshafts installed.

NOTE: Camshaft buckets must be replaced if cylinder head or camshafts are replaced.

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Remove camshaft buckets.
4. Repeat removal procedure for each camshaft bucket.
5. If reusing, mark each camshaft bucket for reassembly in original position.

INSTALLATION

NOTE: If reinstalling original buckets they must go back in their original location or engine damage could result.

1. Apply a light coat of clean engine oil to camshafts buckets prior to assembly.
2. Install camshaft bucket into cylinder head.
3. Repeat installation procedure for each camshaft bucket.

NOTE: If installing new buckets, the valve lash procedure must be performed.

4. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
5. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVES & SEATS-INTAKE/EXHAUST

DESCRIPTION

The valves are made of heat resistant steel. They have nitrided stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves have a single bead lock keepers to retain the springs.

OPERATION

The four valves per cylinder (two intake and two exhaust) are opened by using direct acting buckets which are actuated by the camshaft.

CLEANING

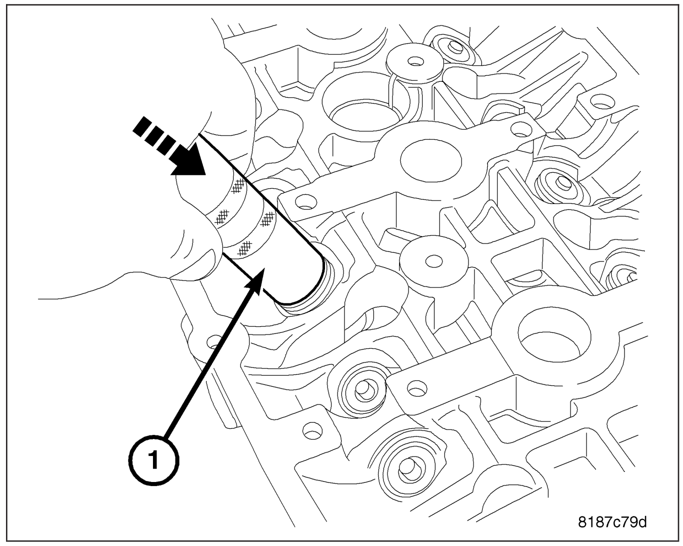
1. Clean all valves thoroughly and discard burned, warped and cracked valves.

SPRINGS & SEALS-VALVE

REMOVAL

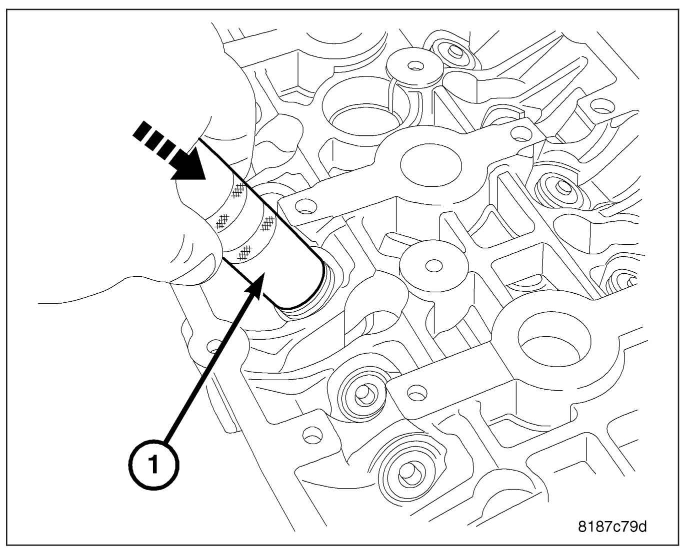
CYLINDER HEAD ON

1. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
3. Rotate crankshaft until piston is at TDC on compression.
4. With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.
5. Using metric valve keeper remover (1), and remove valve spring keepers and retainer.
6. Remove valve spring(s).
7. Remove valve stem seal(s) by a using valve stem seal tool.



CYLINDER HEAD OFF

1. With cylinder head removed from cylinder block, place a ball of rags in the combustion chamber.
2. Using Snap On metric valve keeper remover (1) or equivalent, remove valve keepers with a downward push.
3. Remove retainer and springs.
4. Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves, locks and retainers to insure installation in original location.
5. Inspect the valves. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSPECTION).



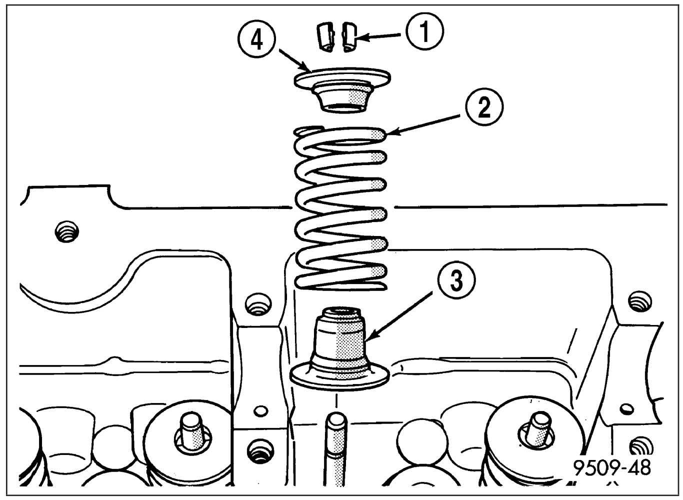
INSPECTION

1. Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:
   - Valve Closed Nominal Tension—75 lbs. @ 38.0 mm (1.50 in.)
   - Valve Open Nominal Tension—134 lbs. @ 29.75 mm (1.17 in.)
2. Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

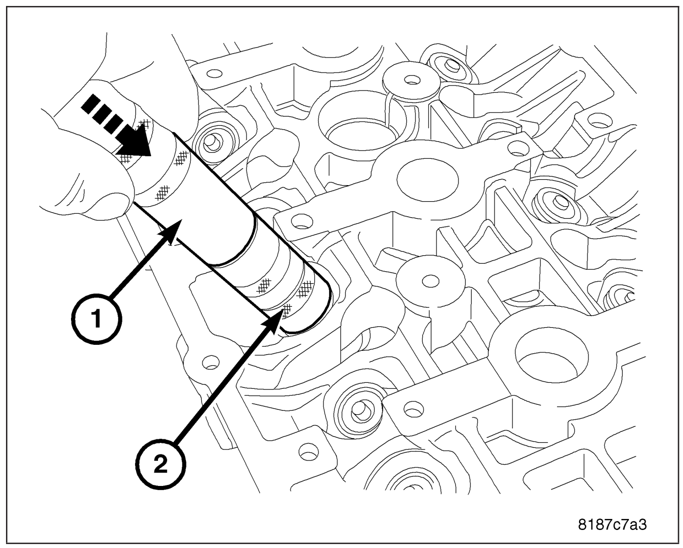
INSTALLATION

CYLINDER HEAD ON

1. Install valve seal/valve spring seat (3) assembly. Push the assembly down with appropriate size socket to seat it onto the valve guide.
2. Install valve spring (2) and retainer (4) with keepers (1).

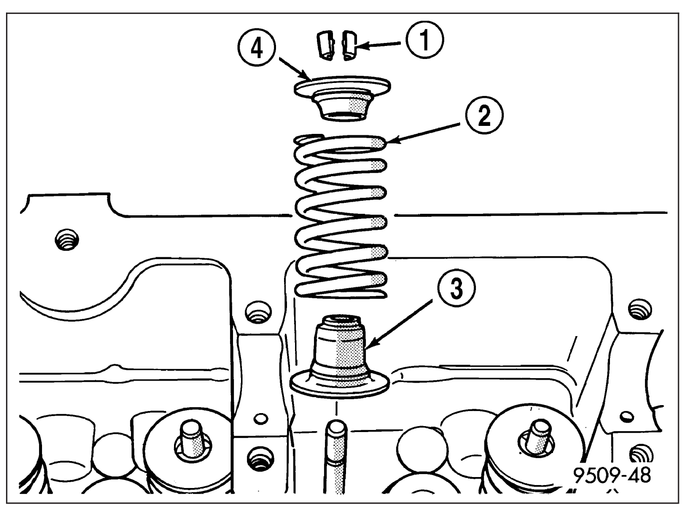


3. Place the valve keepers in the retainer. Using Snap On metric valve keeper installer (2) and remover (1) as a handle, install valve keepers with a downward push.
4. Remove air hose and install spark plugs.
5. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).
6. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

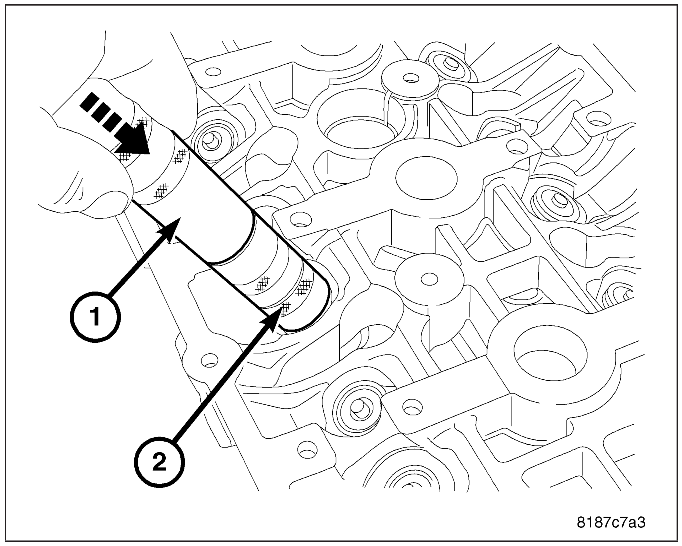


CYLINDER HEAD OFF

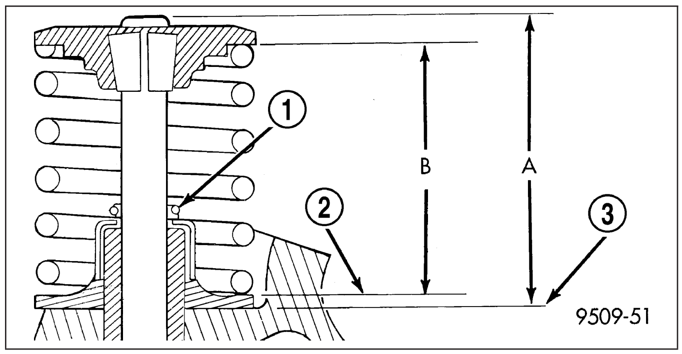
1. Coat valve stems with clean engine oil and insert in cylinder head.
2. Install new valve stem seals (3) on all valves using an appropriate sized socket to seat the seal/spring seat. The valve stem seals should be pushed firmly and squarely over valve guide.
3. Install valve springs (2), retainers (4), and keepers (1) in place.



4. Using Snap-on metric valve keeper installer (2) and remover (1) as a handle, push downward to install keepers.



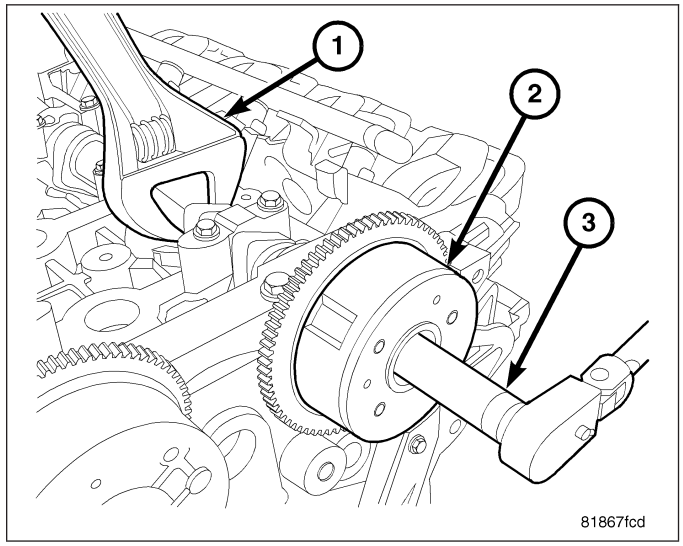
5. Check the valve spring installed height B after refacing the valve and seat. Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a 0.762 mm (0.030 in.) spacer under the valve spring seat to bring spring height back within specification.



PHASERS-CAMSHAFT

REMOVAL

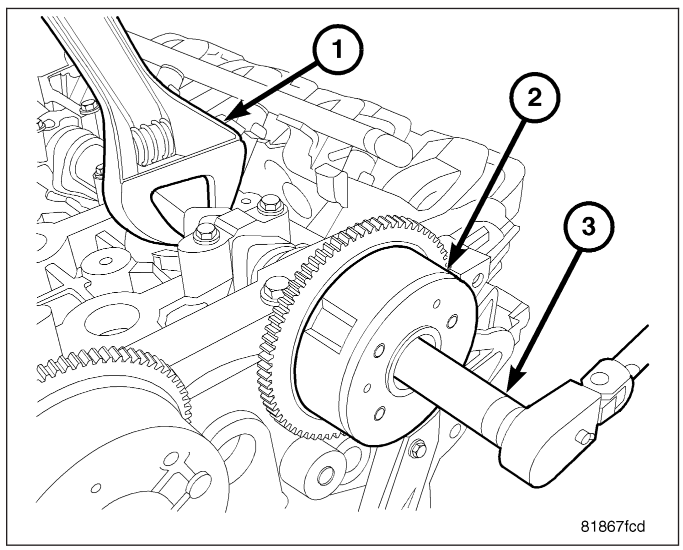
1. Remove camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).
2. Remove camshaft phaser (2) retaining bolt while holding the camshaft in place with a wrench (1).
3. Remove phaser (2) assembly from camshaft.



INSTALLATION

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin and camshaft phaser may occur.

1. Install phaser (2) assembly on camshaft.
2. Install phaser retaining bolt and torque while holding camshaft in place with a wrench (1).
3. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

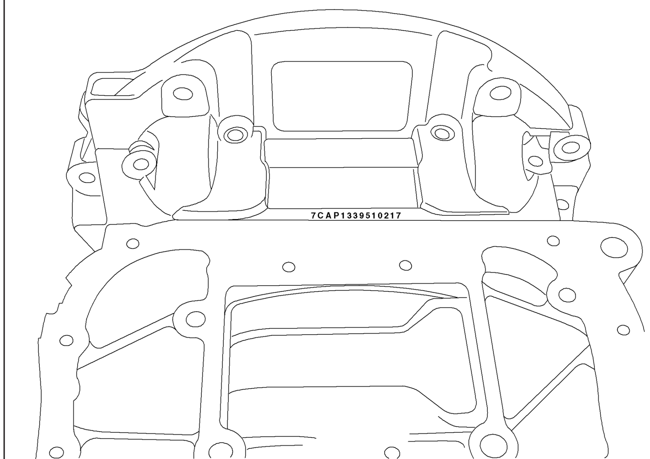


ENGINE BLOCK

DESCRIPTION

The die cast aluminum cylinder block is a two-piece assembly, consisting of the cylinder block and ladder frame. The block is an open deck design with cast in place cast iron cylinder liners. The cast iron cylinder liners are recessed below the aluminum deck surface. The ladder frame bolts to the cylinder block and does not incorporate the main bearing caps. This design offers a much stronger lower end and increased cylinder block and transaxle rigidity. The rear oil seal retainer is integral with the block and ladder frame. The ladder frame and block are serviced as an assembly.

The engine build date is located on the bottom of the ladder frame just behind the oil pan. The date can be seen with the oil pan in place.

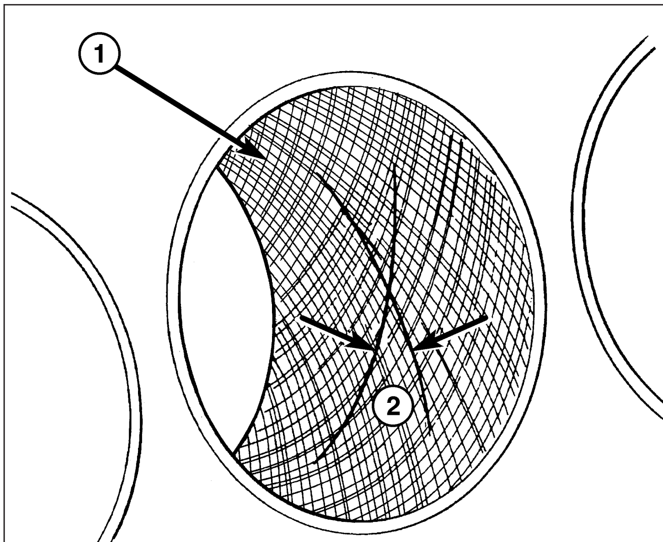


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STANDARD PROCEDURE

CYLINDER BORE HONING

1. Used carefully, a quality commercially available cylinder bore resizing hone equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.
2. Deglazing of the cylinder walls may be done using a quality commercially available cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20–60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.



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3. Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 30-50 degrees, the cross hatch angle is most satisfactory for proper seating of rings.
4. A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 degree angle. Faster up and down strokes increase the cross-hatch angle.
5. After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

CAUTION: Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

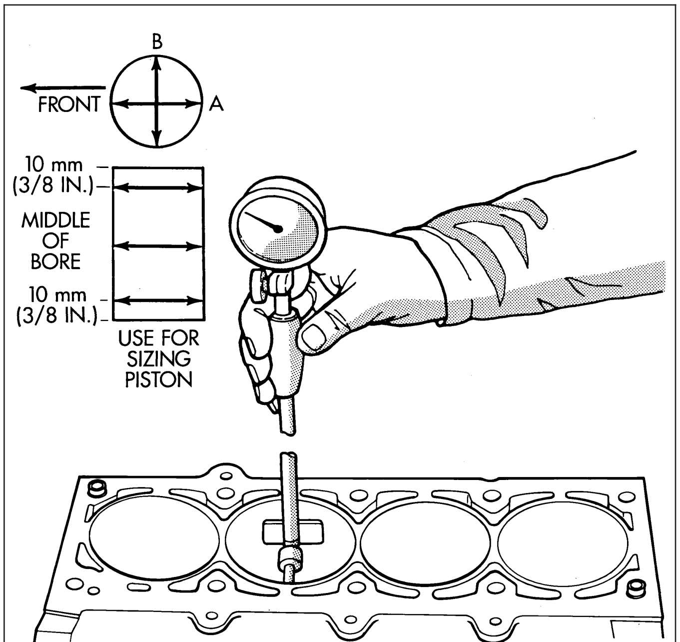
ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.050 mm (0.002 in.).

CYLINDER BORE

NOTE: The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.



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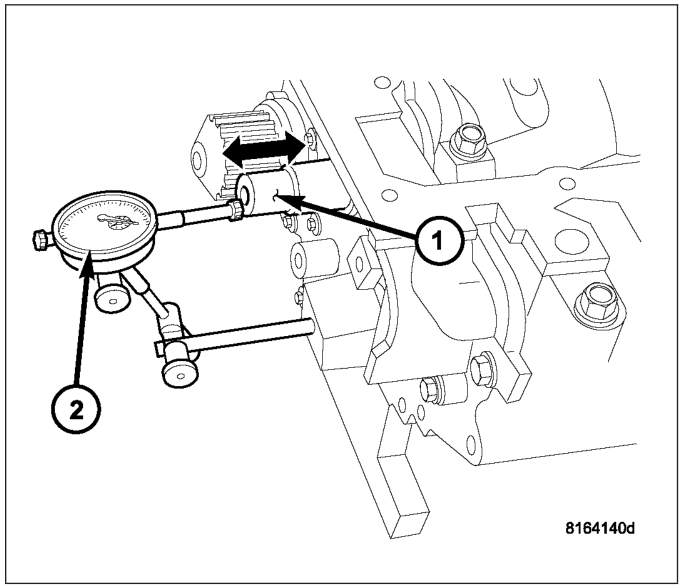
Measure the cylinder bore at three levels in directions A and B. Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).

CRANKSHAFT

STANDARD PROCEDURE

MEASURING CRANKSHAFT END PLAY

1. Mount a dial indicator (2) to front of engine with the locating probe on nose of crankshaft (1).
2. Move crankshaft all the way to the rear of its travel.
3. Zero the dial indicator.
4. Move crankshaft all the way to the front and read the dial indicator. (Refer to 9 - ENGINE - SPECIFICATIONS) for end play specification.



REMOVAL - CRANKSHAFT

NOTE: Crankshaft can not be removed when engine is in vehicle.

1. Remove engine assembly from vehicle (Refer to 9 - ENGINE - REMOVAL).
2. Separate transaxle from engine.
3. Remove drive plate/flex plate.
4. Remove crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).
5. Mount engine on a suitable repair stand.
6. Drain engine oil and remove oil filter.
7. Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
8. Remove engine mount support bracket.
9. Remove timing chain cover.
10. Remove the timing chain
11. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
12. Remove balance shaft module.
13. Remove the crankshaft sprocket.
14. Remove crankshaft position sensor.
15. Remove all ladder frame bolts from the engine block.
16. Using a pry bar gently pry the ladder frame loose from the engine block dowel pins using the pry points cast into the block and ladder frame.
17. Ladder frame should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins.

NOTE: If piston/connecting rod replacement is necessary, remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

18. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

19. Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

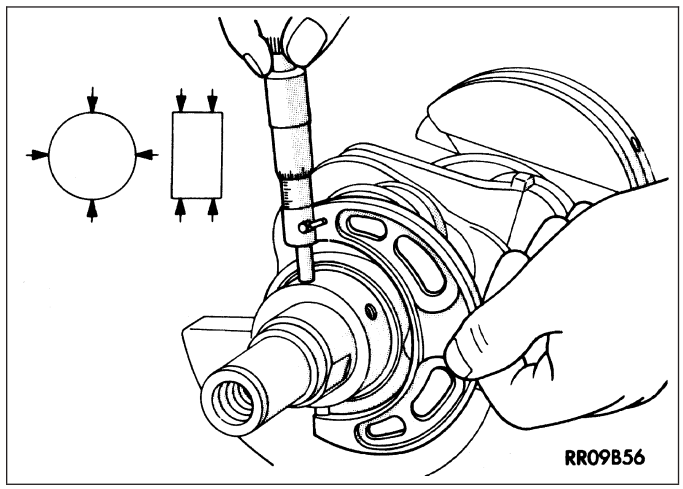
20. Remove main bearing caps.

CAUTION: Use extreme care when handling crankshaft. Tone wheel damage can occur if crankshaft is mishandled.

21. Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

INSPECTION

The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.



INSTALLATION - CRANKSHAFT

The crankshaft is supported in five main bearings. All upper bearing shells in the crankcase have oil grooves and holes. All lower bearing shells are smooth. Crankshaft end play is controlled by a two piece thrust bearing on the number three main bearing journal.

1. Install the main bearing upper shells with the lubrication groove and oil hole in the engine block.
2. Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

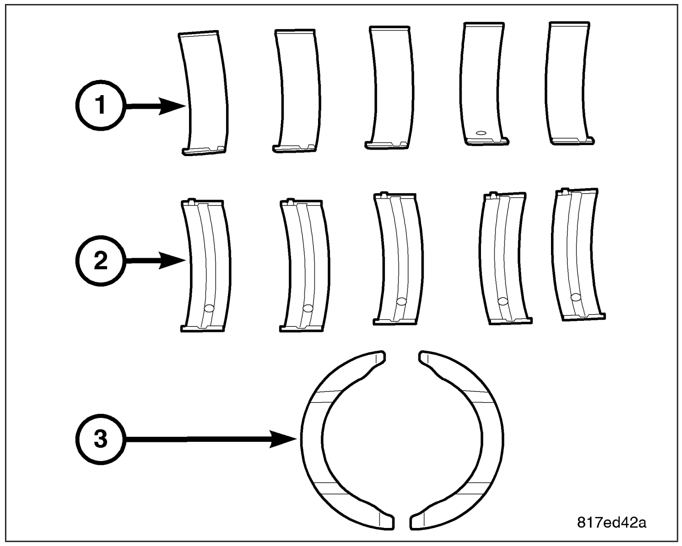
NOTE: If the crankshaft is sent out for machine work, it must be balanced as an assembly with the target ring installed.

3. Clean crankshaft and target ring with MOPAR® Brake Parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

4. Install **NEW**mounting screws finger tight starting with the #1 location. Make sure engagement occurs with the shoulder of the screws and mounting hole before starting all other screws.
5. Torque all mounting screws with T30 torx bit to 13 Nm (110 in-lbs) following the torque sequence.

NOTE: Lightly apply trans gel to thrust bearings to hold bearings in block.



6. Install thrust bearings (3) in block.

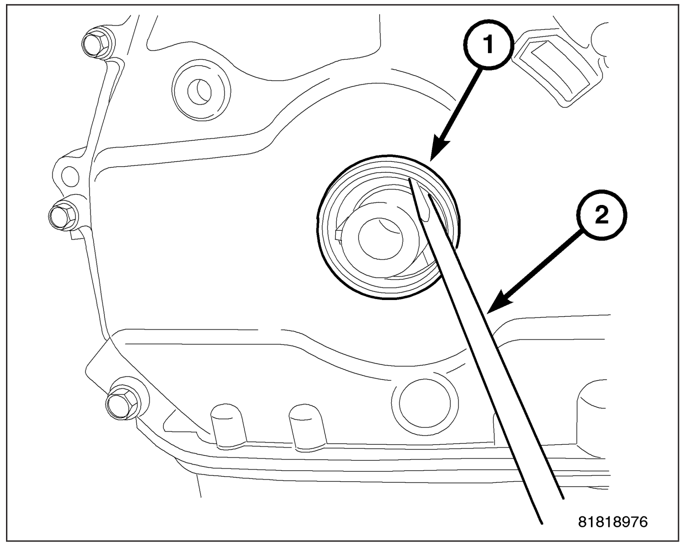
CAUTION: Do not get oil on the ladder frame mating surface. It will affect the ability of the RTV to seal the ladder frame to cylinder block.

7. Oil the bearings and journals. Install crankshaft in engine block.
8. Install lower main bearings (1) into main bearing cap. Make certain the bearing tabs are seated into the bearing cap slots.
9. Before installing the bolts the threads should be clean and dry.
10. Install main bearing caps to engine block, install bolts finger tight.
11. To ensure correct thrust bearing alignment, perform the following steps:
    - Step 1: Rotate crankshaft until number 4 piston is at TDC.
    - Step 2: Move crankshaft rearward to limits of travel.
    - Step 3: Then, move crankshaft forward to limits of travel.
    - Step 4: Wedge an appropriate tool between the rear of the cylinder block and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
12. Tighten bolts (1–10) again to 41 N·m (30 ft. lbs.) in sequence shown.
13. Remove wedge tool used to hold crankshaft.
14. Check the crankshaft turning torque, it should not exceed 5.6 N·m (50 in. lbs.).
15. Check crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).
16. Install connecting rod bearings and caps. **Do Not Reuse Connecting Rod Bolts.** Torque connecting rod bolts to 27 N·m (20 ft. lbs.) plus 1/4 turn.
17. Install the ladder frame assembly (Refer to 9 - ENGINE/ENGINE BLOCK/LADDER FRAME - INSTALLATION).
18. Install the balance shaft module (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
19. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
20. Install crankshaft position sensor.
21. Install cylinder head if it was removed (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
22. Install front crankshaft sprocket.
23. Install the timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
24. Install the timing chain front cover.
25. Install front crankshaft oil seal.
26. Install engine mount support bracket.
27. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
28. Remove engine from repair stand and position on Special Tools 6135 and 6710 Engine Dolly and Cradle. Install safety straps around the engine to cradle and tighten and lock them into position.
29. Install crankshaft rear oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).
30. Install drive plate/flex plate. Apply Mopar® Lock & Seal Adhesive to bolt threads and tighten to 95 N·m (70 ft. lbs.).
31. Attach transaxle to engine. Tighten attaching bolts to 101 N·m (75 ft. lbs.).
32. Install the engine assembly (Refer to 9 - ENGINE - INSTALLATION).
33. Install new oil filter and fill with oil.
34. Start engine and check for leaks.

SEAL-FRONT CRANKSHAFT OIL

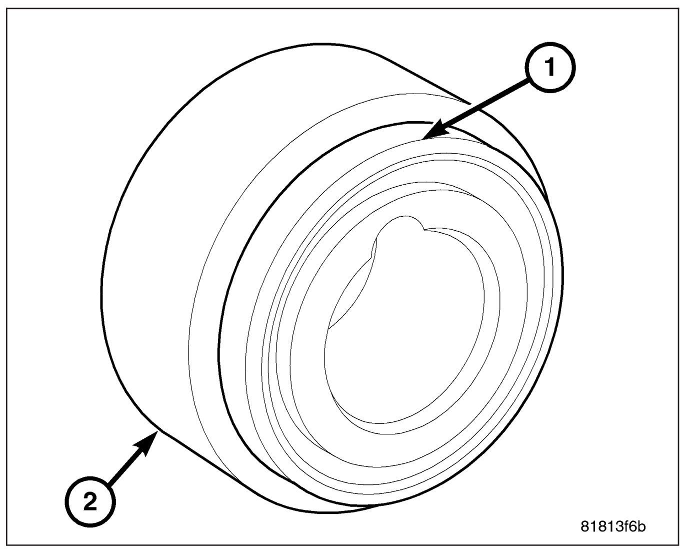
REMOVAL

1. Remove the crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove front crankshaft oil seal (1) by prying out with a screw driver (2). Be careful not to damage the cover seal surface.

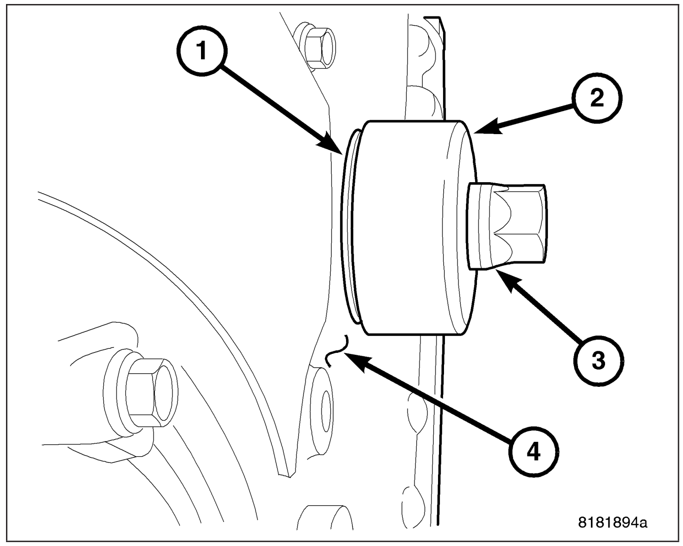


INSTALLATION

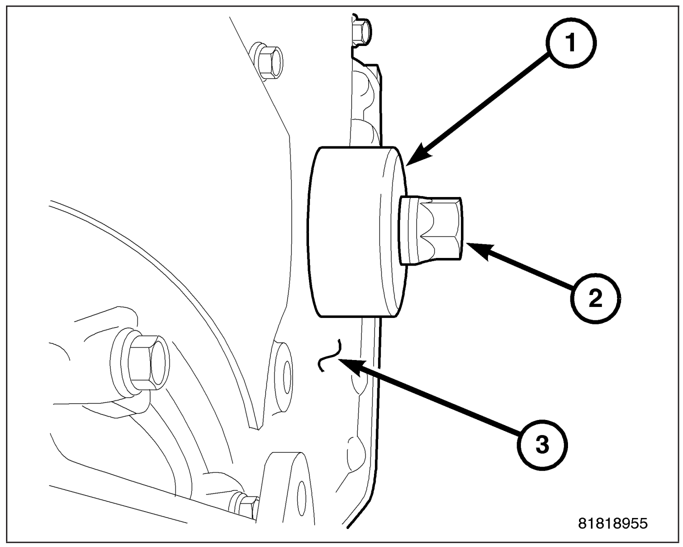
1. Place seal (1) onto Seal installer 9506 (2) with seal spring towards the inside of engine.



2. Install new seal (1) by using Seal installer 9506 (2) and crankshaft damper bolt (3).



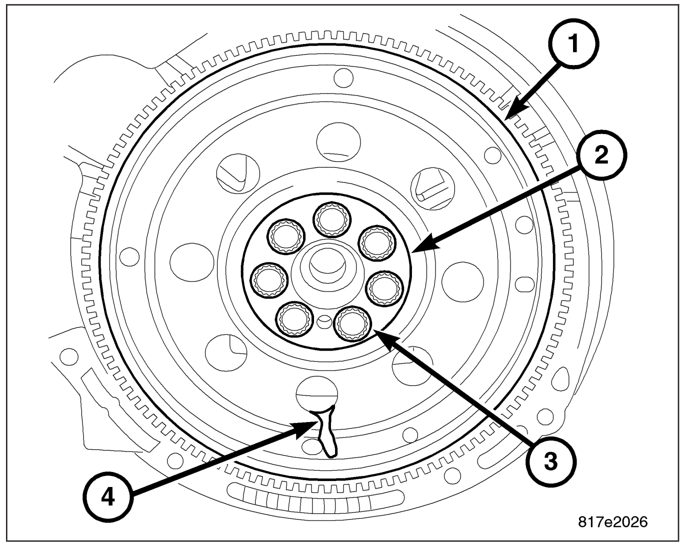
3. Press seal into front cover until Seal Installer 9506 (1) seats against timing chain cover (3).
4. Remove seal installer 9506 (1).
5. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION.



SEAL- REAR CRANKSHAFT OIL

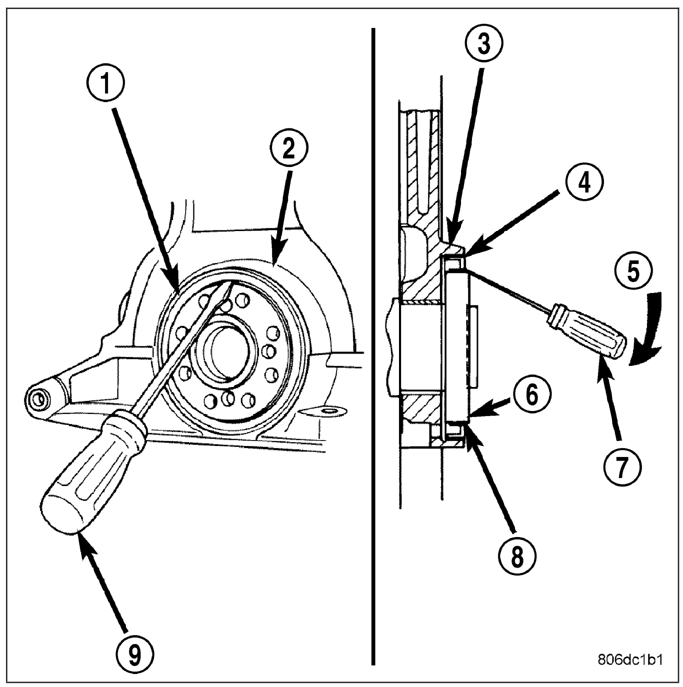
REMOVAL

1. Remove transaxle
2. Remove flex plate bolts and discard.
3. Remove flex plate (1).



4. Insert a 3/16 flat bladed screwdriver (7) between the dust lip (8) and the metal case (4) of the crankshaft seal (1). Angle the screwdriver through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

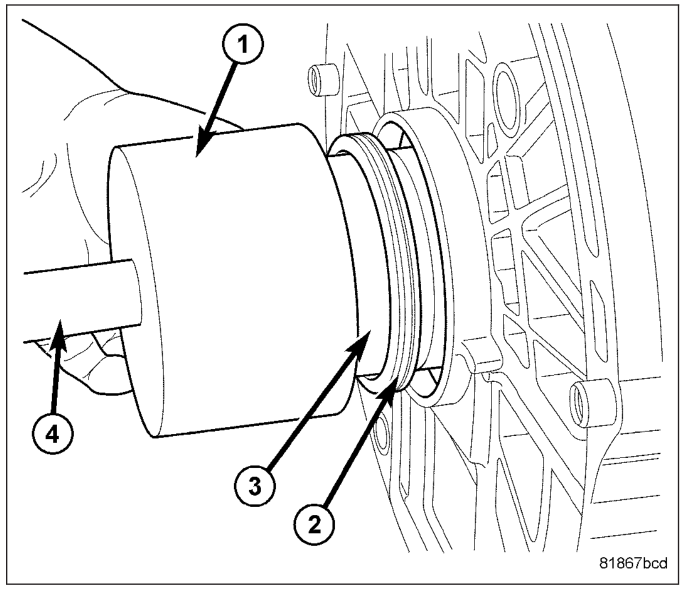


INSTALLATION

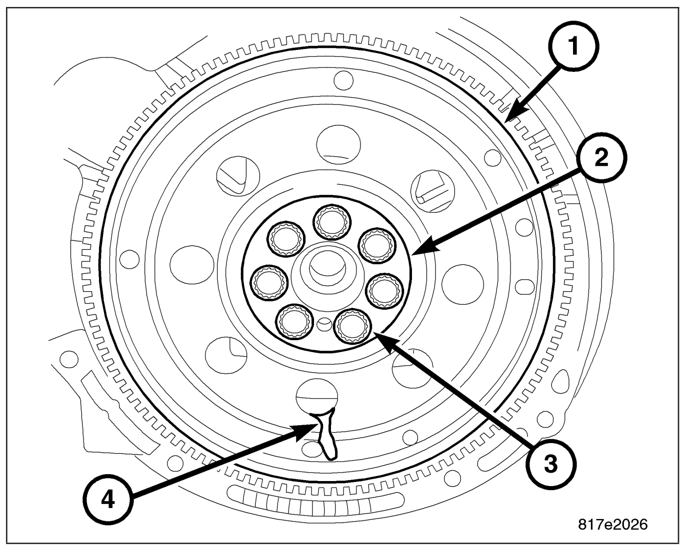
CAUTION: If a burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

NOTE: When installing seal, no lube on seal is needed.

1. Place Special Tool 9509 (3) Seal Guide on crankshaft.
2. Position seal (2) over guide tool. Guide tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.
3. Drive the seal into the block using Special Tool 9706 (1) and handle C-4171 (4) until the tool bottoms out against the block.



4. Install flex plate (1). Install new flex plate bolts and torque to 95 N·m (70 ft. lbs.).
5. Install transaxle. Refer to TRANSMISSION/TRANSAXLE - INSTALLATION for procedure.



PISTON & ROD-CONNECTING

DESCRIPTION

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged connecting rods. The pistons pin is offset 0.8 mm (0.0314 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. The pistons with rings and connecting rods are serviced as an assembly.

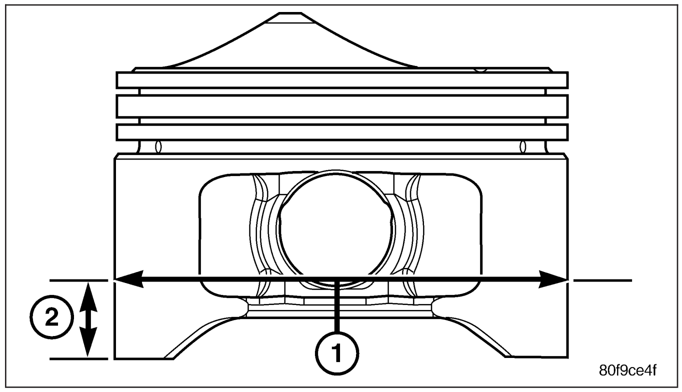
STANDARD PROCEDURE

PISTON TO CYLINDER BORE FITTING

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

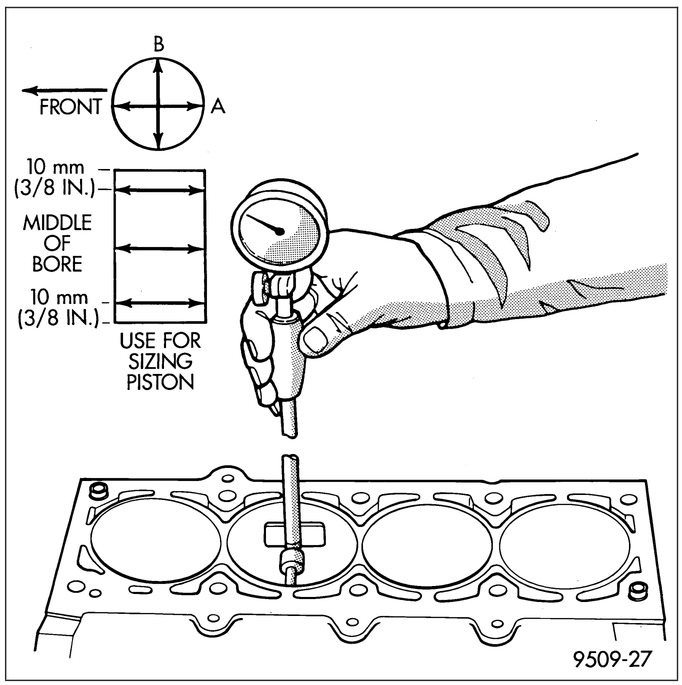
Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin (1).

1. Measurement should be taken approximately 16 mm (0.629 in.) from the bottom of the skirt (2) as shown in.



NOTE: Correct piston to bore clearance must be established in order to assure quiet and economical operation.

2. Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in. Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS).



REMOVAL

NOTE: Pistons, rings, and rods are serviced as an assembly.

CAUTION: All four piston/rod assemblies must be replaced as a set or engine damage may result.

1. Remove engine (Refer to 9 - ENGINE - REMOVAL).
2. Separate engine from transaxle.
3. Remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

4. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove balance shaft assembly.

NOTE: Remove any carbon build up prior to piston removal.

6. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation**.
7. Rotate crankshaft so that each connecting rod is centered in cylinder bore.
8. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods, as damage to connecting rod could occur.

CAUTION: Care must be taken not to damage the fractured rod and cap joint surfaces, as engine damage many occur.

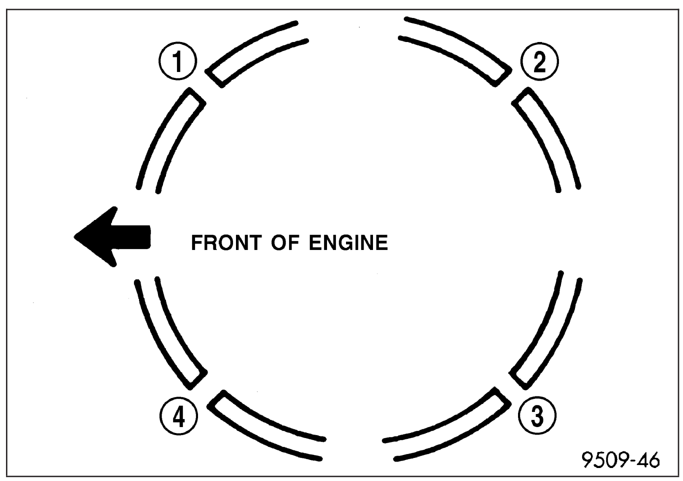
9. Remove connecting rod bolts and cap.

NOTE: Do not reuse connecting rod bolts.

10. Carefully push each piston and rod assembly out of cylinder bore. Re-install bearing cap on the mating rod.
11. Repeat procedure for each piston and connecting rod assembly.

INSTALLATION

1. Install piston rings on piston (Refer to 9 - ENGINE/ ENGINE BLOCK/PISTON RINGS - INSTALLATION).
2. Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.
3. Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown above. As viewed from the top of the piston.
4. Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston. **Be sure position of rings does not change during this operation**.



5. The directional arrow stamped on the piston should face toward the front of the engine.
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

NOTE: There are three different size rod bearings, perform rod bearing selection procedure.

7. The rod bearing sizes are indicated on the nose of the crankshaft.
8. Install connecting rod upper bearing half into connecting rod.
9. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

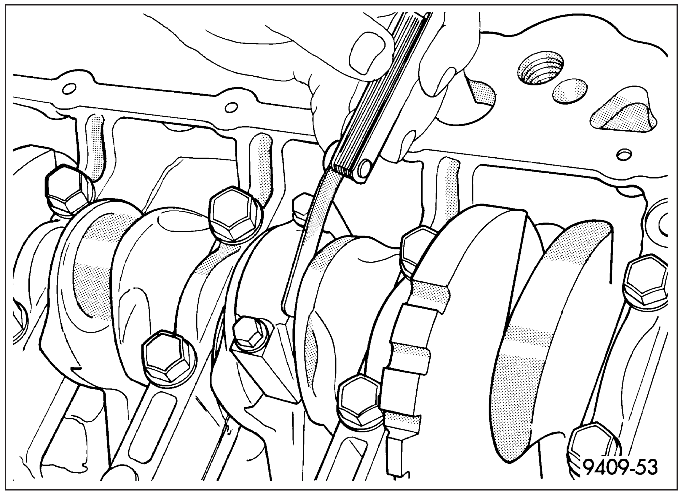
NOTE: The connecting rod cap bolts should NOT be reused.

10. Before installing the **NEW** bolts, the threads should be coated with clean engine oil.
11. Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.
12. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
13. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

1. Tighten the bolts to 27 N·m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN.**

14. Using a feeler gauge, check connecting rod side clearance. (Refer to 9 - ENGINE - SPECIFICATIONS) for connecting rod side clearance.
15. Install the ladder frame.
16. Install oil pump/Balance Shaft Carrier Assembly (Refer to 9 - ENGINE/VALVE TIMING/BALANCE SHAFT CARRIER - INSTALLATION).
17. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
18. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).



BEARINGS-MAIN

STANDARD PROCEDURE - MAIN BEARING SELECTION

NOTE: There are three different possibilities for the upper main bearings and five different lower main bearings. The upper and lower bearing shells are not interchangeable.

The lower main bearing identification is stamped in the nose of the crankshaft (1). There are 5 different bearing sizes available 0 through 4.

CRANKSHAFT IDENTIFICATION		LOWER CRANKSHAFT BEARING SELECTION	
JOURNAL DIAMETER GRADE	DIMENSION	LOWER MAIN BEARING SIZE CLASSIFICATION	LOWER MAIN BEARING DIMENSION
0	52 mm	0 (Pink or Red)	2 mm
1	52 mm	1 (Black)	2 mm
2	52 mm	2 (No Color)	2 mm
3	52 mm	3 (Green)	2 mm
4	52 mm	4 (Blue)	2 mm

The upper main bearing shell identification is located in the middle of cylinder block on the right side of the engine when viewing from the flywheel. There are three different size bearings available.

UPPER MAIN BEARING SELECTION

CYLINDER BLOCK IDENTIFICATION		UPPER CRANKSHAFT BEARING SELECTION	
MAIN BEARING GRADE	DIMENSION	UPPER MAIN BEARING SIZE CLASSIFICATION	UPPER MAIN BEARING DIMENSION
1	56 mm	1 (Black)	2 mm
2	56 mm	2 (No Color)	2 mm
3	56 mm	3 (Green)	2 mm

BEARINGS-CONNECTING ROD

STANDARD PROCEDURE

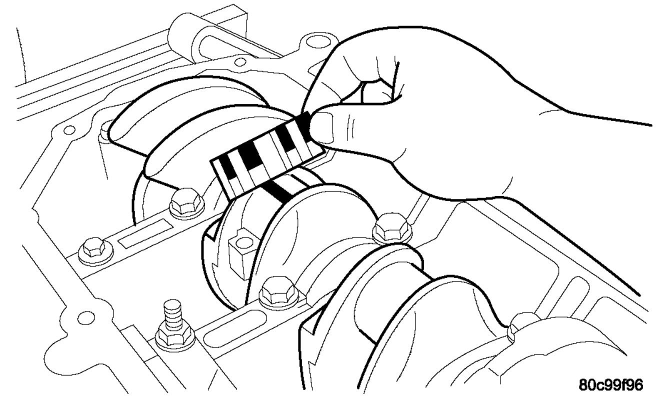
CONNECTING ROD - FITTING

There are three different sizes of rod bearings available. Connecting rod bearing identification can be found on the nose of the crankshaft. Use the table below for proper bearing selection.

CONNECTING ROD BEARING SELECTION

CRANKSHAFT PIN DIAMETER GRADE	DIMENSION	CONNECTING ROD BEARING CLASSIFICATION	CONNECTING ROD BEARING DIMENSION
1	48 mm	1 (Black)	1.5 mm
2	48 mm	2 (No Color)	1.5 mm
3	48 mm	3 (Green)	1.5 mm

1. For measuring connecting rod bearing clearance procedure and use of Plastigage (Refer to 9 - ENGINE - STANDARD PROCEDURE) For bearing clearance refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS).


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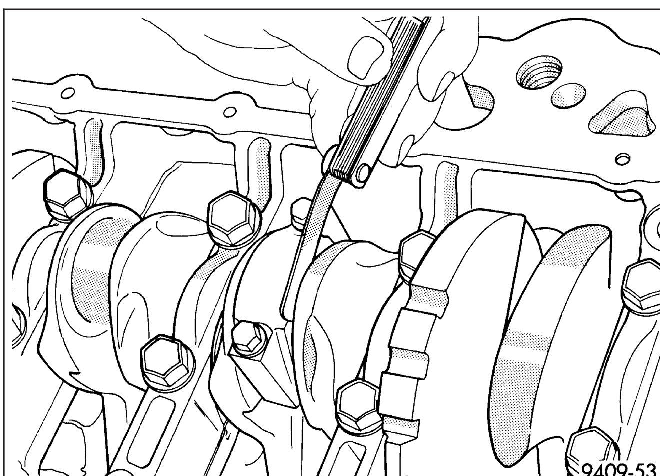
NOTE: The rod bolts should not be reused.

2. Before installing the **NEW** rod bolts the threads and under the bolt head should be oiled with clean engine oil.
3. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

CAUTION: Do not use a torque wrench for the second step.

   1. Tighten the bolts to 27 N·m (20 ft. lbs.).
   2. Tighten the connecting rod bolts an additional 90°.

5. Using a feeler gauge, check connecting rod side clearance. Refer to clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

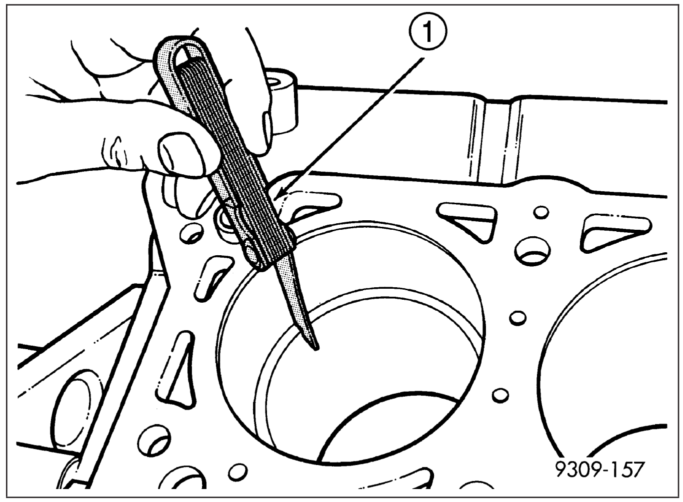

9409-53

RINGS-PISTON

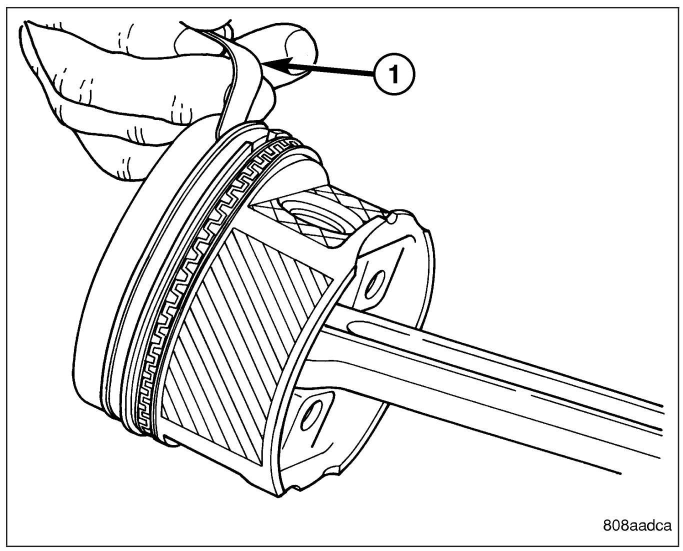
STANDARD PROCEDURE

PISTON RING - FITTING

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge. Refer to Engine Specifications.

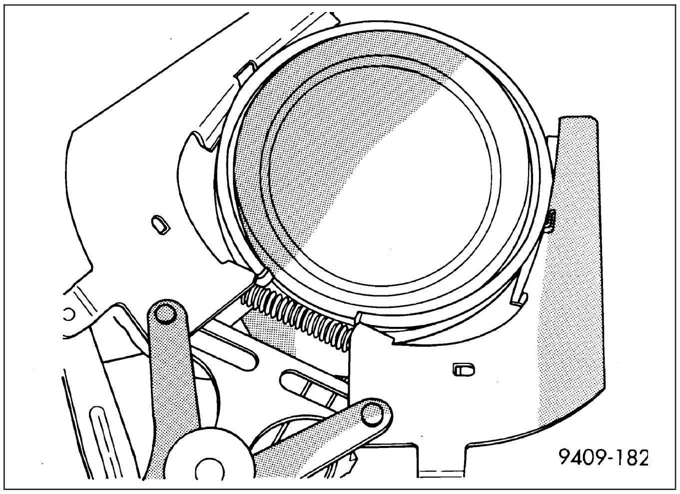


2. Check piston ring to groove side clearance. Refer to Engine Specifications.



REMOVAL

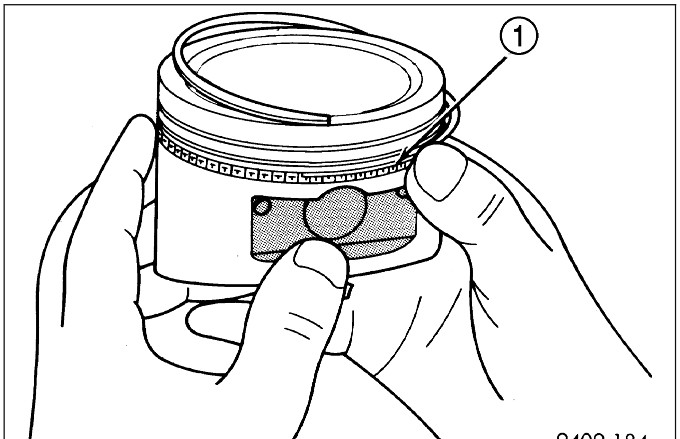
1. Using a suitable ring expander, remove upper and intermediate piston rings.
2. Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.
3. Clean ring grooves of any carbon deposits.



9409-182

INSTALLATION

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.



9409-184

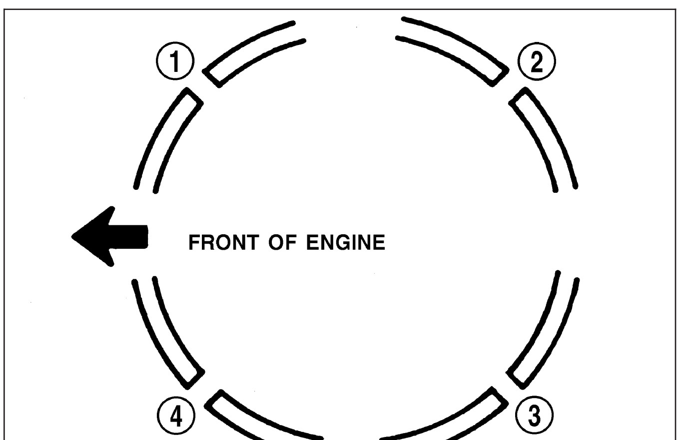
CAUTION: Install piston rings in the following order:

1. Oil ring expander.
2. Upper oil ring side rail.
3. Lower oil ring side rail.
4. No. 2 Intermediate piston ring.
5. No. 1 Upper piston ring.

1. Install oil ring expander.
2. Install upper side rail first and then the lower side rail. Install the side rails by placing one end between the piston ring groove and the oil ring expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander.**

NOTE: The compression rings are marked Y1 for the upper compression ring and Y2 for the second compression ring. These markings must face upward.

3. Install No. 2 piston ring and then No. 1 piston ring.
4. Position piston ring end gaps as shown in.
5. Position oil ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.

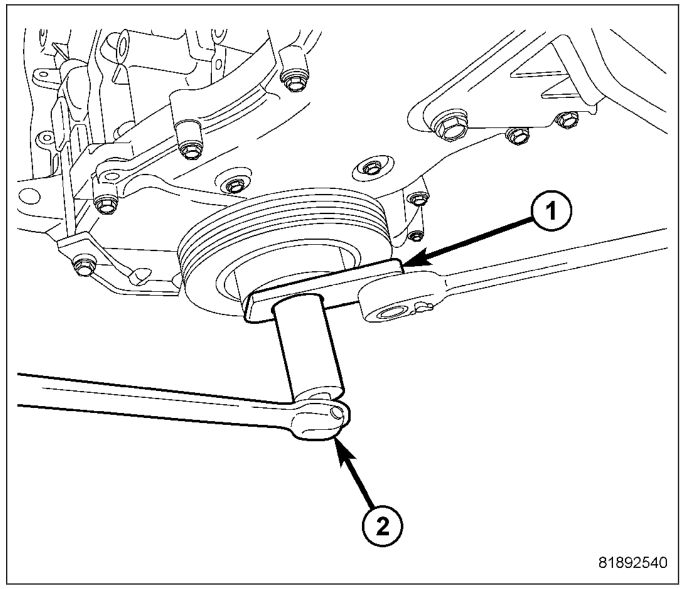


9509-46

DAMPER-VIBRATION

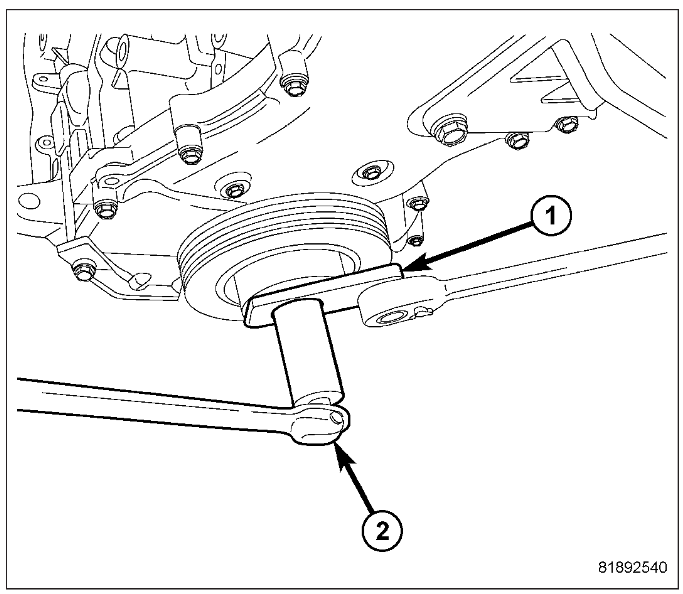
REMOVAL

1. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Install Damper holder 9707 (1).
3. Remove crankshaft damper bolt.
4. Pull damper off crankshaft.



INSTALLATION

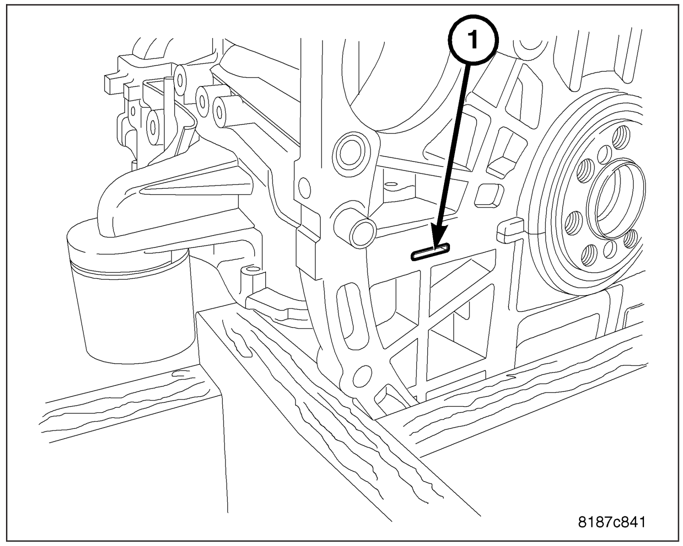
1. Install crankshaft damper.
2. Apply clean engine oil crankshaft damper bolt threads and between bolt head and washer. Torque bolt to 210 N·m (155 ft. lbs.).
3. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



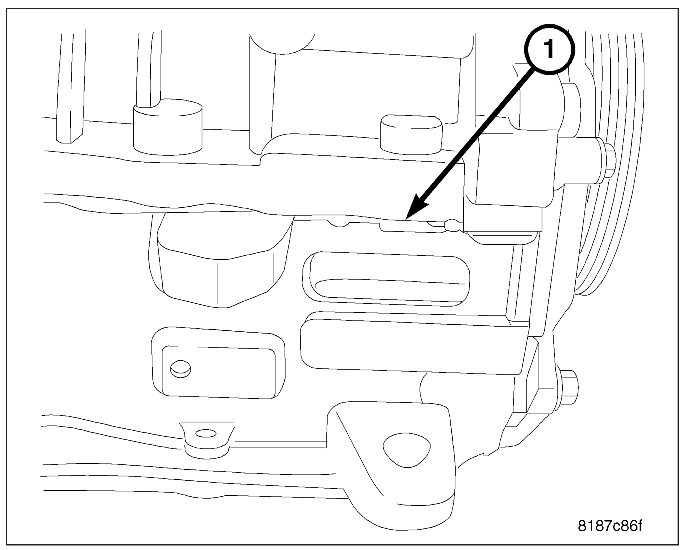
FRAME-LADDER

REMOVAL

1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove oil pump/balance shaft assembly (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
3. Remove ladder frame retaining bolts.
4. Remove ladder frame using pry points cast in the rear of the block (1).



5. To assist in removing the ladder frame another (1) pry points cast in the left side of the block.

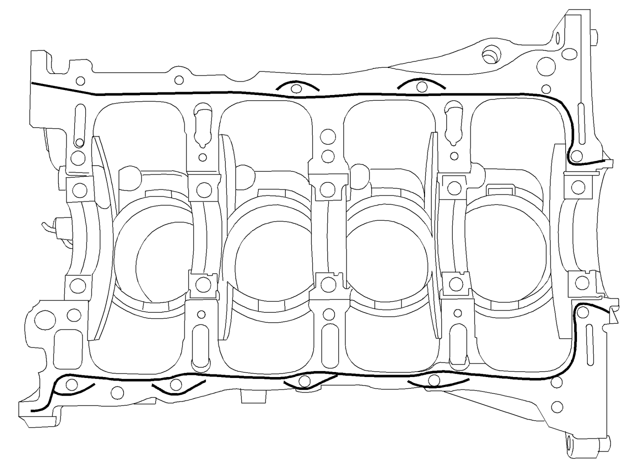


CLEANING

Clean ladder frame with a plastic or wooden scraper and a suitable solvent.

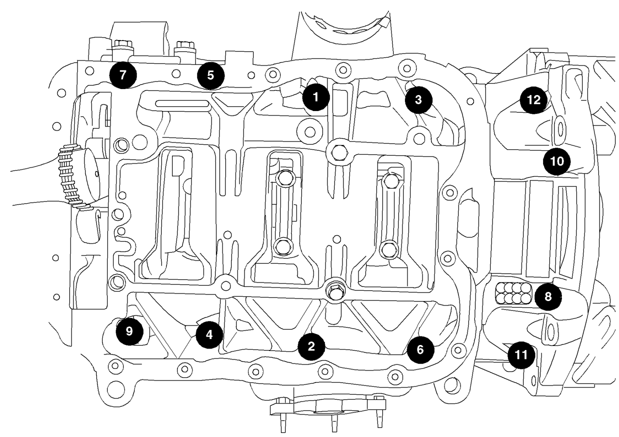
INSTALLATION

1. Apply a 2 mm bead of sealant as shown.



8186540e

2. Install bolts and torque shown following a three step method.
   - First: All to 20 N·m (15 ft. lbs.)
   - Second: All to 49 N·m (36 ft. lbs.)
   - Third: All to 49 N·m (36 ft. lbs.)
3. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/ OIL PAN - INSTALLATION).



818670ab

ENGINE MOUNTING

DESCRIPTION

The engine mounting system consists of a four-point system utilizing two load-carrying mounts and two torque controlling mounts. The load-carrying mounts are located on each frame rail. The right mount is a hydro-elastic mount and left mount is a conventional elastomeric isolator. The two torque controlling mounts are attached to a fore/aft member and the front and rear of the engine.

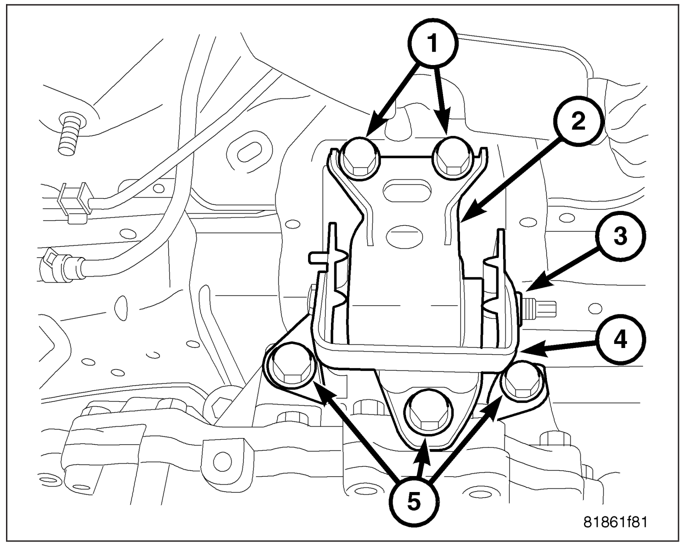
OPERATION

The four-point engine mounting system minimizes the transmission of structure-borne engine noise to the passenger compartment. The load-carrying right and left mounts dampen and isolate vertical motion and vibration. The front and rear mount absorb torque reaction forces and torsional vibrations.

MOUNT-LEFT

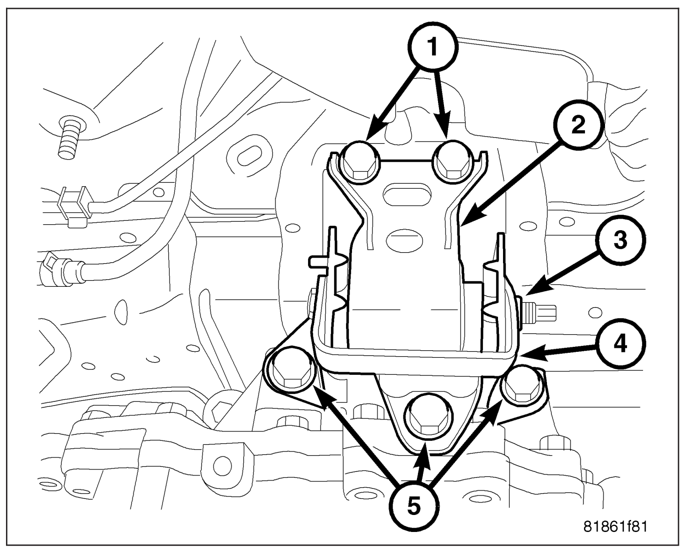
REMOVAL

1. Remove air cleaner assembly.
2. Disconnect negative cable from battery.
3. Remove PCM.
4. Remove PCM mounting bracket.
5. Support transaxle with a suitable jack.
6. Remove left mount through bolt (3).
7. Remove mount to transaxle bolts (5).
8. Remove left mount bracket (4).
9. Remove left mount bracket to body frame rail fasteners.
10. Remove mount.



INSTALLATION

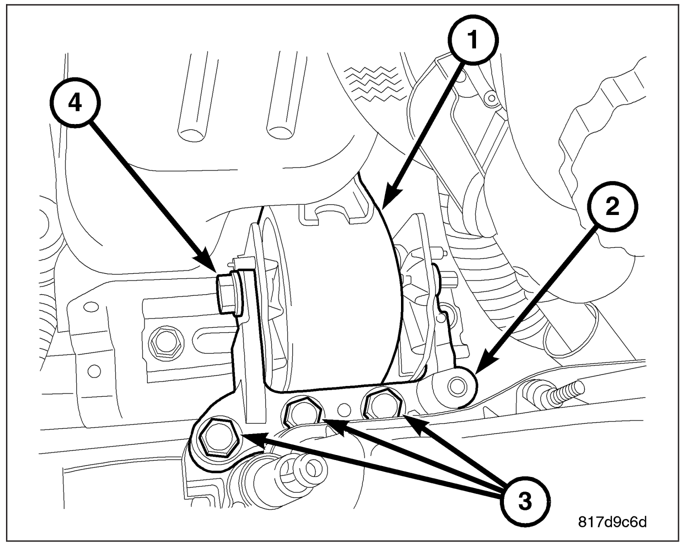
1. Install mount.
2. Install left mount to frame rail bolts and torque to 28N·m (250 in. lbs.).
3. Install left mount bracket (4).
4. Install mount to transaxle bolts (5) and torque to 68 N·m (50 ft.lbs.).
5. Install mount through bolt (3) and torque to 115 N·m (85 ft.lbs.).
6. Remove jack.
7. Install PCM mounting bracket.
8. Install PCM.
9. Connect negative battery cable.
10. Install air cleaner assembly.



MOUNT-RIGHT

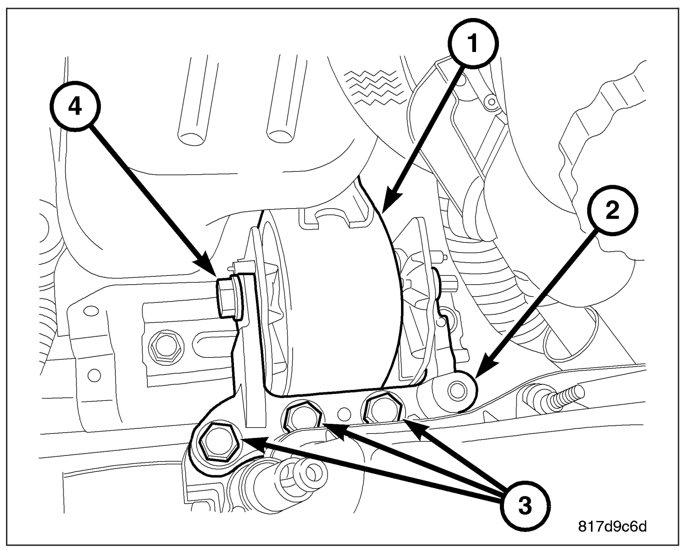
REMOVAL

1. Remove coolant reservoir and set aside.
2. Remove power steering reservoir and set aside.
3. Remove windshield washer bottle.
4. Remove power steering line support bracket from engine mount.
5. Support transaxle with a block of wood and a suitable jack.
6. Remove engine mount through bolt (4).
7. Remove engine mount bracket bolts (3).
8. Remove engine mount retaining bolts.
9. Remove engine mount.



INSTALLATION

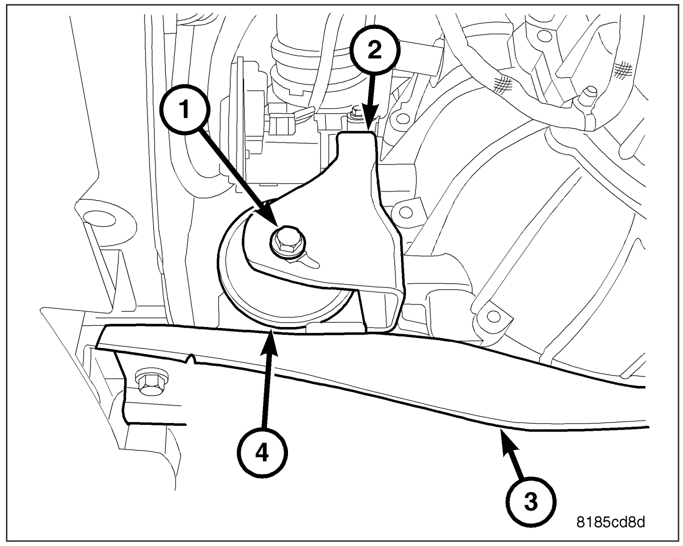
1. Install engine mount.
2. Install engine mount retaining bolts and torque to 28 N·m (250 in. lbs.).
3. Install engine mount bracket and torque bolts (3) to 68 N·m (50 ft. lbs.).
4. Install engine mount through bolt (4) and torque to 115 N·m (85 ft. lbs.).
5. Remove jack.
6. Install power steering line support bracket at engine mount.
7. Install windshield washer bottle.
8. Install power steering reservoir.
9. Install coolant reservoir.



MOUNT-FRONT

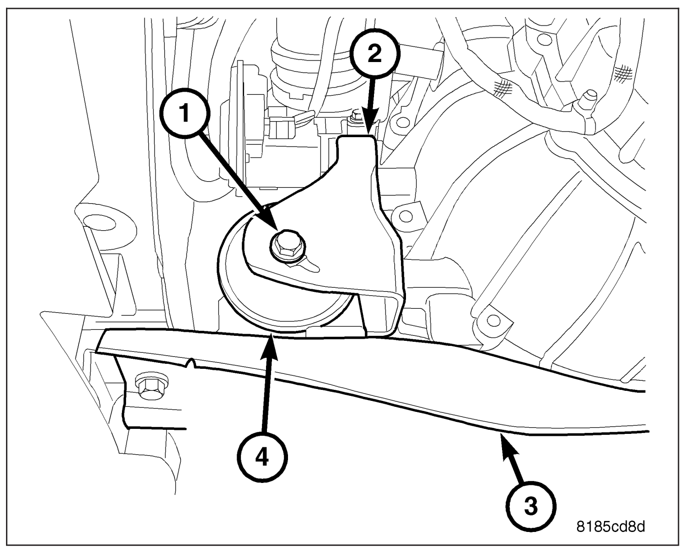
REMOVAL

1. Raise vehicle.
2. Remove fore aft member (3) to mount (4) bolts.
3. Remove mount through bolt (1).
4. Remove fore aft member (3) mounting bolts and remove.
5. Remove front mount (4).



INSTALLATION

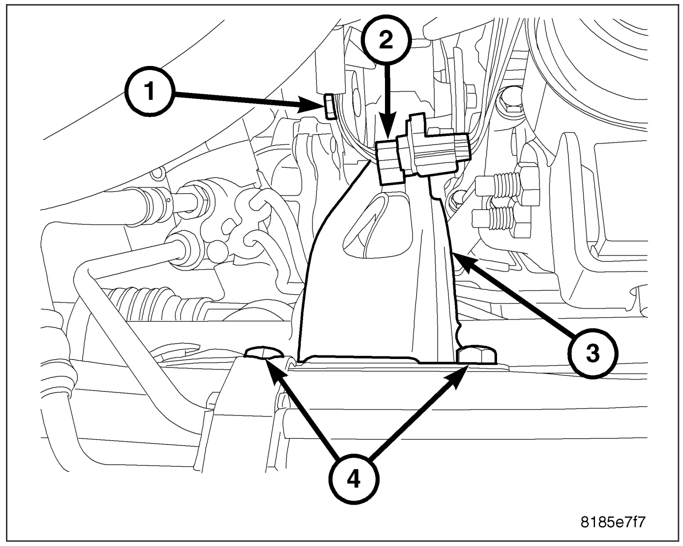
1. Install mount (4) and tighten bolts.
2. Install fore aft member (3) and tighten bolts.
3. Install mount through bolt (1) and tighten.
4. Lower vehicle.



MOUNT-REAR

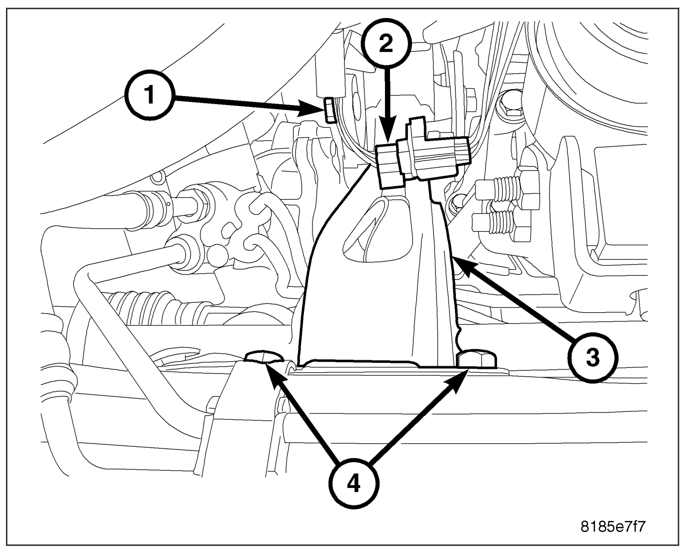
REMOVAL

1. Remove rear mount retaining bolts (4).
2. Remove rear mount through bolt (1).
3. Remove oxygen sensor connector (2) from mount.
4. Remove rear mount (3).



INSTALLATION

1. Install rear mount (3).
2. Install rear mount retaining bolts (4) and tighten.
3. Install rear mount through bolt (1) and tighten.
4. Install oxygen sensor connector (2) retainer to mount (3).



LUBRICATION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is mounted in the ladder frame and chain driven by the crankshaft.

OPERATION

Engine oil drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals. Balance shaft lubrication is provided through an internal oil passage. A vertical hole at the number one bulkhead routes pressurized oil through a filter screen and head gasket up to the cylinder head. The oil then divides into three passages; one to the intake cam phaser, one to the exhaust cam phaser and one to the camshafts. The passage to the camshafts divides to feed both of the hollow camshafts at the second cam journal.The rest of cam journals are feed oil through the hollow camshafts. The #1 cam journals are feed oil through the VVT oil passages. Oil passages to the phasers are directed through the OCV (oil control valves) to the #1 journals. The oil then flows through the camshafts then to the cam phasers. Oil returning to the pan from pressurized components supplies lubrication to the valve stems, cam lobes, and tappets. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

1. Disconnect and remove oil pressure switch. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL)
2. Install Special Tools C-3292 Gauge with 8406 Adaptor fitting.
3. Start engine and record oil pressure. Refer to Specifications for correct oil pressure requirements. (Refer to 9 - ENGINE - SPECIFICATIONS)

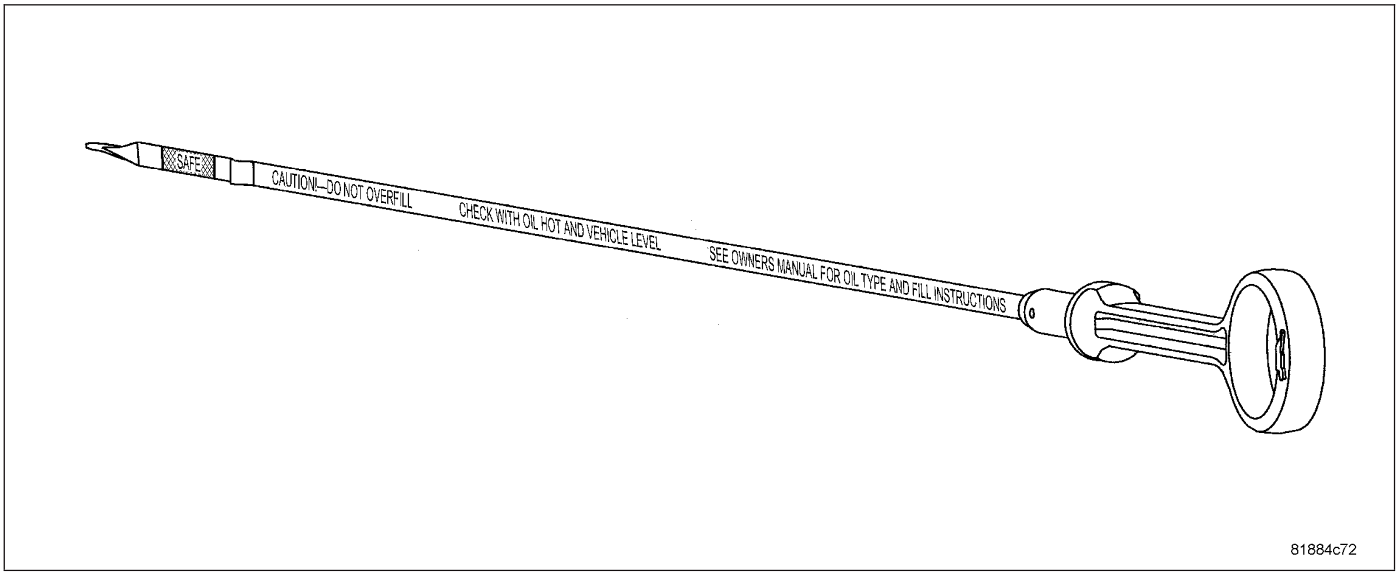
CAUTION: If oil pressure is 0 at idle, do not perform the 3000 RPM test

4. If oil pressure is 0 at idle, shut off engine. check for pressure relief valve stuck open, a clogged oil pick-up screen or a damaged oil pick-up tube O-ring.
5. Remove oil pan and inspect for debris.
6. Remove pressure relief valve and inspect, if damaged replace pressure relief valve.
7. If pressure relief valve is ok, replace balance shaft module assembly.
8. After test is complete, remove test gauge and fitting.
9. Install oil pressure switch and connector. (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - INSTALLATION).

OIL

STANDARD PROCEDURE

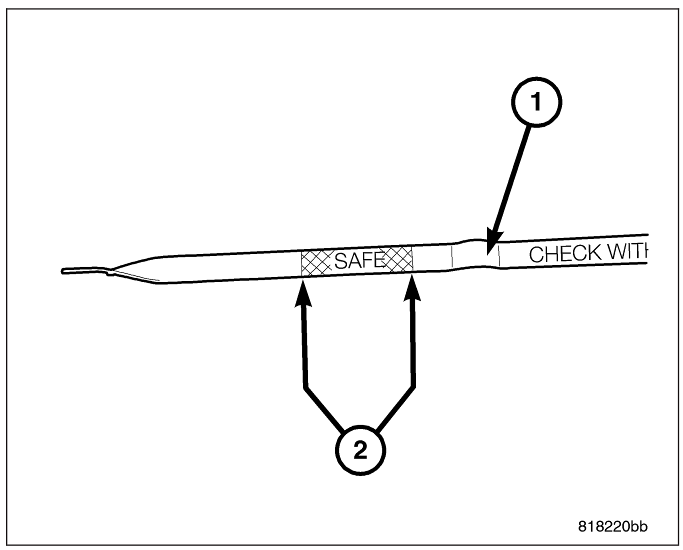
ENGINE OIL LEVEL CHECK



NOTE: The engine must be HOT when checking oil level.

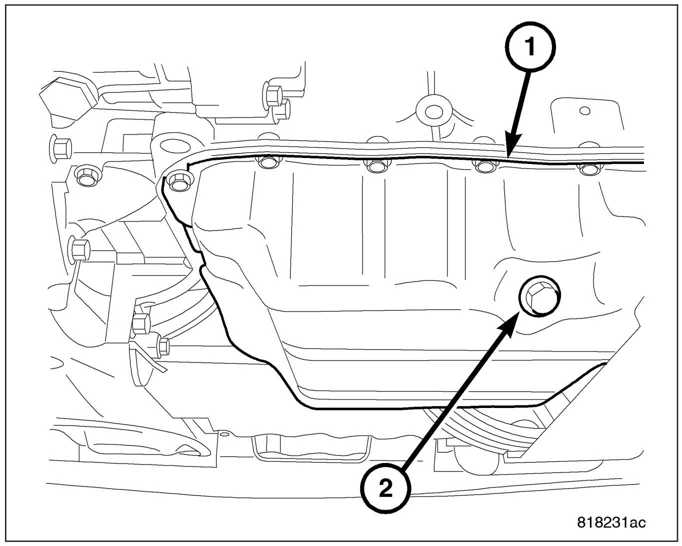
The best time to check engine oil level is after the engine is at operating temperature. Allow the engine to be shut off for at least 5 minutes before checking oil level.

Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Remove dipstick (1), and observe oil level. Add oil only when the level is at or below the SAFE mark. If the oil level is in the safe (2) range, do not add oil.



CAUTION: Do not operate engine if the oil level is above the MAX mark on the dipstick. Excessive oil volume can cause oil aeration which can lead to engine failure due to loss of oil pressure or increase in oil temperature.

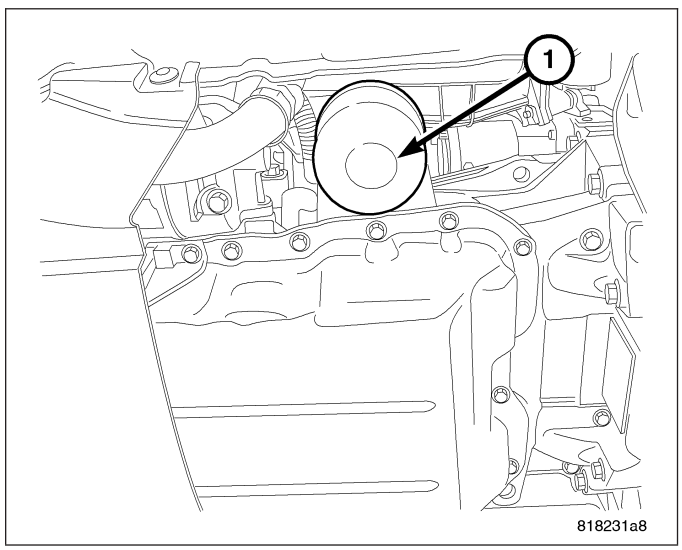
ENGINE OIL AND FILTER CHANGE



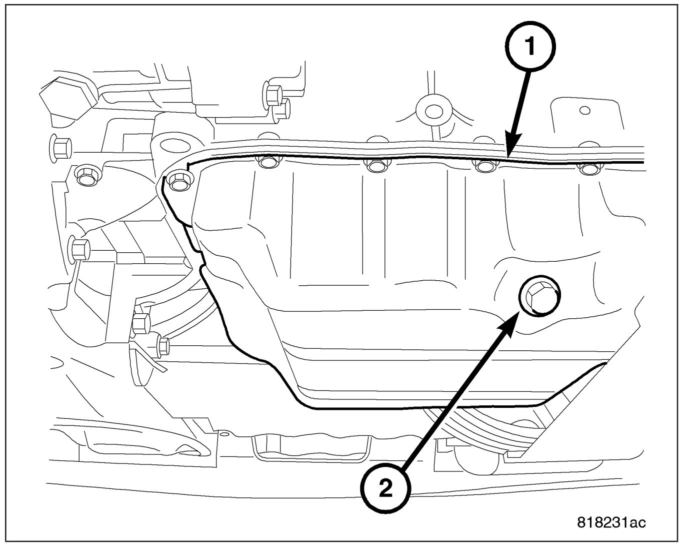
WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

Change engine oil at mileage and time intervals described in the Maintenance Schedule (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

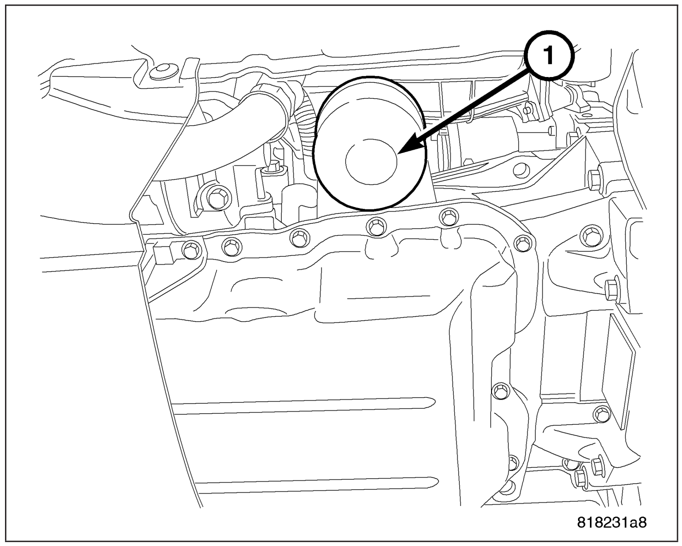
1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Remove oil fill cap.
4. Raise vehicle on hoist.
5. Place a suitable oil collecting container under oil pan drain plug (2).
6. Remove oil pan drain plug (2) or and allow oil to drain into collecting container. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.
7. Remove oil filter (1) (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).



8. Install oil pan drain plug (2). Torque drain plug to 28 N·m (20 ft. lbs.).



9. Install new oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - INSTALLATION).
10. Lower vehicle and fill crankcase with specified type and amount of engine oil (Refer to LUBRICATION & MAINTENANCE/SPECIFICATIONS - FLUID CAPACITIES) and (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).
11. Install oil fill cap.
12. Start engine and inspect for leaks.
13. Stop engine and inspect oil level.



OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. Replace oil filter with a Mopar® or the equivalent.

USED ENGINE OIL DISPOSAL

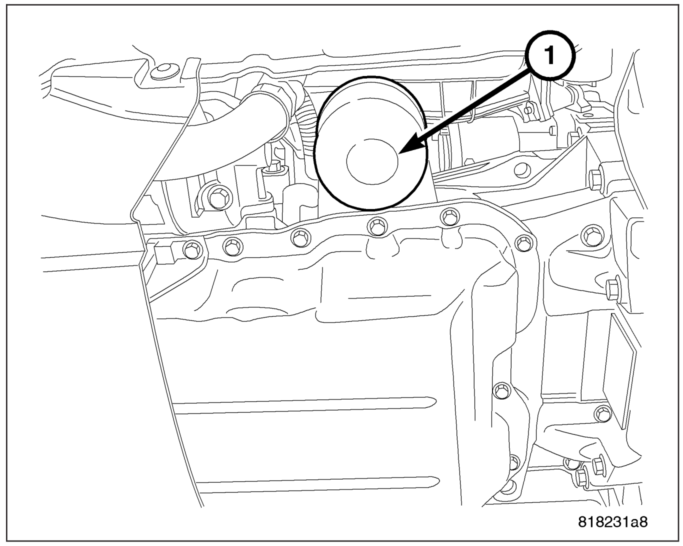
Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

FILTER-OIL

REMOVAL

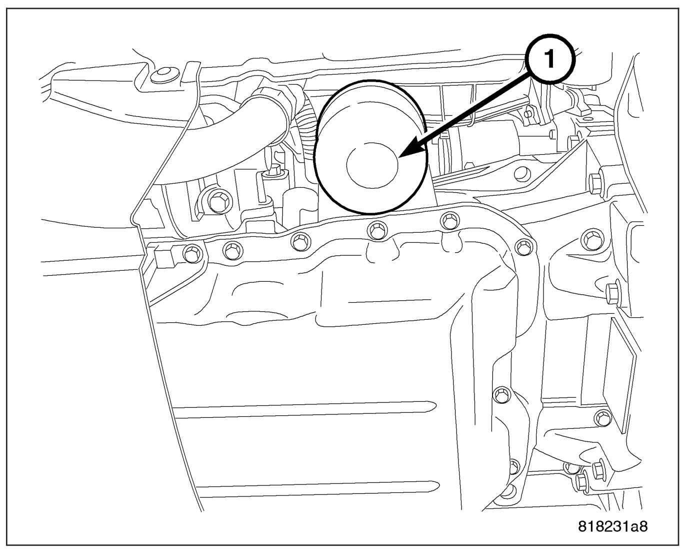
CAUTION: When servicing the oil filter avoid deforming the filter can by installing the remove/ install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

1. Using a suitable filter wrench, turn oil filter (1) counterclockwise to remove.



INSTALLATION

1. Clean and check filter mounting surface. The surface must be smooth, flat and free of debris or pieces of gasket.
2. Lubricate new oil filter gasket.
3. Screw oil filter (1) on until the gasket contacts base. Tighten to 21 N·m (15 ft. lbs.).



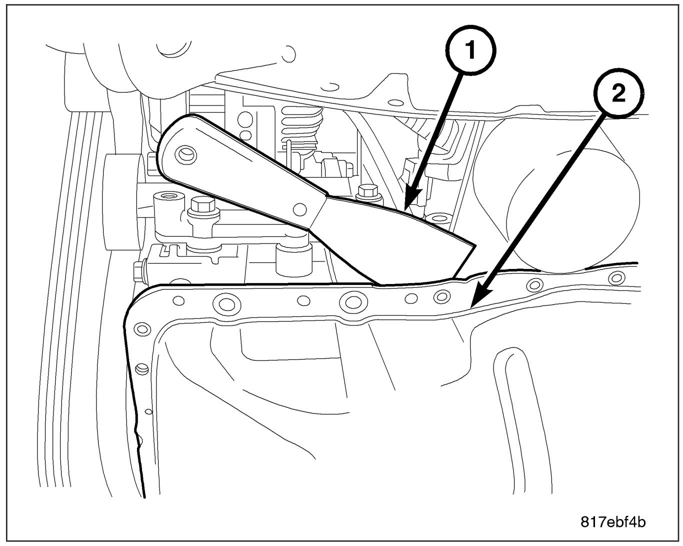
PAN-OIL

REMOVAL

1. Raise vehicle on hoist.
2. Drain engine oil.
3. Remove accessory drive belt splash shield.
4. Remove lower A/C compressor mounting bolt (if equipped).
5. Remove A/C mounting bracket.

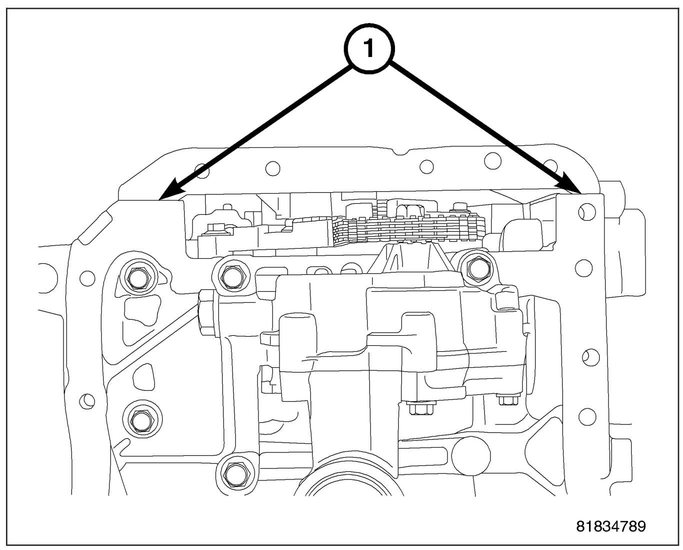
NOTE: Do not use pry points in block to remove oil pan.

6. Remove oil pan retaining bolts.
7. Using a putty knife (1), loosen seal around oil pan (2).
8. Remove oil pan (2).

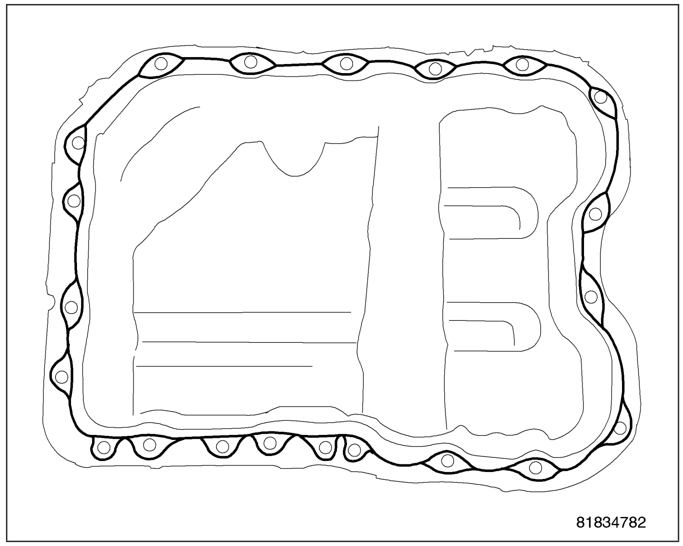


INSTALLATION

1. Apply Mopar® Engine RTV GEN II at the front cover to engine block parting lines (1).



2. Apply a 2 mm bead of Mopar® Engine RTV GEN II around the oil pan as shown.

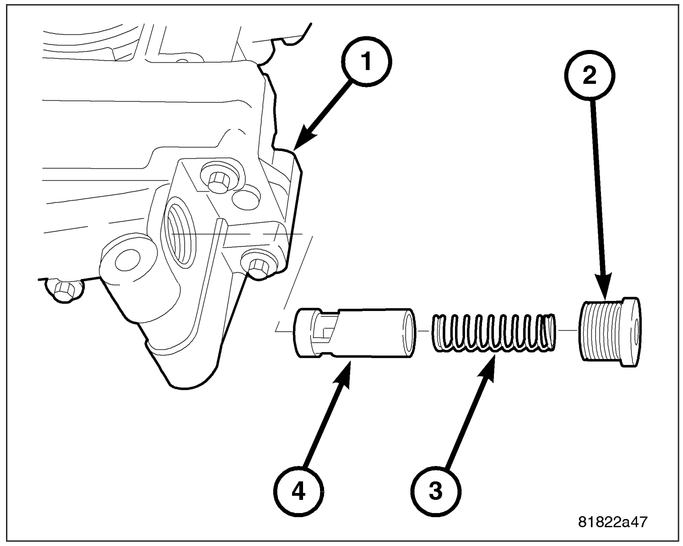


3. Tighten screws to 12 N·m (105 in. lbs.).
4. Install oil drain plug.
5. Lower vehicle and fill engine crankcase with proper oil to correct level.
6. Start engine and check for leaks.

VALVE-OIL PRESSURE RELIEF

REMOVAL

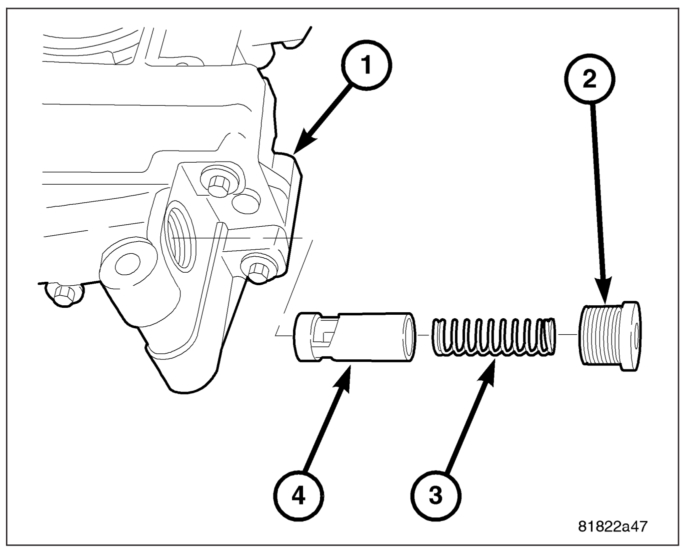
1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)
2. Remove pressure regulating valve cap (2).
3. Remove pressure regulating valve spring (3) and valve (4).



INSPECTION

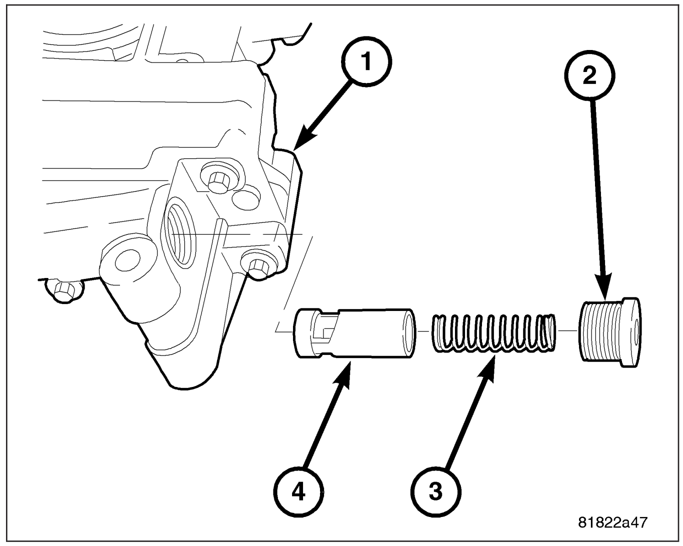
NOTE: Pressure regulating valve (4) can be service separately from the oil pump assembly.

1. Inspect pressure relief valve (4) scoring, gouging, or debris. Replace as needed.
2. Inspect the pressure relief valve bore in the pump for scoring, gouging, or debris.
3. If pump bore is damaged, replace balance shaft module.



INSTALLATION

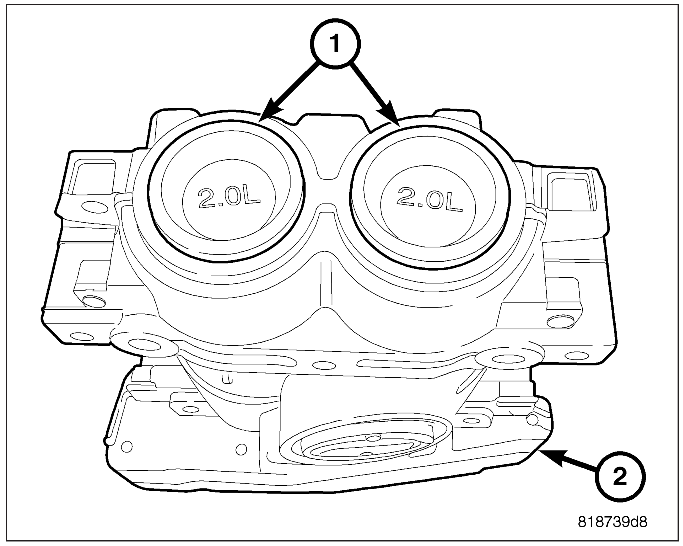
1. Lightly coat pressure regulating valve with clean engine oil and install valve (4).
2. Install spring (3) and cap (2).
3. Torque cap to 42 N·m (31 lbs.ft.).



PUMP-OIL

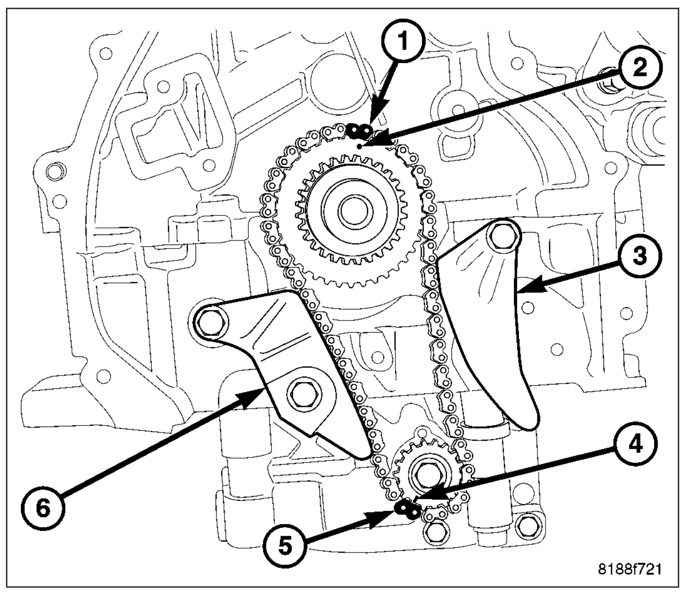
DESCRIPTION

The oil pump is integral to the balance shaft module (BSM) (2). The oil pump cannot be disassembled for inspection. The pressure relief valve is serviceable and can be removed and inspected. The BSM can be identified by the plastic end caps (1).

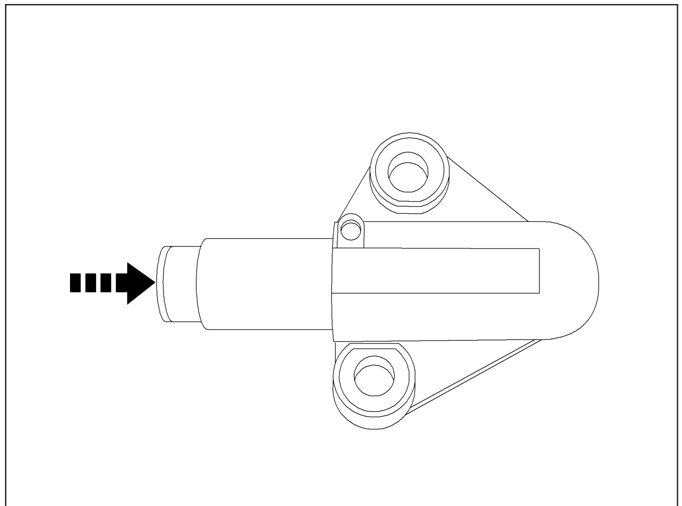


REMOVAL

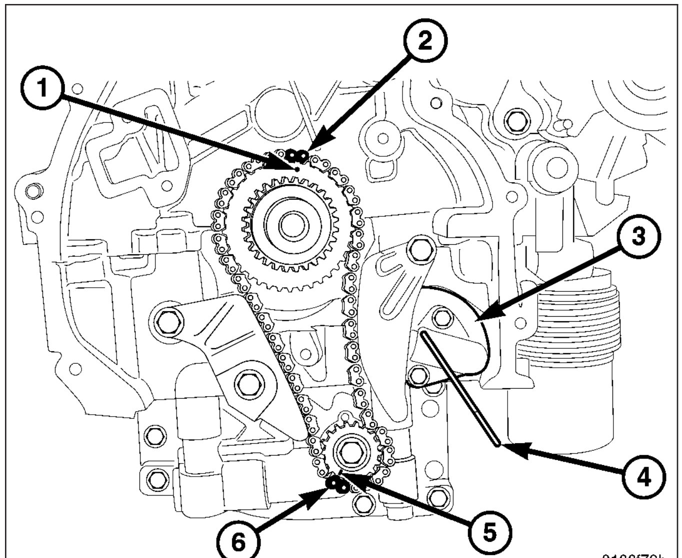
1. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Mark the chain (4) and the sprocket (5) for reassembly.



3. Push tensioner toward the front of the vehicle.


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4. Install 9703 (4).
5. Remove BSM mounting bolts and discard.
6. Lower the back of the BSM and remove sprocket from chain.
7. Remove BSM from the engine.

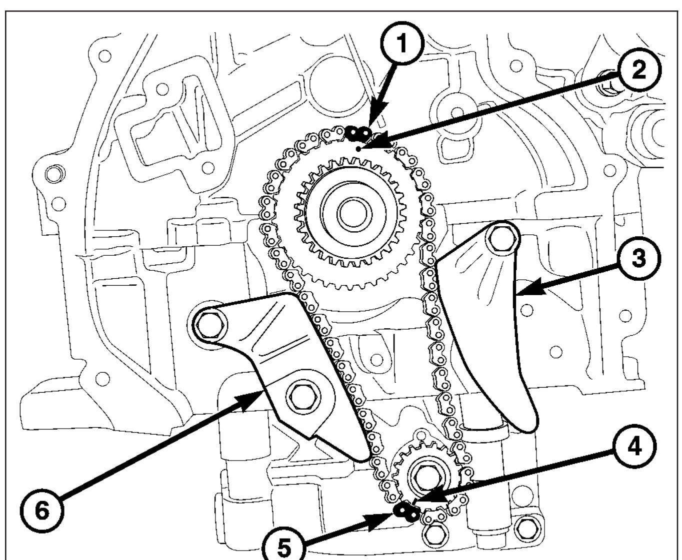


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INSTALLATION

CAUTION: Do not reuse Balance Shaft Module (BSM) to engine block bolts. Always discard bolts after removing. Failure to replace bolts can result in engine damage.

1. Align marks on oil pump sprocket (5) and chain (4).
2. Install chain on sprocket.
3. Pivot BSM assembly upwards toward the engine block.

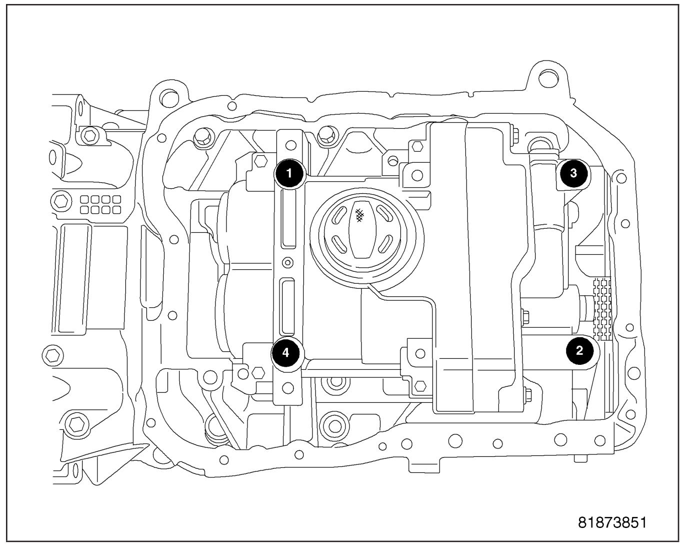


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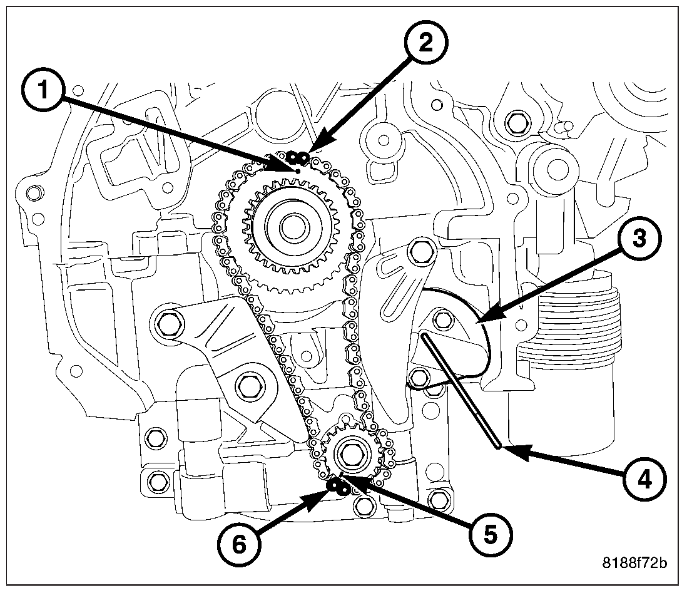
4. Start **new** BSM mounting bolts by hand.

NOTE: Use a three step procedure when torqueing BSM mounting bolts.

5. Torque BSM mounting bolts to 15 N·m (11 ft. lbs.) as shown.
6. Torque BSM mounting bolts to 29 N·m (22 ft. lbs.) as shown.
7. Rotate bolts an additional 90° as shown.



8. Remove tensioner pin 9703 (4).
9. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
10. Fill with oil.
11. Start engine and check for leaks.



SENSOR/SWITCH-ENGINE OIL PSI

DESCRIPTION

The oil pressure switch is located on the left front side of the engine block. The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

OPERATION

The oil pressure switch is normally "Closed." The switch changes from a ″Closed″ circuit to an ″Open″ circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an ″Open″ circuit to a ″Closed″ circuit, on decreasing pressure, between 2 psig and 4 psig.

REMOVAL

1. Raise vehicle.
2. Disconnect electrical connector.
3. Remove oil pressure sending unit using oil pressure socket C-4597.

INSTALLATION

1. Install oil pressure sending unit using oil pressure socket C-4597.
2. Connect electrical connector.

COOLER-OIL

DESCRIPTION

An engine oil cooler is used on some 2.4L engine packages. The cooler is a coolant-to-oil type and mounted between the oil filter and oil filter adapter.

REMOVAL

1. Raise vehicle on hoist.
2. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
3. Disconnect oil cooler coolant hoses.
4. Remove oil filter.
5. Remove oil cooler connector bolt.
6. Remove oil cooler.

INSTALLATION

1. Replace oil cooler seal.
2. Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab.
3. Install oil cooler connector bolt. Torque connector bolt to 55 N·m (41 ft. lbs.).
4. Install oil filter.
5. Connect oil cooler coolant hose.
6. Lower vehicle.
7. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

MANIFOLD-INTAKE

DIAGNOSIS AND TESTING

INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water (Spray Bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

LOWER INTAKE MANIFOLD

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

1. Remove engine cover.
2. Perform fuel system pressure release procedure **before attempting any repairs (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).**
3. Remove air cleaner housing.
4. Disconnect negative battery cable.
5. Disconnect fuel line at rail.
6. Remove fuel injector electrical connectors.
7. Remove fuel rail retaining bolts and remove fuel rail.
8. Disconnect oil temperature sensor.
9. Disconnect variable valve timing solenoid electrical connector.
10. Disconnect intake camshaft position sensor electrical connector.
11. Position harness out of the way.
12. Remove throttle body support bracket.
13. Disconnect electronic throttle control electrical connector.
14. Remove wiring harness retainer from the intake manifold.
15. Disconnect MAP sensor electrical connector.
16. Disconnect vacuum lines at intake.
17. Remove upper radiator hose retaining bracket.
18. Remove intake manifold retaining bolts.
19. Remove intake manifold.

CLEANING

1. Discard gasket(s).
2. Clean all sealing surfaces.

INSPECTION

1. Inspect manifold for cracks, distortion, or mounting surface warpage. Replace manifold if necessary.
2. Inspect manifold gasket for surface damage or excessive swelling. Replace gaskets as necessary.

INSTALLATION

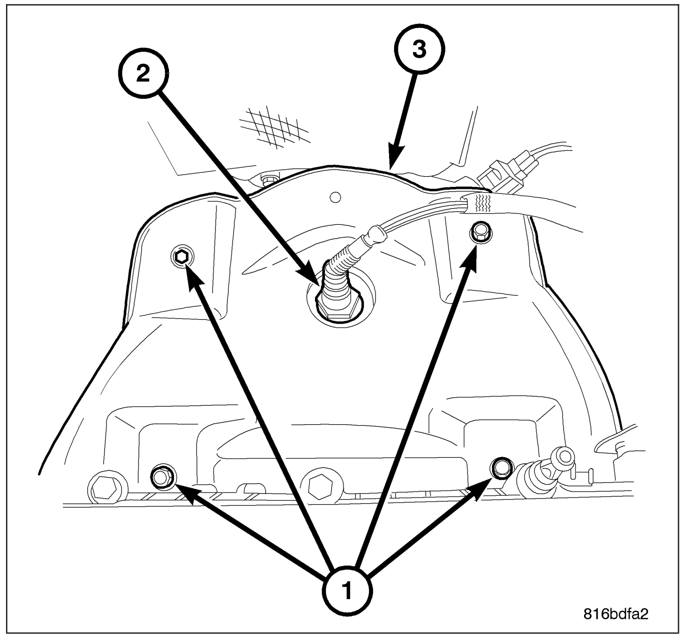
LOWER INTAKE MANIFOLD

1. Clean all gasket surfaces.
2. Replace intake manifold gasket.
3. Install intake manifold, torque bolts to 25 N·m (220 in. lbs.).
4. Install the fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).
5. Connect fuel injector electrical connectors.
6. Inspect quick connect fittings for damage, replace if necessary (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE). Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.
7. Connect negative cable to battery.
8. Fill the cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

MANIFOLD-EXHAUST

REMOVAL

1. Remove engine cover.
2. Remove clean air hose and air cleaner housing.
3. Disconnect negative cable from battery.
4. Disconnect throttle and speed control cables from the throttle lever and bracket.
5. Disconnect MAP sensor electrical connector.
6. Remove fasteners securing power steering fluid reservoir to cylinder head.
7. Remove coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL).
8. Remove bolts attaching upper heat shield.
9. Remove upper heat shield.
10. Raise vehicle.
11. Disconnect exhaust pipe from manifold.
12. Remove engine wiring heat shield.
13. Remove manifold support bracket.
14. Remove lower exhaust manifold heat shield.
15. Disconnect oxygen sensor electrical connector.
16. Remove exhaust manifold lower retaining fasteners.
17. Lower vehicle and remove the upper exhaust manifold retaining fasteners.
18. Remove exhaust manifold from above/between the engine and cowl panel.
19. Remove and discard manifold gasket.
20. Mark prop shaft and differential for proper installation (if equipped).
21. Remove the rear prop shaft (if equipped) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
22. Remove the two exhaust to maniverter (exhaust manifold with catalytic converter) bolts.
23. Unplug the down - stream O2 sensor connector.
24. Remove the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
25. Lower the vehicle on the hoist.
26. Unplug the up - stream O2 sensor connector.
27. Remove up - stream O2 sensor from the maniverter (exhaust manifold with catalytic converter) using o2 sensor socket 8439 (2).



28. Remove the four maniverter heat shield bolts (1).
29. Remove the two retaining bolts and one nut from the maniverter side heat shield (3).
30. Remove the seven maniverter to head retaining bolts.
31. Slide the maniverter up and to the right, The support the maniverter (1) with the help of a bungie cord.
32. Raise the vehicle on the hoist.
33. Remove the four (1) engine to maniverter bracket bolts.
34. Remove the rear engine mount through bolt (2).
35. Remove the three front engine mount to frame bolts and the mount through bolt.
36. Remove the PTU mounting bolts.
37. Install a screw jack (2)on front engine mount bracket (1).
38. Raise the front of the engine until the rear mount has dropped (1,2).
39. Separate the PTU from the transaxle.

40. Remove and discard old O-ring between Transmission and PTU
41. Roll the PTU (1) forward and down to remove.

CLEANING

1. Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

1. Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
2. Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

1. Install a new exhaust manifold gasket. **DO NOT APPLY SEALER**.
2. Position exhaust manifold in place. Tighten fasteners, starting at center and progressing outward in both directions to 23 N·m (200 in. lbs.). Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.
3. Install exhaust manifold heat shields. Tighten bolts to 12 N·m (105 in. lbs.).
4. Install exhaust manifold support bracket.
5. Install engine wiring heat shield.
6. Connect oxygen sensor electrical connector.
7. Install exhaust pipe to manifold. Tighten fasteners to 28 N·m (250 in. lbs.).
8. Install coolant recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION).
9. Install fasteners securing power steering fluid reservoir to cylinder head.
10. Connect MAP sensor electrical connector.
11. Connect throttle and speed control cables to the throttle lever and bracket.
12. Connect negative cable to battery.
13. Install clean air hose and air cleaner housing.
14. Roll the PTU in moving from front to back.
15. Rest the PTU on the frame while the engine and transaxle are raised back into position.
16. Lower screw jack until rear mount through bolt can be installed.
17. Install rear mount through bolt and torque bolt to 75 Nm (55 ft. lbs.).
18. Install the transmission crossmember and bolts, torque to 75 Nm (55 ft. lbs.).
19. Install the through bolt at the front transmission mount and torque to 75 Nm (55 ft. lbs.)
20. Insure that the O-ring between the PTU and transaxle is in place.
21. Slide the PTU into place.
22. Install and torque PTU mounting bolts to 58 N-m (43 lbf-ft).
23. Lower the hoist.
24. Place the maniverter back into place and install the seven bolts.
25. Torque the maniverter bolts.
26. Install the maniverter side heat shield into place.
27. Install the two retaining bolts and one retaining nut.
28. Install the maniverter heat shield and the four retaining bolts.
29. Torque the maniverter heat shield bolts.
30. Using tool 8439 install the O2 sensor.
31. Install the air box.
32. Install engine trim cover.
33. Raise the vehicle on the hoist.
34. Install the maniverter to block bracket and four mounting bolts.

35. Torque maniverter to block bracket mounting bolts.
36. Install the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
37. Install the Prop shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
38. install the right axle shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
39. Install the right front tire.
40. Fill PTU. (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).
41. lower hoist
42. Connect battery cables.
43. Top off the fluids.

COVER-TIMING CHAIN

REMOVAL

1. Remove engine cover.
2. Perform fuel pressure bleed procedure.
3. Remove air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Disconnect negative battery cable.
5. Drain cooling system
6. Remove coolant recovery bottle.
7. Remove windshield washer bottle.
8. Remove power steering reservoir and set aside.
9. Remove make up air hose.
10. Remove PCV hose.
11. Disconnect ignition coil electrical connectors.
12. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
13. Raise vehicle.
14. Remove right lower splash shield.
15. Set engine to TDC.
16. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
17. Remove lower A/C compressor retaining bolts.
18. Remove A/C compressor lower bracket.
19. Remove accessory drive belt lower idler pulley.
20. Remove crankshaft pulley.
21. Remove water pump pulley.
22. Remove timing chain cover lower bolts.
23. Lower vehicle.
24. Remove power steering pump and set aside.
25. Support engine with a suitable jack.
26. Remove right engine mount.
27. Remove accessory drive belt upper idler pulley.
28. Remove right engine mount bracket.
29. Remove accessory drive belt tensioner.
30. Remove timing chain cover upper retaining bolts.
31. Remove timing chain cover.

INSTALLATION

1. Clean all sealing surfaces.
2. Apply RTV as shown at the cylinder head to block parting line.
3. Apply RTV as shown in the corner of the oil pan and block.
4. Apply 2mm bead of RTV as shown.
5. Install timing chain cover.
6. Install timing chain cover upper retaining bolts and torque bolts.
7. Install accessory drive belt tensioner.
8. Install right engine mount bracket and torque.
9. Install accessory drive belt upper idler pulley.
10. Install right engine mount and torque bolts.

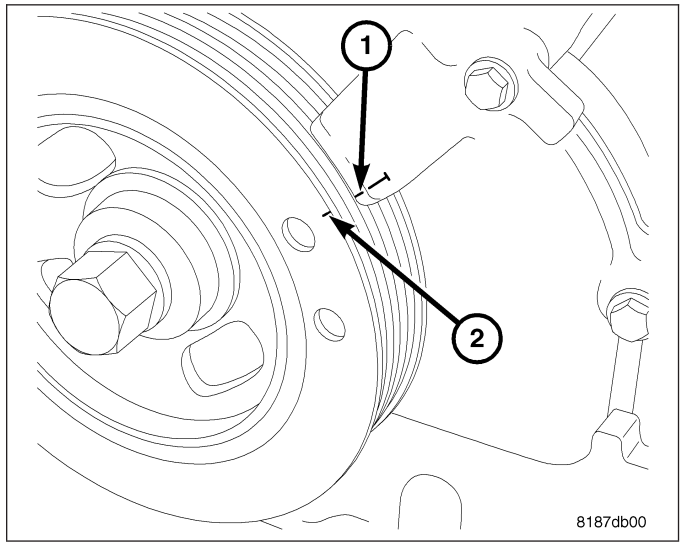
11. Remove jack from under engine.
12. Install power steering pump.
13. Raise vehicle.
14. Install timing chain cover lower retaining bolts and torque bolts.
15. Install oil pan to timing chain cover lower retaining bolts and torque bolts.
16. Install water pump pulley.
17. Install crankshaft pulley and torque bolt.
18. Install accessory drive belt lower idler pulley.
19. Install lower A/C compressor mounting bracket.
20. Install A/C compressor.
21. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
22. Install right lower splash shield.
23. Lower vehicle.
24. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)
25. Connect coil electrical connector,
26. Connect PCV hose to PCV valve.
27. Connect make up air hose.
28. Install power steering reservoir.
29. Install windshield washer bottle.
30. Install coolant recovery bottle.
31. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
32. Connect negative battery cable.
33. Install air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
34. Install engine cover.

CHAIN AND SPROCKETS-TIMING

REMOVAL

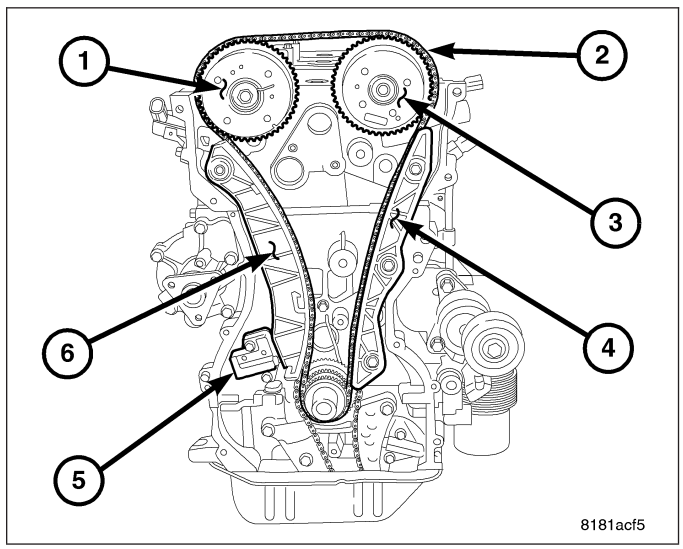
TIMING CHAIN

1. Perform fuel pressure bleed procedure.
2. Remove air cleaner housing.
3. Set engine to TDC.
4. Remove timing chain cover (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



NOTE: If the timing chain plated links can no longer be seen, the timing chain links corresponding the timing marks must be marked prior to removal if the chain is to be reused.

5. Remove timing chain tensioner (5) (Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - REMOVAL).
6. Remove timing chain (2).

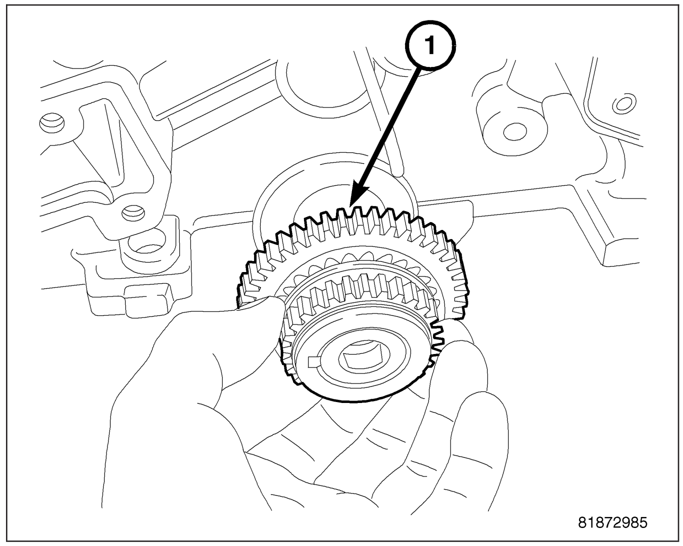


CAMSHAFT SPROCKET(S)

Refer to camshaft phasor removal (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

CRANKSHAFT SPROCKET

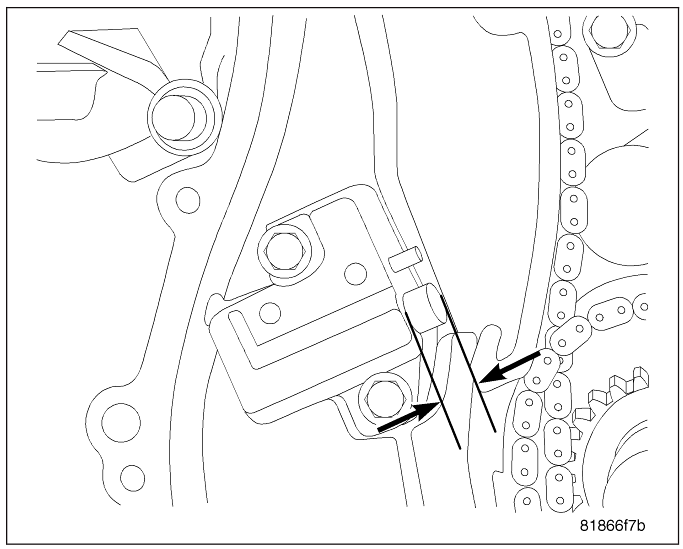
1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove oil pump drive chain tensioner.
4. Remove oil pump drive chain.
5. Remove crankshaft sprocket (1).



INSPECTION

Inspect timing chain for stretching prior to removal.

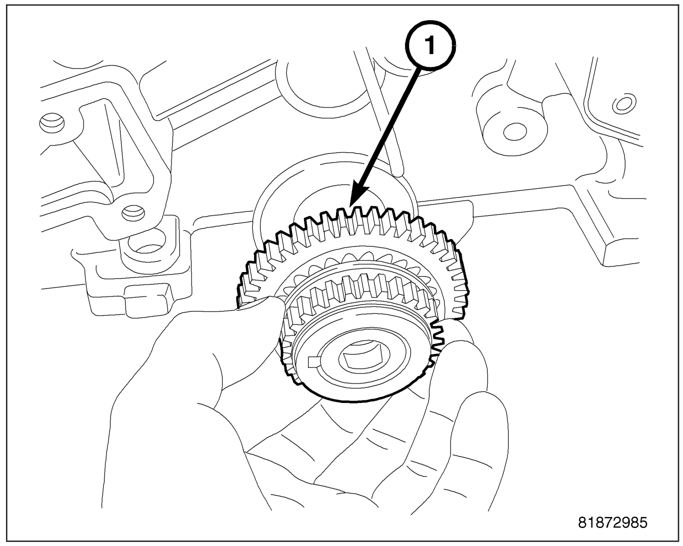
1. Rotate engine while watching timing chain tensioner plunger. When the plunger reaches its maximum travel stop rotating engine.
2. Measure the distance from the tensioner body and the edge of the chain guide as shown.
3. If the distance is greater than 20.5 mm (0.81 in.) inspect guide shoes for excessive wear.
4. If guides are okay, replace timing chain.



INSTALLATION

CRANKSHAFT SPROCKET

1. Install crankshaft sprocket (1) onto crankshaft.
2. Install oil pump drive chain. Verify that Oil pump is correctly timed.
3. Reset oil pump drive chain tensioner by pushing plunger inward and install Tensioner Pin 8514.
4. Install oil pump drive chain tensioner and remove Tensioner Pin 8514.
5. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
6. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/ OIL PAN - INSTALLATION).
7. Fill engine with oil (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE).
8. Start engine and check for leaks.



CAMSHAFT SPROCKET(S)

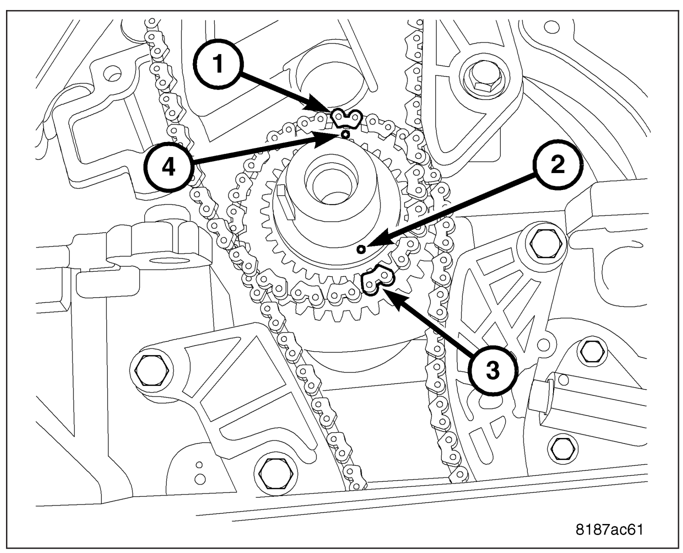
NOTE: The camshaft sprockets and the camshaft phasers are an assembly and cannot be serviced separately.

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin and camshaft phaser may occur.

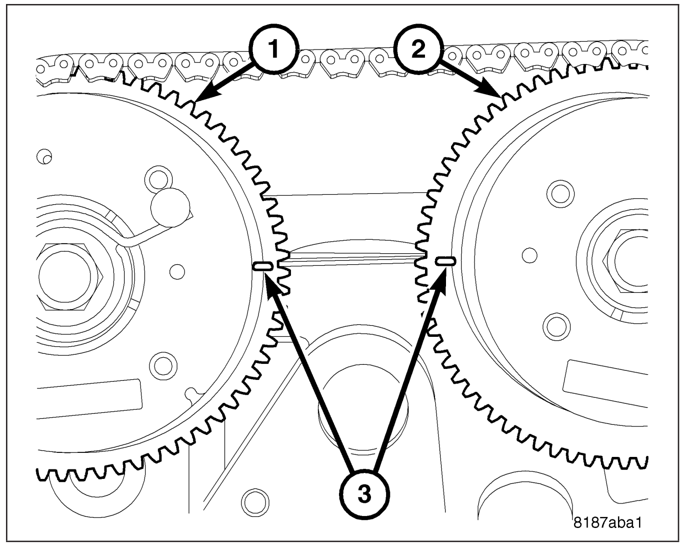
1. Refer to Camshaft phaser installation (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION).

TIMING CHAIN

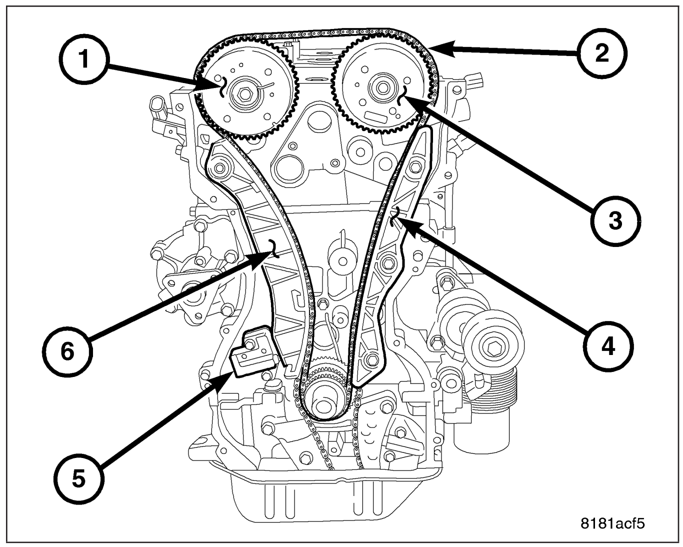
1. Verify that the crankshaft sprocket keyway is at the 9 o'clock position.



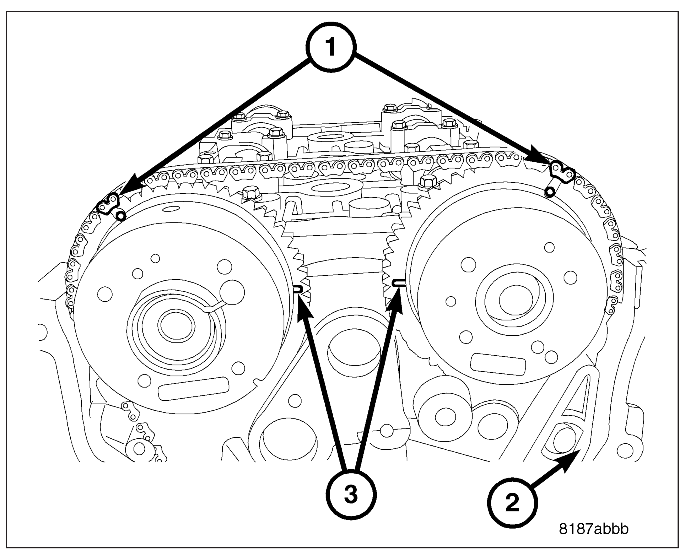
2. Align camshaft timing marks (3) so they are parallel to the cylinder head as shown.



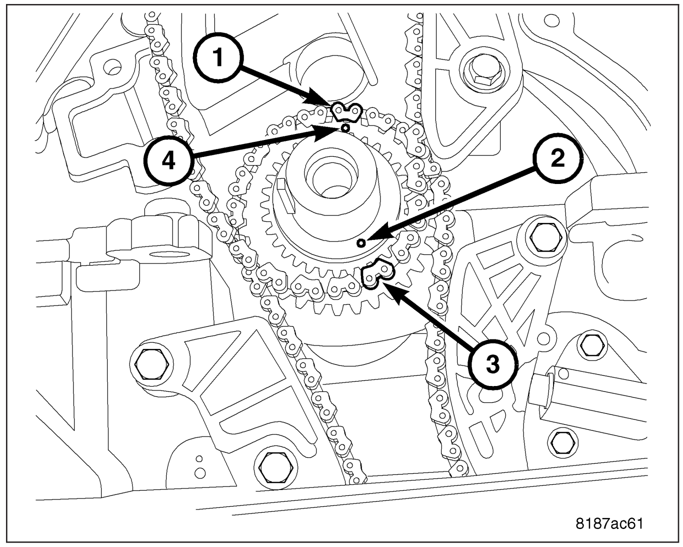
3. Install timing chain guide (4) and torque bolts.

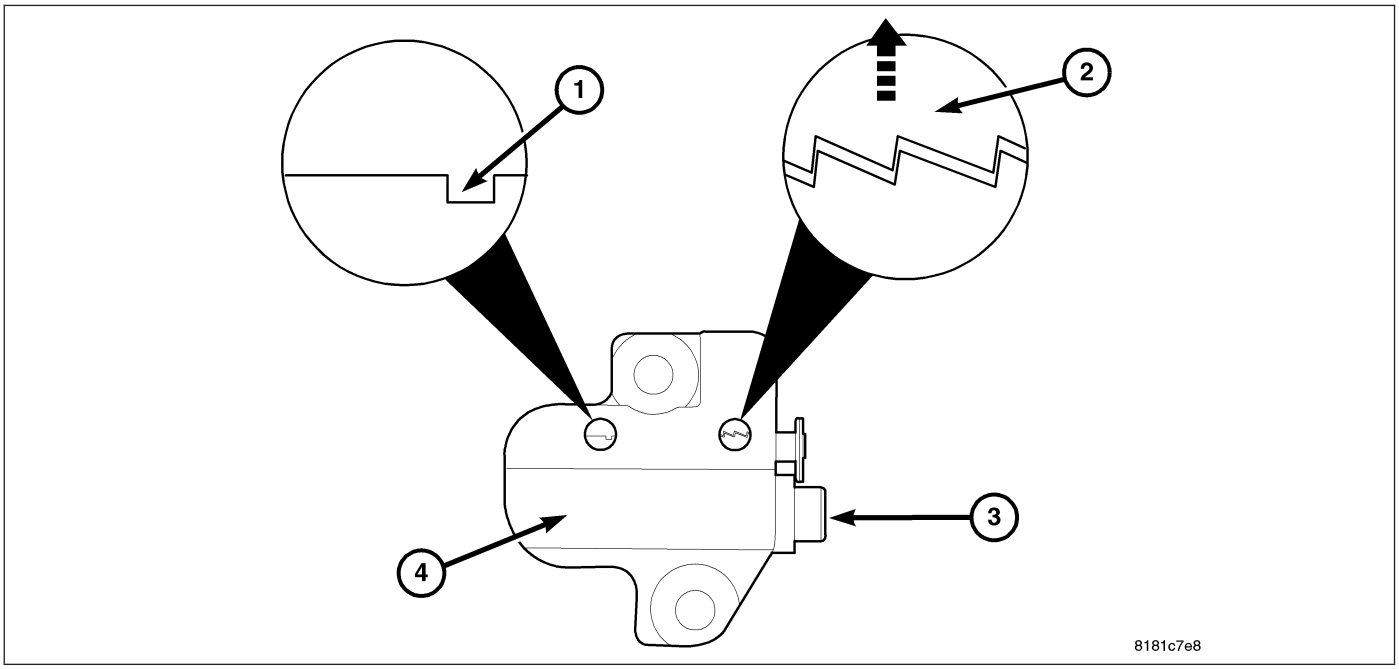


4. Install timing chain so plated links on chain align with timing marks on camshaft sprockets (1).



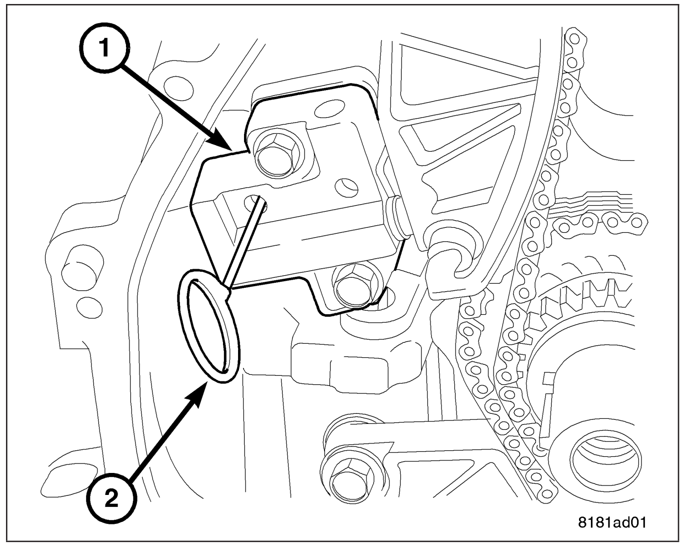
5. Align timing mark on the crankshaft sprocket (2) with the plated link (3) on the timing chain. Position chain so slack will be on the tensioner side.





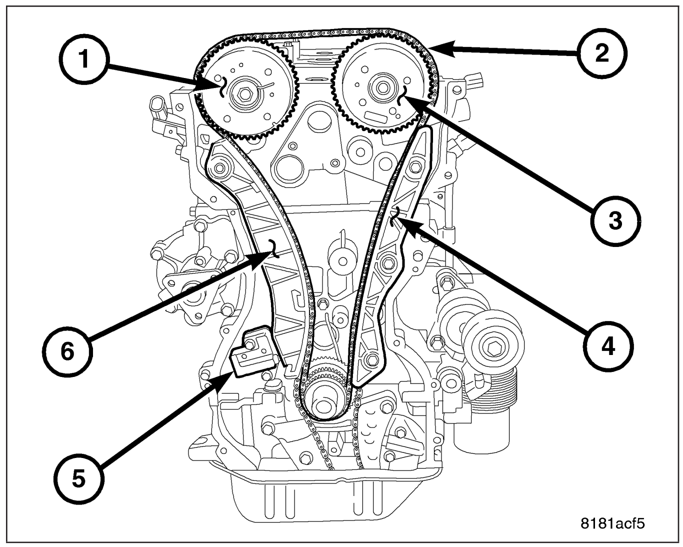
6. Reset timing chain tensioner (4) by lifting up on ratchet (2) and pushing plunger (3) inward towards the tensioner body (4). Insert tensioner pin 8514 into slot (1) to hold tensioner plunger in the retracted position.

7. Install timing chain tensioner (1) and torque bolts to 12 N·m (105 in. lbs.).

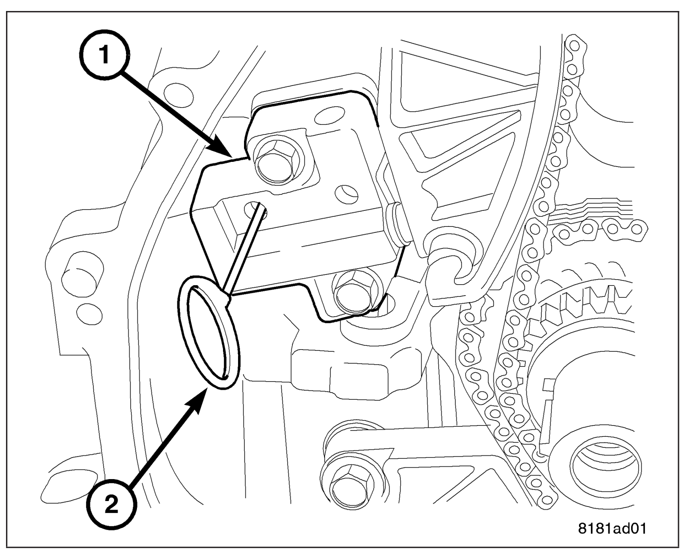


NOTE: Keep the slack in the timing chain on the tensioner side.

8. Install the moveable timing chain pivot guide (6) and torque bolt to 12 N·m (105 in. lbs.).



9. Remove timing tensioner pin 8514 (2).
10. Rotate the crankshaft CLOCKWISE two complete revolutions until the crankshaft is repositioned at the TDC position. Verify that the camshaft and crankshaft timing marks are in proper position.
11. Install front timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Connect negative battery cable.
13. Fill with oil, start engine and check for leaks.



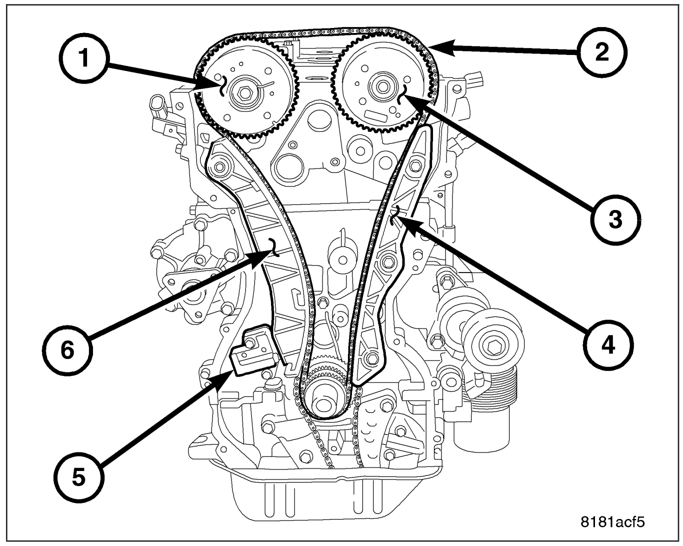
TENSIONER-TIMING CHAIN

REMOVAL

1. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

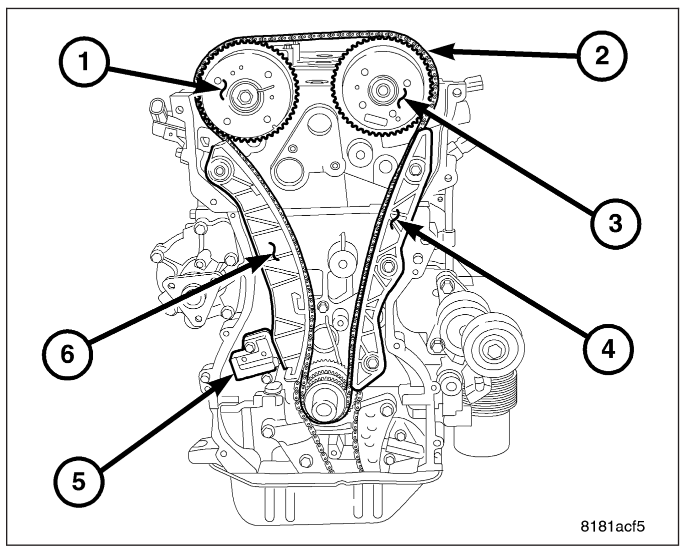
NOTE: Tensioner will not come apart during removal.

2. Remove timing chain tensioner retaining bolts and remove tensioner.



INSTALLATION

1. Reset tensioner.
2. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



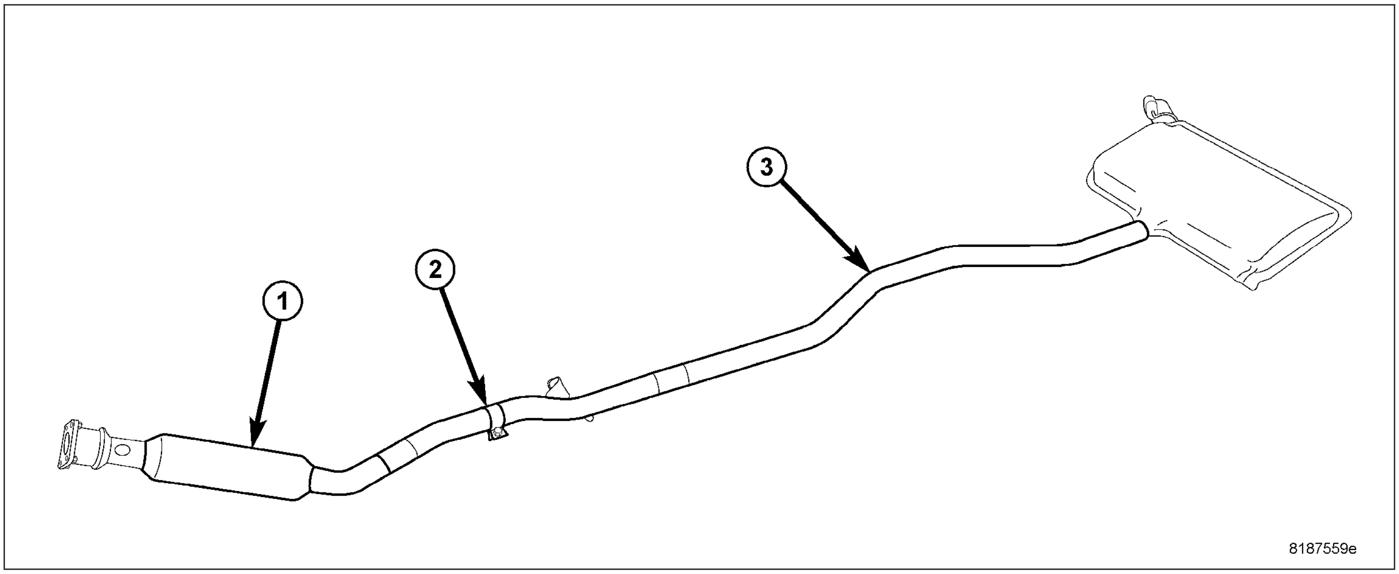
EXHAUST SYSTEM

TABLE OF CONTENTS

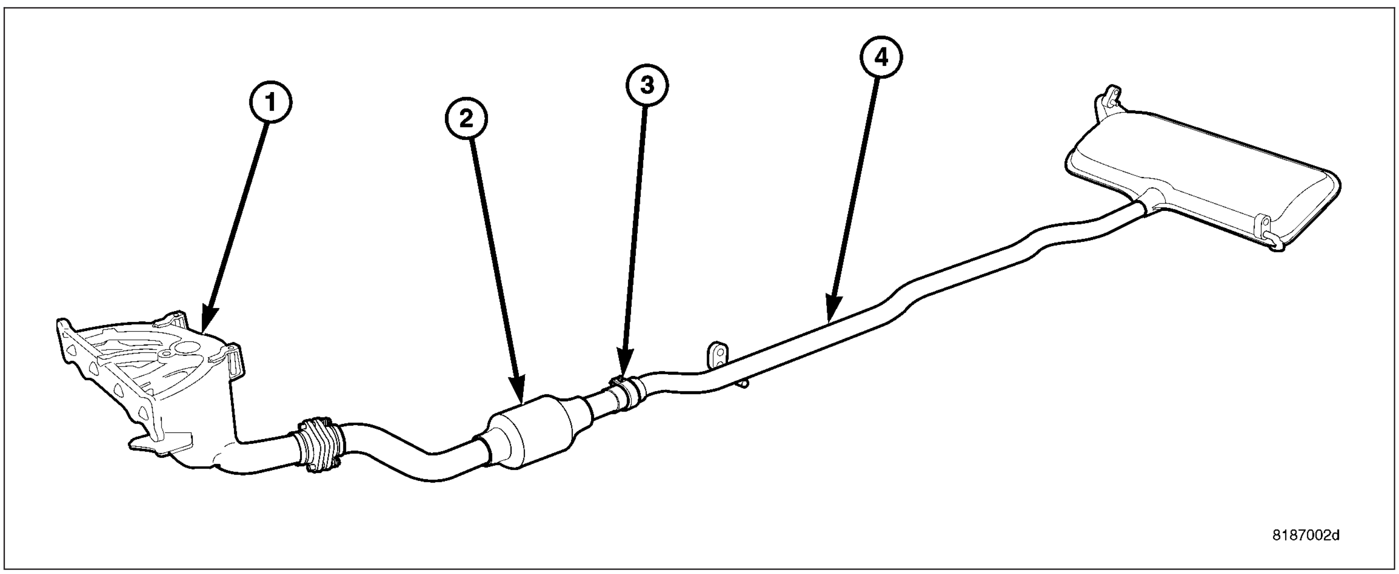
EXHAUST SYSTEM AND TURBOCHARGER

DESCRIPTION

GAS ENGINE



The FWD gas engine exhaust system components consist of a catalytic converter, intermediate pipe, muffler, clamps and support isolators



The AWD gas engine exhaust system components consist of a maniverter, under floorcatalytic converter, intermediate pipe, muffler, clamps and support isolators

DIAGNOSIS AND TESTING

EXHAUST SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST NOISE (UNDER HOOD)	1. Exhaust manifold cracked or broken.	1. Replace manifold.
	2. Manifold to cylinder head leak.	2. Tighten manifold and/or replace gasket.
	3. Exhaust flex joint to manifold leak.	3.Tighten fasteners or replace gasket.
	4. Exhaust flex joint.	4. Replace catalytic converter assembly.
	5. Pipe and shell noise from front exhaust pipe.	5. Characteristic of single wall pipes.
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints.	1. Tighten or replace clamps at leaking joints.
	2. Burned, blown, or rusted out exhaust pipe or muffler.	2. Replace muffler or exhaust pipes.
	3. Restriction in muffler or tailpipe.	3. Remove restriction, if possible or replace as necessary.
	4. Catalytic converter material in muffler.	4. Replace muffler and converter assembly. Check fuel injection and ignition systems for proper operation.

DIAGNOSIS AND TESTING - EXHAUST SYSTEM RESTRICTION CHECK

Exhaust system restriction can be checked by measuring back pressure using the DRB III® and PEP module pressure tester.

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it is cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

NOTE: For Special Tool identification, (Refer to 11 - EXHAUST SYSTEM - SPECIAL TOOLS).

1. Disconnect and remove the upstream (before catalytic converter) oxygen sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - REMOVAL)
2. Install the Back Pressure Test Adaptor CH8519.
3. Connect the Pressure Transducer CH7063 to the back pressure fitting.
4. Following the PEP module instruction manual, connect all required cables to the DRB III® and PEP module. Select the available menu options on the DRBIII® display screen for using the digital pressure gauge function.
5. Apply the park brake and start the engine.
6. With transmission in Park or Neutral, raise engine speed to 2000 RPM. Monitor the pressure readings on the DRBIII®. Back pressure should not exceed specified limit. Refer to specification in table below EXHAUST BACK PRESSURE LIMITS .
7. If pressure exceeds maximum limits, inspect exhaust system for restricted component. For further catalytic converter inspection procedures, (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSPECTION). Replace component(s) as necessary.

EXHAUST BACK PRESSURE LIMITS

Exhaust Back Pressure Limit (Max)	
Vehicle in Park/Neutral (no load) @2000 RPM	3.45 Kpa (0.5 psi)

INSPECTION

Inspect the exhaust pipes, catalytic converters, muffler, and resonators for cracked joints, broken welds and corrosion damage that would result in a leaking exhaust system. Inspect the clamps, support brackets, and insulators for cracks and corrosion damage.

NOTE: Slip joint band clamps are spot welded to exhaust system. If a band clamp must be replaced, the spot weld must be ground off.

ADJUSTMENTS

EXHAUST SYSTEM ADJUSTMENTS

A misaligned exhaust system is usually indicated by a vibration, rattling noise, or binding of exhaust system components. These noises are sometimes hard to distinguish from other chassis noises. Inspect exhaust system for broken or loose clamps, heat shields, insulators, and brackets. Replace or tighten as necessary. It is important that exhaust system clearances and alignment be maintained.

Perform the following procedures to align the exhaust system:

1. Loosen clamps and support brackets.
2. Align the exhaust system starting at the front, working rearward.
3. Tighten all clamps and brackets once alignment and clearances are achieved.

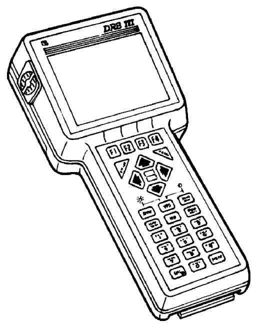
SPECIFICATIONS

TORQUE

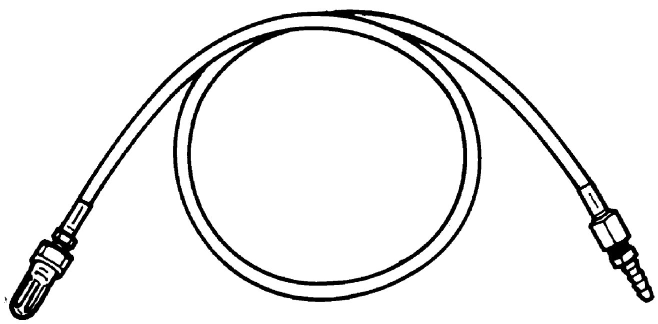
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fastener, Band Clamps	55	40	-
Fasteners, Catalytic Converter to Exhaust Manifold Flange	28	-	250
Fastener, under floor catalytic converter to maniverter - AWD	33	24	-
Fasteners, Intermediate Pipe Heat Shield	3.7	-	33
Fasteners, Support Brackets (Frame Rail Mounted)	8.5	-	75
Fasteners, Support Bracket (Rear Panel Mounted)	3.7	-	33
Fasteners, Charge Air Cooler	8	-	70
Hose Clamps, Charge Air Cooler	1.7	-	15
Banjo Fitting, Coolant Line	37	27	-
Brass Fitting, Coolant/Oil Line	41	30	-
Flared Fitting, Coolant/Oil Line	31	23	-
Elbow	28	-	250
Elbow Support Bracket			
M8 Fasteners	28	-	250
M10 Fasteners	54	40	-
Fasteners, Exhaust Manifold/Turbocharger Assembly to Cylinder Head	28	-	250
Fasteners, Heat Shield	28	-	250
Fasteners, Oil Return Tube	12	-	105
Turbocharger Support Bracket	54	40	-

SPECIAL TOOLS

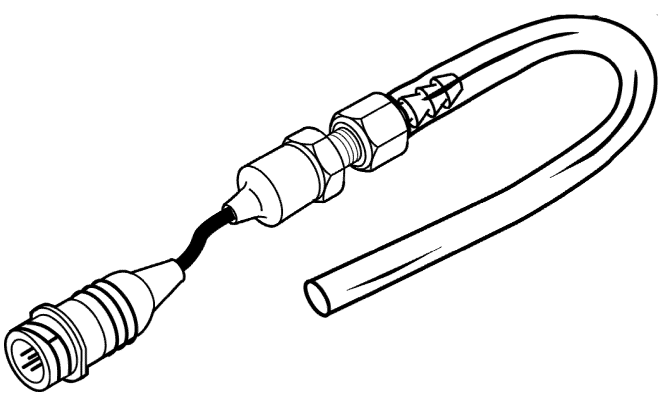
EXHAUST SYSTEM



DRB III & PEP Module - OT-CH6010A



Back Pressure Test Adapter - CH8519

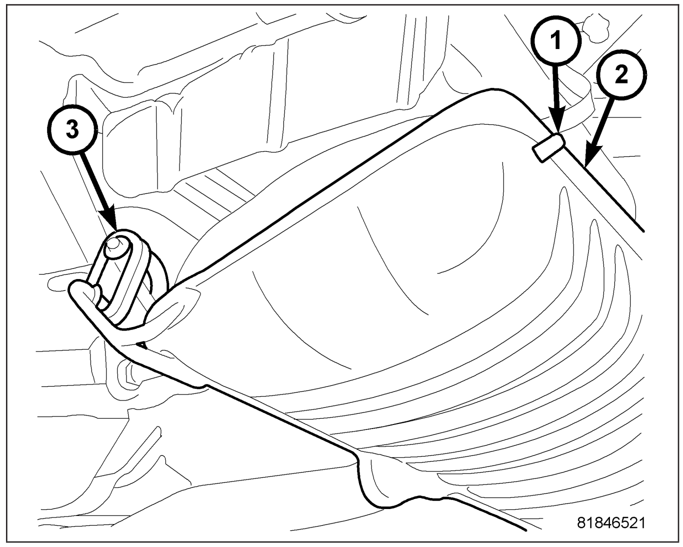


Pressure Transducer CH7063

MUFFLER

REMOVAL

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it is cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operating time.



NOTE: When replacement is required on any component of the exhaust system, you must use original equipment parts (or their equivalent).

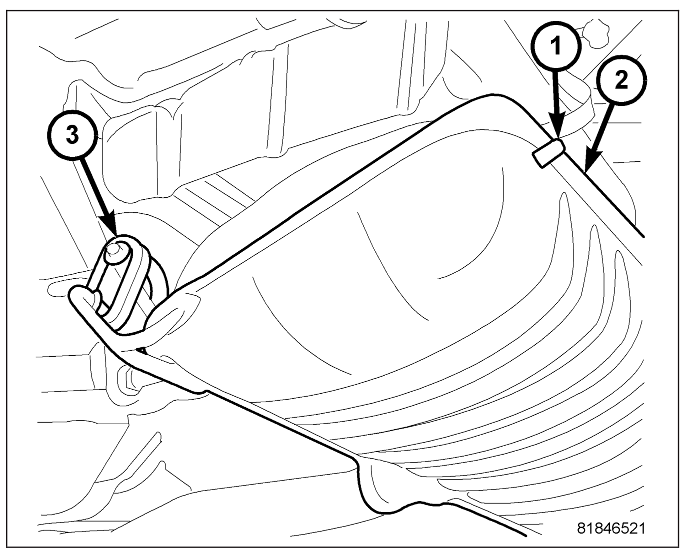
1. Raise vehicle on hoist and apply penetrating oil to band clamp nut and bolt of component being removed.

NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators (3) as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

2. Remove exhaust system ground strap (1) at rear of I-Pipe/Muffler assembly (2).
3. Loosen band clamp and remove support isolators (3) at I-Pipe/Muffler assembly (2). Remove I-Pipe/Muffler assembly (2) from catalytic converter.
4. Clean ends of pipes and muffler to assure mating of all parts. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.

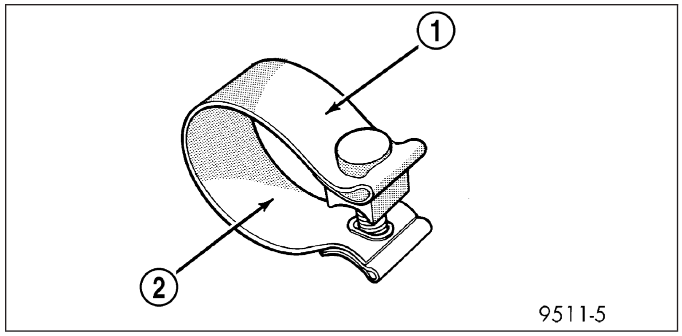
INSTALLATION

When assembling exhaust system **do not** tighten clamp until components are aligned and clearances are checked.



1. Install the I-Pipe/Muffler assembly to catalytic converter and the isolator supports to the underbody.

2. Working from the front of system; align each component to maintain position and proper clearance with underbody parts. For clearance specifications (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS). Tighten band clamp to 55 N·m (40 ft. lbs.).



CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp band has been stretched and has lost its clamping force and must be replaced.
To replace the band clamp; remove the nut and peel back the ends of the clamp until spot weld breaks. File or grind remaining weld material until pipe surface is smooth.

NOTE: Maintain proper clamp orientation when replacing with new clamp.

3. Connect the exhaust system ground strap.
4. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
5. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

CONVERTER CATALYTIC

DESCRIPTION

The combination exhaust manifold/catalytic converter is attached to the intermediate pipe using fasteners and a gasket for sealing.

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it is cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

CAUTION: DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

FWD vehicles use a catalytic converter located after the exhaust manifold and before the I-Pipe/Muffler assembly.

AWD vehicles use a maniverter and a underfloor catalytic converter. The underfloor catalytic converter is located between the maniverter and the I-Pipe/muffler assembly.

Diesel engine vehicles use a catalytic converter located between the turbocharger and the I-Pipe/Muffler assembly.

OPERATION - GAS ENGINE

The three-way catalytic converter simultaneously converts three exhaust emissions into harmless gases. Specifically, HC and CO emissions are converted into water (H2O) and carbon dioxide (CO2). Oxides of Nitrogen (NOx) are converted into Nitrogen (N) and Oxygen. The three-way catalyst is most efficient in converting HC, CO and NOx at the stoichiometric air fuel ratio of 14.7:1.

The oxygen content in a catalyst is important for efficient conversion of exhaust gases. When a high oxygen content (lean) air/fuel ratio is present for an extended period, oxygen content in a catalyst can reach a maximum. When a rich air/fuel ratio is present for an extended period, the oxygen content in the catalyst can become totally depleted. When this occurs, the catalyst fails to convert the gases. This is known as catalyst ″punch through.″

Catalyst operation is dependent on its ability to store and release the oxygen needed to complete the emissions-reducing chemical reactions. As a catalyst deteriorates, its ability to store oxygen is reduced. Since the catalyst's ability to store oxygen is somewhat related to proper operation, oxygen storage can be used as an indicator of catalyst performance. Refer to the appropriate Diagnostic Information for diagnosis of a catalyst related Diagnostic Trouble Code (DTC).

The combustion reaction caused by the catalyst releases additional heat in the exhaust system, causing temperature increases in the area of the reactor under severe operating conditions. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency. **Do not** remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to temperature increases caused by unburned fuel passing through the converter. This deterioration of the catalyst core can result in excessively high emission levels, noise complaints, and exhaust restrictions.

Unleaded gasoline must be used to avoid ruining the catalyst core. Do not allow engine to operate above 1200 RPM in neutral for extended periods over 5 minutes. This condition may result in excessive exhaust system/floor pan temperatures because of no air movement under the vehicle.

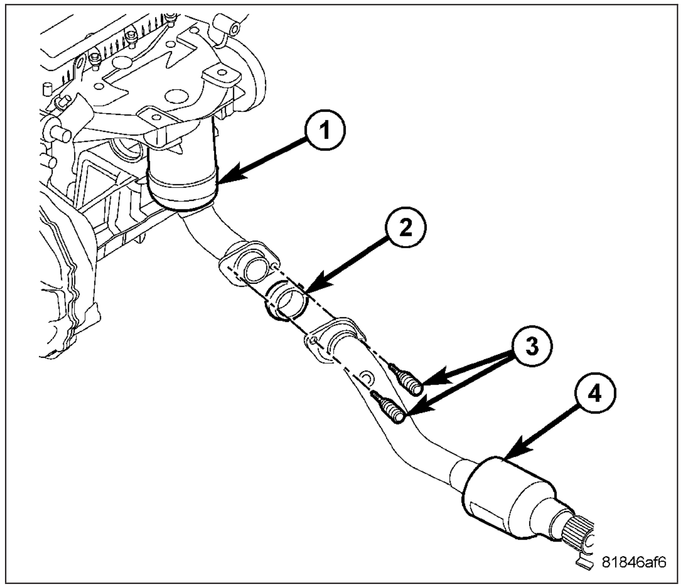
The flex joint allows flexing as the engine moves, preventing breakage that could occur from the back-and-forth motion of a transverse mounted engine.

CAUTION: Due to exterior physical similarities of some catalytic converters with pipe assemblies, extreme care should be taken with replacement parts. There are internal converter differences required in some parts of the country (particularly vehicles built for States with strict emission requirements) and between model years.

REMOVAL

UNDER FLOOR CATALYTIC CONVERTER

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATING TIME.



1. Raise vehicle on hoist and apply penetrating oil to band clamp fastener of component being removed.

NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

2. Remove I-Pipe/Muffler assembly (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
3. Disconnect oxygen sensor electrical connectors.

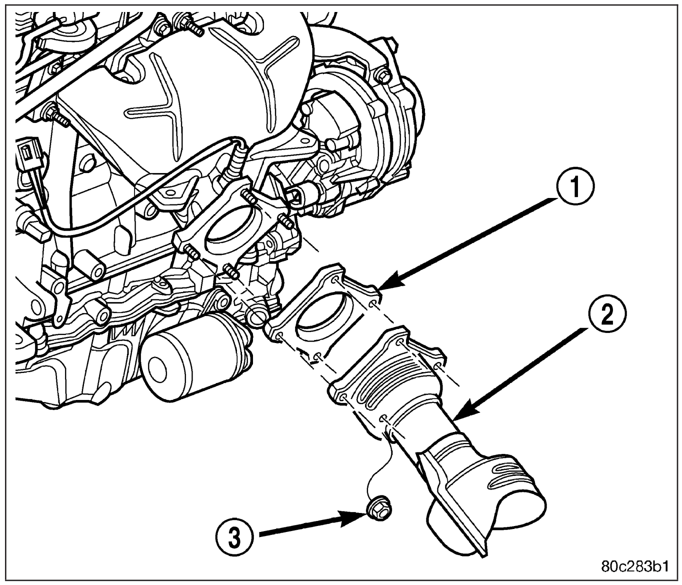
NOTE: If spherical gasket is to be reused, mark orientation.

4. Remove flange bolts (3), springs and spherical gasket.
5. Remove under floor catalytic converter (3) from combination manifold/catalytic converter assembly (1).
6. Clean ends of pipes to assure mating of all parts. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.

NOTE: When replacement is required on any component of the exhaust system, you must use original equipment parts (or their equivalent).

CATALYTIC CONVERTER - FWD

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never attempt to service any part of the exhaust system until it is cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.



NOTE: Before replacing a catalytic converter, determine the root cause of failure. Most catalytic converter failures are caused by air, fuel or ignition problems. Refer to the appropriate service diagnostic information for repair procedures.

1. Loosen intermediate pipe-to catalytic converter clamp.

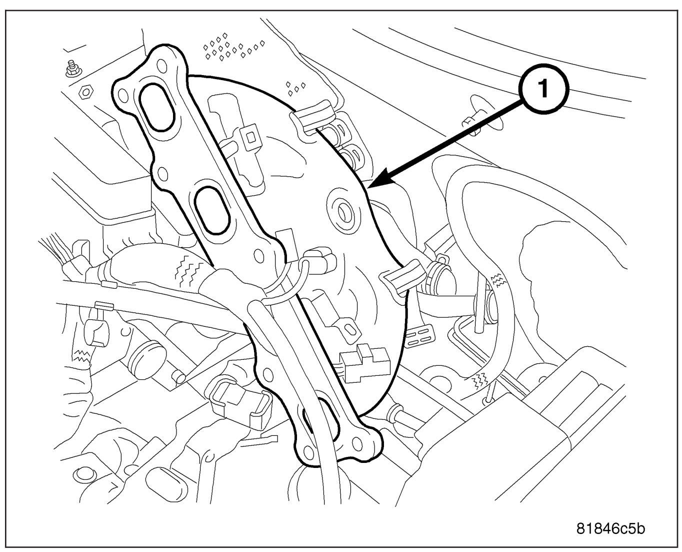
NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

2. Remove catalytic converter to exhaust manifold attaching fasteners and remove converter from vehicle.
3. Remove I-Pipe/Muffler assembly insolators as necessary to slide I-Pipe/Muffler assembly out of catalytic converter.
4. Remove and discard flange gasket.

NOTE: When replacement is required on any component of the exhaust system, original equipment parts (or equivalent) must be used.

REMOVAL - MANIVERTER

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.



NOTE: Before replacing a catalytic converter, determine the root cause of failure. Most catalytic converter failures are caused by air, fuel or ignition problems. Refer to the appropriate service diagnostic information for repair procedures.

1. Remove under floor catalytic converter (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - REMOVAL).

NOTE: When replacement is required on any component of the exhaust system, original equipment parts (or equivalent) must be used.

2. Lower vehicle.
3. Remove secondary thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).
4. Remove maniverter mounting bolts.
5. Remove maniverter and gasket from the engine compartment.

INSPECTION

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never attempt to service any part of the exhaust system until it is cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

Check catalytic converter for a flow restriction. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Exhaust System Restriction Check for procedure.

Visually inspect the catalytic converter element by using a borescope or equivalent. Remove oxygen sensor(s) and insert borescope. If borescope is not available, remove converter and inspect element using a flashlight. Inspect element for cracked or melted substrate.

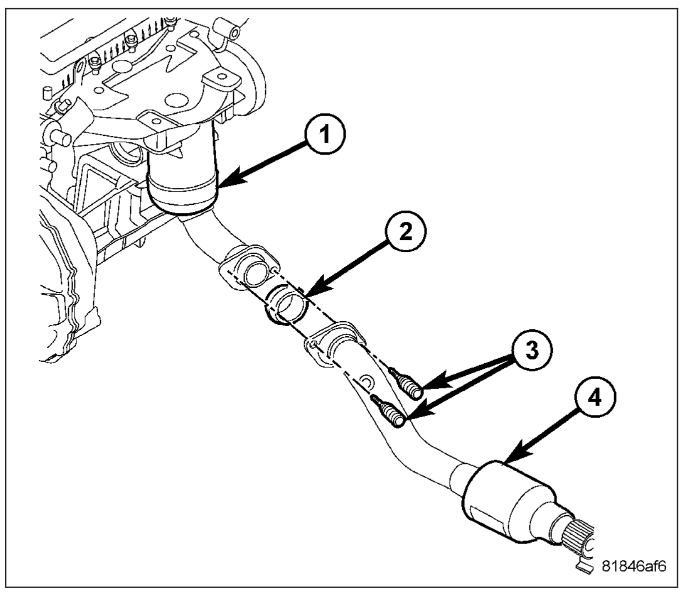
NOTE: Before replacing a catalytic converter, determine the root cause of failure. Most catalytic converter failures are caused by air, fuel or ignition problems. (Refer to Appropriate Diagnostic Information) for test procedures.

INSTALLATION

UNDER FLOOR CATALYTIC CONVERTER

When assembling exhaust system **do not** tighten clamps until components are aligned and clearances are checked.

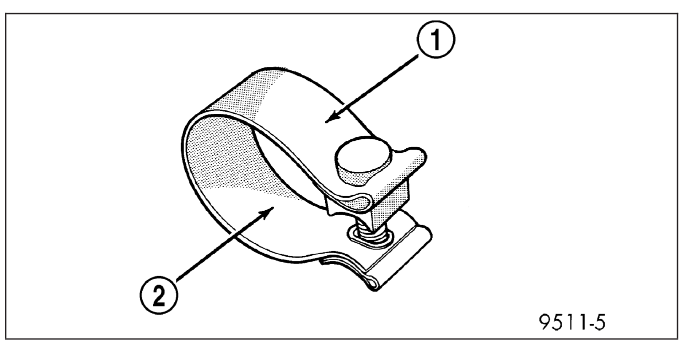
1. Install under floor catalytic converter and the isolator supports to the underbody.
2. Position spherical gasket (2) with white side facing rear of vehicle, install springs, and bolts (3). Tighten bolts to 33 N·m (24 ft. lbs.).
3. Install I-Pipe/muffler assembly (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION)
4. Working from the front of system; align each component to maintain position and proper clearance with underbody parts.



5. Tighten band clamps to 55 N·m (40 ft. lbs.).

CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp band has been stretched and has lost its clamping force and must be replaced.

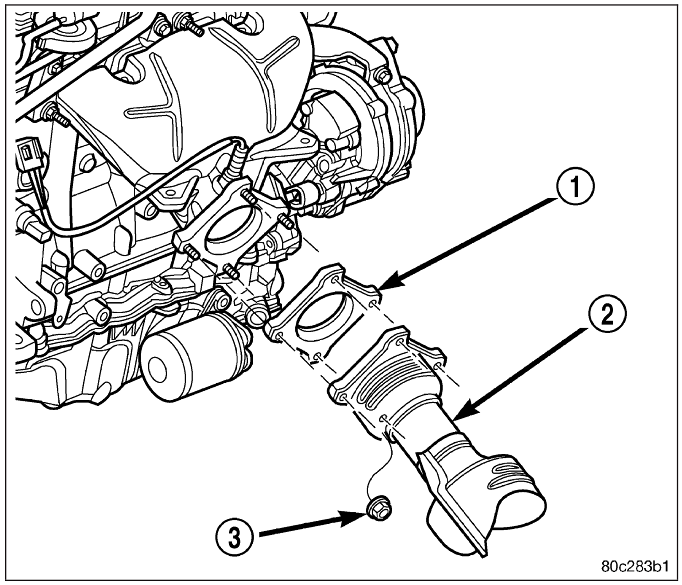
NOTE: Maintain proper clamp orientation when replacing with new clamp.



6. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
7. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

CATALYTIC CONVERTER - FWD

1. Position catalytic converter into I-Pipe/muffler assembly.
2. Using new gasket position catalytic converter against exhaust manifold.
3. Install flange bolts. Tighten to 29 N·m (21 ft. lbs.).
4. Working from the front of system; align each component to maintain position and proper clearance with underbody parts.
5. Tighten band clamps to 55 N·m (40 ft. lbs.).

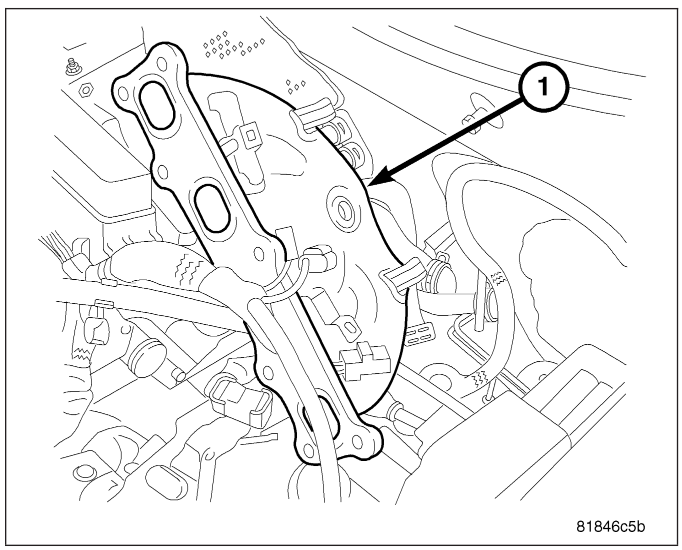


CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp has lost clamping force and must be replaced.

6. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
7. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

INSTALLATION - MANIVERTER

NOTE: When assembling exhaust system do not tighten clamps until all components are aligned and clearances are checked.

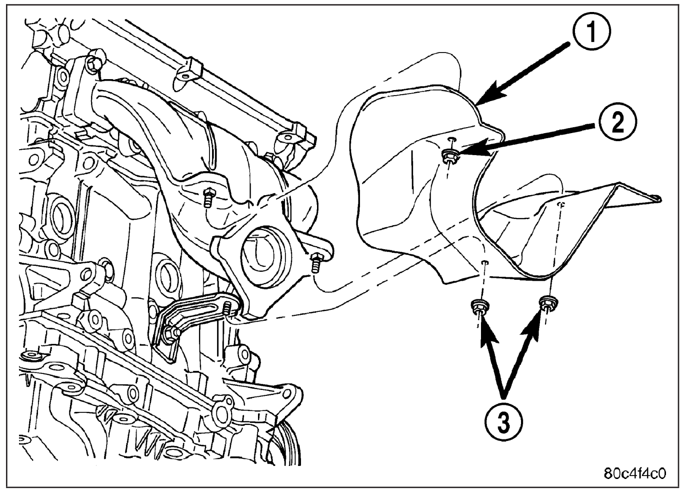


1. Position maniverter (1) in vehicle. Use a new flange gasket.
2. Using new gasket, install maniverter (1) and mounting bolts. Tighten bolts to 28 N·m (250 in. lbs.).
3. Install secondary thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION).
4. Install under floor catalytic converter (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSTALLATION).
5. Working from the front of system; align each component to maintain position and proper clearance with underbody parts.
6. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
7. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

SHIELDS HEAT

DESCRIPTION

Heat shields (1), are needed to protect both the vehicle and the environment from the high temperatures developed in the vicinity of the catalytic converter.



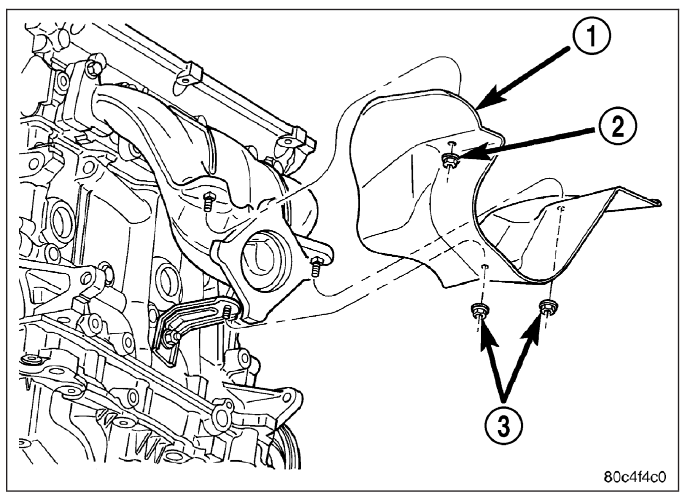
CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shield on cars if equipped. Light over-spray near the edges is permitted. Application of coating will greatly reduce the efficiency of the heat shields resulting in excessive floor pan temperatures and objectionable fumes.

REMOVAL

1. Raise vehicle on hoist.
2. Remove fasteners attaching heat shield.
3. Remove heat shield (s)

INSTALLATION

1. Position heat shield(s) to underbody.
2. Install heat shield fasteners.
3. Inspect heat shield to exhaust system clearances and adjust as necessary. For clearance specifications (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).
4. Lower vehicle.
5. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
6. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.



FRAME & BUMPERS

TABLE OF CONTENTS

BUMPERS

SPECIFICATIONS

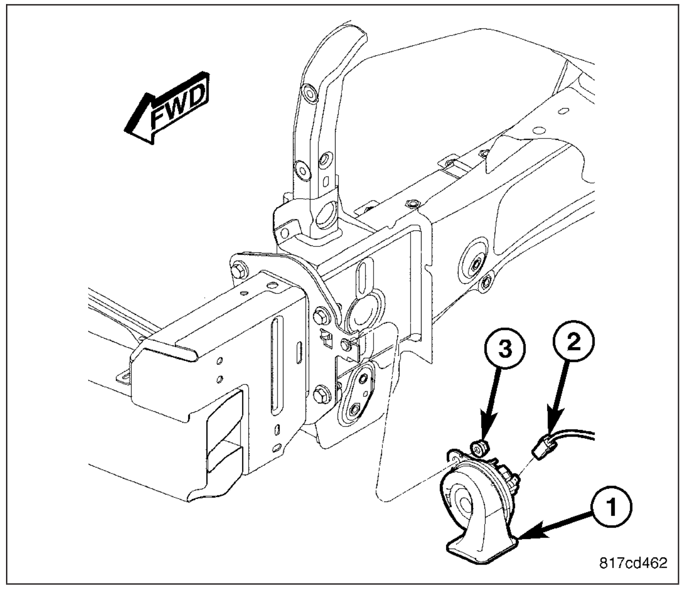
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front bumper reinforcement nuts	23	–	204
Rear bumper reinforcement nuts	23	–	204

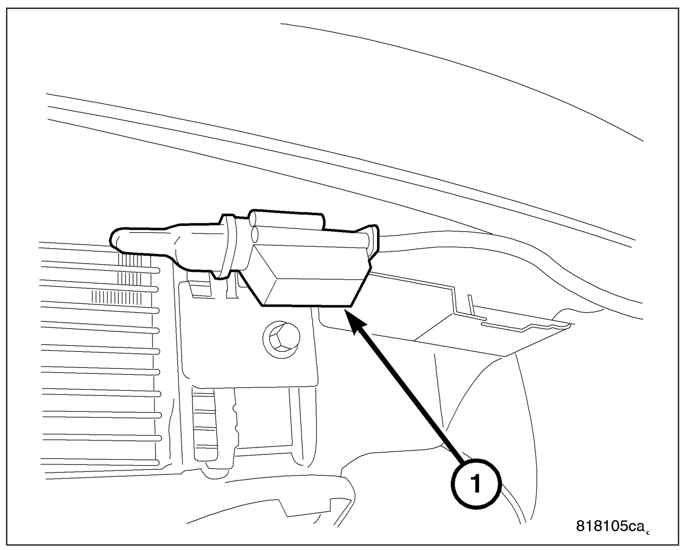
FRONT BUMPER REINFORCEMENT

REMOVAL

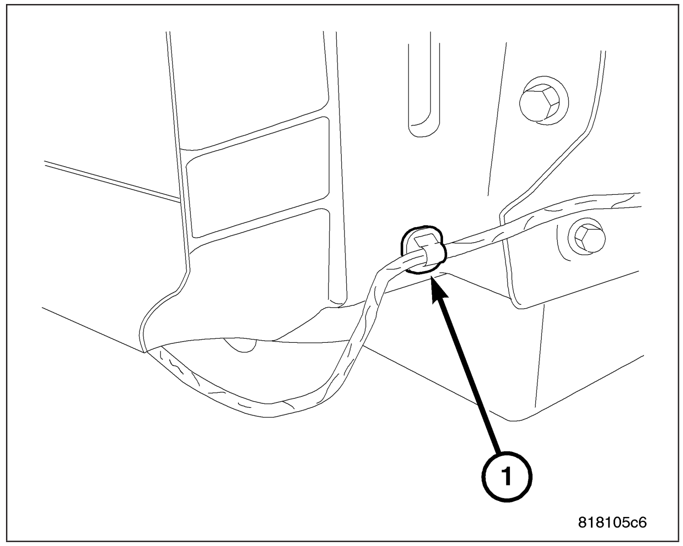
1. Remove fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL)
2. Disconnect wire connector (2) and remove horn (3). (Refer to 8 - ELECTRICAL/HORN/HORN - REMOVAL)



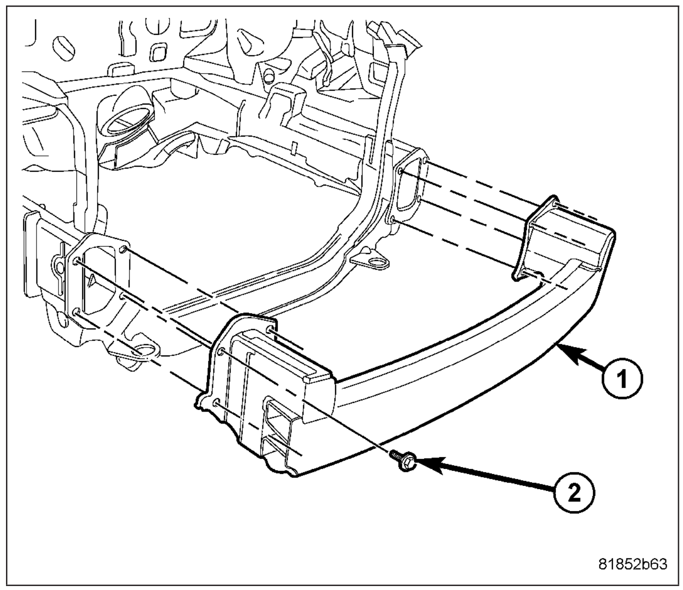
3. Remove wire harness push pin fastener (1).



4. Remove wire harness (1) from bottom of bumper reinforcement.

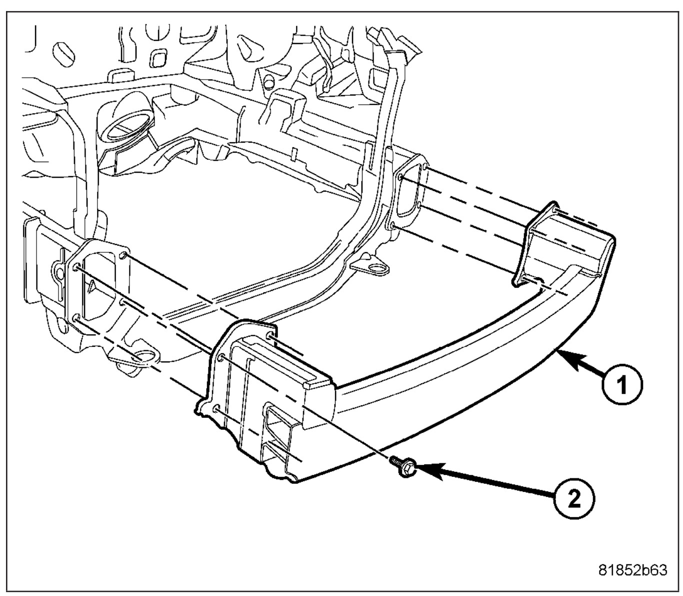


5. Remove 8 fasteners (2) from bumper reinforcement (1).

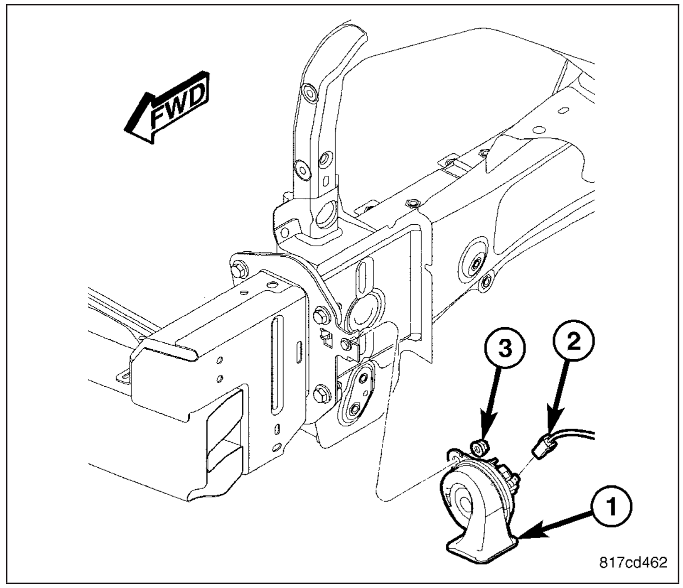


INSTALLATION

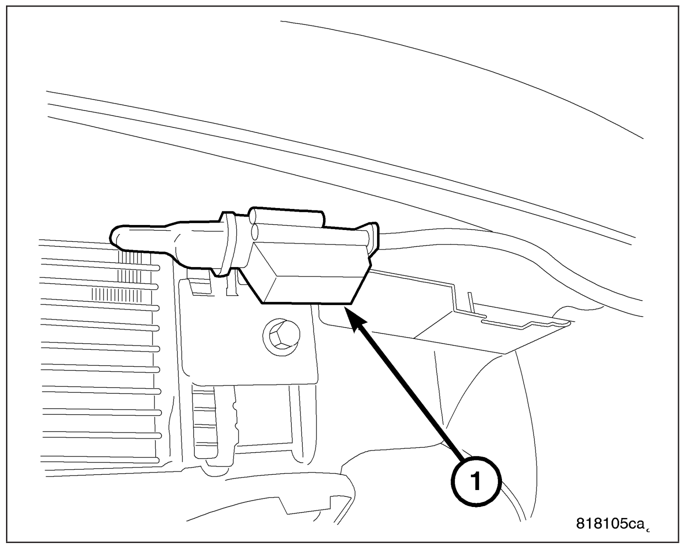
1. Install fasteners (2) and torque to 23 N·m (204 in. lbs.).



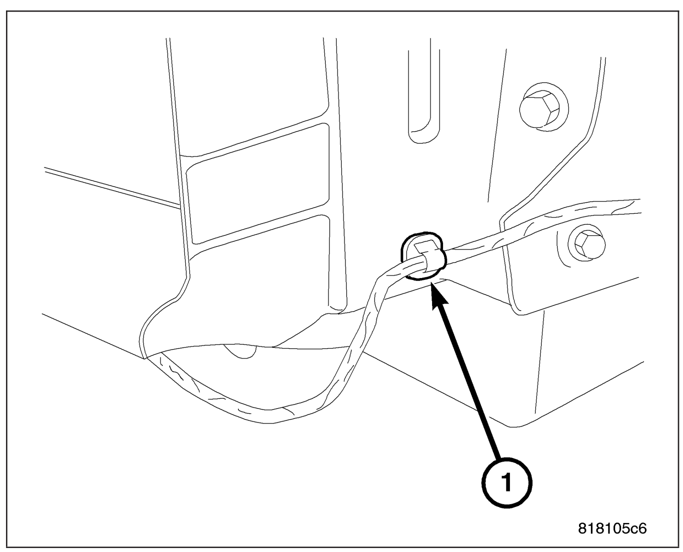
2. Connect wire connector (2) and install horn (1). (Refer to 8 - ELECTRICAL/HORN/HORN - INSTALLATION)



3. Install wiring harness push pin.



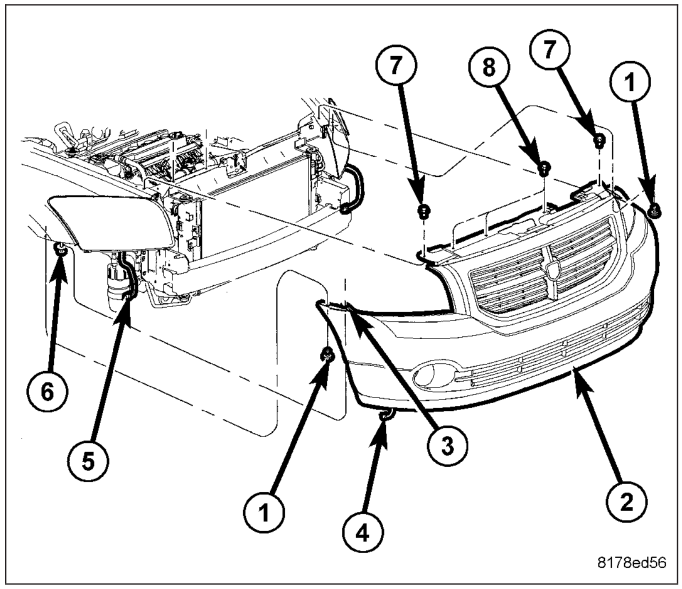
4. Install wire connector (1) to bumper reinforcement.
5. Install front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)



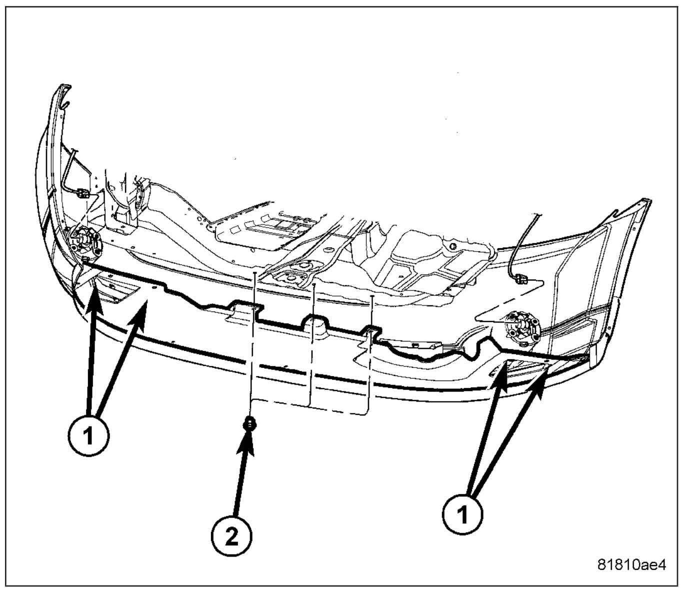
FRONT BUMPER FASCIA

REMOVAL

1. Remove splash shield. (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - REMOVAL)
2. Remove left and right side fastener (1) located in the wheel well.
3. Remove three fasteners (2) located at the bottom of fascia.
4. Remove middle fasteners (8) located on the top of the fascia.

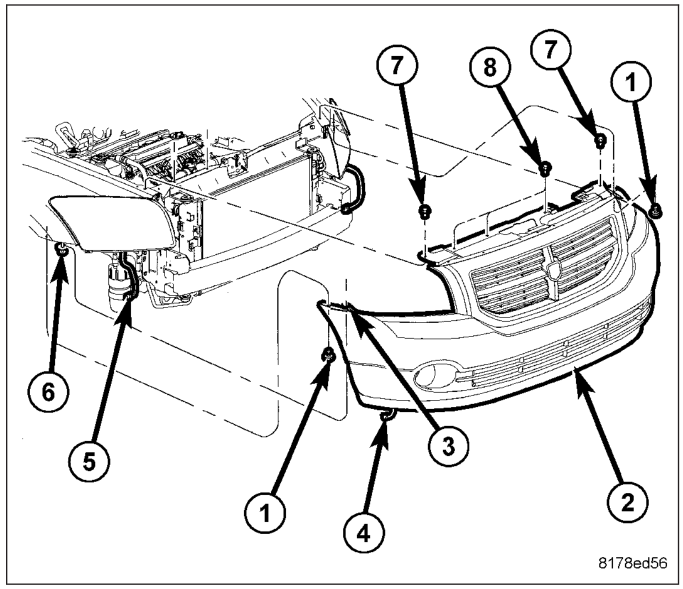


5. If equipped, disconnect fog lamps (1).
6. Remove two fasteners located at the top of fascia (7).
7. Carefully, remove fascia from vehicle.

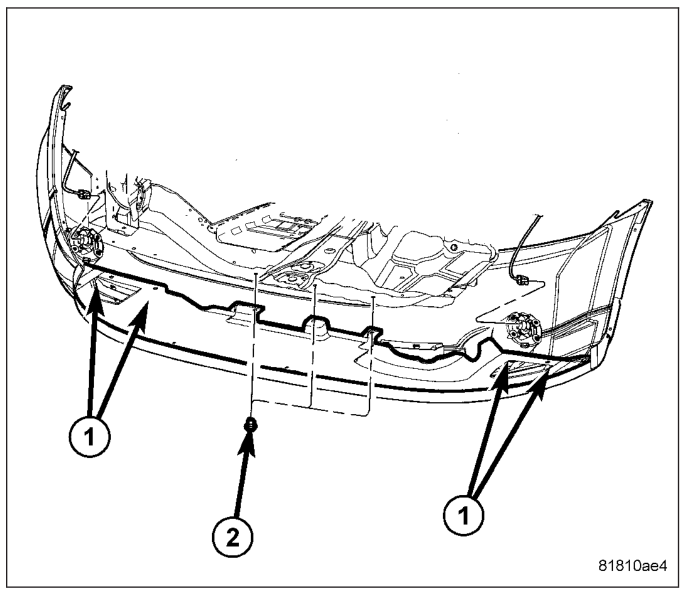


INSTALLATION

1. Lift fascia (2) and fasten both sides of fascia notch (3) onto push pin (6).
2. Install fasteners (1) located inside wheel well up through fascia.
3. Install fascia fasteners (7).
4. Install fascia fasteners (8) through fascia.
5. If equipped, connect wire harness (5) to fog lamp (4).
6. Raise vehicle.



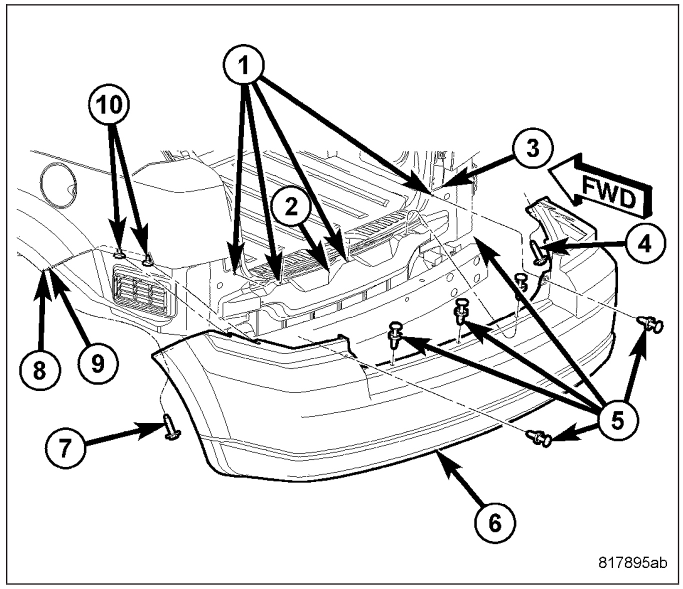
7. Install push pins into locations (1).
8. Install fasteners (2).



REAR BUMPER FASCIA

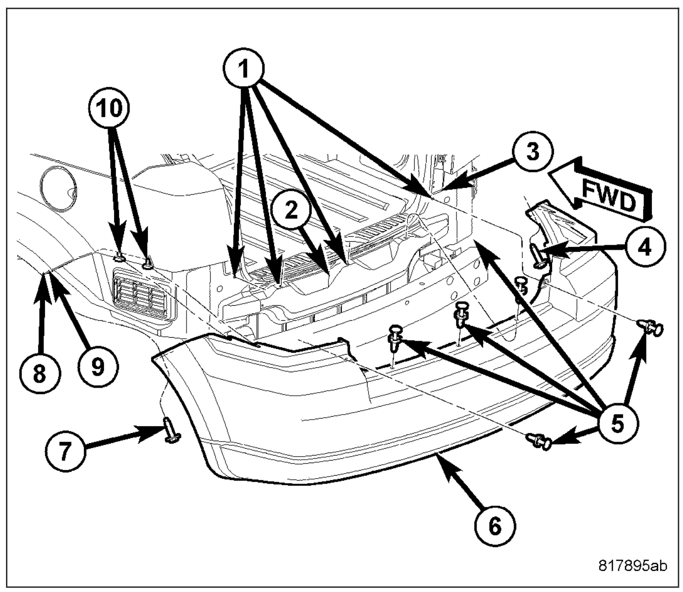
REMOVAL

1. Remove push pins (5) from holes (1) located on vehicle (2).
2. Remove rear splash shields.
3. Remove both left (7) and right screws (4).
4. Remove fascia from push pins (10).



INSTALLATION

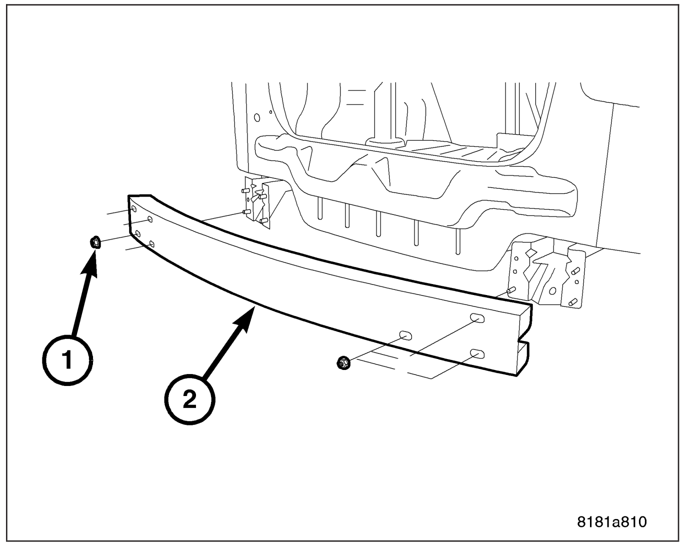
1. Raise fascia (6) and hang fascia onto push pins (10).
2. Install push pins (5) into push pin locations (1).
3. Install left (7) and right (4) screws into their respective locations.
4. Install splash shields.



REAR BUMPER REINFORCEMENT

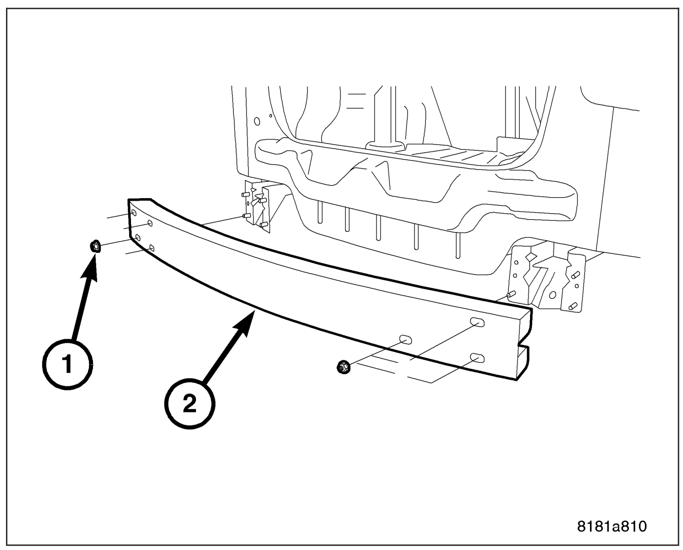
REMOVAL

1. Remove rear fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR BUMPER - REMOVAL)
2. Remove seven bumper reinforcement nuts (1).
3. Remove bumper reinforcement (2).



INSTALLATION

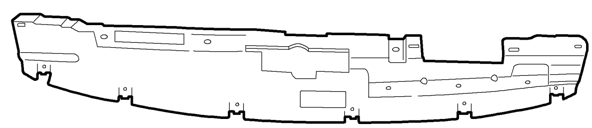
1. Place bumper reinforcement (2) up to frame locations.
2. Install seven nuts (1) and tighten to 23 N·m (204 in. lbs.)
3. Install fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR BUMPER - INSTALLATION)



FRONT FASCIA CLOSEOUT PANEL

REMOVAL

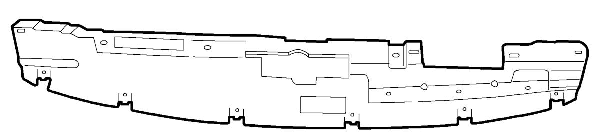
1. Remove fasteners and push pins.



8180f353

INSTALLATION

1. Install fasteners and push pins.



8180f353

FRAME

SPECIFICATIONS

SPECIFICATIONS - FRAME DIMENSIONS

Frame dimensions are listed in metric scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location.

VEHICLE PREPARATION

Position the vehicle on a level work surface. Using screw or bottle jacks, adjust the vehicle PLP heights to the specified dimension above a level work surface. Vertical dimensions can be taken from the work surface to the locations indicated were applicable.

INDEX

DESCRIPTION	FIGURE
FRAME DIMENSIONS (PLAN VIEW)	1
FRAME DIMENSIONS (SIDE VIEW)	2

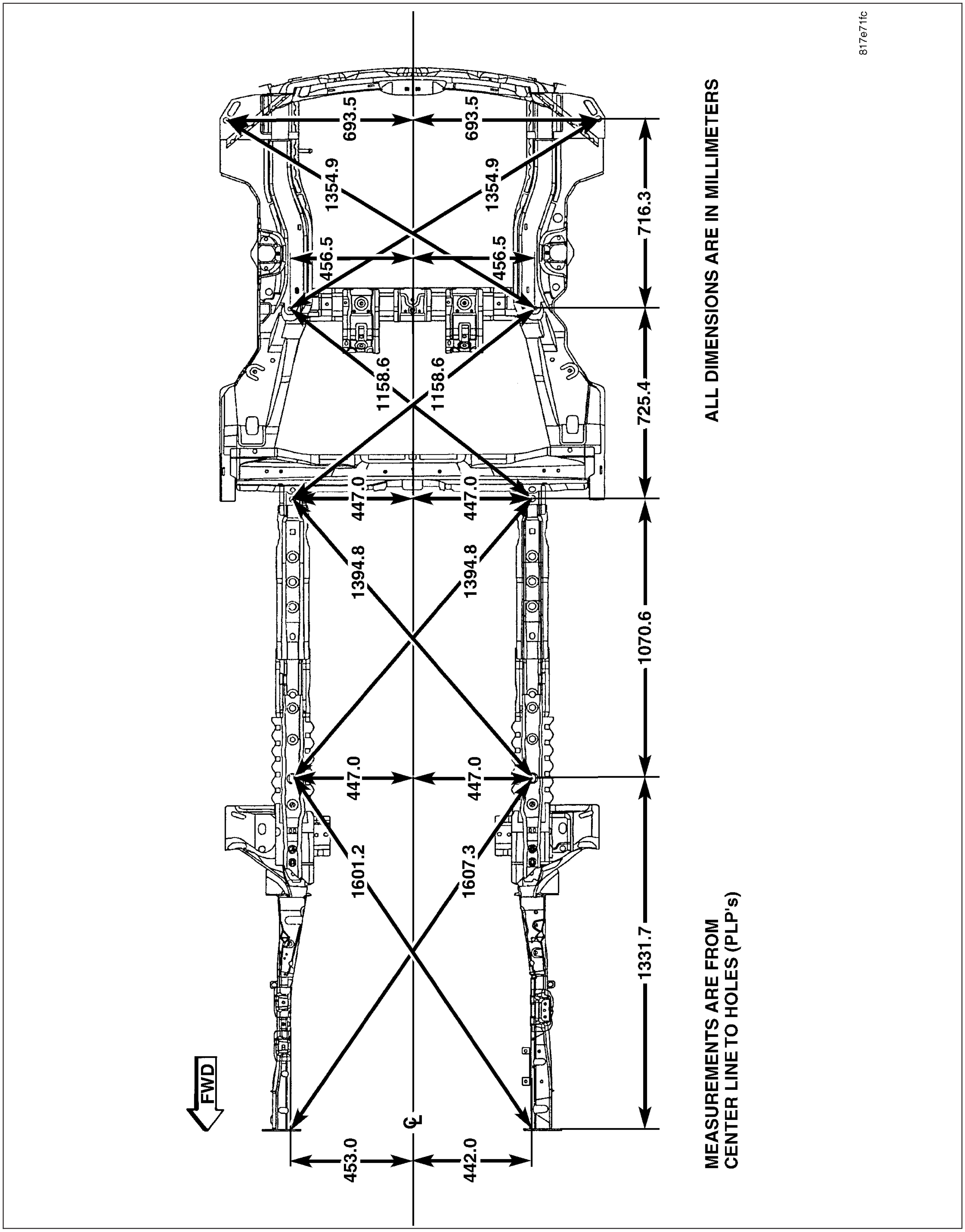


Fig. 1 FRAME DIMENSIONS (PLAN VIEW)

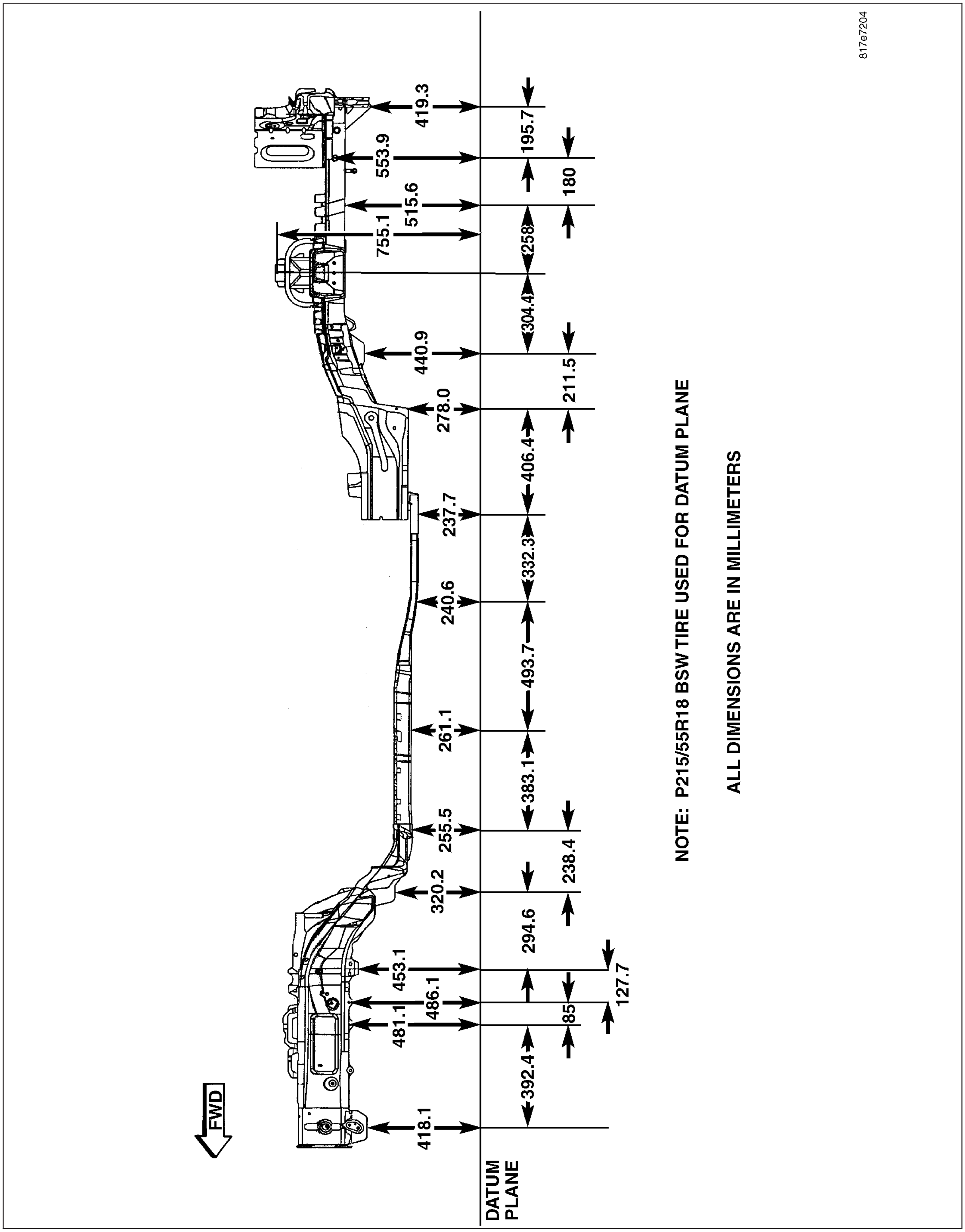


Fig. 2 FRAME DIMENSIONS (SIDE VIEW)

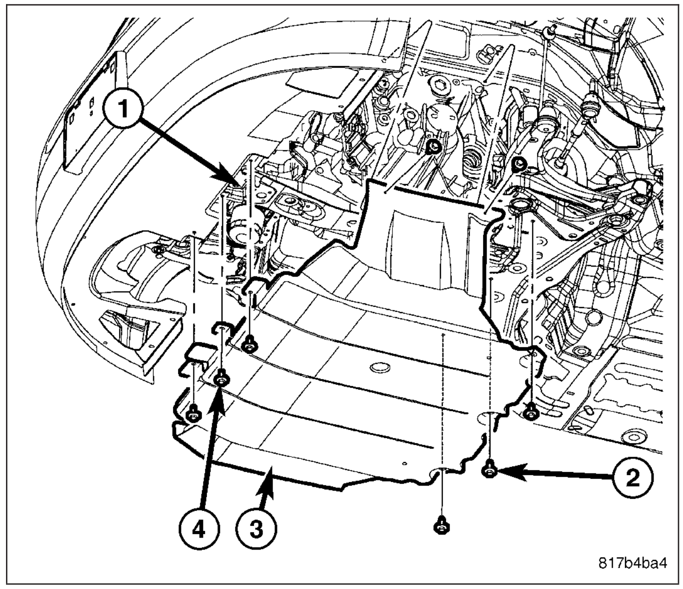
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Ball joint stud pinch bolt	82	60	—
Brake Flex Hose Trailing Link Mounting Nut	15	11	—
Brake flex hose trailing link mounting screw	23	17	—
Control arm bushing bolts	123	91	—
Cradle bolts front, rear, inboard and outboard	110	81	—
Crossmember Mounting Bolts	153	112	—
Crossmember rear roll mount through bolt	65	48	—
Engine Anti Roll Bolt.	65	48	—
Engine cradle bolts	190	140	—
Front control arm bushing bolts	123	92	—
Front Fore/aft inboard and outboard crossmember bolts	78	58	—
Front Fore/aft rearward crossmember bolt	129	95	—
Hub nut	244	180	—
Lower control arm front pivot bolts	163	120	
Lower control arm rear isolator bushings	250	180	—
Lower Control Arm Trailing Link Bolt Nut	95	70	—
Lower link bolts at cradle	90	70	—
Lower strut bolts	99	73	—
Pencil nut struts	58	43	—
Power steering line clamp	8	—	70
Rear Fore/aft cross member bolts	129	95	—
Rear half shaft nuts	244	180	—
Rear roll mount rearward crossmember bolts	153	112	—
Stabilizer bar bushing bolts	61	45	—
Stabilizer bar cushion retainer	28	20	—
Stabilizer bar link nuts	58	430	—
Steering gear mounting bolts	61	45	—
Toe link cam bolts	35	26	—
Trailing link bushing bolts	110	81	—
Upper Control Arm Trailing Link Bolt Nut	95	70	—
Upper link bolts at cradle	90	70	—

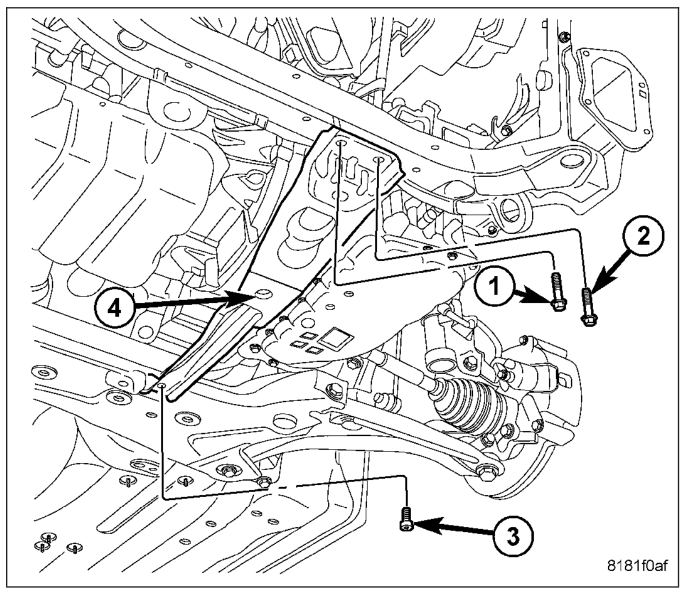
CROSSMEMBER-FRONT FORE/AFT

REMOVAL

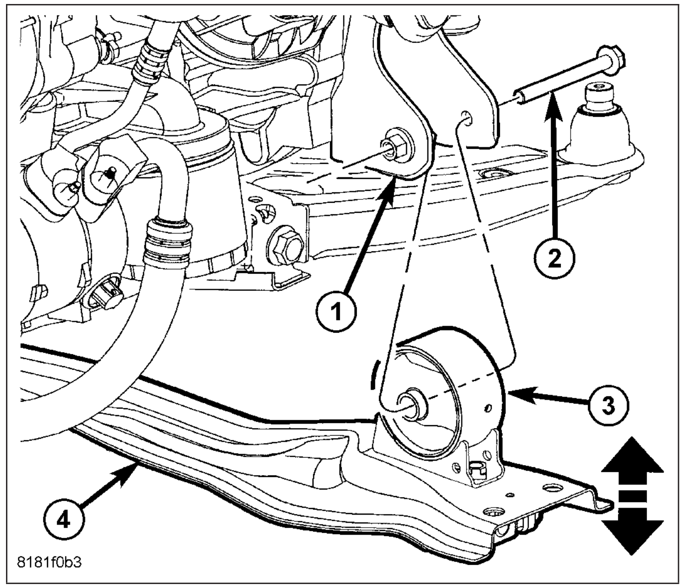
1. Raise and support the vehicle, (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
2. Remove the four wheel well screws.
3. If equipped, remove the three front screws (4), the three rear screws (2) and one push pin fastener from the center of the belly pan.



4. Remove the crossmember bolts (1, 2 and 3).

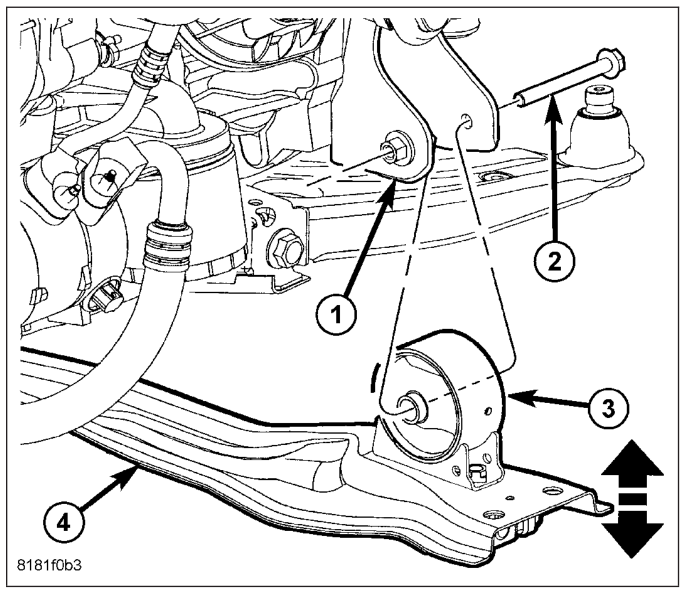


5. Remove the engine roll mount (3) through bolt (2) and remove the fore/aft crossmember (4).

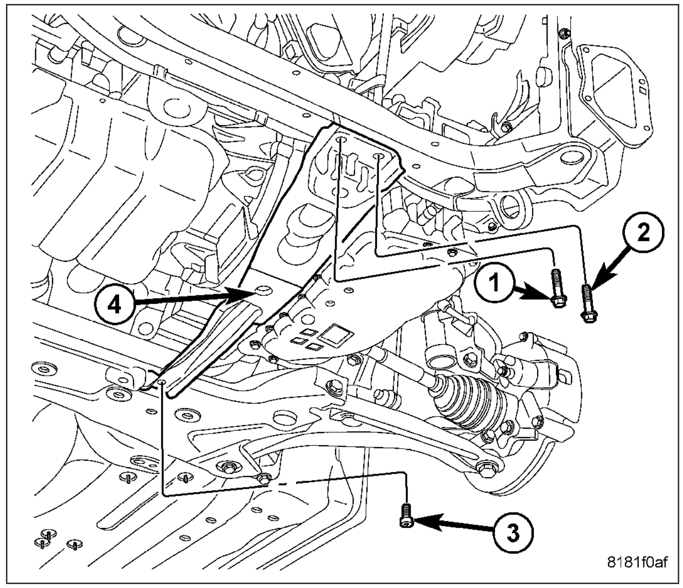


INSTALLATION

1. Install the fore/aft crossmember and install the engine anti-roll mount (3) through bolt (2).



2. Install the bolts (1, 2 and 3), and tighten using the following sequence:

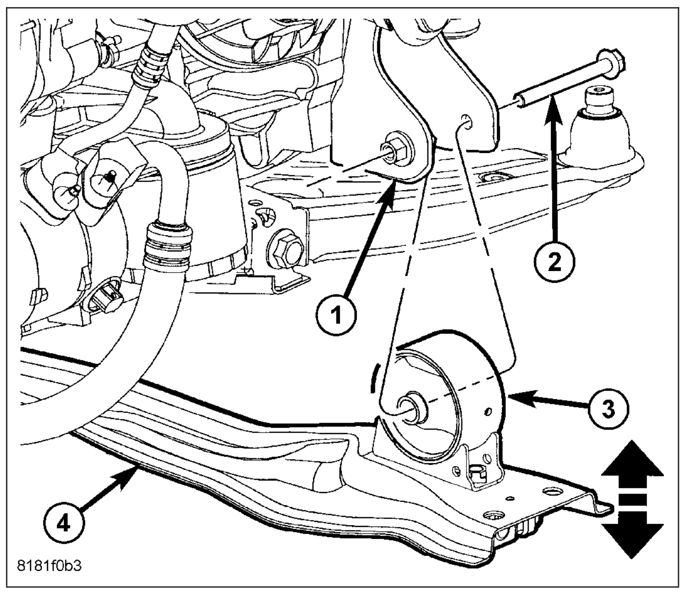


a. Tighten the bolt (1) to 78 N·m (58 ft. lbs.).

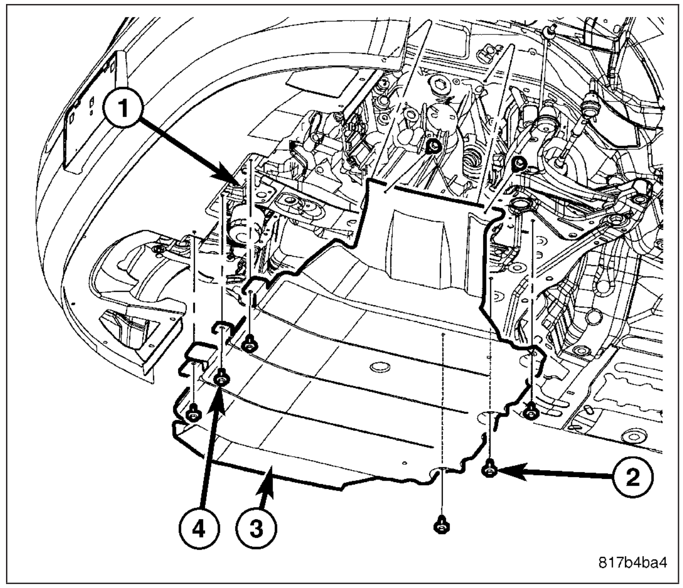
b. Tighten the bolt (2) to 78 N·m (58 ft. lbs.).

c. Tighten the bolt (3) to 129 N·m (95 ft. lbs.).

3. Tighten the bolt (2) to 65 N·m (48 ft. lbs.).



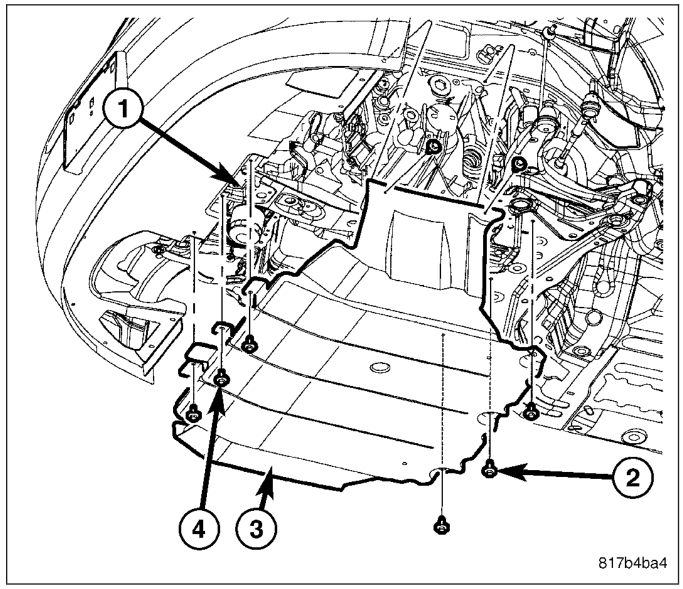
4. If equipped, install the belly pan.
5. Install the three front screws (4), the three rear screws (2) and on push pin fastener into the center of the belly pan.



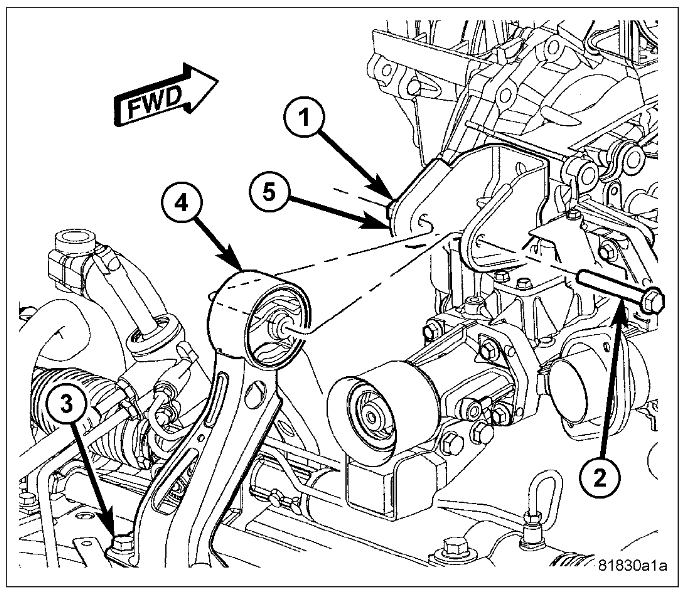
CROSSMEMBER-FRONT SUSPENSION

REMOVAL

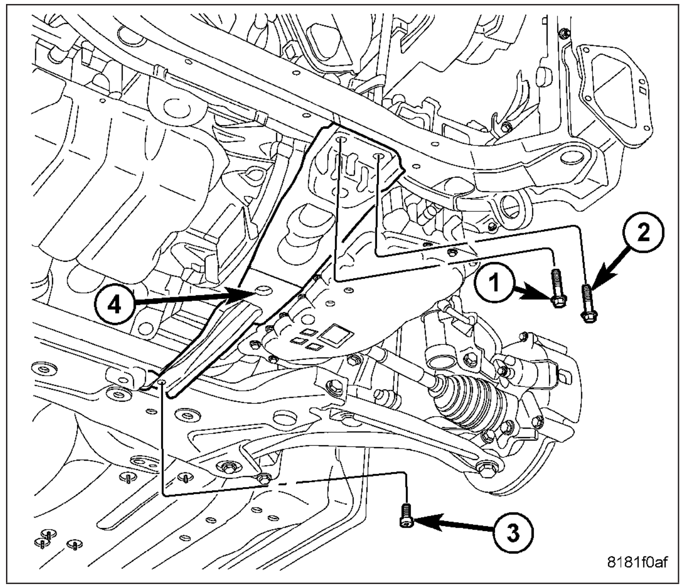
1. Raise and support the vehicle, (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
2. Remove the four wheel well screws.
3. If equipped, remove the three front screws (4), the three rear screws (2) and one push pin fastener from the center of the belly pan.



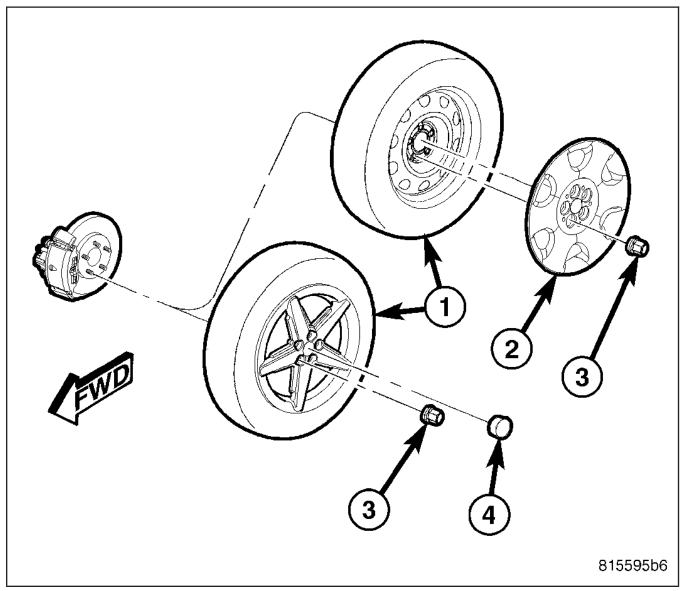
4. Remove the rear roll mount (4) through bolt (2).
5. Remove the three bolts (3) attaching the rear roll mount (5) to the crossmember and remove the mount.



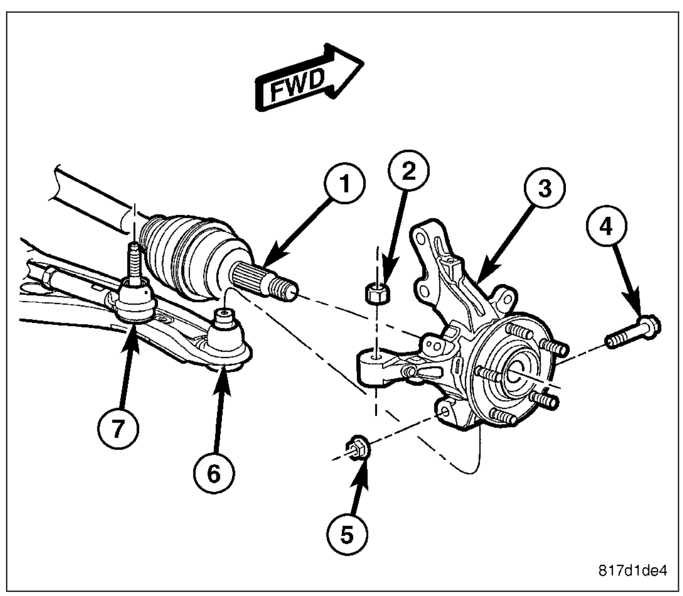
6. Remove the for/aft crossmember (4) (Refer to 13 - FRAME & BUMPERS/FRAME/CROSSMEMBER-FRONT FORE/AFT - REMOVAL).



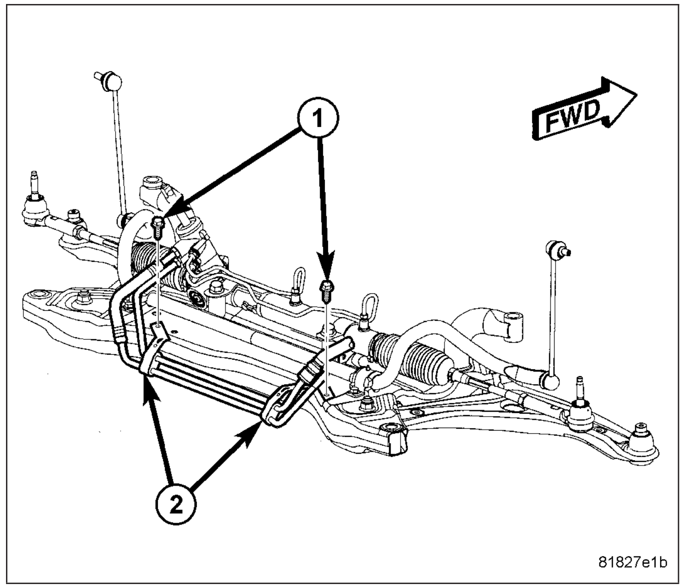
7. Remove the front wheels (1), (Refer to 22 - TIRES/WHEELS - SERVICE INFORMATION - REMOVAL).



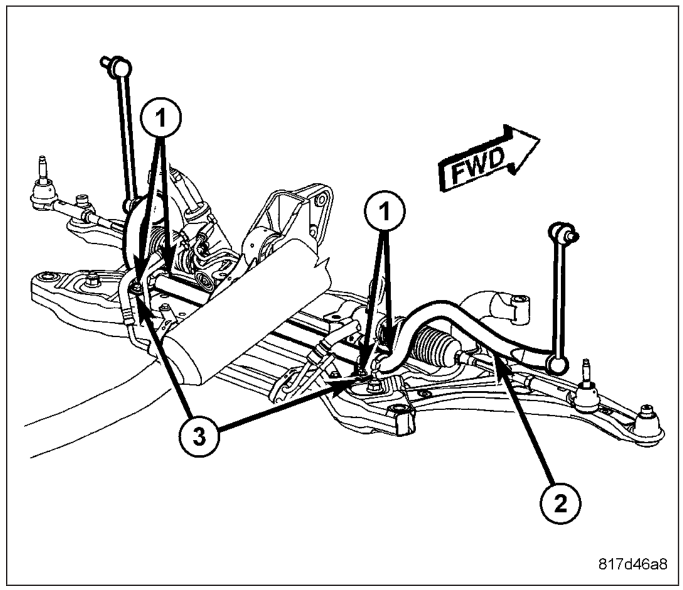
8. Remove the lower ball joint (6) pinch bolts (4) and nuts (5).



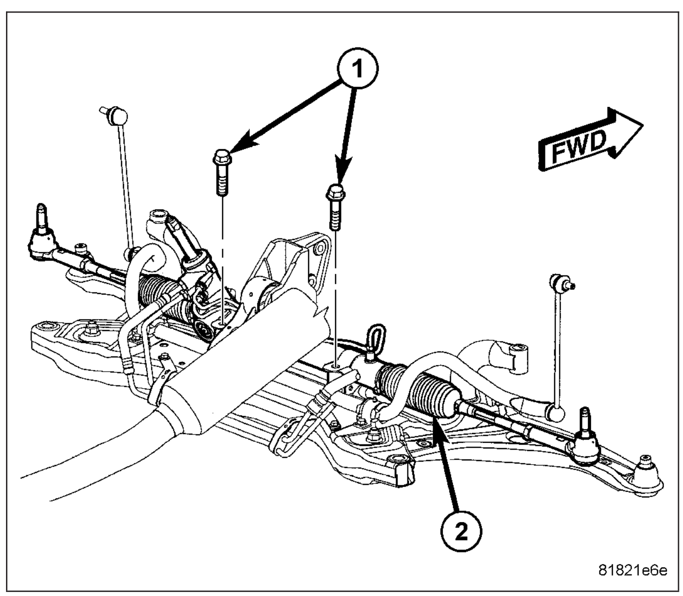
9. Remove the bolt attaching the pressure line routing bracket to the steering gear.
10. Remove the bolt attaching the return line to the crossmember.



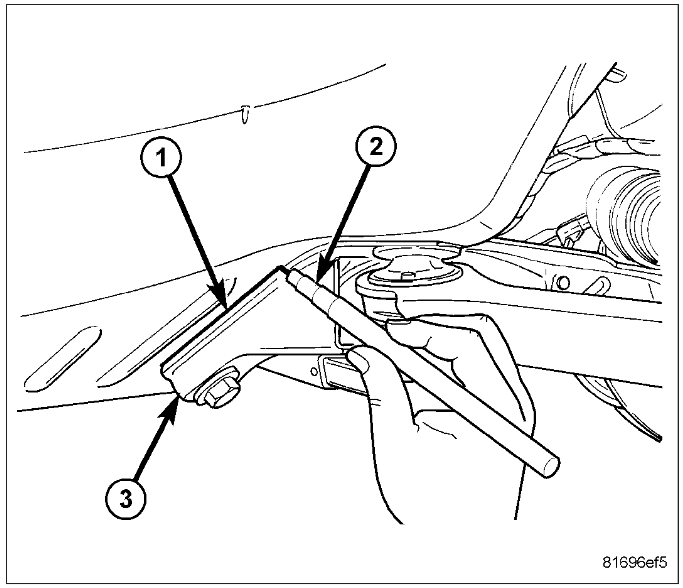
11. Remove the sway bar bushing bolts (1) and support the sway bar (2) up in the vehicle.

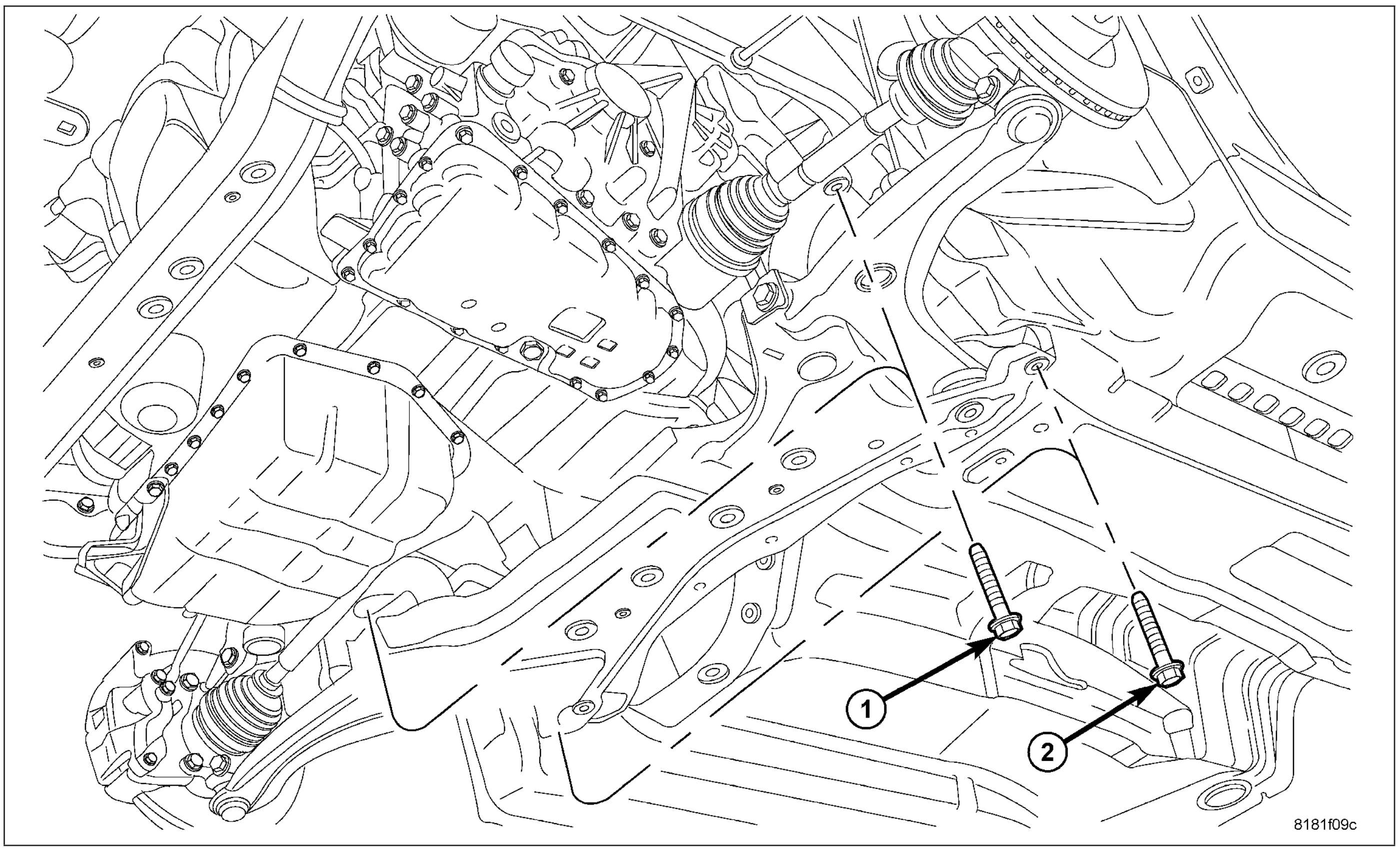


12. Remove the steering gear mounting bolts (1) and support the steering gear (2) up in the vehicle.



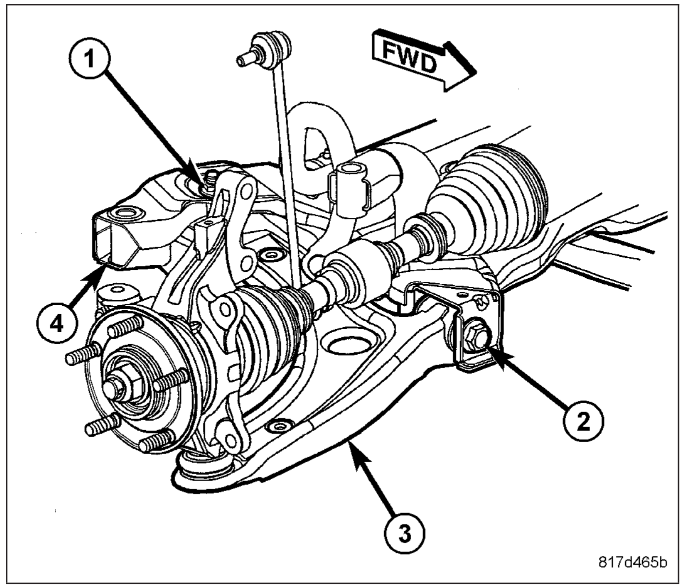
13. Mark the crossmember (3) to body location (1) using a grease pencil (2) or equivalent.



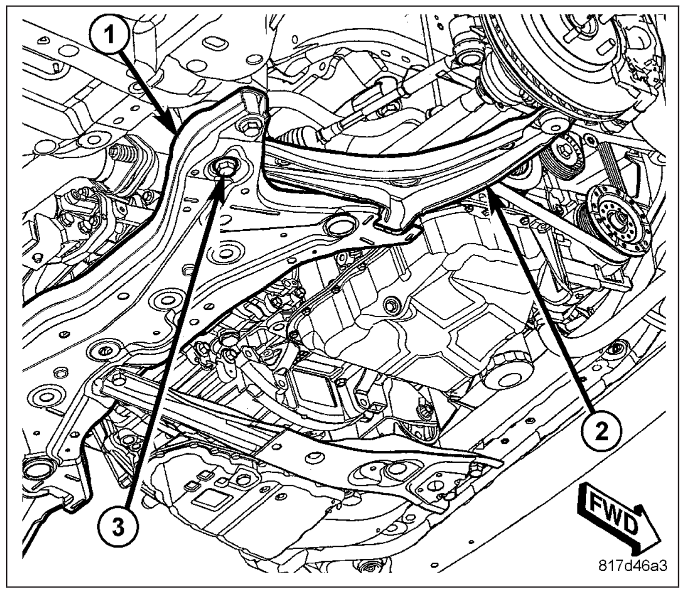


14. Support the crossmember with a suitable lifting device.
15. Remove the crossmember bolts (1 and 2) and lower the crossmember from the vehicle.

16. Remove the lower control arm (3) front pivot bolts (2).

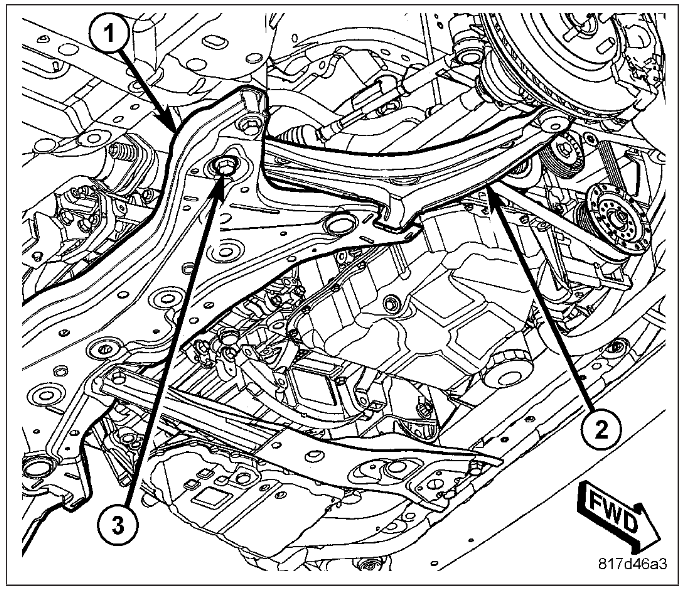


17. Remove the lower control arm rear pivot bolts (3) and separate the lower control arms from the crossmember (1).

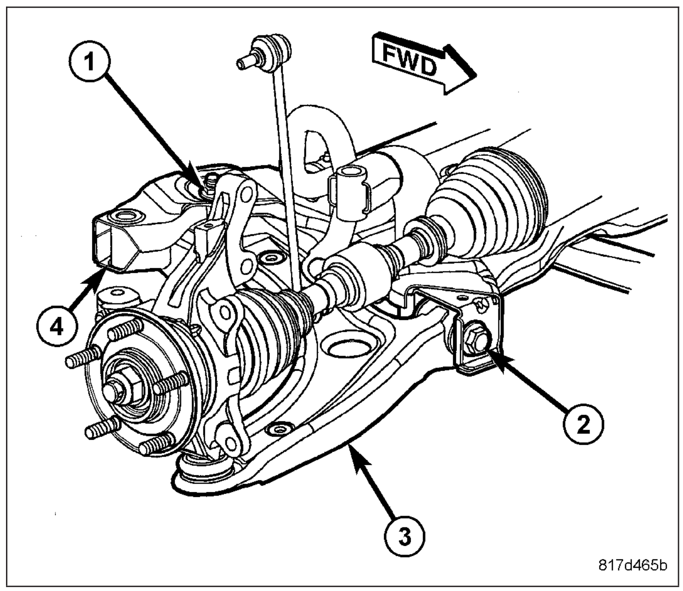


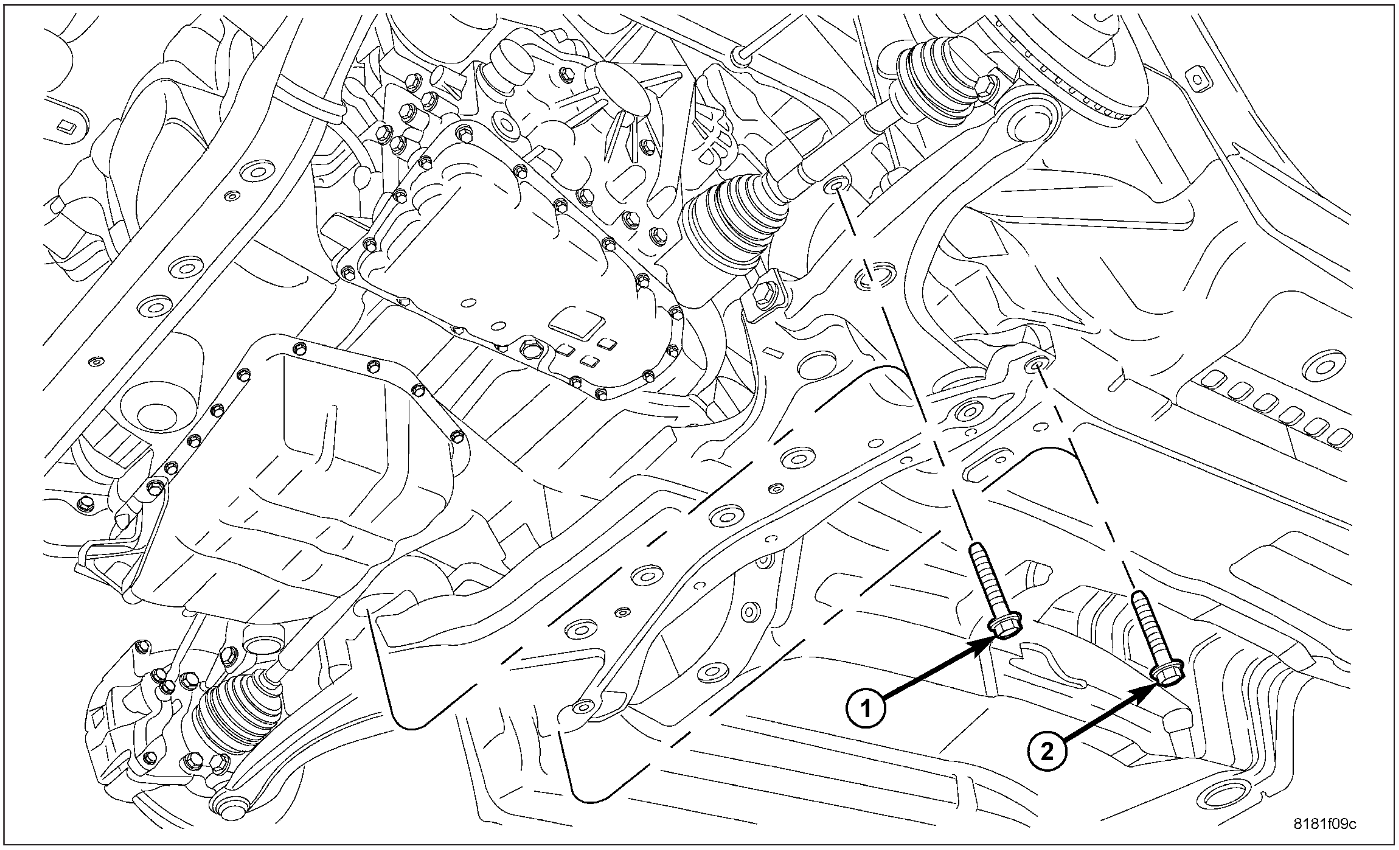
INSTALLATION

1. Install the lower control arms and install the rear pivot bolts (3).

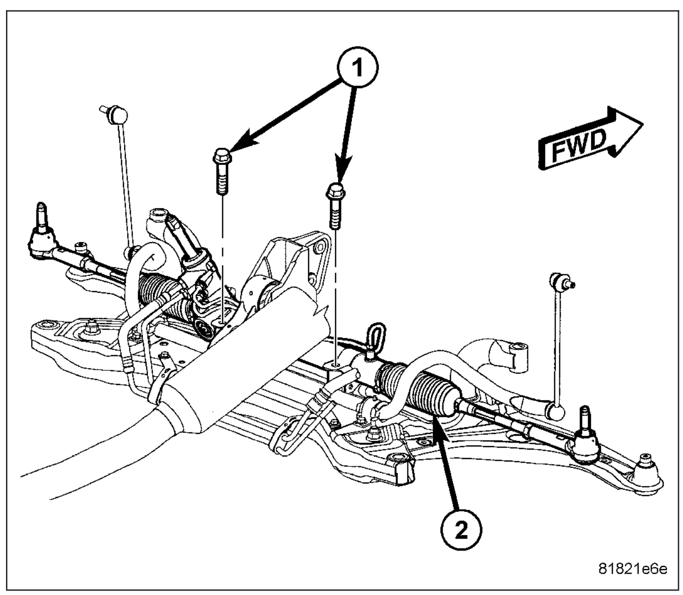


2. Install the front pivot bolts (2).

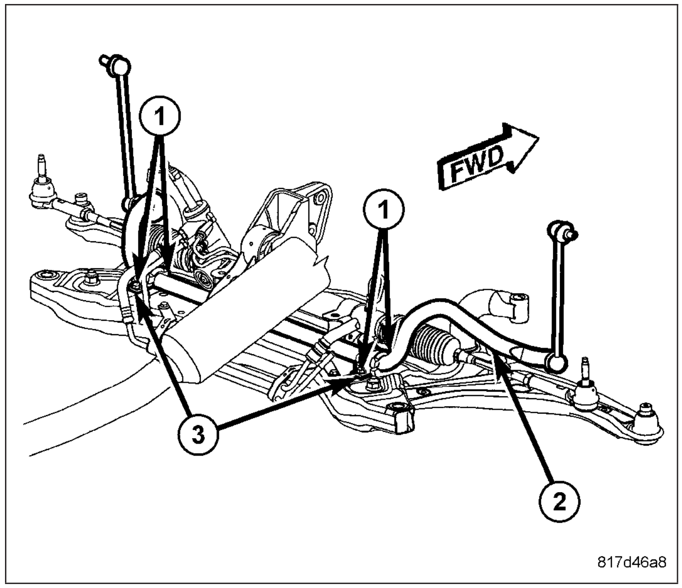




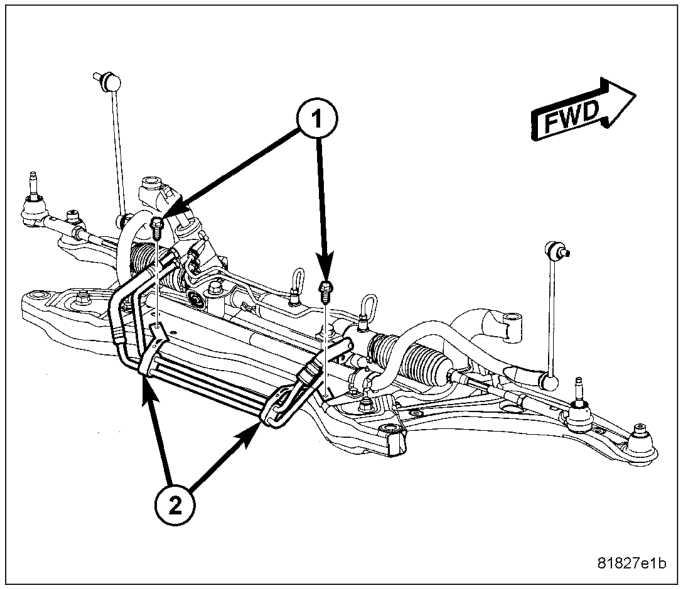
3. Support the crossmember on a suitable lifting device.
4. Raise the crossmember into position onto the vehicle.
5. Install the bolts (1 and 2) and align the engine cradle to the marks made during removal.
6. Tighten the bolts to 190 N·m (140 ft. lbs.).
7. Position the steering gear back into place and install the bolts (1).
8. Tighten the bolts to 61 N·m (45 ft. lbs.).



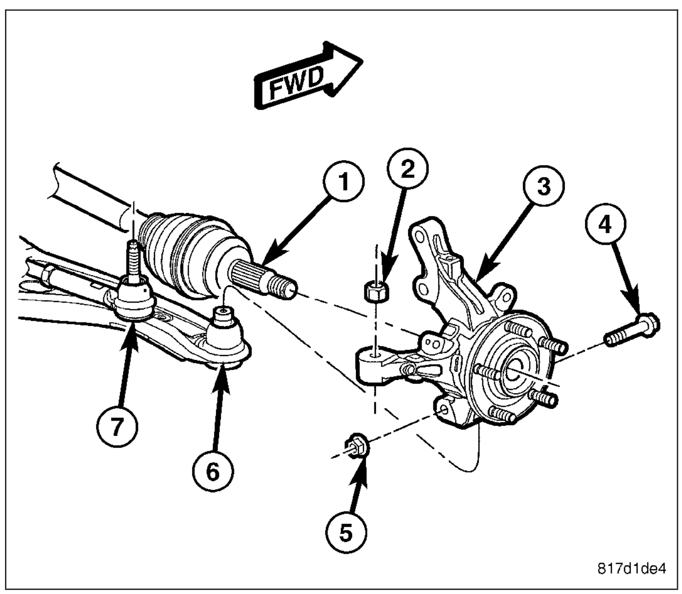
9. Position the stabilizer bar (2) back into place and install the bushing bolts (1).
10. Tighten the bolts to 61 N·m (45 ft. lbs.).



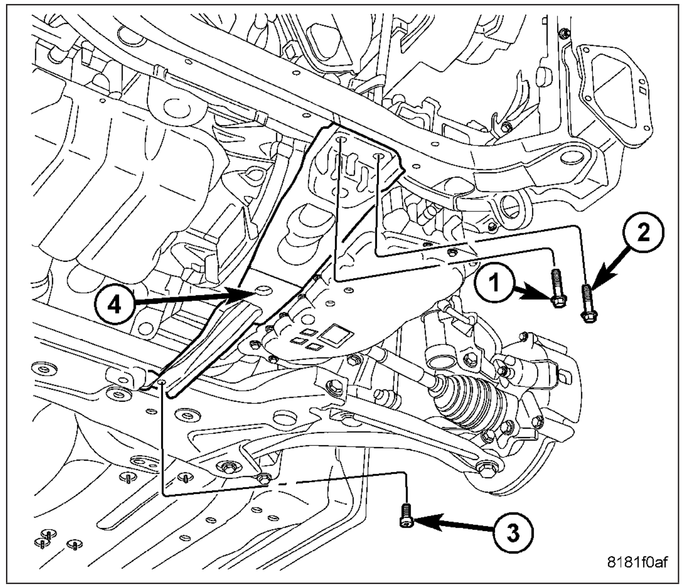
11. Position the power steering lines back into place and install the support bracket (2) bolts (1).
12. Tighten the bolts to 8 N·m (70 ft. lbs.).



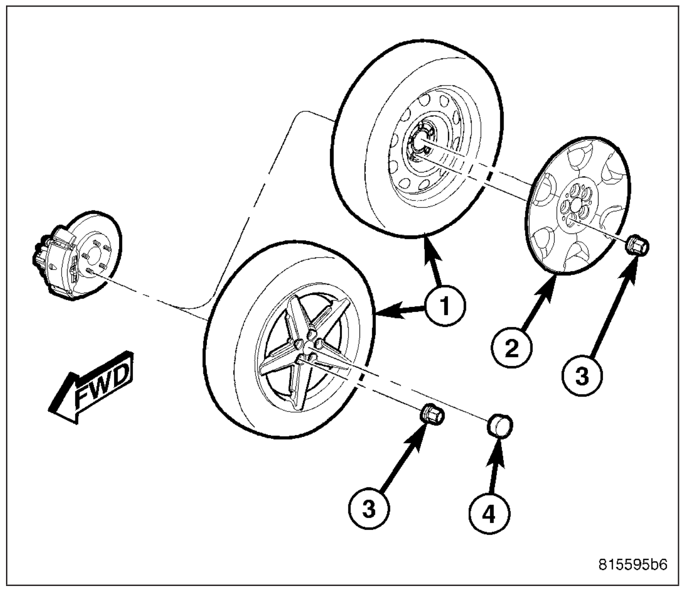
13. Connect the lower ball joint stud (6) to the knuckle (3).
14. Install a NEW ball joint stud pinch bolt (4) and nut (5). Tighten the nut to 82 N·m (60 ft. lbs.).



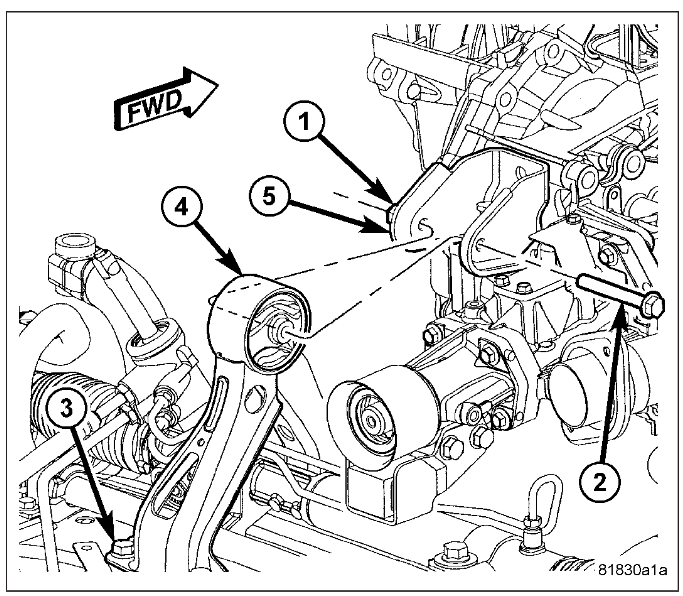
15. Install the fore/aft crossmember (4), (Refer to 13 - FRAME & BUMPERS/FRAME/CROSSMEMBER-FRONT FORE/AFT - INSTALLATION)



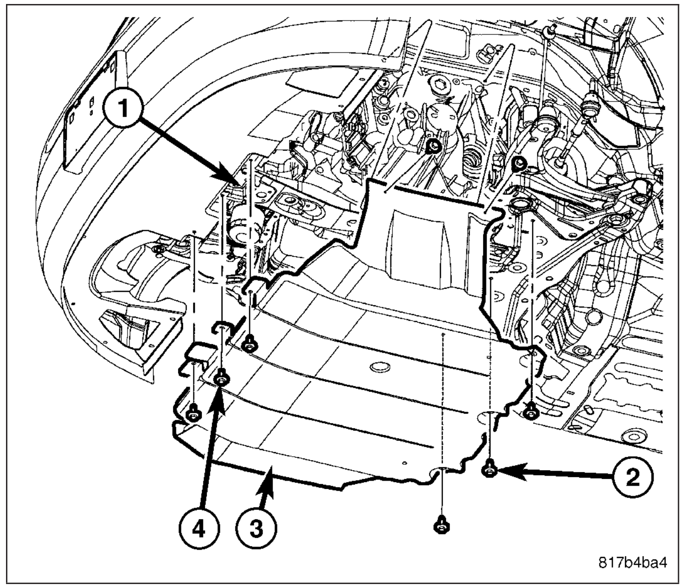
16. Install the front wheels (1), (Refer to 22 - TIRES/WHEELS - INSTALLATION)
17. With the full weight of the vehicle on the suspension tighten the front control arm bushing bolts to 123 N·m (91 ft. lbs.)
18. Perform wheel alignment as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



19. Install the rear roll mount (4) and install the three bolts (3) attaching it to the crossmember.
20. Tighten the bolts (3) to 153 N·m (112 ft. lbs.).
21. Install the through bolt (2) and tighten to 65 N·m (48 ft. lbs.).



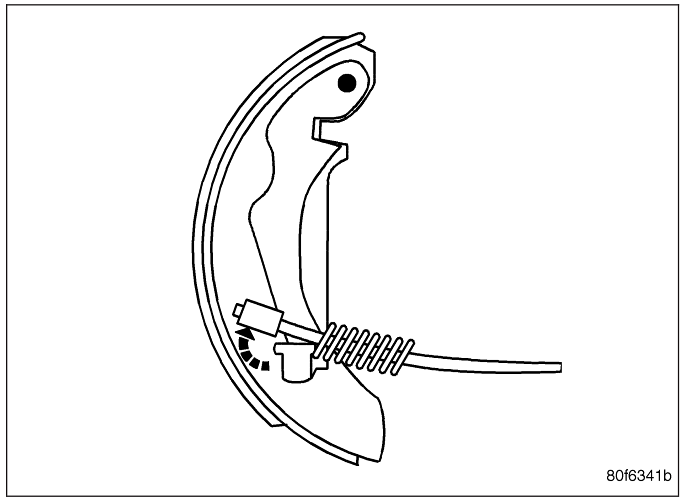
22. If equipped, install the belly pan.
23. Install the three front screws (4), the three rear screws (2) and push pin fasteners into the center of the belly pan.



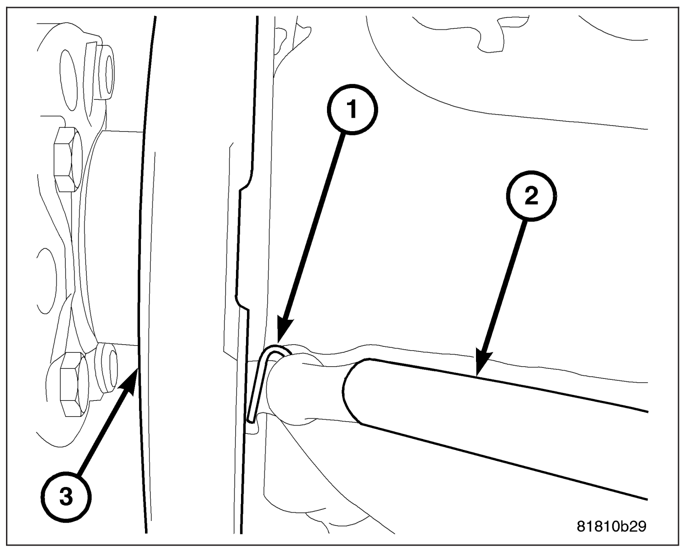
CROSSMEMBER-REAR SUSPENSION

REMOVAL

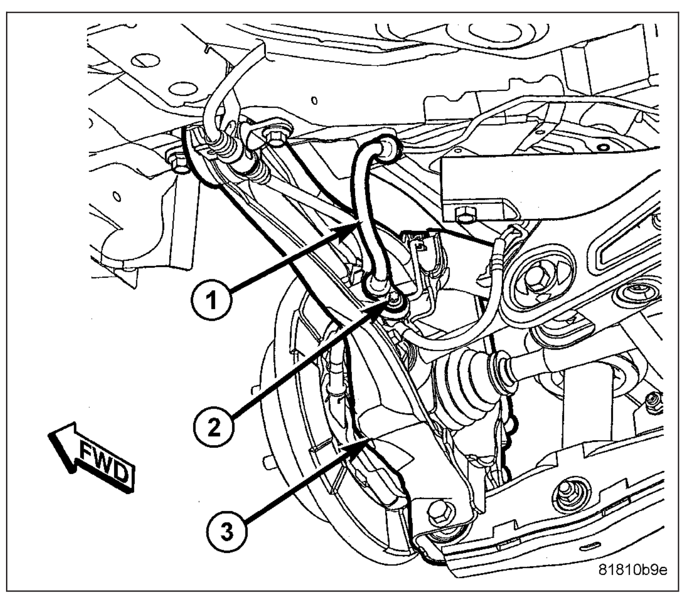
1. Remove the park brake shoes, (Refer to 5 - BRAKES/PARKING BRAKE/SHOE AND LININGS-PARKING BRAKE - REMOVAL).
2. Park brake cable from lever.



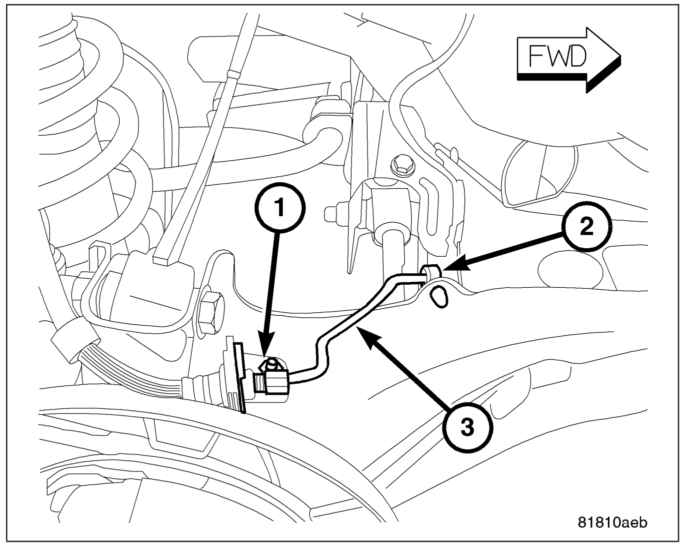
3. Remove the hair pin clip and separate the brake cable (2) from the backing plate (3).



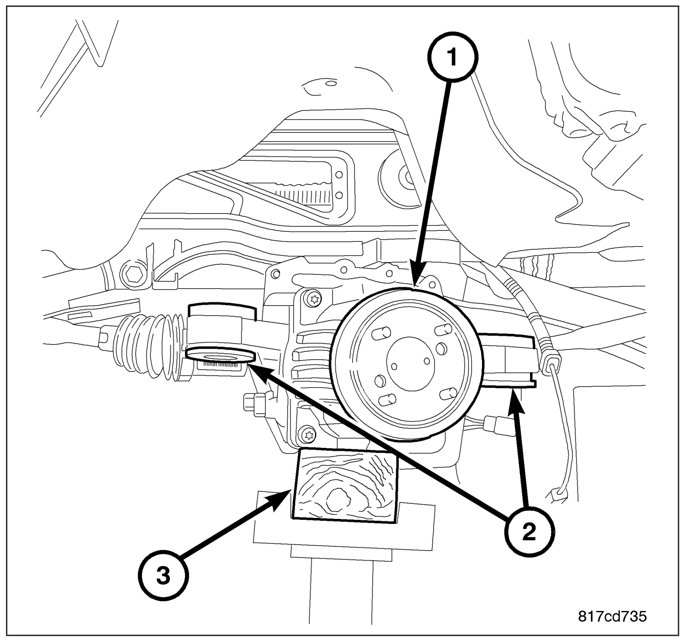
4. Remove the bolt (2) and separate the brake line (1) from the trailing arm (3).



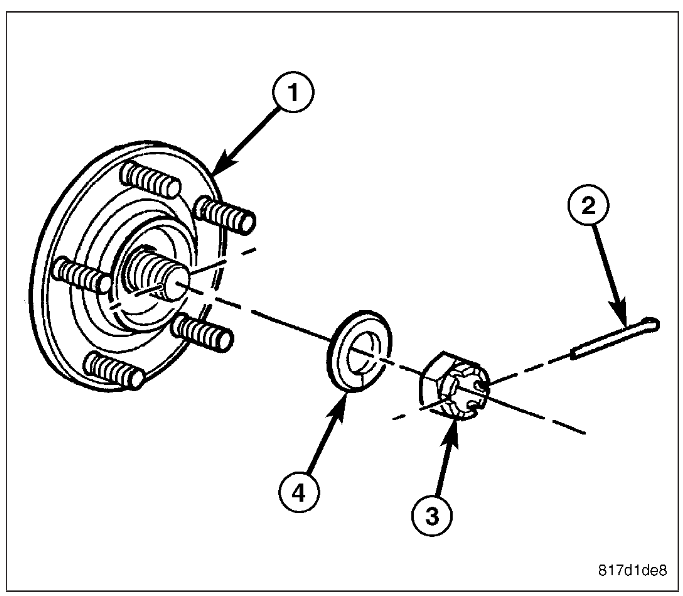
5. Remove the bolt (1), the clip (2) and separate the brake line (3) from the trailing arm.
6. Separate the wheel speed sensors and position aside as necessary to remove the crossmember, (Refer to 5 - BRAKES/ELECTRICAL/SENSOR-REAR WHEEL SPEED - REMOVAL)



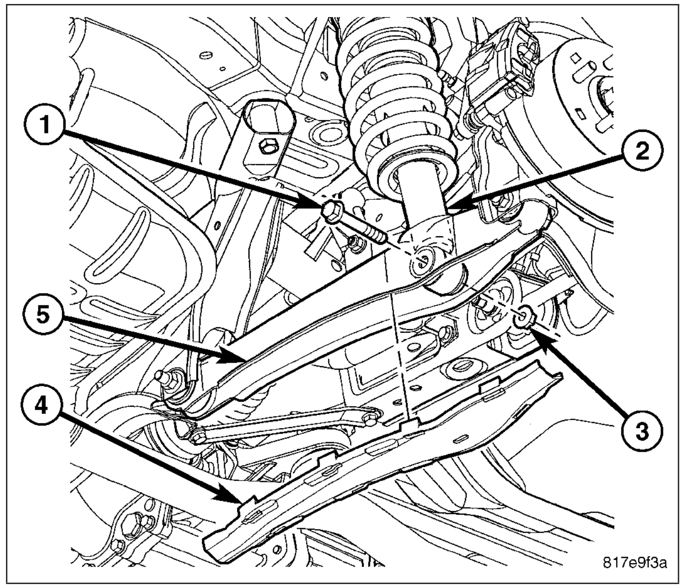
7. If equipped, remove the rear drive module, (Refer to 3 - DIFFERENTIAL & DRIVELINE/MODULE-REAR DRIVELINE - REMOVAL).



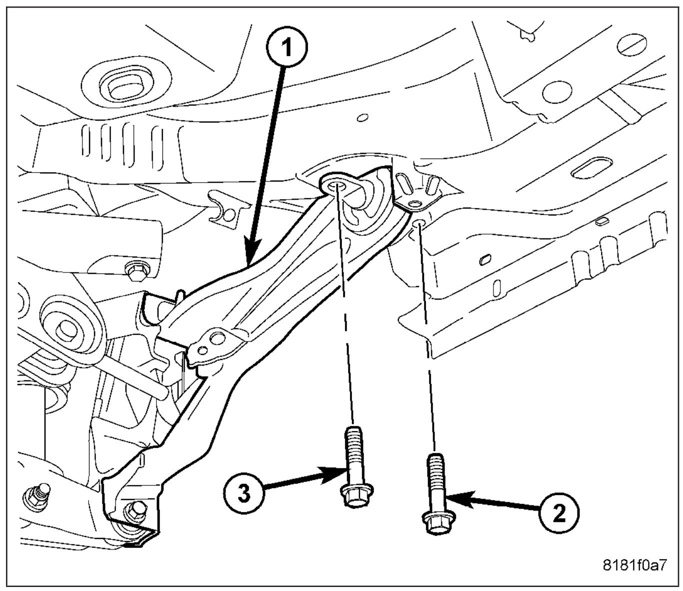
8. Remove the cotter pins (2), the nuts (3) and the washers (4).
9. Remove both half shafts.



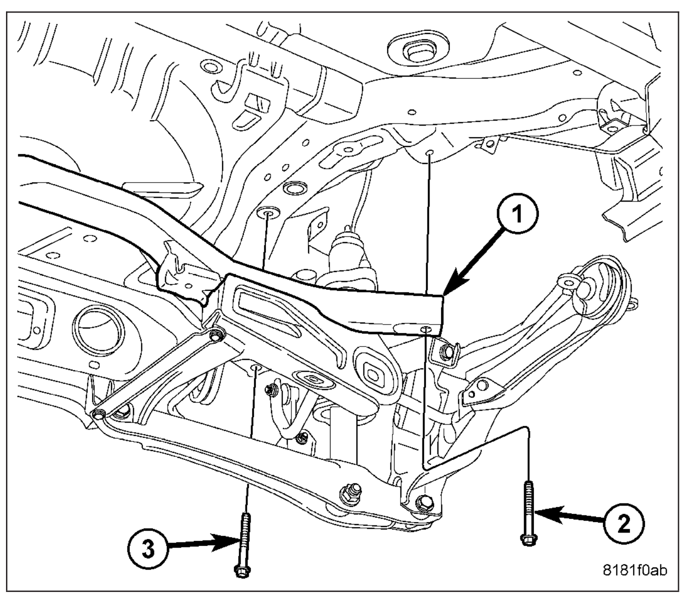
10. Remove the lower strut bolts.



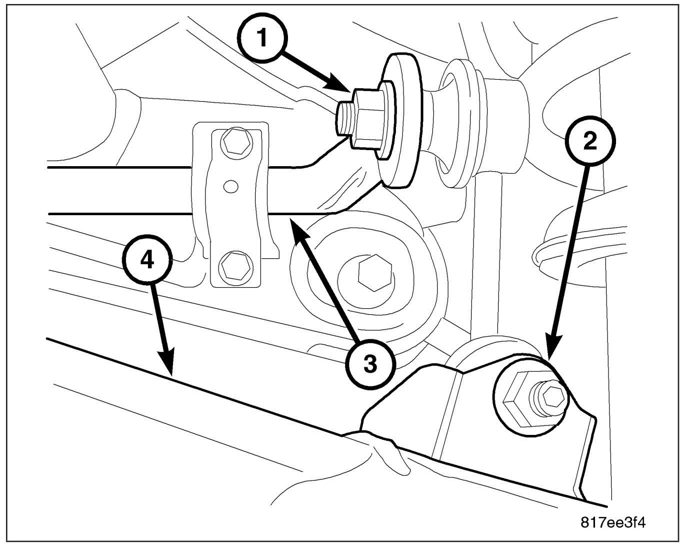
11. Remove the trailing link bushing bolts.



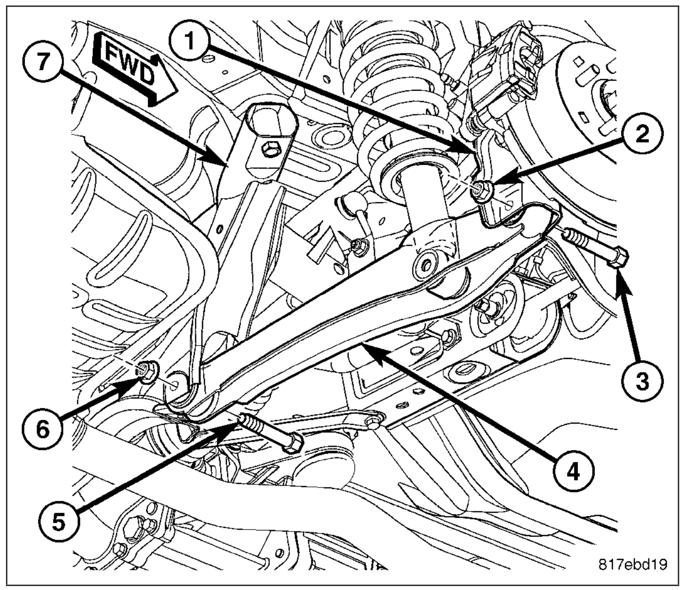
12. Support the rear cradle with a suitable lifting device.
13. Remove the rear cradle bolts and lower the cradle assembly from vehicle.



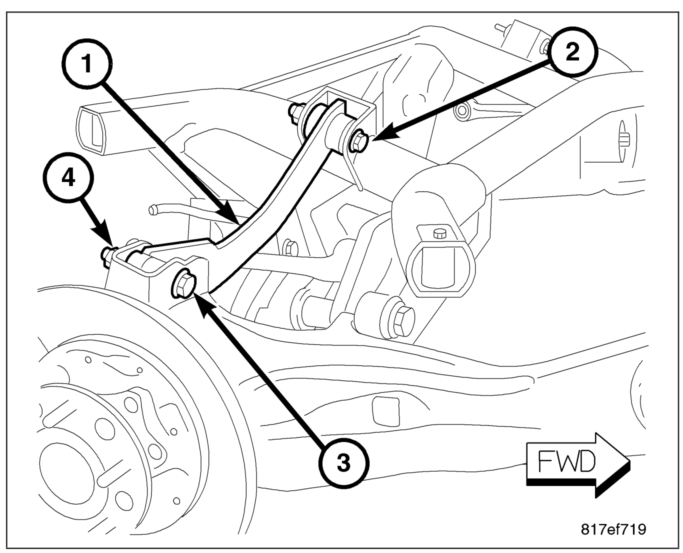
14. Remove the lower stabilizer link nuts (2).



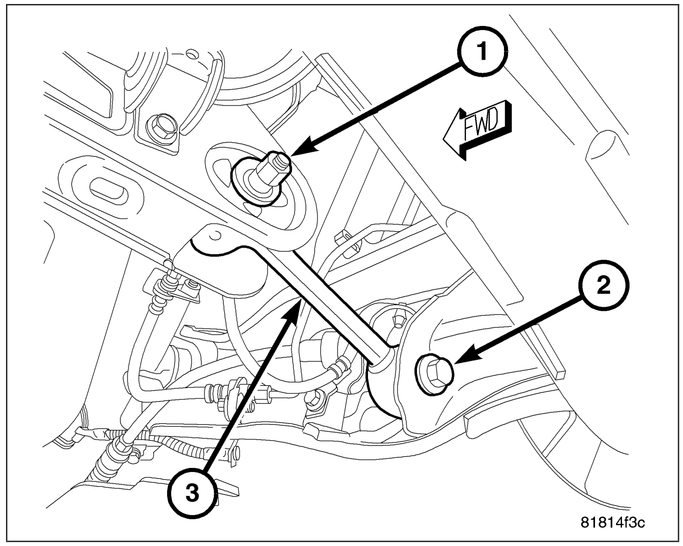
15. Remove the lower link bolts (5 and 6) at the cradle.



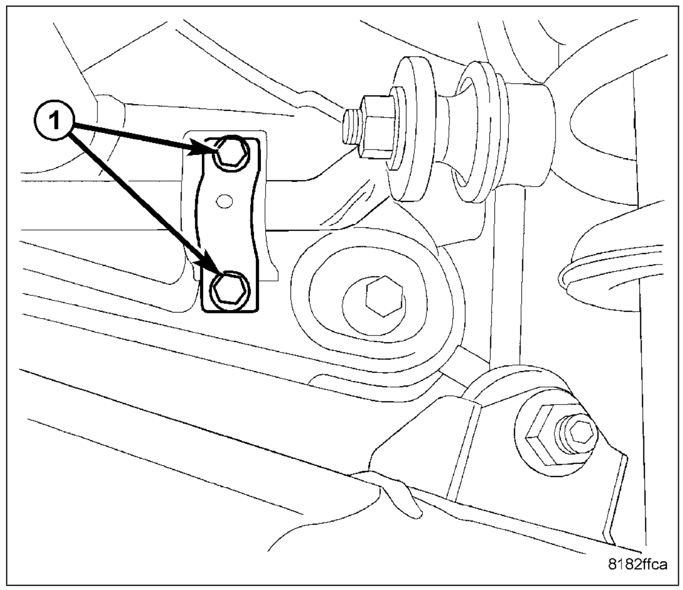
16. Remove the upper link bolts (2) at the cradle.



17. Remove the toe link cam bolts (1) at the cradle.

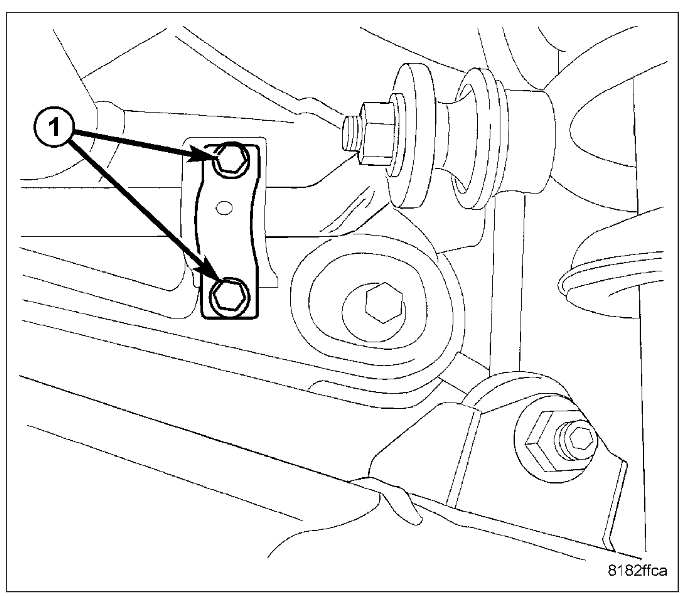


18. Remove the suspension knuckle assemblies.
19. Remove the stabilizer bushing bolts (1) and separate the stabilizer bar from the cradle.

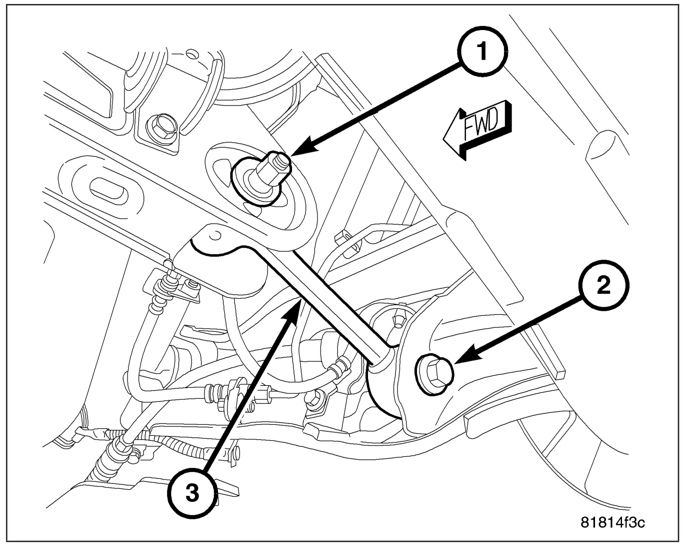


INSTALLATION

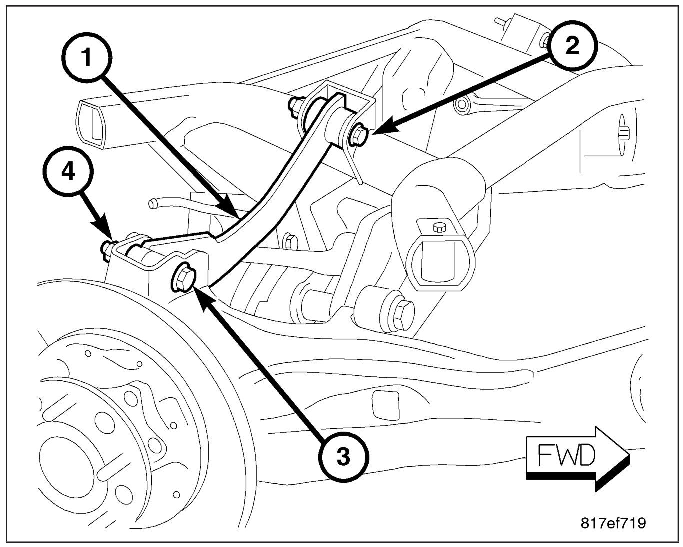
1. Install the stabilizer bar and install the bushings and bolts (1).
2. Tighten the bolts to 61 N·m (45 ft. lbs.).



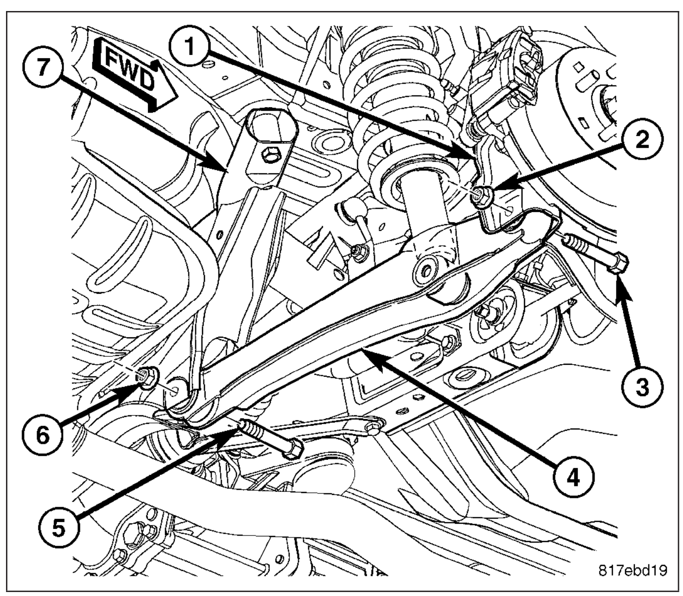
3. Position the suspension knuckle assemblies back into position onto the crossmember.
4. Install the toe link cam bolts (1) at the cradle.
5. Tighten the bolts to 35 N·m (26 ft. lbs.).



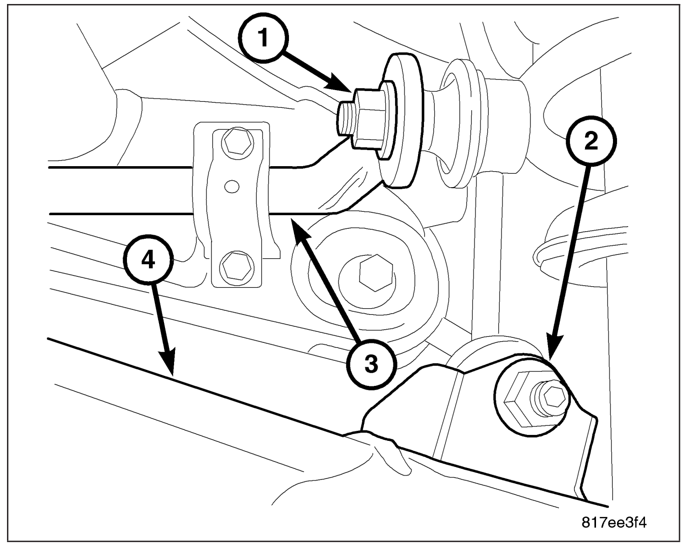
6. Install the upper link bolts (2) at the cradle.
7. Tighten the bolts to 90 N·m (70 ft. lbs.).



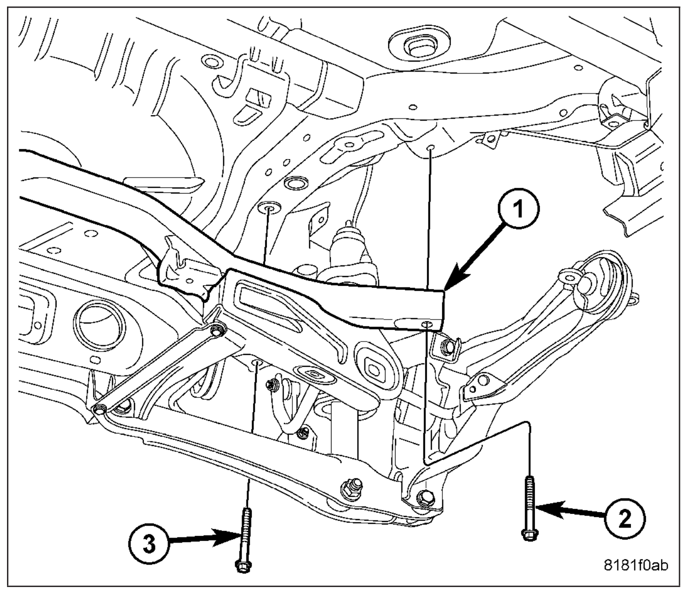
8. Install the lower link bolts (5 and 6) at the cradle.
9. Tighten the bolts to 90 N·m (70 ft. lbs.).



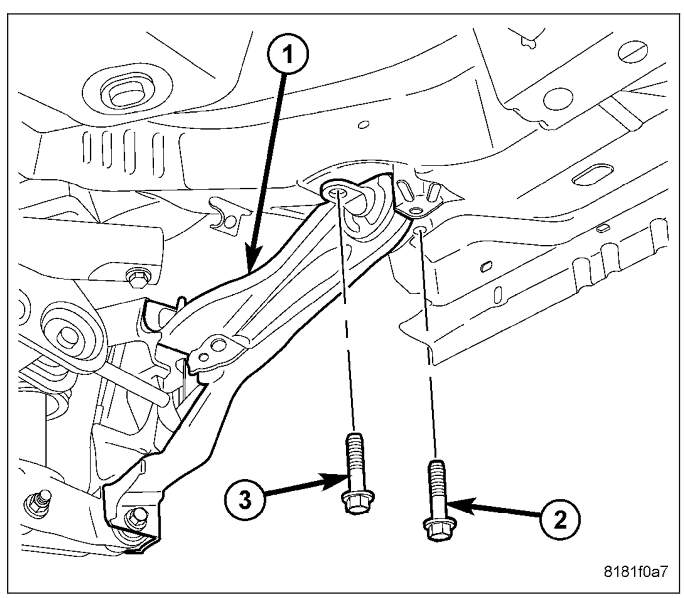
10. Install the stabilizer link nuts (2).
11. Tighten the nuts to 58 N·m (43 ft. lbs.).



12. Support the rear cradle assembly (1) with a suitable lifting device and position back into the vehicle.
13. Install the cradle bolts (2 and 3):



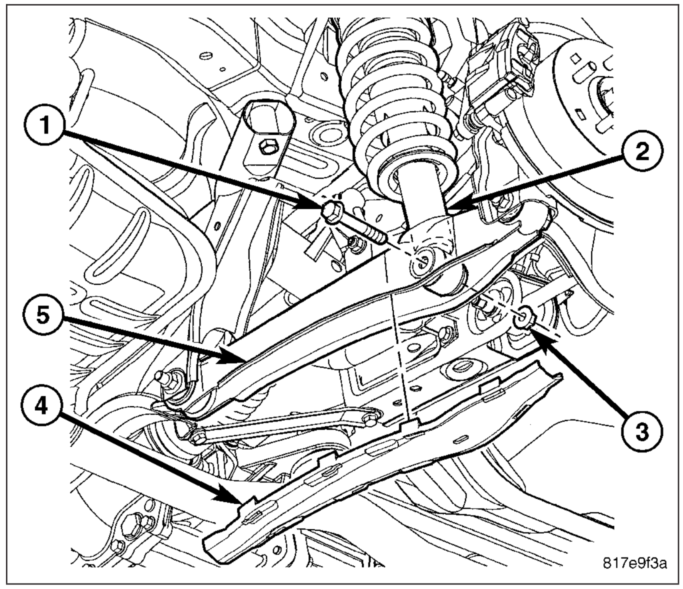
   a. Tighten the front bolts (2) first to 110 N·m (81 ft. lbs.).
   b. Tighten the rear bolts (3) next to 110 N·m (81 ft. lbs.).
14. Install the trailing link (1) bushing bolts (2 and 3):



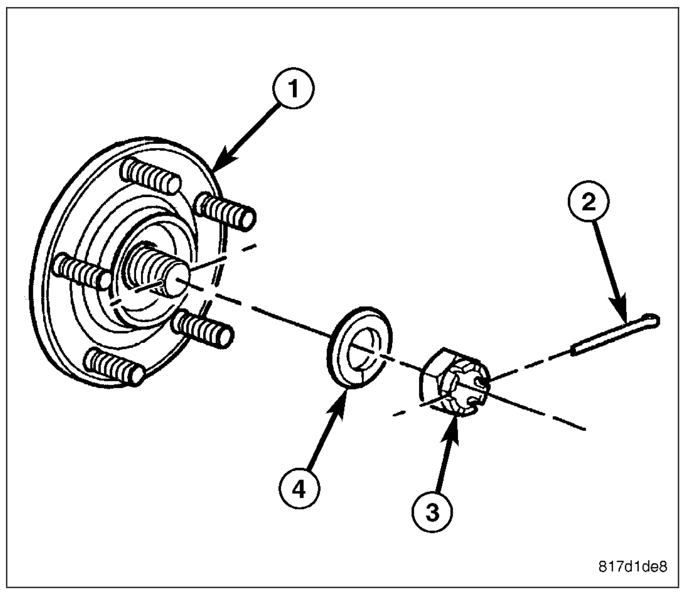
a. Tighten the inboard bolts (3) first to 110 N·m (81 ft. lbs.).

b. Tighten the outboard bolts (2) next to 110 N·m (81 ft. lbs.).

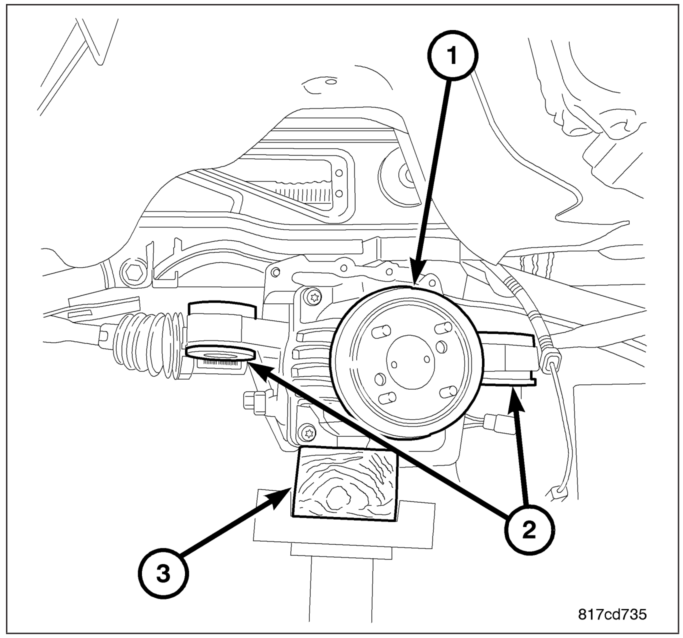
15. Install the lower strut bolts (1).
16. Tighten the bolts to 99 N·m 73 ft. lbs.).



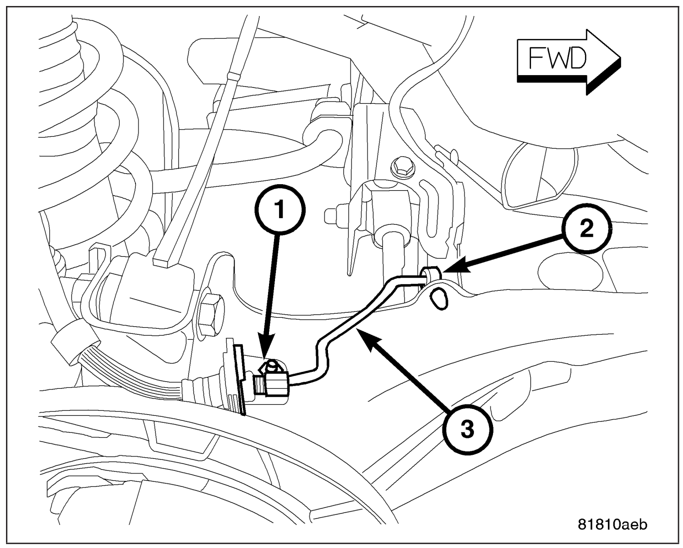
17. If equipped, install the rear half shafts.
18. Install the nuts (3) and washers (4).
19. Tighten the nuts to 244 N·m (180 ft. lbs.).
20. Install new cotter pins (2).



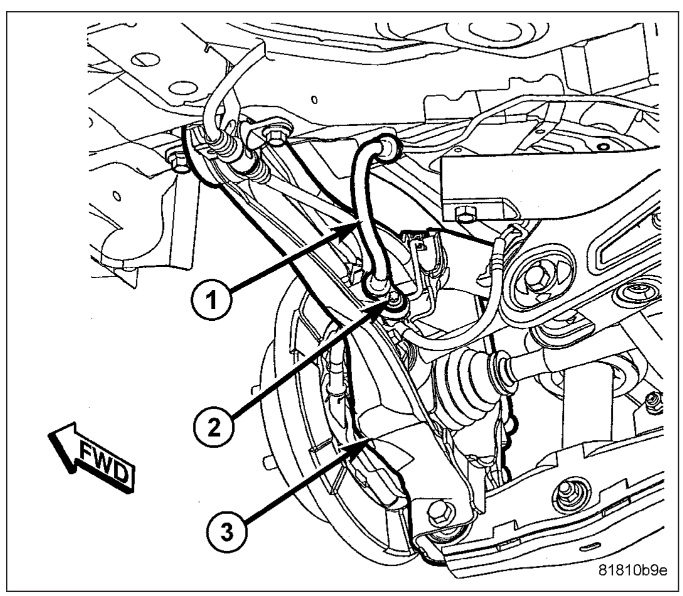
21. Install the rear drive module (1), (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR DRIVELINE MODULE - INSTALLATION).
22. Install the wheel speed sensor back, (Refer to 5 - BRAKES/ELECTRICAL/SENSOR-REAR WHEEL SPEED - INSTALLATION).



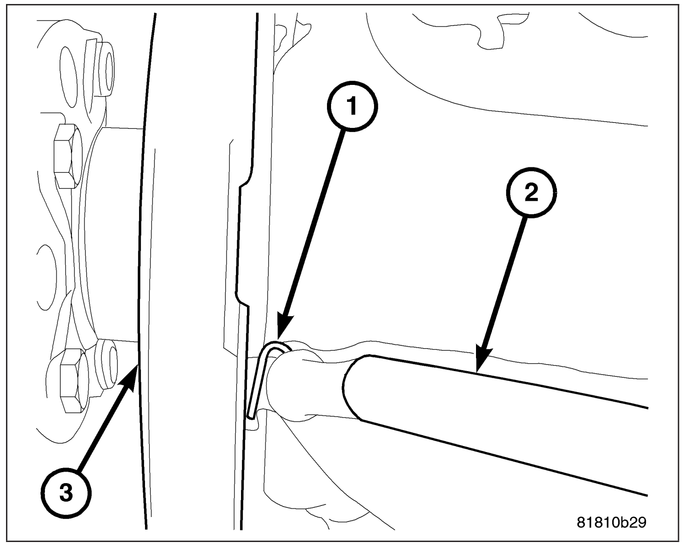
23. Position the brake lines (3) back into place, connect the clips (2) and install the bolts (1).
24. Tighten the bolts to 15 N·m (11 ft. lbs.).



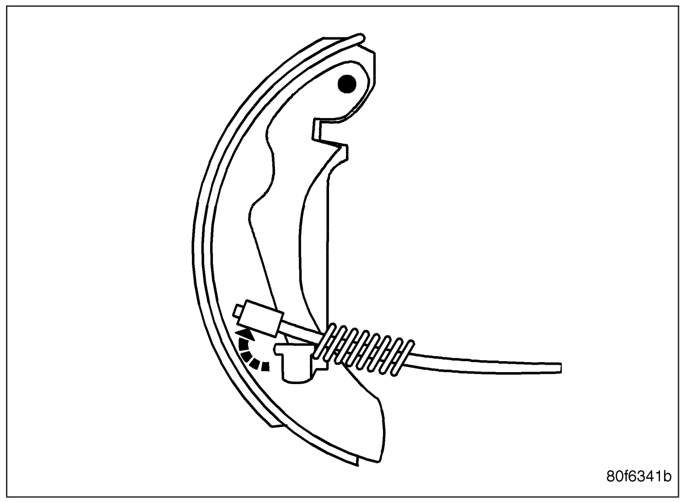
25. Position the brake lines (1) back into place, and install the bolts (2).
26. Tighten the bolts to 23 N·m (17 ft. lbs.).



27. Install the brake cable (2) onto the backing plate (3) and install the hair pin clip (1).



28. Connect the brake cable to the park brake lever.
29. Install the park brake shoes, (Refer to 5 - BRAKES/PARKING BRAKE/SHOE AND LININGS-PARKING BRAKE - INSTALLATION).
30. Check and adjust wheel alignment as necessary, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).



FUEL SYSTEM

TABLE OF CONTENTS

FUEL DELIVERY

TABLE OF CONTENTS

FUEL DELIVERY

DESCRIPTION

The fuel tank is made of plastic and is located near the rear center of the vehicle.

The Fuel Delivery System consists of: the following items:

- Electric fuel pump module
- Fuel filter
- Tubes/lines/hoses
- Fuel injectors

The in-tank fuel pump module contains the fuel pump. The pump is serviced as part of the fuel pump module. Refer to Fuel Pump Module.

The fuel filter is not serviceable, it is mounted on the inside of the fuel tank in the fuel pump module.

DIAGNOSIS AND TESTING - FUEL DELIVERY SYSTEM

(Refer to Group 9 Engine for all Powertrain Diagnostic Information)

STANDARD PROCEDURE

FUEL CONTAMINATION

If a engine's fuel supply has been contaminated, the following procedure must be followed:

1. Remove all fuel from fuel tank. Use an appropriate fuel container. Dispose of contaminated fuel through the proper procedure of disposal. Clean fuel tank. This will require removal of the fuel tank to make sure all contaminated fuel is removed. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK - REMOVAL).
2. Install fuel tank to vehicle, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK - INSTALLATION).
3. Fill fuel tank with fuel.
4. Check for DTC's and clear DTC's.
5. Start vehicle and run engine for 15 minutes and turn off vehicle.
6. Check for DTC's and clear DTC's.
7. Road test vehicle.
8. Check for DTC's.

NOTE: Dispose of Petroleum based products in a manner consistent with State, Federal, and Provincial Regulations.

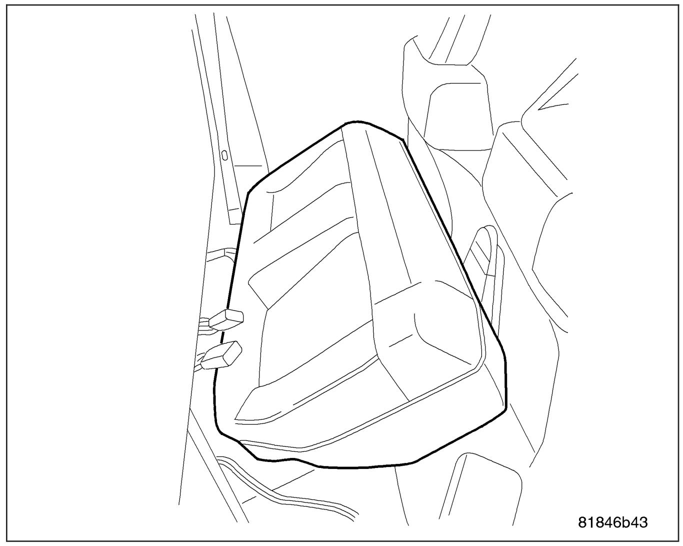
The engine should then be evaluated to determine if the contaminated fuel has caused any damage to the fuel system and or engine. Indicators that the fuel system and or engine has been damaged are the following:

- Unstable fuel rail pressure. This can manifest itself as instability at idle speeds, excessive undershoot/overshoot at engine start, or excessive undershoot/overshoot when the engine operating conditions change. A typical engine response to a large rail pressure undershoot would be a decrease in engine speed or engine stall.
- Excessive noise from the engine. This could indicate poor rail pressure control or the inability of the injection system to inject the proper amount of fuel.
- Excessive smoke (black or white). This could indicate inability of the fuel system to inject the proper amount of fuel.

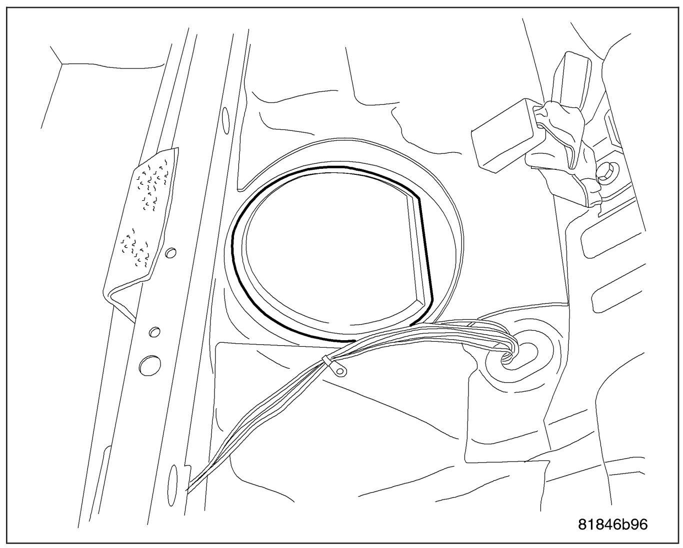
NOTE: If any of these conditions are exhibited after cleaning the fuel system, proceed to the appropriate fuel system information. Repair fuel system and or engine as necessary.

STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE PROCEDURE

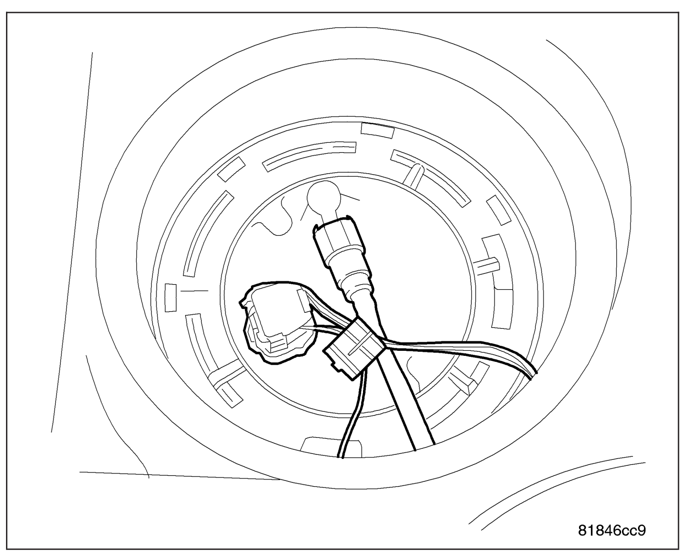
1. Remove lower rear seat cushion.



2. Remove the fuel pump module cover.



3. Disconnect the electrical connector for fuel pump module.
4. Start and run engine until it stalls.
5. Attempt restarting engine until it will no longer run.
6. Turn ignition key to OFF position.
7. Disconnect negative battery cable.
8. One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory. The scan tool must be used to erase a DTC.



SPECIFICATIONS

TORQUE

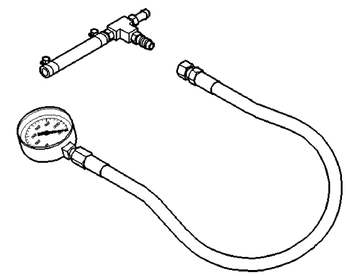
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Accelerator Pedal to Dash Nuts	12	8.8	105
Fuel Tank Strap Bolts	47	34.5	-
Fuel Rail Bolts	27	20	-
Ignition Coil Mounting Bolts	8	-	71
Throttle Body Bolts	9	-	79.5
Fuel Filler Tube Clamp	2.8	-	24
Filler Tube Mounting Bolt	9	-	79.5

FUEL SYSTEM PRESSURE

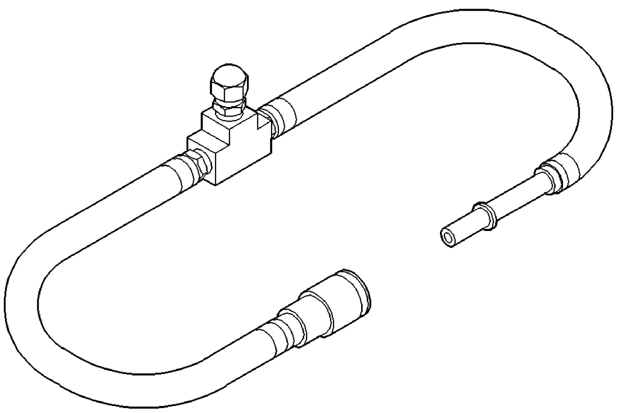
400 kpa ±34 kpa (58 psi ± 5 psi)

SPECIAL TOOLS

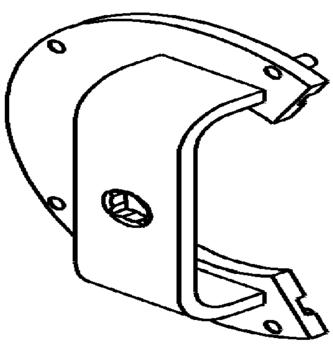
FUEL



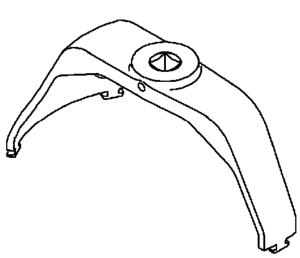
Pressure Gauge Assembly C–4799–B



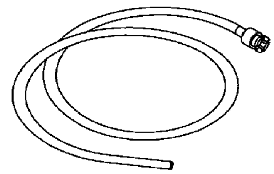
Fuel Pressure Test Adapter 6539



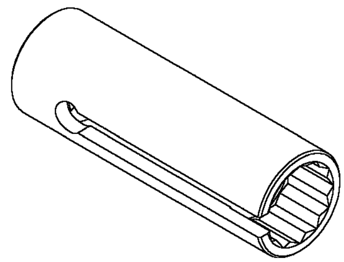
9318 LOCK RING TOOL



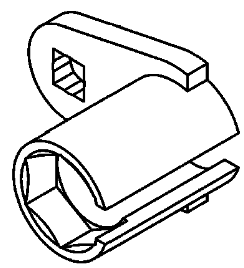
Spanner Wrench 9340



Fuel Line Adapter 1/4



O2S (Oxygen Sensor) Remover/Installer—C-4907



O2S (Oxygen Sensor) Remover/Installer - 8439

FUEL FILTER

DESCRIPTION

The fuel filter mounts inside the fuel pump module and is a non-serviceable part.

FUEL LINES

DESCRIPTION - FUEL LINES/HOSES AND CLAMPS

Also refer to Quick-Connect Fittings.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before servicing any fuel system hoses, fittings or lines, the fuel system pressure must be released. Refer to the fuel system pressure release procedure in this group. This may result in personal injury or death.

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, use new original equipment lines/tubes/hoses.

If equipped: The hose clamps used to secure rubber hoses on vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause leaks.

Use new original equipment type hose clamps.

STANDARD PROCEDURE - HOSES AND CLAMP

Inspect all hose connections (clamps and quick connect fittings) for completeness and leaks. Replace cracked, scuffed, or swelled hoses. Replace hoses that rub against other vehicle components or show sign of wear.

Fuel injected vehicles use specially constructed hoses. When replacing hoses, only use hoses marked EFM/EFI.

When installing hoses, ensure that they are routed away from contact with other vehicle components that could rub against them and cause failure. Avoid contact with clamps or other components that cause abrasions or scuffing. Ensure that rubber hoses are properly routed and avoid heat sources.

The hose clamps have rolled edges to prevent the clamp from cutting into the hose. Only use clamps that are original equipment or equivalent. Other types of clamps may cut into the hoses and cause high pressure fuel leaks. Tighten hose clamps to 1 N·m (9 in. lbs.) torque.

Inspect all hose connections such as clamps, couplings and fittings to make sure they are secure and leaks are not present. The component should be replaced immediately if there is any evidence of degradation that could result in failure.

Never attempt to repair a plastic fuel line/tube. Replace as necessary.

Avoid contact of any fuel tubes/hoses with other vehicle components that could cause abrasions or scuffing. Be sure that the plastic fuel lines/tubes are properly routed to prevent pinching and to avoid heat sources.

FUEL PUMP

DESCRIPTION

The electric fuel pump is located in and is part of the fuel pump module. It is a positive displacement, gerotor type, immersible pump with a permanent magnet electric motor. The fuel pump module is suspended in fuel in the fuel tank.

OPERATION

The pump draws fuel through a strainer and pushes it through the motor to the outlet. The pump contains a check valve. The valve, in the pump outlet, maintains pump pressure during engine off conditions, for a short while. It is normal for fuel pressure to drop to zero after cooldown. The fuel pump relay provides voltage to the fuel pump. The fuel pump has a maximum deadheaded pressure output of approximately 880 kPa (130 psi). The regulator adjusts fuel system pressure to approximately 400 kpa ±34 kpa (58 psi ± 5 psi).

FUEL PUMP MODULE

DESCRIPTION

The fuel pump module is installed in the top of the fuel tank.

The fuel pump module contains the following:

- Electric fuel pump
- Fuel pump reservoir
- Inlet strainer
- Fuel pressure regulator
- Fuel gauge sending unit
- Fuel supply line connection
- Fuel Filter

NOTE: The fuel level sensor and the pressure regulator are the only serviceable items. If the fuel pump or electrical wiring harness requires service, replace the fuel pump module.

OPERATION

The pump draws fuel through a strainer and pushes it through the motor to the outlet. The pump contains one check valve. The check valve, in the pump outlet, maintains pump pressure during engine off conditions. The fuel pump relay provides voltage to the fuel pump.

The fuel pump has a maximum deadheaded pressure output of approximately 880 kPa (130 psi). The regulator adjusts fuel system pressure to approximately 400 ±34 kPa (58 ±5 psi).

FUEL PUMP ELECTRICAL CONTROL

Voltage to operate the electric pump is supplied through the fuel pump relay. For an electrical operational description of the fuel pump refer to fuel Pump Relay—PCM Output.

ELECTRICAL PUMP REPLACEMENT

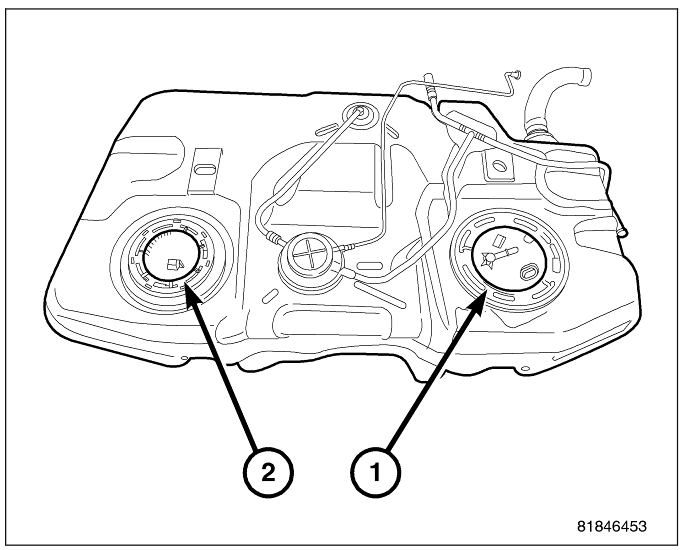
The electric fuel pump is not serviceable. If the fuel pump or electrical wiring harness needs replacement, the complete fuel pump module must be replaced. Perform the Fuel System Pressure Release procedure before servicing the fuel pump.

REMOVAL

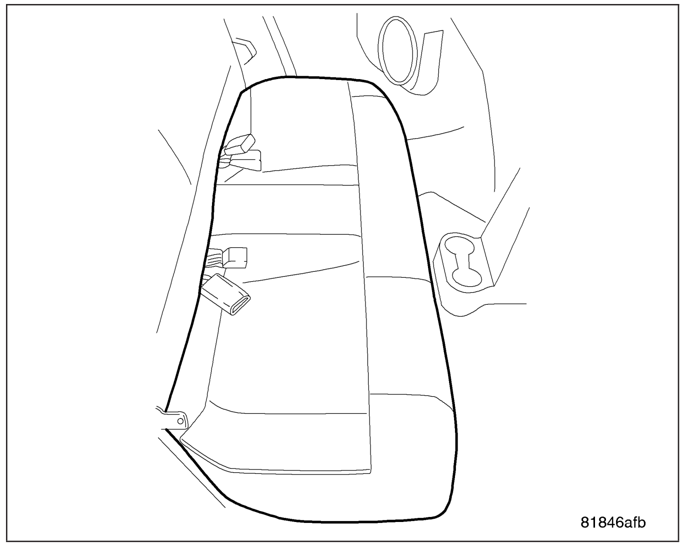
ALL WHEEL DRIVE

WARNING: Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

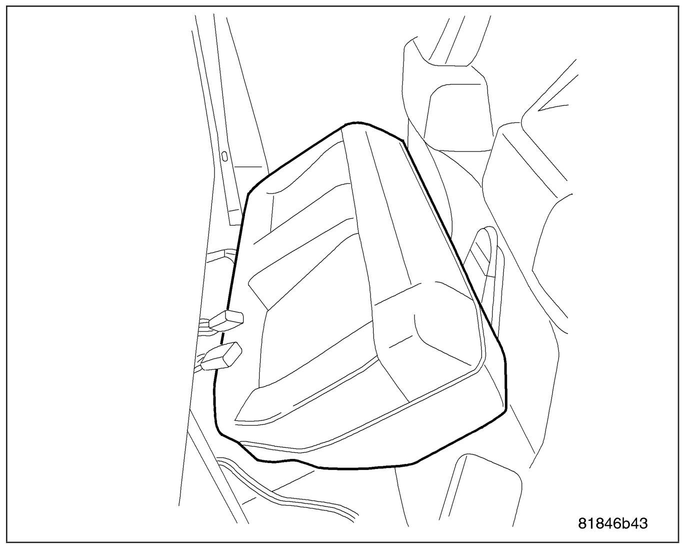
1. Perform Fuel System Pressure Release procedure.
2. Remove the air cleaner lid, disconnect the inlet air temperature sensor and makeup air hose.
3. Remove the negative battery cable.



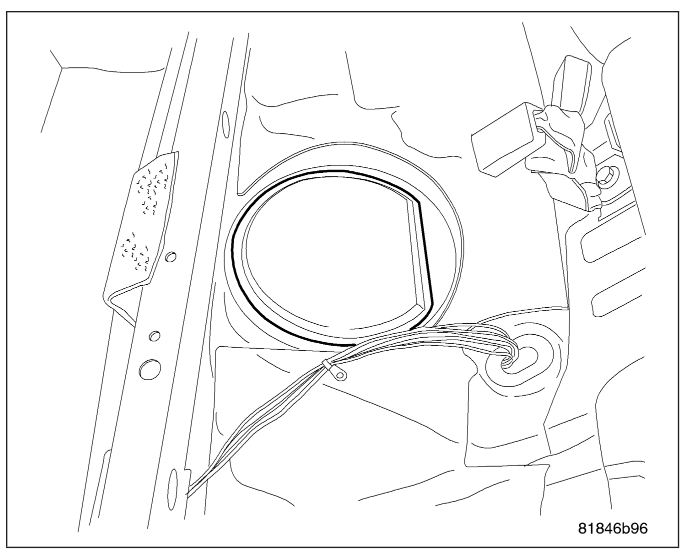
4. Remove the rear seat cushion.



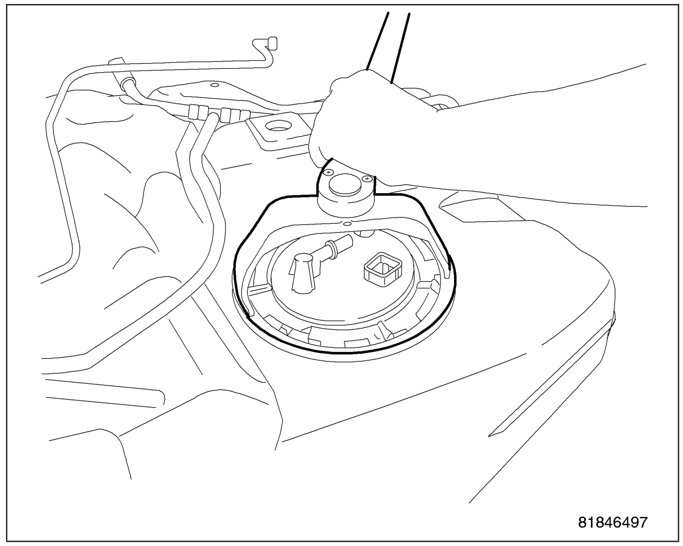
5. Rear seat cushion loose.



6. Remove plastic cover.

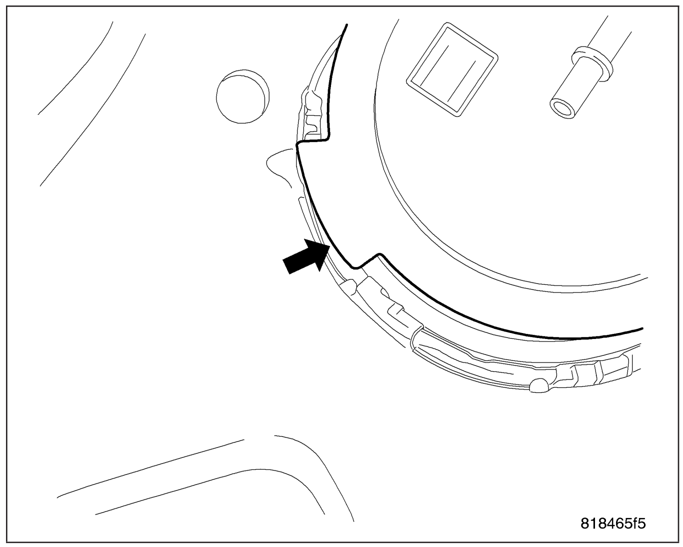


7. Clean top of tank to remove loose dirt and debris.
8. Use special tool #9340 to remove left side module lock ring.

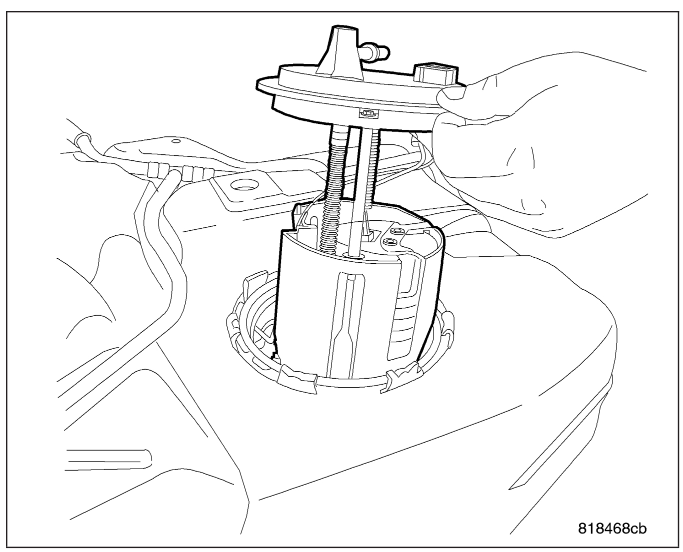


9. **Note the fuel pump location on the top of the fuel tank.**

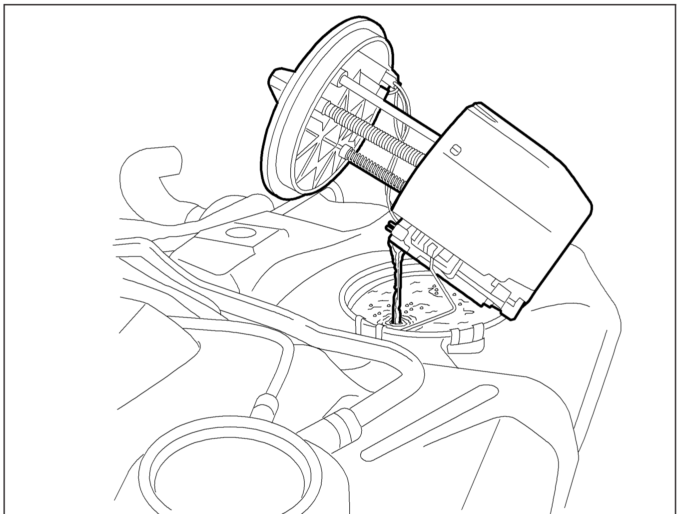
NOTE: The pump has to be properly located to the tank for the fuel gauge to work properly.



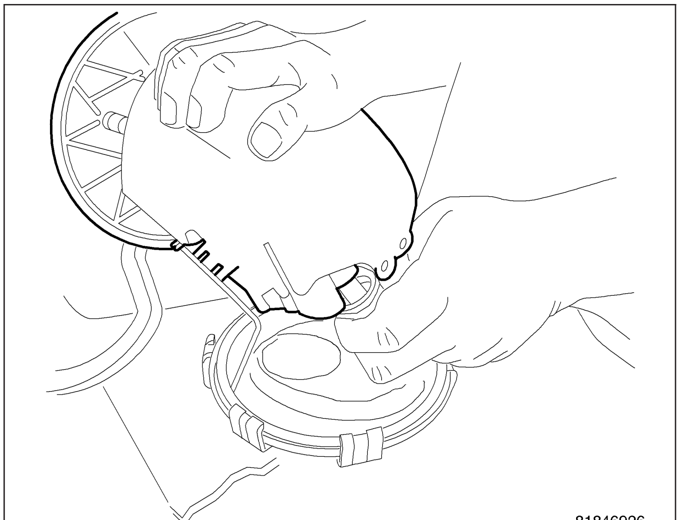
10. Pull module up out of fuel tank, make sure that you do not spill fuel inside of vehicle.



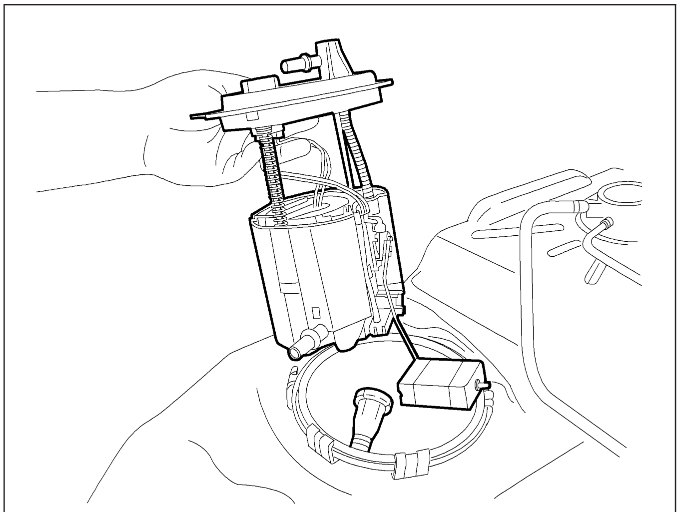
11. Drain fuel from fuel pump module. Do not spill fuel in interior of vehicle.


8184691b

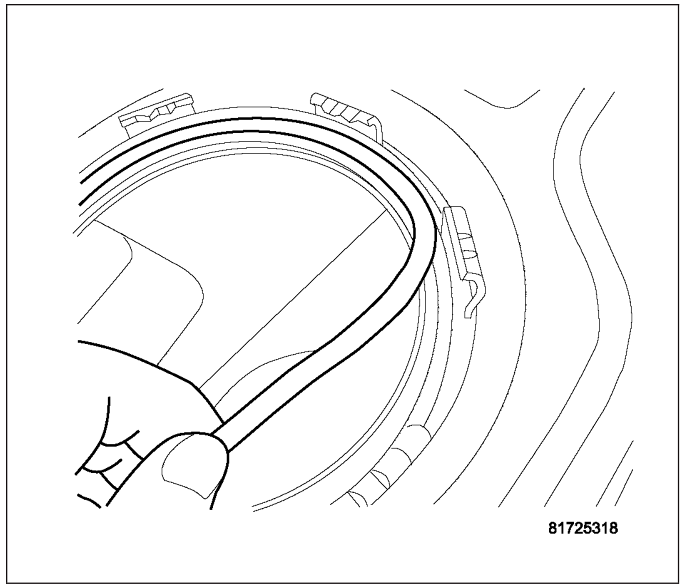
12. Disconnect internal line from fuel pump module.
13. Tip module on its side to drain remaining fuel from reservoir and remove module from vehicle.


81846926

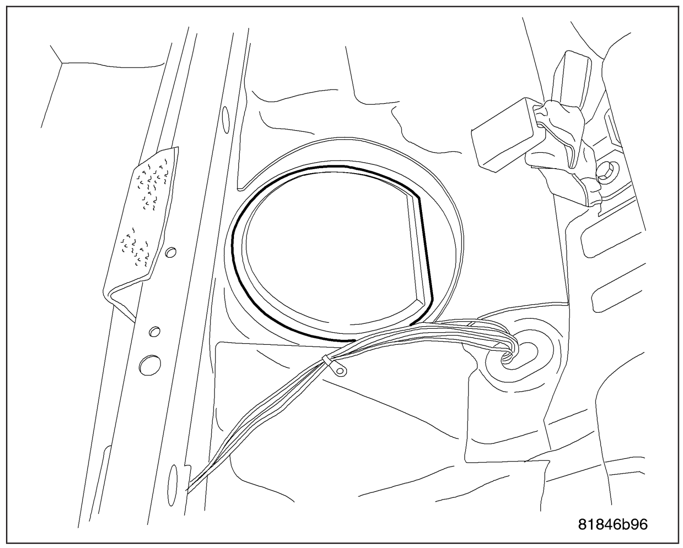
14. Remove module from vehicle.


81846930

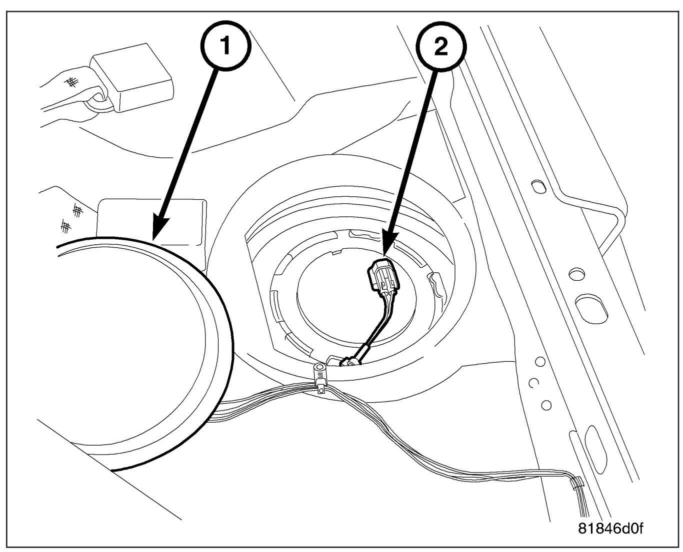
15. Remove seal from tank. Discard seal.



16. Remove plastic cover.



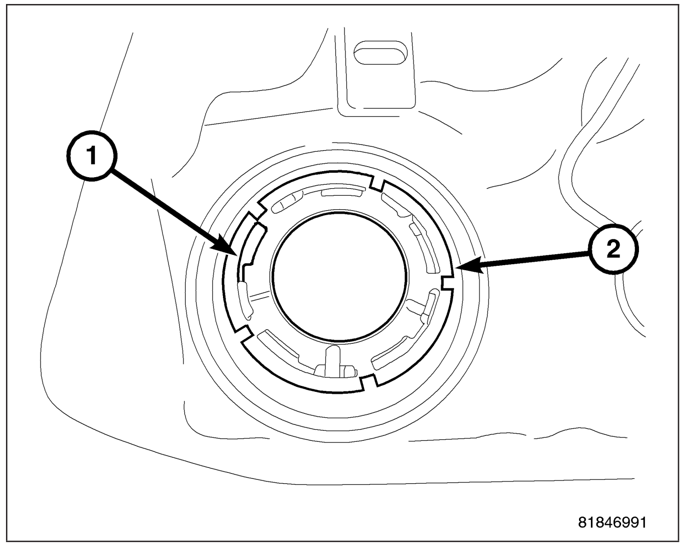
17. Clean top of tank to remove loose dirt and debris.
18. Disconnect electrical line from module.



19. **Note the fuel level unit location on the top of the fuel tank (1).**

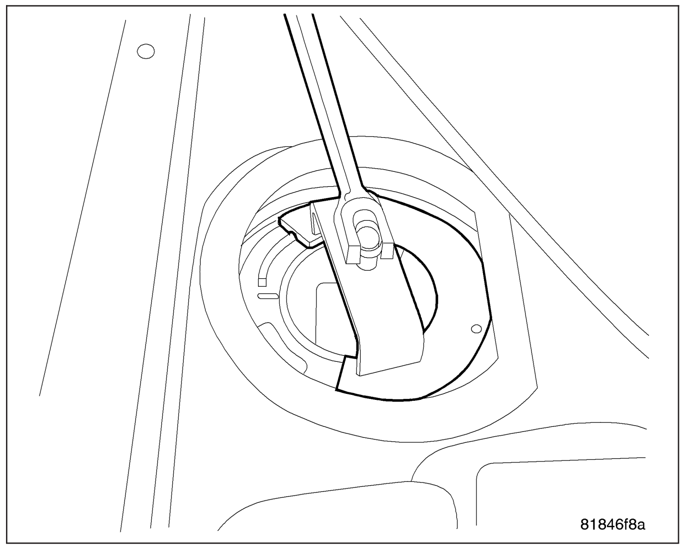
NOTE: The fuel level unit has to be properly located to the tank for the fuel gauge to work properly.

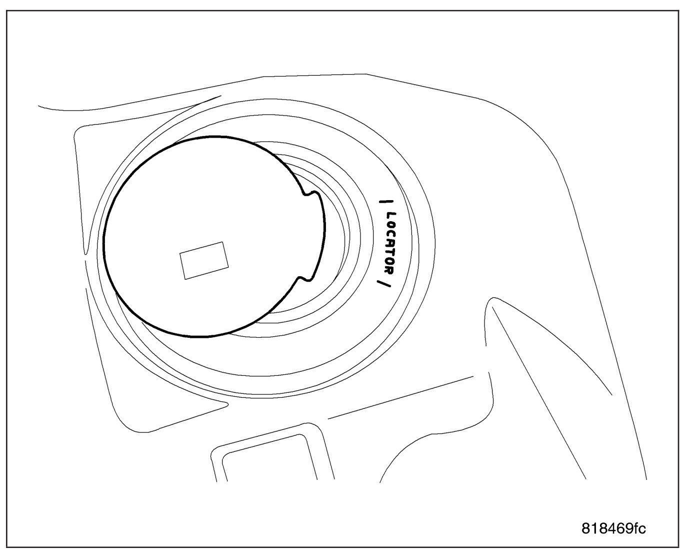
20. Using Special Tool #9318 remove lock ring (2) to release fuel level unit.



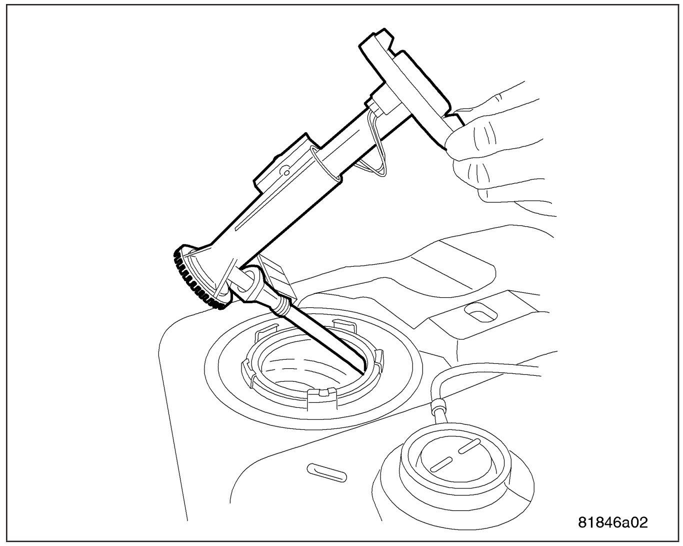
21. **Note the fuel level unit location on the top of the fuel tank.**

NOTE: The fuel level unit has to be properly located to the tank for the fuel gauge to work properly.

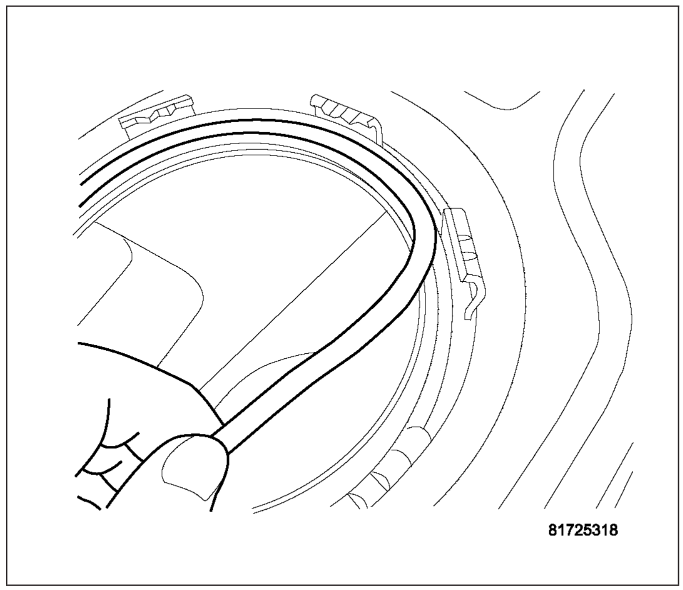




22. Remove fuel level unit module and disconnect line.



23. Remove module and seal from tank. Discard seal.

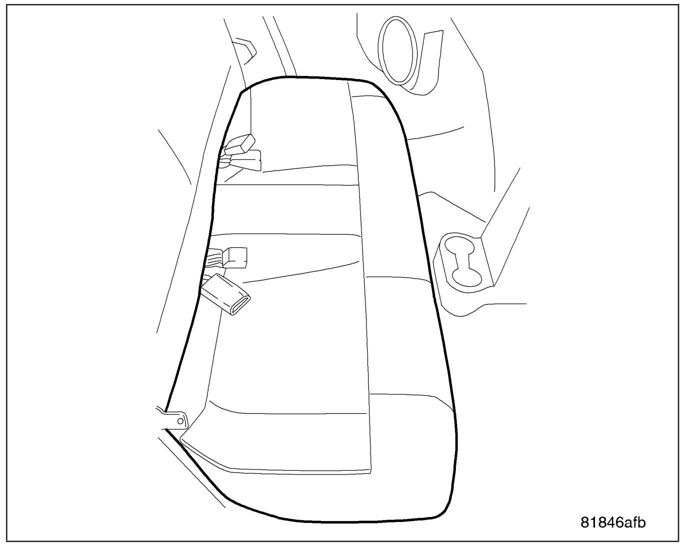


FRONT WHEEL DRIVE

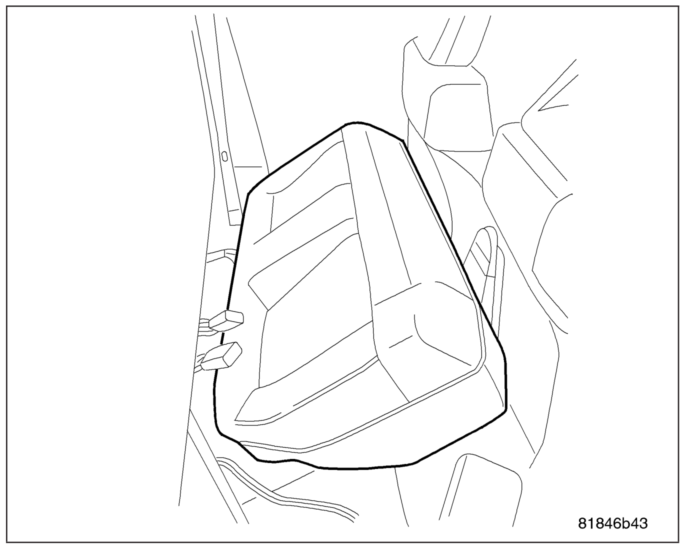
WARNING: Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

1. Perform Fuel System Pressure Release procedure.
2. Remove the air cleaner lid, disconnect the inlet air temperature sensor and makeup air hose.
3. Remove the negative battery cable.

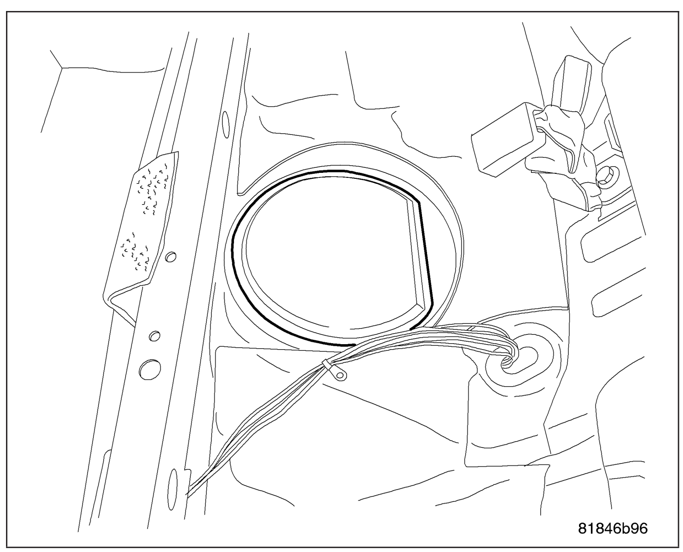
4. Remove the rear seat cushion.



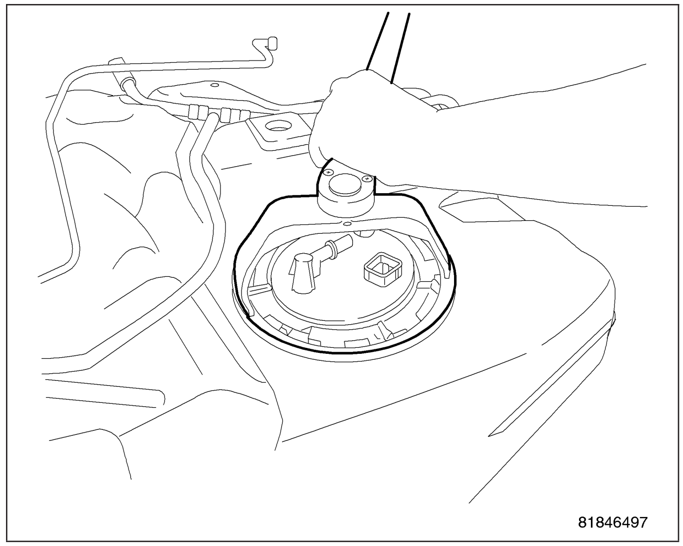
5. Rear seat cushion loose.



6. Remove plastic cover.

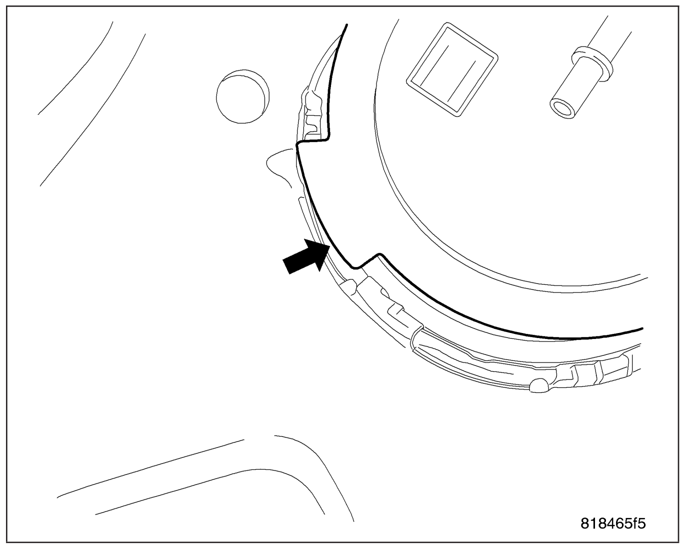


7. Clean top of tank to remove loose dirt and debris.
8. Use special tool #9340 to remove left side module lock ring.

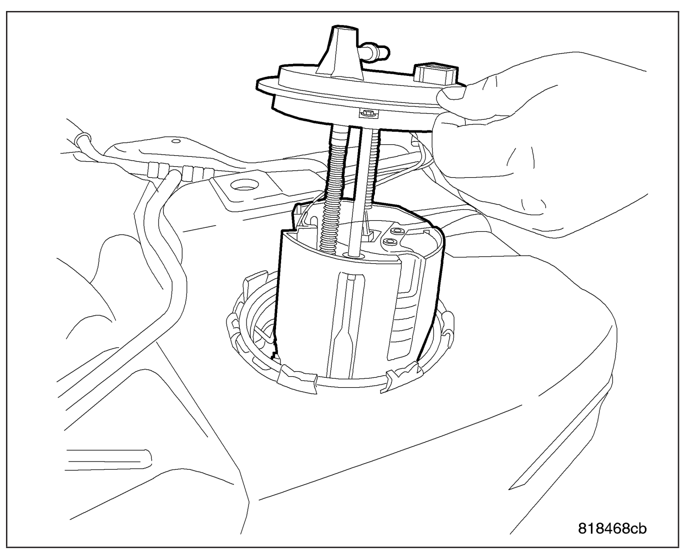


9. **Note the fuel pump location on the top of the fuel tank.**

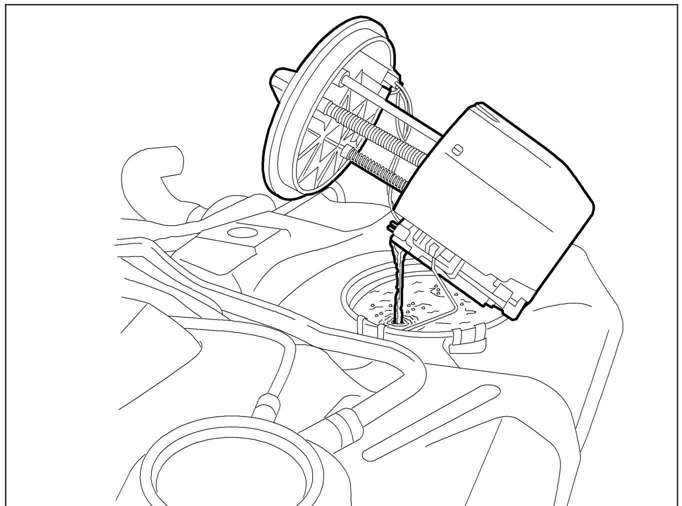
NOTE: The pump has to be properly located to the tank for the fuel gauge to work properly.



10. Pull module up out of fuel tank, make sure that you do not spill fuel inside of vehicle.



11. Drain fuel from fuel pump module. Do not spill fuel in interior of vehicle.

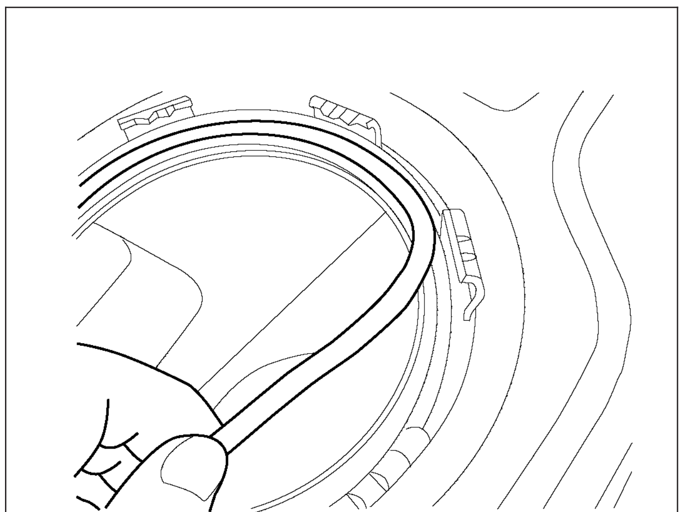

8184691b

INSTALLATION

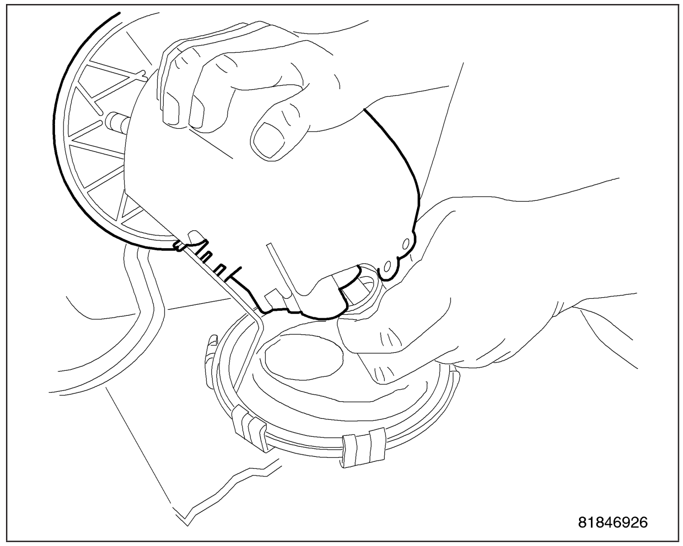
ALL WHEEL DRIVE

NOTE: The pump has to properly located to the tank for the fuel gauge to work properly.

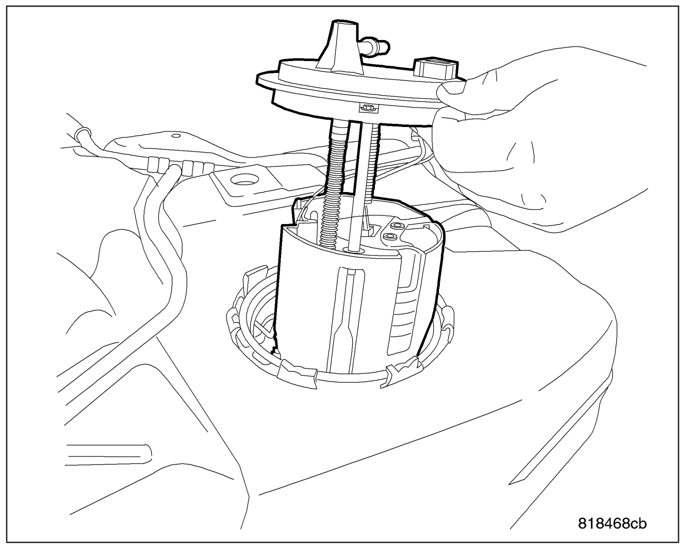
1. Wipe seal area of tank clean. Place a new seal between the tank threads and the pump module opening.


81725318

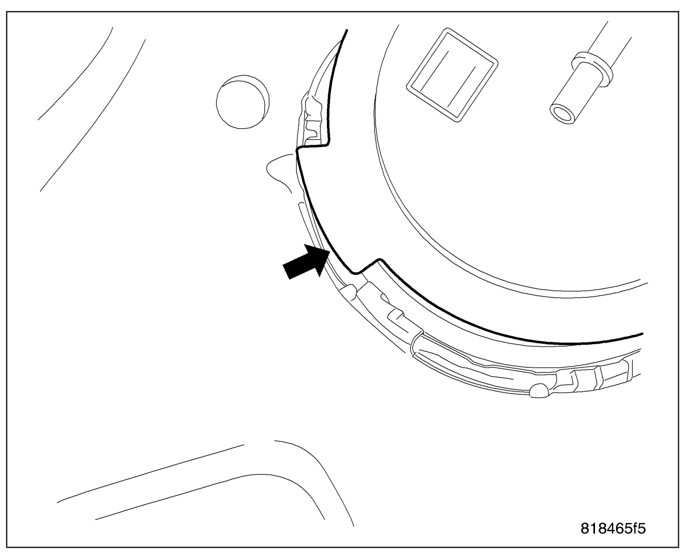
2. Connect line to module.



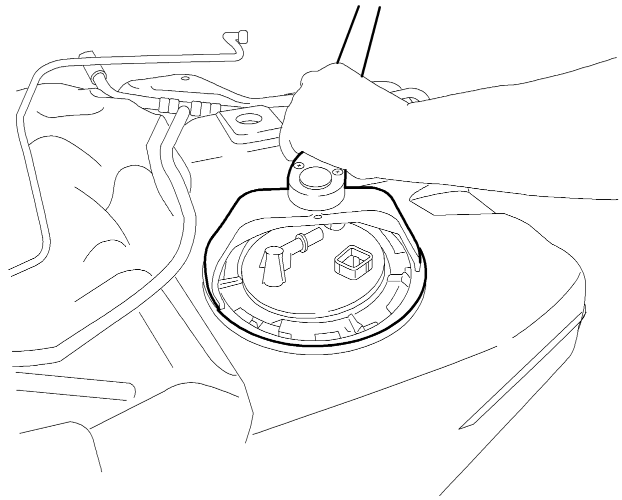
3. Install module.



4. Position fuel pump module in tank. Make sure the alignment tab line up on the fuel tank and pump module for Gas or Diesel fuel tanks.

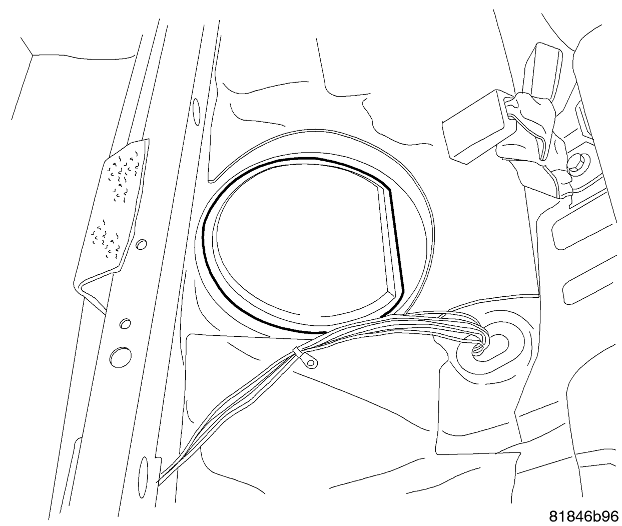


5. While holding the pump module in position, install lock ring and use special tool #9340 to tighten lock ring.



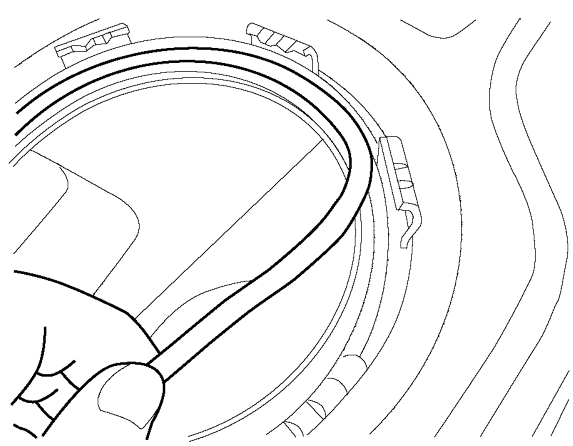
81846497

6. Install plastic cover.



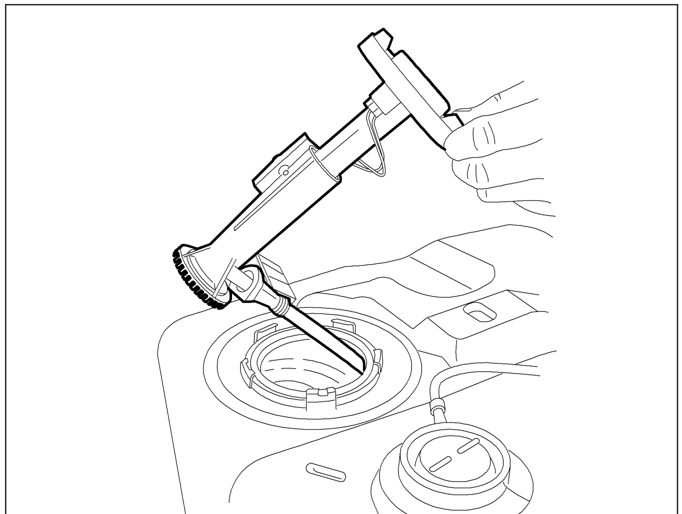
81846b96

7. Wipe seal area of tank clean. Place a new seal between the tank threads and the pump module opening.



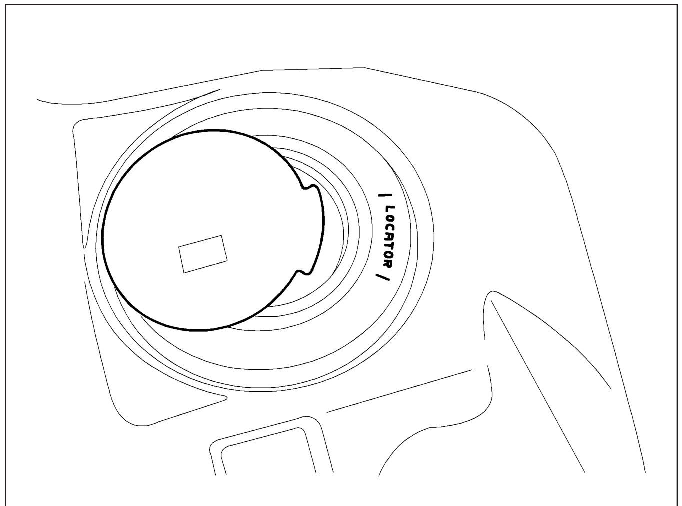
81725318

8. Connect line and install venturi module.



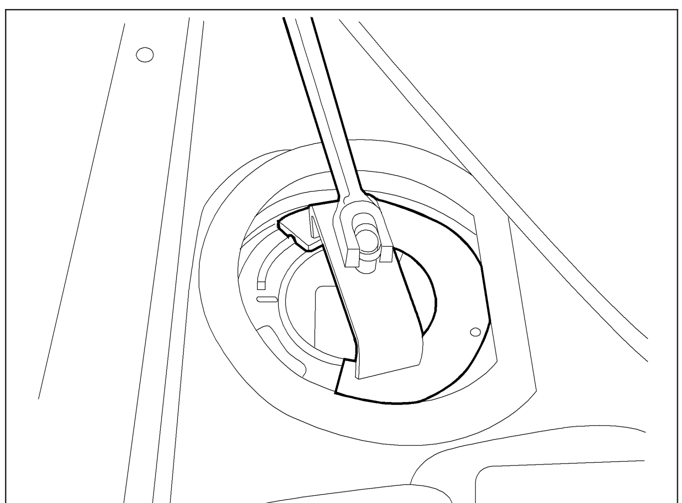
81846a02

9. Position fuel pump module in tank. Make sure the alignment tab line up on the fuel tank and pump module for Gas or Diesel fuel tanks.



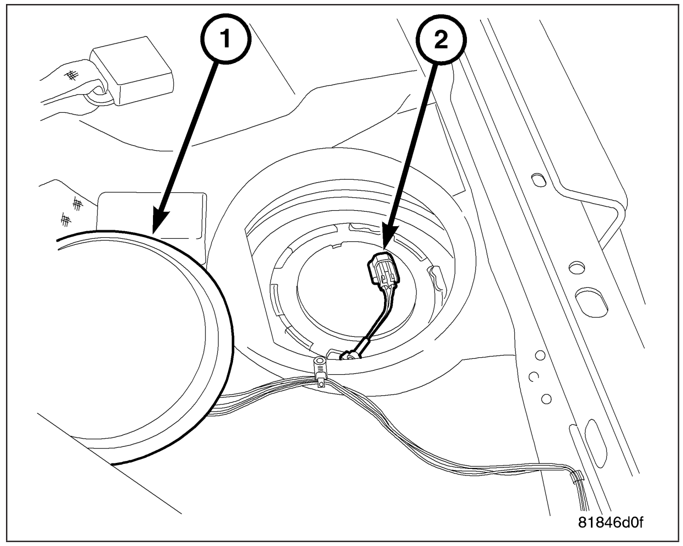
818469fc

10. While holding the pump module in position, install lock ring and use special tool #9340 to tighten lock ring.

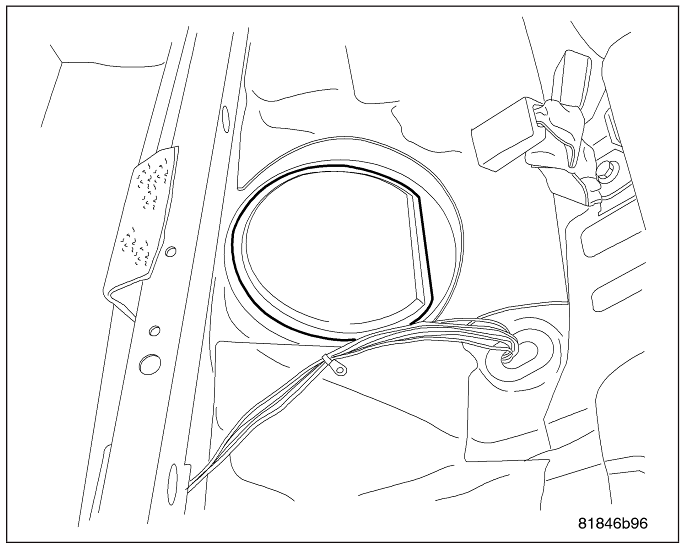


81846f8a

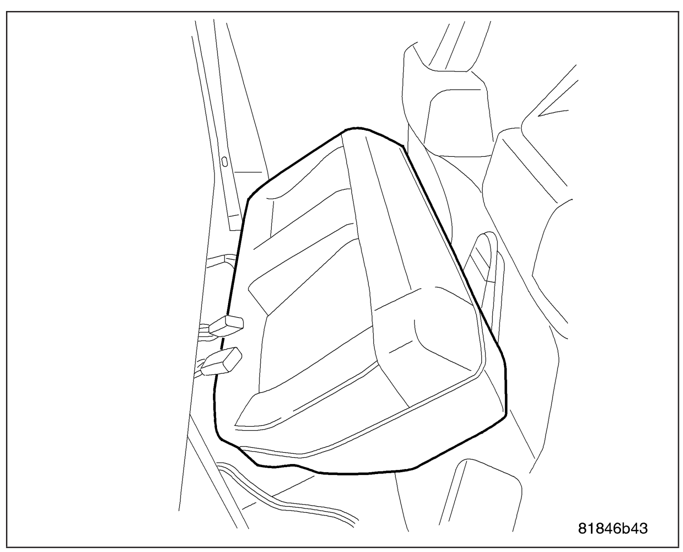
11. Connect electrical connector.



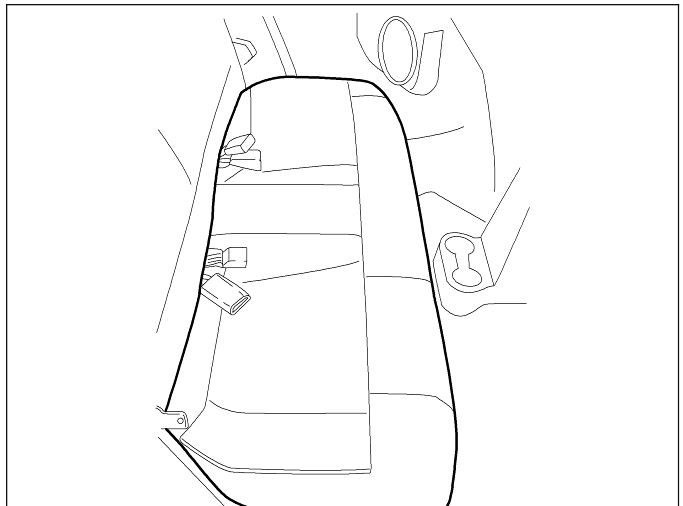
12. Install plastic cover.



13. Install rear cushion.



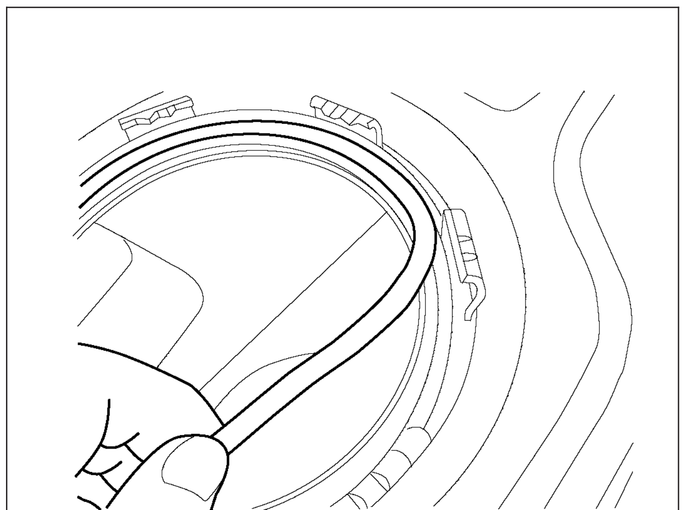
14. Install the negative battery cable.
15. Install the air cleaner lid, connect the inlet air temperature sensor and makeup air hose.
16. Fill fuel tank with clean fuel. Use the Scan Tool to pressurize the system and check for leaks.


81846afb

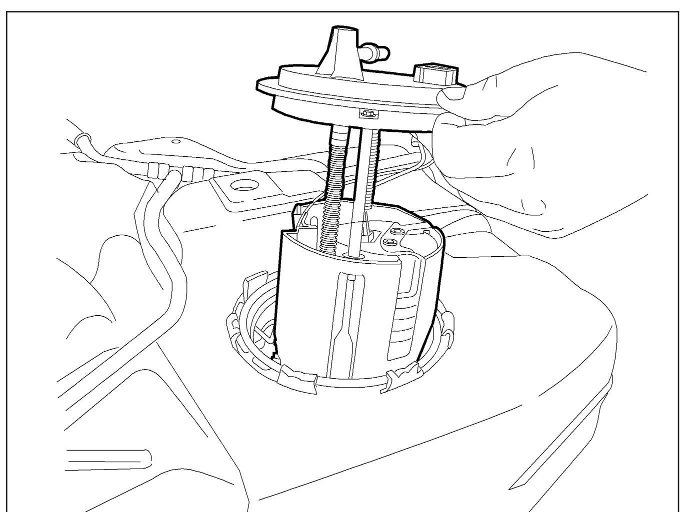
FRONT WHEEL DRIVE

NOTE: The pump has to properly located to the tank for the fuel gauge to work properly.

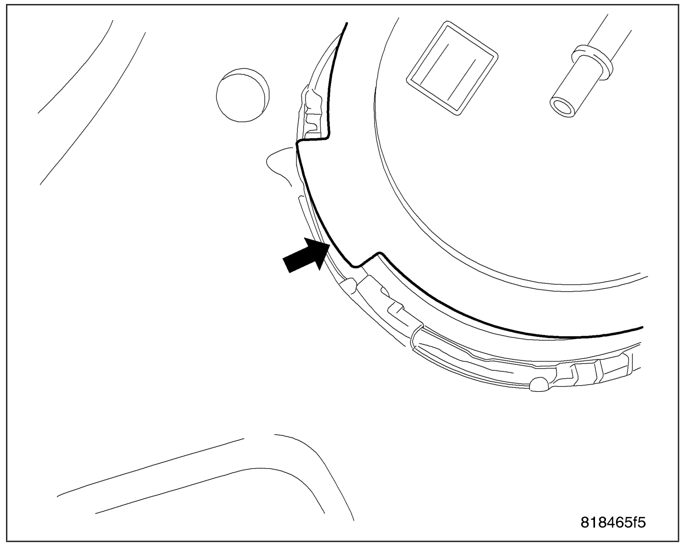
1. Wipe seal area of tank clean. Place a new seal between the tank threads and the pump module opening.


81725318

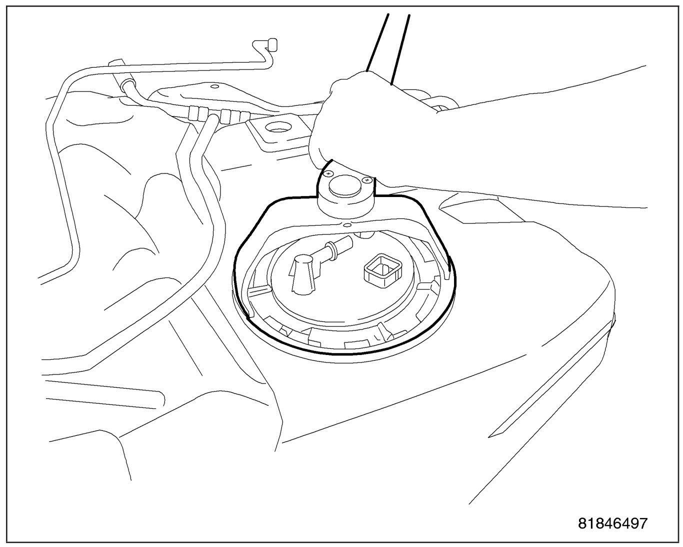
2. Install module.


818468cb

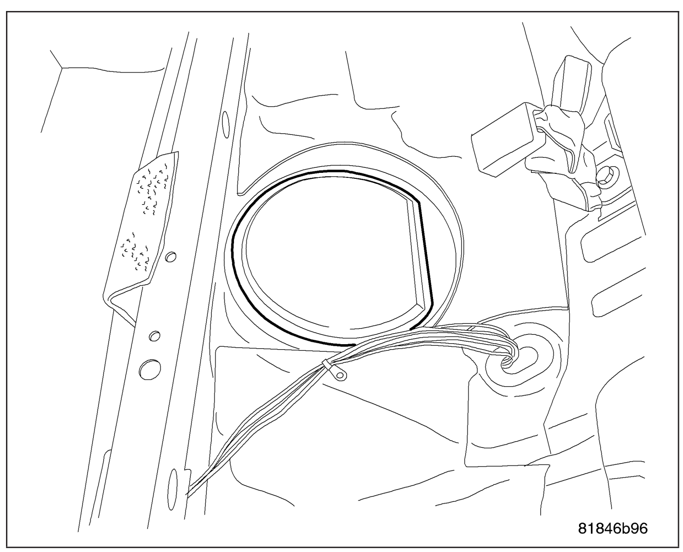
3. Position fuel pump module in tank. Make sure the alignment tab line up on the fuel tank and pump module for Gas or Diesel fuel tanks.



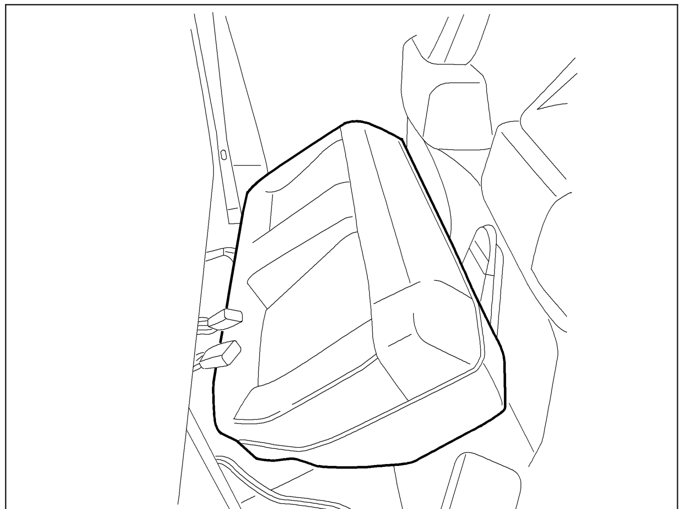
4. While holding the pump module in position, install lock ring and use special tool #9340 to tighten lock ring.



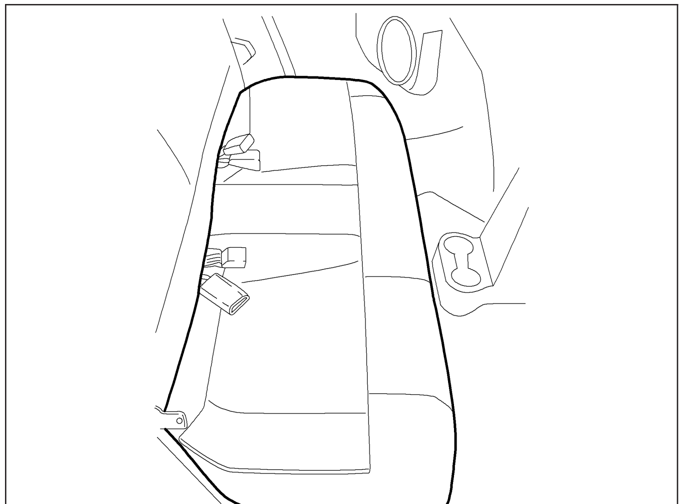
5. Install plastic cover.



6. Install rear cushion.


81846b43

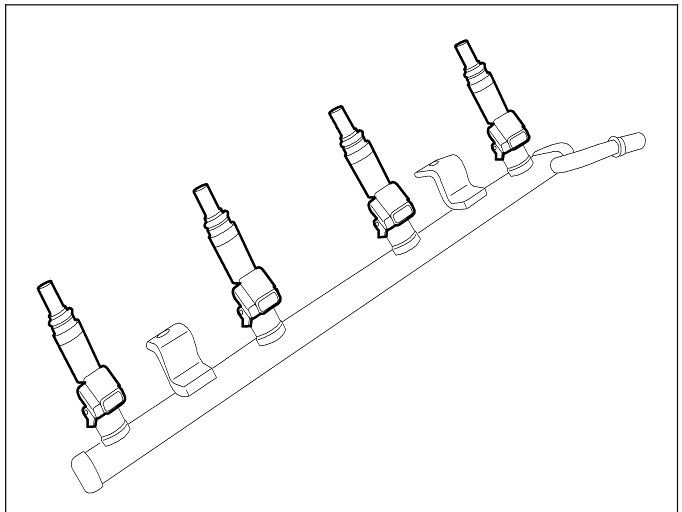
7. Install the negative battery cable.
8. Install the air cleaner lid, connect the inlet air temperature sensor and makeup air hose.
9. Fill fuel tank with clean fuel. Use the Scan Tool to pressurize the system and check for leaks.


81846afb

FUEL RAIL

DESCRIPTION

The fuel rail supplies the necessary fuel to each individual fuel injector and is mounted to the intake manifold



818384d6

OPERATION

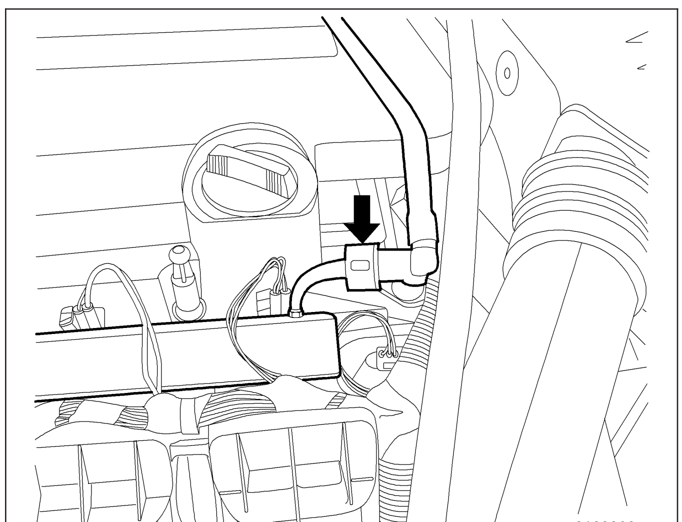
The fuel pressure regulator is no longer mounted to the fuel rail on any engine. It is now located on the fuel tank mounted fuel pump module. Refer to Fuel Pressure Regulator in the Fuel Delivery System section of this group for information. The fuel rail is not repairable.

REMOVAL

WARNING: Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

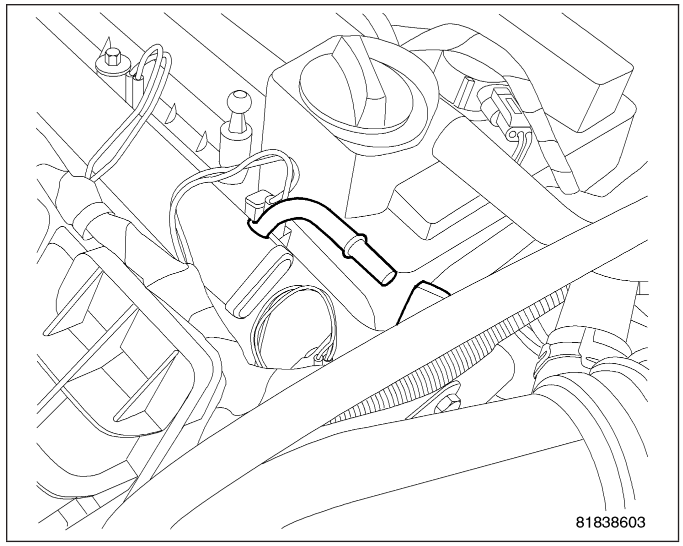
NOTE: Wrap shop towels around hose to catch any gasoline spillage.

1. Release the fuel system pressure.
2. Disconnect the negative battery cable.
3. Disconnect the fuel line from the fuel rail. Refer to the Quick-Connect Fittings in this section.

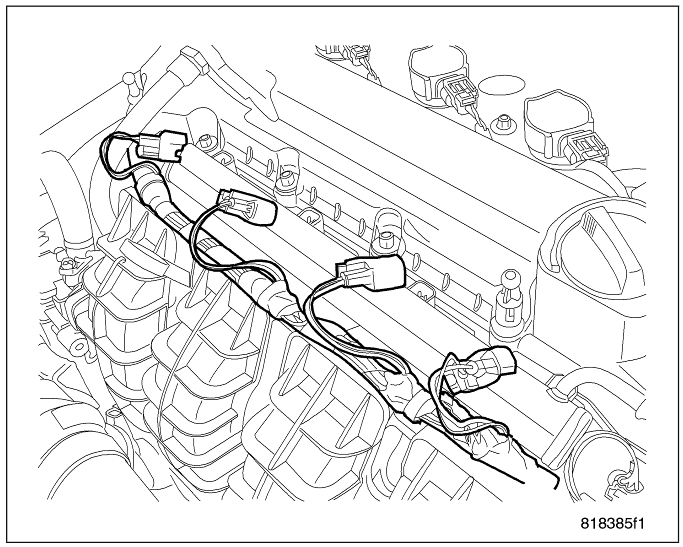


8183860a

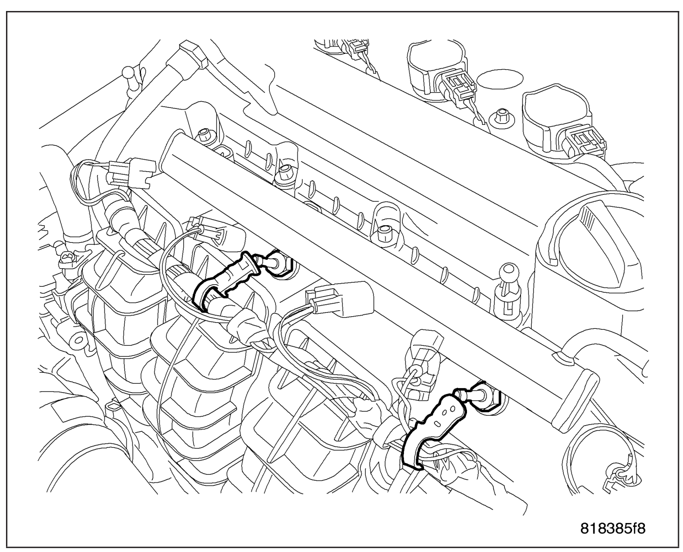
4. Fuel line removed from the fuel rail.



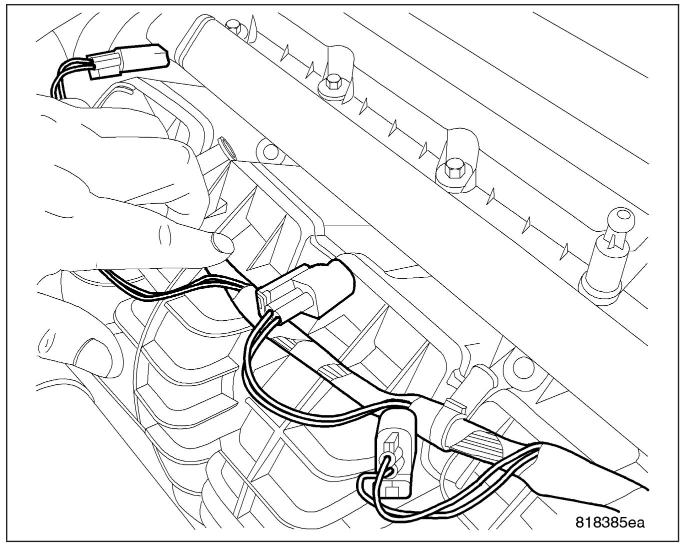
5. Unlock and disconnect the electrical connectors from the fuel injectors.



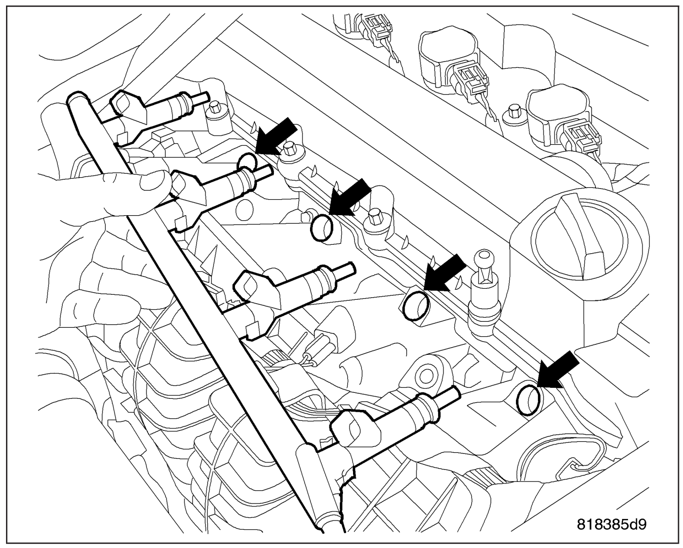
6. Remove the wiring harness from the fuel rail studs.



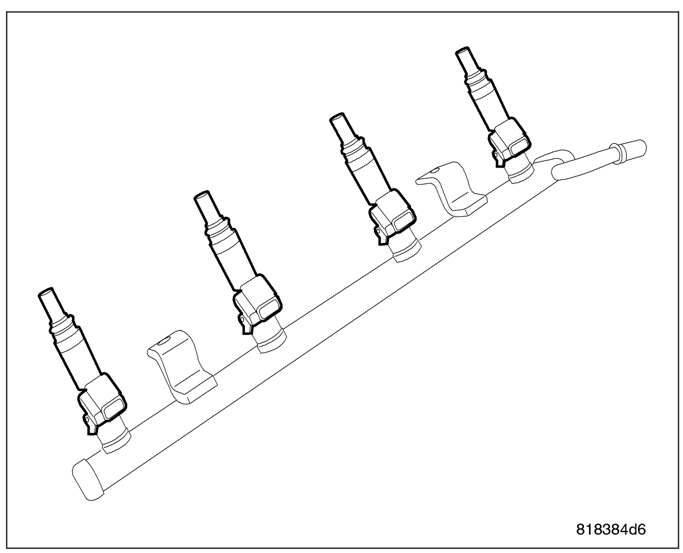
7. Remove the 2 bolts from the fuel rail.



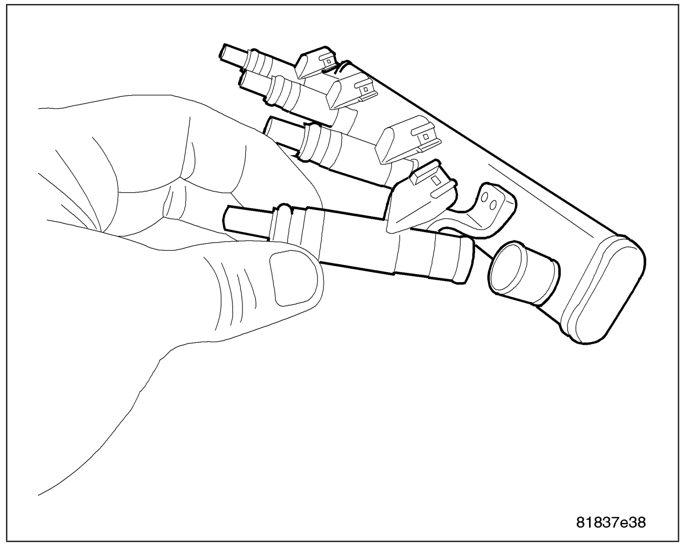
8. Remove the fuel rail and injectors from the intake manifold.



9. Fuel rail removed from intake manifold.

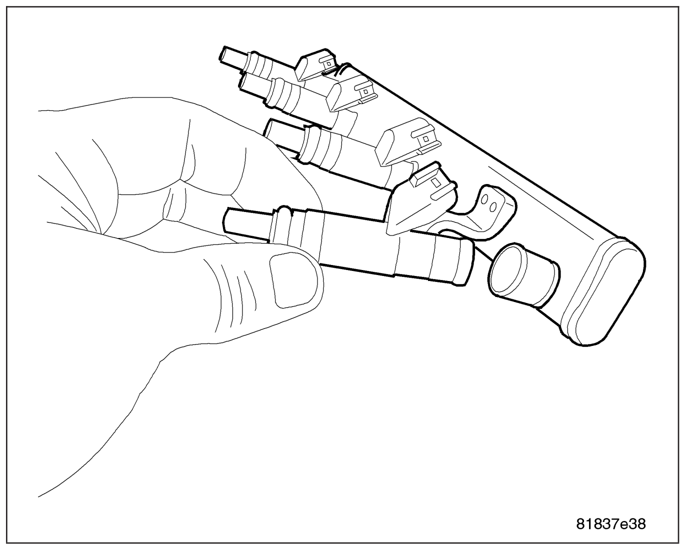


10. Remove fuel injectors from fuel rail.

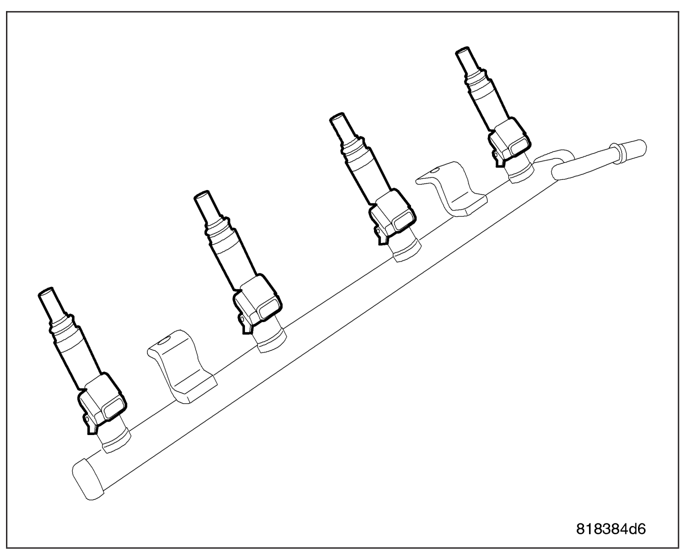


INSTALLATION

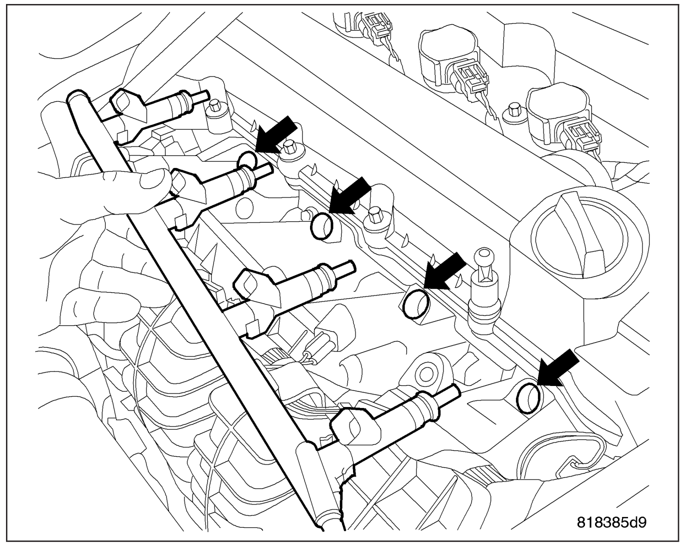
1. Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.
2. Install the fuel injectors to the fuel rail.
3. Install injector into cup of fuel rail.
4. Install retaining clip and check to ensure injector is properly captured.



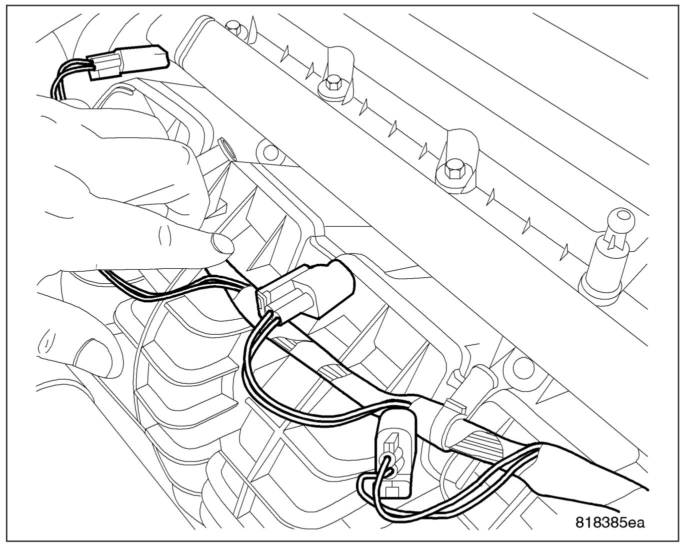
Fuel rail assembly.



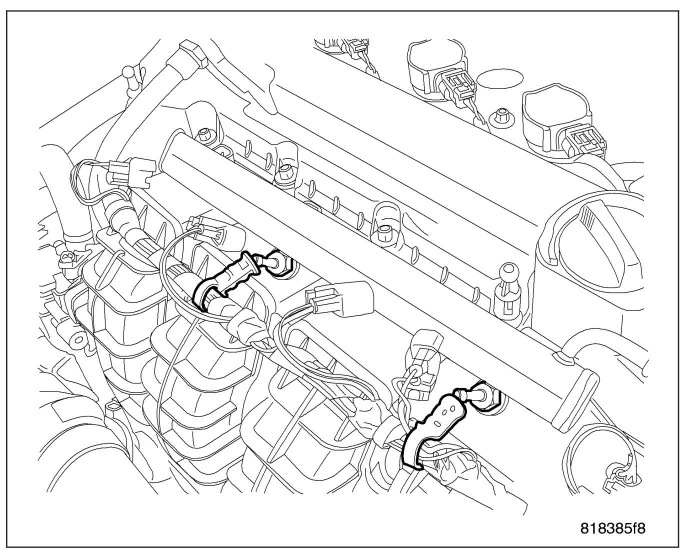
5. Insert fuel injector nozzles into openings in intake manifold. Seat the injectors in place.



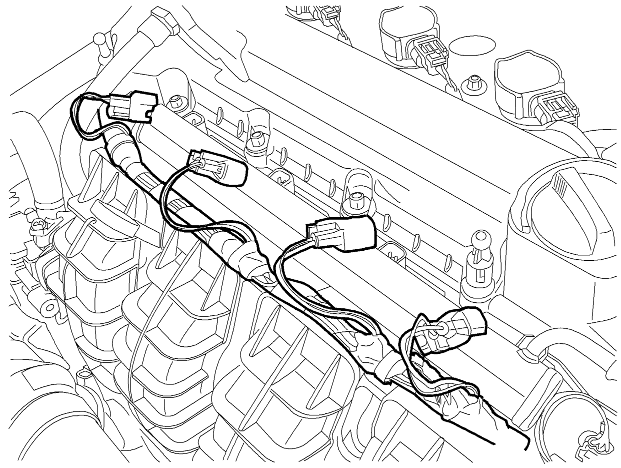
6. Install the 2 bolts to the fuel rail. Tighten fuel rail bolts to 27 N·m (20 ft. lbs.).



7. Install the wiring harness to the fuel rail.

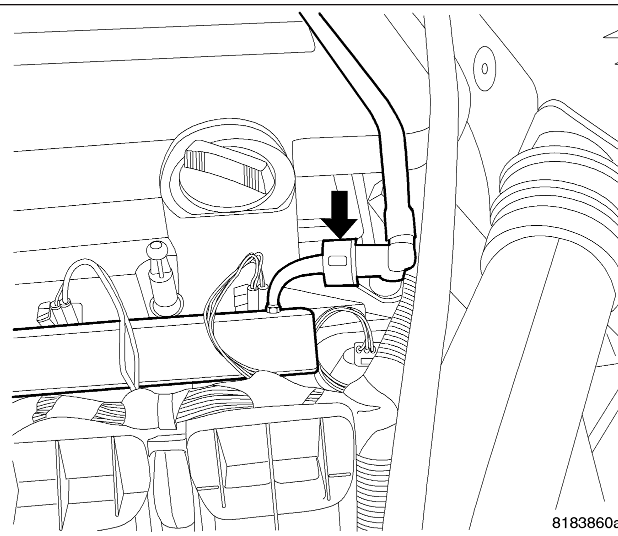


8. Connect and lock the electrical connectors to the fuel injectors.



818385f1

9. Connect the fuel line to the fuel rail. Refer to Quick Connect Fittings in the Fuel Delivery Section of this Group.
10. Connect the negative battery cable.
11. Use the San Tool Fuel System Test to pressurize the fuel system. Check for leaks.



8183860a

FUEL TANK

DESCRIPTION

The fuel tank is constructed of a plastic material. Its main functions are for fuel storage and for placement of the fuel pump module. The tank is made from High density Polyethylene (HDPE) material.If equipped with ORVR (Onboard Refueling Vapor Recovery) it has been added to the fuel tank to control refueling vapor emissions.

OPERATION

All models pass a full 360 degree rollover test without fuel leakage. To accomplish this, fuel and vapor flow controls are required for all fuel tank connections.

All models are equipped with either one or two check valves mounted into the top of the fuel tank (or pump module).

An evaporation control system is connected to the check valve(s)/control valve (Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS/ORVR - OPERATION) to reduce emissions of fuel vapors into the atmosphere, when the tank is vented due to vapor expansion in the tank. When fuel evaporates from the fuel tank, vapors pass through vent hoses or tubes to a charcoal canister where they are temporarily held. When the engine is running, the vapors are drawn into the intake manifold. In addition, fuel vapors produced during vehicle refueling are allowed to pass through the vent hoses/tubes to the charcoal canister(s) for temporary storage (prior to being drawn into the intake manifold). All models are equipped with a self-diagnosing system using a Leak Detection Pump (LDP) or Natural Vacuum Leak Detection (NVLD). Refer to the Emission Control System for additional information.

INLET CHECK VALVE

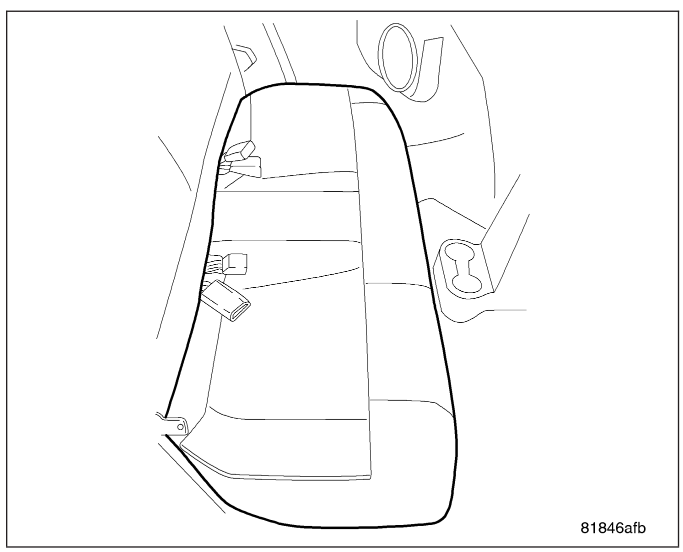
All vehicles have an inlet check valve on the inside of the fuel tank at the filler inlet

The valve prevents fuel from splashing back on customer during vehicle refueling. The valve is a non-serviceable item.

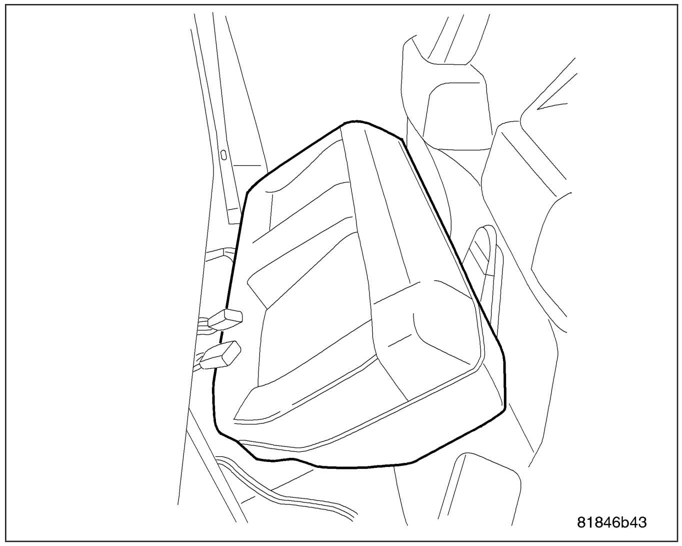
REMOVAL

WARNING: Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

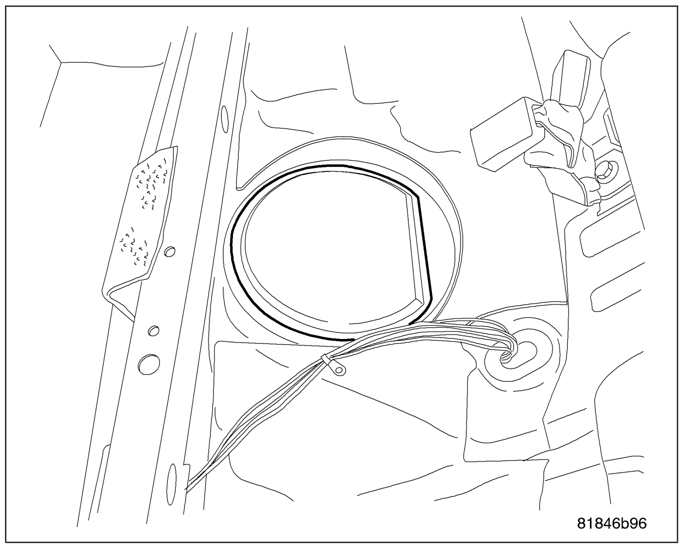
1. Release fuel system pressure. Refer to Fuel Pressure Release Procedure in this section.
2. Remove the air cleaner lid, disconnect the inlet air temperature sensor and makeup air hose.
3. Remove the negative battery cable.
4. Remove the rear seat cushion.



5. Rear seat cushion loose.



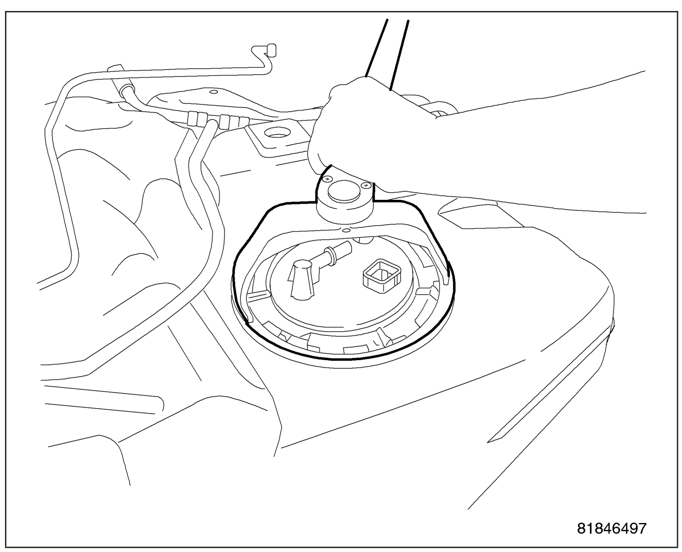
6. Remove plastic cover.



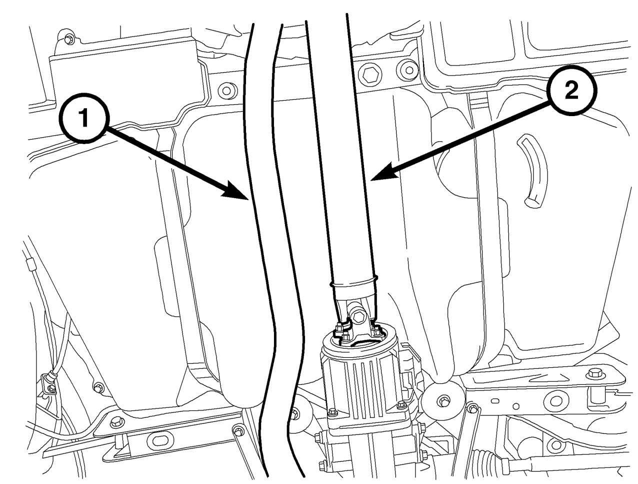
7. Clean top of tank to remove loose dirt and debris.
8. Use special tool #9340 to remove left side module lock ring.

NOTE: wrap shop towels around hoses to catch any gasoline spillage.

9. Disconnect electrical and fuel lines from module.
10. Drain fuel from tank.
11. Raise and support the vehicle.

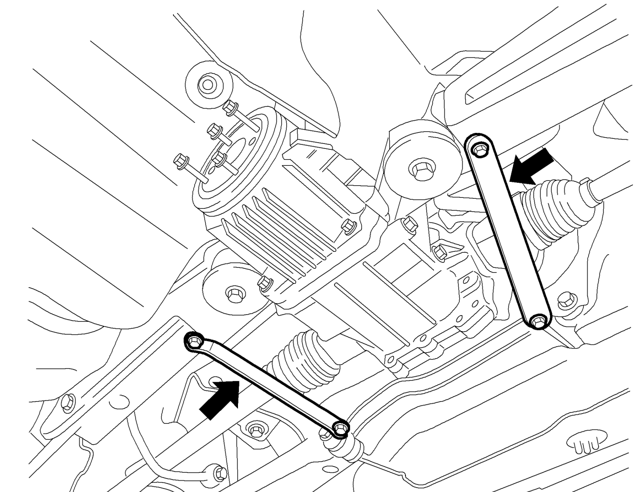


12. Remove exhaust system.
13. For All Wheel Drive vehicles, remove drive shaft



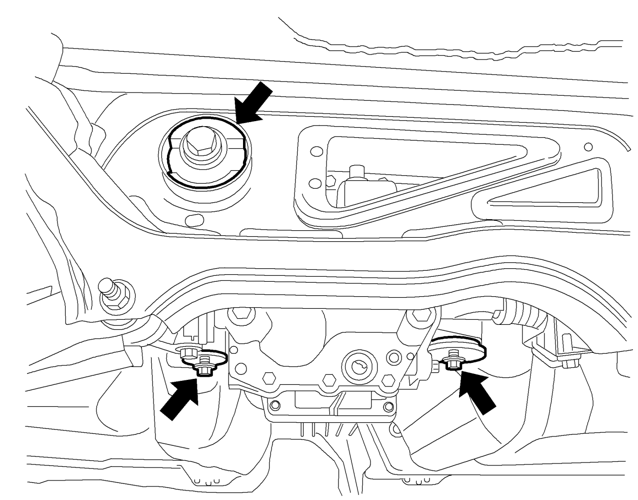
81838988

14. Remove stay bars.

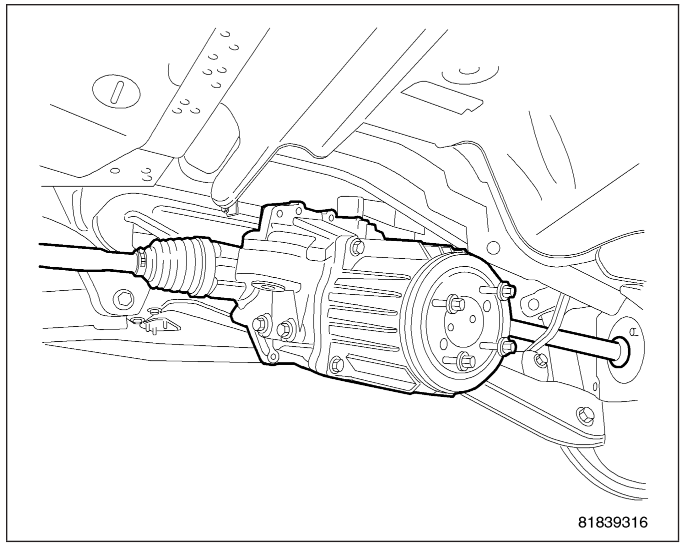

8183929c

NOTE: For All Wheel Drive vehicles the rear driveline module most be lowered to remove fuel tank assembly.

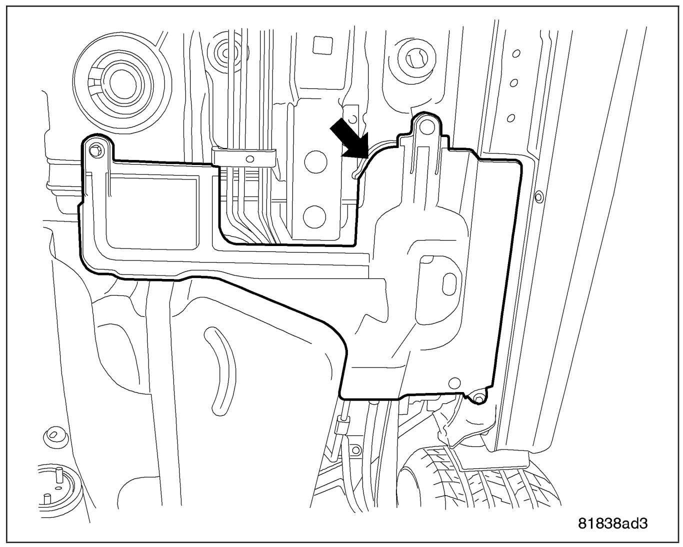
15. Tie rear driveline module to suspension crossmember.
16. Support rear driveline module.
17. Remove 3 mounting bolts and lower rear drive line module from suspension crossmember.


81839264

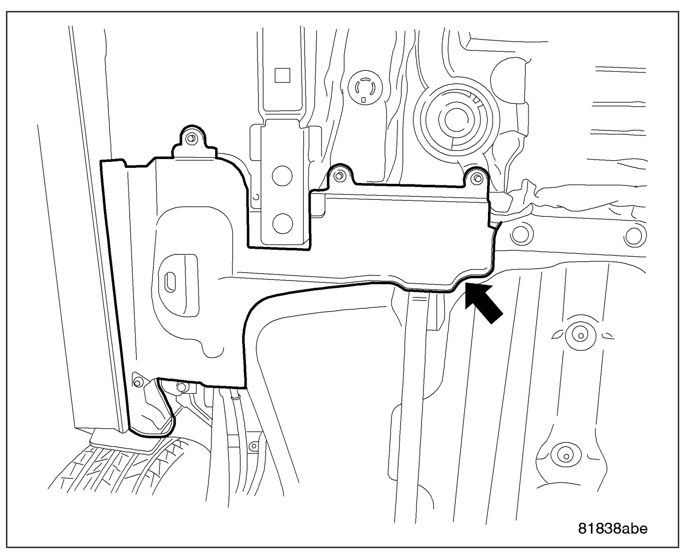
18. Module lowered.



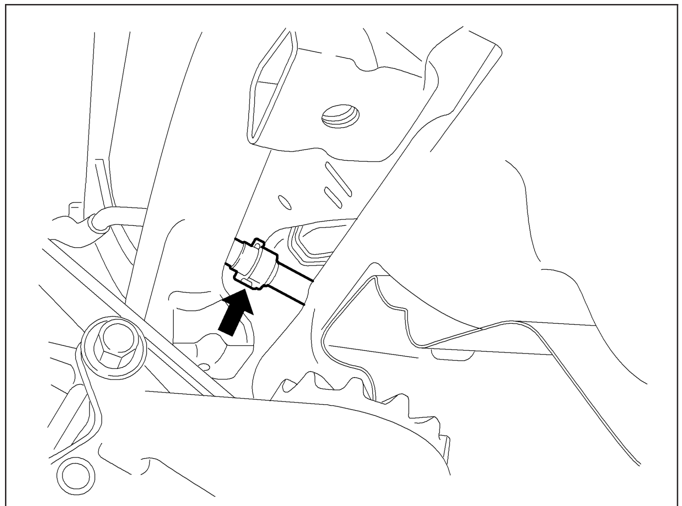
19. Remove splash shield.



20. Remove splash shield.

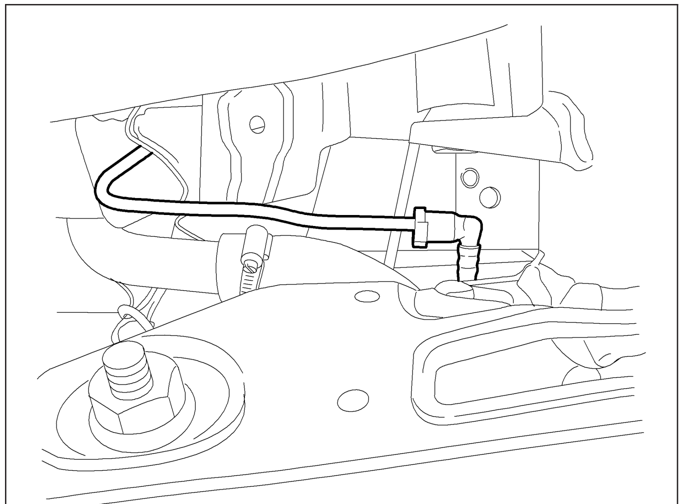


21. Disconnect vapor canister line.



8183924a

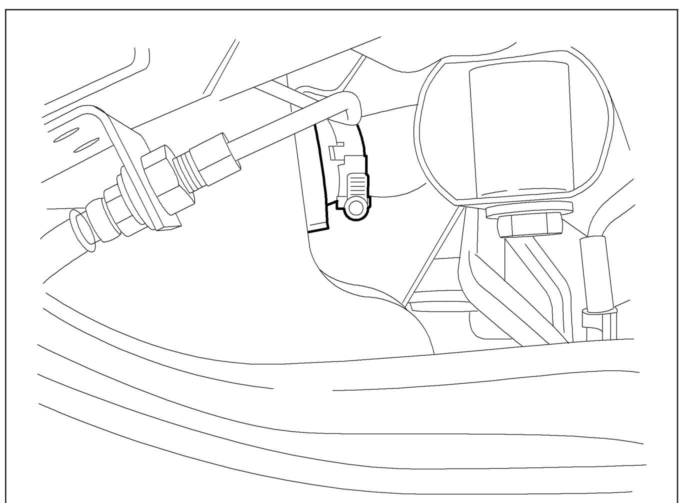
22. Disconnect filler tube recirculation vent line and purge line.



8183923a

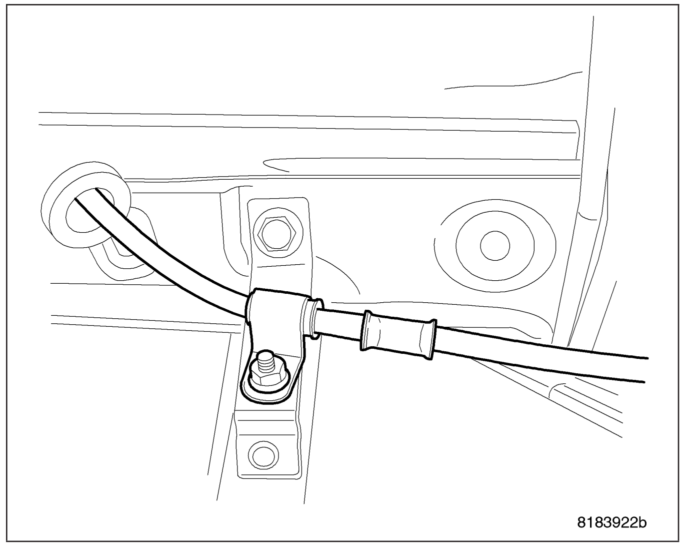
CAUTION: There may be fuel in the fill tube. Remove hose carefully to reduce fuel splash.

23. Disconnect fuel tank from rubber fill hose.

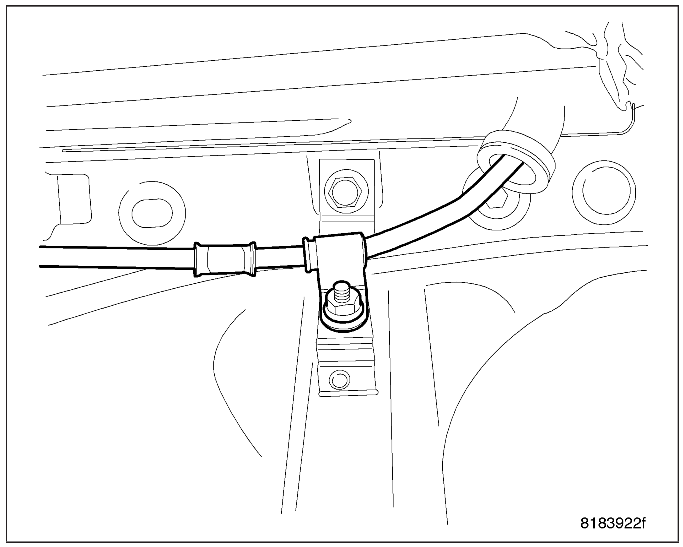


8181243a

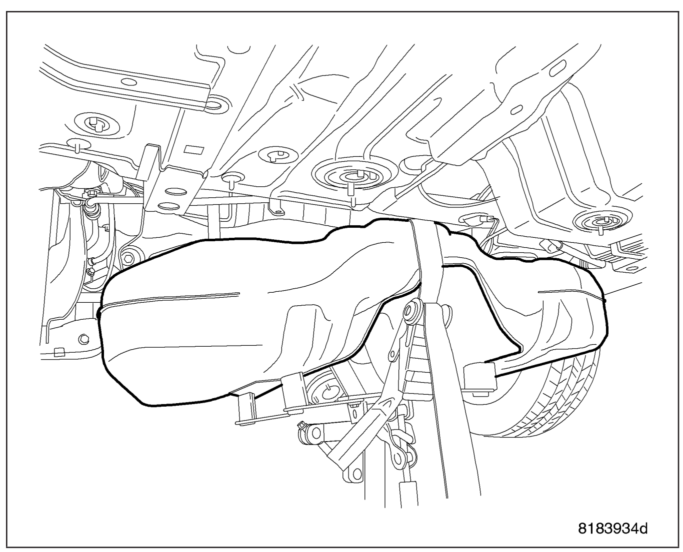
24. Remove parking brake cable mounting.



25. Remove parking brake cable mounting.

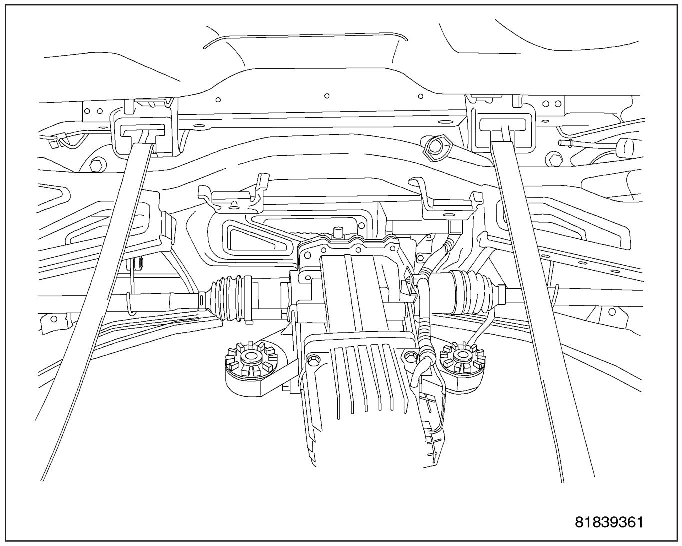


26. Support fuel tank.
27. Remove bolts from the fuel tank straps.
28. Remove fuel tank from vehicle.

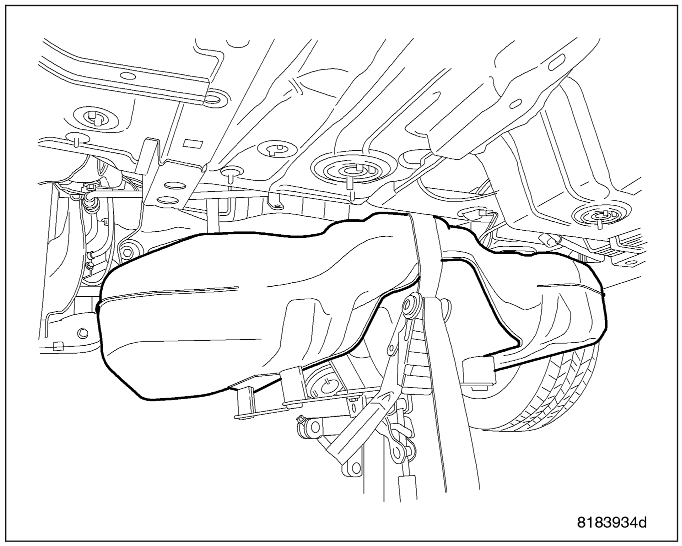


INSTALLATION

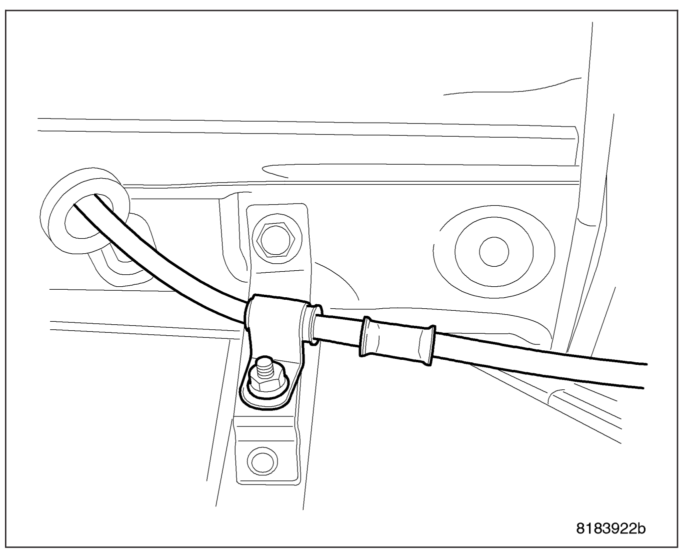
1. Install fuel tank straps.


81839361

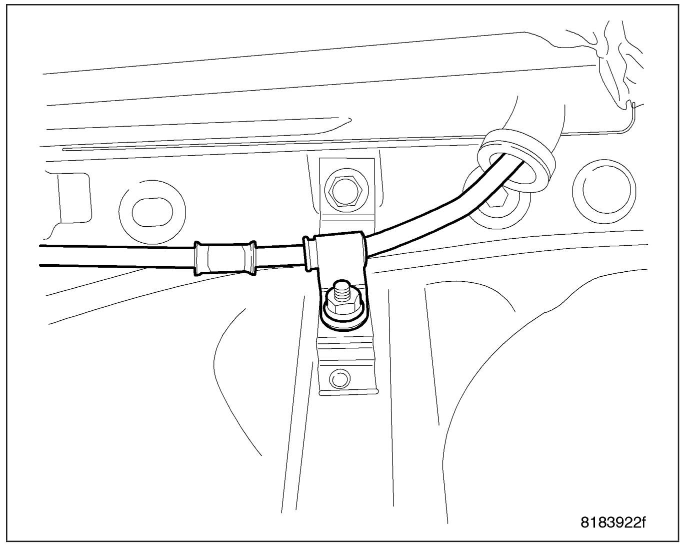
2. Raise fuel tank into position.
3. Position fuel tank straps. Tighten fuel tank strap bolts to 47 N·m (34.5 ft. lbs.) torque. Remove transmission jack. Ensure straps are not twisted or bent.


8183934d

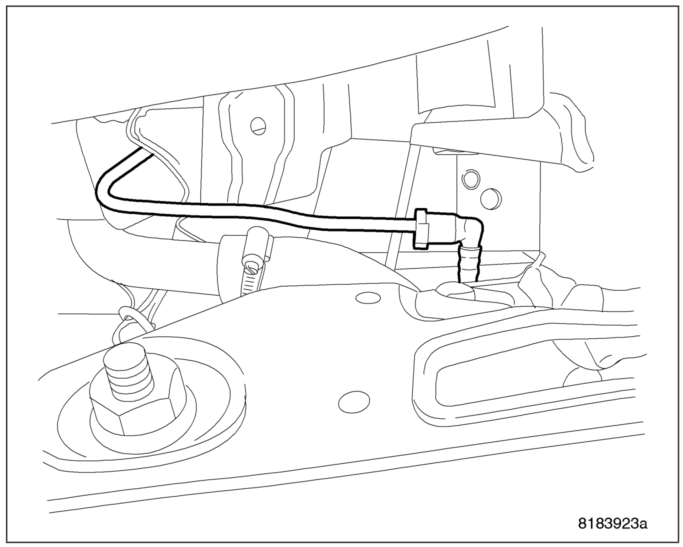
4. Install parking brake cable,


8183922b

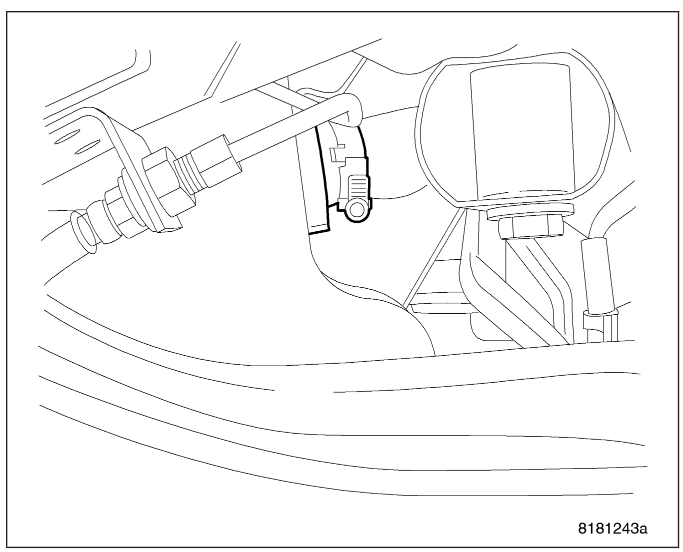
5. Install parking brake cable,



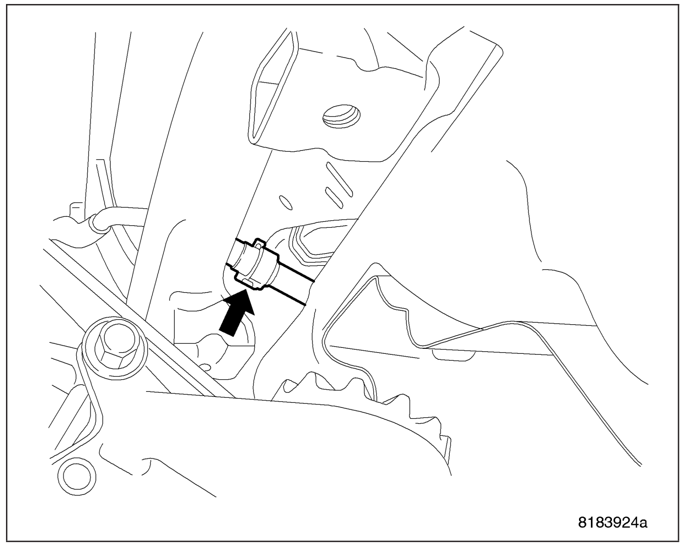
6. Connect filler tube recirculation vent and line purge line.



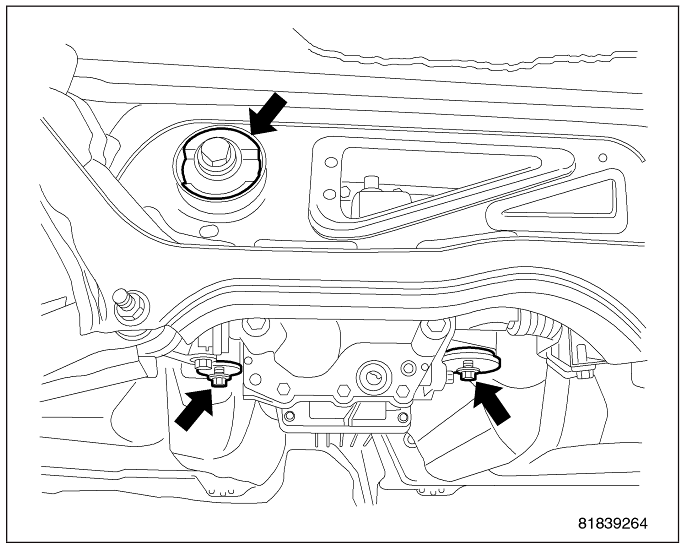
7. Connect fuel fill tube to tank inlet. Tighten hose clamp to 4.1 N·m (38 in. lbs.) torque.



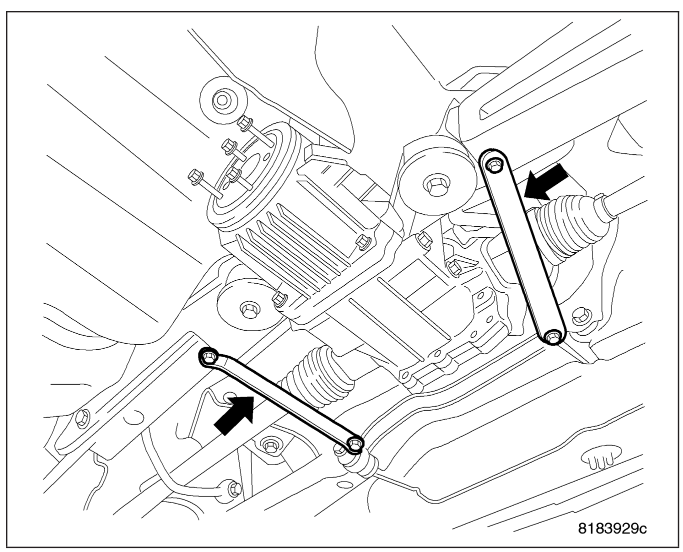
8. Connect vapor canister line.



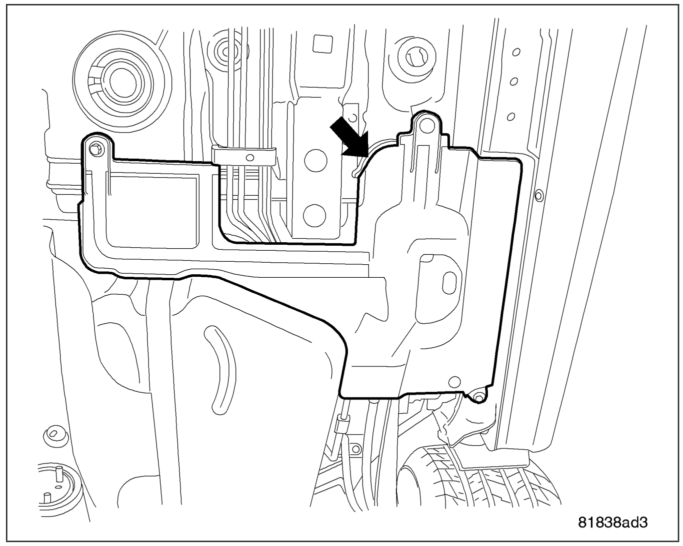
9. Install rear driveline module, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR DRIVELINE MODULE - INSTALLATION).



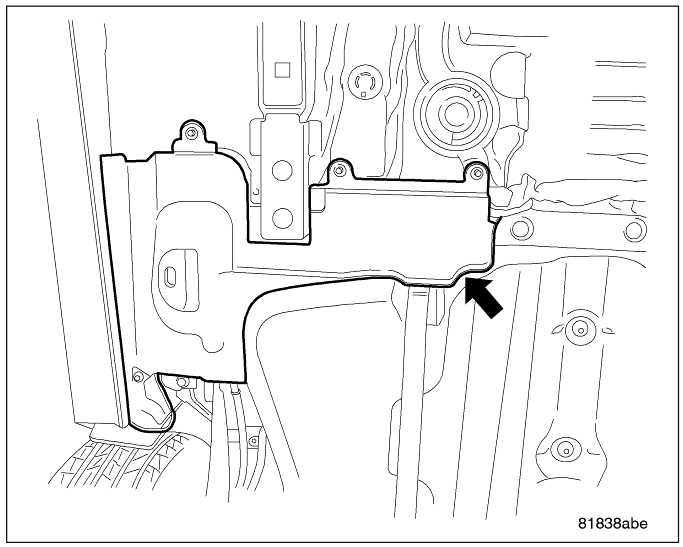
10. Install stay bars, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR DRIVELINE MODULE - INSTALLATION).



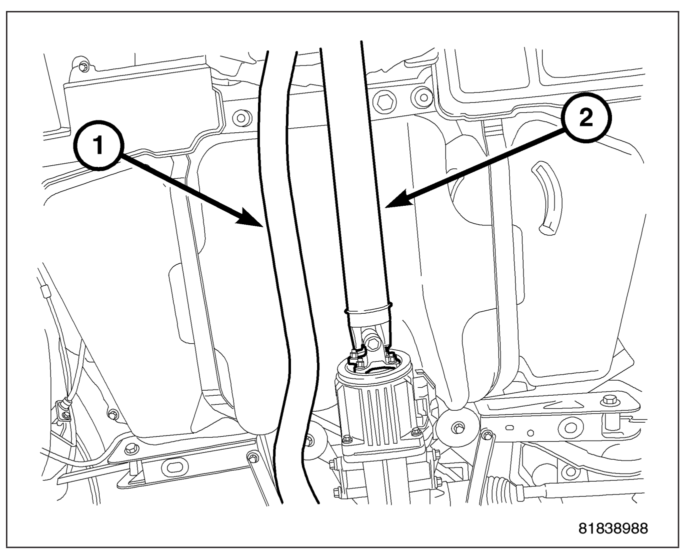
11. Install splash shield.



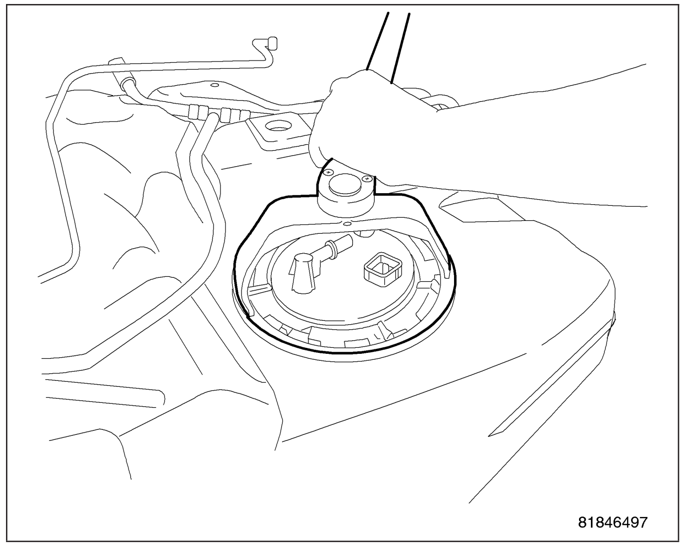
12. Install splash shield.



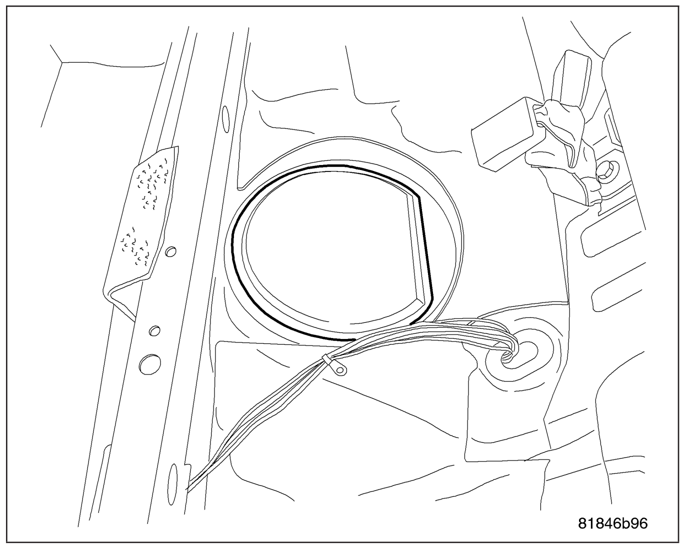
13. Install exhaust system (1).
14. Install drive shaft (2), (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).



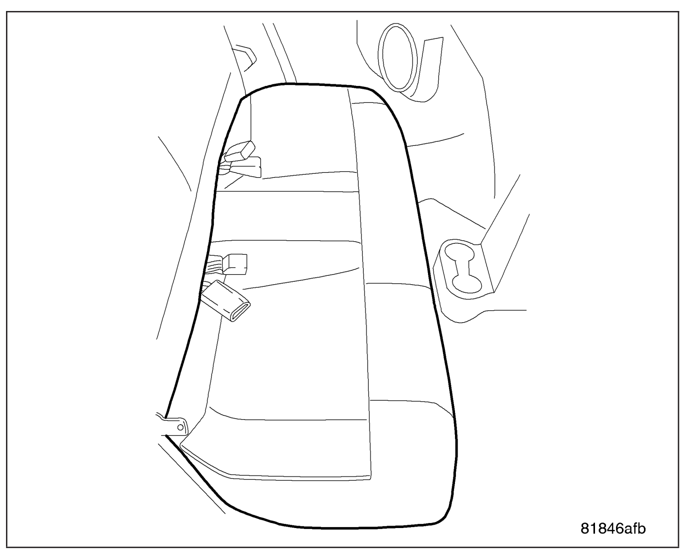
15. While holding the pump module in position, install lock ring and use special tool #9340 to tighten lock ring.
16. Connect electrical connector and lock the connector.
17. Connect the fuel line. Refer to Quick Connect Fittings in this section.



18. Install plastic cover.



19. Install rear cushion.
20. Install the negative battery cable.
21. Install the air cleaner lid, connect the inlet air temperature sensor and makeup air hose.
22. Fill fuel tank with clean fuel. Use the Scan Tool to pressurize the system and check for leaks.

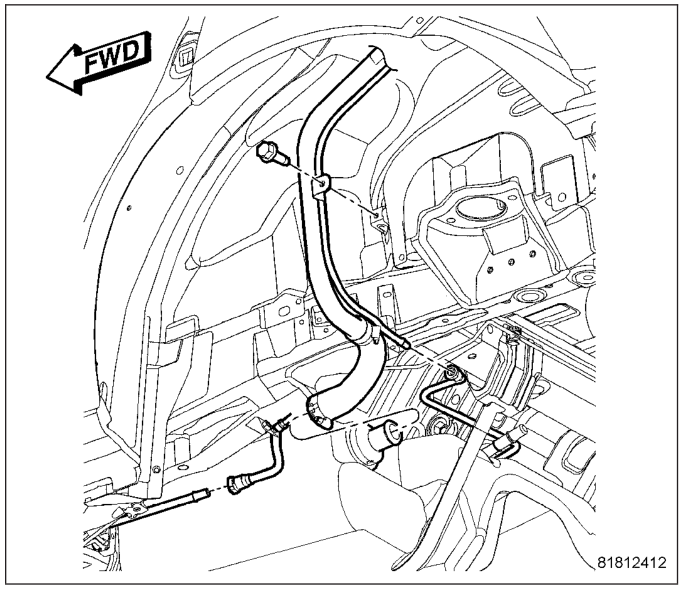


FUEL TANK FILLER TUBE

REMOVAL

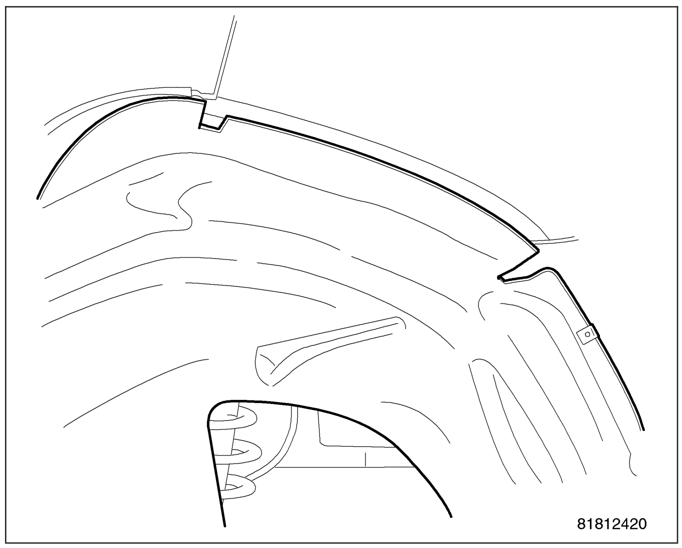
NOTE: Drain fuel tank if it is more than half full.

1. Remove the negative battery cable.
2. Loosen fuel filler tube cap.
3. Raise vehicle and support.

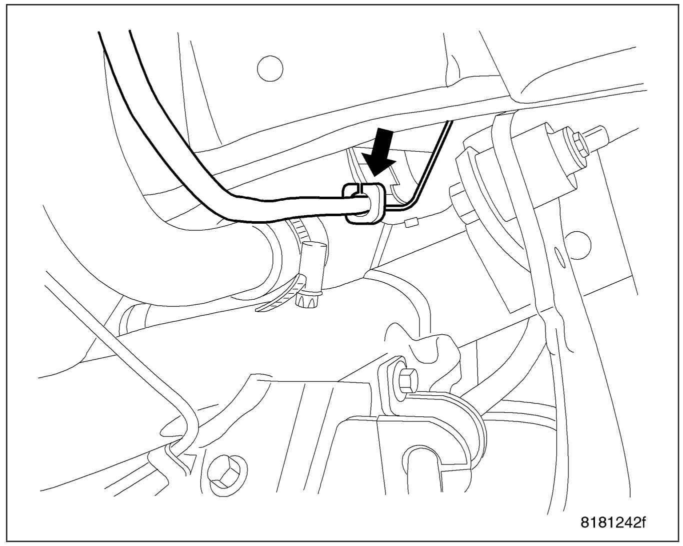


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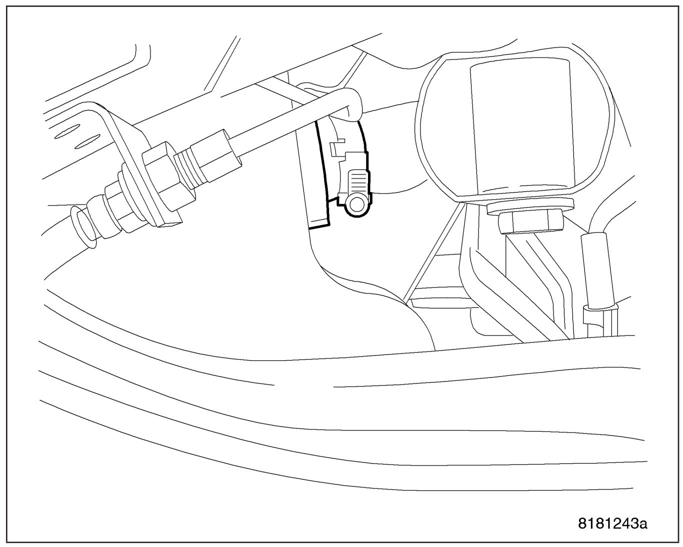
4. Remove the left rear wheel.
5. Remove the inner splash shield.


81812420

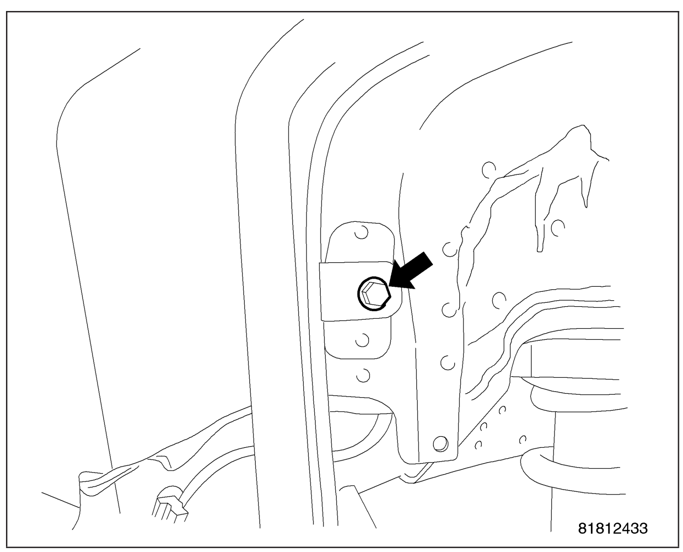
6. Disconnect filler tube recirculation vent line.



7. Disconnect fuel filler tube hose from fuel tank neck.

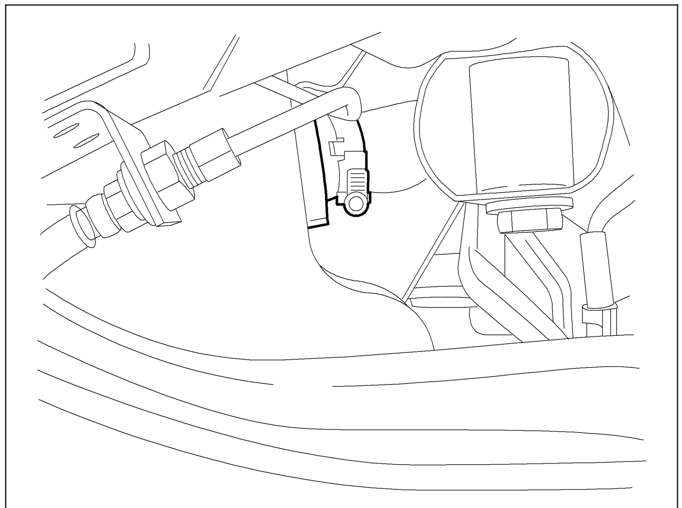


8. Remove filler tube mounting screw.
9. Remove fuel filler tube assembly.

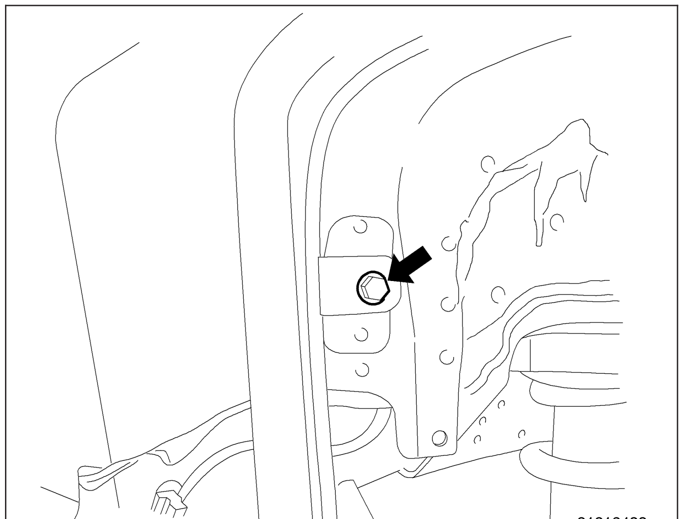


INSTALLATION

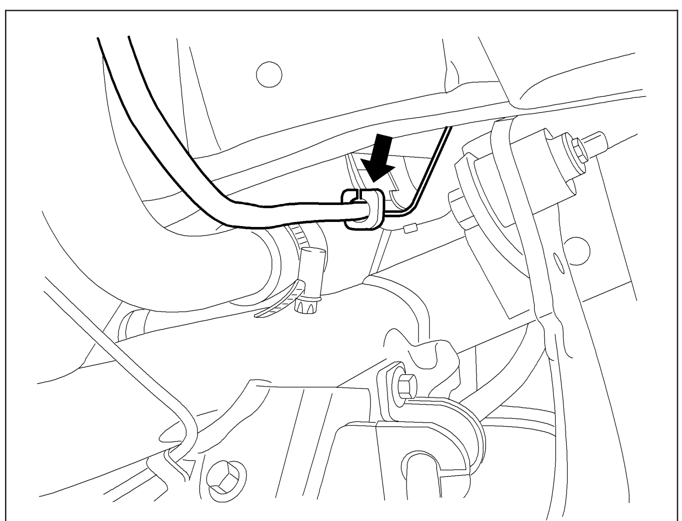
1. Install fuel filler tube. Connect fuel filler tube hose to fuel tank neck and tighten clamp to 2.8 N·m (24 ins. lbs.).


8181243a

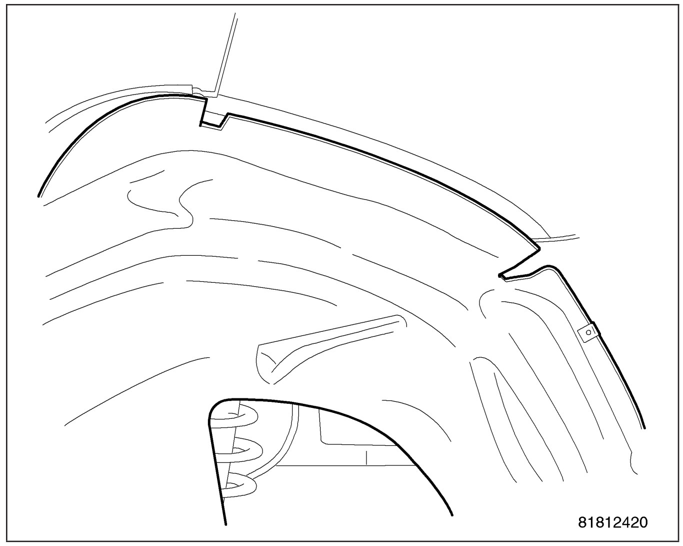
2. Install fuel filler tube mounting screw and tighten to 9 N·m (79.5 ins. lbs.).


81812433

3. Connect filler tube vent line.


8181242f

4. Install the inner splash shield.
5. Install rear tire.
6. Lower vehicle.
7. Install fuel filler tube cap.
8. Install the negative battery cable.
9. Install the air cleaner lid and makeup air hose.



INLET FILTER

DESCRIPTION

The fuel pump inlet strainer is a non-serviceable part.

FUEL INJECTION

TABLE OF CONTENTS

FUEL INJECTION

OPERATION

INJECTION SYSTEM

All engines used in this section have a sequential Multi-Port Electronic Fuel Injection system. The MPI system is computer regulated and provides precise air/fuel ratios for all driving conditions. The Powertrain Control Module (PCM) operates the fuel injection system.

The PCM regulates:

- Ignition timing
- Air/fuel ratio
- Emission control devices
- Cooling fan
- Charging system
- Idle speed
- Vehicle speed control

Various sensors provide the inputs necessary for the PCM to correctly operate these systems. In addition to the sensors, various switches also provide inputs to the PCM.

The PCM can adapt its programming to meet changing operating conditions.

Fuel is injected into the intake port above the intake valve in precise metered amounts through electrically operated injectors. The PCM fires the injectors in a specific sequence. Under most operating conditions, the PCM maintains an air fuel ratio of 14.7 parts air to 1 part fuel by constantly adjusting injector pulse width. Injector pulse width is the length of time the injector is open.

The PCM adjusts injector pulse width by opening and closing the ground path to the injector. Engine RPM (speed) and manifold absolute pressure (air density) are the **primary** inputs that determine injector pulse width.

MODES OF OPERATION

As input signals to the PCM change, the PCM adjusts its response to output devices. For example, the PCM must calculate a different injector pulse width and ignition timing for idle than it does for Wide Open Throttle (WOT). There are several different modes of operation that determine how the PCM responds to the various input signals.

There are two different areas of operation, OPEN LOOP and CLOSED LOOP.

During OPEN LOOP modes the PCM receives input signals and responds according to preset PCM programming. Inputs from the upstream and downstream heated oxygen sensors are not monitored during OPEN LOOP modes, except for heated oxygen sensor diagnostics (they are checked for shorted conditions at all times).

During CLOSED LOOP modes the PCM monitors the inputs from the upstream and downstream heated oxygen sensors. The upstream heated oxygen sensor input tells the PCM if the calculated injector pulse width resulted in the ideal air-fuel ratio of 14.7 to one. By monitoring the exhaust oxygen content through the upstream heated oxygen sensor, the PCM can fine tune injector pulse width. Fine tuning injector pulse width allows the PCM to achieve optimum fuel economy combined with low emissions.

For the PCM to enter CLOSED LOOP operation, the following must occur:

1. Engine coolant temperature must be over 35°F (1.6°C).
   - If the coolant is over 35°F (1.6°C) the PCM will wait 38 seconds.
   - If the coolant is over 50°F (10°C) the PCM will wait 15 seconds.
   - If the coolant is over 167°F (75°C) the PCM will wait 3 seconds.
2. For other temperatures the PCM will interpolate the correct waiting time.
3. O2 sensor must read either greater than 0.745 volts or less than 0.29 volt.
4. The multi-port fuel injection systems has the following modes of operation:
   - Ignition switch ON (Zero RPM)
   - Engine start-up
   - Engine warm-up
   - Cruise

- Idle
- Acceleration
- Deceleration
- Wide Open Throttle
- Ignition switch OFF

5. The engine start-up (crank), engine warm-up, deceleration with fuel shutoff and wide open throttle modes are OPEN LOOP modes. Under most operating conditions, the acceleration, deceleration (with A/C on), idle and cruise modes, **with the engine at operating temperature** are CLOSED LOOP modes.

IGNITION SWITCH ON (ZERO RPM) MODE

When the ignition switch activates the fuel injection system, the following actions occur:

- The PCM monitors the engine coolant temperature sensor and throttle position sensor input. The PCM determines basic fuel injector pulse width from this input.
- The PCM determines atmospheric air pressure from the MAP sensor input to modify injector pulse width.

When the key is in the ON position and the engine is not running (zero rpm), the Auto Shutdown (ASD) and fuel pump relays de-energize after approximately 1 second. Therefore, battery voltage is not supplied to the fuel pump, ignition coil, fuel injectors and heated oxygen sensors.

ENGINE START-UP MODE

This is an OPEN LOOP mode. If the vehicle is in park or neutral (automatic transaxles) or the clutch pedal is depressed (manual transaxles) the ignition switch energizes the starter relay when the engine is not running. The following actions occur when the starter motor is engaged.

- If the PCM receives the camshaft position sensor and crankshaft position sensor signals, it energizes the fuel pump. If the PCM does not receive both signals within approximately one second, it will not energize the fuel pump. The PCM supply voltage to the fuel pump, fuel injectors, ignition coil, (EGR solenoid and PCV heater if equipped) and heated oxygen sensors.
- The PCM energizes the injectors (on the 69° degree falling edge) for a calculated pulse width until it determines crankshaft position from the camshaft position sensor and crankshaft position sensor signals. The PCM determines crankshaft position within 1 engine revolution.
- After determining crankshaft position, the PCM begins energizing the injectors in sequence. It adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.
- When the engine idles within ±64 RPM of its target RPM, the PCM compares current MAP sensor value with the atmospheric pressure value received during the Ignition Switch On (zero RPM) mode.

Once the fuel pump relay has been energized, the PCM determines injector pulse width based on the following:

- MAP
- Engine RPM
- Battery voltage
- Engine coolant temperature
- Inlet/Intake air temperature (IAT)
- Throttle position
- The number of engine revolutions since cranking was initiated

During Start-up the PCM maintains ignition timing at 9° BTDC.

ENGINE WARM-UP MODE

This is an OPEN LOOP mode. The following inputs are received by the PCM:

- Manifold Absolute Pressure (MAP)
- Crankshaft position (engine speed)
- Engine coolant temperature
- Inlet/Intake air temperature (IAT)
- Camshaft position
- Knock sensor
- Throttle position

- A/C switch status
- Battery voltage
- Vehicle speed
- Speed control
- O2 sensors

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts ignition timing and engine idle speed. Engine idle speed is adjusted through the idle air control motor.

CRUISE OR IDLE MODE

When the engine is at operating temperature this is a CLOSED LOOP mode. During cruising or idle the following inputs are received by the PCM:

- Manifold absolute pressure
- Crankshaft position (engine speed)
- Inlet/Intake air temperature
- Engine coolant temperature
- Camshaft position
- Knock sensor
- Throttle position
- Exhaust gas oxygen content (O2 sensors)
- A/C switch status
- Battery voltage
- Vehicle speed

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts engine idle speed and ignition timing. The PCM adjusts the air/fuel ratio according to the oxygen content in the exhaust gas (measured by the upstream and downstream heated oxygen sensor).

The PCM monitors for engine misfire. During active misfire and depending on the severity, the PCM either continuously illuminates or flashes the malfunction indicator lamp (Check Engine light on instrument panel). Also, the PCM stores an engine misfire DTC in memory, if 2nd trip with fault.

The PCM performs several diagnostic routines. They include:

- Oxygen sensor monitor
- Downstream heated oxygen sensor diagnostics during open loop operation (except for shorted)
- Fuel system monitor
- EGR monitor (if equipped)
- Purge system monitor
- Catalyst efficiency monitor
- All inputs monitored for proper voltage range, rationality.
- All monitored components (refer to the Emission section for On-Board Diagnostics).

The PCM compares the upstream and downstream heated oxygen sensor inputs to measure catalytic convertor efficiency. If the catalyst efficiency drops below the minimum acceptable percentage, the PCM stores a diagnostic trouble code in memory, after 2 trips.

During certain idle conditions, the PCM may enter a variable idle speed strategy. During variable idle speed strategy the PCM adjusts engine speed based on the following inputs.

- A/C status
- Battery voltage
- Battery temperature or Calculated Battery Temperature
- Engine coolant temperature
- Engine run time
- Inlet/Intake air temperature

- Vehicle mileage

ACCELERATION MODE

This is a CLOSED LOOP mode. The PCM recognizes an abrupt increase in Throttle Position sensor output voltage or MAP sensor output voltage as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased fuel demand.

- Wide Open Throttle-open loop

DECELERATION MODE

This is a CLOSED LOOP mode. During deceleration the following inputs are received by the PCM:

- A/C status
- Battery voltage
- Inlet/Intake air temperature
- Engine coolant temperature
- Crankshaft position (engine speed)
- Exhaust gas oxygen content (upstream heated oxygen sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position sensor

The PCM may receive a closed throttle input from the APPS when it senses an abrupt decrease in manifold pressure. This indicates a hard deceleration (Open Loop). In response, the PCM may momentarily turn off the injectors. This helps improve fuel economy, emissions and engine braking.

WIDE-OPEN-THROTTLE MODE

This is an OPEN LOOP mode. During wide-open-throttle operation, the following inputs are used by the PCM:

- Inlet/Intake air temperature
- Engine coolant temperature
- Engine speed
- Knock sensor
- Manifold absolute pressure
- Throttle position

When the PCM senses a wide-open-throttle condition through the APPS it de-energizes the A/C compressor clutch relay. This disables the air conditioning system and disables EGR (if equipped).

The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel, based on MAP and RPM.

IGNITION SWITCH OFF MODE

When the operator turns the ignition switch to the OFF position, the following occurs:

- All outputs are turned off, unless 02 Heater Monitor test is being run. Refer to the Emission section for On-Board Diagnostics.
- No inputs are monitored except for the heated oxygen sensors. The PCM monitors the heating elements in the oxygen sensors and then shuts down.

FUEL CORRECTION or ADAPTIVE MEMORIES

DESCRIPTION

In Open Loop, the PCM changes pulse width without feedback from the O2 Sensors. Once the engine warms up to approximately 30° to 35° F (-1.1° to 1.6°C), the PCM goes into closed loop **Short Term Correction** and utilizes feedback from the O2 Sensors. Closed loop **Long Term Adaptive Memory** is maintained above 170° to 190° F unless the PCM senses wide open throttle. At that time the PCM returns to Open Loop operation.

OPERATION

Short Term

The first fuel correction program that begins functioning is the short term fuel correction. This system corrects fuel delivery in direct proportion to the readings from the Upstream O2 Sensor.

The PCM monitors the air/fuel ratio by using the input voltage from the O2 Sensor. When the voltage reaches its preset high or low limit, the PCM begins to add or remove fuel until the sensor reaches its switch point. The short term corrections then begin.

The PCM makes a series of quick changes in the injector pulse-width until the O2 Sensor reaches its opposite preset limit or switch point. The process then repeats itself in the opposite direction.

Short term fuel correction will keep increasing or decreasing injector pulse-width based upon the upstream O2 Sensor input. The maximum range of authority for short term memory is 25% (+/-) of base pulse-width. Short term is violated and is lost when ignition is turned OFF.

Long Term

The second fuel correction program is the long term adaptive memory. In order to maintain correct emission throughout all operating ranges of the engine, a cell structure based on engine rpm and load (MAP) is used.

Ther number of cells varies upon the driving conditions. Two cells are used only during idle, based upon TPS and Park/Neutral switch inputs. There may be two other cells used for deceleration, based on TPS, engine rpm, and vehicle speed. The other twelve cells represent a manifold pressure and an rpm range. Six of the cells are high rpm and the other six are low rpm. Each of these cells has a specific MAP voltage range Typical Adaptive Memory Fuel Cells .

As the engine enters one of these cells the PCM looks at the amount of short term correction being used. Because the goal is to keep short term at 0 (O2 Sensor switching at 0.5 volt), long term will update in the same direction as short term correction was moving to bring the short term back to 0. Once short term is back at 0, this long term correction factor is stored in memory.

The values stored in long term adaptive memory are used for all operating conditions, including open loop and cold starting. However, the updating of the long term memory occurs after the engine has exceeded approximately 170°-190° F (77° to 88°C), with fuel control in closed loop and two minutes of engine run time. This is done to prevent any transitional temperature or start-up compensations from corrupting long term fuel correction.

Long term adaptive memory can change the pulse-width by as much as 25%, which means it can correct for all of short term. It is possible to have a problem that would drive long term to 25% and short term to another 25% for a total change of 50% away from base pulse-width calculation.

Typical Adaptive Memory Fuel Cells

	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Idle	Decel
Vacuum	20	17	13	9	5	0		
Above 1,984 rpm	1	3	5	7	9	11	13 Drive	15
Below 1,984 rpm	0	2	4	6	8	10	12 Neutral	14
MAP volt =	0	1.4	2.0	2.6	3.3	3.9		

Fuel Correction Diagnostics

There are two fuel correction diagnostic routines:

- Fuel System Rich
- Fuel System Lean

A DTC is set and the MIL is illuminated if the PCM detects either of these conditions. This is determined based on total fuel correction, short term times long term.

SYSTEM DIAGNOSIS

OPERATION

The PCM can test many of its own input and output circuits. If the PCM senses a fault in a major system, the PCM stores a Diagnostic Trouble Code (DTC) in memory.

For DTC information see On-Board Diagnostics (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE - DESCRIPTION) .

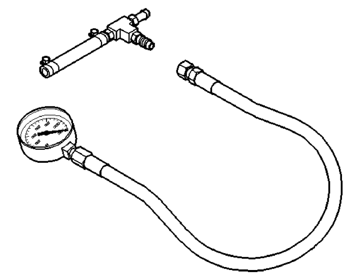
SPECIFICATIONS

TORQUE

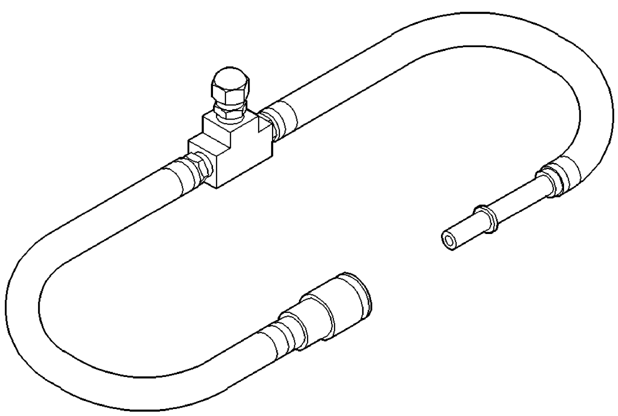
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Crankshaft Position Sensor Mounting Bolts	9	-	79.5
MAP Sensor	4.5	-	40
Oxygen Sensor	28	20	
Powertrain Control Module (PCM) Mounting Screws	4	-	35
Throttle Body Mounting Bolts	9	-	79.5
Crankshaft Position Sensor	9	-	79.5
Fuel Rail bolts	27	20	-
Inlet Air Tube Clamp	3	-	25

SPECIAL TOOLS

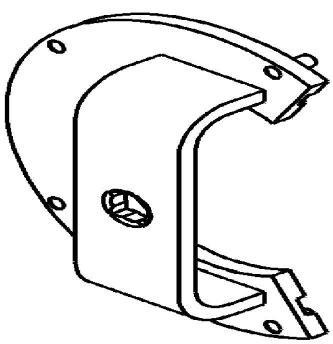
FUEL



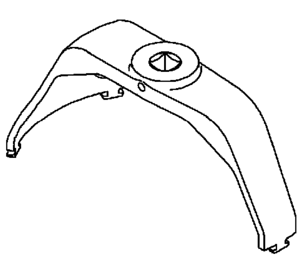
Pressure Gauge Assembly C–4799–B



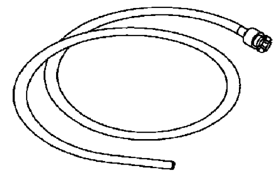
Fuel Pressure Test Adapter 6539



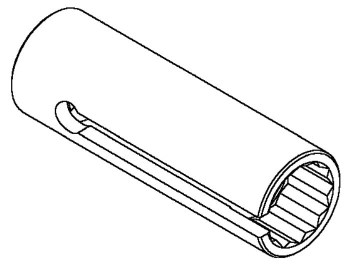
9318 LOCK RING TOOL



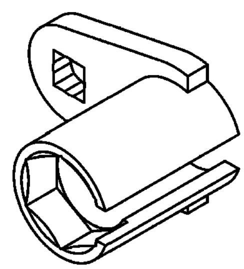
Spanner Wrench 9340



Fuel Line Adapter 1/4



O2S (Oxygen Sensor) Remover/Installer—C-4907



O2S (Oxygen Sensor) Remover/Installer - 8439

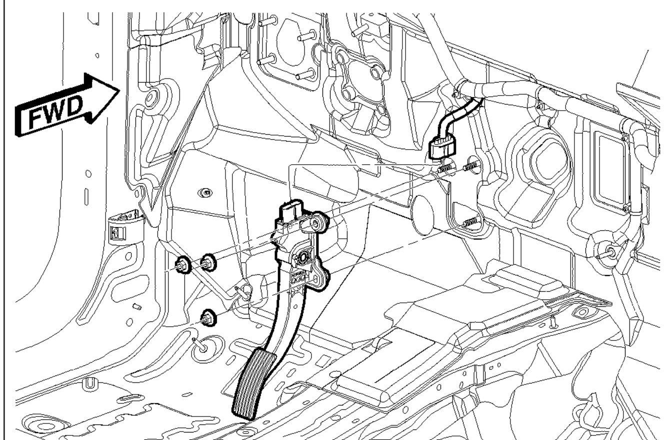
SENSOR-ACCELERATOR PEDAL POSITION

DESCRIPTION

The Accelerator Pedal Position Sensor (APPS) is a variable resistor that provides the PCM with an input signal (voltage). The signal represents pedal angle position. As the position of the accelerator pedal changes, the resistance of the APPS changes.

REMOVAL

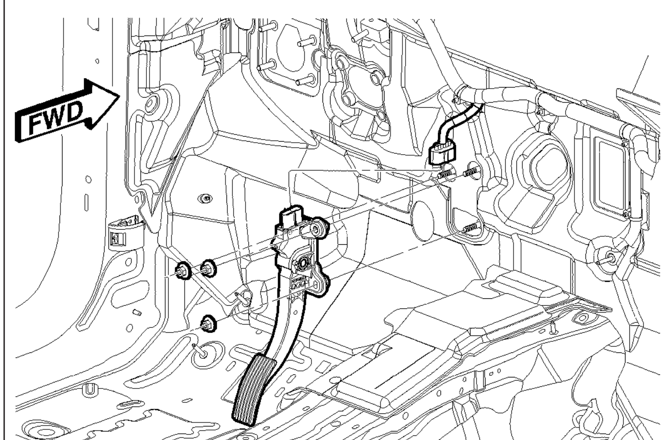
1. Disconnect negative battery cable.
2. Unlock the electrical connector and then disconnect the electrical connector from the module
3. Remove the mounting nuts.
4. Remove assembly from the mounting studs.



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INSTALLATION

1. Install APPS module.
2. Tighten the mounting nuts.
3. Connect electrical connector and lock.
4. Connect negative battery cable.



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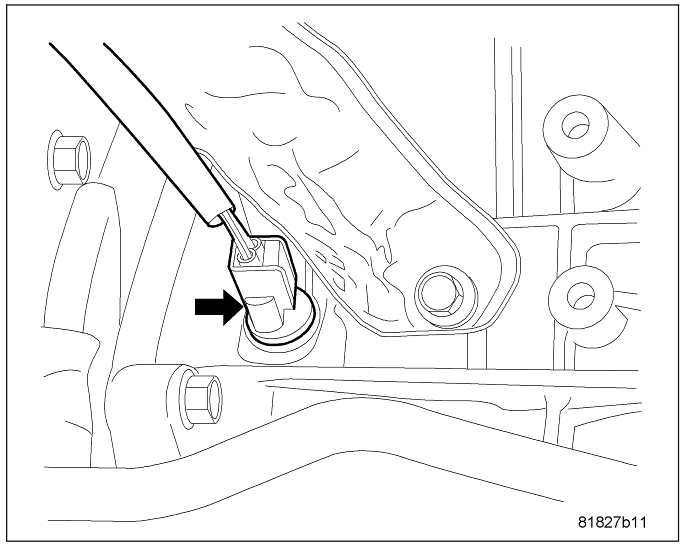
CRANKSHAFT POSITION SENSOR

DESCRIPTION

The crankshaft position sensor mounts to the rear of the engine block near the transmission.

The PCM uses the Crankshaft Position sensor to calculate the following:

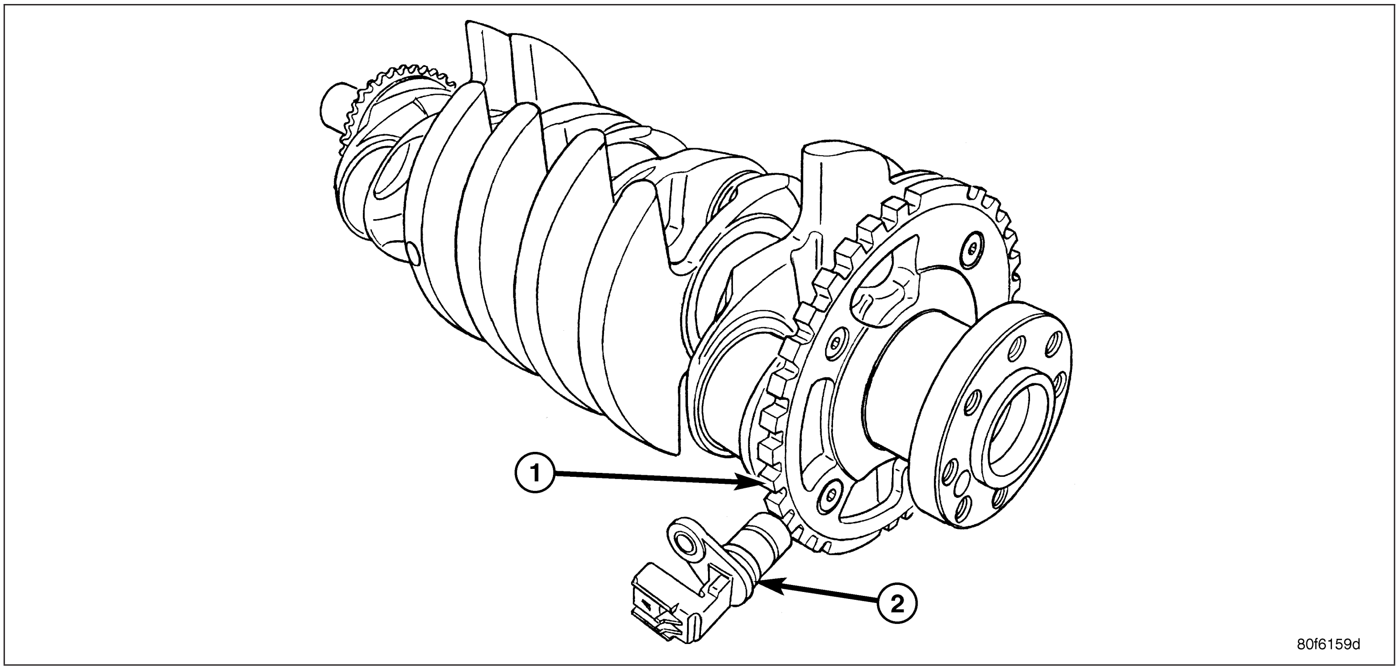
- Engine RPM
- TDC number 1 and 4
- Ignition coil synchronization
- Injector synchronization
- Camshaft-to-crankshaft misalignment (Timing belt skipped 1 tooth or more diagnostic trouble code).



OPERATION

The PCM sends approximately 5 volts to the Hall-effect sensor. This voltage is required to operate the Hall-effect chip and the electronics inside the sensor. A ground for the sensor is provided through the sensor return circuit. The input to the PCM occurs on a 5 volt output reference circuit that operates as follows: The Hall-effect sensor contains a powerful magnet. As the magnetic field passes over the dense portion of the counterweight, the 5-volt signal is pulled to ground (.3 volts) through a transistor in the sensor. When the magnetic field passes over the notches in the crankshaft counterweight, the magnetic field turns off the transistor in the sensor, causing the PCM to register the 5-volt signal. The PCM identifies crankshaft position by registering the change from 5 to 0 volts, as signaled from the Crankshaft Position sensor (2).

The PCM determines what cylinder to fire from the crankshaft position sensor input and the camshaft position sensor input. The #8 crankshaft counterweight has a target ring with 32 teeth and notches (1), including one long reference tooth and notch. From the crankshaft position sensor input the PCM determines engine speed and crankshaft angle (position).

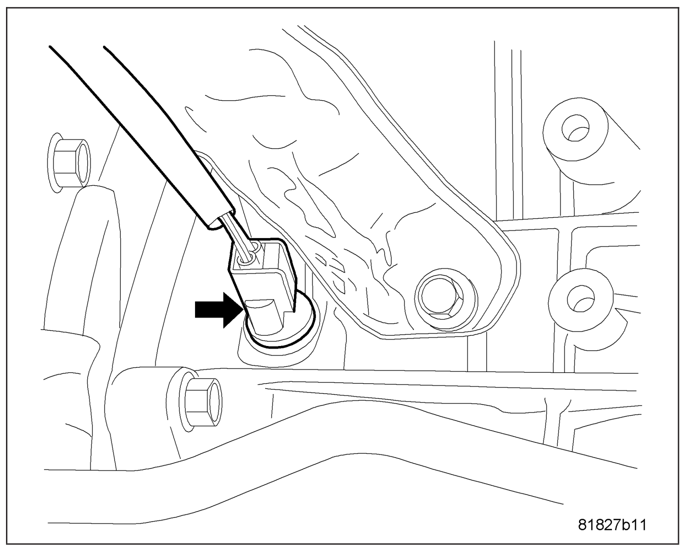


REMOVAL

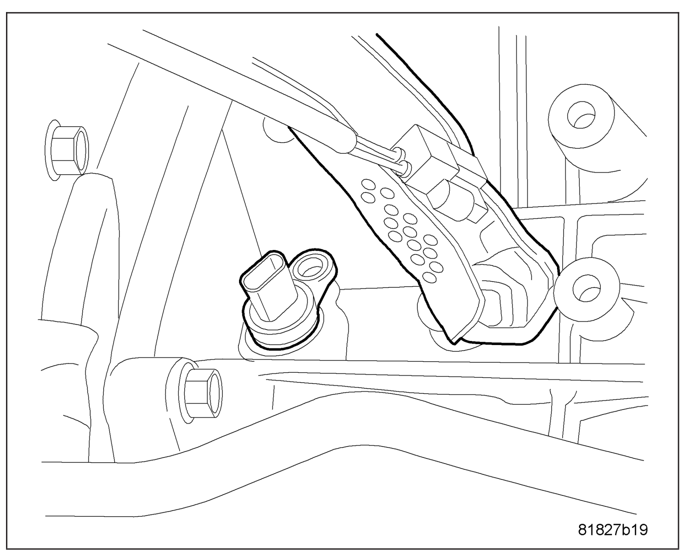
The Crankshaft Position Sensor is in the rear of the engine block near the transmission.

If vehicle is All Wheel Drive the Power Transfer Unit must be removed, (Refer to 21 - TRANSMISSION/ TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).

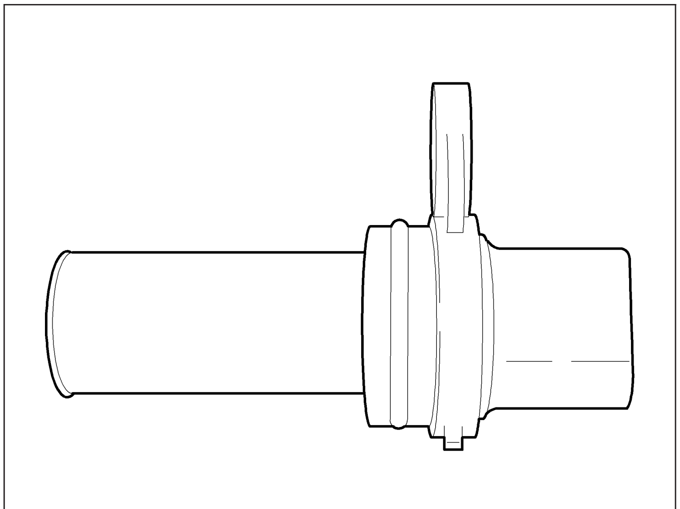
1. Disconnect the negative battery cable.
2. Raise vehicle and support.



3. Remove heat shield retaining bolt.
4. Move heat shield.
5. Unlock and disconnect the electrical connector to the crankshaft position sensor.



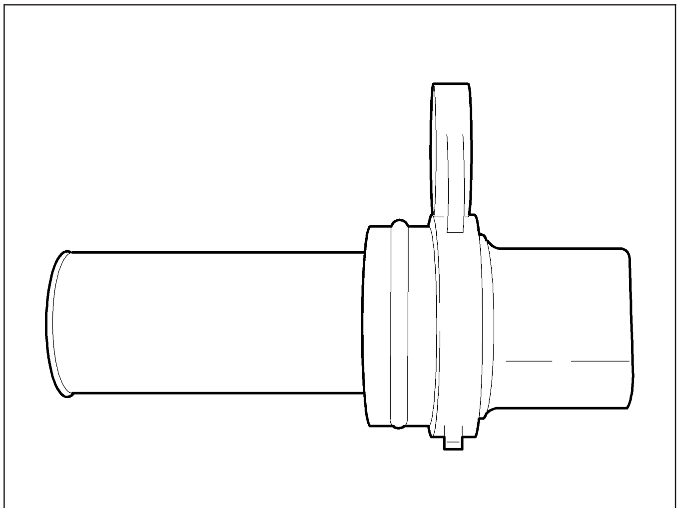
6. Remove the crankshaft position sensor bolt.
7. Remove the sensor.



81827b1d

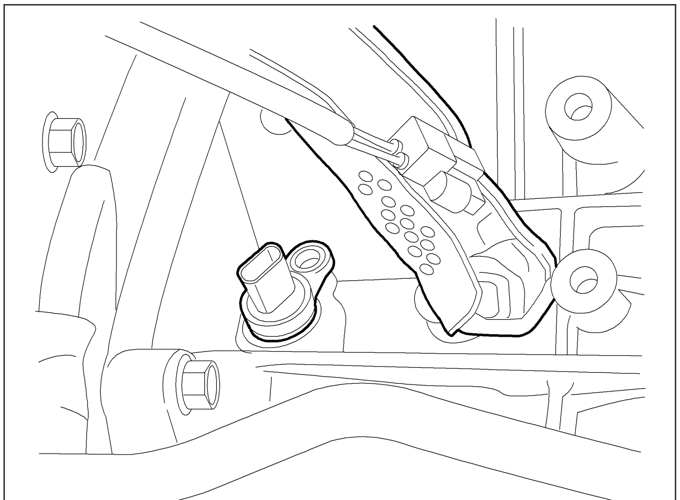
INSTALLATION

1. Check o-ring for damage and lubricate the o-ring with engine oil before installing sensor.
2. Use a twisting motion when installing the sensor.



81827b1d

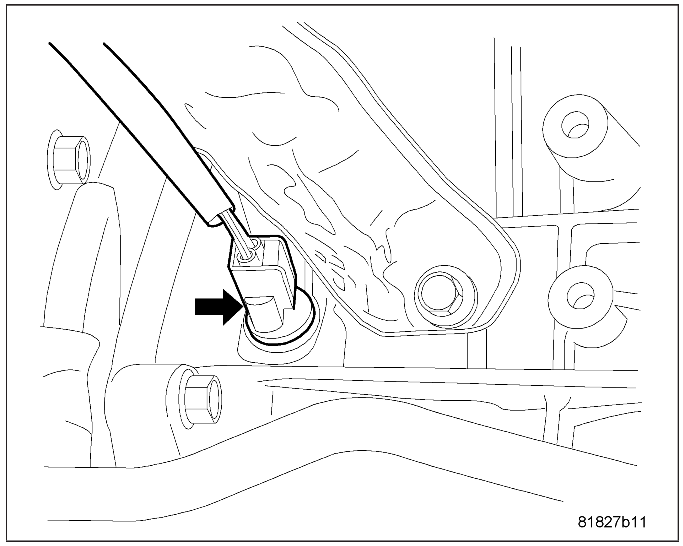
3. Install and tighten the crankshaft position sensor bolt and tighten to 9 N·m (79.5 ins. lbs.).
4. Connect and lock the electrical connector to the crankshaft position sensor.
5. Install heat shield and retaining bolt.



81827b19

If vehicle is All Wheel Drive the Power Transfer Unit must be installed, (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - INSTALLATION).

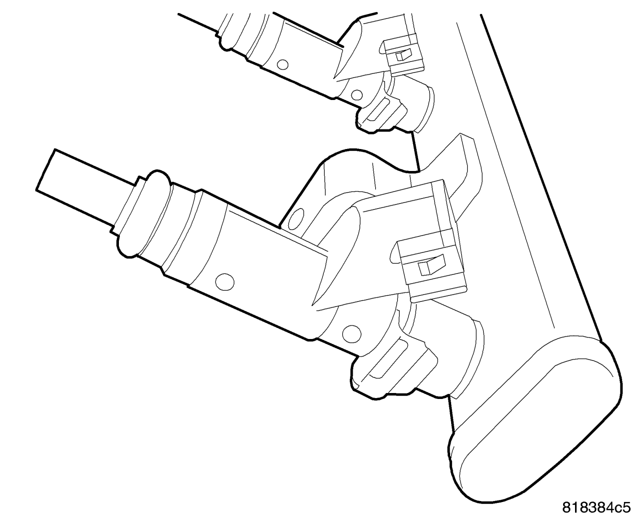
6. Lower vehicle.
7. Connect the negative battery cable.



FUEL INJECTOR

DESCRIPTION

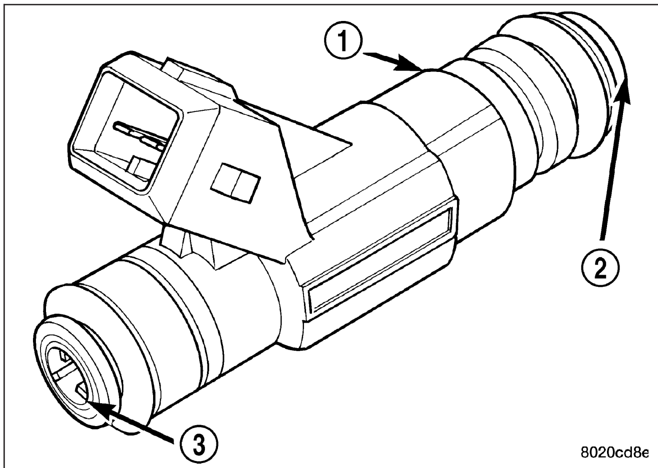
The injectors are positioned in the intake manifold with the nozzle ends directly above the intake valve port.



818384c5

OPERATION

The fuel injectors are 12 volt electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a hollow cone or two streams. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber. Fuel injectors are not interchangeable between engines.



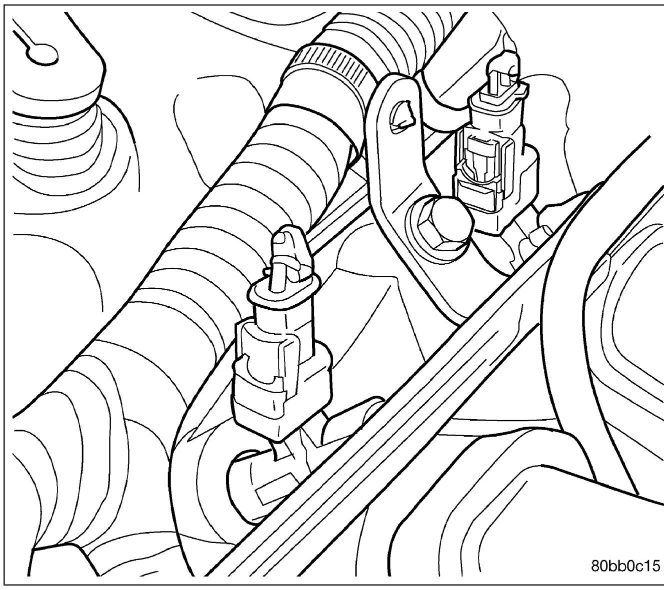
8020cd8e

The PCM provides battery voltage to each injector through the ASD relay. Injector operation is controlled by a ground path provided for each injector by the PCM. Injector on-time (pulse-width) is variable, and is determined by the PCM processing all the data previously discussed to obtain the optimum injector pulse width for each operating condition. The pulse width is controlled by the duration of the ground path provided.

STANDARD PROCEDURE

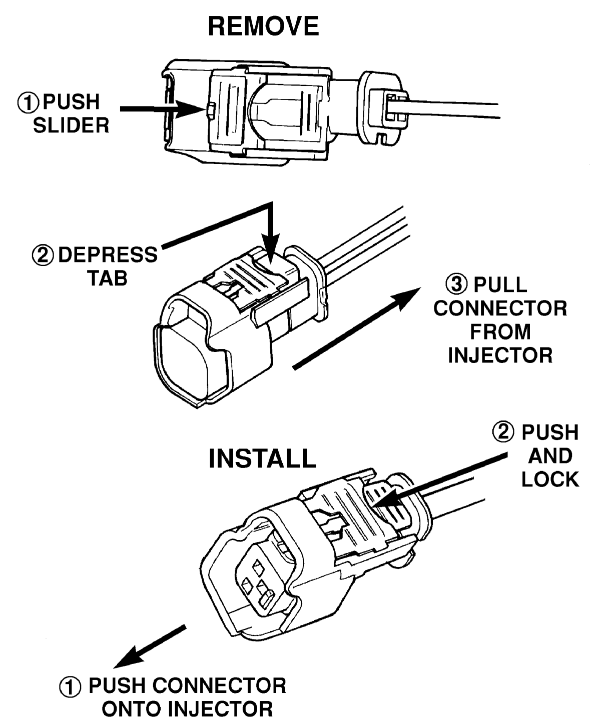
REMOVAL - INJECTOR CONNECTOR

1. Disconnect electrical connectors at the fuel injectors.



80bb0c15

2. To remove connector pull the red colored slider away from injector (1). While pulling the slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, make note of wiring location before removal.

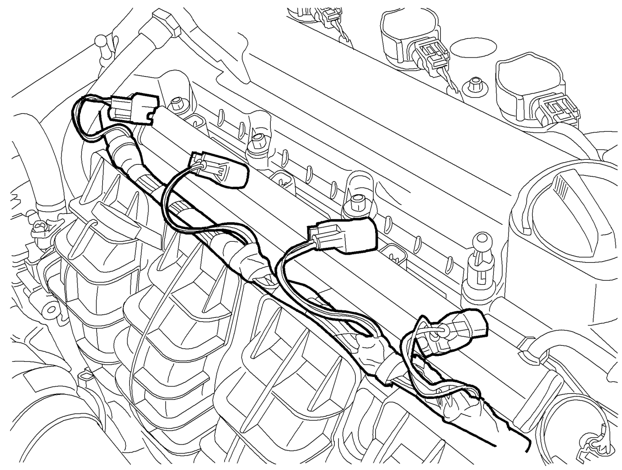


80b6f033

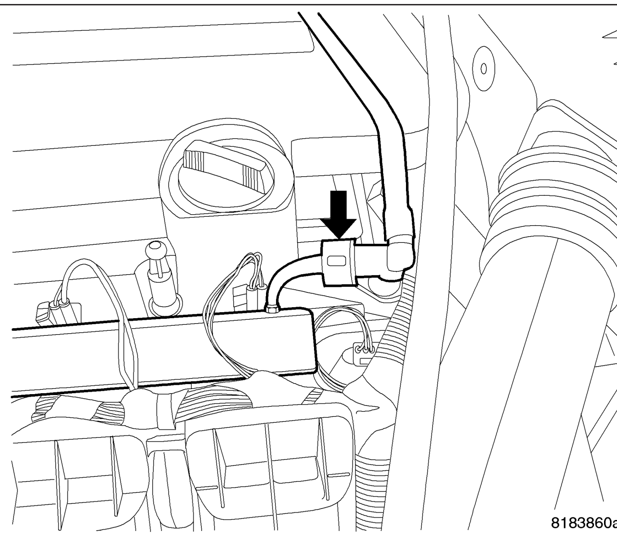
REMOVAL

WARNING: Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

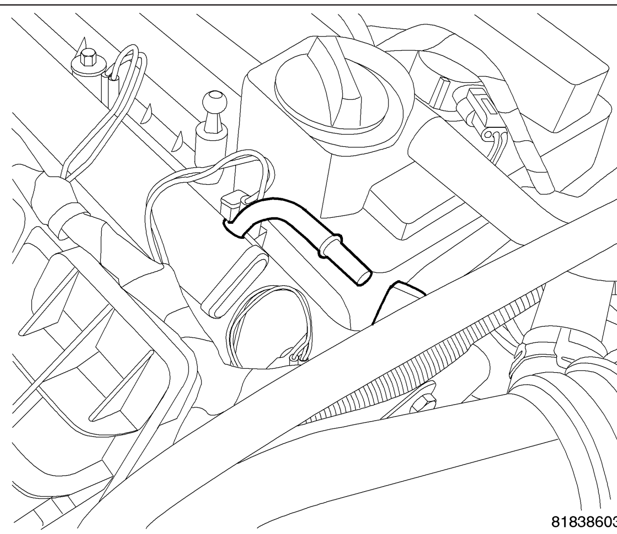
1. Release the fuel pressure, refer to the fuel pressure release procedure.
2. Disconnect the negative battery cable.
3. Disconnect the electrical connectors from the fuel injectors.


818385f1

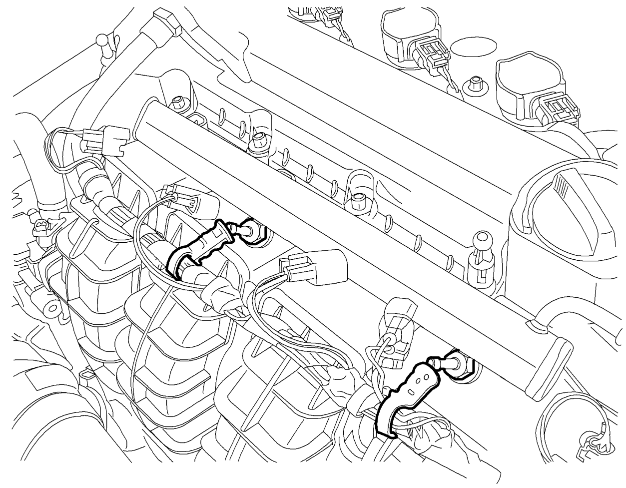
4. Fuel line connection at fuel rail.


8183860a

5. Remove the fuel line from the fuel rail.

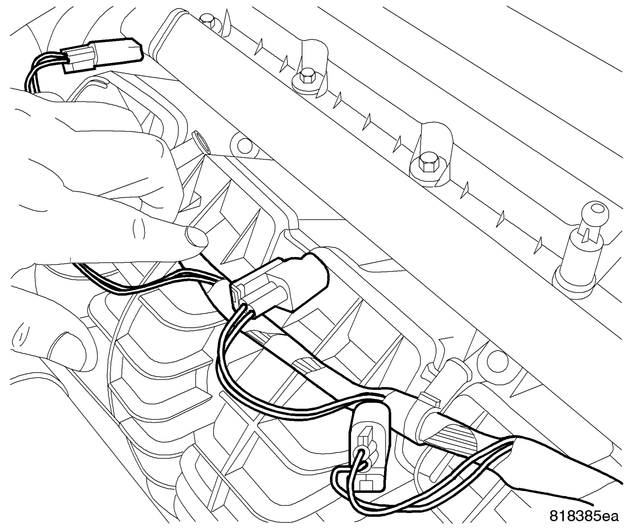

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6. Remove wire harness from fuel rail mounting studs.



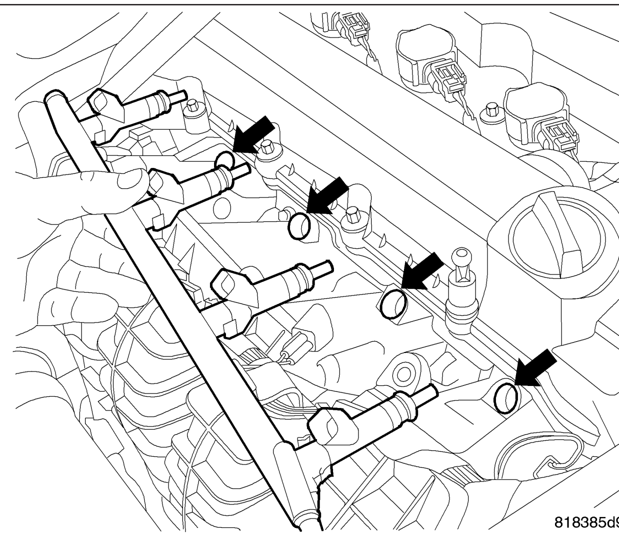
818385f8

7. Remove the 2 bolts to the fuel rail at the lower manifold.



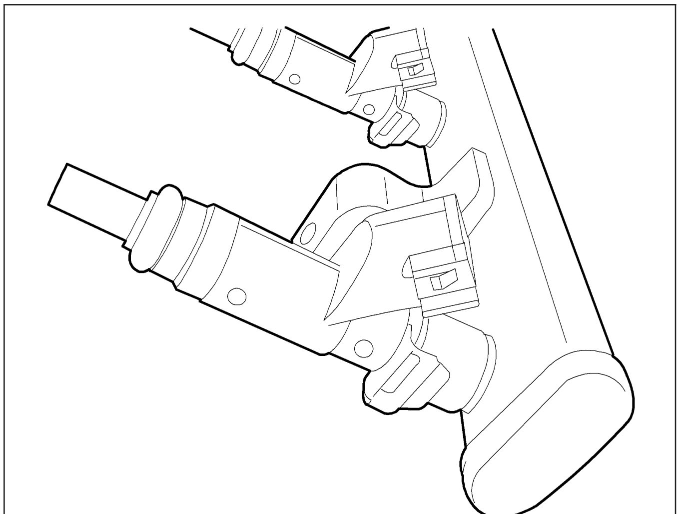
818385ea

8. Remove the fuel rail



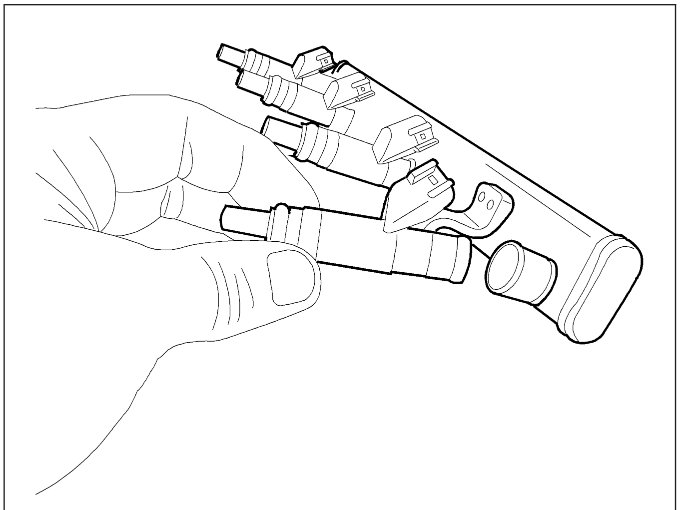
818385d9

9. Remove clip holding fuel injector to fuel rail.



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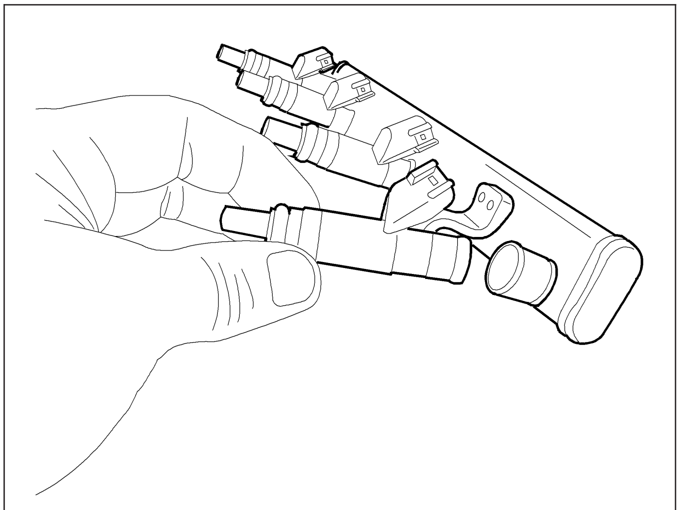
10. Remove fuel injector from fuel rail.



81837e38

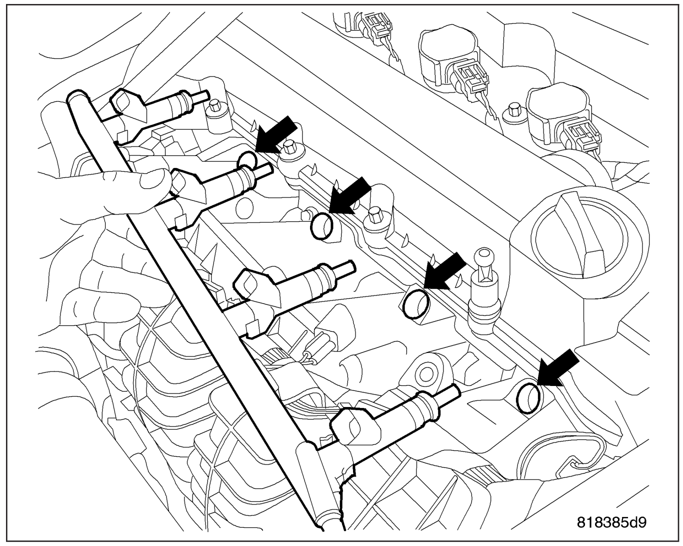
INSTALLATION

1. Apply a light coating of clean engine oil to the upper O-ring.
2. Install injector in cup on fuel rail.
3. Install retaining clip.

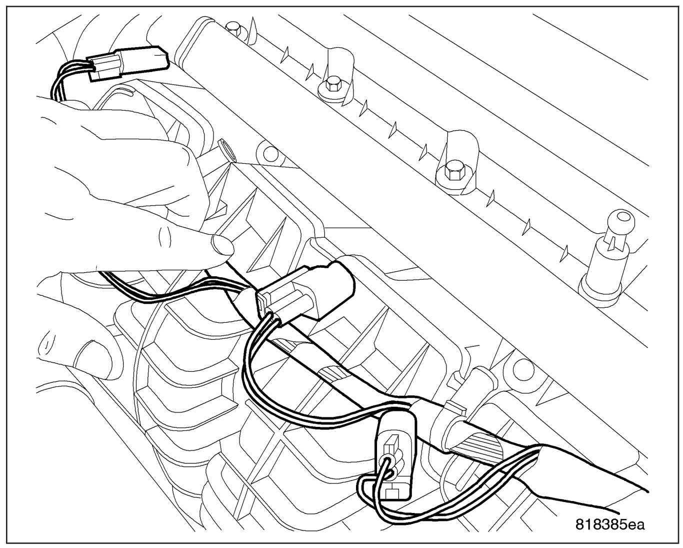


81837e38

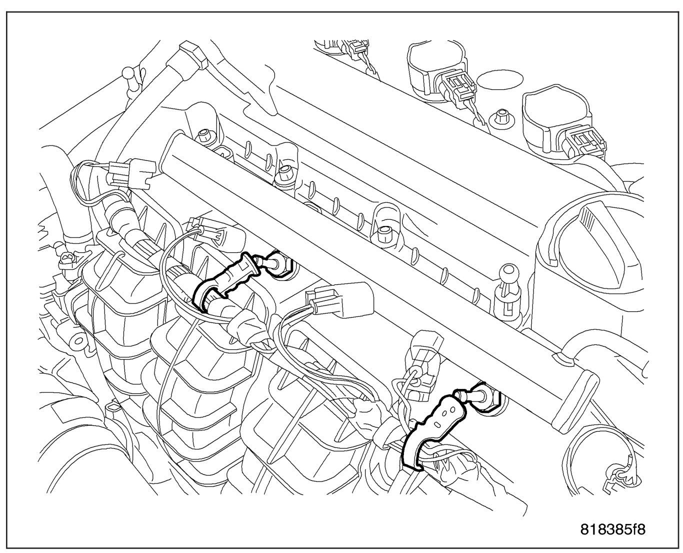
4. Apply a light coating of clean engine oil to the O-ring on the nozzle end of each injector.
5. Insert fuel injector nozzles into openings in lower intake manifold. Seat the injectors in place.



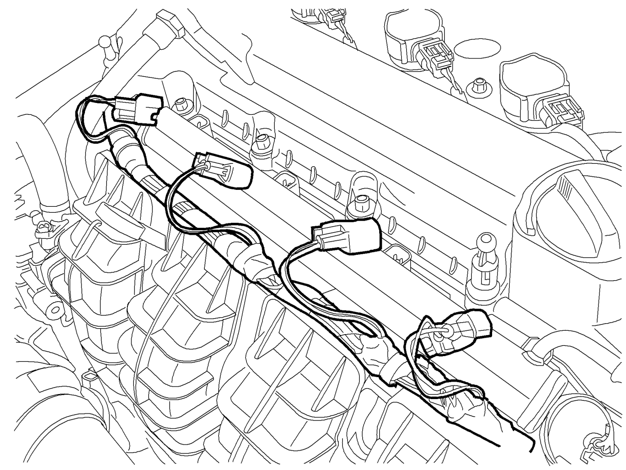
6. Tighten fuel rail mounting screws to 27 N·m (20 ft. lbs.).



7. Install wiring harness clips to the fuel rail mounting studs.

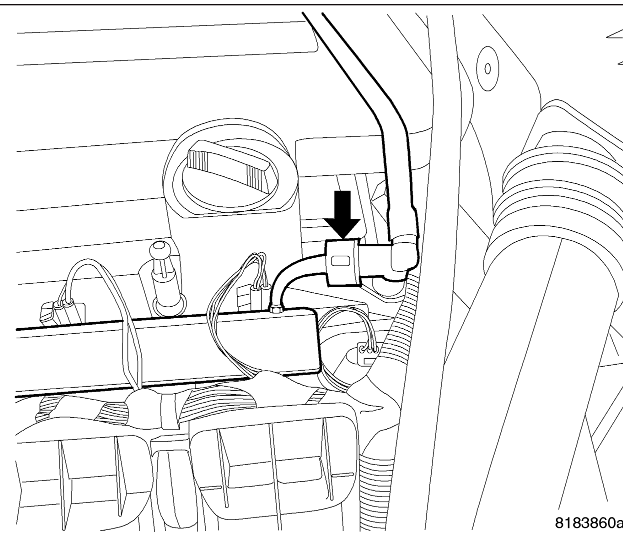


8. Attach electrical connectors to fuel injectors, refer to the fuel injector connector section for electrical connector installation.



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9. Connect fuel supply tube to fuel rail.
10. Connect the negative battery cable.
11. Use the scan tool to pressurize the fuel system. Check for leaks.



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INLET AIR TEMPERATURE SENSOR

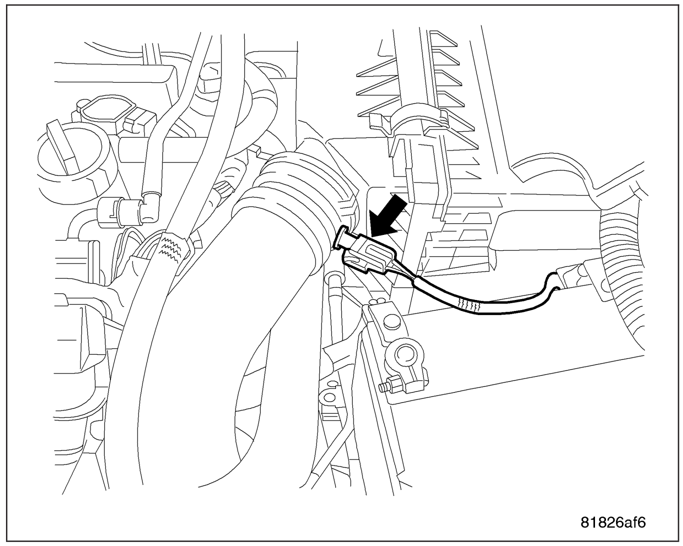
DESCRIPTION

The IAT Sensor is a Negative Temperature Coefficient (NTC) Sensor that provides information to the PCM regarding the temperature of the air entering the intake manifold.

REMOVAL

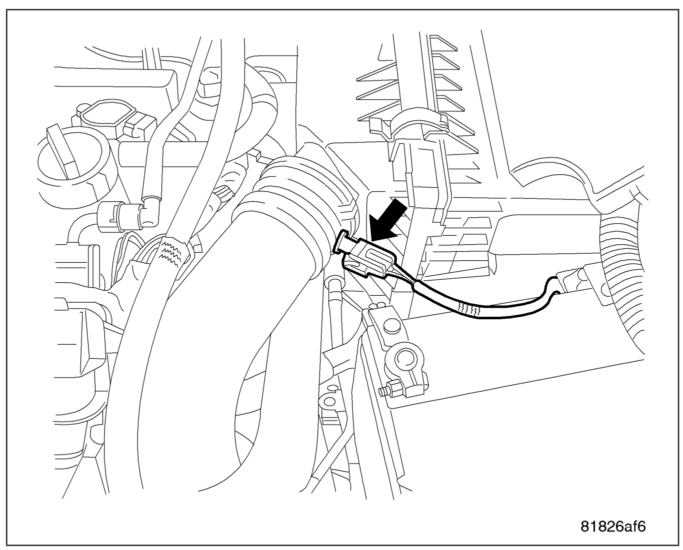
The sensor is located in the clean air duct (1)

1. Disconnect the negative battery cable.
2. Disconnect electrical connector from the sensor.
3. Remove the sensor.

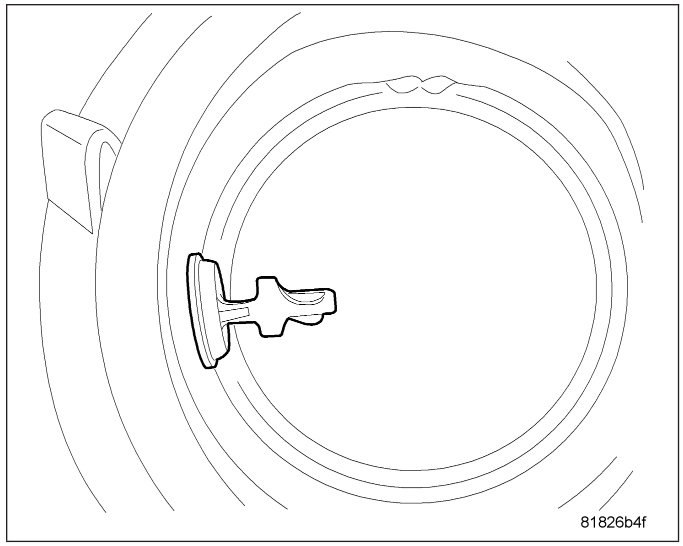


INSTALLATION

The sensors is in the clean air duct.



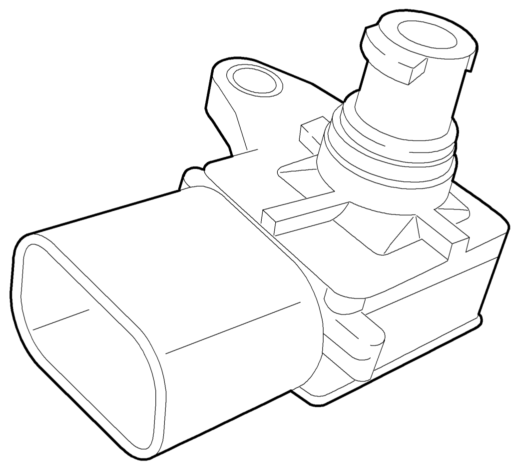
1. Install sensor. Make sure of sensor orientation.
2. Attach electrical connector to sensor.
3. Connect the negative battery cable.



MAP SENSOR

DESCRIPTION

The MAP sensor mounts to the intake manifold.



8184efa2

OPERATION

The MAP serves as a PCM input, using a silicon based sensing unit, to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When MAP equals Barometric pressure, the pulse width will be at maximum.

Also like the cam and crank sensors, a 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0 — 15 psi the voltage changes 4.0V. The sensor is supplied a regulated 4.8 to 5.1 volts to operate the sensor. Like the cam and crank sensors ground is provided through the sensor return circuit.

The MAP sensor input is the number one contributor to pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or is it in Denver at 5000 feet above sea level, because the air density changes with altitude. It will also help to correct for varying weather conditions. If a hurricane was coming through the pressure would be very, very low or there could be a real fair weather, high pressure area. This is important because as air pressure changes the barometric pressure changes. Barometric pressure and altitude have a direct inverse correlation, as altitude goes up barometric goes down. The first thing that happens as the key is rolled on, before reaching the crank position, the PCM powers up, comes around and looks at the MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure relative to altitude. Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key on. The difference between current and what it was at key on is manifold vacuum.

During key On (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring known good sensor in you work area.

As the altitude increases the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key On the barometric pressure needs to be updated. Any time the PCM sees Wide Open throttle, based upon TPS angle and RPM it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor to aid in calculating the following:

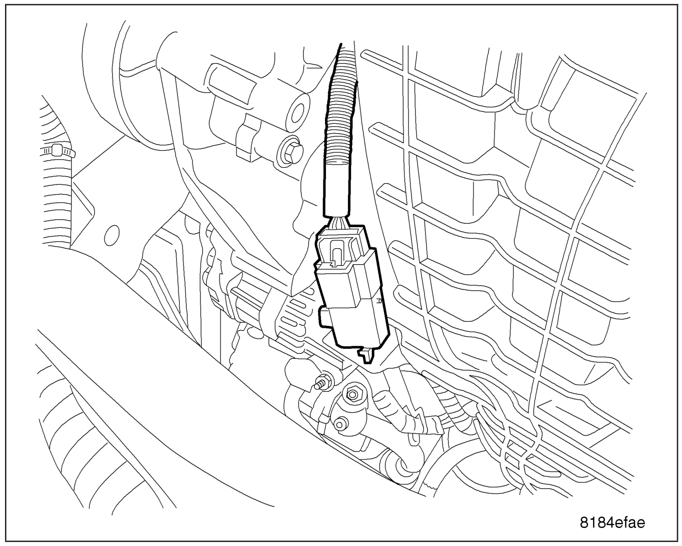
- Barometric pressure
- Engine load
- Manifold pressure
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (F4AC1 transmissions only, via the PCI bus)
- Idle speed

- Decel fuel shutoff

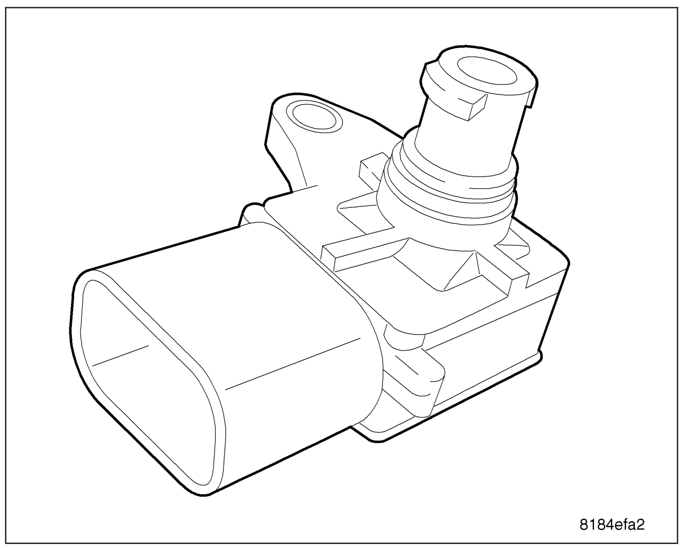
The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is 29.92 in Hg. For every 100 feet of altitude barometric pressure drops .10 in. Hg. If a storm goes through it can either add, high pressure, or decrease, low pressure, from what should be present for that altitude. You should make a habit of knowing what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

1. Remove the air cleaner cover.
2. Disconnect the negative battery cable.
3. Disconnect the electrical connector from the MAP sensor.
4. Remove the screws from the MAP sensor.

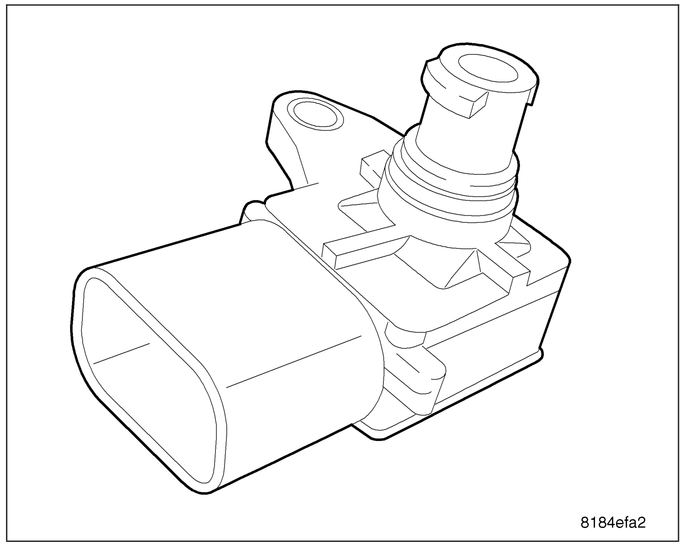


5. Remove the MAP sensor.

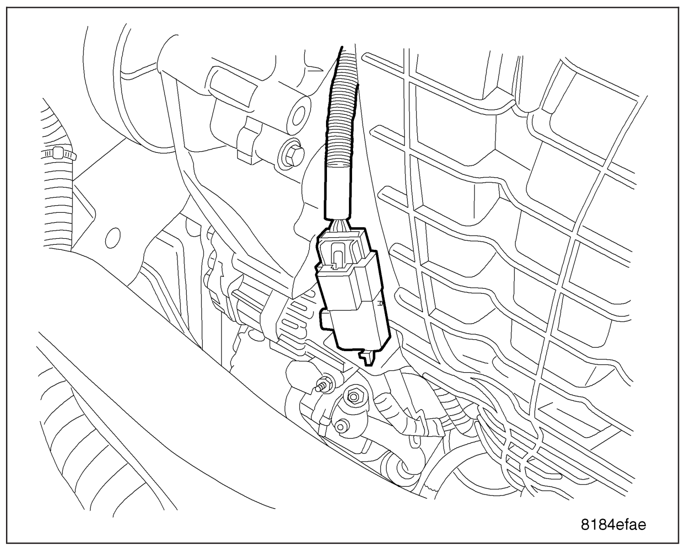


INSTALLATION

1. Make sure that the manifold is clean.
2. Install sensor to manifold.



3. Tighten screw.
4. Connect the electrical connector to the sensor.
5. Connect the negative battery cable
6. Install the air cleaner cover.

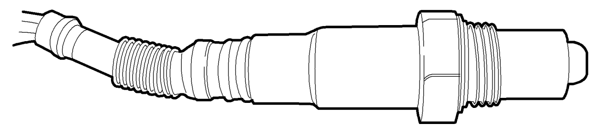


SENSOR-OXYGEN

DESCRIPTION

The upstream oxygen sensor threads into the outlet flange of the exhaust manifold.

The downstream heated oxygen sensor threads into the system depending on emission package.


81821bd0

OPERATION

A separate upstream and downstream grounds are used on the NGC vehicles (4 Cyl.).

As vehicles accumulate mileage, the catalytic convertor deteriorates. The deterioration results in a less efficient catalyst. To monitor catalytic convertor deterioration, the fuel injection system uses two heated oxygen sensors. One sensor upstream of the catalytic convertor, one downstream of the convertor. The PCM compares the reading from the sensors to calculate the catalytic convertor oxygen storage capacity and converter efficiency. Also, the PCM uses the upstream heated oxygen sensor input when adjusting injector pulse width.

When the catalytic converter efficiency drops below emission standards, the PCM stores a diagnostic trouble code and illuminates the malfunction indicator lamp (MIL).

The O2 sensors produce a constant 2.5 volts on NGC vehicles, depending upon the oxygen content of the exhaust gas. When a large amount of oxygen is present (caused by a lean air/fuel mixture, can be caused by misfire and exhaust leaks), the sensors produces a low voltage. When there is a lesser amount of oxygen present (caused by a rich air/fuel mixture, can be caused by internal engine problems) it produces a higher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch.

The oxygen sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all operating modes. Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

In Closed Loop operation the PCM monitors the O2 sensors input (along with other inputs) and adjusts the injector pulse width accordingly. During Open Loop operation the PCM ignores the O2 sensor input. The PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

NGC Controller - Has a common ground for the heater in the O2S. 12 volts is supplied to the heater in the O2S by the NGC controller. Both the upstream and downstream O2 sensors for NGC are pulse width modulation (PWM). **NOTE**: When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C-1 connector or momentarily disconnecting the Battery negative terminal. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

UPSTREAM OXYGEN SENSOR

The input from the upstream heated oxygen sensor tells the PCM the oxygen content of the exhaust gas. Based on this input, the PCM fine tunes the air-fuel ratio by adjusting injector pulse width.

The sensor input switches from 2.5 to 3.5 volt, depending upon the oxygen content of the exhaust gas in the exhaust manifold. When a large amount of oxygen is present (caused by a lean air-fuel mixture), the sensor pro-

duces voltage as low as 2.5 volt. When there is a lesser amount of oxygen present (rich air-fuel mixture) the sensor produces a voltage as high as 3.5 volt. By monitoring the oxygen content and converting it to electrical voltage, the sensor acts as a rich-lean switch.

The heating element in the sensor provides heat to the sensor ceramic element. Heating the sensor allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

In Closed Loop, the PCM adjusts injector pulse width based on the upstream heated oxygen sensor input along with other inputs. In Open Loop, the PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

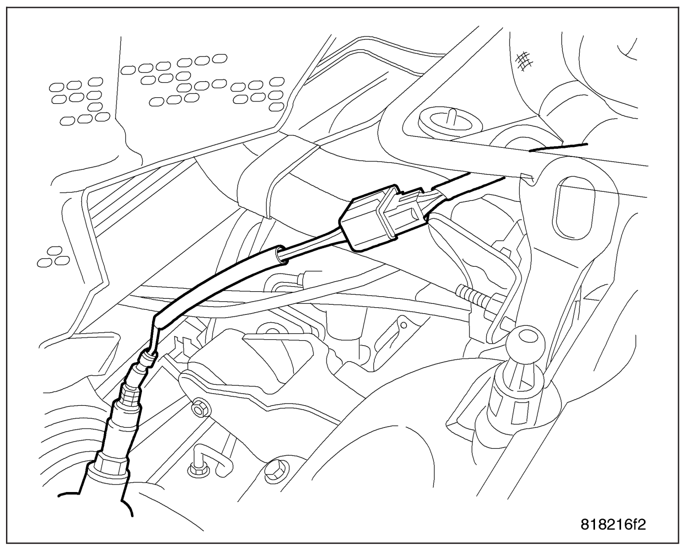
DOWNSTREAM OXYGEN SENSOR

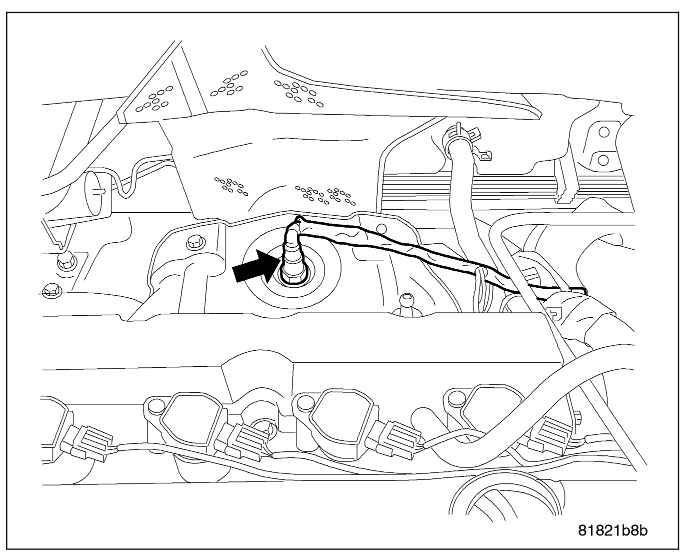
The downstream heated oxygen sensor input is used to detect catalytic convertor deterioration. As the convertor deteriorates, the input from the downstream sensor begins to match the upstream sensor input except for a slight time delay. By comparing the downstream heated oxygen sensor input to the input from the upstream sensor, the PCM calculates catalytic convertor efficiency. Also used to establish the upstream O2 goal voltage (switching point).

REMOVAL

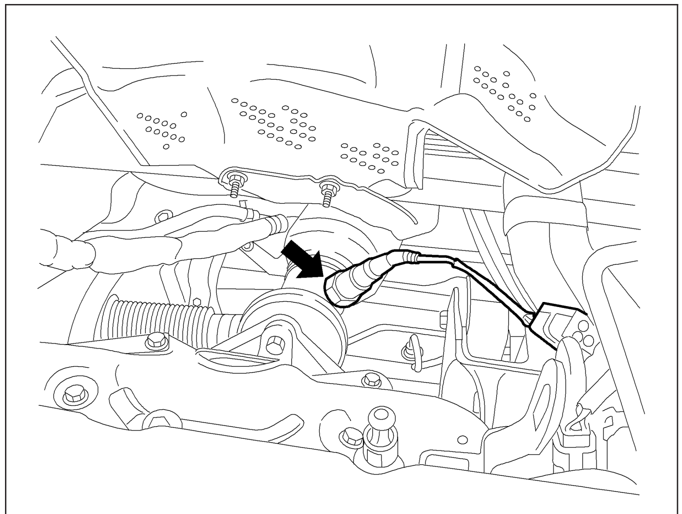
1/1 UPSTREAM

1. Remove the engine cover.
2. Remove the negative battery cable.
3. Disconnect electrical connector from O2 sensor.





4. Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent.

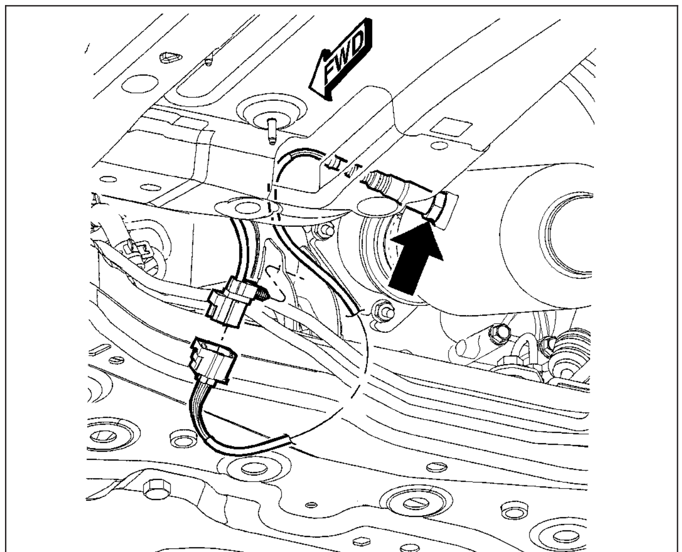


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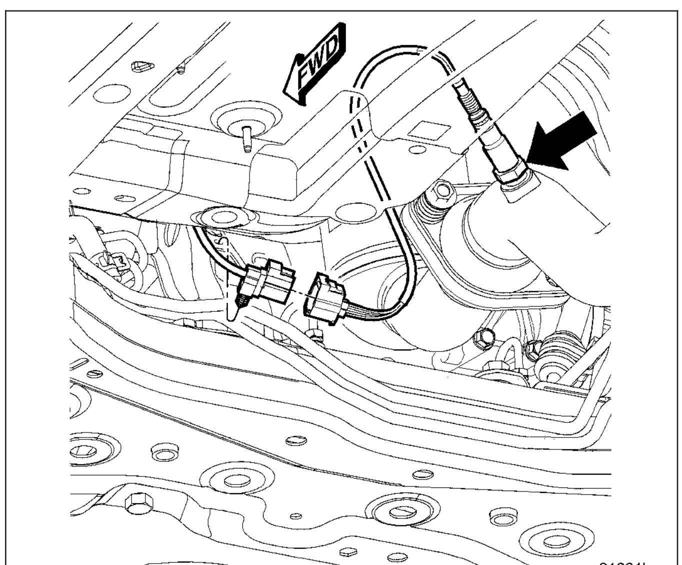
1/2 DOWNSTREAM

The downstream heated oxygen sensor threads into the catalytic convertor.

1. Remove the negative battery cable.
2. Raise vehicle and support.
3. Disconnect electrical connector from sensor.
4. Disconnect sensor electrical harness from clips along body.
5. Remove sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent.



81821bc8

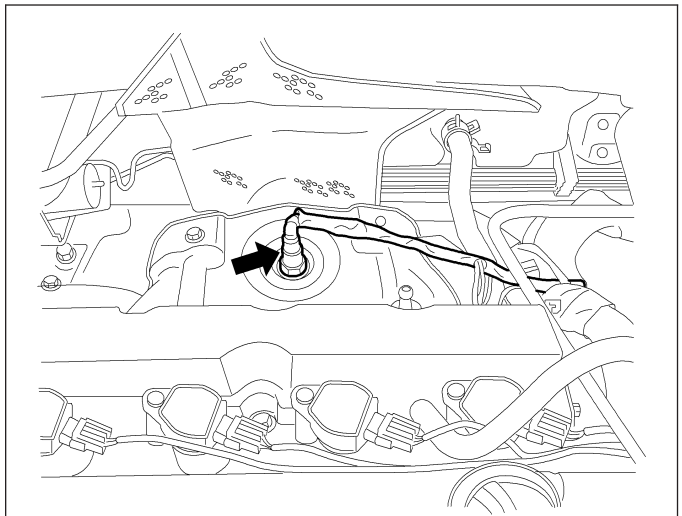


81821bcc

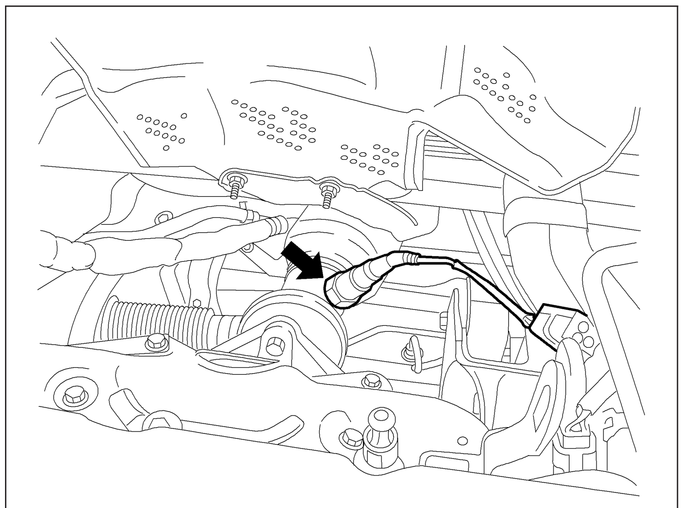
INSTALLATION

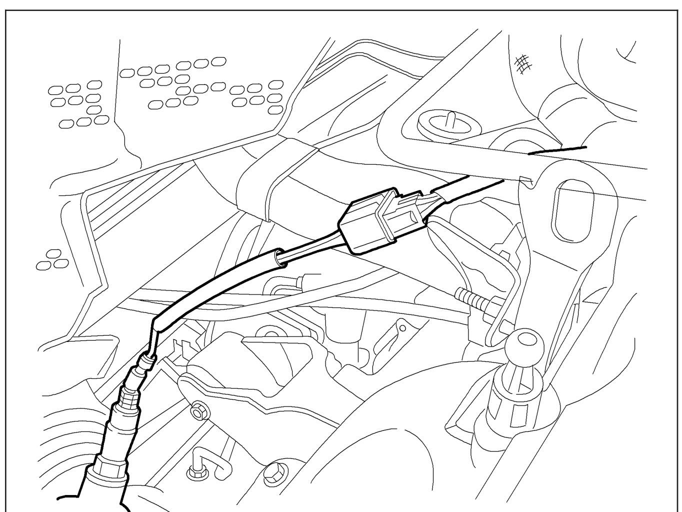
1/1 UPSTREAM

1. After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite® 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.
2. Install sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent


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3. Connect electrical connector to sensor.
4. Install the negative battery cable.
5. Install the engine cover.

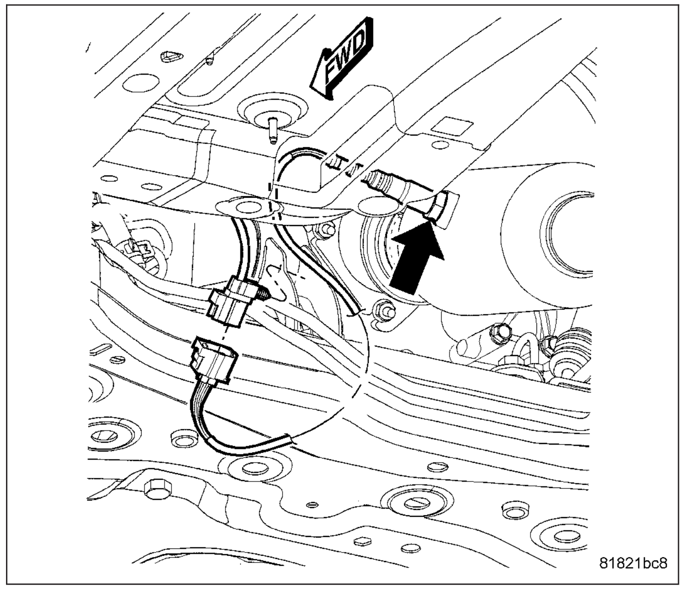

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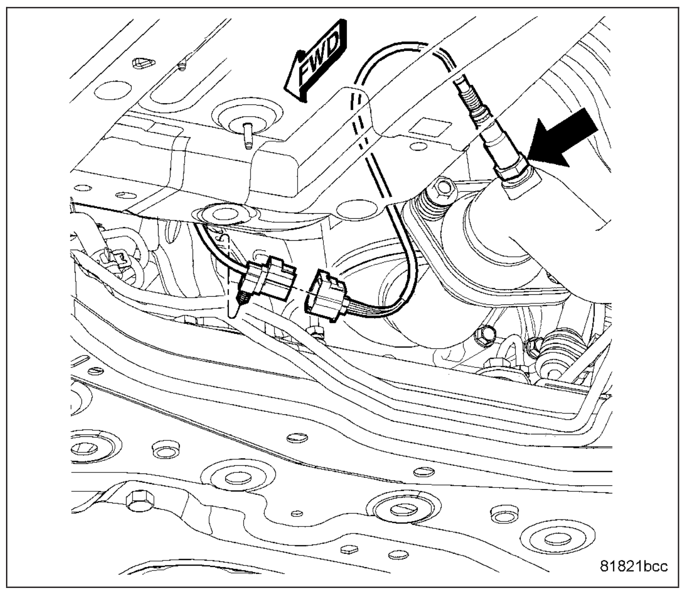

818216f2

1/2 DOWNSTREAM

The downstream heated oxygen sensor threads into the exhaust pipe behind the catalytic convertor.

1. After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite® 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.
2. Install sensor using an oxygen sensor crow foot wrench such as Snap-On tool YA8875 or equivalent
3. Connect sensor electrical harness to clips along body.
4. Connect electrical connector to sensor.
5. Lower vehicle.
6. Install the negative battery cable.





THROTTLE BODY

DESCRIPTION

The throttle body mounts to the intake manifold. The throttle position sensor and idle air control motor attach to the throttle body.

OPERATION

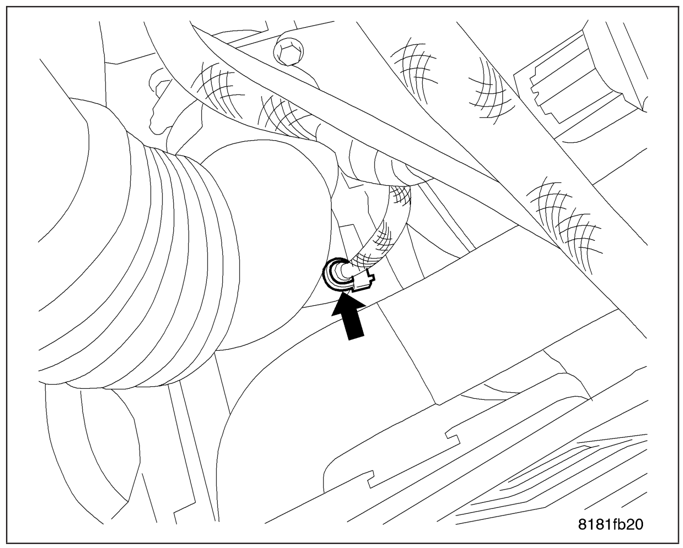
Filtered air from the air cleaner enters the intake manifold through the throttle body. The throttle body contains an air control passage controlled by an Idle Air Control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

Certain sensors are attached to the throttle body. The accelerator pedal cable, speed control cable are connected to the throttle body cam.

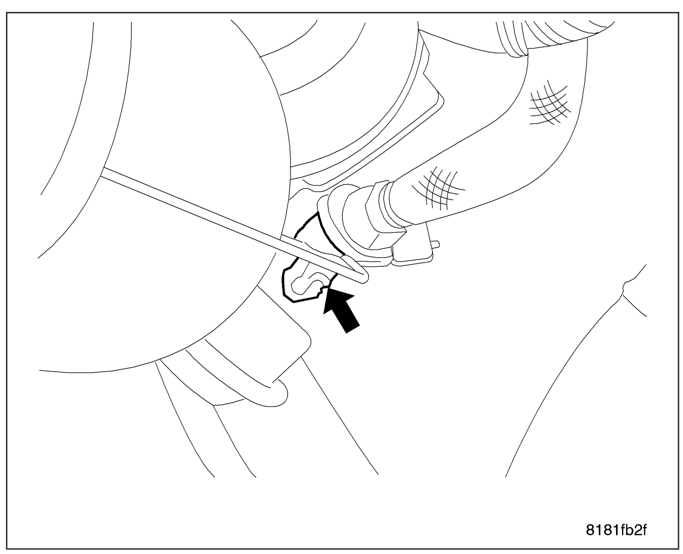
A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

REMOVAL

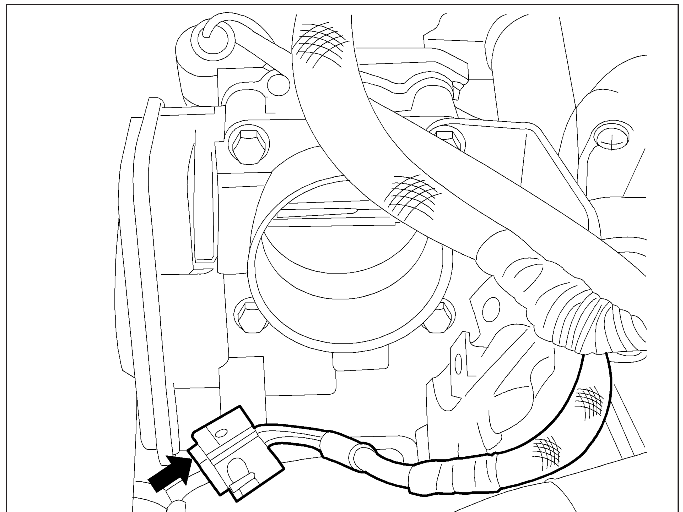
1. Remove the air cleaner lid, disconnect the inlet air temperature sensor and makeup air hose.
2. Remove the negative battery cable.
3. Remove the engine cover.



4. Remove wire harness clip from air tube.

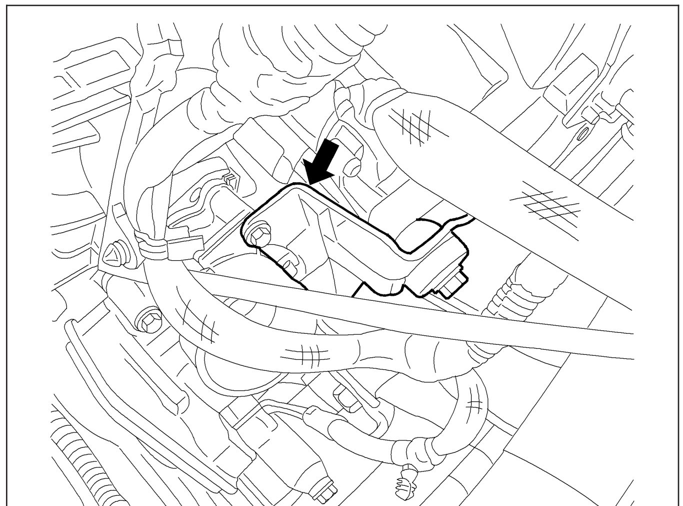


5. Remove the electrical connectors from the throttle body.



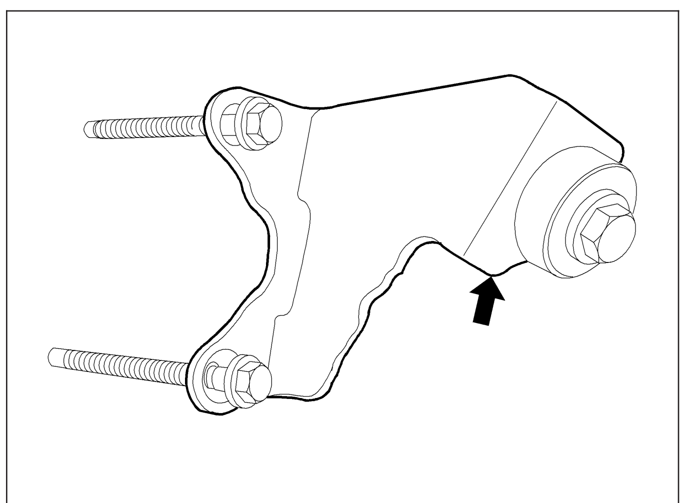
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6. Remove throttle body support bracket and bolts.



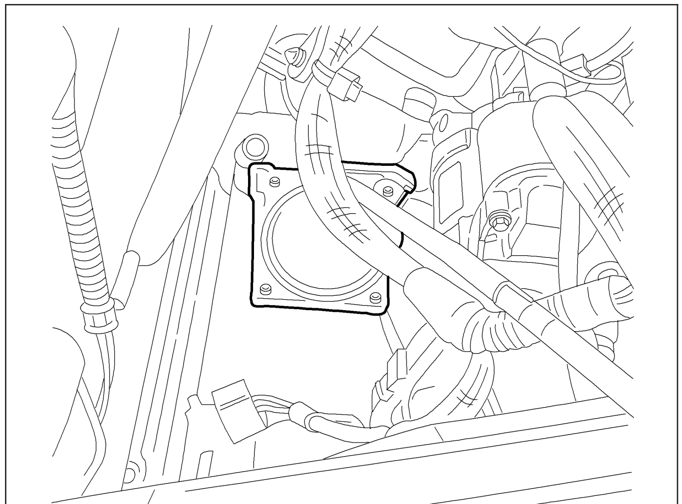
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7. Bracket removed and bolts.

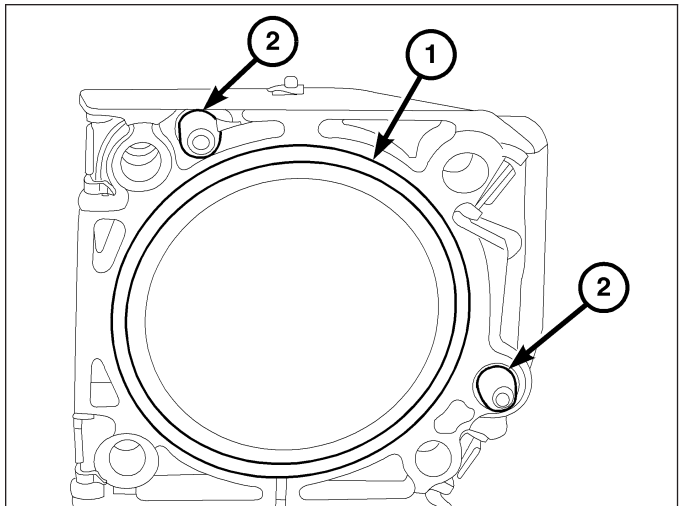


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8. Remove throttle body mounting bolts.


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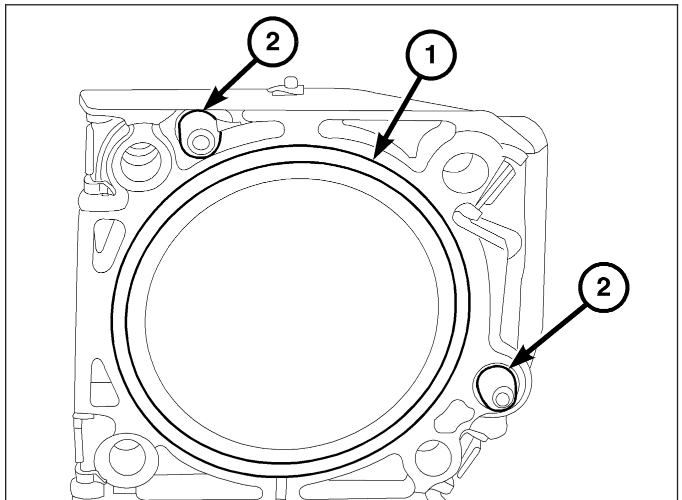
9. Throttle body o-ring (1) and location pins (2).



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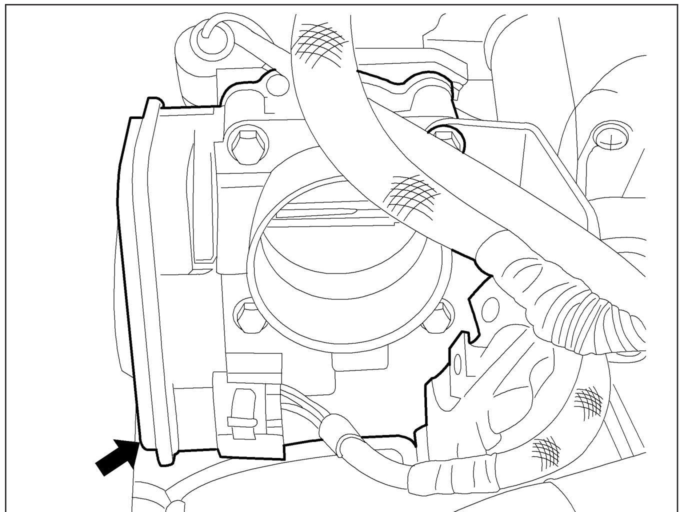
INSTALLATION

1. Make sure that the throttle body gasket (1) is in place in the manifold.



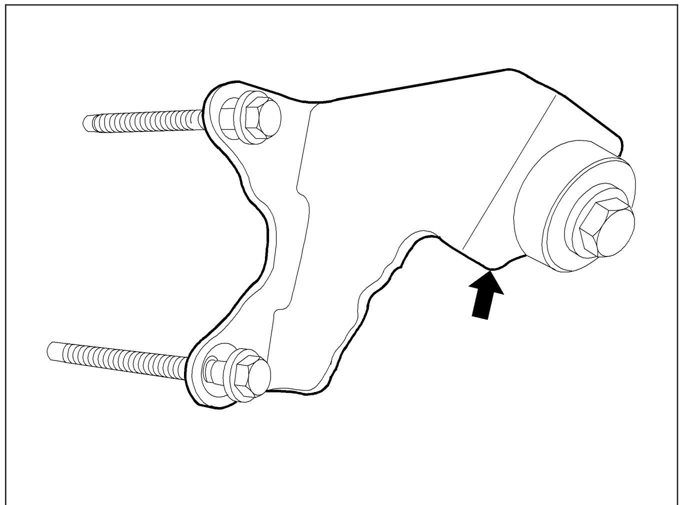
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2. Position throttle body on intake manifold alignment pins and install 2 mounting bolts. Do Not tighten bolts at this time.



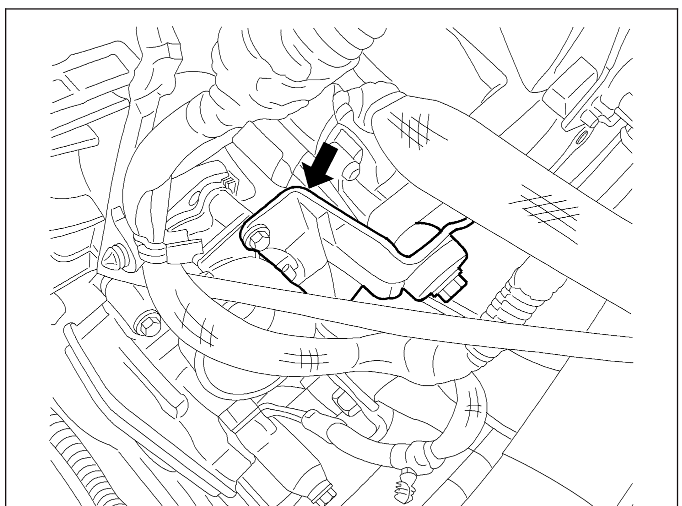
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3. Install throttle body bracket.
4. Tighten throttle body bolts to 9 N·m (79.5 in. lbs.) torque.



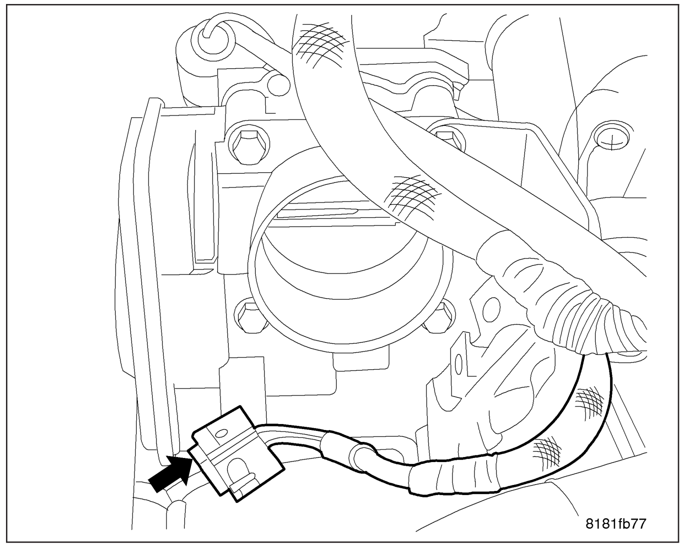
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5. Throttle body bracket installed.

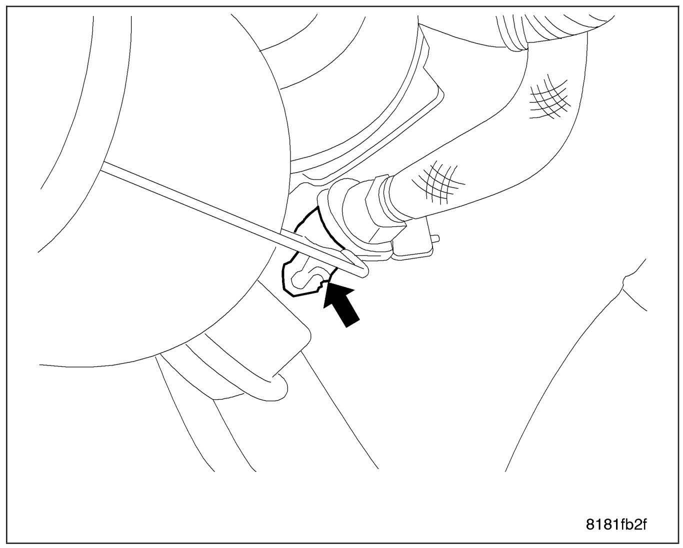


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6. Connect electrical connectors to throttle body.



7. Install air tube and connect wiring harness to air tube.
8. Connect negative battery cable.



MANIFOLD FLOW VALVE

OPERATION

The World Engine is equipped with an intake manifold flow control valve to promote maximum air/fuel atomization. The valve restricts airflow, causing it to tumble or swirl. The tumbling action helps ensure that the fuel and air mix thoroughly and burn faster. The intake manifold flow control valve and variable valve timing work together to improve fuel economy, idle stability, and emissions.

The electrically controlled intake manifold flow control valve is located in the intake manifold at the cylinder head. The intake manifold is constructed of composite material and divided into equal length runners. At the end of each runner is an intake manifold flow control valve flap. The intake manifold flow control valve actuator controls the flaps through a common shaft.

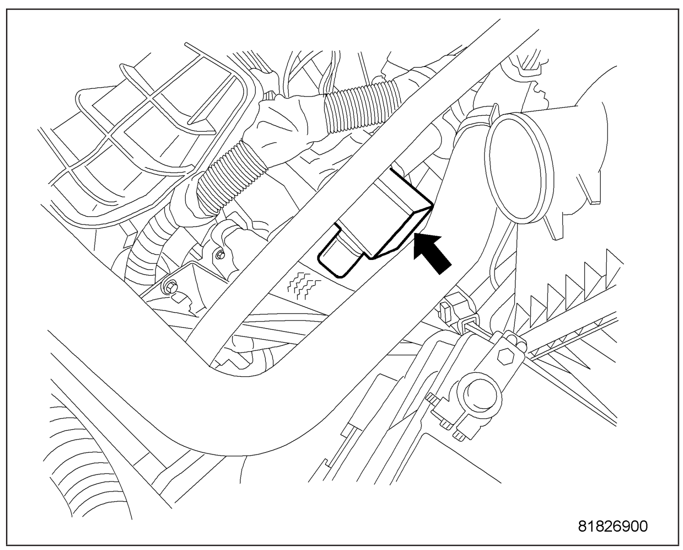
The intake manifold flow control valve actuator is a two-position torque motor that is pulse-width driven by the GPEC1. The actuator is either energized to move the flaps out of the way to the wide-open position or de-energized to move the flaps up, to a restricted position.

The intake manifold flow control valve actuator also contains a potentiometer feedback system to aid in diagnosis. The potentiometer circuit reports the actual position of the intake manifold flow control valve flaps. The GPEC1 compares the actual position with the desired position to ensure that the system is functioning correctly. The intake manifold flow control valve flaps are the mechanical components that restrict airflow to the intake ports. When the valves are moved upward, airflow is restricted and tumble occurs. When the valves are flat against the manifold, the full, unrestricted air charge flows to the intake ports.

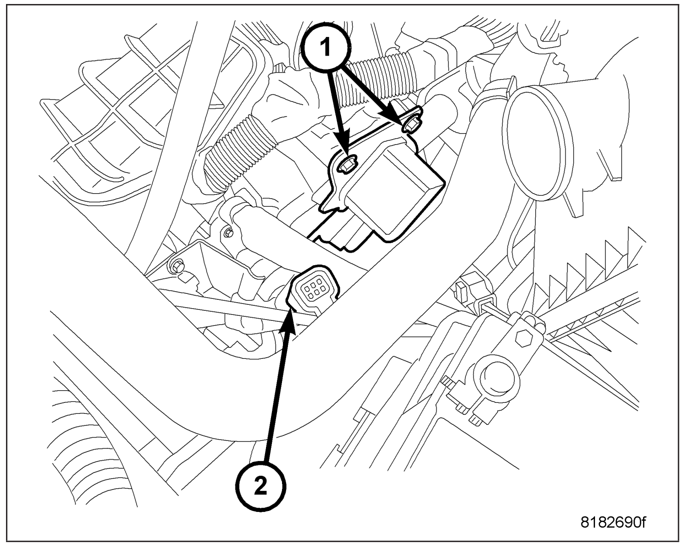
It is energized under specific operating conditions: At high engine speeds (greater than 3600 rpm on the 1.8 and 2.0 liter or greater than 4000 rpm on the 2.4 liter) or at wide-open throttle, the intake manifold flow control valve actuator is energized and the flaps move to the wide-open position, at lower engine speeds (less than 3600 rpm on the 1.8 and 2.0 liter or less than 4000 rpm on the 2.4 liter), the actuator is de-energized allowing the flaps to remain in the restricted position. The flap is held at that position by the return spring.

REMOVAL

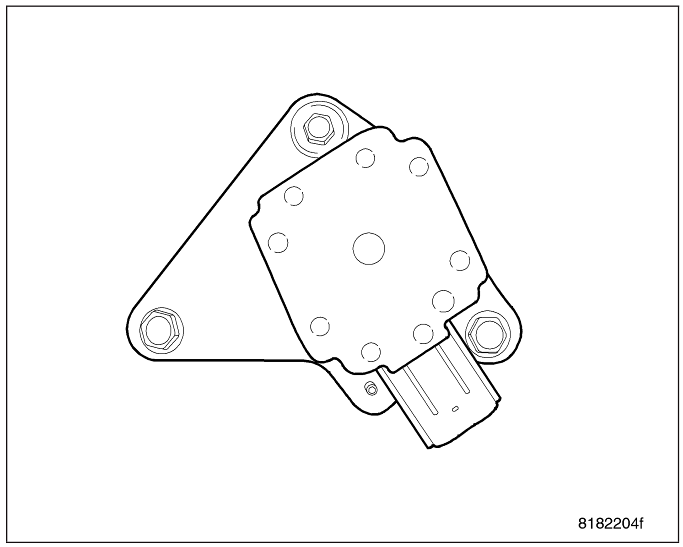
1. Disconnect negative battery cable.
2. Remove air tube,



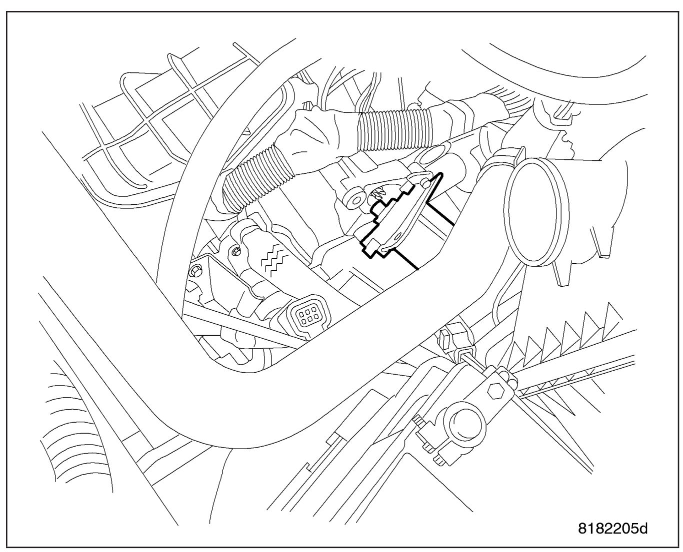
3. Disconnect electrical connector.



4. Remove 3 mounting screws.

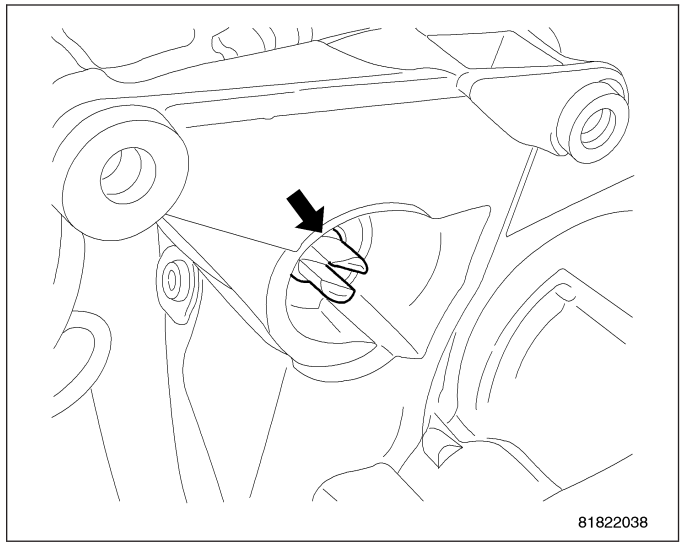


5. Remove valve.

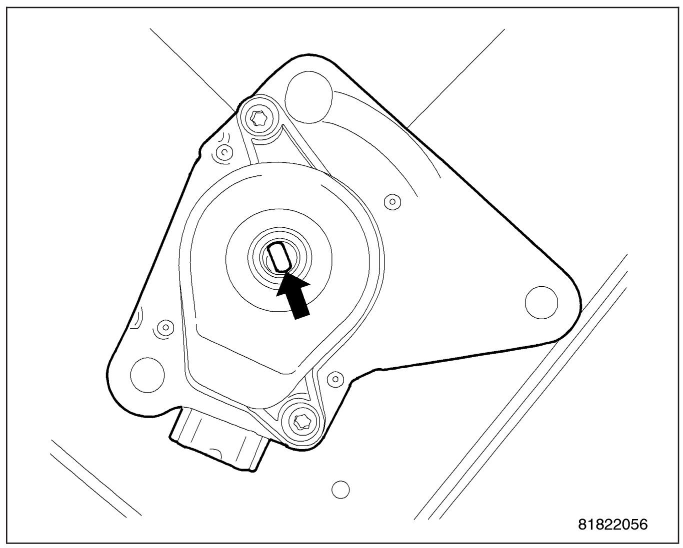


INSTALLATION

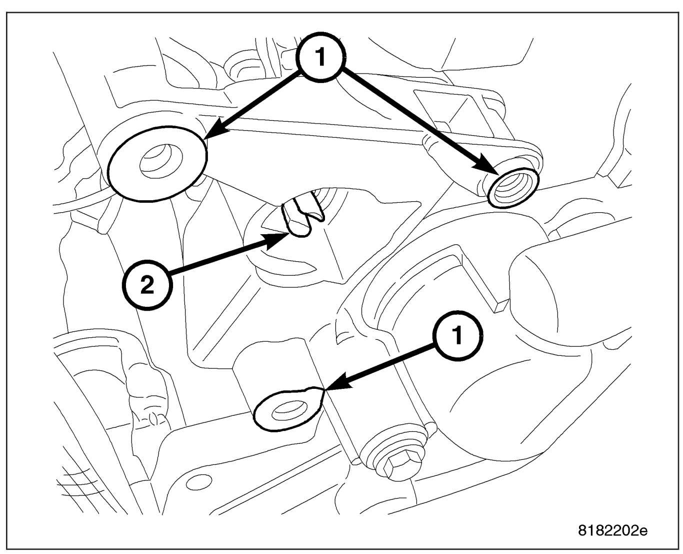
1. Make sure that slot in shaft is not damaged.



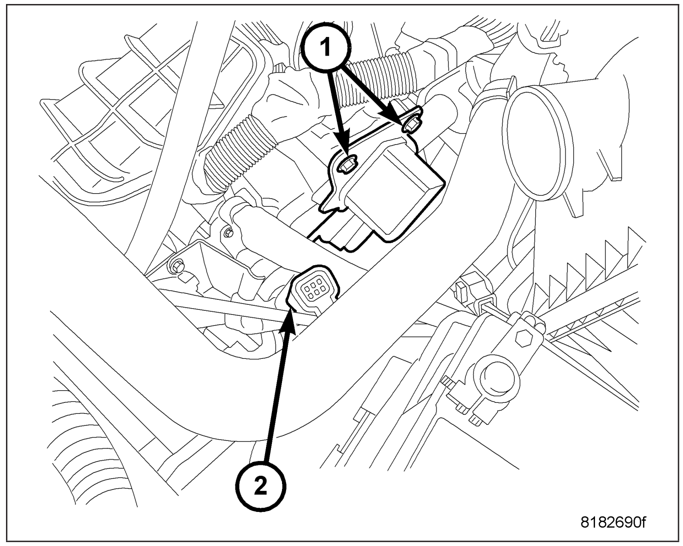
2. Make sure that tab in valve is not damaged.



3. Align tab in valve with slot in intake manifold shaft (2) and rotate valve counterclock-wise until valve drops onto location pin mounting (1).
4. Install mounting screws.



5. Connect electrical connector.
6. Install air tube.
7. Connect negative battery cable.



STEERING

TABLE OF CONTENTS

STEERING

DESCRIPTION - POWER STEERING SYSTEM

This vehicle comes with power steering as standard equipment and it is the only steering system available. The power steering system consists of these major components:

- Power Steering Pump
- Power Steering Gear
- Power Steering Fluid Reservoir
- Power Steering Fluid Pressure Hose
- Power Steering Fluid Return Hose
- Power Steering Fluid Cooler

For information on the first two components, refer to their respective sections within this service manual group. Information on the remaining components can be found in Power Steering Pump.

OPERATION - POWER STEERING SYSTEM

Turning of the steering wheel is converted into linear (side-to-side) travel through the meshing of the helical pinion teeth with the rack teeth within the steering gear. The lateral travel pushes and pulls the tie rods to change the direction of the vehicle's front wheels.

Power assist steering is provided by a belt driven rotary type pump. It directs fluid through power steering fluid hoses to the power steering gear where it is used to assist the driver's turning effort.

Manual steering control of the vehicle can be maintained if power steering assist is lost. However, under this condition, steering effort is significantly increased.

WARNING

WARNINGS AND CAUTIONS

WARNING: Power steering fluid, engine parts and exhaust system may be extremely hot if engine has been running. Do not start engine with any loose or disconnected hoses. Do not allow hoses to touch hot exhaust manifold or catalyst.

WARNING: Fluid level should be checked with the engine off to prevent personal injury from moving parts.

CAUTION: When the system is open, cap all open ends of the hoses, power steering pump fittings or power steering gear ports to prevent entry of foreign material into the components.

DIAGNOSIS AND TESTING

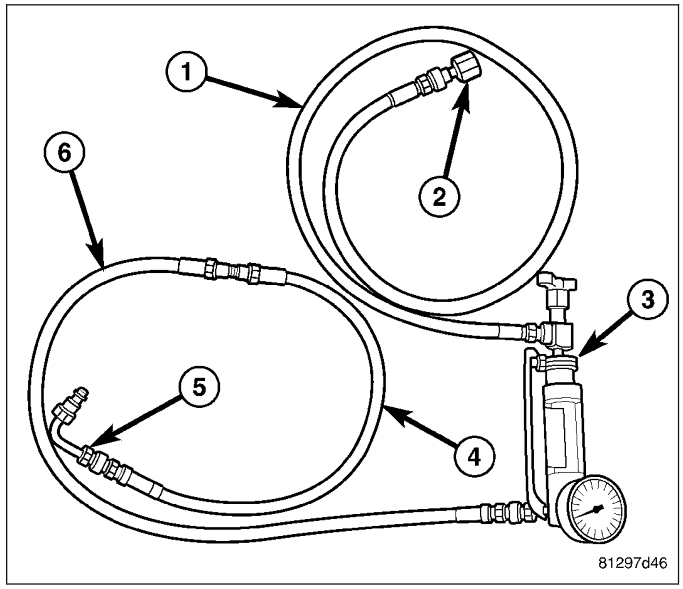
HYDRAULIC FLOW AND PRESSURE TEST

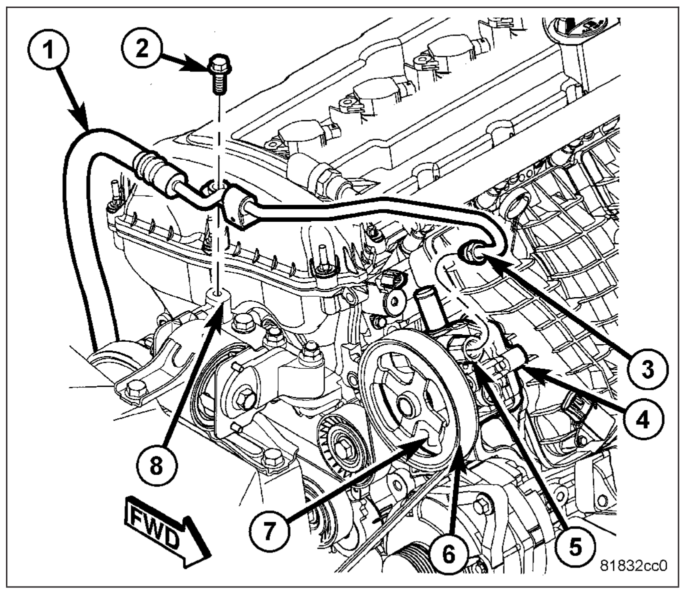
WARNING: To prevent personal injury, safety goggles should be worn at all times while performing any test procedures on the power steering system.

The following procedure is to be used to test the operation of the power steering system on this vehicle. This test will provide the flow rate (Gallons Per Minute (GPM)) of the power steering pump along with the maximum relief pressure. Perform this test any time a power steering system problem is present. This test will help determine if the power steering pump or power steering gear is not functioning properly. The test is performed using tools in the

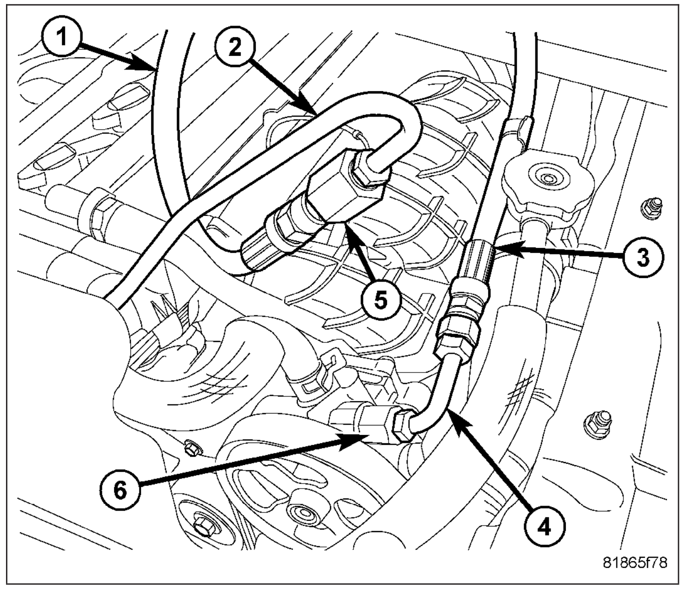
Power Steering Analyzer Kit 6815 with appropriate hoses and adapters. (Refer to 19 - STEERING - SPECIAL TOOLS)

1. Check the power steering belt to ensure it is in good condition and adjusted properly.
2. Assemble the following hoses and adapters on the Flow Meter And Gauge 6800 (1):
   a. Gauge end (inlet) – Hose 6905 (6) (in 6893 kit), Hose 6713 (4) (in 6815 kit), Adapter Tube 6844 (5) (in 6893 kit)
   b. Valve end (outlet) – Hose 6959 (1), Adapter Fitting 6826 (2)





3. Unthread the tube nut (3) and disconnect the power steering pressure hose (1) at the power steering pump pressure fitting (5).
4. Connect the vehicle's power steering pressure hose (2) to Adapter Fitting 6826 (5) (on Hose 6959 (1) leading to Analyzer outlet). Tighten the tube nut to specifications. (Refer to 19 - STEERING - SPECIFICATIONS)
5. Connect Adapter Fitting 6844 (6) (on Hose 6713 (3) leading to Analyzer inlet), to the open power steering pump pressure fitting (6). Tighten the tube nut to pressure hose specifications. (Refer to 19 - STEERING - SPECIFICATIONS)
6. Route the hoses away from the exhaust system as well as possible.



TEST PROCEDURE

1. Completely open the valve on the Power Steering Analyzer flow meter.
2. Start the engine and let idle long enough to circulate power steering fluid through the analyzer and hoses, until the air is out of the fluid. Shut the off engine.
3. Check the power steering fluid level and add fluid as necessary. Start the engine again and let idle.
4. The analyzer gauge should read below 862 kPa (125 psi). If above, inspect the hoses for restrictions and repair as necessary. The initial pressure should be in the range of 345-552 kPa (50-80 psi). The flow meter should read between 1.5 and 1.7 GPM.

CAUTION: The following test procedure step involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than five seconds as the pump could be damaged.

NOTE: Power steering pump maximum relief pressure is 9308 to 9998 kPa (1350 to 1450 psi.).

5. Close the flow meter valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**
   - If the power steering pump pressures are above specifications, but not within 345 kPa (50 psi) of each other, replace the power steering pump.
   - If the pressures are within 345 kPa (50 psi) of each other, but below specifications, replace the power steering pump.

If the power steering pump requires replacement, (Refer to 19 - STEERING/PUMP - REMOVAL).

CAUTION: During the next step, do not force the pump to operate against the stops for more than 5 seconds at a time as pump damage may result.

6. Completely open the valve on the Power Steering Analyzer flow meter. Turn the steering wheel to the extreme left until the stop in the steering gear is met, then turn the steering wheel to the right until the right stop is met. Record the highest indicated pressure at each position. Compare the recorded readings to the specifications. If the highest output pressure reading against one stop is not within 345 kPa (50 psi) of the highest reading at the other stop, the steering gear is leaking internally and must be replaced.

If the power steering gear requires replacement, (Refer to 19 - STEERING/GEAR - REMOVAL).

STEERING DIAGNOSIS CHARTS

NOTE: There are three diagnosis charts following that cover the topics Power Steering Noise, Steering Wheel Feel, and Power Steering Fluid.

POWER STEERING NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONABLE HISS OR WHISTLE*	1. Damaged or mispositioned steering column shaft/coupling dash panel seal.	1. Reposition steering column/shaft. Lubricate dash panel seal or replace dash panel seal as necessary.
	2. Noisy valve in power steering gear.	2. Replace power steering gear.
RATTLE OR CLUNK	1. Power steering gear loose on front suspension crossmember.	1. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.
	2. Front suspension crossmember mounting fasteners loose at frame.	2. Tighten the front suspension crossmember mounting fasteners to the specified torque.
	3. Loose tie rod (outer or inner).	3. Check tie rod pivot points for wear. Replace worn/loose parts as required.
	4. Loose lower control arm mounting bolts at front suspension crossmember.	4. Tighten control arm mounting bolts to the specified torques.
	5. Loose strut assembly mounting fasteners at strut tower.	5. Tighten strut assembly fasteners to the specified torques.
	6. Power steering fluid pressure hose touching the body of the vehicle.	6. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing.
	7. Internal power steering gear noise.	7. Replace power steering gear.
	8. Damaged front suspension crossmember.	8. Replace front suspension crossmember.
CHIRP OR SQUEAL (POWER STEERING PUMP)	1. Loose power steering pump drive belt.	1. Check and replace automatic belt tensioner as necessary. Replace belt if worn or glazed.
WHINE OR GROWL (POWER STEERING PUMP)**	1. Low fluid level.	1. Fill power steering fluid reservoir to proper level and check for leaks.
	2. Power steering hose touching vehicle body or frame.	2. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing. Replace hose if damaged.
	3. Extreme wear of power steering pump internal components.	3. Replace power steering pump and flush system as necessary.
SUCKING AIR SOUND	1. Loose clamp on power steering fluid return hose.	1. Tighten or replace hose clamp.
	2. Missing O-Ring on power steering hose connection.	2. Inspect connection and replace O-Ring as required.

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Low power steering fluid level. 4. Air leak between power steering fluid reservoir and power steering pump.	3. Fill power steering fluid reservoir to proper level and check for leaks. 4. Replace power steering pump (with reservoir).
SQUEAK OR RUBBING SOUND	1. Steering column shroud rubbing. 2. Steering column shaft rubbing. 3. Steering column shaft dry-rubbing seal at dash panel. 4. Steering gear internally noisy.	1. Realign shrouds as necessary. 2. Move or realign item rubbing shaft. 3. Lubricate contact surface. 4. Replace steering gear.
SCRUBBING OR KNOCKING NOISE	1. Incorrect tire or wheel size. 2. Interference between steering gear and other vehicle components. 3. Steering gear internal stops worn excessively.	1. Replace incorrect size tire or wheel with size used as original equipment. 2. Check for bent or misaligned components and correct as necessary. 3. Replace steering gear.

NOTE: * There is some noise in all power steering systems. One of the most common is a hissing sound evident when turning the steering wheel when at a standstill or when parking and the steering wheel is at the end of its travel. Hiss is a very high frequency noise similar to that experienced while slowly closing a water tap. The noise is present in every valve and results when high velocity fluid passes valve orifice edges. There is no relationship between this noise and the performance of the steering system.

NOTE: ** Power steering pump growl results from the development of high pressure fluid flow. Normally this noise level should not be high enough to be objectionable.

STEERING WHEEL FEEL

CONDITION	POSSIBLE CAUSES	CORRECTION
STEERING WHEEL/ COLUMN CLICKING, CLUNKING OR RATTLING	1. Loose steering coupling pinch bolt. 2. Steering column bearings.	1. Replace pinch bolt and torque to specifications. 2. Replace steering column.
STEERING WHEEL HAS FORE AND AFT LOOSENESS	1. Steering wheel retaining screw not properly tightened and torqued.	1. Tighten the steering wheel retaining nut to its specified torque.
STEERING WHEEL OR DASH VIBRATES DURING LOW SPEED OR STANDSTILL STEERING MANEUVERS	1. Air in the fluid of the power steering system. 2. Tires not properly inflated. 3. Excessive engine vibration. 4. Engine torque struts out of alignment.	1. Bleed air from system following the power steering pump initial operation service procedure.* 2. Inflate tires to the specified pressure. 3. Ensure that the engine is running properly. 4. Align engine torque struts.

CONDITION	POSSIBLE CAUSES	CORRECTION
	5. Loose tie rod end jam nut.	5. Tighten the inner to outer tie rod jam nut to the specified torque.
	6. Overcharged air conditioning system.	6. Check air conditioning pump head pressure and correct as necessary.
STEERING CATCHES, STICKS IN CERTAIN POSITIONS OR IS DIFFICULT TO TURN	1. Low power steering fluid level.	1. Fill power steering fluid reservoir to specified level and check for leaks.
	2. Tires not inflated to specified pressure.	2. Inflate tires to the specified pressure.
	3. Lack of lubrication in front suspension control arm ball joints.	3. Lubricate ball joints if ball joints are not a lubricated for life type ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	4. Lack of lubrication in steering gear outer tie rod ends.	4. Lubricate tie rod ends if they are not a lubricated for life type. If tie rod end is a lubricated for life type, replace tie rod end.
	5. Loose power steering pump drive belt.	5. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	6. Faulty power steering pump flow control (Follow Power Steering System Flow and Pressure Test procedure).	6. Replace power steering pump.
	7. Excessive friction in steering column or intermediate shaft.	7. Isolate and correct condition.
	8. Binding upper strut bearing.	8. Disassemble strut assembly. Correct binding condition in strut bearing or replace bearing.
	9. Excessive friction in power steering gear.	9. Replace power steering gear.
STIFF, HARD TO TURN, SURGE, MOMENTARY INCREASE IN EFFORT WHEN TURNING	1. Tires not properly inflated.	1. Inflate tires to specified pressure.
	2. Low power steering fluid level.	2. Add power steering fluid as required to power steering fluid reservoir to obtain proper level. Check for leaks.
	3. Loose power steering pump drive belt.	3. Check and replace automatic belt tensioner as necessary. If drive belt is worn or glazed, replace belt.
	4. Lack of lubrication in control arm ball joints.	4. Lubricate ball joints if ball joints are not a lubricated for life type ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	5. Low power steering pump pressure (Follow Power Steering System Flow and Pressure Test procedure).	5. Replace the power steering pump as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
	6. High internal leak in power steering gear (Follow Power Steering System Flow and Pressure Test procedure).	6. Replace power steering gear.
STEERING WHEEL DOES NOT RETURN TO CENTER POSITION	1. Tires not inflated properly.	1. Inflate tires to specified pressure.
	2. Improper front wheel alignment.	2. Check and adjust wheel alignment as necessary.
	3. Lack of lubrication in front suspension control arm ball joints.	3. Lubricate ball joints if ball joints are not a lubricated for life type of ball joint. If ball joint is a lubricated for life ball joint, replace ball joint or control arm.
	4. Steering column coupling joints misaligned.	4. Realign steering column coupling joints.
	5. Steering wheel rubbing.**	5. Adjust steering column shrouds to eliminate rubbing condition.
	6. Damaged, mis-positioned or un-lubricated steering column coupler to dash seal.**	6. Replace, reposition, or lubricate dash seal.
	7. Binding upper strut bearing.	7. Disassemble strut assembly. Correct binding condition in strut bearing or replace bearing.
	8. Tight shaft bearing in steering column.	8. Replace the steering column.
	9. Excessive friction in steering column coupling.	9. Replace steering column coupling.
	10. Excessive friction in power steering gear.	10. Replace power steering gear.
EXCESSIVE STEERING WHEEL KICKBACK OR TOO MUCH STEERING WHEEL FREE PLAY	1. Air in the fluid of the power steering system.	1. Bleed air from system following the power steering pump initial operation service procedure.*
	2. Power steering gear loose on front suspension crossmember.	2. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.
	3. Steering column coupling worn, broken or loose.	3. Replace steering column coupling and pinch bolt. Tighten to specifications.
	4. Free play in steering column.	4. Check all components of the steering system and repair or replace as required.
	5. Worn control arm ball joints.	5. Replace ball joint or control arm as required.
	6. Loose steering knuckle to ball joint stud pinch bolt.	6. Inspect pinch bolts, replace as necessary, and tighten to specified torque.
	7. Front wheel bearings loose or worn.	7. Replace wheel bearing or knuckle as necessary.
	8. Loose outer tie rod ends.	8. Replace outer tie rod ends that have excessive free play.
	9. Loose inner tie rod ends.	9. Replace power steering gear.

CONDITION	POSSIBLE CAUSES	CORRECTION
	10. Defective steering gear rotary valve.	10. Replace power steering gear.

NOTE: * Steering shudder can be expected in new vehicles and vehicles with recent steering system repairs. Shudder should dissipate after the vehicle has been driven several weeks.

NOTE: ** To evaluate this condition, it may be necessary to disconnect the coupling at the base of the steering column. Turn the steering wheel and feel or listen for internal rubbing in steering column. To avoid damaging the column clockspring, note the following. Before disconnecting coupling, place tires in the straight-ahead position and center steering wheel. Once disconnected, DO NOT rotate steering wheel more than one revolution in either direction and place steering wheel in original location before reconnecting coupling. If this position is lost, the steering column clockspring must be re-centered following the procedure found within the procedure for steering column installation in the steering column section.

POWER STEERING FLUID

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW FLUID LEVEL WITH VISIBLE LEAK	1. Loose power steering hose fittings.	1. Tighten the fitting to its specified torque.
	2. Damaged or missing fitting seal, gasket, or O-ring.	2. Replace as necessary.
	3. Power steering pump or power steering gear leaking.	3. Repair or replace the leaking component as required.
AERATED FLUID*	1. Low fluid level.**	1. Fill power steering fluid reservoir to proper level.
	2. Air leak between power steering fluid reservoir and pump.	2. Inspect for proper sealing. Replace the power steering pump (with reservoir).
	3. Cracked power steering pump housing.	3. Replace the power steering pump.
RESERVOIR FLUID OVERFLOW AND FLUID IS MILKY IN COLOR	1. Water contamination.	1. Drain the power steering fluid from the system. Flush the system with fresh clean power steering fluid, drain, then refill to the proper level.

NOTE: * Aerated fluid will appear with bubbles or foam, somewhat like champagne, when viewed through the reservoir fill opening.

NOTE: ** Extremely cold temperatures may cause power steering fluid aeration, if the power steering fluid is low.

STANDARD PROCEDURE

POWER STEERING SYSTEM BLEEDING

WARNING: The fluid level should be checked with engine off to prevent injury from moving components.

CAUTION: Mopar® Power Steering Fluid + 4 or Mopar® ATF+4 Automatic Transmission Fluid is to be used in the power steering system. Both Fluids have the same material standard specifications (MS-9602). No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if another fluid is used. Do not overfill the system.

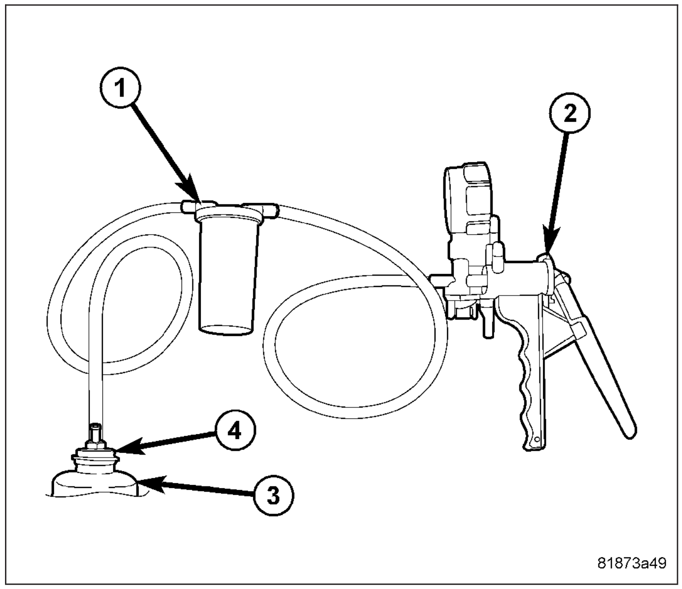
CAUTION: If the air is not purged from the power steering system correctly, pump failure could result.

NOTE: Be sure the vacuum tool used in the following procedure is clean and free of any fluids.

1. Check the fluid level. As measured on the side of the reservoir, the level should indicate between MAX and MIN when the fluid is at normal ambient temperature. Adjust the fluid level as necessary. (Refer to 19 - STEERING/PUMP/FLUID - STANDARD PROCEDURE)
2. Tightly insert Power Steering Cap Adapter (4), Special Tool 9688, into the mouth of the reservoir (3).

CAUTION: Failure to use a the vacuum pump reservoir (1) may allow power steering fluid to be sucked into the hand vacuum pump.

3. Attach Hand Vacuum Pump (2), Special Tool C-4207 or equivalent, with reservoir (1) attached, to the Power Steering Cap Adapter (4).



CAUTION: Do not run the engine while vacuum is applied to the power steering system. Damage to the power steering pump can occur.

NOTE: When performing the following step make sure the vacuum level is maintained during the entire time period.

4. Using Hand Vacuum Pump (1), apply 68-85 kPa (20-25 in. Hg) of vacuum to the system for a minimum of three minutes.
5. Slowly release the vacuum and remove the special tools.
6. Adjust the fluid level as necessary. Refer to Step 1.
7. Repeat Step 1 through Step 6 until the fluid no longer drops when vacuum is applied.
8. Start the engine and cycle the steering wheel lock-to-lock three times.

NOTE: Do not hold the steering wheel at the stops.

9. Stop the engine and check for leaks at all connections.
10. Check for any signs of air in the reservoir and check the fluid level. If air is present, repeat the procedure as necessary.

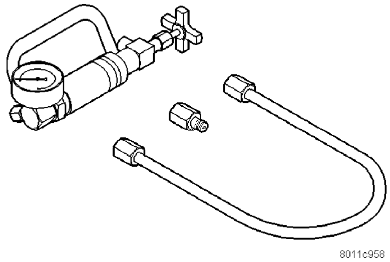
SPECIFICATIONS

STEERING FASTENER TORQUE

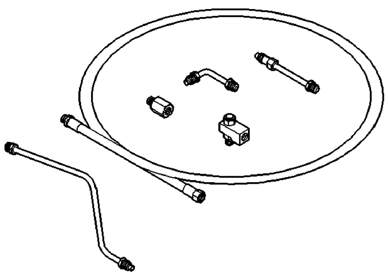
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Cooler Mounting Screws	8	6	71
Gear Mounting Bolts	70	52	—
Hose Routing Clamp Screws To Crossmember	8	6	71
Hose Tube Nut At Gear	32	24	—
Hose Tube Nut At Pump	32	24	—
Pump Pressure Fitting	88	65	—
Pump Mounting Bolts - Gas Engine	20	15	177
Pump Mounting Bolts - Diesel Engine	26	19	230
Reservoir Mounting Screw	12	9	106
Pressure Hose Routing Clamp Bolt To Exhaust Manifold	9	6.5	80
Pressure Hose Routing Clamp Nut To Engine Rear - Diesel	24	18	212
Suspension Crossmember Mounting Bolts	190	140	—
Tie Rod End-to-Knuckle Nut	54	40	—
Tie Rod Jam Nut	75	55	—

SPECIAL TOOLS

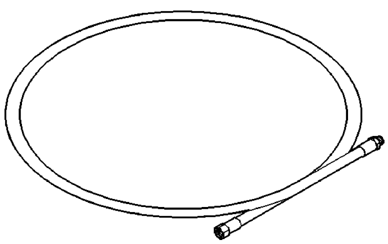
STEERING



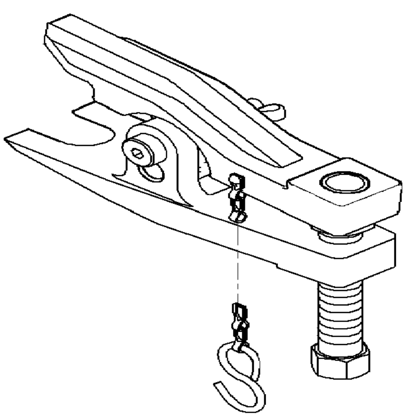
Kit, Power Steering Analyzer 6815



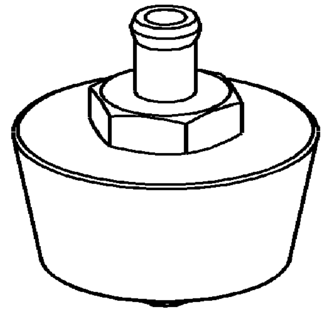
Kit, Power Steering Adapter 6893



Hose, Power Steering Analyzer 6959



Remover, ball joint 9360



Adapter, Power Steering Cap 9688

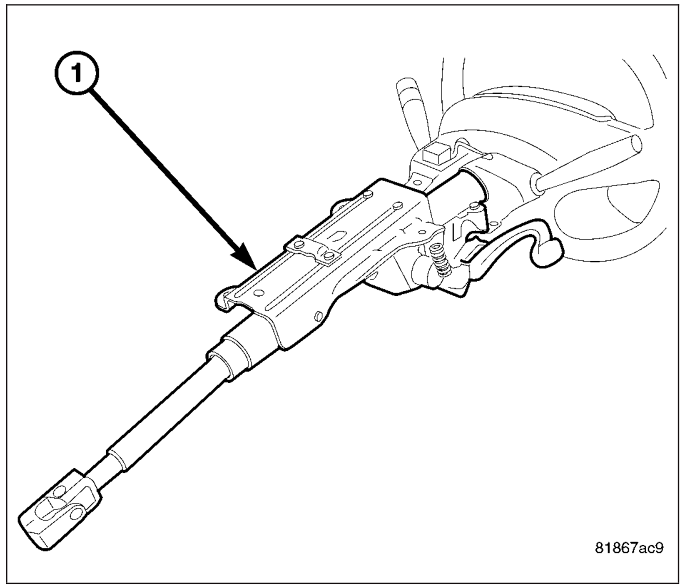
COLUMN

TABLE OF CONTENTS

COLUMN

DESCRIPTION

This vehicle is equipped with a tilt type steering column (1). The steering column is designed to be serviced only as complete assembly if an internal component is found to be defective. The shaft, bearings and intermediate shaft are all serviced with the column.

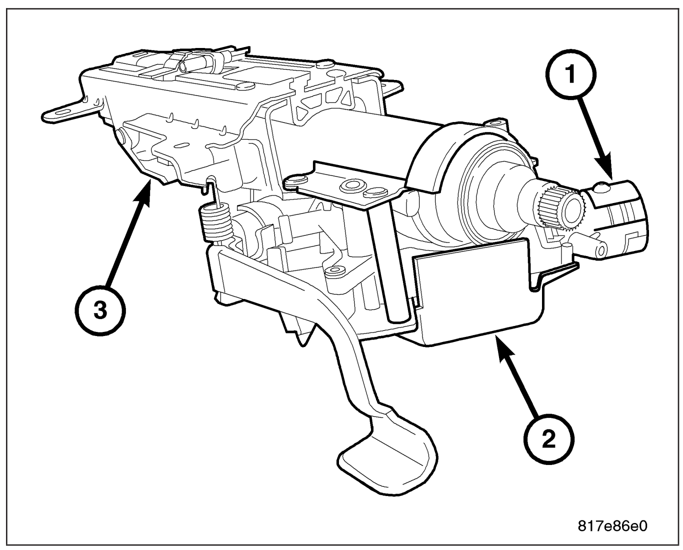


The serviceable components on the steering column assembly are:

- Clockspring (Integral part of Steering Column Control Module (SCCM))
- Driver Airbag
- Ignition Switch
- Key Cylinder
- Lock Cylinder Housing
- Multi-Function Switches (left and right)
- Tilt Lever
- Shrouds
- Steering Wheel

These components can be serviced without removal of the steering column from the vehicle. Refer to the appropriate section for servicing these components separately.

A special steering column is used in some Export areas meeting Thatcham security requirements. This steering column (3) is much the same as the standard steering column except for the addition of a tamper-proof shield (2) around the lock cylinder housing and an antitheft cup (1) surrounding the key cylinder. The tamper-proof shield disallows service of the lock cylinder housing. The antitheft cup can be removed allowing access to the key cylinder for service purposes.



The Thatcham steering column also features a ratcheting slip collar. This collar is not serviceable.

WARNING

WARNINGS AND CAUTIONS

WARNING: Safety goggles should be worn at all times when working on steering columns.

WARNING: Before beginning any service procedures that involves removing the air bag: Remove and isolate the negative (-) battery cable (ground) from the vehicle battery. This is the only sure way to disable the air bag system. Failure to do this could result in accidental air bag deployment and possible personal injury.

WARNING: The air bag system is a sensitive, complex electro-mechanical unit. Before attempting to diagnose, remove or install the air bag system components you must first disconnect and isolate the battery negative (ground) cable. Failure to do so could result in accidental deployment of the air bag and possible personal injury. The fasteners, screws, and bolts, originally used for the air bag components, have special coatings and are specifically designed for the air bag system. They must never be replaced with any substitutes. Anytime a new fastener is needed, replace with the correct fasteners provided in the service package or fasteners listed in the parts books. Before servicing a steering column equipped with an air bag, (REFER to 8 - Electrical/Restraints - Warning).

WARNING: When handling an undeployed air bag during servicing of the steering column, the following precautions should be observed:
- **At no time should any source of electricity be permitted near the inflator on the back of the air bag.**
- **When carrying a live air bag, the trim cover should be pointed away from the body to minimize injury if the air bag should accidently deploy.**
- **If the air bag is placed on a bench or other surface, the plastic cover should be face-up to minimize movement, in case of accidental deployment.**

CAUTION: Disconnect negative (ground) cable from the battery before servicing any column component.

CAUTION: Do not attempt to remove the pivot pins to disassemble the tilting mechanism. Damage will occur.

DIAGNOSIS AND TESTING

STEERING COLUMN

For diagnosis of conditions relating to the steering column, (Refer to 19 - STEERING - DIAGNOSIS AND TESTING).

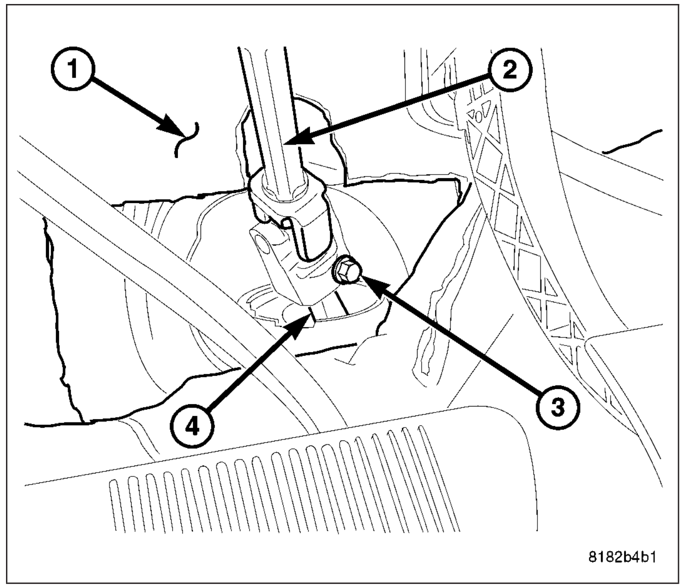
REMOVAL

NOTE: Before proceeding, (Refer to 19 - STEERING/COLUMN - WARNING).

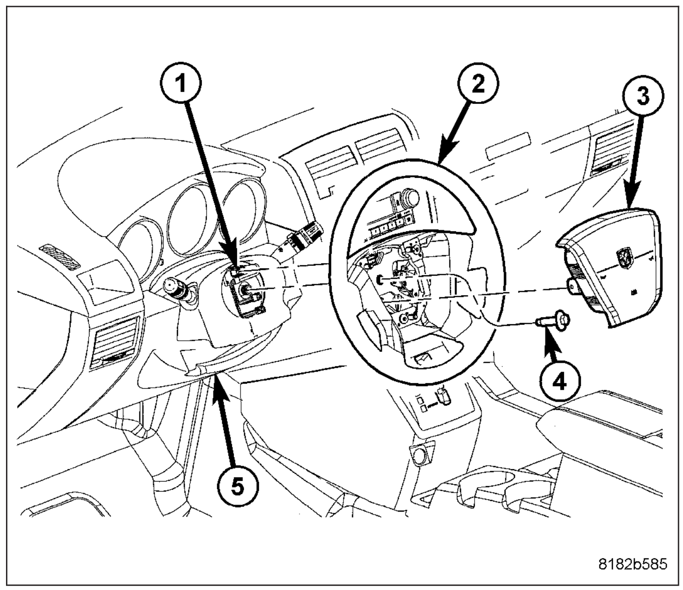
WARNING: When an undeployed airbag module is to be removed from the vehicle, first disconnect the battery ground cable and isolate it. Allow the system capacitor to discharge for a minimum of two minutes before starting any removal.

1. Disconnect the negative (-) cable from the battery and isolate the cable.

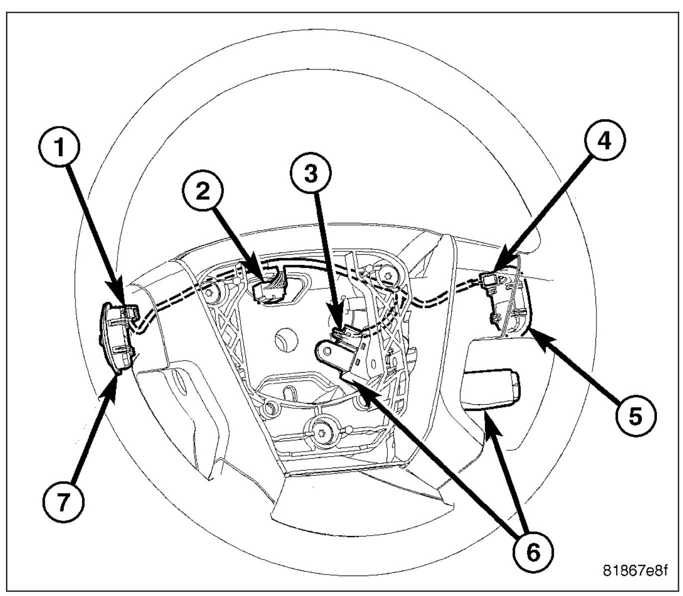
2. Reposition the floor carpeting to access the steering column coupling at the base of the column.
3. Position the front wheels of vehicle in the STRAIGHT-AHEAD position, then turn the steering wheel to the right until the pinch bolt (3) at the base of the column can be accessed.
4. Remove the pinch bolt (3). **Do not separate the intermediate shaft (2) from the steering gear pinion shaft (4) at this time.**
5. Return the front wheels of vehicle (and steering wheel) to the STRAIGHT-AHEAD position.



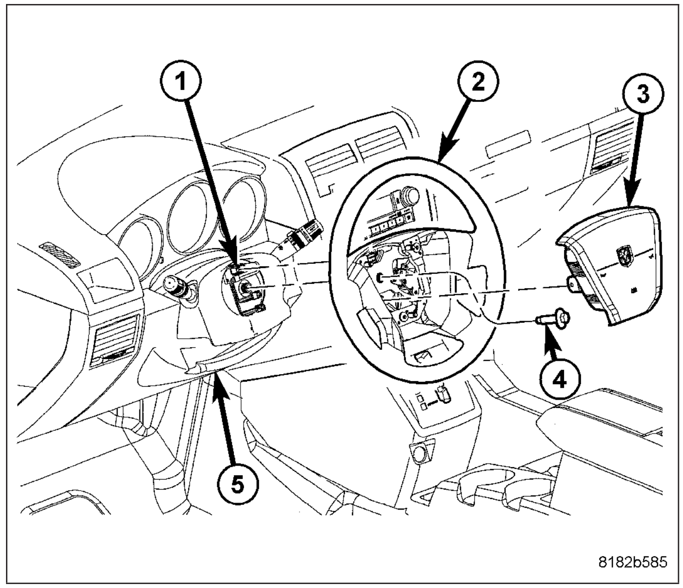
6. Remove the driver airbag (3). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL)



7. Disconnect the wiring connector (2) at the clockspring.

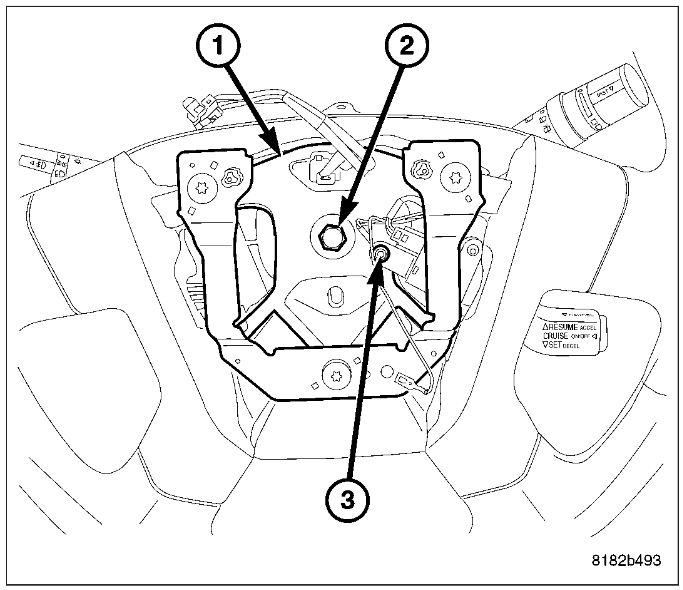


8. Holding the steering wheel firmly in place, remove the steering wheel retaining bolt (4) from the steering column shaft.



CAUTION: Threading the retaining bolt (2) back in the end of the shaft until approximately 13 mm (0.5 in.) of thread is showing between the wheel and the head of the bolt allows a safe reaction surface for the puller to work against.

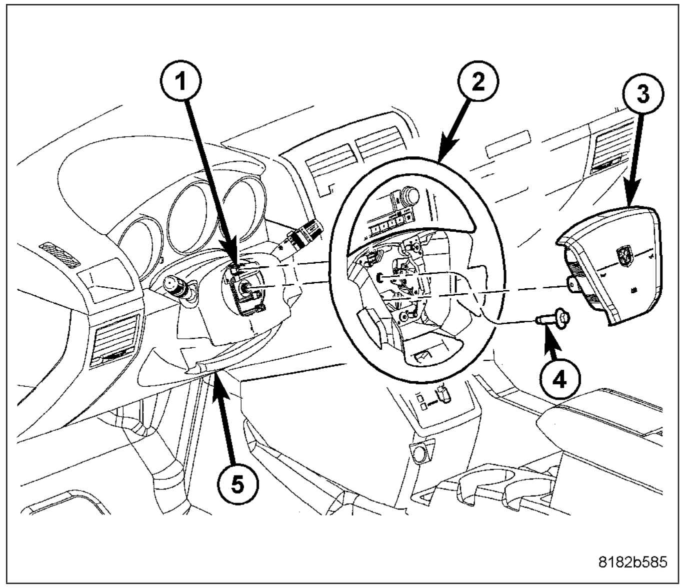
9. Thread the steering wheel retaining bolt (2) back into the end of the steering shaft until approximately 13 mm (0.5 in.) of thread is showing between the wheel and the head of the bolt.
10. Remove the speed control screw (3) in order to install the steering wheel puller.
11. Install an appropriate wheel puller on the steering wheel over the steering shaft (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).



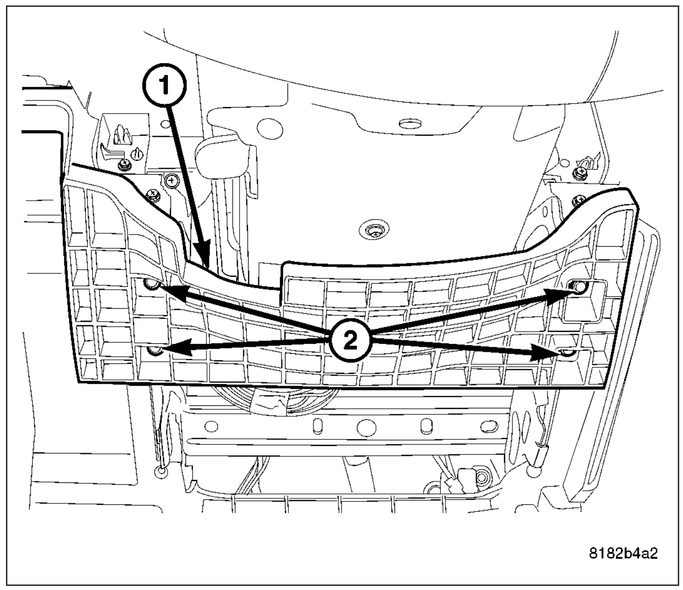
CAUTION: Do not bump or hammer on the steering wheel or steering column shaft when removing the steering wheel.

12. Holding the steering wheel firmly in the STRAIGHT-AHEAD position, release the steering wheel from the steering column shaft splines using the puller. Remove the wheel retainer bolt (2) and the steering wheel from the column.

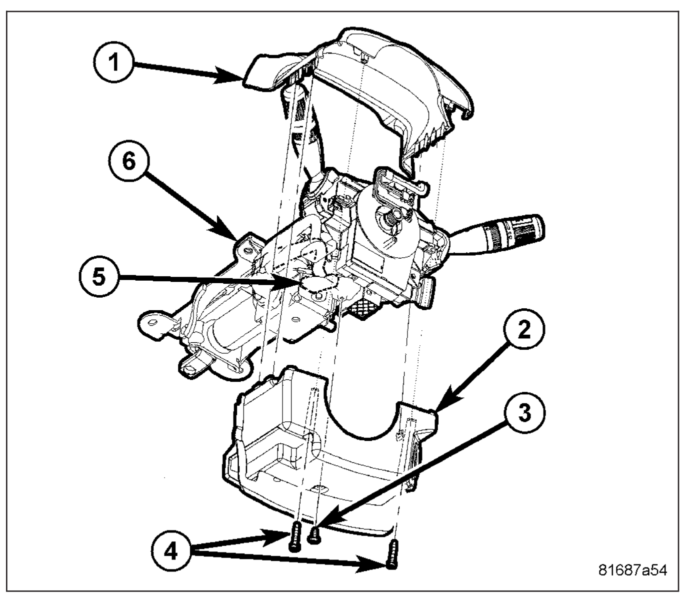
13. Position the column tilt at the full-upward position.
14. Remove the IP side trim (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).
15. Remove the steering column opening cover (5) (Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - REMOVAL).



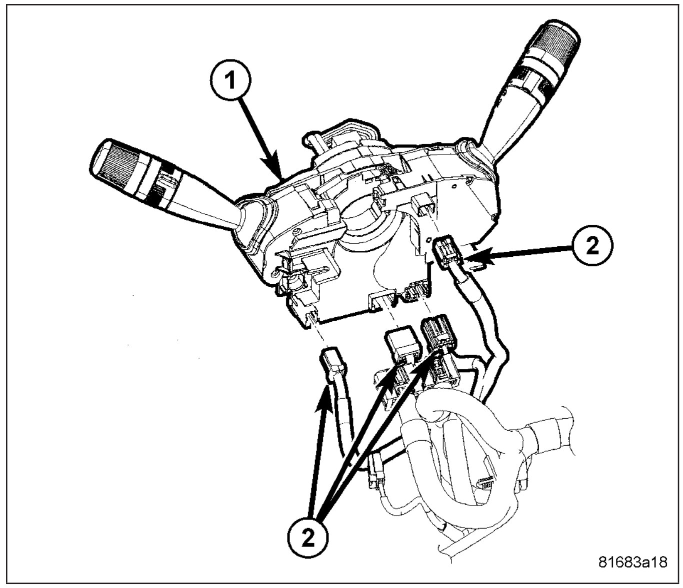
16. Remove the steering column cover reinforcement panel (1) four screws (2).



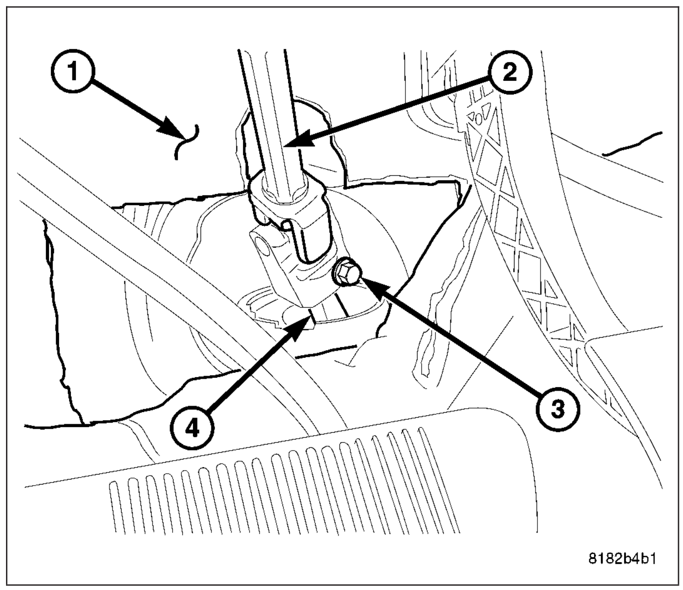
17. Remove the two screws (4) attaching the upper shroud (1) to the lower shroud (2). After removing the screws, unclip the shrouds from each other by applying hand pressure along the seams where the shrouds connect on the sides, then remove the upper shroud.
18. Push the tilt lever (5) downward.
19. Remove the screw (3) attaching the lower shroud (2) to the steering column (6). Remove the lower shroud.
20. Push the tilt lever (5) upward, locking it in place.



21. Disconnect the wiring harness connectors (2) at the Steering Column Control Module (SCCM) (1).
22. Disconnect all other wiring harness connectors at column components.

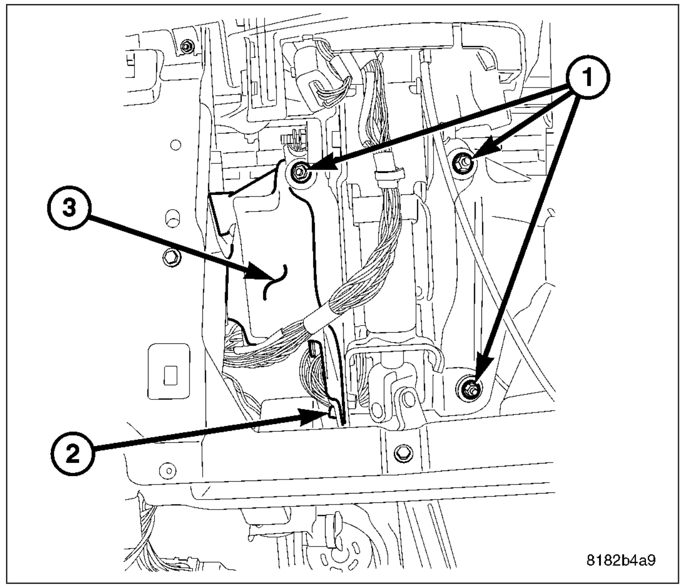


23. If the vehicle is equipped with an automatic transaxle, disconnect the ignition shift interlock cable at the steering column.
24. Separate the intermediate shaft (2) at the base of the column from the steering gear pinion shaft (2).



NOTE: If the same steering column is to be reinstalled, clamp the tilt lever to lock the column in place so that it can be easily reinstalled in the same orientation.

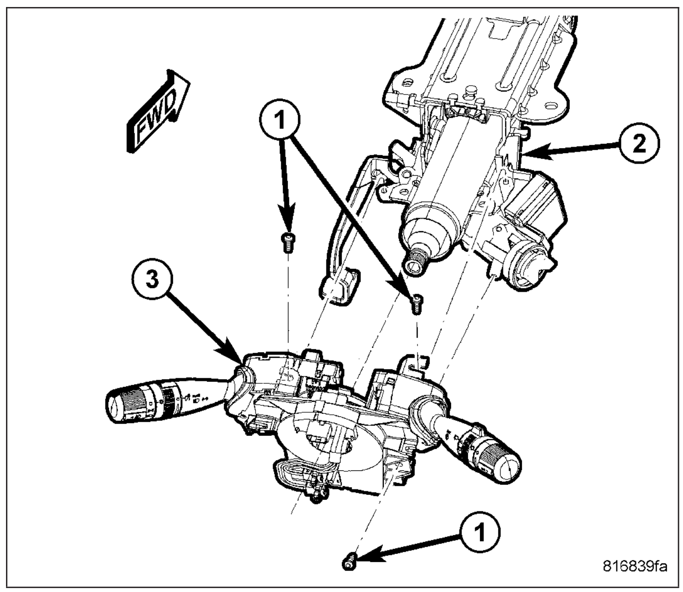
25. Remove the three mounting nuts (1) attaching the steering column to the instrument panel (3).
26. Remove the one mounting bolt (left lower) (2) attaching the steering column to the instrument panel (3).
27. Remove the steering column from the vehicle.
28. To remove remaining components from the column, (Refer to 19 - STEERING/COLUMN - DISASSEMBLY).



DISASSEMBLY

STEERING COLUMN CONTROL MODULE

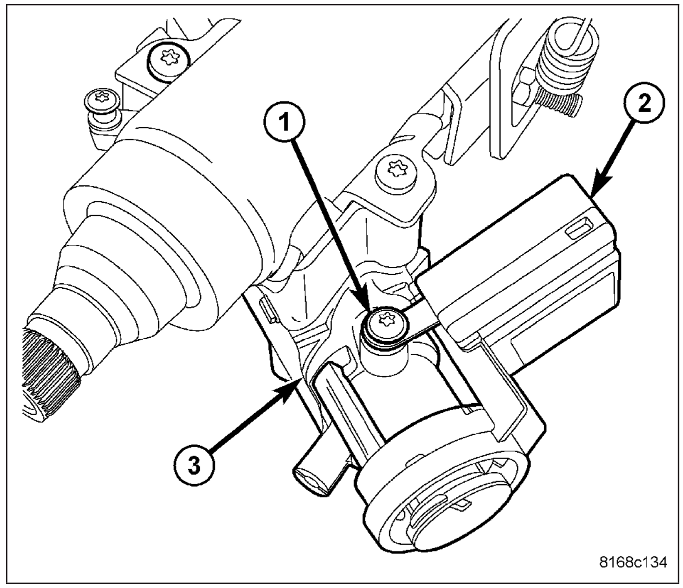
1. Remove the screws (1) attaching the Steering Column Control Module (SCCM) (with switch stalks) (3) to the steering column (2).
2. Slide the SCCM (with switch stalks) (3) off the steering column (2).



SKREEM/WCM (IF EQUIPPED)

NOTE: SCCM previously removed.

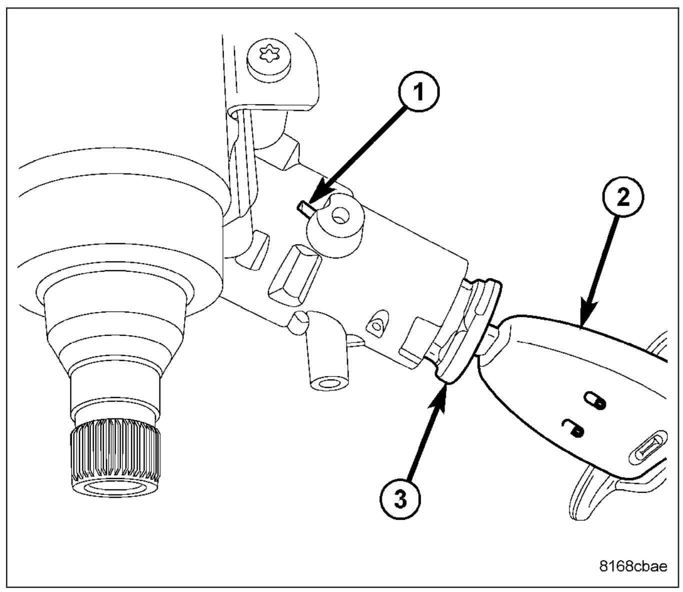
1. Remove the screw (1) fastening the SKREEM/WCM (2) to the lock cylinder housing (3).
2. Unhook the SKREEM/WCM (2) retainer fingers from the lock cylinder housing (3) and remove it from the housing.



KEY CYLINDER

NOTE: SCCM and SKREEM/WCM previously removed.

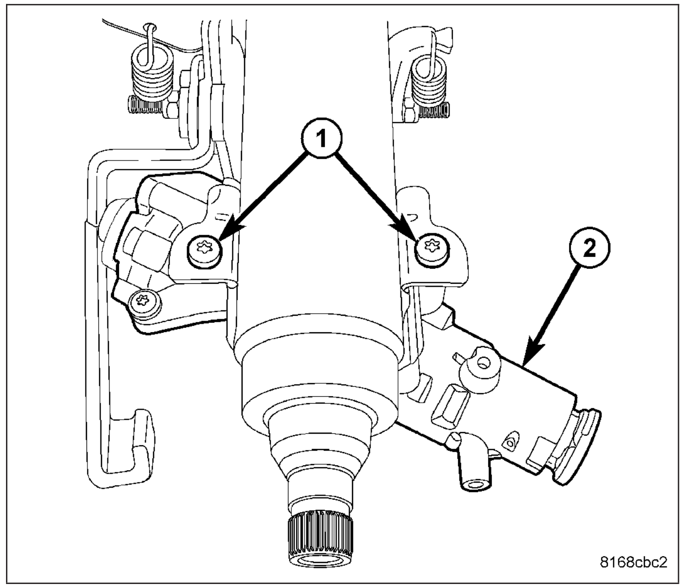
1. Insert the key (2) and turn the key cylinder (3) to the RUN position.
2. Insert an appropriate tool into the slot (1) formed into the lock cylinder housing depressing the key cylinder retaining tab.
3. Pull the key cylinder and key straight out of the lock cylinder housing as one unit.



LOCK CYLINDER HOUSING

NOTE: SCCM previously removed.

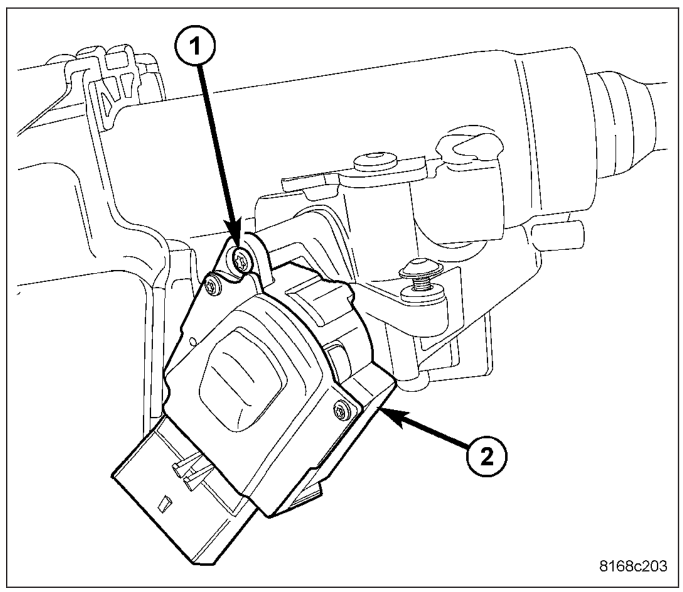
1. Using Tamper-Proof Torx® Plus (five point) 30 bit, remove the two screws (1) fastening the lock cylinder housing (2) to the column.
2. Remove the lock cylinder housing from the steering column.



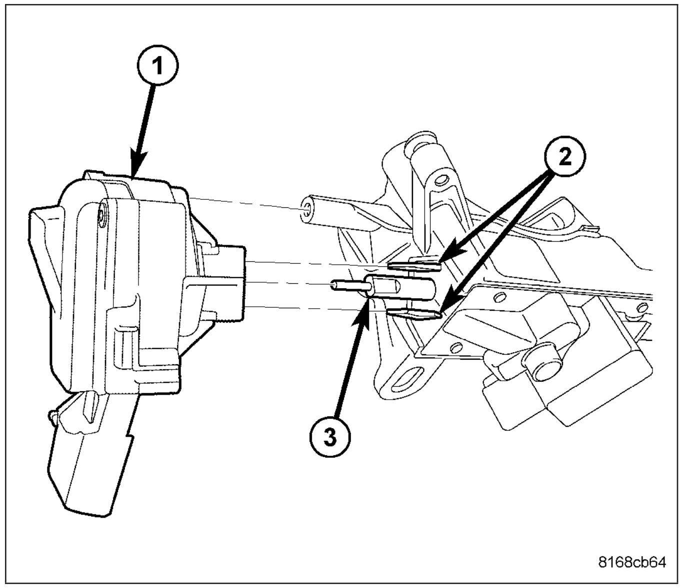
IGNITION SWITCH

NOTE: Lock cylinder housing previously removed.

1. Lower the column tilt lever to the full-downward position.
2. Remove the ignition switch (2) mounting screw (1).



3. Pull the switch (1) straight out and off the retaining tabs (2) located on the lock cylinder housing.



INSPECTION

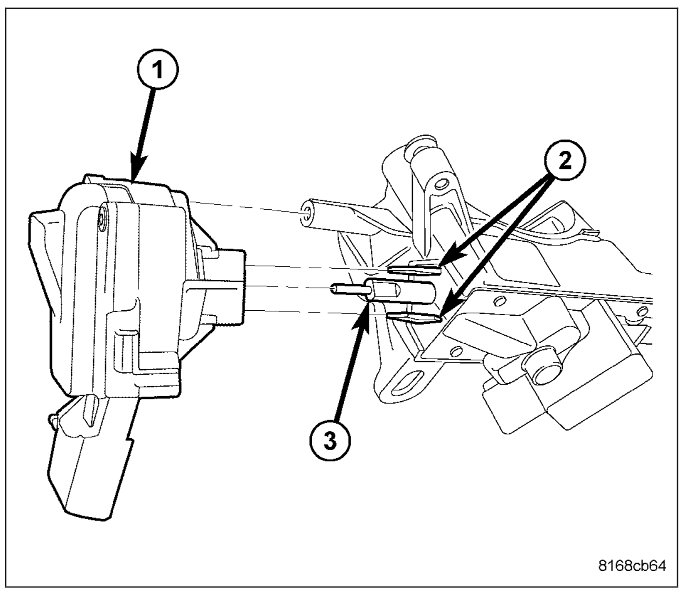
Replace the steering column if the driver airbag has deployed, regardless of the extent of damage to the vehicle.

ASSEMBLY

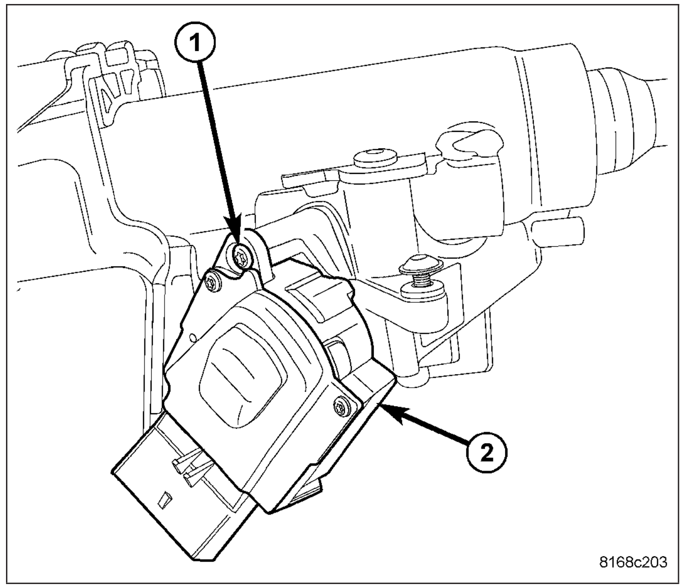
NOTE: Assemble the column components in the order shown to ensure proper installation of all components.

IGNITION SWITCH

1. Ensure the ignition switch is in the RUN position and the actuator shaft in the lock housing is in the RUN position.
2. Align the ignition switch with the pin (3), actuator shaft and retaining tabs (2) located on the lock cylinder housing. Carefully install the switch snapping it into place over the retaining tabs.

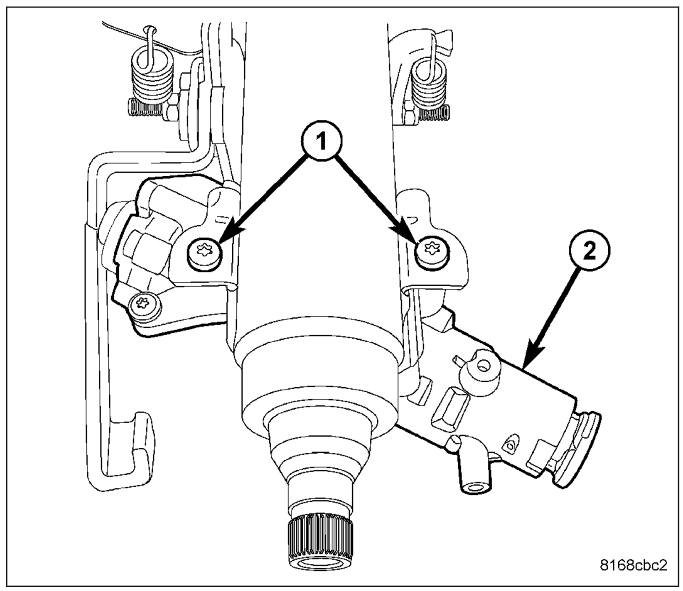


3. Install the ignition switch (2) mounting screw (1). Tighten the screw to 2 N·m (18 in. lbs.).



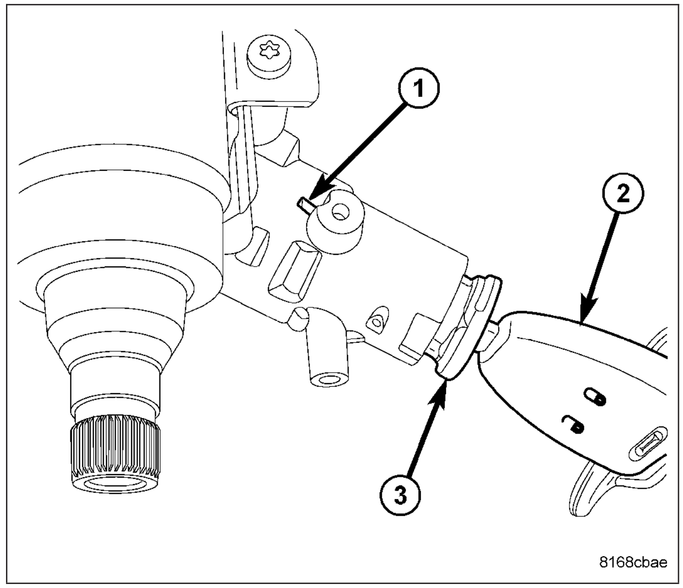
LOCK CYLINDER HOUSING

1. Position the lock cylinder housing in the RUN position.
2. Align the lock cylinder housing (2) with the steering column.
3. Install the two screws (1) fastening the lock cylinder housing (2) to the column. Tighten the screws to 12 N·m (110 in. lbs.).



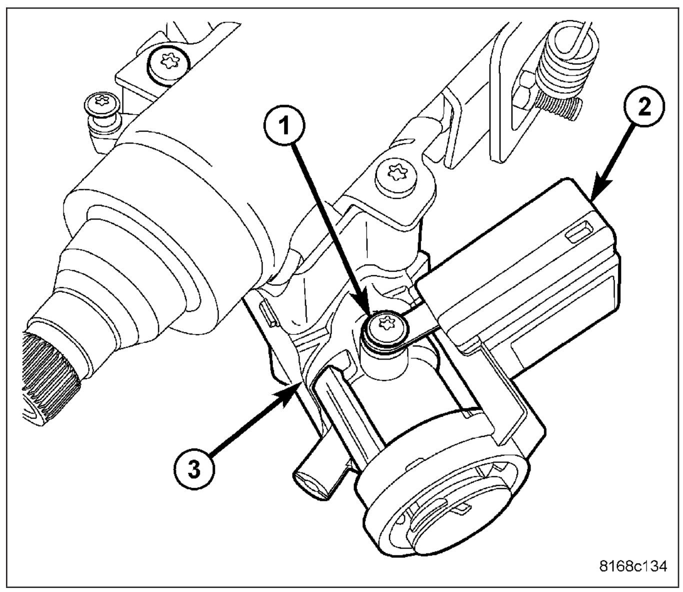
KEY CYLINDER

1. Place the actuator in the lock cylinder housing to the RUN position (if not already there).
2. Insert the key into the key cylinder and turn the key cylinder to the RUN position.
3. Align the retaining tab on the key cylinder with the slot in the top of the lock cylinder housing.
4. Slide the key cylinder into the lock cylinder housing until the key cylinder retaining tab locks the cylinder into place.
5. Rotate the key back and forth, then remove and reinstall it, making sure the key cylinder and lock cylinder housing operate properly.



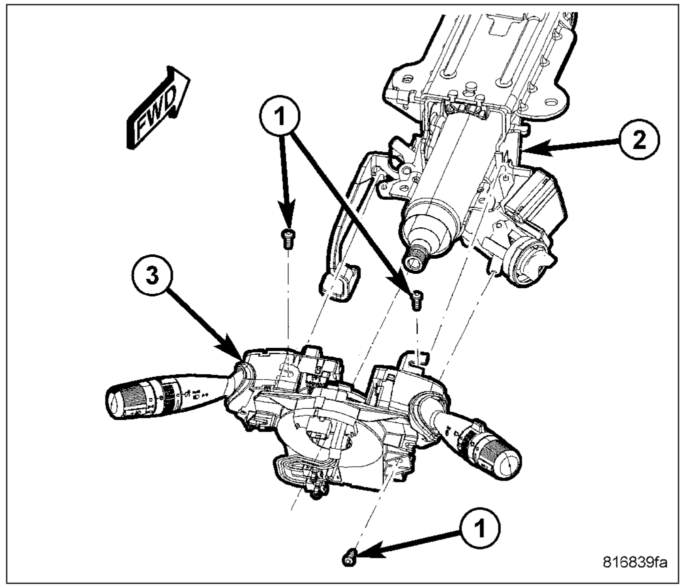
SKREEM/WCM (IF EQUIPPED)

1. Slide the ring of the SKREEM/WCM (2) over the lock cylinder housing (3) and engage the retainer fingers in the recesses formed on the lock cylinder housing.
2. Install the screw (1) fastening the SKREEM/WCM (2) to the lock cylinder housing (3). Tighten the screw to 2.5 N·m (22 in. lbs.).



STEERING COLUMN CONTROL MODULE

1. Slide the Steering Column Control Module (SCCM) (with switch stalks) (3) onto the steering column (2).
2. Install the screws (1) attaching the SCCM (with switch stalks) (3) to the steering column (2). Tighten the screws to 3 N·m (25 in. lbs.).

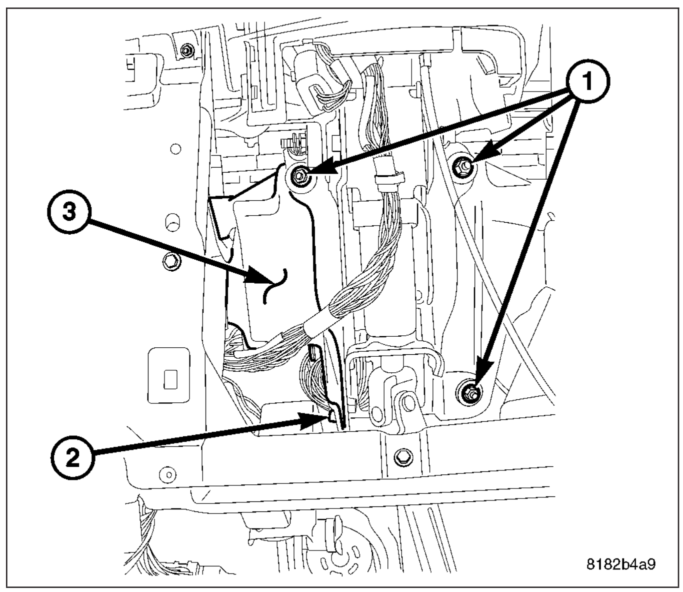


INSTALLATION

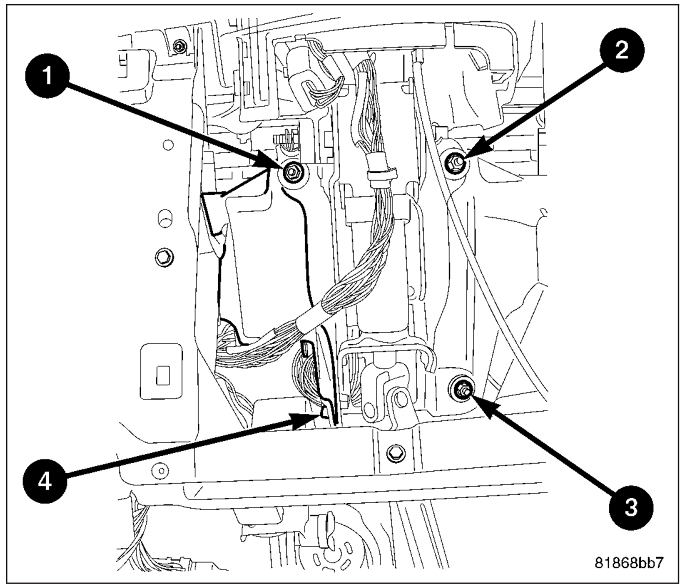
1. If the steering column is being replaced, assemble components on the steering column as necessary before column installation. (Refer to 19 - STEERING/COLUMN - ASSEMBLY)

NOTE: When installing a tilt column, do not release the tilt lever from the locked position until after the column is installed on the instrument panel.

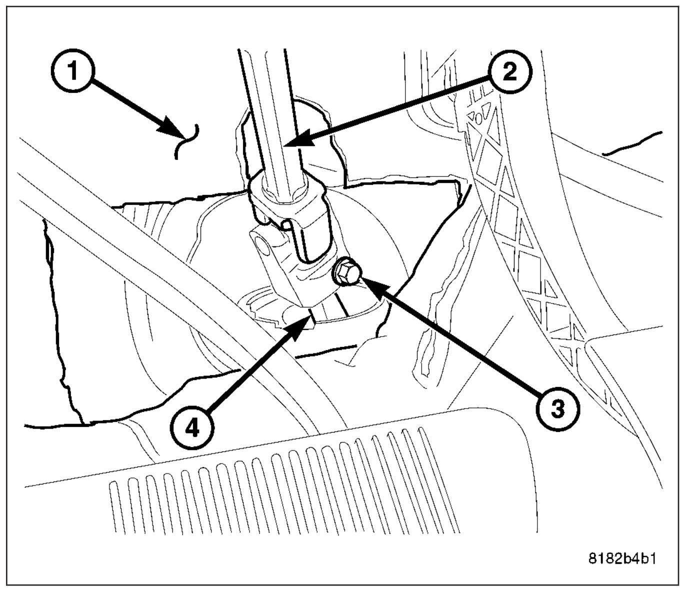
2. Install the steering column through the steering column opening.
3. Raise the column onto the mounting studs and install the three mounting nuts (1) on the studs and the 1 bolt (2).



4. Starting with the left upper nut and proceeding in a clockwise tightening sequence ending at the bolt (left lower) (2), Tighten all four mounting fasteners to 28 N·m (21 ft. lbs.).

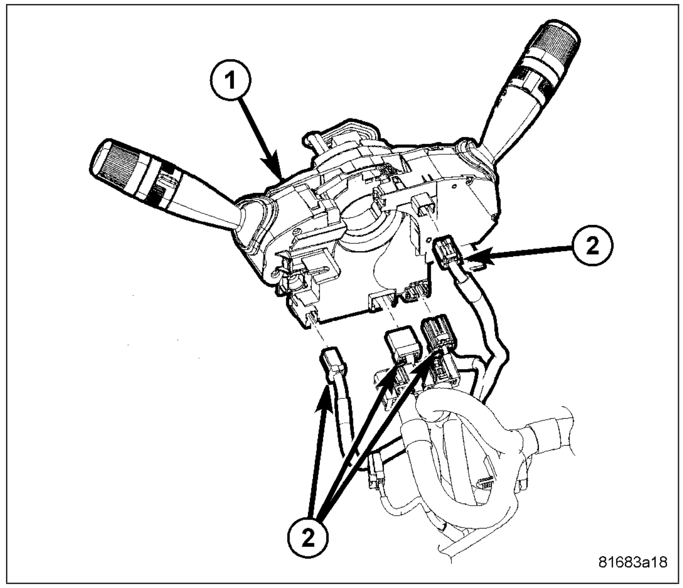


5. Verify the front wheels of vehicle are in the STRAIGHT-AHEAD position.
6. Collapse the intermediate shaft (2). Center it over the steering gear pinion shaft (4), lining up the ends, then slide the intermediate shaft onto the steering gear pinion shaft. **Do not install the pinch bolt (3) at this time. The pinch bolt can be more easily installed in a later step.**

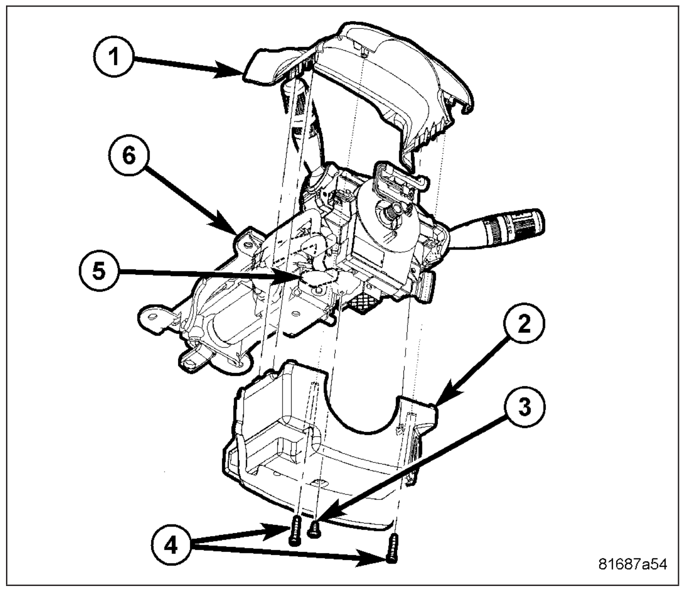


7. If the vehicle is equipped with an automatic transaxle, connect the ignition shift interlock cable to the steering column.

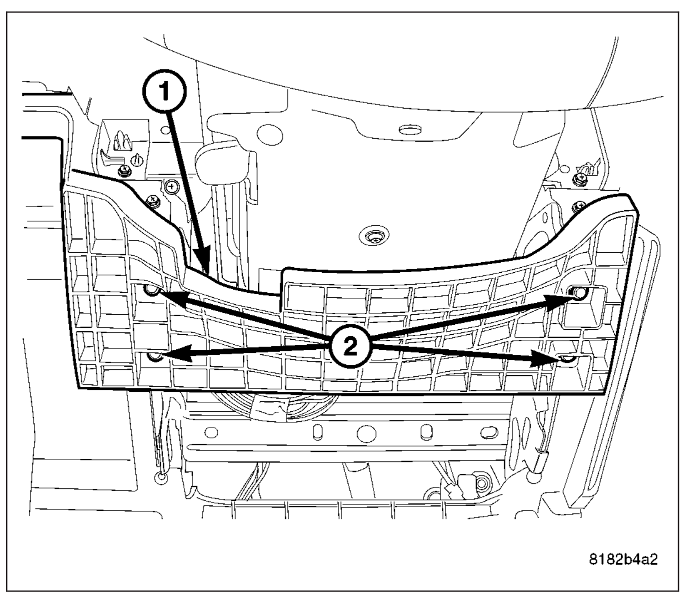
8. Connect the wiring harness connectors (2) to the Steering Column Control Module (SCCM) (1).
9. Connect any other the wiring harness connectors.



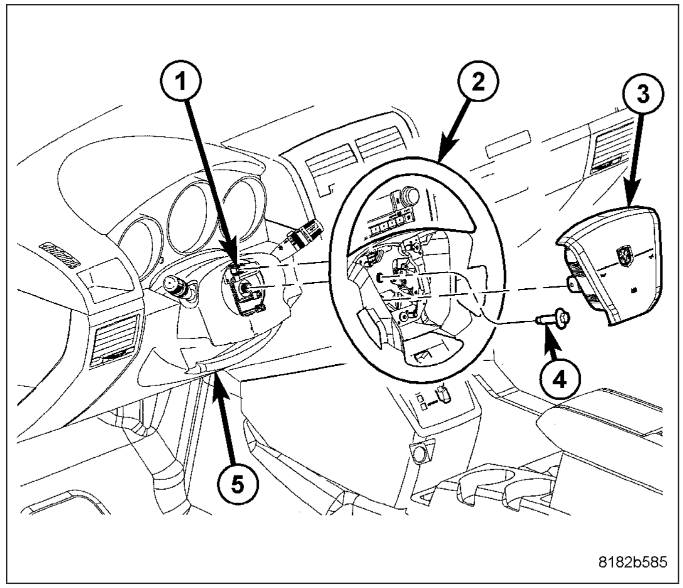
10. Push the tilt lever (5) downward.
11. Install the lower shroud (2) over the tilt lever and onto the column.
12. Position the column tilt (5) at the full-upward position.
13. Push the tilt lever (5) upward, locking it in place.
14. Install the screw (3) attaching the lower shroud (2) to the steering column (6).
15. Position the column tilt at the full-downward position and lock it in place.
16. Install the upper shroud over the lower shroud, clipping the shrouds to one another.
17. Install the two screws (4) attaching the upper shroud (1) to the lower shroud (2).



18. Position the column tilt at the full-upward position.
19. Install the steering column reinforcement panel (1) and four screws (2).

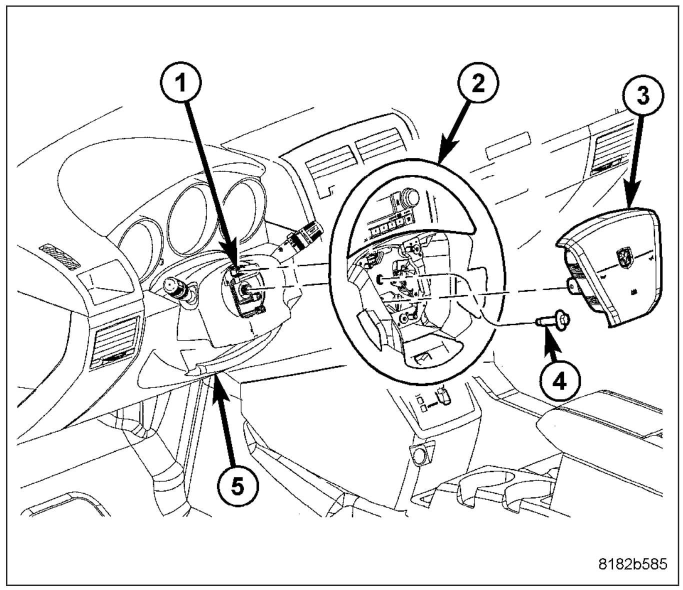


20. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
21. Install the IP side trim (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

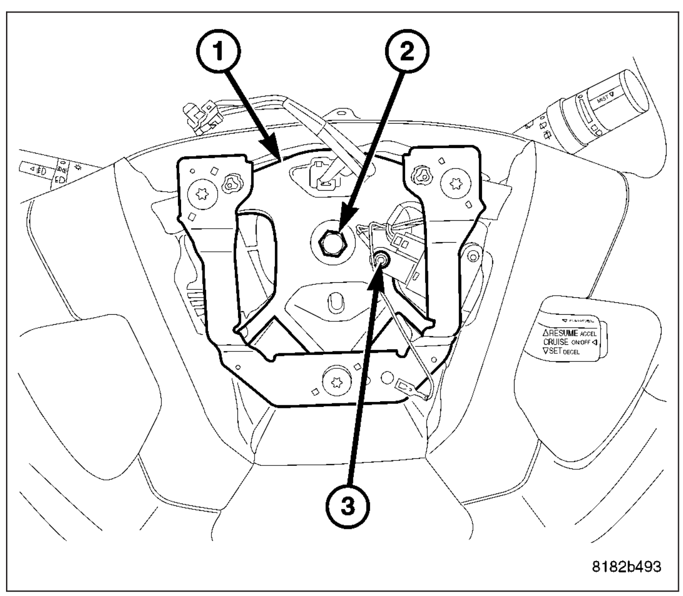


CAUTION: When installing the steering wheel, the clockspring must be centered in its travel to avoid overextending the clockspring inner parts, causing the clockspring to become inoperative. If removed and handled properly using the correct procedures, it should be in the "centered" position. If there is any question as to whether the clockspring is in the "centered" position of travel, perform the clockspring centering procedure before proceeding. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE)

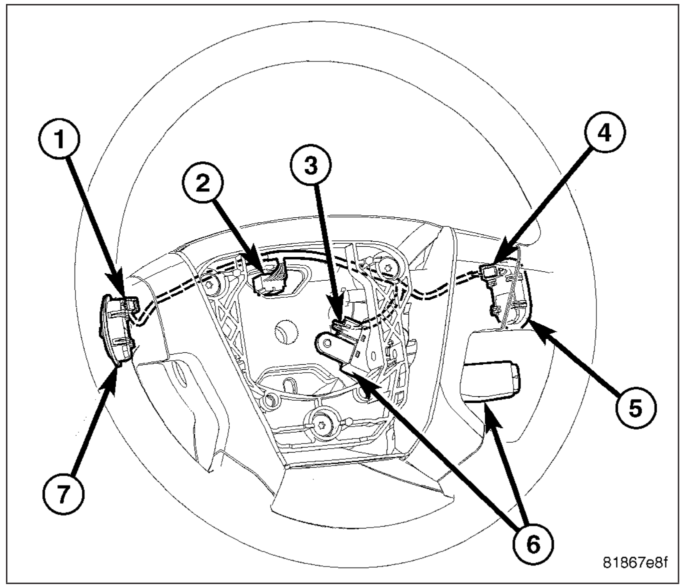
22. Install the steering wheel (2) and the retaining bolt (4). Tighten the steering wheel retaining bolt to 43 N·m (32 ft. lbs.) (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).



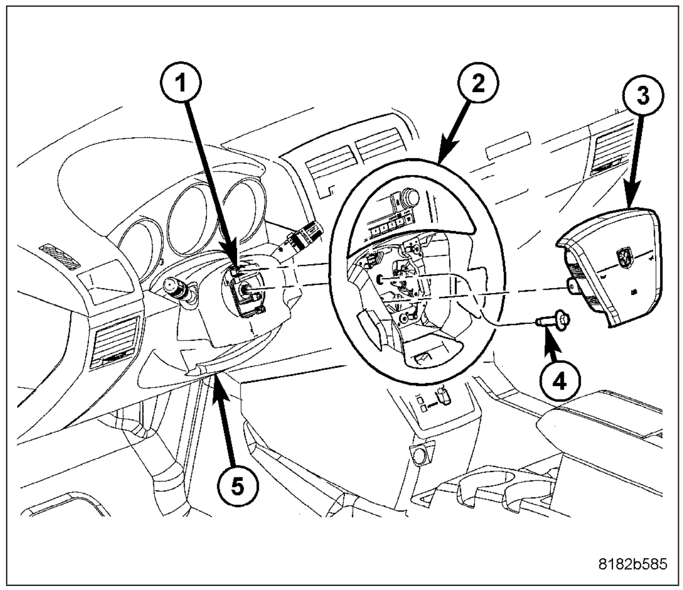
23. Install the speed control switch mounting screw (3).



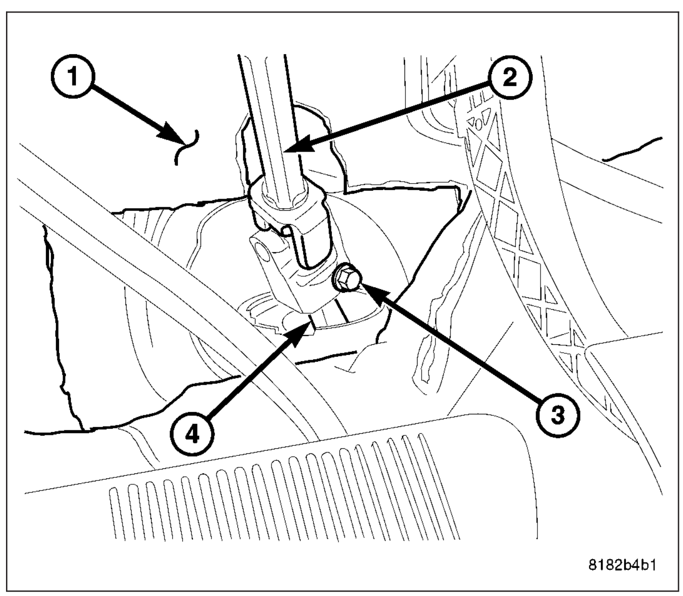
24. Connect the wiring connector (2) at the clockspring.



25. Install the driver airbag (3). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION)



26. From center, rotate the steering wheel to the right approximately 90° or until the shaft coupling pinch bolt (3) can be easily installed.
27. Install the pinch bolt (3). Tighten the pinch bolt to 28 N·m (21 ft. lbs.).
28. Reposition the floor carpet (1) in place.
29. Straighten the steering wheel to STRAIGHT-AHEAD position.



WARNING: Do not connect the battery ground cable without following the proper procedure as indicated in the following step. Personal injury or death may result if the Airbag System Test is not performed first.

30. Reconnect the battery ground terminal following the Airbag System Test found in Restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)
31. Test the operation of the all column mounted components. If applicable, reset the radio and the clock as necessary.
32. Road test the vehicle to ensure proper operation of the steering system.

SPECIFICATIONS

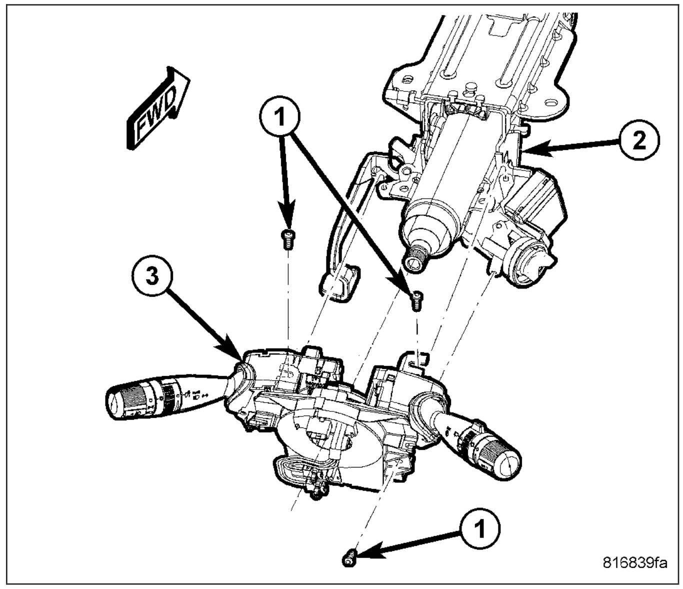
STEERING COLUMN FASTENER TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Coupling Pinch Bolt Nut	28	21	250
Lock Cylinder Housing Mounting Screws	12	—	110
SKREEM/WCM Mounting Screws	2.5	—	22
Steering Column Mounting Nuts	28	21	250
Steering Wheel Retaining Bolt	43	32	—

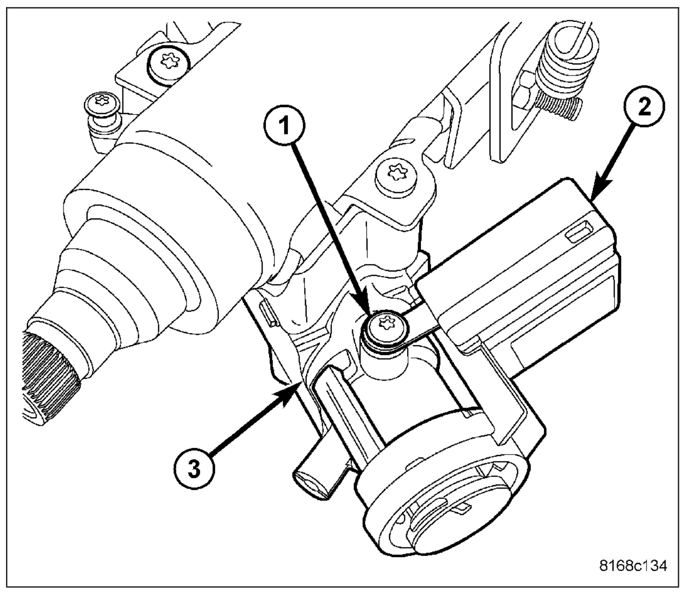
HOUSING-LOCK CYLINDER

REMOVAL

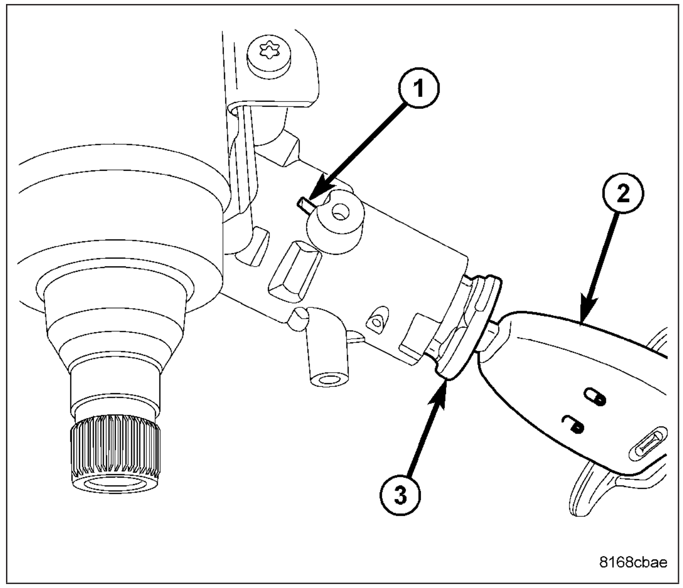
1. Access and remove the Steering Column Control Module (SCCM) (3) from the steering column (2). (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - REMOVAL)



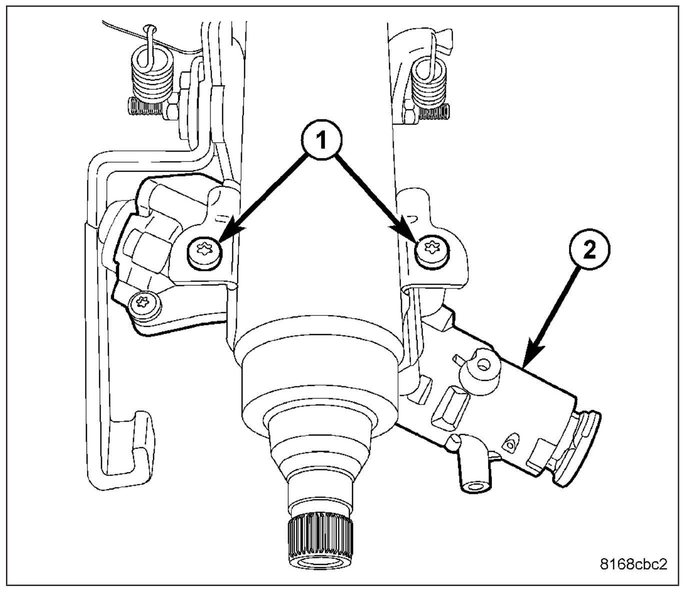
2. Remove the screw (1) fastening the SKREEM/WCM (2) to the lock cylinder housing (3).
3. Unhook the SKREEM/WCM (2) retainer fingers from the lock cylinder housing (3) and remove it.



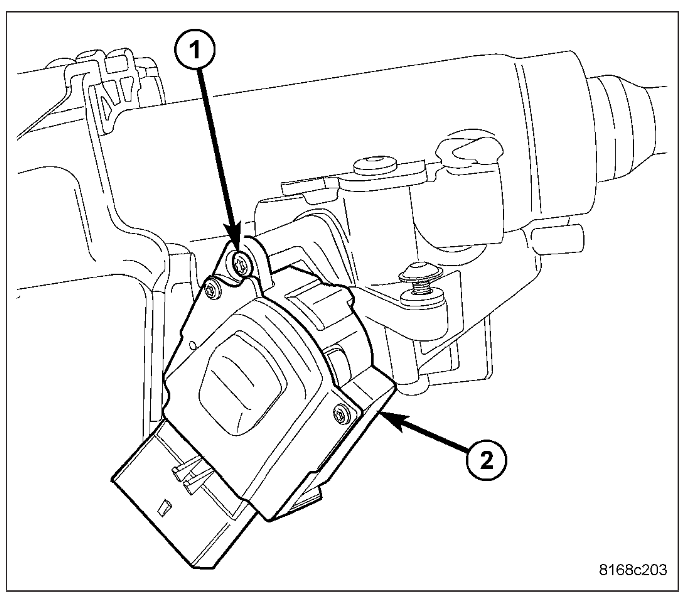
4. Insert the key (2) and turn the key cylinder (3) to the RUN position.
5. Insert an appropriate tool into the slot (1) formed into the lock cylinder housing depressing the key cylinder retaining tab.
6. Pull the key cylinder and key straight out of the lock cylinder housing as one unit.



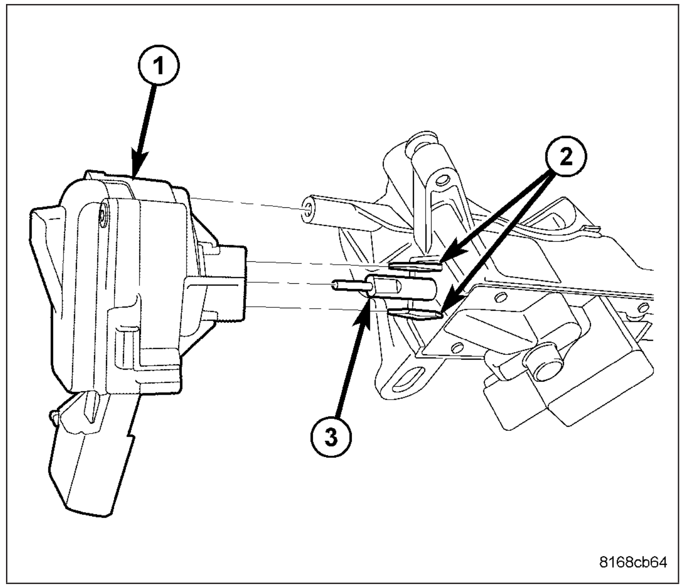
7. Using a Tamper-Proof Torx® Plus (five point) 30 bit, remove the two screws (1) fastening the lock cylinder housing (2) to the column.
8. Remove the lock cylinder housing from the steering column.



9. Remove the ignition switch (2) mounting screw (1).



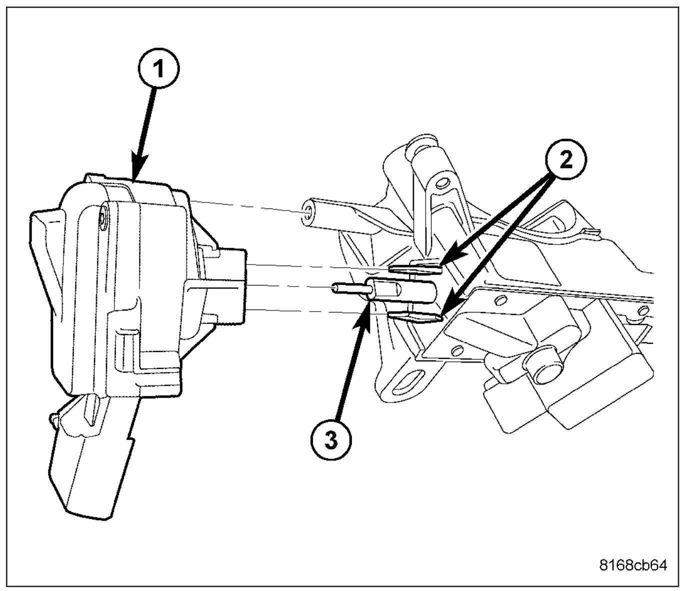
10. Pull the switch (1) straight out and off the retaining tabs (2) located on the lock cylinder housing.



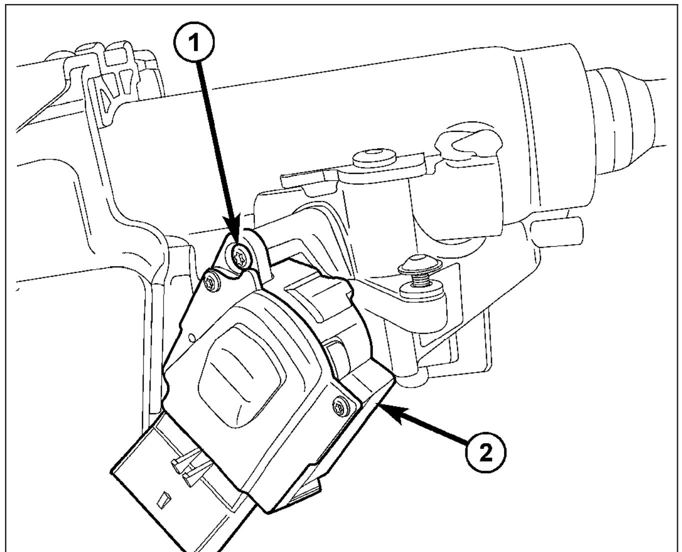
INSTALLATION

NOTE: Ignition switch must be installed prior to lock housing installation on column. Otherwise, the tilt lever will obstruct installation of ignition switch.

1. Ensure the ignition switch is in the RUN position and the actuator shaft in the lock housing is in the RUN position.
2. Align the ignition switch with the pin (3), actuator shaft and retaining tabs (2) located on the lock cylinder housing. Carefully install the switch, snapping it into place over the retaining tabs.



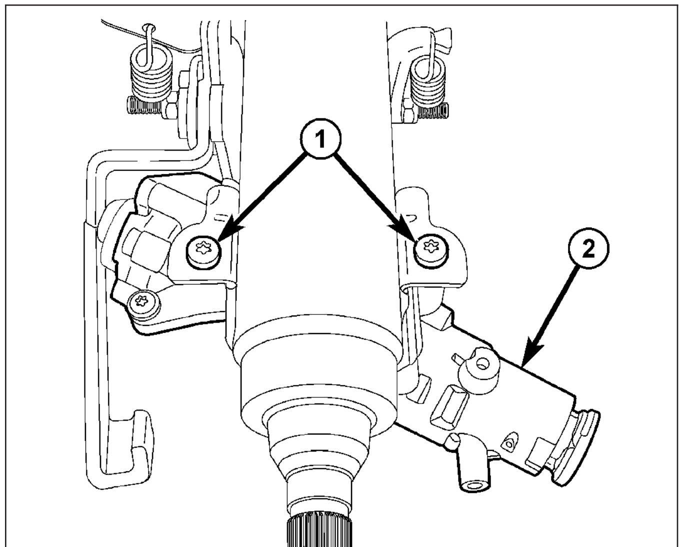
3. Install the ignition switch (2) mounting screw (1). Tighten the screw to 2 N·m (18 in. lbs.).



8168c203

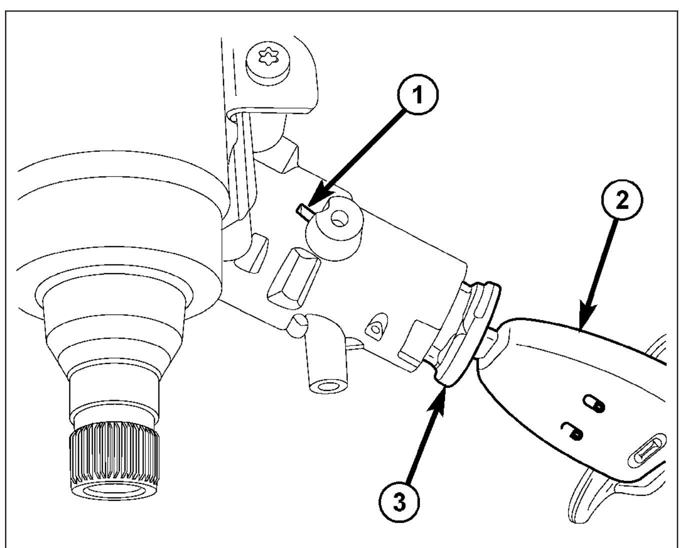
NOTE: Ignition switch needs to be installed on lock cylinder housing before housing installation to clear tilt lever.

4. Position the lock cylinder housing in the RUN position.
5. Align the lock cylinder housing (2) with the steering column.
6. Install the two screws (1) fastening the lock cylinder housing (2) to the column. Tighten the screws to 12 N·m (110 in. lbs.).



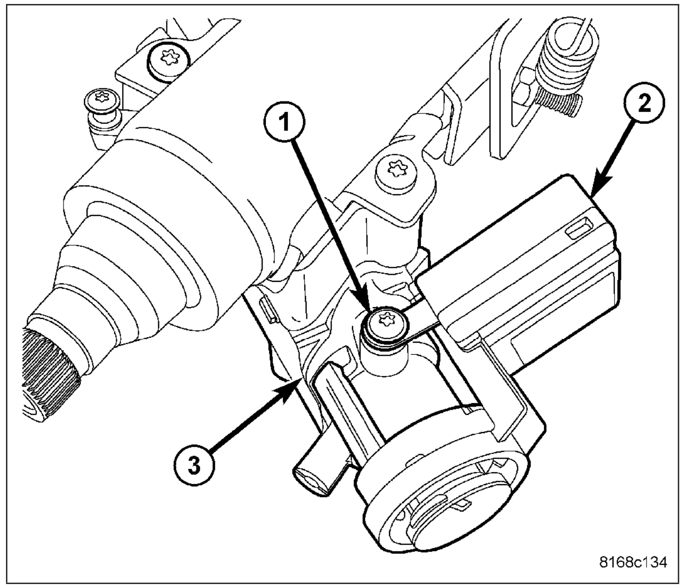
8168cbc2

7. Place the actuator in the lock cylinder housing to the RUN position (if not already there).
8. Insert the key into the key cylinder and turn the key cylinder to the RUN position.
9. Align the retaining tab on the key cylinder with the slot in the top of the lock cylinder housing.
10. Slide the key cylinder into the lock cylinder housing until the key cylinder retaining tab locks the cylinder into place.
11. Rotate the key back and forth (OFF to START), then remove and reinstall it, making sure the key cylinder and lock cylinder housing operate properly.

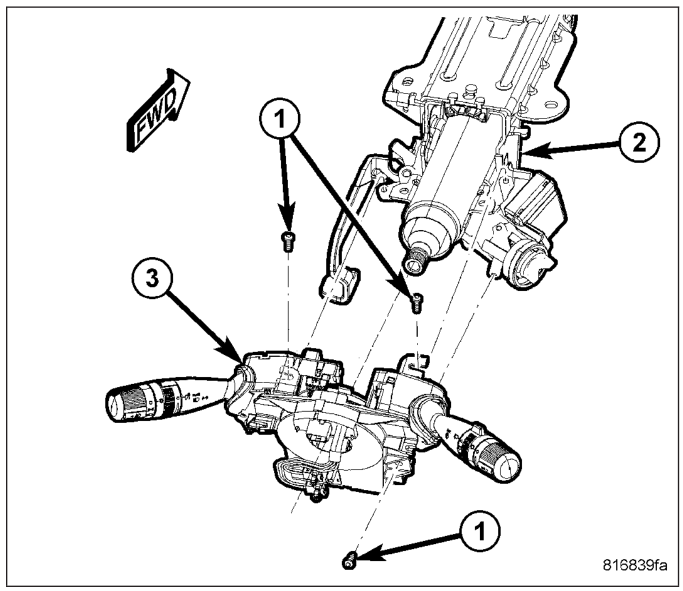


8168cbae

12. Slide the ring of the SKREEM/WCM (2) over the lock cylinder housing (3) and engage the retainer fingers in the recesses formed on the lock cylinder housing.
13. Install the screw (1) fastening the SKREEM/WCM (2) to the lock cylinder housing (3). Tighten the screw to 2.5 N·m (22 in. lbs.).



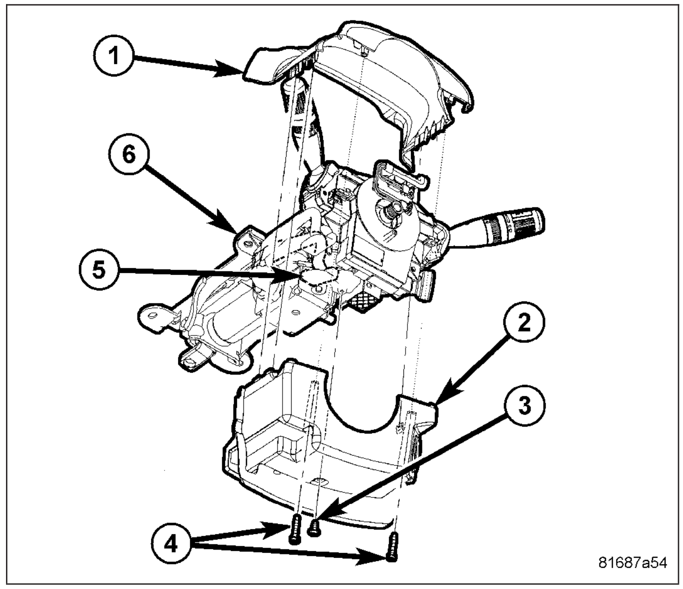
14. Install the Steering Column Control Module (SCCM) (3) and all components removed to access it. (Refer to 19 - STEERING/COLUMN/ STEERING COLUMN CONTROL MODULE - INSTALLATION)
15. Check operation of all steering column mounted components.



SHROUD-LOWER

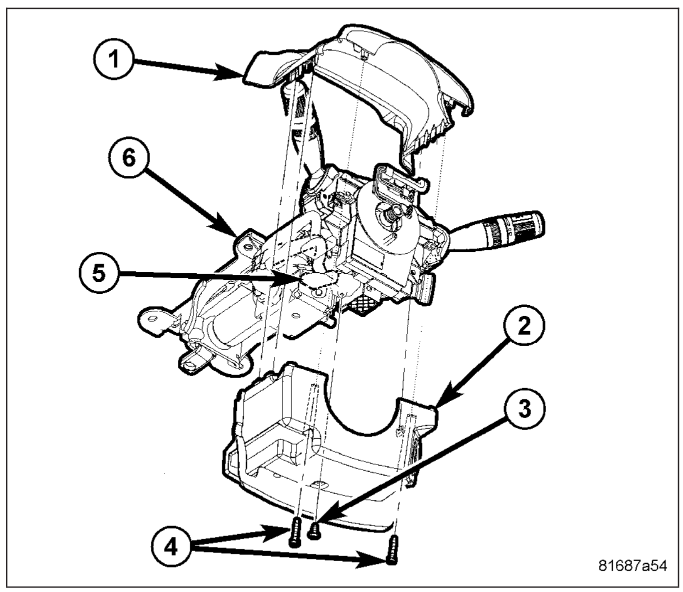
REMOVAL

1. Position the column tilt at the full-downward position.
2. Remove the two screws (4) attaching the upper shroud (1) to the lower shroud (2). After removing the screws, unclip the shrouds from each other by applying hand pressure along the seams where the shrouds connect on the sides, then remove the upper shroud.
3. Push the tilt lever (5) downward.
4. Remove the screw (3) attaching the lower shroud (2) to the steering column (6). Remove the lower shroud.



INSTALLATION

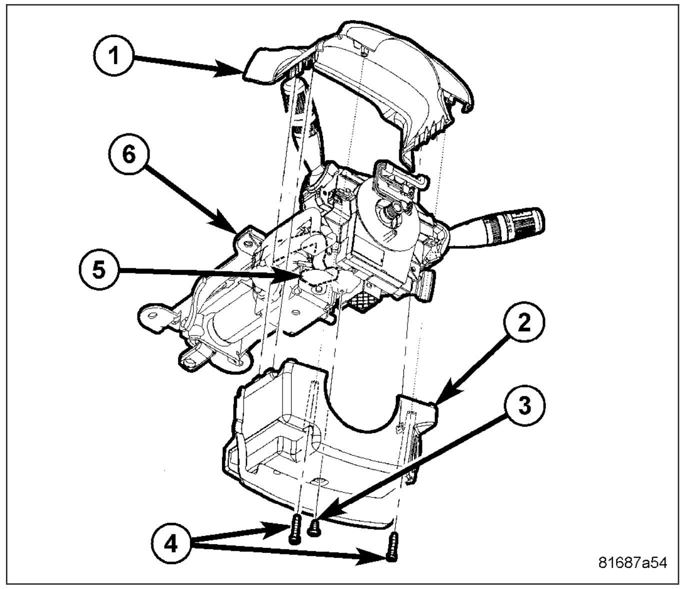
1. Push the tilt lever (5) downward.
2. Install the lower shroud (2) over the tilt lever and onto the column.
3. Position the column tilt (5) at the full-upward position.
4. Push the tilt lever (5) upward, locking it in place.
5. Install the screw (3) attaching the lower shroud (2) to the steering column (6).
6. Position the column tilt at the full-downward position and lock it in place.
7. Install the upper shroud over the lower shroud, clipping the shrouds to one another.
8. Install the two screws (4) attaching the upper shroud (1) to the lower shroud (2).



SHROUD-UPPER

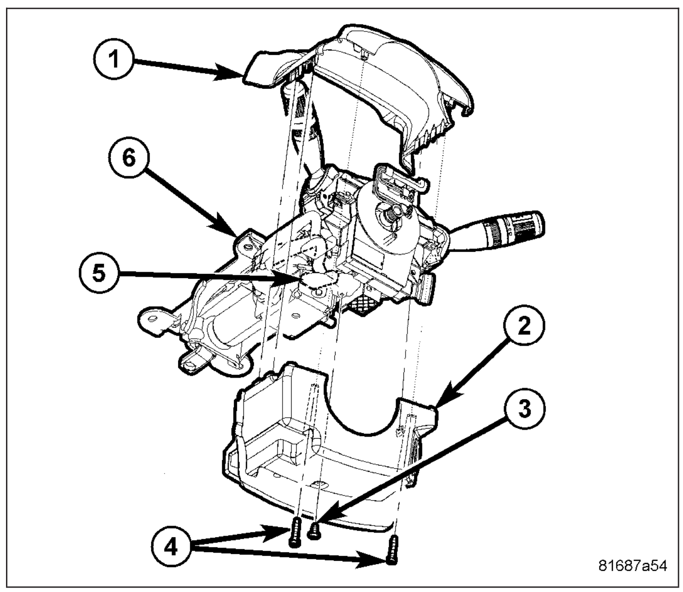
REMOVAL

1. Position the column tilt at the full-downward position.
2. Remove the two screws (4) attaching the upper shroud (1) to the lower shroud (2). After removing the screws, unclip the shrouds from each other by applying hand pressure along the seams where the shrouds connect on the sides, then remove the upper shroud.



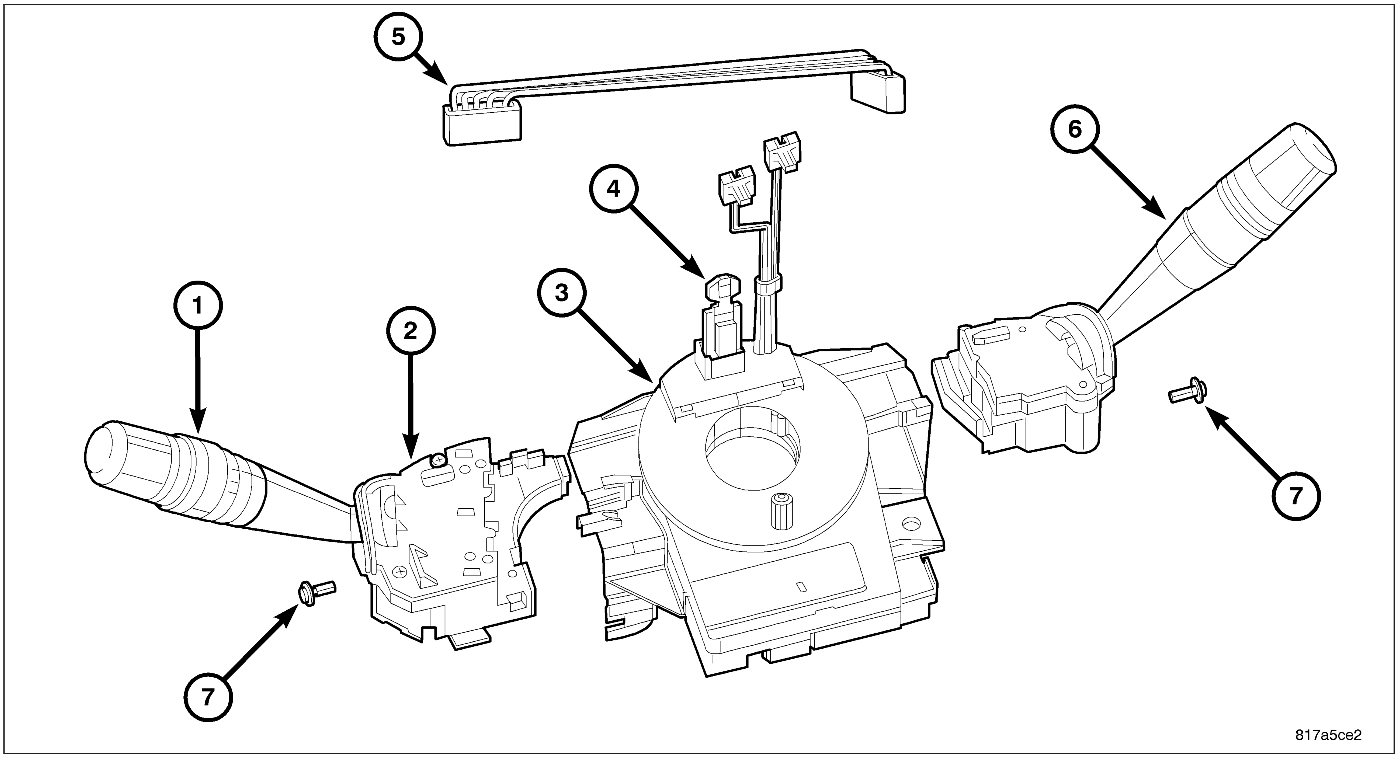
INSTALLATION

1. Position the column tilt at the full-downward position and lock it in place.
2. Install the upper shroud over the lower shroud, clipping the shrouds to one another.
3. Install the two screws (4) attaching the upper shroud (1) to the lower shroud (2).



STEERING COLUMN CONTROL MODULE

DESCRIPTION



This vehicle is equipped with a Steering Column Control Module (SCCM) The SCCM is secured near the top of the steering column below the steering wheel and is completely concealed beneath the steering column shrouds. It is installed as a modular unit that supports the left (lighting) multi-function switch (1) and right (wiper) multi-function switch (6). The controls for each of these switches extend through appropriate clearance holes provided in the steering column shrouds.

The microprocessor-based Steering Control Module (SCM) (2) utilizes integrated circuitry and information carried on the Controller Area Network (CAN) data bus along with several hard wired analog and multiplexed inputs to monitor both the right and left multi-function switches. The SCCM uses a Local Interconnect Network (LIN) data bus for exterior lighting and wiper functions. The LIN data is sent to the Cab Compartment Node (CCN) and the CCN then sends it out on the CAN data bus (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - CAN BUS). The SCCM is available for service replacement as a unit or each individual component:

- Clockspring (with integral Steering Angle Sensor if equipped)
- Left Multi-Function Switch
- Right Multi-Function Switch

OPERATION

The Steering Control Module (SCM) communicates over the Local Interconnect Network (LIN) data bus with other electronic modules in the vehicle and/or a diagnostic scan tool. The horn switch circuits pass through the clockspring to the Cab Compartment Node (CCN) and the CCN sends a CAN message to the Totally Integrated Power Module (TIPM) to control the horn. The CCN stores Diagnostic Trouble Codes (DTC’s) for the SCM. The right (wiper) multi-function switch has several inputs to the CCN.

The SCM is connected to a fused B(+) circuit and receives a path to ground at all times. These connections allow it to remain functional regardless of the ignition switch position. The driver airbag squib circuits of the clockspring, the horn, and the speed control switch circuits pass through the SCM, but the SCM does not monitor, and has no control outputs related to these circuits. Any other input to the SCM that would cause a vehicle system to function but does not require that the ignition switch be in the On position, such as turning on the lights or sounding the horn, prompts the SCM to wake up and transmit on the CAN data bus.

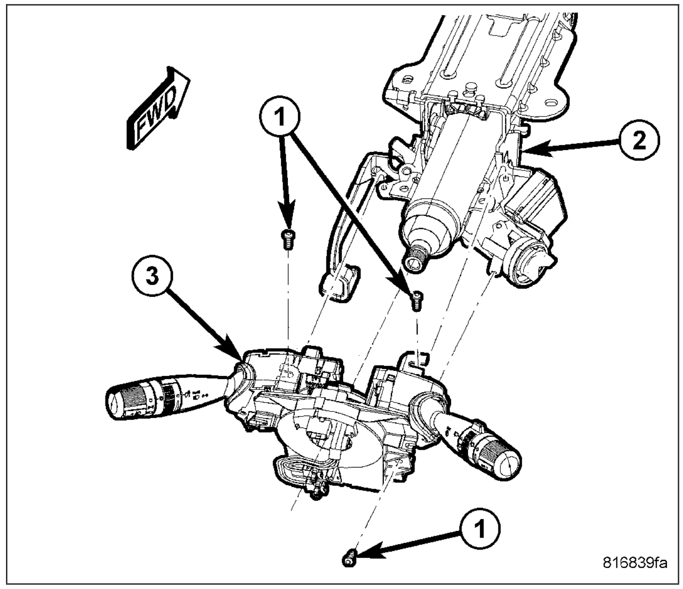
The most reliable, efficient, and accurate means to diagnose the SCM, the CAN data bus, the hard wired inputs or the electronic communication related to SCM operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

The integral SCM is not available for separate service replacement. If found inoperative or defective, the entire left (lighting) multi-function switch must be replaced (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LEFT MULTI-FUNCTION SWITCH - REMOVAL).

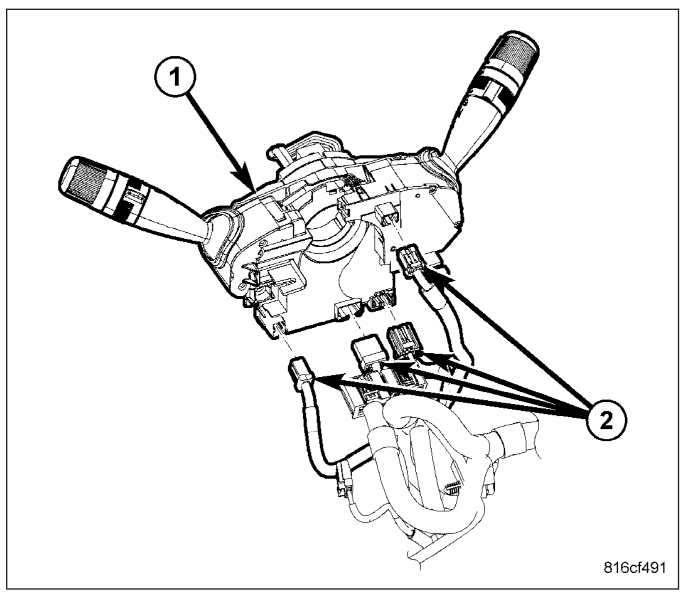
REMOVAL

1. Place the front road wheels in the straight-ahead position.
2. Open hood.
3. Disconnect and isolate the battery negative cable.

WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.



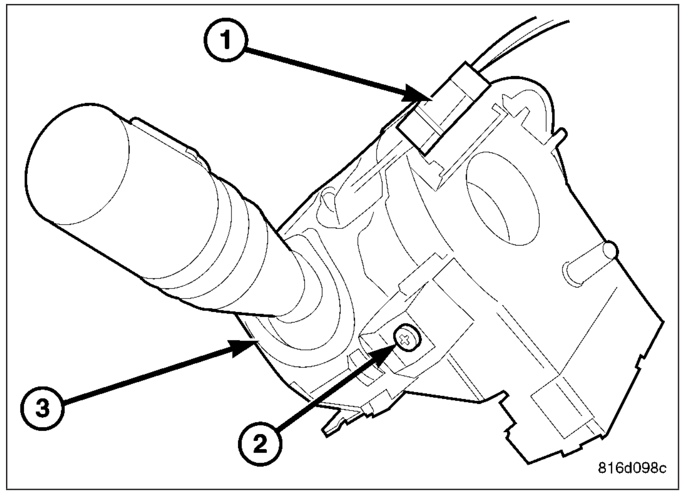
4. Remove steering wheel (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).
5. Remove upper and lower steering column shrouds to gain access to the Steering Control Module (SCCM) (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - REMOVAL).
6. Lock the clockspring rotor in the center position as follows: Insert a grenade pin through the hole in the rotor at the 10 o'clock position.
7. Remove the three screws (1) to the Steering Column Control Module (SCCM) (3).
8. Disconnect the electrical connectors (2) between the SCCM (1) and the instrument panel wiring harness at the base of the SCCM and remove from column.



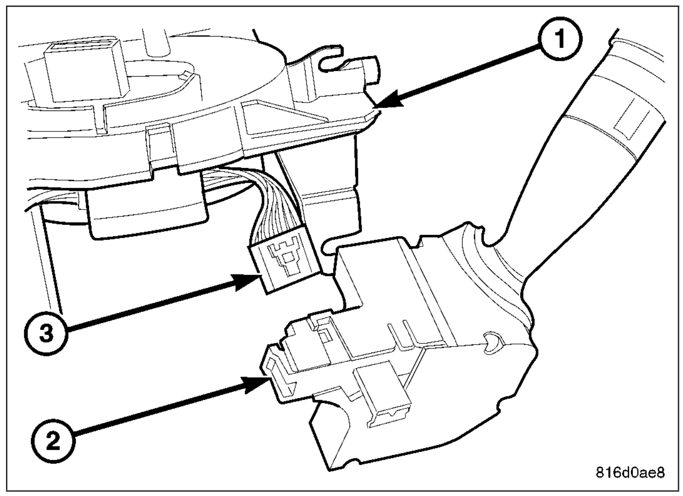
NOTE: If only removing the SCCM from column, there is no need to continue to next step.

DISASSEMBLY

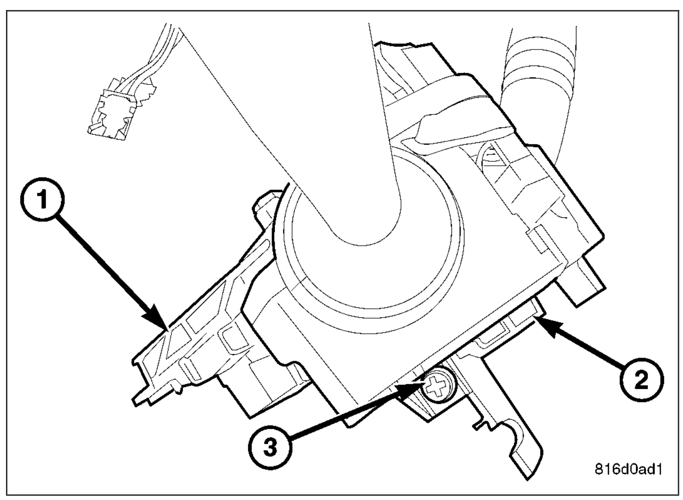
1. Remove the left multi-function switch stalk retaining screw (2).
2. Pull the left stalk out of the SCCM.



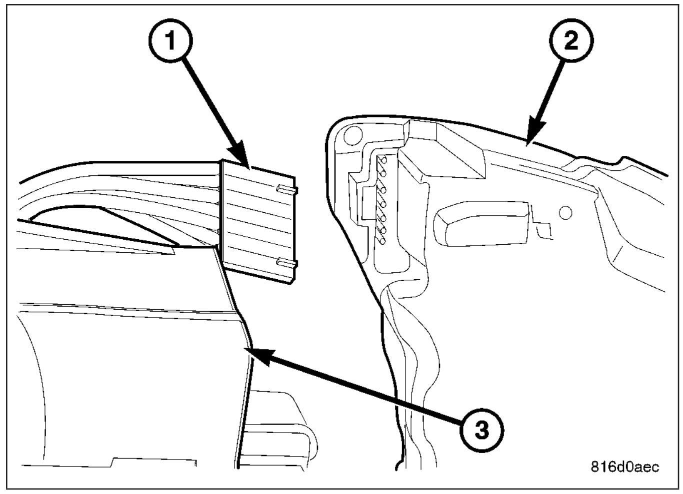
3. Disconnect the left stalk electrical connector.
4. Separate the left switch from the SCCM.



5. Remove the one right multi-function switch retaining screw.
6. Pull right switch out of SCCM.



7. Disconnect the right switch electrical connector.

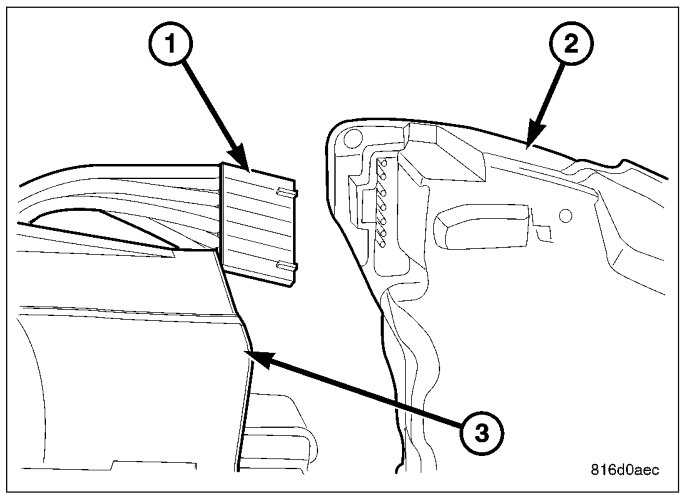


INSTALLATION

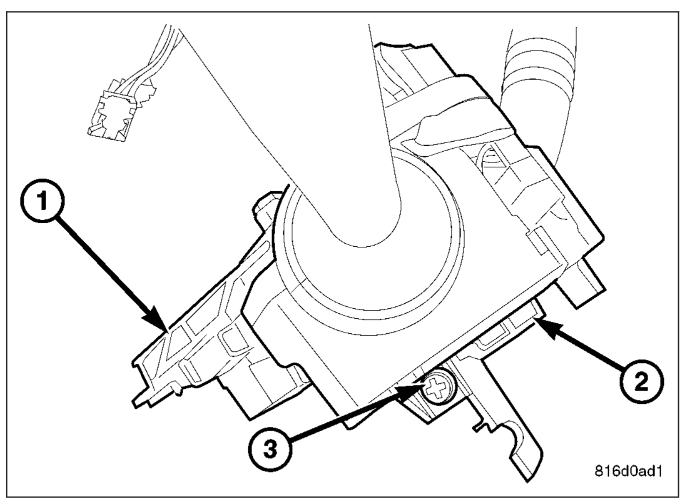
NOTE: If only installing the SCCM, go to Step 1

ASSEMBLY

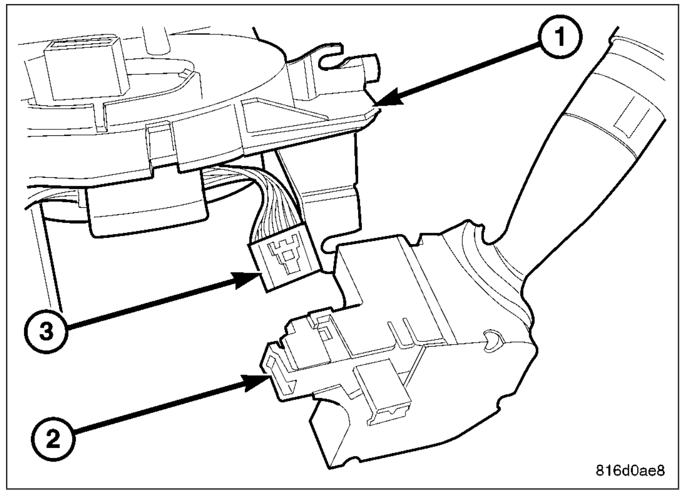
1. Connect the right stalk electrical connector.



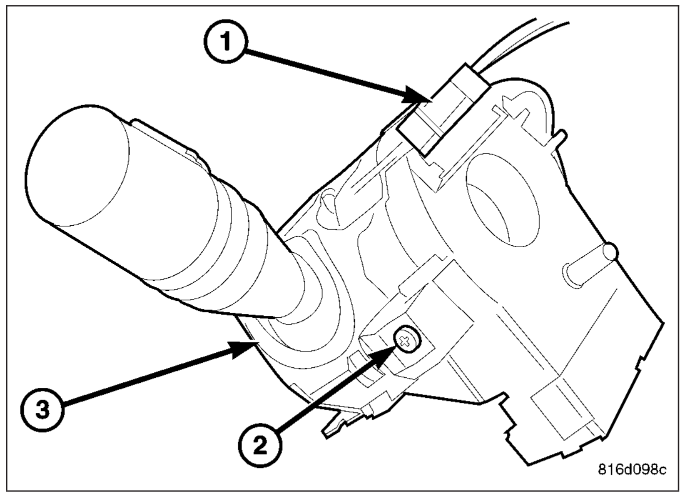
2. Slide the right stalk into the groove and install the one retaining screw.



3. Connect the left stalk switch electrical connector.

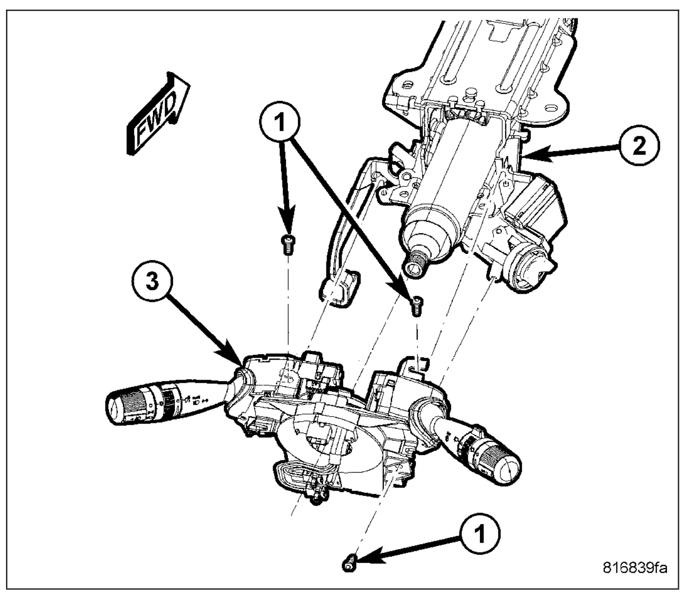


4. Install the left stalk switch retaining screw.

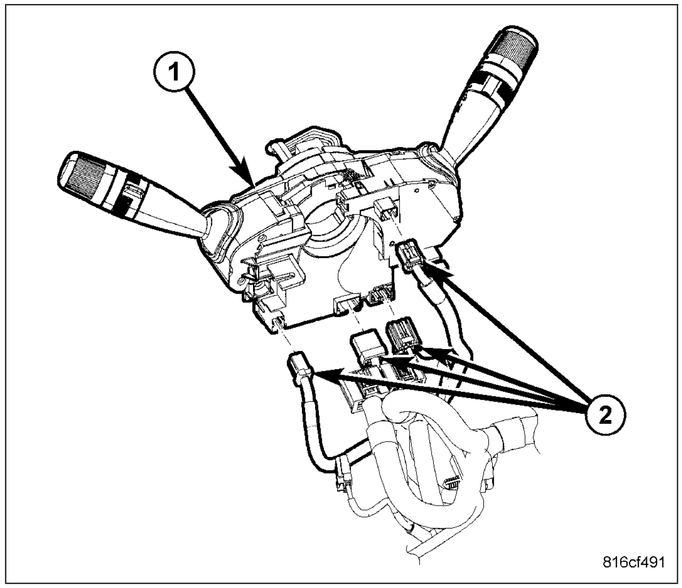


INSTALLATION

1. Position the SCCM (3) over the steering column shaft (2).
2. Install the three screws (1).



3. Connect the electrical connectors (2) to the instrument panel harness, ensure wiring is properly routed. Then check that the connectors, locking tabs are properly engaged.
4. Install steering column shrouds (Refer to 19 - STEERING/COLUMN/UPPER SHROUD - INSTALLATION). Be sure all wires are inside of shrouds.
5. Install steering wheel ensuring the flats on hub align with the clockspring (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION). Pull the airbag leads through the larger slot. Ensure leads do not get pinched under the steering wheel.



NOTE: There is a small wire harness in the steering wheel and it contains the horn circuits and speed control circuits.

6. Connect the speed control and horn wire connector into the clockspring.
7. Pull the grenade pin out of the clockspring.
8. Install the driver airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION)

WARNING: Do not connect the battery negative cable (REFER TO 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

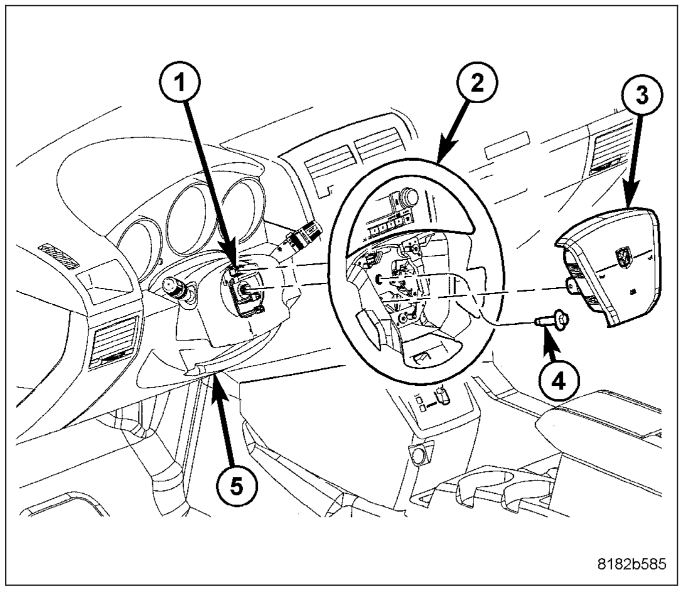
STEERING WHEEL

REMOVAL

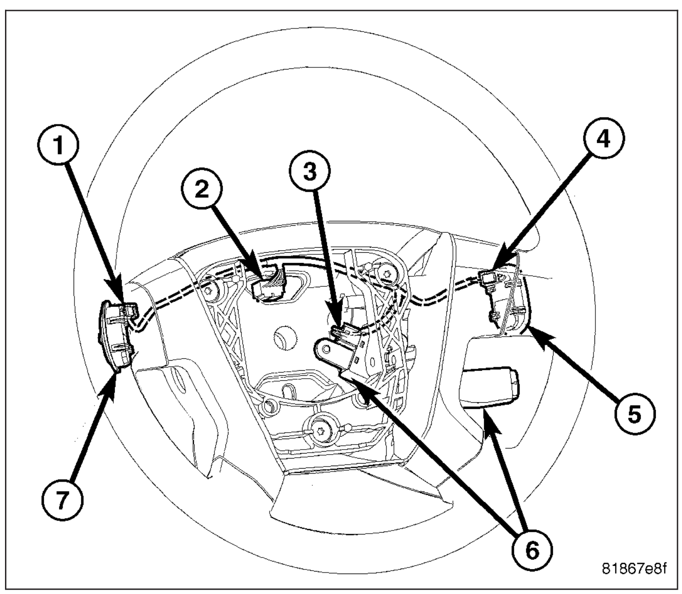
WARNING:

- **Do not place a non-deployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed, and could result in serious or fatal injury.**
- **Disconnect and isolate the battery negative (ground) cable before beginning steering wheel removal or installation. This will disable the airbag system. Failure to disconnect the battery could result in accidental airbag deployment and possible personal injury.**
- **Allow the airbag system capacitor to discharge for two minutes before removing the steering wheel or any airbag system component.**

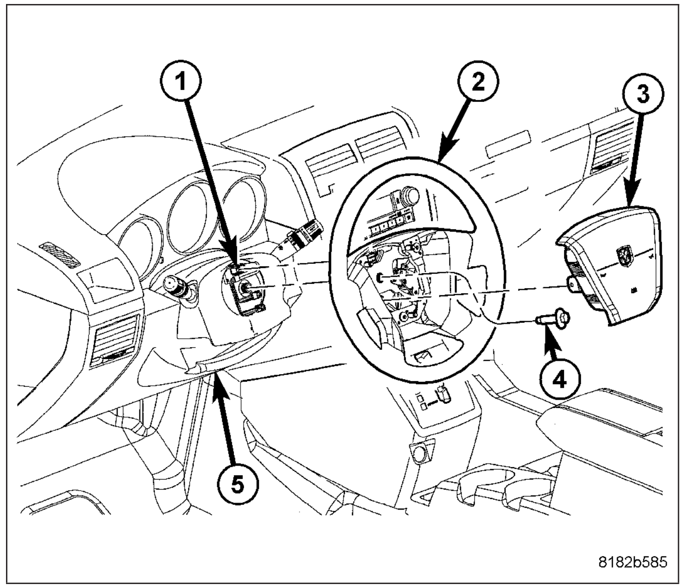
1. Adjust the steering wheel so that the tires are in the STRAIGHT-AHEAD position.
2. Disconnect and isolate the battery negative cable.
3. Remove the driver airbag (3). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).



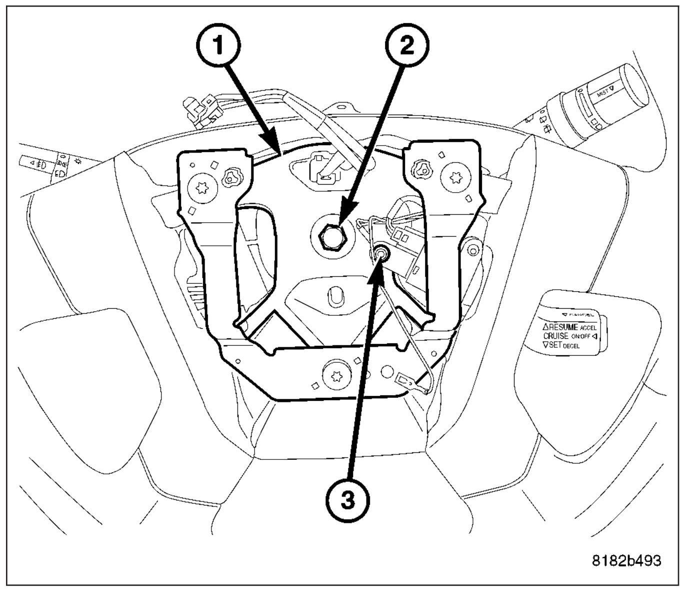
4. Disconnect the wiring connector (2) at the clockspring.



5. While holding the steering wheel firmly in place, remove the retaining bolt (2) securing the steering wheel to the steering column shaft.



CAUTION: When installing a wheel puller on the steering wheel, be sure the puller jaws are fully seated around the steering wheel base (1). If the jaws are not fully seated the jaws may slipped off the steering wheel when attempting to remove the steering wheel.
Also, threading the retaining bolt (2) back in the end of the shaft until approximately 13 mm (0.5 in.) of thread is showing between the wheel and the head of the bolt allows a safe reaction surface for the puller to work against.



6. Thread the wheel retaining bolt (2) back into the end of the shaft until approximately 13 mm (0.5 in.) of thread is showing between the wheel and the head of the bolt.
7. Remove the screw for the speed control switch (3) in order to install the steering wheel puller tool.
8. Install a steering wheel puller on the steering wheel.

CAUTION: Do not bump or hammer on steering wheel or steering column shaft when removing steering wheel from steering column.

9. While holding the steering wheel firmly in the STRAIGHT-AHEAD position, remove steering wheel from the steering column shaft using the puller.
10. Remove the wheel retaining bolt (2) and the steering wheel.

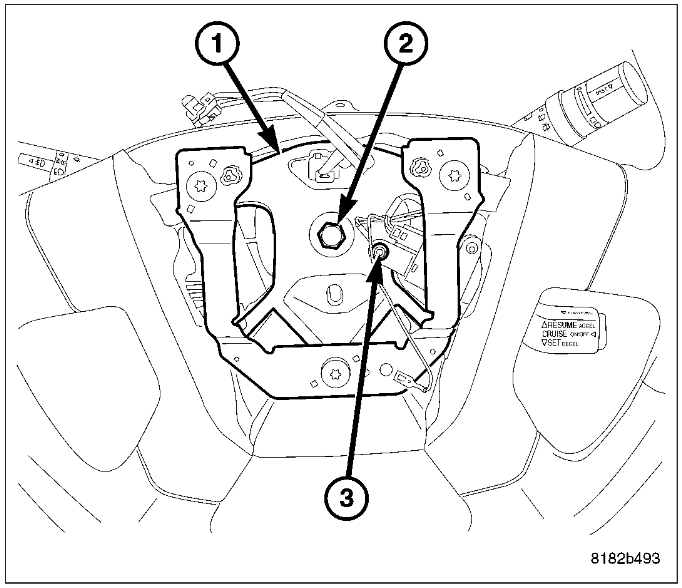
INSTALLATION

1. Confirm that:
   a. The front wheels are in the STRAIGHT-AHEAD position.
   b. The turn signal stalk is in the neutral position.

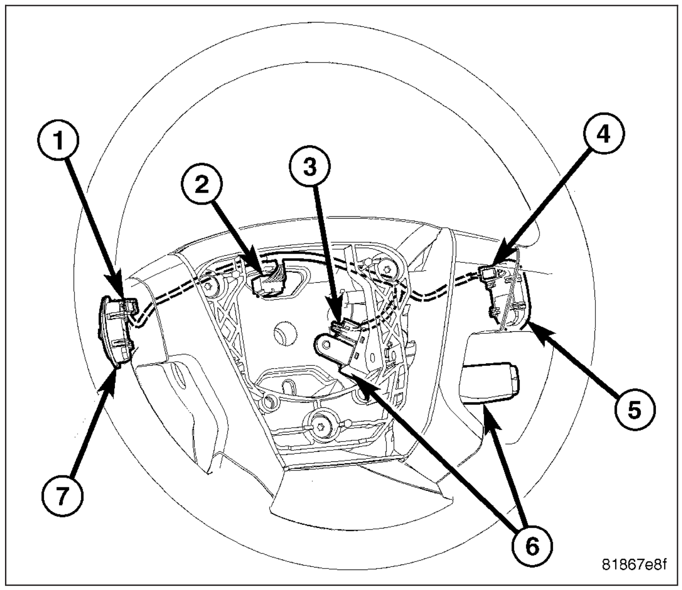
CAUTION: Do not install the steering wheel onto the shaft of the steering column by driving it onto the shaft.

2. Align the steering wheel's wide mounting spline with the steering column shaft missing spline area and push the wheel onto the shaft. Make sure the clockspring lines up with the back of the wheel and does not bind.

3. Install the steering wheel retaining bolt (2) and tighten it until the steering wheel is fully installed on shaft. Tighten the steering wheel retaining bolt to 43 N·m (32 ft. lbs.).
4. Install the speed control screw (3) that was removed for the puller.



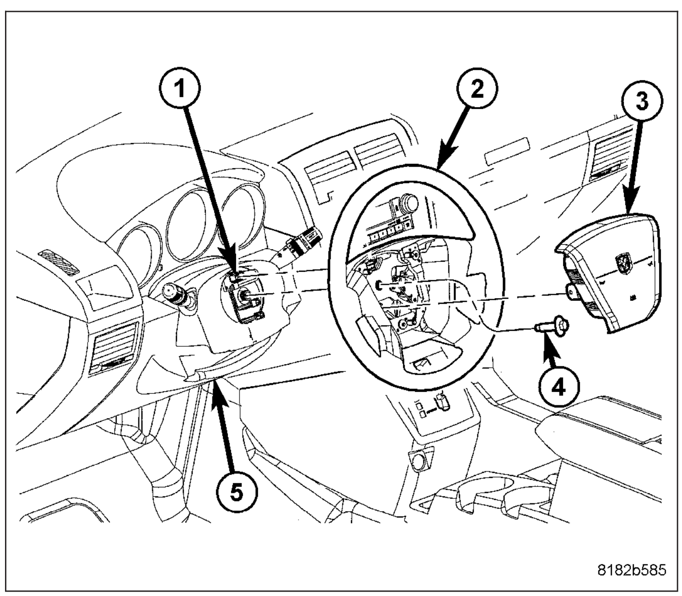
5. Connect the wiring connector (2) at the clockspring.



6. Install the driver airbag (3). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION)

WARNING: Do not connect battery negative cable yet. Refer first to airbag system test. (refer to 8 - electrical/restraints - diagnosis and testing)

7. Reconnect the battery using the Airbag System Test procedure in Restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING)
8. Verify vehicle and system operation.



GEAR

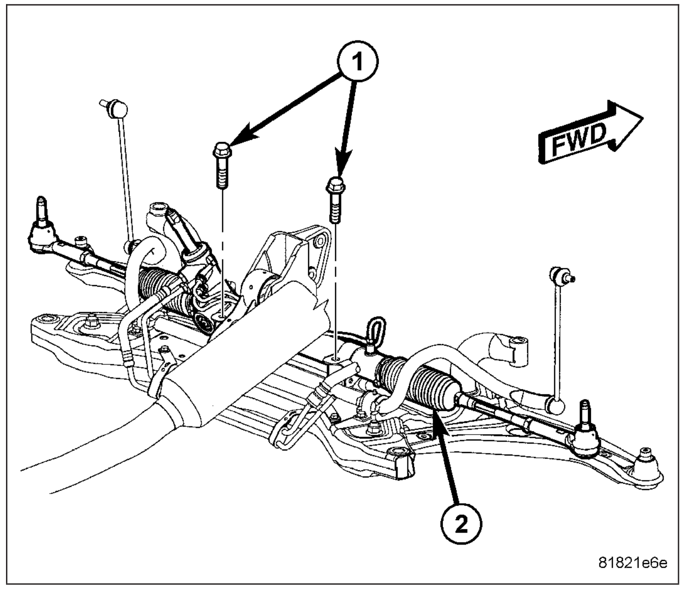
TABLE OF CONTENTS

GEAR

DESCRIPTION

The steering gear used is the rack-and-pinion type with power assist. It is mounted on the front suspension crossmember . The outer ends of the outer tie rods attach to the steering knuckles.

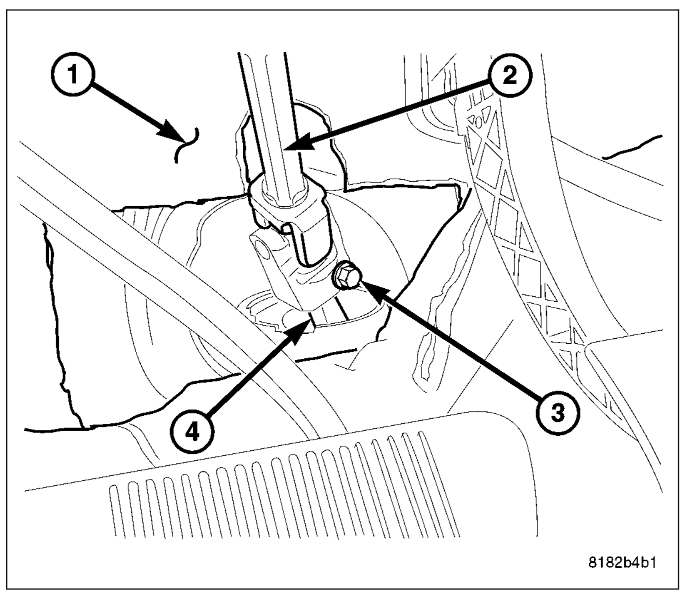
NOTE: The power steering gear should not be serviced or adjusted. If a malfunction or oil leak occurs with the steering gear, the complete steering gear needs to be replaced.



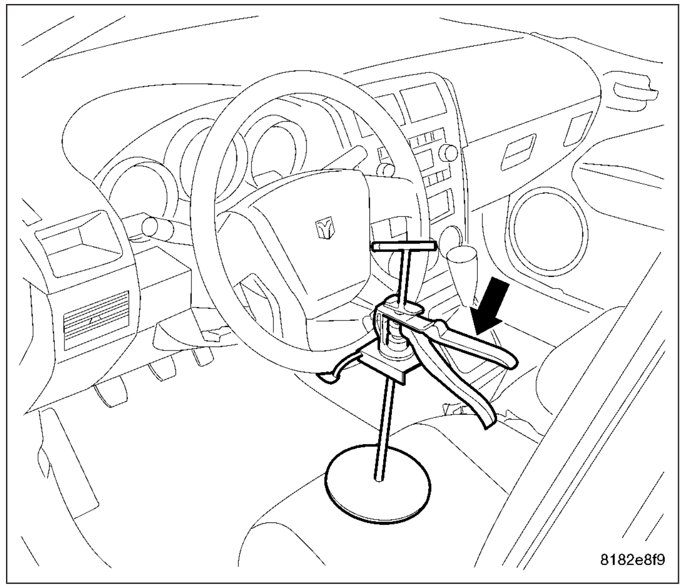
REMOVAL

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

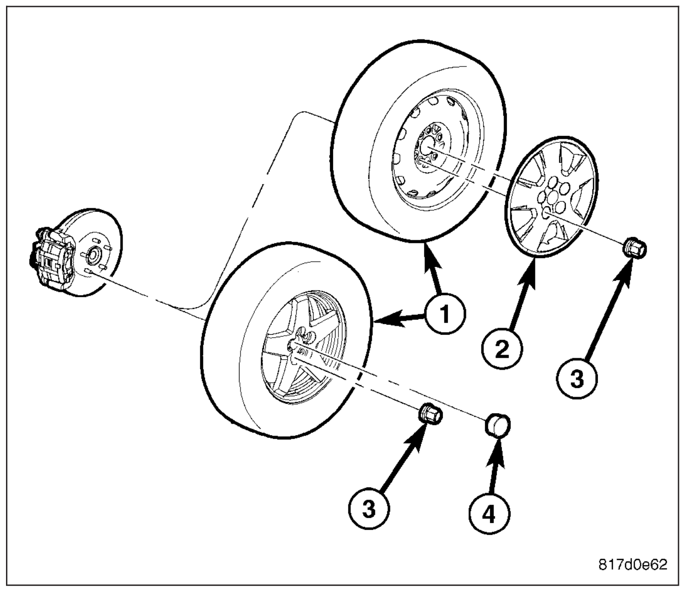
1. Siphon out as much power steering fluid as possible from the pump.
2. Reposition the floor carpeting to access the steering column coupling at the base of the column.
3. Position the front wheels of vehicle in the STRAIGHT-AHEAD position, then turn the steering wheel to the right until the pinch bolt (3) at the base of the column can be accessed.
4. Remove the pinch bolt (3). **Do not separate the intermediate shaft (2) from the steering gear pinion shaft (4) at this time.**



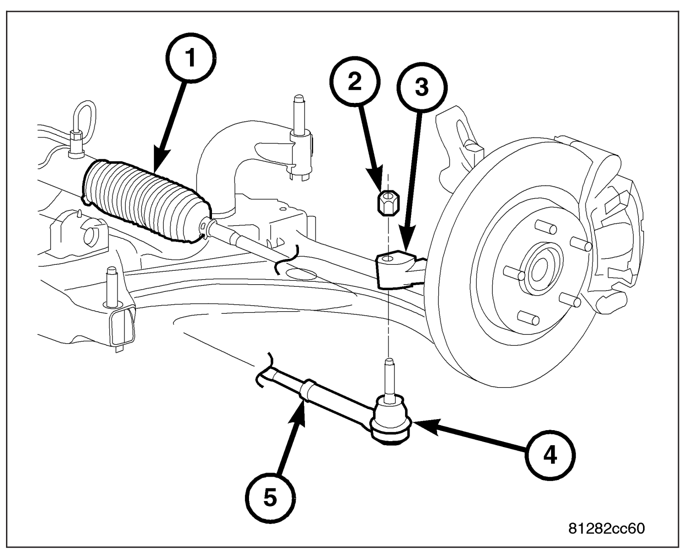
5. Return the front wheels of vehicle (and steering wheel) to the STRAIGHT-AHEAD position. Using a steering wheel holder, lock the steering wheel in place to keep it from rotating. This keeps the clock-spring in the proper orientation.



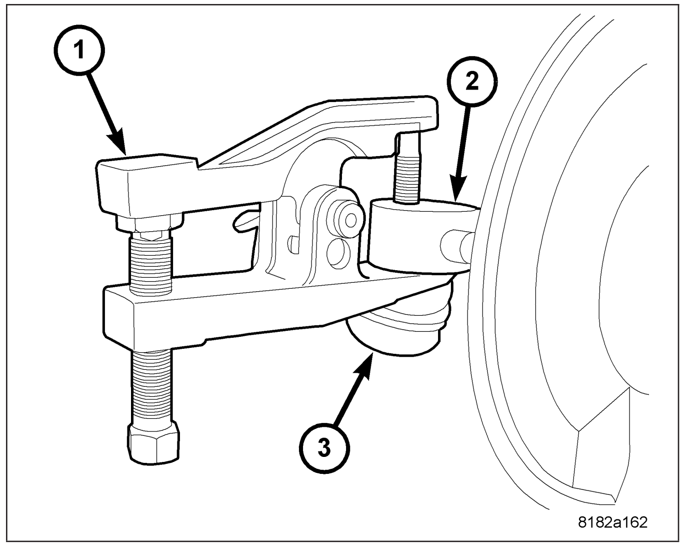
6. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
7. Remove the wheel mounting nuts (3), then the tire and wheel assembly (1).



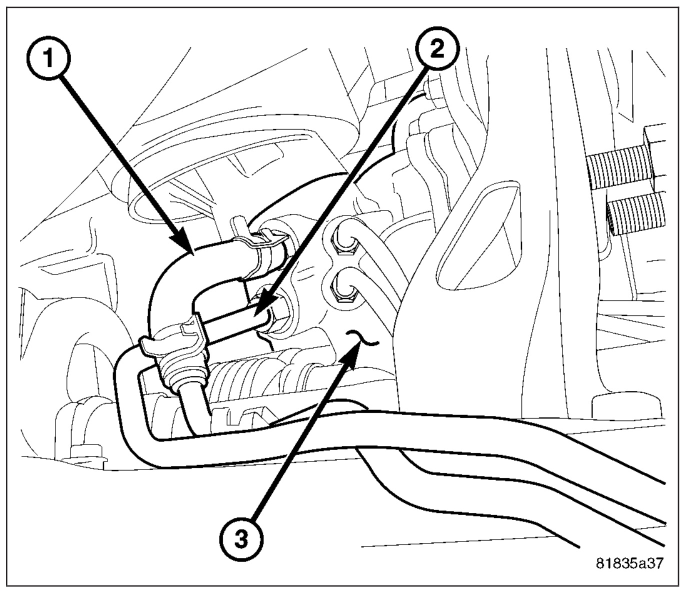
8. On each side of the gear, remove the nut (2) from the out tie rod end (4) at the knuckle (3).



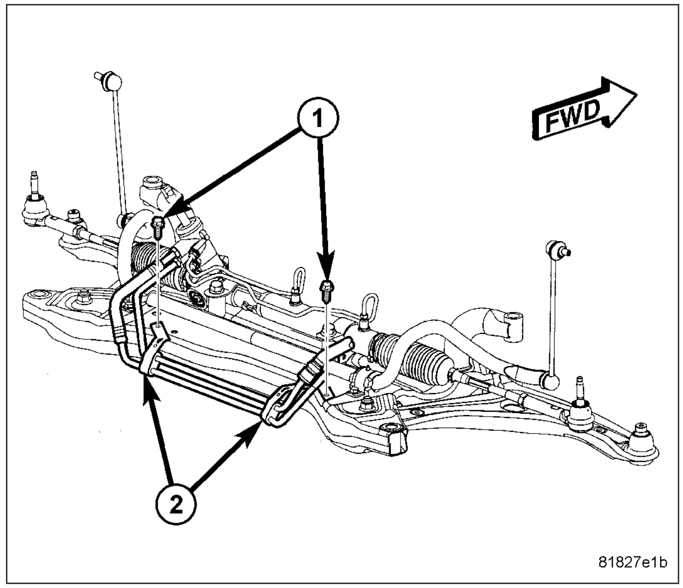
9. On each side of the gear, separate the tie rod end (3) from the knuckle (2) using Remover (1), Special Tool 9360.



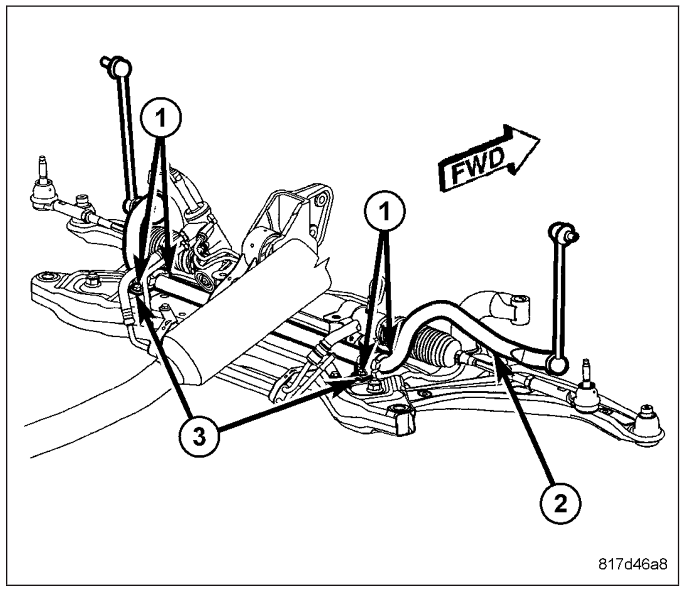
10. If equipped, remove the engine belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)
11. Remove the rear engine mount. (Refer to 9 - ENGINE/ENGINE MOUNTING/REAR MOUNT - REMOVAL)
12. Remove the front engine mount through-bolt.
13. Remove the return hose (1) at the steering gear (3).
14. Remove the pressure hose (2) at the steering gear (3).

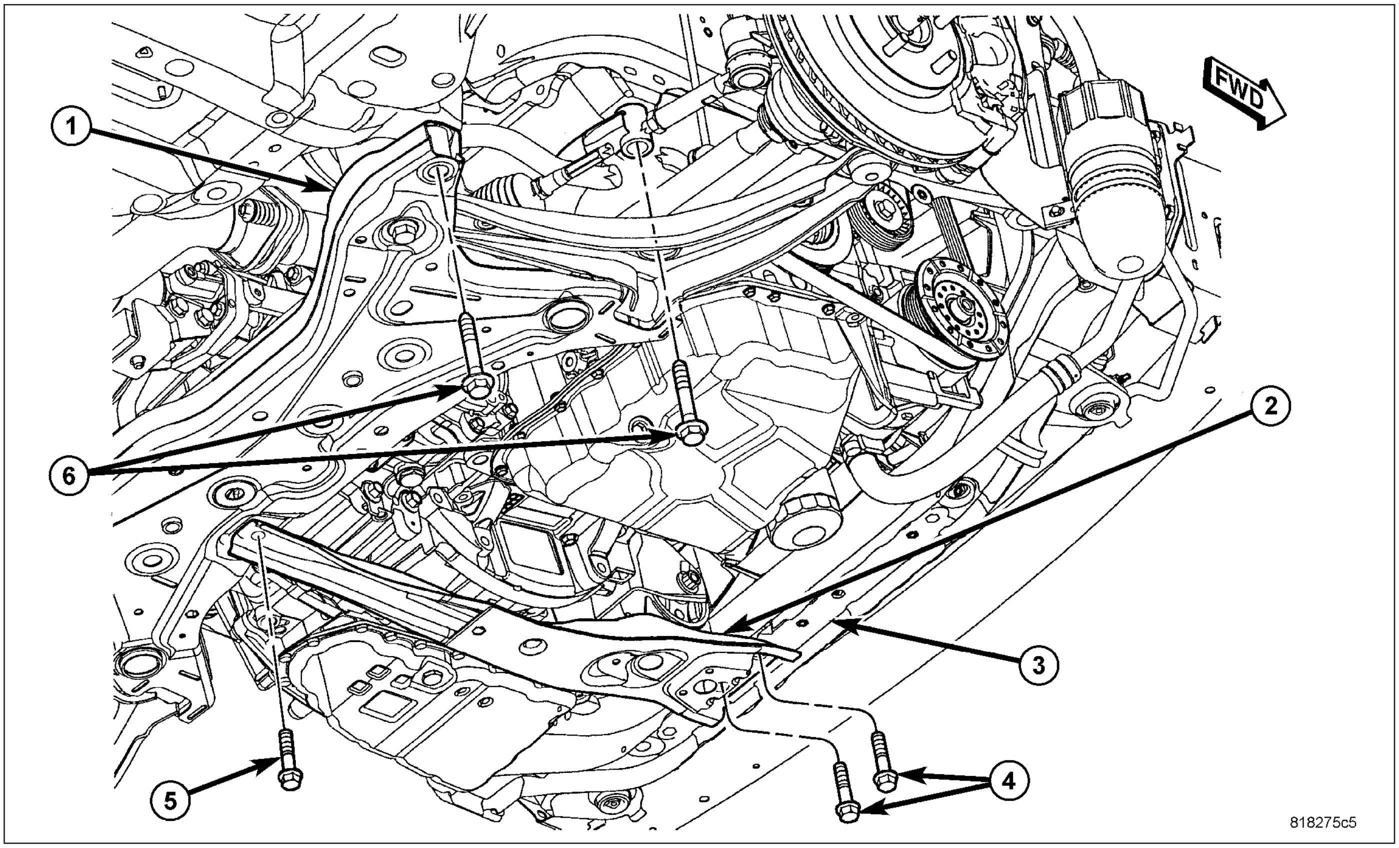


15. Remove the screws (1) securing the power steering hose routing clamps (2) to the crossmember.



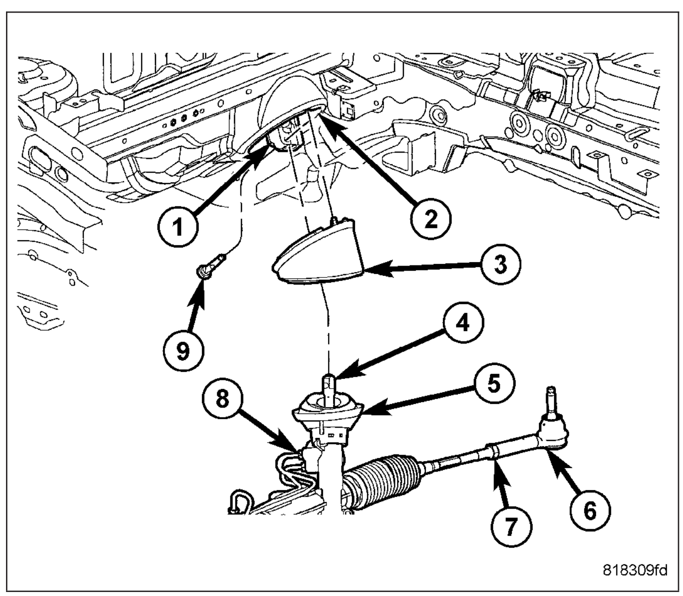
16. Remove the screws (1) securing the stabilizer bushing retainers (3) to the crossmember.
17. Remove the two stabilizer bushing retainers.



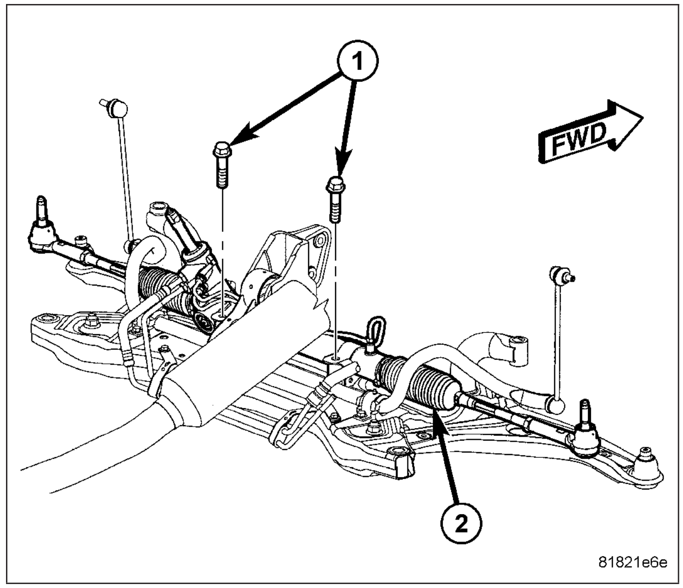


NOTE: Before removing the front suspension crossmember from the vehicle, the location of the crossmember must be marked on the body of the vehicle. Do this so the crossmember can be relocated, upon reinstallation, against the body of vehicle in the same location as before removal. If the front suspension crossmember is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) may be lost.

18. Mark the location of the front crossmember on the body near each mounting bolt using a marker or crayon. **Do not use a scratch awl or other tool that can penetrate the protective coating on the body.**
19. Support the front crossmember with a transmission jack.
20. Remove the four mounting bolts (6) securing the front crossmember (1) to the body.
21. Lower the crossmember enough to access the intermediate shaft coupling (1) at the steering gear pinion shaft (4). Slide the coupling off the pinion shaft.
22. Remove the dash seals (3, 5) as necessary.

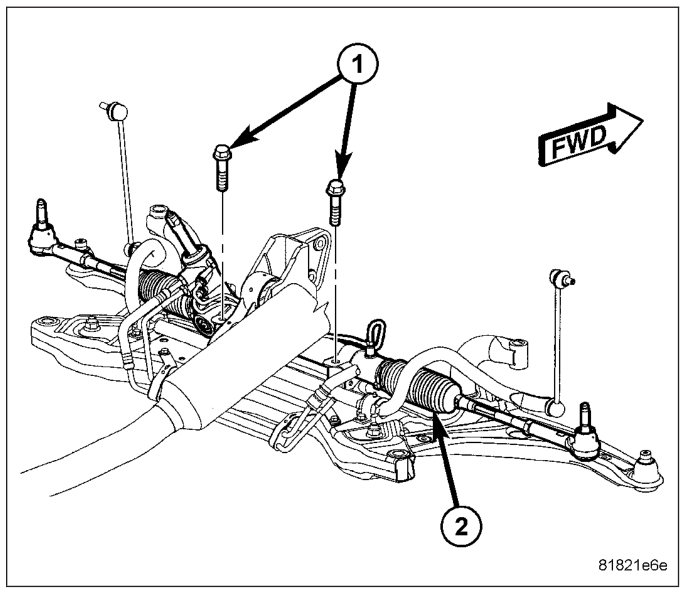


23. Remove the two bolts (1) securing the steering gear (2) to the crossmember.
24. Rotate the stabilizer bar up in order to remove the steering gear from the vehicle.
25. Remove the steering gear from the crossmember.

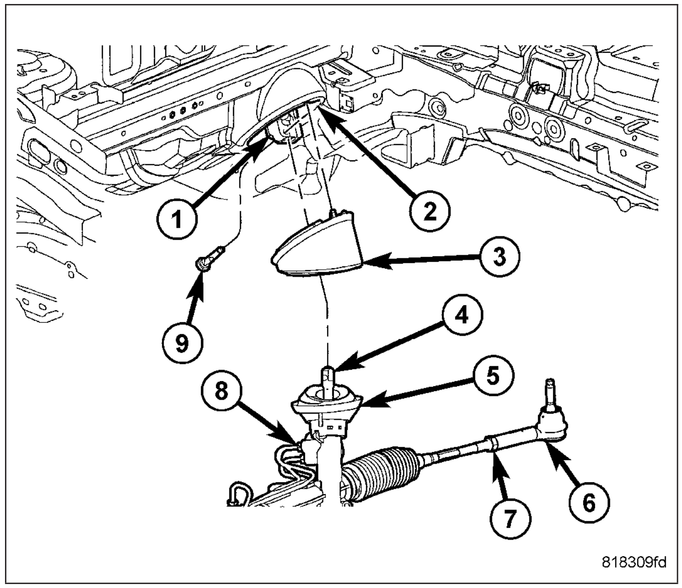


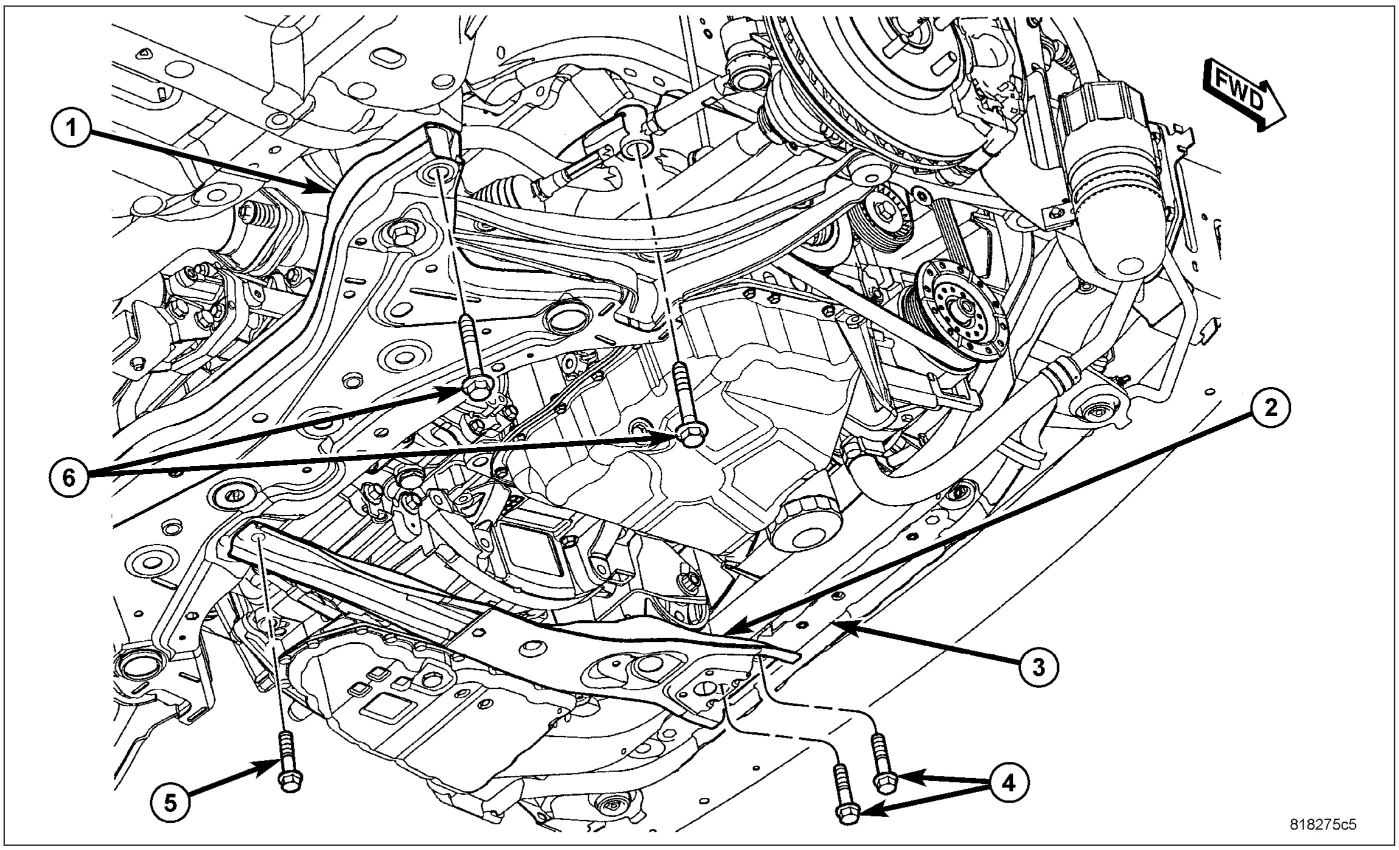
INSTALLATION

1. Rotate the stabilizer bar up and install the steering gear on the crossmember.
2. Install the two bolts (1) securing the steering gear (2) to the crossmember. Tighten the steering gear mounting bolts to 70 N·m (52 ft. lbs.).



3. Install the dash seals (3, 5) as necessary.



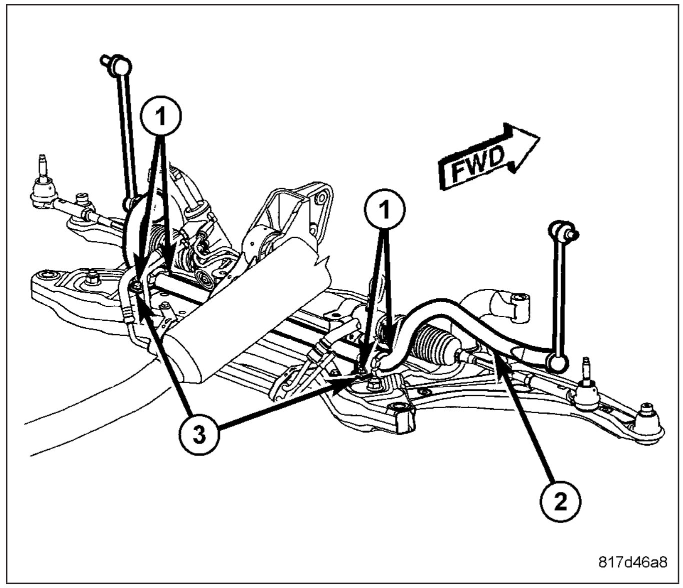


4. Center the power steering gear rack in its travel as necessary.

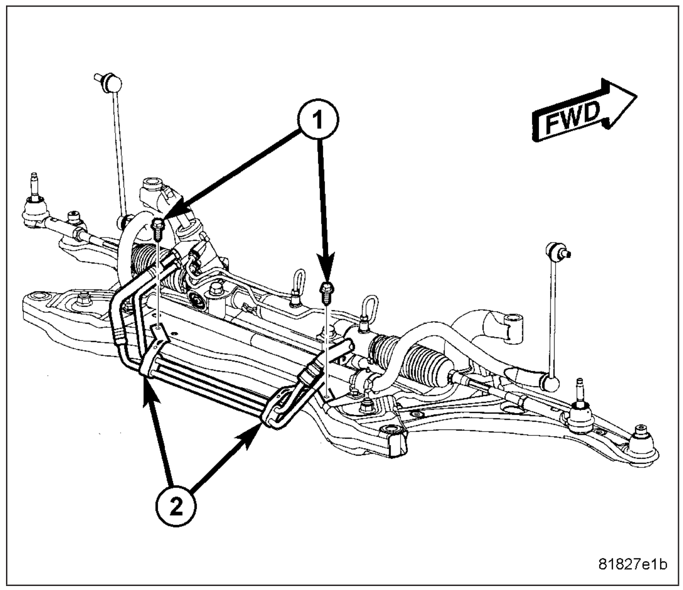
NOTE: When installing the front suspension crossmember (1) back in the vehicle, it is very important that the crossmember be attached to the body in exactly the same spot as when it was removed. Otherwise, the vehicle's wheel alignment settings (caster and camber) will be lost.

5. Slowly raise the crossmember (1) into mounted position using the transmission jack matching the crossmember to the marked locations on the body made during removal.
6. Check the positioning of the seals at the dash panel and adjust as necessary.
7. Install the four mounting bolts (6) securing the front crossmember (1) to the body. Tighten the crossmember mounting bolts to 190 N·m (140 ft. lbs.).
8. Remove the transmission jack.

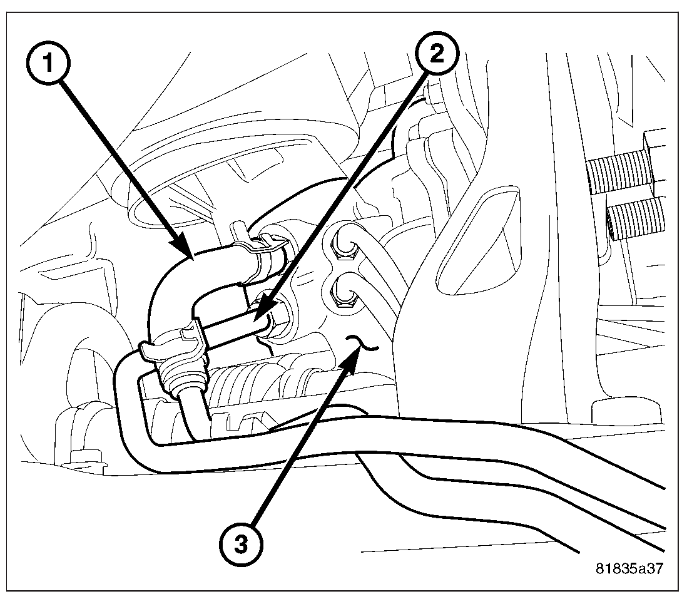
9. Install the retainers (3) over the stabilizer bar cushions. Install all four stabilizer bar cushion retainer screws (1) and tighten them to 30 N·m (22 ft. lbs.).



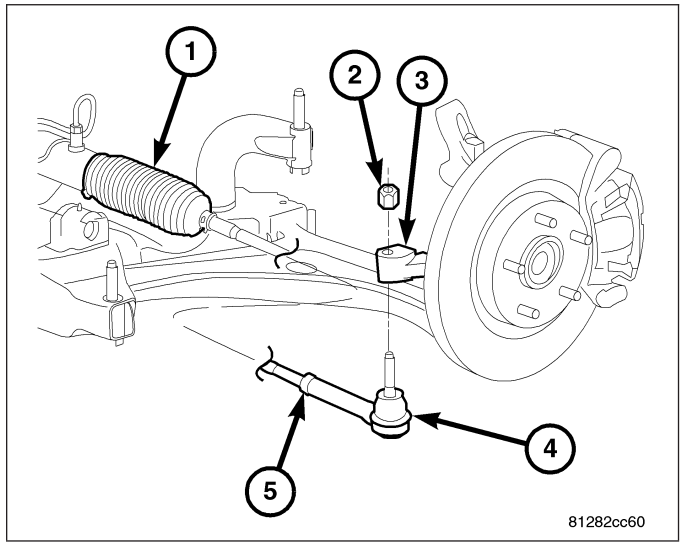
10. Install the screws (1) securing the power steering hose routing clamps (2) to the crossmember. Tighten the screws to 8 N·m (71 in. lbs.).



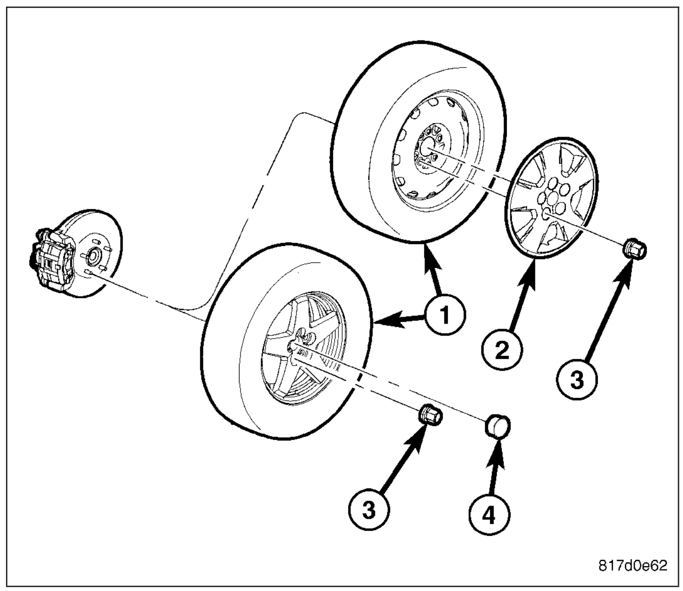
11. Install the Pressure hose at the gear. Tighten the tube nut to 32 N·m (24 ft. lbs.).
12. Install the return hose at the gear.



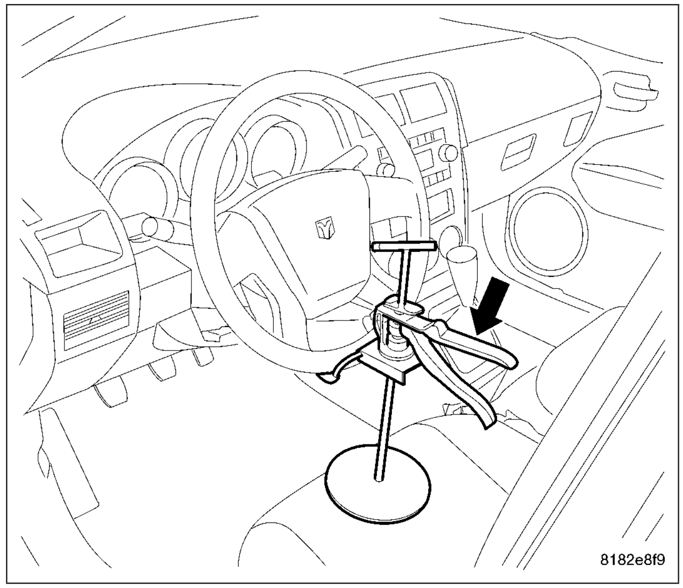
13. Install the front engine mount through-bolt.
14. Install the rear engine mount. (Refer to 9 - ENGINE/ENGINE MOUNTING/REAR MOUNT - REMOVAL)
15. If equipped, install the engine belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)
16. On each side of the gear, install the outer tie rod end (4) into the hole in the knuckle arm (3). Start the tie rod mounting nut (2) onto the stud. While holding the tie rod end stud with a wrench, tighten the nut with a wrench or crowfoot wrench. Tighten the nut to 54 N·m (40 ft. lbs.).



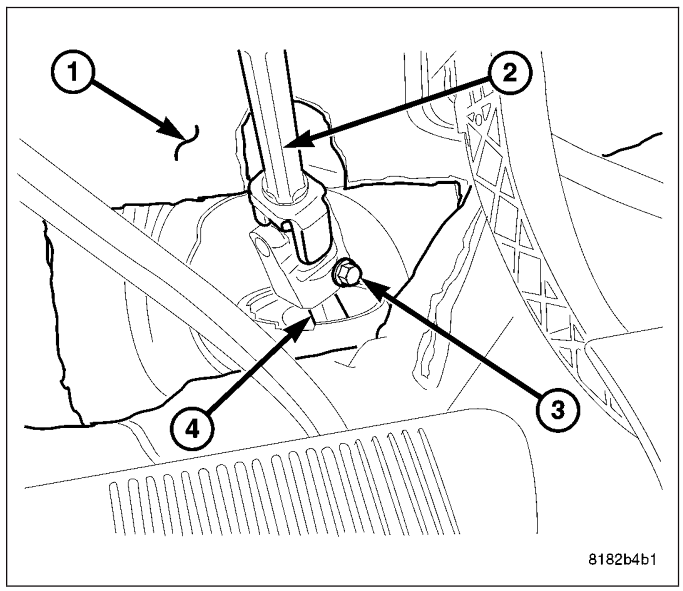
17. On each side of the vehicle, install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
18. Lower the vehicle.



19. Remove the steering wheel holder.



20. Verify the front wheels of vehicle are in the STRAIGHT-AHEAD position.
21. Center the intermediate shaft (2) over the steering gear pinion shaft (4), lining up the ends, then slide the intermediate shaft onto the steering gear pinion shaft.
22. From center, rotate the steering wheel to the right approximately 90° or until the shaft coupling pinch bolt (3) can be easily installed.
23. Install the pinch bolt (3). Tighten the pinch bolt to 28 N·m (21 ft. lbs.).
24. Reposition the floor carpet (1) in place.
25. Straighten the steering wheel to STRAIGHT-AHEAD position.

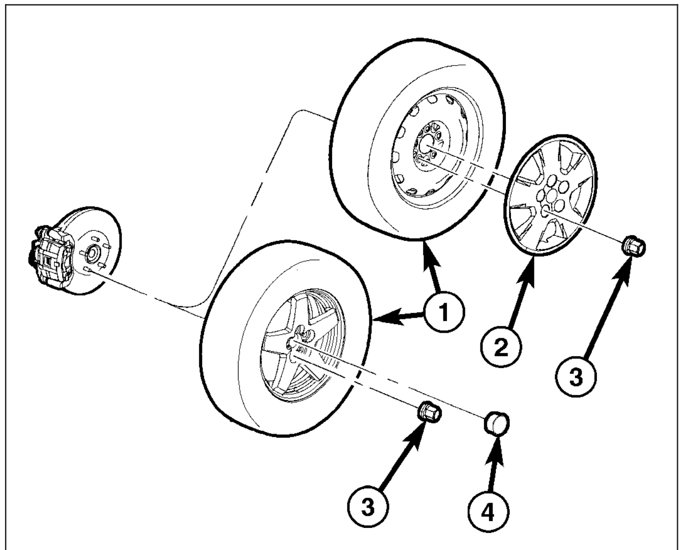


26. Fill and bleed the power steering system. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)
27. Check for fluid leaks.
28. Adjust front wheel toe as necessary. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

TIE ROD-OUTER

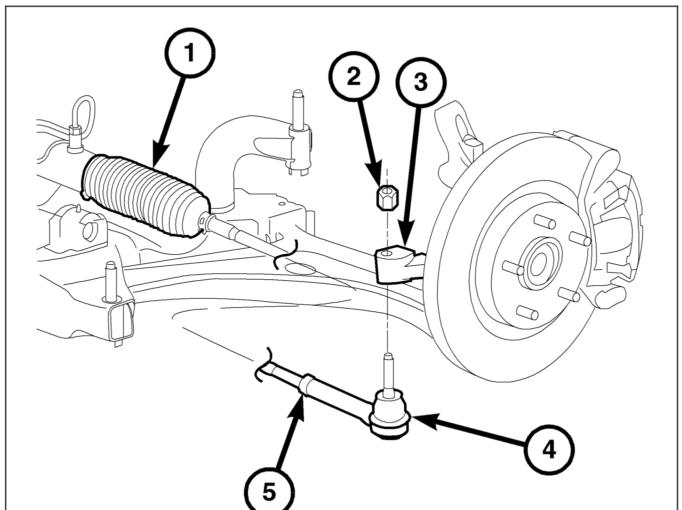
REMOVAL

1. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove the wheel mounting nuts (3) , then the tire and wheel assembly (1).



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3. Loosen the tie rod jam nut (5).
4. Remove the nut (2) attaching the outer tie rod (4) to the knuckle (3). To do this, hold the tie rod end stud with a wrench while loosening and removing the nut with a standard wrench or crowfoot wrench.

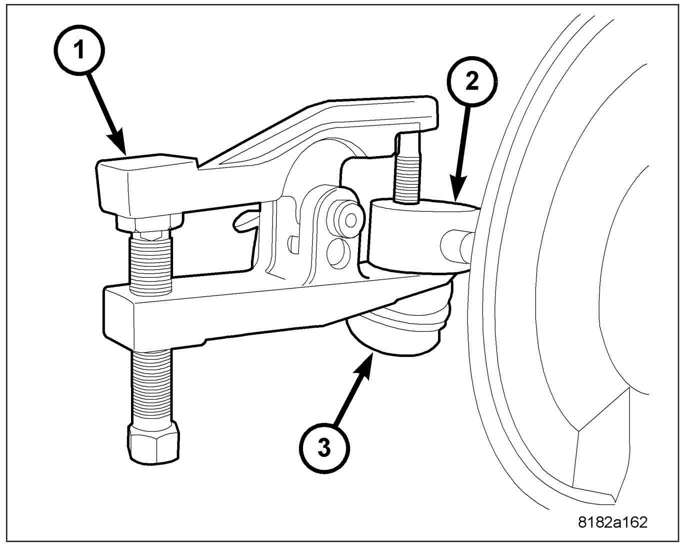


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5. Release the tie rod end (3) from the knuckle (2) using Remover, Special Tool 9360 (1)
6. Remove the outer tie rod (3) from the knuckle (2).

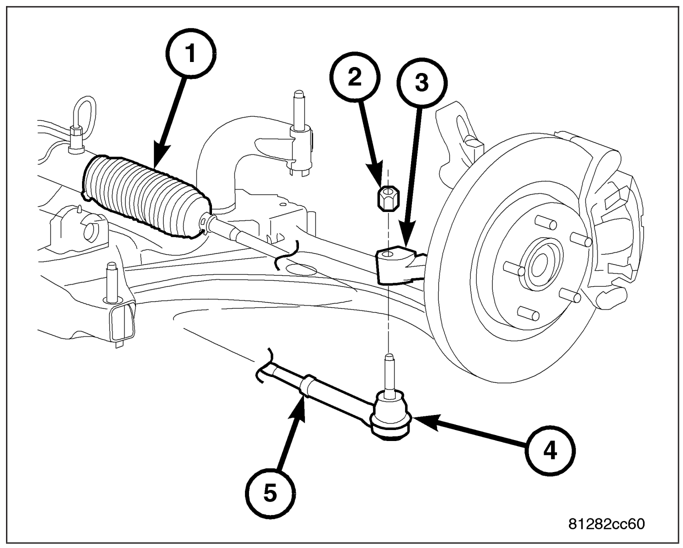
NOTE: When unscrewing the outer tie rod from inner, count the number of revolutions to take it off. This action will aid in installation, getting the toe close to where it needs to be when setting the wheel alignment.

7. Remove the outer tie rod from the inner tie rod.

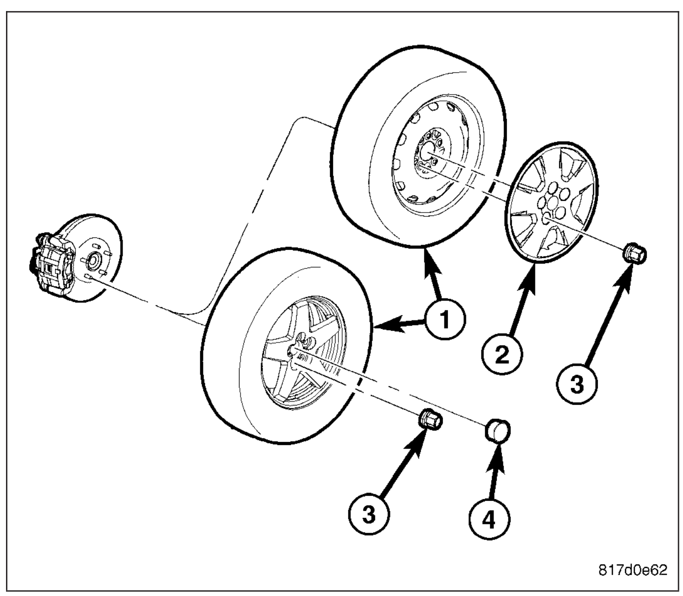


INSTALLATION

1. If it is not already installed, install the jam nut (5) on the inner tie rod threads.
2. Thread the outer tie rod (4) onto the inner tie rod approximately the same amount of revolutions as the original was installed.
3. Thread the jam nut (5) down the inner tie rod far enough to hold the outer tie rod. Do not tighten the jam nut at this time.
4. Install the outer tie rod ball stud into the hole in the knuckle arm (3). Start the tie rod mounting nut (2) onto the stud. While holding the tie rod end stud with a wrench, tighten the nut with a wrench or crowfoot wrench. Tighten the nut to 54 N·m (40 ft. lbs.).



5. Install the tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Install and tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
6. Lower the vehicle.
7. Adjust the front wheel toe setting. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).
8. Tighten the tie rod jam nut to 75 N·m (55 ft. lbs.) once wheel toe is set.



PUMP

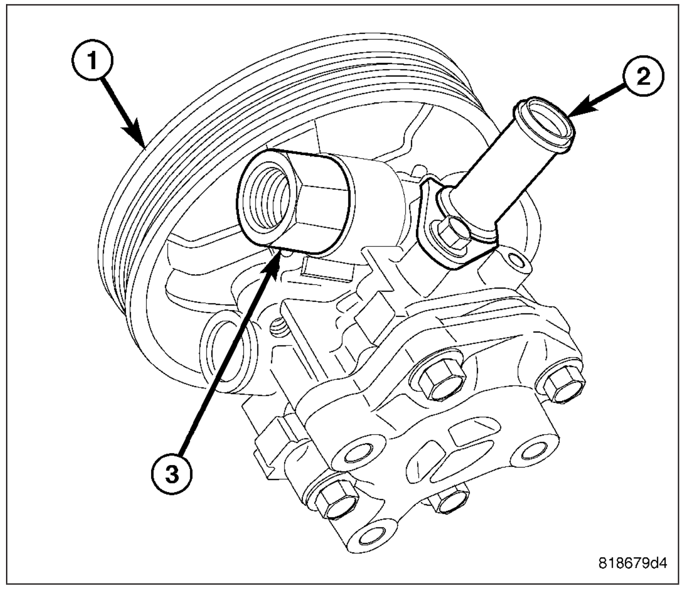
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PUMP

DESCRIPTION

Hydraulic pressure for operation of the power steering gear is provided by a constant flow rate and displacement vane-type power steering pump.

The power steering pump is belt driven. The pulley (1) cannot be serviced separately. The power steering pump is serviced as a complete assembly.

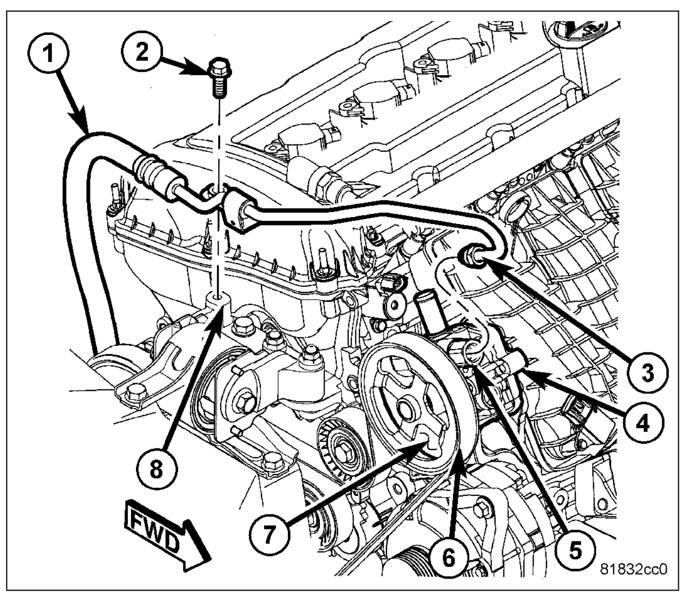


REMOVAL

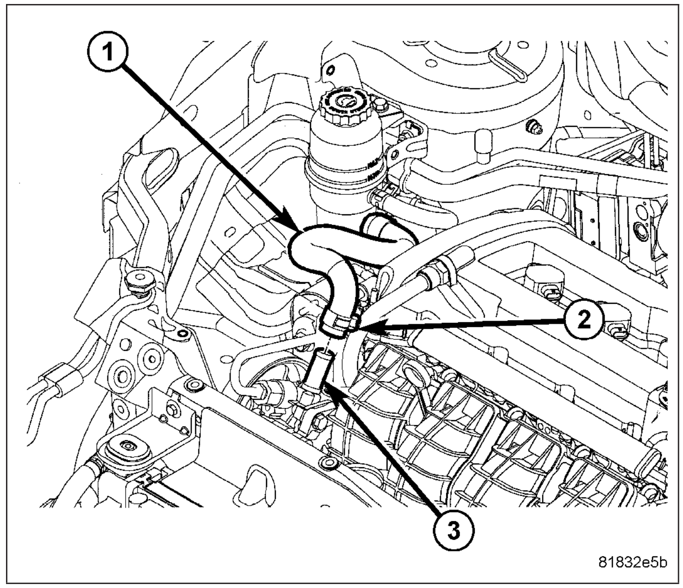
GAS ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

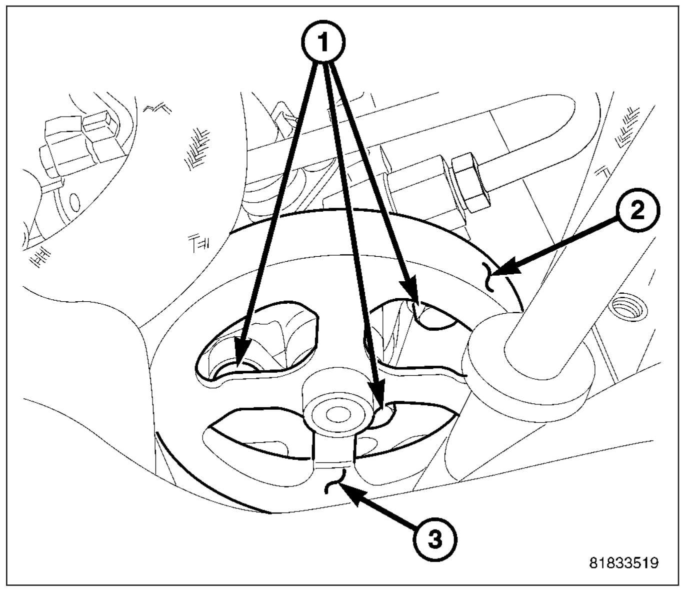
1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Remove the engine appearance cover.
3. Remove the pressure hose routing bracket bolt (2) at the upper mount (8).
4. Remove the pressure hose (3) at the pump pressure port (5).



5. Remove the hose clamp (2) securing the supply hose (1) at the pump.
6. Remove the supply hose (1) from the pump (3).



7. Remove the drive belt (2). (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)
8. Remove the three pump mounting bolts (1) through the pulley (3) openings.
9. Remove the power steering pump.

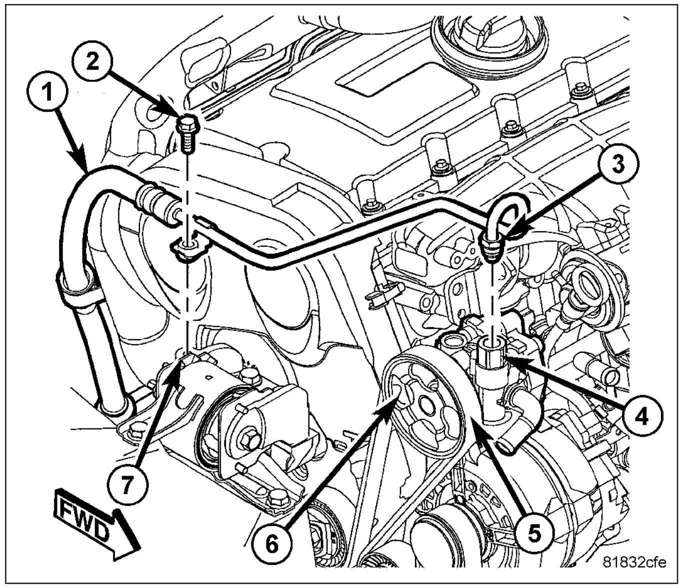


DIESEL ENGINE

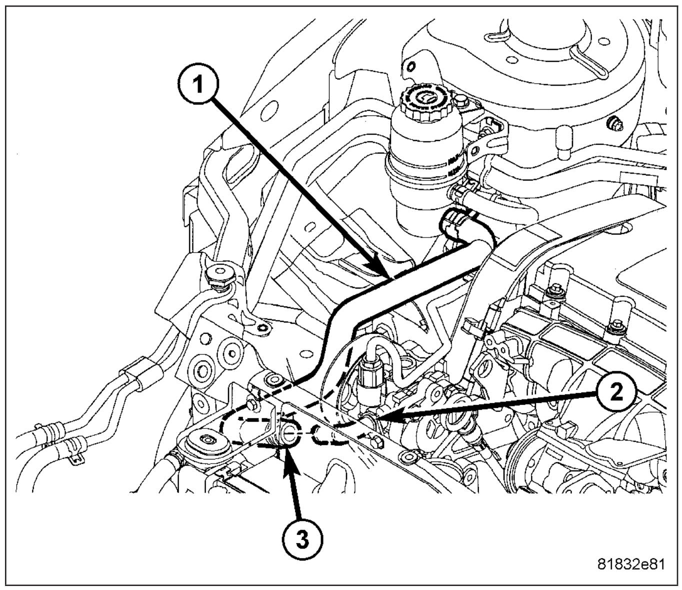
NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Remove the engine appearance cover.

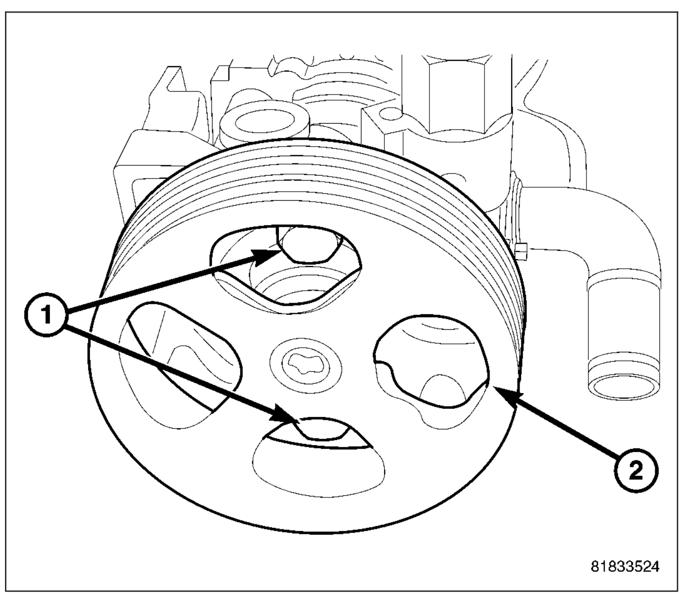
3. Remove the pressure hose routing bracket bolt (2) to the upper mount (7).
4. Remove the pressure hose (3) at the pump pressure port (4).



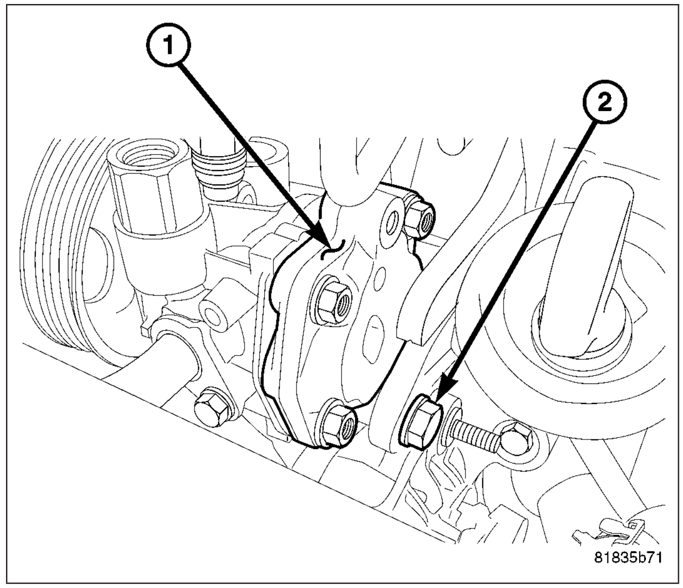
5. Remove the hose clamp (3) securing the supply hose (1) at the pump.
6. Remove the supply hose (1) from the pump (2).



7. Remove the drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)
8. Remove the two pump mounting bolts (1) through the pulley (2) openings.



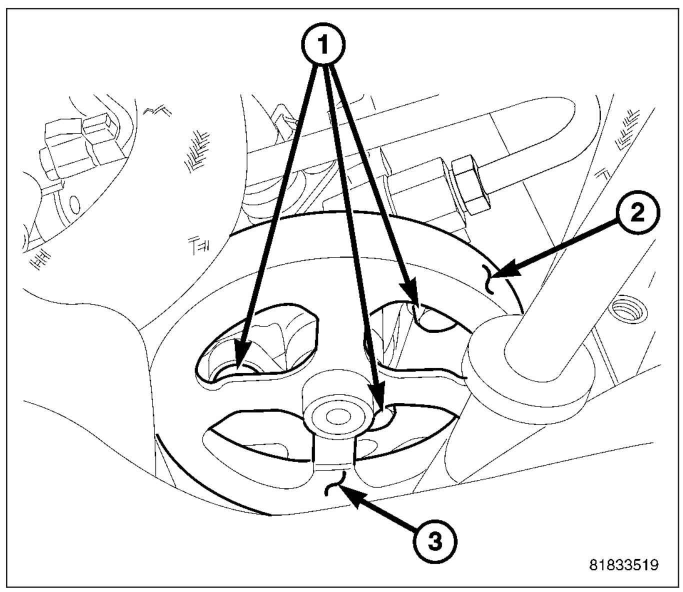
9. Remove the rear pump mounting bolt (2) behind the pump (1).
10. Remove the power steering pump (1).



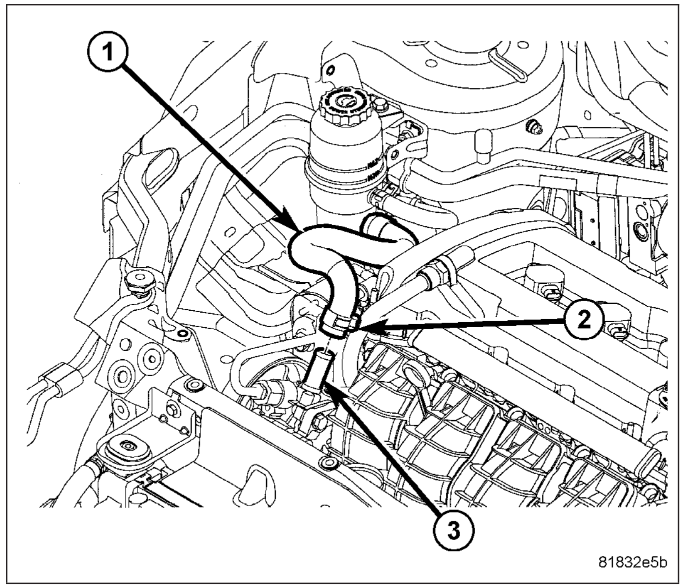
INSTALLATION

GAS ENGINE

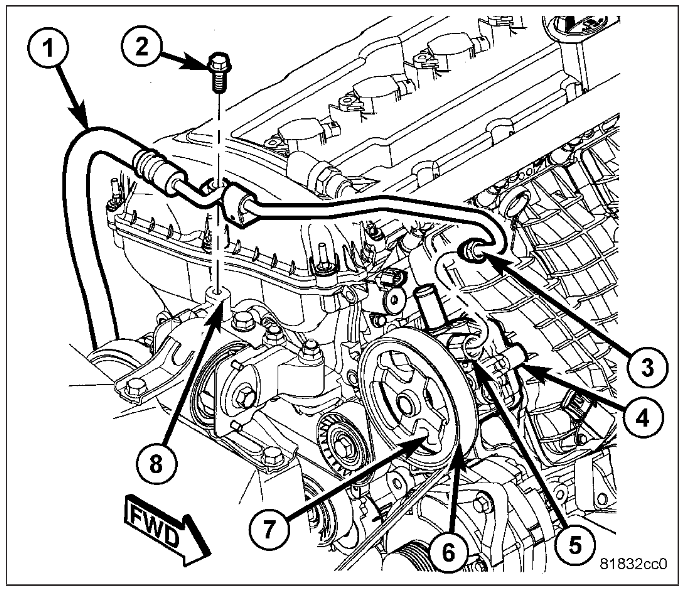
1. Using a lint free towel, wipe clean the open power steering pressure hose end and the power steering pump port. Replace any used O-rings with new. Lubricate the O-ring with clean power steering fluid.
2. Place the pump in mounting position. Install the three bolts (1) through the pulley (3) openings. Tighten the mounting bolts (1) to 20 N·m (177 in. lbs.).
3. Install the drive belt (2). (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)



4. Install the supply hose (1) at the pump (3).
5. Clamp the hose clamp (2) securing the supply hose (1) to the pump.

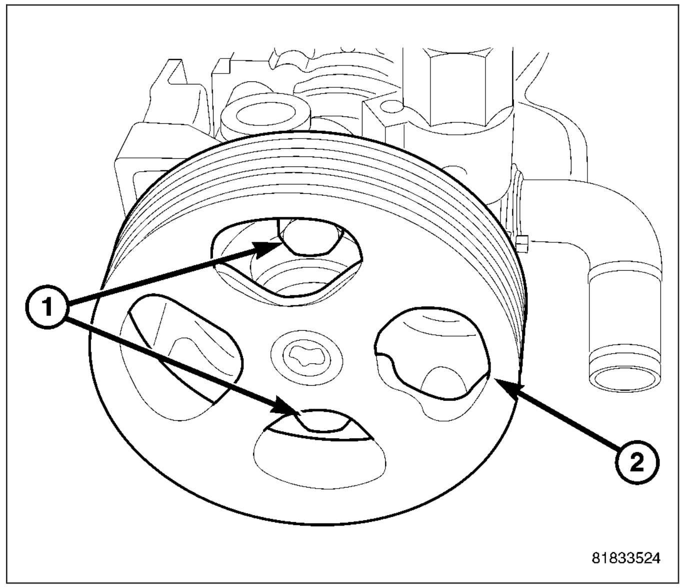


6. Install the pressure hose (3) at the pump pressure port (5). Tighten the tube nut to 32 N·m (24 ft. lbs.).
7. Install the pressure hose routing bracket bolt (2) to the upper mount (8).
8. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
9. Check for leaks.
10. Install the engine appearance cover.

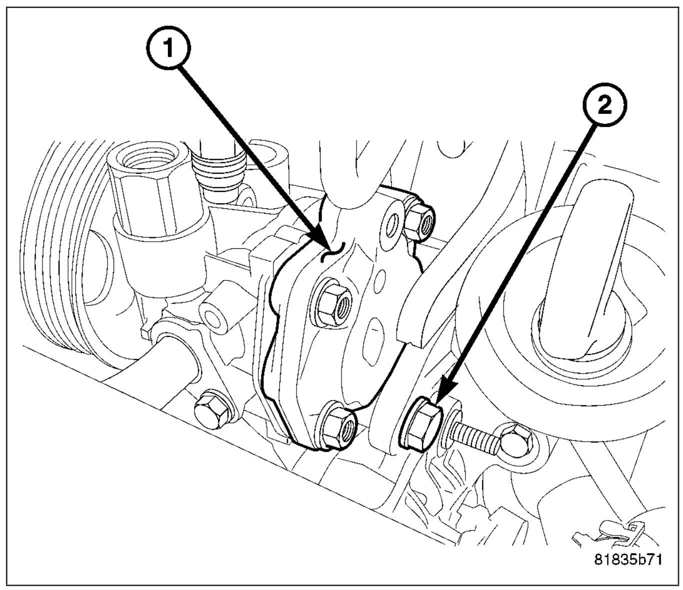


DIESEL ENGINE

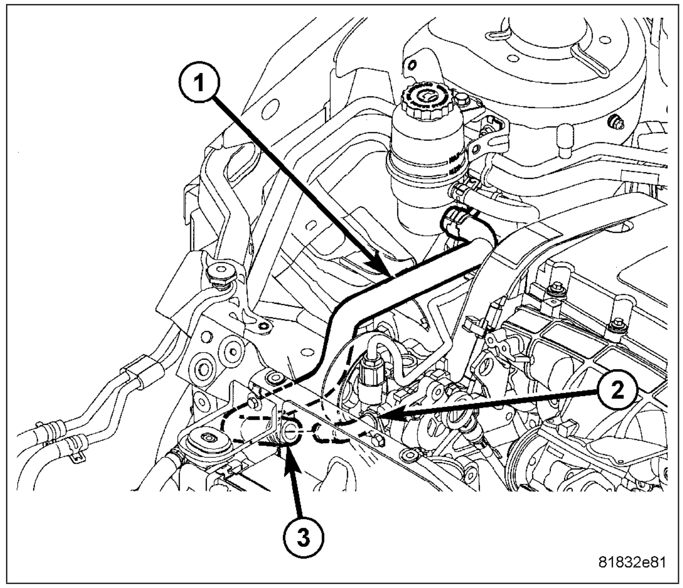
1. Using a lint free towel, wipe clean the open power steering pressure hose end and the power steering pump port. Replace any used O-rings with new. Lubricate the O-ring with clean power steering fluid.
2. Place the pump in mounting position. Install the two mounting bolts (1) through the pulley (2) openings. Tighten the mounting bolts to 26 N·m (230 in. lbs.).



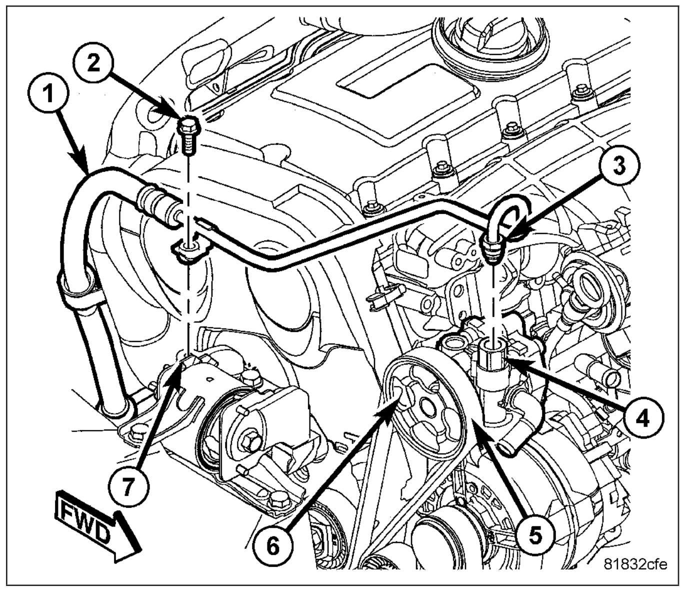
3. Install the rear mounting bolt (2) securing the rear of the pump (1). Tighten the mounting bolt to 26 N·m (230 in. lbs.).
4. Install the drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)



5. Install the supply hose (1) at the pump (2).
6. Clamp the hose clamp (3) securing the supply hose (1) to the pump.



7. Install the pressure hose (3) at the pump pressure port (4). Tighten the tube nut to 32 N·m (24 ft. lbs.).
8. Install the pressure hose routing bracket bolt (2) to the upper mount (7).
9. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
10. Check for leaks.
11. Install the engine appearance cover.



FLUID

DESCRIPTION

The recommended fluid for the power steering system is Mopar® Power Steering fluid + 4 or Mopar® ATF+4 Automatic Transmission Fluid. Both Fluids have the same material standard specifications (MS-9602).

Mopar® ATF+4 (and Mopar® Power Steering fluid + 4), when new, is red in color. ATF+4 is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, ATF+4 will begin to look darker in color and may eventually become brown. **THIS IS NORMAL.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

STANDARD PROCEDURE

POWER STEERING FLUID LEVEL CHECKING

WARNING: Fluid level should be checked with the engine OFF to prevent personal injury from moving parts and to assure an accurate fluid level reading.

CAUTION: Mopar® Power Steering Fluid + 4 or Mopar® ATF+4 Automatic Transmission Fluid is to be used in the power steering system. Both Fluids have the same material standard specifications (MS-9602). No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if another fluid is used. Do not overfill the system.

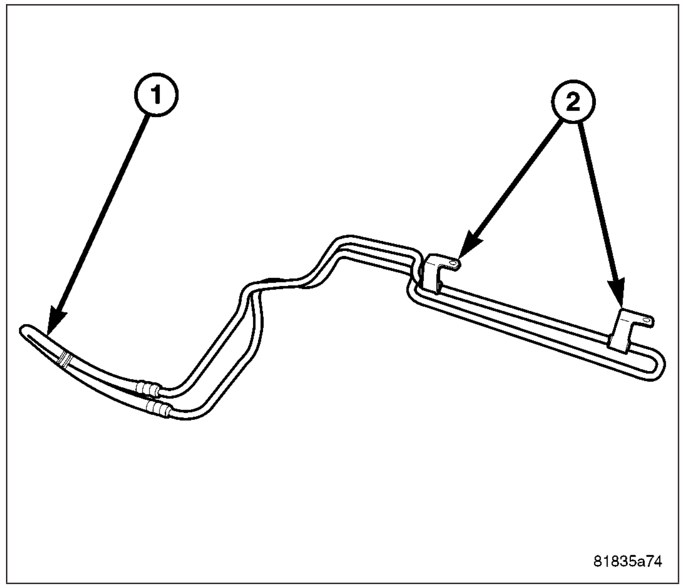
NOTE: Although not required at specific intervals, the fluid level may be checked periodically. Check the fluid level anytime there is a system noise or fluid leak suspected.

The power steering fluid level can be viewed through the side of the power steering fluid reservoir. Compare the fluid level to the markings on the side of the reservoir. When the fluid is at normal ambient temperature, approximately 21°C to 27°C (70°F to 80°F), the fluid level should read between the MAX. COLD and MIN. COLD markings. When the fluid is hot, fluid level is allowed to read up to the highest end of the MAX. HOT range.

FLUID COOLER

DESCRIPTION

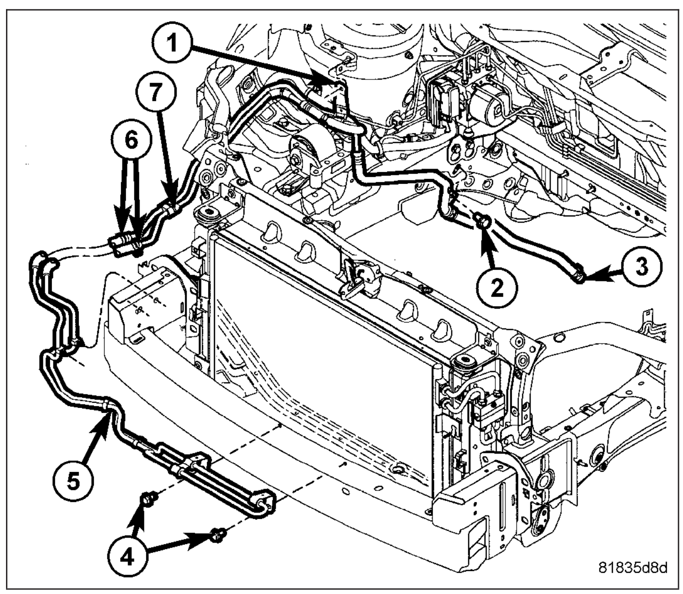
The cooler is placed in series with the power steering fluid return hose, between the steering gear fluid outlet port and the fluid return hose leading to the power steering fluid reservoir.



REMOVAL

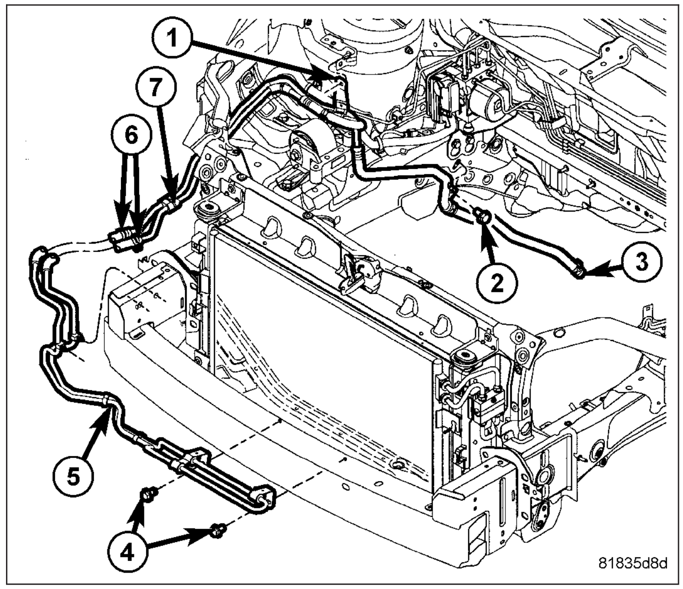
NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
3. Remove the front fascia.
4. Remove the hose clamps (6) attaching the fluid return hose (7) to the power steering fluid cooler line. Separate the return hose from the cooler line (5).
5. Remove the two cooler mounting screws (4).
6. Remove the cooler tubes from the clips on the side of the frame rail.
7. Remove the cooler lines (5) from the vehicle.



INSTALLATION

1. Install the cooler tubes in the clips on the side of the frame rail.
2. Install the fluid cooler mounting screws (4) to the support. Tighten the screws to 8 N·m (71 in. lbs.).
3. Install the fluid return hose (7) on the power steering fluid cooler lines (5). Install the hose clamp (6) on the hose past the bead formed into the end of the cooler tube and secure in place.



4. Install the front fascia.
5. Lower the vehicle.
6. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
7. Check for leaks.

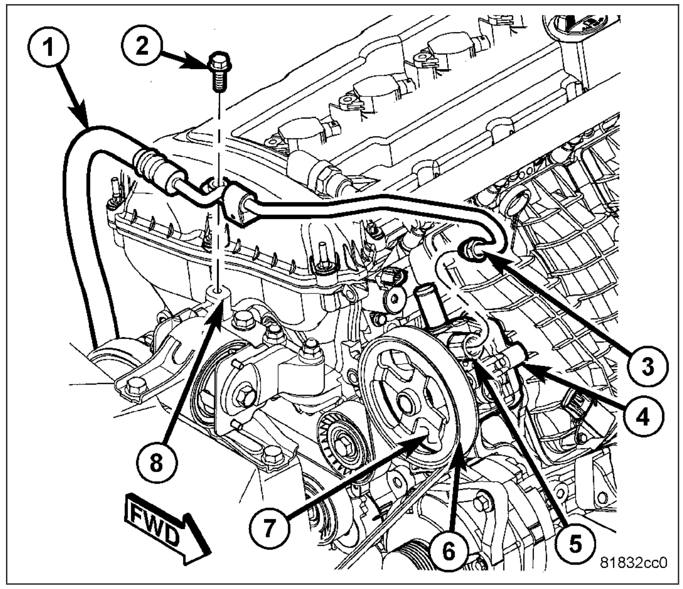
HOSE-PRESSURE

REMOVAL

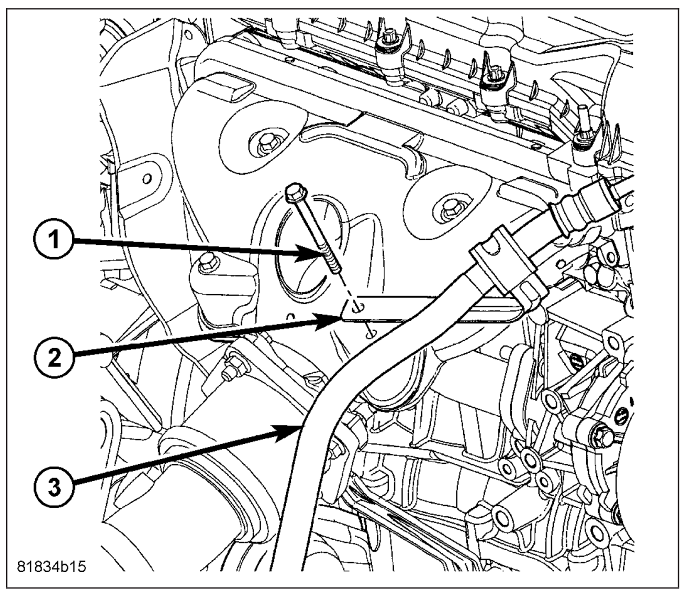
GAS ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

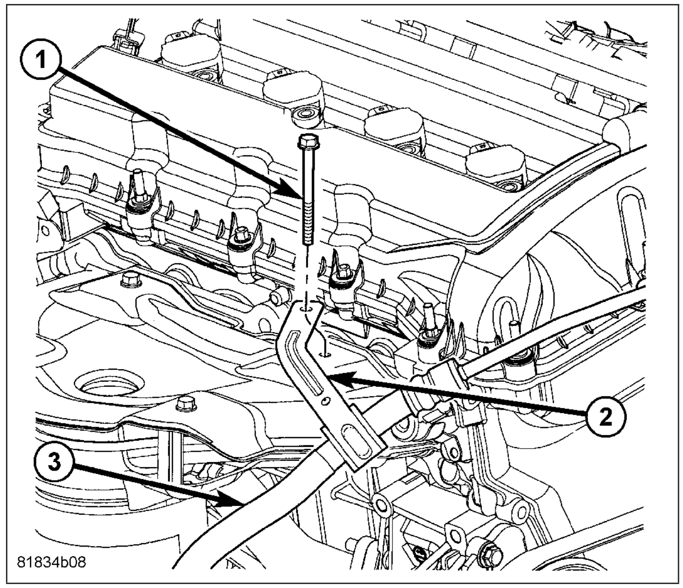
1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Remove the engine appearance cover.
3. Remove the pressure Hose (3) at the pump pressure port (5).
4. Remove the pressure hose routing bracket bolt (2) at the upper mount (8).



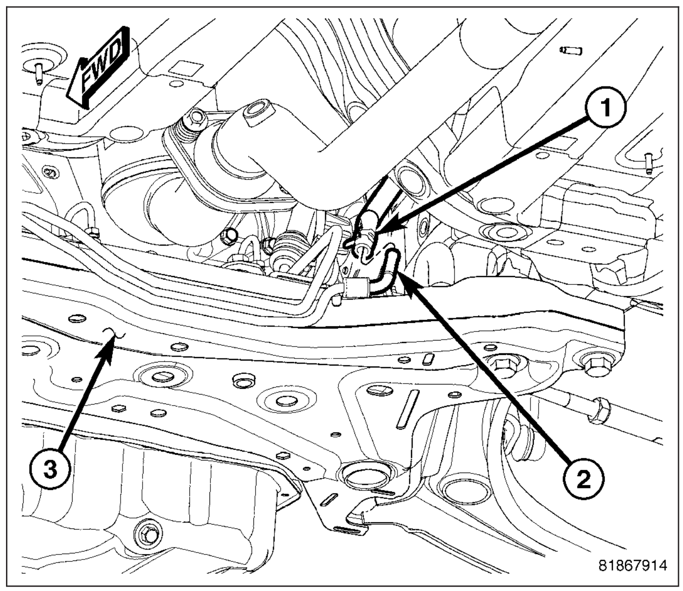
5. 2.0L Engine - Remove the pressure hose routing clamp bolt (1) at the exhaust manifold.



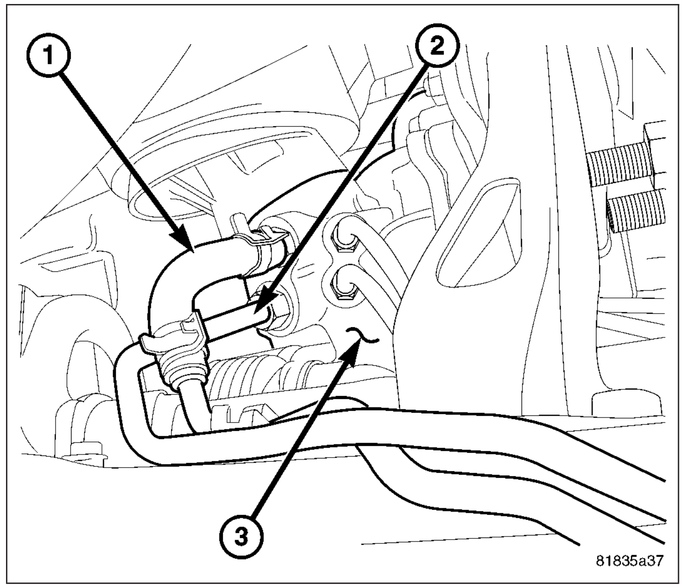
6. 2.4L Engine - Remove the pressure hose routing clamp bolt (1) at the exhaust manifold.



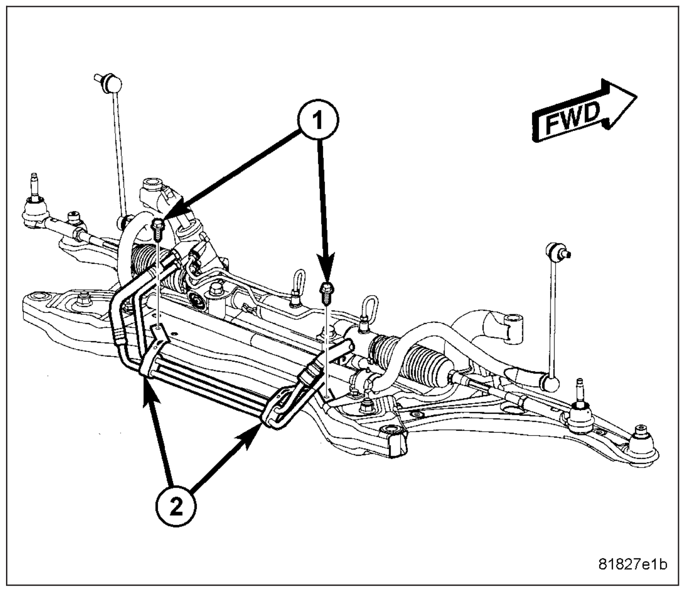
7. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
8. Remove the return hose (1) at the return tube (2).



9. Remove the return hose (1) at the steering gear (3).
10. Remove the pressure hose (2) at the steering gear (3).



11. Remove the screws (1) securing the power steering hose routing clamps (2) to the crossmember.
12. Remove the power steering pressure line (2) from the vehicle.

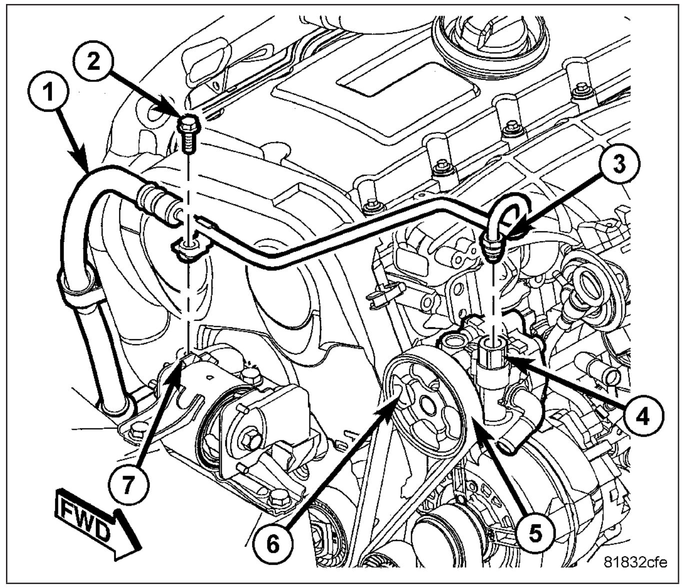


DIESEL ENGINE

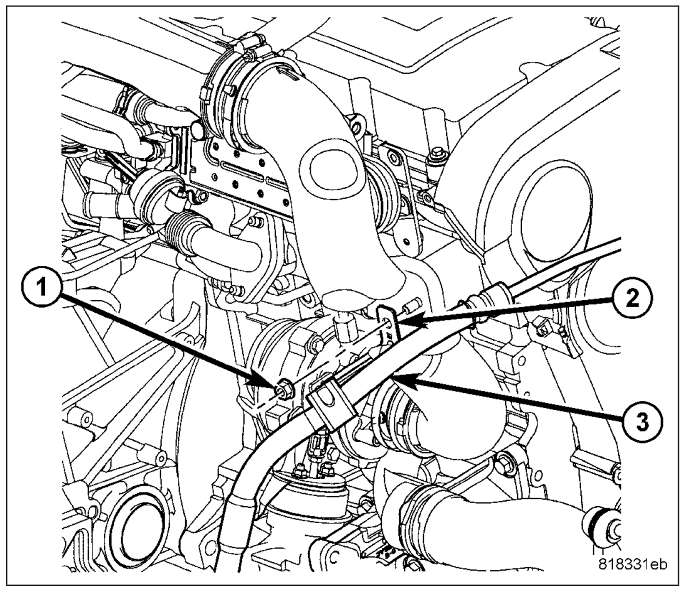
NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Siphon as much fluid as possible from power steering fluid reservoir.
2. Remove the engine appearance cover.

3. Remove the pressure line (3) at the pump (4).
4. Remove the pressure line routing bracket bolt (2) at the upper mount (7).

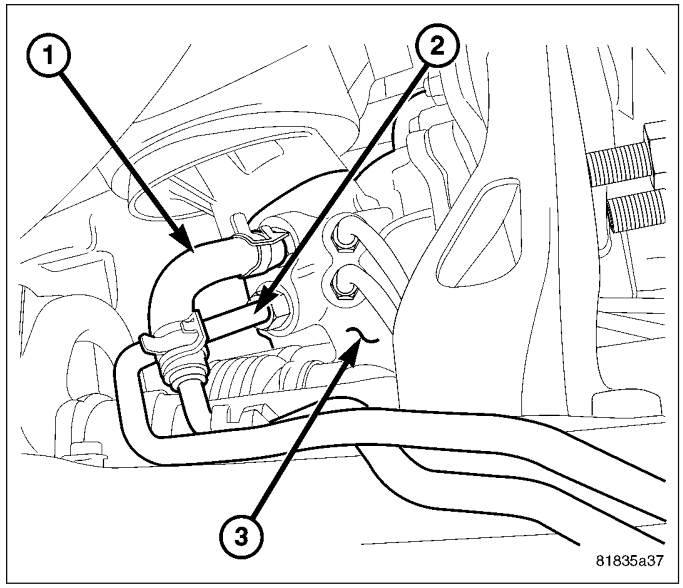


5. Remove the pressure line routing bracket bolt (1) at the back of the engine (2).

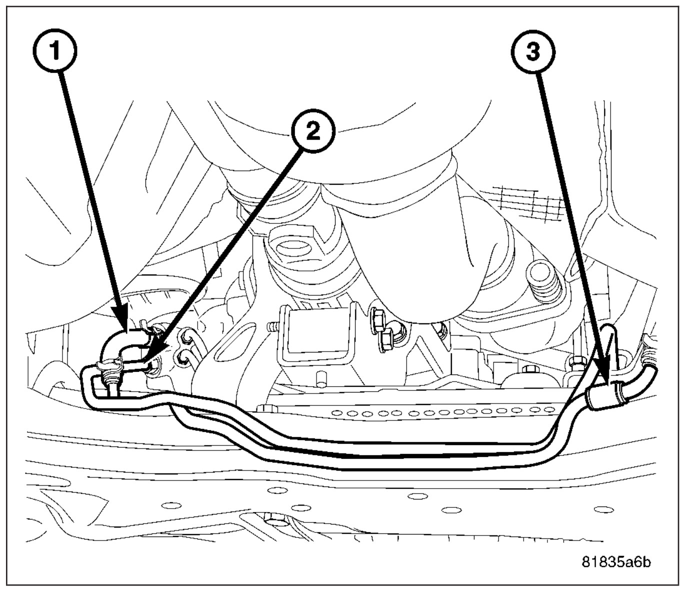


6. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

7. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
8. Remove the pressure line (2) at the steering gear (3).



9. Remove the power steering pressure line (2) from the vehicle.



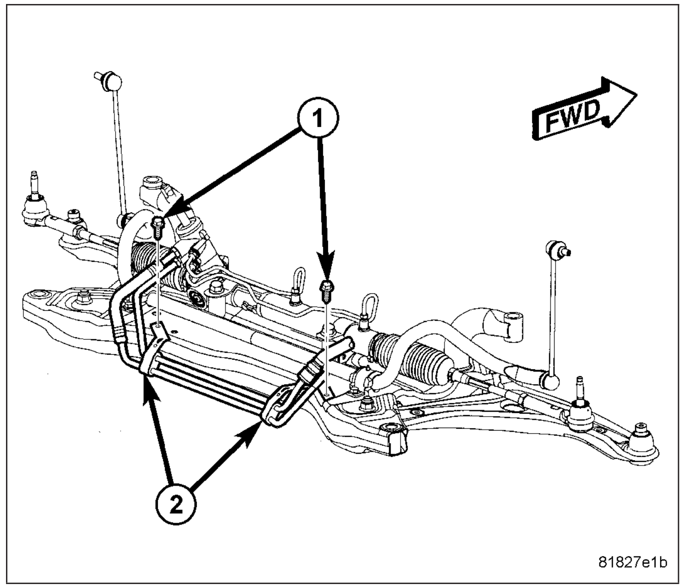
INSTALLATION

GAS ENGINE

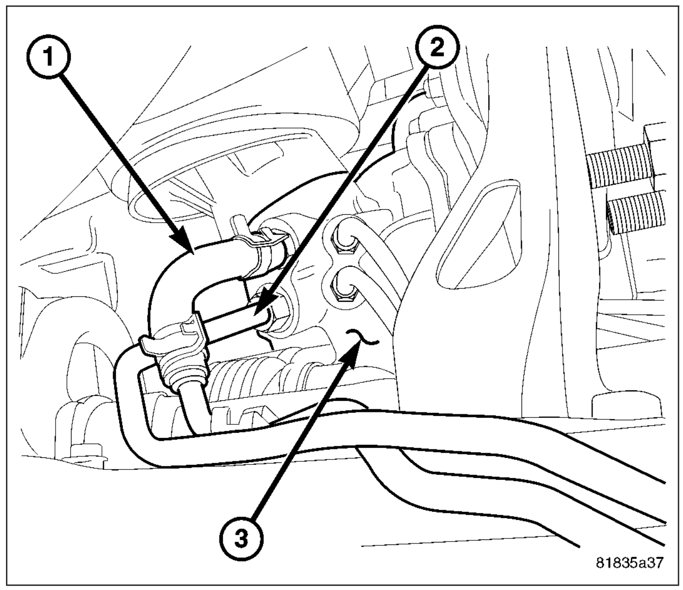
CAUTION: Power steering fluid hoses must remain away from the exhaust system, driveshafts, vehicle components and any unfriendly surface that can possibly damage the hoses.

1. Using a lint free towel, wipe clean the open power steering hose end and the power steering pump port. Replace any used O-rings with new. Lubricate the O-ring with power steering fluid.

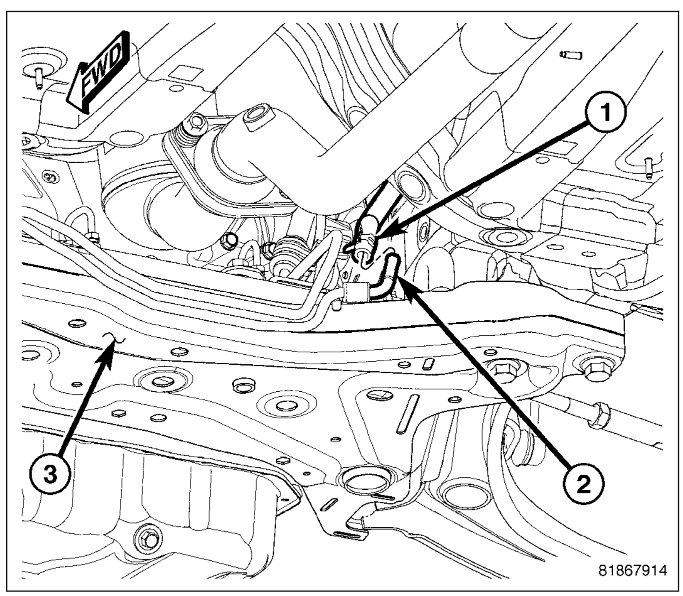
2. Install the power steering pressure hose into the engine compartment from below.
3. Install the screws (1) securing the power steering hose routing clamps (2) to the crossmember. Tighten the screws to 8 N·m (71 in. lbs.).



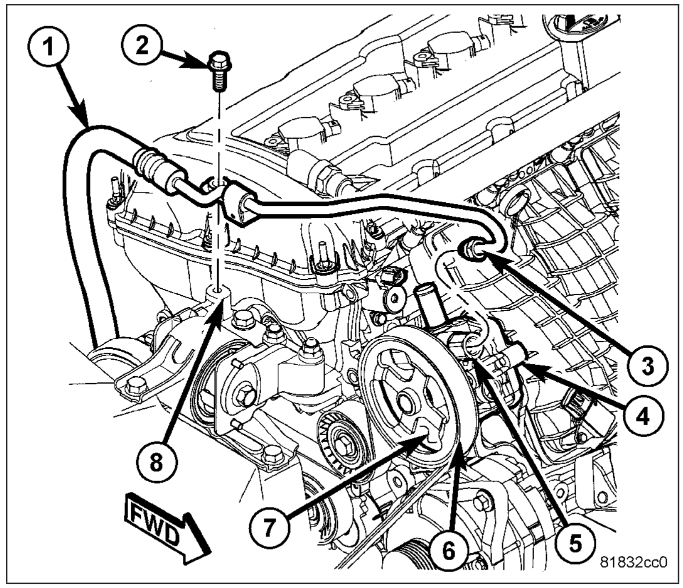
4. Install the Pressure hose at the gear. Tighten the tube nut to 32 N·m (24 ft. lbs.).
5. Install the return hose at the gear.



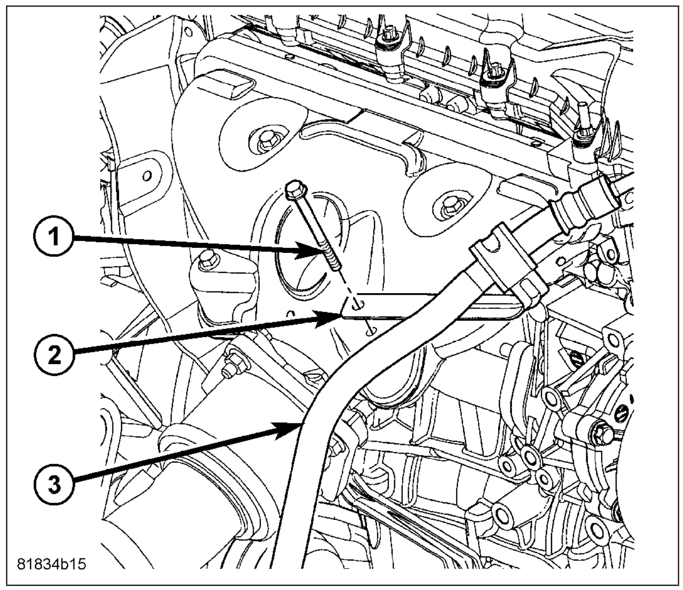
6. Install the return hose (1) at the return tube (2).
7. Lower the vehicle.



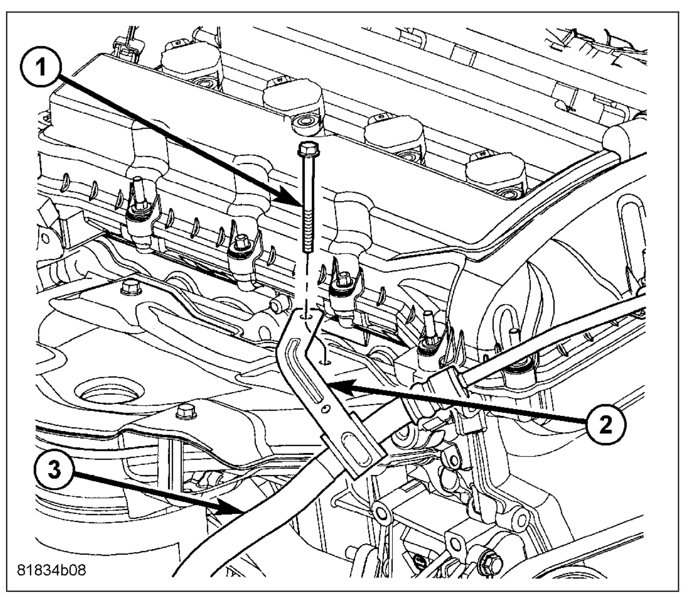
8. Install the pressure hose (3) at the pump pressure port (5). Tighten the tube nut to 32 N·m (24 ft. lbs.).
9. Install the pressure hose routing bracket bolt (2) to the upper mount (8).



10. 2.0L Engine - Position the pressure hose routing clamp (2) at the exhaust manifold and install the mounting bolt (1). Tighten the bolt to 9 N·m (80 in. lbs.).



11. 2.4L Engine - Position the pressure hose routing clamp (2) at the exhaust manifold and install the mounting bolt (1). Tighten the bolt to 9 N·m (80 in. lbs.).

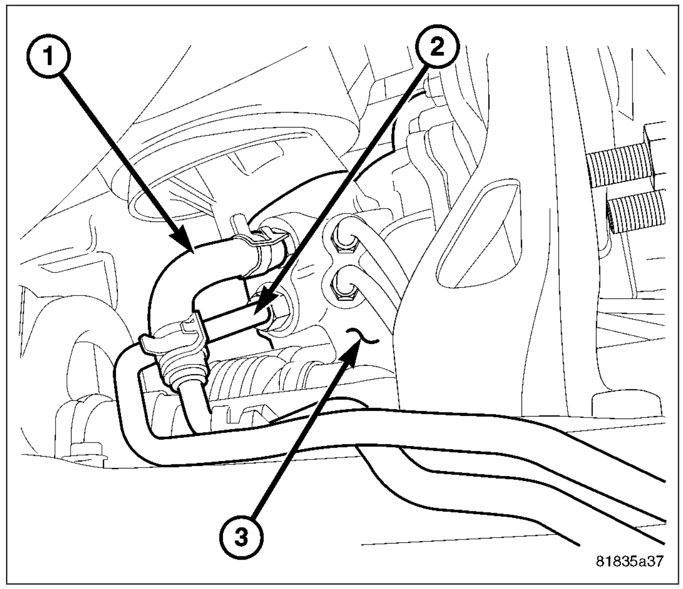


12. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
13. Check for leaks.
14. Install the engine appearance cover.

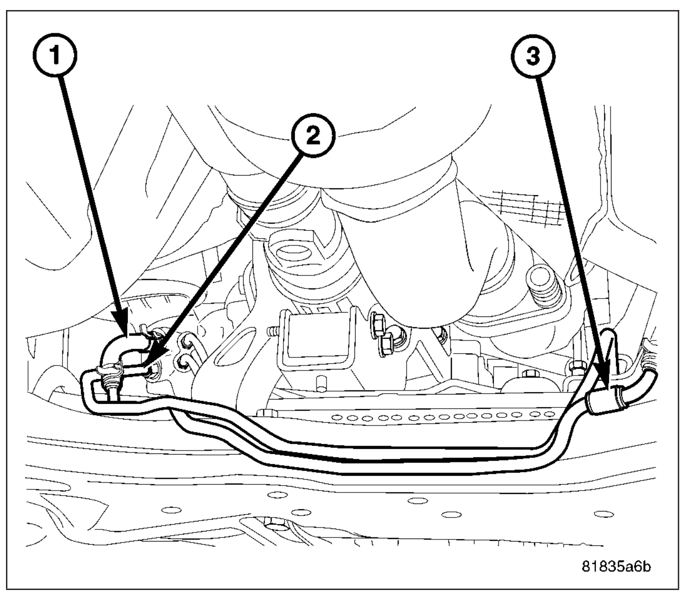
DIESEL ENGINE

CAUTION: Power steering fluid hoses must remain away from the exhaust system, driveshafts, vehicle components and any unfriendly surface that can possibly damage hoses.

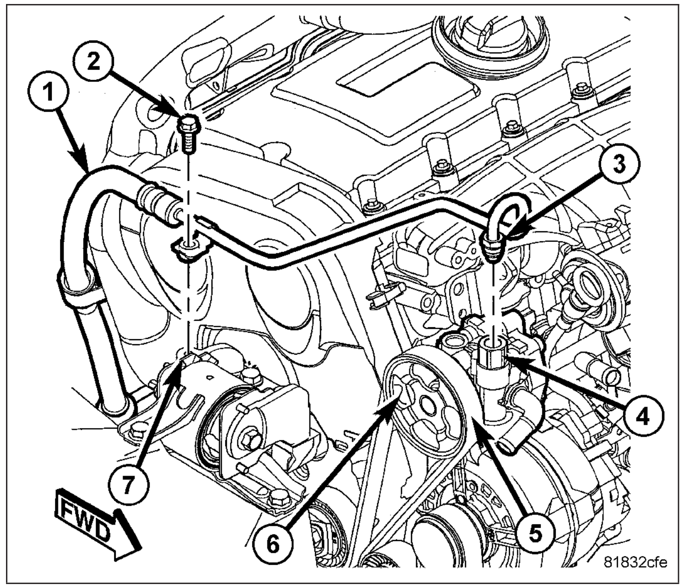
1. Using a lint free towel, wipe clean the open power steering hose end and power steering pump port. Replace any used O-rings with new. Lubricate the O-ring with fresh power steering fluid.
2. Install the power steering pressure hose into the engine compartment.
3. Install the pressure line (2) at the gear (3).



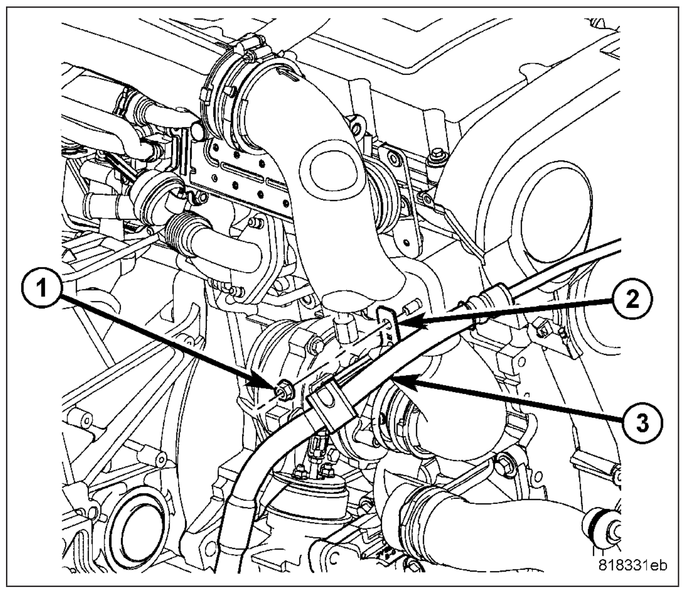
4. Install the pressure line (2) in place at the cross-member.
5. Lower the vehicle.



6. Install the pressure line (3) at the pump pressure port (4). Tighten the tube nut to 32 N·m (24 ft. lbs.).
7. Install the pressure line routing bracket bolt (2) to the upper mount (7).



8. Install the mounting bolt (1) for the pressure line bracket (2) to the rear of the engine. Tighten the nut to 24 N·m (18 ft. lbs.).
9. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
10. Check for leaks.
11. Install the engine appearance cover.

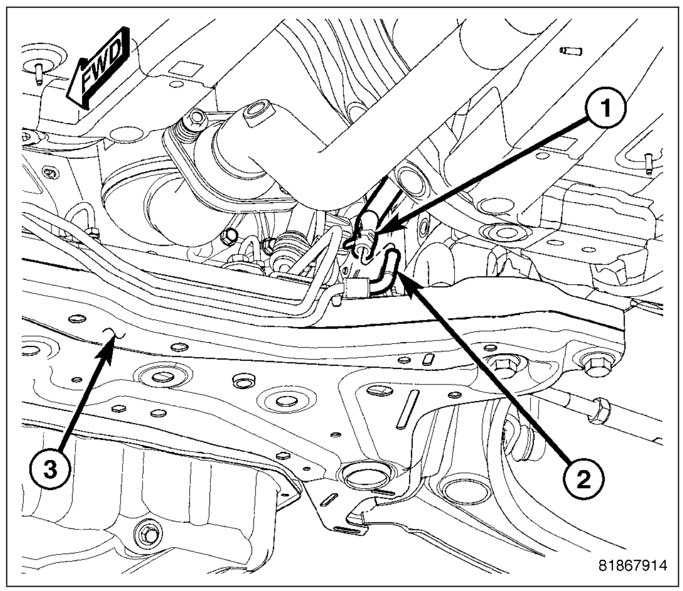


HOSE-RETURN

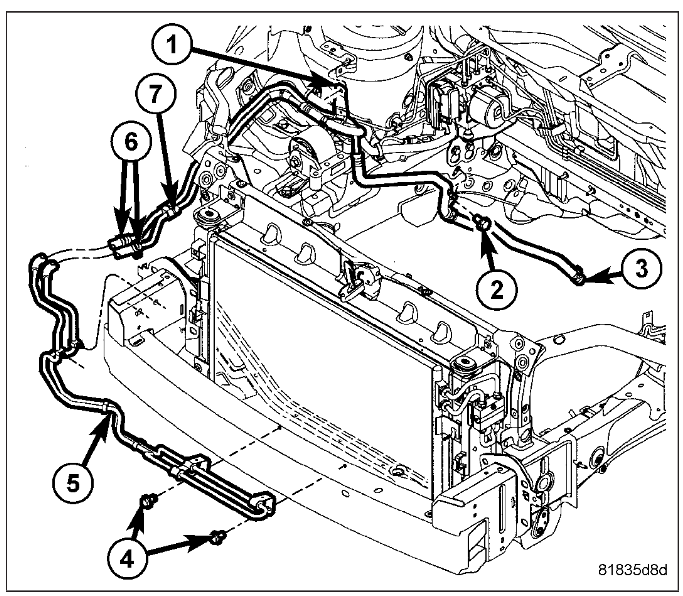
REMOVAL

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Remove the engine appearance cover.
2. Remove the coolant recovery bottle. (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL)
3. Siphon as much fluid as possible from the power steering fluid reservoir.
4. Remove the power steering fluid reservoir. (Refer to 19 - STEERING/PUMP/RESERVOIR - REMOVAL)
5. Remove the windshield washer reservoir. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL)
6. Remove the front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL)
7. Remove the right headlamp. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL)
8. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
9. Remove the return hose (1) at the return tube (2).

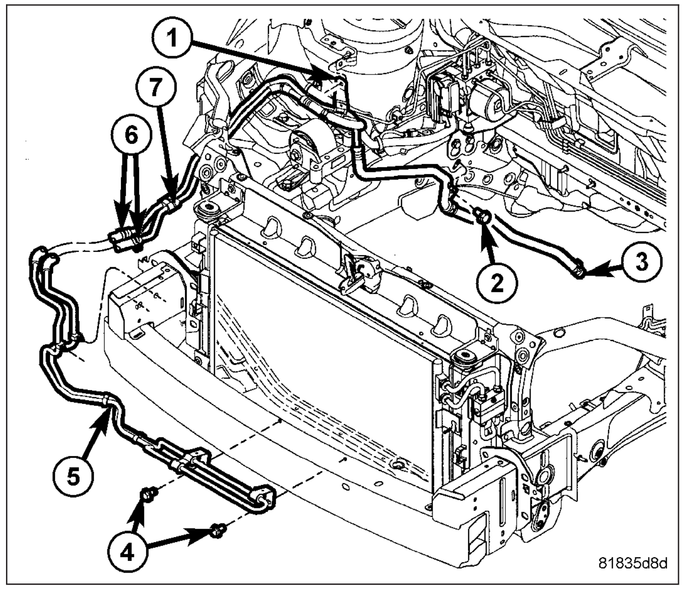


10. Remove the return hose routing clamp pushpin (2) securing the return hose (7) to the frame rail.
11. Lower the vehicle.
12. Remove the return hose routing clamp screw (1) securing the return hose (7) to the strut tower.
13. Remove the hose clamps (6) securing the return hose to the power steering reservoir and cooler. Slide the hose off the end of the cooler tube.
14. Remove the return hose from the vehicle.

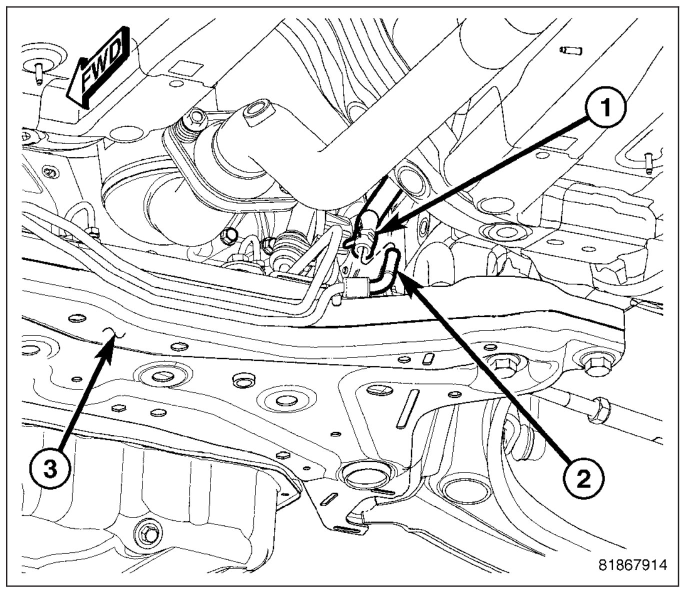


INSTALLATION

1. Install the power steering return hose (7) into the engine compartment.
2. Install the return hose routing clamp screw (1) securing the return hose (7) to the strut tower.
3. Install the return hose onto the cooler tubes (5) and install the hose clamps (6).
4. Raise and support the vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
5. Install the pushpin (2) securing the return hose to the frame rail.



6. Install the return hose (1) at the return tube (2).
7. Lower the vehicle.



8. Install the right headlamp. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION)
9. Install the front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)
10. Install the windshield washer reservoir. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION)
11. Install the power steering fluid reservoir. (Refer to 19 - STEERING/PUMP/RESERVOIR - INSTALLATION)
12. Install the coolant recovery bottle. (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION)
13. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
14. Check for leaks.
15. Install the engine appearance cover.

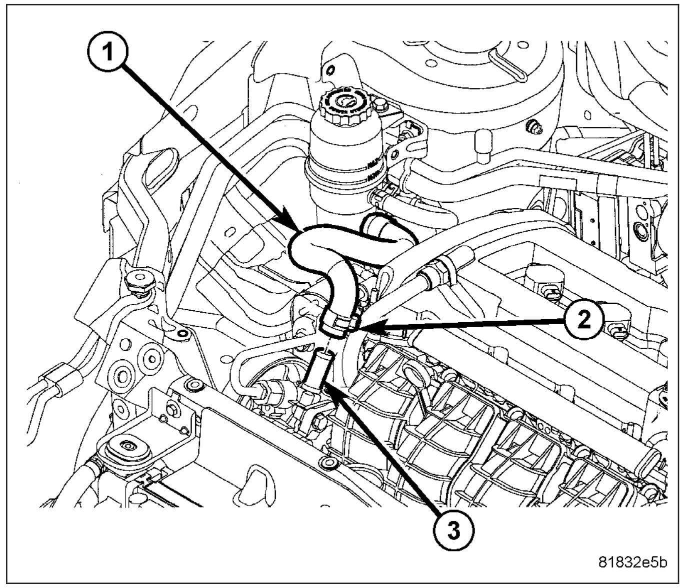
HOSE-SUPPLY

REMOVAL

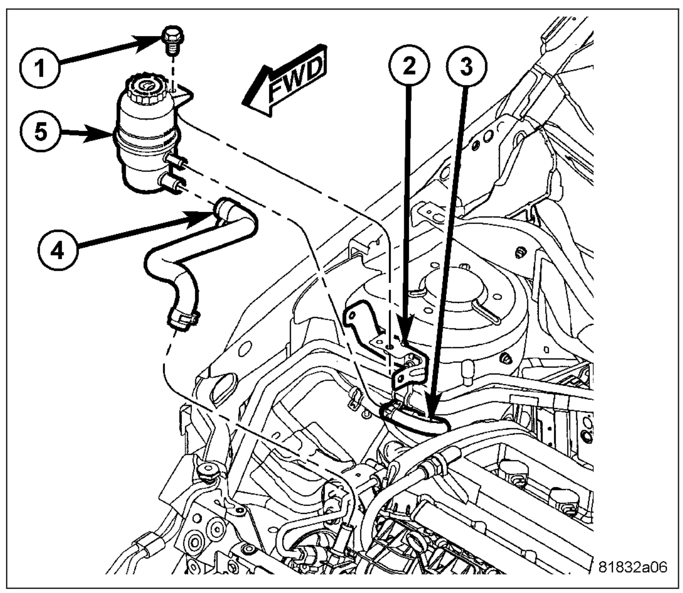
GAS ENGINE

NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Remove the clamp (2) securing the supply hose to the power steering pump (3) supply fitting, then remove the hose from the supply fitting.



3. Remove the hose clamp securing the supply hose (4) to the power steering fluid reservoir (5). Slide the hose off the end of the reservoir fitting and remove from vehicle.

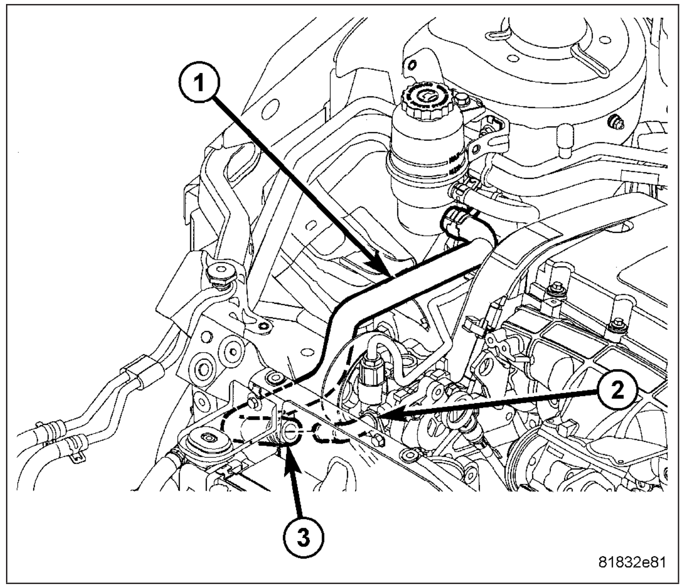


DIESEL ENGINE

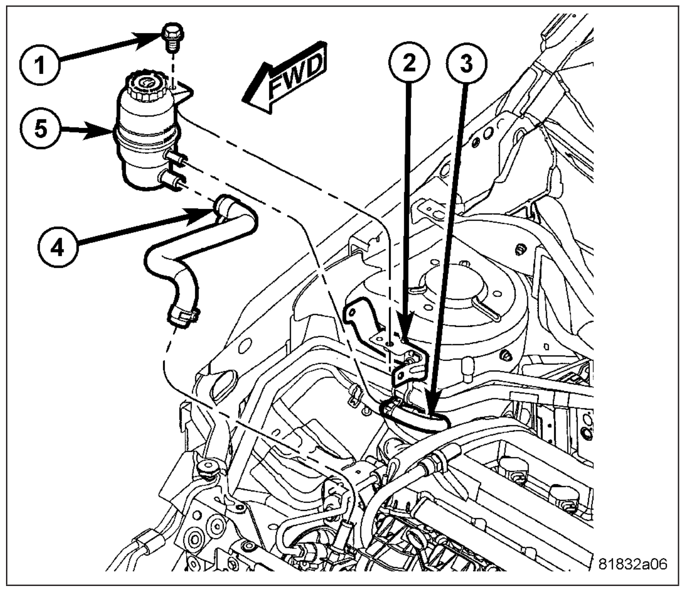
NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Remove the engine top appearance cover.
2. Siphon as much fluid as possible from power steering fluid reservoir.

3. Remove the clamp securing the supply hose (3) to the power steering pump supply fitting (2), then remove the hose from the fitting (1).



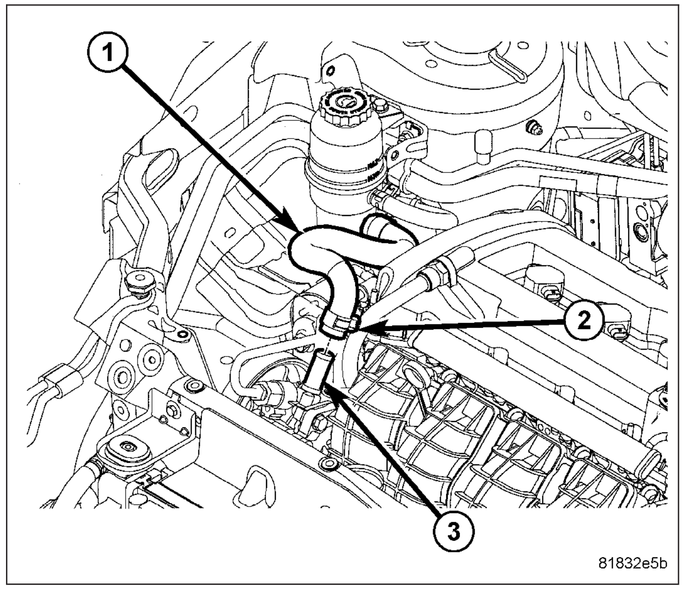
4. Remove the hose clamp (4) securing supply hose to the power steering fluid reservoir (5). Slide the hose off the end of the reservoir fitting and remove from vehicle.



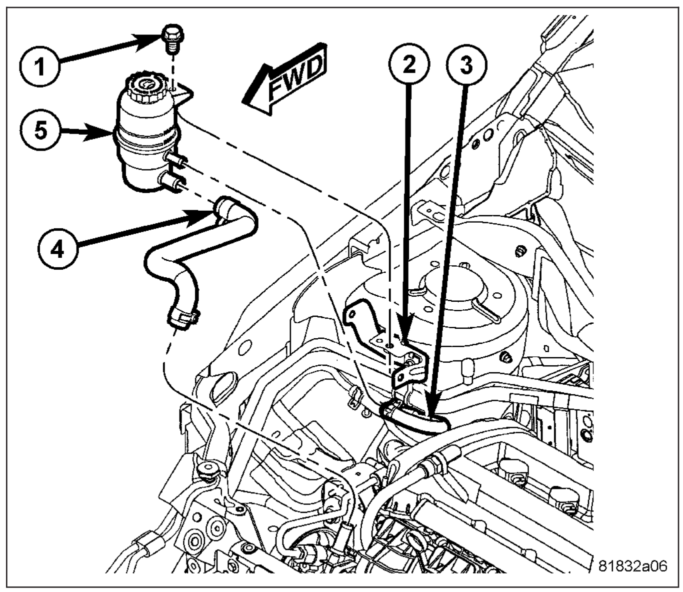
INSTALLATION

GAS ENGINE

1. Slide hose clamps (2) onto both ends of the power steering fluid supply hose (1) far enough to clear the fittings on the reservoir and pump once the hose is installed.
2. Place the pump end of the supply hose (1) onto the pump (3) supply fitting. Expand the hose clamp (2) and slide it over the hose and pump supply fitting. Secure the clamp once it is past the bead formed into the fluid supply fitting.

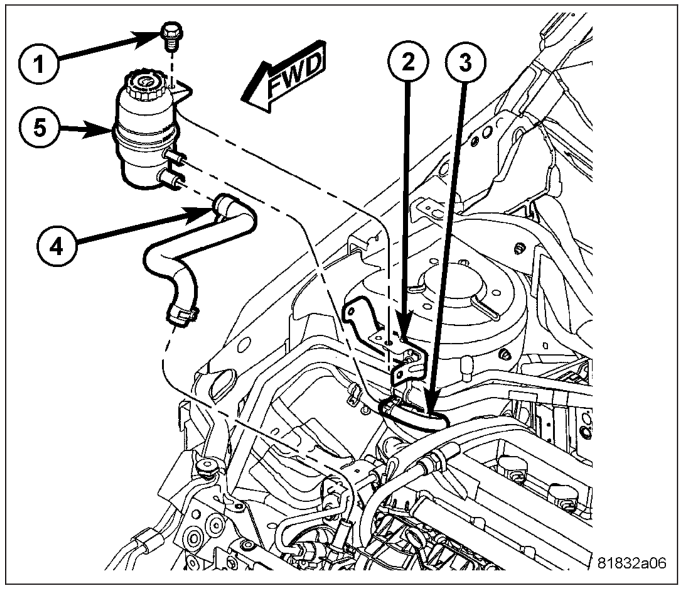


3. Expand the hose clamp (4) at the fluid reservoir (5) and slide it over the hose and fitting. Secure the clamp once it is past the bead formed into the fluid reservoir fitting.
4. Perform the POWER STEERING PUMP BLEED PROCEDURE. (Refer to 19 - STEERING - STANDARD PROCEDURE)
5. Check for leaks at all hose connections.

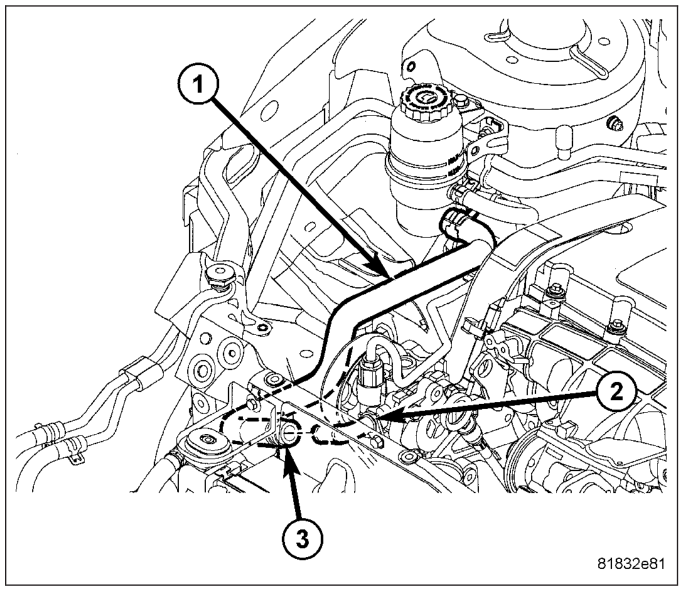


DIESEL ENGINE

1. Slide hose clamps onto both ends of the power steering fluid supply hose far enough to clear the fittings on the reservoir and pump once hose is installed.
2. Expand the hose clamp (4) at the fluid reservoir end (5) and slide it over the hose and fitting. Secure the clamp once it is past the bead formed into the fluid reservoir fitting.



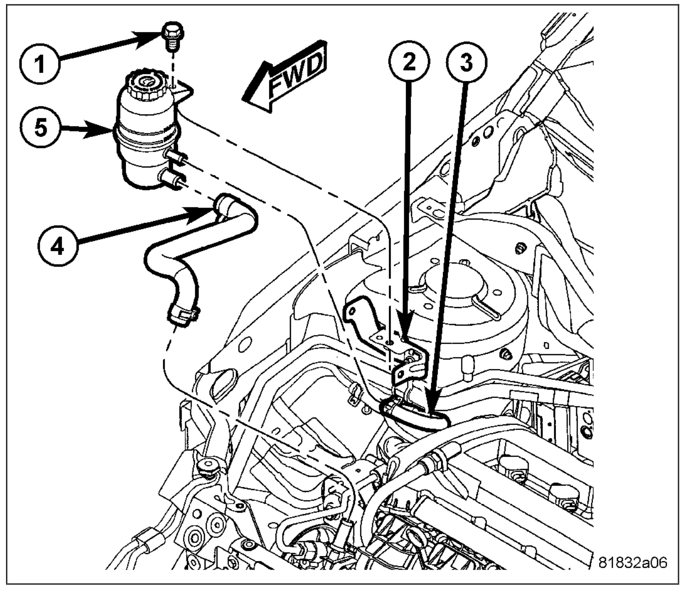
3. Place the pump end of the supply hose (1) onto the pump supply fitting (2). Expand the hose clamp and slide it over the hose and pump supply fitting. Secure the clamp (3) once it is past the bead formed into the fluid supply fitting.
4. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
5. Check for leaks.
6. Install the engine appearance cover.



RESERVOIR

DESCRIPTION

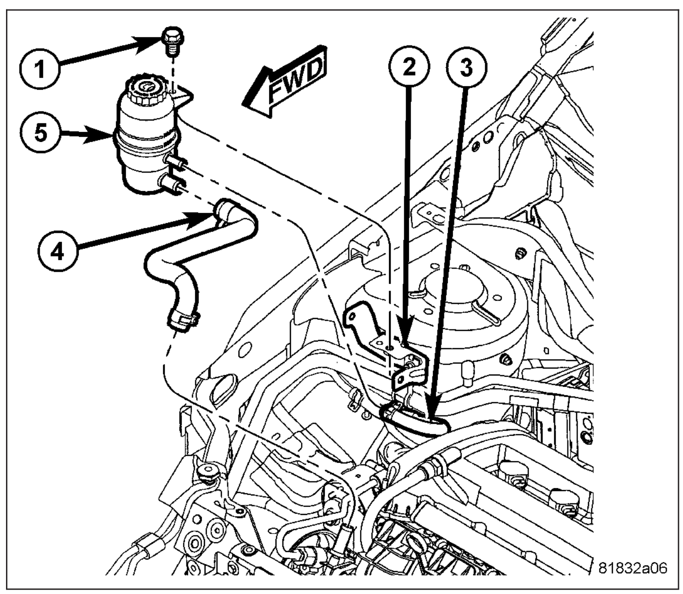
The power steering fluid reservoir (5) is mounted above the right front inner fender well to a bracket (2).



REMOVAL

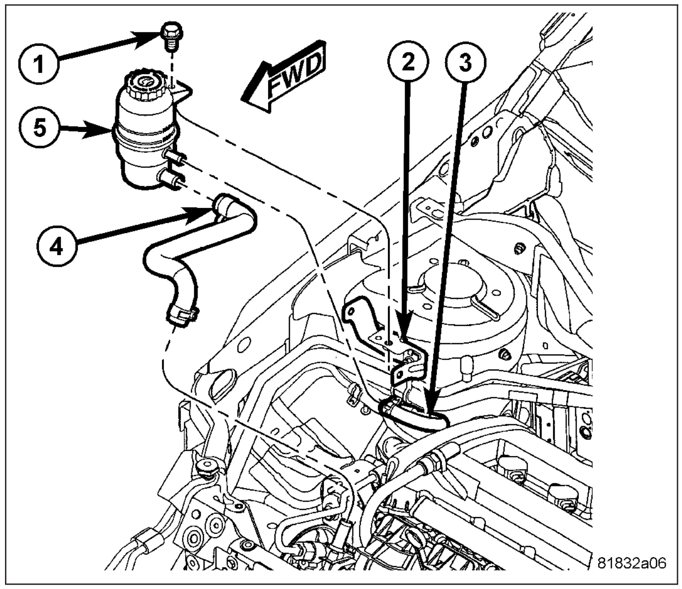
NOTE: Before proceeding, (Refer to 19 - STEERING - WARNING).

1. Remove engine appearance cover.
2. Remove the fasteners securing the coolant recovery bottle to its mounts and move it away from the power steering fluid reservoir. It is not necessary to disconnect the coolant recovery bottle fluid lines. (Refer to 7 - COOLING/ ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL)
3. Siphon as much fluid as possible from the power steering fluid reservoir (5).
4. Remove hose clamp securing cooler return hose (3) to fluid reservoir fitting. Slide the hose off the end of the reservoir fitting.
5. Remove hose clamp securing pump supply hose (4) to the fluid reservoir fitting. Slide the hose off the end of the reservoir fitting.
6. Remove the reservoir mounting screw (1) used to secure the reservoir in place.
7. Remove the reservoir (5).



INSTALLATION

1. Attach the reservoir (5) to the strut tower bracket (2) using the mounting screw (1). Tighten mounting screw (1) to 12 N·m (106 in. lbs.).
2. Slide the pump supply hose (4) onto reservoir fitting. Expand hose clamp and slide it over hose on reservoir fitting. Secure clamp once it is past bead formed into fluid reservoir fitting.
3. Slide cooler return hose (3) onto reservoir fitting. Expand hose clamp and slide it over hose on reservoir fitting. Secure clamp once it is past bead formed into fluid reservoir fitting.



4. Install the coolant recovery bottle. (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION)
5. Fill and bleed the power steering system. (Refer to 19 - STEERING - STANDARD PROCEDURE)
6. Check for leaks.
7. Install the engine appearance cover.

TRANSAXLE

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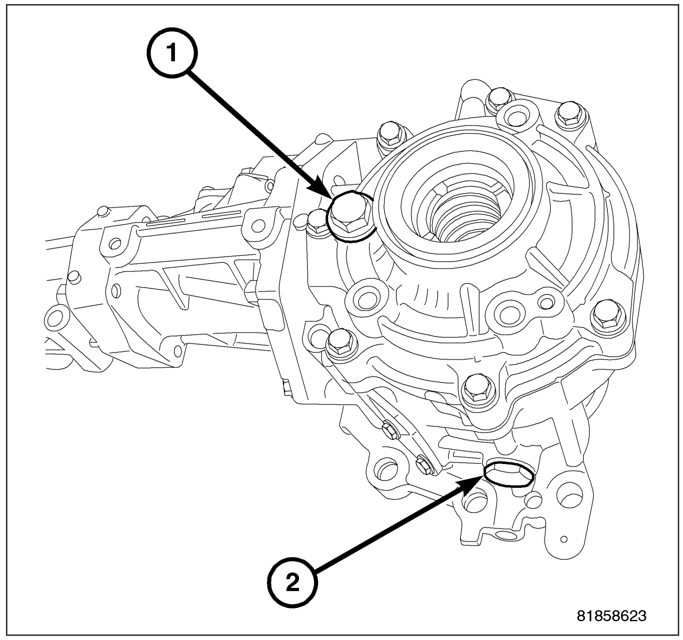
POWER TRANSFER UNIT

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POWER TRANSFER UNIT

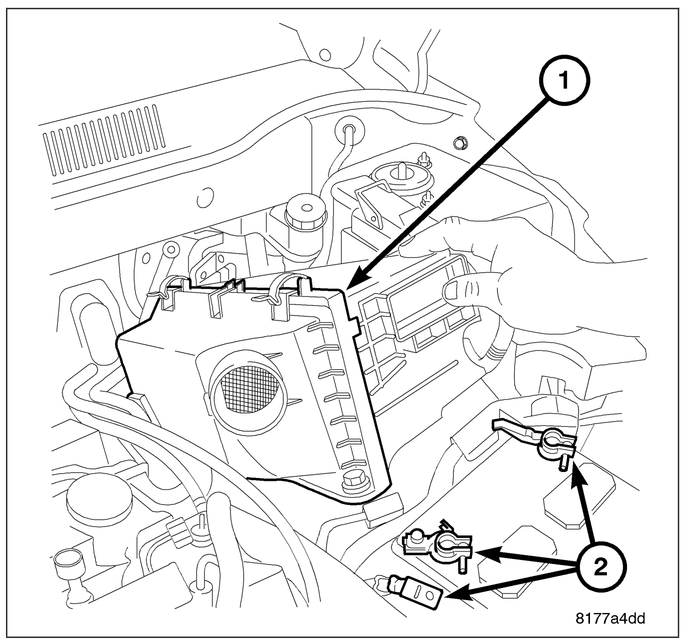
STANDARD PROCEDURE -

1. If fluid level is low or fluid change is required fill with PN 4874468 Mopar MS9020 SAE80W90 Gear Lube until to bottom of fill plug.
2. Torque fill plug (1) to 32 N-m (24 lbf-ft).
3. Torque drain plug (2) to 32 N-m (24 lbf-ft).

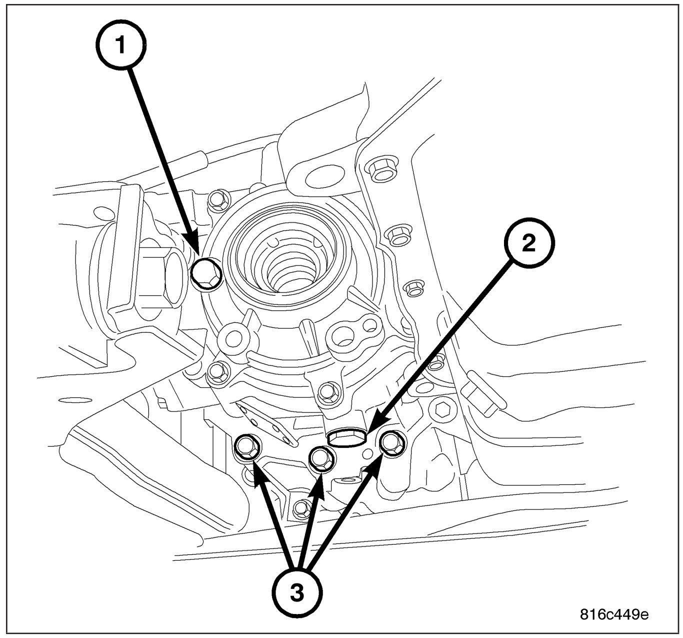


REMOVAL

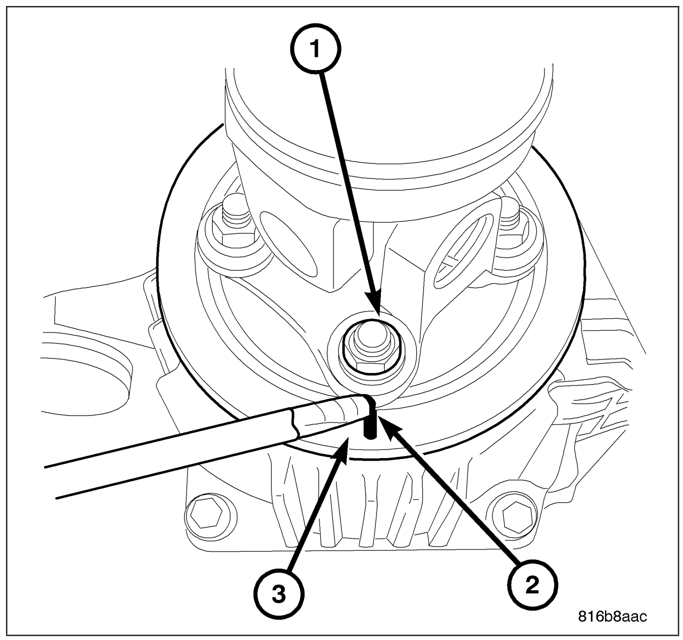
1. Disconnect negative battery cable (2).
2. Remove the engine trim cover.
3. Remove air cleaner assembly (1).
4. Remove Power Distribution Center (PDC) from bracket.
5. Raise the vehicle on the hoist.
6. Remove front halfshafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).



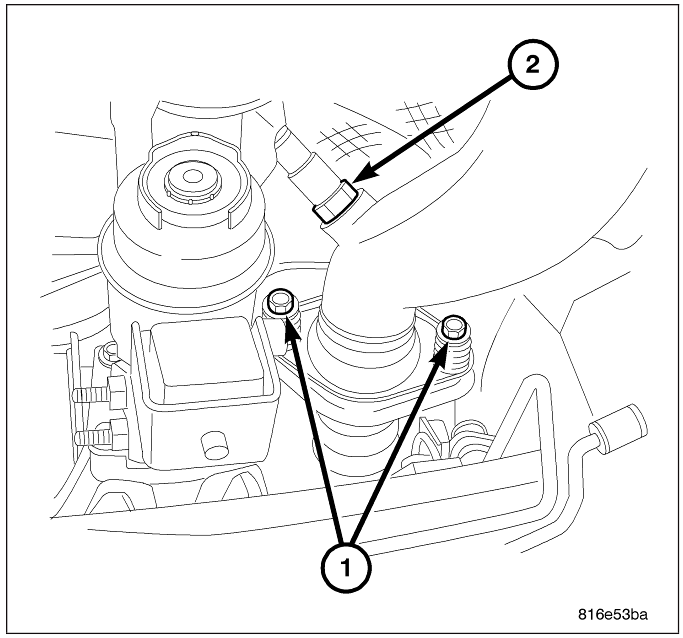
7. Remove drain plug (2) at PTU and allow fluid to drain.
8. Reinstall drain plug.



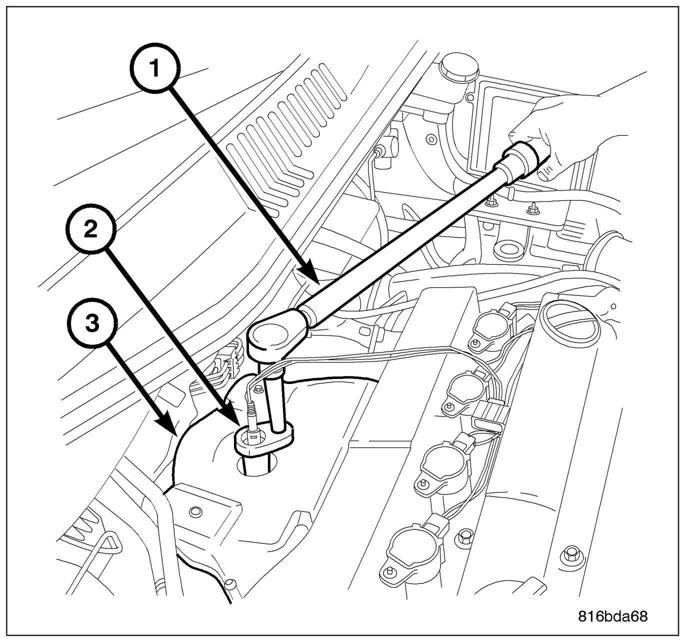
9. Mark (2) prop shaft and differential (3) for proper installation (if equipped).
10. Remove the rear prop shaft (if equipped) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).



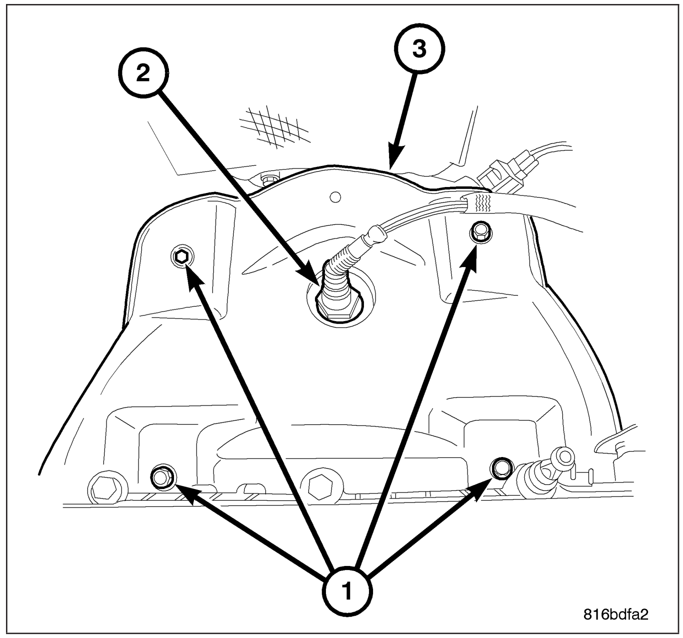
11. Remove the two exhaust to maniverter (exhaust manifold with catalytic converter) bolts (1).
12. Unplug the downstream O2 sensor connector.
13. Remove the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
14. Lower the vehicle on the hoist.
15. Unplug the upstream O2 sensor connector.



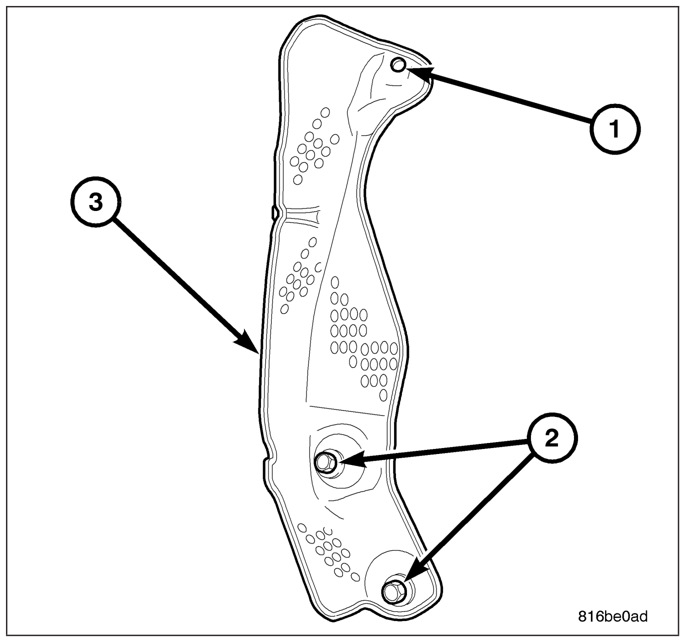
16. Remove upstream O2 sensor from the maniverter (exhaust manifold with catalytic converter) using 02 sensor socket 8439 (2).



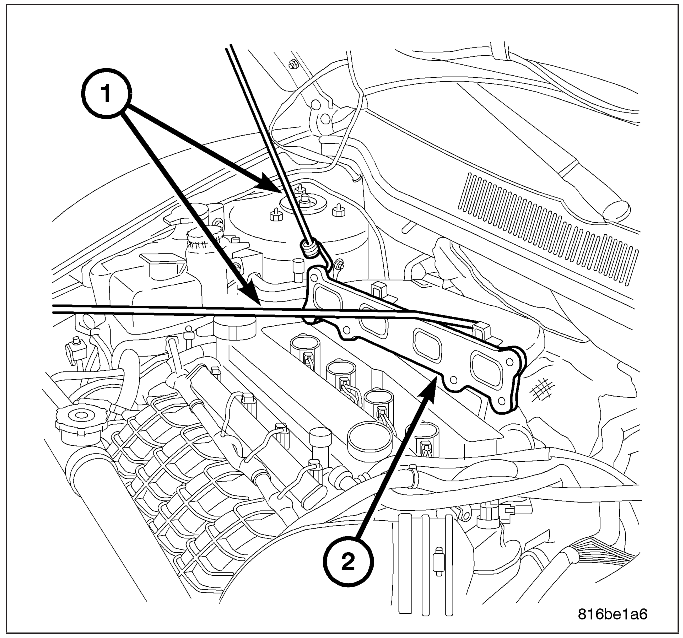
17. Remove the four maniverter heat shield bolts (1).



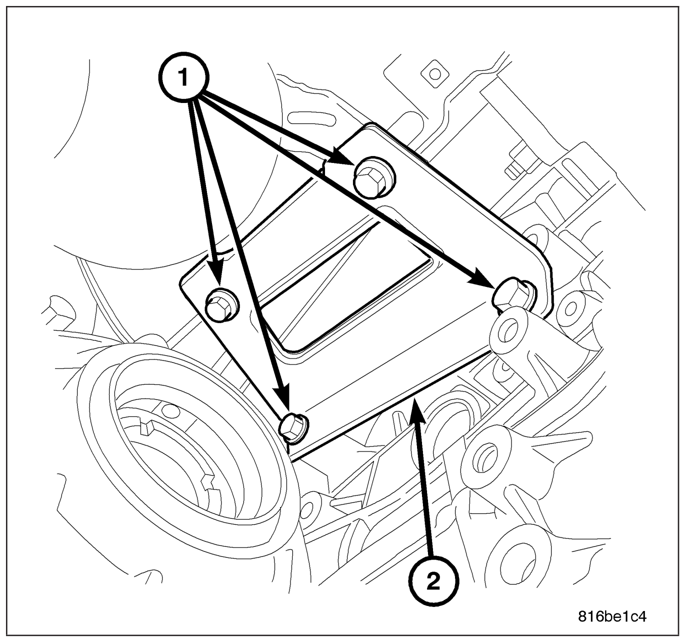
18. Remove the two retaining bolts (2) and one nut (1) from the maniverter side heat shield (3).



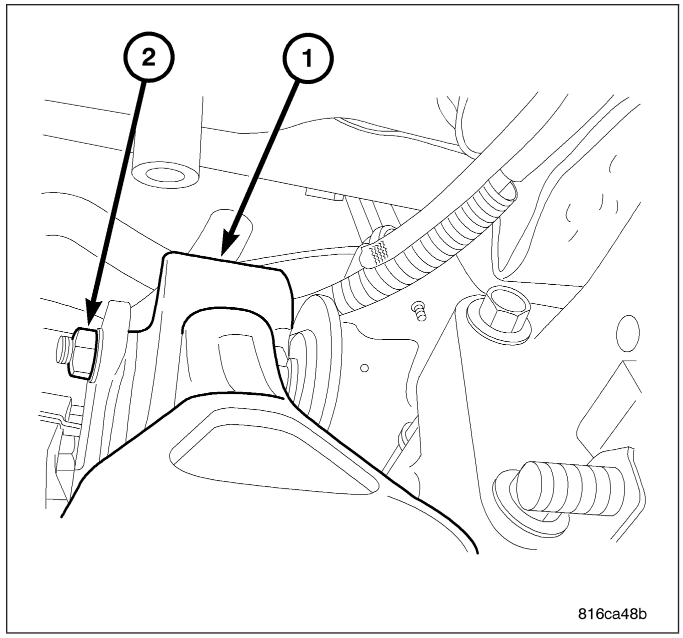
19. Remove the seven maniverter to head retaining bolts.
20. Slide the maniverter up and to the right, The support the maniverter (1) with the help of a bungie cord.



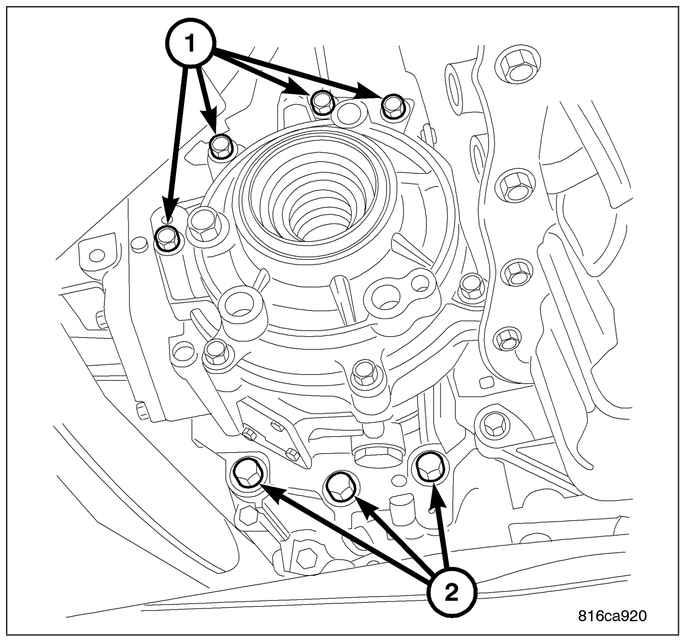
21. Raise the vehicle on the hoist.
22. Remove the four (1) engine to maniverter bracket bolts.



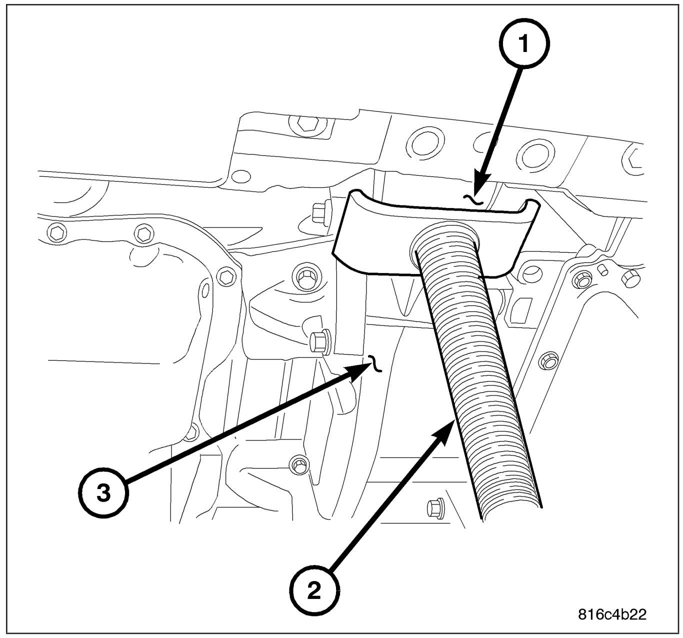
23. Remove the rear engine mount through bolt (2).
24. Remove the three front engine mount to frame bolts and the mount through bolt.



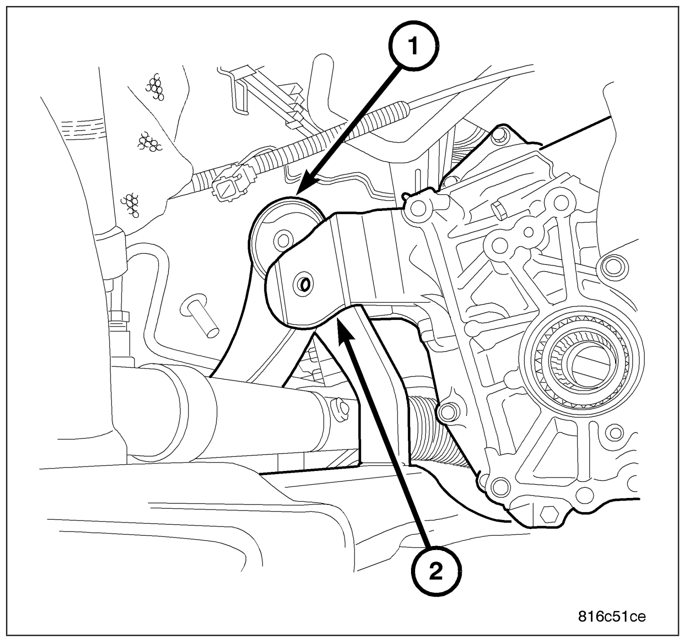
25. Remove the PTU mounting bolts.



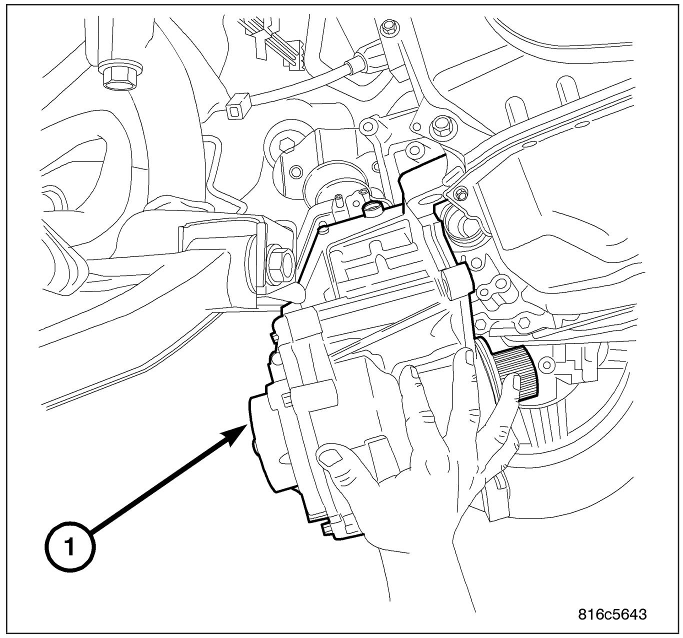
26. Install a screw jack (2)on front engine mount bracket (1).



27. Raise the front of the engine until the rear mount has dropped (1,2).
28. Separate the PTU from the transaxle.
29. Remove and discard old O-ring between Transmission and PTU

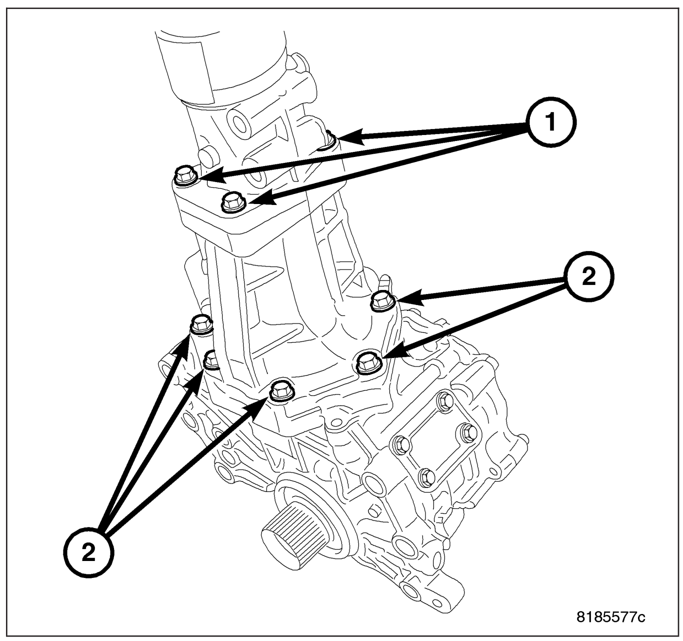


30. Roll the PTU (1) forward and down to remove.

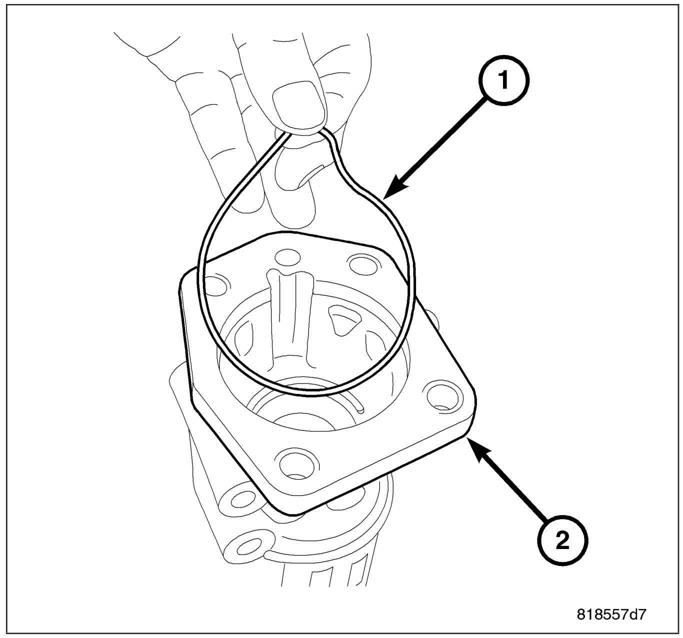


DISASSEMBLY

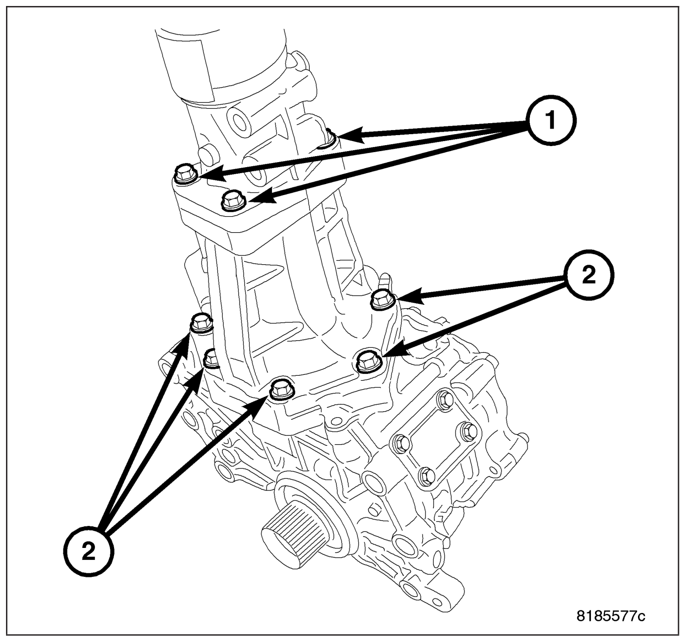
1. Remove extension housing bolts.



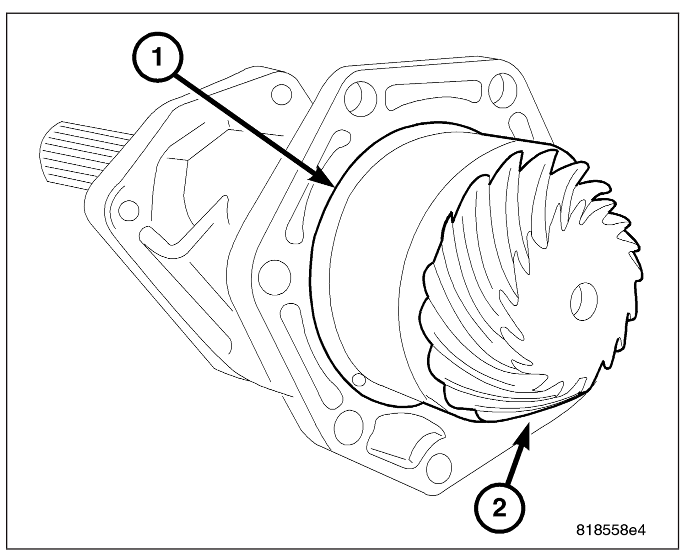
2. Remove the extension housing.
3. Remove the extension housing O-ring.



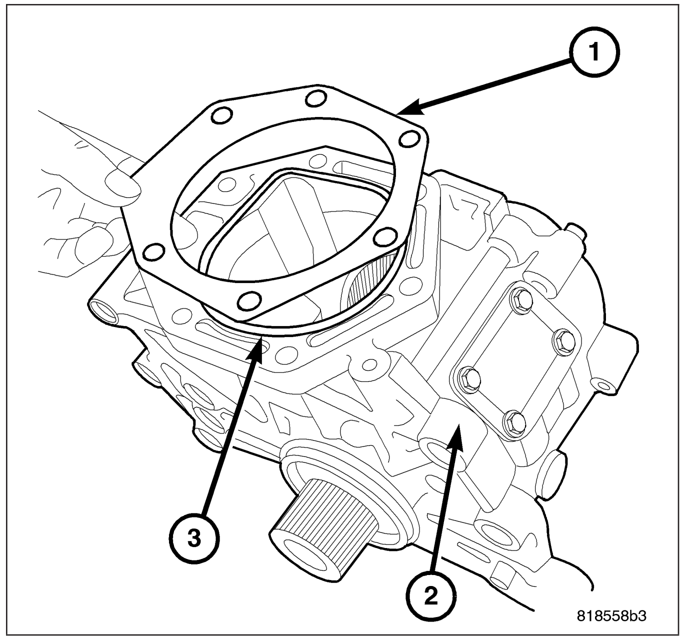
4. Remove the pinion housing bolts.



5. Remove the pinion housing.

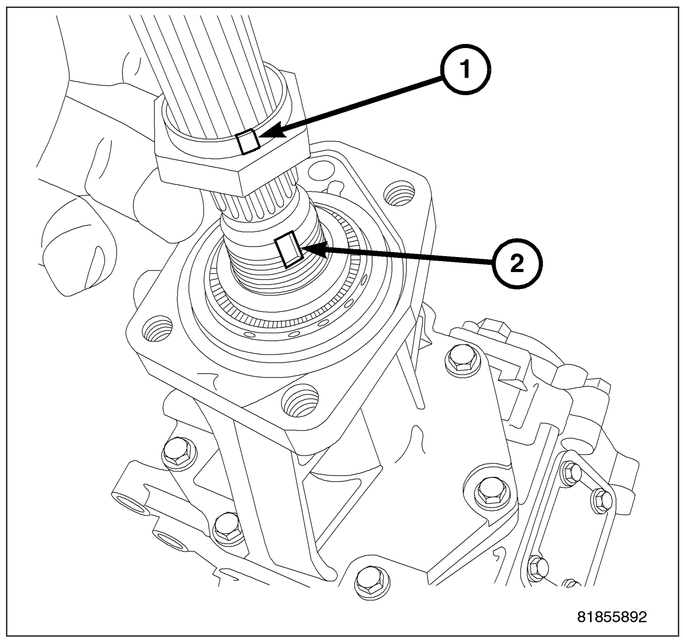


6. Remove the pinion housing shim.
7. Remove the pinion housing O-ring

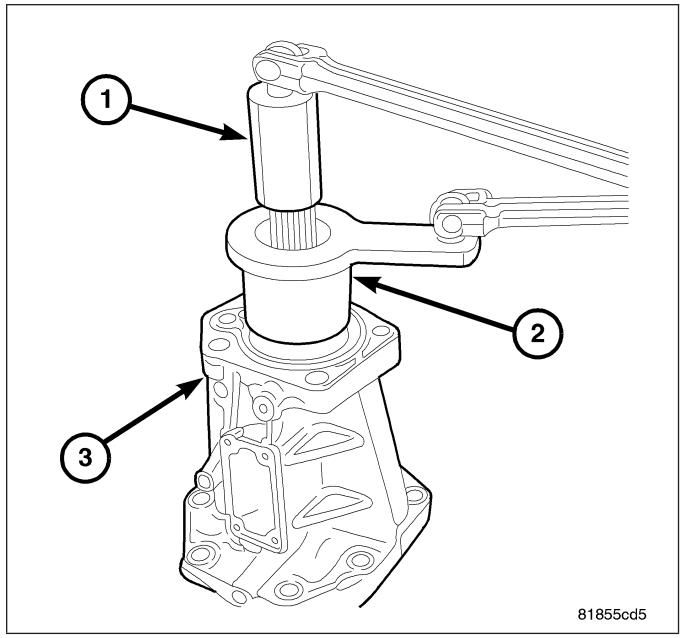


NOTE: The pinion nut is a staked type nut

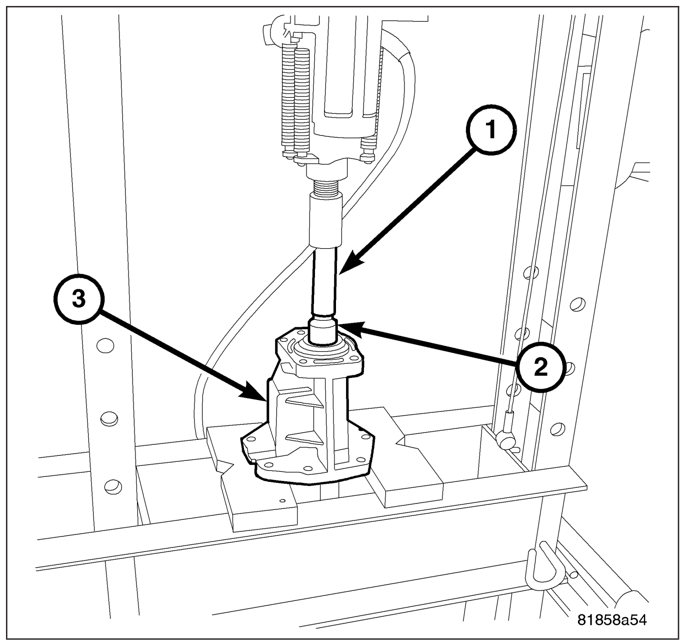
8. Using a punch, remove the staked depression in the pinion nut.



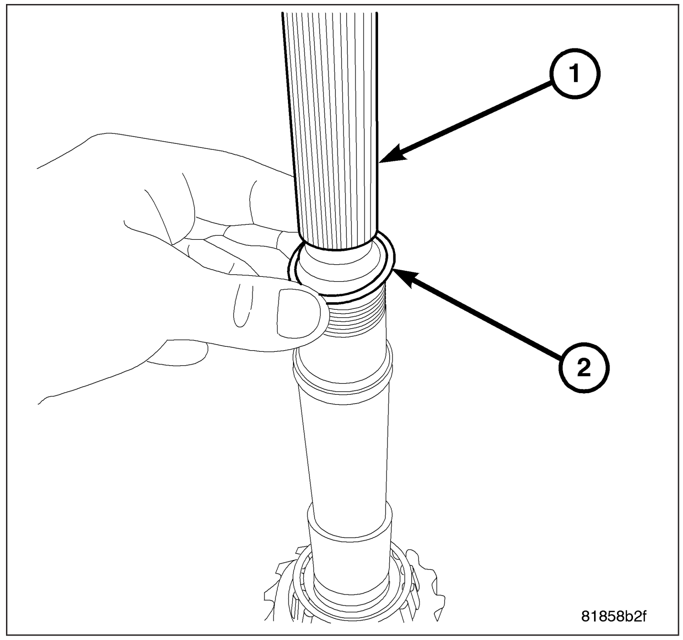
9. Remove the output shaft nut, using the Pinion Nut Socket 9921 and Spline Socket 9922.



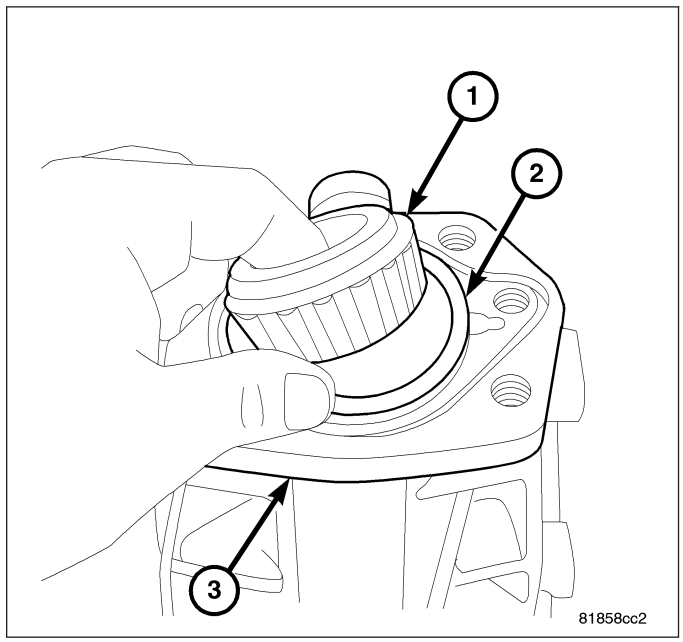
10. Press the output shaft from the housing using a press.



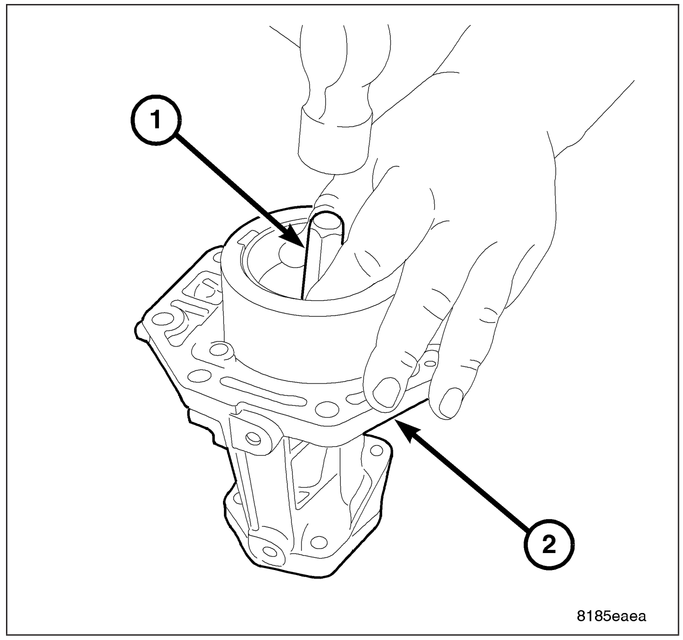
11. Remove the output shaft spacer.



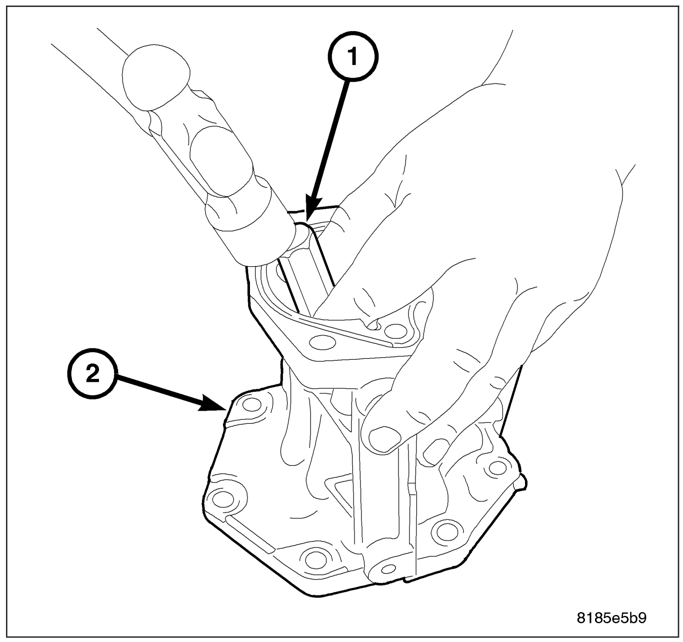
12. Remove the output shaft bearing.



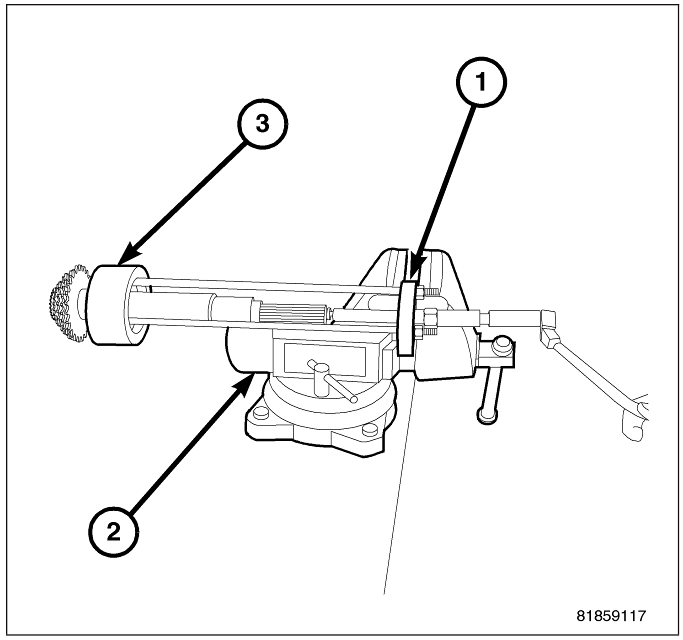
13. Remove the output shaft housing small side bearing cup using a brass drift.



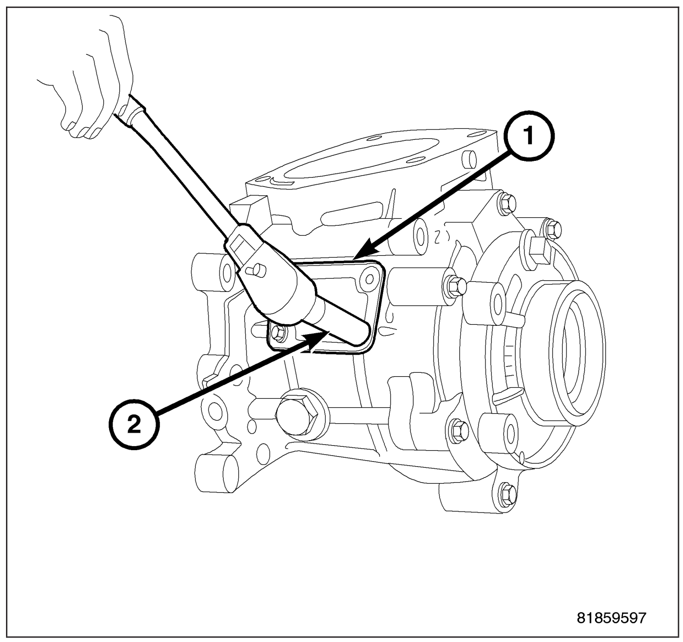
14. Remove the output shaft housing large side bearing cup using a brass drift.



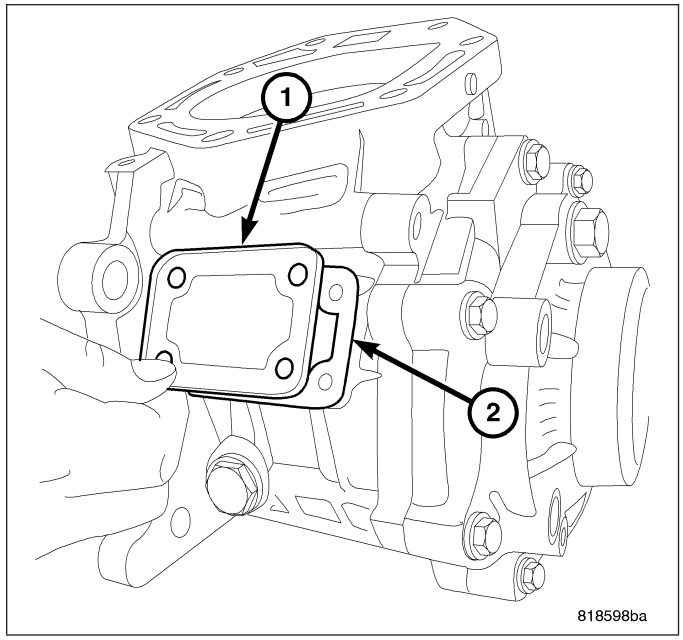
15. Install Puller 6444 and Jaws 6451 onto output shaft head bearing.
16. Place Puller in a vice and remove the bearing.



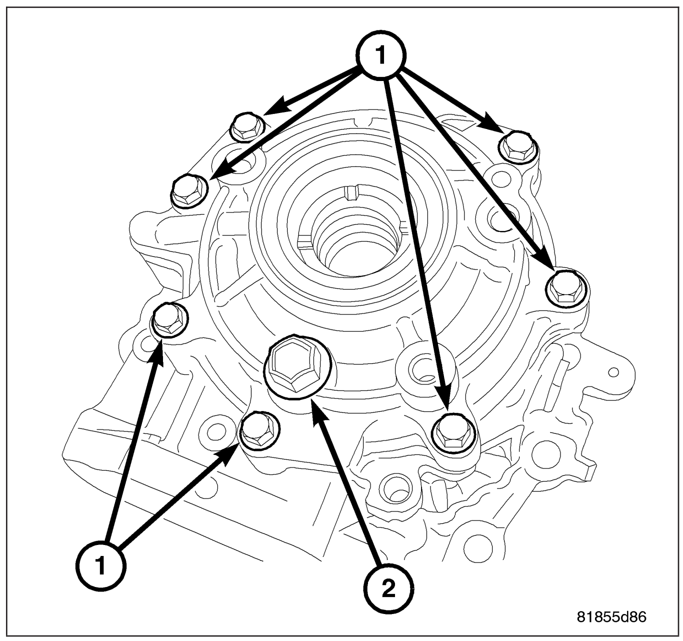
17. Remove the inspection cover bolts (1).



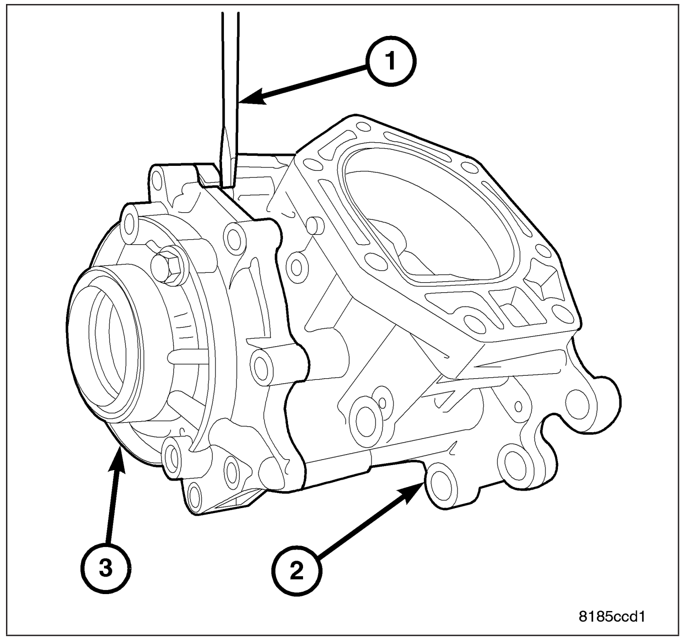
18. Remove the inspection cover.



19. Remove the side cover bolts (1).

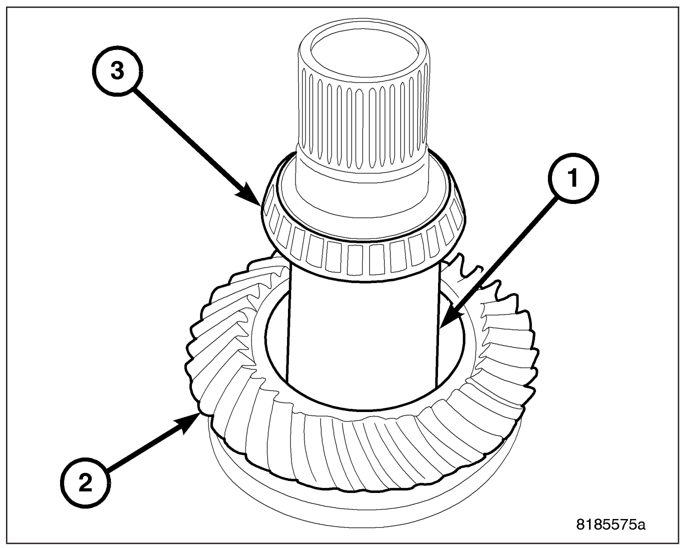


20. Remove the side cover from case.

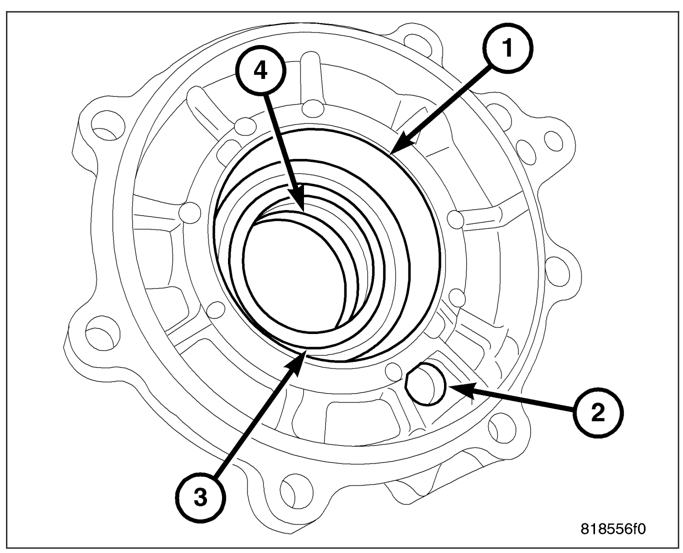


21. Remove the carrier assembly.

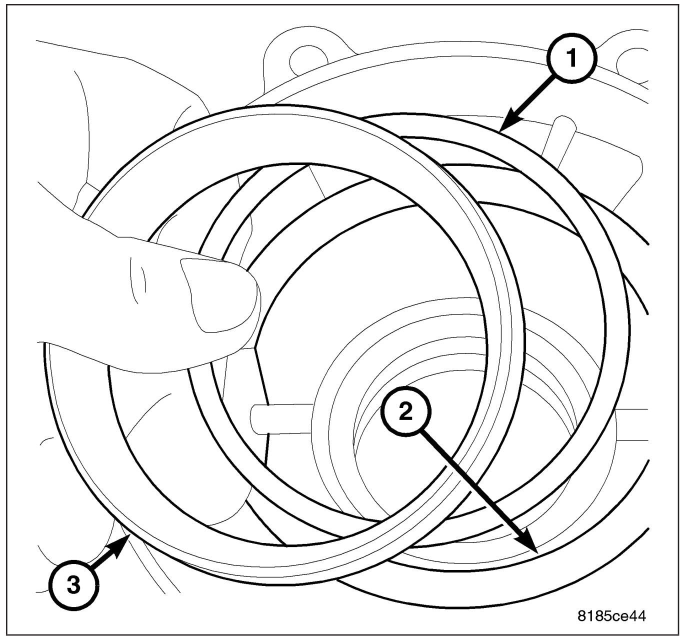
NOTE: Bearing cup is a slip fit



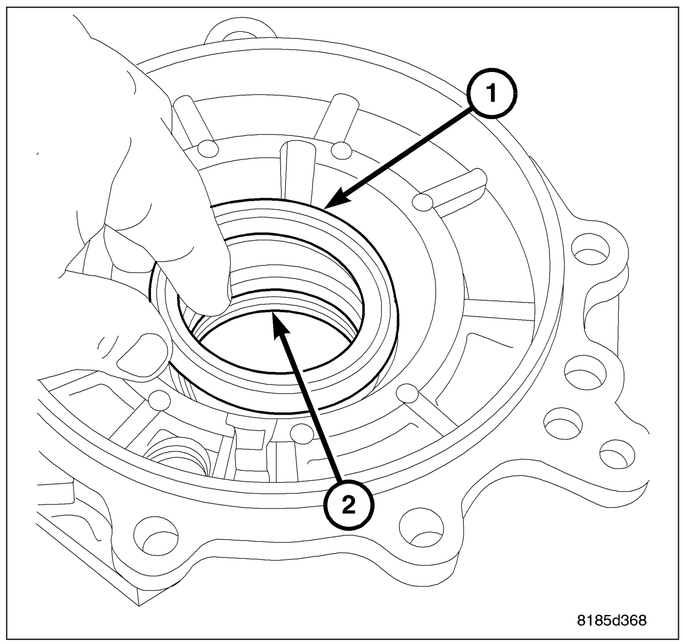
22. Remove bearing cup by hand (1) or by using a pick.



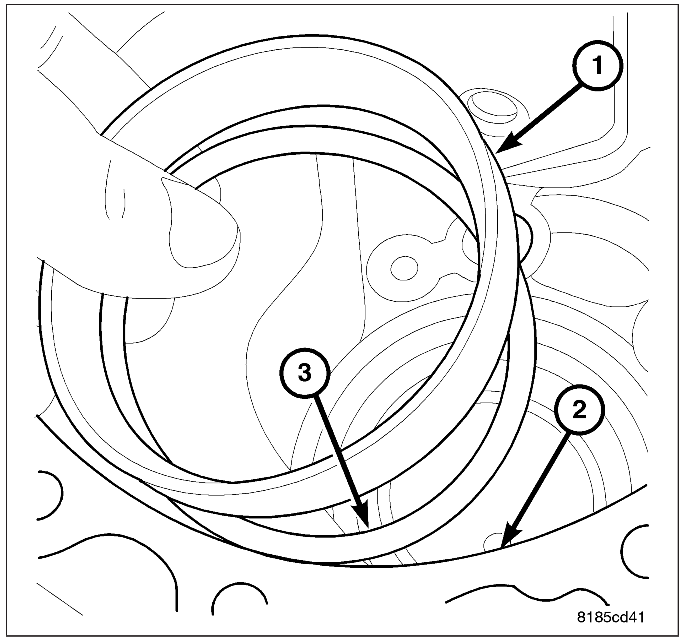
23. Remove the shim (1) under the bearing cup (3) measure and record the size of the shim.



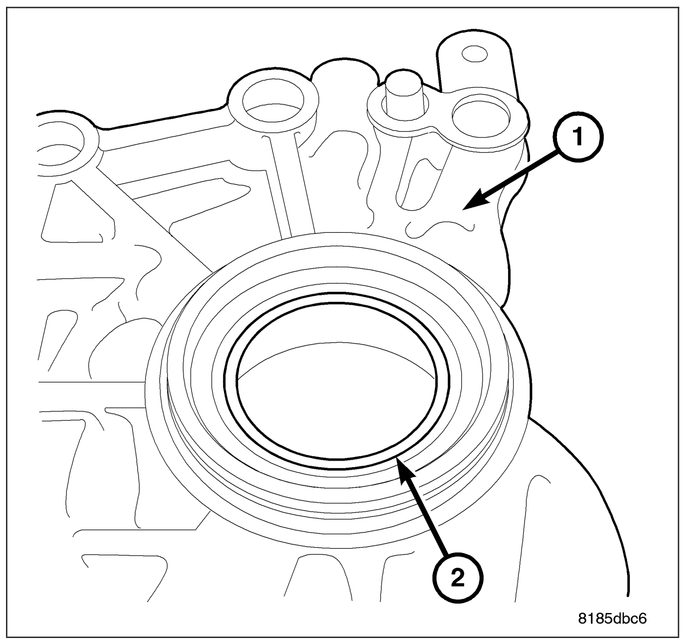
24. Remove the inner seal from the PTU cover.
25. Remove the outer seal from the PTU cover.



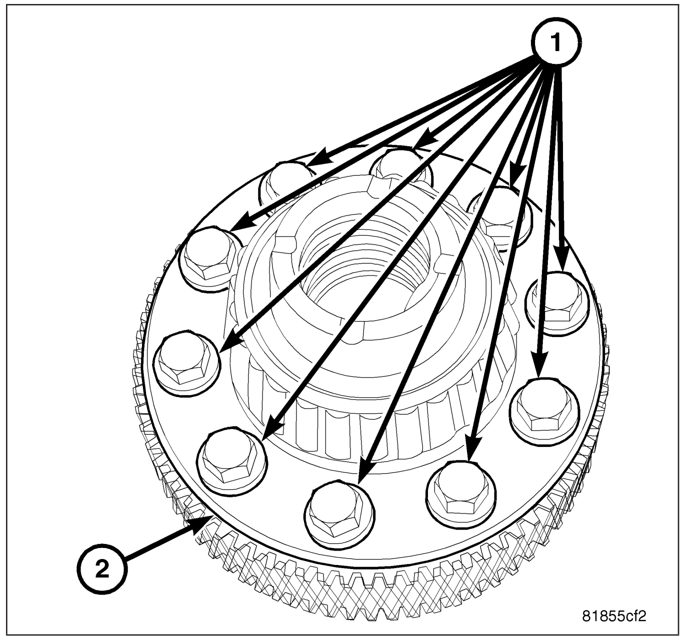
26. Remove bearing cup by hand (1) or by using a pick.
27. Remove the shim (3) under the bearing cup (1) measure and record the size of the shim.



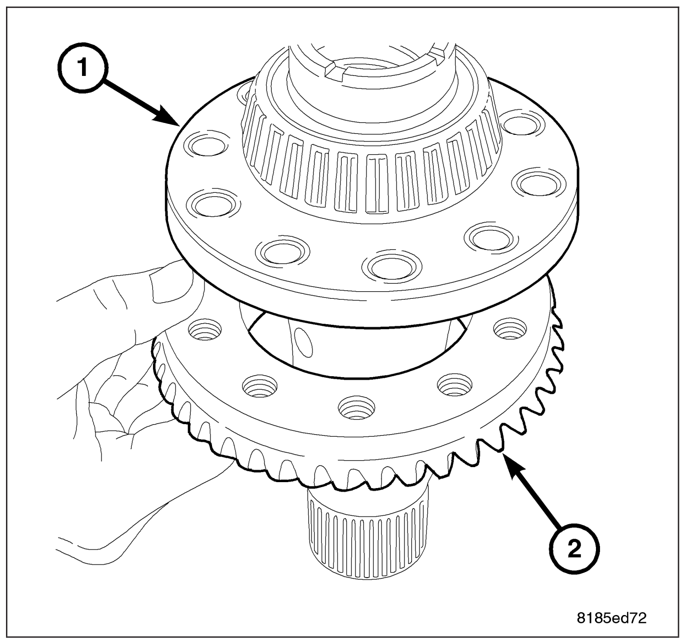
28. Remove the carrier case seal.



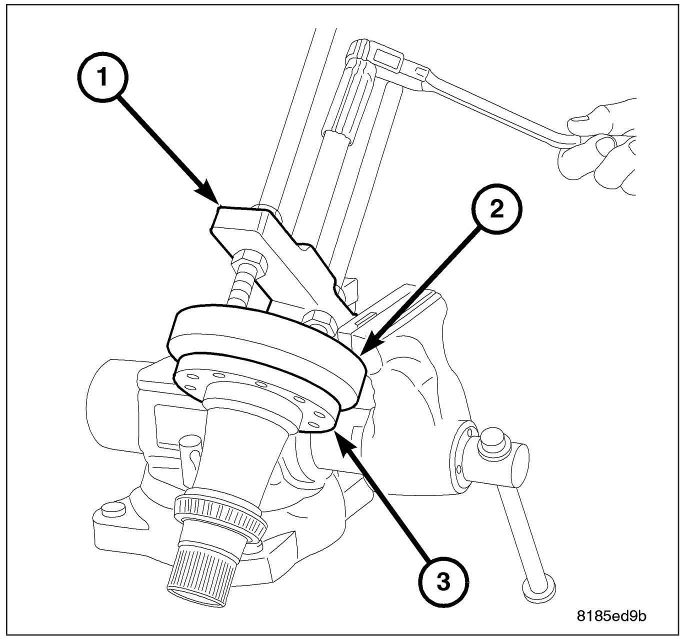
29. Remove the ring gear bolts.



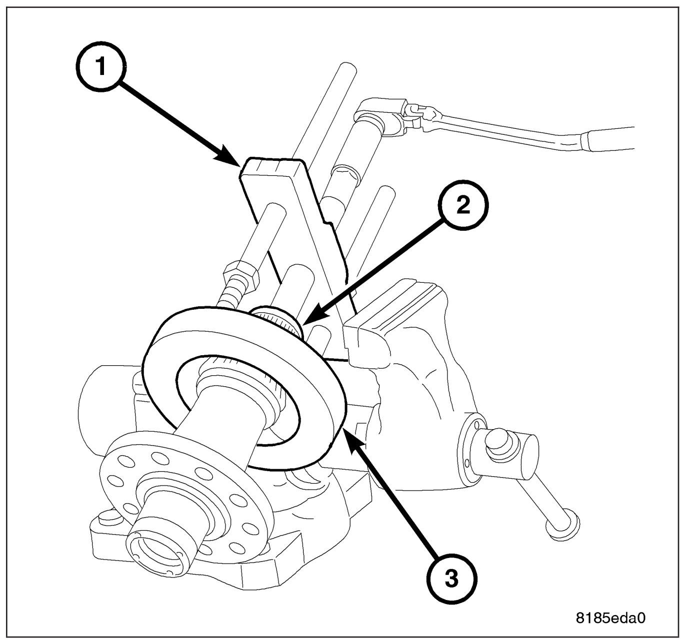
30. Remove the ring gear.



31. Remove ring gear side bearing using Puller C-293–PA, Inserts C-293-37 and Insert C-4487–1.

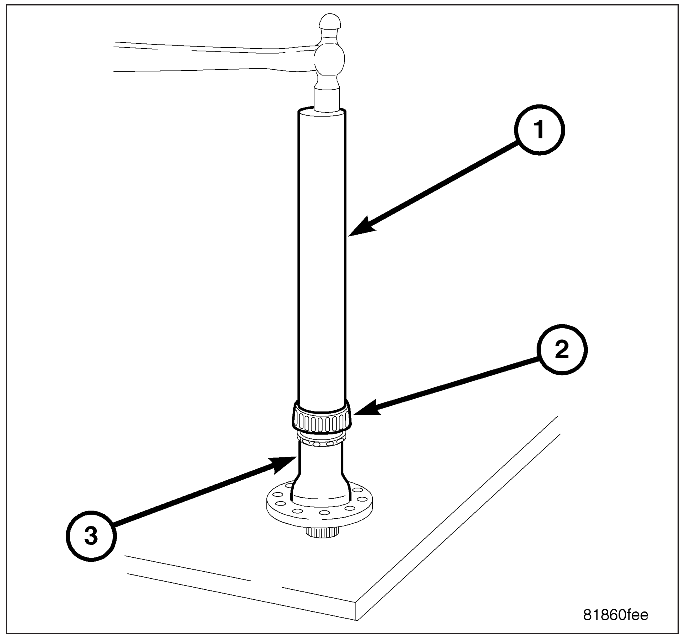


32. Remove output side bearing using Puller C-293–PA, Inserts C-293-37 and Insert C-4487–1.

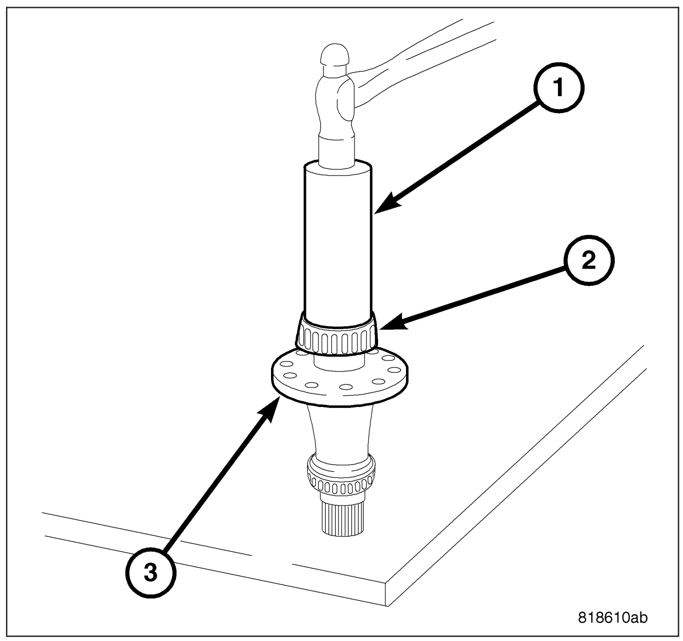


ASSEMBLY

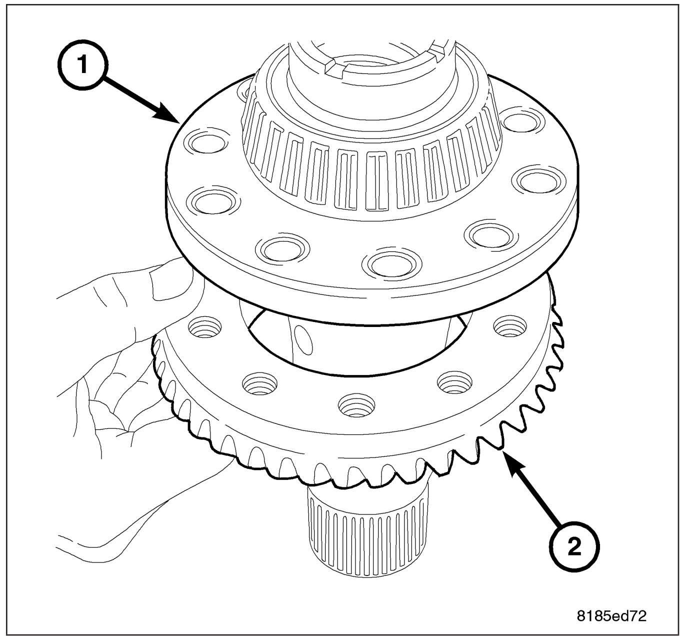
1. Install output side spool shaft bearing using Installer C-3095-A.



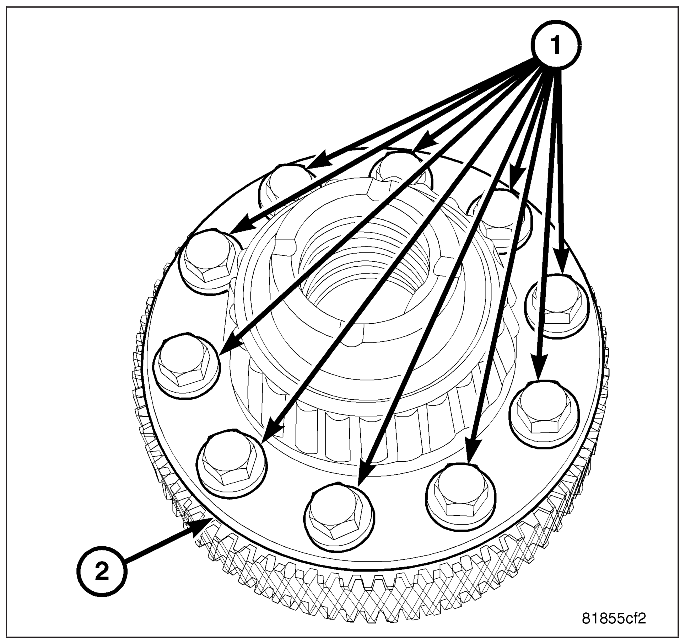
2. Install ring gear side bearing using Installer 8148.



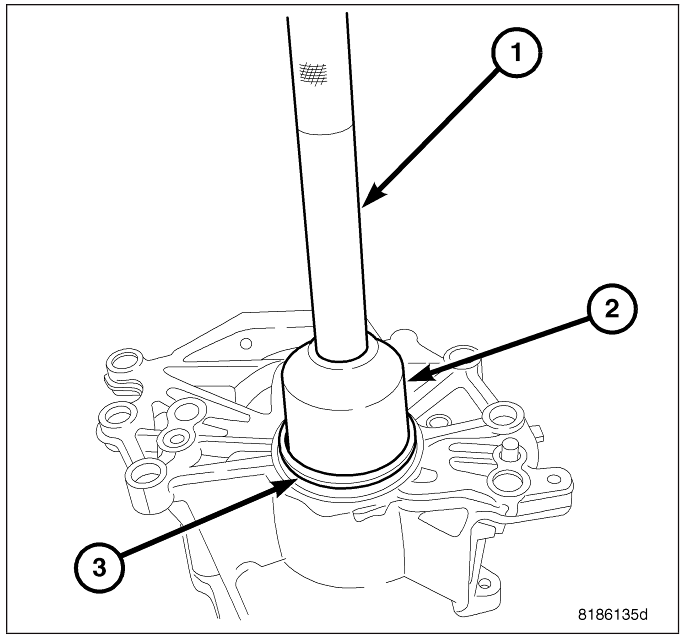
3. Install the ring gear.



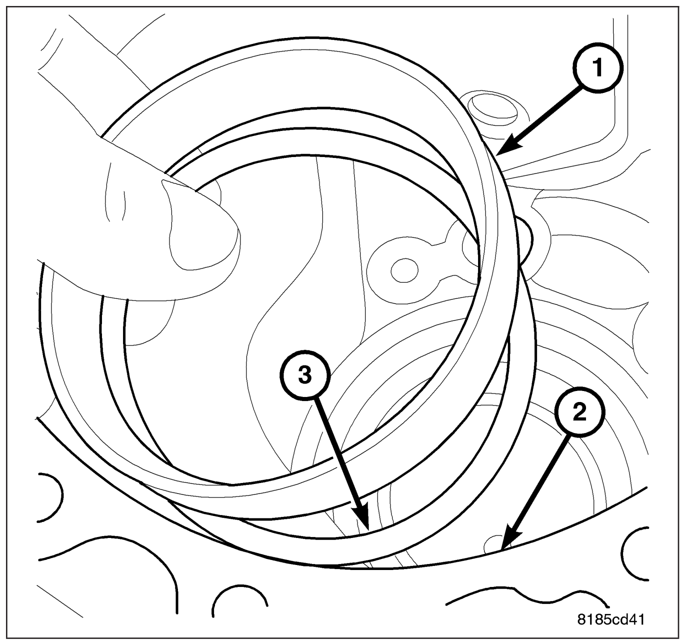
4. Install the ring gear Bolts and torque to 74 N·m (55 ft. lbs.).



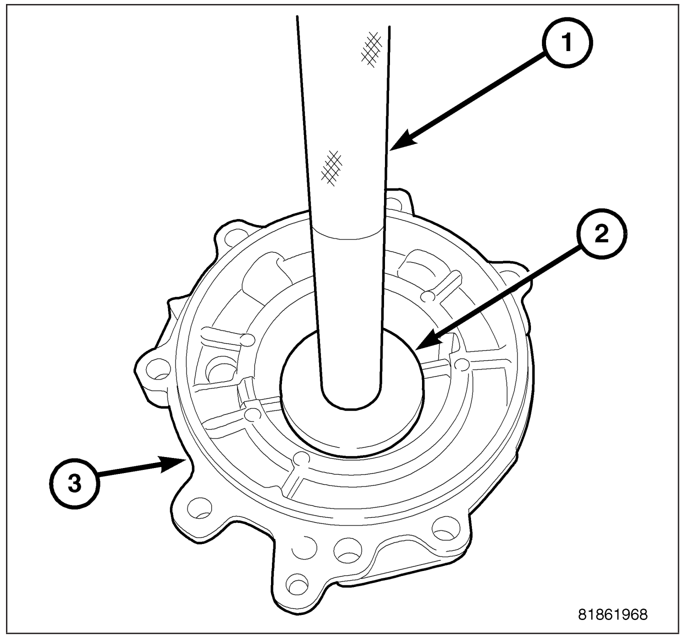
5. Install the carrier case seal using Installer 9851 and Handle C- 4171.



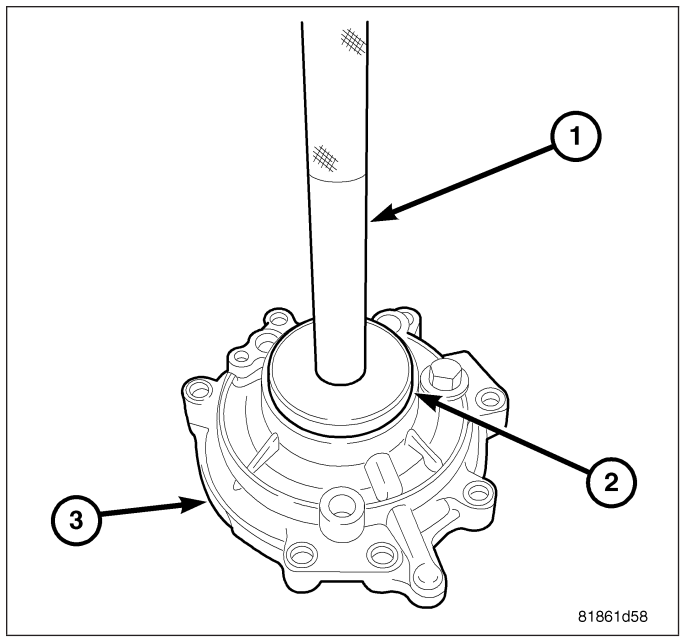
6. Install the shim (3) under the bearing cup (1) in the case side.
7. Install the bearing cup by hand.



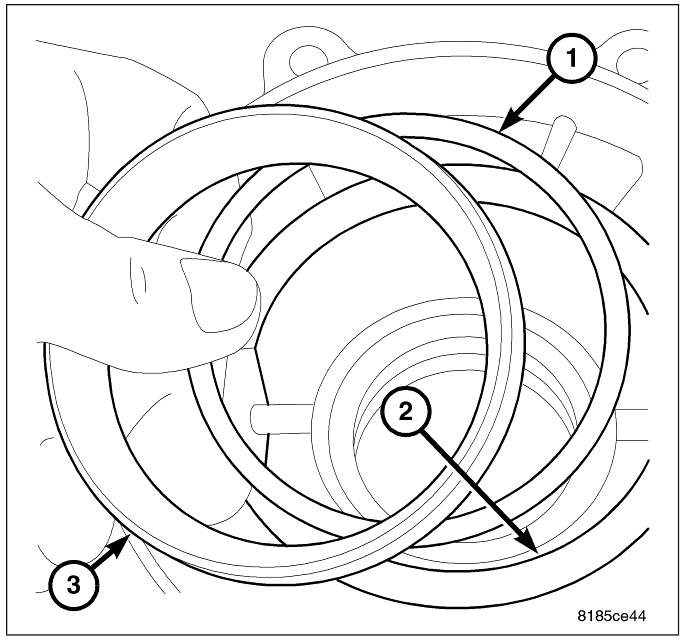
8. Install the inner seal into the PTU cover using Installer 9852 and Handle C-4171.



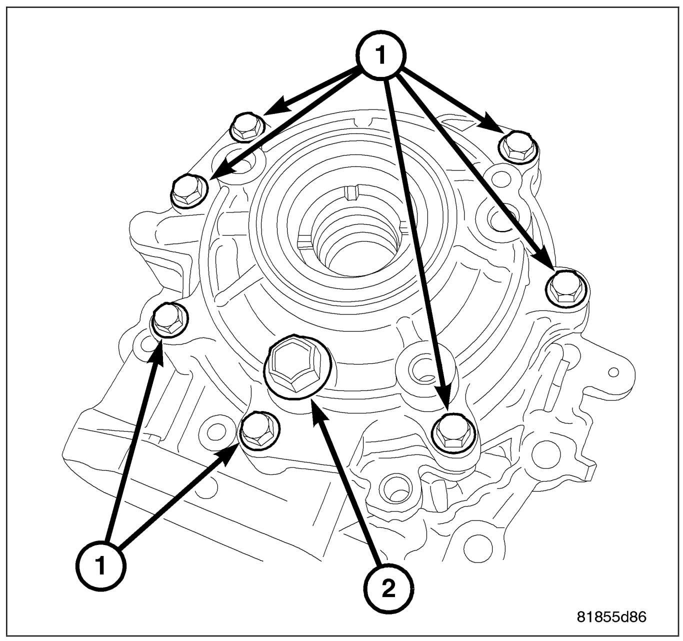
9. Install the outer seal into the PTU cover using Installer 9853 and Handle C-4171.



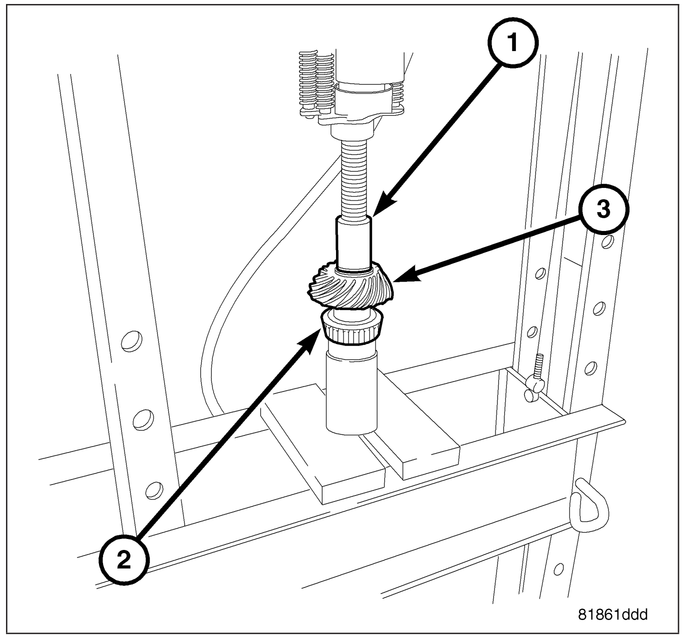
10. Install the shim (1) under the bearing cup (3).
11. Install bearing cup by hand (1).



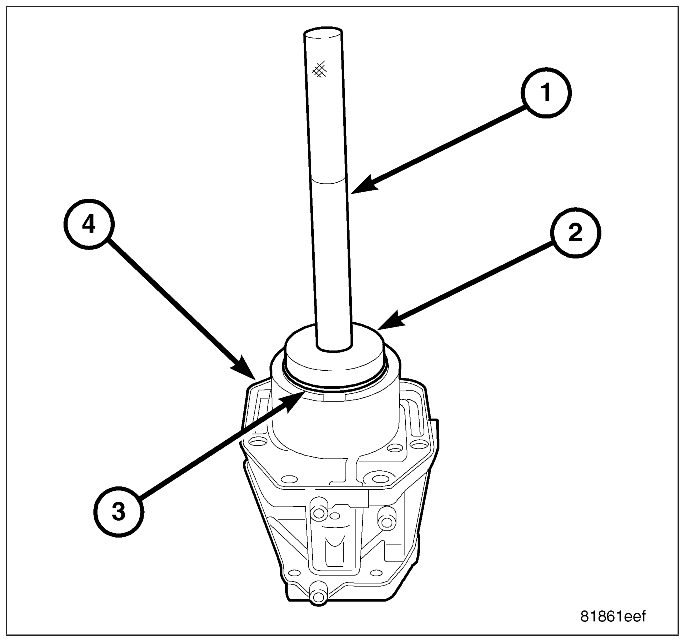
12. Install the carrier assembly into the case
13. Install the side cover
14. Torque side cover bolts (1) to 23 N·m (17 ft. lbs.).



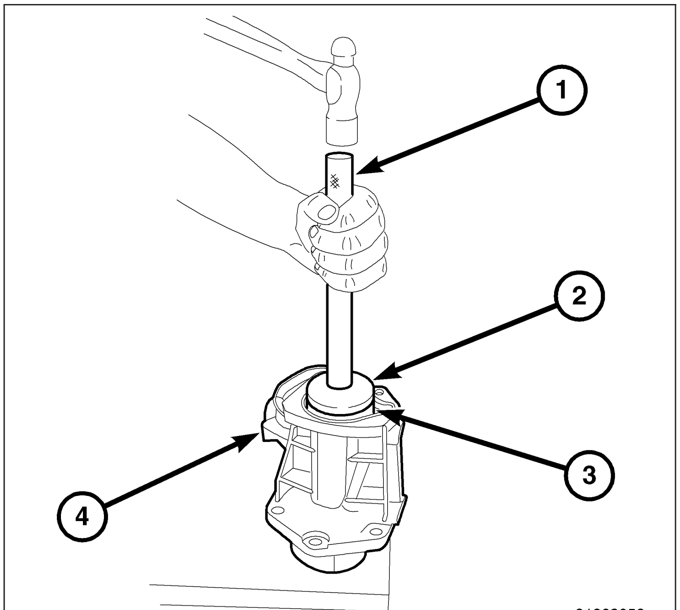
15. Install the output shaft head bearing on to the pinion shaft using Installer 9714 and a Press.



16. Install the output shaft head bearing cup using Installer 6061 and Handle C-4171

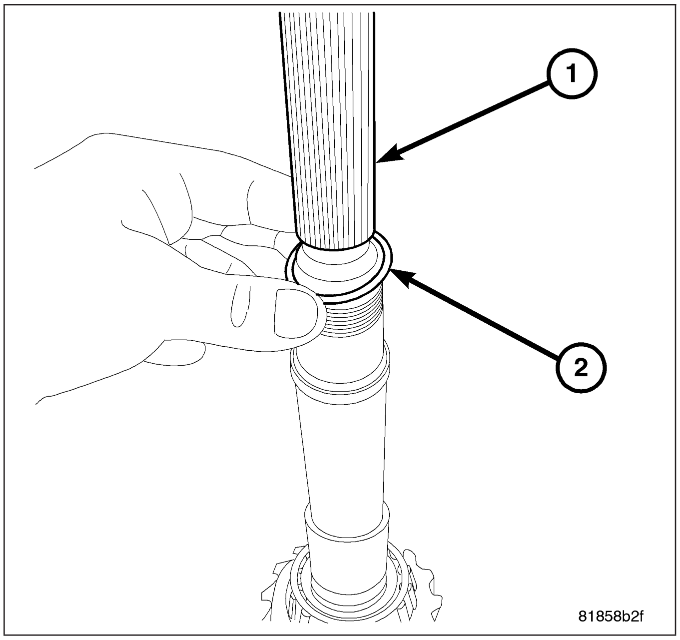


17. Install the output shaft tail bearing cup using Installer 9855 and Handle C-4171.



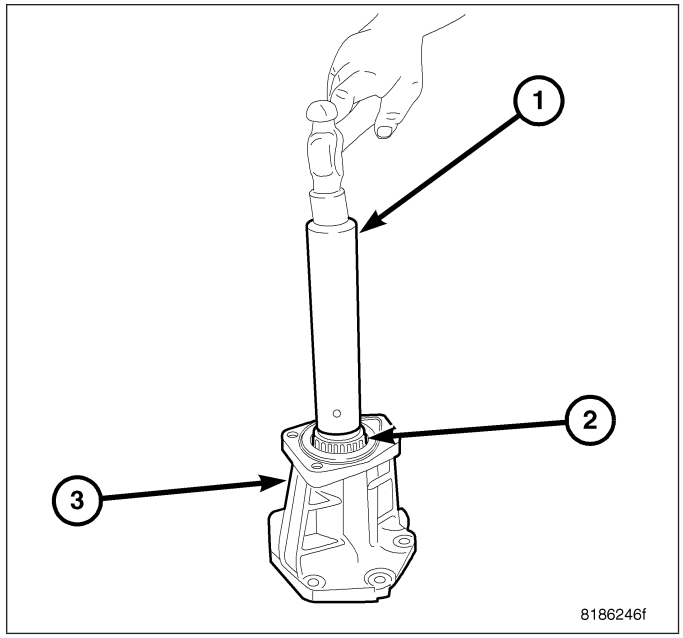
81862059

18. Install the output shaft spacer onto the output shaft.



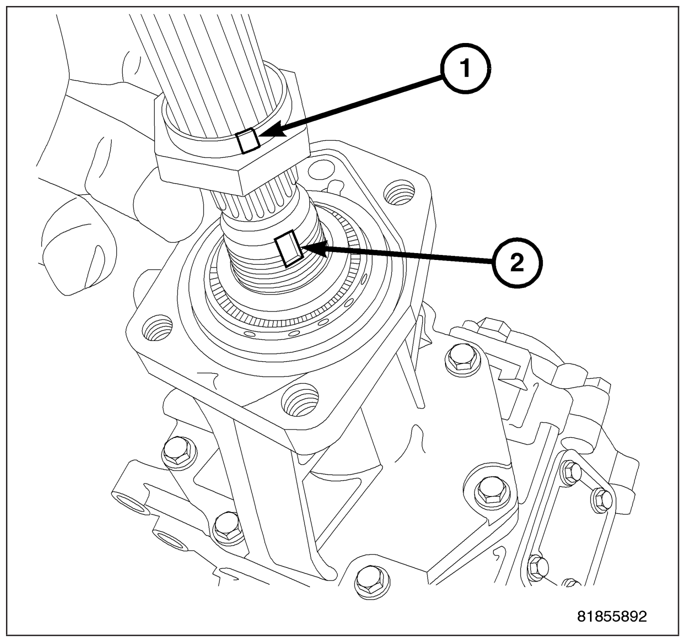
81858b2f

19. Install output shaft into output shaft housing.
20. Install output shaft tail bearing on to out put shaft using Installer L-4411.

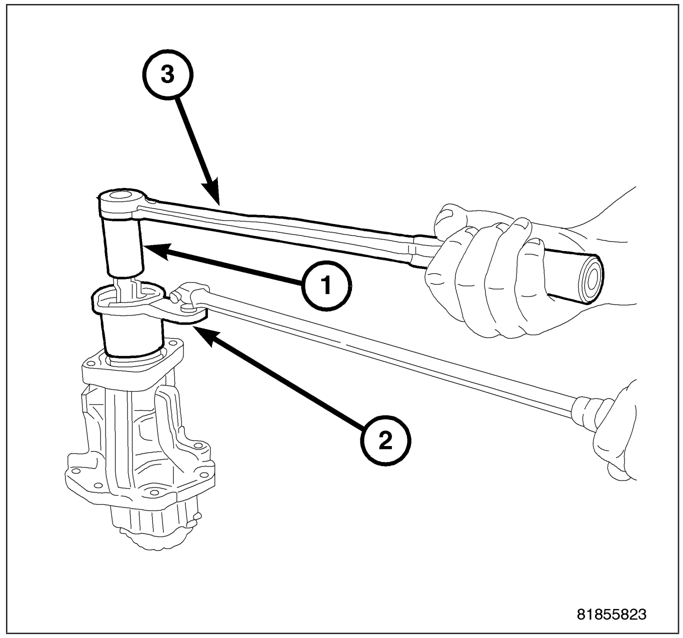


NOTE: The output shaft nut is a staked type nut

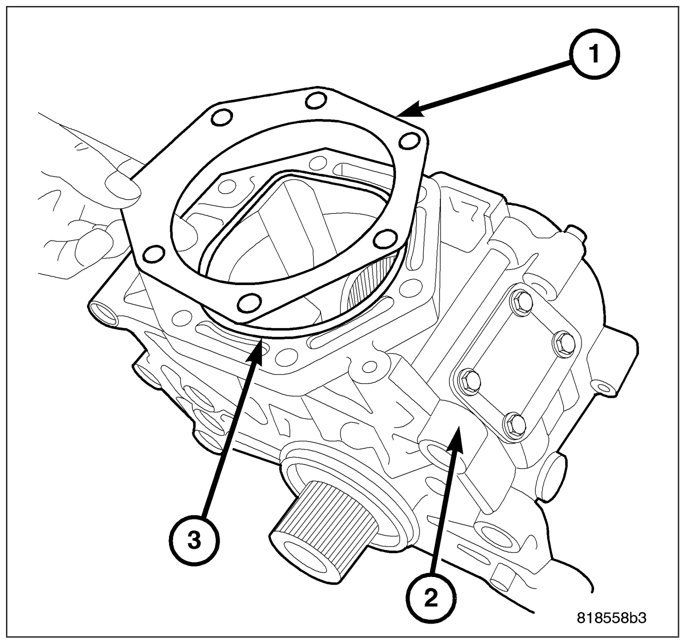
21. Install the output shaft nut (1) onto the output shaft (2).



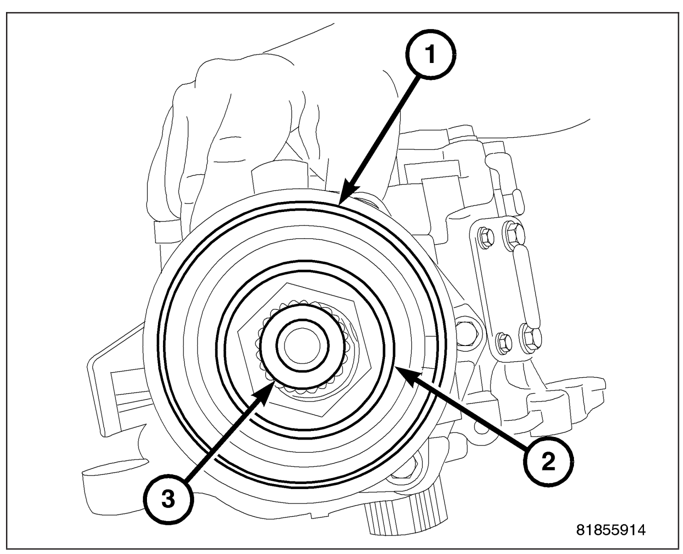
22. Torque the output shaft nut using Pinion Nut Socket 9921 to 150 N·m (111 ft. lbs.)..
23. Using a punch stake the out put shaft nut.



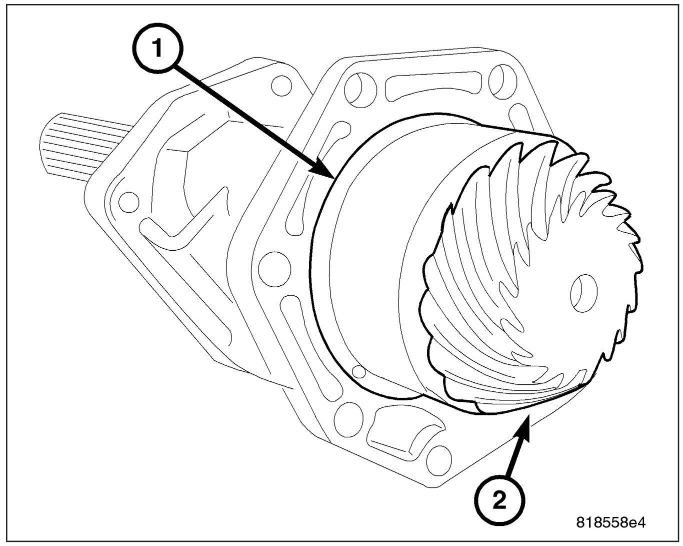
24. Install the pinion housing O-ring (3).
25. Install the pinion housing shim (1).



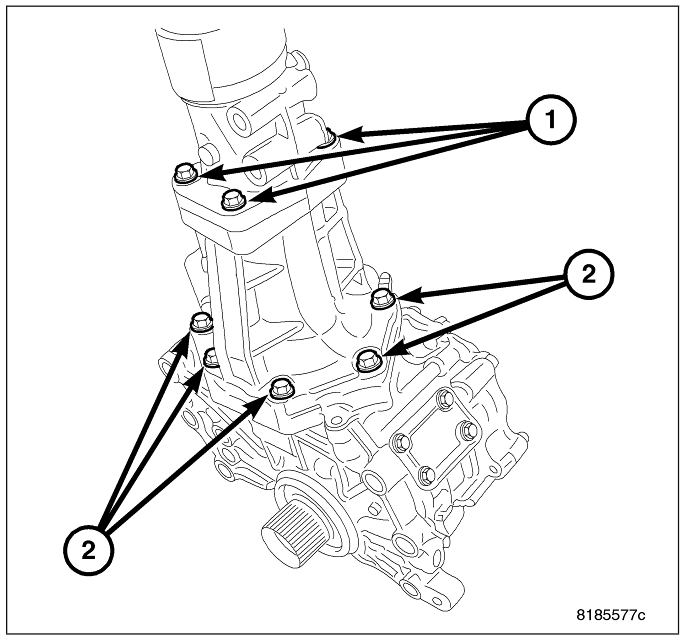
26. Install the output shaft seal using Installer 9851 and Handle C-4171.



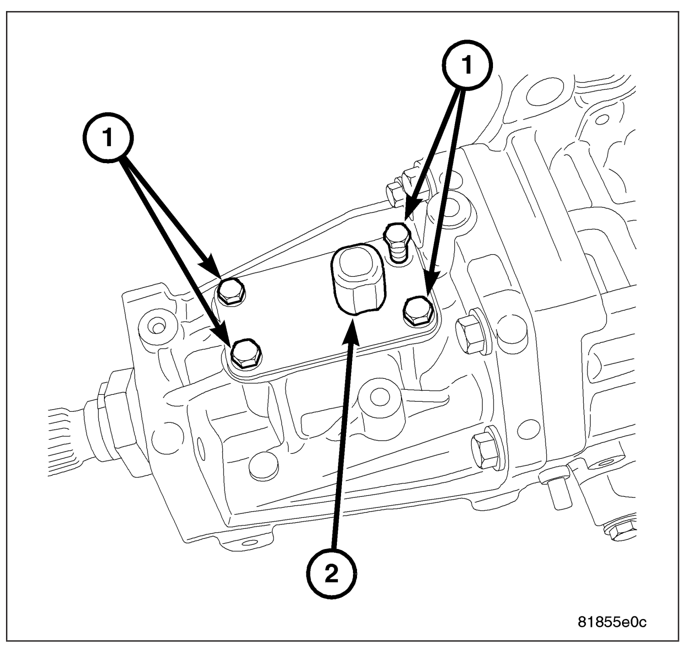
27. Install the output shaft housing and bolts onto the carrier housing.



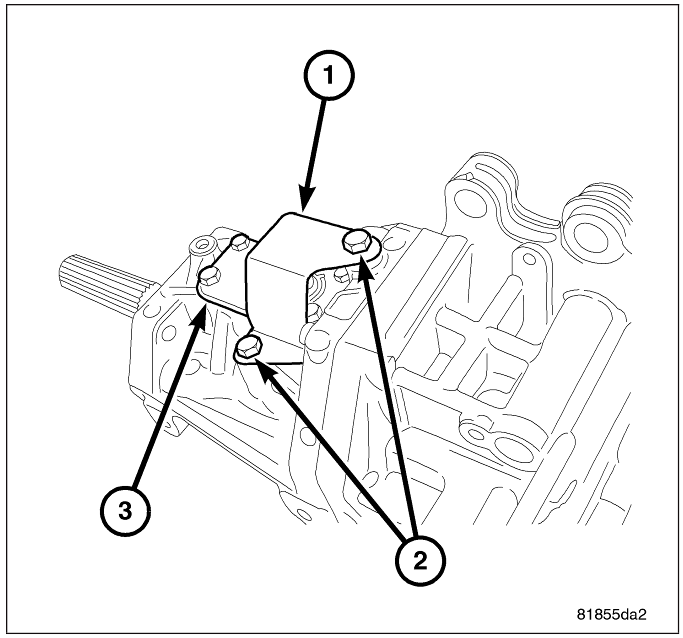
28. Install the extension housing and bolts.
29. Torque output shaft housing bolts to 38 N·m (28 ft. lbs.).
30. Torque the extension housing bolts to 38 N·m (28 ft. lbs.).



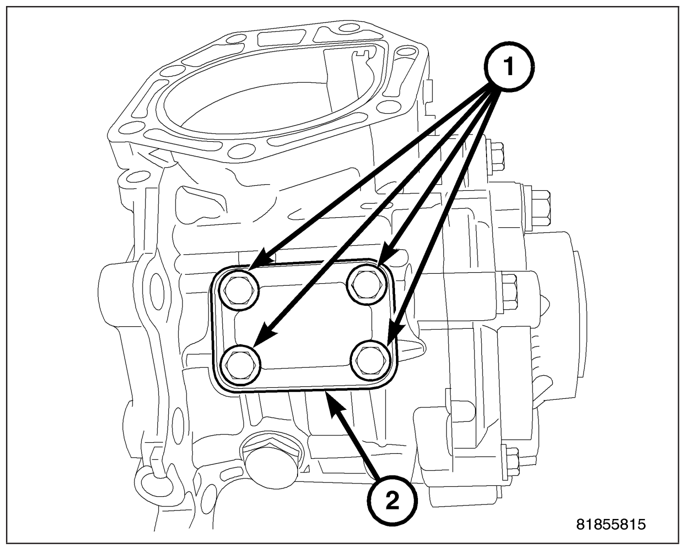
31. Install the vent and bolts, torque the bolts to 23 N·m (17 ft. lbs.).



32. Install the vent shield and bolts, Torque the bolts to 23 N·m (17 ft. lbs.).

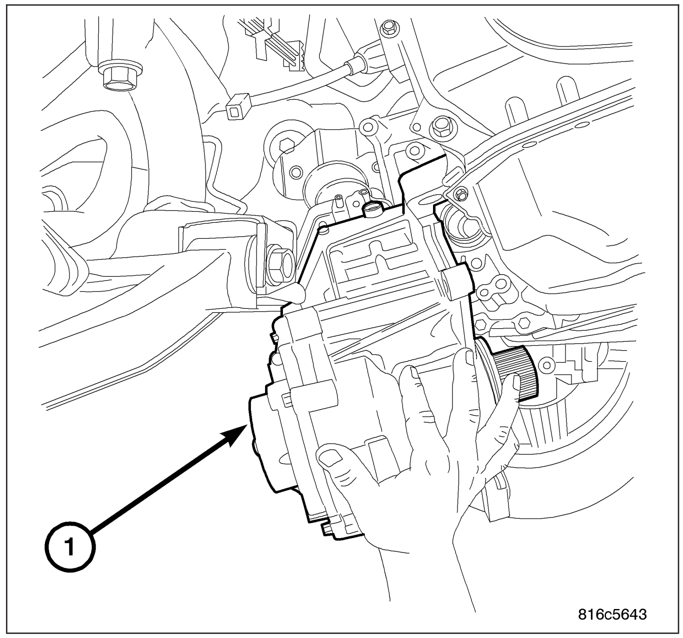


33. Install the inspection cover and bolts , Torque the bolts to 23 N·m (17 ft. lbs.).
34. Fill the PTU (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).

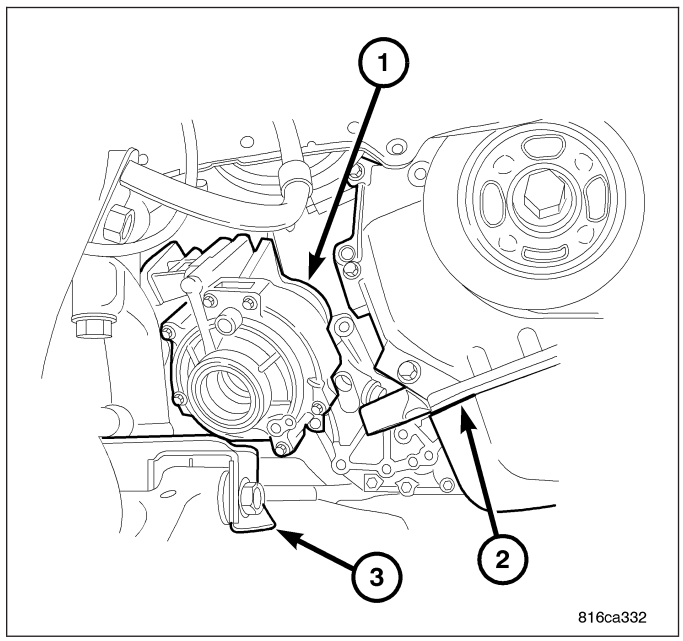


INSTALLATION

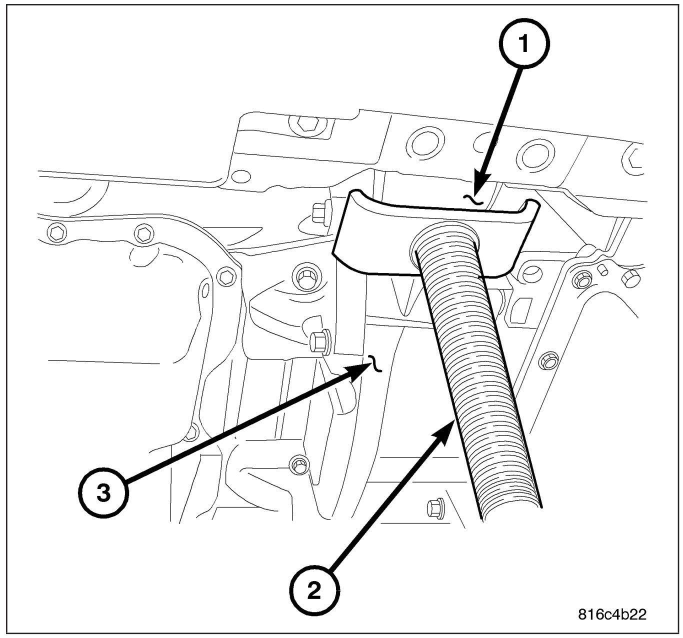
1. Roll the PTU in moving from front to back (1).



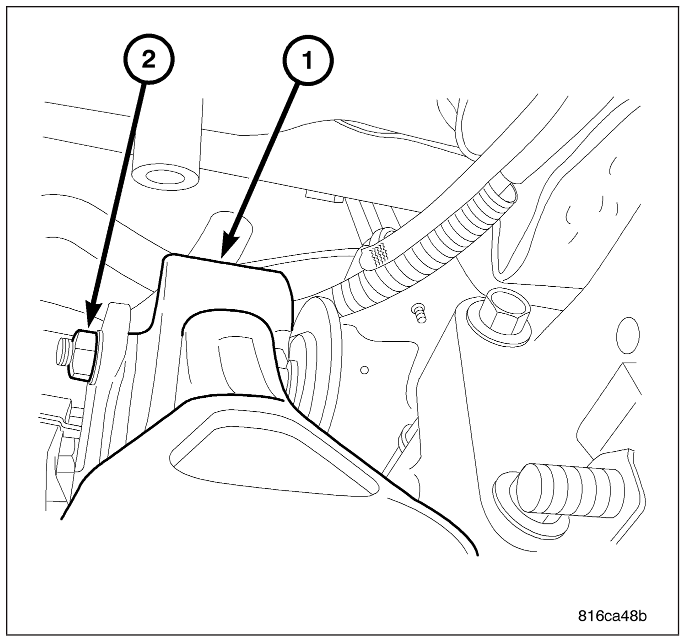
2. Rest the PTU (1) on the frame (3) while the engine and transaxle (2) are raised back into position.



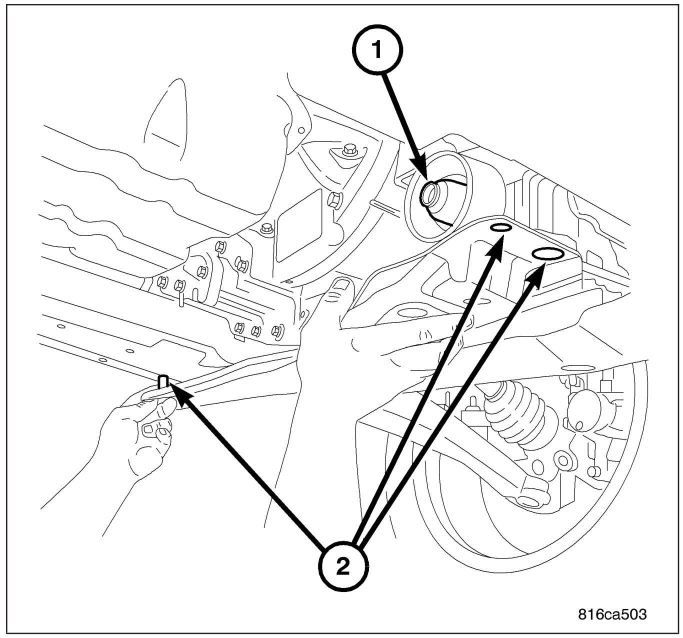
3. Lower screw jack (2) until rear mount through bolt can be installed.



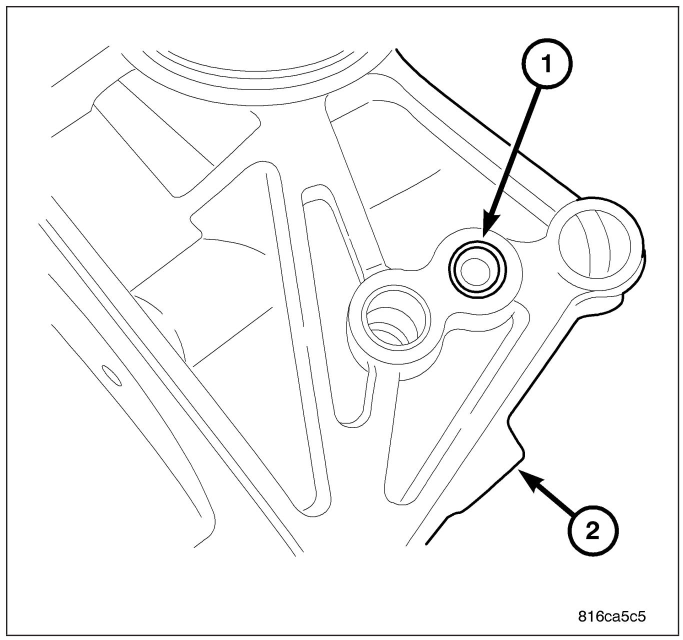
4. Install rear mount through bolt (2) and torque bolt to 75 Nm (55 ft. lbs.).



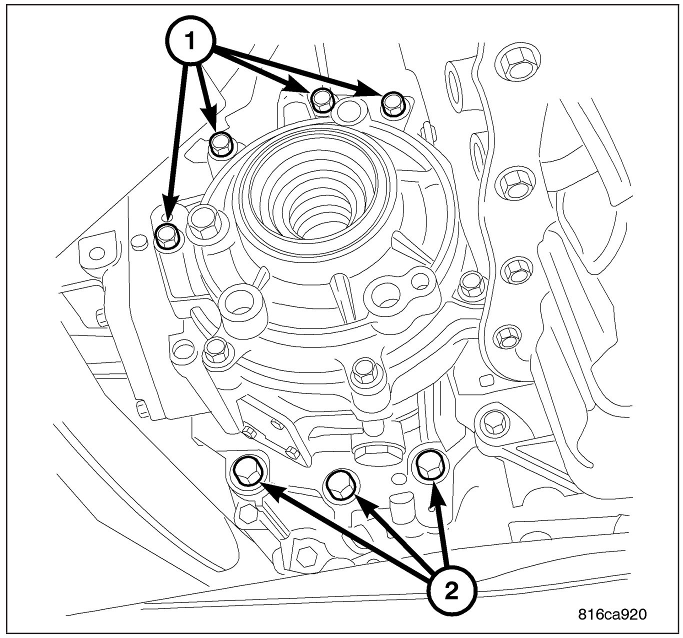
5. Install the transmission crossmember and bolts, (2) torque to 75 Nm (55 ft. lbs.).
6. Install the through bolt at the front transmission mount (1) and torque to 75 Nm (55 ft. lbs.).



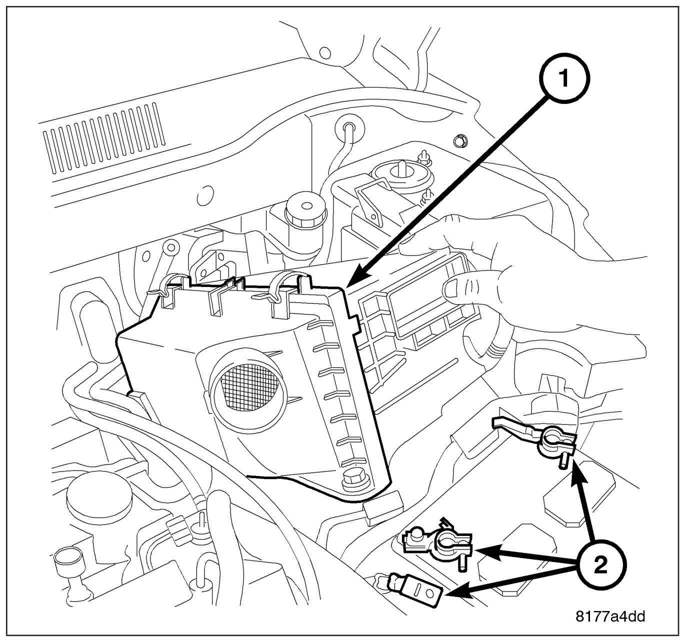
7. Insure that the O-ring (1)between the PTU and transaxle is in place.



8. Slide the PTU into place.
9. Install and torque PTU mounting bolts (1,2)to 58 N-m (43 lbf-ft).
10. Lower the hoist.
11. Install the maniverter (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSTALLATION).



12. Install the air box (1).
13. Install engine trim cover.
14. Raise the vehicle on the hoist.
15. Install the exhaust system (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).
16. Install the Prop shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).
17. Install the axle shafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
18. Fill PTU (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).
19. lower hoist.
20. Connect battery cables (2).
21. Top off the fluids (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - STANDARD PROCEDURE).

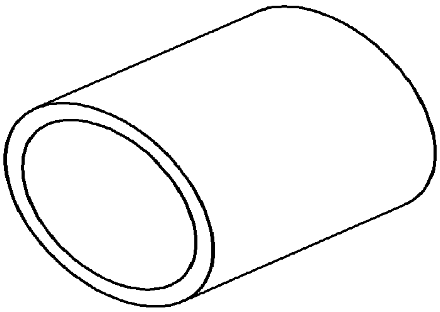


SPECIFICATIONS -

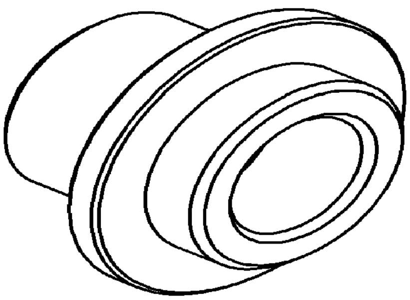
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Fill	32	24	-
Plug, Drain	32	24	-
Bolts, Inspection cover	23	17	-
Bolts, Vent Shield	23	17	-
Bolts, Vent	23	17	-
Bolts, Output Shaft Housing	38	28	-
Bolts, extension housing	38	28	-
Nut, Output Shaft	150	111	-
Bolts, Carrier Assembly Side Cover	23	17	-
Bolts, Ring Gear	74	55	-
Bolt and Nut, Rear Mount Through	75	55	-
Bolts, Transmission Crossmember	75	55	-
Bolt and Nut, Transmission Crossmember through	75	55	-
Bolts, PTU Mounting	58	43	-

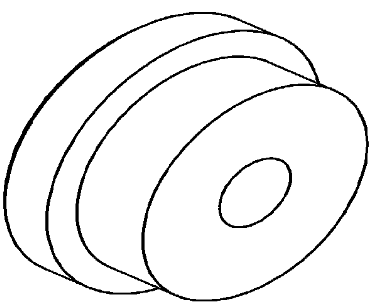
SPECIAL TOOLS



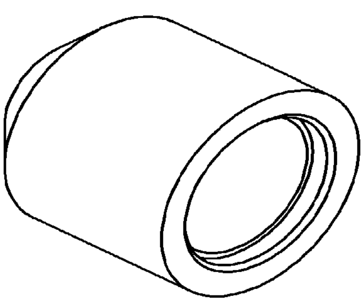
INSTALLER 9714



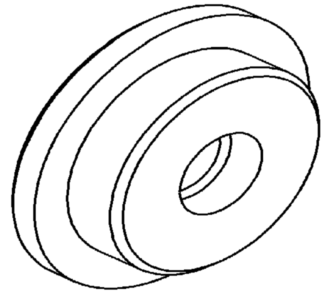
INSTALLER 9715



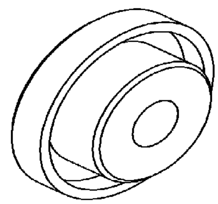
SPLINE SOCKET 9743



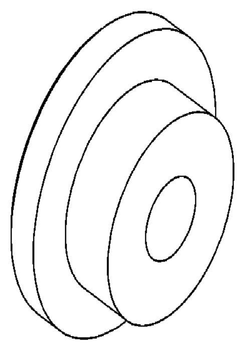
INSTALLER 9851



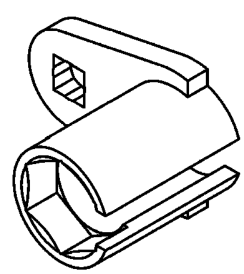
INSTALLER 9852



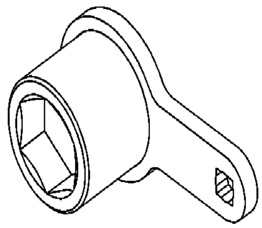
INSTALLER 9853



INSTALLER 9855



O2S (Oxygen Sensor) Remover/Installer - 8439



OUTPUT SHAFT NUT SOCKET 9921

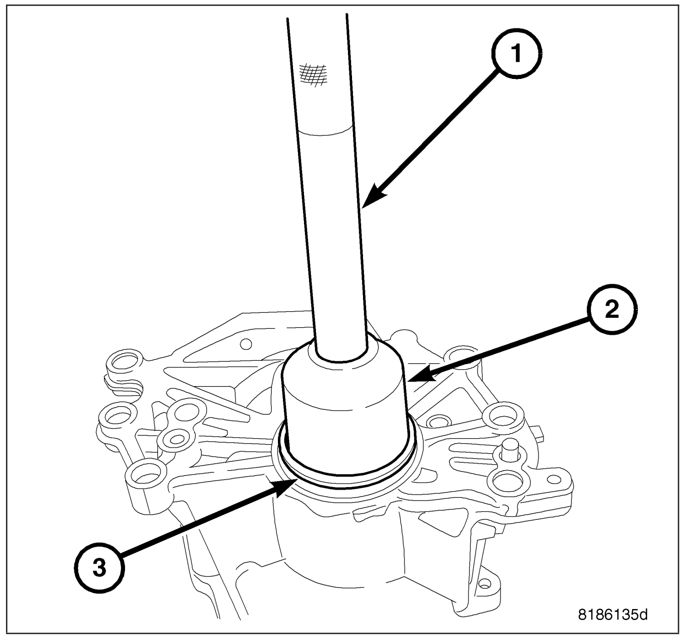
SEAL-DIFFERENTIAL CARRIER

REMOVAL

1. Remove PTU from transaxle (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).
2. Use a screw mounted in a slide hammer to remove seal. Be careful not to damage seal journal when removing seal.

INSTALLATION

1. Install the carrier case seal using Installer 9851 and Handle C- 4171.
2. Install the PTU (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - INSTALLATION).



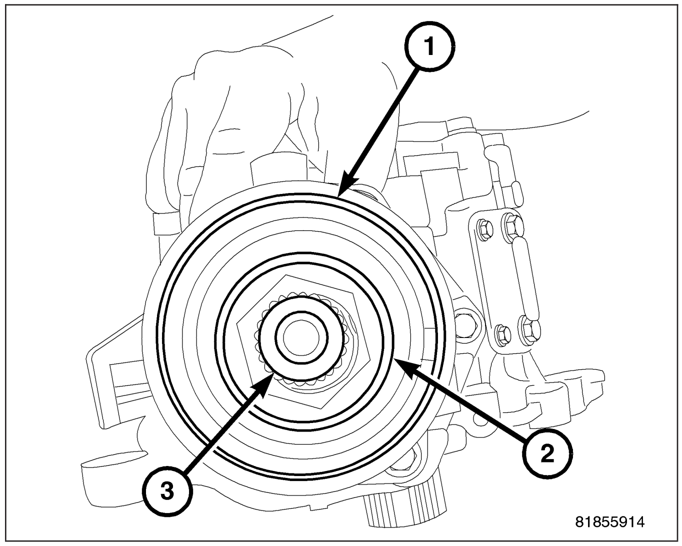
SEAL-OUTPUT FLANGE

REMOVAL

1. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL).
2. Using a screwdriver remove the output seal.

INSTALLATION

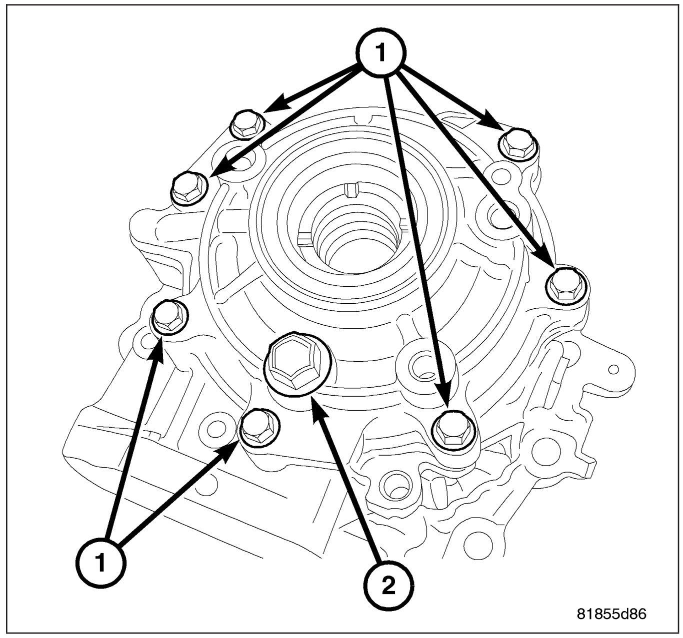
1. Install the output shaft seal using Installer 9851 and Handle C-4171.
2. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION).



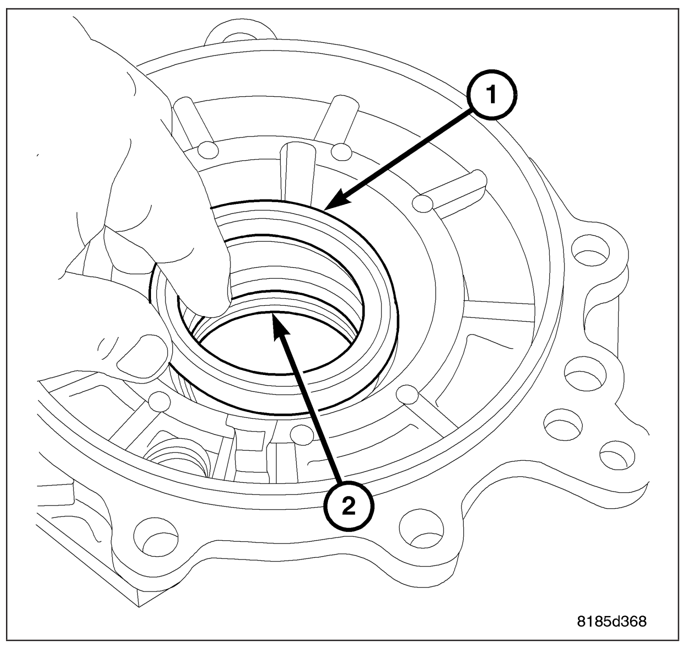
SEALS-END COVER

REMOVAL

1. Remove the right halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).
2. Remove the side cover bolts.
3. Remove the side cover.

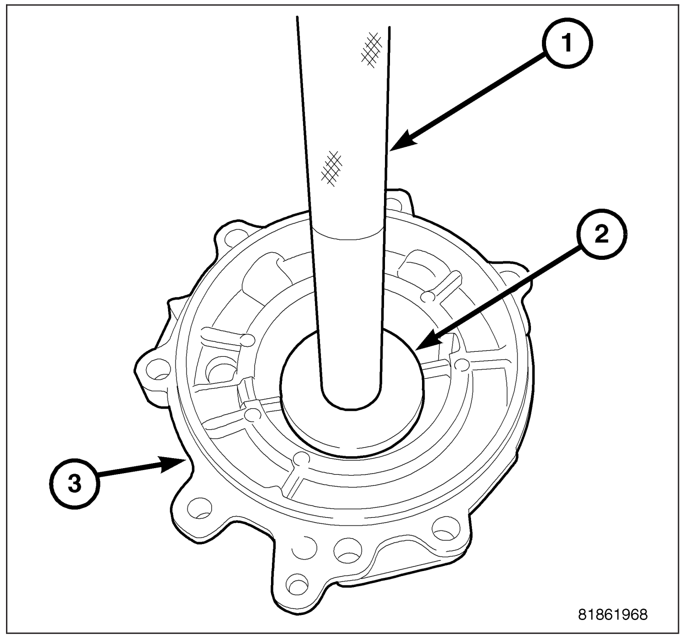


4. Using a drift remove both inner and outer seals.

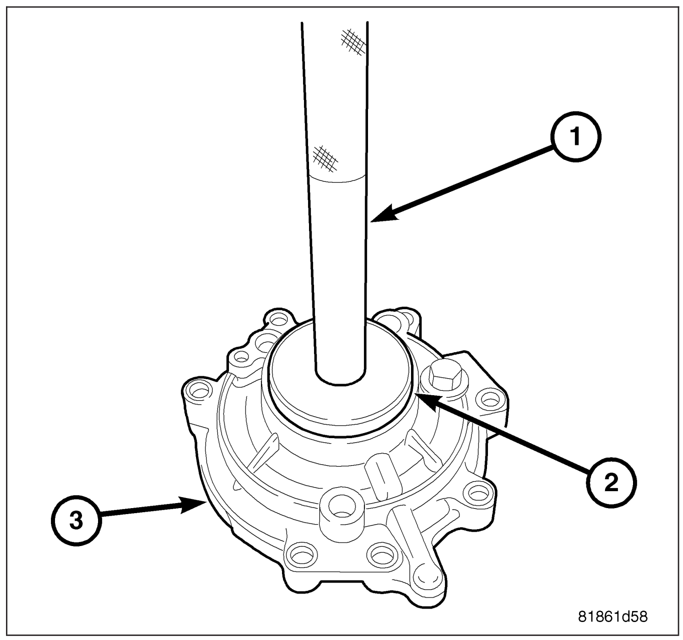


INSTALLATION

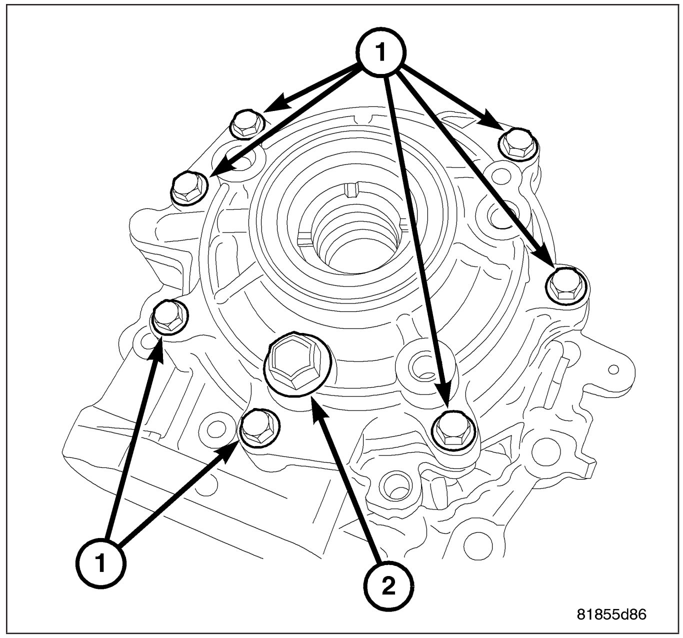
1. Install the inner seal into the PTU cover using Installer 9852 and Handle C-4171.



2. Install the outer seal into the PTU cover using Installer 9853 and Handle C-4171.



3. Install the side cover
4. Torque side cover bolts (1) to 23 N·m (17 ft. lbs.).
5. Install the right halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)



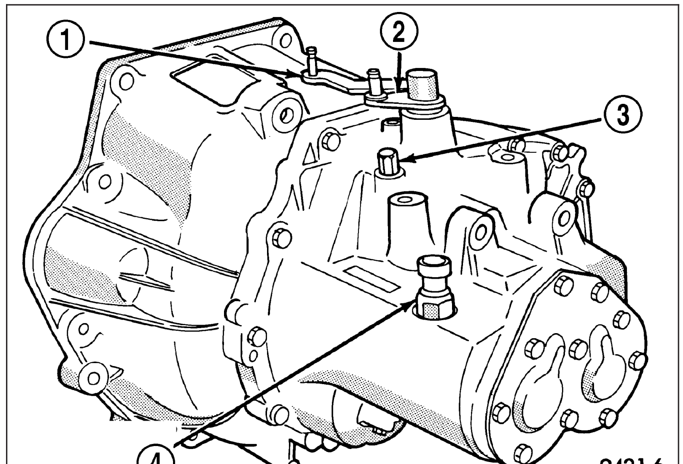
T355 MANUAL TRANSAXLE

TABLE OF CONTENTS

T355 MANUAL TRANSAXLE

DESCRIPTION

This five speed is a constant-mesh manual transaxle. All gear ranges, except reverse, are synchronized. The reverse gear utilizes a reverse brake for shifting ease. The reverse idler gear is supported on a sliding spindle idler shaft. The transaxle case is aluminum with a steel end-plate bearing cover. It is housed in a die-cast aluminum case featuring a two-piece, middle split design.



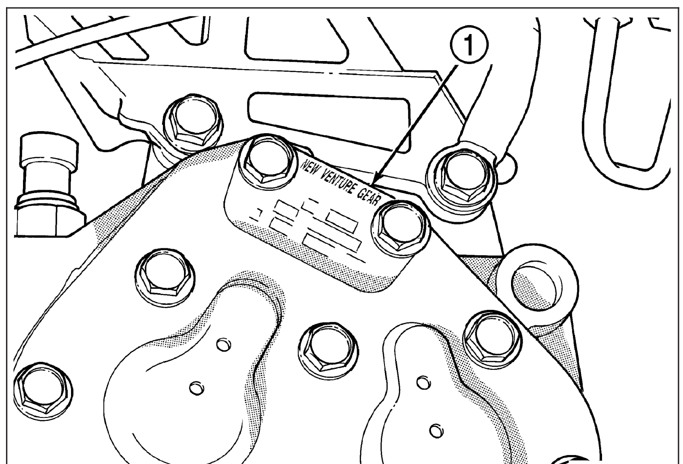
9421-6

The T355 transaxle internal components can be serviced only by separating the gear case from the bell-housing case.

CAUTION: The transaxle output shaft is serviced as a unit. No disassembly and reassembly is possible. Damage to the transaxle may result.

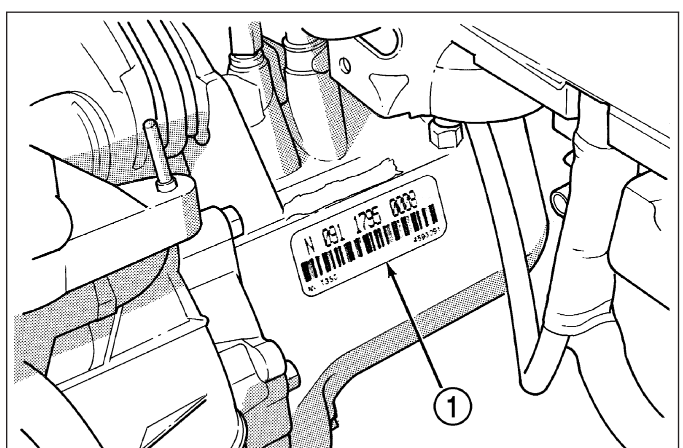
TRANSAXLE IDENTIFICATION

The transaxle model, assembly number, and build date are on a metal I.D. tag (1) that is attached to the end cover of the transaxle.



9521-234

This information is also shown on a bar code label (1) that is attached to the front of the transaxle.



9521-233

GEAR RATIOS

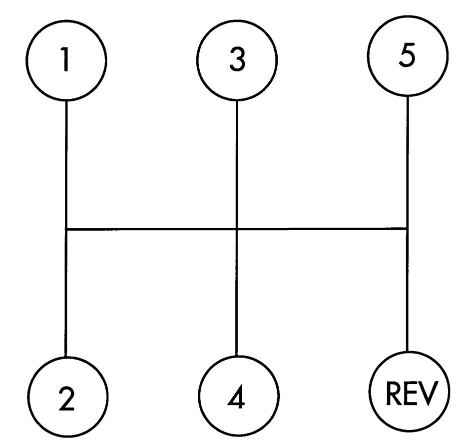
GEAR	
1st	3.77
2nd	2.16
3rd	1.41
4th	1.026
5th	0.81
REVERSE	3.4
FINAL DRIVE RATIO	4.12
REVERSE BRAKE	YES
CLUTCH RELEASE SYSTEM	HYDRAULIC

CAUTION: All gears and shafts must not be interchanged with other transaxles; they will not function correctly.

The differential is a conventional arrangement of gears that is supported by tapered roller bearings. The final output gear turns the ring gear and differential assembly, thereby turning the drive axle shafts.

GEARSHIFT PATTERN

The T355 transaxle shift pattern is a modified H–pattern. Overdrive fifth and reverse gears are in-line and outboard of the first through fourth gear positions.



FJ9521-110

DIAGNOSIS AND TESTING

COMMON PROBLEM CAUSES

The majority of transaxle malfunctions are a result of:

- Insufficient lubrication
- Incorrect lubricant
- Mis-assembled or damaged internal components
- Improper operation

HARD SHIFTING

Hard shifting may be caused by a mis-adjusted crossover cable. If hard shifting is accompanied by gear clash, synchronizer clutch and stop rings or gear teeth may be worn or damaged.

Mis-assembled synchronizer components also cause shifting problems. Incorrectly installed synchronizer sleeves, struts, or springs can cause shift problems.

Worn, damaged, mis-assembled or leaking hydraulic clutch release system/components can also cause difficult shifting or gear clash.

NOISY OPERATION

Transaxle noise is most often a result of worn or damaged components. Chipped, broken gear or synchronizer teeth, and brinnelled, spalled bearings all cause noise.

Abnormal wear and damage to the internal components is frequently the end result of insufficient lubricant.

SLIPS OUT OF GEAR

Transaxle disengagement may be caused by misaligned or damaged shift components, or worn teeth on the drive gears or synchronizer components. Incorrect assembly also causes gear disengagement.

LOW LUBRICANT LEVEL

Insufficient transaxle lubricant is usually the result of leaks, or inaccurate fluid level check or refill method. **Vehicle must be level to accurately check fluid level.** Leakage is evident by the presence of oil around the leak point. If leakage is not evident, the condition is probably the result of an underfill.

If air–powered lubrication equipment is used to fill a transaxle, be sure the equipment is properly calibrated. Equipment out of calibration can lead to an underfill condition.

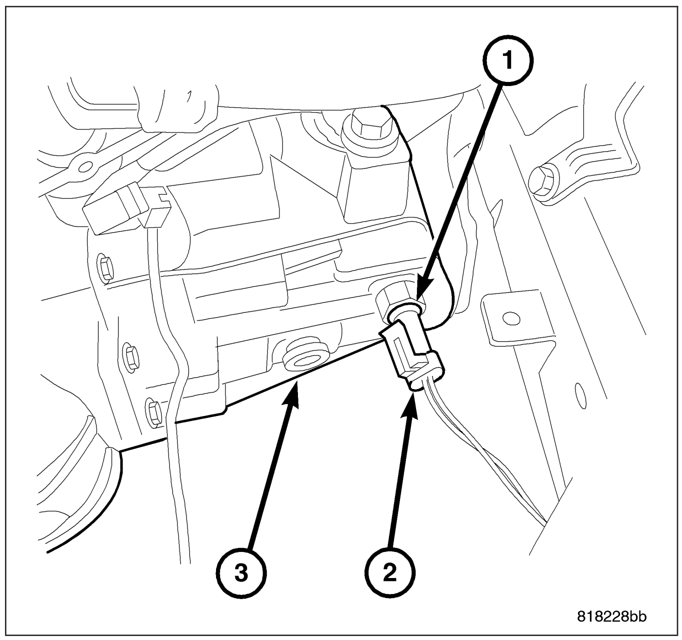
CLUTCH PROBLEMS

Worn, damaged, or misaligned clutch components can cause difficult shifting, gear clash, and noise.

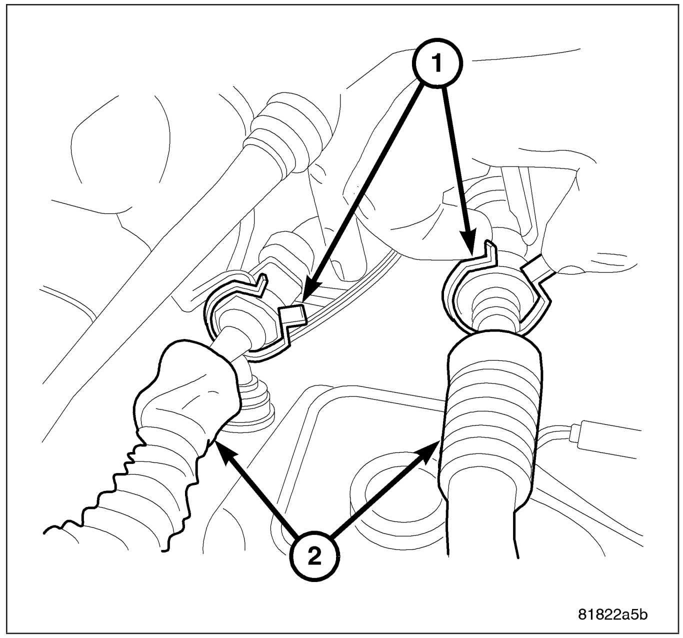
A worn or damaged clutch disc, pressure plate, or release bearing can cause hard shifting and gear clash.

REMOVAL

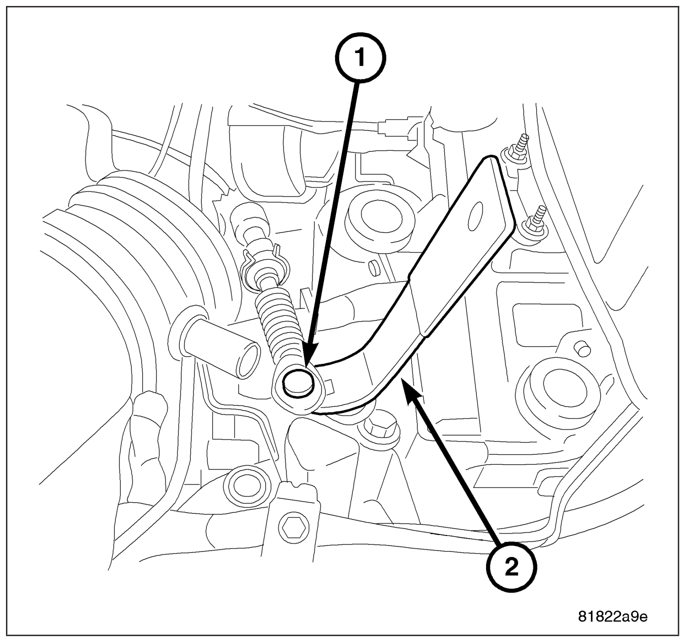
1. Raise hood.
2. Remove the resonator.
3. Remove engine cover.
4. Remove air cleaner assembly.
5. Disconnect both battery cables. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL)
6. Remove battery hold down clamp and bolt, and remove battery.
7. Remove battery tray. (Refer to 8 - ELECTRICAL/ BATTERY SYSTEM/TRAY - REMOVAL)
8. Unplug the speed sensor connector (if equipped).
9. Disconnect back-up lamp switch connector (2).



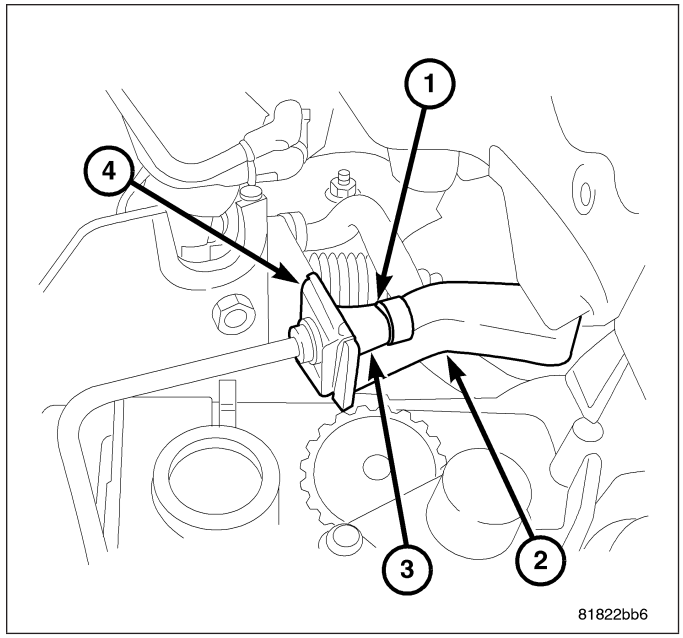
10. Remove shift cable-to-bracket clips (1).



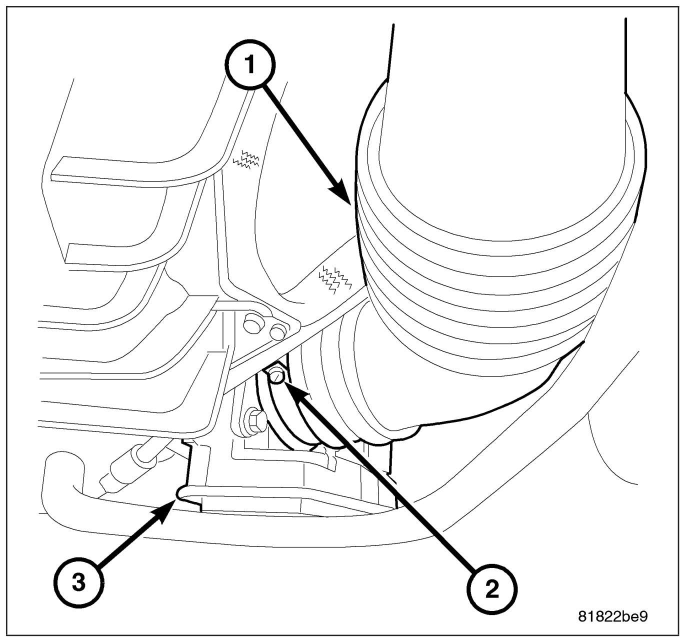
11. Disconnect shift selector and crossover cable (1) from levers. Remove cables and secure out of the way.



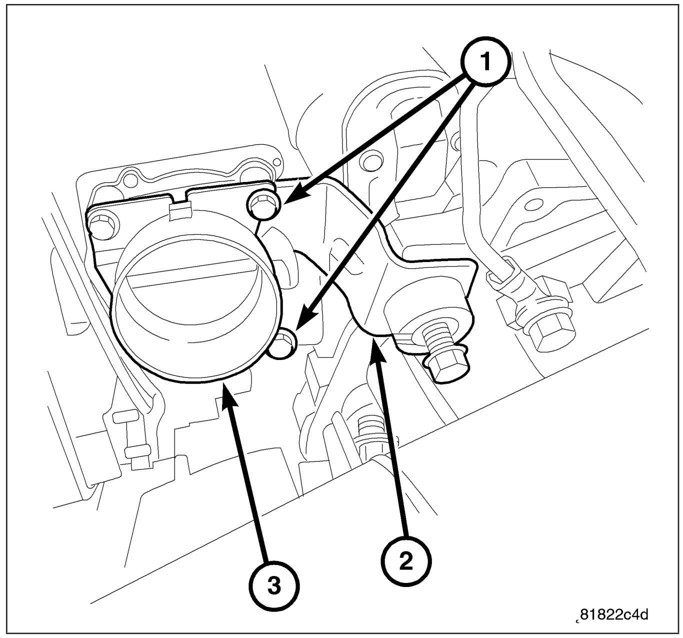
12. Remove the slave cylinder hose (1) at bracket (2).



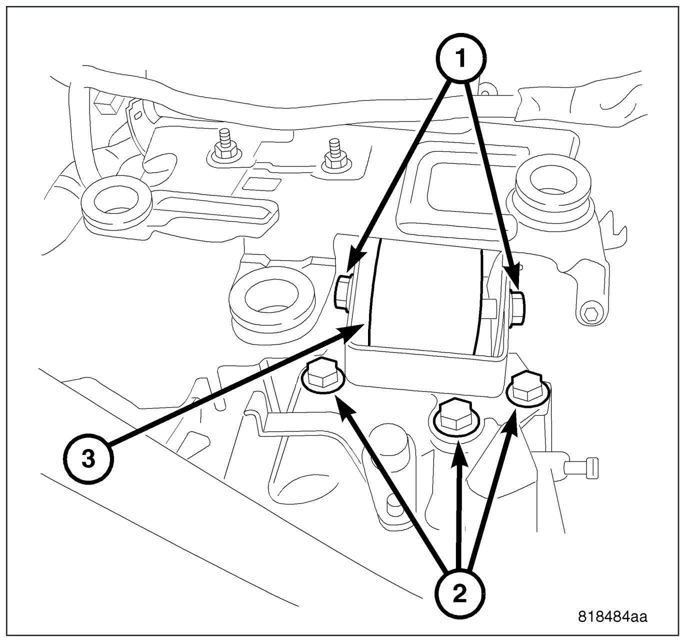
13. Remove the air inlet tube (1) by loosing the screw (2) at the throttle body (3).



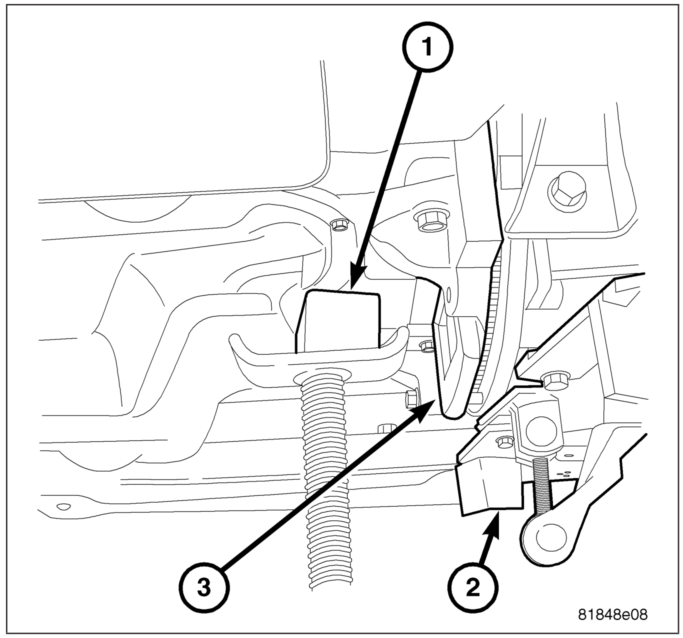
14. Remove the throttle body support bracket bolts (1).
15. Remove the throttle body support bracket (2).
16. Remove upper bell housing bolts.
17. Remove the starter bolts and slide the starter back. (Refer to 8 - ELECTRICAL/STARTING/ STARTER MOTOR - REMOVAL)



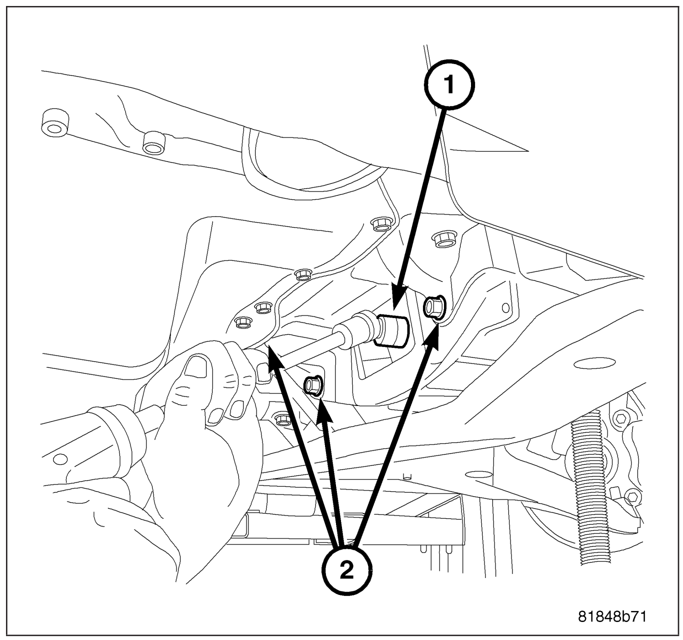
18. Support transmission and remove the upper transmission mount through bolt (1).
19. Raise vehicle on hoist.
20. Unplug the backup switch electrical connector (2).
21. Remove transaxle oil drain plug (3) and drain oil into a suitable container. Reinstall drain plug and torque to 14 N·m (120 in. lbs.) torque.
22. Remove both axle halfshafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).



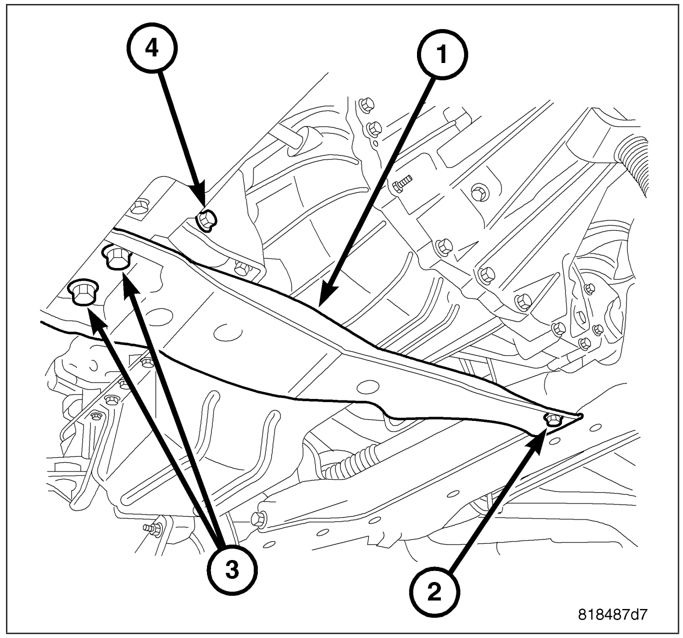
23. Support the engine with a screw jack (1).
24. Remove bell housing dust cover (3).



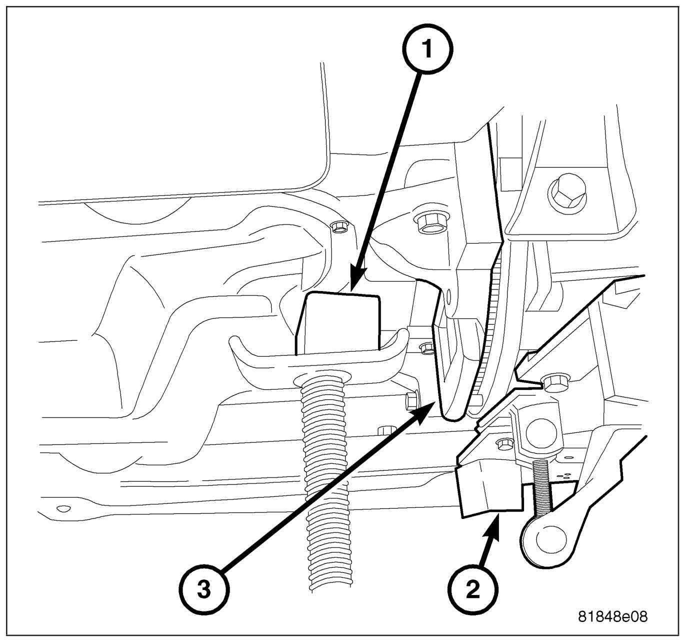
25. Remove four modular clutch-to-drive plate bolts (1). While removing bolts, one tight-tolerance (slotted) drive plate hole will be encountered. When this bolt is removed, mark drive plate and modular clutch assembly at this location, and be sure to align marks upon reassembly.



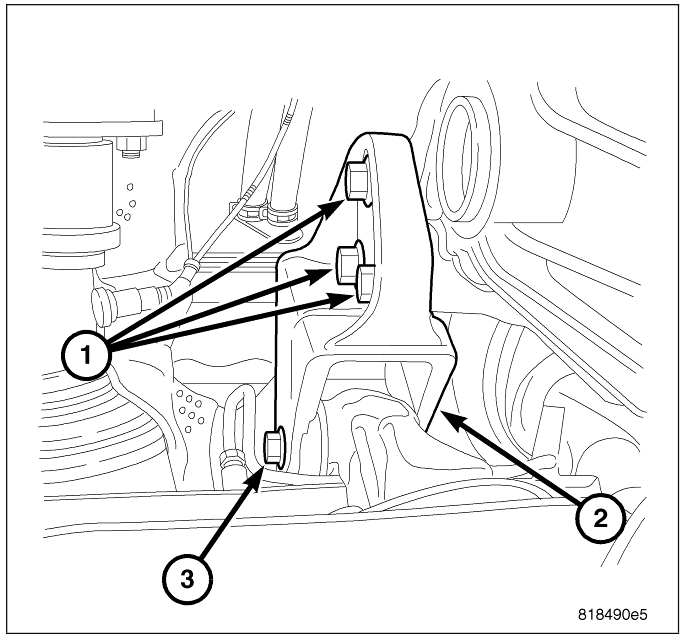
26. Remove the front transmission mount through bolt (4).
27. Remove the transmission cross member mounting bolts (2, 3).
28. Remove the transmission cross member (1).



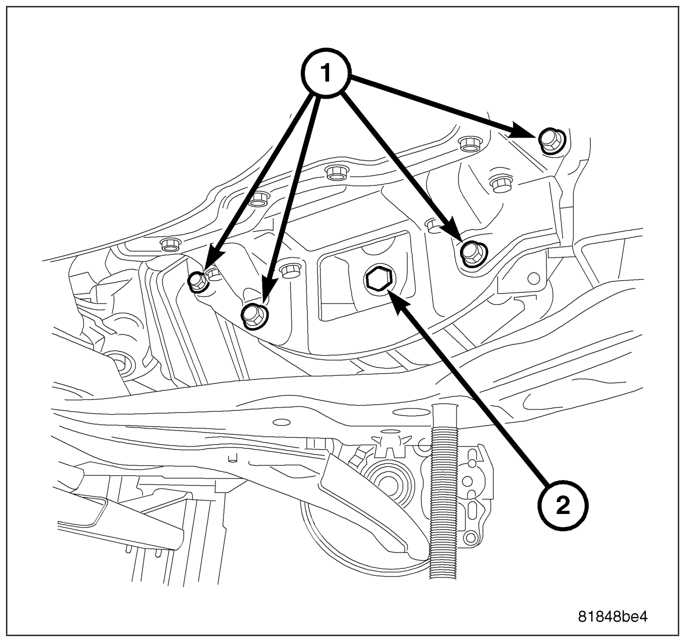
29. Install a transmission jack (2).



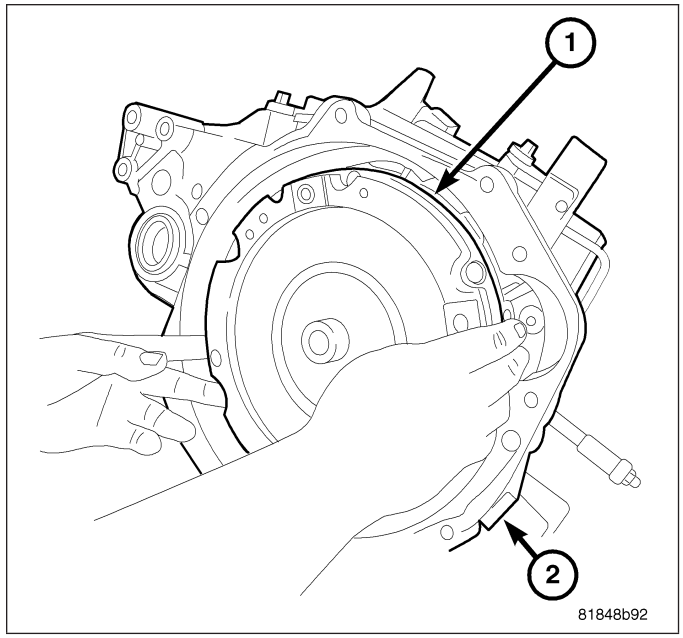
30. Remove the rear transmission through bolt (3).
31. Remove the rear transmission mount bolts (1) and mount (2).



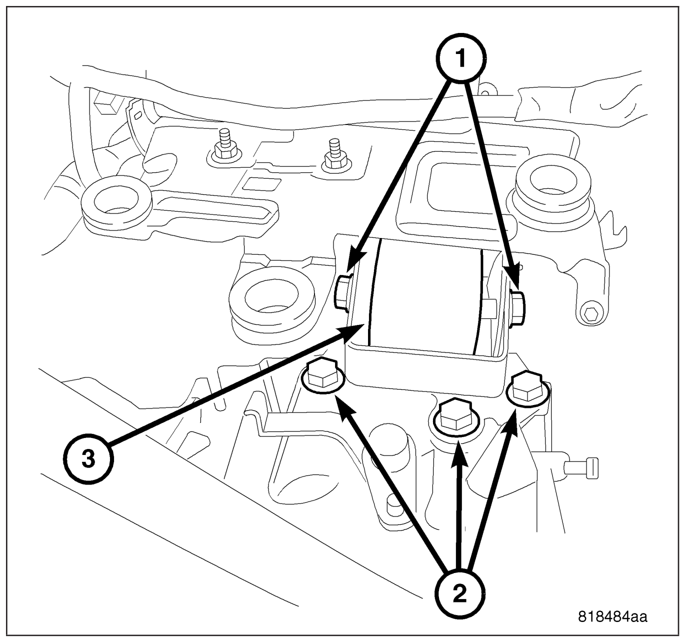
32. Remove the remaining transmission bell housing bolts (1).
33. Carefully lower engine and transaxle on screw jack and transmission jack until proper removal clearance is obtained.
34. Obtain a helper to assist in holding transaxle while removing transaxle-to-engine mounting bolts.
35. Remove transaxle from vehicle.



36. Remove clutch module from transaxle input shaft (1).



37. If installing a new or replacement transaxle, remove the upper mount (3), transfer to the replacement unit and torque all bolts (2) to 62 N·m (45 ft. lbs.) torque.



CLEANING

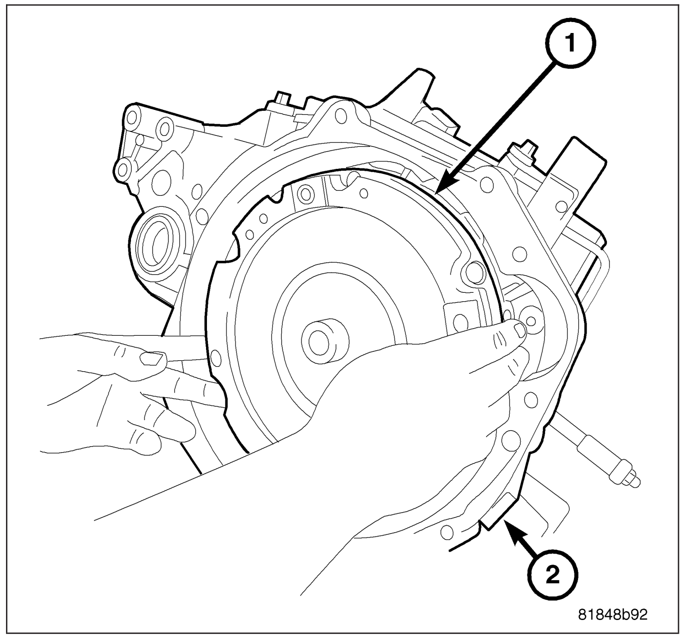
Clean the gears, bearings, shafts, synchronizers, thrust washers, oil feeder, shift mechanism, gear case, and bell-housing with solvent. Dry all parts except the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

INSPECTION

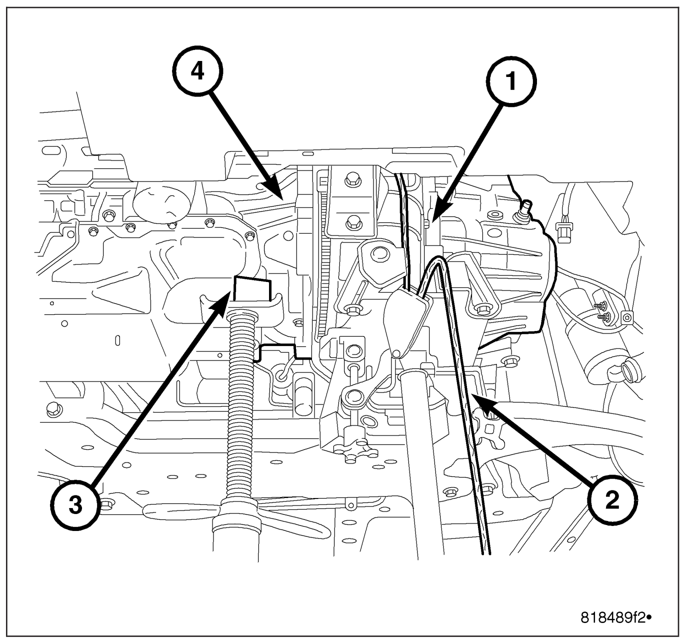
Inspect the gears, bearings, shafts and thrust washers. Replace the bearings and cups if the rollers are worn, chipped, cracked, flat spotted, or brinnelled, or if the bearing cage is damaged or distorted. Replace the thrust washers if cracked, chipped, or worn. Replace the gears if the teeth are chipped, cracked, or worn thin. Inspect the synchronizers. Replace the sleeve if worn or damaged in any way. Replace the stop rings if the friction material is burned, flaking off, or worn. Check the condition of the synchro keys and springs. Replace these parts if worn, cracked, or distorted.

INSTALLATION

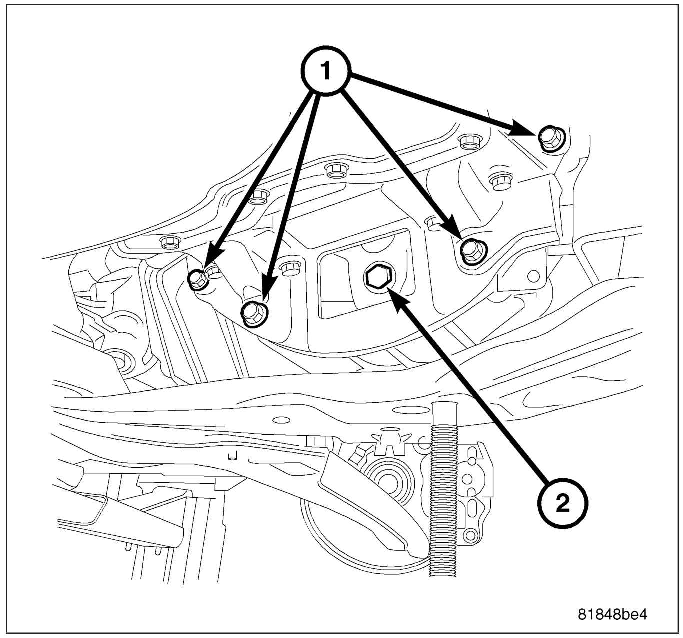
1. Install clutch module (1) (if equipped) onto input shaft.



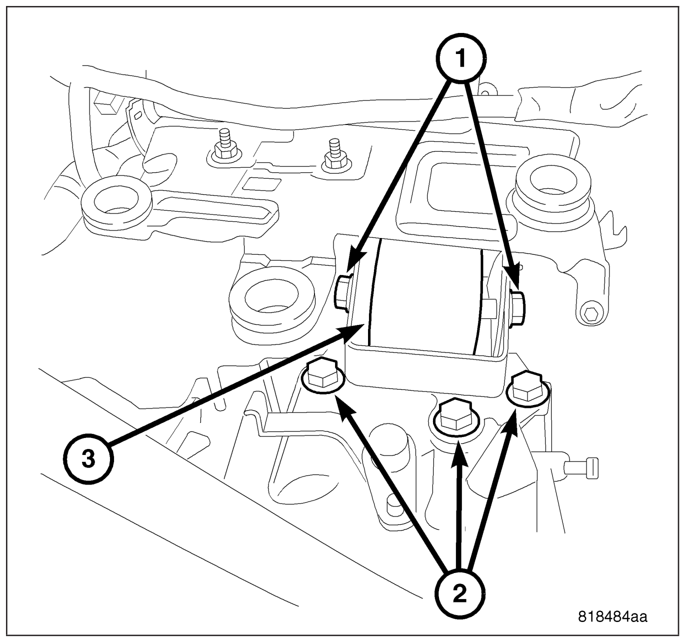
2. Install transaxle (1) into position.



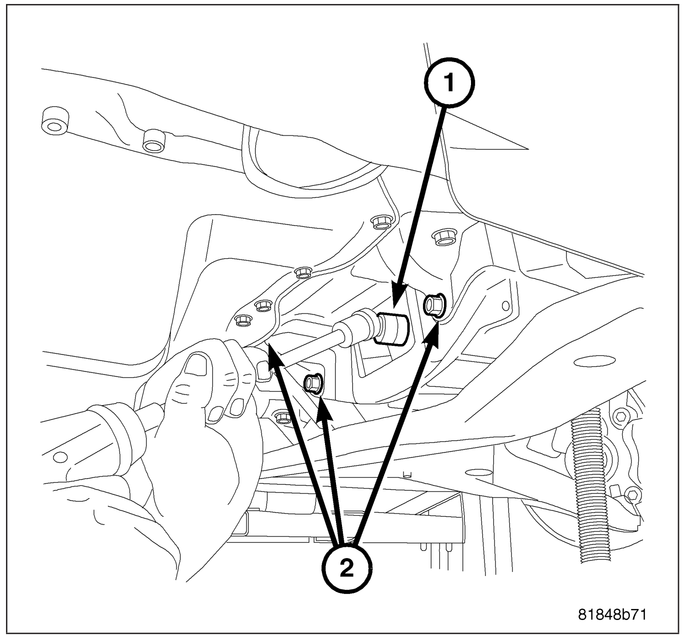
3. Install transaxle-to-engine mounting bolts and tighten to 108 N·m (80 ft. lbs.) torque.



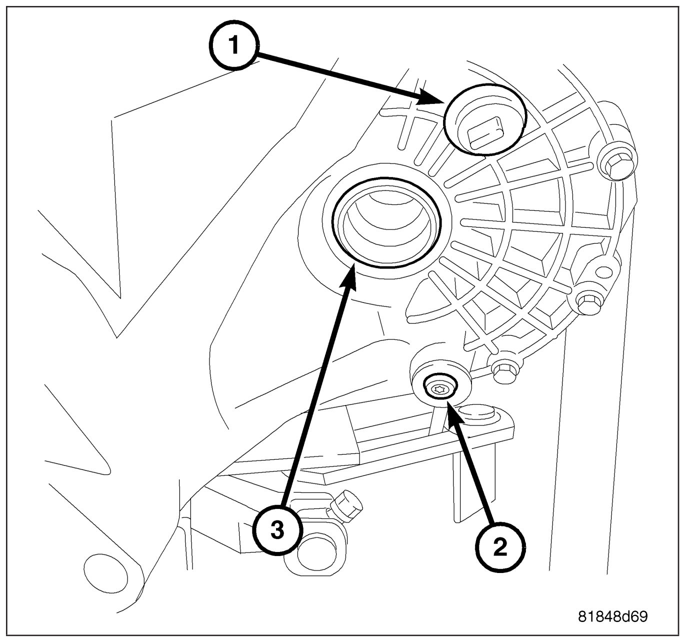
4. Raise engine and transaxle (2) with screw jack and transmission jack until upper mount bracket aligns with upper mount. Install mount bolts (1) and tighten to 68 N·m (50 ft. lbs.) torque.
5. Remove screw jack.



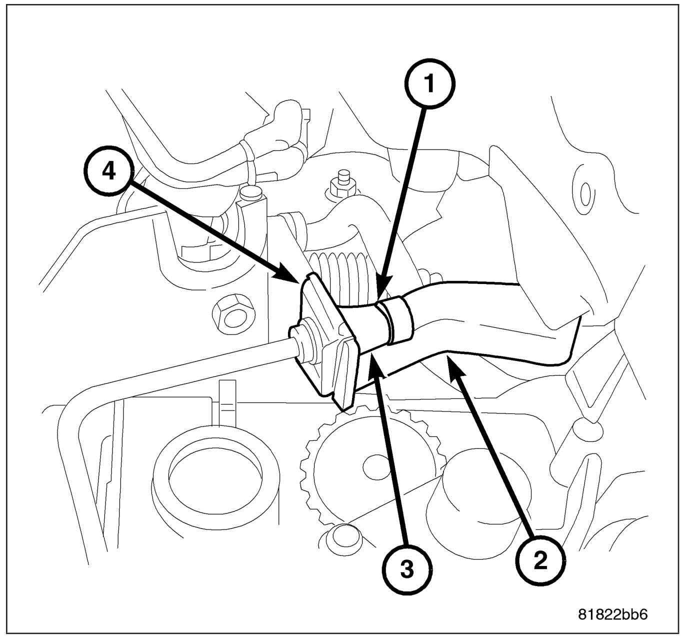
6. Install four (4) modular clutch-to-driveplate bolts (4). Align drive plate and modular clutch alignment marks placed upon disassembly. Start with tight-tolerance (slotted) hole, install and torque bolts to 88 N·m (65 ft. lbs.) torque.
7. Install starter motor and tighten bolts to 54 N·m (40 ft. lbs.) torque. Make sure to fasten ground cable to upper starter bolt. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION)
8. Install bell housing dust cover.
9. Install both front axle driveshafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).



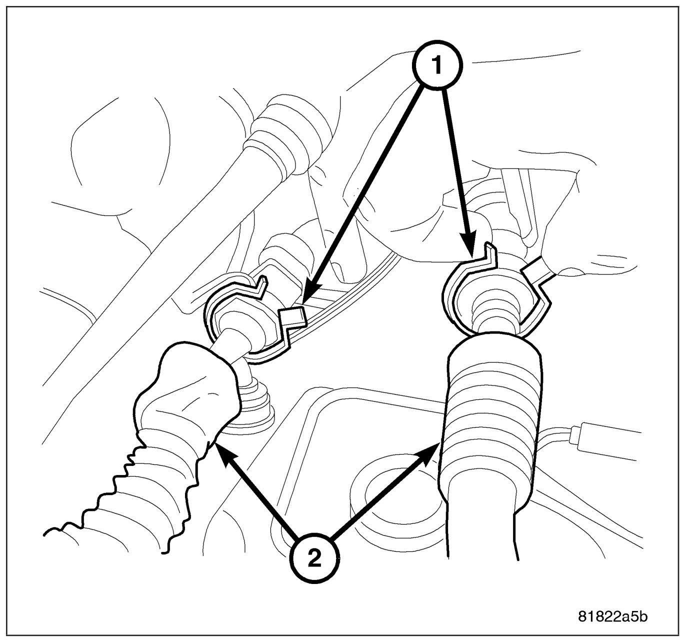
10. Fill transaxle with suitable amount of fluid.
11. Lower the vehicle.
12. Install the remaining bell housing bolts.



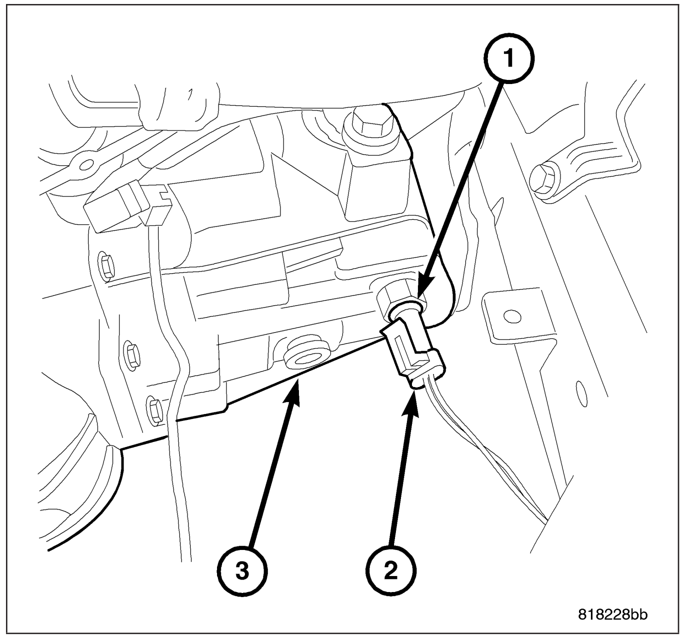
13. Connect the hydraulic clutch slave cylinder (1). An audible click should be heard. Verify connection by pushing and pulling quick connect.



14. Connect shift crossover and selector cables (2) to shift lever. Install cables to bracket (1).



15. Connect back-up lamp switch connector (1).
16. Connect the vehicle speed sensor connector if equipped.
17. Install battery tray.
18. Install battery and tighten hold down clamp to secure battery.
19. Install the air cleaner assembly.
20. Connect the battery cables.
21. Road test vehicle and inspect for leaks.



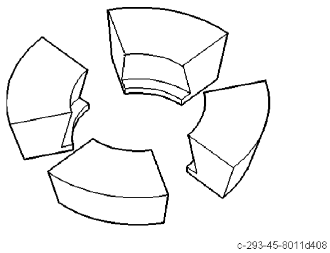
SPECIFICATIONS

TORQUE SPECIFICATIONS

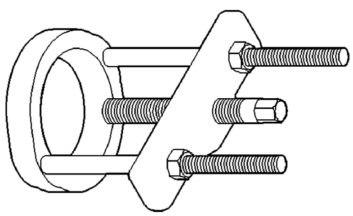
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Back-up Lamp Switch	24	18	-
Crossover Cable Adj. Screw	8	-	70
Drain Plug	14	-	120
Bolts, Differential Ring Gear	81	60	-
Bolts, End Plate Cover	29	21	-
Output Bearing Race Ret. Strap	11	-	96
Reverse Fork Bracket	11	-	96
Bolt, Reverse Idler Shaft	29	19	-
Shift Cable Bracket to Transaxle	28	-	250
Transaxle Case Bolts	29	21	-
Bolt, Transaxle to Engine	95	70	-
Vehicle Speed Sensor	7	-	60
Bolts, Modular Clutch-to-Driveplate	88	65	-
Drain Plug, Transmission	28	-	250
Bolt, Reverse Idler Shaft	26	19	-

Bolts that have thread sealer or torque lock patches should not be reused. Always install new bolts in these applications.

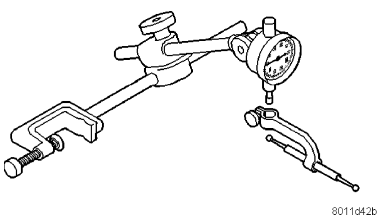
SPECIAL TOOLS



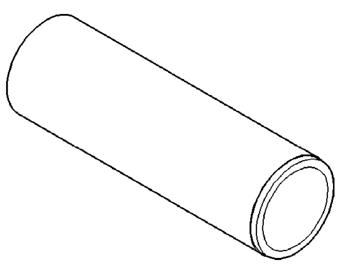
Adapter Blocks C-293-45



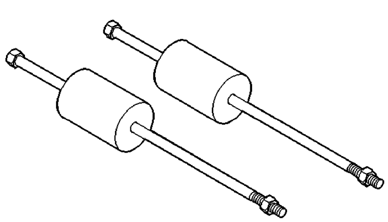
Puller Press C-293–PA



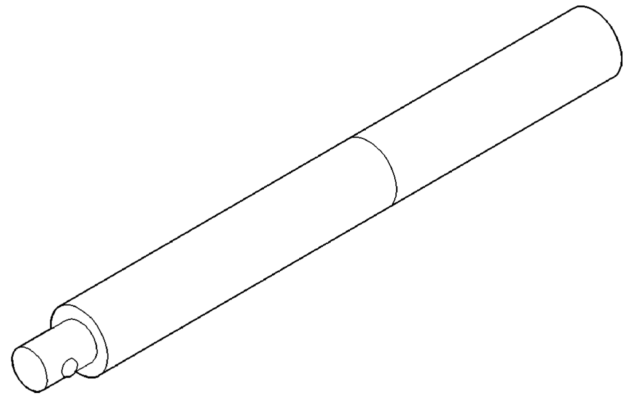
Dial Indicator C-3339



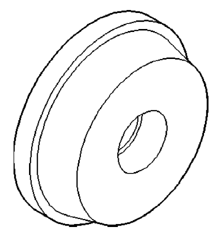
Sleeve C-3717



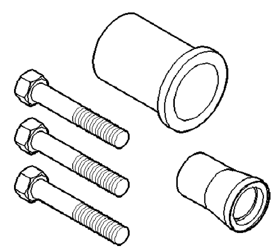
Slide Hammer C-3752



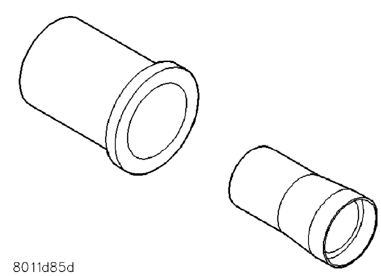
Universal Handle C-4171



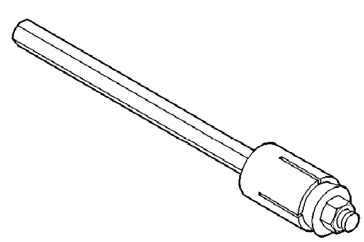
Bearing Installer C-4628



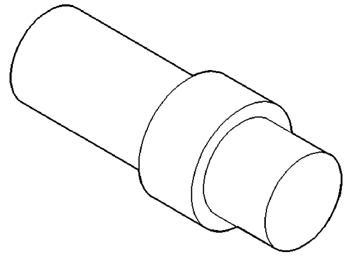
Seal Remover C-4680



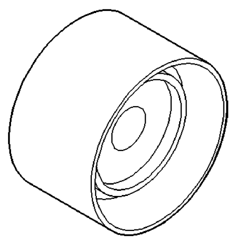
Seal Installer C-4992



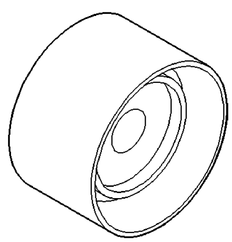
Torque Tool C-4995



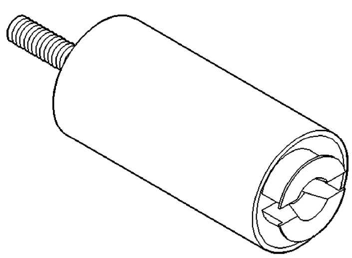
Adapter C-4996



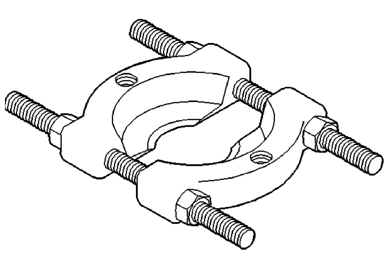
Installer L-4410



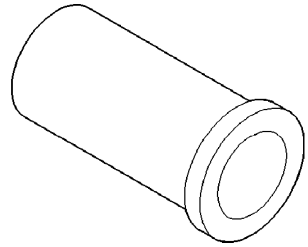
Installer L-4440



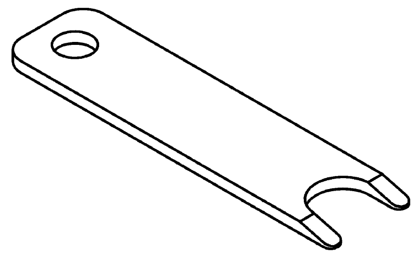
Special Jaw Set L-4518



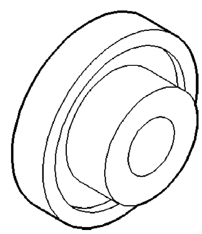
Bearing Splitter 1130



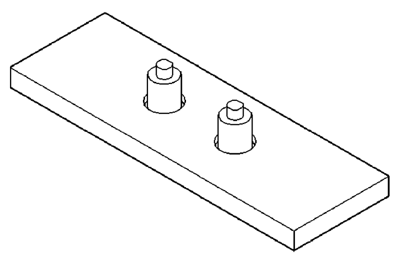
Driver 6342



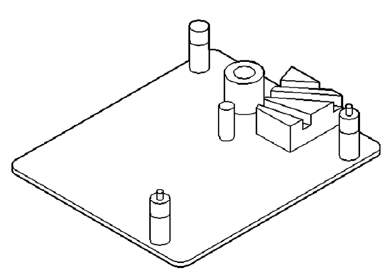
Disconnect Tool 6638A



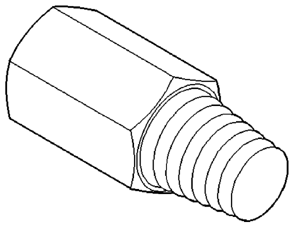
Seal Installer 9928



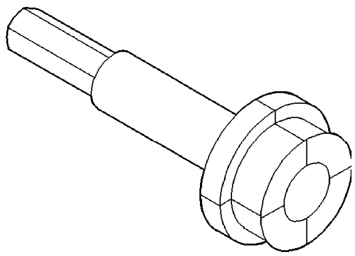
Bearing Remover 6768



Bench Fixture 6785



Remover 6786

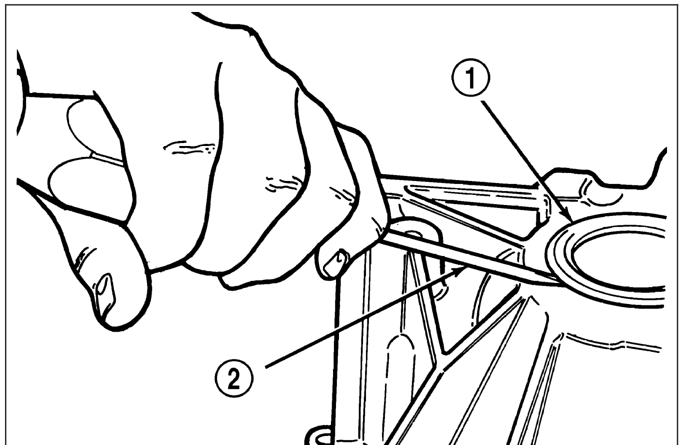


Remover 6787

SEALS-AXLE SHAFT

REMOVAL

1. Remove axle shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)
2. Insert a flat–blade pry tool (2) at outer edge of axle shaft seal (1).
3. Tap on the pry tool (2) with a small hammer and remove axle shaft seal (1).



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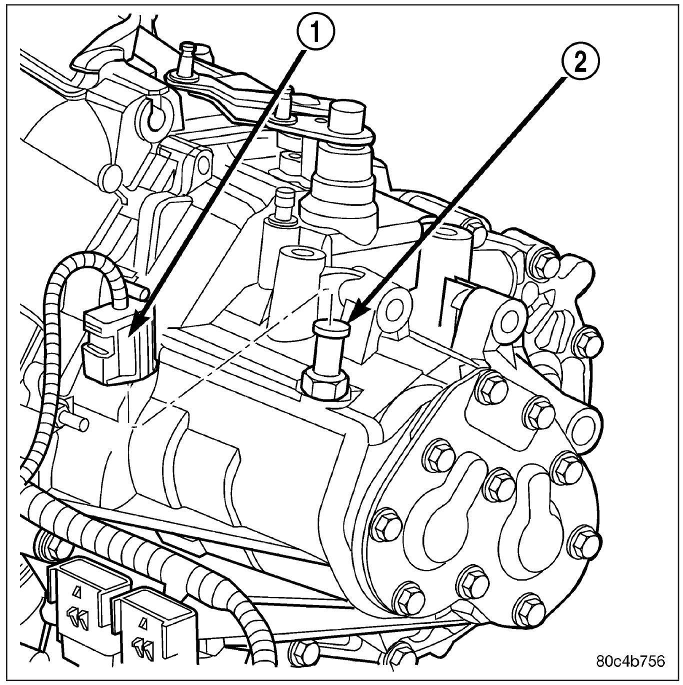
INSTALLATION

1. Clean axle shaft seal bore of any excess sealant.
2. Align axle shaft seal with axle shaft seal bore.
3. Install axle seal on Seal Installer 9928 and Handle C-4171 and insert into axle shaft seal bore.
4. Tap seal into position until seated against transaxle case.
5. Install axle shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)
6. Check transaxle fluid level and adjust as necessary.

SWITCH-BACK-UP LAMP

REMOVAL

1. Lift vehicle on hoist.
2. From bottom side of vehicle, disconnect back-up lamp switch connector (1).
3. Unscrew switch (2) from transaxle.



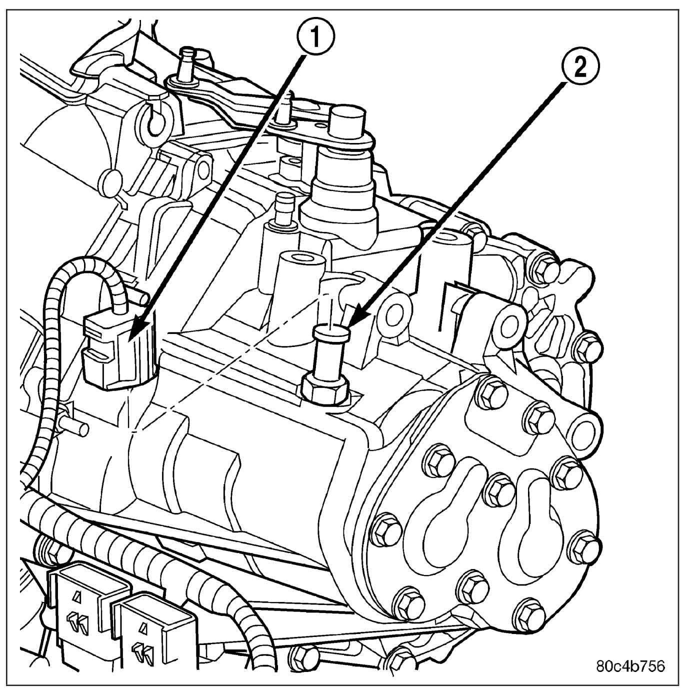
80c4b756

INSTALLATION

Install back-up lamp switch (2). Teflon tape or equivalent must be used on switch threads. Tighten switch to 24 N·m (18 ft. lbs.) torque.

CAUTION: Do not overtighten switch.

1. Connect back-up lamp switch connector (1).
2. Lower vehicle.
3. Verify back-up lamp operation.

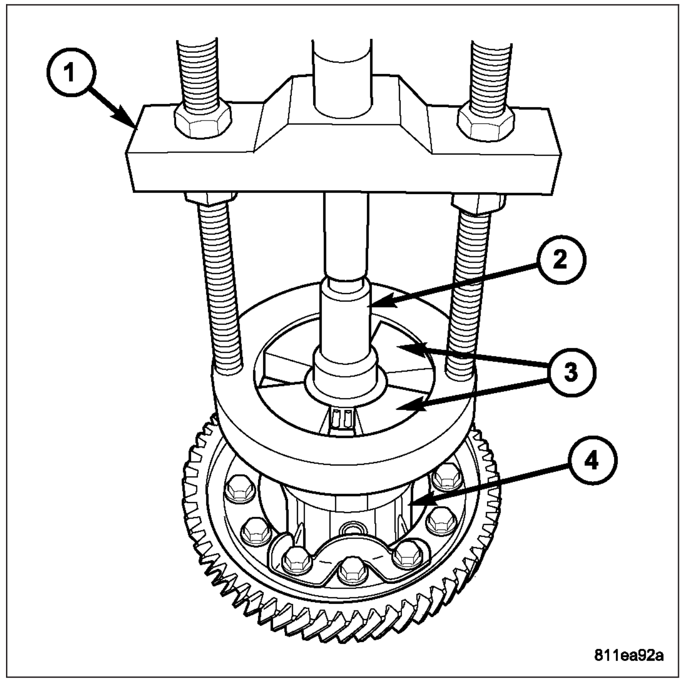


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DIFFERENTIAL

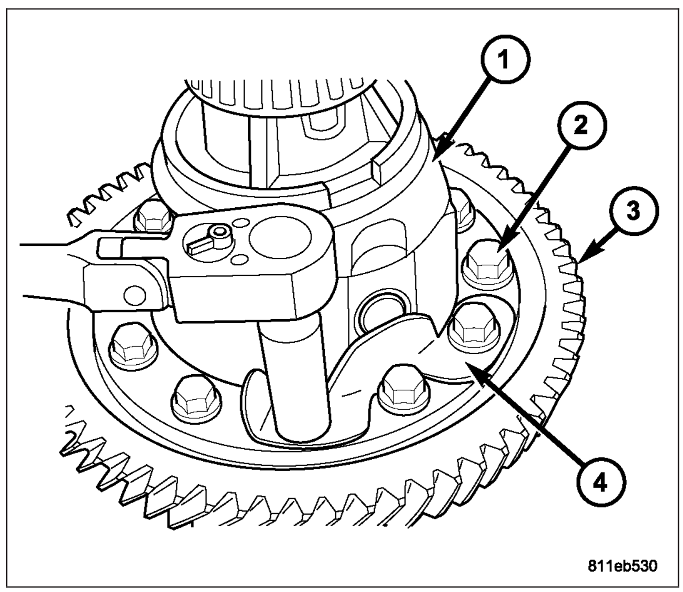
DISASSEMBLY

1. Remove differential bearing cones (ring gear and differential case side) using Puller Press C-293 (1), Adapter Blocks C-293-45 (3), and Adaptor 4996 (2)

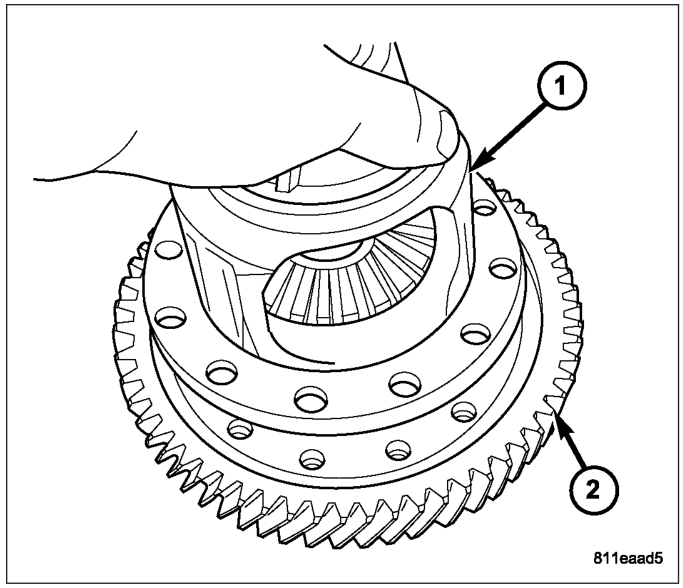


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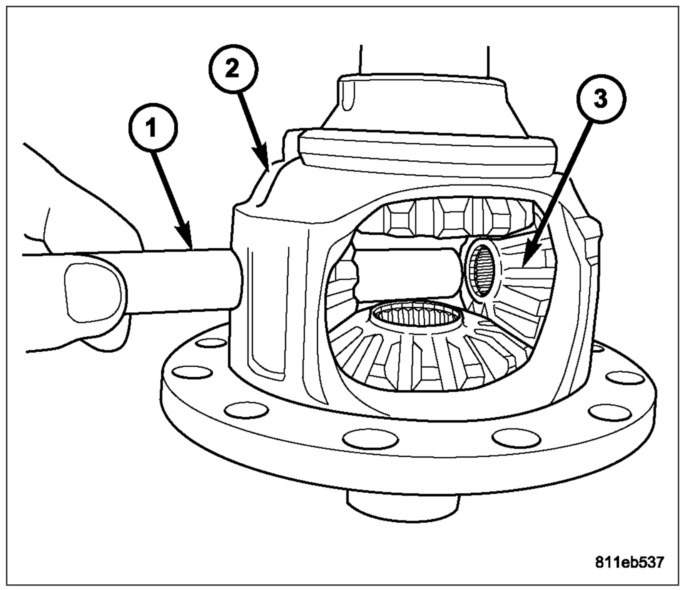
2. Remove the bolts holding the pinion shaft retainer (4) to the ring gear (3) and differential case (1).



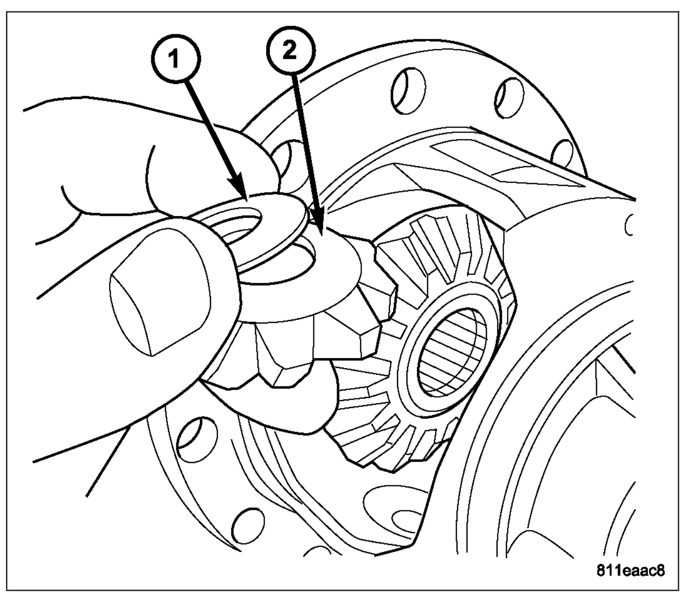
3. If servicing ring gear (2) as well, remove remaining ring gear-to-case bolts and remove ring gear (2) from case (1).



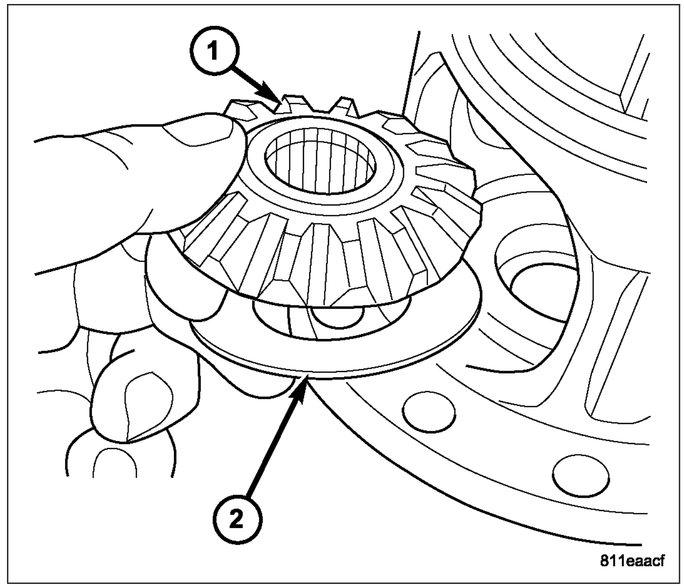
4. Remove pinion shaft (1).



5. Remove pinion gear (2) and thrust washers (1).

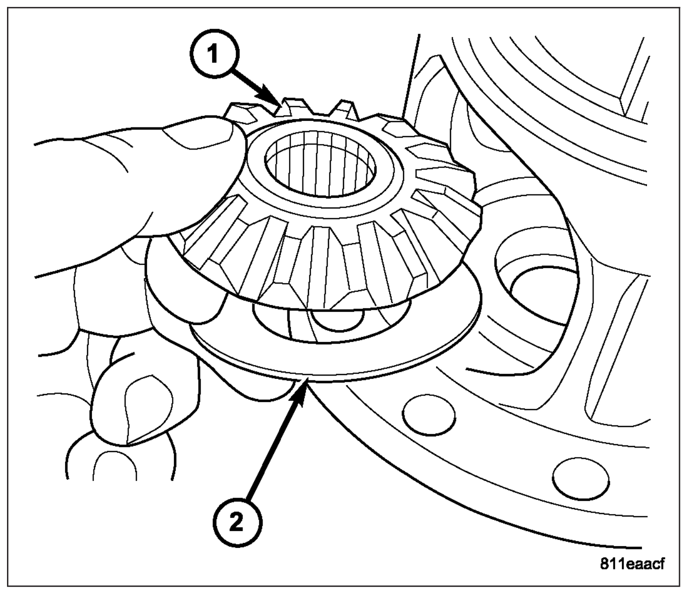


6. Remove side gears (1) and thrust washers.

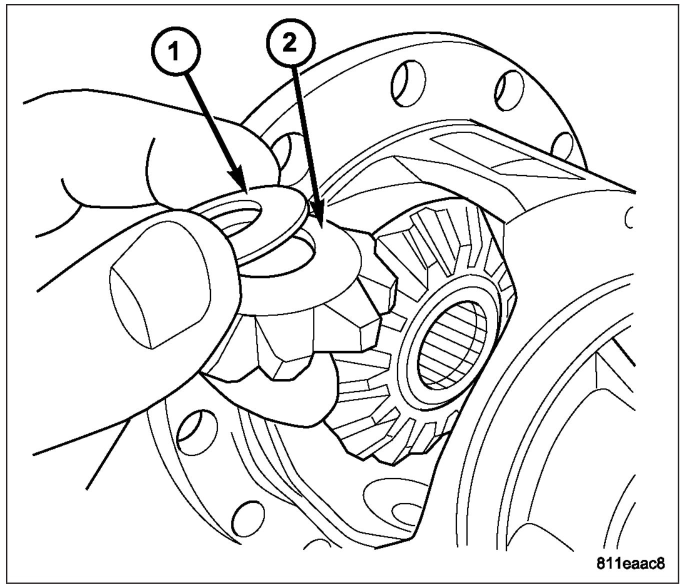


ASSEMBLY

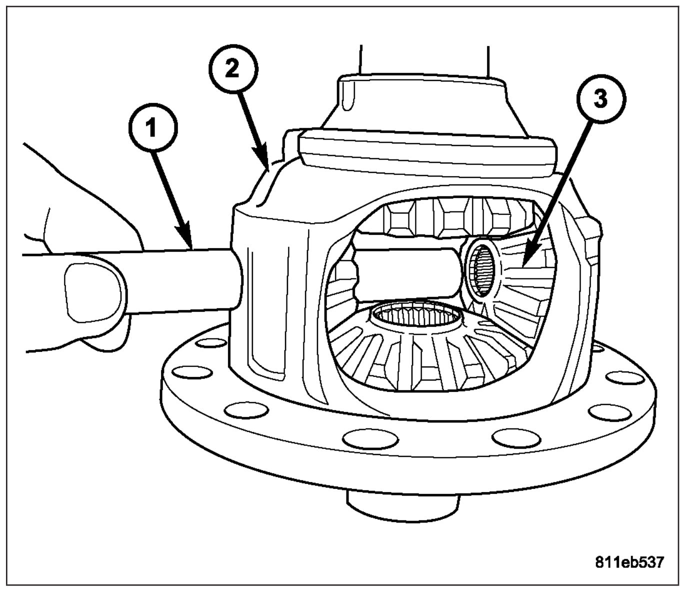
1. Install side gears (1) and thrust washers (2) into case through opening and rotating into position.



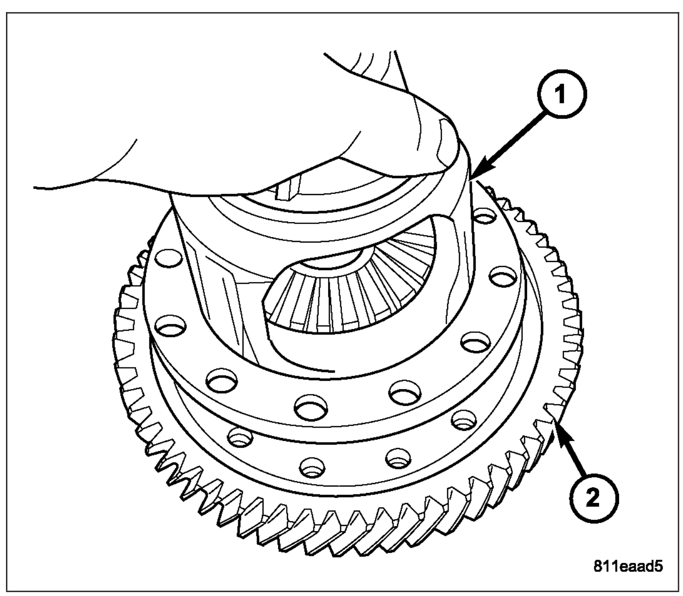
2. Install pinion gears (2) and thrust washers (1) into case through opening and rotating into position.



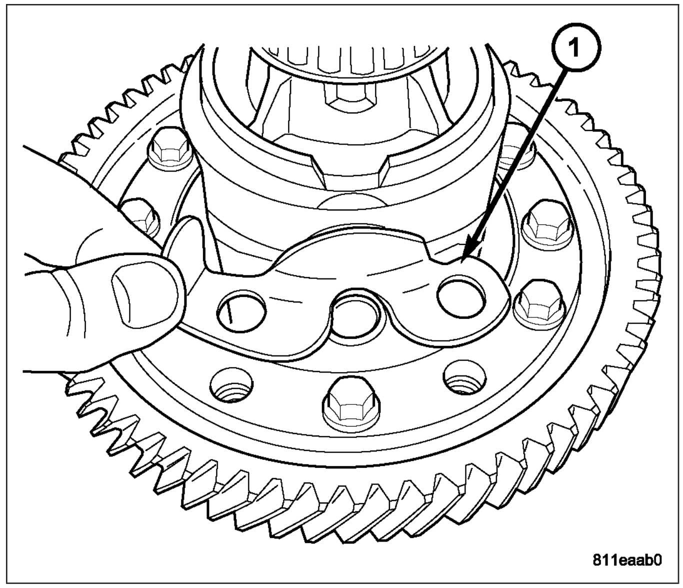
3. Install pinion shaft (1).



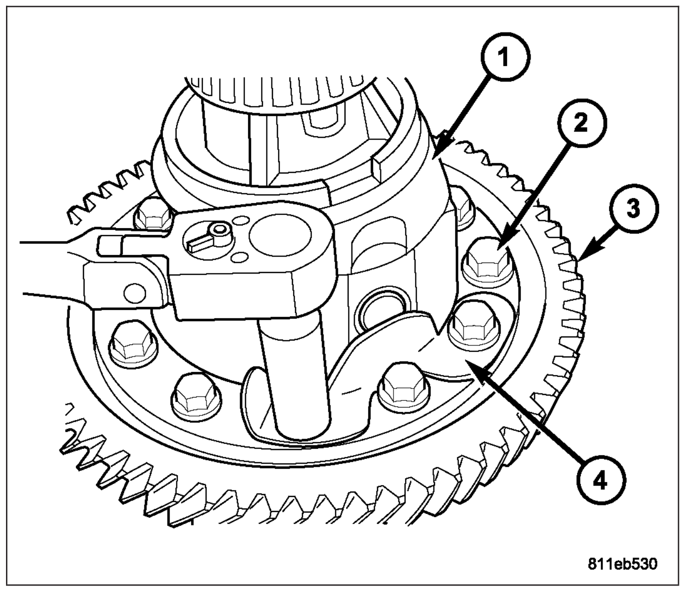
4. If previously removed, install ring gear to differential case (1).



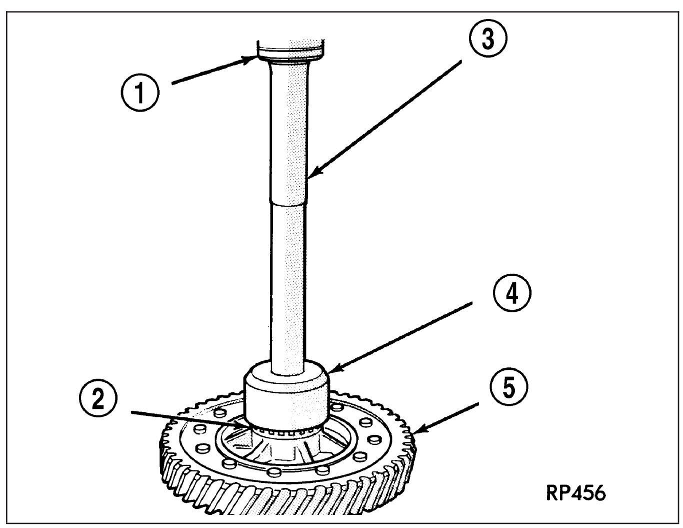
5. Install pinion shaft retainer (1).



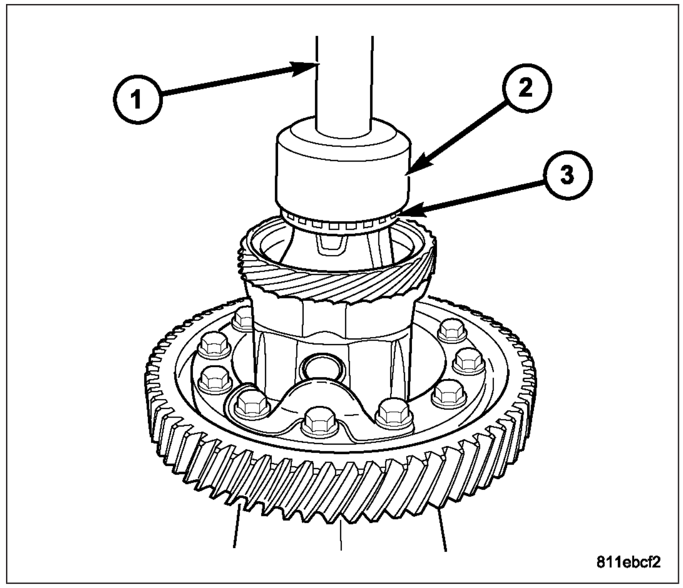
6. Install **NEW** ring gear-to-case bolts (2) and torque to 81 N·m (60 ft. lbs.) torque.



7. Using an arbor press (1), Handle C-4171(3), and Installer L-4410 (4), install differential side bearings to ring gear side.

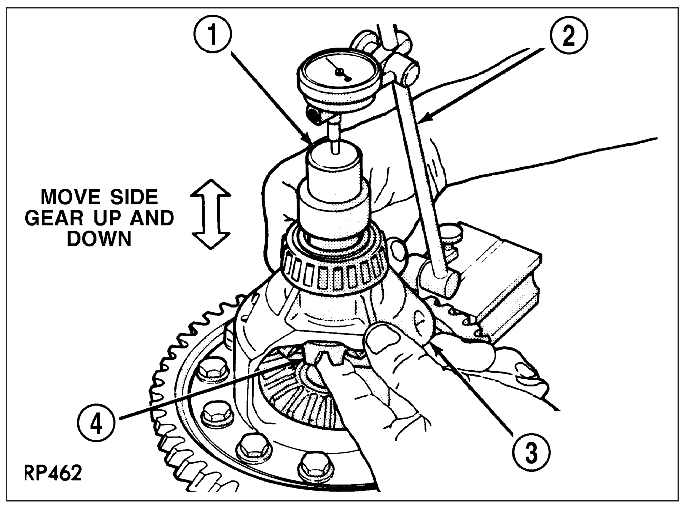


8. Using an arbor press, Handle C-4171 (1), and Installer L-4410 (2), install differential side bearings (3) to case side.



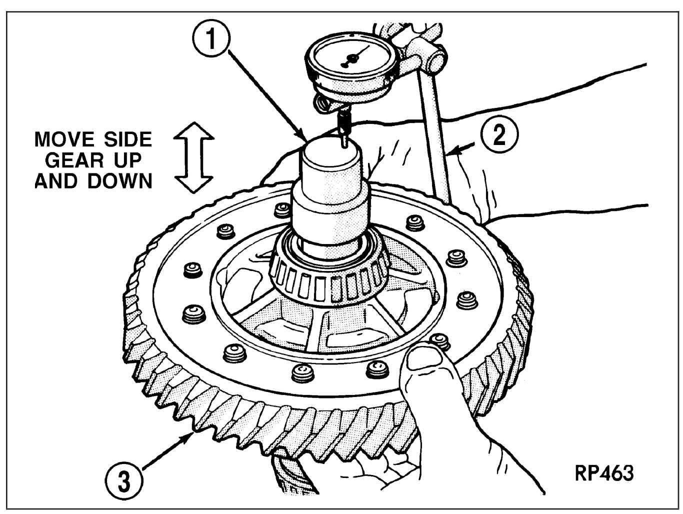
Measure and Adjust Side Gear End-Play

1. Rotate the assembly (3) two full revolutions both clockwise and counterclockwise. Set up dial indicator (2) and record end play.



2. Rotate side gear 90 degrees and take another measurement (2). Again, rotate side gear 90 degrees and record a final measurement.
3. Using the smallest end play recorded, shim that side gear to within 0.001 to 0.013 inch. The other side gear should be checked using the same procedure.

CAUTION: Side gear end play must be within 0.001 to 0.013 inch.



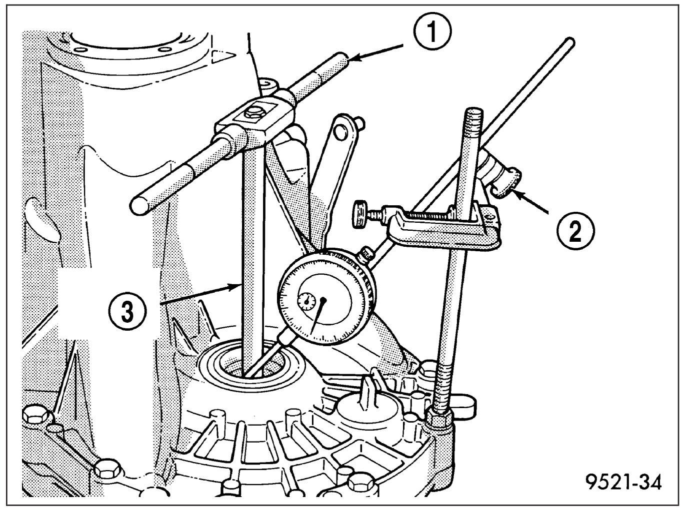
ADJUSTMENTS

DIFFERENTIAL BEARING PRELOAD ADJUSTMENT / SHIM SELECTION

Measure and adjust differential side bearing preload during any transaxle service, especially when the following components are replaced:

- Transaxle gear case
- Clutch bellhousing case
- Differential case
- Differential bearings

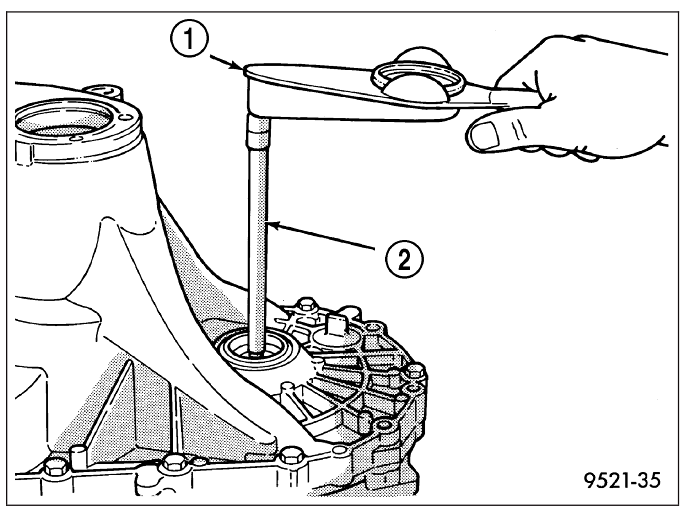
NOTE: True bearing turning torque readings can be obtained only with the geartrain removed from the case.



1. Remove bearing cup and existing shim from clutch bellhousing case.
2. Press in new bearing cup into bellhousing case (or use a cup that has been ground down on the outer edge for ease of measurement).
3. Press in new bearing cup into gear case side.
4. Oil differential bearings with transmission fluid. Install differential assembly in transaxle gear case. Install clutch bellhousing over gear case. Install and torque case bolts to 29 N·m (19 ft. lbs.).
5. Position transaxle with bellhousing facing down on workbench with C-clamps. Position dial indicator (2).

NOTE: Indicator is set up as shown for illustrative purposes only. Indicator must be parallel to T-Handle to obtain the most accurate reading.

6. Apply a medium load to differential with Torque Tool C-4995 (3) and a T-handle (1), in the downward direction. Roll differential assembly back and forth a number of times. This will settle the bearings. Zero the dial indicator (2). To obtain end play readings, apply a medium load in an upward direction while rolling differential assembly back and forth. Record end play.
7. The shim required for proper bearing preload is the **total of end play, plus (constant) preload of 0.18 mm (0.007 in.).** Never combine shims to obtain the required preload.
8. Remove case bolts. Remove clutch bellhousing differential bearing cup. Install shim(s) selected in Step 7. Then press the bearing cup into clutch bellhousing.
9. Install clutch bellhousing. Install and torque case bolts to 29 N·m (19 ft. lbs.).
10. Using Torque Tool C-4995 (2) and an inch-pound torque wrenched (1) check turning torque of the differential assembly. **The turning torque should be 6 to 12 in. lbs. If the turning torque is too high, install a 0.05 mm (0.002 inch) thinner shim. If the turning torque is too low, install a 0.05mm (0.002 inch) thicker shim.**

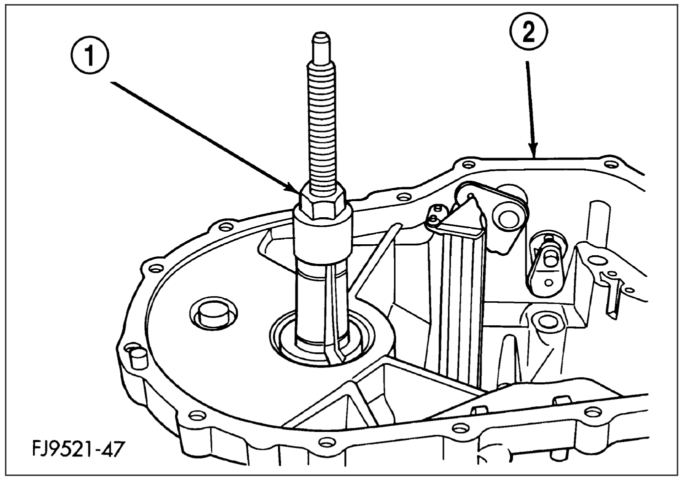


11. Recheck turning torque. Repeat Step 10 until the proper turning torque is obtained.

CUPS-DIFFERENTIAL BEARING

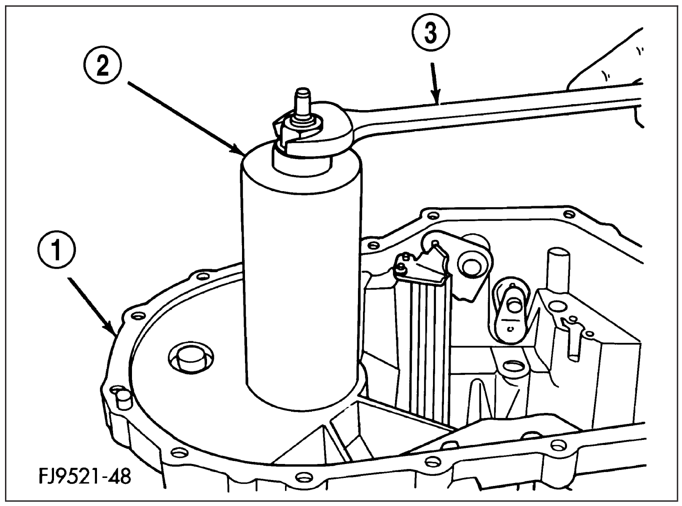
REMOVAL

1. Remove differential assembly from gear case (2) using the procedure outlined in this group.
2. Install Remover L-4518 (1) into the differential bearing cup.



FJ9521-47

3. Install the tool cup (2) over the tool.
4. Tighten the tool until the race is removed from the case.



FJ9521-48

INSTALLATION

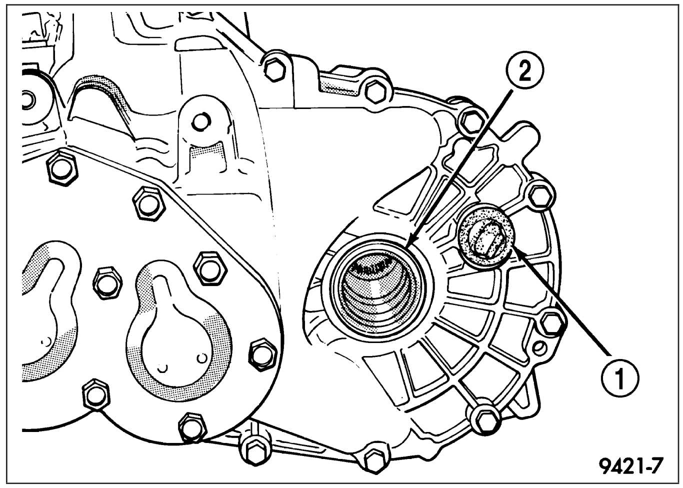
1. Position the bearing cup into the case.
2. Install the bearing cup onto Installer L-4520.
3. Using Installer L-4520 and Universal Handle C-4171, install differential bearing cup into the transaxle case.

FLUID

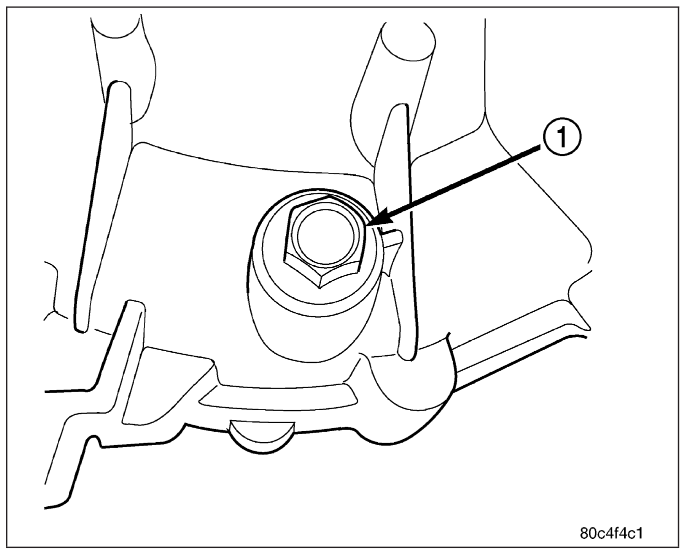
STANDARD PROCEDURE - FLUID DRAIN AND FILL

NOTE: All T355 Manual Transaxles require the use of ATF+4 (Automatic Transmission Fluid).

The transaxle fill plug (1) is located on the left side of the transaxle differential area. The fluid level should be within 3/16 inch from the bottom of the transaxle fill hole (vehicle must be level when checking).



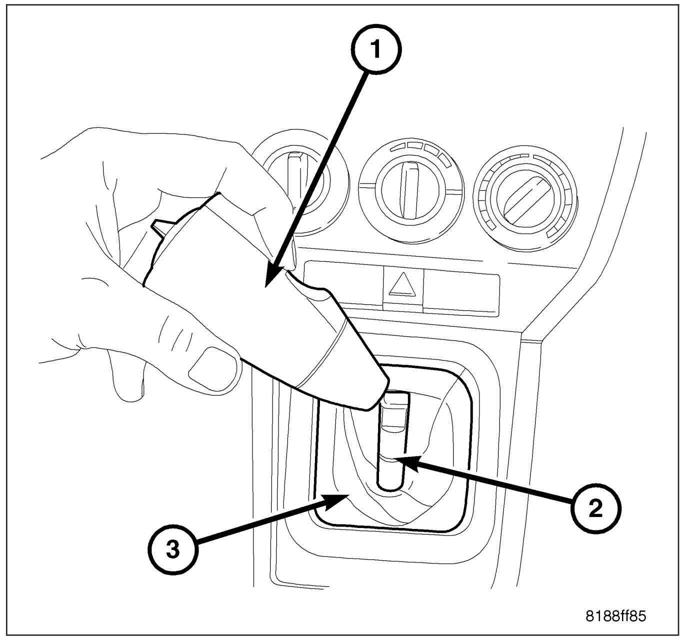
The transaxle drain plug (1) is located on the lower right side of the transaxle differential housing. Tighten drain plug to 14 N·m (120 in. lbs.).



BOOT-GEAR SHIFT

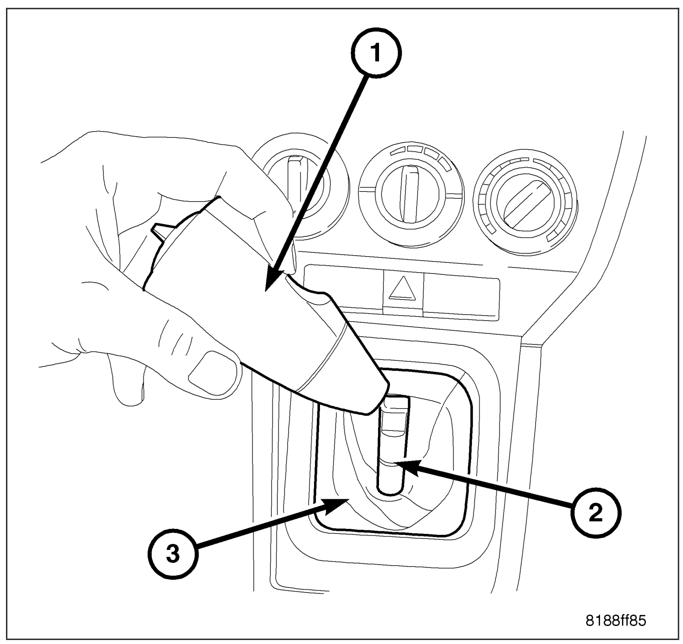
REMOVAL

1. Pull up on gearshift knob (1) with moderate force to remove from gearshift mechanism.
2. Remove shifter boot/bezel (3) assembly from console by lifting up at mounting ring area.



INSTALLATION

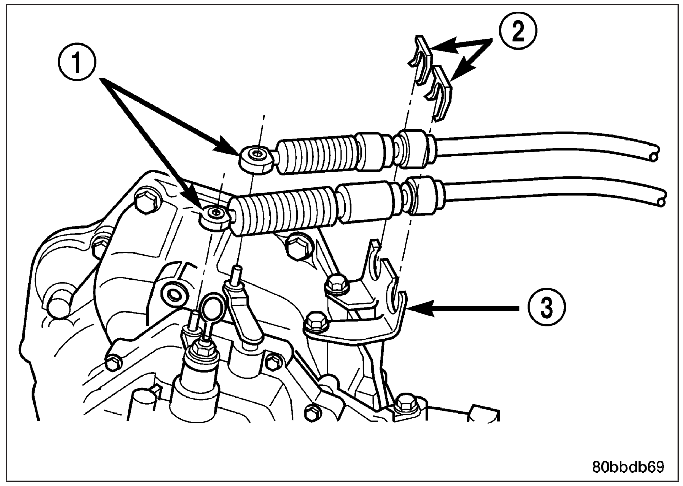
1. Position gearshift boot (3) over the operating lever (2) and apply hand pressure to engage and snap console into place.
2. Position gearshift knob (1) hole over the gearshift mechanism and align the shift pattern.
3. Verify that shift pattern is aligned properly.
4. Strike knob (1) with rubber mallet to engage knob to mechanism.



CABLE-GEAR SHIFT

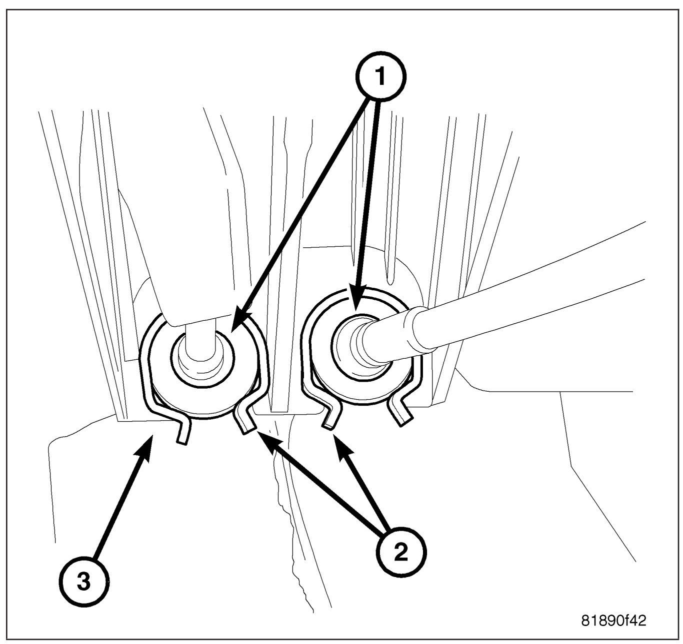
REMOVAL

1. Remove the shifter (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/SHIFT MECHANISM - REMOVAL).
2. Raise hood.
3. Remove the resonator.
4. Remove engine cover.
5. Remove air cleaner assembly.
6. Disconnect both battery cables. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL)
7. Remove battery hold down clamp and bolt, and remove battery.
8. Remove battery tray. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - REMOVAL)
9. Disconnect cables (1) from the shift levers at the transaxle.



CAUTION: Pry up with equal force on both sides of shifter cable isolator bushings to avoid damaging cable isolator bushings.

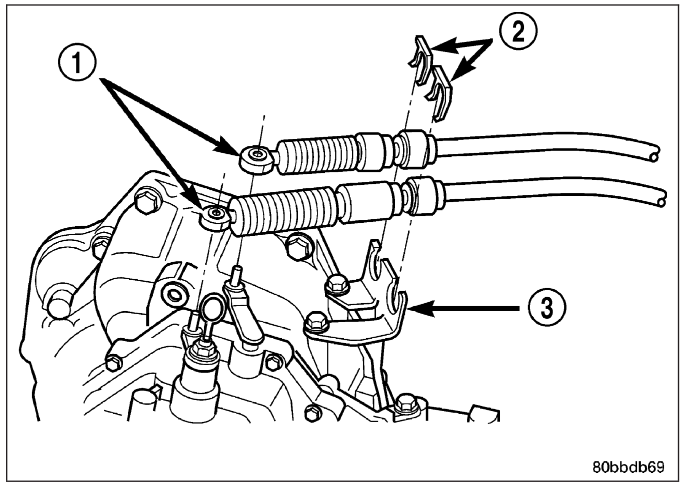
10. Remove cable retaining clips (2) and remove cables (1) from bracket (3).
11. Remove the Occupant Restraint Controller (ORC) (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/SHIFT MECHANISM - REMOVAL).
12. Remove cable clips at floor pan.
13. Remove cable assembly (1) from vehicle.



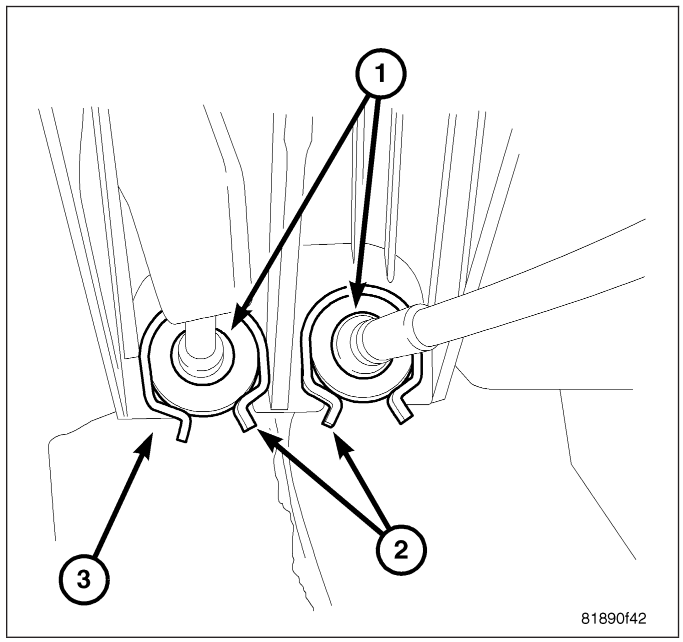
INSTALLATION

CAUTION: Gearshift cable bushings must not be lubricated or the bushings will swell and split.

1. Install cable assembly through floor pan opening and secure to floor pan with grommet plate. Make sure the
2. Route transaxle end of cable assembly into engine compartment and over transaxle assembly.
3. Connect cables (1) to the shift levers (3) at the transaxle.
4. Install cables (1) and NEW retaining clips to bracket.



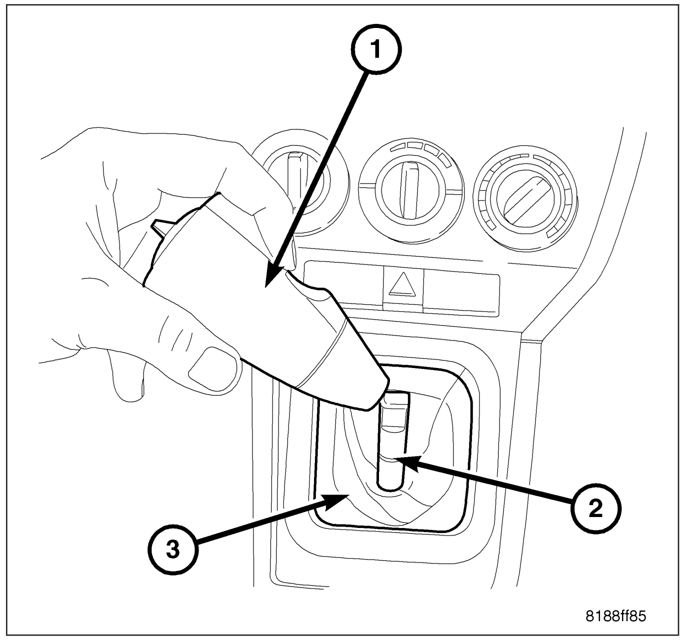
5. Install gearshift cables to mounting bracket and fasten with NEW clips (2). Make sure clips are installed flush to bracket.
6. Install ORC (Refer to 8 - ELECTRICAL/RESTRAINTS/OCCUPANT RESTRAINT CONTROLLER - INSTALLATION).
7. Install shifter (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/SHIFT MECHANISM - INSTALLATION).
8. Install battery tray.
9. Install battery and hold-down clamp.
10. Install the air cleaner assembly.
11. Connect battery cables.



KNOB-GEAR SHIFT

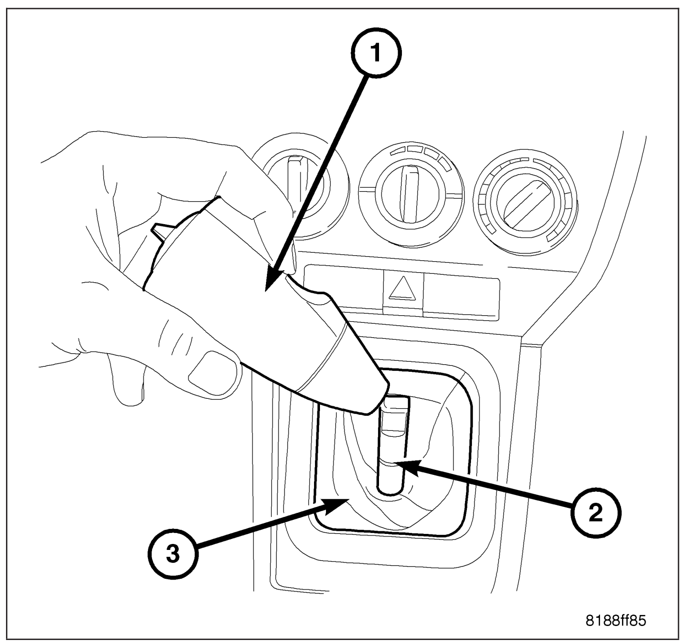
REMOVAL

1. Pull up on gearshift knob (1) with moderate force to remove from gearshift mechanism.



INSTALLATION

1. Position knob hole (1) over the gearshift mechanism and align the shift pattern.
2. Verify that shift pattern is aligned properly.
3. Strike knob (1) with rubber mallet to engage knob to mechanism.



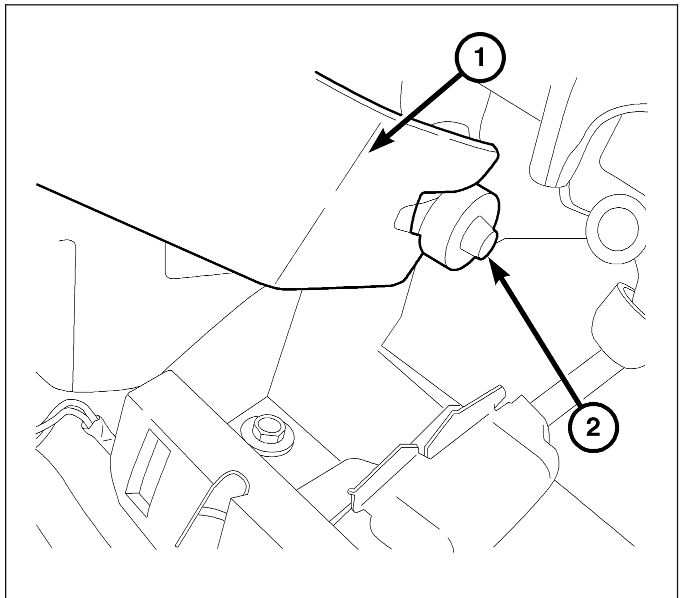
MECHANISM-GEAR SHIFT

REMOVAL

1. Remove gear shift knob (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/GEAR SHIFT KNOB - REMOVAL).
2. Remove gear shift boot (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/GEAR SHIFT BOOT - REMOVAL).
3. Remove the center console assembly (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL). Remove rear power window switch (if equipped) and disconnect harness from console.

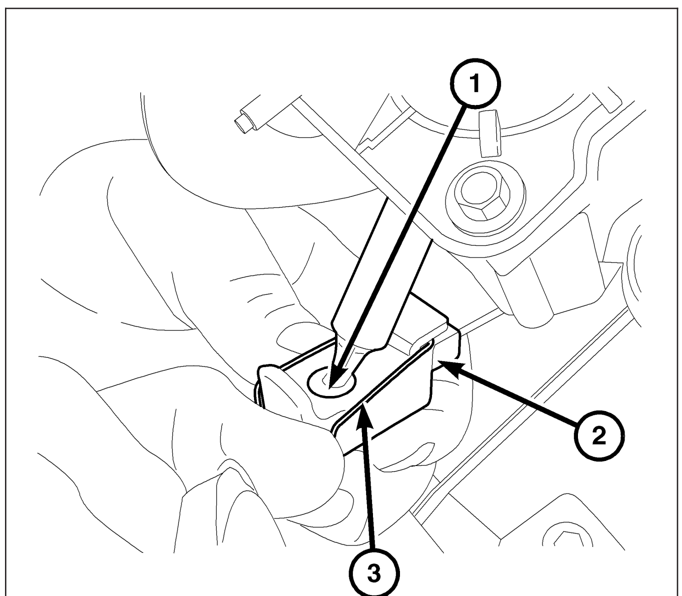
NOTE: Cable is pushed into a rubber grommet

4. Remove crossover cable (2) from shift lever (1).



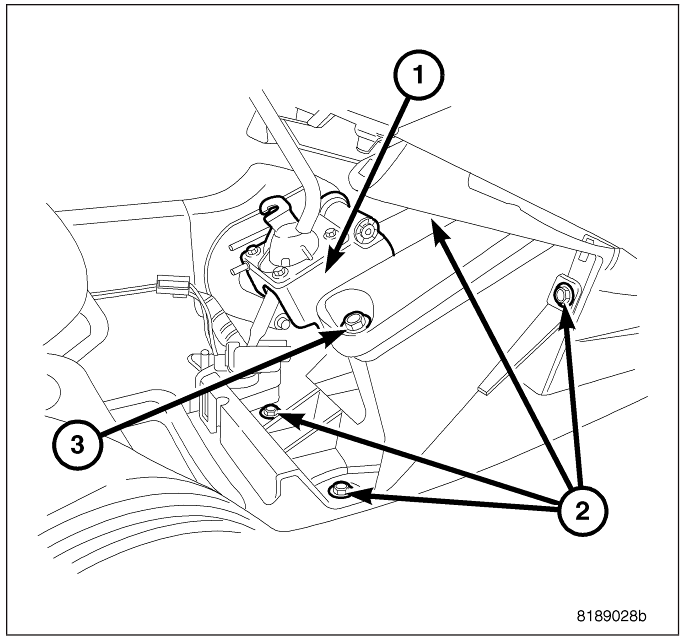
818900f8

5. Remove selector cable retaining clip (3) and disconnect cable (2) from the shift lever (1).



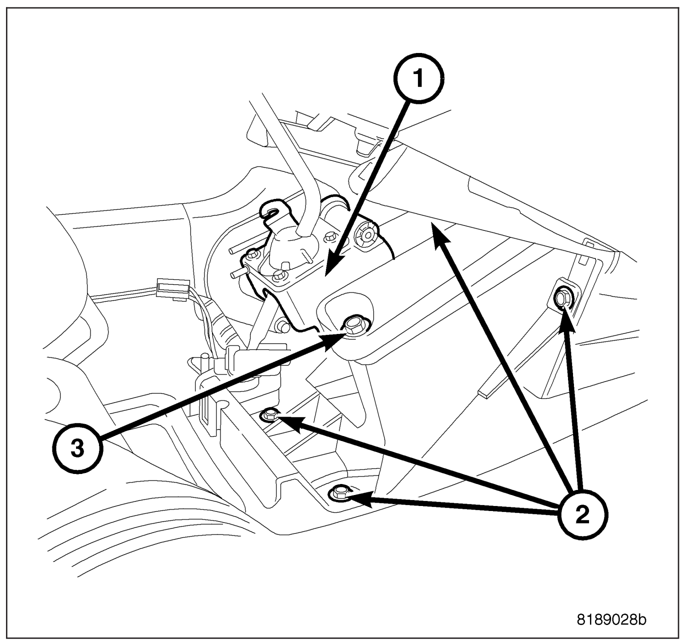
818901ed

6. Remove The shifter assy. to floor pan bolts and remove shifter from vehicle.

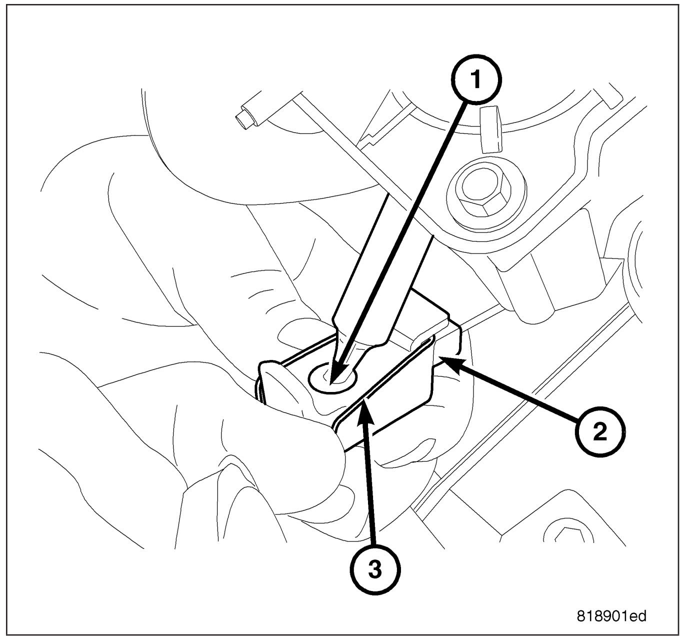


INSTALLATION

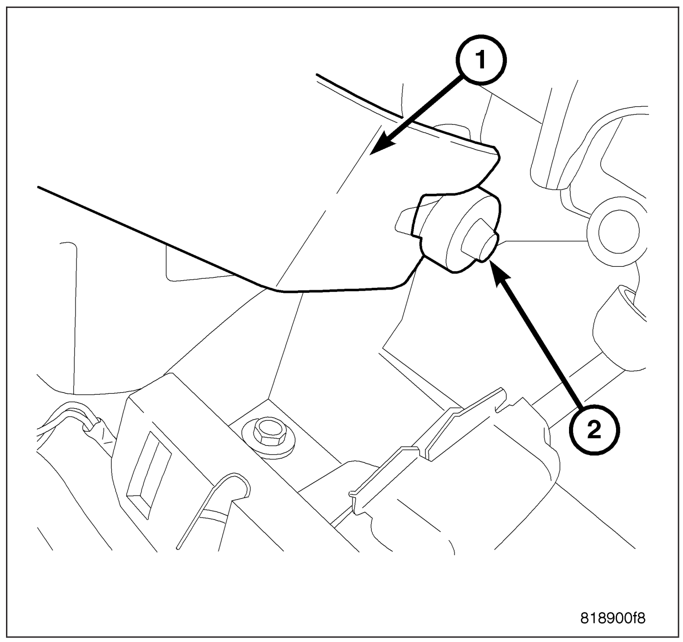
1. Install shifter assy. (1) to floor pan. Install and torque bolts to 7N·m (61 in. lbs.).



2. Install selector cable (2) to shifter lever (1) and secure cable to shifter bracket with clip (3).



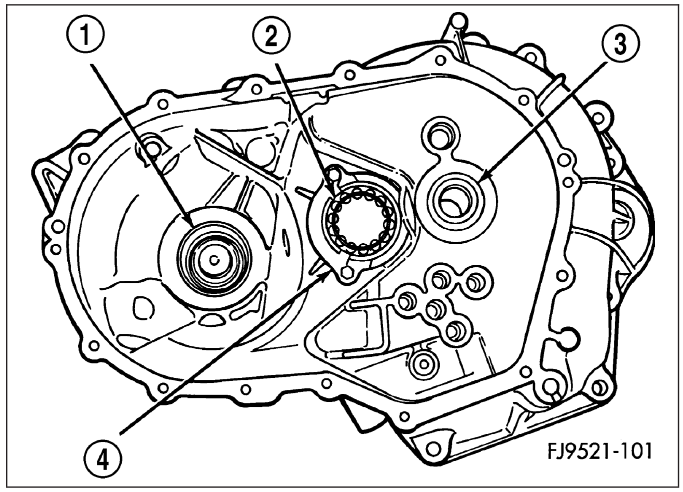
3. Install crossover cable to shifter lever and secure cable to shifter bracket.
4. Install center console assembly. Install rear power window switch (if equipped) and fasten harness to console (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION).
5. Install gearshift boot (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/GEAR SHIFT BOOT - INSTALLATION).
6. Install gearshift knob (Refer to 21 - TRANSMISSION/TRANSAXLE/MANUAL/GEAR SHIFT KNOB - INSTALLATION).
7. Verify that shift pattern is aligned properly.



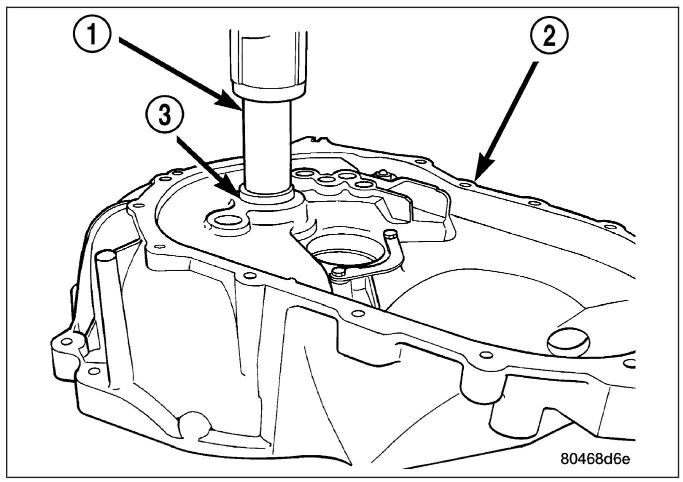
BEARING AND SLEEVE-INPUT

REMOVAL

The input bearing (3) is a one-piece bearing and sleeve unit. The sleeve is the slide point for the clutch-release bearing and lever.

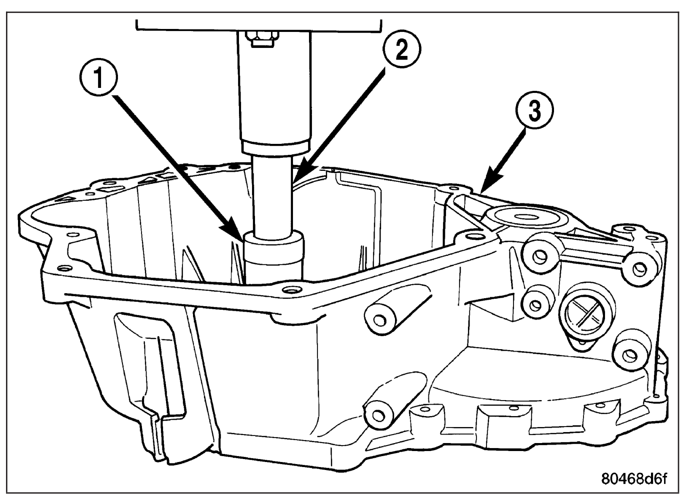


1. Install Driver 6342 (1) over input bearing on the gear case side of the transaxle clutch housing (2).
2. Press the input bearing (3) out of the housing.

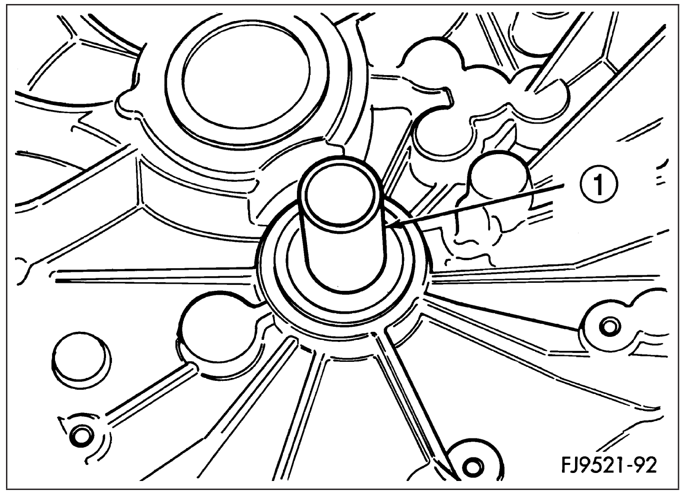


INSTALLATION

1. Apply coating of Loctite® sealant on bearing outer diameter. Position sleeve and bearing assembly at input bearing bore.
2. Install Seal Remover C-4680-1 (1), over input bearing.



3. Using a suitable spacer tool and shop press, install input bearing (1) into bore until it is fully seated.



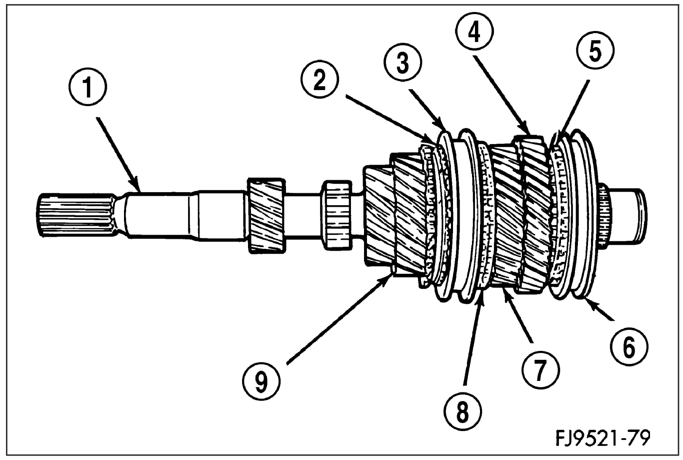
SHAFT-INPUT

DISASSEMBLY

Before disassembly of the input shaft (1), it is necessary to check the synchronizer stop ring gap. Use a feeler gauge to measure the gaps between the stop rings (2,5, and 8) and the speed gears. The correct gaps are listed below:

- 1st - 0.522-2.208 mm (0.021-0.087 in)
- 2nd - 0.522-2.208 mm (0.021-0.087 in)
- 3rd - 0.73-1.53 mm (0.029-0.060 in)
- 4th - 0.77-1.57 mm (0.030-0.062 in).
- 5th - 0.73-1.53 mm (0.029-0.060 in)
- Reverse Brake - 0.505-1.74 mm (0.020-0.068 in.)

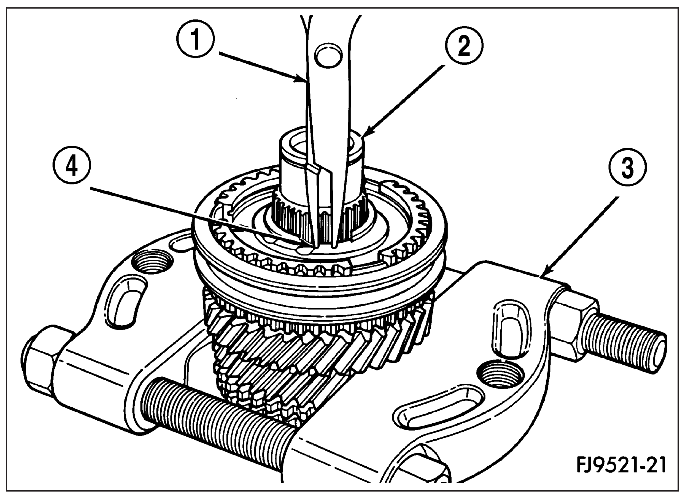
The reverse brake measurement is taken between the stop ring and case.



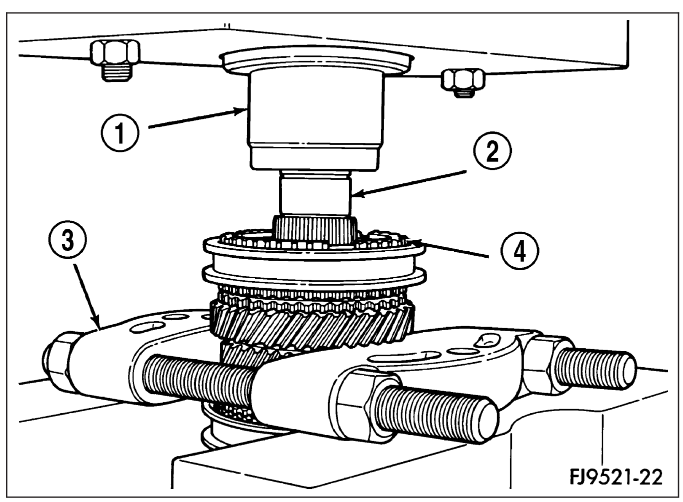
If a stop ring gap does not fall within the specifications, it must be inspected for wear and replaced. If the 1st or 2nd synchronizer stop ring is worn beyond specifications, the complete output shaft assembly must be replaced.

The input shaft incorporates the 3rd, 4th, and 5th speed gears and synchronizers on the assembly.

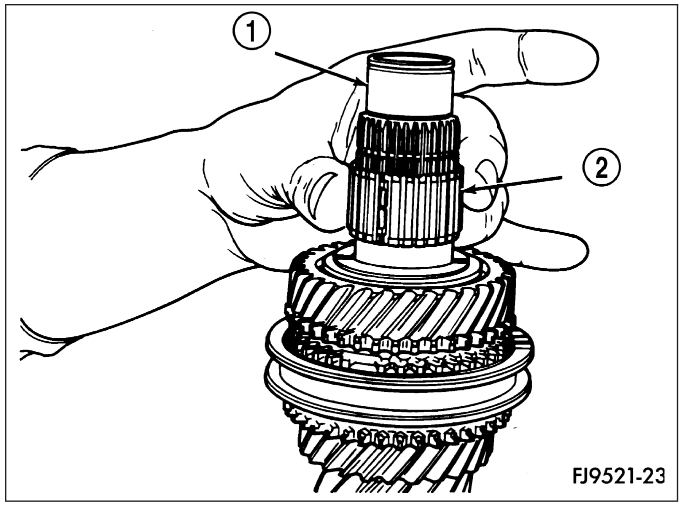
1. Install bearing splitter (3) behind 5th speed gear. Remove snap ring (4) at 5th synchronizer hub on input shaft (2).



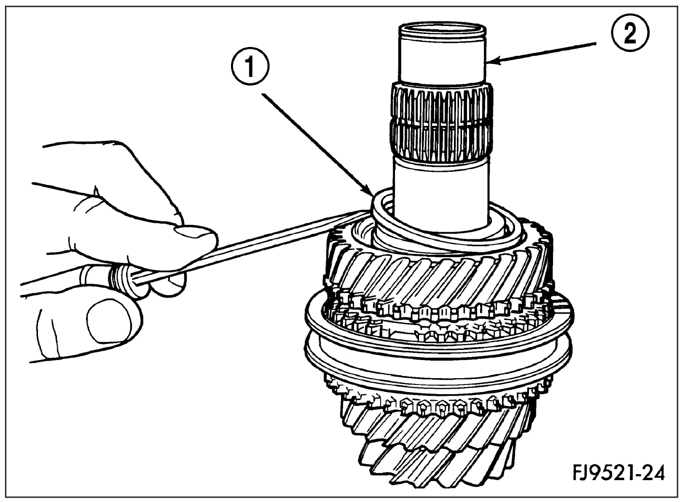
2. Remove synchronizer (4) and gear using shop press (1).



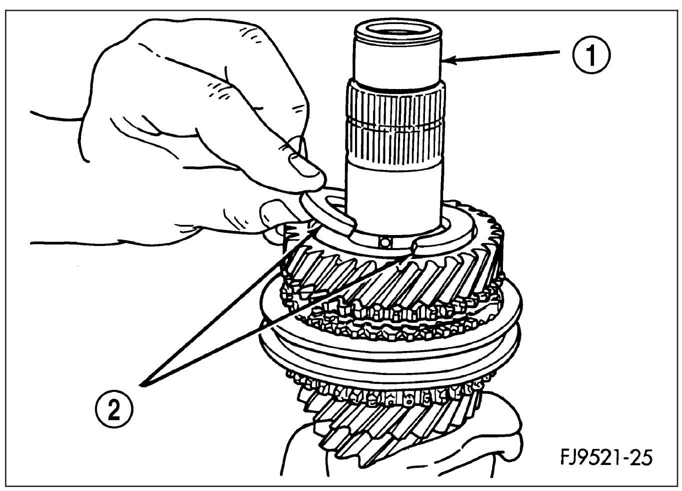
3. Remove caged needle bearing (2).



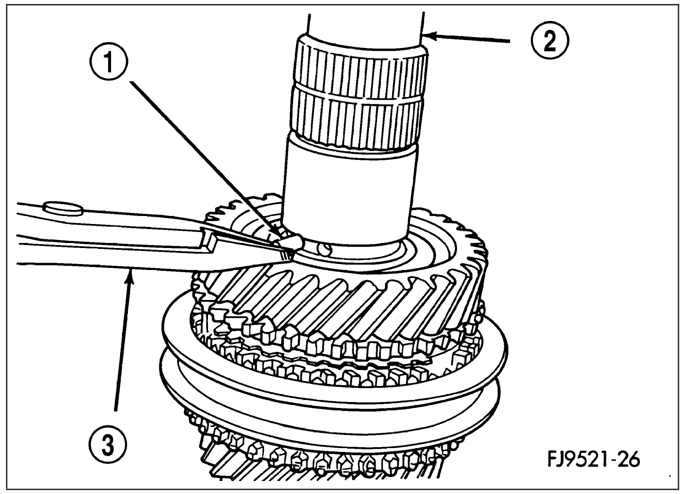
4. Remove 4-5 gears split thrust washer ring (1).



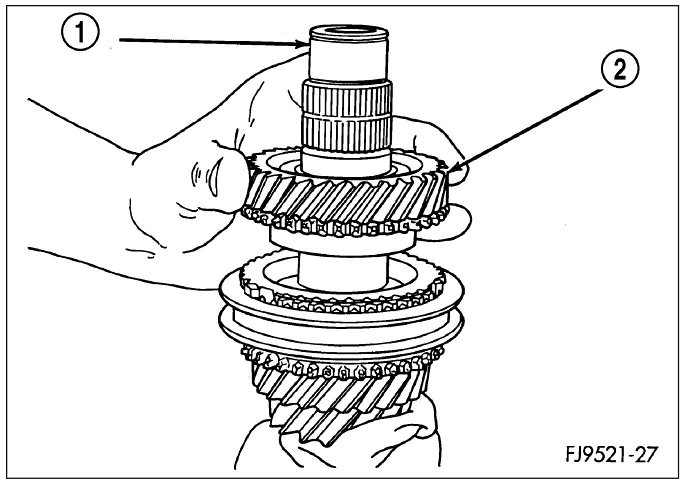
5. Remove split thrust washer (2).



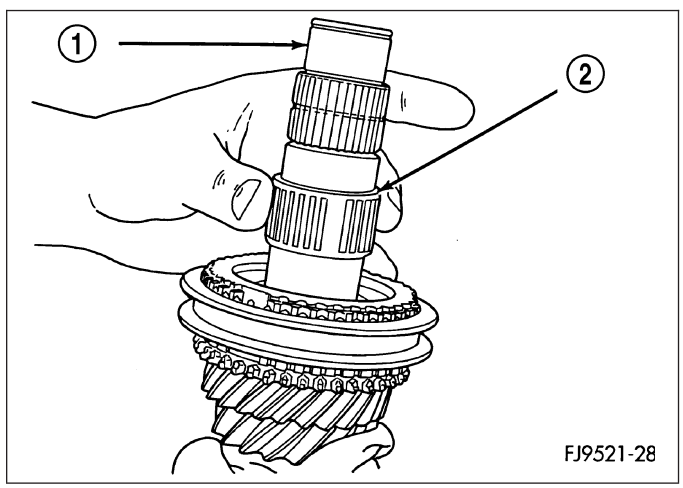
6. Remove split thrust washer separation pin (1).



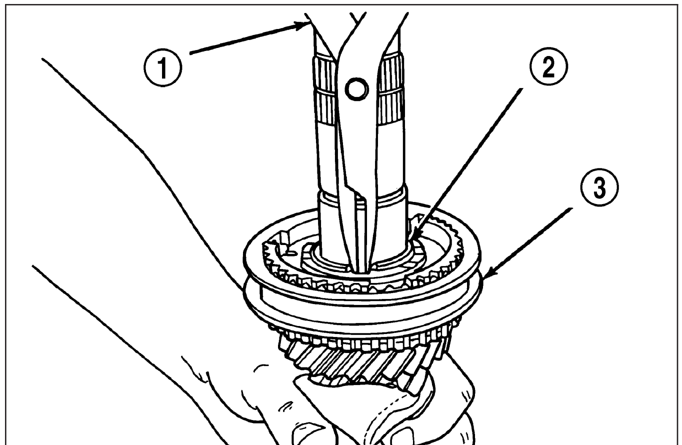
7. Remove 4th gear (2).



8. Remove 4th gear caged needle bearing (2). Check the caged needle bearing (2) for a broken retention spring.

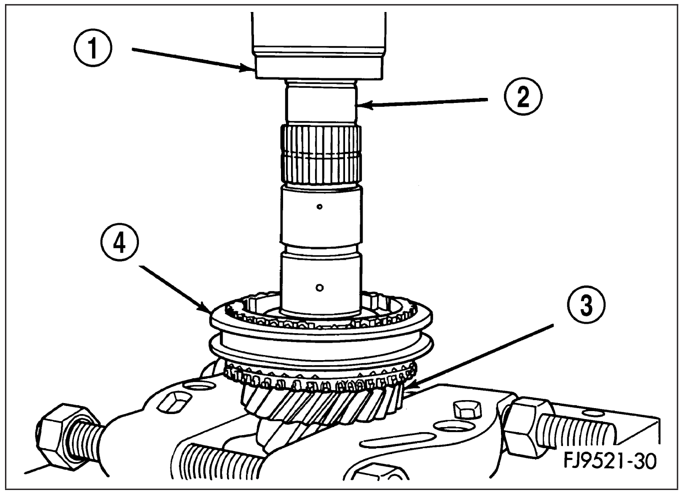


9. Remove blocking ring. Remove 3-4 synchronizer hub retaining snap ring (3).



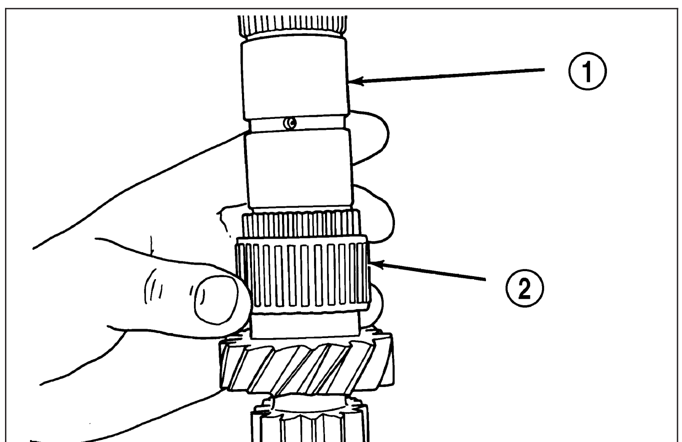
FJ9521-29

10. Install input shaft in shop press (1). Using bearing splitter, remove 3-4 synchronizer and 3rd gear (3).



FJ9521-30

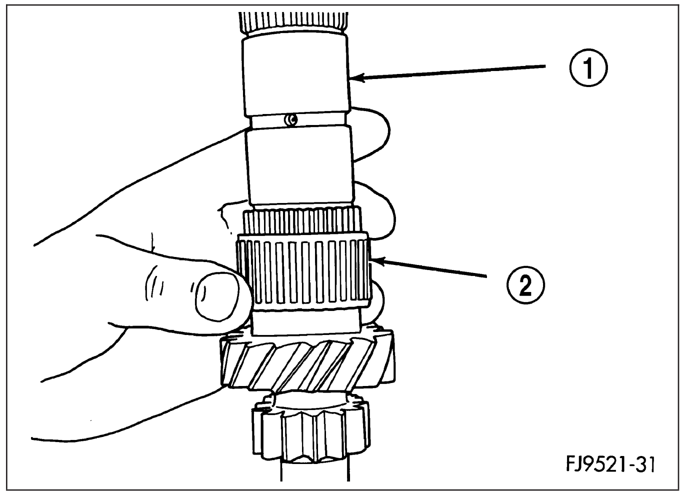
11. Remove 3rd gear caged needle bearing (2). Inspect needle bearing for a broken retention spring.
12. Inspect the input shaft for worn or damaged bearing races or chipped gear teeth. Replace as necessary.



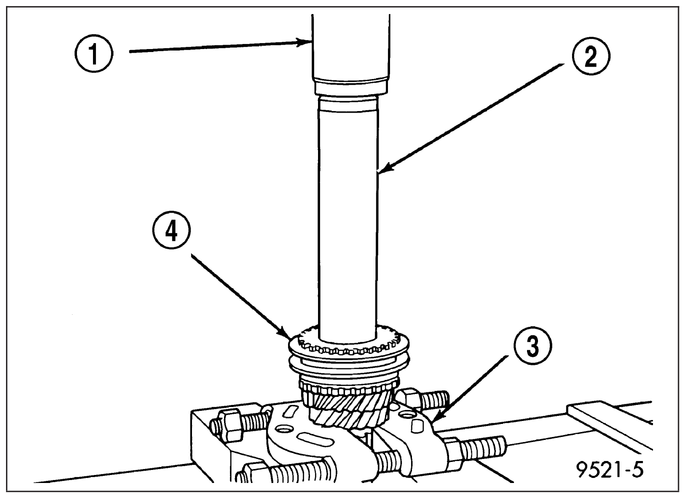
FJ9521-31

ASSEMBLY

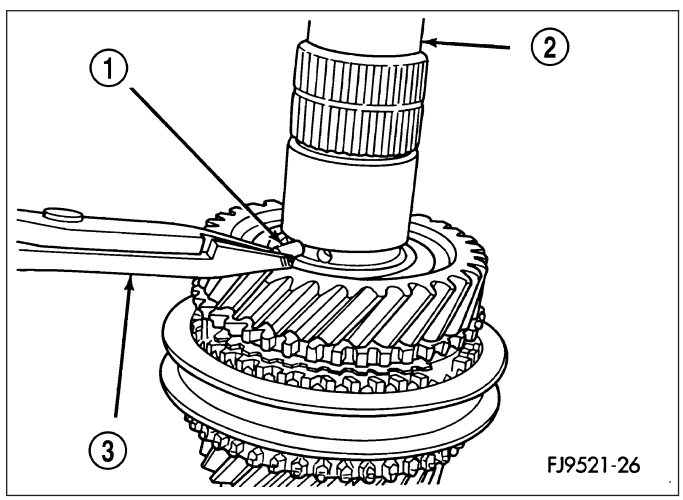
1. Place input shaft into shop press.
2. Install 3rd gear caged needle bearing (2).



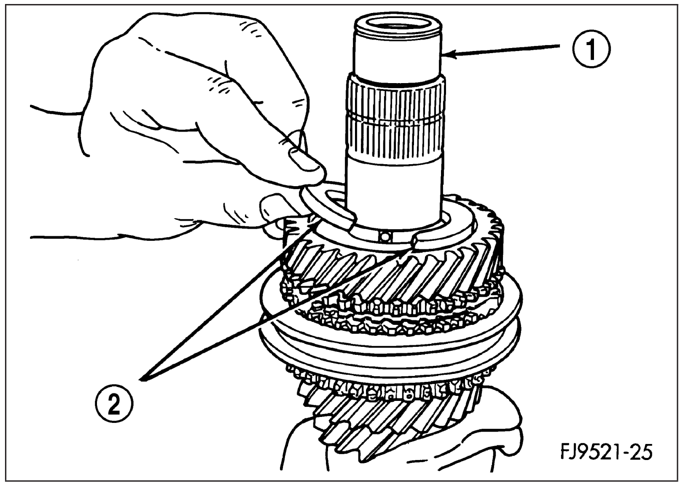
3. Install 3rd gear and 3-4 synchronizer (4) onto input shaft. Install Sleeve C-3717 (2) over input shaft and press on synchronizer hub and 3rd gear. The synchronizer hub has the letter **U** stamped on the top face of the hub. This designates that the hub must be installed with the **U** facing upward.



4. Install 3-4 synchronizer snap ring into slot on input shaft.
5. Install blocking ring into 3-4 synchronizer. Install 4th gear caged needle bearing.
6. Install 4th gear onto input shaft.
7. Install 4-5 split thrust washer separation pin (1).

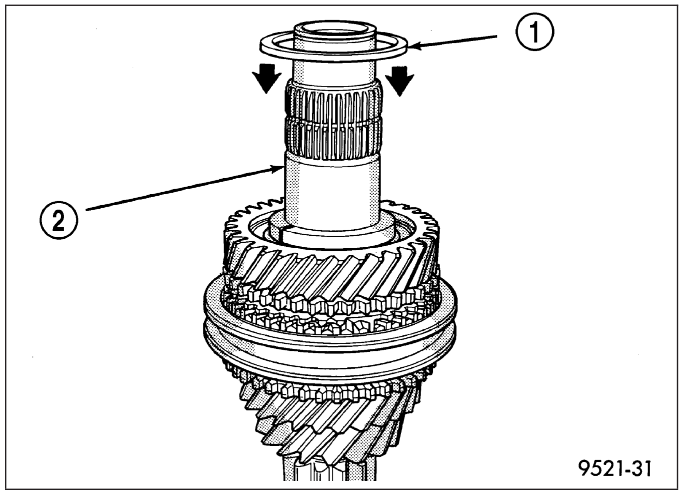


8. Install split thrust washer (2) onto input shaft (1).



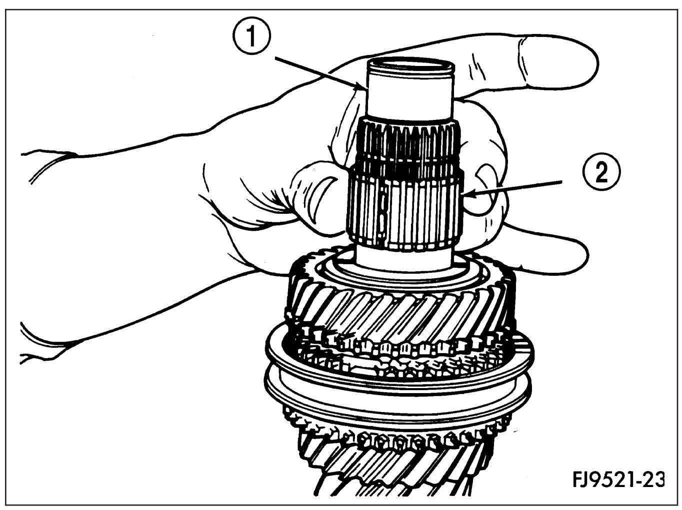
FJ9521-25

9. Install split thrust washer retaining ring (1).



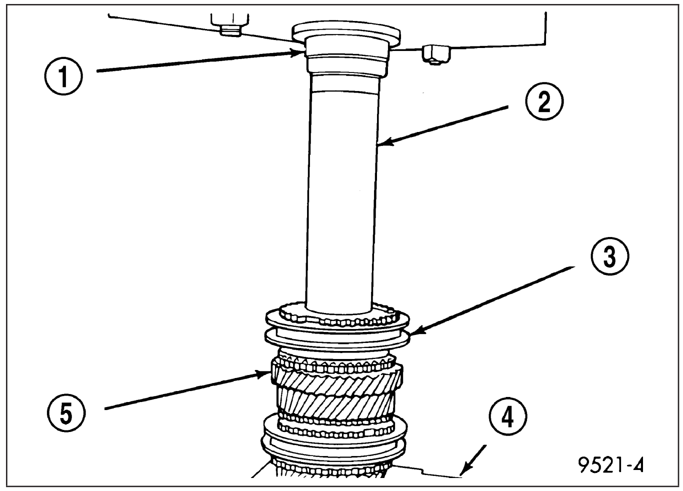
9521-31

10. Install 5th gear caged needle bearing (2).

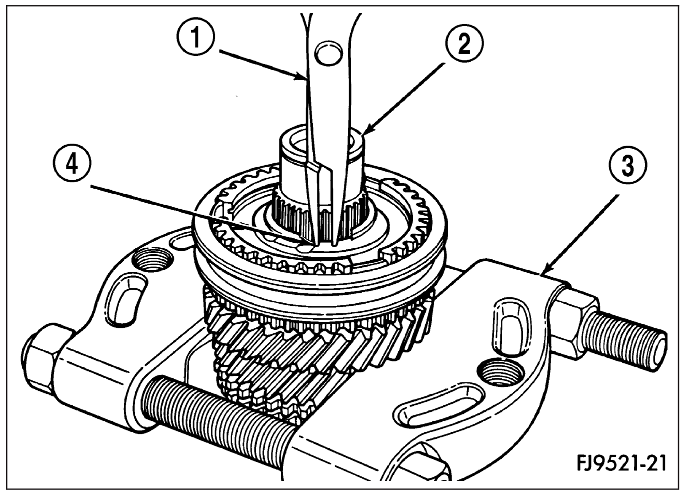


FJ9521-23

11. Using special Sleeve C-3717 (2), install 5th speed gear (5) and synchronizer (3). The 5th gear synchronizer hub has the letter **S** stamped on the top face of the hub. This designates that the hub must be installed with the **S** facing upward.



12. Install 5th gear synchronizer snap ring (4).



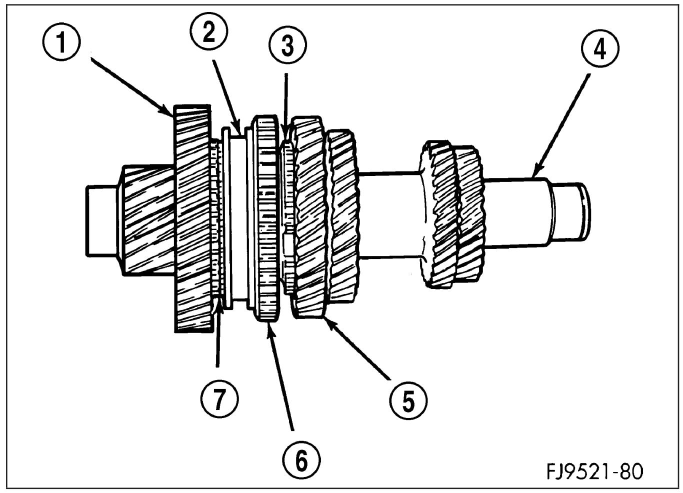
SHAFT-OUTPUT

DISASSEMBLY

CAUTION: The output shaft is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1-2 synchronizer or gear fails, it is necessary to replace the output shaft assembly.

It is necessary to check the synchronizer stop ring gap. Use a feeler gauge to measure the gaps between the stop rings and the speed gears. The correct gaps are listed below:

- 1st - 0.522-2.208 mm (0.021-0.087 in)
- 2nd - 0.522-2.208 mm (0.021-0.087 in)
- 3rd - 0.73-1.53 mm (0.029-0.060 in)
- 4th - 0.77-1.57 mm (0.030-0.062 in)
- 5th - 0.73-1.53 mm (0.029-0.060 in)
- Reverse Brake - 0.51-1.74 mm (0.020-0.068 in.)



If a stop ring gap does not fall within the specifications it must be inspected for wear and replaced. If the 1st or 2nd synchronizer stop ring is worn beyond specifications, the complete output shaft assembly must be replaced.

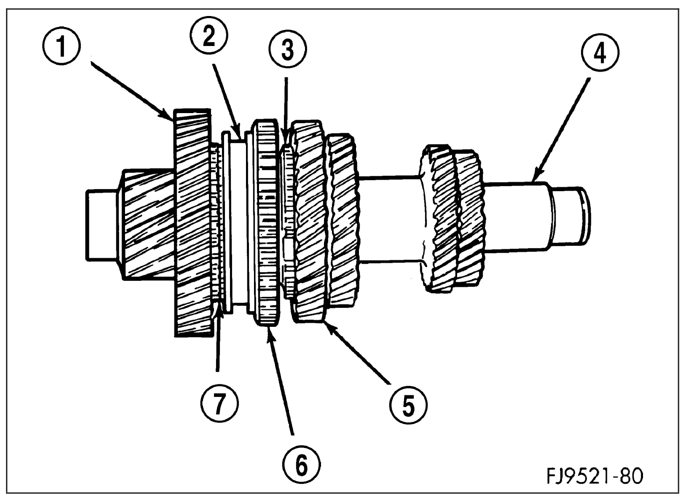
The output shaft incorporates the 1st and 2nd gears and synchronizers on the assembly.

INSPECTION

CAUTION: The output shaft is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1-2 synchronizer or gear fails, it is necessary to replace the output shaft assembly.

It is necessary to check the synchronizer stop ring gap. Use a feeler gauge to measure the gaps between the stop rings and the speed gears (3,7). The correct gaps are listed below:

- 1st - 0.522-2.208 mm (0.021-0.087 in)
- 2nd - 0.522-2.208 mm (0.021-0.087 in)
- 3rd - 0.73-1.53 mm (0.029-0.060 in)
- 4th - 0.77-1.57 mm (0.030-0.062 in)
- 5th - 0.73-1.53 mm (0.029-0.060 in)
- Reverse Brake - 0.51-1.74 mm (0.020-0.068 in.)



If a stop ring gap does not fall within the specifications it must be inspected for wear and replaced. If the 1st or 2nd synchronizer stop ring is worn beyond specifications, the complete output shaft assembly must be replaced.

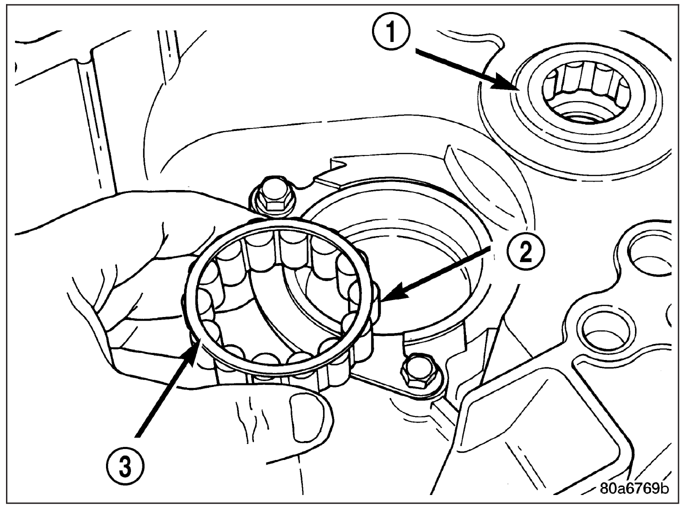
The output shaft incorporates the 1st and 2nd gears and synchronizers on the assembly.

BEARING AND RACE-OUTPUT

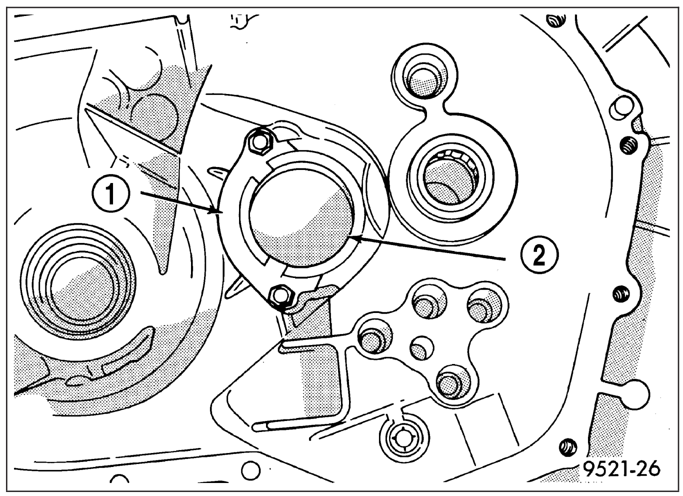
REMOVAL

CAUTION: The position of the output shaft bearing is critical. The bearing is not identical end-to-end. Install bearing with larger diameter cage ring facing out.

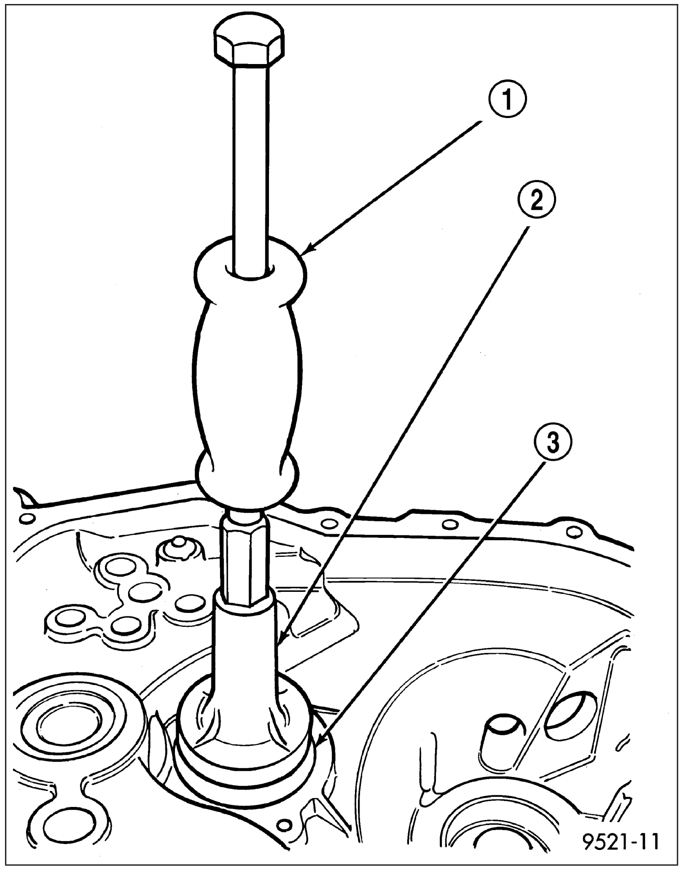
1. Remove caged roller bearing (3) from output bearing race.



2. Remove screws at output bearing retainer strap (1).

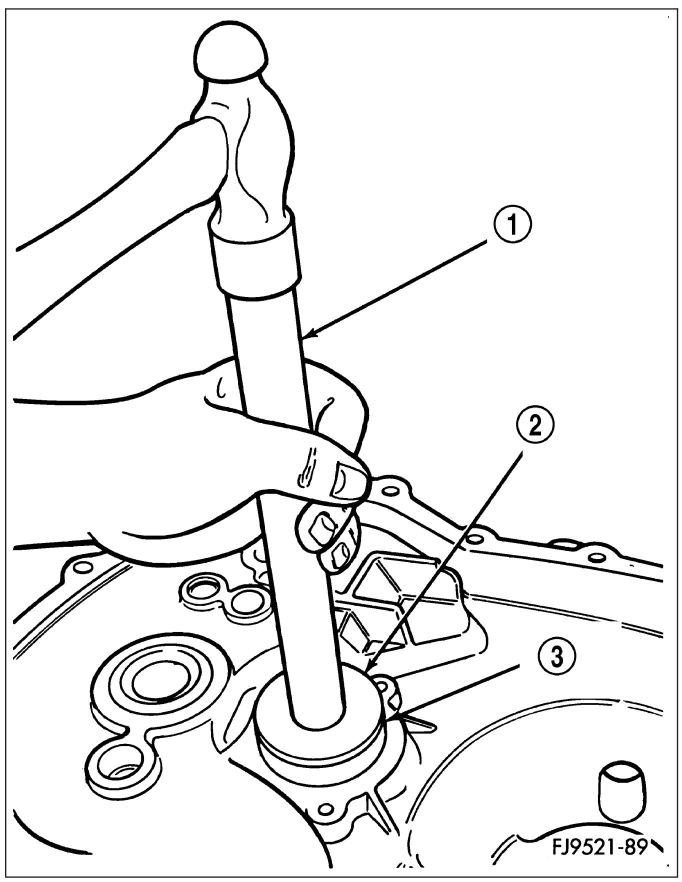


3. Install slide Remover 6787 and Slide Hammer C-3752 (2). Tighten tool to output bearing race.
4. Using slide hammer, remove output bearing race (3).



INSTALLATION

1. Line up output bearing race (3) to race bore.
2. Insert tool Installer 4628 (2) with Handle C-4171 (1) into output bearing race. Tap race into bore. Install output bearing into race. Verify that the larger diameter cage is facing outward. Position bearing retaining strap. Tighten bolts to 11 N·m (96 in. lbs.).

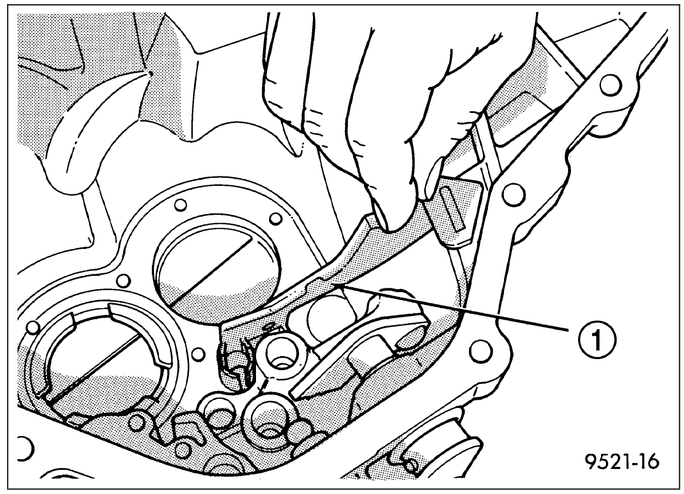


TROUGH-REAR BEARING OIL FEED

REMOVAL

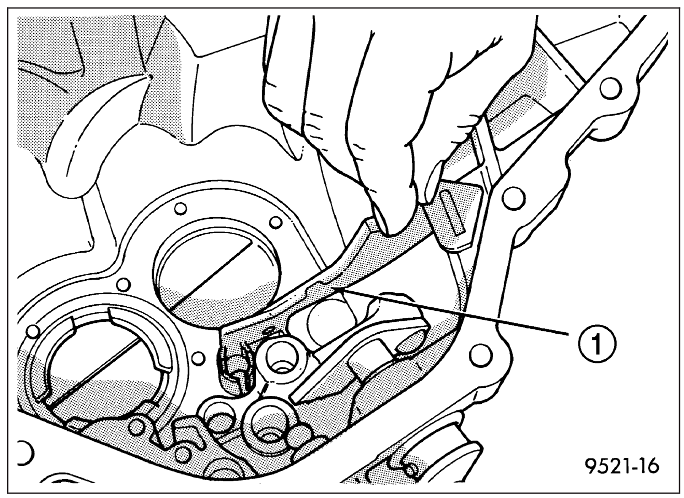
The bearing oil feed trough (1) is retained in the case by a pin that is molded into the case and clips that are part of the trough.

1. Using light plier pressure, squeeze the clips together at the rear of the trough.
2. Slide the trough over the retaining pin that locates the trough in the case.



INSTALLATION

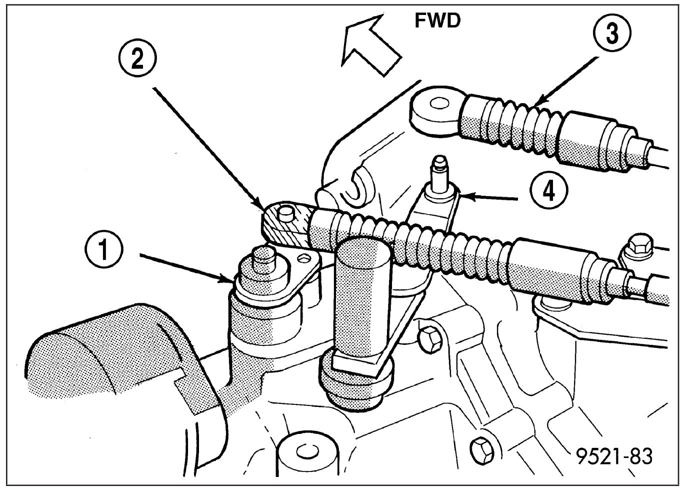
1. Slide the trough (1) over the retaining pin that locates the trough in the case.



LEVER-SHIFT CROSSOVER

REMOVAL

1. Disconnect crossover cable (2) from crossover lever (1) and cable bracket.
2. Using a pin punch, remove the crossover roll pin from lever (4).
3. Pull up and remove the crossover lever (4) from the transaxle crossover shaft.



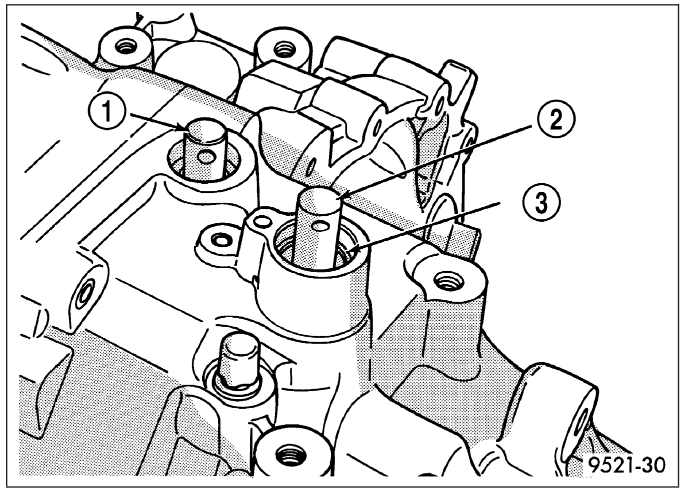
INSTALLATION

1. Install crossover lever to shaft and fasten with NEW roll pin.
2. Install crossover cable to bracket. Fasten with clip.
3. Install crossover cable to crossover lever.

SHAFT-SHIFT CROSSOVER

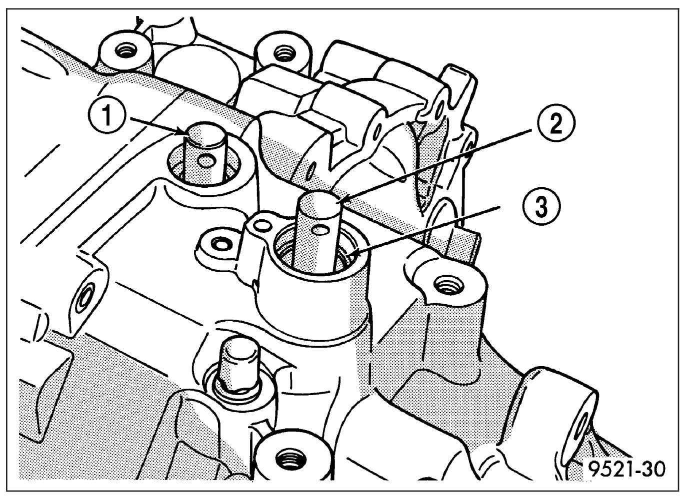
REMOVAL

1. Disassemble transaxle.
2. With the transaxle disassembled, remove the crossover shaft seal.
3. Using snap-ring pliers, remove the snap ring (3) at the crossover shaft bore.
4. Push the crossover shaft (2) in the case and remove the crossover assembly.



INSTALLATION

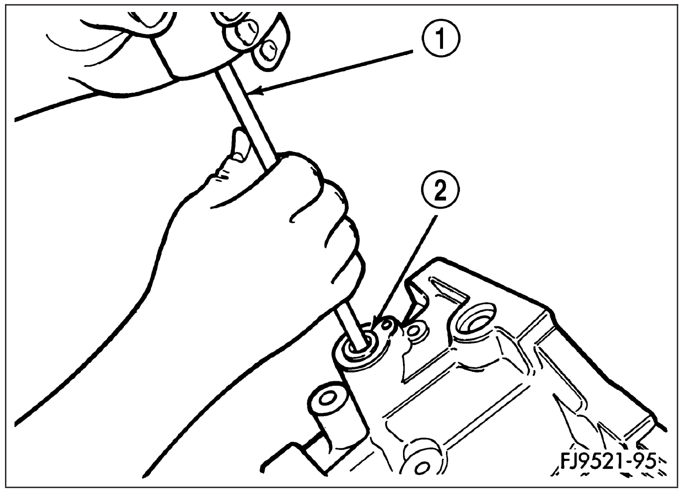
1. Install crossover shaft to case and install snap ring (3).
2. Install the crossover shaft seal.
3. Assemble transaxle.



BUSHING-SHIFT CROSSOVER SHAFT

REMOVAL

1. Install Slide Hammer C-3752 (1) through the crossover bushing.
2. Thread nut and washer onto slide hammer.
3. Using the slide hammer, remove the crossover shaft bushing (2).



INSTALLATION

1. Position the replacement crossover shaft bushing over the crossover shaft bushing bore.
2. Using an appropriate size deep-well socket, install the crossover shaft bushing into the bushing bore.

RAIL AND FORK-SHIFT

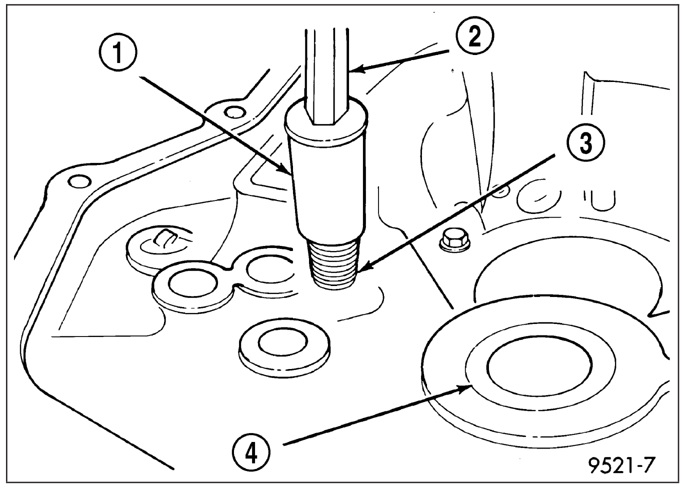
DISASSEMBLY

1. Remove shift rails from the geartrain.
2. To service the 5-R shift rail, remove the C-clip retaining the reverse shift lever arm. Remove the 5th shift fork roll pin and remove the 5th shift fork. Remove the shift lug roll pin and remove the shift lug. Replace parts as necessary.
3. To service the 3-4 shift rail, remove the roll pin retaining the 3-4 shift fork. Remove the shift fork. Remove the shift lug roll pin and remove the shift lug. Replace parts as necessary.
4. To service the 1-2 shift rail, remove the roll pin retaining the 1-2 shift fork. Remove the shift fork and replace parts as necessary.

BUSHINGS-SHIFT RAIL

REMOVAL

1. Thread Remover 6786 (1) into shift rail bushing.
2. Install slide hammer C-3752 (2) onto tool.
3. Remove bushing (3) using slide hammer and tool assembly.



INSTALLATION

1. Line up replacement bushing in bore.
2. Using Installer MD998343, tap bushing into bore until flush with the chamfer in the case.

SHAFT-SHIFT SELECTOR

REMOVAL

1. Disassemble transaxle.
2. With the transaxle disassembled, remove the selector shaft by pushing on the shaft from the outside. Pull shaft out from the inside.

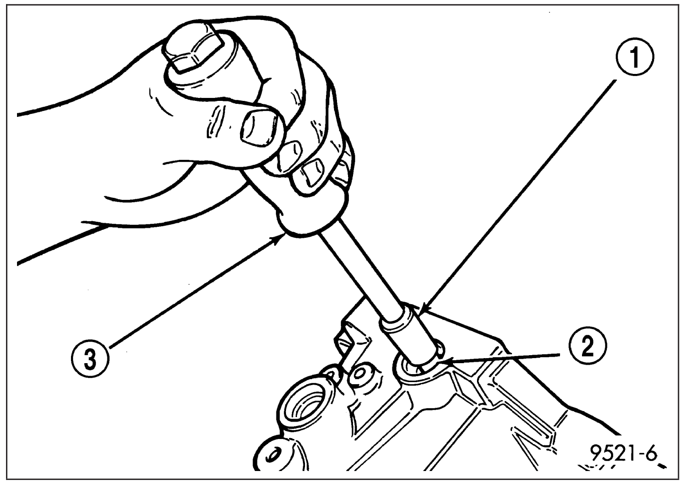
INSTALLATION

1. Pull selector shaft into position from the outside.
2. Assemble transaxle.

BUSHING-SHIFT SELECTOR SHAFT

REMOVAL

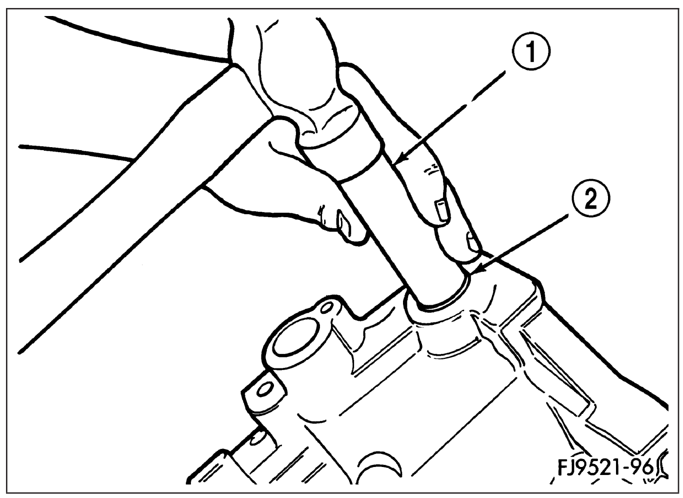
1. Remove selector shaft using procedure in this group.
2. Thread Remover 6786 (1) into bushing.
3. Install slide hammer C-3752 (3) onto tool and remove bushing (2) using slide hammer



.

INSTALLATION

1. Position replacement bushing over selector shaft bore.
2. Using an appropriate size deep-well socket (1), install bushing (2) in selector shaft bore.



SEALS-SHIFT SHAFT

REMOVAL

It is not necessary to remove the shift shafts from the transaxle to service the shift shaft seals.

1. Using a pick tool, pry up on the shift shaft seal, and remove seal from bore.

INSTALLATION

1. Position new shift shaft seal into bore.
2. Install shift shaft seal into bore using an appropriate size deep-well socket.

SYNCHRONIZER

DISASSEMBLY

Place synchronizer in a clean shop towel and wrap. Press on inner hub. Carefully open up shop towel and remove springs, balls, keys, hub, and sleeve.

CLEANING

CLEAN

Do not attempt to clean the blocking rings in solvent. The friction material will become contaminated. Place synchronizer components in a suitable holder and clean with solvent. Air dry.

INSPECTION

INSPECT

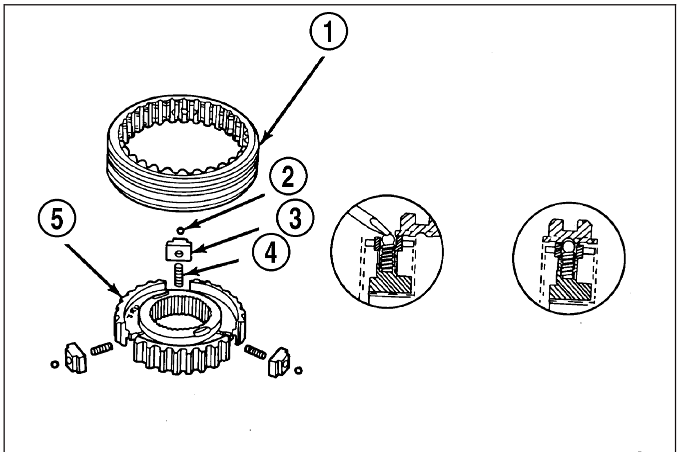
Proper inspection of components involve:

- Teeth, for wear, scuffed, nicked, burred, or broken teeth
- Keys, for wear or distortion
- Balls and springs, for distortion, cracks, or wear

If any of these conditions exist in these components, replace as necessary.

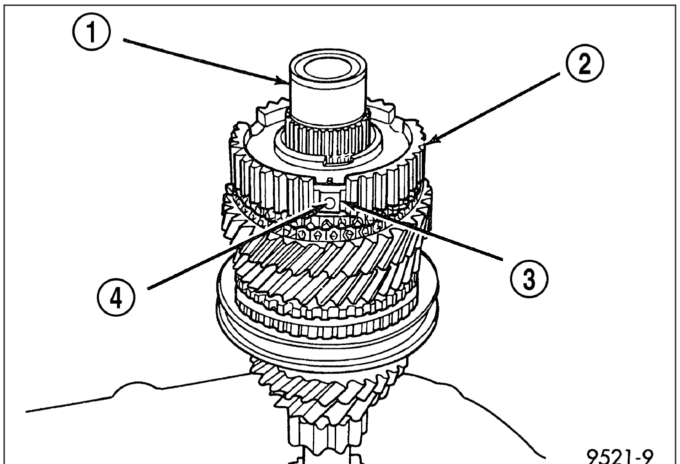
ASSEMBLY

1. Position synchronizer hub (5) onto a suitable holding fixture (input shaft). The synchronizer hubs (5) are directional. The hubs must be installed with the **U** facing upward.
2. Install springs (4) into hub slot.



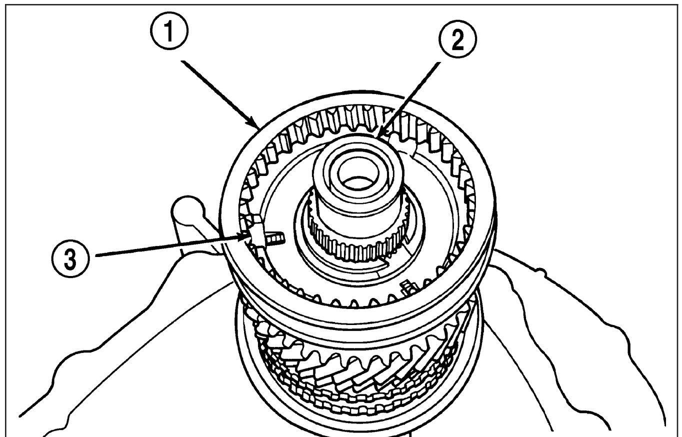
9521-69

3. Insert key (3) into hub (2) and spring.
4. Apply petroleum jelly to the hole in the key. Insert balls (4) into each key.



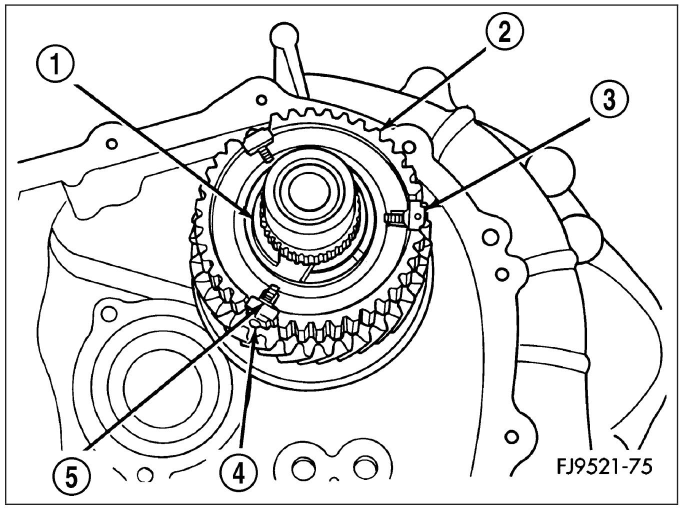
9521-9

5. Slide sleeve (1) over the hub and depress balls as you carefully slip the sleeve into position.



FJ9521-76

6. Line up stop ring tang over the keys in the hub, install stop rings, center the keys (3) and balls (4) by pushing on both stop rings.



FJ9521-75

SENSOR-VEHICLE SPEED

DESCRIPTION

VEHICLE SPEED SENSOR

The Vehicle Speed Sensor (VSS) is a hall effect sensor mounted above the transaxle differential. The sensor is triggered by the ring gear teeth passing below it. The VSS pulse signal to the speedometer/odometer is monitored by the PCM speed control circuitry to determine vehicle speed and to maintain speed control set speed.

REMOVAL

1. Open hood.
2. Remove the air cleaner housing. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL)
3. Disconnect the speed sensor connector (1).

CAUTION: Clean area around speed sensor before removing to prevent dirt from entering the transaxle during speed sensor removal.

4. Remove speed sensor retaining bolt.
5. Remove speed sensor from transaxle.

INSTALLATION

1. Using a NEW o-ring (3), install the speed sensor (2) to the transaxle.
2. Install the bolt and torque to 7 N·m (60 in. lbs.).
3. Connect speed sensor connector (1).
4. Install the air cleaner housing. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION)

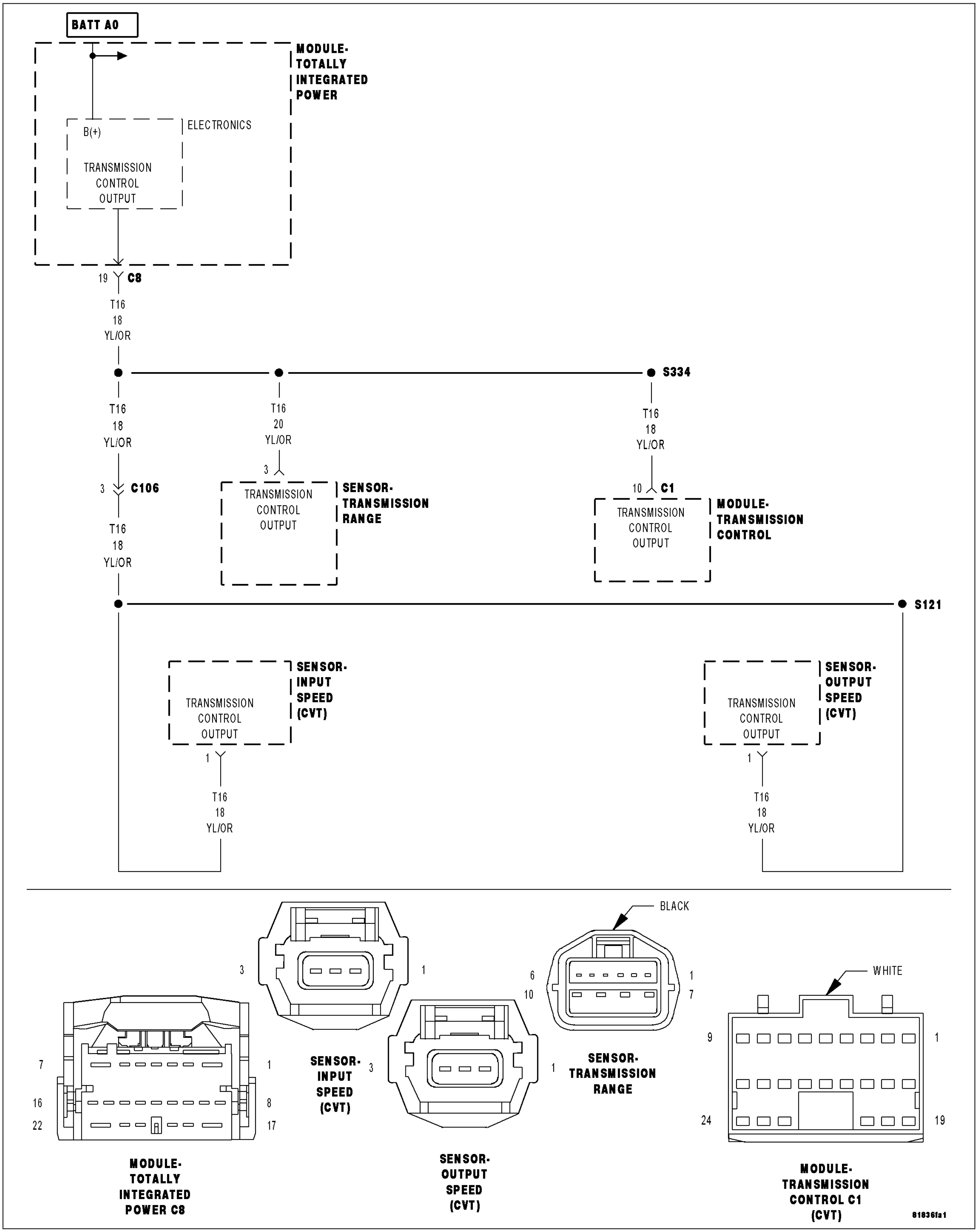
AUTOMATIC - CVT-ELECTRICAL DIAGNOSTICS

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AUTOMATIC - CVT-ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

P128B-TCM POWER CONTROL CIRCUIT 2 LOW - TIPM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  A shorted condition is detected in the Transmission Control Output circuit.

Possible Causes
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT SHORT TO GROUND
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, check Transmission DTCs.

Are there any Speed Sensor or Transmission Range Sensor DTCs present?

Yes >> Refer to the transmission category and perform the appropriate symptom(s).

No >> Go to 2

2. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, check TIPM DTCs.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Go to 6

3. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT SHORT TO GROUND

Turn the ignition off
Disconnect the TIPM C8 harness connector.
Disconnect the TCM C1 harness connector.
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.
Measure the resistance between ground and the (T16) Transmission Control Output circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Output circuit for a short to ground.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go to 4

4. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Connect the TIPM C8 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuits.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly at all the (T16) Transmission Control Output circuits?

Yes >> Go To 5

No >> Repair the (T16) Transmission Control Output circuit for an open.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. TOTALLY INTEGRATED POWER MODULE

Using the schematics as a guide, inspect the wire harness and connectors.

Check the TIPM harness connector terminals for corrosion, damage, or terminal push out.

Pay particular attention to all power and ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace and program the TIPM per Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

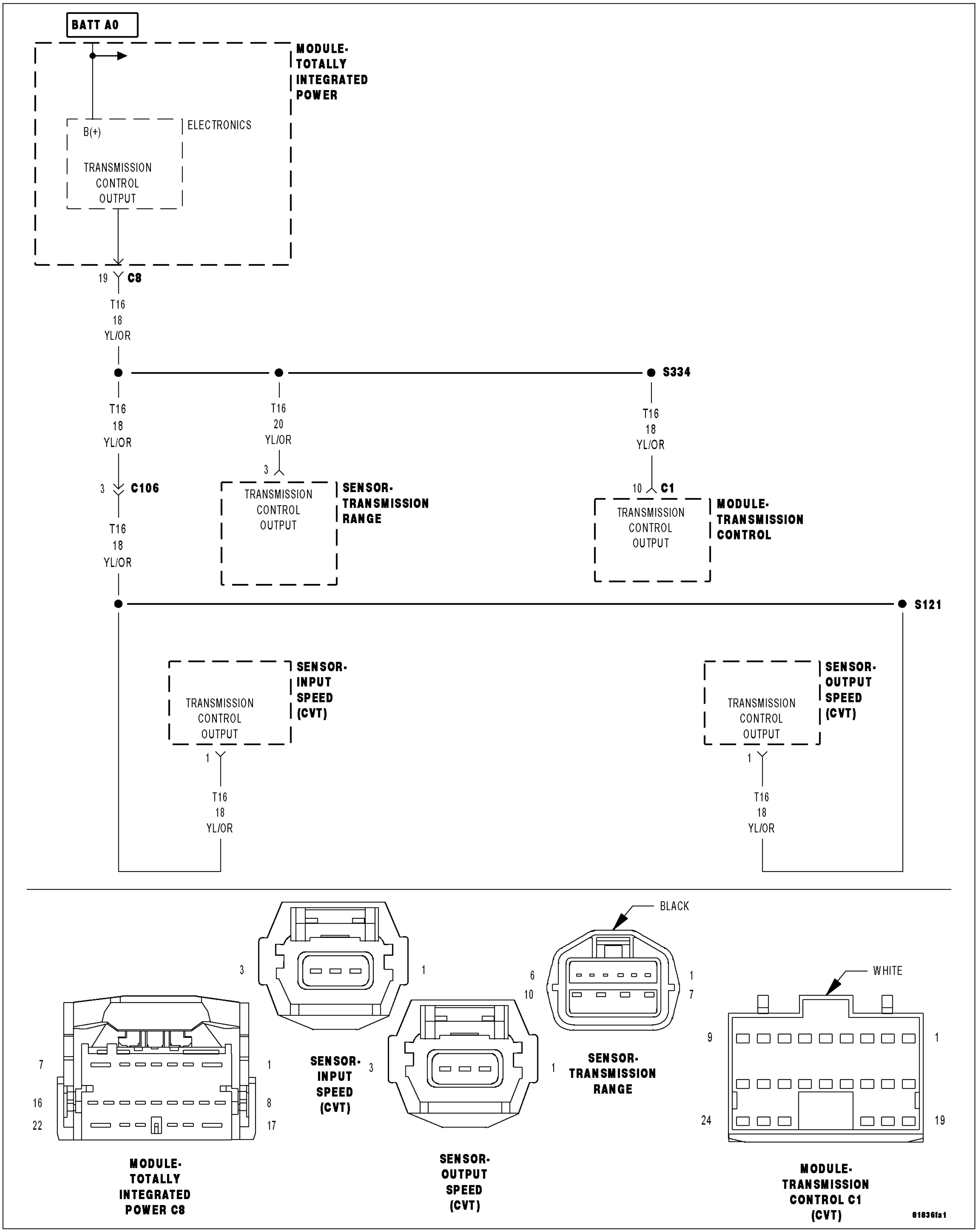
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test complete.

P128C-TCM POWER CONTROL CIRCUIT 2 HIGH - TIPM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  A shorted condition is detected in the TIPM Transmission Control Output circuit.

Possible Causes
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT SHORT TO VOLTAGE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, read TIPM DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Go to 4

2. (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TIPM C10 harness connector.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T16) Transmission Control Output circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (T16) Transmission Control Output circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go to 3

3. TOTALLY INTEGRATED POWER MODULE

Using the schematics as a guide, inspect the wire harness and connectors.

Check the TIPM harness connector terminals for corrosion, damage, or terminal push out

Pay particular attention to all power and ground circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Power Module per Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

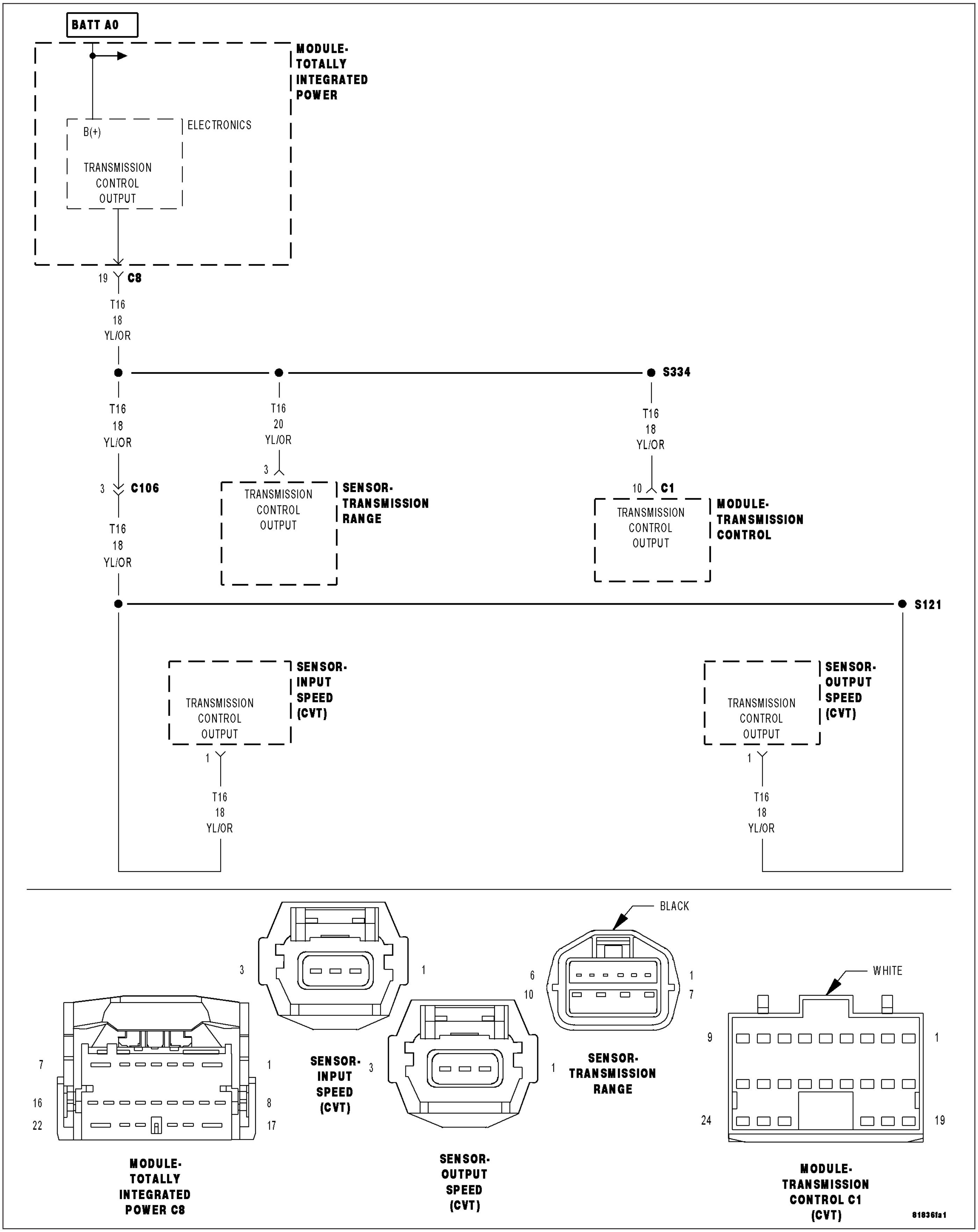
Were any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test complete.

P128D-TCM POWER CONTROL CIRCUIT 2 OPEN - TIPM



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An open condition of the Transmission Control Output circuit is detected by the Totally Integrated Power Module (TIPM).

Possible Causes
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT OPEN
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.

With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes >> Go to 2

No >> Go to 4

2. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Using the scan tool under the TIPM Actuators, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuits.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (T16) Transmission Control Output circuit for an open.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

3. TOTALLY INTEGRATED POWER MODULE

Using the schematics as a guide, inspect the wire harness and connectors.

Check the TIPM harness connector terminals for corrosion, damage, or terminal push out.

Pay particular attention to all power and ground circuits.

Were any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace and program the TIPM per Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

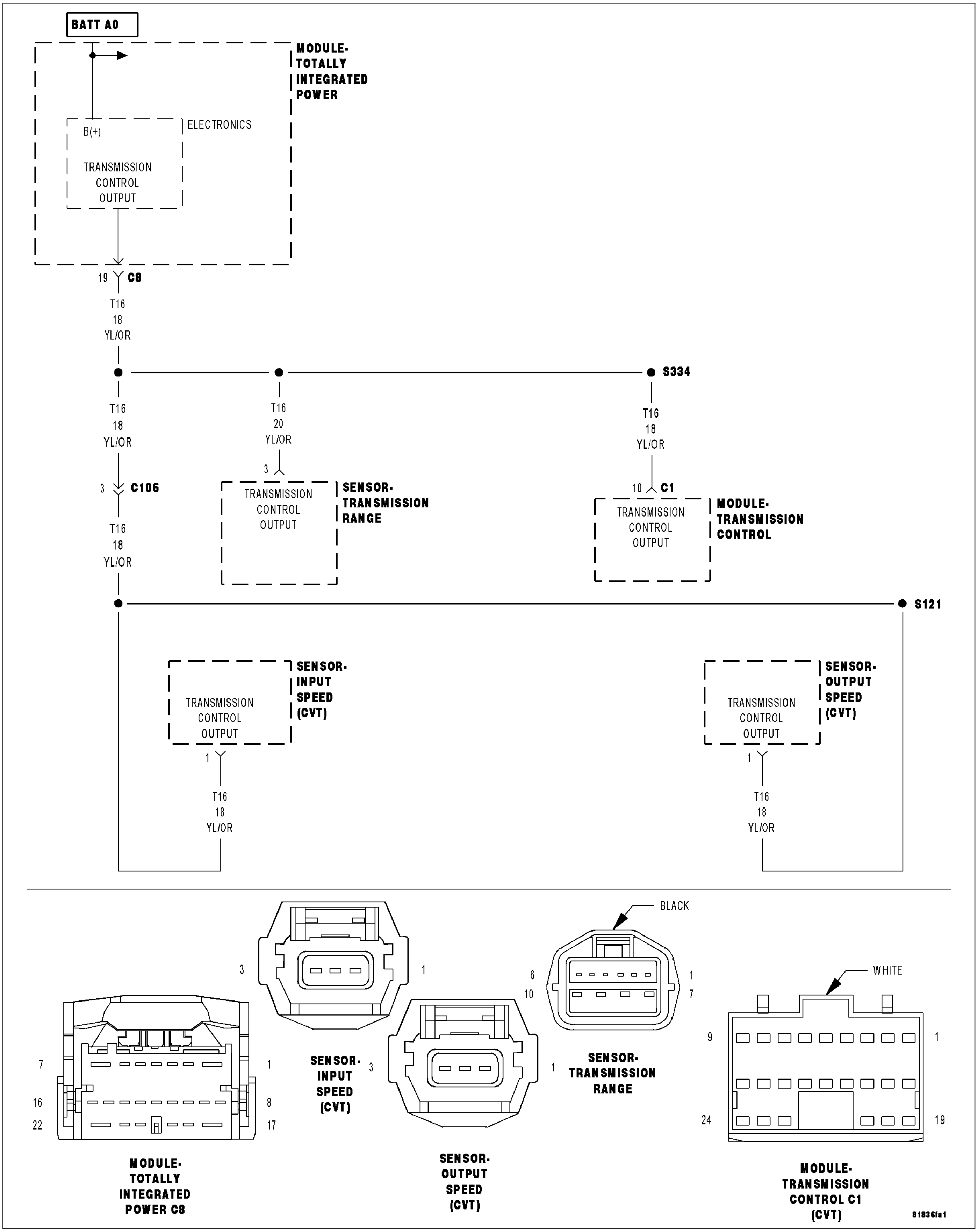
Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test complete.

P128E-TCM POWER CONTROL CIRCUIT 2 OVERCURRENT - TIPM

For a complete wiring diagram **Refer to Section 8W**.



- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An overcurrent condition is detected in the TCM Power Control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INPUT OR OUTPUT SPEED SENSOR
TRANSMISSION RANGE SENSOR
TRANSMISSION CONTROL MODULE
TOTALLY INTEGRATED POWER MODULE (TIPM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.

With a scan tool, read TIPM DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 4

2. CHECK IF THE DTC IS ACTIVE

Ignition on, engine not running.

With a scan tool, read Transmission DTCs.

Are there any Input or Output Speed Sensor or Transmission Range Sensor (TRS) DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE TCM

Disconnect the amp meter from the TIPM C10 harness connector and battery positive.

Disconnect the TCM C1 harness connector.

Connect the positive probe of an ammeter to battery positive and connect the negative probe to the (T16) Transmission Control Output circuit in the TIPM C10 harness connector.

Read the amperage on the ammeter.

Does the amperage read below 2.0 amps?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Totally Integrated Control Module per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0219-ENGINE OVERSPEED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) receives a engine rpm over the CAN bus. If the engine rpm exceeds a predetermined value a DTC will set.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  No active CAN Bus DTCs present.
  System voltage between 9.0 and 16 volts.
- **Set Condition:**
  Monitored engine speed over the CAN Bus is greater than 6800 rpm for the period of 100 msecs.

Possible Causes
ENGINE MECHANICAL PROBLEM
TRANSMISSION MECHANICAL PROBLEM
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check for other transmission DTCs.

Are there any TCC, gear ratio and/or speed sensor DTCs present in addition to P0219?

Yes >> Refer back to the CVT Transaxle Diagnosis and Testing category and perform the appropriate symptom. If speed sensor DTCs are present, perform their respective tests first.

No >> Go To 2

2. CHECK FOR ENGINE DTCS

With the scan tool, check for engine DTCs.

Are there any engine DTCs present?

Yes >> Refer back to the Engine Diagnosis and Testing category and perform the appropriate symptom.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF DTC RESETS

With the scan tool erase transmission DTCs.

Test drive the vehicle and try to duplicate the setting conditions.

Pick the answer that best describes your findings:

DTC resets with a speed sensor DTC
Refer to the Transmission Diagnostic and Testing category and perform the appropriate symptom.

DTC resets without a speed sensor DTC
Replace or repair the CV Transmission as necessary per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0571-BRAKE SWITCH 1 PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the brake switch 1 signal over the CAN Bus. If the Transmission is shifted into any valid gear position without confirming that the brake was depressed before the shift, a DTC will set.

- **When Monitored:**
  After initial start and any time the shift lever is changed from park to reverse, drive or neutral.
  System voltage between 9.0 and 16 volts.
  No active CAN Bus DTCs present.
- **Set Condition:**
  The brake switch status does not change during a drive cycle with a vehicle speed greater than 30 Km/h (18.5 mph) for the period of 10 seconds.
  It take to consecutive problem identification trips to set the MIL.

Possible Causes
ENGINE BRAKE SWITCH DTCS PRESENT
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

2. CHECK FOR ENGINE BRAKE SWITCH DTCS

With the scan tool, check for engine brake switch DTCs.

With the scan tool, check if the brake switch changes when the brake pedal is pressed.

Are there any engine brake switch DTCs present or is the brake switch not registering any change on the scan tool?

Yes >> Refer to the engine Diagnosis and Testing category and perform the appropriate symptom. If no DTCs are present and the brake switch does not seem to function, diagnose the brake switch as though a valid DTC is present.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK OTHER CONTROLLERS FOR BRAKE SWITCH DTCS

With the scan tool check other controllers for Brake Switch DTCs.

Do any other controllers report a Brake Switch DTC?

Yes >> Refer to the Engine Diagnosis and Testing category and perform diagnostics for P0571 as though the DTC is active.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0602-CONTROL MODULE PROGRAMING ERROR/NOT PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

After initial vehicle start, the Transmission Control Module (TCM) looks for a message over the CAN BUS verifying vehicle information which is crucial for transmission configuration. After the information is received it is stored in the EEPROM of the TCM. If the TCM does not receive a valid configuration within a predetermined time, the DTC will set and the MIL will be illuminated.

- **When Monitored:**
  After an initial vehicle start with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  Transmission Control Module (TCM) does not receive valid vehicle information from the Front Control Module (FCM) for the period of 5 seconds.

Possible Causes
CAN BUS DTCS PRESENT
TOTALLY INTEGRATED CONTROL MODULE (TIPM) NOT PROGRAMED
TRANSMISSION CONTROL MODULE (TCM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR CAN BUS DTCS

With the scan tool, check for CAN BUS DTCs.

Are there any CAN BUS DTCs present?

Yes >> Refer to the Communication category and perform the appropriate symptom. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 2

2. CHECK IF CONTROLLER WAS REPLACED

Has the Transmission Control Module been recently replaced?

Yes >> Go To 3

No >> Go To 5

3. CHECK IF CONTROLLER WAS PROGRAMED

Was the Transmission Control Module flashed?

Yes >> Go To 4

No >> Flash the control module with the proper part number for the vehicle.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK FOR OTHER DTCS

With the scan tool, check Transmission DTCs.

Are the DTCs P0602 and U140F Active and P161B and P1729 Stored?

Yes >> Check the Controller part number coincides with the vehicle setup such as engine size or with or without All wheel Drive (AWD). This is an indication of an improper vehicle configuration. Verify all configurations to the Vehicle Identification Number (VIN) and reprogram as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE FCM FOR PROPER PROGRAMING OF TIRE SIZE

With the scan tool, check the TIPM/FCM for proper tire size programing.

Is the tire size properly programed in the TIPM/FCM?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Program the TIPM/FCM with the proper tire size.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

P0610-ECU VEHICLE OPTIONS MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) stores in its EEPROM vehicle information data transmitted over the CAN Bus from the FCM/TIPM. If the stored information in the TCM does not match the information obtained over the CAN Bus, the DTC will set.

- **When Monitored:**
  One time at initial ignition on with system voltage between 9.0 and 16.0 volts.
  FCM/TIPM variant data received more than once over the CAN Bus.
  FCM/TIPM variant data is in a valid range.
  Vehicle Configuration Learn Routine not finished.
- **Set Condition:**
  The vehicle option data received over the CAN Bus does not match the data stored in the EEPROM of the TCM. It takes one trip of problem identification to set the MIL.

Possible Causes
USED CONTROLLER INSTALLED WITH WRONG CONFIGURATION
FCM/TIPM NOT PROPERLY PROGRAMED OR WAS REPLACED AND NOT PROGRAMED
NEW TCM INSTALLED
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 4

2. CHECK THE TIPM

Has the TIPM been reprogrammed (tire size) or replaced without being programed?

Yes >> Program the TIPM if not programed. If the tire size was changed, with the scan tool clear the TCM memory and relearn.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE TCM

Has the TCM been recently replaced with a new or used controller?

Yes >> With the scan tool perform a TCM relearn.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

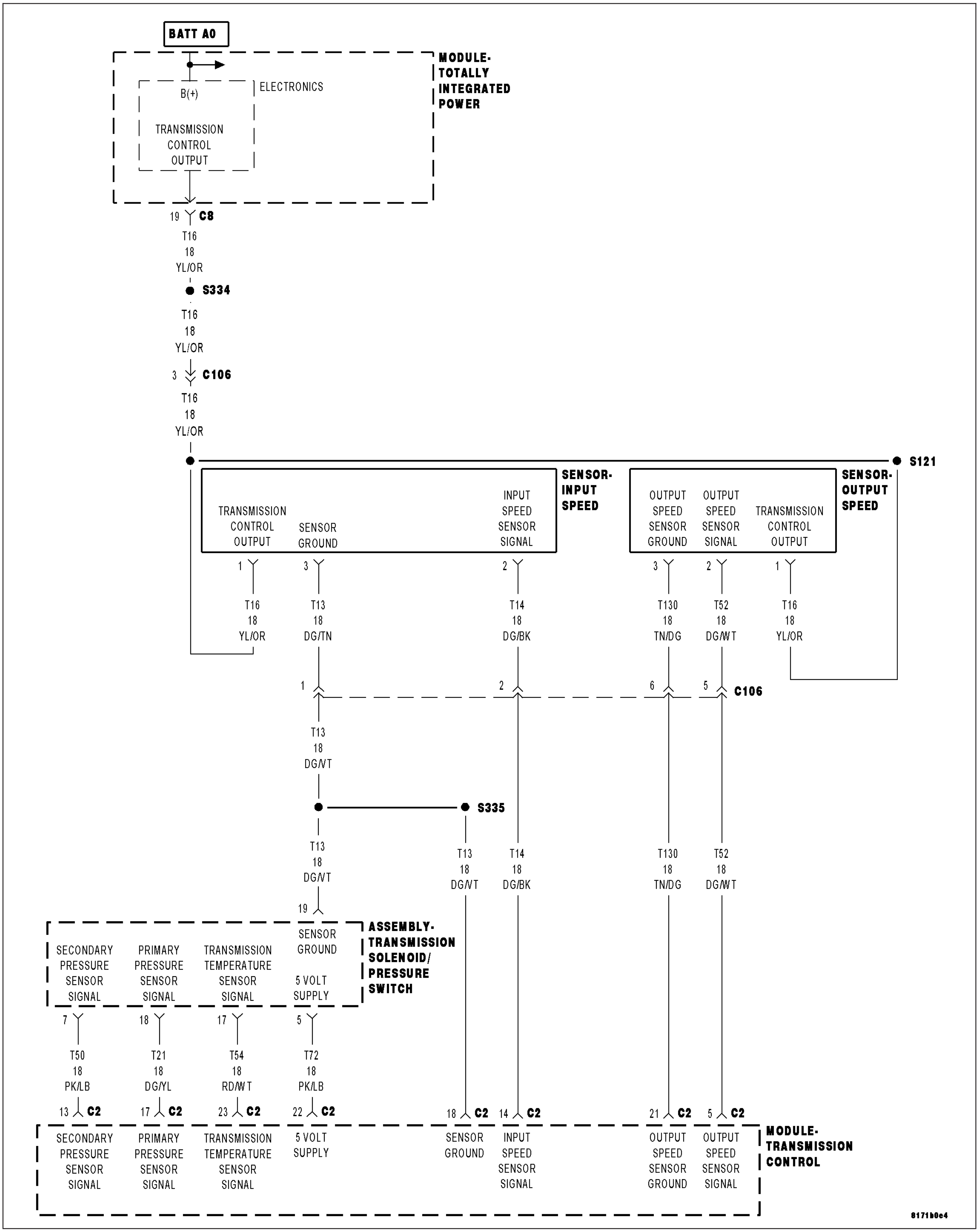
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0641-SENSOR REFERENCE VOLTAGE 1 CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

A common 5-volt power supply is used by both the primary and secondary pressure sensors as well as an internal ROM Assembly. If the power supply does not maintain a predetermined voltage range to the pressure sensors after the period of 5.0 seconds, the Transmission Control Module (TCM) sets the DTC and illuminates the MIL.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  When the monitored input voltage from primary pressure sensor and secondary pressure sensor is less than 0.05 volts for a continuous period of 5.0 seconds.

Possible Causes
(T72) 5-VOLT SUPPLY CIRCUIT OPEN
(T72) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 5

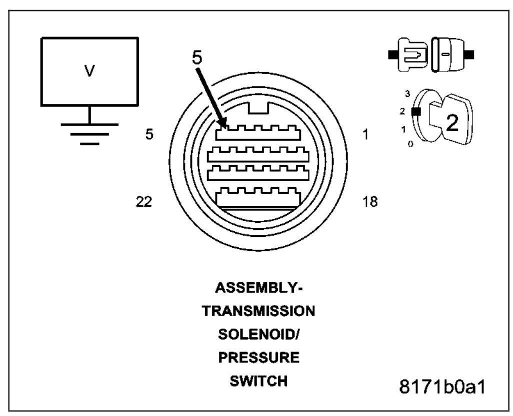
2. CHECK THE (T72) 5-VOLT SUPPLY CIRCUIT VOLTAGE

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5-volt Supply circuit.



Is the voltage 5.0 volts (± 0.5 volts)?

Yes >> Replace the Valve Body per the Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

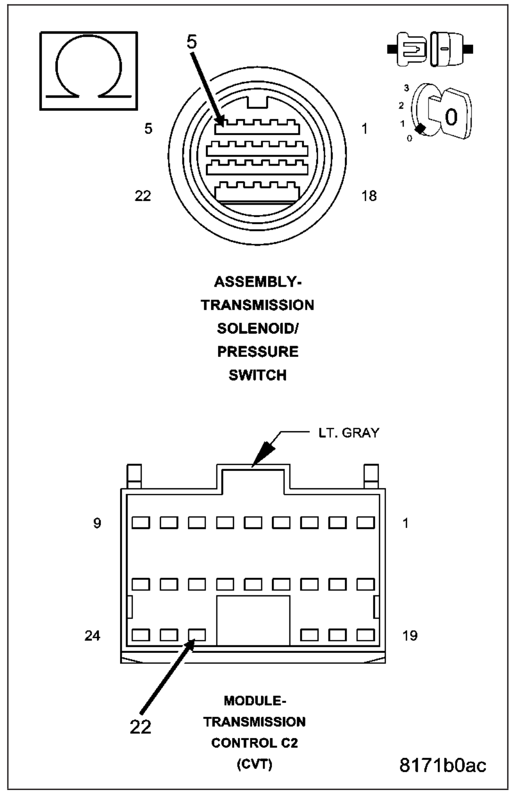
No >> Go To 3

3. CHECK THE (T72) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance of the (T72) 5-volt Supply circuit between the TCM C2 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

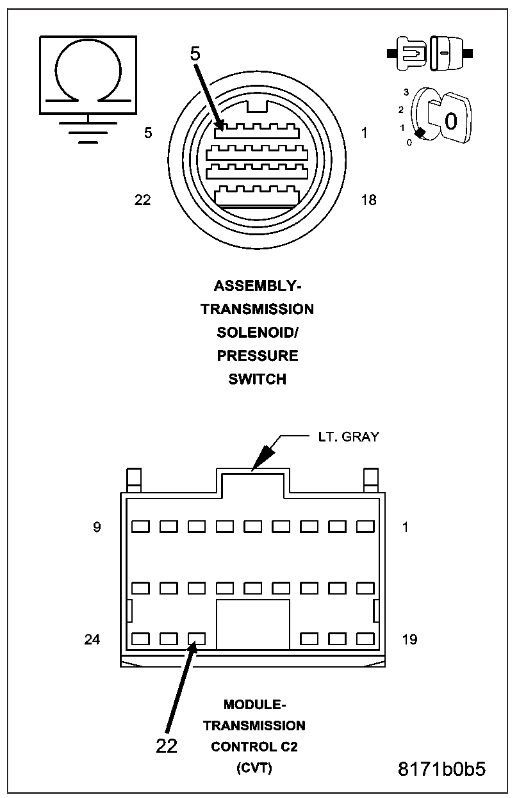
Yes >> Repair the (T72) 5-volt Supply circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T72) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T72) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T72) 5-volt Supply circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

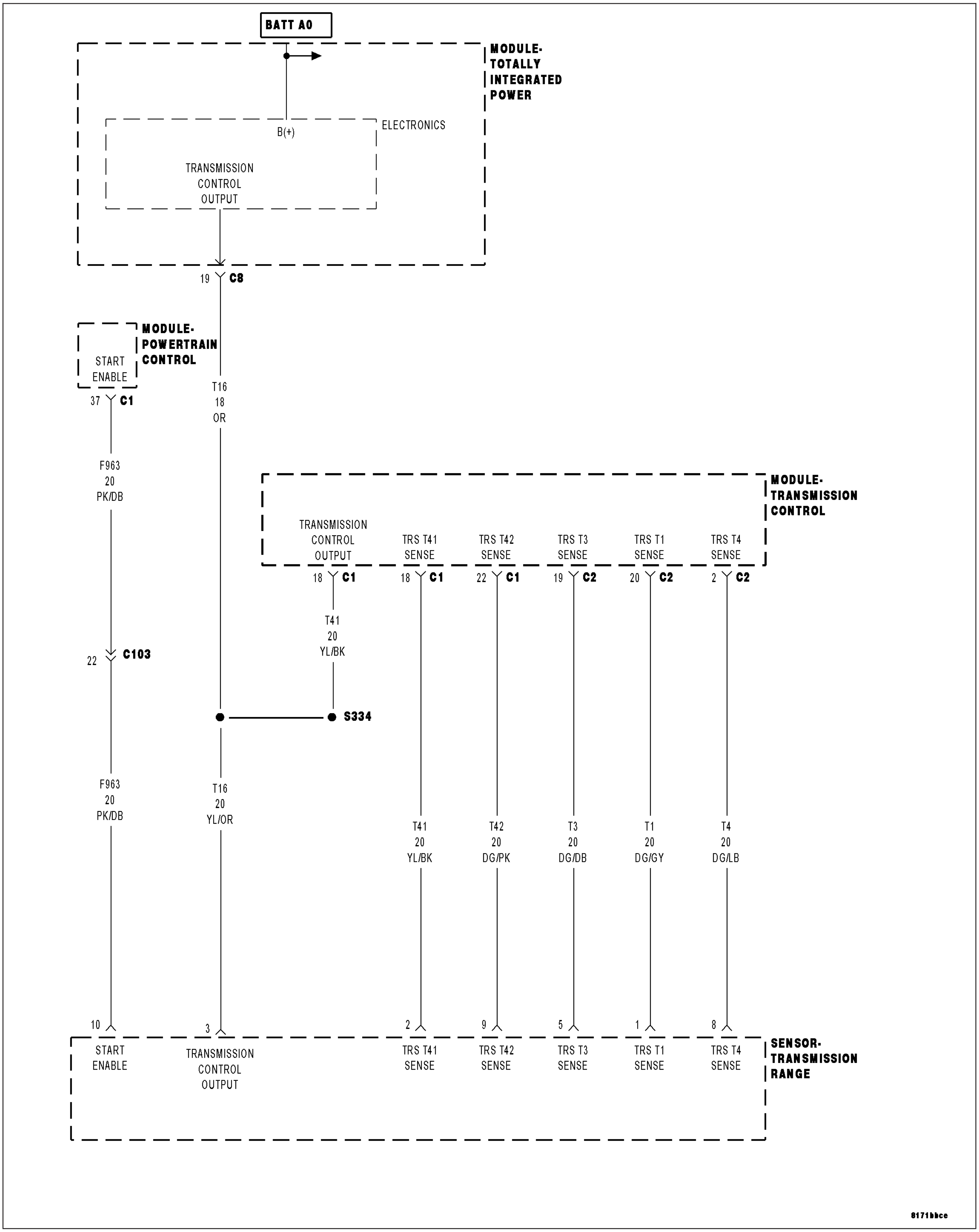
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0707-TRANSMISSION RANGE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Range Sensor (TRS) has a contact point for each shift lever position. The Transmission Control Module (TCM) monitors the signal from the TRS which specifies the shift lever position. The TCM also broadcast the shift lever position over the CAN BUS to other modules.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16.0 volts.
  Vehicle speed above 10 Km/h (6 mph).
  No other Transmission Range Sensor (TRS) DTCs present.
- **Set Condition:**
  If a continuous input signal loss is read by the TCM from the TRS for the period of 5 seconds. It takes two consecutive one trips of problem identification to light the MIL.

Possible Causes
TRANSMISSION RANGE SENSOR CONNECTOR UNPLUGGED OR DAMAGED
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT OPEN
TRS SENSE CIRCUIT OPEN
TRS SENSE CIRCUIT SHORT TO GROUND
TRANSMISSION RANGE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active or is the STARTS SINCE SET counter 2 or less for this DTC?

Yes >> Go To 2

No >> Go To 8

2. CHECK THE TRS HARNESS CONNECTOR

Turn the ignition off to the lock position.

Check if the TRS harness connector for terminal push out, corrosion or if it is properly plugged in.

NOTE: If the Transmission Range Sensor is unplugged the vehicle will not start.

Were there any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE TRS READINGS ON THE SCAN TOOL

SHIFT LEVER POSITION TO TRS SWITCH STATE				
PARK	**REVERSE**	**NEUTRAL**	**DRIVE**	**LOW**
T41 CLOSED	T42 CLOSED	T4 CLOSED	T3 CLOSED	T1 CLOSED

Ignition on, engine not running.

With the scan tool, read the TRS states while moving the shift lever to all positions note any circuits that do not change.

Pick which answer best describes your findings:

One TRS Sense circuit failed to change on the scan tool

Go To 5

None of the TRS Sense circuits changed at all

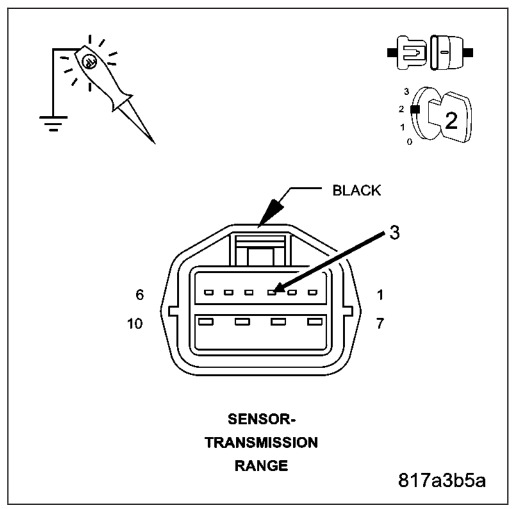
Go To 4

All TRS Sense circuits changed properly on the scan tool

Check the Sift Lever Cable for proper adjustment and binding per the Service Information. If no problems are found, using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If again no problems are found, replace the TCM per the Service Information

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN



Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Ignition on, engine not running.

Using the scan tool under TIPM, actuate the transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuit in the TRS harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 7

No >> Repair the (T16) Transmission Control Output circuit for an open.

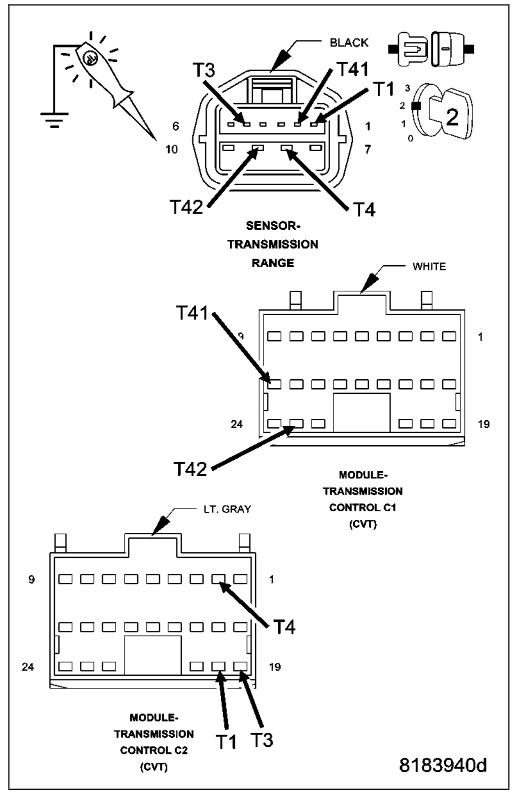
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. CHECK THE TRS SENSE CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Check the resistance of the previously identified TRS Sense circuit between the TRS harness connector and the TCM harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the identified TRS Sense circuit for an open

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

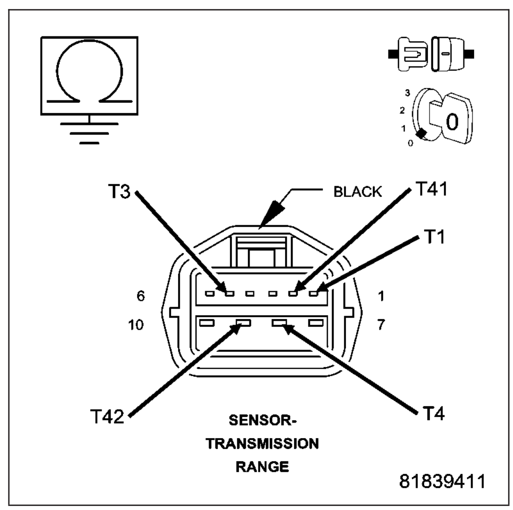
No >> Go To 6

6. CHECK THE TRS SENSE CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Check the resistance between ground and the identified TRS Sense circuit in the previous test procedure.



Is the resistance below 5.0 ohms?

Yes >> Repair the identified TRS Sense circuit for a short to ground

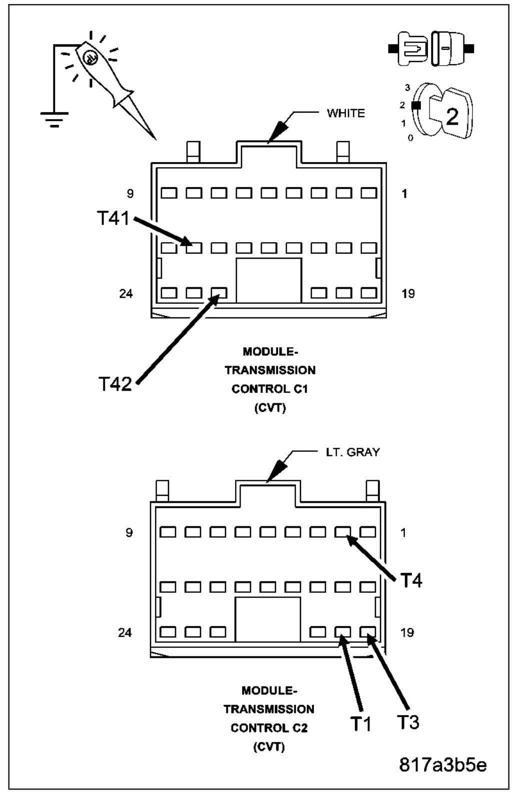
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Transmission Range Sensor (TRS) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. CHECK THE TRANSMISSION RANGE SENSOR

SHIFT LEVER POSITION TO TRS SWITCH STATE				
PARK	**REVERSE**	**NEUTRAL**	**DRIVE**	**LOW**
T41 CLOSED	T42 CLOSED	T4 CLOSED	T3 CLOSED	T1 CLOSED



Stop the scan tool transmission actuation and turn the ignition off to the lock position.

Reconnect the TRS harness connector.

Disconnect the TCM C1 and C2 harness connectors.

Ignition on, engine not running.

Using the scan tool under TIPM, actuate the transmission.

Using a 12-volt test light connected to ground, check each TRS Sense circuit (T41, T42, T4, T3, and T1) in the TCM C1 and C2 harness connectors while moving the shift lever to each desired position.

NOTE: Use the above chart to identify which sense circuit should be closed in each shift lever position.

Does the test light illuminate brightly on all the TRS Sense circuits?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Transmission Range Sensor per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

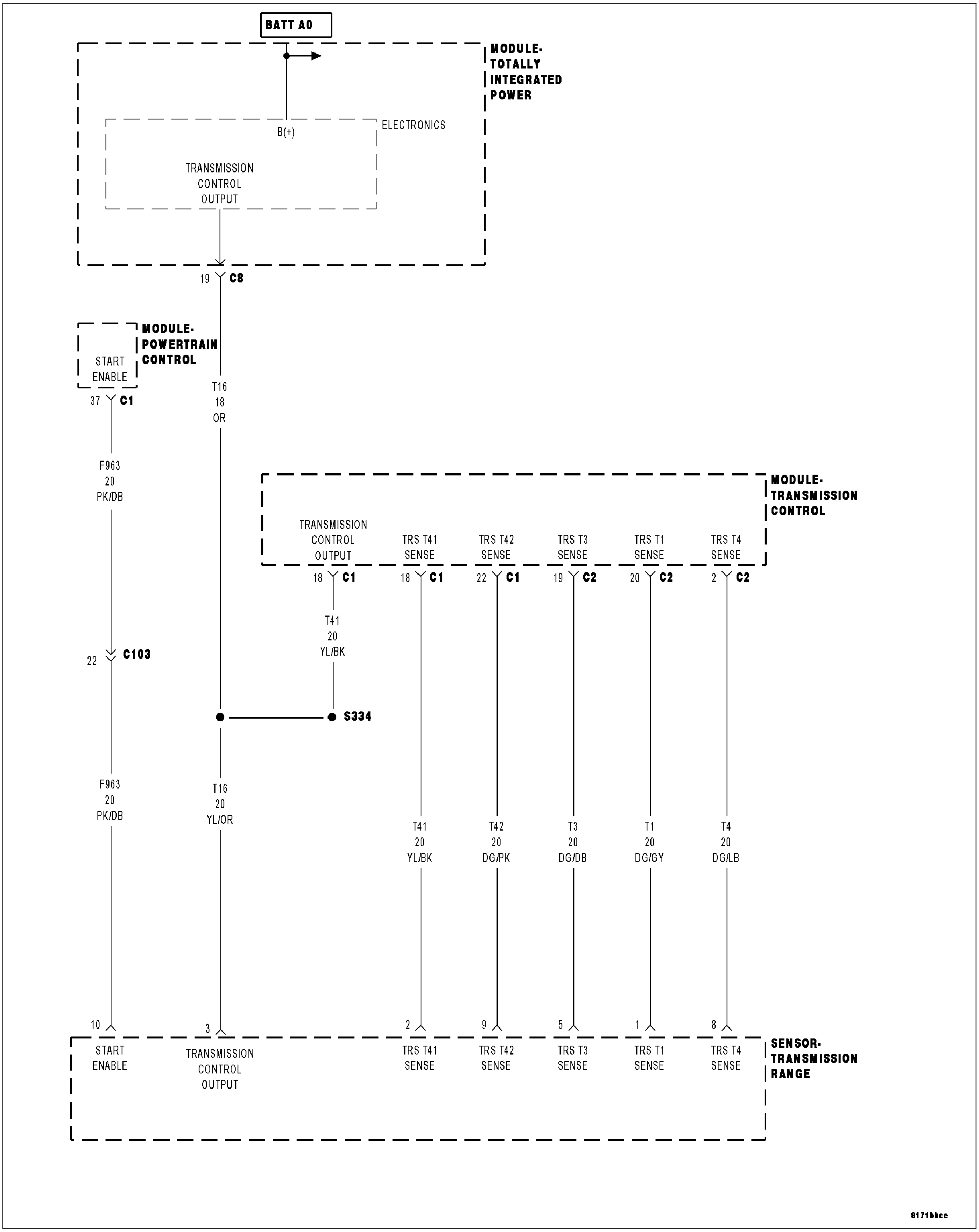
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0708-TRANSMISSION RANGE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Range Sensor (TRS) has a contact point for each shift lever position. The Transmission Control Module (TCM) monitors the signal from the TRS which specifies the shift lever position. The TCM also broadcast the shift lever position over the CAN BUS to other modules.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16.0 volts.
  No other Transmission Range Sensor (TRS) DTCs present.
- **Set Condition:**
  When the Transmission Control Module (TCM) receives more than one Transmission Range Sensor (TRS) signal from the TRS continuously for the period of 2.0 seconds.

Possible Causes
TRS SENSE CIRCUIT SHORT TO VOLTAGE
TWO TRS SENSE CIRCUITS SHORTED TOGETHER
TRANSMISSION RANGE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 5

2. CHECK THE TRS READINGS ON THE SCAN TOOL

SHIFT LEVER POSITION TO TRS SWITCH STATE				
PARK	**REVERSE**	**NEUTRAL**	**DRIVE**	**LOW**
T41 CLOSED	T42 CLOSED	T4 CLOSED	T3 CLOSED	T1 CLOSED

Ignition on, engine not running.

With the scan tool, read the TRS states while moving the shift lever to all positions note any circuits may close at the same time.

Did one or more TRS Sense circuits show being closed at the same time?

Yes >> Go To 3

No >> Check the Shift Lever Cable for proper adjustment and binding per the Service Information. If no problems are found, using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If again no problems are found, replace the TCM per the Service Information

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

3. CHECK THE TRS SENSE CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

NOTE: The possibility of erroneous DTCs may set due to disconnection of the TRS harness connector. Disregard any additional DTCs that may set.

Ignition on, engine not running.

Using the scan tool, read the TRS Sense circuit states.

Do any of the TRS Sense circuits read closed?

Yes >> Repair the identified TRS Sense circuit for a short to voltage.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE TRS SENSE CIRCUIT FOR A SHORT TO ANOTHER TRS SENSE CIRCUIT

Turn the ignition off to the lock position.

Disconnect the TCM C1 and C2 harness connectors.

Measure the resistance between the two identified TRS Sense circuits in the second step.

Is the resistance below 5.0 ohms?

Yes >> Repair the identified TRS Sense circuits for a short to each other.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the TRS Assembly per the Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

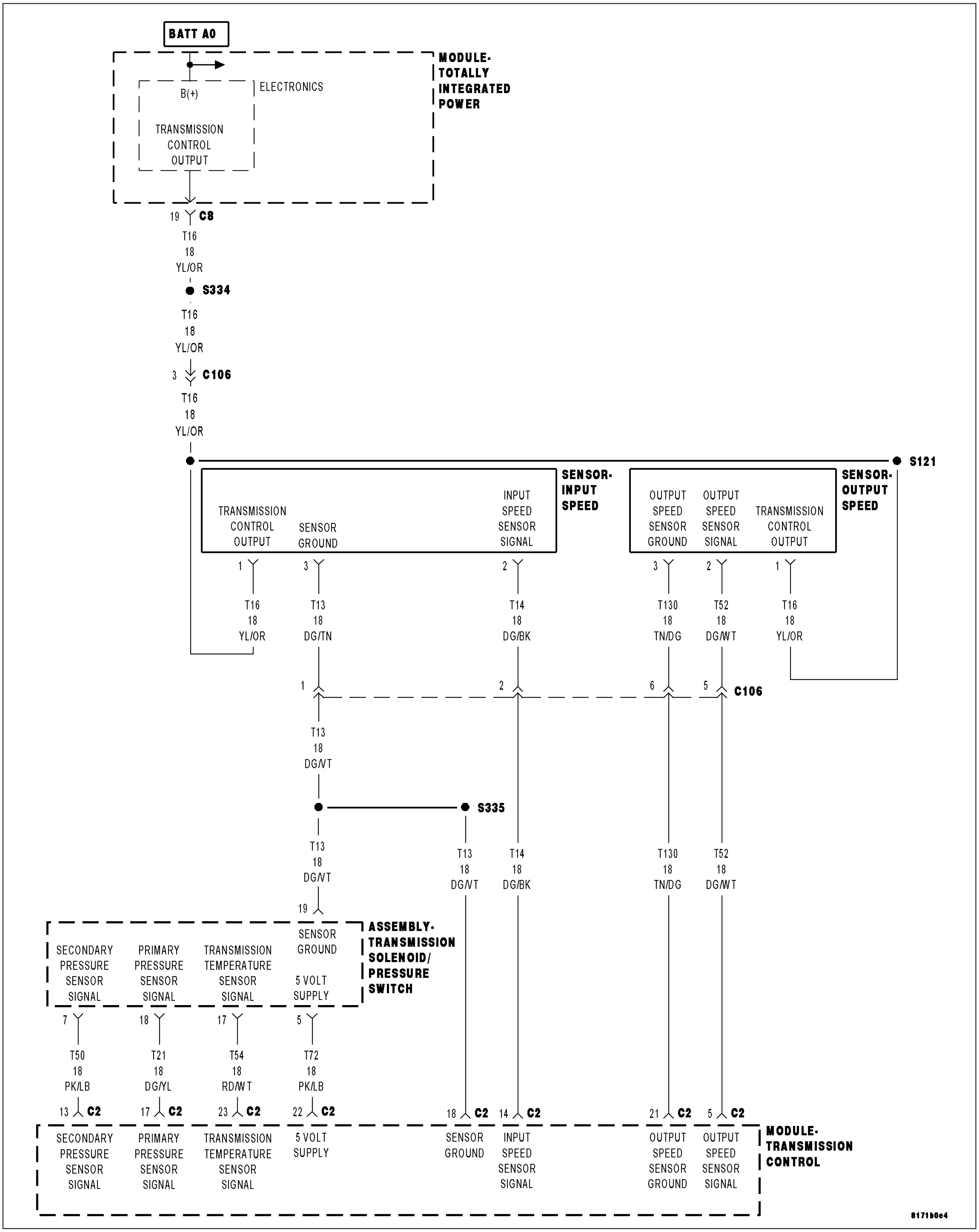
Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the Transmission Temperature Sensor Signal circuit for voltage changes within desired limits. The TCM calculates the transmission fluid temperature from the temperature sensor signal voltage. This value is used in conjunction with various other inputs to calibrate different operating modes such as Torque Converter lock-up and Torque reduction.

The Transmission Temperature Sensor is a thermistor that changes resistive value when subject to different temperatures. When the monitored voltage rises, the calculated temperature decreases.

- **When Monitored:**
  Condition one : Transmission in a valid forward gear.
  System voltage between 9.0 and 16.0 volts.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm.
  Condition two: Ignition off for greater than 8 hours.
  Difference between the engine coolant temperature and the intake temperature is less than 3° C (37° F).
  No other temperature sensor or sensor ground DTCs present.
- **Set Condition:**
  Condition one: No change in the Transmission oil temperature the period of 10 minutes.
  Condition two: Transmission oil temperature is 40° C (104° F) different than the average temperature which consists of the combined average of the Engine Coolant temperature, Intake Temperature, Oil Temperature, and Ambient Temperature for the period of 5 seconds.

Possible Causes
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR ENGINE DTCS

With the scan tool, read Engine DTCs.

Are there any Engine Temperature Sensor DTCs present?

Yes >> Refer to the Engine Diagnostic and Testing category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 2

2. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 7

3. IDENTIFY THE SETTING CONDITION

NOTE: The vehicle must be completely cooled for a minimum period of 8 hours for the following test procedure.

With the scan tool monitor the Transmission Temperature while test driving the vehicle.

NOTE: It may take up to 10 to 12 minutes of continuous driving to accurately test the Transmission Temperature Sensor.

Did the Transmission Temperature stay the same or increase a very limited amount?

Yes >> Go To 6

No >> Go To 4

4. CHECK THE TRANSMISSION TEMPERATURE SENSOR

Did the TCM set a one trip DTC during the previous test drive?

Yes >> Go To 5

No >> Go To 7

5. COMPARE TRANSMISSION TEMPERATURE TO OTHER TEMPERATURES

With the scan tool compare the Transmission Temperature to other Temperature sensors such as Engine Coolant, Intake, Oil Temperature.

Is the Transmission Temperature within 40° C (104° F) of the other temperatures?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

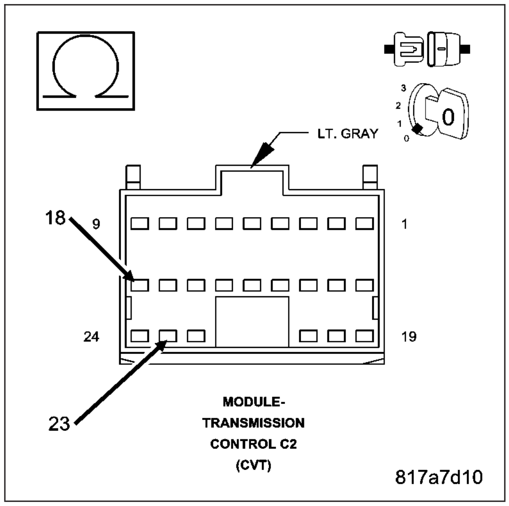
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the CVT or repair the Transmission Temperature Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR

Temperature Sensor Resistive Values Chart	
Transmission Temperature	Resistive Value Compared to Temperature (± 10%)
20° C (68° F)	2.5k ohms to 6.5k ohms
80° C (176° F)	0.3k ohms to 0.9k ohms



Start the engine and allow to obtain normal operating temperature (approximately 10 min. of engine run time).

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and the (T13) Sensor Ground circuit in the TCM C2 harness connector.

Is the resistance within the desired range listed on the above chart?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the CVT or repair the Transmission Temperature Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

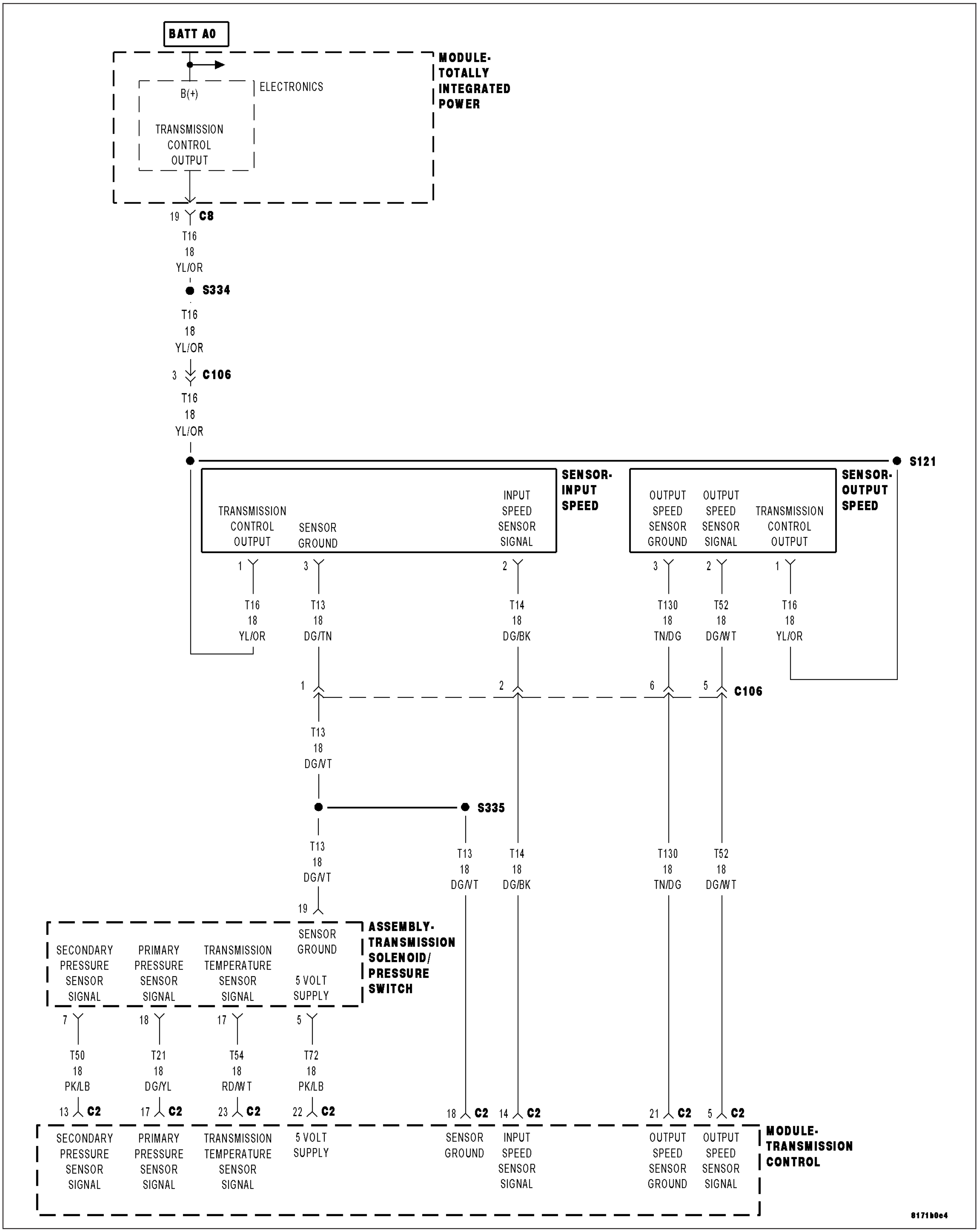
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0712-TRANSMISSION TEMPERATURE SENSOR LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the Transmission Temperature Sensor Signal circuit for voltage changes within desired limits. The TCM calculates the transmission fluid temperature from the temperature sensor signal voltage. This value is used in conjunction with various other inputs to calibrate different operating modes such as Torque Converter lock-up and Torque reduction.

The Transmission Temperature Sensor is a thermistor that changes resistive value when subject to different temperatures. When the monitored voltage rises, the calculated temperature decreases.

- **When Monitored:**
  Ignition on with battery voltage between 9.0 and 16.0 volts.
  Vehicle speed greater than 10 Km/h (6 mph).
  No secondary speed sensor or sensor ground DTCs detected.
- **Set Condition:**
  Indicated temperature is greater than 180° C (356° F) for the continuous period of 5 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active or is the STARTS SINCE SET counter 2 or less for this DTC?

Yes >> Go To 2

No >> Go To 4

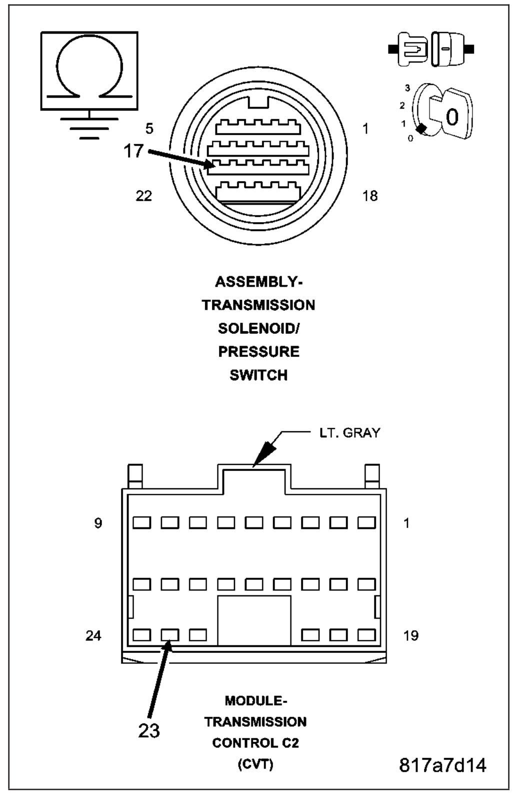
2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR

Temperature Sensor Resistive Values Chart	
Transmission Temperature	Resistive Value Compared to Temperature (± 10%)
20° C (68° F)	2.5k ohms to 6.5k ohms
80° C (176° F)	0.3k ohms to 0.9k ohms

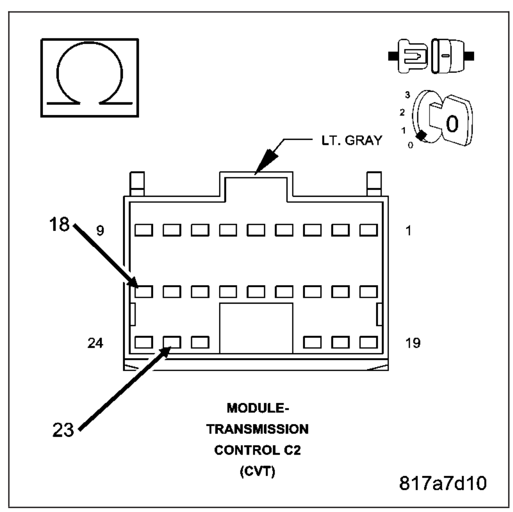
Reconnect all previously disconnected connectors.

Start the engine and allow to obtain normal operating temperature (approximately 10 min. of engine run time).

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and the (T13) Sensor Ground circuit in the TCM C2 harness connector.



Is the resistance within the desired range listed on the above chart?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible

causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Transmission Temperature Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

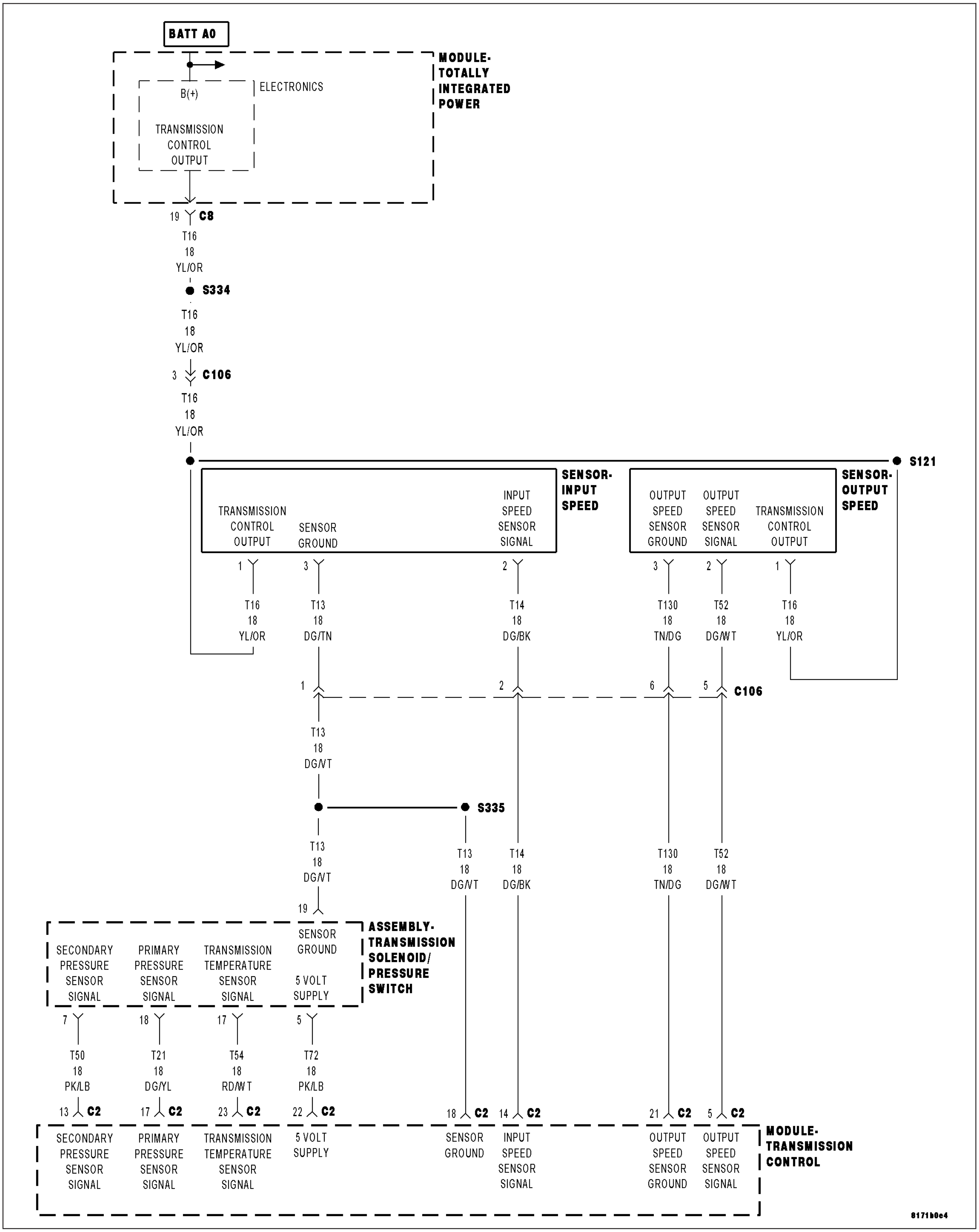
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the Transmission Temperature Sensor Signal circuit for voltage changes within desired limits. The TCM calculates the transmission fluid temperature from the temperature sensor signal voltage. This value is used in conjunction with various other inputs to calibrate different operating modes such as Torque Converter lock-up and Torque reduction.

The Transmission Temperature Sensor is a thermistor that changes resistive value when subject to different temperatures. When the monitored voltage rises, the calculated temperature decreases.

- **When Monitored:**
  Ignition on engine running with battery voltage between 9.0 and 16.0 volts.
  Vehicle speed greater than 10 Km/h (6 mph).
  No secondary speed sensor or sensor ground DTCs present.
- **Set Condition:**
  Indicated temperature drops below -40° C (-40° F) for the continuous period of 5.0 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active or is the STARTS SINCE SET counter 2 or less for this DTC?

Yes >> Go To 2

No >> Go To 6

2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

In the following step using the scan tool, monitor the Transmission Temperature voltage.

Jump the (T54) Transmission Temperature Sensor Signal circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector to ground.

Did the Transmission Temperature voltage drop from approximately 2.5 volts to 0.0 volts?

Yes >> Replace the Transmission Temperature Sensor (Valve Body) per the Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

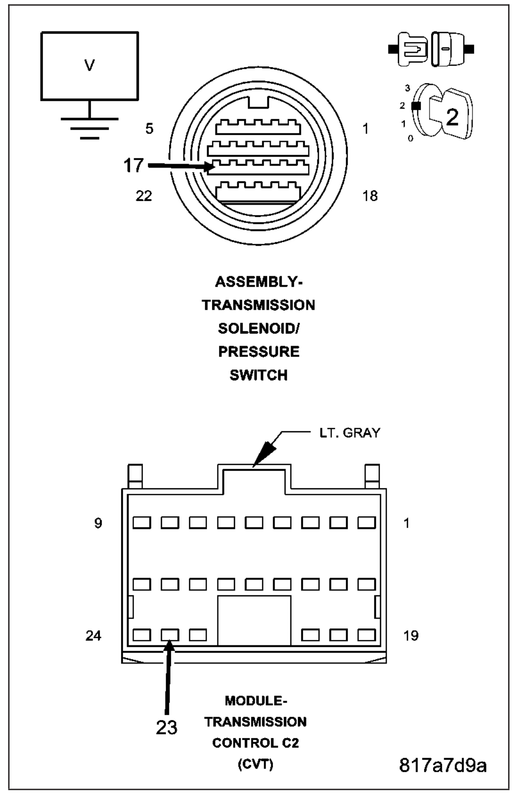
Measure the voltage of the (T54) Transmission Temperature Sensor Signal circuit.

Is the voltage above .05 volts?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4



4. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

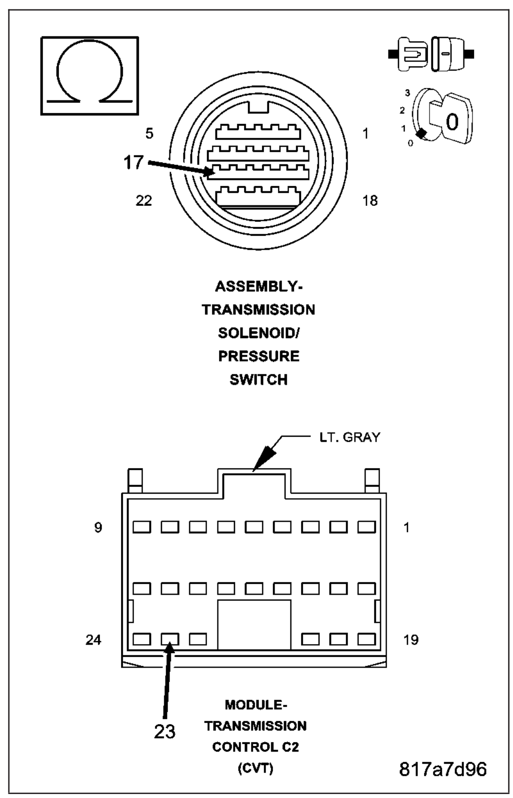
Measure the resistance of the (T54) Transmission Temperature Sensor Signal circuit between the TCM C2 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5



5. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR

Temperature Sensor Resistive Values Chart	
Transmission Temperature	Resistive Value Compared to Temperature (± 10%)
20° C (68° F)	2.5k ohms to 6.5k ohms
80° C (176° F)	0.3k ohms to 0.9k ohms

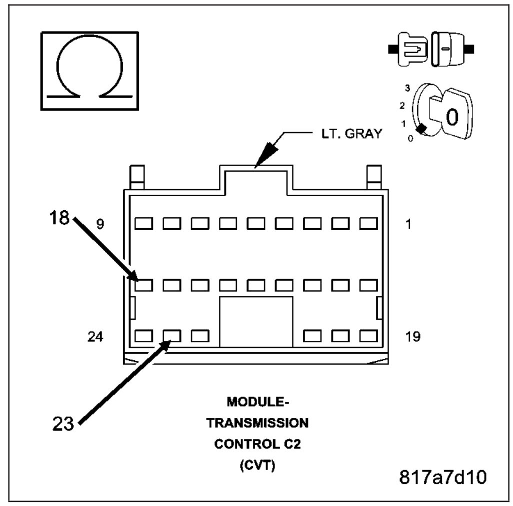
Reconnect all previously disconnected connectors.

Start the engine and allow to obtain normal operating temperature (approximately 10 min. of engine run time).

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and the (T13) Sensor Ground circuit in the TCM C2 harness connector.



Is the resistance within the desired range listed on the above chart?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Transmission Temperature Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

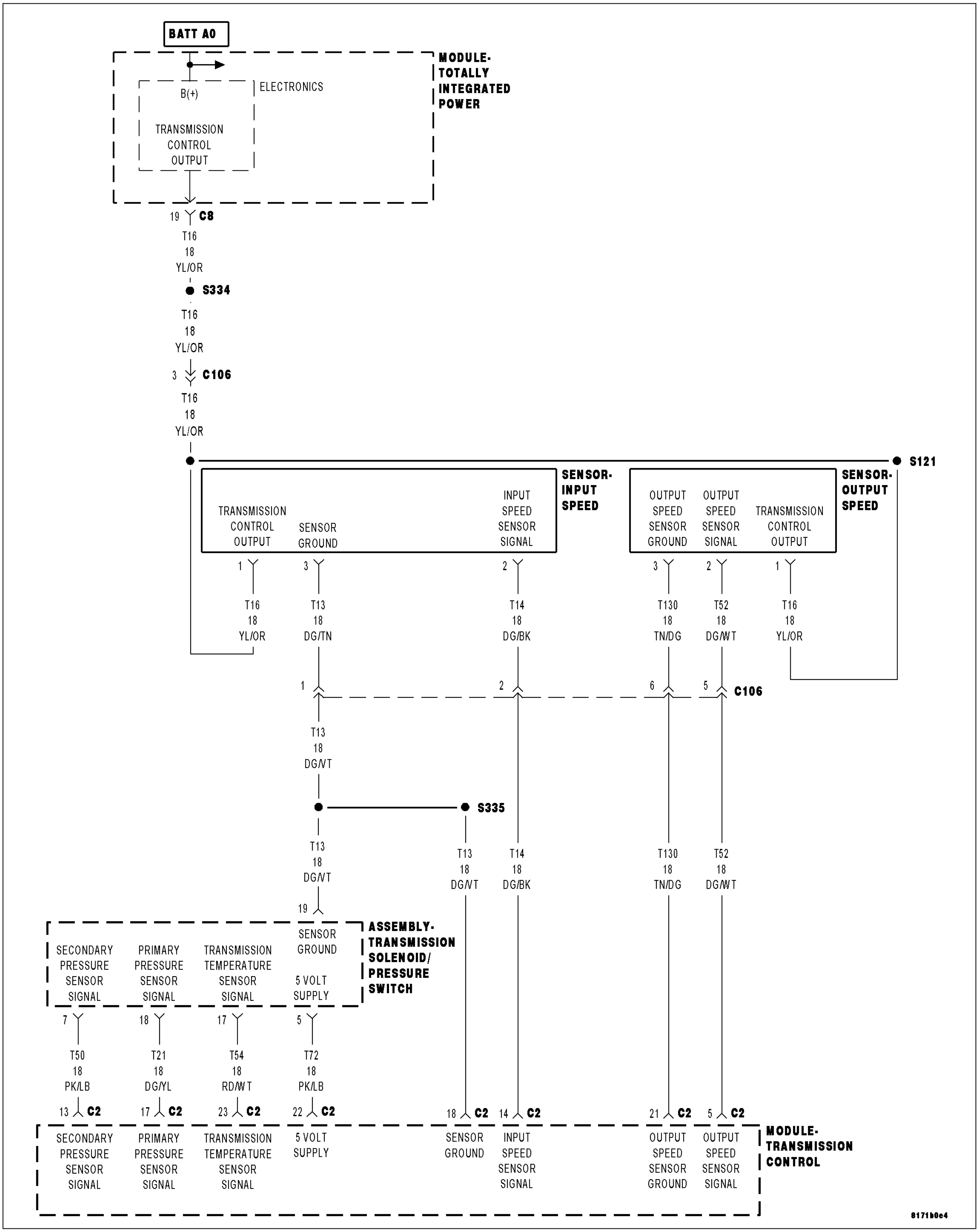
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0716-INPUT SPEED SENSOR 1 CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The transmission system uses two speed sensors. One is used to measure input rpm (primary pulley) and one to measure output rpm (secondary pulley).

The Input Speed sensor detects the primary pulley rpm by the use of a three-wire magnetic pickup devices that generates a square wave signal as rotation occurs and is monitored by the Transmission Control Module (TCM). These inputs are essential for proper transmission operation.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  System voltage between 9.0 and 16.0 volts
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with TCC lock-up enabled.
  No DTCs from the following:
- TCC Solenoid
- Lock-up solenoid
- Step motor
- Input or Output Speed Sensor No Signal
- Transmission Range Sensor (TRS)
- Sensor Ground
- CAN
- **Set Condition:**
  All the below conditions must be present for the period of 5 seconds for the DTC to set:
- Engine speed minus the primary speed is greater than 1000 rpm.
- Secondary speed multiplied by the estimated ratio, minus the Primary speed is greater than 1000 rpm.
- Engine speed minus the Secondary speed, multiplied by the estimated ratio is less than 1000 rpm.

Possible Causes
ENGINE CAM OR CRANK DTCS PRESENT
DIRTY OR DAMAGED INPUT SPEED SENSOR
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
(T14) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T14) INPUT SPEED SENSOR SIGNAL CIRCUIT HIGH RESISTANCE
INPUT SPEED SENSOR
TORQUE CONVERTER CLUTCH
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 10

2. CHECK FOR ENGINE CAM OR CRANK SENSOR DTCS

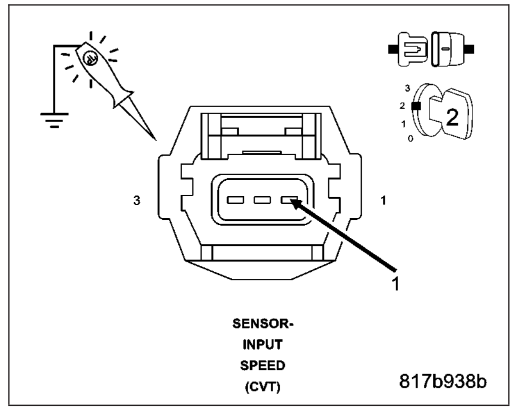
With the scan tool, check engine DTCs.

Are there any Engine Cam or Crank sensor DTCs present?

Yes >> Refer to the engine category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN (HIGH RESISTANCE)



Disconnect the Input Speed Sensor harness connector.

Ignition on, engine not running

With the scan tool under TIPM, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuit at the Input Speed Sensor harness connector.

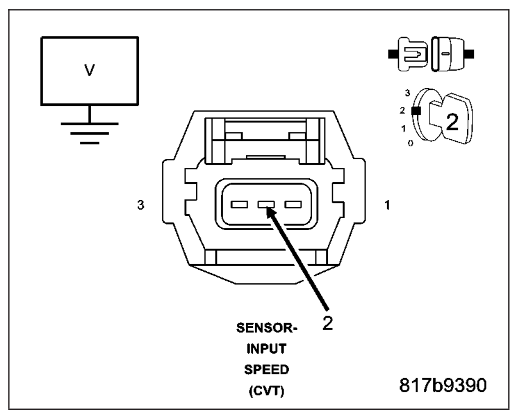
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (T16) Transmission Control Output circuit for an open or high resistance.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT



With the scan tool under TIPM, stop the Transmission actuator.

Turn the ignition off, wait 5 seconds, then turn the ignition on.

Measure the voltage of the (T14) Input Speed Sensor Signal circuit.

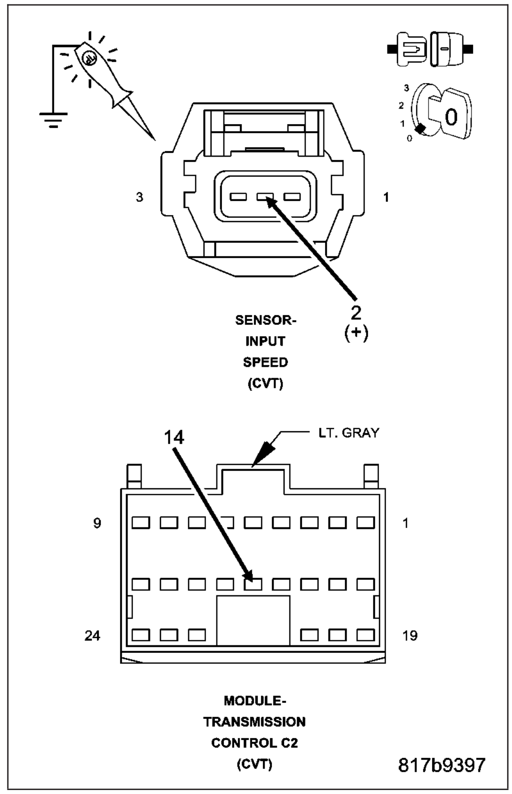
Pick the answer that best matches your findings:

Voltage above 5.5 volts
Go To 6

Voltage below 4.5 volts
Go To 5

Voltage between 4.5 and 5.5 volts
Go To 7

5. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN (HIGH RESISTANCE)



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the (T14) Input Speed Sensor Signal circuit in the Input Speed Sensor harness connector and B(+).

Using a 12-volt test light connected to ground, check the (T14) Input Speed Sensor Signal circuit in the TCM C2 harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

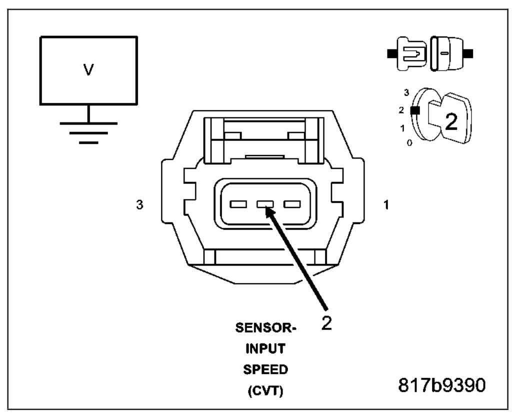
Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair the (T14) Input Speed Sensor Signal circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running

Measure the voltage of the (T14) Input Speed Sensor Signal circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (T14) Input Speed Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. CHECK THE TORQUE CONVERTER

Turn the ignition off to the lock position.

Reinstall all components and reconnect all previously disconnected harness connectors.

Ignition on, engine not running

With the scan tool, erase all Transmission DTCs.

Test drive the vehicle to speeds allowing the Torque Converter to obtain lock-up. Note the Engine rpm compared to the Transmission Input rpm.

Did the difference between the Engine rpm and the Transmission Input rpm differ over 1000 rpm?

Yes >> Go To 8

No >> Go To 9

8. CHECK THE INPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Input Speed Sensor per the Service Information.

Check the Input Speed Sensor for any debris buildup or damage.

Did the Input Speed Sensor show any signs of debris buildup or damage?

Yes >> If there is a debris build up, clean the Output Speed Sensor as necessary and reinstall. If damaged or questionable in condition, replace the Input Speed Sensor.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the Torque Converter per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

9. CHECK IF THE DTC RESETS

Did the DTC P0716-INPUT SPEED SENSOR 1 CIRCUIT PERFORMANCE reset during the test drive?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 10

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Check for any Service Bulletins for possible causes that may apply.

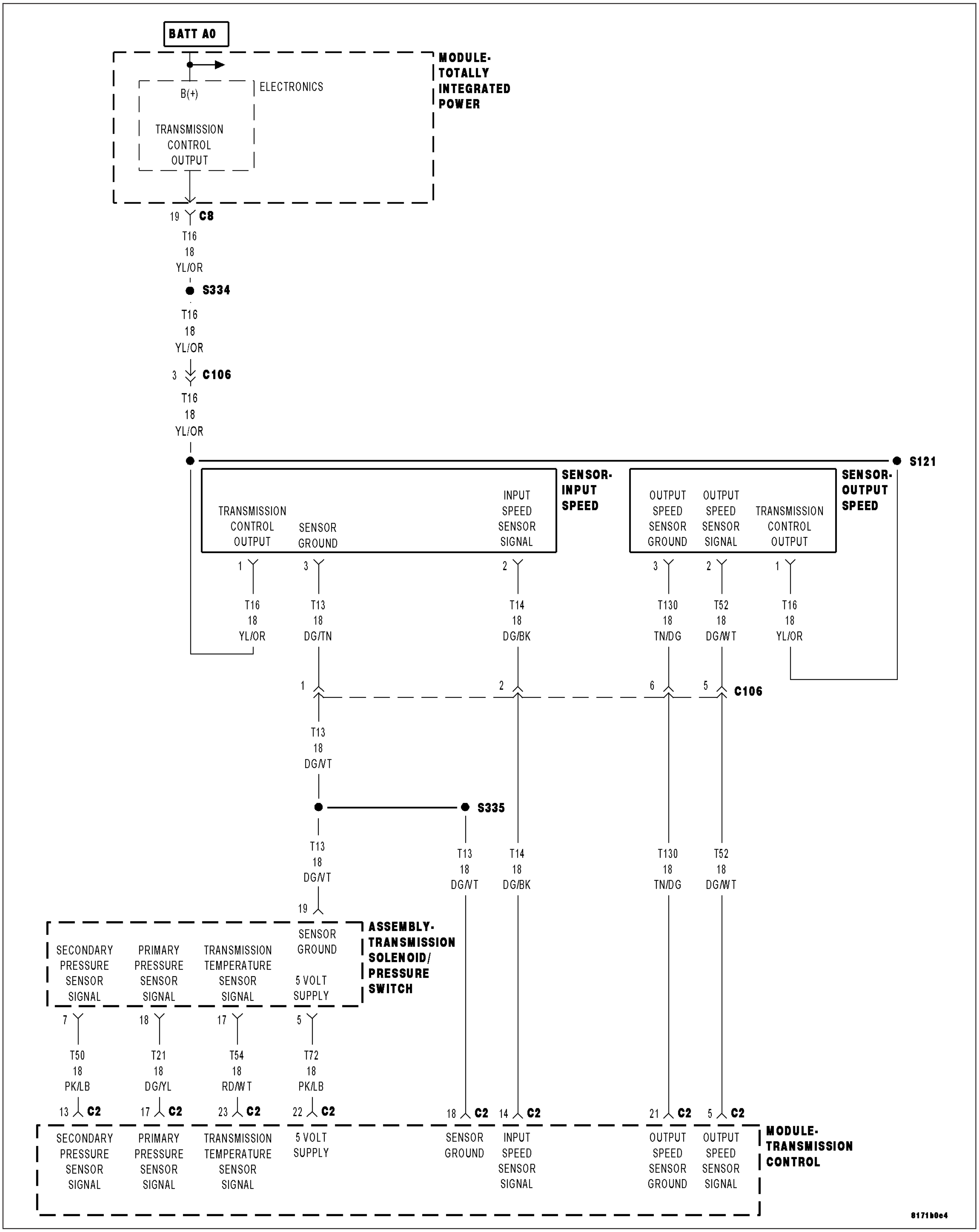
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The transmission system uses two speed sensors. One is used to measure input rpm (primary pulley) and one to measure output rpm (secondary pulley).

The Input Speed sensor detects the primary pulley rpm by the use of a three-wire magnetic pickup device that generates a square wave signal as rotation occurs and is monitored by the Transmission Control Module (TCM). These inputs are essential for proper transmission operation.

- **When Monitored:**
  Ignition on, engine running with system voltage between 9.0 and 16.0 volts.
  No detected Primary Speed Sensor and/or Sensor ground DTCs.
- **Set Condition:**
  Condition one: Input speed rpm is less than 150 rpm with a Output speed rpm greater than 1000 rpm for the period of 5 seconds.
  Condition two: Input speed rpm last value is greater than 1000 rpm where as the Input speed rpm current value is zero rpm for the period of 500 msec.

Possible Causes
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT OPEN
(T14) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T14) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T14) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T13) SENSOR GROUND CIRCUIT OPEN
INPUT SPEED SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 8

2. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN

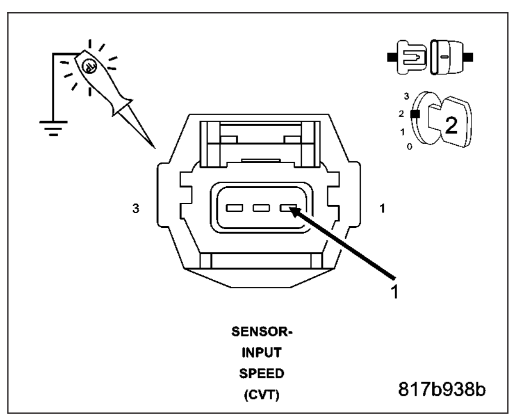
Turn the ignition off to the lock position.

Disconnect the Input Speed Sensor harness connector.

Ignition on, engine not running.

With the scan tool under TIPM, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuit at the Input Speed Sensor harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

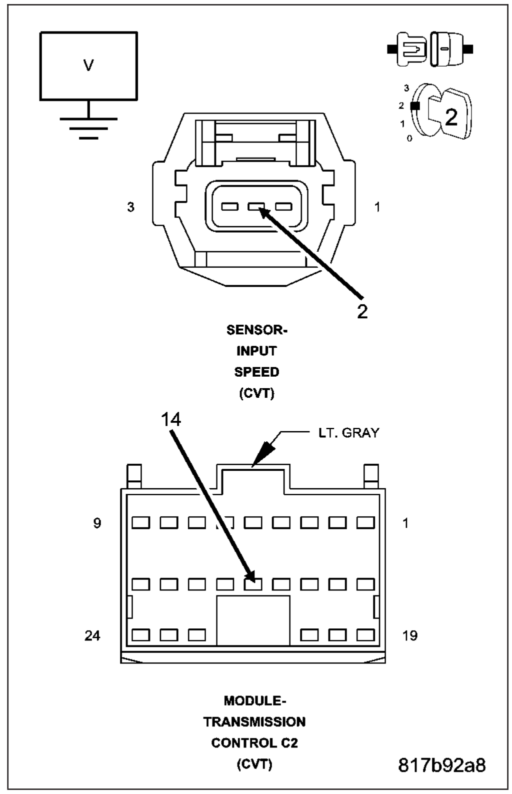
Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (T16) Transmission Control Output circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

3. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T14) Input Speed Sensor Signal circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T14) Input Speed Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

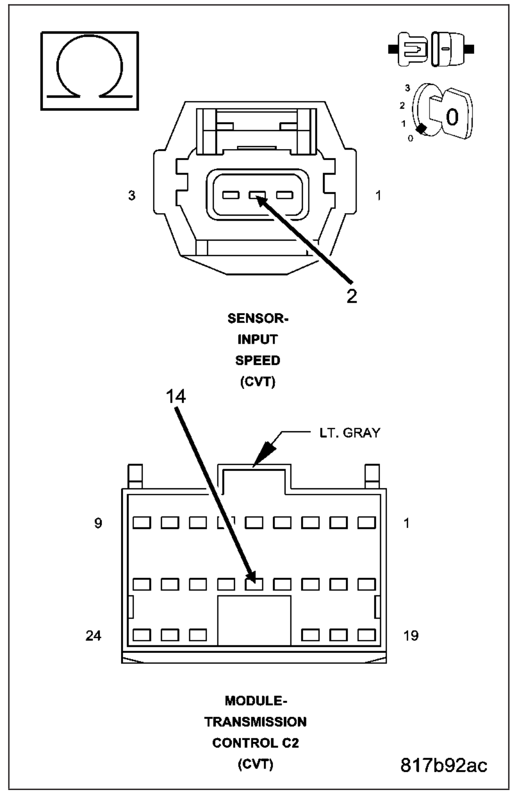
Measure the resistance of the (T14) Input Speed Sensor Signal circuit between the TCM C2 harness connector and the Input Speed Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T14) Input Speed Sensor Signal circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



5. CHECK THE (T14) INPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

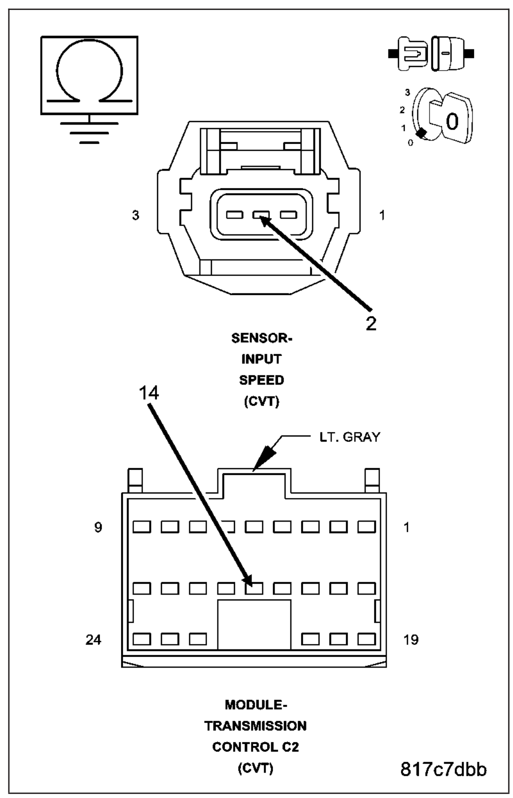
Measure the resistance between ground and the (T14) Input Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T14) Input Speed Sensor Signal circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 6



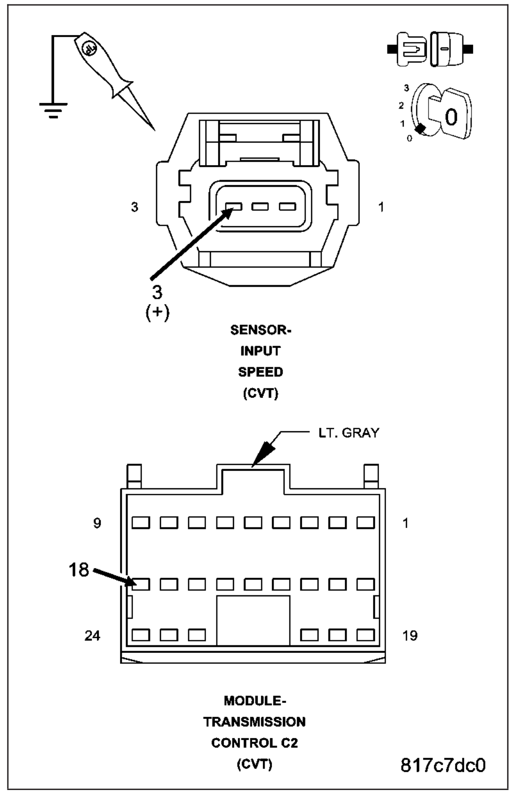
6. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN (HIGH RESISTANCE)

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the (T13) Sensor Ground circuit in the Input Speed Sensor harness connector and B(+).

Using a 12-volt test light connected to ground, check the (T13) Sensor Ground circuit in the TCM C2 harness connector.



Does the test light illuminate brightly?

Yes >> Go To 7

No >> Repair the (T13) Sensor Ground circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. CHECK THE INPUT SPEED SENSOR

Turn the ignition off to the lock position

Replace the Input Speed Sensor per the Service Information.

Reconnect all previously disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase all Transmission DTCs.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

NOTE: Make sure to perform a test drive of the vehicle.

With the scan tool, read Transmission DTCs.

Did the DTC P0717 reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair is complete.

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

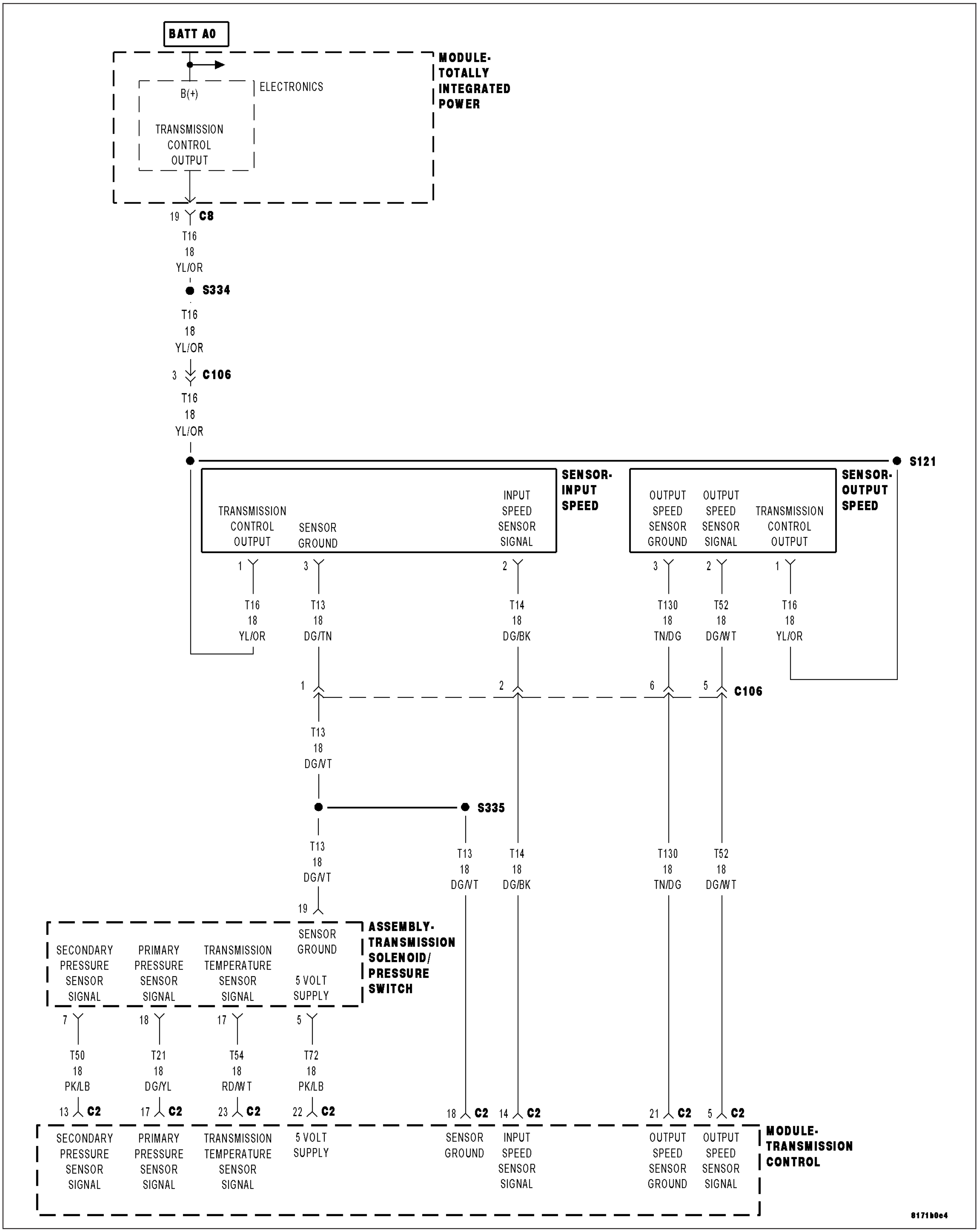
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0721-OUTPUT SPEED SENSOR CIRCUIT PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The transmission system uses two speed sensors. One is used to measure input rpm (primary pulley) and one to measure output rpm (secondary pulley).

The Input Speed sensor detects the primary pulley rpm by the use of a three-wire magnetic pickup device that generates a square wave signal as rotation occurs and is monitored by the Transmission Control Module (TCM). These inputs are essential for proper transmission operation.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  System voltage between 9.0 and 16+.0 volts.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with TCC lock-up enabled.
  No active DTCs from the following:
- Torque Convertor Clutch (TCC)
- Lock-up Solenoid
- CAN Bus
- Step Motor
- Input or Output Speed Sensor No Signal
- Transmission Range Sensor (TRS)
- Sensor Ground
- **Set Condition:**
  All the below conditions must be present for the period of 5 seconds for the DTC to set:
- Engine speed minus the primary speed is less than 1000 rpm.
- Secondary speed multiplied by the estimated ratio, minus the Primary speed is greater than 1000 rpm.
- Vehicle speed minus the Vehicle speed calculated using the Secondary speed, is greater than or equal to 20 Km/h (12.5 mph)

Possible Causes
ENGINE CAM OR CRANK DTCS PRESENT
DIRTY OR DAMAGED OUTPUT SPEED SENSOR
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT HIGH RESISTANCE
(T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT HIGH RESISTANCE
(T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T130) OUTPUT SPEED SENSOR GROUND CIRCUIT HIGH RESISTANCE
OUTPUT SPEED SENSOR
TORQUE CONVERTER CLUTCH
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 11

2. CHECK FOR ENGINE CAM OR CRANK SENSOR DTCS

With the scan tool, check engine DTCs.

Are there any Engine Cam or Crank sensor DTCs present?

Yes >> Refer to the engine category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

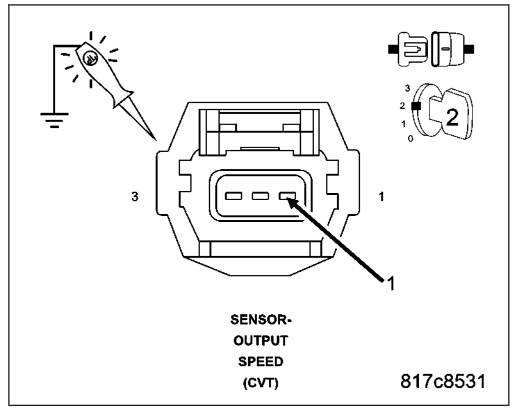
3. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN (HIGH RESISTANCE)

Disconnect the Output Speed Sensor harness connector.

Ignition on, engine not running

With the scan tool under TIPM, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuit at the Output Speed Sensor harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 4

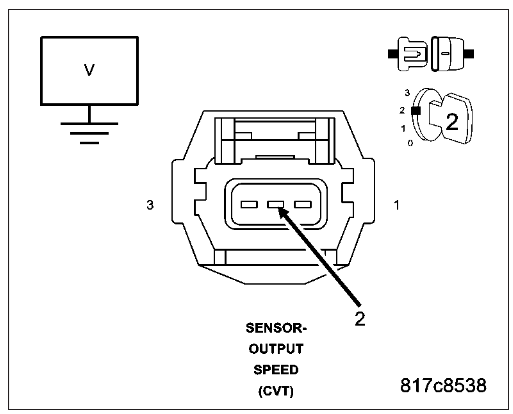
No >> Repair the (T16) Transmission Control Output circuit for an open or high resistance.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT

With the scan tool under TIPM, stop the Transmission actuator.

Turn the ignition off, wait 5 seconds, then turn the ignition on.

Measure the voltage of the (T52) Output Speed Sensor Signal circuit.



Pick the answer that best matches your findings:

Voltage above 9.0 volts
Go To 5

Voltage below 9.0 volts
Go To 6

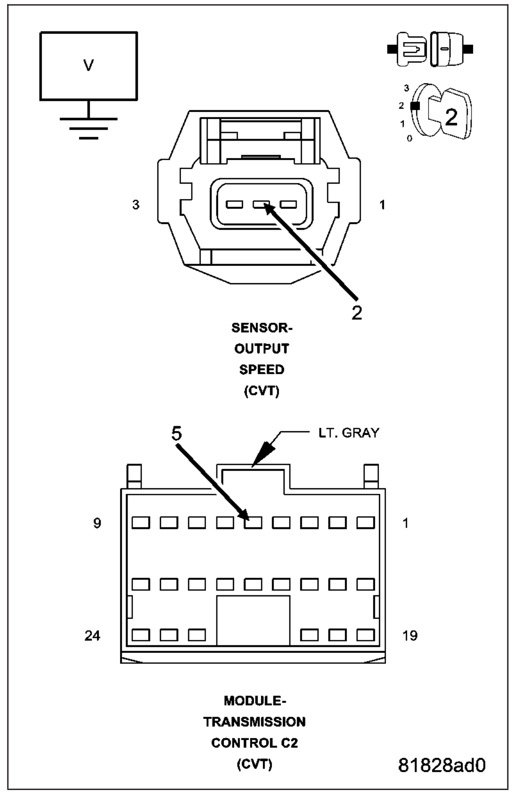
5. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running

Measure the voltage of the (T52) Output Speed Sensor Signal circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (T52) Output Speed Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

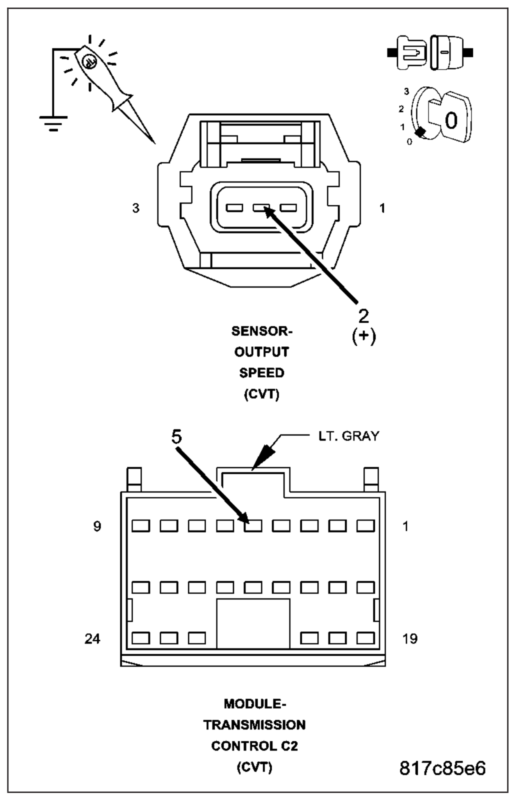
6. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN (HIGH RESISTANCE)

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the (T52) Output Speed Sensor Signal circuit and B(+) in the Output Speed Sensor harness connector.

Using a 12-volt test light connected to ground, check the (T52) Output Speed Sensor Signal circuit in the TCM C2 harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 7

No >> Repair the (T52) Output Speed Sensor Signal circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. CHECK THE (T130) OUTPUT SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Disconnect the jumper wire.

Disconnect the TCM C2 harness connector.

Measure the voltage of the (T130) Output Speed Sensor Ground circuit.

Is the volage above 0.2 volts?

Yes >> Repair the (T130) Output Speed Sensor Ground circuit for a short to voltage

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 8

8. CHECK THE (T130) OUTPUT SPEED SENSOR GROUND CIRCUIT FOR AN OPEN (HIGH RESISTANCE)

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the (T130) Output Speed Sensor Ground circuit in the Output Speed Sensor harness connector and B(+).

Using a 12-volt test light connected to ground, check the (T130) Output Speed Sensor Ground circuit in the TCM C2 harness connector.

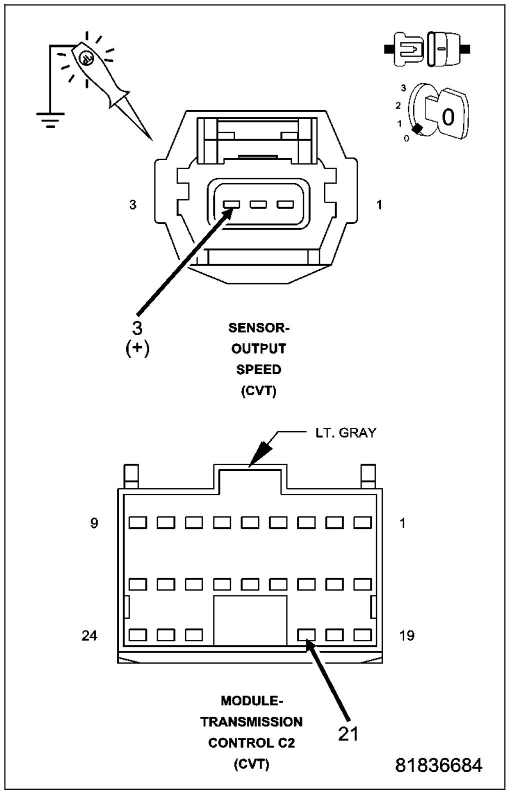
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (T130) Output Speed Sensor Ground circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



9. CHECK THE OUTPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Output Speed Sensor per the Service Information.

Check the Output Speed Sensor for any debris buildup or damage.

Did the Output Speed Sensor show any signs of debris buildup or damage?

Yes >> If there is a debris build up, clean the Output Speed Sensor as necessary and reinstall. If damaged or questionable in condition, replace the Output Speed Sensor.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 10

10. REPLACE SPEED SENSOR AND TEST DRIVE VEHICLE

Turn the ignition off to the lock position.

Replace the Output Speed Sensor per the Service Information

Reconnect all previously disconnected harness connectors.

Ignition on, engine not running

With the scan tool, erase all Transmission DTCs.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

NOTE: Test drive the vehicle to speeds that will allow Torque Converter lock-up.

With the scan tool, read Transmission DTCs.

Does the DTC P0721 reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

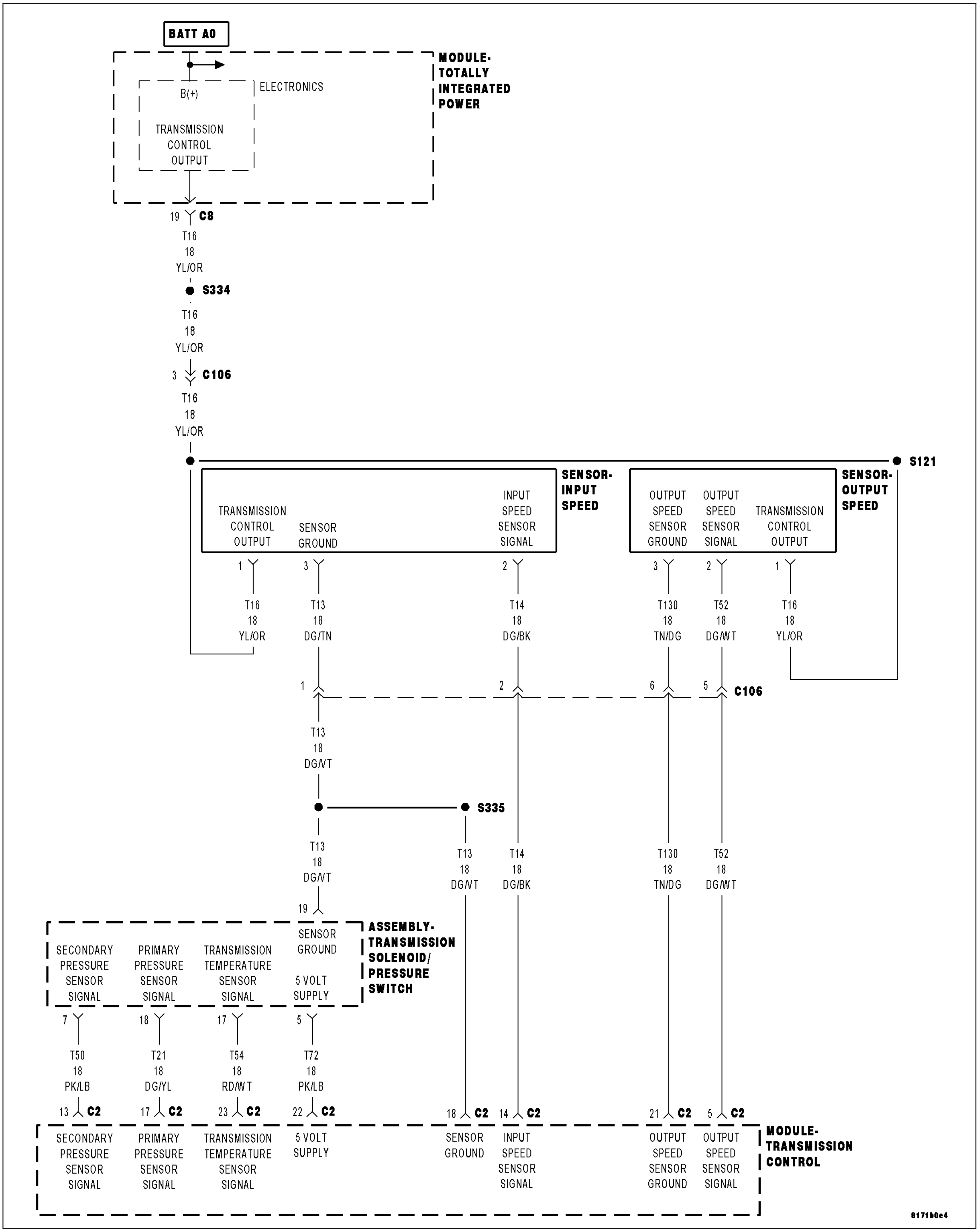
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0722-OUTPUT SPEED SENSOR CIRCUIT NO SIGNAL



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The transmission system uses two speed sensors. One is used to measure input rpm (primary pulley) and one to measure output rpm (secondary pulley).

The Output Speed sensor detects the secondary pulley rpm by the use of a three-wire magnetic pickup device that generates a square wave signal as rotation occurs and is monitored by the Transmission Control Module (TCM). These inputs are essential for proper transmission operation.

- **When Monitored:**
  Ignition on, engine running with system voltage between 9.0 and 16.0 volts.
  No detected Primary Speed Sensor and/or Sensor ground DTCs.
- **Set Condition:**
  Condition one: Output speed rpm is less than 150 rpm with a Input speed rpm greater than 1000 rpm for the period of 5 seconds.
  Condition two: Vehicle speed is greater than 20 Km/h (12.5 mph) calculated by the last secondary speed with the current Output Speed value equals to 0 rpm for the period of 500 msec.

Possible Causes
(T16) TRANSMISSION CONTROL OUTPUT CIRCUIT OPEN
(T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T130) OUTPUT SPEED SENSOR GROUND CIRCUIT OPEN
OUTPUT SPEED SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 8

2. CHECK THE (T16) TRANSMISSION CONTROL OUTPUT CIRCUIT FOR AN OPEN

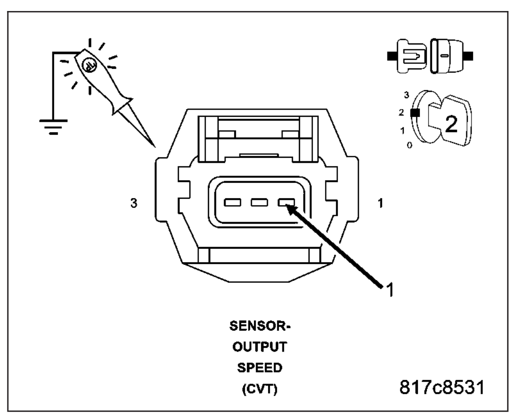
Turn the ignition off to the lock position.

Disconnect the Output Speed Sensor harness connector.

Ignition on, engine not running.

With the scan tool under TIPM, actuate the Transmission.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Output circuit at the Output Speed Sensor harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (T16) Transmission Control Output circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

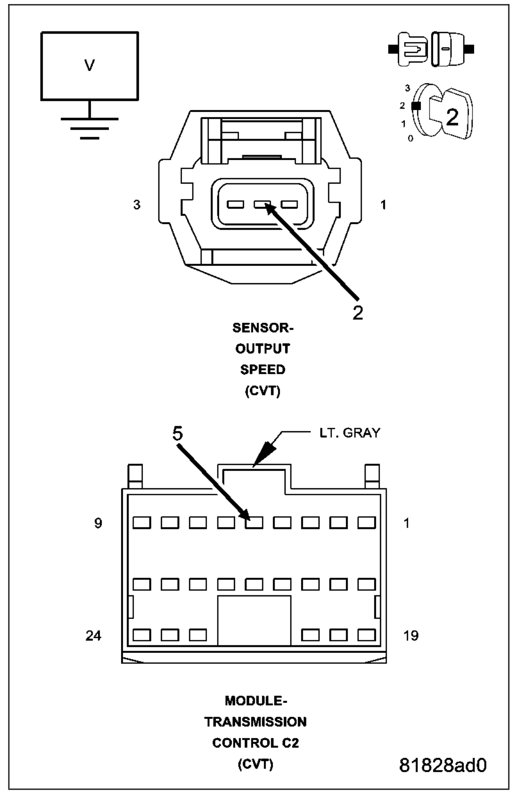
3. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T52) Output Speed Sensor Signal circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T52) Output Speed Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

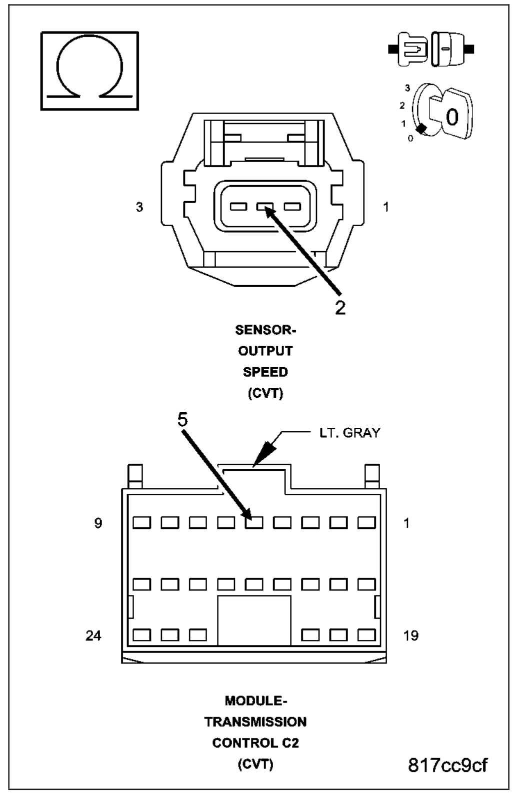
Measure the resistance of the (T52) Output Speed Sensor Signal circuit between the TCM C2 harness connector and the Output Speed Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T52) Output Speed Sensor Signal circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



5. CHECK THE (T52) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

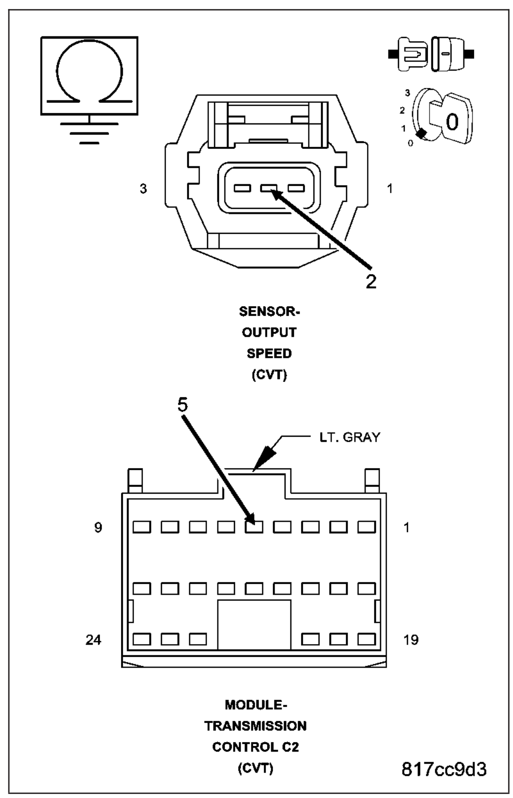
Measure the resistance between ground and the (T52) Output Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T52) Output Speed Sensor Signal circuit for a short to ground.

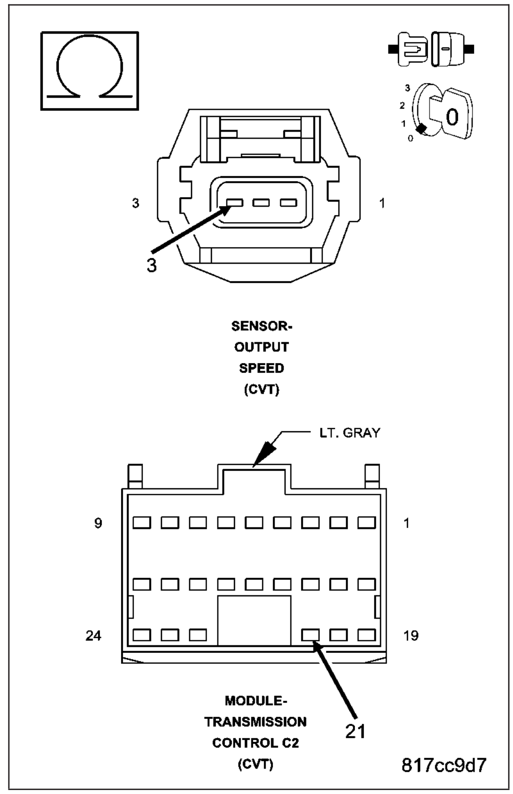
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 6



6. CHECK THE (T130) OUTPUT SPEED SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (T130) Output Speed Sensor Ground circuit between the TCM C2 harness connector and the Output Speed Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the (T130) Output Speed Sensor Ground circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. CHECK THE OUTPUT SPEED SENSOR

Turn the ignition off to the lock position

Replace the Output Speed Sensor per the Service Information.

Reconnect all previously disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase all Transmission DTCs.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

NOTE: Make sure to perform a test drive of the vehicle.

With the scan tool, read Transmission DTCs.

Did the DTC P0722 reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair is complete.

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0730-INCORRECT GEAR RATIO

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module controls the gear ratio by the use of a Step motor that transfers electrical power to mechanical movement. The rationality is a continuous test that monitors the Step motor movement. If the Step motor is stuck at a certain position, the estimated ratio is increased or decreased continuously by the feedback value of the primary pulley speed difference. When the difference between the estimated and actual primary pulley speed has reached 1000 rpm, a DTC will set.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  System voltage between 9.0 and 16.0 volts.
  Accelerator Pedal Position (APP) greater than 12.5% with an engine rpm greater than 450 rpm.
  Vehicle speed greater than 10 Km/h (6 mph).
  Transmission fluid temperature greater than 20° C (68° F).
  No active DTCs from the following:
- Step Motor
- Transmission Temperature Sensor
- Transmission Range Sensor
- Line Pressure Solenoid
- Input or Output Speed Sensor
- Primary or Secondary Pressure Sensor
- Over Temperature
- **Set Condition:**
  If the difference between the transmission estimated pulley speed and the measured primary pulley speed is greater than 1000 rpm (belt slipping) for the continuous period of 5.0 seconds.

Possible Causes
STEP MOTOR PERFORMANCE
SHIFT VALVE STICKING
CVT BELT SLIPPING
HYDRAULIC CIRCUIT
INTERNAL TRANSMISSION

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. REPAIR INTERNAL TRANSMISSION

This DTC indicates an internal transmission problem.

Check for the following possible causes but not limited to these:

- Step motor
- Shift Valve sticking
- CVT Belt slipping
- Hydraulic control circuit including the Valve Body

Repair

Replace or repair the CV Transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

P0741-TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE

Theory of Operation

The Transmission Control Module (TCM) monitors the Torque Convertor Clutch for slippage using a calculation derived from turbine revolution (input speed) and engine rpm broadcast over the CAN C BUS. If the slip value exceeds a predetermined value the DTC will set.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  System voltage between 9.0 and 16.0 volts.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with TCC lock-up enabled.
  TCC Lock up command is ON (True).
  No active DTCs from the following:
- Step motor,
- Line Pressure Solenoid
- Secondary Solenoid
- Input or Output Speed Sensor
- Primary or Secondary Pressure Sensor
- CAN Bus
- **Set Condition:**
  The DTC is detected If the Torque Convertor Clutch (TCC) slip monitored by the Transmission Control Module (TCM) is greater than a predetermined value for the period of 30 seconds. Note: This is not an electrical fault but a mechanical malfunction such as a control valve sticking in its bore or a TCC Solenoid hydraulic malfunction. It takes two consecutive problem identification trips for the DTC to mature and illuminate the MIL.

Possible Causes
TORQUE CONVERTOR HYDRAULIC CIRCUIT
TORQUE CONVERTOR CLUTCH SOLENOID
TORQUE CONVERTOR CLUTCH
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, erase Transmission DTCs.

Start the vehicle and check Transmission Fluid Level per the Service Information and adjust as necessary.

Test drive the vehicle to a constant speed greater than 40 Km/h (25 mph) for the period of at least 30 seconds.

NOTE: This can not be performed on a hoist, actual road conditions must be present for proper results.

Did the DTC reset (one trip) during the road test?

Yes >> Replace or repair the CV Transmission as necessary. Note the components related to the Torque Converter Clutch (TCC) such as the TCC Solenoid, control valves, valve body leakage or the TCC. Refer to the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 2

2. INTERMITTENT CONDITION

The conditions necessary to set this DTC are not present at this time.

Refer to an Technical Service Bulletins that may apply.

It may be necessary to Test Drive the vehicle again trying different conditions that may cause the DTC to reset.

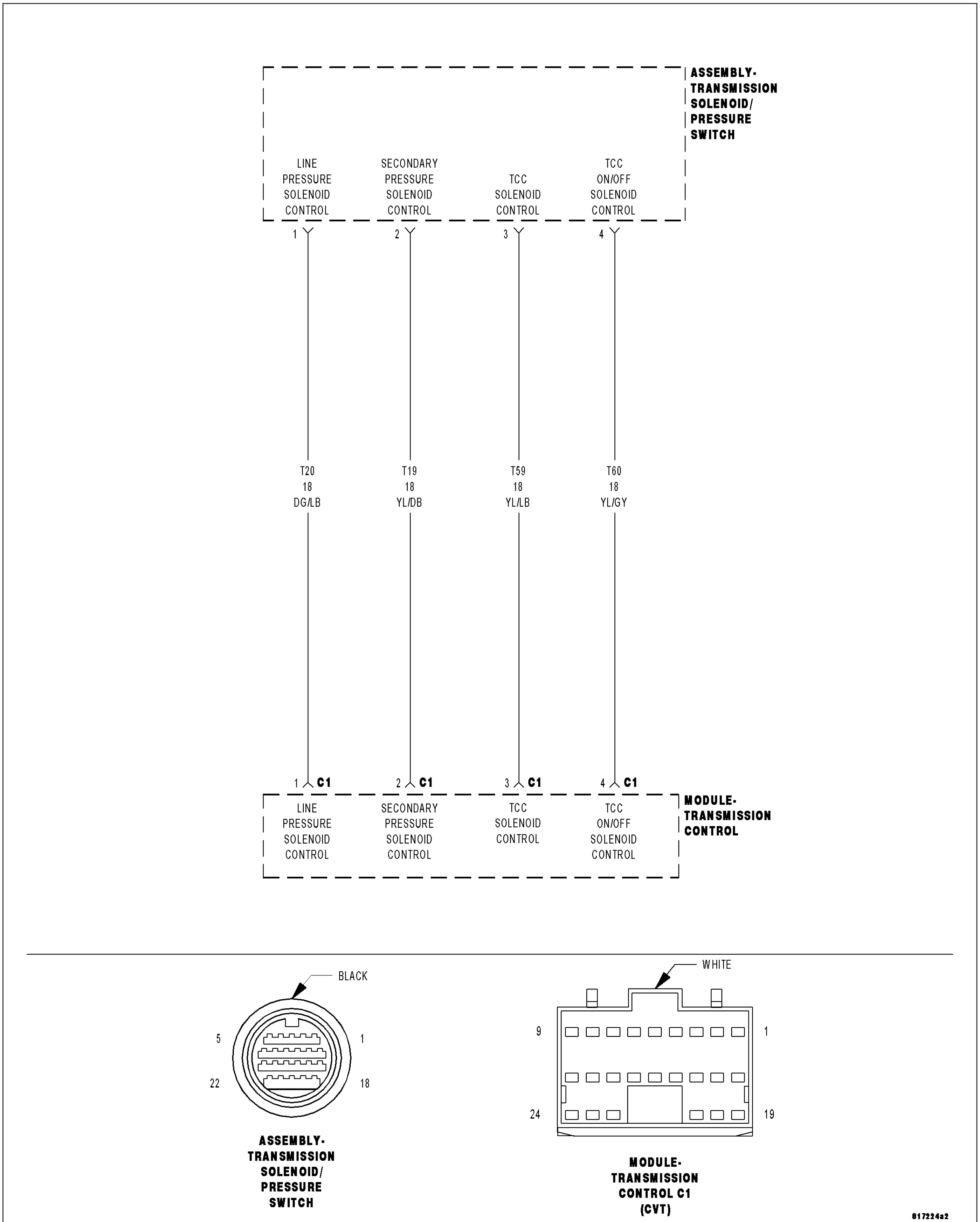
Were there any problems found or did the DTC reset?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0746-LINE PRESSURE SOLENOID PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Line Pressure Solenoid regulates the Line Pressure (Oil Pump discharge pressure) which is controlled by the Transmission Control Module (TCM). If the line pressure does not reach at the desired pressure due to driving conditions, the possibility of belt slippage can occur. The gear ratio changes to a value beyond the maximum gear ratio which is a calculation between the Primary Pulley speed and the Secondary Pulley speed. If the gear ratio exceeds a predetermined limit a DTC will set.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm.
  Primary Pulley Speed grater than 500 rpm.
  No active DTCs from the following:
- Line Pressure Solenoid
- Temperature Sensor
- Primary or Secondary Pressure Sensor
- Transmission Range Sensor
- Step Motor
- Secondary Solenoid electrical
- Input and Output Speed Sensor
- Torque Convertor Clutch
- CAN Bus
- Over Temperature Condition
- **Set Condition:**
  Condition one: Gear ratio is greater than 2.7 - 2 for the period of 0.2 seconds (first trip).
  Condition two: Gear ratio is greater than 3.5 - 1 for the period of 0.1 seconds (second trip).

Possible Causes
(T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT OPEN (HIGH RESISTANCE)
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

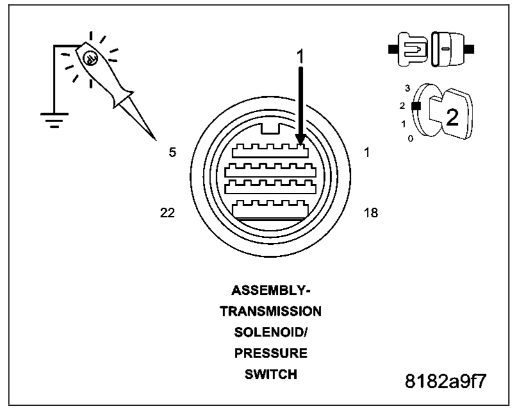
With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

2. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT



Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Line Pressure Solenoid (PL).

Using a 12-volt test light connected to ground, check the (T20) Line Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

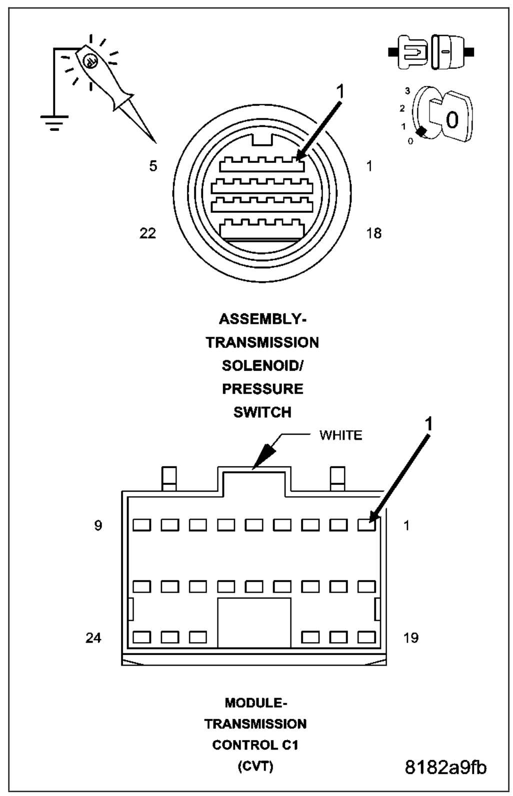
Does the test light illuminate brightly?

Yes >> Replace or repair the CV Transmission per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE TRANSMISSION CONTROL MODULE



Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Connect a jumper wire between the (T20) Line Pressure Solenoid Control circuit in the TCM C1 harness connector and B(+).

Using a 12-volt test light connected to ground, check the (T20) Line Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

Does the test light illuminate brightly?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair the (T20) Line Pressure Solenoid Control circuit for an open (high resistance).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

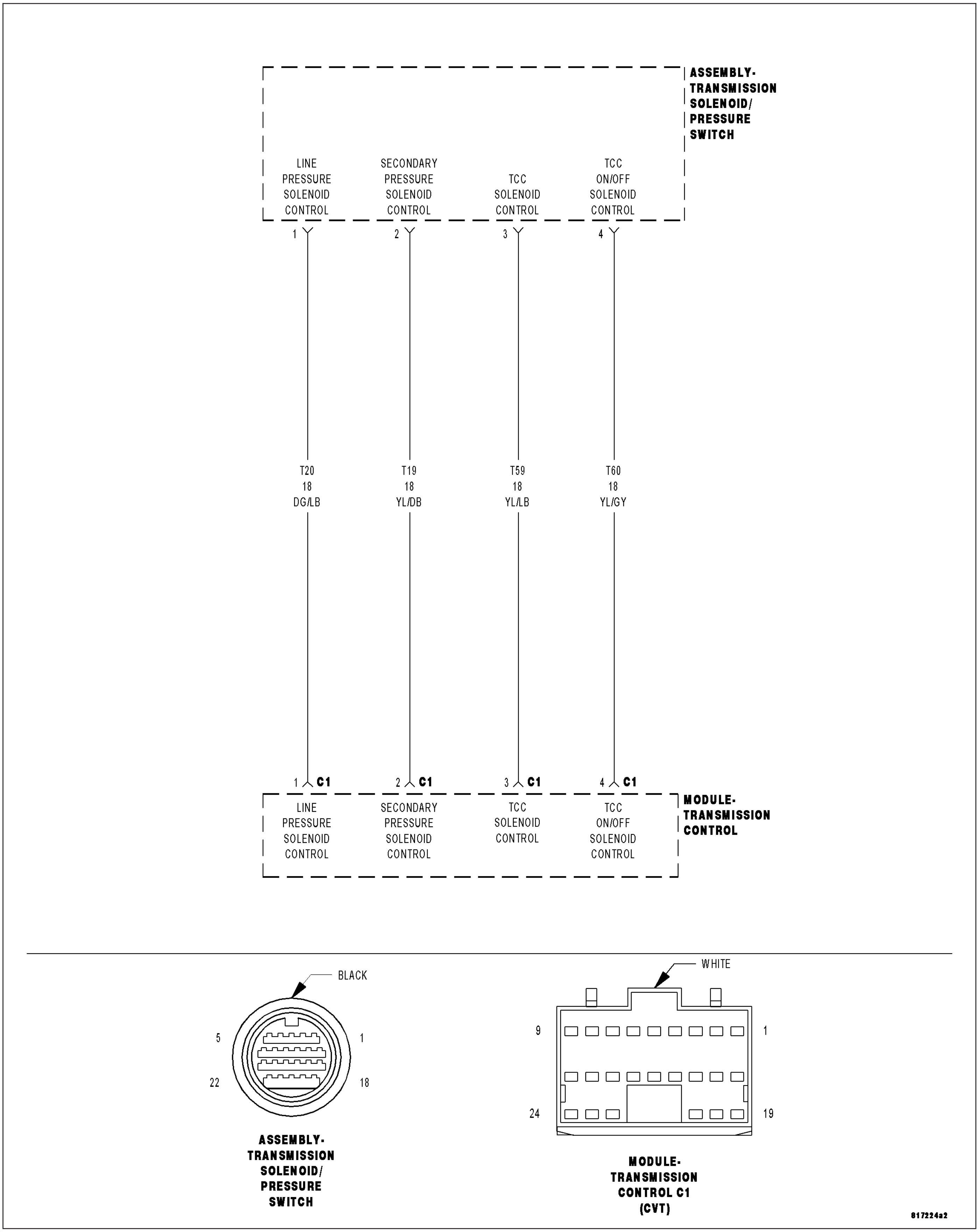
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0776-SECONDARY PRESSURE SOLENOID STUCK OFF (HIGH PRESSURE)



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the secondary line pressure (secondary pulley pressure) from the secondary pressure sensor. The TCM compares the actual secondary line pressure to the target (desired) line pressure. Failure to match the target line pressure over a given time will set the DTC.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with a transmission fluid temperature greater than 20° C (68° F)
  No active DTCs from the following:
- Line Pressure Solenoid
- Lock-up Solenoid
- Primary or Secondary Pressure Sensor
- Transmission Range Sensor
- Step Motor
- Secondary Solenoid electrical
- Input and Output Speed Sensor
- Torque Convertor Clutch
- CAN Bus
- Over Temperature Condition
- **Set Condition:**
  When the difference between actual secondary pressure compared to the target (desired) secondary pressure is greater than 1200 Kpa (174 psi) for the period of 30 seconds. It takes two consecutive problem identified trips to set the DTC.

Possible Causes
(T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT
LINE PRESSURE
SECONDARY PRESSURE SENSOR
SECONDARY PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 7

2. CHECK LINE PRESSURE

Approximate Engine rpm to Line pressure readings

Engine rpm	Line Pressure
Idle	750 kPa (108.8 psi) ± 2%
2.0L – 2500 to 3000 rpm 2.4L – 2600 to 3100 rpm	5300 - 5700 kPa (768.5 - 826.5 psi) ± 2%

Start the engine and warm the transmission to 50 - 80° C (122 - 174° F).

Turn the ignition off to the lock position.

Install an appropriate pressure gauge in the Line Pressure test port per the Service Information.

WARNING: The CV Transmission can generate a line pressure up to 7000 kPa (1015 psi). Failure to use recommended test equipment referred to by the Service Information can result in personal injury or death.

With the scan tool, erase Transmission DTCs.

WARNING: Apply the parking brake. Failure to follow these instructions can result in personal injury or death.

With the brakes firmly applied, start the engine allow to idle and shift the transmission into Reverse, Drive and Low while recording the scan tool Line pressure reading and the pressure gauge reading in each shift lever position.

With the brakes still firmly applied, raise the engine rpm between 2700 - 3250 rpm and shift the transmission into Reverse, Drive and Low while recording the scan tool line pressure reading and the pressure gauge reading in each shift lever position.

CAUTION: Do not hold the engine rpm between 2700 - 3250 rpm for more than 5 seconds in any given shift position. If the 5 second threshold is exceeded, transmission damage can occur. Allow to idle in neutral between shifts for at least 15 to 20 seconds to allow transmission fluid to cool.

Do the gauge readings fall into the desired pressure ranges?

Yes >> Go To 4

No >> Go To 3

3. VERIFY PROBLEM

Possible causes to conditions detected

ENGINE RPM	LINE PRESSURE CONDITION DETECTED	POSSIBLE CAUSES BUT NOT JUST LIMITED TO THESE
Idle speed	Low for all shift lever positions	Oil Pump Wear
		Pressure Regulator Valve for plug sticking or spring fatigue
		Oil filter, oil pump, pressure regulator valve passage oil leak
		Engine idle speed too low
	Only low for a specific position	Oil pressure leak in a passage or component related to the position after the pressure is distributed by the manual valve
	High	TP or APP sensor signal malfunction
		CVT fluid temperature sensor malfunction
		Line pressure solenoid sticking in the off state, filter plugged, cut line
		Pressure regulator valve or plug sticking
Engine rpm between 2700 and 3250 rpm	Line pressure does not rise above the line pressure at idle	TP or APP sensor signal malfunction
		Line pressure solenoid sticking in the on state, filter plugged
		Pressure regulator valve or plug sticking
		Transmission Control Module (TCM)
		Oil pump weak or worn
	Line Pressure rises but does not reach desired level	TP or APP sensor signal malfunction
		Line pressure solenoid sticking in the off state, filter plugged, cut line
		Pressure regulator valve or plug sticking
		Oil pump weak or worn
	Line pressure is low in only one shift lever position	Oil pressure leak in a passage or component related to the position after the pressure is distributed by the manual valve

Use the above chart to help identify the possible cause.

NOTE: There may be other possible causes besides those listed on the above chart. Review any Service Bulletins and refer to the Service Information for any additional possible causes that may apply.

View repair

Repair

Replace or repair the CV Transmission as necessary per the Service Information

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE SECONDARY PRESSURE

Turn the ignition off to the lock position.

Disconnect the pressure gauge from the Line Pressure test port and reinstall the test port plug.

Install the pressure gauge in the Secondary Pressure test port per the Service Information.

With the scan tool, erase Transmission DTCs.

WARNING: Apply the parking brake. Failure to follow these instructions can result in personal injury or death.

With the brakes firmly applied, start the engine allow to idle and shift the transmission into Reverse, Drive and Low while comparing the Secondary Pressure gauge reading to the scan tool Secondary Pressure reading in each shift lever position and record your findings.

With the brakes still firmly applied, raise the engine rpm between 2700 - 3250 rpm and shift the transmission into Reverse, Drive and Low while comparing the gauge Secondary Pressure to the scan tool Secondary Pressure in each shift lever position and record your findings.

CAUTION: Do not hold the engine rpm between 2700 - 3250 rpm for more than 5 seconds in any given shift position. If the 5 second threshold is exceeded, transmission damage can occur. Allow to idle in neutral between shifts for at least 15 to 20 seconds to allow transmission fluid to cool.

Does the Secondary Pressure gauge readings match the scan tool readings in all of the above procedures?

Yes >> Replace or repair the CV Transmission as necessary per the Service Information for components related to the Secondary pressure solenoid.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE SECONDARY PRESSURE SENSOR

Turn the ignition off to the lock position.

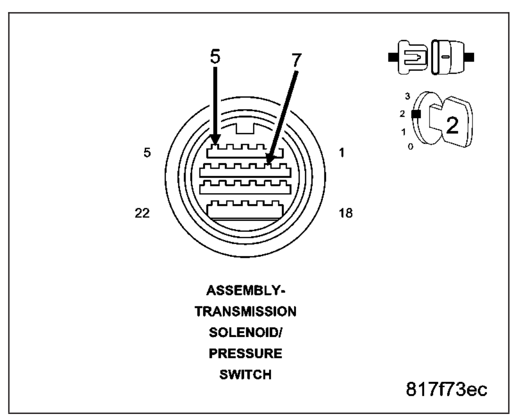
Disconnect the pressure gauge from the Secondary Pressure test port and reinstall the test port plug.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Connect a jumper wire between the (T50) Secondary Pressure Sensor Signal circuit and the and the (T72) 5-volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool read the Secondary Pressure voltage.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the CVT or the Secondary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 6

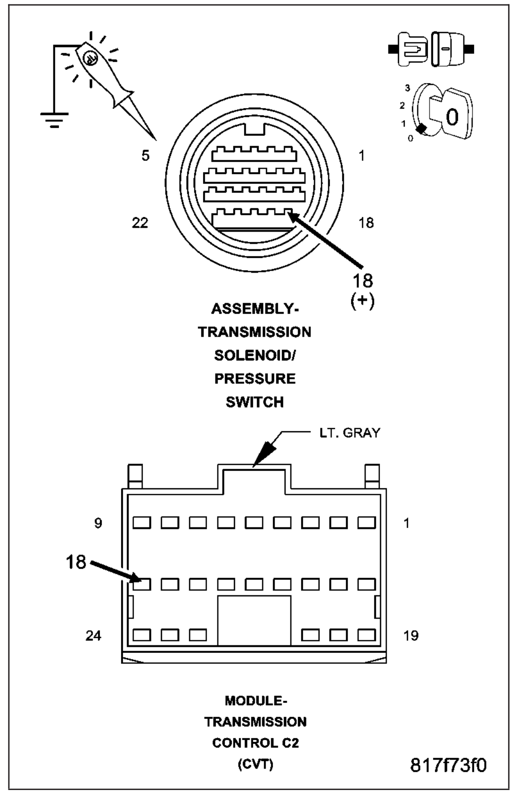
6. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT FOR HIGH RESISTANCE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the B(+) and the (T21) Primary Pressure Sensor Signal circuit in the Transmission Solenoid/Pressure Switch harness connector.

Using a 12-volt test light connected to ground, check the (T21) Primary Pressure Sensor Signal circuit in the TCM C2 harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair the (T21) Primary Pressure Sensor Signal circuit for an open (high resistance).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

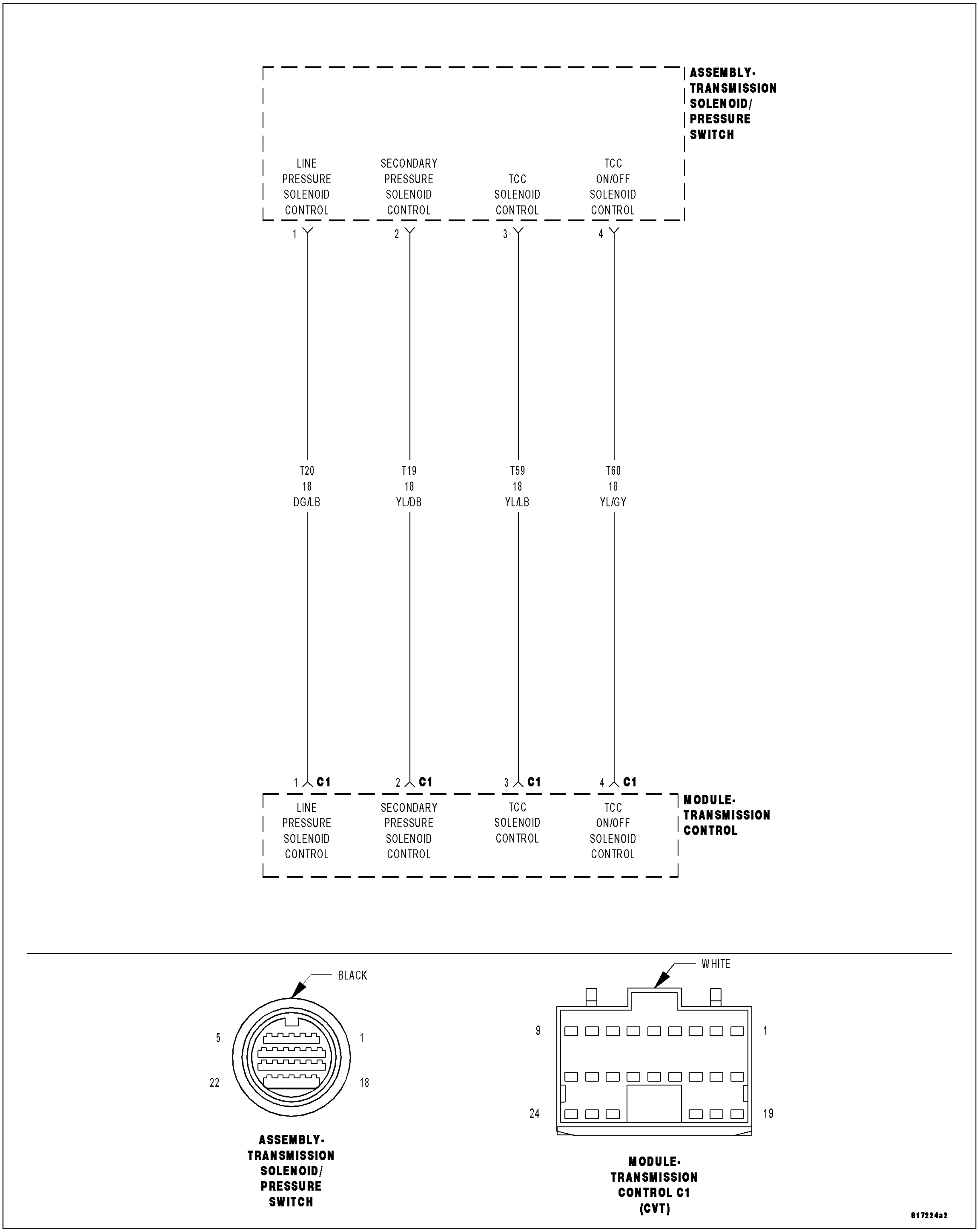
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0777-SECONDARY PRESSURE SOLENOID STUCK ON (LOW PRESSURE)



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the secondary line pressure (secondary pulley pressure) from the secondary pressure sensor. The TCM compares the actual secondary line pressure to the target (desired) line pressure. Failure to match the target line pressure over a given time will set the DTC.

- **When Monitored:**
  Ignition on, engine running with the transmission not in neutral or park.
  Transmission fluid temperature greater than -20° C (-4° F).
  Brake Switch in the OFF mode.
  Change rate of vehicle speed greater than 24 Km/h (15 mph).
  Change rate of accelerator pedal position less than ± 6.25%.
  Engine rpm greater than 450 rpm with a transmission fluid temperature greater than 20° C (68° F)
  No active DTCs from the following:
- Line Pressure Solenoid
- Primary or Secondary Pressure Sensor
- Step Motor
- Secondary Solenoid electrical
- Input and Output Speed Sensor
- CAN Bus
- **Set Condition:**
  When the secondary pressure goes down gradually below a predetermined value during a drive cycle. The DTC could be due to the failure of the secondary pressure control system, secondary pressure solenoid performance or line pressure solenoid. There are two possible setting conditions to set this DTC.
  Condition one:
- Target secondary pressure minus the measured secondary pressure is greater than 0.25 MPa (36 psi) for two consecutive instances of a problem identification for the period of 1.5 seconds within a 30 second interval.
  Condition two:
- Target secondary pressure minus the measured secondary pressure is greater than 2.0 MPa (291 psi) for the period of 800 msec.

Possible Causes
(T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT
LINE PRESSURE SOLENOID
SECONDARY PRESSURE SENSOR
SECONDARY PRESSURE SOLENOID
SECONDARY PRESSURE CONTROL SYSTEM
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 7

2. CHECK LINE PRESSURE

Approximate Engine rpm to Line pressure readings

Engine rpm	Line Pressure
Idle	750 kPa (108.8 psi) ± 2%
2.0L – 2500 to 3000 rpm 2.4L – 2600 to 3100 rpm	5300 - 5700 kPa (768.5 - 826.5 psi) ± 2%

Start the engine and warm the transmission to 50 - 80° C (122 - 174° F).

Turn the ignition off to the lock position.

Install an appropriate pressure gauge in the Line Pressure test port per the Service Information.

WARNING: The CV Transmission can generate a line pressure up to 1800 psi. Failure to use recommended test equipment referred to by the Service Information can result in personal injury or death.

With the scan tool, erase Transmission DTCs.

WARNING: Apply the parking brake. Failure to follow these instructions can result in personal injury or death.

With the brakes firmly applied, start the engine allow to idle and shift the transmission into Reverse, Drive and Low while recording the scan tool Line pressure reading and the pressure gauge reading in each shift lever position.

With the brakes still firmly applied, raise the engine rpm between 2700 - 3250 rpm and shift the transmission into Reverse, Drive and Low while recording the scan tool line pressure reading and the pressure gauge reading in each shift lever position.

CAUTION: Do not hold the engine rpm between 2700 - 3250 rpm for more than 5 seconds in any given shift position. If the 5 second threshold is exceeded, transmission damage can occur. Allow to idle in neutral between shifts for at least 15 to 20 seconds to allow transmission fluid to cool.

Do the gauge readings fall into the desired pressure ranges?

Yes >> Go To 4

No >> Go To 3

3. VERIFY PROBLEM

Possible causes to conditions detected

ENGINE RPM	LINE PRESSURE CONDITION DETECTED	POSSIBLE CAUSES BUT NOT JUST LIMITED TO THESE
Idle speed	Low for all shift lever positions	Oil Pump Wear
		Pressure Regulator Valve for plug sticking or spring fatigue
		Oil filter, oil pump, pressure regulator valve passage oil leak
		Engine idle speed too low
	Only low for a specific position	Oil pressure leak in a passage or component related to the position after the pressure is distributed by the manual valve
	High	TP or APP sensor signal malfunction
		CVT fluid temperature sensor malfunction
		Line pressure solenoid sticking in the off state, filter plugged, cut line
		Pressure regulator valve or plug sticking
Engine rpm between 2700 and 3250 rpm	Line pressure does not rise above the line pressure at idle	TP or APP sensor signal malfunction
		Line pressure solenoid sticking in the on state, filter plugged
		Pressure regulator valve or plug sticking
		Transmission Control Module (TCM)
		Oil pump weak or worn
	Line Pressure rises but does not reach desired level	TP or APP sensor signal malfunction
		Line pressure solenoid sticking in the off state, filter plugged, cut line
		Pressure regulator valve or plug sticking
		Oil pump weak or worn
	Line pressure is low in only one shift lever position	Oil pressure leak in a passage or component related to the position after the pressure is distributed by the manual valve

Use the above chart to help identify the possible cause.

NOTE: There may be other possible causes besides those listed on the above chart. Review any Service Bulletins and refer to the Service Information for any additional possible causes that may apply.

View repair

Repair

Replace or repair the CV Transmission as necessary per the Service Information

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE SECONDARY PRESSURE

Turn the ignition off to the lock position.

Disconnect the pressure gauge from the Line Pressure test port and reinstall the test port plug.

Install the pressure gauge in the Secondary Pressure test port per the Service Information.

With the scan tool, erase Transmission DTCs.

WARNING: Apply the parking brake. Failure to follow these instructions can result in personal injury or death.

With the brakes firmly applied, start the engine allow to idle and shift the transmission into Reverse, Drive and Low while comparing the Secondary Pressure gauge reading to the scan tool Secondary Pressure reading in each shift lever position and record your findings.

With the brakes still firmly applied, raise the engine rpm between 2700 - 3250 rpm and shift the transmission into Reverse, Drive and Low while comparing the gauge Secondary Pressure to the scan tool Secondary Pressure in each shift lever position and record your findings.

CAUTION: Do not hold the engine rpm between 2700 - 3250 rpm for more than 5 seconds in any given shift position. If the 5 second threshold is exceeded, transmission damage can occur. Allow to idle in neutral between shifts for at least 15 to 20 seconds to allow transmission fluid to cool.

Does the Secondary Pressure gauge readings match the scan tool readings in all of the above procedures?

Yes >> Replace or repair the CV Transmission as necessary per the Service Information for components related to the Secondary Pressure Control System.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE SECONDARY PRESSURE SENSOR

Turn the ignition off to the lock position.

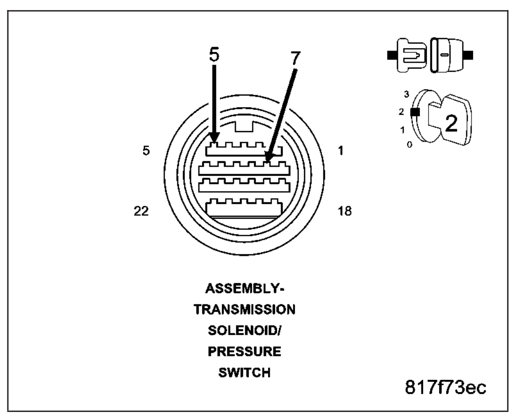
Disconnect the pressure gauge from the Secondary Pressure test port and reinstall the test port plug.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Connect a jumper wire between the (T50) Secondary Pressure Sensor Signal circuit and the (T72) 5-volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool read the Secondary Pressure voltage.



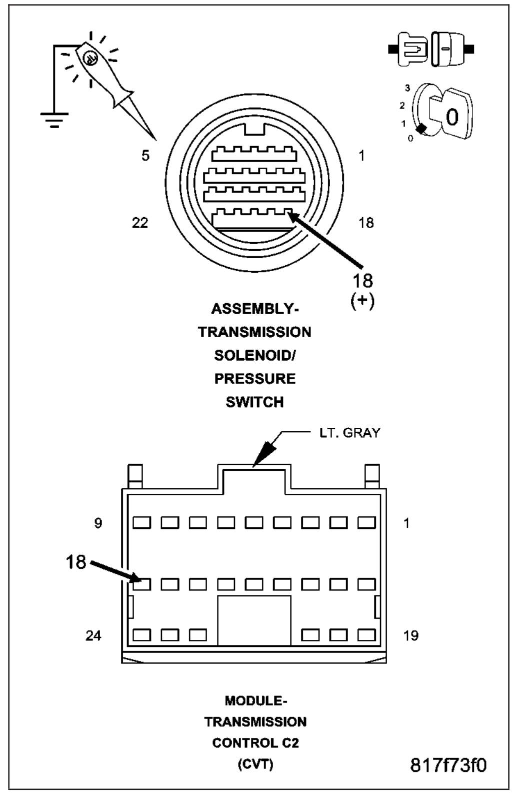
Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the CVT or the Secondary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 6

6. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT FOR HIGH RESISTANCE



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Connect a jumper wire between the B(+) and the (T21) Primary Pressure Sensor Signal circuit in the Transmission Solenoid/Pressure Switch harness connector.

Using a 12-volt test light connected to ground, check the (T21) Primary Pressure Sensor Signal circuit in the TCM C2 harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Repair the (T21) Primary Pressure Sensor Signal circuit for an open (high resistance).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

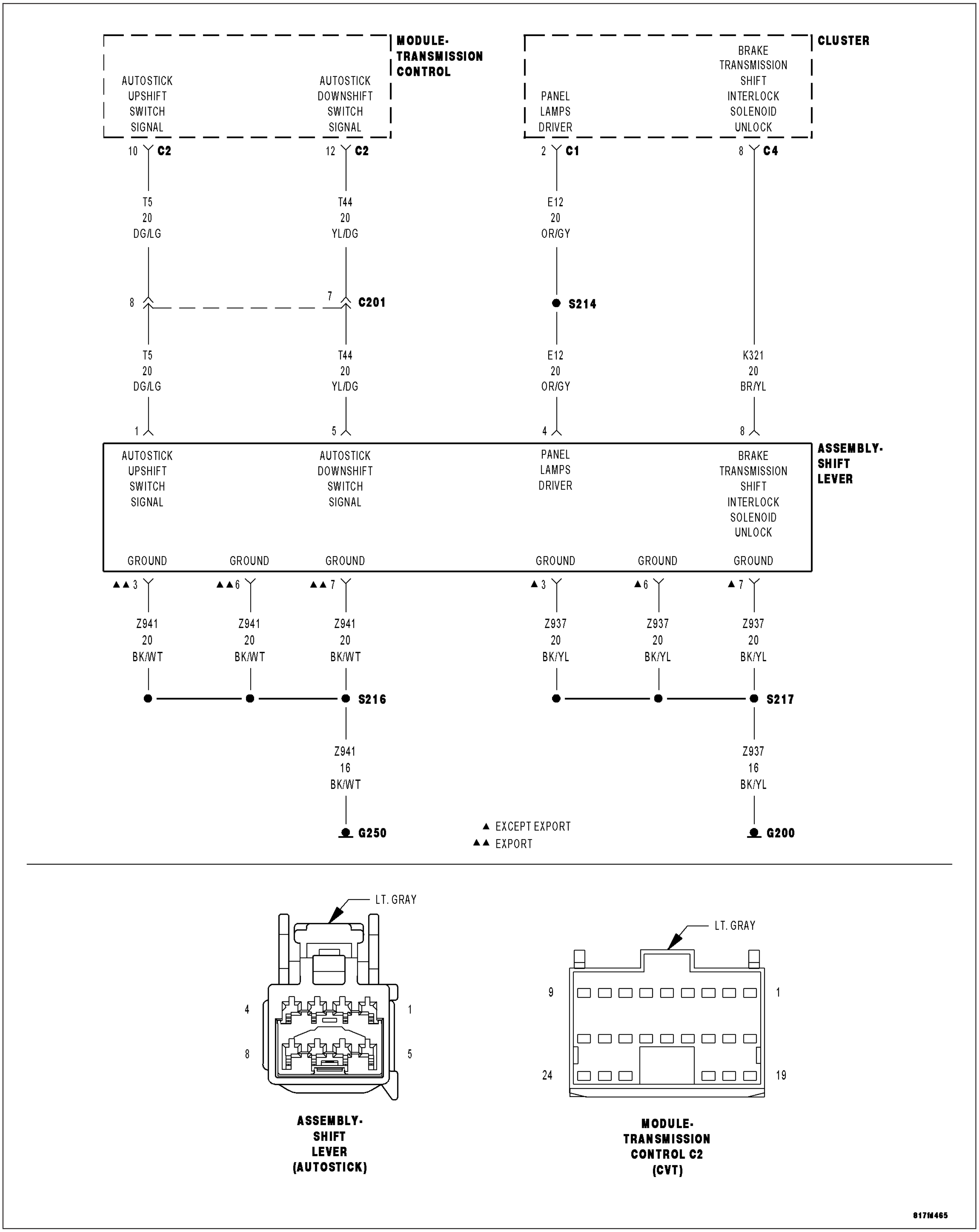
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0826-UP/DOWN SHIFT SWITCH CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The AutoStick function allows the driver to manually change the gear ratio to a locked ratio. The Transmission Control Module (TCM) monitors the AutoStick Upshift and Downshift circuits. If the TCM receives an Upshift and Downshift request simultaneously, or manual mode Upshift/Downshift request while other than in the D-Range, a DTC will set.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16 volts.
- **Set Condition:**
  Upshift and Downshift requested simultaneously while in the Drive position or the Upshift and/or Downshift request during while not in the Drive position for the period of 1.0 second.

Possible Causes
(T5) AUTOSTICK UPSHIFT SWITCH SIGNAL CIRCUIT SHORT TO GROUND
(T44) AUTOSTICK DOWNSHIFT SWITCH SIGNAL CIRCUIT SHORT TO GROUND
SHIFT LEVER ASSEMBLY
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, erase Transmission DTCs.

Start the engine, with the brakes firmly applied shift the shift lever into Drive and make several AutoStick upshifts and downshifts.

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 7

2. VERIFY PROBLEM

With the scan tool, read the AutoStick upshift and downshift status.

Does the scan tool show either the upshift or downshift as true with the shifter in the center position (pick best answer)?

Upshift shows as true
Go To 3

Downshift shows as true
Go To 5

Neither circuit shows as true
Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

3. CHECK THE SHIFT LEVER ASSEMBLY

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assembly harness connector.

Ignition on, engine not running.

With the scan tool read the AutoStick Upshift status.

Does the Upshift still show as true?

Yes >> Go To 4

No >> Replace the Shift Lever Assembly per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T5) AUTOSTICK UPSHIFT SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance between ground and the (T5) AutoStick Upshift Switch Signal circuit.

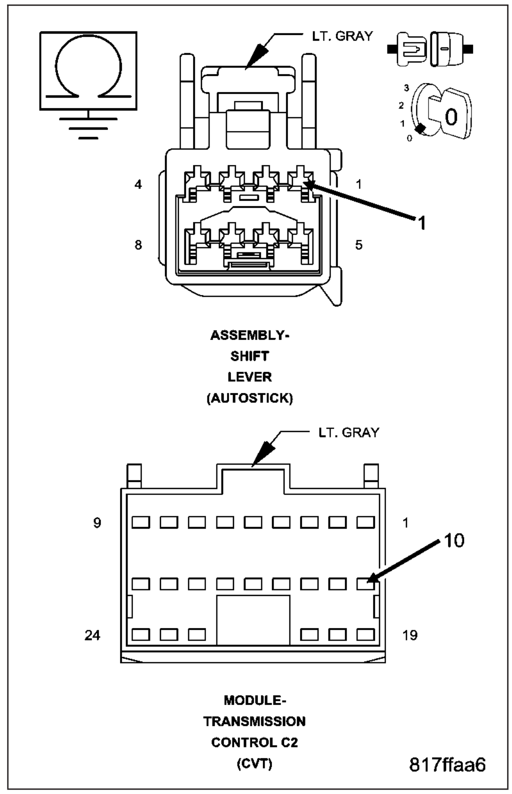
Is the resistance below 5.0 ohms?

Yes >> Repair the (T5) AutoStick Upshift Switch Signal circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



5. CHECK THE SHIFT LEVER ASSEMBLY

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assembly harness connector.

Ignition on, engine not running.

With the scan tool read the AutoStick Downshift status.

Does the Downshift still show as true?

Yes >> Go To 6

No >> Replace the Shift Lever Assembly per the Service Information.

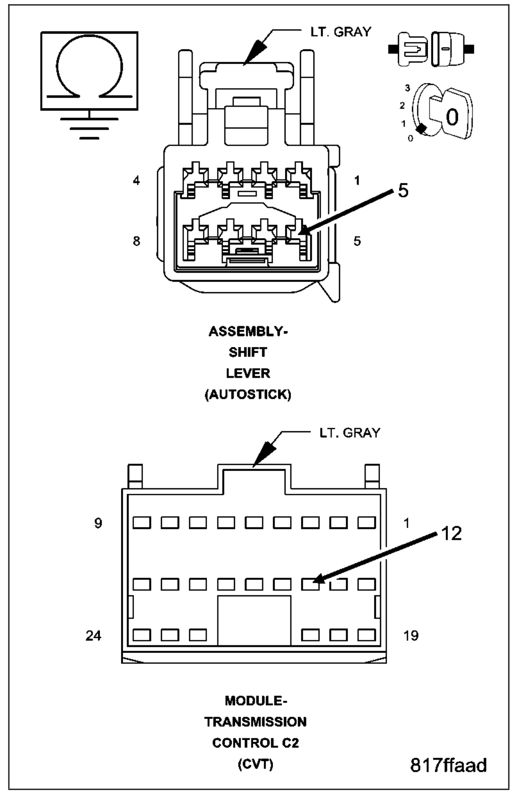
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. CHECK THE (T44) AUTOSTICK DOWNSHIFT SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance between ground and the (T44) AutoStick Downshift Switch Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T44) AutoStick Downshift Switch Signal circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

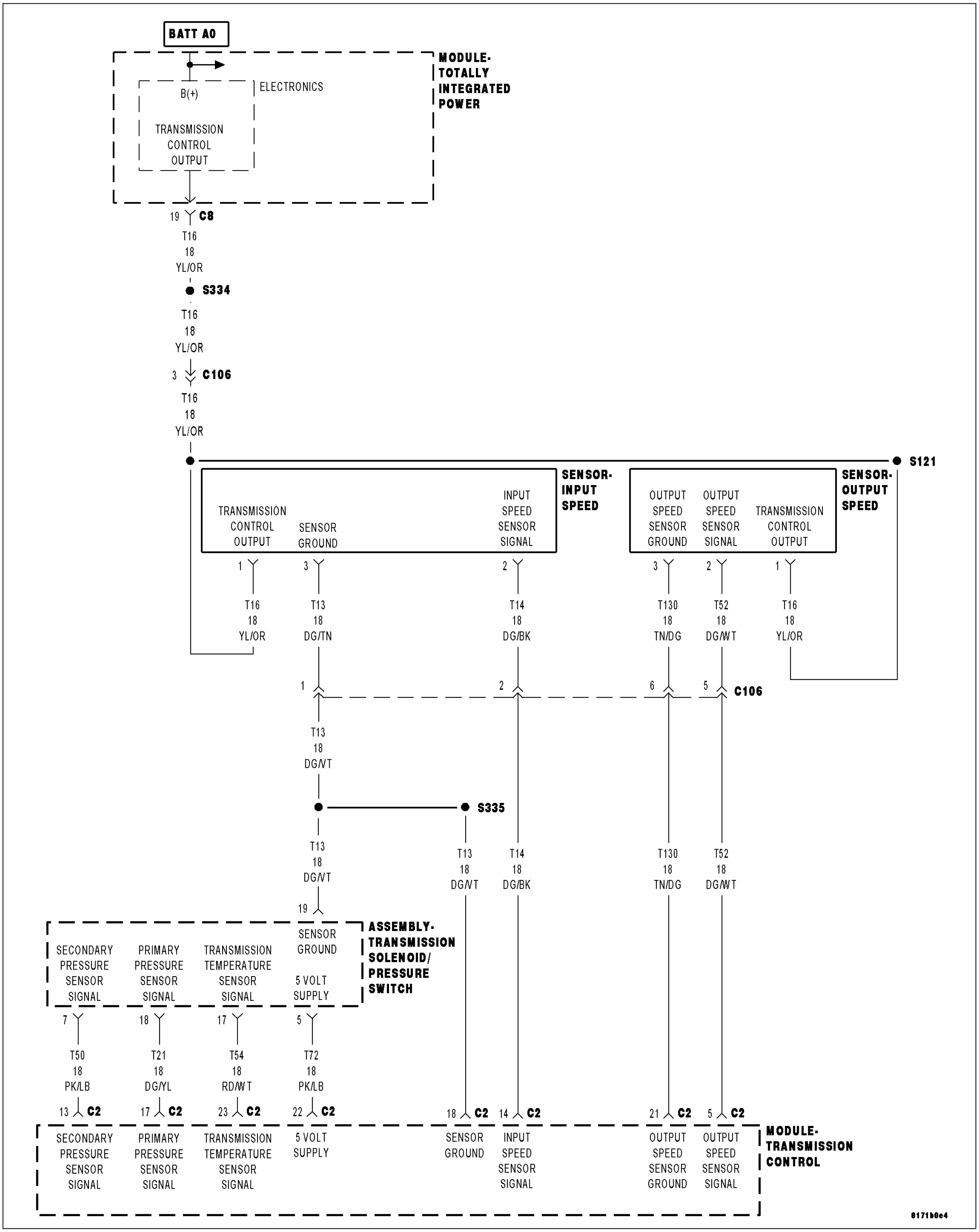
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0842-PRIMARY OIL PRESSURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the input voltage from the primary pulley pressure sensor. When the voltage is below a predetermined limit a DTC will set.

- **When Monitored:**
  Ignition on, system voltage between 9.0 and 16.0 volts.
  Transmission temperature greater than -20° C (-4° F)
  No active DTCs from the following:
- Primary Oil Pressure Sensor High
- Sensor ground
- **Set Condition:**
  When the monitored voltage drops below 0.09 volts for the period of 5 seconds.

Possible Causes
(T72) 5 VOLT SUPPLY CIRCUIT OPEN
(T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
PRIMARY PRESSURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK THE PRIMARY PRESSURE SENSOR VOLTAGE

With the scan tool, read the Primary Pulley Pressure Sensor voltage.

Is the voltage below 0.09 volts?

Yes >> Go To 2

No >> Go To 7

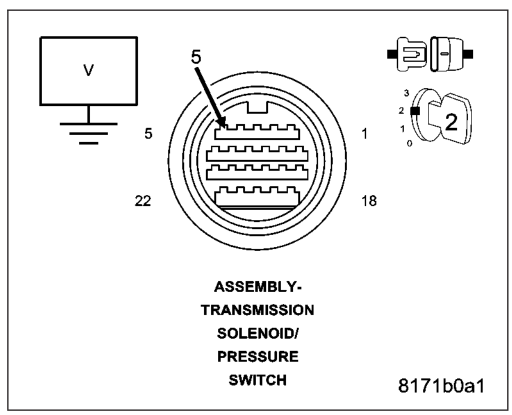
2. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

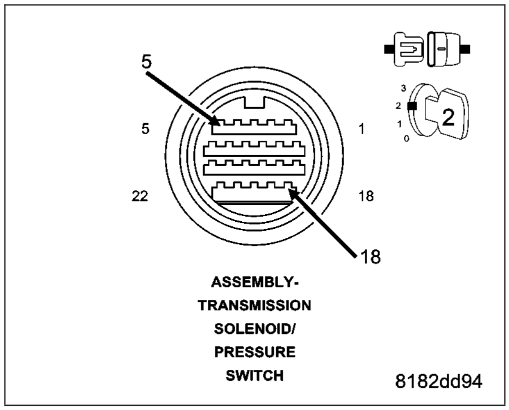


Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Go To 3

No >> Go To 6

3. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT



8182dd94

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Connect a jumper wire between the (T21) Primary Pressure Sensor Signal circuit and the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

With the scan tool, read the Primary Pulley Pressure Sensor voltage.

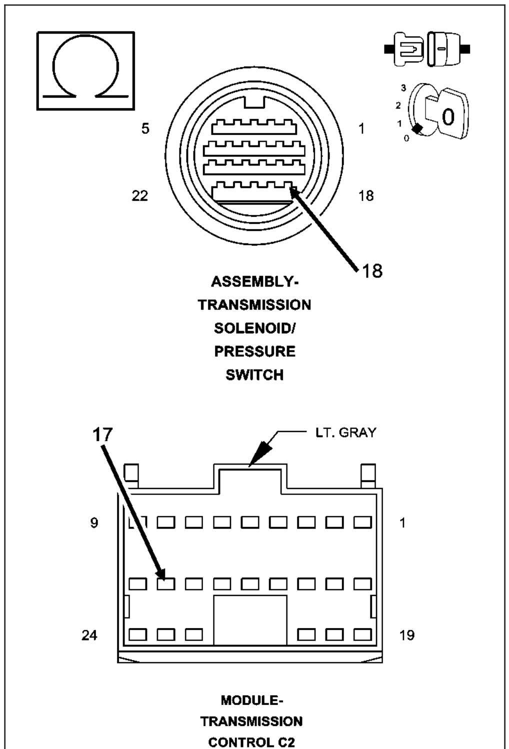
Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Replace CV Transmission or replace the Primary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN



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Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance of the (T21) Primary Pressure Sensor Signal circuit between the TCM C2 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T21) Primary Pressure Sensor Signal circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T21) Primary Pressure Sensor Signal circuit.

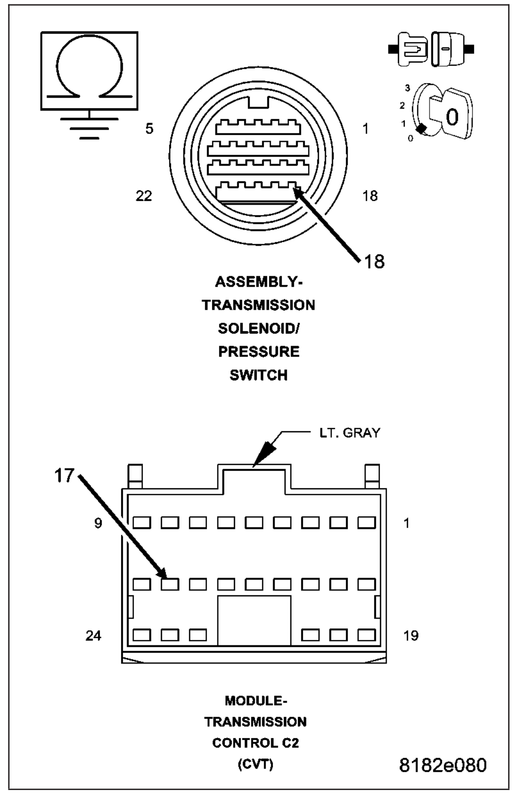
Is the resistance below 5.0 ohms?

Yes >> Repair the (T21) Primary Pressure Sensor Signal circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



6. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

While back probing, measure the voltage of the (T72) 5 Volt Supply circuit in Transmission Solenoid/Pressure Switch Assembly harness connector.

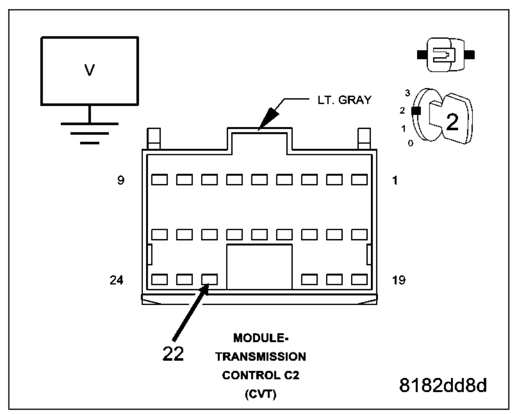
Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Repair the (T72) 5 Volt Supply circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

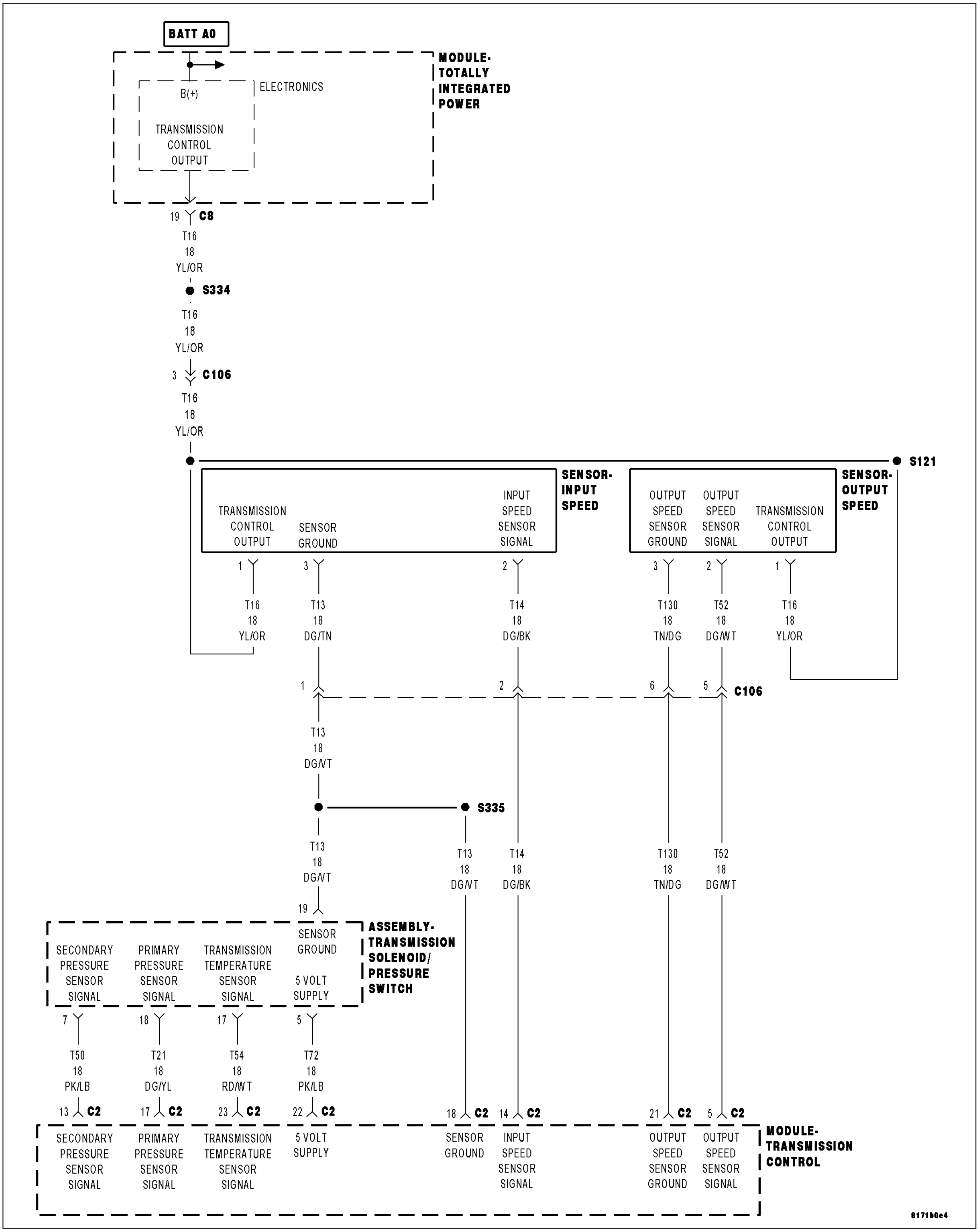
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0843-PRIMARY OIL PRESSURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the input voltage from the primary pulley pressure sensor. When the voltage is above a predetermined limit a DTC will set.

- **When Monitored:**
  Ignition on, system voltage between 9.0 and 16.0 volts.
  Transmission temperature greater than -20° C (-4° F)
  No active DTCs from the following:
- Primary Oil Pressure Sensor Low
- Sensor ground
- **Set Condition:**
  When the monitored voltage rises above 4.7 volts for the period of 5 seconds.

Possible Causes
(T72) 5 VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
(T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
PRIMARY PRESSURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK THE PRIMARY PRESSURE SENSOR VOLTAGE

With the scan tool, read the Primary Pulley Pressure Sensor voltage.

Is the voltage greater than 4.7 volts?

Yes >> Go To 2

No >> Go To 6

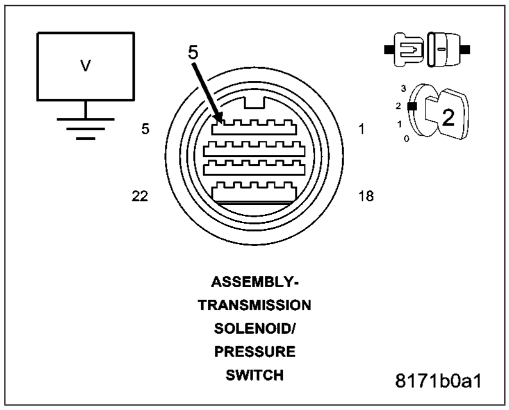
2. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go To 3

No >> Go To 5

3. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, read the Primary Pulley Pressure Sensor voltage.

Does the scan tool read any voltage?

Yes >> Go To 4

No >> Replace CV Transmission or replace the Primary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T21) PRIMARY PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T21) Primary Pressure Sensor Signal circuit.

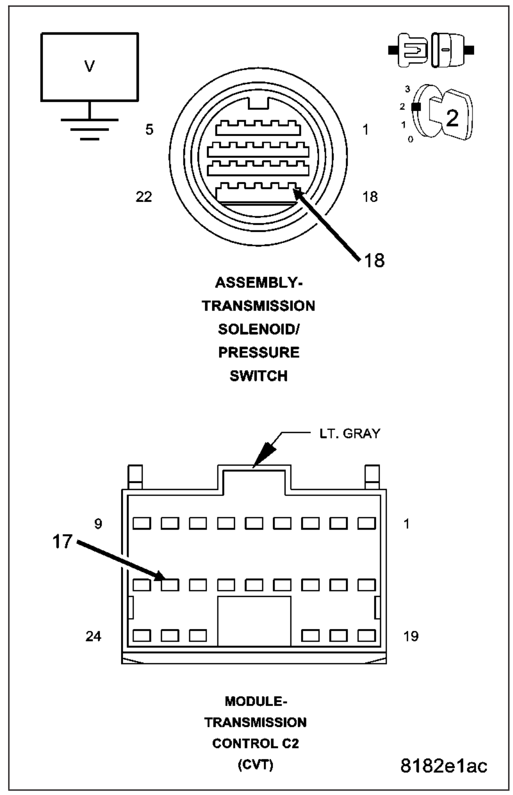
Is there any voltage present?

Yes >> Repair the (T21) Primary Pressure Sensor Signal circuit for a short to voltage.

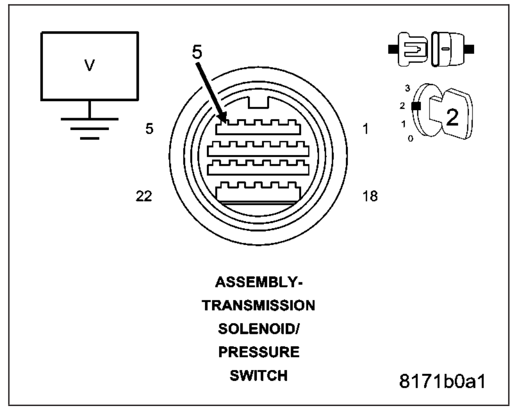
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)



5. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is there any voltage present?

Yes >> Repair the (T72) 5 Volt Supply circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

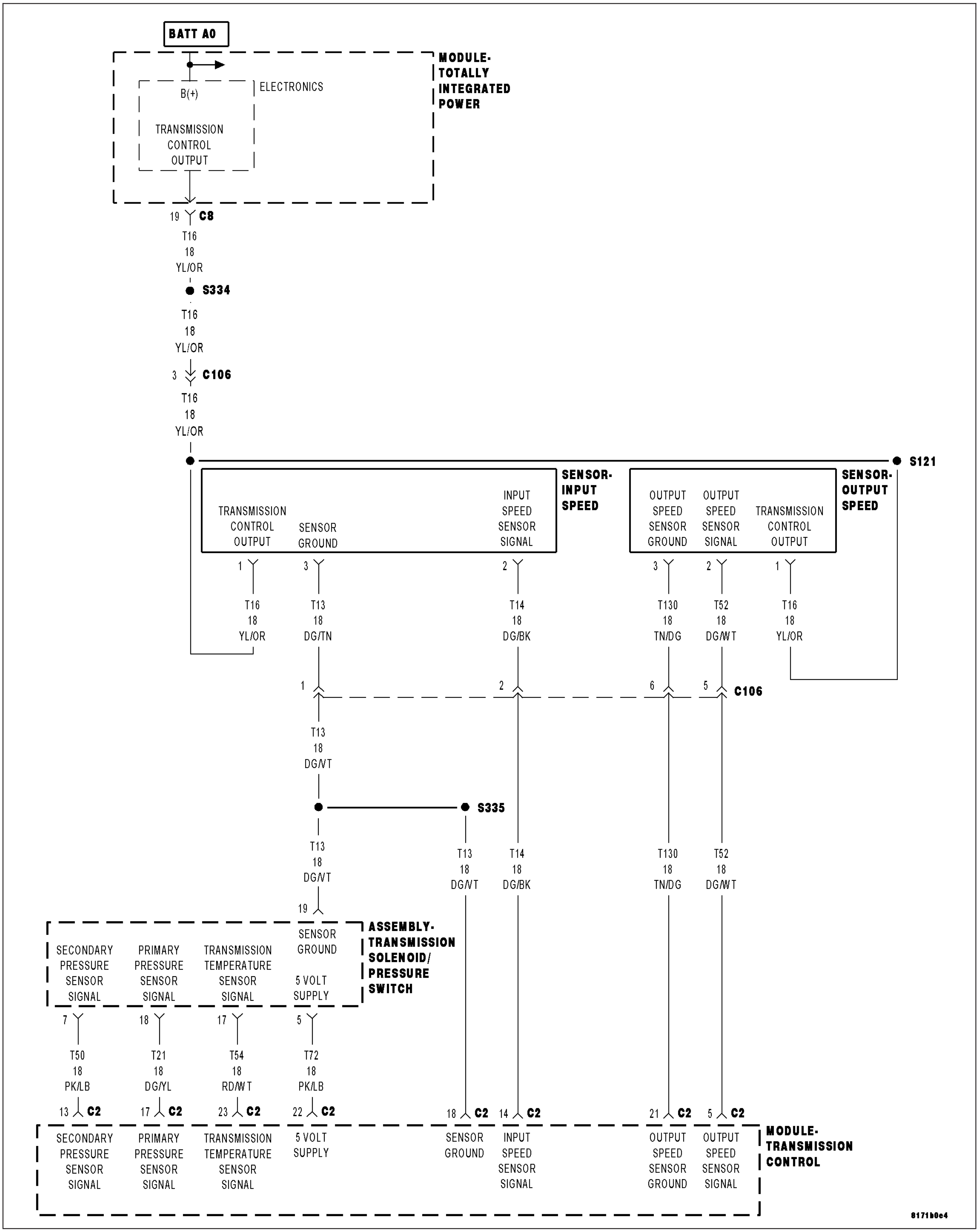
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0847-SECONDARY OIL PRESSURE SENSOR CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the input voltage from the secondary pulley pressure sensor. When the voltage is below a predetermined limit a DTC will set.

- **When Monitored:**
  Ignition on, system voltage between 9.0 and 16.0 volts.
  Transmission temperature greater than -20° C (-4° F)
  No active DTCs from the following:
- Primary Oil Pressure Sensor High
- Sensor ground
- **Set Condition:**
  When the monitored voltage drops below 0.09 volts for the period of 5 seconds.

Possible Causes
(T72) 5 VOLT SUPPLY CIRCUIT OPEN
(T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK THE SECONDARY PRESSURE SENSOR VOLTAGE

With the scan tool, read the Secondary Pulley Pressure Sensor voltage.

Is the voltage below 0.09 volts?

Yes >> Go To 2

No >> Go To 7

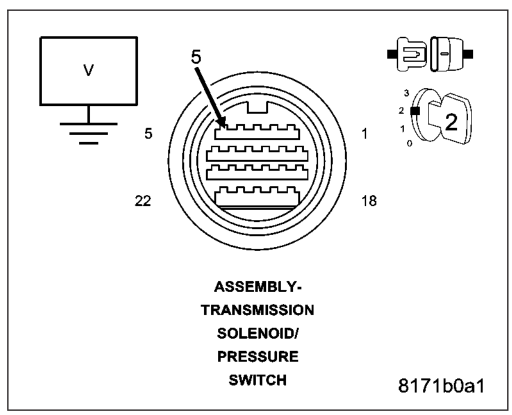
2. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

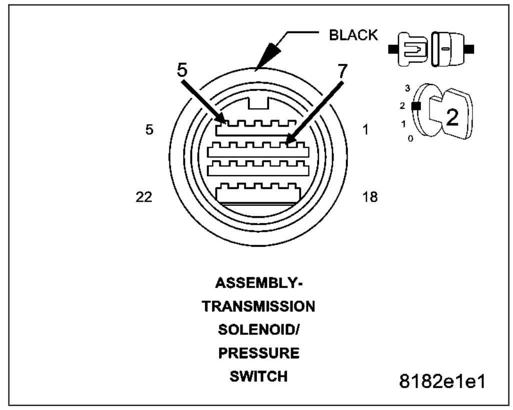


Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Go To 3

No >> Go To 6

3. CHECK THE (T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT



Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Connect a jumper wire between the (T50) Secondary Pressure Sensor Signal circuit and the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

With the scan tool, read the Secondary Pulley Pressure Sensor voltage.

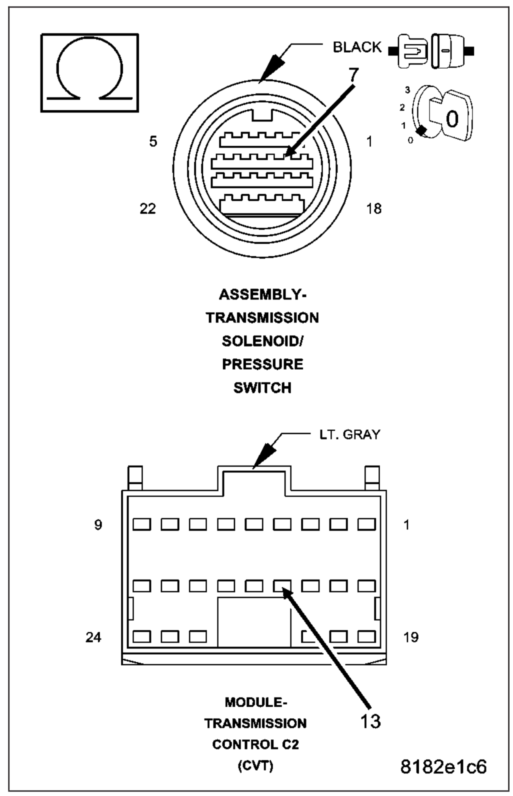
Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Replace CV Transmission or replace the Secondary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN



Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Measure the resistance of the (T50) Secondary Pressure Sensor Signal circuit between the TCM C2 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

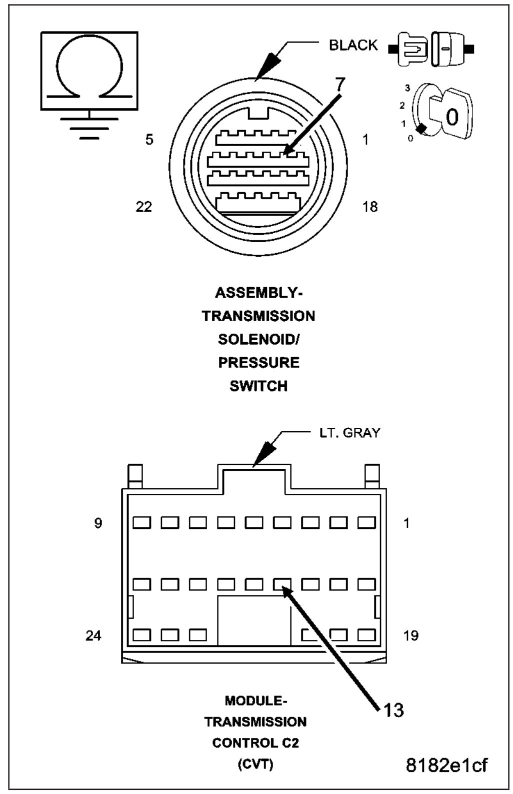
Yes >> Repair the (T50) Secondary Pressure Sensor Signal circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE (T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T50) Secondary Pressure Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) Secondary Pressure Sensor Signal circuit for a short to ground.

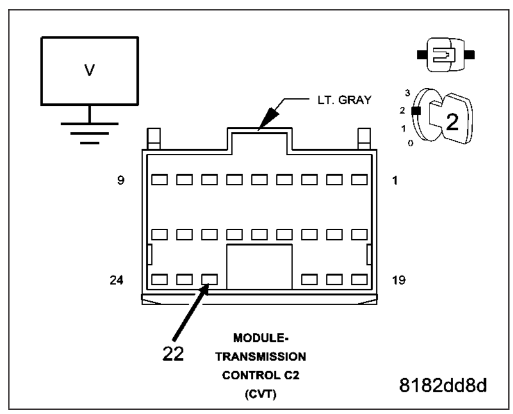
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

While back probing, measure the voltage of the (T72) 5 Volt Supply circuit in Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the voltage 5.0 volts (± 0.2 volts)?

Yes >> Repair the (T72) 5 Volt Supply circuit for an open or high resistance.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

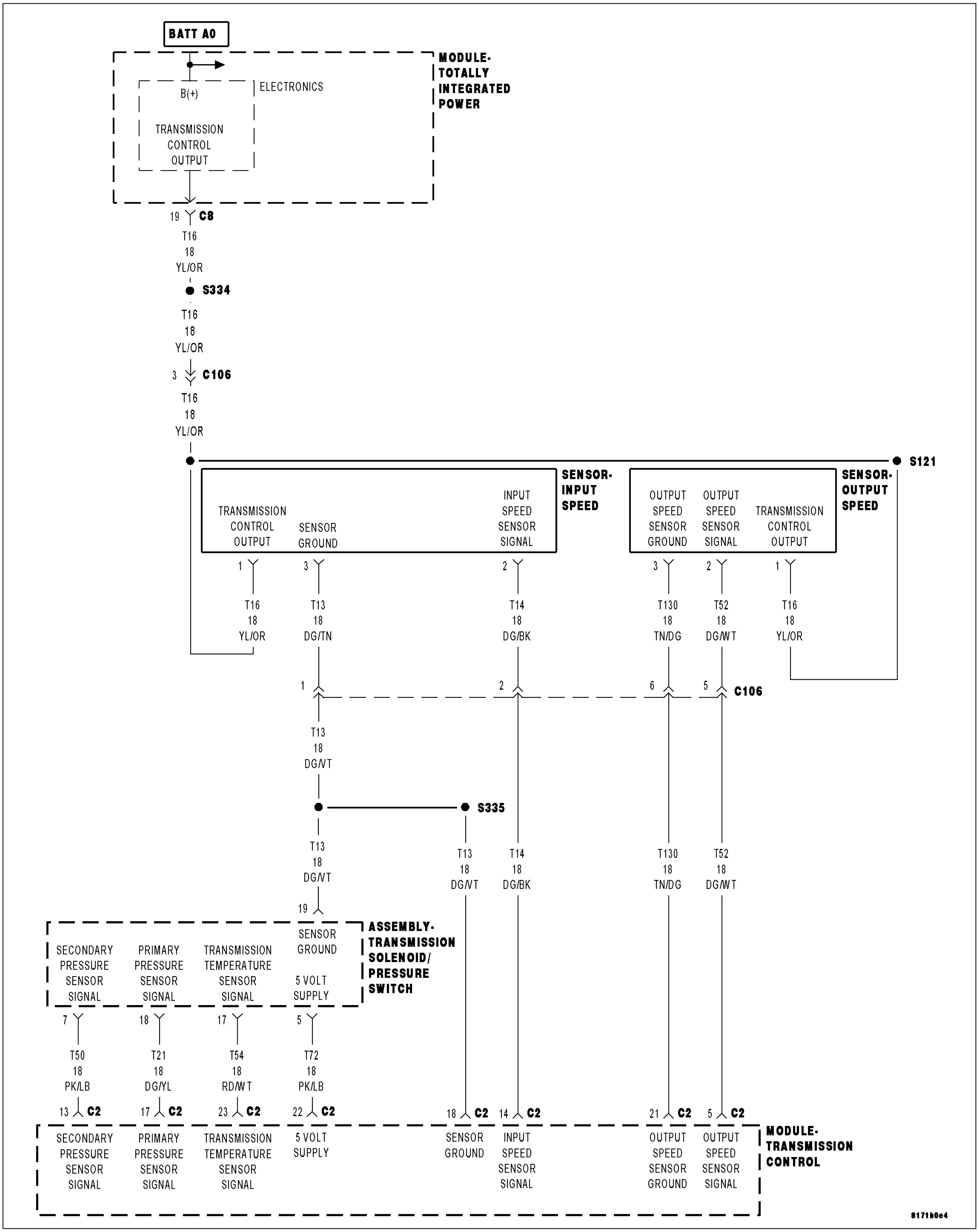
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0848-SECONDARY OIL PRESSURE SENSOR CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the input voltage from the secondary pulley pressure sensor. When the voltage is above a predetermined limit a DTC will set.

- **When Monitored:**
  Ignition on, system voltage between 9.0 and 16.0 volts.
  Transmission temperature greater than -20° C (-4° F)
  No active DTCs from the following:
- Secondary Oil Pressure Sensor Low
- Sensor ground
- **Set Condition:**
  When the monitored voltage rises above 4.7 volts for the period of 5 seconds.

Possible Causes
(T72) 5 VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
(T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SECONDARY PRESSURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK THE SECONDARY PRESSURE SENSOR VOLTAGE

With the scan tool, read the Secondary Pulley Pressure Sensor voltage.

Is the voltage greater than 4.7 volts?

Yes >> Go To 2

No >> Go To 6

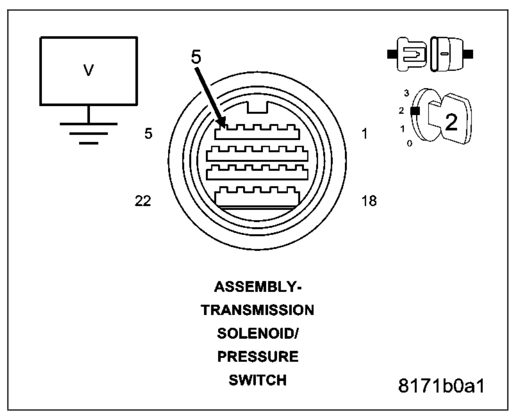
2. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Go To 3

No >> Go To 5

3. CHECK THE (T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, read the Secondary Pulley Pressure Sensor voltage.

Does the scan tool read any voltage?

Yes >> Go To 4

No >> Replace CV Transmission or replace the Secondary Pressure Sensor (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

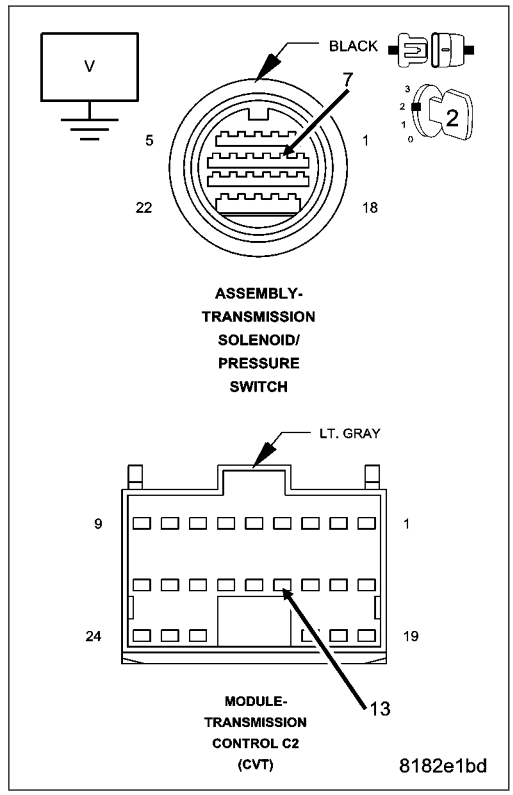
4. CHECK THE (T50) SECONDARY PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T50) Secondary Pressure Sensor Signal circuit.



Is there any voltage present?

Yes >> Repair the (T50) Primary Pressure Sensor Signal circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

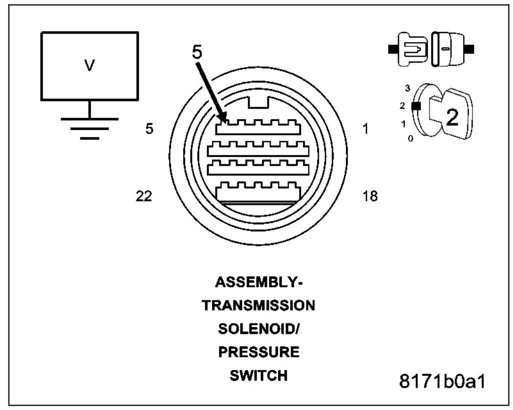
5. CHECK THE (T72) 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T72) 5 Volt Supply circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is there any voltage present?

Yes >> Repair the (T72) 5 Volt Supply circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

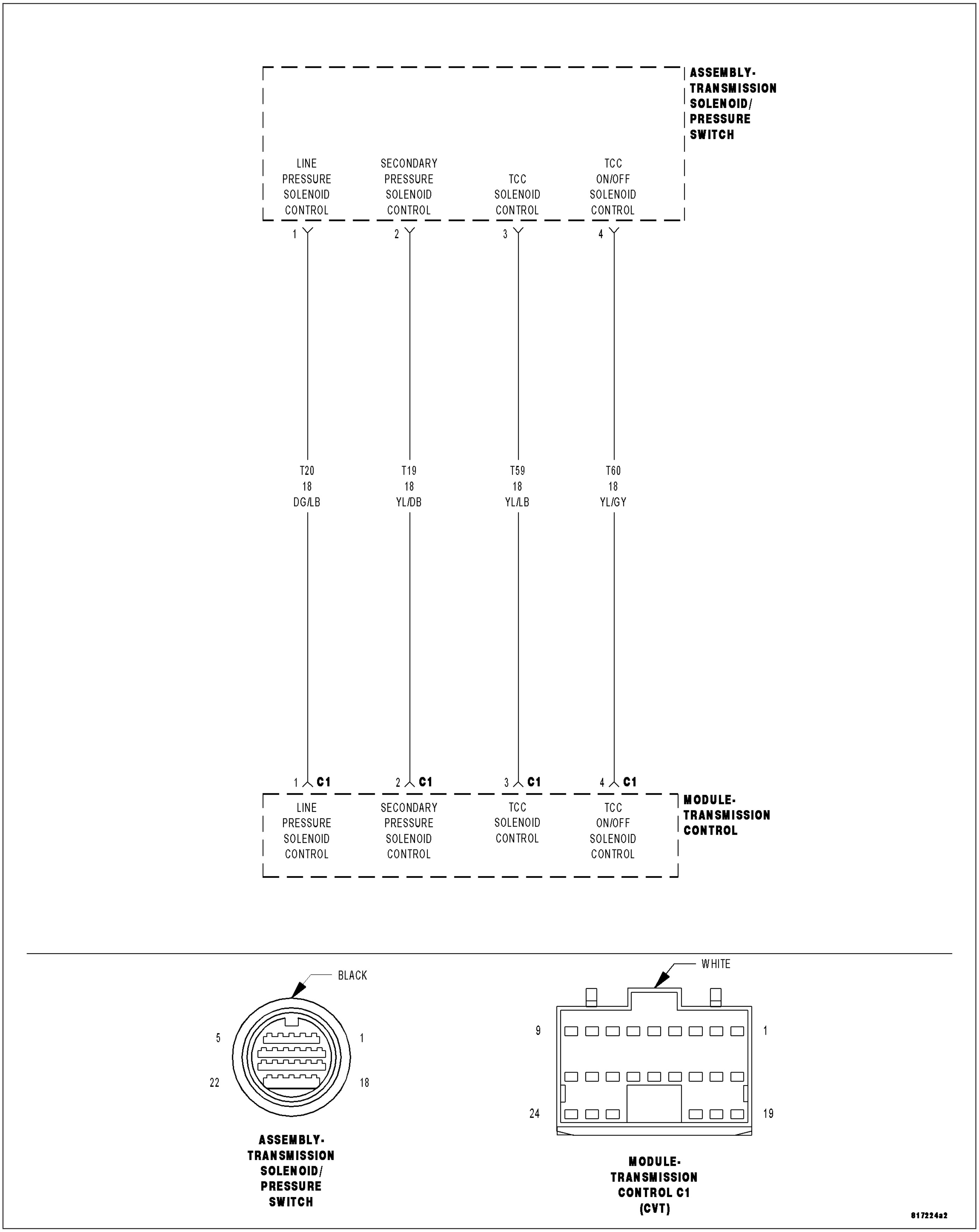
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0962-PRESSURE CONTROL SOLENOID A CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) regulates the line pressure by pulsing the line pressure solenoid. The TCM monitors the line pressure solenoid voltage and current draw during operation.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  If the monitored line pressure solenoid voltage is less than 70% of the target line pressure solenoid voltage for the period of 1.0 second.

Possible Causes
(T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
LINE PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

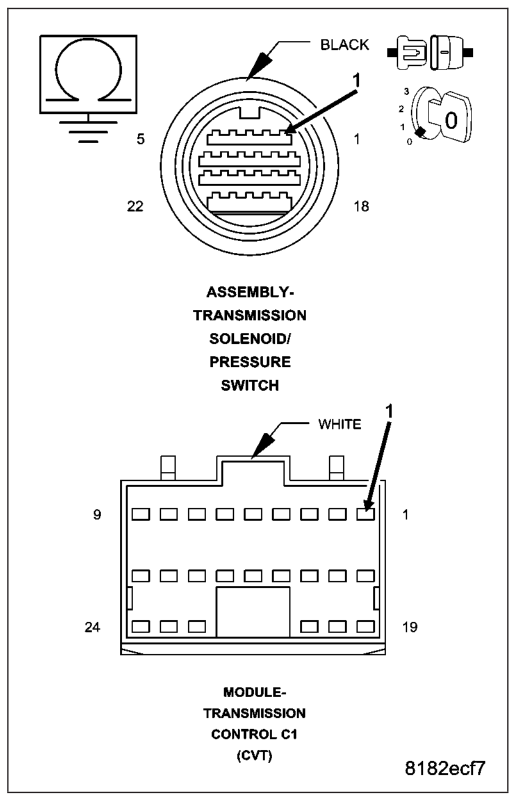
2. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T20) Line Pressure Solenoid Control circuit.

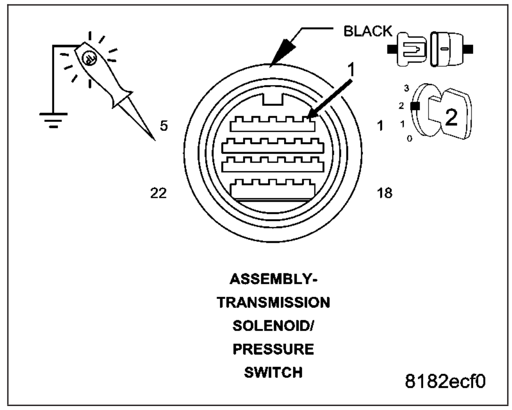


Is the resistance below 5.0 ohms?

Yes >> Repair the (T20) Line Pressure Solenoid Control circuit for a short to ground.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT



Turn the ignition off to the lock position.

Reconnect the TCM C1 harness connector.

Ignition on, engine not running.

With the scan tool actuate the Line Pressure Solenoid.

Using a test light connected to ground, check the (T20) Line Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Replace the Line Pressure Solenoid (Valve Body) or the CVT per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

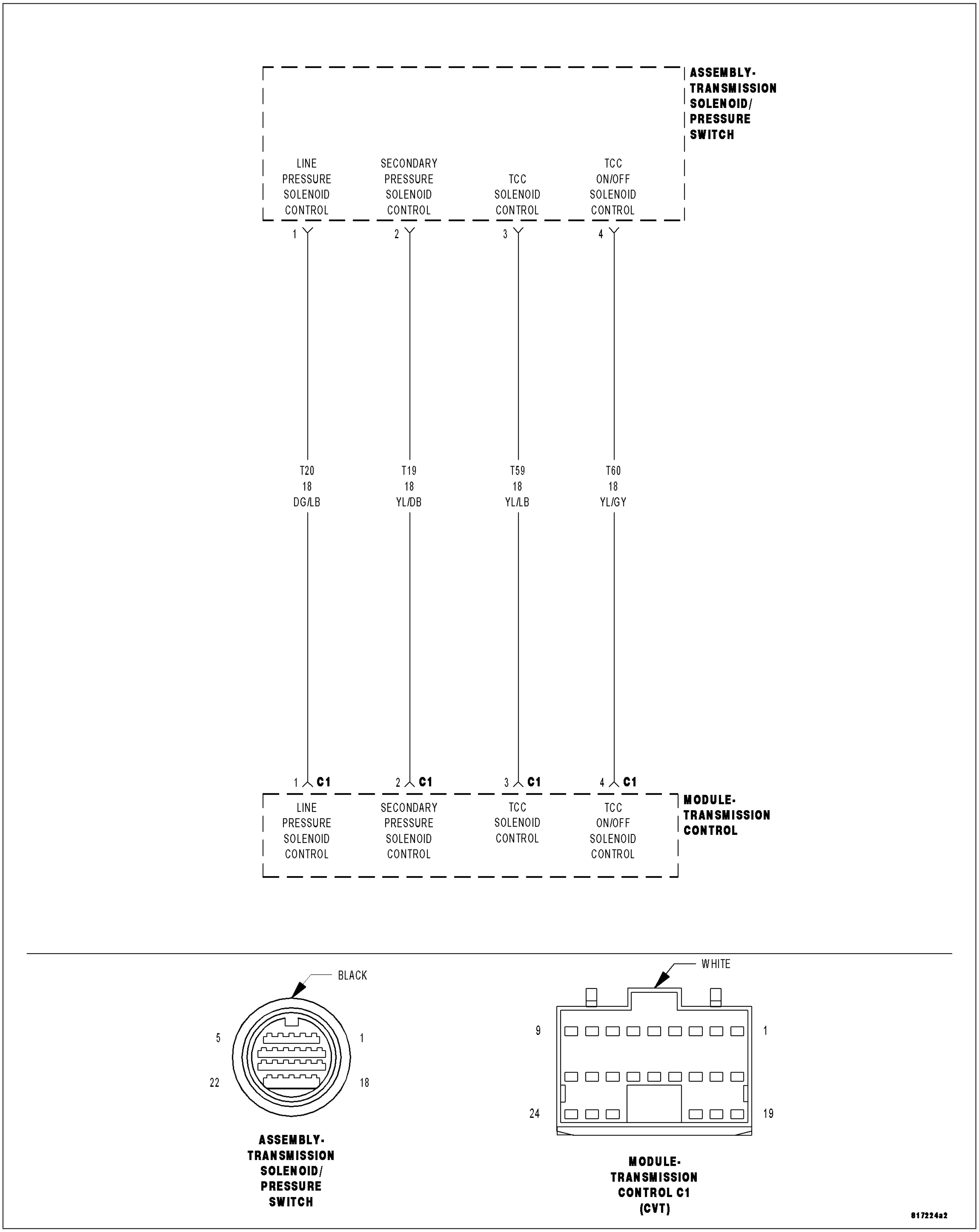
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0963-PRESSURE CONTROL SOLENOID A CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) regulates the line pressure by pulsing the line pressure solenoid. The TCM monitors the line pressure solenoid voltage and current draw during operation.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
  No Line Pressure Solenoid Circuit Low DTC present.
- **Set Condition:**
  When the target line pressure solenoid current is greater than 0.75 amps while the monitored line pressure solenoid current is less than 0.4 amps for the period of 5.0 seconds.

Possible Causes
(T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT OPEN
LINE PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

2. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT

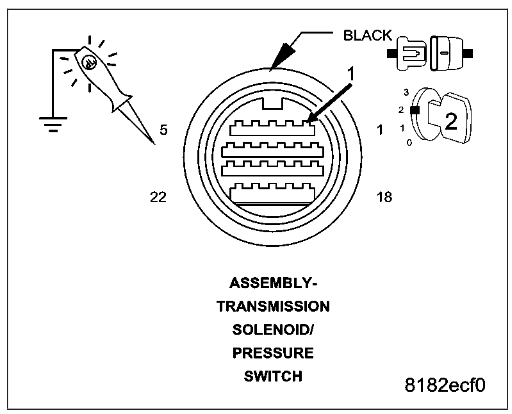
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Line Pressure Solenoid.

Using a test light connected to ground, check the (T20) Line Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 5

3. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

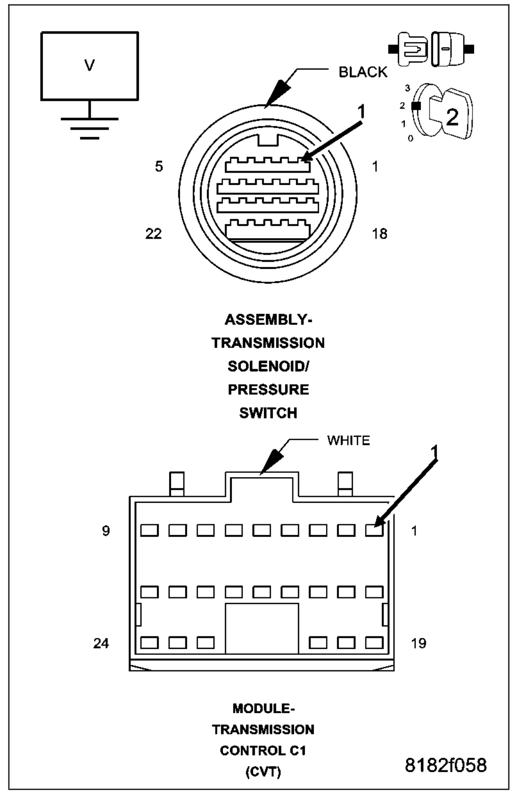
With the scan tool, stop the actuation of the Line Pressure Solenoid.

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T20) Line Pressure Solenoid Control circuit.



Is the voltage above .05 volts?

Yes >> Repair the (T20) Line Pressure Solenoid Control circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE LINE PRESSURE SOLENOID

Turn the ignition off to the lock position.

Reconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T20) Line Pressure Solenoid Control circuit in the TCM C1 harness connector.

Is the resistance between 3.0 and 9.0 ohms?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

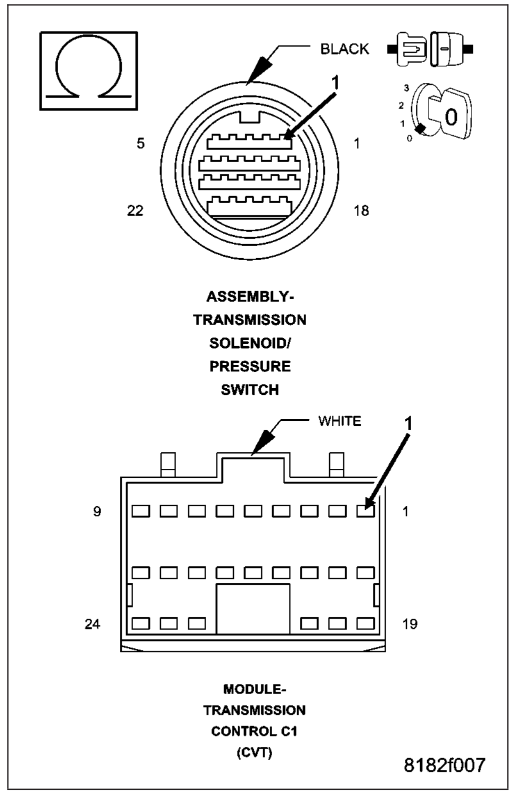
No >> Replace the CV Transmission or replace the Line Pressure Solenoid (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. CHECK THE (T20) LINE PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Measure the resistance of the (T20) Line Pressure Solenoid Control circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T20) Line Pressure Solenoid Control circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

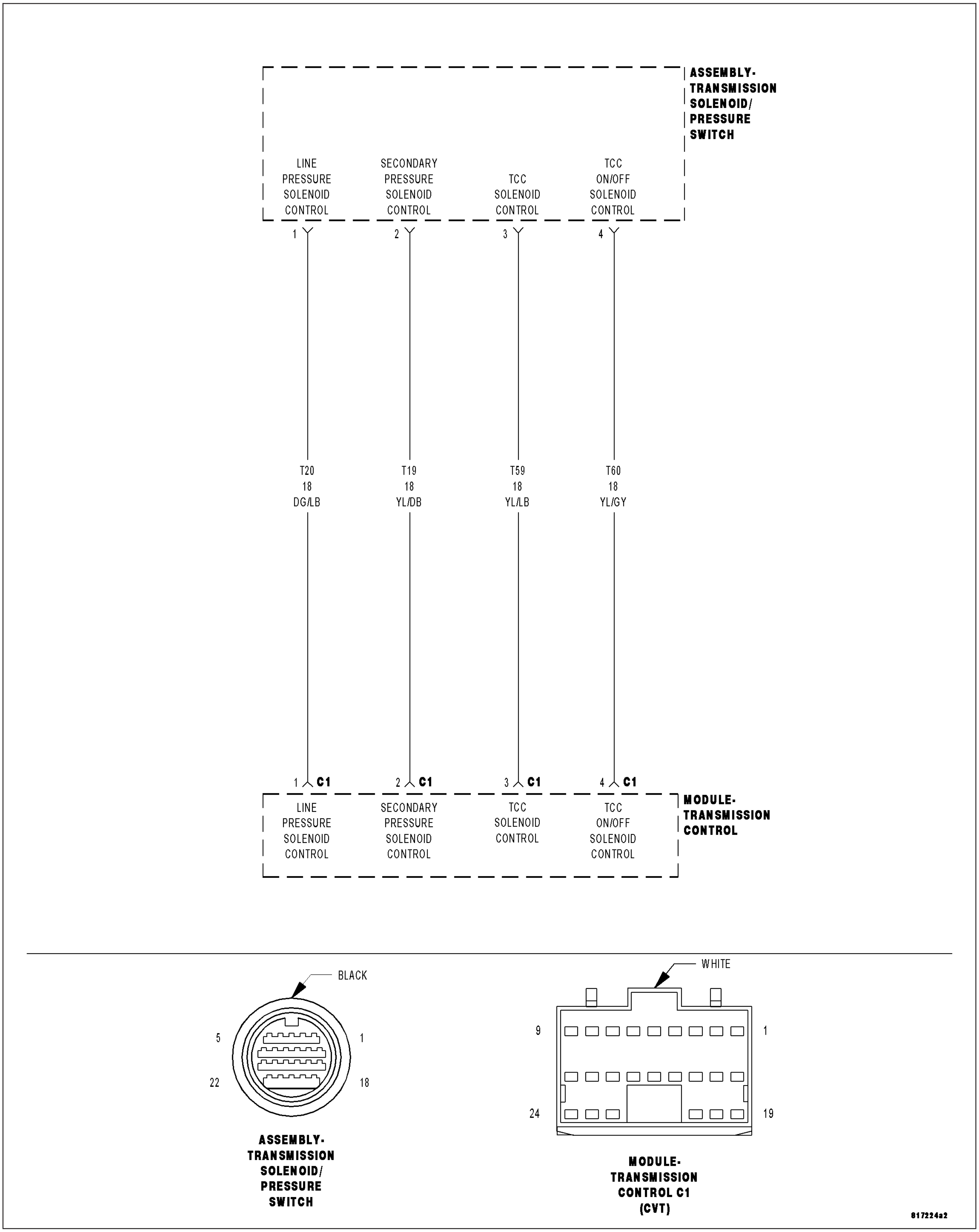
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0966-PRESSURE CONTROL SOLENOID B CONTROL CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) regulates the secondary pressure by pulsing the secondary pressure solenoid. The TCM monitors the secondary pressure solenoid voltage and current draw during operation.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts..
- **Set Condition:**
  If the monitored secondary pressure solenoid voltage is less than 70% of the target secondary pressure solenoid voltage for the period of 1.0 second.

Possible Causes
(T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
SECONDARY PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

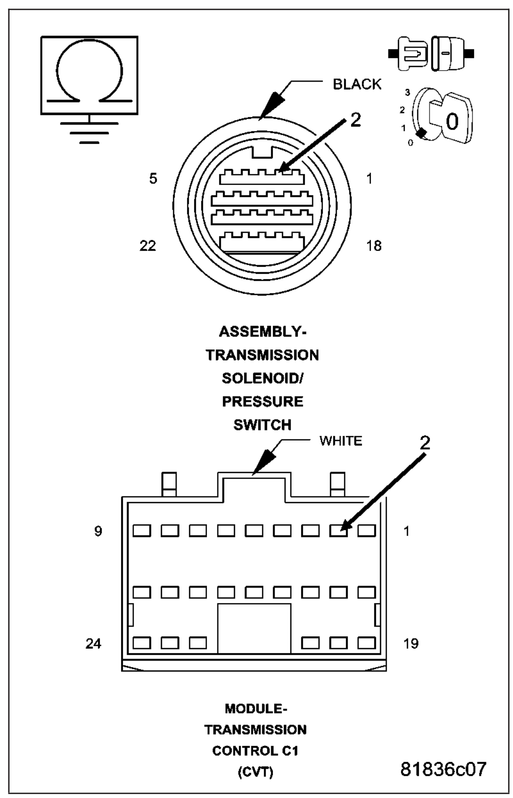
2. CHECK THE (T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T19) Secondary Pressure Solenoid Control circuit.

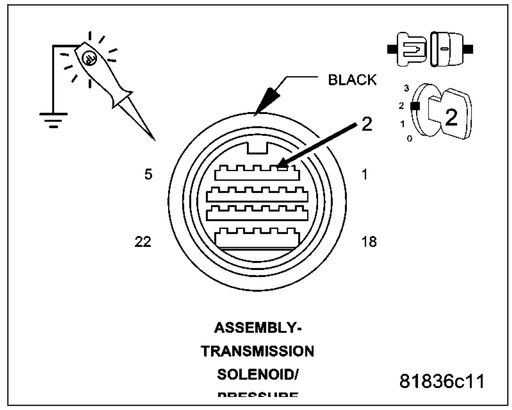


Is the resistance below 5.0 ohms?

Yes >> Repair the (T19) Secondary Pressure Solenoid Control circuit for a short to ground.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT



Turn the ignition off to the lock position.

Reconnect the TCM C1 harness connector.

Ignition on, engine not running.

With the scan tool actuate the Secondary Pressure Solenoid.

Using a test light connected to ground, check the (T19) Secondary Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Replace the CV Transmission or repair or replace the Secondary Pressure Solenoid (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

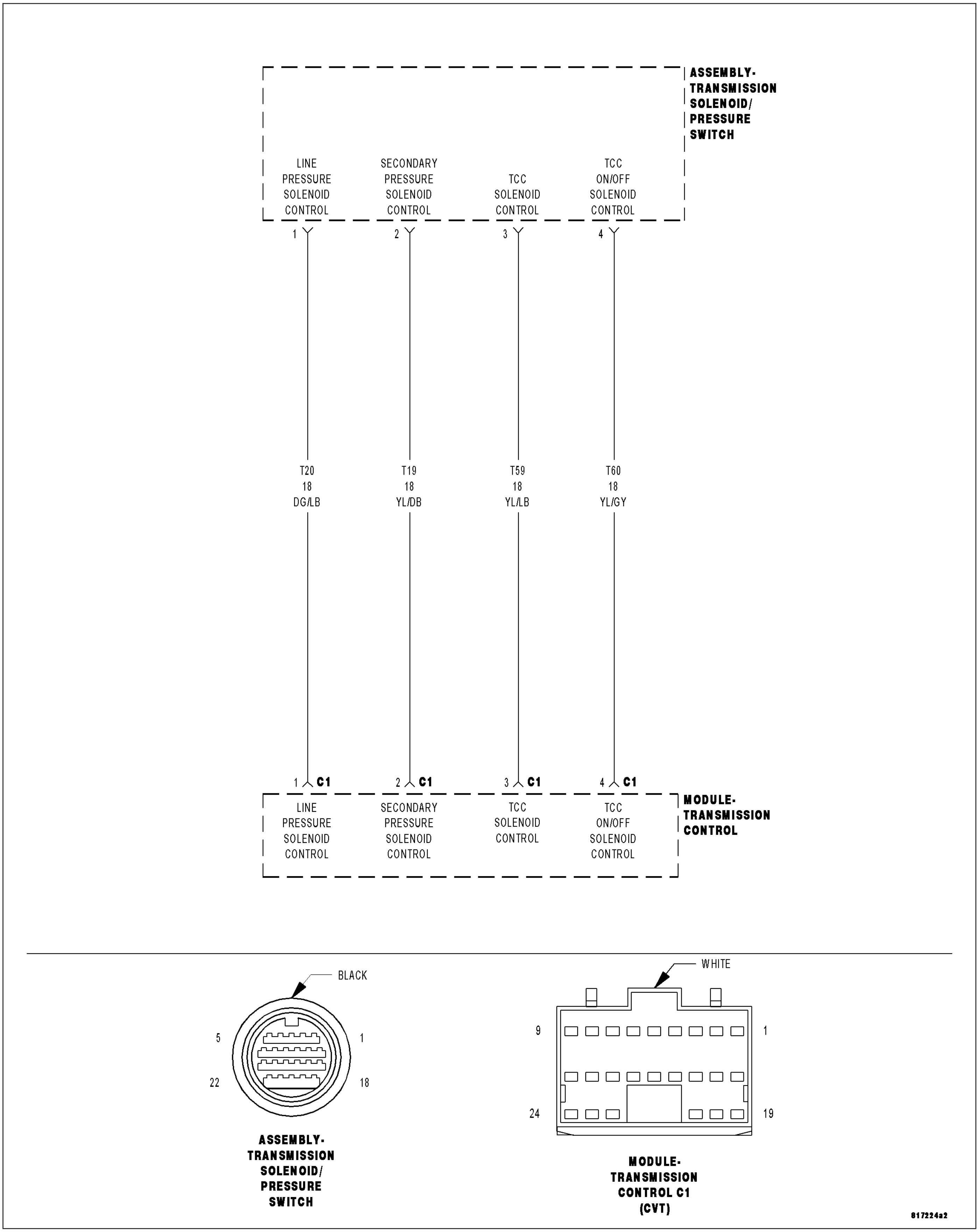
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P0967-PRESSURE CONTROL SOLENOID B CONTROL CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) regulates the secondary pressure by pulsing the secondary pressure solenoid. The TCM monitors the secondary pressure solenoid voltage and current draw during operation.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
  No Secondary Pressure Solenoid Low DTC present.
- **Set Condition:**
  When the target secondary pressure solenoid current is greater than 0.75 amps while the monitored secondary pressure solenoid current is less than 0.4 amps for the period of 5 seconds.

Possible Causes
(T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT OPEN
SECONDARY PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

2. CHECK THE (T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Secondary Pressure Solenoid.

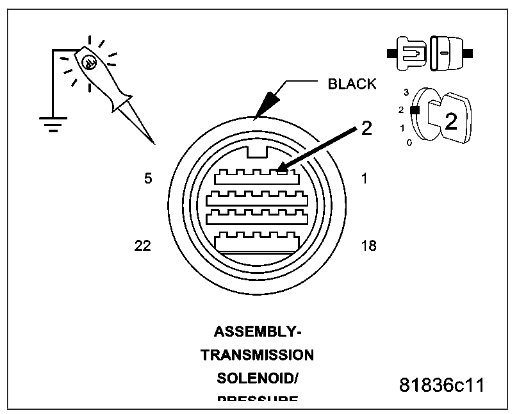
Using a test light connected to ground, check the (T19) Secondary Pressure Solenoid Control circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 5



3. CHECK THE (T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

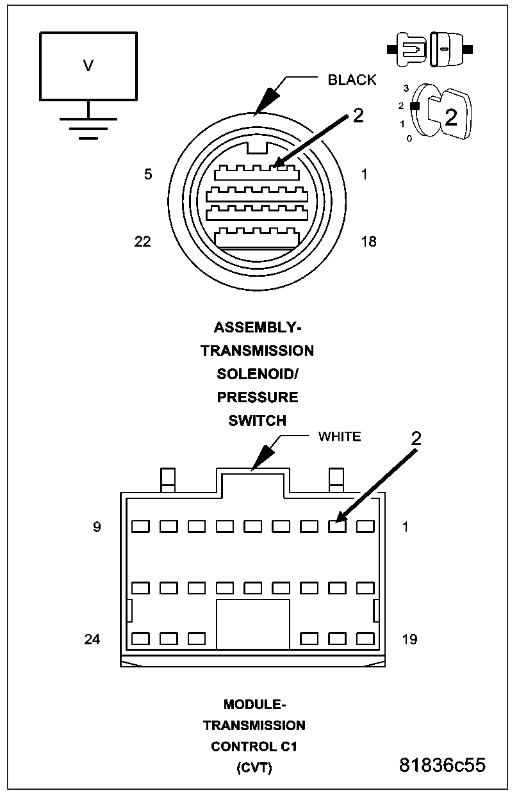
With the scan tool, stop the actuation of the Secondary Pressure Solenoid.

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T19) Secondary Pressure Solenoid Control circuit.



Is the voltage above .05 volts?

Yes >> Repair the (T19) Secondary Pressure Solenoid Control circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE SECONDARY PRESSURE SOLENOID

Turn the ignition off to the lock position.

Reconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T19) Secondary Pressure Solenoid Control circuit in the TCM C1 harness connector.

Is the resistance between 3.0 and 9.0 ohms?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

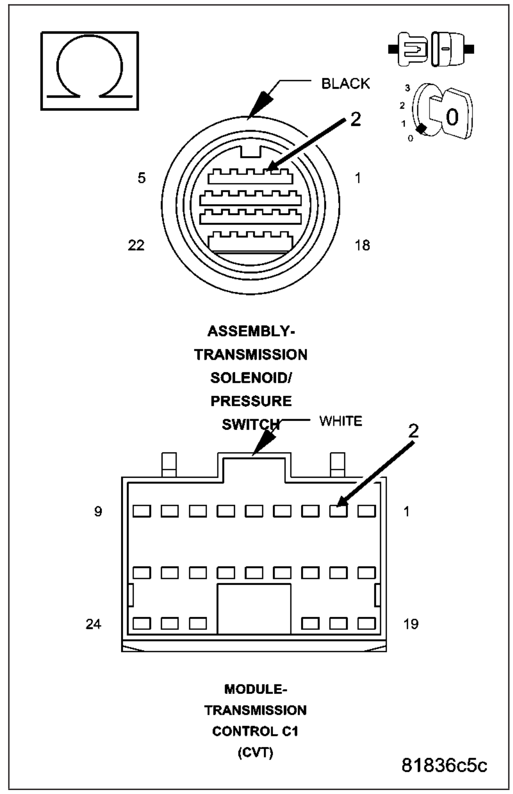
No >> Replace the CV Transmission or replace the Secondary Pressure Solenoid (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. CHECK THE (T19) SECONDARY PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Measure the resistance of the (T19) Secondary Pressure Solenoid Control circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T19) Secondary Pressure Solenoid Control circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

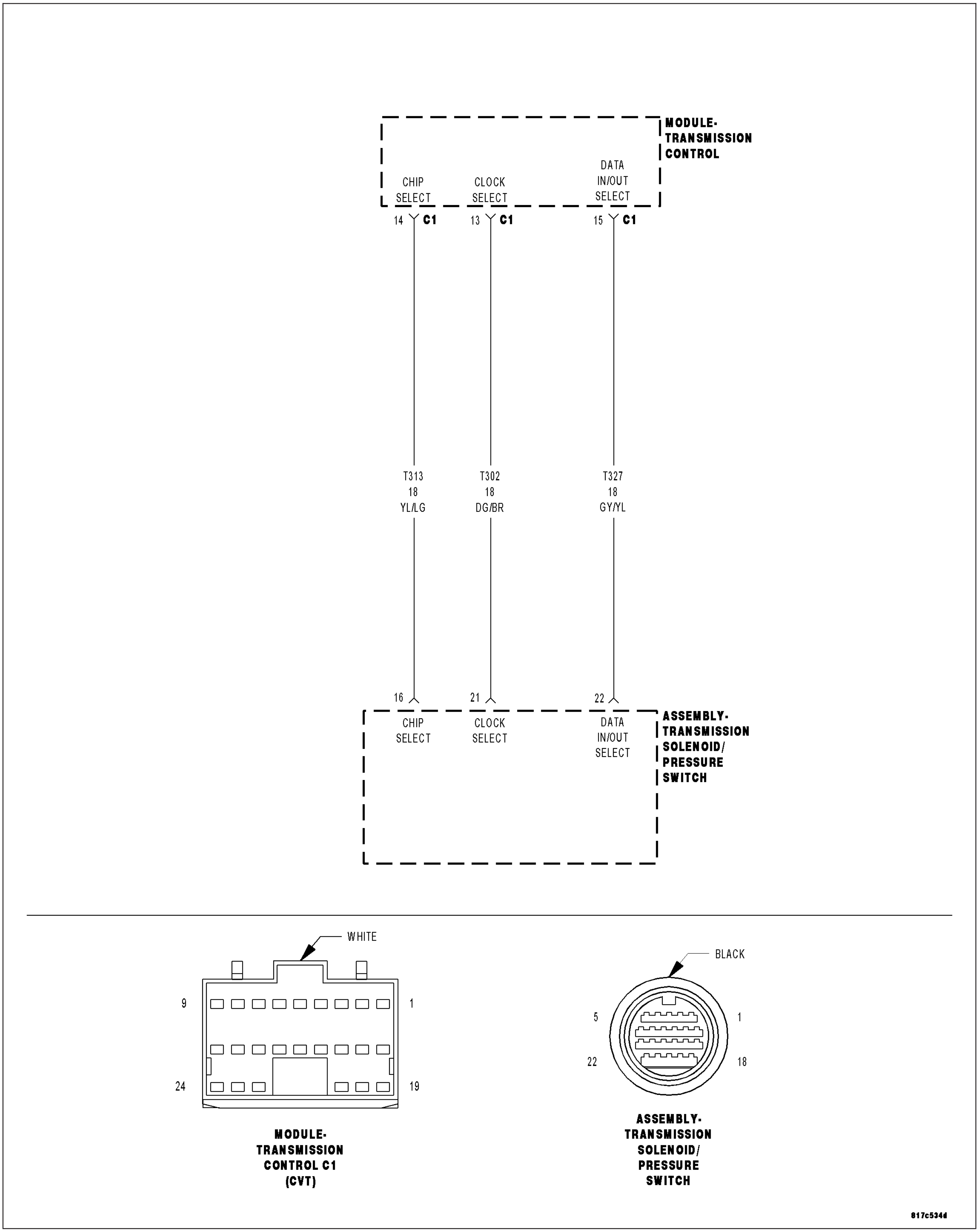
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P161B-BATTERY DISCONNECT / TCM INTERNAL



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) calculates the checksum in the EEPROM and compares it to the stored checksum value. If the calculated checksum value does not match the stored checksum value the TCM sets the DTC and illuminates the MIL.

- **When Monitored:**
  One time at every ignition on cycle.
- **Set Condition:**
  When the calculated checksum does not equal the stored checksum configuration or loss of power to the controller. It takes one trip of problem identification to set the MIL.

Possible Causes
WRONG VEHICLE CALIBRATION
FUSED B(+), TRANSMISSION CONTROL OUTPUT, AND/OR GROUND OPEN
TRANSMISSION CONTROL MODULE (TCM)

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for P161B?

Yes >> Go To 3

No >> Go To 2

2. CHECK FOR OTHER DTCS

With the scan tool, read Transmission DTCs.

Is the status Active for P0602?

Yes >> Refer to the Transmission category and perform diagnostic procedure for P0602.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE TCM

Has the TCM been flashed, a new TCM installed or the battery or TCM disconnected with the ignition in the On or Accessory position?

Yes >> This is a normal condition. Cycle the ignition off for 4 seconds and turn the ignition back on. Erase DTCs and cycle the ignition off again for 4 seconds and turn the ignition back on. Read TCM DTCs. If the DTC resets and remains active - Go To 4. If the DTC does not reset perform CVT TRANSMISSION VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

•

NOTE: A loss of the TCM Fused B(+), TCM ground, and/or the Transmission Control Output circuits can cause this fault to set.

Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace and program the TCM per the Service Information.

Perform CVT TRANSMISSION VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK IF THE RIGHT PART NUMBER IS USED

With the scan tool, check the TCM part number and compare it to the vehicle configuration.

Does the controller have the right part number?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

•

NOTE: A loss of the TCM Fused B(+), TCM ground, and/or the Transmission Control Output circuits can cause this fault to set.

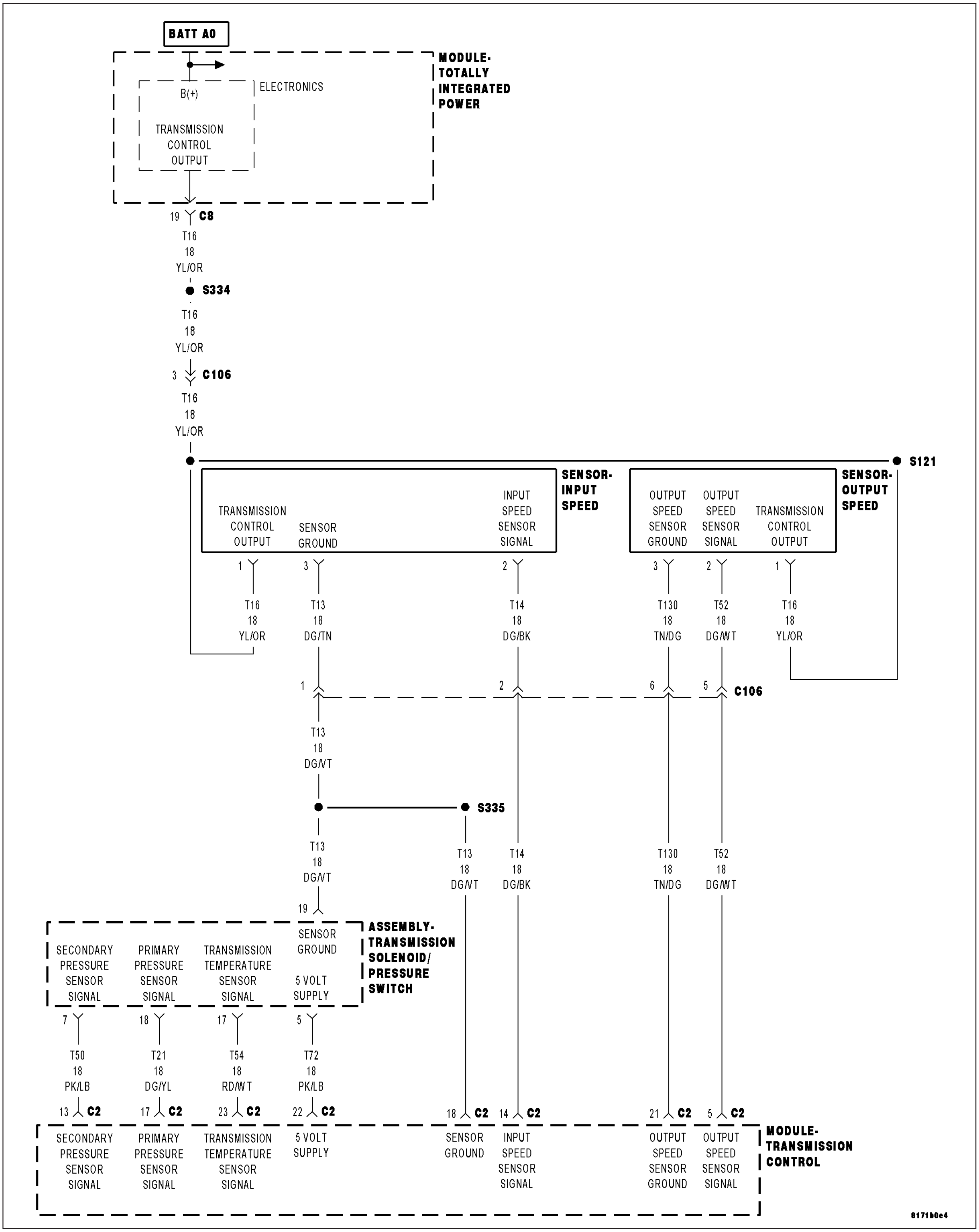
Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace and program the TCM per the Service Information.

Perform CVT TRANSMISSION VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Do to the configuration mismatch the controller will need to be replaced with the proper part number for the configuration of the vehicle. Replace and program the TCM per the Service Information.

Perform CVT TRANSMISSION VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

P1661-SENSOR GROUND REFERENCE CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Oil Temperature Sensor , Primary and Secondary Oil Pressure Sensor and the Input Speed Sensor use a common ground circuit that returns to the Transmission Control Module (TCM). If all of these circuits show an open (high voltage) the DTC will set.

- **When Monitored:**
  With the ignition on and a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  When all are present for the period of 200 msec:
- Transmission Fluid Temperature Sensor voltage is greater than 2.5 volts.
- Primary Pressure Sensor voltage greater than 5.0 volts.
- Secondary Pressure Sensor voltage is greater than 5.0 volts

Possible Causes
(T13) SENSOR GROUND CIRCUIT OPEN
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

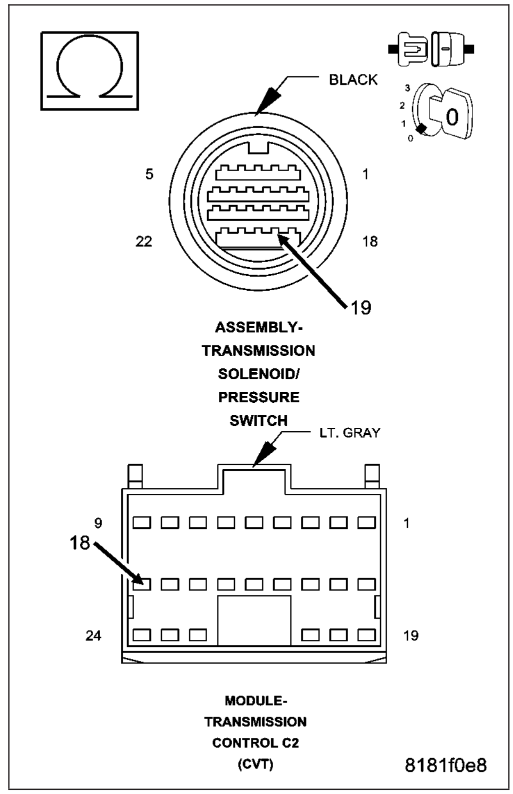
2. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance of the (T13) Sensor Ground circuit between the TCM C2 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T13) Sensor Ground circuit for an open.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN INTERNALLY

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace and program the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset during the Verification procedure?

Yes >> Replace the CV Transmission or repair the valve body (internal wiring) per the Service Information.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P1679-CALIBRATION NOT LEARNED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The first time the vehicle is started, the Transmission Control Module (TCM) receives hydraulic calibration data from an external EEPROM (located in the transmission) and stores this information in the EEPROM of the TCM. If there is no stored hydraulic calibration stored in the TCM this DTC will set. It takes one failure to turn on the MIL.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  The TCM is unable to read the hydraulic calibration data stored in the TCM EEPROM for the period of 5.0 seconds.

Possible Causes
OTHER TRANSMISSION DTCS PRESENT
TRANSMISSION RELEARN PERFORMED
TRANSMISSION CONTROL MODULE
CV TRANSMISSION REPLACED

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 4

2. CHECK FOR OTHER DTCS

With the scan tool, read Transmission DTCs.

Is the DTC U1146-LOST COMMUNICATION WITH EXTERNAL MEMORY also present?

Yes >> Refer to the Transmission Diagnosis and Testing category and perform diagnostics for U1146-LOST COMMUNICATION WITH EXTERNAL MEMORY.

No >> Go To 3

3. CHECK THE TCM

Has the Transmission Control Module (TCM), the CV Transmission been replaced, or a Transmission relearn procedure been performed?

Yes >> Cycle the ignition off for 5 seconds and then back on. Erase the DTC and cycle the ignition again. If the DTC still remains active, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any

Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

If the DTC is not active, erase the DTC and perform the CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Did the DTC P1679-CALIBRATION NOT LEARNED reset?

Yes >> Go To 2

No >> Test Complete.

P167A-CALIBRATION MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

During the initial ignition on, the Transmission Control Module (TCM) receives the calibrated data from the EEPROM assembly inside the transmission and stores this information in the EEPROM of the TCM. At every ignition on, the TCM compares the stored data in the EEPROM to the transmitted data from the EEPROM in the transmission. If the calibration data does not match the DTC will set and the MIL will illuminate after one failure.

- **When Monitored:**
  One time at initial ignition on with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  If the TCM stored calibration does not match the EEPROM assembly in the transmission. This DTC requires only one problem identification to set the MIL.

Possible Causes
TRANSMISSION CONTROL MODULE RELEARN PROCEDURE NOT PERFORMED

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. PERFORM TCM RELEARN PROCEDURE

View repair

Repair

This is an informational DTC indicating that the TCM, CV Transmission, or the CV Transmission internal controller (valve body) was replaced without being calibrated. With the scan tool perform a TCM relearn procedure.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

P1702-PRIMARY OIL PRESSURE SENSOR / SECONDARY OIL PRESSURE SENSOR CORRELATION

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the correlation between the primary and secondary pressure sensors. If the correlation between the sensors is out of range a DTC will set.

- **When Monitored:**
  Ignition on, system voltage between 9.0 and 16.0 volts.
  Engine running with the transmission in Drive.
  Vehicle speed greater than 10.0 Km/h (6.0 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm.
  No active DTCs from the following:
- Primary or Secondary Pressure Sensor
- Transmission Temperature Sensor
- TCC Lock Up Solenoid
- Step Motor
- Input or Output Speed Sensor
- Transmission Range Sensor (TRS)
- Line Pressure Solenoid
- Secondary Pressure Solenoid
- **Set Condition:**
  Condition one:
  Reported primary pressure is less than the lower limit of the primary pressure correlated with the reported secondary pressure for more than 5.0 seconds.
  Condition two:
  Reported primary pressure is greater than the upper limit of the primary pressure correlated with the reported secondary pressure for more than 5.0 seconds.

Possible Causes
PRIMARY PRESSURE SENSOR
SECONDARY PRESSURE SENSOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR TRANSMISSION DTC(s)

With the scan tool, read Transmission DTCs.

Are any of the following DTC(s) present PO842, PO843, PO847, or PO848?

Yes >> Refer to the Transmission Diagnostic and Testing category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 2

2. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 4

3. CHECK THE TCM

Replace or repair (valve body) the CV Transmission per the Service Information. Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Did the DTC reset during the verification test?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

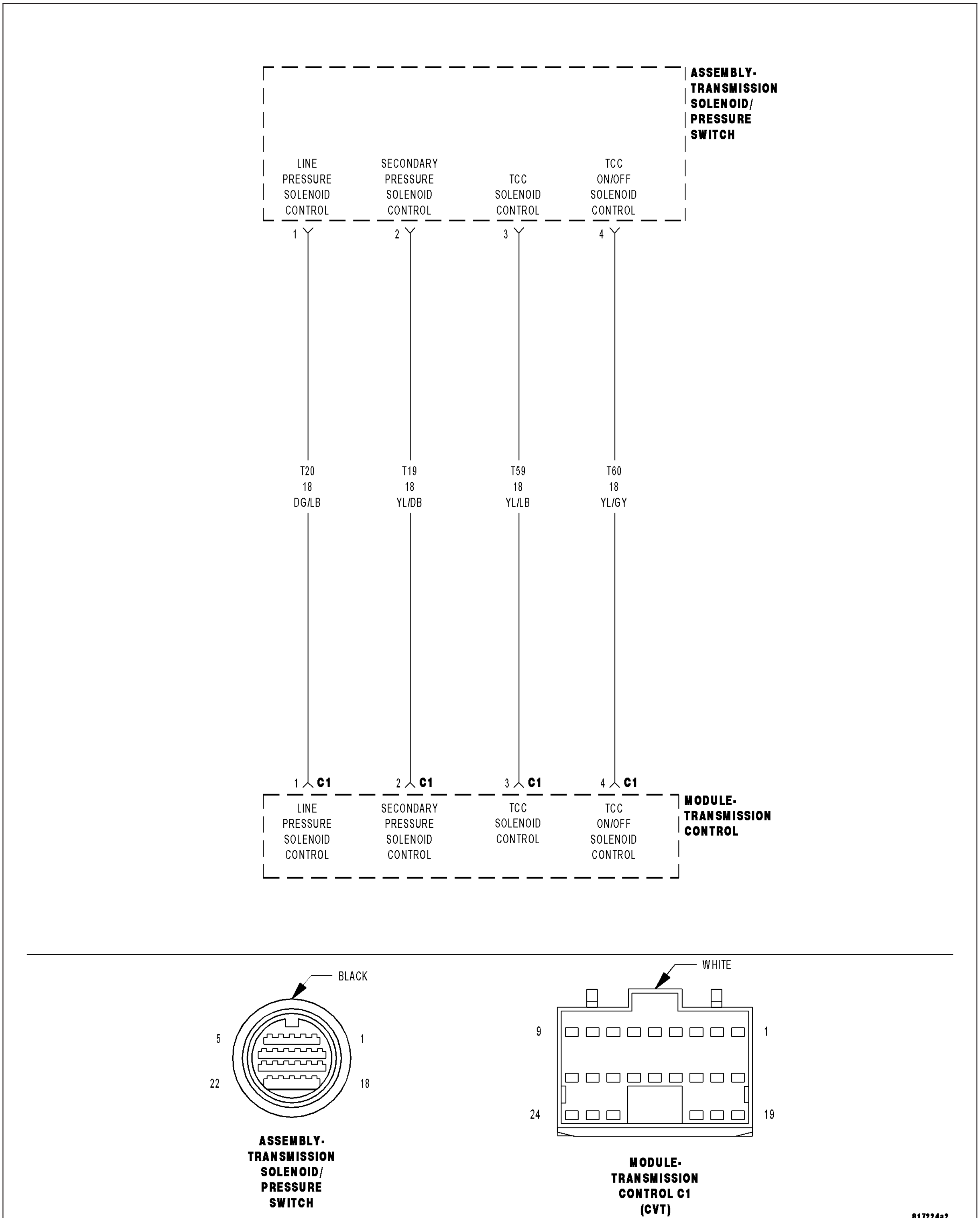
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P1723-LOCK UP / SELECT CONTROL CIRCUIT



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) monitors the TCC ON/OFF Solenoid Control signal during normal operation. If the TCC ON/OFF Solenoid status does not match the TCM requested ON/OFF status a DTC will set.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  If the TCC ON/OFF Solenoid status does not match the TCM requested ON/OFF status for the period of 200 msec the DTC will set. It takes two consecutive problem identification trips to illuminate the MIL.

Possible Causes
(T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT OPEN
(T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TCC ON/OFF SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

2. CHECK TO SEE IF THE DTC IS ACTIVE

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool actuate the TCC ON/OFF Solenoid.

Using a 12-volt test light connected to ground, check the (T60) TCC ON/OFF Solenoid Control circuit.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 4

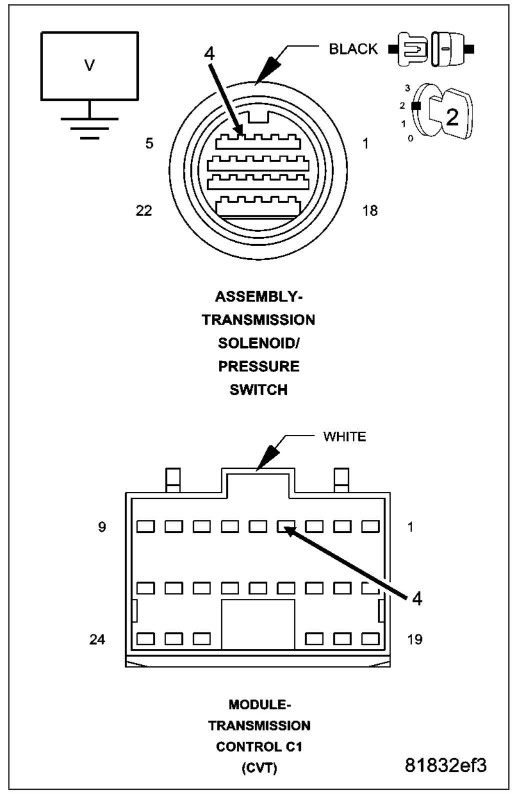
3. CHECK THE (T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T60) TCC ON/OFF Solenoid Control circuit.



Is the voltage above .05 volts?

Yes >> Repair the (T60) TCC ON/OFF Solenoid Control circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

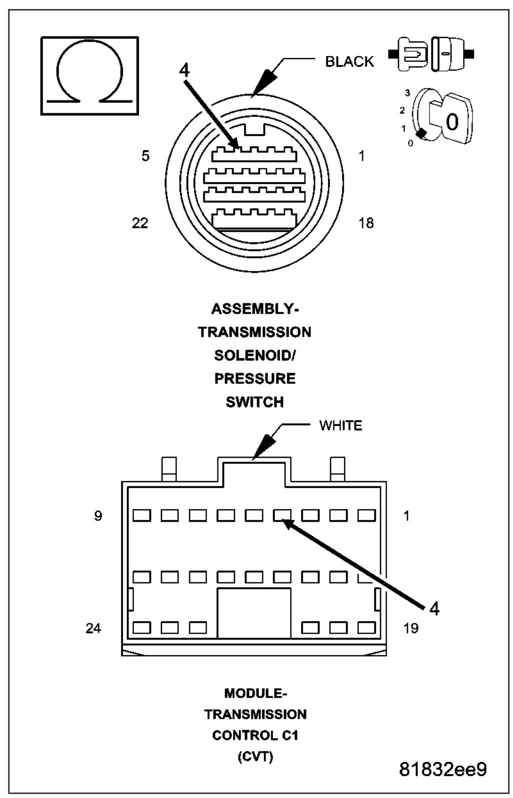
No >> Replace or repair (valve body) the CV Transmission per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Measure the resistance of the (T60) TCC ON/OFF Solenoid Control circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

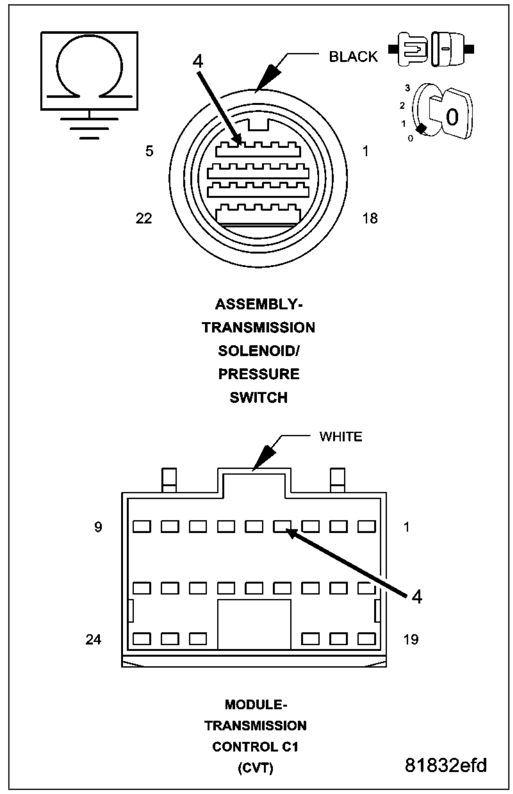
Yes >> Repair the (T60) TCC ON/OFF Solenoid Control circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE (T60) TCC ON/OFF SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T60) TCC ON/OFF Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T60) TCC ON/OFF Solenoid Control circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P1729-TRANSMISSION RATIO CONTROL CIRCUIT

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module monitors and controls the gear ratio by the use of a Step motor that transfers electrical power to mechanical movement. The rationality is a continuous test that monitors the Step motor movement. If the Step motor ON/OFF status does not match the TCM requested ON/OFF status a DTC will set.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  If the Step motor ON/OFF status does not match the TCM requested ON/OFF status for the period of 200 msec the DTC will set. It takes two consecutive problem identification trips to illuminate the MIL.

Possible Causes
(T314) A, (T315) B, (T316) C, AND/OR (T317) D STEP MOTOR CONTROL CIRCUIT(S) SHORT TO VOLTAGE
(T314) A, (T315) B, (T316) C, AND/OR (T317) D STEP MOTOR CONTROL CIRCUIT(S) OPEN
(T314) A, (T315) B, (T316) C, AND/OR (T317) D STEP MOTOR CONTROL CIRCUIT(S) SHORT TO GROUND
STEP MOTOR
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

2. CHECK THE (T314) A, (T315) B, (T316) C, AND (T317) D STEP MOTOR CONTROL CIRCUIT(S) FOR A SHORT TO VOLTAGE

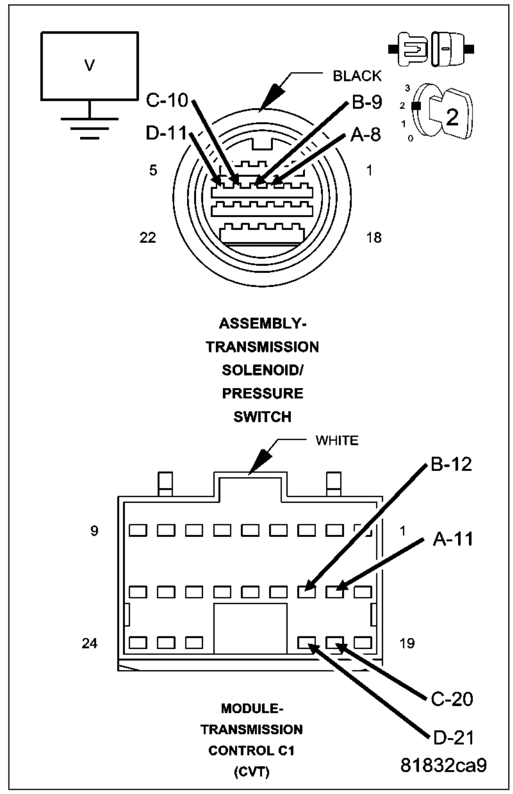
Turn the ignition off to the lock position.

Disconnect the TCM C1 and C2 harness connectors.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure separately the voltage of the (T314) A, (T315) B, (T316) C, and (T317) D Step Motor Control circuits.



Is the voltage above .05 volts for any of the Step Motor Control circuits?

Yes >> Repair the (T314) A, (T315) B, (T316) C, and/or (T317) D Step Motor Control circuit(s) for a short to voltage.

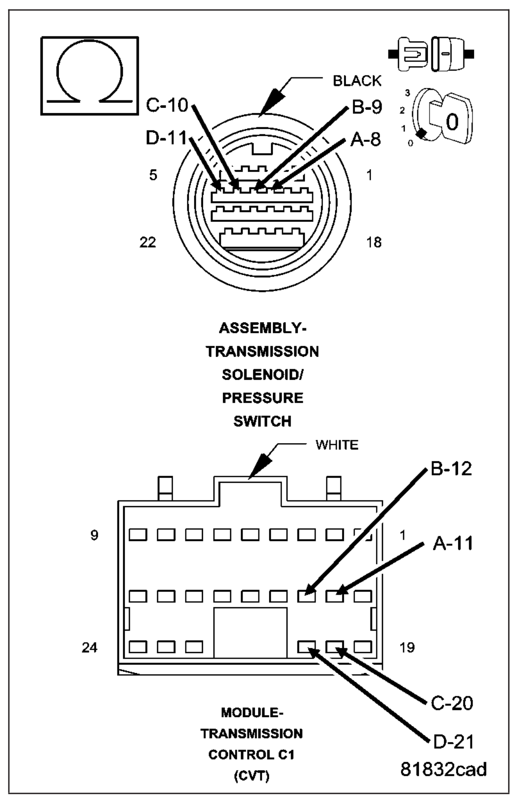
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T314) A, (T315) B, (T316) C, AND (T317) D STEP MOTOR CONTROL CIRCUIT(S) FOR AN OPEN

Turn the ignition off to the lock position.

Measure separately the resistance of the (T314) A, (T315) B, (T316) C, and (T317) D Step Motor Control circuits between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch harness connector.



Is the resistance above 5.0 ohms for any of the Step Motor Control circuits?

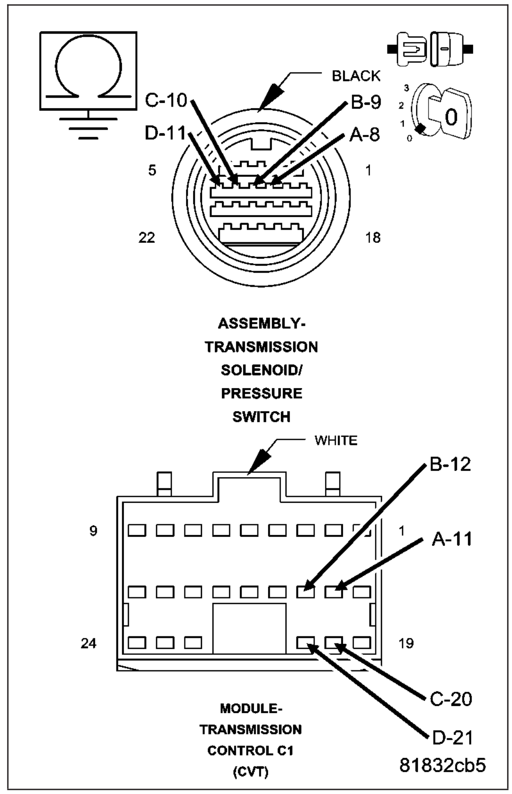
Yes >> Repair the (T314) A, (T315) B, (T316) C, and/or (T317) D Step Motor Control circuit(s) for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T314) A, (T315) B, (T316) C, AND (T317) D STEP MOTOR CONTROL CIRCUIT(S) FOR A SHORT TO GROUND

Measure separately the resistance between ground and the (T314) A, (T315) B, (T316) C, and (T317) D Step Motor Control circuits.



Is the resistance below 5.0 ohms for any of the Step Motor Control circuits?

Yes >> Repair the (T314) A, (T315) B, (T316) C, and/or (T317) D Step Motor Control circuit(s) for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. TRANSMISSION CONTROL MODULE

Replace the Transmission Control Module per the Service Information. Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

During the verification test did the DTC reset?

Yes >> Replace or repair the CV Transmission (Step Motor) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

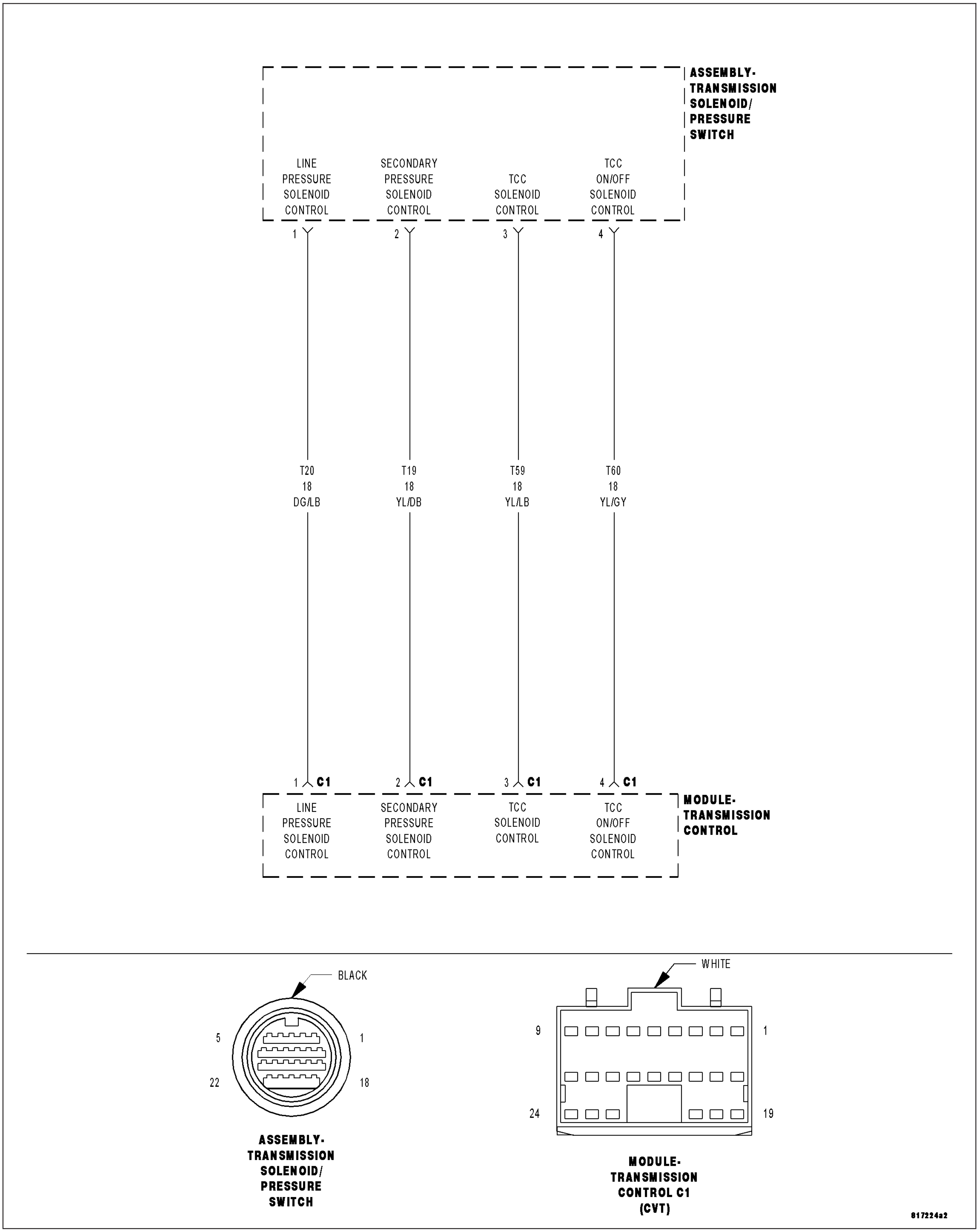
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P2769-TORQUE CONVERTER CLUTCH CIRCUIT LOW



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module monitors two signals from the TCC Solenoid during normal operation. One is the feedback electric current of the TCC Solenoid and the other is the voltage between ground and the TCM termination for the TCC Solenoid.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with TCC lock-up enabled.
  TCC Lock up command is ON (True).
  No DTCs active from the following:
- Step motor
- Line Pressure Solenoid,
- Secondary Solenoid
- Input and Output Speed Sensor
- Primary or Secondary Pressure Sensor
- CAN Bus
- **Set Condition:**
  If the actual voltage is 70% of the target voltage for the period of 1.0 second. It takes two consecutive problem identification trips for the DTC to mature and illuminate the MIL.

Possible Causes
(T59) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TORQUE CONVERTOR CLUTCH SOLENOID
TORQUE CONVERTOR CLUTCH
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 5

2. CHECK THE (T59) TCC SOLENOID CONTROL CIRCUIT

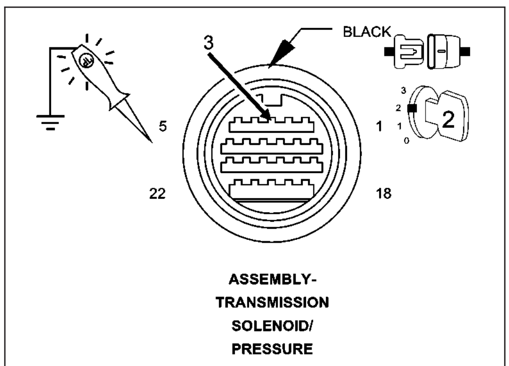
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the TCC Solenoid.

Using a 12-volt test light connected to ground, check the (T59) TCC Solenoid Control circuit.



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NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 4

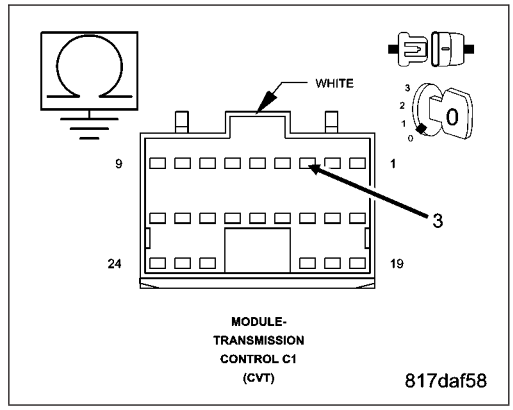
3. CHECK THE TCC SOLENOID

Turn the ignition off to the lock position.

Reconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Disconnect the TCM C1 harness connector.

Measure the resistance between ground and the (T59) TCC Solenoid Control circuit in the TCM C1 harness connector.



Is the resistance between 3.0 and 9.0 ohms?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the TCC Solenoid (Valve Body) per the Service Information.

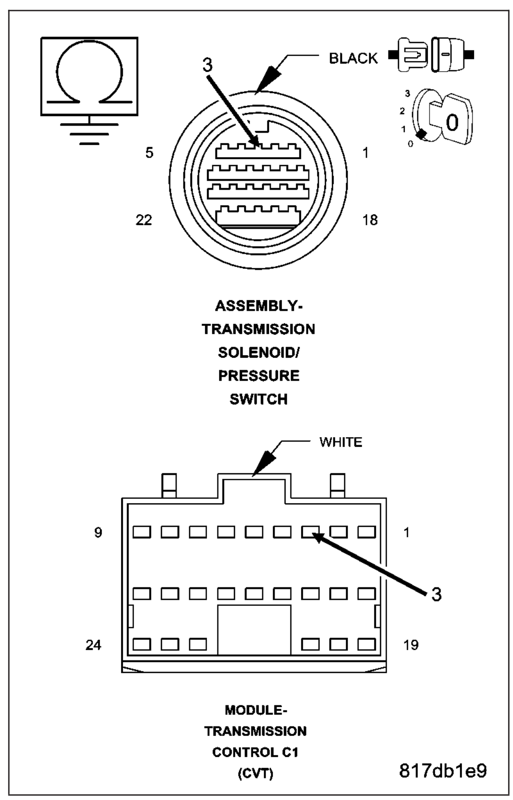
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. CHECK THE (T59) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Measure the resistance between ground and the (T59) TCC Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T59) TCC Solenoid Control circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

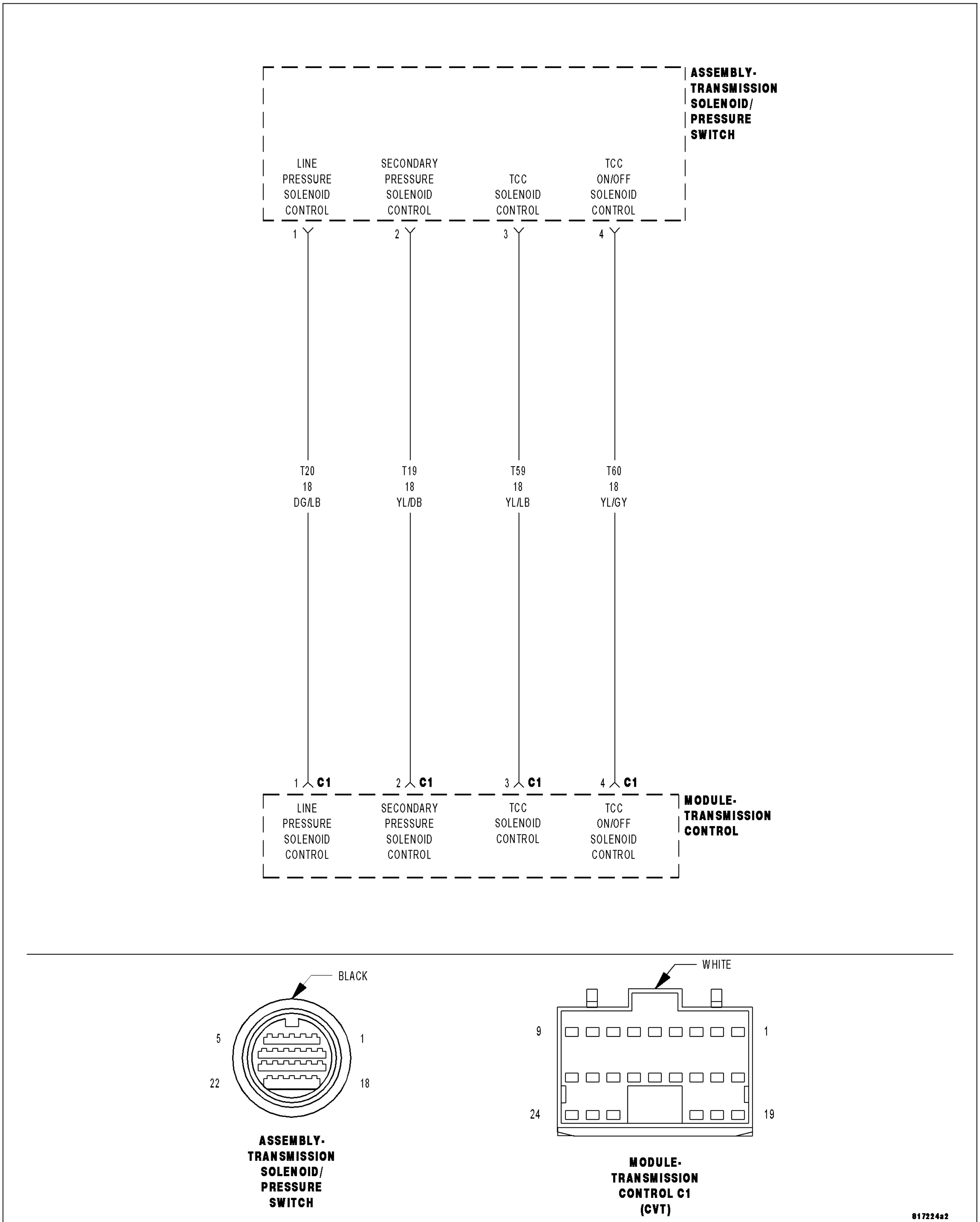
Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

P2770-TORQUE CONVERTER CLUTCH CIRCUIT HIGH



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module monitors two signals from the TCC Solenoid during normal operation. One is the feedback electric current of the TCC Solenoid and the other is the voltage between ground and the TCM termination for the TCC Solenoid.

- **When Monitored:**
  Ignition on, engine running with the transmission in a valid forward gear.
  Vehicle speed greater than 10 Km/h (6 mph).
  Accelerator Pedal Position (APP) greater than 12.5%.
  Engine rpm greater than 450 rpm with TCC lock-up enabled.
  TCC Lock up command is ON (True).
  No DTCs active from the following:
  Step motor, Line Pressure Solenoid, Secondary Solenoid, Input and Output Speed Sensor, Primary or Secondary Pressure Sensor, or CAN BUS.
- **Set Condition:**
  If the target current is greater than 0.75 amps and the monitored current is less than 0.4 amps for the period of 5 seconds. It takes two consecutive problem identification trips for the DTC to mature and illuminate the MIL.

Possible Causes
(T59) TCC SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T59) TCC SOLENOID CONTROL CIRCUIT OPEN
TORQUE CONVERTOR CLUTCH SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK TO SEE IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

2. CHECK THE (T59) TCC SOLENOID CONTROL CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the TCC Solenoid.

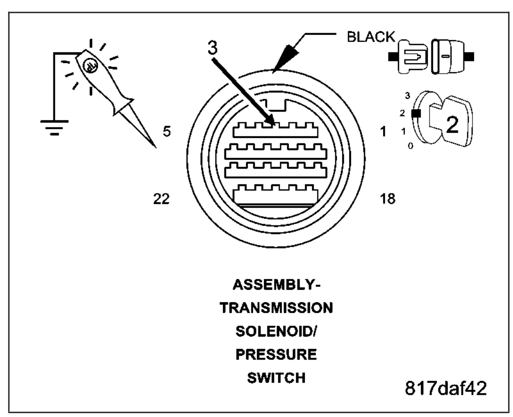
Using a 12-volt test light connected to ground, check the (T59) TCC Solenoid Control circuit.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

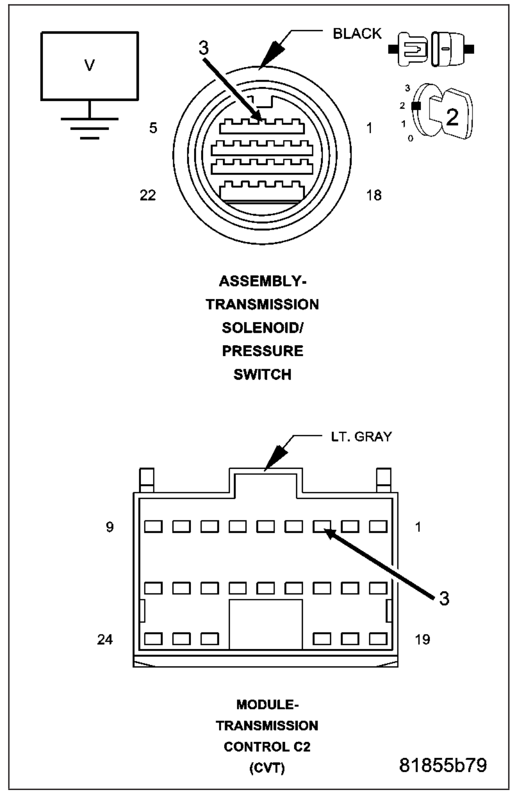
Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 5



3. CHECK THE (T59) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE



With the scan tool, stop the TCC Solenoid actuator.

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T59) TCC Solenoid Control circuit.

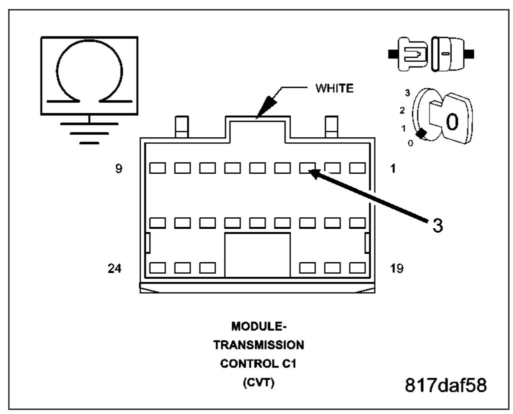
Is the voltage above 0.5 volts?

Yes >> Repair the (T59) TCC Solenoid Control circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE TCC SOLENOID



Turn the ignition off to the lock position.

Reconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T59) TCC Solenoid Control circuit in the TCM C1 harness connector.

Is the resistance between 3.0 and 9.0 ohms?

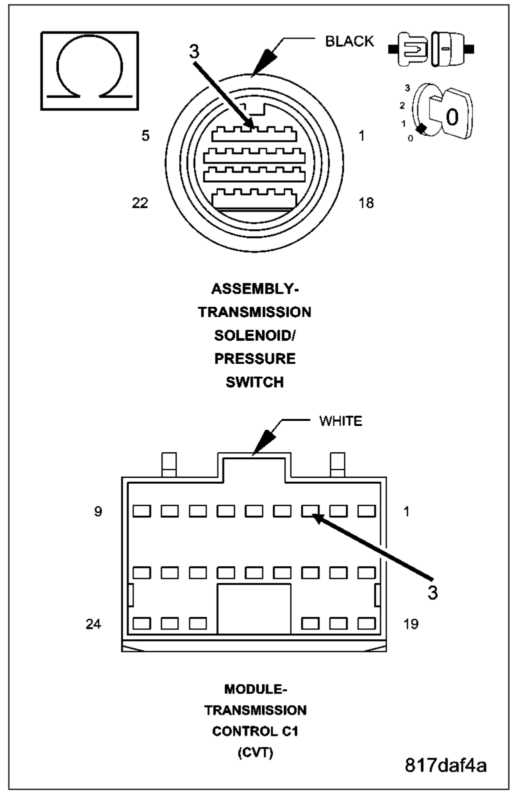
Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Replace the TCC Solenoid (Valve Body) per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. CHECK THE (T59) TCC SOLENOID CONTROL CIRCUIT FOR AN OPEN



With the scan tool, stop the TCC Solenoid actuator.

Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Ignition on, engine not running.

Measure the resistance of the (T59) TCC Solenoid Control circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T59) TCC Solenoid Control circuit for an open.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U0001-CAN C BUS

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Controller Area Network (CAN) is a high speed serial communication line for multiplex communication between multiple controllers that reside on the network. The Transmission Control Module monitors the transmit and receive message from the CAN BUS.

- **When Monitored:**
  Ignition on in the run position with a system voltage between 9.0 and 16.0 volts.
- **Set Condition:**
  If the Transmit or receive error counter is equal to or greater than 256.

For CAN Bus diagnostic procedures refer to (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

U0100-LOST COMMUNICATION WITH ECM/PCM

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Controller Area Network (CAN) is a high speed serial communication line for multiplex communication between multiple controllers that reside on the network. The Transmission Control Module monitors the transmit and receive message from the CAN BUS.

- **When Monitored:**
  Ignition on in the run position with a system voltage between 9.0 and 16.0 volts.
  IOD fuse is installed or vehicle odometer is over 80 kilometers (50 miles).
  No CAN C Bus DTCs present.
- **Set Condition:**
  A loss of CAN Bus communication between the TCM and ECM/PCM for the period of 2.0 seconds.

For CAN Bus diagnostic procedures refer to (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

U0121-LOST COMMUNICATION WITH ANTILOCK BRAKE MODULE

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Controller Area Network (CAN) is a high speed serial communication line for multiplex communication between multiple controllers that reside on the network. The Transmission Control Module monitors the transmit and receive message from the CAN BUS.

- **When Monitored:**
  Ignition on in the run position with a system voltage between 9.0 and 16.0 volts.
  IOD fuse is installed or vehicle odometer is over 80 kilometers (50 miles).
  No CAN C Bus DTCs present.
  Vehicle configuration is completed.
- **Set Condition:**
  A loss of CAN Bus communication between the TCM and ABS for the period of 2.0 seconds.

For CAN Bus diagnostic procedures refer to (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

U0141-LOST COMMUNICATION WITH IPM (FCM/TIPM)

For a complete wiring diagram **Refer to Section 8W**.

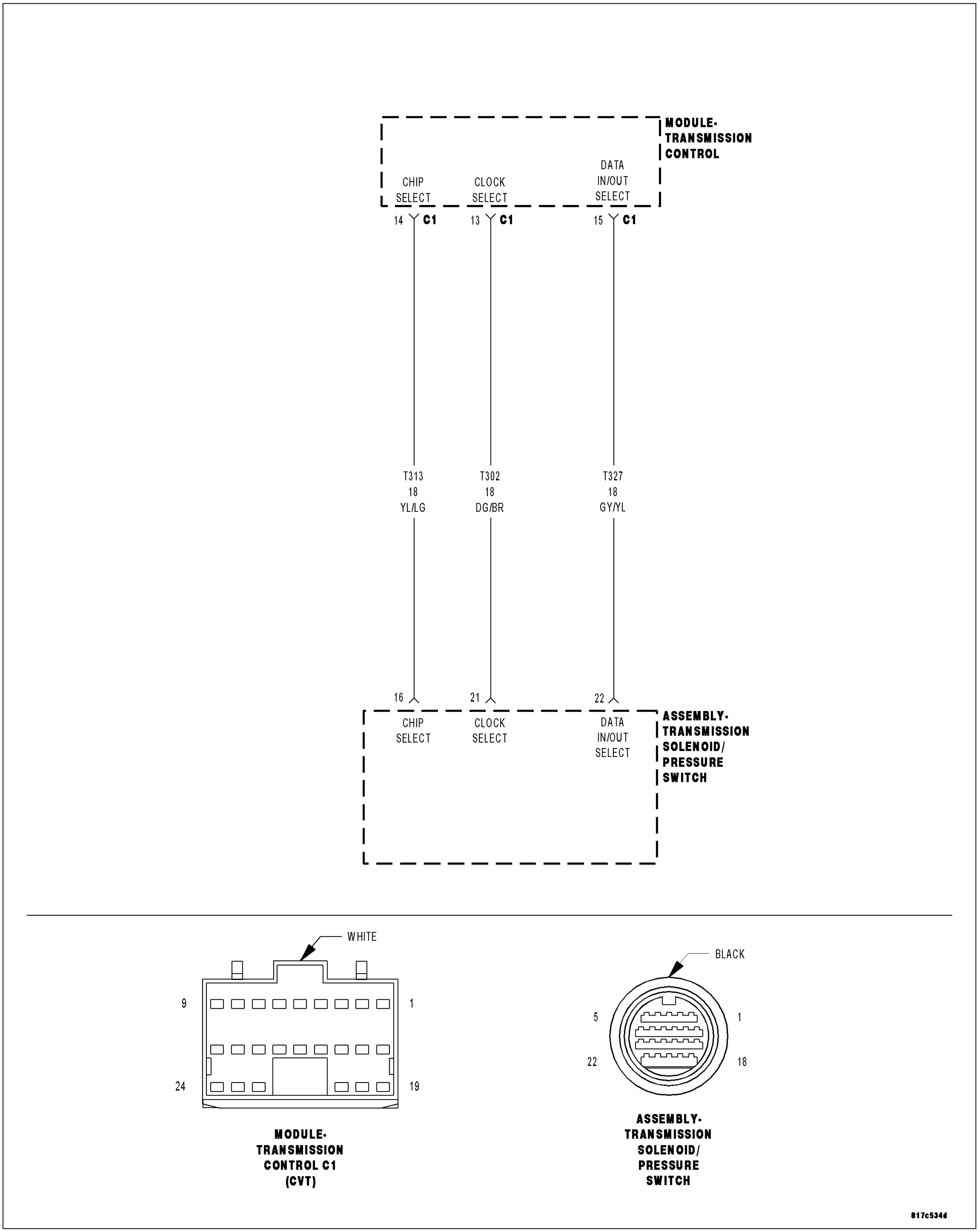
Theory of Operation

The Controller Area Network (CAN) is a high speed serial communication line for multiplex communication between multiple controllers that reside on the network. The Transmission Control Module monitors the transmit and receive message from the CAN BUS.

- **When Monitored:**
  Ignition on in the run position with a system voltage between 9.0 and 16.0 volts.
  IOD fuse is installed or vehicle odometer is over 80 kilometers (50 miles).
  No CAN C Bus DTCs present.
- **Set Condition:**
  A loss of CAN Bus communication between the TCM and FCM/TIPM for the period of 2.0 seconds.

For CAN Bus diagnostic procedures refer to (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

U1146-LOST COMMUNICATION WITH EXTERNAL MEMORY



For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The first time the vehicle is started, the Transmission Control Module (TCM) receives hydraulic calibration data from an external EEPROM (located in the transmission) and stores this information in the EEPROM of the TCM. If the TCM can not read the external EEPROM in the transmission this DTC will set. It takes two consecutive failures to turn on the MIL.

- **When Monitored:**
  Ignition on in the run position with a system voltage between 9.0 and 16.0 volts.
  Shift lever in Park or Reverse position.
- **Set Condition:**
  Communication between the TCM and the EEPROM in the transmission is not active for the period of 5 seconds.

Possible Causes
(T327) DATA IN/OUT SELECT CIRCUIT SHORT TO VOLTAGE
(T313) CHIP SELECT CIRCUIT SHORT TO VOLTAGE
(T302) CLOCK SELECT CIRCUIT SHORT TO VOLTAGE
(T327) DATA IN/OUT SELECT CIRCUIT OPEN
(T302) CLOCK SELECT CIRCUIT OPEN
(T302) CLOCK SELECT CIRCUIT SHORT TO GROUND
(T327) DATA IN/OUT SELECT CIRCUIT SHORT TO GROUND
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 10

2. CHECK THE (T327) DATA IN/OUT SELECT CIRCUIT FOR A SHORT TO VOLTAGE

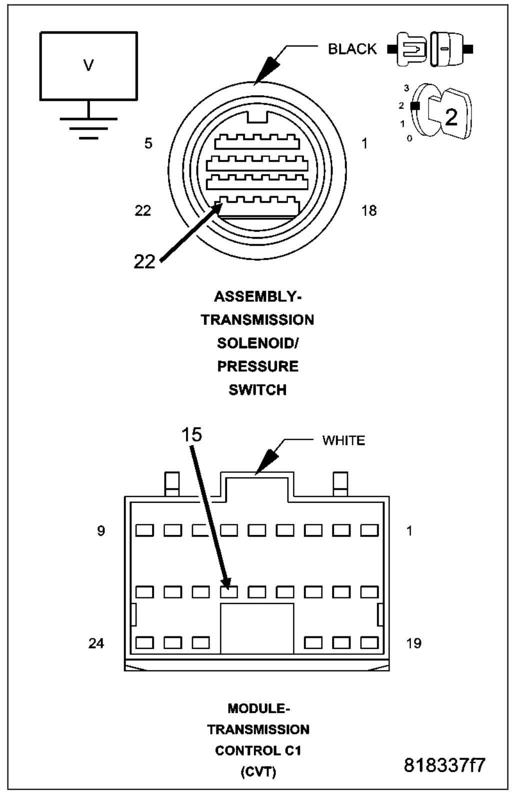
Turn the ignition off to the lock position.

Disconnect the TCM C1 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T327) Data IN/OUT Select circuit.



Is the voltage above .02 volts?

Yes >> Repair the (T327) Data IN/OUT Select circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK THE (T327) DATA IN/OUT SELECT CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage of the (T327) Data IN/OUT Select circuit.

Is the voltage above 0.1 volts?

Yes >> Repair the (T327) Data IN/OUT Select circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE (T302) CLOCK SELECT CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage of the (T302) Clock Select circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (T302) Clock Select circuit for a short to voltage.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 5

5. CHECK THE (T327) DATA IN/OUT SELECT CIRCUIT FOR AN OPEN

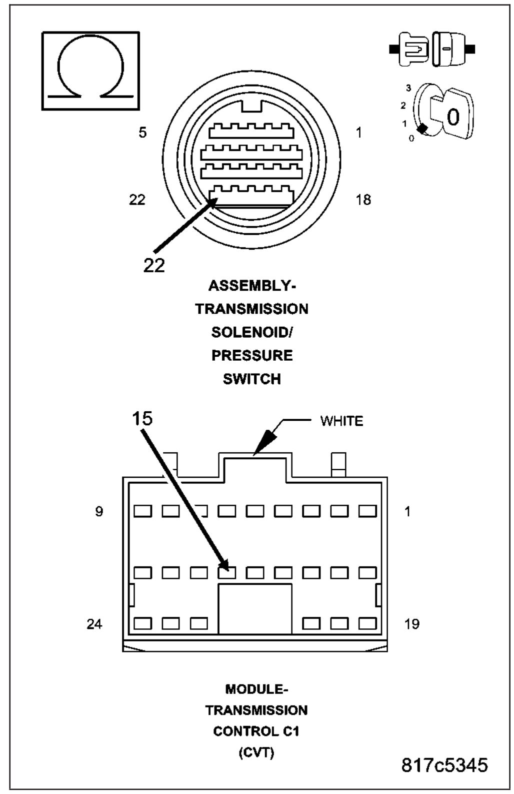
Turn the ignition off to the lock position.

Measure the resistance of the (T327) Data In/OutSelect circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T327) Data IN/OUT Select circuit for an open.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 6



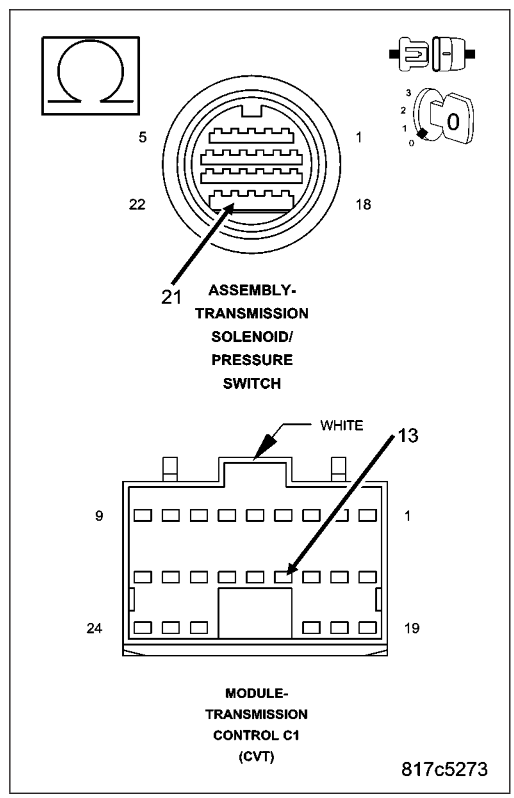
6. CHECK THE (T302) CLOCK SELECT CIRCUIT FOR AN OPEN

Measure the resistance of the (T302) Clock Select circuit between the TCM C1 harness connector and the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

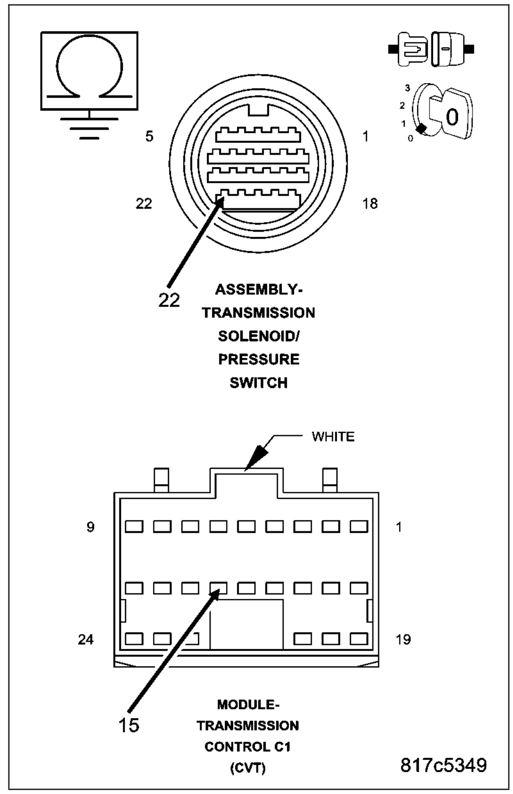
Yes >> Repair the (T302) Clock Select circuit for an open.
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 7



7. CHECK THE (T327) DATA IN/OUT SELECT CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T327) Data IN/OUT Select circuit.



Is the resistance below 5.0 ohms?

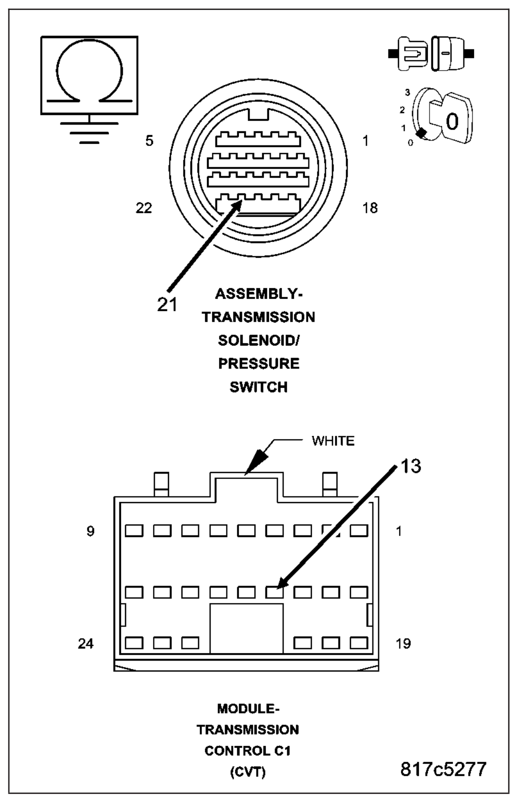
Yes >> Repair the (T327) Data IN/OUT Select circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 8

8. CHECK THE (T302) CLOCK SELECT CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T302) Clock Select circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T302) Clock Select circuit for a short to ground.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 9

9. CHECK THE TCM

Replace or repair the CV Transmission (valve body) per the Service Information. Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE).

Did the DTC reset during the verification test?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1400-IMPLAUSIBLE TPS SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) receives two throttle position related signals over the CAN Bus. One is the throttle pedal position and the other is a throttle pedal position toggle bit. When the Toggle signal pattern is out of range from a predefined signal pattern a DTC will set.

- **When Monitored:**
  Ignition on with no Lost Communication with ECM/PCM DTCs present.
- **Set Condition:**
  When the throttle pedal position toggle signal pattern is out of range from a predefined signal pattern for the period of 1 second.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ECM/PCM DTCS PRESENT
ECM/PCM
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ECM/PCM DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1401-IMPLAUSIBLE ENGINE SPEED SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module (TCM) receives Engine rpm over the CAN Bus.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts.
  Time since last TRS change greater than 2.0 seconds.
  Condition one:
  TCC ON/OFF in the ON position.
  No Active DTCs from the following:
- Lost Communication with ECM/PCM
- Step Motor
- No CAN Bus DTCs present.
- Transmission Range Sensor
- TCC ON/OFF Solenoid
- Input or Output Speed Sensor
  Condition two:
  No Active DTCs from the following:
- Lost Communication with ECM/PCM
- No CAN Bus DTCs present.
- Step Motor
-
  Condition one:
  All the below conditions must be present for the period of 5 seconds for the DTC to set:
- Engine speed minus Input speed is greater than 1000 rpm for the period of 5 seconds.
- Engine speed minus Secondary speed estimated ratio is greater than 1000 rpm for the period of 5 seconds.
- Secondary speed multiplied by the estimated ratio minus the primary speed is less than 1000 rpm.
  Condition two:
- Engine speed is less than 450 rpm and the Input speed is greater than or equal to 1000 rpm for the period of 20 msec.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 4

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1407-IMPLAUSIBLE ENGINE TORQUE REQUEST SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with a system voltage between 9.0 and 16.0 volts with no CAN DTCs detected.
- **Set Condition:**
  When the TCM receives an implausible engine torque request from the PCM over the CAN Bus.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U140F-IMPLAUSIBLE ENGINE VARIANT DATA

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

During the initial ignition on, the Transmission Control Module (TCM) receives the calibrated data from the Engine/Powertrain Control Module (ECM/PCM) over the CAN Bus and stores this information in the EEPROM of the TCM. During normal operation the TCM compares the stored data in the EEPROM to the transmitted data from the ECM/PCM. If the calibration data does not match the DTC will set and the MIL will illuminate after two consecutive failures.

- **When Monitored:**
  Ignition on, engine running with a system voltage between 9.0 and 16.0 volts.
  ECM/PCM variant data received more than twice in a row over the CAN Bus.
- **Set Condition:**
  ECM/PCM has wrong variant data installed.
  ECM/PCM sending wrong or improper CAN message for more than 5.0 seconds.

Possible Causes
FCM/TIPM DTCS PRESENT
WRONG ENGINE CONTROLLER SOFTWARE
WRONG TRANSMISSION CONTROLLER SOFTWARE
ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF THE ECM/PCM WAS REPLACED

Was the ECM/PCM replaced?

Yes >> Check to make sure the right part number was used that correlates with the engine and transmission using the vehicle identification number. It may be necessary to flash the ECM/PCM to the proper configuration or replace the controller. With the scan tool perform a TCM relearn procedure.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK IF THE TCM WAS REPLACED

Was the TCM replaced?

Yes >> Check to make sure the right part number was used that correlates with engine and transmission using the vehicle identification number. It may be necessary to flash the PCM/TCM to the proper configuration or replace the TCM with the correct configuration. With the scan tool perform a TCM relearn procedure.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the TCM per the Service Information.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1410-IMPLAUSIBLE FCM VARIANT DATA

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module receives vehicle information over the CAN Bus from the FCM/TIPM and stores this information in the EEPROM of the controller. This information is compared information received over the CAN Bus. If the information does not match, the DTC will set.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16.0 volts.
  FCM/TIPM variant data received more than twice in a row over the CAN Bus.
- **Set Condition:**
  One or more FCM/TIPM variant data received over the CAN Bus is not in a valid range for the period of 5.0 seconds.

Possible Causes
FCM/TIPM WAS REPLACED
TCM WAS REPLACED
FCM/TIPM
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK MODULE PART NUMBERS TO VEHICLE IDENTIFICATION NUMBER

View repair

Repair

This DTC is an indication of either the FCM/TIPM was replaced with the wrong configuration (improper tire size), or the TCM was replaced with the wrong configuration. If either controller was replaced, confirm the part numbers to the Vehicle Identification Number (VIN) and program or replace as necessary. With the scan tool perform a TCM relearn procedure.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

U1424-IMPLAUSIBLE ENGINE TORQUE SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Transmission Control Module request from the ECM/PCM to change the torque of the engine to avoid possible damage to the transmission.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16 volts.
  No PCM/ECM CAN Bus DTCs present.
- **Set Condition:**
  When the TCM receives an implausible engine torque signal from the PCM over the CAN Bus for a period of 1.0 second.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).
Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1425-IMPLAUSIBLE PEDAL POSITION SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with system voltage between 9.0 and 16.0 volts.
  No PCM/ECM CAN Bus DTCs present.
- **Set Condition:**
  When the TCM receives an implausible throttle pedal position over the CAN Bus from the PCM/ECM.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1426-IMPLAUSIBLE TCC SLIP REQUEST SIGNAL RECEIVED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with no PCM/ECM CAN Bus DTCs present.
- **Set Condition:**
  When the TCM receives an implausible Torque Converter Clutch slip request (EMCC) from the PCM/ECM.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1428-RECEIVED ENGINE TORQUE REQUEST SIGNAL STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with no CAN DTCs detected.
- **Set Condition:**
  When the TCM receives an engine torque request from the PCM over the CAN Bus that does not change for the period of 1.0 second.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

U1429-RECEIVED ENGINE TORQUE SIGNAL STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with no CAN DTCs detected.
- **Set Condition:**
  When the TCM receives an engine torque request from the PCM over the CAN Bus that does not change for the period of 1.0 second.

Possible Causes
FCM/TIPM CAN BUS DTCS PRESENT
ENGINE MODULE DTCS PRESENT
POWERTRAIN CONTROL MODULE
TRANSMISSION CONTROL MODULE

Always perform the CVT Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS ACTIVE

With the scan tool, read Transmission DTCs.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 5

2. CHECK FOR FCM/TIPM CAN BUS DTCS

With the scan tool, read FCM/TIPM DTCs.

Are there any FCM/TIPM CAN BUS DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 3

3. CHECK IF ENGINE DTCS ARE PRESENT

With the scan tool, read engine DTCs.

Are there any engine DTCs present?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) category and perform the appropriate symptom(s).

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Go To 4

4. CHECK THE PCM

Replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - REMOVAL)

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.

Perform CVT VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Test Complete.

STANDARD PROCEDURE

CVT - PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram **Refer to Section 8W**.

Perform the following pre-diagnostic troubleshooting procedures prior to performing any diagnostic test.

Always perform diagnostics with a fully charged battery to avoid false symptoms. The Transmission Control Module (TCM) requires a system voltage between 9 and 16 volts.

1. Many transmission symptoms can be caused by a low fluid level. If the fluid level is low, locate and repair any leaks and fill the transmission to the proper fluid level. Refer to the Service Information for the proper repair and fluid fill procedures.

CAUTION: The CVT Transmission uses a specific green transmission fluid that is substantially different from standard ATF used in other automatic transmissions. Failure to use the proper fluid will result in excessive transmission damage or total failure. Refer to the Service Information for the proper fluid type.

2. With the scan tool, read Engine DTCs. If Engine DTCs are present, refer to the Engine (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) and perform to the appropriate diagnostic procedure(s) before proceeding.
3. With the scan tool, read Transmission (TCM) DTCs. Record all Stored, Active, and Pending DTC information. Diagnose any Pending DTC as a matured DTC.
4. Use the wiring diagram as a guide, inspect the wiring and connectors related to this circuit and repair as necessary.
5. Refer to the When Monitored and Set Conditions for this DTC. DTCs can set at ignition on, at start up, driving under specific conditions, and after controller diagnostic monitors have run or otherwise know as a Good Trip.
6. Check for any Service Information Tune-ups or Service Bulletins for any possible causes that may apply. Check for controller software update information. Some conditions can be corrected by upgrading the Engine (PCM) or Transmission (TCM) controller software.

1.

Did any of the above procedures repair the vehicle?

Yes >> Testing is complete.

Perform CVT TRANSMISSION VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - STANDARD PROCEDURE)

No >> Refer to the identified category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - DIAGNOSIS AND TESTING)

CVT VERIFICATION TEST

Perform the following after completion of a diagnostic repair:

1. Reconnect any disconnected components.
2. With the scan tool, erase all Transmission and Engine DTCs.
3. If the Transmission Control Module or the Transmission has been repaired or replaced, it is necessary to perform the scan tool Quick Learn Procedure.
4. With the scan tool, display Transmission Temperature. Start and run the engine until the transmission temperature is HOT, above 43° C or 110° F.
5. Check the transmission fluid and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure.

CAUTION: The CVT uses a specific transmission fluid type that is green in color. Do not use a standard ATF fluid. Doing so can damage the transmission. Make sure to follow the Service Information fluid type and fill procedure.

6. Road test the vehicle. With the scan tool, monitor the engine rpm and throttle angle. Drive the vehicle from a standing start to 45 mph with a constant throttle opening of 20 to 25 degrees with an engine speed above 450 rpm.
7. For a specific DTC, drive the vehicle to the Symptom's When Monitored/When Set condition to verify the DTC is repaired.
8. If equipped with AutoStick®, upshift and downshift several times using the AutoStick® feature during the road test.

NOTE: Use the OBDII task manager to run a Good Trip. This will confirm the repair(s) made and to ensure the DTC has not re-matured.

9. Check for any Diagnostic Trouble Codes (DTCs) during and after the road test.

1.

Did any Diagnostic Trouble Codes set during the road test?

Yes >> Repair is not complete. Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - DIAGNOSIS AND TESTING)

No >> Repair is complete.

AUTOMATIC - CVT-SERVICE INFORMATION

TABLE OF CONTENTS

AUTOMATIC - CVT-SERVICE INFORMATION

DESCRIPTION

The continuously variable transmission (CVT) has a torque converter which allows optimal limitless driving force in response to the accelerator pedal operation, therefore giving us smooth driving without shift shock. The CVT also has a manual mode function for both smooth driving without shift shock, and enjoyable driving with manual gear selection.

The CVT allows for maximum driving force and performance when compared to a conventional A/T. When the throttle is fully opened, driving force for the conventional automatic transmission changes unevenly because the gear is shifted in steps. On the other hand, driving force for the CVT changes smoothly because it is possible for it to accelerate while keeping it in the peak power range of the engine. Therefore, CVT avoids the loss of driving force, and enables smooth and shock free driving.

Coordinated control of the engine and the multifaceted shift diagram have made it possible to realize both, smooth and powerful driving with a good gear change response and an improvement in fuel consumption.

OPERATION

PARK POWERFLOW

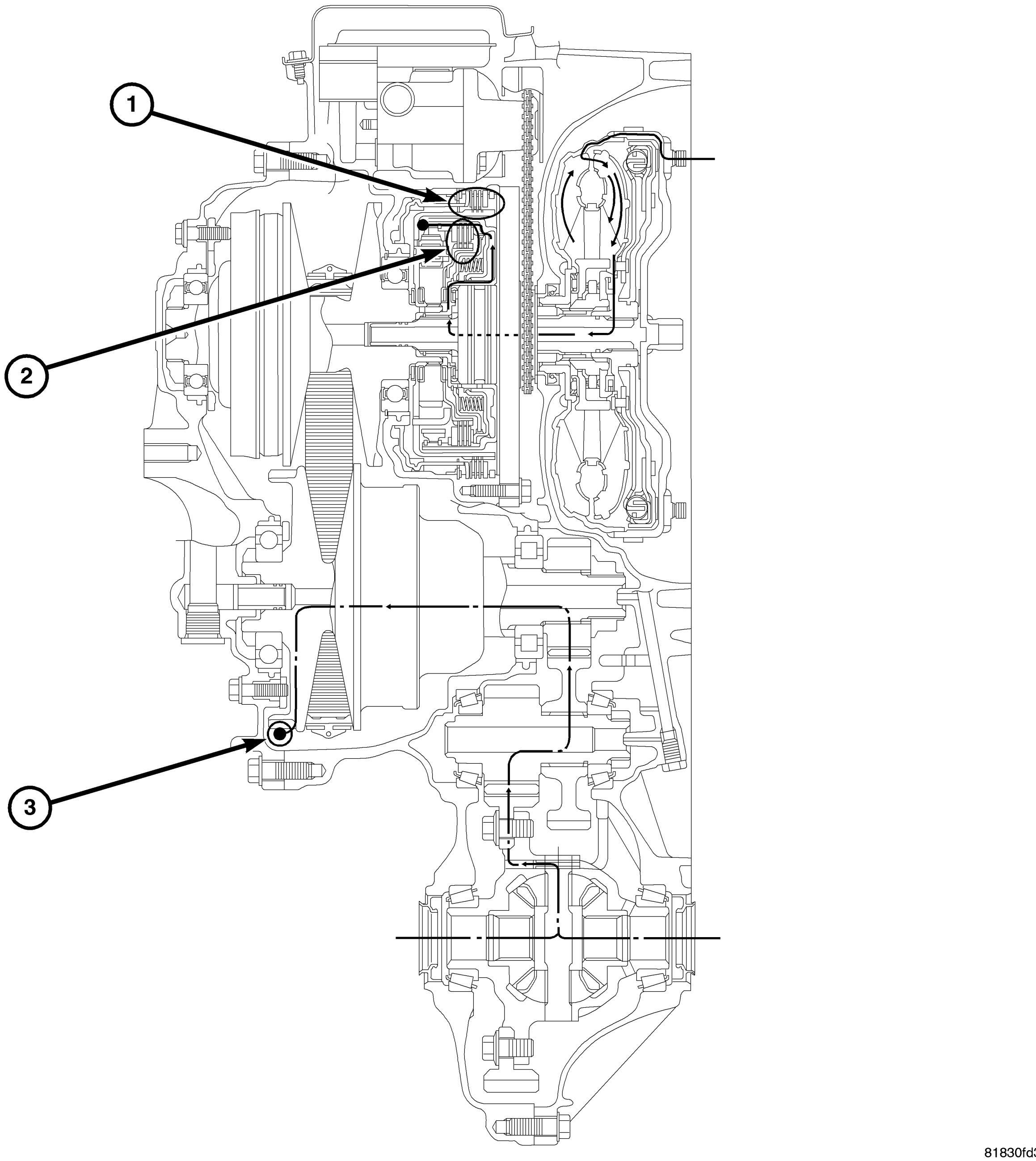


Fig. 1 PARK

1 - REVERSE BRAKE (RELEASED)
2 - FORWARD CLUTCH (RELEASED)
3- PARKING GEAR (FIXED)

When the forward clutch and the reverse brake are released, the driving force from the engine runs idly and power is not transmitted to the primary pulley.

When the parking gear is fixed, the torque load from the tires is not transmitted up to the primary pulley.

REVERSE POWERFLOW

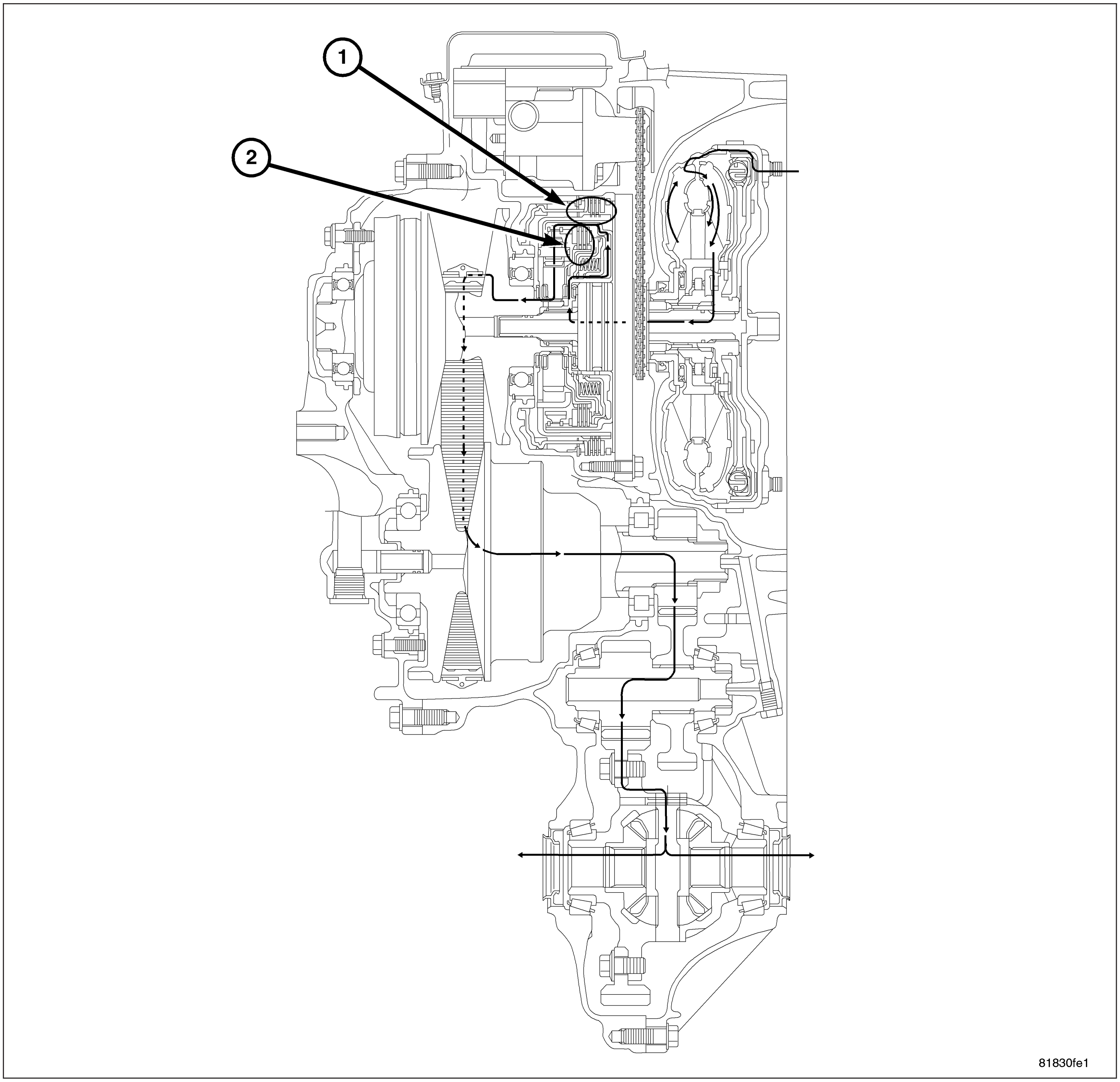


Fig. 2 REVERSE

1 - REVERSE BRAKE (ENGAGED)
2 - FORWARD CLUTCH (RELEASED)

When the reverse brake is engaged, the planetary carrier is fixed and the driving force from the engine rotates the sun gear reversely.

Therefore, the primary pulley is rotated reversely and the driving force is outputted in the reverse rotating direction.

NEUTRAL POWERFLOW

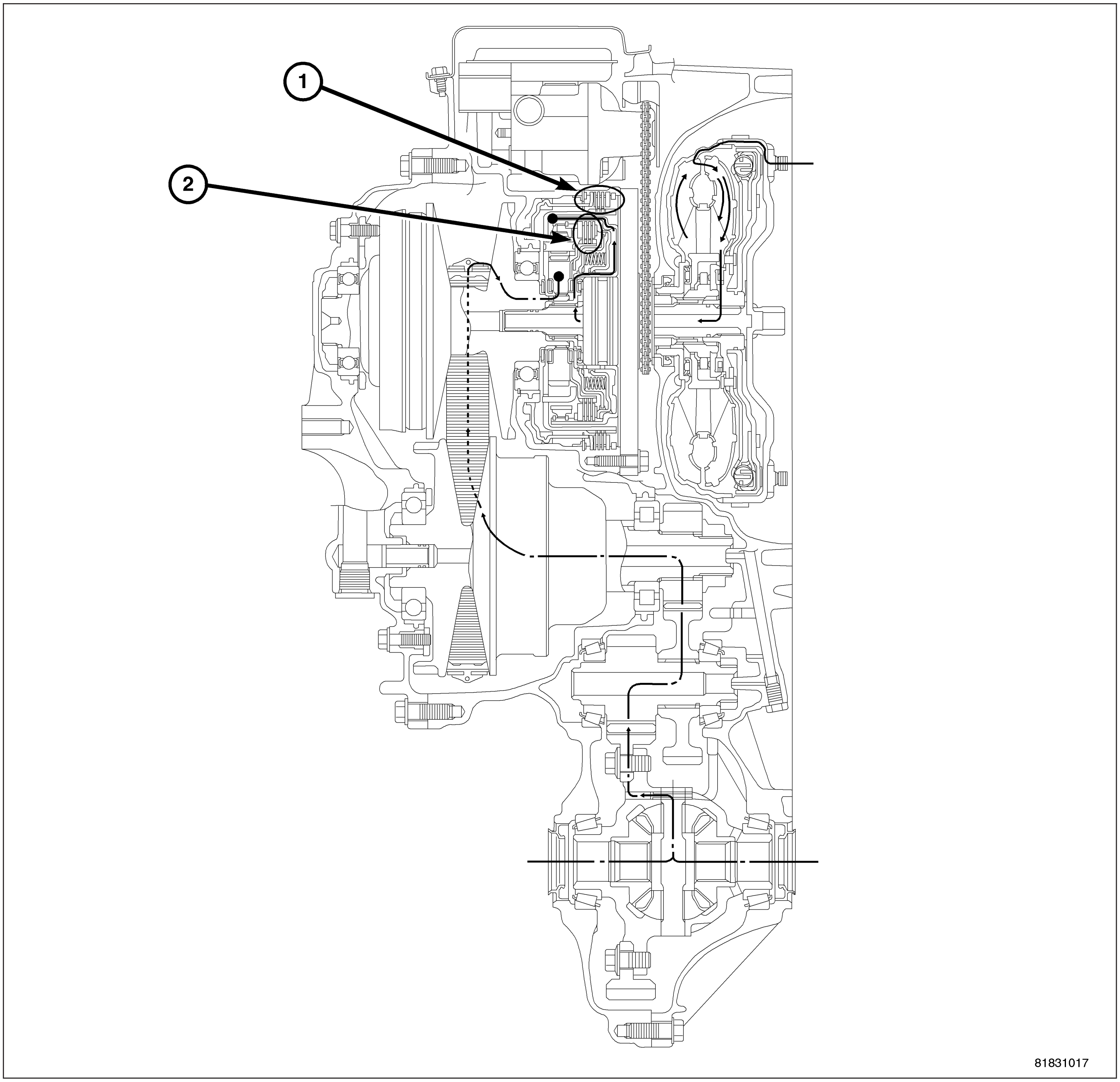


Fig. 3 NEUTRAL

1 - REVERSE BRAKE (RELEASED)
2 - FORWARD CLUTCH (RELEASED)

When the forward clutch and the reverse brake are released, the driving force from the engine runs idly and is not transmitted to the primary pulley.

When the forward clutch and the reverse brake are released, the planetary carrier runs idly and the torque from the tires are not transmitted.

DRIVE POWERFLOW

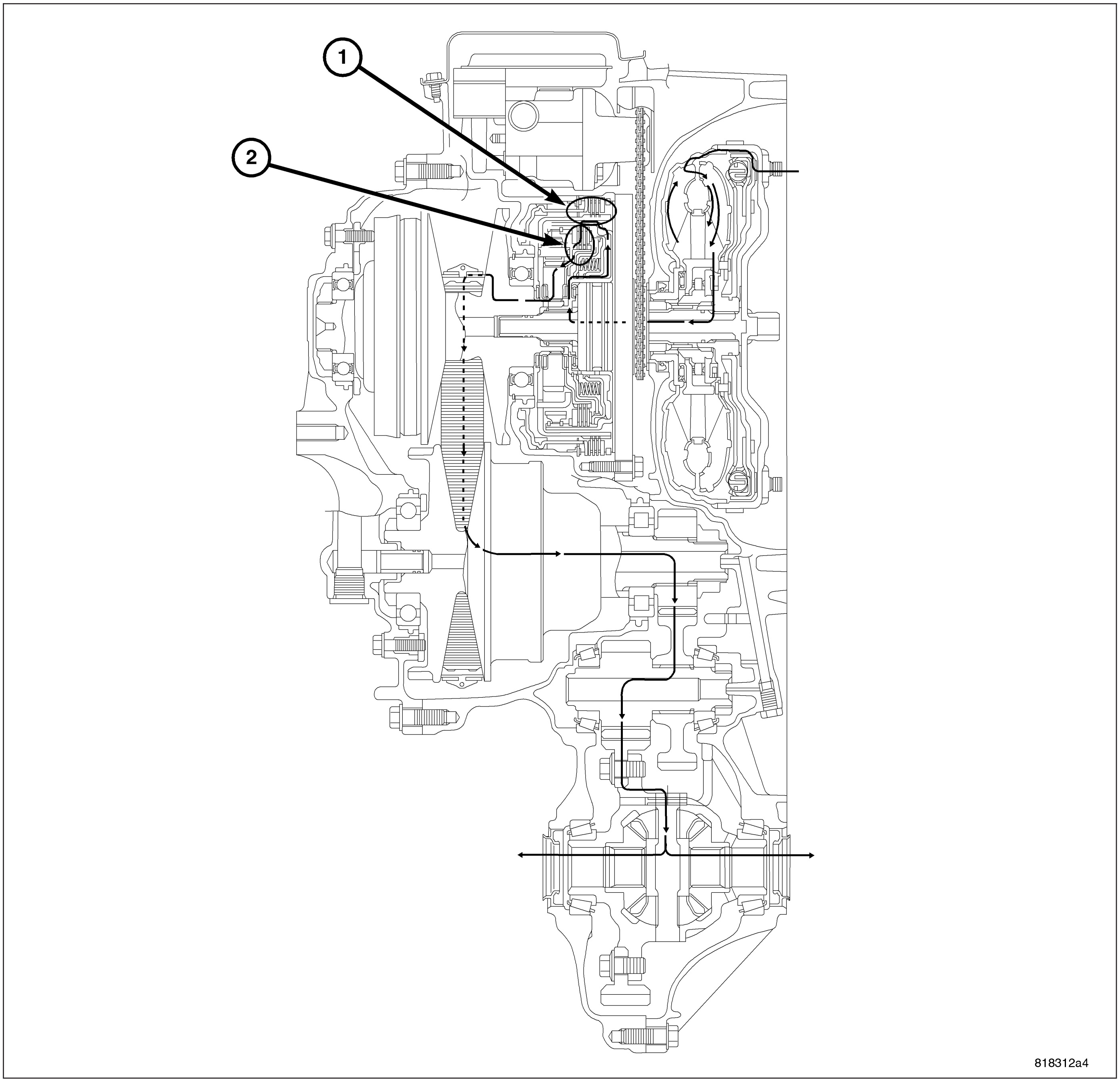


Fig. 4 DRIVE

1 - REVERSE BRAKE (RELEASED)
2 - FORWARD CLUTCH (ENGAGED)

When the forward clutch is engaged, the driving force from the engine rotates the sun gear normally through the forward clutch.

Therefore, the primary pulley is rotated normally and the driving force is outputted in the normally rotated direction.

SHIFT LOW TO HIGH - PHASE 1

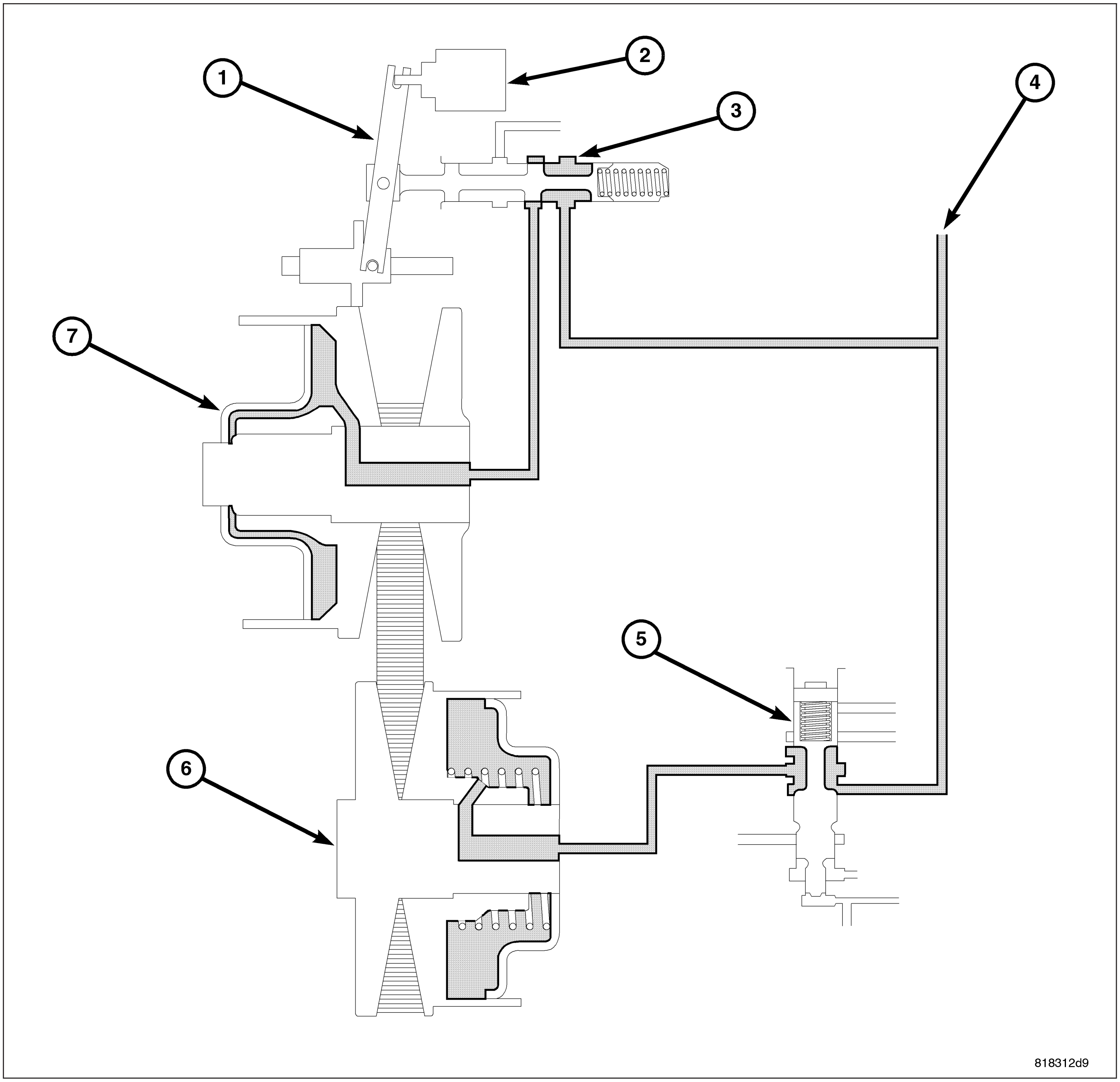


Fig. 5 SHIFT LOW TO HIGH

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

When the line pressure circuit is closed by the ratio control valve, the line pressure is not applied to the primary pulley.

When the secondary valve moves downwards, line pressure is applied to the secondary pulley.

SHIFT LOW TO HIGH - PHASE 2

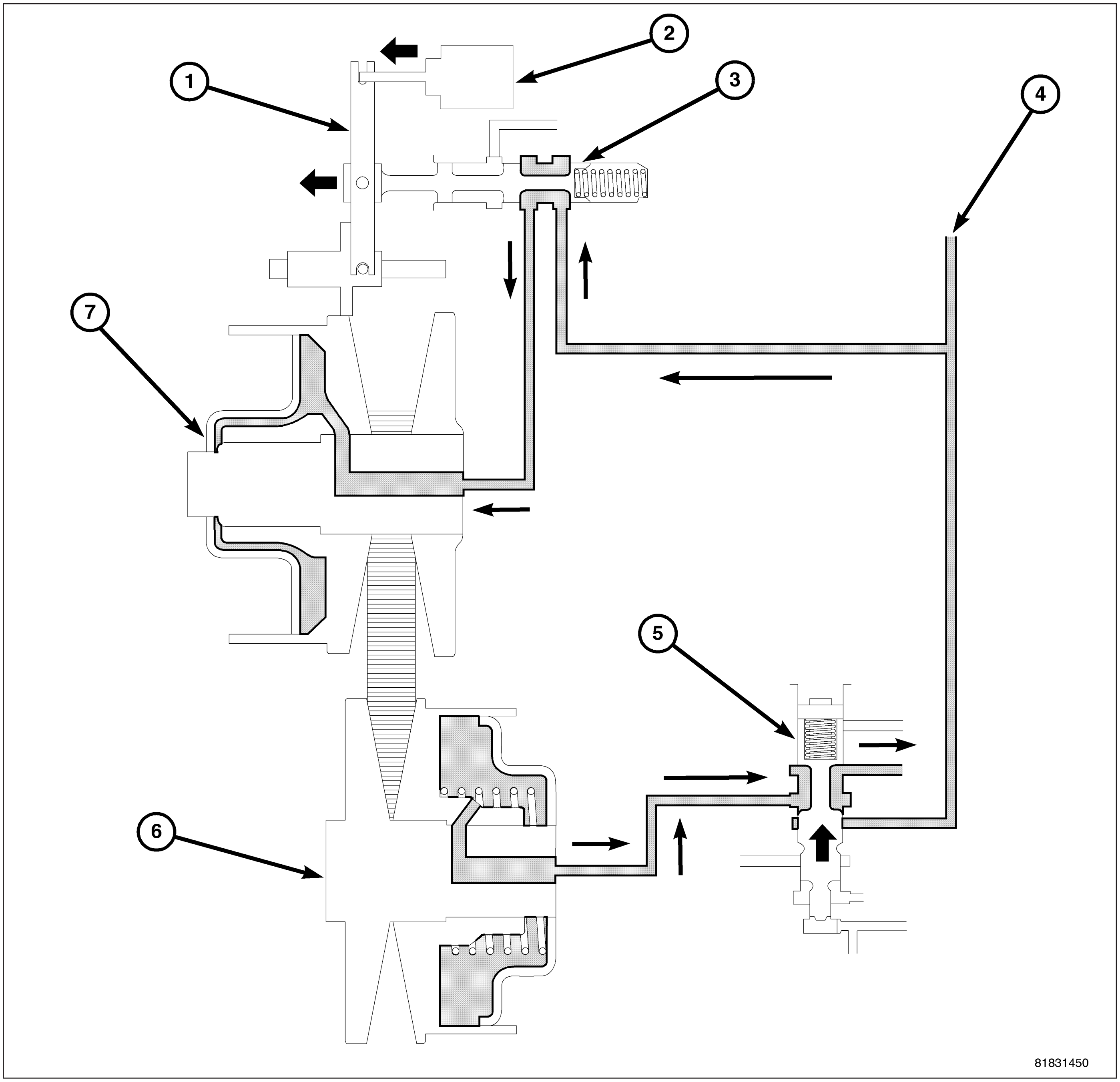


Fig. 6 SHIFT LOW TO HIGH 2

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

The pulley ratio linkage moves to the left direction of the stepper motor. The line pressure circuit opens due to the movement of the ratio control valve which links to the pulley linkage, and line pressure is applied to the primary pulley.

The secondary valve moves to open and fluid in the secondary pulley is drained.

SHIFT LOW TO HIGH - PHASE 3

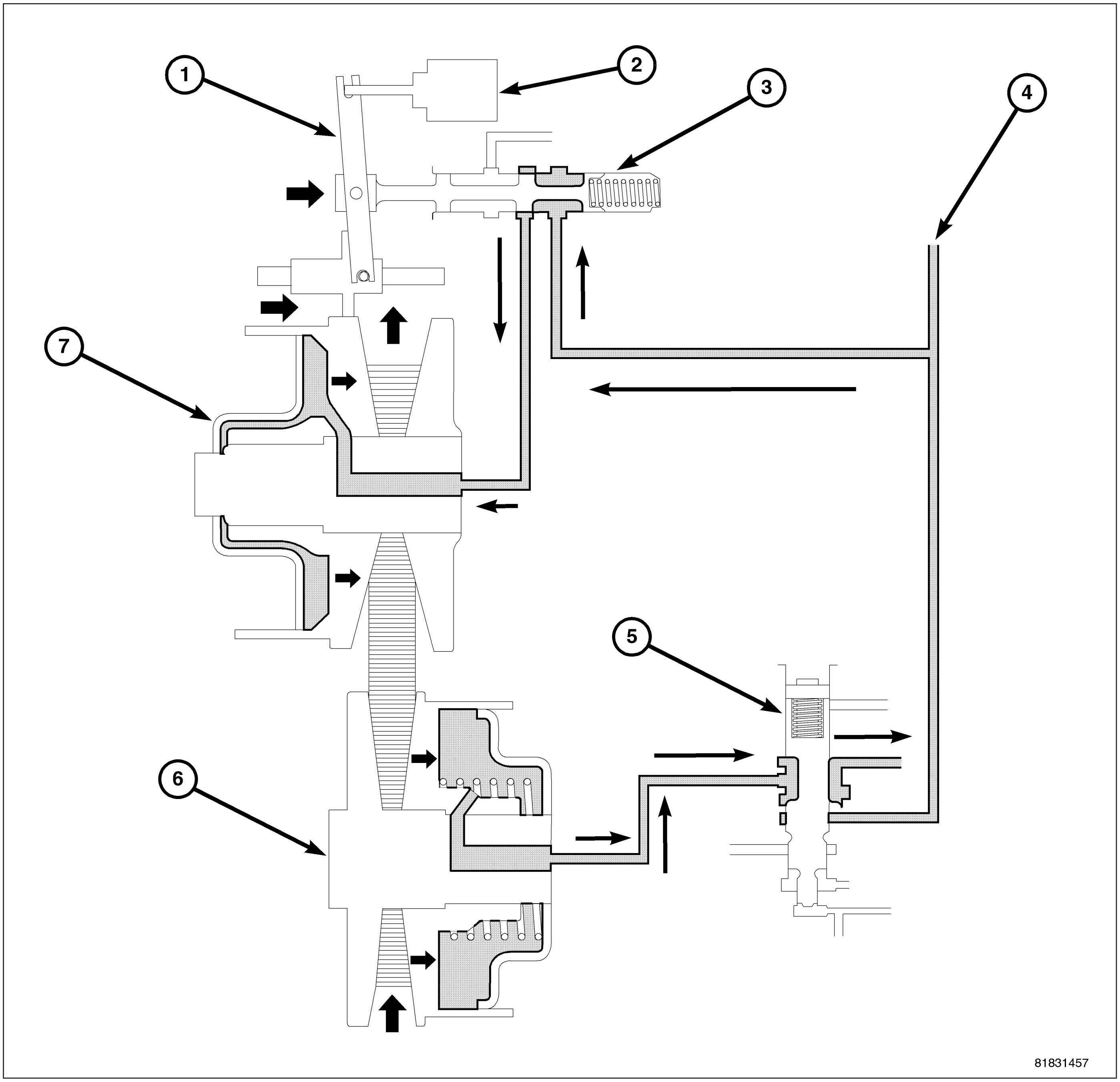


Fig. 7 SHIFT LOW TO HIGH 3

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

By applying line pressure to the primary pulley, the sliding element moves to the right direction and the steel belt is pushed outside.

By actuating the “moving-pulley” of the primary pulley to the right direction, the ratio control valve starts to move to the right direction through the pulley ratio linkage which is driven by the sliding element.

By pulling the steel belt to the primary pulley side, the moving-pulley of the secondary pulley moves to the right side also.

SHIFT LOW TO HIGH - PHASE 4

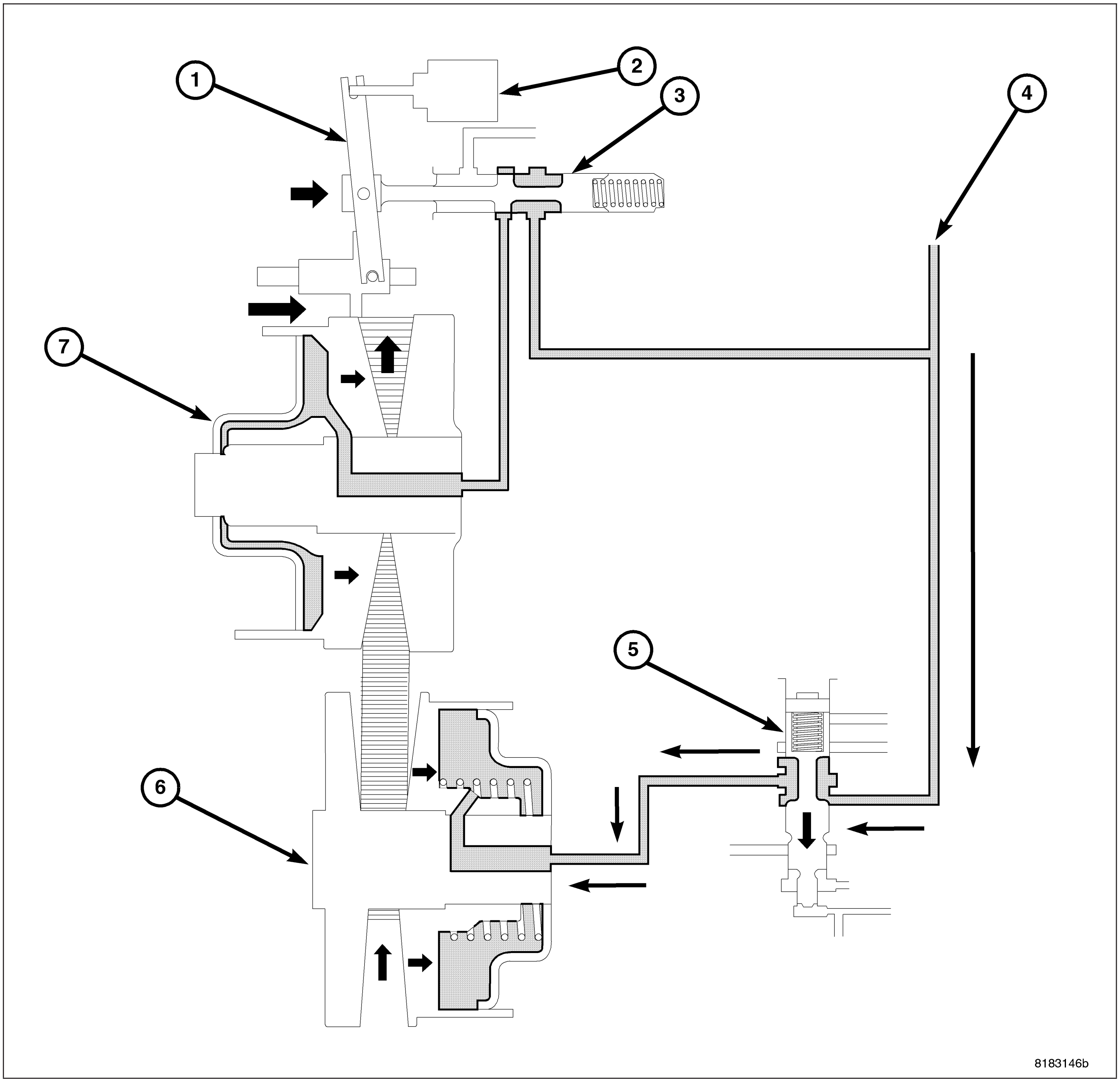


Fig. 8 SHIFT LOW TO HIGH 4

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

Additionally, the sliding element of the primary pulley moves to the right direction and the ratio control valve also moves to the right side and closes the line pressure circuit; this is a completion of the shift.

The secondary valve moves downwards to apply the line pressure to the secondary pulley in order to apply clamping force to the steel belt.

SHIFT HIGH TO LOW - PHASE 1

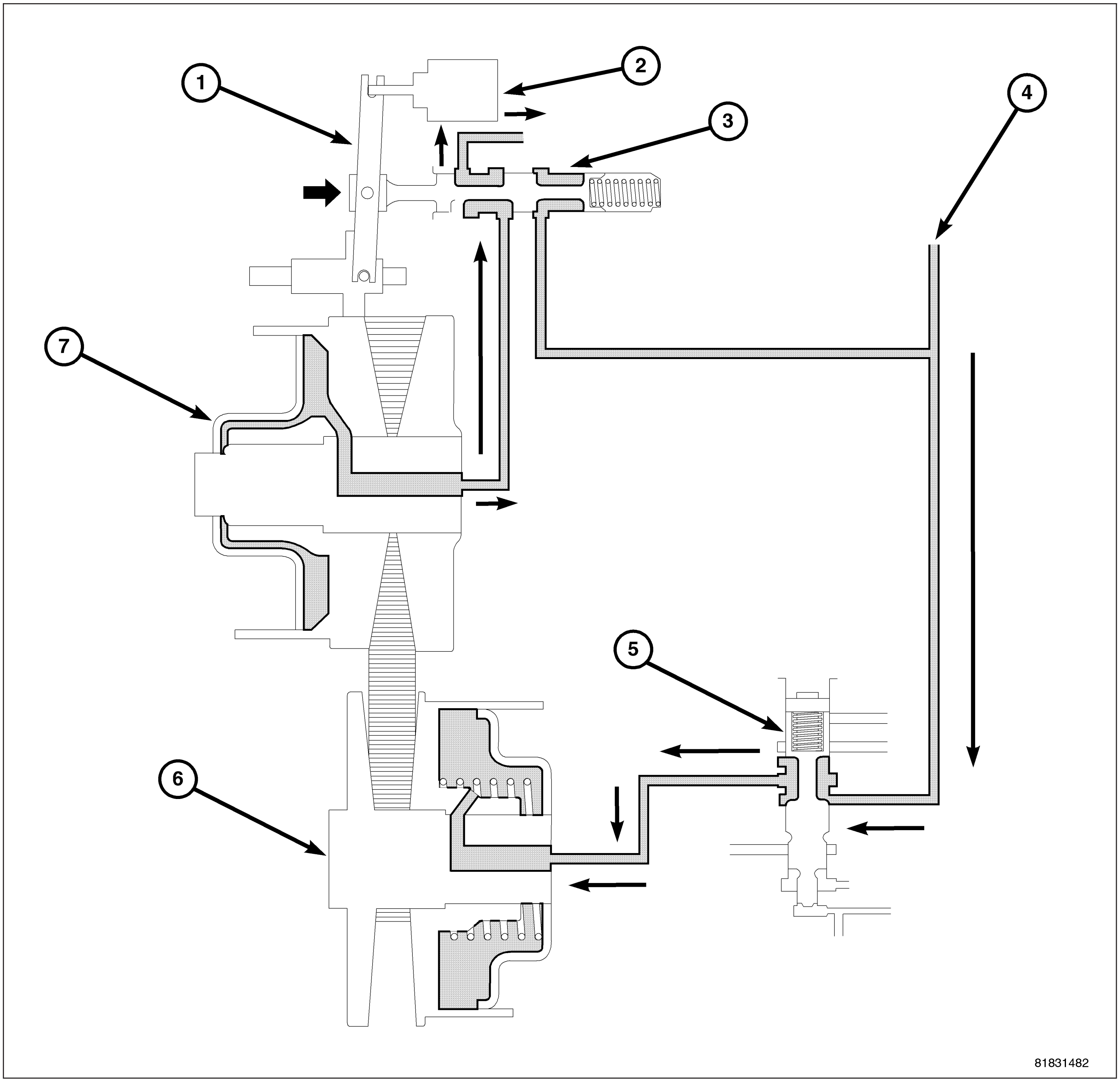


Fig. 9 SHIFTING HIGH TO LOW

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

The pulley ratio linkage moves to the right direction in the stepper motor. As the ratio control valve which links to the pulley ratio linkage, moves fluid and the primary pulley is drained.

Because the secondary valve is moving downwards, line pressure is applied to the secondary pulley.

SHIFT HIGH TO LOW - PHASE 2

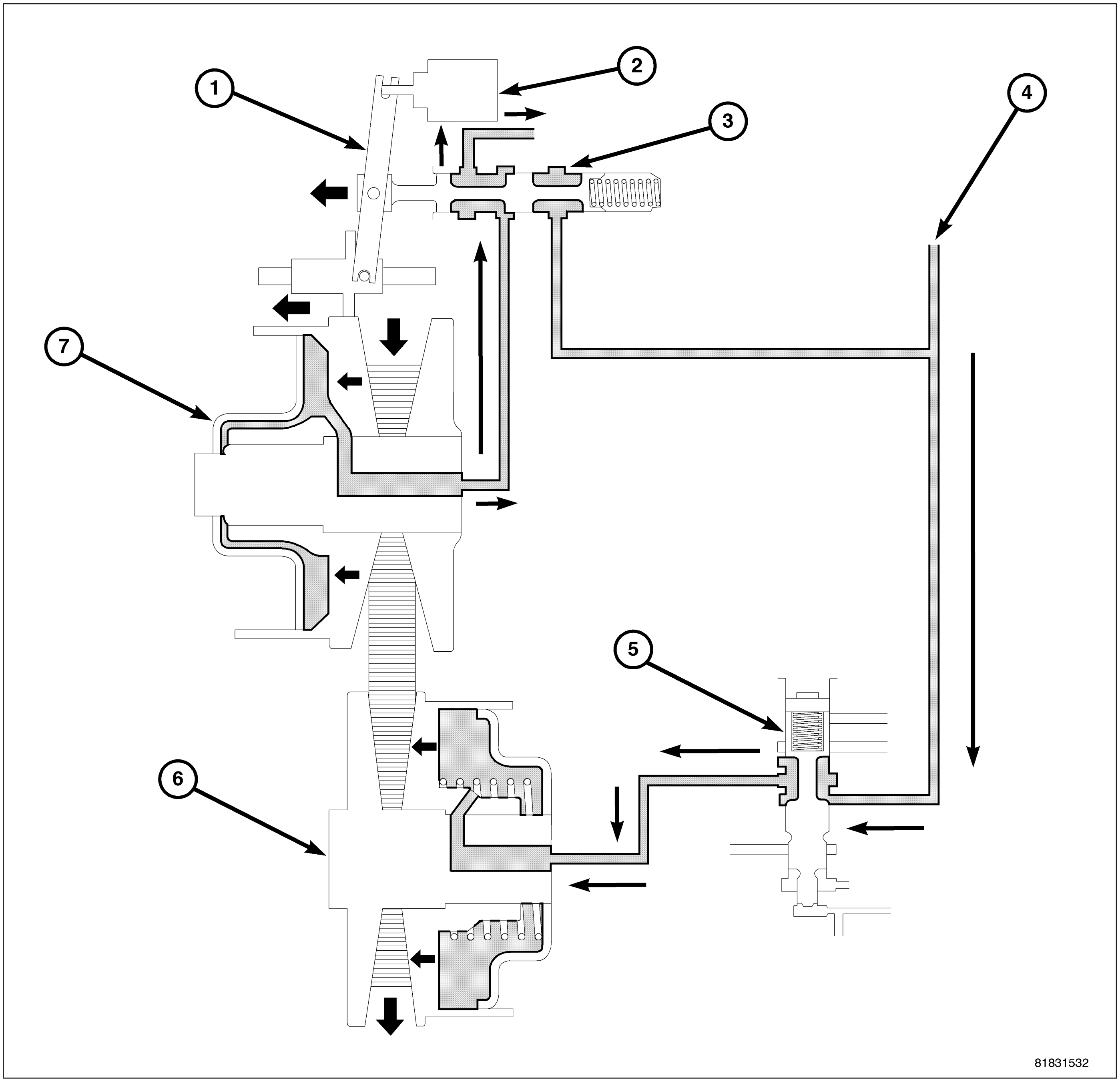


Fig. 10 SHIFTING HIGH TO LOW 2

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

By applying line pressure to the secondary pulley, the sliding element moves to the left direction and the steel belt is pushed outside.

By pulling the steel belt to the secondary pulley side, the moving-pulley of the primary pulley moves to the left side.

By actuating the “Sliding element” of the primary pulley moves to the left side, the ratio control valve starts to move to the left side through the pulley ratio linkage which is linked to the sliding element.

SHIFT HIGH TO LOW - PHASE 3

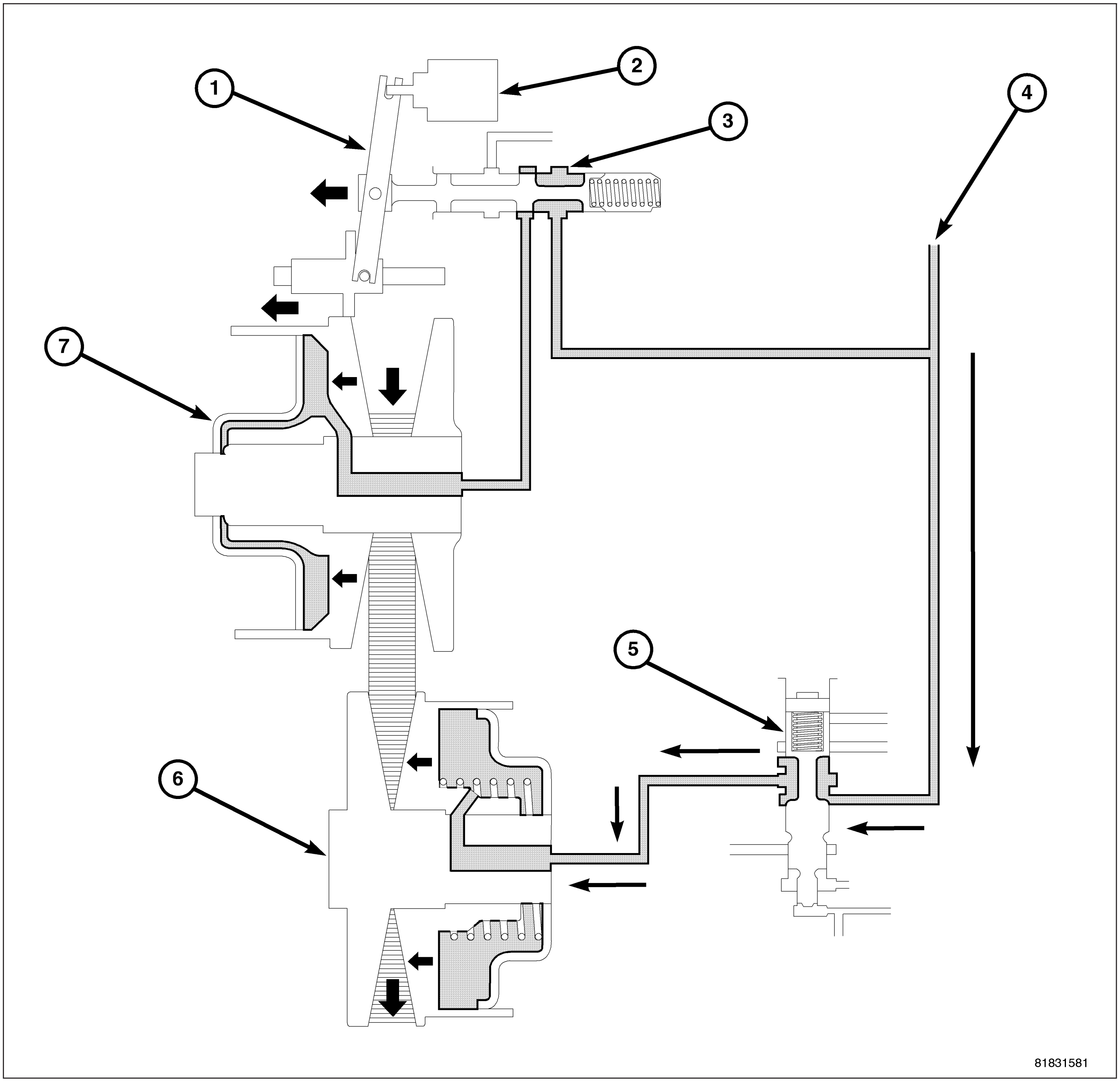


Fig. 11 SHIFTING HIGH TO LOW 3

1 - PULLEY RATIO LINKAGE
2 - STEPPER MOTOR
3 - RATIO CONTROL VALVE
4 - LINE PRESSURE
5 - SECONDARY VALVE
6 - SECONDARY PULLEY
7 - PRIMARY PULLEY

Additionally, the moving-pulley of the secondary pulley moves to the left direction and the steel belt is pushed outside. In accordance with this, the sliding element of the primary pulley moves to the left side.

The moving-pulley of the primary pulley moves to the right direction, then the ratio control valve also moves to the left direction and closes the drain circuit; this is a completion of the shift.

DIAGNOSIS AND TESTING

TEST PORTS

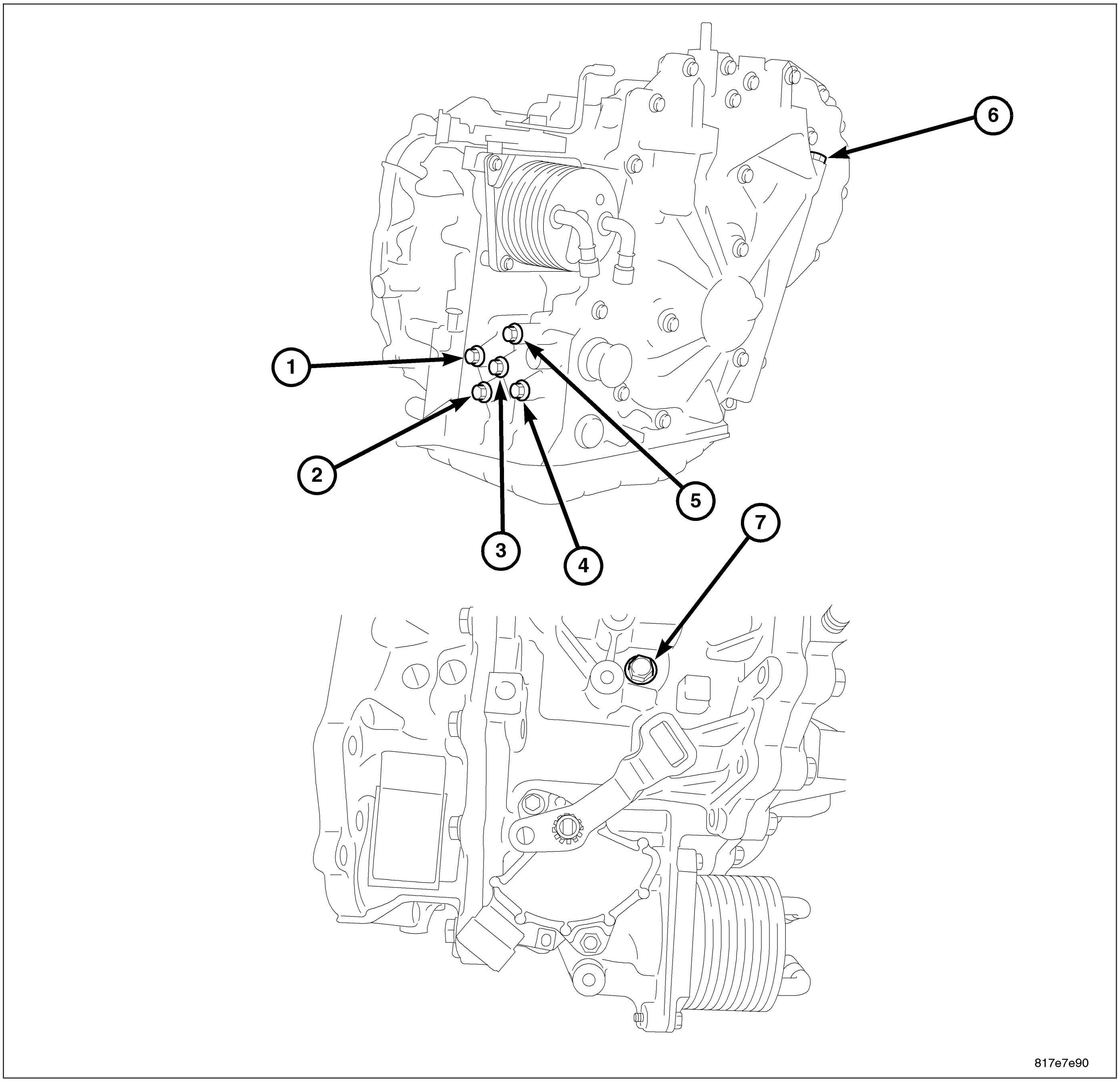
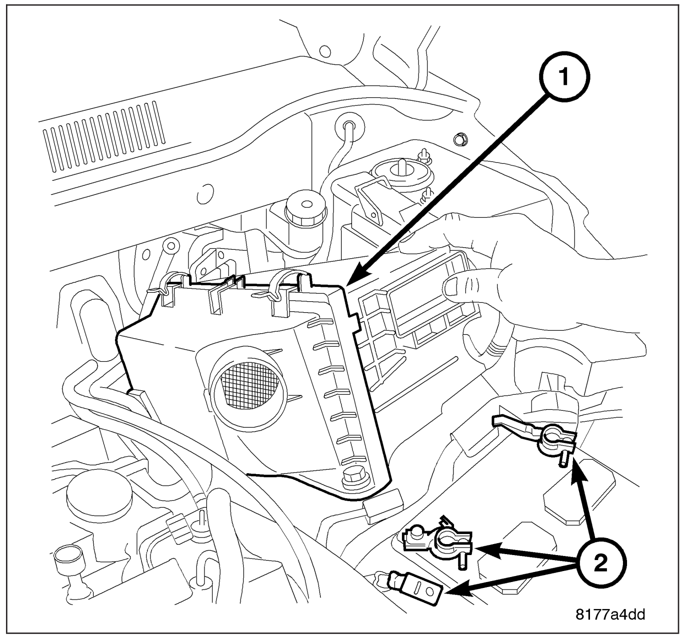


Fig. 12 TEST PORTS

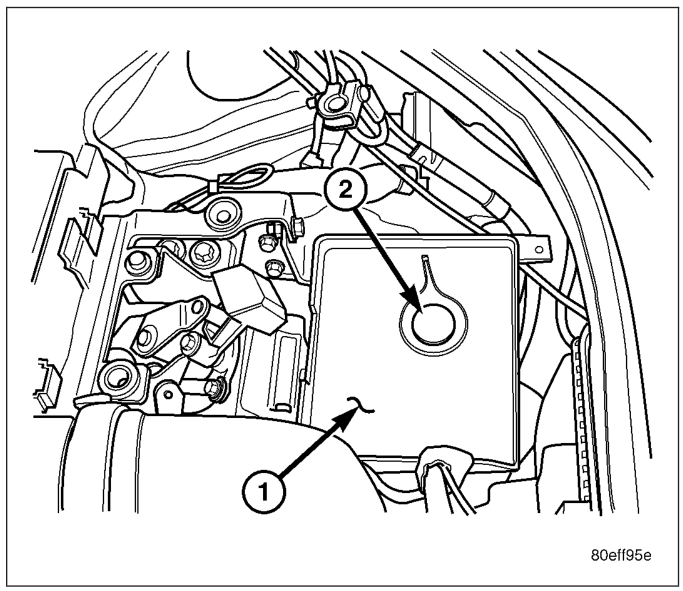
1 - Line Pressure
2 - Forward Clutch Pressure
3 - Primary Pressure
4 - Torque Converter Apply Pressure
5 - Torque Converter Release Pressure
6 - Secondary Pressure
7 - Reverse Brake Pressure

REMOVAL

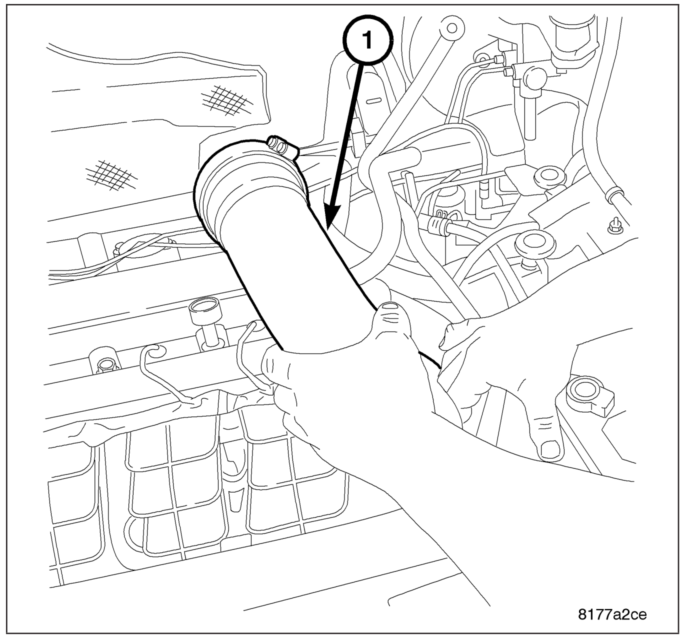
1. Disconnect battery cables (2).
2. Remove air cleaner assembly (1).
3. Remove battery.



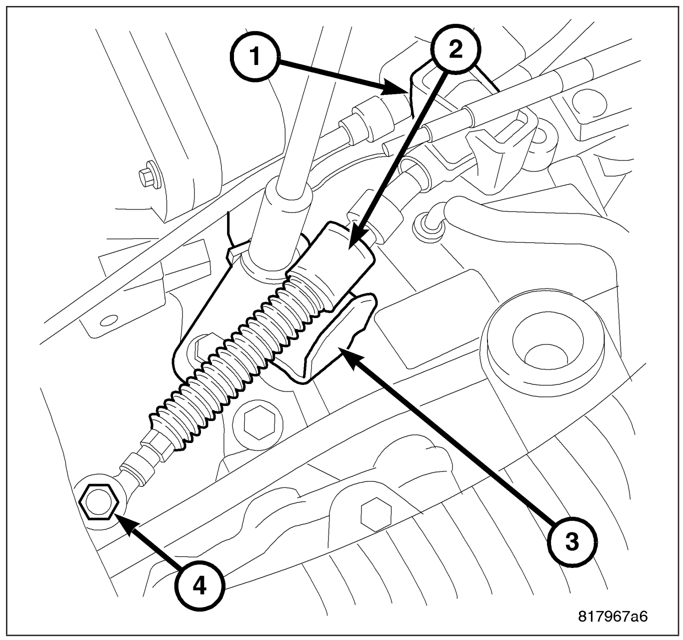
4. Remove battery tray (1).
5. Drain coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE)



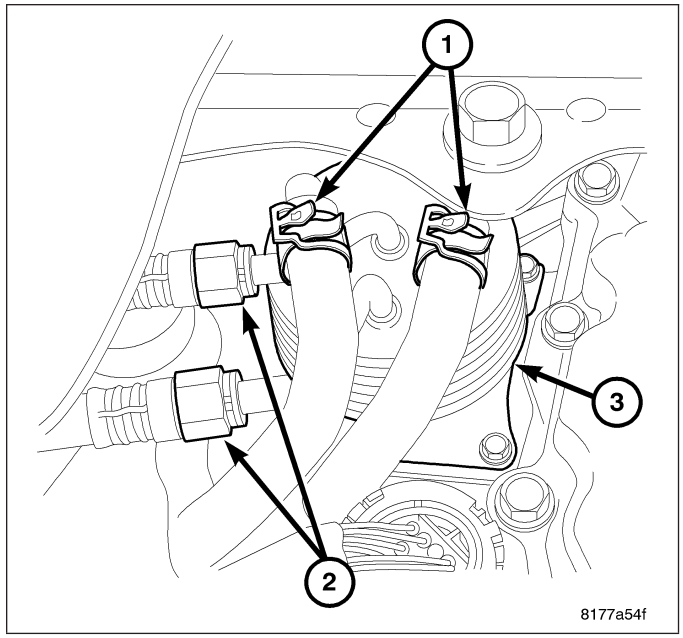
6. Remove inlet air tube (1).
7. Remove vacuum supply lines.



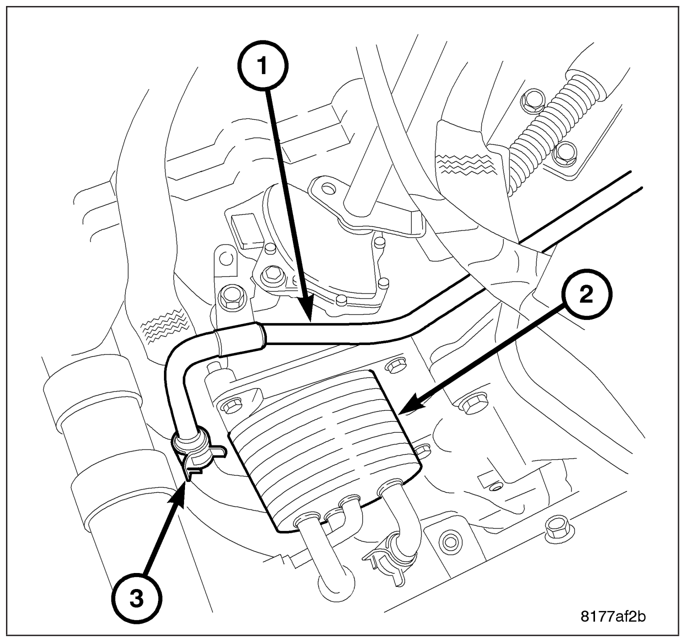
8. Remove the shiftier cable (2) and bracket (3).



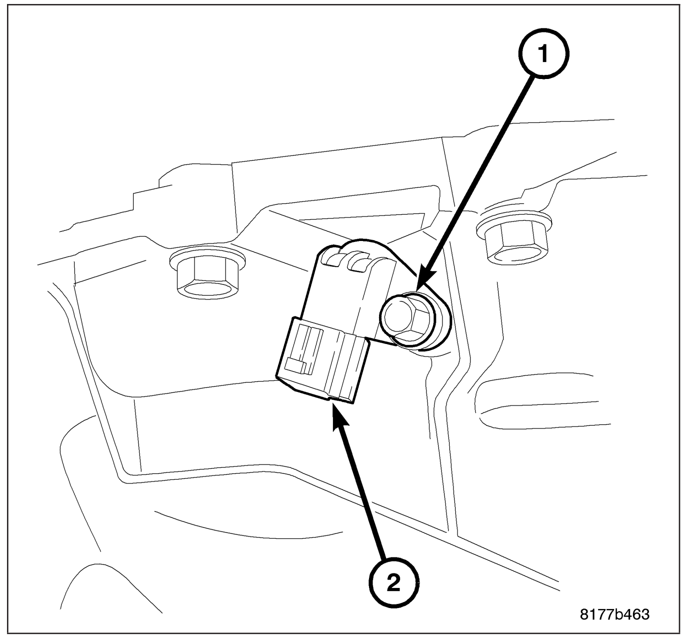
9. Remove coolant lines (1) at CVT fluid cooler.



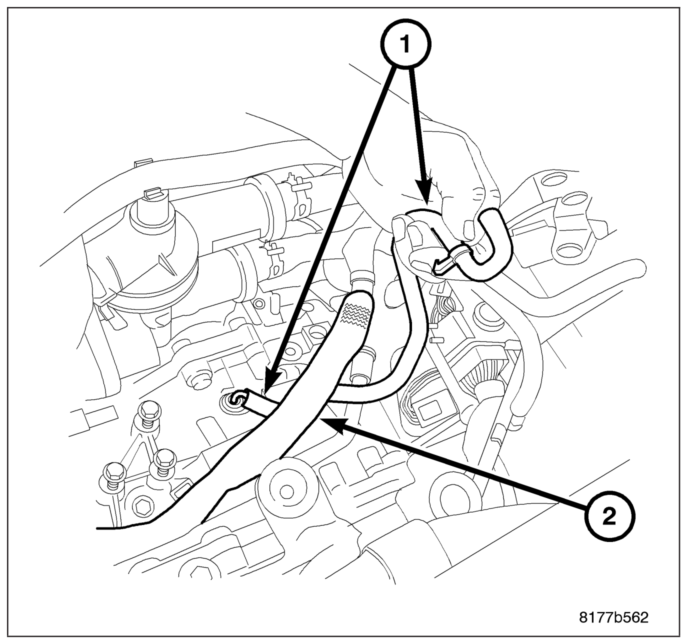
10. Remove heater hose (3) at CVT fluid cooler.



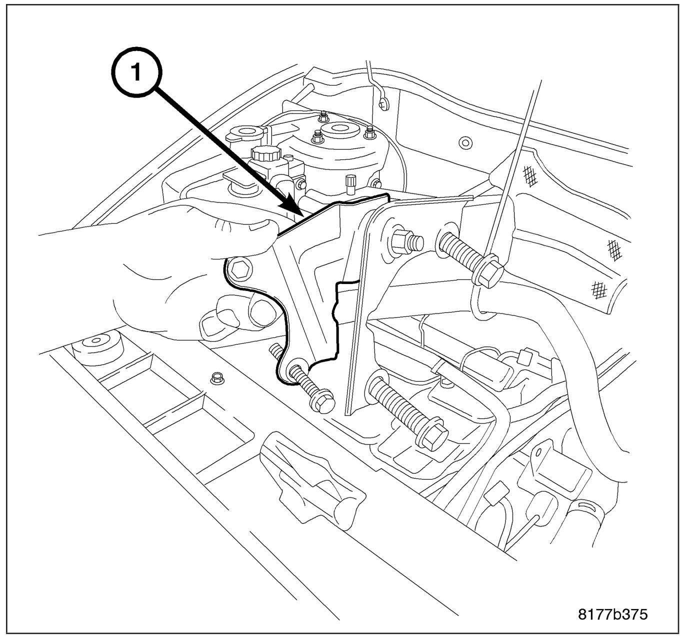
11. Remove the speed sensor connector (1).



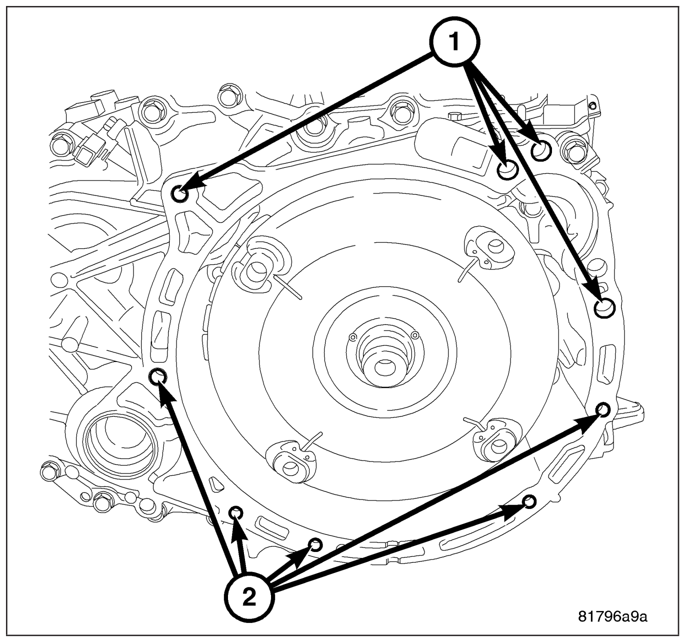
12. Remove the wiring harness from the top of the transmission (2).
13. Remove the transmission vent tube (1).



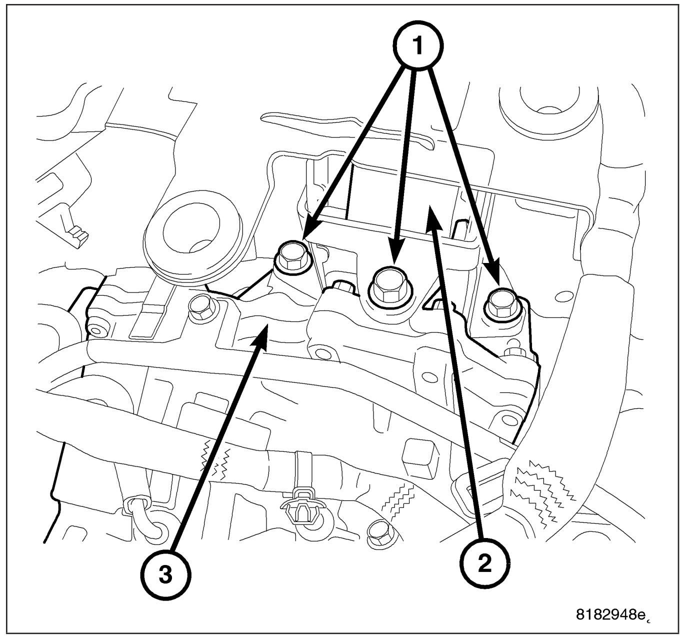
14. Remove the throttle body support bracket (1).



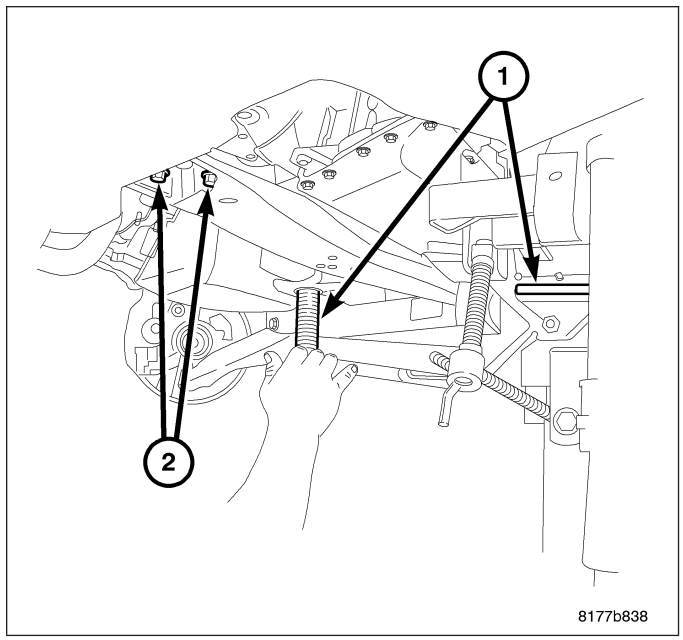
15. Remove the upper bell housing bolts (1).



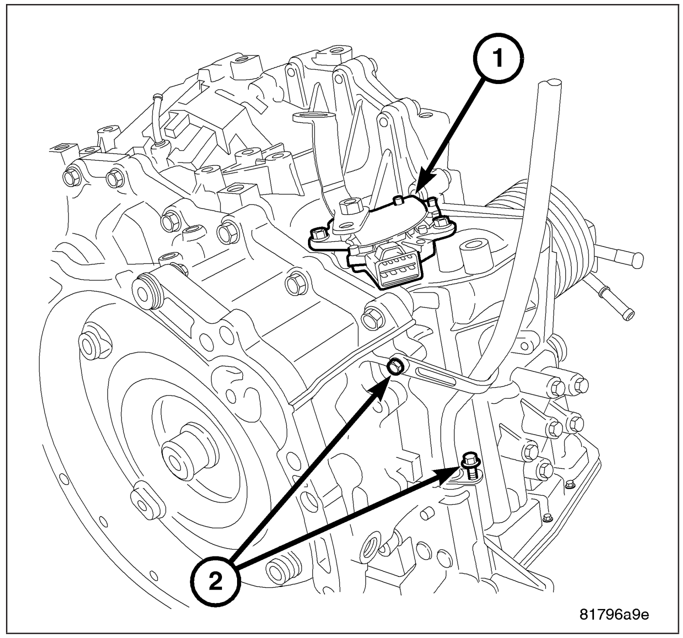
16. Remove the upper transmission mount bolts (1).
17. Remove the upper transmission mount through bolt.
18. Remove the upper transmission mount (2).
19. Raise vehicle on a hoist.
20. Drain transmission fluid.
21. Remove the left front lower splash shield.
22. Remove the right front lower splash shield.
23. Remove lower splash shield (if equipped).



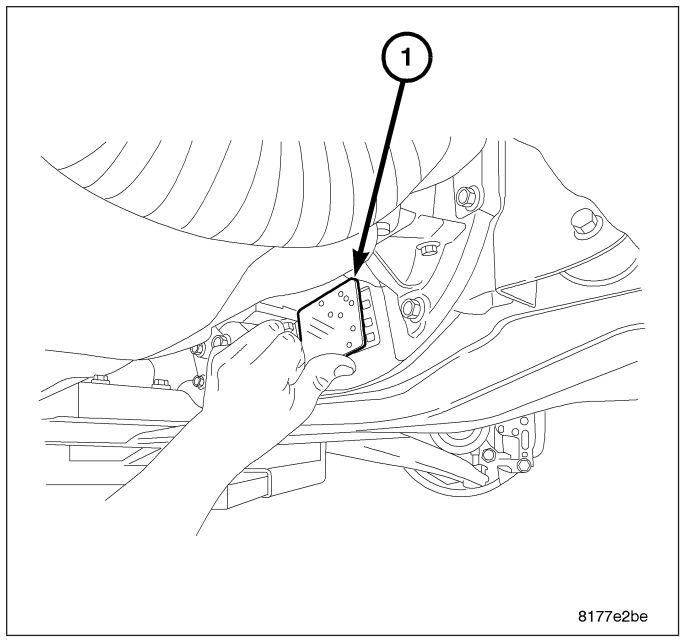
24. Support the transmission with a jack (1).
25. Remove the starter (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).
26. Lower transmission jack.



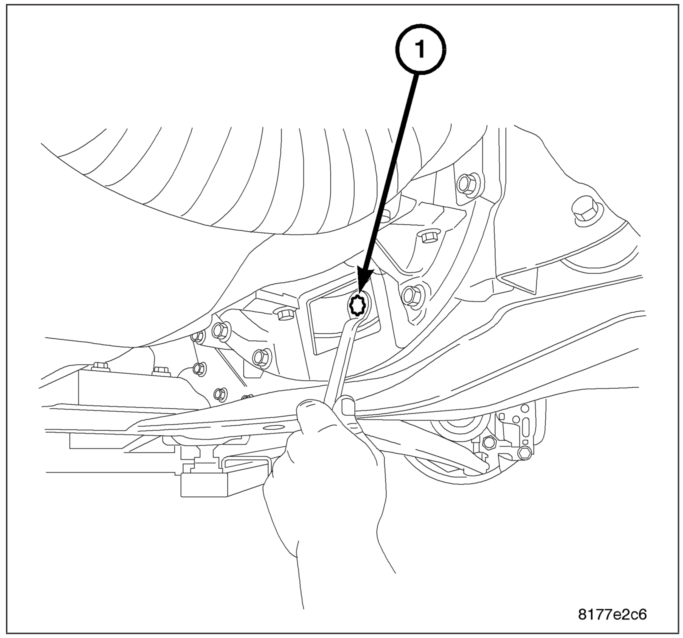
27. Remove the two transmission fill tube bolts (2) and remove the fill tube.
28. Drain the transmission fluid.
29. Remove both front wheels.
30. Remove the right and left halfshafts (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALFSHAFT - REMOVAL).



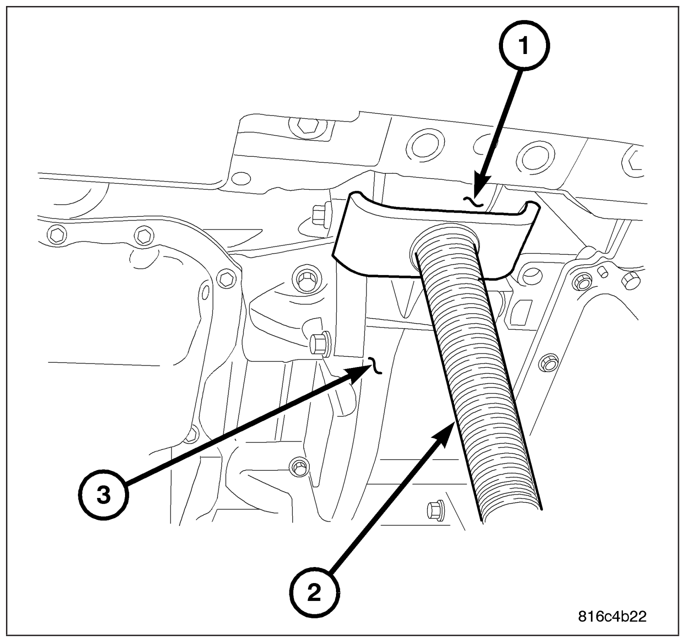
31. Remove inspection cover (1).
32. Mark the torque converter to the flex plate for alignment upon installation.



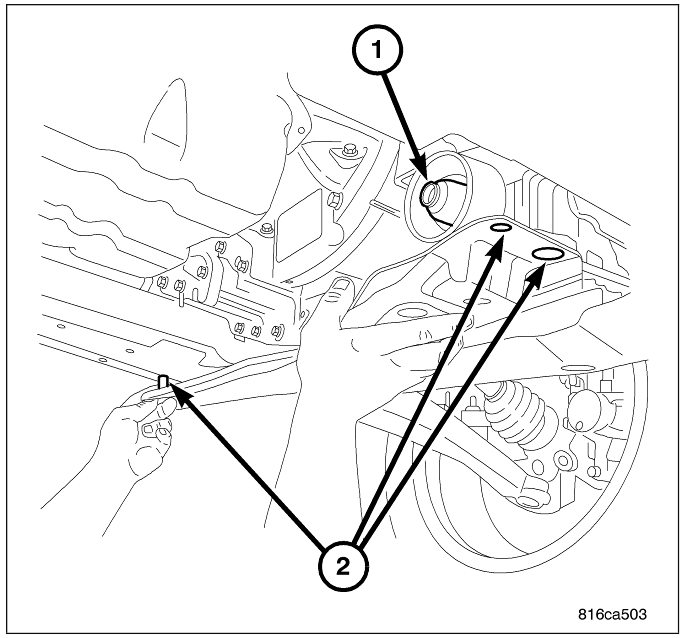
33. Remove torque converter bolts (1).



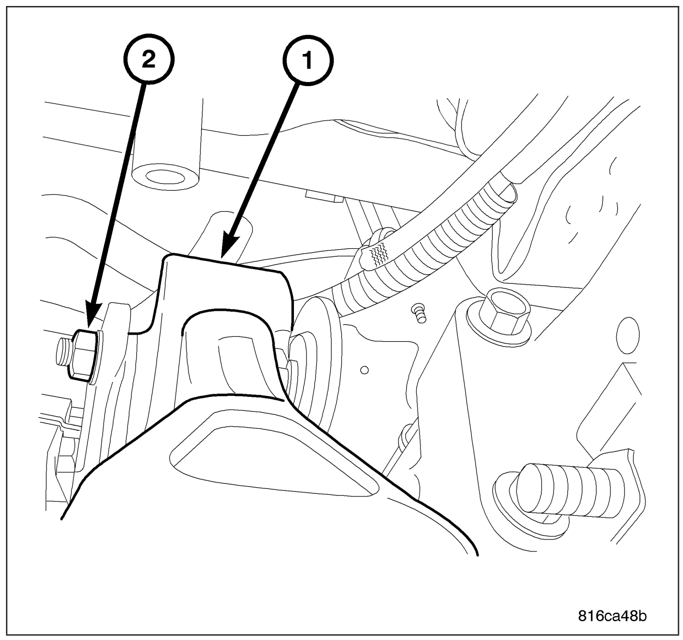
34. Support the engine with a screw jack (2).



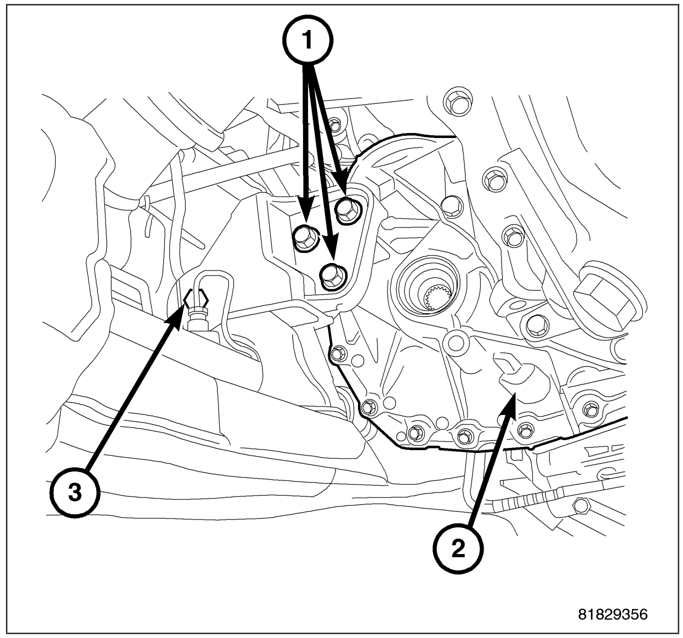
35. Remove the through bolt (1) at the front transmission mount.
36. Remove bolts (2) at the transmission cross member.
37. Remove the transmission cross member.



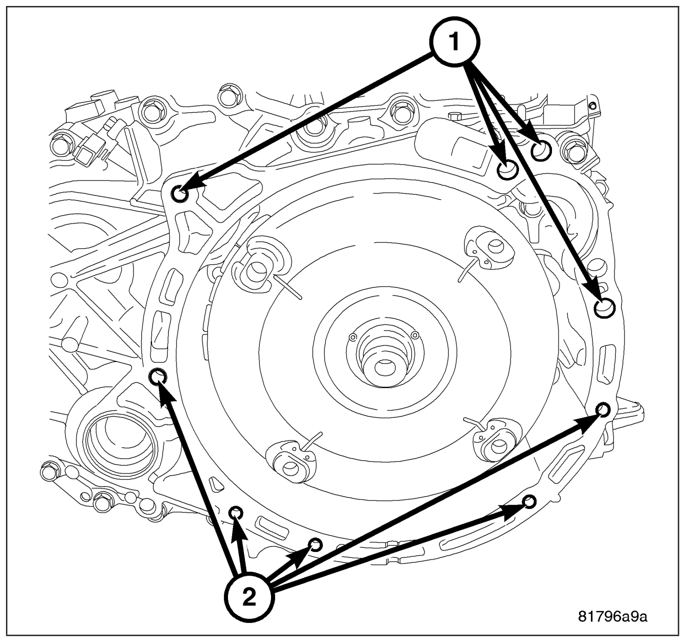
38. Remove the transmission rear mount thorough bolt (2).



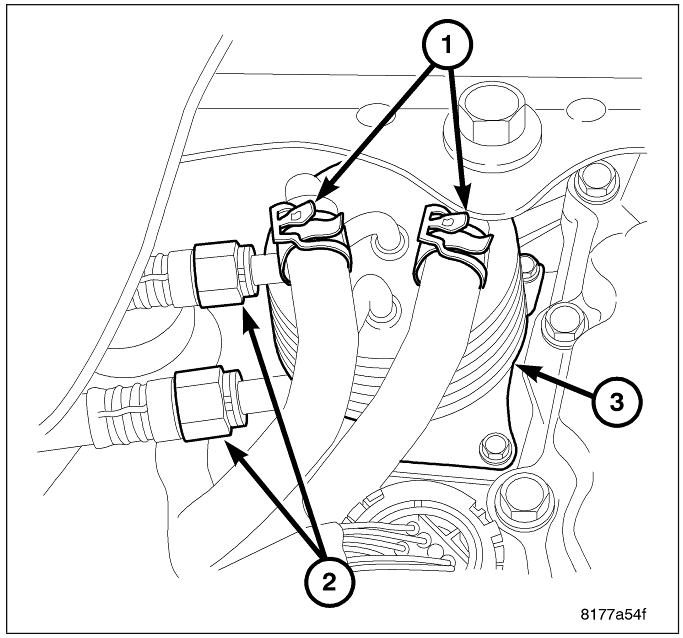
39. Remove the rear mount to transaxle bolts (1).
40. Remove the PTU if equipped (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).



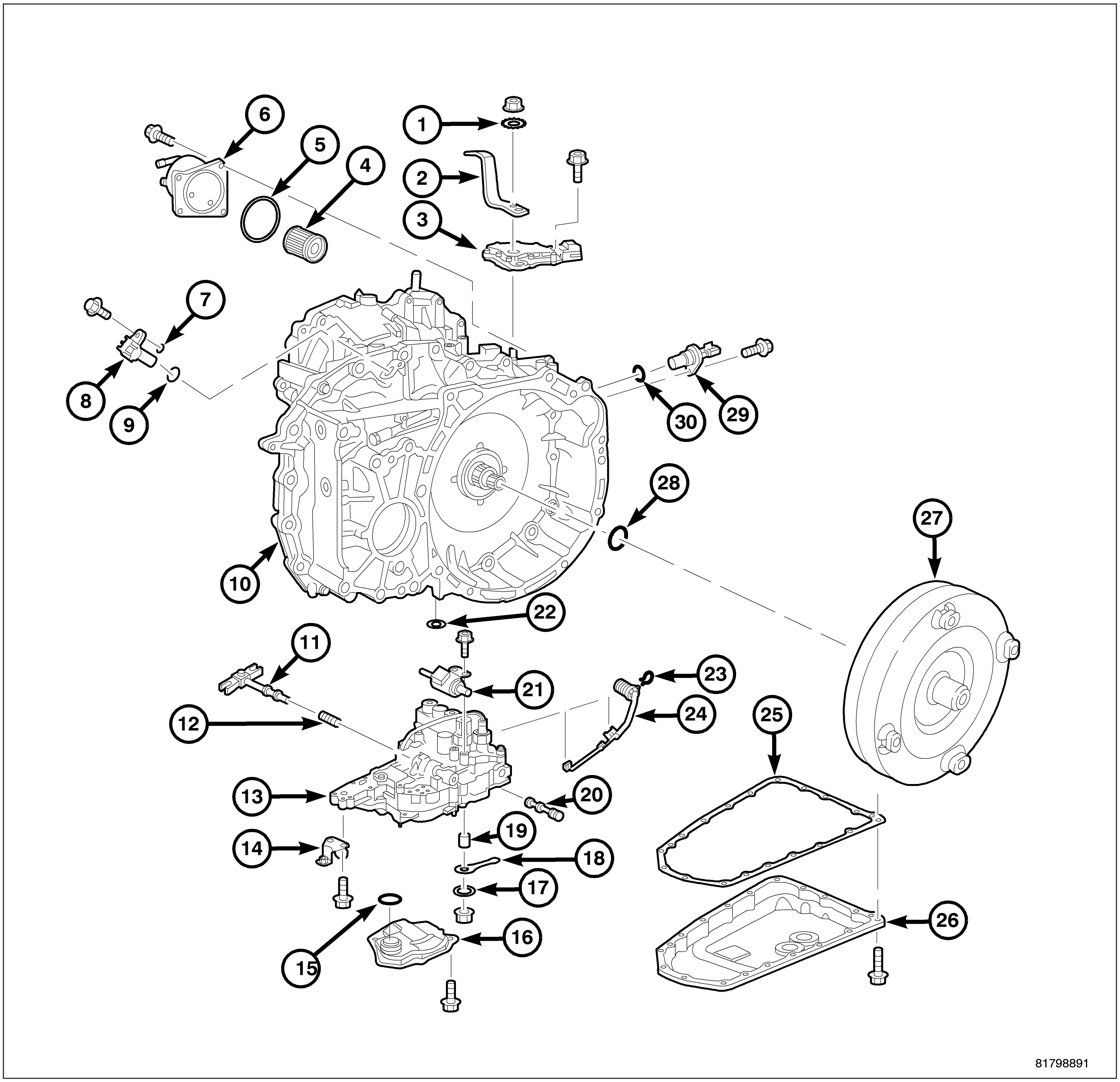
41. Remove the lower transmission bell housing bolts (2).



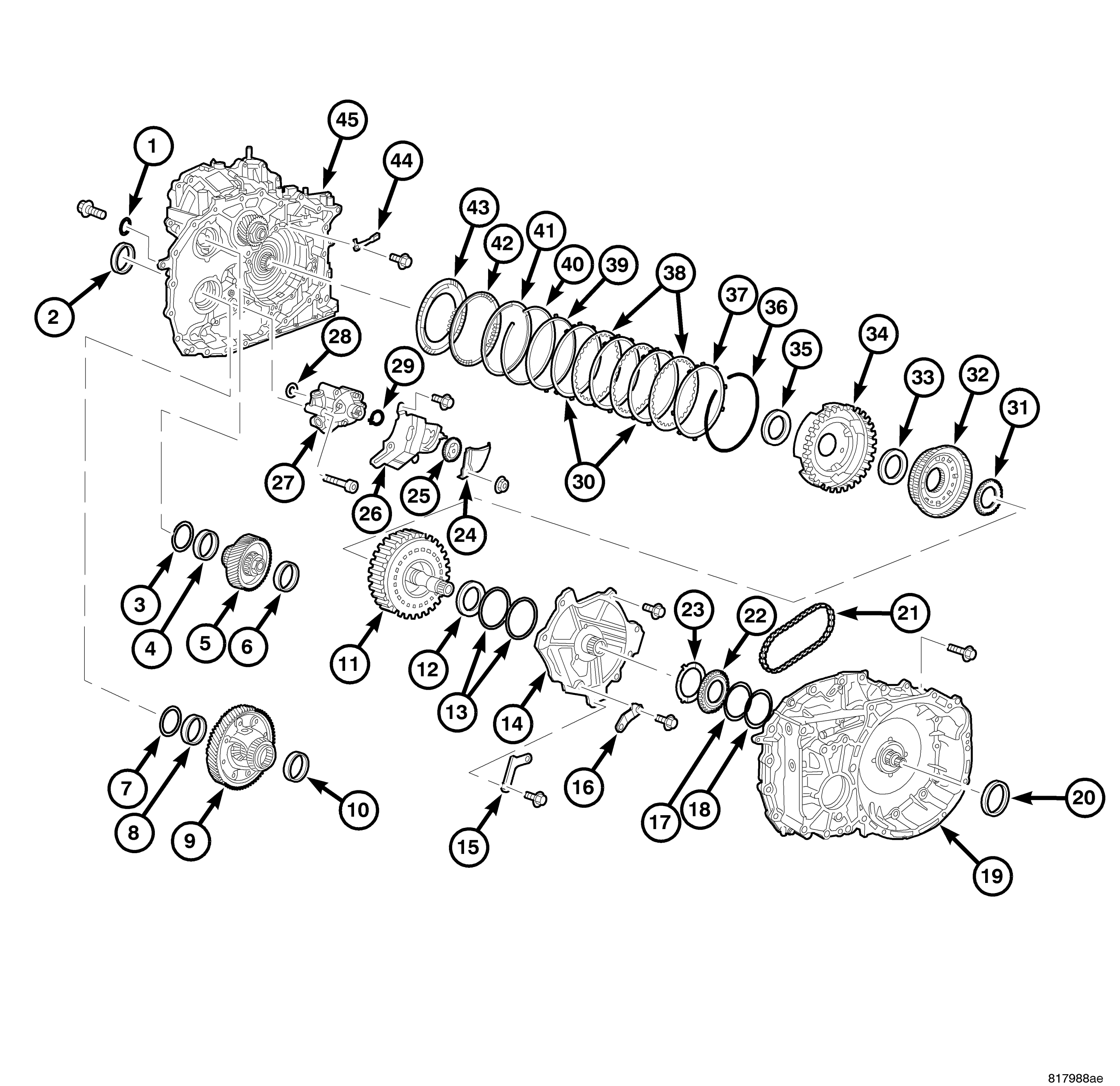
42. Lower the transmission to gain access to remaining transmission cooler lines.
43. Remove the remaining transmission cooler lines.
44. Lower transmission.



DISASSEMBLY

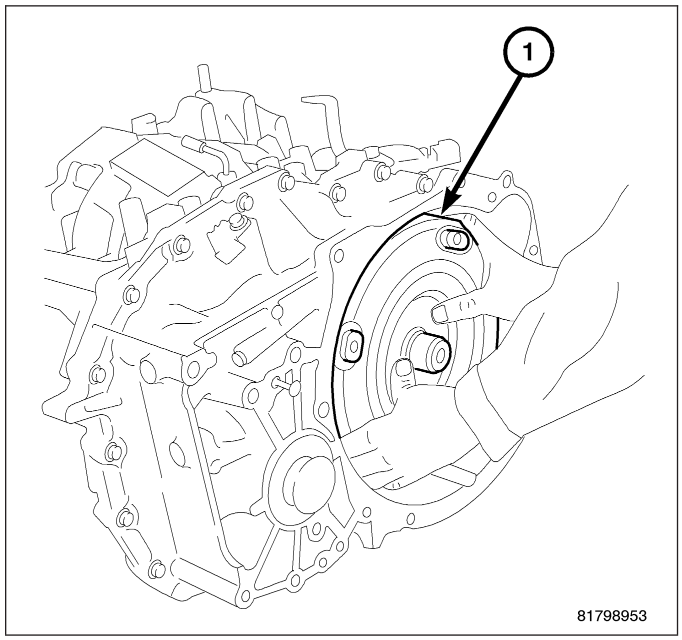


1- WASHER
2 - SHIFT LEVER
3 - INHIBITOR SWITCH
4 - CVT FLUID FILTER
5 - O-RING
6 - CVT FLUID COOLER
7 - SHIM
8 - OUTPUT SPEED SENSOR
9 - O-RING
10 - TRANSAXLE
11 - PULLEY RATIO LINKAGE
12 - SPRING
13 - CONTROL VALVE
14 - BRACKET
15 - O-RING
16 - OIL STRAINER
17 - PLAIN WASHER
18 - MANUAL LEVER
19 - BELL HOUSING
20 - MANUAL VALVE
21 - STEPPER MOTOR
22 - LIP SEAL
23 - SNAP RING
24 - VALVE BODY HARNESS
25 - OIL PAN GASKET
26 - OIL PAN
27 - TORQUE CONVERTER
28 - O-RING
29 - INPUT SPEED SENSOR
30 - O-RING


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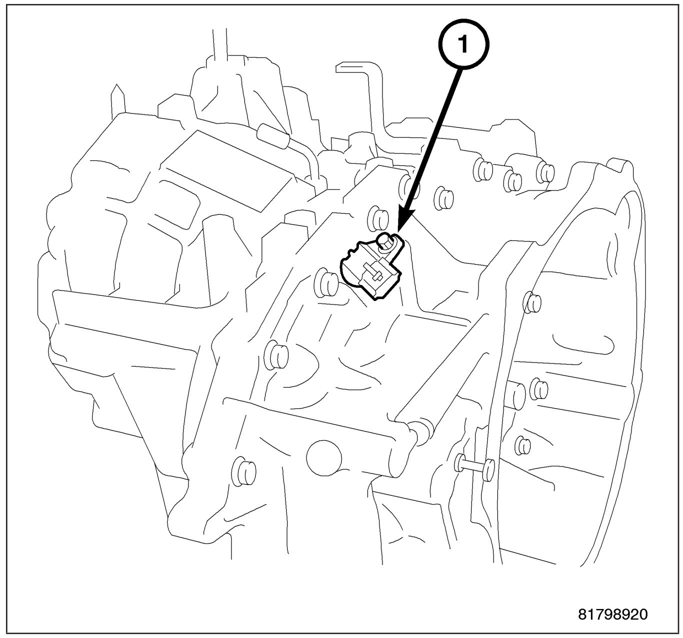
1 - O-RING
2 - SIDE OIL SEAL
3 - ADJUSTABLE SHIM
4 - OUTER RACE
5 - REDUCTION GEAR ASSEMBLY
6 - OUTER RACE
7 - ADJUSTABLE SHIM
8 - OUTER RACE
9 - DIFFERENTIAL ASSEMBLY
10 - OUTER RACE
11 - FORWARD CLUTCH ASSEMBLY
12 - NEEDLE BEARING
13 - SEAL RING
14 - OIL PUMP COVER
15 - BAFFLE PLATE
16 - BRACKET
17 - ADJUSTABLE SHIM
18 - ADJUSTABLE SHIM
19 - CONVERTER HOUSING
20 - CONVERTER HOUSING OIL SEAL
21 - OIL PUMP CHAIN
22 - DRIVE SPROCKET
23 - THRUST WASHER
24 - BAFFLE PLATE
25 - DRIVEN SPROCKET (OIL PUMP)
26 - BAFFLE PLATE
27 - OIL PUMP
28 - LIP SEAL
29 - SNAP RING
30 - DRIVEN PLATES
31 - NEEDLE BEARING
32 - SUN GEAR
33 - NEEDLE BEARING
34 - PLANETARY CARRIER
35 - NEEDLE BEARING
36 - SNAP RING
37 - RETAINING PLATE
38 - DRIVEN PLATES
39 - DISH PLATE
40 - SNAP RING
41 - RETAINING PLATE
42 - SPRING RETAINER ASSEMBLY
43 - REVERSE PLATE PISTON
44 - DETENT SPRING
45 - TRANSAXLE CASE

1. Refer to the exploded views as necessary when performing the following steps.
2. Drain the CVT fluid from the transaxle assembly.
3. Remove the power transfer unit assembly and o-ring (4WD only).
4. Remove the torque converter (1) from the transaxle.

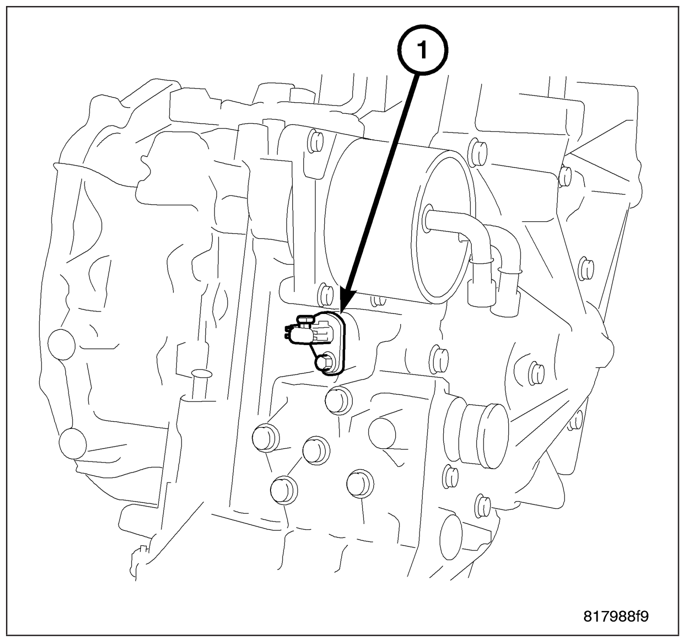


5. Remove the output speed sensor (1) from the converter housing. Remove and discard the o-ring from the output speed sensor.

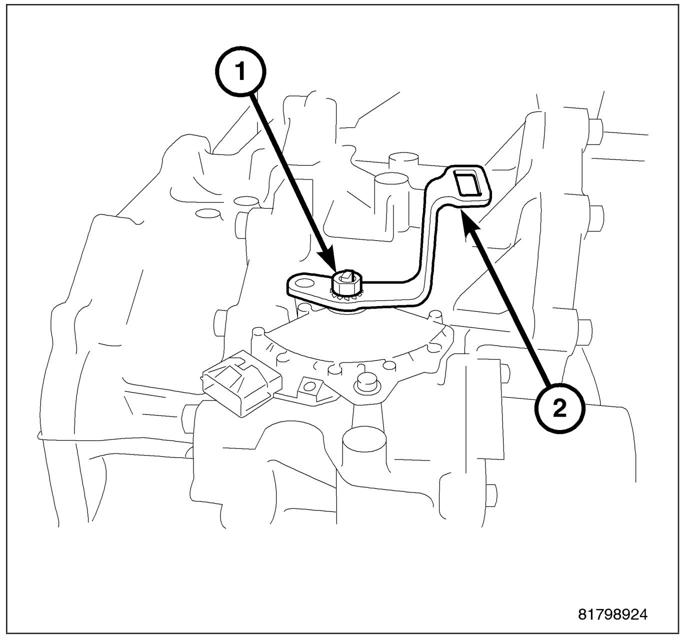
CAUTION: Set aside and reuse any adjusting shim found between the output speed sensor and the converter housing.



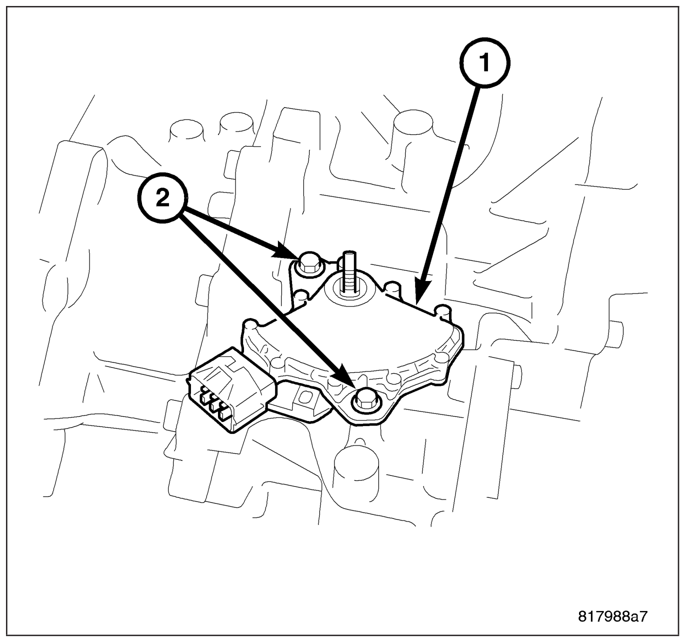
6. Remove the input speed sensor (1) from the transaxle case. Remove and discard the o-ring from the input speed sensor.



7. Remove the nut (1) holding the shift lever (2) to the manual shaft.
8. Remove the shift lever from the manual shaft.

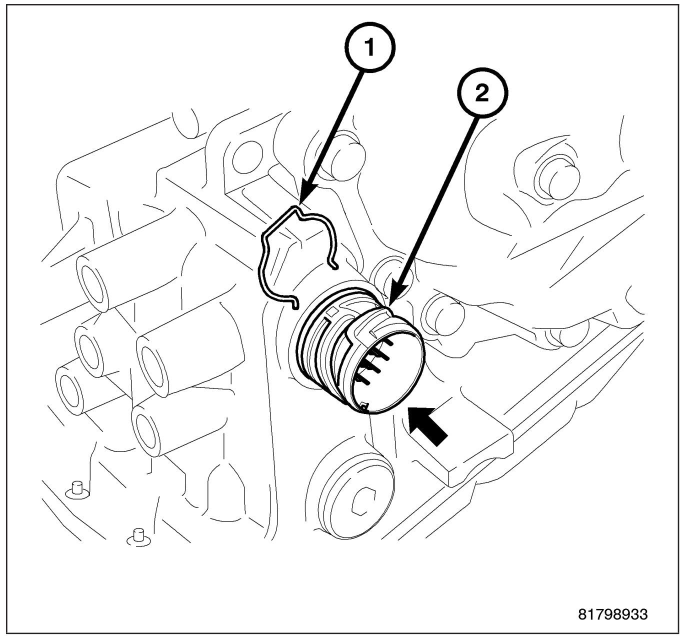


9. Remove the bolts (2) holding the transmission range sensor (TRS) (1) to the transaxle case.
10. Remove the (TRS) transmission range sensor (1) from the transaxle case and the manual shaft.

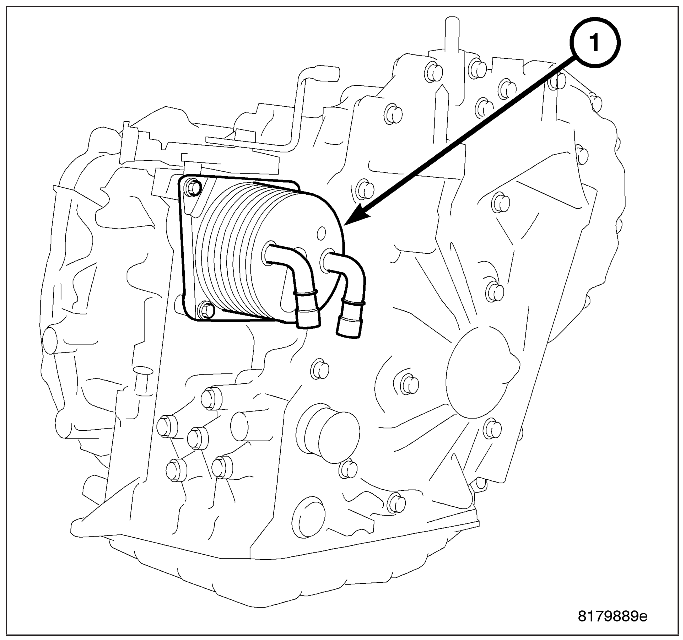


11. Remove the snap ring (1) from the terminal body (2) and press the terminal body into the transaxle case.

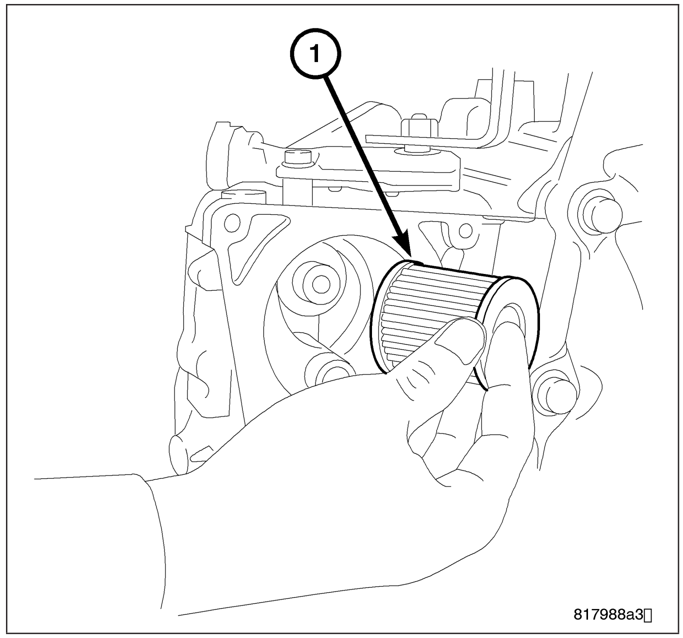
CAUTION: Be careful not to cause damage to the terminal body.



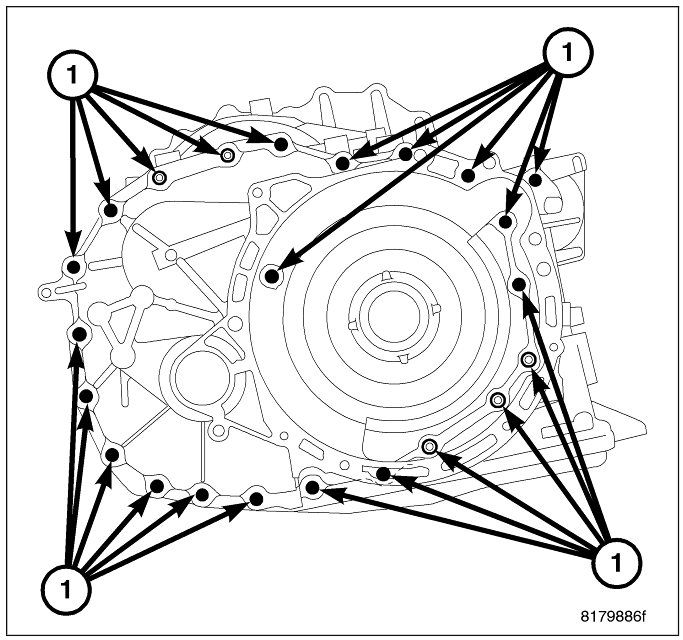
12. Remove CVT fluid cooler (1) from transaxle case. Remove and discard the CVT fluid cooler o-ring.



13. Remove the bolts holding the CVT fluid filter to the transaxle case.
14. Remove the CVT fluid filter (1) from the transaxle case.

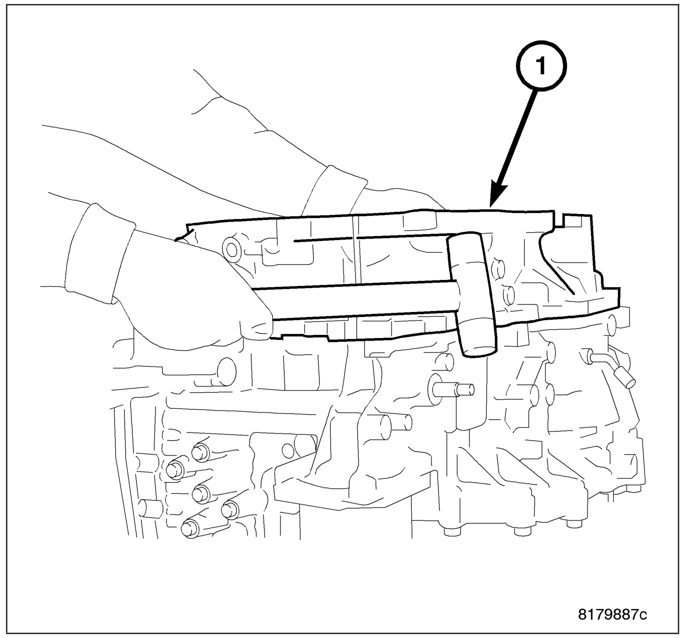


15. Remove the converter housing mounting bolts.

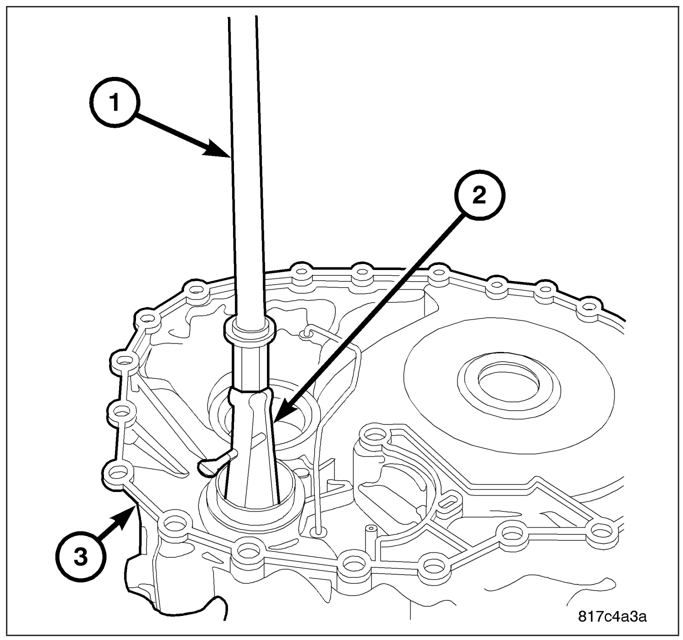


16. Remove the converter housing (1) by tapping with plastic hammer.

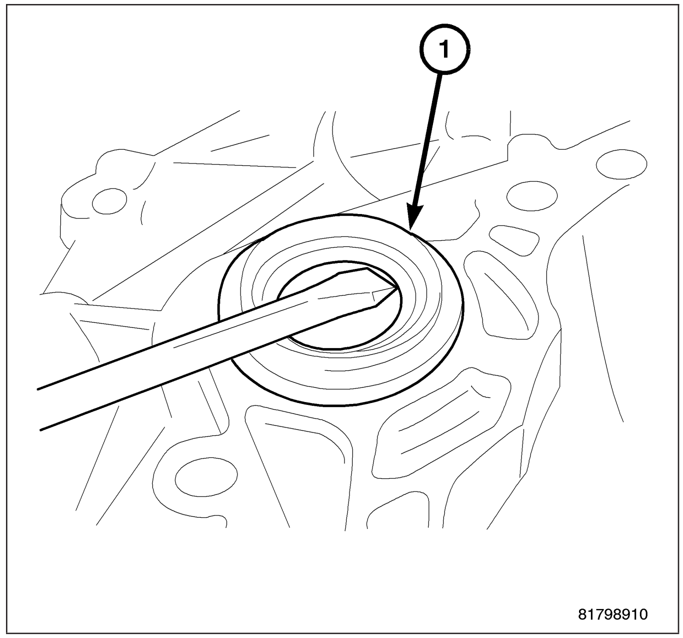
CAUTION: There is a possibility that the drive sprocket adjusting shim may be dislodged and fall out.



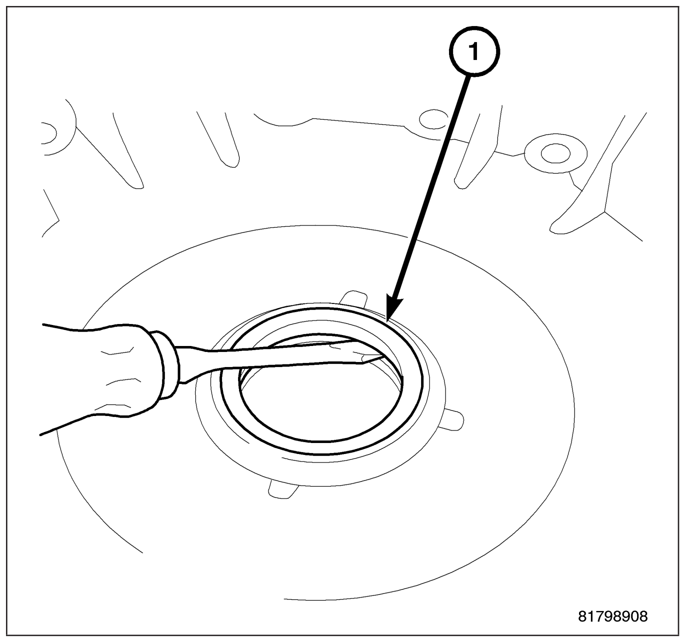
17. Remove outer race of reduction gear bearing (1) from the converter housing using Puller 7794-A and Slide Hammer C-637.



18. Remove differential side oil seal (1) from converter housing using a screwdriver. (2WD)

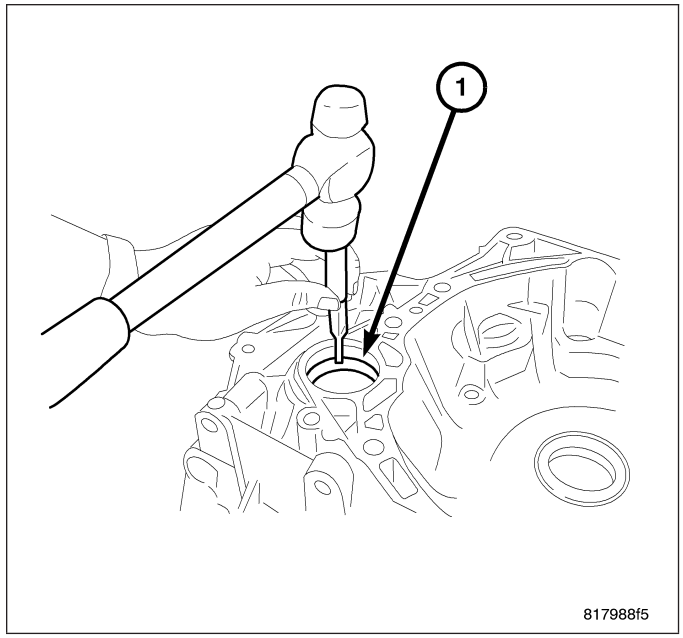


19. Remove converter housing oil seal (1) from converter housing using a screwdriver.

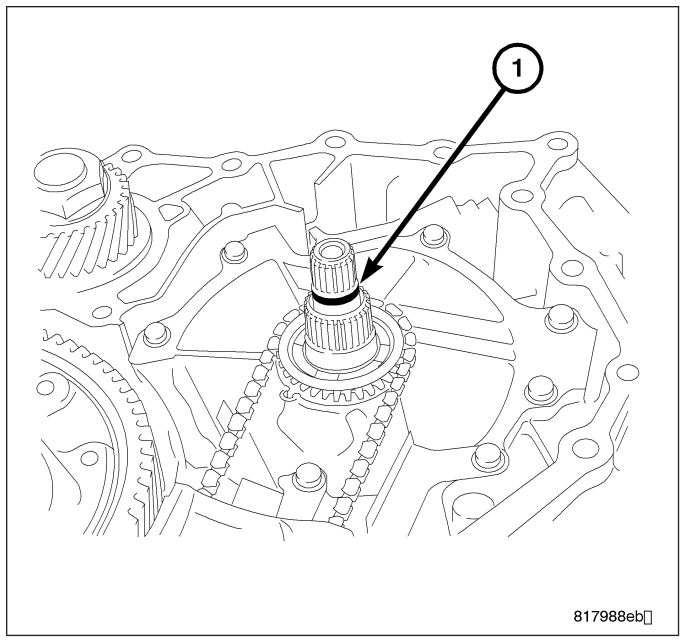


20. Remove outer race (1) of differential side bearing from converter housing using a suitable punch.

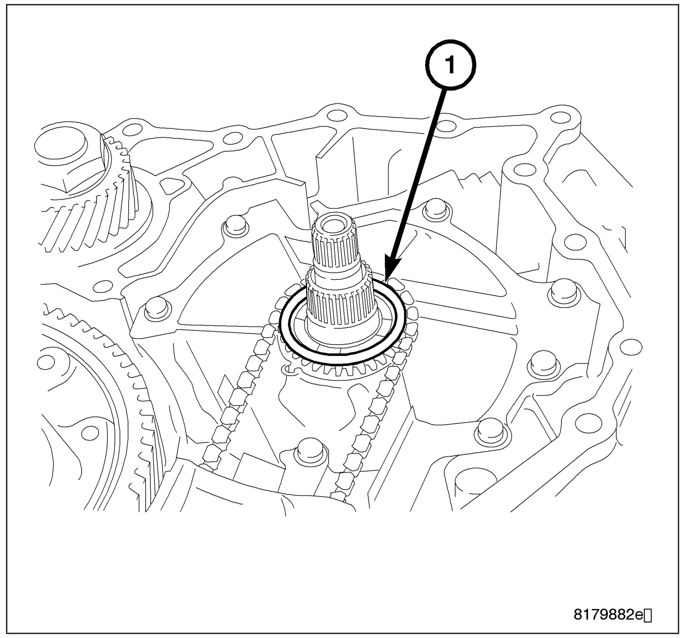
CAUTION: When removing the outer race, tap the outer race on both sides evenly. When removing the outer race, do not damage the converter housing.



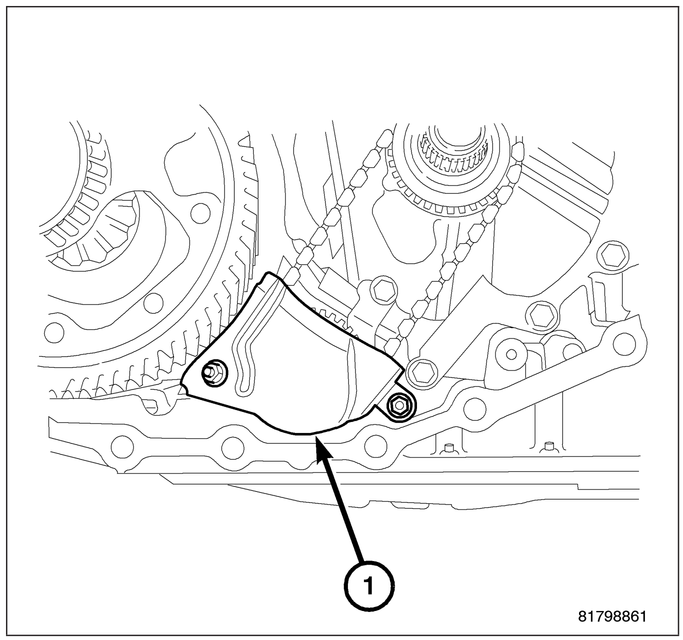
21. Remove and discard the O-ring (1) from the input shaft.



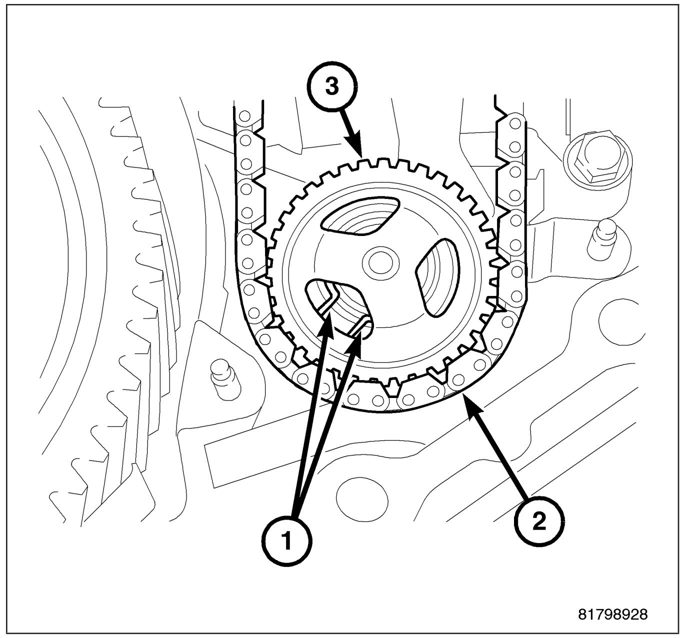
22. Remove the adjusting shim (1) from the drive sprocket, if necessary.



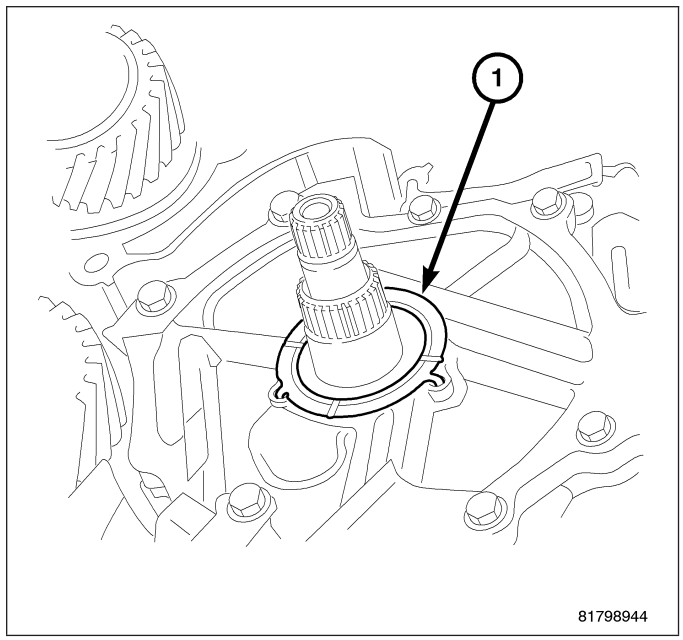
23. Remove the nuts holding the baffle plate (1) to the transaxle.
24. Remove the baffle plate.



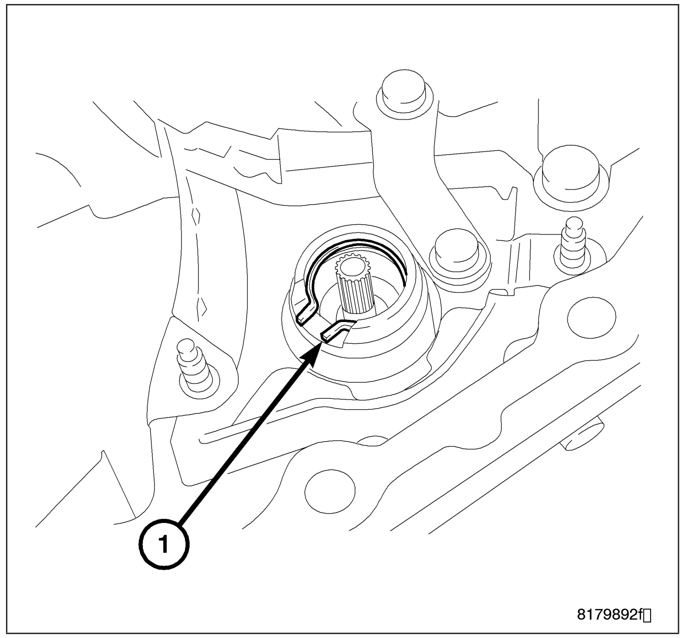
25. Expand the snap ring (1), and remove the driven sprocket (3), the oil pump chain (2), and the drive sprocket.



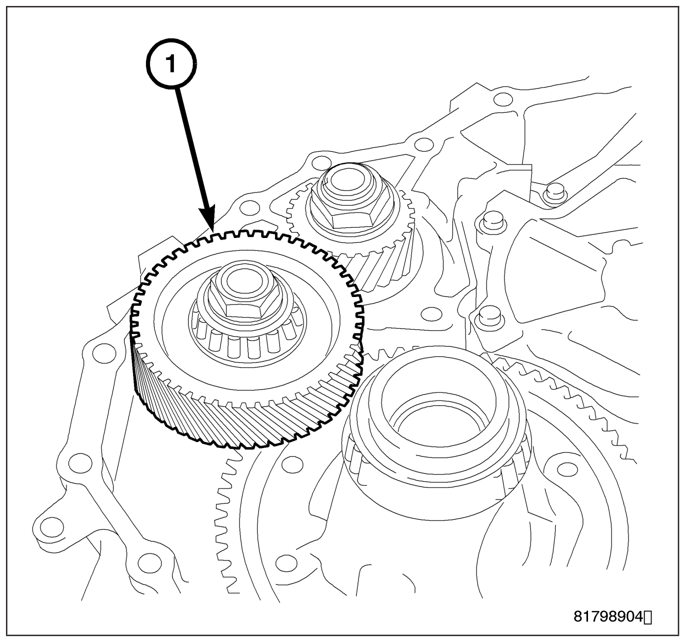
26. Remove the thrust washer (1) from the oil pump cover.



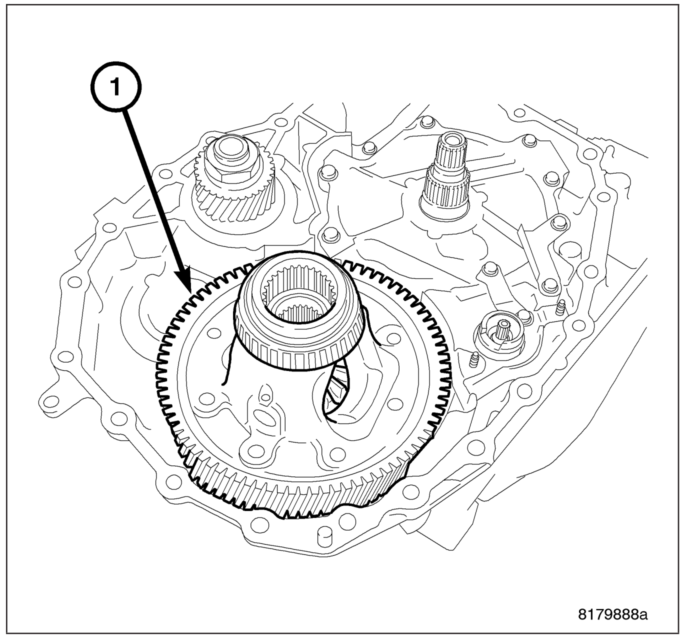
27. Remove the snap ring (1) from the oil pump.



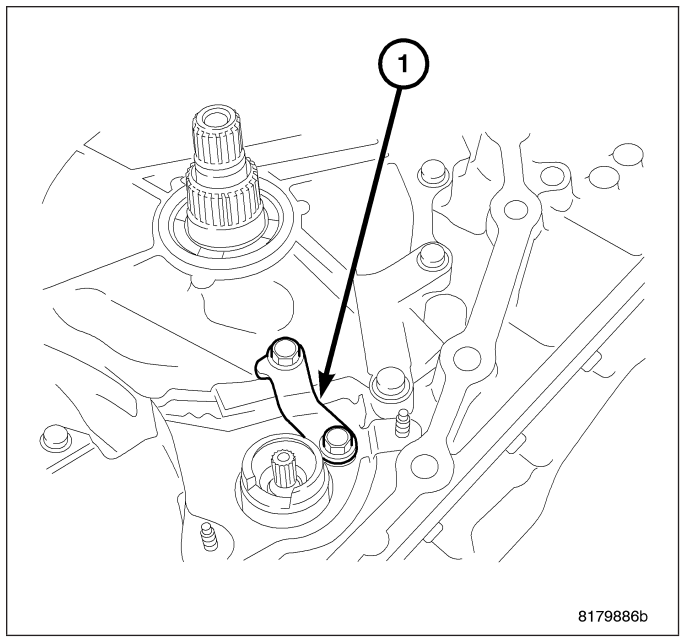
28. Remove the reduction gear assembly (1) from the transaxle case.



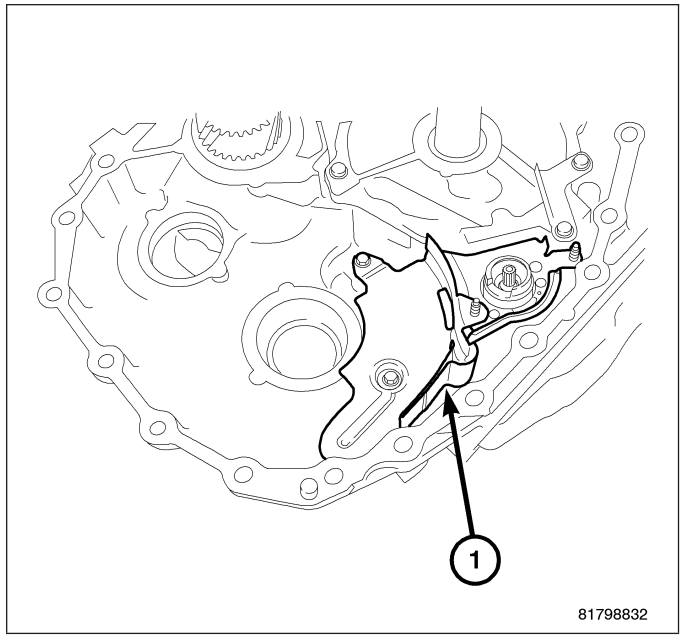
29. Remove the differential assembly (1) from the transaxle case.



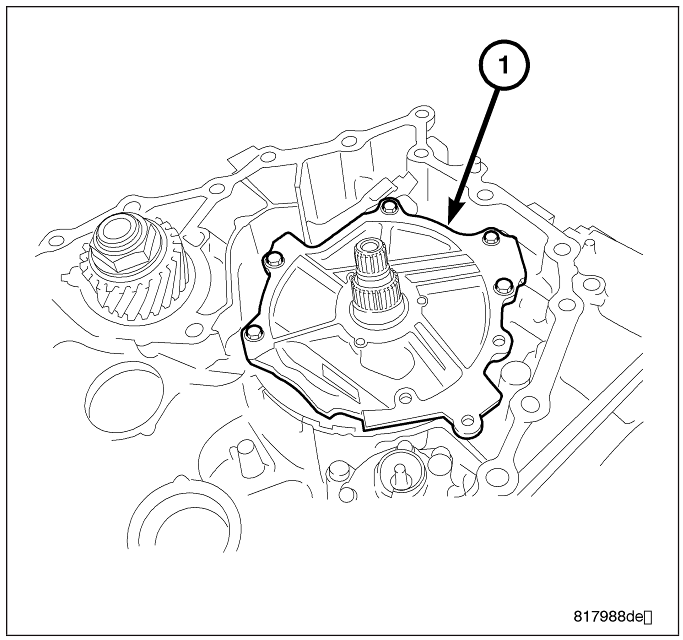
30. Remove the bolts holding the bracket (1) to the oil pump cover and the transaxle.
31. Remove the bracket (1).



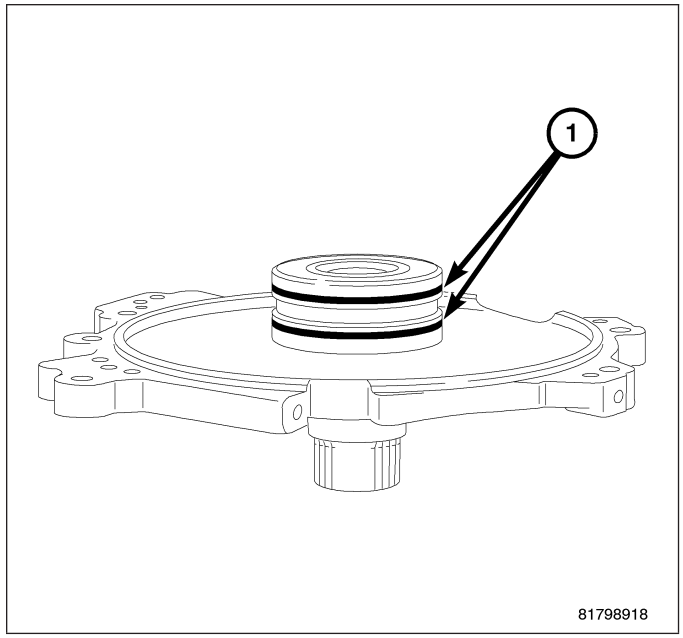
32. Remove the bolts holding the baffle plate (1) to the transaxle.
33. Remove the baffle plate.



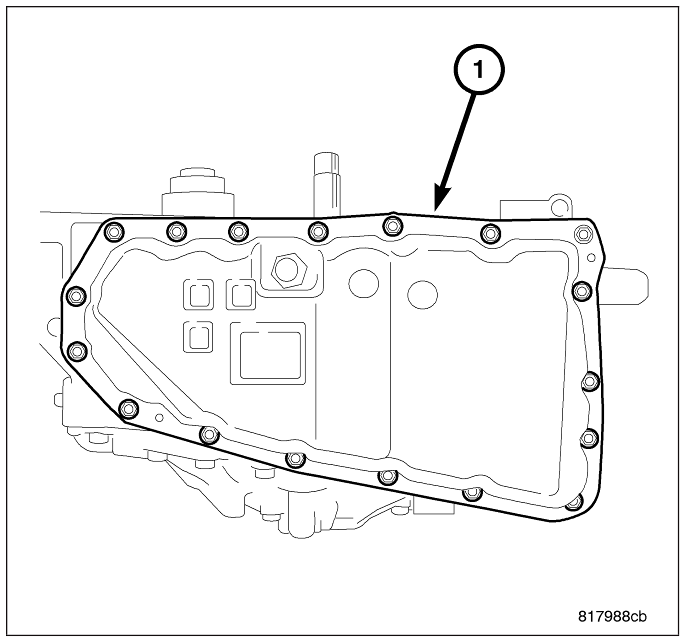
34. Remove the bolts holding the reaction shaft support (1) to the transaxle.
35. Remove the reaction shaft support from the transaxle case.



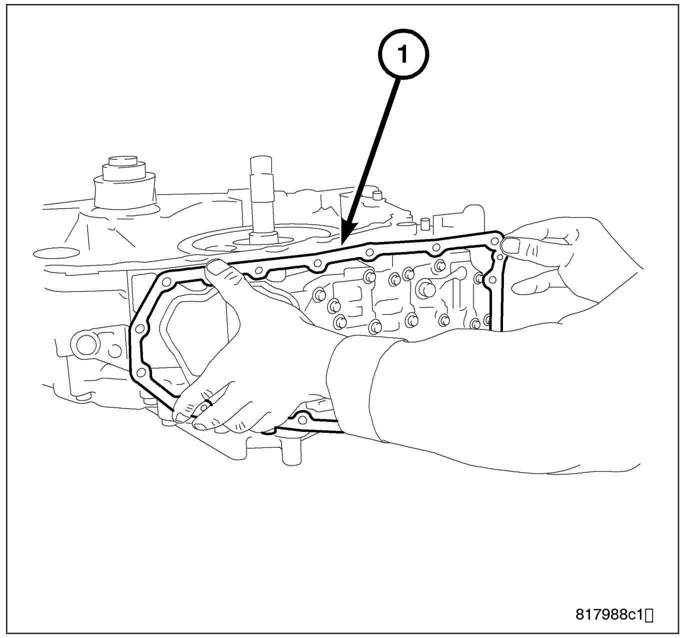
36. Remove and discard the seal rings (1) from the reaction shaft support.



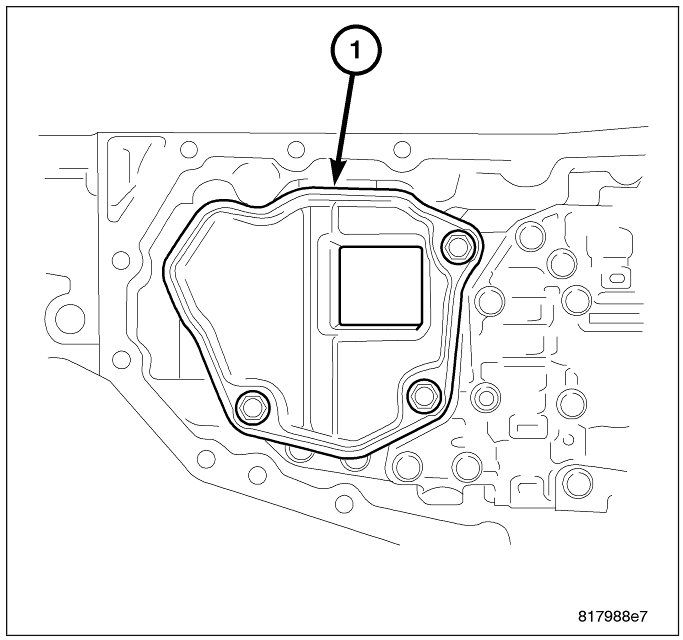
37. Remove the bolts holding the oil pan (1) to the transaxle case.
38. Remove the oil pan from the transaxle case.



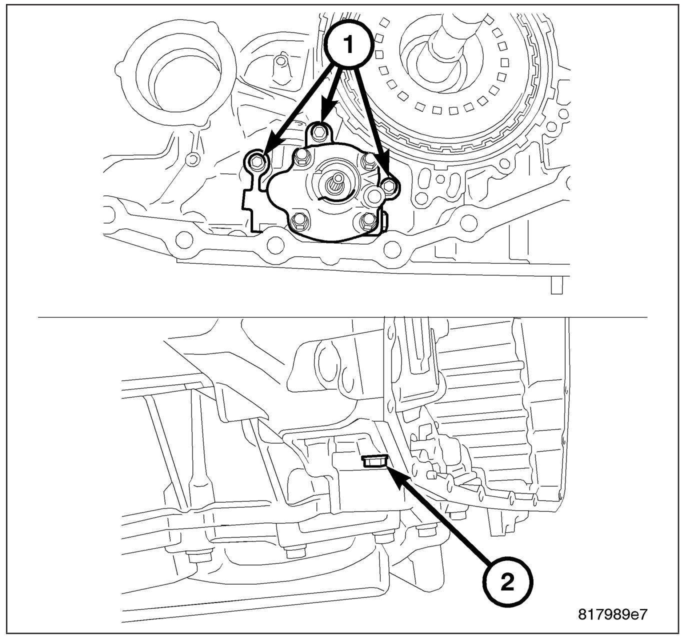
39. Remove the oil pan gasket (1) from the transaxle case.



40. Remove the bolts holding the oil strainer (1) to the valve body.
41. Remove the oil strainer.
42. Remove and discard the oil strainer o-ring.

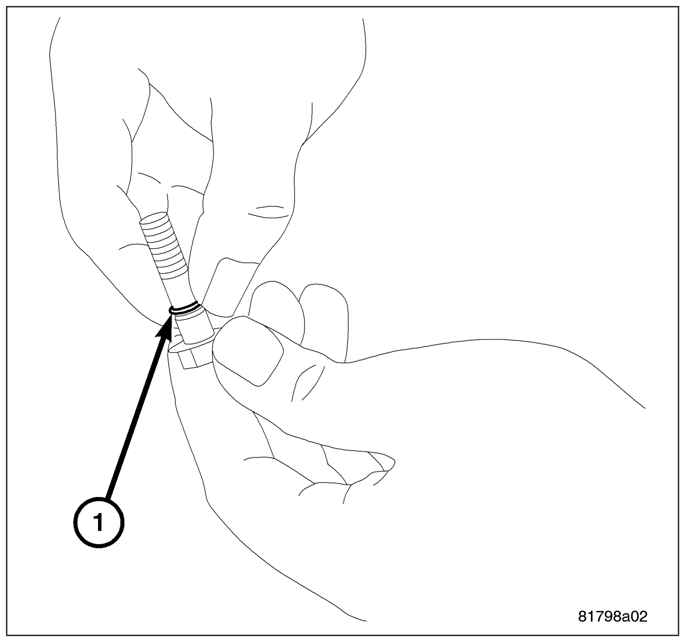


43. Remove the bolt (2) holding the oil pump to the transaxle case from the rear of the transaxle.
44. Remove the bolts (1) holding the oil pump to the transaxle case from inside the transaxle.
45. Remove the oil pump from the transaxle case.

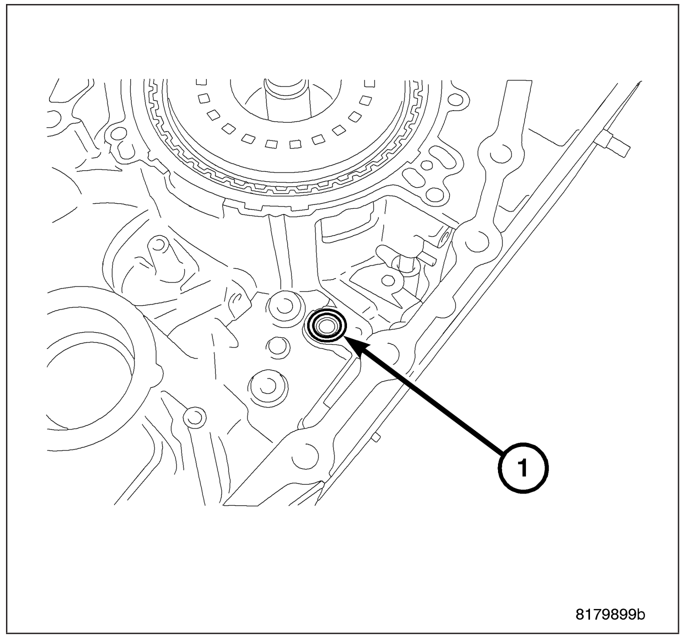


NOTE: One of the oil pump retaining bolts is installed from the outside of the transaxle case into the rear part of the oil pump.

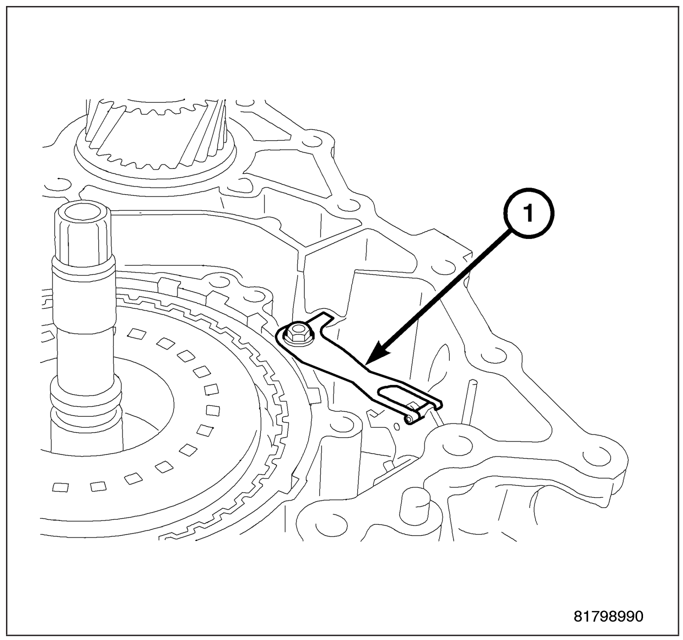
46. Remove and discard the o-ring (1) from the oil pump mounting bolt. (Only on bolt installed from the outside of the transaxle case)



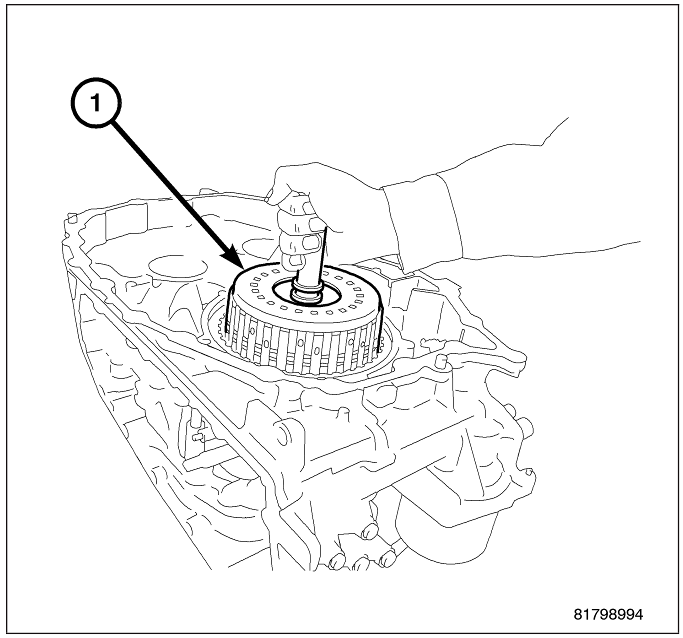
47. Remove and discard the lip seal (1) from the transaxle case.



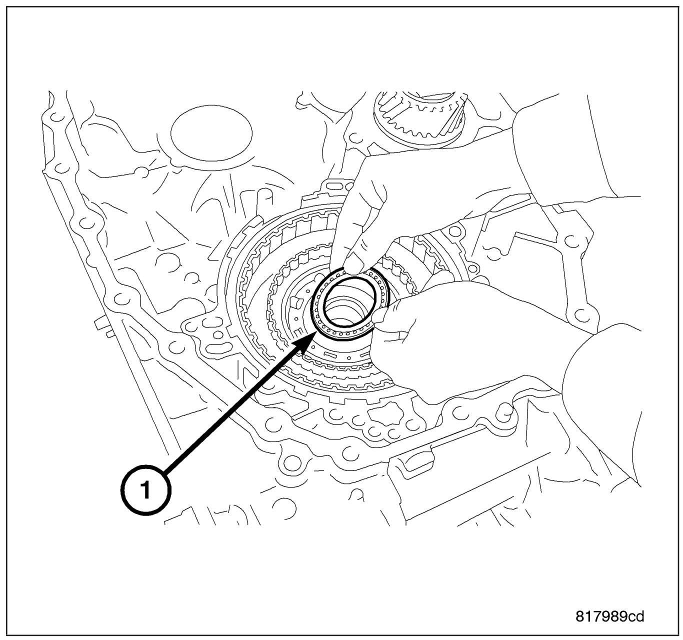
48. Remove the bolt holding the detente spring (1) to the transaxle case.
49. Remove the detente spring from the transaxle case.



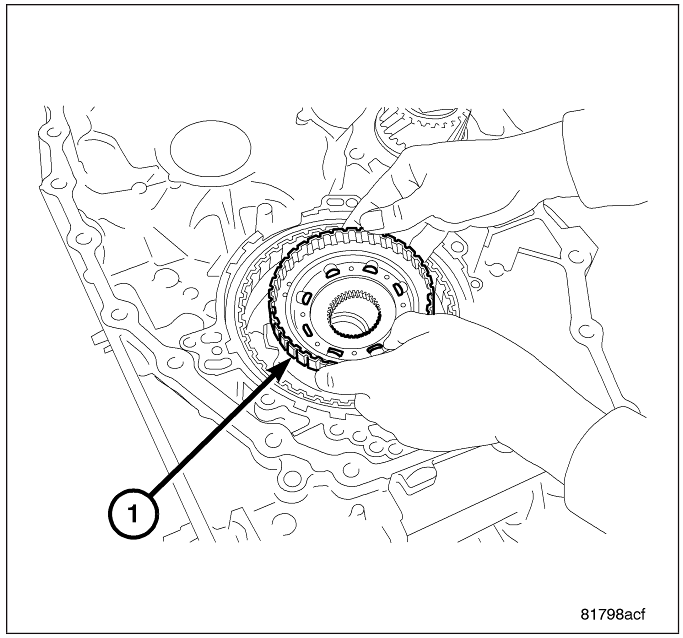
50. Remove the forward clutch assembly (1) from the transaxle case.



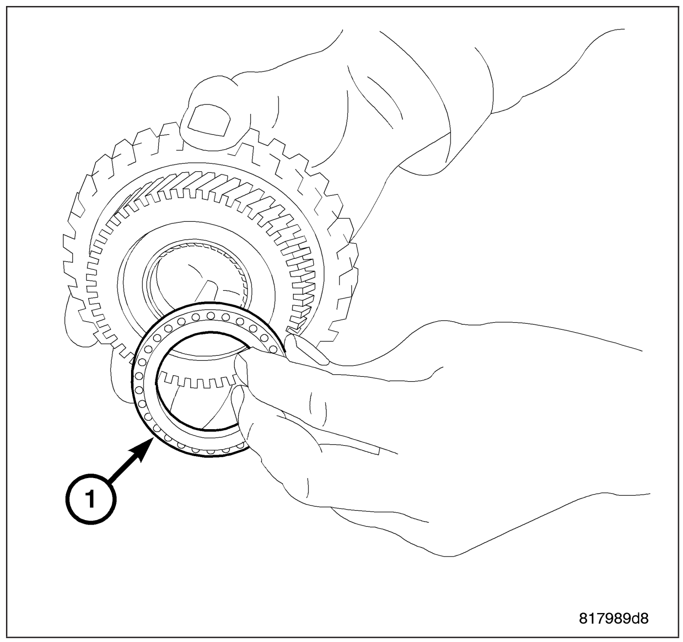
51. Remove needle bearing (1) from forward clutch drum side of the sun gear.



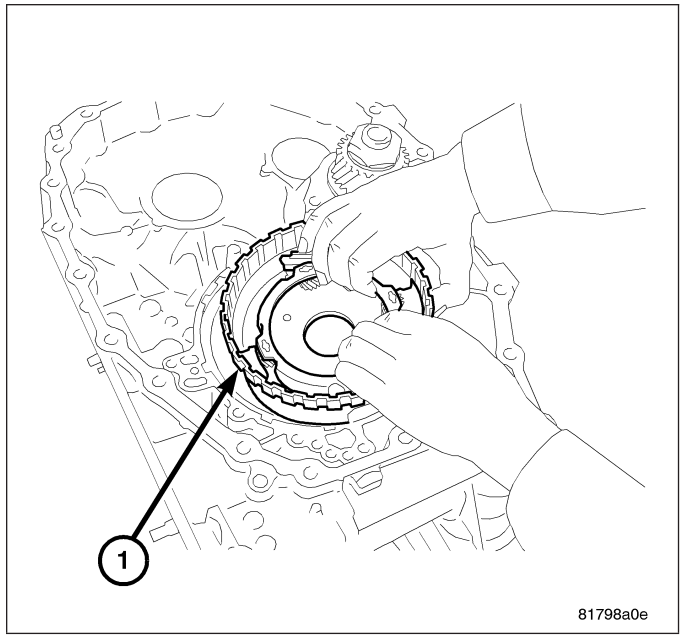
52. Remove the sun gear (1) from the planetary carrier.



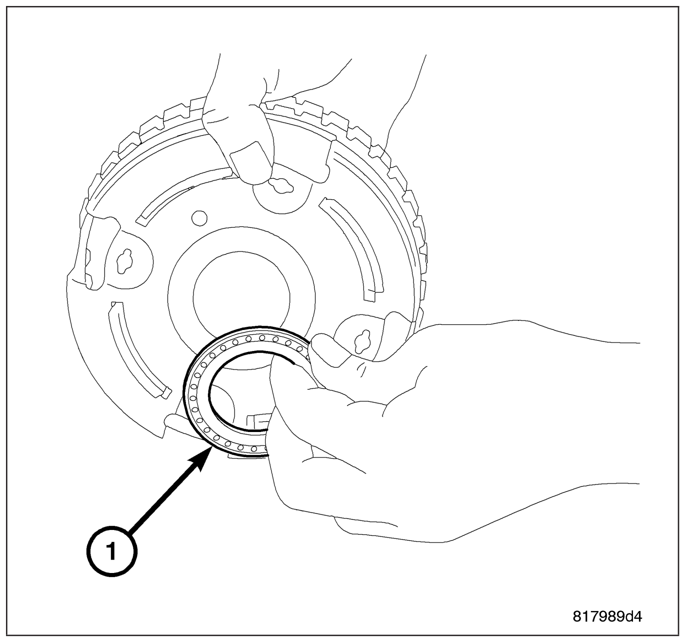
53. Remove the needle bearing (1) from the sun gear.



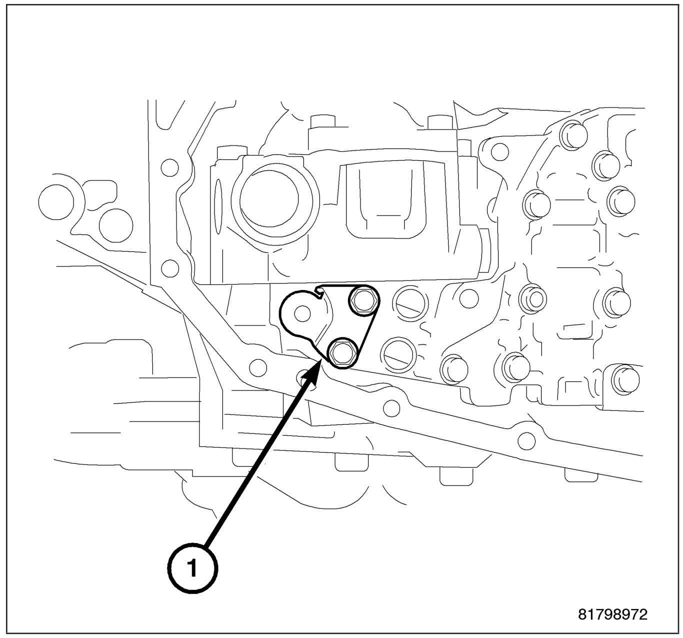
54. Remove the planetary carrier assembly (1) from the transaxle case.



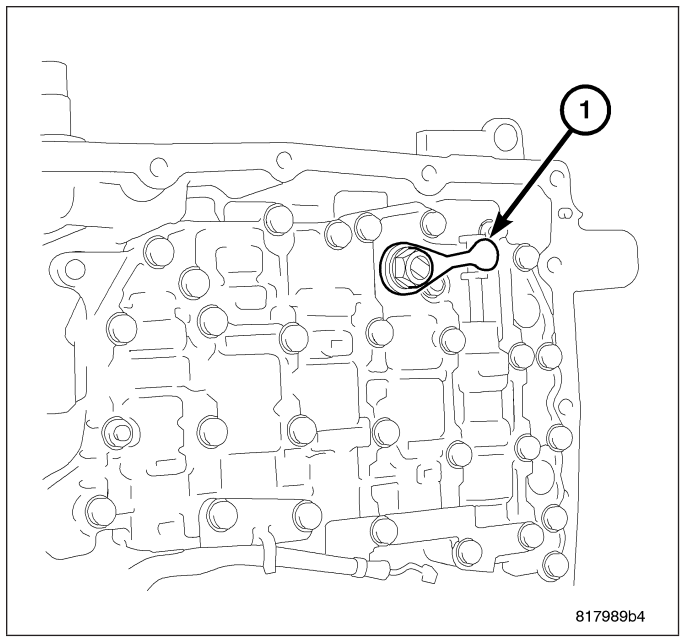
55. Remove the needle bearing (1) from the planetary carrier.



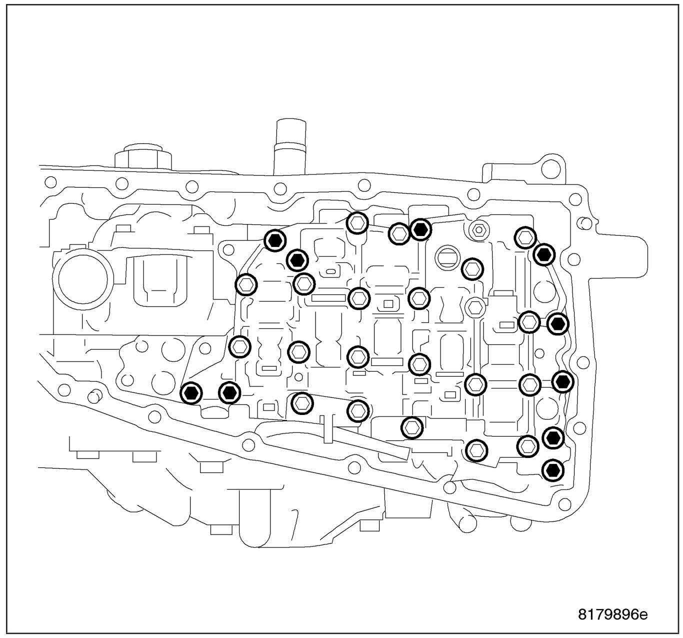
56. Remove the bolts holding the bracket (1) to the valve body assembly.
57. Remove the bracket from the valve body assembly.



58. Remove the nut holding the manual lever (1) to the manual shaft.
59. Remove the manual lever.

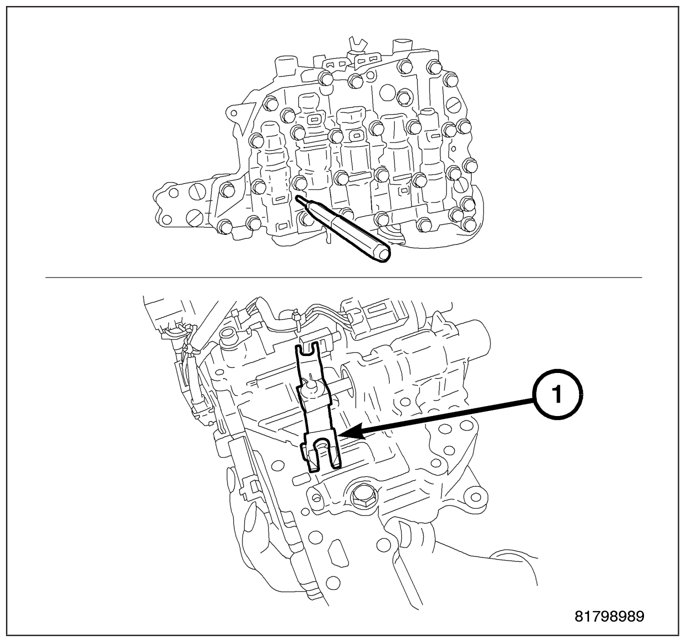


60. Use this picture when removing valve body attaching bolts.

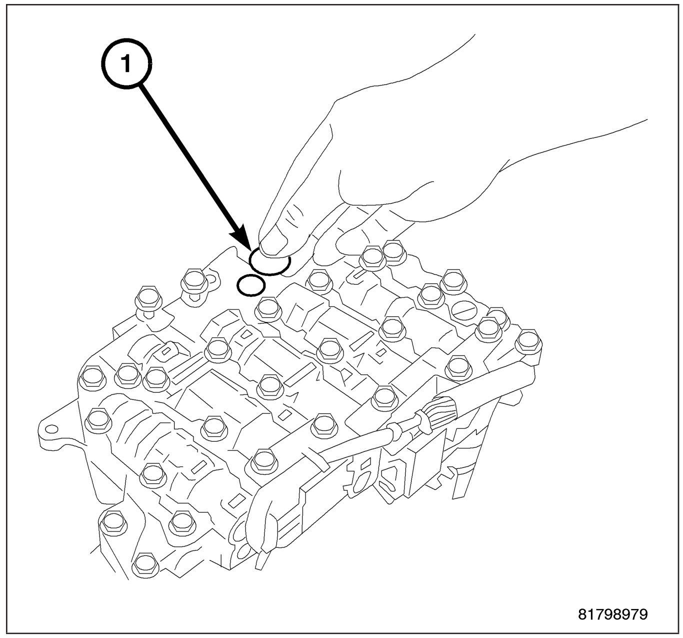


CAUTION: Tilt the valve body assembly away from the transaxle case on the manual shaft side to ease removal. Pay attention to completely remove the terminal body from the transaxle case.

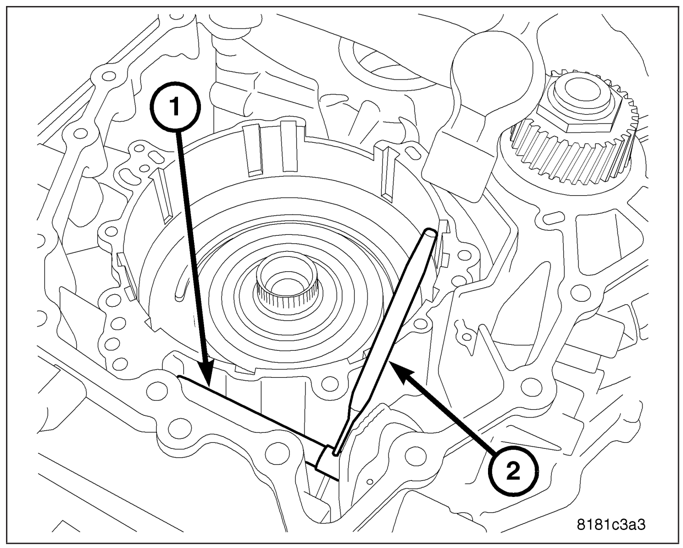
61. Remove the valve body assembly from the transaxle case as follows:
    a. Insert a 75 mm (3 in.) long 3 mm (0.118 in.) rod or wire into the linkage stopper hole of the valve body assembly to fix the pulley ratio linkage (1).
    b. Remove the bolts holding the valve body assembly to the transaxle case.
    c. Remove the valve body assembly from the transaxle case.



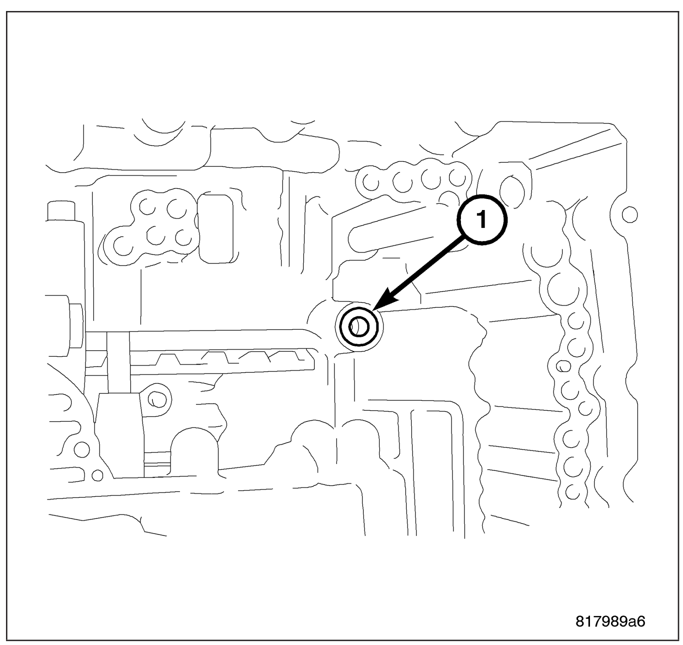
62. Remove and set aside the bushing (1) from the valve body.



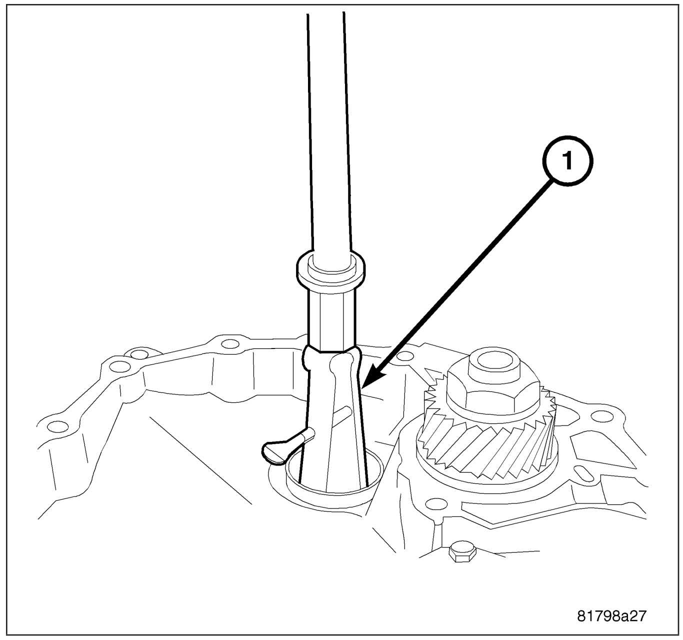
63. Remove the pin at the manual shaft using a punch (2).
64. Remove the manual shaft from case.



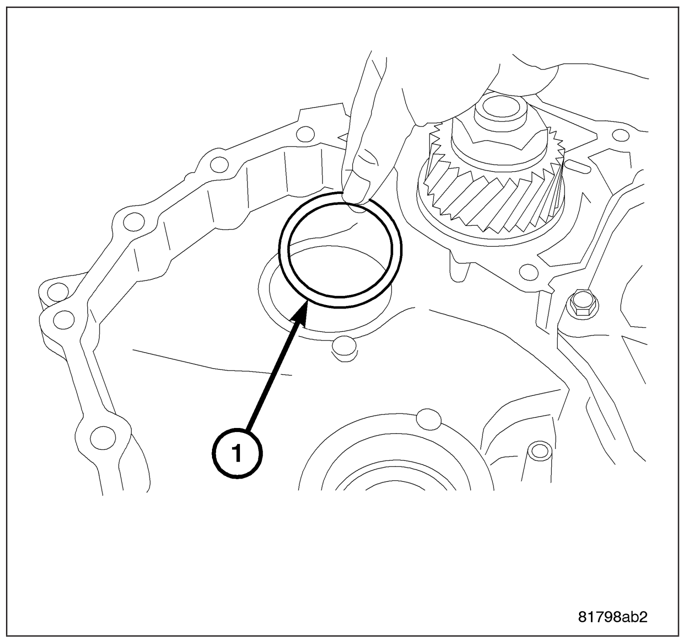
65. Remove and discard the lip seal (1) from the transaxle case.



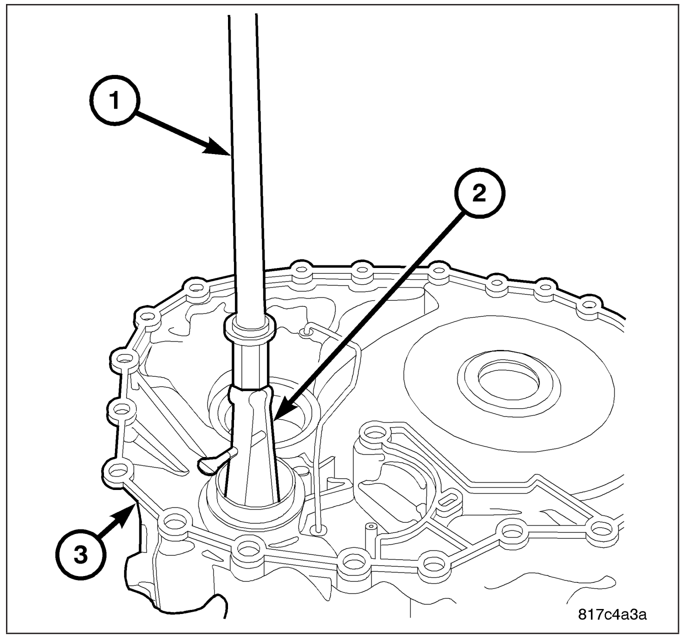
66. Remove outer race (1) of differential side bearing from converter main housing using Puller 9664 and Slide Hammer C-637.



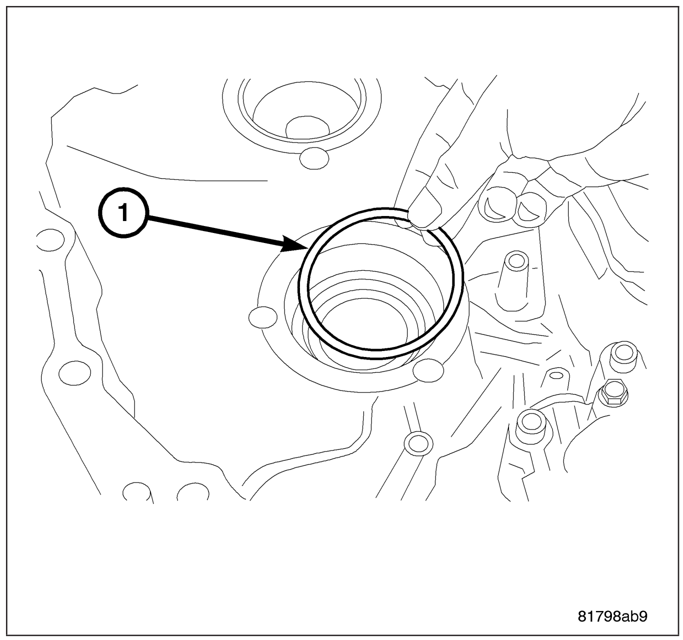
67. Remove the selective shim (1) from the transaxle case.



68. Remove outer race of reduction gear bearing (1) from transaxle case using Slide Hammer C-637 and Remover 7794-A.

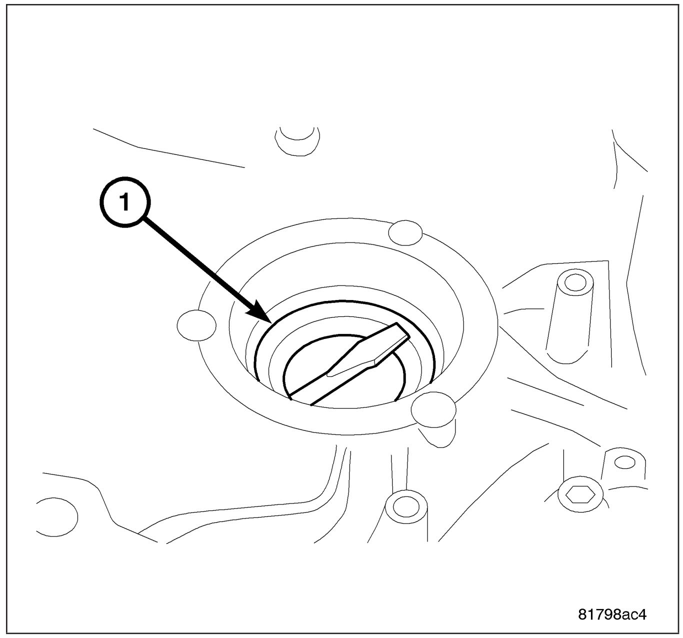


69. Remove the selective shim (1) from the transaxle case.



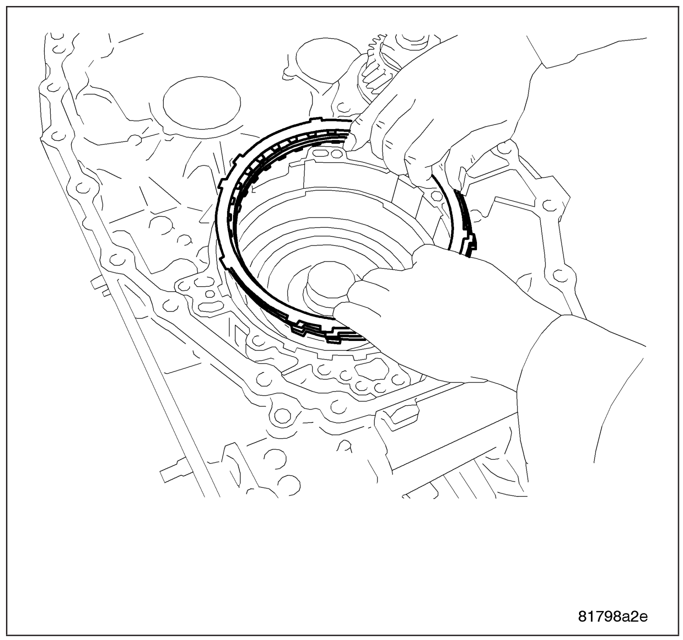
CAUTION: When removing the side oil seal, do not damage to the transaxle case.

70. Remove side oil seal (1) from transaxle case using a screwdriver.



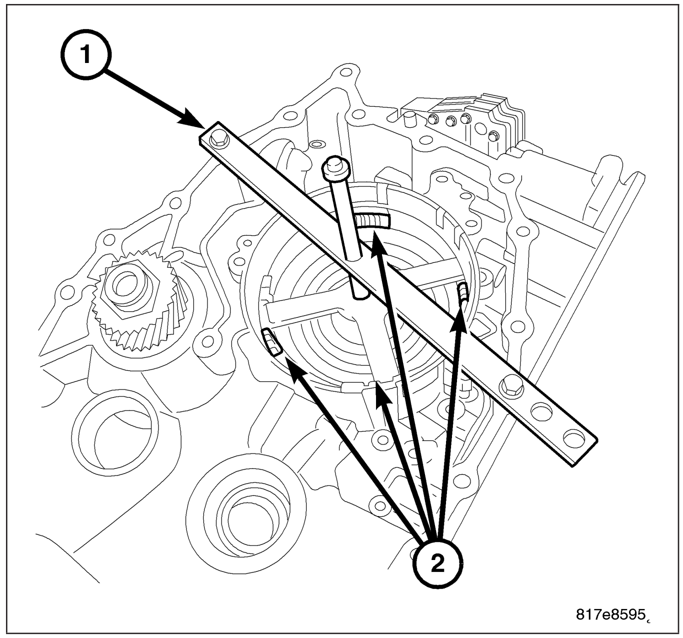
CAUTION: Check if there is damage, deformation, or burning on the surface of any of the drive or driven plates. Check for permanent fatigue of the dish plate, driven plates, retaining plate, snap ring, and the drive plates. Replace all reverse brake components if any of these conditions exist.

71. Remove the reverse brake snap ring using a screwdriver. Then remove the reverse brake retaining plate, the drive plates, the driven plates, and the dish plate from the reverse brake drum.



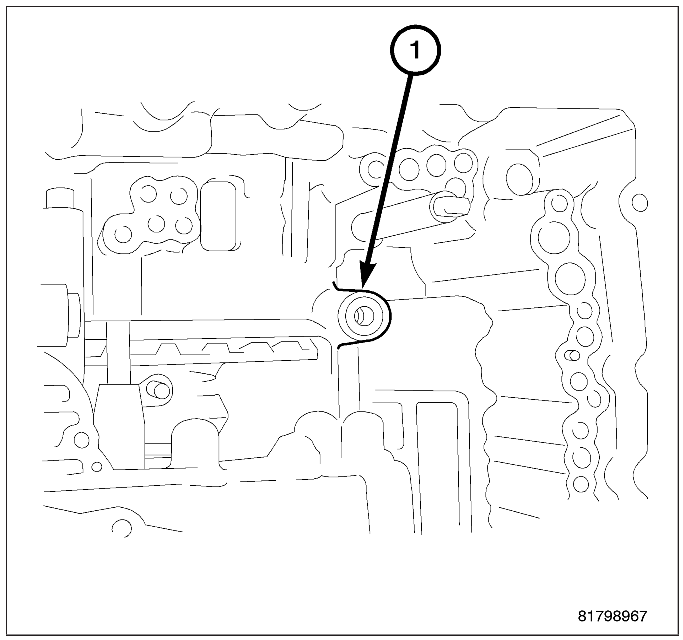
CAUTION: Set the spring compressor right on top of the return spring of the spring retainer assembly. Do not remove the return springs from the spring retainer assembly.

72. Compress the reverse brake return spring using Spring Compressor 5058A (1) and Reverse Piston Compressor 9875. Remove the snap ring (2) from the transaxle case.
73. Remove the retaining plate and the spring retainer assembly.



CAUTION: There is a possibility that the reverse brake piston might be stuck if excessive pressure is required to remove.

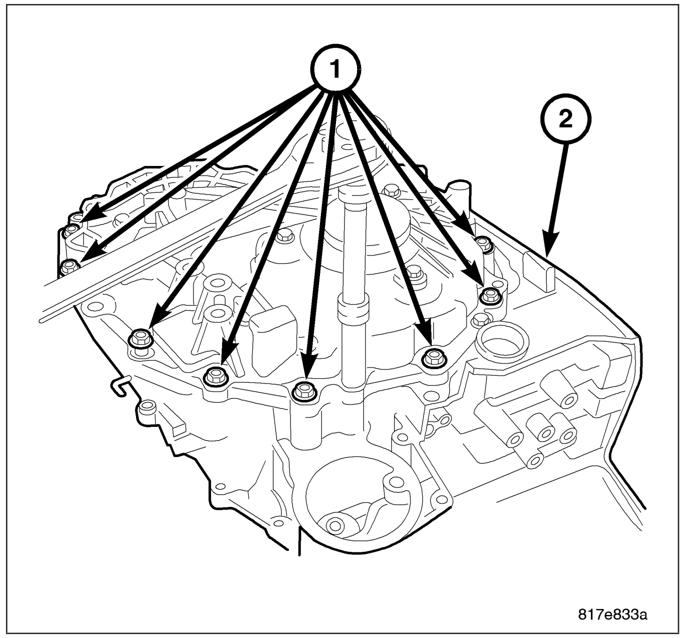
74. Try removing the reverse brake piston from the transaxle case by hand, apply compressed air to the fluid passage (1). and remove the reverse brake piston from the transaxle case if unable to remove by hand.



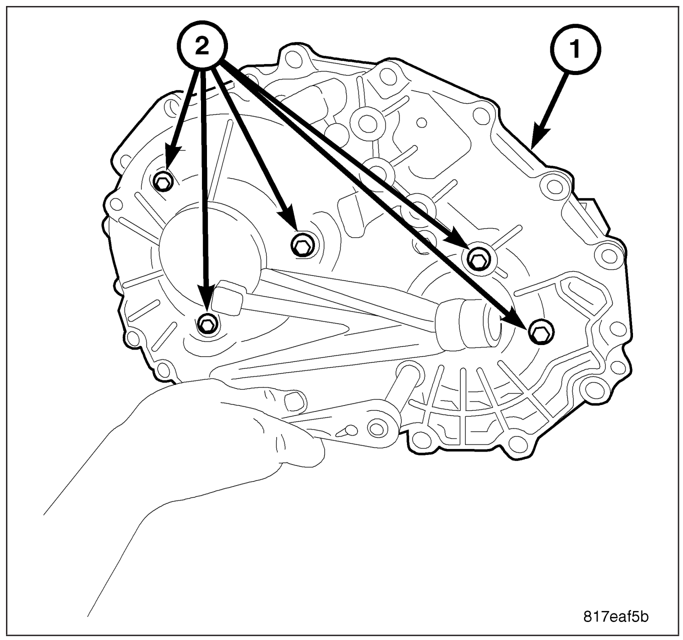
75. Remove the case bolts (1) at the drive belt assembly (2).

NOTE: Pin at pulley sensor stays with drive belt assembly case

76. Separate drive belt assembly case from main housing.

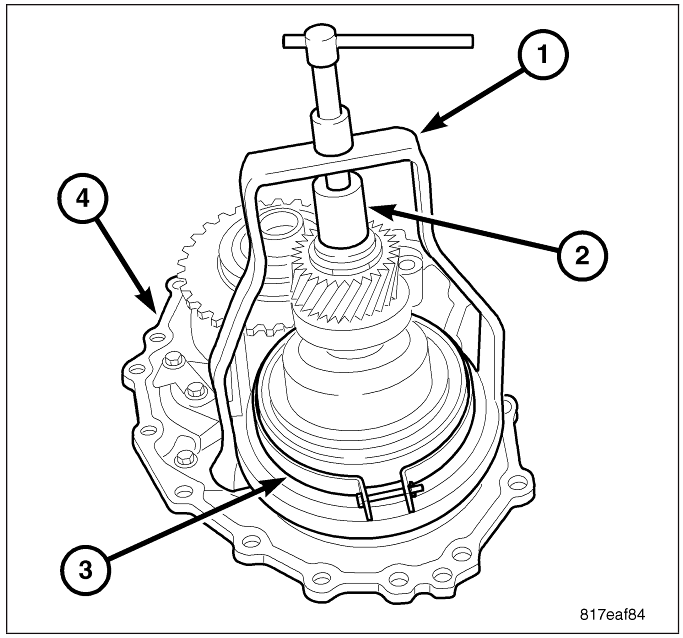


77. Remove the bolts (2) that hold both sheaves to the case (1).



CAUTION: Do not allow the Sheave Compressor 9874 to come in contact with the belt at any time

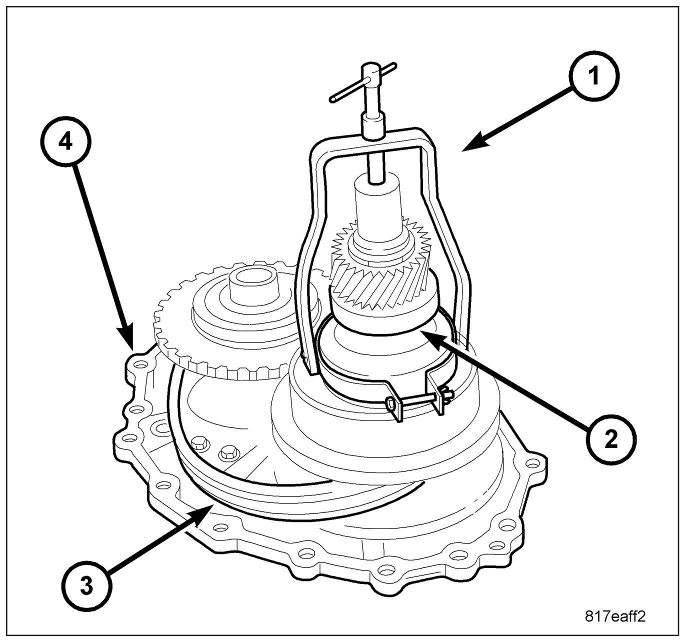
78. Install the Sheave Compressor 9874 (1) and Press Insert 8513A (2) onto the secondary sheave (3).



CAUTION: Do not over tighten the compressor tool. Tighten to no more than 7 N·m (50 in. lbs.)

NOTE: The belt is directional, look for an arrow indicating the direction of the belt for installation

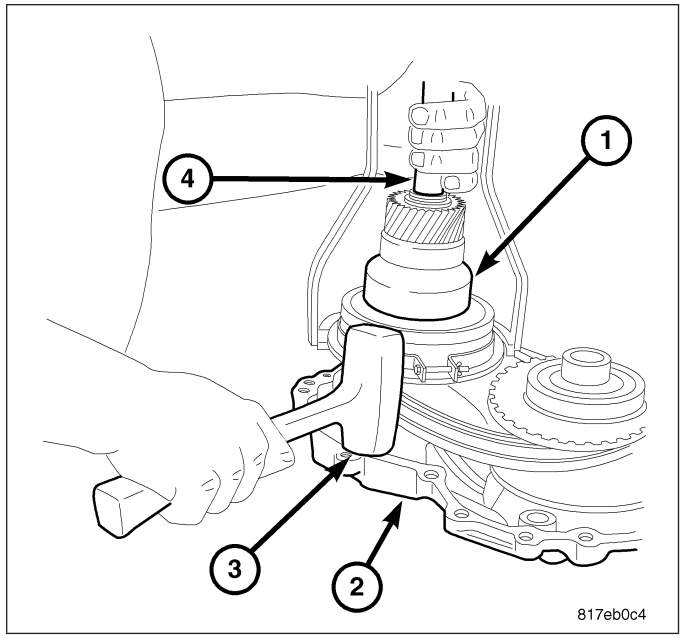
79. Compress sheave (2) to the stop.



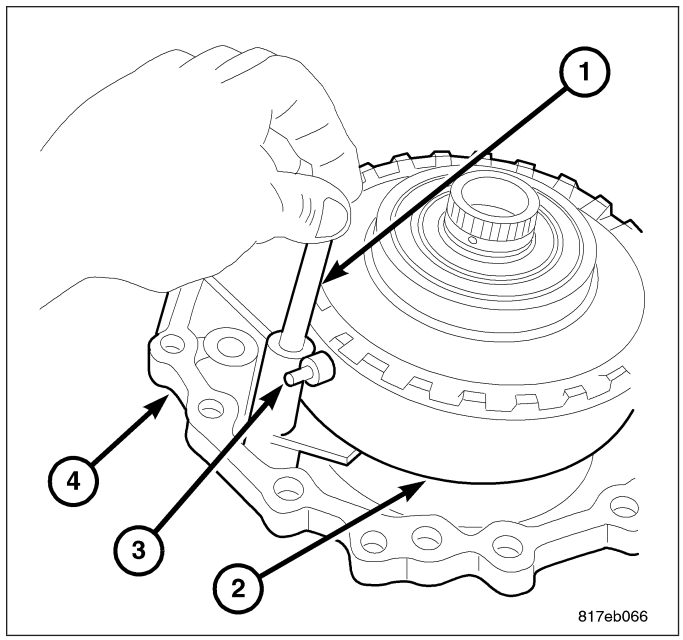
CAUTION: Do not allow the primary sheave to contact the drive surface of the secondary sheave.

NOTE: You may need to lightly tap case while holding secondary sheave.

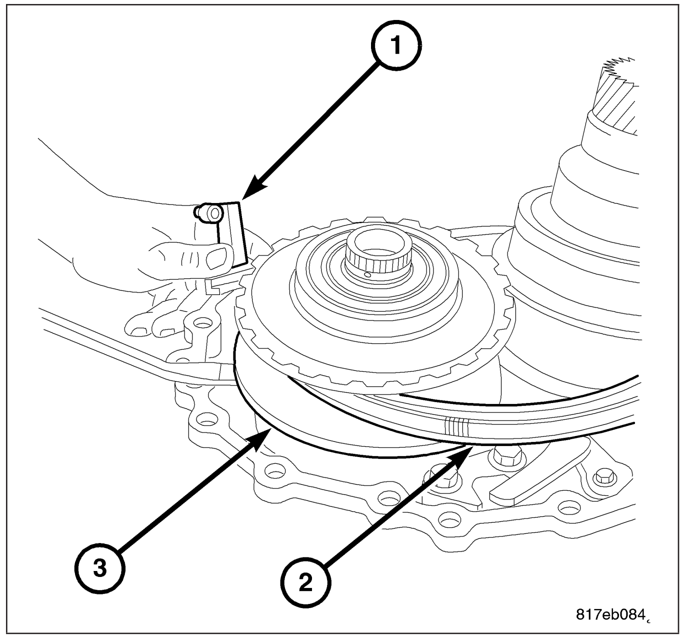
80. Lift and move the secondary sheave (1) closer to the primary sheave.



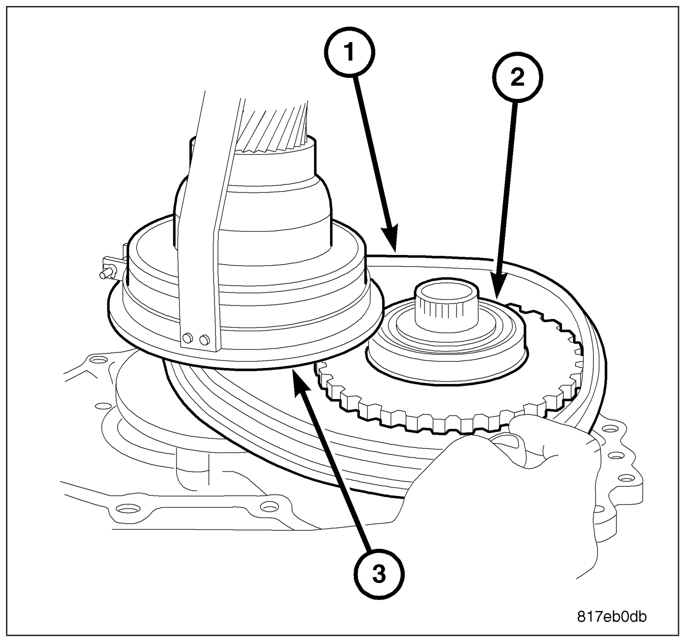
81. Remove the pin (1) from the sheave height sensor (3).



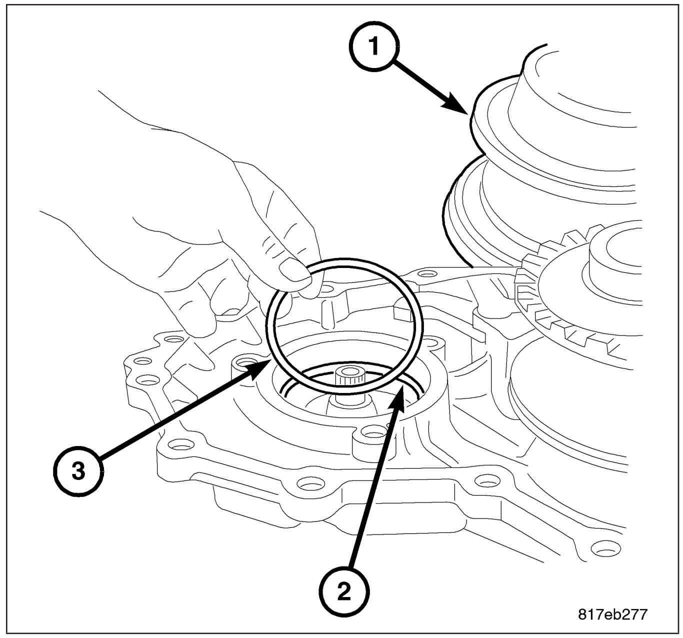
82. Lift the primary sheave (3) enough to remove the sheave height sensor (1).



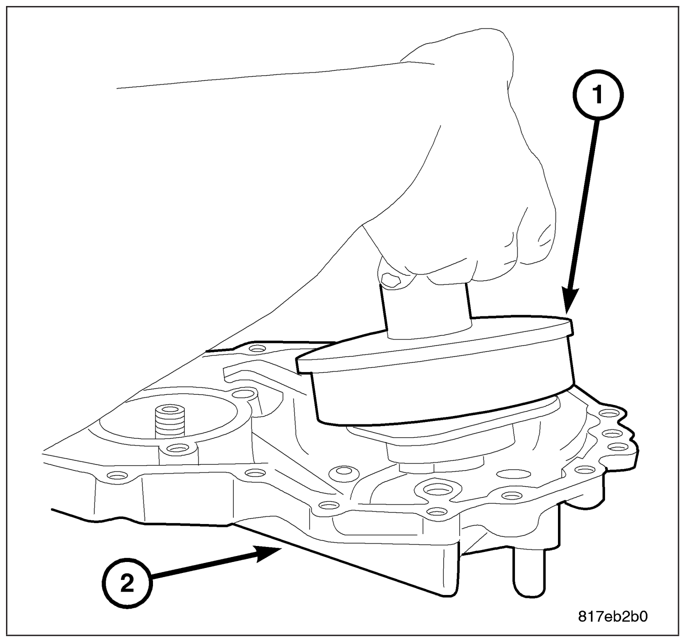
83. Remove the drive belt (1) from both secondary (3) and primary sheaves (2).
84. Remove the secondary sheave.



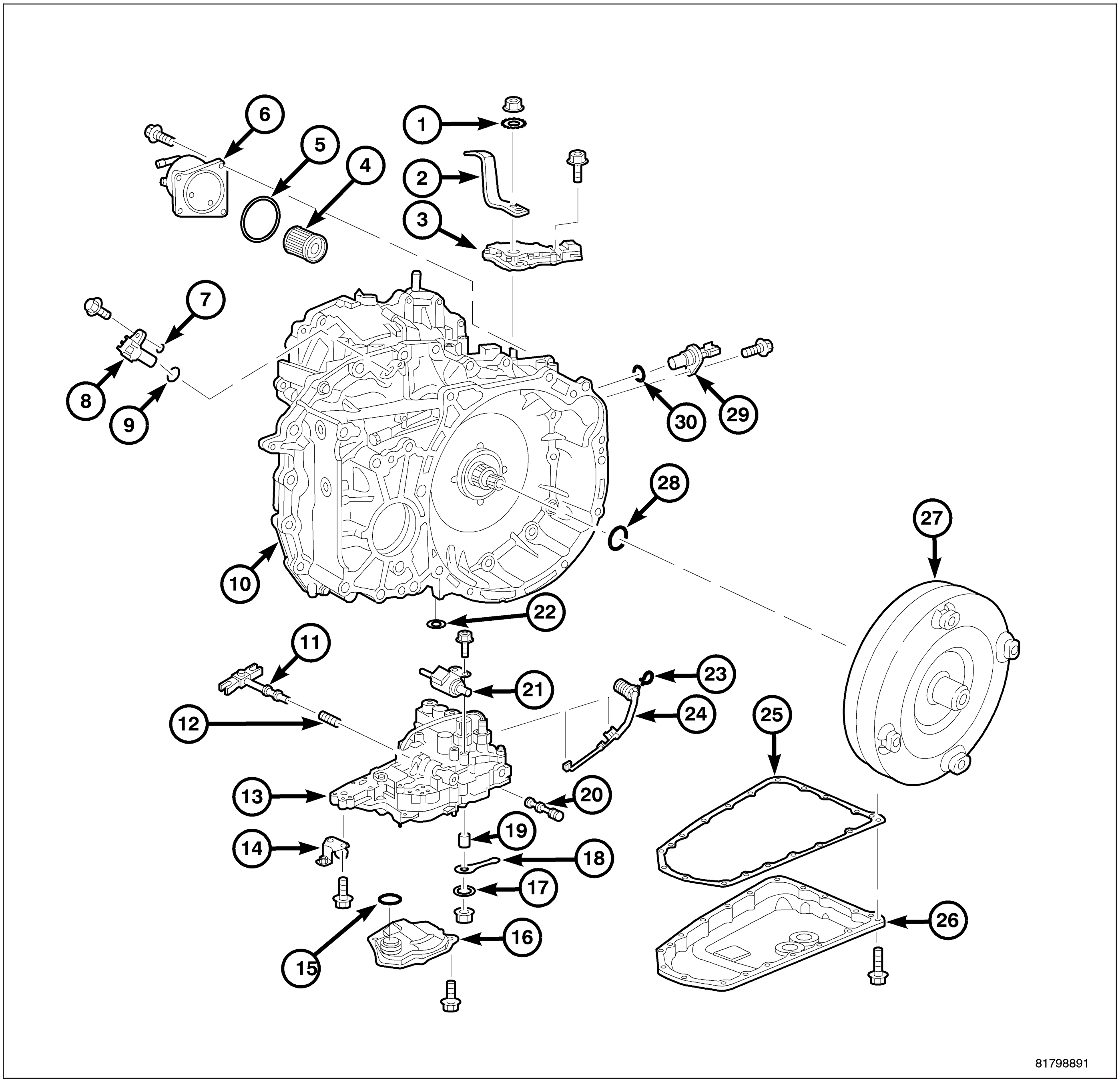
85. Remove the shim (3) under the secondary sheave (1).



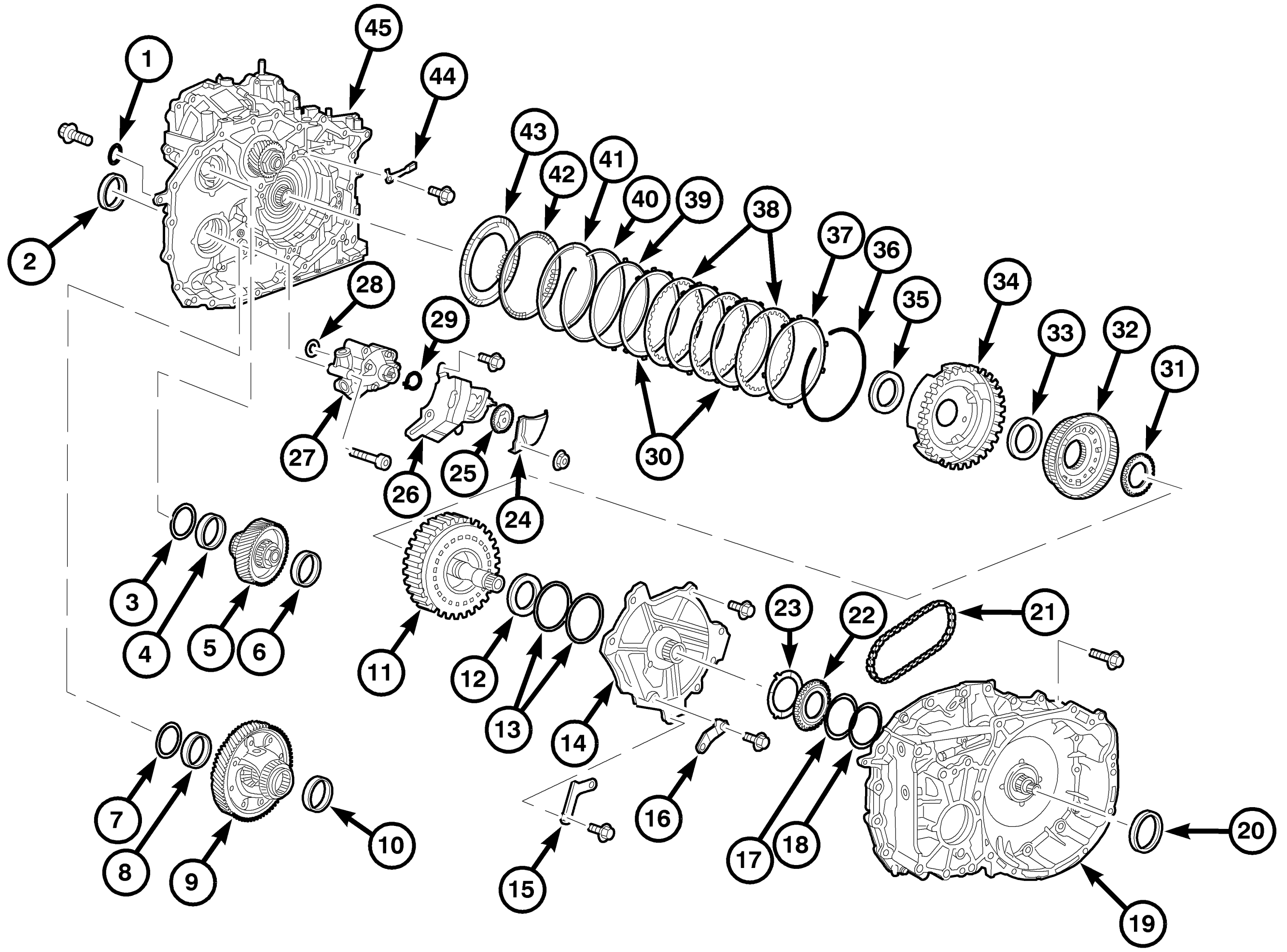
86. Remove the primary sheave.
87. Remove bolts at the park pawl.
88. Remove the park pawl.



ASSEMBLY



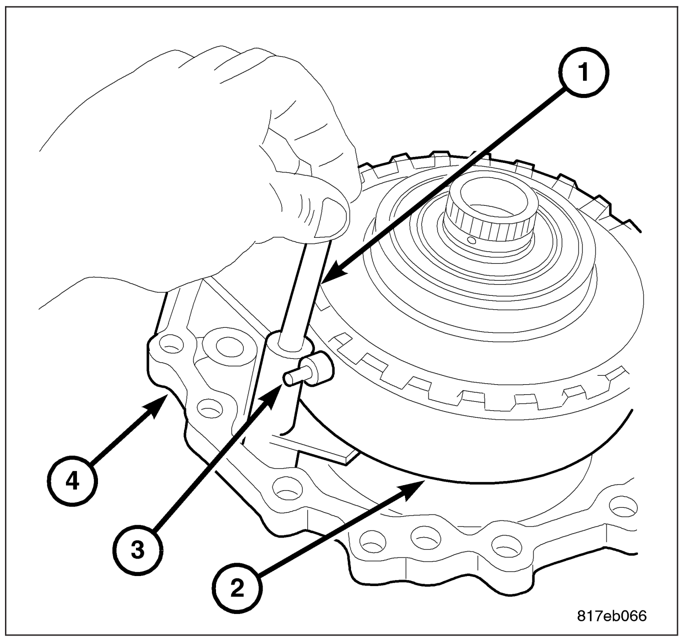
1- WASHER
2 - SHIFT LEVER
3 - INHIBITOR SWITCH
4 - CVT FLUID FILTER
5 - O-RING
6 - CVT FLUID COOLER
7 - SHIM
8 - OUTPUT SPEED SENSOR
9 - O-RING
10 - TRANSAXLE
11 - PULLEY RATIO LINKAGE
12 - SPRING
13 - CONTROL VALVE
14 - BRACKET
15 - O-RING
16 - OIL STRAINER
17 - PLAIN WASHER
18 - MANUAL LEVER
19 - BELL HOUSING
20 - MANUAL VALVE
21 - STEPPER MOTOR
22 - LIP SEAL
23 - SNAP RING
24 - VALVE BODY HARNESS
25 - OIL PAN GASKET
26 - OIL PAN
27 - TORQUE CONVERTER
28 - O-RING
29 - INPUT SPEED SENSOR
30 - O-RING



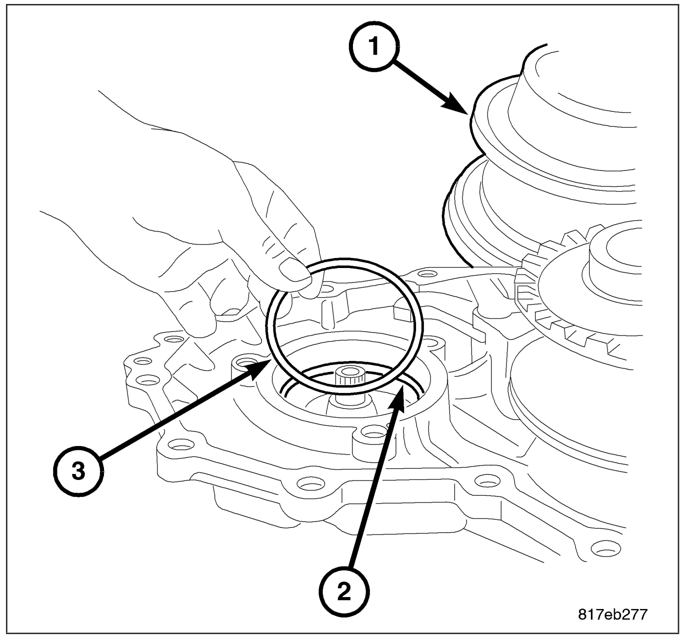
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1 - O-RING
2 - SIDE OIL SEAL
3 - ADJUSTABLE SHIM
4 - OUTER RACE
5 - REDUCTION GEAR ASSEMBLY
6 - OUTER RACE
7 - ADJUSTABLE SHIM
8 - OUTER RACE
9 - DIFFERENTIAL ASSEMBLY
10 - OUTER RACE
11 - FORWARD CLUTCH ASSEMBLY
12 - NEEDLE BEARING
13 - SEAL RING
14 - OIL PUMP COVER
15 - BAFFLE PLATE
16 - BRACKET
17 - ADJUSTABLE SHIM
18 - ADJUSTABLE SHIM
19 - CONVERTER HOUSING
20 - CONVERTER HOUSING OIL SEAL
21 - OIL PUMP CHAIN
22 - DRIVE SPROCKET
23 - THRUST WASHER
24 - BAFFLE PLATE
25 - DRIVEN SPROCKET (OIL PUMP)
26 - BAFFLE PLATE
27 - OIL PUMP
28 - LIP SEAL
29 - SNAP RING
30 - DRIVEN PLATES
31 - NEEDLE BEARING
32 - SUN GEAR
33 - NEEDLE BEARING
34 - PLANETARY CARRIER
35 - NEEDLE BEARING
36 - SNAP RING
37 - RETAINING PLATE
38 - DRIVEN PLATES
39 - DISH PLATE
40 - SNAP RING
41 - RETAINING PLATE
42 - SPRING RETAINER ASSEMBLY
43 - REVERSE PLATE PISTON
44 - DETENT SPRING
45 - TRANSAXLE CASE

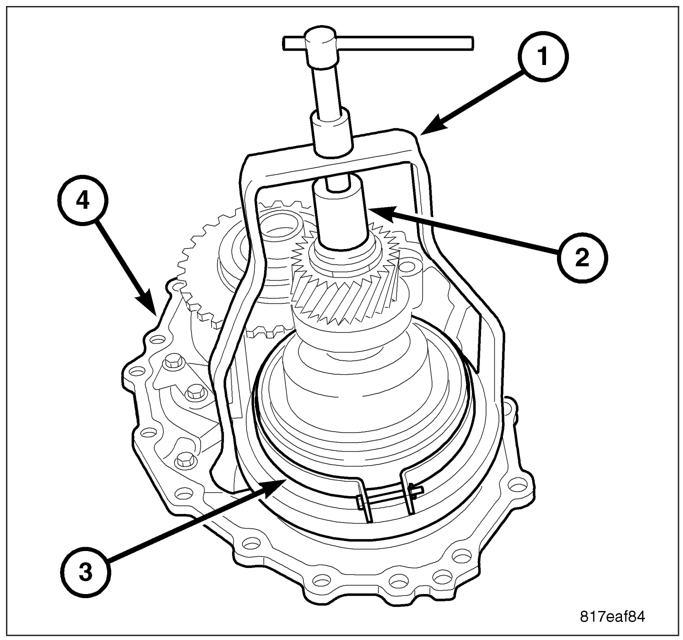
1. Refer to the exploded views as necessary when performing the following steps.
2. Install the primary sheave (2) with the sheave height sensor, (3) spring and pin (1) into the belt side case.



3. Install the secondary sheave positioning shim (3) into the belt side cover.



4. Install Sheave Compressor 9874 (1) and Press Insert 8513 A, (2) onto secondary sheave.



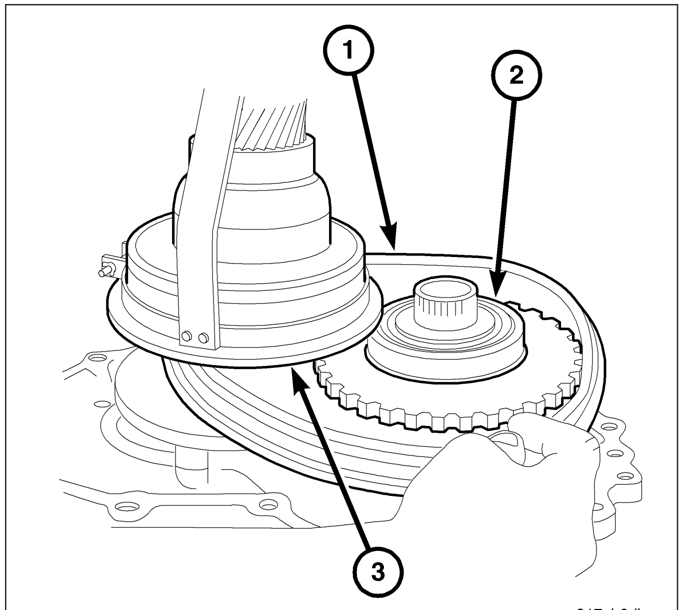
5. Move the secondary sheave (3) close enough to the primary (2) sheave to allow the drive belt (1) to be put around both secondary and primary sheaves.

NOTE: The drive belt is directional and will need to be installed in the same direction as noted in disassembly, if installed incorrectly failure will accrue

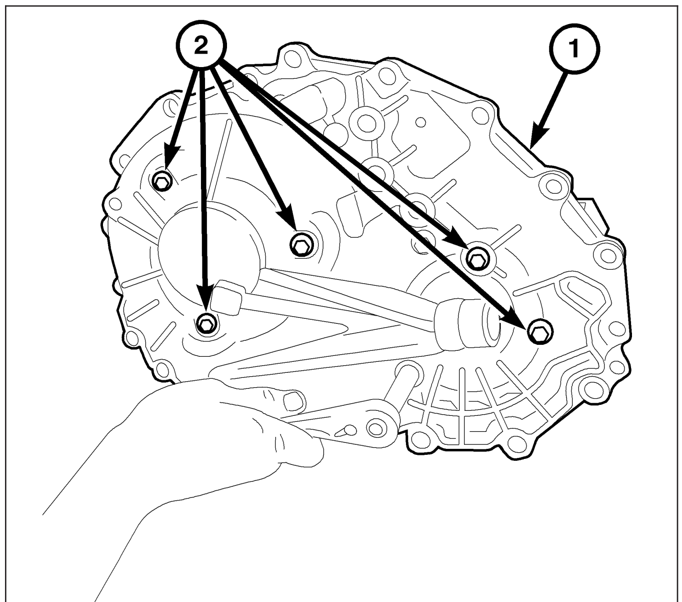
6. Install the drive belt (1).

CAUTION: Do not over tighten the compressor tool. Tighten to no more than 7 N·m (50 in. lbs.)

7. Compress the secondary (3) sheave to the stop.
8. Install the drive belt (1) around both secondary (3) and primary (2) sheaves.
9. Install the primary sheave into place.
10. Remove Sheave Compressor 9874 and Press Insert 8513A from the primary sheave.
11. Install the bolts (2) that hold both sheaves to the case (1).



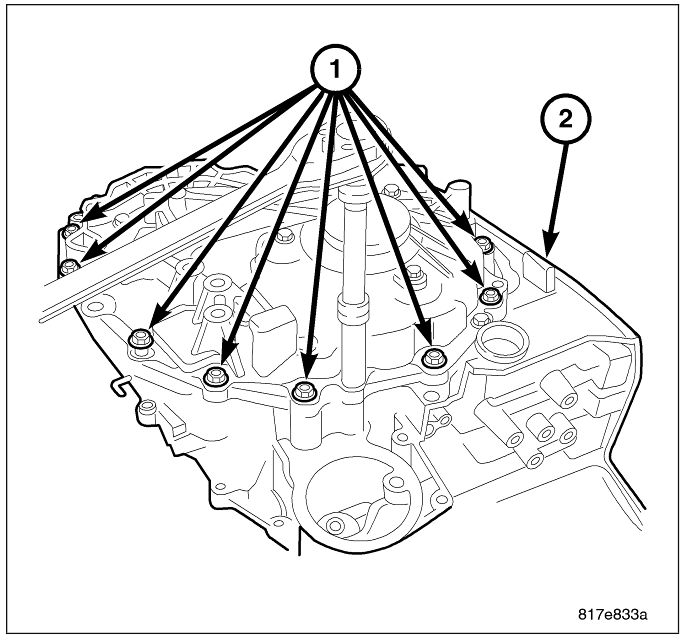
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CAUTION: Remove moisture, oil, and used sealant from the sealant application surface. Make sure that the starting point and the ending point are between two bolt holes.

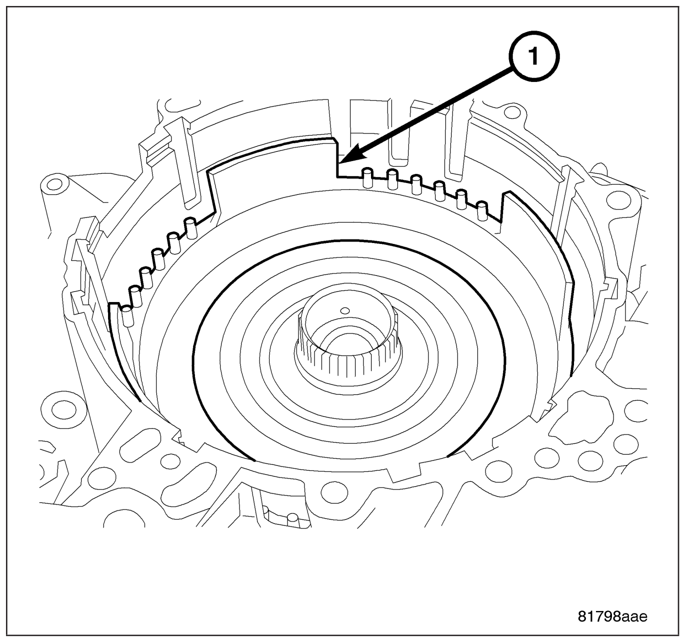
12. Apply Loctite 509 sealer onto the belt side of the transaxle case.
13. Install the belt side assembly to the transaxle case.
14. Install the case bolts (1) to hold the drive belt assembly (2) to the transaxle. Torque to 45 N·m (33 ft.lbs.).



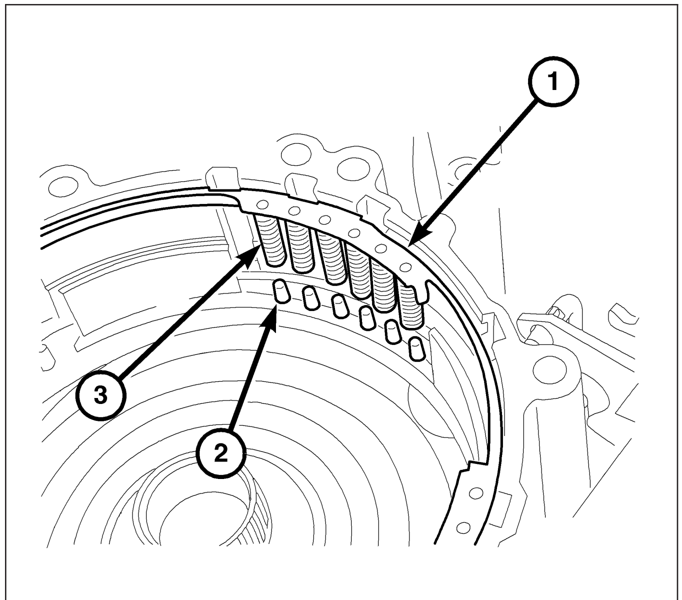
CAUTION: Inspect the reverse brake piston and, if damaged, replace it before installation. Apply CVT fluid to the seal when installing the reverse brake piston.

NOTE: Rotate reverse brake piston into place

15. Rotate and install the reverse brake piston (1) into the transaxle case.



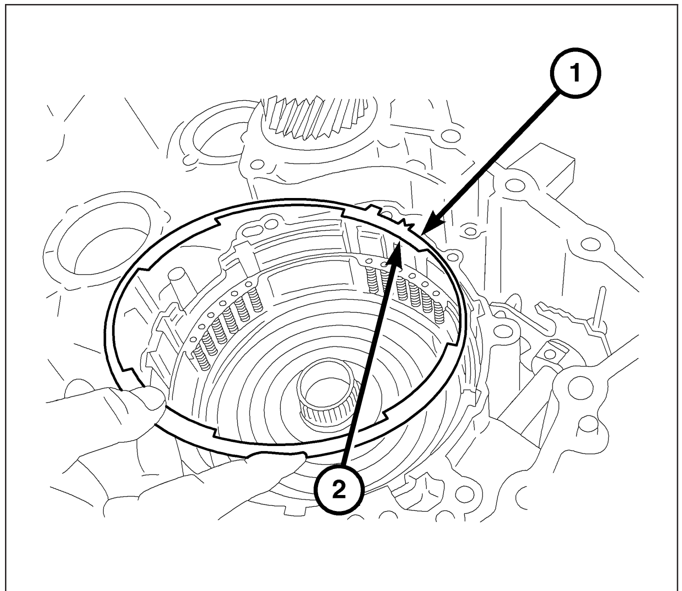
16. Align the return springs (3) of the spring retainer assembly (1) to the locating posts (2) of the reverse clutch piston.



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NOTE: There is a notch in the retaining plate that points to the top of the case

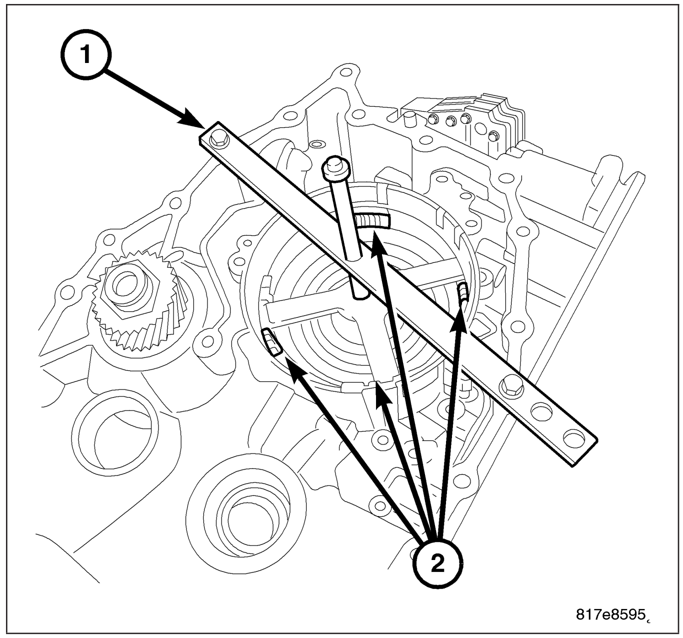
17. Install the retaining plate (1) into the transaxle case with the notch on the plate to the top (2).



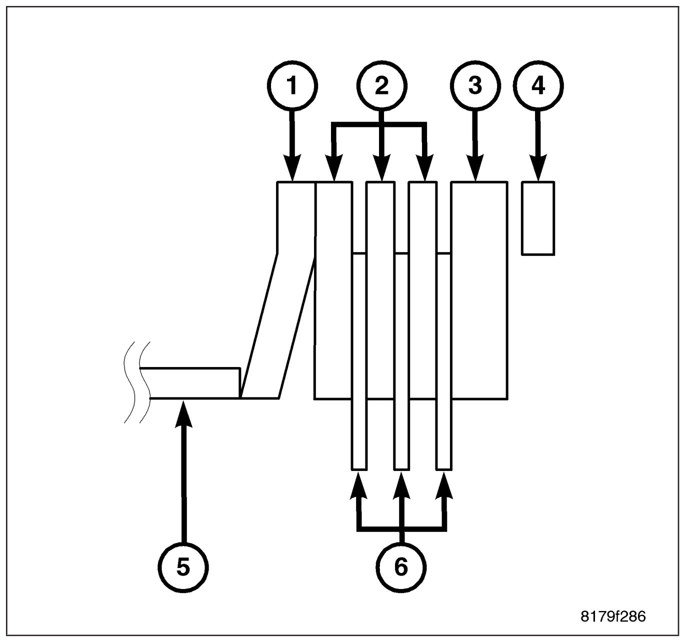
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CAUTION: Set the spring compressor on top of the spring of the spring retainer assembly.

18. Compress the reverse brake return spring using Spring Compressor 5058 A (1) and Reverse Piston Compressor 9875 and install the snap ring into the transaxle case using a screwdriver.

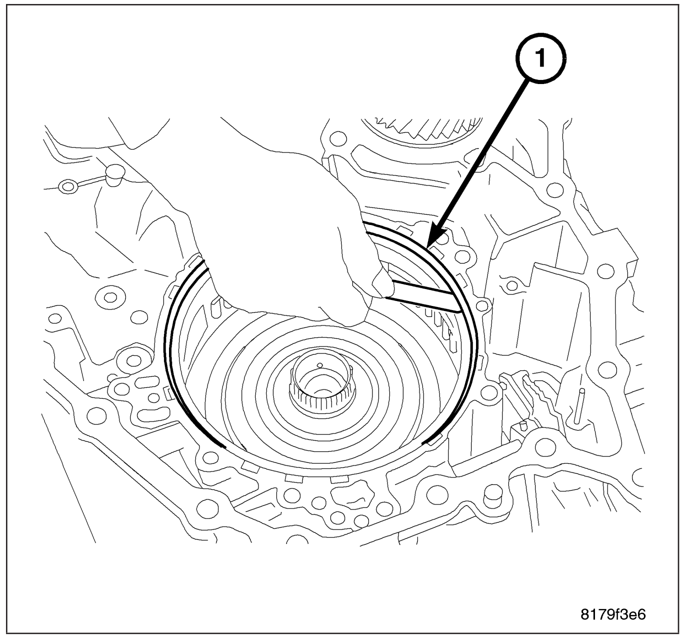


19. Install the dish plate (1) with the convex side down onto the reverse brake piston.
20. Install driven plate (2) and then a drive plate (6) until all the driven and drive plates are installed.
21. Install the retaining plate (3) into the reverse brake assembly.
22. Install the reverse brake snap ring (4) into the transaxle case.



CAUTION: When conducting measurements, measure two or more places and calculate the average value.

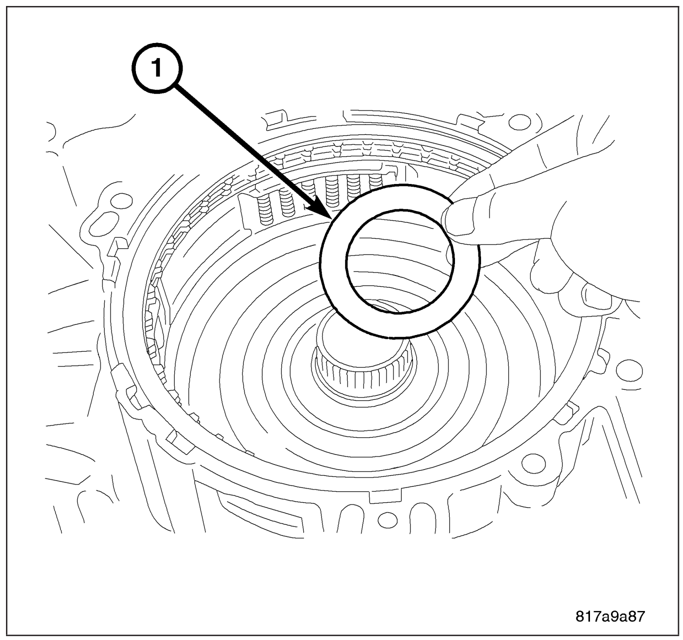
23. Measure the clearance between the snap ring and the retaining plate (1). The correct clutch clearance is 1.2-1.5 mm (0.047-0.059 in.). If the clutch clearance is not within specifications, measure the existing retaining plate and select the correct retaining plate.



CAUTION: Apply Vaseline or assembly lube when installing the needle bearing. Be careful to verify correct orientation of the needle bearing when installing it.

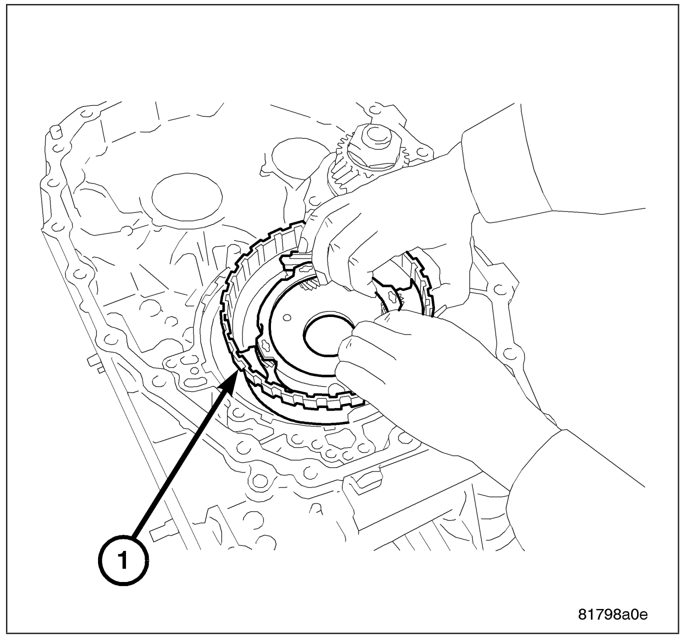
NOTE: The inner race will need to face down

24. Install the needle bearing (1) onto the reverse brake piston. Check for the direction of the needle bearing while installing.



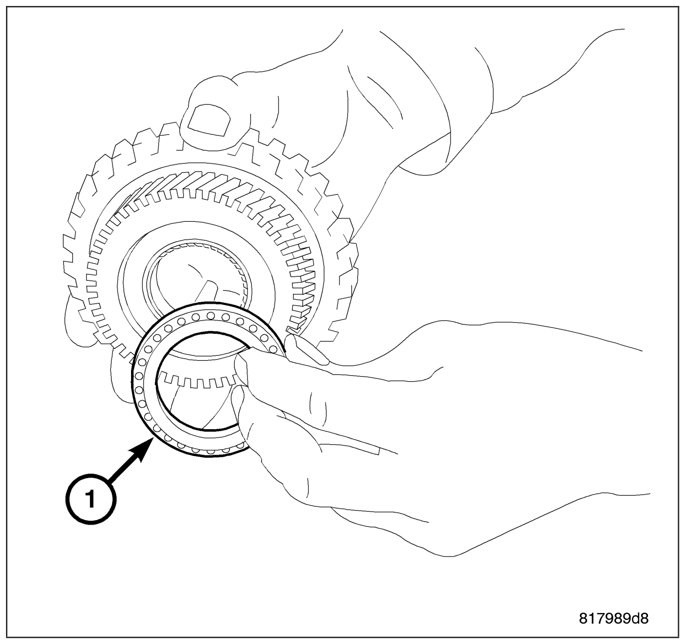
NOTE: The inner race will need to face down

25. Install the planetary carrier assembly (1) onto the reverse brake.

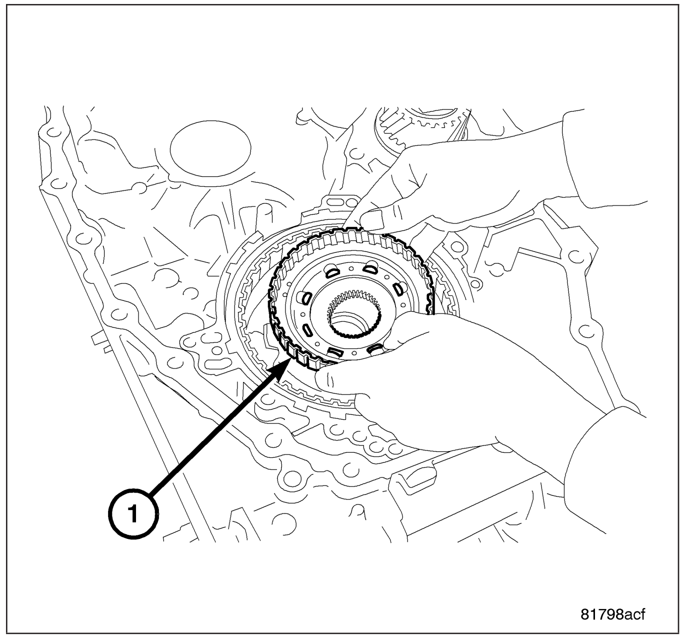


CAUTION: Apply Vaseline or assembly lube when installing the needle bearing. Be careful to verify correct orientation of the needle bearing when installing it.

26. Install the needle bearing (1) onto the primary pulley side of the sun gear.



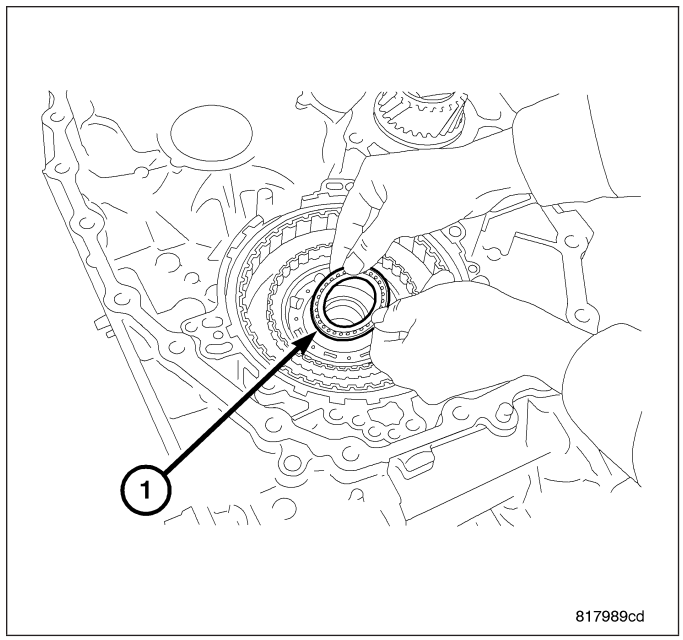
27. Install the sun gear (1) onto the planetary carrier.



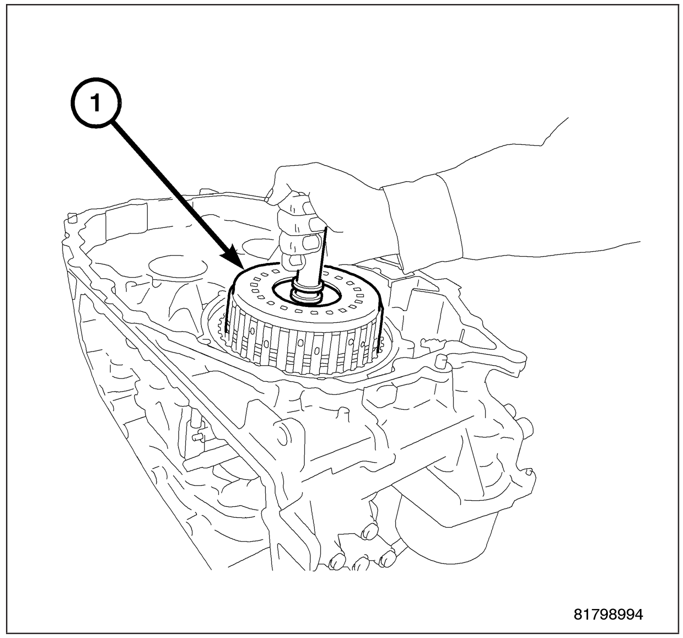
CAUTION: Apply Vaseline or assembly lube when installing the needle bearing. Be careful to verify correct orientation of the needle bearing when installing it.

NOTE: The inner race will need to face up

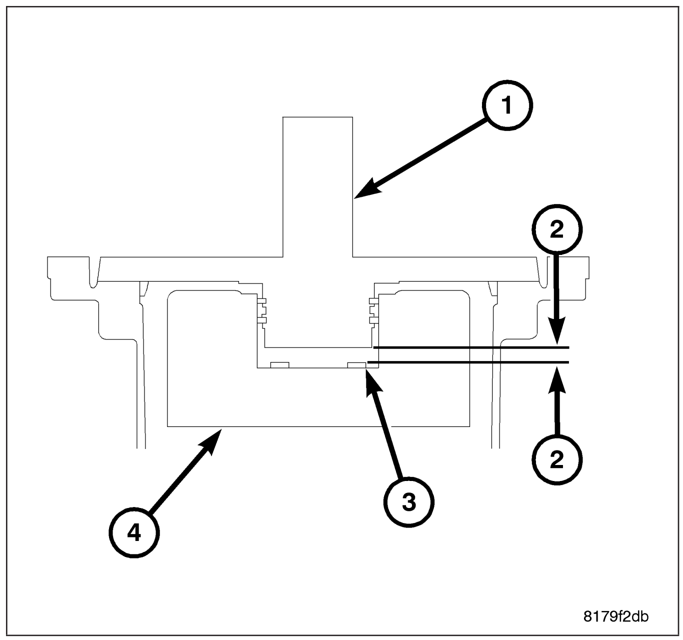
28. Install the needle bearing (1) on the forward clutch drum side of the sun gear.



29. Install the forward clutch assembly (1) into the transaxle case.

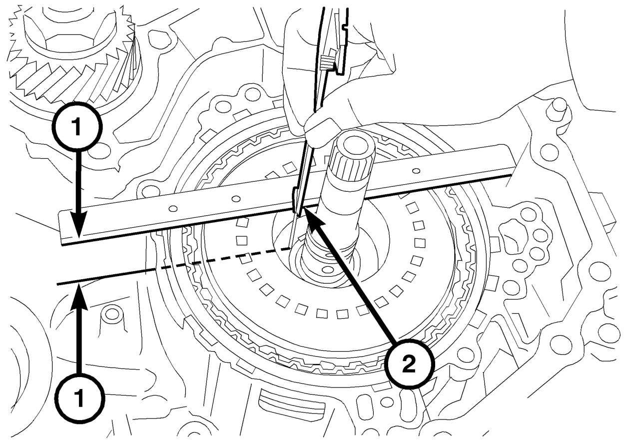


30. Measure the total end play (2) in the following steps. Total end play should be 0.25 - 0.55 mm (0.010 - 0.022 in).



NOTE: Gauge bar 6311 can be used for doing the following measurement

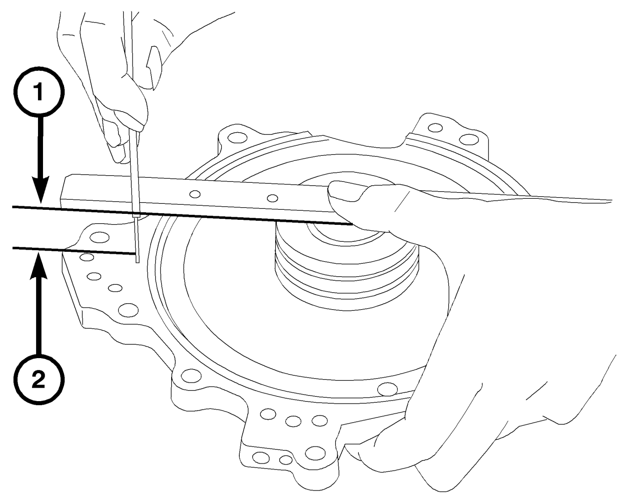
31. Measure the distance (1) from the oil pump cover installation surface of the transaxle case to the needle bearing installation surface of the forward clutch drum. Call this measurement one.



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NOTE: Gauge bar 6311 can be used for doing the following measurement

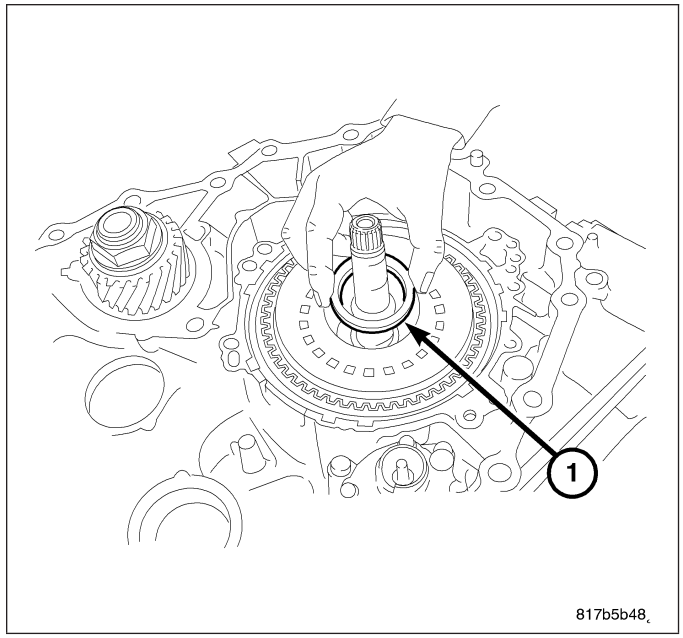
32. Measure the distance (1 to 2) as shown. Call this measurement two.
33. Calculate the bearing thickness required to achieve the necessary end play with the following formula. The bearing thickness is equal to measurement one, minus measurement two minus the nominal end play (0.40 mm or 0.016 “in).



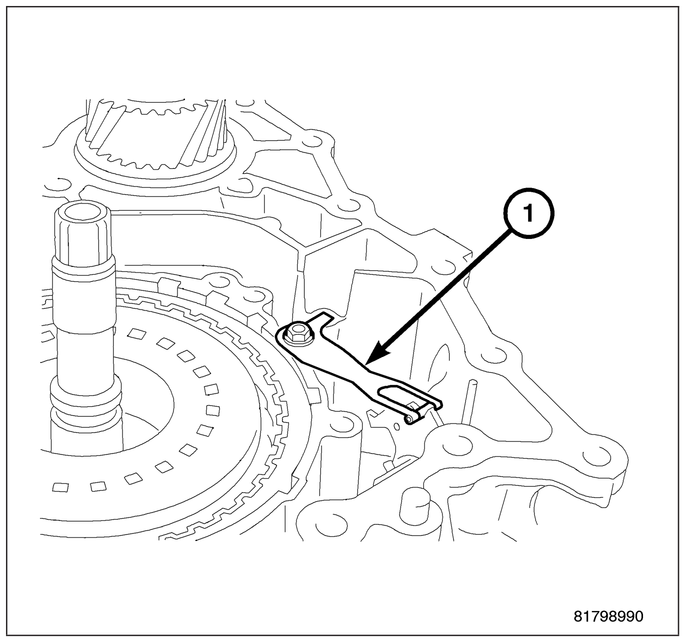
8179f477

CAUTION: Apply Vaseline or assembly lube when installing the needle bearing. Be careful to verify correct orientation of the needle bearing when installing it.

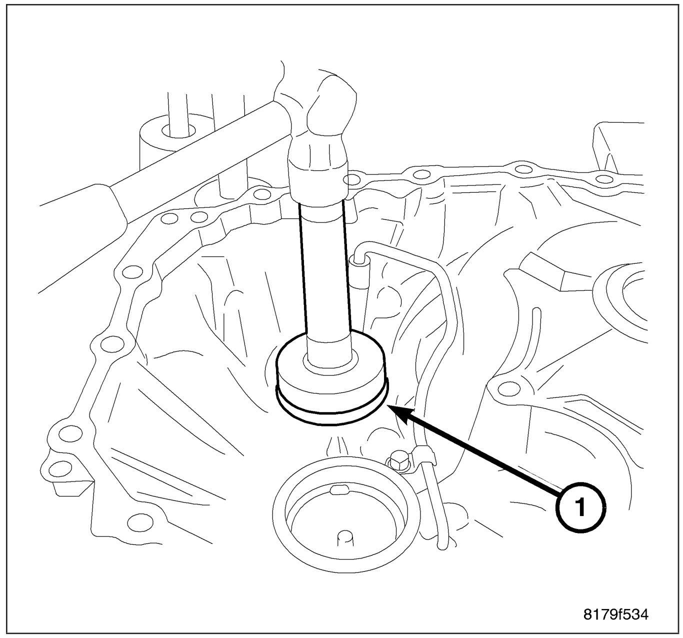
34. Install the selected needle bearing (1) on the forward clutch assembly.



35. Install the detente spring (1) onto the transaxle case. Install the bolt to hold the detente spring to the transaxle case and Torque the mounting bolt to 7 N·m (61 in.lbs.).

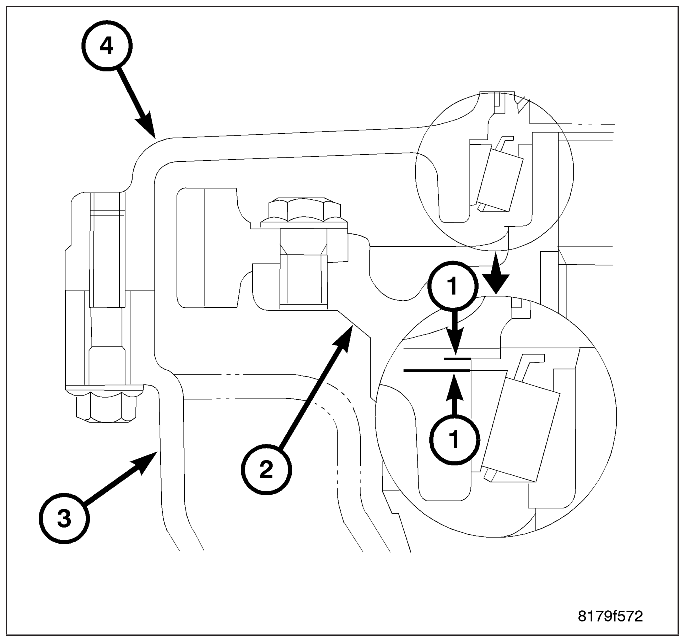


36. Install the outer race of the differential bearing (1) into the converter housing using Installer 9668 and Installer 46628 on 4WD, use Installer 46628 on 2WD and Driver Handle C- 4171.



CAUTION: When adjusting the preload, apply CVT fluid on the bearing to make it roll smoothly. When conducting measurements, measure two or more places and calculate the average value.

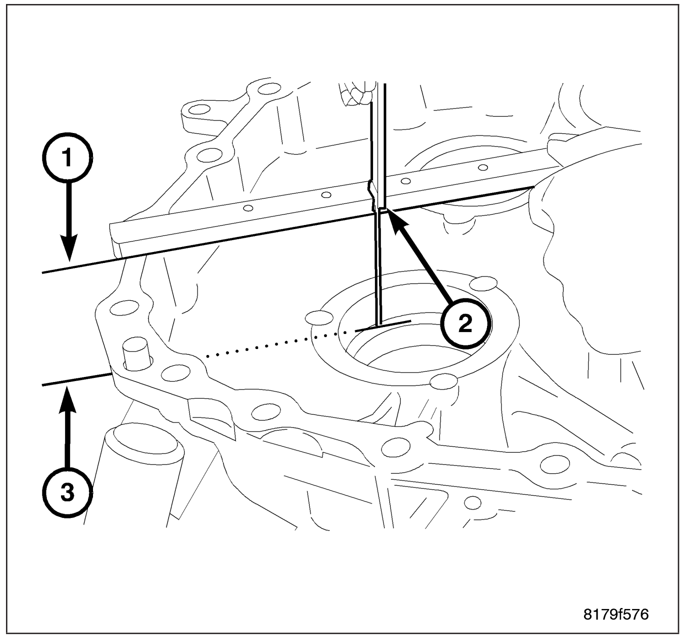
37. Measure for the differential preload shim (1) in the following steps. Refer to the graphic as necessary when performing the steps.



1 - PRELOAD SHIM
2 - DIFFERENTIAL ASSEMBLY
3 - TRANSAXLE CASE
4 - CONVERTER HOUSING

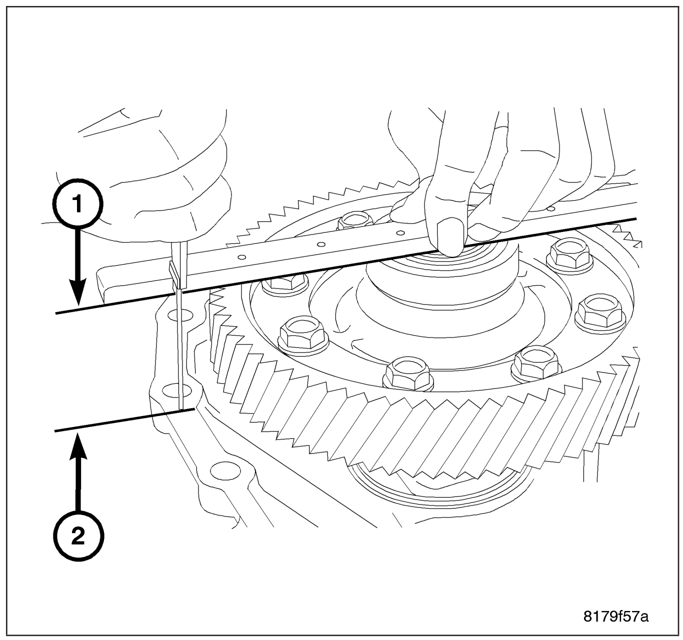
NOTE: Gauge bar 6311 can be used for doing the following measurement

38. The required differential preload is 0.17 mm (0.007 in).
39. Measure the distance (1-3) from the edge of the transaxle case to the select shim installation surface. This is differential measurement one.



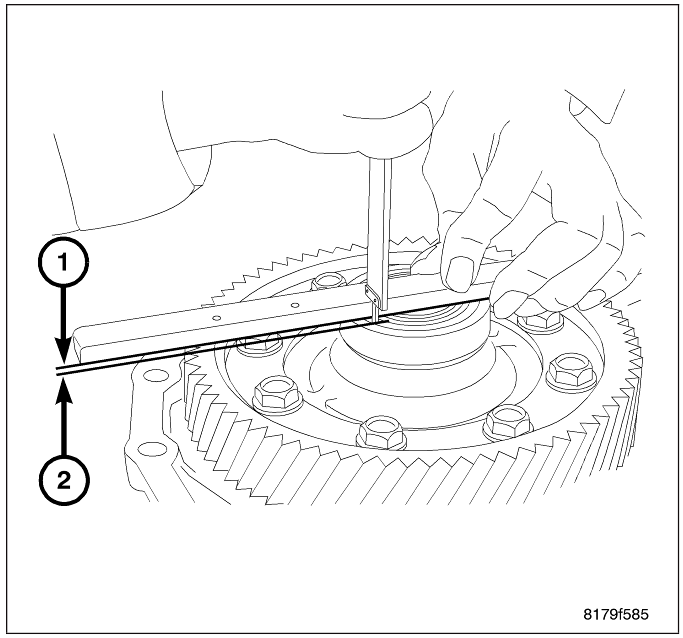
NOTE: Gauge bar 6311 can be used for doing the following measurement

40. Install the differential assembly on the converter case and measure the distance (differential measurement two) (1-2) from the differential hub to the surface of the converter housing.



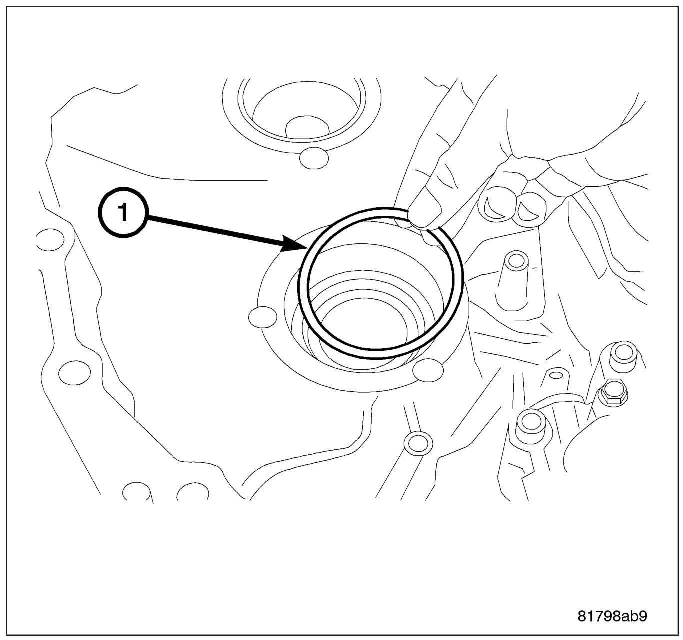
NOTE: Gauge bar 6311 can be used for doing the following measurement

41. Install the outer race for the differential side bearing and measure the distance (differential measurement three) (1-2) from the differential case to the outer race of the differential side bearing.
42. The thickness of the required select shim is calculated as follows: differential measurement one, minus differential measurement two, plus differential measurement three, plus 0.17 mm (0.007 in).

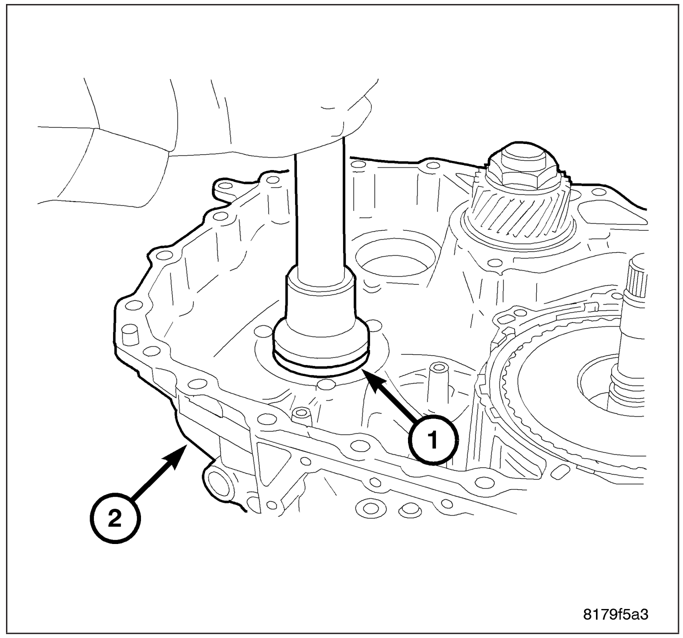


CAUTION: Do not re-use the select shim.

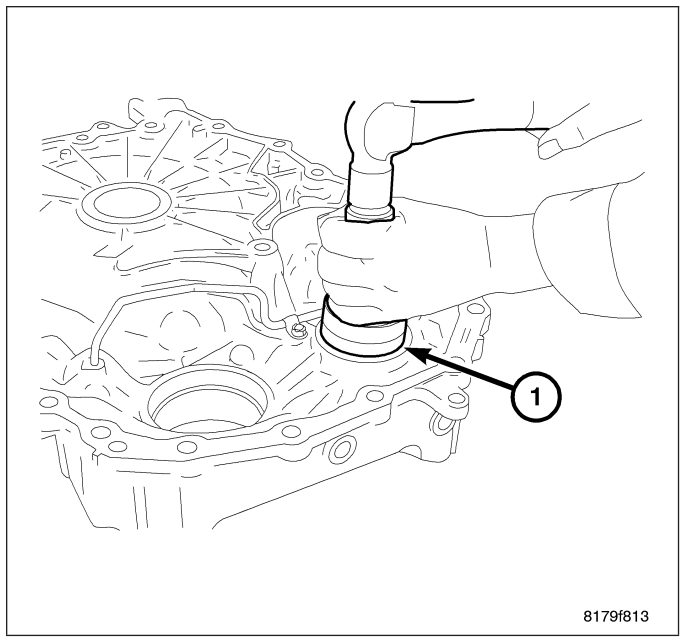
43. Install the chosen select shim (1) into the transaxle case.



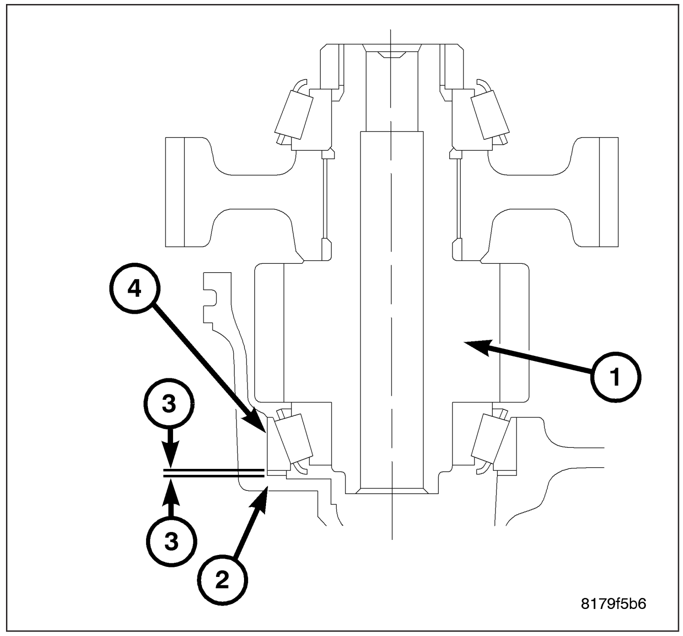
44. Install the outer race (1) of the differential bearing on the transaxle case using the Installer D-129 and Drive Handle C-4171.



45. Install the outer race (1) of the reduction gear bearing into the converter housing using Installer C-4628 and Driver Handle C-4171.



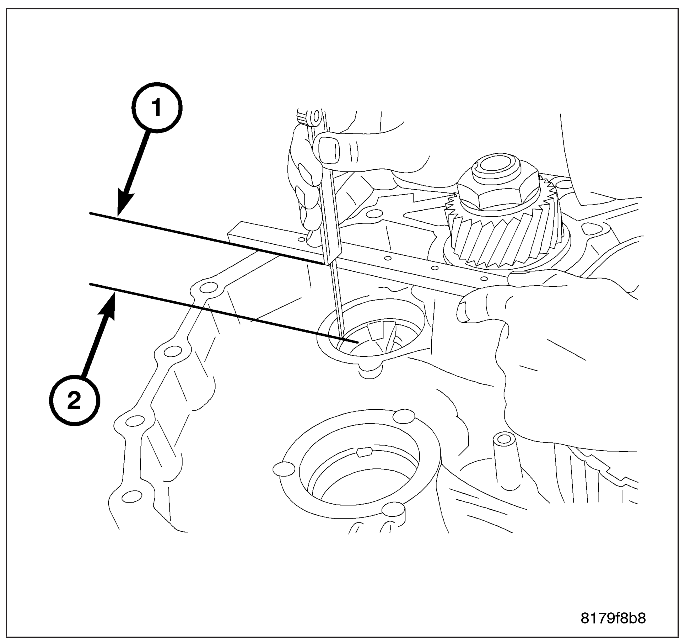
46. The required preload on the reduction gear assembly is 0.13-0.19 mm (0.005-0.0075 in). Measure for the required preload shim (3) as follows:



1 - REDUCTION GEAR
2 - TRANSAXLE CASE
3 - PRELOAD SHIM
4 - BEARING OUTER RACE

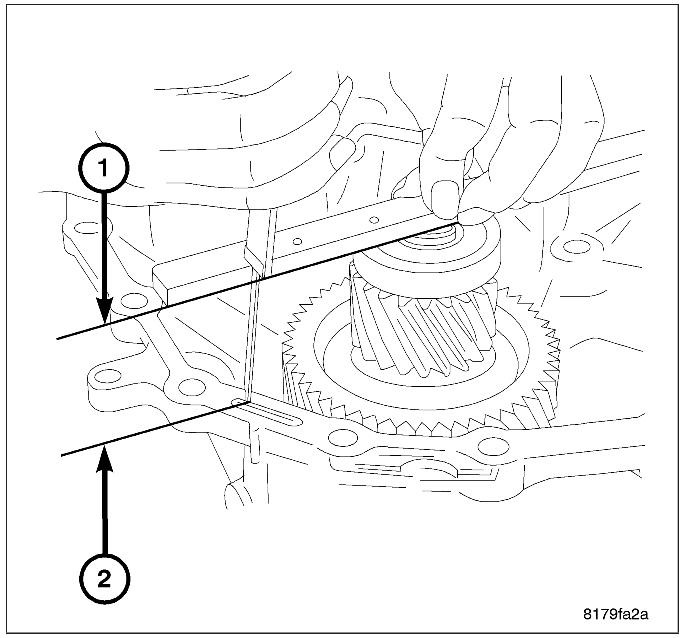
NOTE: Gauge bar 6311 can be used for doing the following measurement

47. Measure the distance (reduction assembly measurement one) (1-2) from the edge of the transaxle case to the select shim installation surface.



NOTE: Gauge bar 6311 can be used for doing the following measurement

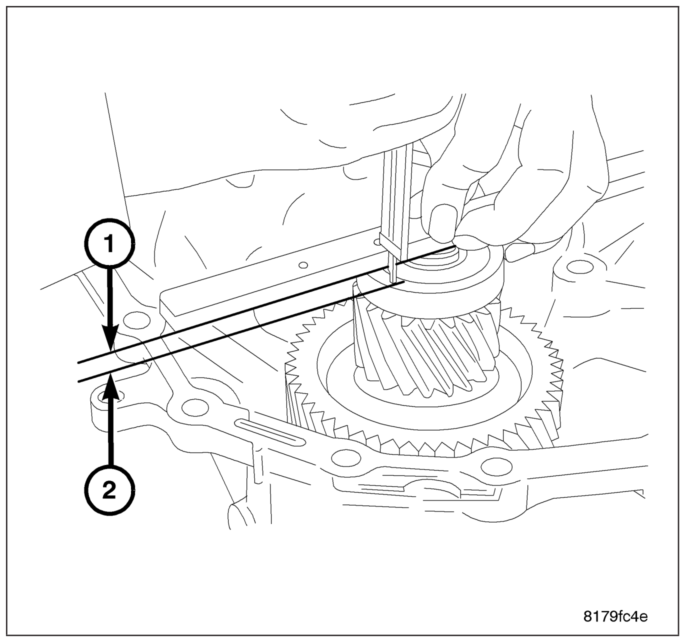
48. Install the reduction gear assembly on the converter housing and measure the distance (reduction assembly measurement two) (1-2) from the top of the reduction gear assembly to the edge of the converter housing.



CAUTION: When adjusting the preload, apply CVT fluid on the bearing to make it roll smoothly. When conducting measurements, measure two or more places and calculate the average value.

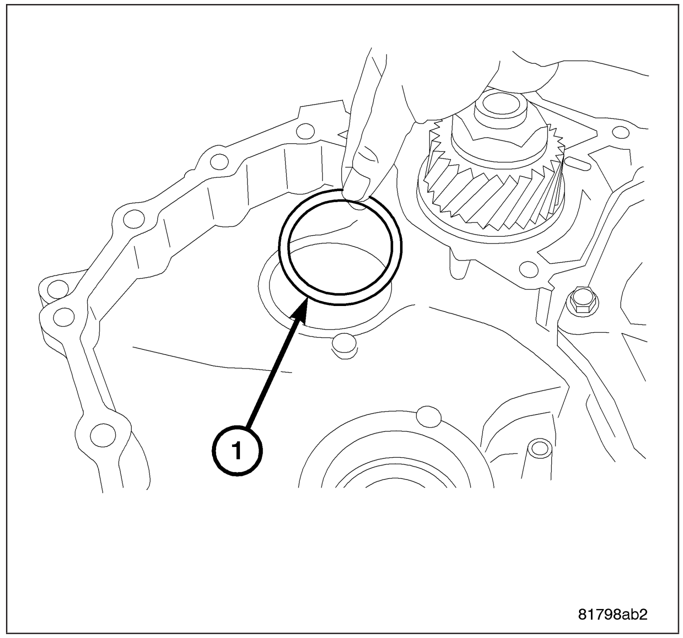
NOTE: Gauge bar 6311 can be used for doing the following measurement

49. Install the outer race of the reduction gear bearing and measure the distance (reduction assembly measurement three) (1-2) from the top of the reduction gear assembly to the outer race of the reduction gear bearing.
50. The thickness of the required select shim is calculated as follows: reduction assembly measurement one, minus reduction assembly measurement two, plus reduction assembly measurement three, plus 0.16 mm (0.006 in).

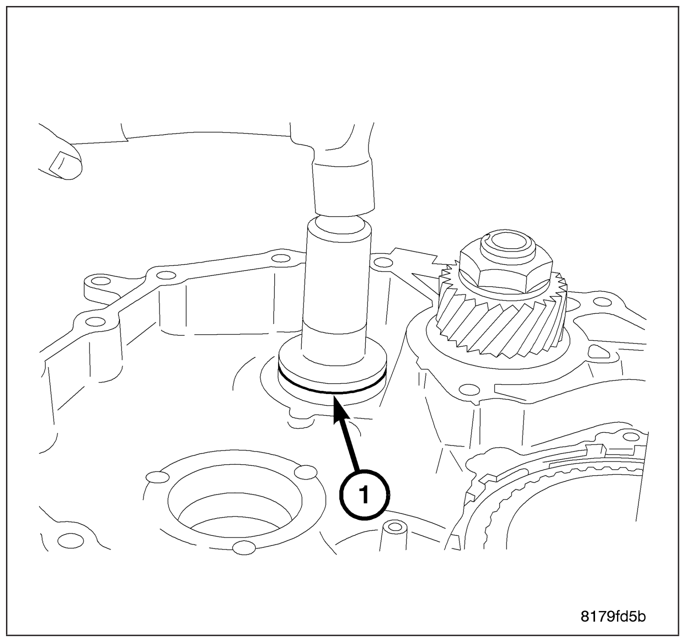


CAUTION: Do not re-use the select shim.

51. Install the chosen select shim (1) into the transaxle case.

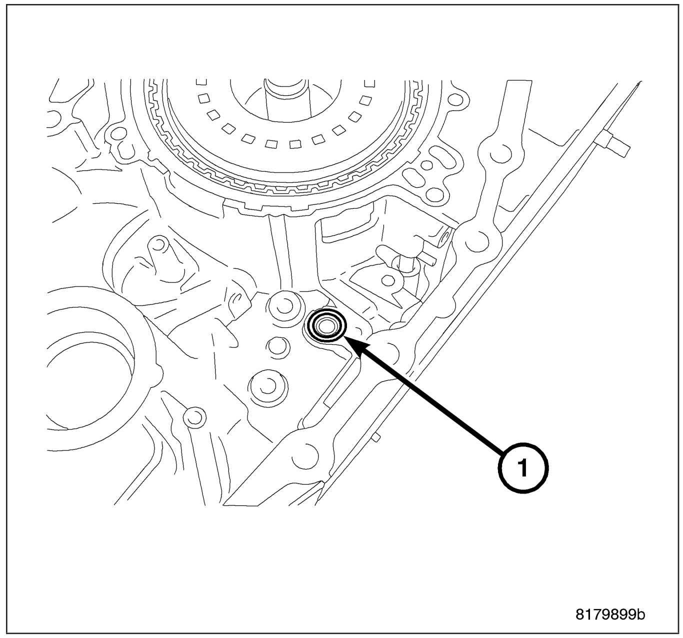


52. Install the outer race (1) of the reduction gear bearing on the transaxle case using Installer C-4628 and Driver Handle C-4171.



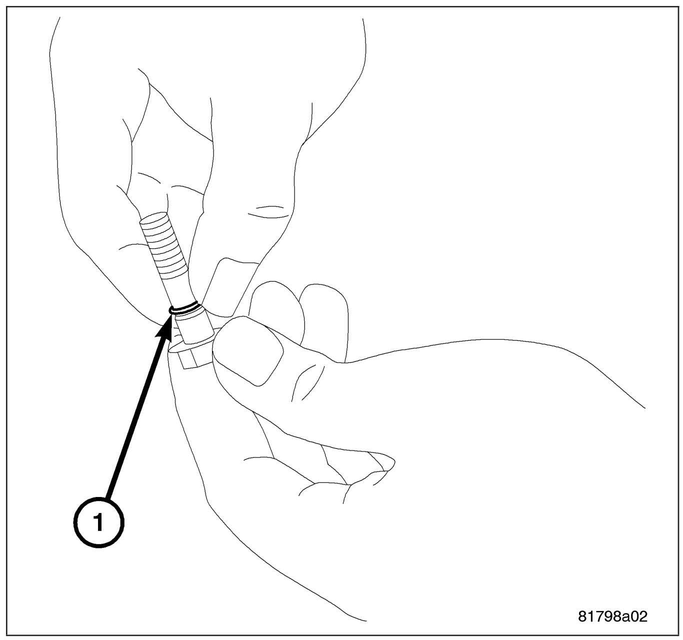
CAUTION: Do not re-use the lip seal. Apply CVT fluid when installing the lip seal.

53. Install the new lip seal (1) on the transaxle case.



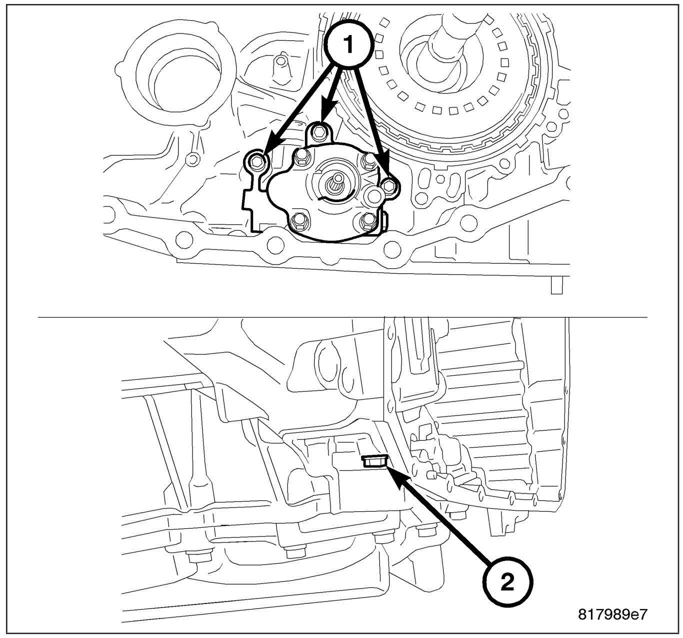
CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the O-ring.

54. Install the new o-ring (1) onto the oil pump mounting bolts. (Only for bolts installed from the outside of the transaxle case).



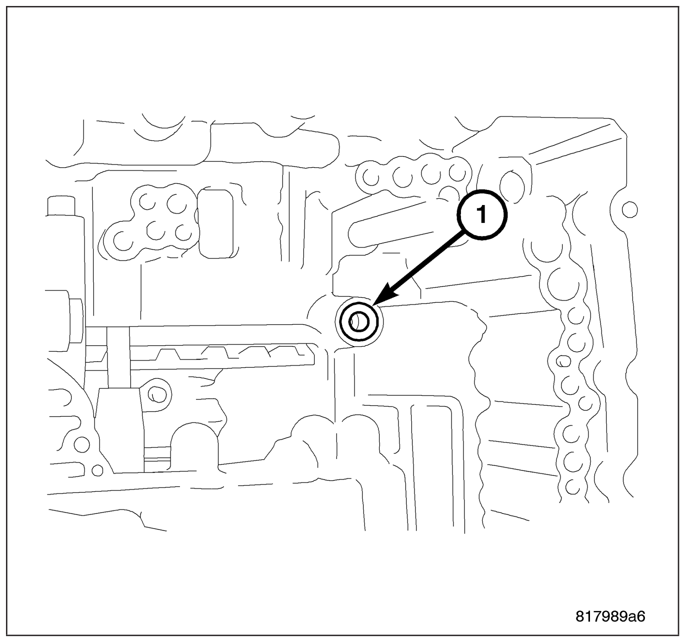
NOTE: One of the oil pump retaining bolts is installed from the outside of the transaxle case in the rear part of the oil pump.

55. Install the oil pump on the transaxle case. Install and tighten the mounting bolts (1) to 19 N·m (14 ft.lbs.) Install and torque the mounting bolt (2) to 28 N·m (20 ft.lbs.).

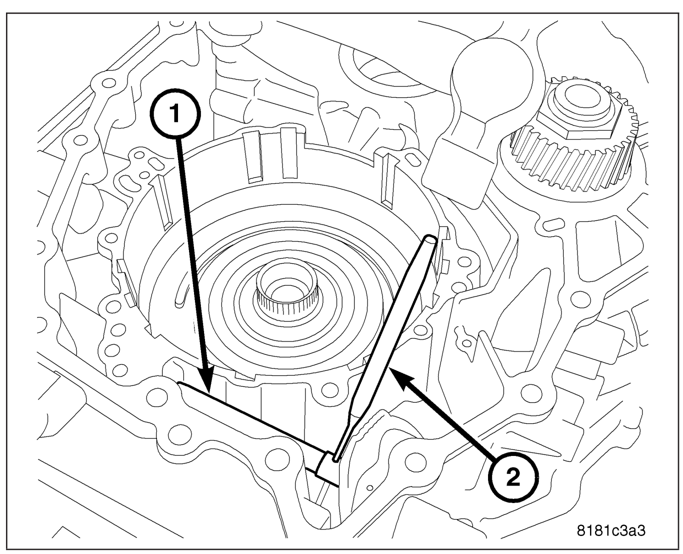


CAUTION: Do not re-use the lip seal. Apply CVT fluid when installing the lip seal.

56. Install the new lip seal (1) into the transaxle case.

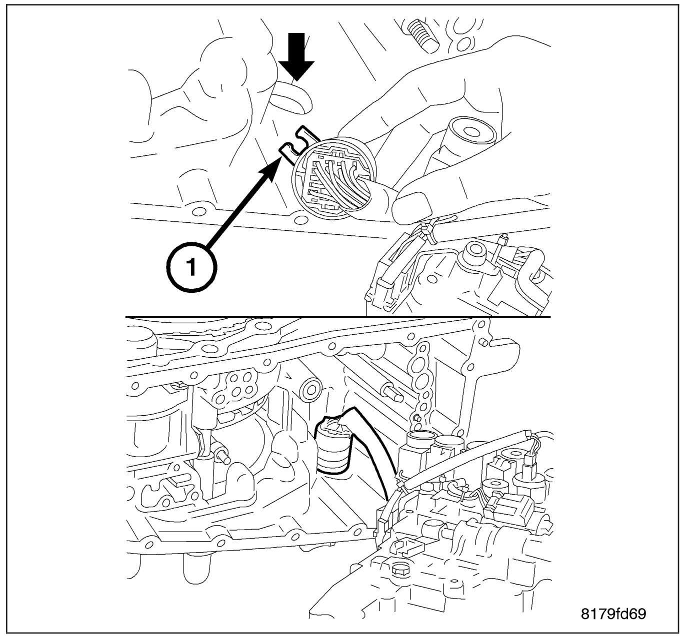


57. Install the manual shaft (1) into the case.
58. install the pin at the manual shaft using a punch (2)

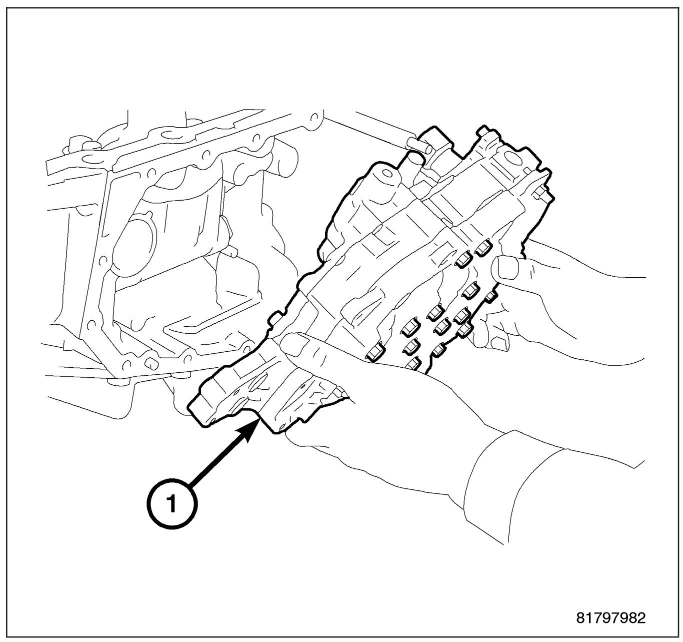


59. To install the valve body assembly on to the transaxle case, insert a 75 mm (3 in.) long 3 mm (0.118 in.) rod or wire into the linkage stopper hole of the valve body assembly to set the pulley ratio linkage (1) in position.

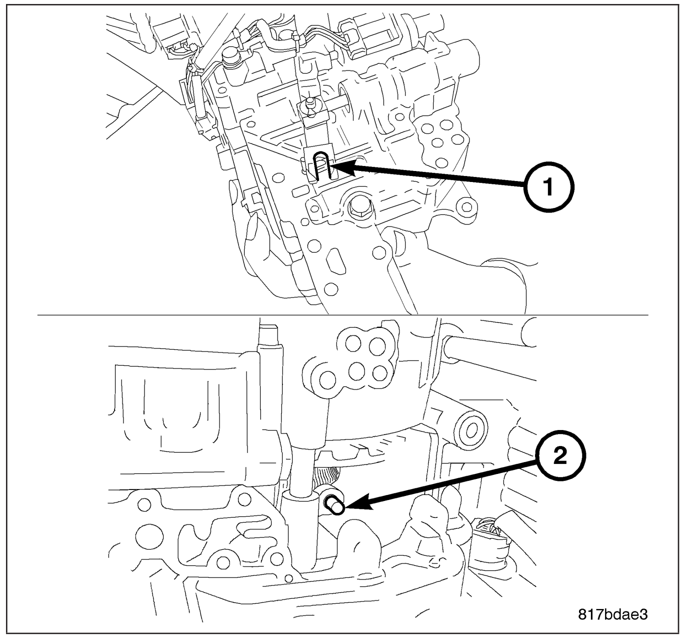
60. Position the locating tab (1) of the terminal body and install the terminal body into the transaxle case.



61. Install the valve body assembly (1) up from the bottom side and install it into the transaxle case.

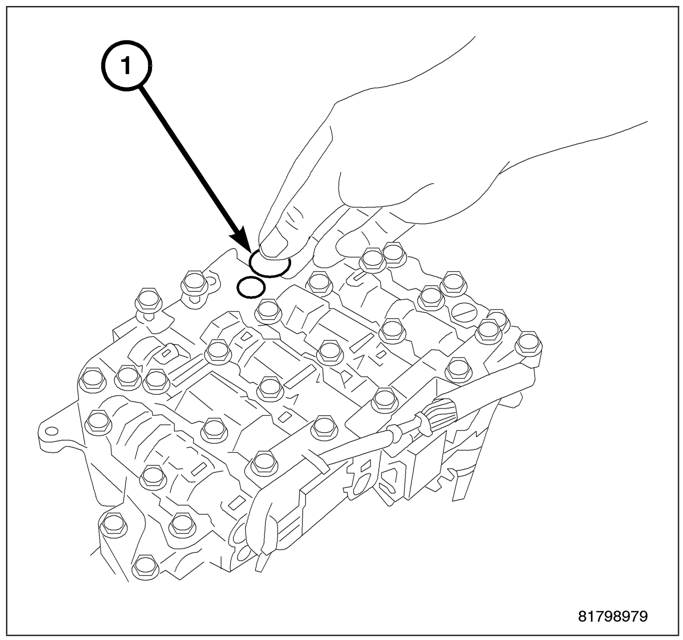


62. Align the notch (1) of the pulley ratio linkage with the sheave position sensor (2).

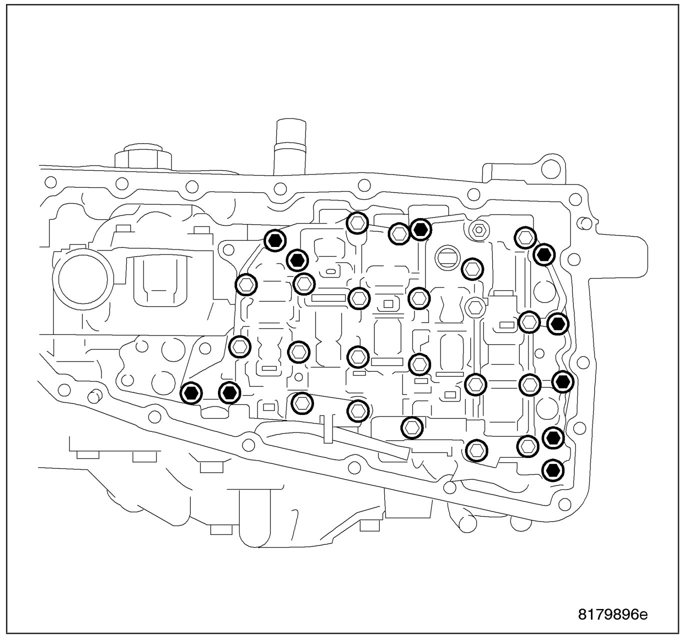


CAUTION: Apply CVT fluid when installing the bushing.

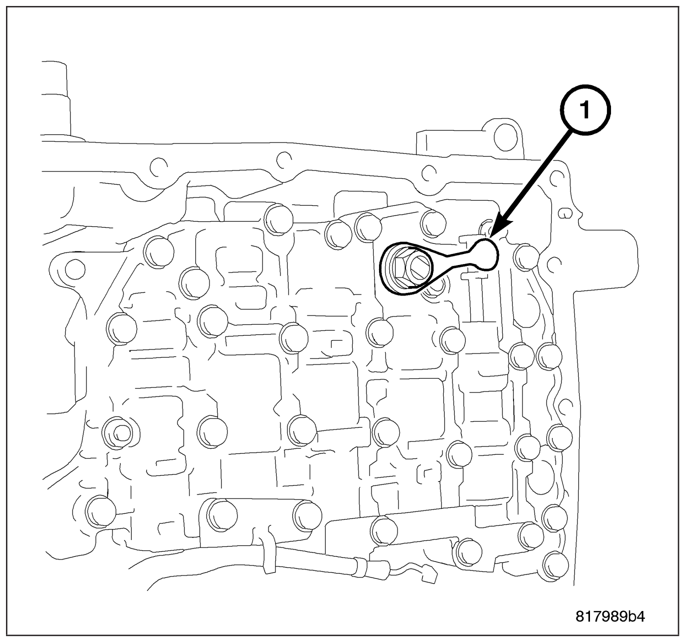
63. Install the bushing (1) into the valve body assembly.



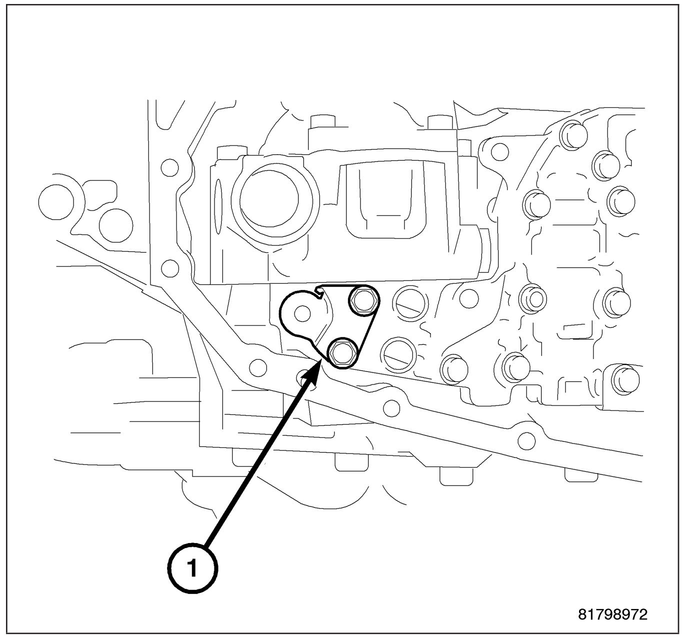
64. Torque the mounting bolts of the valve body assembly to 8 N·m (70 in.lbs).



65. Install the manual lever (1) onto the manual shaft. Install and Torque the mounting nut to 22 N·m 194 in.lb.

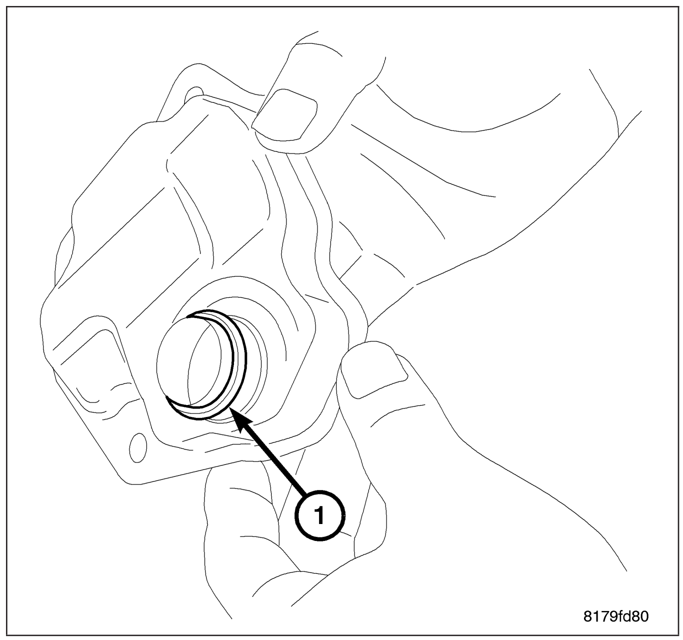


66. Install the bracket (1) onto the valve body assembly. Install and Torque the mounting bolts to 8 N·m (70 in.lbs.).

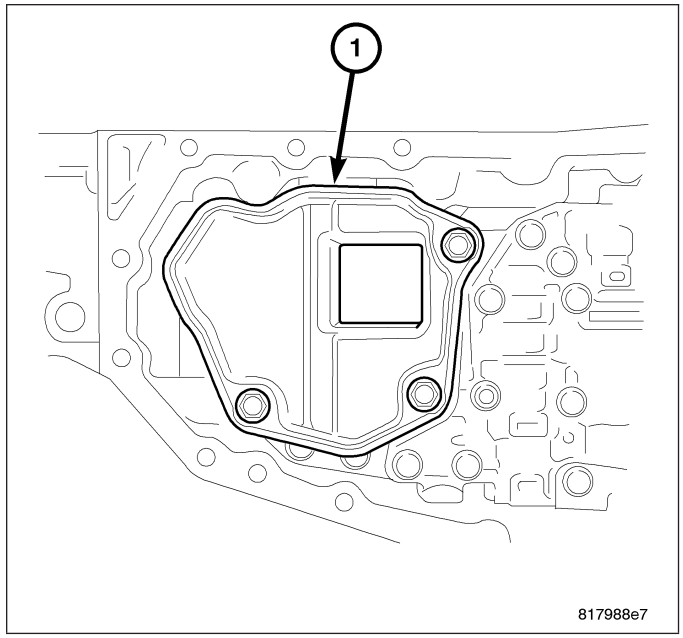


CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

67. Install the new o-ring (1) onto the new oil strainer.

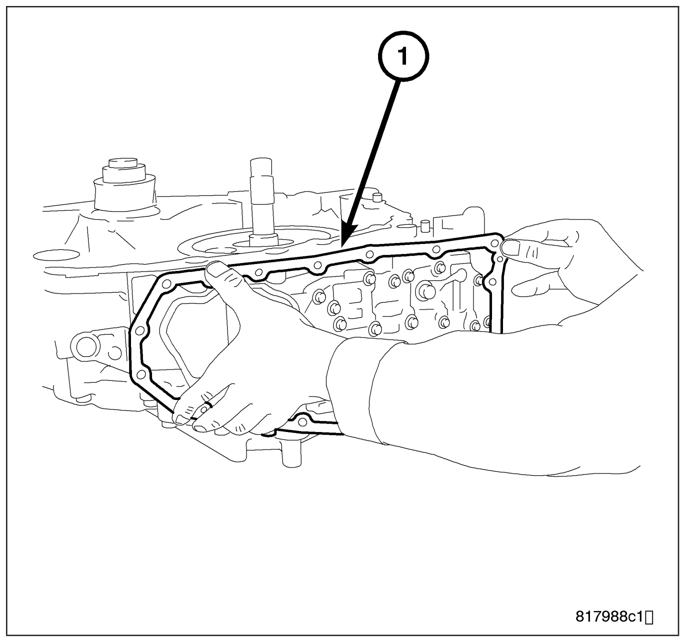


68. Install the new oil strainer (1) onto the valve body assembly. Install and Torque the mounting bolts to 8 N·m (70 in.lbs.).



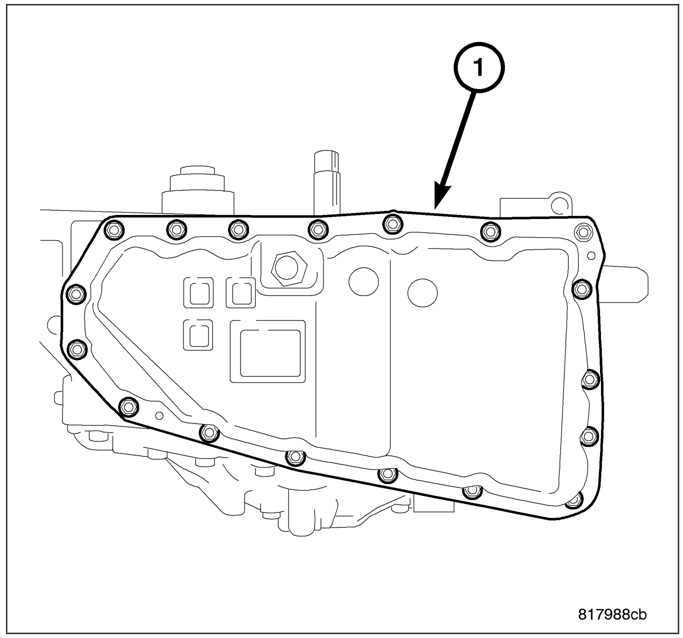
CAUTION: Do not re-use the oil pan gasket. Remove any moisture, oil, and used gasket material from the surface where the new gasket is to be installed. When installing the oil pan gasket, align the dowel pin with the dowel pin hole in the oil pan gasket.

69. Install the oil pan gasket (1) onto the transaxle case.

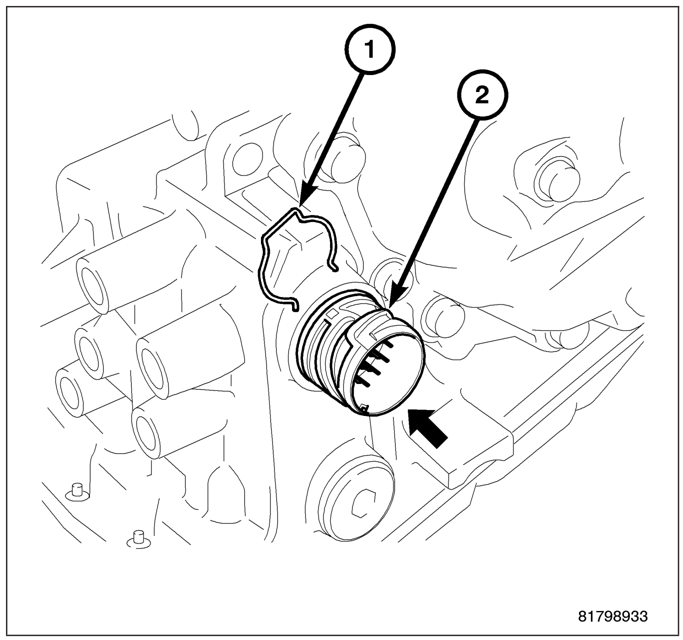


CAUTION: When installing the oil pan, align the dowel pin of the transaxle case with the dowel pin hole of the oil pan.

70. Install the oil pan on the transaxle case (1). Install and Torque the mounting bolts to 8 N·m (70 in.lbs.).

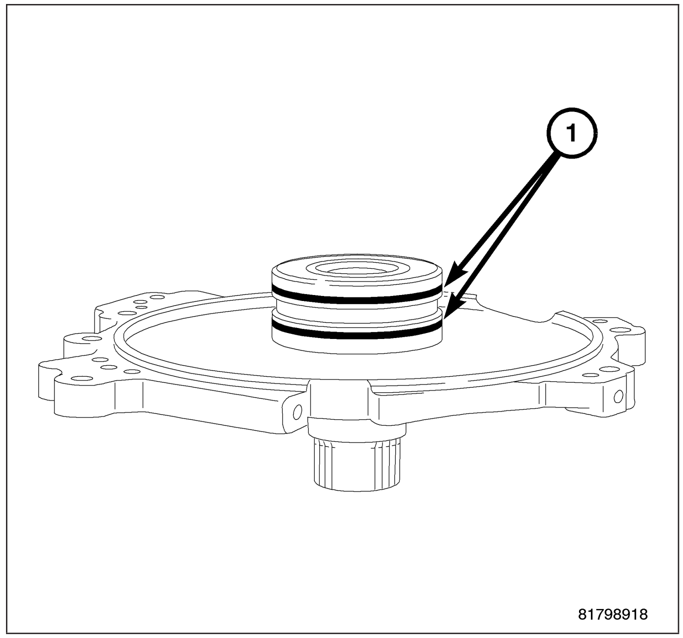


71. Install the snap ring (1) onto the terminal body.

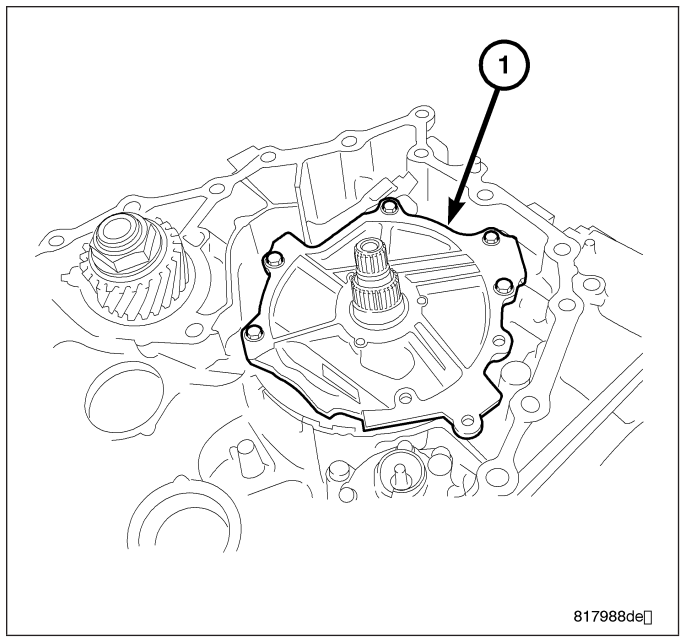


CAUTION: Do not re-use the seal rings. Apply Vaseline or assembly lube when installing the seal rings.

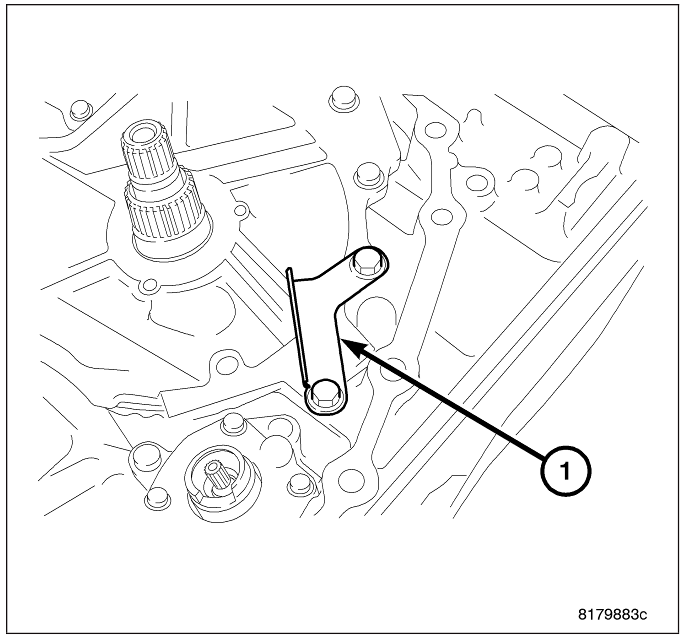
72. Install the new seal rings (1) onto the reaction shaft support.



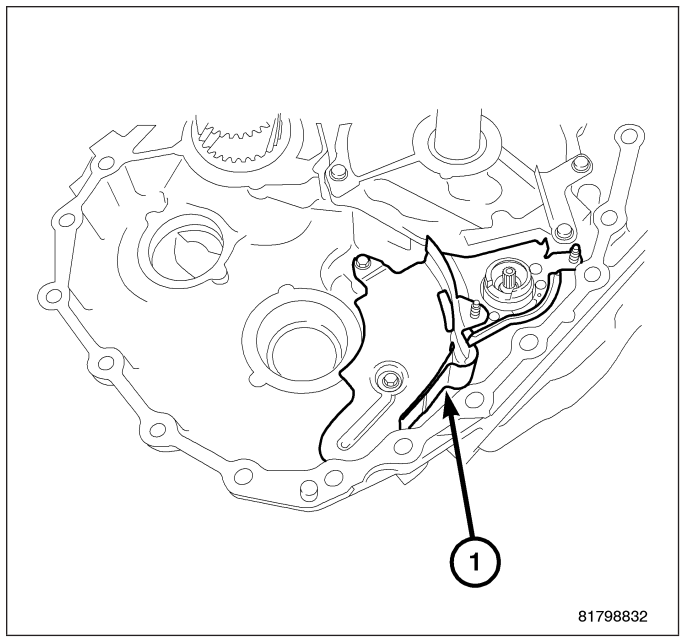
73. Install the reaction shaft support (1) onto the transaxle case temporarily with the mounting bolts.



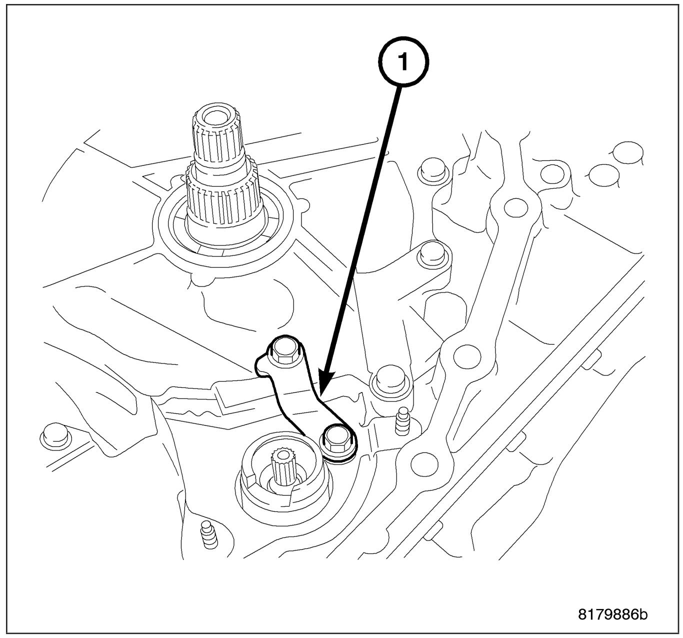
74. Install the baffle plate (1) temporarily with the mounting bolts.



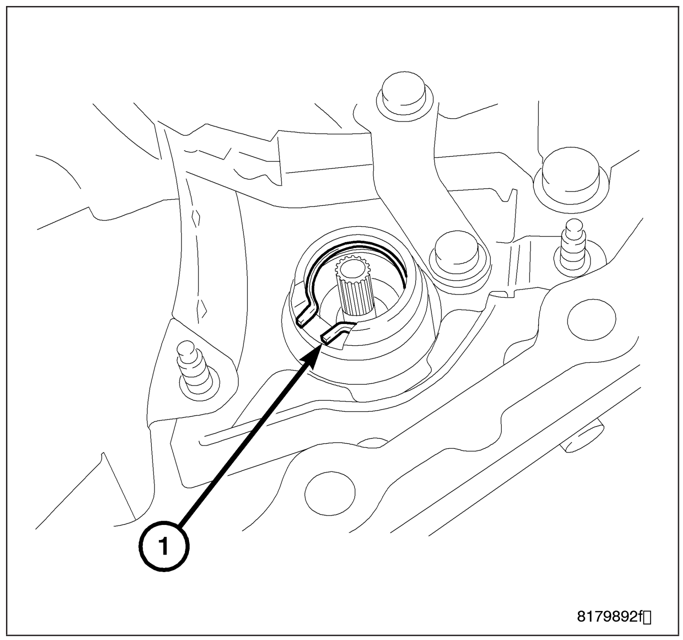
75. Install the baffle plate (1). Install and Torque the mounting bolts to 6 N·m (52 in.lbs.).



76. Install the bracket (1) as shown. Torque the mounting bolts of the oil pump cover, baffle plate, and brackets to 26 N·m (19 in.lbs.).

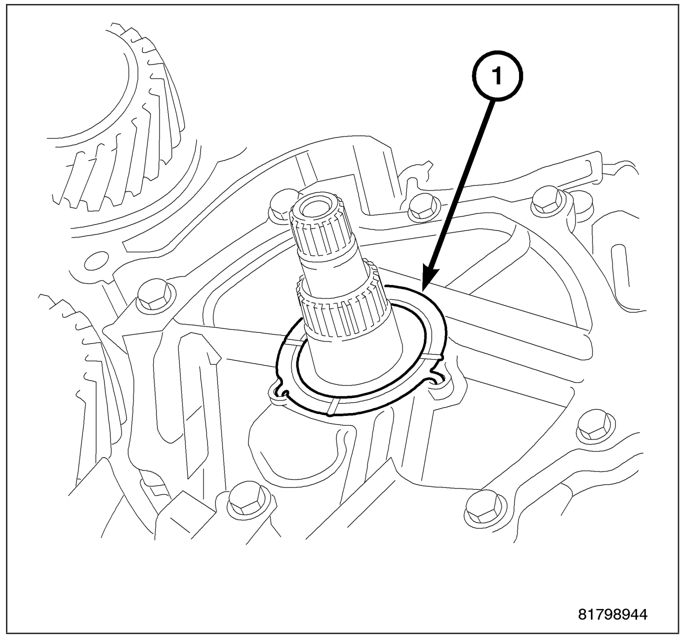


77. Install the snap ring (1) into the oil pump.



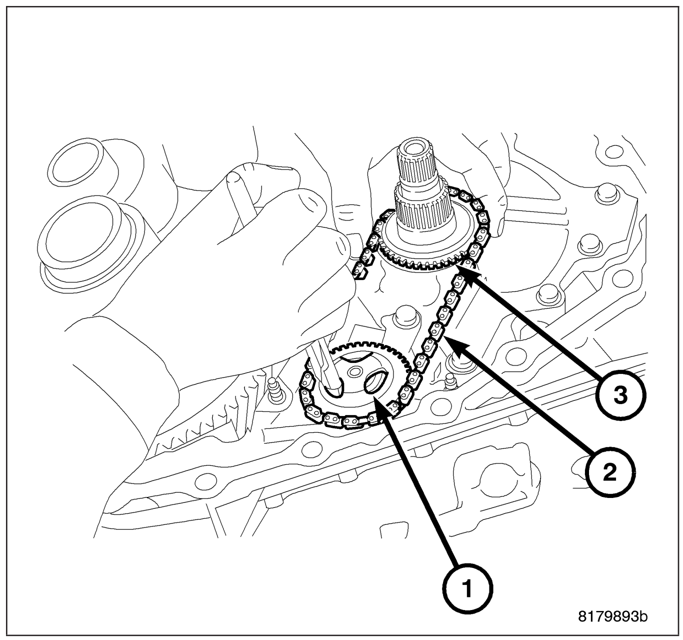
CAUTION: Be sure to align the pawl of the thrust washer with the alignment hole of the oil pump cover. Apply Vaseline or assembly lube when installing the thrust washer.

78. Install the thrust washer (1) onto the oil pump cover.

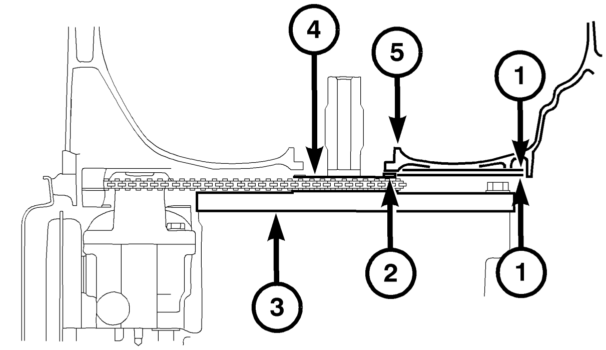


CAUTION: When necessary to replace any of the driven sprocket, oil pump chain, or drive sprocket, replace all components as a matched set. Pull the driven sprocket up softly and check that the driven sprocket is securely installed.

79. Expand the snap ring (1).
80. Install the driven sprocket, oil pump chain (2) and drive sprocket (3).



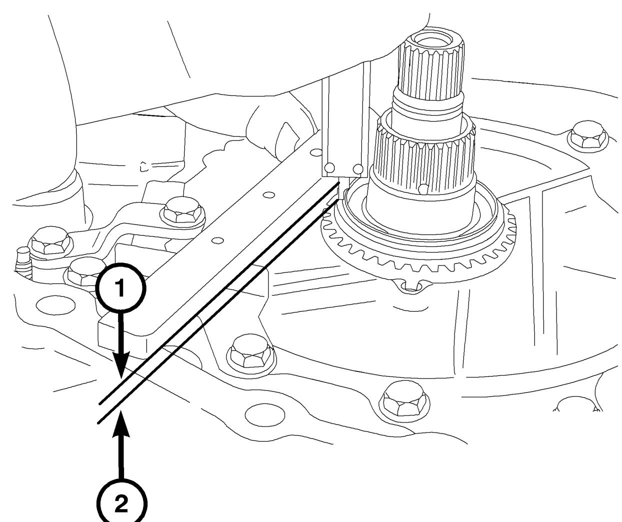
81. The required clearance for the oil pump drive sprocket is 0.10-0.23 mm (0.004-0.009 in.). Measure the clearance (1) between the oil pump drive sprocket (4) and the converter housing (5) in the following procedure:



817c36a1

NOTE: Gauge bar 6311 can be used for doing the following measurement

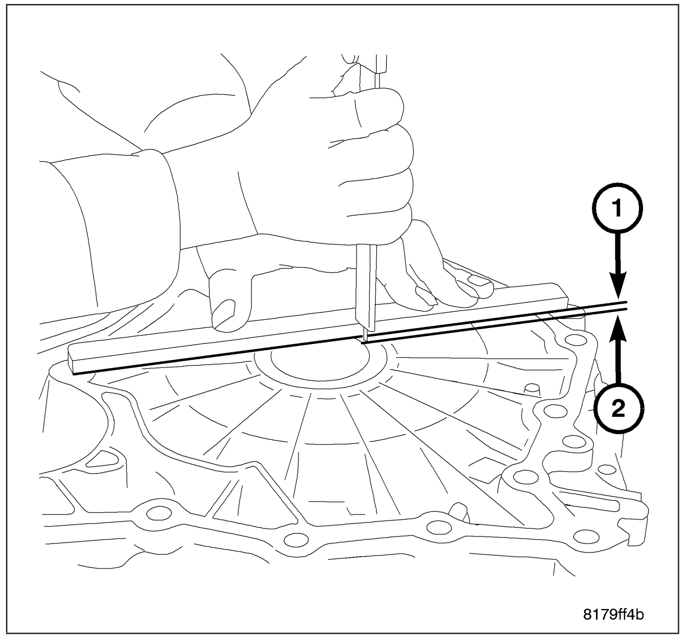
82. Measure the distance (1-2) from the edge of the transaxle case to the select shim installation surface of the drive sprocket. This is the oil pump drive sprocket measurement one.



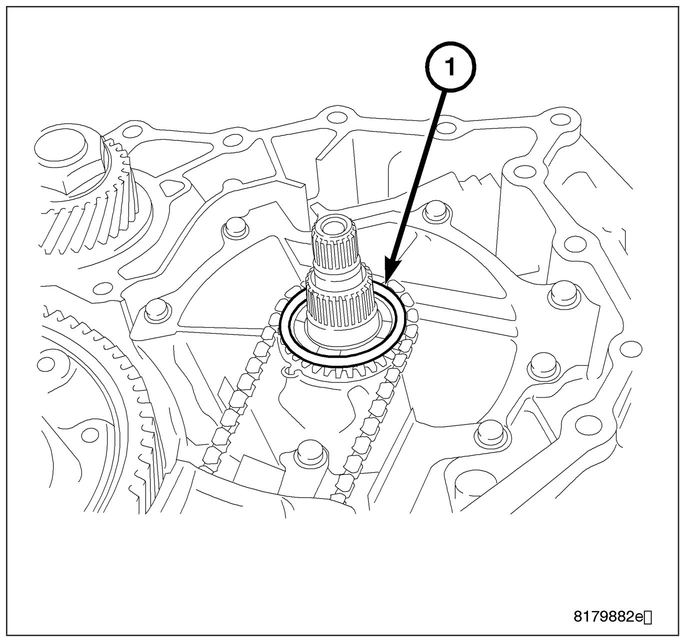
8179fead

NOTE: Gauge bar 6311 can be used for doing the following measurement

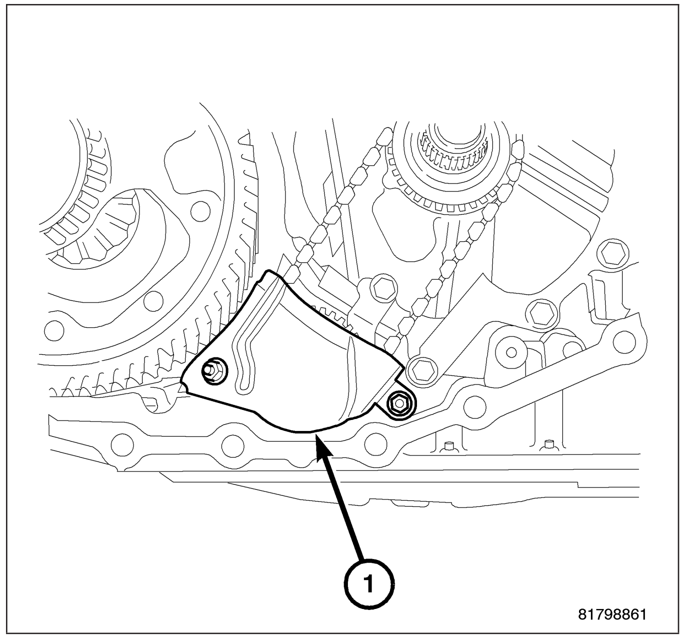
83. Measure the distance (1-2) from the edge of the converter housing to the surface touching the select shim contact surface. This is the oil pump drive sprocket measurement two.
84. Calculate the thickness of the required select shim with the following formula: The select shim is equal to the oil pump drive sprocket measurement one, plus the oil pump drive sprocket measurement two, minus 0.16 mm (0.0065 in.).



85. Install the chosen select shim (1) onto the drive sprocket.

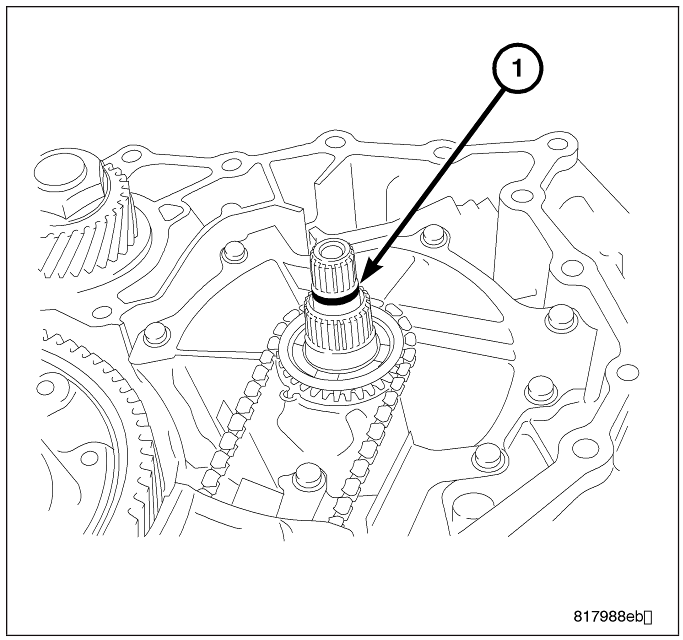


86. Install the baffle plate (1) over the oil pump driven sprocket. Install and torque the mounting nut to 6 N·m (52 in.lbs.).

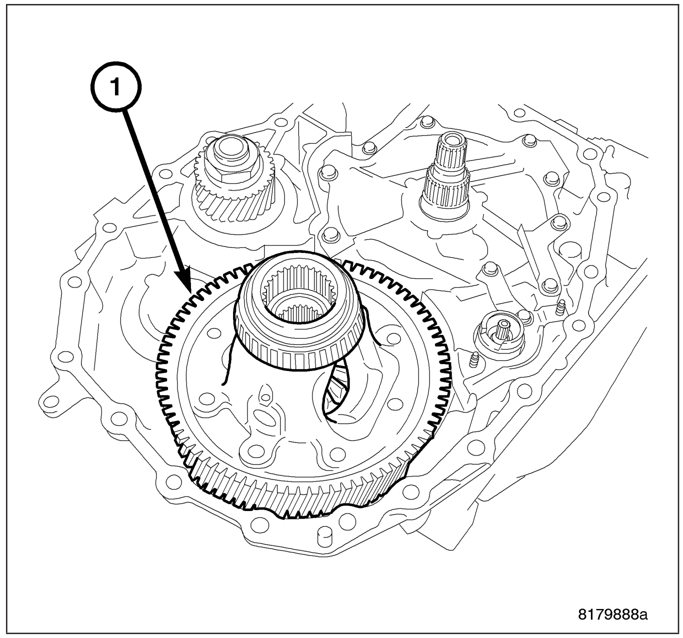


CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

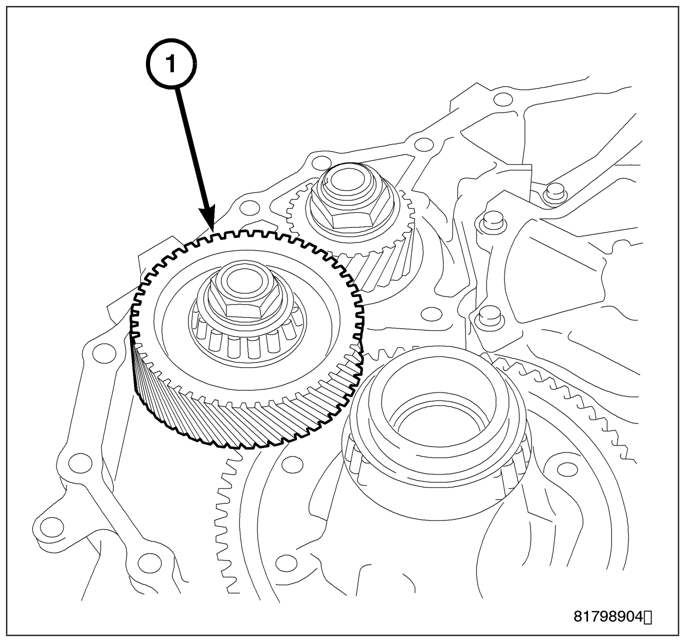
87. Install the new o-ring (1) onto the input shaft.



88. Install the differential assembly (1) into the transaxle case.

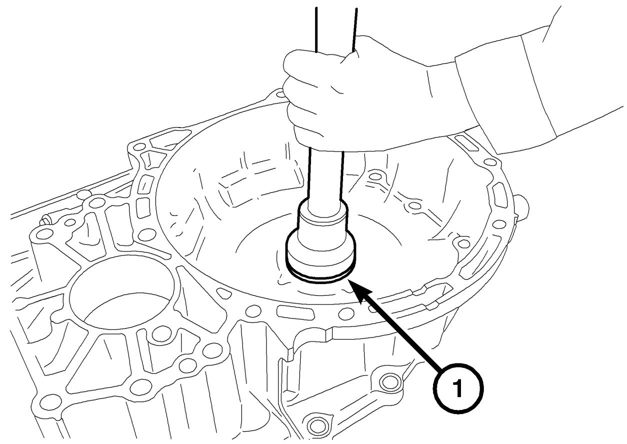


89. Install the reduction gear assembly (1) into the transaxle case.



CAUTION: Do not re-use the converter housing oil seal (1). Apply CVT fluid when installing the converter housing oil seal (1).

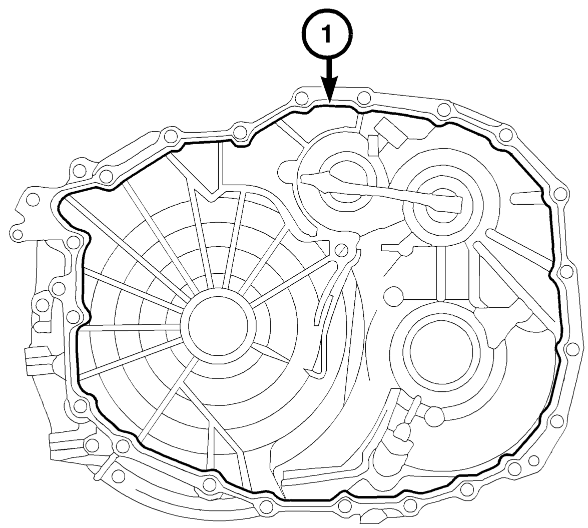
90. Install the converter housing oil seal (1) into the converter housing with Installer 9858.



817a0329

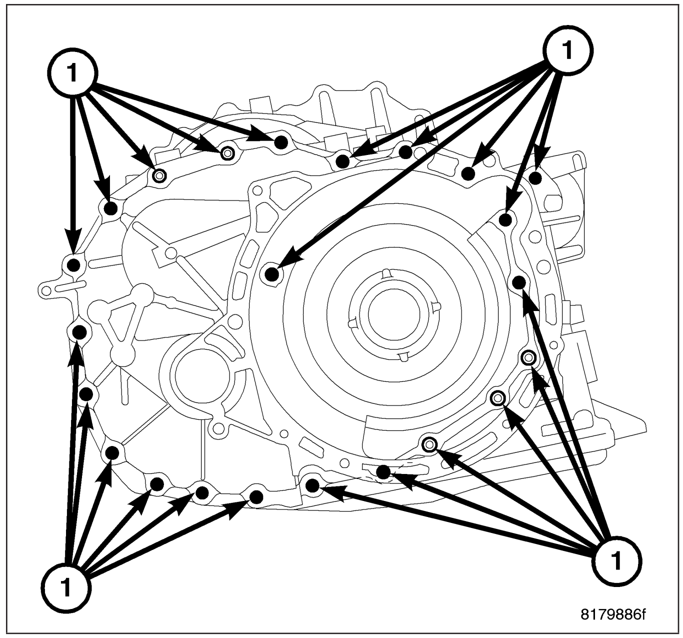
91. Apply MOPAR gasket sealer (1) on the converter housing installation surface of the transaxle case.

CAUTION: Remove moisture, oil, and used sealant from the sealant application surface. Make sure that the starting point and the ending point are between two bolt holes.

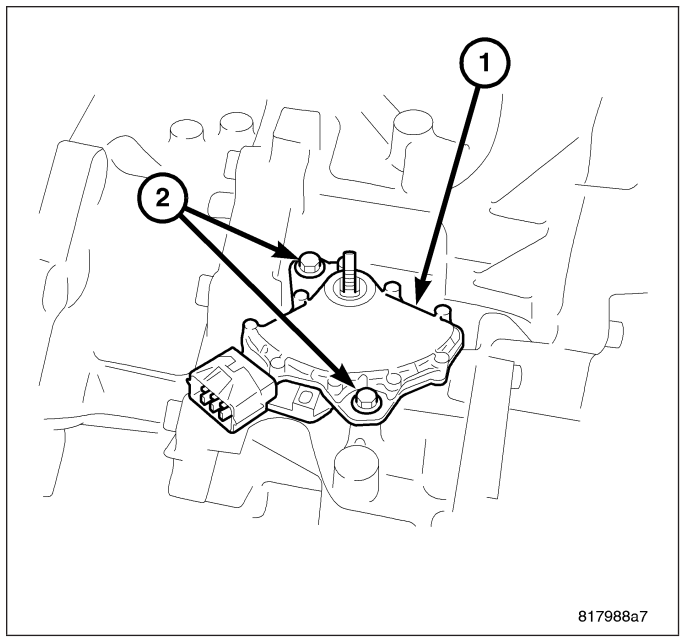


817a0547

92. Install the converter housing on the transaxle case and Torque the bolts to 45 N·m (33 ft.lbs.).

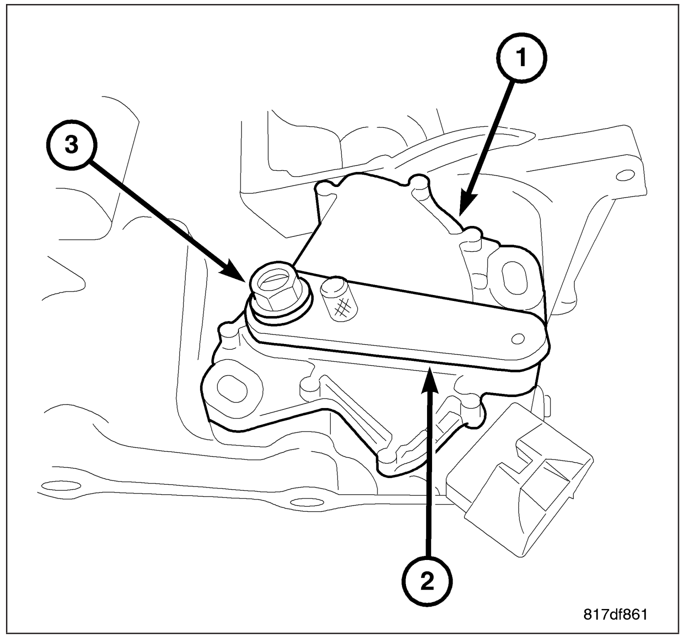


93. Install the transmission range sensor (TRS) (1) over the manual shaft and onto the transaxle case.

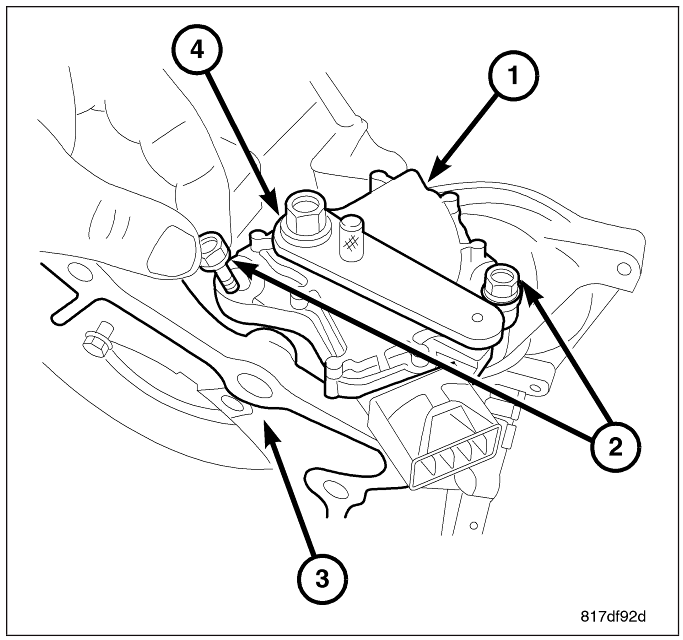


CAUTION: Do not re-use the TRS transmission range sensor.

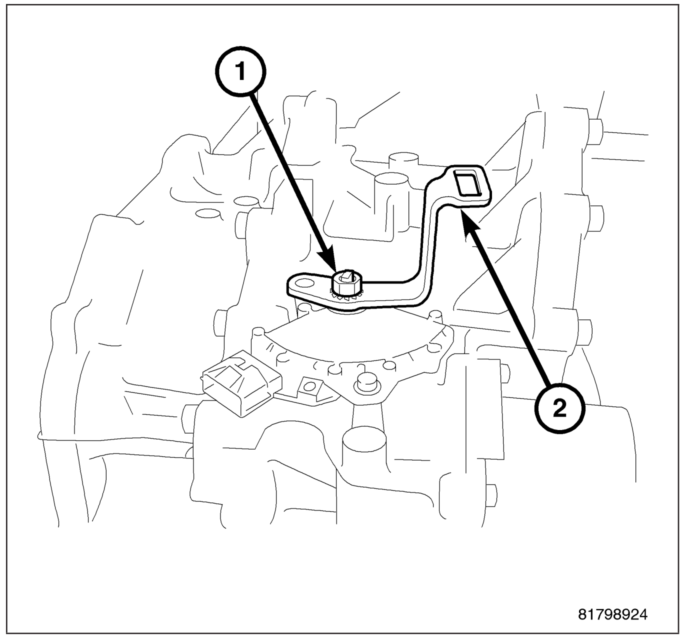
94. Put the manual shaft in the N position (3). Install Alignment Tool 9876 (2) and adjust the position of the TRS (1).



95. Install and Torque the mounting bolts of the TRS to 6 N·m (49 in.lbs.).
96. Remove the TRS alignment tool from the TRS.

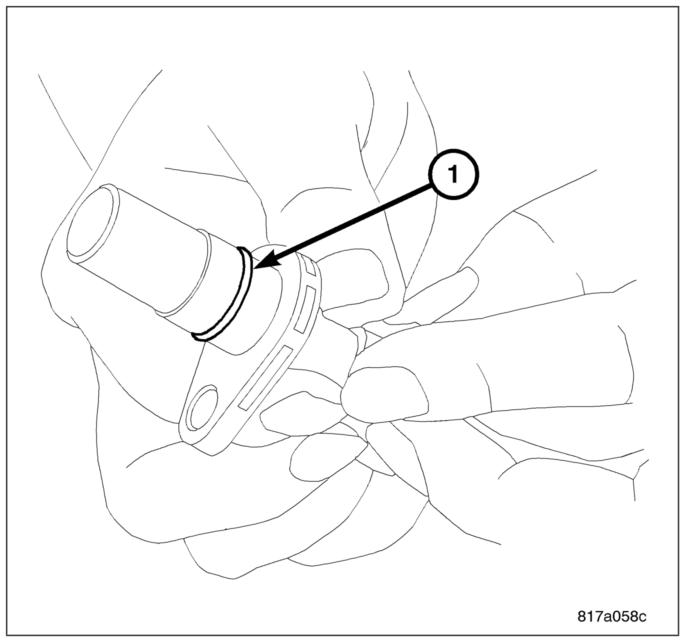


97. Install the shift lever (1) onto the manual shaft. Install and Torque the mounting nut to 17 N·m (150 in.lbs.).

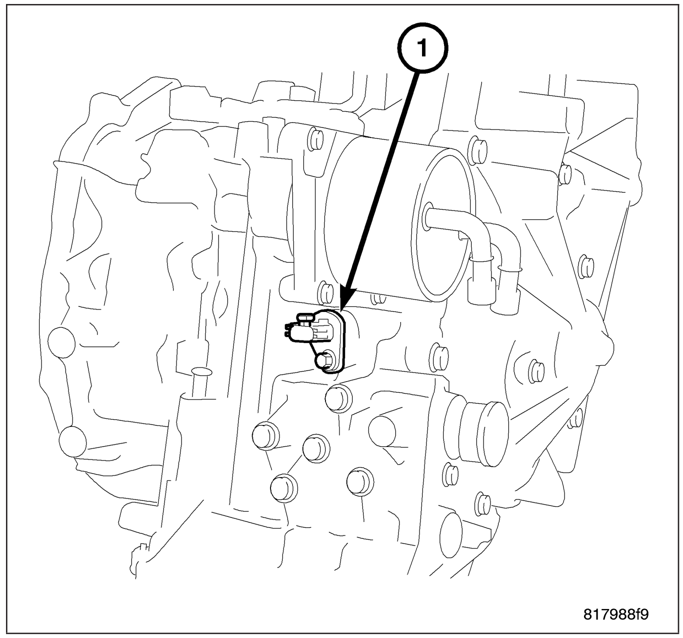


CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

98. Install the o-ring (1) onto the input speed sensor.

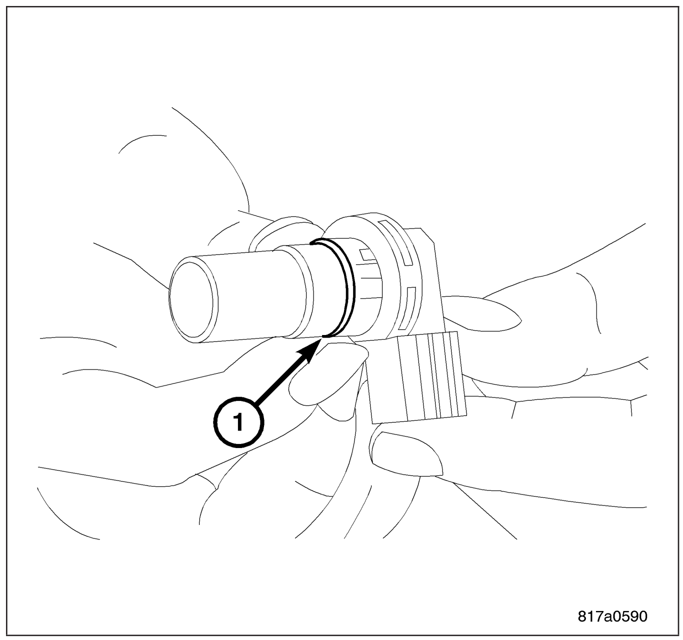


99. Install the input speed sensor (1) into the transaxle case. Install and Torque the mounting bolt to 6 N·m (52 in.lbs.).



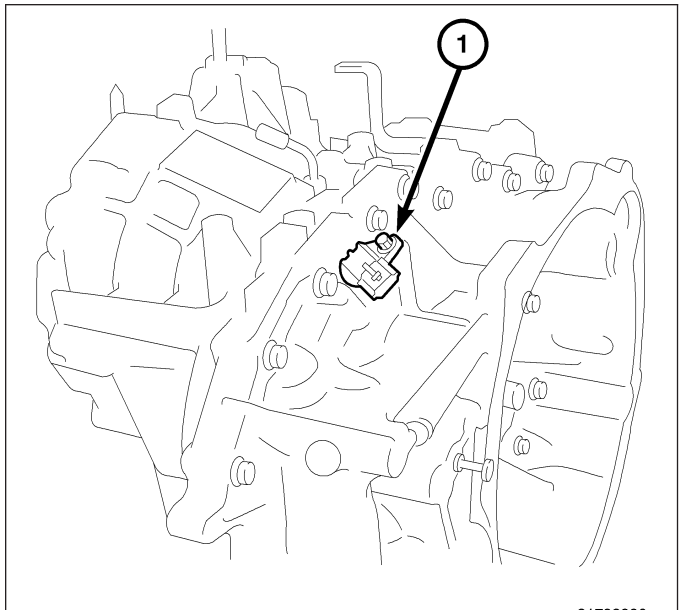
CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

100. Install the new o-ring (1) onto the output speed sensor.



CAUTION: Be sure to install the select shim between the secondary speed sensor and the converter housing before installing the secondary speed sensor.

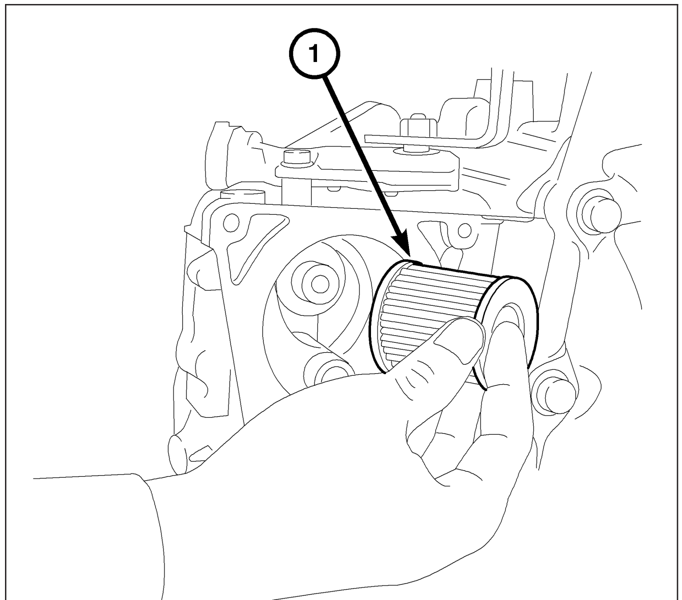
101. Install the output speed sensor (1) into the converter housing. Install and Torque the mounting bolt to 6 N·m (52 in.lbs.).



81798920

CAUTION: Apply CVT fluid on the seal part when installing the CVT fluid filter.

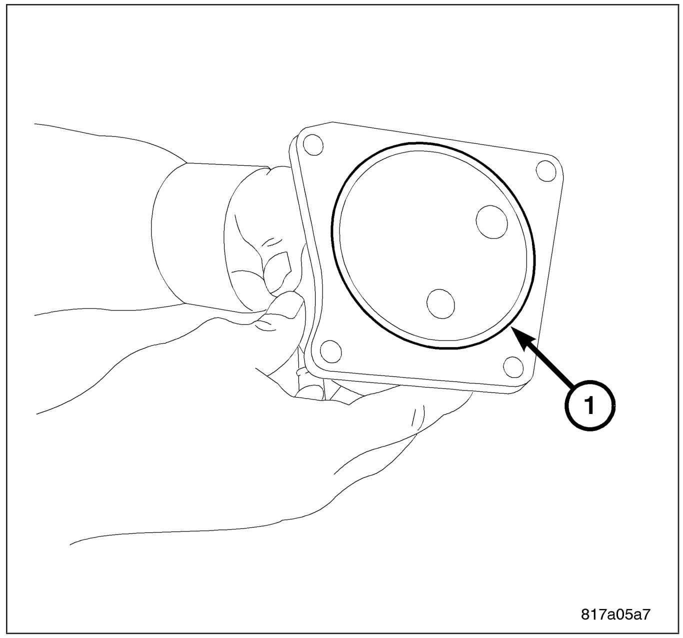
102. Install the CVT fluid filter (1) into the transaxle case.



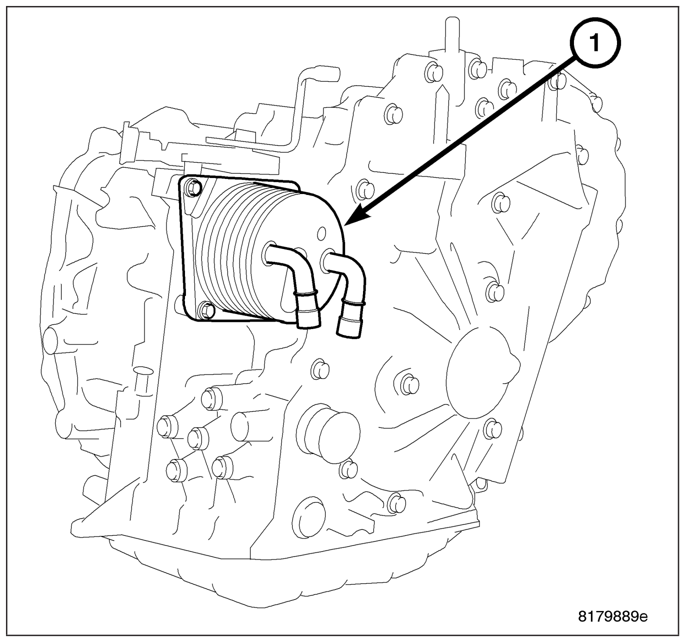
817988a3

CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

103. Install the new o-ring (1) onto the CVT fluid filter.



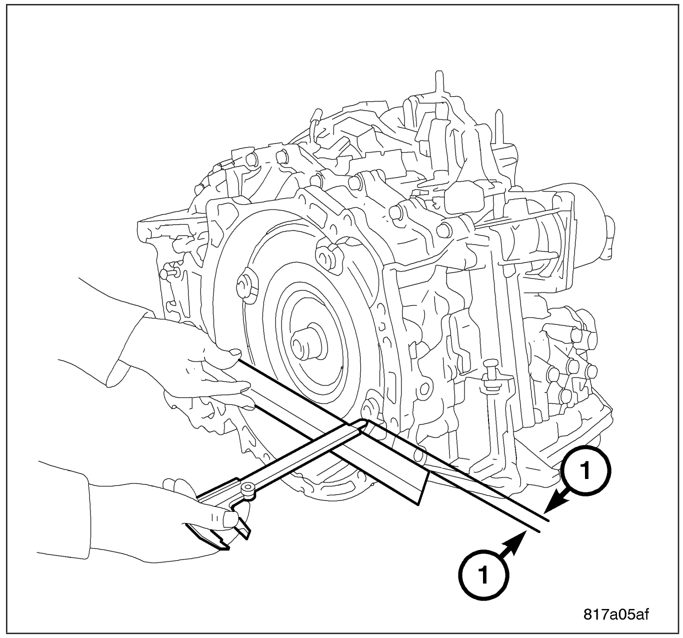
104. Install the CVT fluid cooler (1) onto the transaxle case. Install and Torque the mounting bolts to 4 N·m (37 in.lbs.).



NOTE: Gauge bar 6311 can be used for doing the following measurement

NOTE: When conducting measurements, measure two or more places and calculate the average value.

105. Install the torque converter on the transaxle and measure the dimension (1) to see if it is at least 13 mm. If the measurement is less than 13 mm, the torque converter is not fully installed.



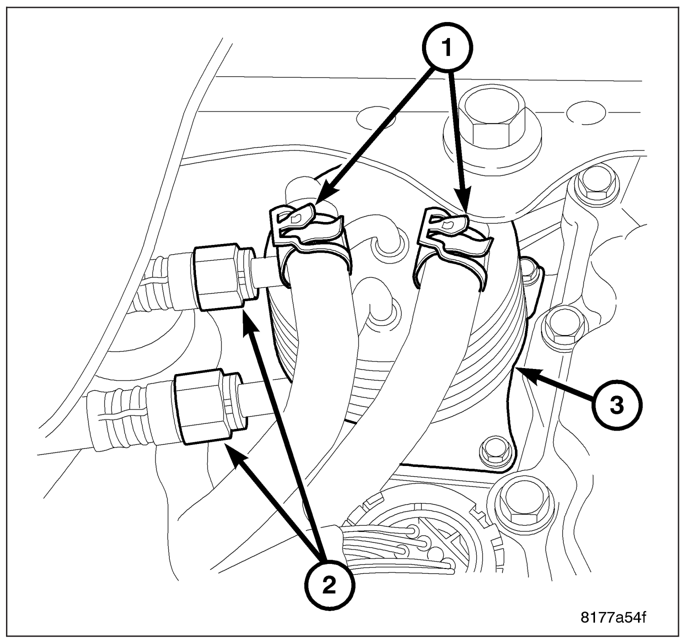
NOTE: Use the designated brand of CVT fluid. Use of other brands of CVT fluid other than the designated brand will deteriorate the driveability and the durability of the CVT, and will cause damage to the CVT.

106. Fill the transaxle with CVT fluid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/FLUID - STANDARD PROCEDURE)

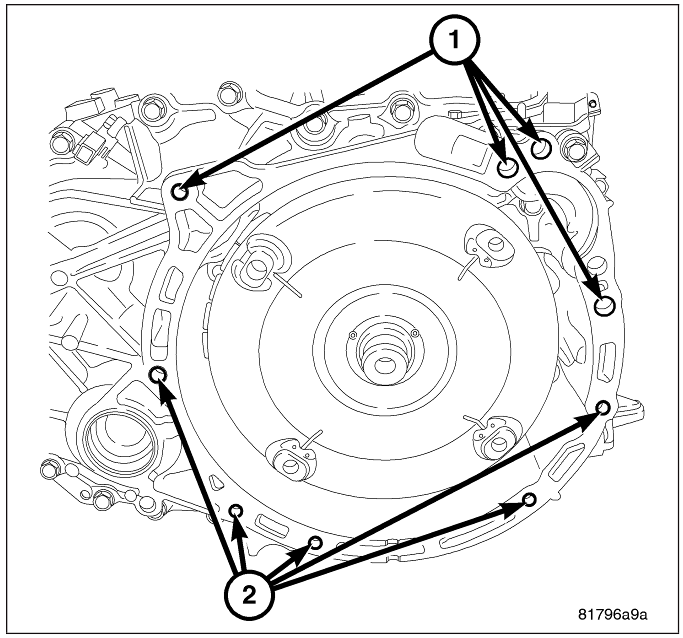
INSTALLATION

NOTE: Verify that both dowel pins are present in the engine before installing the transmission.

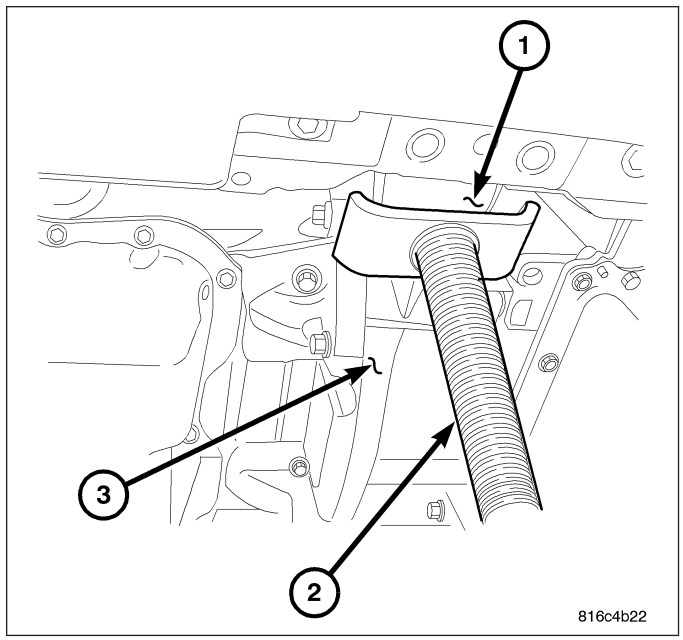
1. Raise transmission into place.
2. Install the transmission cooler lines (1, 2).



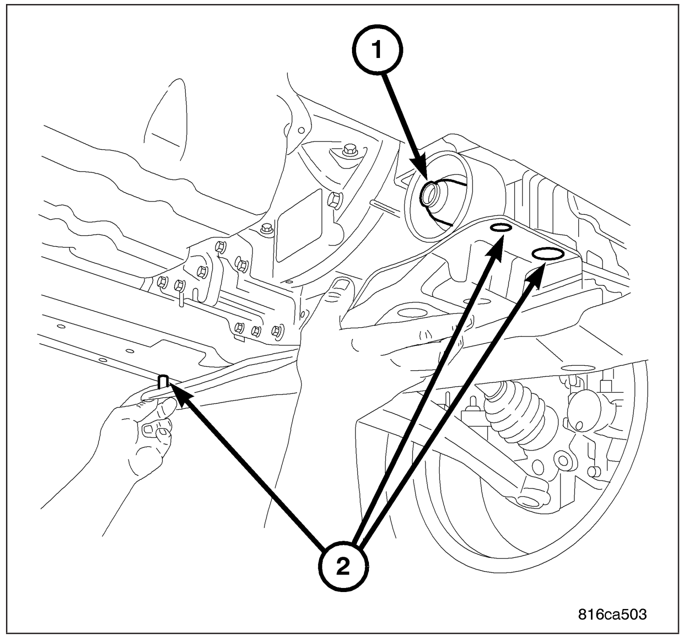
3. Install the lower transmission bell housing bolts (2) and torque to 108 N·m (80 ft. lbs.).



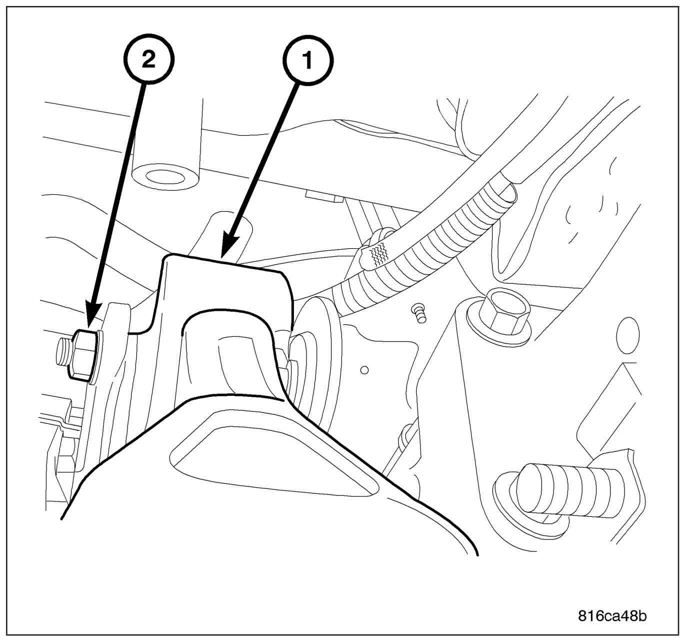
4. Raise the transmission using a screw jack (2).



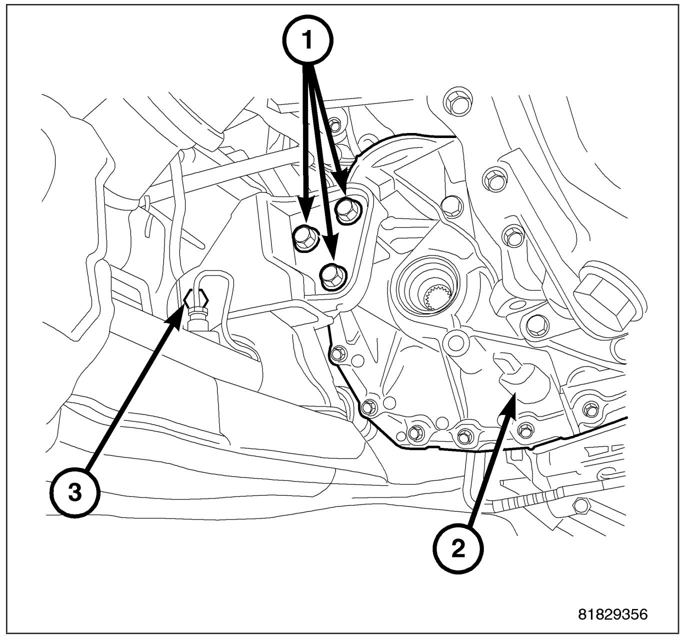
5. Install the transmission crossmember and bolts, (2) torque to 75 N·m (55 ft lbs.).
6. Install the through bolt at the front transmission mount (1) and torque to 75 N·m (55 ft lbs.).



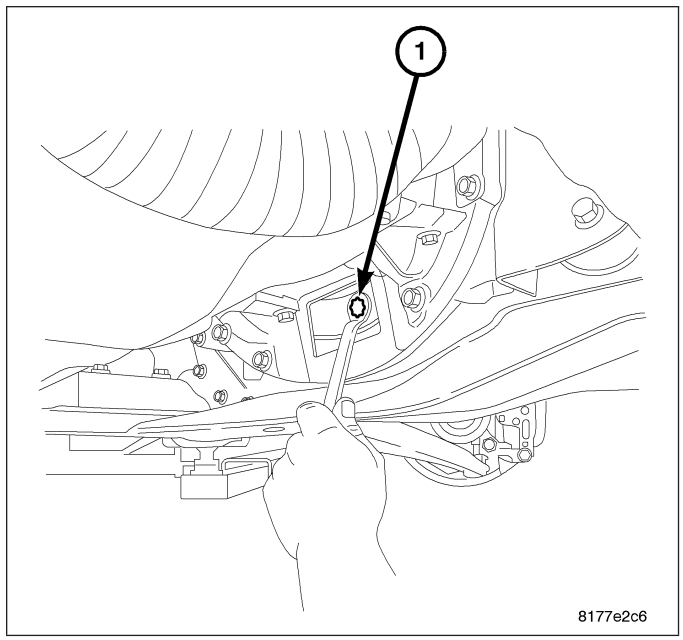
7. Install rear mount through bolt (1) and torque bolt to 75 N·m (55 ft lbs.).



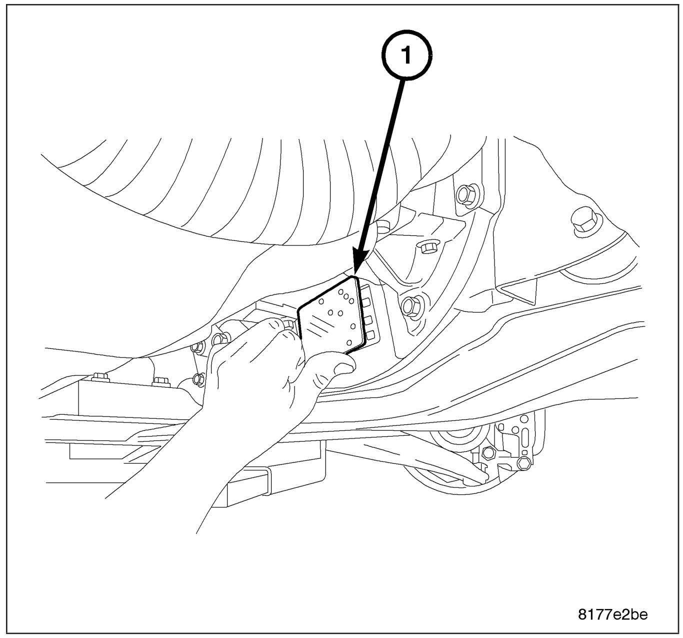
8. Install rear mount to transaxle and torque bolts (1) to 75 N·m (55 ft lbs.).



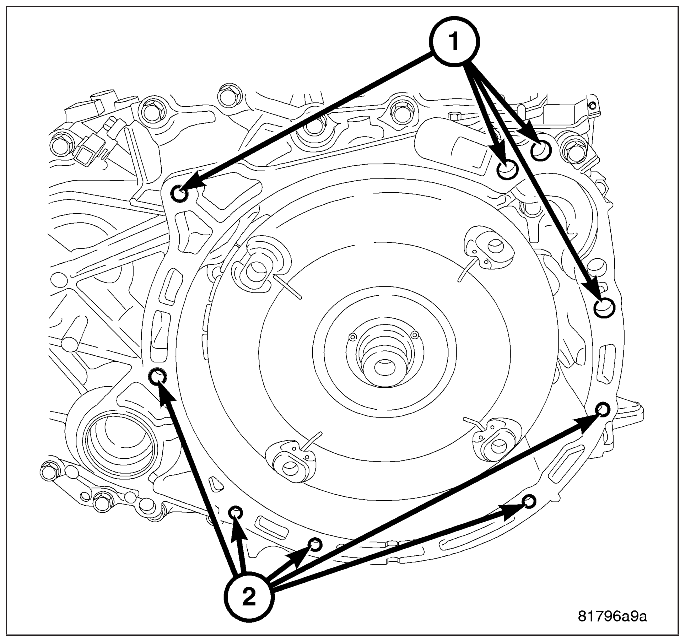
9. Install new torque converter bolts (1) and torque to 88 N·m (65 ft. lbs.).



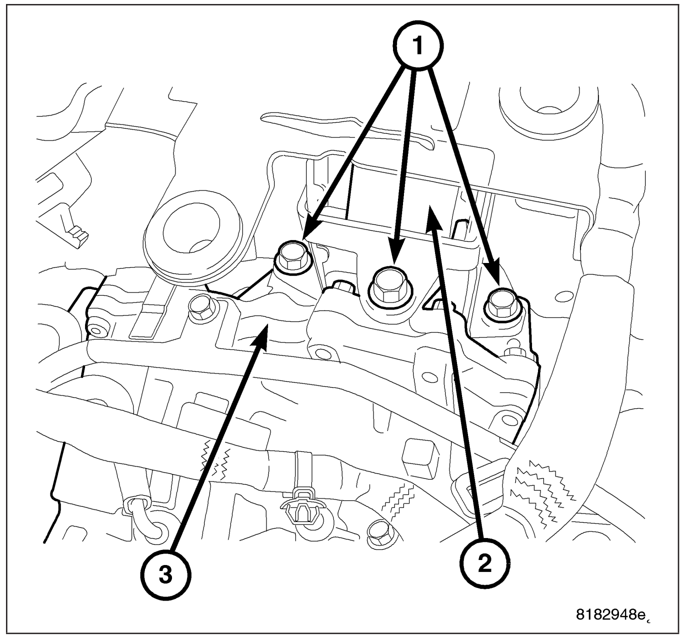
10. Install cover at torque converter (1).
11. Install the PTU if equipped (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - INSTALLATION).
12. Install the right front lower splash shield.
13. Install the left front lower splash shield.
14. Install left half and right half shafts to the transaxle (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
15. Install both front wheels (Refer to 22 - TIRES/WHEELS - REMOVAL).



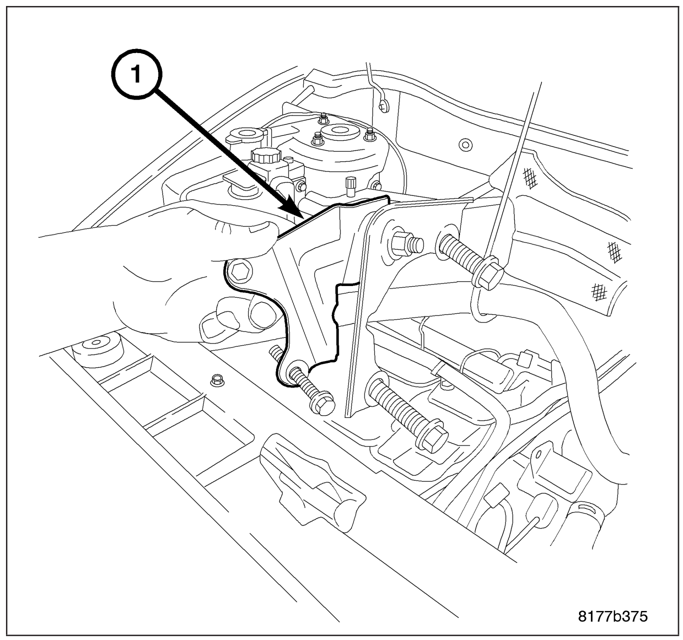
16. Lower hoist.
17. Install upper bell housing bolts (1) and torque to 108 N·m (80 ft. lbs.).



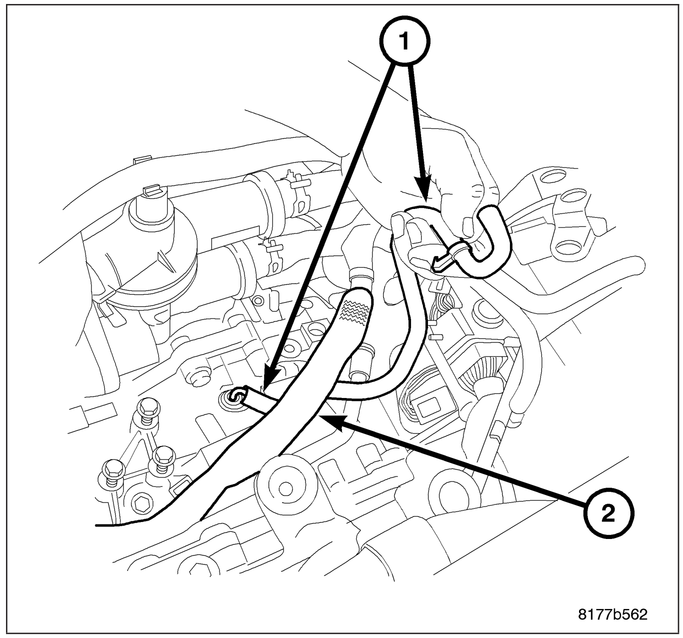
18. Install the upper mount bolts and torque to 75 N·m (55 ft lbs.).
19. Install the upper mount through bolt and torque 75 N·m (55 ft lbs.).



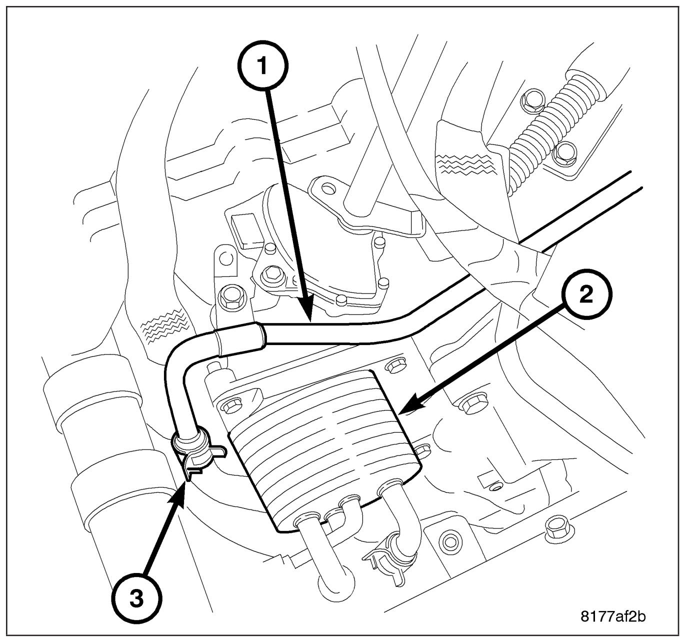
20. Install the throttle body support bracket (1) and torque to 11 N·m (105 in. lbs.).



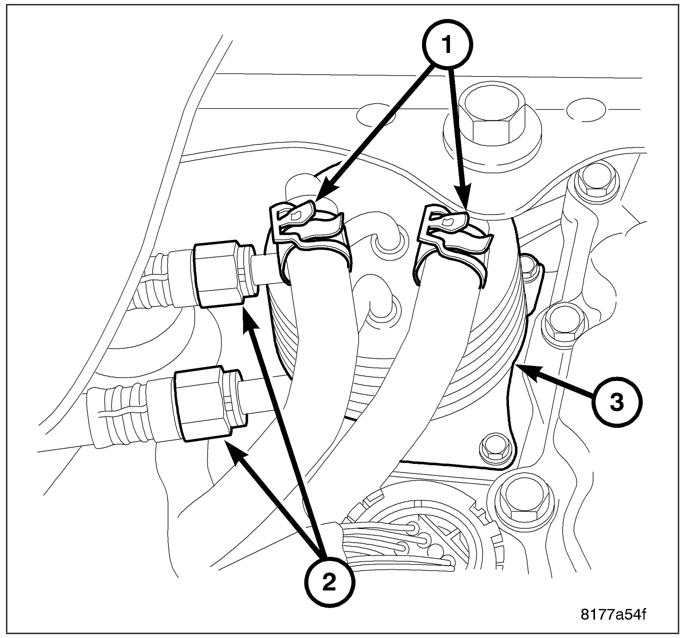
21. Connect the transmission vent tube (1).



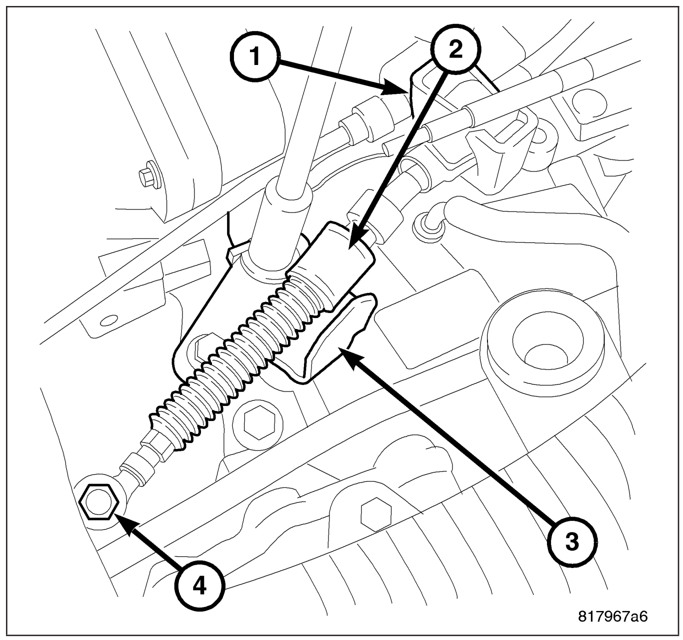
22. Install the heater hose at transmission cooler tube (3).



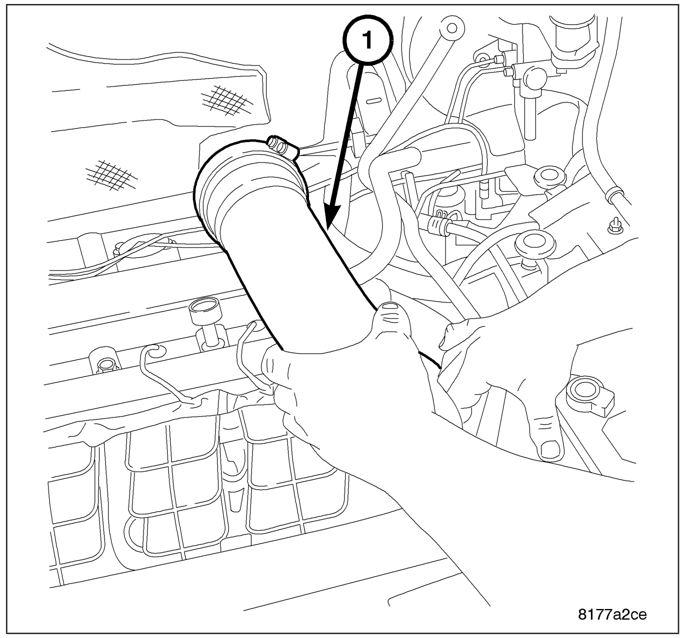
23. Connect coolant lines at transmission cooler.



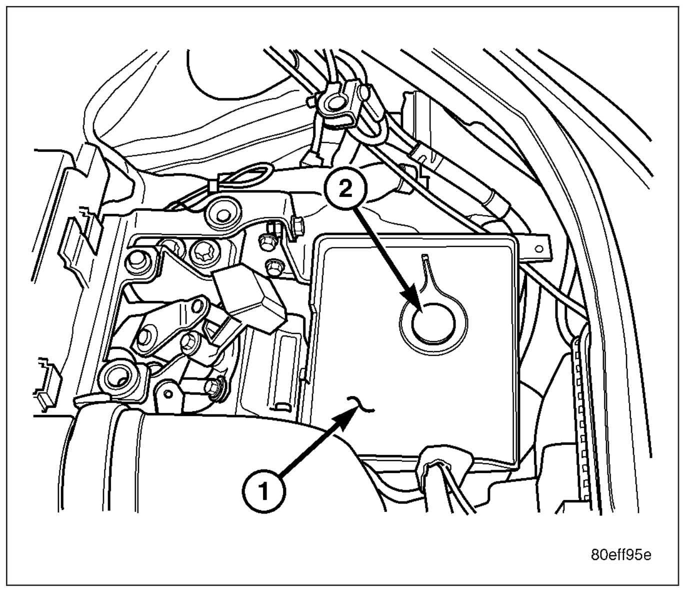
24. Install the shiftier cable (1) and bracket (2) torque to 11 N·m (105 in. lbs.).
25. Install the vacuum supply lines.



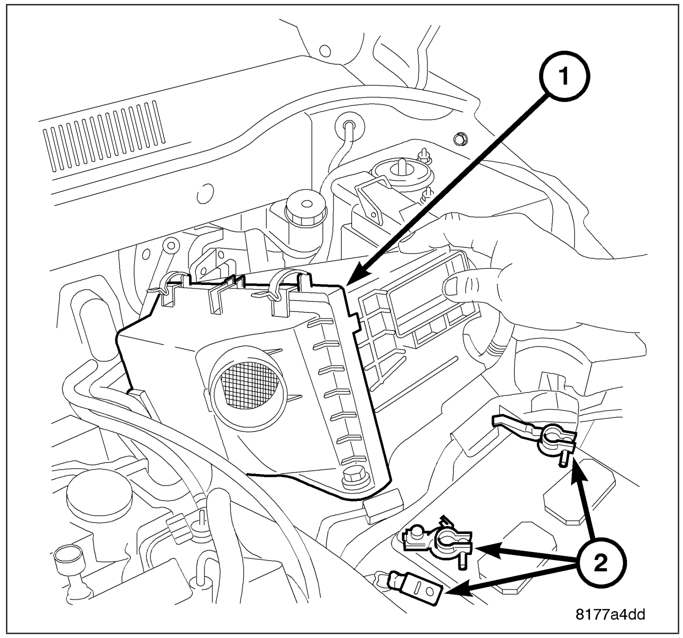
26. Install intake air tube (1).
27. Fill engine coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).



28. Install the battery tray (1).
29. Install the battery.



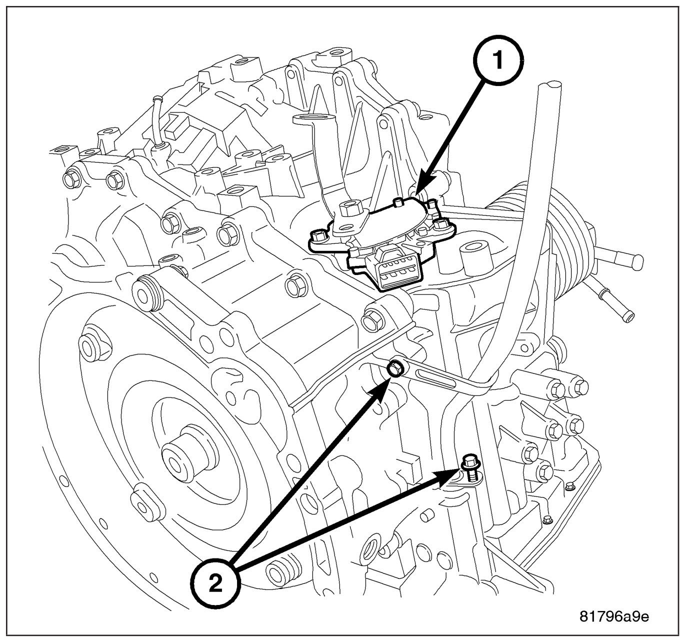
30. Install the air cleaner assembly (1).
31. Connect battery cables (2).



32. Install the transmission fill tube (1) Torque bolt to 9 N·m (79 in. lbs.).
33. Fill the transmission with fluid to the correct level.

CAUTION: Use only MOPAR ® CVTF +4, use of any other type of automatic transmission fluid may cause damage to the CVT.

34. Road test vehicle and inspect for leaks.



SPECIFICATIONS -

CLEARANCES

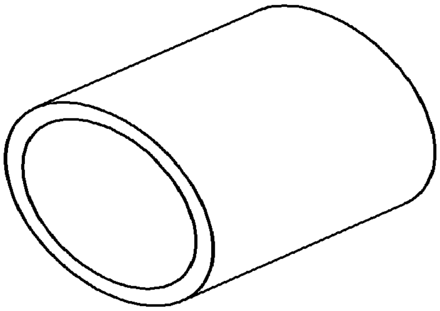
DESCRIPTION	SPECIFICATION
Forward clutch	1.2-1.5 mm (0.047-0.059 in.)
Forward Clutch, Total end play	0.25 - 0.55 mm (0.010 - 0.022 in)
Required differential preload	0.17 mm (0.007 in)
Required preload , Reduction gear	0.13-0.19 mm (0.005-0.0075 in)
Reduction Assembly required select shim	Reduction assembly measurement , minus reduction assembly measurement, plus reduction assembly measurement , plus 0.16 mm (0.006 in)

DESCRIPTION	SPECIFICATION
Required clearance, Oil pump drive sprocket	0.10-0.23 mm (0.004-0.009 in.) The select shim is equal to the oil pump drive sprocket measurement one plus the oil pump drive sprocket measurement two minus 0.16 mm (0.0065 in.).
Torque converter installed depth	at least 13 mm

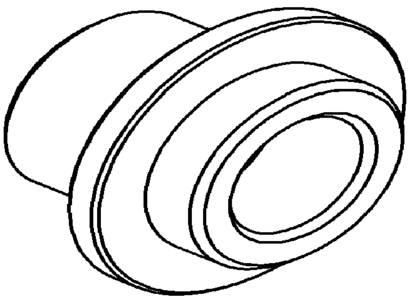
TORQUE SPECIFICATIONS

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
bolts, drive belt assembly - to - transaxle case	45	33	-
Bolt, Detente spring to case	7	-	61
Bolts, oil pump - to - transaxle case	19	14	168
Bolt, oil pump - to - transaxle case (out side)	28	20	247
Bolts, Valve body assembly - to - case	8	-	70
Nut, Valve body manual lever - to - manual shaft	22	16	194
Bolts, Oil strainer to valve body	8	-	70
Bolts, oil pan - to - transaxle case	8	-	70
Bolts, baffle plate	6	-	52
Bolts, oil pump cover	26	19	230
Bolts, Bracket oil pump cover - to oil pump	26	19	230
Bolts, Baffle plate	26	19	230
Bolts, Baffle plate at oil pump driven sprocket	6	-	52
Bolts, Converter housing - to - transaxle case	45	33	398
Bolts, TRS	6	-	49
Nut, Shift lever to manual shaft	17	13	150
Bolt, Speed input sensor - to - transaxle case	6	-	52
Bolt, Speed output sensor - to - transaxle case	6	-	52
Bolts, Fluid cooler - to - transaxle case	4	-	37
Bolts, transmission bell housing - to - engine	108	80	-
Bolts, Transmission cross member	75	55	-
Nut, Rear mount through bolt	75	55	-
Bolts, Rear mount to transaxle	75	55	-
Bolts, Torque converter	88	65	-
Bolts, Bell housing	108	80	-
Bolts, Upper mount	75	55	-
Nut, Upper mount through bolt	75	55	-
Bolts, Throttle body support bracket	11	-	105
Nut, Shiftier cable	11	-	105
Bolts, Transmission fill tube	9	-	79
Nut, Reduction gear	250	185	-
Bolts, Shiftier - to - floor	70	52	-
Bolts, Bracket to Valve Body	8	70	-

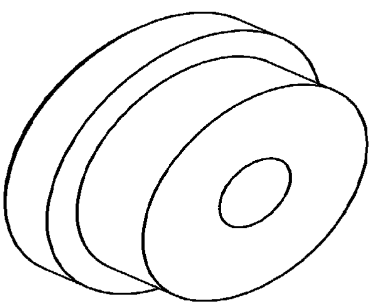
SPECIAL TOOLS



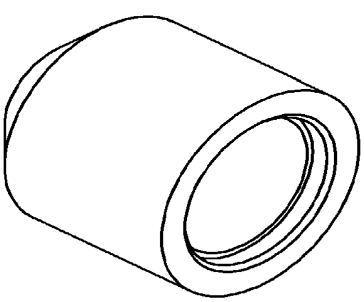
INSTALLER 9714



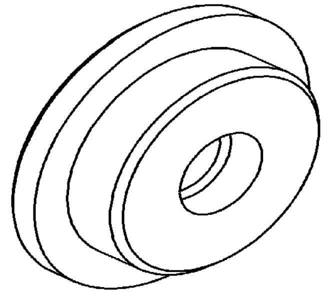
INSTALLER 9715



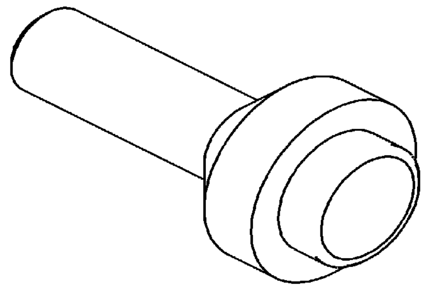
INSTALLER 9743



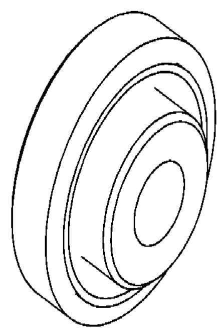
INSTALLER 9851



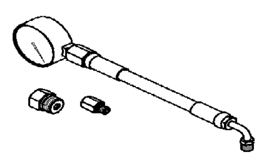
INSTALLER 9852



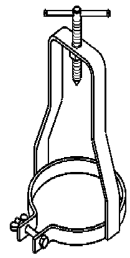
INSTALLER 9858



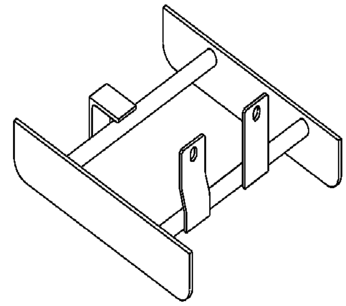
9871 SEAL INSTALLER



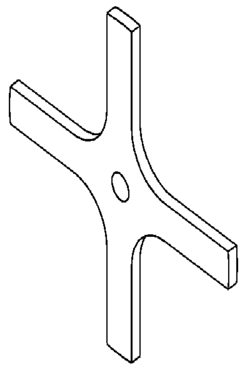
9873 PRESSURE GAUGE



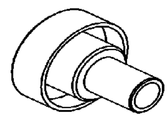
9874 PULLER



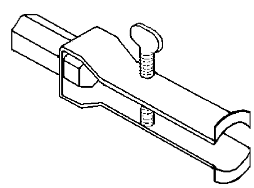
9878 SERVICE STAND



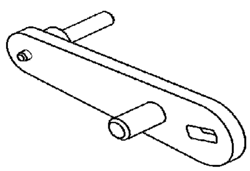
9875 COMPRESSOR



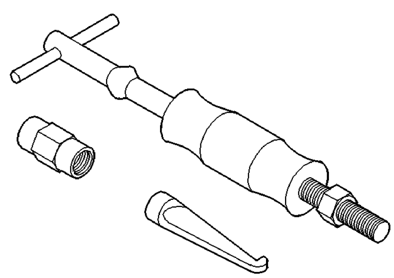
9919 BEARING INSTALLER



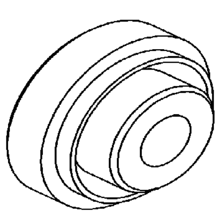
PULLER 7794-A



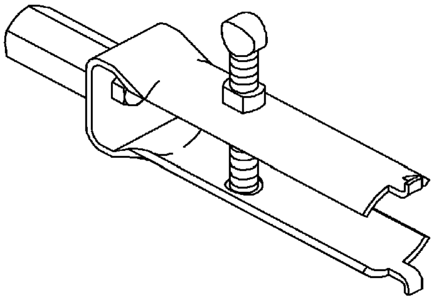
9876 PARK NEUTRAL SWITCH ADJUSTM



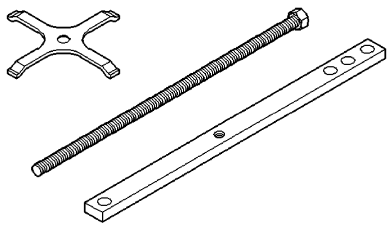
PULLER C-637

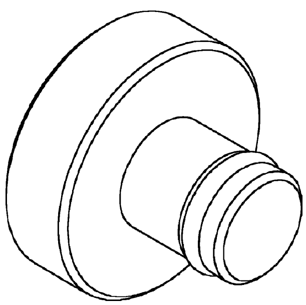


9877 SEAL INSTALLER

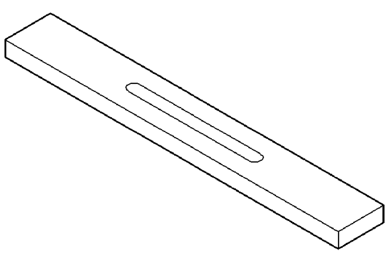


PULLER, 9664





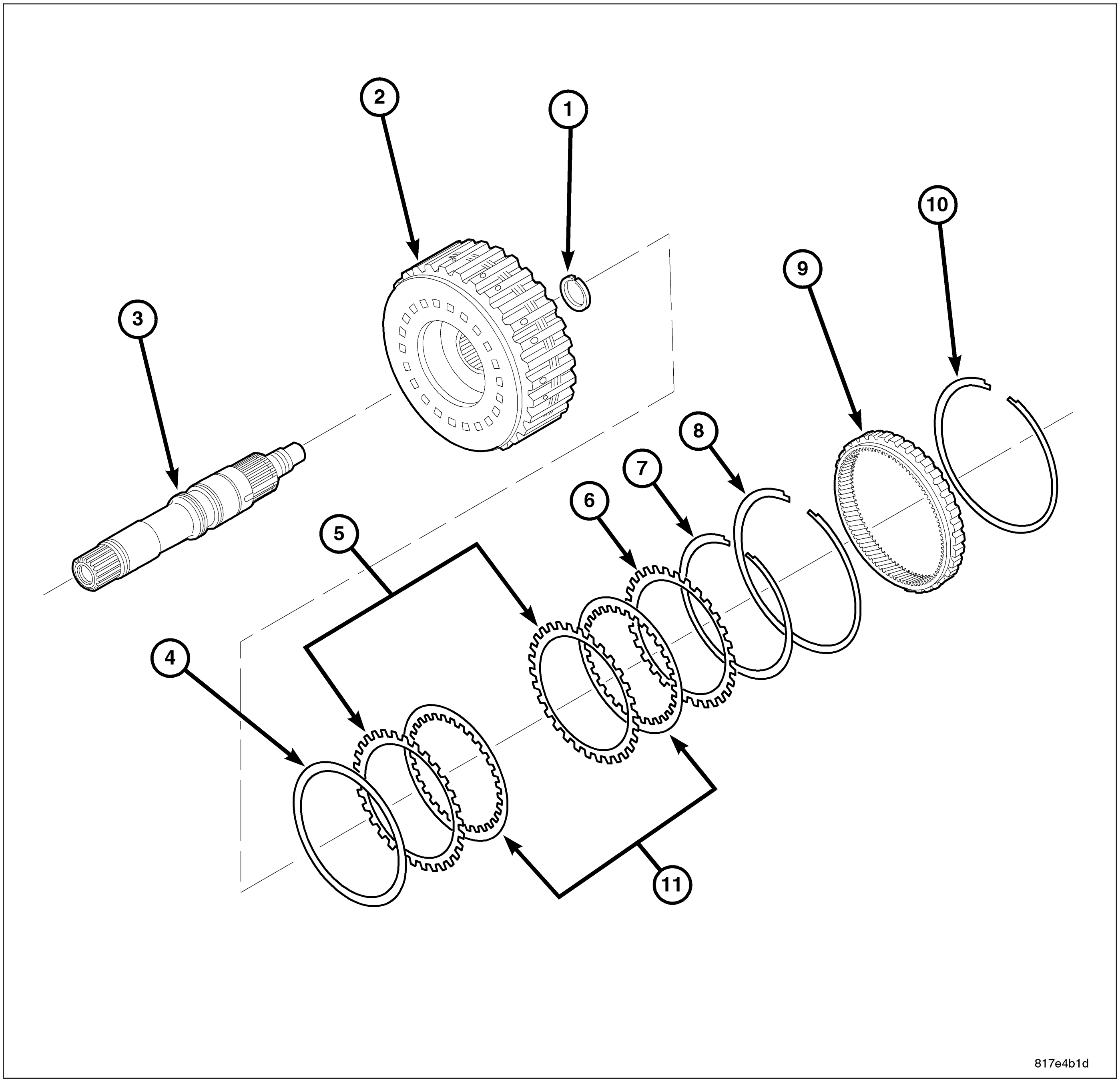
INSERT 8513A



Bar, Gauge - 6311

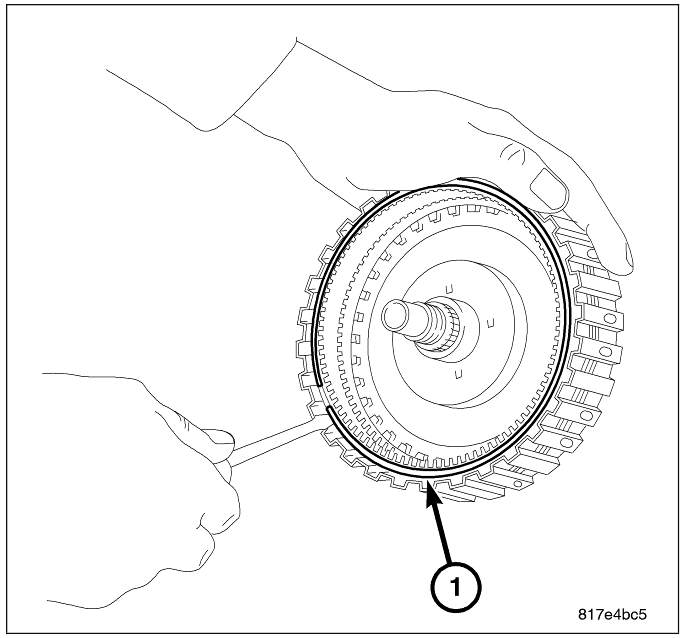
CLUTCH-FORWARD

DISASSEMBLY

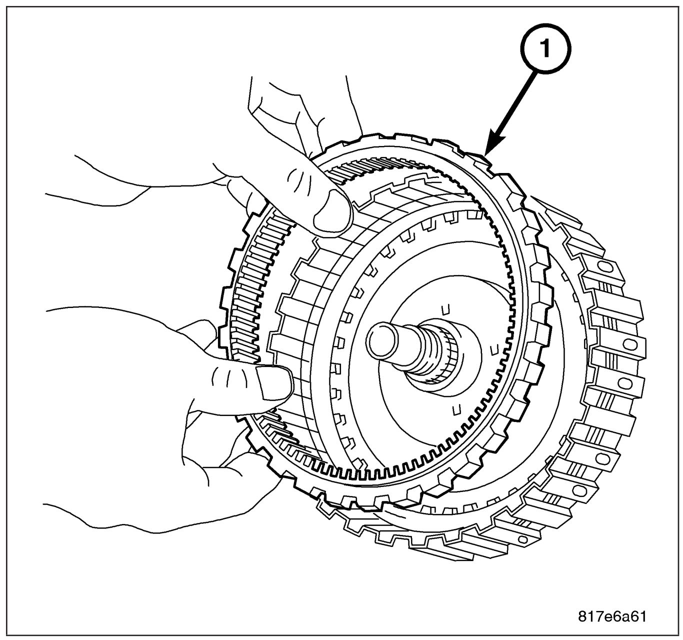


NOTE: Refer to the exploded views as necessary when performing the following steps.

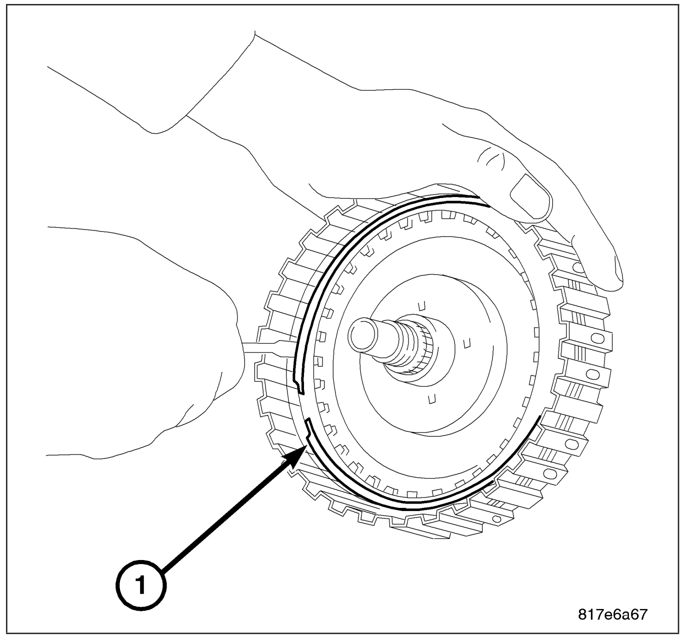
1. Remove the snap ring (1) from the forward clutch drum using a flat head screwdriver.



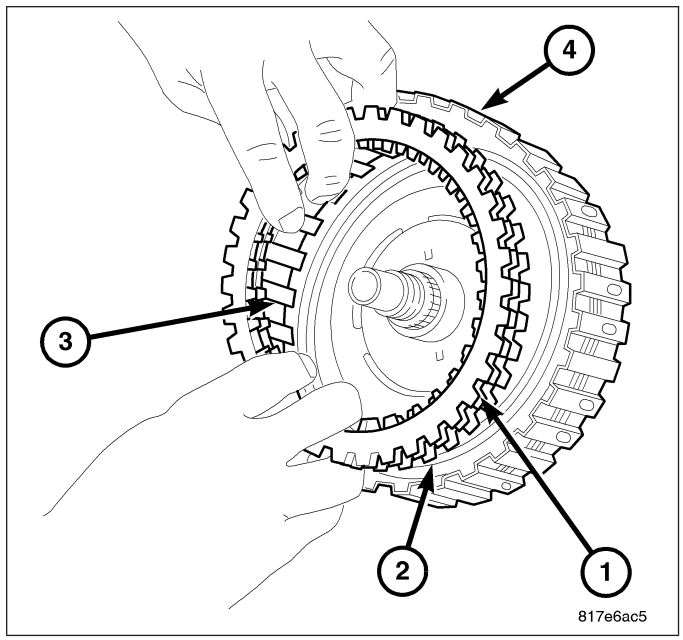
2. Remove the internal gear (1) from the forward clutch drum.



3. Remove the snap rings (1) from the forward clutch drum using a flat head screwdriver.

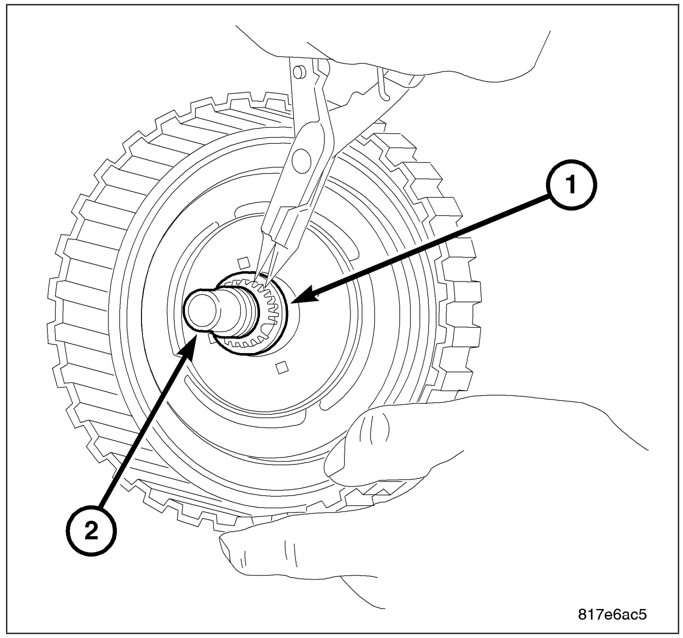


4. Remove the retaining plate (1), the drive and driven plates (3), and the dish plate (2) from the forward clutch drum (4).

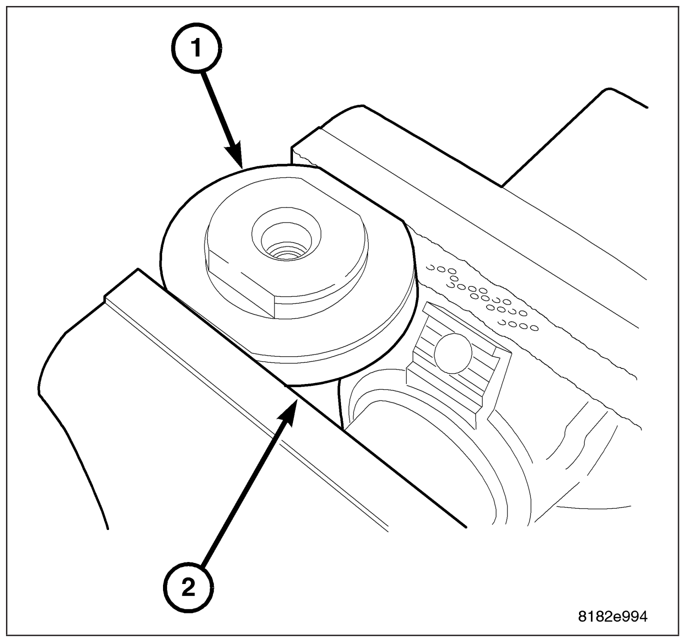


CAUTION: Do not expand the snap ring beyond necessity and do not deform it.

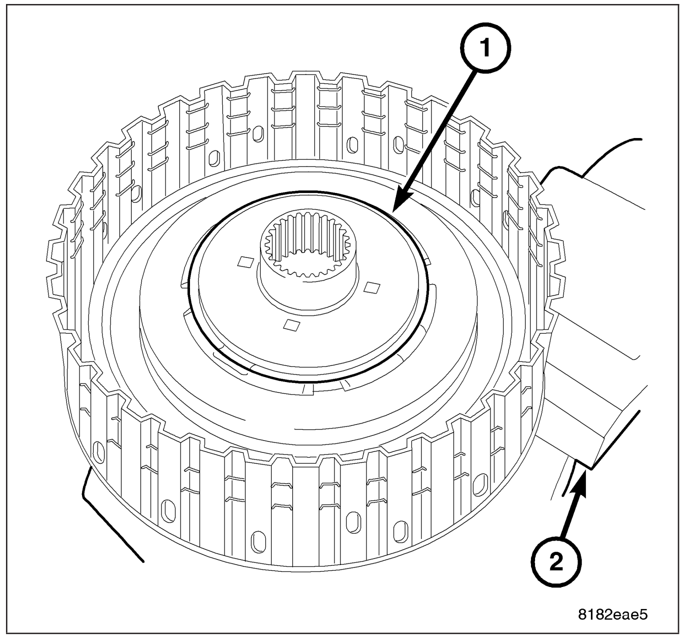
5. Remove the snap ring (1), and remove the input shaft (2) from the forward clutch drum.



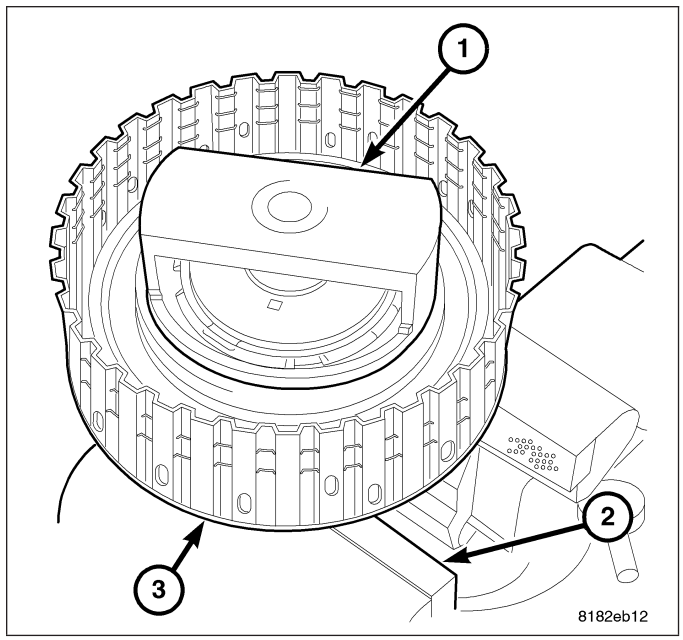
6. Place bottom of Compressor 8900 (1) in Vice (2).



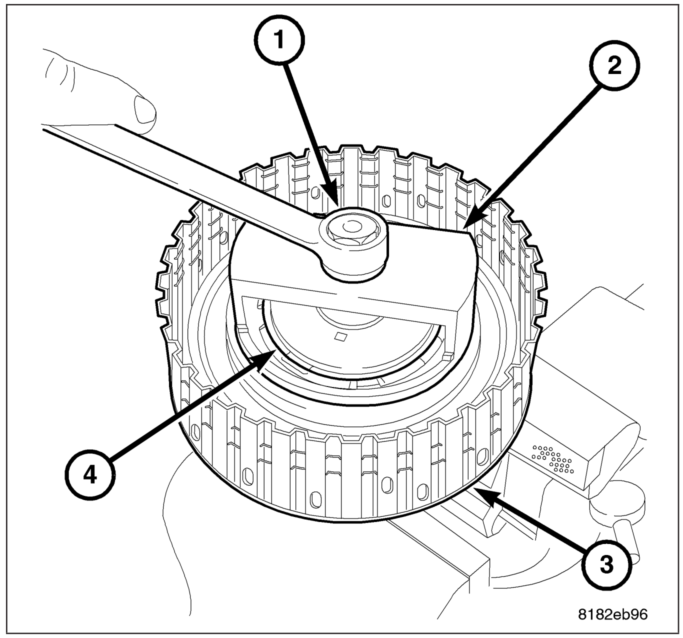
7. Place the drum (1) over Compressor bottom 8900 in Vice (2).



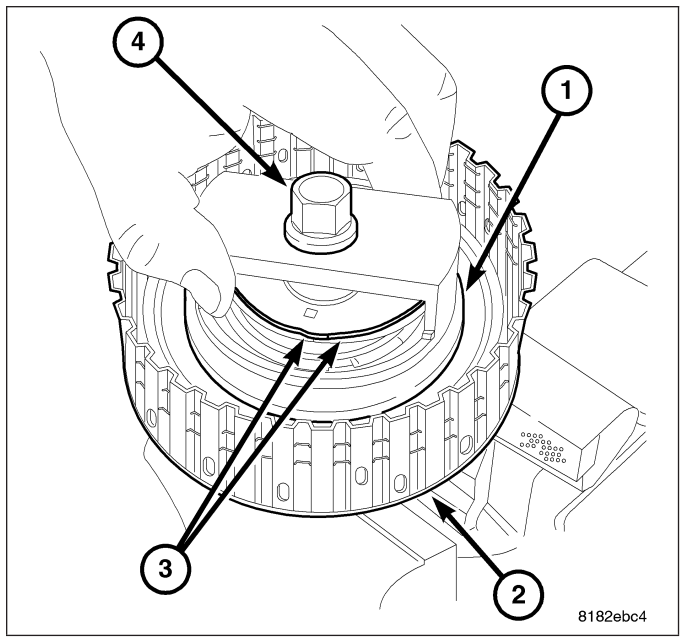
8. Place correct ring (1) that comes with Compressor 8900 in drum (3).



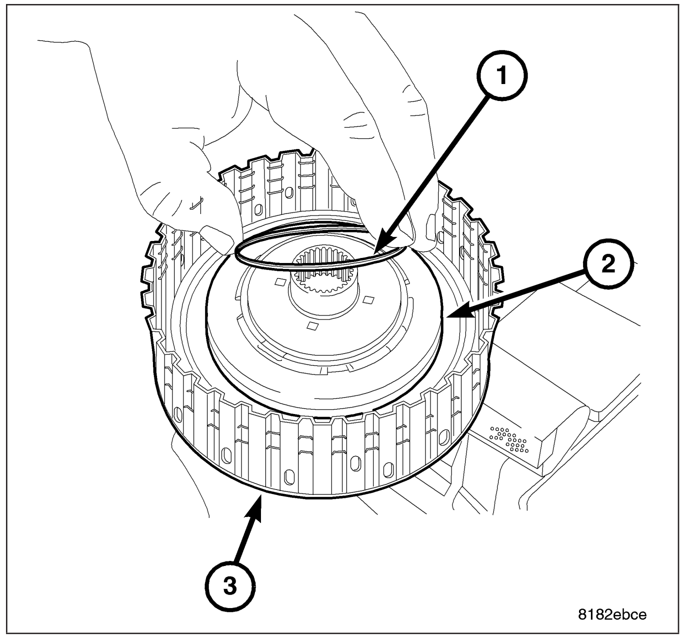
9. Install threaded rod (1) that comes with Compressor 8900 (2) in drum (3).
10. Compress tool until the snap ring (4) can be removed.



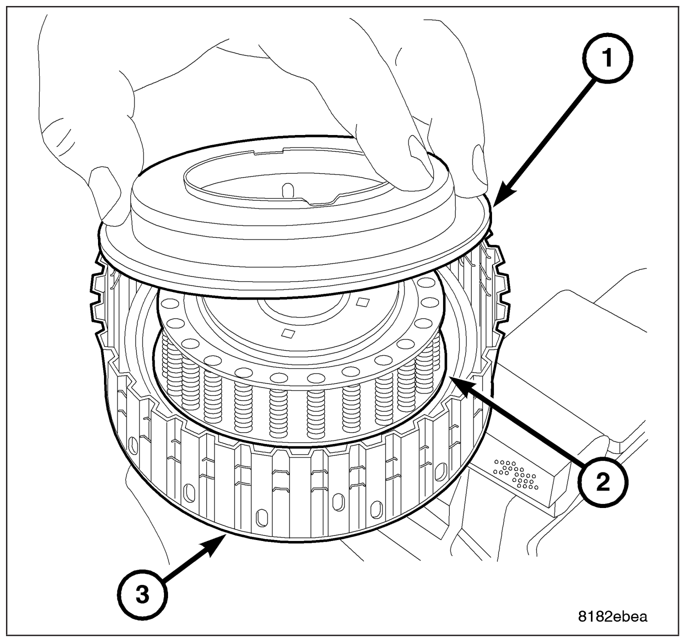
11. Use snap ring pliers or a small screw driver to remove the snap ring (3) from the piston (1).



12. Remove snap ring.



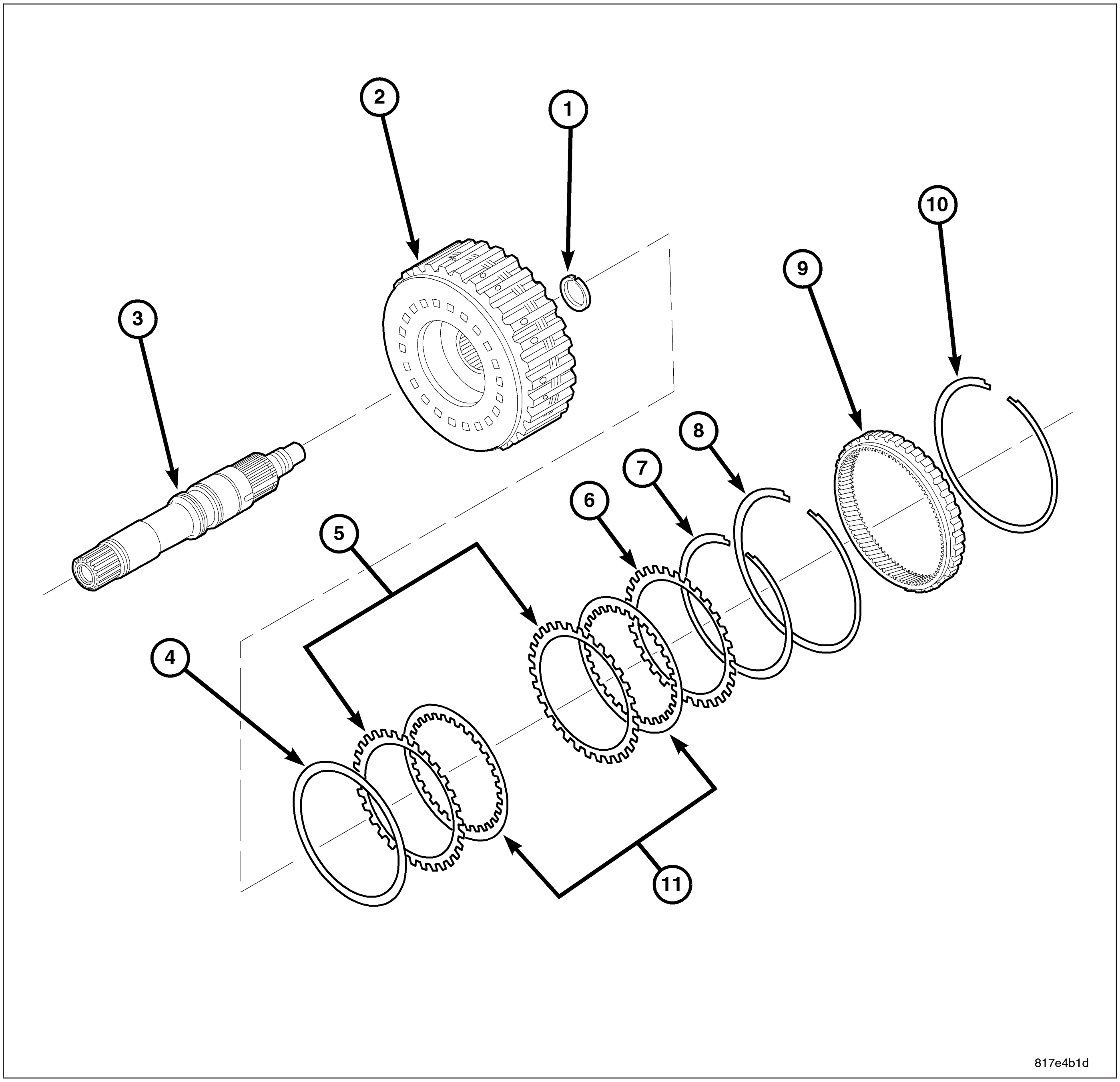
13. Remove the piston (1) from the drum (3).
14. Remove the spring assembly (2) form the drum (3).



INSPECTION

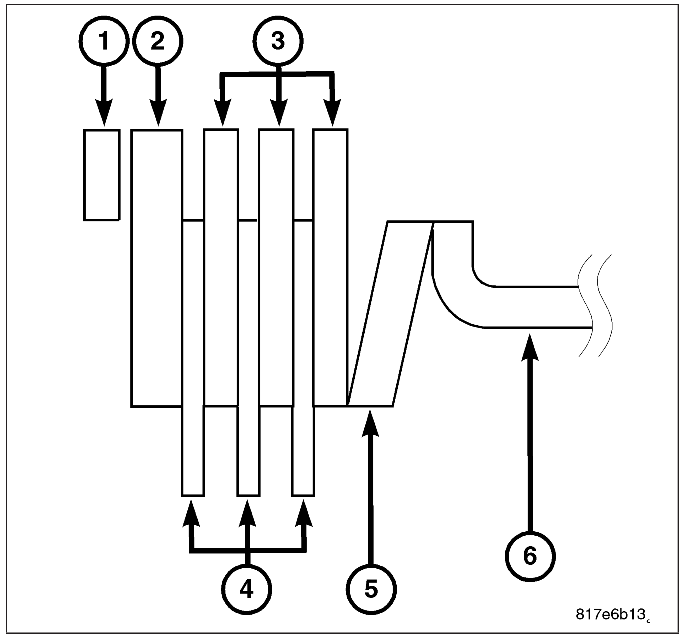
1. Check driven plate, drive plate, retaining plate and forward clutch drum for damage, distortion or burnt surfaces.
2. Check snap ring and dish plate for damage, distortion or permanent fatigue.
3. Check input shaft and internal gear for damage and distortion.

ASSEMBLY

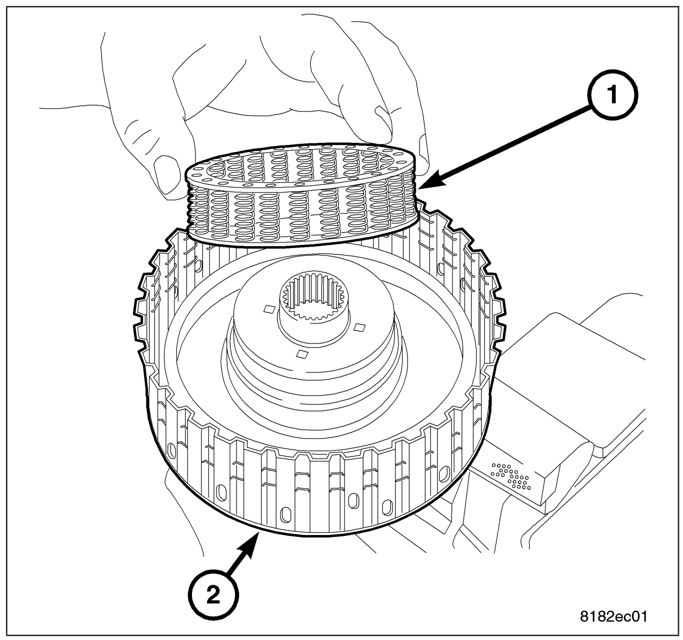


1. Refer to the exploded views as necessary when performing the following steps.

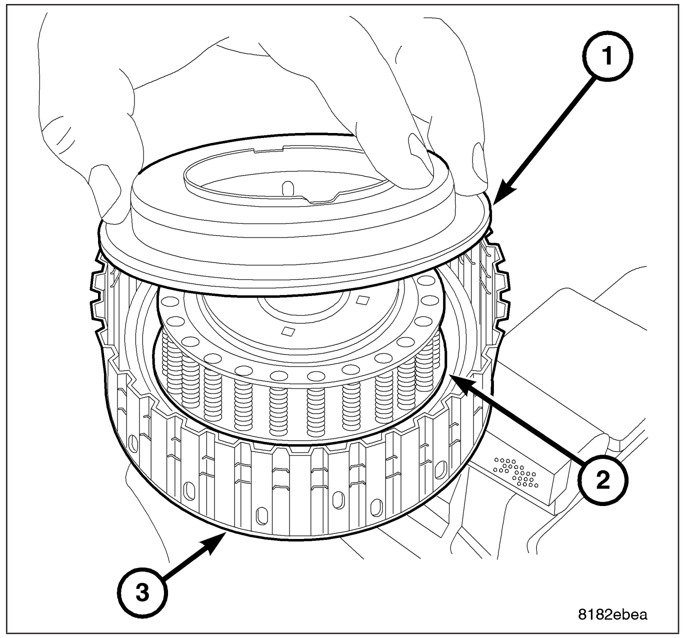
2. Refer to this view as necessary when performing the following steps.



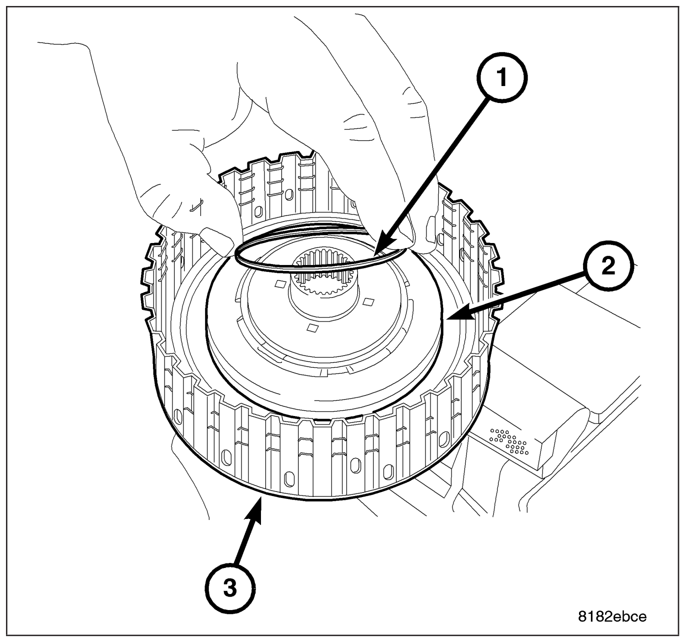
3. Install the spring assembly (1) into the drum (2).



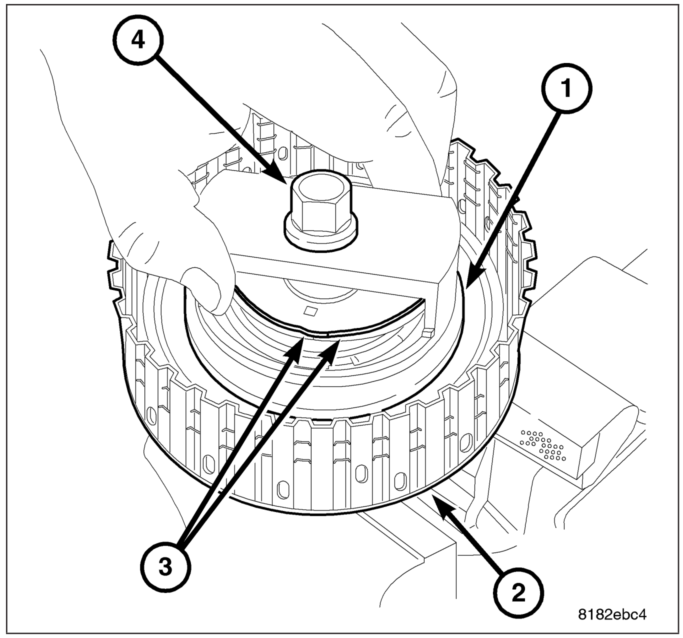
4. Install the piston (1) into the drum (3).



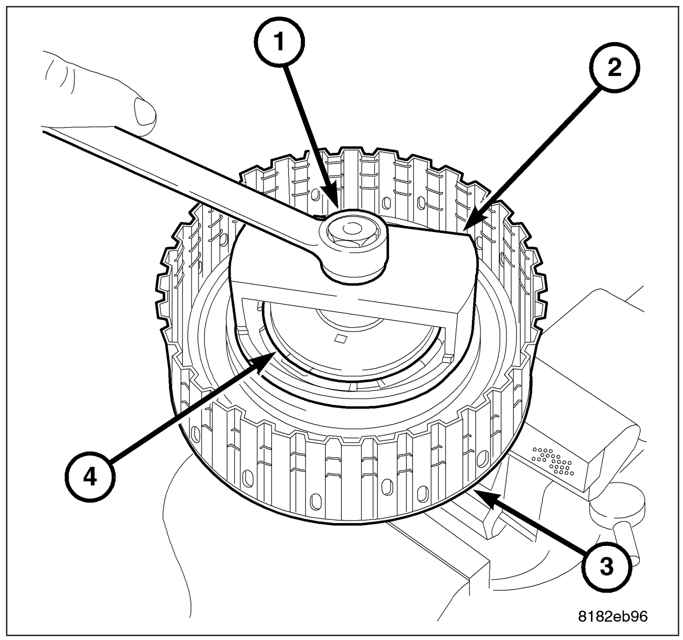
5. Lay the snap ring onto the piston.



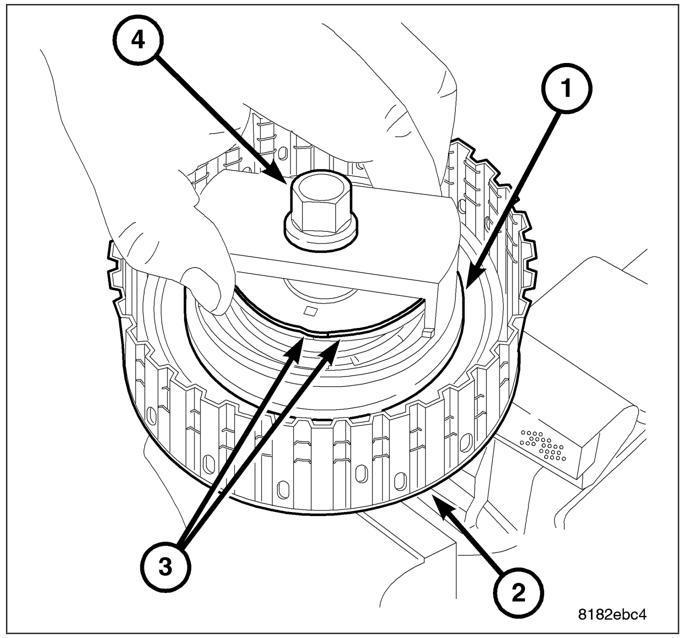
6. Install Compressor 8900.



7. Compress the piston.

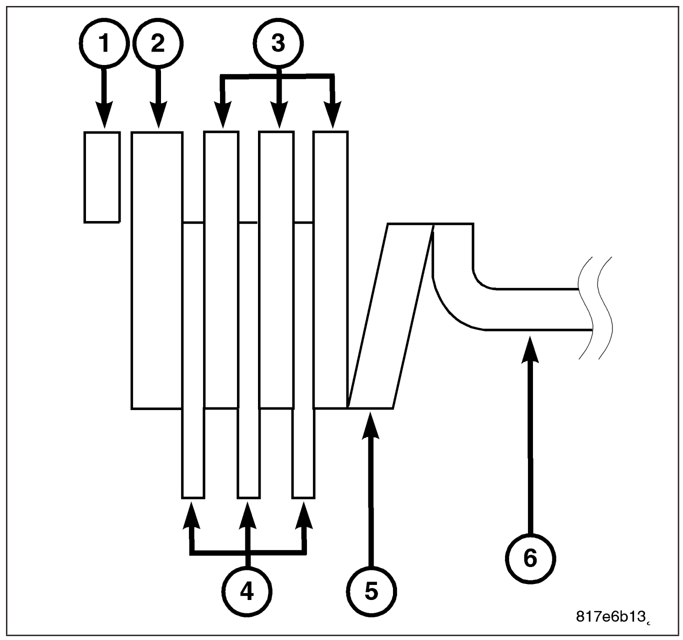


8. Use snap ring pliers or a small screw driver to install the snap ring (3) onto the piston (1).



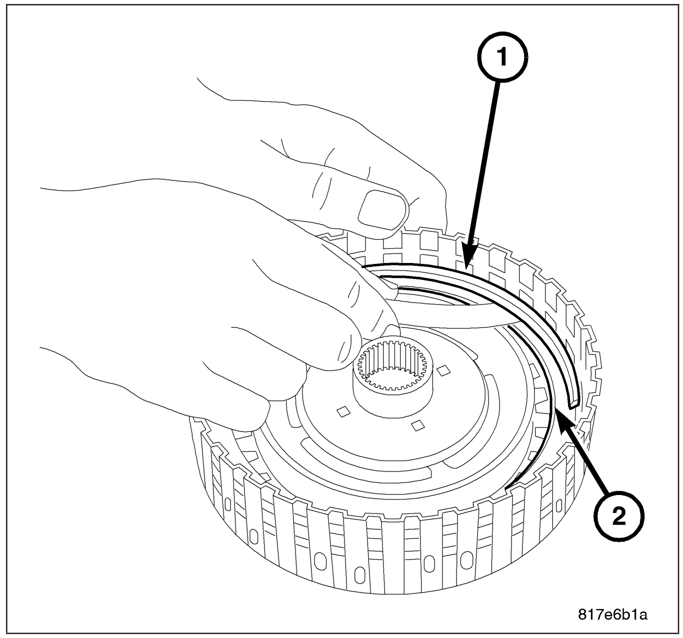
CAUTION: Install so that the installation order of each plate is correct.

9. Install the dish plate (5), the driven plate (3), the drive plate (4), the retaining plate (2) and one piece of the snap ring (1), in the forward clutch piston (6).



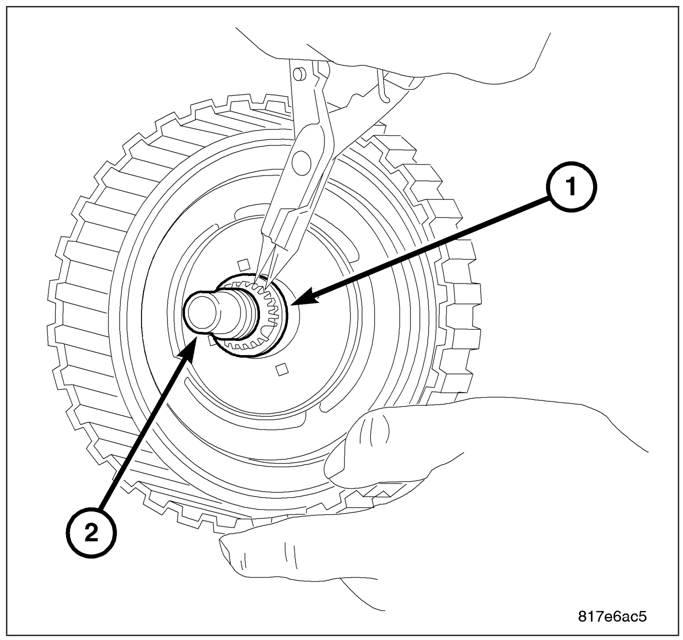
CAUTION: When conducting measurements, measure two or more places and calculate the average value. If clearance is beyond standard value, replace the forward clutch assembly.

10. Measure the clearance between the snap ring (1) and the retaining plate (2). the correct clutch clearance is 1.2-1.5 mm (0.047-0.059 in.).

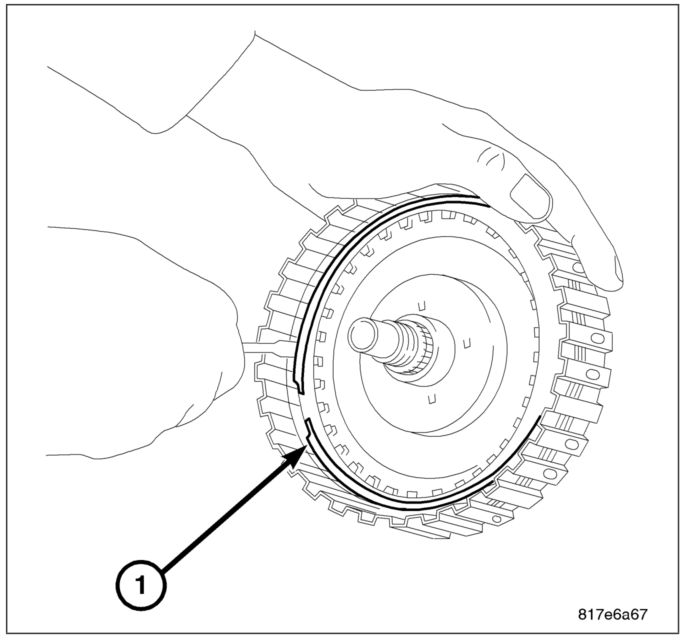


CAUTION: Do not expand the snap ring beyond level required to install and do not deform it.

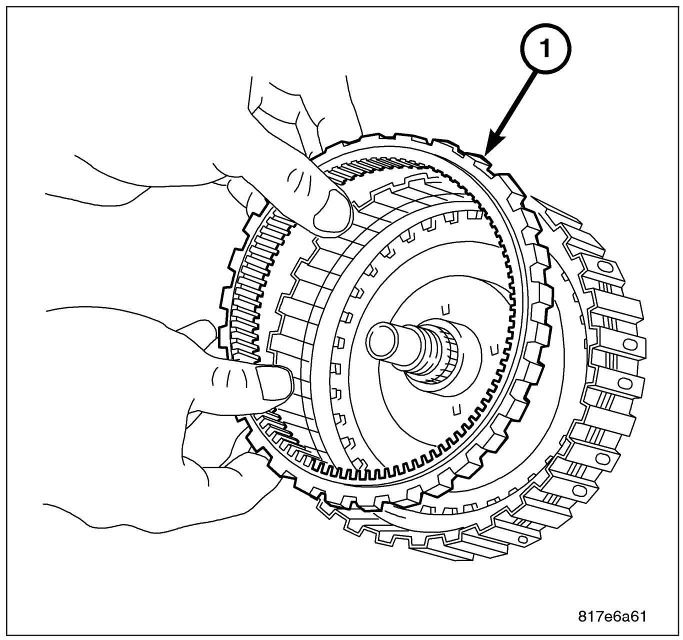
11. Install the input shaft (2) in the forward clutch drum, and install the snap ring (1).



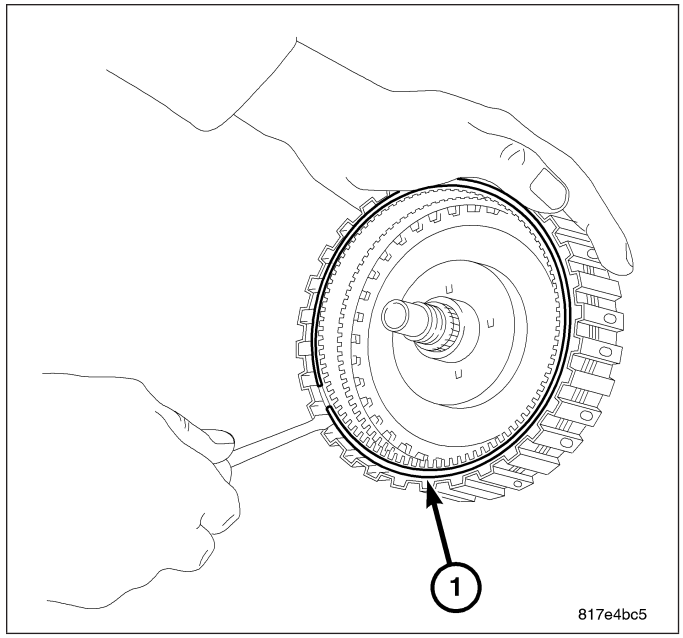
12. Install one piece of the snap ring (1) into the forward clutch drum.



13. Install the internal gear (1) into the forward clutch drum.



14. Install the snap ring (1) in the forward clutch drum.



FLUID

DIAGNOSIS AND TESTING

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

1. Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.
2. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
3. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

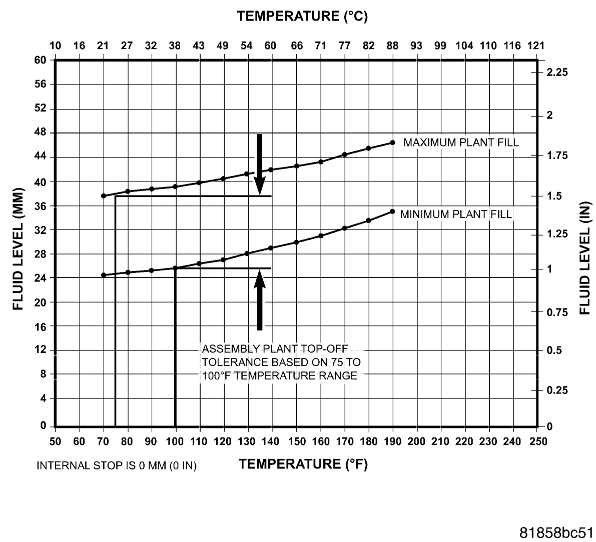
CHECK OIL LEVEL

1. Verify that the vehicle is parked on a level surface.
2. Remove the dipstick tube cap.

WARNING: There is a risk of accident from vehicle starting off by itself when engine running. There is a risk of injury from contusions and burns if you insert your hands into the engine when it is started or when it is running. Secure vehicle to prevent it from moving off by itself. Wear properly fastened and close-fitting work clothes. Do not touch hot or rotating parts.

3. Actuate the service brake. Start engine and let it run at idle speed in selector lever position ″P″.
4. Shift through the transmission modes several times with the vehicle stationary and the engine idling
5. Warm up the transmission, wait at least 2 minutes and check the oil level with the engine running. Push the Oil Dipstick 9336 into transmission fill tube until the dipstick tip contacts the oil pan and pull out again, read off oil level, repeat if necessary.

NOTE: The dipstick will protrude from the fill tube when installed.



CVT TRANSMISSION FILL GRAPH

6. Check transmission oil temperature using the appropriate scan tool.
7. The transmission Oil Dipstick 9336 has indicator marks every 10 mm. Determine the height of the oil level on the dipstick and using the height, the transmission temperature, and the Transmission Fluid Graph, determine if the transmission oil level is correct.
8. Add or remove oil as necessary and recheck the oil level.
9. Once the oil level is correct, install the dipstick tube cap.

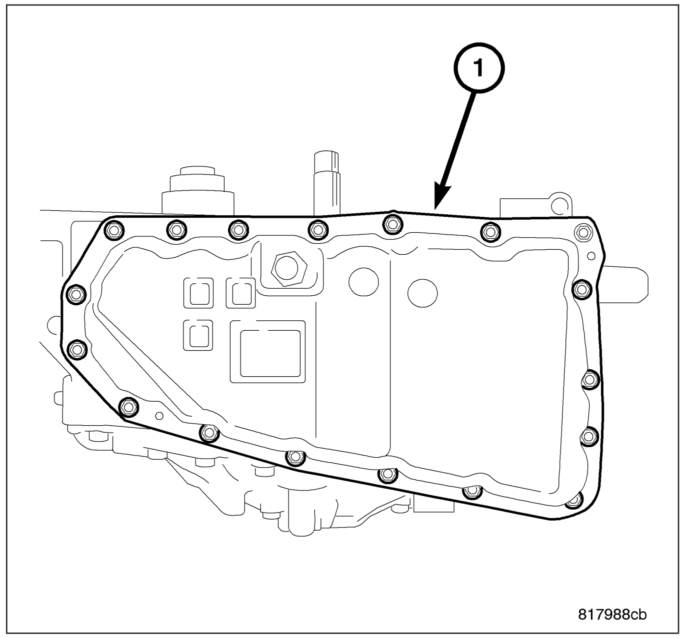
TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

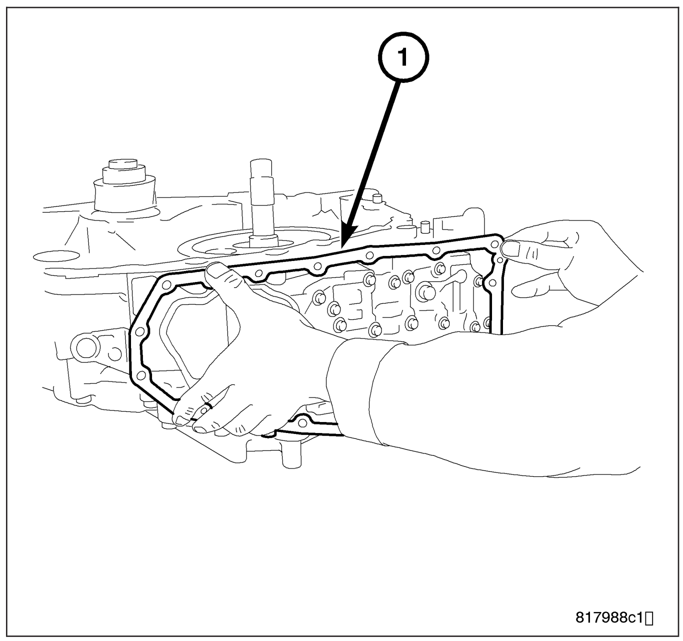
1. Verify that the vehicle is parked on a level surface.
2. Remove the dipstick tube cap.
3. Add following initial quantity of MOPAR® CVT+4, Automatic Transmission Fluid, to the transmission:
   a. If only fluid and filter were changed, add **7.0 L (14.8 pts.)** of transmission fluid to transmission.
   b. If the transmission was completely overhauled or the torque converter was replaced or drained, add **8.1 L (17.1 pts.)** of transmission fluid to transmission.
4. Check the transmission fluid (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/FLUID - STANDARD PROCEDURE) and adjust as required.

FLUID AND STRAINER SERVICE

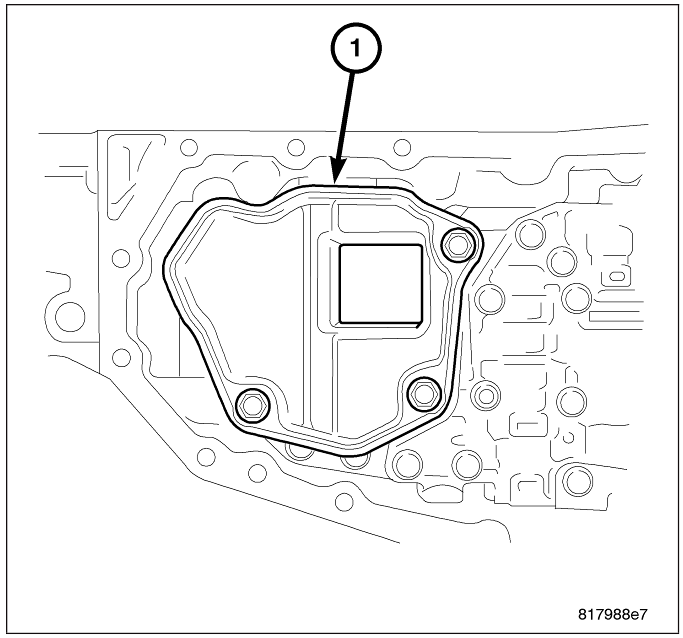
1. Remove the bolts holding the oil pan (1) to the transaxle case.
2. Remove the oil pan from the transaxle case.



3. Remove the oil pan gasket (1) from the transaxle case.

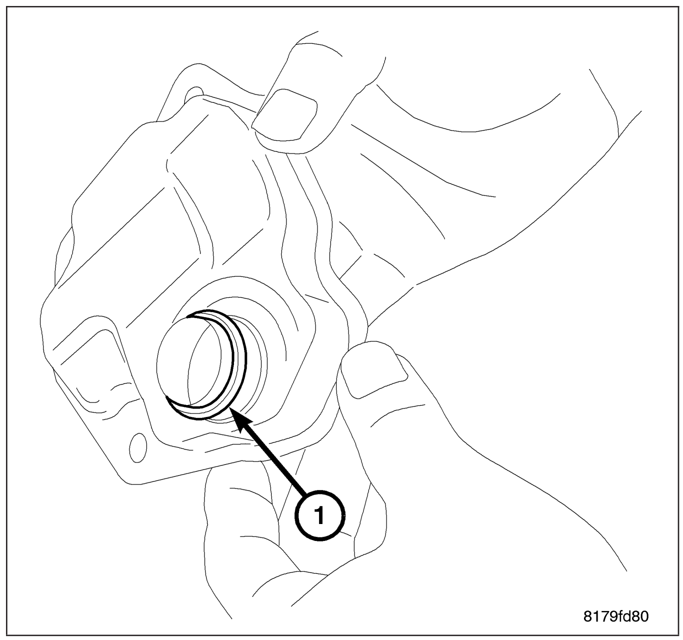


4. Remove the bolts holding the oil strainer (1) to the valve body.
5. Remove the oil strainer.
6. Remove and discard the oil strainer o-ring.

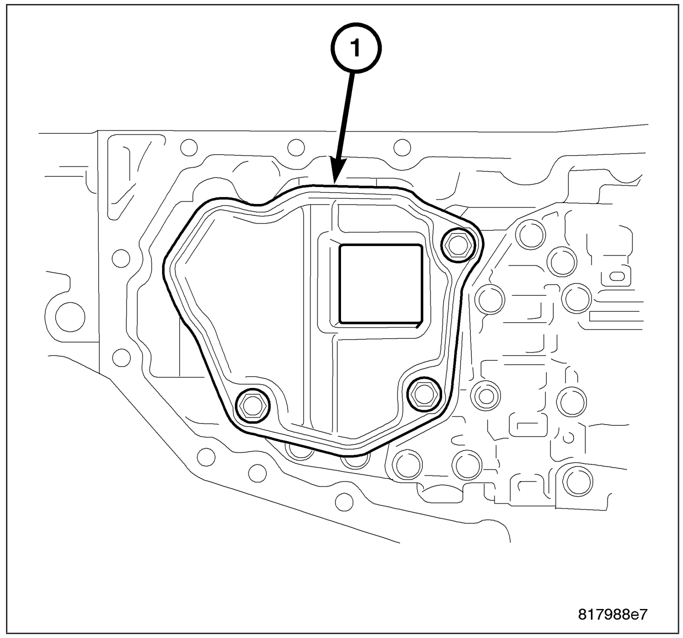


CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

7. Install the new o-ring (1) onto the new oil strainer.

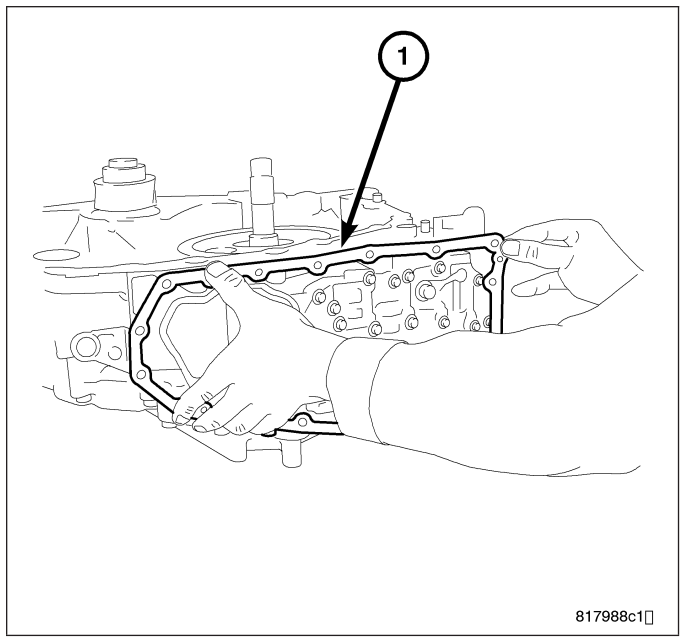


8. Install the new oil strainer (1) onto the control valve assembly. Install and tighten the mounting bolts to 8 N·m (70 in.lbs.).



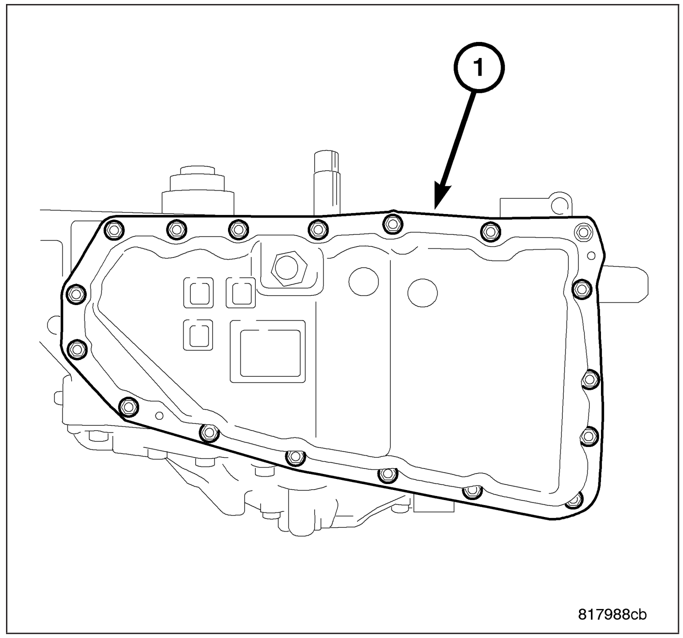
CAUTION: Do not re-use the oil pan gasket. Remove any moisture, oil, and used gasket material from the surface where the new gasket is to be installed. When installing the oil pan gasket, align the dowel pin with the dowel pin hole in the oil pan gasket.

9. Install the oil pan gasket (1) onto the transaxle case.



CAUTION: When installing the oil pan, align the dowel pin of the transaxle case with the dowel pin hole of the oil pan.

10. Install the oil pan on the transaxle case (1). Install and tighten the mounting bolts to 8 N·m (70 in.lbs.).



NOTE: Only transmission fluid of the type labeled Mopar® CVTF+4 (Automatic Transmission Fluid) should be used in this transaxle.

11. Check the oil level (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/FLUID - STANDARD PROCEDURE)

BODY-VALVE

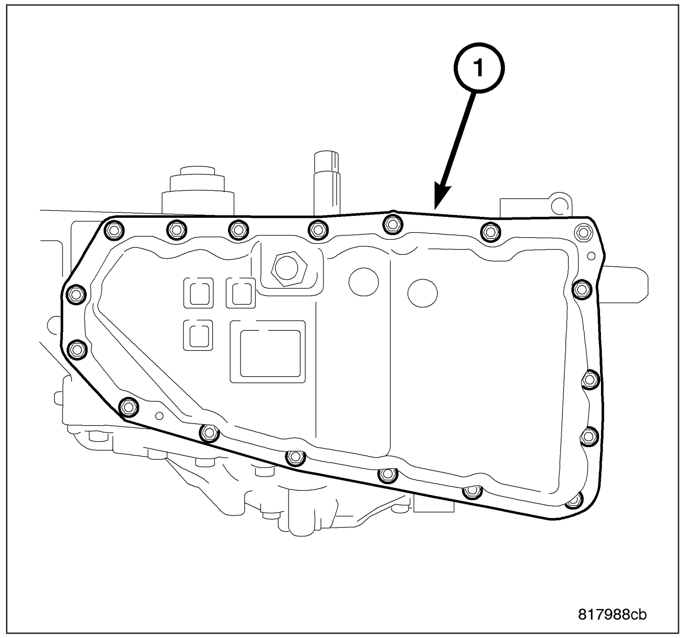
OPERATION

Outline of the Functions of the Main Components

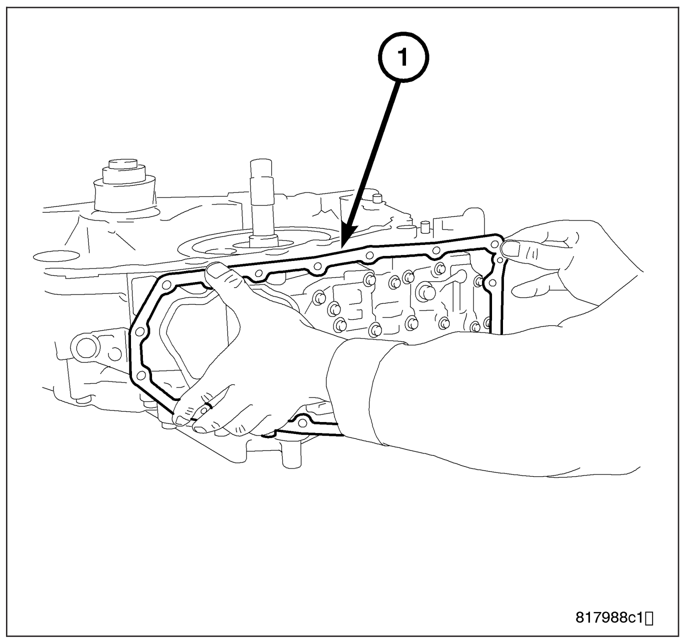
Component	Function
Torque converter regulator valve	Optimizes the supply pressure for the torque converter depending on driving conditions.
Clutch regulator valve	Adjusts the clutch operating pressure depending on operating conditions.
Pressure regulator valve	Optimizes the discharge pressure (line pressure) from the oil pump depending on driving conditions.
Shift control valve	Controls flow-in/out of line pressure to/from the primary pulley depending on the stroke difference between the stepping motor and the primary pulley.
Lock-up/Select switch solenoid valve	Switches use of the lock-up solenoid control pressure between applying/releasing lock-up and engaging/ releasing the forward/reverse clutch (the forward clutch and the reverse brake).
Select switch valve	Switches use of the lock-up solenoid control pressure between applying/releasing lock-up and engaging/ releasing the forward/reverse clutch (the forward clutch and the reverse brake).
Line pressure solenoid valve	Controls the line pressure control valve.
Lock-up solenoid valve	Controls the lock-up control valve.
Lock-up/Select switch solenoid valve	Controls the select switching valve.
Stepping motor	Controls the pulley ratio.
Secondary valve	Reduces the line pressure and adjusts the secondary pressure.
Select control valve	Engages when making a selection. Adjusts the forward clutch pressure and the reverse brake pressure.
Lock-up control valve	Adjusts engaging/releasing pressure for the torque converter.
Secondary pressure solenoid valve	Controls flow-in/out of line pressure to/from the secondary pulley depending on driving conditions.

REMOVAL

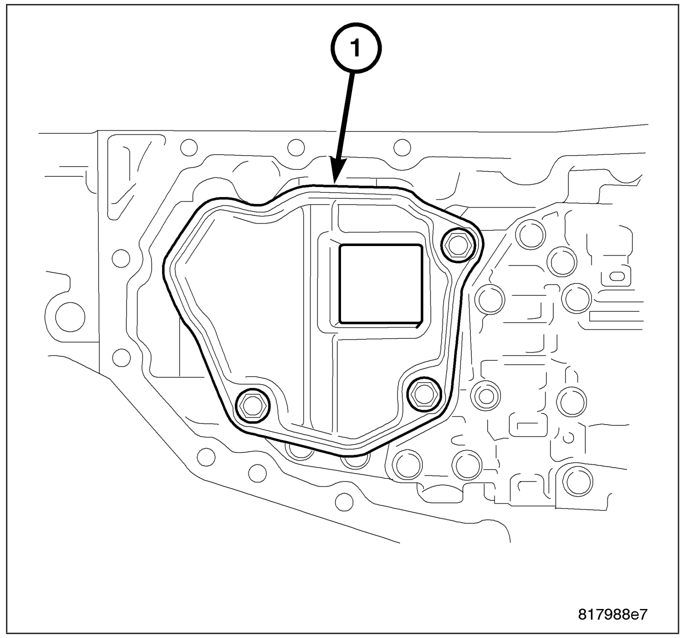
1. Remove the bolts holding the oil pan (1) to the transaxle case.
2. Remove the oil pan from the transaxle case.



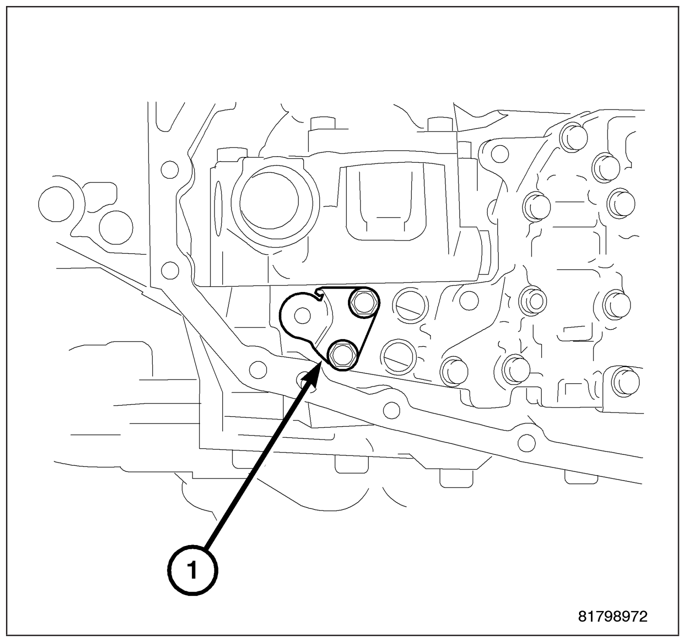
3. Remove the oil pan gasket (1) from the transaxle case.



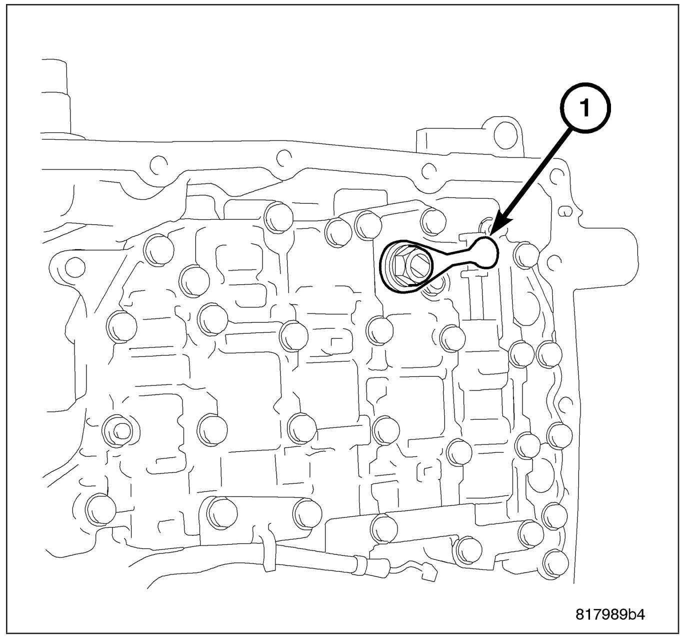
4. Remove the bolts holding the oil strainer (1) to the valve body.
5. Remove the oil strainer.
6. Remove and discard the oil strainer o-ring.



7. Remove the bolts holding the bracket (1) to the valve body assembly.
8. Remove the bracket from the valve body assembly.

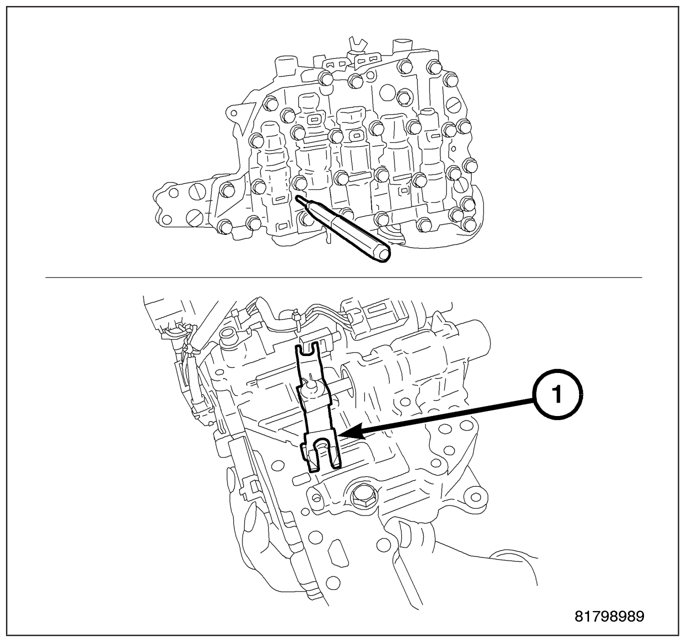


9. Remove the nut holding the manual lever (1) to the manual shaft.
10. Remove the manual lever from the manual shaft.



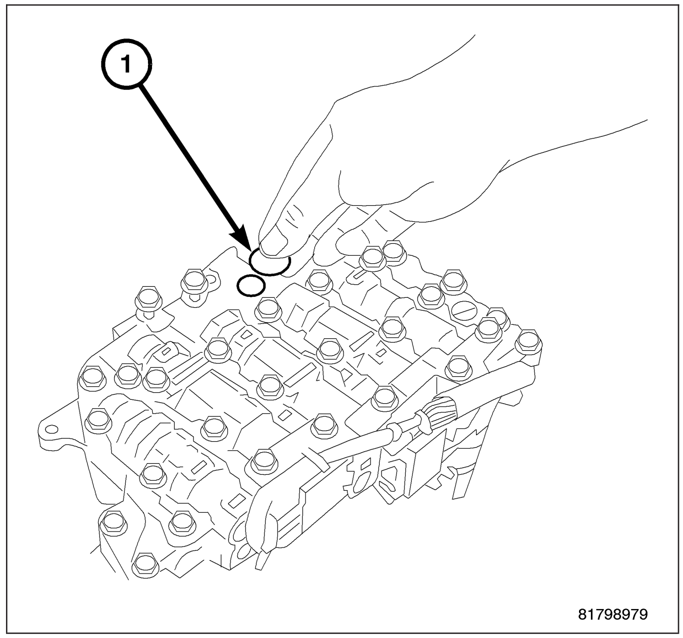
CAUTION: Tilt the valve body assembly away from the transaxle case on the manual shaft side to ease removal. Pay attention to completely remove the terminal body from the transaxle case.

11. Remove the valve body assembly from the transaxle case as follows:
    a. Insert a 75 mm (3 in.) long 3 mm (0.118 in.) rod or wire into the linkage stopper hole of the valve body assembly to fix the pulley ratio linkage (1).
    b. Remove the bolts holding the valve body assembly to the transaxle case.
    c. Remove the valve body assembly from the transaxle case.

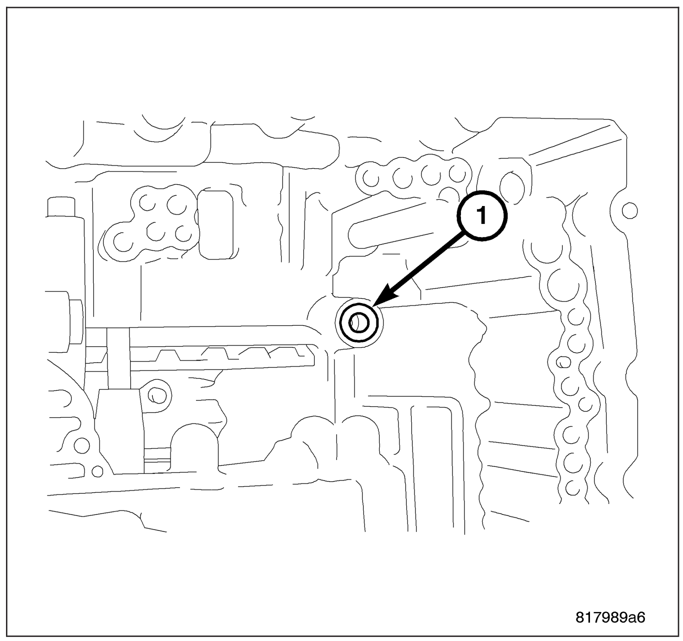


DISASSEMBLY

1. Remove and discard the bushing (1) from the valve body.

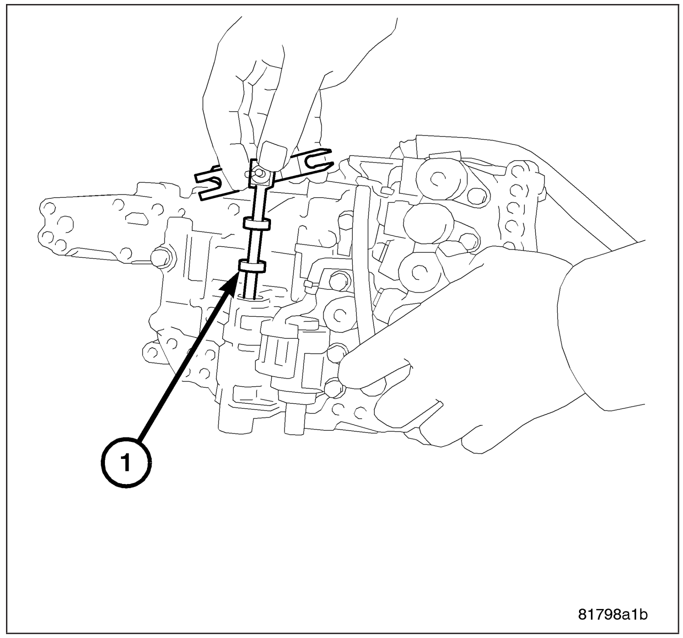


2. Remove and discard the lip seal (1) from the trans-axle case.

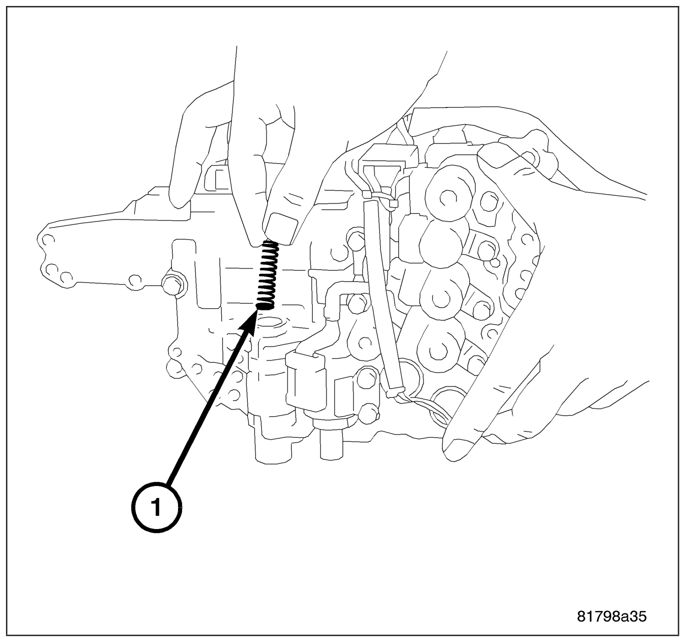


CAUTION: Do not drop the pulley ratio linkage.

3. Remove the pulley ratio linkage (1) from the valve body.

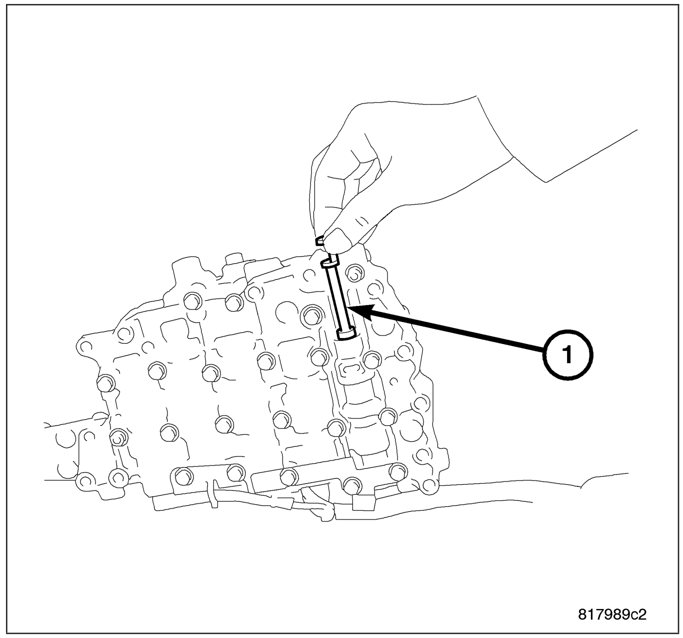


4. Remove the return spring (1) from the valve body.

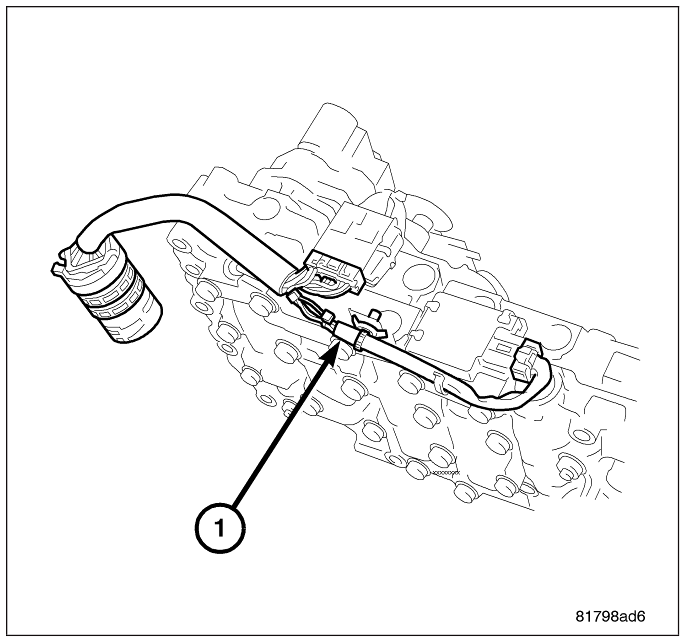


CAUTION: Do not drop the manual valve.

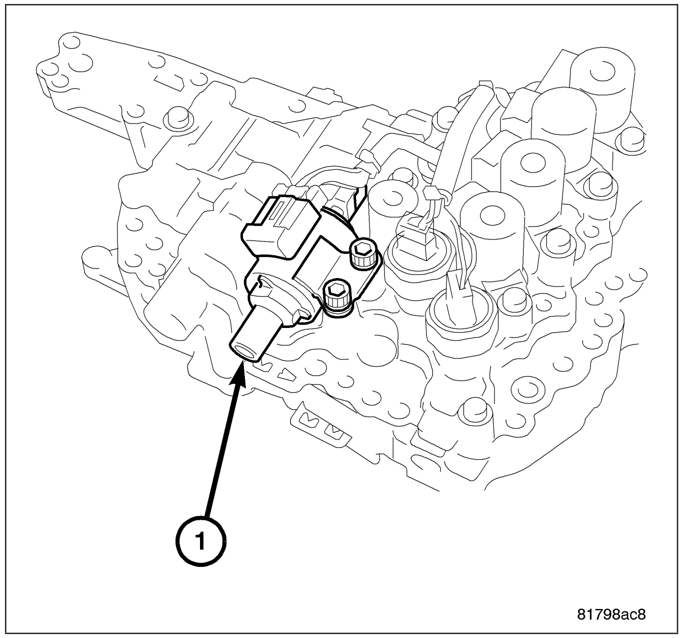
5. Remove the manual valve (1) from the valve body.



6. Remove the valve body harness (1) from the valve body.



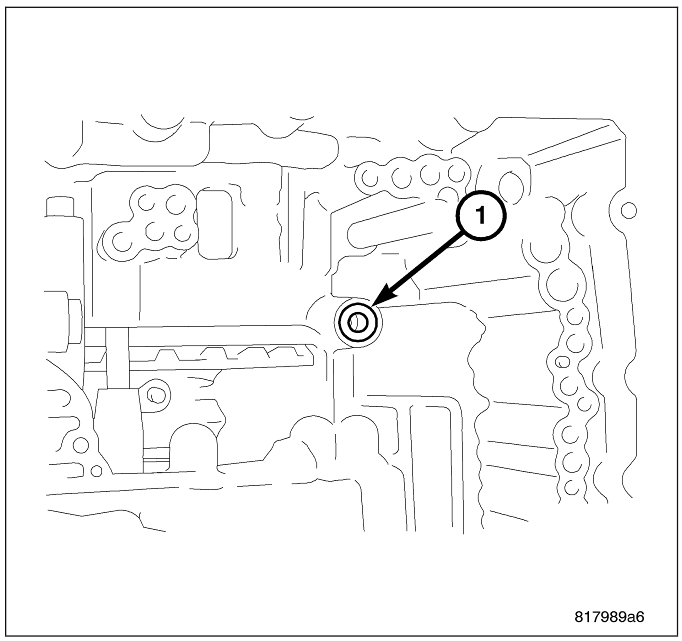
7. Remove the stepping motor (1) from the valve body.



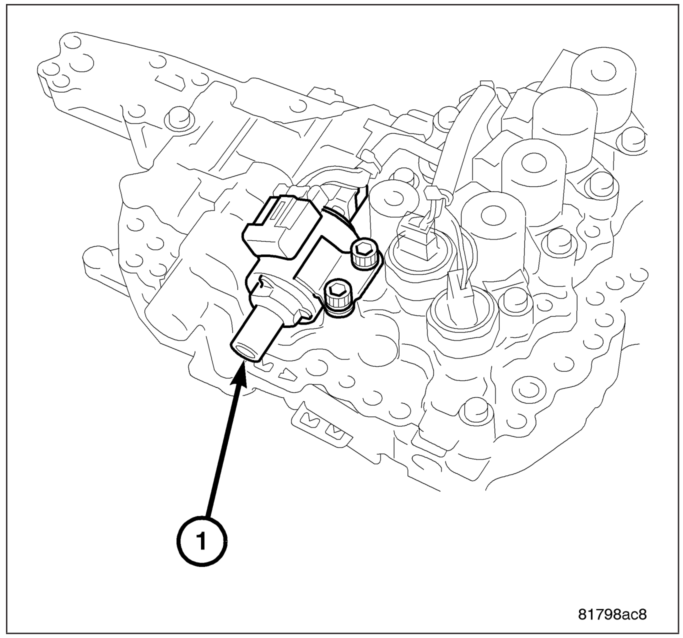
ASSEMBLY

CAUTION: Do not re-use the lip seal. Apply CVT fluid when installing the lip seal.

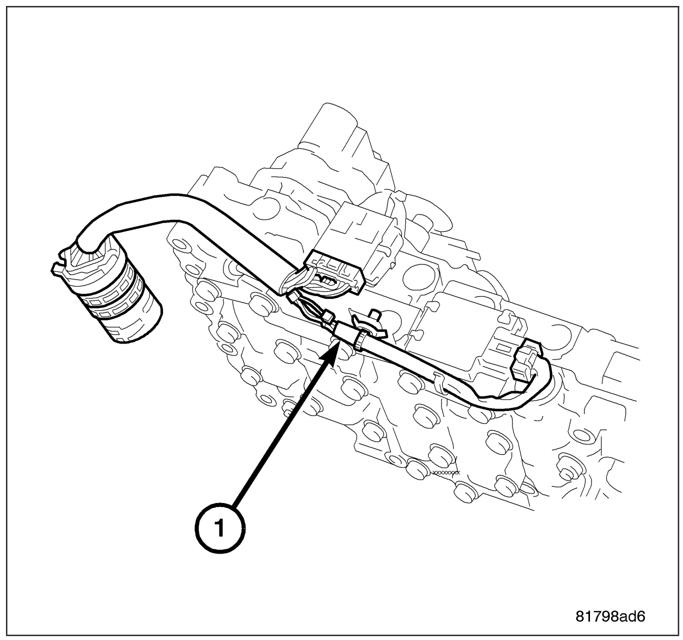
1. Install the new lip seal (1) into the transaxle case.



2. Install the stepping motor (1) onto the control valve body. Install and Torque the mounting bolts to 8 N·m (70 in.lbs.).

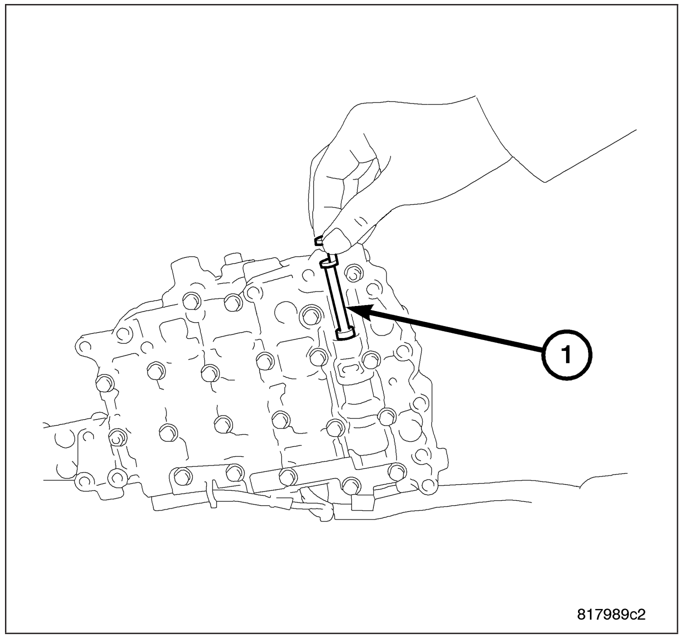


3. Install the valve body harness (1) onto the control valve body.

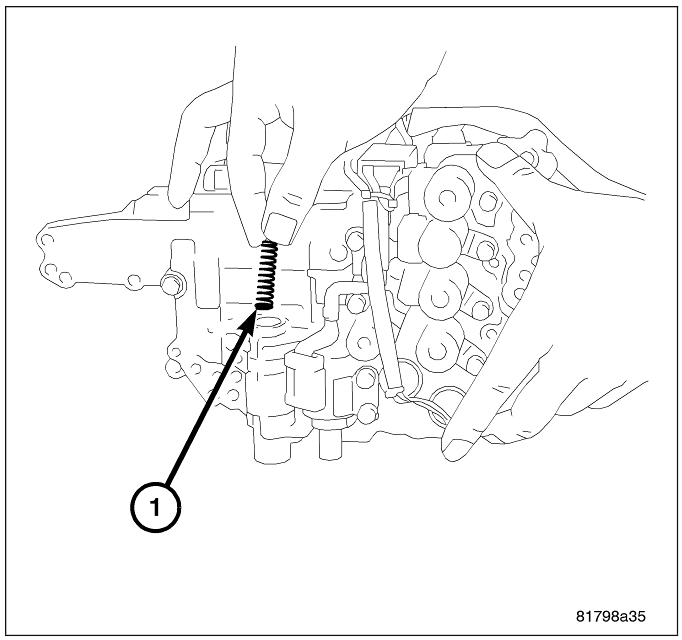


CAUTION: Ensure the manual valve is free of dirt, lint or other debris. Apply CVT fluid when installing the manual valve.

4. Install the manual valve (1) into the control valve body.

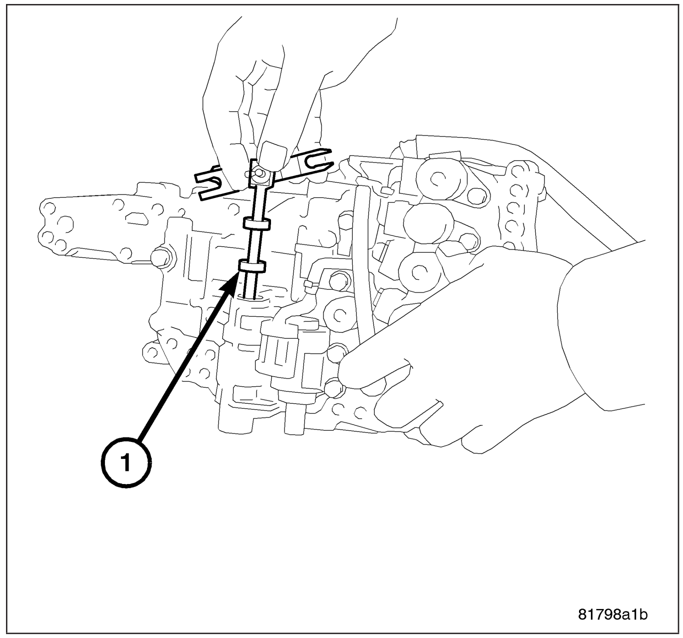


5. Install the return spring (1) into the control valve body.



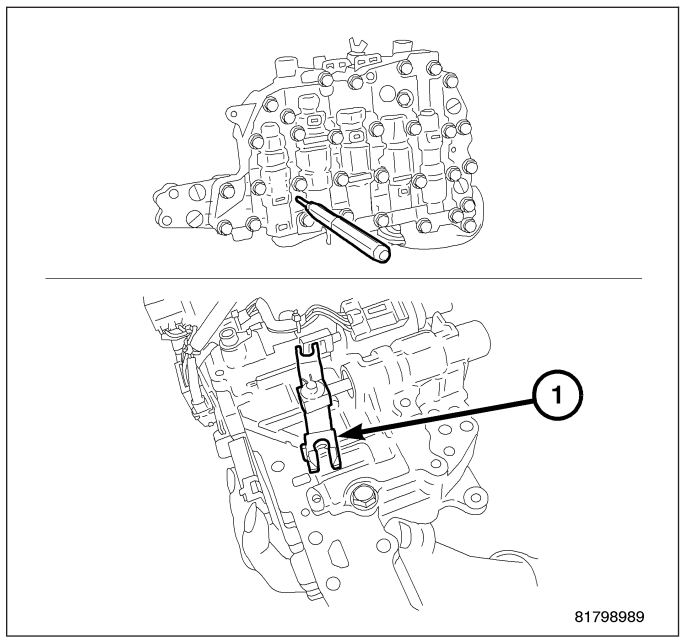
CAUTION: Apply CVT fluid when installing the pulley ratio linkage.

6. Hook the pawl of the pulley ratio linkage (1) onto the stepping motor and install it on the control valve.

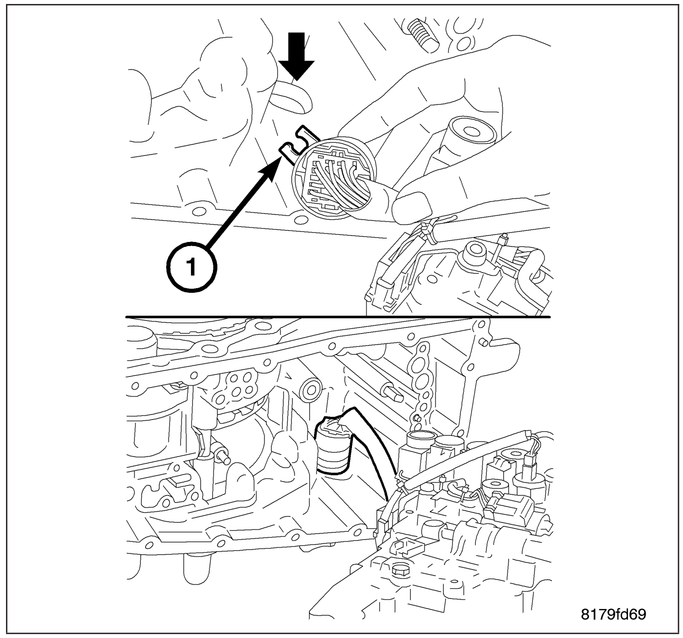


INSTALLATION

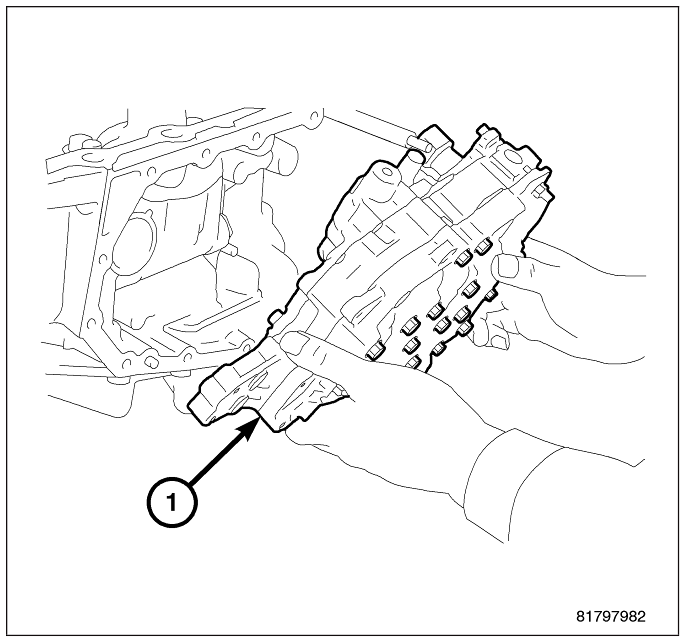
1. To install the control valve body assembly on to the transaxle case, insert a 75 mm (3 in.) long 3 mm (0.118 in.) rod or wire into the linkage stopper hole of the control valve assembly to set the pulley ratio linkage (1) in position.



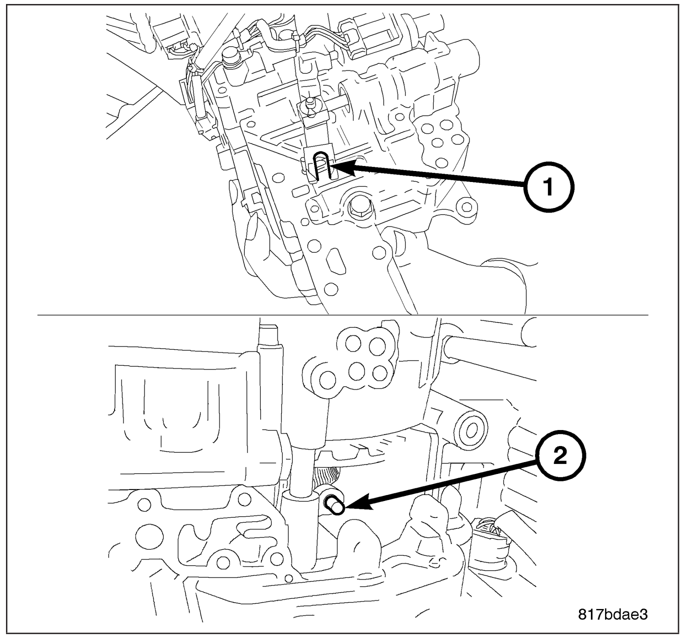
2. Position the locating tab (1) of the terminal body as shown and install the terminal body into the transaxle case.



3. Install the control valve assembly (1) up from the bottom side and install it into the transaxle case.

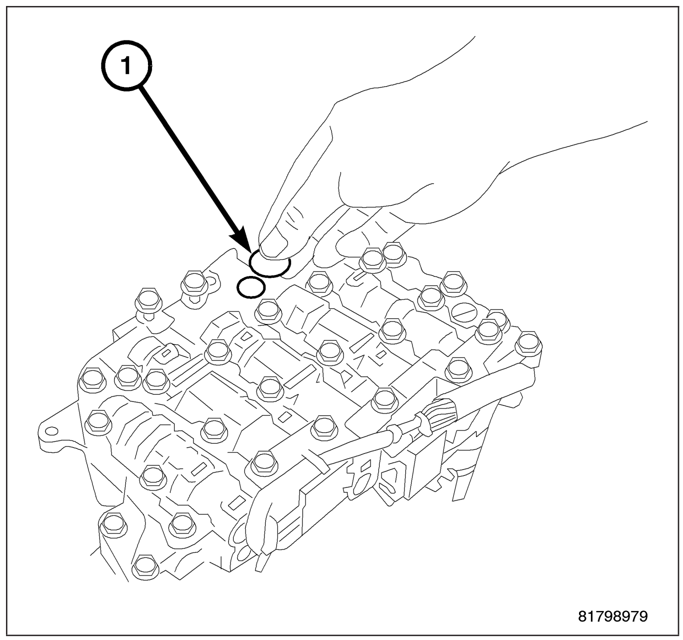


4. Align the notch (1) of the pulley ratio linkage with the sheave position sensor (2).

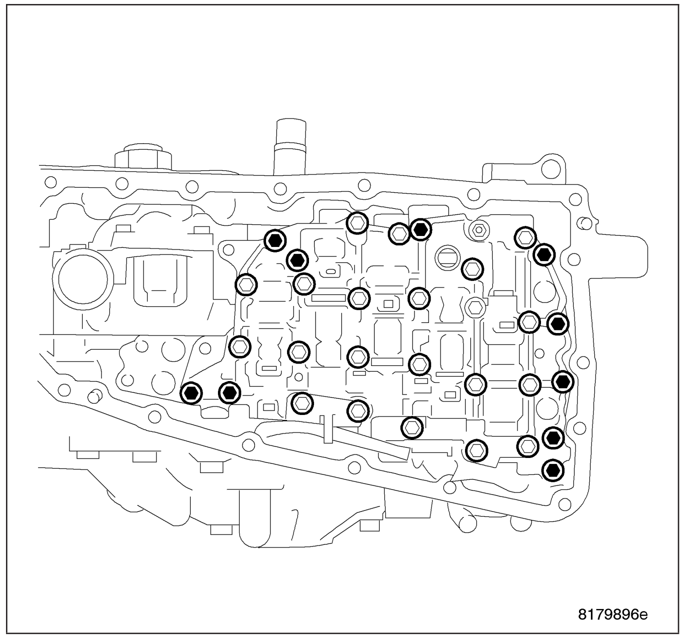


CAUTION: Apply CVT fluid when installing the bushing.

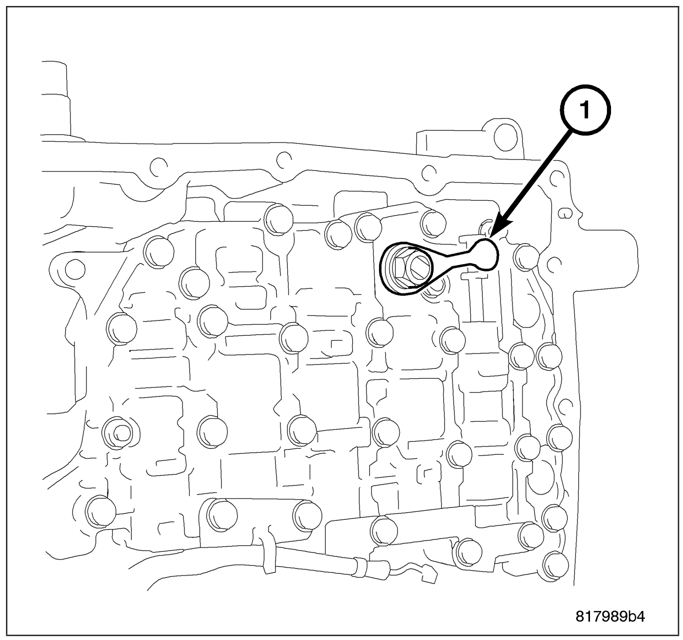
5. Install the bushing (1) into the control valve assembly.



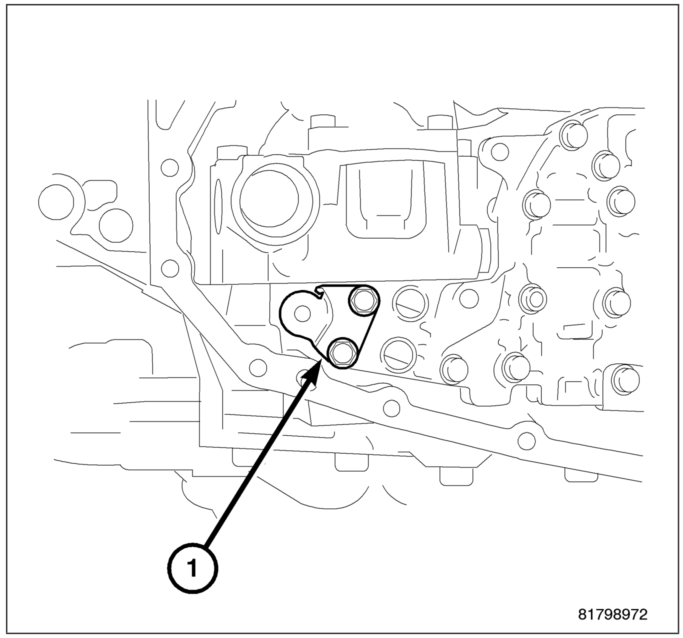
6. Torque the mounting bolts of the control valve body assembly to 8 N·m (70 in.lbs).



7. Install the manual lever (1) onto the manual shaft. Install and torque the mounting nut to 22 N·m (16 in. lbs.).

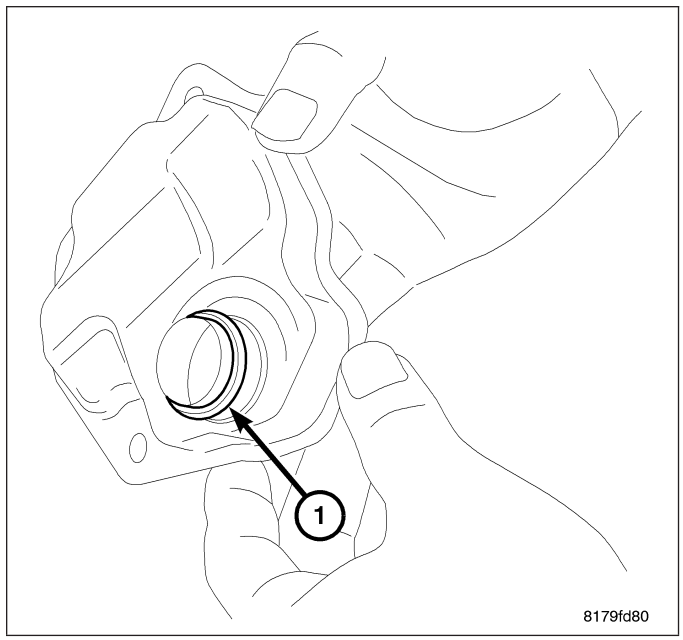


8. Install the bracket (1) onto the control valve assembly. Install and tighten the mounting bolts to 8 N·m (70 in. lbs.).

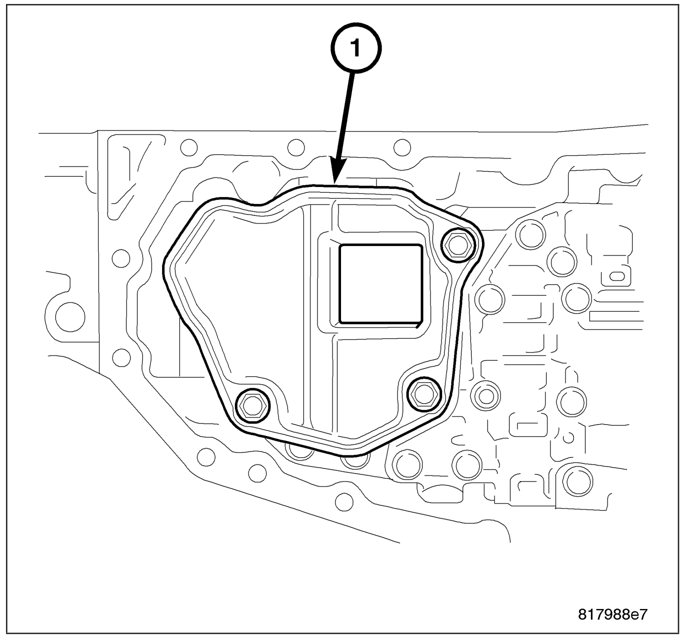


CAUTION: Do not re-use the o-ring. Apply CVT fluid when installing the o-ring.

9. Install the new o-ring (1) onto the new oil strainer.

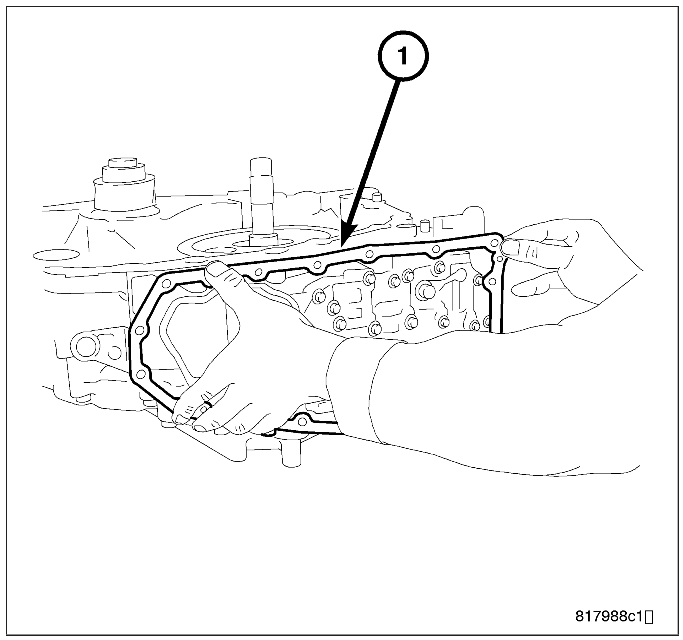


10. Install the new oil strainer (1) onto the control valve assembly. Install and torque the mounting bolts to 8 N·m (70 in. lbs.).



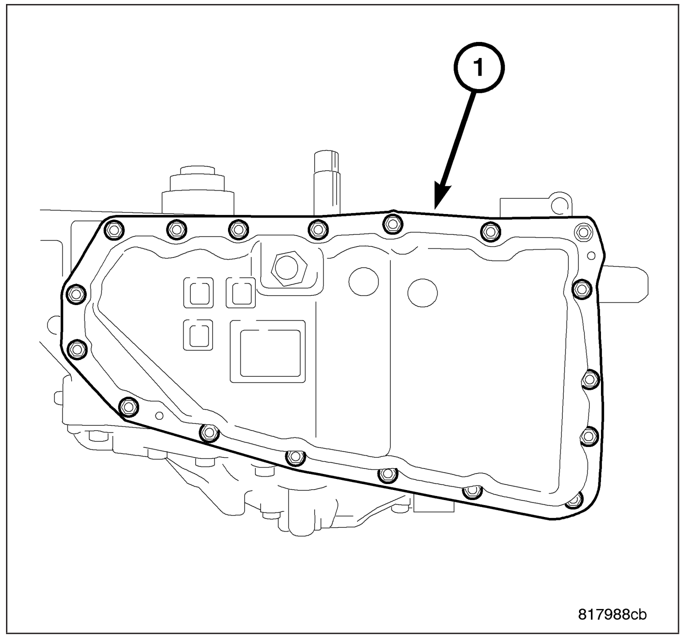
CAUTION: Do not re-use the oil pan gasket. Remove any moisture, oil, and used gasket material from the surface where the new gasket is to be installed. When installing the oil pan gasket, align the dowel pin with the dowel pin hole in the oil pan gasket.

11. Install the oil pan gasket (1) onto the transaxle case.

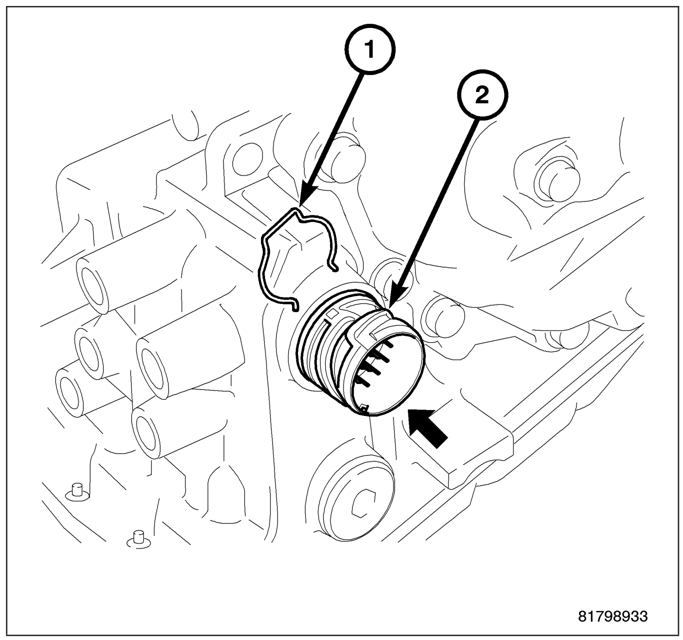


CAUTION: When installing the oil pan, align the dowel pin of the transaxle case with the dowel pin hole of the oil pan.

12. Install the oil pan on the transaxle case (1). Install and torque the mounting bolts to 8 N·m (70 in. lbs.).



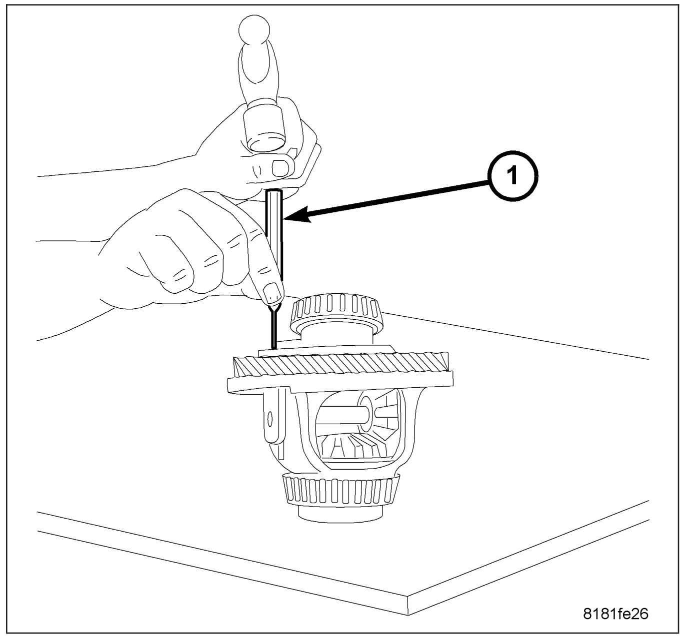
13. Install the snap ring (1) onto the terminal body.
14. Fill transmission with the required fluid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/FLUID - STANDARD PROCEDURE)



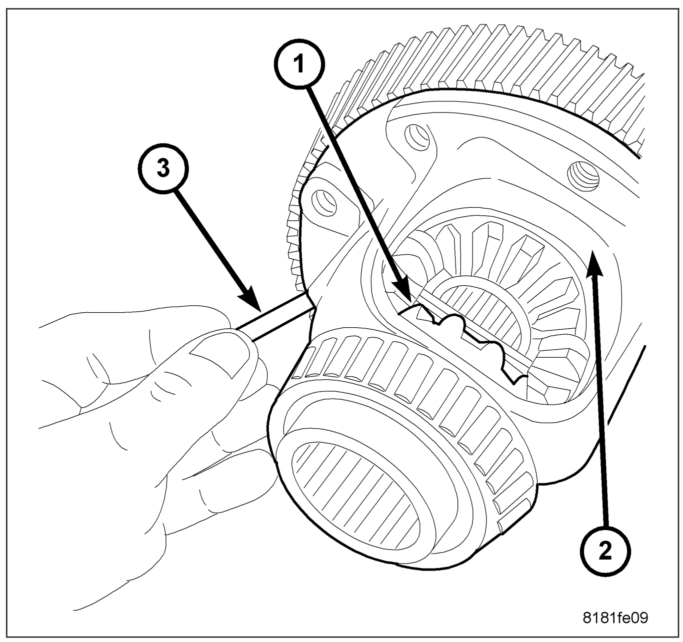
DRIVE-FINAL

DISASSEMBLY

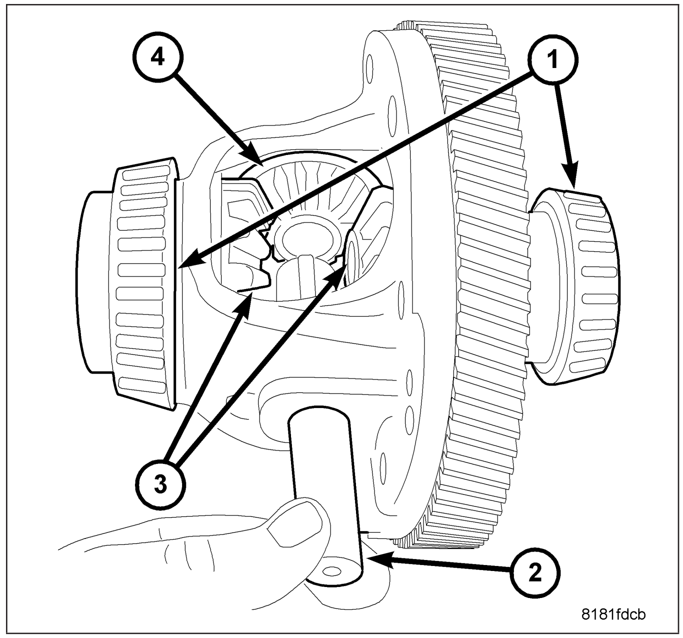
1. Remove the roll pin using a pin punch (1).



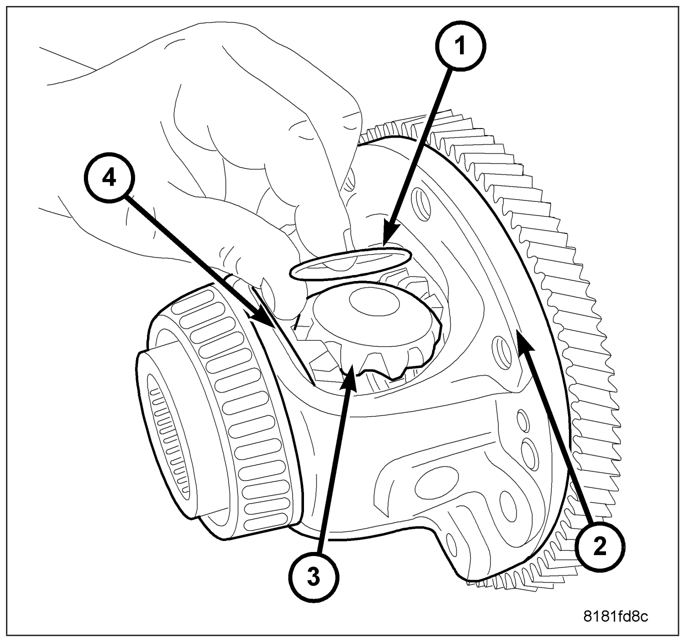
2. Discard the old roll pin (3).



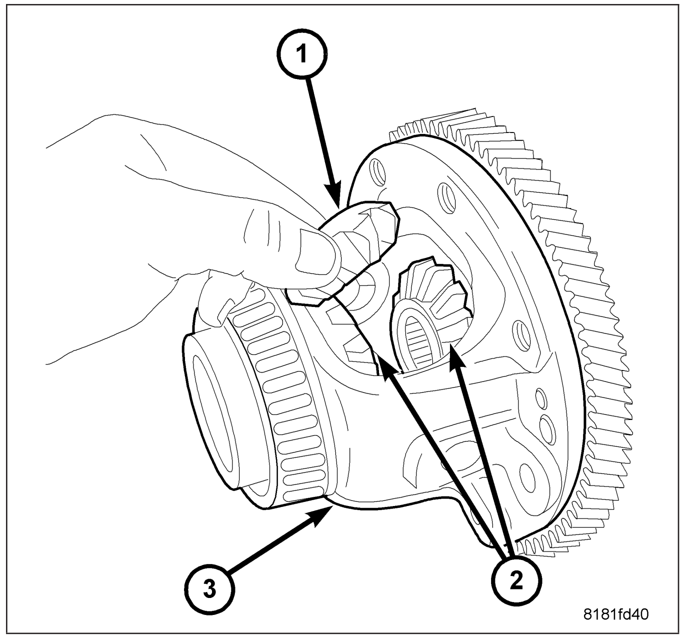
3. Remove the pinion shaft (2) and inspect for excessive ware.



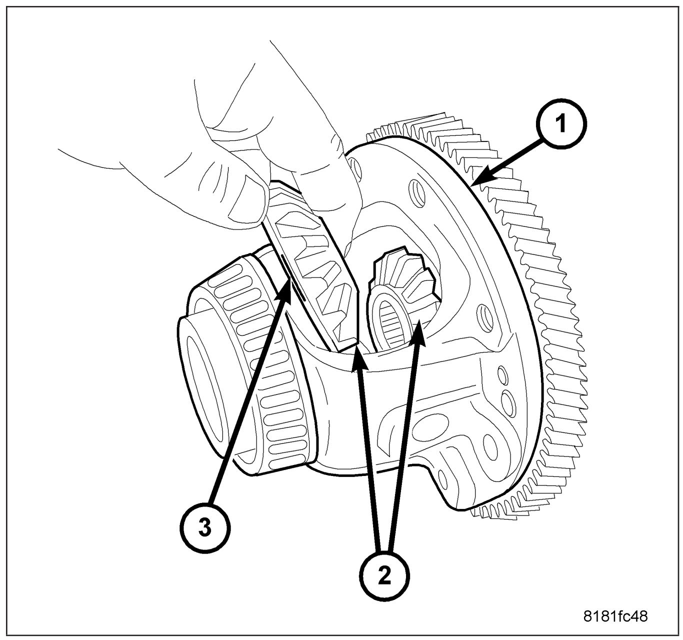
4. Roll the pinion gears (3)and shims (1) out of the carrier (2).
5. Remove the pinion gear shims (1) and mark for installation.



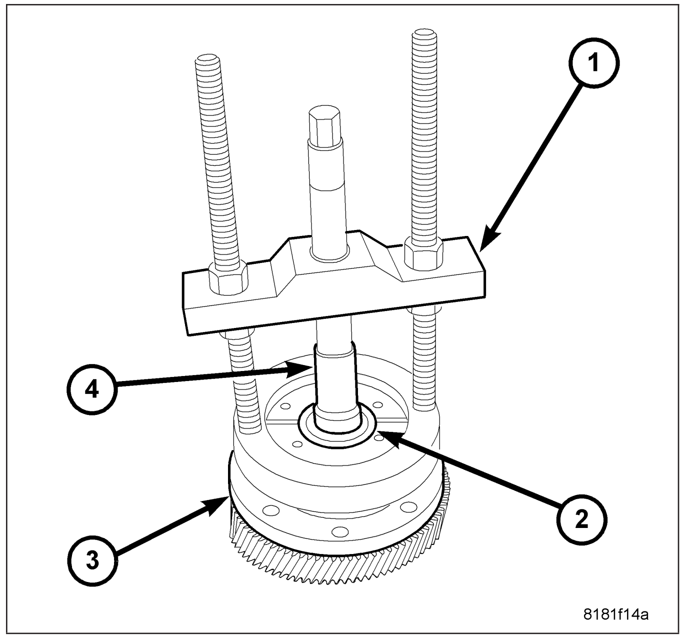
6. Remove the pinion gears (1) from the carrier (3).



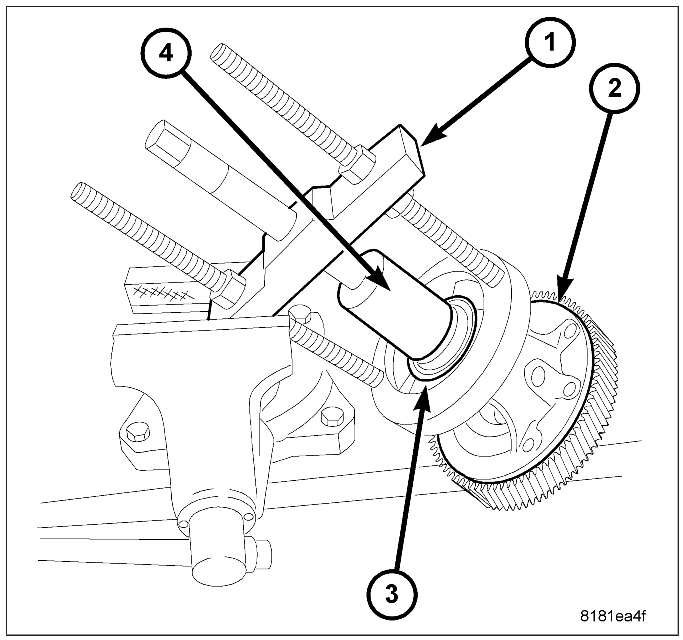
7. Remove the side gears (2) and shims (3) from the carrier.



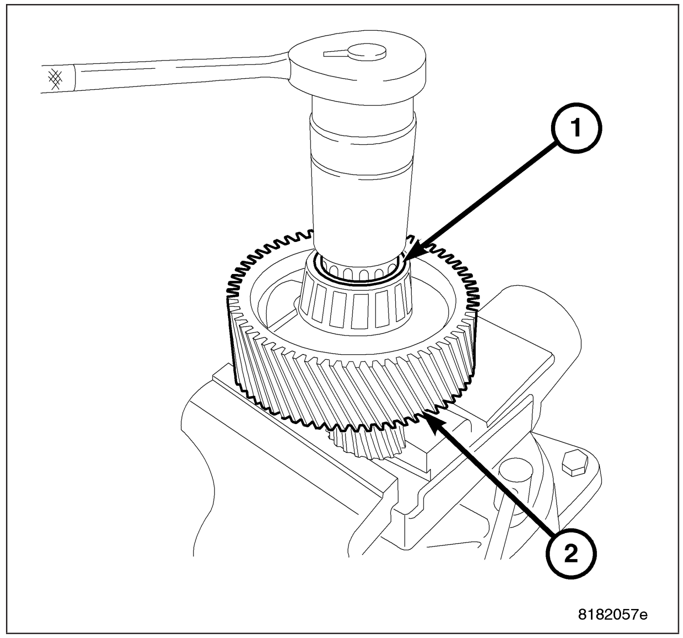
8. If the vehicle is a two wheel drive remove the carrier bearings using Puller C-293 PA, six Inserts C-293-40 and Press Insert C-4996.



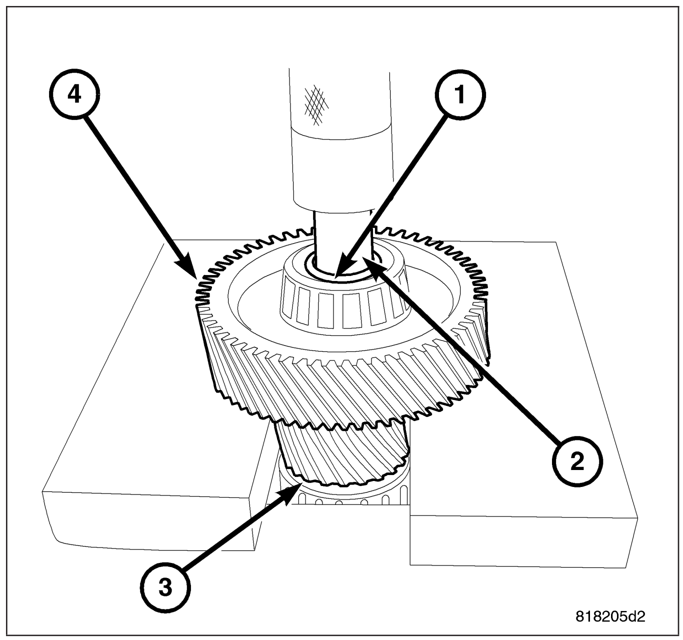
9. If all wheel drive use Puller C-293 PA, six 9613 inserts and Press insert 8888 to remove the carrier bearings.



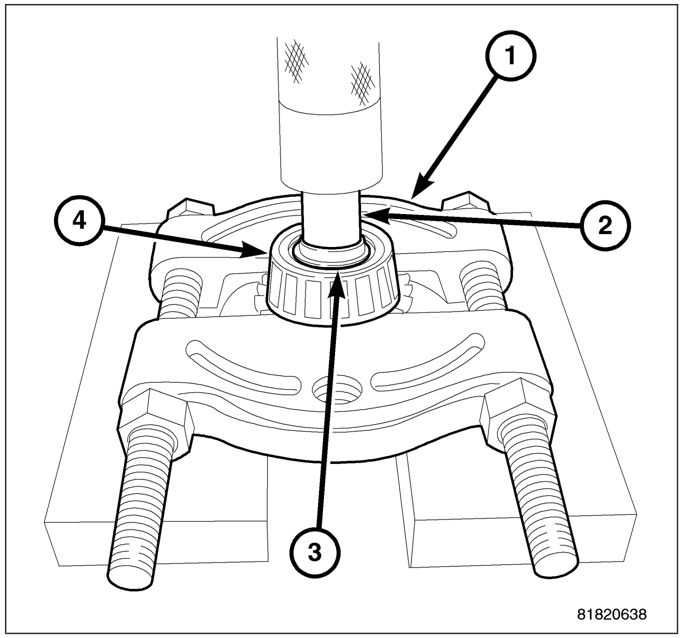
10. Remove the nut (1) on the reduction gear (2).



11. Press the shaft of the small gear (1) using Button 8923 (2), a Press and Blocks to remove from large gear (4).



12. Remove the small side reduction gear bearing (4) using Splitter 1126 (1), Button 8923 (2) and a Press.

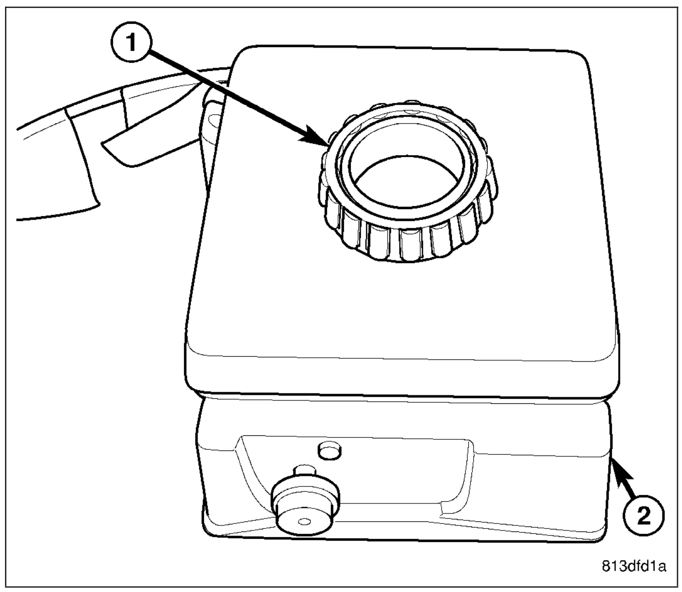


ASSEMBLY

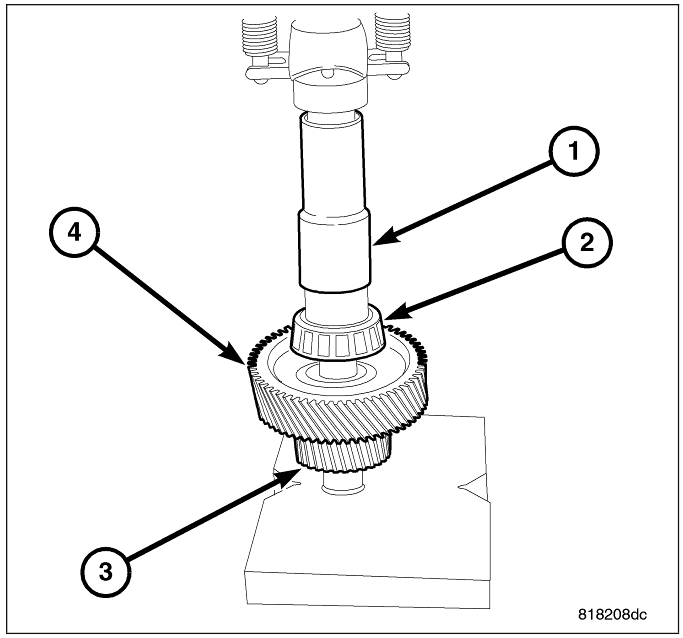
WARNING: Use welding gloves when handling heated components. Failure to follow these instructions will result in personal injury.

CAUTION: A bearing heater is used to assembly some components. Use only a bearing heater/hot plate and follow manufacture's instructions. Heat components to 100 - 177 Celsius (212 deg Min. - 350 deg Max Fahrenheit). Never use an open flame to heat components. Never leave components on heater for an extended amount of time. If component is discolored after heating, the component has been overheated and must not be used. Failure to follow these instructions will result in component damage.

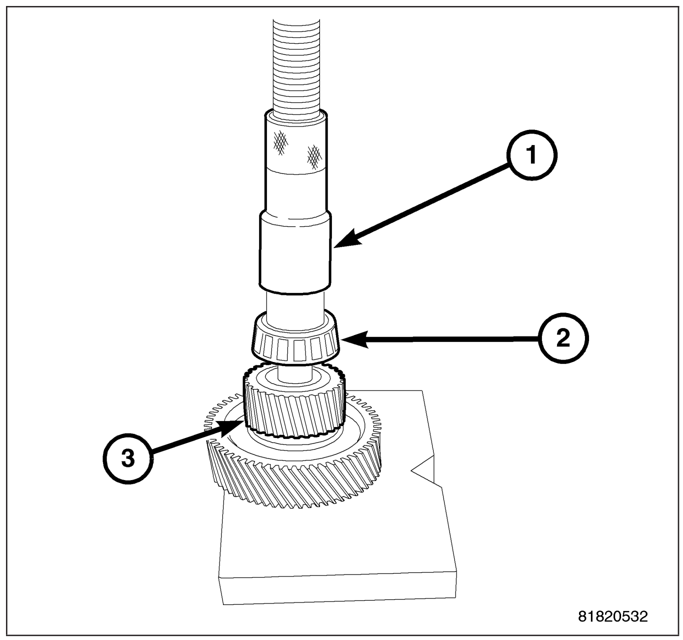
1. A bearing heater may be used in place of a installer.



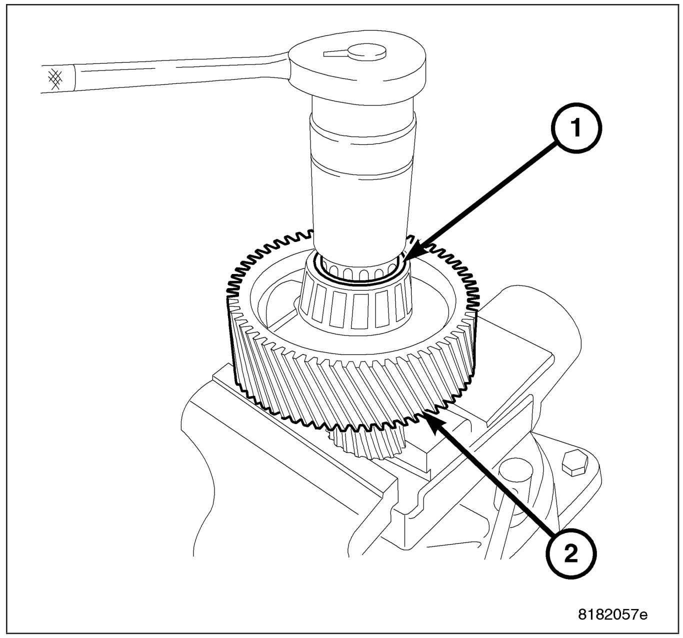
2. Install small gear and shaft (3)onto large gear (4).
3. Using installer L-4507 (1) or a bearing heater install the bearing (2) onto the shaft.



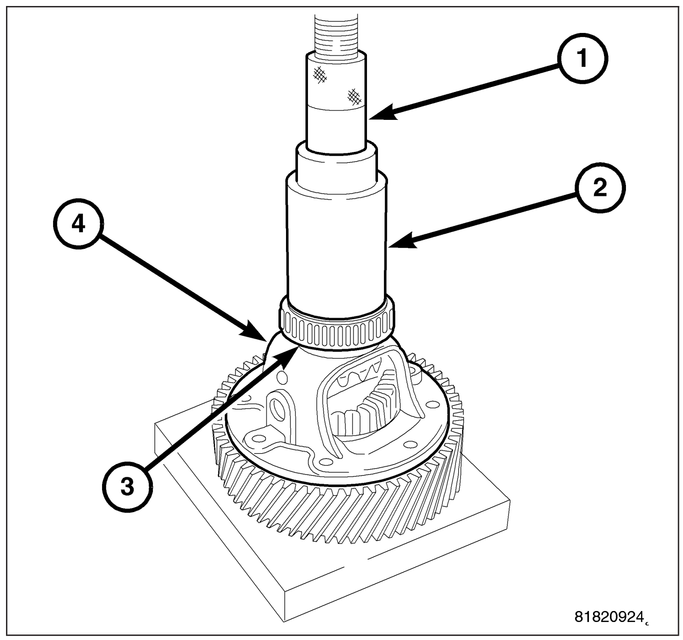
4. Using installer L-4507 (1) or a bearing heater install the small gear side bearing onto the shaft.



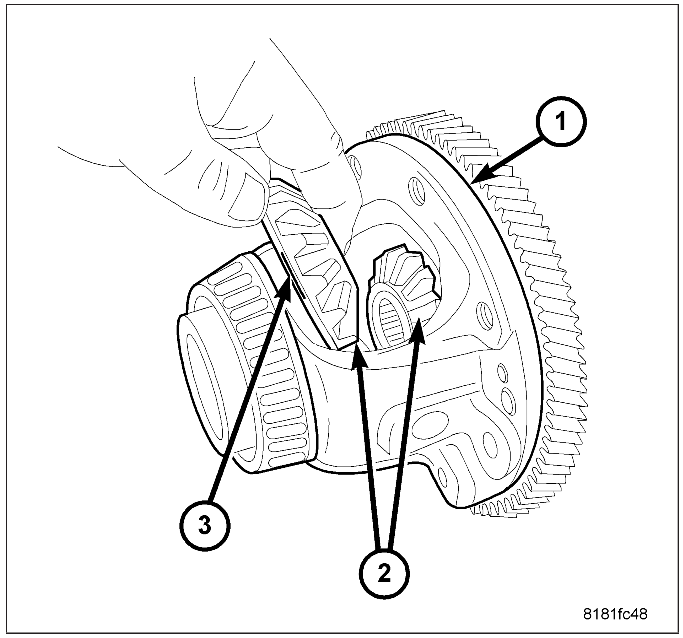
5. Install the new reduction gear nut and torque to 250 N·m (184 ft. lbs.)



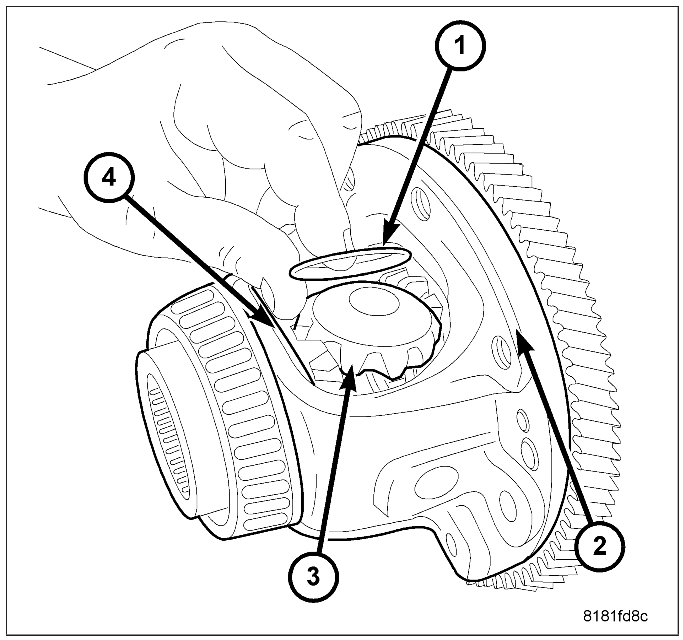
6. For two wheel vehicles use Installer C-3716 A and Handle C-4171 or a bearing heater to install the bearings onto the carrier (both sides). Use installer 9333-2 or a bearing heater on the big bearing and Installer C-3716 A and Handle C-4171 on the small bearing for four wheel drive vehicles.



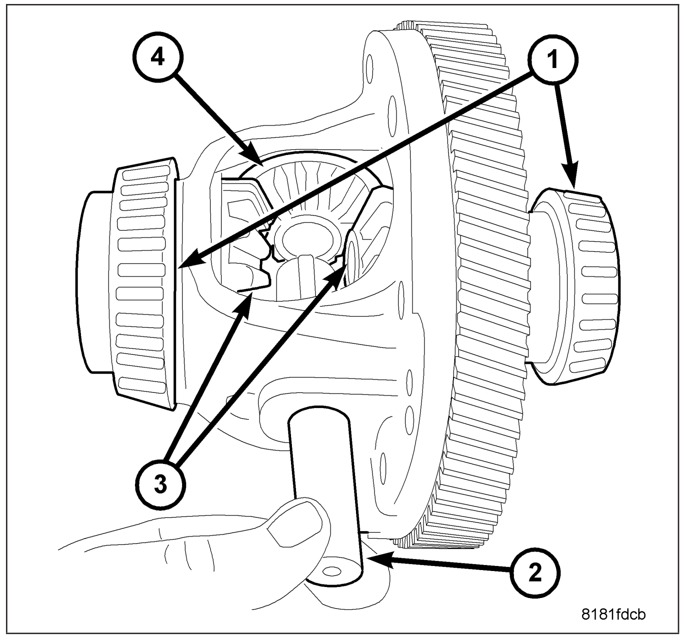
7. Install the side gears (2) and shims (3) onto the carrier.



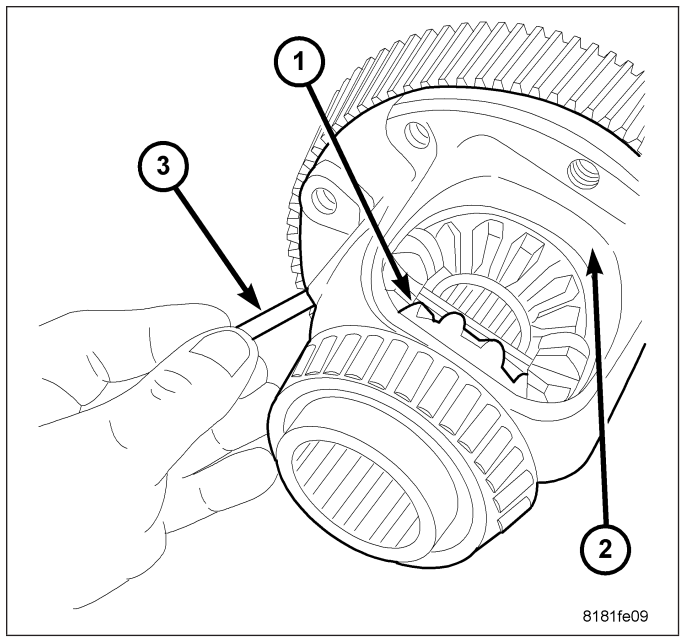
8. Place the pinion gears (3) onto the side gears with the correct shims (1).
9. Roll into place.



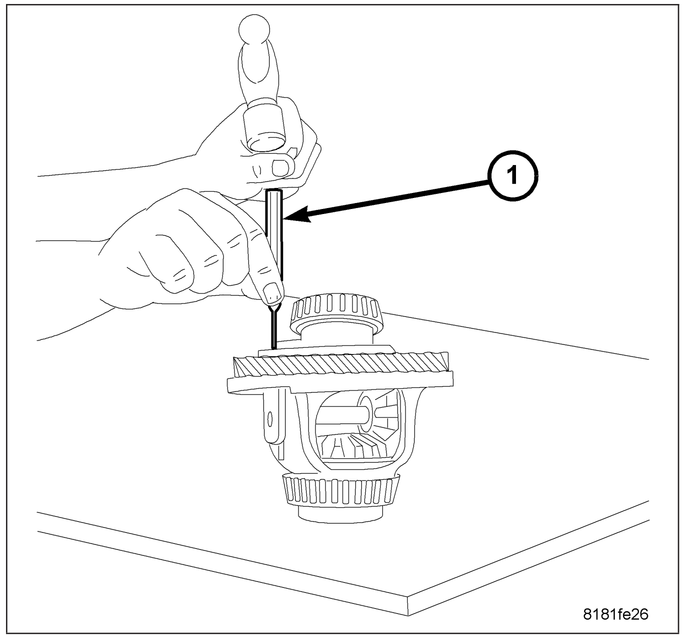
10. Install the pinion shaft (2).



11. Use a new roll pin (3).



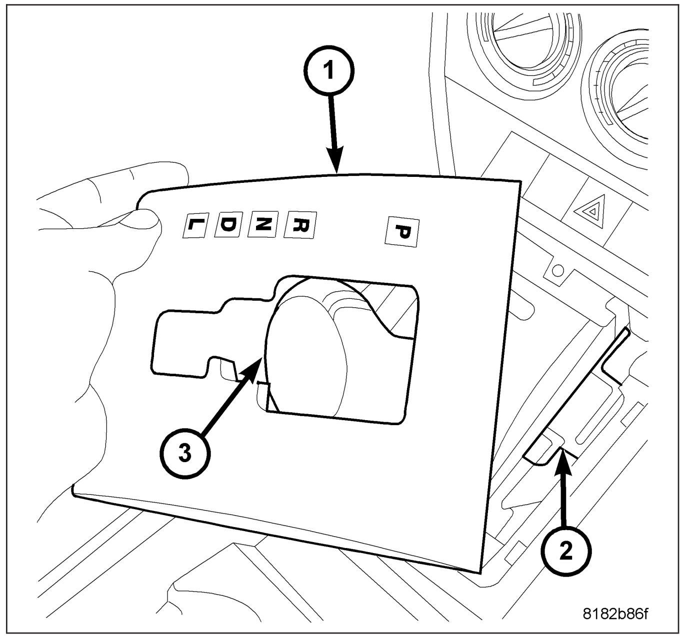
12. Install the roll pin (3) a pin punch (1).



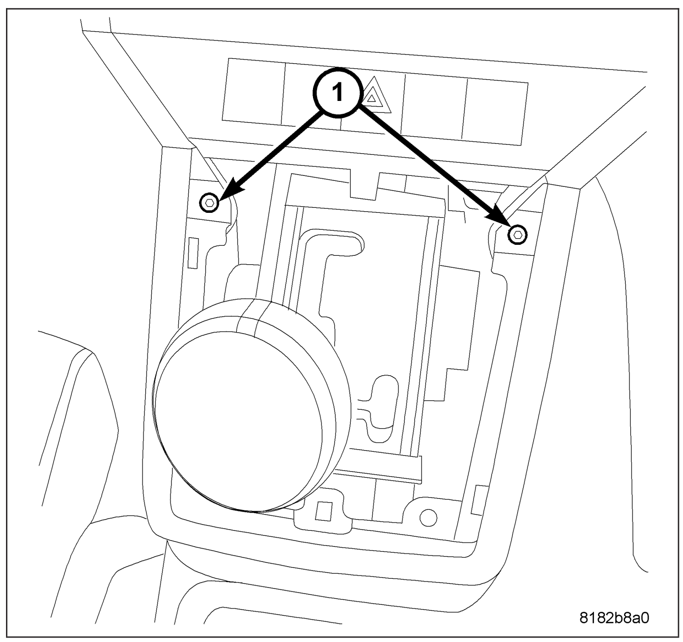
MECHANISM-SHIFT

REMOVAL

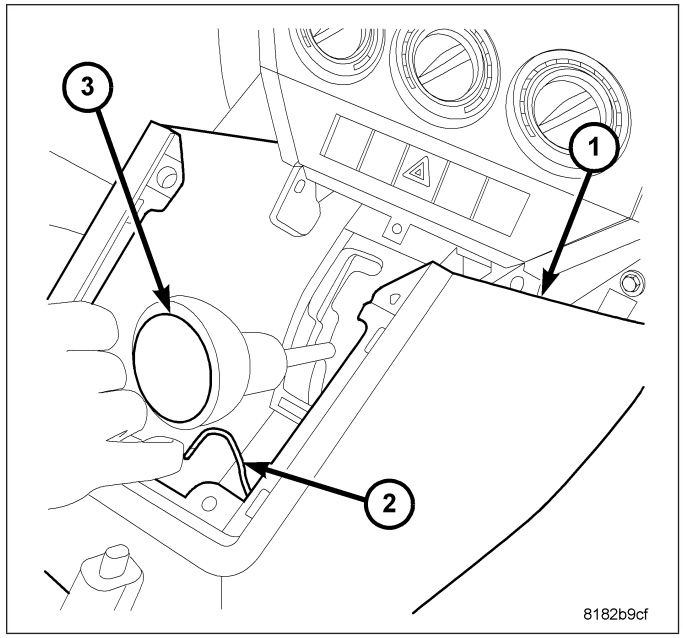
1. Remove the shifter bezel (1).



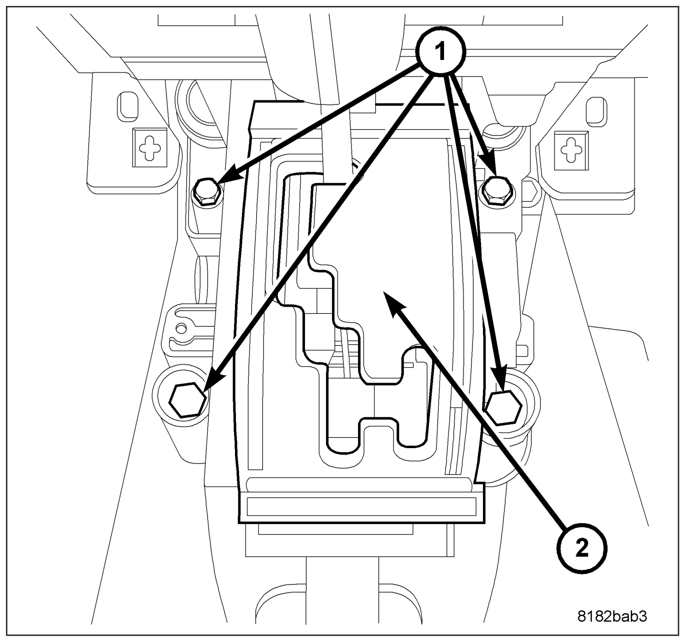
2. Remove the screws (1) at the counsel.



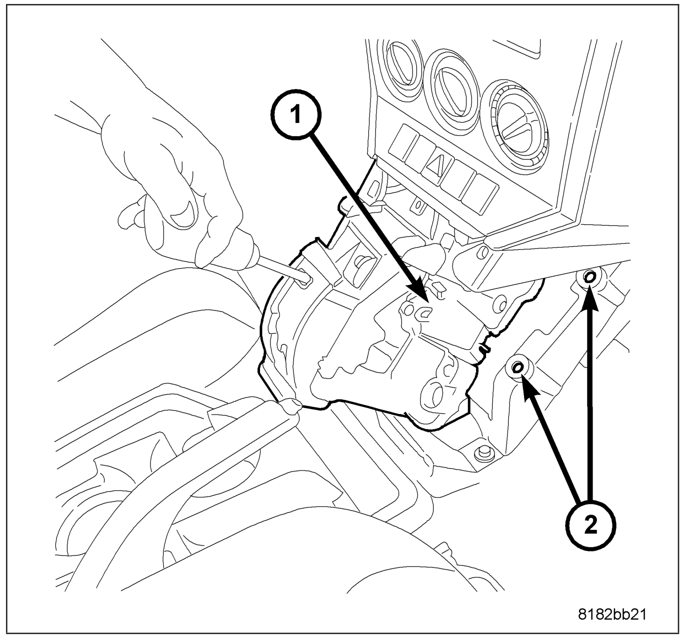
3. Pull the counsel (1) back and remove electrical connector (2) (if equipped).
4. Remove the counsel (1).



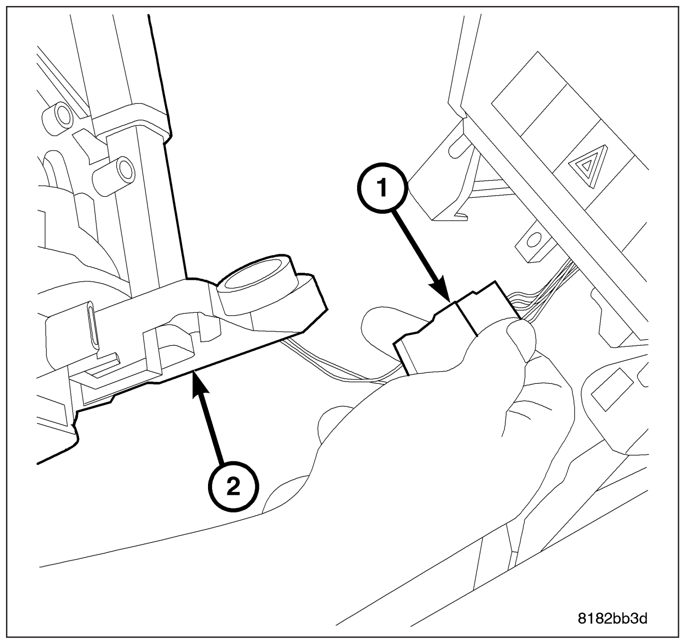
5. Remove the bolts (1) at the shifter.
6. Separate the shift cable from the shifter.



7. Lift the shifter enough to gain access to electrical connector.

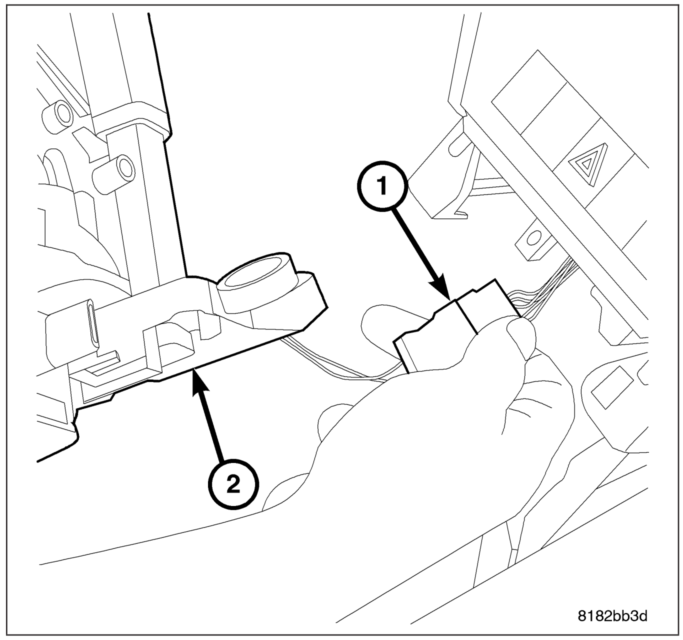


8. Unplug the electrical connector at the shifter.
9. Remove the shifter.

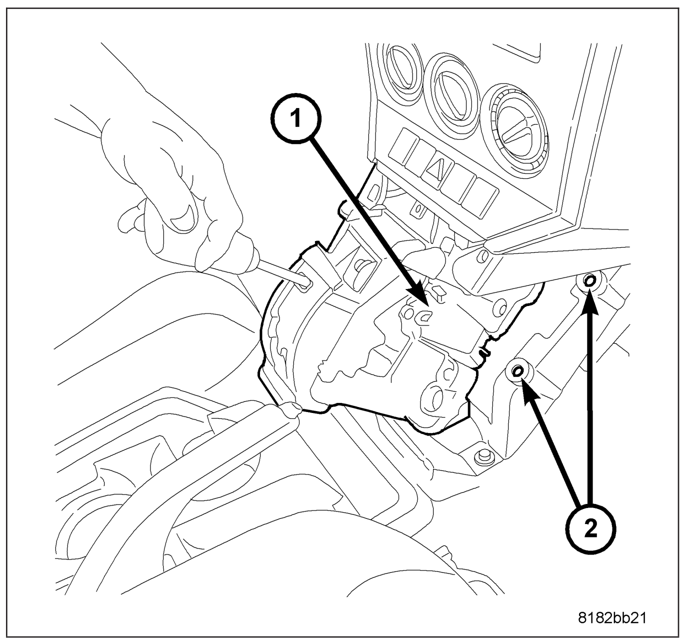


INSTALLATION

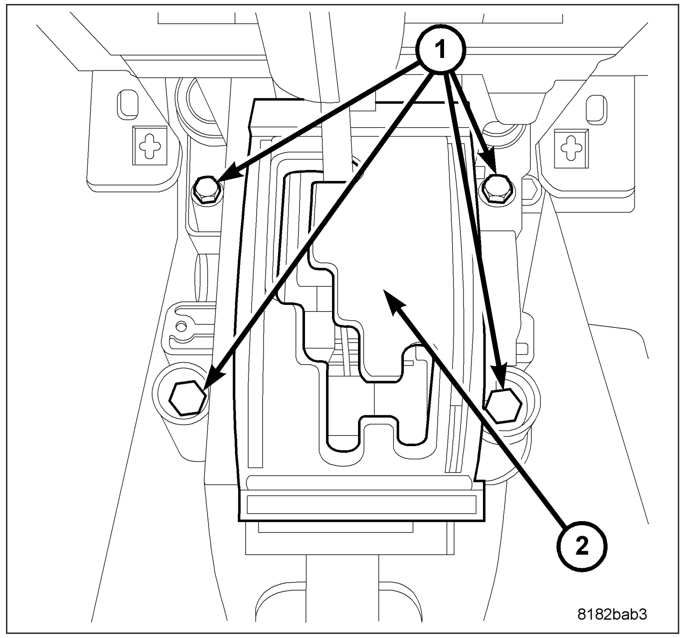
1. Plug the electrical connector in at the shifter.



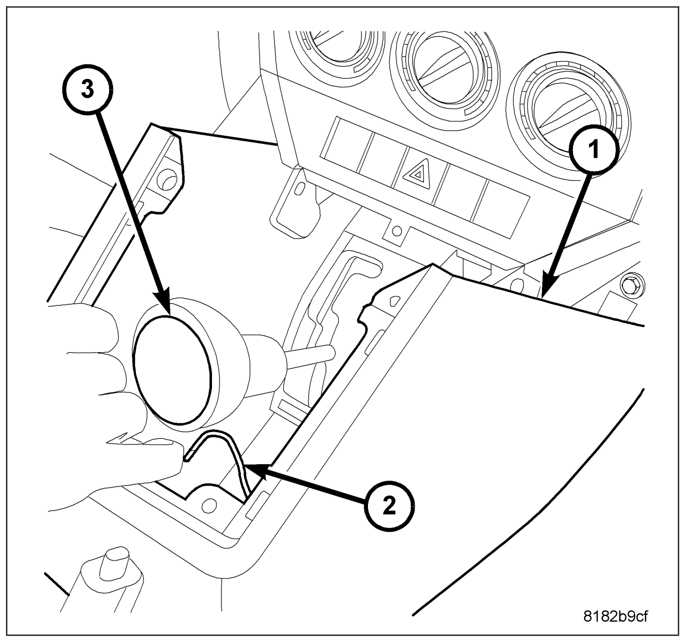
2. Install the shifter in place.
3. Clip the shift cable to the shifter.



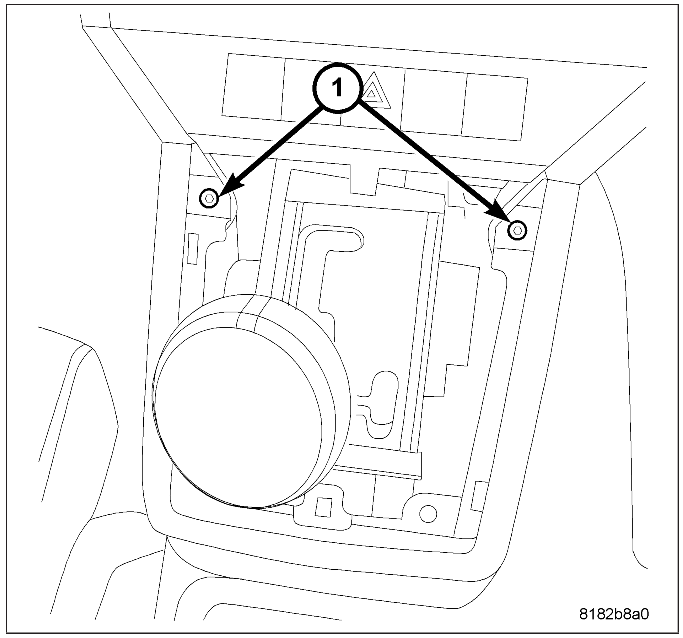
4. Install the shifter bolts and torque to 70 N·m (52 ft. lbs.).



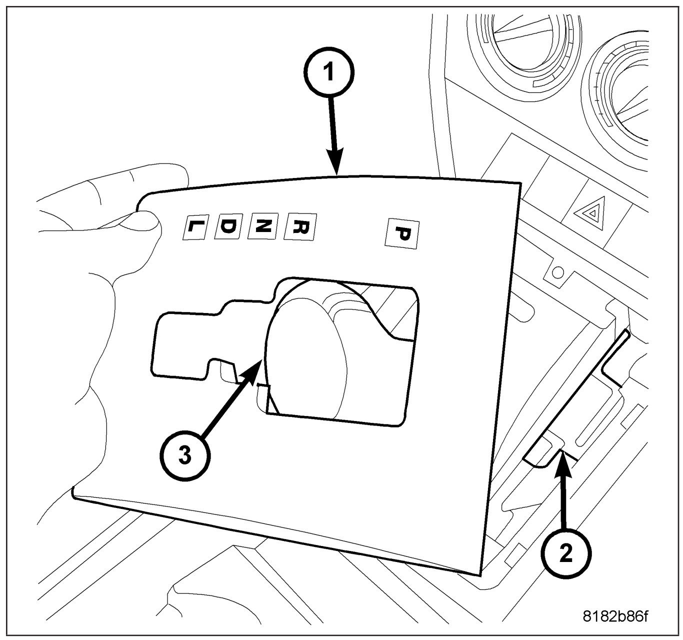
5. Install the counsel (1).
6. Connect the electrical connector (2) (if equipped).



7. Install the screws (1) at the counsel.



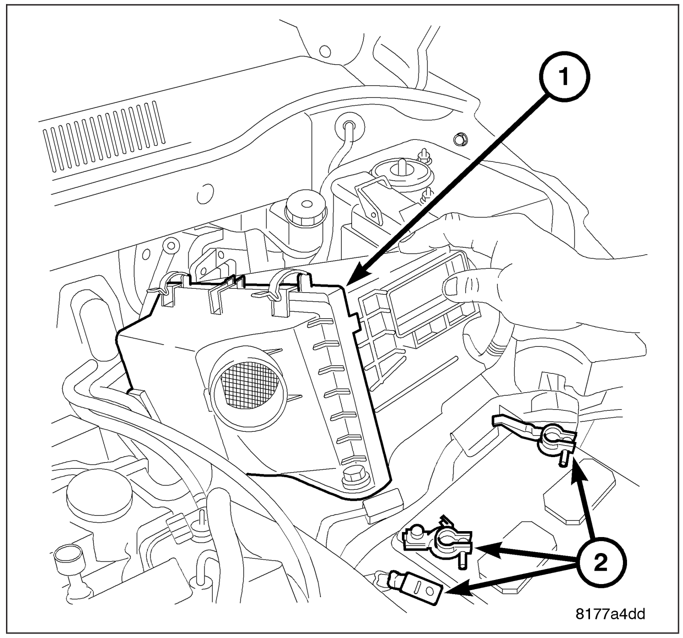
8. Install the shifter bezel (1).



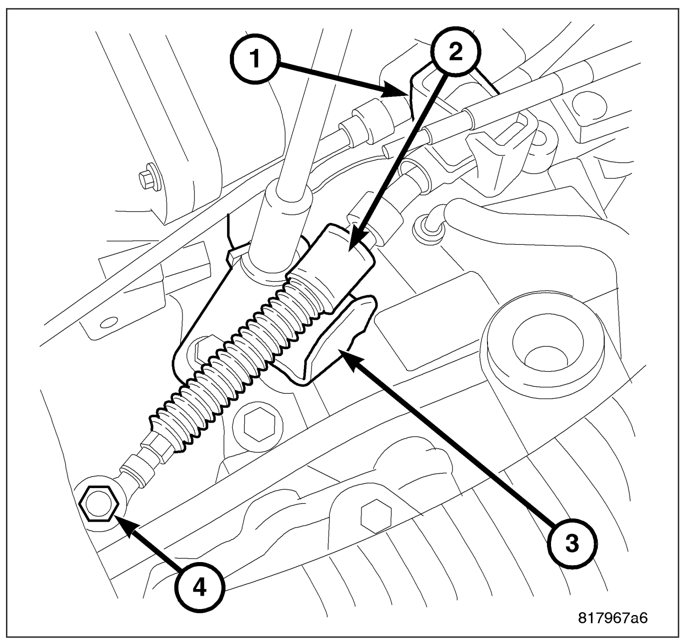
CABLE-GEAR SHIFT

REMOVAL

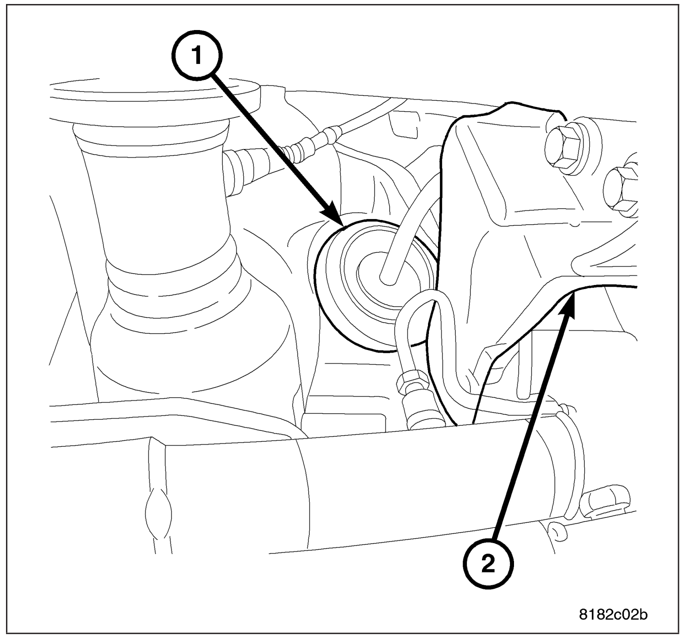
1. Remove the air box (1).
2. Disconnect the Negative battery cable (2).



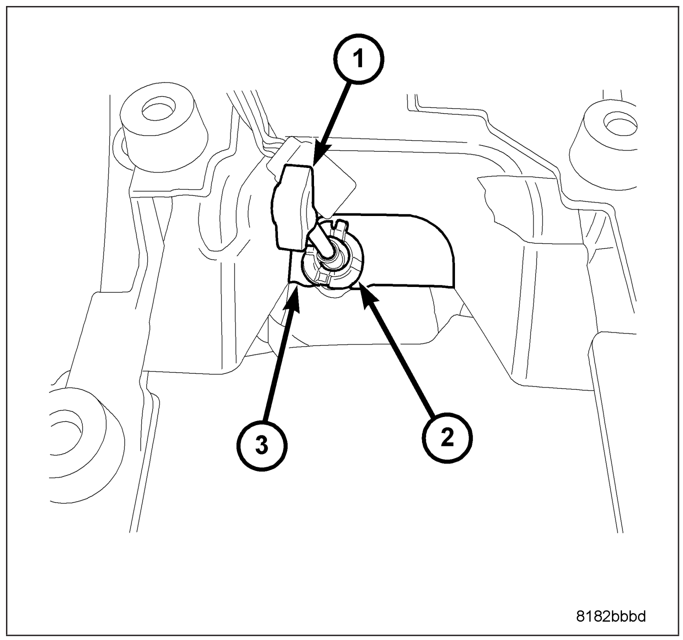
3. Remove shifter cable (2)at transmission bracket (3).
4. Remove the nut (3) on the shifter cable to shift lever.



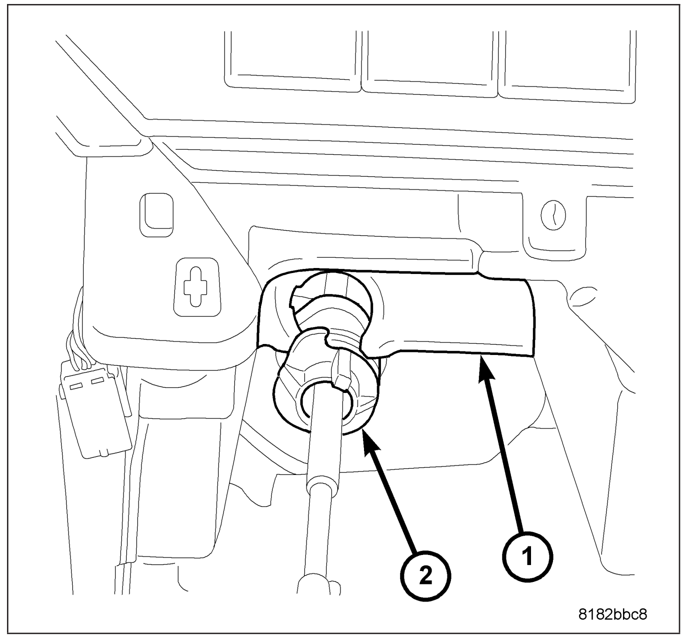
5. Remove the grommet (1) at the bulkhead.
6. Remove the shifter (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/SHIFT MECHANISM - REMOVAL).



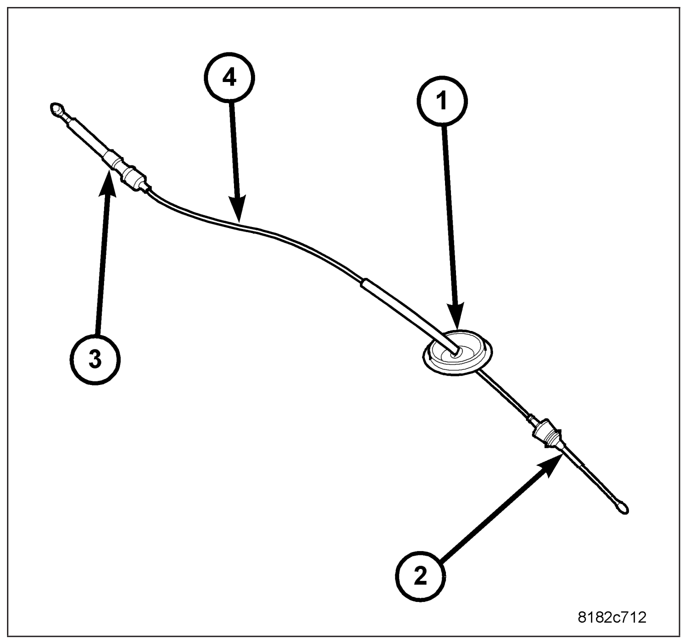
7. Squeeze clip (2) at cable (1).



8. Pull cable from bracket (2) at bulkhead (1).

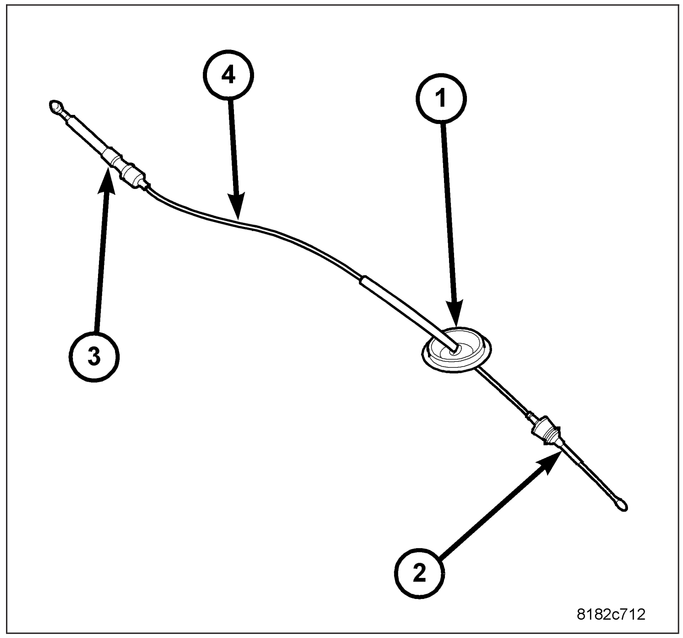


9. Pull the cable (1,2) through the bulkhead into the engine compartment.

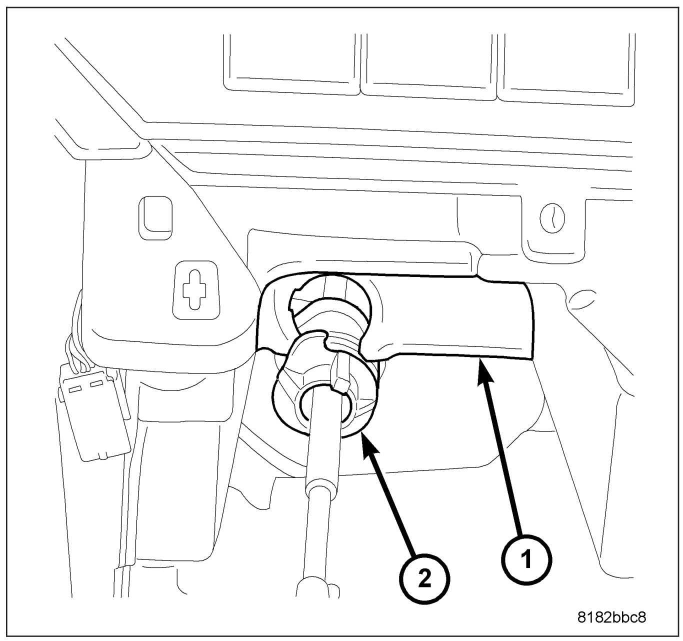


INSTALLATION

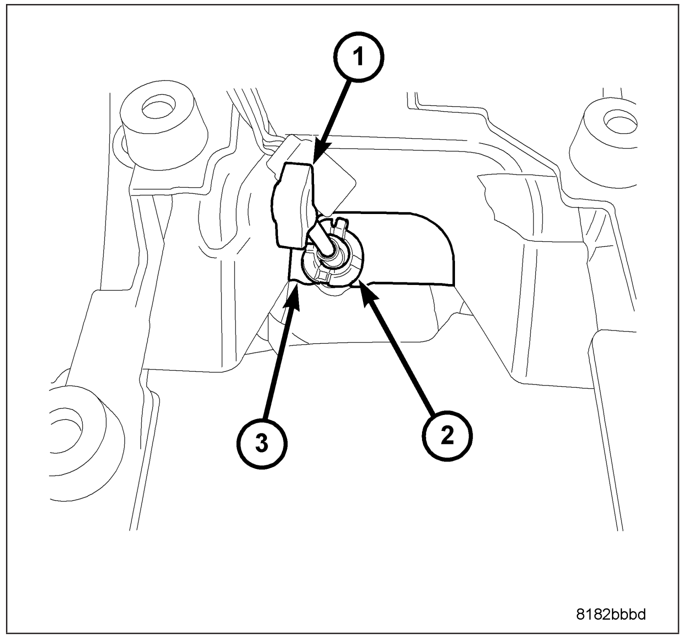
1. Install the shifter cable (1,2) through the bulkhead and into the passenger compartment.



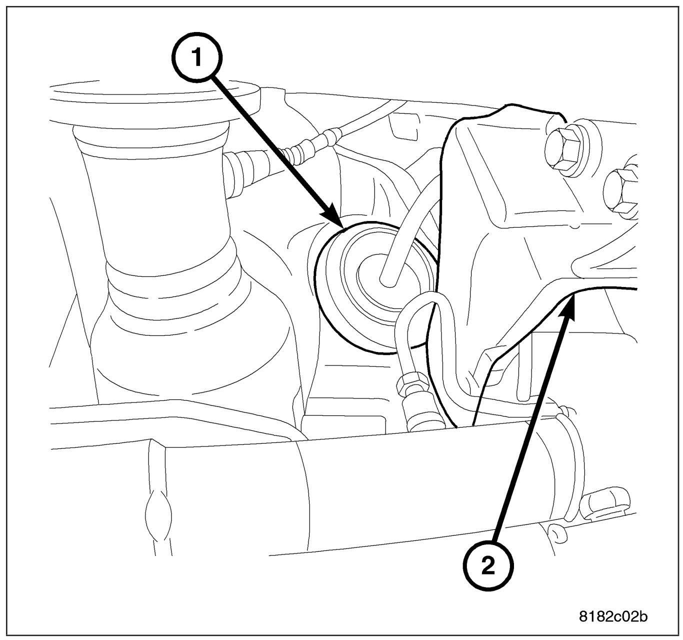
2. Install the cable into the bracket (2) at bulkhead (1).



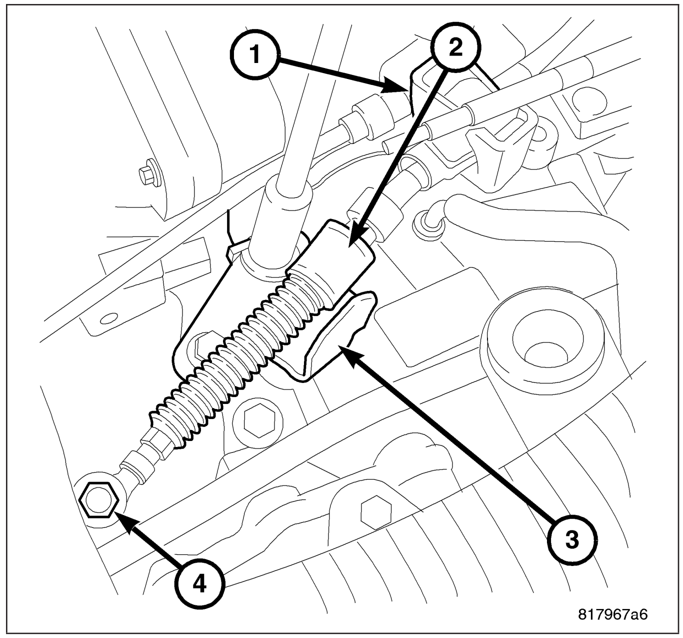
3. Insure the cable clips into place.
4. Install the shifter (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT/SHIFT MECHANISM - INSTALLATION).



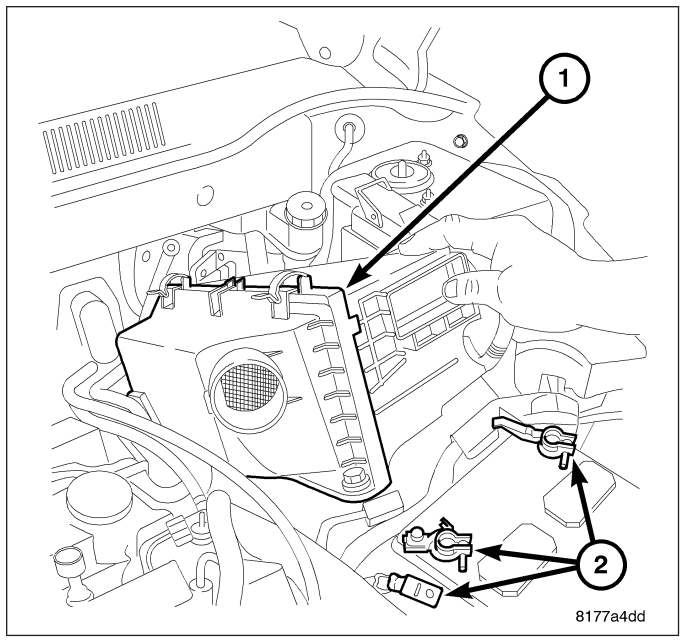
5. Install the shifter cable grommet (1) at the bulkhead.



6. Clip the cable (2) into the bracket (1) install the nut (4) over the shifter cable at the transmission shift lever.



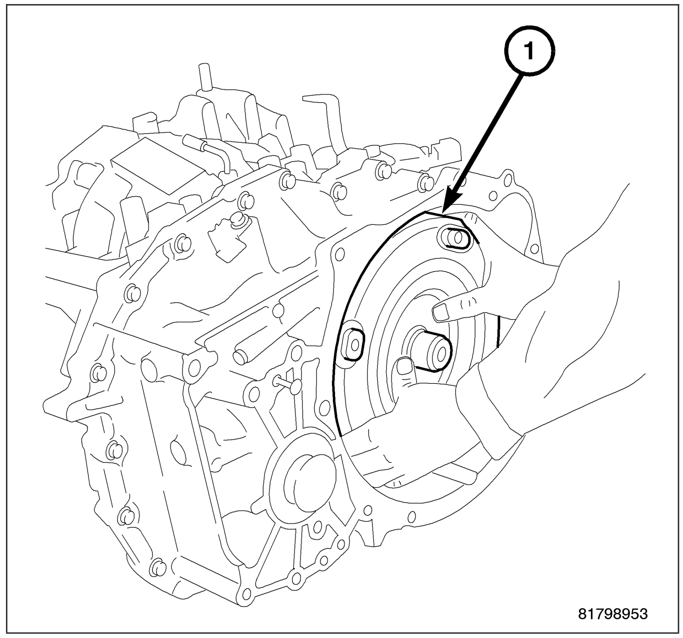
7. Connect the Negative battery cable (2).
8. Install the air box (1)



SEAL-TORQUE CONVERTER

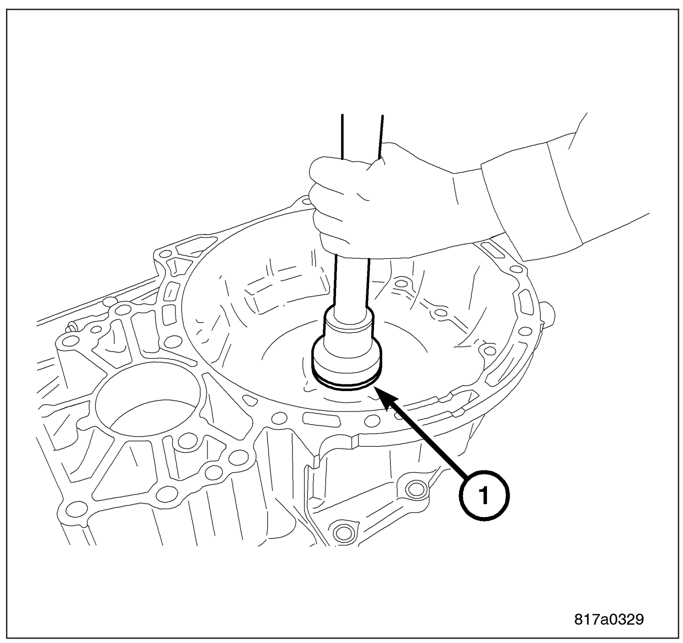
REMOVAL

1. Remove transmission (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - REMOVAL).
2. Remove torque converter.
3. Remove torque converter seal using Slide Hammer C-3752 and oil Seal Remover 9667.



INSTALLATION

1. Install torque converter seal using oil seal Installer 9858.

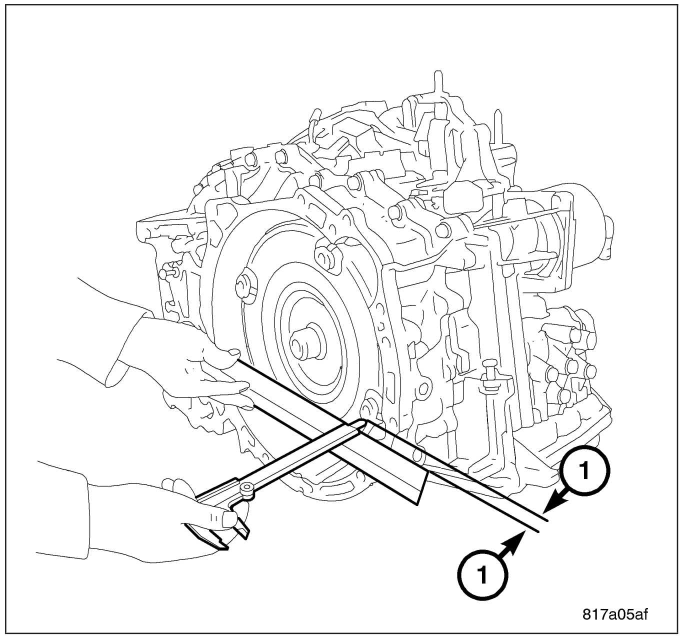


NOTE: Gauge Bar 6311 can be used for doing the following measurement

NOTE: When conducting measurements, measure two or more places and calculate the average value.

2. Install the torque converter on the transaxle and measure the dimension (1) to see if it is at least 13 mm. If the measurement is less than 13 mm, the torque converter is not fully installed.

NOTE: Use the designated brand of CVT fluid. Use of other brands of CVT fluid other than the designated brand will deteriorate the driveability and the durability of the CVT, and will cause damage to the CVT.

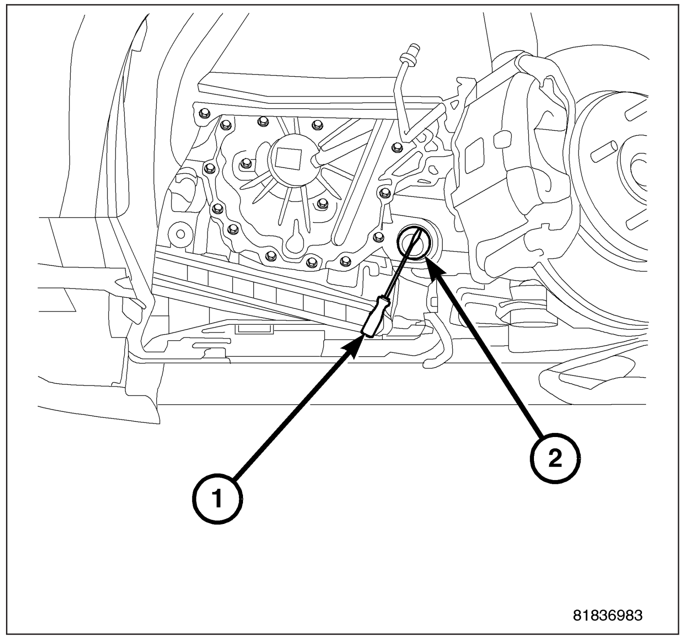


3. Install the transmission (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - CVT - INSTALLATION).

SEAL-HALFSHAFT LEFT SIDE

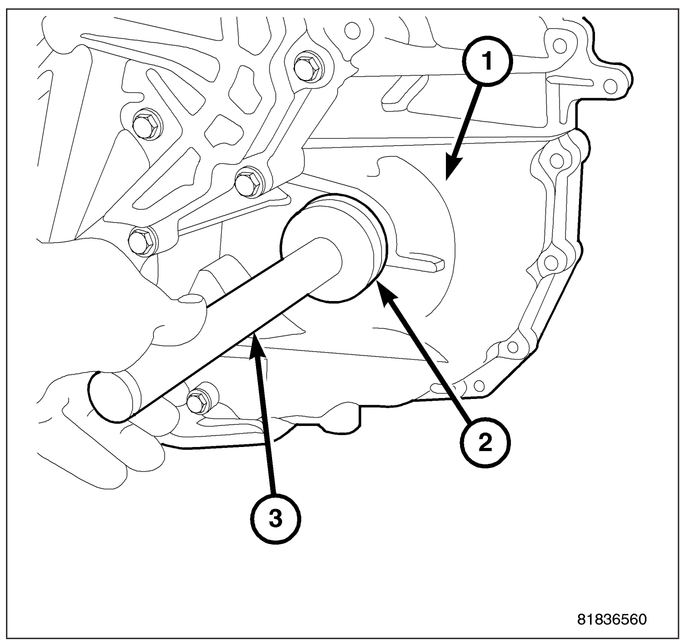
REMOVAL

1. Remove halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).
2. Remove left side differential oil seal.



INSTALLATION

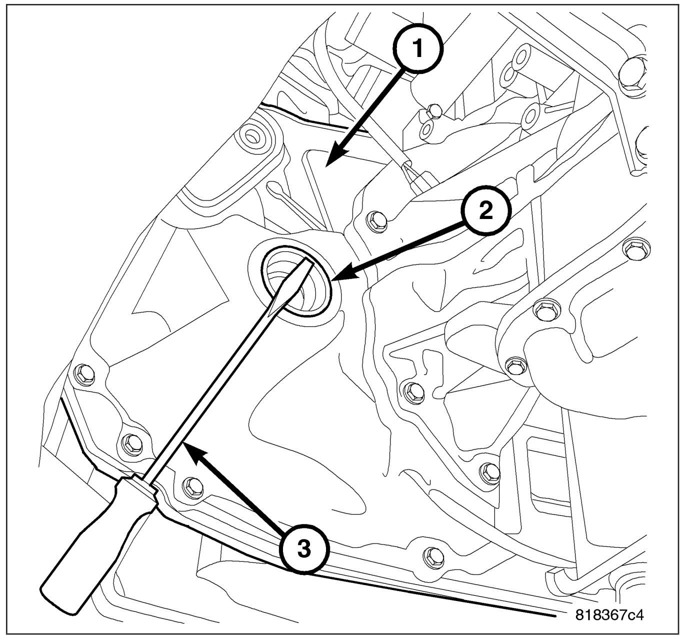
1. Install the left side differential oil seal using Installer 9871 (2) and Handle C-4171 (3).
2. Install halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
3. Road test vehicle and inspect for leaks.



SEAL-HALFSHAFT RIGHT SIDE

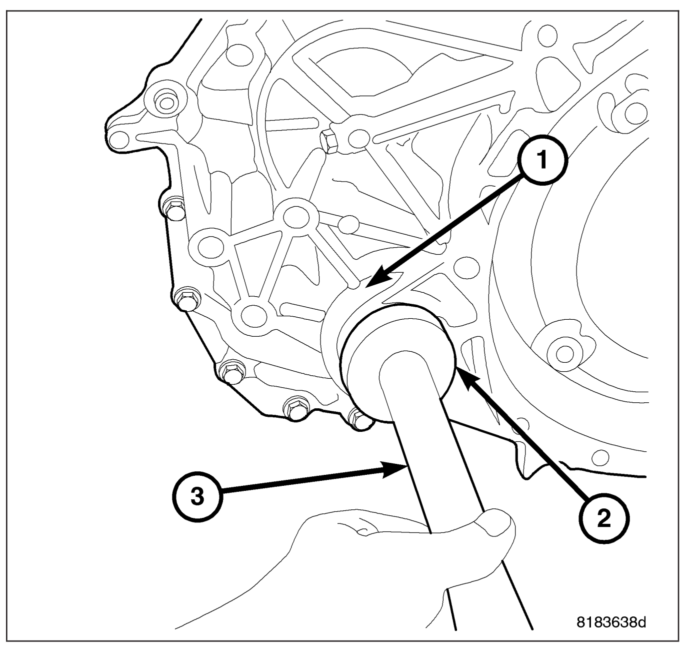
REMOVAL

1. Remove halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL).
2. If all wheel drive remove the PTU (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - REMOVAL).
3. Remove the seal (2) form the transaxle using a screwdriver (3).



INSTALLATION

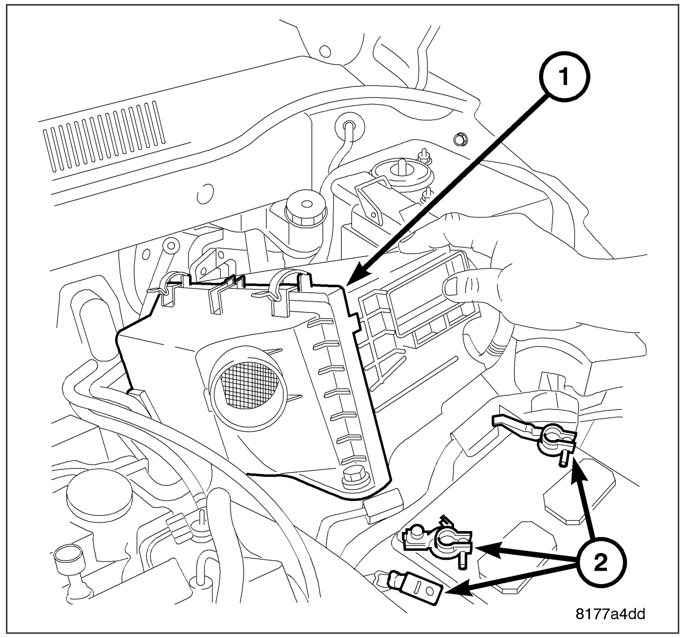
1. Install the seal using Installer 9877(2) and Handle C-4171 (3).
2. If all wheel drive install the PTU (Refer to 21 - TRANSMISSION/TRANSAXLE/POWER TRANSFER UNIT - INSTALLATION).
3. Install Halfshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION).
4. Road test vehicle and inspect for leaks.



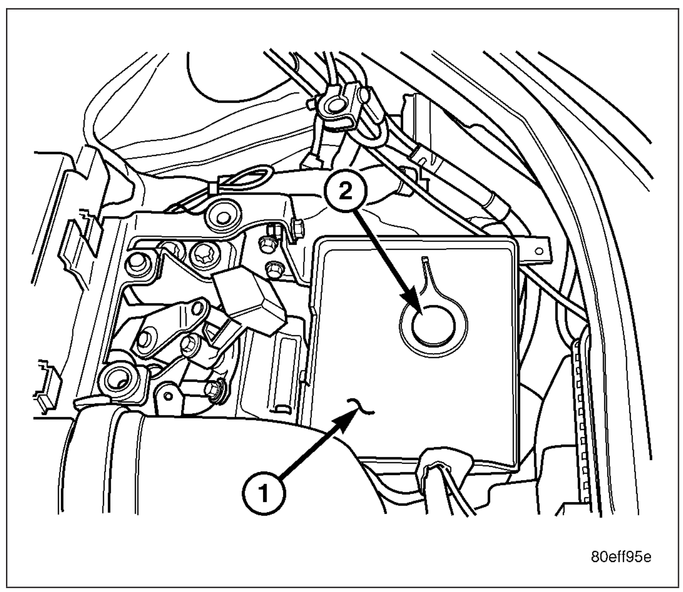
TRANSMISSION RANGE SENSOR

REMOVAL

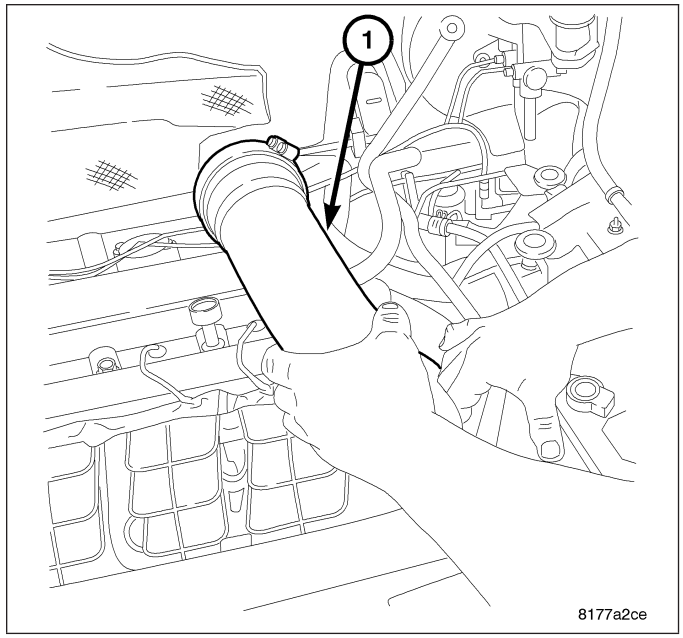
1. Disconnect battery cables (2).
2. Remove air cleaner assembly (1).



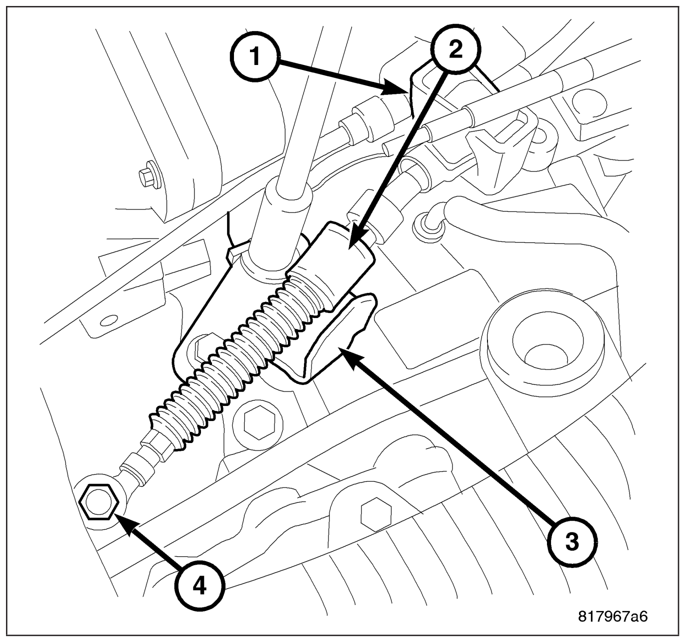
3. Remove battery.
4. Remove battery tray (1).



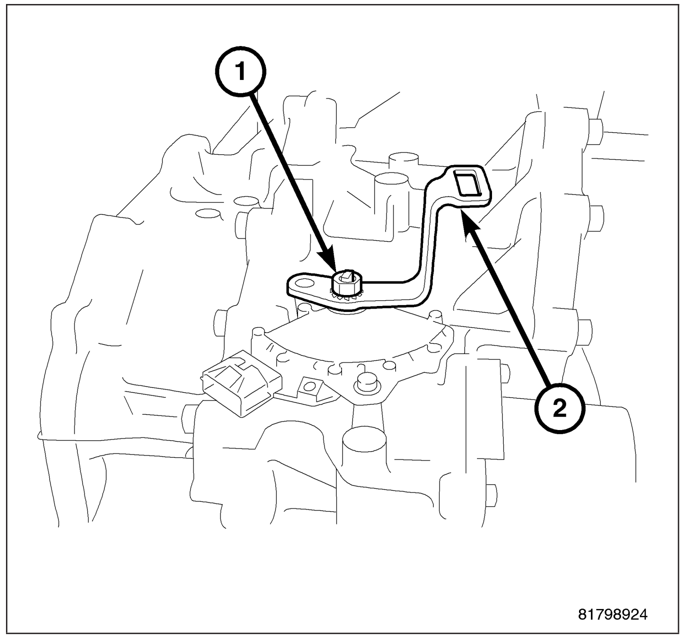
5. Remove inlet air tube (1).



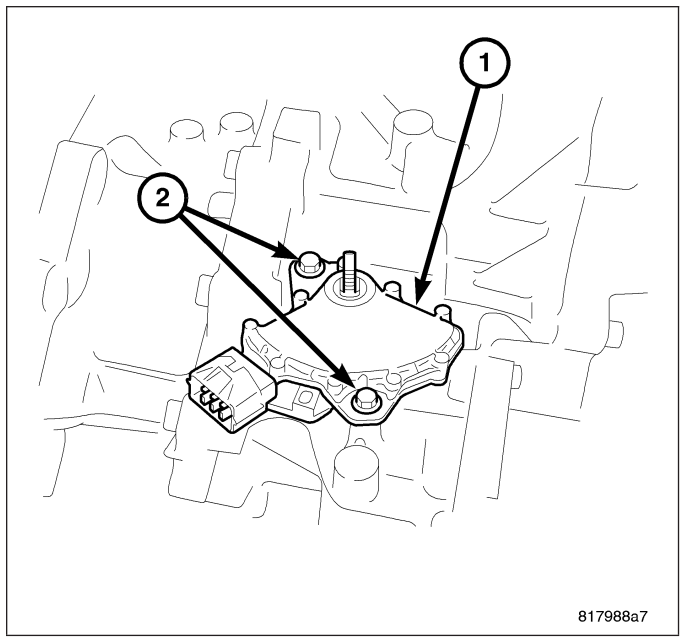
6. Remove the shiftier cable (2).



7. Remove nut (1) at shift lever.
8. Remove shift lever (2).

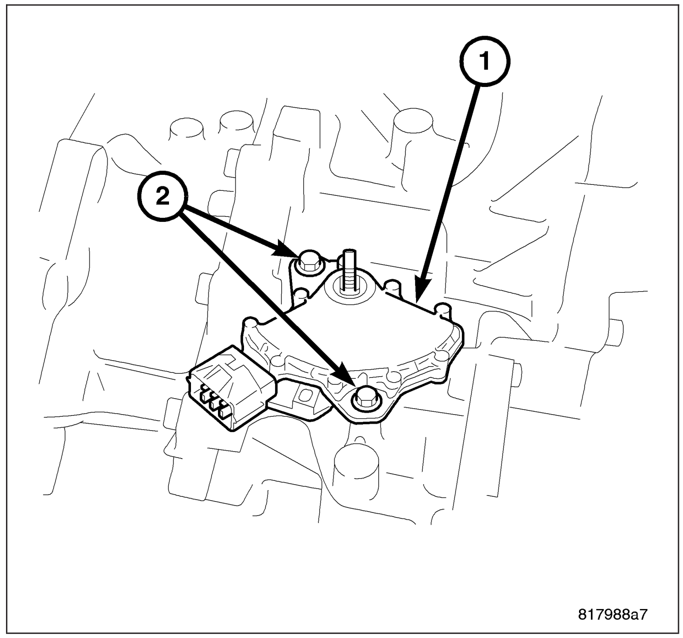


9. Remove bolts (2) at TRS.
10. Remove TRS (1).

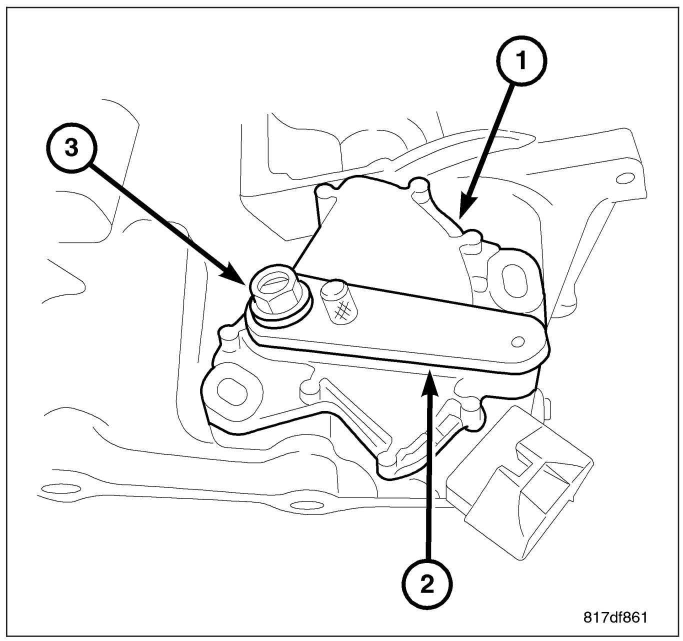


INSTALLATION

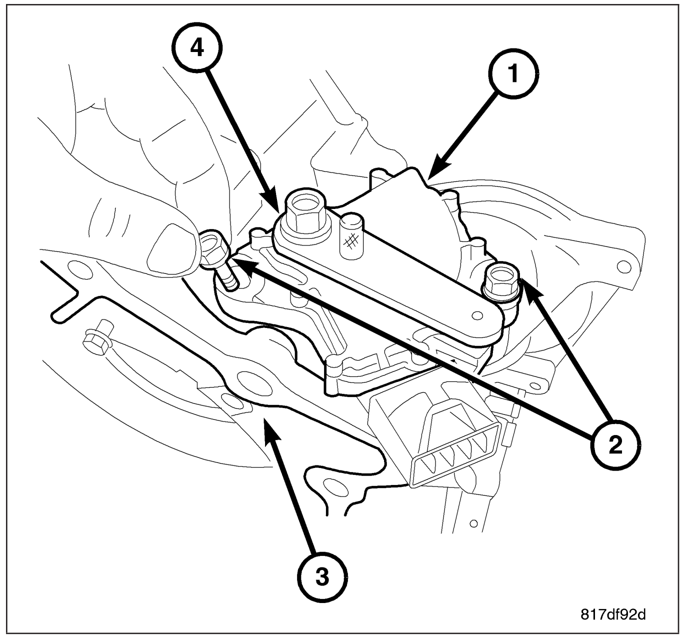
1. Install TRS into position (1).



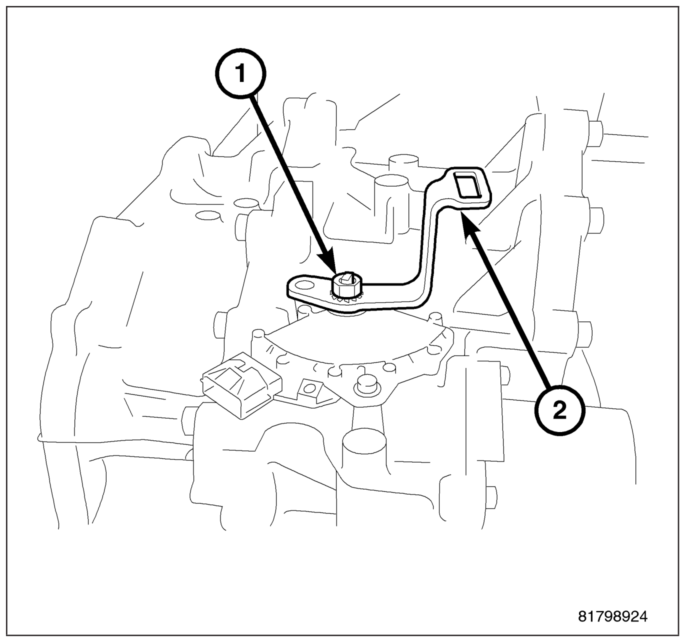
2. Put the manual shaft in the N position (3).
3. Install Alignment Tool 9876 (2) and adjust the position of the TRS (1).



4. Install and Torque the mounting bolts of the TRS to 6 N·m (49 in.lbs.).



5. Remove Alignment Tool 9876 and Install the shift lever (2) onto the manual shaft (1).
6. Install and Torque the mounting nut to 17 N·m (150 in.lbs.).



TIRES/WHEELS

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TIRES/WHEELS - ELECTRICAL DIAGNOSIS

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TIRE PRESSURE MONITORING - ELECTRICAL DIAGNOSIS

DIAGNOSIS AND TESTING

C0077- LOW TIRE PRESSURE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  A low pressure condition will exist when the tire pressure falls below or is equal to the low pressure threshold value as specified for the vehicle.

Possible Causes
INTERMITTENT PERFORMANCE DTC
INCORRECT TIRE PRESSURE
TIRE PRESSURE SENSOR
WCM (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE: If the incorrect Placard Values were programmed into the WCM/SKREEM, a DTC could be set. Before continuing with any TPM diagnostic test, using the scan tool, check that the correct Placard Values have been programmed in to the module.

NOTE:
If the following conditions are present:
– Low Tire Pressure DTC (C0077) (Active)
– Spare Tire is not equipped with a Tire Pressure Sensor
– Spare Tire is currently on the vehicle
Repair the tire and place it back on the vehicle.
Test drive the vehicle.
If the DTC(s) reset continue with the diagnostic procedure.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. LOW TIRE PRESSURE

Correct all tire pressure to the recommended specifications and wait 2 minutes.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

3. TIRE PRESSURE SENSOR

NOTE: Before continuing, ensure the tire is free from any leaks or damage that would cause a low tire pressure condition. If a problem is found, repair as necessary and retest.

Turn the ignition off.

Replace the Tire Pressure Sensor in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

No >> Test Complete.

4. INTERMITTENT TIRE PRESSURE SENSOR DTC

The conditions necessary to set this DTC are not present at this time.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Repair as necessary.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

No >> Test complete.

C1501–TIRE PRESSURE SENSOR 1 INTERNAL

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The tire pressure sensor actively monitors the air pressure and air temperature inside the tire, the sensor internal battery status, and the radial acceleration of the wheel. Each sensor has a unique ID code. The sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Wireless Control Module (SKREEM).

- **When Monitored:**
  With vehicle speed greater than 15 MPH (24 km/h). (24 km/h).
- **Set Condition:**
  The WCM (SKREEM) will monitor the signals from the four active road tire sensors. A loss of signal error is detected when eight consecutive blocks of data are not received or cannot be accurately decoded within a maximum peroid of 10 minuntes. An internal sensor hardware error condition will be set when an error in the accelerometer, pressure sensor, or temperature sensor is detected.

Possible Causes
INTERMITTENT TIRE PRESSURE SENSOR INTERNAL DTC
TIRE PRESSURE SENSOR
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE:
If the following conditions are present:
– Tire Pressure Sensor Internal DTC (Active)
– Spare Tire is not equipped with a Tire Pressure Sensor
– Spare Tire is currently on the vehicle
Repair the tire and place it back on the vehicle.
Test drive the vehicle.
If the DTC(s) reset continue with the diagnostic procedure.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE SENSOR

NOTE:
When working with vehicles equipped with the base tire pressure monitoring system the correct tire that set the fault must be identified. Following the below procedure will help in identifying the correct tire.
1. Set all tire pressures to the recommended specifications and recheck for fault/alert.
2. Turn the ignition on.
3. Starting with the left front wheel, deflate the tire to 20 PSI and wait 2 minutes. The fault will set once the pressure has reached 20 PSI within the 2 minute time frame.
4. If the TPM fault was detected and not associated to this Sensor/Transmitter, repeat the process until the faulty Sensor/Transmitter has been identified. Once a fault/alert has set, it will establish the location of the tire pressure sensor/transmitter. Repeat steps until the applicable Tire Pressure Sensor/Transmitter has been located.

Turn the ignition off.

Replace the Tire Pressure Sensor in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

4. INTERMITTENT TIRE PRESSURE SENSOR DTC

The conditions necessary to set this DTC are not present at this time.
Refer to any Technical Service Bulletins that may apply to this condition.
With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).
Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the beginning of this test and perform the diagnostic procedure as necessary.

No >> Test complete.

C1502–TIRE PRESSURE SENSOR 2 INTERNAL

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The tire pressure sensor actively monitors the air pressure and air temperature inside the tire, the sensor internal battery status, and the radial acceleration of the wheel. Each sensor has a unique ID code. The sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Wireless Control Module (SKREEM).

- **When Monitored:**
  With vehicle speed greater than 15 MPH (24 km/h).
- **Set Condition:**
  The WCM (SKREEM) will monitor the signals from the four active road tire sensors. A loss of signal error is detected when eight consecutive blocks of data are not received or cannot be accurately decoded within a maximum period of 10 minunites. An internal sensor hardware error condition will be set when an error in the accelerometer, pressure sensor, or temperature sensor is detected.

Possible Causes
INTERMITTENT TIRE PRESSURE SENSOR INTERNAL DTC
TIRE PRESSURE SENSOR
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE:
If the following conditions are present:
– Tire Pressure Sensor Internal DTC (Active)
– Spare Tire is not equipped with a Tire Pressure Sensor
– Spare Tire is currently on the vehicle
Repair the tire and place it back on the vehicle.
Test drive the vehicle.
If the DTC(s) reset continue with the diagnostic procedure.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE SENSOR

NOTE:
When working with vehicles equipped with the base tire pressure monitoring system the correct tire that set the fault must be identified. Following the below procedure will help in identifying the correct tire.
1. Set all tire pressures to the recommended specifications and recheck for fault/alert.
2. Turn the ignition on.
3. Starting with the left front wheel, deflate the tire to 20 PSI and wait 2 minutes. The fault will set once the pressure has reached 20 PSI within the 2 minute time frame.
4. If the TPM fault was detected and not associated to this Sensor/Transmitter, repeat the process until the faulty Sensor/Transmitter has been identified. Once a fault/alert has set, it will establish the location of the tire pressure sensor/transmitter. Repeat steps until the applicable Tire Pressure Sensor/Transmitter has been located.

Turn the ignition off.

Replace the Tire Pressure Sensor in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

4. INTERMITTENT TIRE PRESSURE SENSOR DTC

The conditions necessary to set this DTC are not present at this time.
Refer to any Technical Service Bulletins that may apply to this condition.
With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).
Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the beginning of this test and perform the diagnostic procedure as necessary.

No >> Test complete.

C1503–TIRE PRESSURE SENSOR 3 INTERNAL

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The tire pressure sensor actively monitors the air pressure and air temperature inside the tire, the sensor internal battery status, and the radial acceleration of the wheel. Each sensor has a unique ID code. The sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Wireless Control Module (SKREEM).

- **When Monitored:**
  With vehicle speed greater than 15 MPH (24 km/h).
- **Set Condition:**
  The WCM (SKREEM) will monitor the signals from the four active road tire sensors. A loss of signal error is detected when eight consecutive blocks of data are not received or cannot be accurately decoded within a maximum period of 10 minunites. An internal sensor hardware error condition will be set when an error in the accelerometer, pressure sensor, or temperature sensor is detected.

Possible Causes
INTERMITTENT TIRE PRESSURE SENSOR INTERNAL DTC
TIRE PRESSURE SENSOR
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE:
If the following conditions are present:
– Tire Pressure Sensor Internal DTC (Active)
– Spare Tire is not equipped with a Tire Pressure Sensor
– Spare Tire is currently on the vehicle
Repair the tire and place it back on the vehicle.
Test drive the vehicle.
If the DTC(s) reset continue with the diagnostic procedure.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE SENSOR

NOTE:
When working with vehicles equipped with the base tire pressure monitoring system the correct tire that set the fault must be identified. Following the below procedure will help in identifying the correct tire.
1. Set all tire pressures to the recommended specifications and recheck for fault/alert.
2. Turn the ignition on.
3. Starting with the left front wheel, deflate the tire to 20 PSI and wait 2 minutes. The fault will set once the pressure has reached 20 PSI within the 2 minute time frame.
4. If the TPM fault was detected and not associated to this Sensor/Transmitter, repeat the process until the faulty Sensor/Transmitter has been identified. Once a fault/alert has set, it will establish the location of the tire pressure sensor/transmitter. Repeat steps until the applicable Tire Pressure Sensor/Transmitter has been located.

Turn the ignition off.

Replace the Tire Pressure Sensor in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

4. INTERMITTENT TIRE PRESSURE SENSOR DTC

The conditions necessary to set this DTC are not present at this time.
Refer to any Technical Service Bulletins that may apply to this condition.
With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).
Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the beginning of this test and perform the diagnostic procedure as necessary.

No >> Test complete.

C1504–TIRE PRESSURE SENSOR 4 INTERNAL

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The tire pressure sensor actively monitors the air pressure and air temperature inside the tire, the sensor internal battery status, and the radial acceleration of the wheel. Each sensor has a unique ID code. The sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Wireless Control Module (SKREEM).

- **When Monitored:**
  With vehicle speed greater than 15 m.p.h. (24 km/h).
- **Set Condition:**
  The WCM (SKREEM) will monitor the signals from the four active road tire sensors. A loss of signal error is detected when eight consecutive blocks of data are not received or cannot be accurately decoded within a maximum period of 10 minunites. An internal sensor hardware error condition will be set when an error in the accelerometer, pressure sensor, or temperature sensor is detected.

Possible Causes
INTERMITTENT TIRE PRESSURE SENSOR INTERNAL DTC
TIRE PRESSURE SENSOR
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE:
If the following conditions are present:
– Tire Pressure Sensor Internal DTC (Active)
– Spare Tire is not equipped with a Tire Pressure Sensor
– Spare Tire is currently on the vehicle
Repair the tire and place it back on the vehicle.
Test drive the vehicle.
If the DTC(s) reset continue with the diagnostic procedure.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE SENSOR

NOTE:
When working with vehicles equipped with the base tire pressure monitoring system the correct tire that set the fault must be identified. Following the below procedure will help in identifying the correct tire.
1. Set all tire pressures to the recommended specifications and recheck for fault/alert.
2. Turn the ignition on.
3. Starting with the left front wheel, deflate the tire to 20 PSI and wait 2 minutes. The fault will set once the pressure has reached 20 PSI within the 2 minute time frame.
4. If the TPM fault was detected and not associated to this Sensor/Transmitter, repeat the process until the faulty Sensor/Transmitter has been identified. Once a fault/alert has set, it will establish the location of the tire pressure sensor/transmitter. Repeat steps until the applicable Tire Pressure Sensor/Transmitter has been located.

Turn the ignition off.

Replace the Tire Pressure Sensor in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 m.p.h.
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

4. INTERMITTENT TIRE PRESSURE SENSOR DTC

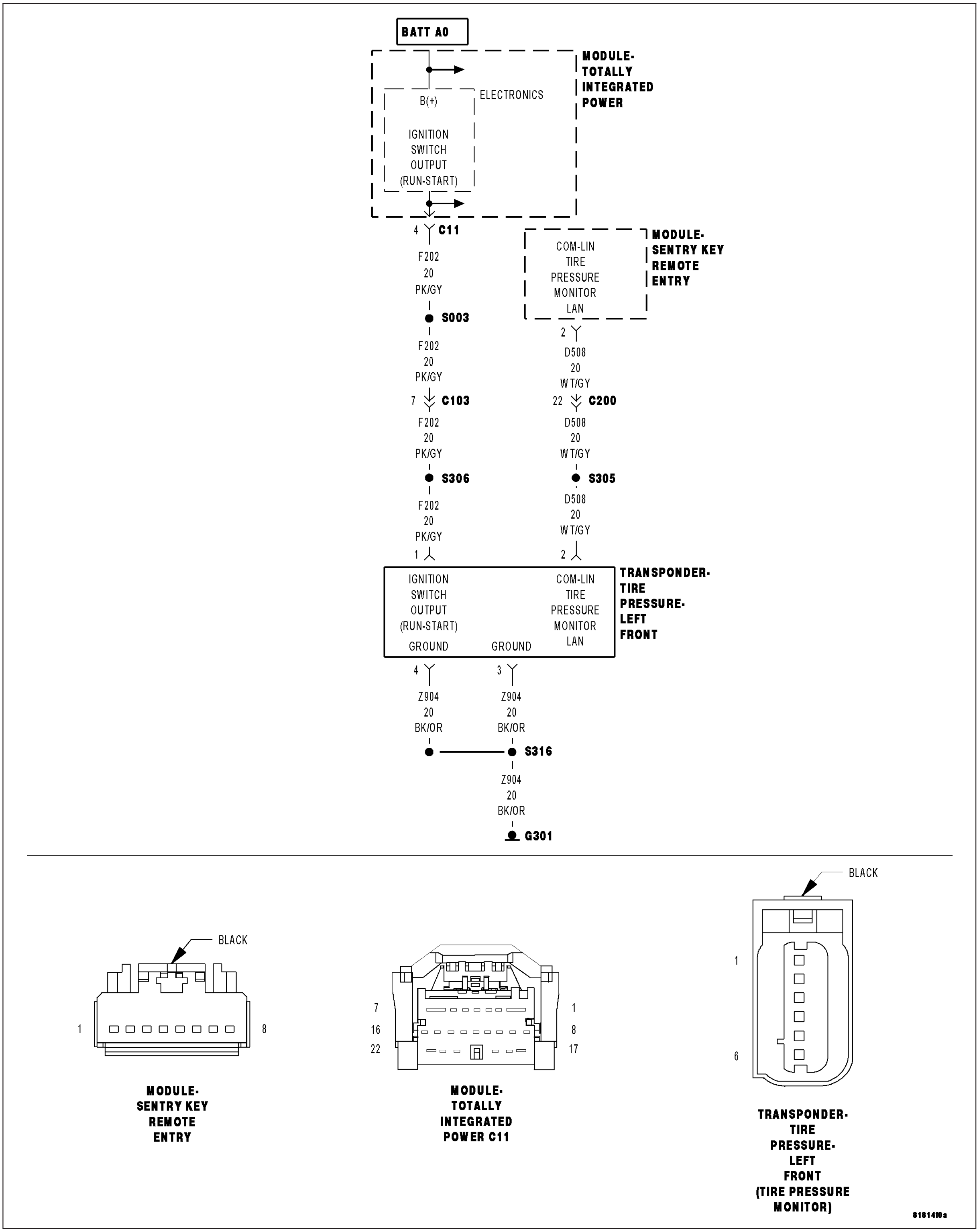
The conditions necessary to set this DTC are not present at this time.
Refer to any Technical Service Bulletins that may apply to this condition.
With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).
Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the beginning of this test and perform the diagnostic procedure as necessary.

No >> Test complete.

C1506–LEFT FRONT TIRE PRESSURE TRIGGER MODULE PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (TPM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a RF transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM (TPM) will monitor the messages from each Tire Pressure Trigger Module over the LIN bus. If any of the messages are not received, or are received other than as expected, a DTC will set. When the condition is corrected, or is no longer detected, as acknowledged via a LIN bus message, the WCM will reset the appropriate trigger module fault status.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (TPM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE: If the incorrect Placard Values were programmed into the WCM/TPM, a DTC could be set. Before continuing with any TPM diagnostic test, using the scan tool, check that the correct Placard Values have been programmed in to the module.

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (TPM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (TPM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (TPM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

3. WIRELESS CONTROL MODULE (TPM)

View repair.

Repair

Replace the Wireless Control Module (TPM) in accordance with the Service Information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

The conditions necessary to set this DTC are not present at this time.

Using the wiring schematic as a guide, inspect the wiring and connectors relative to this circuit.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (TPM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

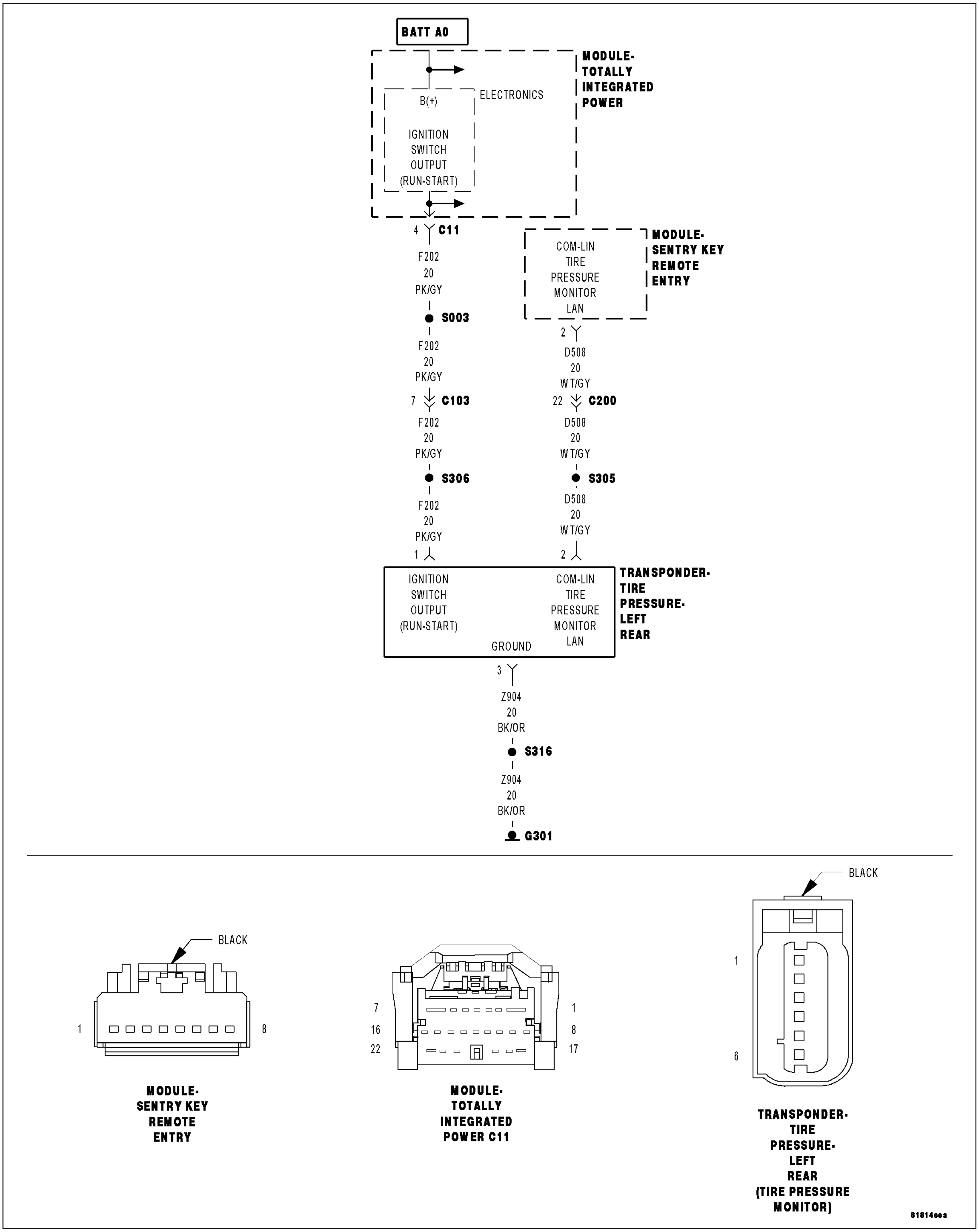
With the scan tool, select View DTCs in the Wireless Control Module (TPM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C1508–LEFT REAR TIRE PRESSURE TRIGGER MODULE PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (SKREEM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a LR transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM (SKREEM) will monitor the messages from each Tire Pressure Trigger Module over the LIN bus. If any of the messages are not received, or are received other than as expected, a DTC will set. When the condition is corrected, or is no longer detected, as acknowledged via a LIN bus message, the WCM will reset the appropriate trigger module fault status.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

4. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

The conditions necessary to set this DTC are not present at this time.

Using the wiring schematic as a guide, inspect the wiring and connectors relative to this circuit.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

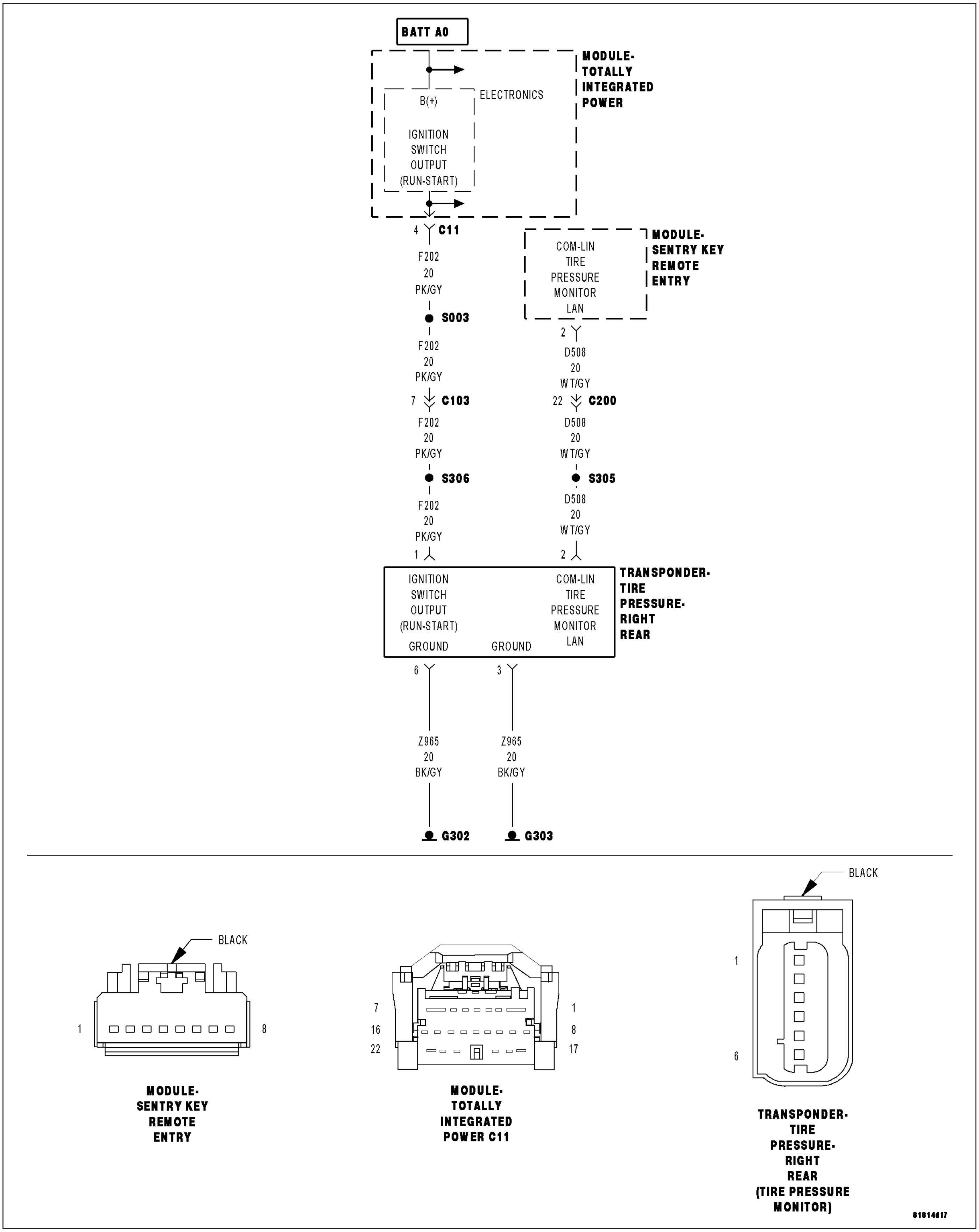
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C1509–RIGHT REAR TIRE PRESSURE TRIGGER MODULE PERFORMANCE



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (SKREEM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a RF transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM (SKREEM) will monitor the messages from each Tire Pressure Trigger Module over the LIN bus. If any of the messages are not received, or are received other than as expected, a DTC will set. When the condition is corrected, or is no longer detected, as acknowledged via a LIN bus message, the WCM will reset the appropriate trigger module fault status.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

Turn the ignition on.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 4

2. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 3

No >> Test Complete.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

3. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

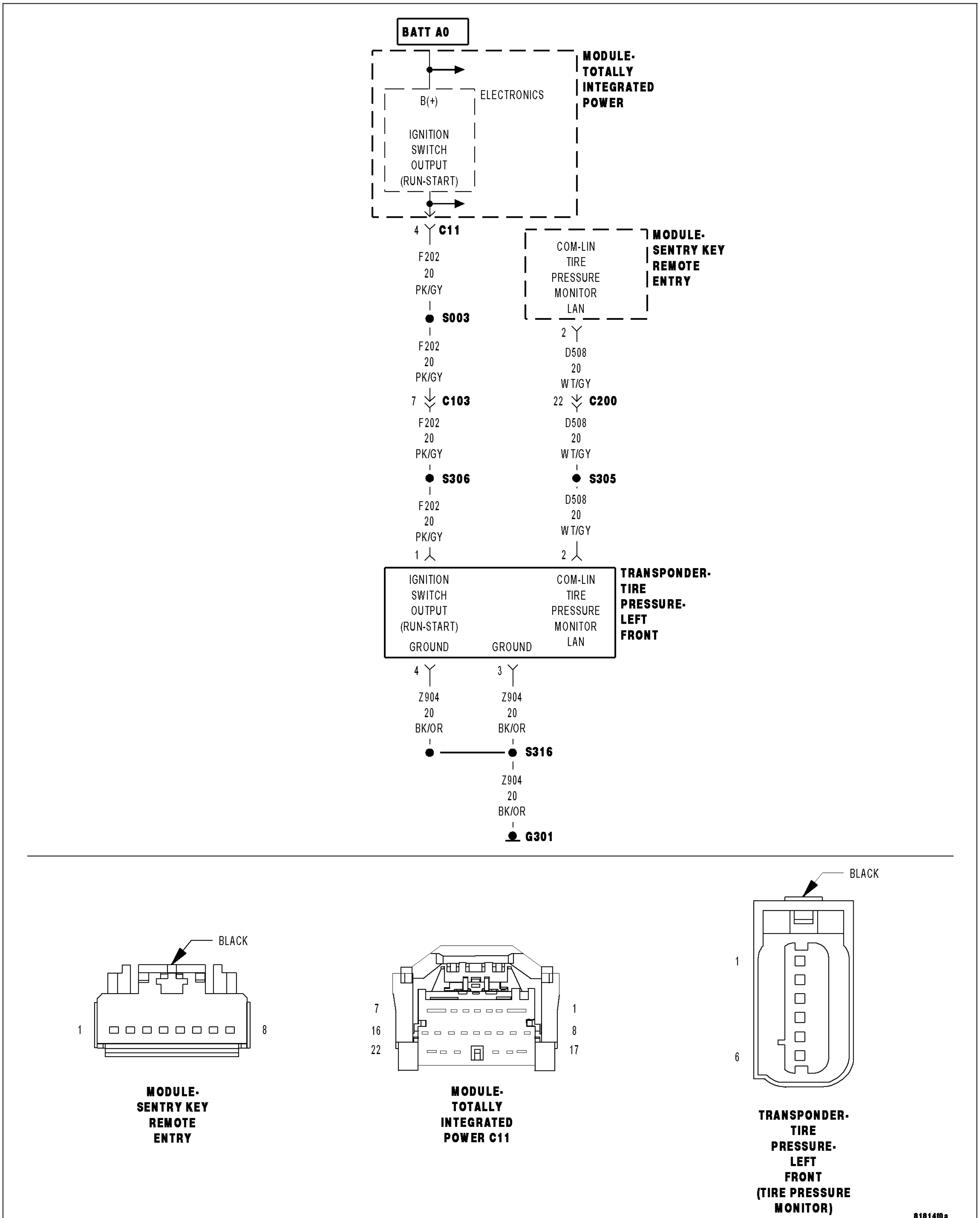
The conditions necessary to set this DTC are not present at this time.
Using the wiring schematic as a guide, inspect the wiring and connectors relative to this circuit.
Refer to any Technical Service Bulletins that may apply to this condition.
With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).
Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C150A–LEFT FRONT TIRE PRESSURE TRIGGER MODULE VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (SKREEM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a RF transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM receives a message from the Tire Pressure Trigger Module indicating that an over voltage condition has been detected.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE: If the incorrect Placard Values were programmed into the WCM/SKREEM, a DTC could be set. Before continuing with any TPM diagnostic test, using the scan tool, check that the correct Placard Values have been programmed in to the module.

Turn the ignition on.

NOTE: If a system or battery voltage high DTC is set in the Wireless Control Module (SKREEM) or in the PCM, repair the voltage DTC before continuing with this test.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 6

2. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F202) Fused Ignition Switch Output (Run) circuit.

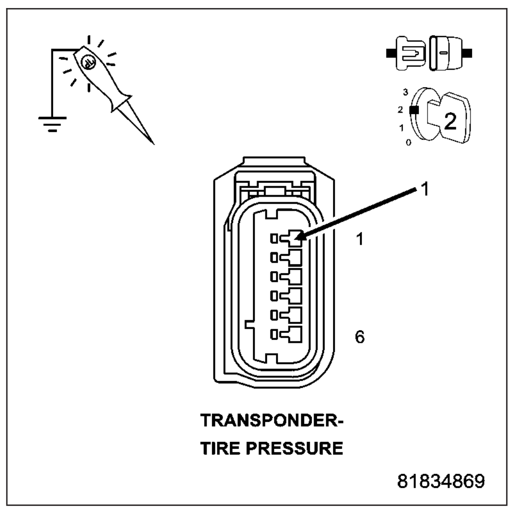
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

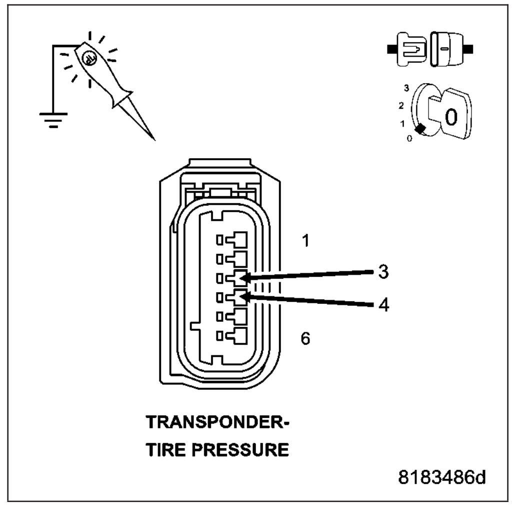
Yes >> Go to 3

No >> Repair the (F202) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



3. (Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE



Using a 12–volt test light connect to 12 volts, check each of the (Z904) Ground circuit(s).

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (Z904) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 5

No >> Test Complete.

5. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

6. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

The conditions necessary to set this DTC are not present at this time.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

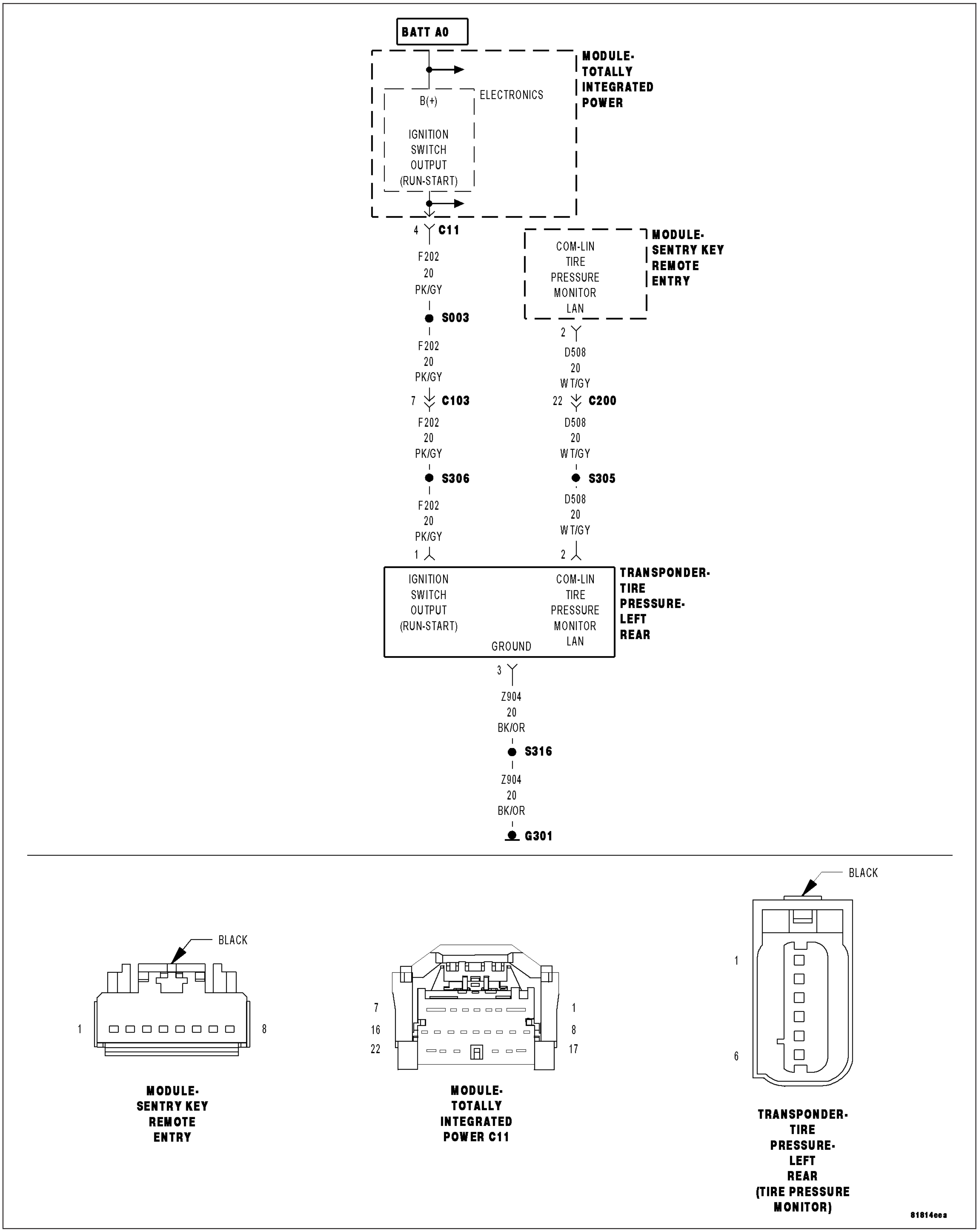
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C150C–LEFT REAR TIRE PRESSURE TRIGGER MODULE VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (SKREEM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a RF transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM receives a message from the Tire Pressure Trigger Module indicating that an over voltage condition has been detected.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE: If the incorrect Placard Values were programmed into the WCM/SKREEM, a DTC could be set. Before continuing with any TPM diagnostic test, using the scan tool, check that the correct Placard Values have been programmed in to the module.

Turn the ignition on.

NOTE: If a system or battery voltage high DTC is set in the Wireless Control Module (SKREEM) or in the PCM, repair the voltage DTC before continuing with this test.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

Yes >> Go to 2

No >> Go to 6

2. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F202) Fused Ignition Switch Output (Run) circuit.

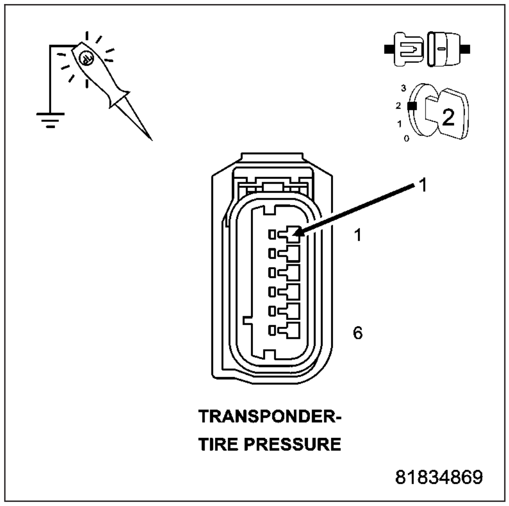
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (F202) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



3. (Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12–volt test light connect to 12 volts, check each of the (Z904) Ground circuit(s).

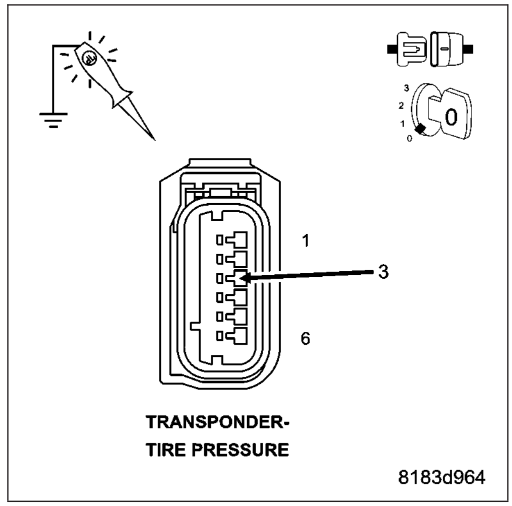
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (Z904) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



4. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 5

No >> Test Complete.

5. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

6. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

The conditions necessary to set this DTC are not present at this time.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

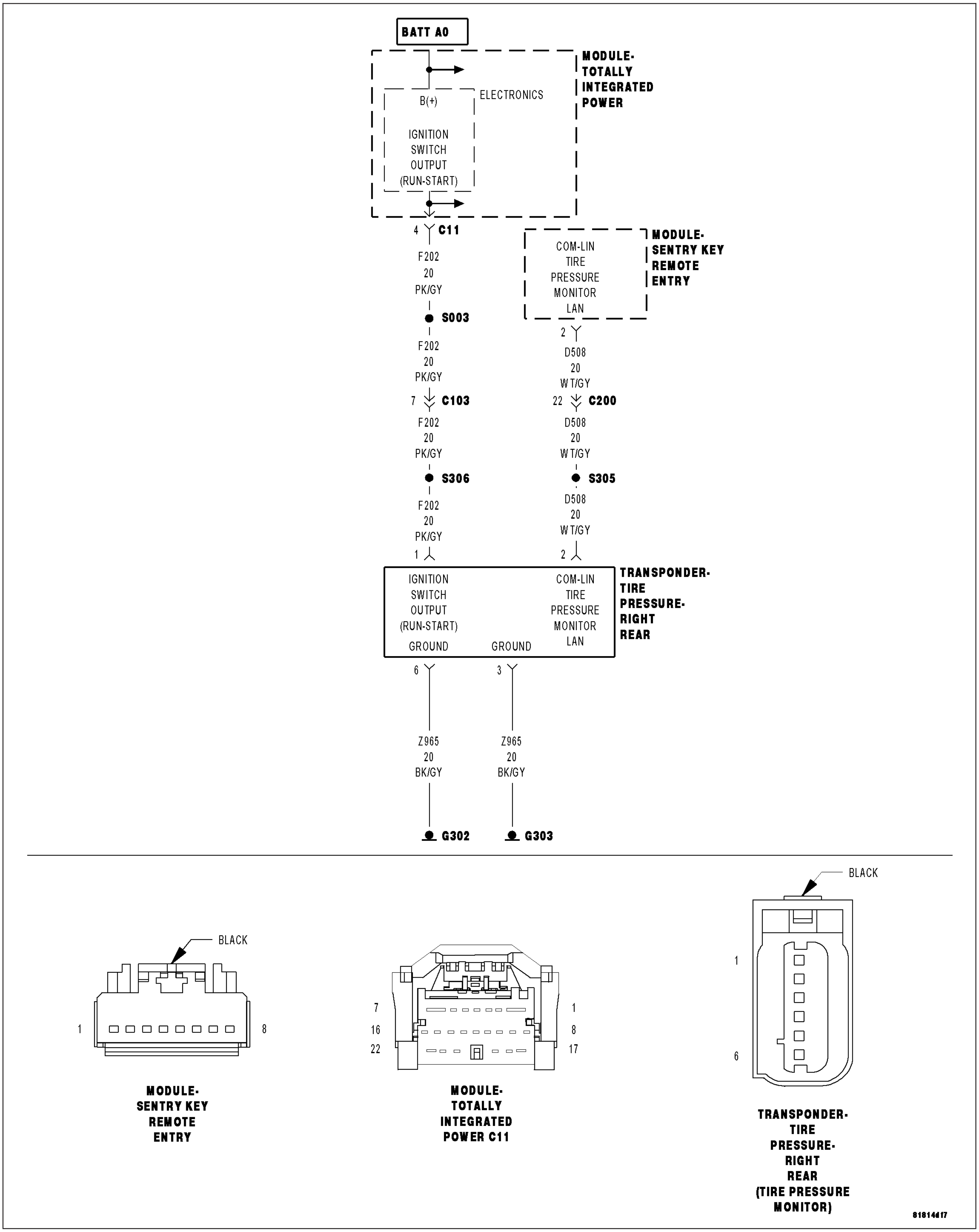
With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C150D–RIGHT REAR TIRE PRESSURE TRIGGER MODULE VOLTAGE HIGH



For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Tire Pressure Trigger Module is used to automatically learn the location of each wheel sensor on the vehicle. The module is controlled and activated in sequence by the Wireless Control Module (SKREEM) over a LIN bus. When activated, the module will generate a 125 KHz signal of sufficient field strength to trigger the tire pressure sensor and force a RF transmission from the sensor.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The WCM receives a message from the Tire Pressure Trigger Module indicating that an over voltage condition has been detected.

Possible Causes
INTERMITTENT TIRE PRESSURE TRIGGER MODULE PERFORMANCE DTC
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
TIRE PRESSURE TRIGGER MODULE
WIRELESS CONTROL MODULE (SKREEM)

Diagnostic Test

1. DTC STATUS IS ACTIVE

NOTE: If the incorrect Placard Values were programmed into the WCM/SKREEM, a DTC could be set. Before continuing with any TPM diagnostic test, using the scan tool, check that the correct Placard Values have been programmed in to the module.

Turn the ignition on.

NOTE: If a system or battery voltage high DTC is set in the Wireless Control Module (SKREEM) or in the PCM, repair the voltage DTC before continuing with this test.

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Is the DTC status Active at this time?

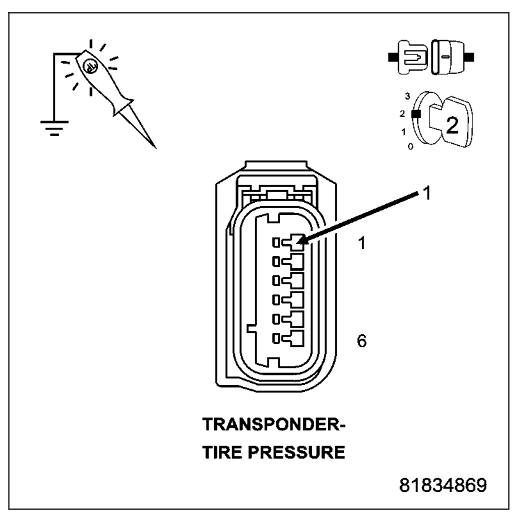
Yes >> Go to 2

No >> Go to 6

2. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F202) Fused Ignition Switch Output (Run) circuit.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 3

No >> Repair the (F202) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

3. (Z965) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12–volt test light connect to 12 volts, check each of the (Z965) Ground circuit(s).

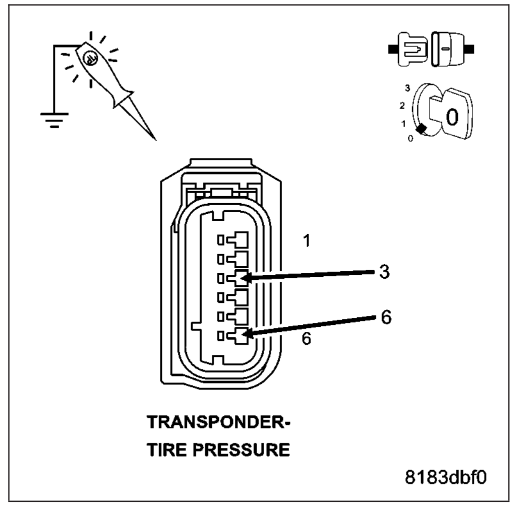
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (Z965) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



4. TIRE PRESSURE TRIGGER MODULE

Turn the ignition off.

Replace the appropriate Tire Pressure Trigger Module in accordance with the Service Information.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Go to 5

No >> Test Complete.

5. WIRELESS CONTROL MODULE (SKREEM)

View repair.

Repair

Replace the Wireless Control Module (SKREEM) in accordance with the Service Information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

6. INTERMITTENT TIRE PRESSURE TRIGGER MODULE DTC

The conditions necessary to set this DTC are not present at this time.

Refer to any Technical Service Bulletins that may apply to this condition.

With the scan tool, clear DTCs in the Wireless Control Module (SKREEM).

Test Drive the vehicle for a minimum of 10 minutes with vehicle speed greater than 15 MPH (24 km/h).

With the scan tool, select View DTCs in the Wireless Control Module (SKREEM).

Does the DTC reset or is the status Active for this DTC?

Yes >> Return to the first step of this test and perform the diagnostic procedure.

No >> Test complete.

C151D-TIRE PRESSURE SENSOR LOCATION UNDERETEMIND

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The vehicle sensor locate process occurs after the vehicle sits at zero speed for more than 19 min. The tire pressure monitor system will determin the sensor positios while driving at speeds above 15 MPH (24 Km/h). This process can take up to 10 min to determin sensor positions.

- **When Monitored:**
  During vehicle sensor locate process.
- **Set Condition:**
  Must fail vehicle sensor locate process 3 times in a row.

Possible Causes
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
(D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN
TIRE PRESSURE TRIGGER MODULE POWER AND GROUND
TPM SENSOR
WCM

Diagnostic Test

1. OTHER DTC'S SET

Repair all other DTC's first.

Is this DTC still active after all other DTC's repaired?

Yes >> Go To 2

No >> Test Complete.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

2. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
Turn the ignition on.

With the scan tool, read and record WCM DTCs.

With the scan tool, erase WCM DTCs.

Cycle the ignition switch.

With the scan tool, read WCM DTCs.

Does this DTC reset?

Yes >> Go To 3

No >> Perform the Stored Lost Communication test procedure. Refer to the table of contents in this section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).
Perform BODY VERIFICATION TEST. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN

Turn the ignition off.

Disconnect the Tire Pressure Trigger Module.

Disconnect the WCM.

With an ohmmeter measure the resistance of the (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT.

Is the resistance below 5 Ohms?

Yes >> Go To 4

No >> Repair or replace the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Tire Pressure Transponder harness connector.

Disconnect the Sentry Key Remote Entry Module harness connector.

Turn the ignition on.

Using a 12–volt test light connect to ground, check the Fused Ignition Switch Output (Run) circuit.

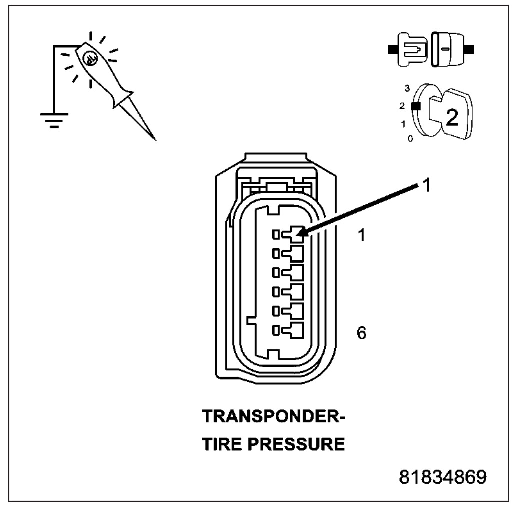
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 5

No >> Repair the Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12-volt test light connect to battery voltage, probe each of the Ground circuit(s).

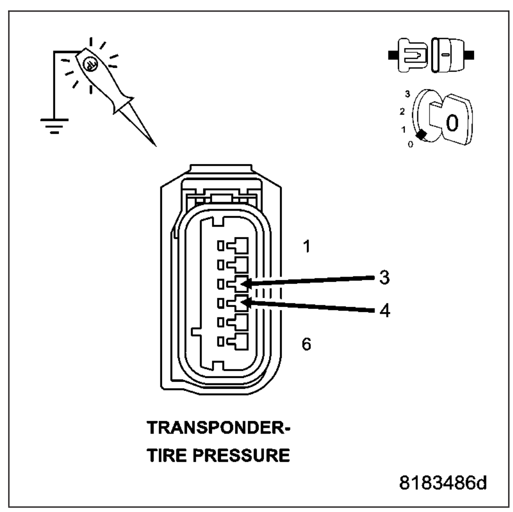
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 6

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

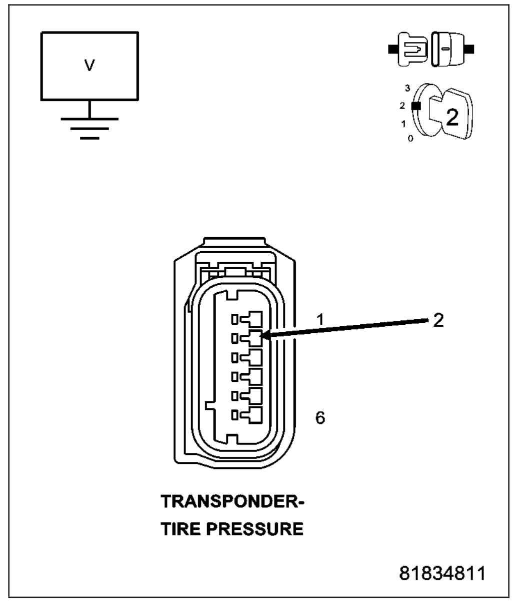
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)



6. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (D508) COM - LIN Tire Pressure Monitor LAN circuit.



Is there any voltage present?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to voltage.

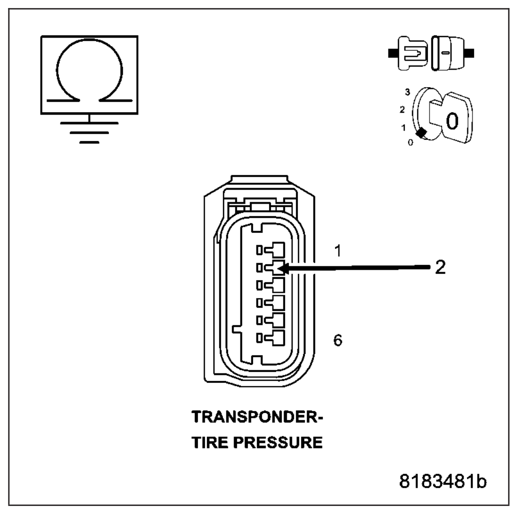
No >> Go to 7

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

7. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (D508) COM - LIN Tire Pressure Monitor LAN circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to ground.

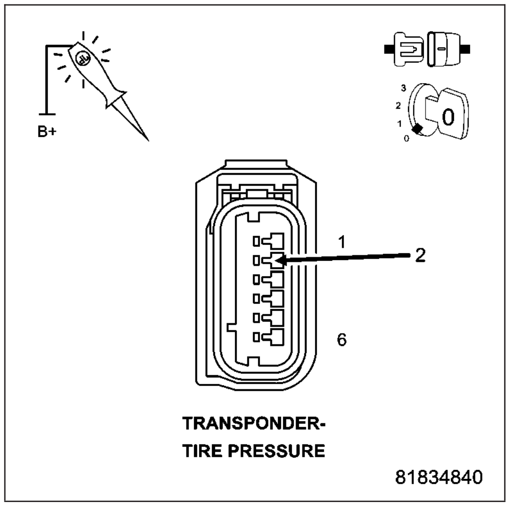
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Go to 8

8. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE

Use a jumper wire with one end connected to ground and the other to the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the Front Left Pressure Tire Transponder harness connector.

Using a 12-Volt test light connected to battery voltage, probe the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the TPM harness connector.



NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate bright?

Yes >> Go to 9

No >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

9. POWER AND GROUND CIRCUIT OPEN

Turn the ignition on.

With a voltmeter measure the voltage between the power and ground circuit at the Trigger Module.

Is the voltage at least the same as battery voltage?

Yes >> Go To 10

No >> Repair the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

10. CHECK FOR ADDITIONAL TRIGGER MODULE COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the WCM?

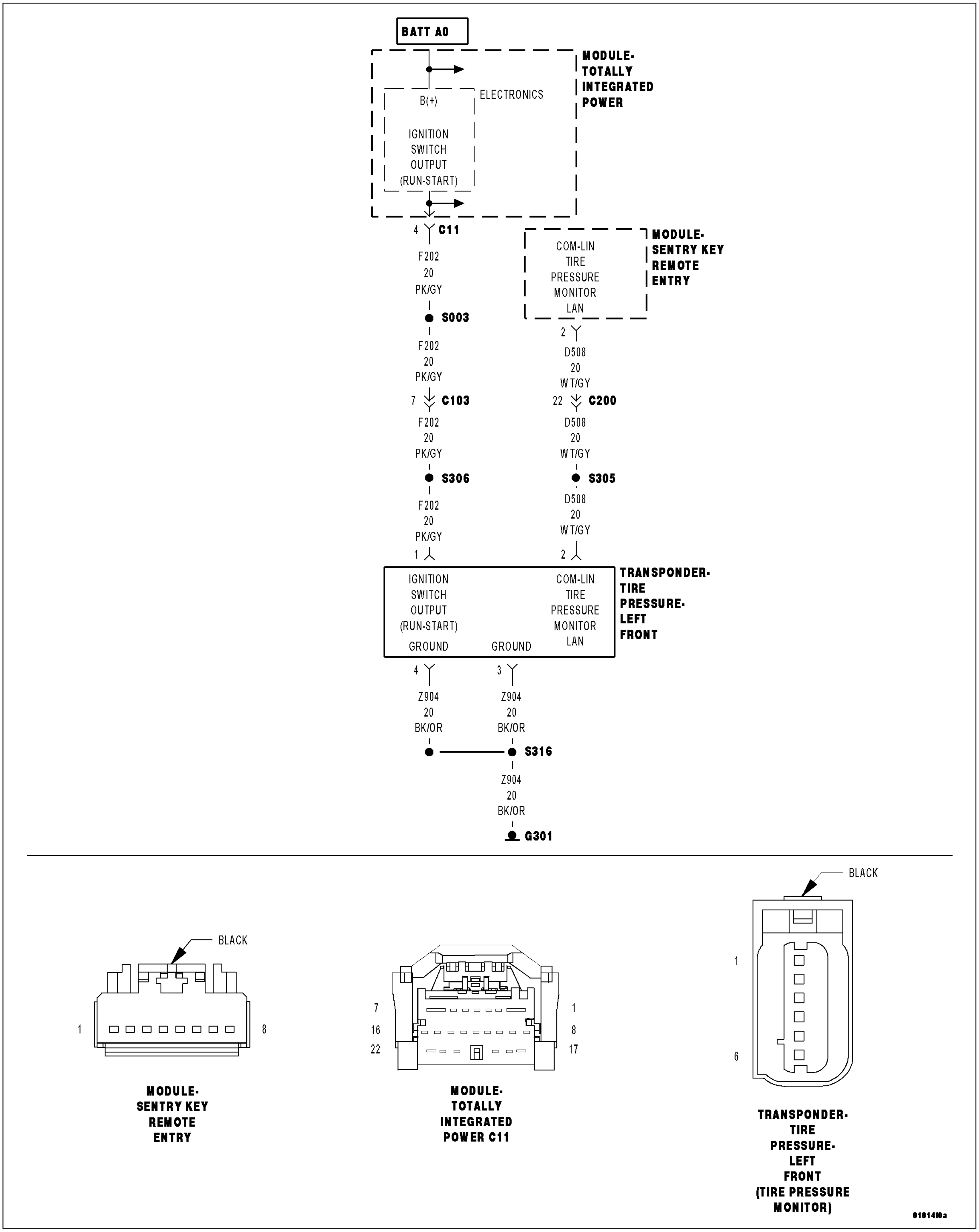
Yes >> Replace/update the WCM in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Replace the Tire pressure trigger Module in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

U1114–LOST COMMUNICATION WITH LEFT FRONT TIRE PRESSURE TRIGGER MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the WCM fails to receive bus messages from the Tire pressure trigger module for two consecutive counts of trigger module not responding to a communication check.

Possible Causes
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
(D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN
TIRE PRESSURE TRIGGER MODULE POWER AND GROUND
WCM

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

Turn the ignition on.

With the scan tool, read and record WCM DTCs.

With the scan tool, erase WCM DTCs.

Cycle the ignition switch.

With the scan tool, read WCM DTCs.

Does this DTC reset?

Yes >> Go To 3

No >> Perform the Stored Lost Communication test procedure. Refer to the table of contents in this section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN

Turn the ignition off.

Disconnect the Tire Pressure Trigger Module.

Disconnect the WCM.

With an ohmmeter measure the resistance of the (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT.

Is the resistance below 5 Ohms?

Yes >> Go To 4

No >> Repair or replace the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

3. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

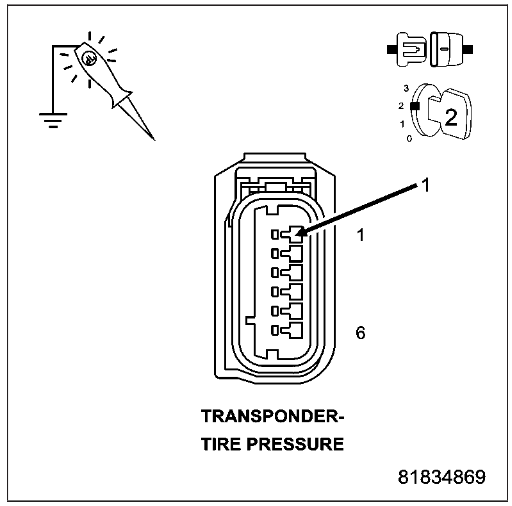
Turn the ignition off.

Disconnect the Tire Pressure Transponder harness connector.

Disconnect the Sentry Key Remote Entry Module harness connector.

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F924) Fused Ignition Switch Output (Run) circuit.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

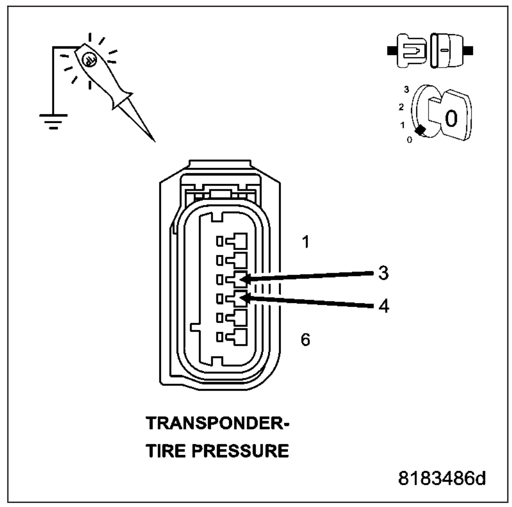
Yes >> Go to 5

No >> Repair the (F924) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. (Z924) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12-volt test light connect to battery voltage, probe each of the (Z924) Ground circuit(s).



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

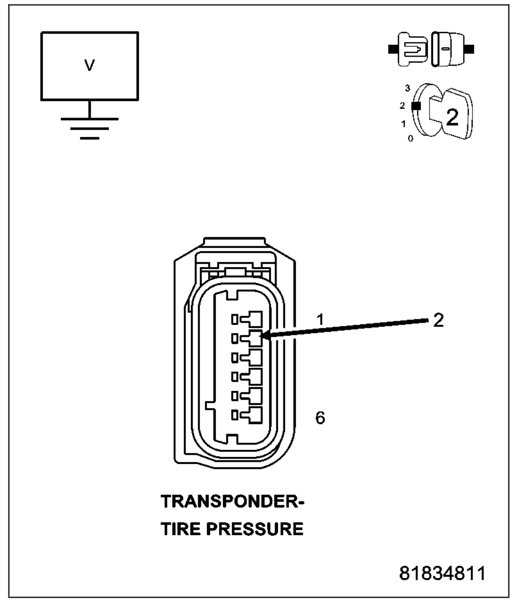
Does the test light illuminate brightly?

Yes >> Go to 6

No >> Repair the (Z924) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

5. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE



Turn the ignition on.

Measure the voltage of the (D508) COM - LIN Tire Pressure Monitor LAN circuit.

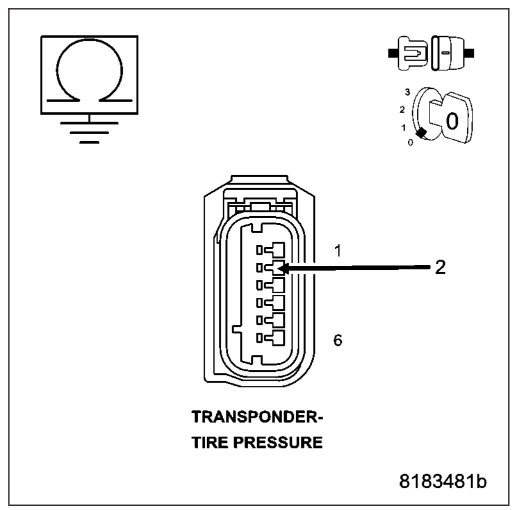
Is there any voltage present?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to voltage.

No >> Go to 7

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

6. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND



Turn the ignition off.

Measure the resistance between ground and the (D508) COM - LIN Tire Pressure Monitor LAN circuit.

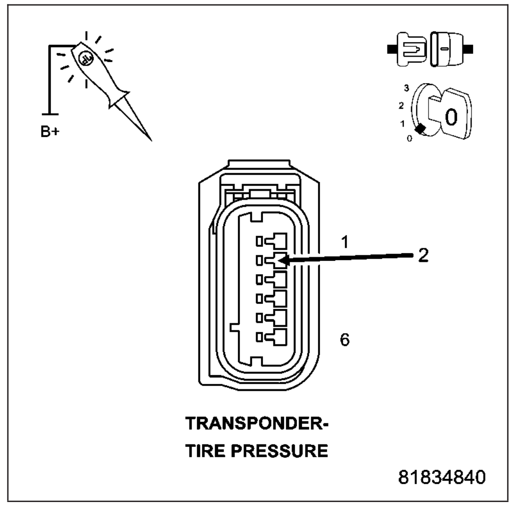
Is the resistance below 5.0 ohms?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to ground.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Go to 8

7. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE



Use a jumper wire with one end connected to ground and the other to the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the Front Left Pressure Tire Transponder harness connector.

Using a 12-Volt test light connected to battery voltage, probe the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the TPM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate bright?

Yes >> Go to 9

No >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

8. POWER AND GROUND CIRCUIT OPEN

Turn the ignition on.

With a voltmeter measure the voltage between the power and ground circuit at the Trigger Module.

Is the voltage at least the same as battery voltage?

Yes >> Go To 10

No >> Repair the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

9. CHECK FOR ADDITIONAL TRIGGER MODULE COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the WCM?

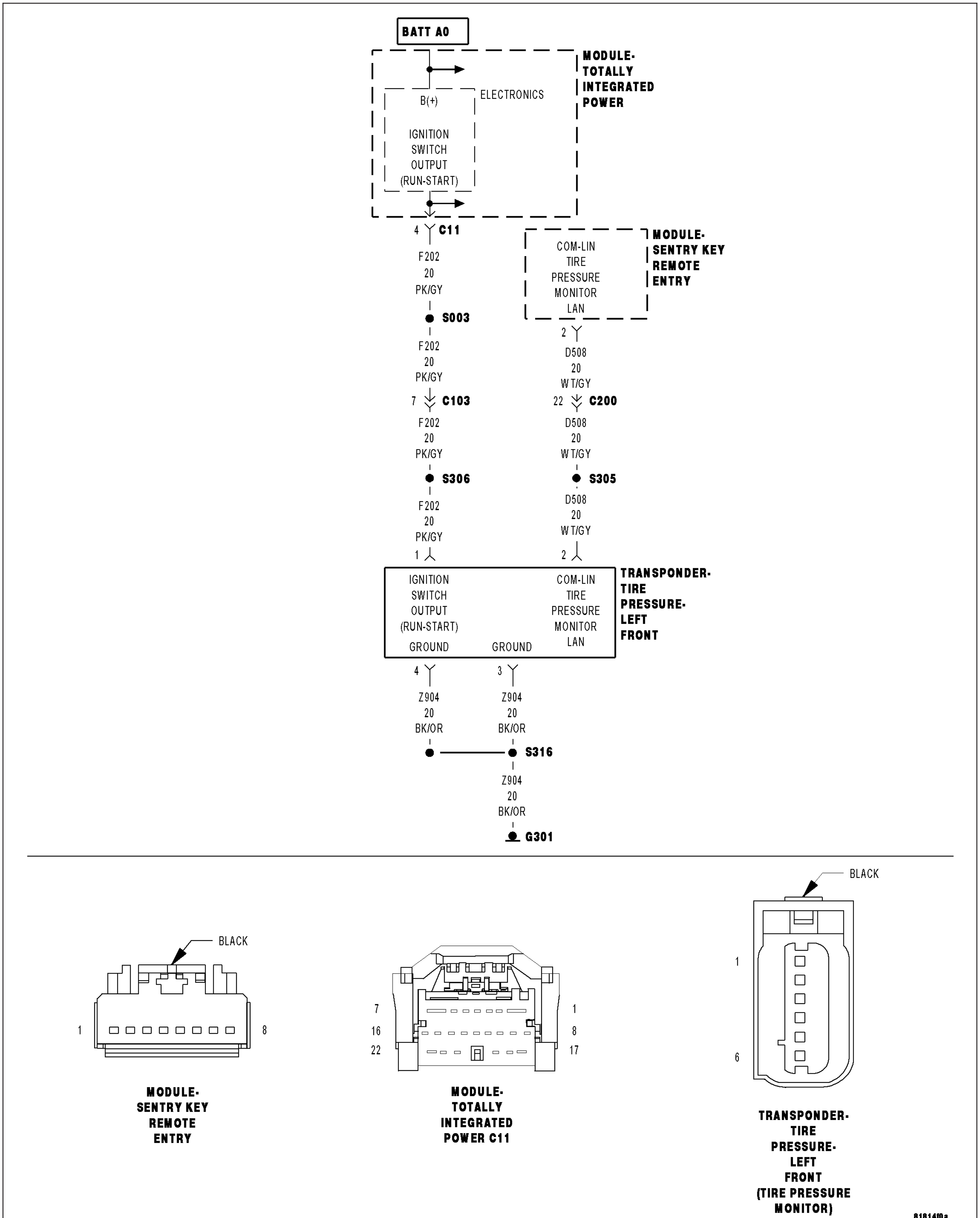
Yes >> Replace/update the WCM in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Replace the Tire pressure trigger Module in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

U1116–LOST COMMUNICATION WITH LEFT REAR TIRE PRESSURE TRIGGER MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the WCM fails to receive bus messages from the Tire pressure trigger module for two consecutive counts of trigger module not responding to a communication check.

Possible Causes
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
(D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN
TIRE PRESSURE TRIGGER MODULE POWER AND GROUND
WCM

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
Turn the ignition on.

With the scan tool, read and record WCM DTCs.

With the scan tool, erase WCM DTCs.

Cycle the ignition switch.

With the scan tool, read WCM DTCs.

Does this DTC reset?

Yes >> Go To 2

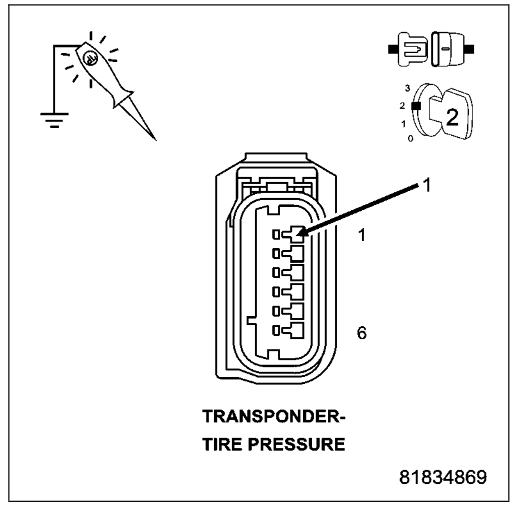
No >> Perform the Stored Lost Communication test procedure. Refer to the table of contents in this section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F202) Fused Ignition Switch Output (Run) circuit.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

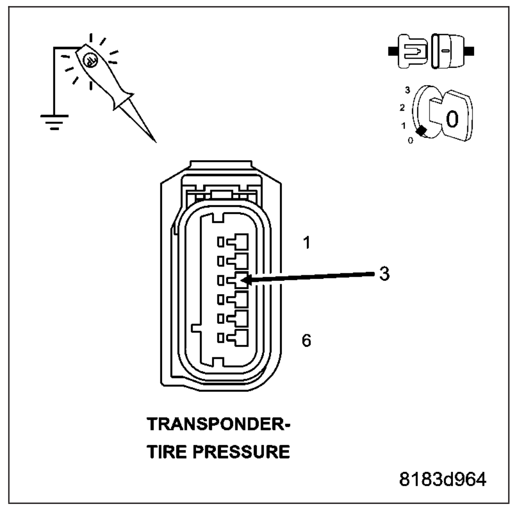
Yes >> Go to 3

No >> Repair the (F202) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/ WHEELS - DIAGNOSIS AND TESTING)

3. (Z904) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12–volt test light connect to 12 volts, check each of the (Z904) Ground circuit(s).



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (Z904) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/ WHEELS - DIAGNOSIS AND TESTING)

4. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE

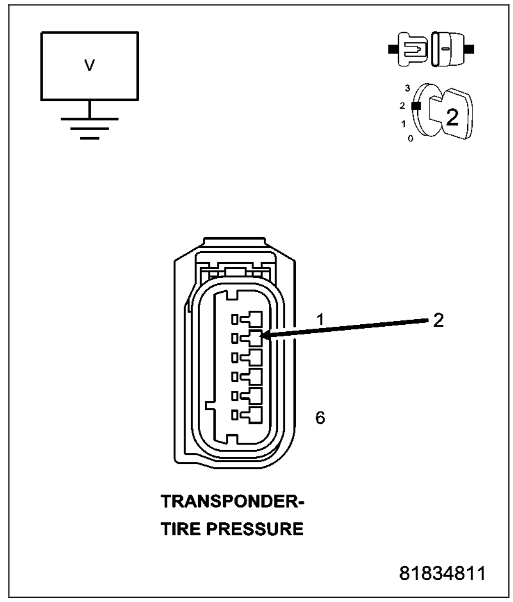
Turn the ignition off.

Disconnect the Tire Pressure Transponder harness connector.

Disconnect the Sentry Key Remote Entry Module harness connector.

Turn the ignition on.

Measure the voltage of the (D508) COM - LIN Tire Pressure Monitor LAN circuit.



Is there any voltage present?

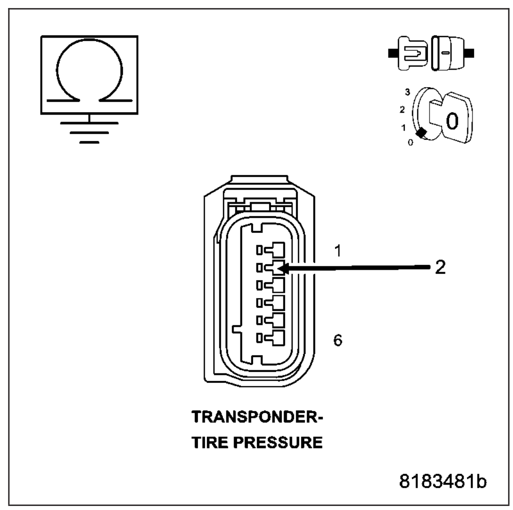
Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to voltage.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

No >> Go to 5

5. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (D508) COM - LIN Tire Pressure Monitor LAN circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to ground.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

No >> Go to 6

6. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE

Use a jumper wire with one end connected to ground and the other to the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the Front Left Pressure Tire Transponder harness connector.

Using a 12-Volt test light connected to battery voltage, probe the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the SKREEM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate bright?

Yes >> Go to 7

No >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for an open circuit or high resistance.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

7. (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN

Turn the ignition off.

Disconnect the Tire Pressure Trigger Module.

Disconnect the WCM.

With an ohmmeter measure the resistance of the (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT.

Is the resistance below 5 Ohms?

Yes >> Go To 8

No >> Repair or replace the open circuit.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

8. POWER AND GROUND CIRCUIT OPEN

Turn the ignition on.

With a voltmeter measure the voltage between the power and ground circuit at the Trigger Module.

Is the voltage at least the same as battery voltage?

Yes >> Go To 9

No >> Repair the open circuit.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

9. CHECK FOR ADDITIONAL TRIGGER MODULE COMMUNICATION RELATED DTCs

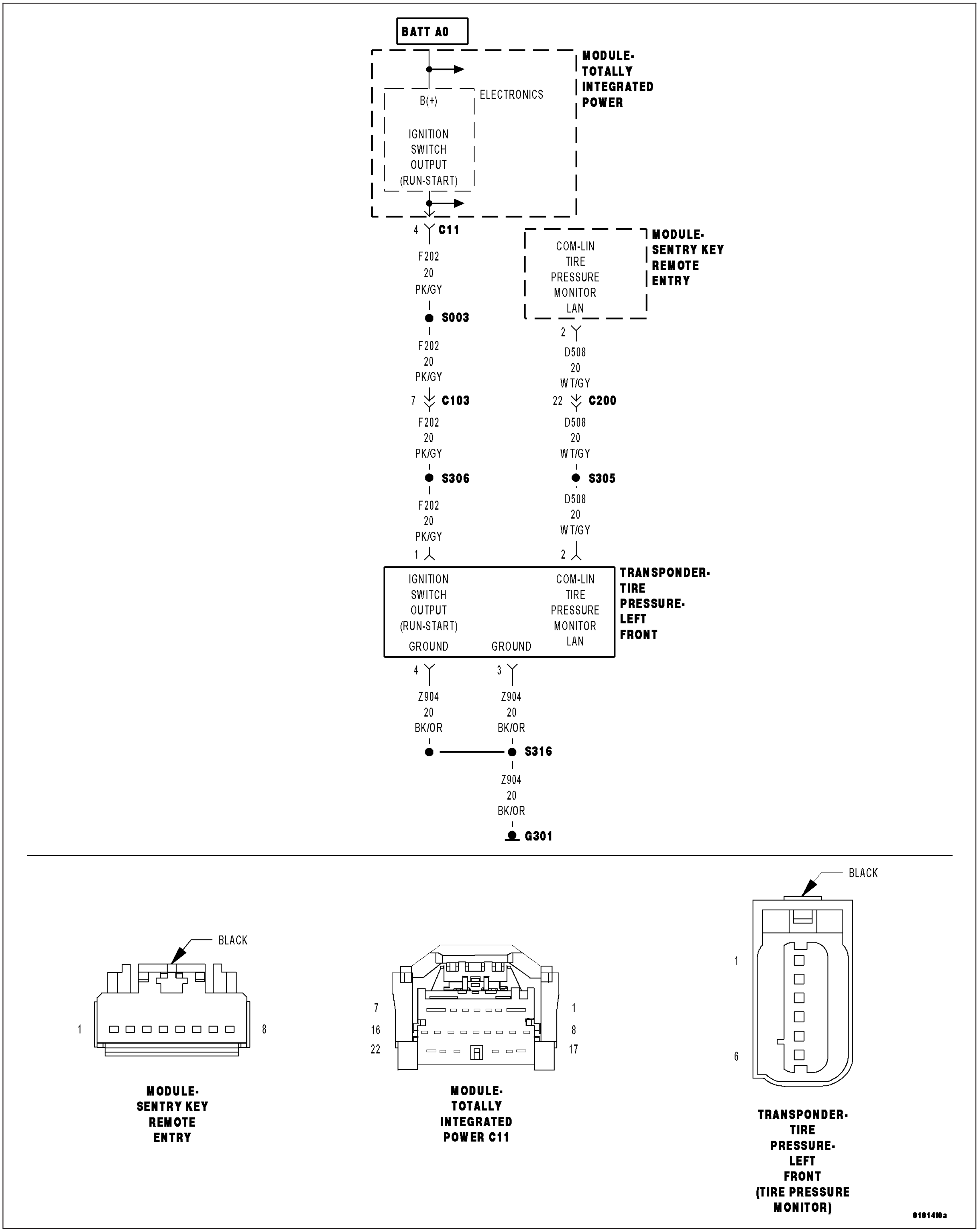
With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the WCM?

Yes >> Replace/update the WCM in accordance with the service information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Replace the Tire pressure trigger Module in accordance with the service information.
Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

U1117–LOST COMMUNICATION WITH RIGHT REAR TIRE PRESSURE TRIGGER MODULE



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
- **Set Condition:**
  If the WCM fails to receive bus messages from the Tire pressure trigger module for two consecutive counts of trigger module not responding to a communication check.

Possible Causes
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND
(D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE
(F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE
(Z965) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE
(D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN
TIRE PRESSURE TRIGGER MODULE POWER AND GROUND
WCM

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

Turn the ignition on.

With the scan tool, read and record WCM DTCs.

With the scan tool, erase WCM DTCs.

Cycle the ignition switch.

With the scan tool, read WCM DTCs.

Does this DTC reset?

Yes >> Go To 2

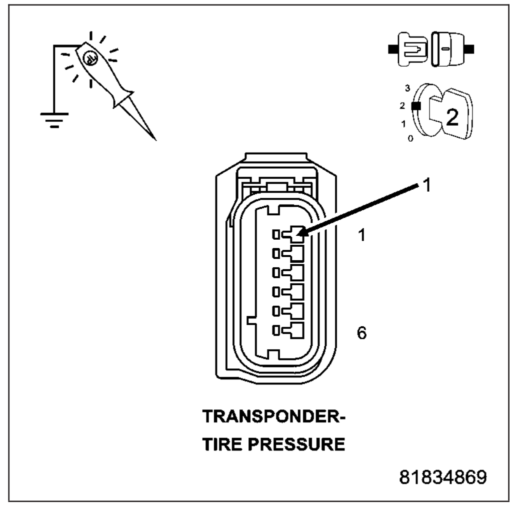
No >> Perform the Stored Lost Communication test procedure. Refer to the table of contents in this section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. (F202) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition on.

Using a 12–volt test light connect to ground, check the (F202) Fused Ignition Switch Output (Run) circuit.



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

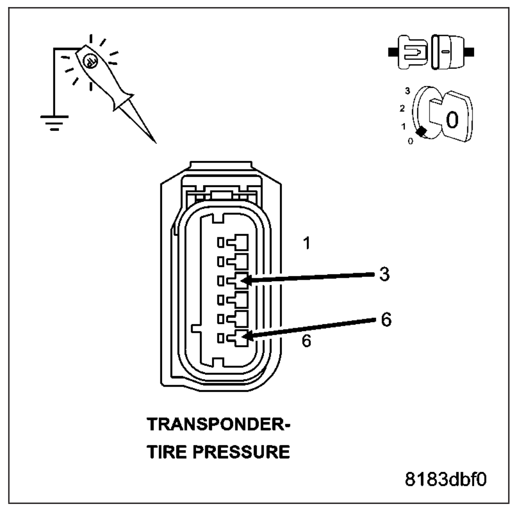
Yes >> Go to 3

No >> Repair the (F202) Fused Ignition Switch Output (Run) circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

3. (Z965) GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Using a 12–volt test light connect to 12 volts, check each of the (Z965) Ground circuit(s).



NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go to 4

No >> Repair the (Z965) Ground circuit(s) for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

4. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Tire Pressure Transponder harness connector.

Disconnect the Sentry Key Remote Entry Module harness connector.

Turn the ignition on.

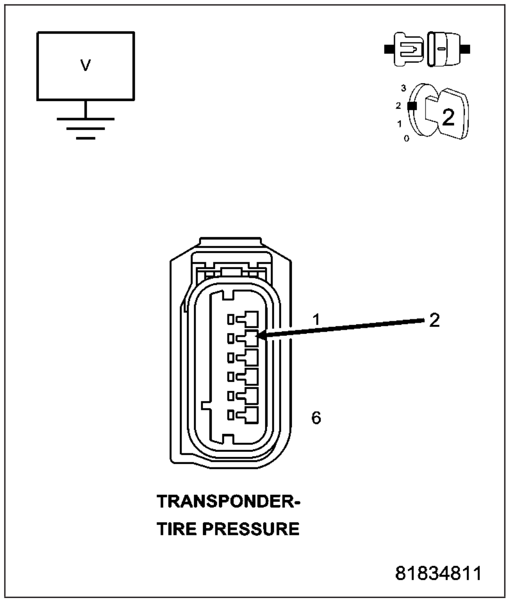
Measure the voltage of the (D508) COM - LIN Tire Pressure Monitor LAN circuit.

Is there any voltage present?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to voltage.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Go to 5



5. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT SHORT TO GROUND

Turn the ignition off.

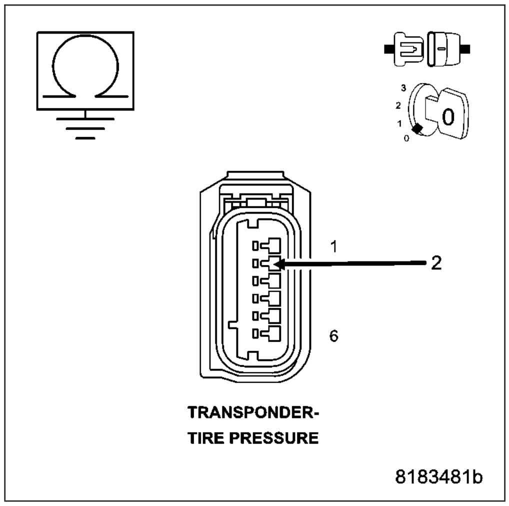
Measure the resistance between ground and the (D508) COM - LIN Tire Pressure Monitor LAN circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for a short to ground.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Go to 6



6. (D508) COM - LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN OR HIGH RESISTANCE

Use a jumper wire with one end connected to ground and the other to the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the Front Left Pressure Tire Transponder harness connector.

Using a 12-Volt test light connected to battery voltage, probe the (D508) COM - LIN Tire Pressure Monitor LAN circuit in the SKREEM harness connector.

NOTE: The test light should be illuminated and bright. Compared the brightness to that of a direct connection to the battery.

Does the test light illuminate bright?

Yes >> Go to 7

No >> Repair the (D508) COM - LIN Tire Pressure Monitor LAN circuit for an open circuit or high resistance.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

7. (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT OPEN

Turn the ignition off.

Disconnect the Tire Pressure Trigger Module.

Disconnect the WCM.

With an ohmmeter measure the resistance of the (D508) COM-LIN TIRE PRESSURE MONITOR LAN CIRCUIT.

Is the resistance below 5 Ohms?

Yes >> Go To 8

No >> Repair or replace the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

8. POWER AND GROUND CIRCUIT OPEN

Turn the ignition on.

With a voltmeter measure the voltage between the power and ground circuit at the Trigger Module.

Is the voltage at least the same as battery voltage?

Yes >> Go To 9

No >> Repair the open circuit.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

9. CHECK FOR ADDITIONAL TRIGGER MODULE COMMUNICATION RELATED DTCs

With the scan tool, select Network View and select Advanced.

Is there more than one module with active DTCs “Logged Against” the WCM?

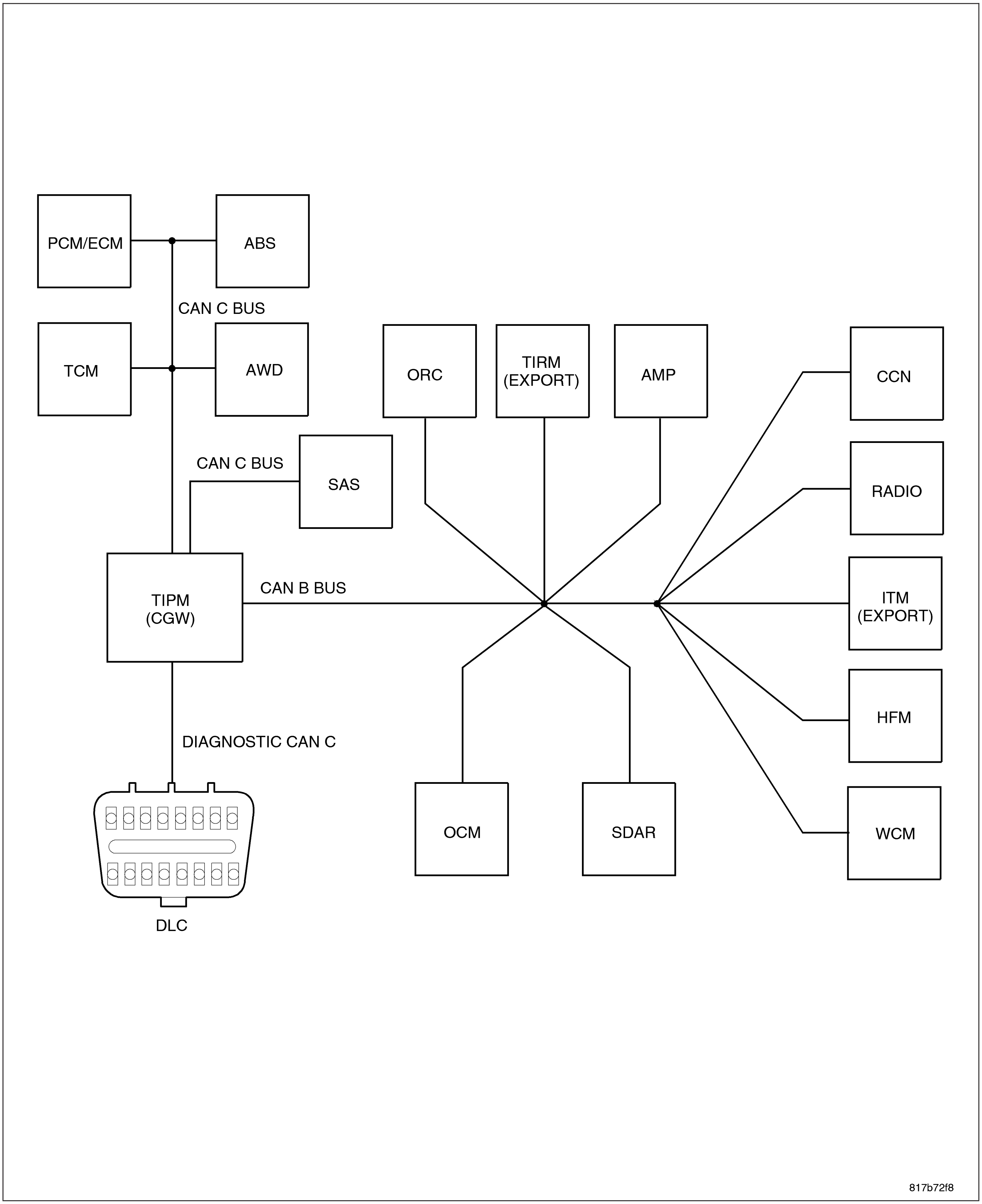
Yes >> Replace/update the WCM in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

No >> Replace the Tire pressure trigger Module in accordance with the service information.

Perform TPM VERIFICATION TEST. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - STANDARD PROCEDURE)

*STORED LOST COMMUNICATION DTC'S



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
  Battery voltage between 10 and 16 volts.
  IOD fuse installed.
  TIPM is configured correctly.
- **Set Condition:**
  Bus messages not received for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
TIPM NOT CONFIGURED CORRECTLY
POWER OR GROUND FROM THE REPORTING MODULE
MODULE THAT SET THIS DTC
PREVIOUS SERVICE PERFORMED WITHIN THE LAST 100 KEY CYCLES (FUSE/RELAYS REMOVED, WIRING SERVICE, BATTERY DISCONNECT)
LOW BATTERY/JUMP START CONDITION
IOD FUSE WAS REMOVED DURING SHIPPING
CHECK FOR RELATED TSB'S

Diagnostic Test

1. VERIFY DTC IS STORED

NOTE: Stored faults may indicate a customer perceived intermittent condition.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read stored DTC's.

Is this DTC stored?

Yes >> Go To 2

No >> Diagnose the active DTC. Refer to the Table of Contents for a list of the symptoms.

2. CHECK THE ENVIRONMENTAL DATA

With the scan tool, read the loss of communication environmental data.

Does the loss of communication environmental odometer data match up to any of the previous service procedures listed in the possible causes or are their any stored CAN B or C hardware electrical, battery, ignition voltage, VIN missing/mismatch, TIPM configuration DTC's present with matching environmental data?

Yes >> These DTC's may have been the result of other service procedures performed. Clear DTC's.

No >> Go To 3

3. VERIFY INTERMITTENT LOST COMMUNICATION DTC – WIRING CONCERNS

Turn the ignition on.

With the scan tool, select Network View and select Advanced.

Is there more than one ECU with stored DTC's "Logged Against" the module and one or more lost communication DTC's stored in the offending module?

Yes >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

No >> Go To 4

4. VERIFY INTERMITTENT LOST COMMUNICATION DTC – OFFENDING MODULE

Turn the ignition on.

With the scan tool, select Network View and select Advanced.

Is there more than one ECU with stored DTC's "Logged Against" the module and NO lost communication DTC's stored in the offending module?

Yes >> Check for TSB related to this offending module.

No >> Go To 5

5. VERIFY INTERMITTENT LOST COMMUNICATION DTC – REPORTING MODULE

Turn the ignition on.

With the scan tool, select Network View and select Advanced.

Is there ONLY ONE ECU with stored DTC's "Logged Against" the module?

Yes >> Check for TSB related to the module that set this DTC.

No >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

STANDARD PROCEDURE

TPM VERIFICATION

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. TPM

Was the WCM/SKREEM replaced during the test procedure?

Yes >> Go to 2

No >> Go to 3

2. WCM/SKREEM

NOTE: When entering the PIN, care should be taken because the SKREEM will only allow three consecutive attempts to enter the correct PIN. If three consecutive incorrect PIN's are entered the SKREEM will Lock Out the scan tool. To exit Lock Mode, the ignition key must remain in the Run position for one hour. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

1. Reconnect the previously removed and/or disconnected components and connectors.
2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKREEM. This number can be obtained from the vehicle invoice or from the DaimlerChrysler Customer Center (Phone 1-800-992-1997).
3. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
4. If the WCM/SKREEM was replaced, all the customer's keys must be programmed to the new module. Use the scan tool and the Program Key procedure
5. With the scan tool, erase all DTCs. Perform 5 ignition key cycles, leaving the key on for at least 90 seconds per cycle.
6. Drive the vehicle for a minimum of 10 minutes while maintaining a continuous speed above 15 mph (24 km/h). During this time the system will learn the new sensor ID code and will clear any DTC(s) automatically.
7. With the scan tool, read WCM/SKREEM DTC(s).

Are there any DTC(s) present?

Yes >> Repair not complete, refer to the appropriate symptom.

No >> Repair is complete.

3. TIRE PRESSURE SENSOR/TIRE PRESSURE TRANSPONDER REPLACE

1. Reconnect the previously removed and/or disconnected components and connectors.
2. Drive the vehicle for a minimum of 10 minutes while maintaining a continuous speed above 15 mph (24 km/h). During this time the system will learn the new sensor ID code and will clear any DTC(s) automatically.
3. With the scan tool, read TPM DTC(s).

Are there any DTC(s) present?

Yes >> Repair not complete, refer to the appropriate symptom.

No >> Repair is complete.

TIRES/WHEELS - SERVICE INFORMATION

TABLE OF CONTENTS

TIRES/WHEELS - SERVICE INFORMATION

DIAGNOSIS AND TESTING

TIRE AND WHEEL VIBRATION

Tire and wheel imbalance, runout and force variation can cause vehicles to exhibit steering wheel vibration.

VISUAL INSPECTION

Visual inspection of the vehicle is recommended prior to road testing or performing any other procedure. Raise the vehicle on a suitable hoist. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

Inspect for the following:

- Verify correct (OEM) wheel and tire, as well as correct wheel weights.
- Inspect tires and wheels for damage, mud packing and unusual wear; correct as necessary.
- Check and adjust tire air pressure to the pressure listed on the label attached to the driver's door opening.

ROAD TEST

Road test vehicle on a smooth road for a least five miles to warm tires (remove any flat spots). Lightly place hands on steering wheel at the 10:00 and 2:00 positions while slowly sweeping up and down from 90 to 110 km/h (55 to 70 mph) where legal speed limits allow.

Observe the steering wheel for:

- Visual Nibble (oscillation: clockwise/counterclockwise, usually due to tire imbalance)
- Visual Buzziness (high frequency, rapid vibration up and down)

To rule out vibrations due to brakes or powertrain:

- Lightly apply brakes at speed; if vibration occurs or is enhanced, vibration is likely due to causes other than tire and wheel assemblies.
- Shift transmission into neutral while vibration is occurring; if vibration is eliminated, vibration is likely due to causes other than tire and wheel assemblies.

For brake vibrations, (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/ROTOR - DIAGNOSIS AND TESTING).

For powertrain vibrations, (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING).

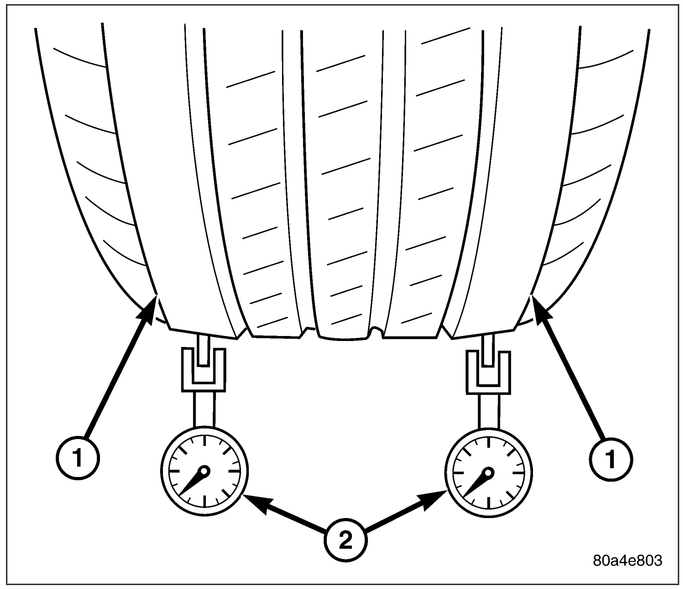
For tire and wheel assembly vibrations, continue with this diagnosis and testing procedure.

TIRE AND WHEEL BALANCE

1. Balance the tire and wheel assemblies as necessary following the wheel balancer manufacturer's instructions and using the information listed in Tire And Wheel Balance. (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE)
2. Road test the vehicle for at least 5 miles, following the format described in Road Test.
3. If the vibration persists, continue with this diagnosis and testing procedure.

TIRE AND WHEEL RUNOUT/MATCH MOUNTING

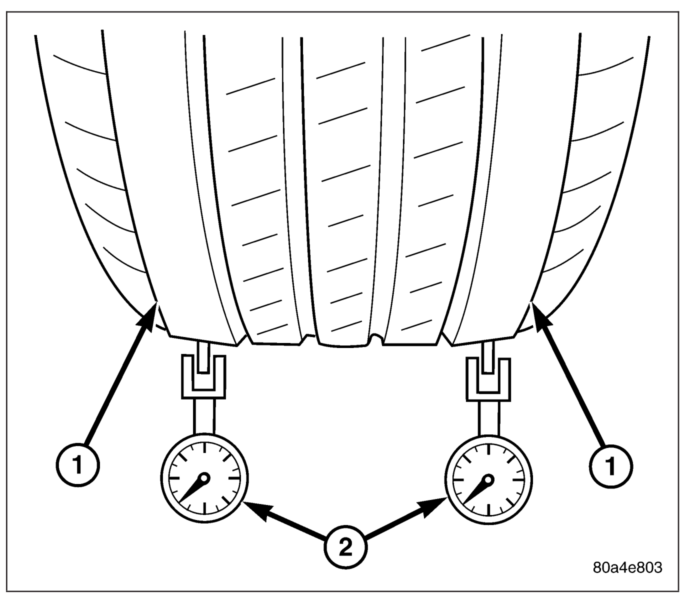
1. **System Radial Runout.** This on-the-vehicle system check will measure the radial runout including the hub, wheel and tire.
   a. Raise vehicle so tires clear floor. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
   b. Apply masking tape around the circumference of the tire in the locations to be measured (1). Do not overlap the tape.
   c. Check system runout using Dial Indicator Set, Special Tool C-3339A with 25-W wheel, or equivalent. Place the end of the indicator against each taped area (one at a time) (2) and rotate the tire and wheel. System radial runout should not exceed 0.76 mm (0.030 inch) with no tread “dips” or “steps.” Tread “dips” and “steps” can be identified by spikes of the dial indicator gauge.



- Tread ″dips″; Rapid decrease then increase in dial indicator reading over 101.6 mm (4.0 inch) of tread circumference.
- Tread ″steps″; Rapid decrease or increase in dial indicator reading over 101.6 mm (4.0 inch) of tread circumference.

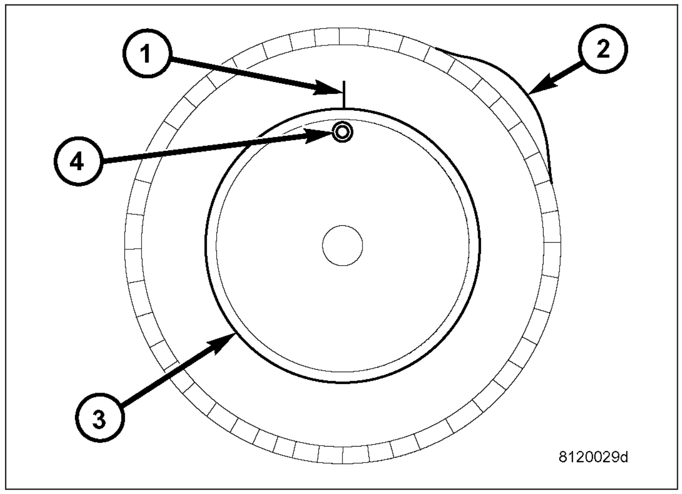
   d. If system runout is excessive, re-index the tire and wheel assembly on the hub. Remove assembly from vehicle and install it back on the hub two studs over from original mounting position. If re-indexing the tire and wheel assembly corrects or reduces system runout, check hub runout and repair as necessary (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS AND TESTING).
   e. If system runout is still excessive, continue with this diagnosis and testing procedure.

2. **Tire and Wheel Assembly Radial Runout.** This radial runout check is performed with the tire and wheel assembly off the vehicle.
   a. Remove tire and wheel assembly from vehicle and install it on a suitable wheel balancer.
   b. Check system runout using Dial Indicator Set, Special Tool C-3339A with 25-W wheel, or equivalent. Place the end of the indicator against each taped area (one at a time) and rotate the tire and wheel. Radial runout should not exceed 0.76 mm (0.030 inch) with no tread “dips” or “steps.” Tread “dips” and “steps” can be identified by spikes of the dial indicator gauge.



c. If runout exceeds limits, mark the original location of the tire on the wheel at the valve stem (1)(4). Also, mark the tire and wheel to indicate the original high spot (2) of the assembly and record the runout measurement.

d. If runout exceeds limits, the tire will need to be dismounted from the wheel to verify wheel vs. tire contribution. Refer to Wheel Runout below.

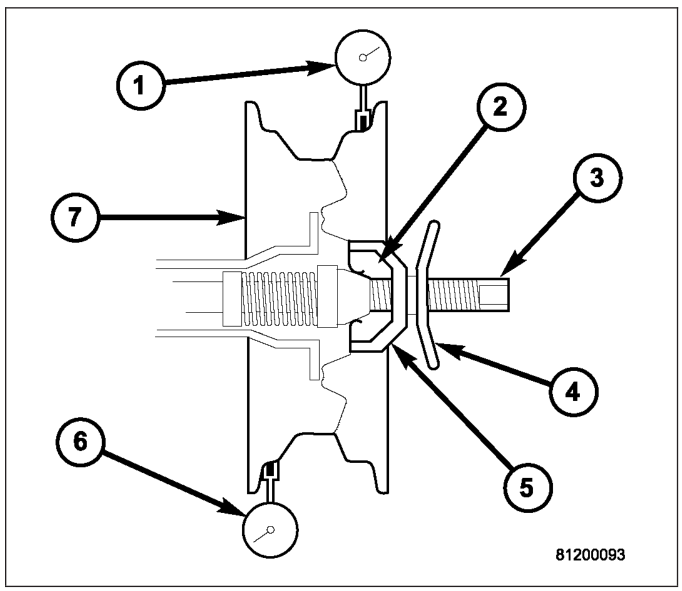


3. **Lateral Runout.** Lateral runout for the vehicle system as well as the tire and wheel assembly should be less than 0.76 mm (0.030 inch). The same procedure and theory described for radial runout can also be applied to identify and reduce lateral runout.
4. **Wheel Runout.** This runout check is performed as follows:

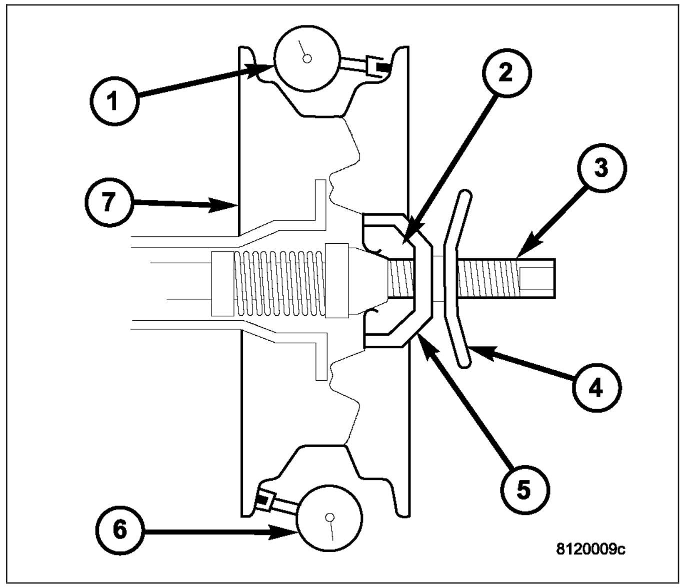
a. Dismount the tire from the wheel.

b. Mount the wheel back on the wheel balancer.

c. Measure radial runout of the wheel at the tire bead seat (1, 6). Runout should not exceed the specification limit listed in the following table. Replace the wheel if it exceeds the limit.



d. Measure lateral runout of the wheel at the tire bead seat (1, 6). Runout should not exceed the specification limit listed in the following table. Replace the wheel if it exceeds the limit.



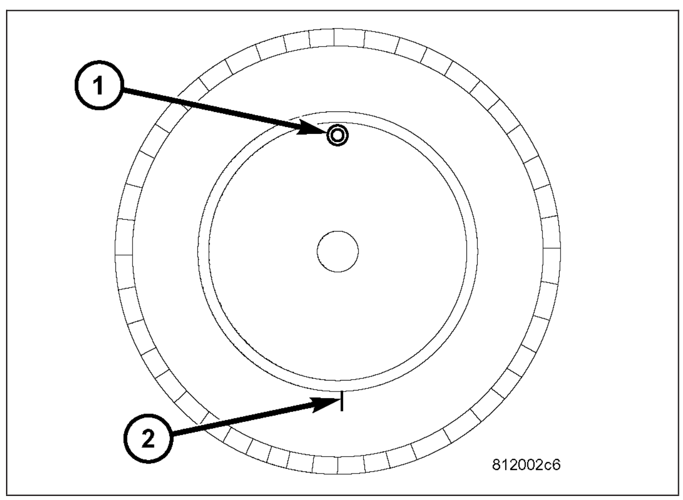
WHEEL RUNOUT LIMITS

WHEEL TYPE	RADIAL RUNOUT	LATERAL RUNOUT
Aluminum Wheel	0.50 mm (0.020 inch)	0.50 mm (0.020 inch)
Steel Wheel	0.62 mm (0.024 inch)	0.80 mm (0.031 inch)

5. **Match Mounting.** If the wheel runout is within specifications, tire and wheel assembly runout can be improved by re-indexing (match mounting) the tire to the wheel as described below.

a. Remount the tire on the rim 180 degrees from its original location. Ensure the tire bead is properly seated.

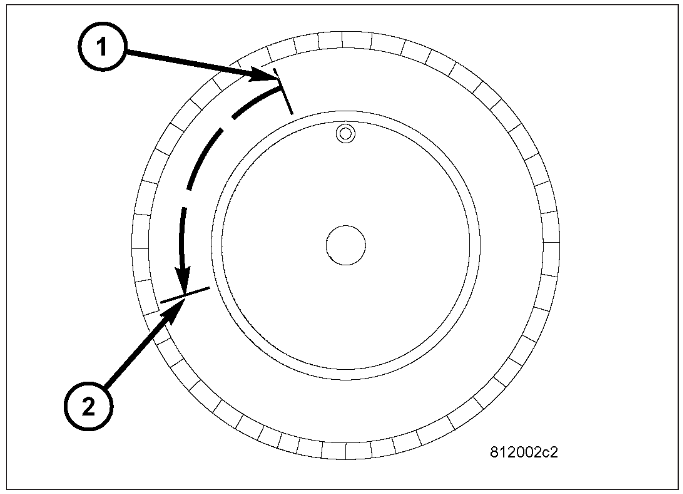
b. Re-measure the total runout. Mark the tire at the high spot and record the measurement.



If runout is still excessive, perform the following:

- If the new high spot is within 102 mm (4.0 inch) of the first high spot on the tire, replace the tire.
- If the new high spot is within 102 mm (4.0 inch) of the first high spot on the wheel, the wheel may be out of specification. Refer to Wheel Runout above.

- If the new high spot is NOT within 102 mm (4.0 inch) of either high spot, draw an arrow on the tread from new high spot toward the original (2). Break down the tire and remount it 90 degrees on rim in that direction, then re-measure runout. This will normally reduce the runout to an acceptable amount.



6. Once back together, road test the vehicle for at least 5 miles, following the format described in Road Test. If vibration persists, and all components tested are within specification, the tires may have an excessive radial force condition. Radial force variation can be checked using a wheel balancer capable of measuring radial force variation, such as the Hunter GSP 9700 Vibration Control System (Wheel Balancer) or equivalent. If this equipment is not available, consult with the tire manufacturer.

STANDARD PROCEDURE

TIRE AND WHEEL BALANCE

NOTE: Balance equipment must be calibrated and maintained per equipment manufacturer's specifications.

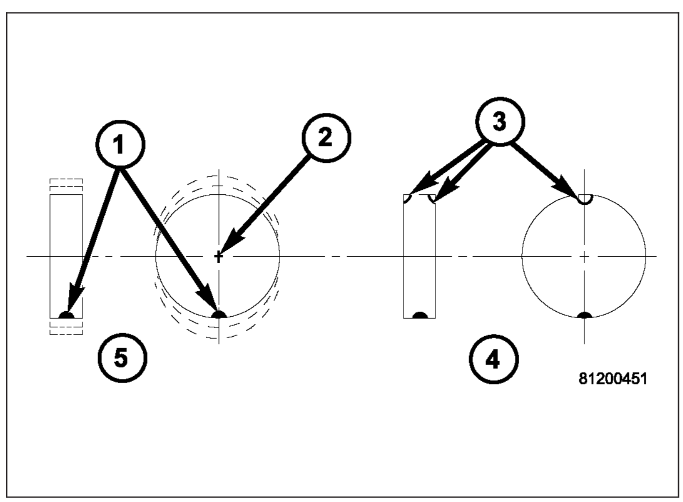
Wheel balancing can be accomplished with either on-vehicle or off-vehicle equipment.

NOTE: If using on-vehicle balancing equipment, on the driving axle, remove the opposite wheel and tire assembly.

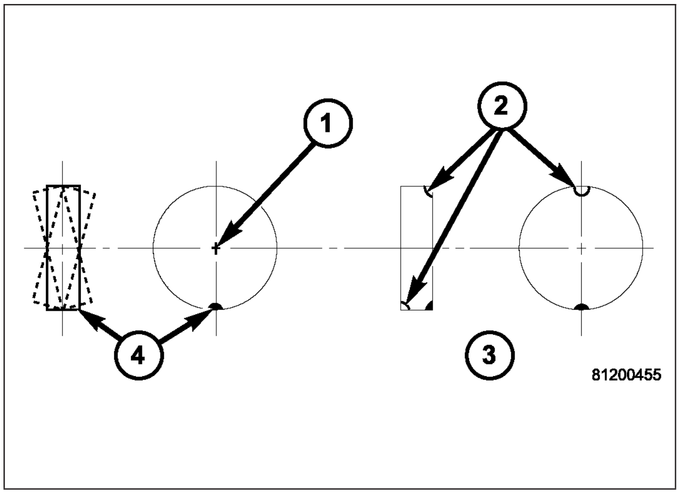
It is recommended that a two-plane dynamic balancer be used when a tire and wheel assembly requires balancing. A static balancer should only be used when a two-plane balancer is not available.

Balance wheel and tire assemblies dynamically and statically to less than 0.25 (¼) ounce.

For static balancing, find the location of the heavy spot causing the imbalance (1). Counter balance the wheel directly opposite the heavy spot. Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (3) at the predetermined spots.



For dynamic balancing, the balance equipment is designed to indicate the location and amount of weight to be applied to both the inner and outer rim flanges (2).



The aluminum wheels on this vehicle use a different wheel weight than do the steel wheels. Be sure to use the correct wheel weight for the wheel type.

Always verify the Balance. When using off-vehicle equipment, remount the tire and wheel assembly 180 degrees on the balancer spindle and recheck balance. Balance variation from one spot to the other should not be more than 0.125 (⅛) ounce. If variation is more than 0.125 ounce, balancing equipment could be malfunctioning.

If difficult to balance, break down the tire and wheel assembly and check for loose debris inside the tire. Prior to disassembly, mark (index) the tire at the valve stem. Use this mark in order to remount the tire in its original orientation with respect to the wheel.

TIRE AND WHEEL MATCH MOUNTING

Wheels and tires are match mounted at the factory. This means that the high spot of the tire is matched to the low spot on the wheel rim. This technique is used to reduce runout in the wheel and tire assembly. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the wheel is identified with a label on the outside of the rim and a dot or line in the drop well area of the rim (inside where the tire mounts). If the outside label has been removed, the tire will have to be removed to locate the dot or line on the inside of the rim. The tire can then be match mounted to the tire.

Information on match mounting the tire to the wheel can be found in Tire and Wheel Runout/Match Mounting, items (2) through (5), within Diagnosis And Testing - Tire And Wheel Vibration. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

TIRE AND WHEEL ROTATION

NOTE: Refer to the Owner's Manual for rotation schedules.

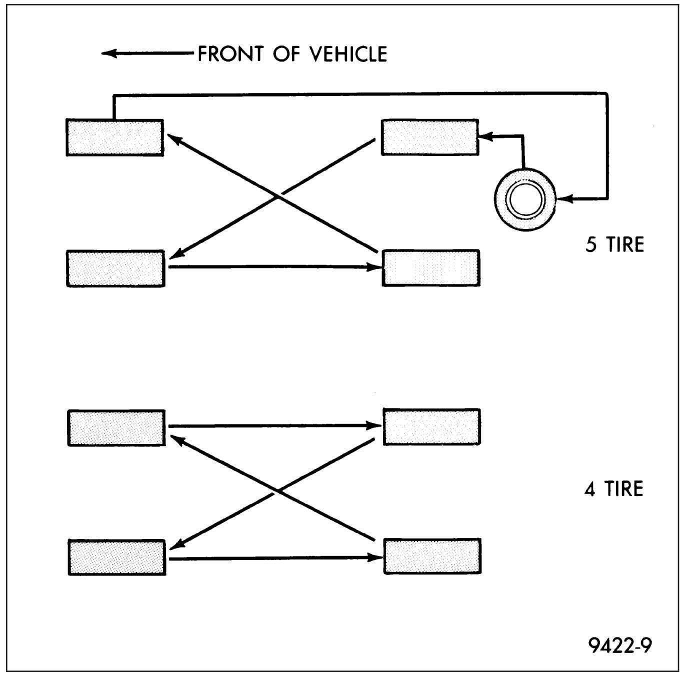
NON-DIRECTIONAL TREAD PATTERN TIRES

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is shown in this graphic. Other rotation methods can be used, but they will not provide all the tire longevity benefits.

NOTE: Only the 4 tire rotation method may be used if the vehicle is equipped with a compact or temporary spare tire.



DIRECTIONAL TREAD PATTERN TIRES

Some vehicles may be fitted with special high-performance tires having a directional tread pattern. These tires are designed to improve traction on wet pavement. To obtain the full benefits of this design, the tires must be installed so that they rotate in the correct direction. This is indicated by arrows on the tire sidewalls.

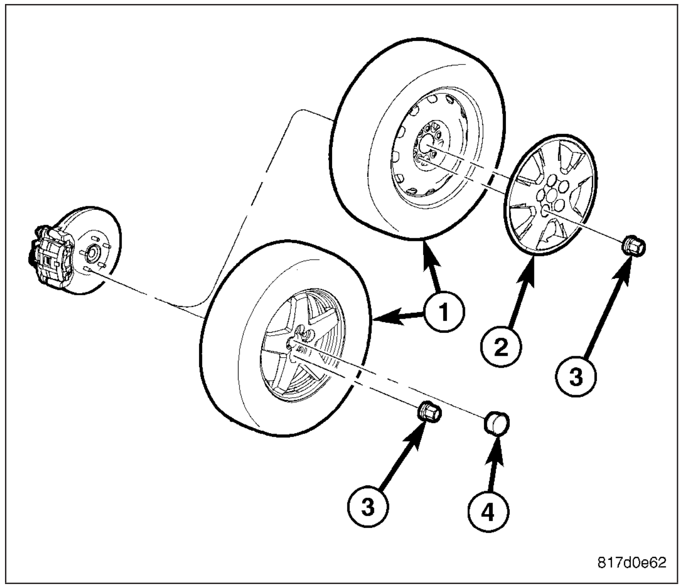
When being installed, extra care is needed to ensure that this direction of rotation is maintained.

REMOVAL

TIRE AND WHEEL ASSEMBLY - ALUMINUM WHEEL

1. Raise and support the vehicle so that tire and wheel assembly clears ground level. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. If the vehicle is equipped with wheel center caps that cover the wheel nuts, remove the cap with an appropriate removal tool utilizing the notch formed into the wheel near valve stem. Use care not to damage the wheel coating.

3. Remove five wheel mounting (lug) nuts (3) from studs.
4. Remove tire and wheel assembly (1) from hub.

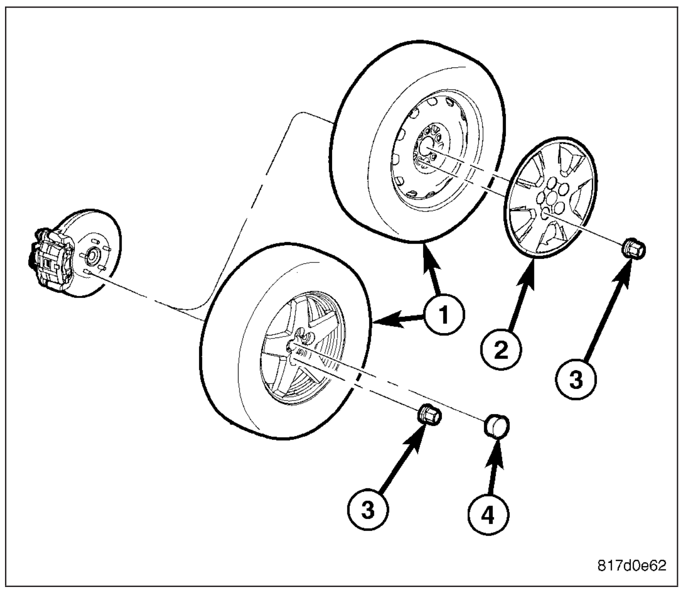


TIRE AND WHEEL ASSEMBLY - STEEL WHEEL

1. Raise and support the vehicle so that tire and wheel assembly clears ground level. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

CAUTION: When removing the bolt-on wheel cover, do not attempt to pry the wheel cover off the wheel. It is held on by the wheel mounting nuts.

2. Remove the five wheel mounting (lug) nuts (3) from the wheel studs. While removing the nuts, hold the wheel cover (2) in place so it doesn't fall off when the last nut is removed.
3. Remove the wheel cover (2) using care not to let the tire and wheel assembly (1) fall off the vehicle.
4. Remove the tire and wheel assembly (1) from the hub.



INSTALLATION

TIRE AND WHEEL ASSEMBLY - ALUMINUM WHEEL

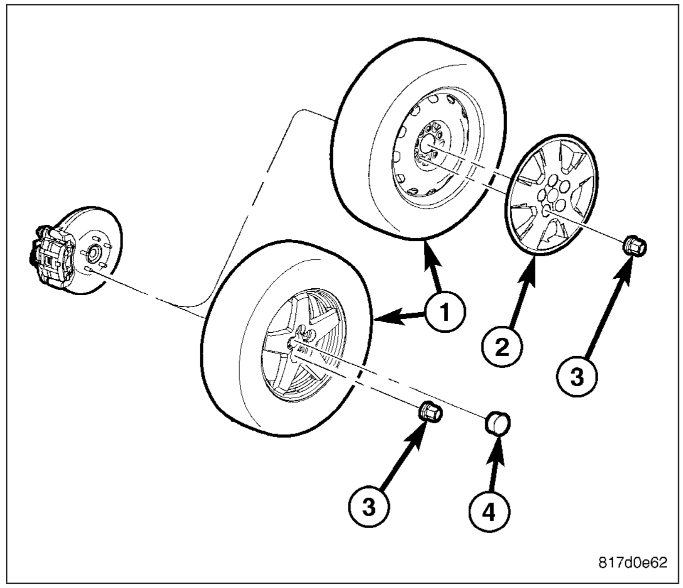
WARNING: Installing wheels without good metal-to-metal contact with the mounting surface could cause loosening of the wheel mounting (lug) nuts. This could adversely affect the safety and handling of the vehicle.

NOTE: Never use oil or grease on studs or wheel mounting (lug) nuts.

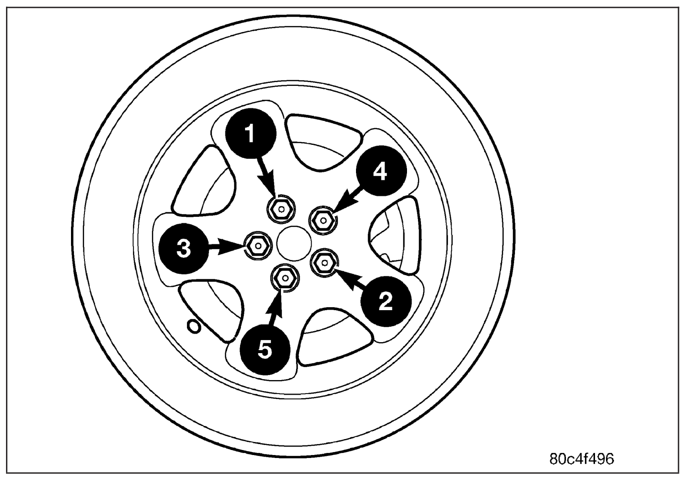
1. Clean wheel mounting surfaces, removing any build-up of corrosion. It is important to have good metal-to-metal contact between the wheel and vehicle.
2. Position the tire and wheel assembly (1) on the wheel mounting studs using the hub pilot as a guide. Place and hold the wheel flush up against the mounting surface.

NOTE: Always use the original (OEM) style wheel mounting (lug) nuts. Do not use replacement parts of lesser quality or substitute design.

3. Install and lightly snug all five wheel mounting (lug) nuts (3) **Do not tighten at this time**.



4. If applicable, install the wheel center cap.
5. Lower the vehicle.
6. Progressively tighten all wheel mounting nuts in the proper sequence shown. Tighten nuts to a final torque of 135 N·m (100 ft. lbs.).



TIRE AND WHEEL ASSEMBLY - STEEL WHEEL

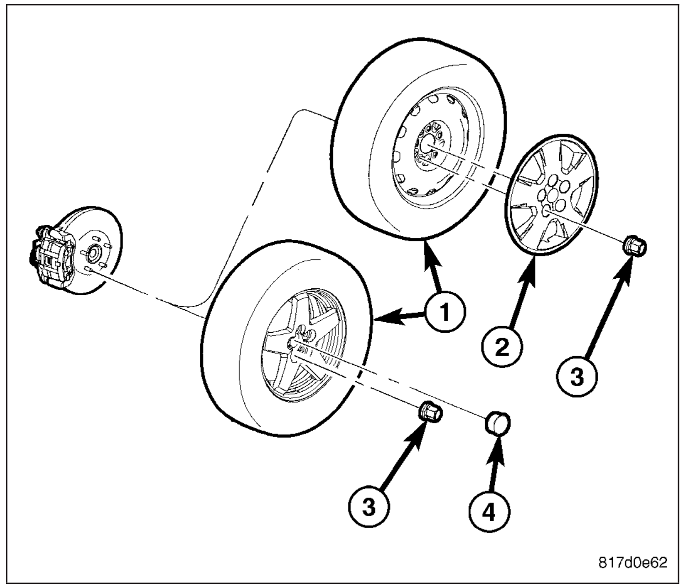
WARNING: Installing wheels without good metal-to-metal contact with the mounting surface could cause loosening of the wheel mounting (lug) nuts. This could adversely affect the safety and handling of the vehicle.

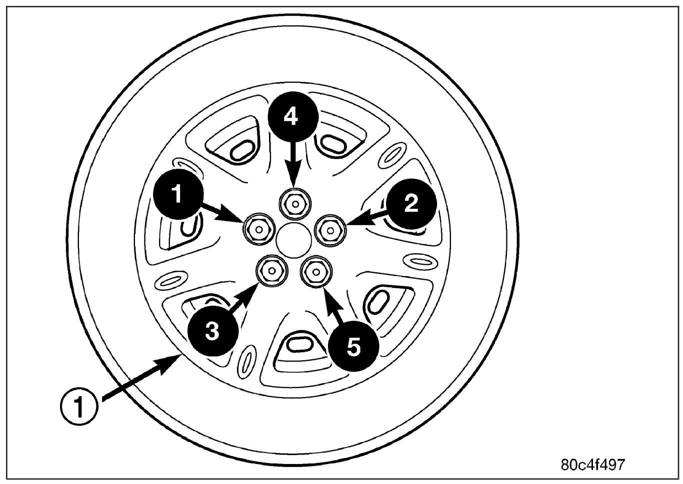
NOTE: Never use oil or grease on studs or wheel mounting (lug) nuts.

1. Clean the wheel mounting surfaces, removing any build-up of corrosion. It is important to have good metal-to-metal contact between the wheel and vehicle.
2. Position the tire and wheel assembly (1) on the wheel mounting studs using the hub pilot as a guide. Place and hold the wheel flush up against the mounting surface.
3. Align the valve notch in the wheel cover with the valve stem on the wheel and install the wheel cover over the studs.

NOTE: Always use the original (OEM) style wheel mounting (lug) nuts. Do not use replacement parts of lesser quality or substitute design.

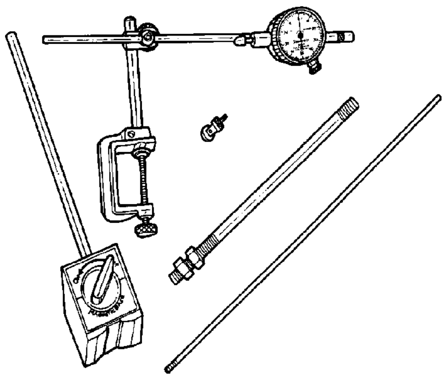
4. Install and lightly snug all five wheel mounting (lug) nuts (3) **Do not tighten at this time**.
5. Lower the vehicle.
6. Progressively tighten all wheel mounting (lug) nuts in the proper sequence shown. Tighten the nuts to a final torque of 135 N·m (100 ft. lbs.).



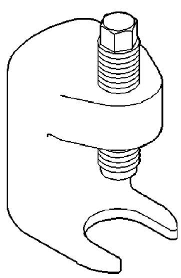


SPECIAL TOOLS

TIRES AND WHEELS



Dial Indicator C-3339A



Press, Ball Joint C-4150A

TIRE PRESSURE MONITORING - SERVICE INFORMATION

DESCRIPTION

The Tire Pressure Monitoring (TPM) system monitors air pressure in the four road tires (excludes spare). Pressure in the spare tire is not monitored. A premium system specifying how many tires are low and where they are located is used on this vehicle.

TPM alerts the driver when tire pressure falls below predetermined thresholds. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - OPERATION)

The TPM systems are controlled by the Wireless Control Module (WCM), commonly referred to as the Sentry Key Remote Entry Module (SKREEM).

There is a sensor (transmitter) in each of the vehicle's four road wheels that operates on a 315 MHz radio frequency. Export vehicle sensors operate on a 433 MHz radio frequency.

Premium TPM transponders are located in three of the four wheel wells of the vehicle are used to provide the WCM with the location of the tire pressure sensors on the vehicle. The transponders are located in the left front, left rear and right rear wheel wells.

An indicator lamp located in the instrument cluster and messages in the Electronic Vehicle Information Center (EVIC) are used to communicate system information.

For further information, refer to the Owners Manual or the appropriate diagnostic information.

OPERATION

The Tire Pressure Monitoring (TPM) system uses radio and sensor technology to monitor tire air pressure levels. Sensors, mounted to each road wheel as part of the valve stem, transmit an RF signal indicating their individual pressure to a receiver located in the Wireless Control Module (WCM), commonly referred to as the Sentry Key Remote Entry Module (SKREEM). These transmissions occur approximately once every minute at speeds over 15 mph (24 km/h). The Tire Pressure Monitoring system remains active even if no tire pressure related message is displayed.

The sensors lay dormant (Park Mode), then wake and start transmitting (Drive Mode) when the vehicle first reaches speeds over 15 mph (24 km/h). Once the wheels stop rotating for a period of approximately 20 minutes, the sensors shut down until again awaken. Although not transmitting as when in Drive Mode, while in Park Mode, the sensors still transmit approximately once every 13 hours to let the receiver know air pressure status at that time. Sensors will also transmit when a pressure change of one psi (seven kPa) or more is detected during that period. For more information on sensors, (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING/SENSOR - OPERATION).

Premium TPM transponders located in three of the four wheel wells of the vehicle are used to provide the WCM with the location of the tire pressure sensors on the vehicle. The transponders are located in the left front, left rear and right rear wheel wells. A fourth transponder is not necessary in the remaining wheel well due to the process-of-elimination theory. Once the system knows the location of the first three sensors it assumes the location of the fourth tire pressure sensor is in the right front tire. For more information, (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING/TRANSPONDER - OPERATION).

If the system detects that the tire pressure in any road tire is going low, beyond the Low Pressure (lamp) ON threshold (see following table), the TPM system will continuously illuminate an indicator lamp. Also, a message will be displayed in the instrument cluster. The text message will indicate which tire is low and the display will show all current tire pressures, the low tire will be flashing with its pressure value. This message will be displayed for the rest of the ignition cycle, or until the Low Tire pressure condition has been corrected. A chime will sound upon initial detection. Once pressure in the suspect tire raises above the Low Pressure (lamp) OFF Threshold, the lamp will go out and the system returns to normal within approximately two minutes time. If a message center button is pressed, the message is replaced by the new message requested; however, if the Low Tire condition has not been corrected, the Low Tire pressure message will again be displayed.

If a system fault is detected, the indicator lamp will flash on/off for 60 seconds, once every 10 minutes.

For further information, refer to the Owners Manual or the Appropriate Diagnostic Information.NOTE:
To determine the pressure thresholds for a vehicle, refer to the Tire Inflation Pressure (Placard) Label found on the Driver's B-Pillar, then apply the placard pressure to the following table.

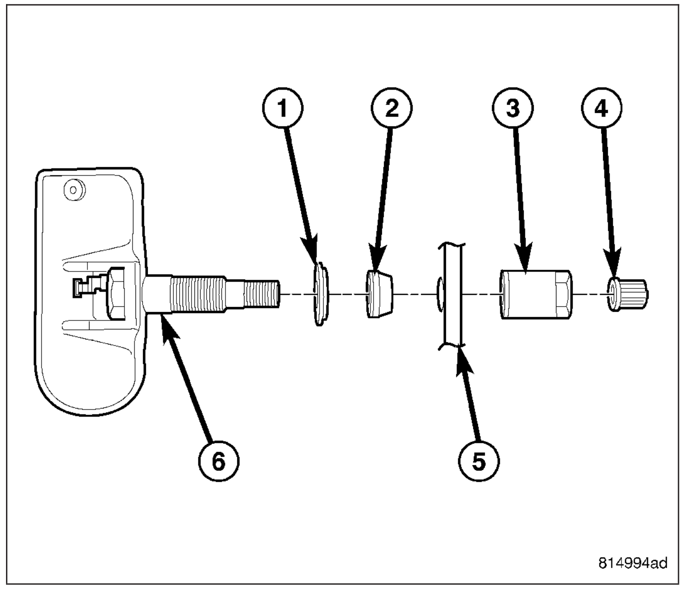
TPM THRESHOLD PRESSURES

Placard Pressure (Cold) (PSI)	Low Pressure ON Threshold (PSI)	Low Pressure OFF Threshold (PSI)
28	22	26
29	23	27
30	24	28
31	25	29
32	25	29
33	26	30
34	27	31
35	28	32
36	29	33
37	29	34
38	30	35
39	31	36
40	32	37
41	33	38
42	34	39
43	35	40
44	36	41
45	37	42
46	38	43
47	39	44
48	40	45
49	41	46
50	42	47
51	43	48
55	47	52
60	52	57
65	57	62
70	62	67
75	67	72
80	72	77

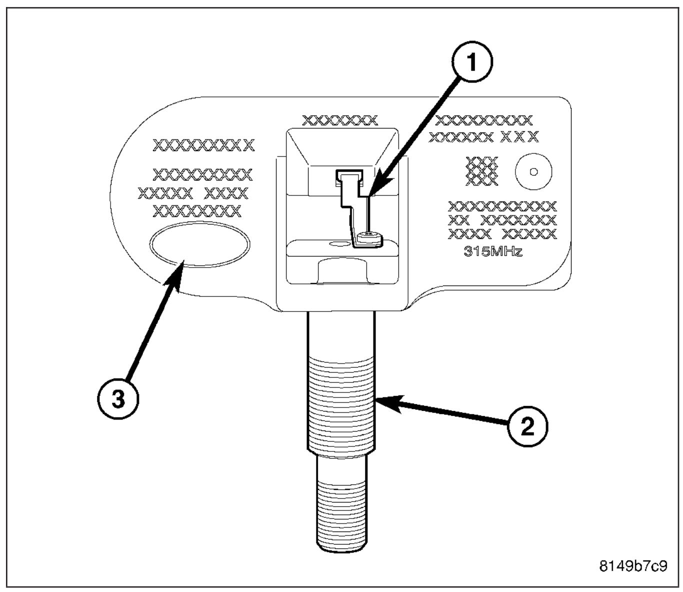
SENSOR - TPM

DESCRIPTION

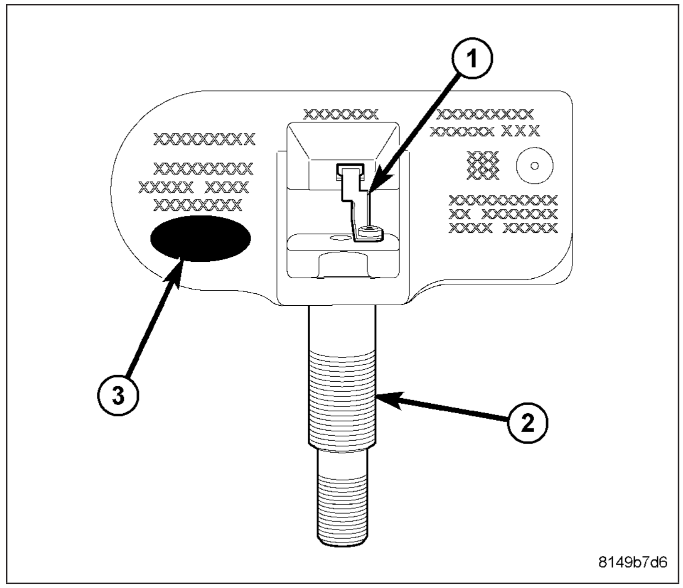
On vehicles equipped with Tire Pressure Monitoring (TPM), one tire pressure sensor (6) is mounted to each wheel (5) in place of the traditional tire valve stem. Each sensor has an internal battery that lasts up to 10 years. The battery is not serviceable. At the time of battery failure, the sensor must be replaced.



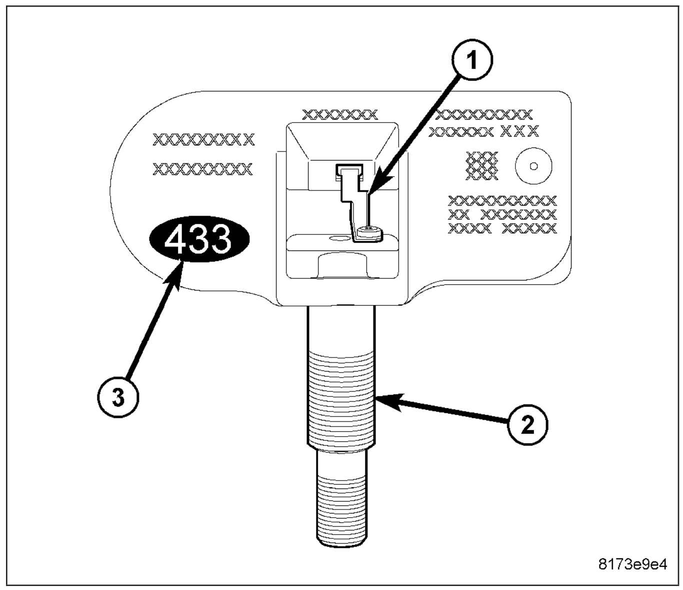
The TPM system operates on a 315 MHz radio frequency. The 315 MHz sensors can be easily identified by a white outline oval (black center) insignia (3) on the sensor body.



The Export TPM system operates on a 433 MHz radio frequency. The 433 MHz sensors can be easily identified by either a solid white oval insignia (3) on the body or...



... a solid white oval insignia (3) with 433 printed in the center. The sensors are identical except for the oval insignia.



CAUTION: Although 315 MHz and 433 MHz sensors are identical in size and shape, they are not interchangeable. Always make sure the correct sensor is being used.

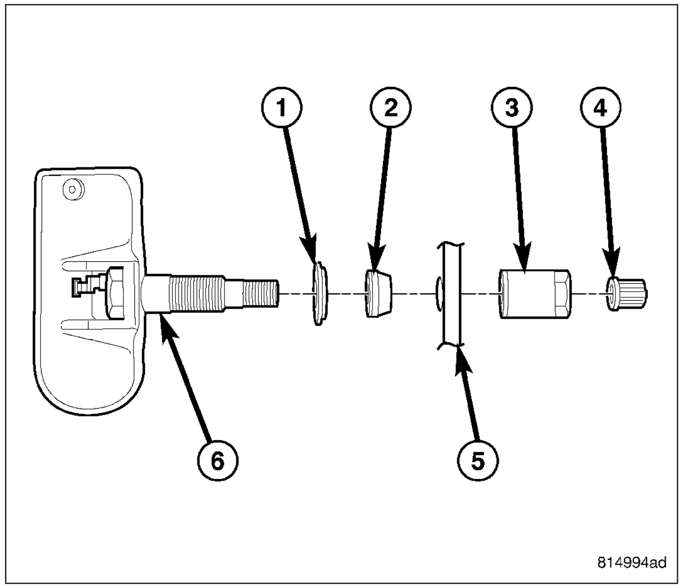
NOTE: Sensors may be identified by valve stem cap color. From the factory, 315 MHz sensors have a gray valve stem cap while 433 MHz sensors have a black valve stem cap. Otherwise, once mounted inside a tire and wheel assembly you are not able to visually tell the difference between a 315 MHz and 433 MHz sensor. The tire must be dismounted allowing visual inspection of the sensor body.

The TPM sensors are designed for original style factory wheels. **Do not attempt to install a tire pressure sensor in an aftermarket wheel. If aftermarket wheels are installed and do not contain tire pressure sensors, the system will not function properly and the driver will be continuously notified of a system malfunction.**

The serviceable components of the tire pressure sensor are:

- Sensor-To-Wheel Seal (2) and Metal Washer (1)
- Valve Stem Cap (4)
- Valve Stem Core
- Valve Stem Nut (with pressed-in washer) (3)

NOTE: Any time a sensor is installed on a wheel, a new Sensor-To-Wheel Seal (2) and Metal Washer (1) must be installed to ensure proper sealing.



The valve stem caps and cores used are specifically designed for the tire pressure monitoring sensors. Although similar to standard valve stem caps and cores, they are different. The valve stem cap has a special seal inside to keep moisture and corrosion out. The valve stem core has a special nickel coating to protect from corrosion.

OPERATION

The battery operated tire pressure sensors lay dormant (Park Mode), then wake and start transmitting (Drive Mode) when the vehicle first reaches speeds over 15 mph (24 km/h). Once the wheels stop rotating for a period of approximately 20 minutes, the sensors shut down until again awaken. Although not transmitting as when in Drive Mode, while in Park Mode, the sensors still transmit approximately once every 13 hours to let the receiver know air pressure status at that time. Sensors will also transmit when a pressure change of one psi (seven kPa) or more is detected during that period.

Using an RF signal, each sensor transmits tire pressure data approximately once every minute. Each sensor's (transmitter) broadcast is uniquely coded so that the Wireless Control Module (WCM), commonly referred to as the Sentry Key Remote Entry Module (SKREEM), can monitor the state of each of the sensors in the four rotating road wheels. Once a sensor has been replaced and the vehicle has remained stationary for more than 19 minutes, the WCM automatically learns and stores the sensor's ID while driving. This learning process can take up to 10 minutes while driving at speeds above 15 mph (24 km/h). **There is no formal retraining procedure necessary.**

For additional information, refer to appropriate diagnostic information.

CAUTION

CAUTION: The use of tire sealants is strictly prohibited for vehicles equipped with the Tire Pressure Monitoring system. Tire sealants can clog tire pressure sensors.

CAUTION: Tire pressure sensor valve stem caps and cores are specially designed for the sensors. Due to risk of corrosion, do not use a standard valve stem cap or core in a tire pressure sensor in place of the original equipment style sensor cap and core.

CAUTION: Do not attempt to install a tire pressure sensor in an aftermarket wheel. Use tire pressure sensors in original style factory wheels only. If aftermarket wheels are installed, and therefore do not contain tire pressure sensors, the system will not function properly and the driver will be continuously notified of a system malfunction.

CAUTION: Any time a sensor is to be installed in a wheel, a new seal and washer must be installed on the stem to ensure air tight sealing.

NOTE: TPM thresholds have been established for the original tire size equipped on the vehicle. Use original size tires only to maintain system accuracy.

DIAGNOSIS AND TESTING

TIRE PRESSURE SENSOR

NOTE: Tire pressure may increase from 2 to 6 psi (14 to 41 kPa) during normal driving conditions. Do NOT reduce this normal pressure build up.

When diagnosing a tire pressure issue, always check air pressure in the tires first with a known accurate air gauge. Adjust air pressure as necessary to that listed on the Tire Inflation Pressure Label (Placard) provided with the vehicle (usually applied to the driver's side B-pillar). After adjusting air pressure in a tire on the vehicle, allow approximately two minutes for the message or indicator lamp to go out.

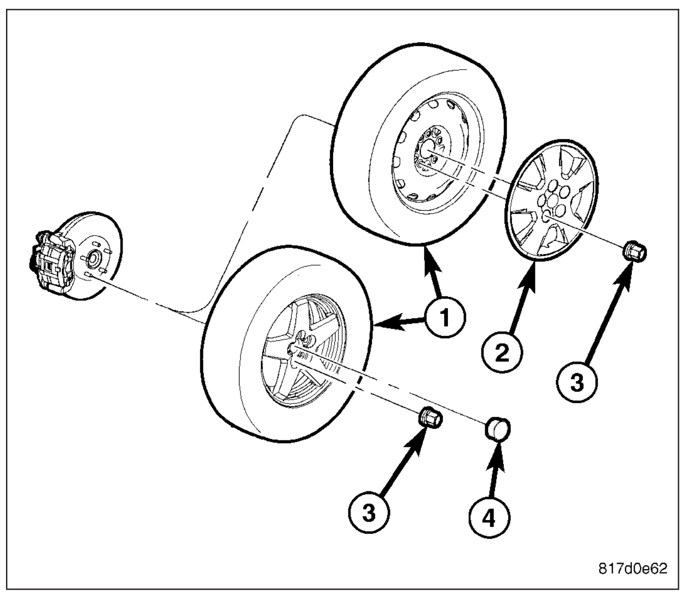
Check the tire pressure indicator lamp in the instrument cluster. If the lamp is illuminating continuously, proceed as listed below. If the indicator lamp is flashing on/off for 60 seconds, once every 10 minutes, there is a system fault detected. Refer to the appropriate diagnostic information.

If air pressure in any tire is low, inspect **all** the tires for leaks. A water "dunk tank" or other water test may be used to check for a leak around the sensor as long as any water at the valve core is removed once the procedure is completed. The water can be easily expelled from the core area by pushing in on the core for several seconds, allowing escaping air to drive out any moisture. Reinflate the tire as necessary. Always make sure the original valve stem cap is securely installed to keep moisture out of the sensor.

If the gauge-read pressure in the tires does not indicate a tire pressure issue, refer to the appropriate diagnostic information.

REMOVAL

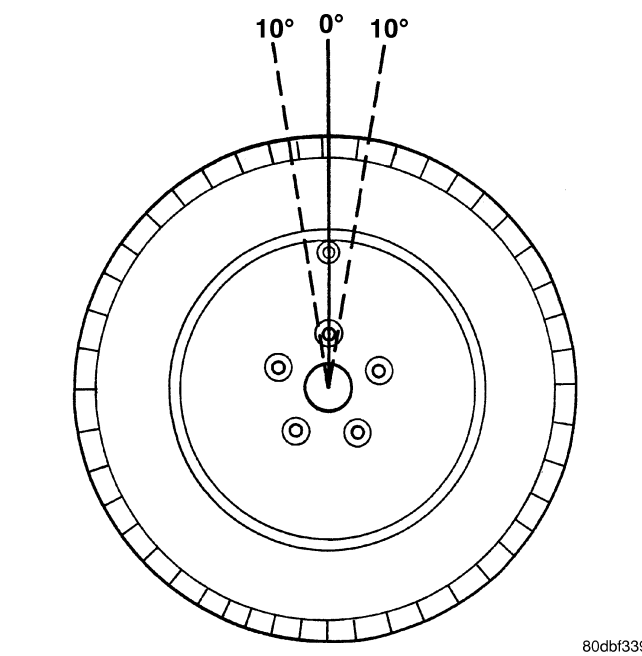
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1). (Refer to 22 - TIRES/WHEELS - REMOVAL)



CAUTION: The cap used on this valve stem contains an O-ring seal to prevent contamination and moisture from entering the valve stem. Retain this valve stem cap for reuse. Do not substitute a regular valve stem cap in its place.

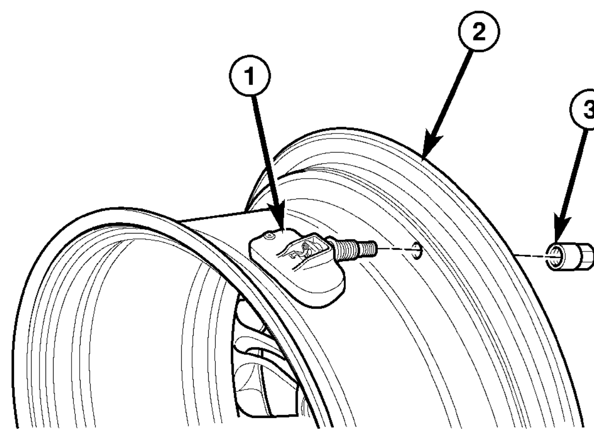
CAUTION: The valve stem used on this vehicle is made of aluminum and the core is nickel plated brass. The original valve stem core must be reinstalled and not substituted with a valve stem core made of a different material. This is required to prevent corrosion in the valve stem caused by the different metals.

3. Dismount tire from wheel following tire changer manufacturers instructions while paying special attention to the following to avoid damaging the pressure sensor:
   a. When breaking the tire bead loose from the wheel rim, avoid using the Bead Breaker in the area of the sensor. That includes both front and rear beads of the tire.
   b. When preparing to dismount the tire from the wheel, carefully insert the mounting/dismounting tool at the valve stem ± 10°, then proceed to dismount the tire from the wheel. Use this process on both the upper and lower tire beads.



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4. Remove sensor nut (3) retaining sensor to wheel. While removing nut, hold pressure against rear of metal valve stem to keep valve stem from pushing rearward, damaging antenna strap.
5. Remove sensor (1) from wheel (2).

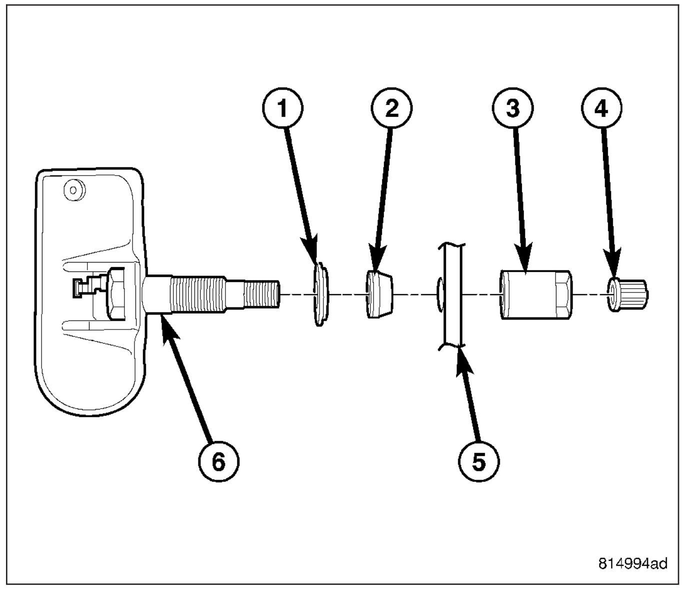


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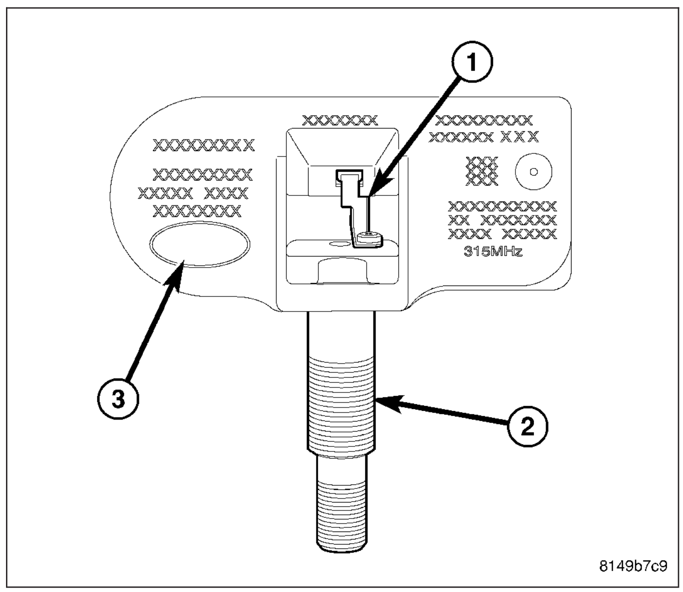
INSTALLATION

NOTE: Before reinstalling an existing tire pressure sensor, replace seal (2) and metal washer (1) at base of sensor valve stem (6) to ensure proper sealing.

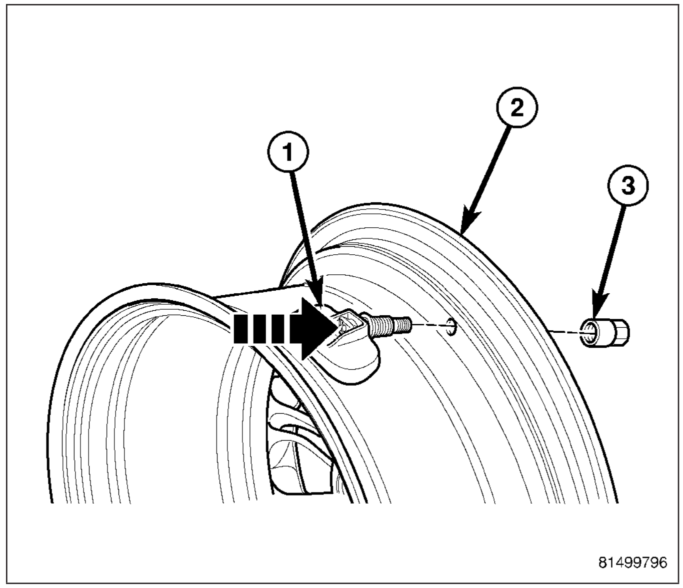
1. Wipe area clean around sensor/valve stem mounting hole in wheel (5). Make sure surface of wheel is not damaged.



CAUTION: To avoid damaging sensor antenna strap (1), hold pressure against rear of metal valve stem (2) while sensor is inserted through wheel mounting hole and nut is installed.



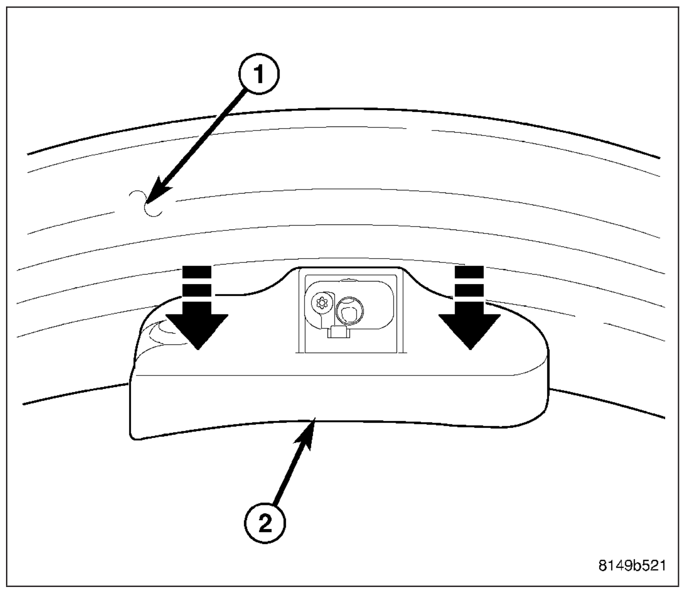
2. Insert sensor (1) through wheel (2) as shown keeping pressure against rear of metal valve stem (See Arrow). Potted side of sensor is to be positioned toward wheel. Do not attempt to mount sensor otherwise, damage may occur.
3. Install sensor nut (with pressed-in washer) (3) by hand.



NOTE: Before tightening sensor nut, push downward on sensor housing (2) in an attempt to make it flush with interior contour of wheel (1).

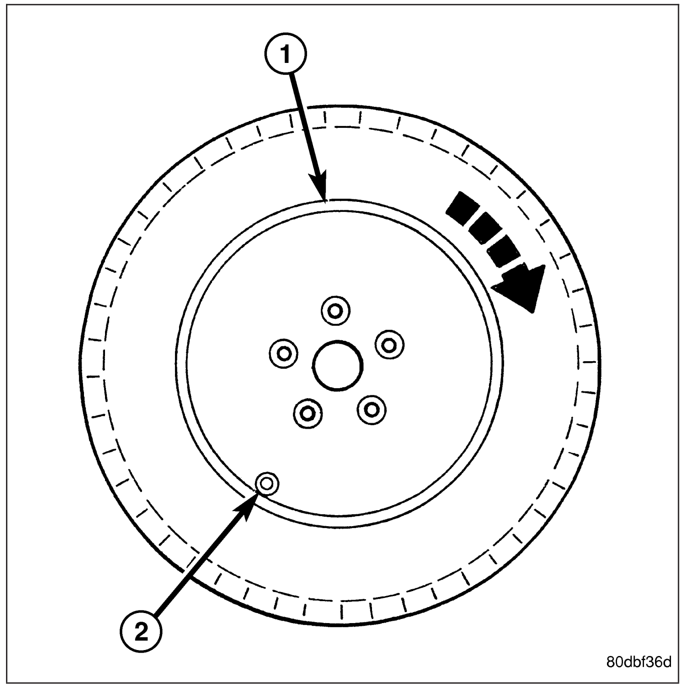
4. While holding sensor in position, tighten sensor nut to 6.5 N·m (58 in. lbs.).

CAUTION: Over-torquing the sensor nut by as little as 12 N·m (106 in. lbs.) may result in sensor separation from the valve stem. Under this condition, the sensor may still function. However, the condition should be corrected immediately.

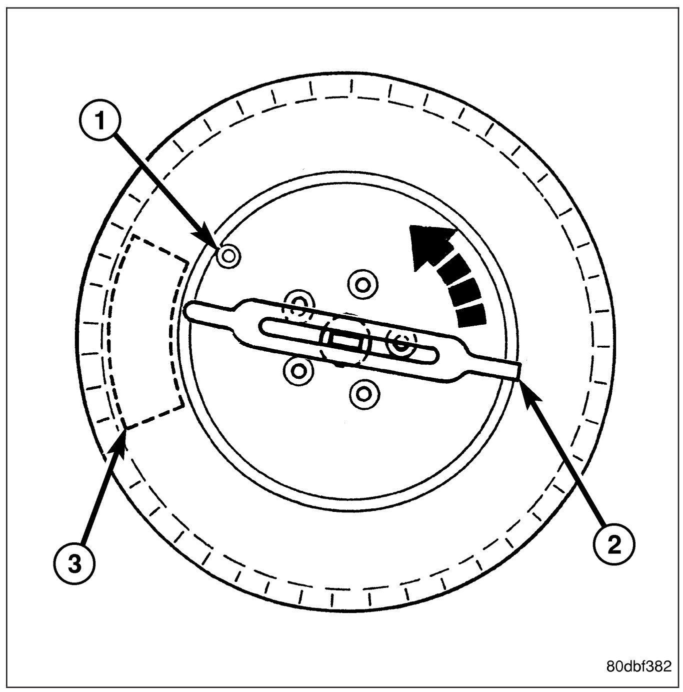


5. Mount tire on wheel following tire changer manufacturers instructions, paying special attention to the following to avoid damaging tire pressure sensor:

a. Rotating Wheel Tire Changers - Once the wheel is mounted to the changer, position the sensor valve stem (2) approximately 210° from the head of the changer (located at 1) in a clockwise direction before rotating the wheel (also in a clockwise direction) to mount the tire. Use this procedure on both the upper and lower tire beads.

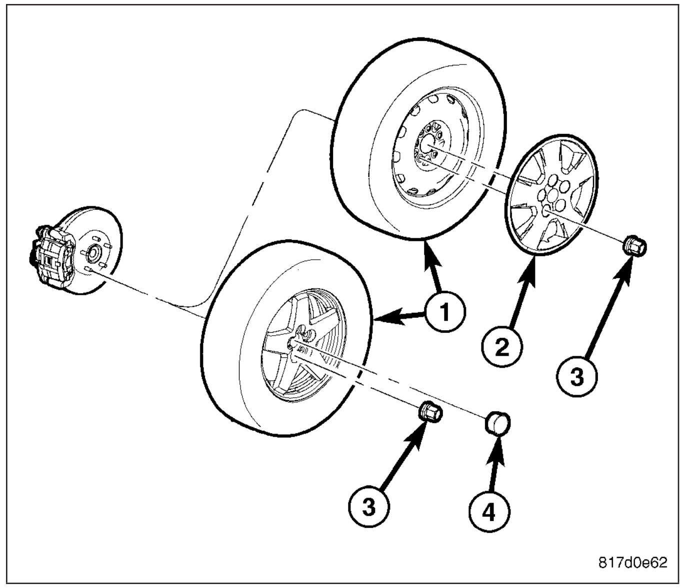


b. Rotating Tool Tire Changers - Position the wheel on the changer so that the sensor valve stem (1) is located approximately 210° clockwise from the installation end of the mounting/dismounting tool (2) once the tool is mounted for tire installation. Make sure the sensor is clear of the lower bead breaker area (3) to avoid damaging the sensor when the breaker rises. Rotate the tool (2) in a counterclockwise direction to mount the tire. Use this procedure on both the upper and lower tire beads.



6. Adjust air pressure to that listed on Tire Inflation Pressure Label (Placard) provided with vehicle (applied to driver's side B-pillar). Make sure **original style and color** valve stem cap is securely installed to keep moisture out of sensor.
7. Install tire and wheel assembly (1) on vehicle (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 135 N·m (100 ft. lbs.).
8. Lower vehicle.

NOTE: Once a sensor has been replaced and the vehicle has remained stationary (0 mph (0 km/h)) for more than 19 minutes, the WCM automatically learns and stores the sensor's ID while driving.



9. Drive vehicle for a minimum of 10 minutes while maintaining a continuous speed above 15 mph (24 km/h). During this time the system will learn the new sensor ID code and will clear any DTC's automatically (refer to above note).

NOTE: If a sensor cannot be trained, refer to appropriate diagnostic information.

TRANSPONDER - TPM

DESCRIPTION

Vehicles equipped with the premium TPM system use transponders, sometimes referred to as trigger modules, to provide the Wireless Control Module (WCM), commonly referred to as the Sentry Key Remote Entry Module (SKREEM), with the location of the tire pressure sensors on the vehicle. A transponder is located in three of the four wheel wells on the vehicle The transponders are located in the left front, left rear and right rear wheel wells behind the wheelhouse splash shields. Only three transponders are necessary to locate the four rotating sensors because the WCM can determine the location of the fourth by using the process-of-elimination theory. Once the system knows the location of the first three sensors, it assumes the location of the fourth tire pressure sensor is in the right front tire.

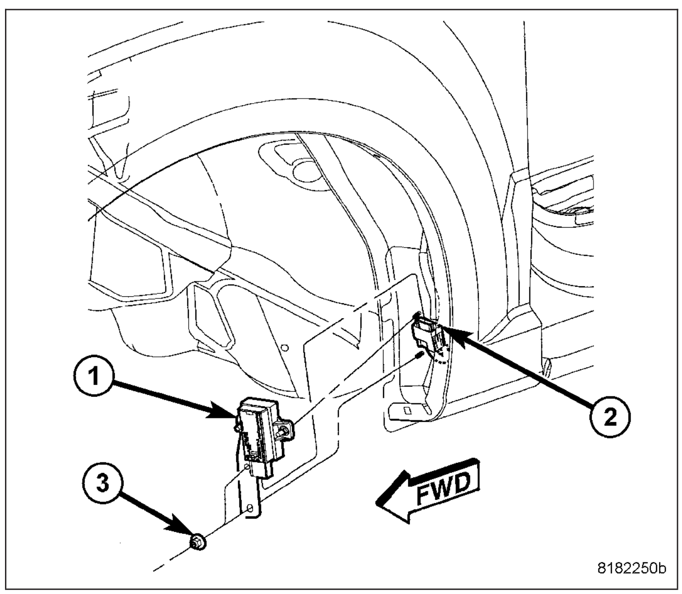
OPERATION

On vehicles equipped with the premium TPM system, the Wireless Control Module (WCM), commonly referred to as the Sentry Key Remote Entry Module (SKREEM), uses transponders (trigger modules) located in three of the four wheel wells on the vehicle to provide it with the location of the tire pressure sensors on the vehicle. Like the base system, the WCM receives RF signals from all four rotating wheel speed sensors. When the WCM needs to know which sensor is located at a particular location on the vehicle, it directs the transponder at that location to send out a low frequency signal to excite the nearby sensor. The WCM then receives that excited signal and knows where that sensor is located. This auto-locating process only happens in the first 10 minutes of any WCM cycle while traveling at speeds above 20 mph (32 km/h) (Each WCM cycle ends when the vehicle has been shut off for a time period of approximately 15 minutes or longer). Once the WCM has performed this to the three locations that have transponders (left front, left rear and right rear wheel wells), it uses the process-of-elimination theory to know that the fourth sensor ID signal is coming from the right front tire sensor.

REMOVAL

FRONT

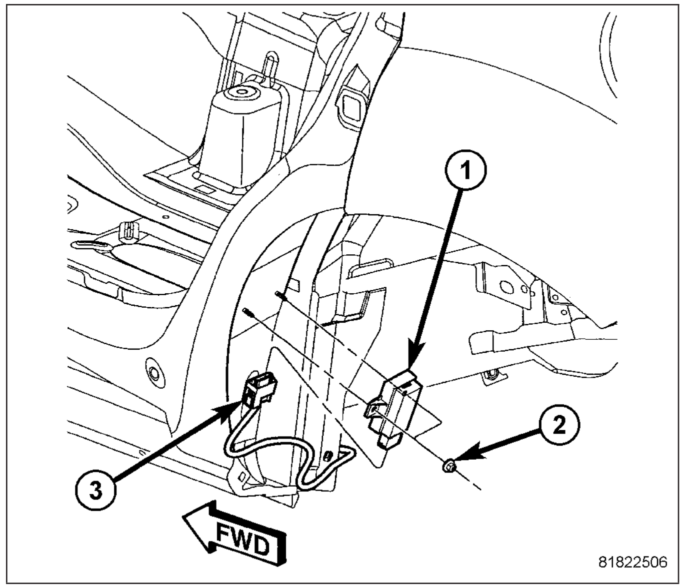
1. Remove the wheelhouse splash shield at the transponder requiring service. (Refer to 23 - BODY/EXTERIOR/F WHEELHOUSE SPLASH SHIELD - REMOVAL)
2. Disconnect the wiring harness connector (2) at the transponder (1).
3. Remove the mounting nuts (3), then remove the transponder (1).



REAR

1. Remove the wheelhouse splash shield at the transponder requiring service. (Refer to 23 - BODY/EXTERIOR/ REAR WHEELHOUSE SPLASH SHIELD - REMOVAL)

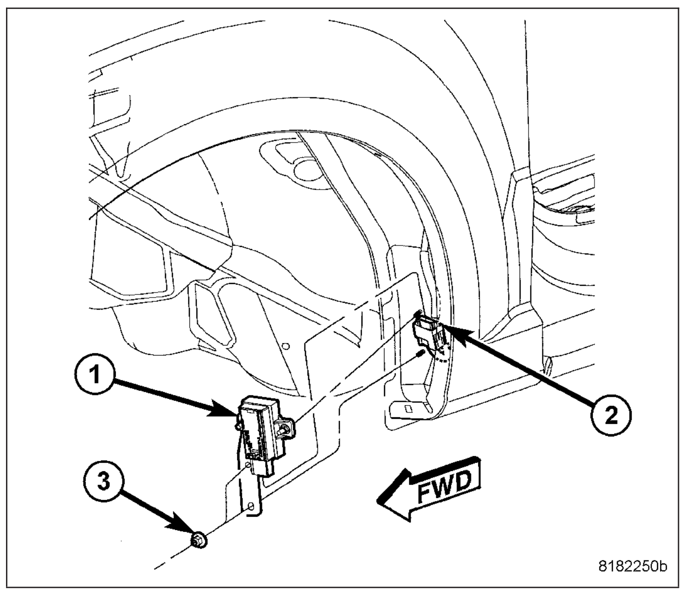
2. Disconnect the wiring harness connector (3) at the transponder (1).
3. Remove the mounting nuts (2), then remove the transponder (1).



INSTALLATION

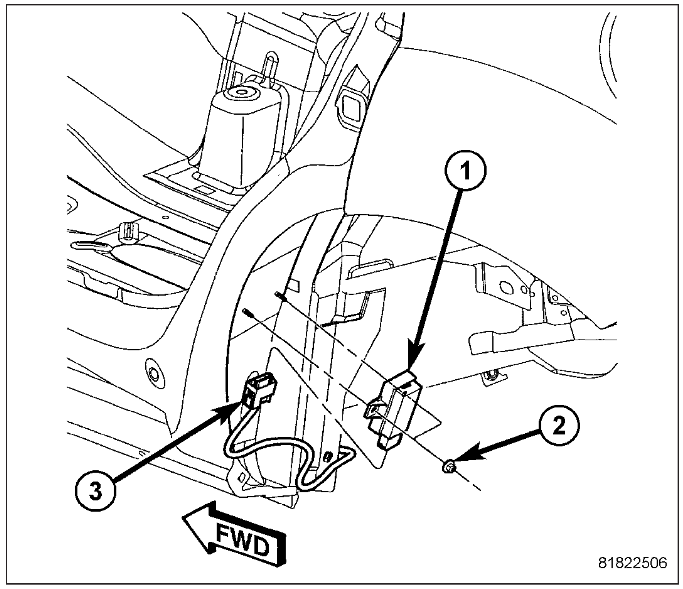
FRONT

1. Position the transponder (1) and install the mounting nuts (3).
2. Connect the wiring harness connector (2) to the transponder (1).
3. Install the wheelhouse splash shield and all components removed to access it. (Refer to 23 - BODY/EXTERIOR/F WHEELHOUSE SPLASH SHIELD - INSTALLATION)
4. Perform the TPM Diagnostic Verification Test. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - DIAGNOSIS AND TESTING)



REAR

1. Position the transponder (1) and install the mounting nuts (2).
2. Connect the wiring harness connector (3) to the transponder (1).
3. Install the wheelhouse splash shield and all components removed to access it. (Refer to 23 - BODY/EXTERIOR/REAR WHEELHOUSE SPLASH SHIELD - INSTALLATION)
4. Perform the TPM Diagnostic Verification Test. (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING - DIAGNOSIS AND TESTING)



TIRES

DESCRIPTION

TIRE

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles
- Operating vehicle with over or under inflated tire pressures

Radial ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation. This will help to achieve a greater tread-life potential.

TIRE IDENTIFICATION

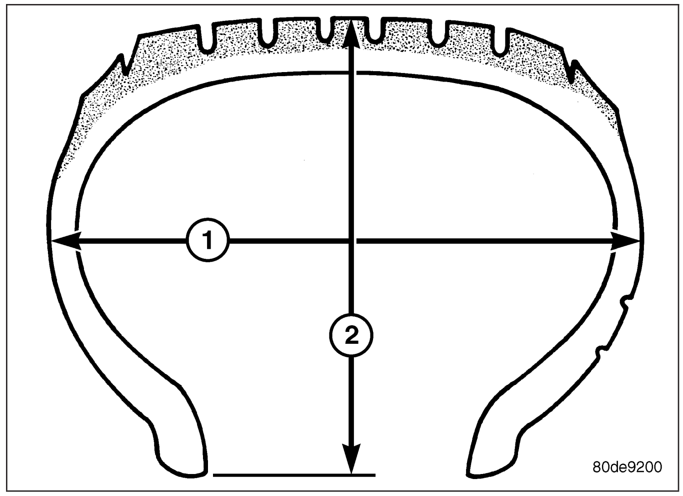
Tire type, size, load index and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the Tire Identification chart to decipher the code. For example purposes, the tire size P225/60 R 16 97 T is used in the chart. An All Season type tire will also have either M + S, M & S or M - S (indicating mud and snow traction) imprinted on the side wall. An Extra or Light Load marking "XL" or "LL" may also be listed on the sidewall. The absence of an "XL" or "LL" marking infers a standard load tire.

TIRE IDENTIFICATION

P	TIRE TYPE (Not present on all tires)	P - Passenger T - Temporary C - Commercial LT - Light Truck
225	SECTIONAL WIDTH	SHOWN IN MILLIMETERS
60	ASPECT RATIO	SECTIONAL HEIGHT ÷ SECTIONAL WIDTH *
R	CONSTRUCTION TYPE	R - RADIAL B - BIAS BELTED D - DIAGONAL (BIAS)
16	WHEEL DIAMETER	SHOWN IN INCHES
97	LOAD INDEX	**
T	SPEED RATING	**

*** NOTE: Height (2) ÷ Width (1) = Aspect Ratio.**

**** NOTE: Consult the tire manufacturer regarding any questions on tire specifications or capabilities.**



TIRE CHAINS

Refer to the owners manual supplied with the vehicle to determine whether the use of tire chains is permitted on this vehicle.

REPLACEMENT TIRES

WARNING: Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure.

WARNING: In order to maintain the speed capability of the vehicle, replacement tires must have speed ratings equal to or higher than those fitted to the vehicle as original equipment. If tires with lower speed ratings are fitted, the vehicle's handling may be affected and the speed capability of the vehicle may be lowered to the maximum speed capability of the replacement tires. To avoid an accident resulting in severe or fatal injury, consult the tire manufacturer in regards to maximum speed ratings.

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The original equipment tires provide a proper combination of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

The use of tires smaller than the minimum tire size approved for the vehicle can result in tire overloading and failure.

Use tires that have the approved load rating for the vehicle and never overload them. Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure and loss of vehicle control.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

SPARE TIRE

A compact (temporary) spare tire is standard equipment on this vehicle. A full-size spare is available on some models.

The compact spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 80 km/h (50 mph) when using the compact spare tire. Refer to the Owner’s Manual for complete details.

DIAGNOSIS AND TESTING

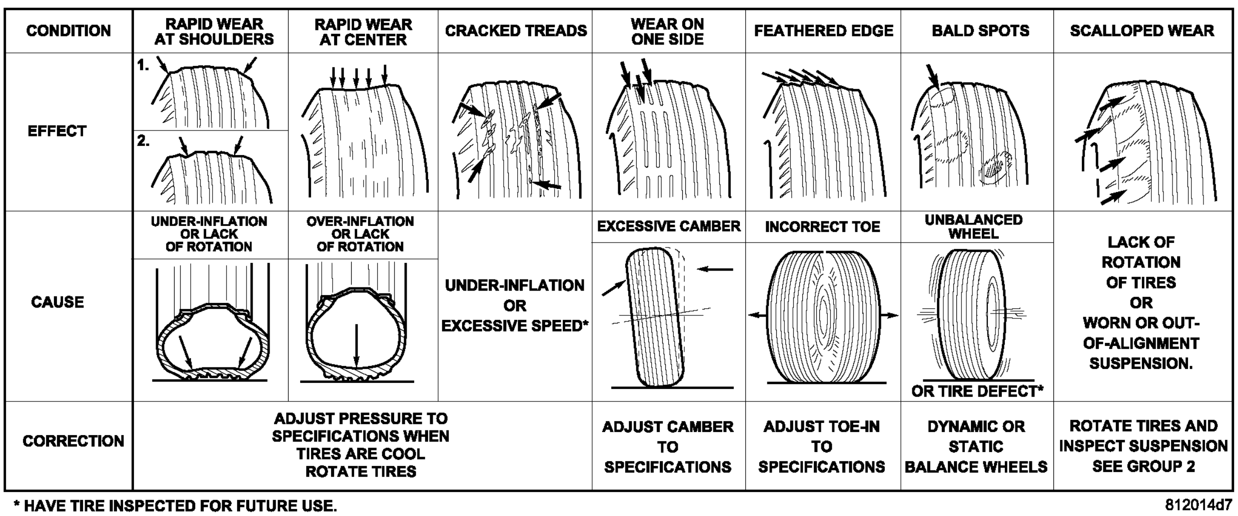
TIRE NOISE

Unusual tire noise can be associated with tire and wheel vibration or irregular tire wear. For vibration issues, (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING). For irregular tire wear issues, (Refer to 22 - TIRES/WHEELS/TIRES - DIAGNOSIS AND TESTING).

TIRE/VEHICLE LEAD

(Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - DIAGNOSIS AND TESTING)

TIRE WEAR PATTERNS



CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT	1. 2.						
CAUSE	UNDER-INFLATION OR LACK OF ROTATION	OVER-INFLATION OR LACK OF ROTATION	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER	INCORRECT TOE	UNBALANCED WHEEL OR TIRE DEFECT*	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

* HAVE TIRE INSPECTED FOR FUTURE USE.

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Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

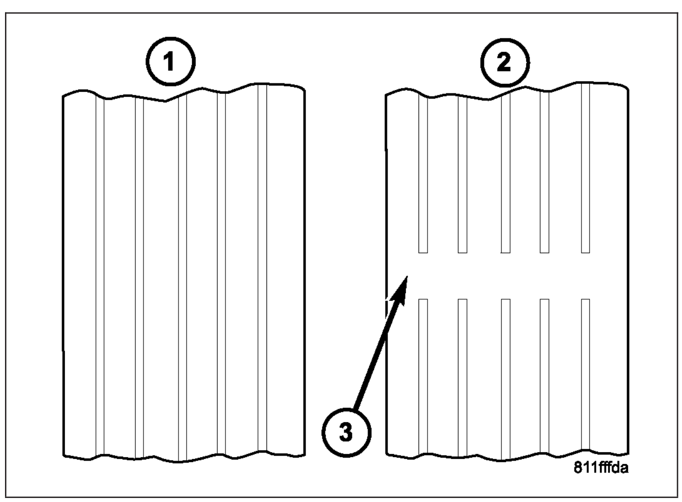
Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread.

TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (3).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.



STANDARD PROCEDURE

TIRE INFLATION PRESSURES

The specified tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. The proper tire pressure specification can be found on the Tire And Loading Information Label provided with the vehicle (usually on the driver's door opening (B-pillar) or rear shutface of driver's door).

A quality air pressure gauge is recommended to check tire air pressure. Tire pressure should be checked cold once per month. Check tire pressure more frequently when the weather temperature varies widely. Tire pressure will decrease when the outdoor temperature drops. After checking the air pressure, replace valve cap finger tight.

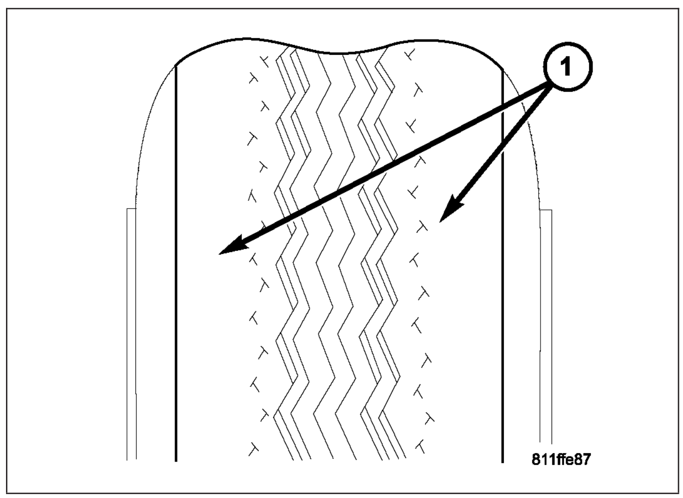
Inflation pressures specified on the Tire Inflation Pressure Label are always the cold inflation pressure of the tire. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours, or the vehicle is driven less than one mile after being inoperative for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. Do not reduce this normal pressure buildup.

Improper inflation can cause:

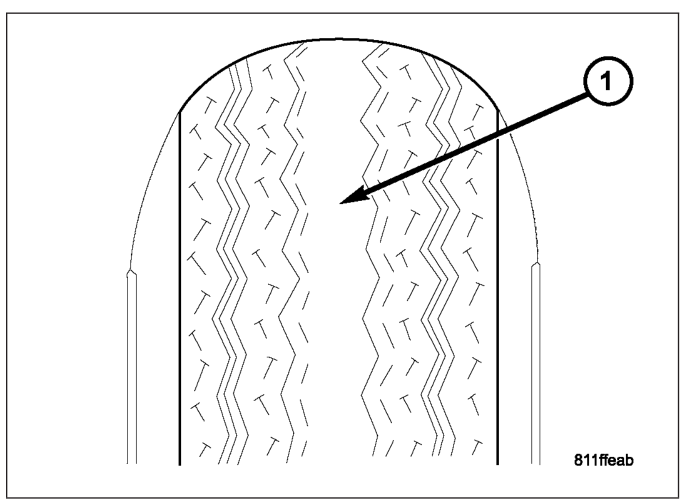
- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift.

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING. THE TIRE CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

Under inflation causes rapid shoulder wear, tire flexing, and can result in tire failure (1).



Over inflation causes rapid center wear and loss of the tire's ability to cushion shocks (1).

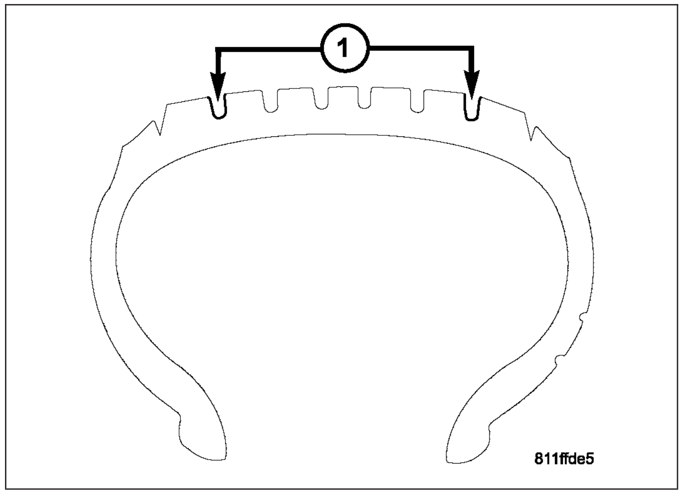


TIRE PRESSURE FOR HIGH SPEED OPERATION

Refer to the vehicle's Owners Manual Package.

TIRE LEAK REPAIRING

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (1). The tire should be replaced if the puncture is located in the sidewall.



Deflate tire completely before attempting to dismount the tire from the wheel. **Use a lubricant such as a mild soap solution when dismounting or mounting tire.** Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and progressively tighten the five wheel nuts to a torque of 135 N·m (100 ft. lbs.).

CLEANING

TIRE CLEANING

Before delivery of a vehicle, remove the protective coating on the tires with white sidewalls or raised white letters. To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

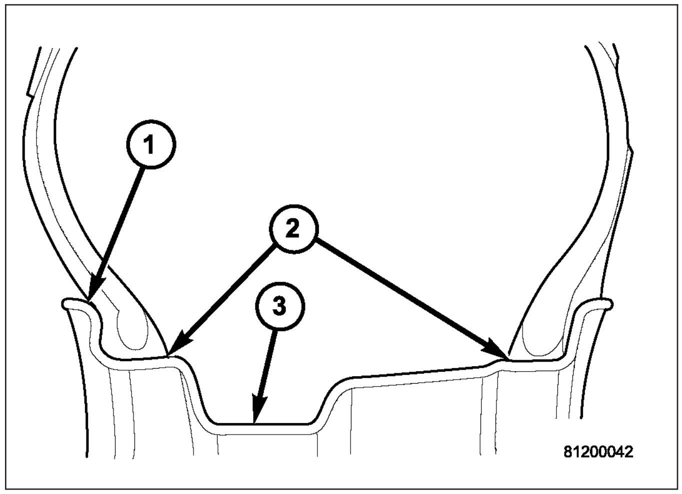
CAUTION: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

WHEELS

DESCRIPTION

WHEEL

All vehicles use either steel or cast aluminum drop center wheels. The original equipment wheels are designed for proper operation at all loads up to the specified maximum vehicle capacity.



Every wheel has raised sections between the rim flanges (1) and drop well (3) called safety humps (2). In case of air loss, these raised sections help hold the tire in position on the wheel until the vehicle can be brought to a safe stop. When being installed on the wheel, initial inflation of the tire forces the tire bead over these raised sections into place.

The wheel studs and nuts are designed for specific wheel applications and must be replaced with equivalent parts. Do not use replacement parts of lesser quality or of a substitute design. All aluminum and steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels.

DIAGNOSIS AND TESTING

WHEEL INSPECTION

Inspect wheels for:

- Excessive runout
- Dents, cracks or irregular bends
- Damaged wheel stud (lug) holes
- Air Leaks

NOTE: Do not attempt to repair a wheel by hammering, heating or welding.

If a wheel is damaged, an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

WARNING: Failure to use equivalent replacement wheels may adversely affect the safety and handling of the vehicle.

WARNING: Replacement with used wheels is not recommended. The service history of the wheel may have included severe treatment or very high mileage. The rim could fail without warning.

CLEANING

WHEEL AND WHEEL TRIM CARE

All wheels and wheel trim, especially aluminum and chrome plated, should be cleaned regularly using mild soap and water to maintain their luster and to prevent corrosion. Wash them with the same soap solution recommended for the body of the vehicle.

When cleaning extremely dirty wheels, care must be taken in the selection of tire and wheel cleaning chemicals and equipment to prevent damage to the wheels. Mopar® Wheel Treatment or Mopar® Chrome Cleaner is recommended. Any of the “DO NOT USE” items listed below can damage wheels and wheel trim.

DO NOT USE:

- Any abrasive cleaner
- Any abrasive cleaning pad (such as steel wool) or abrasive brush
- Any cleaner that contains an acid which can react with and discolor the chrome surface. **Many wheel cleaners contain acids that can harm the wheel surface.**
- Oven cleaner
- A car wash that uses carbide-tipped wheel cleaning brushes or acidic solutions.

SPECIFICATIONS

WHEEL

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Wheel Mounting (Lug) Nut Hex Size	19 mm
Wheel Mounting Stud Size	M12 x 1.5 mm

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
TPM Sensor Nut	6.5	—	58
TPM Transponder Mounting Nut	3	—	26
Wheel Mounting (Lug) Nut	135	100	—

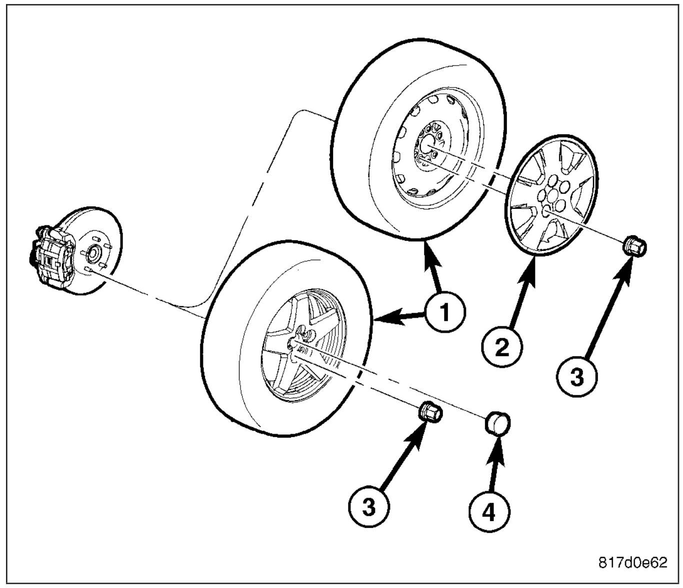
WHEEL COVER

REMOVAL

1. Raise and support the vehicle so that tire and wheel assembly clears ground level. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

CAUTION: When removing the bolt-on wheel cover, do not attempt to pry the wheel cover off the wheel. It is held on by the wheel mounting nuts.

2. Remove the five wheel mounting (lug) nuts (3) from the wheel studs. While removing the nuts, hold the wheel cover (2) in place so it doesn't fall off when the last nut is removed.
3. Remove the wheel cover (2) using care not to let the tire and wheel assembly (1) fall off the vehicle.



INSTALLATION

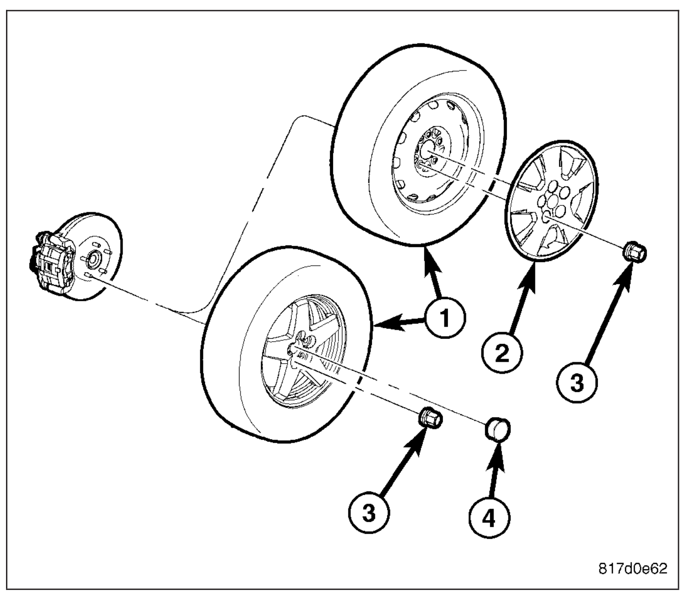
WARNING: Installing wheels without good metal-to-metal contact with the mounting surface could cause loosening of the wheel mounting (lug) nuts. This could adversely affect the safety and handling of the vehicle.

NOTE: Never use oil or grease on studs or wheel mounting (lug) nuts.

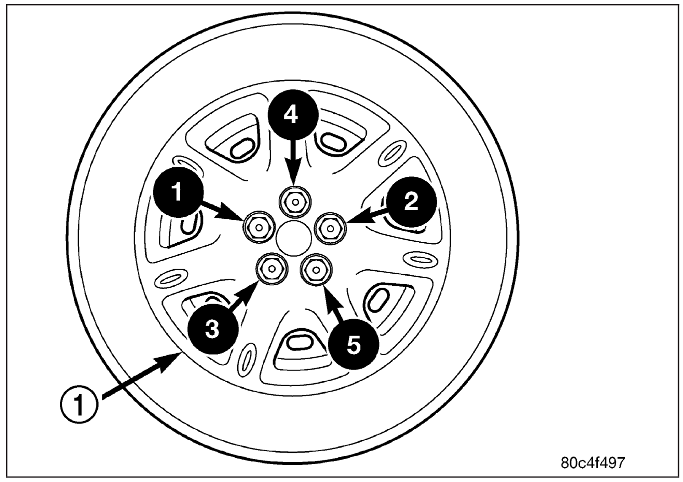
1. With the tire and wheel assembly (1) positioned on the wheel studs without the wheel mounting (lug) nuts installed, align the valve notch in the wheel cover with the valve stem on the wheel and install the wheel cover over the studs.

NOTE: Always use the original (OEM) style wheel mounting (lug) nuts. Do not use replacement parts of lesser quality or substitute design.

2. Install and lightly snug all five wheel mounting (lug) nuts (3) **Do not tighten at this time**.
3. Lower the vehicle.



4. Progressively tighten all wheel mounting (lug) nuts in the proper sequence shown. Tighten the nuts to a final torque of 135 N·m (100 ft. lbs.).



STUDS-WHEEL MOUNTING FRONT

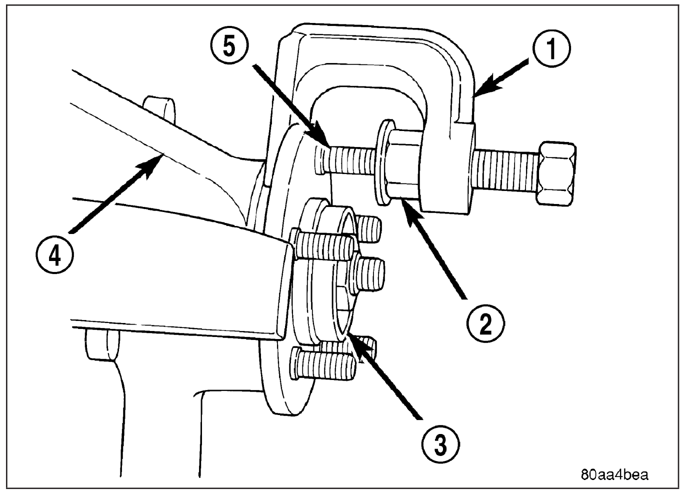
REMOVAL

NOTE: Use the following procedure to remove one of five studs on one wheel hub.

1. Access and remove front brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)

CAUTION: Do not hammer wheel mounting studs out of the hub. Damage to the wheel bearing will occur, leading to premature bearing failure.

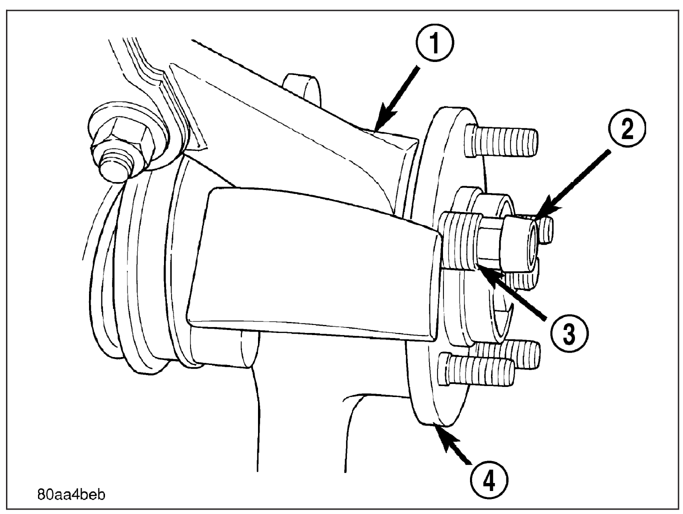
2. If possible, install a standard wheel mounting nut (2) on the wheel mounting stud (5) being removed far enough so the threads on the stud are even with end of lug nut.
3. Rotate the hub so the stud requiring removal is aligned with the notch cast into the front of the steering knuckle (4).
4. Install Remover (1), Special Tool C-4150A, on the hub flange and wheel stud.
5. Tighten the Remover, pushing the wheel mounting stud out the rear of the hub flange. When the shoulder of the stud is past the flange, remove the Remover from the hub.
6. Remove the nut from the stud, then remove the stud from the flange.



INSTALLATION

NOTE: Use the following procedure to install one of five studs on one wheel hub.

1. Install the NEW wheel mounting stud in the flange of hub from the rear.
2. Install several washers (3) and a standard wheel mounting (lug) nut (2) on the stud. Install the mounting nut so that the flat side of the nut is against the washers to eliminate any binding.
3. Tighten the wheel mounting nut (2). This will pull the wheel mounting stud into the hub flange. When the head of the stud is fully seated against the rear of the hub flange, remove the wheel mounting nut and washers.



4. Install the brake rotor and all components previously removed to access it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)

STUDS-WHEEL MOUNTING REAR

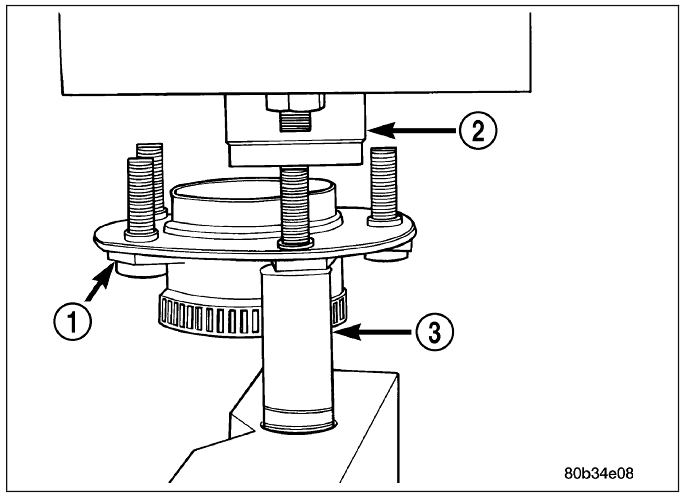
REMOVAL

CAUTION: DO NOT hammer studs out of the hub flange. If a stud is removed by hammering it out of the bearing flange, damage to the hub and bearing assembly will occur leading to premature bearing failure.

1. Remove the hub and bearing from the vehicle. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)

CAUTION: Take care to keep hub and bearing assembly from falling during stud removal. Damage to the hub and bearing could result.

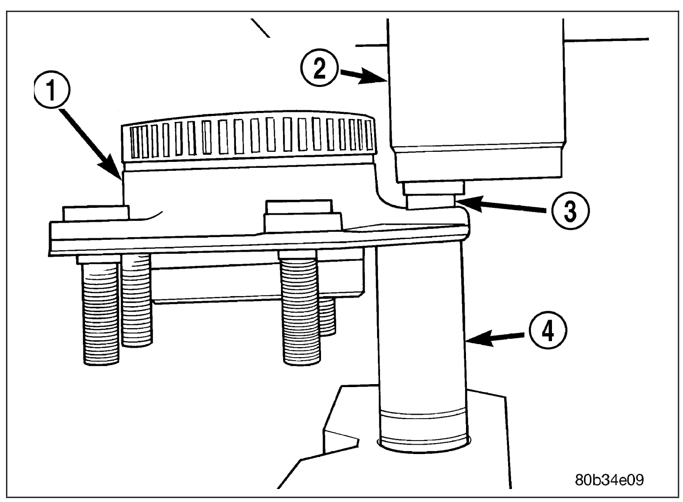
2. Position the hub and bearing assembly (1) under a hydraulic press ram (2), supported by a 21 mm deep-well impact socket (3) under the stud to be replaced.
3. Press the stud out of the hub flange and into the socket well.
4. Remove the hub and bearing assembly (1) from the press.
5. Remove the stud from the socket (3).



INSTALLATION

CAUTION: DO NOT hammer studs into the hub flange. If a stud is installed in such a manner, damage to the hub and bearing assembly may occur leading to premature bearing failure.

1. Install the wheel stud (3) into mounting hole from the rear of the hub and bearing assembly.
2. Position the hub and bearing assembly (1) face down with the stud pointing down into the well of the 21 mm impact socket (3). The hydraulic press ram (2) must line up with the stud (3).
3. Press the stud (3) into the hub flange until it bottoms.
4. Remove the hub and bearing assembly (1) from the press.



5. Install the hub and bearing on the vehicle. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)

BODY

TABLE OF CONTENTS

BODY

DESCRIPTION - VEHICLE IDENTIFICATION

Throughout this group, references to the DaimlerChrysler Corporation vehicle family identification code are used when describing a procedure that is unique to that vehicle. Refer to Introduction Group of this manual for detailed information on vehicle identification. If a procedure is common to all vehicles covered in this manual, no reference will be made to a vehicle family code.

WARNING

SAFETY PRECAUTIONS AND WARNINGS

WARNING: USE AN OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.
AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.
DO NOT STAND UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.

CAUTION: When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.
Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.
Always have a fire extinguisher ready for use when welding.
Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.
Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.
Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.
Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

1. Drive the vehicle to verify the general location of the wind noise.
2. Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

STANDARD PROCEDURE

PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively on DaimlerChrysler Motors vehicles. Always follow repair material manufacturer's plastic identification and repair procedures.

Rigid Plastics:

Examples of rigid plastic use: Fascias, Hoods, Doors, and other Body Panels, which include SMC, ABS, and Polycarbonates.

Semi-Rigid Plastics:

Examples of semi-rigid plastic use: Interior Panels, Under Hood Panels, and other Body Trim Panels.

Flexible Plastics:

Examples of flexible plastic use: Fascias, Body Moldings, and upper and lower Fascia Covers.

Repair Procedure:

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

Adhesion Promoter/Surface Modifier:

Adhesion Promoters/Surface Modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

SAFETY PRECAUTION AND WARNINGS

WARNING:

- **Eye protection should be used when servicing components. Personal injury can result.**
- **Use an OSHA approved breathing mask when mixing epoxy, grinding, and spraying paint or solvents in a confined area. Personal injury can result.**
- **Avoid prolonged skin contact with resin, petroleum, or alcohol based solvents. Personal injury can result.**
- **Do not venture under a hoisted vehicle that is not properly supported on safety stands. Personal injury can result.**

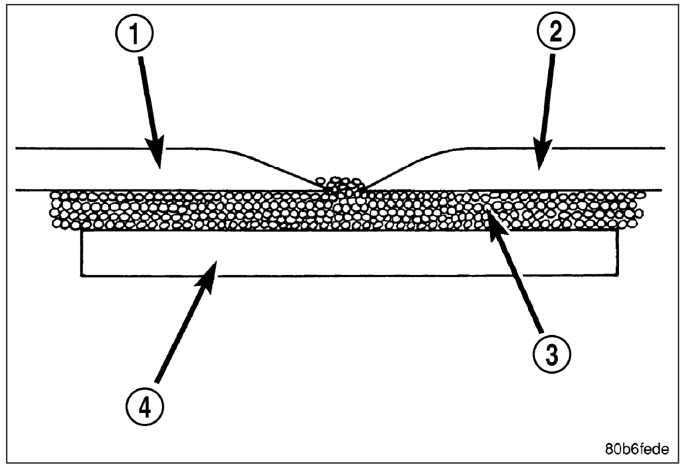
NOTE:
- **When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.**
- **Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.**

RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	ACRYLONITRILE STYRENE ACRYLITE	LURAN S	CONSOLES, GRILLES
ABS	ACRYLONITRILE BUTADIENE STYRENE	TERLURAN	″A″ PILLARS, CONSOLES, GRILLES
ABS/PC	ABS/PC ALLOY	PULSE, PROLOY, BAYBLEND	DOORS, INSTRUMENT PANELS
ABS/PVC	ABS/PV ALLOY	PROLOY, PULSE, LUSTRAN, CYCLOVIN	DOOR PANELS, GRILLES, TRIM
BMC	BULK MOLDING COMPOUND	BMC	FENDER EXTENSIONS
EMA	EHTYLENE METHYL ACRYLATE/IONOMER	SURLYN, EMA, IONOMER	BUMPER GUARDS, PADS
METTON	METTON	METTON	GRILLES, KICK PANELS, RUNNING BOARDS
MPPO	MODIFIED POLYPHENYLENE OXIDE	MPPO	SPOILER ASSEMBLY
PA	POLYAMID	ZYTEL, VYDYNE, PA, MINLON	FENDERS, QUARTER PANELS
PET	THERMOPLASTIC POLYESTER	RYNITE	TRIM
PBT/PPO	PBT/PPO ALLOY	GERMAX	CLADDINGS
PBTP	POLYBUTYLENE THEREPTHALATE	PBT, PBTP, POCAN, VALOX	WHEEL COVERS, FENDERS, GRILLES
PBTP/EEBC	POLYBUTYLENE THEREPTHALATE/EEBC ALLOY	BEXLOY, ″M″, PBTP/EEBC	FASCIAS, ROCKER PANEL, MOLDINGS
PC	POLYCARBONATE	LEXAN, MERLON, CALIBRE, MAKROLON PC	TAIL LIGHT LENSES, IP TRIM, VALANCE PANELS
PC/ABS	PC/ABS ALLOY	GERMAX, BAY BLENDS, PULSE	DOORS, INSTRUMENT PANELS
PPO	POLYPHENYLENE OXIDE	AZDEL, HOSTALEN, MARLEX, PRFAX, NORYL, GTX, PPO	INTERIOR TRIM, DOOR PANELS, SPLASH SHIELDS, STEERING COLUMN SHROUD
PPO/PA	POLYPHENYLENE/ POLYAMID	PPO/PA, GTX 910	FENDERS, QUARTER PANELS
PR/FV	FIBERGLASS REINFORCED PLASTIC	FIBERGLASS, FV, PR/FV	BODY PANELS
PS	POLYSTYRENE	LUSTREX, STYRON, PS	DOOR PANELS, DASH PANELS
RTM	RESIN TRANSFER MOLDING COMPOUND	RTM	BODY PANELS

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
SMC	SHEET MOLDED COMPOUND	SMC	BODY PANELS
TMC	TRANSFER MOLDING COMPOUND	TMC	GRILLES
UP	UNSATURATED POLYESTER (THERMOSETTING)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	GRILLE OPENING PANEL, LIFTGATES, FLARESIDE FENDERS, FENDER EXTENSIONS
EEBC	ETHER/ESTER BLOCKED CO-POLYMER	EEBC	BUMPERS
EEBC/PBTP	EEBC/POLYBUTYLENE TEREPTHALATE	EEBC, PBTP, BEXLOY	BUMPER, ROCKER PANELS
EMPP	ETHYLENE MODIFIED POLYPROPYLENE	EMPP	BUMPER COVERS
EPDM	ETHYLENE/ PROPROPYLENE DIENE MONOMER	EPDM, NORDEL, VISTALON	BUMPERS
EPM	ETHYLENE/ PROPROPYLENE CO-POLYMER	EPM	FENDERS
MPU	FOAM POLYURETHANE	MPU	SPOILERS
PE	POLYETHYLENE	ALATHON, DYLAN, LUPOLEN, MARLEX	—
PP	POLYPROPYLENE (BLENDS)	NORYL, AZDEL, MARLOX, DYLON, PRAVEX	INNER FENDER, SPOILERS, KICK PANELS
PP/EPDM	PP/EPDM ALLOY	PP/EPDM	SPOILERS, GRILLES
PUR	POLYURETHANE	COLONELS, PUR, PU	FASCIAS, BUMPERS
PUR/PC	PUR/PC ALLOY	TEXIN	BUMPERS
PVC	POLYVINYL CHLORIDE	APEX, GEON, VINYLITE	BODY MOLDINGS, WIRE INSULATION, STEERING WHEELS
RIM	REACTION INJECTED MOLDED POLYURETHANE	RIM, BAYFLEX	FRONT FASCIAS, MODULAR WINDOWS
RRIM	REINFORCED REACTION INJECTED MOLDED	PUR, RRIM	FASCIAS, BODY PANELS, BODY TRIMS
TPE	THERMO POLYETHYLENE	TPE, HYTREL, BEXLOY-V	FASCIAS, BUMPERS, CLADDINGS
TPO	THERMOPOLYOLEFIN	POLYTROPE, RENFLEX, SANTOPRENE, VISAFLEX, ETA, APEX, TPO, SHIELDS, CLADDINGS	BUMPERS, END CAPS, TELCAR, RUBBER, STRIPS, SIGHT, INTERIOR B POST
TPP	THERMO-POLYPROPYLENE	TPP	BUMPERS
TPU	THERMOPOLYURETHANE, POLYESTER	TPU, HYTREL, TEXIN, ESTANE	BUMPERS, BODY SIDE, MOLDINGS, FENDERS, FASCIAS

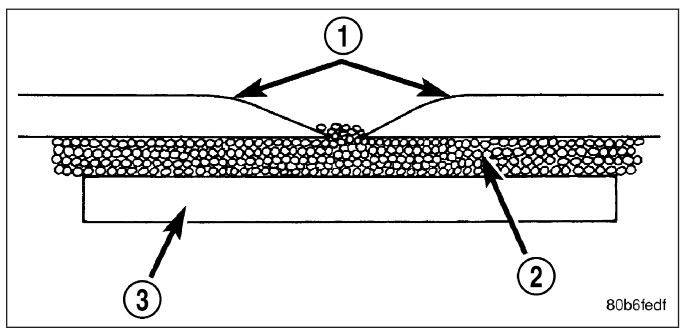
PANEL SECTIONING



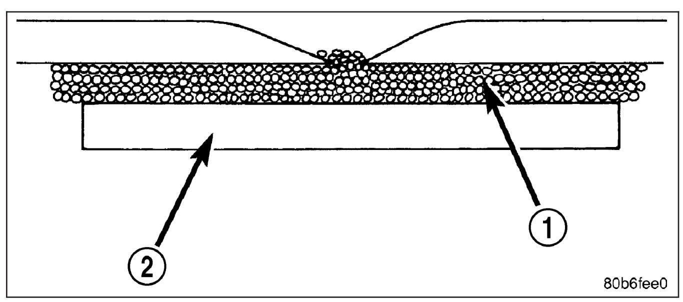
If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel. To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be "V'd" at a 20 °angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

When bonding plastic panels, follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

PANEL REINFORCEMENT

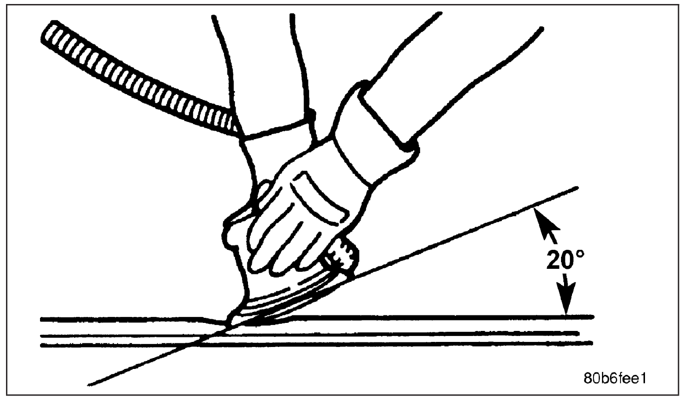


Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement and open meshed fiberglass dry wall tape can be used to form a reinforcement. The dry wall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more dry wall tape used, the stronger the repair.

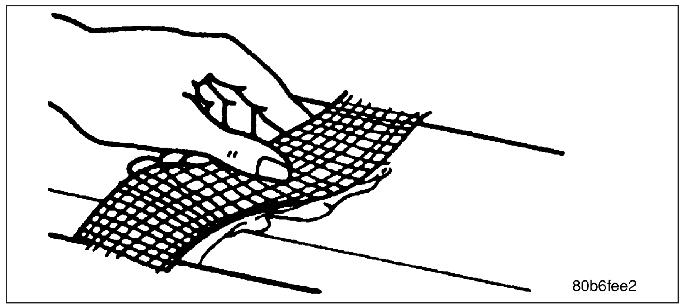


Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first “V’d” out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 ° angle will increase the bonding surface for a repair. It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.



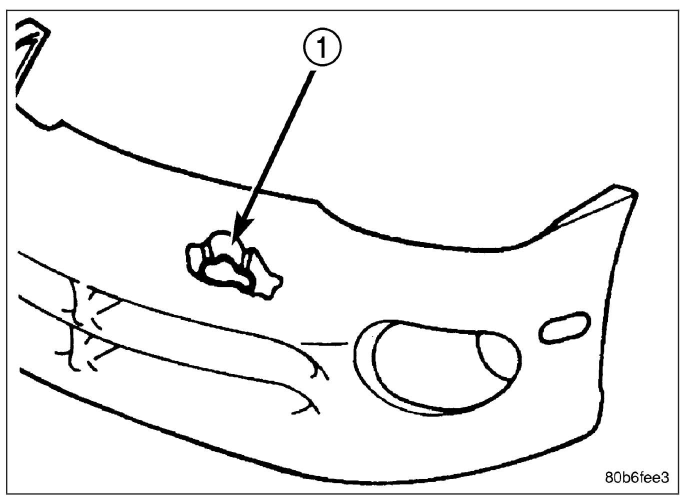
- Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used.
- The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damage part to its original strength and appearance without exceeding the value of the replacement part.
- When plastic repairs are required, it is recommended that the part be left on the vehicle when ever possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.



VISUAL INSPECTION

Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind.

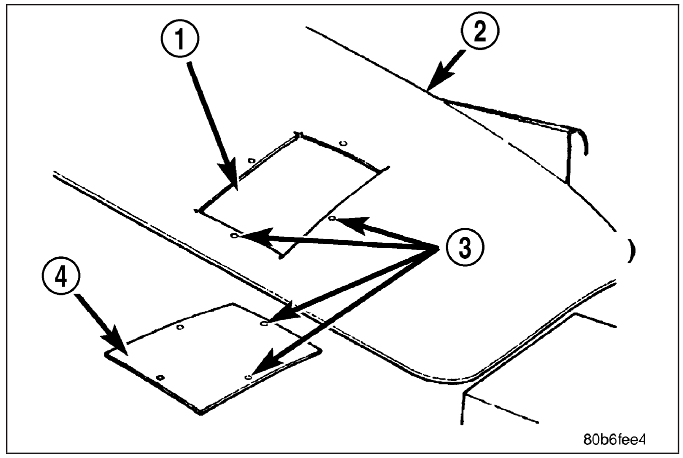


PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel would require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to assure adhesion of repair materials.

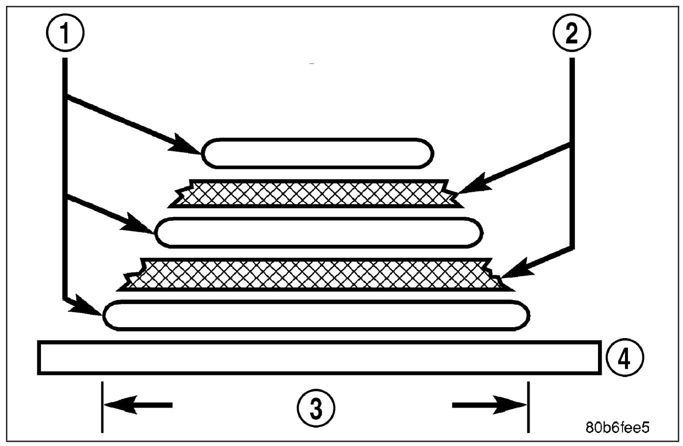
PATCHING PANELS

A panel that has extensive puncture type damage can be repaired by cutting out the damaged material. Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20° to expose a larger bonding area on the outer side. This will allow for an increased reinforcement areas.



PANEL PATCH FABRICATIONS

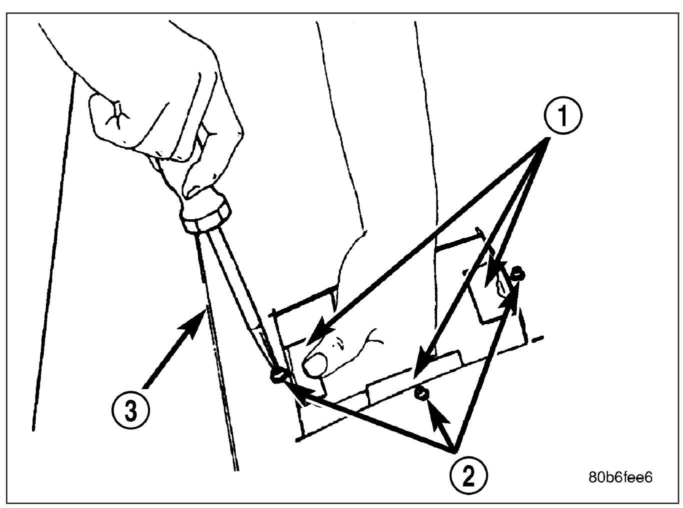
A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. Lift gates and fenders can be used to supply patch material. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (dry wall tape). Perform the following operation if required:



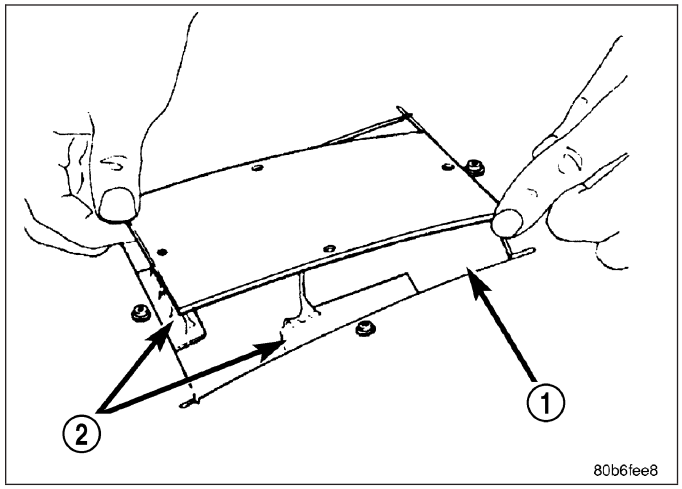
1. Cover waxed paper or plastic with adhesive backed nylon mesh (dry wall tape) larger than the patch required.
2. Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.
3. Apply a liberal coat of adhesive over the reinforcement mesh. If necessary apply a second or third coat of adhesive and mesh after first coat has cured. The thickness of the patch should be the same as the repair area.
4. After patch has cured, peel waxed paper or plastic from the back of the patch.
5. If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.

PANEL PATCH INSTALLATION

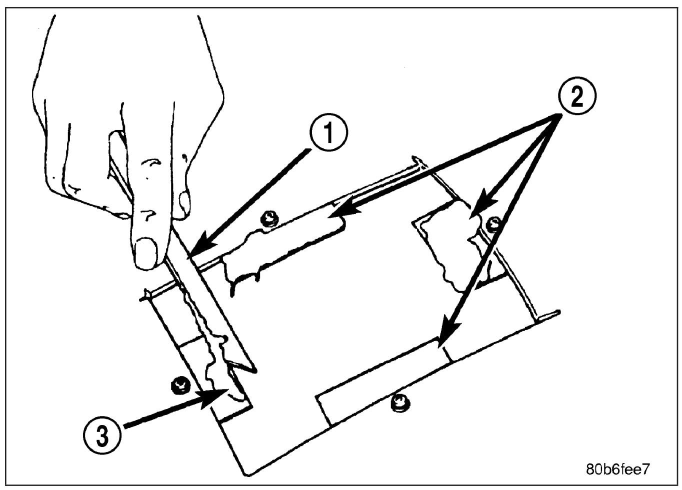
1. Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.
2. Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.
3. Using the pattern as a guide, cut the patch to size.
4. Cut scrap pieces of patch material into 50 mm (2 in.) squares to use as patch supports to sustain the patch in the cutout.
5. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole.
6. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.



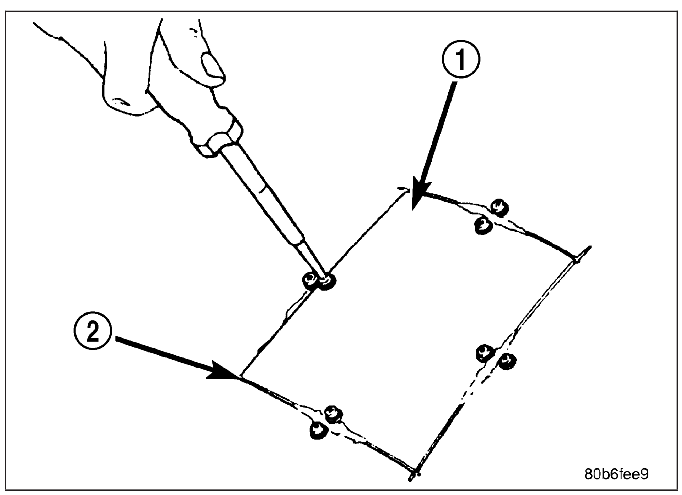
7. Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.
8. Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.
9. Mix enough adhesive to cover one side of all support squares.
10. Apply adhesive to cover one side of all support squares.
11. Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares.
12. Position patch in cutout against support squares and adjust patch until the gap is equal along all sides.
13. Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.



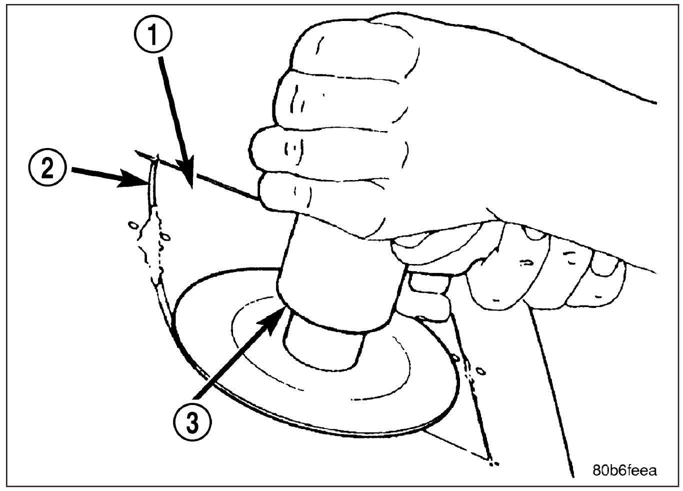
14. Apply a coat of adhesive to the exposed ends of the support squares.



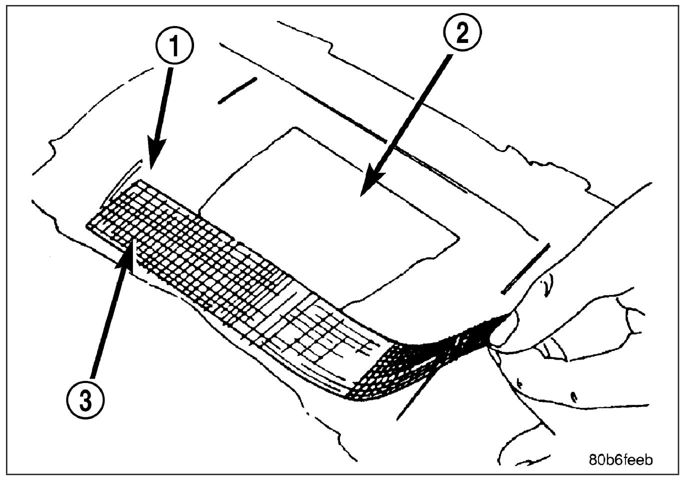
15. Install screws to hold the patch to support squares. Tighten screws until patch surface is flush with panel surface.
16. Allow adhesive to cure, and remove all screws.



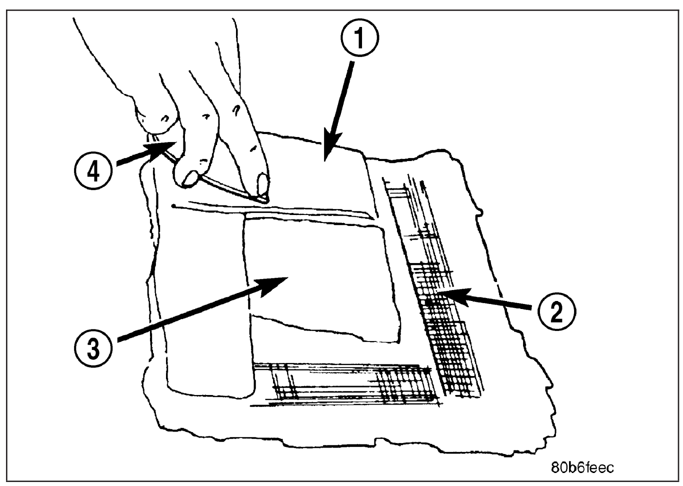
17. Using a 125 mm (5 in.) 24 grit disc grinder, grind a 50 mm (2 in.) to 75 mm (3 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch. With compressed air, blow dust from around patch.



18. Apply adhesive backed nylon mesh (dry wall tape) over gaps around patch.
19. Mix enough adhesive to cover the entire patch area.



20. Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair.



PATCHED PANEL SURFACING

After patch panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

STANDARD PROCEDURE - HEAT STAKING

1. Remove trim panel.

2. Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and/or component seams for looseness.
3. Heat stake the components.
   a. If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
   b. If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
4. Allow the repaired area to cool and verify the repair.
5. Install trim panel.

SPECIFICATIONS

BODY LUBRICATION

LUBRICATION REQUIREMENTS

Body mechanisms and linkages should be inspected, cleaned, and lubricated, as required, to maintain ease of operation and to provide protection against rust and wear. When performing other under hood services, the hood latch release mechanism and safety catch should be inspected, cleaned, and lubricated. During the winter season, external door lock cylinders should be lubricated to assure proper operation when exposed to water and ice.

Prior to the application of any lubricant, the parts concerned should be wiped clean to remove dust and grit. If necessary, a suitable solvent can be used to clean the item to be lubricated. After lubricating a component, any excess oil or grease should be removed.

LUBRICANT APPLICATION

DOOR LOCK CYLINDERS

1. Apply a small amount of lubricant directly into the lock cylinder.
2. Apply a small amount of lubricant to the key.
3. Insert key into lock cylinder and cycle the mechanism from the locked to the unlocked position.

NOTE: Do not add more lubricant.

4. Cycle the lock cylinder mechanism several times to allow the lubricant to flow throughout the cylinder.
5. Wipe all lubricant from exterior of lock cylinder and key.

ALL OTHER BODY MECHANISMS

1. Clean component as described above.
2. Apply specified lubricant to all pivoting and sliding contact areas of component.

LUBRICANT USAGE

ENGINE OIL

- Door Hinges – Hinge Pin and Pivot Contact Areas
- Hood Hinges – Pivot Points
- Liftgate Hinges

MOPAR® SPRAY WHITE LUBE OR EQUIVALENT

- Door Check Straps
- Liftgate Latches
- Liftgate Prop Pivots

- Ash Receiver
- Fuel Filler Door Remote Control Latch Mechanism
- Parking Brake Mechanism
- Sliding Seat Tracks
- Liftgate Latch

MOPAR® Multipurpose GREASE OR EQUIVALENT

- All Other Hood Mechanisms

MOPAR® LOCK CYLINDER LUBRICANT OR EQUIVALENT

- Door Lock Cylinders
- Liftgate Lock Cylinder

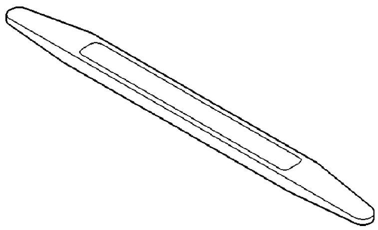
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
All seat belt anchor bolts	40	30.	—
All seat belt anchor nuts	40	30	—
All seat belt retractor bolts	40	30	—
Liftgate hinge nuts	15	11	—
Liftgate latch striker	22	16	—
Front door outside handle	8	6	—
Front door mirror nuts	5	4	—
Front door latch assembly	9	7	—
Front seat forward, rearward, inboard, outboard bolt	51	38	—
Front seat track to floor pan bolts	55	40	—
Front seat inboard pivot bolt	40	30	—
Front seat recliner to seat cushion frame	12	9	—
Front seat track to cushion frame bolt	12	9.	—
Front seat back	40	30	—
Front seat back recliner to seat back	12	9	—
Front door hinge to hinge pillar bolt	26	19	—
Front door hinge nuts	28	21	—
Front door latch striker	26	19	—
Hood to hinge nuts	20	15	—
Hood hinge nuts	20	15	—
Hood latch striker	14	10	—
Instrument panel cowl fasteners	21	15	—
Liftgate hinge	15	11	—
Liftgate hinge to body	20	15	—
Liftgate latch	8	6	—
Liftgate striker	23	17	—
Rear door glass to regulator bolt	11	–	105
Rear door handle	8	6	—
Rear door hinge to B-pillar bolt	26	19	—
Rear door latch	9	7	—
Rear door latch striker	26	19	—
Rear seat cushion front mounting bolts	56	42	—

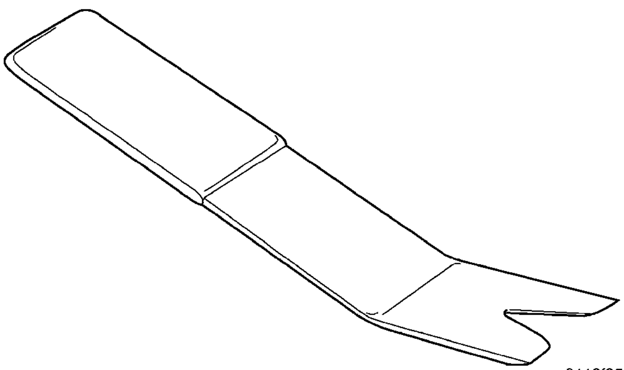
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Rear seat back bolt	46	34	—
Rear seat back and seat belt buckle anchor nut	57	42	—
Seat belt anchor bolt	47	35	—
Seat back assembly	40	30	—
Seat back pivot bolt	45	33	—
Seat back latch bolts	28	21	—
Seat belt buckle bolt	45	33	—
Seat cushion strap bolts	11	8	—
Sunroof assembly fasteners	9	—	80
Sunroof side bracket fasteners	9	—	80

SPECIAL TOOLS

BODY



STICK, TRIM C 4755



REMOVER, MOLDINGS C-4829-A

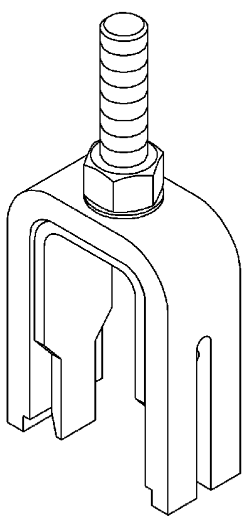


Fig. 1 STRAIN GAUGE HOLDER 9689

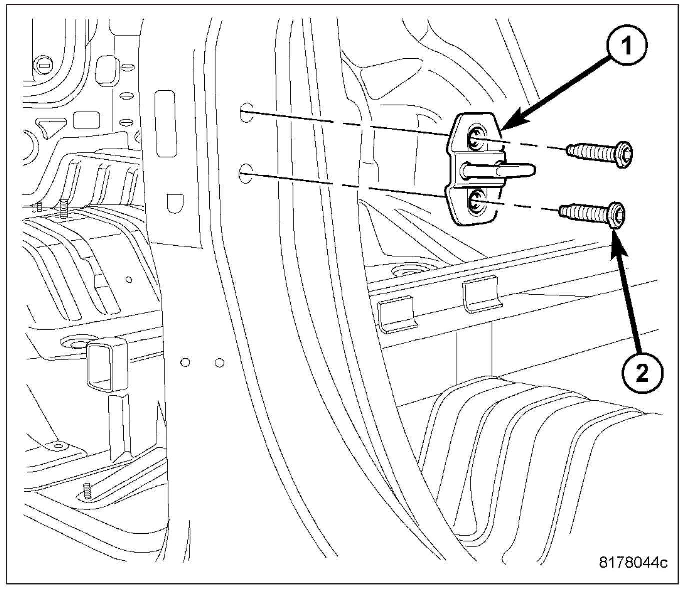
DOOR - FRONT

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FRONT DOOR LATCH STRIKER

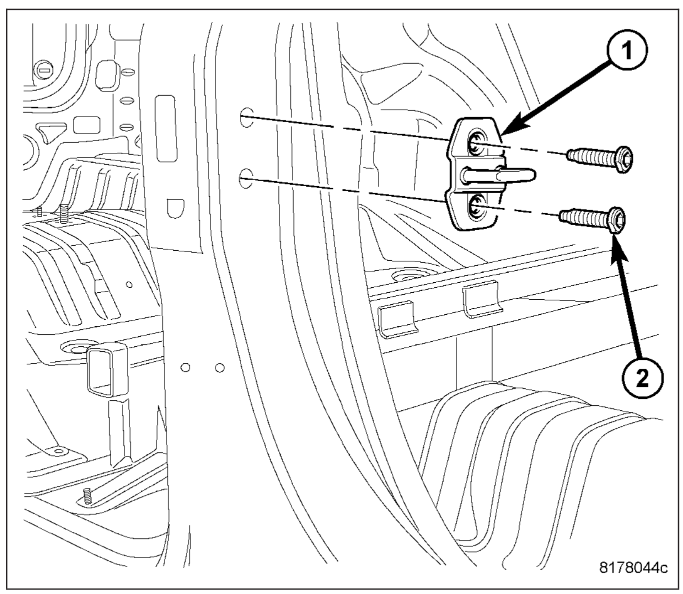
REMOVAL

1. Remove fasteners (2) from door jamb.
2. Remove door striker (1) from vehicle.



INSTALLATION

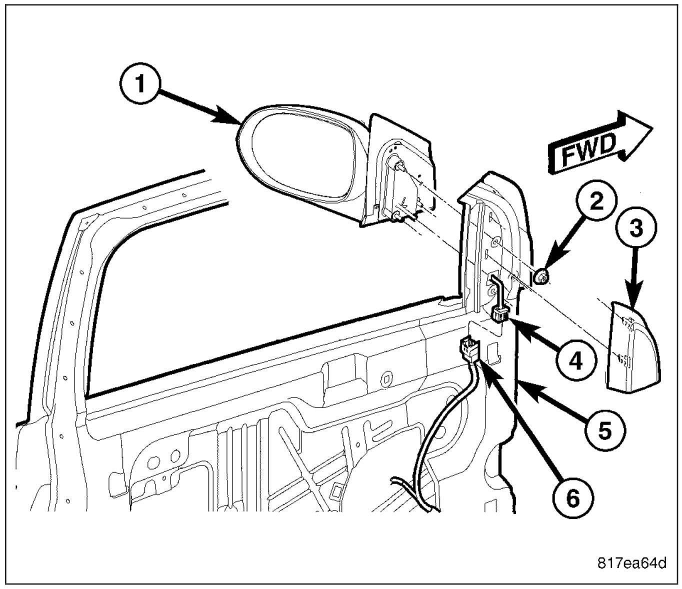
1. Install striker (1) onto door jamb.
2. Install fasteners (2) into striker.
3. Tighten fasteners to 26 N·m (19 ft. lbs.)



DOOR- OUTSIDE MIRROR

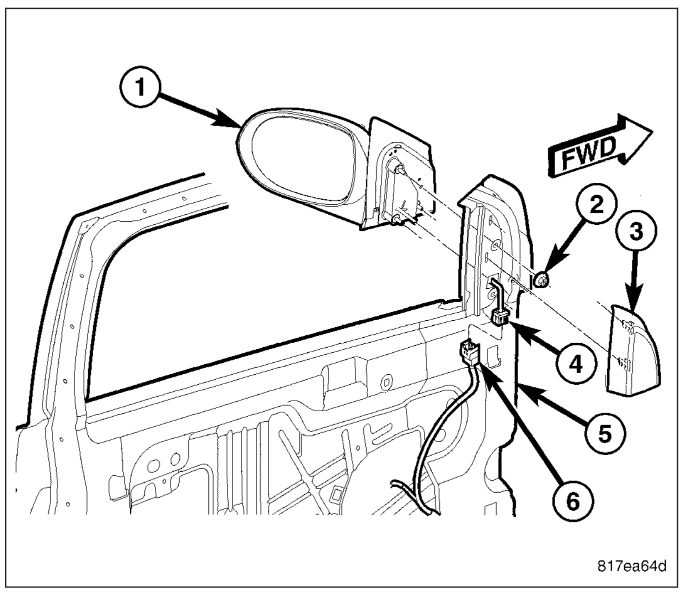
REMOVAL

1. Using trim stick C-4755, pry up mirror flag cover (3).
2. Disconnect wire connector (4) from wire harness (6).
3. Remove nuts (2).
4. Remove mirror (1) from door (5).



INSTALLATION

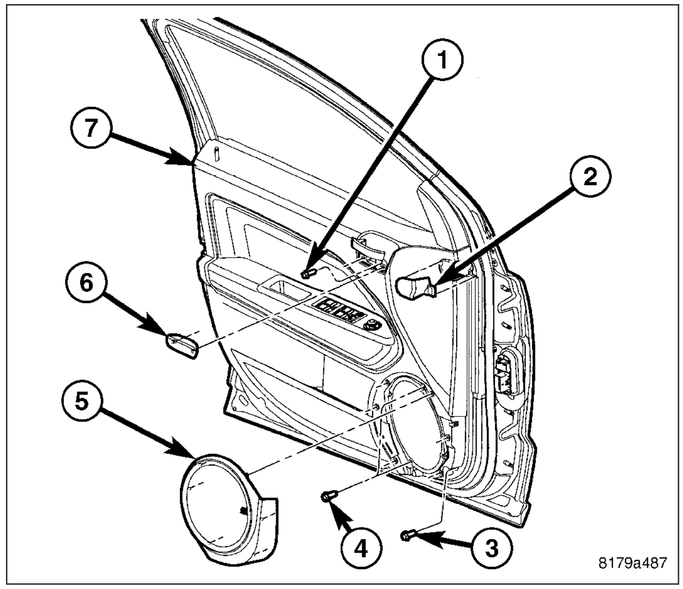
1. Insert mirror (1) into door (5).
2. Install nuts (2) onto mirror studs.
3. Tighten nuts to 5 N·m (4 ft. lbs.)
4. Connect wire connector (4) to wire harness (6).
5. Install mirror flag cover (3).



DOOR-PLUGS

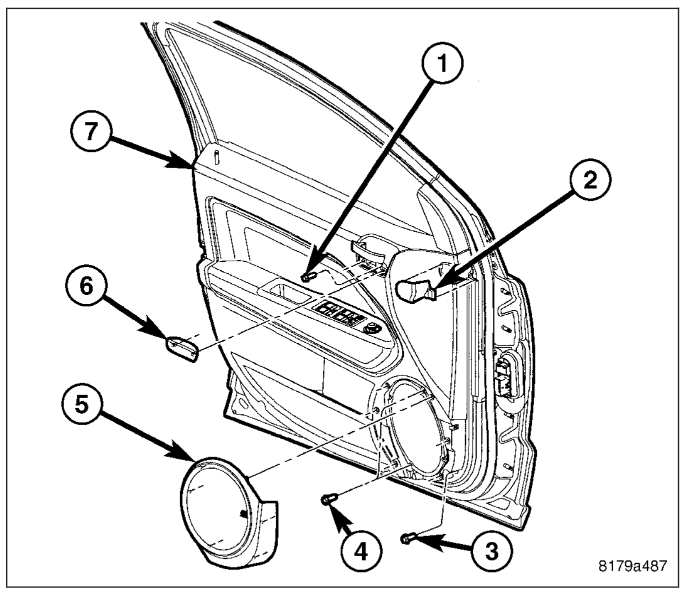
REMOVAL

1. Remove screw (1) and handle plug (6).
2. Using trim stick C-4755, remove mirror flag plug (2).
3. Using trim stick C-4755 remove speaker grille (5).
4. Remove screws (3) and (4) fastening speaker to door (7).



INSTALLATION

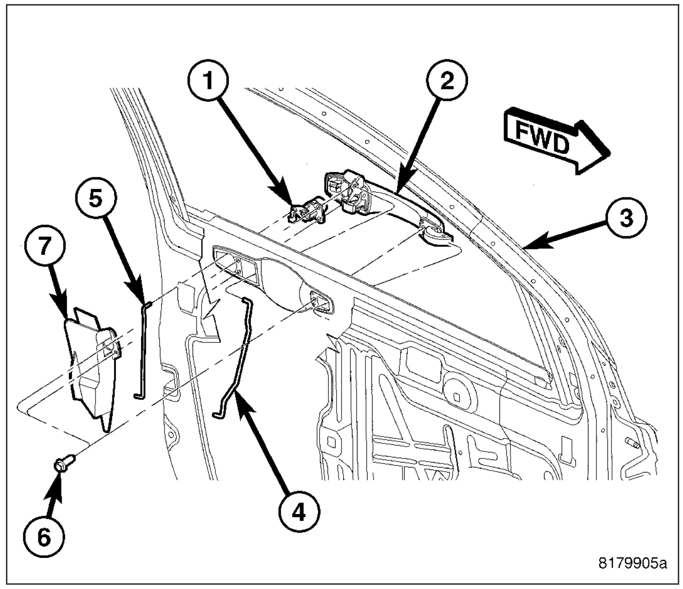
1. Install speaker screws (3) and (4) fastening speaker to door.
2. Hand tap speaker grille to door (7).
3. Install handle plug (6) and screw (1) to door.
4. Hand tap mirror flag (2) to door (7).



FRONT DOOR OUTSIDE HANDLE

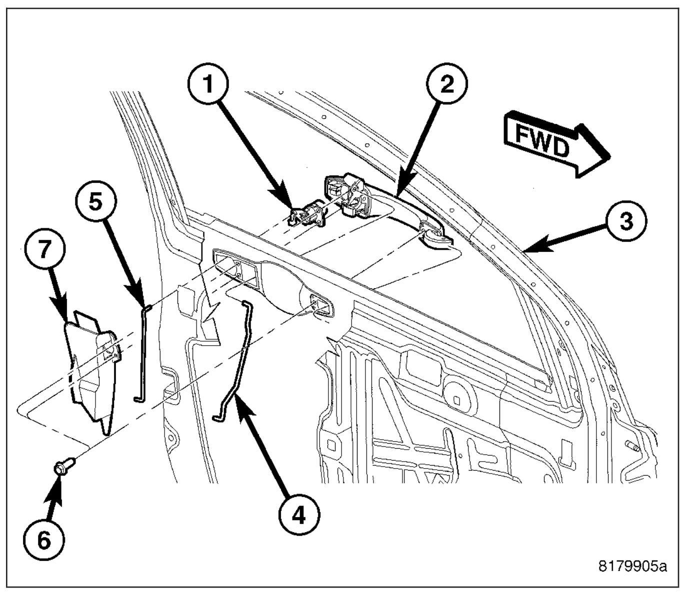
REMOVAL

1. Remove bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
2. Remove door plugs. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
3. Remove door module. (Refer to 23 - BODY/DOOR - FRONT/DOOR MODULE - REMOVAL)
4. Raise window to up position.
5. Remove key cylinder lock link rod (5) from lock cylinder (1).
6. Remove handle link rod (4) from handle (2).
7. Remove screws (6) from handle assembly (2).
8. Remove handle assembly (2) from door (3).



INSTALLATION

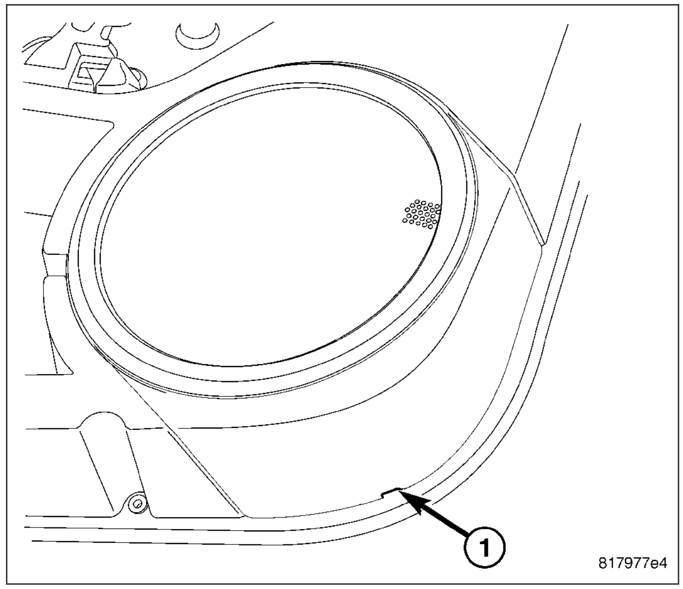
1. Raise window to up position.
2. Insert lock cylinder (1) into door handle (2) then into door opening.
3. Tighten screws (6) to 8 N·m (6 ft. lbs.)
4. Connect lock cylinder link rod (5) on to lock cylinder (1).
5. Connect handle link rod (4) on to door handle (2).



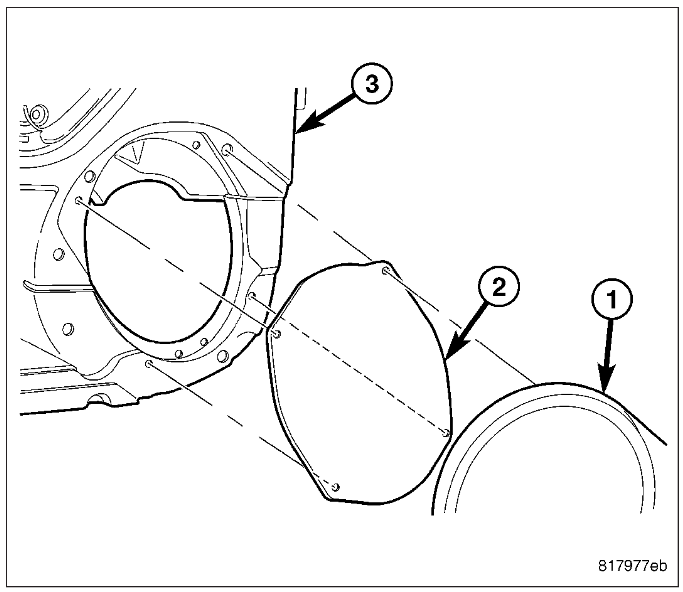
SPEAKER AND GRILLE

REMOVAL

1. Using trim stick C–4755, find service notch (1) located at the bottom of speaker grille and pry up speaker grille.

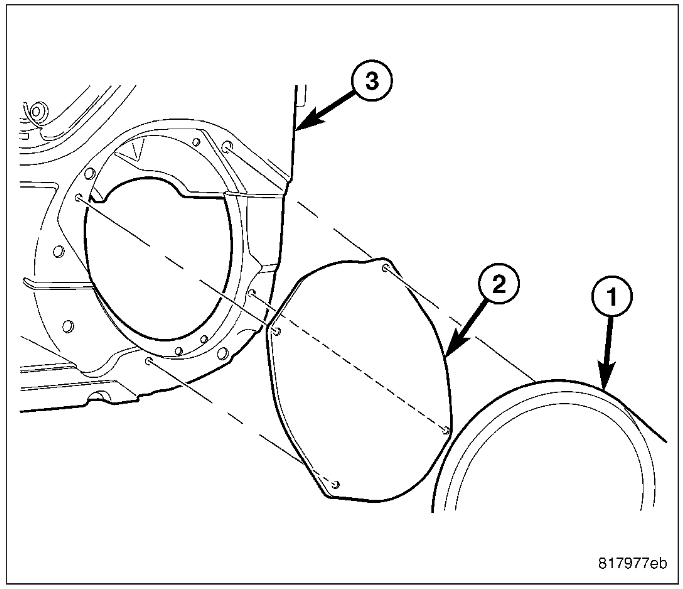


2. Remove two screws attaching speaker to door panel (3).
3. Remove two screws attaching speaker (2) to door module (1).
4. Disconnect wire connector.



INSTALLATION

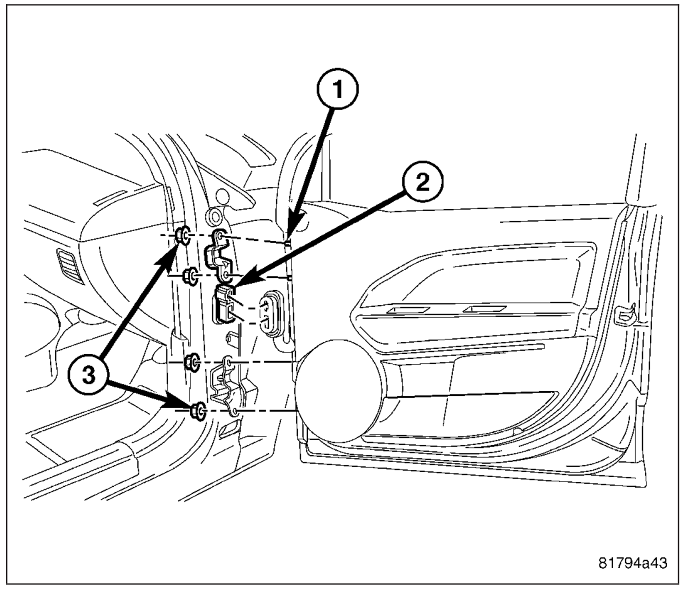
1. Connect wire connector.
2. Install speaker (2) into panel (3) and install two screws into door panel.
3. Install two screws into trim panel (1).
4. Install speaker grille (1) onto trim panel (3).



FRONT DOOR HINGE

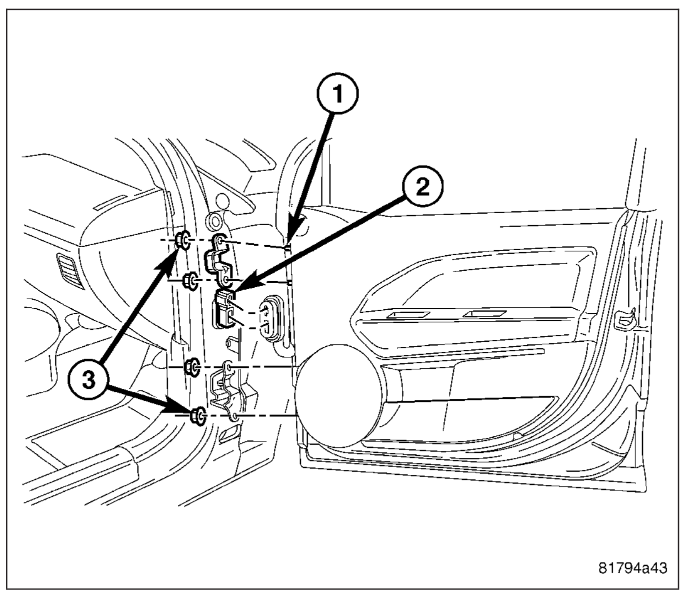
REMOVAL

1. Remove nuts (3) from door studs (1).
2. Remove door.
3. Disconnect door harness (2).



INSTALLATION

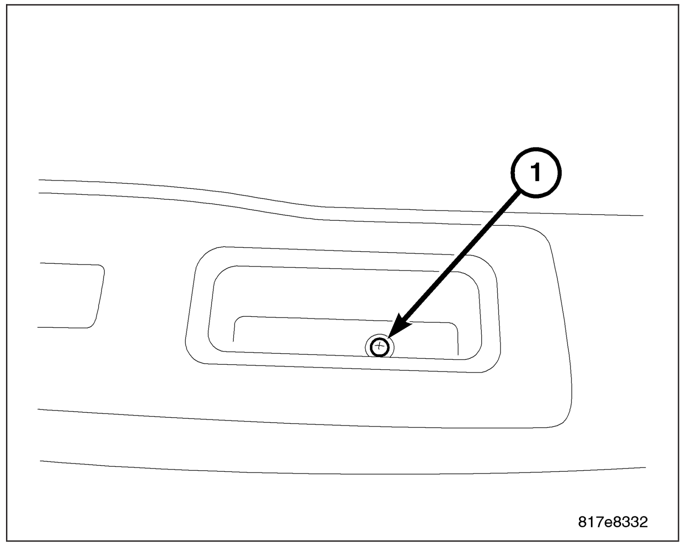
1. Connect door harness (2).
2. Install door studs (1) into door hinges.
3. Install nuts (3) onto door studs. Tighten to 26 N·m (19 ft. lbs.)



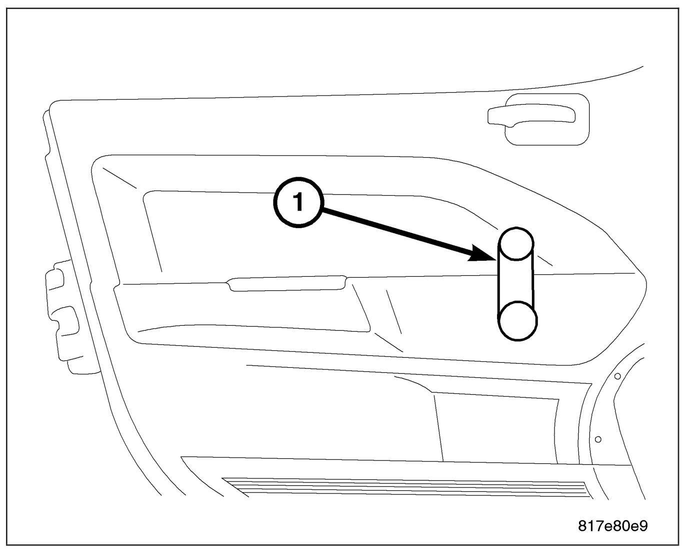
FRONT DOOR - BOLSTER

REMOVAL

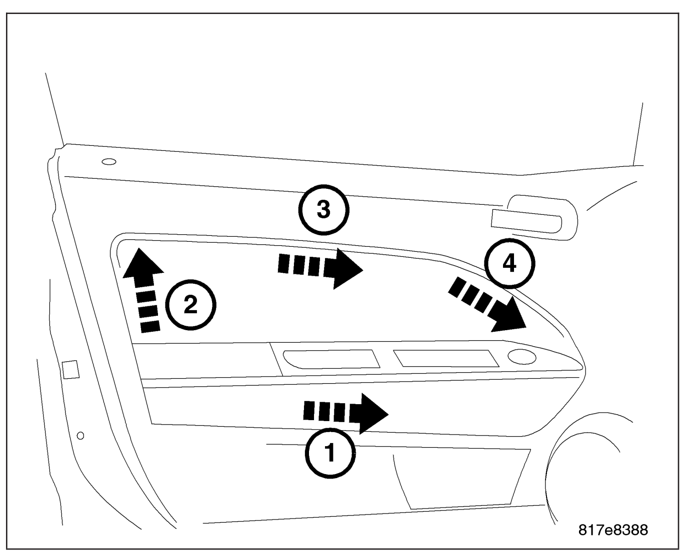
1. Remove pull-cup screw (1).



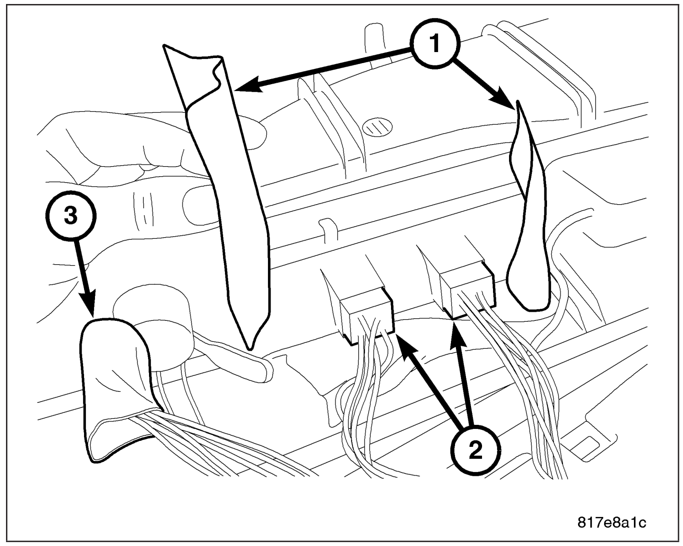
2. Remove window crank (1) from spindle if equipped.



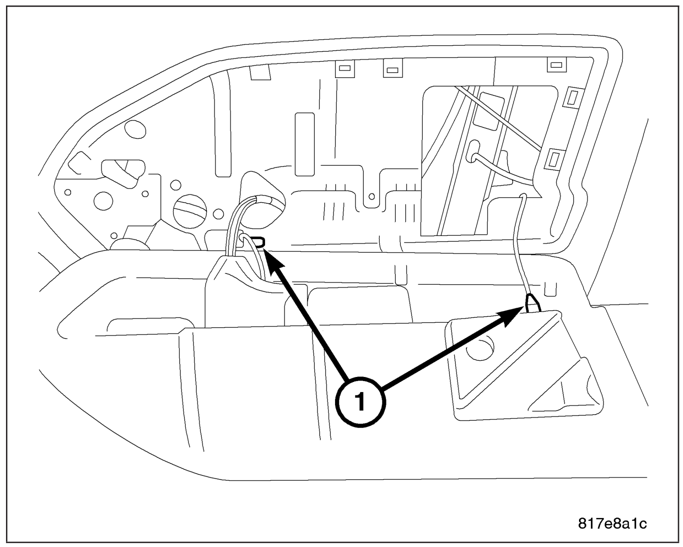
3. Using trim stick C-4755, start at the lower corner and pull in the direction of the arrows. Bolster should unsnap.



4. Remove sock seal (1) and (3) that wraps around switch bezel and wire harness. Disconnect wire connectors (2).
5. Remove switch bezel from bolster.

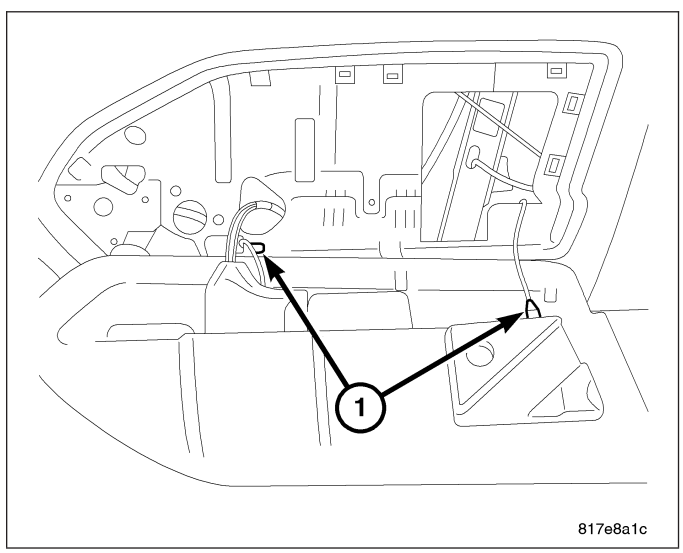


6. Remove bolster by unsnapping plastic tethers (1) from bolster back side of surface.

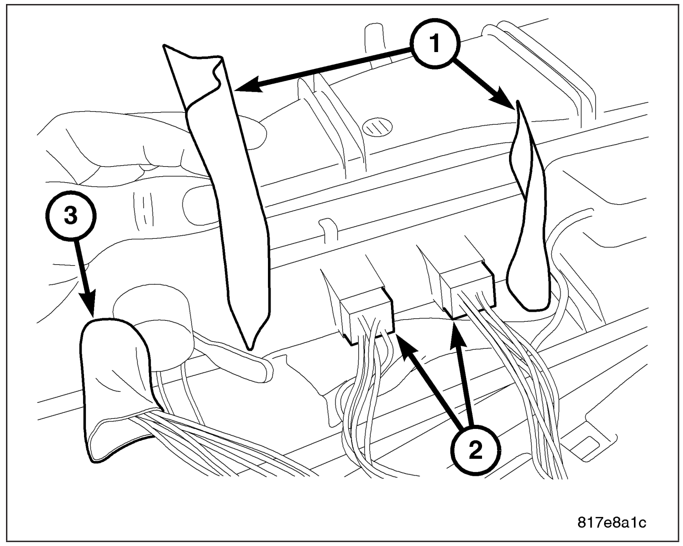


INSTALLATION

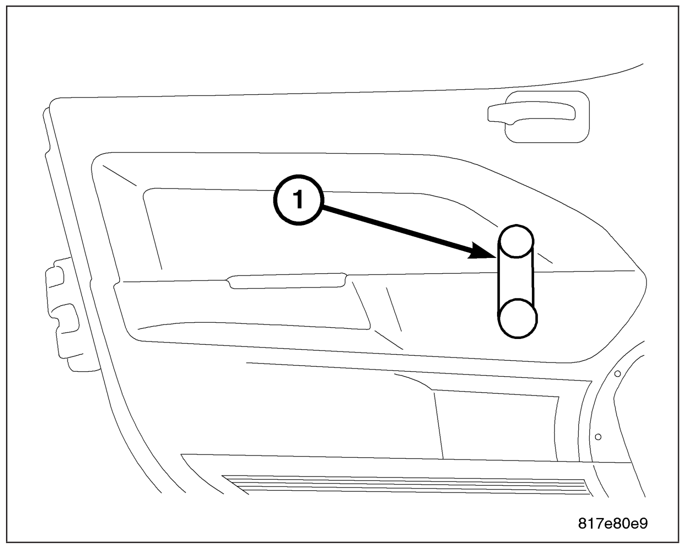
1. Connect bolster to door module tethers (1).



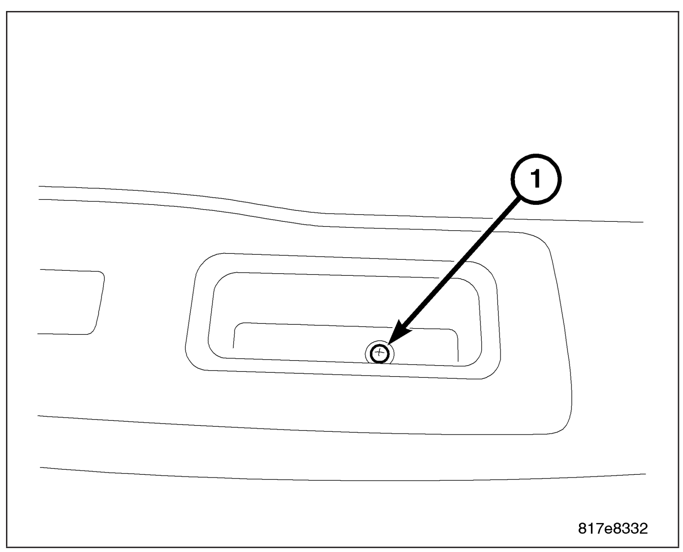
2. Connect wire connectors (2) and close sock seal (1).



3. Replace window crank (1) to spindle.



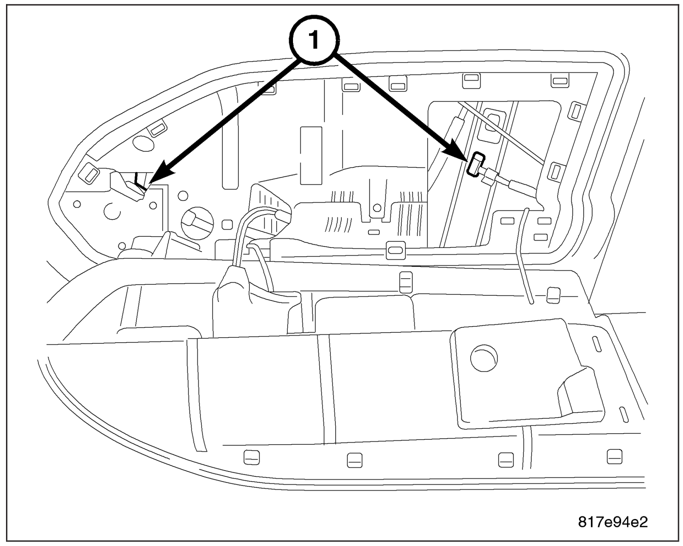
4. Replace pull cup screw.



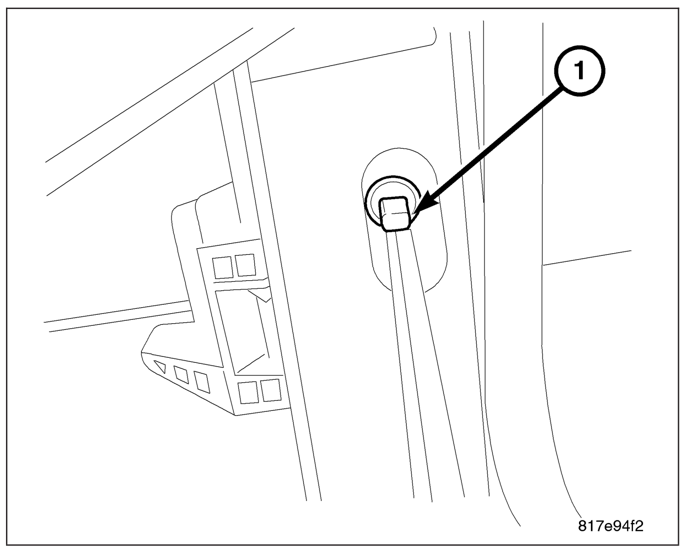
FRONT DOOR GLASS

REMOVAL

1. Remove bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
2. Move glass to line up snap plates with access holes (1).

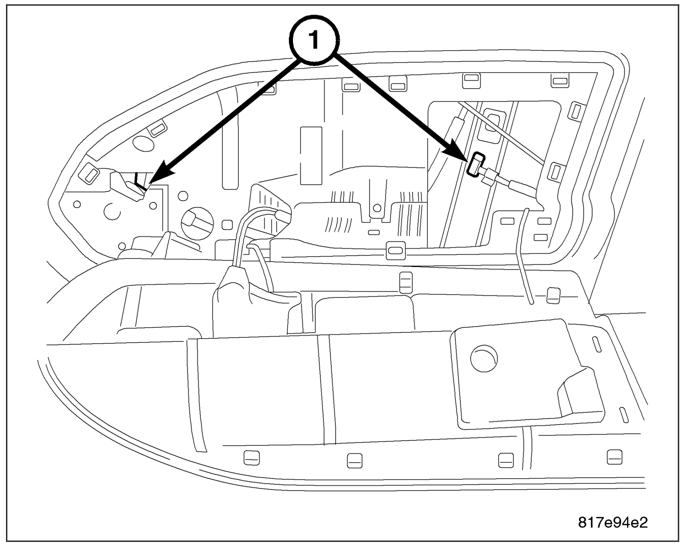


3. Using a punch or equivalent, press tabs releasing glass from window regulator.
4. Manually move glass upward to full up position and remove from window frame.

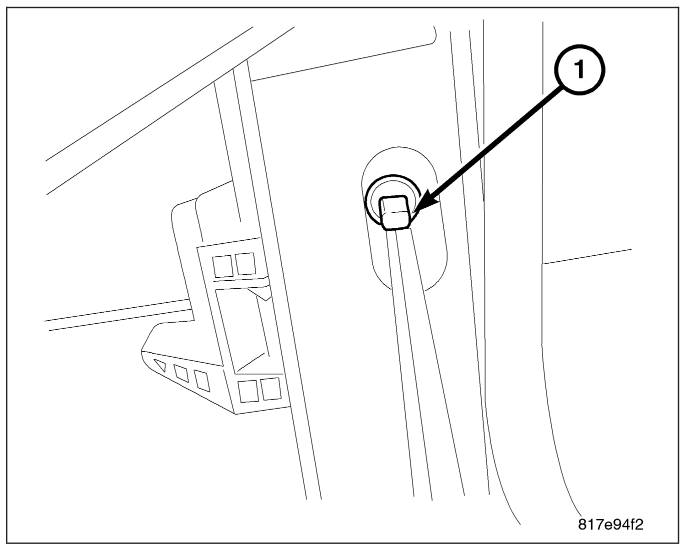


INSTALLATION

1. Insert glass into glass channel and slide down ensuring access holes (1) align with snaps.



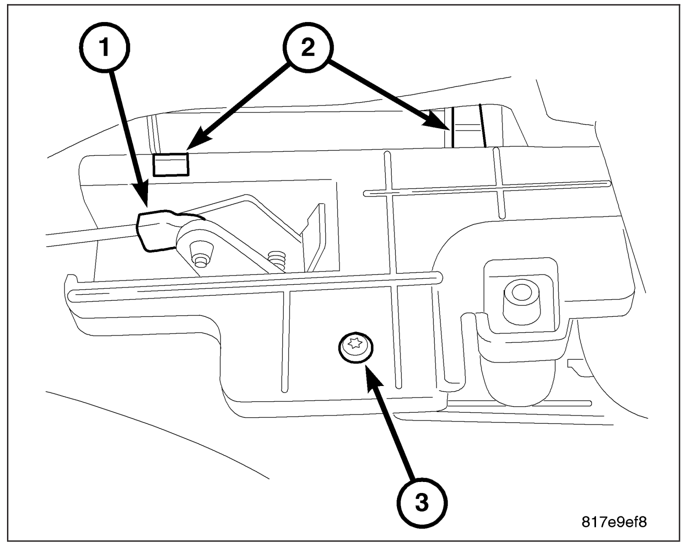
2. Ensure access holes properly lock into snaps (1).
3. Install bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)



FRONT DOOR INSIDE HANDLE

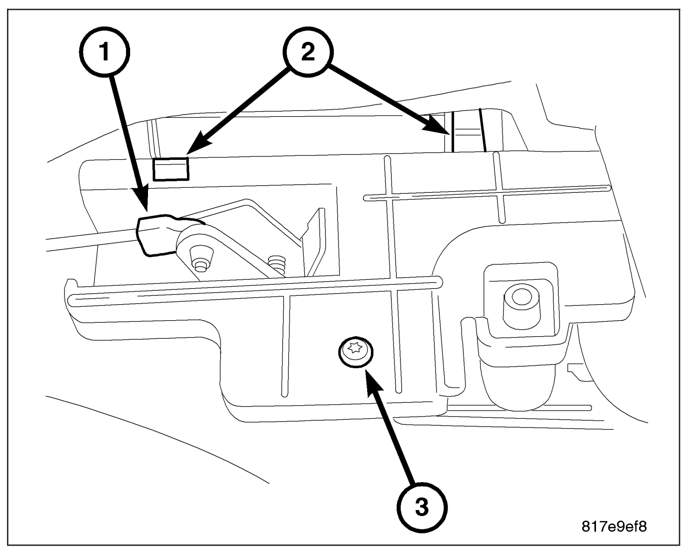
REMOVAL

1. Unsnap link rod to latch (1).
2. Remove screw (3) attaching plate to panel.
3. Unsnap housing snaps from (2) belt line ribs on trim panel.
4. Pull up on trim panel belt line to aid in unsnapping of housing.



INSTALLATION

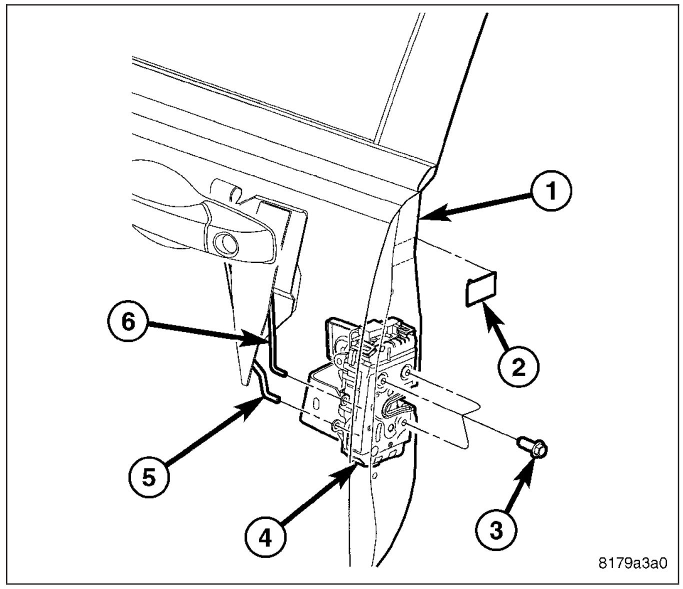
1. Snap inside handle to belt line ribs (2) on trim panel.
2. Install screw (3) attaching handle to panel.
3. Snap link rod to latch.



FRONT DOOR LATCH

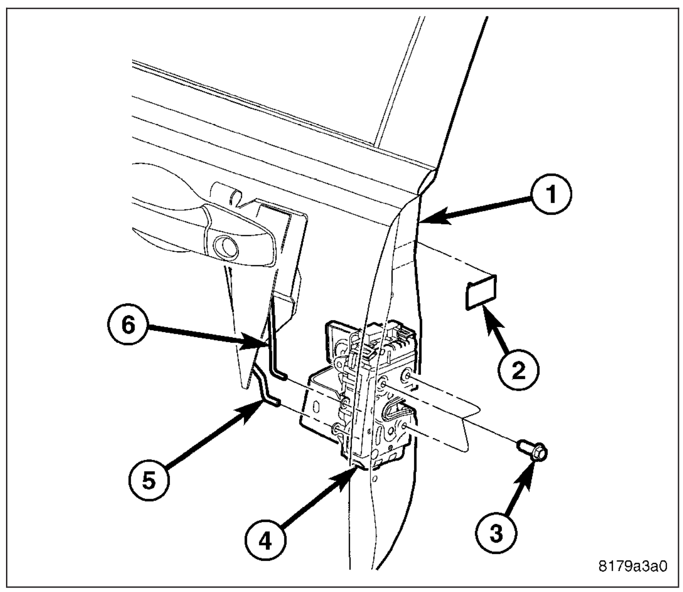
REMOVAL

1. If equipped, disconnect wire harness from Latch.
2. Disconnect inside hand link (5) and lock rod (6) from latch (4).
3. Unscrew latch presenter or unsnap latch from presenter.



INSTALLATION

1. Move glass to the full up position.
2. Install latch assembly into door face (1).
3. Connect hand link (5) and lock rod (6) into latch.
4. Install fasteners and torque to 9 N·m (7 ft. lbs.)



ADJUSTMENTS

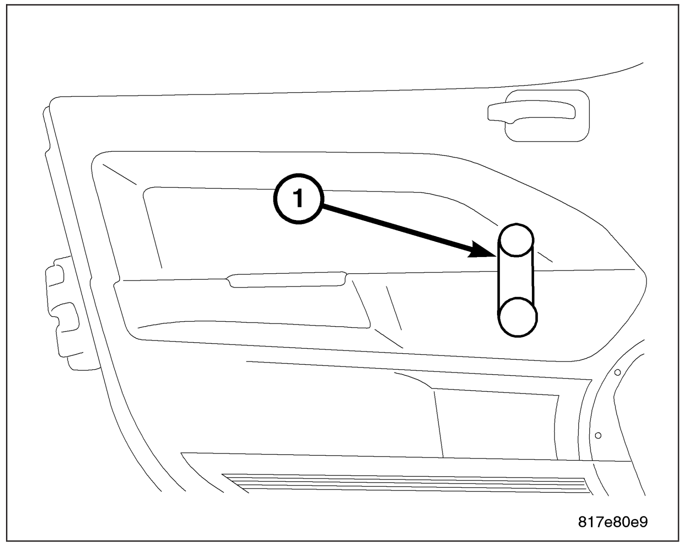
FRONT DOOR LATCH ADJUSTMENT

1. Insert a Torx®-wrench through the elongated hole in the door end frame near the latch striker opening.
2. Loosen Torx® head screw on the side of the latch linkage.
3. Push button on outside door handle and release it.
4. Tighten Torx® head screw on latch.
5. Verify latch operation.

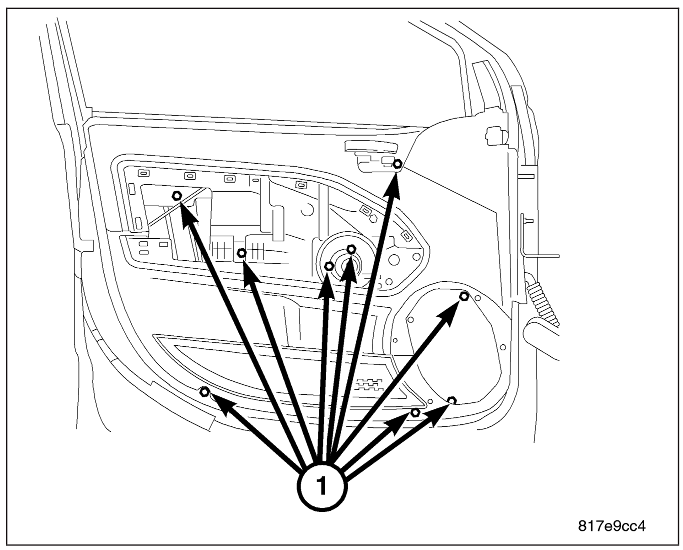
FRONT DOOR WINDOW REGULATOR

REMOVAL

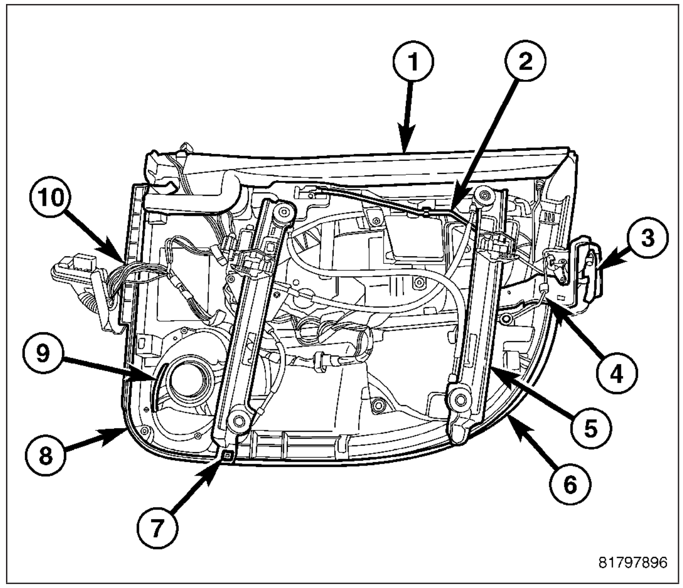
1. Remove bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
2. Remove door plugs. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
3. If equipped, remove window crank (1).
4. Remove glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL)



5. Remove power motor attachment screws (1) from front side of trim panel. (For manual windows only, unsnap manual drive from drum housing).

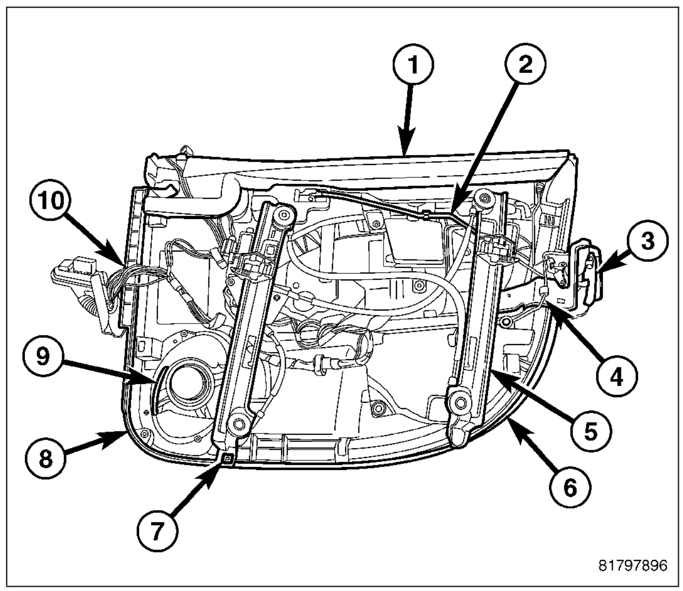


6. Remove lower attachment bolts through front side of trim panel for Window Regulator rails (7).
7. Disconnect wire harness (10) from power motor on back of trim panel.
8. Remove rails for towers on back side of trim panel.
9. Remove window regulator (5) from trim panel.



INSTALLATION

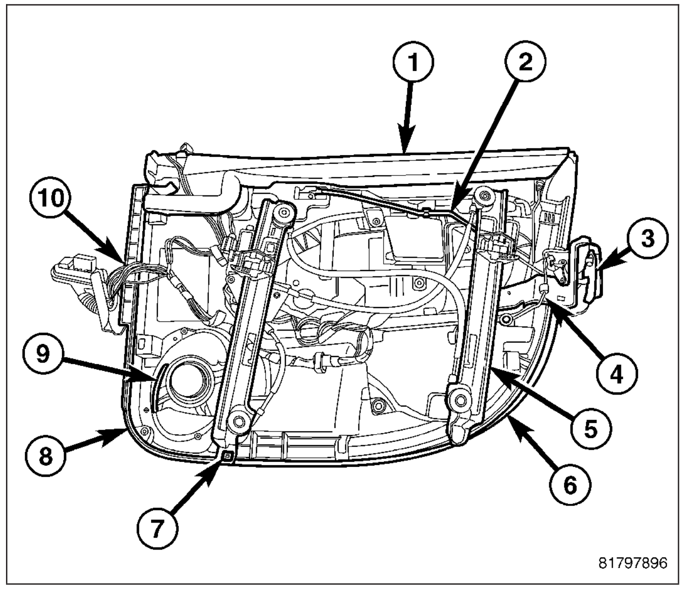
1. Install window regulator (5) to door module (6).
2. Install rails (5) back to trim panel.
3. Connect wire harness (10).



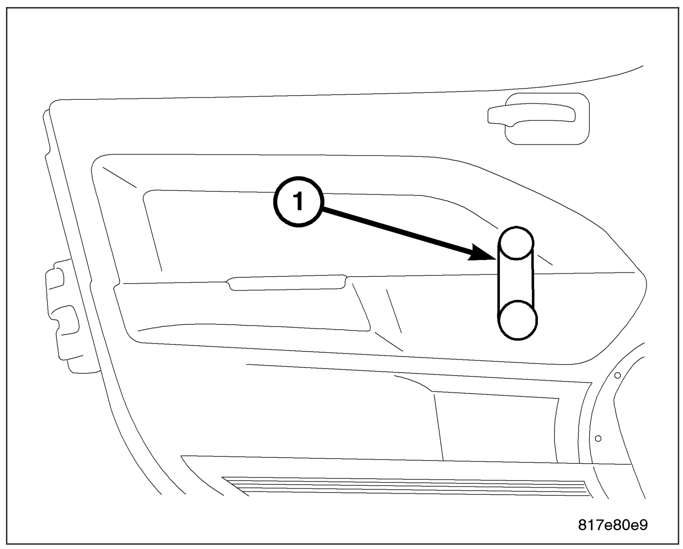
DOOR MODULE

REMOVAL

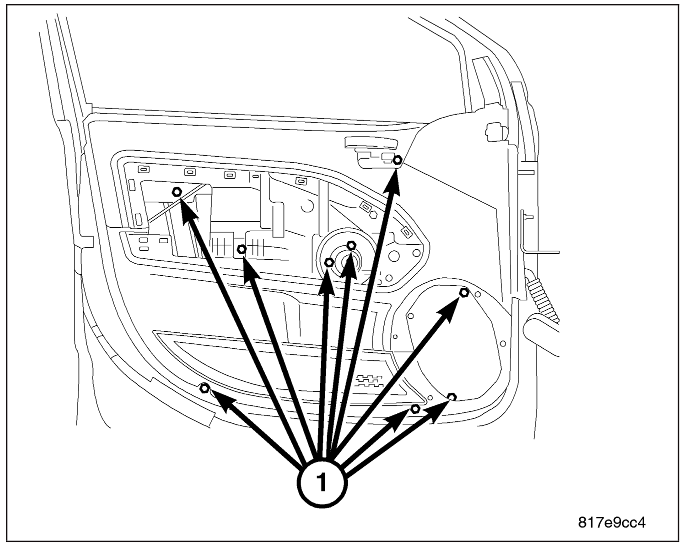
1. Remove door plugs. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)



2. Remove manual window crank if equipped.
3. To remove bolster using trim stick C-4755 start at the lower left corner and pry and slide special tool until bolt unsnaps from clips.
4. Remove glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL)

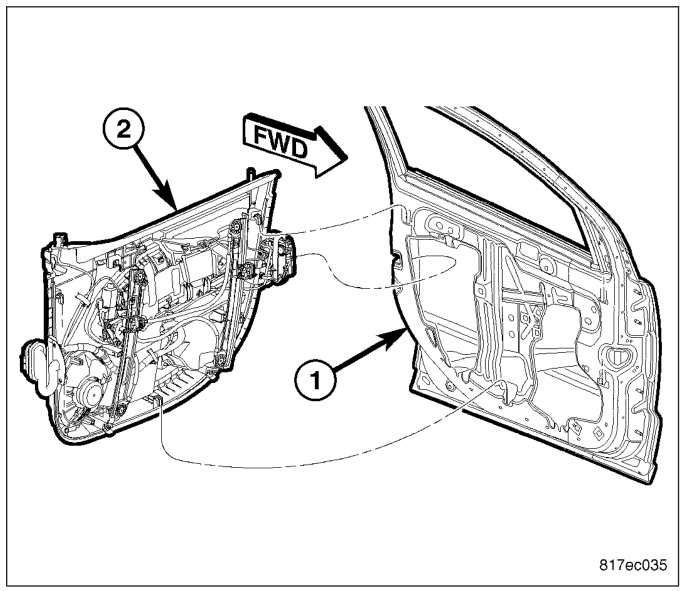


5. Remove fasteners from locations.

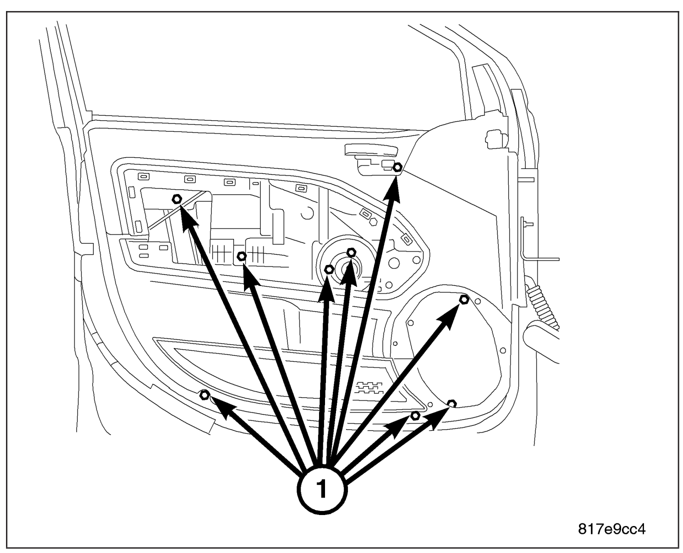


INSTALLATION

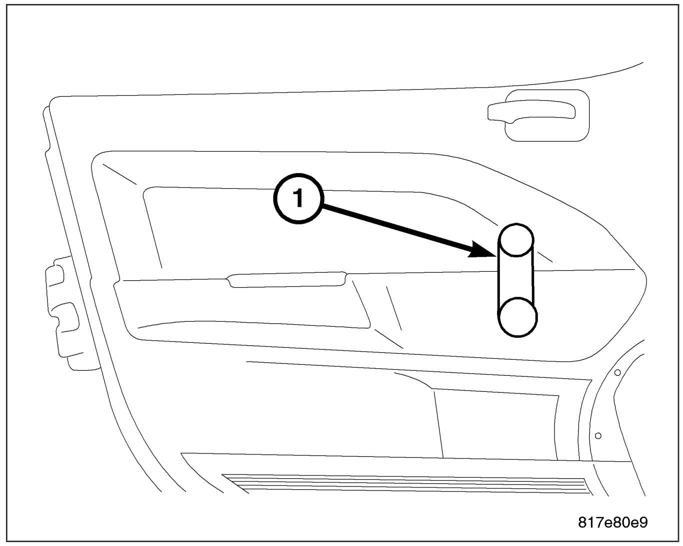
1. Install door module (2) to door (1) aligning module clips with door access holes.



2. Install fasteners to module ensuring proper seat.
3. Install glass into window regulator clips. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - INSTALLATION)



4. Install window crank (1) if equipped.
5. Install bolster. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)
6. Install door plugs. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)



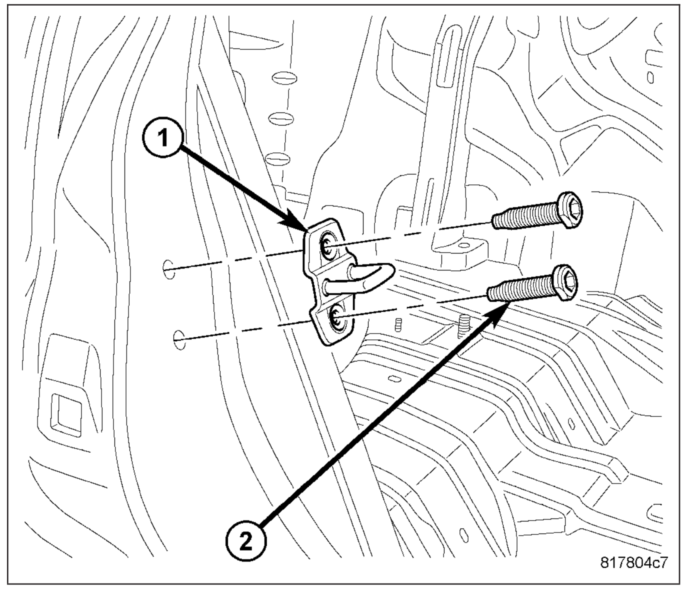
DOORS - REAR

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REAR DOOR LATCH STRIKER

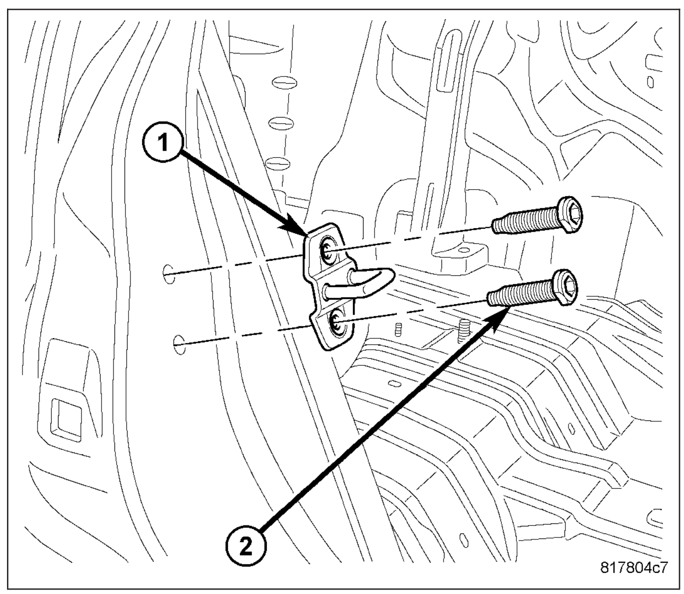
REMOVAL

1. Open door.
2. Remove fasteners (2).
3. Remove striker (1).



INSTALLATION

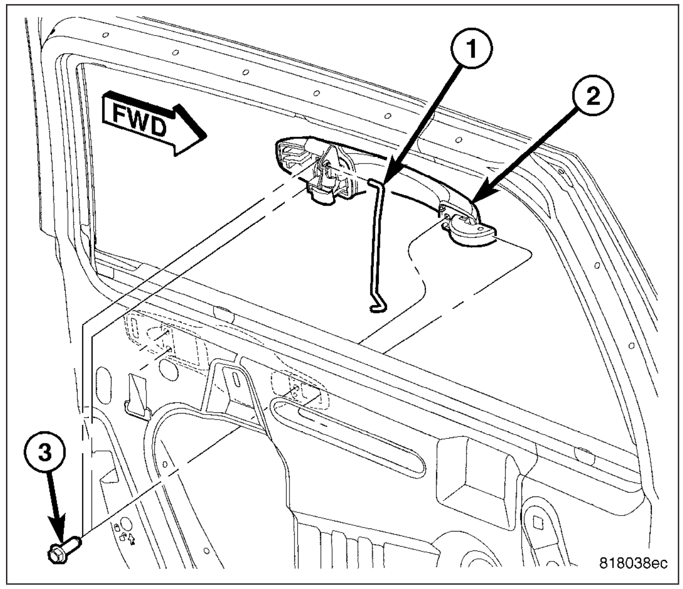
1. Align striker (1) with holes in body.
2. Install fasteners.
3. Tighten fasteners to 26 N·m (19 ft. lbs.)



REAR DOOR OUTSIDE HANDLE

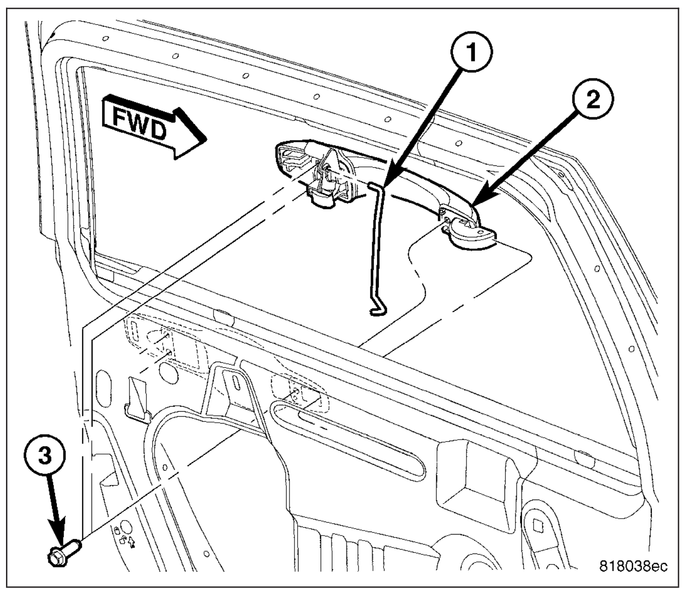
REMOVAL

1. Remove door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - REMOVAL)
2. Remove bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
3. Remove door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)
4. Remove rod link (1).
5. Remove fasteners (3).
6. Remove handle (2) from door.



INSTALLATION

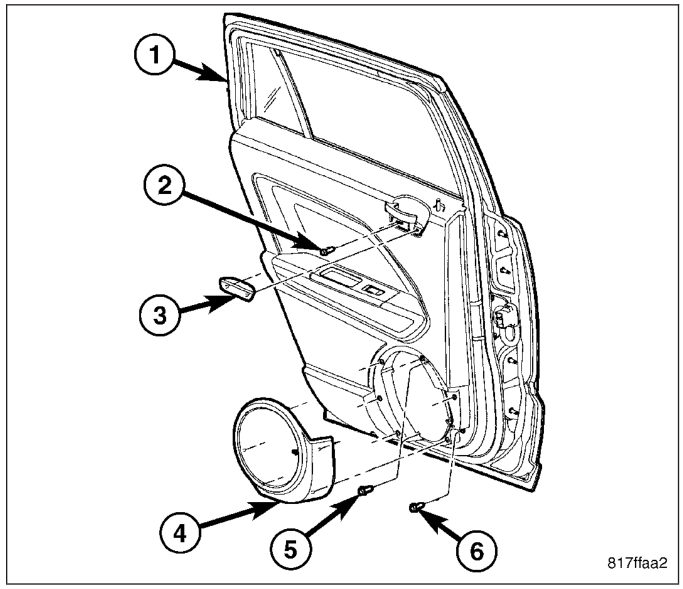
1. Install door handle (2).
2. Install three fasteners. Tighten to 8 N·m (6 ft. lbs.).
3. Install rod link (1).
4. Install door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)
5. Install bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)
6. Install door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - INSTALLATION)



REAR DOOR PLUGS

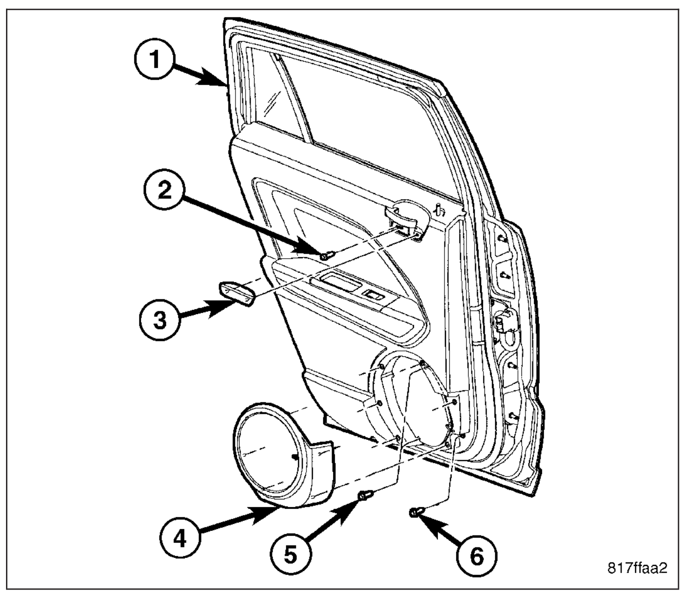
REMOVAL

1. Using special tool C-4755, pry up handle plug (3) from door (1).
2. Using special tool C-4755, pry up speaker grille (4) from door.



INSTALLATION

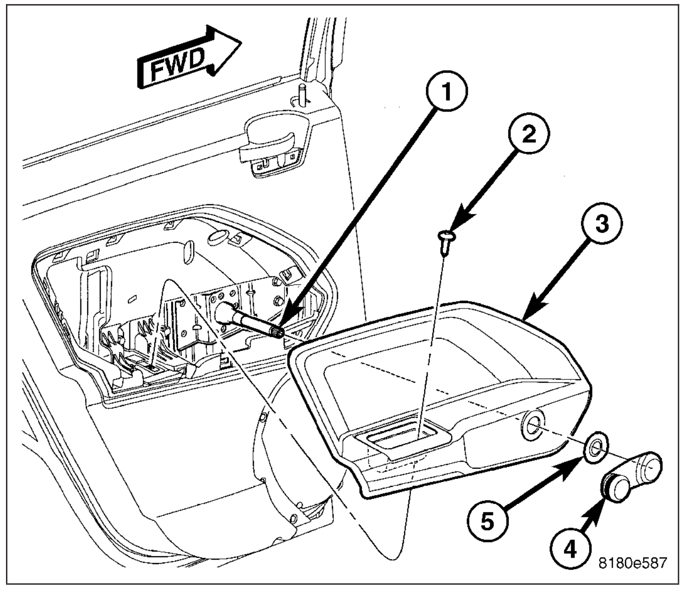
1. Align speaker grille (4) with speaker opening and hand tap speaker grille (4) to door ensuring fit.
2. Align handle plug with handle plug opening and hand tap ensuring fit.



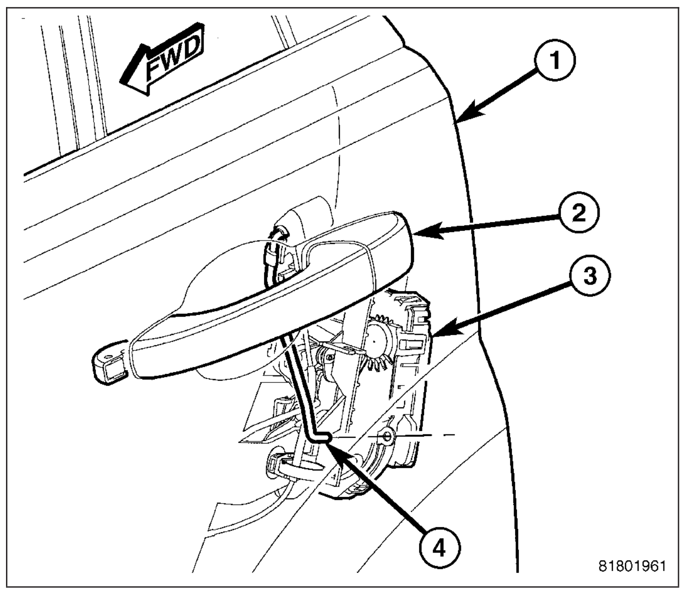
REAR DOOR LATCH

REMOVAL

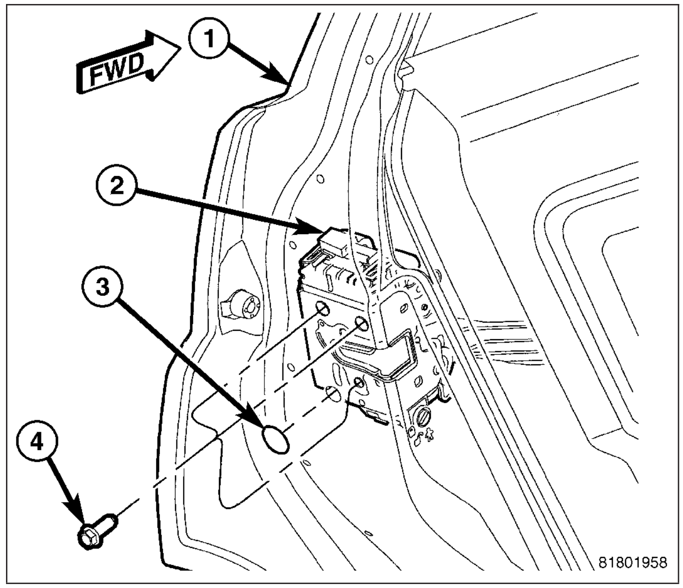
1. Remove window crank handle (4) and washer if equipped.
2. Remove rear door trim bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
3. Remove door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - REMOVAL)
4. Remove rear door module.
5. If equipped, remove wire connector.



6. Remove latch rod (4) from latch (3).

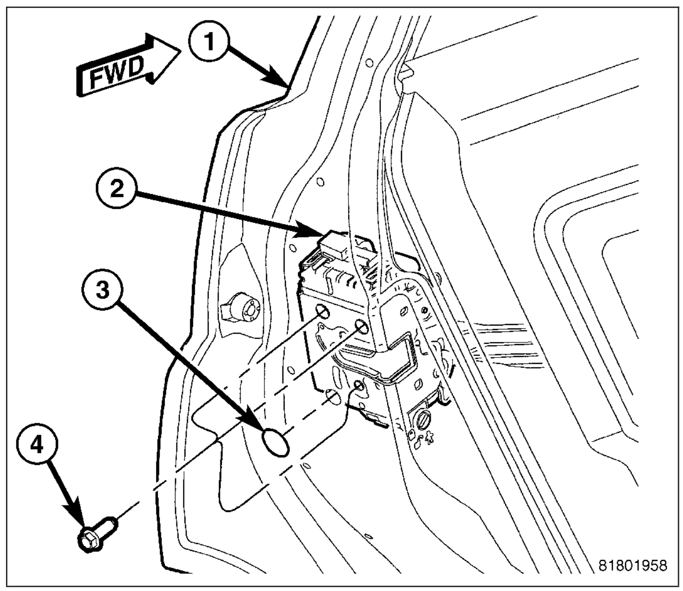


7. Remove fasteners (4) from latch (2).
8. Remove latch from door.

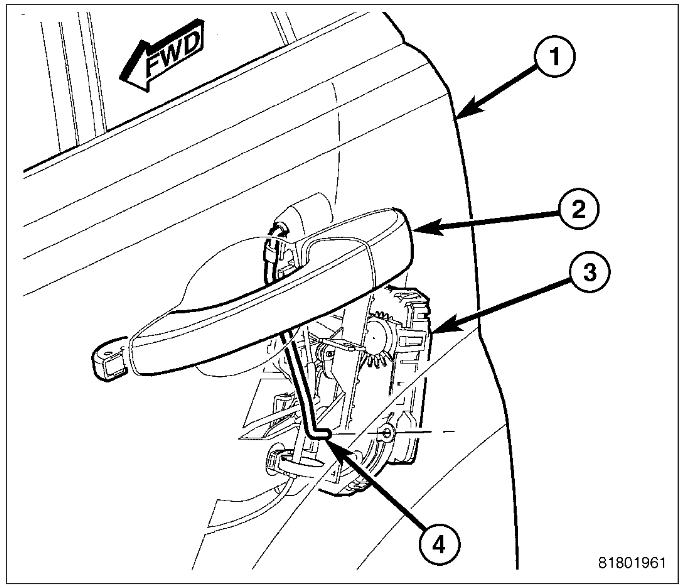


INSTALLATION

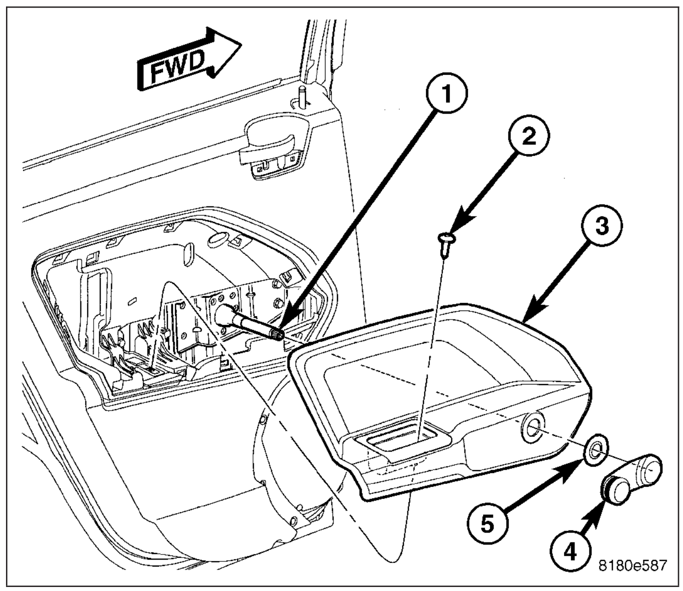
1. Install latch into door (1) and align latch (2) with fastener openings.
2. Install fasteners (4) into latch (2). Tighten to 9 N·m (7ft.lbs.)



3. Connect rod (4) to latch (3).
4. If equipped, connect wire connector to latch.
5. Install door module.
6. Install bolster. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - REMOVAL)
7. Install door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - REMOVAL)



8. If equipped, install window crank (4) and washer.



ADJUSTMENTS

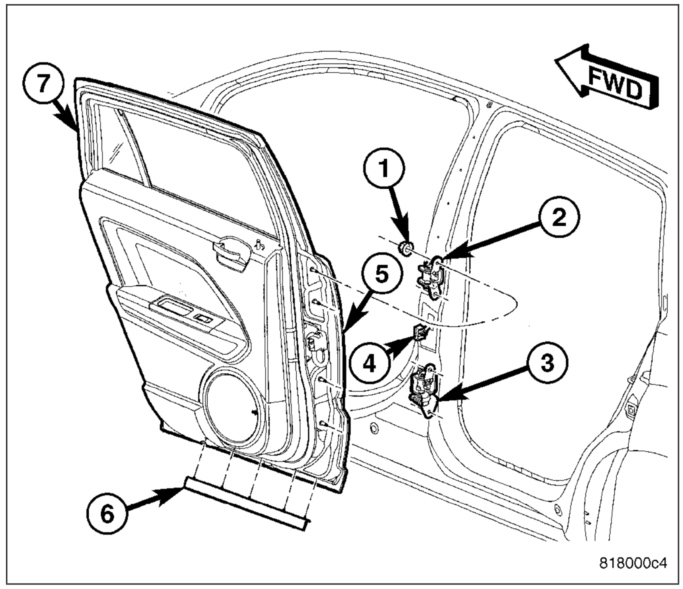
REAR DOOR LATCH ADJUSTMENT

1. Insert a Torx® wrench through the elongated hole in the door end frame near the latch striker opening.
2. Loosen screw on the side of the latch linkage.
3. Push button on outside door handle and release it.
4. Tighten screw on latch.
5. Verify latch operation.

REAR DOOR

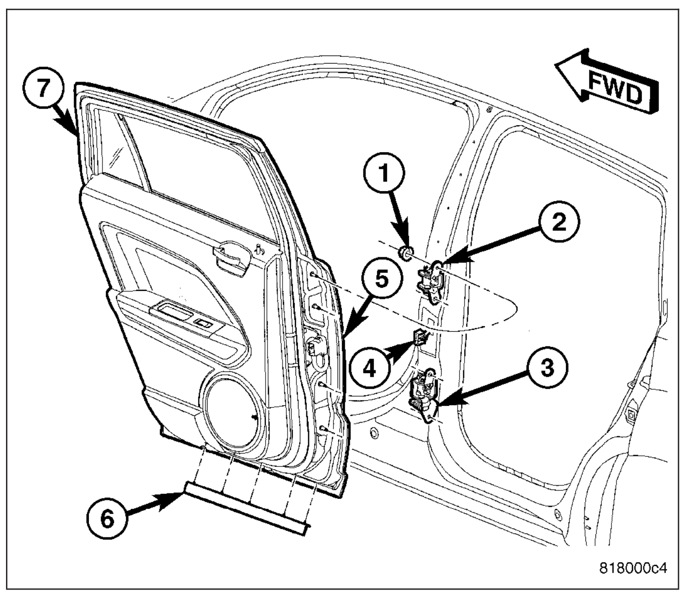
REMOVAL

1. With the help of an assistant, carefully remove nuts (1) from door studs.
2. Remove door (7) from vehicle.
3. Disconnect door harness (4).



INSTALLATION

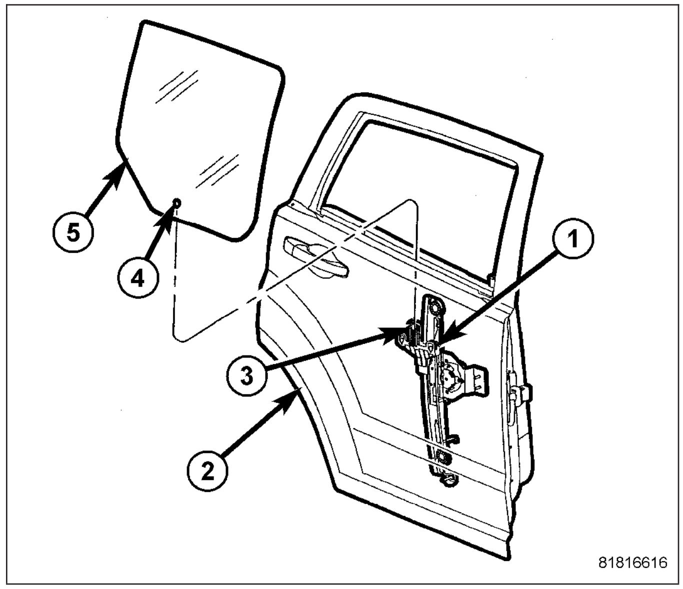
1. Connect wire harness (4) to door (7).
2. With the help of an assistant, insert door studs through hinges.
3. Tighten nuts (1) to 26 N·m (19 ft. lbs).



REAR DOOR GLASS

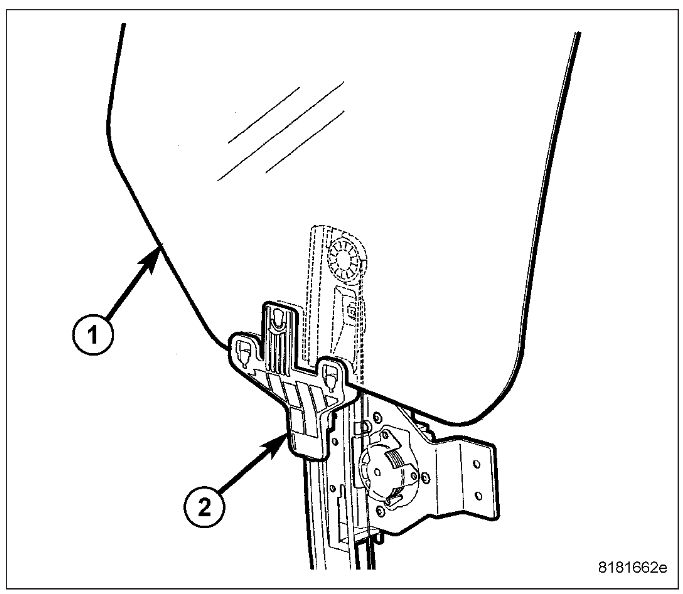
REMOVAL

1. Remove speaker and grille. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)
2. Remove bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
3. Remove door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)
4. Raise window (5) gaining access to window tabs.
5. With a punch or equivalent, press regulator tabs holding window in regulator (3).
6. Carefully, remove window (5).



INSTALLATION

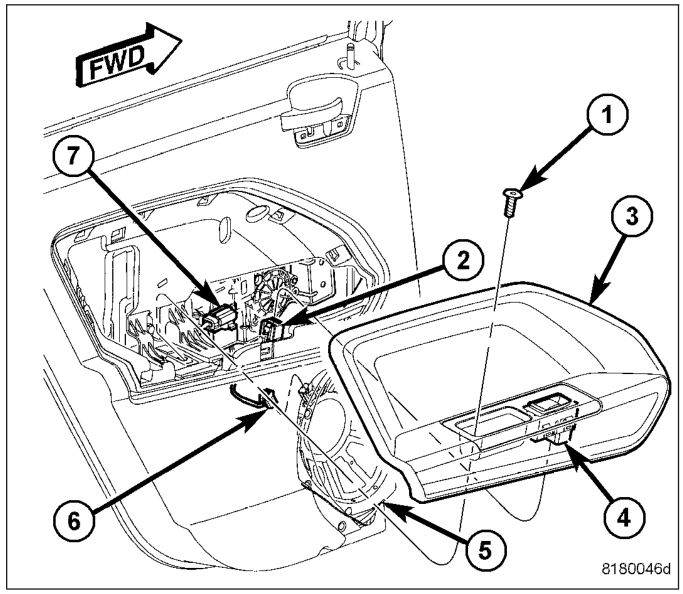
1. Install window regulator to door panel. (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - INSTALLATION)
2. Install glass (1) down through window channel into window regulator (2) ensuring glass properly seats in access holes.
3. Connect wire connectors.
4. Install door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)
5. Install bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)
6. Install speaker and grille. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)



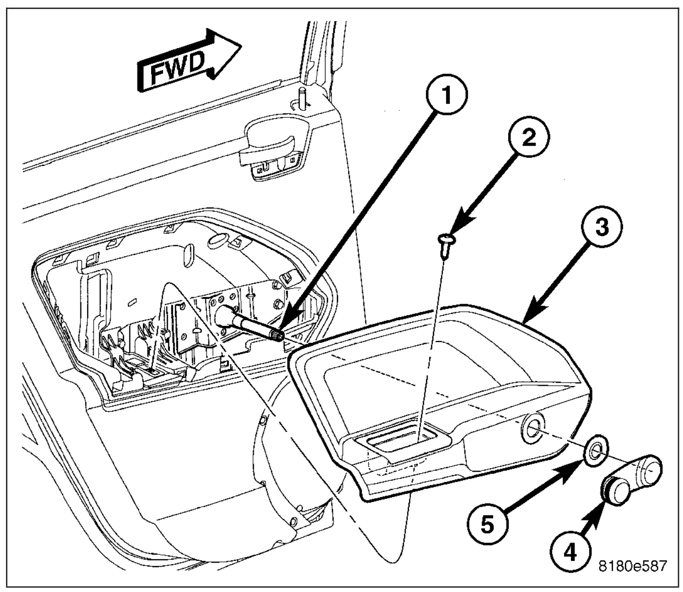
REAR DOOR TRIM BOLSTER

REMOVAL

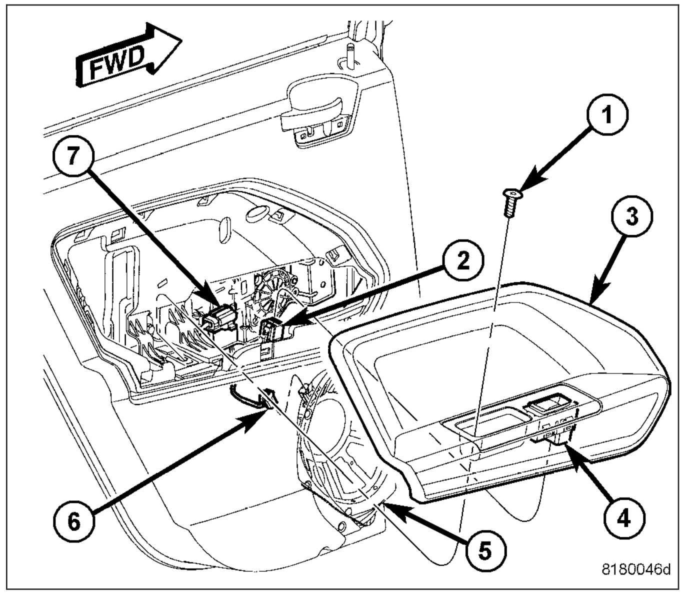
1. Remove screw (1) from pull cup.



2. If equipped, remove window crank (4) and washer (5) from bolster (3).
3. Using trim stick C-4755, unsnap bolster from door panel.
4. If equipped, disconnect wire connector from window switch.



INSTALLATION

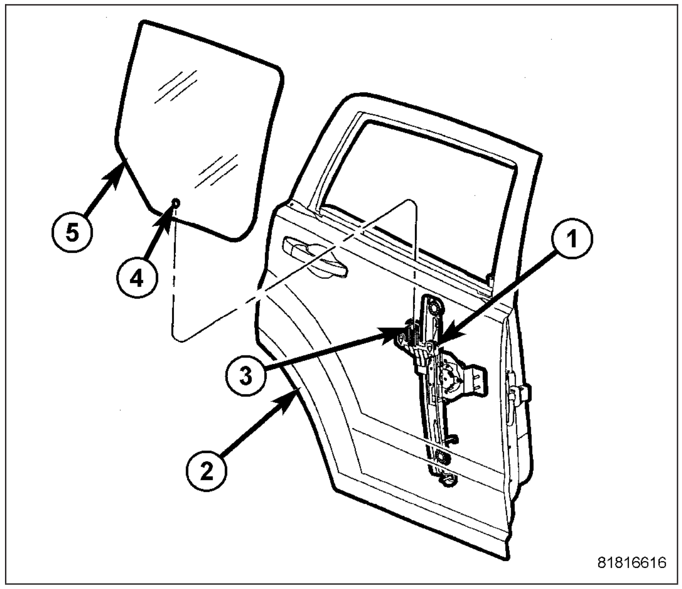


1. Connect wire harness (7) to window switch connector (4).
2. Align bolster (3) with door and hand tap bolster to door ensuring fit.
3. Insert screw (1) into pull cup and tighten.

REAR DOOR WINDOW REGULATOR

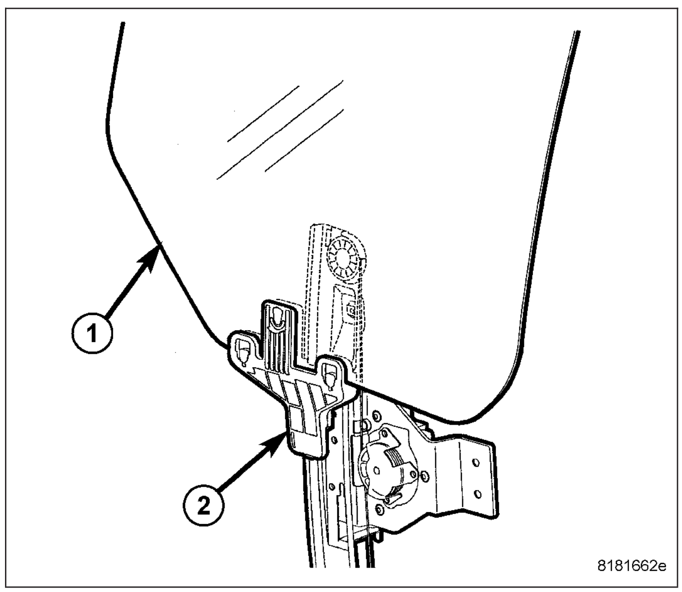
REMOVAL

1. Remove door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)
2. Remove door glass (5). (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - INSTALLATION)
3. Remove fasteners, wire connectors and remove window regulator (1) from door panel.



INSTALLATION

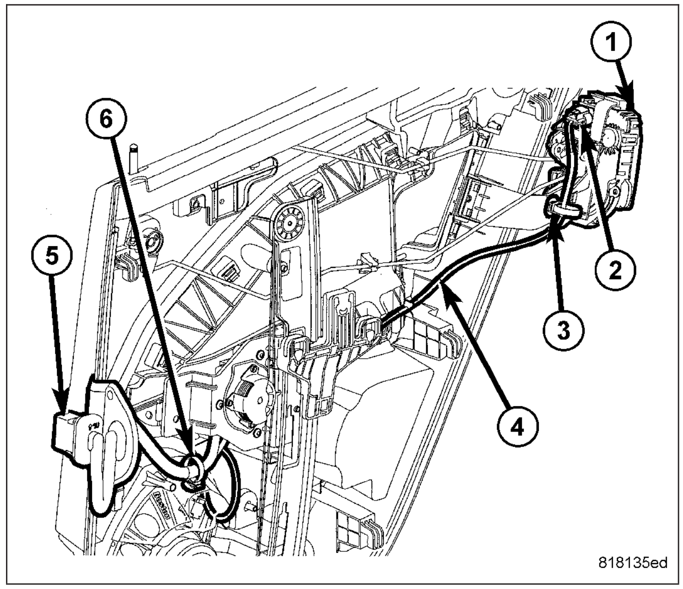
1. Fasten window regulator to door panel.
2. Connect wire connectors.
3. Install glass ensuring proper seat. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - INSTALLATION)
4. Install door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)



DOOR-MODULE

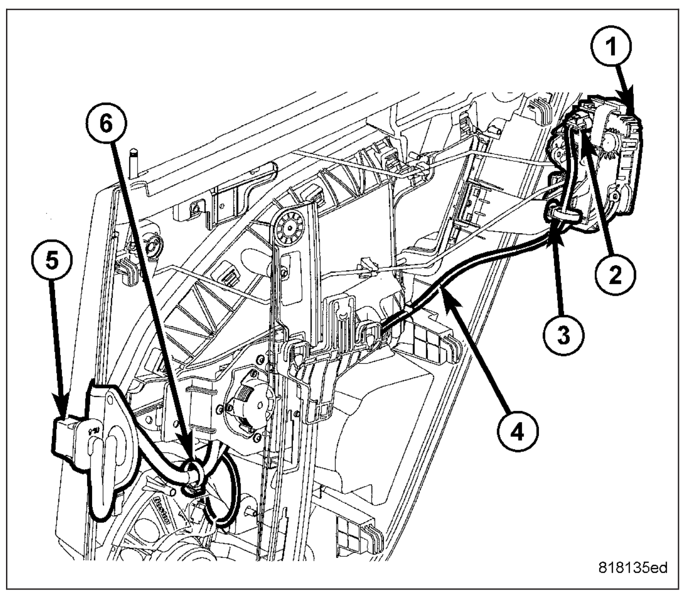
REMOVAL

1. Remove door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - REMOVAL)
2. Remove speaker and grille. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)
3. Remove handle if equipped. (Refer to 23 - BODY/DOORS - REAR/EXTERIOR HANDLE - REMOVAL)
4. Remove trim bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
5. Remove glass. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - REMOVAL)
6. Remove module fasteners.
7. Disconnect wire connector (5).



INSTALLATION

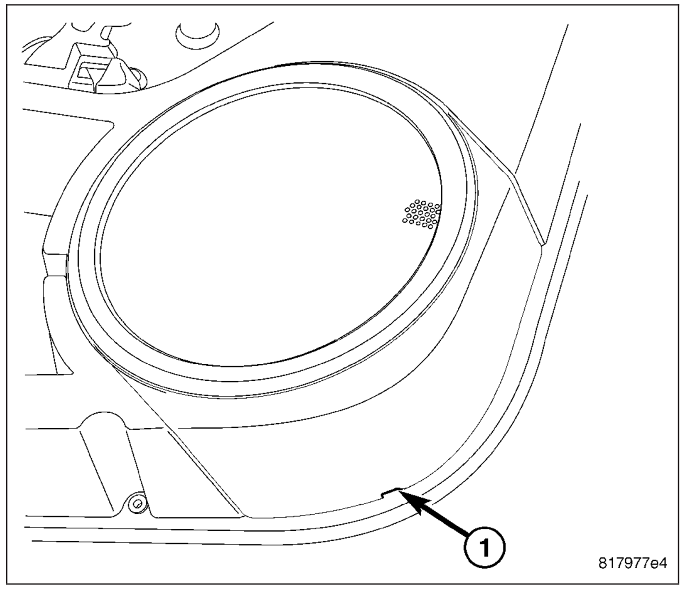
1. Install glass. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - INSTALLATION)
2. Place panel up to door, and plug in electrical connectors (5).
3. Connect wire connector to latch (3).
4. Install module to door and tighten fasteners.
5. If equipped, install window handle crank.
6. Install trim bolster. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)
7. Install door plugs. (Refer to 23 - BODY/DOORS - REAR/APPLIQUE - INSTALLATION)
8. Install door speaker and grille. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)



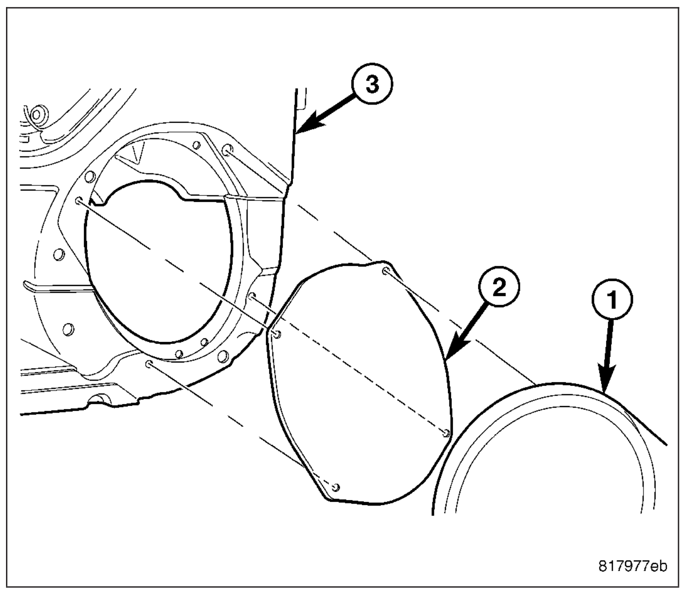
SPEAKER AND GRILLE

REMOVAL

1. Using trim stick C–4755, find service notch (1) located at the bottom of speaker grille and pry up speaker grille.

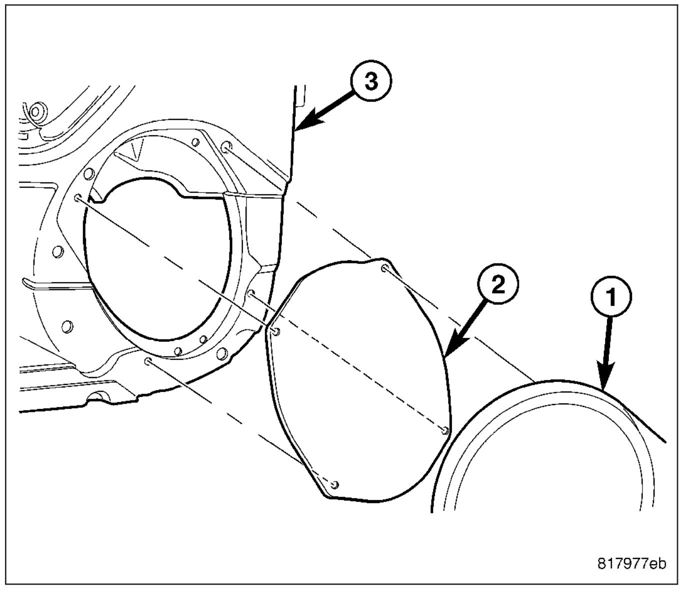


2. Remove two screws attaching speaker to door panel (3).
3. Remove two screws attaching speaker (2) to door module (1).
4. Disconnect wire connector.



INSTALLATION

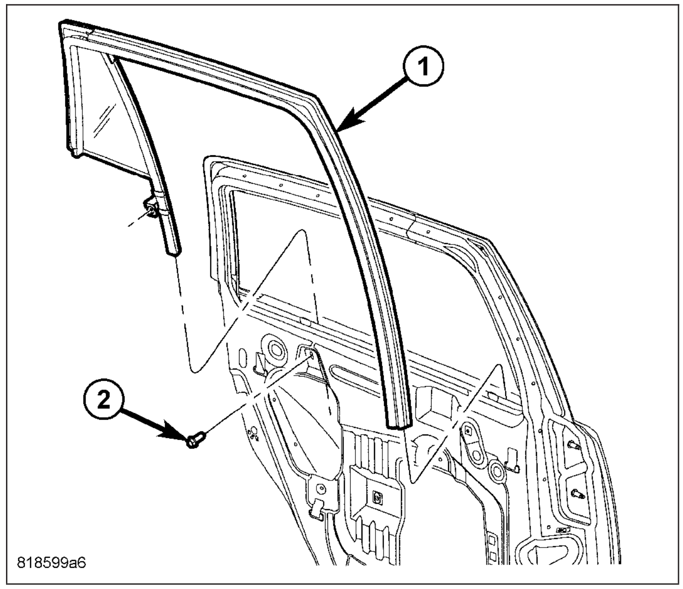
1. Place speaker (2) up to door module (3).
2. Connect wire connector.
3. Install screws fastening speaker to door module.
4. Place speaker grille (1) up to door module and install fasteners.



GLASS RUN CHANNEL

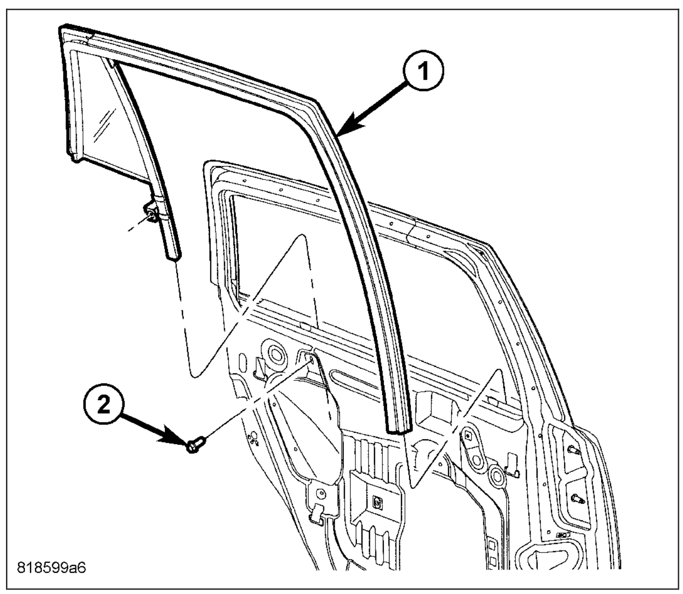
REMOVAL

1. Remove door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)
2. Remove glass run fastener (2).
3. Remove glass run from door.



INSTALLATION

1. Lower glass run into glass run door channel.
2. Install fastener (2).
3. Install door module. (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)



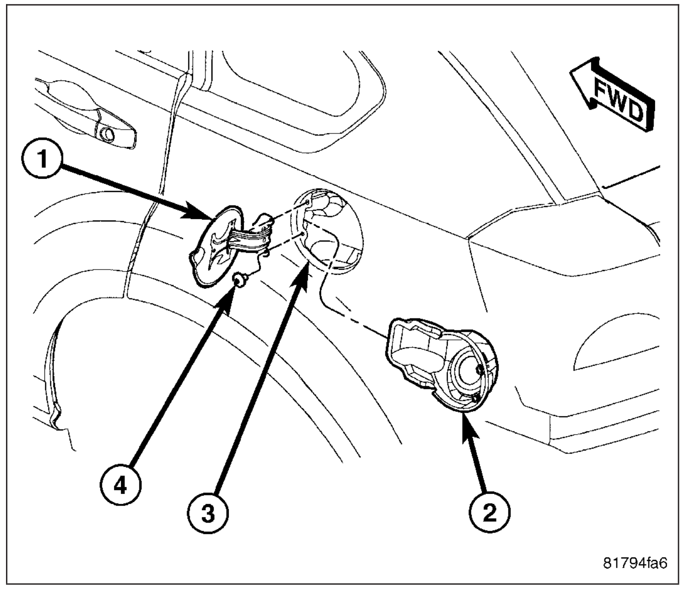
EXTERIOR

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DOOR-FUEL FILL

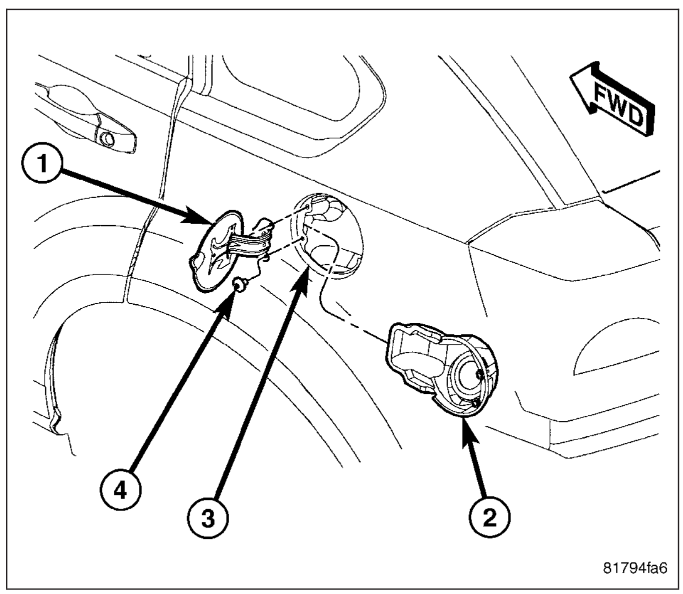
REMOVAL

1. Remove fuel filler door fasteners (4).
2. Remove fuel filler door.
3. Remove fuel filler housing screws.
4. Remove fuel filler housing.



INSTALLATION

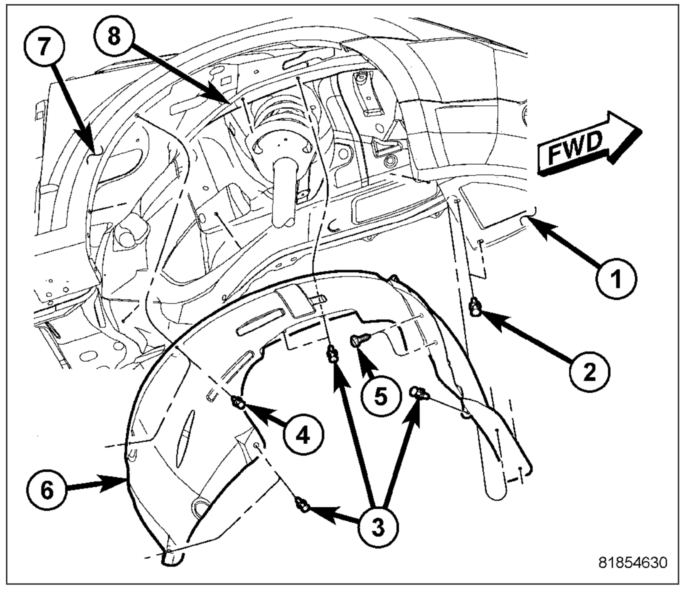
1. Install fuel filler housing (2).
2. Install fuel housing screws.
3. Align fuel door (1) with fuel door holes.
4. Fasten fuel door (1) to fender (3) with fasteners.



SPLASH SHIELD-FRONT WHEELHOUSE

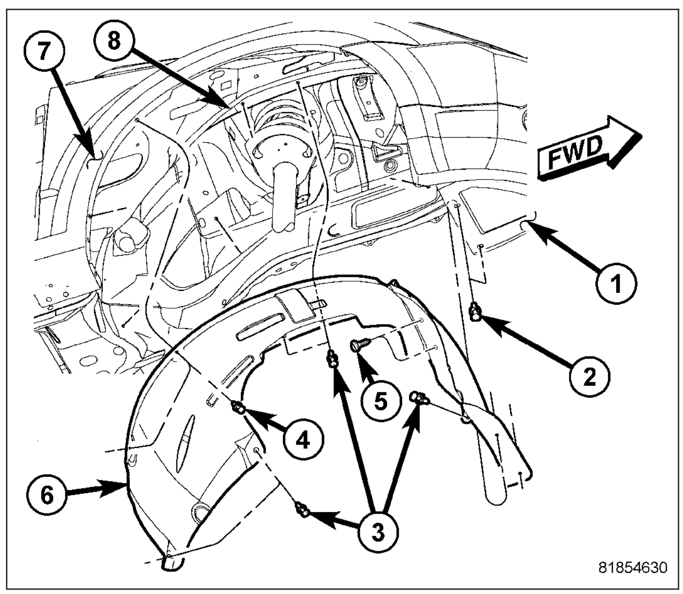
REMOVAL

1. Raise and support the vehicle.
2. Remove the front wheels. (Refer to 22 - TIRES/ WHEELS - REMOVAL).
3. Remove push pins (2) and (3).
4. Remove screws (4) and (5)
5. Remove splash shield (6) from wheelhouse.



INSTALLATION

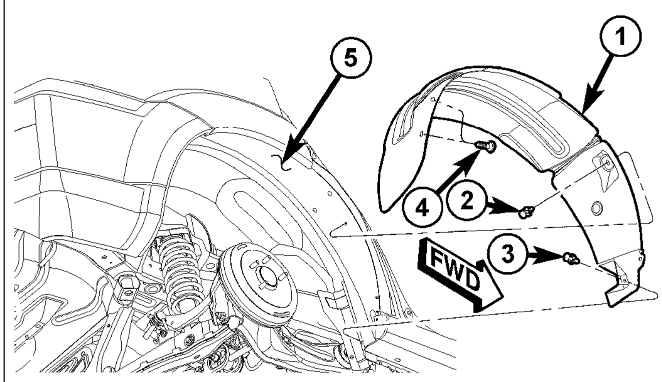
1. Raise and support vehicle.
2. Remove rear wheels. (Refer to 22 - TIRES/ WHEELS - REMOVAL)
3. Raise splash shield (5) up to wheel house and align with holes in quarter panel (6).
4. Install push pins (2)and (3).
5. Install screws (6) and (4).



SPLASH SHIELD-REAR WHEELHOUSE

REMOVAL

1. Raise and support the vehicle.
2. Remove the left and right front wheel. (Refer to 22 - TIRES/WHEELS - REMOVAL)
3. Remove push pins (2) and (3)..
4. Remove fasteners (4).

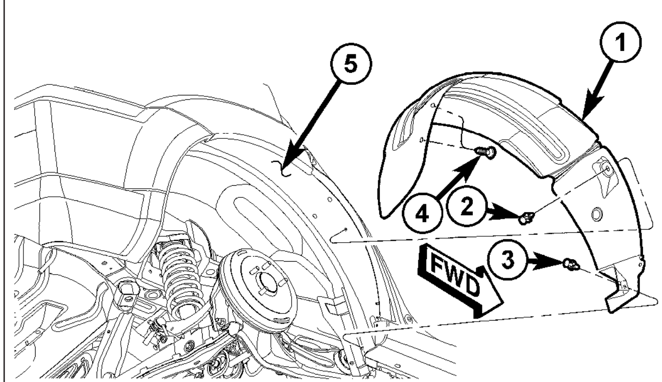


818546d3

INSTALLATION

NOTE: Left hand side has 2 additional push pins as it has additional material to cover the fuel filler tube.

1. Raise and support vehicle.
2. Remove the front wheels. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
3. Place splash shield (1) up to wheel house (4) and align splash shield holes with fender.
4. Install push pins (2) and (3).
5. Remove fasteners (4).

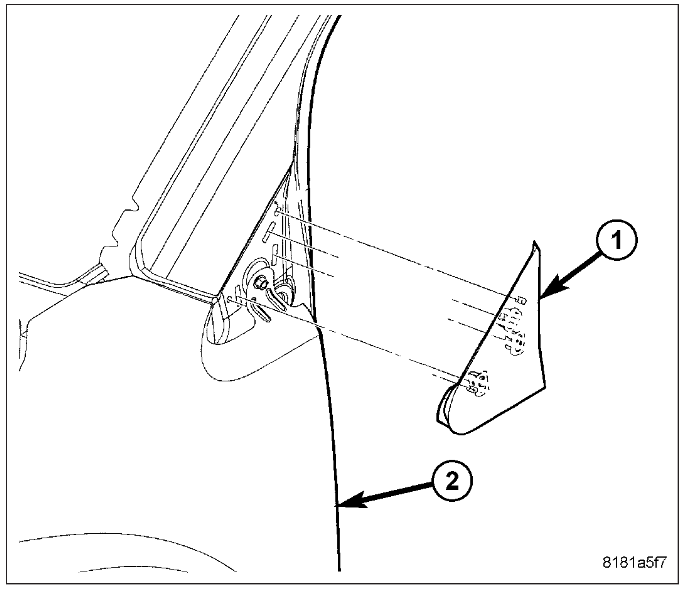


818546d3

SIDE VIEW MIRROR

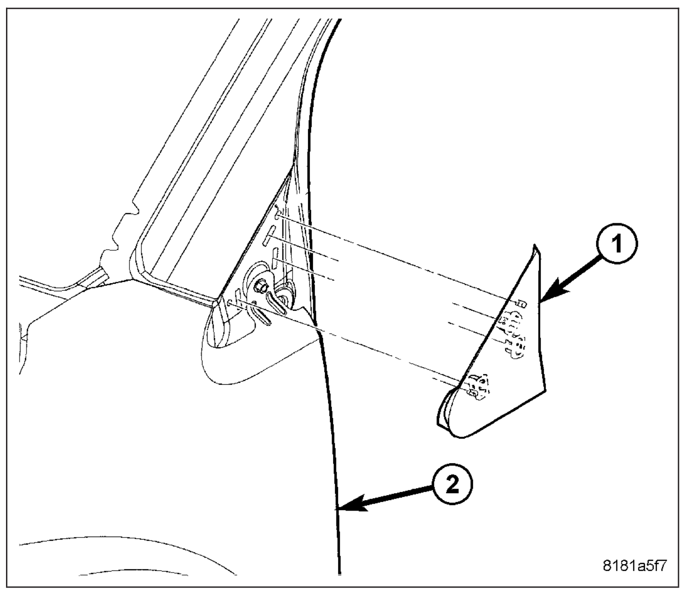
REMOVAL

1. Using trim stick C-4755, pry up mirror flag (1) and remove from door (2).



INSTALLATION

1. Place mirror flag over location ensuring tabs are aligned with tab locations.
2. Hand tap mirror flag (1) into place.



HOOD

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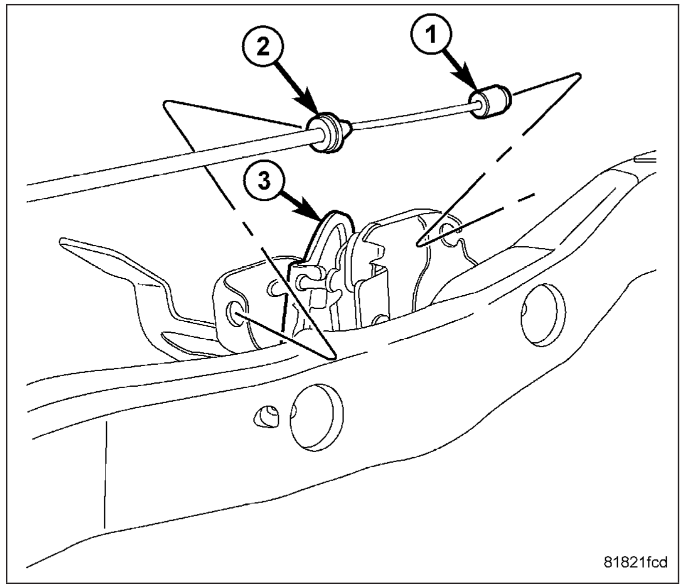
CABLE-LATCH RELEASE

REMOVAL

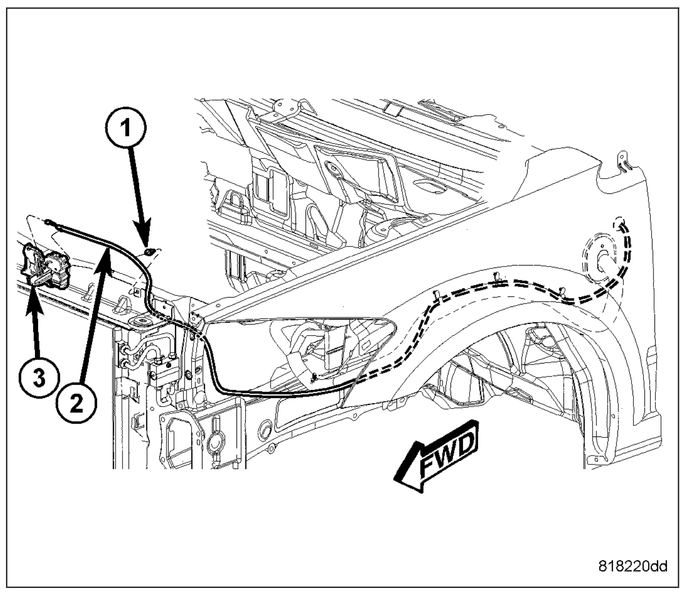
1. Remove the wheel mounting nuts, then the front drivers side tire.
2. Remove front drivers side splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL)

NOTE: See cable route.

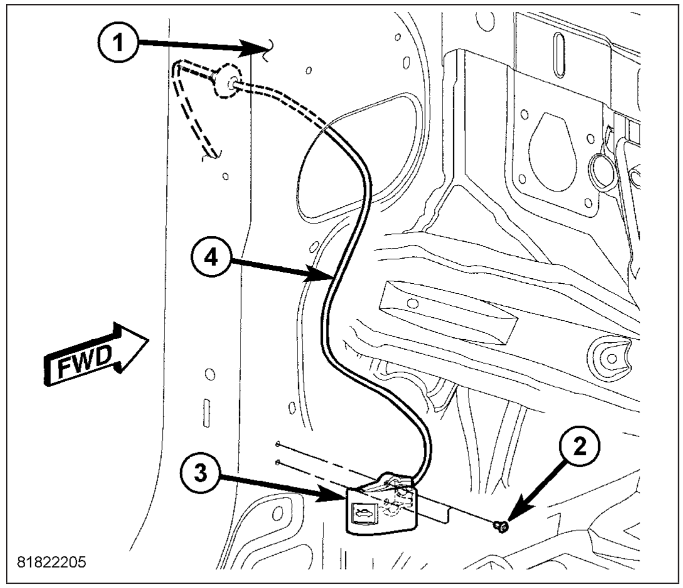
3. Press down latch release (3) and remove cable (2) from grommet (1).



4. Remove cable (2) from latch (3).
5. Follow cable and remove cable from push pin grommets.

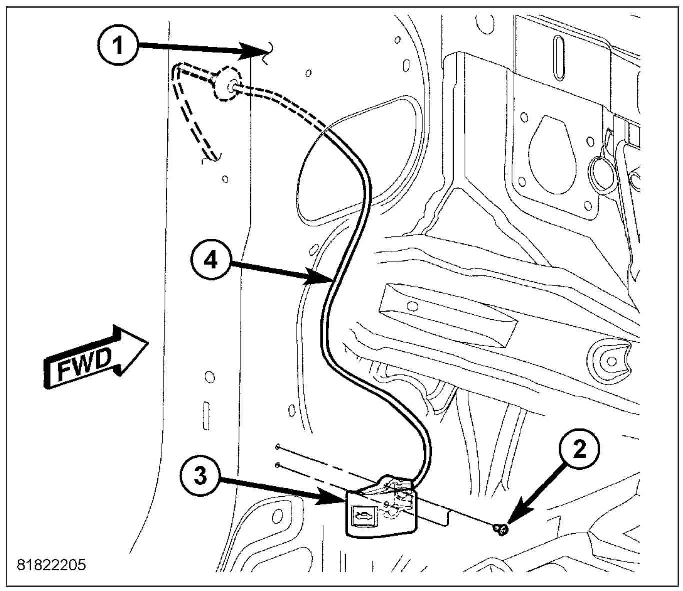


6. Remove fasteners (2) from hood release located inside vehicle.
7. Remove cable from hood release (3).

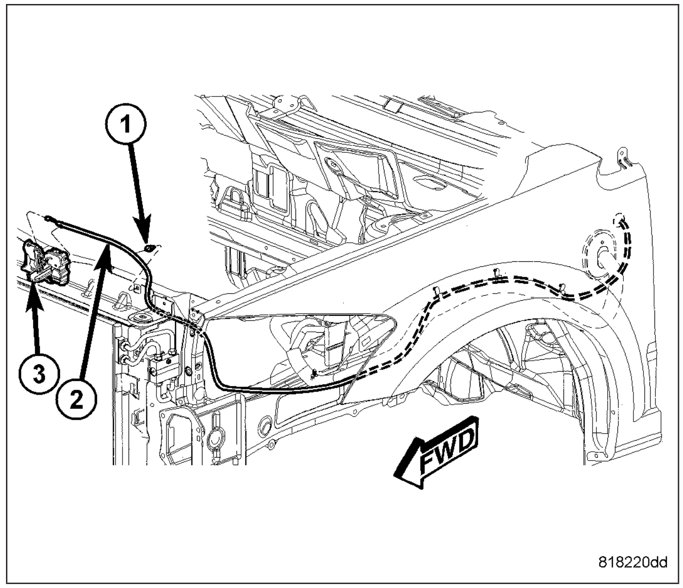


INSTALLATION

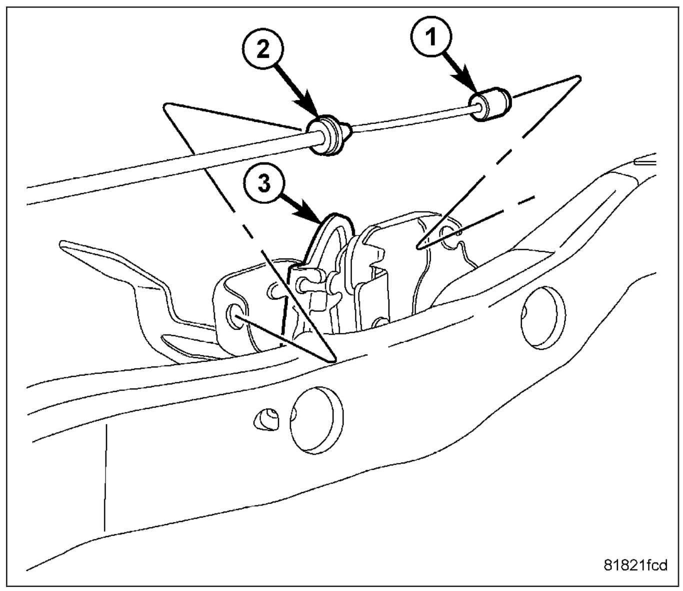
1. Install fasteners (2).
2. Install cable into hood release lever (3), and route cable (4) through grommet.
3. Remove splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL)



4. Route cable along underneath splash shield and route toward radiator support.



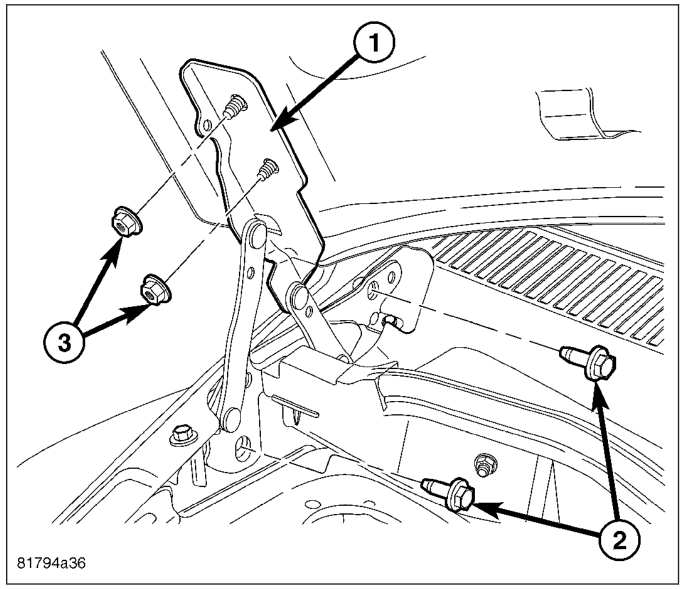
5. Insert cable (2) into latch (3) and route front of cable (1) into access hole.



HINGE

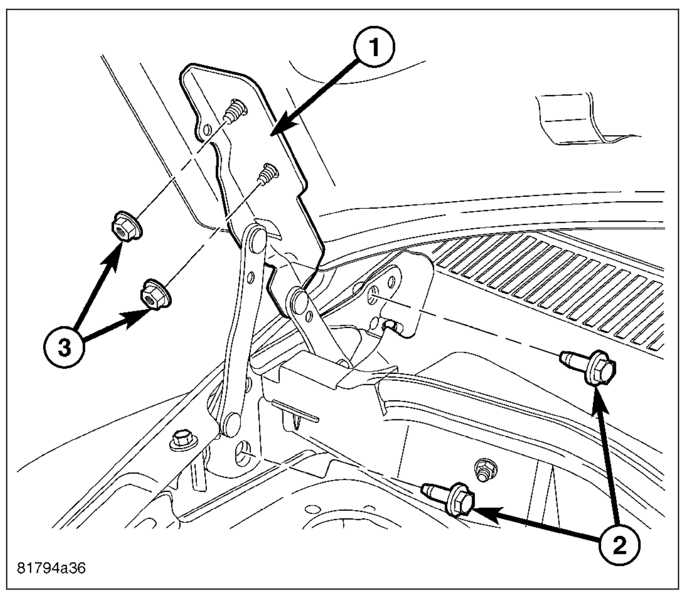
REMOVAL

1. With the help of an assistant, have the assistant hold the opposite side of hood that is being worked on.
2. Remove fasteners (2) from hinge (1).
3. Remove hood from hinge (1). (Refer to 23 - BODY/HOOD/HOOD - REMOVAL)
4. Repeat step if necessary.



INSTALLATION

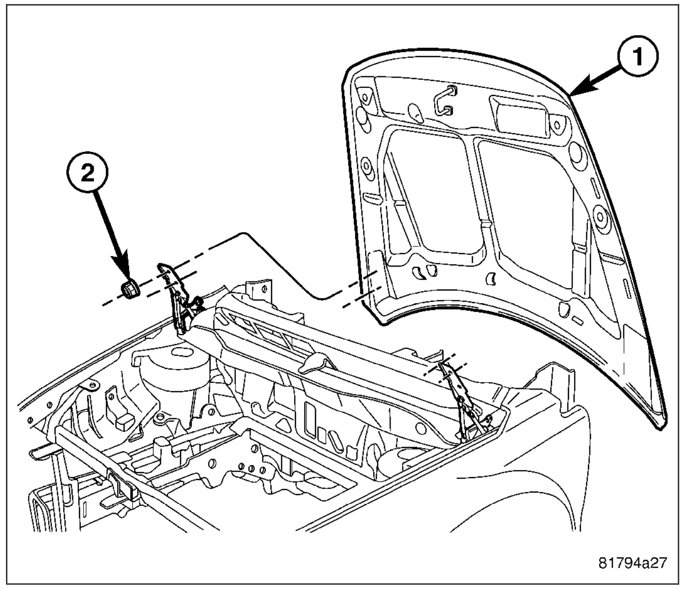
1. Align hood hinge with fastener holes.
2. Install fasteners (2) in to hinge holes.
3. Tighten nuts (3) to 20 N·m (15 ft.lbs.).
4. Install hood to hinge. (Refer to 23 - BODY/HOOD/HOOD - INSTALLATION)



HOOD

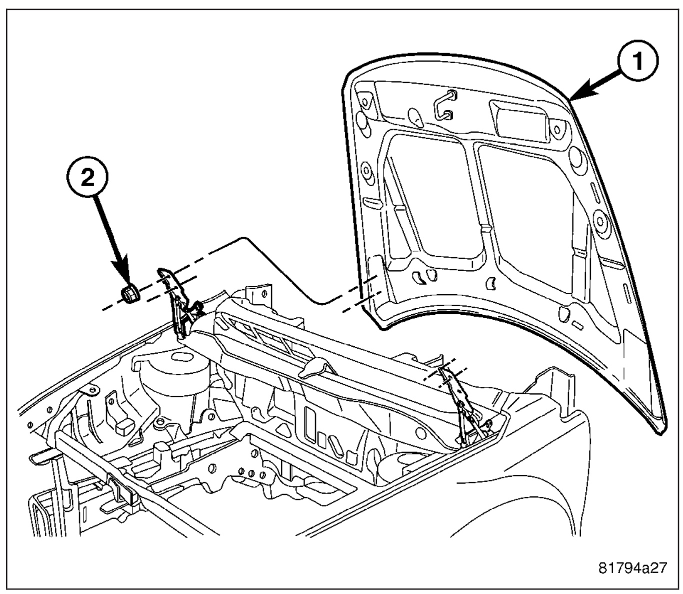
REMOVAL

1. Disconnect wire connector if equipped.
2. Mark nut locations with a grease pencil or scribe to provide reference marks for installation.
3. With the help of an assistant, have the assistant hold the opposite side of the hood while removing nuts (2) from hinge.
4. Move to opposite side of hood (1) and repeat step.
5. Remove hood.



INSTALLATION

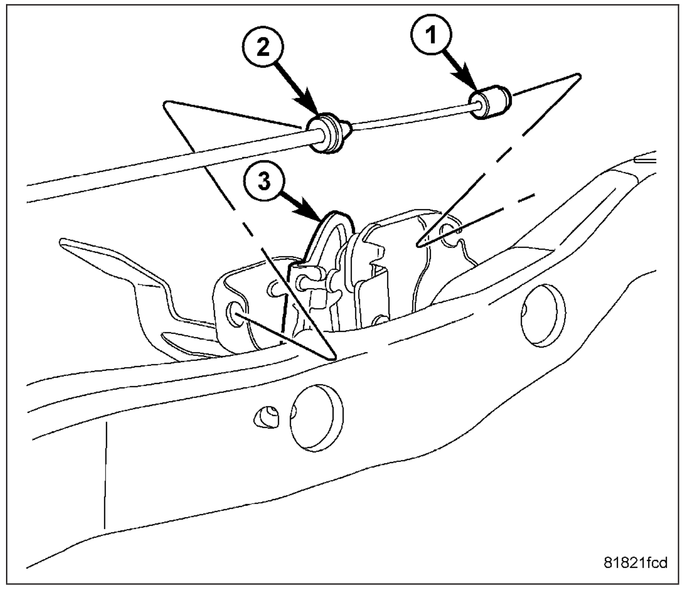
1. With the help of an assistant, align hood with hinge holes.
2. Align nuts with scribed marks and install nuts on studs.
3. Tighten nuts to 20 N·m (15 ft. lbs.).
4. Connect wire connector if necessary.



LATCH

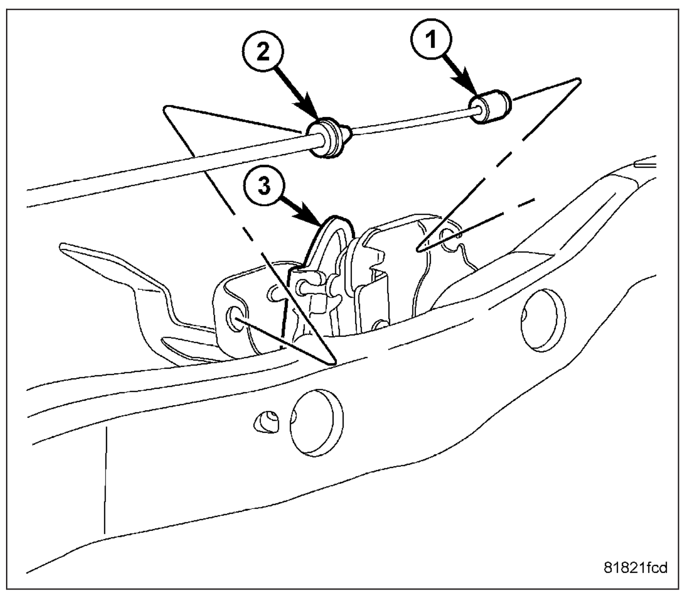
REMOVAL

1. Press down latch release (3) and remove cable (2) from grommet.
2. Remove cable from latch (3).
3. Remove fasteners.



INSTALLATION

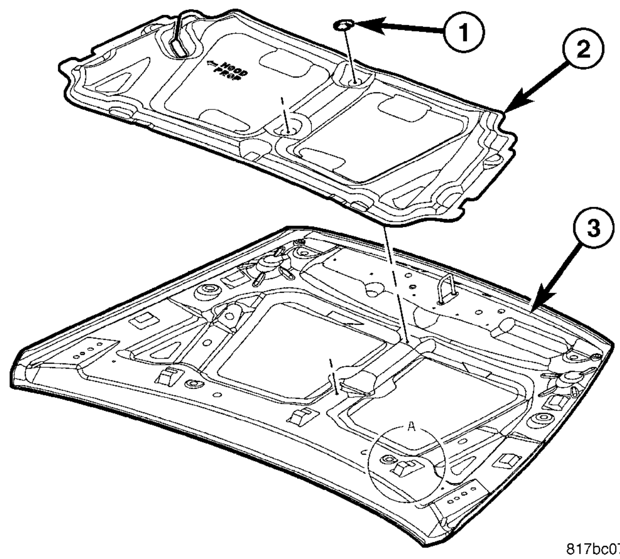
1. Install cable (2) into latch (3) and route end of cable (1). Pull cable into latch (3) ensuring proper seat.



INSULATION - HOOD

REMOVAL

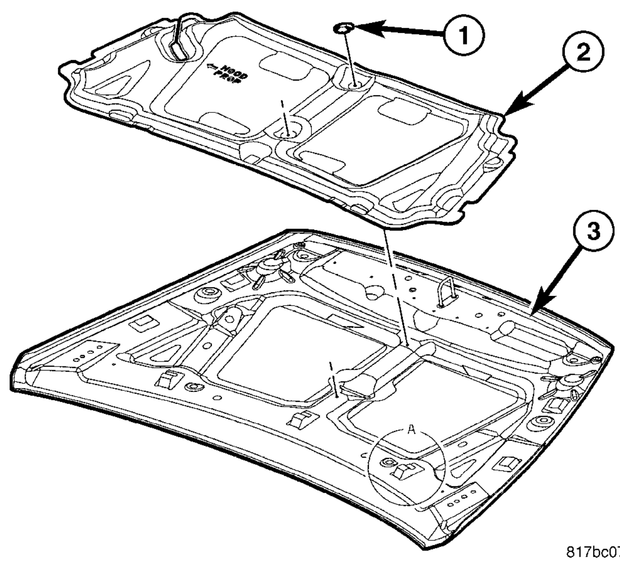
1. Remove two push pins (1) fastening hood insulation (2) to hood (3).
2. Remove insulation from hood by pulling insulation outward from hood tabs.



817bc072

INSTALLATION

1. Insert hood insulation (2) into hood tabs.
2. Insert push two pins (1).



817bc072

INSTRUMENT PANEL

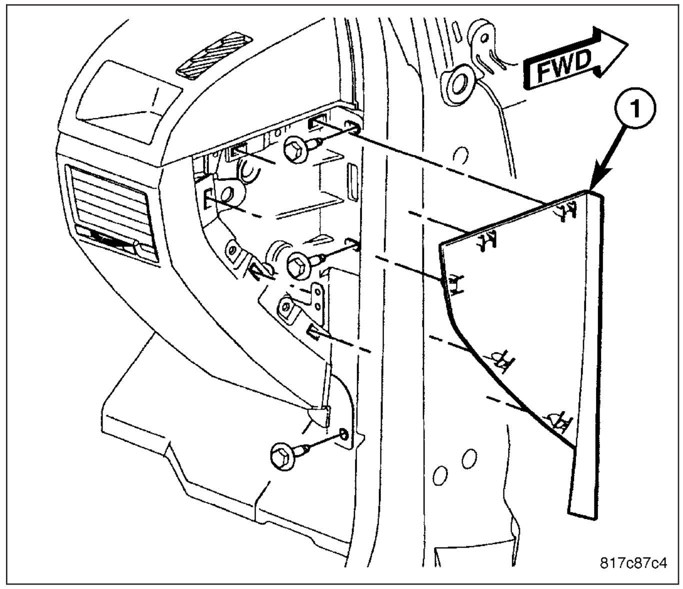
TABLE OF CONTENTS

END CAP-INSTRUMENT PANEL

REMOVAL

NOTE: Right hand shown. Left hand similar.

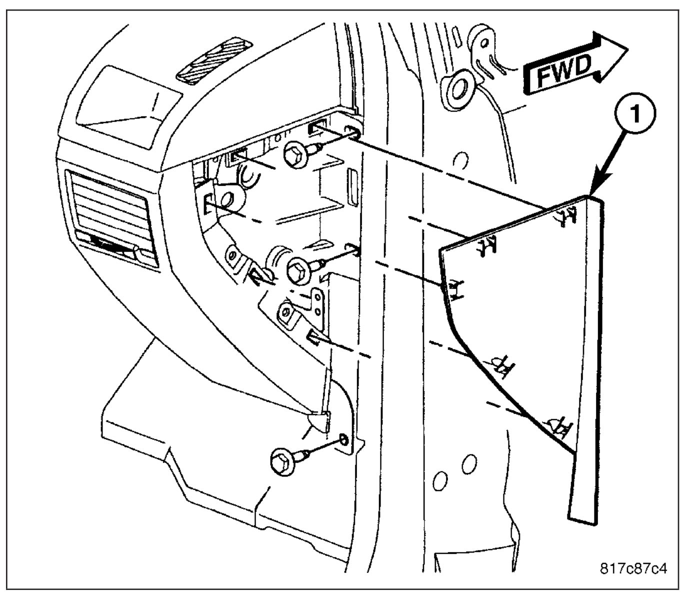
1. Using trim stick C-4755, pry up end cap (1) and remove.



INSTALLATION

NOTE: Right hand shown. Left hand similar.

1. Place end cap clips over instrument panel inner.
2. Tap on end cap clip locations ensuring proper seat.



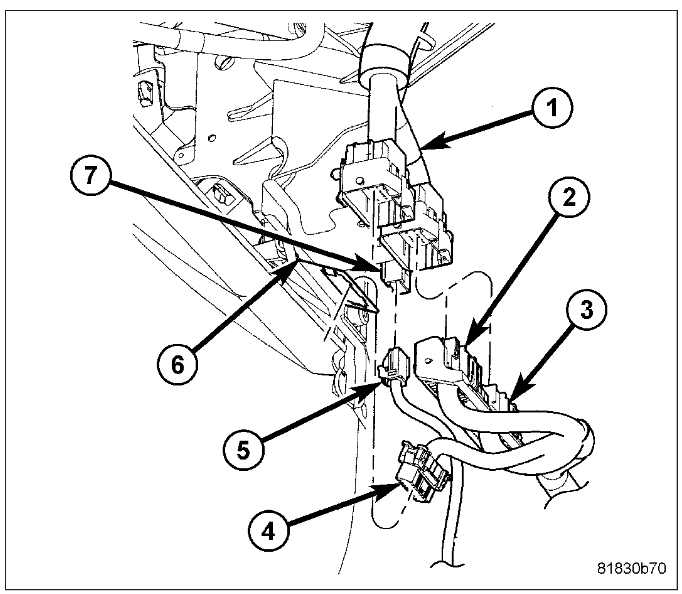
ASSEMBLY-INSTRUMENT PANEL MODULE

REMOVAL

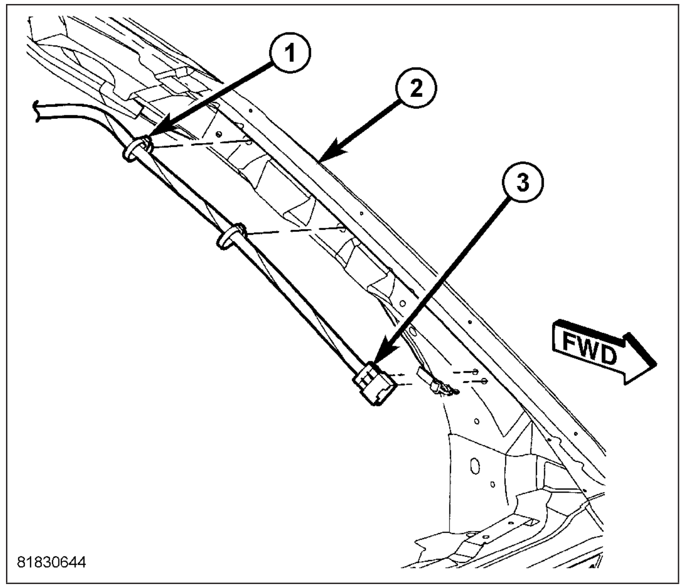
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: Left hand drive shown. Right hand drive similar.

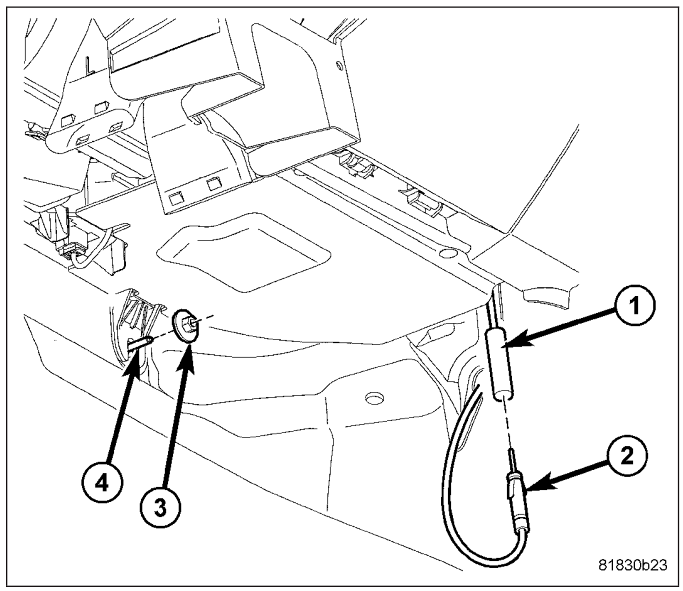
1. Disconnect and isolate the negative battery cable.
2. Remove left and right end caps. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL)
3. If equipped, remove both left and right knee air bag covers.
4. Remove the steering shrouds. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN SUPPORT BKT - REMOVAL)
5. Disconnect steering column wire harness.
6. Remove steering column assembly. (Refer to 19 - STEERING/COLUMN - REMOVAL)
7. Remove automatic or manual shifter bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL)
8. Remove center console shifter housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
9. Remove center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
10. Remove shifter assembly.
11. Remove left and right A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
12. Remove top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
13. Remove left cowl panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL)
14. Disconnect instrument panel wire harness (1) from (2) and (3),(7) and (5) located behind cowl panel.



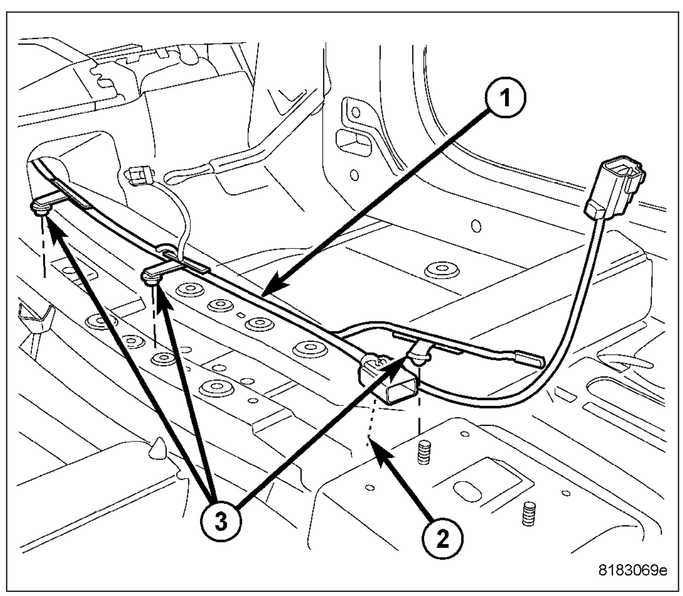
15. Disconnect wire harness (3) clipped (1) along A - pillar (2).
16. Remove glove box. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL)
17. Remove right side cowl trim panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL)



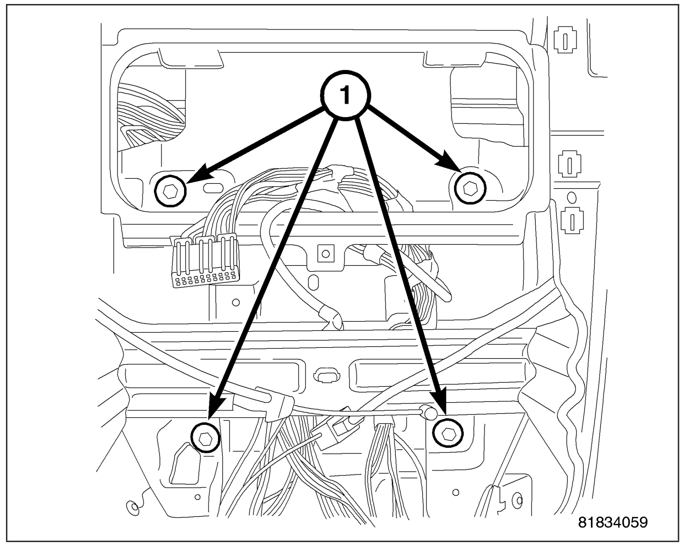
18. Disconnect antenna wire (2) from radio harness (1)
19. Remove left and right front seats. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
20. Remove center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
21. Remove right and left B-pillar trim panels. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL)
22. Remove right and left lower B-pillar trim panels. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)
23. Remove left and right door sill scuff plate. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL)



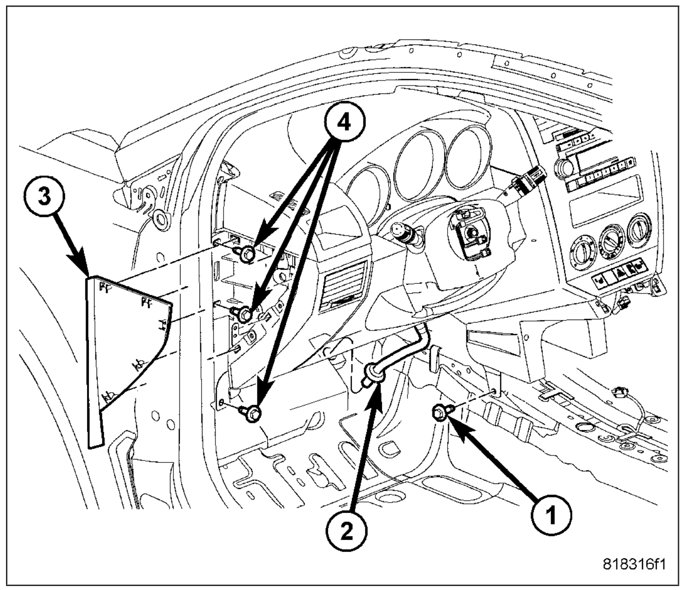
24. Pull back carpet gaining access to center console wire connectors.
25. Disconnect instrument panel center console wire harness (1).
26. Remove left and right floor ducts. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FLOOR DISTRIBUTION DUCTS - REMOVAL)



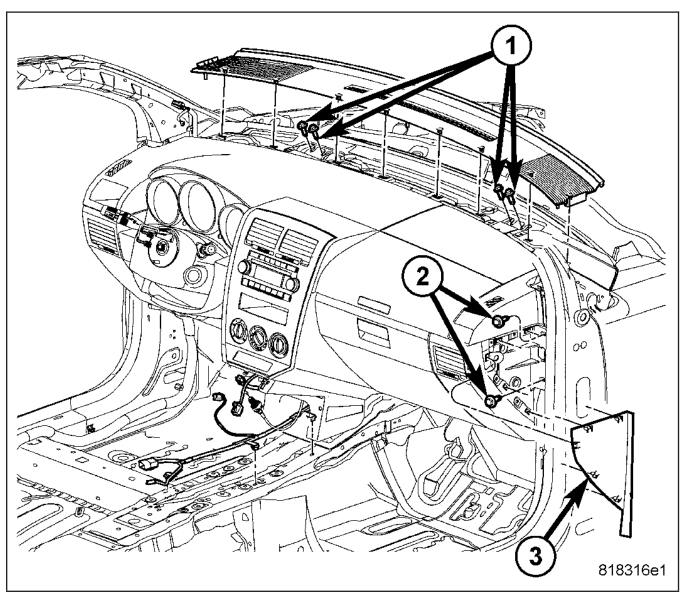
27. Remove four bolts (1) behind center bezel and one behind glove box.



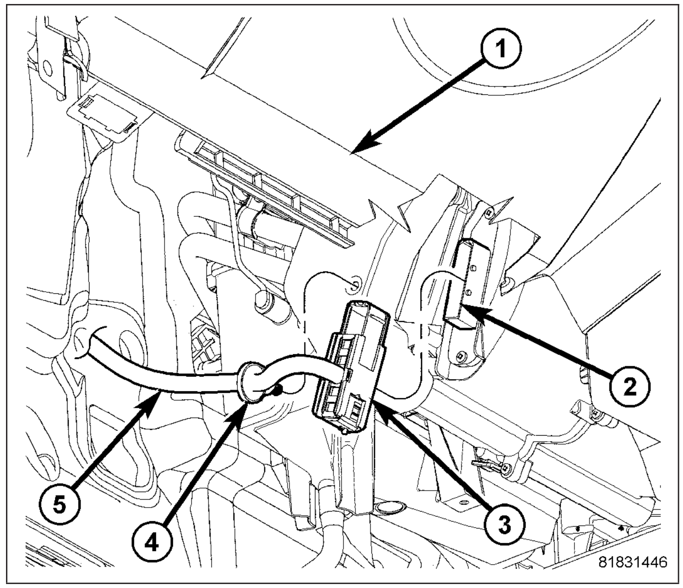
28. Remove bolts fastening Instrument panel to cowl panel. Three bolts (4) located behind left end cap, and one at the bottom of the instrument panel (1).
29. Remove condensation drain tube (2). (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ WATER VALVE - REMOVAL)



30. Remove two bolts (2) behind the left end cap and four screws (1) located under the top cover.



31. Disconnect wire harness from HVAC (2).
32. With the help of assistant, remove instrument panel through driver side door.

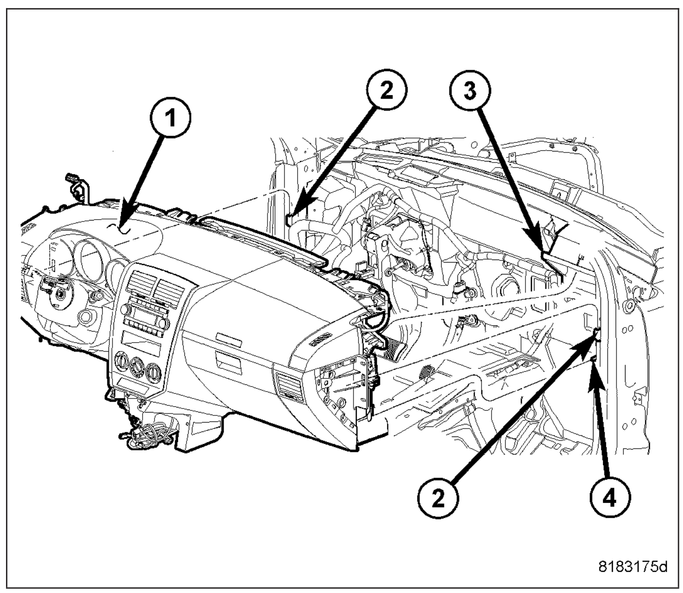


INSTALLATION

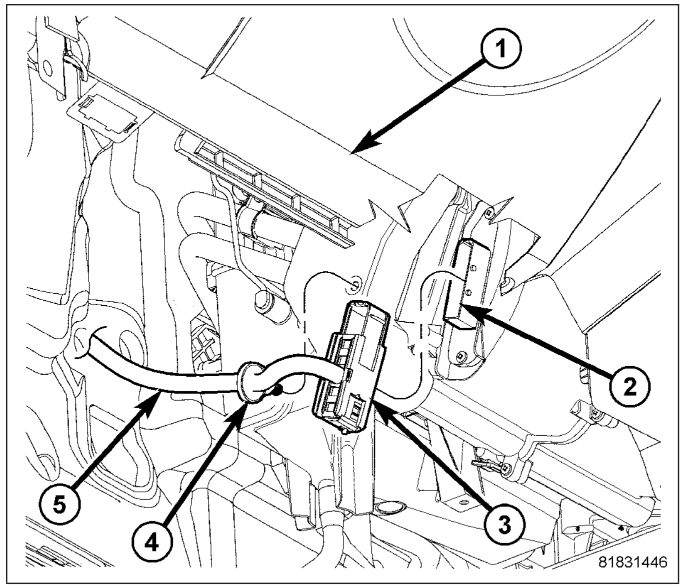
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: Left hand drive shown. Right hand drive similar.

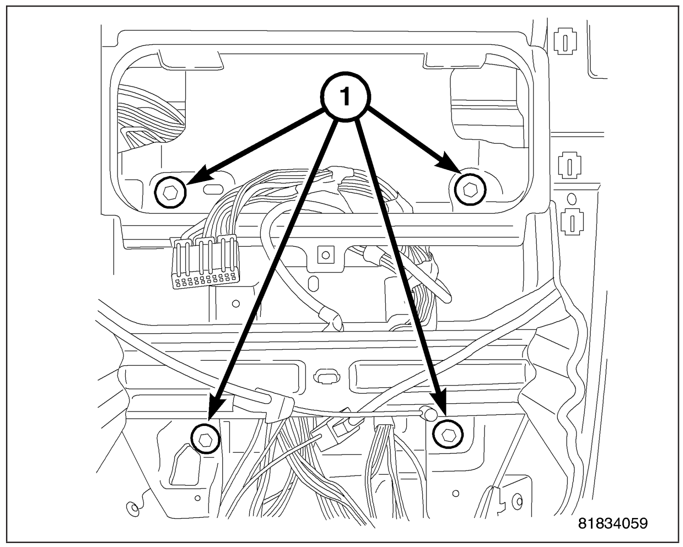
1. With the help of an assistant, load instrument panel into vehicle inserting stud (2) into dash and ensuring instrument panel hangs on reinforcement (2).
2. Install condensation drain tube into floor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ WATER VALVE - REMOVAL)



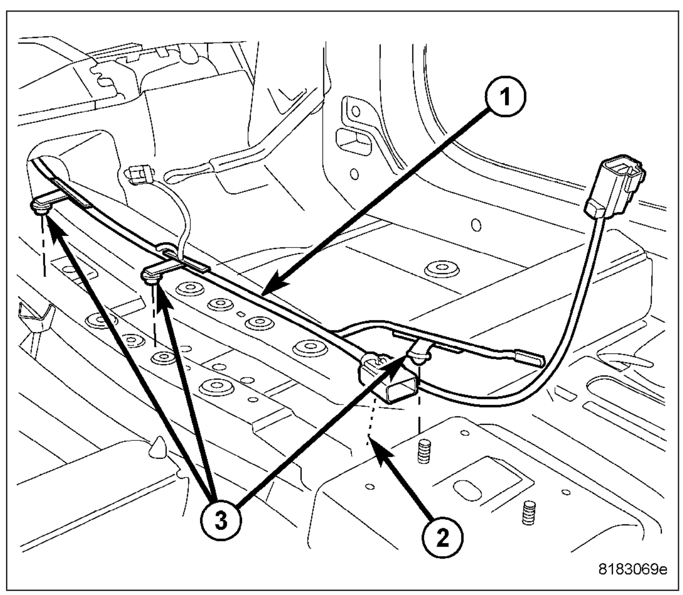
3. Connect HVAC wire harness (2).
4. Install 11 instrument panel to cowl panel fasteners. Tighten to 21 N·m (15 ft. lbs.).



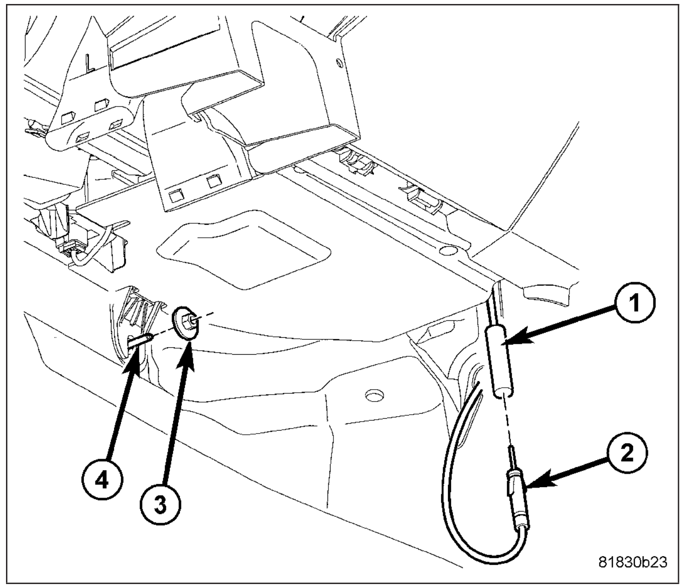
5. Install four fasteners (1) behind center bezel and one behind glove box.
6. Install left and right floor ducts. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/WATER VALVE - REMOVAL)



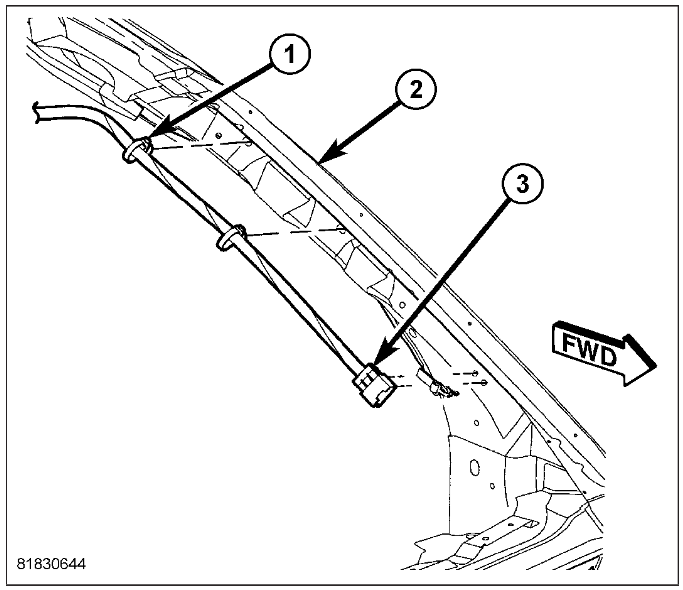
7. Connect instrument panel center console wiring harness.
8. Install left and right door scuff plate. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION)
9. Install lower B - Pillar trim panels. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)
10. Install B - Pillar trim panels. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION)
11. Install Center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
12. Install left and right seats. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)



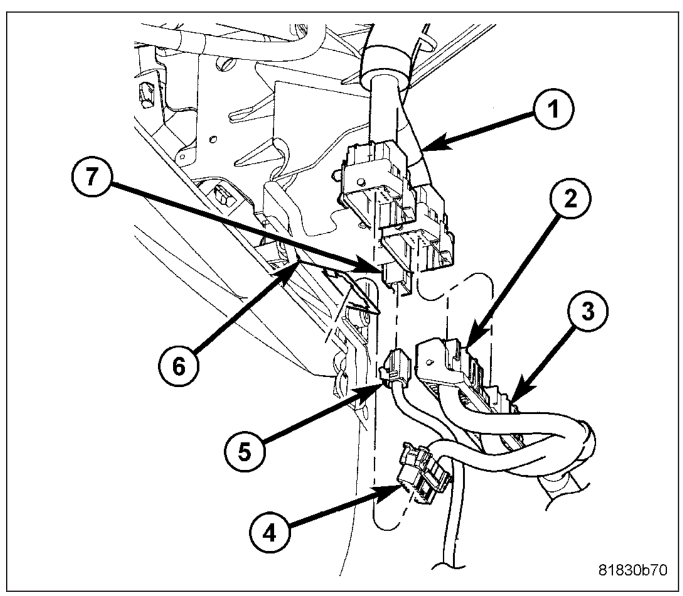
13. Connect radio harness (1) to antenna (2).
14. Install right cowl panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION)
15. Install glove box.



16. Connect A-Pillar (2) wiring harness (3).



17. Connect instrument panel wiring harness (1) to (2) and (3), (7), and (5).
18. Install left cowl panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION)
19. Install Top Panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION)
20. Install left and right A - Pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)
21. Install shifter assembly.
22. Install center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
23. Install center console shifter housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)

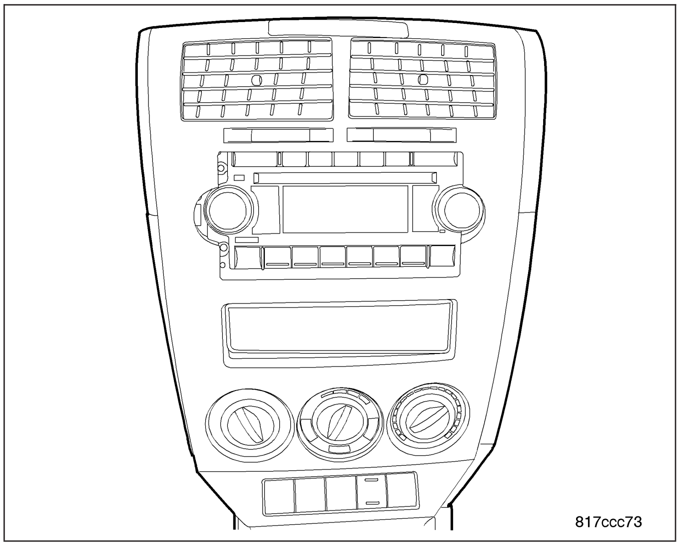


24. Install manual or automatic shifter bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION)
25. Connect steering column wire harness.
26. Connect steering column. (Refer to 19 - STEERING/COLUMN - INSTALLATION)
27. Install steering cover shrouds. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN SUPPORT BKT - INSTALLATION)
28. If equipped, install left and right airbag covers.
29. Install left and right end caps. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION)
30. Connect the negative battery cable.

BEZEL-CENTER

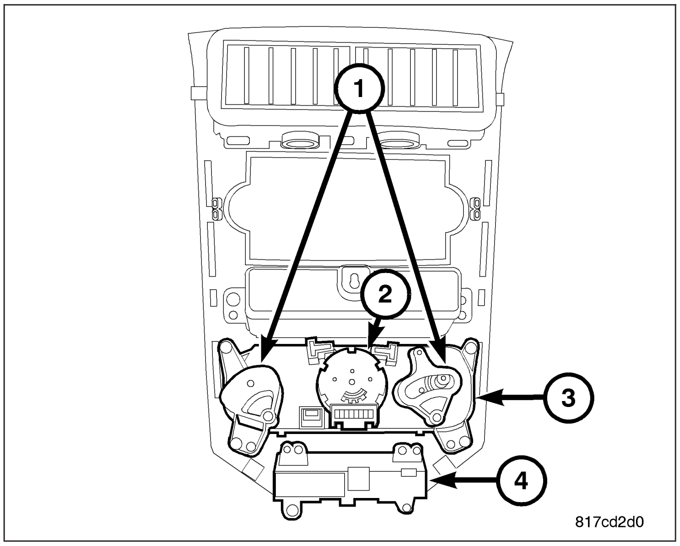
REMOVAL

1. Remove shifter bezel.
2. Using trim stick C-4755, remove center bezel.



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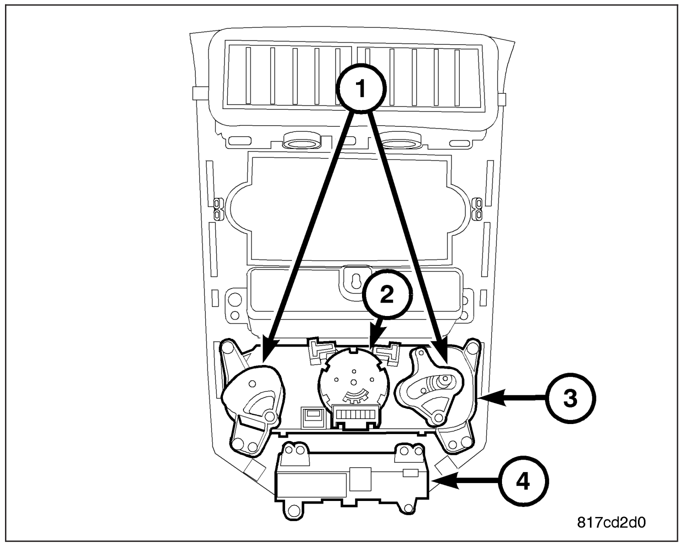
3. Disconnect wire harness from accessory switch bank (2).
4. Disconnect HVAC control cables (1).
5. Remove fasteners attaching HVAC control head (3) to bezel.
6. Remove switch bank (4) from bezel.



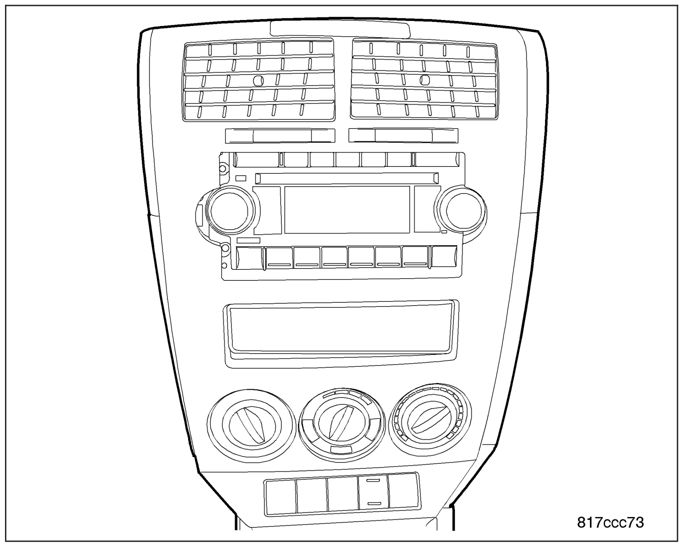
817cd2d0

INSTALLATION

1. Install switch bank (4) onto bezel).
2. Route cables through center bezel and connect to HVAC control head (3).
3. Connect control head (3) to center bezel.
4. Connect wire harness connectors to accessory switch bank (2).



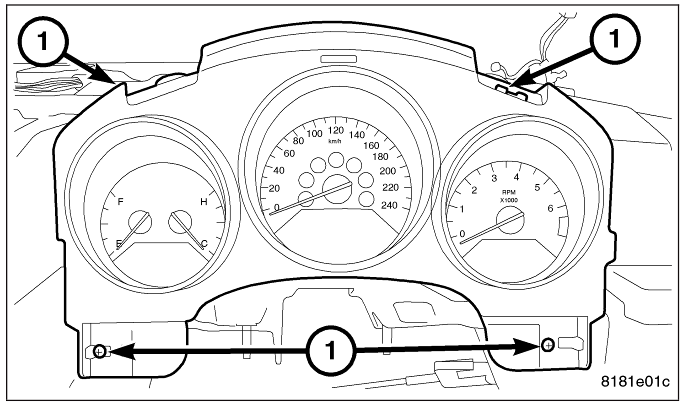
5. Hand tap center bezel on to instrument panel to ensure proper seating.



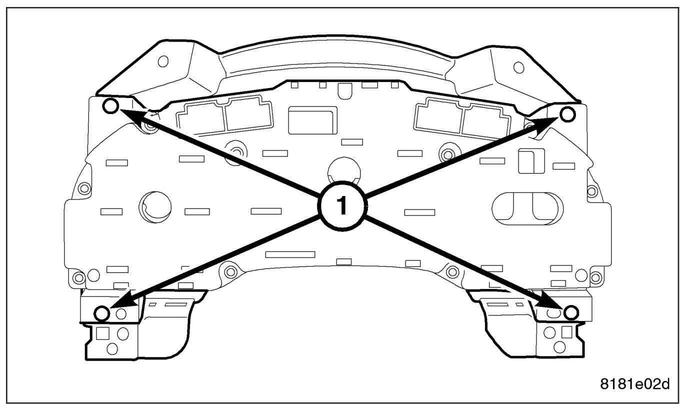
BEZEL-CLUSTER

REMOVAL

1. Remove A - pillar trim.
2. Remove top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
3. Remove fasteners and upper panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
4. Remove cluster bezel fasteners (1).
5. Pull instrument cluster rearward to expose the four electrical connectors.
6. Disconnect electrical connectors.
7. Remove cluster assembly with cluster attached.

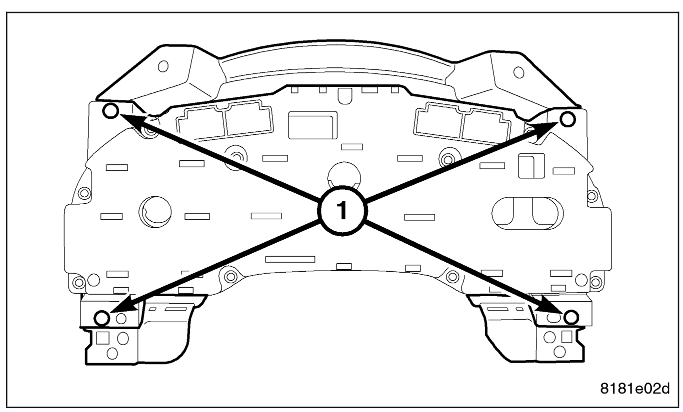


8. Remove fasteners (1) attaching cluster to bezel.

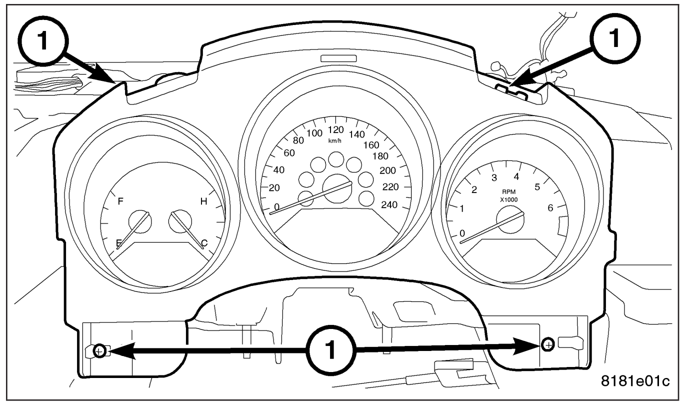


INSTALLATION

1. Install cluster to bezel by installing four fasteners (1).
2. Position cluster into instrument panel opening.
3. Connect wire connectors.



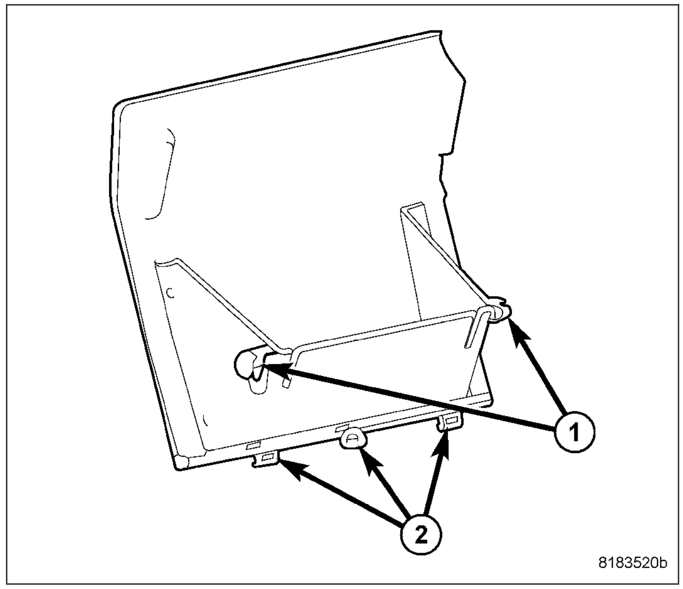
4. Install four fasteners (1) fastening cluster to instrument panel.
5. Install instrument panel upper panel. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ FLOOR DISTRIBUTION DUCTS - REMOVAL)



BIN-GLOVE BOX

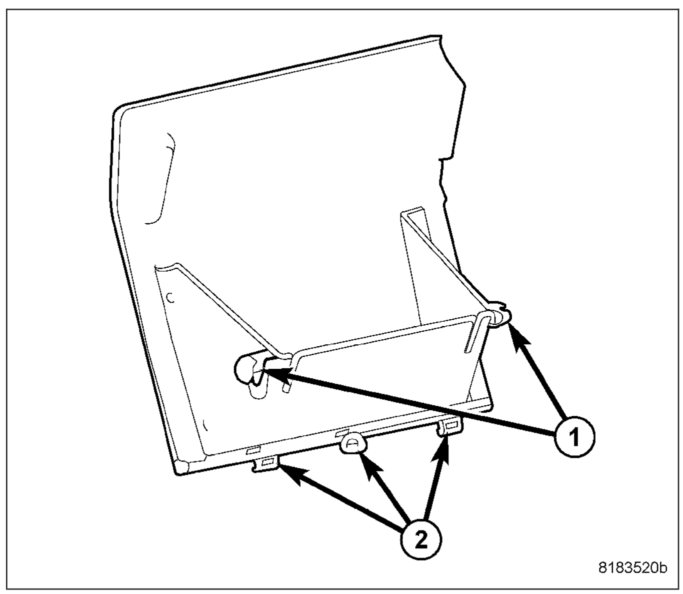
REMOVAL

1. Open glove box latch.
2. Unsnap glove box damper from glove box bin.
3. Flex glove box open position stops (1) inboard and rotate past stops.
4. Unsnap glove box door from base panel lower hinge pins (2).



INSTALLATION

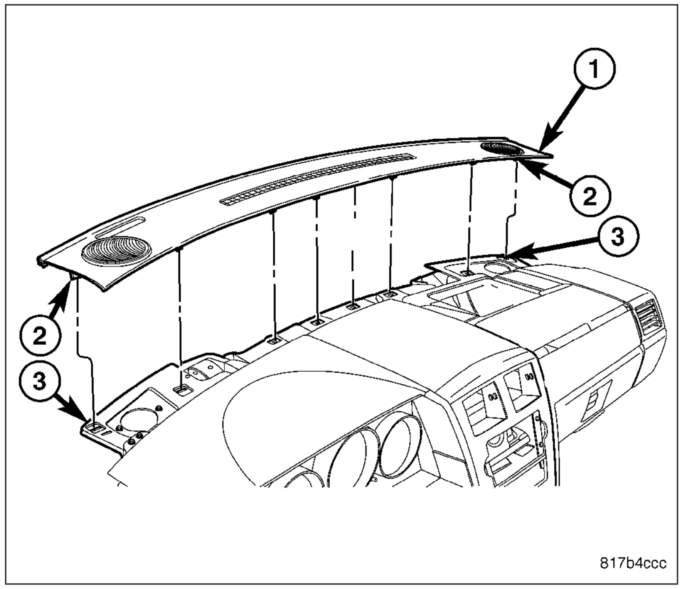
1. Align glove box door with glove box opening.
2. Snap glove box door hinge pins (2) to lower base panel hinges.
3. Flex glove box inboard and rotate inward past stops (1).
4. Close glove box.



COVER-INSTRUMENT PANEL TOP

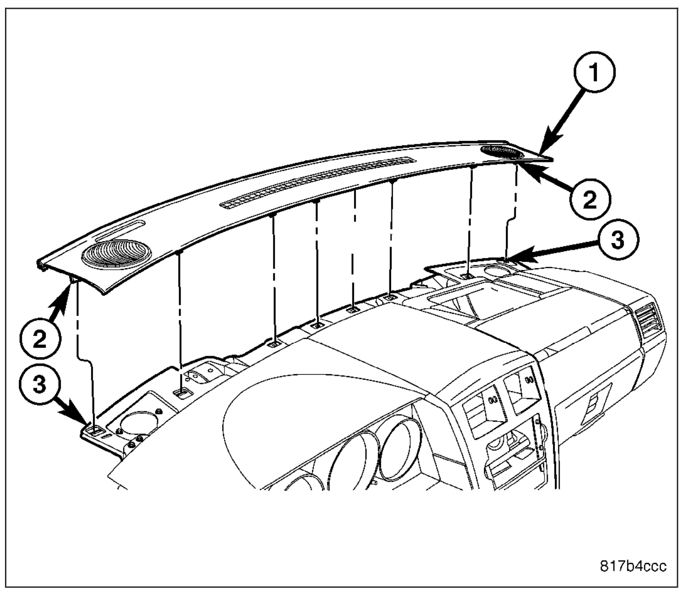
REMOVAL

1. Remove A- pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
2. Using trim stick C-4755, pry up on panel cover (1) disengaging panel clip (2) from instrument panel inner (3).
3. Remove from vehicle.



INSTALLATION

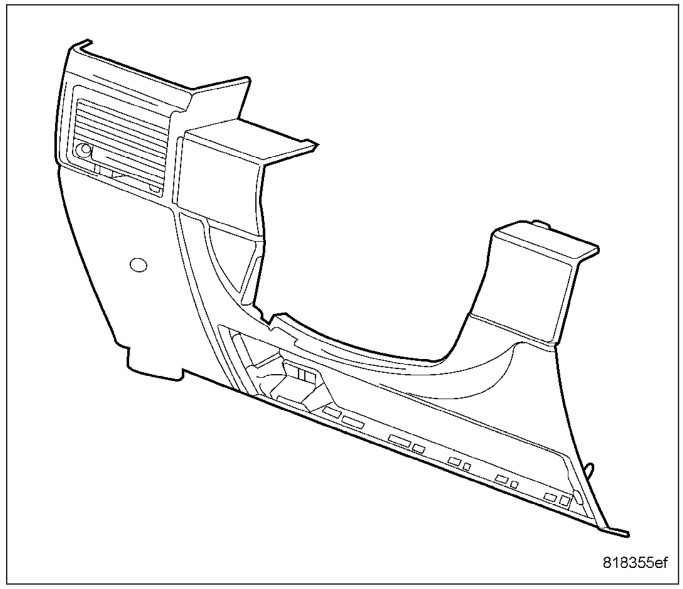
1. Place instrument panel cover (1) over instrument panel aligning instrument panel cover clips over instrument panel inner.
2. Tap on clip locations ensuring instrument panel clips seat.
3. Install A - Pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)



STEERING COLUMN COVER I/P

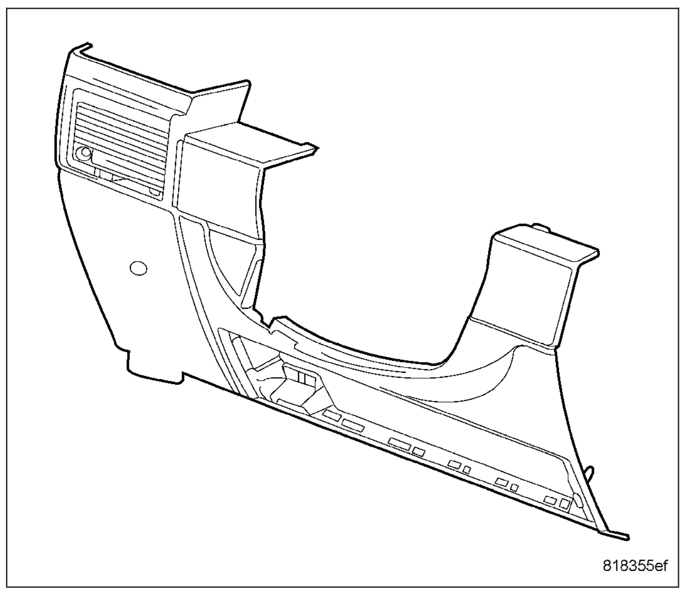
REMOVAL

1. Using trim stick C–4755, disengage clips on column cover top edge.
2. Remove from vehicle.



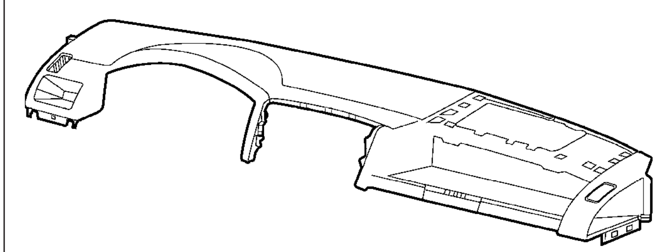
INSTALLATION

1. Align top of column cover tabs with instrument panel.
2. Hand tap top of column cover ensuring column cover tabs seat.



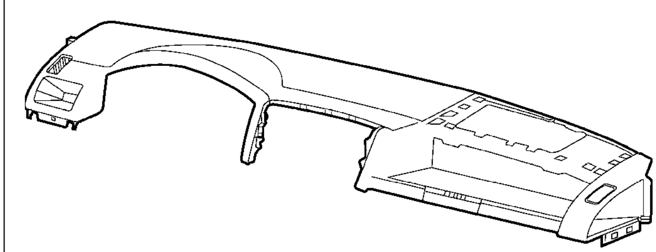
INSTRUMENT PANEL UPPER PANEL

REMOVAL


81835578

1. Remove top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
2. Remove left and right end caps. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL)
3. Remove steering column cover. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN SUPPORT BKT - REMOVAL)
4. Remove shifter bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL).
5. Remove center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
6. Remove ten upper trim panel screws, five screw attachments along forward edge under top cover, two screw attachments under each end cap, two screw attachments under center bezel, two clip attachments in the cooler bin, one screw attachment under the steering cover, one clip attachment on passenger side near outboard outlet, and two clips in the cluster bezel area.

INSTALLATION

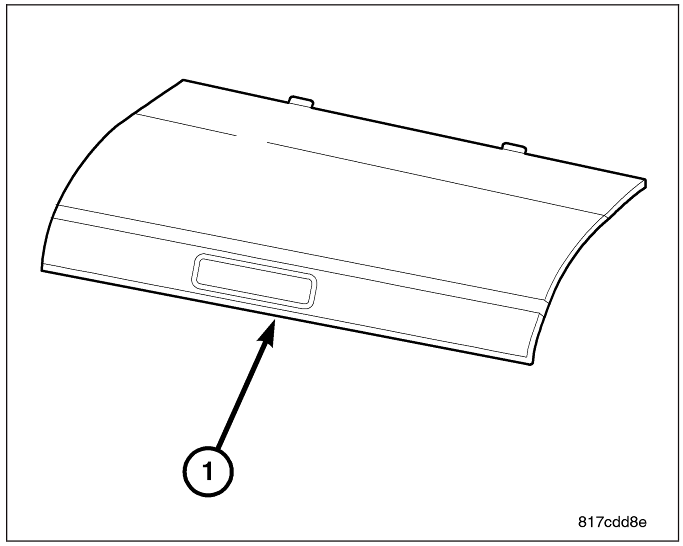

81835578

1. Install upper trim panel over structure.
2. Install five screw attachments along forward edge under top cover, screw attachments under each end cap, two screw attachments under center bezel, two clip attachments in the upper cooler bin, one screw attachment under the steering column cover, one clip attachment on the passenger side near outboard outlet, and two clips in the cluster area.
3. Install center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
4. Install manual or automatic shifter bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
5. Install steering column shrouds. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
6. Install column cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
7. Install right and left end caps. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
8. Install instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)

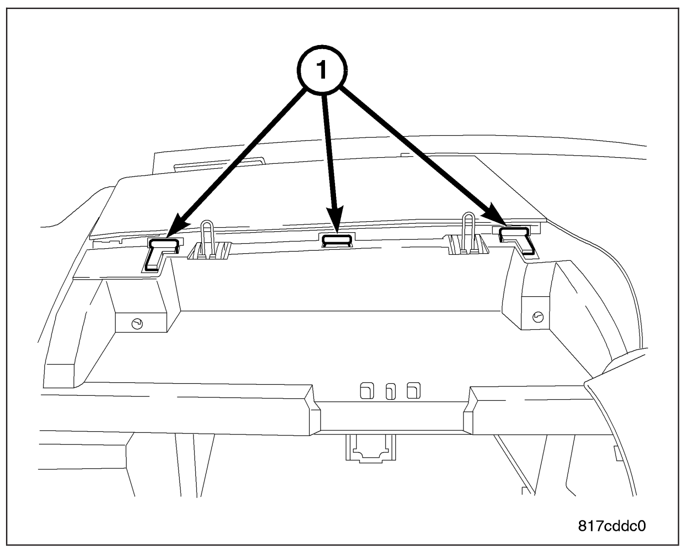
GLOVE BOX-COOLER DOOR

REMOVAL

1. Open glove box cooler door (1).

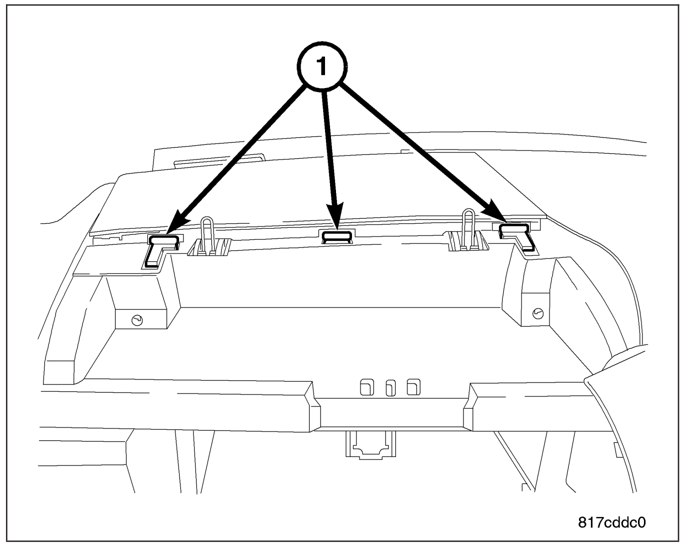


2. Unsnap glove box cooler door from glove box door opening tabs (1).
3. Remove glove box cooler door from vehicle.

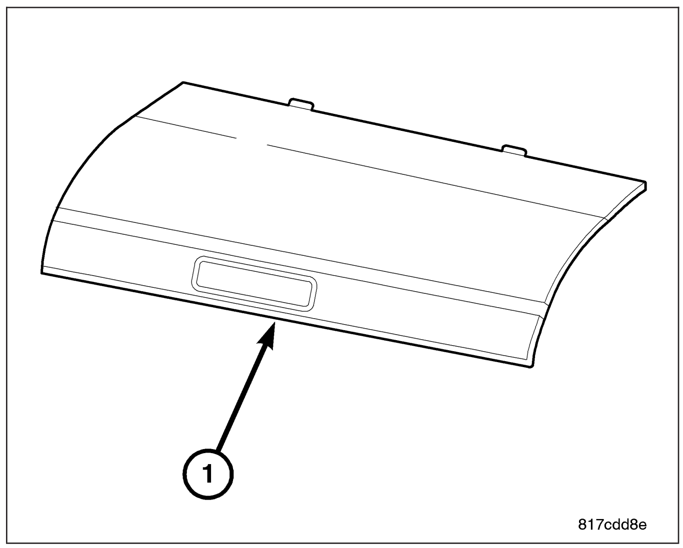


INSTALLATION

1. Align cooler door with cooler door opening tabs (1).



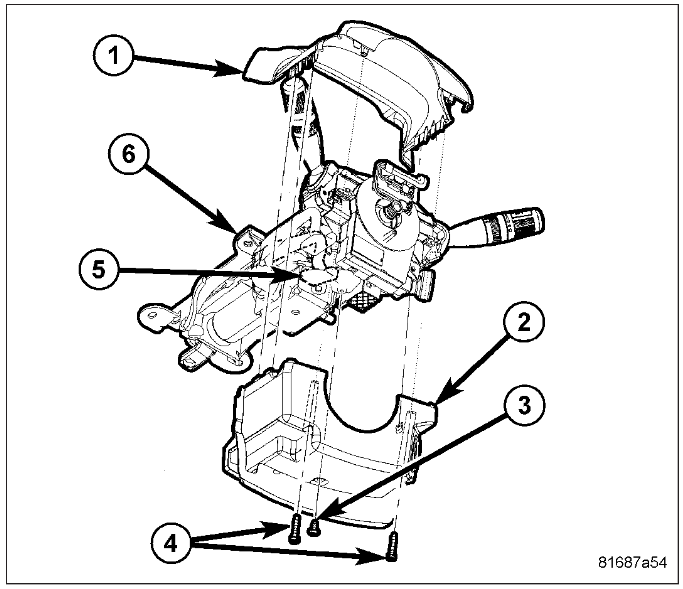
2. Snap cooler door (1) on to door opening tabs.
3. Shut cooler door.



UPPER AND LOWER STEERING BEZEL

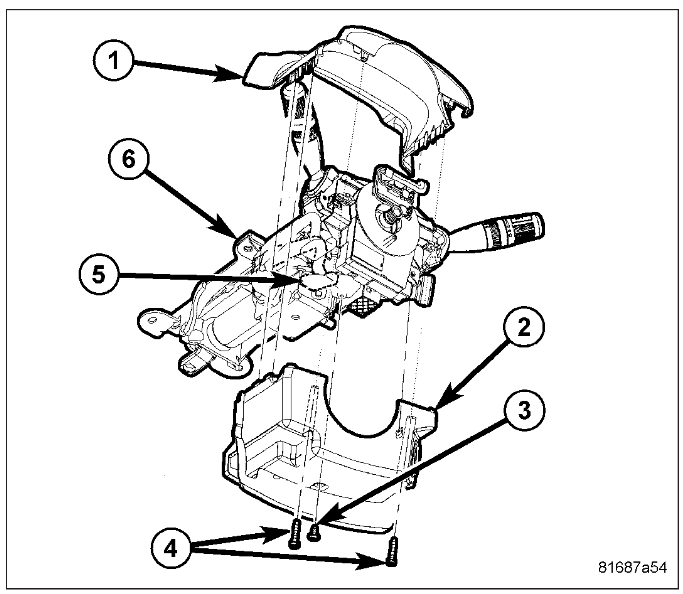
REMOVAL

1. Remove the two screws (4) attaching the upper shroud (1) to the lower shroud (2). After removing the screws, unclip the shrouds from each other by applying hand pressure along the seams where the shrouds connect on the sides, then remove the upper shroud and lower steering column cover.



INSTALLATION

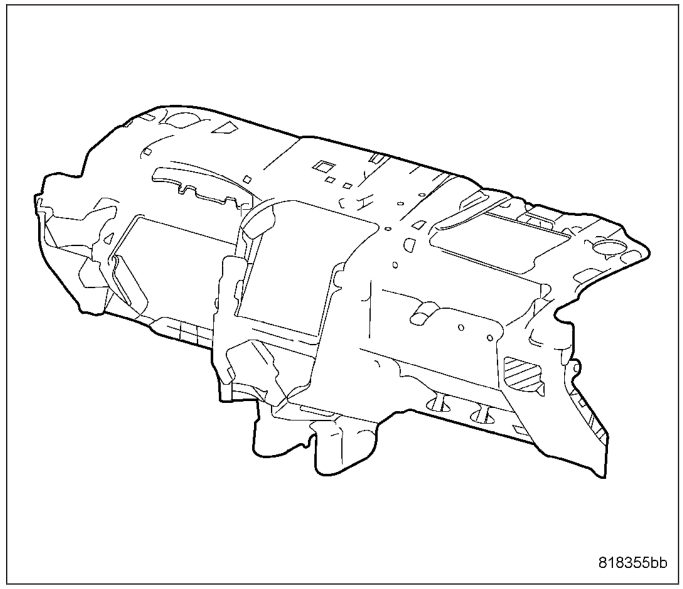
1. Position the column tilt at the full-downward position and lock it in place.
2. Install the upper shroud over the lower shroud, clipping the shrouds to one another.
3. Install the two screws (4) attaching the upper shroud (1) to the lower shroud (2).



INSTRUMENT PANEL BASE PANEL

REMOVAL

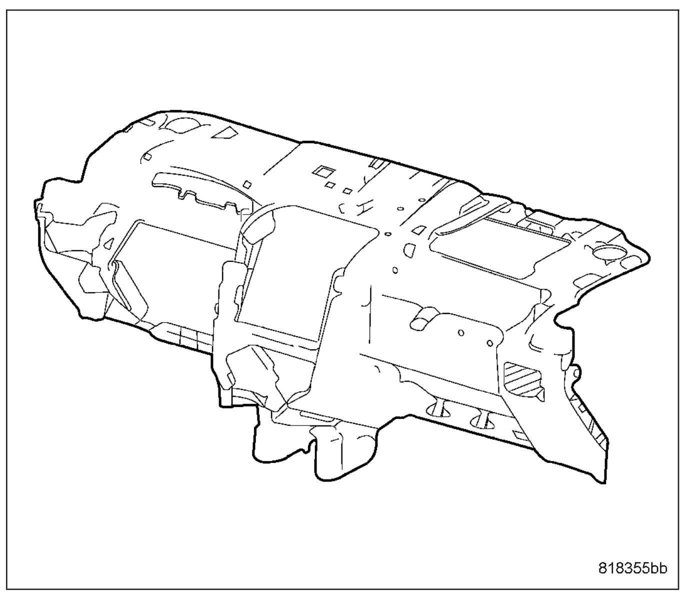
1. Remove instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL)
2. Remove end caps. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL)
3. Remove shift bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL) or (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL)
4. Remove shift housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
5. Remove center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL)
6. Remove steering column cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL)



7. Remove upper panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - REMOVAL)
8. Remove radio. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL)
9. Remove shifter bracket.
10. Remove glove box door. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL)
11. If equipped, remove knee blocker.
12. Remove 25 base panel fasteners from structure.

INSTALLATION

1. Place instrument panel base structure over base panel.
2. Install 25 fasteners.
3. If equipped, install knee blocker.
4. Install glove box door. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION)
5. Install shifter bracket.
6. Install radio. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION)
7. Install upper panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - INSTALLATION)
8. Install steering column shrouds. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN SUPPORT BKT - INSTALLATION)



9. Install steering cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION)
10. Install center bezel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION)
11. Install shifter housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)

12. Install shifter bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION) and (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION)
13. Install right and left end caps.
14. Install top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION)

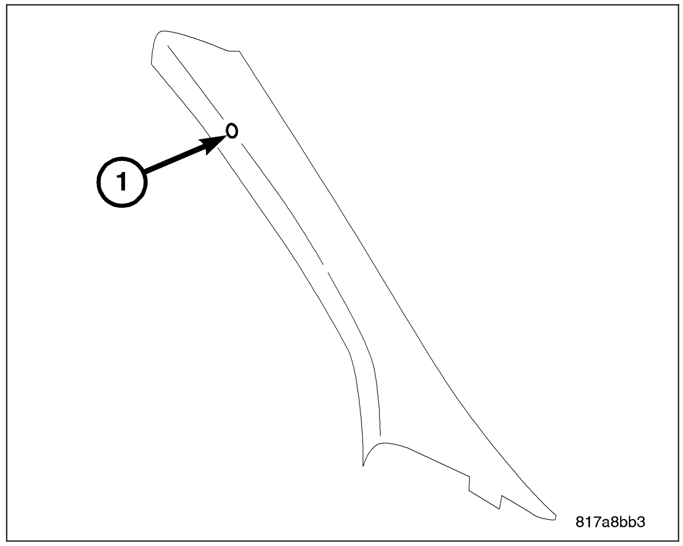
INTERIOR

TABLE OF CONTENTS

A-PILLAR TRIM

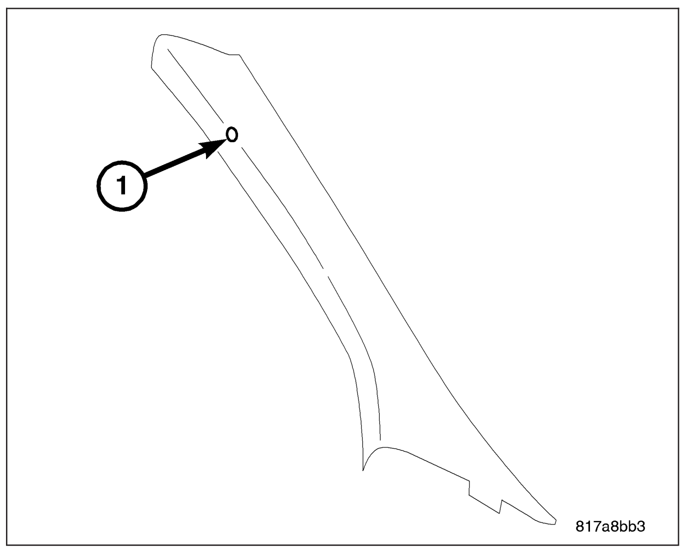
REMOVAL

1. Remove plug (1).
2. Remove screw.
3. Remove trim by pulling from top.



INSTALLATION

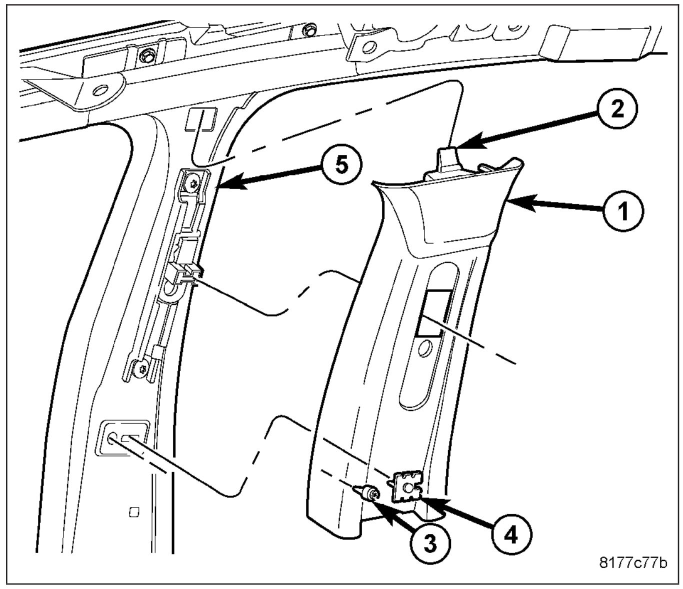
1. Insert bottom first and ensure trim has seated into clips.
2. Install screw.
3. Install plug.



B-PILLAR TRIM

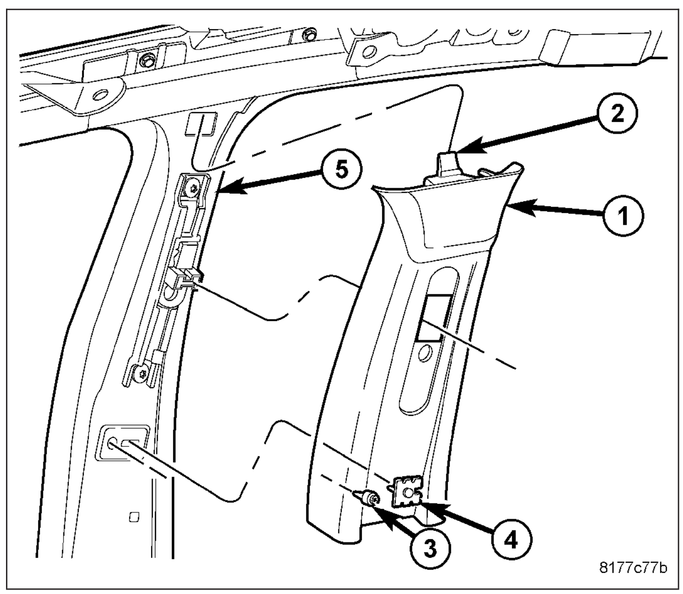
REMOVAL

1. Remove lower B-pillar trim from B-pillar (5).
2. Remove plug.
3. Remove screw (3).
4. Remove trim (1) by pulling tab (2) on top outward.



INSTALLATION

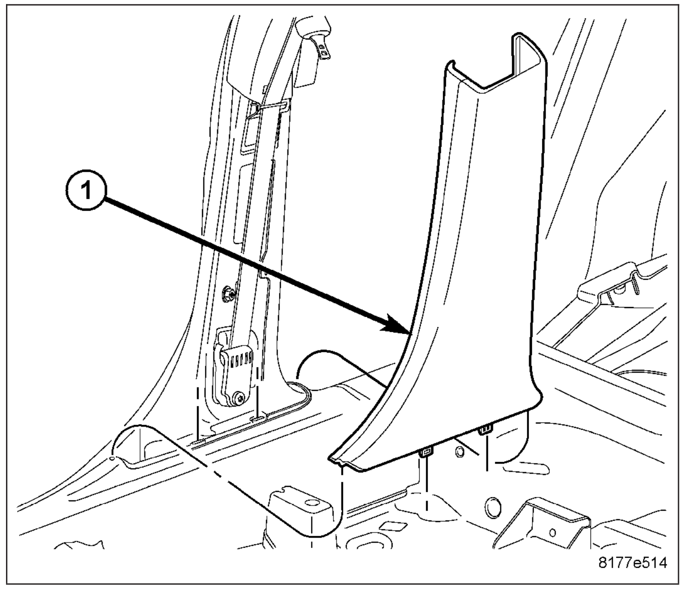
1. Install B-pillar (1) trim to B-pillar (5) by inserting B-pillar trim tab (2) into B-pillar slot.
2. Push B-pillar trim into position ensuring bottom clip (4) has seated.
3. Add screw (3) and reinstall plug.



B-PILLAR LOWER TRIM

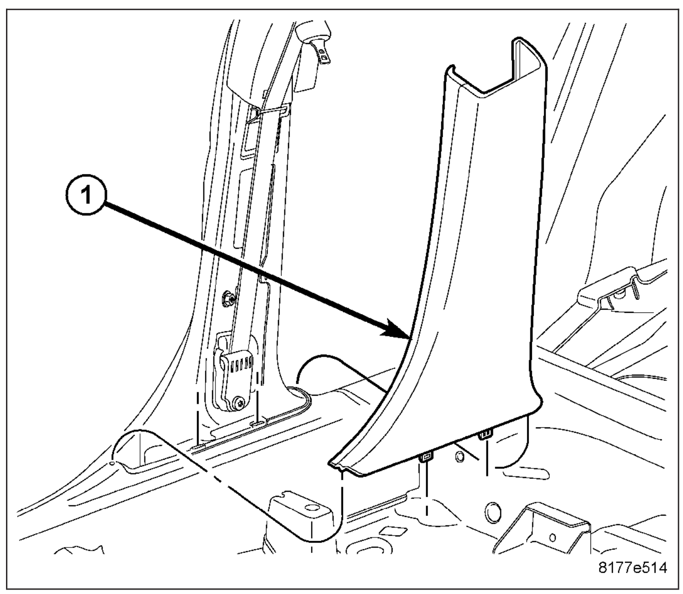
REMOVAL

1. Using special tool C-4755, pry off B-pillar lower trim.
2. Remove from vehicle.



INSTALLATION

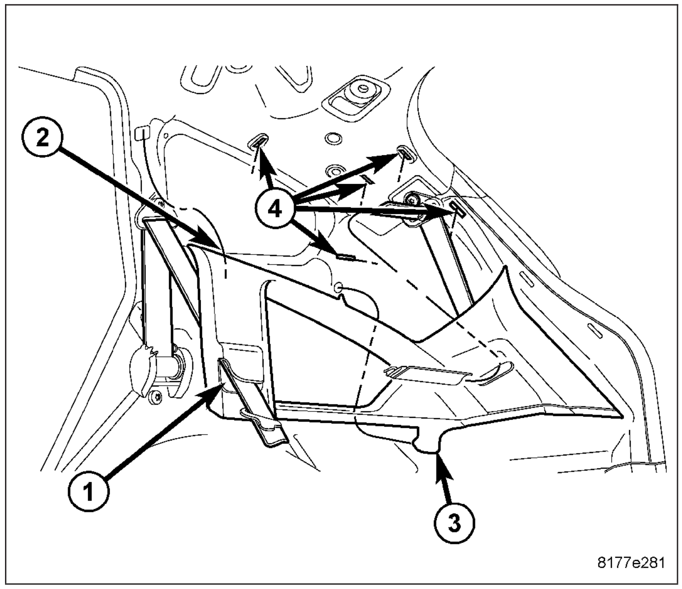
1. Insert lower tabs on B-pillar lower trim (1) onto sill panel.
2. Hand tap on clip locations ensuring clips are properly seated.



UPPER C-PILLAR TRIM

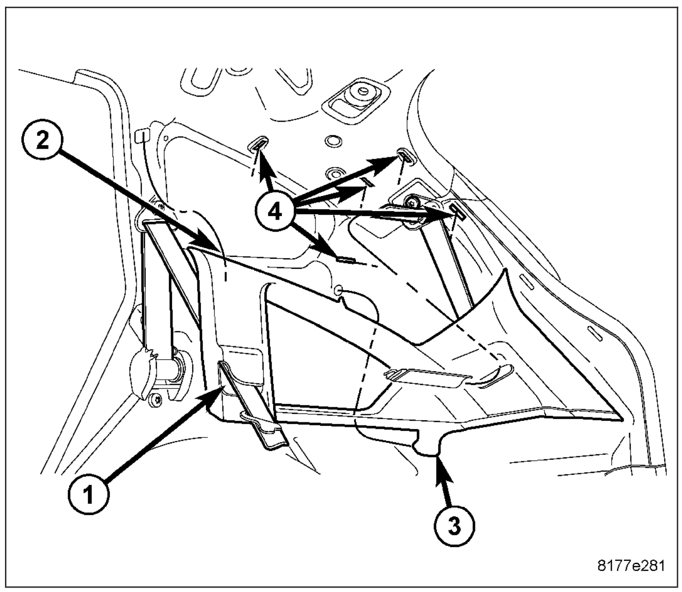
REMOVAL

1. Remove lower quarter.
2. Remove lower seat anchors from seat belt opening (1).
3. Remove upper quarter by pulling on rear portion of upper quarter disengaging clips from metal holes in body (4).
4. Remove front lower portion (3) by pulling clip loose.
5. Slide quarter panel (2) downward and remove from vehicle.



INSTALLATION

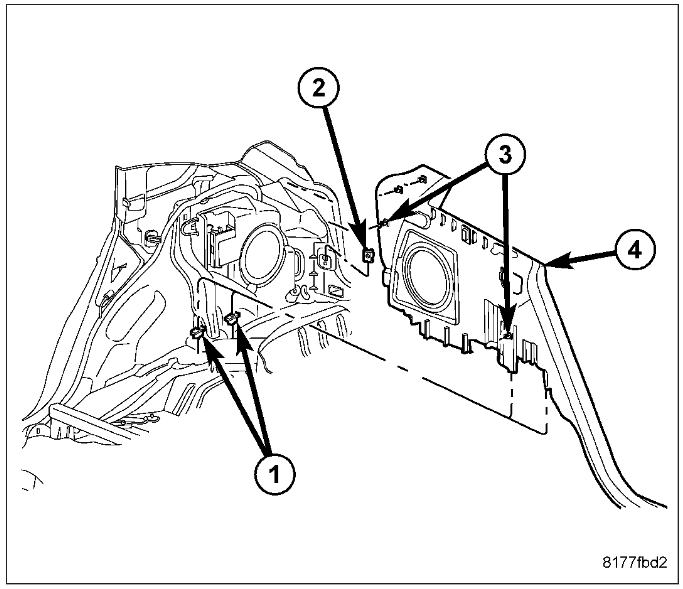
1. Pass seat belt anchors through trim openings (1).
2. Install quarter trim (2) by sliding hook at top and locating 4–way locator into the body side sheet metal holes (4).
3. Complete installation by aligning metal clips and snaping until properly seated.



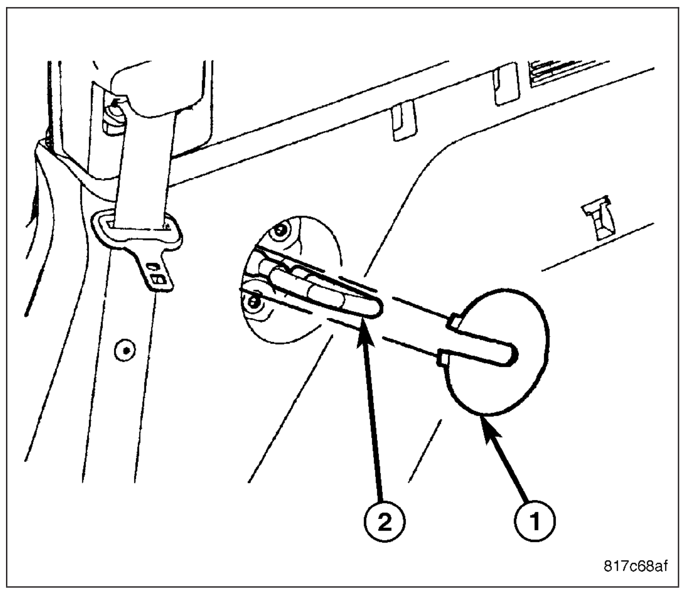
REAR QUARTER PANEL TRIM

REMOVAL

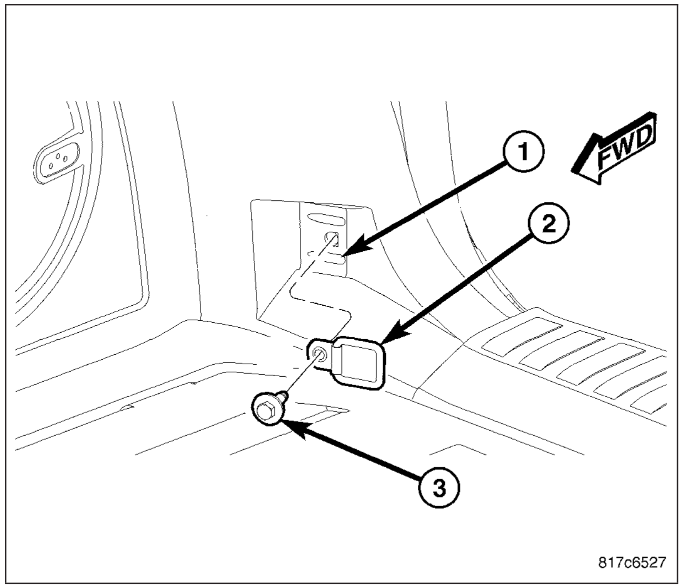
1. Remove liftgate scuff plate. (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - REMOVAL)
2. Remove cargo floor. (Refer to 23 - BODY/INTERIOR/COVER - REMOVAL)
3. Remove B - pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)
4. Remove scuff plate door sill. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL)



5. Using trimstick C-4755, remove the seat striker bezel.



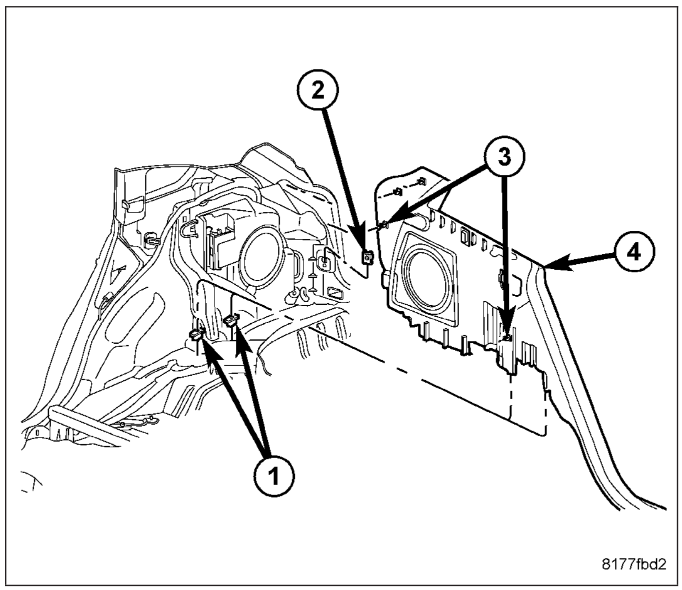
6. Remove the rear quarter trim cargo loop (2) fastener (3).
7. Remove the rear quarter panel.



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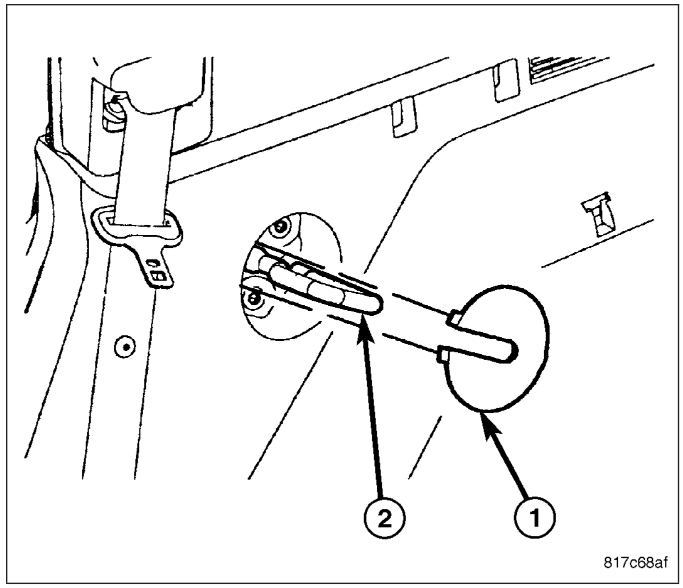
INSTALLATION

1. Twist quarter trim toward quarter body side seating tabs on to clips.
2. Seat four - way and two - way locator on panel to holes on body inner.
3. Tap on panel at each clip location until seated.

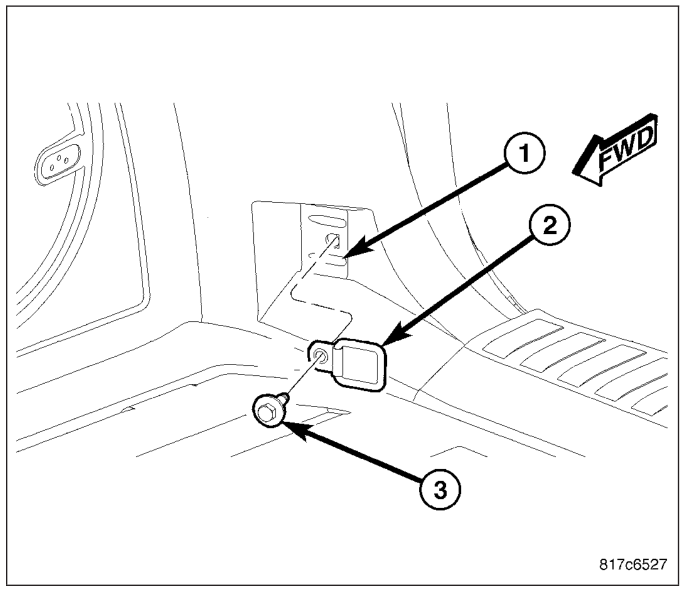


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4. Snap striker bezel to quarter panel.



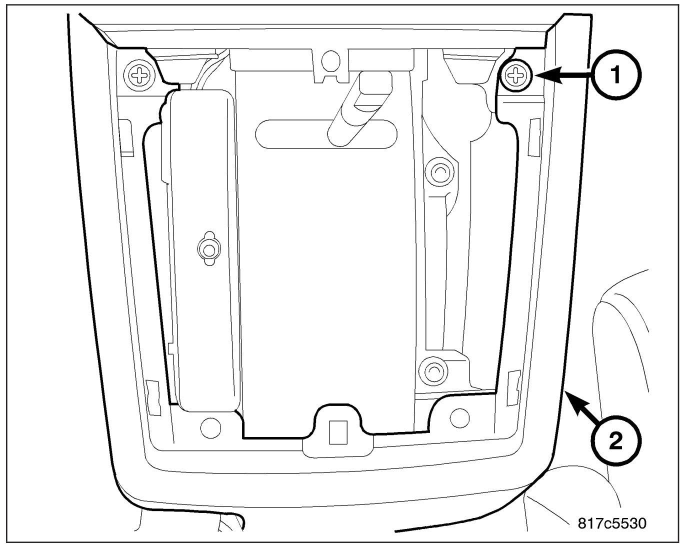
5. Install cargo loop fastener (3).



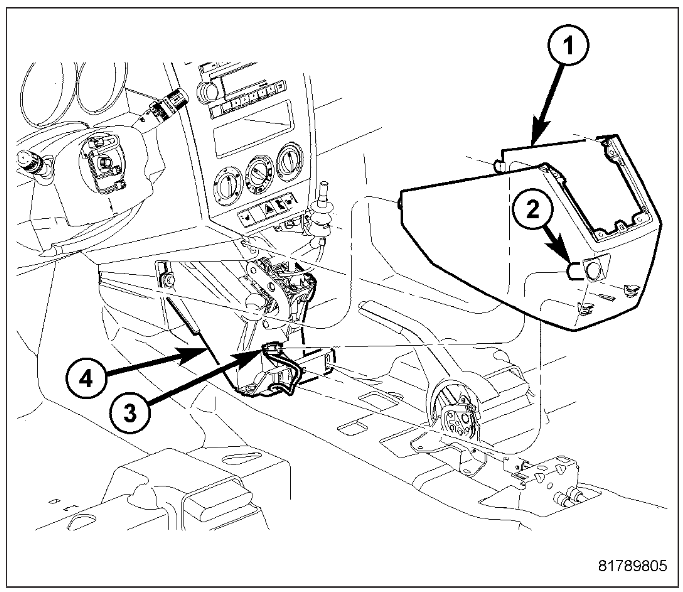
CENTER CONSOLE SHIFTER HOUSING

REMOVAL

1. Remove shift knob and shift bezel. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL) (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - REMOVAL)
2. Remove two screws (1).

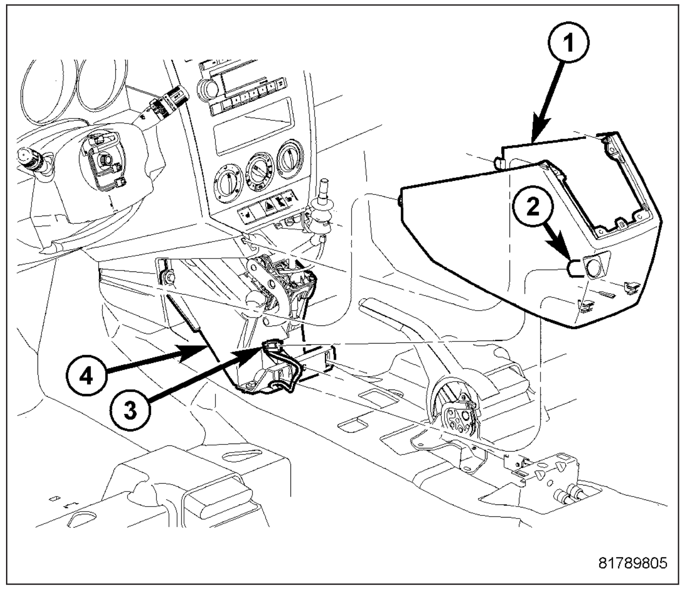


3. Pull on side of housing (1) and unsnap housing tabs.
4. Disconnect console housing wire connector (2) and instrument panel connector (3).
5. Remove from vehicle.

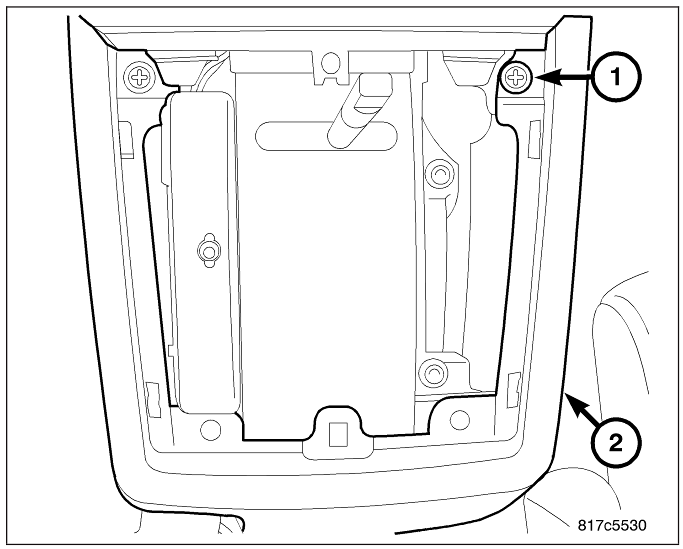


INSTALLATION

1. Connect center console housing wire connector (2) with instrument panel connector (3).
2. Place console housing (1) over shifter lever ensuring console tabs seat properly.



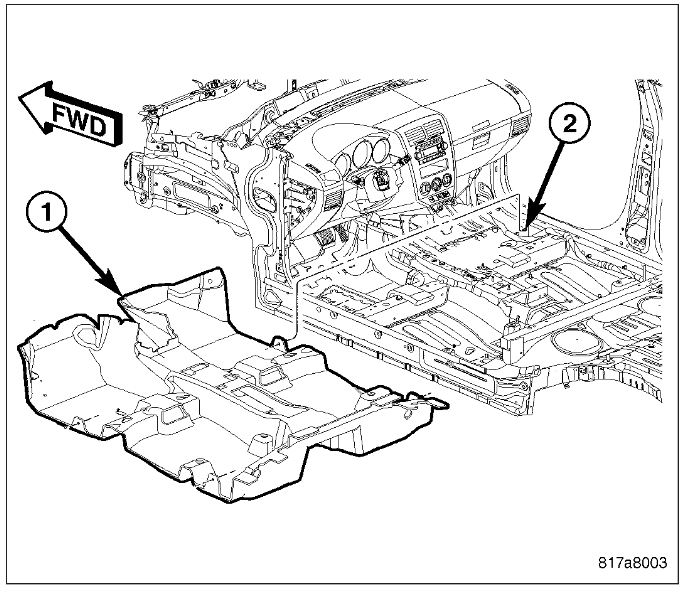
3. Install screws (1).
4. Replace shift bezel and knob. (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION) (Refer to 23 - BODY/INTERIOR/SHIFT BEZEL - INSTALLATION).



FLOOR CARPET

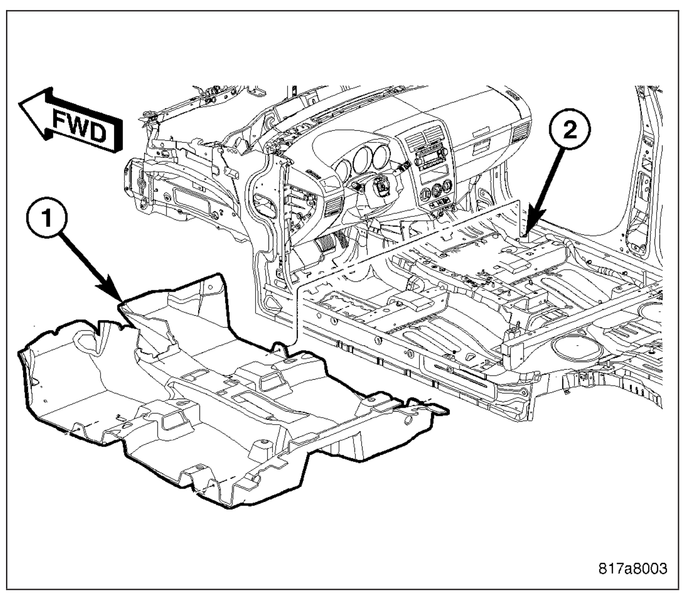
REMOVAL

1. Remove front seats. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
2. Remove rear seats cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - REMOVAL)
3. Remove rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - REMOVAL)
4. Remove cargo load floor. (Refer to 23 - BODY/INTERIOR/COVER - REMOVAL)
5. Remove center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
6. Remove center console shifter housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL)
7. Remove lower B-Pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL)
8. Remove door sill plate. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL)
9. Remove side cowl trim panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL)
10. Remove liftgate scuff plate. (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - REMOVAL)
11. Remove rear quarter trim. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)
12. Remove carpet from vehicle.



INSTALLATION

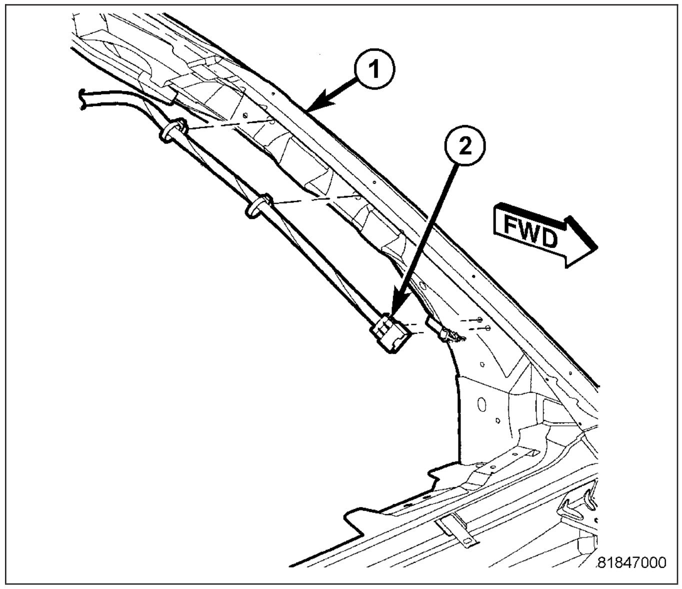
1. Install carpet into vehicle ensuring carpet (1) is aligned with tabs (2).
2. Install rear quarter panel trim. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
3. Install liftgate scuff plate. (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - INSTALLATION)
4. Install cargo load floor. (Refer to 23 - BODY/INTERIOR/COVER - INSTALLATION)
5. Install side cowl trim panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION)
6. Install B-pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)
7. Install door sill scuff plate. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION)
8. Install center console. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
9. Install center console shifter housing. (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION)
10. Install rear seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION - INSTALLATION)
11. Install rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK - INSTALLATION))
12. Install front seats.



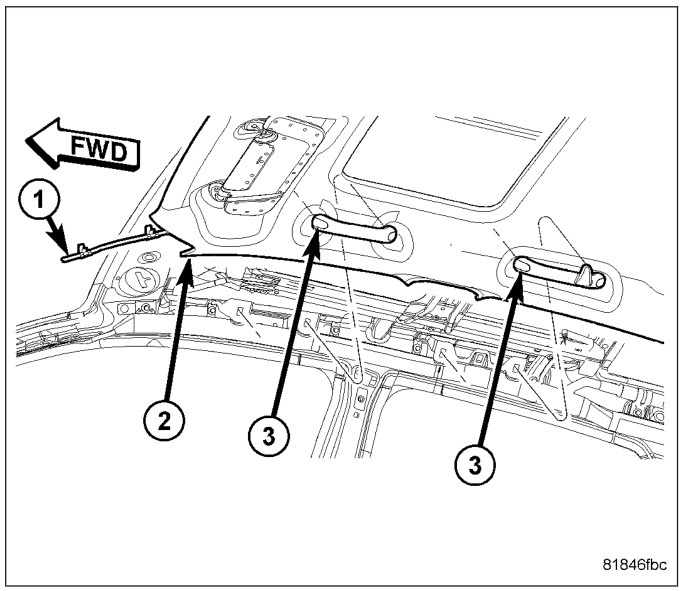
HEADLINER

REMOVAL

1. Remove front windshield. (Refer to 23 - BODY/STATIONARY GLASS/WINDSHIELD - REMOVAL)
2. Remove A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
3. Disconnect A-pillar trim wire connector (2).
4. Remove sunvisors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL)
5. Remove sun visor screws and retainers. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)



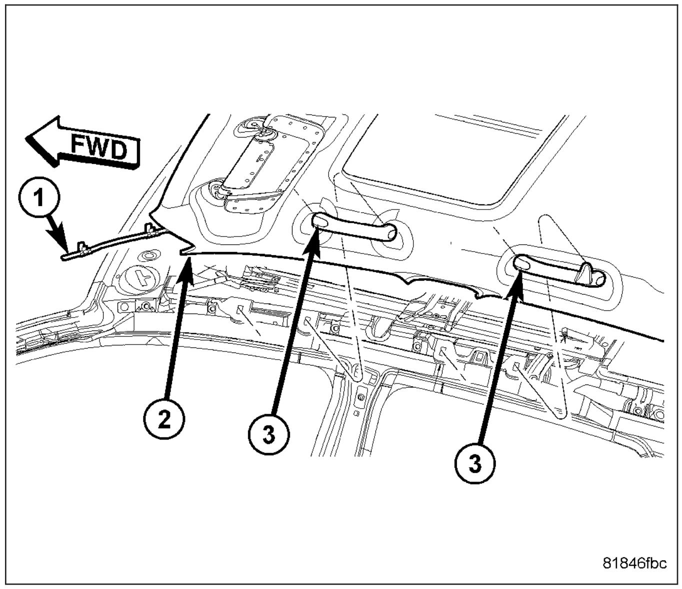
6. Disconnect front washer hose (1).
7. Remove universal homelink module and connector. (Refer to 8 - ELECTRICAL/MESSAGE CENTER/UNIVERSAL TRANSMITTER - REMOVAL).
8. Remove and disconnect dome lamp. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOME LAMP - REMOVAL)
9. Remove front and rear grab handles (3).
10. Remove seat belt turning loops.
11. Remove B-pillar upper trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL)
12. Remove B-pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)
13. Remove fastener attaching cargo loop to rear quarter trim.
14. Remove rear seat striker bezel.
15. Remove C-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL)



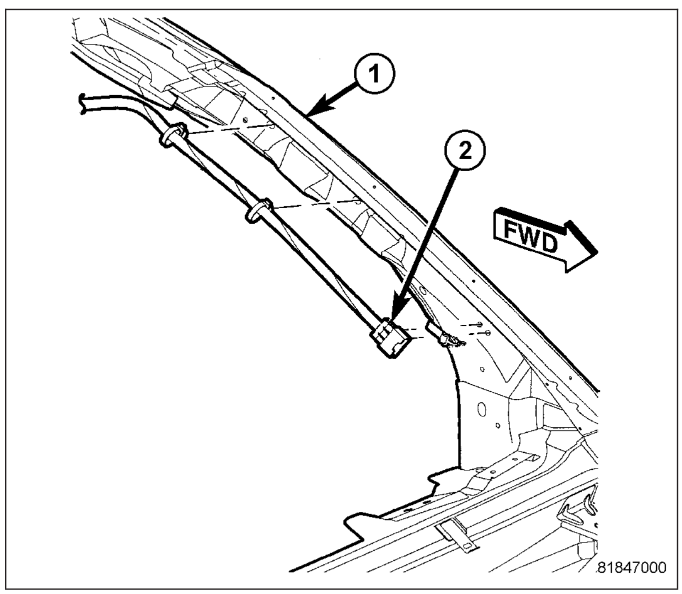
16. Remove rear quarter trim. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL)
17. Remove cargo load floor. (Refer to 23 - BODY/INTERIOR/COVER - REMOVAL)
18. Remove liftgate scuff plate. (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - REMOVAL)
19. Remove rear cargo dome light and disconnect connector.. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOME LAMP - REMOVAL)
20. Remove rear headliner push pins.
21. Disconnect rear washer hose connector
22. Lower headliner.
23. With the help of an assistant, remove headliner through front windshield opening.

INSTALLATION

1. Before headliner installation, install courtesy lamp, cargo lamp, and Universal transmitter module to headliner. (Refer to 8 - ELECTRICAL/MESSAGE CENTER/UNIVERSAL TRANSMITTER - INSTALLATION)
2. With the help of an assistant, Install headliner through windshield opening.
3. Connect rear cargo lamp connector. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/CARGO LAMP - INSTALLATION)
4. Install headliner push pins located at rear of headliner.
5. Connect front dome lamp connector. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOME LAMP - INSTALLATION)
6. If equipped, connect home link module connector. (Refer to 8 - ELECTRICAL/MESSAGE CENTER/UNIVERSAL TRANSMITTER - INSTALLATION)
7. Connect front rear view mirror hardware. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)
8. Install rear view mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)
9. Install grab handles (3).
10. Connect rear washer hose.
11. Install sunvisor retainers. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)
12. Install sun visors.



13. Connect A-pillar wire connector.
14. Install A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)
15. Install scuff plate. (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION)
16. Install B-pillar lower trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)
17. Install B-pillar upper trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION)
18. Install cargo load floor. (Refer to 23 - BODY/INTERIOR/COVER - INSTALLATION)
19. Install rear quarter trim. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
20. Install C-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION)

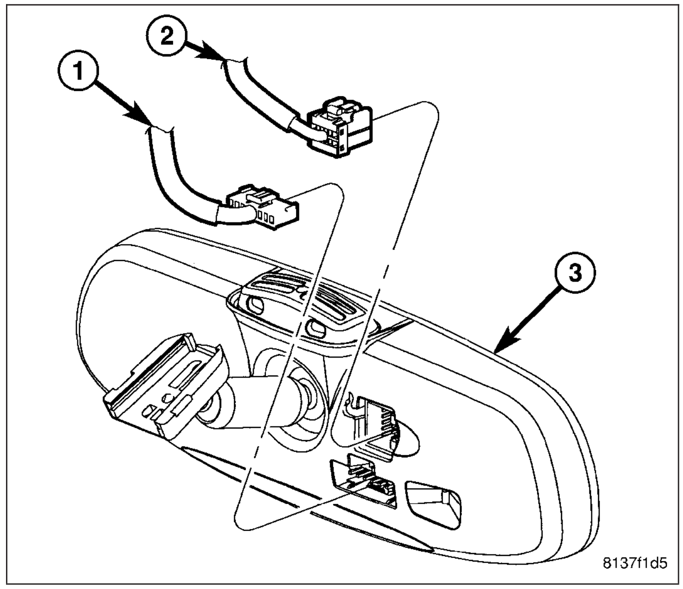


21. Install rear seat striker bezel.
22. Install seat belt turning loops.
23. Install rear cargo scuff plate. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)

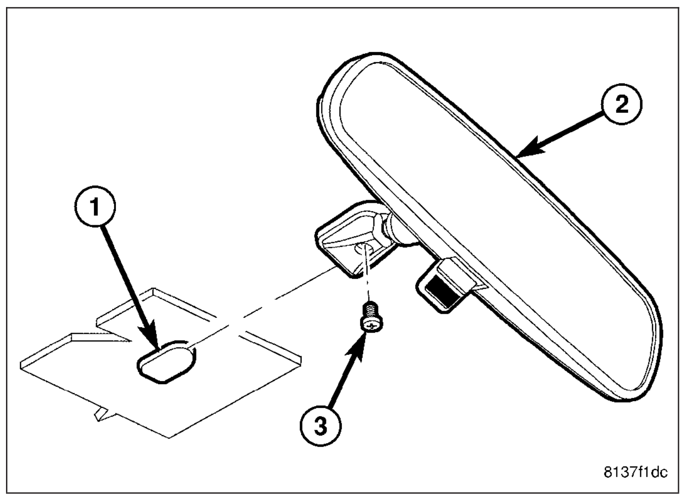
INSIDE REAR VIEW MIRROR

REMOVAL

1. If the vehicle is equipped with either the electrochromic (automatic dimming) or the telematic (hands-free phone) mirror option, disconnect and isolate the battery negative cable.
2. If the vehicle is so equipped, disconnect the electrochromic mirror takeout and connector (1) and/or the telematic mirror takeout and connector (2) of the headliner wire harness from the connector receptacle on the back (windshield side) of the mirror housing (3).



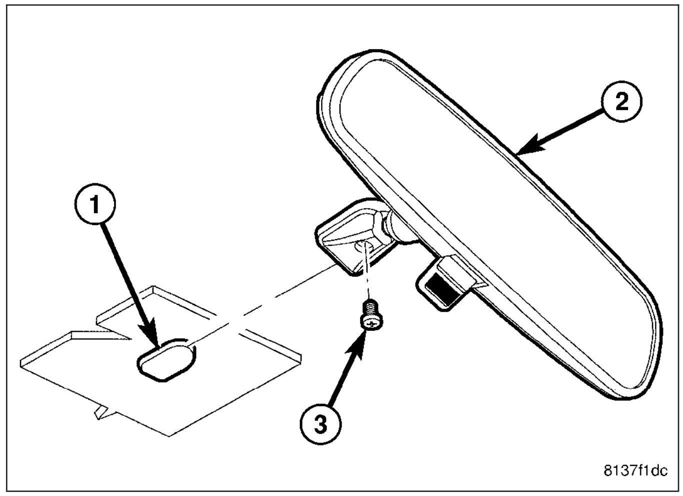
3. Remove the set screw (3) that secures the rear view mirror (2) to the support bracket/button (1) on the inside of the windshield glass.
4. Slide the rear view mirror upward far enough to disengage it from the support bracket/button.



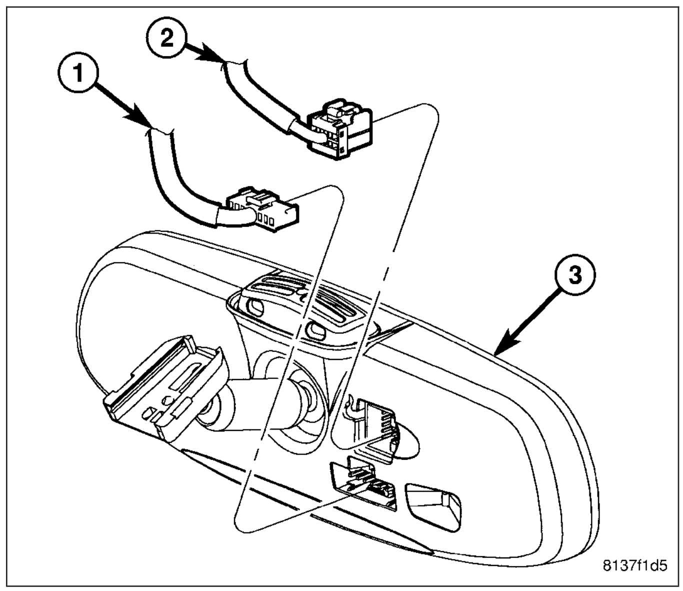
INSTALLATION

MIRROR

1. Position and slide the rear view mirror (2) downward over the support bracket/button (1) on the inside of the windshield glass.
2. Install and tighten the set screw (3) that secures the rear view mirror to the support bracket/button. Tighten the screw to 2 N·m (17 in. lbs.).



3. If the vehicle is so equipped, route the electrochromic (automatic dimming) mirror takeout and connector (1) and/or the telematic (hands-free phone) mirror takeout and connector (2) of the headliner wire harness to the left of the mirror support bracket and reconnect it to the connector receptacle on the back (windshield side) of the mirror housing (3).
4. If the vehicle is equipped with either the electrochromic or the telematic mirror option, reconnect the battery negative cable.



SUPPORT BRACKET

NOTE: The rear view mirror support bracket (or button) is permanently bonded to the inside of the windshield glass. If the bracket should become separated from the glass, it may be rebonded using the following procedure. This procedure requires the use of a Rear View Mirror Adhesive kit that is available through Mopar™ in single application packages that include a two-part adhesive and an accelerant with applicator.

1. Mark the proper position for the mirror bracket on the outside of the windshield glass with a wax pencil. The residual adhesive on the inside of the glass from the prior mirror bracket installation can be used as a guide.
2. Clean the bracket contact area on the inside of the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.
3. Sand the bonding surface (the smaller side) of the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.
4. Apply accelerant to the bonding surface of the bracket according to the following instructions:
   - Crush the accelerant vial to saturate the felt applicator.
   - Remove the paper sleeve.
   - Apply accelerant to the bonding surface of the bracket.

- Allow the accelerant to dry for five minutes.
- Do not touch the bracket bonding surface after the accelerant has been applied.

5. Apply adhesive accelerant to the bracket contact area on the inside of the windshield glass. Allow the accelerant to dry for one minute. Do not touch the bracket contact area of the glass after the accelerant has been applied.
6. Install the bracket according to the following instructions:
   - Apply one drop of adhesive at the center of the bracket contact area on the inside of the windshield glass.
   - Apply an even coat of adhesive to the bonding surface of the bracket.
   - Align the bracket with the marked position on the windshield glass.
   - Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

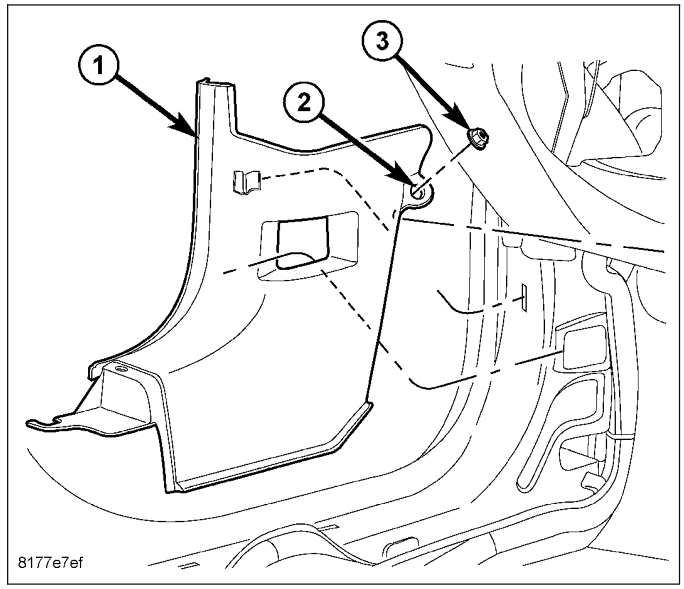
7. Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.
8. Allow the adhesive to cure for an additional 8-10 minutes before reinstalling the mirror.

SIDE COWL TRIM PANEL

REMOVAL

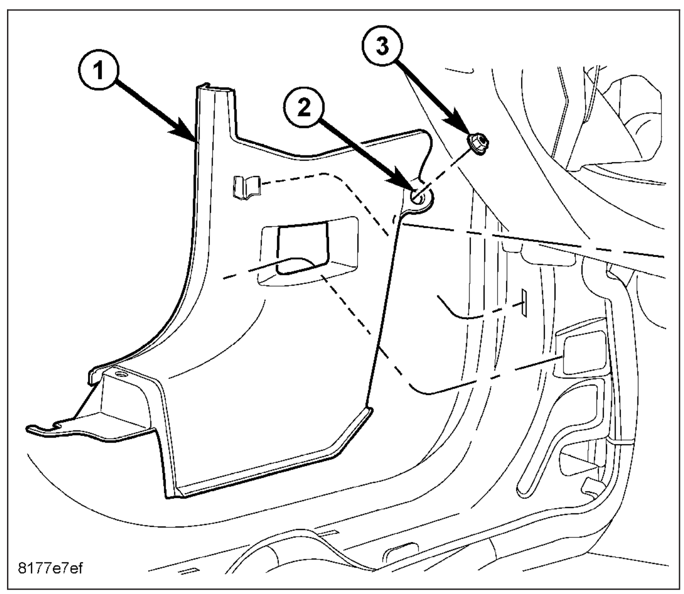
NOTE: Left hand shown, right side similar.

1. Remove door sill scuff plate. (Refer to 23 - BODY/ INTERIOR/DOOR SILL TRIM - REMOVAL)
2. Remove nut (3) securing trim (1) to dash.
3. Using trim stick C-4755, pry up on cowl trim and remove from vehicle.



INSTALLATION

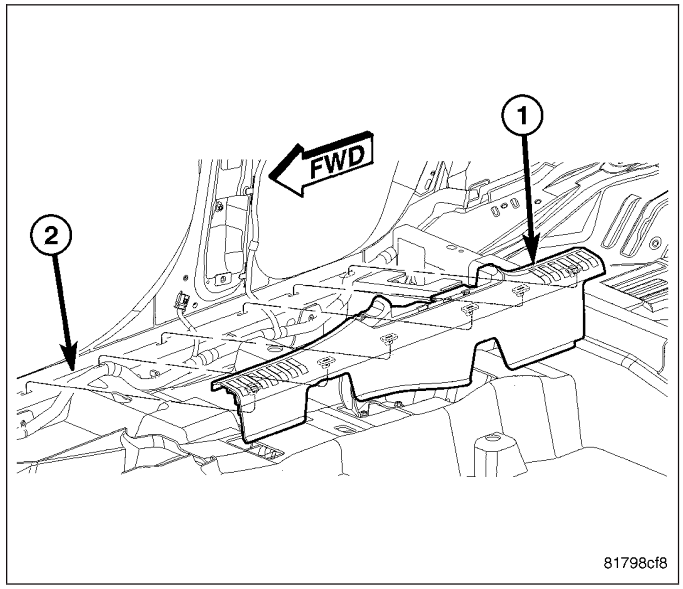
1. Place tab cowl trim (1) over stud on dash and wrap door flange.
2. Align hole for park brake release handle and clip on trim to hole (2) in cowl side.
3. Install nut (3) and fasten until cowl trim is seated.



SCUFF PLATE-DOOR SILL

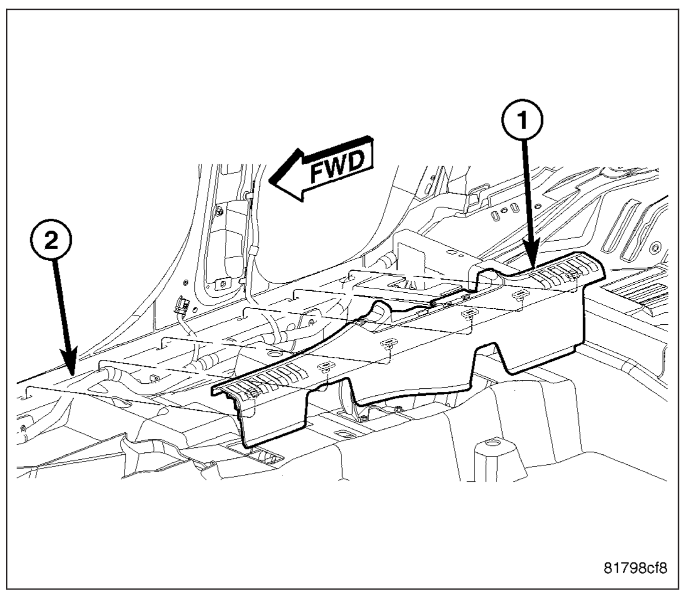
REMOVAL

1. Using trim stick C-4755, pry up scuff plate.
2. Remove scuff plate from vehicle.



INSTALLATION

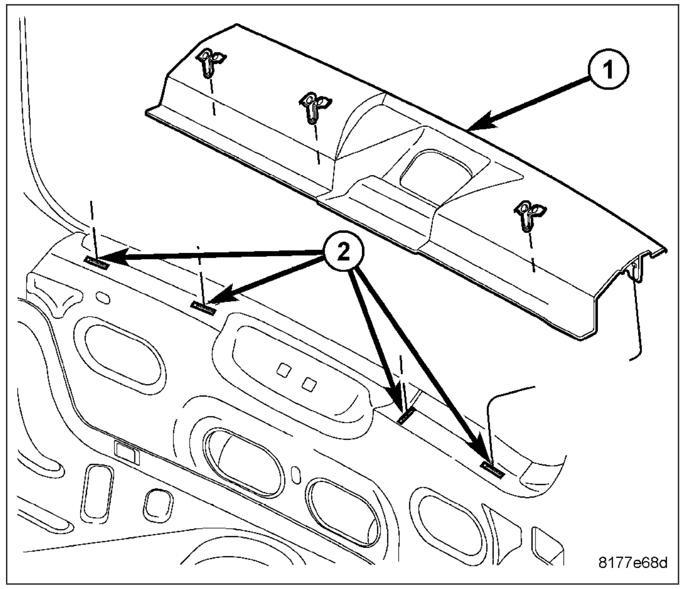
1. Place scuff plate (1) onto door sill (2).
2. Align scuff plate tabs with door scuff holes.
3. Hand press scuff plate ensuring tabs are properly seated.



SCUFF PLATE-LIFTGATE SILL

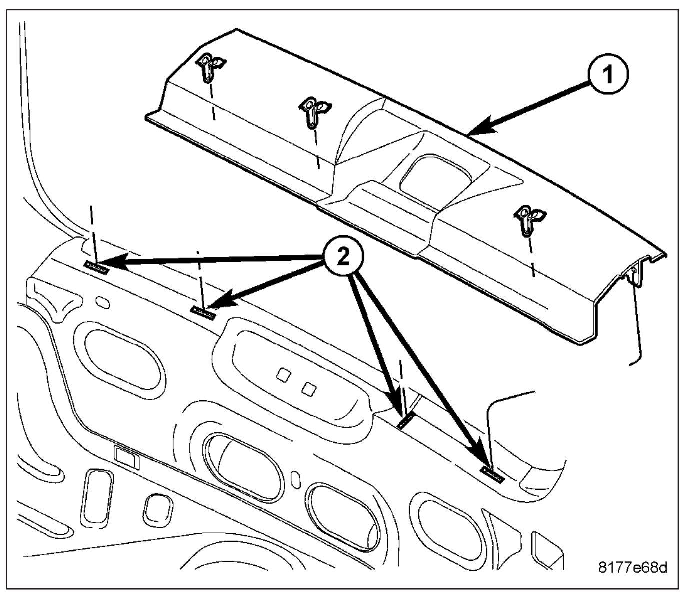
REMOVAL

1. Using trim stick C-4755 or equivalent, pry up on each scuff plate clip location hole (2).
2. Remove scuff plate (1).



INSTALLATION

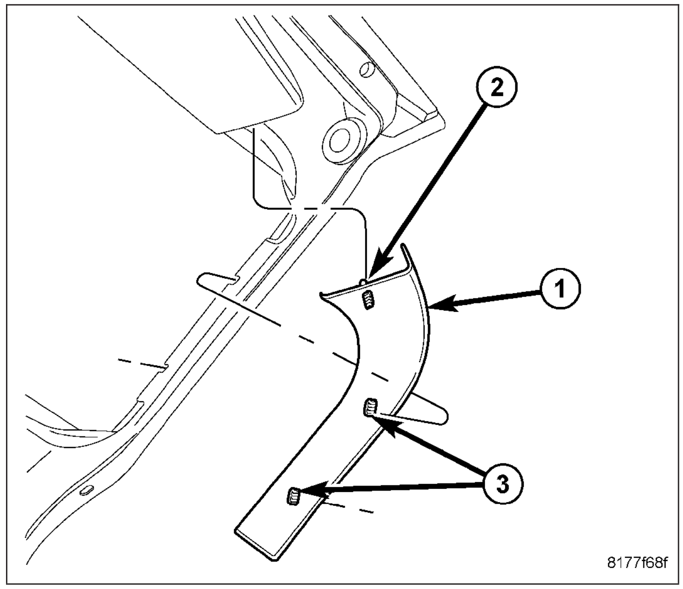
1. Locate trim clips and align metal clips to liftgate inner.
2. Tap on panel at each trim clip location (2) until properly seated.



LIFTGATE UPPER SIDE MOLDING

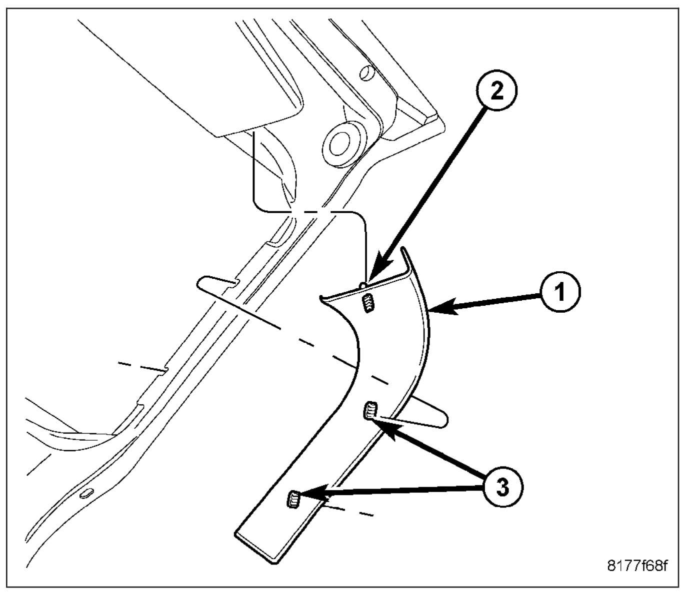
REMOVAL

1. Using trim stick C4755 or equivalent, pry up at each clip location.
2. Remove upper side trim.



INSTALLATION

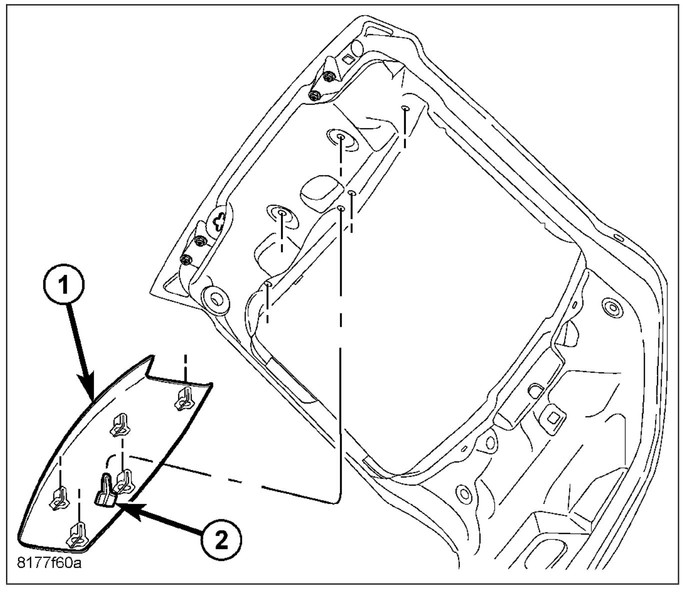
1. Locate and align metal clips to holes in liftgate inner.
2. Start at top clip (2) and work downward to bottom clips (3).
3. Tap on panel at each clip location until side trim (1) is properly seated.



LIFTGATE UPPER MOLDING

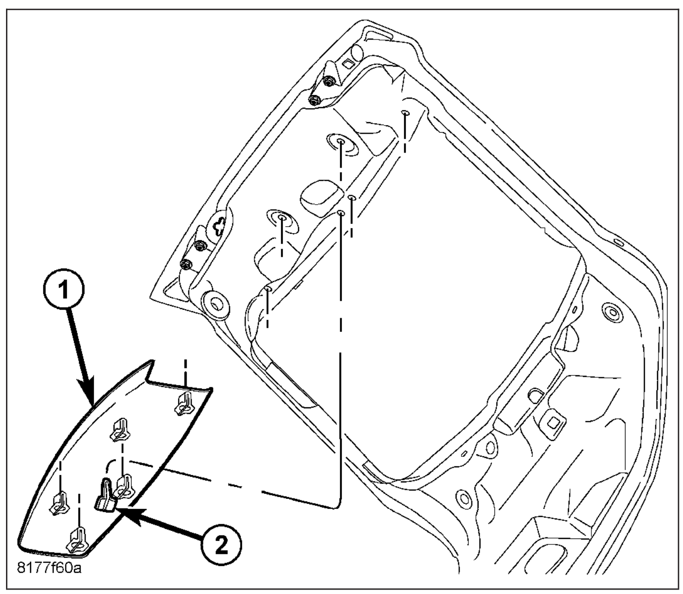
REMOVAL

1. Using trim stick C-4755 or equivalent, pry up on upper trim(1) ensuring trim tabs disengage.
2. Remove from vehicle.



INSTALLATION

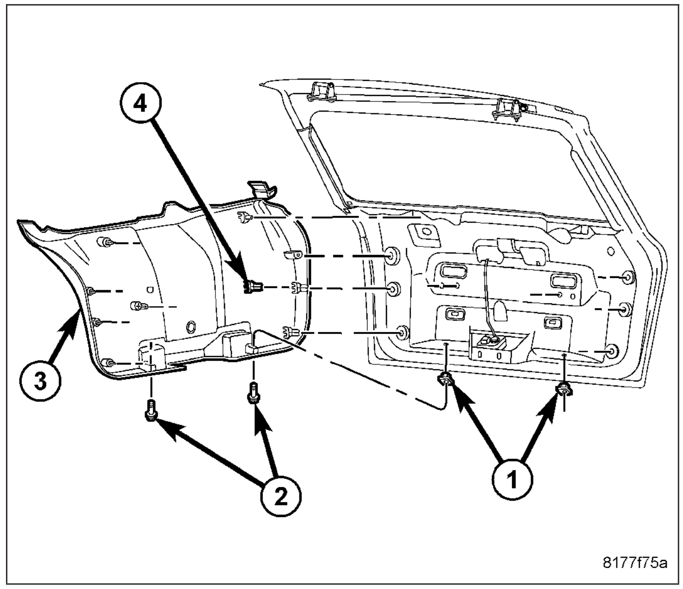
1. Align molding tabs (2) with holes in liftgate.
2. Hand tap trim (1) onto liftgate holes at clip locations.



LOWER LIFTGATE TRIM W/OUT SPEAKER

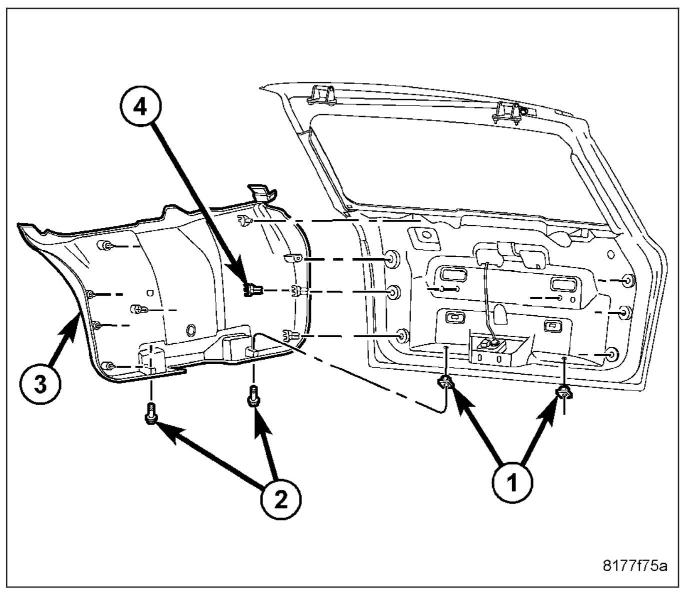
REMOVAL

1. Remove upper liftgate molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - REMOVAL)
2. Remove liftgate upper side molding. (Refer to 23 - BODY/INTERIOR/LGATE UPPER SIDE MOLDING - REMOVAL)
3. Remove liftgate screws (2) from liftgate nuts (1).
4. Using special tool C-4755, pry up liftgate trim tabs (4) from liftgate.
5. Remove lower liftgate trim (3) from vehicle.



INSTALLATION

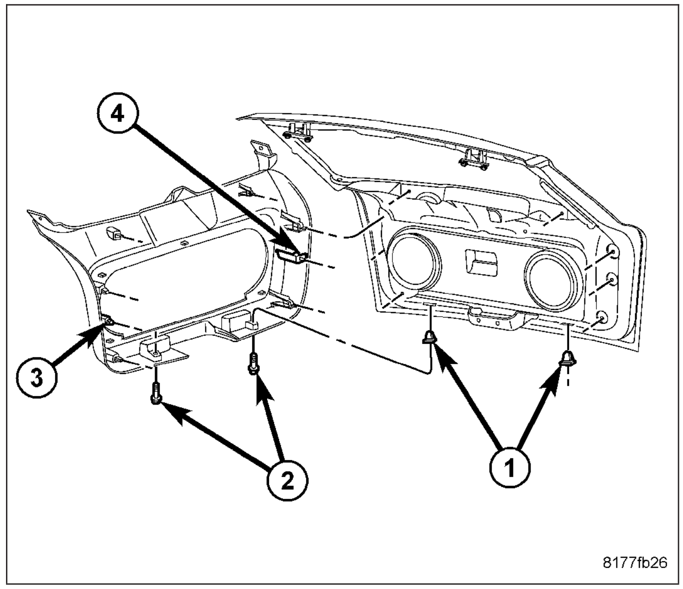
1. Align lower liftgate trim tabs (4) with liftgate holes.
2. Hand tap liftgate panel ensuring liftgate tabs are properly seated.
3. Install liftgate screws (2) into liftgate nuts (1).
4. Install upper side molding. (Refer to 23 - BODY/INTERIOR/LGATE UPPER SIDE MOLDING - INSTALLATION)
5. Install upper liftgate molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - INSTALLATION)



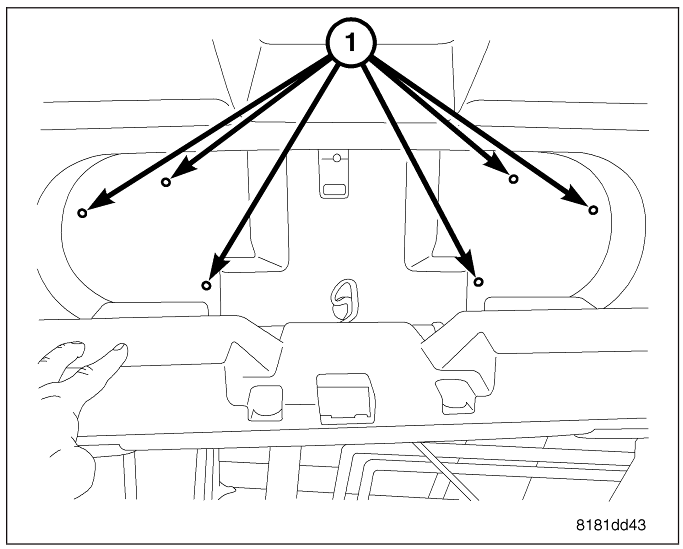
LOWER LIFTGATE TRIM W/ SPEAKER

REMOVAL

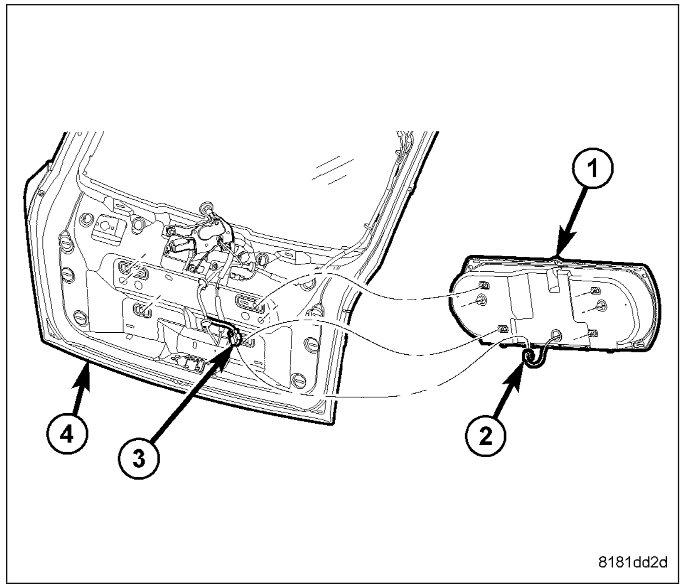
1. Remove trim panel fasteners (2).
2. Using trimstick C-4755, pry up on trim panel and remove trim panel from liftgate.



3. Remove six speaker fasteners.



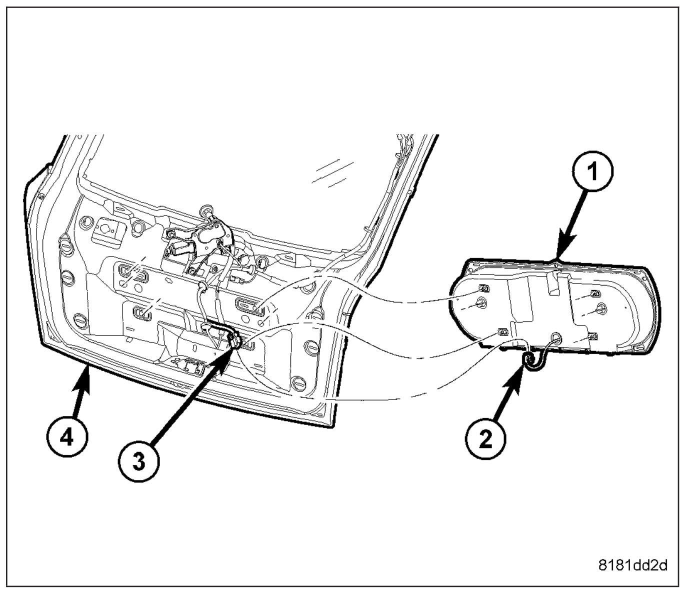
4. Disconnect speaker wire from harness.



8181dd2d

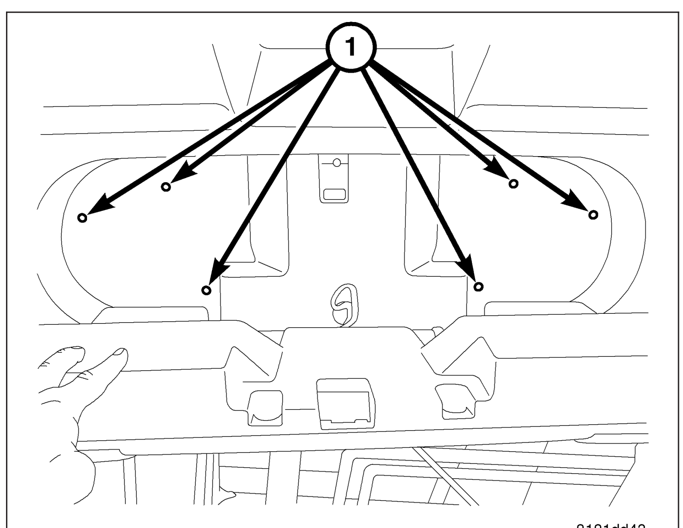
INSTALLATION

1. Connect speaker connector to wire harness.



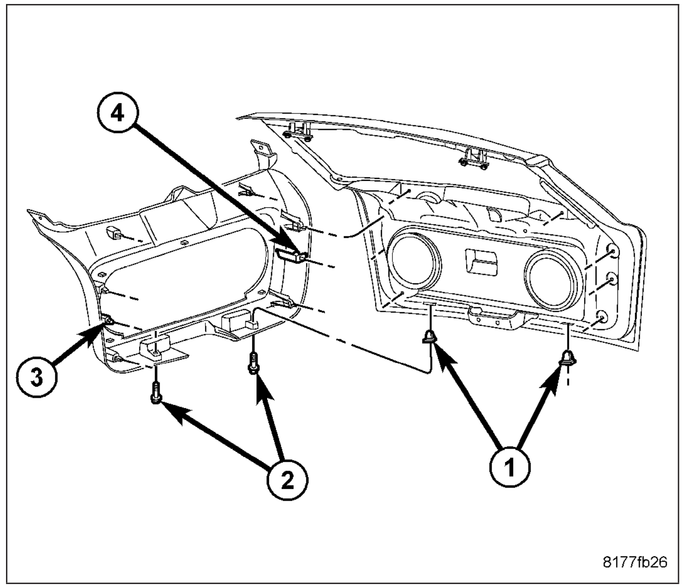
8181dd2d

2. Fasten speaker to liftgate.



8181dd43

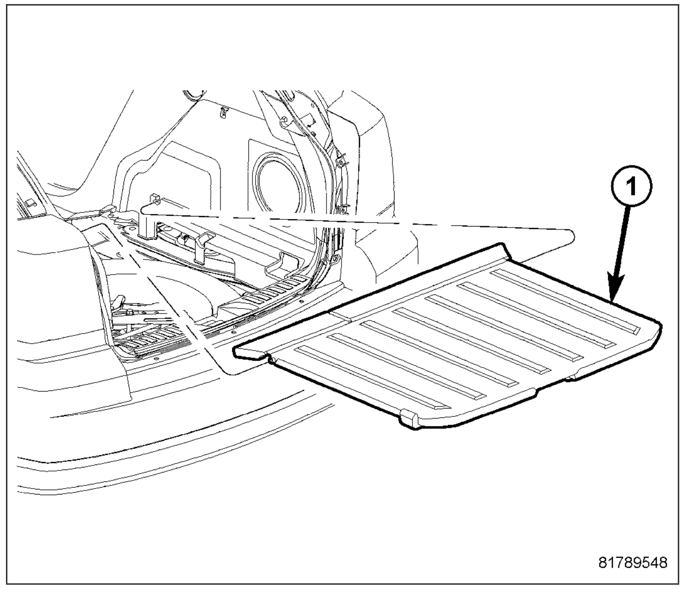
3. Align trim panel to liftgate holes and install trim panel fasteners.



COVER ASSEMBLY CARGO FLOOR

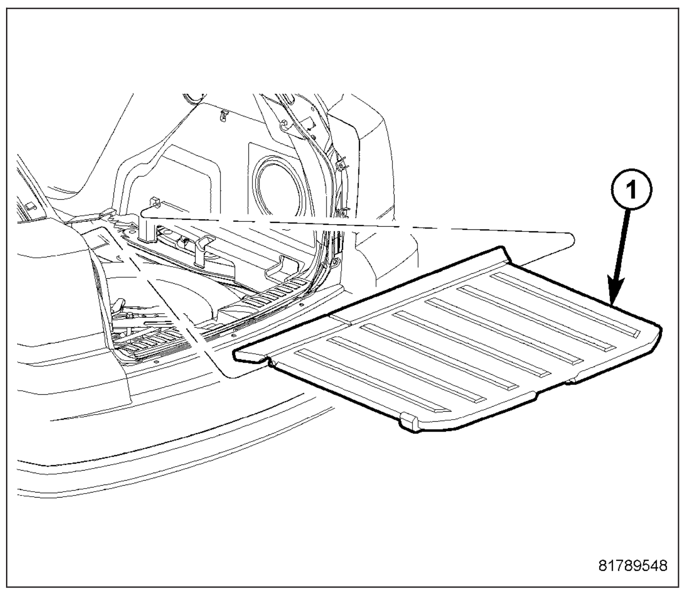
REMOVAL

1. Pull upward on cargo load floor (1) disengaging tabs.
2. Pull outward at rear of cargo load floor removing cargo load floor disengaging cargo load floor from rear quarter panel pockets.
3. Remove from vehicle.



INSTALLATION

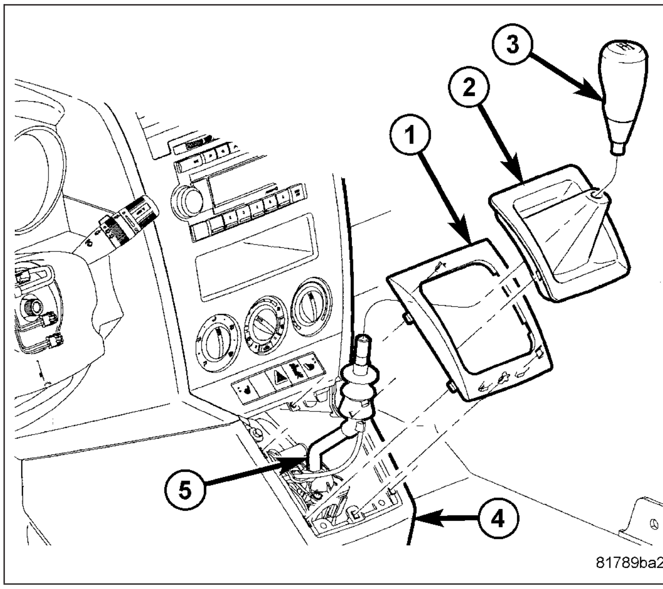
1. Load cargo load floor (1) into vehicle, ensuring cargo load floor pivots fit into pockets onto the rear quarter trim panel.
2. Once rear cargo load floor pivots are properly seated into pockets, snap down the front cargo load floor tabs ensuring cargo load floor is seated.



SHIFT BEZEL - MANUAL

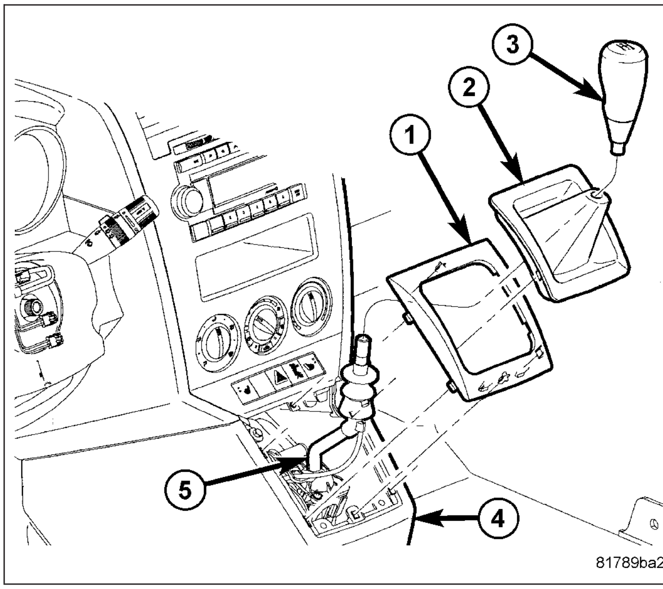
REMOVAL

1. Pull up on shifter knob (3) and remove.
2. Using trim stick C-4755 or equivalent, pry up on bezel (1) and remove from shifter pod (4).



INSTALLATION

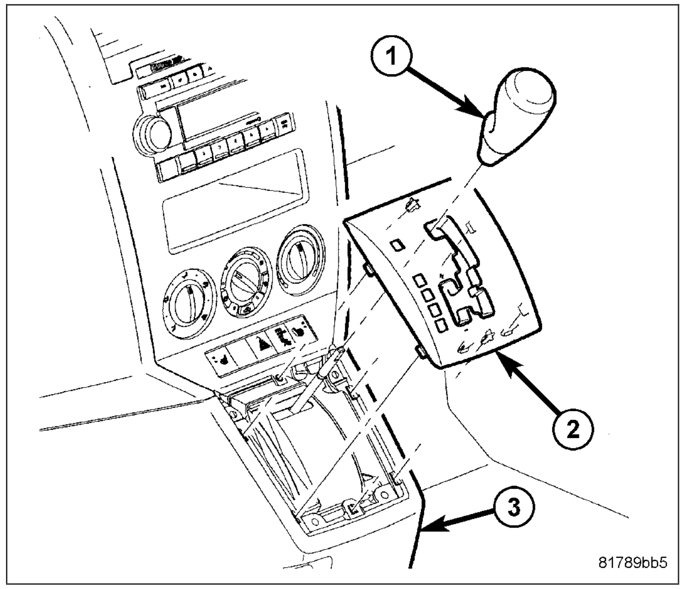
1. Locate bezel (1) over shifter lever (5) and into shifter pod (4).
2. Insert bezel locator to shifter pod (4).
3. Apply hand pressure to bezel (1) until clips are seated.
4. Slide boot (2) over shift lever (5) to bezel (1).
5. Apply hand pressure to snap bottom of boot (2) into bezel (1).
6. Snap shifter knob (3) onto shifter lever (5).
7. Pull up on know to verify seated correctly.



SHIFT BEZEL- AUTOMATIC

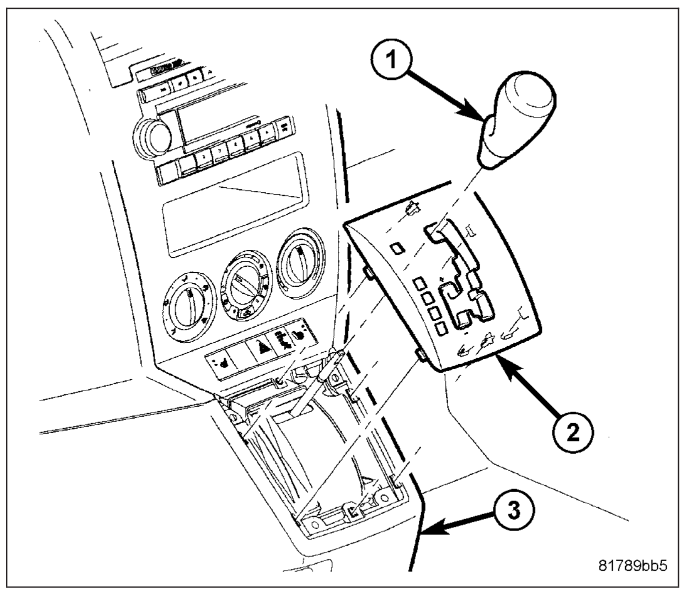
REMOVAL

1. Pull up on shifter knob (1) and remove.
2. Using trim stick C-4755 or equivalent, pry up on bezel (2) and remove from shifter pod (3).



INSTALLATION

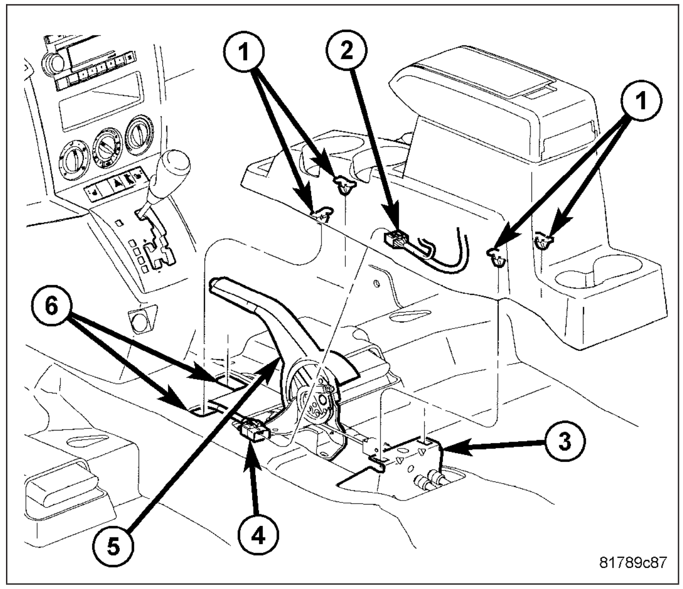
1. Insert bezel (2) locator to shifter pod (3).
2. Apply hand pressure until clips are seated.
3. Snap shifter knob (1) onto shifter shaft.
4. Pull up on knob (1) to verify seated correctly.



CENTER CONSOLE

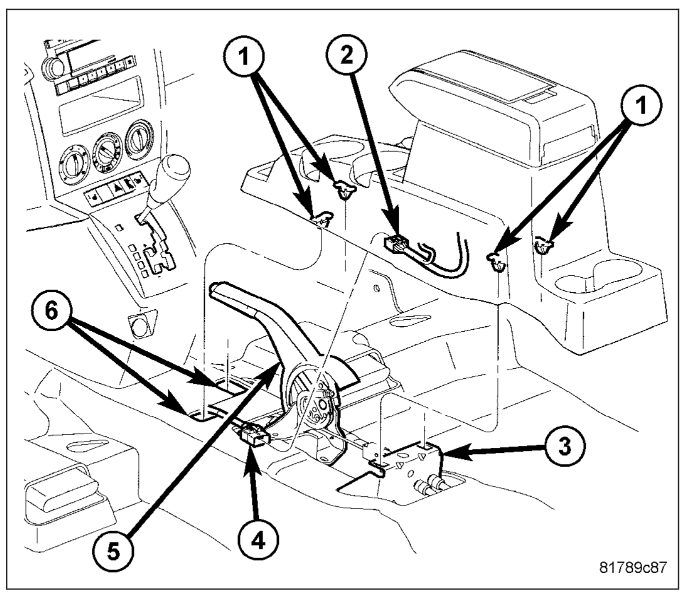
REMOVAL

1. Pull back on parking brake (5) to the upright position.
2. Remove front screws (1) fastening center console to front floor bracket (6).
3. Open console door and remove two screws (1) fastening console to rear floor bracket (3).
4. Disconnect center console wire connector (2) to instrument panel connector.
5. Remove from vehicle.



INSTALLATION

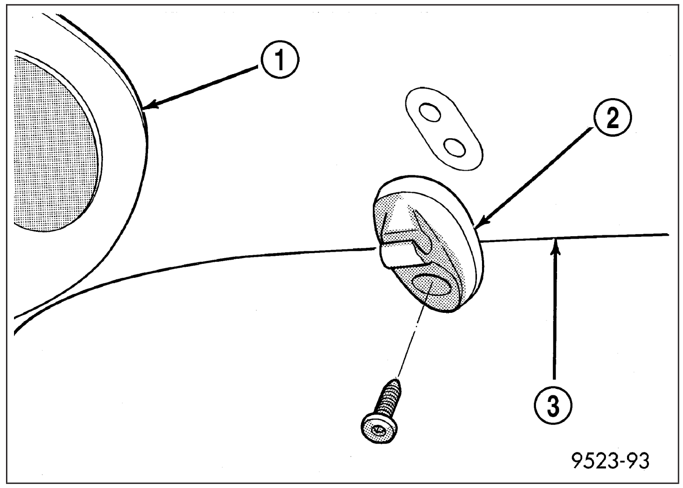
1. Pull parking brake (5) into upright position.
2. Insert center console over parking brake.
3. Connect console wiring connector (2) to instrument panel connector (4).
4. Insert and fasten two front screws (1) into front floor bracket (6).
5. Insert and fasten two rear screws (1) into rear floor bracket (3).



SUPPORT-VISOR

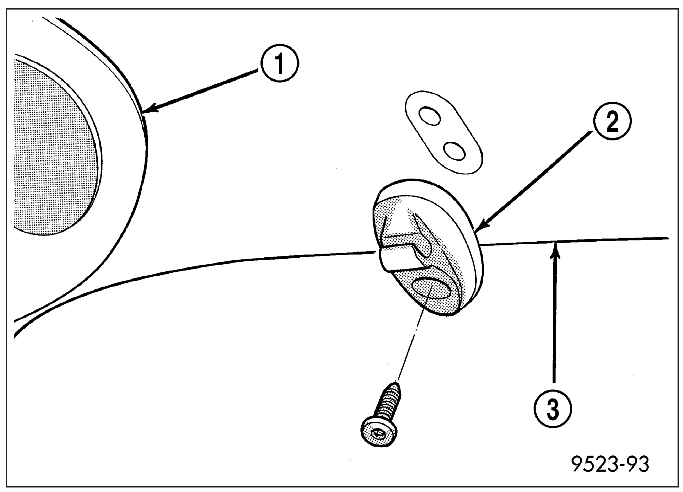
REMOVAL

1. Disengage the sun visor (1) from the sun visor support (2).
2. Remove the screw that secures the support to the roof panel and remove the support from the headliner (3).



INSTALLATION

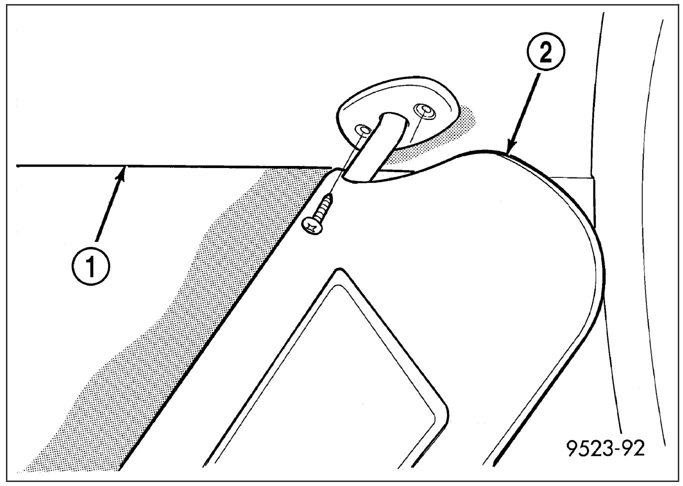
1. Position the sun visor support (2) on the headliner (3) and install the screw that secures the support to the roof panel.
2. Engage the sun visor (1) and sun visor support.



SUN VISOR

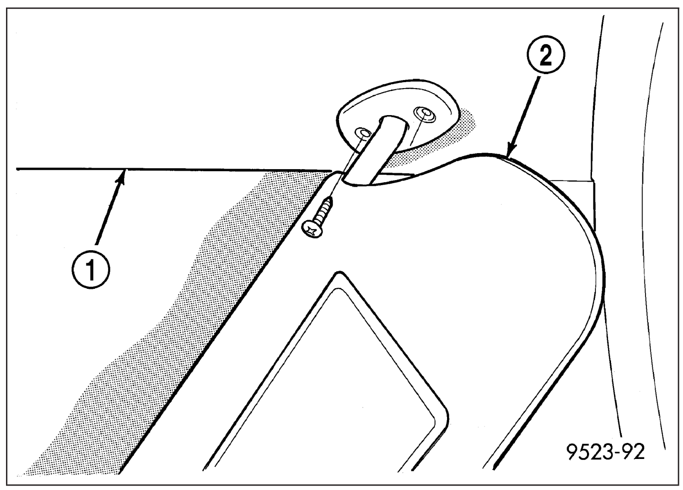
REMOVAL

1. Disengage the sun visor (2) from the sun visor support.
2. Remove the two screws that secure the sun visor to the roof panel and remove the sun visor from the headliner (1).
3. If equipped, disconnect the illuminated vanity mirror wire harness connector.



INSTALLATION

1. If equipped, connect the illuminated vanity mirror wire harness connector.
2. Position the sun visor (2) on the headliner (1) and install the two screws that secure the sun visor to the roof panel.
3. Engage the sun visor and sun visor support.



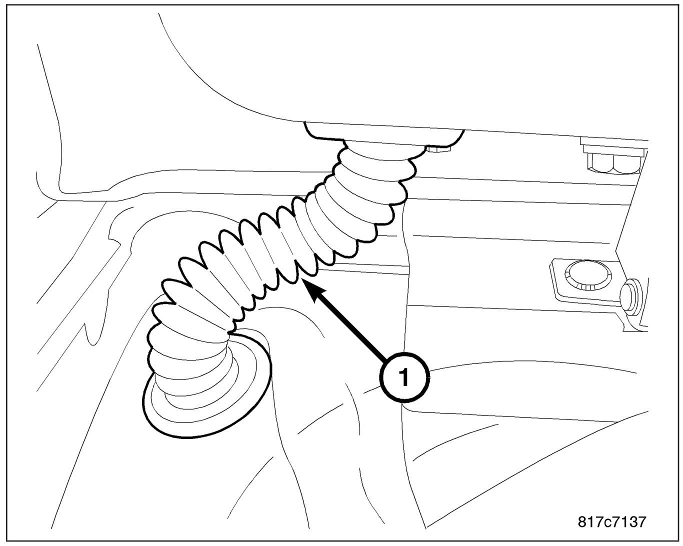
LIFTGATE

TABLE OF CONTENTS

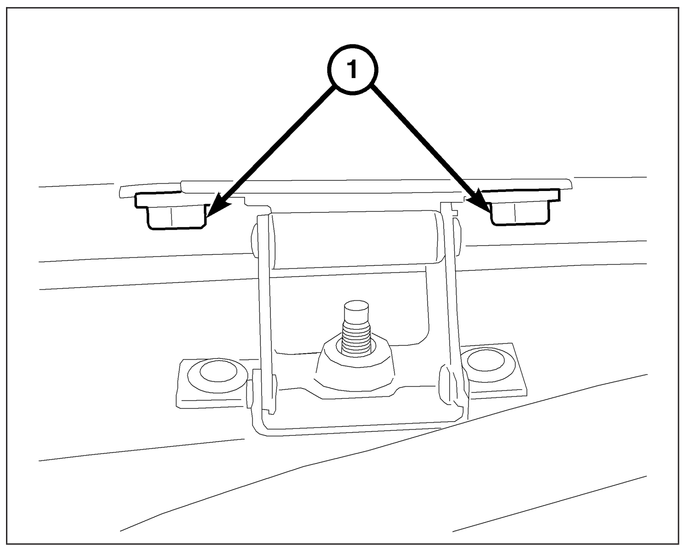
HINGE

REMOVAL

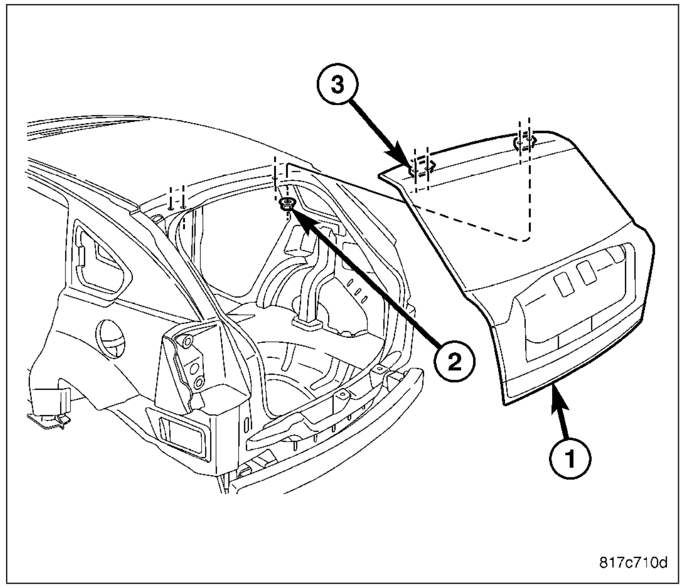
1. Release liftgate latch and open liftgate.
2. Disconnect liftgate harness and washer hose..
3. Support liftgate with a suitable lifting device in the full open position on the side of the vehicle being serviced.



4. Remove the two screws that secure the liftgate hinge (1) to the liftgate.

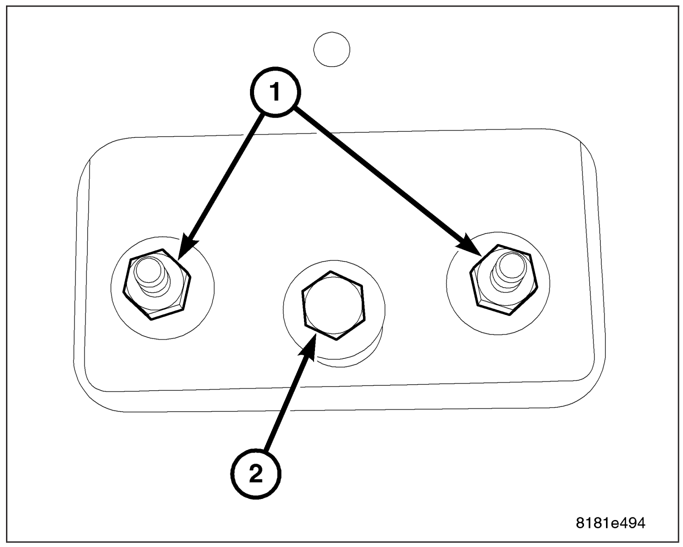


5. Remove liftgate (1) from hinge (3).



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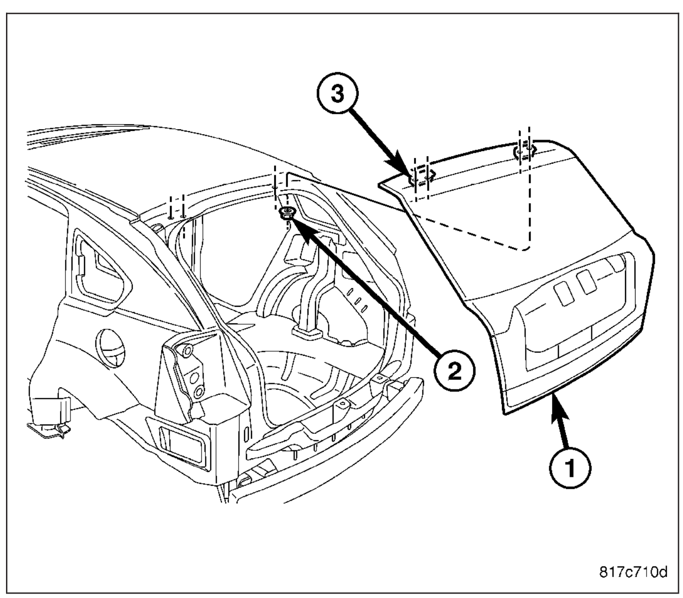
6. Carefully, move down headliner and remove two nuts and one fastener. Remove hinge from vehicle.



8181e494

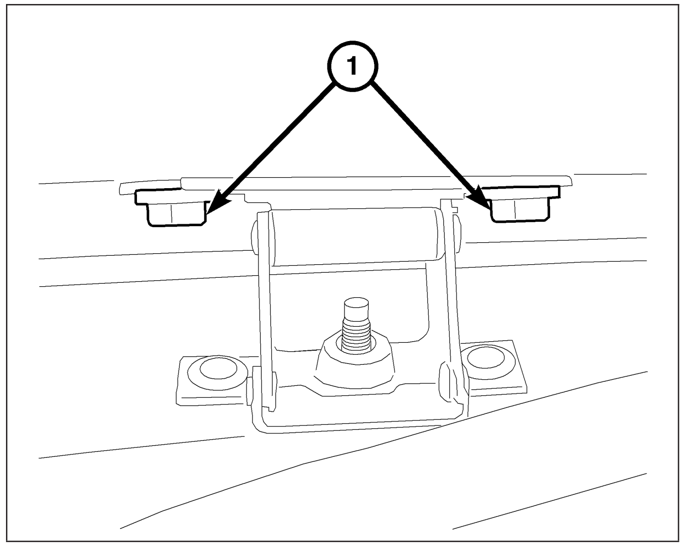
INSTALLATION

1. With the help of an assistant, align liftgate (1) with liftgate hinge (3).

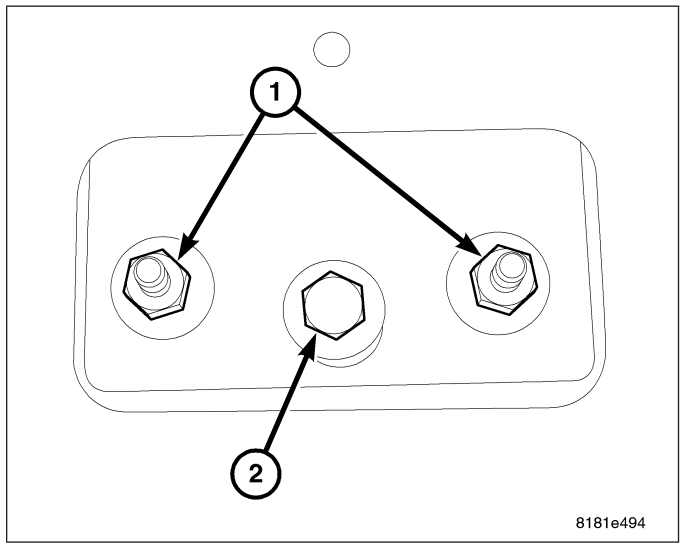


817c710d

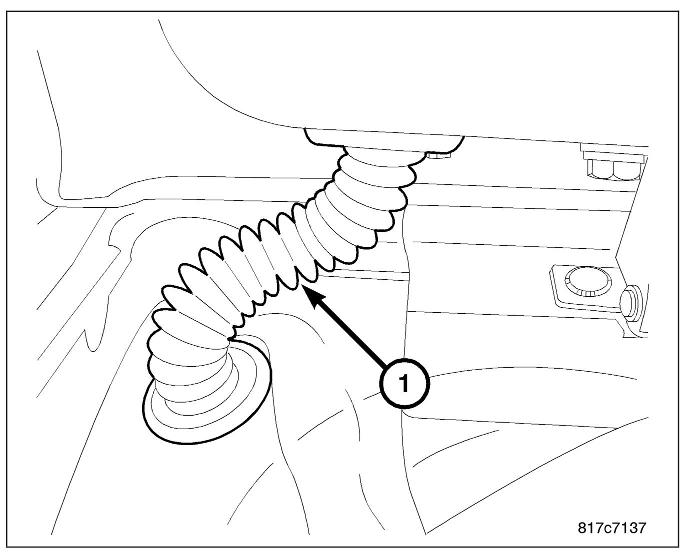
2. Carefully, pry down headliner and install fastener, washers and nuts.



3. Tighten nuts 20 N·m (15 ft. lbs).
4. Install gas props.



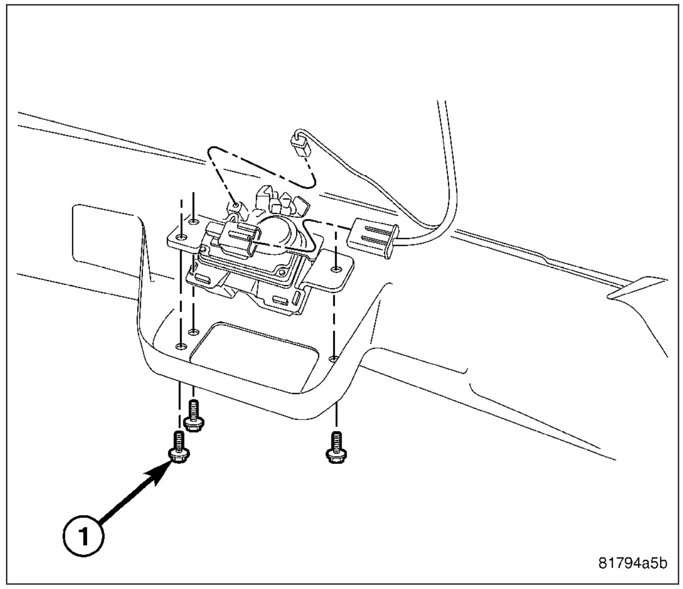
5. Connect liftgate harness (1).



LATCH

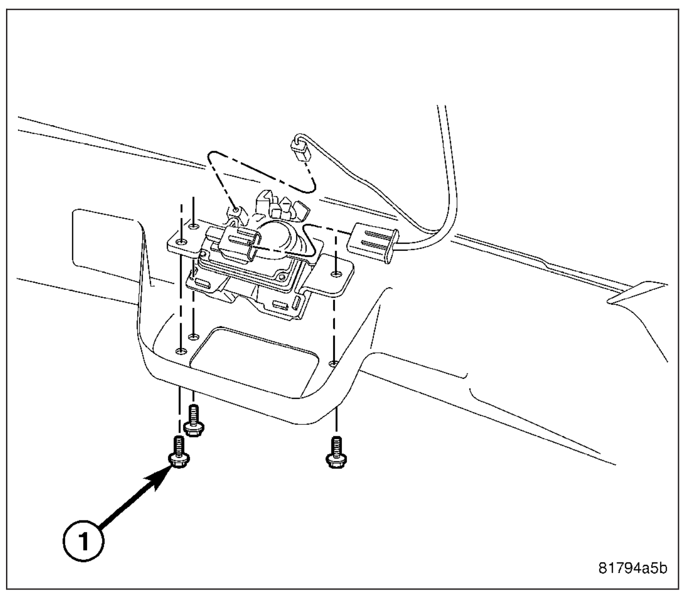
REMOVAL

1. Remove three fasteners (1).
2. Disconnect wire connectors.
3. Disconnect cable from outer handle hole.
4. Disconnect cable from latch.



INSTALLATION

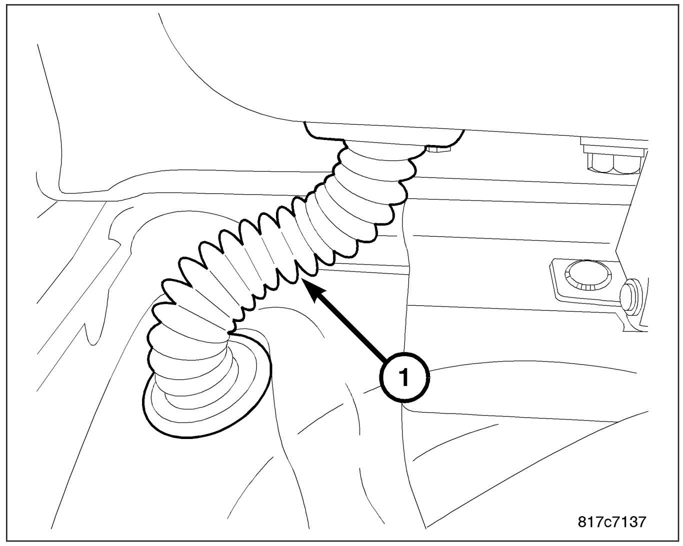
1. Connect wire connectors.
2. Install latch assembly into liftgate pocket.
3. Install three fasteners (1).
4. Tighten fasteners to 8 N·m (6 ft. lbs.).
5. Install cable fastener to liftgate inner while working the cable upward.
6. Guide cable upward through opening and tuck into the outer handle hole.



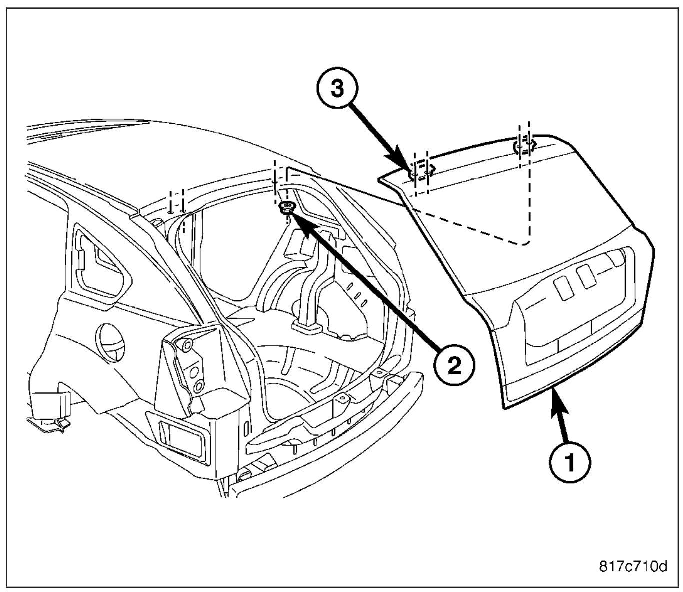
LIFTGATE

REMOVAL

1. Open liftgate.
2. Disconnect washer hose.
3. Disconnect liftgate harness (1).
4. Disconnect cable from handle.
5. With the help from an assistant, support liftgate and disconnect Prop rods. (Refer to 23 - BODY/ DECKLID/HATCH/LIFTGATE/TAILGATE/PROP ASSEMBLY - REMOVAL)

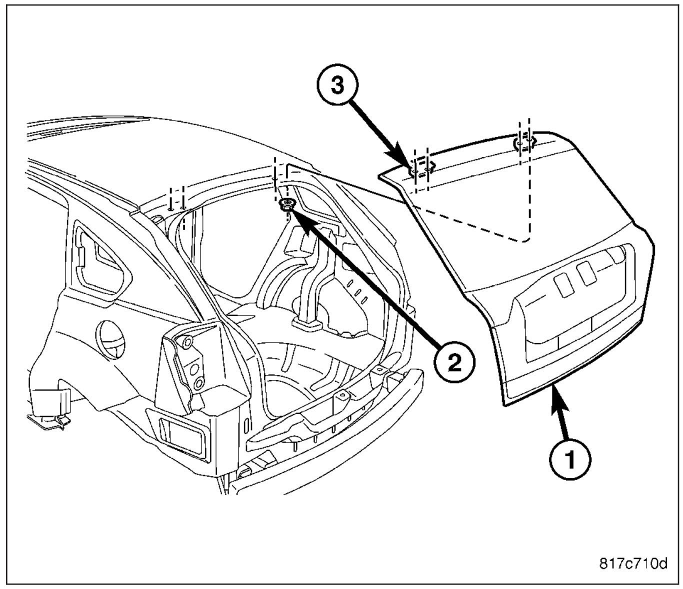


6. Remove fasteners (2) attaching liftgate (1) to liftgate hinge (3).

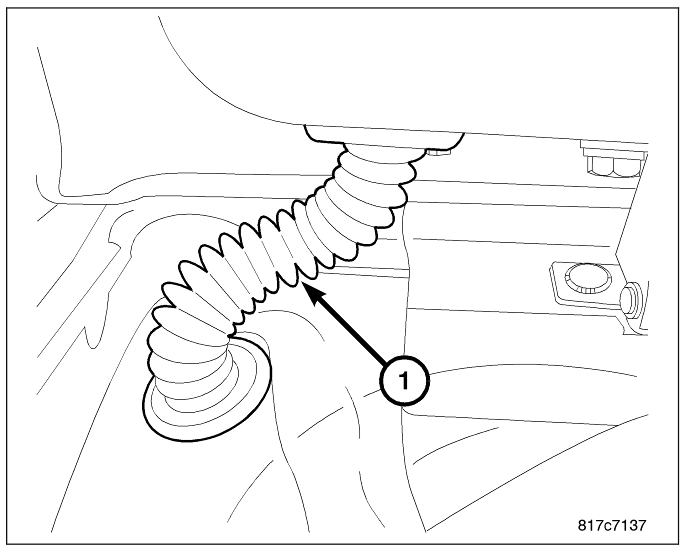


INSTALLATION

1. With the help of an assistant, place liftgate (1) onto liftgate hinges (3).
2. Torque nuts (2) to 15 N ·m (11 ft. lbs).
3. Install prop rods. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/PROP ASSEMBLY - INSTALLATION)



4. Install liftgate harness (1).
5. Install washer hose.



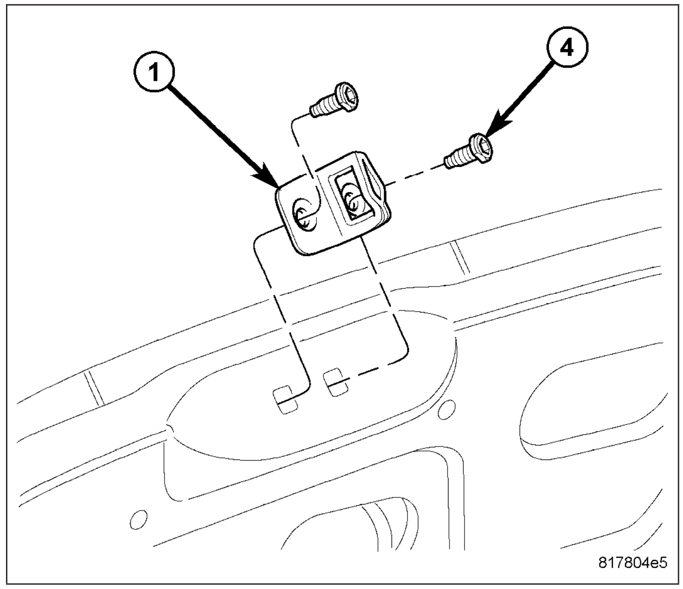
STRIKER

REMOVAL

1. Open the liftgate.
2. Remove the liftgate sill scuff plate (Refer to 23 - BODY/INTERIOR/SCUFF PLATE-LIFTGATE SILL - REMOVAL).

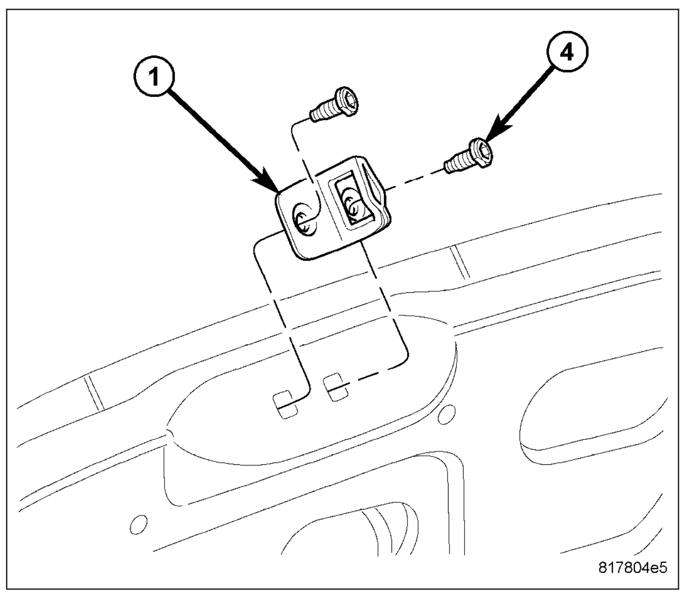
NOTE: Place a reference mark along the outer edge of the striker to ensure it is reinstalled to its original position.

3. Mark the position of the striker (1) on the liftgate opening lower panel to aid installation.
4. Remove the two screws (4) that secure the striker to the lower panel and remove the striker.



INSTALLATION

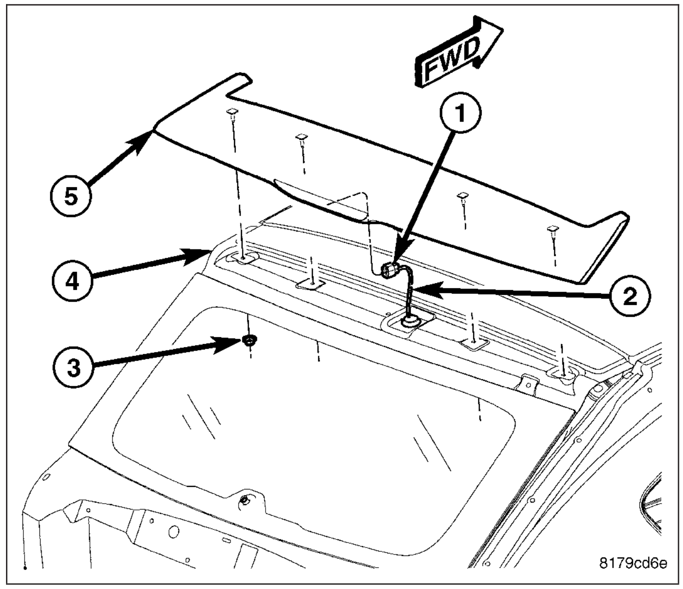
1. Position the liftgate striker (1) onto the liftgate opening lower panel and align the striker to the previously marked location.
2. Install the two bolts (4) that secure the striker to the lower panel. Tighten the bolts to 23 N·m (17 ft. lbs.).
3. Verify liftgate alignment and latch operation. The liftgate should fit flush and have even gaps to adjacent body panels. Gap specifications are as follows:
   - 7 mm (0.280 in.) to the fascia.
   - 6 mm (0.240 in.) to the roof header.
   - 4 mm (0.160 in.) to the body side.
4. Install the liftgate sill scuff plate (Refer to 23 - BODY/INTERIOR/SCUFF PLATE-LIFTGATE SILL - INSTALLATION).



LIFTGATE- SPOILER

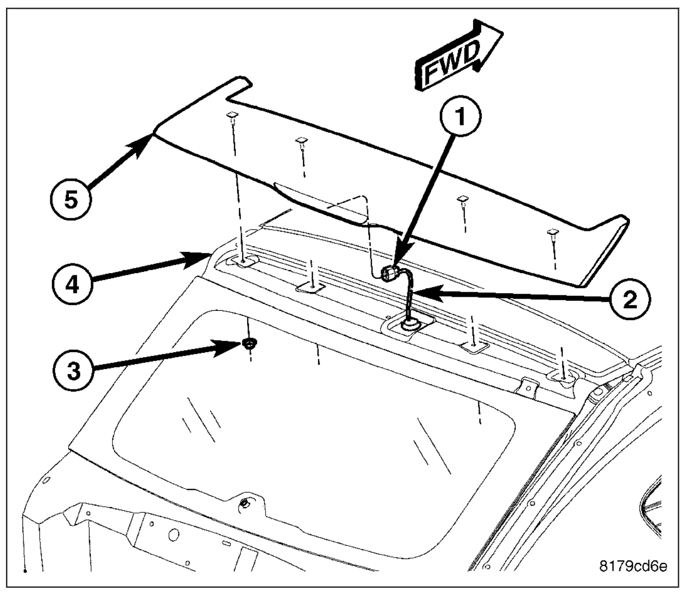
REMOVAL

1. Open liftgate.
2. Remove liftgate upper molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - REMOVAL)
3. Remove 5 body plugs.
4. Remove nuts (3) on spoiler studs.
5. If equipped, remove satellite wire (2) connector (1).
6. Remove spoiler (5) from vehicle (4).



INSTALLATION

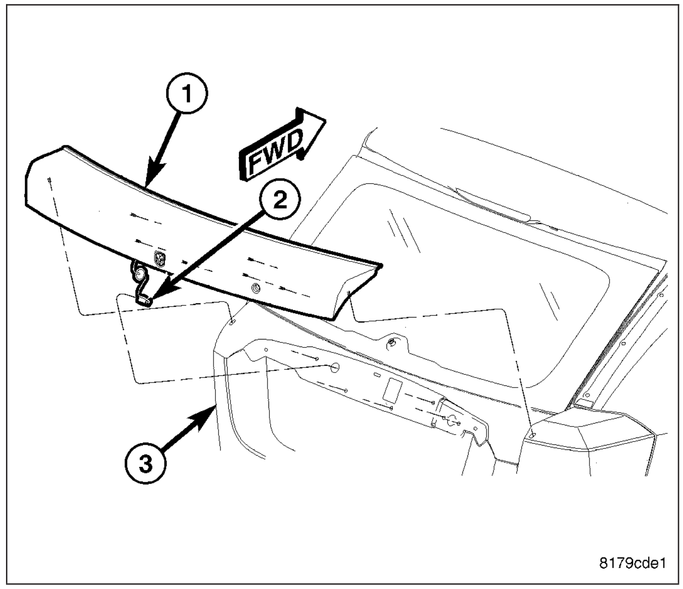
1. If equipped, connect satellite wire (2) connector (1).
2. Replace seal if necessary.
3. Place spoiler (5) onto vehicle (4).
4. Install spoiler nuts onto spoiler studs.
5. Install spoiler plugs.
6. Install liftgate upper molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - INSTALLATION)



LIGHT BAR

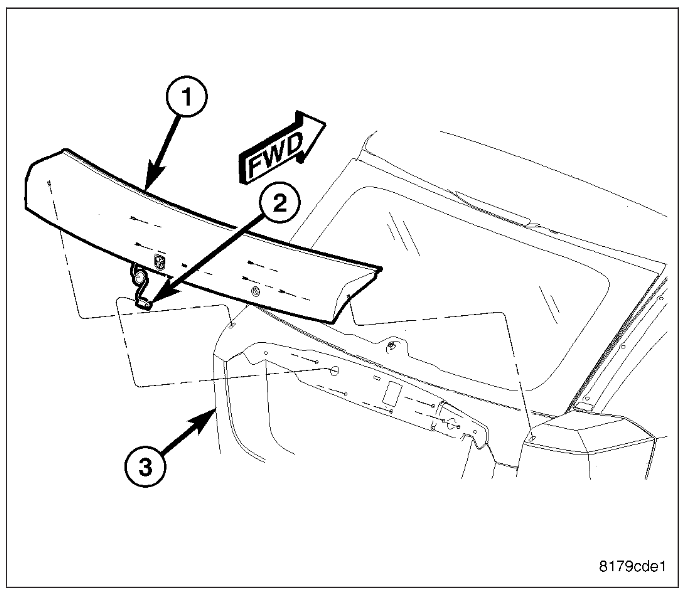
REMOVAL

1. Remove liftgate upper molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - REMOVAL)
2. Remove liftgate upper side molding. (Refer to 23 - BODY/INTERIOR/LGATE UPPER SIDE MOLDING - REMOVAL)
3. Remove liftgate lower molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL)
4. Remove nuts from light bar studs.
5. Disconnect wire connector.
6. Disconnect cable from handle.



INSTALLATION

1. Connect wire connector (2).
2. Connect cable to light bar handle.
3. Align light bar studs through liftgate holes.
4. Install nuts to light bar studs.
5. Install liftgate lower trim panel. (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION)
6. Install liftgate side moldings. (Refer to 23 - BODY/INTERIOR/LGATE UPPER SIDE MOLDING - INSTALLATION)
7. Install liftgate upper molding. (Refer to 23 - BODY/INTERIOR/LIFTGATE UPPER MOLDING - INSTALLATION)



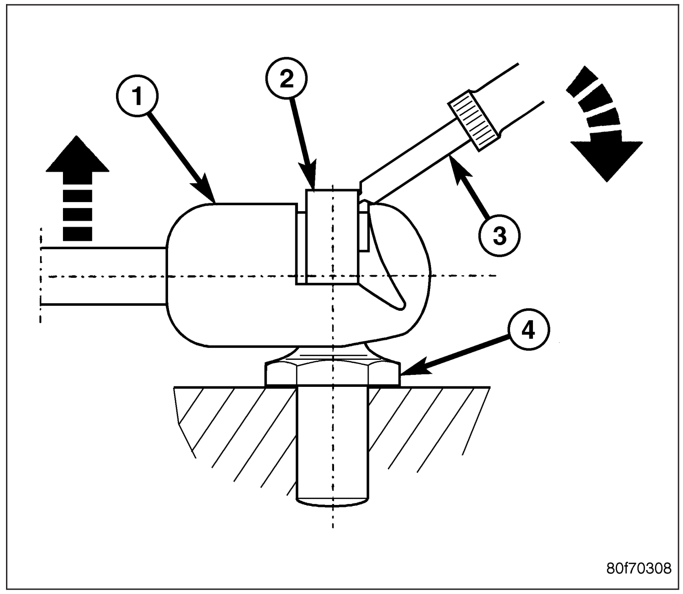
PROP ROD ASSEMBLY

REMOVAL

1. Open the liftgate and support.
2. Using a small flat bladed tool, or equivalent, release the retaining clips while pulling the ball socket away from the ball stud.

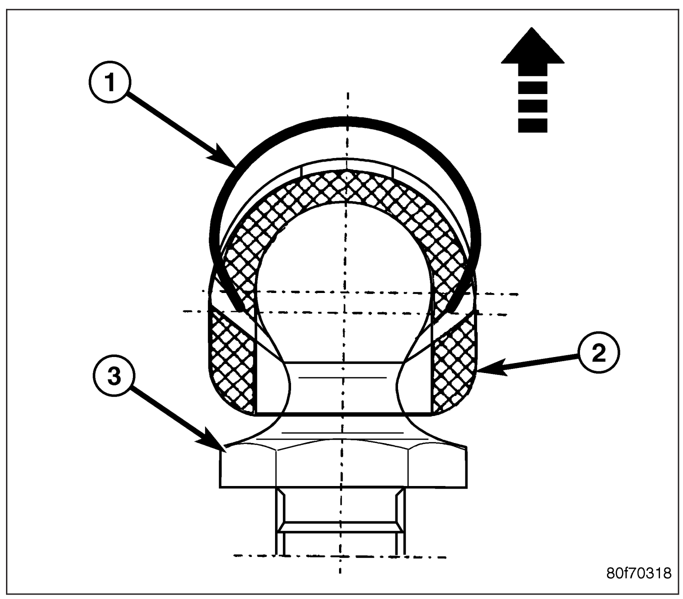
NOTE: Lift the clips only enough to release the ball studs.

3. Remove the support cylinder.



INSTALLATION

1. Make sure the retaining clips are seated into the ball socket (2) fully.
2. Install the support cylinder over the ball studs with the thin end connected to the liftgate and the retaining clips snapping into place.



PAINT

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PAINT

SPECIFICATIONS - PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE
Inferno Red Crystal Pearlcoat	ARH
Solar Yellow	VYH
Sunburst Orange Pearlcoat	DV6
Marine Blue Pearlcoat	CB6
Steel Blue Metallic Clearcoat	DBM
Bright Silver Metallic Clearcoat	WS2
Black Clearcoat	DX8
Stone White Clearcoat	SW1

INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER CODE
Dark Slate Gray/Pastel Slate Gray	DA
Dark Pebble Beige/Pastel Pebble Beige	KA

BASECOAT/CLEARCOAT FINISH

DESCRIPTION

On most vehicles a two-part paint application (basecoat/clearcoat) is used. Color paint that is applied to primer is called basecoat. The clearcoat protects the basecoat from ultraviolet light and provides a durable high-gloss finish.

CAUTION: Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result. Do not use harsh alkaline based cleaning solvents on painted surfaces. Damage to finish or color can result.

PAINT CODE

DESCRIPTION

Exterior vehicle body colors are identified on the Body Code plate. (Refer to VEHICLE DATA/VEHICLE INFORMATION/BODY CODE PLATE - DESCRIPTION). The paint code is also identified on the Vehicle Safety Certification Label which is located on the drivers door shut face. The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat. The codes listed in the Color Code Chart are used for manufacturing purposes.

PAINT TOUCH-UP

DESCRIPTION

When a painted metal surface has been scratched or chipped, it should be touched up as soon as possible to avoid corrosion. For best results, use Mopar® Scratch Filler/Primer, Touch Up Paints and Clear Top Coat. (Refer to VEHICLE DATA/VEHICLE INFORMATION/BODY CODE PLATE - DESCRIPTION).

WARNING: Use an osha approved respirator and safety glasses when spraying paint or solvents in a confined area. Personal injury can result.

TOUCH UP PROCEDURE

1. Scrape loose paint and corrosion from inside scratch or chip.
2. Clean affected area with Mopar® Tar/Road Oil Remover, and allow to dry.
3. Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the scratch or chip without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.
4. Cover the filler/primer with color touch up paint. Do not overlap touch up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch up paint to dry hard.
5. On vehicles without clearcoat, the touch up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.
6. On vehicles with clearcoat, apply clear top coat to touch up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

FINESSE SANDING/BUFFING & POLISHING

DESCRIPTION

Minor acid etching, orange peel, or smudging in clearcoat or single-stage finishes can be reduced with light finesse sanding, hand buffing, and polishing. **If the finish has been finesse sanded in the past, it cannot be repeated. Finesse sanding operation should be performed by a trained automotive paint technician.**

CAUTION: Do not remove clearcoat finish, if equipped. Basecoat paint must retain clearcoat for durability.

SEATS

TABLE OF CONTENTS

SEATS

WARNING

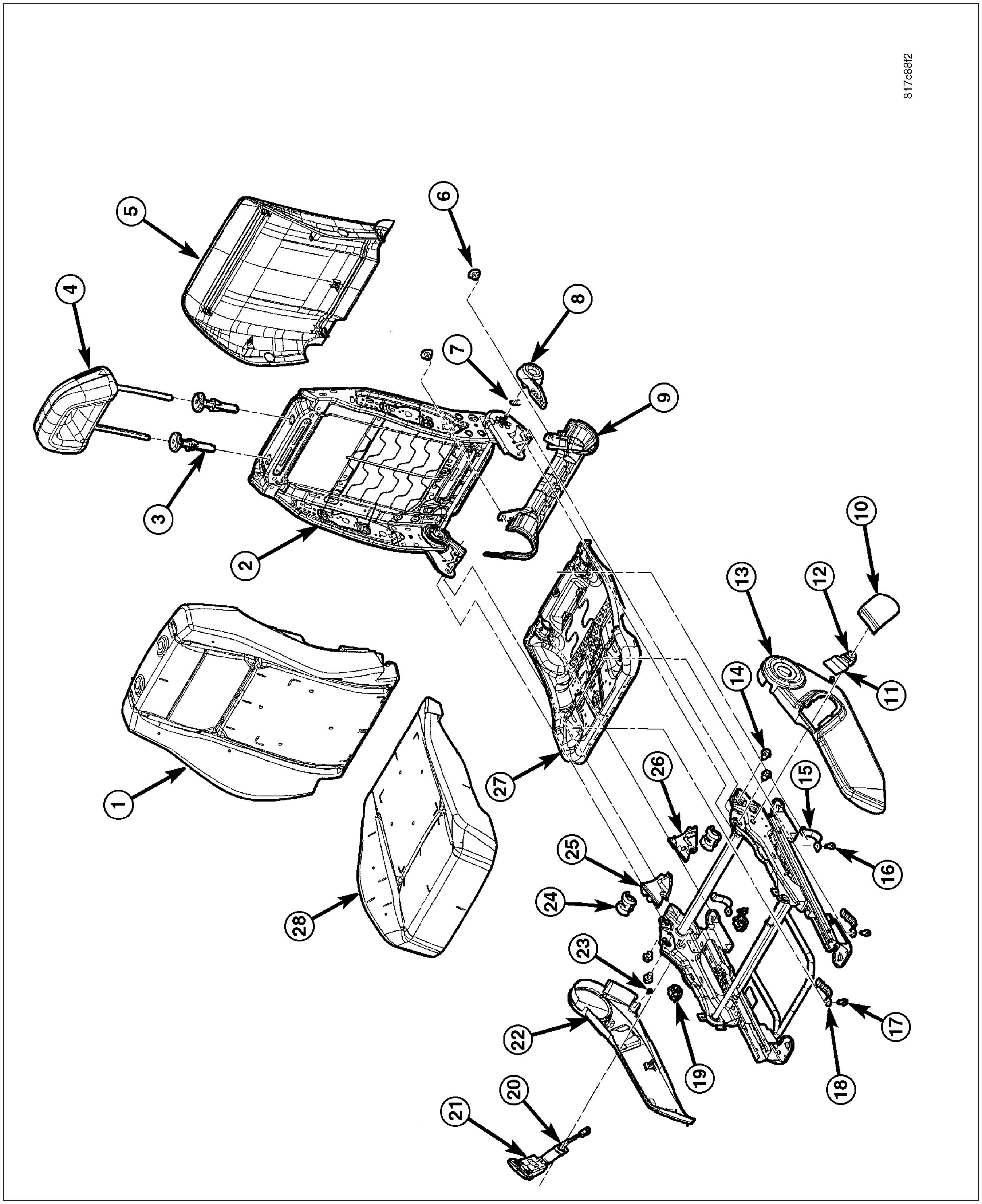
RESTRAINT SYSTEM

WARNING:

- **During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar ™parts catalog. Failure to follow these instructions may result in personal injury or death.**
- **On vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment. Failure to follow these instructions may result in personal injury or death.**
- **On vehicles equipped with airbags, before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the Occupant Restraint Controller (ORC). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components. Failure to follow these instructions may result in personal injury or death.**
- **Replace all restraint system components only with parts specified in the DaimlerChrysler Mopar™ parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection. Failure to follow these instructions may result in personal injury or death.**
- **The fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the DaimlerChrysler Mopar ™parts catalog. Failure to follow these instructions may result in personal injury or death.**
- **On vehicles equipped with the Occupant Classification System (OCS), do not hang any after market devices from the front passengers seat back. Do not install a front drivers seat back cover with map pocket onto the passenger seat. Failure to follow these instructions may result in personal injury or death.**
- **The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.**
- **The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.**
- **When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.**

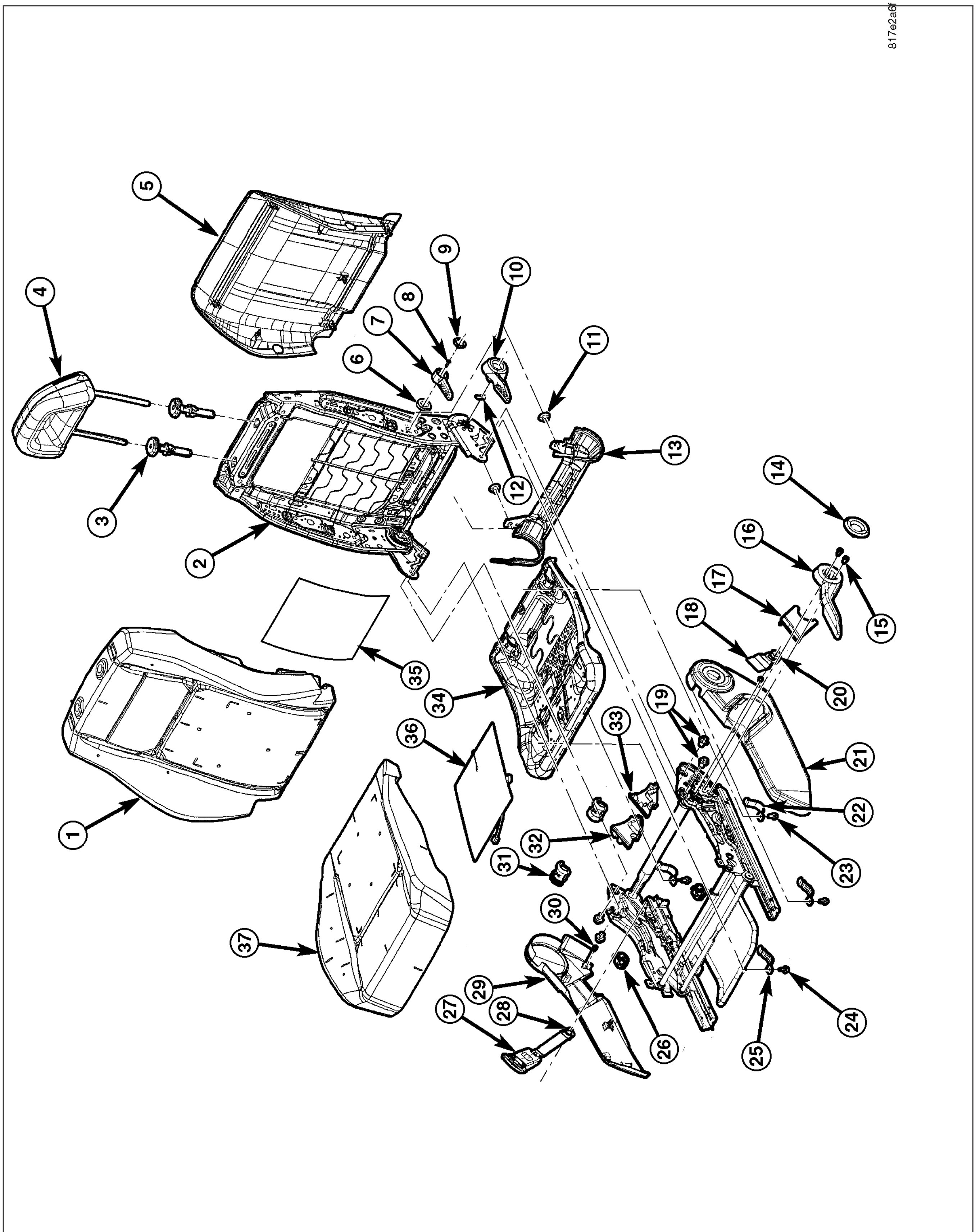
SEAT - FRONT

DESCRIPTION



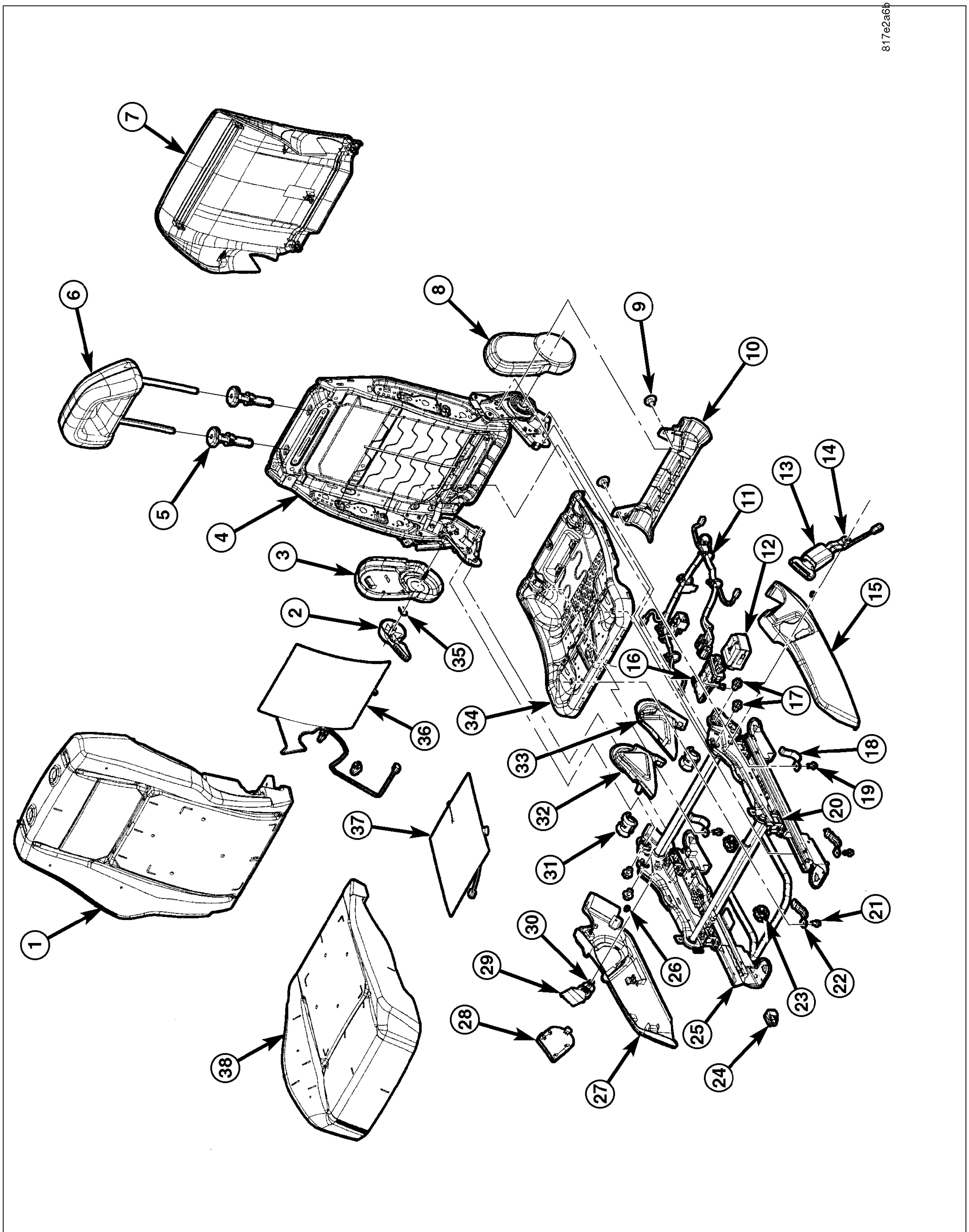
2-WAY DRIVER SEAT

1 - SEAT BACK CUSHION/COVER	15 - SEAT CUSHION STRAPS - REAR (2)
2 - SEAT BACK FRAME	16 - SEAT CUSHION STRAP BOLTS - REAR (2) 11 N·m (8 ft. lbs.)
3 - HEADREST SLEEVES	17 - SEAT CUSHION STRAP BOLTS - FRONT (2) 11 N·m (8 ft. lbs.)
4 - HEADREST	18 - SEAT CUSHION STRAPS - FRONT (2)
5 - SEAT BACK TRIM PANEL	19 - SEAT CUSHION STRAP BUSHINGS - FRONT (2)
6 - PUSH PIN FASTENERS (2)	20 - SEAT BELT BUCKLE BOLT 45 N·m (33 ft. lbs.)
7 - RECLINER HANDLE RETAINER CLIP	21 - SEAT BELT BUCKLE
8 - RECLINER HANDLE	22 - INBOARD SIDE SHIELD - OUTER
9 - SUB PANEL BASE TRIM	23 - SIDE SHIELD SCREWS (one per side)
10 - SEAT BELT ANCHOR TRIM	24 - SEAT CUSHION STRAP BUSHINGS - REAR (2)
11 - SEAT BELT ANCHOR	25 - INBOARD SIDE SHIELD - INNER
12 - SEAT BELT ANCHOR BOLT 47 N·m (35 ft. lbs.)	26 - OUTBOARD SIDE SHIELD - INNER
13 - OUTBOARD SIDE SHIELD - OUTER	27 - SEAT CUSHION PAN
14 - BACK ASSEMBLY BOLTS (4) 40 N·m (30 ft. lbs.)	28 - SEAT CUSHION/COVER



4-WAY DRIVER SEAT

1 - SEAT BACK CUSHION/COVER
2 - SEAT BACK FRAME
3 - HEADREST SLEEVES
4 - HEADREST
5 - SEAT BACK TRIM PANEL
6 - LUMBAR HANDLE GROMMET
7 - LUMBAR HANDLE
8 - LUMBAR HANDLE SCREW
9 - LUMBAR HANDLE CAP
10 - RECLINER HANDLE
11 - PUSH PIN FASTENERS (2)
12 - RECLINER HANDLE RETAINER CLIP
13 - SUB PANEL BASE TRIM
14 - LIFT HANDLE CAP
15 - LIFT HANDLE SCREWS (2)
16 - LIFT HANDLE
17 - SEAT BELT ANCHOR TRIM
18 - SEAT BELT ANCHOR
19 - BACK ASSEMBLY BOLTS (4) 40 N·m (30 ft. lbs.)
20 - SEAT BELT ANCHOR BOLT 47 N·m (35 ft. lbs.)
21 - OUTBOARD SIDE SHIELD - OUTER
22 - SEAT CUSHION STRAPS - REAR (2)
23 - SEAT CUSHION STRAP BOLTS - REAR (2) 11 N·m (8 ft. lbs.)
24 - SEAT CUSHION STRAP BOLTS - FRONT (2) 11 N·m (8 ft. lbs.)
25 - SEAT CUSHION STRAPS - FRONT (2)
26 - SEAT CUSHION STRAP BUSHINGS - FRONT (2)
27 - SEAT BELT BUCKLE
28 - SEAT BELT BUCKLE BOLT 45 N·m (33 ft. lbs.)
29 - INBOARD SIDE SHIELD - OUTER
30 - SIDE SHIELD SCREWS (one per side)
31 - SEAT CUSHION STRAP BUSHINGS - REAR (2)
32 - INBOARD SIDE SHIELD - INNER
33 - OUTBOARD SIDE SHIELD - INNER
34 - SEAT CUSHION PAN
35 - HEATING ELEMENT - SEAT BACK
36 - HEATING ELEMENT - SEAT CUSHION
37 - SEAT CUSHION/COVER

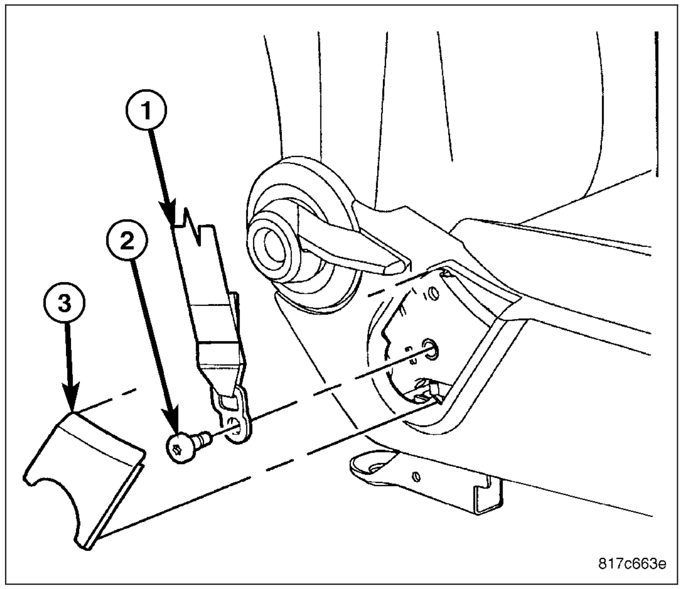


PASSENGER FOLD FLAT SEAT

1 - SEAT BACK CUSHION/COVER	20 - OCS STRAIN GAUGE (4)
2 - RECLINER HANDLE	21 - SEAT CUSHION STRAP BOLTS - FRONT (2) 11 N·m (8 ft. lbs.)
3 - OUTBOARD RECLINER SHIELD	22 - SEAT CUSHION STRAPS - FRONT (2)
4 - SEAT BACK FRAME	23 - SEAT CUSHION STRAP BUSHINGS - FRONT (2)
5 - HEADREST SLEEVES	24 - TRACK POSITION SENSOR
6 - HEADREST	25 - SEAT TRACK ASSEMBLY
7 - SEAT BACK TRIM PANEL	26 - SIDE SHIELD SCREWS (one per side)
8 - INBOARD RECLINER SHIELD	27 - OUTBOARD SIDE SHIELD - OUTER
9 - PUSH PIN FASTENERS (2)	28 - SEAT BELT ANCHOR TRIM
10 - SUB PANEL BASE TRIM	29 - SEAT BELT ANCHOR
11 - WIRE HARNESS	30 - SEAT BELT ANCHOR BOLT 47 N·m (35 ft. lbs.)
12 - HEATED SEAT MODULE	31 - SEAT CUSHION STRAP BUSHINGS - REAR (2)
13 - SEAT BELT BUCKLE	32 - OUTBOARD SIDE SHIELD - INNER
14 - SEAT BELT BUCKLE BOLT 45 N·m (33 ft. lbs.)	33 - INBOARD SIDE SHIELD - INNER
15 - INBOARD SIDE SHIELD - OUTER	34 - SEAT CUSHION PAN
16 - OCS MODULE	35 - RECLINER HANDLE RETAINER CLIP
17 - BACK ASSEMBLY BOLTS (4) 40 N·m (30 ft. lbs.)	36 - HEATING ELEMENT - SEAT BACK
18 - SEAT CUSHION STRAPS - REAR (2)	37 - HEATING ELEMENT - SEAT CUSHION
19 - SEAT CUSHION STRAP BOLTS - REAR (2) 11 N·m (8 ft. lbs.)	38 - SEAT CUSHION/COVER

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)



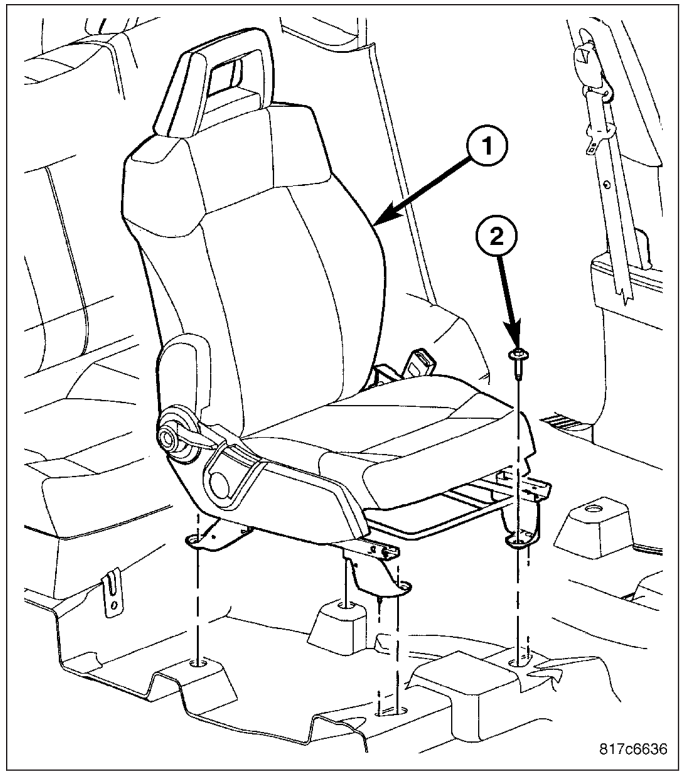
WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

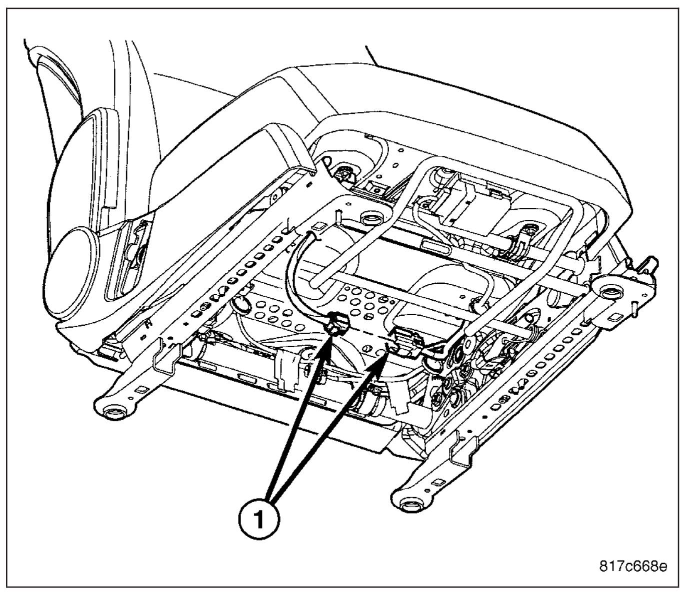
WARNING: When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2. Using a trim stick C-4755 or equivalent, remove the seat belt anchor trim (3).
3. Remove the bolt (2) and separate the seat belt anchor (1).

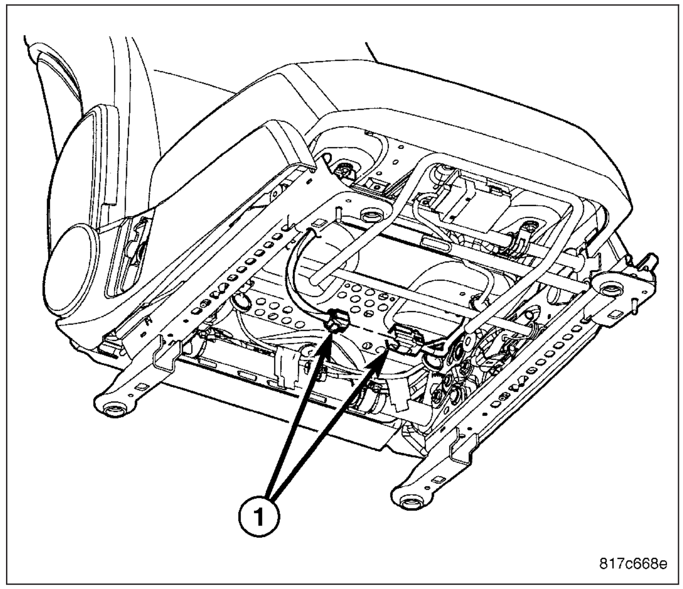
4. Remove the bolts (2).



5. Tip the seat back and disconnect the electrical connectors (1).
6. Remove the seat.



INSTALLATION



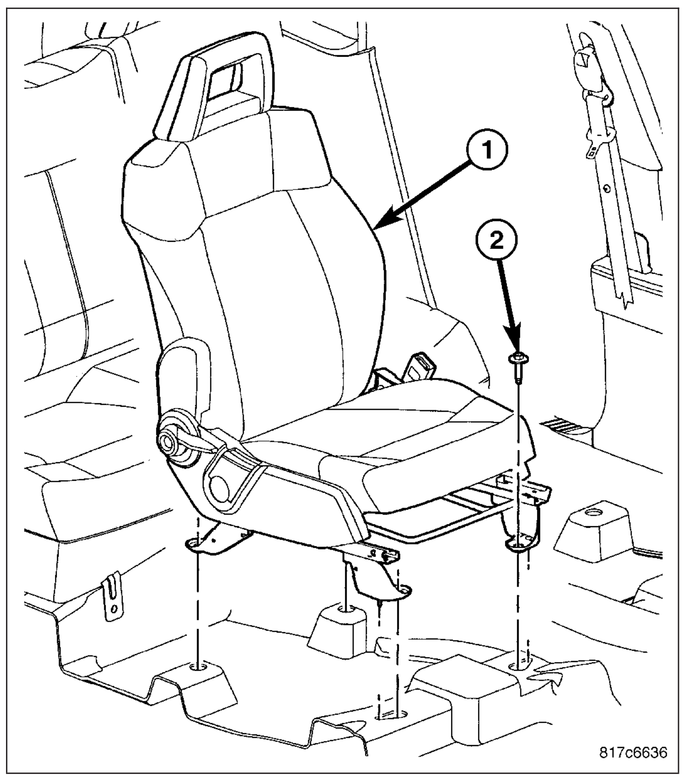
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

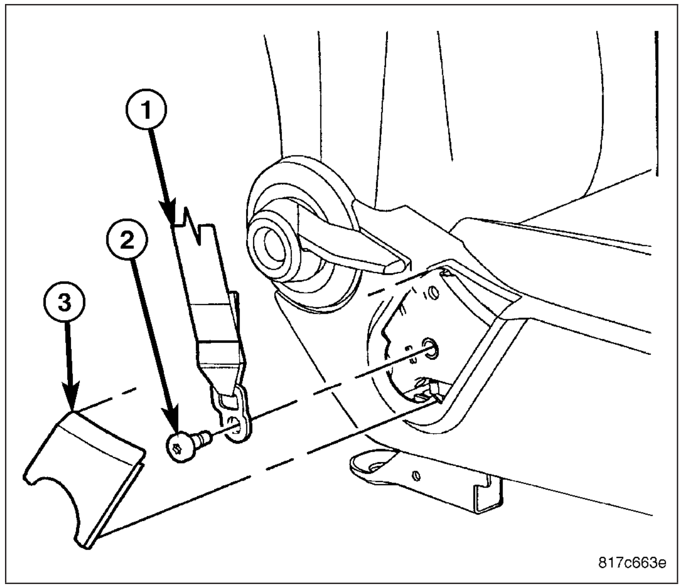
WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

WARNING: When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2. Position the seat into the vehicle and connect the electrical connectors (1), if equipped.
3. Install the bolts (2).
   a. Adjust the seat forward.
   b. Tighten the rear outboard bolt to 51 N·m (38 ft. lbs.).
   c. Tighten the rear inboard bolt to 51 N·m (38 ft. lbs.).
   d. Adjust the seat rearward.
   e. Tighten the front outboard bolt to 51 N·m (38 ft. lbs.).
   f. Tighten the front inboard bolt to 51 N·m (38 ft. lbs.).



4. Install the lower seat belt anchor (1) and install the bolt (2).
5. Tighten the bolt (2) to 39 N·m (29 ft. lbs.) and install the trim cover (3).
6. Do not reconnect the battery negative cable at this time. The occupant classification module system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - *OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST)

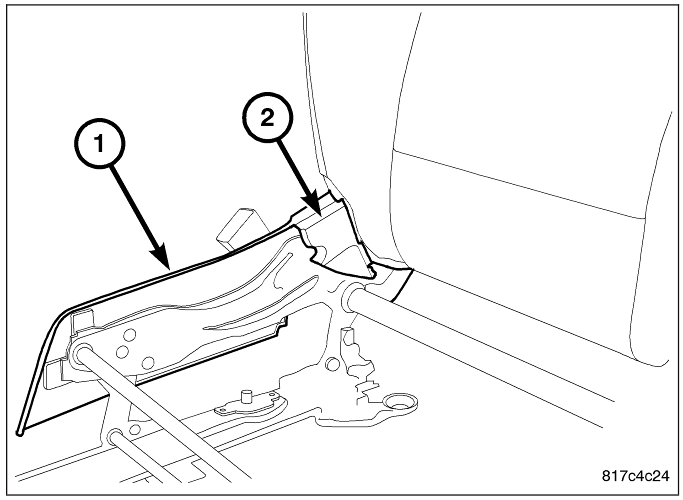


SEAT BACK - FRONT

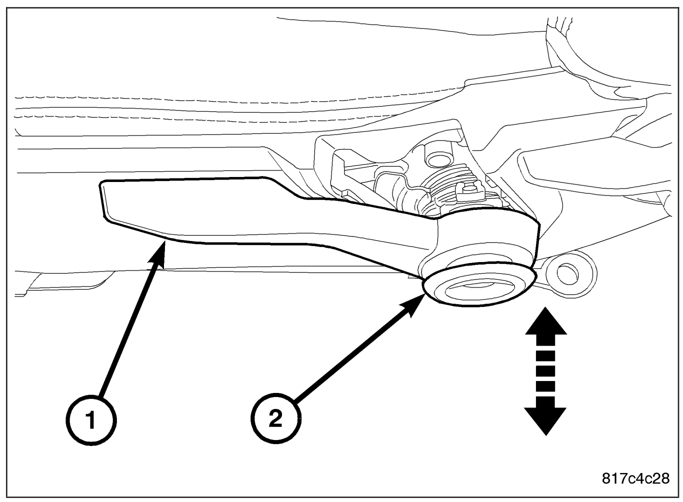
REMOVAL

Driver Seat

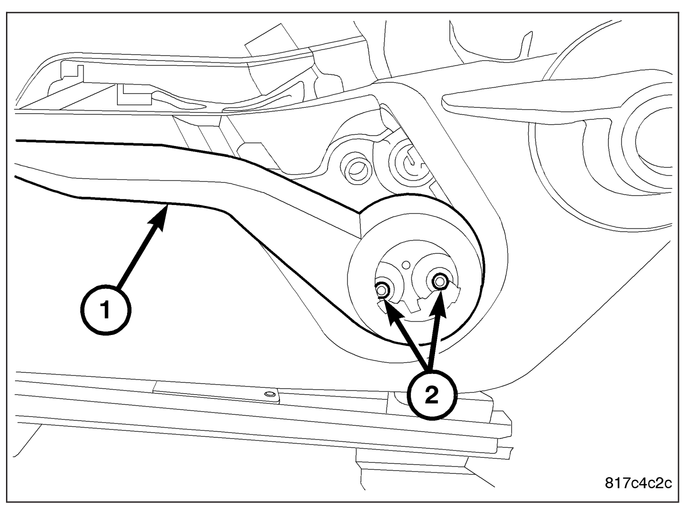
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - REMOVAL).
3. Remove both of the inner side shields (2).



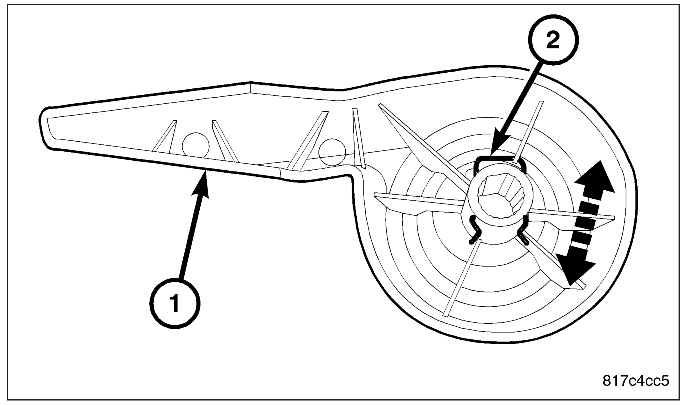
4. Remove the lift lever trim cap (2).



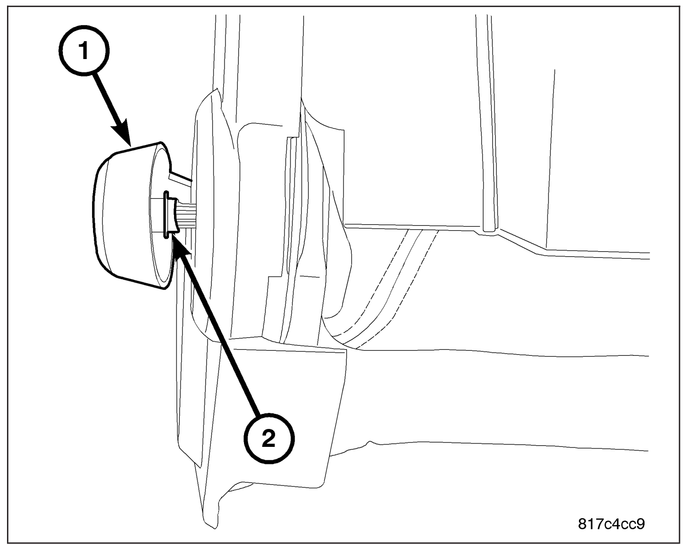
5. Remove the screws (2) and remove the lift lever (1).



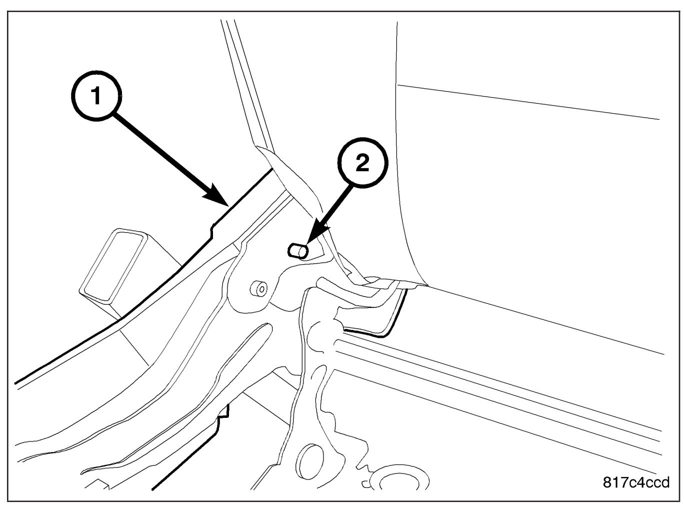
6. Separate the clip (2).



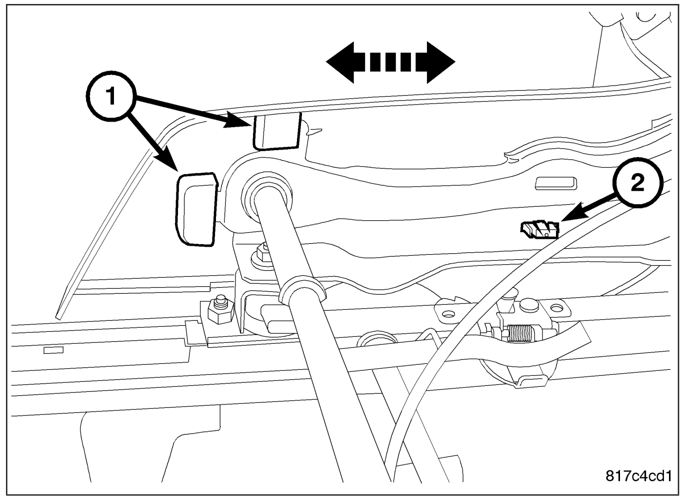
7. Remove the recliner handle (1).



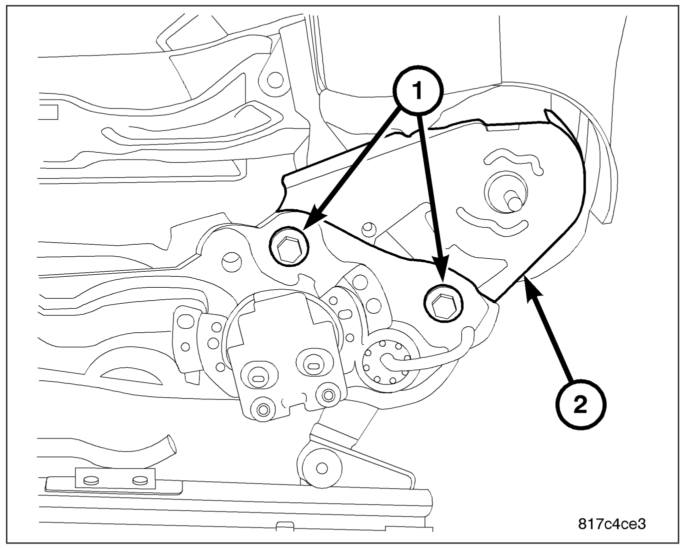
8. Remove the screws (2) attaching the inboard and outboard side shields (1) to the seat frame.



9. Separate the clip fasteners (2) and remove the side shields from the seat cushion frame tabs (1).

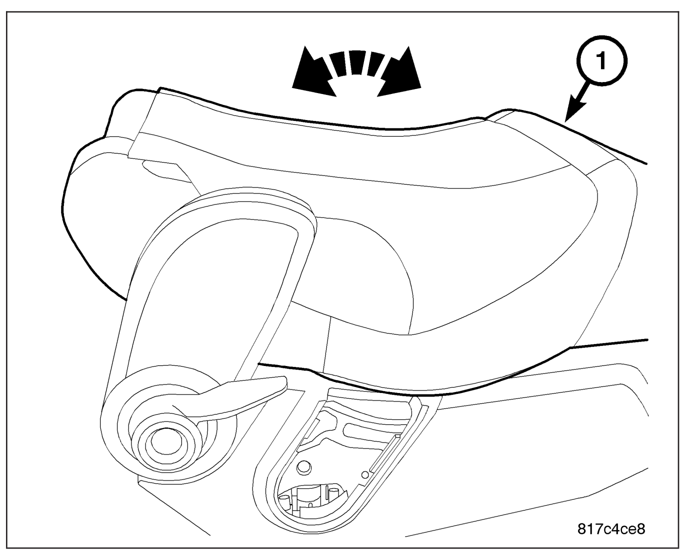


10. Remove the bolts (1) and remove the seat back assembly (2).

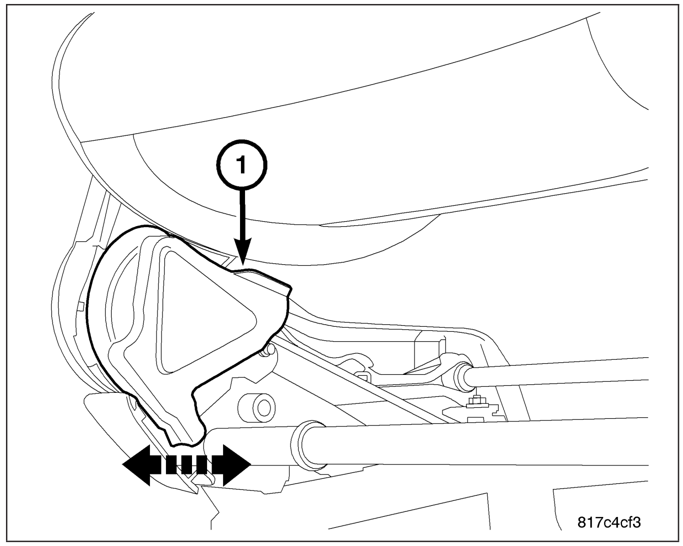


Passenger Seat

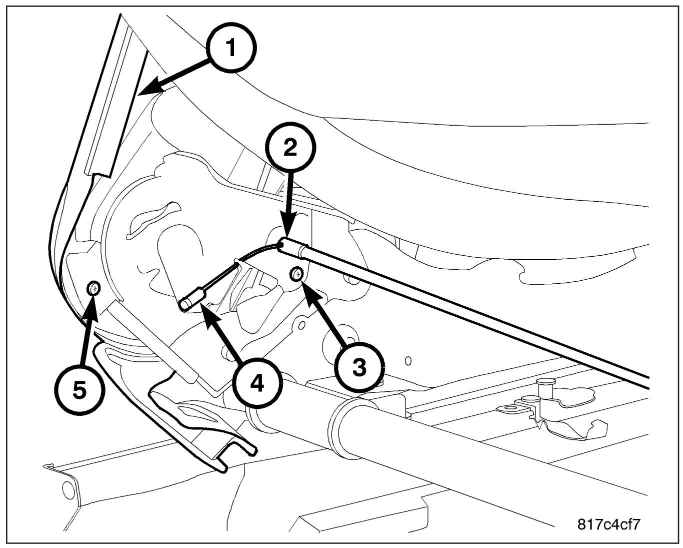
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - REMOVAL).
3. Fold the seat back (1) into the down position.



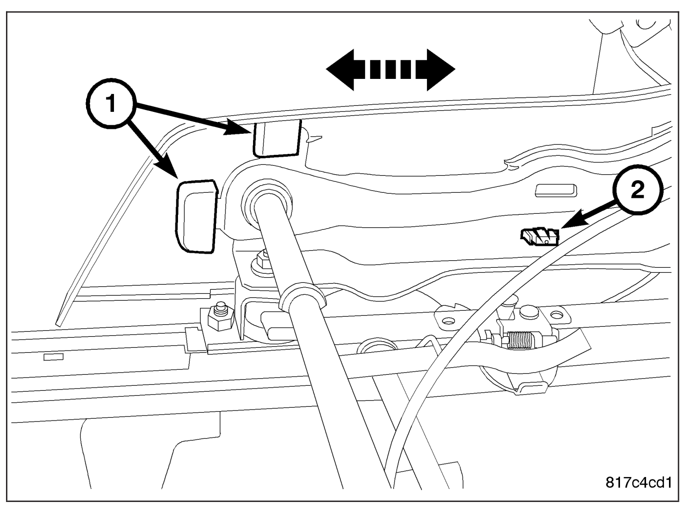
4. Remove both of the inner side shields (1).



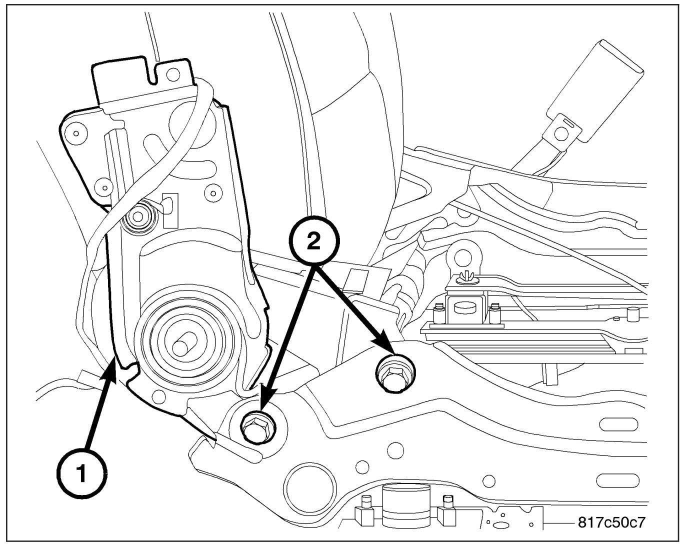
5. Release the cable housing (2) from the seat back frame and disconnect the recliner cable ends (4).
6. Remove the screw (5) and remove the recliner shields (1).
7. Remove the screw (3) attaching the inboard and outboard side shields to the seat frame.



8. Separate the clip fasteners (2) and remove the side shields from the seat cushion frame tabs (1).

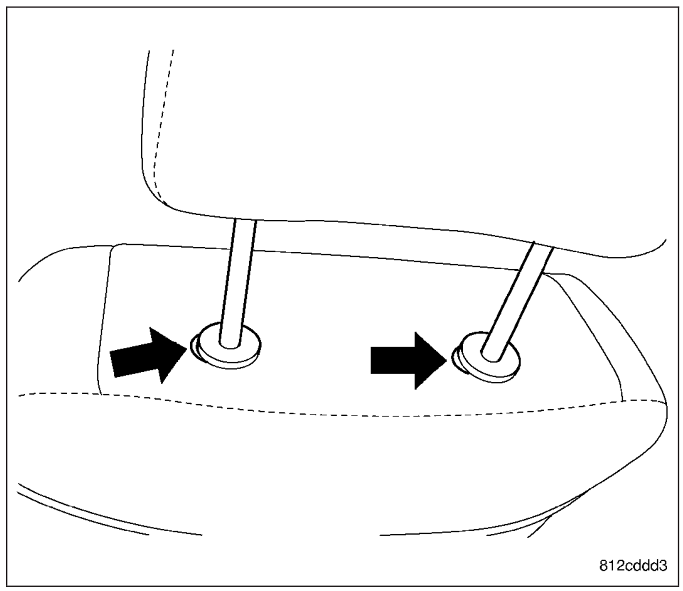


9. Remove the bolts (2) and remove the seat back assembly (1).

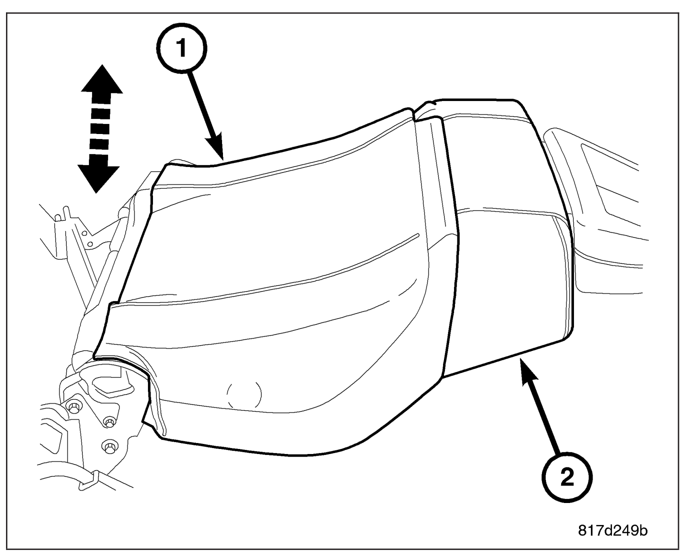


DISASSEMBLY

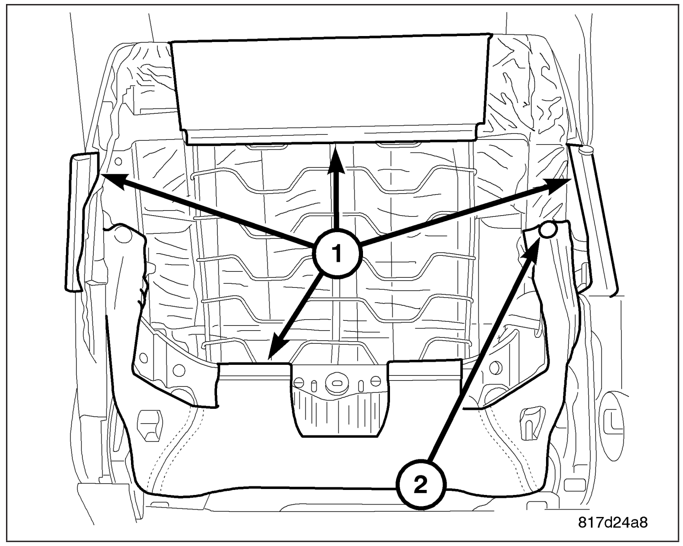
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat back (Refer to 23 - BODY/SEATS/SEAT BACK - FRONT - REMOVAL).
3. Remove the headrest.



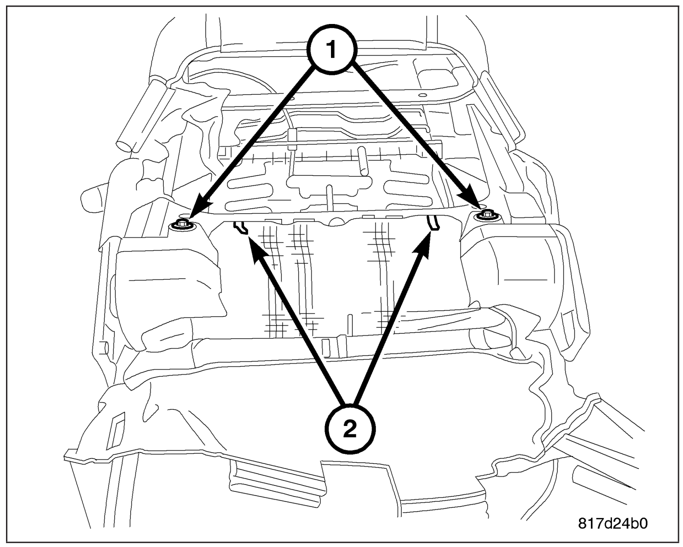
4. Remove the lumbar handle, if equipped.
5. Remove the back panel (1).



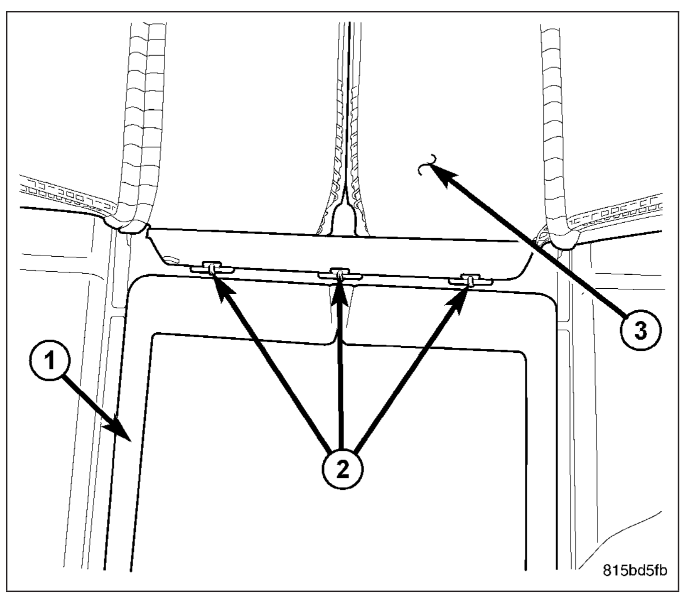
6. Separate the J-straps (1) and the push-pin fasteners (2).



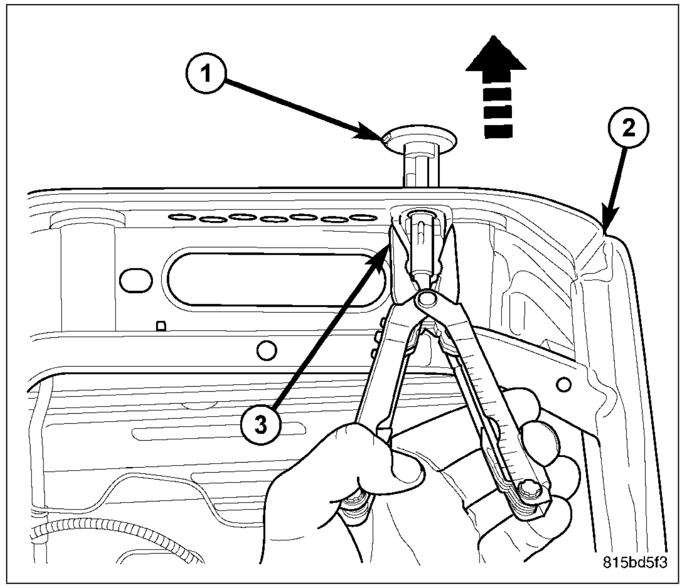
7. Release the push-pin fasteners (1) and release the cover from the hooks (2).



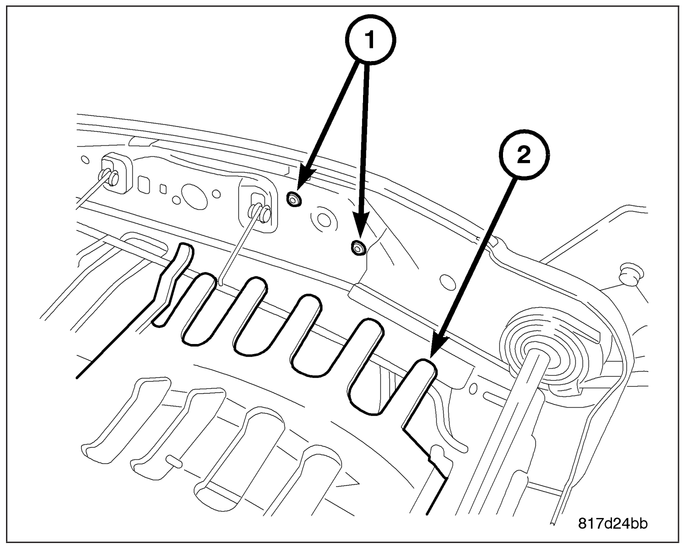
8. Separate the seat cover (3) from the foam cushion (1) and cut off all hog rings (2) attaching cover to the foam.



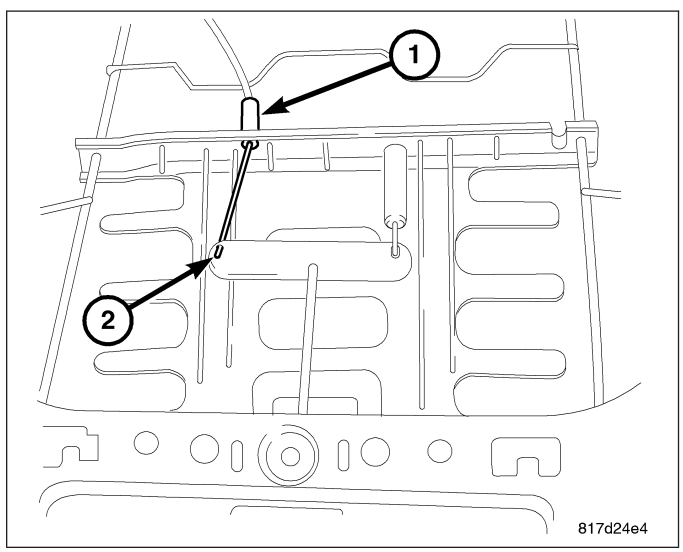
9. Squeeze the locking tab (3) and remove the headrest sleeves (1) and remove the cover.
10. Remove the seat back cover and cushion.



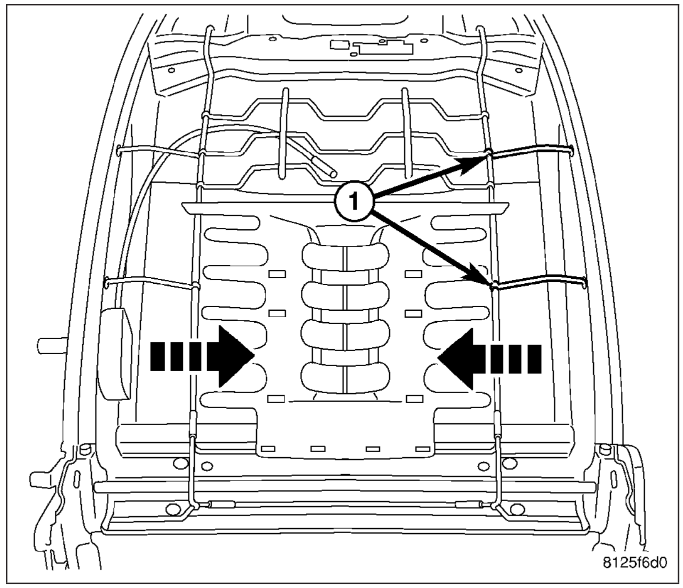
11. Remove the lumbar adjuster screws (1).



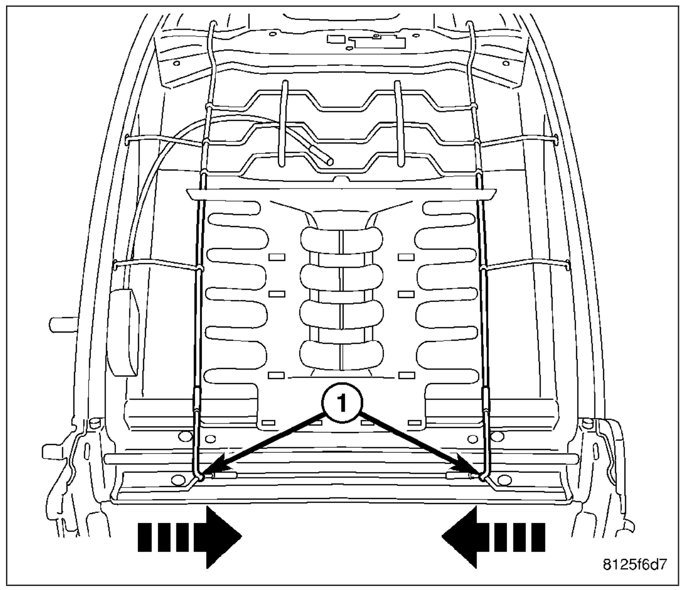
12. Disconnect the lumbar cable (2) and separate the cable housing (1).



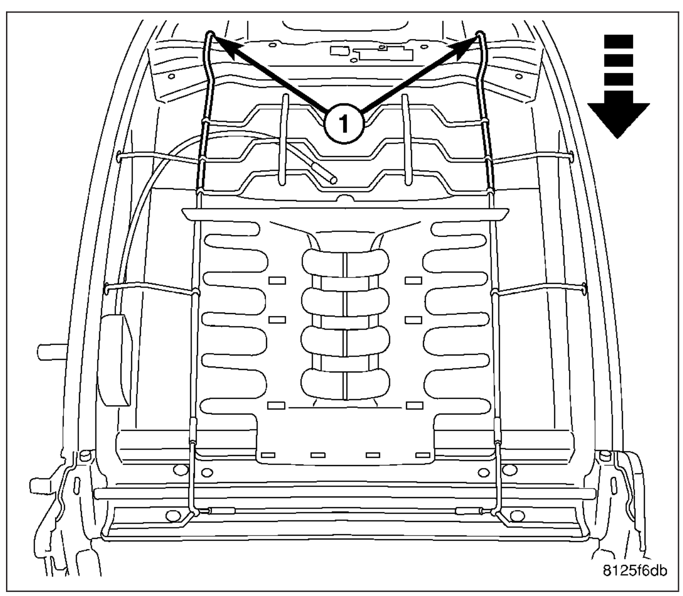
13. Release the lumbar mat side wires (1) by pulling out on the wire supports and then pulling them in.



14. Squeeze the lower support wires (1) in and release the lower wires.

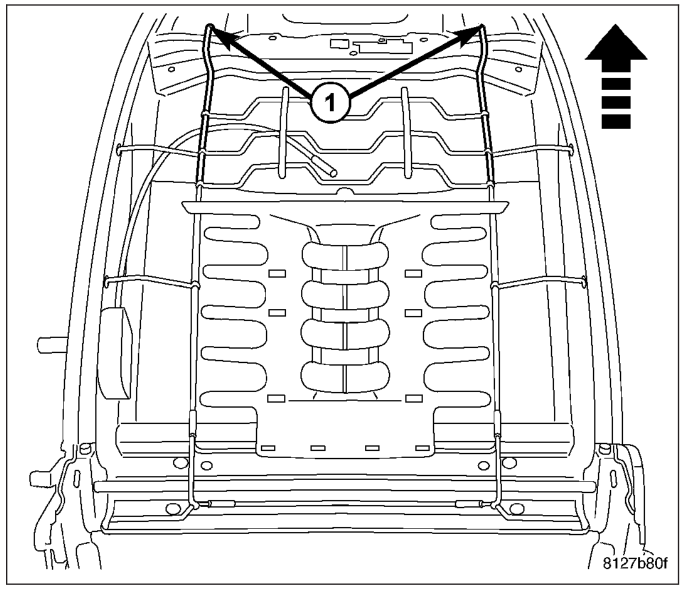


15. Pull the upper support wires (1) down and release the lumbar mat from the seat back frame.

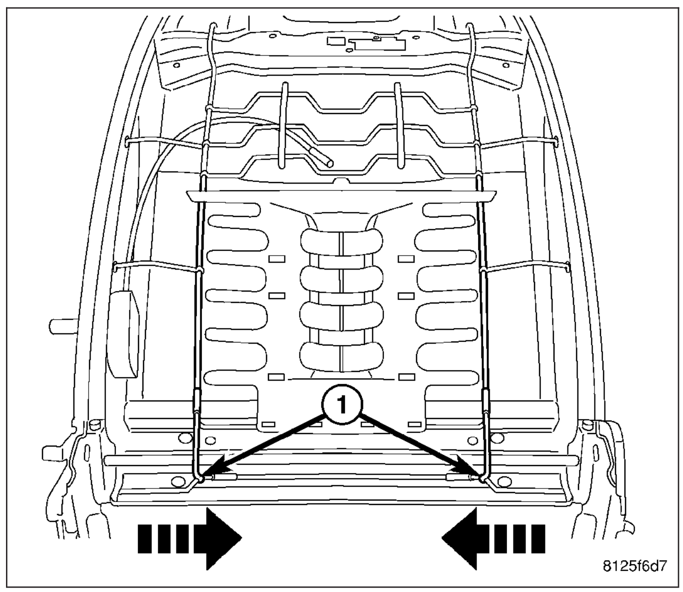


ASSEMBLY

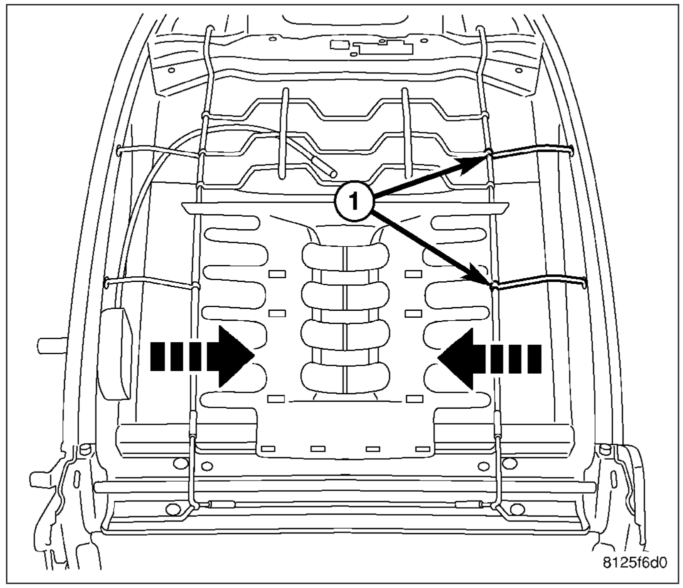
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Place lumbar mat onto seat back frame and insert the upper support wires (1) into the frame.



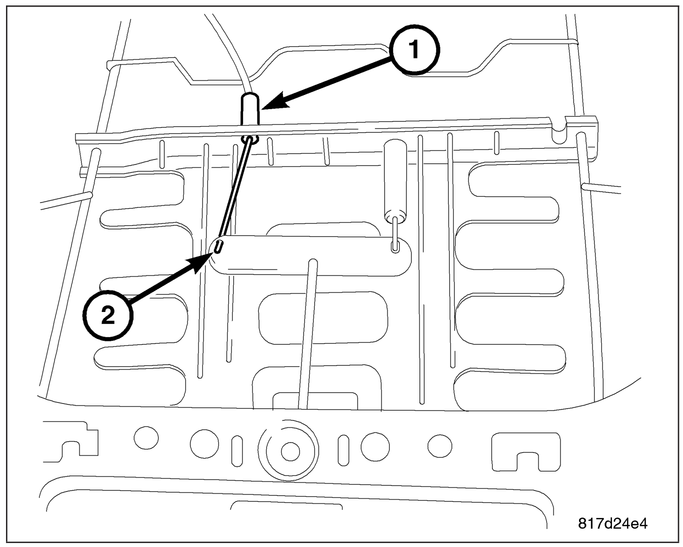
3. Squeeze the lower support wires (1) together and insert into the lower frame.



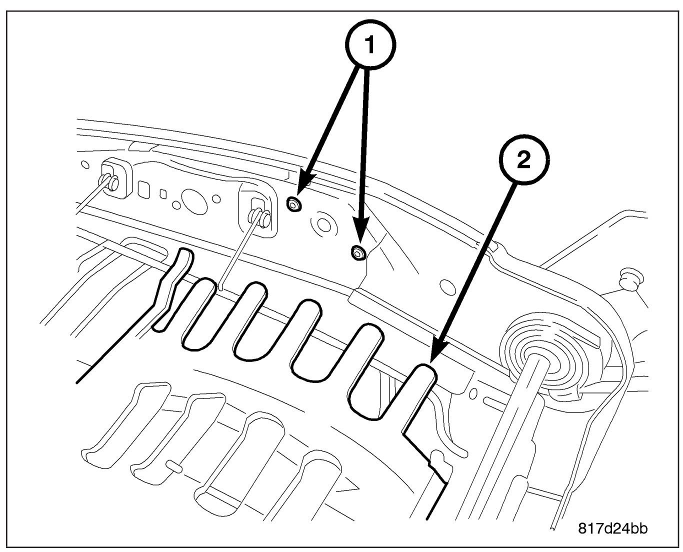
4. Squeeze the side support wires together and insert them into the sides of the seat back frame.



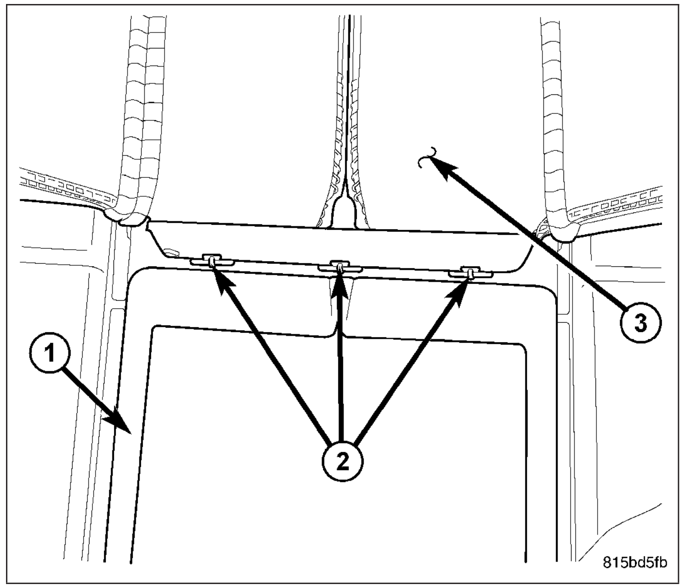
5. Connect the lumbar cable housing (1) and connect the cable end (2) to the anchor.



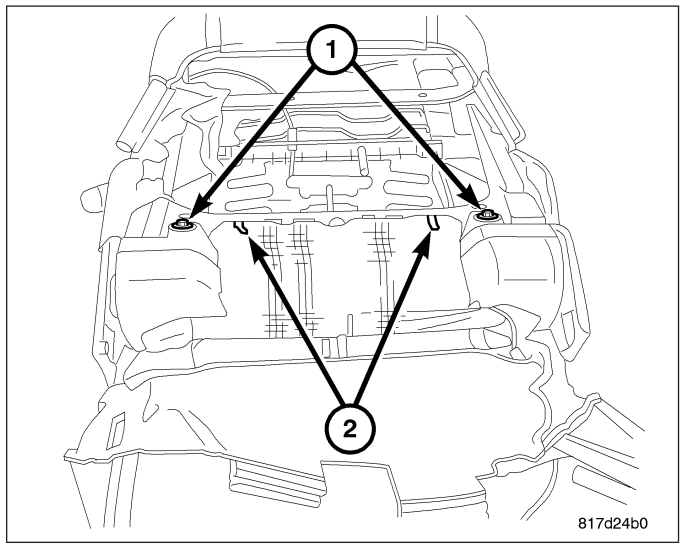
6. Install the lumbar adjuster and install the adjuster screws (1).



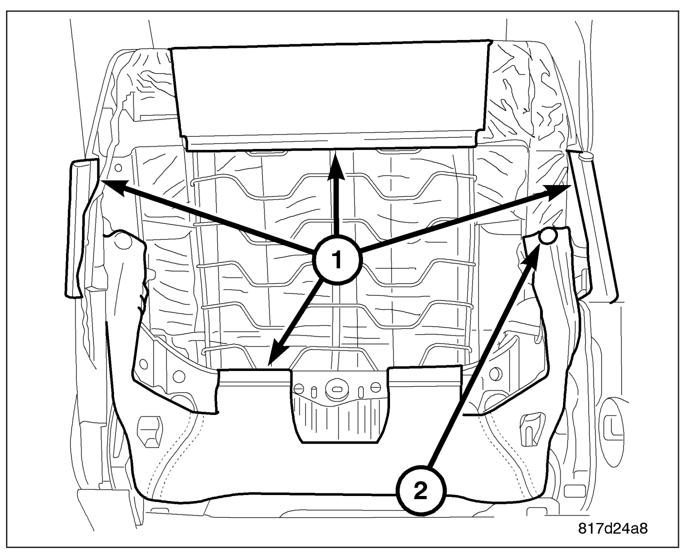
7. Position the seat back cushion on the frame and position the cover over the cushion.
8. Attach the seat cover (3) to the seat back cushion (1) and install new hog rings (2) as required.



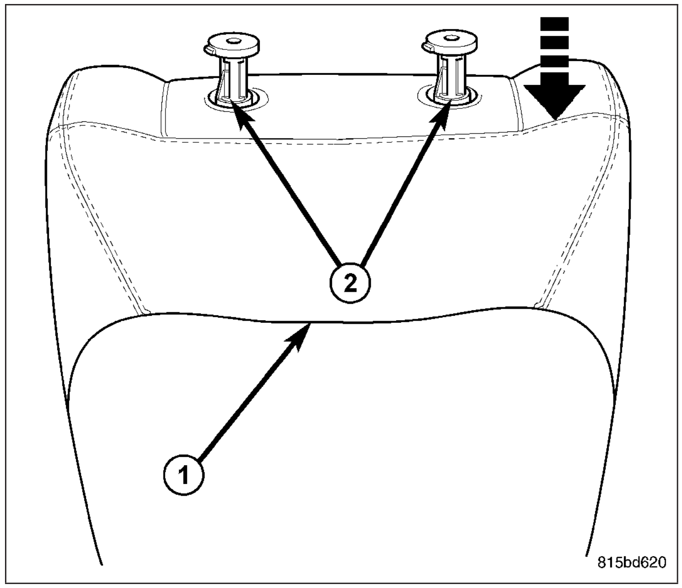
9. Install the push pins (1) and connect the inner cover to the hooks (2).



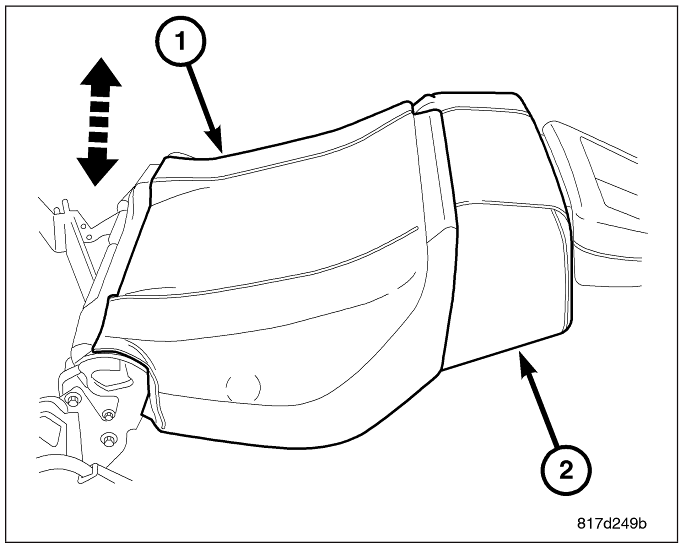
10. Install the push-pin fasteners (2) and connect the J-straps (1).



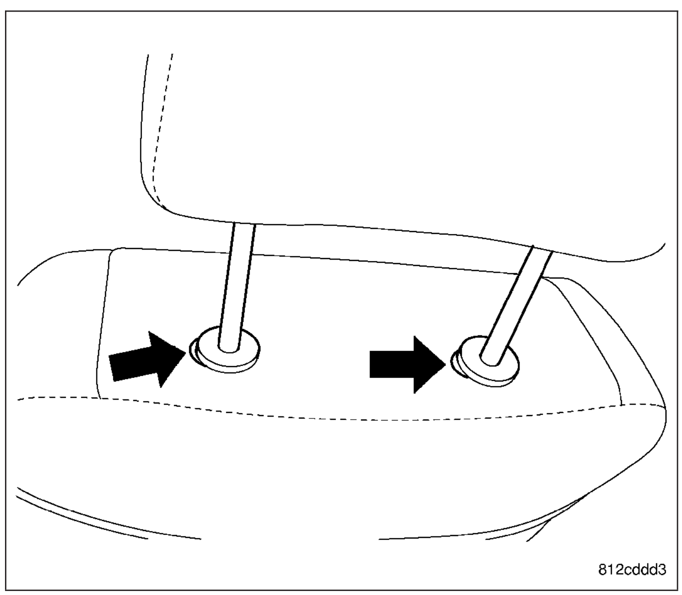
11. Install the headrest sleeves (2).



12. Position the seat back panel (1) onto the seat back (2) and seat fully.



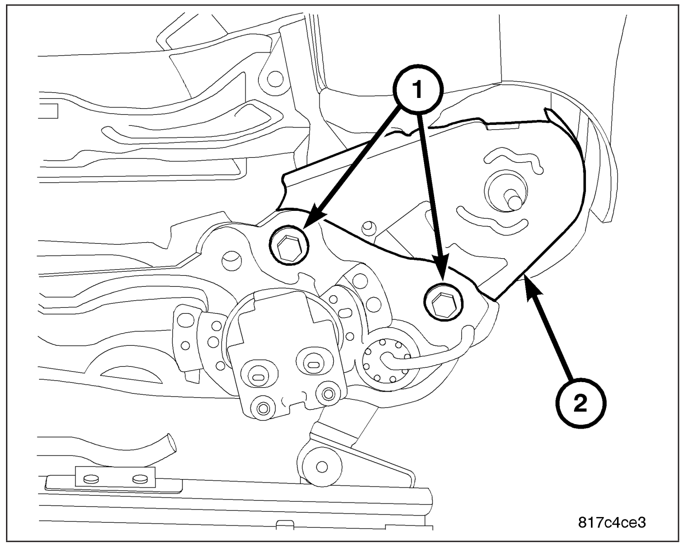
13. Press the headrest sleeve release buttons and install the headrest.
14. Install the seat back (Refer to 23 - BODY/SEATS/ SEAT BACK - INSTALLATION).



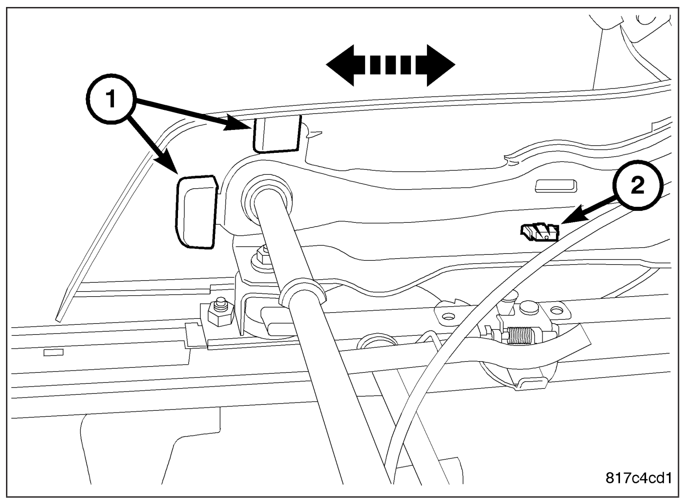
INSTALLATION

Driver Seat

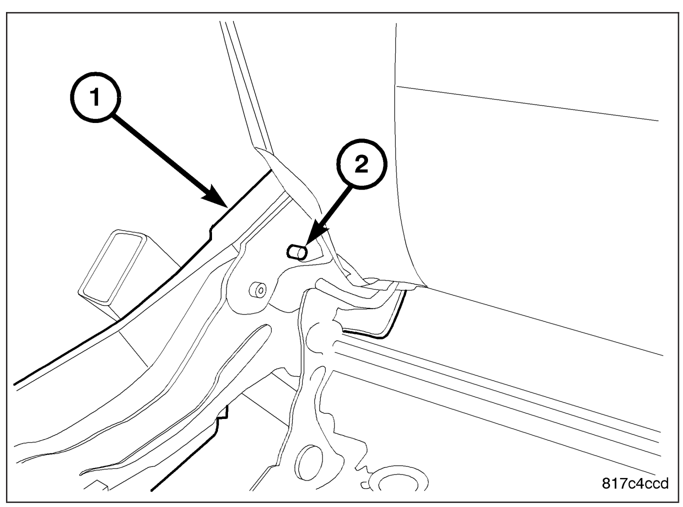
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Install the seat back assembly (2) and install the bolts (1).
3. Tighten the bolts to 40 N·m (30 ft. lbs.).



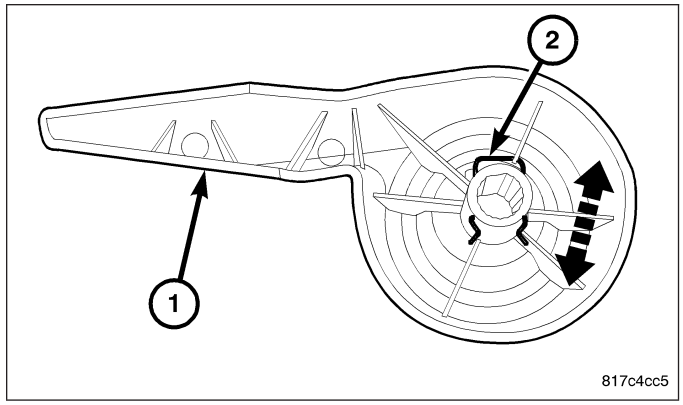
4. Position the side shields onto the seat adjuster tabs (1) and seat the clip (2) fully.



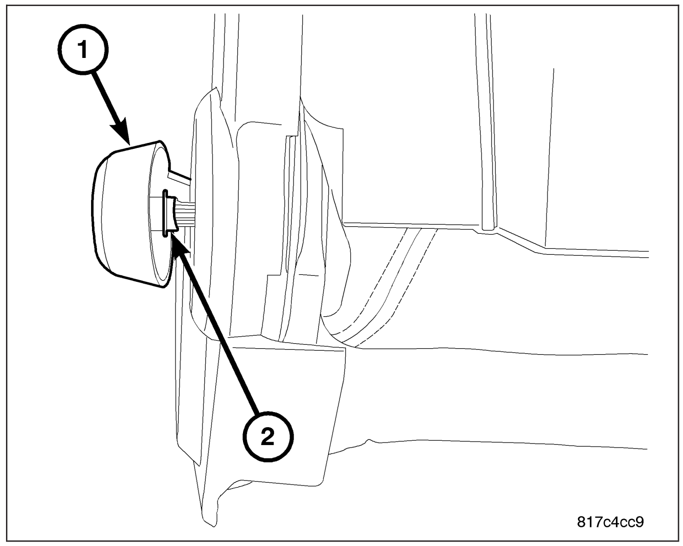
5. Install the outer side shield screw (2).



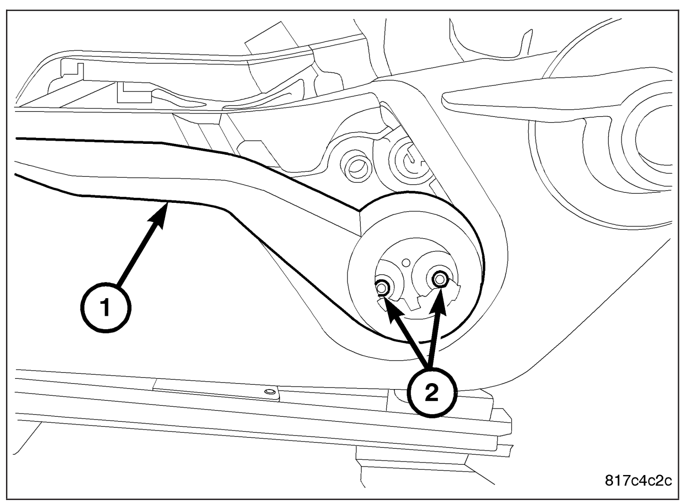
6. Install the clip (2) onto the recliner handle, if necessary.



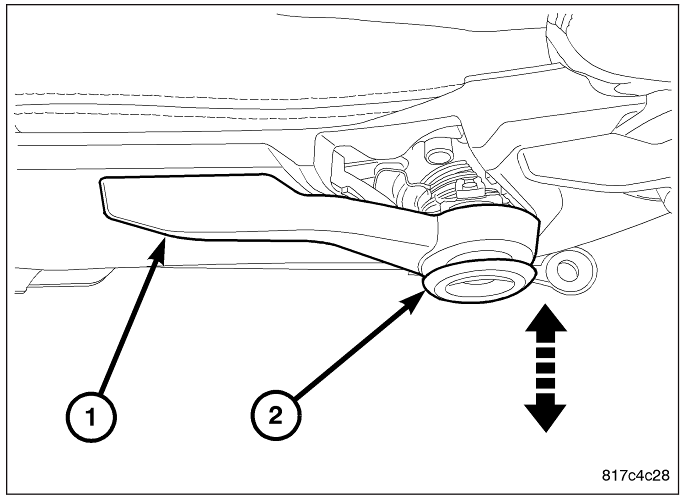
7. Position the recliner handle (1) onto the spined shaft (2) and seat fully.



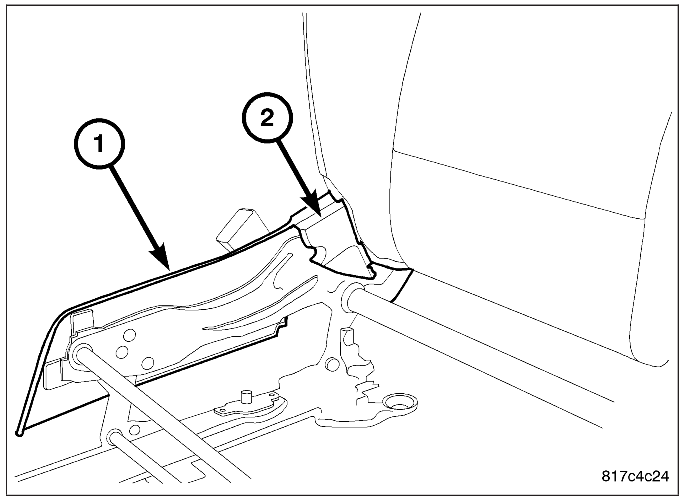
8. Install the height adjuster handle (1) and install the screws (2), if equipped.



9. Position the lift lever trim cap (2) and seat fully.

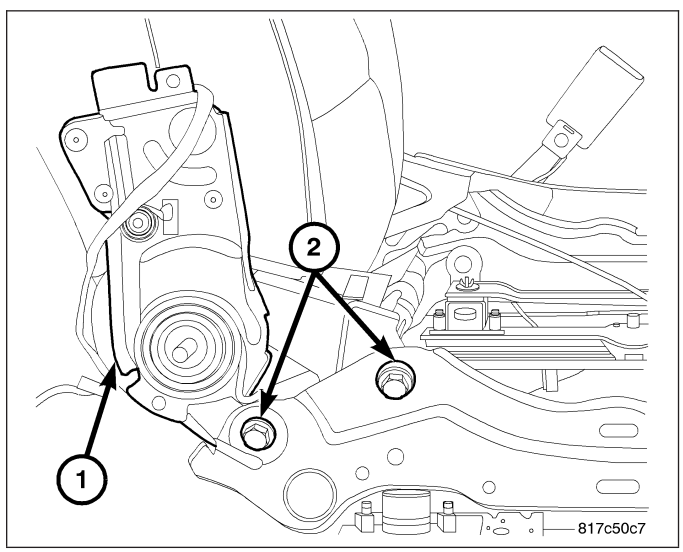


10. Position the inner side shields (2) and seat fully.
11. Install the seat cushion, (Refer to 23 - BODY/ SEATS/SEAT CUSHION - FRONT - INSTALLATION).

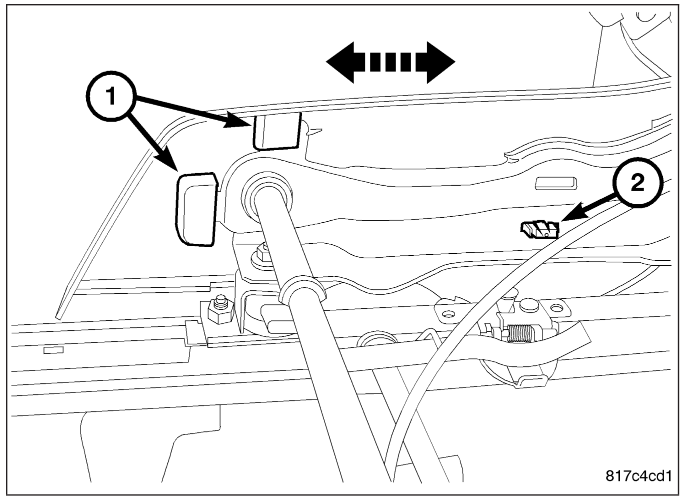


Passenger Seat

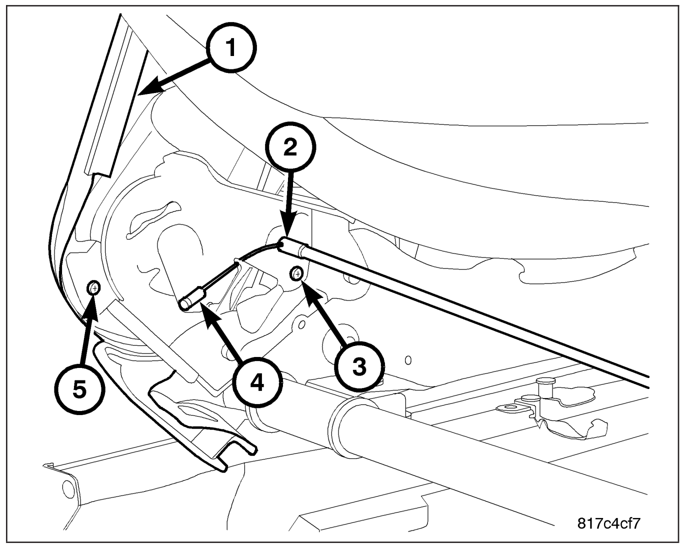
1. Install the seat back assembly (1) and install the bolts (2).
2. Tighten the bolts to 40 N·m (30 ft. lbs.).



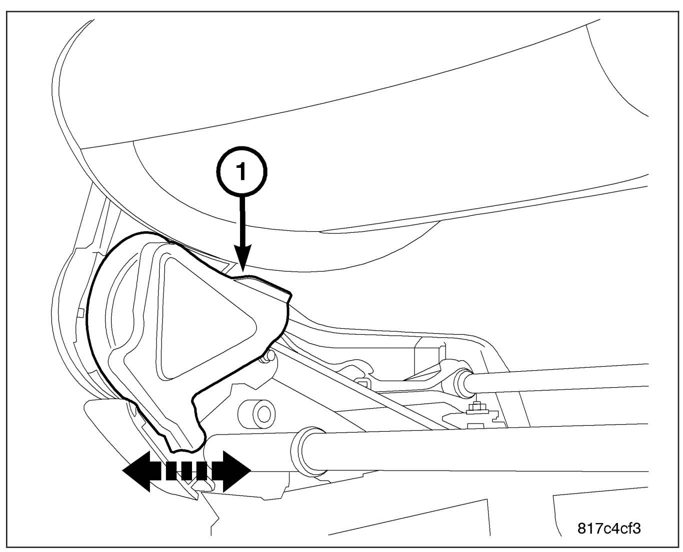
3. Position the side shields onto the seat adjuster tabs (1) and seat the clip (2) fully.



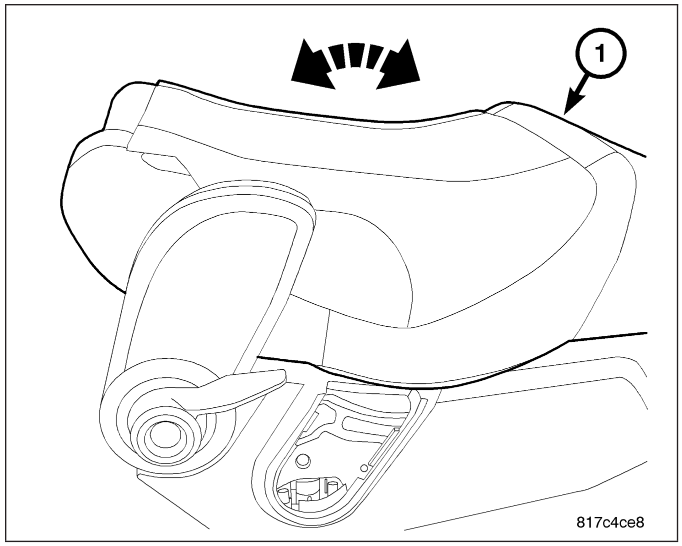
4. Install the screws (3) attaching the inboard and outboard side shields to the seat frame.
5. Install the recliner shields (1) and install the screws (5).
6. Connect the recliner cable ends (4) and fasten the cable housing (2) to the seat back frame.



7. Install both of the inner side shields (1).

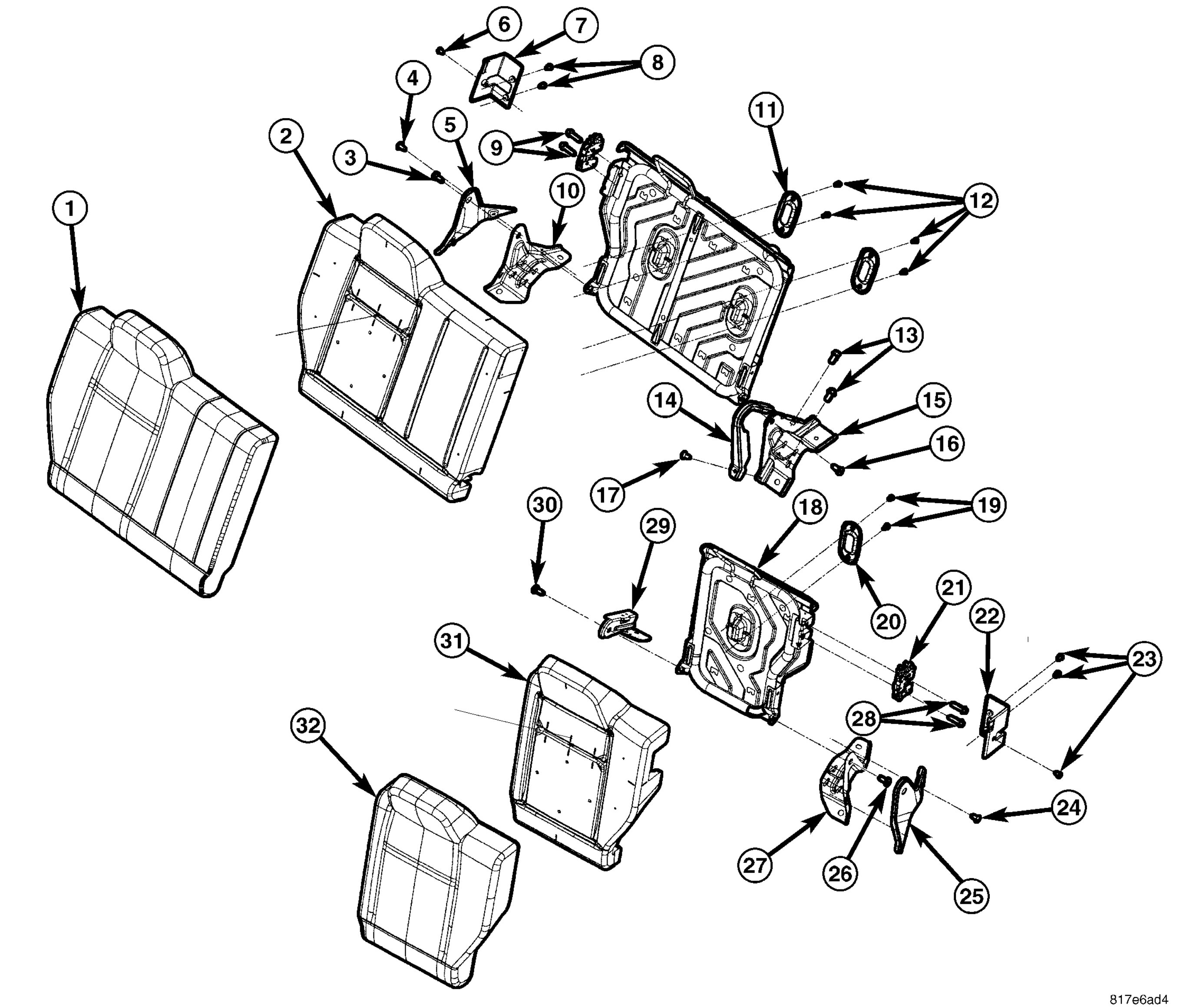


8. Position the seat back (1) into the upright position.
9. Install the seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - INSTALLATION).



SEAT BACK - REAR

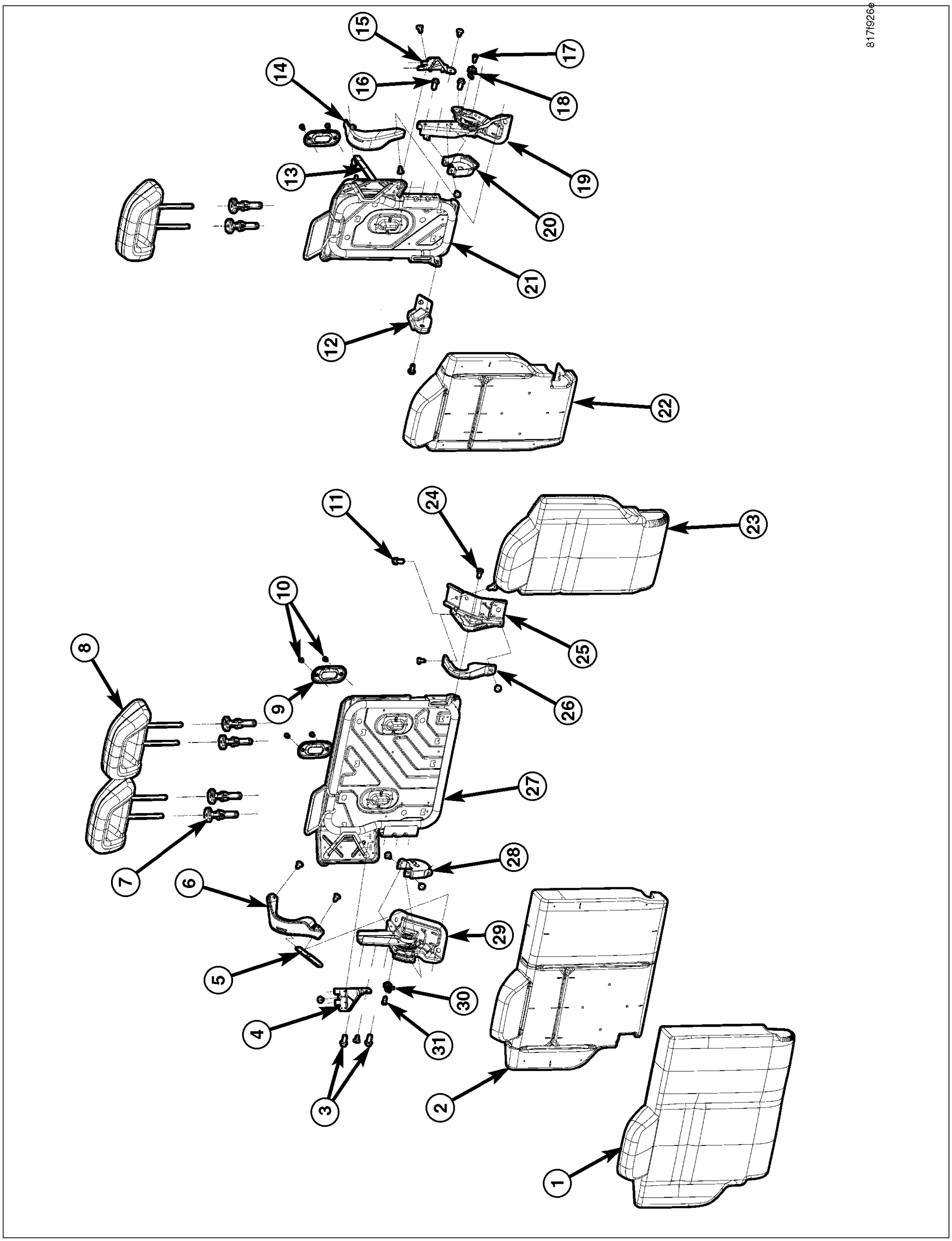
DESCRIPTION



REAR SEAT BACK - W/O RECLINER OPTION

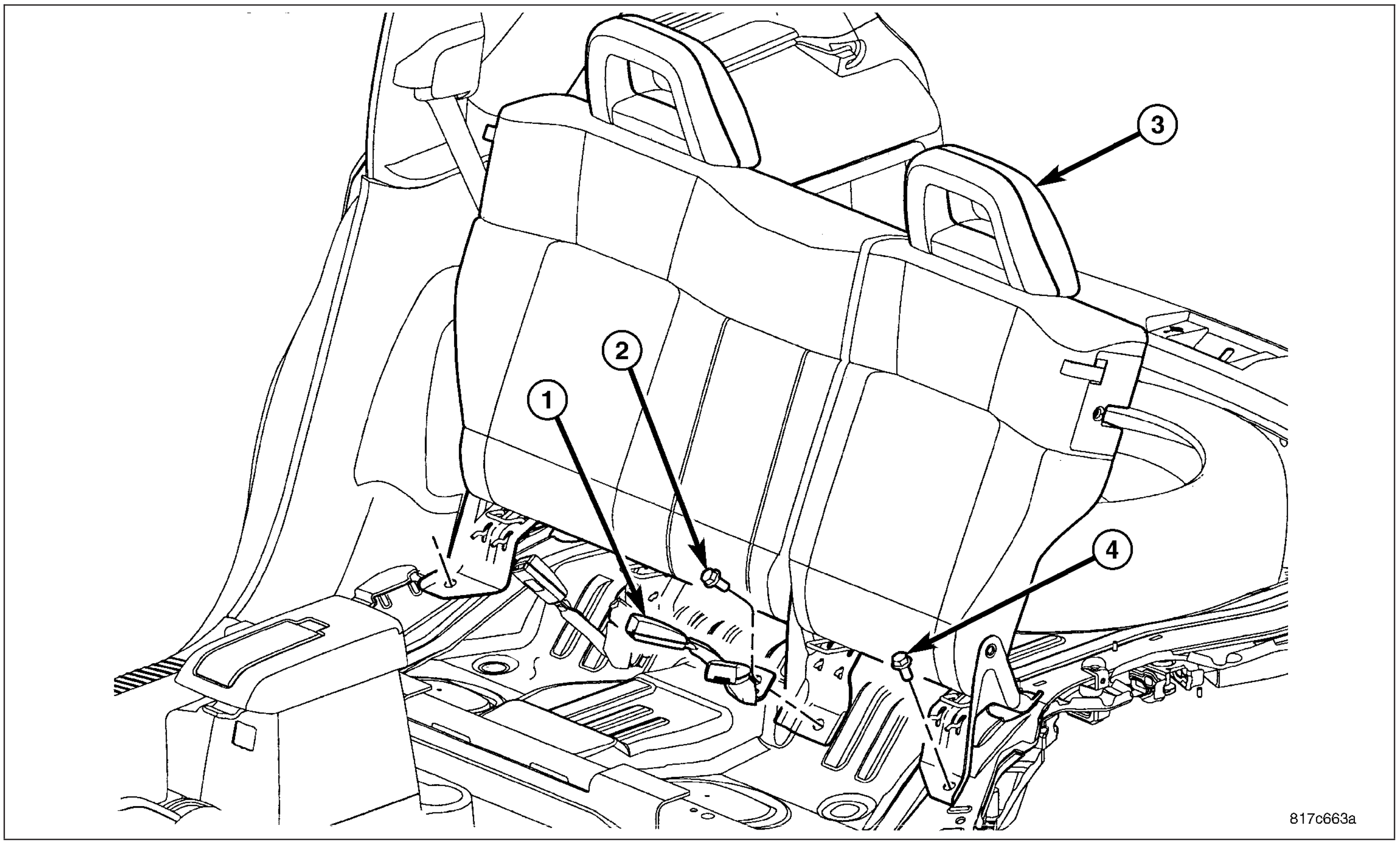
REAR SEAT BACK - W/O RECLINER OPTION

1 - 60% SEAT BACK COVER
2 - 60% SEAT BACK FOAM CUSHION
3 - PIVOT BOLT 32 N·m (24 ft. lbs.)
4 - PIN
5 - FLOOR BRACKET
6 - LATCH BEZEL SCREW
7 - LATCH BEZEL
8 - LATCH BEZEL SCREWS
9 - LATCH BOLTS 28 N·m (21 ft. lbs.)
10 - FLOOR BRACKET
11 - CHILD TETHER BEZELS
12 - CHILD TETHER BEZEL SCREWS
13 - BOLTS 7 N·m (5 ft. lbs.)
14 - CENTER SHIELD
15 - FLOOR BRACKET
16 - PIVOT BOLT 45 N·m (33 ft. lbs.)
17 - PUSH PIN FASTENER
18 - SEAT BACK FRAME ASSEMBLY 40%
19 - CHILD TETHER BEZEL SCREWS
20 - CHILD TETHER BEZEL
21 - LATCHES (2)
22 - LATCH BEZEL
23 - LATCH BEZEL SCREWS
24 - PUSH PIN FASTENER
25 - SHIELD
26 - PIVOT BOLT 32 N·m (24 ft. lbs.)
27 - FLOOR BRACKET
28 - LATCH BOLTS 28 N·m (21 ft. lbs.)
29 - FLOOR BRACKET
30 - PIVOT BOLT 32 N·m (24 ft. lbs.)
31 - SEAT BACK FOAM CUSHION 40%
32 - SEAT BACK CUSHION COVER 40%

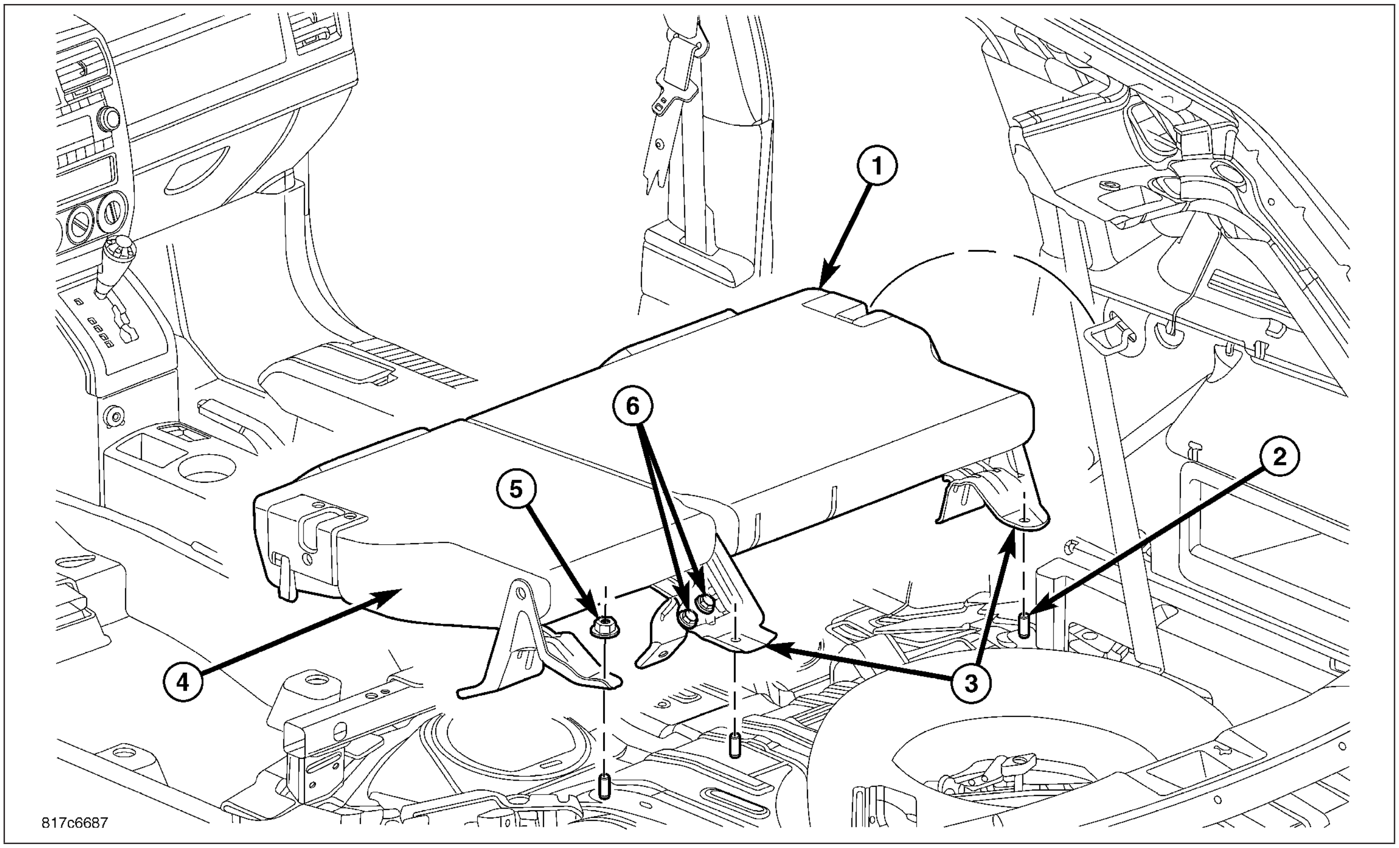


REAR SEAT BACK - RECLINER

REMOVAL



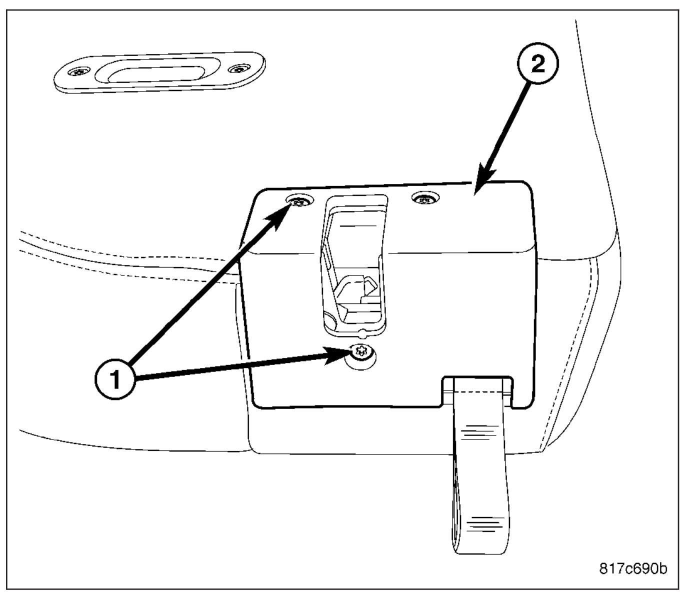
1. Remove the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - REAR - REMOVAL)
2. Remove the belt buckle bolt (2) and the buckle (1).
3. Remove the floor bracket or recliner bolts (4).



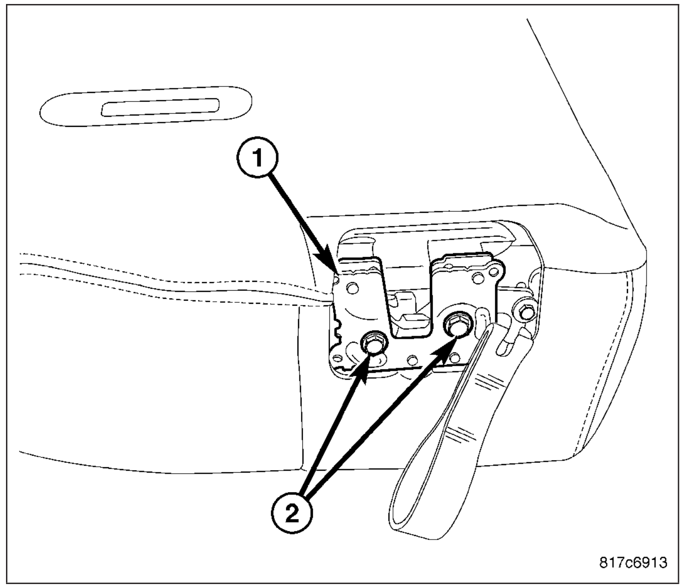
4. Fold the seats forward.
5. Remove the nut (5) and bolts (6) and remove the 40% seat back (4).
6. Remove the nuts from the studs (2) and remove the 60% seat back.

DISASSEMBLY

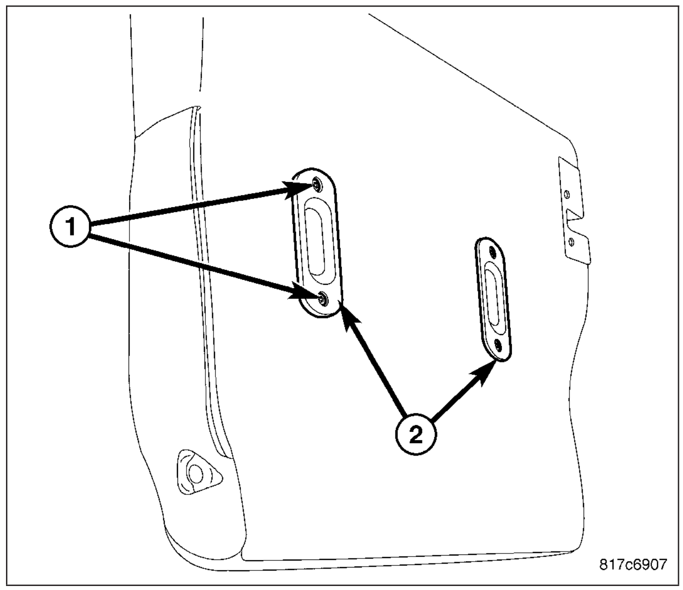
1. Remove the screws (1) and remove the latch bezel (2).



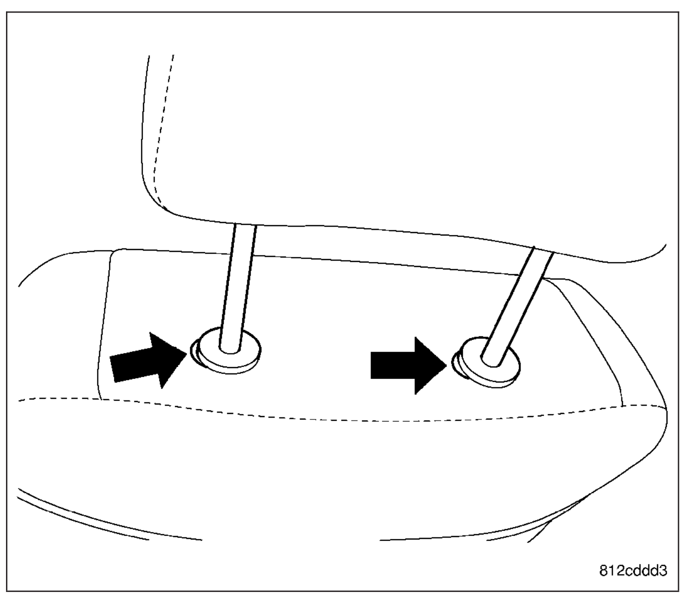
2. Remove the bolts (2) and remove the latch (1).



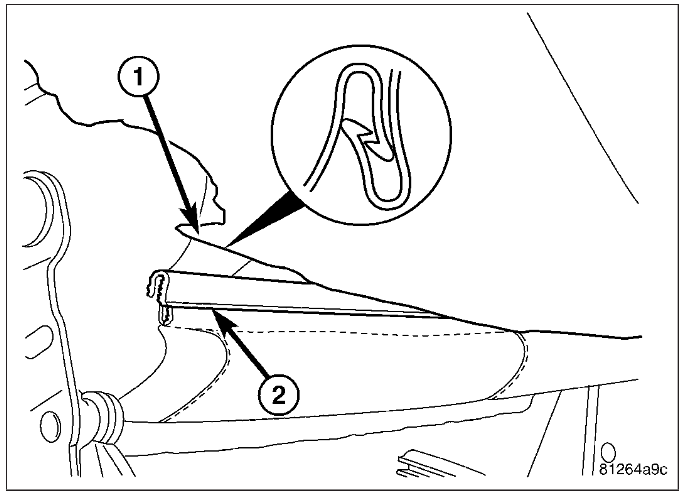
3. Remove the screws (1) and remove the tether trim bezels (2).



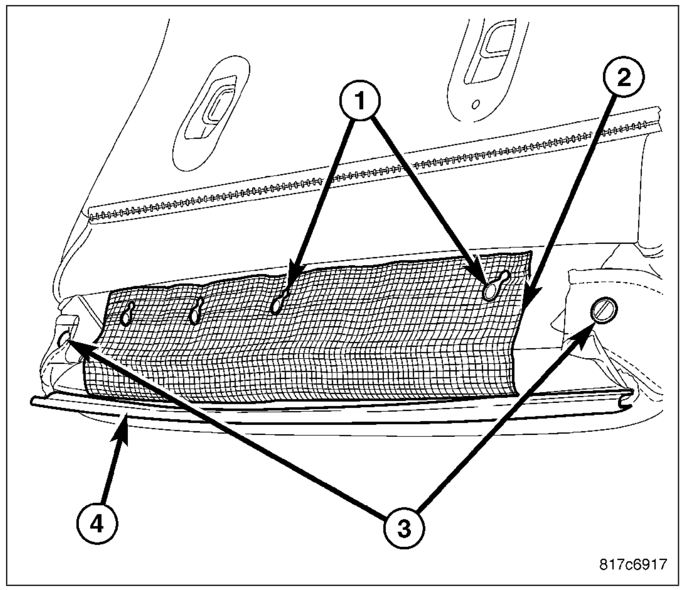
4. Remove the headrest.



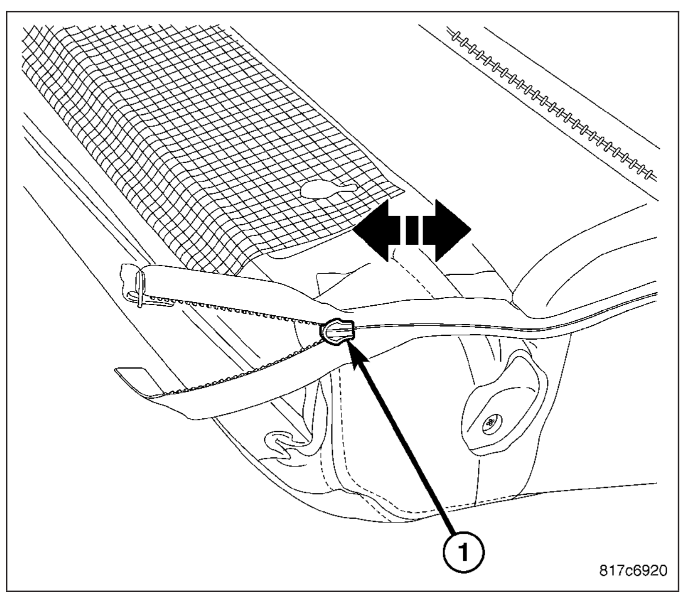
5. Separate the zip strips (1 and 2).



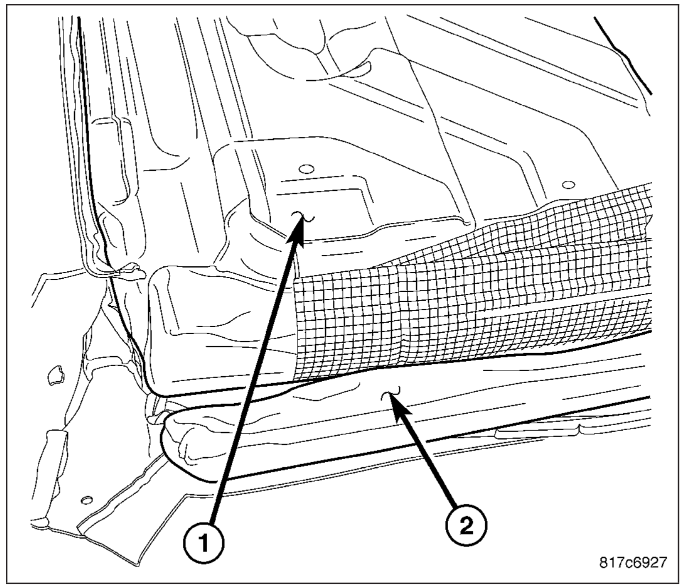
6. Remove the push pin fasteners (3).
7. Separate the inner cover (2) from the hooks (1).



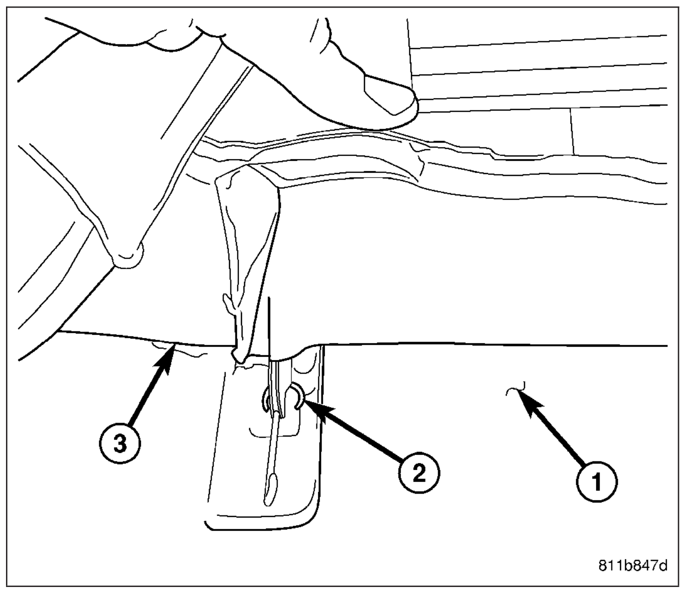
8. Unzip the cover (1).



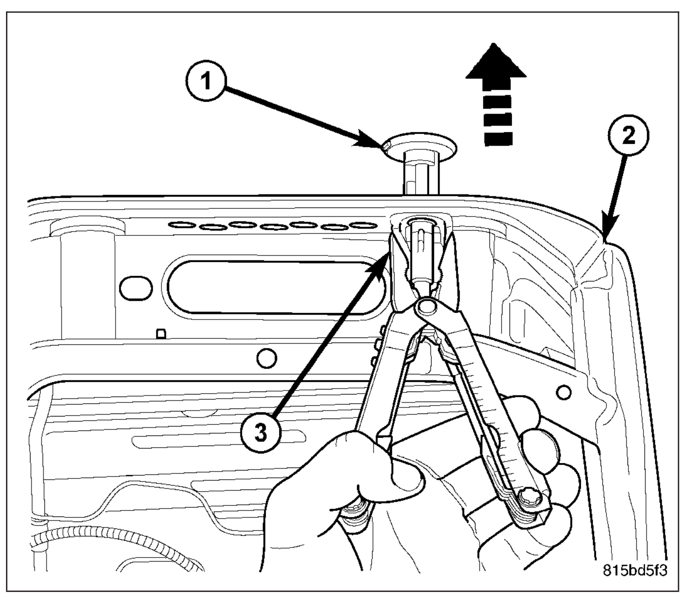
9. Remove the foam insert (2) from the seat back assembly (1).



10. Separate the seat cover (3) from the foam cushion (1) and cut off all hog rings (2) attaching the cover to the foam.

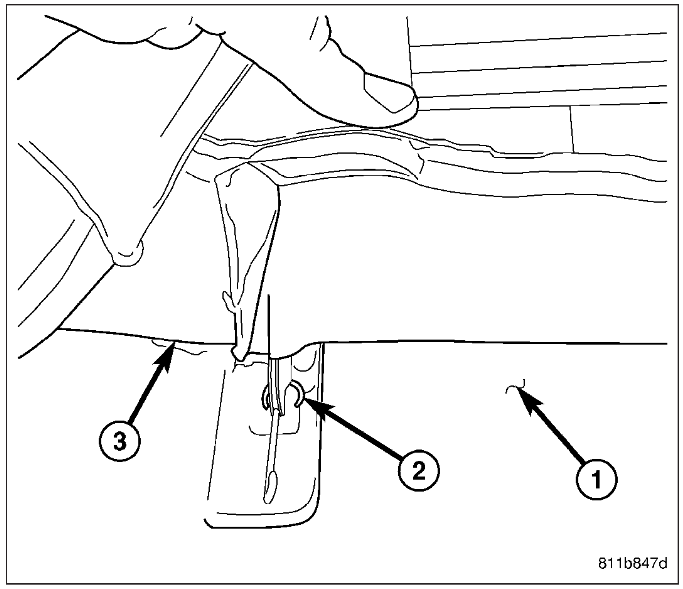


11. Squeeze the locking tab (3) and remove the headrest sleeves (1).
12. Remove the seat back cover and cushion.

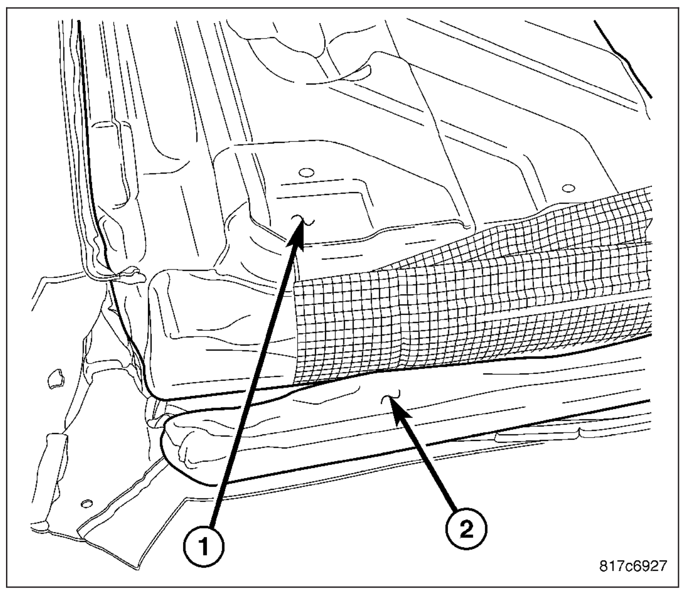


ASSEMBLY

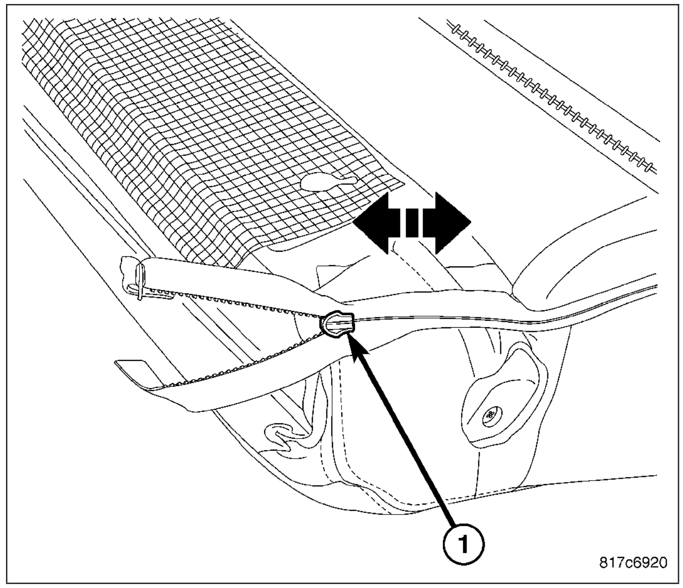
1. Position the seat back cushion on the frame and position the cover over the cushion.
2. Attach the seat cover (3) to the seat back cushion (1) and install new hog rings (2) as required.



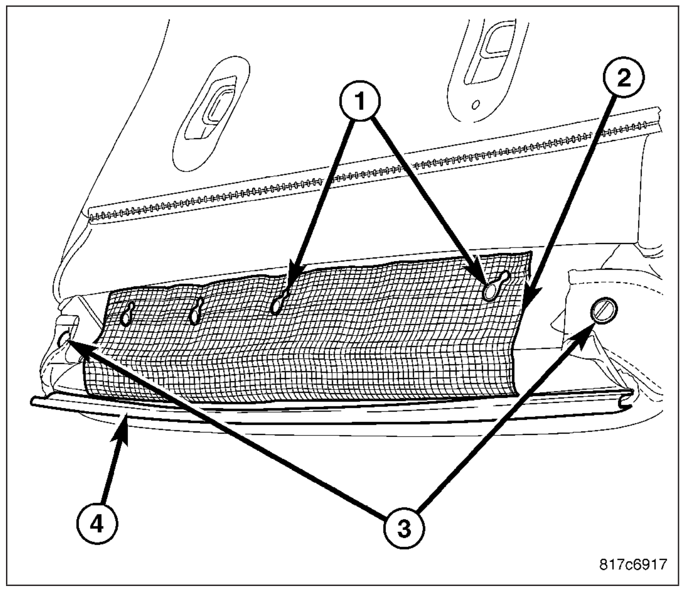
3. Position the foam insert (2) back at the base of the seat back assembly (1).



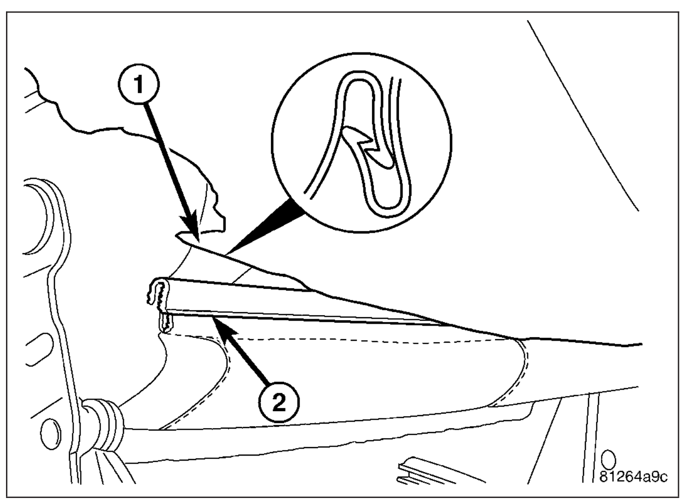
4. Zip the cover back over the frame.



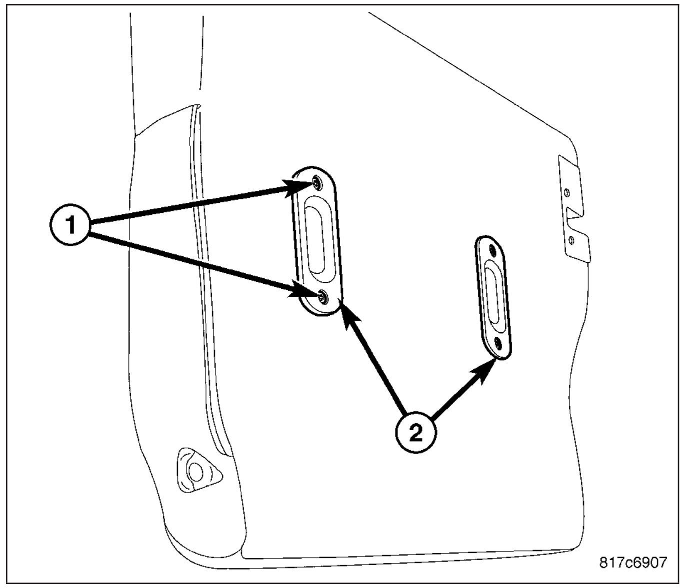
5. Install the push pin fasteners (3).
6. Position the inner cover (2) over the frame hooks (1).



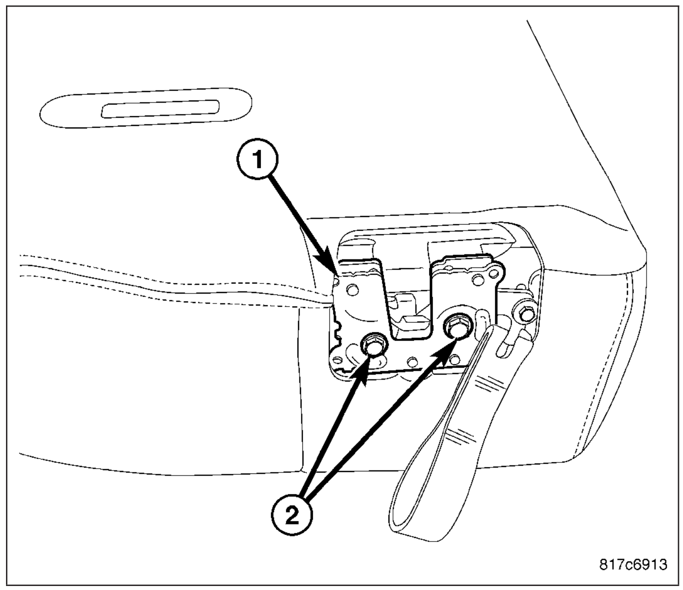
7. Fasten the upper (1) and lower (2) zip strips at the bottom of the seat back.



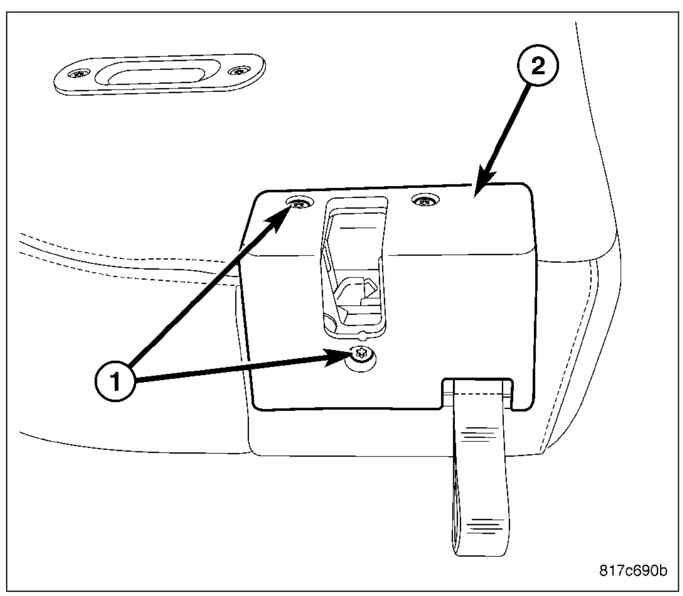
8. Install the child tether bezels (2) and install the screws (1).



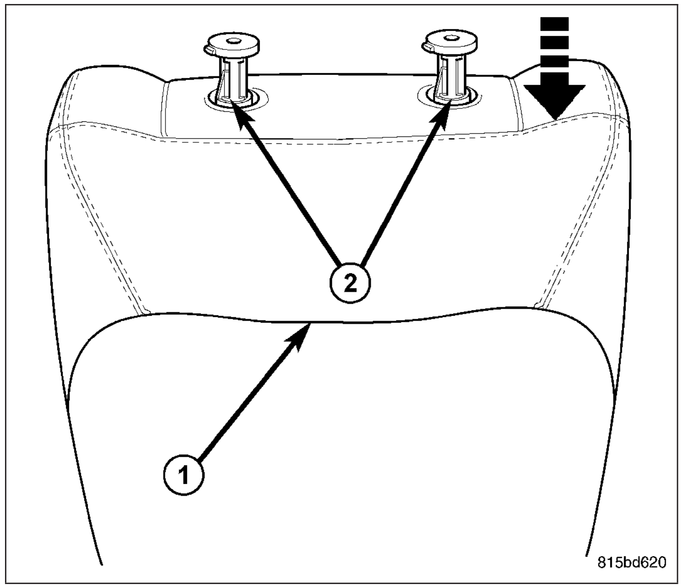
9. Install the latch (1) and install the bolts (2).
10. Tighten the bolts to 28 N·m (21 ft. lbs.).



11. Install the latch bezel (2) and install the screws (1).

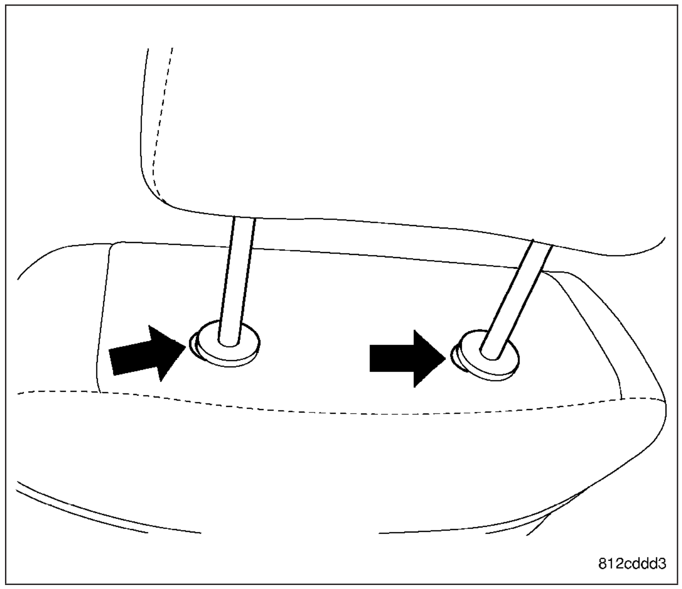


12. Install the headrest sleeves (2), if equipped.

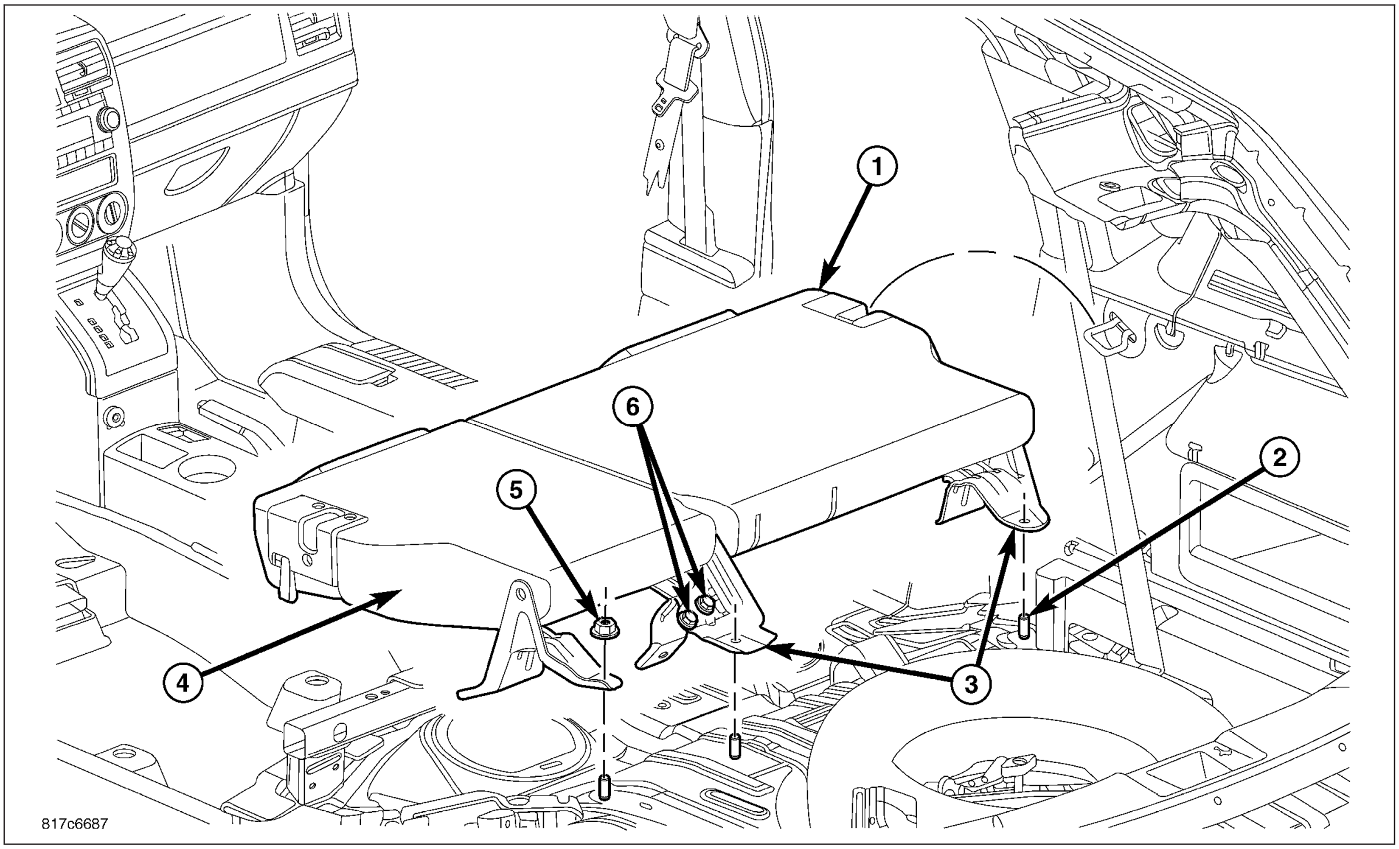


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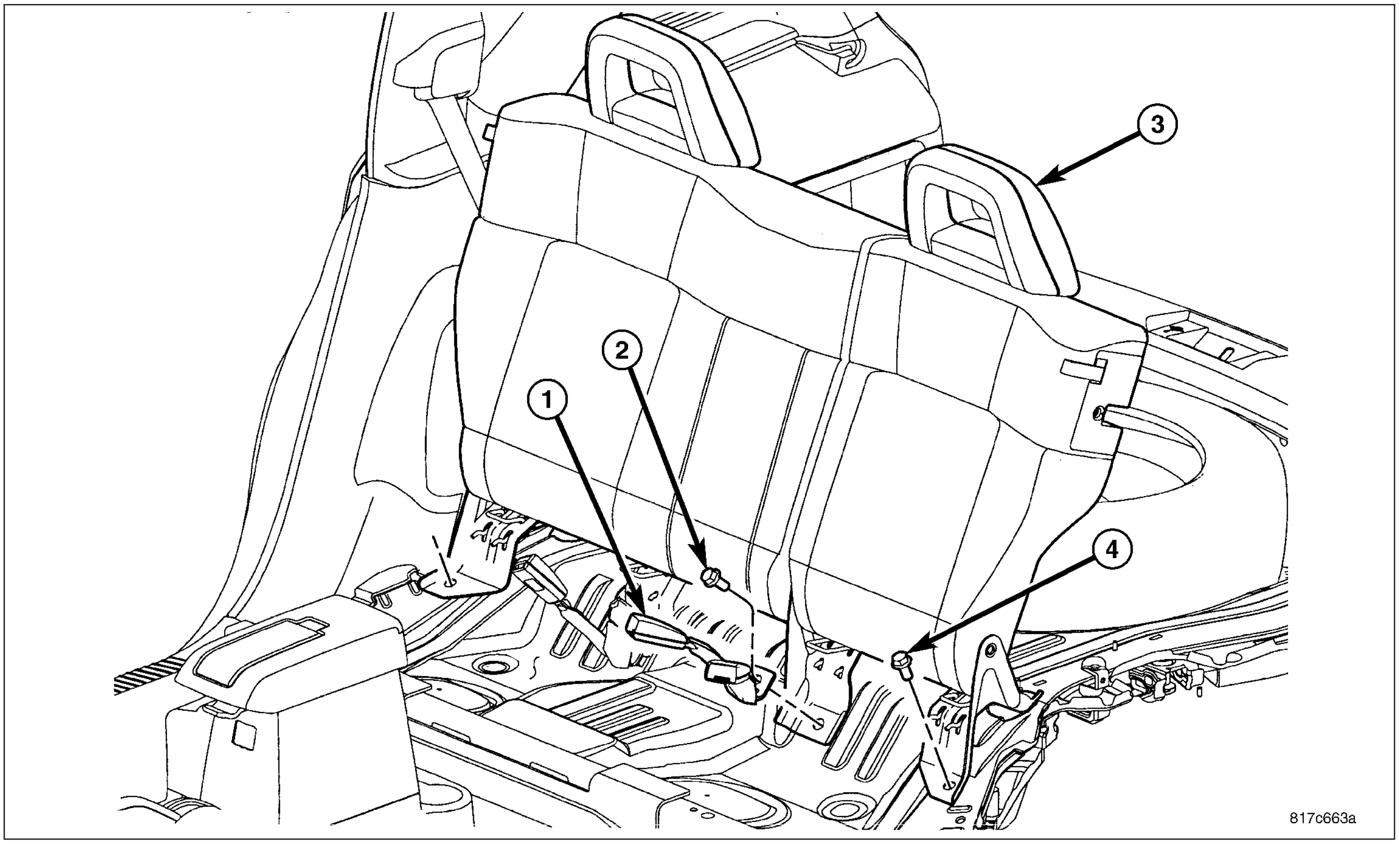
13. Press the headrest sleeve release buttons and install the headrest, if equipped.
14. Install the seat back (Refer to 23 - BODY/SEATS/ SEAT BACK - INSTALLATION).


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INSTALLATION



1. Install the 60% seat section (1) over the studs (2) and install the nuts (3).
2. Install the 40% seat section (4) over the stud and seat bracket and install the seat bracket bolts (6).
3. Tighten the seat bracket bolts (6) to 46 N·m (34 ft. lbs.).
4. Install the nut (5).
5. Tighten the nuts (5 and 3) to 46 N·m (34 ft. lbs.).

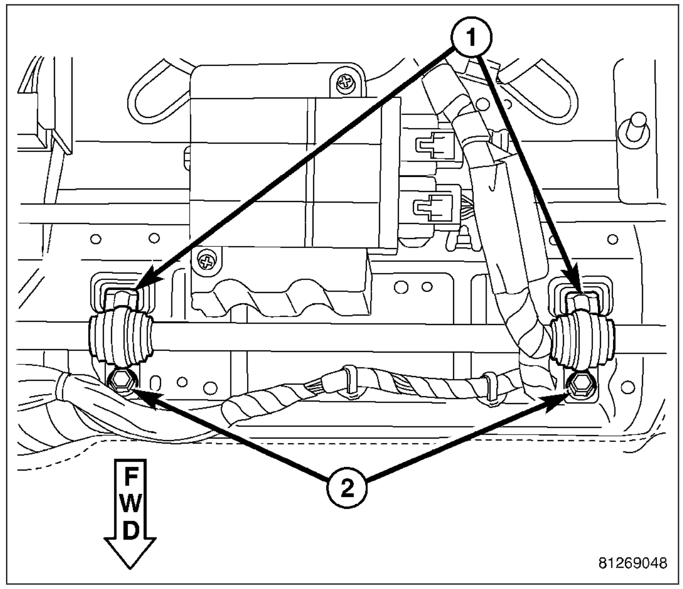


6. Position the seat backs (3) up and latch.
7. Install the belt buckles (1) and install the bolt (2).
8. Tighten the buckle bolt to 45 N·m (33 ft. lbs.)
9. Install the bolts (4) and tighten to 56 N·m (331 ft. lbs.)
10. Install the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - INSTALLATION).

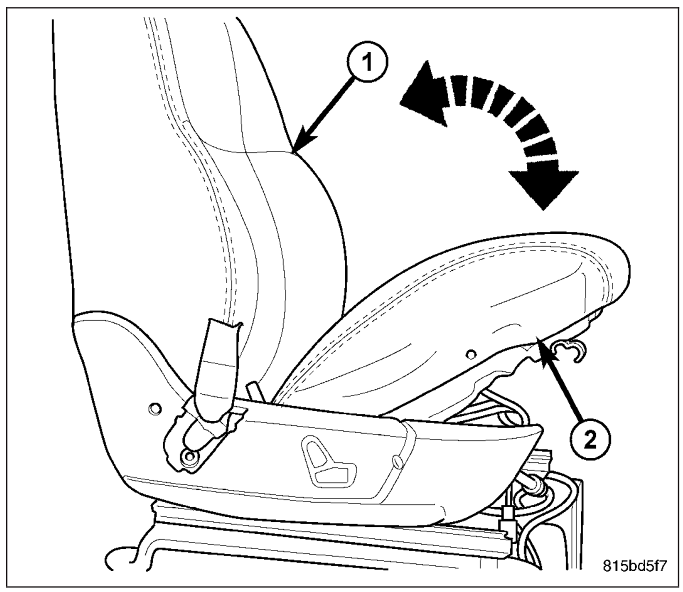
SEAT CUSHION - FRONT

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Move the seat to the forward position and disconnect and isolate the negative battery cable.
3. Remove the bolts (2) and the straps (1).
4. Disconnect the electrical connector, if equipped.

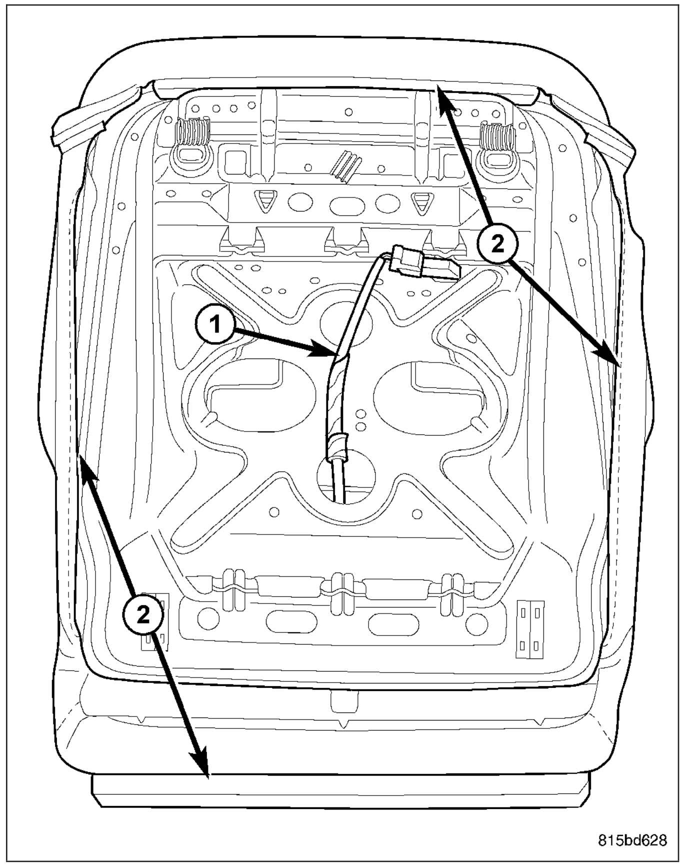


5. Lift the front of the seat cushion (2) up and slide out from under the seat back cushion (1).

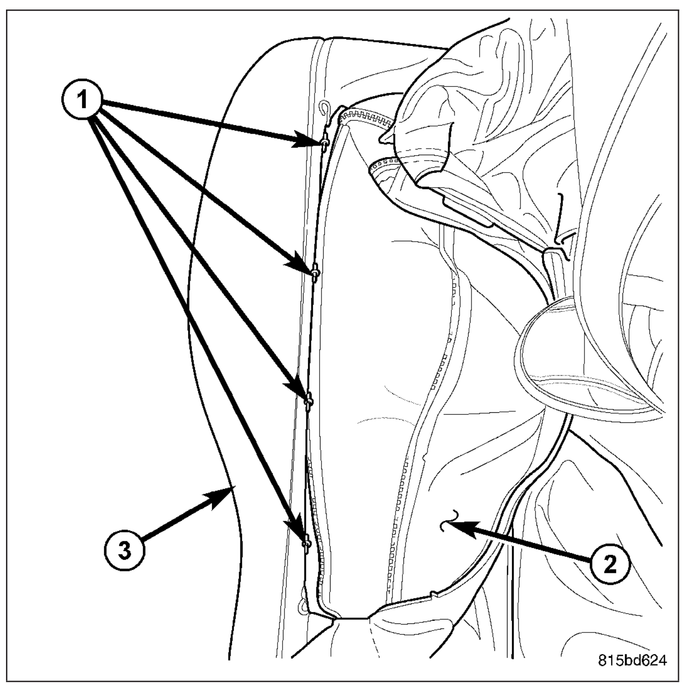


DISASSEMBLY

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION - FRONT - REMOVAL)
3. Release the seat cushion cover J-straps (2) from the seat pan and remove the cushion from the pan.

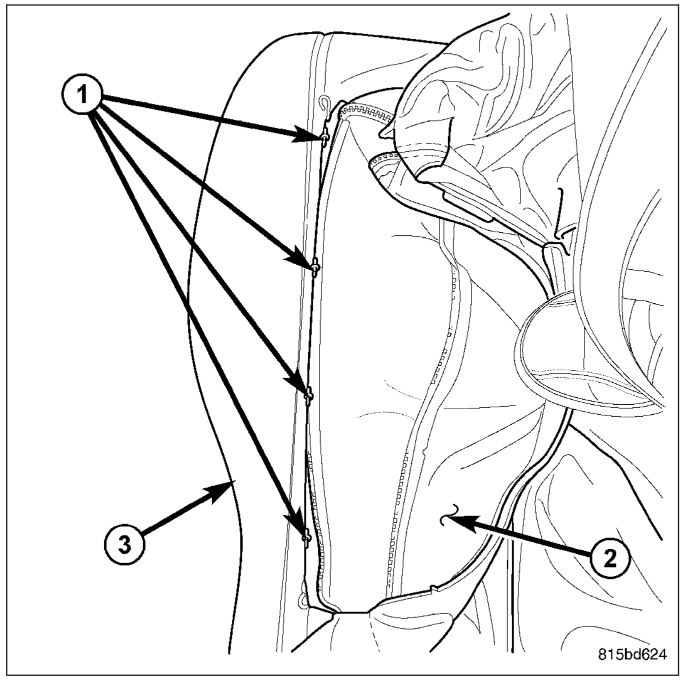


4. Remove the hog rings (1) and separate the seat cushion cover (2) from the seat cushion foam (3).

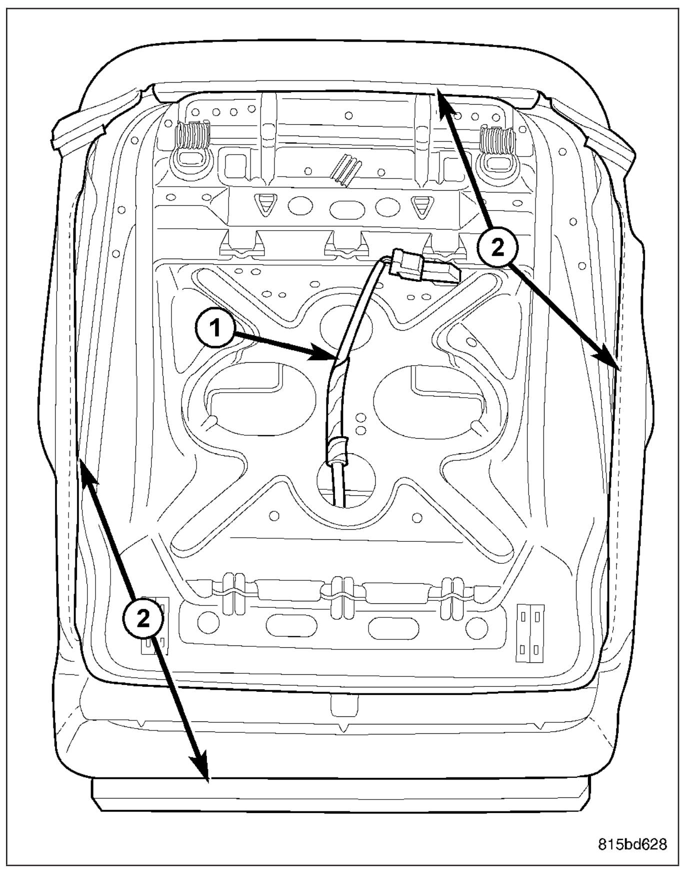


ASSEMBLY

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the seat cushion cover (2) over the seat cushion foam (3) and attach new hog rings (1).

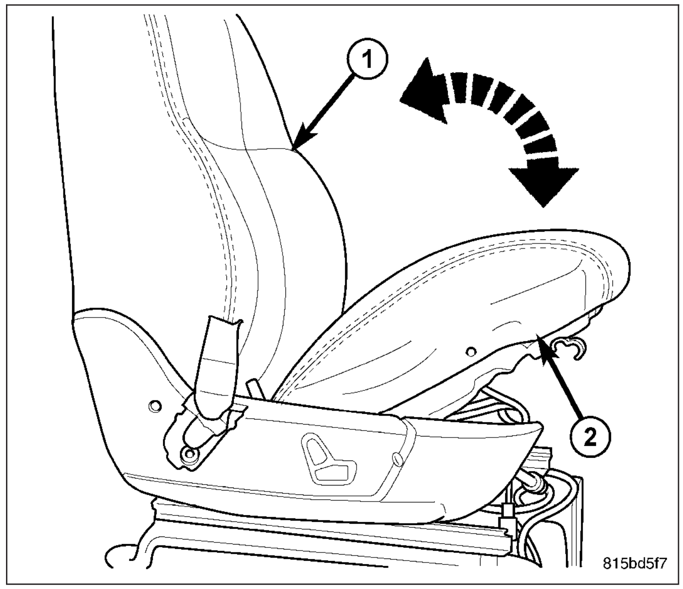


3. Connect the seat cushion cover J-straps (2) to the seat pan.

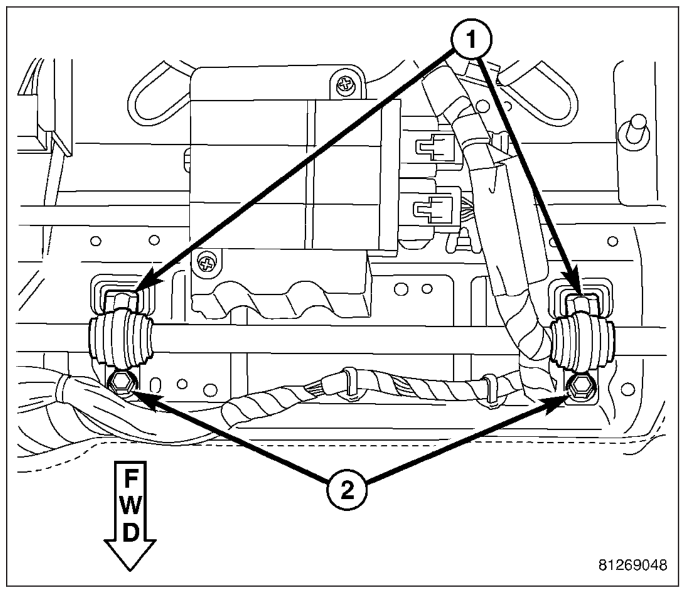


INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the rear of the seat cushion assembly (2) back under the seat back (1) and position the front of the cushion down over the seat adjuster frame.

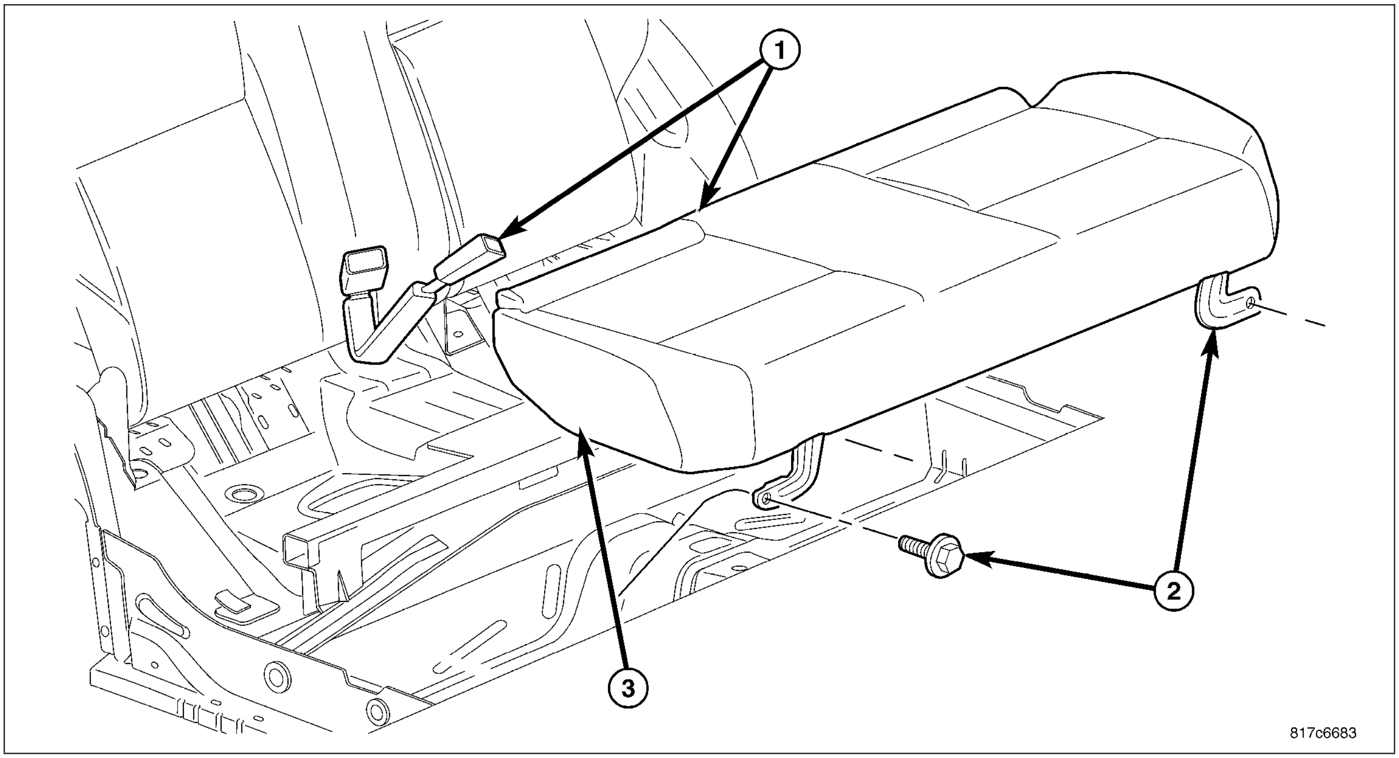


3. Install the seat cushion bushings and straps (1) and install the bolts (2).
4. Tighten the bolts to 11 N·m (8 ft. lbs.).



SEAT CUSHION - REAR

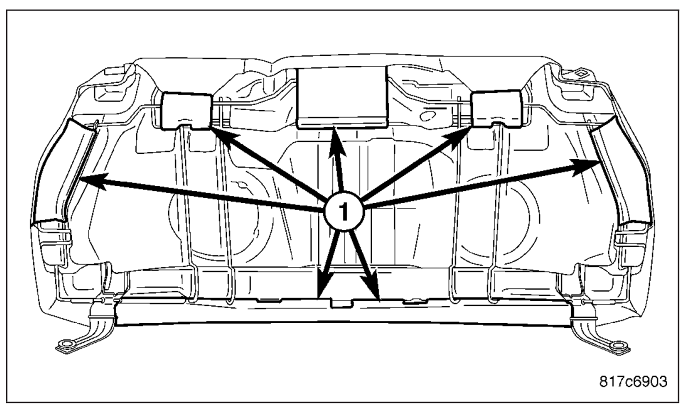
REMOVAL



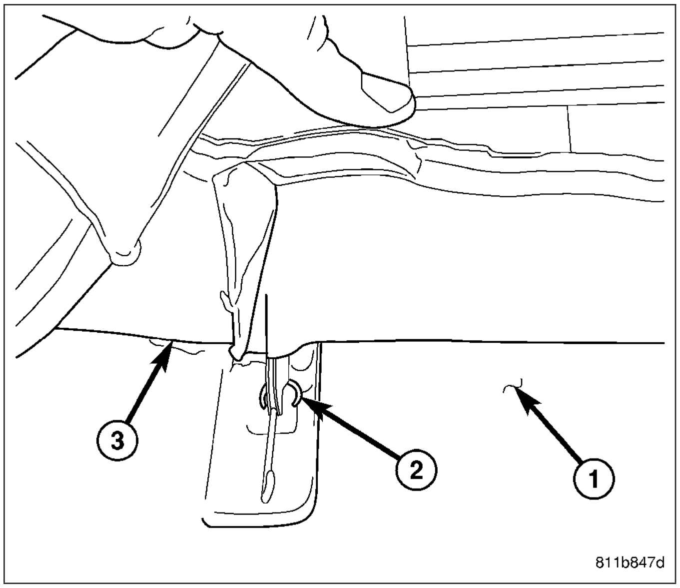
1. Remove the bolts (2).
2. Lift the front of the cushion (3) up and remove the cushion from under the seat back.

DISASSEMBLY

1. Remove the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - REAR - REMOVAL)
2. Separate the J-straps (1) from the seat frame.



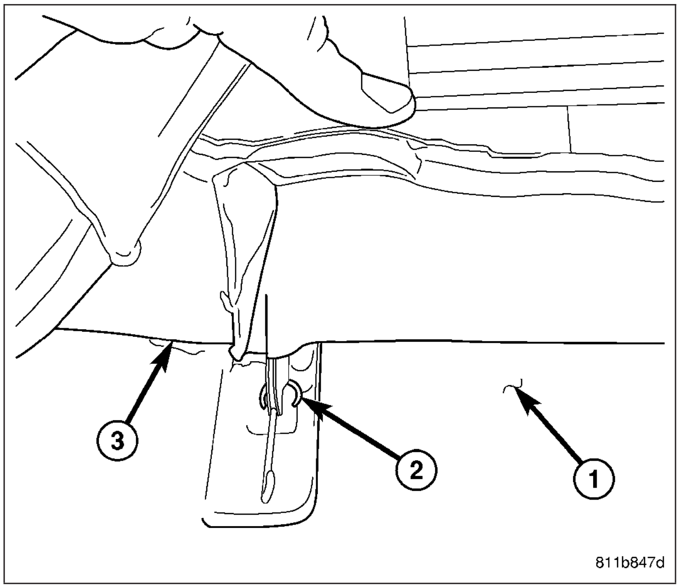
3. Remove the hog rings (2) connecting the seat cover (3) to the seat cushion foam (1) and separate from the seat cushion frame.



811b847d

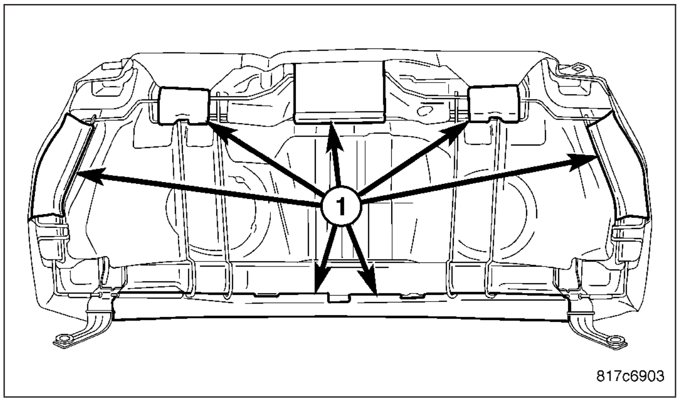
ASSEMBLY

1. Place the cushion cover (3) onto the cushion foam (1) and install new hog rings (2).



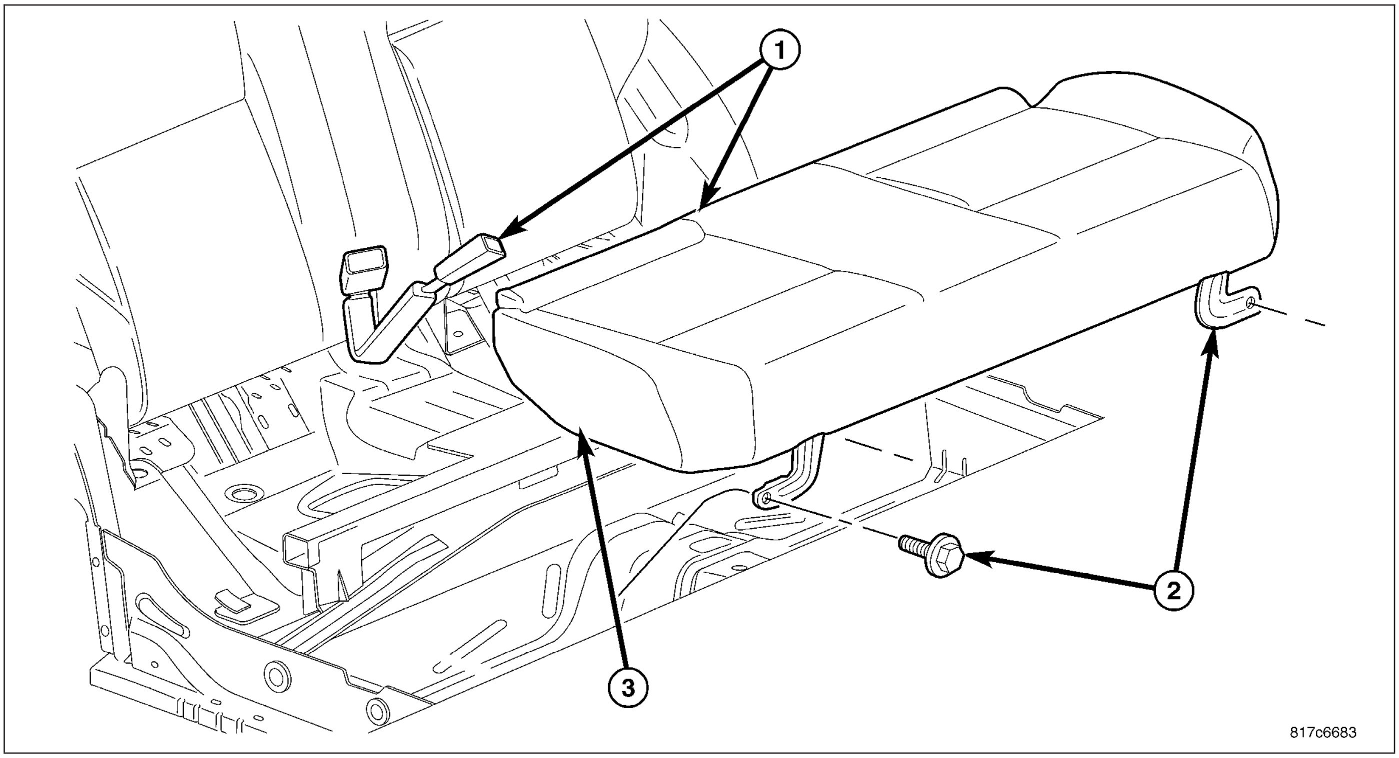
811b847d

2. Connect the J-straps (1) to the seat cushion frame.
3. Install the seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION - REAR - INSTALLATION)



817c6903

INSTALLATION



1. Place the seat cushion into the vehicle and tuck the rear of the cushion (1) up under the seat belt buckles and rear seat back.
2. Lower the front of the cushion (3) down and install the bolts (2).
3. Tighten the bolts to 56 N·m (41.5 ft. lbs.).

STATIONARY GLASS

TABLE OF CONTENTS

STATIONARY GLASS

WARNING

WINDSHIELD SAFETY PRECAUTIONS

WARNING: Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly in an accident.

- **Urethane adhesives are applied as a system. Use glass cleaner, glass prep solvent, glass primer, PVC (vinyl) primer and pinch weld (fence) primer provided by the adhesive manufacturer. If not, structural integrity could be compromised.**
- **DaimlerChrysler does not recommend glass adhesive by brand. Technicians should review product labels and technical data sheets, and use only adhesives that their manufactures warrant will restore a vehicle to the requirements of FMVSS 212. Technicians should also insure that primers and cleaners are compatible with the particular adhesive used.**
- **Be sure to refer to the urethane manufacturer's directions for curing time specifications, and do not use adhesive after its expiration date.**
- **Vapors that are emitted from the urethane adhesive or primer could cause personal injury. Use them in a well-ventilated area.**
- **Skin contact with urethane adhesive should be avoided. Personal injury may result.**
- **Always wear eye and hand protection when working with glass.**

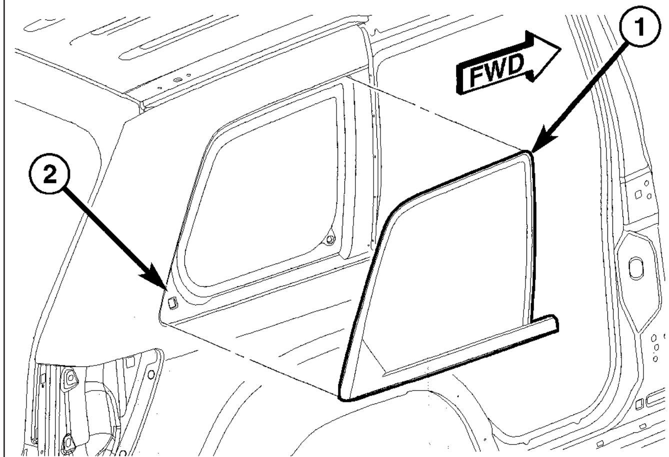
CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers. Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

QUARTER GLASS

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove the quarter panel trim from the side of the vehicle being serviced (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).

CAUTION: Be careful not to damage painted surfaces when removing moldings or cutting urethane around the windshield.



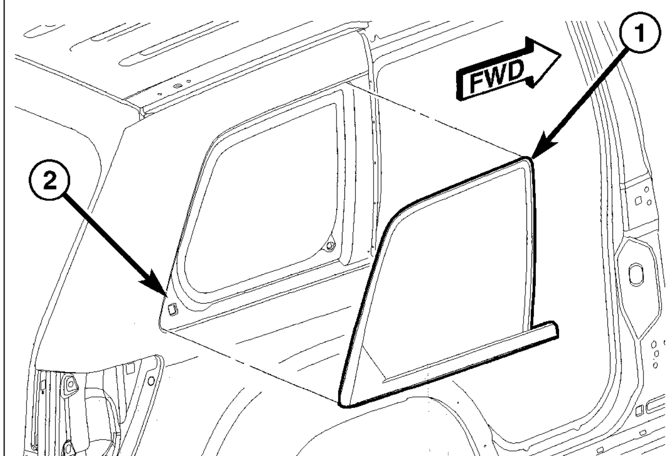
8151d913

3. Using razor knife, cut the urethane adhesive that secures the quarter glass (1) to window fence (2).
4. Carefully push the quarter window glass from the opening.

INSTALLATION

NOTE: Grand Cherokee shown, Caliber similar.

WARNING: Do not operate the vehicle within 24 hours of quarter glass installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the quarter glass may not perform properly if the vehicle is in an accident.



8151d913

CAUTION: To help prevent water leaks, partially roll down the left and right door glass before installing the quarter glass. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

NOTE: To prevent corrosion, do not damage paint on the quarter glass fence when removing original urethane.

NOTE: The quarter glass fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm (.04 in.) in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected.

1. Using a razor knife, level the original bead of urethane on the fence to a thickness of approximately 1 mm (0.04 in.).
2. If the quarter glass is being reused, remove as much of the original urethane as possible from the glass surface using a razor knife.

WARNING: Do not use solvent based glass cleaners to clean the quarter glass before applying glass prep and primer or poor glass adhesion may result.

3. Clean the inside of the quarter glass with an ammonia based glass cleaner and a lint-free cloth.
4. Apply glass prep adhesion promoter 25 mm (1 in.) wide around the perimeter of the glass and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
5. Apply glass primer 25 mm (1 in.) wide around the perimeter of the glass and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
6. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the quarter glass.
7. Re-prime any area that is not fully and evenly primed.
8. Clean the quarter glass fence with an ammonia based glass cleaner and a lint-free cloth.
9. Apply pinch weld primer 15 mm (0.75 in.) wide around the quarter glass fence. Allow at least three minutes drying time.
10. Using a flashlight, verify that the primer is completely and evenly installed along the quarter glass fence.
11. Re-prime any area that is not fully and evenly primed.

CAUTION: Always apply the bead of adhesive to the quarter glass. Always install the quarter glass within 5 minutes after applying the adhesive.

NOTE: If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

12. Apply approximately a 10 mm (0.4 in.) wide bead of adhesive with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass starting at the bottom center of the quarter glass.
13. Run the end of the adhesive bead on the quarter glass parallel to the start of the bead and smooth the ends flush.
14. Place the quarter glass (1) into the window opening (2) and insert mounting studs through the holes in the window fence.
15. Install the headliner.
16. Install the quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).

WINDSHIELD

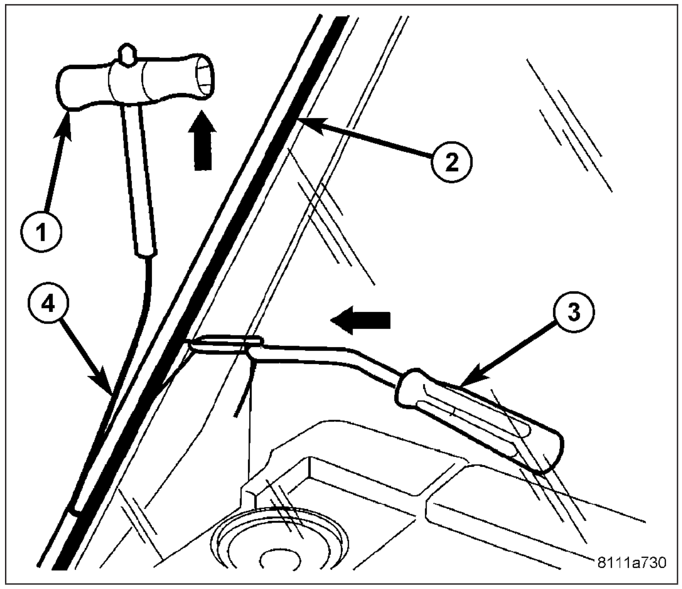
DESCRIPTION

The windshield is attached to the window frame (fence) with urethane adhesive. The urethane adhesive is applied cold and seals the surface area between the window opening and the glass. The primer adheres the urethane adhesive to the windshield.

It is difficult to salvage a windshield during the removal operation. The windshield is part of the structural support for the roof. The urethane bonding used to secure the windshield to the fence is difficult to cut or clean from any surface. If the rubber seals are set in urethane, it would also be unlikely they could be salvaged. Before removing the windshield, check the availability of the windshield and seals from the parts supplier.

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove the rear view mirror (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL).
3. Remove the rain sensor module from the windshield (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RAIN SENSOR MODULE - REMOVAL).
4. Remove the cowl grille (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL.)



CAUTION: Be careful not to damage painted surfaces when removing moldings or cutting urethane around the windshield.

5. Remove molding from the top of the windshield.
6. Using an assistant and a wire-type windshield cut-out tool (1, 3 and 4), cut and separate the urethane adhesive (2) securing the windshield to the windshield fence.
7. Carefully remove the windshield from the vehicle.

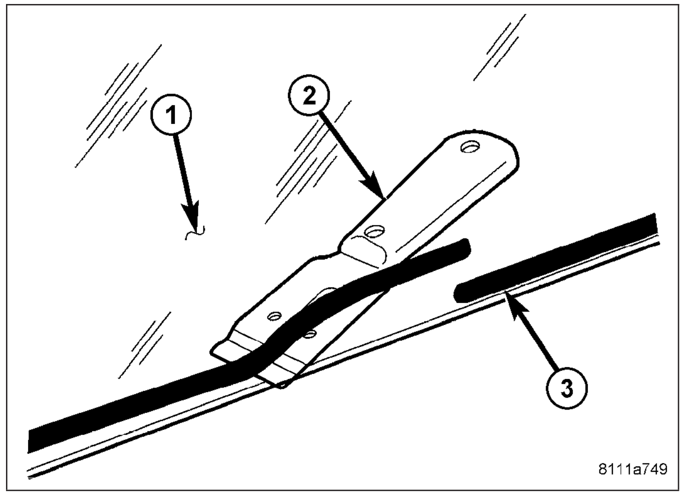
INSTALLATION

WARNING: Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly if the vehicle is in an accident.

CAUTION: To help prevent water leaks, partially roll down the left and right door glass before installing the windshield. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

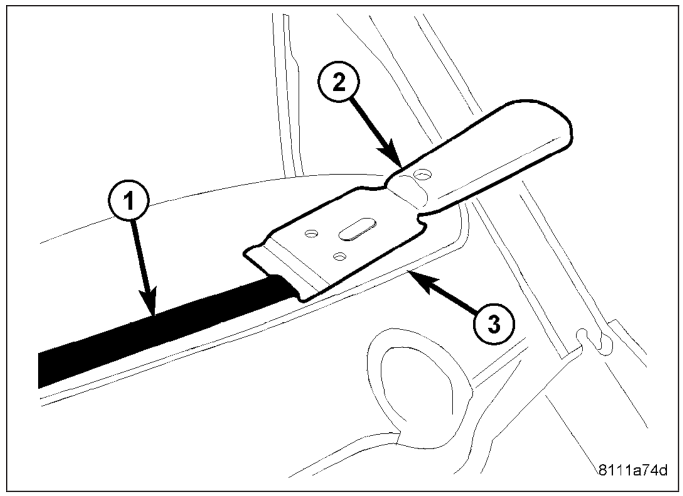
CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

1. If the windshield (1) is being reused, remove as much of the original urethane (3) as possible from the glass surface using a razor knife (2).

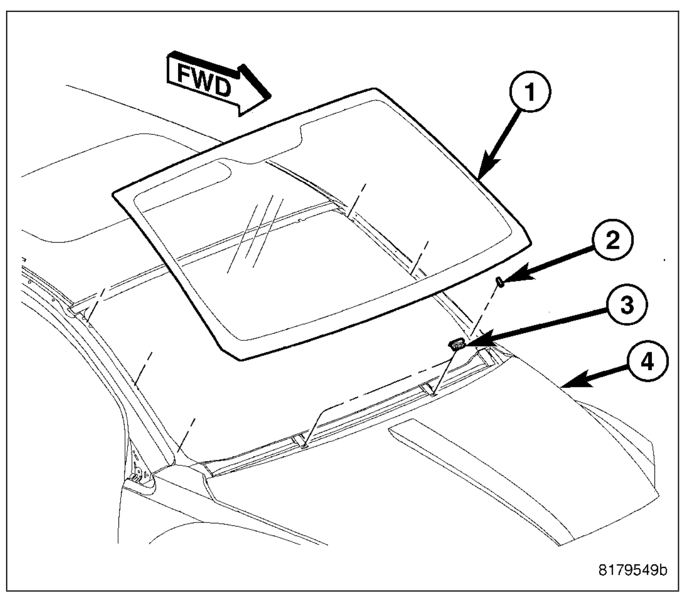


NOTE: To prevent corrosion, do not damage paint on windshield fence when removing original urethane.

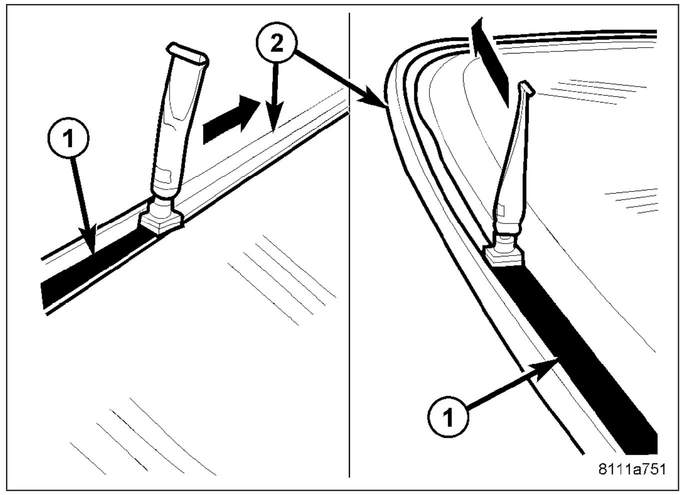
NOTE: The windshield fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm (.04 in.) in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Support spacers located near the cowl at the bottom of the windshield fence should be replaced with new spacers. Replace any missing or damaged spacers around the perimeter of the windshield fence.



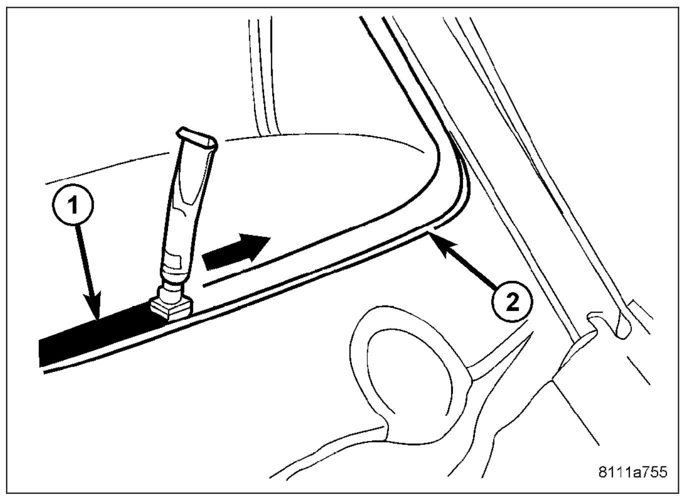
2. Using a razor knife (2), level the original bead of urethane (1) on the windshield fence (3) to a thickness of approximately 1 mm (0.04 in.) and remove any damaged adhesive backed spacers.
3. Install new adhesive backed spacers along the windshield fence as required.
4. Install a new rubber seal (2) along the top of the windshield (1).
5. Using an assistant, position the windshield into the windshield opening and against the windshield fence (3) and spacers.
6. Verify the windshield lays evenly against the fence at the top, bottom and sides of the opening. If not, the fence must be formed to the shape of the windshield.
7. Mark the windshield and the windshield fence with a grease pencil or pieces of masking tape to use as a reference for installation.
8. Using an assistant, remove the windshield from the windshield opening and place it on a suitable padded work surface.



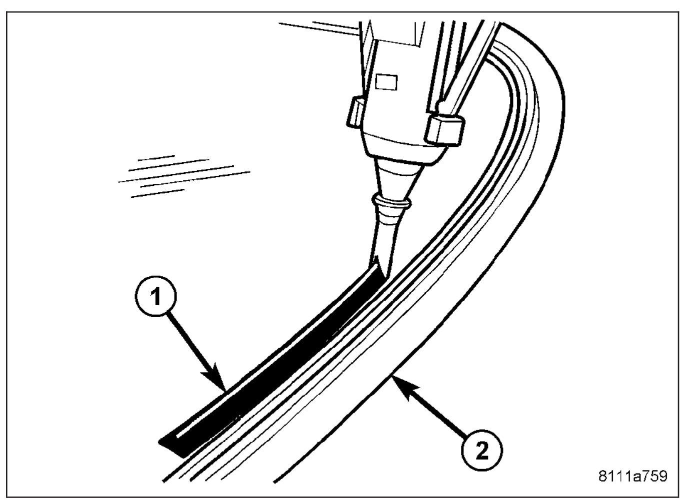
WARNING: Do not use solvent based glass cleaners to clean the windshield before applying glass prep and primer or poor glass adhesion may result.



9. Clean the inside of the windshield with an ammonia based glass cleaner and a lint-free cloth.
10. Apply glass prep adhesion promoter 25 mm (1 in.) wide (1) around the perimeter of the windshield (2) and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
11. Apply glass primer 25 mm (1 in.) wide (1) around the perimeter of the windshield (2) and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
12. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the windshield.
13. Re-prime any area that is not fully and evenly primed.



14. Clean the windshield fence with an ammonia based glass cleaner and a lint-free cloth.
15. Apply pinch weld primer 15 mm (0.75 in.) wide (1) around the windshield fence (2). Allow at least three minutes drying time.
16. Using a flashlight, verify that the primer is completely and evenly installed along the windshield fence.
17. Re-prime any area that is not fully and evenly primed.

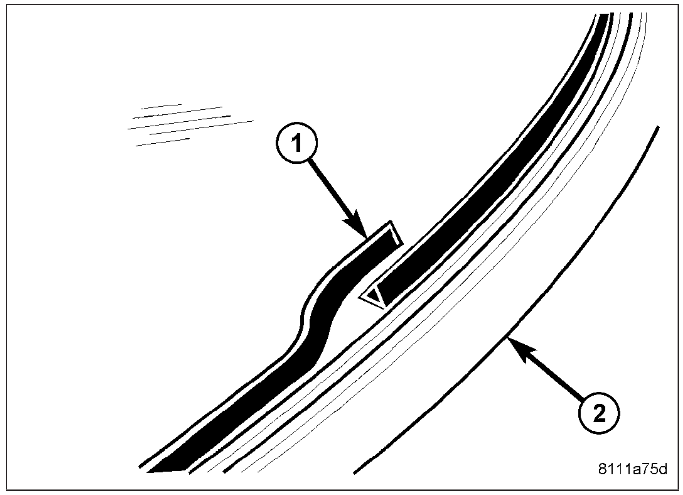


CAUTION: Always apply the bead of adhesive to the windshield. Always install the windshield within 5 minutes after applying the adhesive.

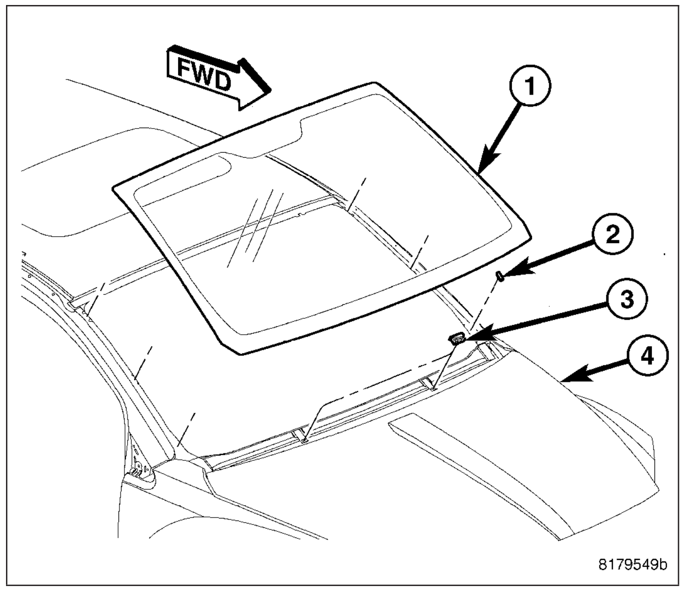
NOTE: If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

18. Apply approximately a 10 mm (0.4 in.) wide bead of adhesive (1) with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass (2) starting at the bottom center of the windshield.

19. Run the end of the adhesive bead (1) on the windshield (2) parallel to the start of the bead and smooth the ends flush.



20. Using an assistant, position the windshield (1) over the windshield opening.
21. Using the grease pencil marks or tape as reference points, align the windshield to the windshield opening.
22. Carefully lower the windshield into the windshield opening. Guide the windshield and the rubber seal (2) at the top the windshield into its proper location.



CAUTION: It is not possible to move the windshield after installation. The windshield should never be pressed into place by more than one person, because the windshield can break if pressed simultaneously on both sides.

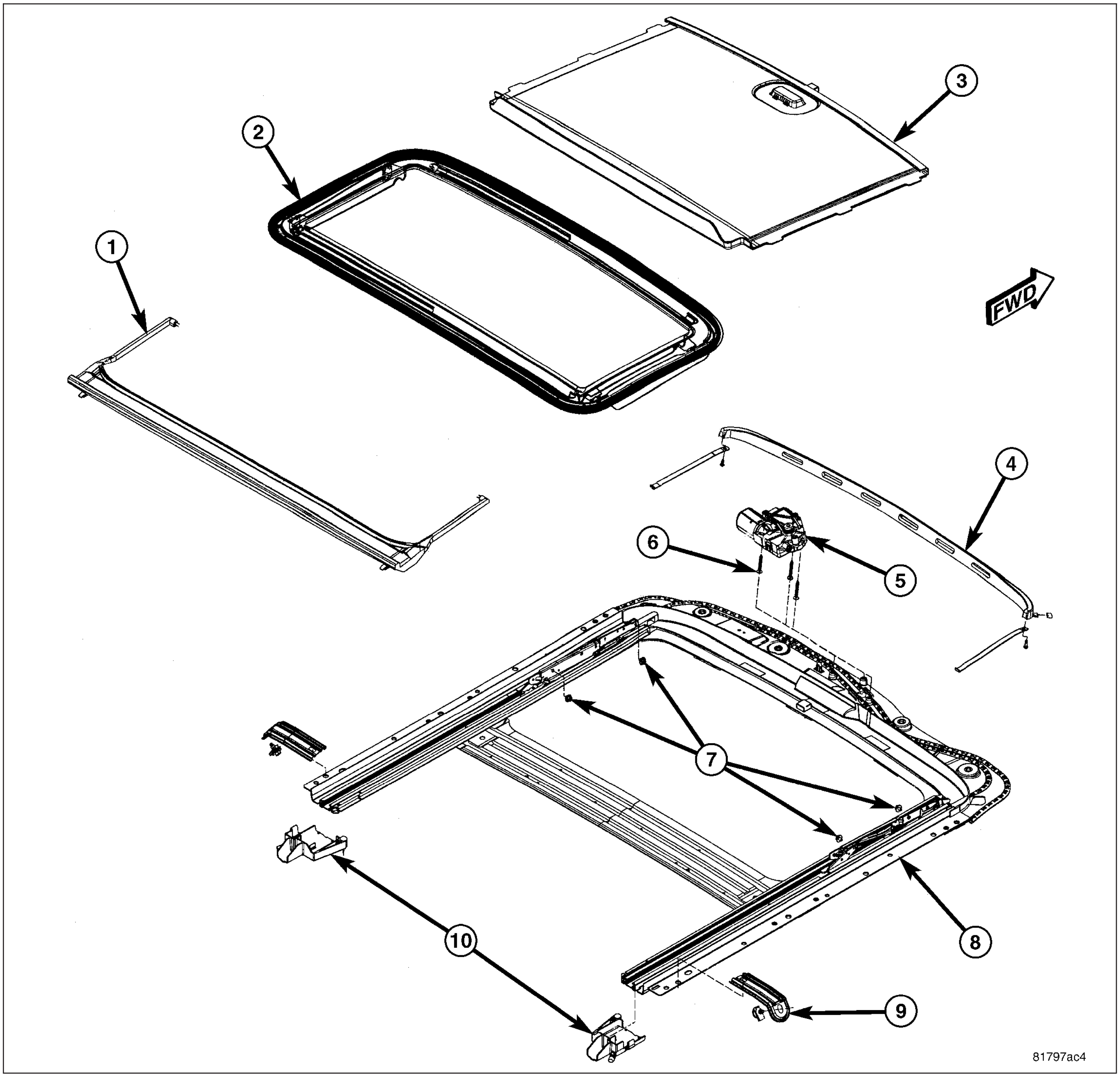
23. Push the windshield inward until the windshield comes into contact with the spacers located on each side and the bottom of the windshield fence.
24. Install the cowl grill (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).
25. Install the rear view mirror onto the windshield (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION).
26. Install the rain sensor module onto the windshield (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RAIN SENSOR MODULE - INSTALLATION).

SUNROOF

TABLE OF CONTENTS

SUNROOF

DESCRIPTION



EXPLODED VIEW

1 - DRAIN TROUGH
2 - GLASS ASSEMBLY
3 - SUN SHADE
4 - WIND DEFLECTOR
5 - MOTOR
6 - MOTOR SCREWS (3) 3 N·m (26 in. lbs.)
7 - GLASS ASSEMBLY SCREWS (4) 3.5 N·m (31 in. lbs.)
8 - FRAME ASSEMBLY
9 - BRACKETS
10 - END CAPS

WARNING: Keep fingers and other body parts out of sunroof opening at all times.

The sunroof features a power sliding glass panel and a sunshade which can be manually positioned anywhere along its travel, rearward of glass panel front edge.

The sunroof is electrically operated from two switches located on the windshield header, between the map lamp. To operate the sunroof the ignition switch must be in either the Accessory or On/Run position. One switch (vent) is a push button type and opens the sunroof to the vent position only. The other switch (open/close) is a rocker type for opening and closing the sunroof. Pressing and releasing the open button once the sunroof will express open and the wind deflector will raise. If the button is pressed a second time the sunroof will stop in that position. Pressing and holding the close button will close the sunroof. If the close button is released the sunroof will stop in that position. Also, by pressing the close button the sunroof will close automatically.

SUNROOF OPERATION INSTRUCTIONS

SWITCH INPUTS			
	OPEN	CLOSE	VENT
FULL VENT	1. Push and hold switch until glass stops in flush closed position glass will then express open 2. Press switch for less than 0.65 seconds for express to full open.	1. Push and hold switch until glass stops in flush closed position. 2. Press switch for less than 0.65 seconds for express to flush closed.	No action
VENT RANGE	1. Push and hold switch until glass passes through flush closed position. Glass will then open 2. Press switch for less than 0.65 seconds for express to full open.	1. Push and hold switch until glass stops in flush closed position. 2. Press switch for less than 0.65 seconds for express to flush closed.	1. Push and hold switch until glass stops in full vent position. 2. Press switch for less than 0.65 seconds for express to full vent.
FLUSH	1. Press switch for less than 0.65 seconds for express to full open. 2. Press switch for more than 0.65 seconds and glass will stop when switch is released	No action	1. Press and hold switch. Glass will travel through flush closed to full vent. Glass will stop when switch is released or when fully vented. 2. Press switch for less than 0.65 seconds for express to full vent.
FULL OPEN	No action	1. Press and hold switch until glass stops in flush closed position or anywhere in between. 2. Press switch for less than 0.65 seconds for express to flush closed.	1. Press and hold switch. Glass will travel through flush closed to full vent. Glass will stop when switch is released. 2. Press switch for less than 0.65 seconds for express to full vent.

DIAGNOSIS AND TESTING

WATER DRAINAGE AND WIND NOISE DIAGNOSIS

The sliding glass panel is designed to seal water entry with a snug fit between the roof and the seal. The fit can be checked by inserting a piece of paper between the roof and the seal. The piece of paper should have some resistance when pulled out when the glass panel is in the closed position. The sunroof housing will drain off a minimum amount of water. Excessive wind noise could result if the gap clearances are exceeded. The sunroof glass panel may need to be adjusted. Refer to Sunroof Glass Panel Adjustment for proper procedures.

Adequate drainage is provided by a drain trough in the sunroof housing which encircles the sliding glass panel and leads to drain hoses. If a wet headliner or other water leak complaints are encountered, before performing any adjustments, first ensure that the drainage system is not plugged or disconnected. Use a pint container to pour water into the sunroof housing drain trough. If water flow is restricted, use compressed air to blow out any material plugging the drain system. Retest system again.

To further check for a disconnected drain hose:

1. Remove A-pillar trim, sun visors, and map lamps/mini console.
2. Lower headliner as necessary to gain access to sunroof housing drain tubes. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
3. Repair as necessary.
4. Install headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

DIAGNOSTIC PROCEDURES

Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. Refer to Sunroof Diagnostic Chart for possible causes. If not, a common electrical problem may exist. Refer to Wiring Diagrams, in this publication for circuit, splice and component descriptions. Check the condition of the circuit protection (20 amp circuit breaker in cavity 19 of the Junction Block). Inspect all wiring connector pins for proper engagement and continuity. Check for battery voltage at the power sunroof drive motor, refer to Wiring Diagrams, for circuit information. If battery voltage of more than 9 volts is detected at the drive motor, proceed with the following tests (the drive motor will not operate at less than 9 volts).

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. If however, the sunroof glass is in a partial closed position, high pressure water may be forced beyond the water management system boundaries and onto the headlining.

SUNROOF DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE
Sunroof motor inoperative.	Faulty control switch. Faulty circuit ground between sunroof drive motor, control switch, and body harness. Faulty power circuit between sunroof drive motor, control switch, and body harness. Faulty drive motor. Faulty drive motor electrical connector.
Audible whine when switch is depressed, sunroof does not operate.	Faulty drive motor. Binding cable.
Audible clicking or ratcheting when switch is pressed, sunroof does not operate.	Broken or worn drive cable. Worn drive motor gear. Mechanisms not synchronized.

SYMPTOM	POSSIBLE CAUSE
Sunroof vents and opens, but does not close.	Binding cable. Faulty circuit. Faulty control switch. Faulty drive motor. Broken trough guide
Sunroof vents, but does not open.	Binding cable or mechanism. Faulty circuit. Faulty switch. Faulty drive motor.
Sunroof does not vent.	Binding cable or mechanism. Faulty circuit. Faulty control switch. Faulty drive motor.
Sunroof water leak.	Drain tubes clogged or kinked or disconnected from the sunroof. Glass panel improperly adjusted. Faulty glass panel seal.
Gurgling sound from sunroof.	Low spot in drain hose routing, allowing water to stand.
Wind noise from sunroof.	Front of glass panel too high or rear too low. Wind deflector not deploying. Glass not centered in opening. Faulty glass panel seal.
Rattles from open sunroof while driving.	Loose or broken attaching hardware. Worn or broken mechanism.
Sunroof does not stop in the fully closed position.	Drive motor has lost position of glass, teach procedure required to reprogram drive motor. Refer to sunroof drive motor teach procedure.

CONTROL SWITCH

DESCRIPTION

Vehicles equipped with a power sunroof utilize an sunroof control switch. On this model, the sunroof control switch is located in the overhead console, in between the two reading lamps. The switch is mounted in the overhead console with four plastic retaining tabs, molded into the switch housing.

This switch incorporates six selections of operation open, auto open, close, auto close, auto vent and vent. The individual switches in the sunroof control switch unit cannot be repaired. If one switch is damaged or faulty, the entire sunroof control switch unit must be replaced.

OPERATION

With the operation of the sunroof control switch, voltage is directed to the sunroof motor, through the switch contacts or control module. If the control switch is depressed and held depressed the voltage signal is controlled manually through the switch contacts, so when the switch is released the sunroof stops.

Refer to the Owner's Manual for more information on the operation of the sunroof switch and system.

DIAGNOSIS AND TESTING

CONTROL SWITCH

The following test will determine if the sunroof control switch is operating properly.

1. Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
2. Remove the sunroof control switch from the overhead console (Refer to 23 - BODY/SUNROOF/CONTROL SWITCH - REMOVAL).
3. Using an ohmmeter, test the switch terminals for proper continuity using the table below. If any of the terminals do not show proper continuity, replace the sunroof control switch.

SWITCH POSITION (DEPRESSED)	CONTINUITY BETWEEN TERMINALS
VENT (V)	3, 4
OPEN (AUTO)	1, 4
CLOSE (AUTO)	2, 4

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
3. Disconnect the sunroof control switch electrical connector. Depress the connector retaining tab and pull the connector straight out.
4. To remove the switch from the overhead console, push on the back of the switch until it comes free from the overhead console.

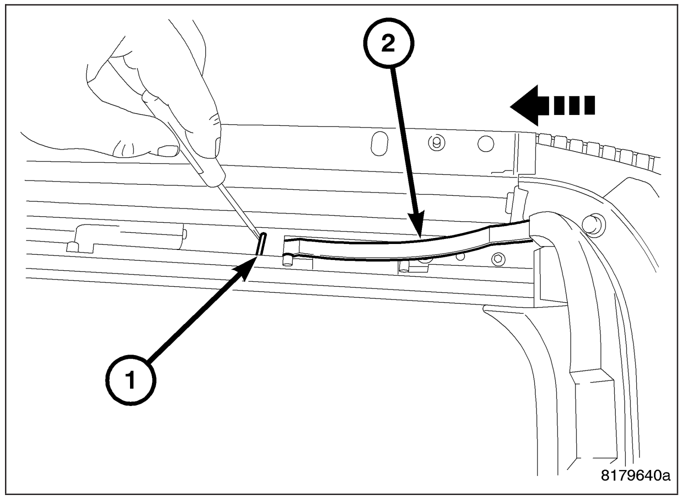
INSTALLATION

1. Install the switch in the overhead console assembly. Be certain the switch is securely snapped in place.
2. Connect the sunroof control switch electrical connector. Be certain the switch connector is securely snapped in place.
3. Install the overhead console (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
4. Connect the negative battery cable.

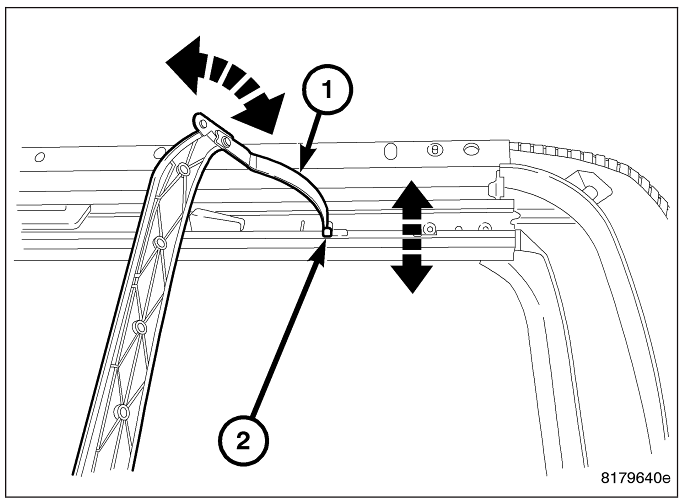
DEFLECTOR-WIND

REMOVAL

1. Open the sunroof glass to the full open position.
2. Press the spring lock (1) with a small flat bladed tool and push the wind deflector (2) reward to release from the car top opening.
3. Repeat the previous step on the opposite side.

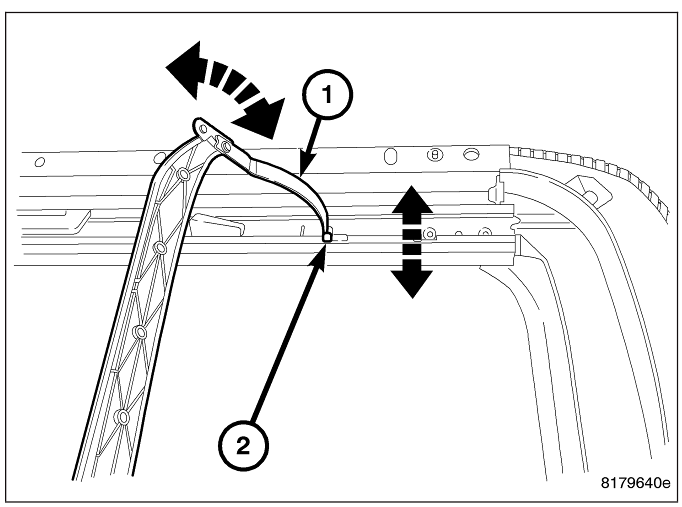


4. Rotate the wind deflector (1) up and release from the mounting hole (2) in the sunroof frame.

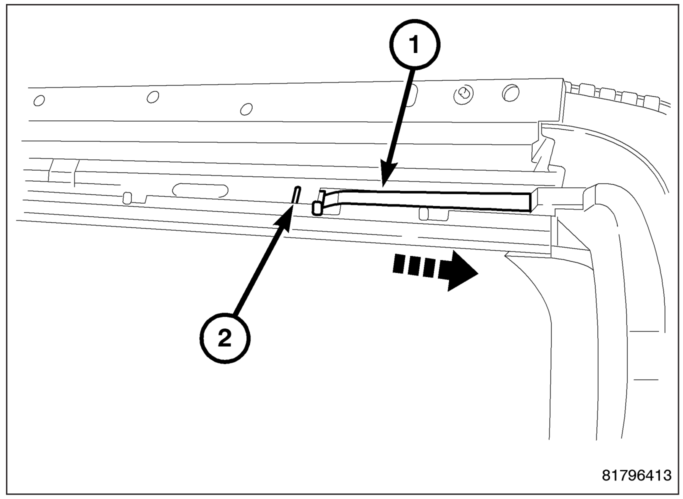


INSTALLATION

1. Position the wind deflector springs (1) into the mounting holes (2) in the sunroof frame.
2. Rotate forward and down into position.



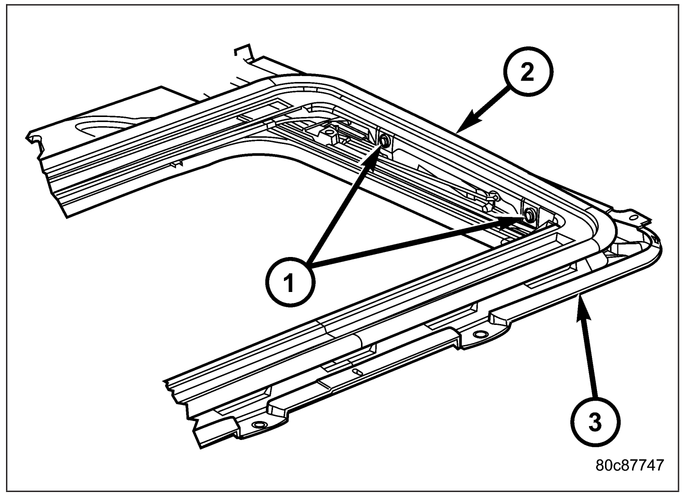
3. Slide the wind deflector and spring (1) forward under the car top lip and make sure the spring lock snaps into place (2) fully.



GLASS

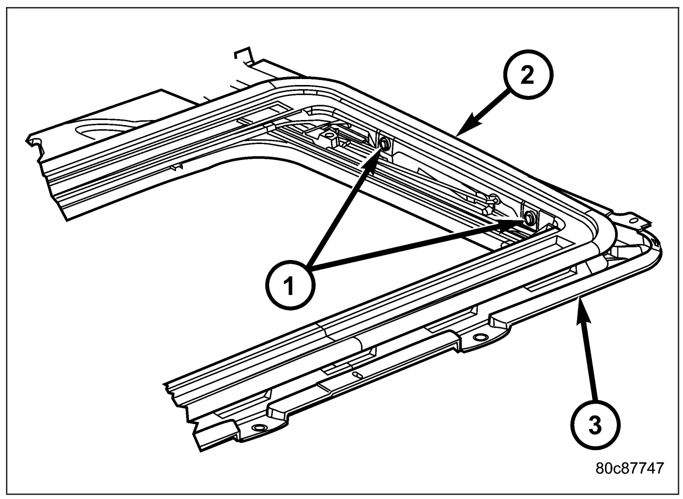
REMOVAL

1. Slide sunshade rearward to the open position.
2. Move the glass panel to the closed position.
3. Remove the four glass panel screws (1).
4. Lift off glass panel and remove from vehicle.



INSTALLATION

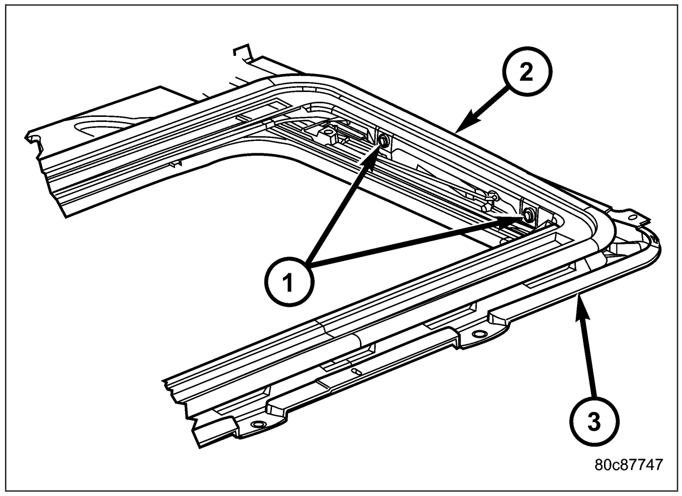
1. Position glass panel (2) on to mechanism lift arm.
2. Start the four attaching screws (1).
3. Center glass in opening by running a business card around the glass.
4. Adjust glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)



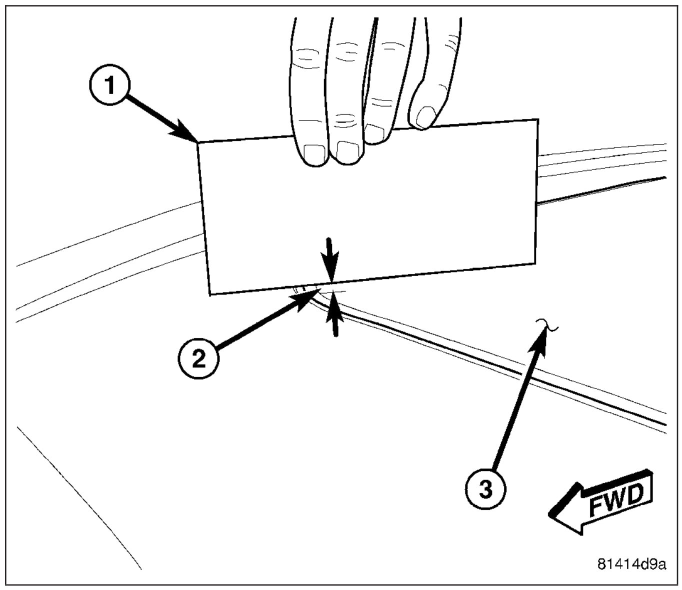
ADJUSTMENTS

SUNROOF GLASS PANEL ADJUSTMENT

1. Move the sunshade rearward to the open position.
2. Move the sunroof glass panel to the fully closed position.
3. Adjust the glass one corner at a time.
    a. Loosen four glass screws (1).
    b. Lift glass assembly and align the top of the glass panel to the top of the roof panel.
    c. Tighten screw to 3.5 N·m (31 in. lbs.).
    d. Repeat steps a. and b. for each corner of the glass panel.
    e. When properly adjusted, the front of the glass panel is 1.0 mm (0.04 in.) to 2.0 mm (0.08 in.) lower than the roof surface and the rear edge of the glass panel is 1.0 mm (0.04 in.) to 2.0 mm (0.08 in.) higher than the roof surface.

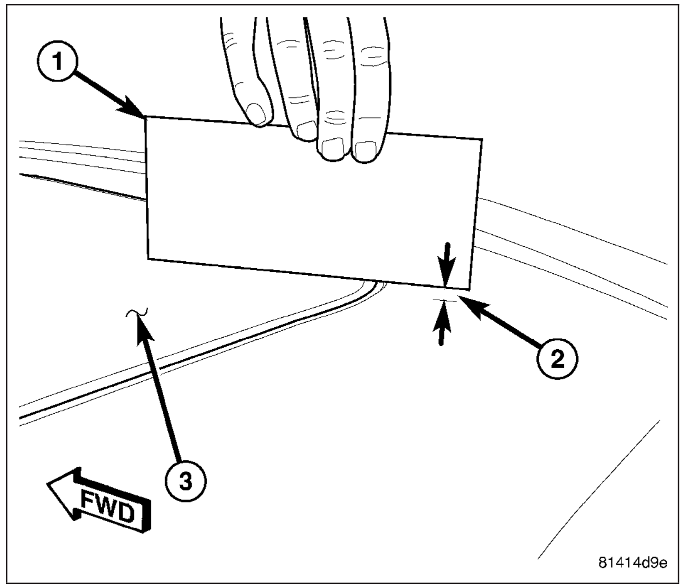


NOTE: When properly adjusted, the front of the glass panel (3) is 1.0 mm (0.04 in.) to 2.0 mm (0.08 in.) lower than the roof surface (2).



NOTE: When properly adjusted, the rear edge of the glass panel (3) is 1.0 mm (0.04 in.) to 2.0 mm (0.08 in.) higher than the roof surface (2).

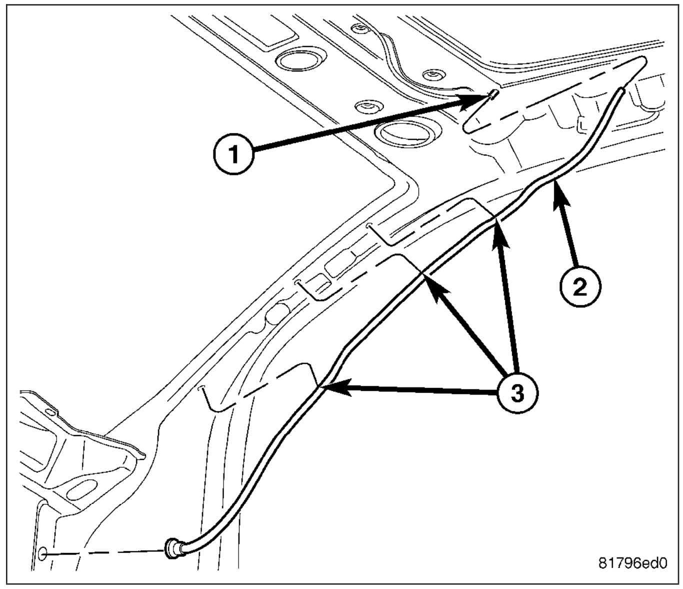
4. Verify sunroof operation and alignment. Check fit and re-adjust as necessary.



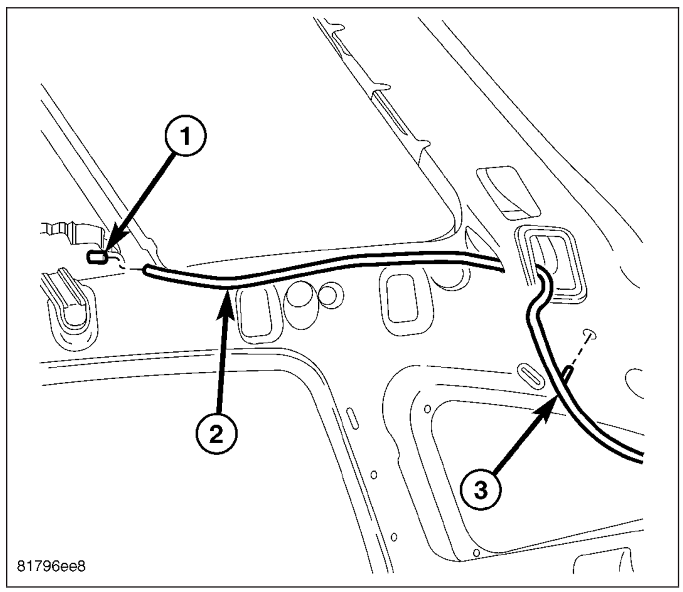
HOSE-DRAIN

REMOVAL

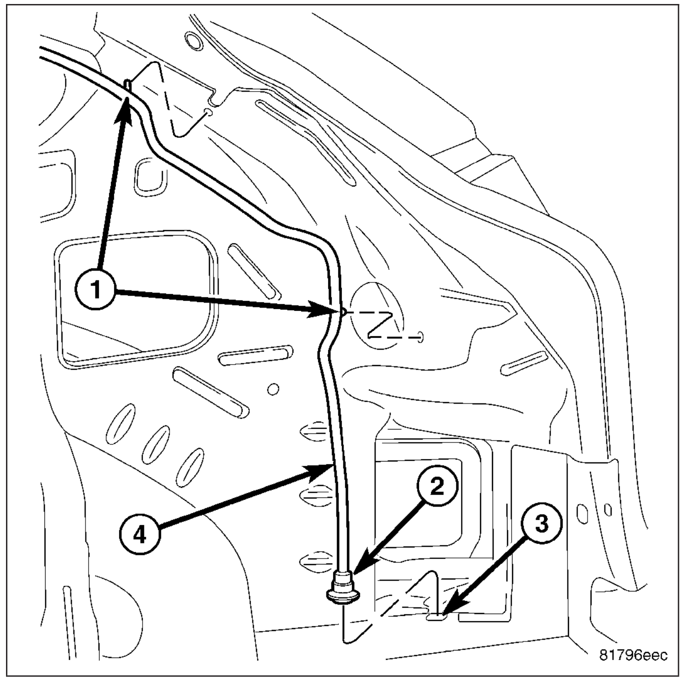
1. Drop down the headliner as necessary to gain access to the drain hoses (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
2. Disconnect the front hoses (2) from the sunroof assembly (1).
3. Release the support clips (3) and disconnect the lower grommet and remove the hose.



4. Disconnect the rear hoses (2) from the sunroof assembly (1) and release the support clips (3).

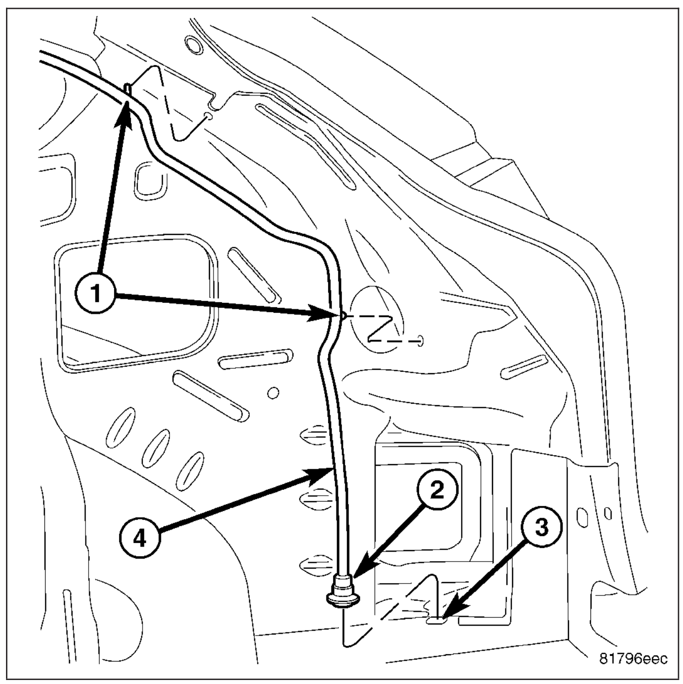


5. Separate the remaining support clips (1).
6. Disconnect the grommet (2) from the body (3) and remove the rear hoses as necessary.

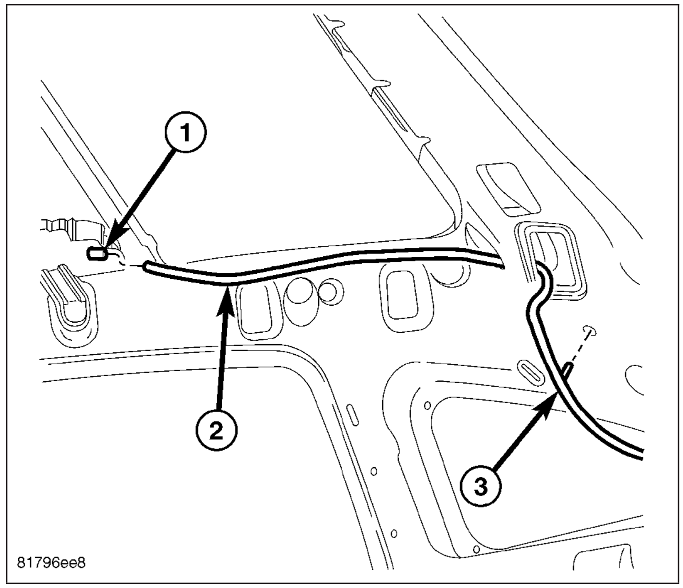


INSTALLATION

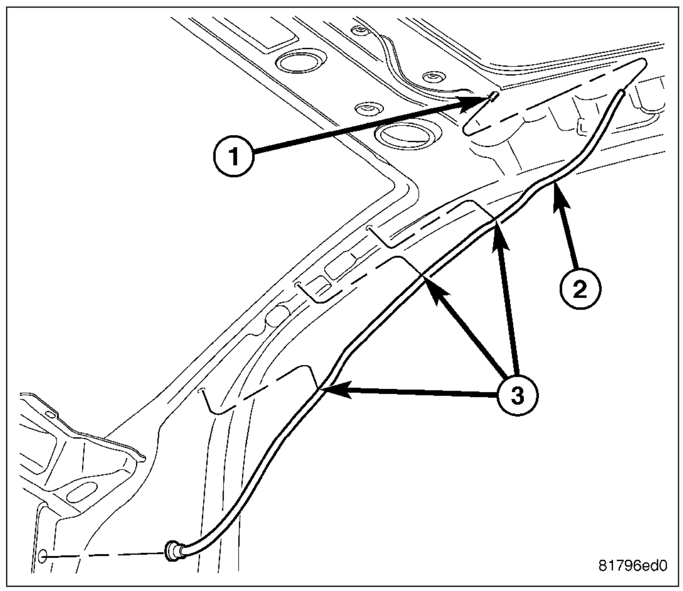
1. Install the rear hoses (4) and connect the grommets (2) to the body (3).
2. Connect the support clips (1).



3. Route the hose as required and connect the remaining support clips (3).
4. Connect the hoses (2) to the sunroof assembly (1).



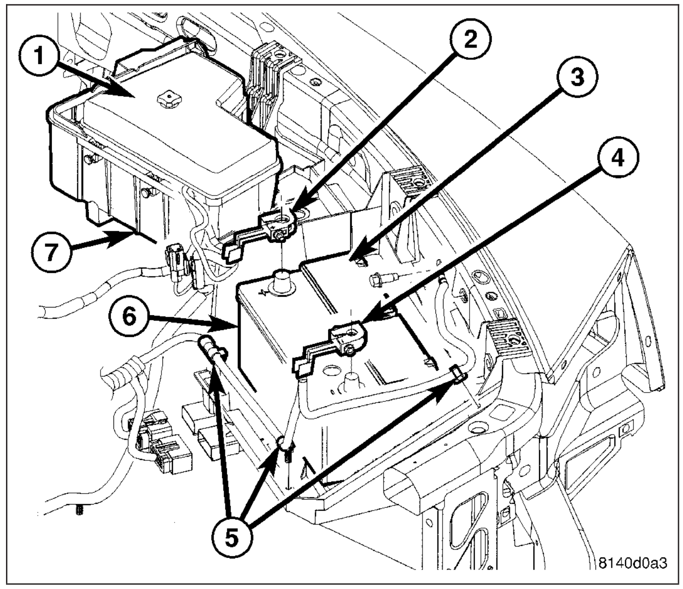
5. Connect the front hose lower grommet to the body.
6. Connect the front hose (2) to the sunroof assembly (1) and connect the support clips (3).



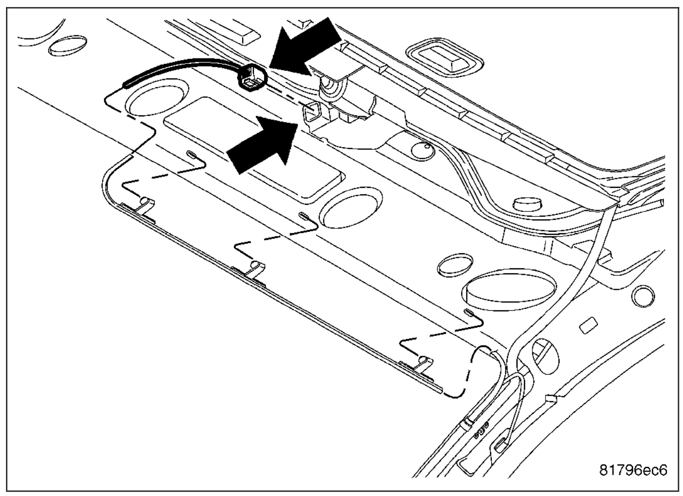
MODULE/FRAME ASSEMBLY

REMOVAL

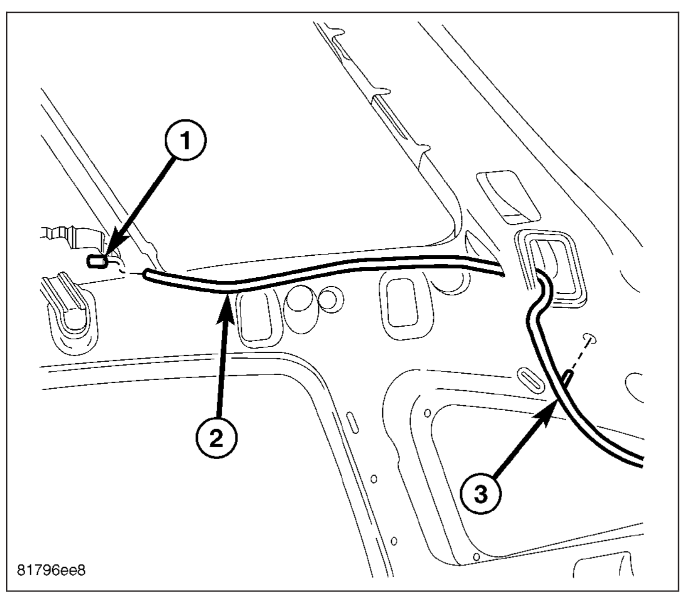
1. Move glass panel to fully closed position.
2. Disconnect and isolate negative battery cable (4).
3. Remove control switch (Refer to 23 - BODY/SUNROOF/CONTROL SWITCH - REMOVAL).
4. Remove headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).

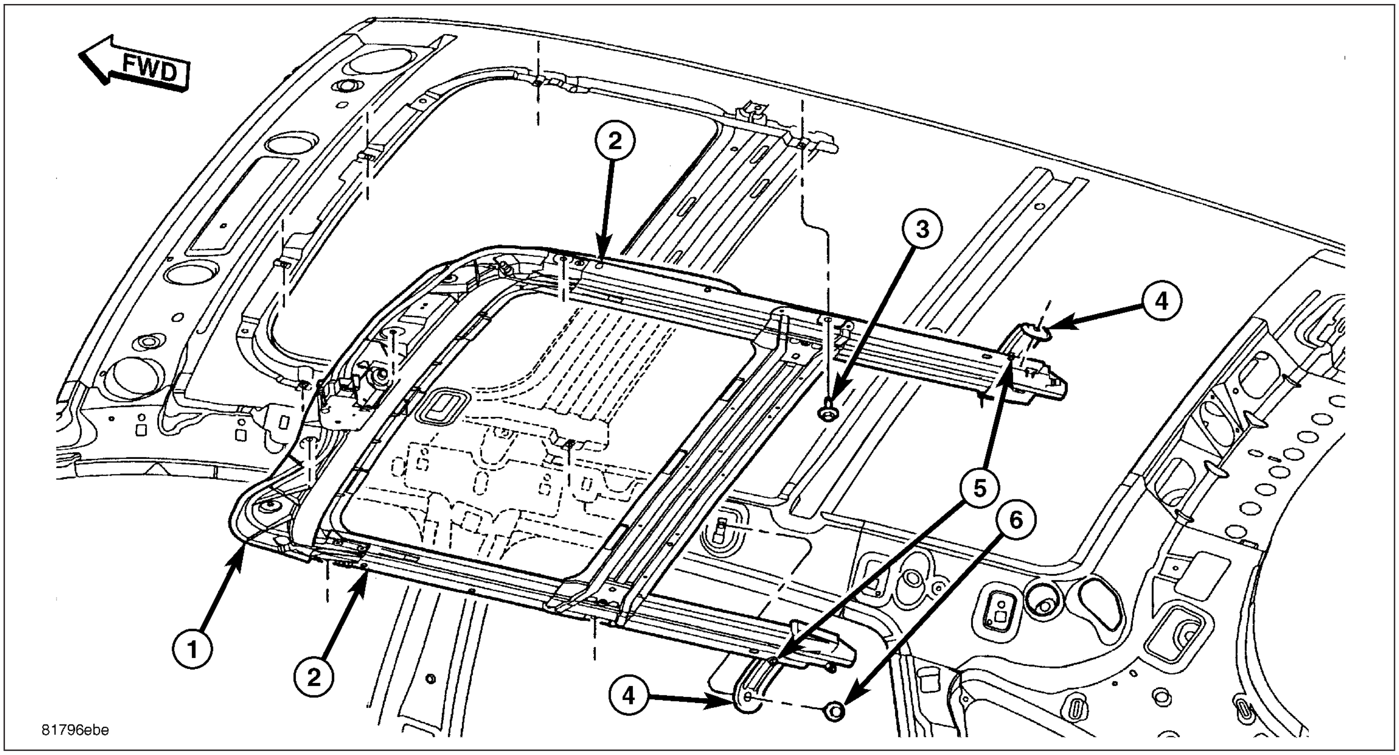


5. Disconnect the electrical connector.



6. Disconnect drain tubes (2) from sunroof housing (1).



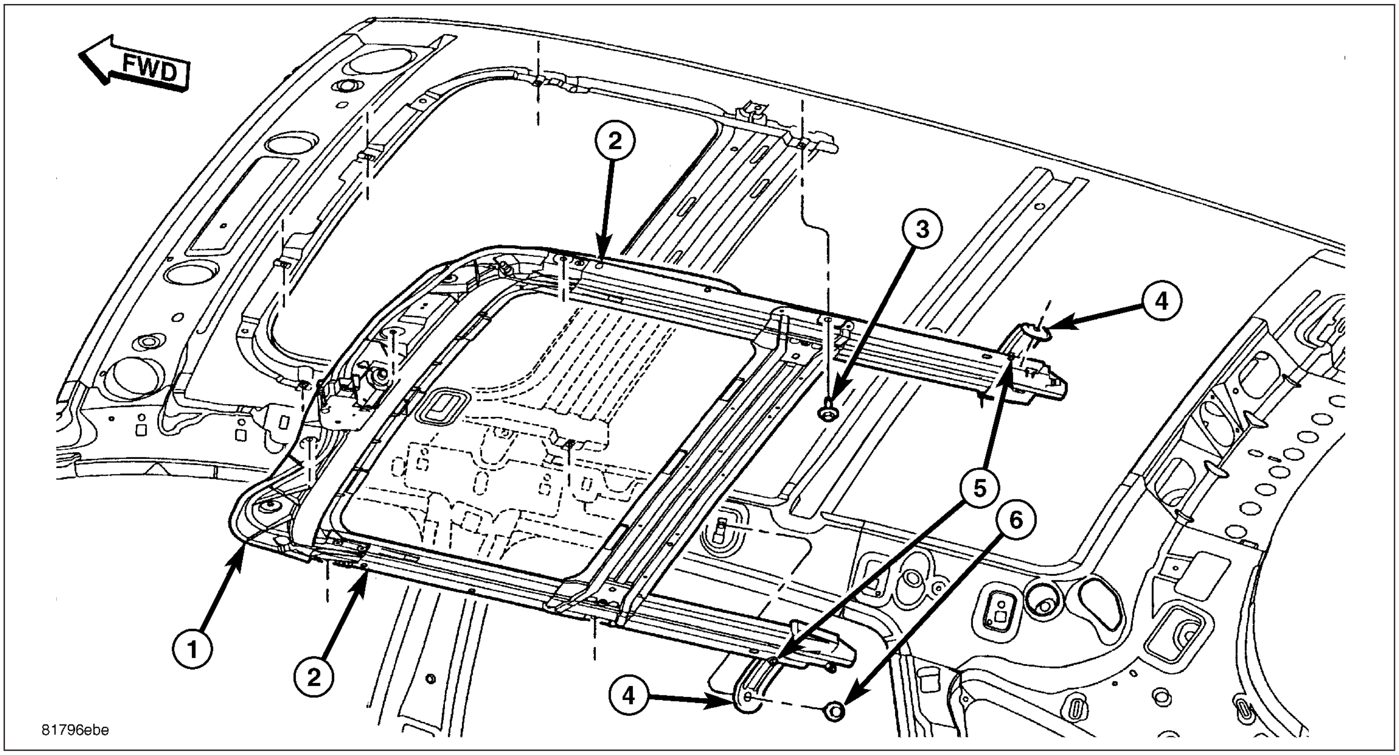


7. Remove two module side bracket (4) bolts (6) and loosen the six remaining fasteners (3).
8. Remove the six (3) fasteners attaching sunroof module assembly (1) to roof panel.
9. Remove the glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL).
10. Remove the sunshade (Refer to 23 - BODY/SUNROOF/SUNSHADE - REMOVAL).
11. Remove the drive motor (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - REMOVAL).
12. Remove the wire harness.
13. Remove the trough guides (Refer to 23 - BODY/SUNROOF/GUIDE ASSEMBLY - REMOVAL).

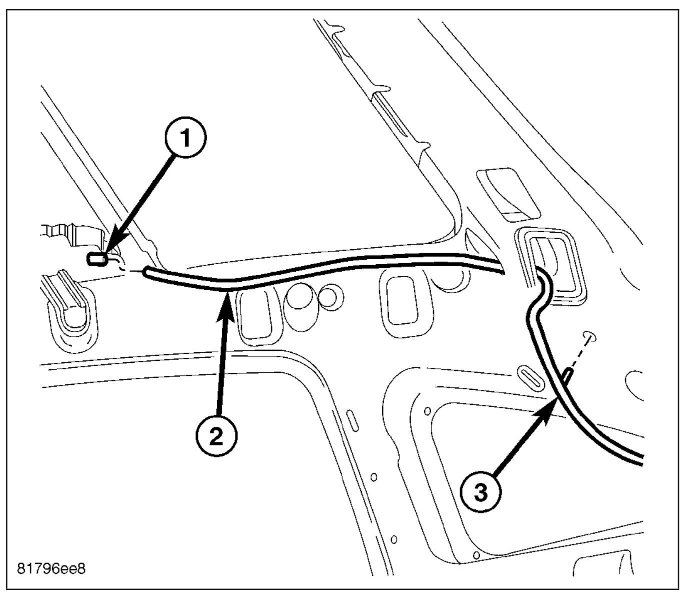
INSTALLATION

NOTE: Mk Sunroof assembly shown, PM similar.

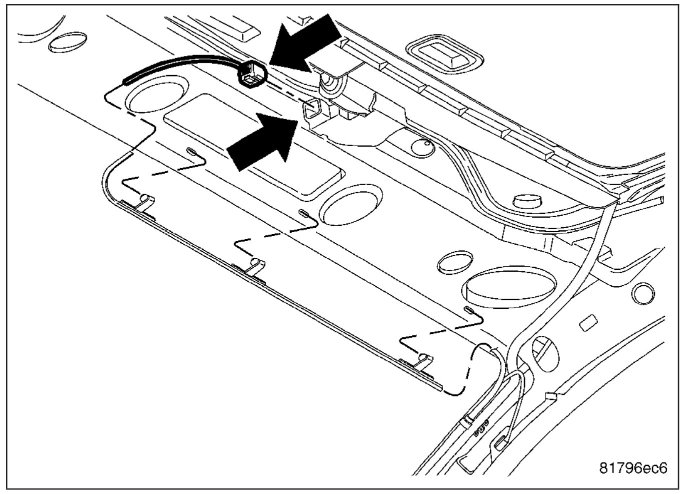
1. Install the trough guides (Refer to 23 - BODY/SUNROOF/TROUGH GUIDE ASSEMBLY - INSTALLATION).
2. Install the drive motor (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - INSTALLATION).
3. Install the sunshade (Refer to 23 - BODY/SUNROOF/SUNSHADE - INSTALLATION).
4. Install the glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION).



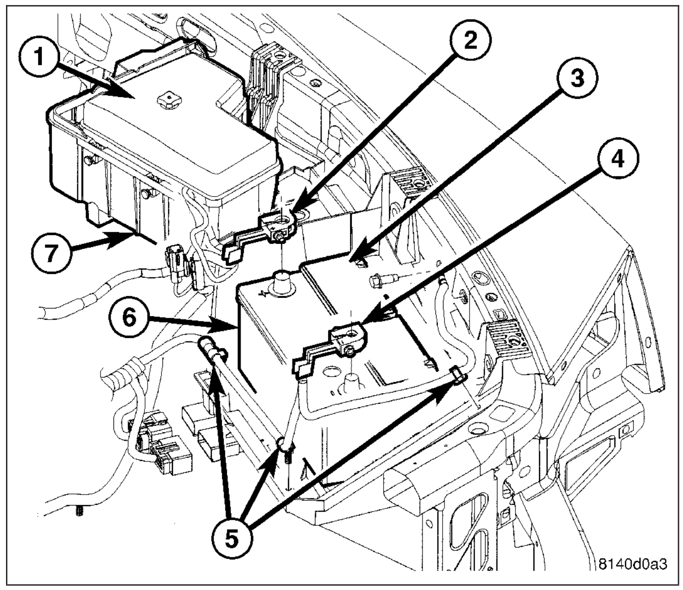
5. Raise rear end of sunroof module assembly (1) and guide into position and start the six fasteners (3).
6. Visually line up the alignment guide holes (2) with the guide holes in the roof of the vehicle.
7. Tighten the six fasteners (3) to 9 N·m (80 in. lbs.).
8. Tighten the two side bracket fasteners (6) to 9 N·m (80 in. lbs.).
9. Connect the drain tubes (2) to the assembly (1).



10. Connect the electrical connector.



11. Connect battery negative cable (4).



12. Test sunroof operation, adjust glass as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)
13. Partially install the headliner and connect the sunroof wiring electrical connectors. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)
14. Temporarily install sunroof switch and perform the sunroof motor teach procedure. (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - STANDARD PROCEDURE - TEACH PROCEDURE)
15. Complete headliner installation. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)
16. Verify correct sunroof operation.

MOTOR-SUNROOF - W/CONTROL UNIT

STANDARD PROCEDURE

DRIVE MOTOR TEACH PROCEDURE

REPLACEMENT DRIVE MOTOR

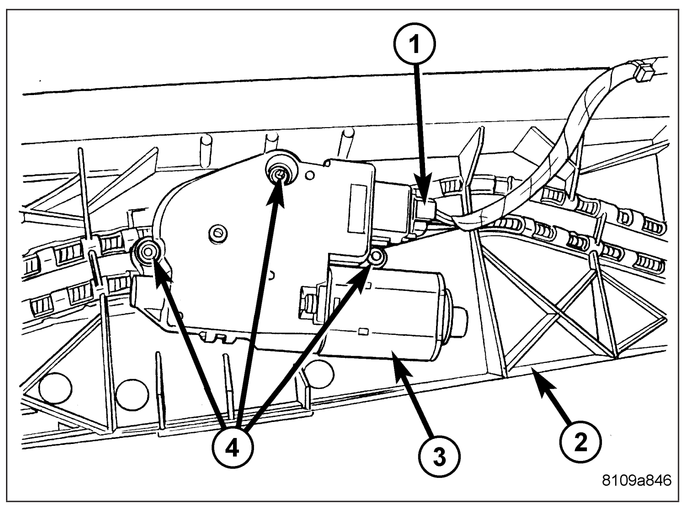
1. Press and hold the sunroof switch open until the sunroof glass fully opens, automatically reverses direction, and stops at a position just forward of the full open position.
2. Release sunroof switch.
3. Within five seconds of releasing sunroof switch, press and hold the sunroof switch open again until the sunroof glass closes, goes into vent position, and then finally stops in the closed position.
4. Release sunroof switch. Sunroof will now operate normally.

ORIGINAL DRIVE MOTOR

1. Press and hold sunroof switch open until the sunroof glass opens and stops.
2. Release sunroof switch.
3. Press and hold sunroof switch open once again for at least 10 seconds. After 10 seconds of pressing the switch open, the sunroof glass will automatically move and stop at a new location.
4. Release sunroof switch.
5. Within five seconds of releasing the sunroof switch, press and hold the switch open again until the sunroof glass closes, goes into vent position, and then finally stops in the closed position.
6. Release sunroof switch. The sunroof will now operate normally.

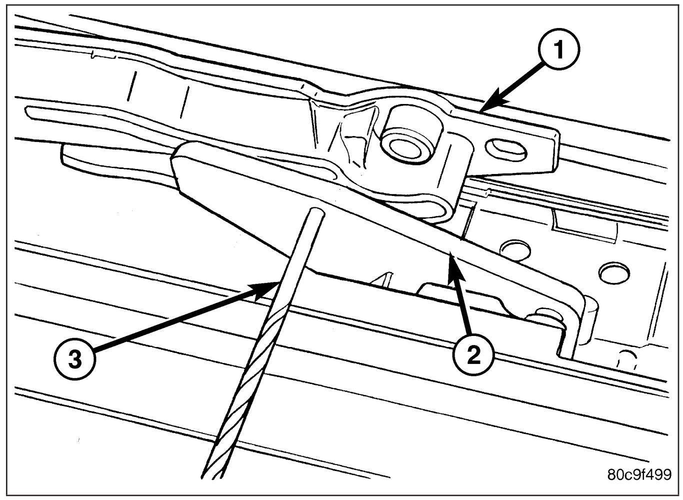
REMOVAL

1. Remove headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
2. Disconnect the electrical connector (1).
3. Remove three motor assembly attaching screws (4) from bottom side of motor assembly (3) and remove motor assembly from the motor bracket.

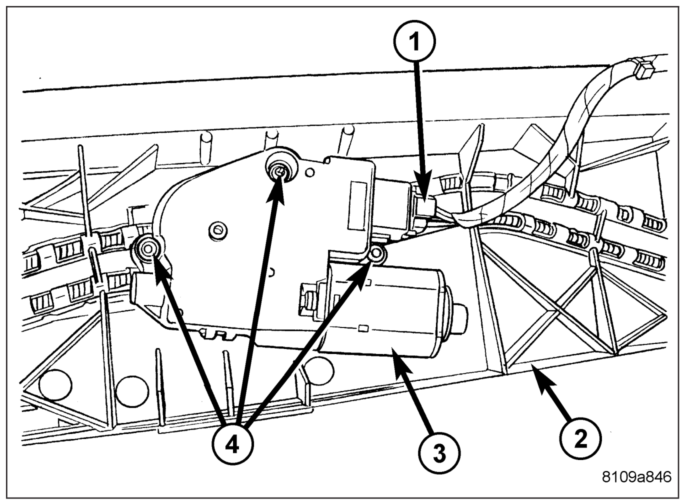


INSTALLATION

1. If sunroof was open when drive motor was removed, carefully move glass panel into closed position and remove glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)
2. Set lifter arm timing by manually sliding the mechanisms (1) in the track until timing holes in the trollies are aligned with the timing holes in the lifter arm cams (2) and insert pins (3) into the mechanisms to hold mechanisms in closed position.



3. Place motor (3) into position and install screws (4) attaching motor to bracket (2).
4. Tighten the screws (4) to 3 N·m (26 in. lbs.).
5. If sunroof glass panel was removed previously, remove the timing pins and install the sunroof glass panel. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION)
6. Partially install the headliner and connect the sunroof wiring electrical connectors. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)
7. Temporarily install sunroof switch and perform the sunroof motor teach procedure. (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - STANDARD PROCEDURE - TEACH PROCEDURE)
8. Test sunroof operation, adjust glass as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

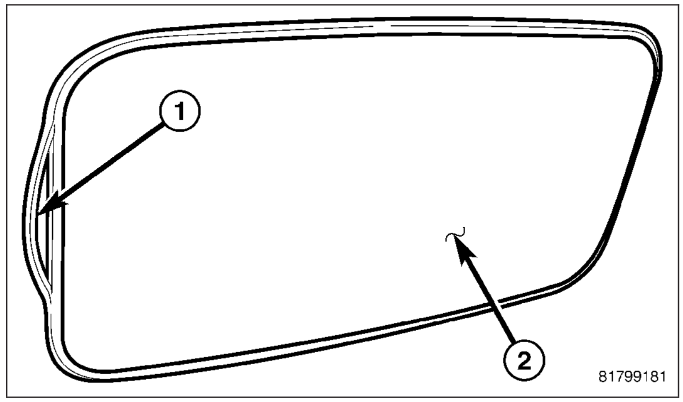


9. Complete the headliner installation. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

SEAL-SUNROOF GLASS

REMOVAL

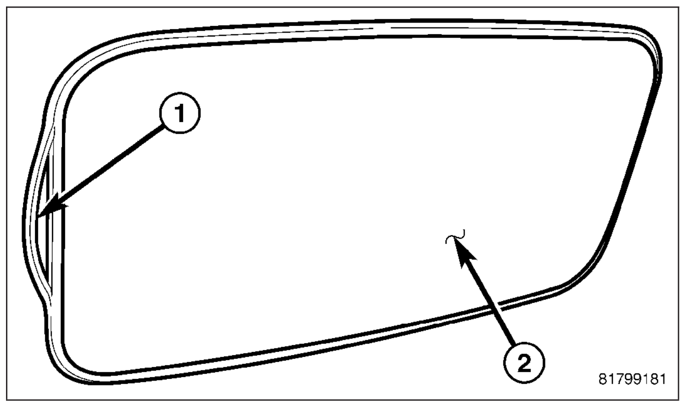
1. Remove sunroof glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL).
2. Place glass panel on clean work area with the top side up. Support the glass assembly from underside to avoid bending or otherwise damaging the mounting tabs.
3. Grasp the seal (1) and pull seal away from the glass panel (2). The seal is a one piece seal.



INSTALLATION

NOTE: Always position seal seam on center of the passenger side of glass panel.

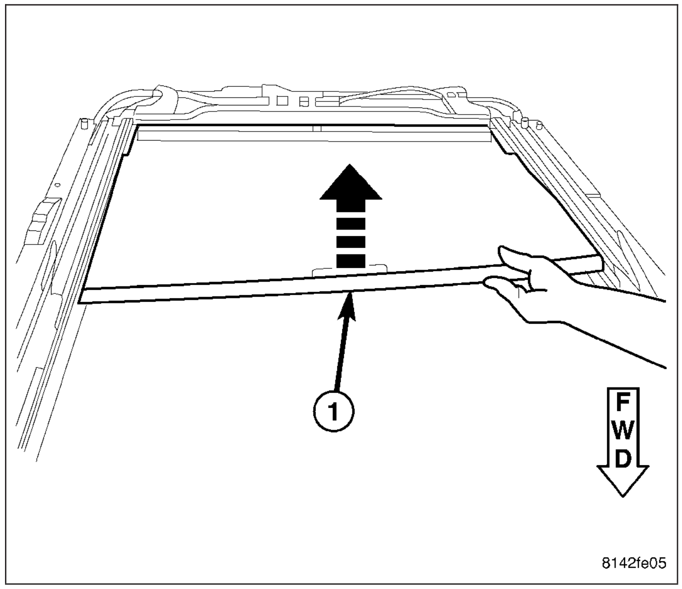
1. Place seal (1) into position.
2. Seat the seal into the glass channel fully. Using care working the seal around the glass (2), being careful not to over stretch the seal while installing.
3. Install the glass panel (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION).



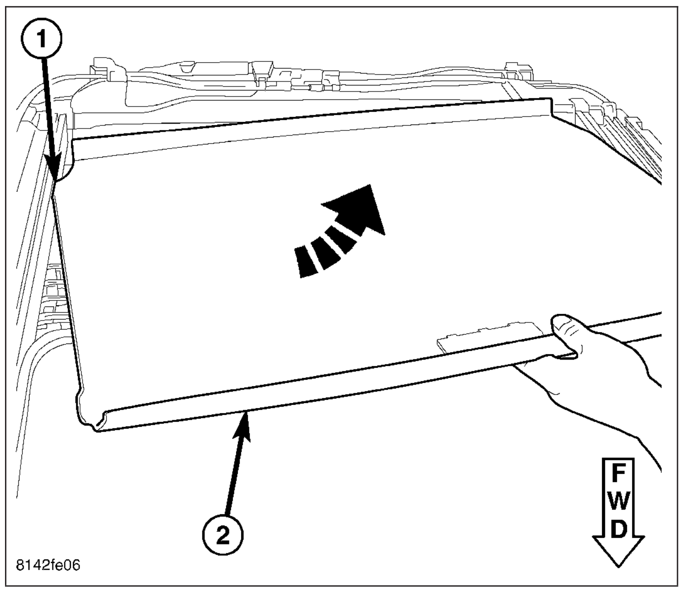
SUNSHADE

REMOVAL

1. Remove the drain trough. (Refer to 23 - BODY/SUNROOF/TROUGH-DRAIN - REMOVAL)
2. Push up the front center of the sunshade (1) to pop out the front two feet.

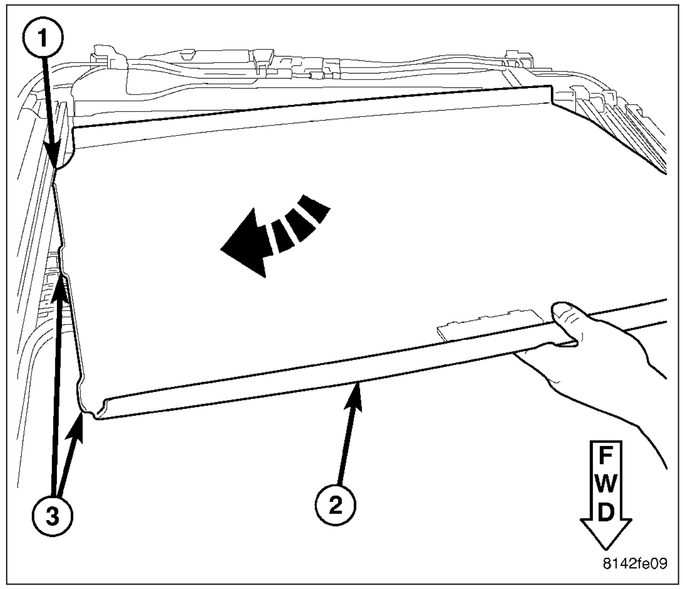


3. Rotate the sunshade (2) so that the other feet (1) are removed from the guide track.

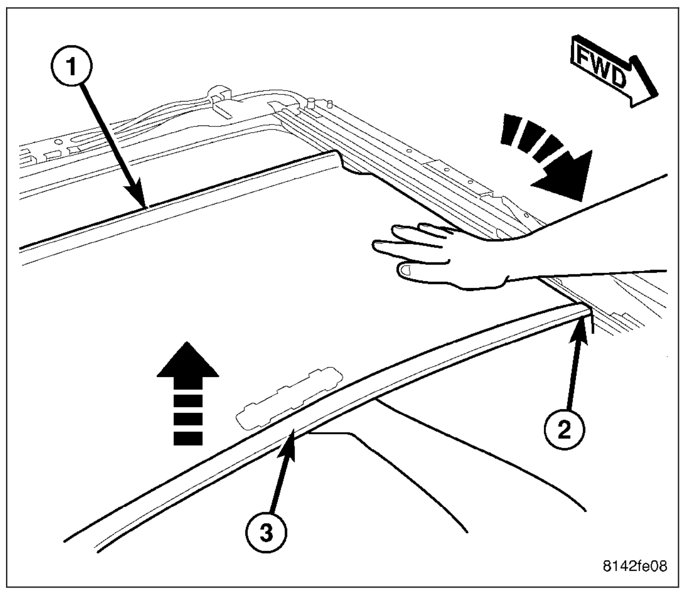


INSTALLATION

1. Verify the sunshade track is free of obstructions like the trim lace/ring.
2. Start with sunshade (2) at an angle with one foot (1) in the track.
3. Rotate the sunshade so the other rear foot is in the track as well as the 2 other feet (3) on the same side as the first foot.



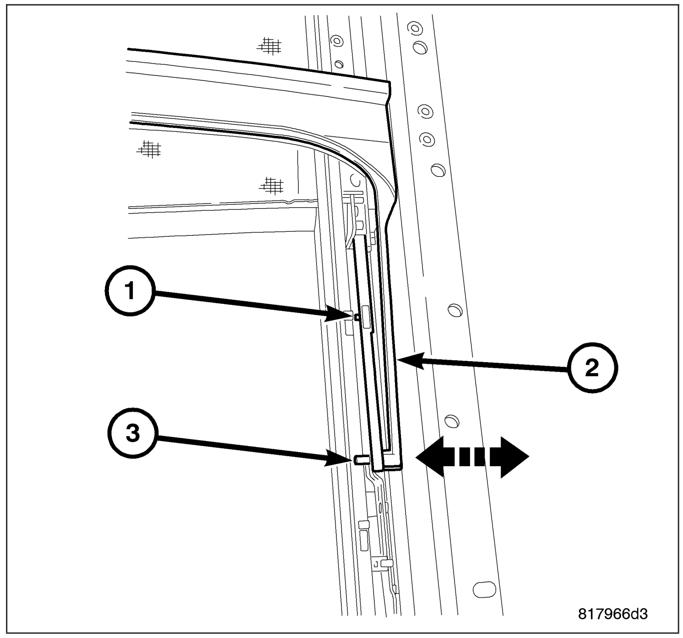
4. To insert the remaining two feet (2) apply force to the middle front of sunshade (3) and guide them into the track.
5. Check that all the feet are in the right track and verify sunshade operation.
6. Install the drain trough. (Refer to 23 - BODY/SUNROOF/TROUGH-DRAIN - INSTALLATION)



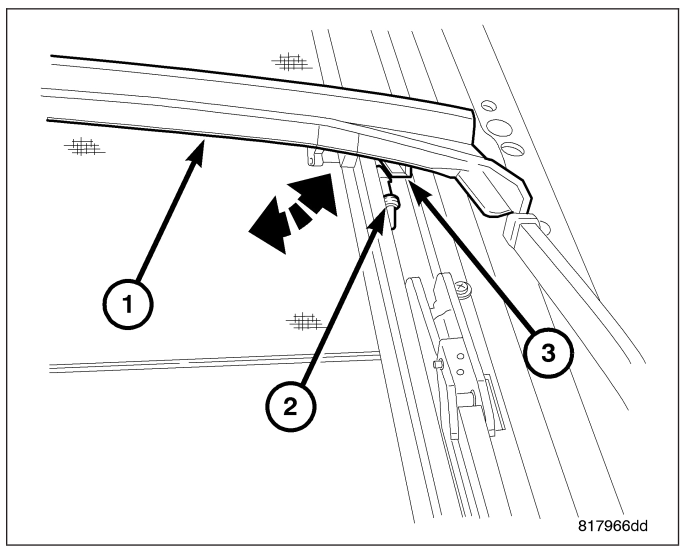
TROUGH

REMOVAL

1. Remove the glass (Refer to 23 - BODY/SUNROOF/GLASS - REMOVAL).
2. Separate the trough pins (3) from the glass lift mechanisms (1).

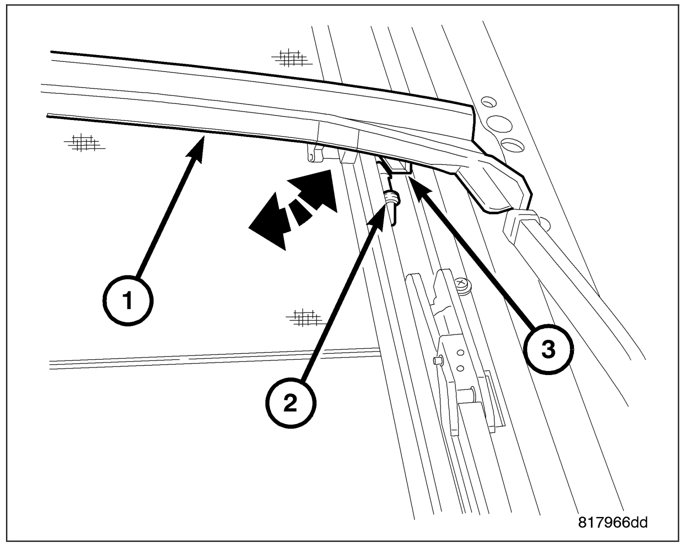


3. Slide trough (1) to one side and push down on the center of the trough until the guide shoe tab (3) releases from the track (2).
4. Slide the trough in the opposite direction to release the other shoe and lift the trough out of the sunroof opening.

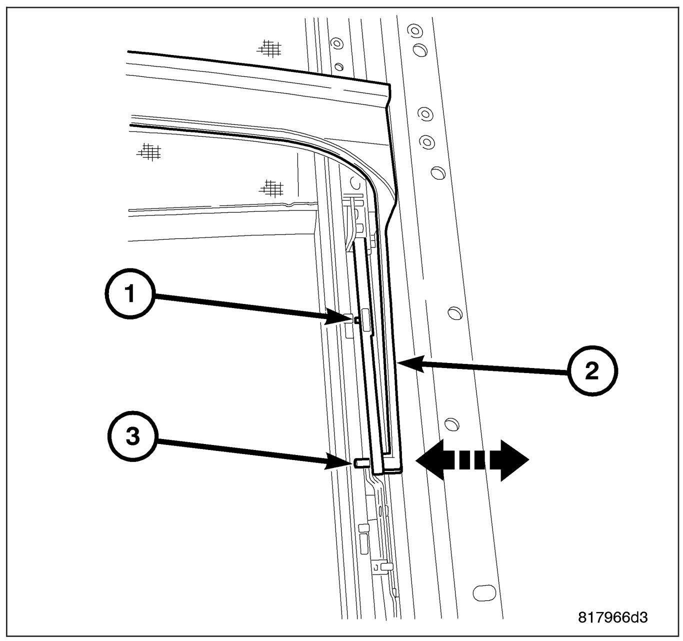


INSTALLATION

1. Insert one of the trough guides (3) and guide shoe (2) into the track.
2. Push down on the center of the trough (1) to flatten it out and install the remaining trough guide (3) and guide shoe (2) into the track.



3. Install the trough guide pins into the glass lift mechanism (3) and seat fully.
4. Install the glass (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION).



BODY STRUCTURE

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GAP AND FLUSH

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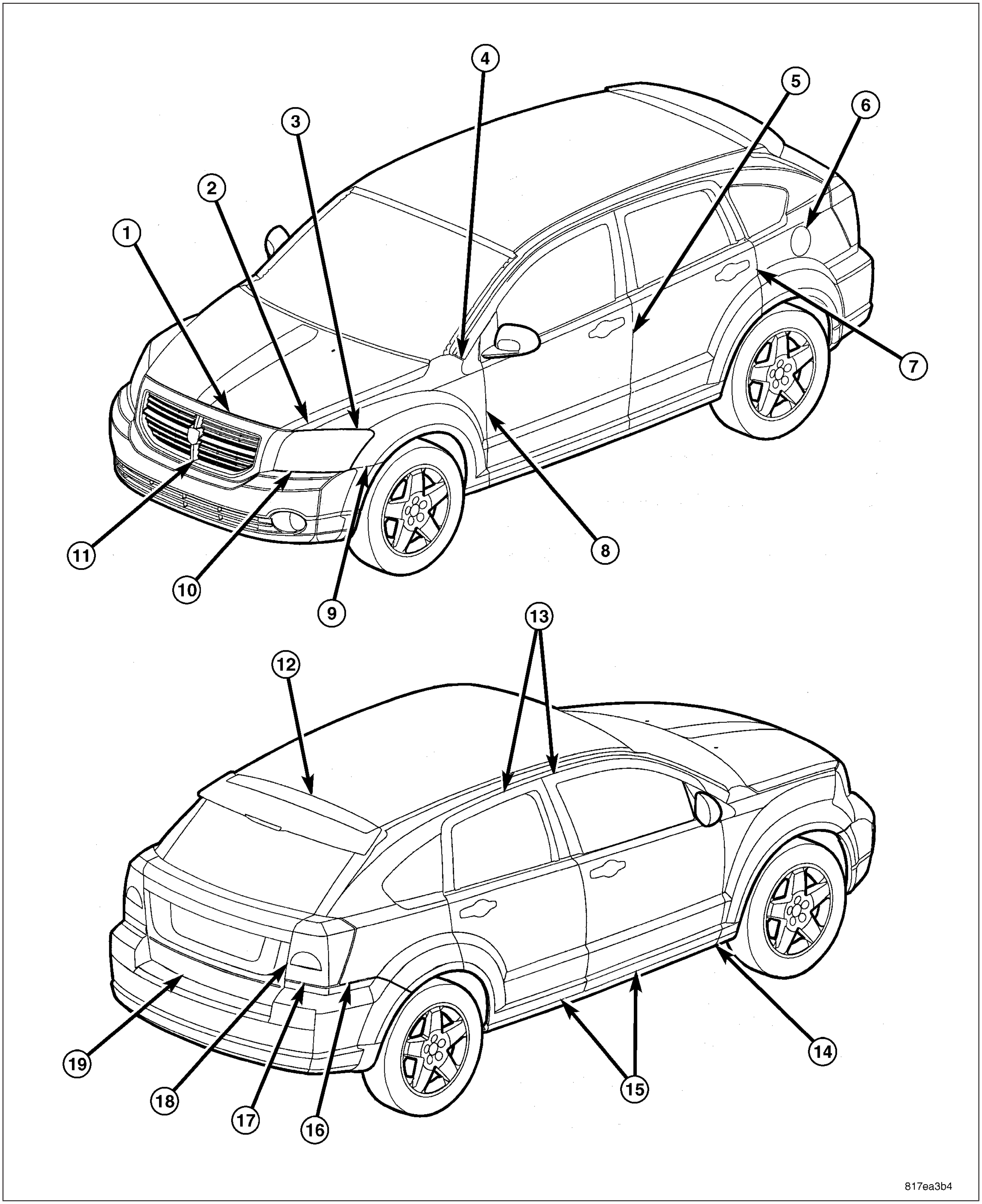


Fig. 1 BODY GAP AND FLUSH

NOTE: All measurements are in mm.
- **O/F = Over Flush**
- **U/F = Under Flush**

DIMENSION	DESCRIPTION	GAP	FLUSH
1	Fascia to Hood	5.0 +/- 1.5 Parallel within 2.0	Fascia U/F 2.4@ Y = 0 U/F 2.7 @ Y = 300 & 4.75 +/-1.5 within 2.0
2	Fender to Hood	5.0 +/- 1.2 Parallel within 1.5	Fender U/F U/D 1.0 and C/C 1.4 +/- 1.5
3	Headlamp to Fender	2.0 +/- 1.7 Parallel within 2.0	Headlamp U/F 1.0 +/- 2.0 C within 2.0
4	"A" Pillar to Fender	3.0 +/- 1.0 Parallel within 1.5	+/- 1.5 C within 1.5
5	Front Door to Rear Door	4.5 +/- 1.2 Parallel within 1.5	Flush above belt and Front Door O/F 1.0 C within 2.0 Below belt 1.5
6	Fuel Filler Door to Body Side	3.0 +/- 0.8 Parallel within 0.75	Fuel Door U/F 0.5 +/- 0.75 C within 1.0
7	Rear Door to Body Side	4.5 +/- 1.2 Parallel within 1.2	1 C within 1.5
8	Fender to Front Door	4.5 +/- 1.0 Parallel within 1.0	Fender O/F 1.0 +/-1.0 C within 1.0
9	Fascia to Fender	Net + 1.0	Fascia U/F 1.0 +/- 1.0 C within 1.5
10	Headlamp to Fascia	C/C 2.0 +/- 2.0 U/D Net to 4.5 Nom = 2.5 Parallel within 2.5	-
11	Grille to Fascia	U/D Net + 1.0	Grille U/F 3.0 +/- 1.0
12	Liftgate to Roof	6.0 +/- 1.5 Parallel within 2.0	Liftgate U/F 1.0 +/- 1.2 C within 2.0
13	Body Side to Door Header	4.5 +/- 1.2 Parallel within 1.2	Body Side O/F 1.9 +/- 1.2 C within 1.5
14	Fender to Sill	4.5 +/- 1.2	Fender O/F 1.0 +/- 1.0
15	Sill to Doors	6.0 +/- 1.5 Parallel within 2.0	Sill O/F 2.8 +/-2.0 C within 2.0
16	Fascia to Body Side	Net to 1.0	Fascia U/F 1.0 +/- 1.0 C within 1.5
17	Tail Lamp to Fascia	Net to 3.0 (Nom = 1.5)	+/- 2.0
18	Tail Lamp to Liftgate	4.0 +/- 2.0	Tail Lamp O/F 1.0 +/- 2.0

DIMENSION	DESCRIPTION	GAP	FLUSH
19	Fascia to Liftgate	U/D 6.0 +/- 2.0 Parallel within 2.0 C/C 4.0 +/- 2.0	Fascia O/F 1.0 +/- 1.7

OPENING DIMENSIONS

SPECIFICATIONS

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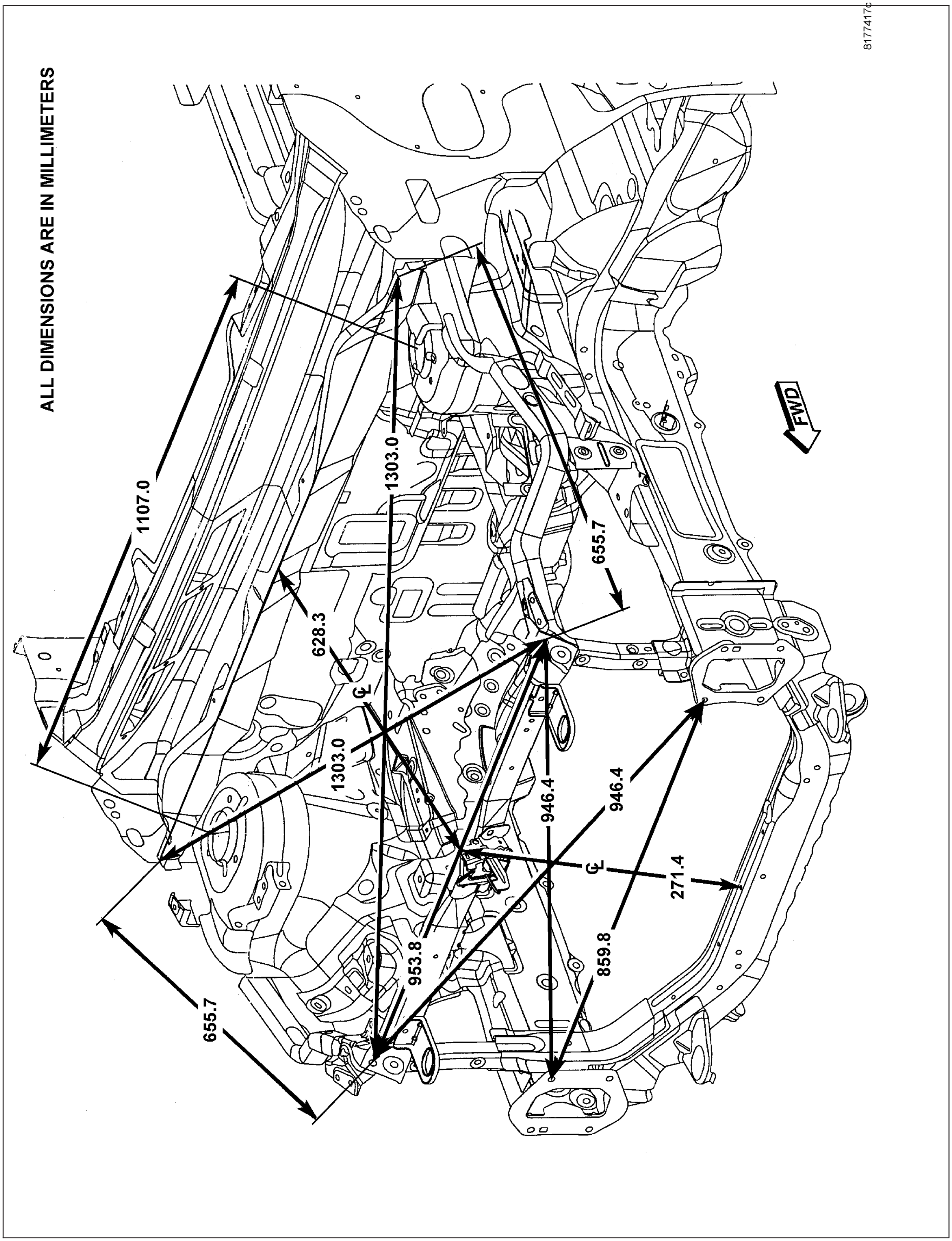


Fig. 2 ENGINE BOX

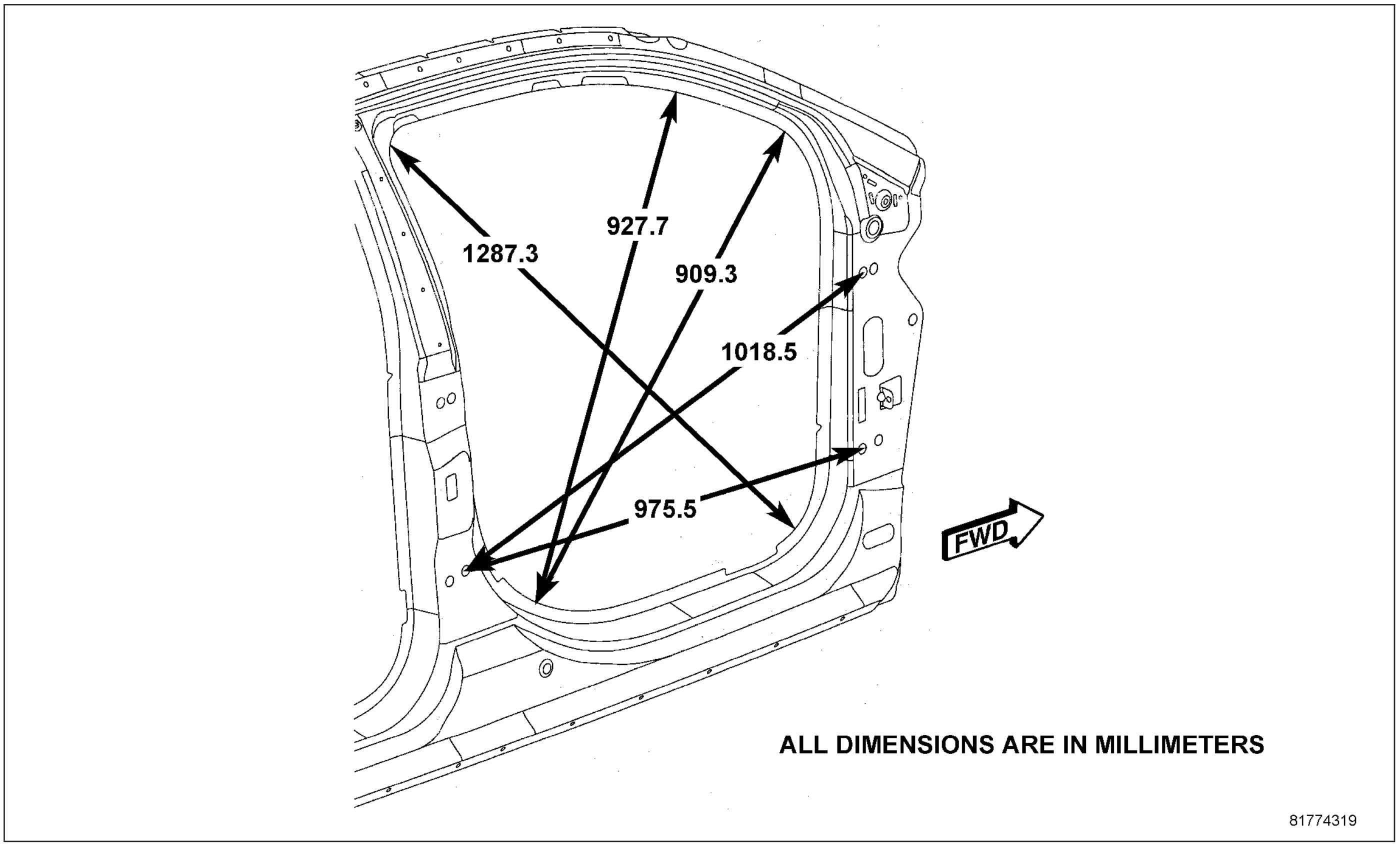


Fig. 3 FRONT DOOR OPENING

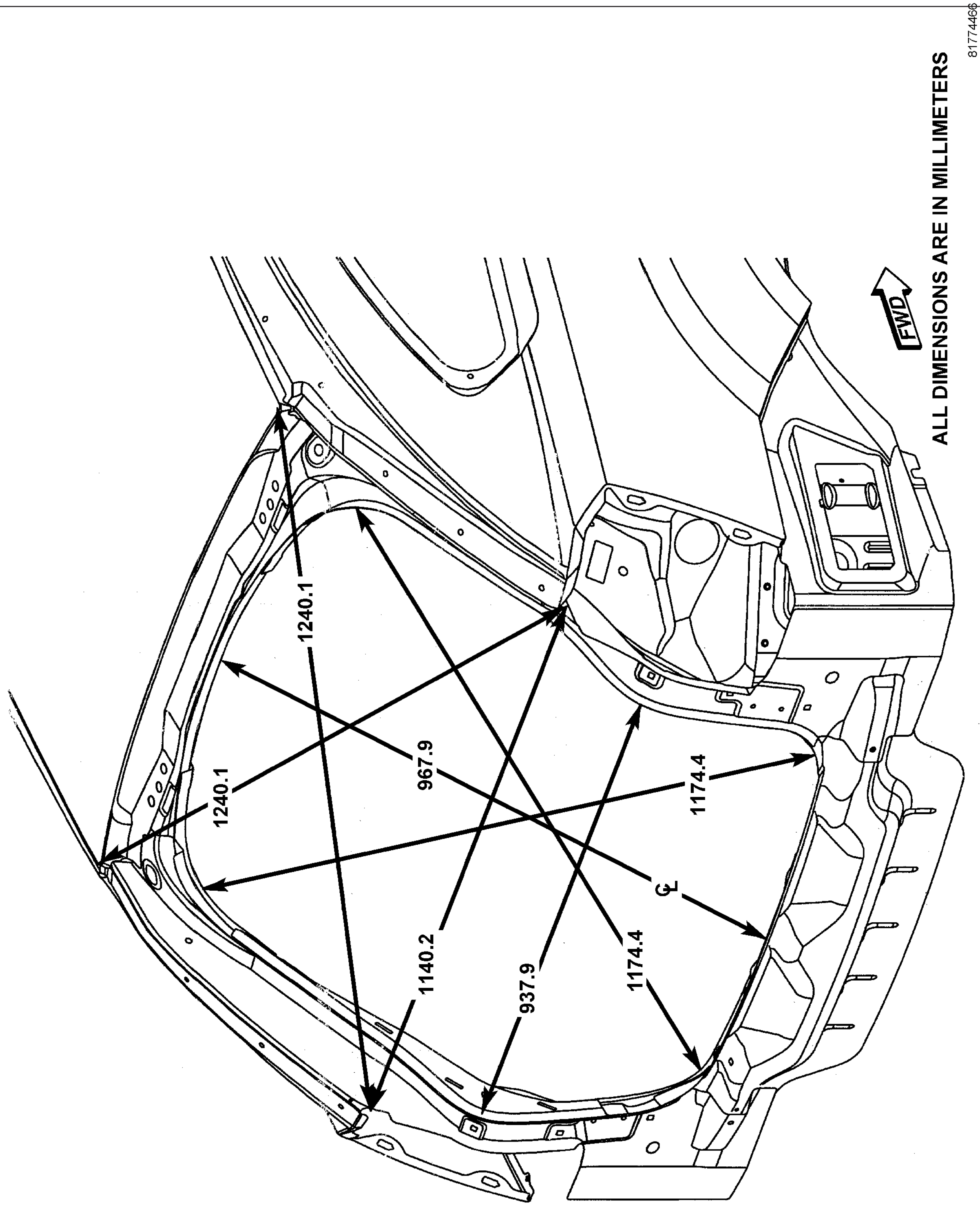


Fig. 4 LIFTGATE OPENING

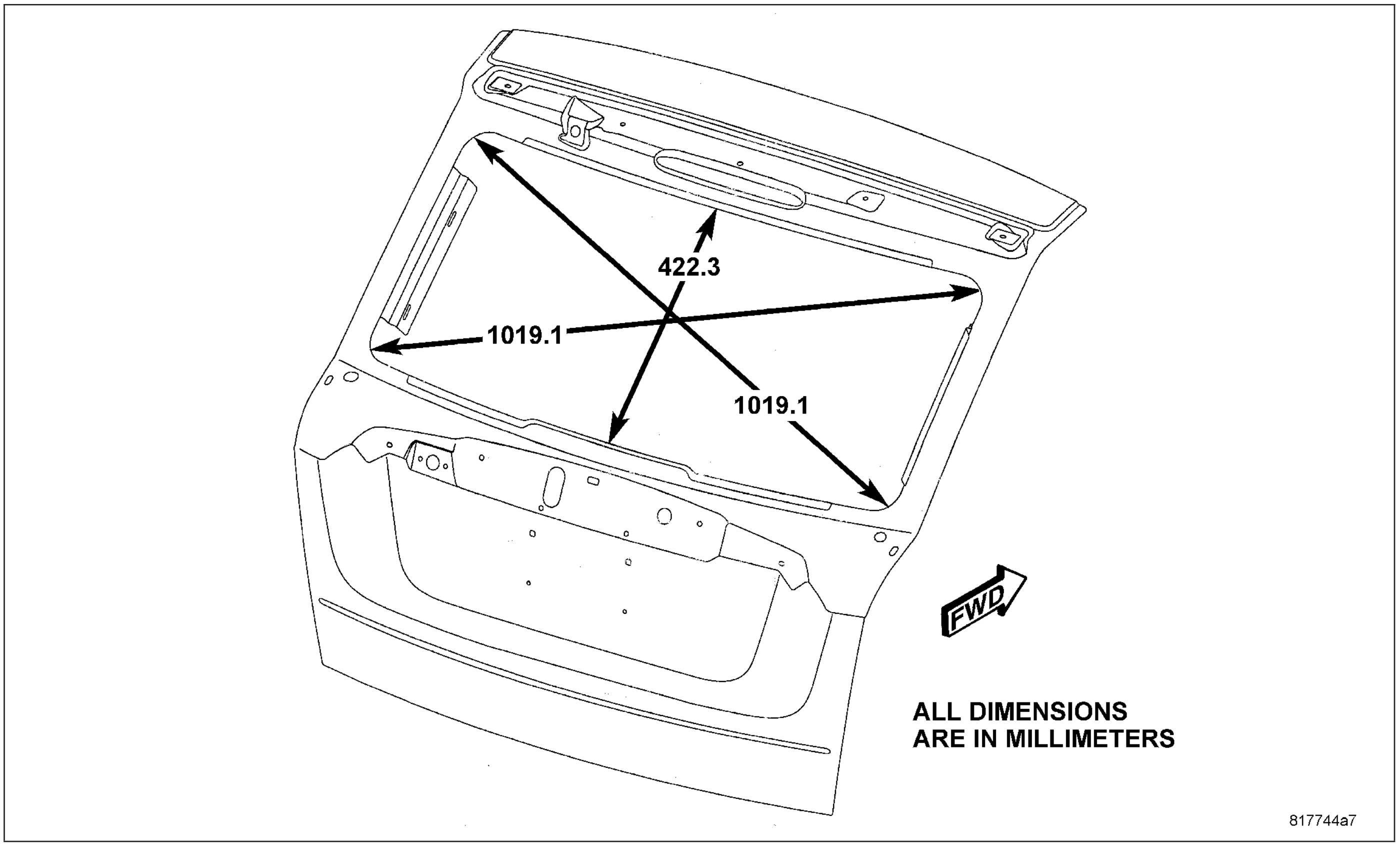


Fig. 5 LIFTGATE WINDOW OPENING

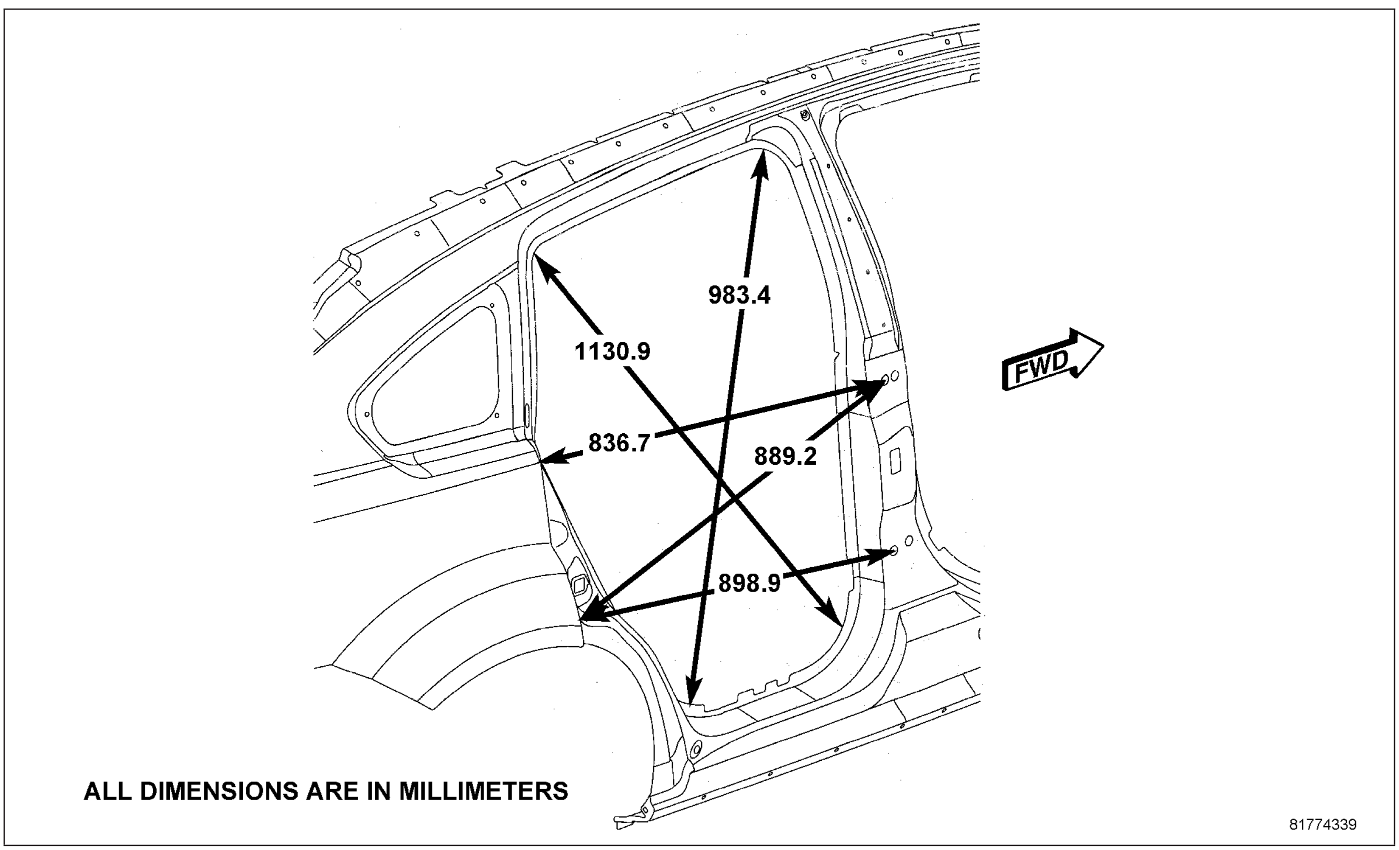


Fig. 6 REAR DOOR OPENING

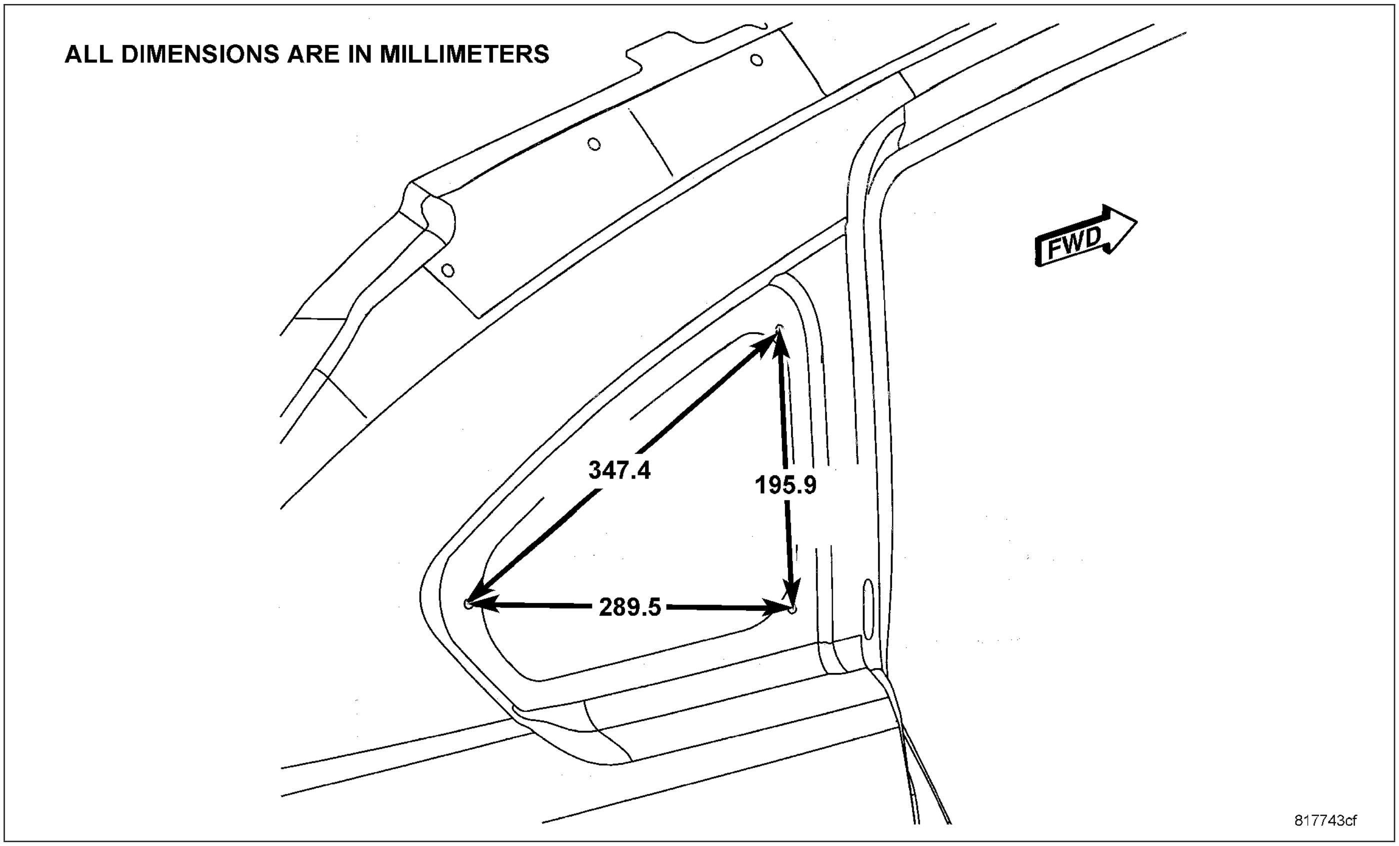


Fig. 7 REAR QUARTER WINDOW OPENING

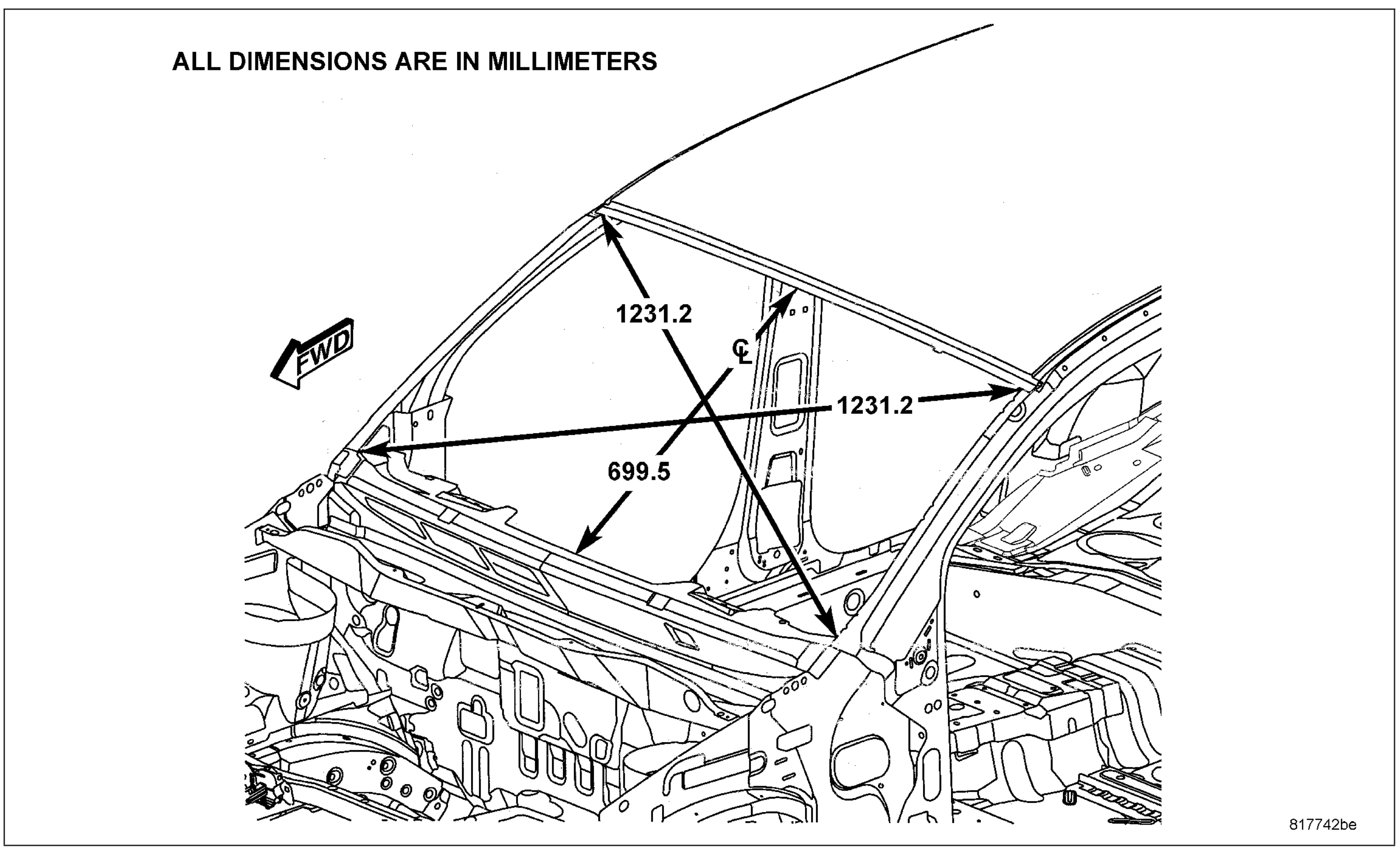


Fig. 8 WINDSHIELD OPENING

SEALER LOCATIONS

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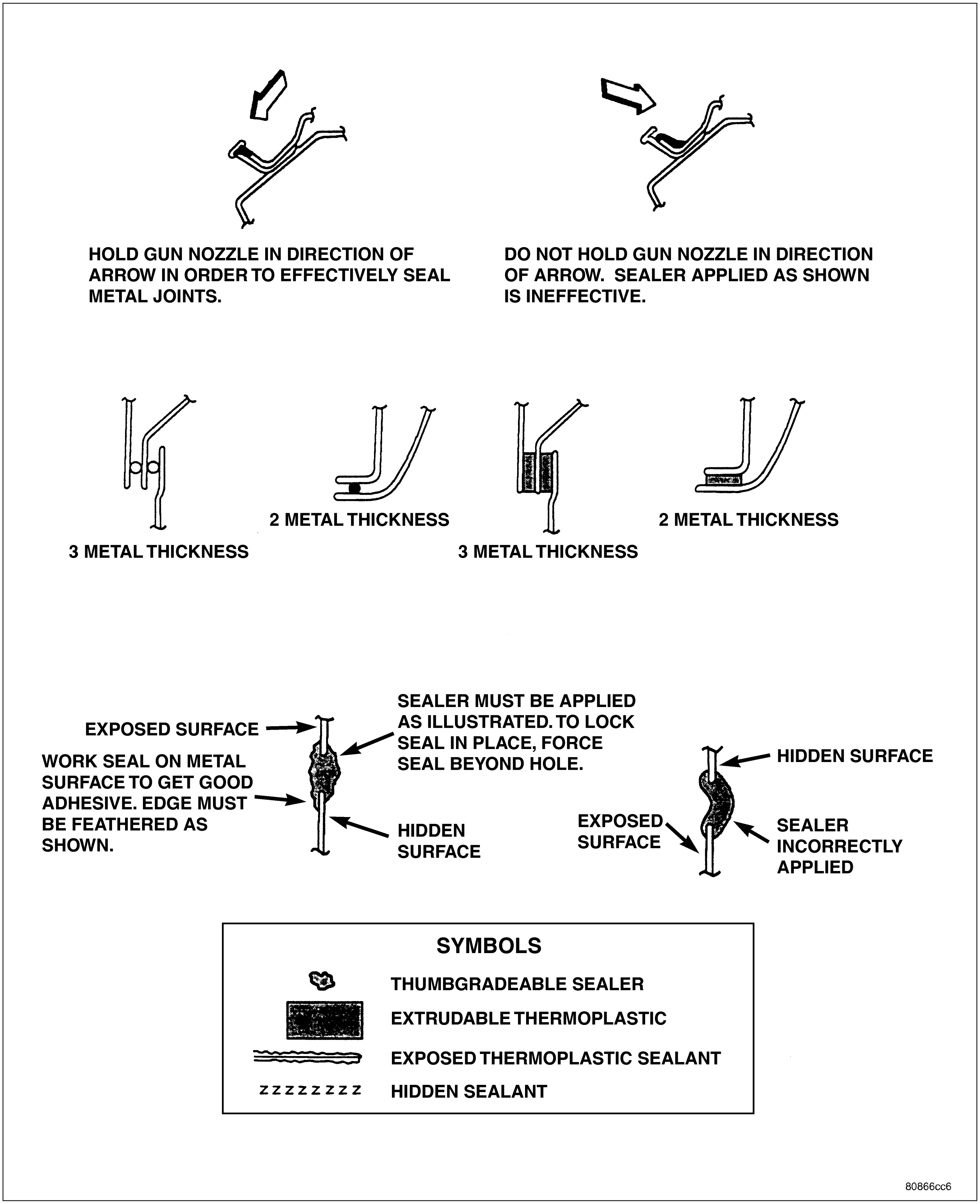


Fig. 9 BODY LOCATIONS

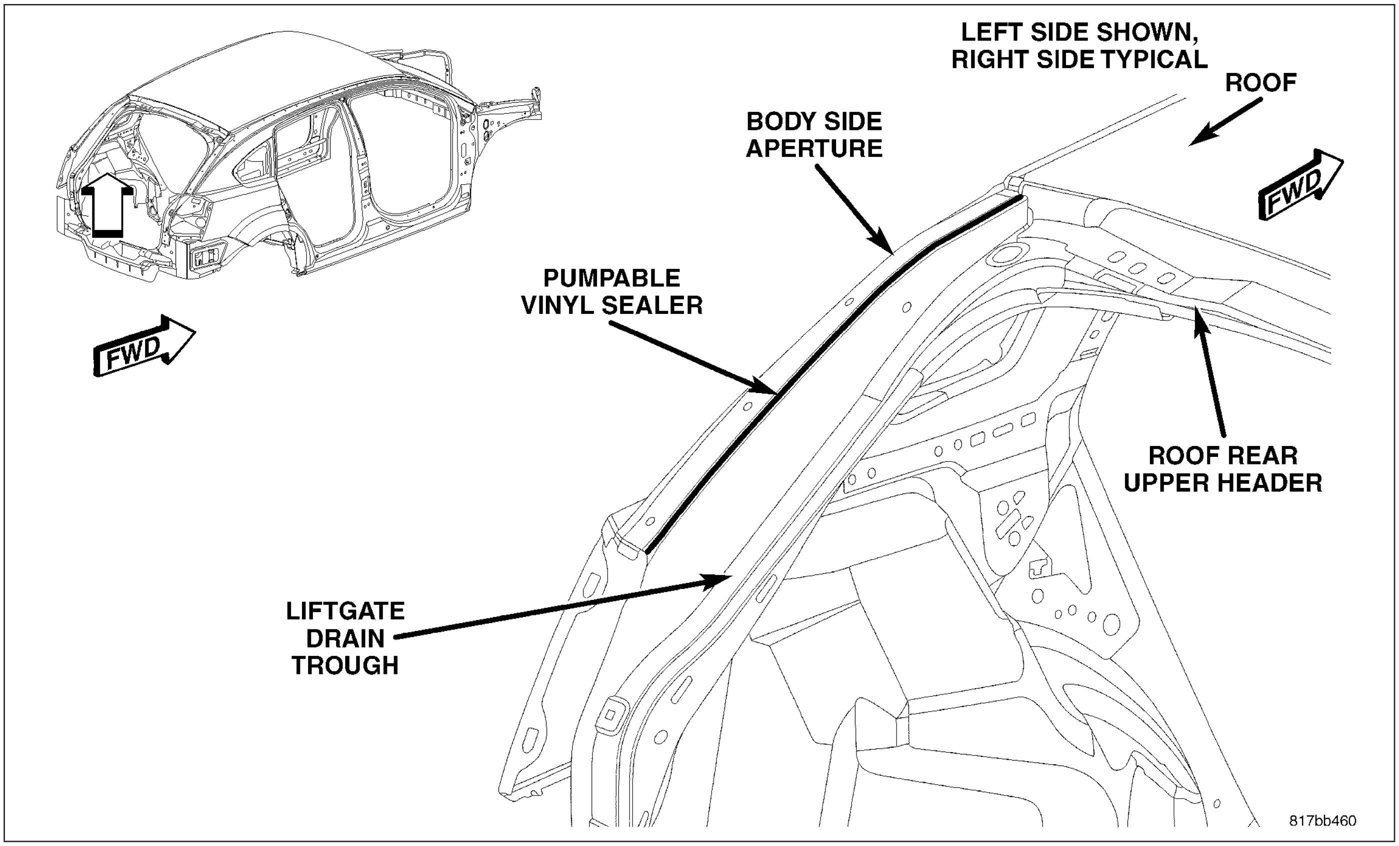


Fig. 10 BODY SIDE APERTURE/LIFTGATE

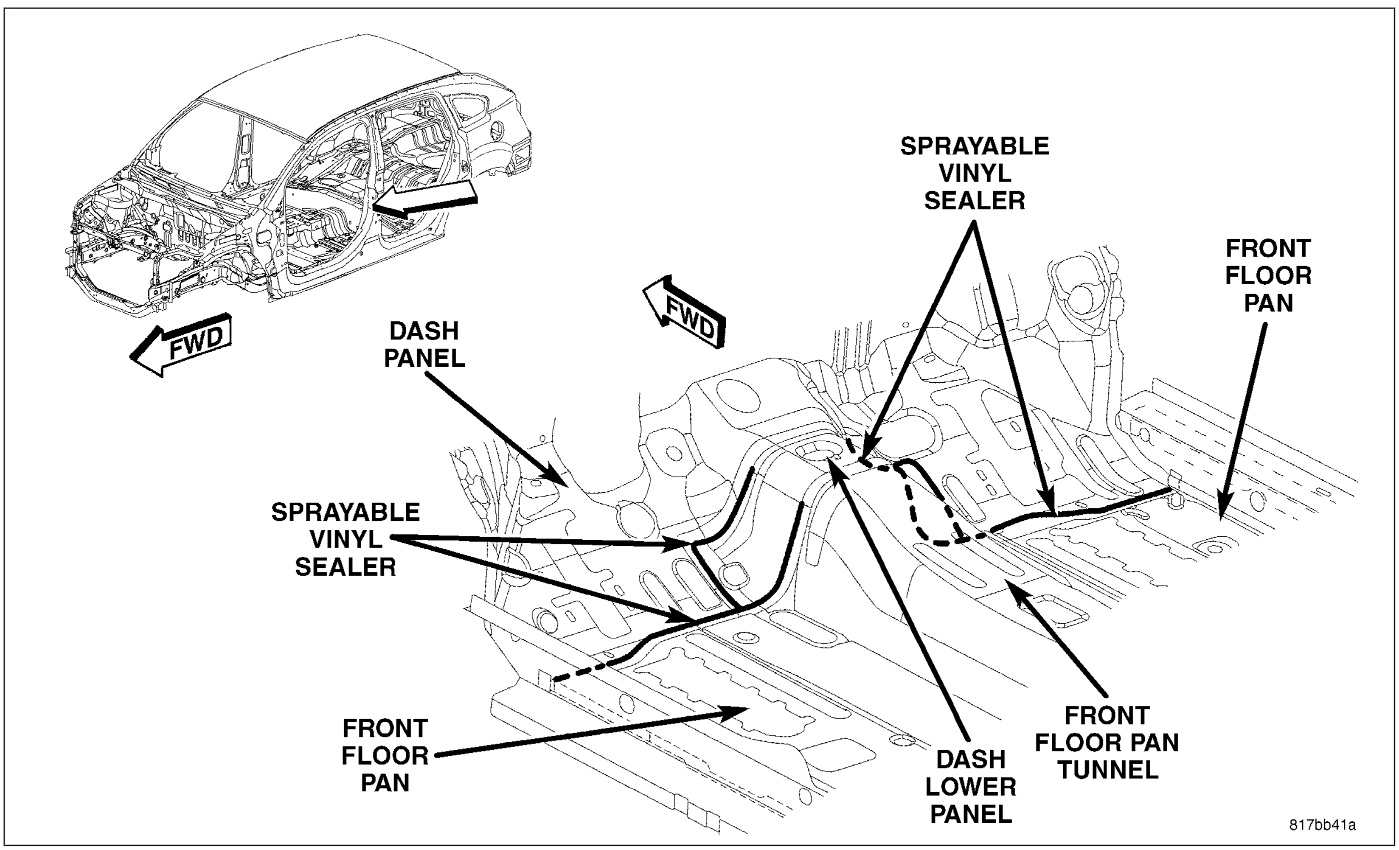


Fig. 11 DASH/FRONT FLOOR PLAN

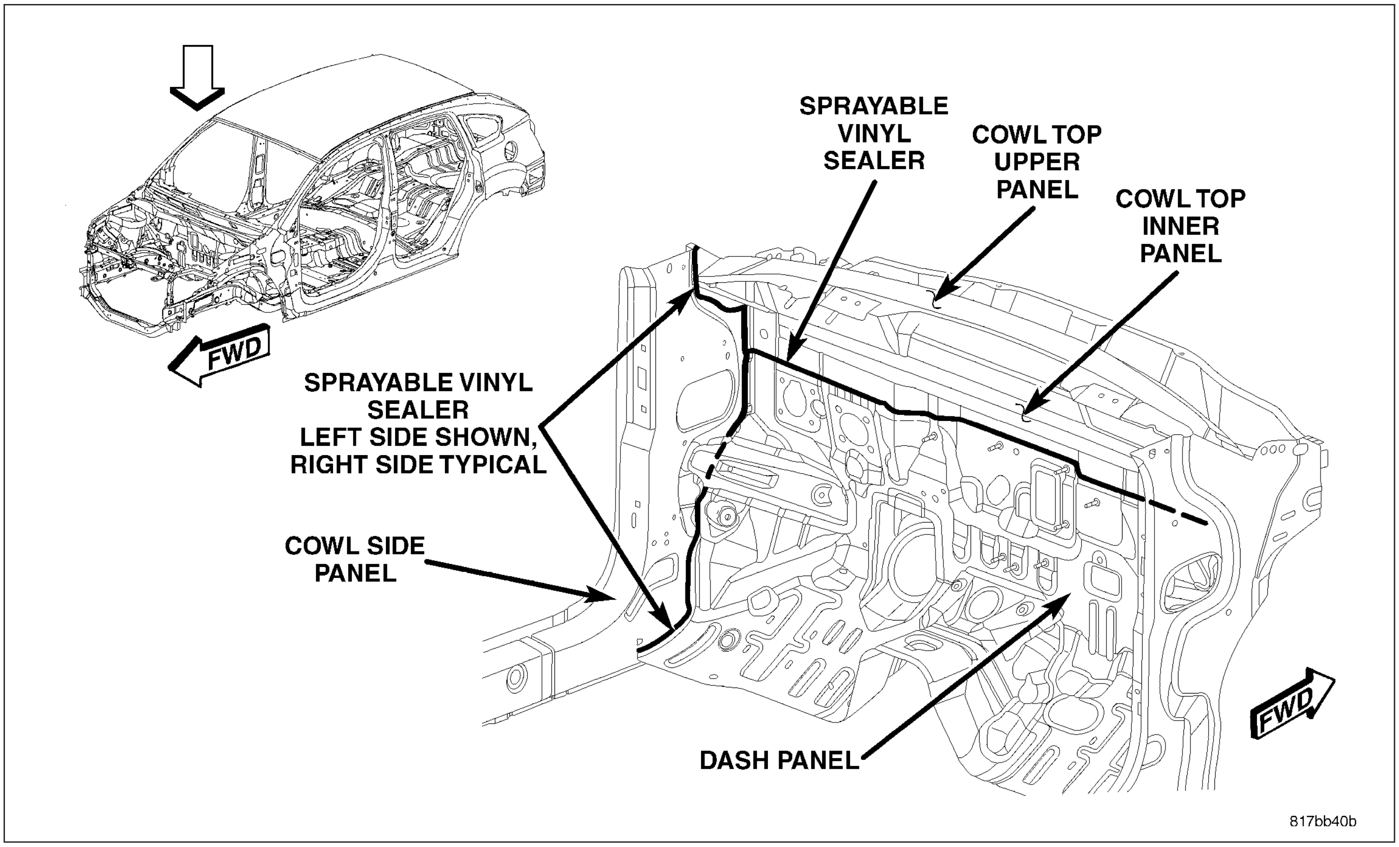


Fig. 12 DASH/PLENUM/COWL SIDE PANEL

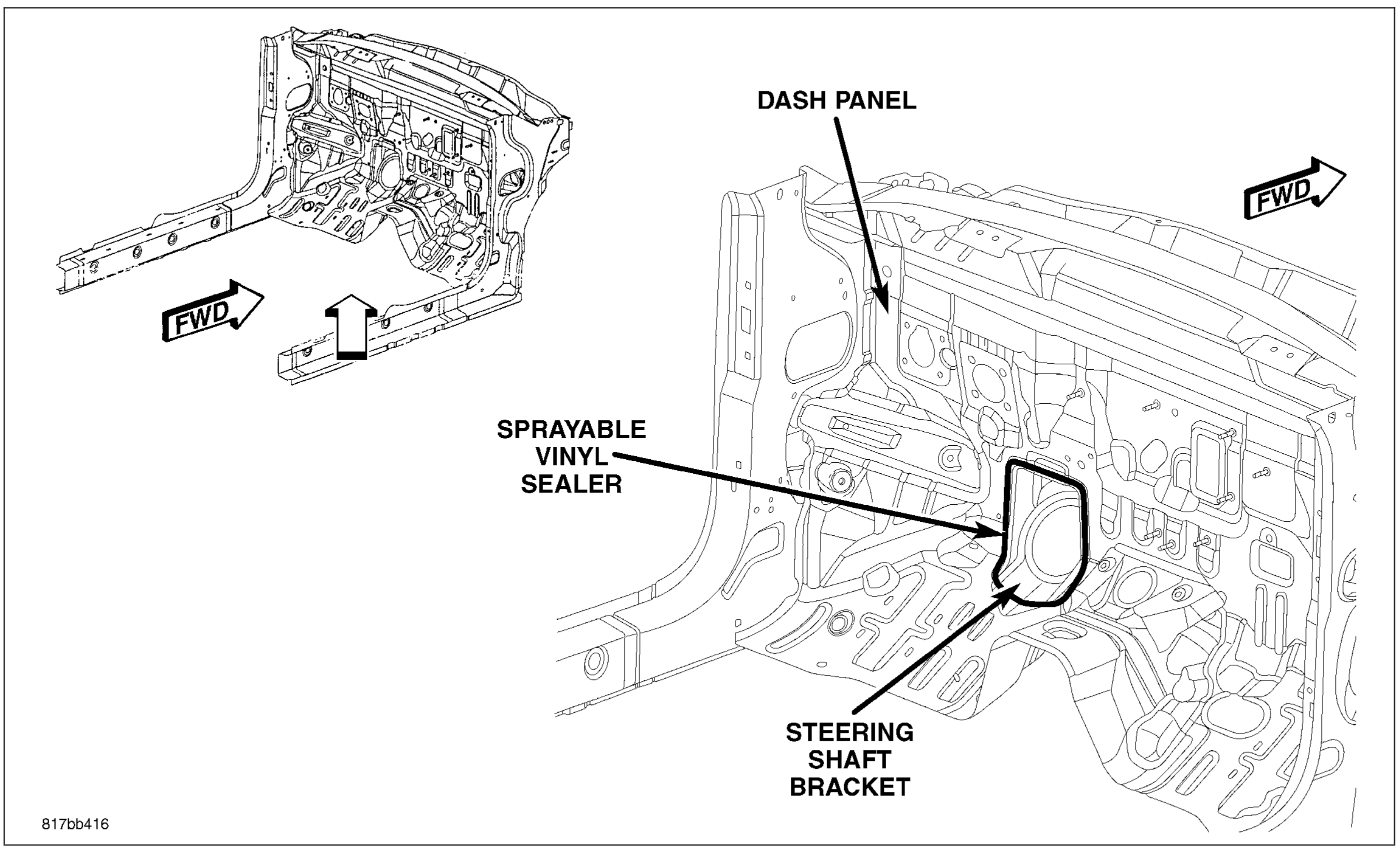


Fig. 13 DASH/STEERING SHAFT BRACKET

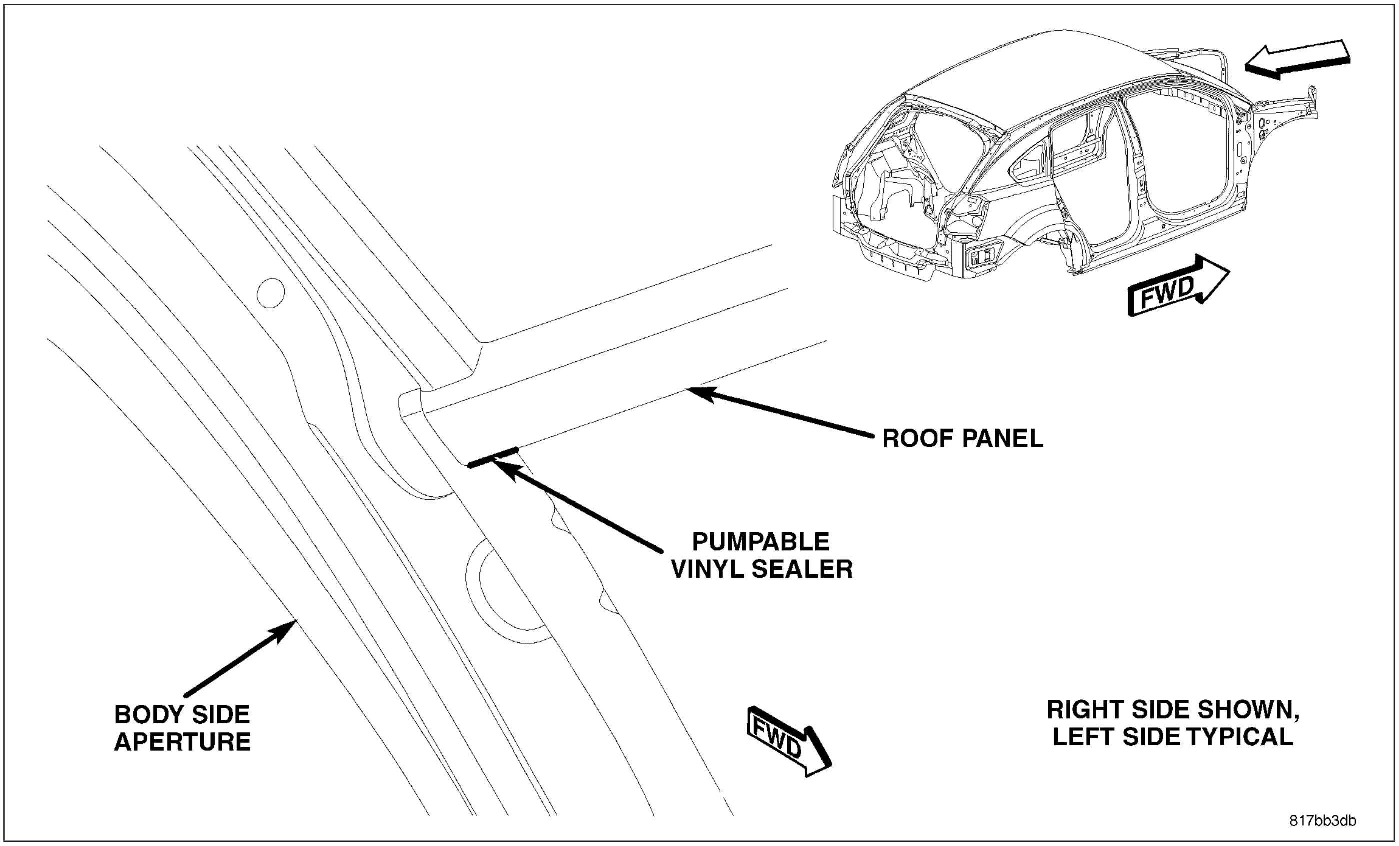


Fig. 14 FRONT ROOF CORNER/APERTURE PANEL

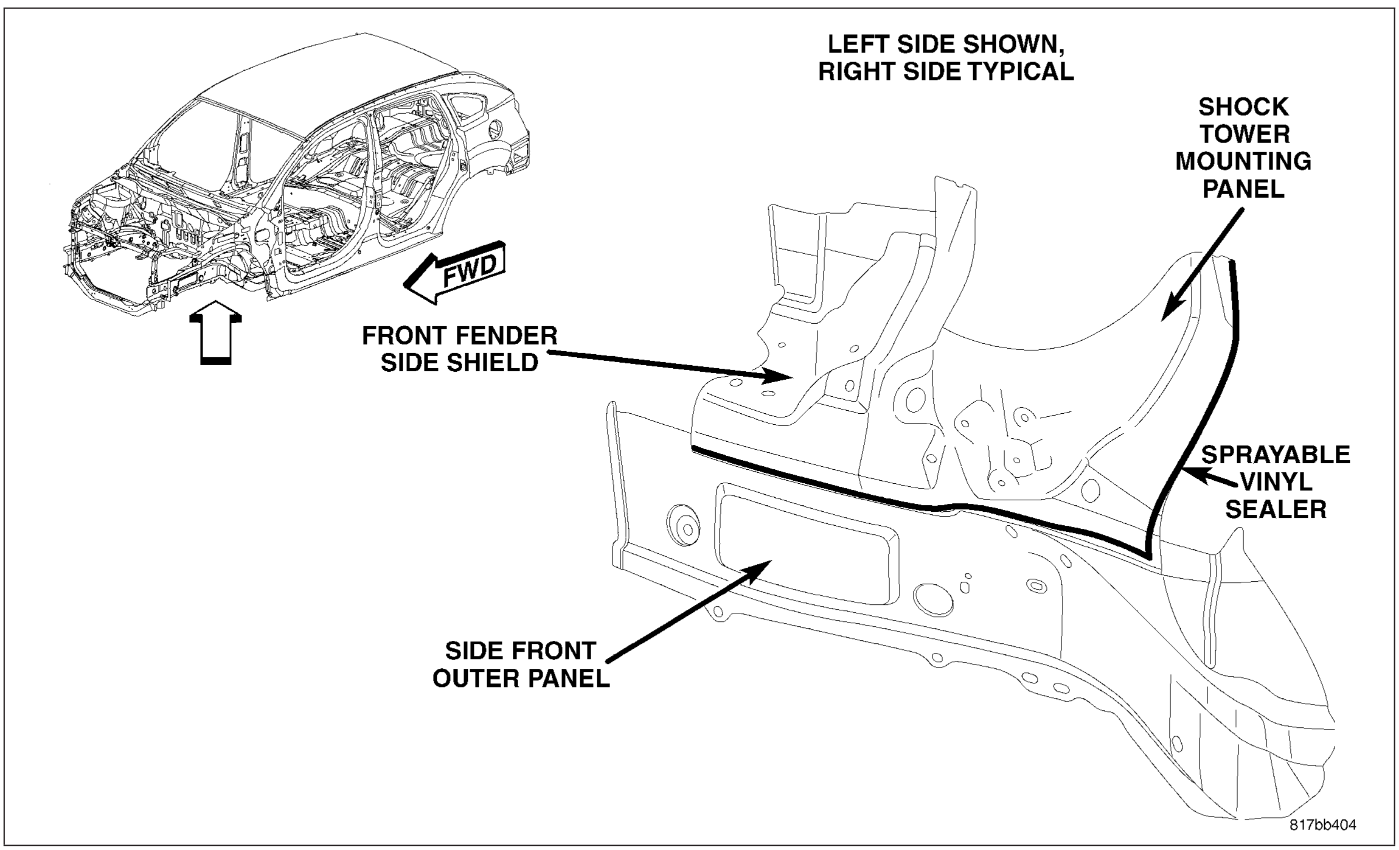


Fig. 15 FRONT WHEELHOUSE

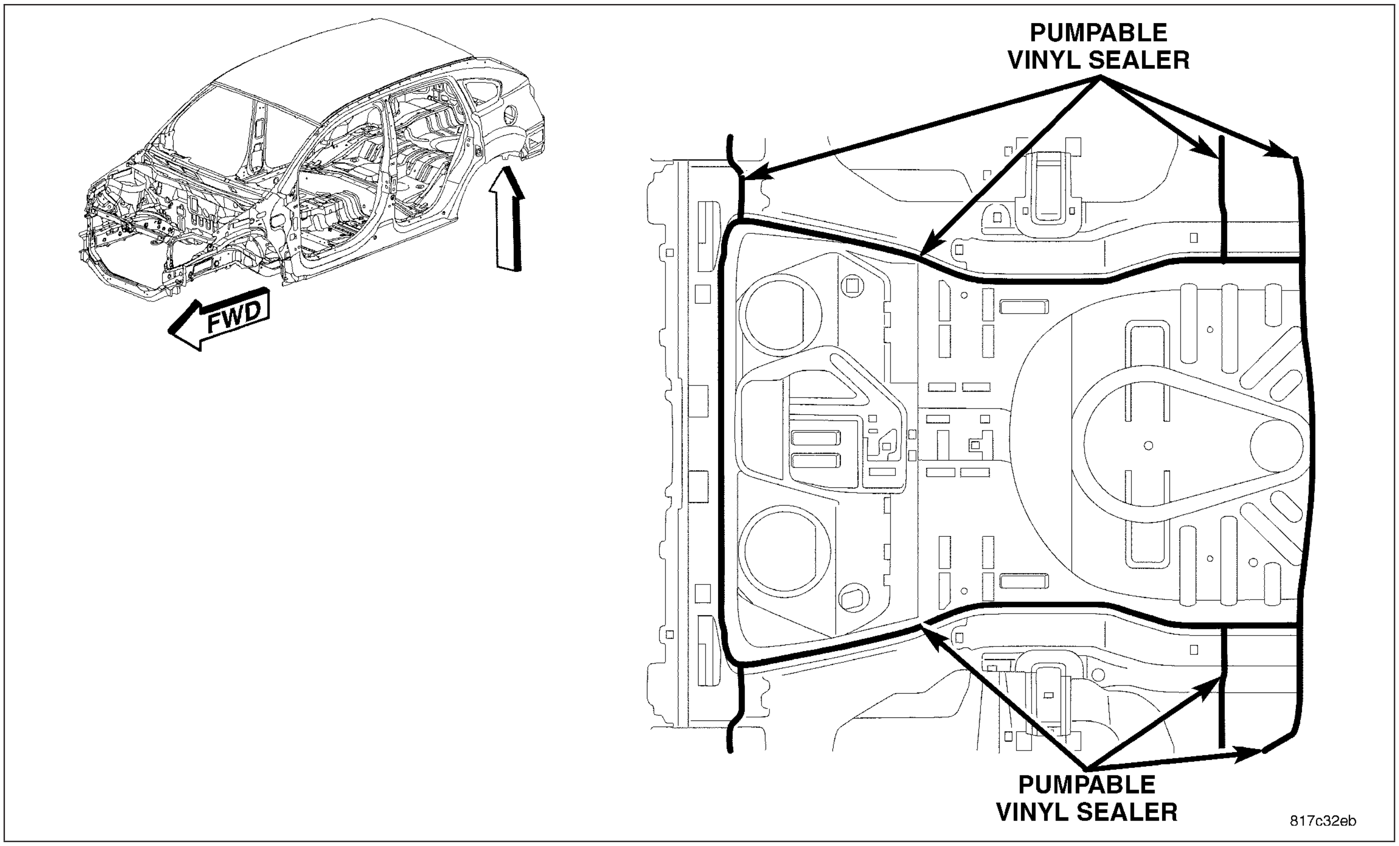


Fig. 16 REAR FLOOR PAN

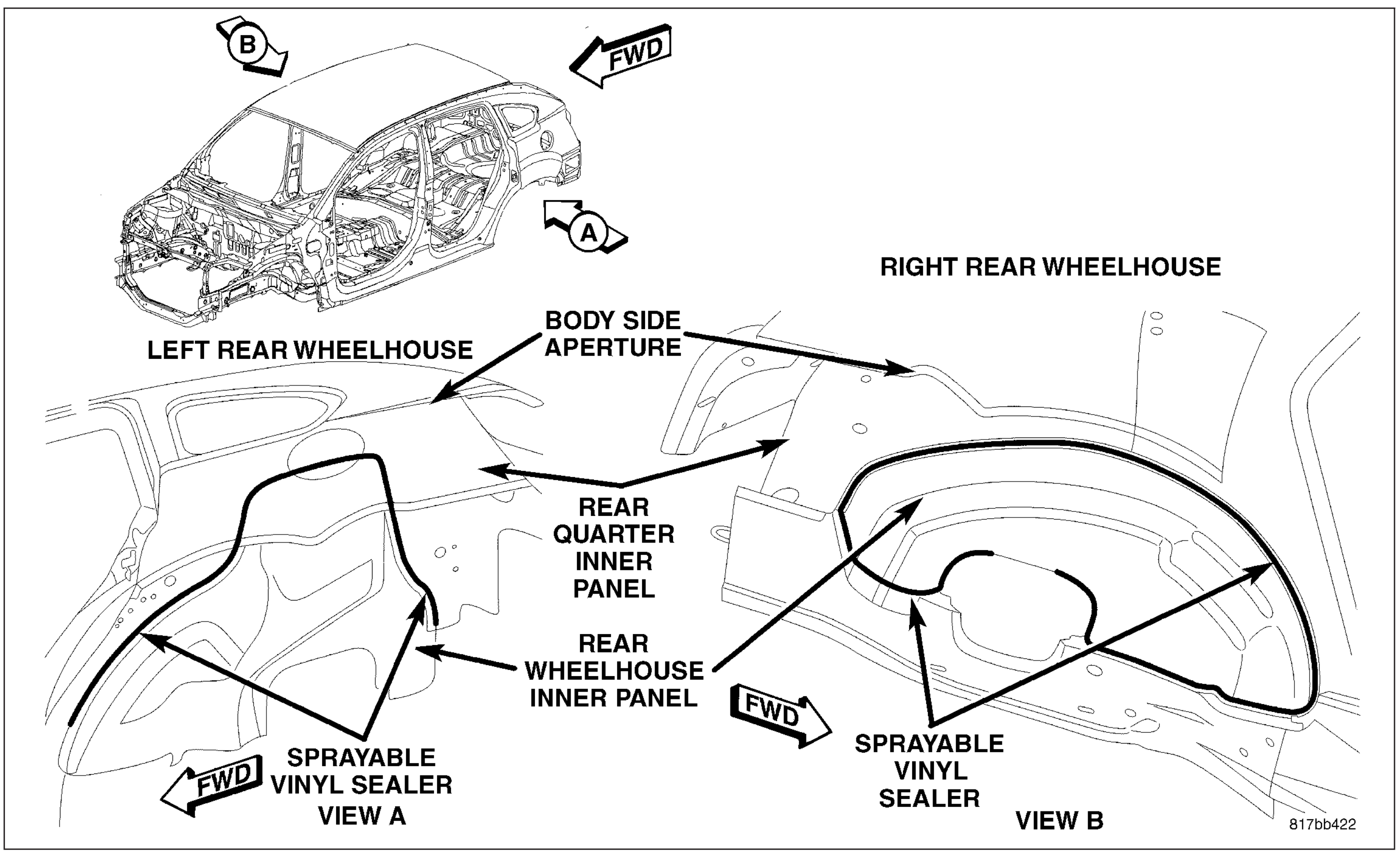


Fig. 17 REAR WHEELHOUSES

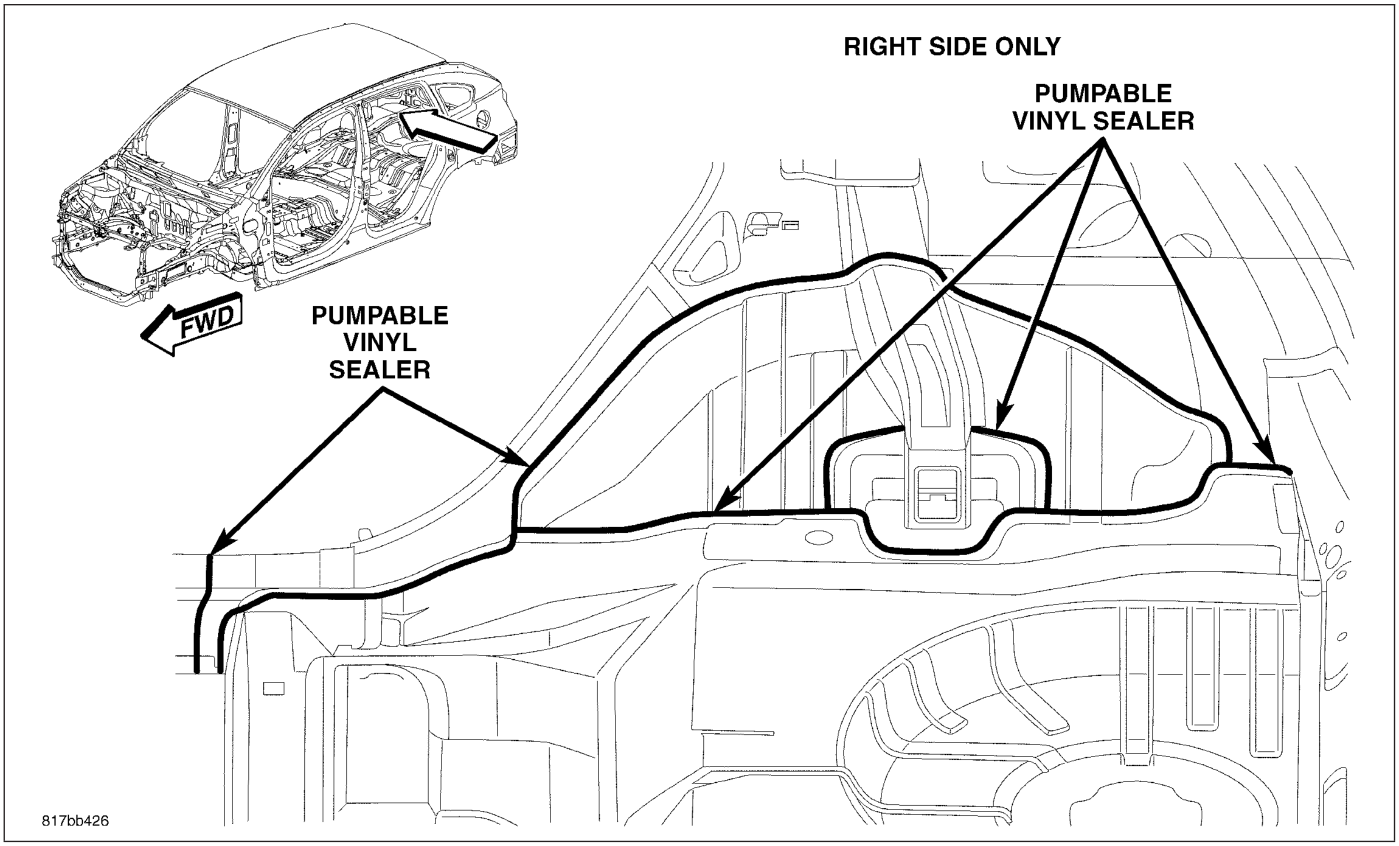


Fig. 18 RIGHT REAR/INNER QUARTER PANEL

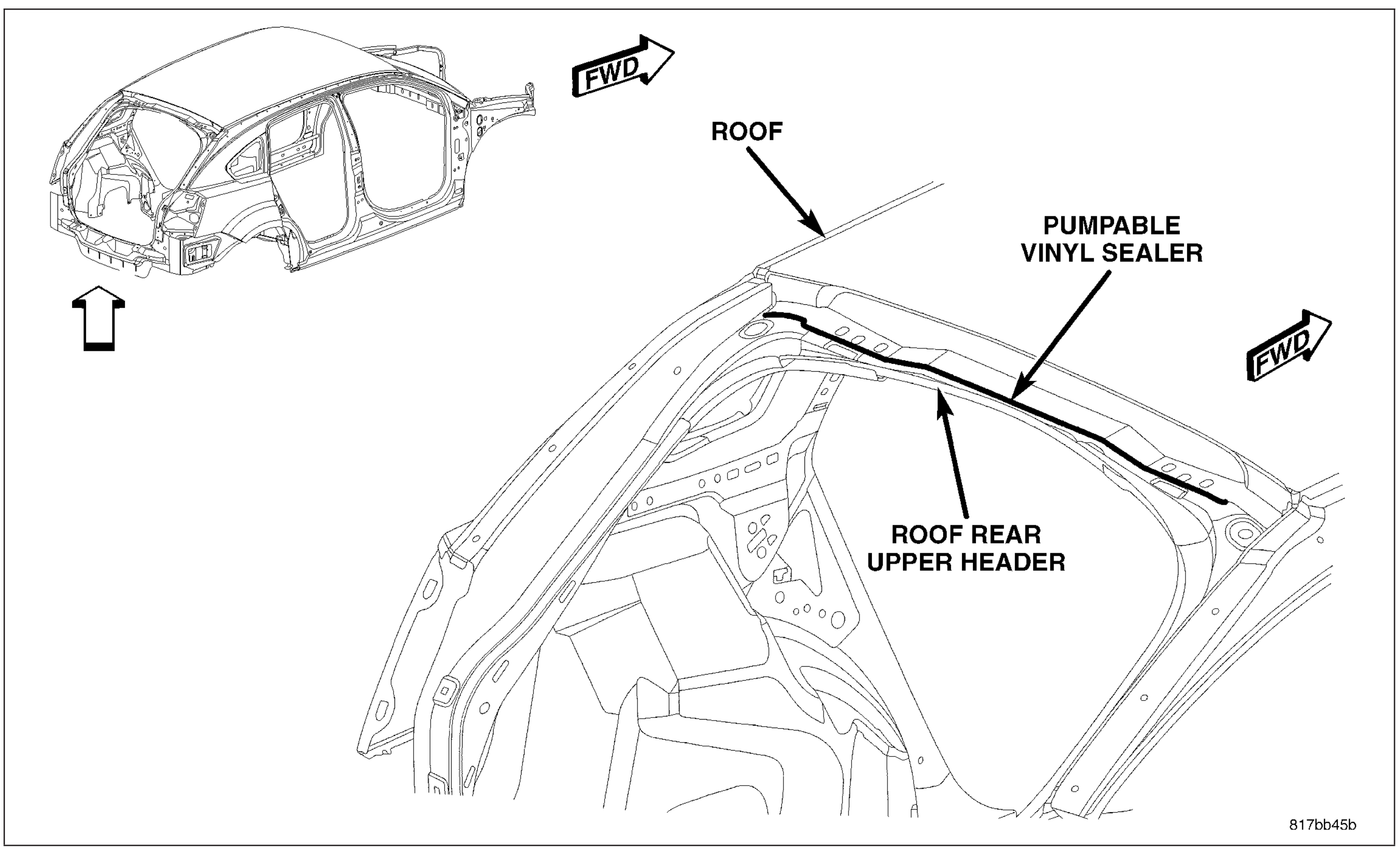


Fig. 19 ROOF/ROOF REAR UPPER HEADER

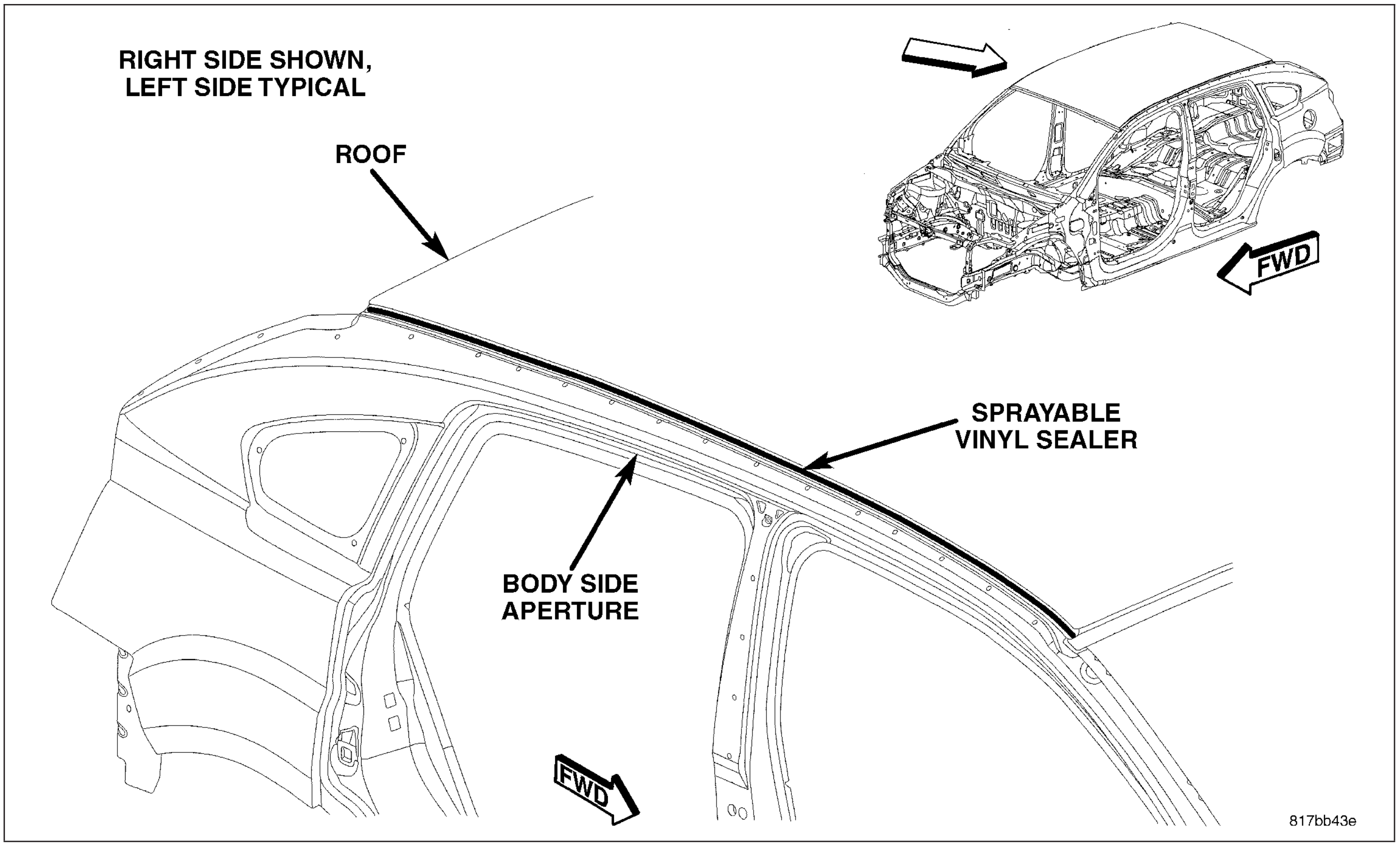


Fig. 20 ROOF/BODY SIDE APERTURE

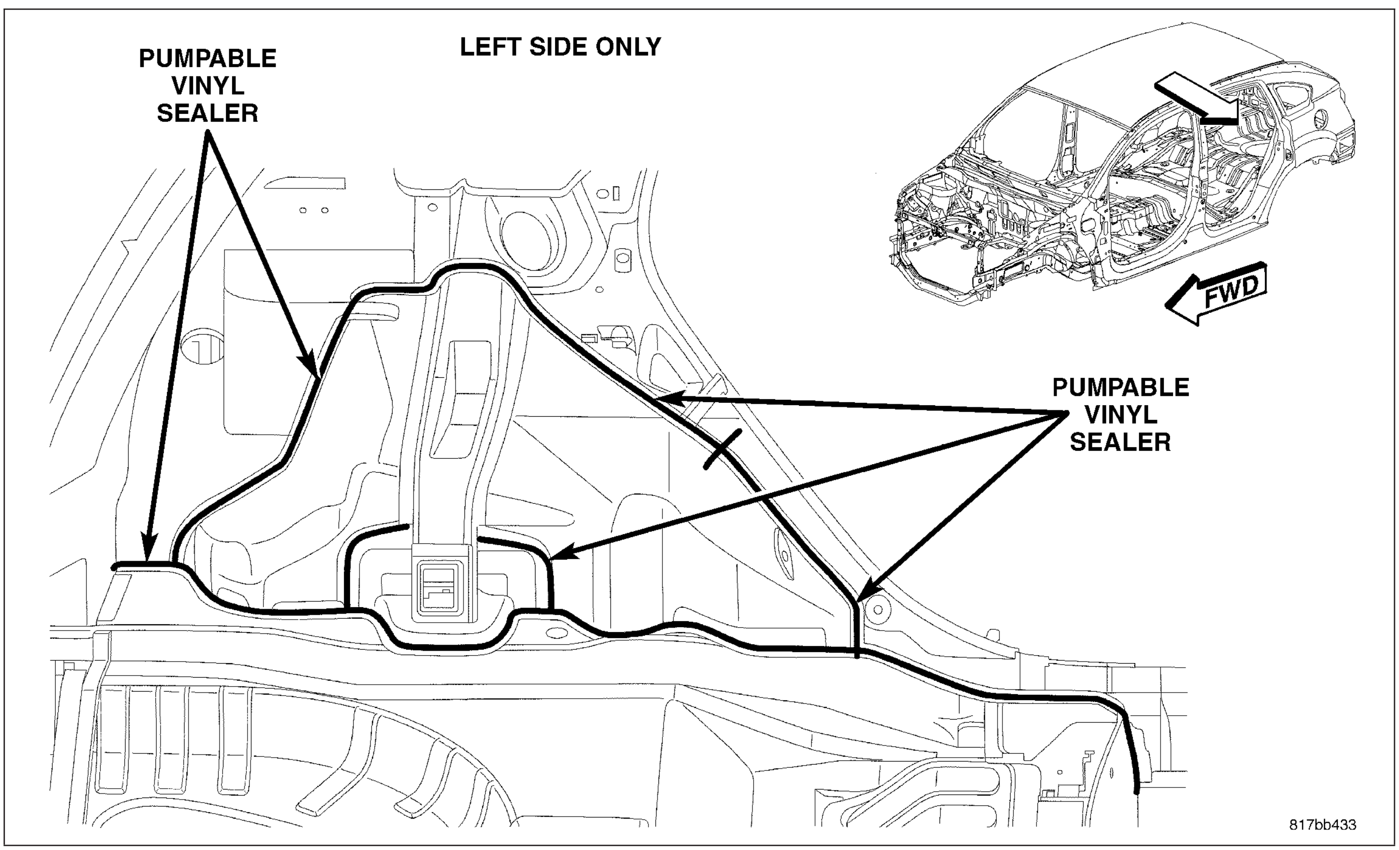


Fig. 21 LEFT REAR INNER QUARTER PANEL

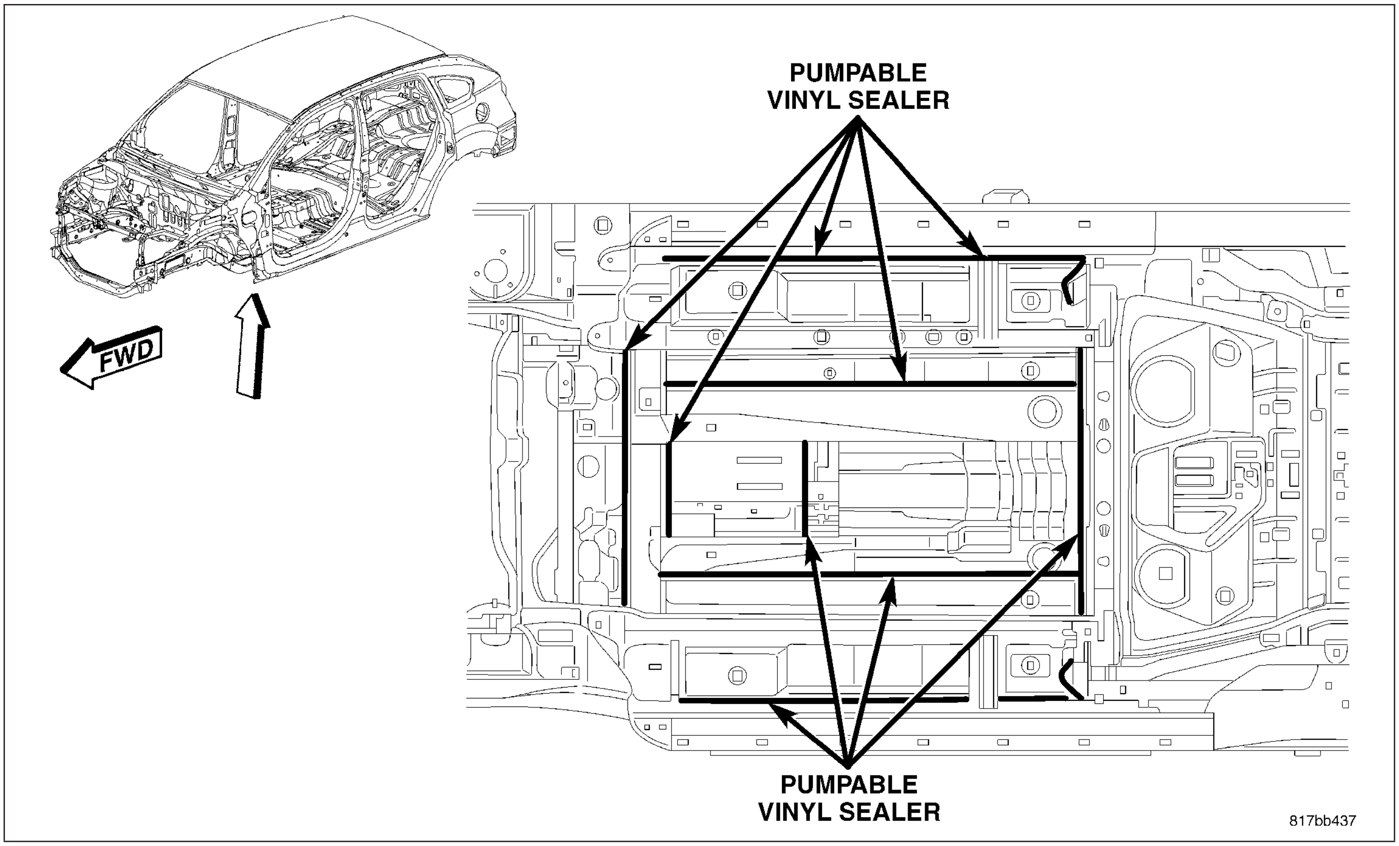


Fig. 22 UNDERBODY

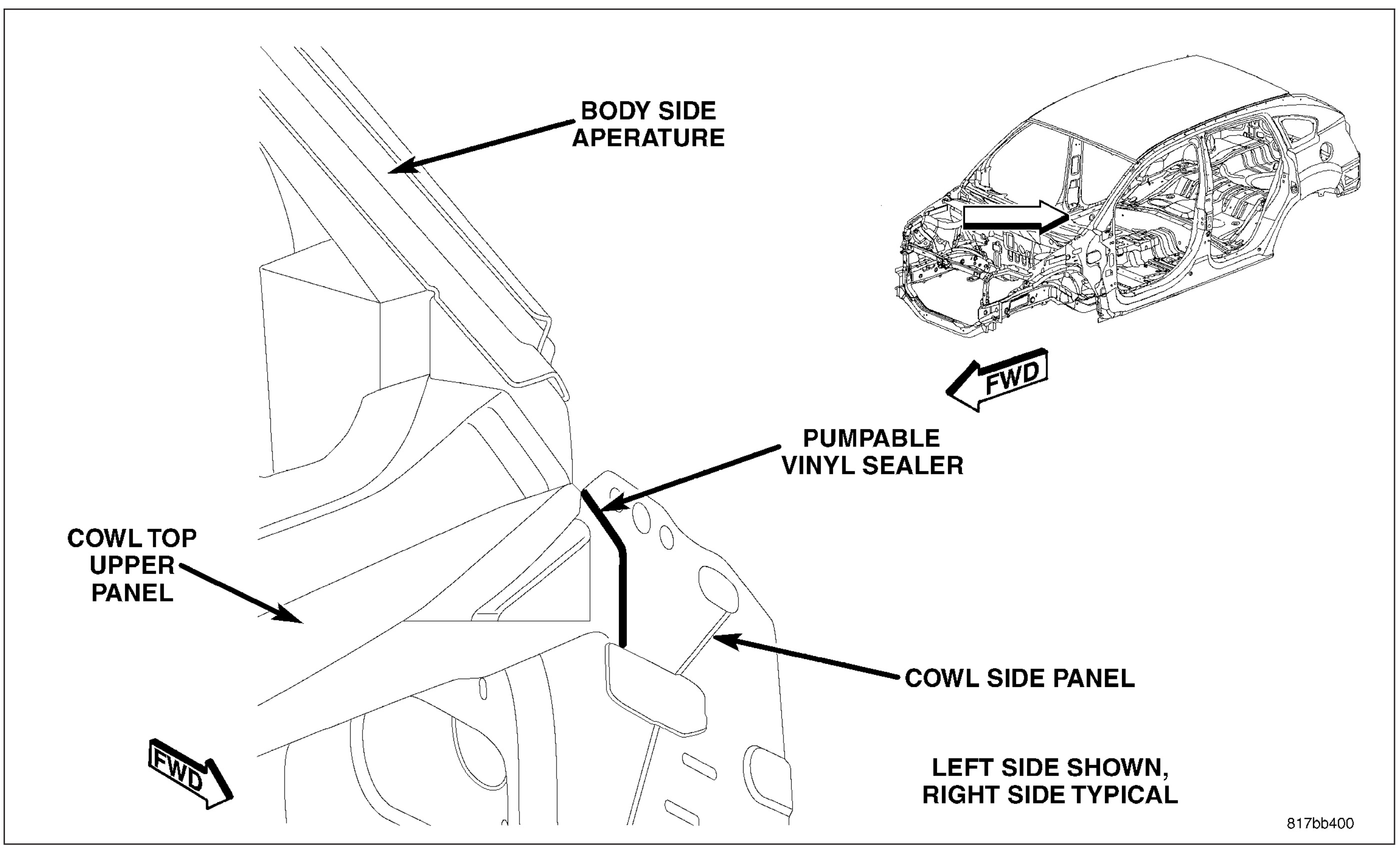


Fig. 23 UPPER COWL TOP/COWL SIDE

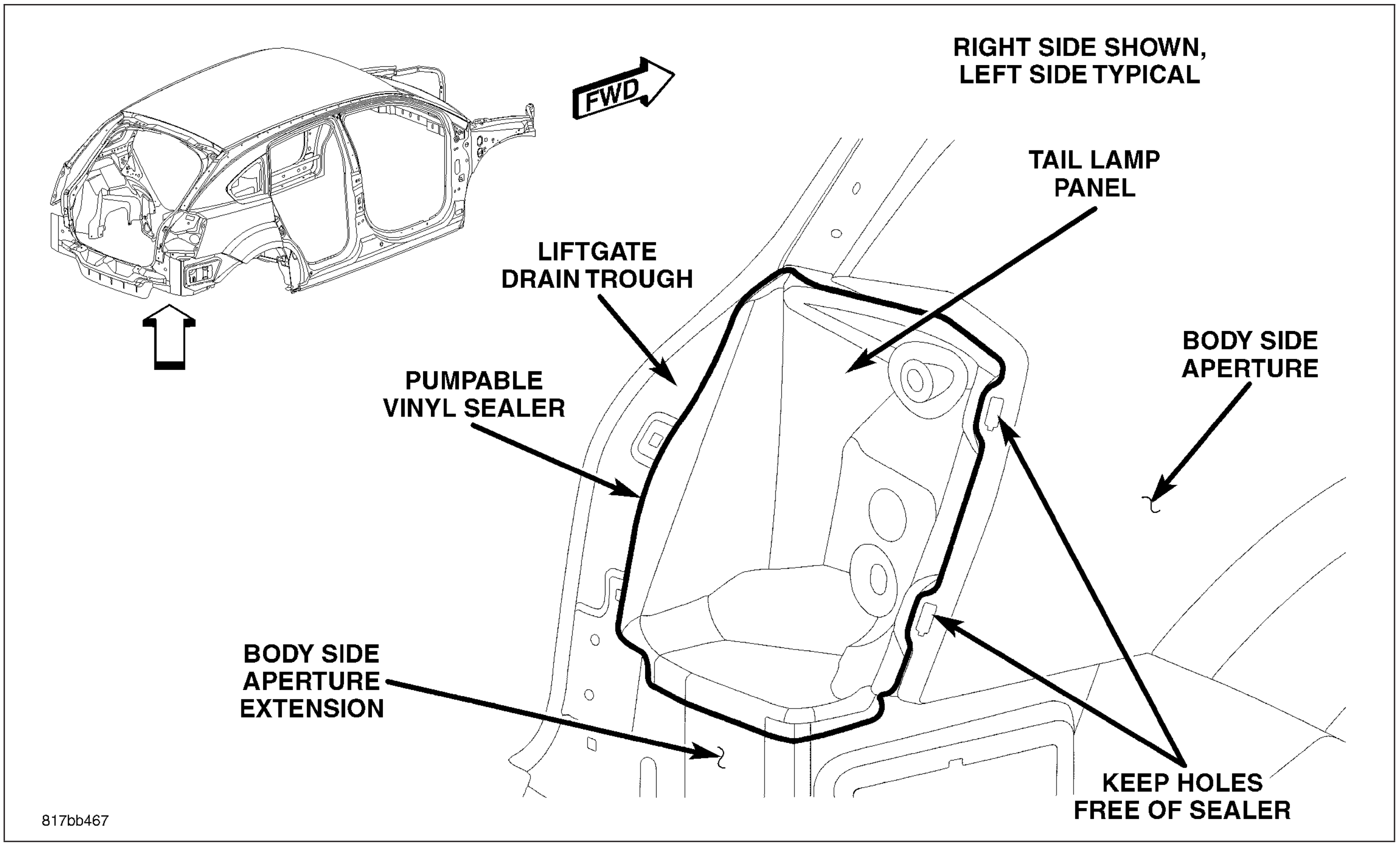


Fig. 24 TAIL LAMP PANEL

STRUCTURAL ADHESIVE LOCATIONS

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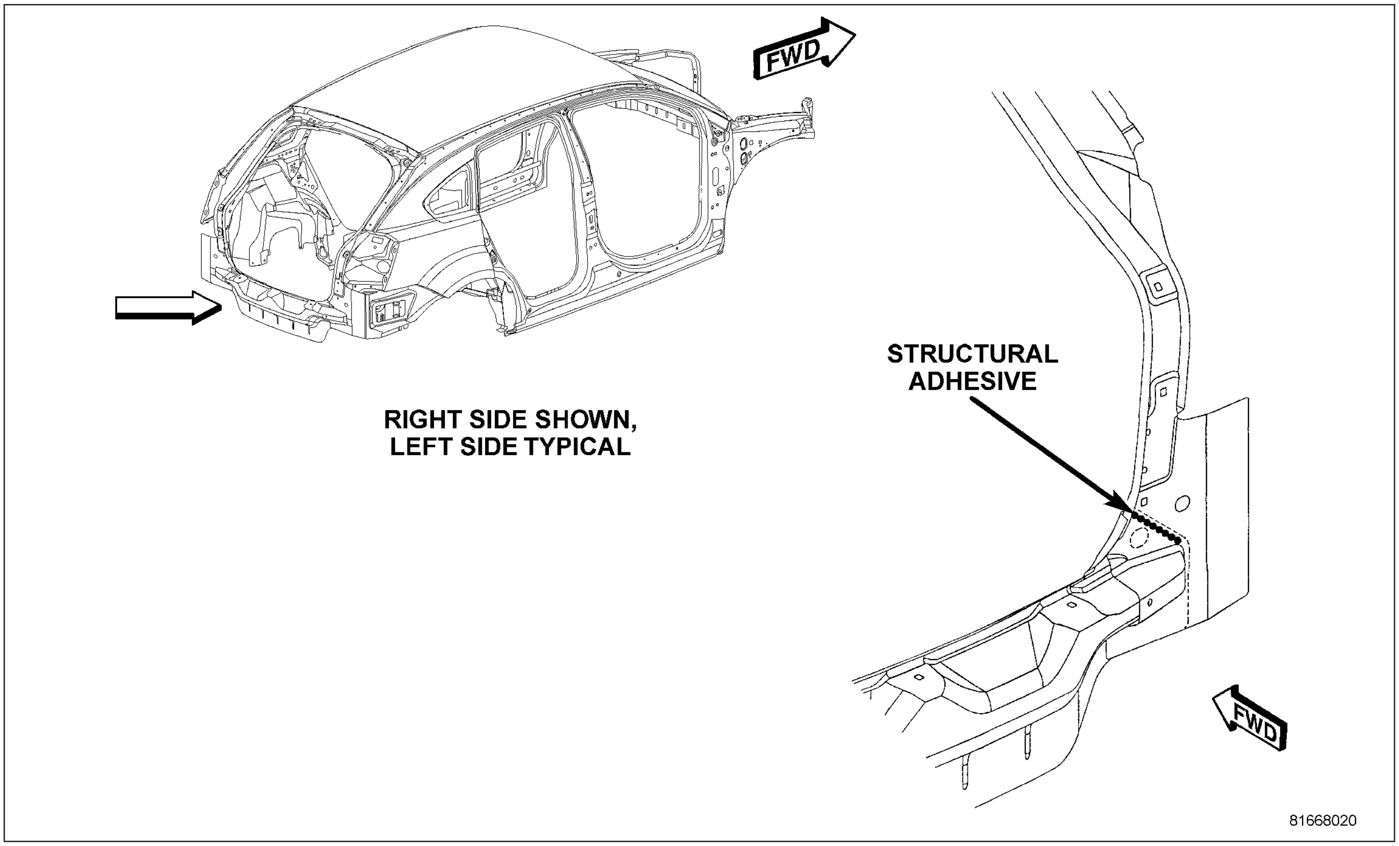


Fig. 25 BODY IN WHITE-COMPLETE (1 OF 3)

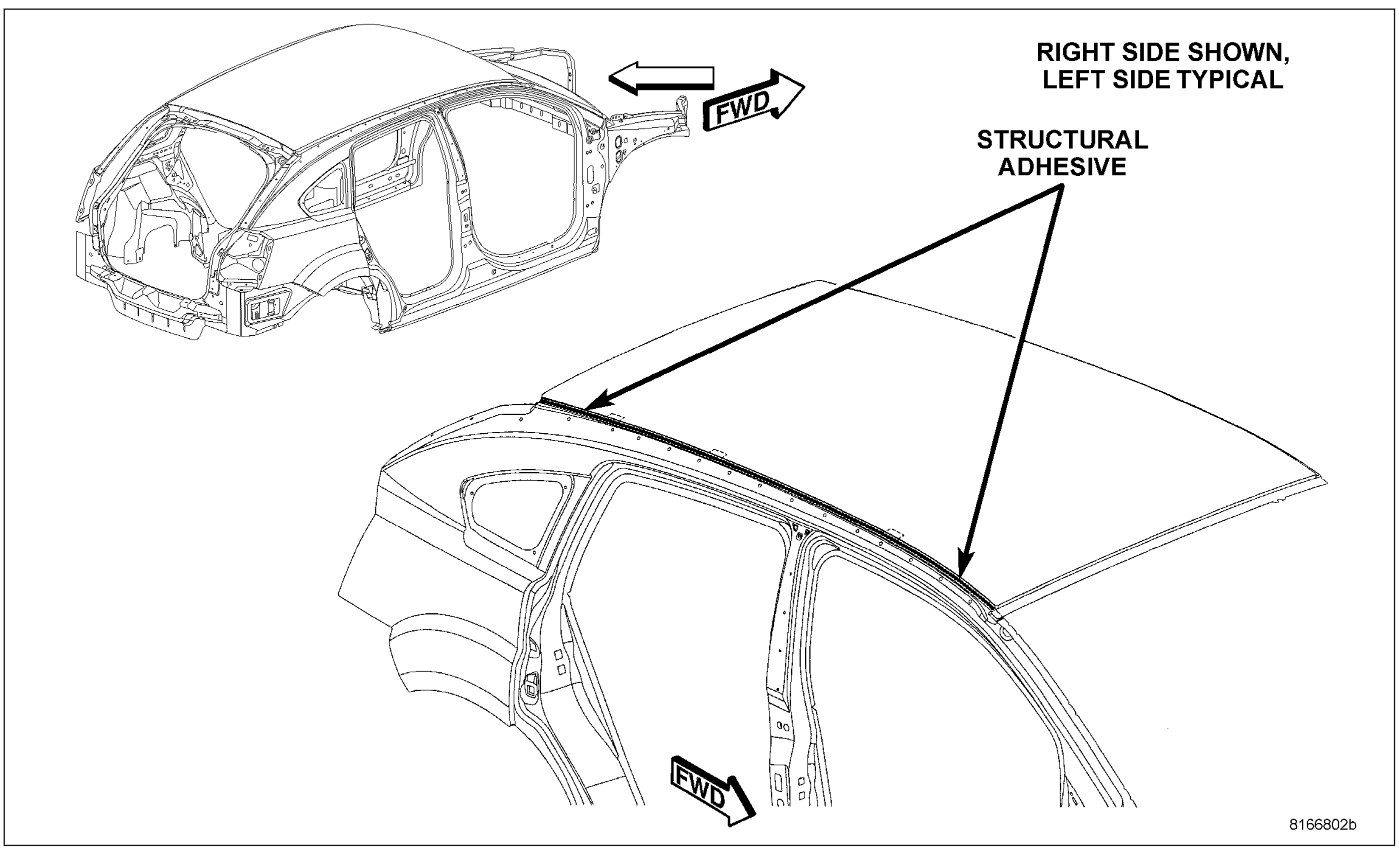


Fig. 26 BODY COMPLETE (2 OF 3)

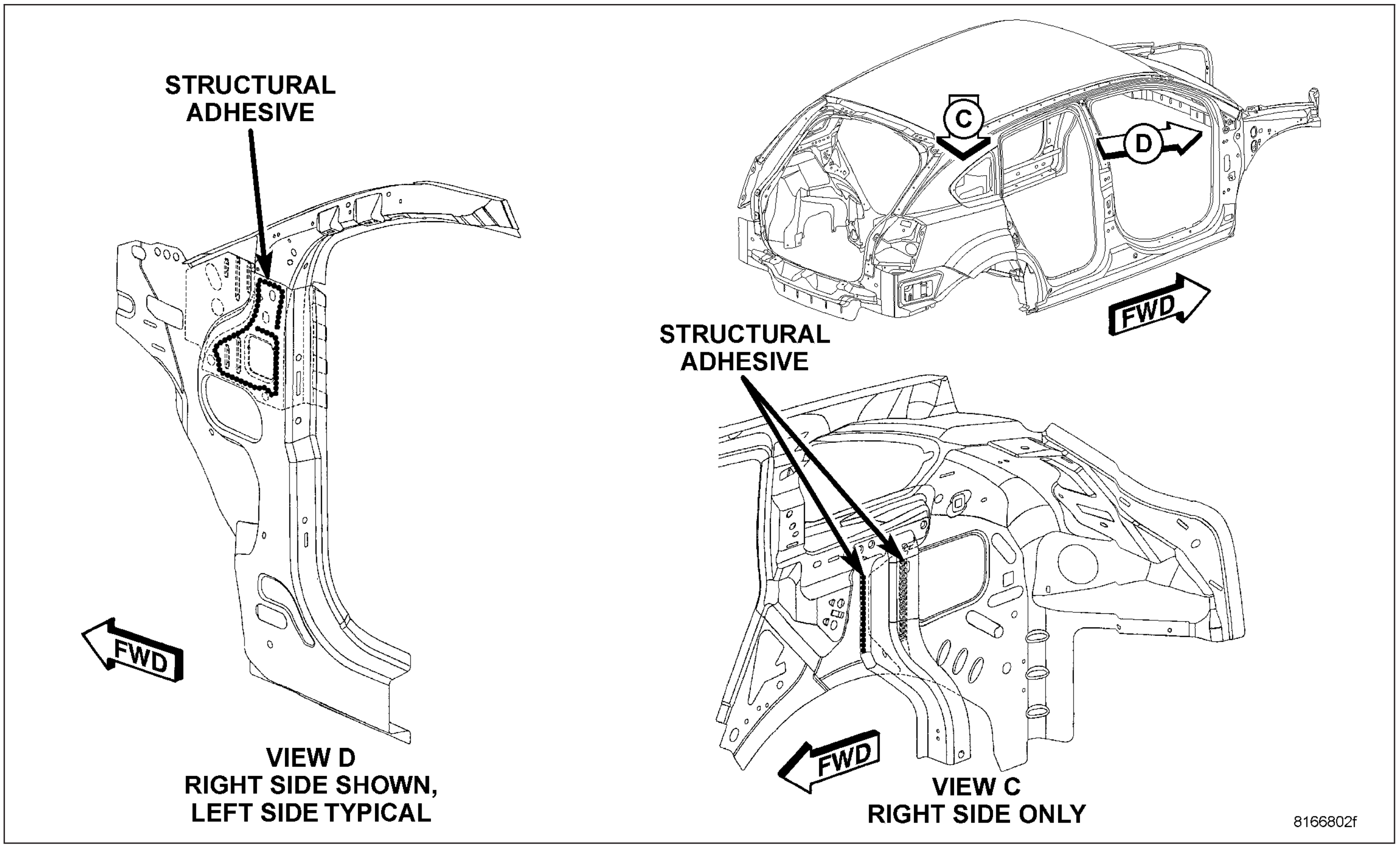


Fig. 27 BODY IN WHITE (3 OF 3)

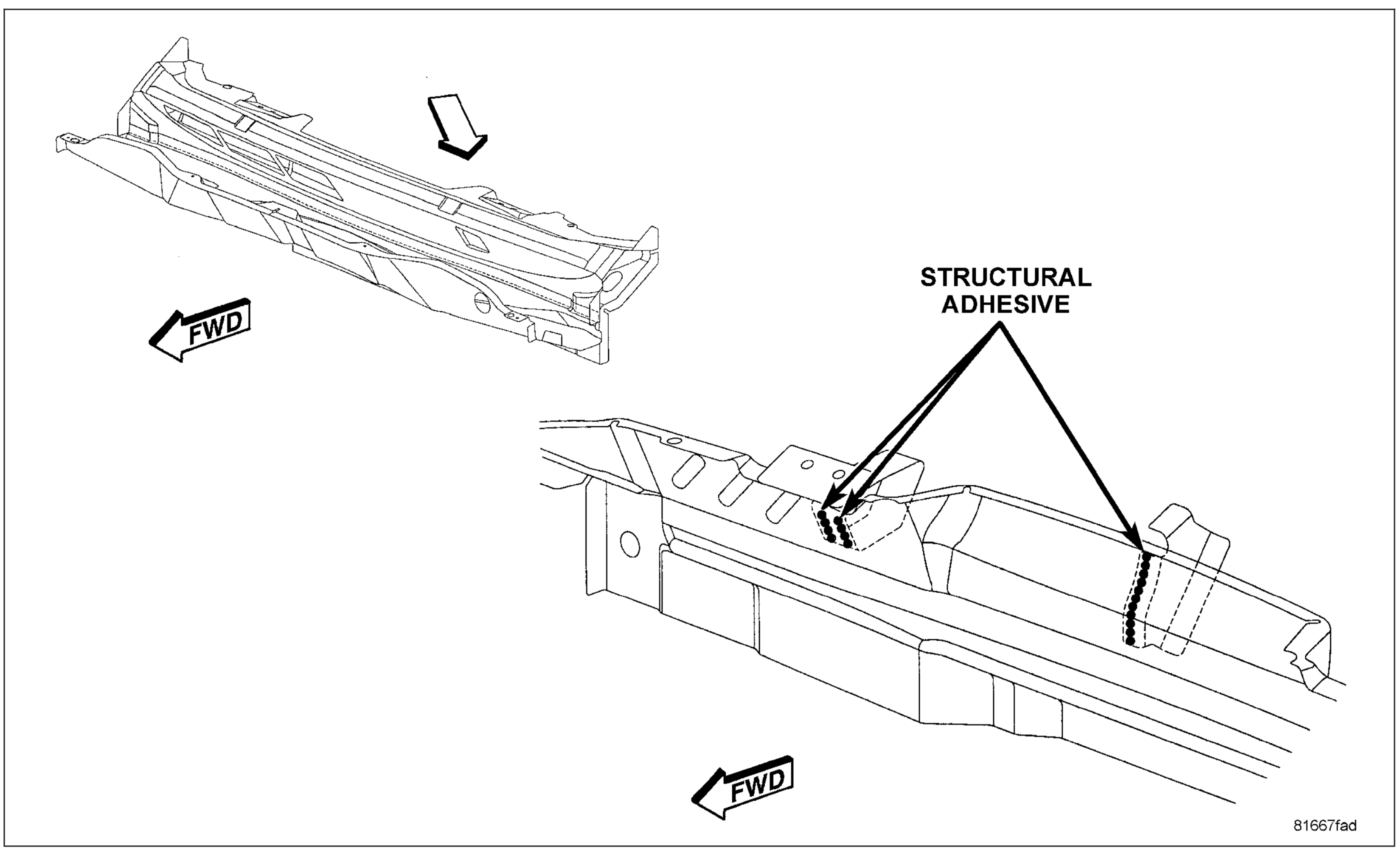


Fig. 28 PLENUM ASSEMBLY

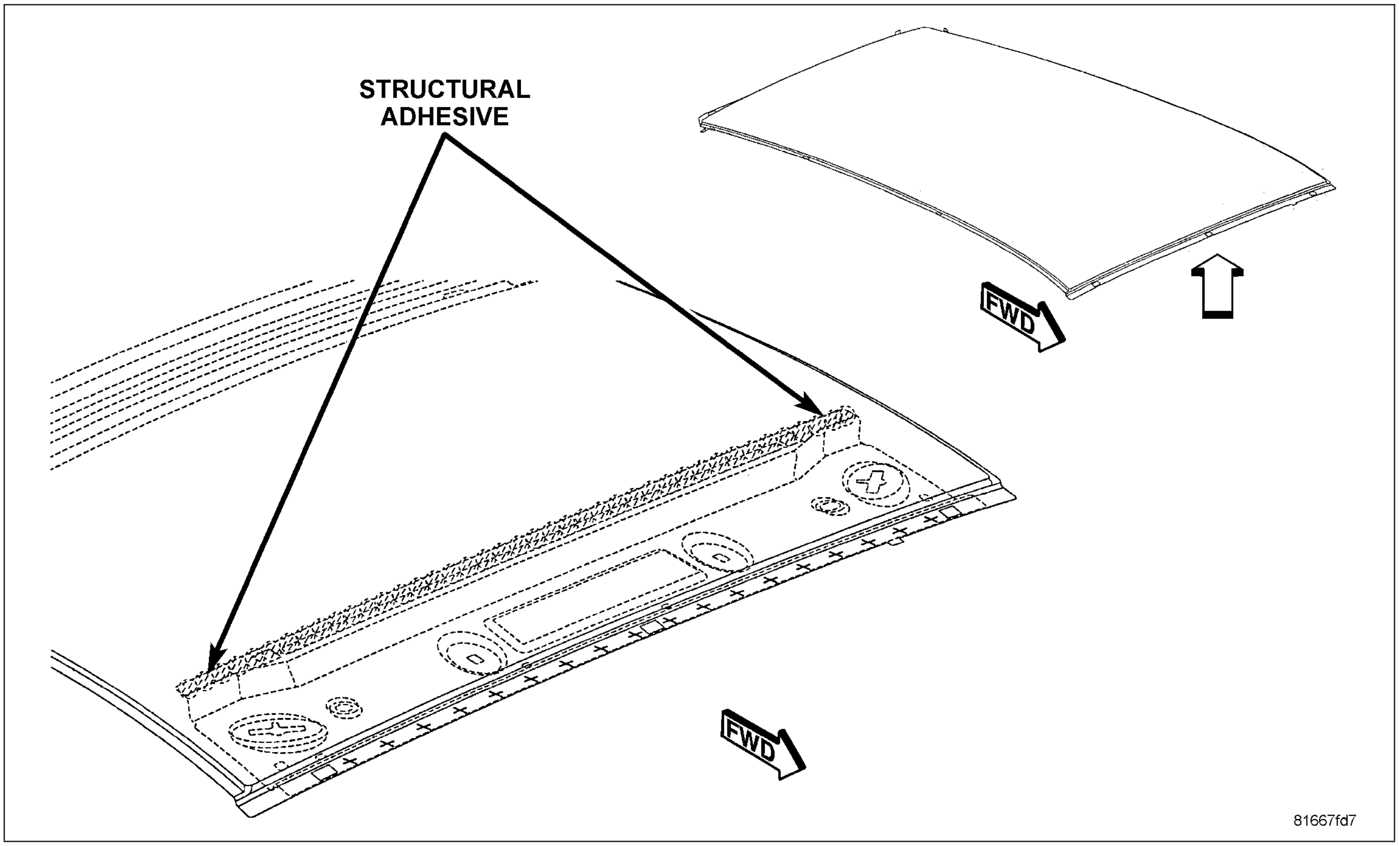


Fig. 29 ROOF WITHOUT SUNROOF (1 OF 2)

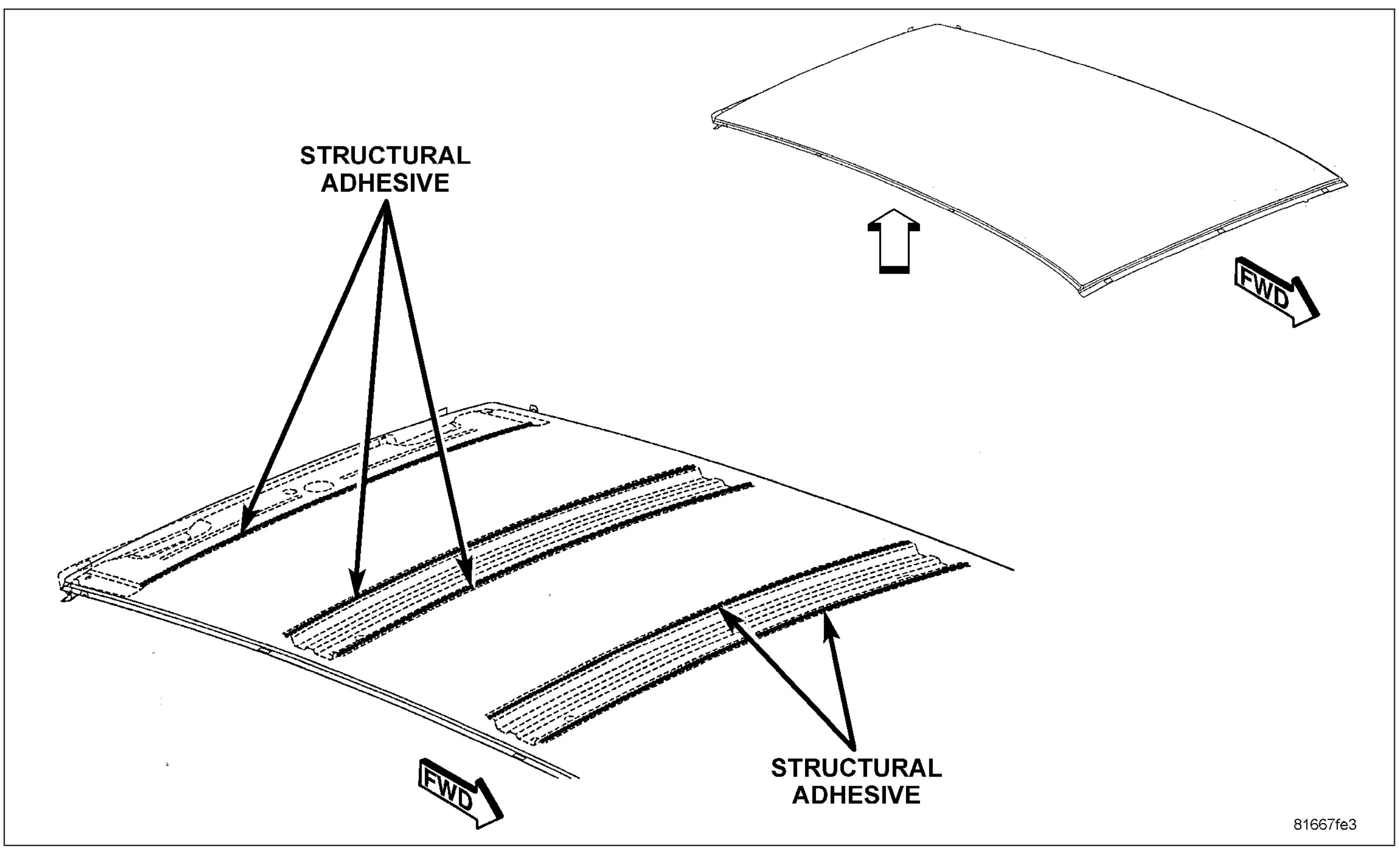


Fig. 30 ROOF WITHOUT SUNROOF (2 OF 2)

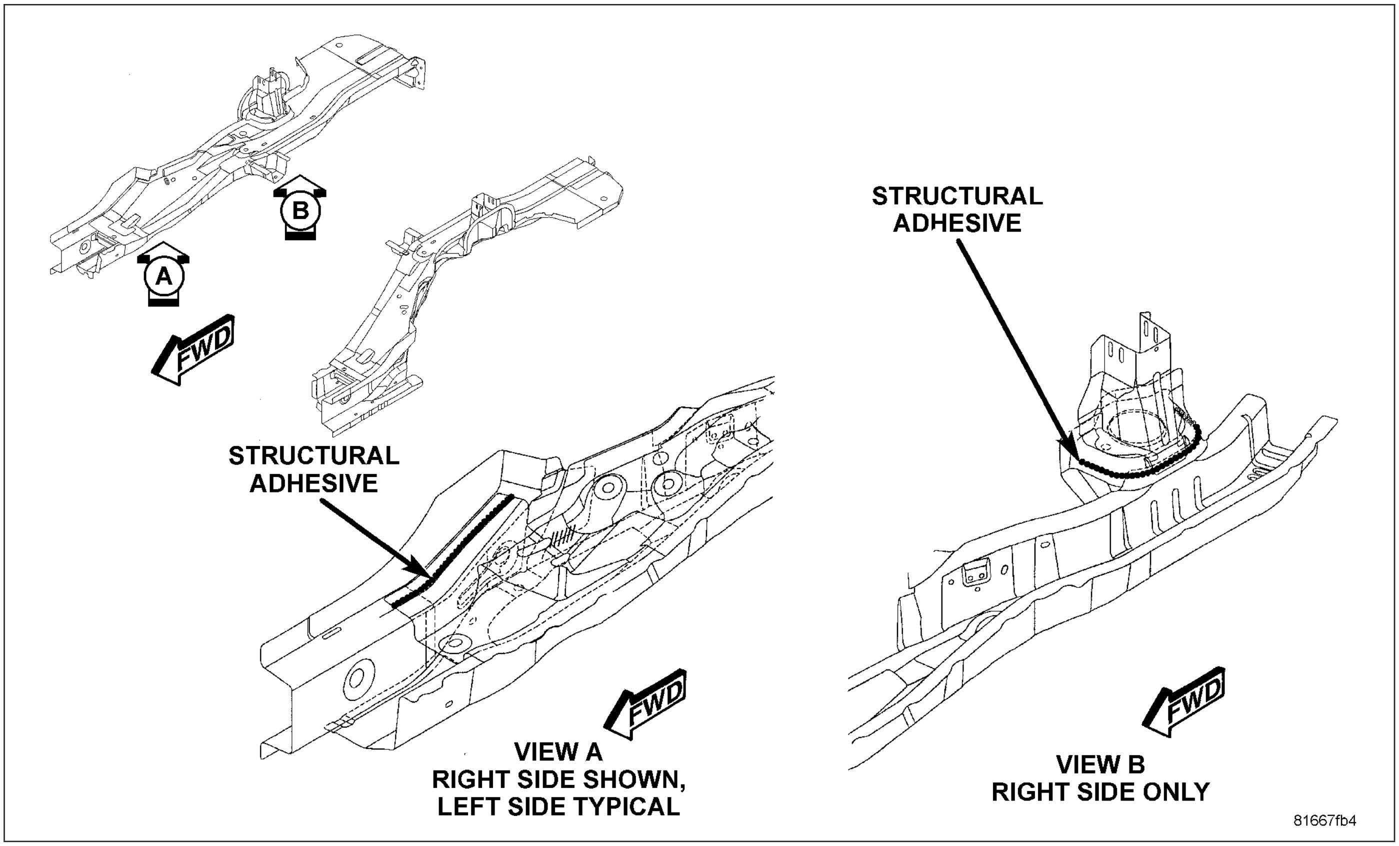


Fig. 31 SIDEMEMBER ASSEMBLY (1 OF 2)

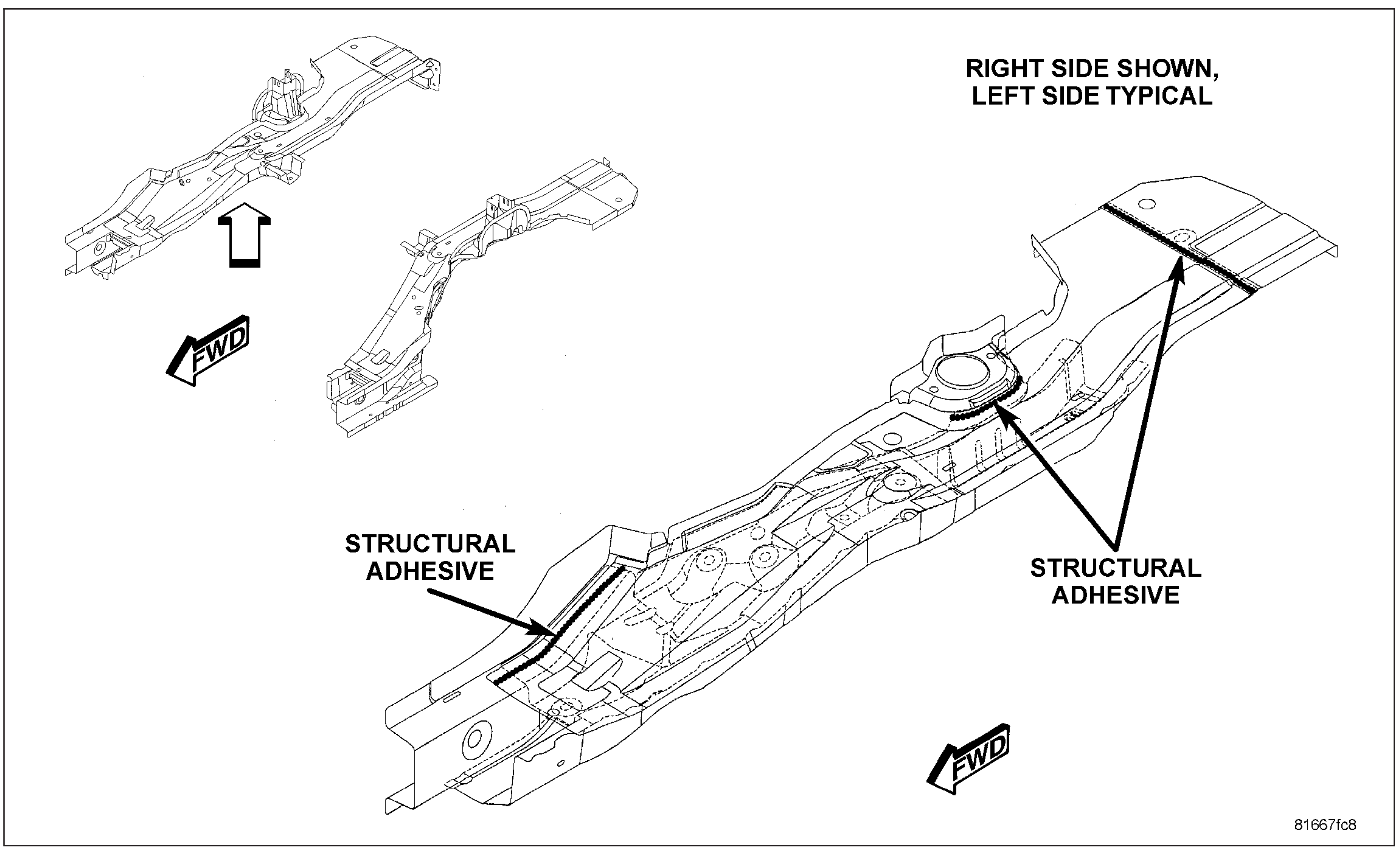


Fig. 32 SIDEMEMBER ASSEMBLY (2 OF 2)

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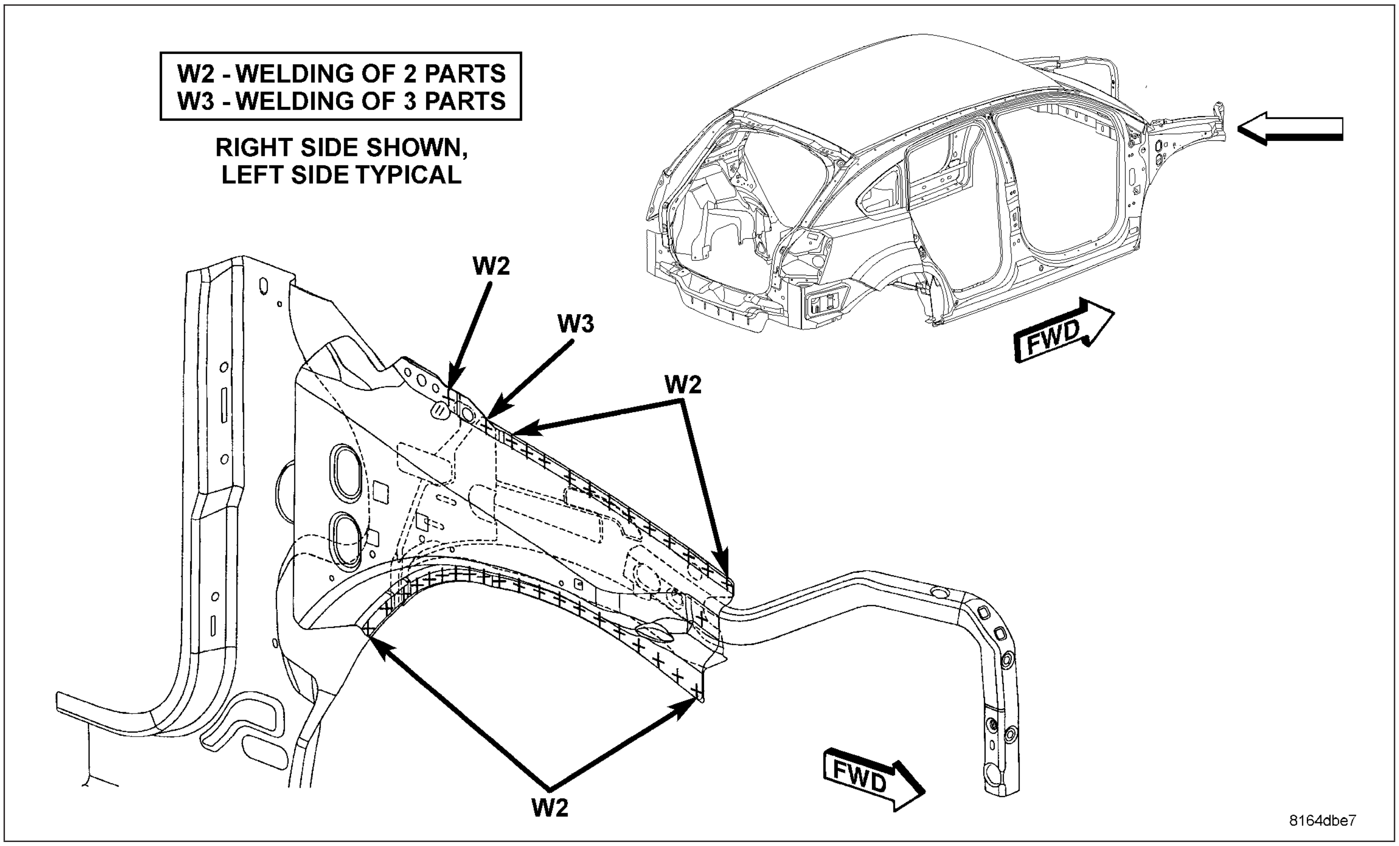


Fig. 33 BODY IN WHITE (1 OF 12)

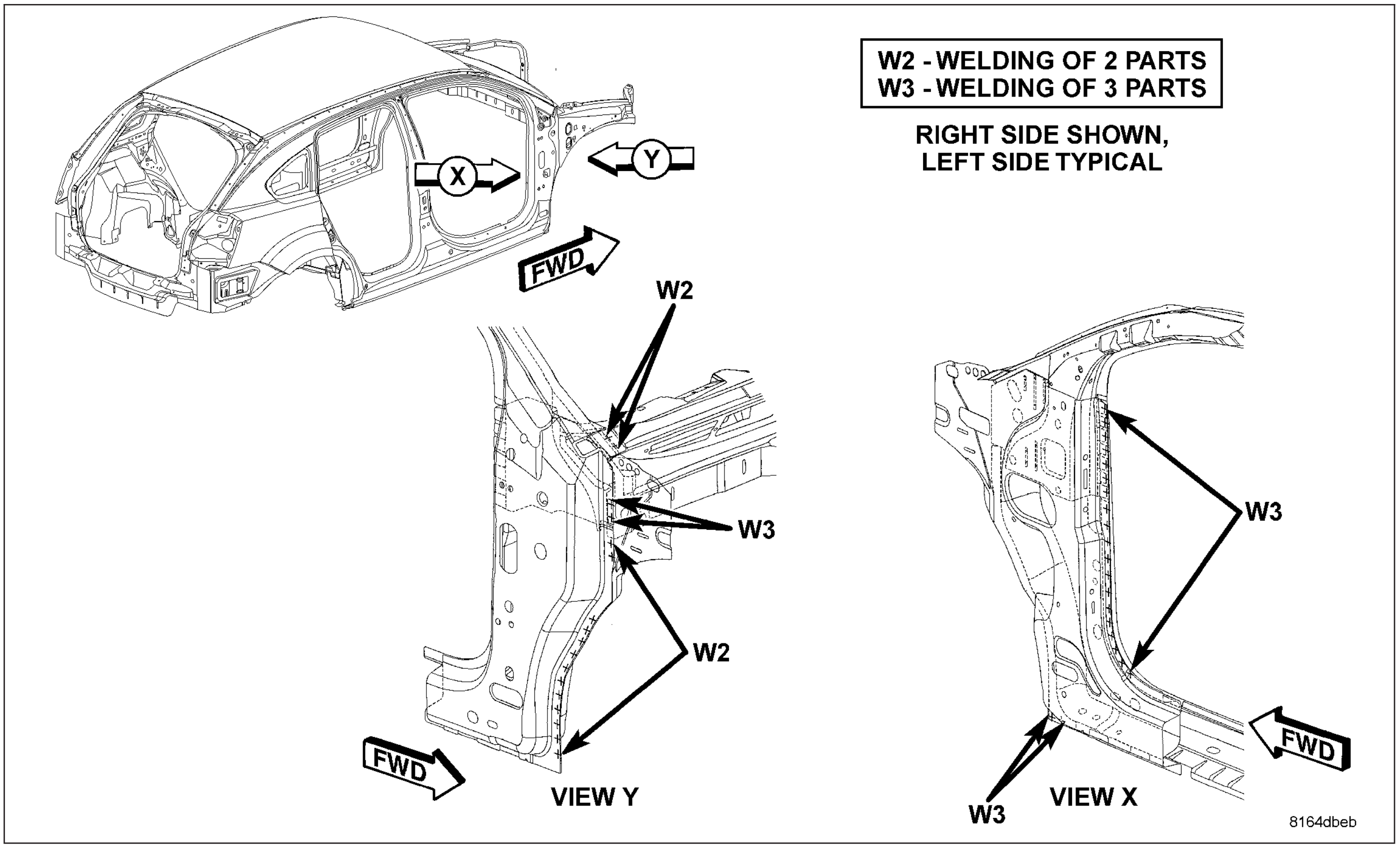


Fig. 34 BODY IN WHITE (2 OF 12)

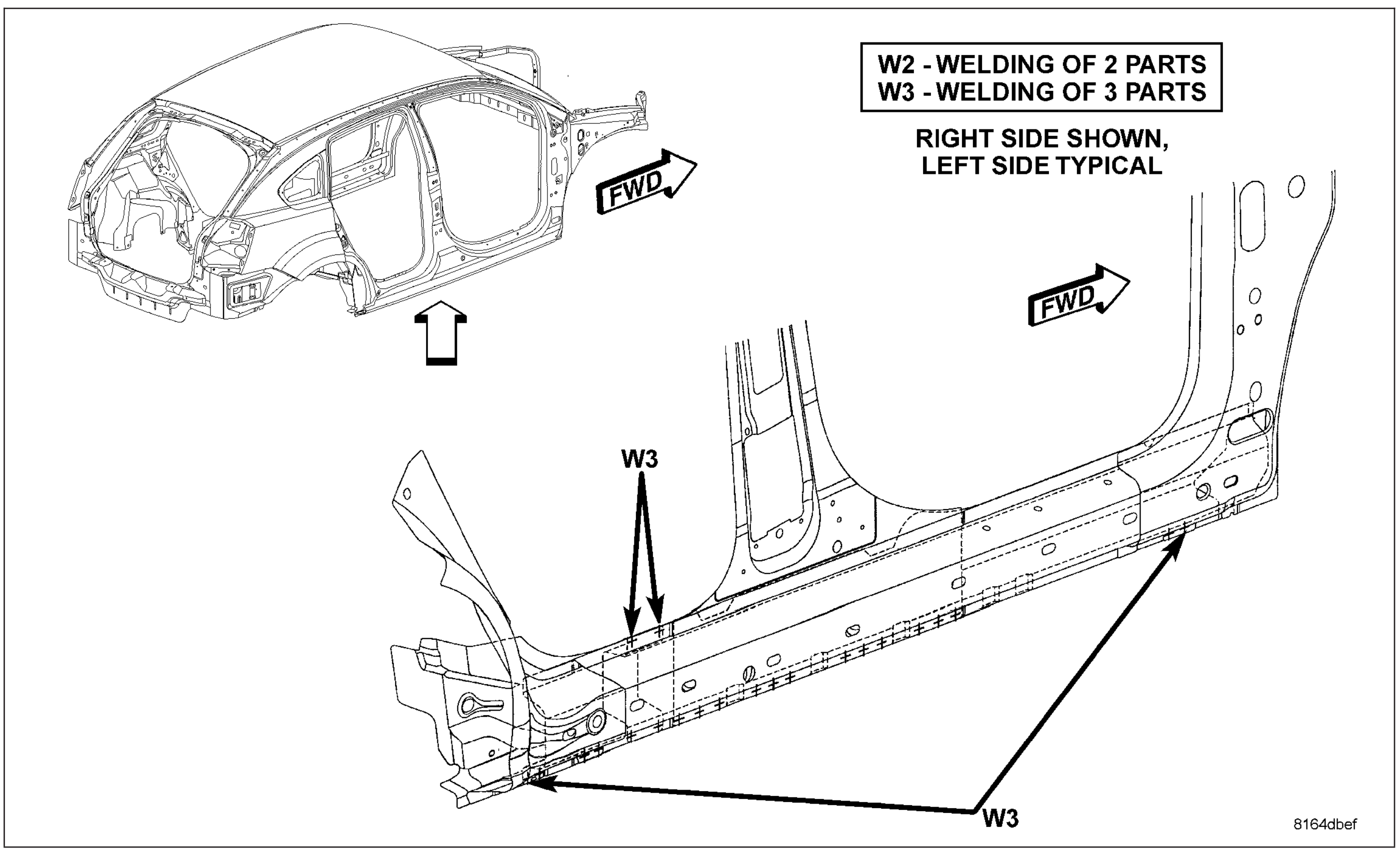


Fig. 35 BODY IN WHITE (3 OF 12)

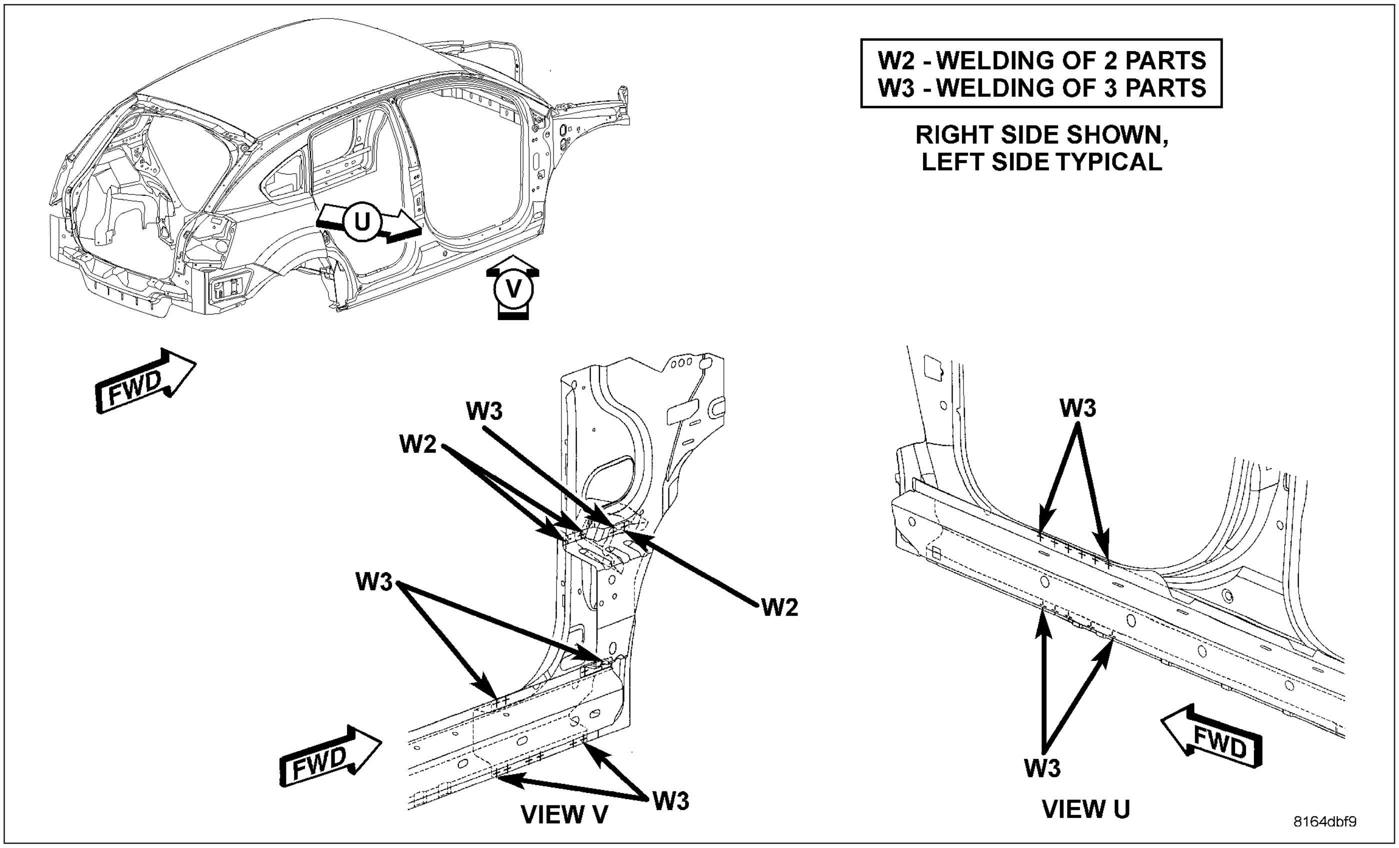


Fig. 36 BODY IN WHITE (4 OF 12)

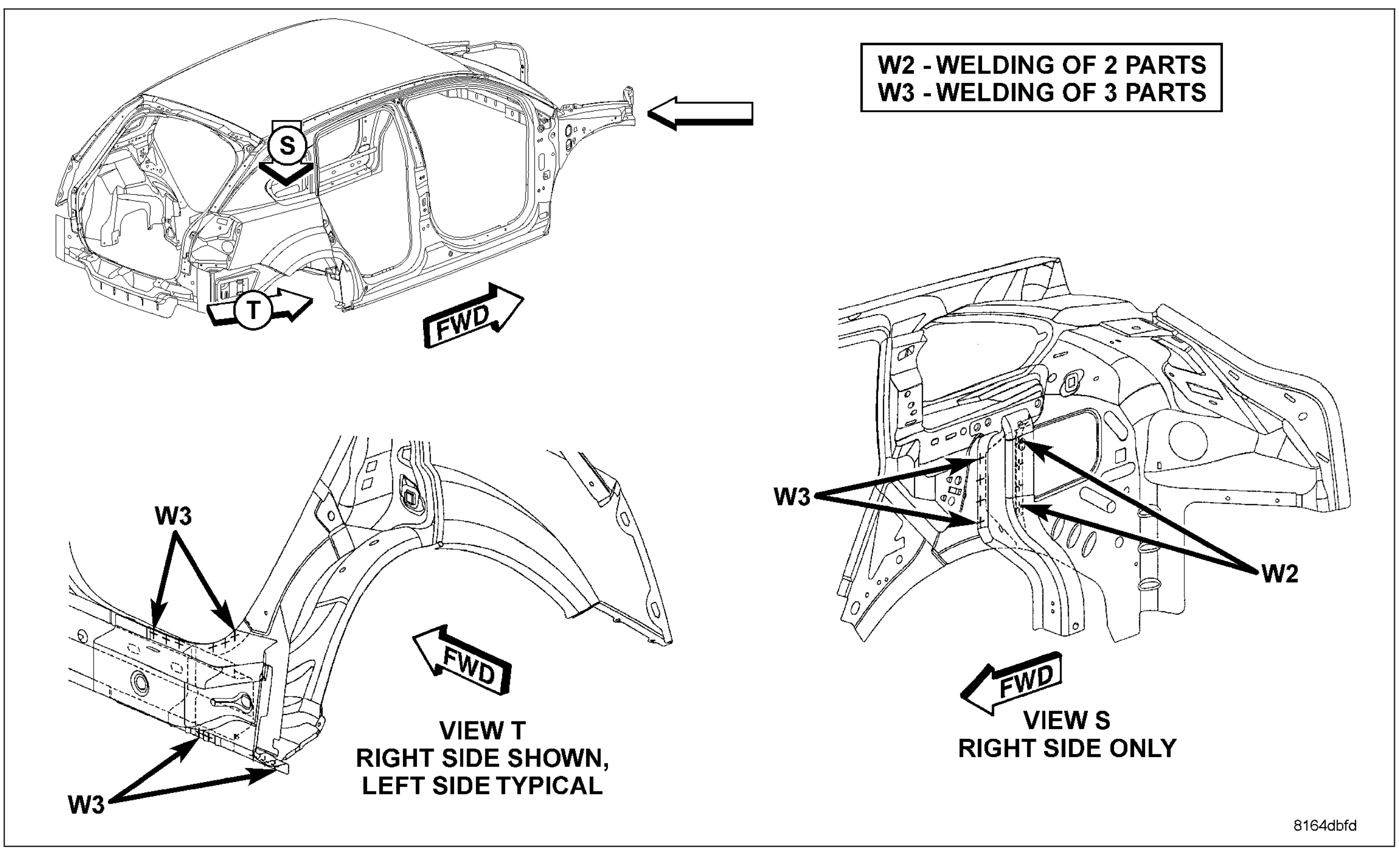


Fig. 37 BODY IN WHITE (5 OF 12)

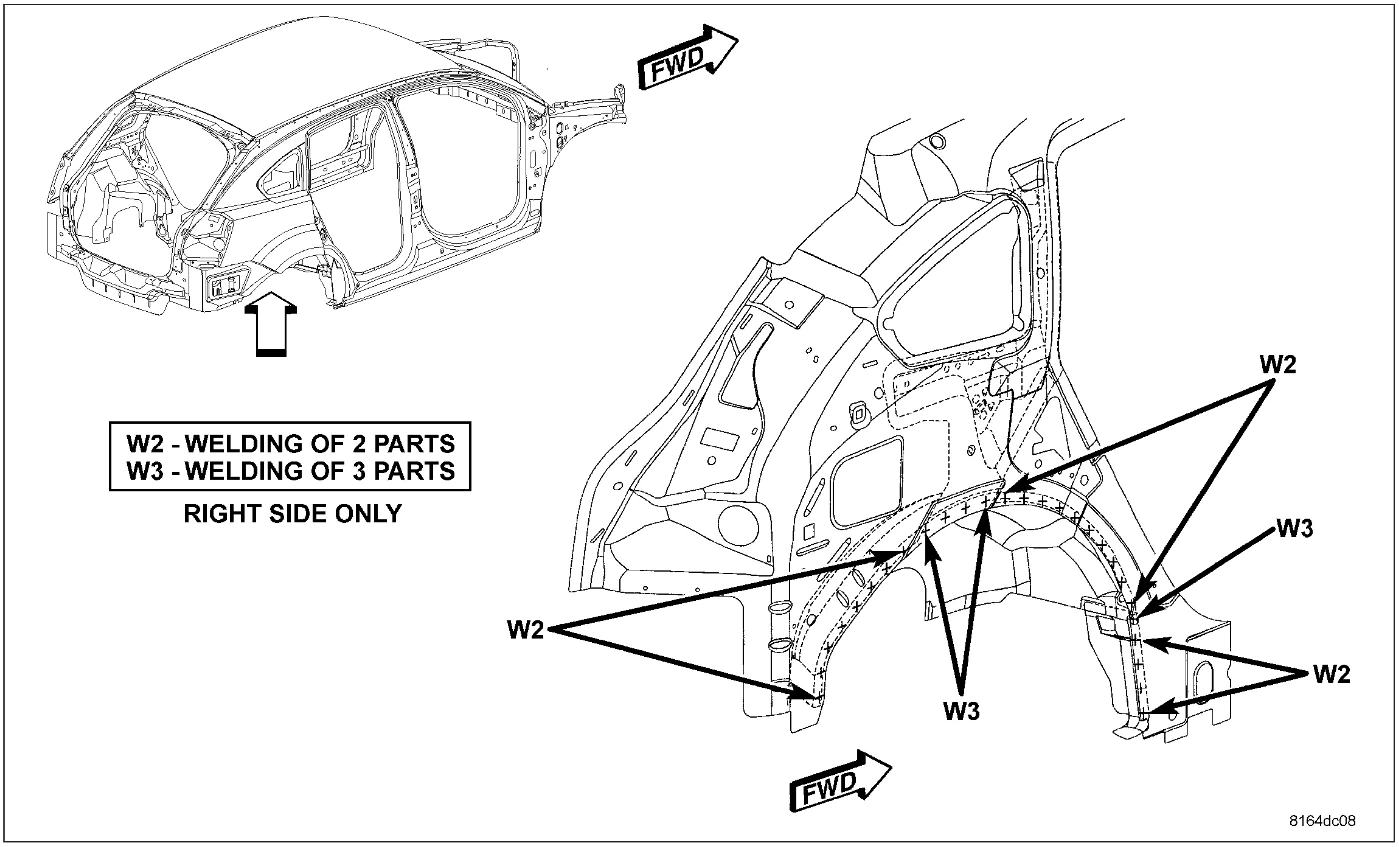


Fig. 38 BODY IN WHITE (6 OF 12)

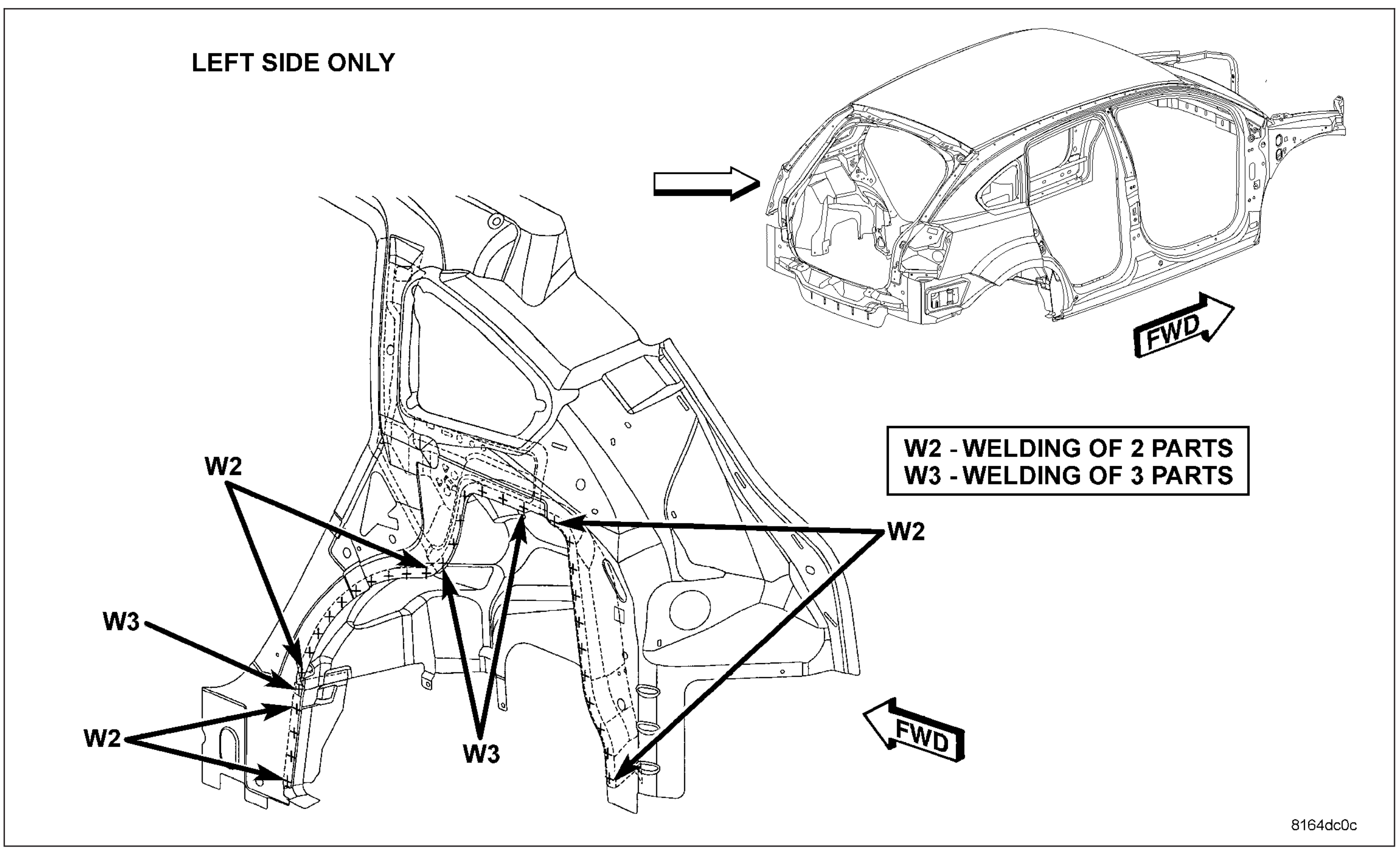


Fig. 39 BODY IN WHITE (7 OF 12)

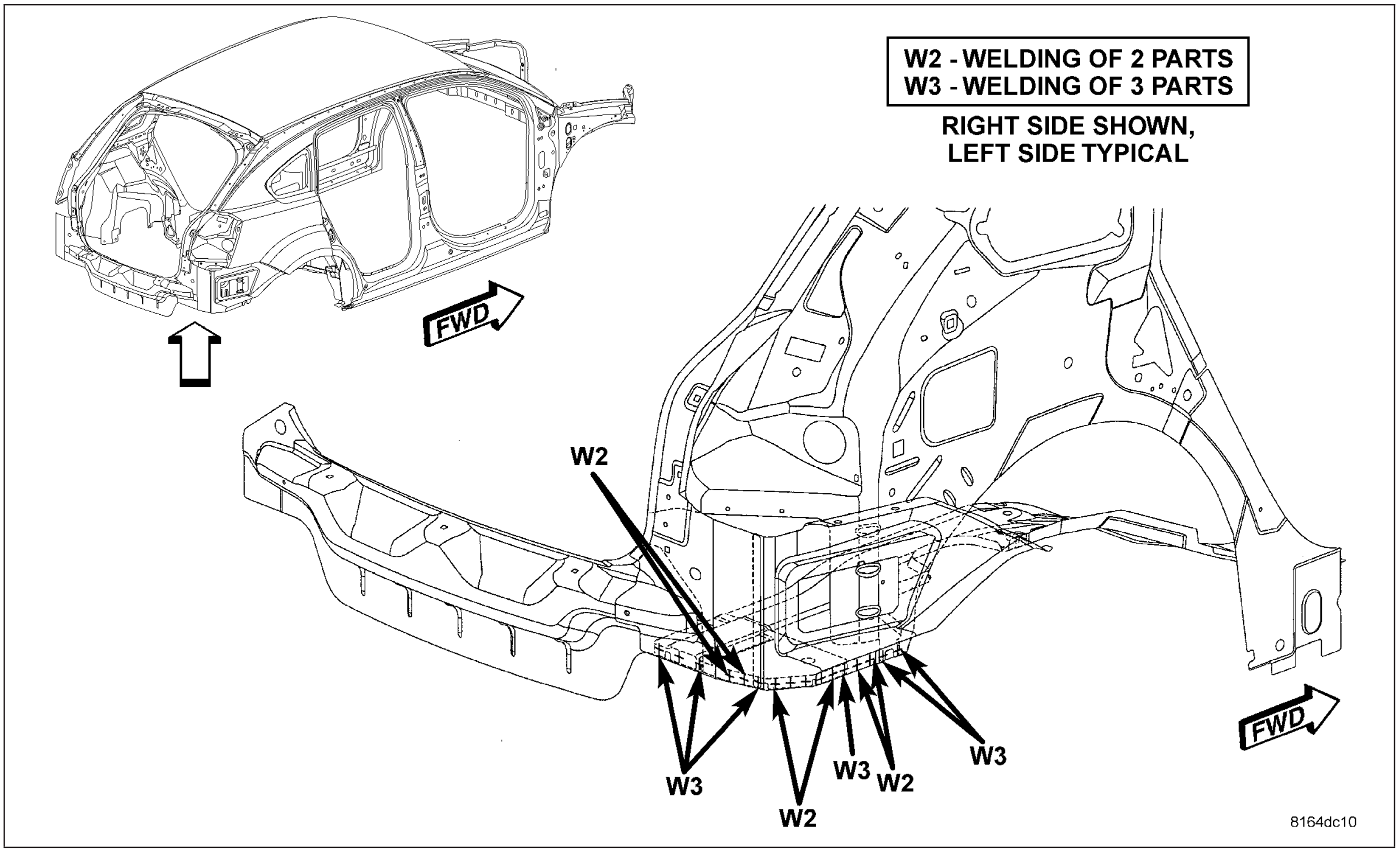


Fig. 40 BODY IN WHITE (8 OF 12)

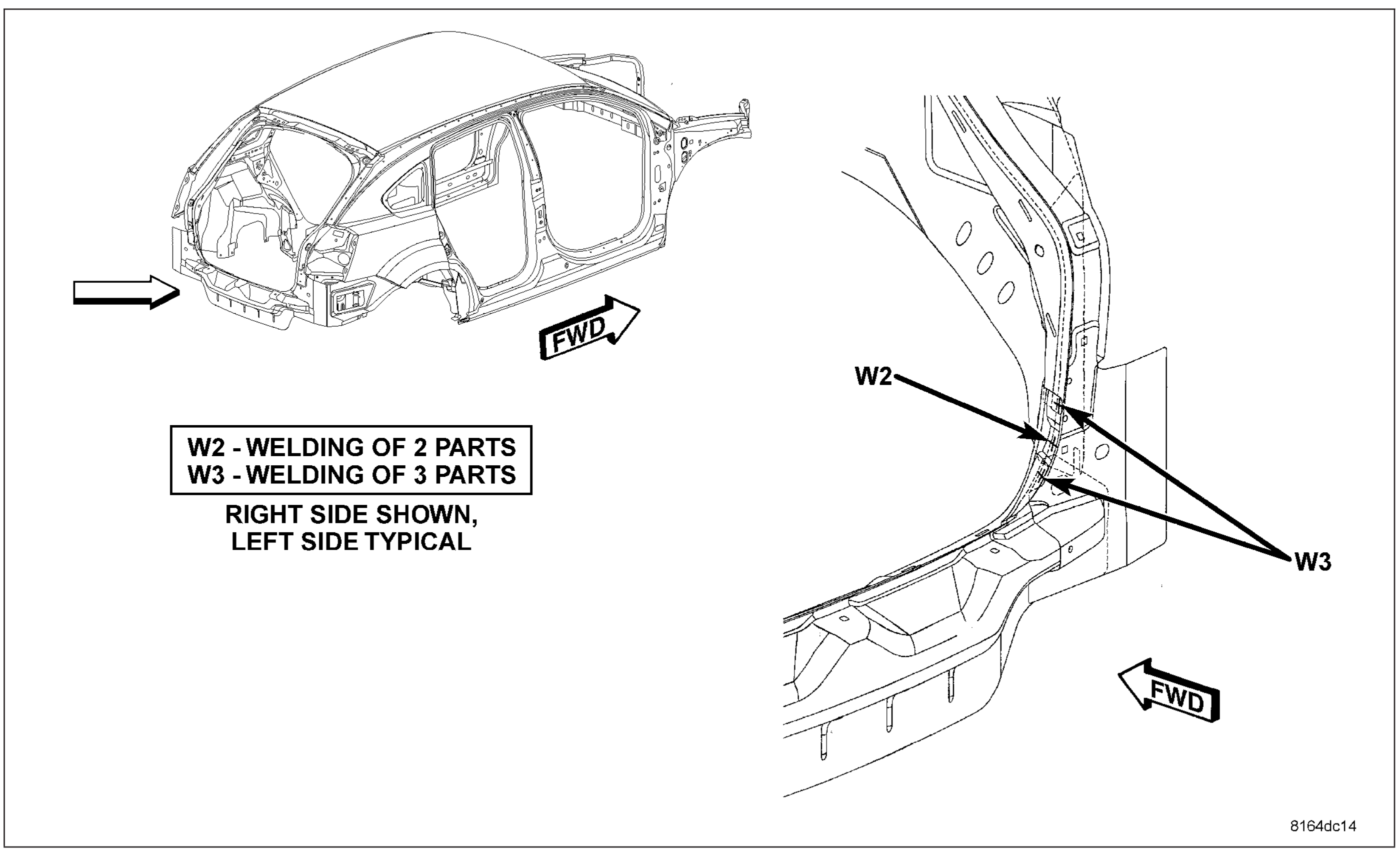


Fig. 41 BODY IN WHITE (9 OF 12)

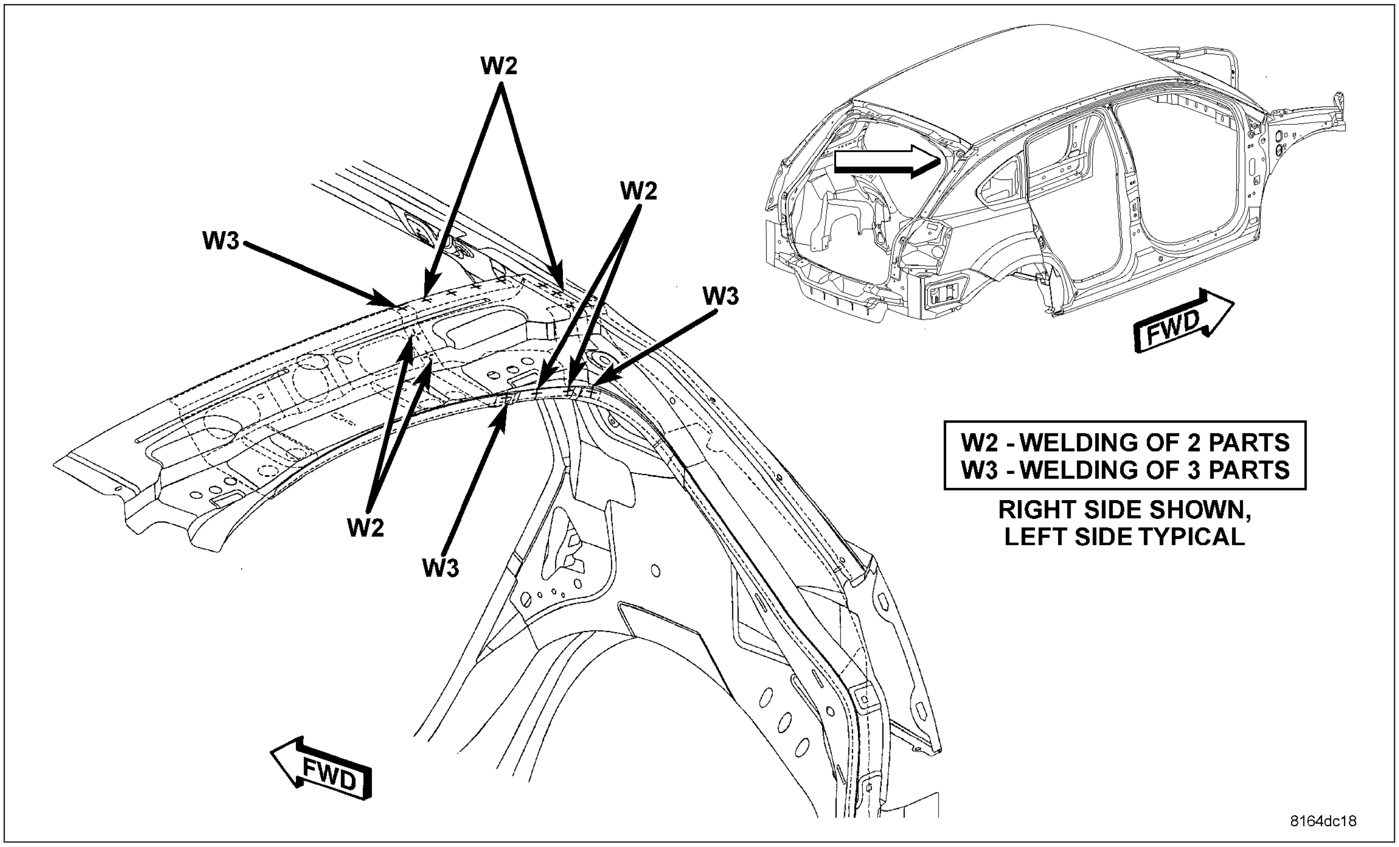


Fig. 42 BODY IN WHITE (10 OF 12)

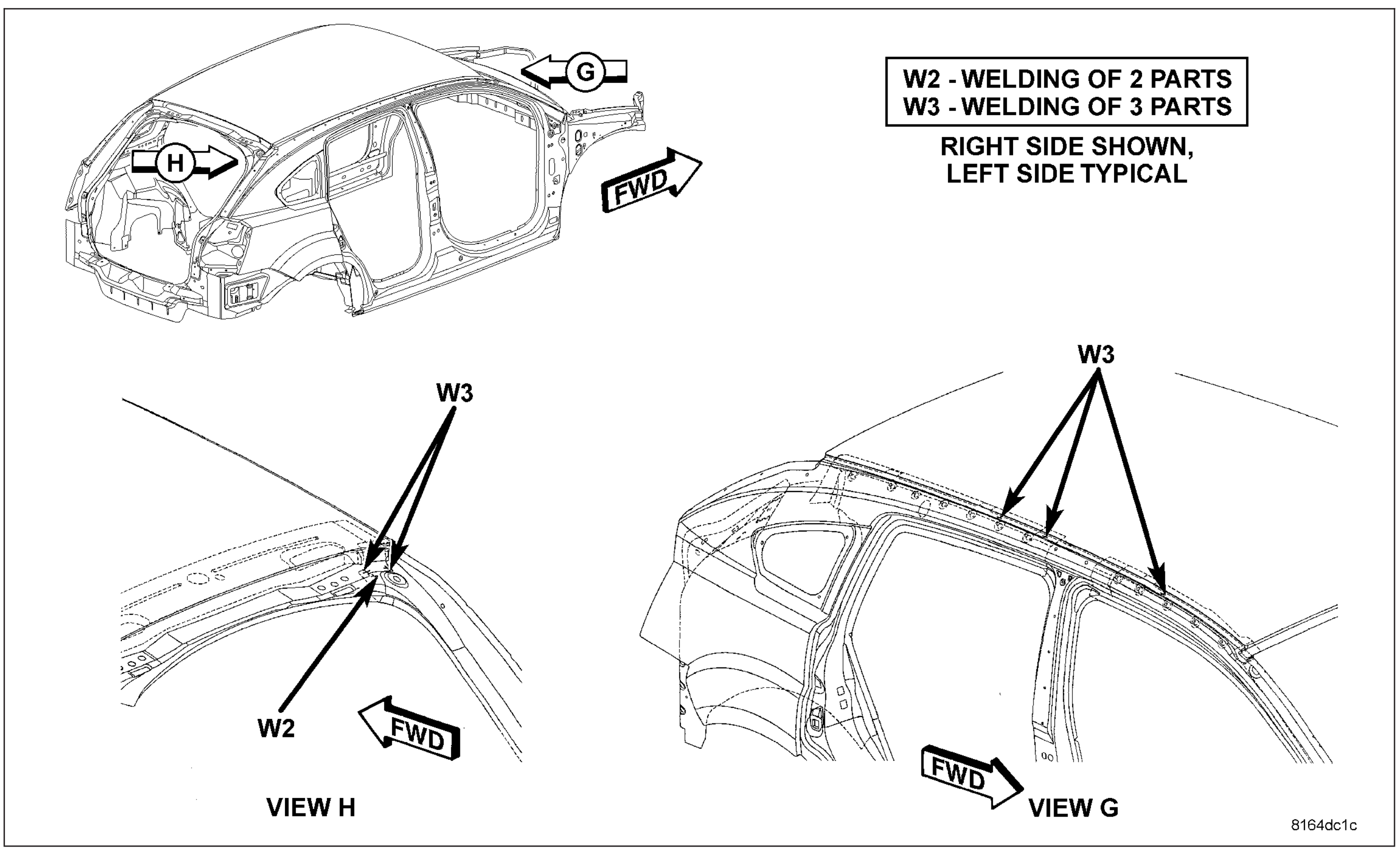


Fig. 43 BODY IN WHITE (11 OF 12)

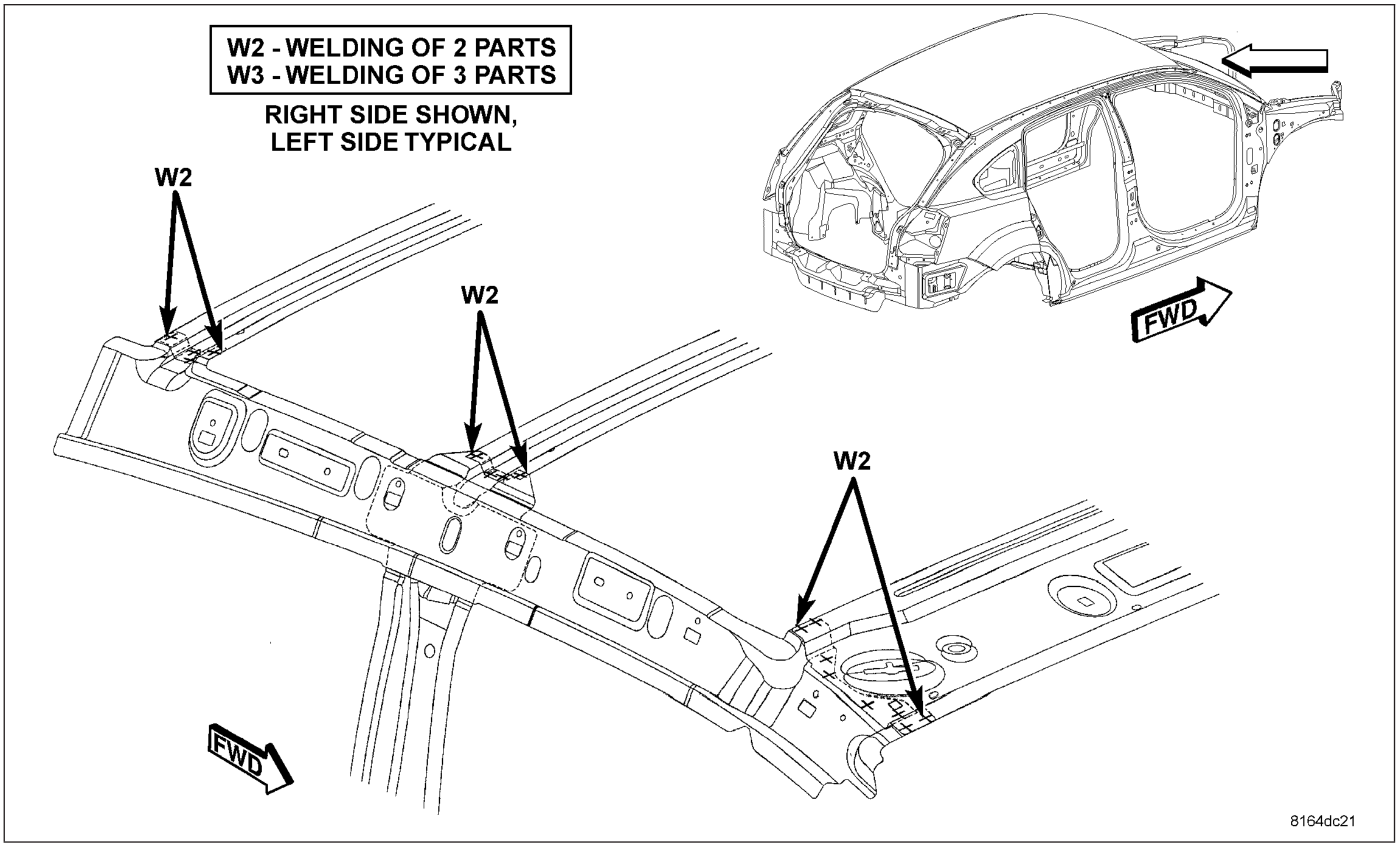


Fig. 44 BODY IN WHITE (12 OF 12)

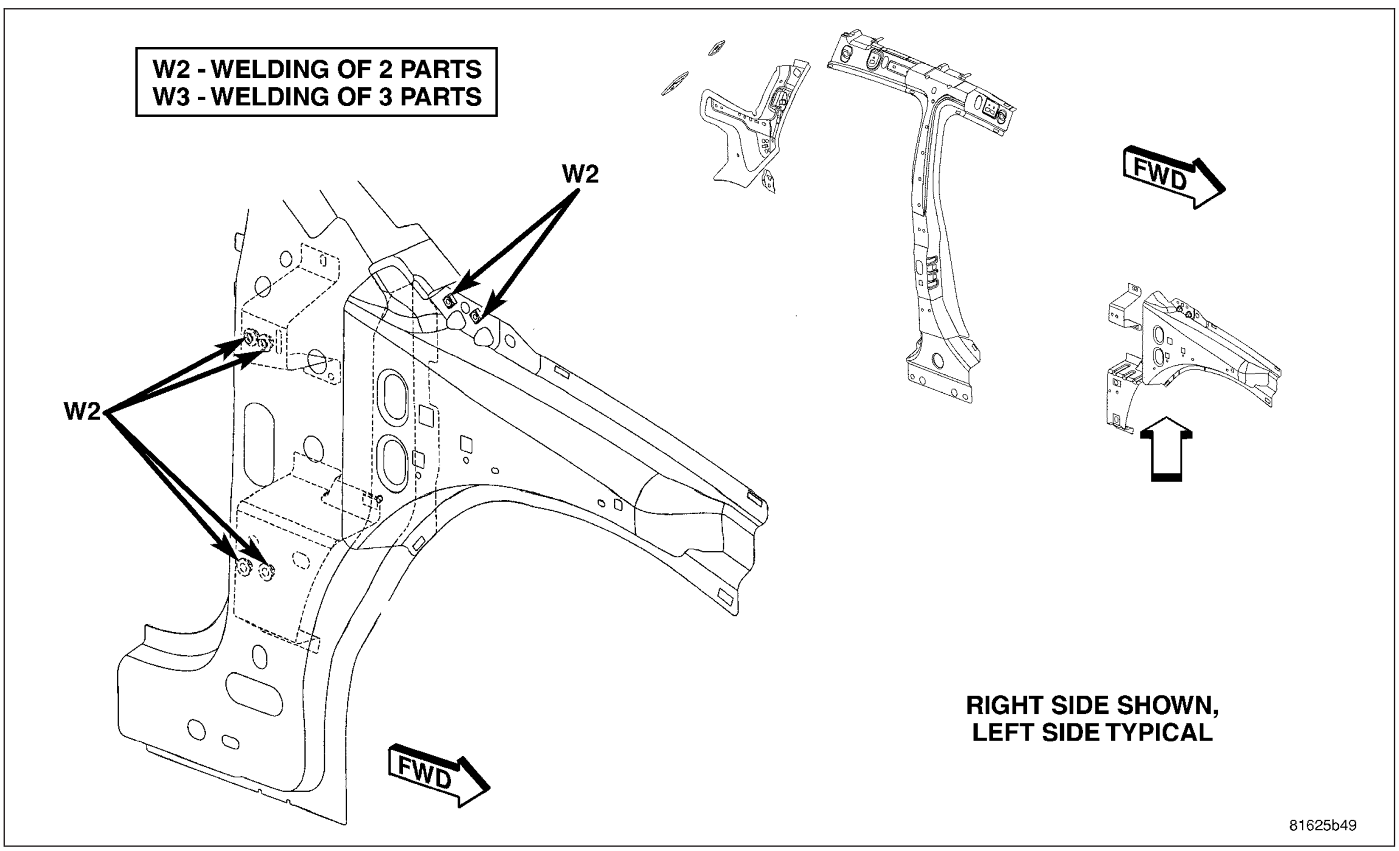


Fig. 45 BODY SIDE APERTURE (1 OF 4)

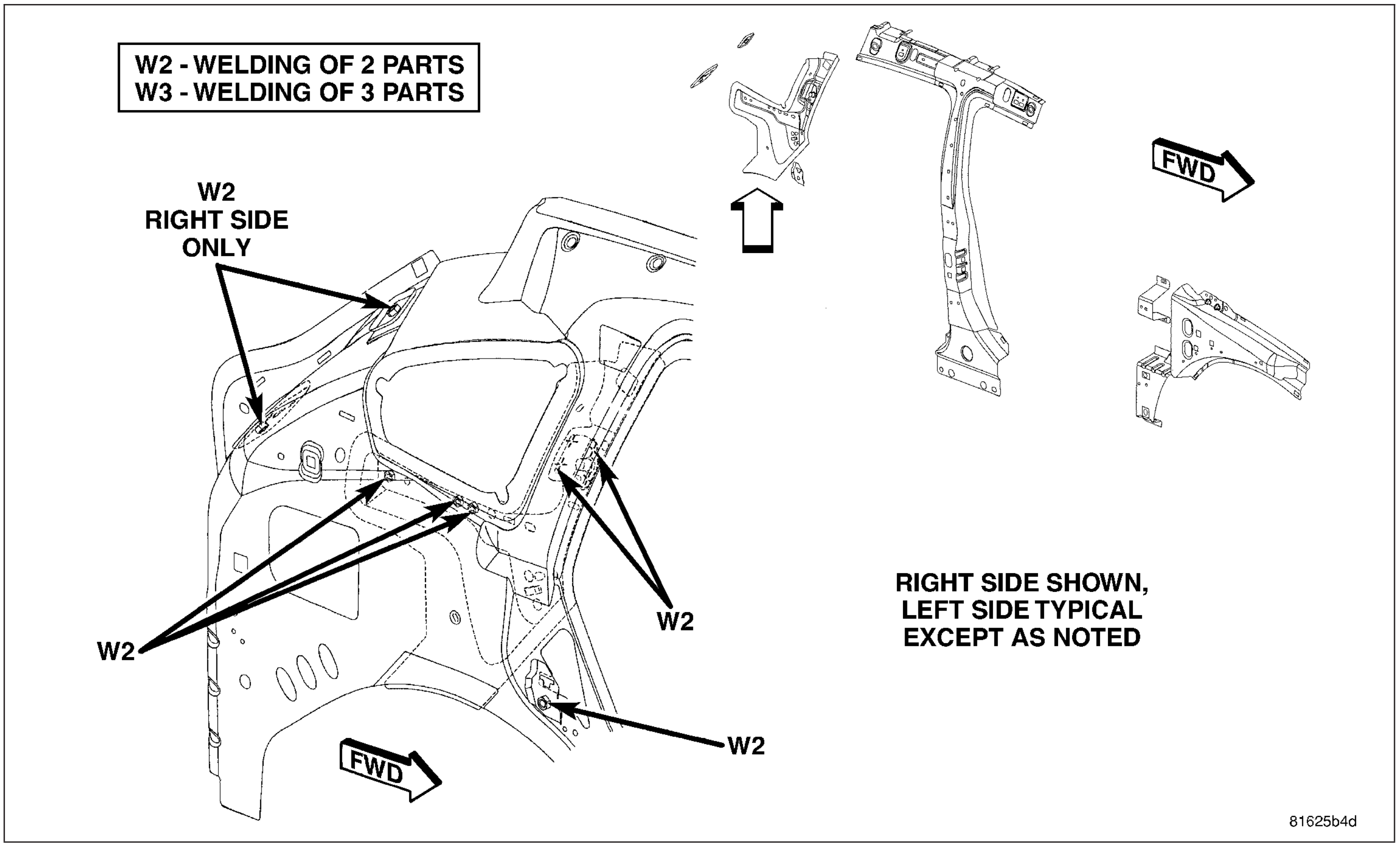


Fig. 46 BODY SIDE APERTURE (2 OF 4)

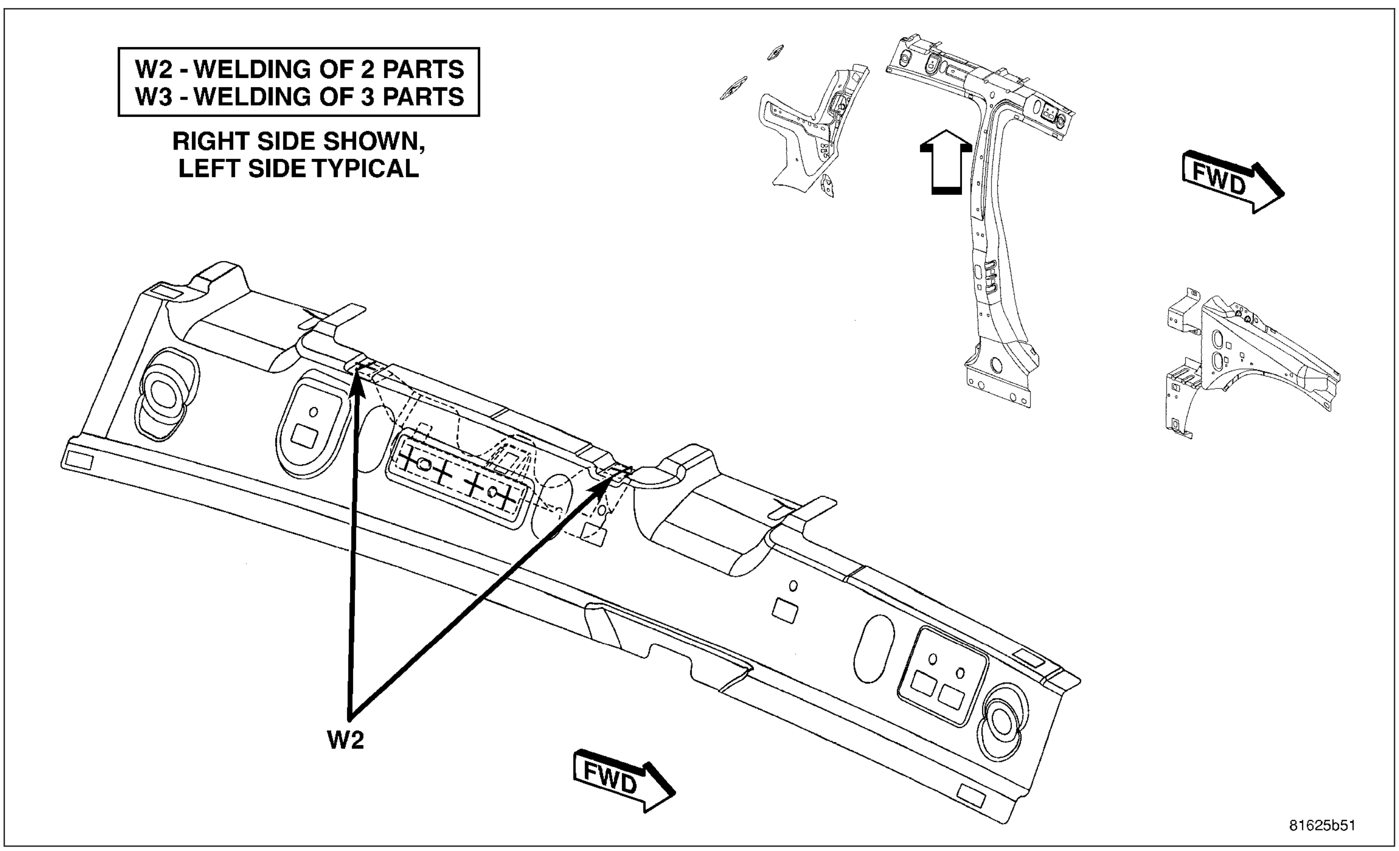


Fig. 47 BODY SIDE APERTURE (3 OF 4)

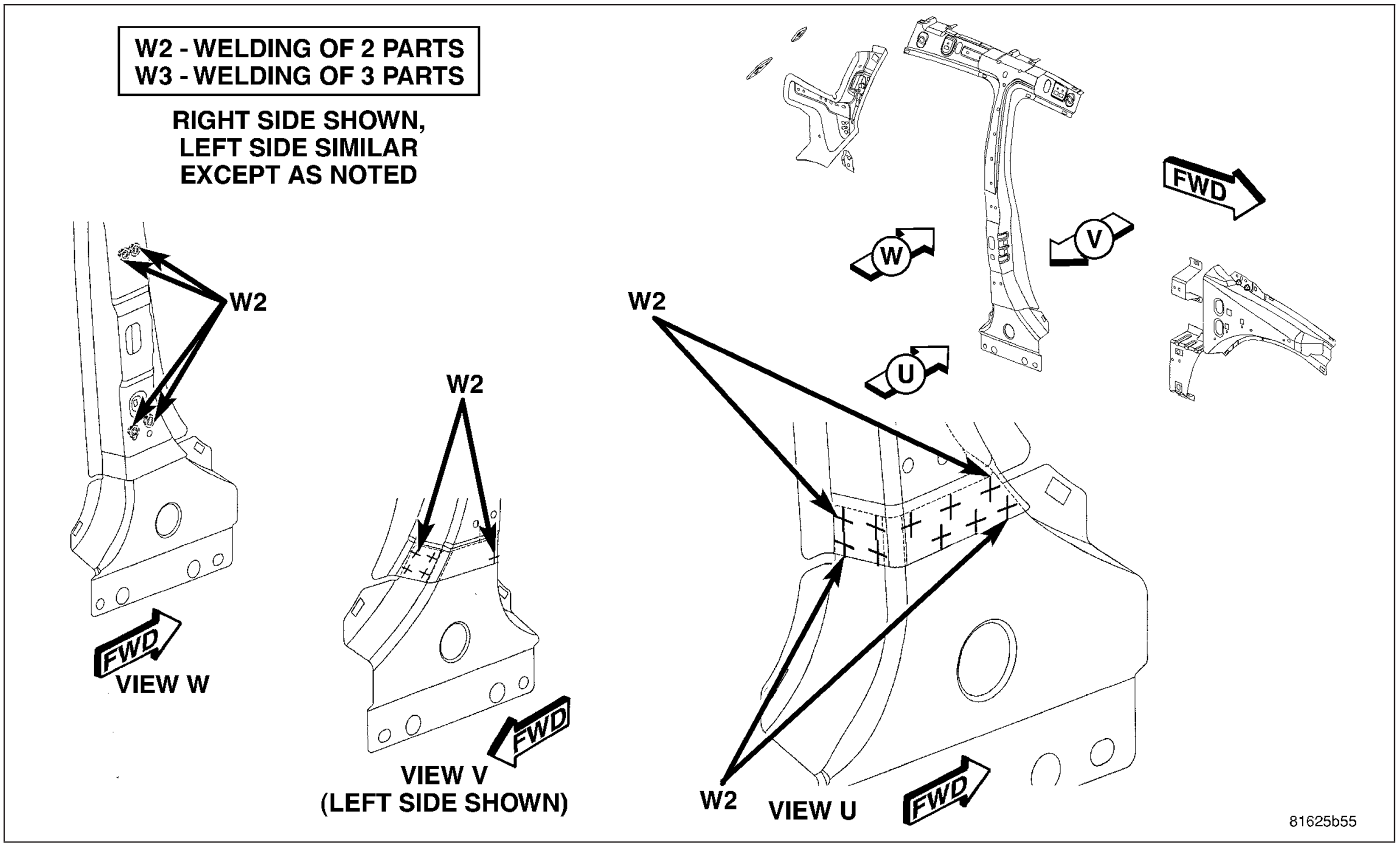


Fig. 48 BODY SIDE APERTURE (4 OF 4)

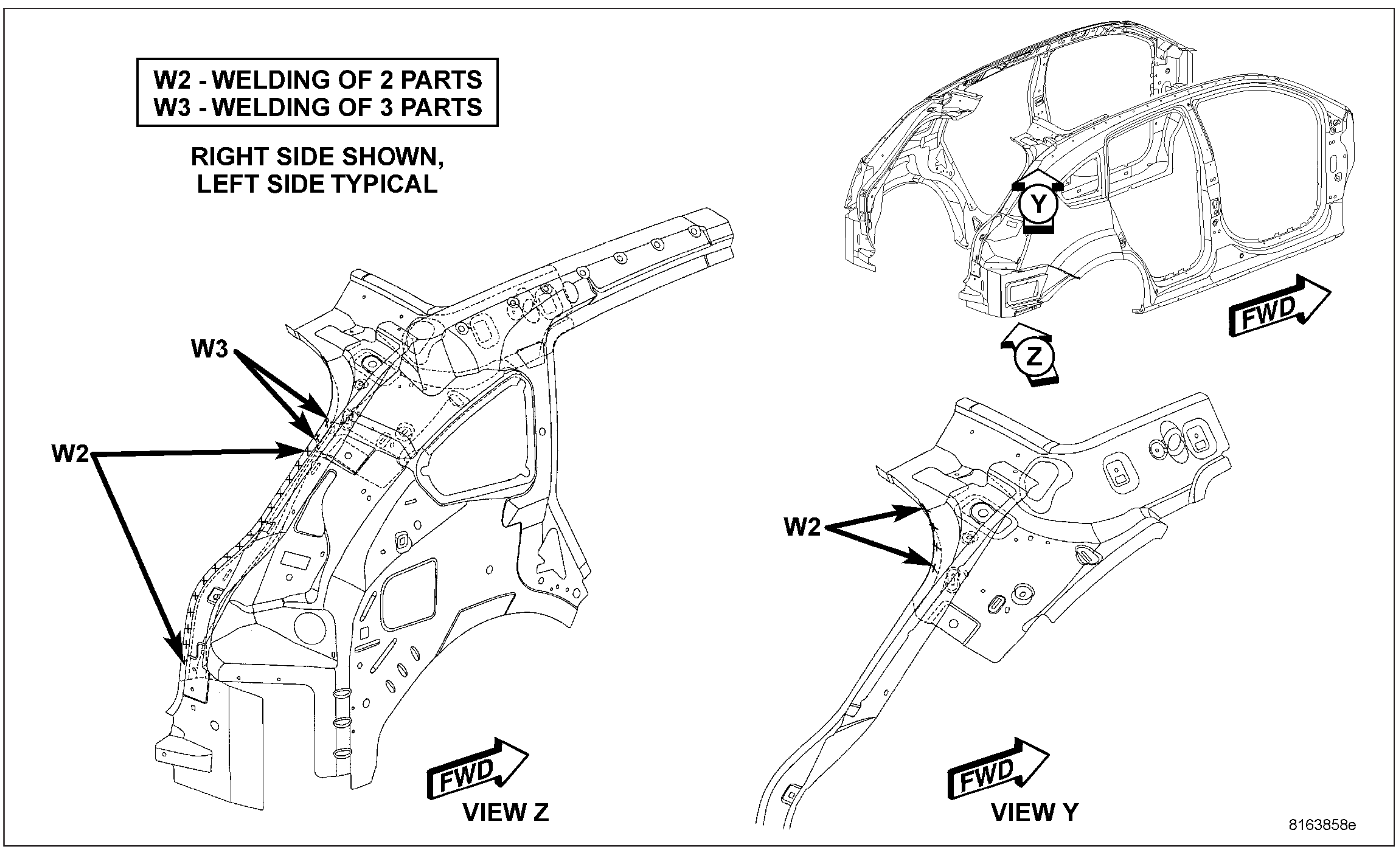


Fig. 49 BODY SIDE APERTURE - COMPLETE (1 OF 8)

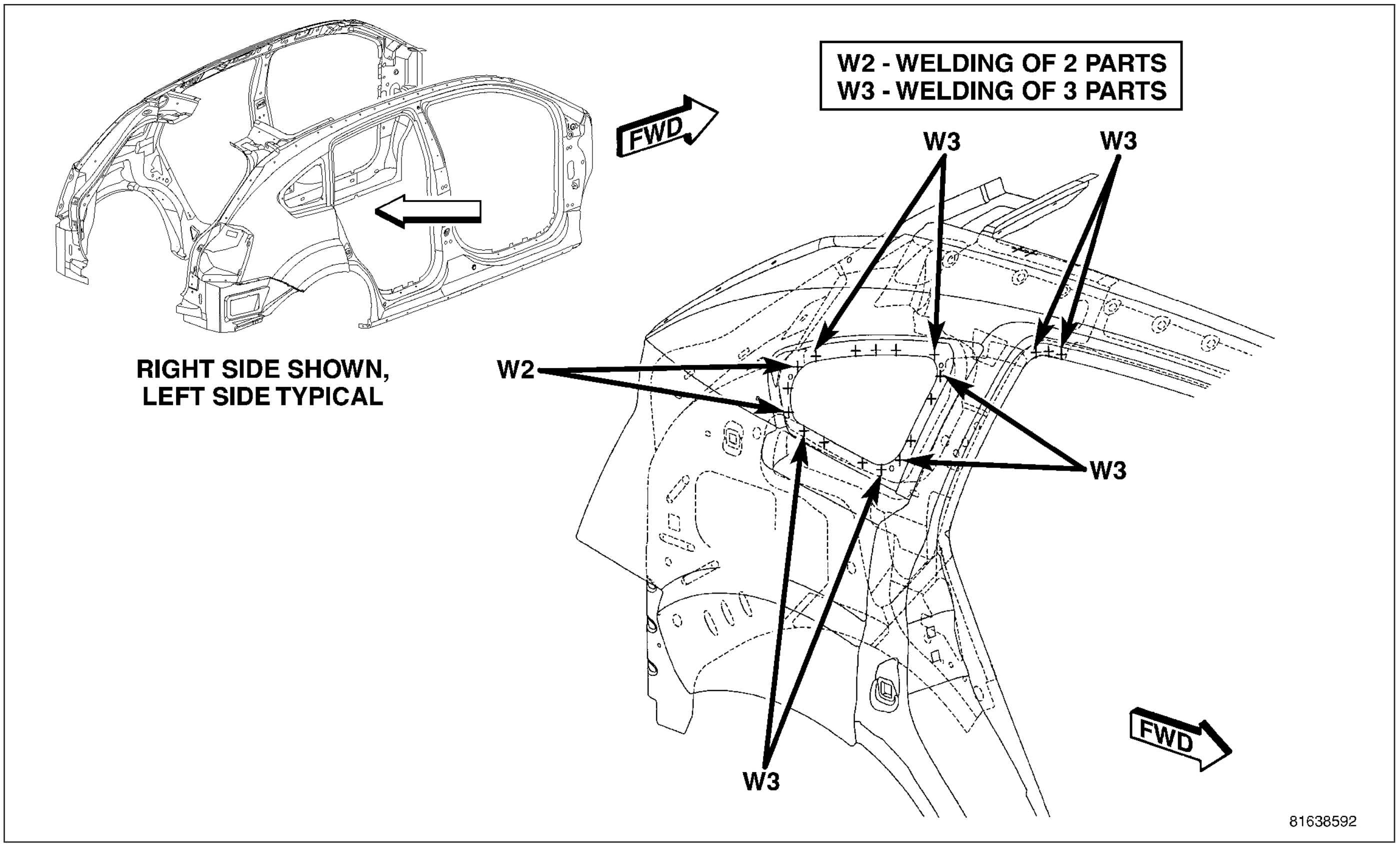


Fig. 50 BODY SIDE APERTURE - COMPLETE (2 OF 8)

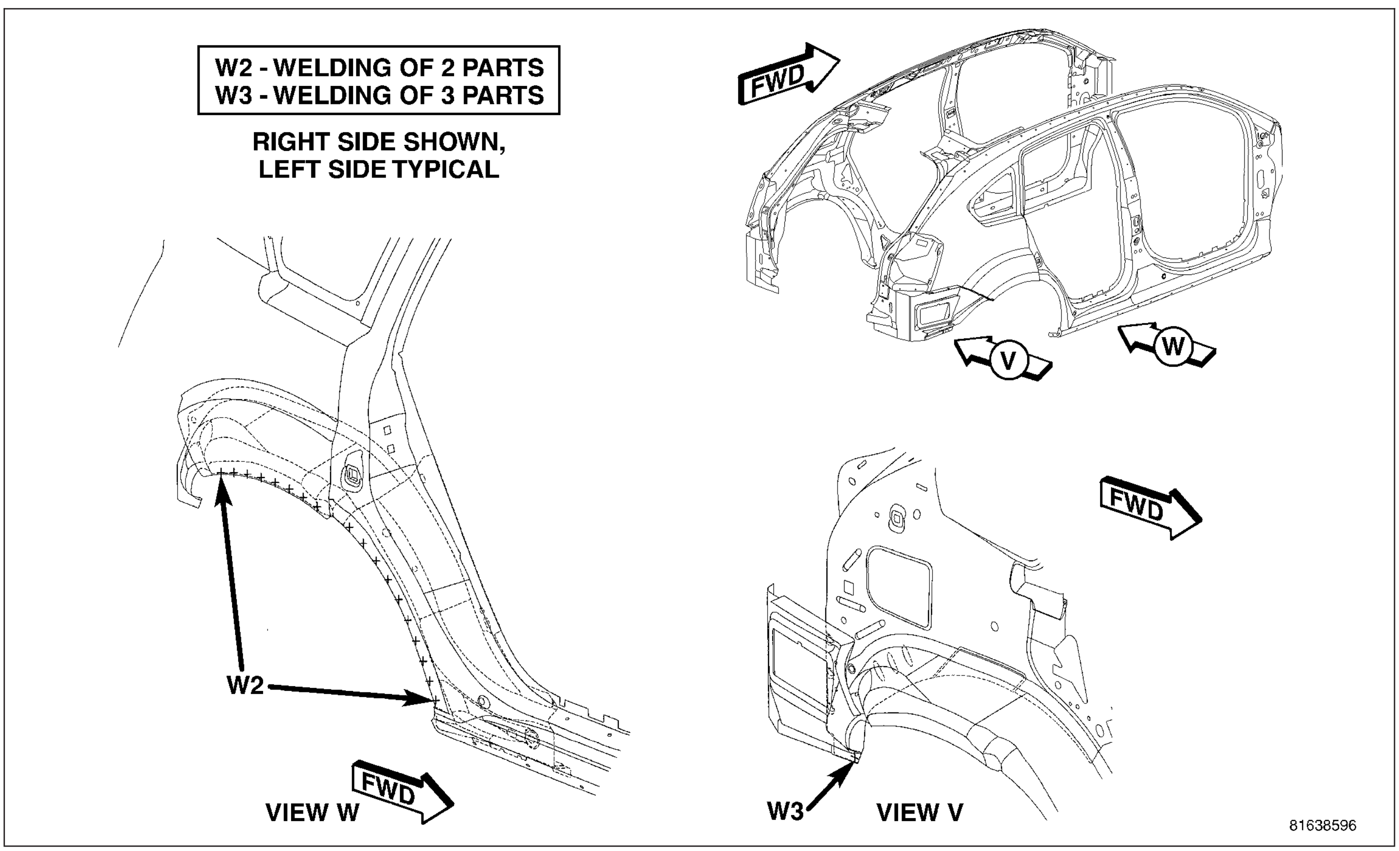


Fig. 51 BODY SIDE APERTURE - COMPLETE (3 OF 8)

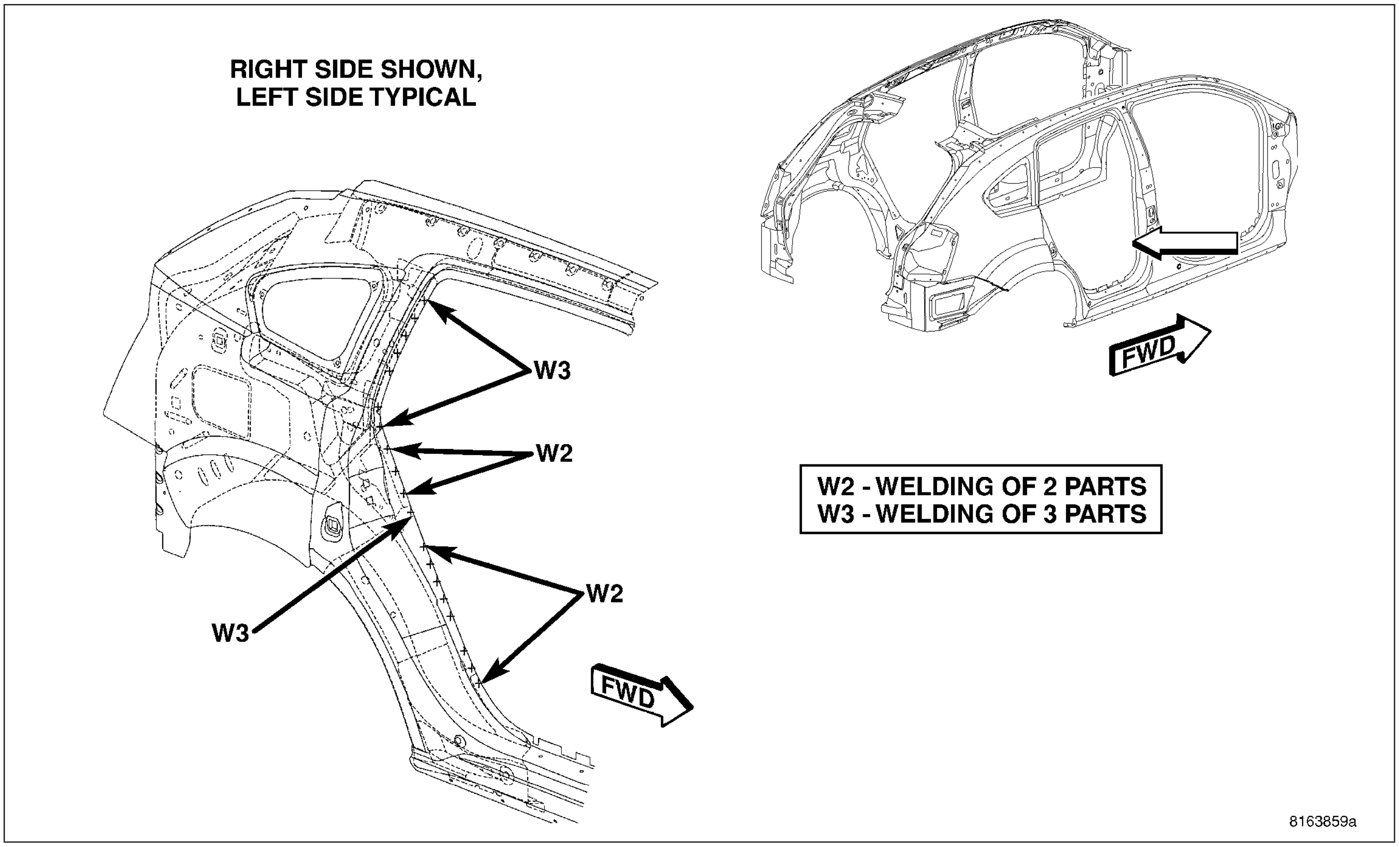


Fig. 52 BODY SIDE APERTURE - COMPLETE (4 OF 8)

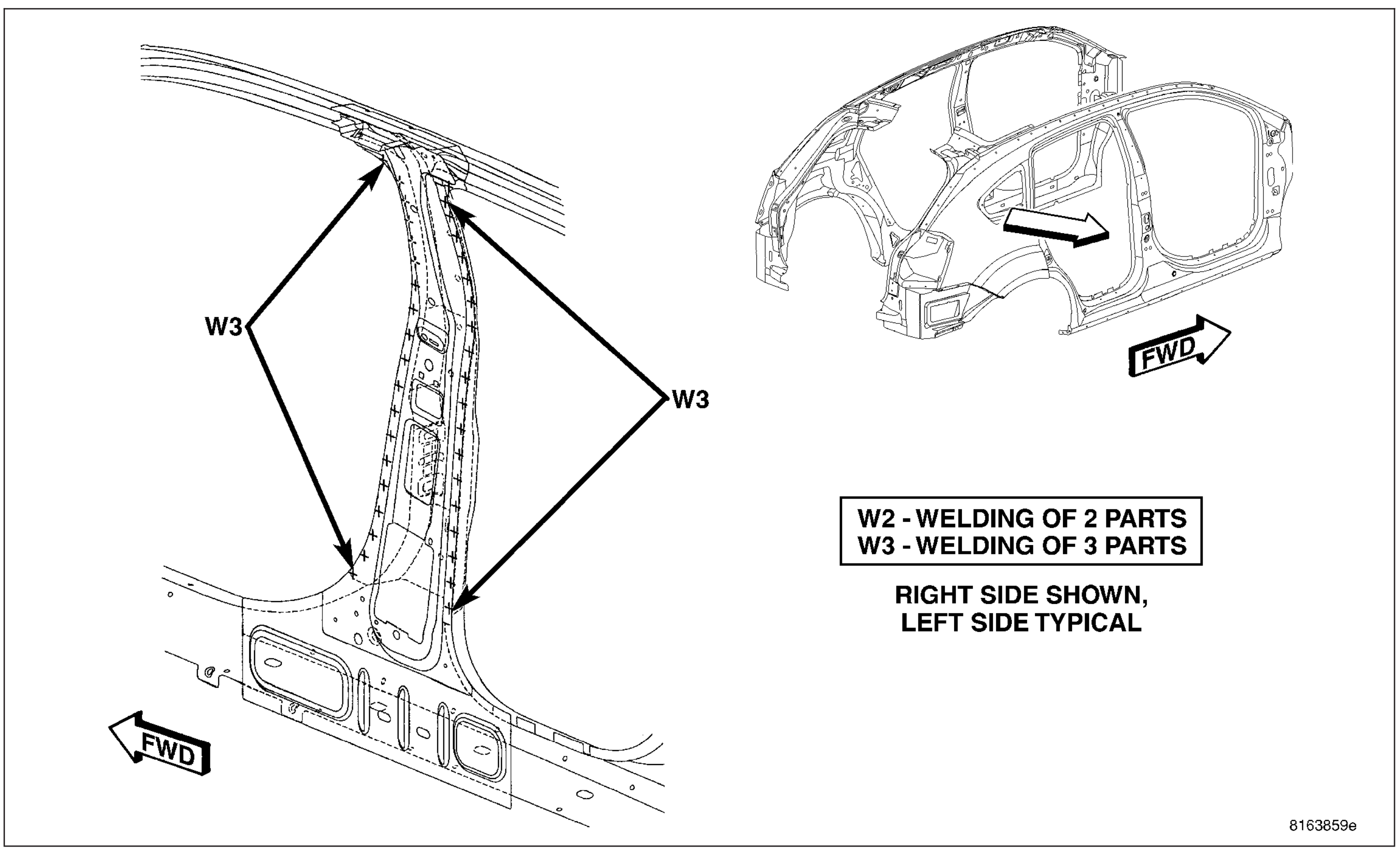


Fig. 53 BODY SIDE APERTURE - COMPLETE (5 OF 8)

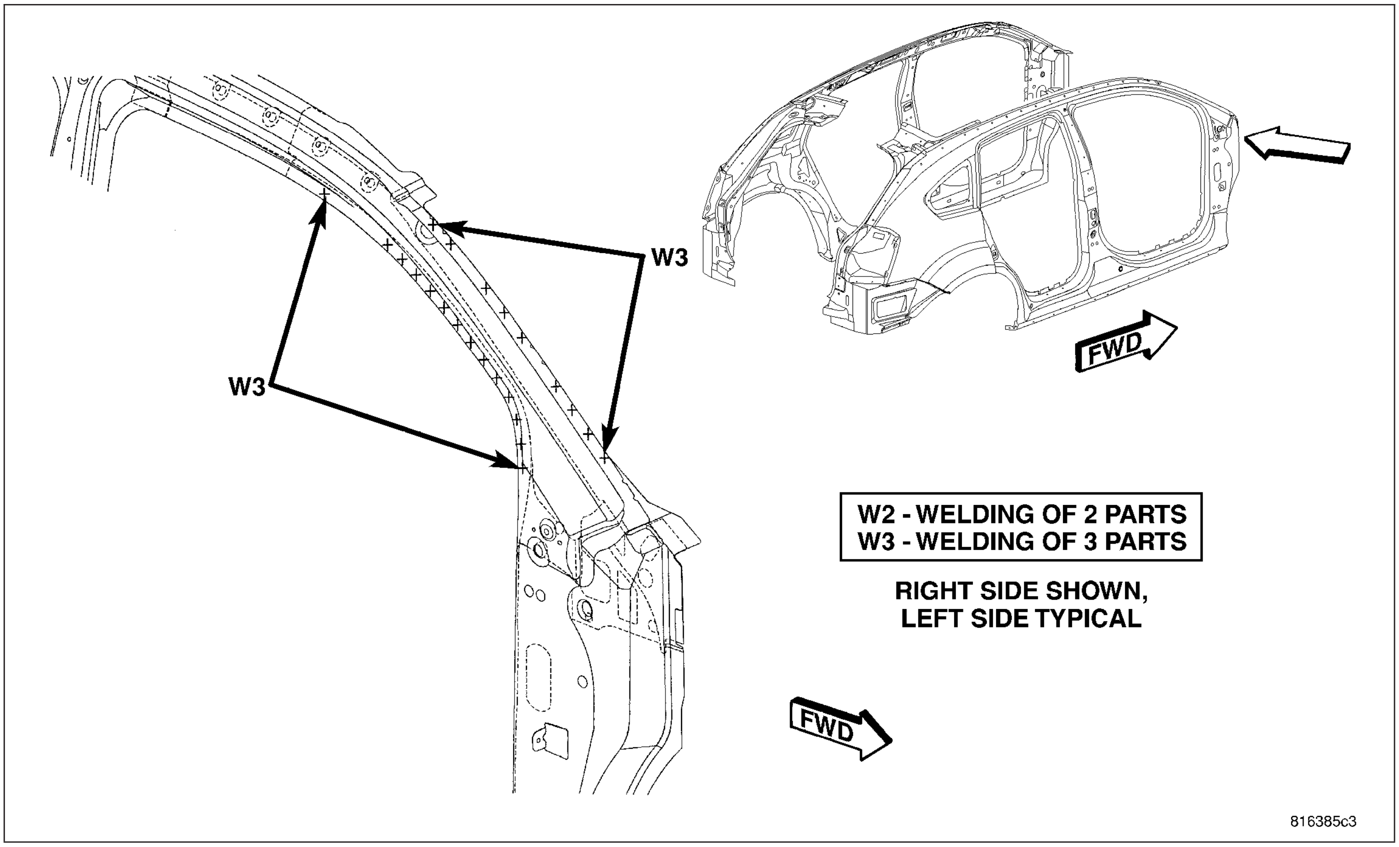


Fig. 54 BODY SIDE APERTURE - COMPLETE (6 OF 8)

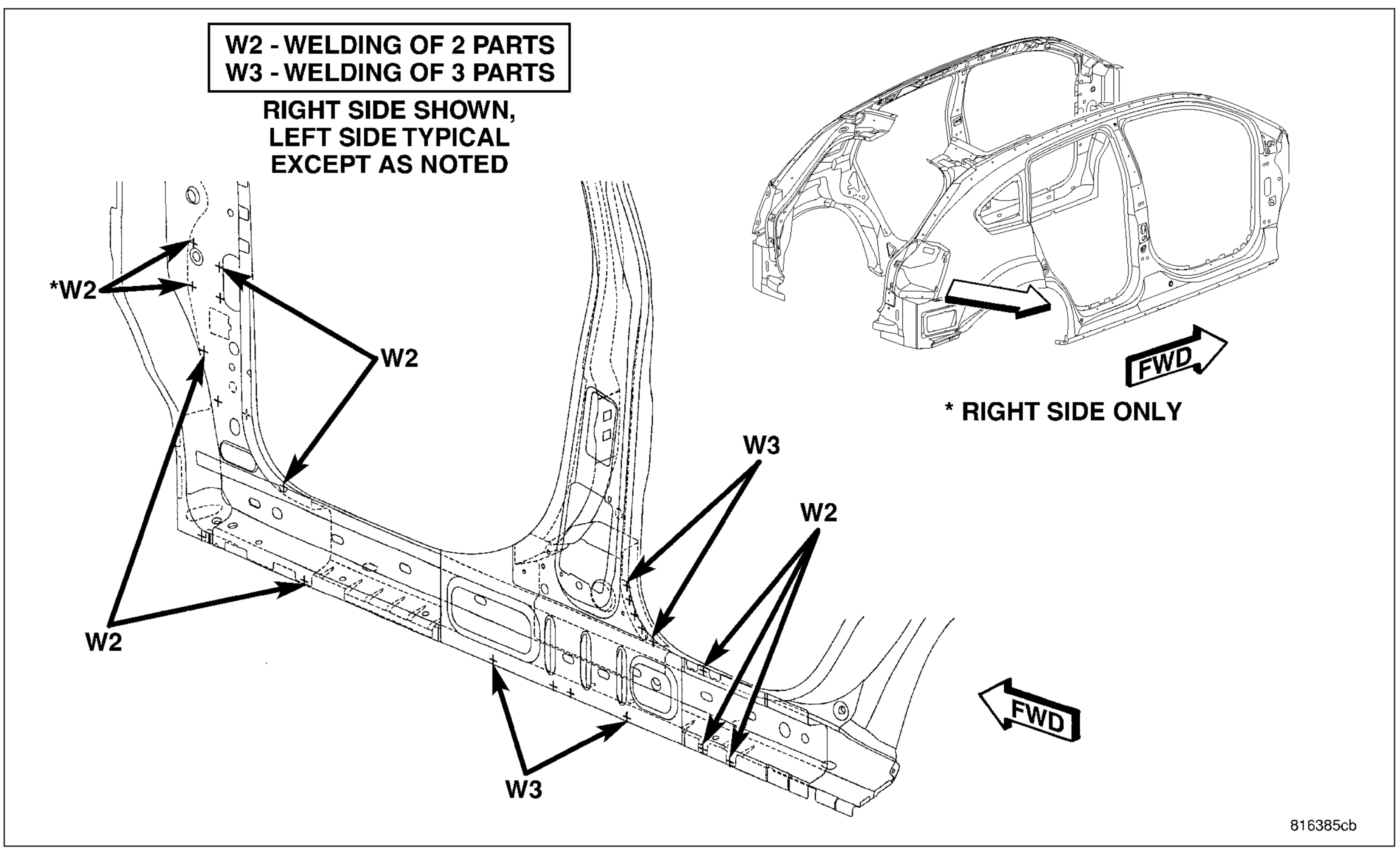


Fig. 55 BODY SIDE APERTURE - COMPLETE (7 OF 8)

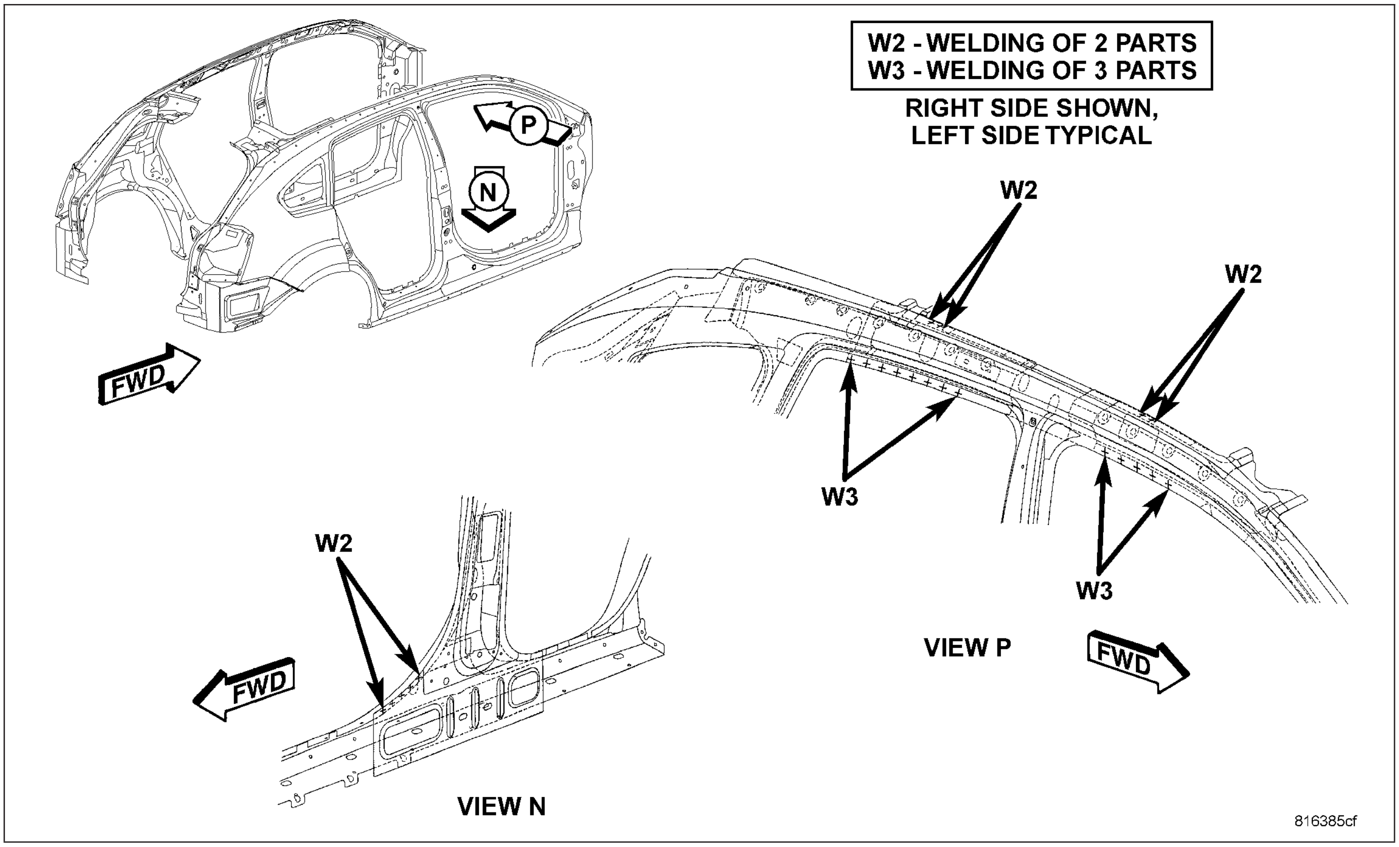


Fig. 56 BODY SIDE APERTURE - COMPLETE (8 OF 8)

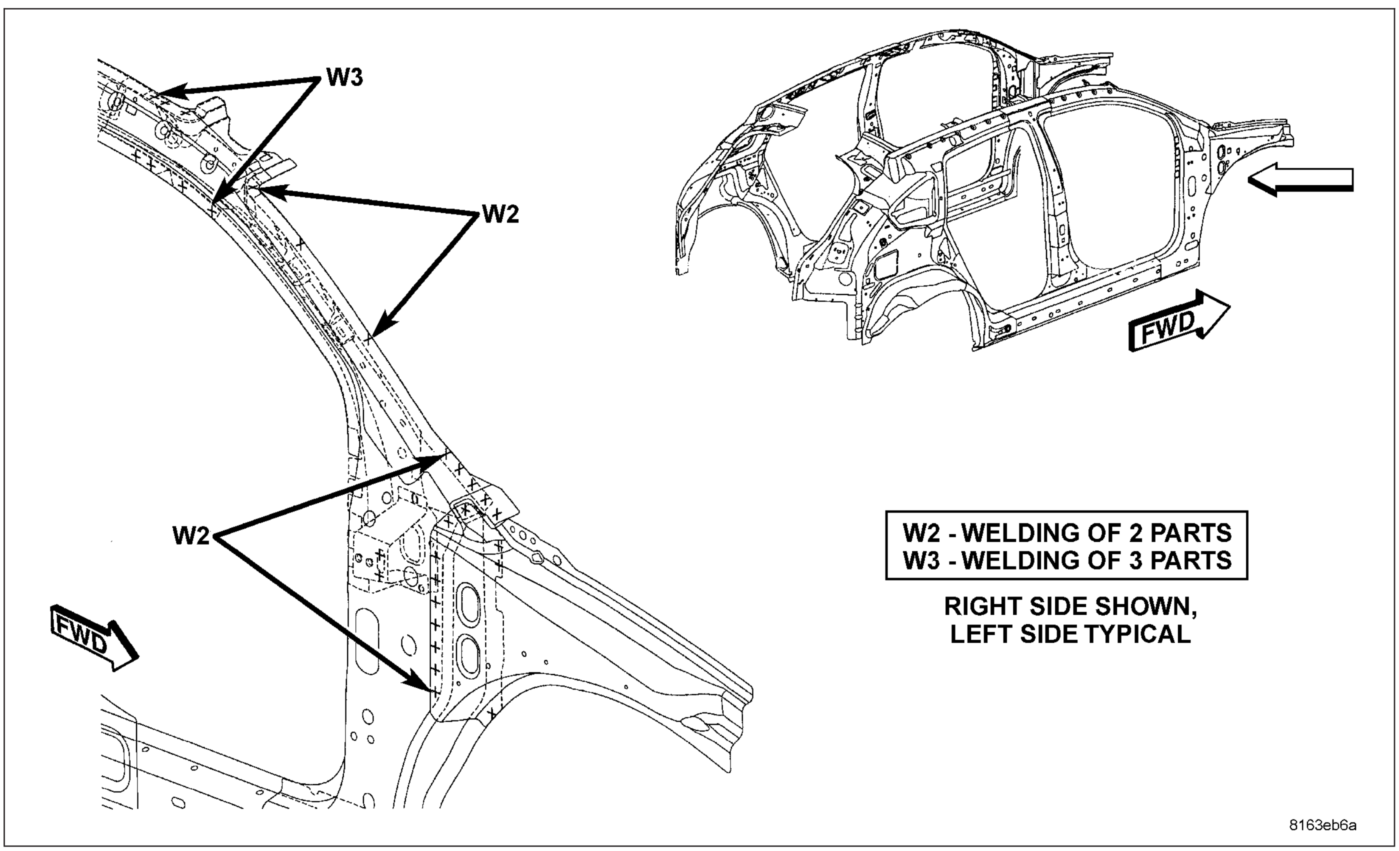


Fig. 57 INNER BODY SIDE APERTURE (1 OF 7)

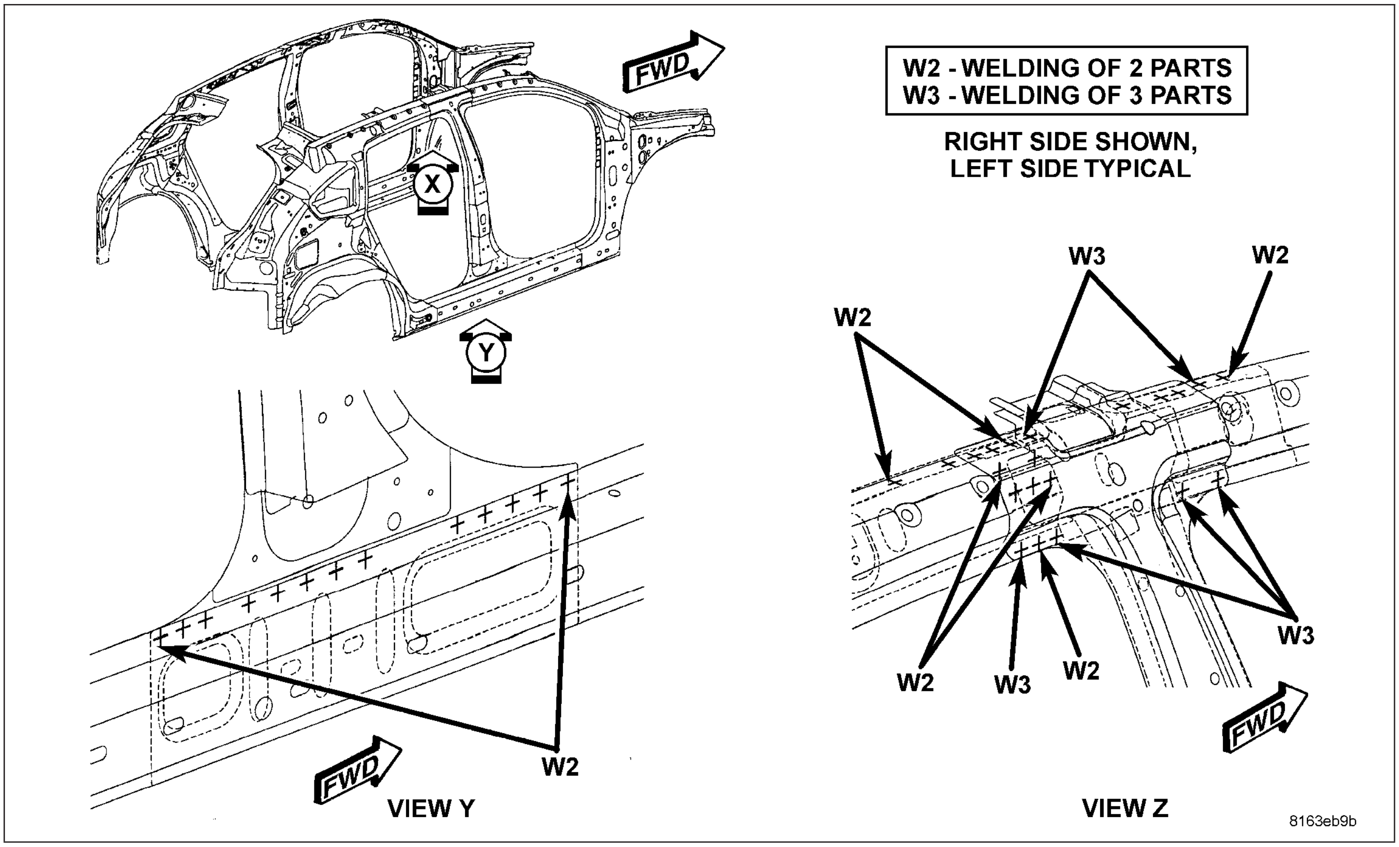


Fig. 58 INNER BODY SIDE APERTURE (2 OF 7)

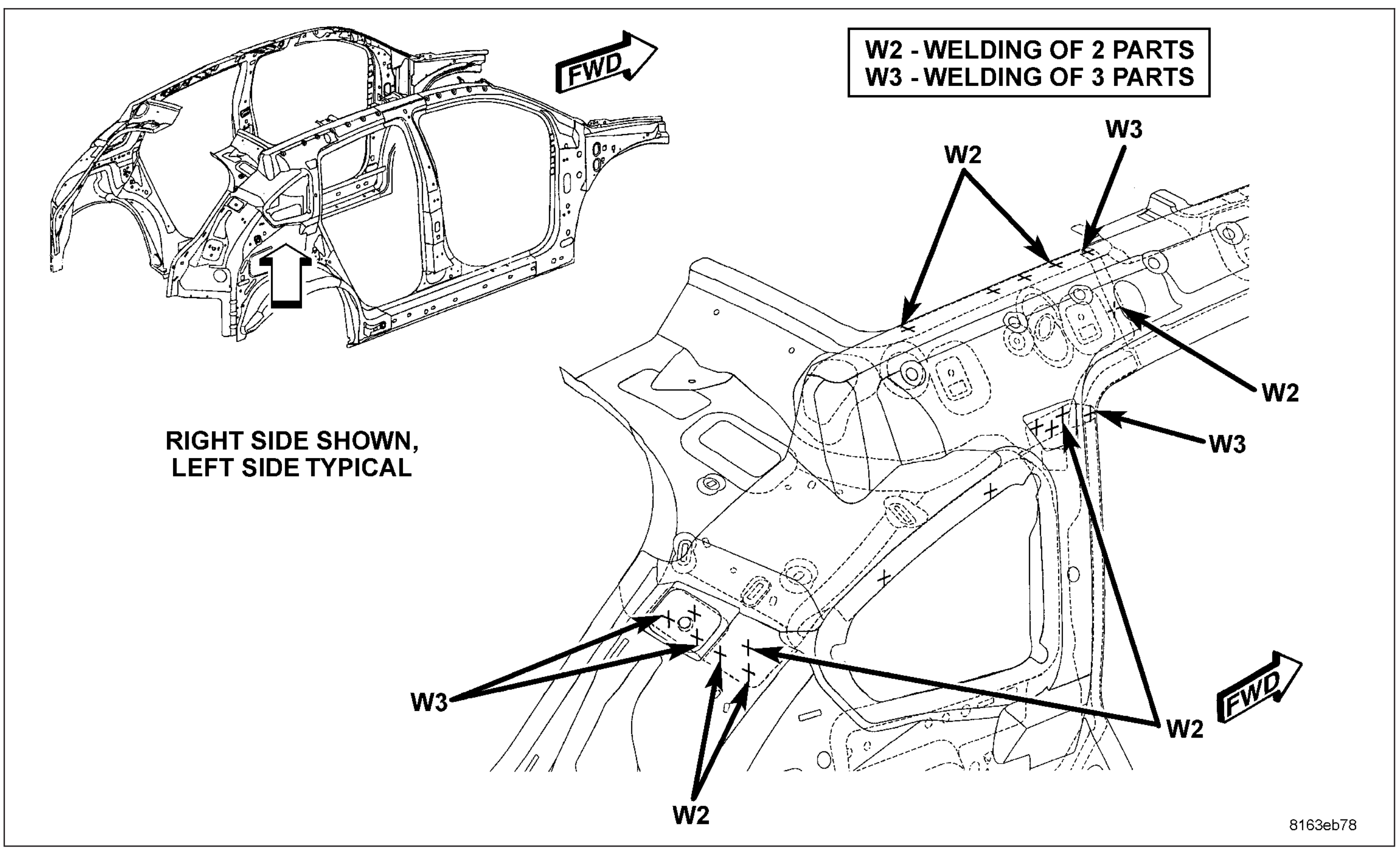


Fig. 59 INNER BODY SIDE APERTURE (3 OF 7)

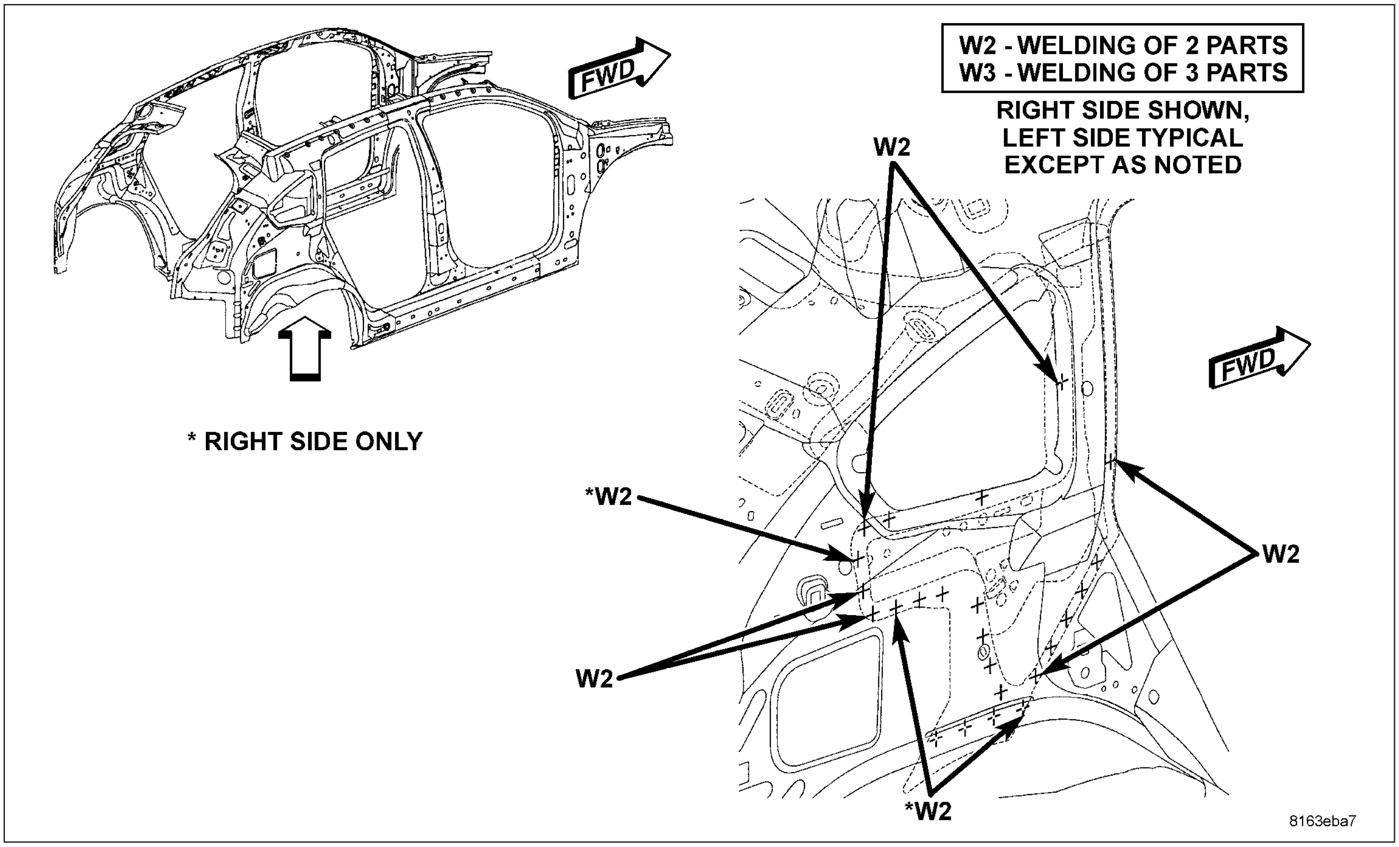


Fig. 60 INNER BODY SIDE APERTURE (4 OF 7)

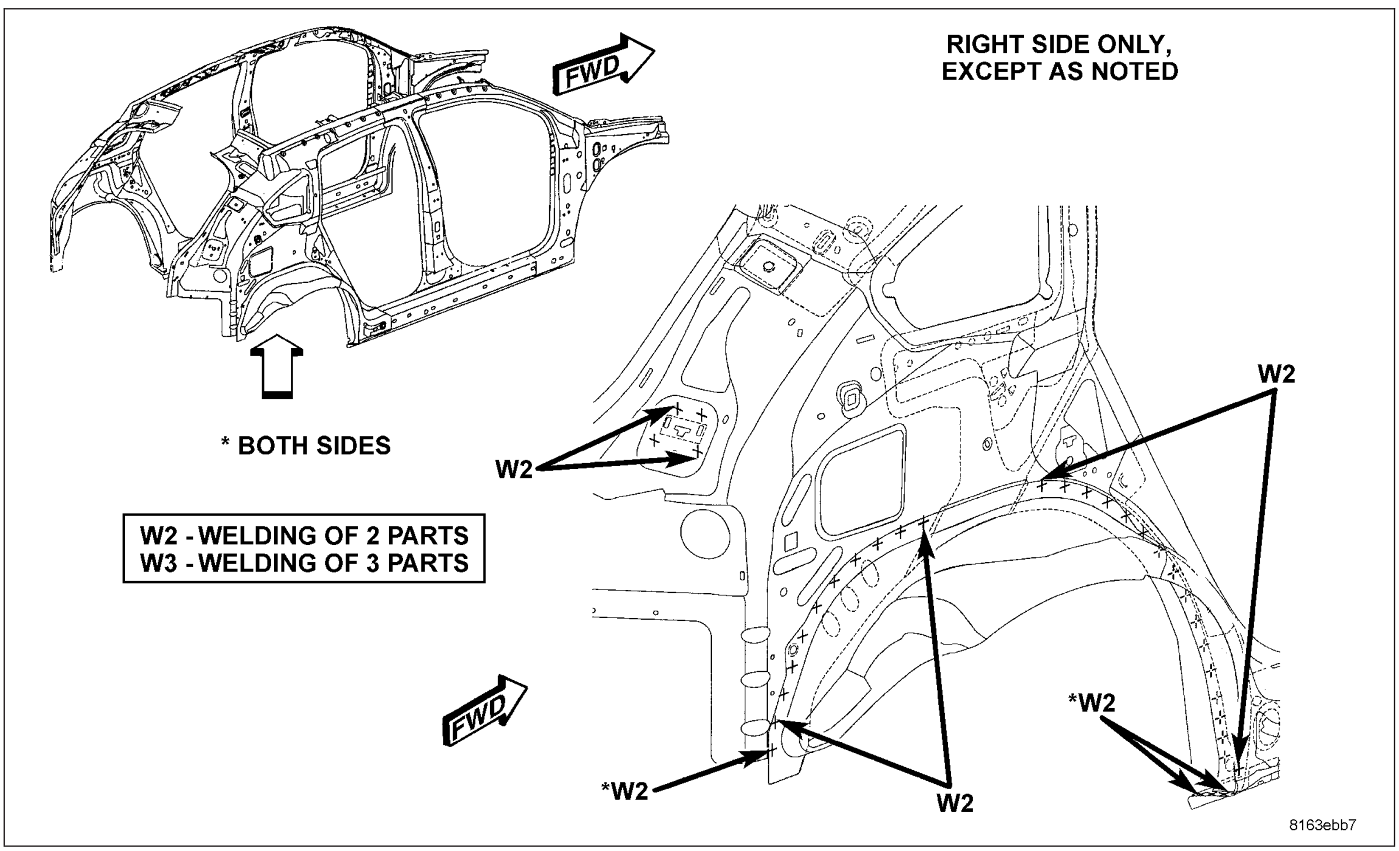


Fig. 61 INNER BODY SIDE APERTURE (5 OF 7)

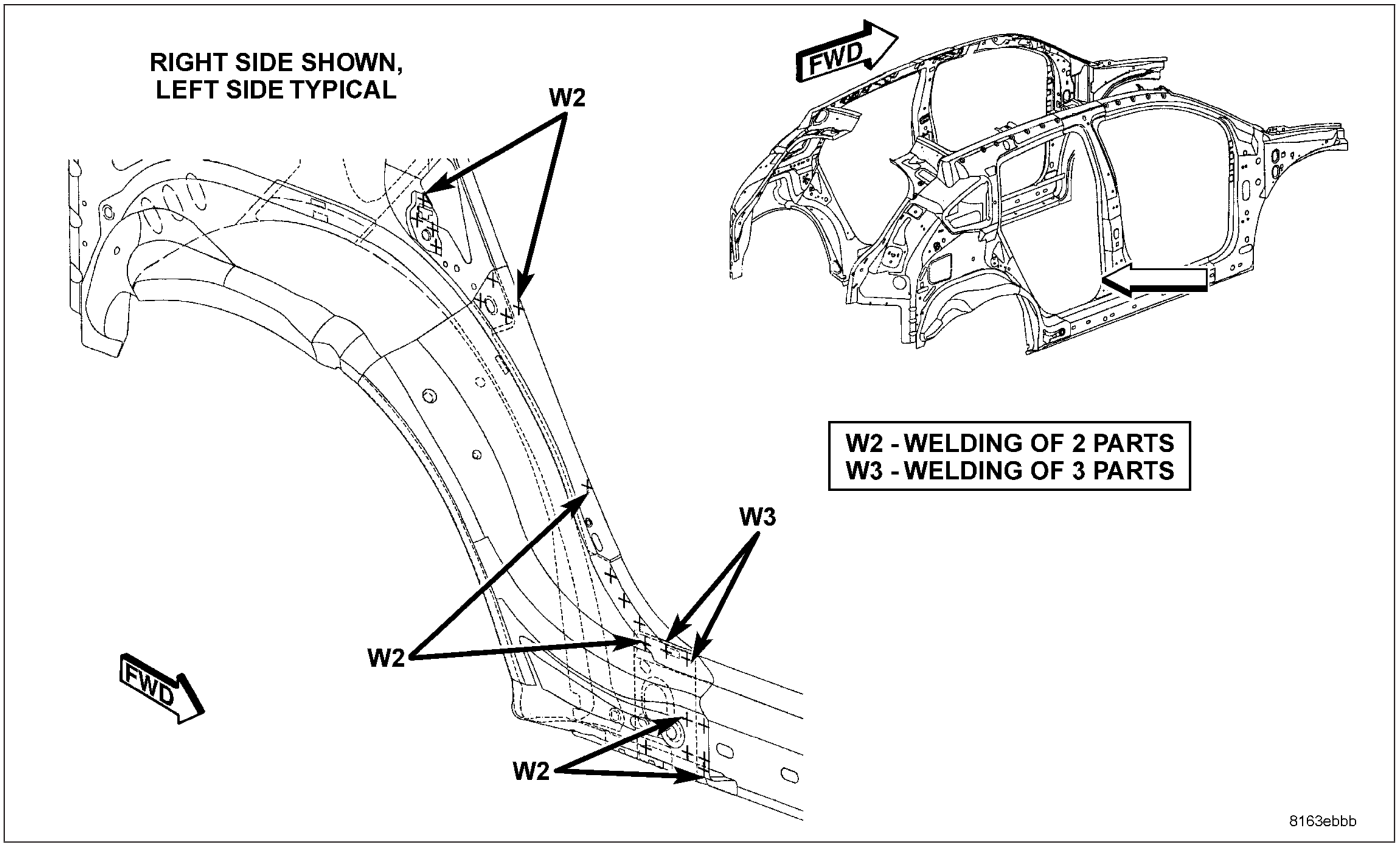


Fig. 62 INNER BODY SIDE APERTURE (6 OF 7)

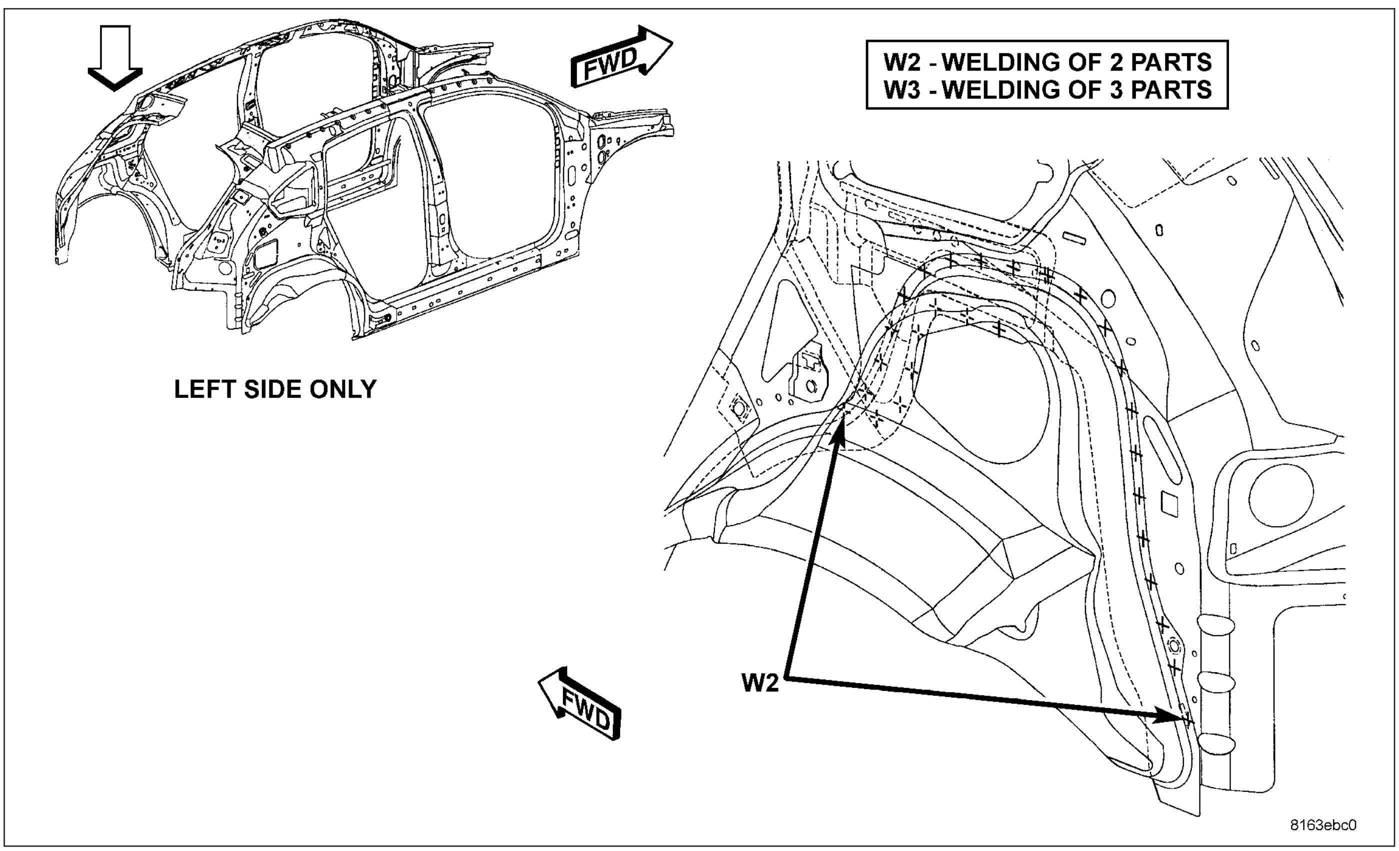


Fig. 63 INNER BODY SIDE APERTURE (7 OF 7)

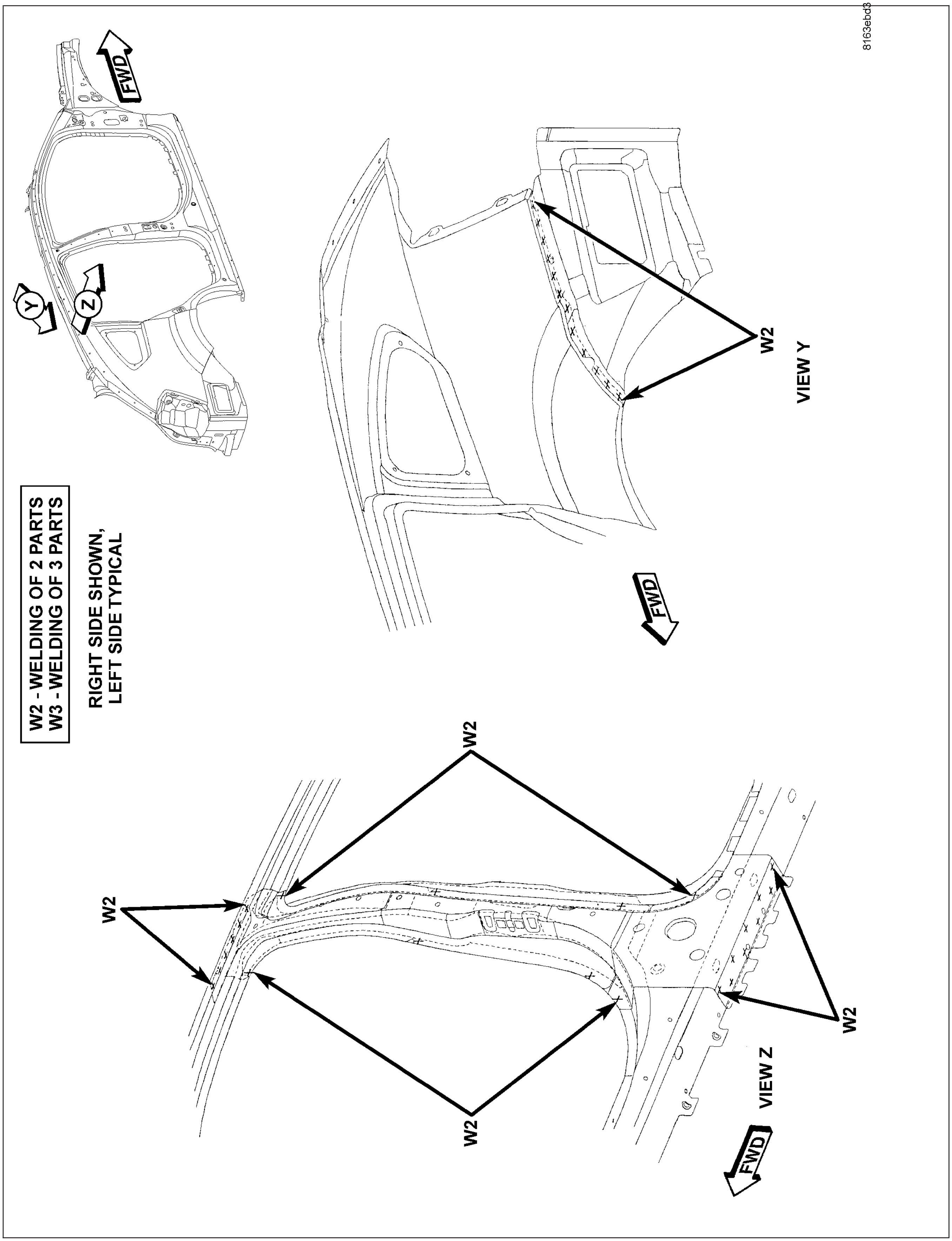


Fig. 64 OUTER BODY SIDE APERTURE (1 OF 3)

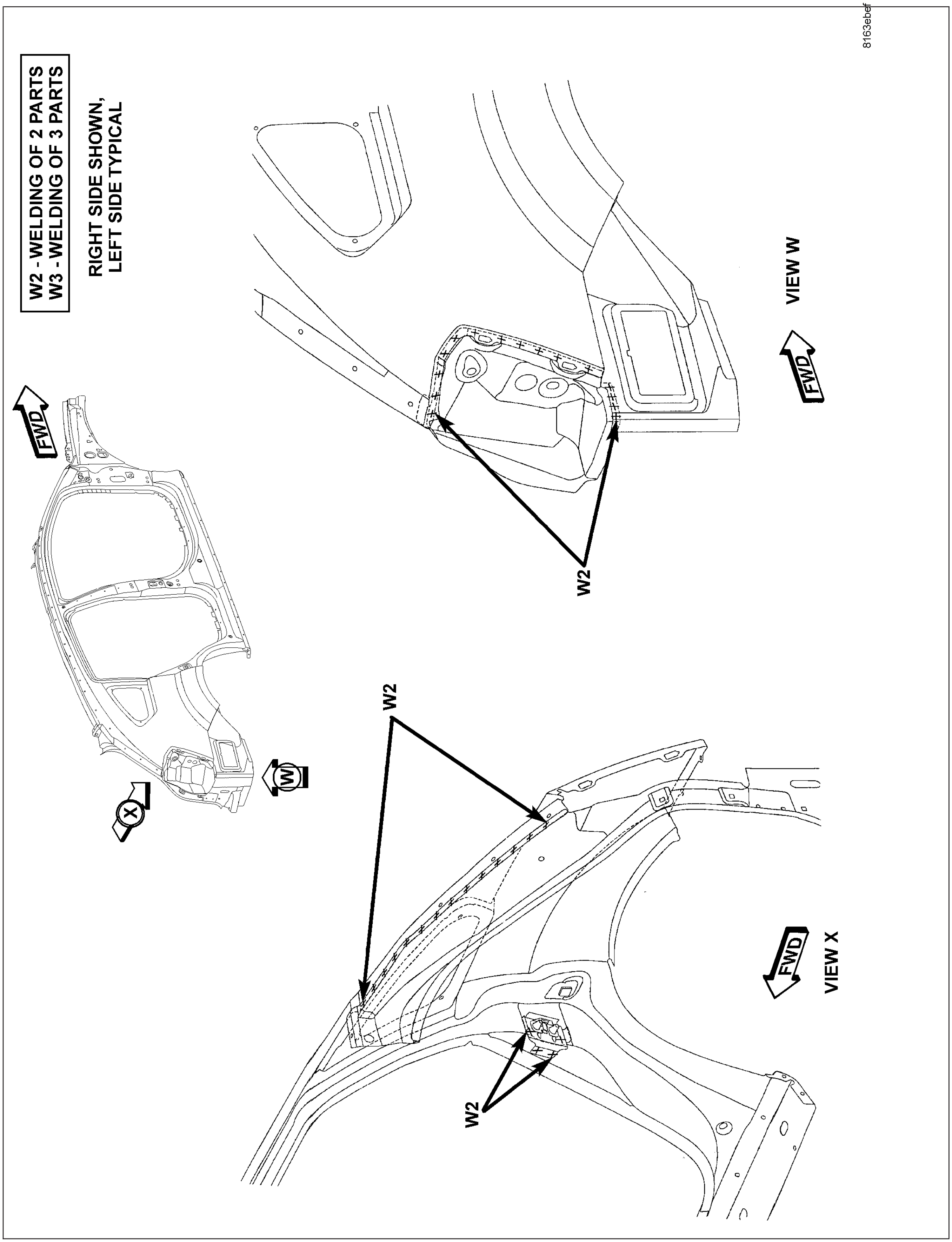


Fig. 65 OUTER BODY SIDE APERTURE (2 OF 3)

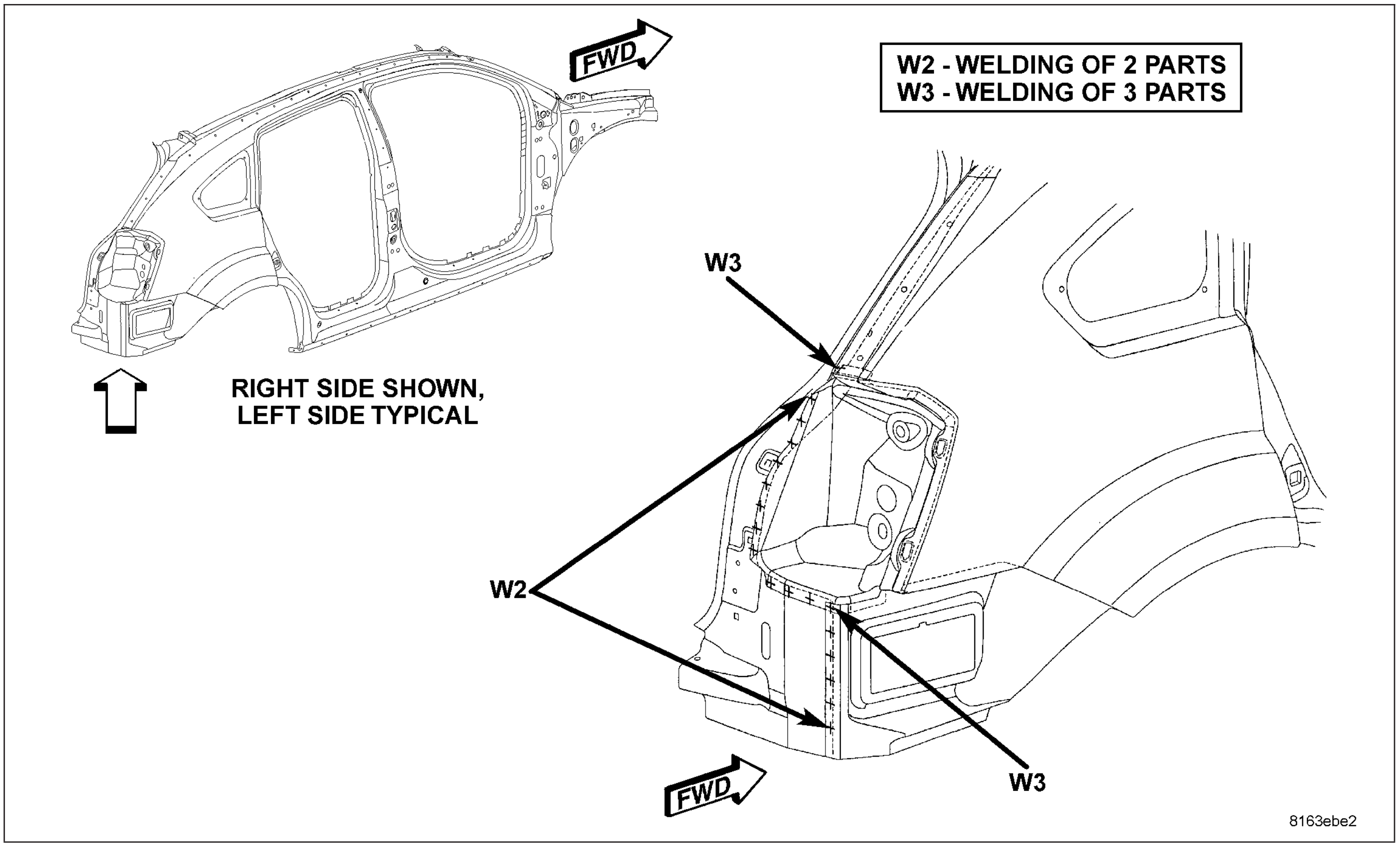


Fig. 66 OUTER BODY SIDE APERTURE (3 OF 3)

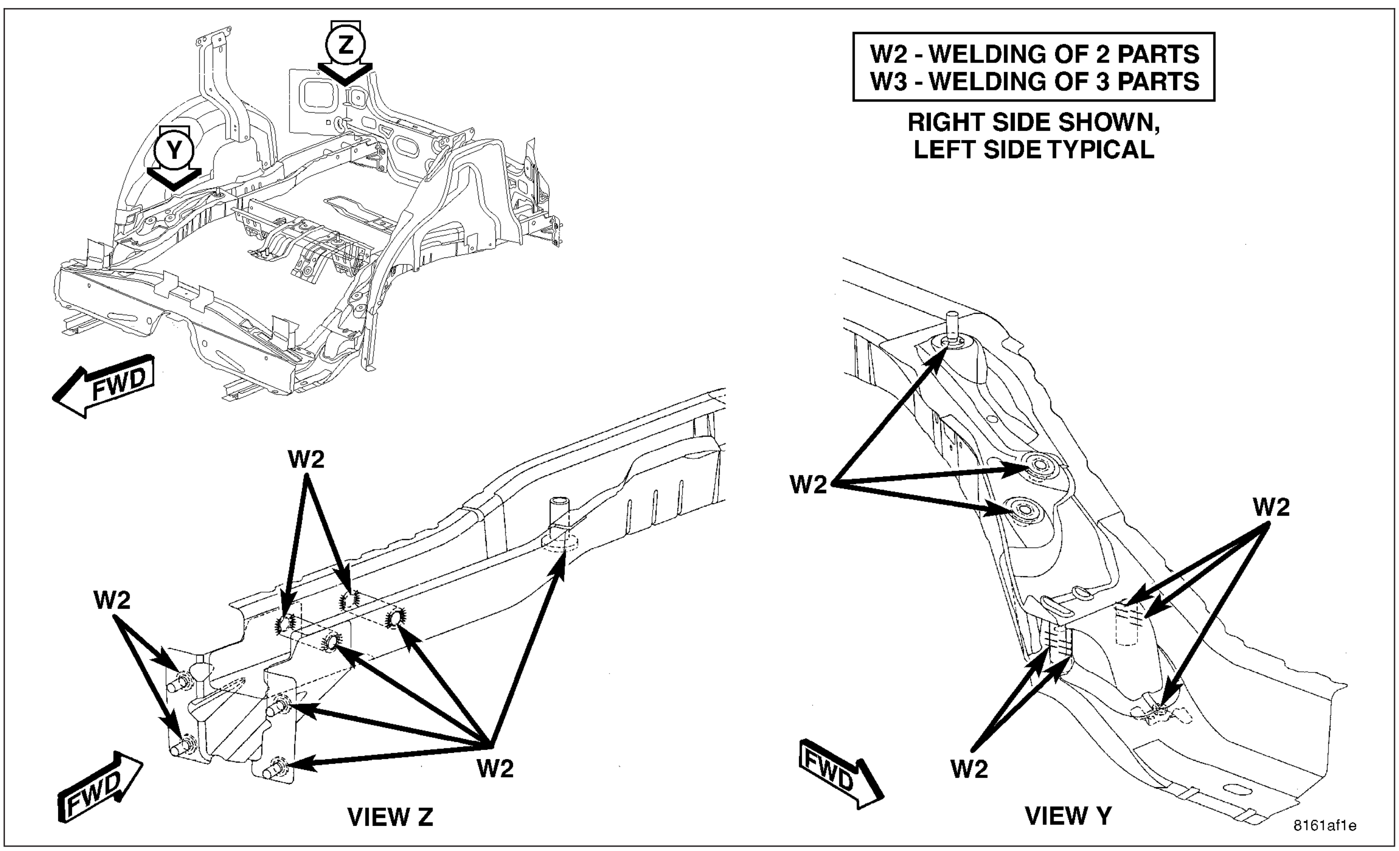


Fig. 67 REAR FLOOR (1 OF 7)

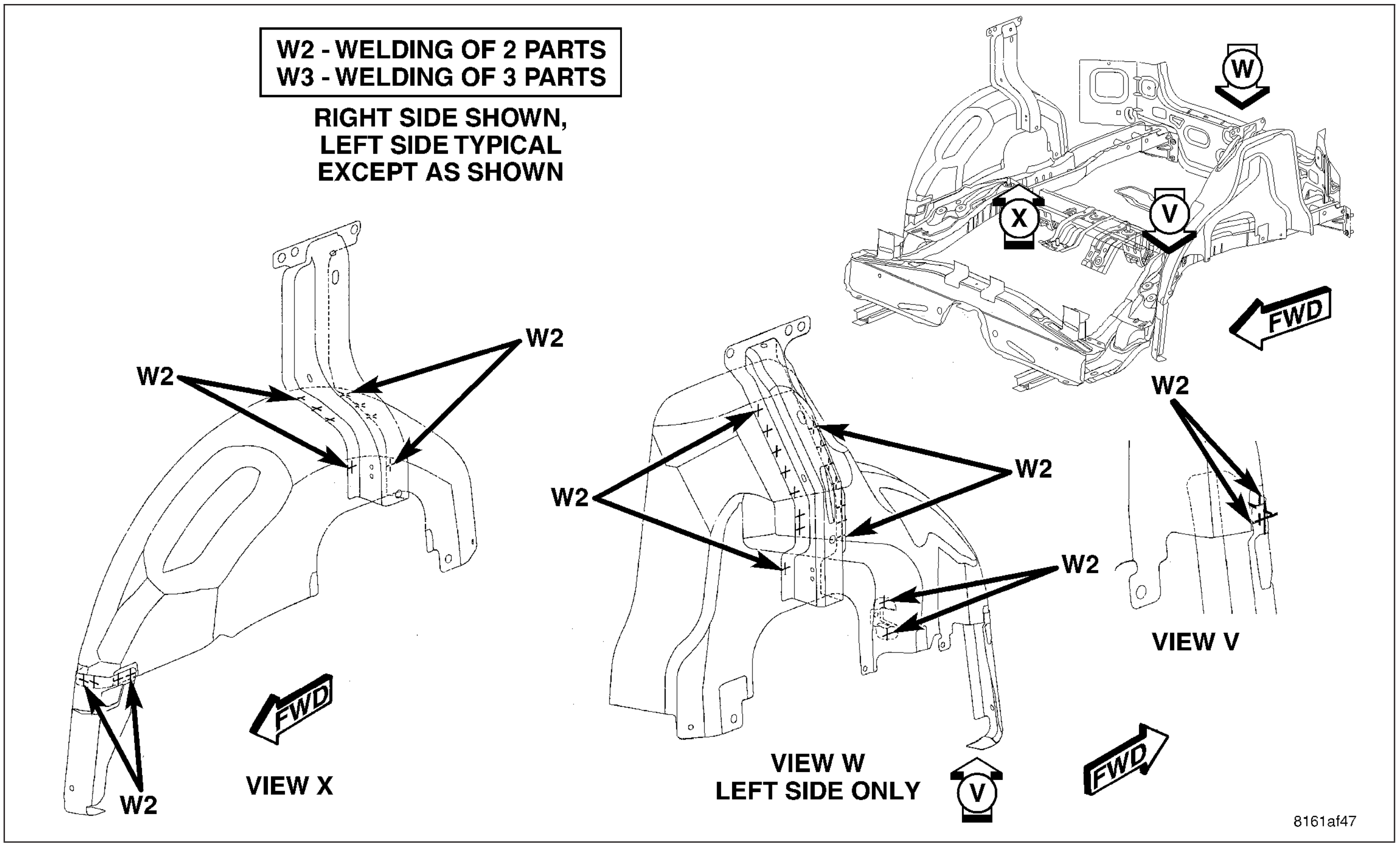


Fig. 68 REAR FLOOR (2 OF 7)

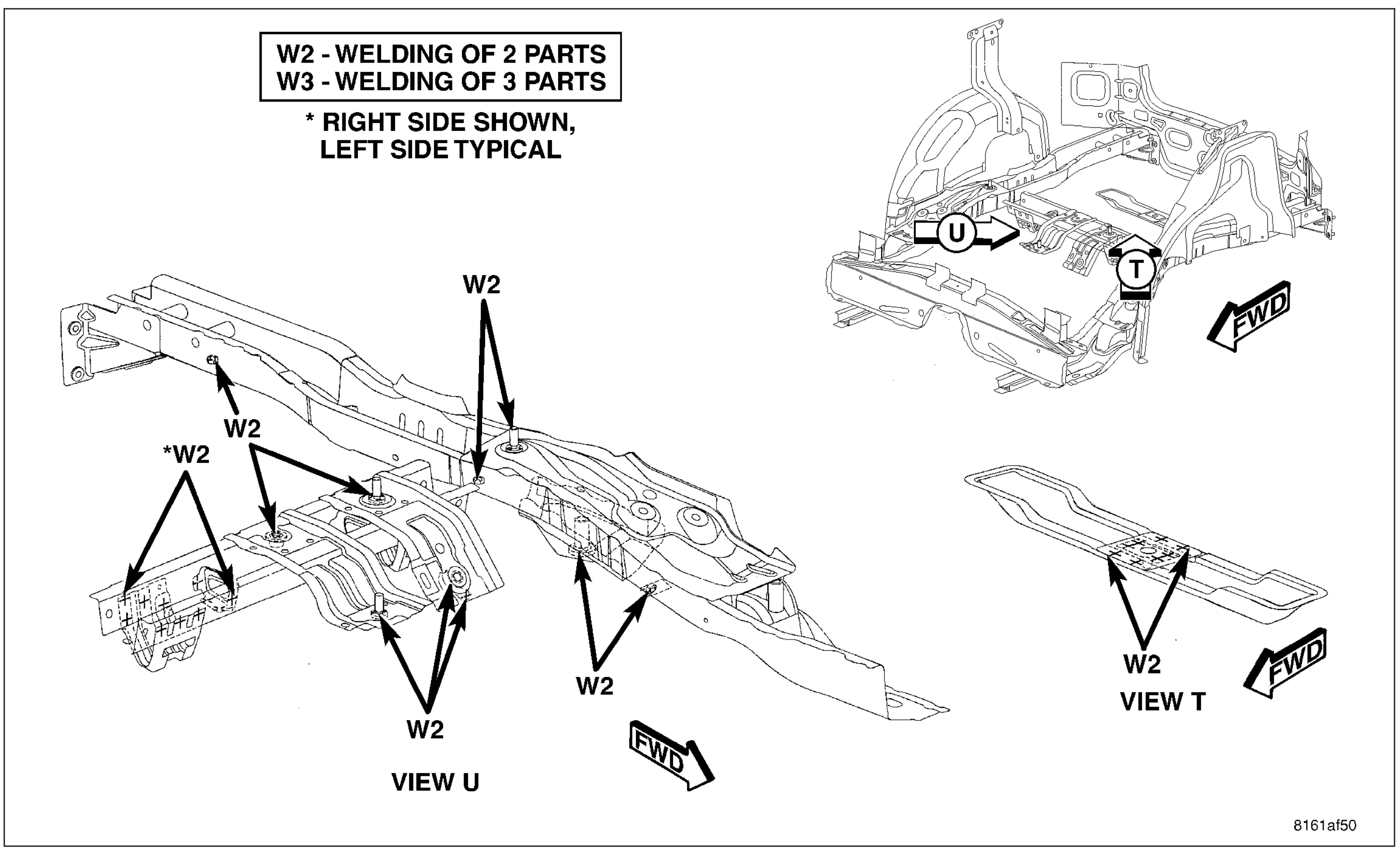


Fig. 69 REAR FLOOR (3 OF 7)

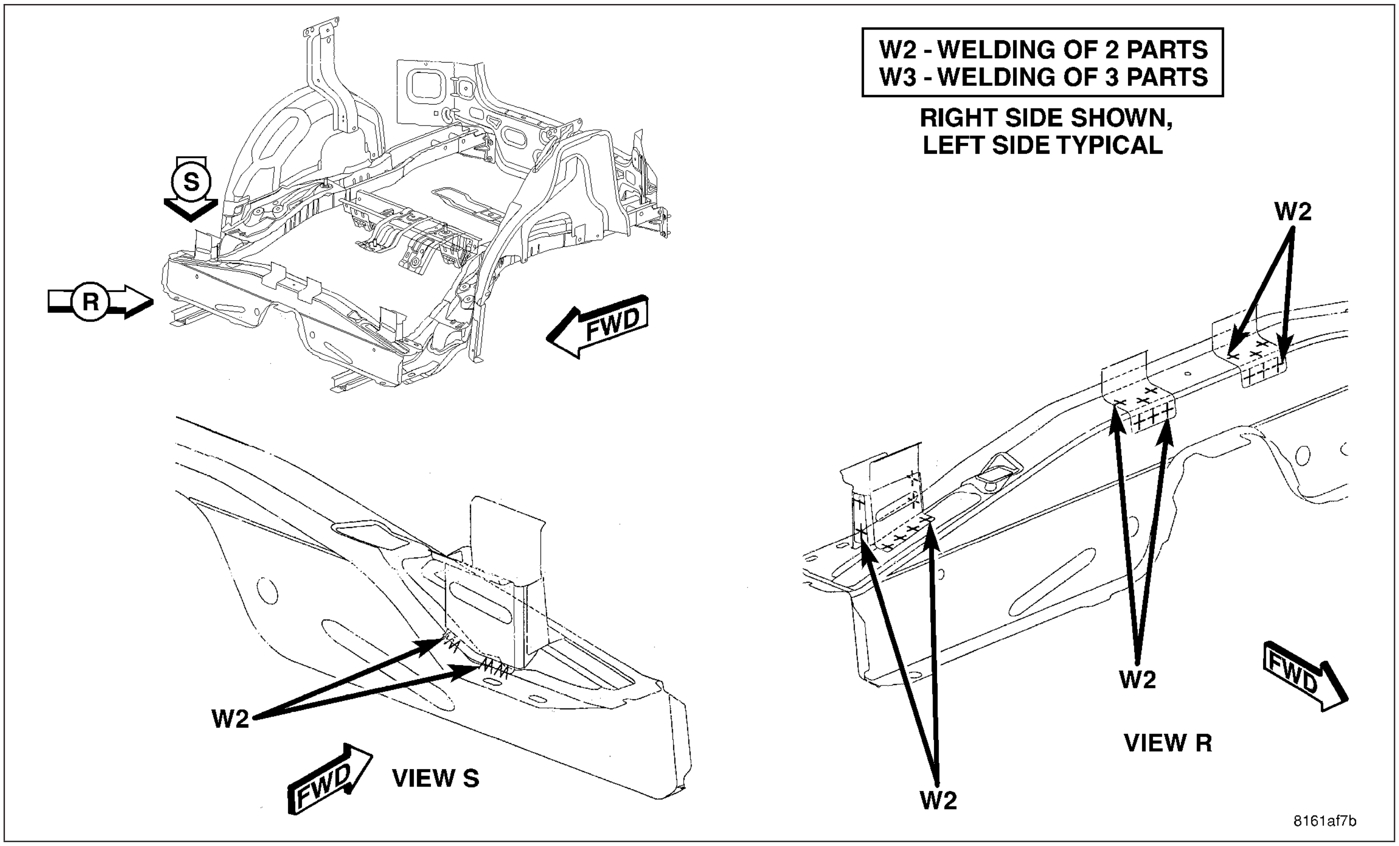


Fig. 70 REAR FLOOR (4 OF 7)

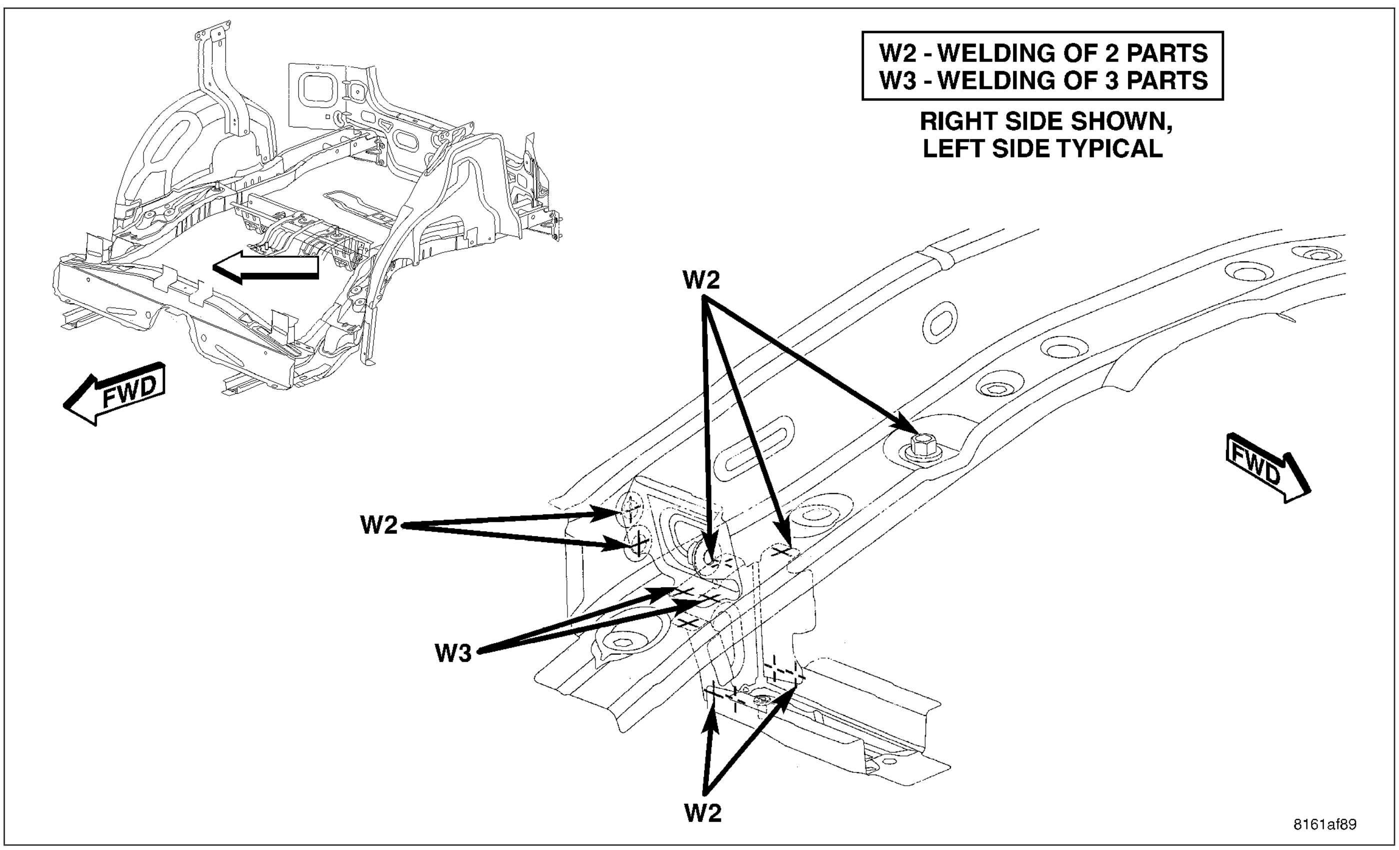


Fig. 71 REAR FLOOR (5 OF 7)

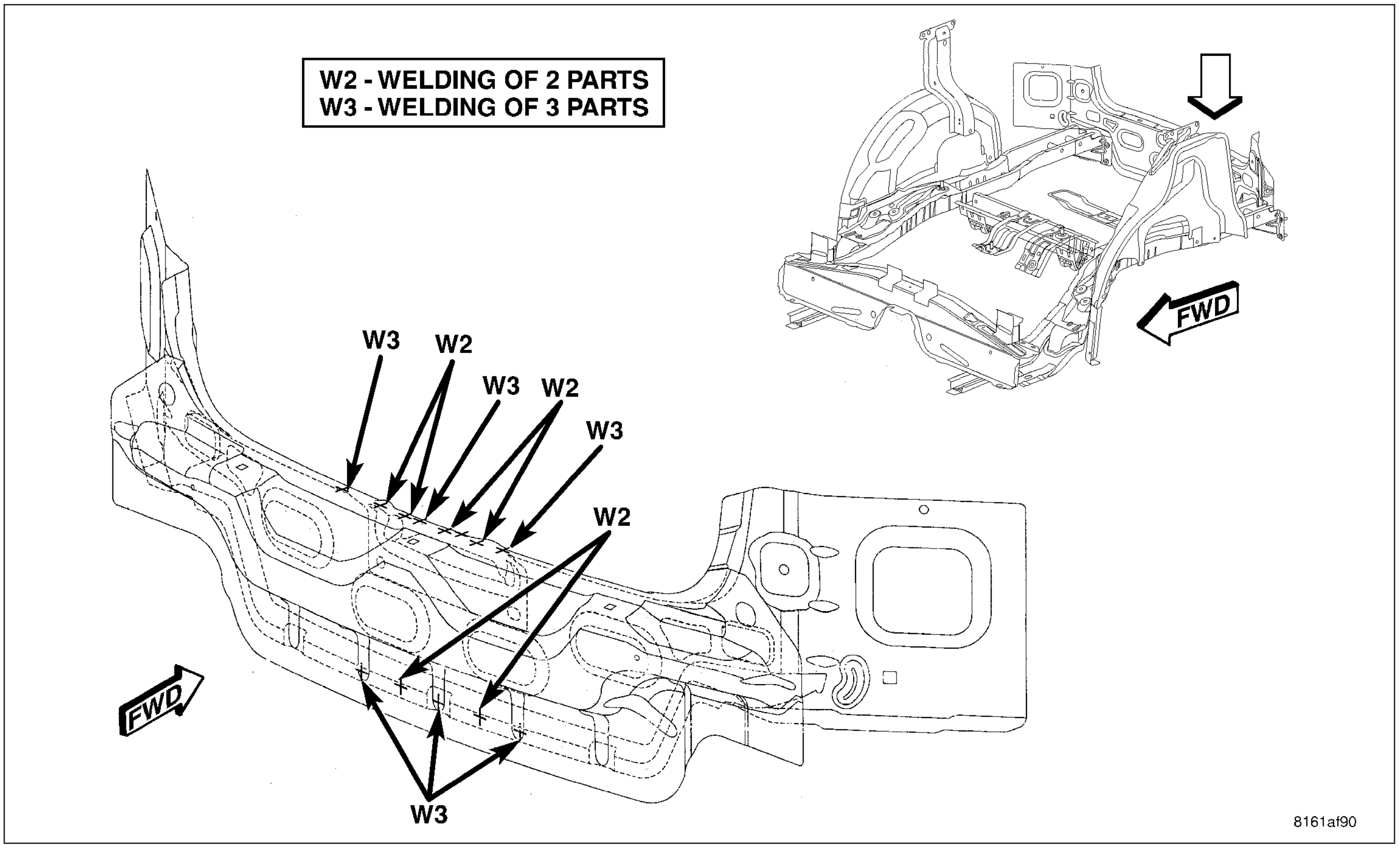


Fig. 72 REAR FLOOR (6 OF 7)

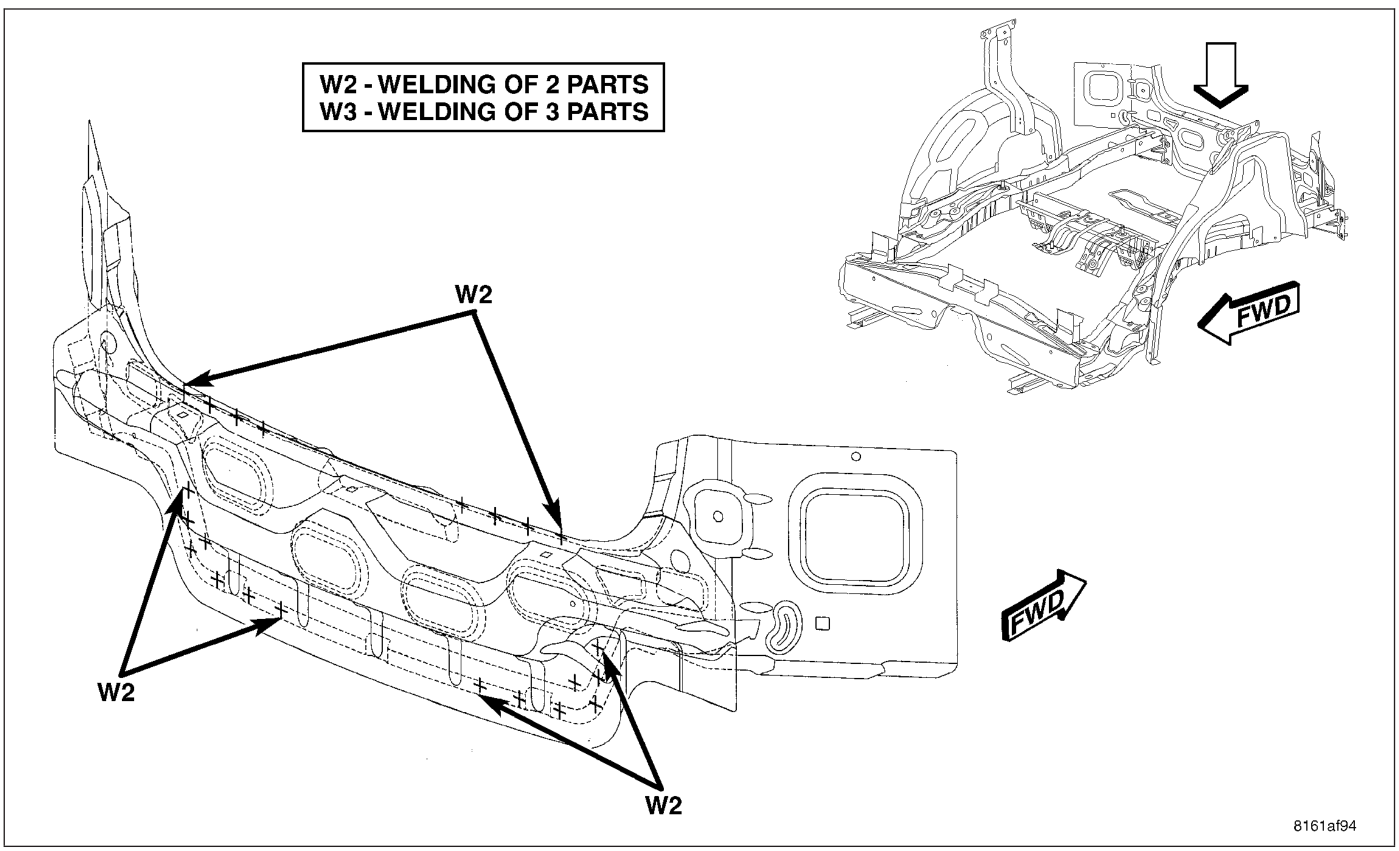


Fig. 73 REAR FLOOR (7 OF 7)

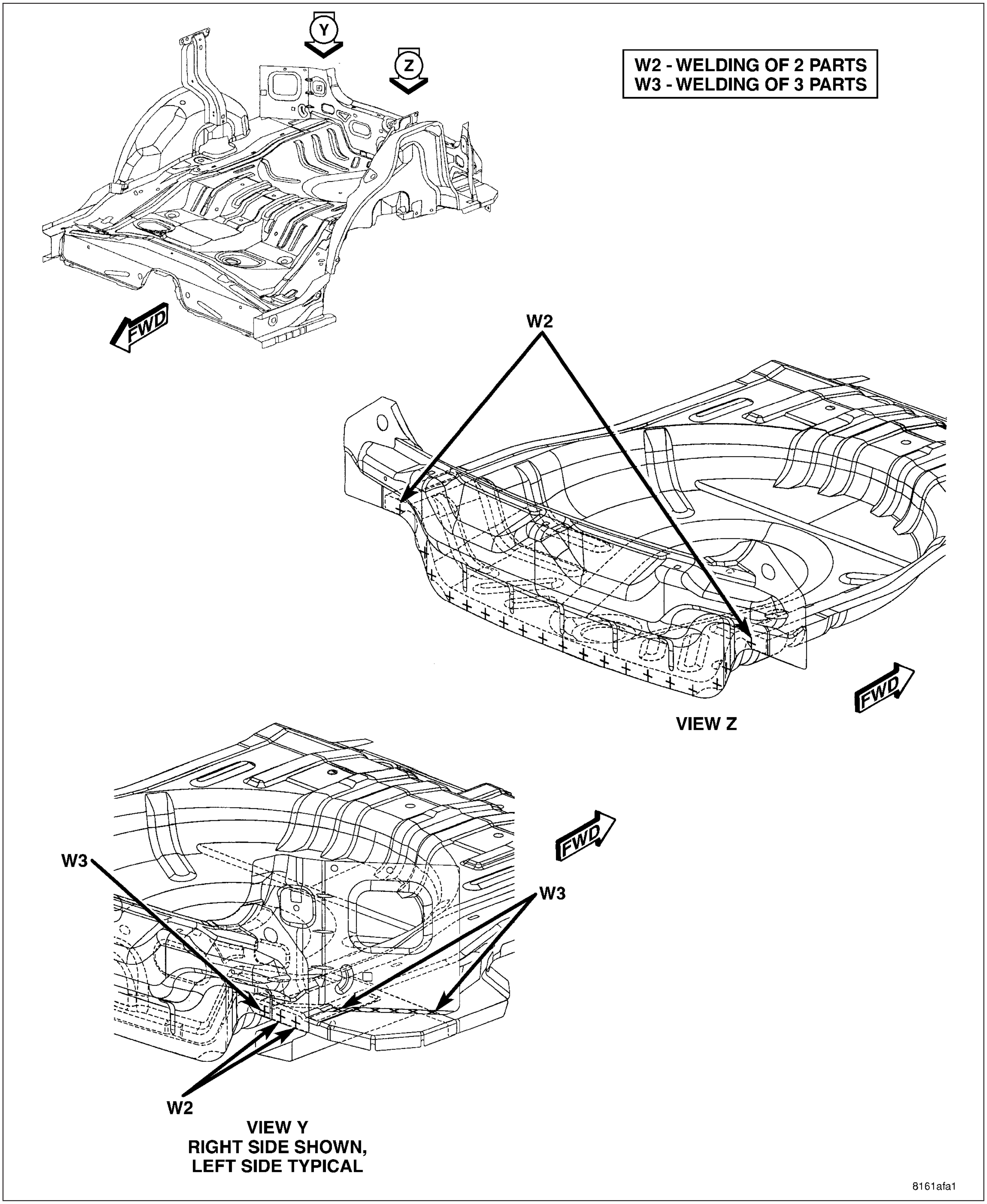


Fig. 74 REAR FLOOR ASSEMBLY (1 OF 14)

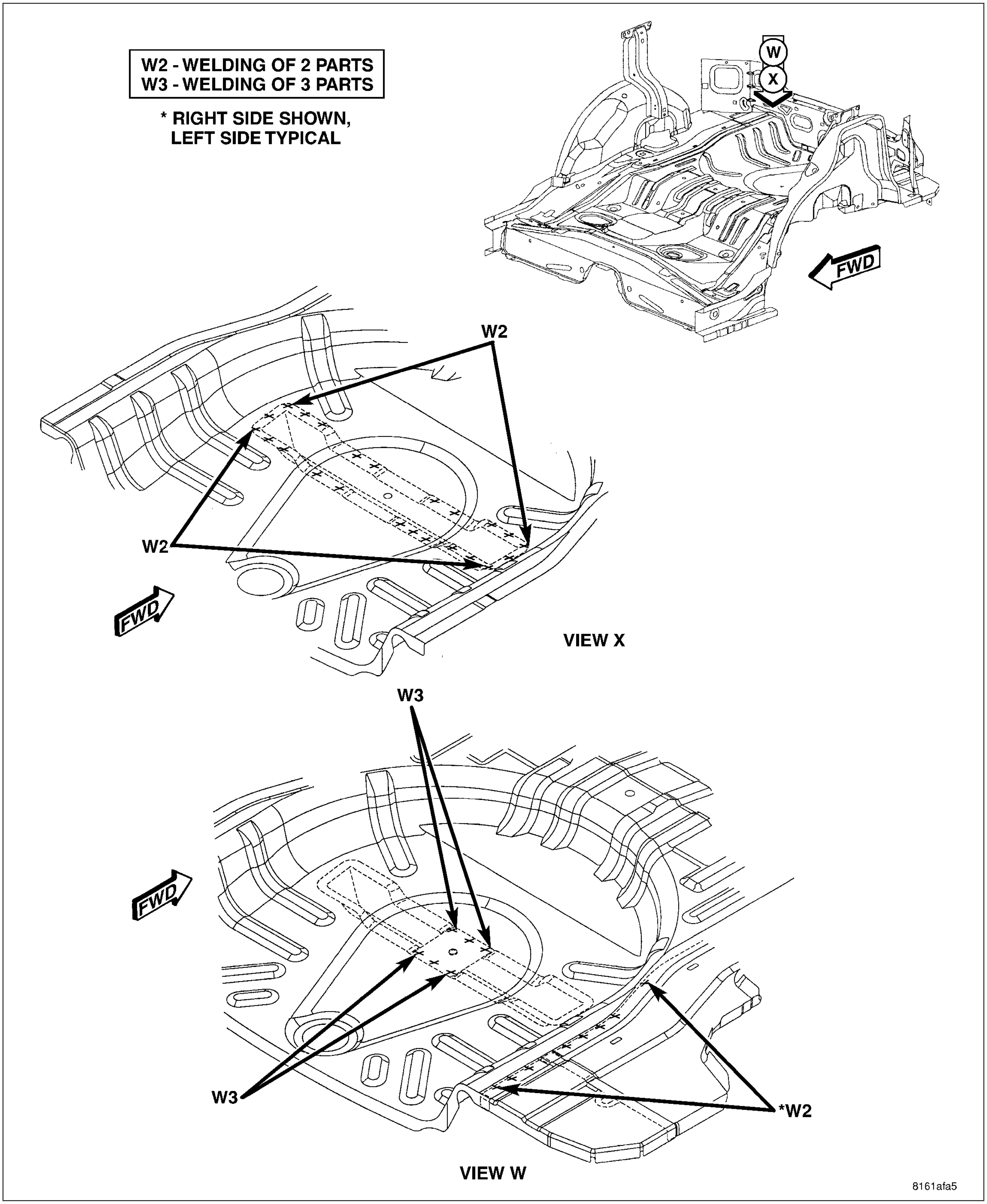


Fig. 75 REAR FLOOR ASSEMBLY (2 OF 14)

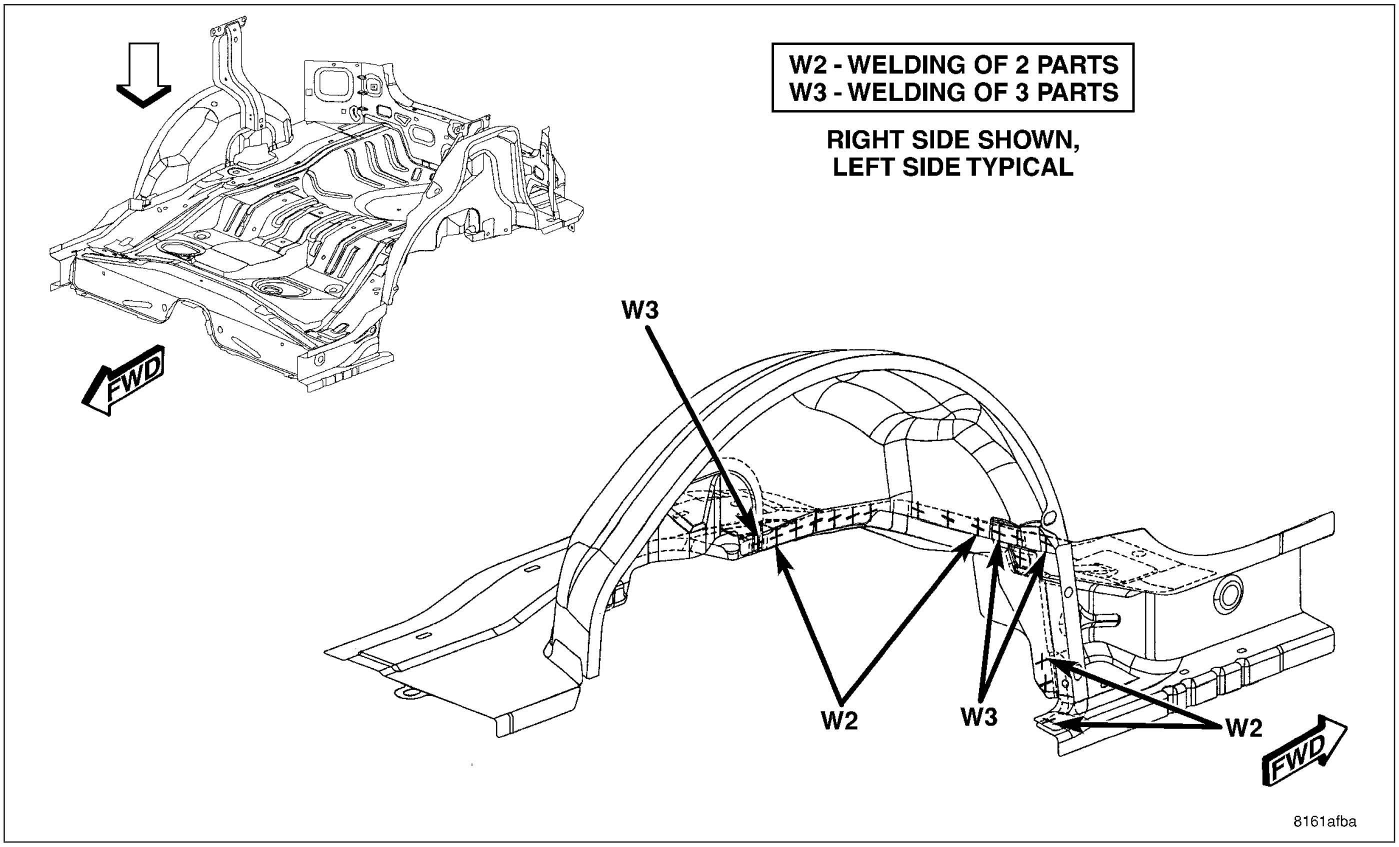


Fig. 76 REAR FLOOR ASSEMBLY (3 OF 14)

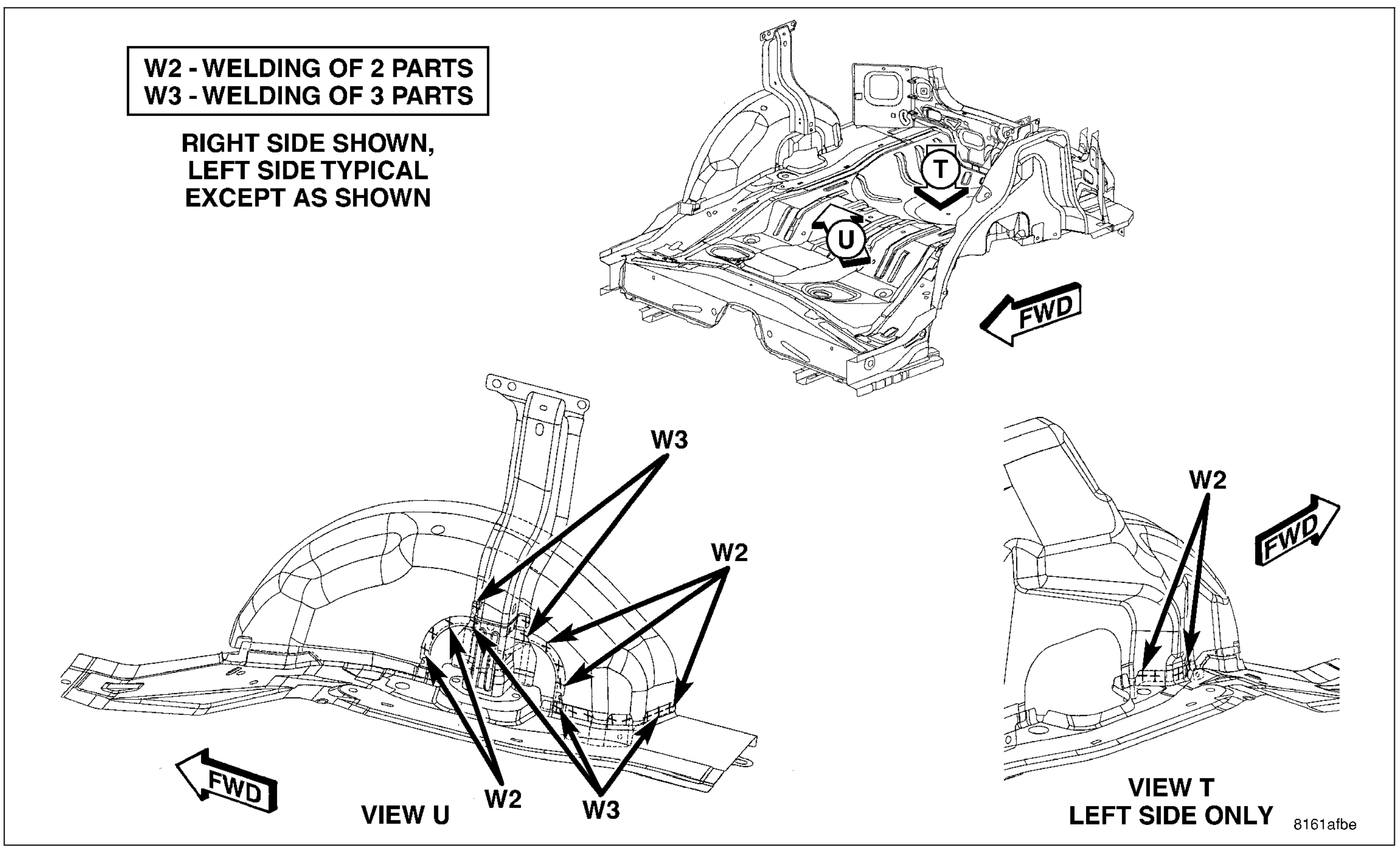


Fig. 77 REAR FLOOR ASSEMBLY (4 OF 14)

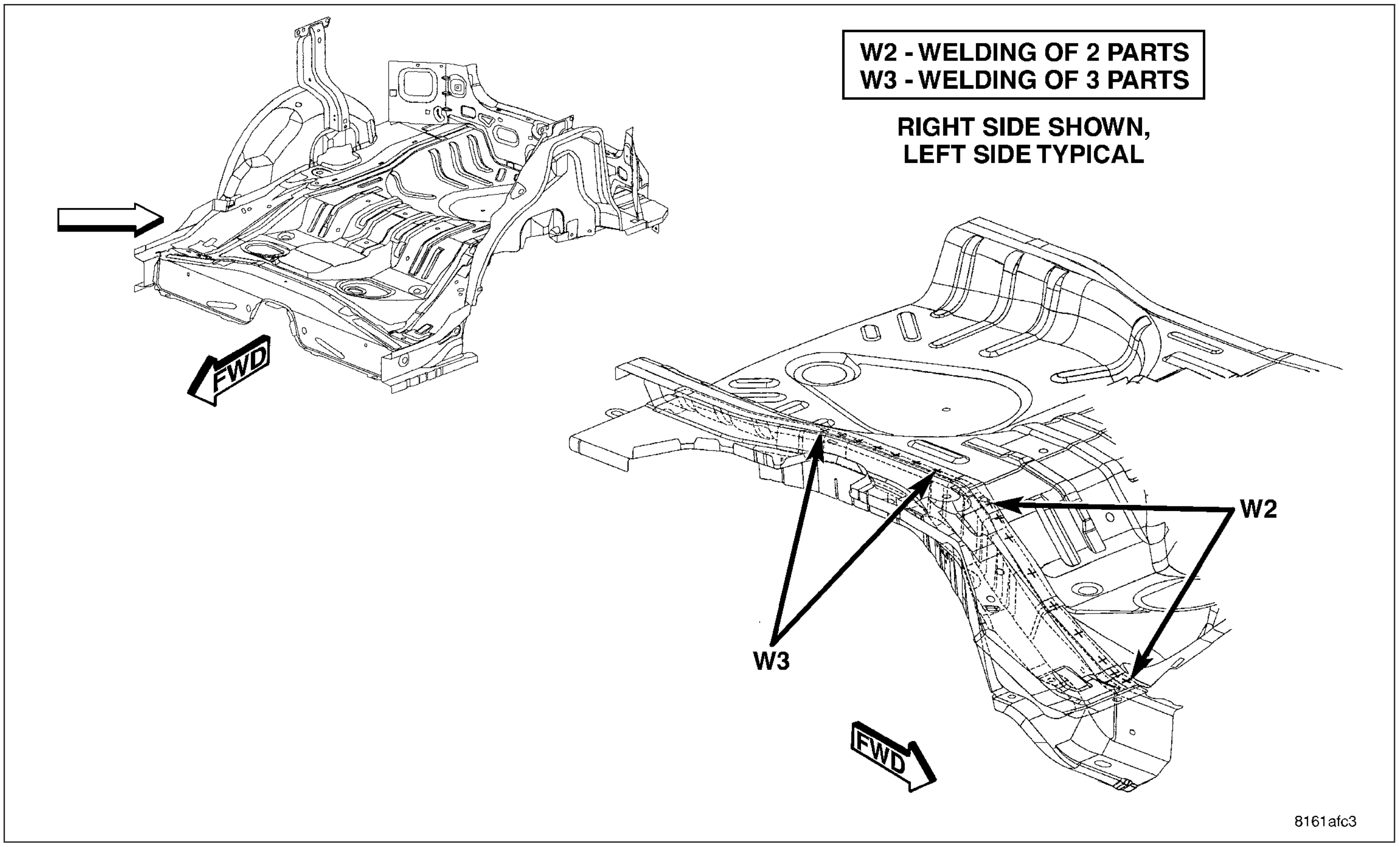


Fig. 78 REAR FLOOR ASSEMBLY (5 OF 14)

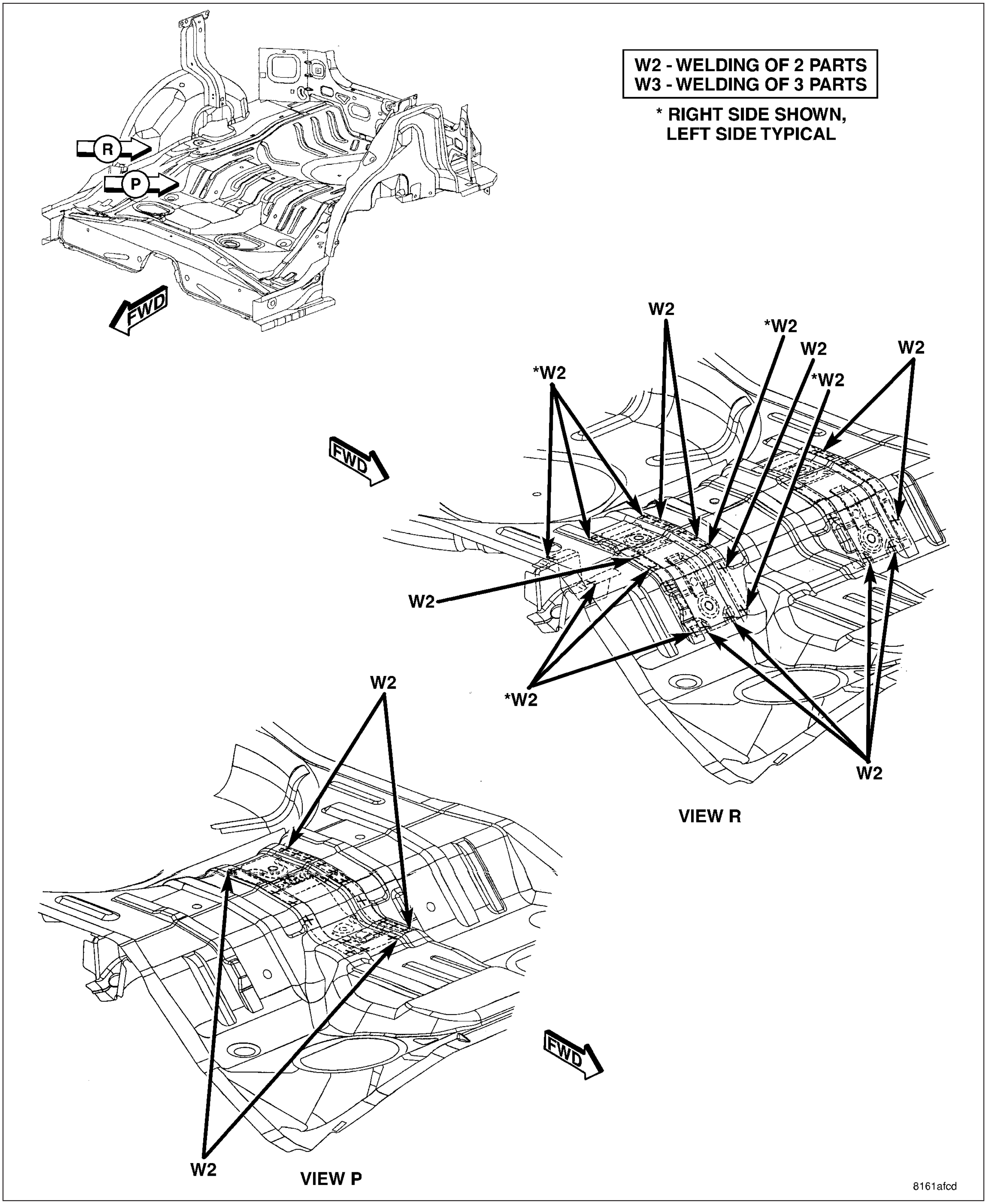


Fig. 79 REAR FLOOR ASSEMBLY (6 OF 14)

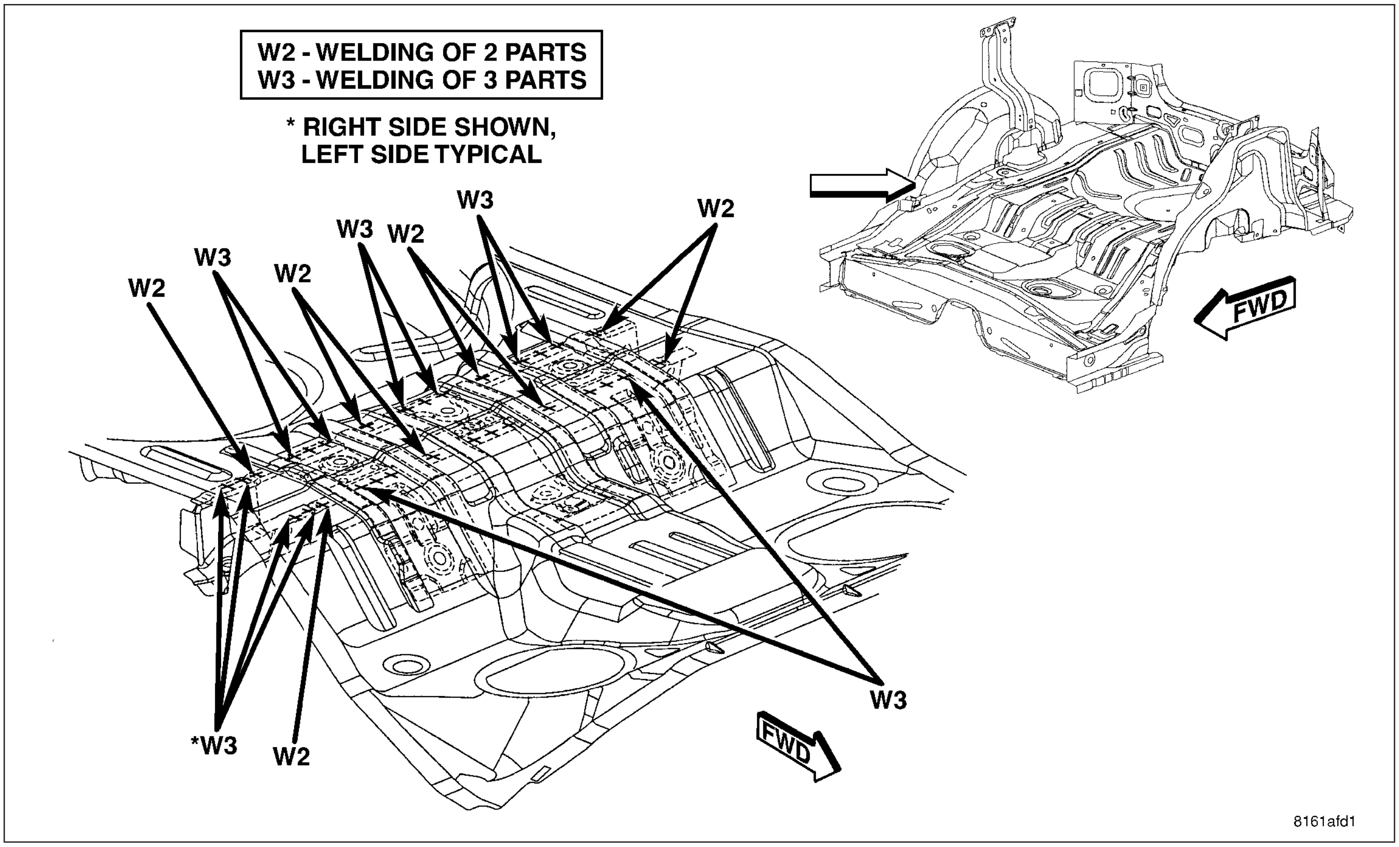


Fig. 80 REAR FLOOR ASSEMBLY (7 OF 14)

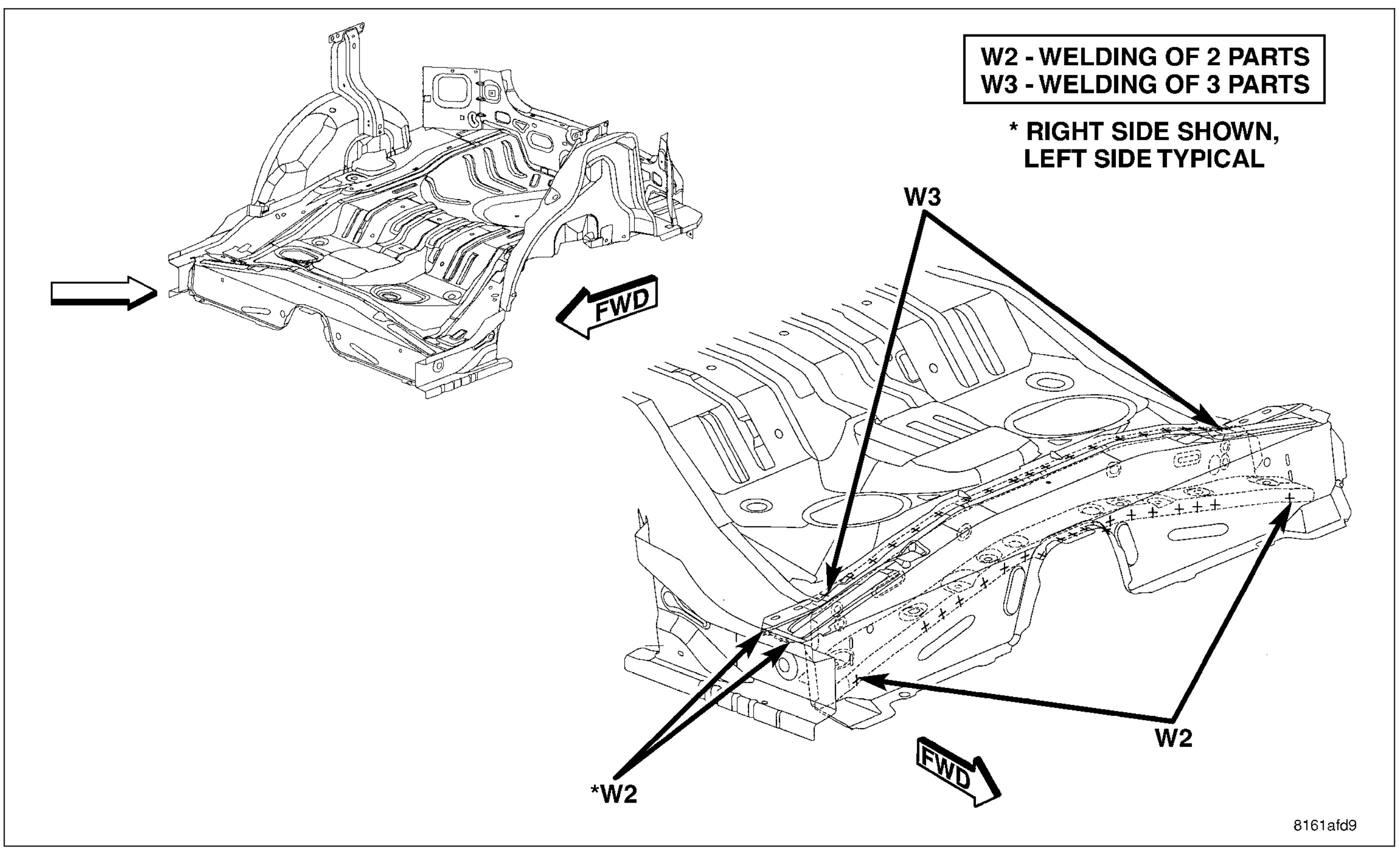


Fig. 81 REAR FLOOR ASSEMBLY (8 OF 14)

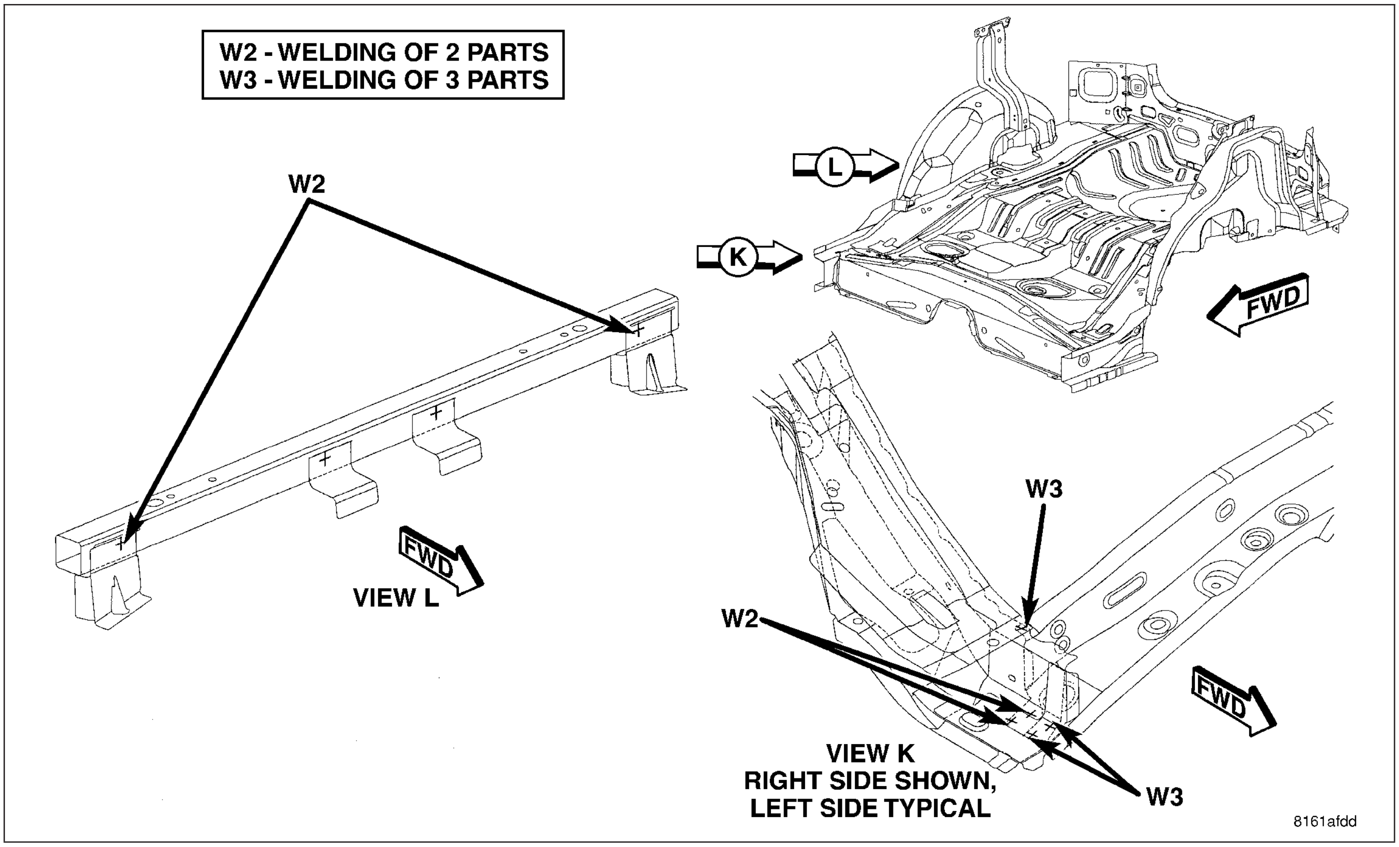


Fig. 82 REAR FLOOR ASSEMBLY (9 OF 14)

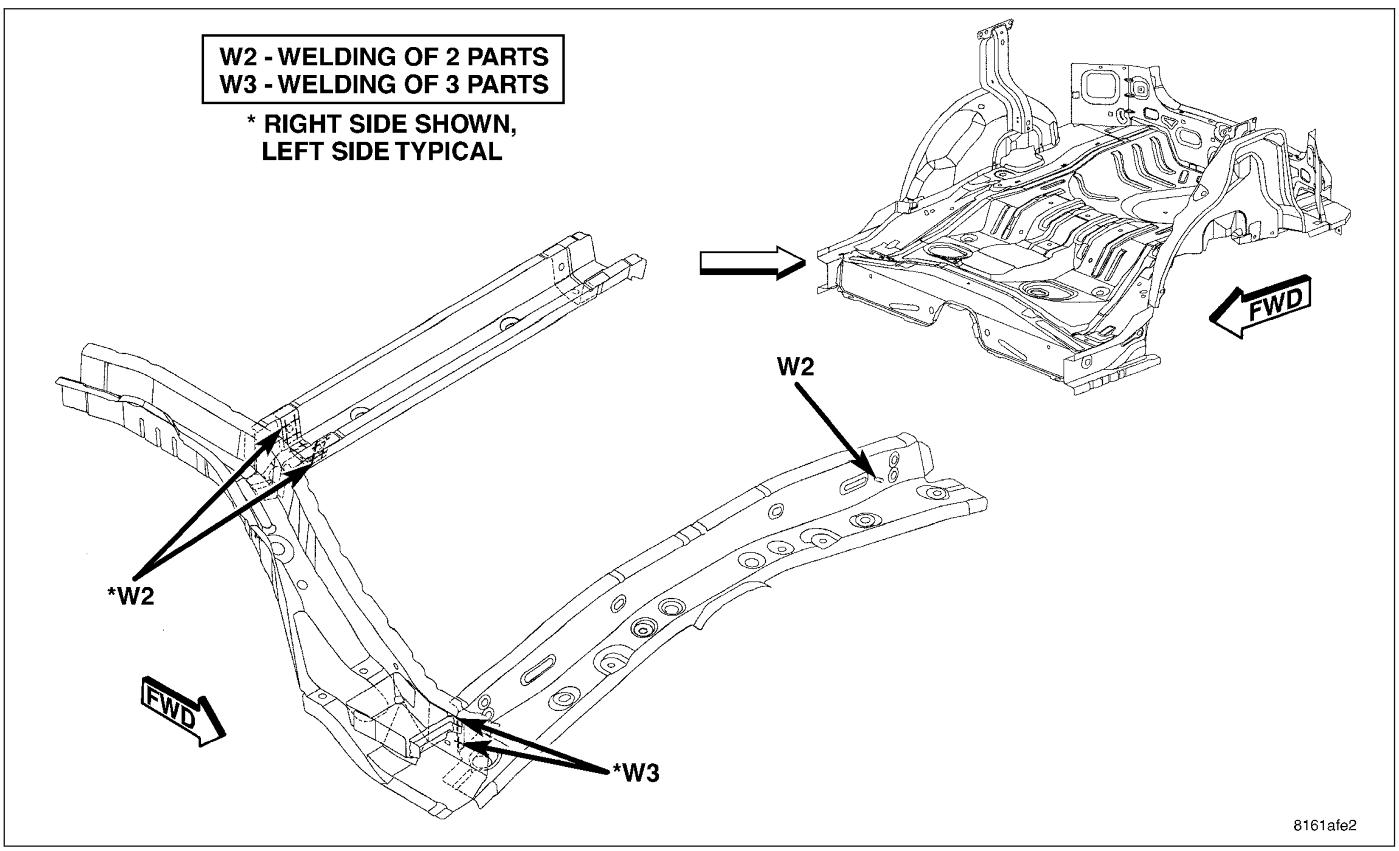


Fig. 83 REAR FLOOR ASSEMBLY (10 OF 14)

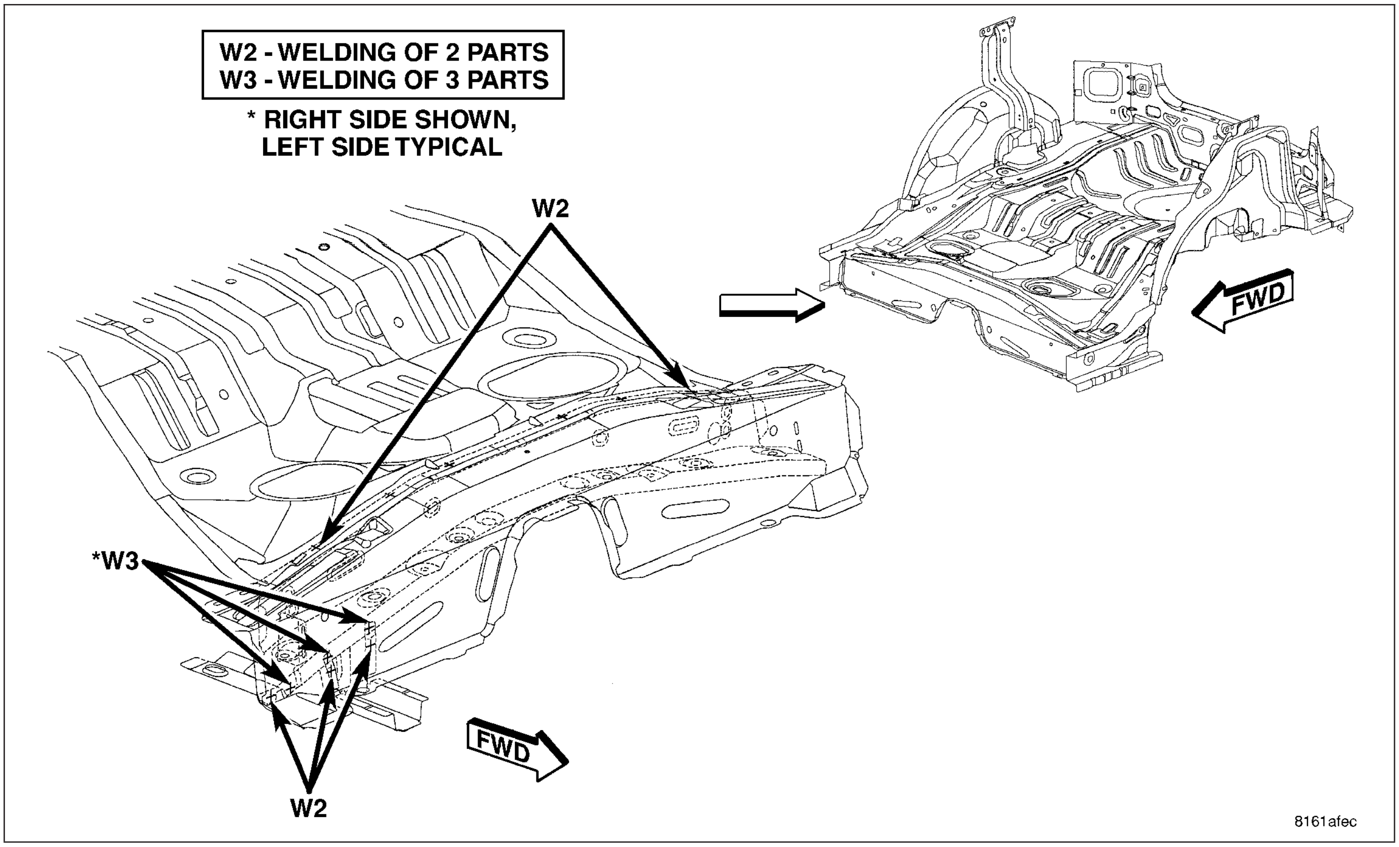


Fig. 84 REAR FLOOR ASSEMBLY (11 OF 14)

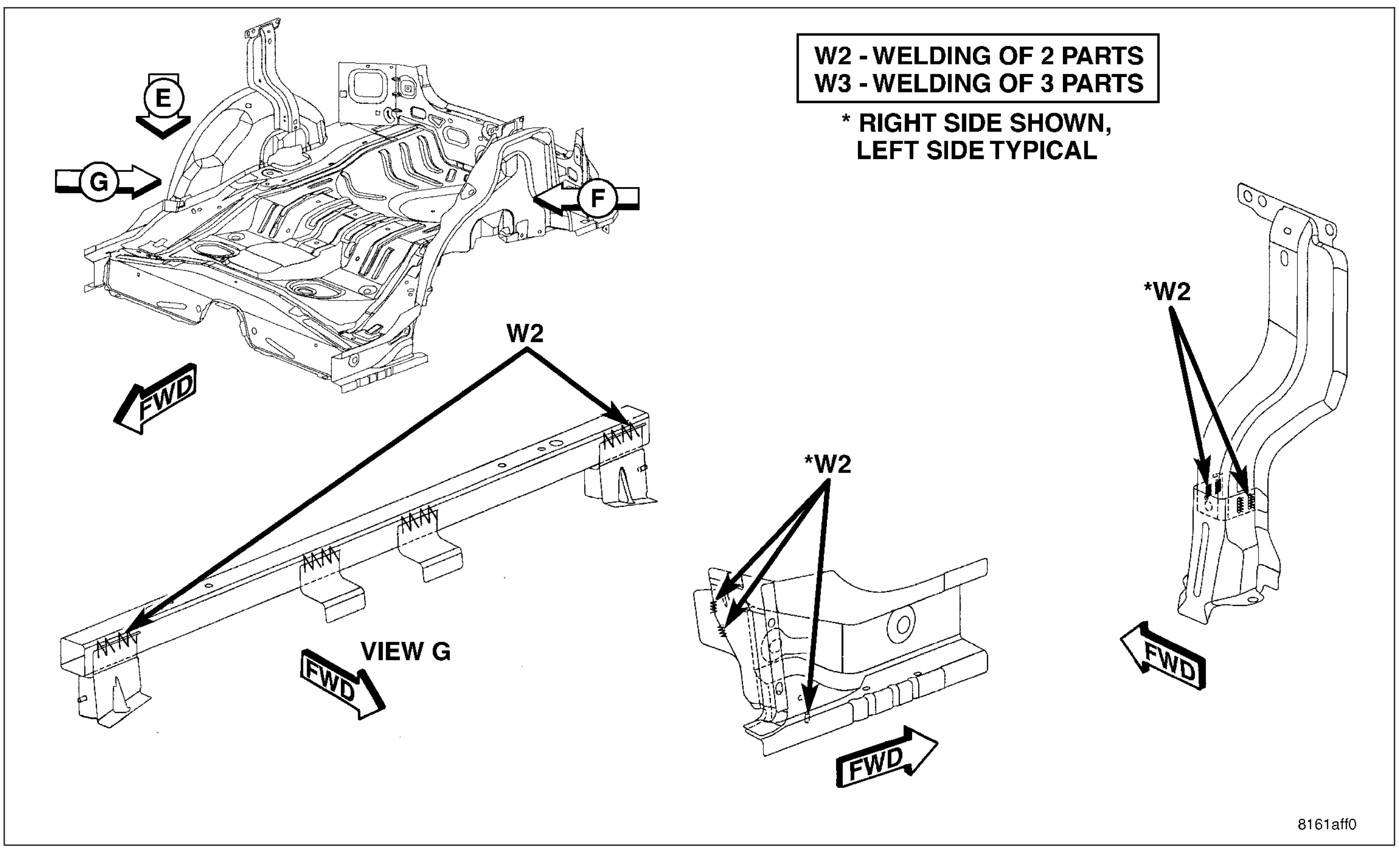


Fig. 85 REAR FLOOR ASSEMBLY (12 OF 14)

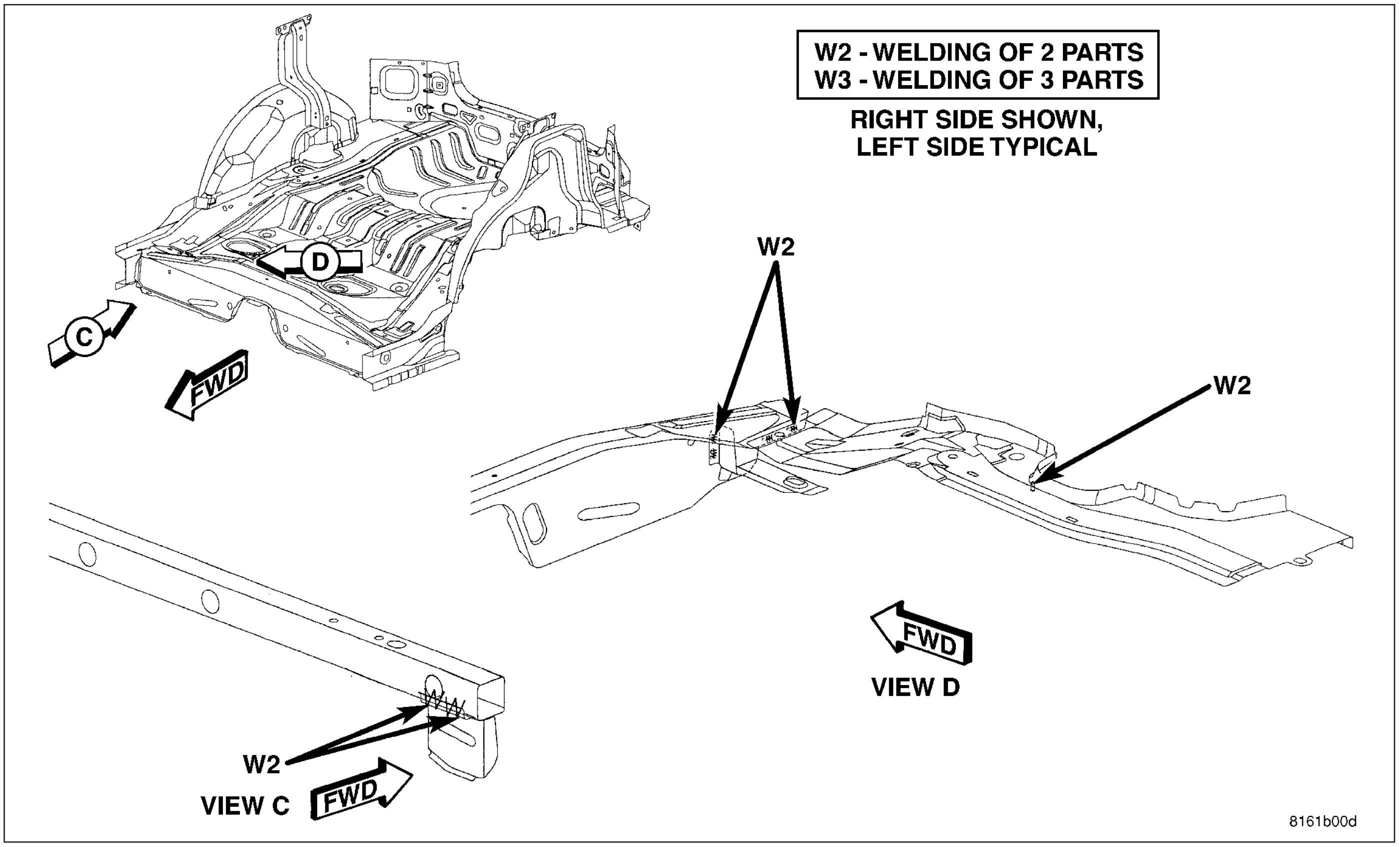


Fig. 86 REAR FLOOR ASSEMBLY (13 OF 14)

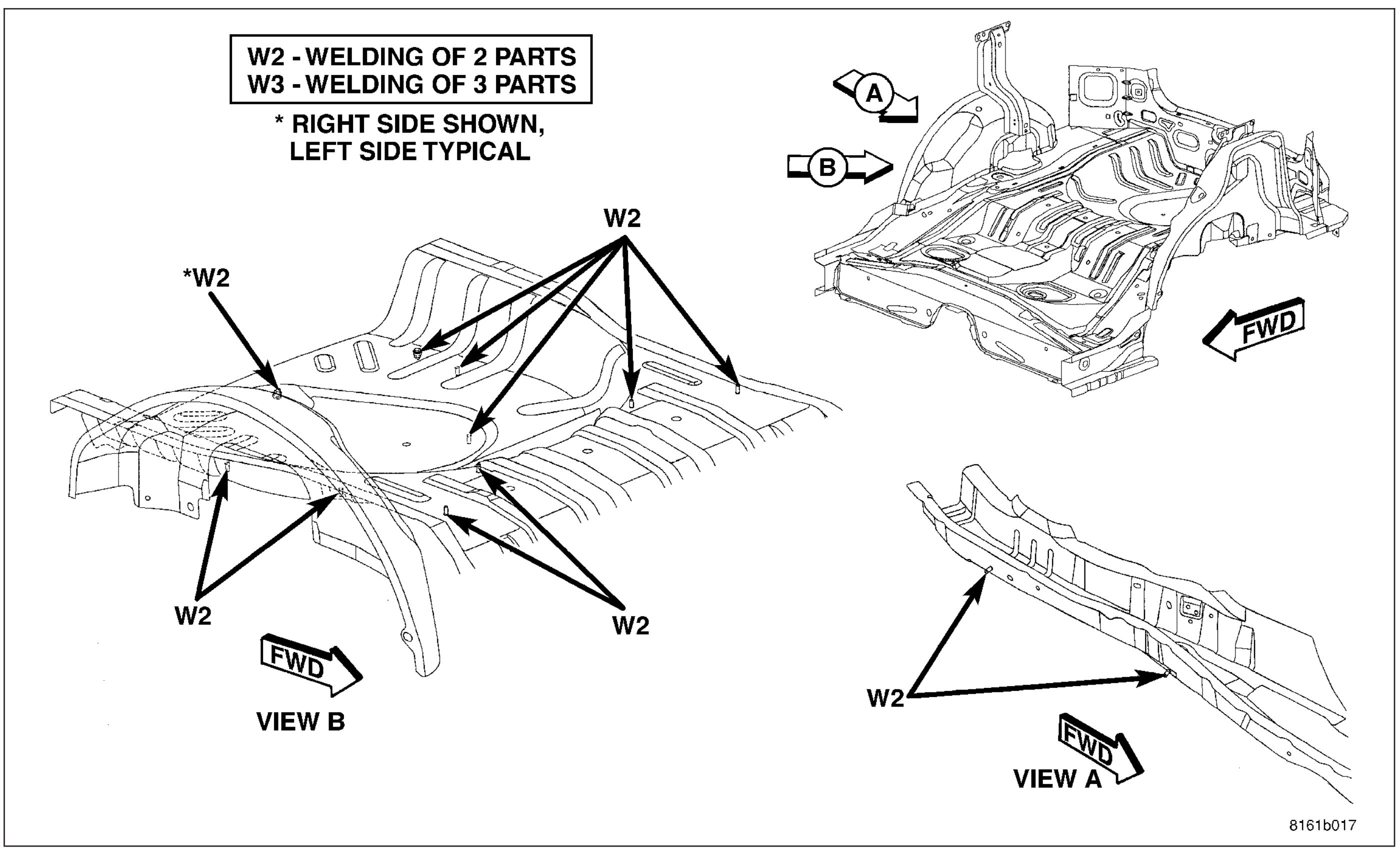


Fig. 87 REAR FLOOR ASSEMBLY (14 OF 14)

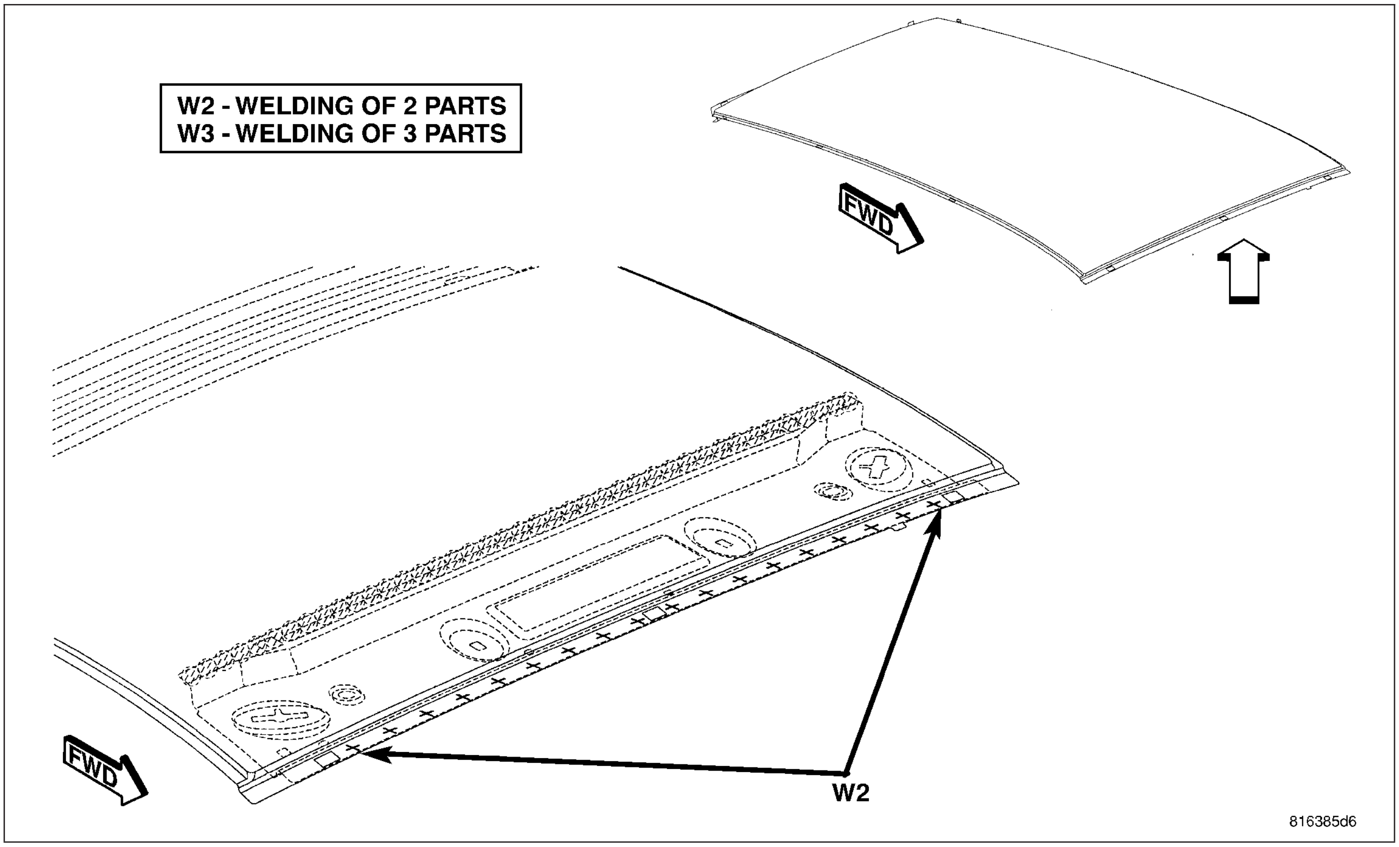


Fig. 88 ROOF WITHOUT SUNROOF (1 OF 2)

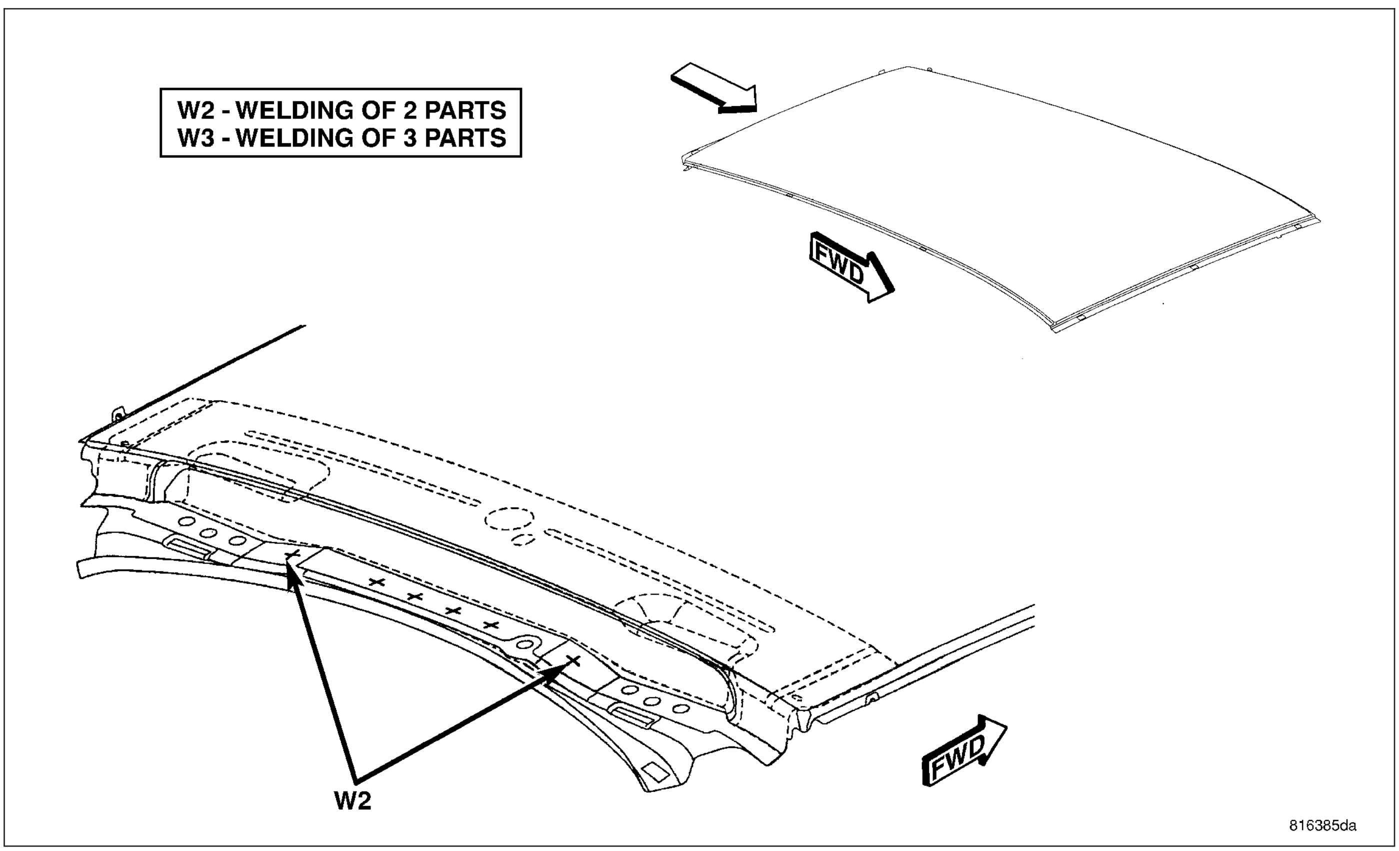


Fig. 89 ROOF WITHOUT SUNROOF (2 OF 2)

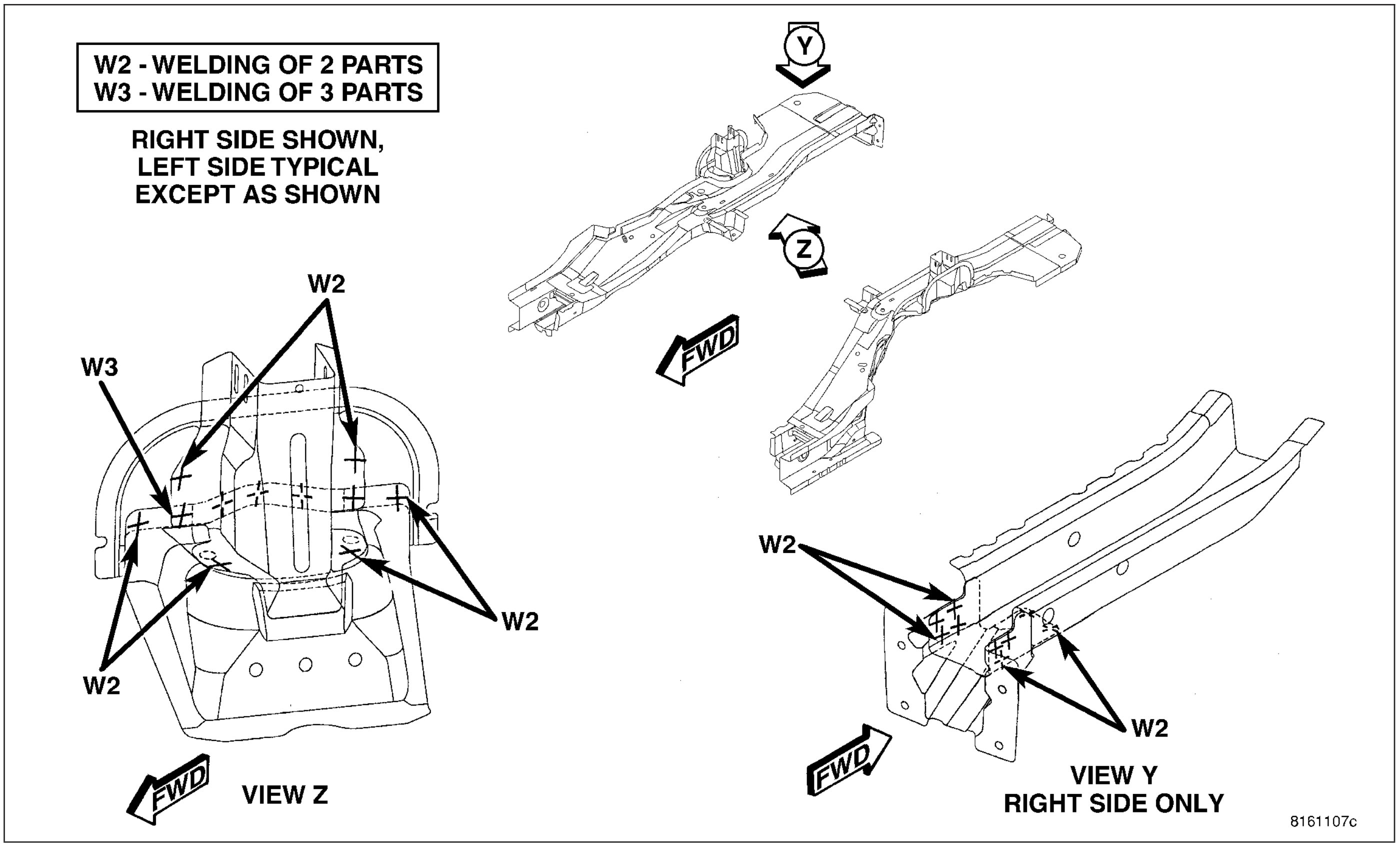


Fig. 90 SIDEMEMBER ASSEMBLY (1 OF 17)

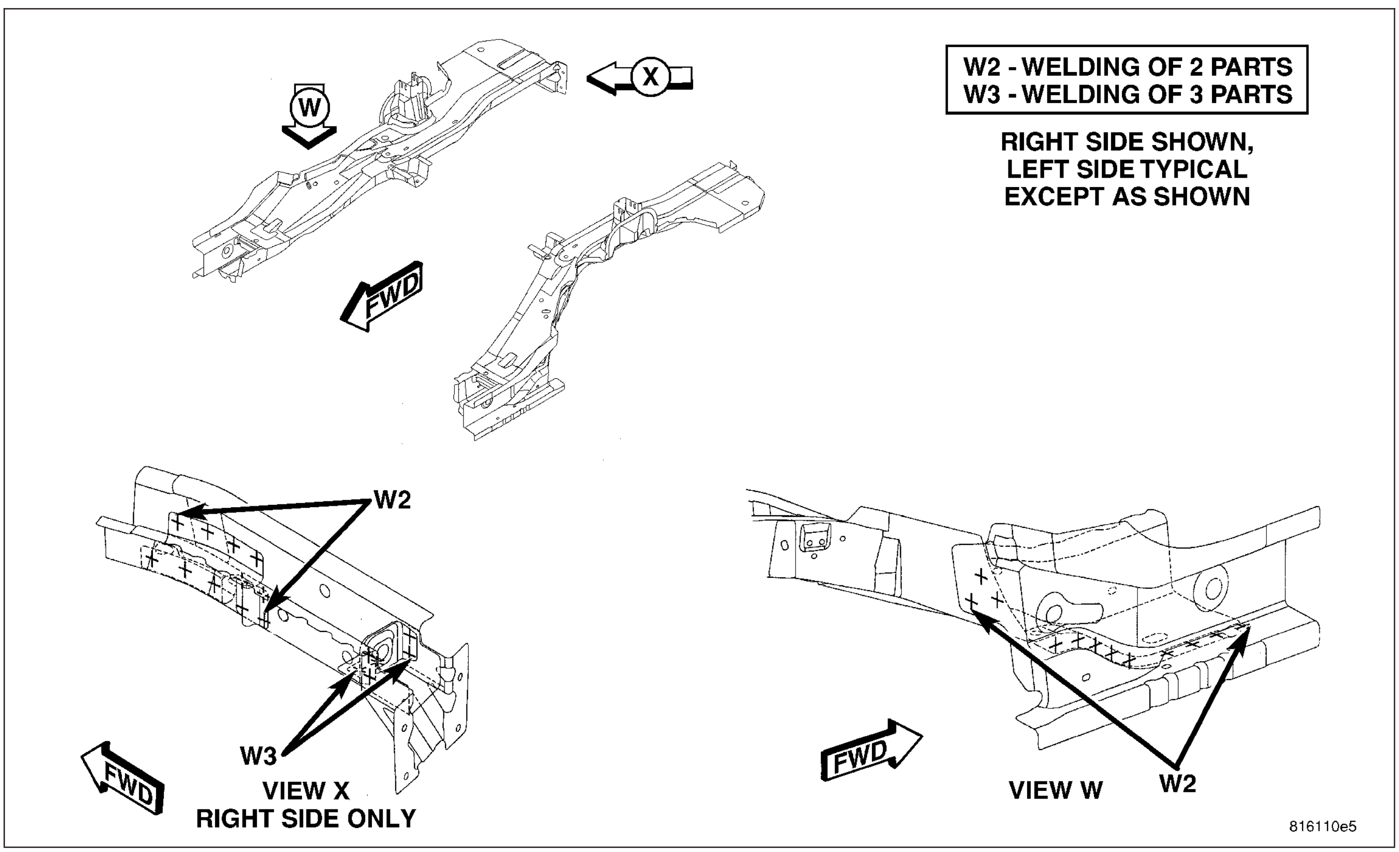


Fig. 91 SIDEMEMBER ASSEMBLY (2 OF 17)

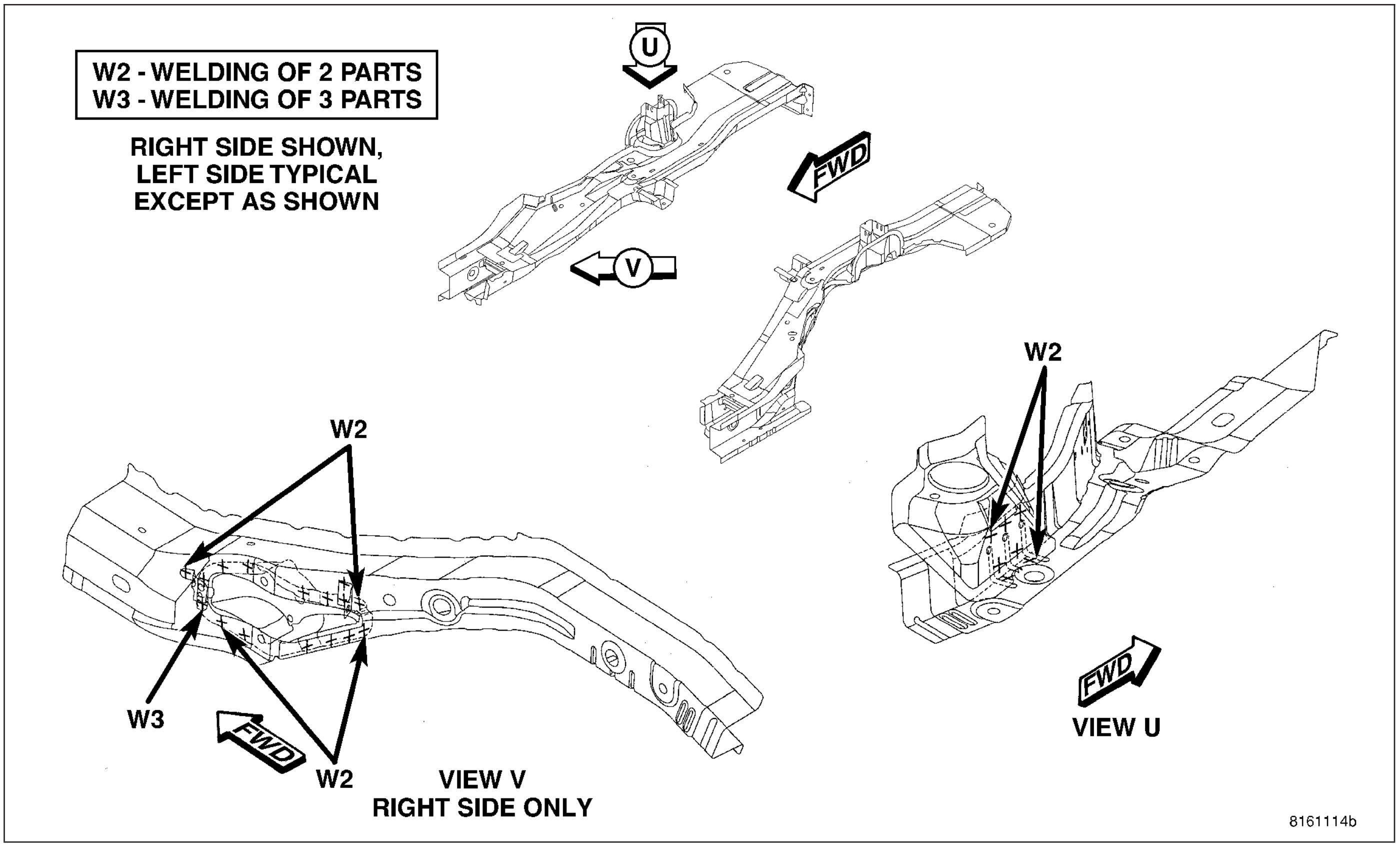


Fig. 92 SIDEMEMBER ASSEMBLY (3 OF 17)

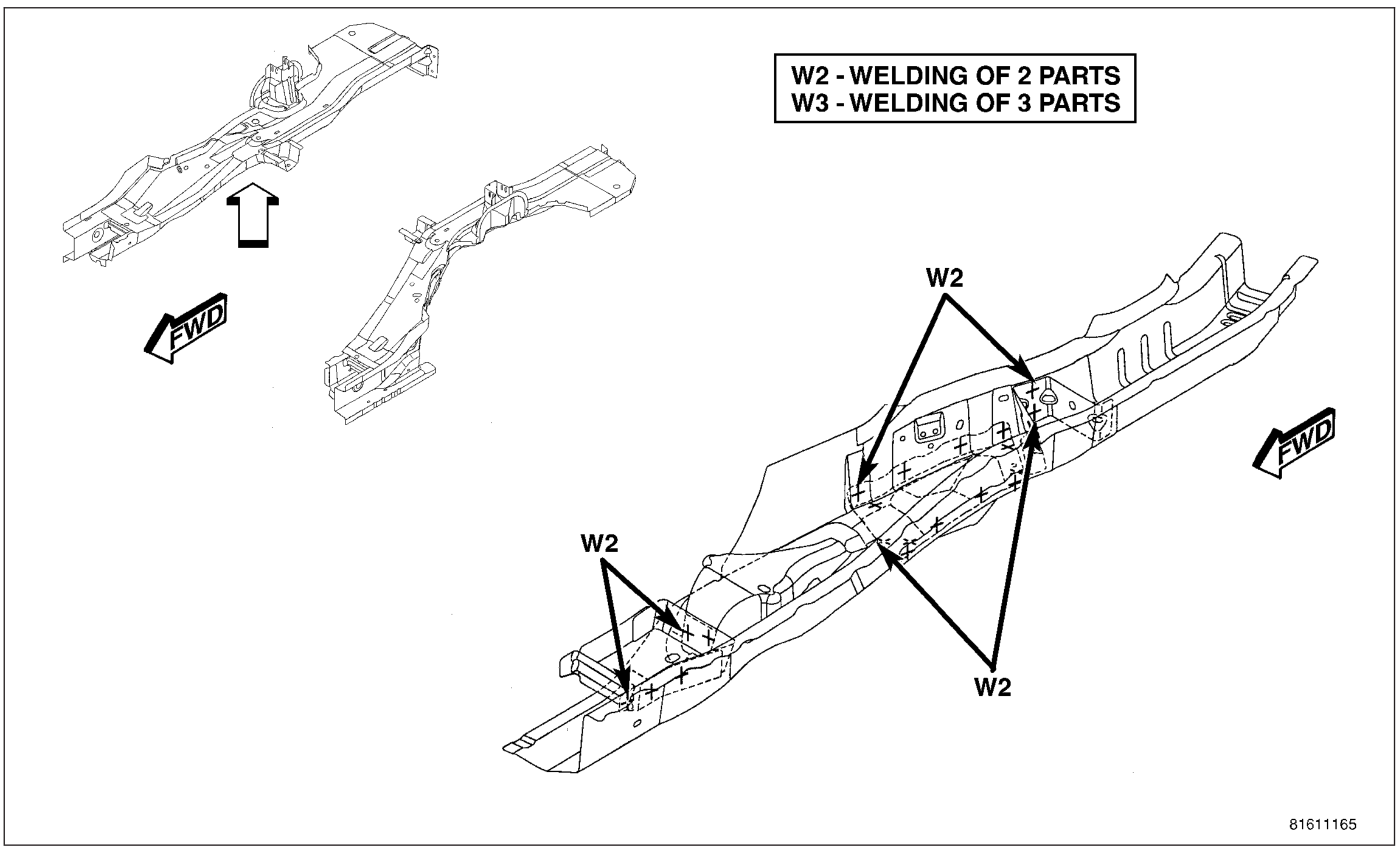


Fig. 93 SIDEMEMBER ASSEMBLY (4 OF 17)

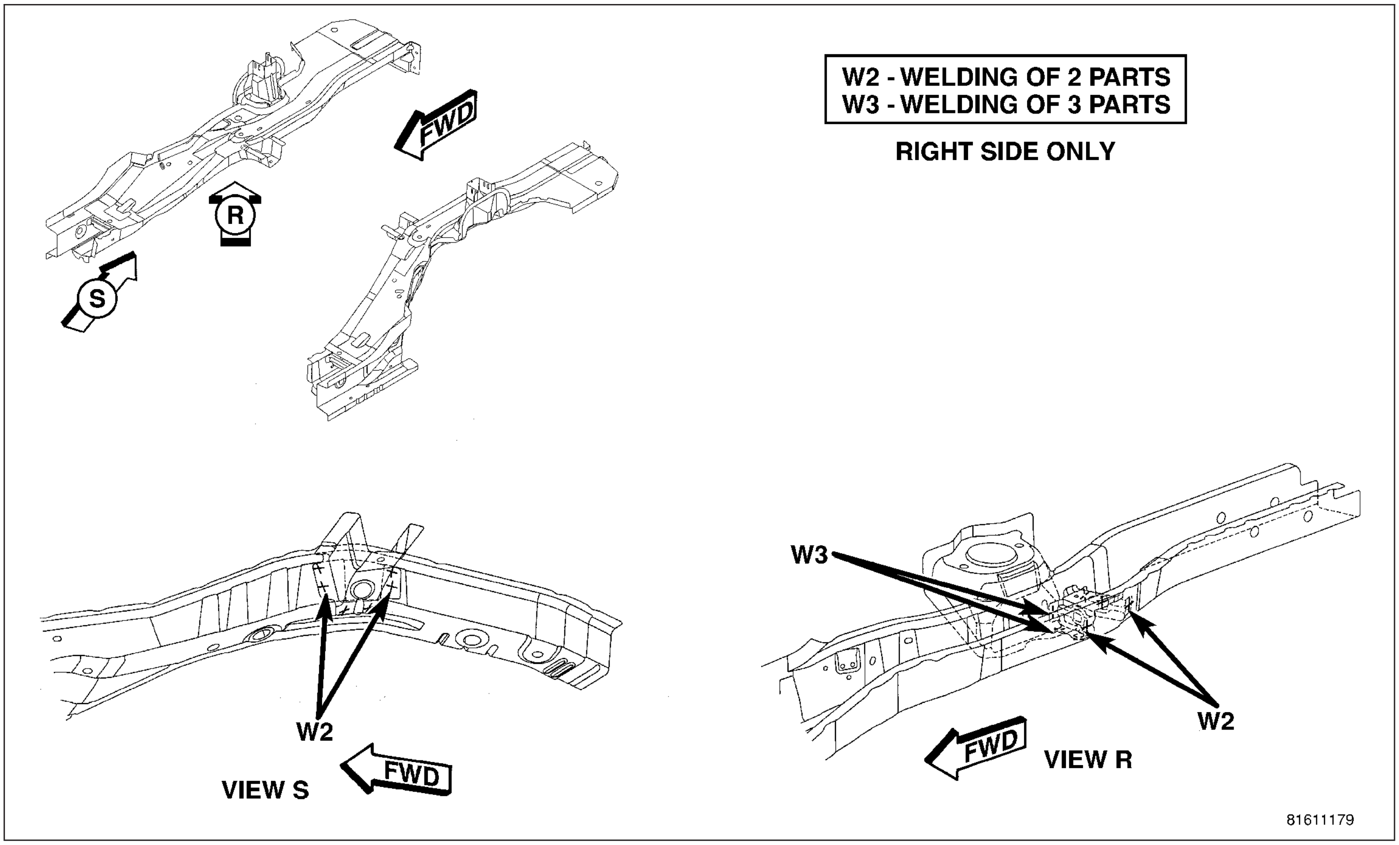


Fig. 94

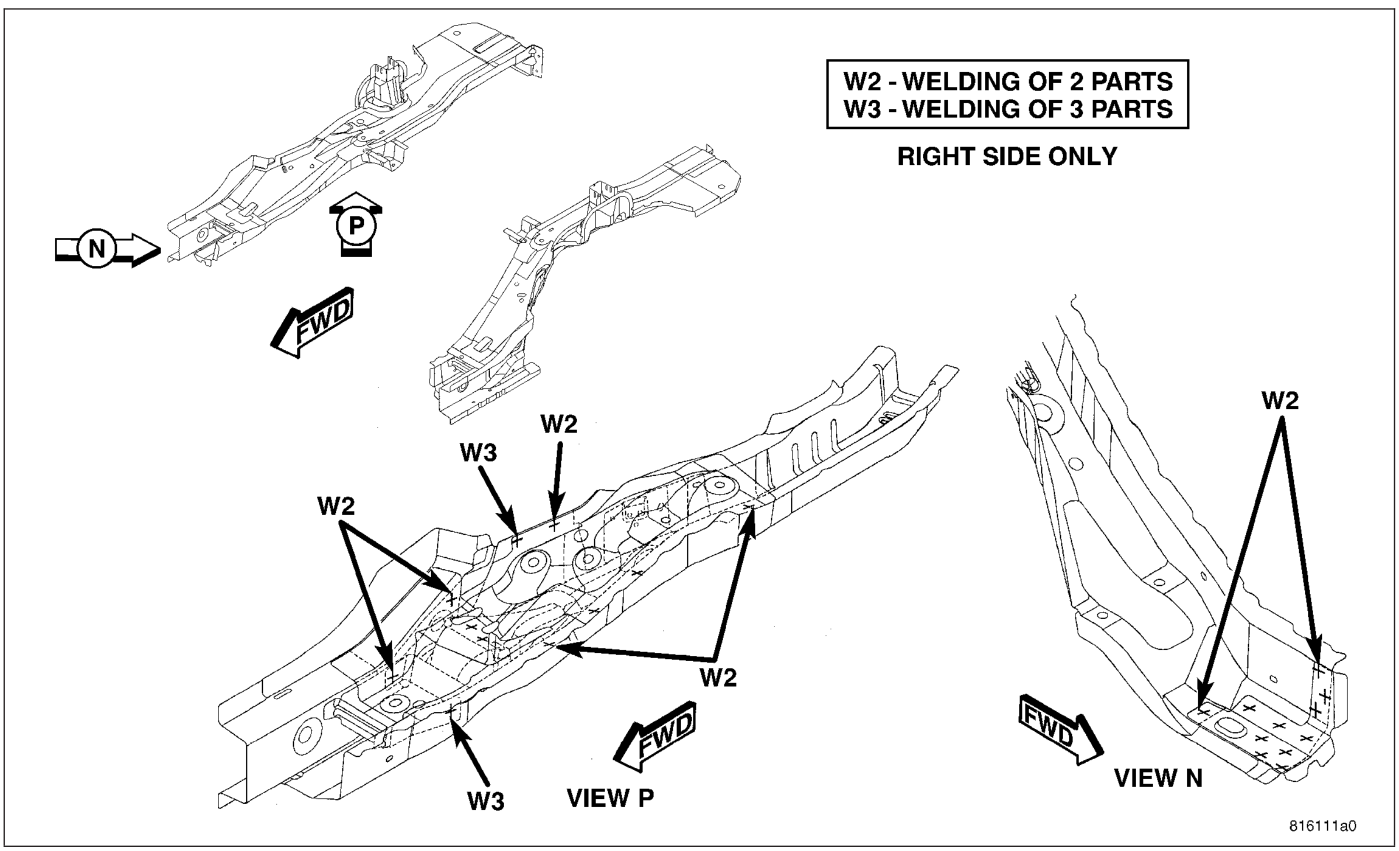


Fig. 95 SIDEMEMBER ASSEMBLY (6 OF 17)

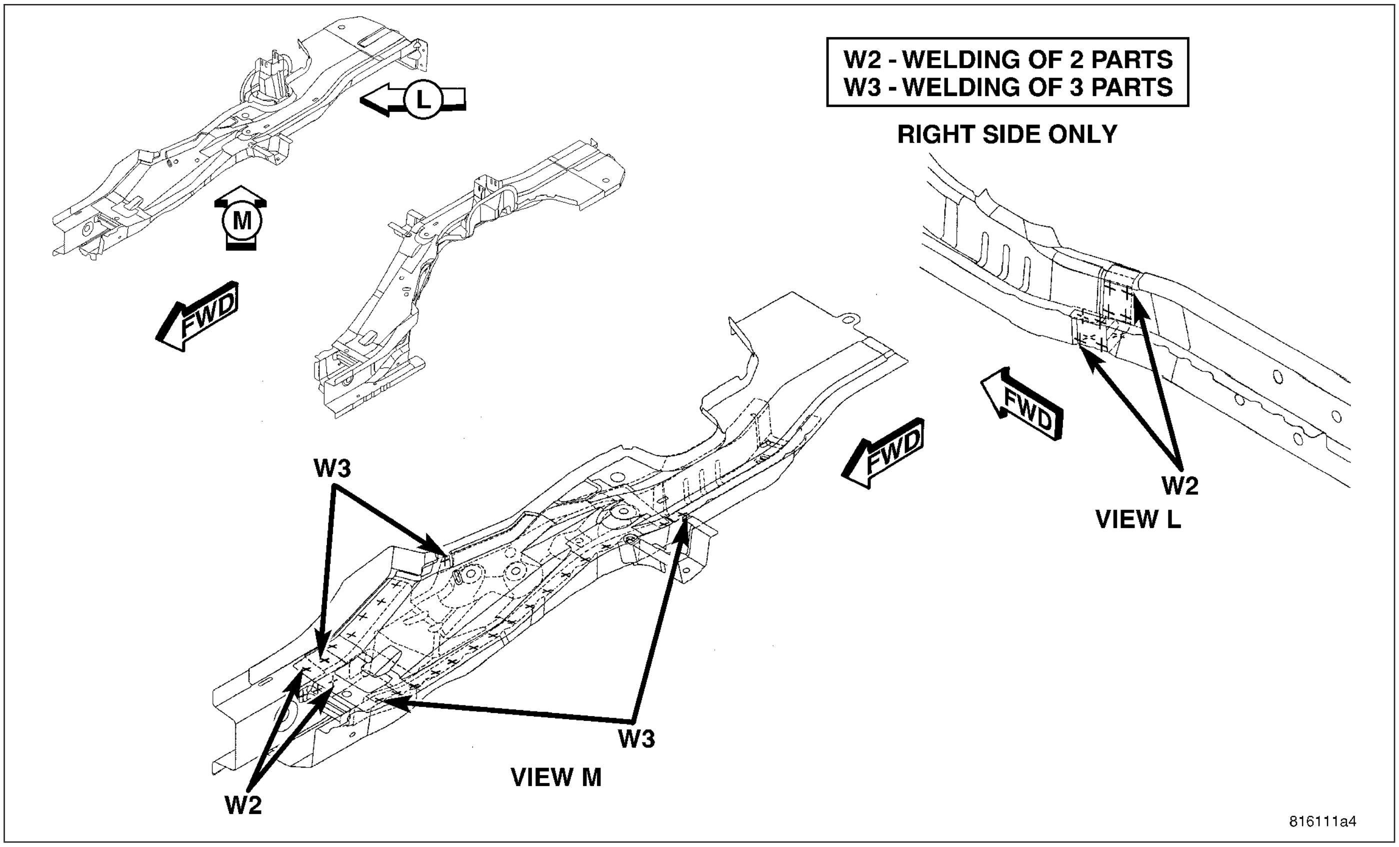


Fig. 96 SIDEMEMBER ASSEMBLY (7 OF 17)

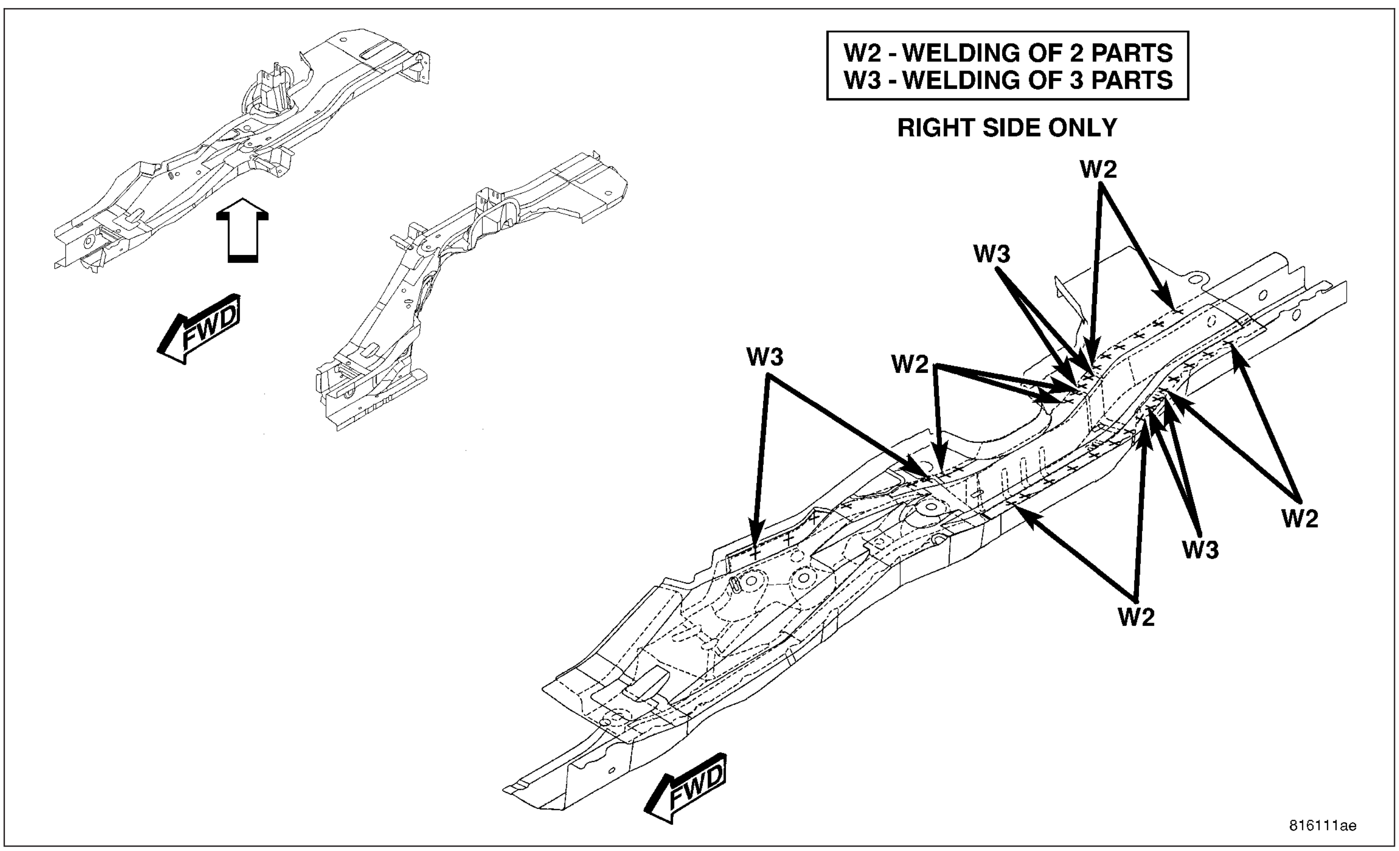


Fig. 97 SIDEMEMBER ASSEMBLY (8 OF 17)

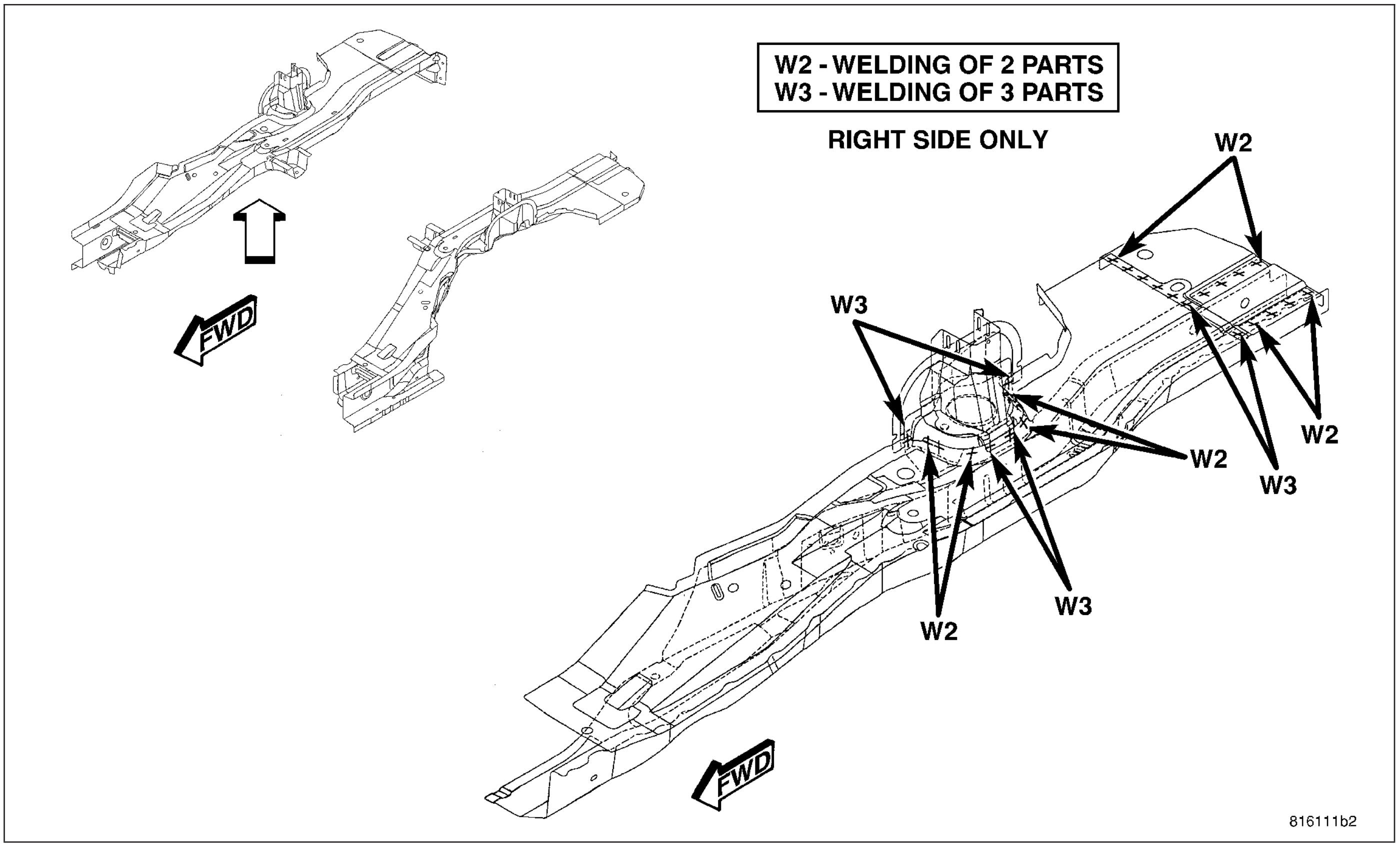


Fig. 98 SIDEMEMBER ASSEMBLY (9 OF 17)

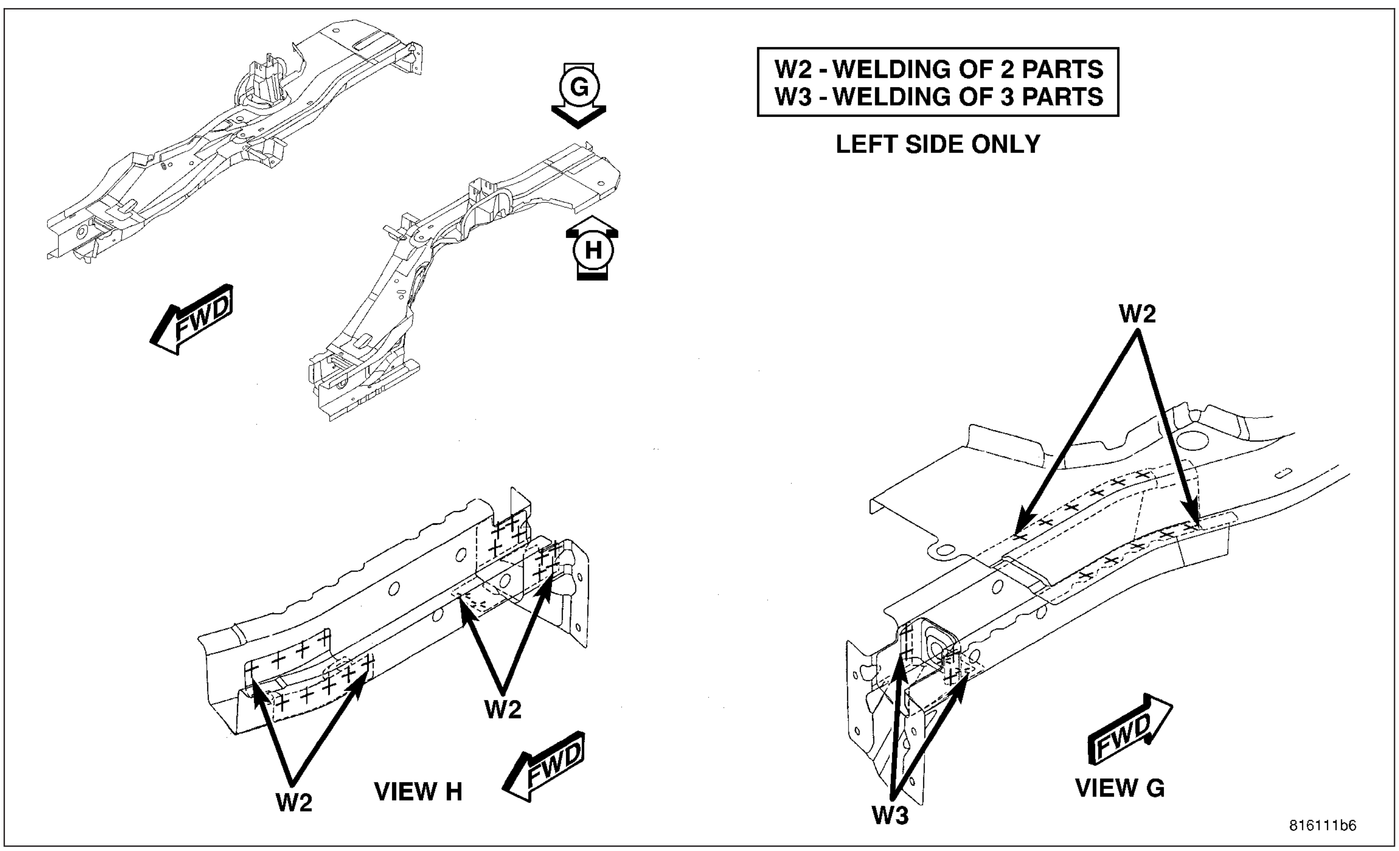


Fig. 99 SIDEMEMBER ASSEMBLY (10 OF 17)

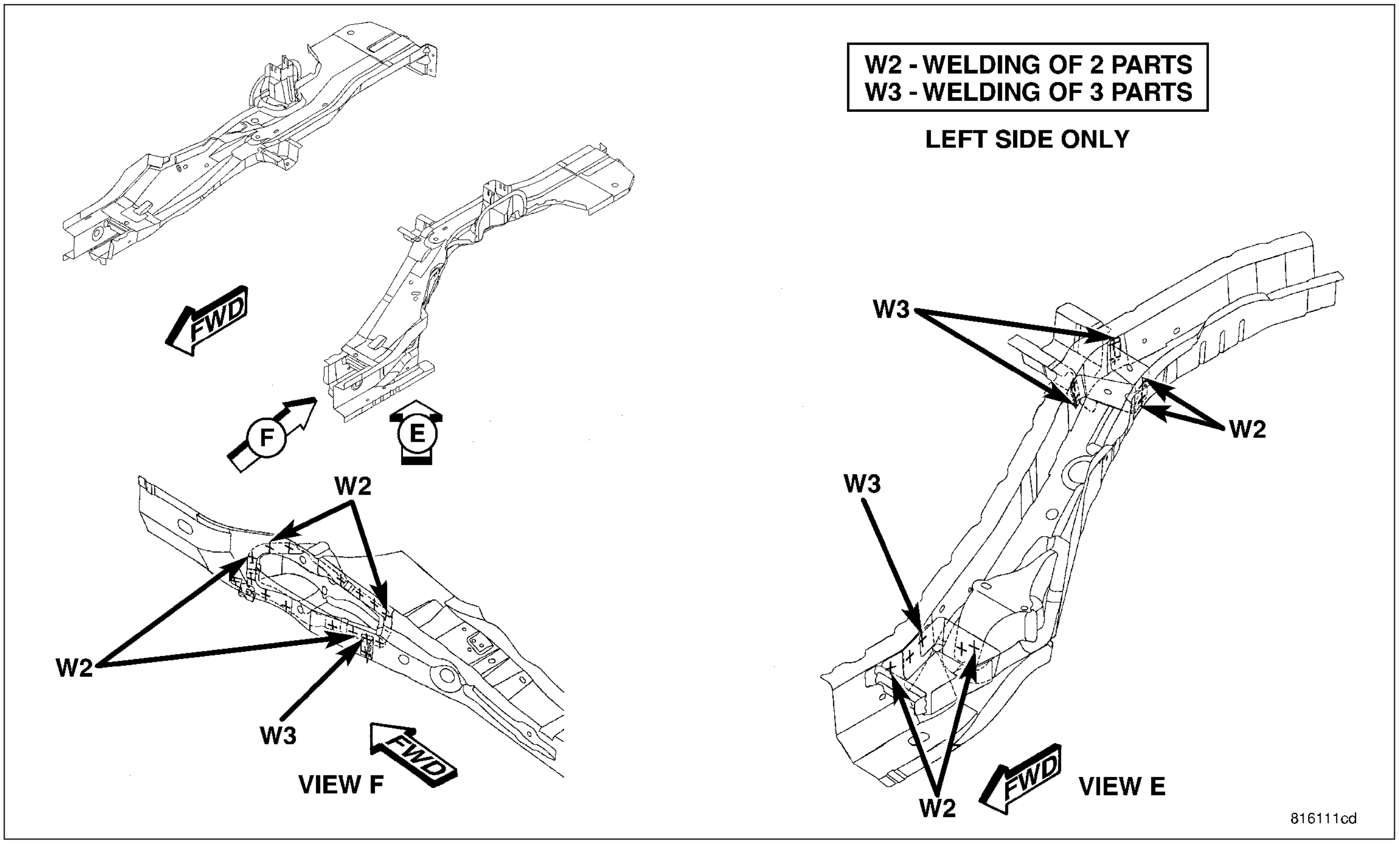


Fig. 100 SIDEMEMBER ASSEMBLY (11 OF 17)

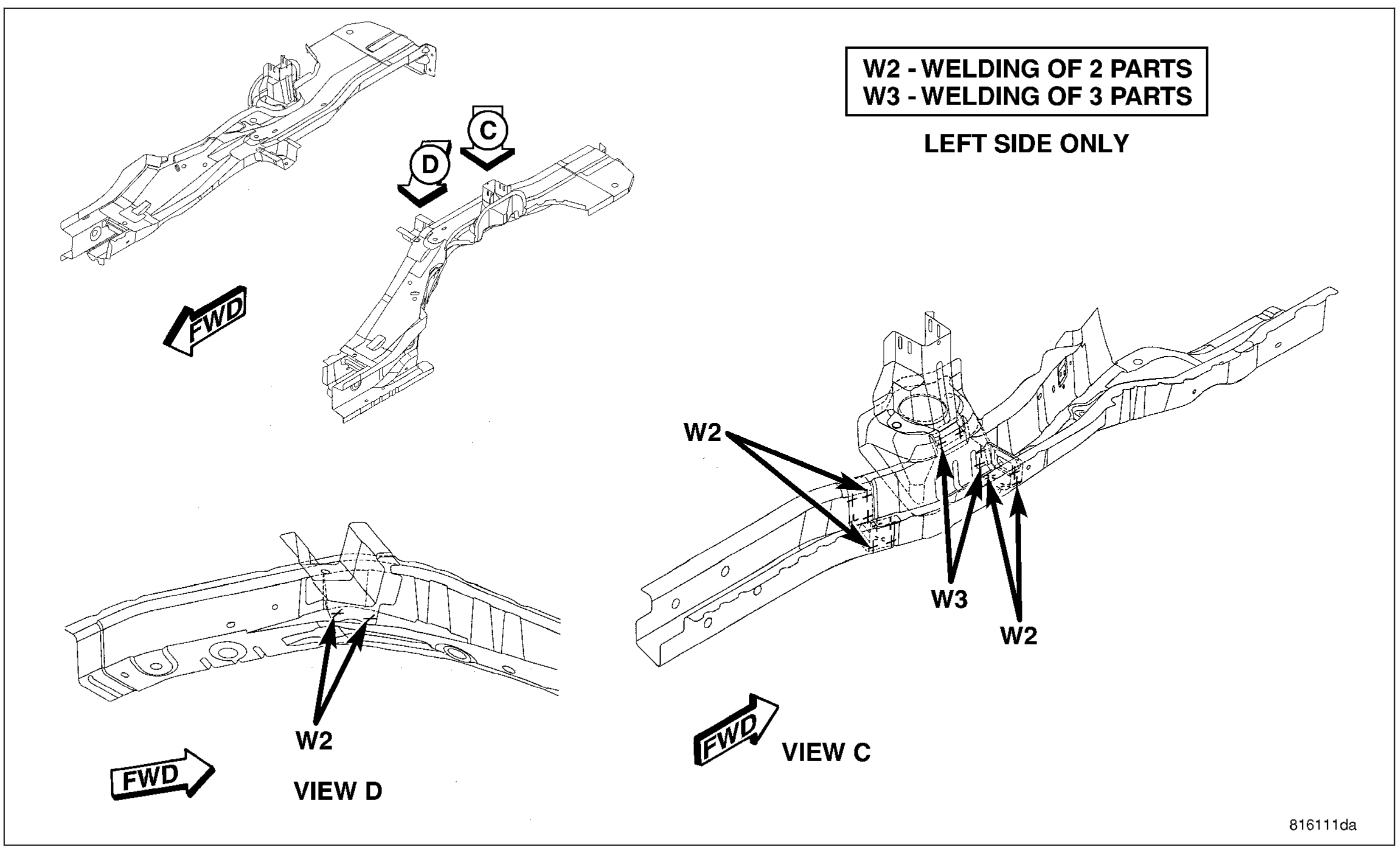


Fig. 101 SIDEMEMBER ASSEMBLY (12 OF 17)

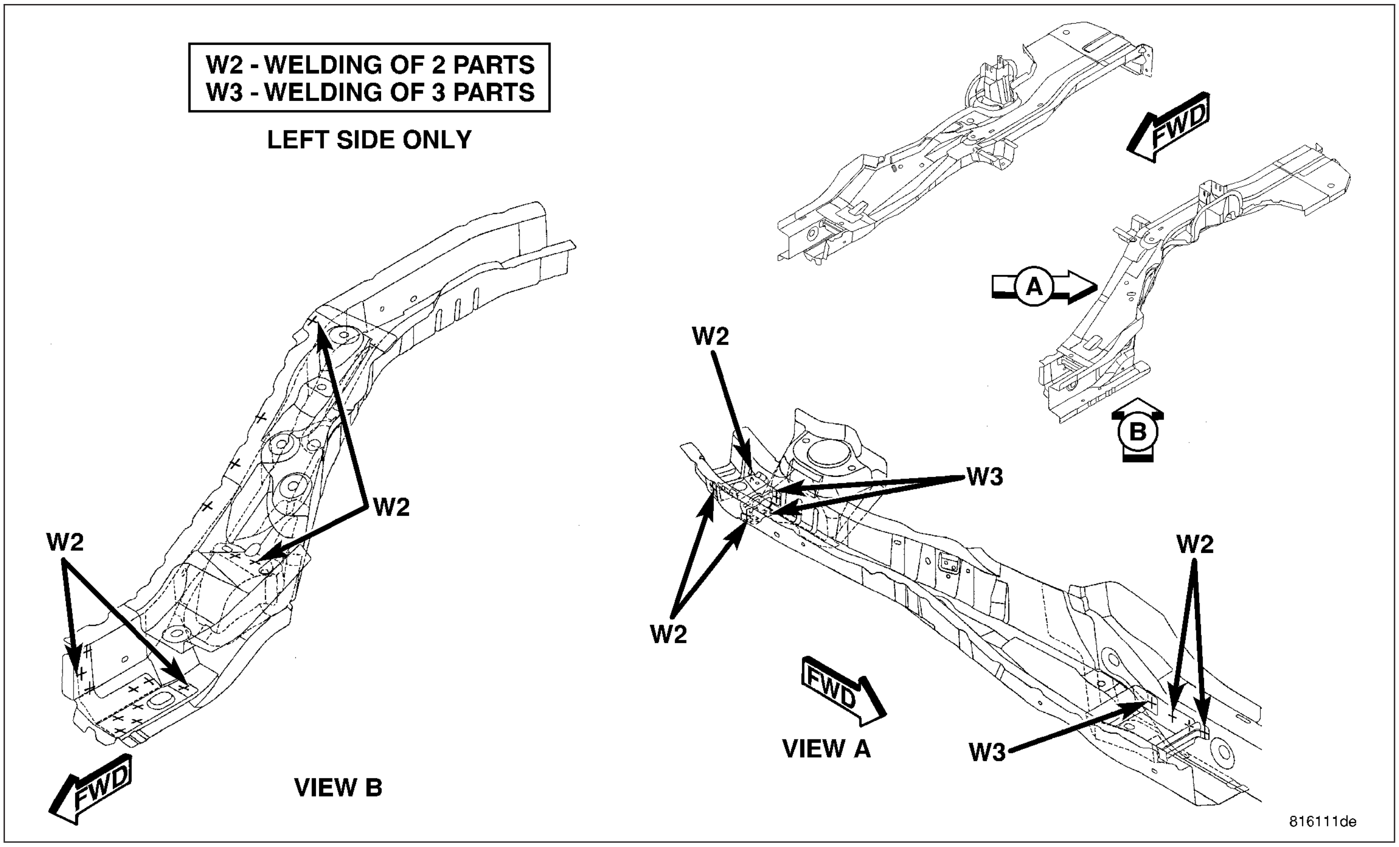


Fig. 102 SIDEMEMBER ASSEMBLY (13 OF 17)

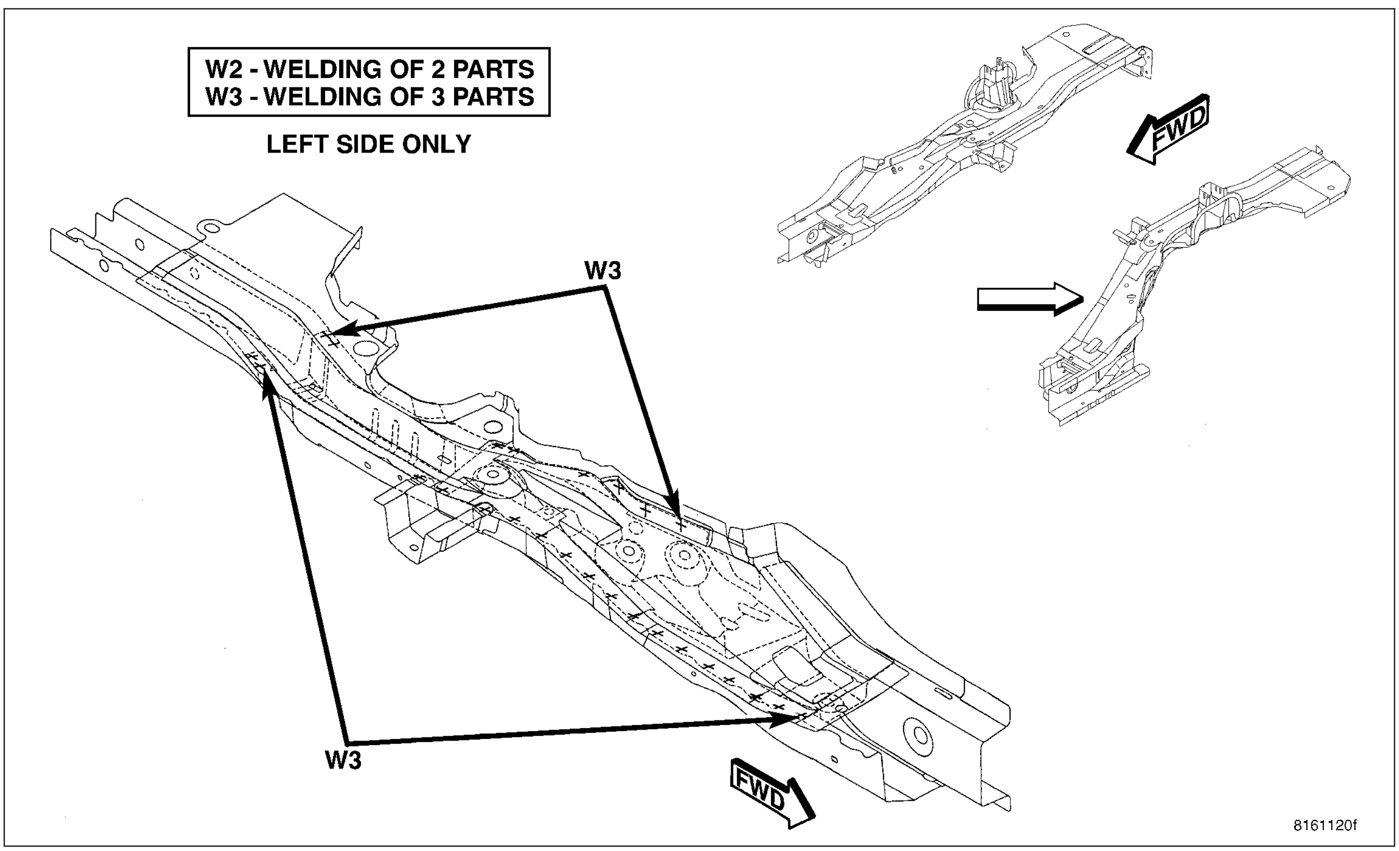


Fig. 103 SIDEMEMBER ASSEMBLY (14 OF 17)

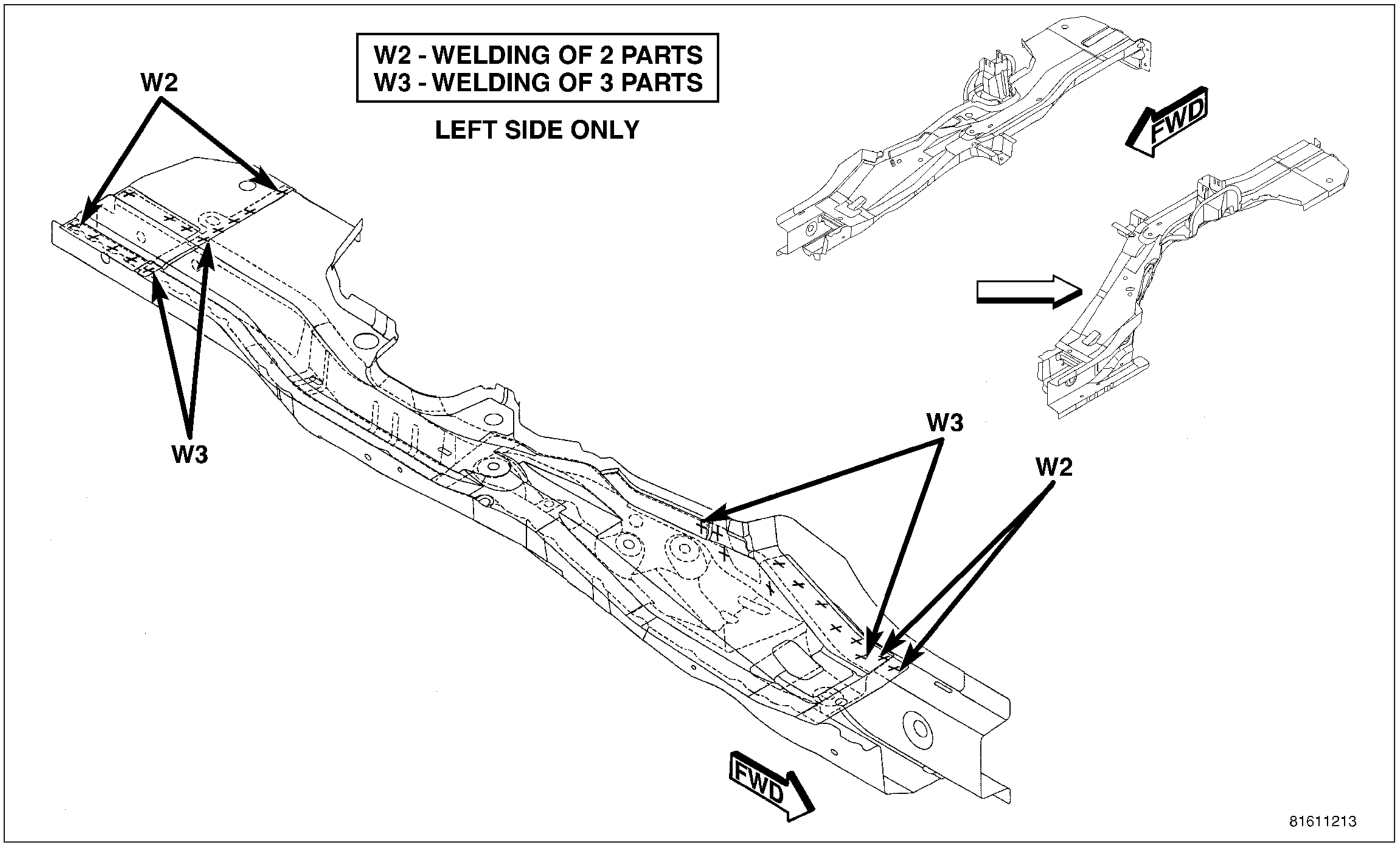


Fig. 104 SIDEMEMBER ASSEMBLY (15 OF 17)

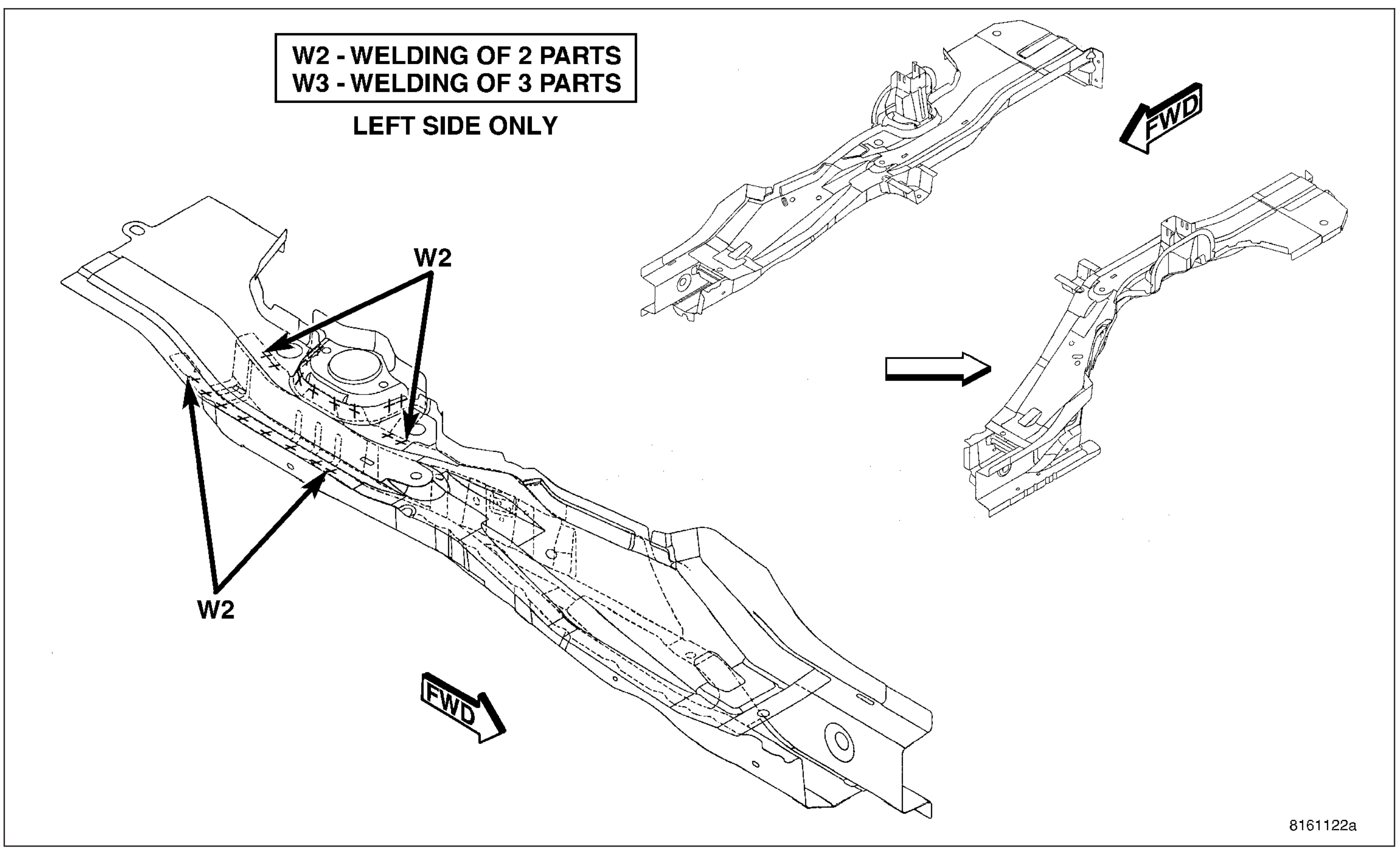


Fig. 105 SIDEMEMBER ASSEMBLY (16 OF 17)

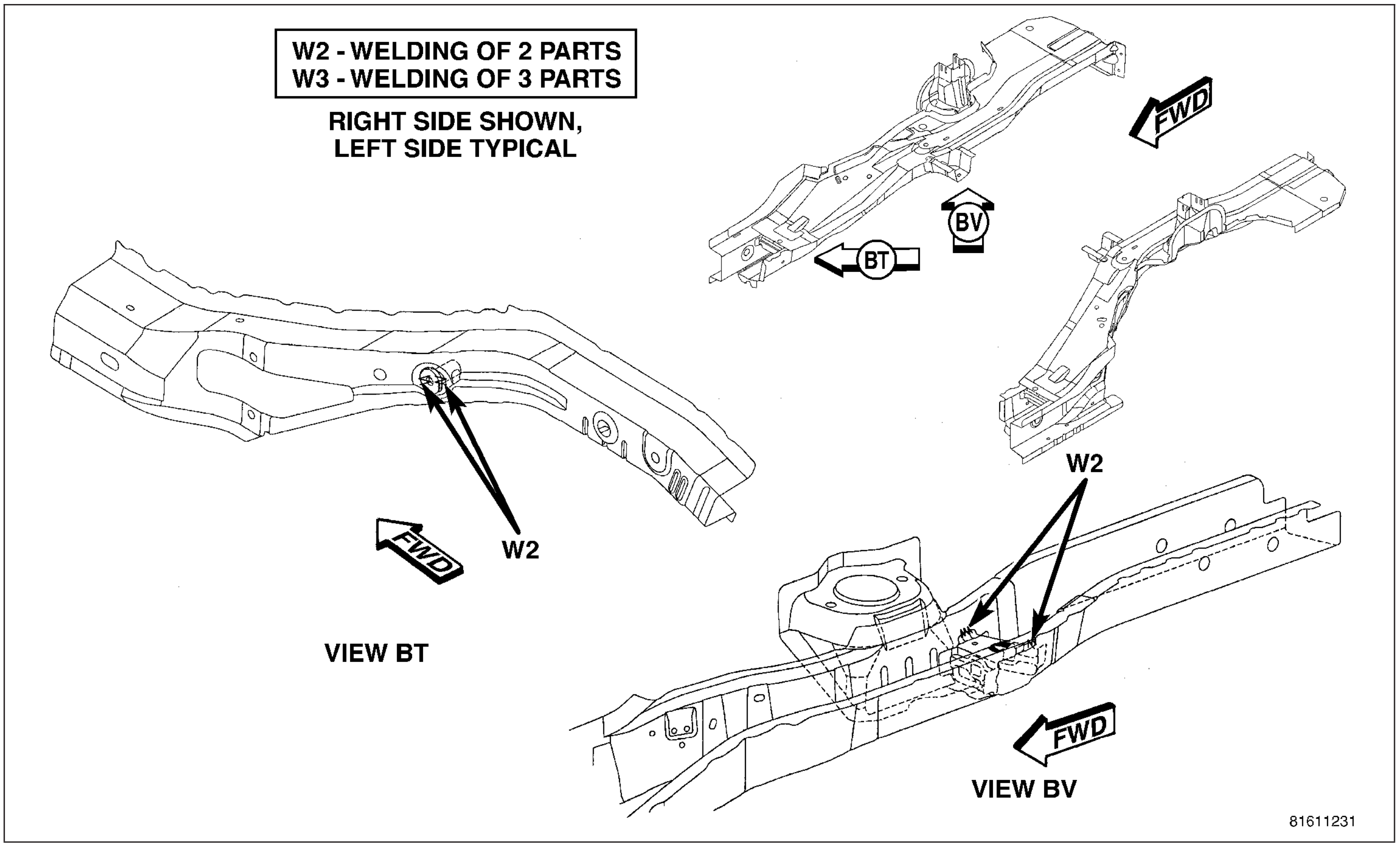


Fig. 106 SIDEMEMBER ASSEMBLY (17 OF 17)

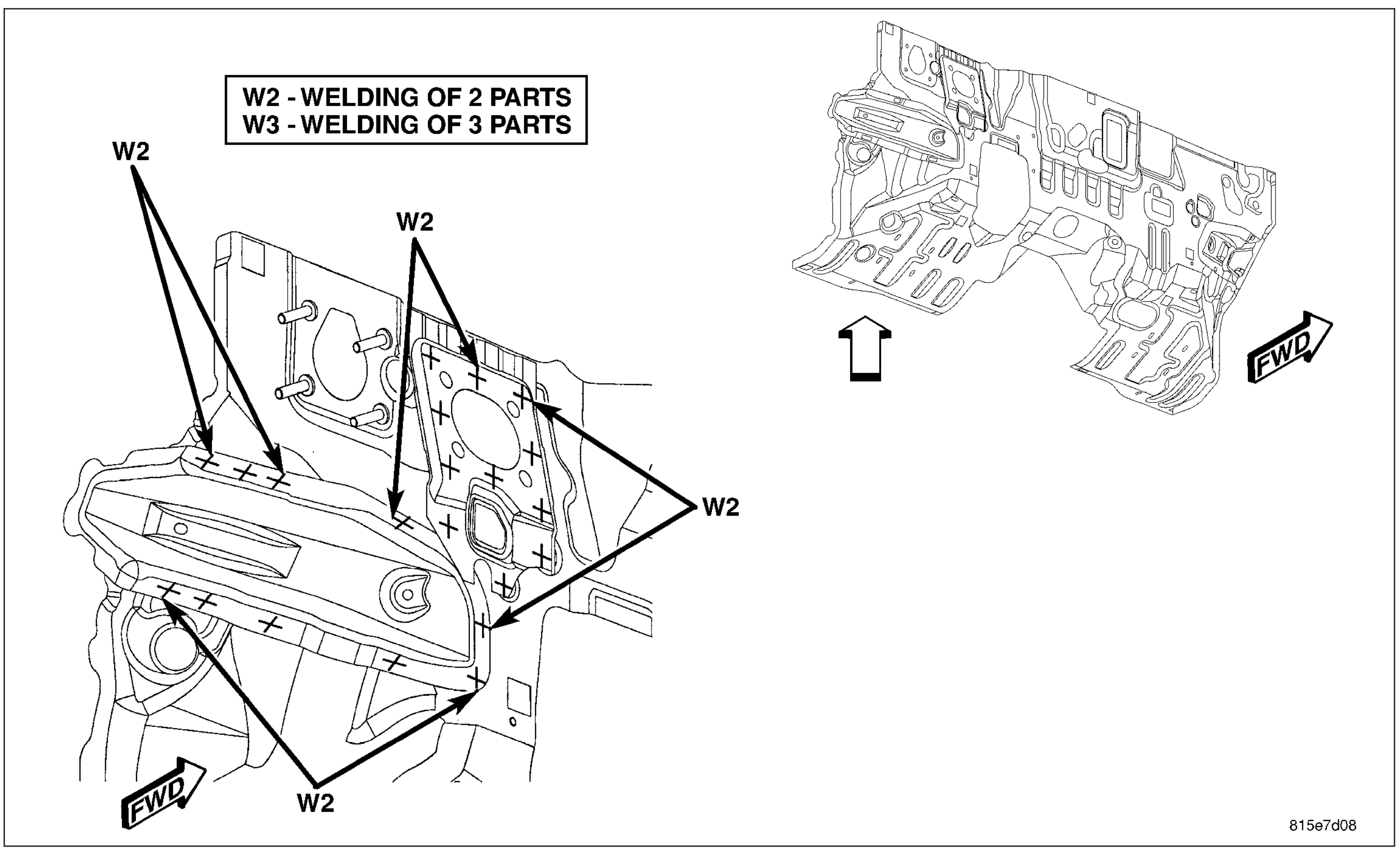


Fig. 107 DASH PANEL (1 OF 2)

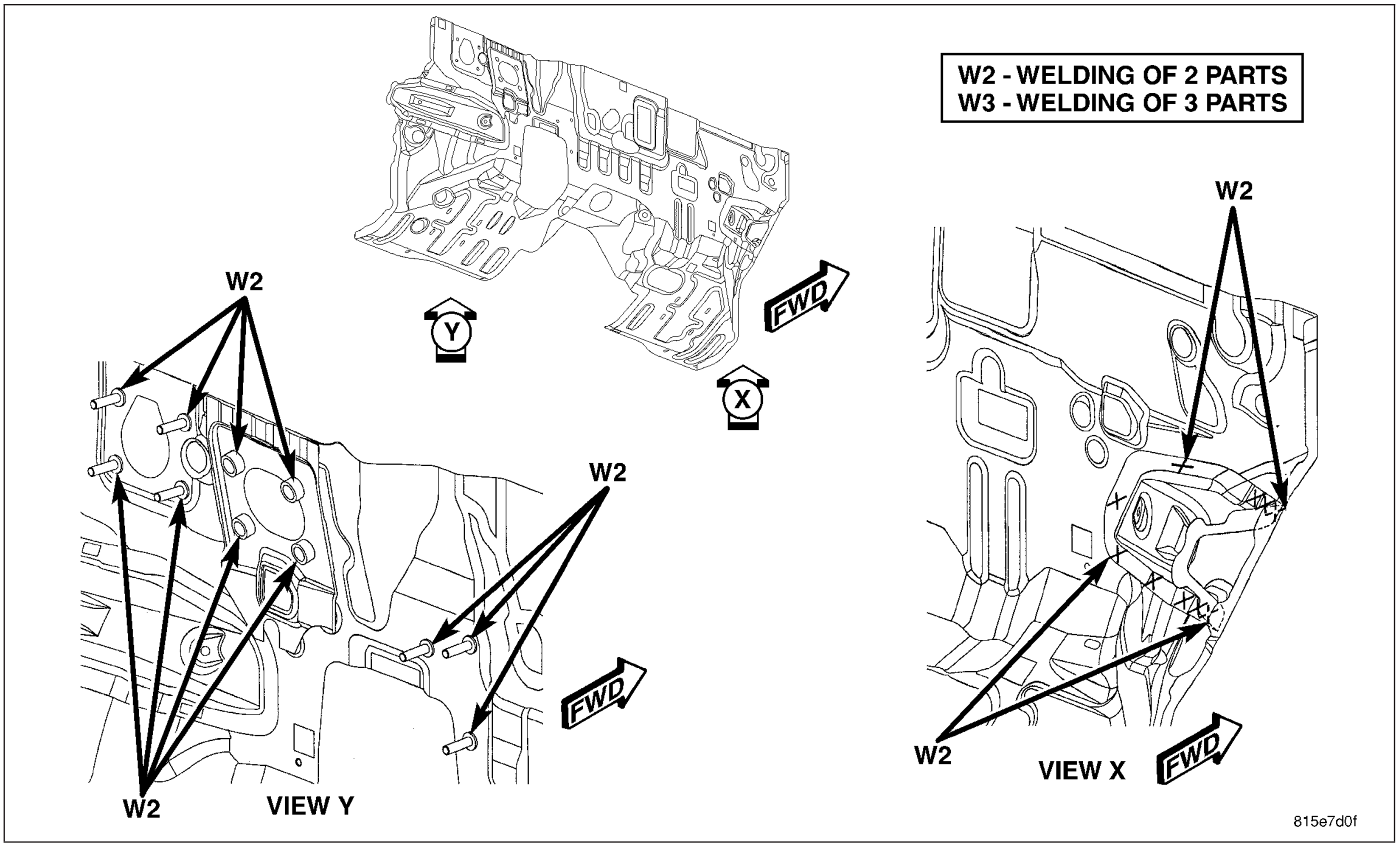


Fig. 108 DASH PANEL (2 OF 2)

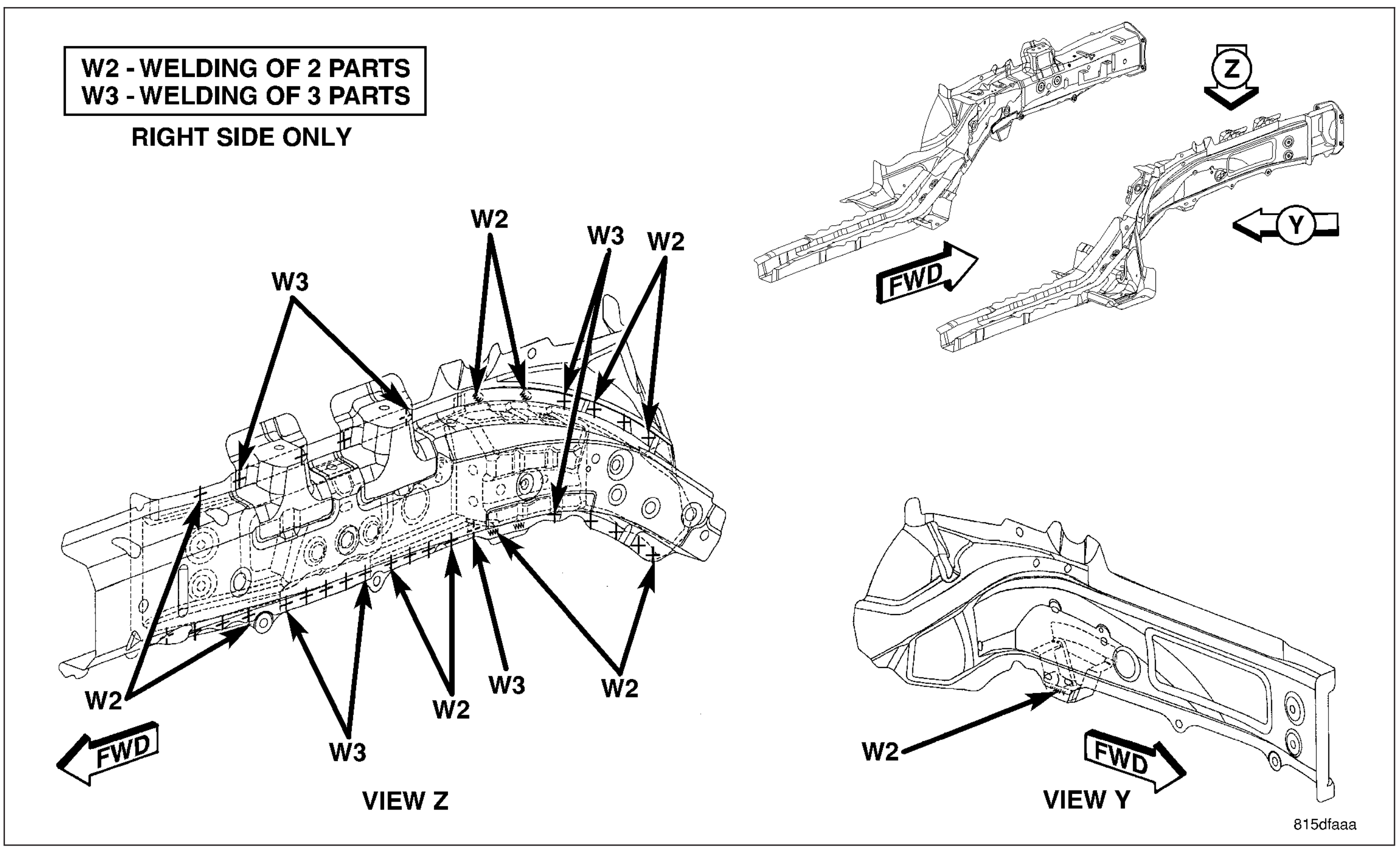


Fig. 109 FRONT RAILS (1 OF 13)

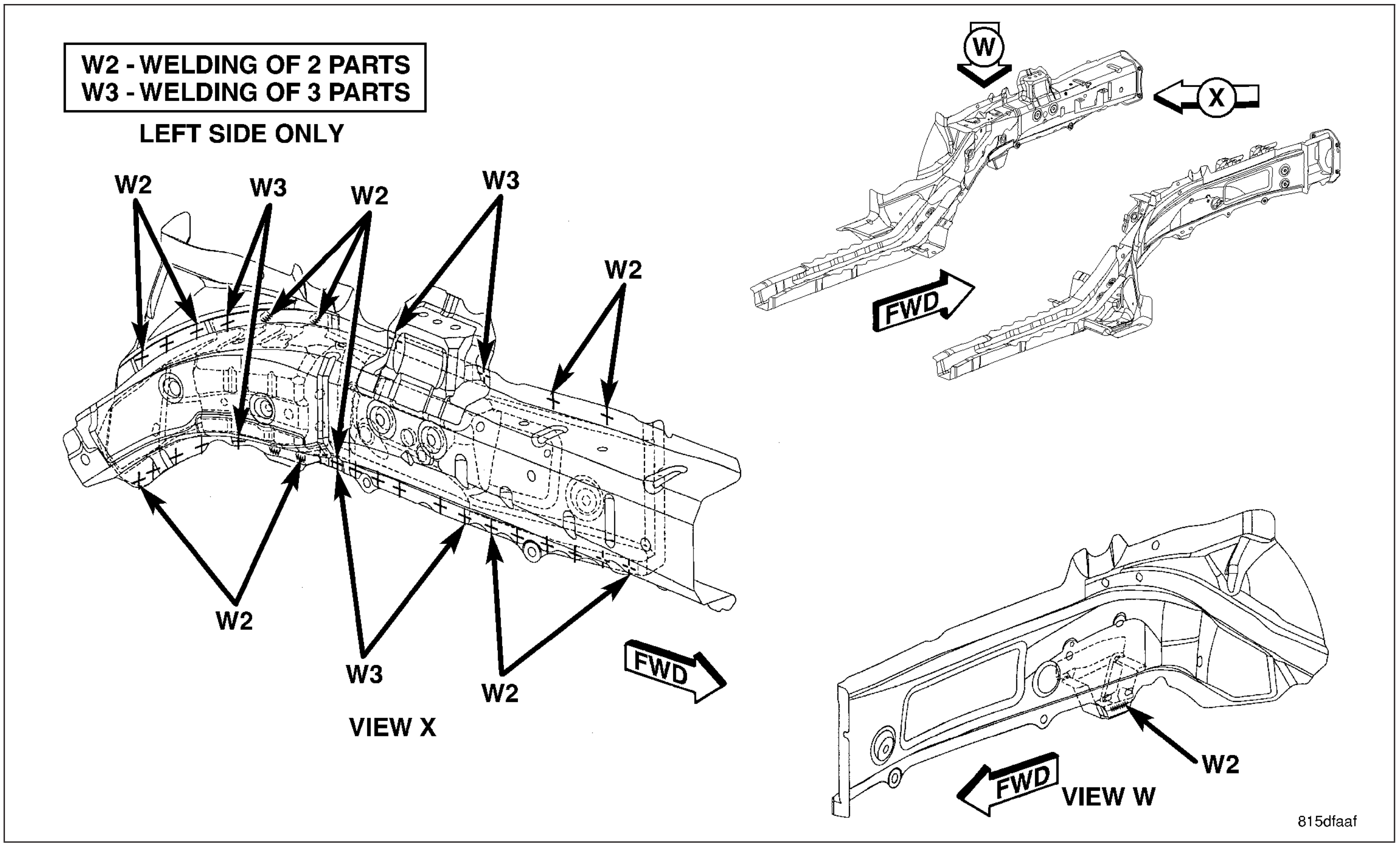


Fig. 110 FRONT RAILS (2 OF 13)

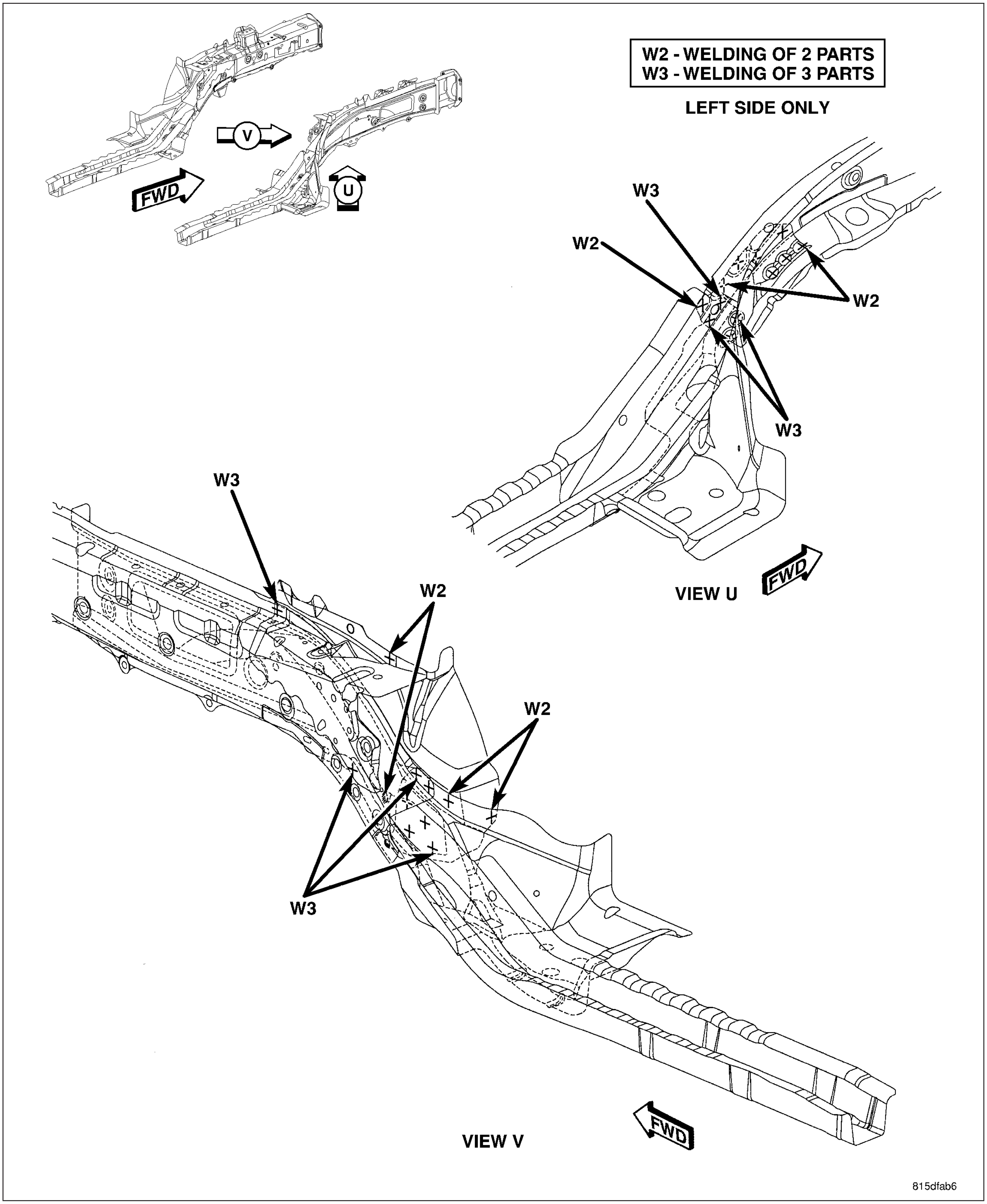


Fig. 111 FRONT RAILS (3 OF 13)

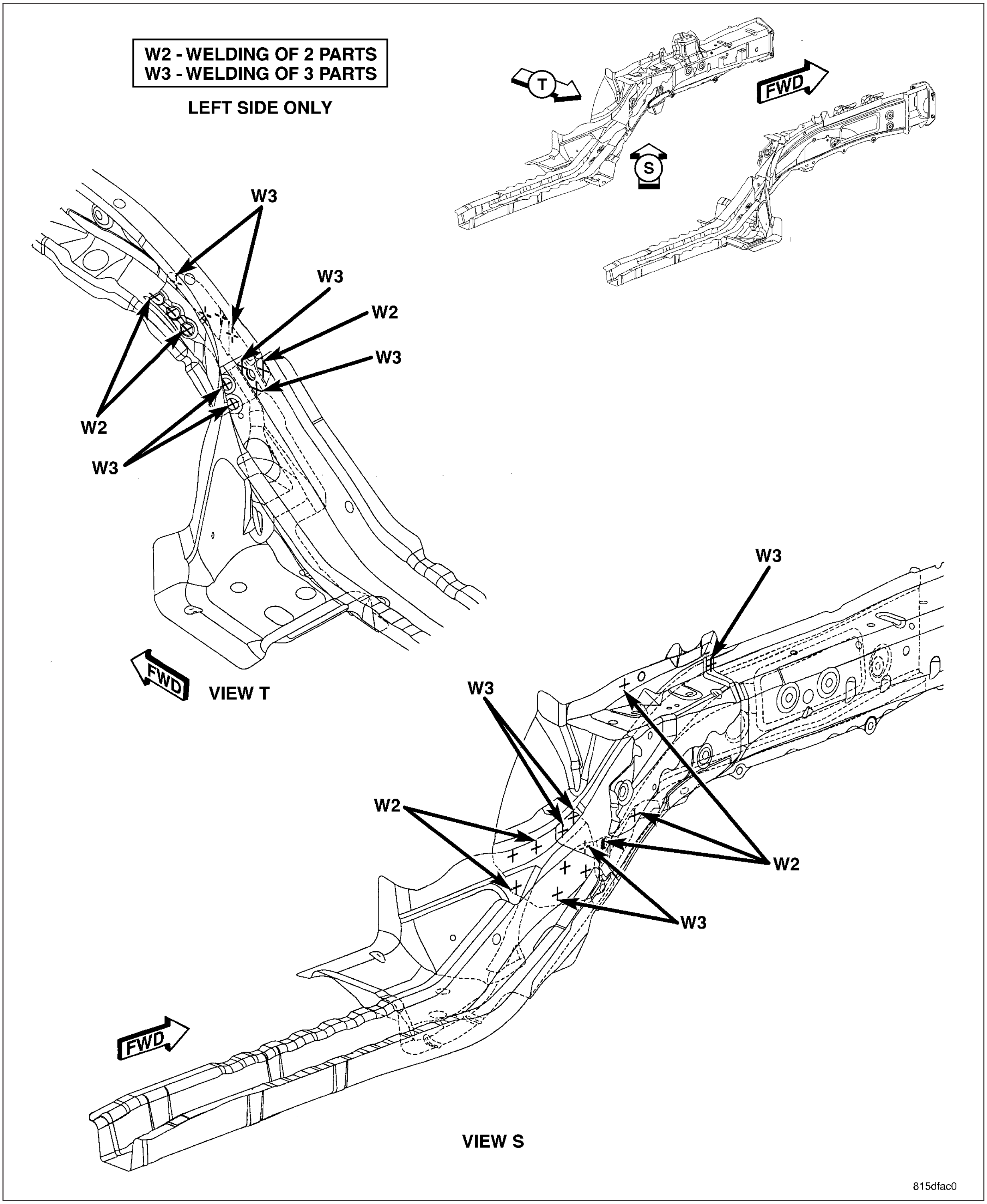


Fig. 112 FRONT RAILS (4 OF 13)

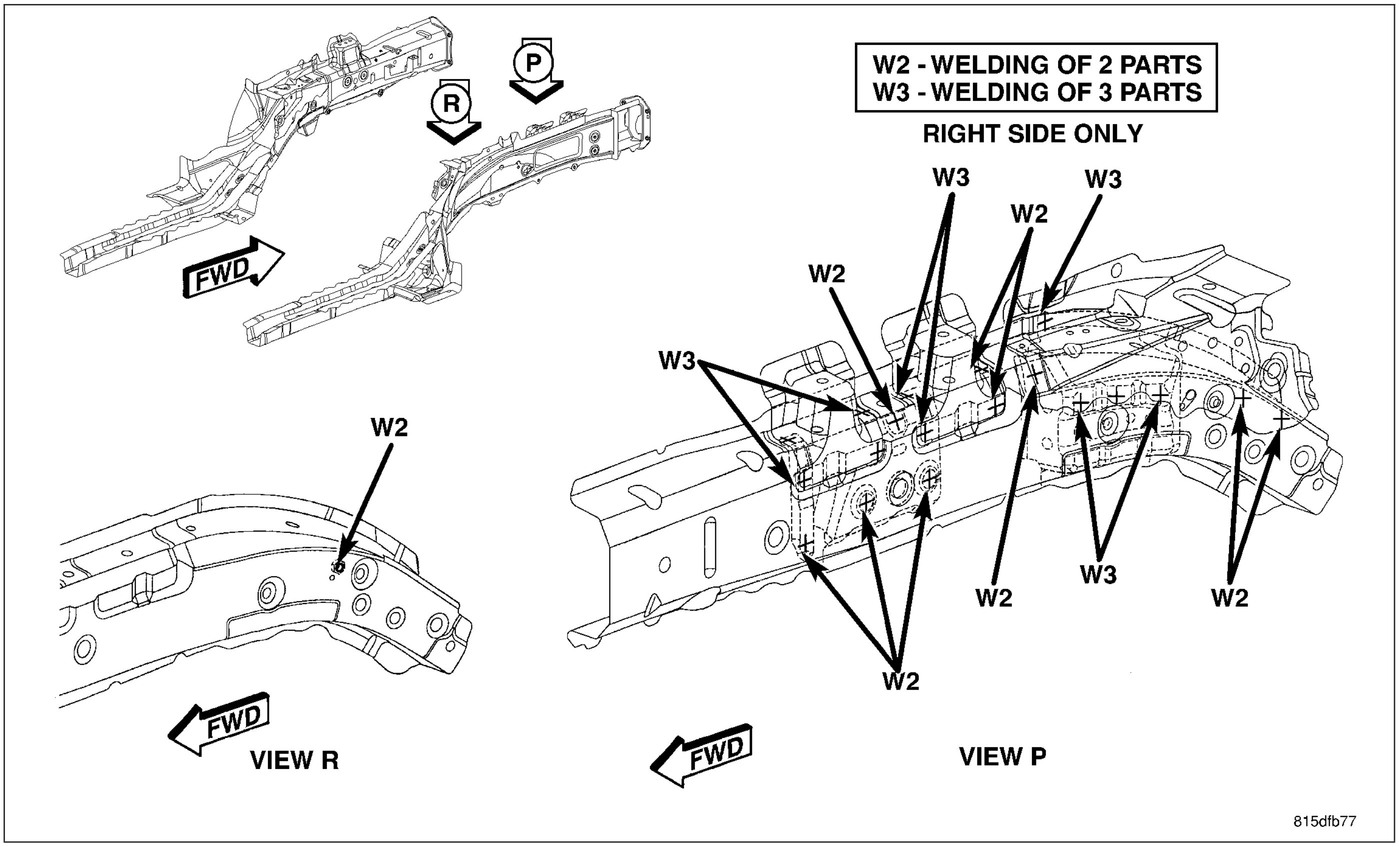


Fig. 113 FRONT RAILS (5 OF 13)

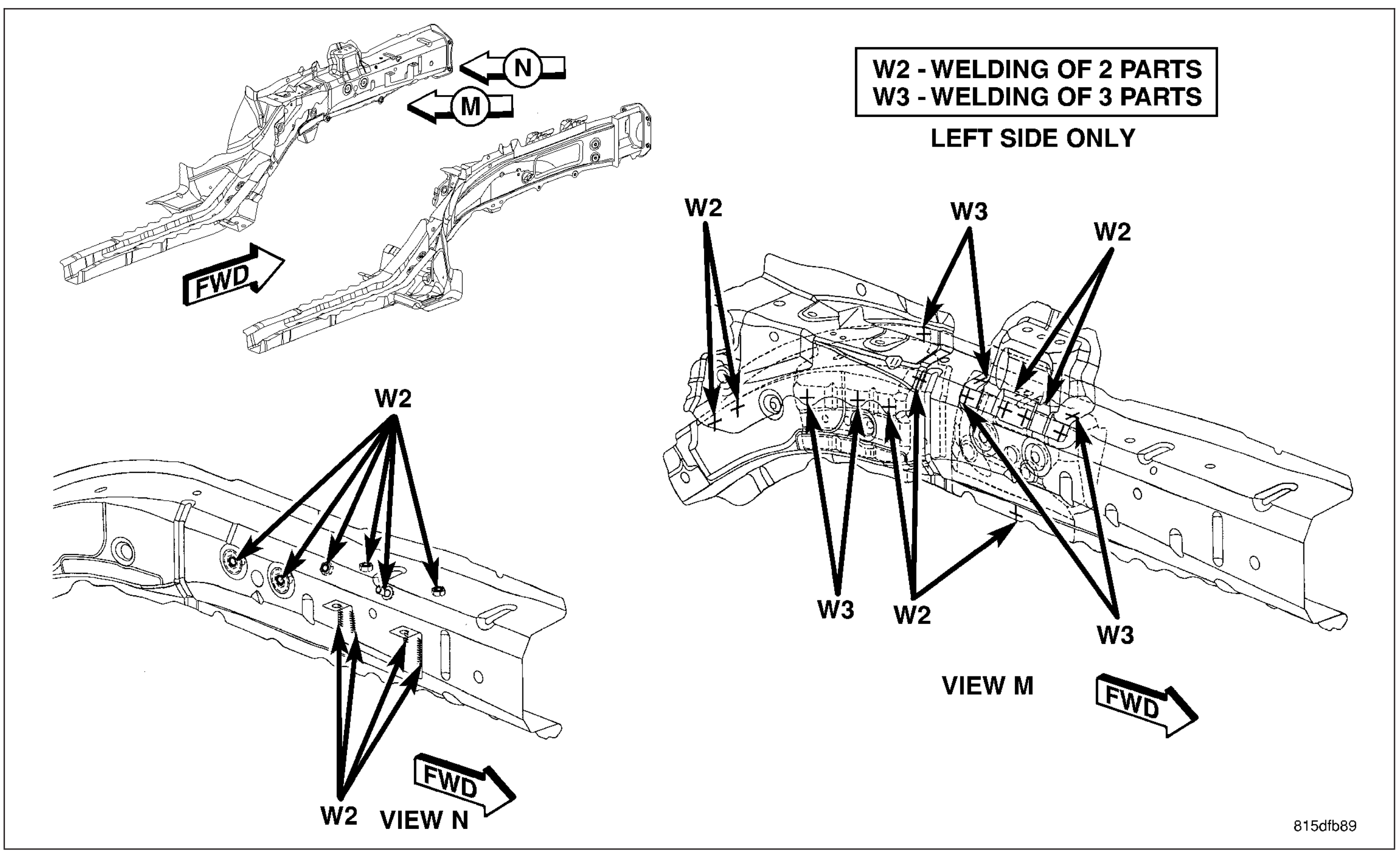


Fig. 114 FRONT RAILS (6 OF 13)

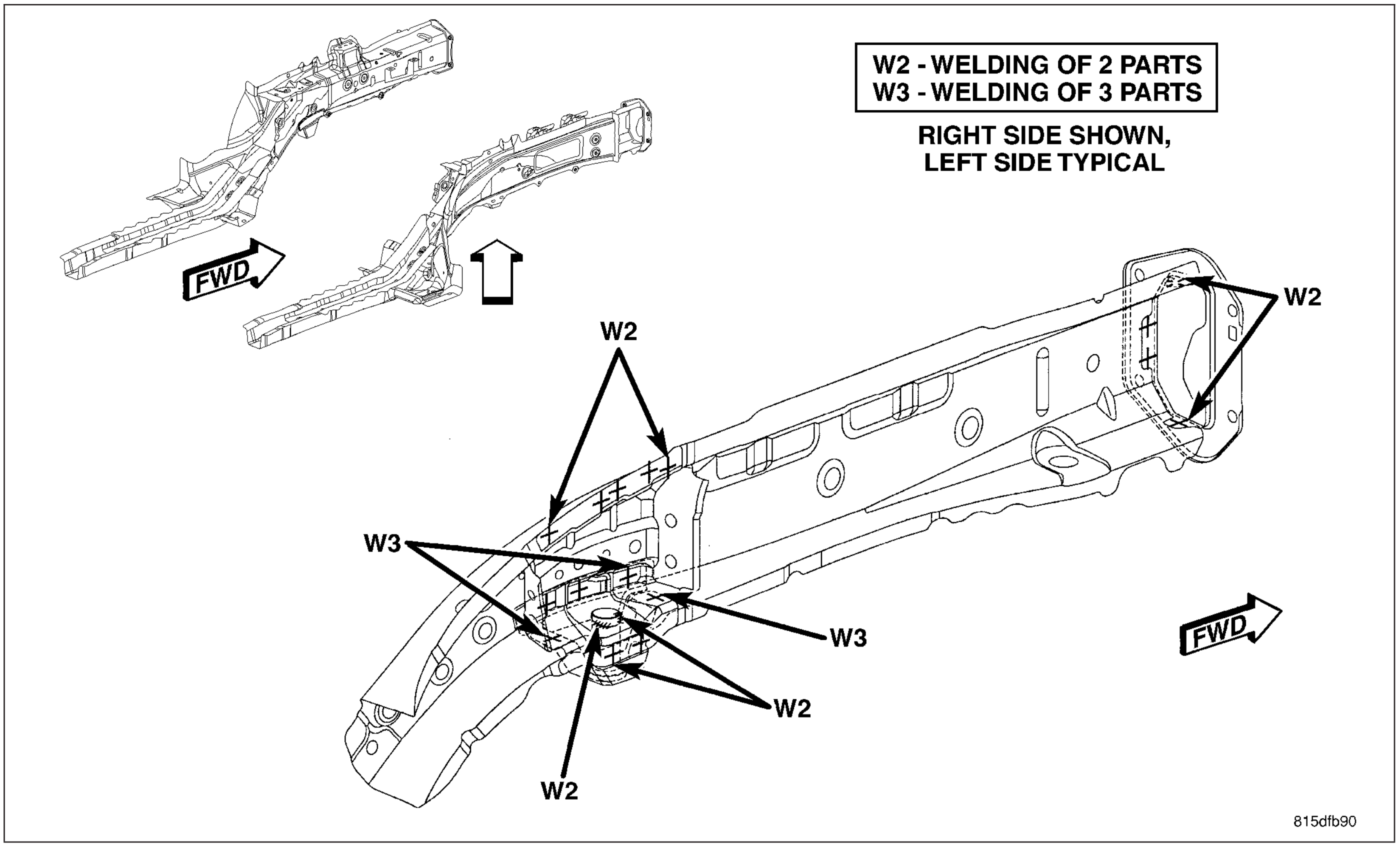


Fig. 115 FRONT RAILS (7 OF 13)

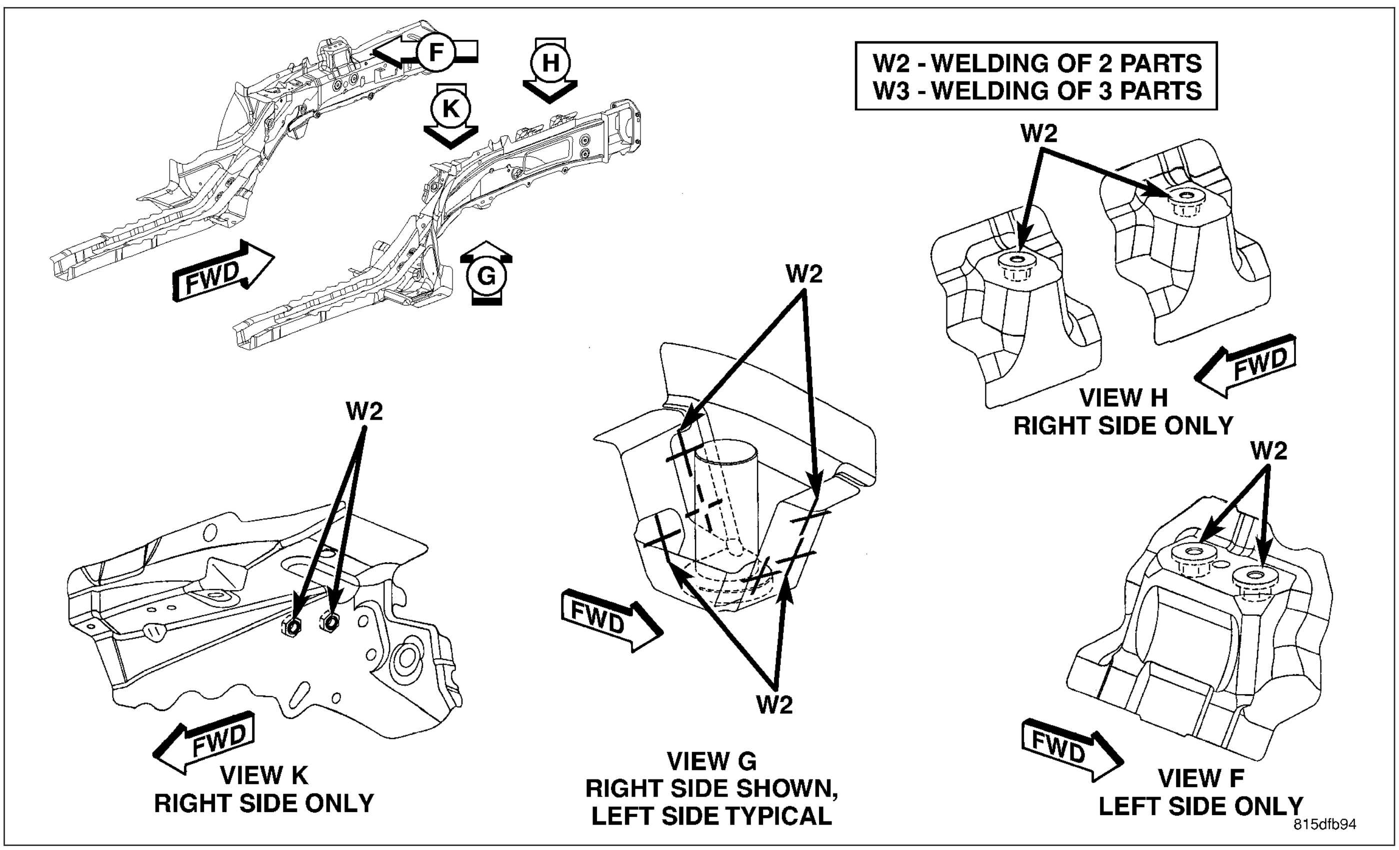


Fig. 116 FRONT RAILS (8 OF 13)

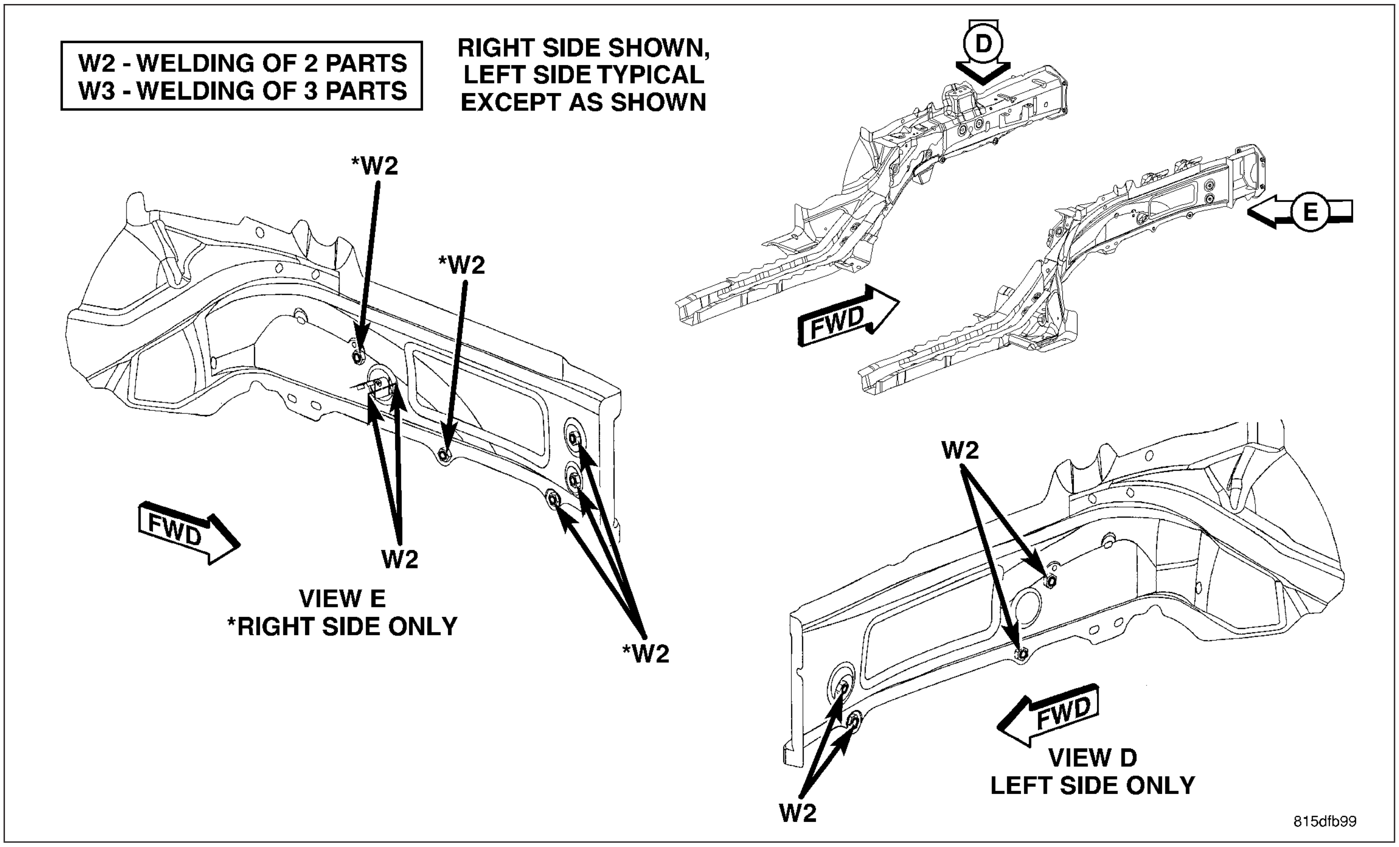


Fig. 117 FRONT RAILS (9 OF 13)

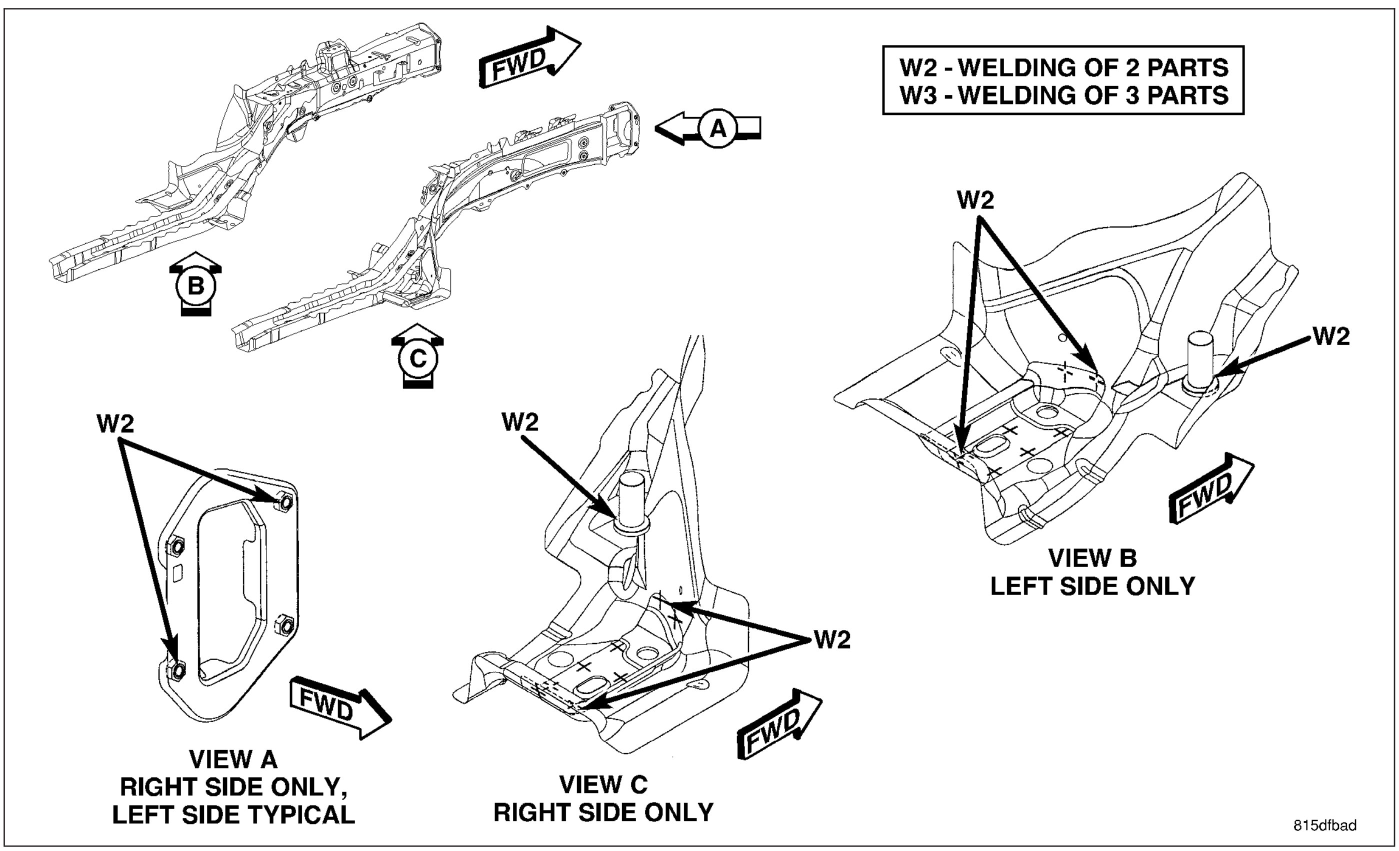


Fig. 118 FRONT RAILS (10 OF 13)

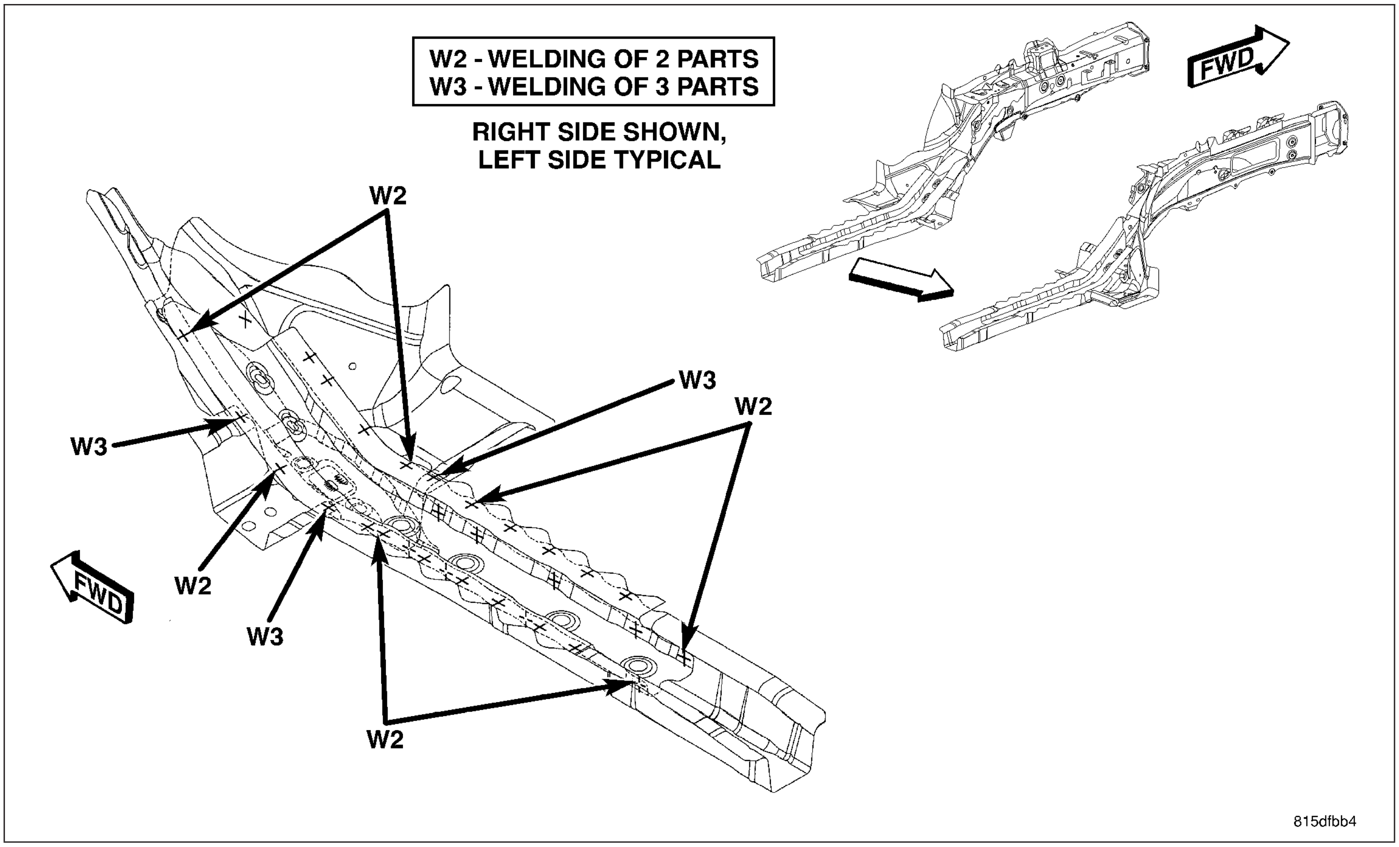


Fig. 119 FRONT RAILS (11 OF 13)

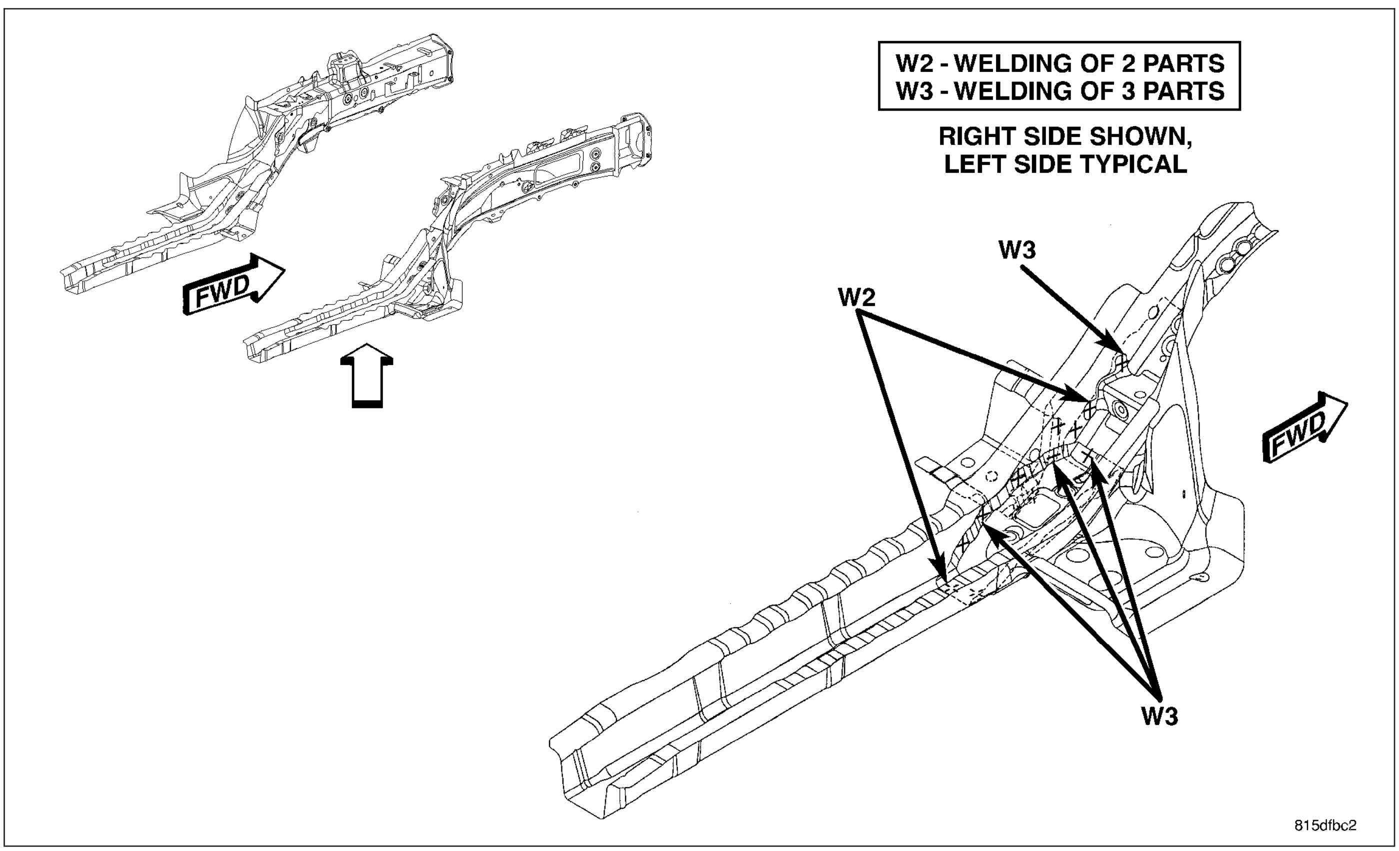


Fig. 120 FRONT RAILS (12 OF 12)

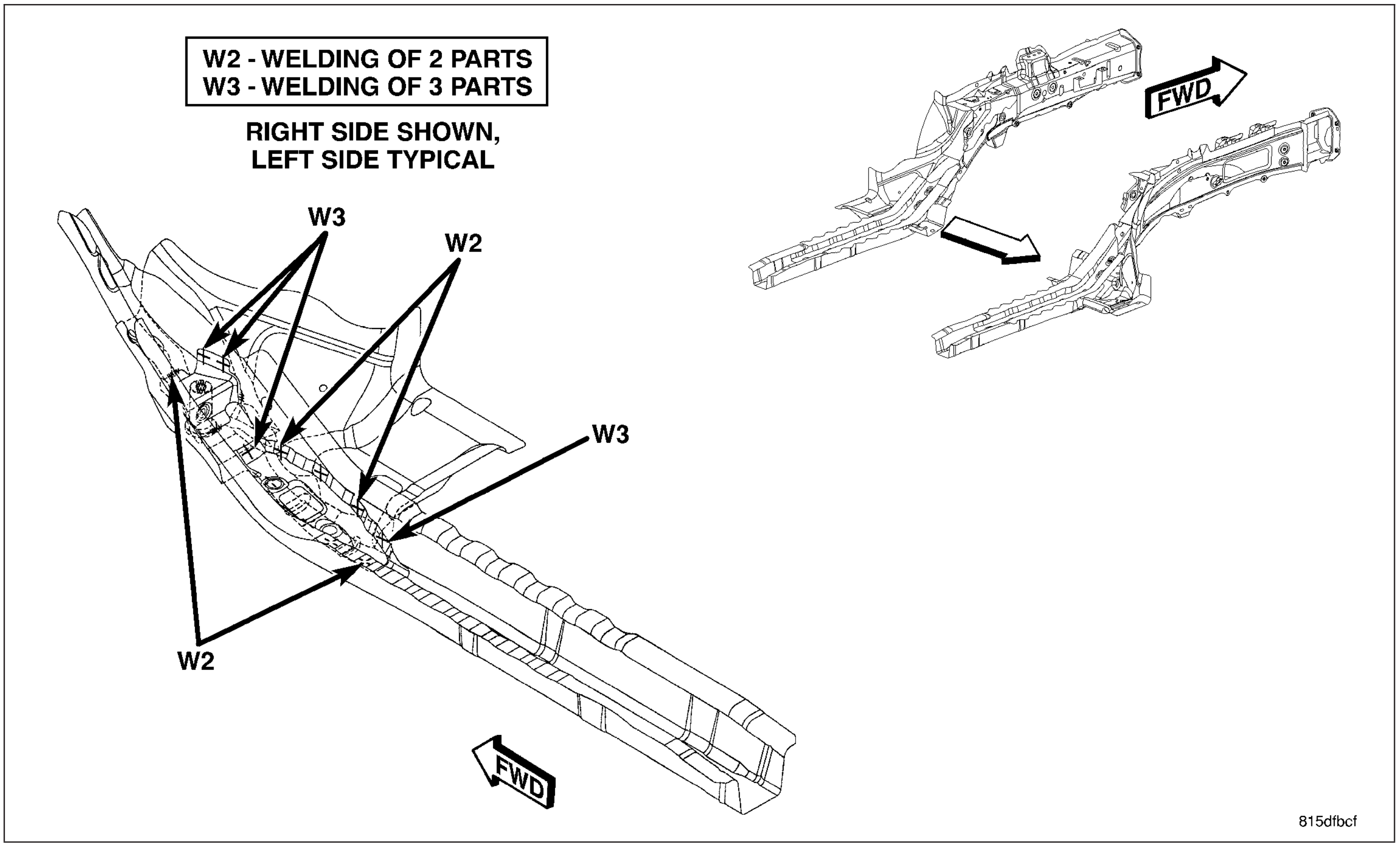


Fig. 121 FRONT RAILS (13 OF 13)

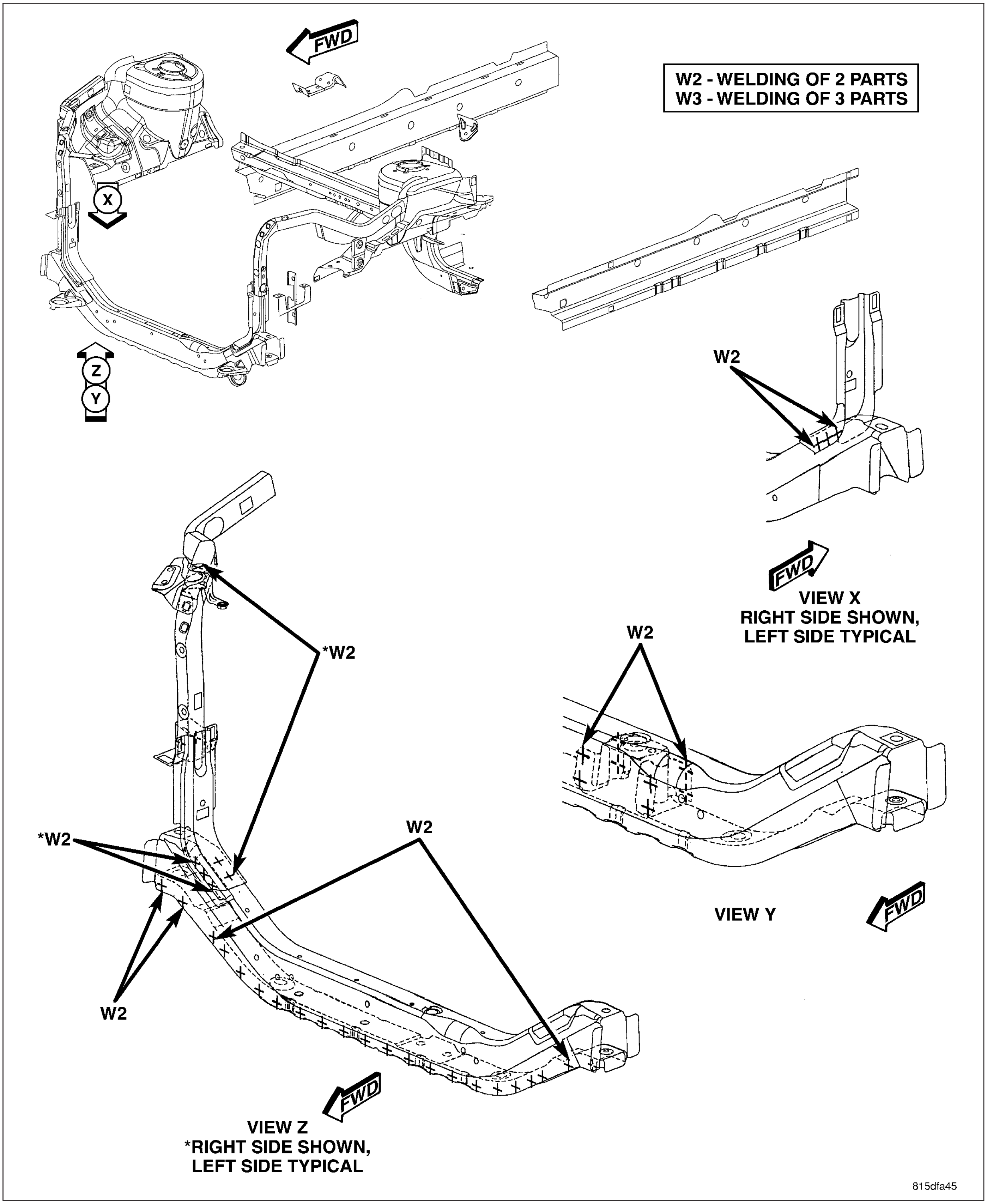


Fig. 122 ENGINE BOX (1 OF 10)

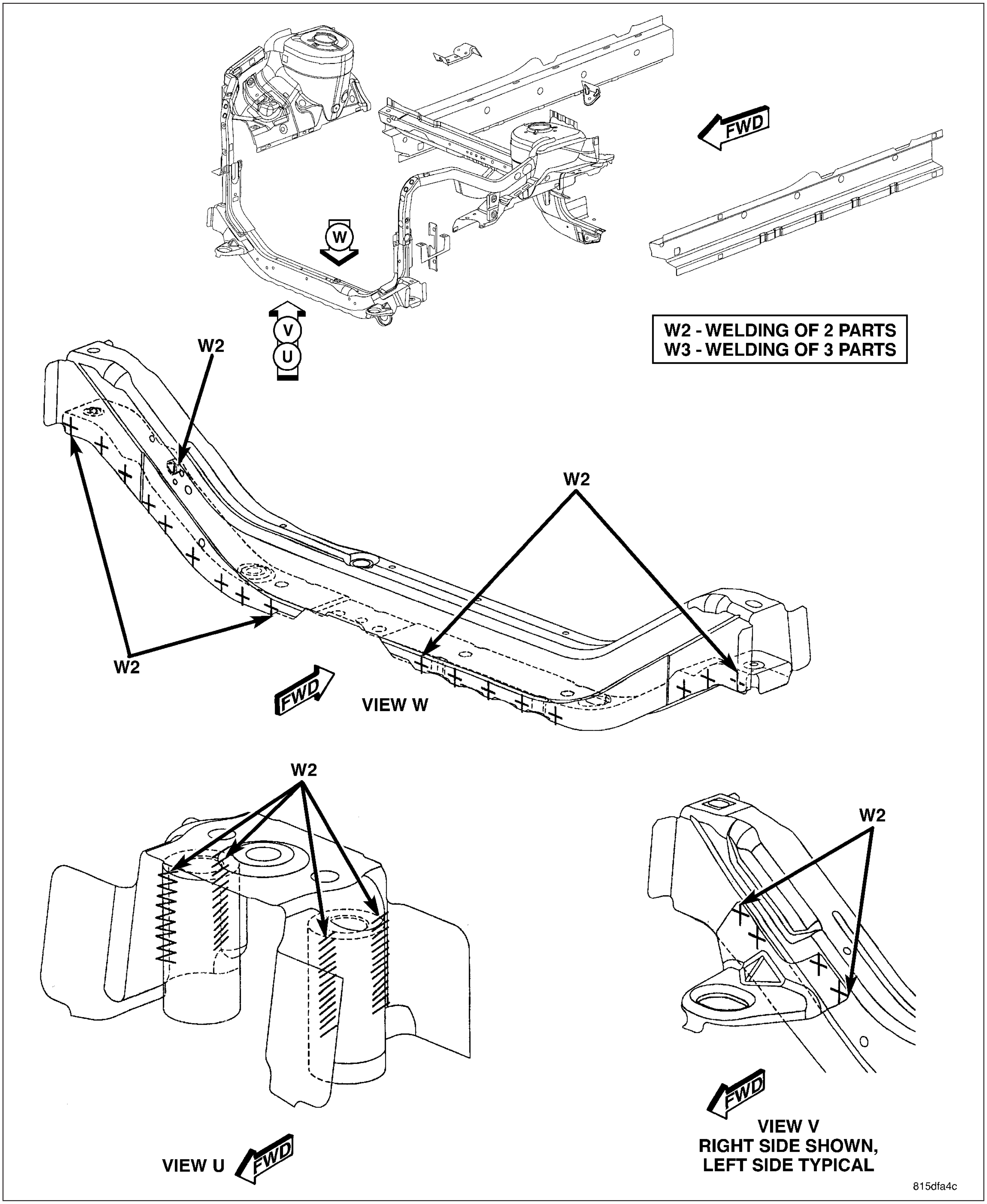


Fig. 123 ENGINE BOX (2 OF 10)

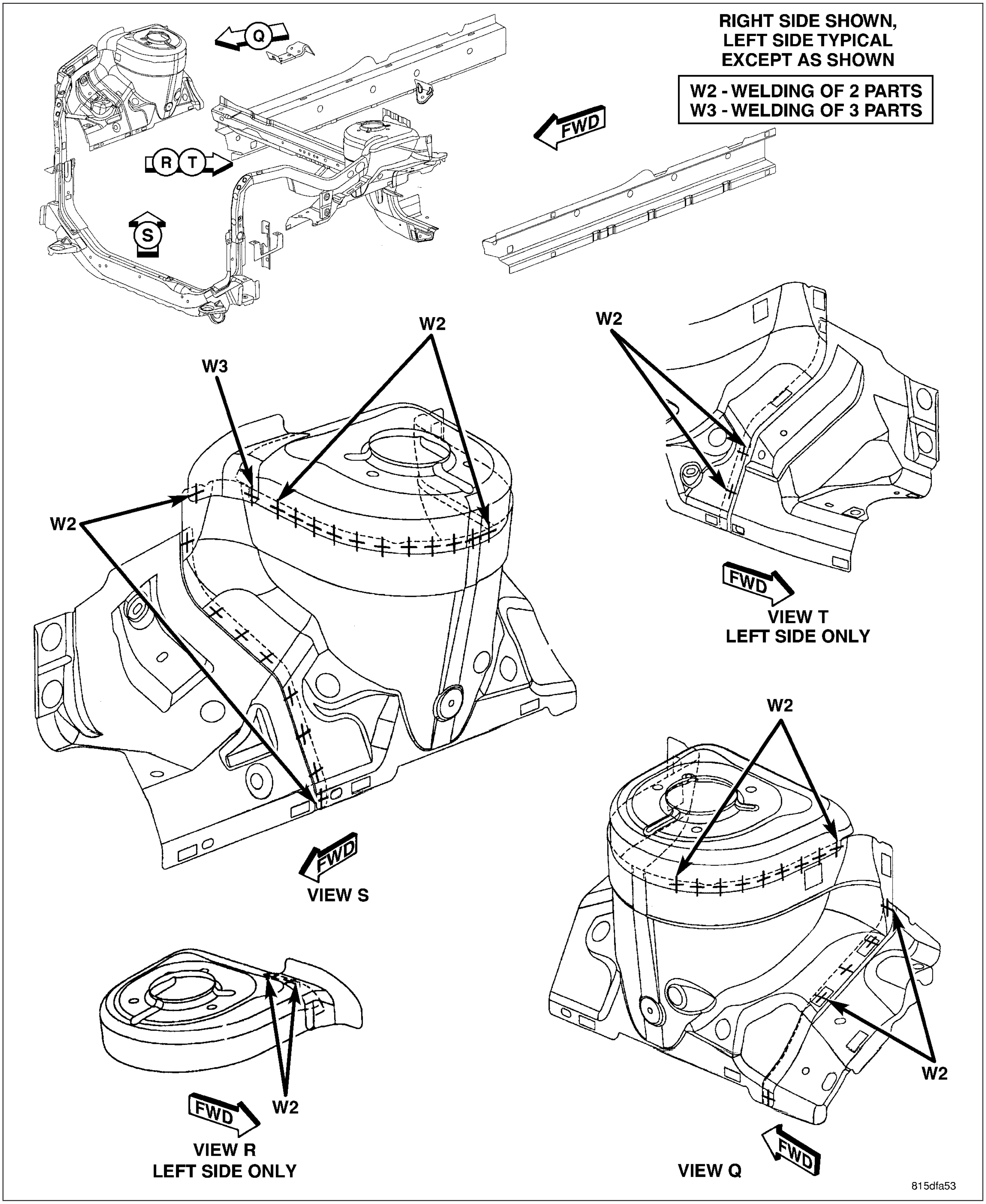


Fig. 124 ENGINE BOX (3 OF 10)

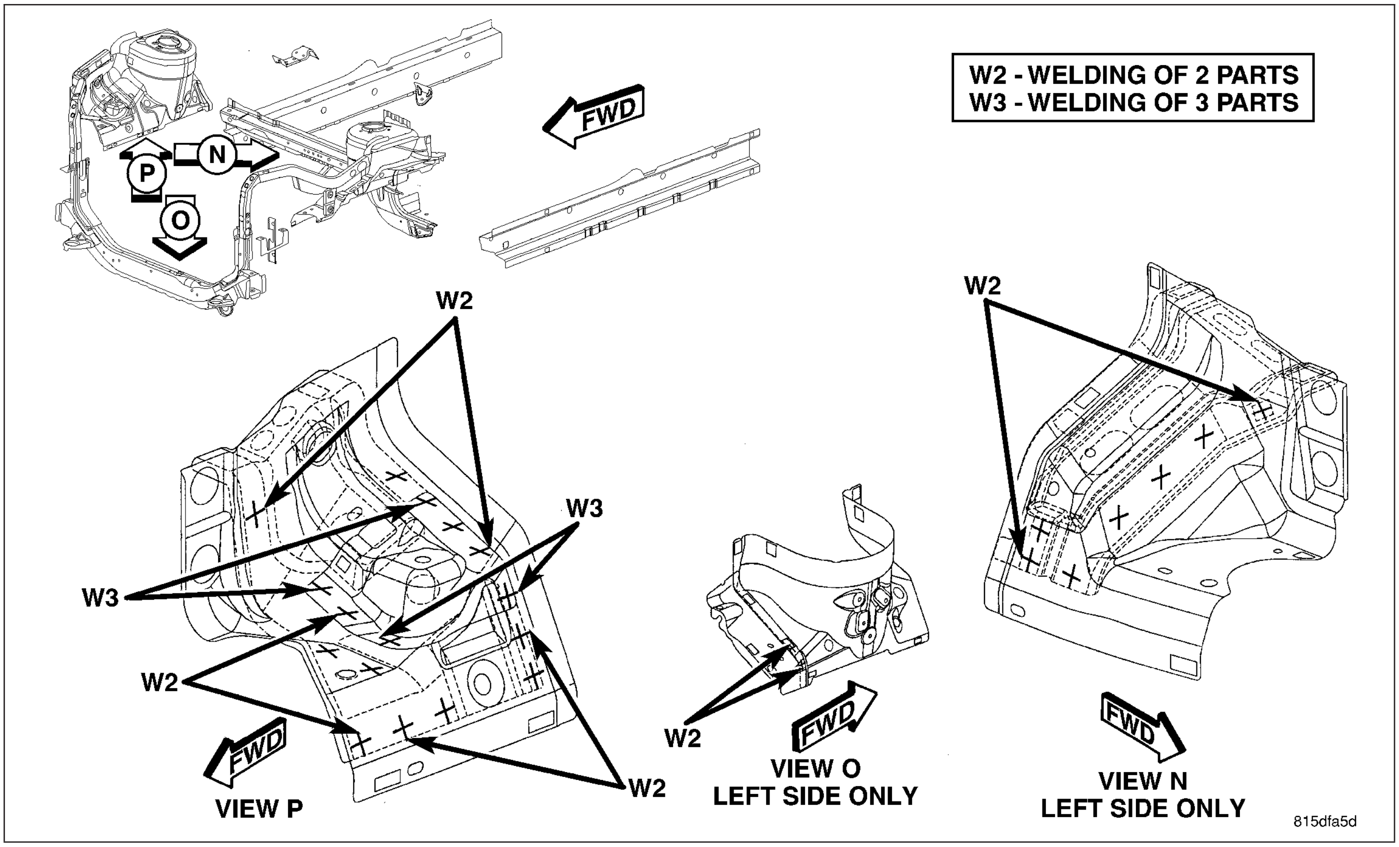


Fig. 125 ENGINE BOX (4 OF 10)

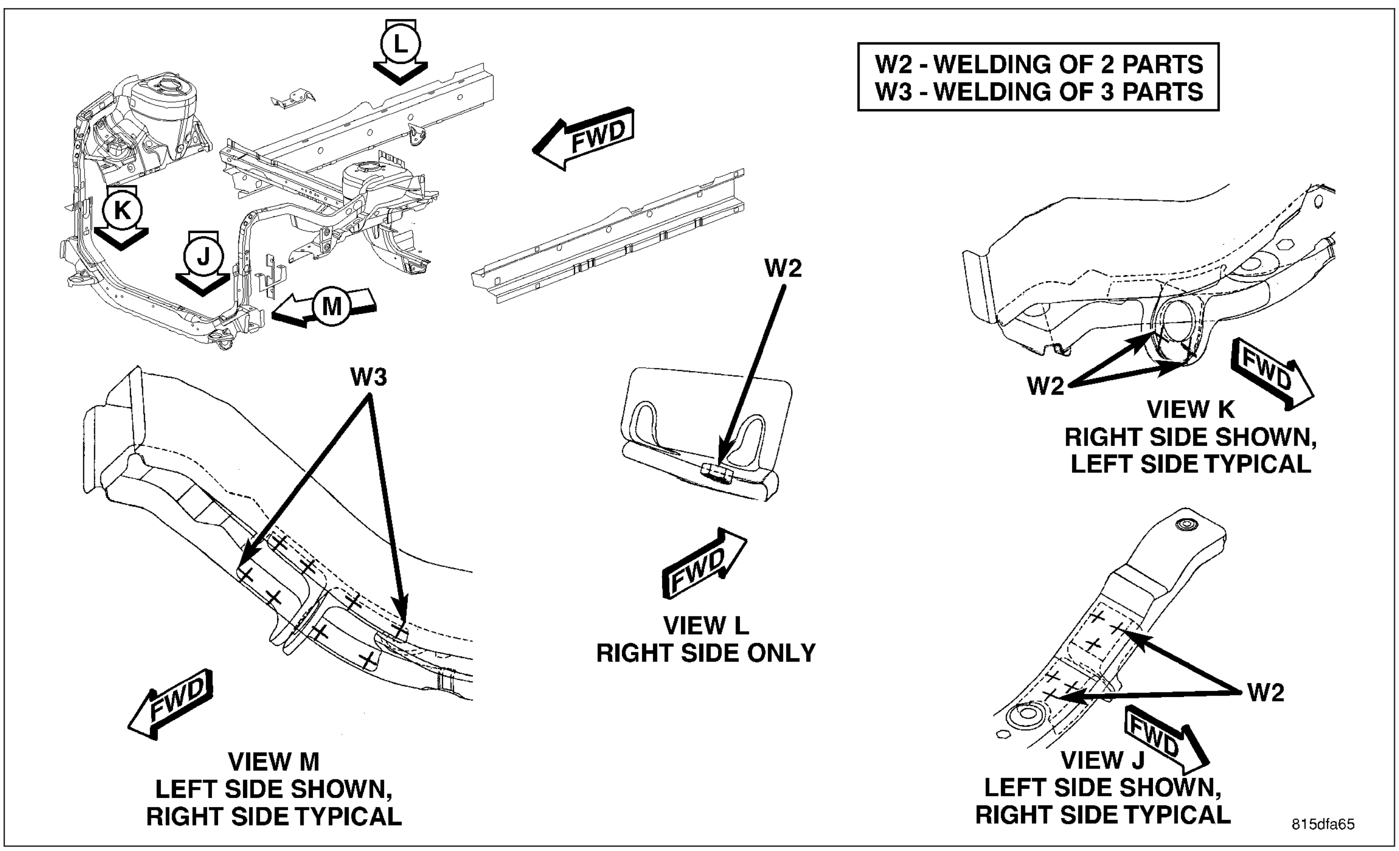


Fig. 126 ENGINE BOX (5 OF 10)

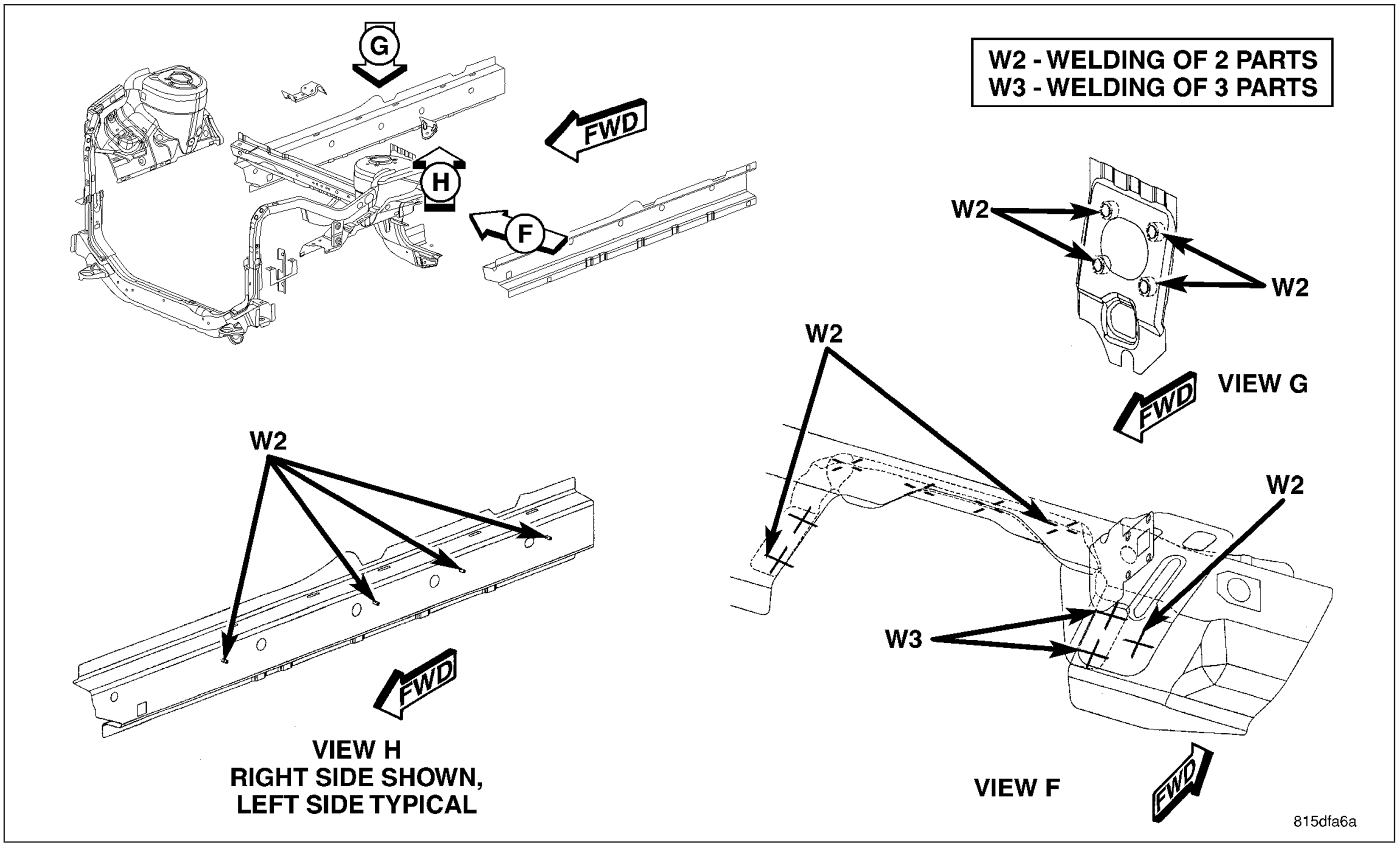


Fig. 127 ENGINE BOX (6 OF 10)

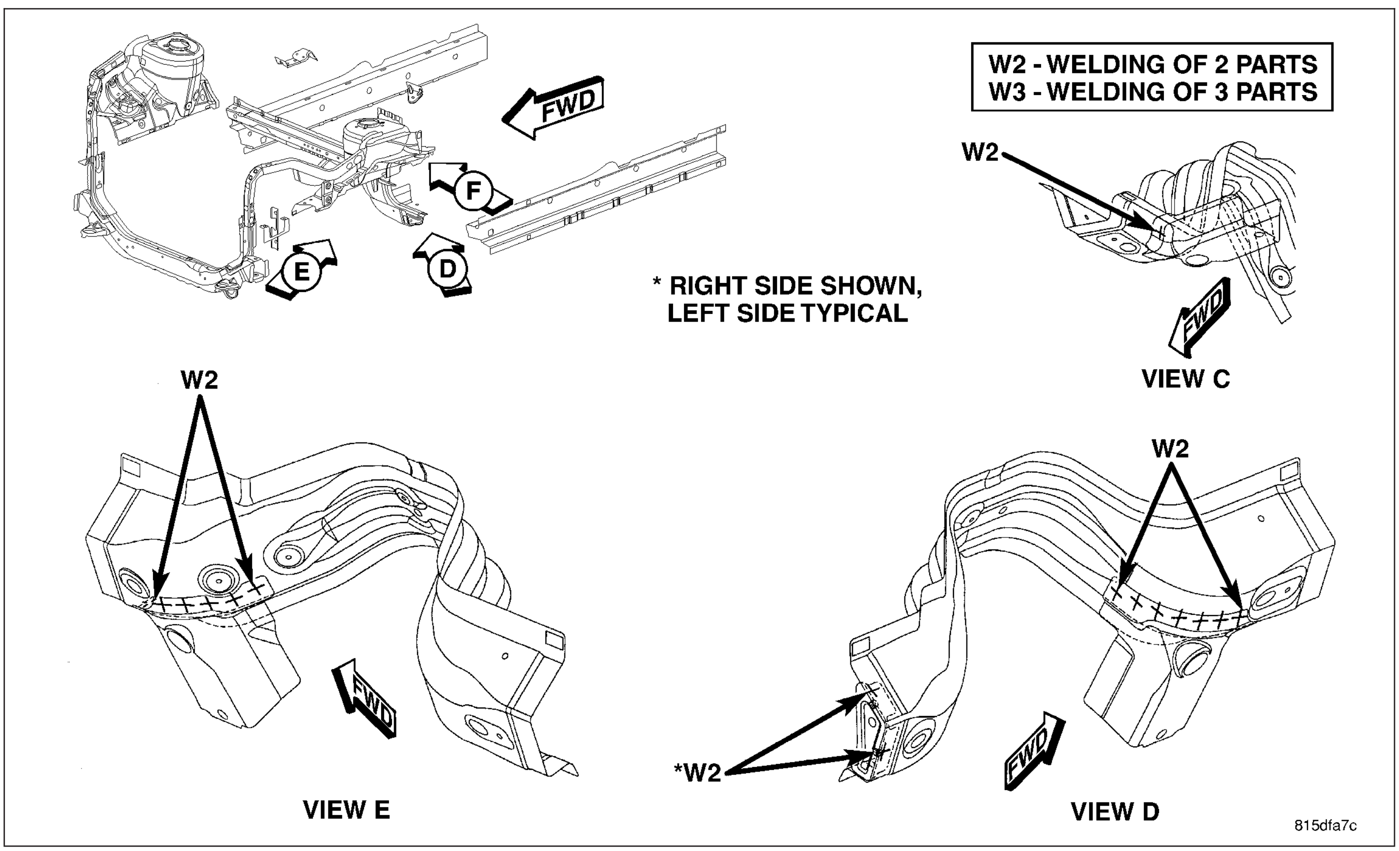


Fig. 128 ENGINE BOX (7 OF 10)

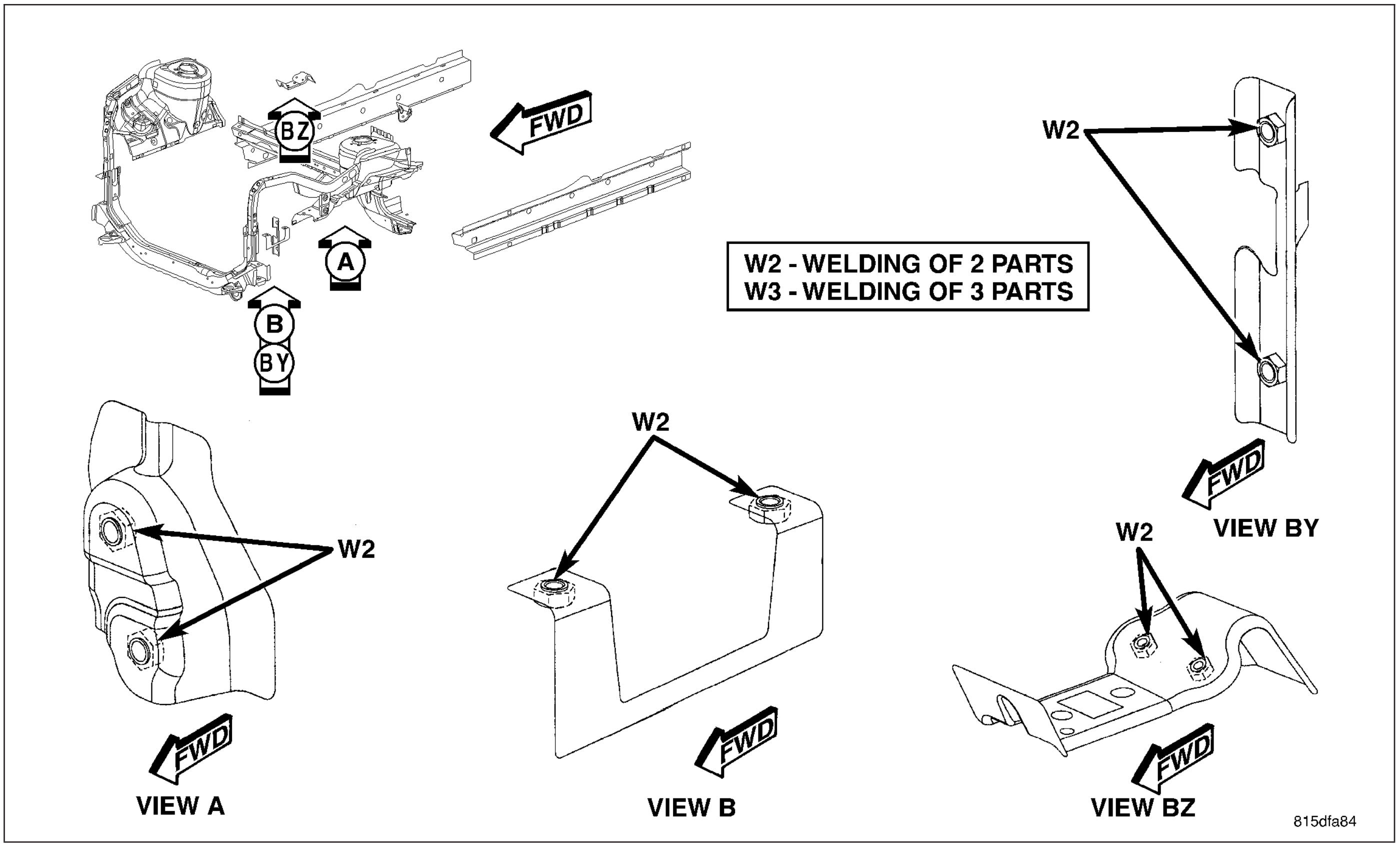


Fig. 129 ENGINE BOX (8 OF 10)

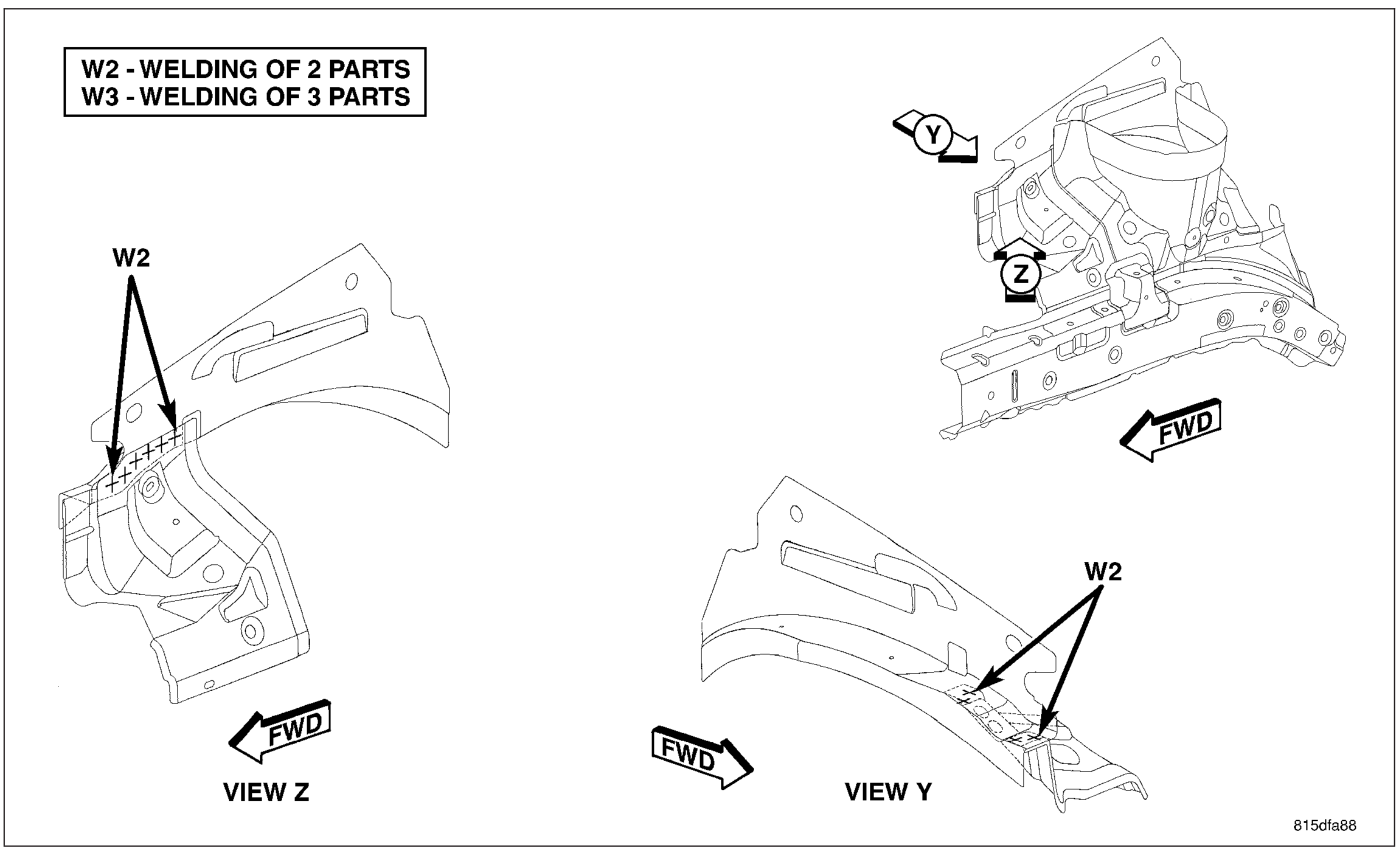


Fig. 130 ENGINE BOX (9 OF 10)

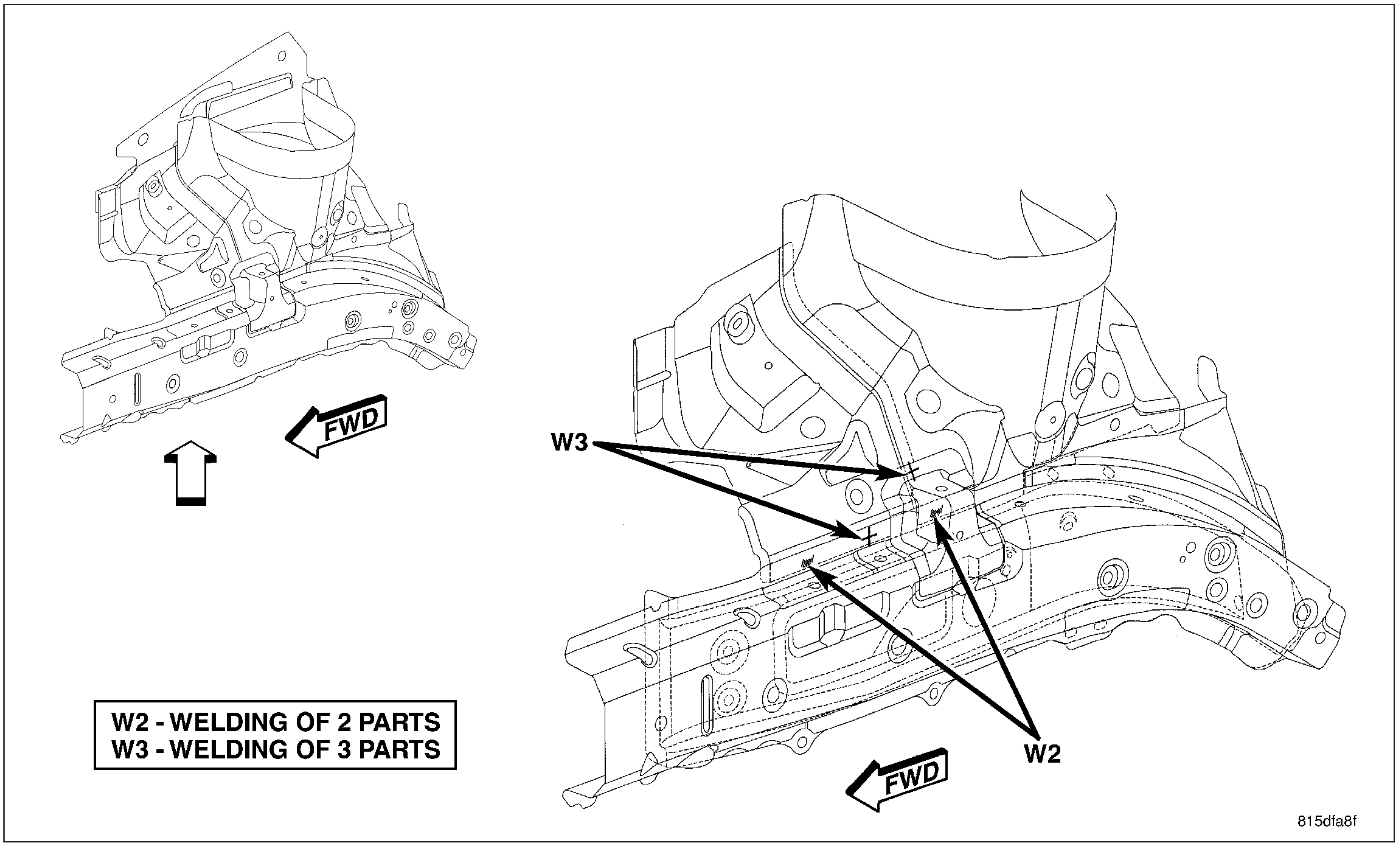


Fig. 131 ENGINE BOX (10 OF 10)

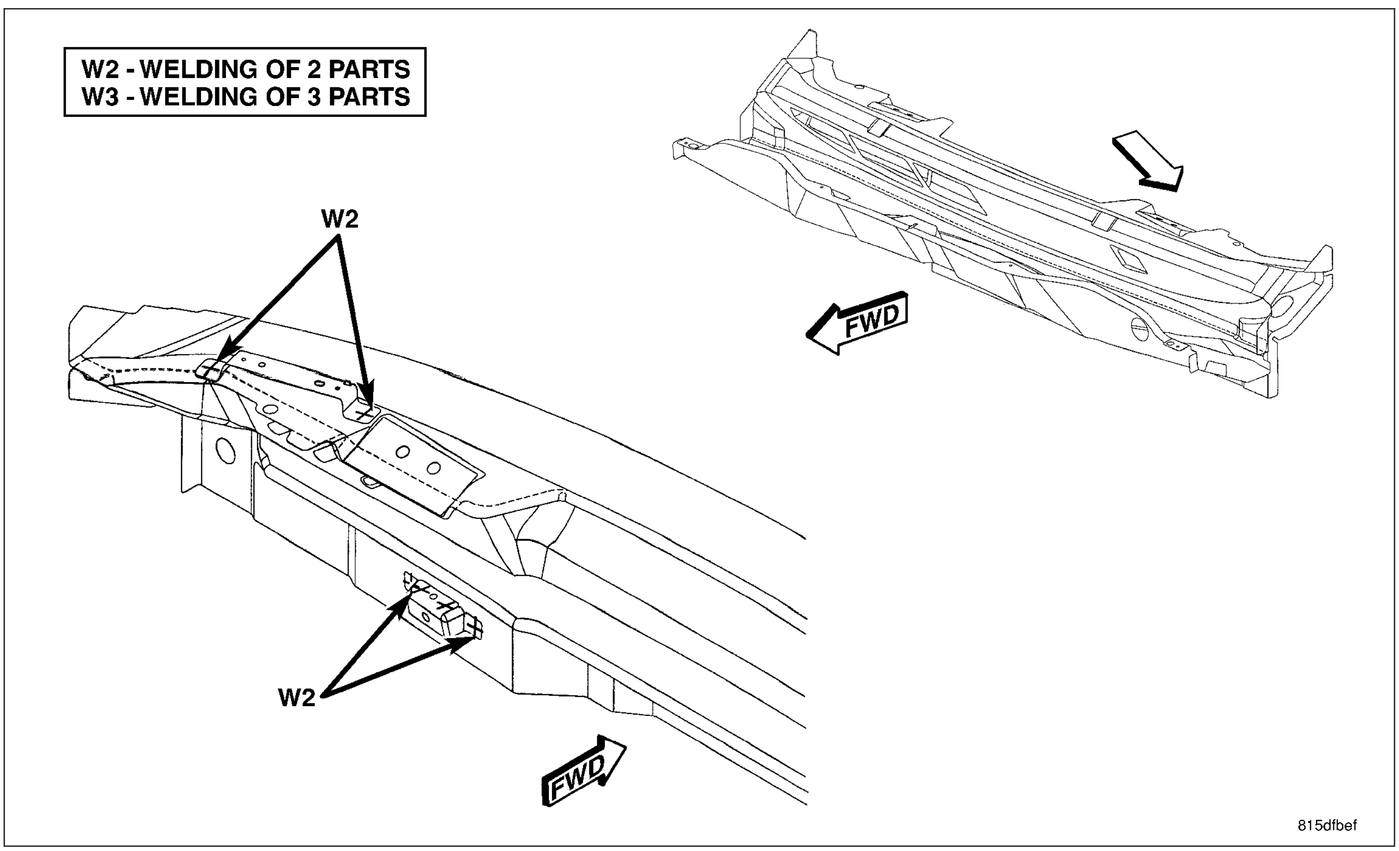


Fig. 132 PLENUM (1 OF 4)

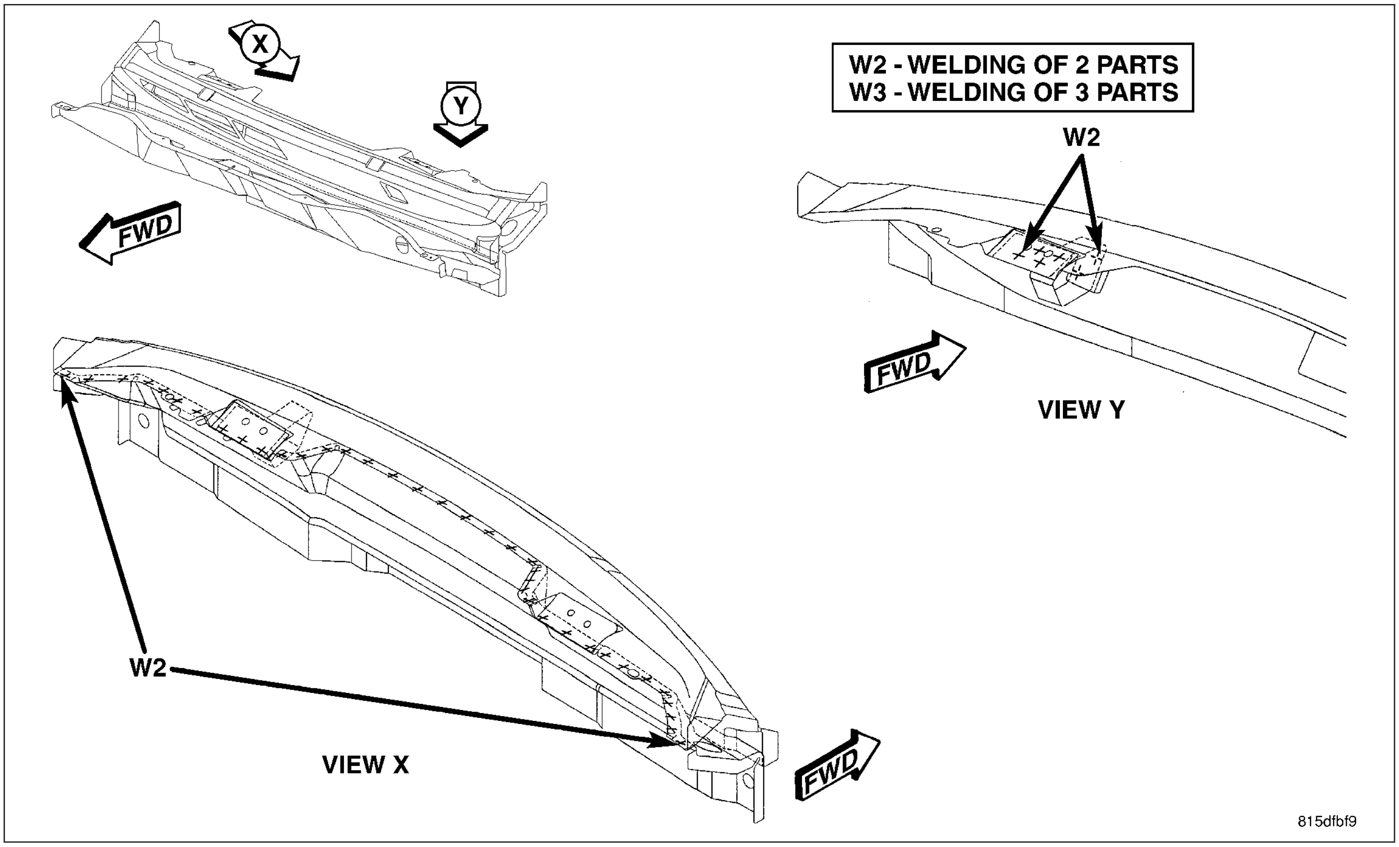


Fig. 133 PLENUM (2 OF 4)

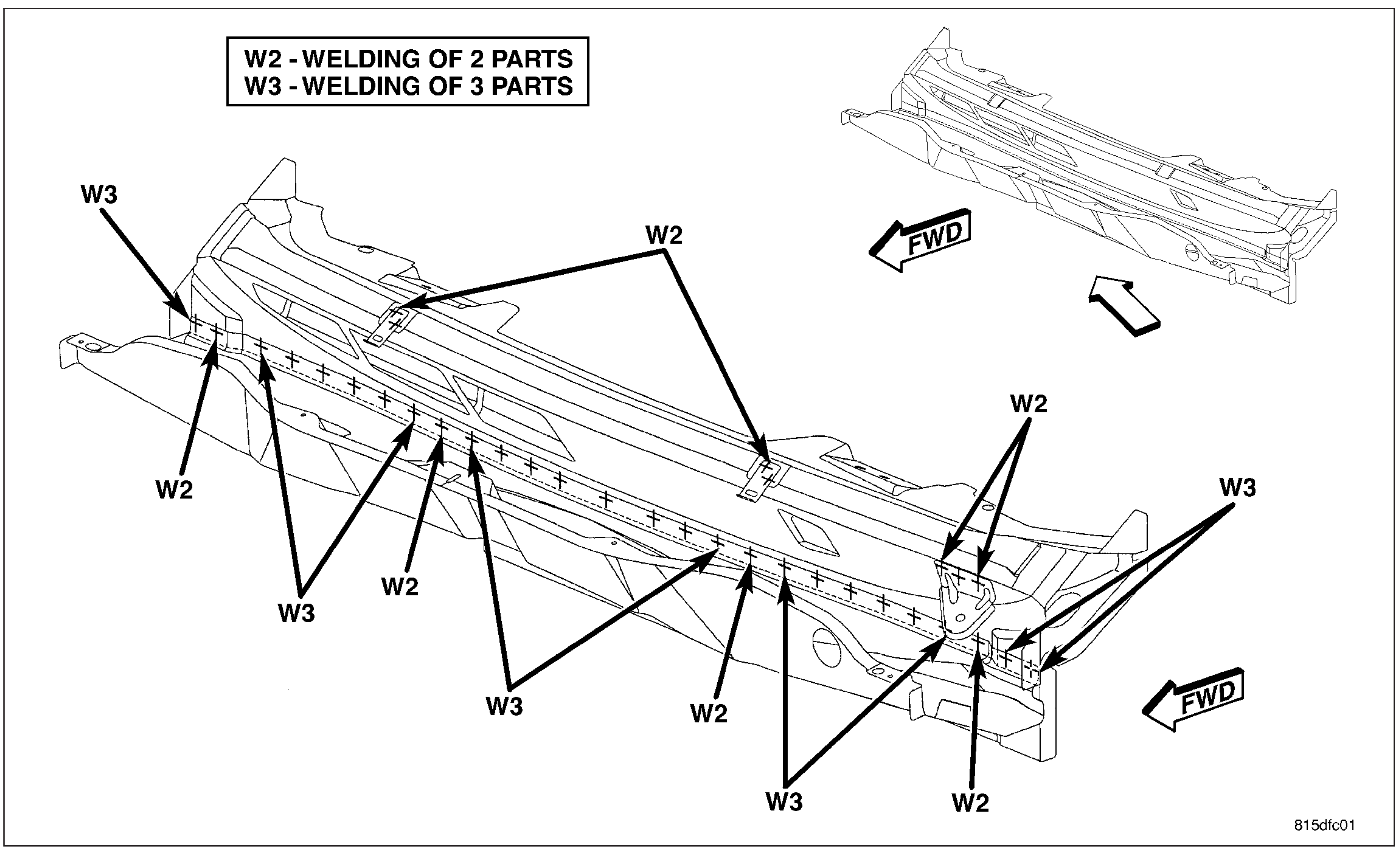


Fig. 134 PLENUM (3 OF 4)

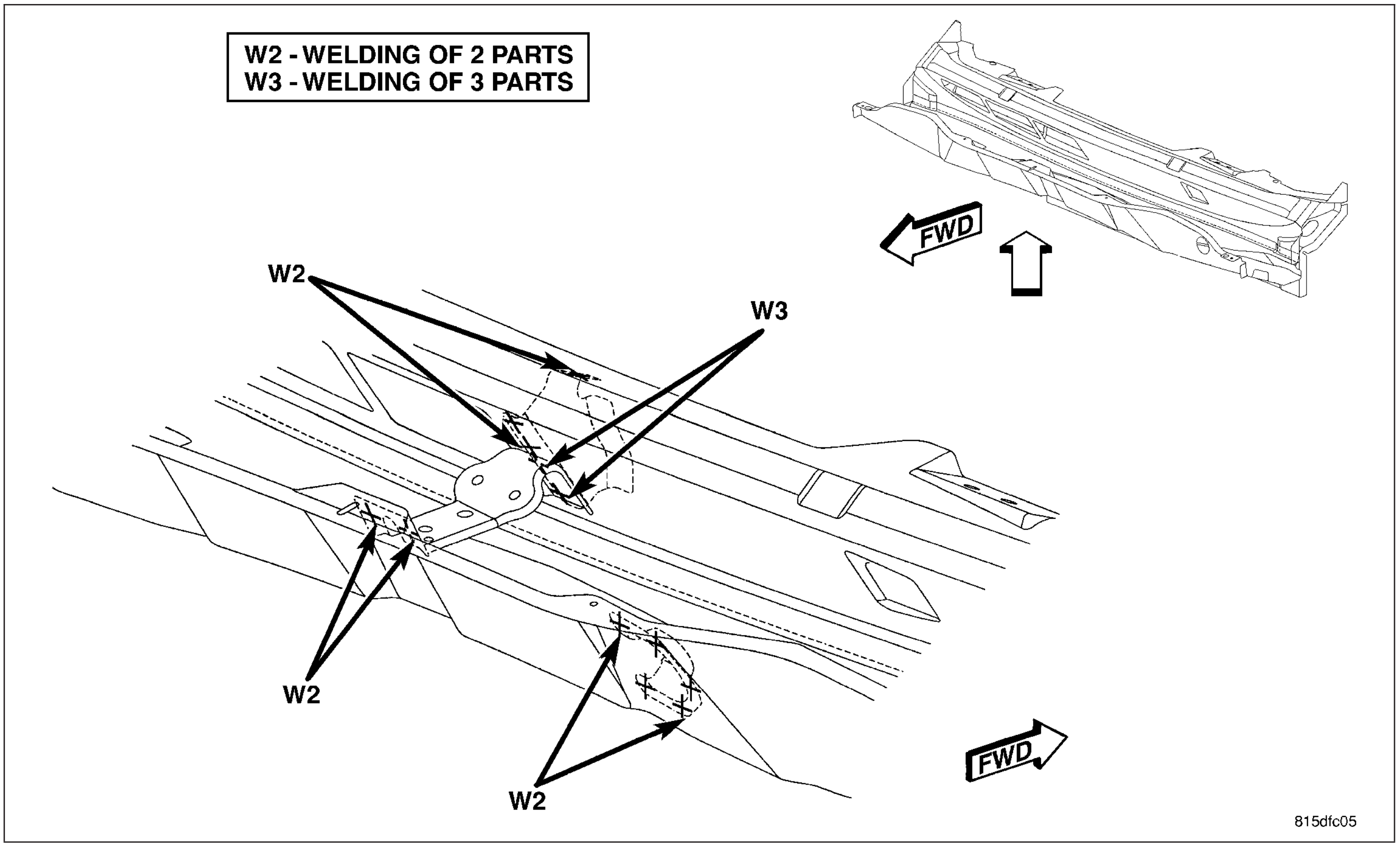


Fig. 135 PLENUM (4 OF 4)

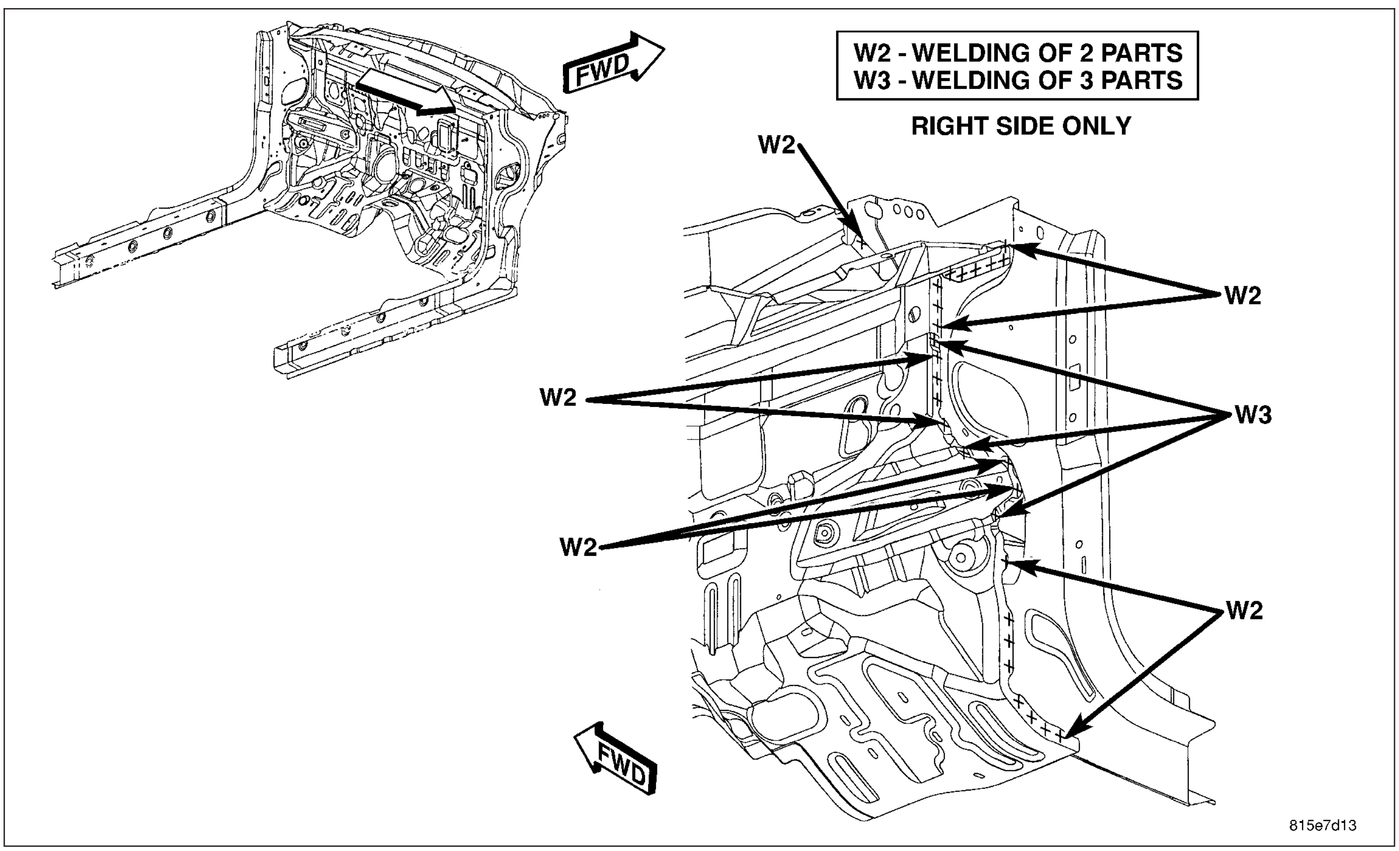


Fig. 136 PLENUM/DASH (1 OF 6)

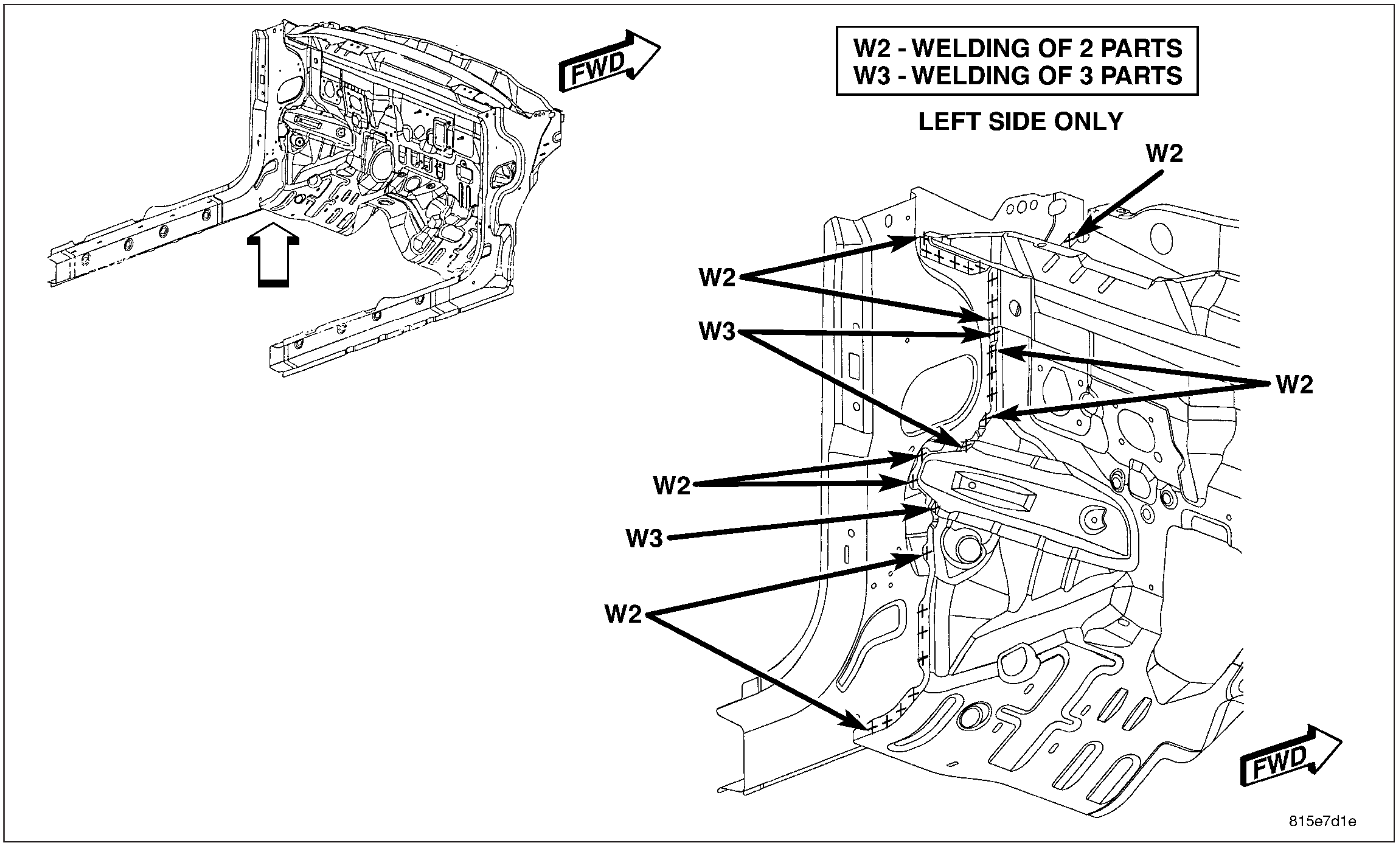


Fig. 137 PLENUM/DASH (2 OF 6)

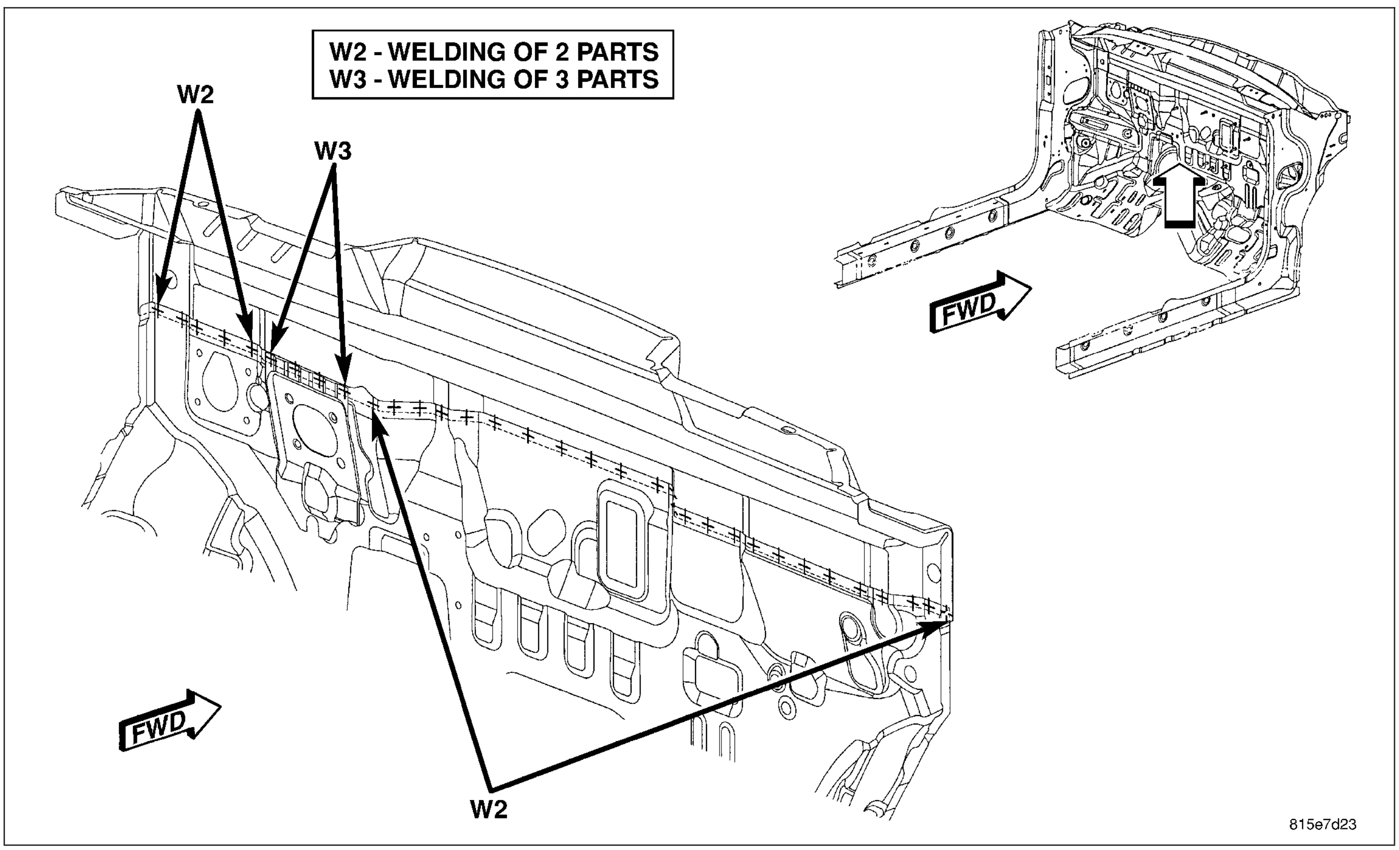


Fig. 138 PLENUM/DASH (3 OF 6)

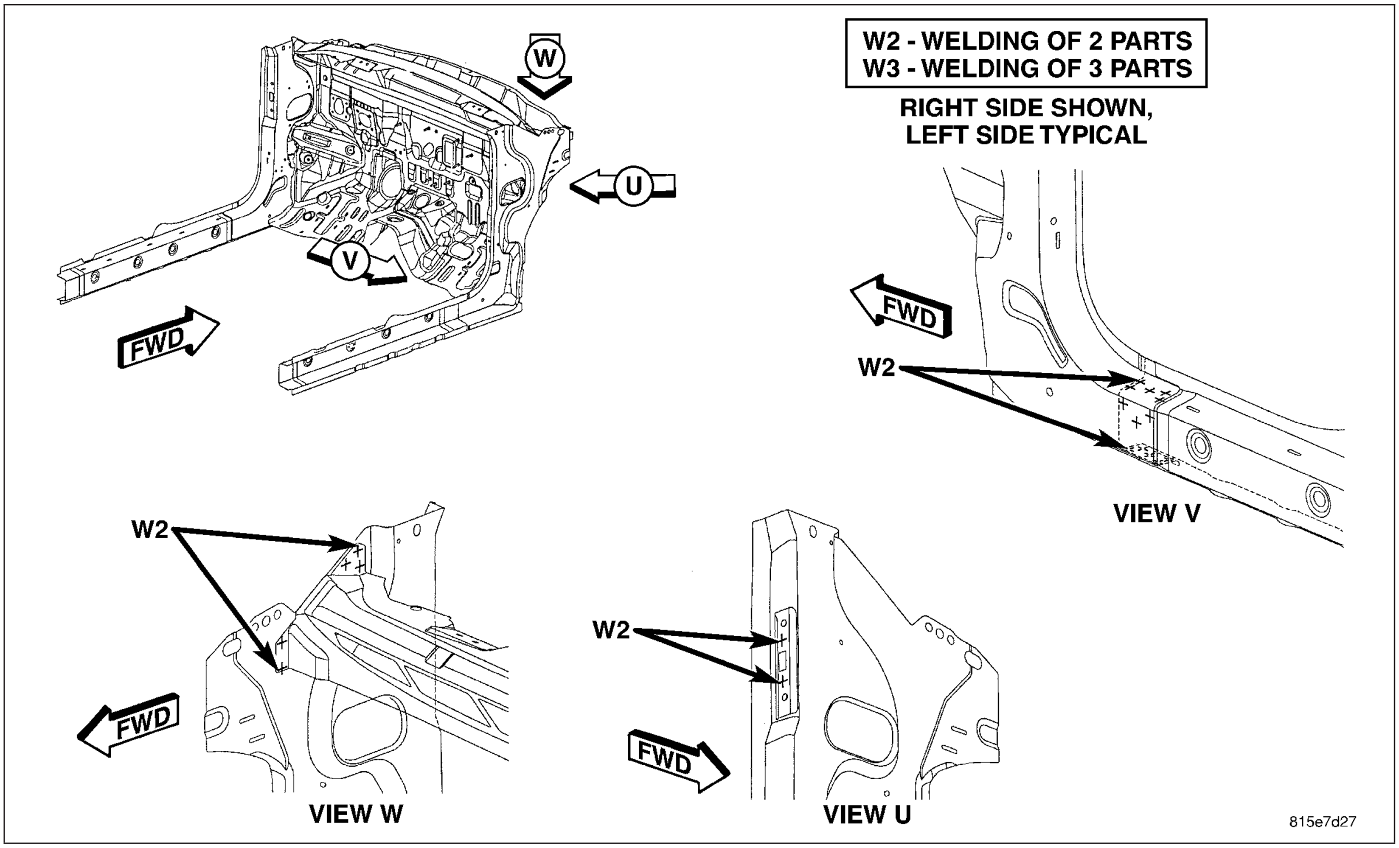


Fig. 139 PLENUM/DASH (4 OF 6)

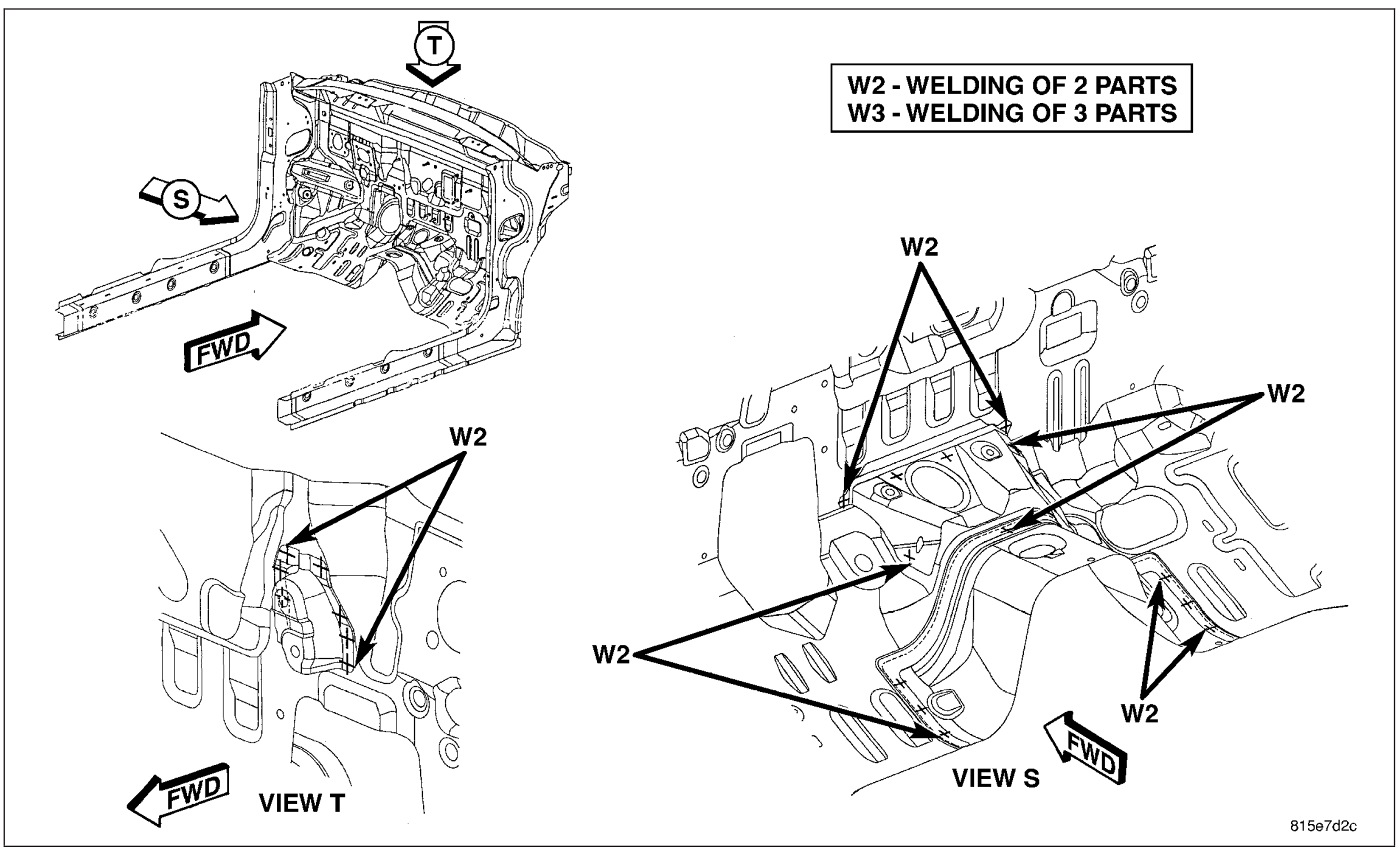


Fig. 140 PLENUM/DASH (5 OF 6)

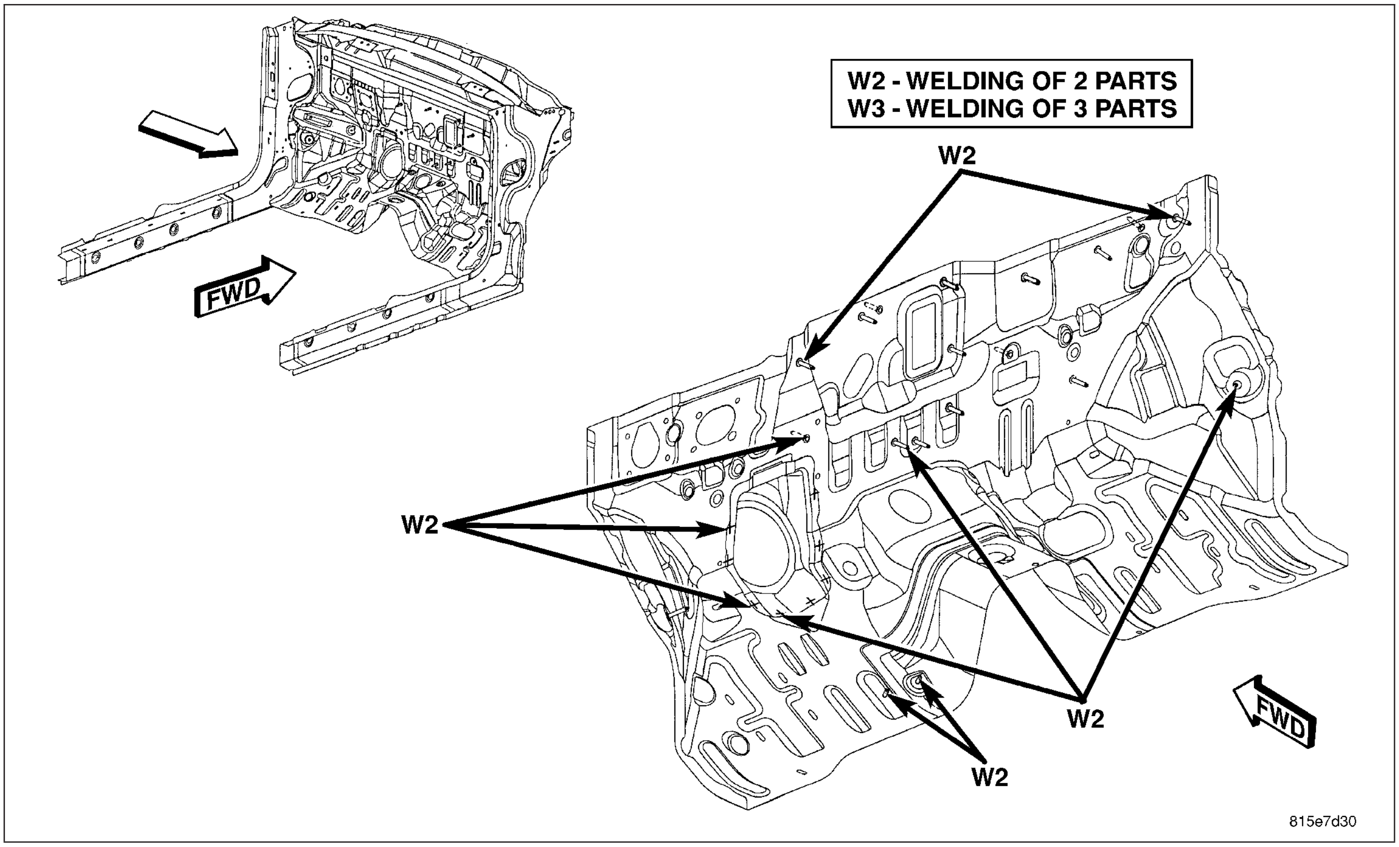


Fig. 141 PLENUM/DASH (6 OF 6)

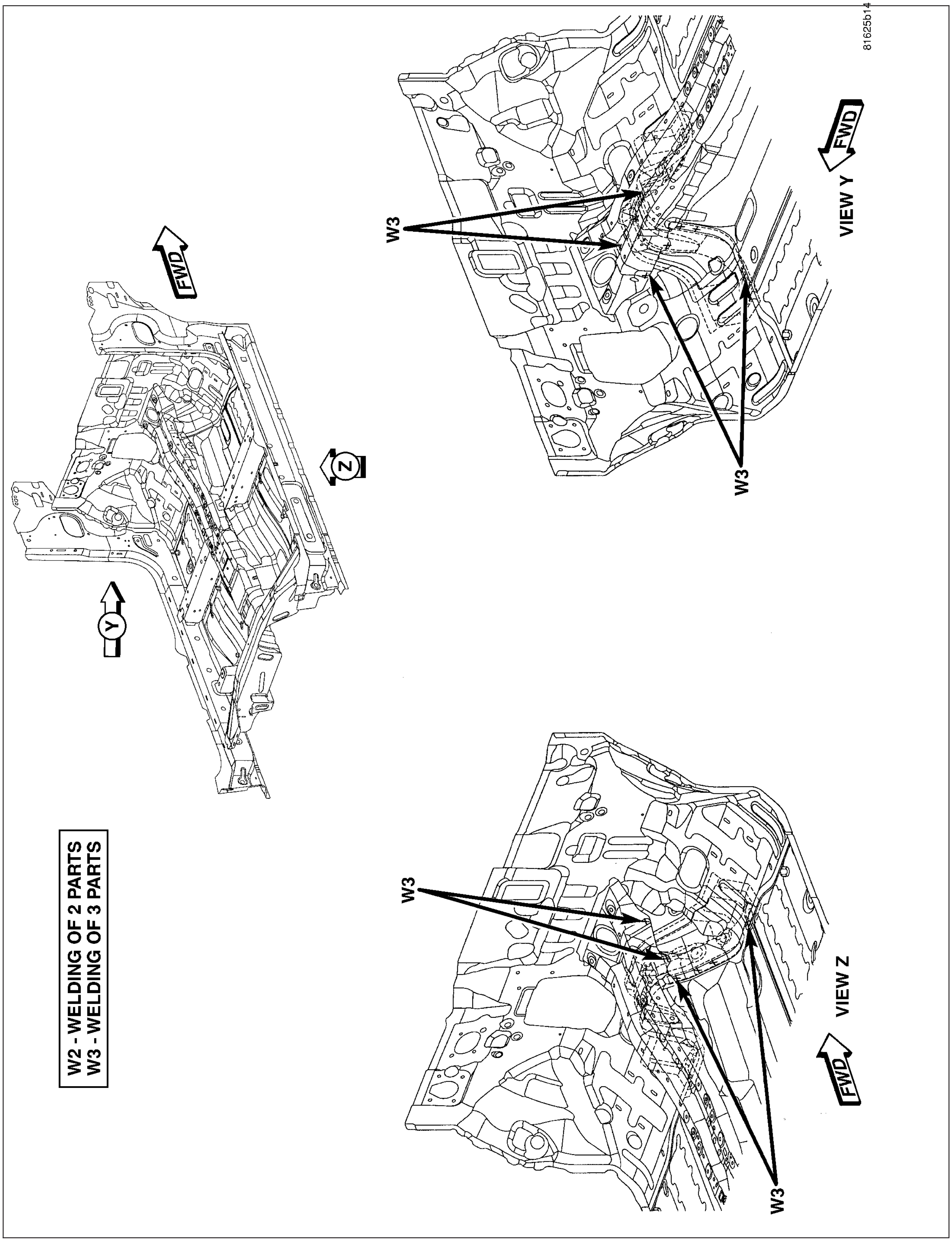


Fig. 142 UNDERBODY - COMPLETE (1 OF 11)

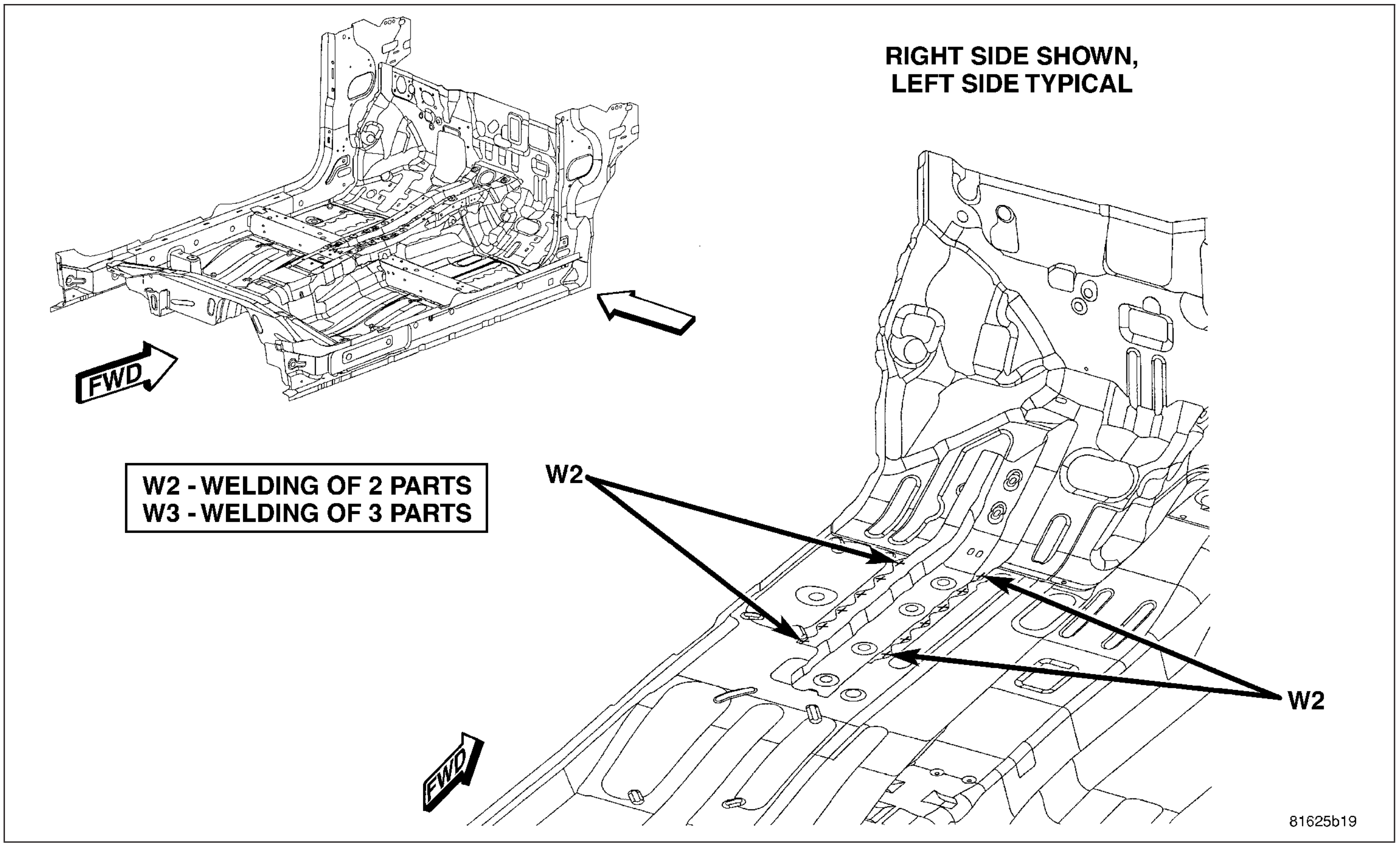


Fig. 143 UNDERBODY - COMPLETE (2 OF 11)

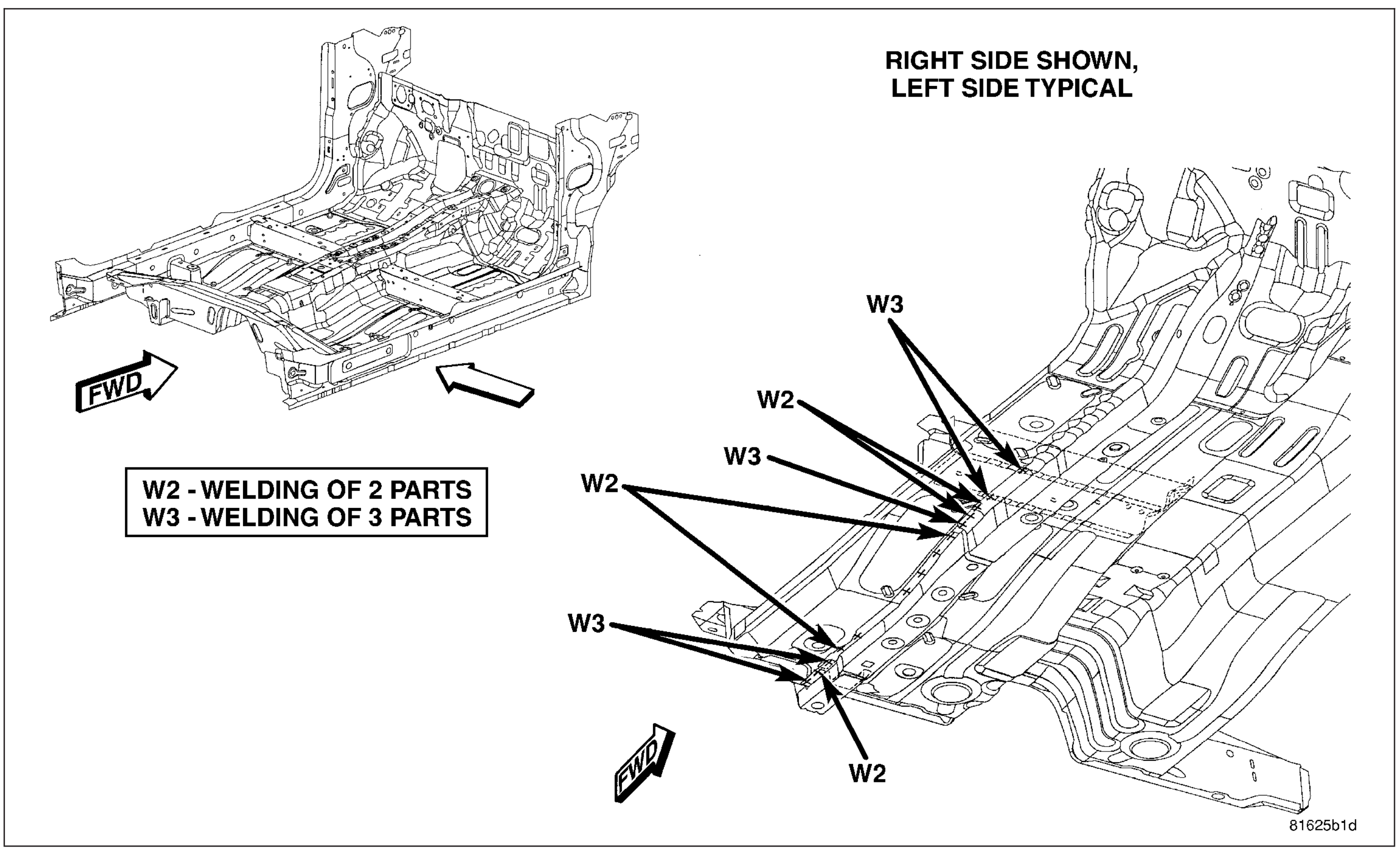


Fig. 144 UNDERBODY - COMPLETE (3 OF 11)

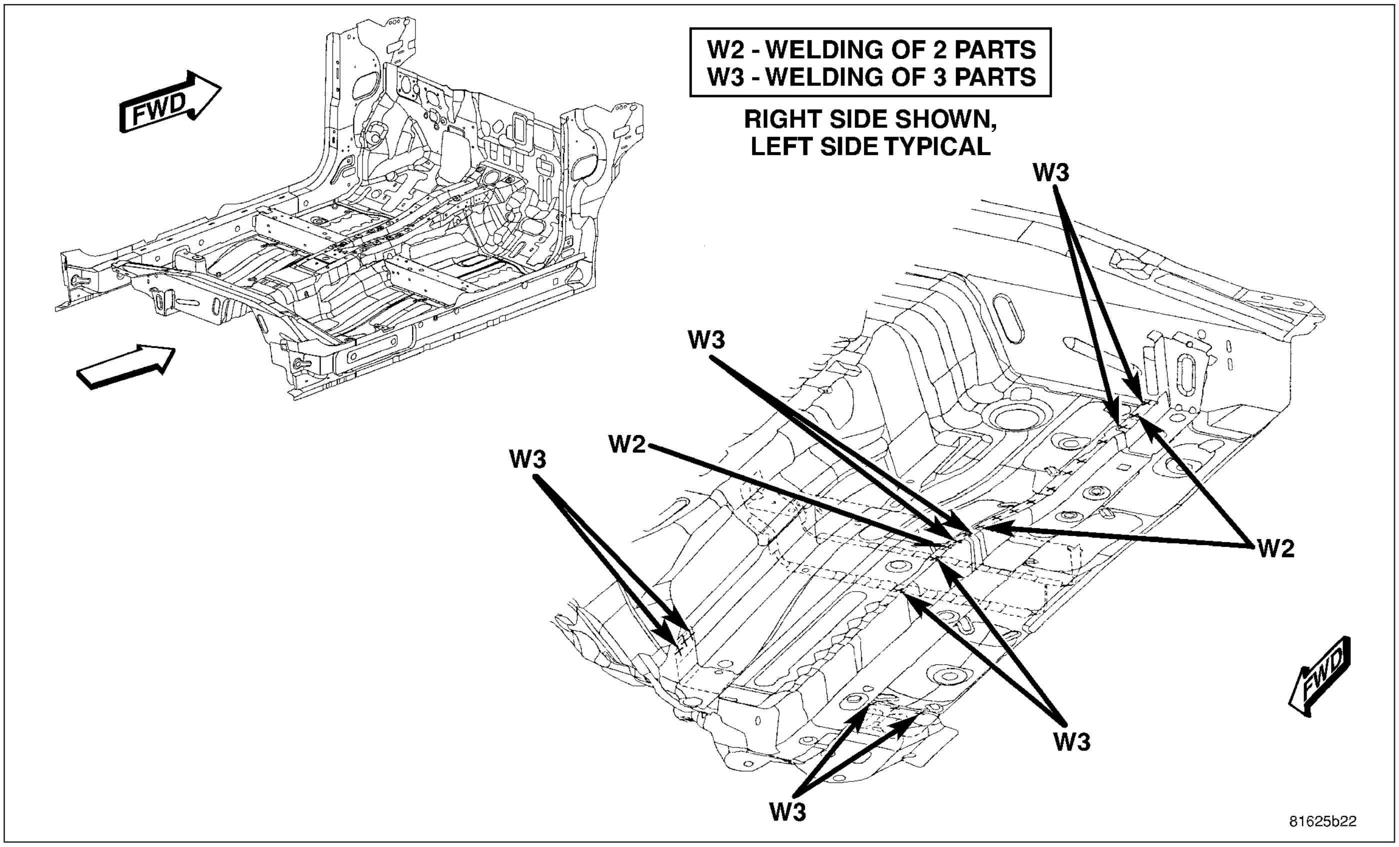


Fig. 145 UNDERBODY - COMPLETE (4 OF 11)

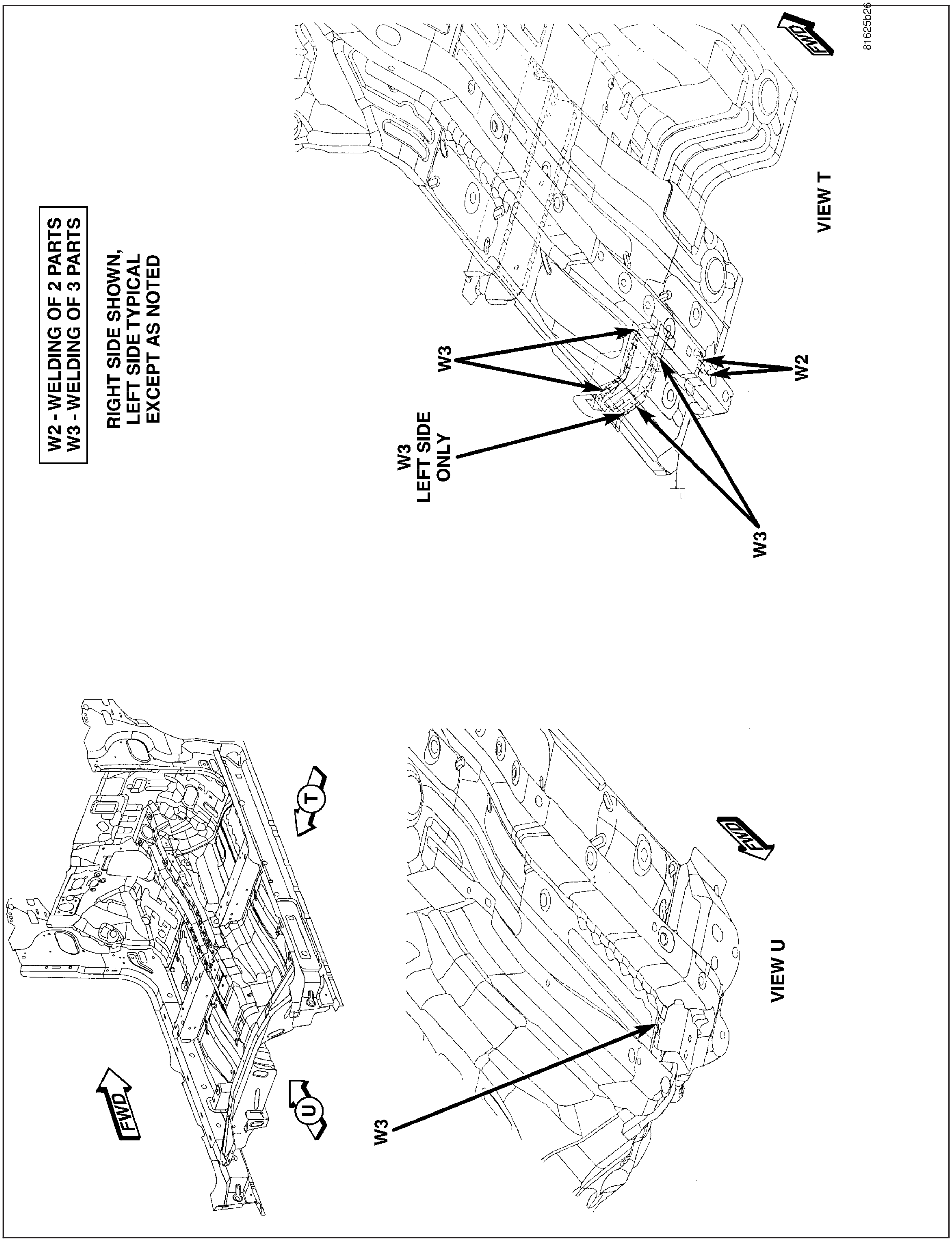


Fig. 146 UNDERBODY - COMPLETE (5 OF 11)

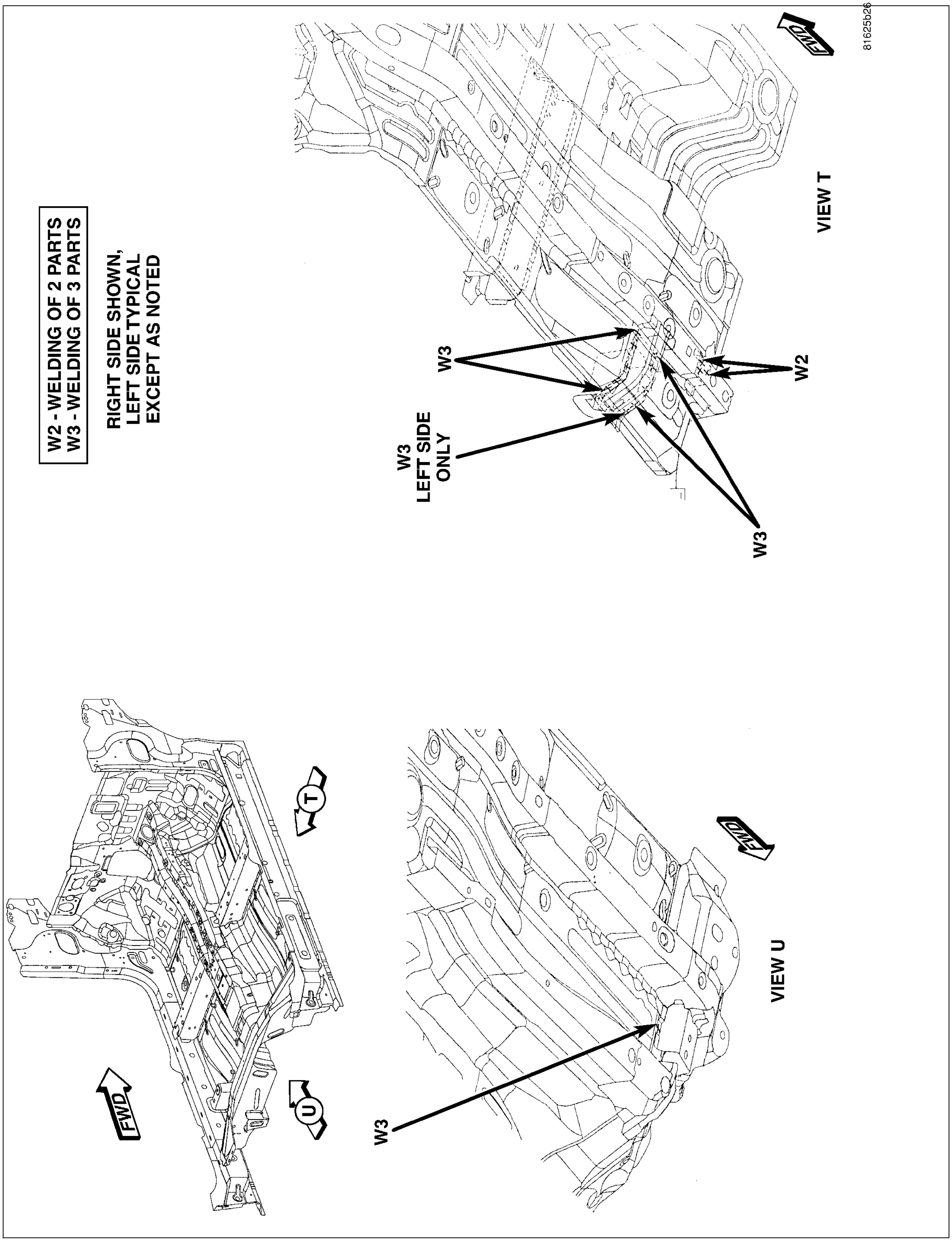


Fig. 147 UNDERBODY - COMPLETE (5 OF 11)

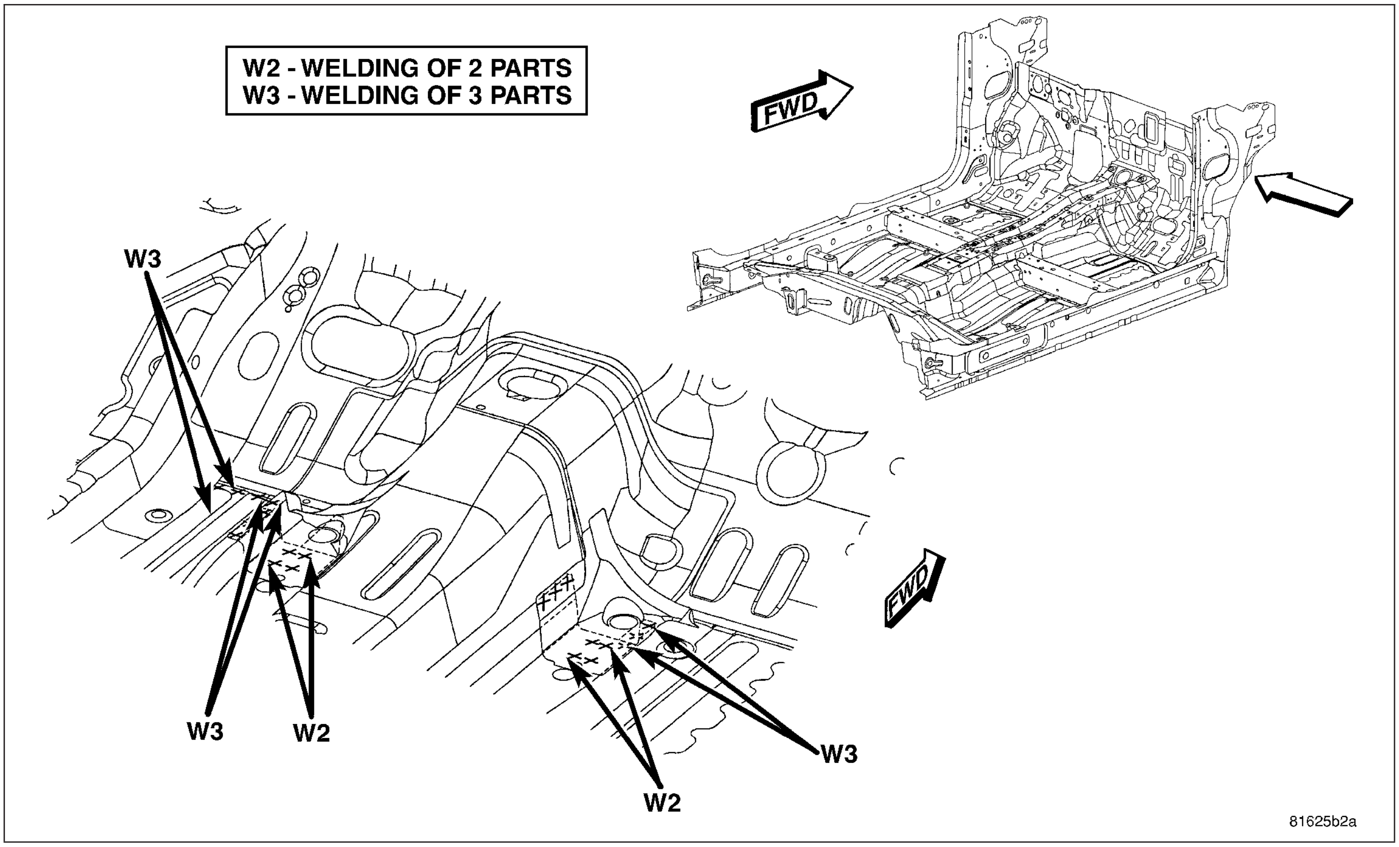


Fig. 148 UNDERBODY - COMPLETE (6 OF 11)

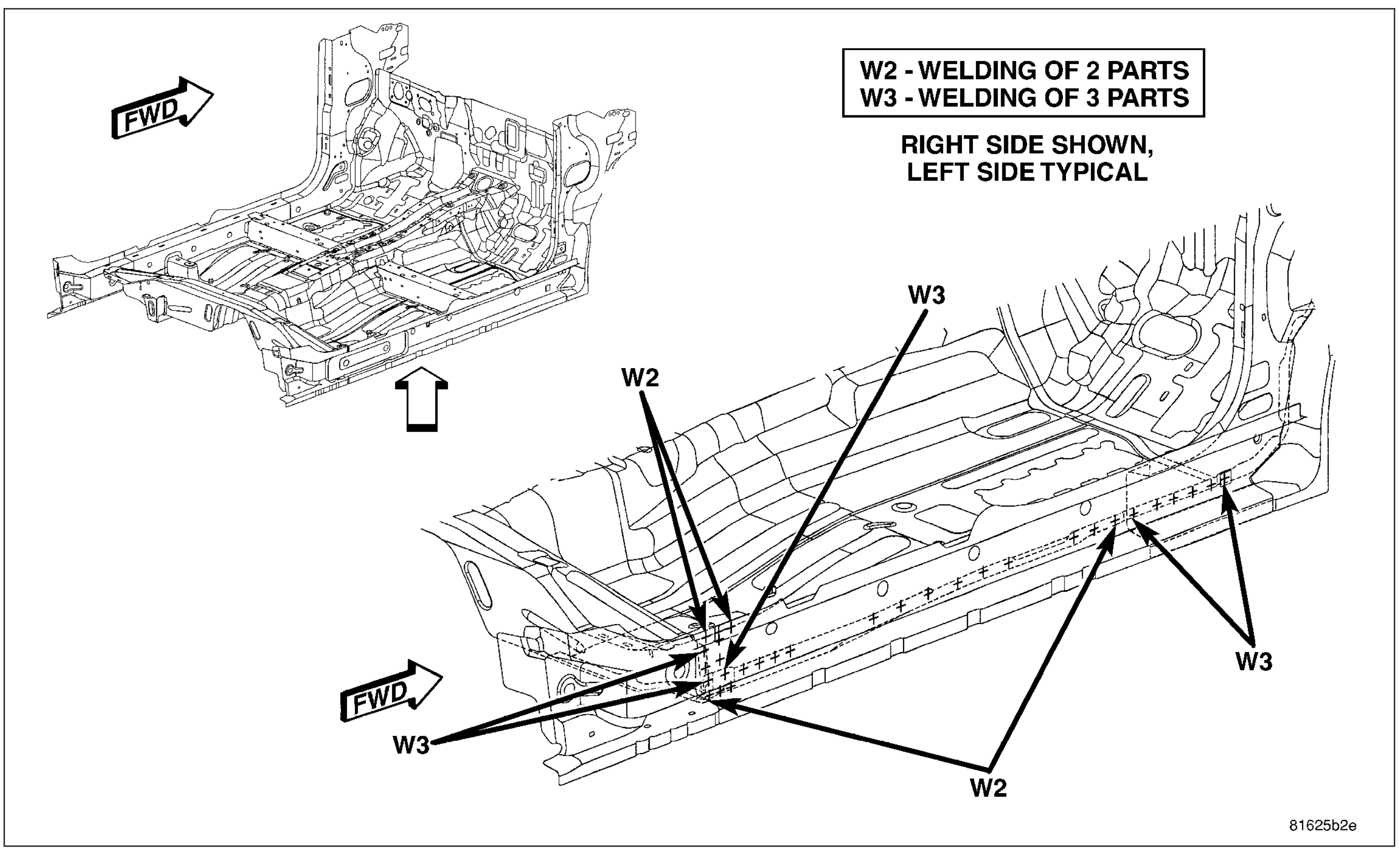


Fig. 149 UNDERBODY - COMPLETE (7 OF 11)

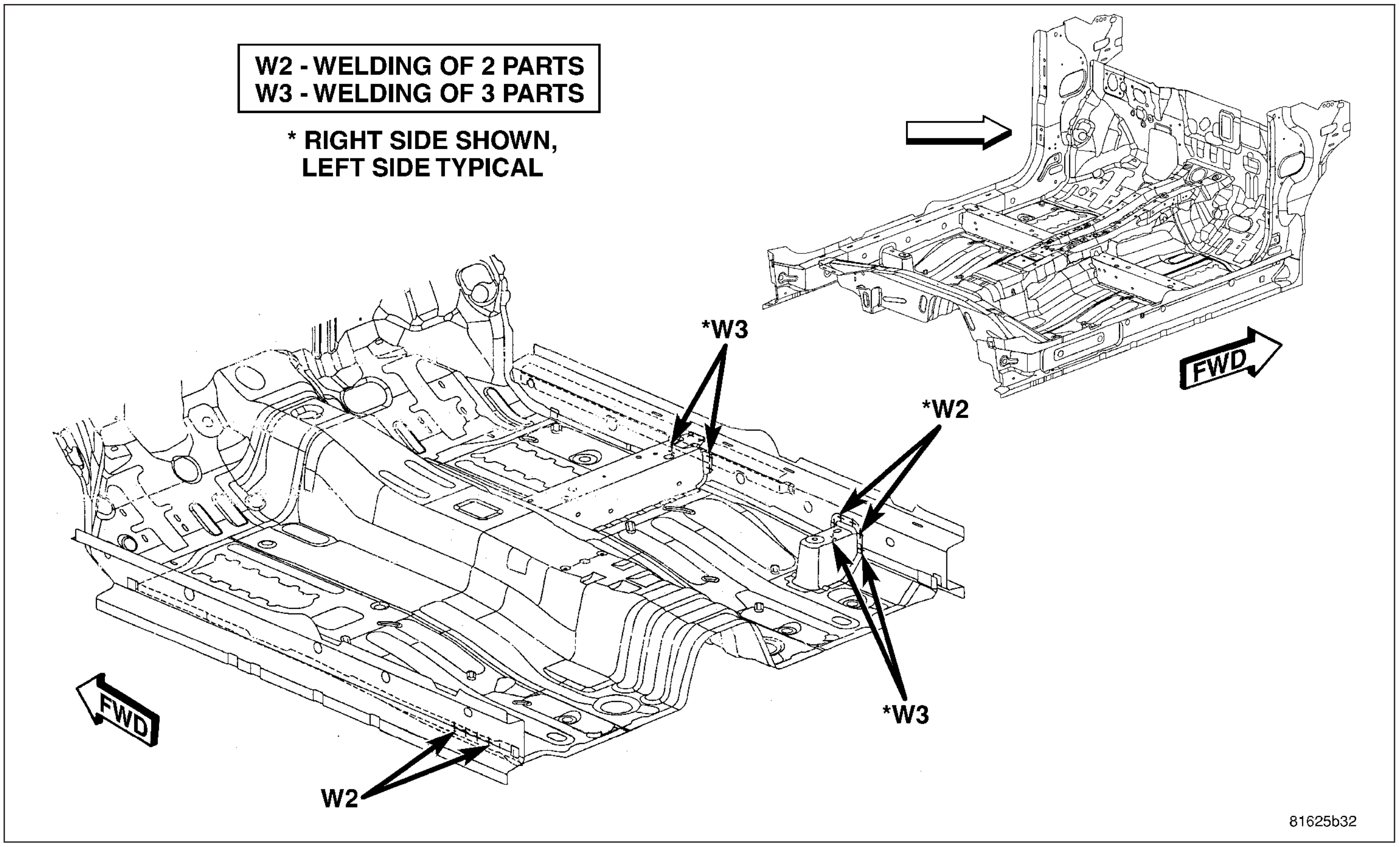


Fig. 150 UNDERBODY - COMPLETE (8 OF 11)

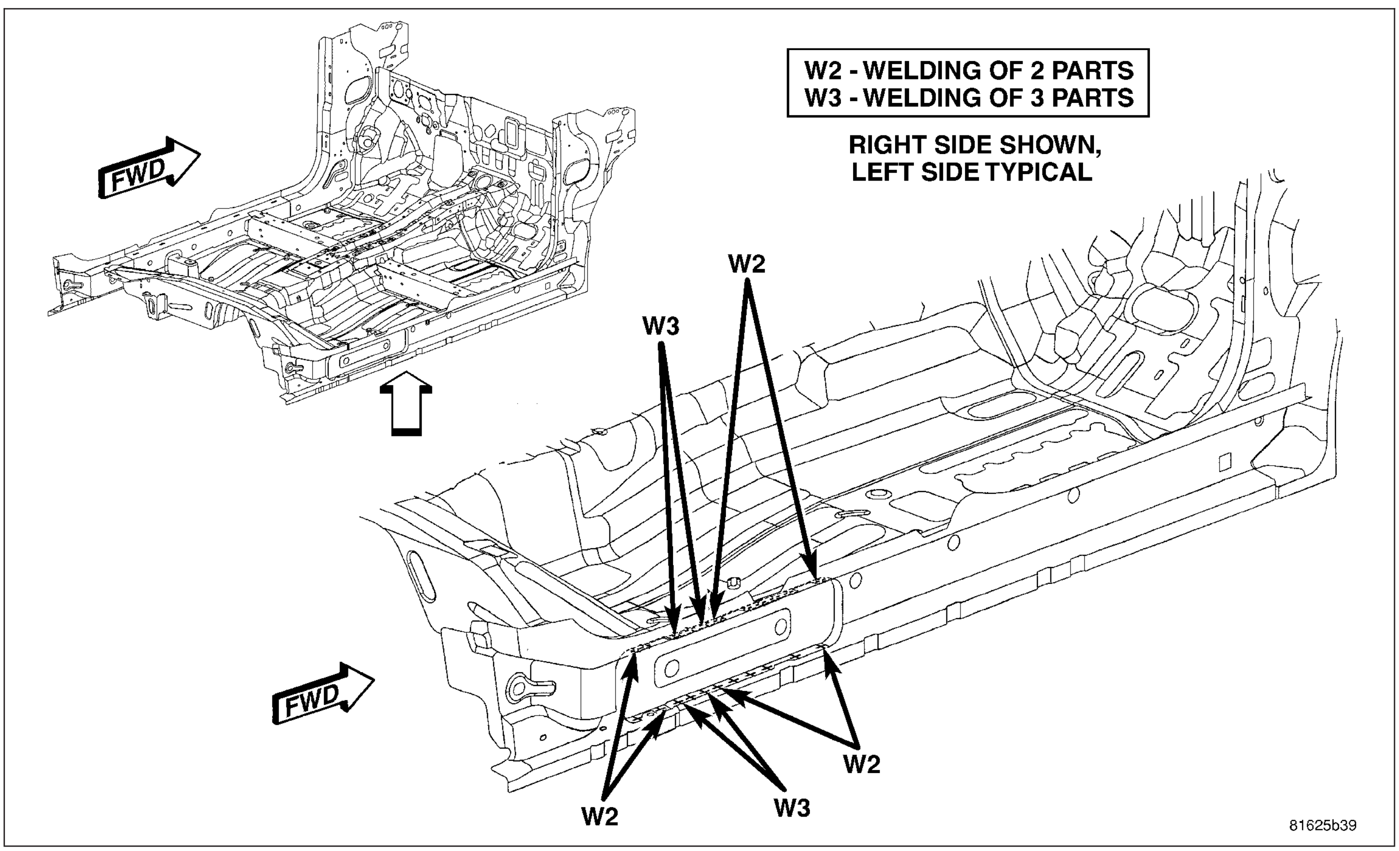


Fig. 151 UNDERBODY - COMPLETE (9 OF 11)

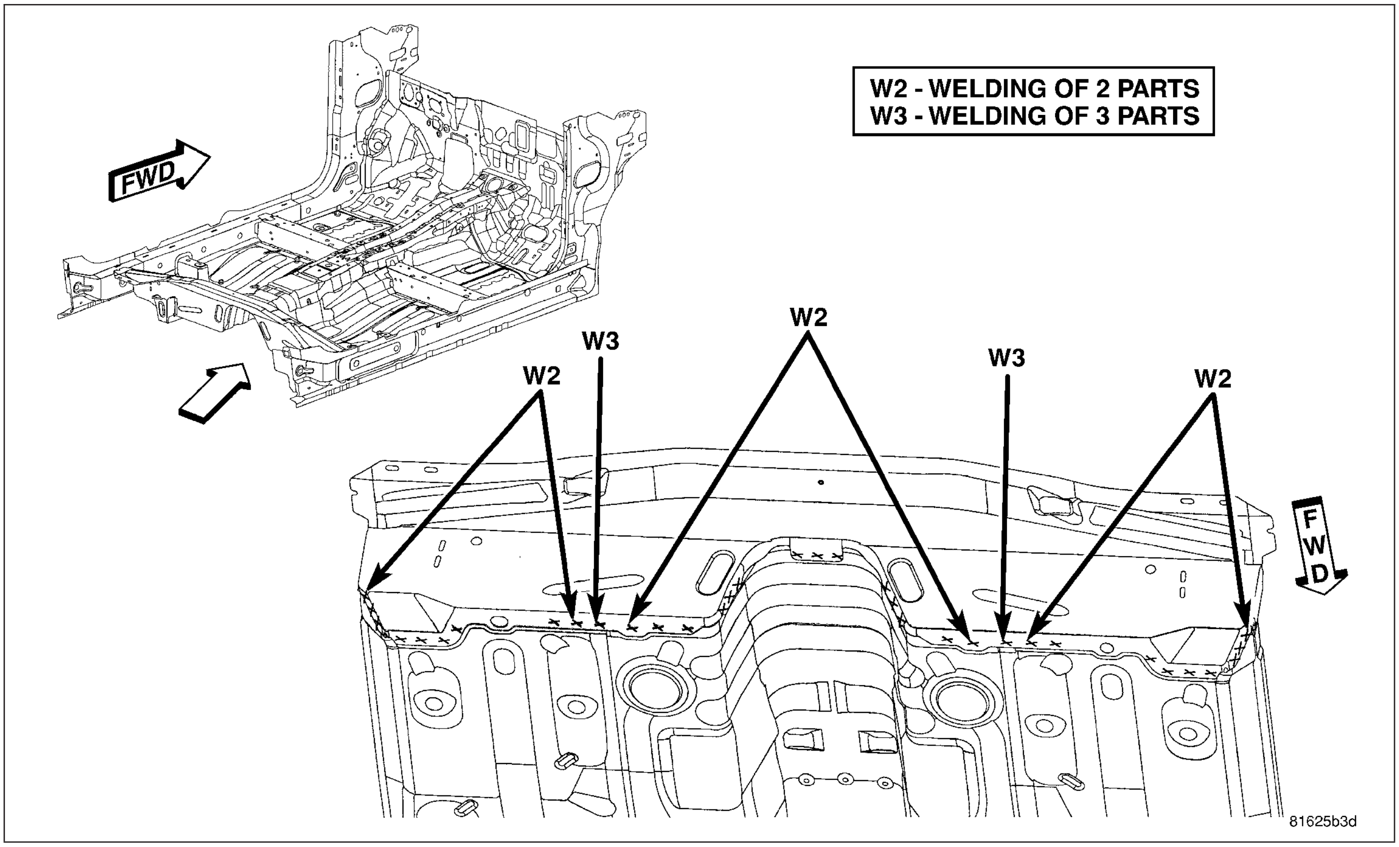


Fig. 152 UNDERBODY - COMPLETE (10 OF 11)

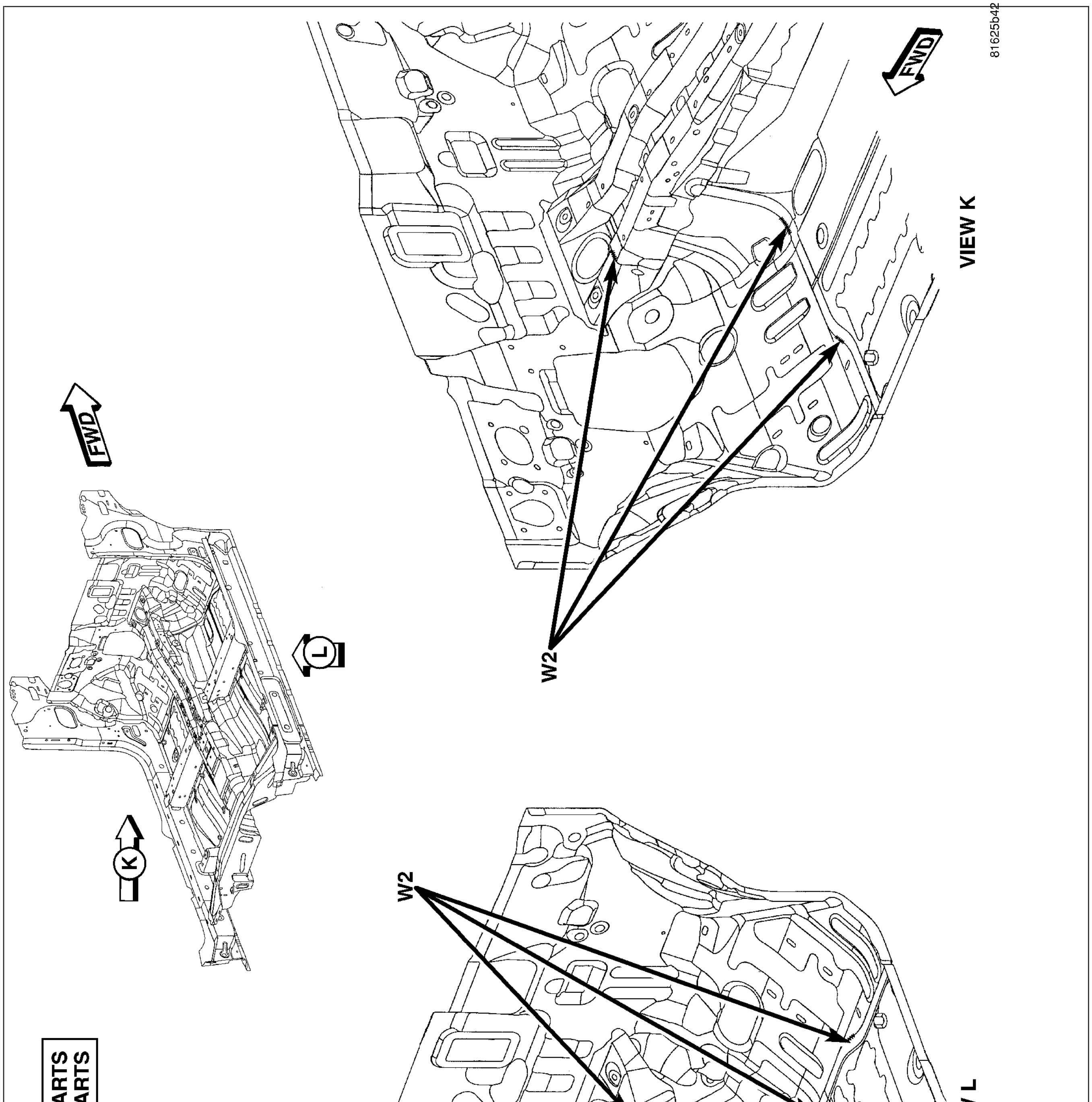


Fig. 153 UNDERBODY - COMPLETE (11 OF 11)

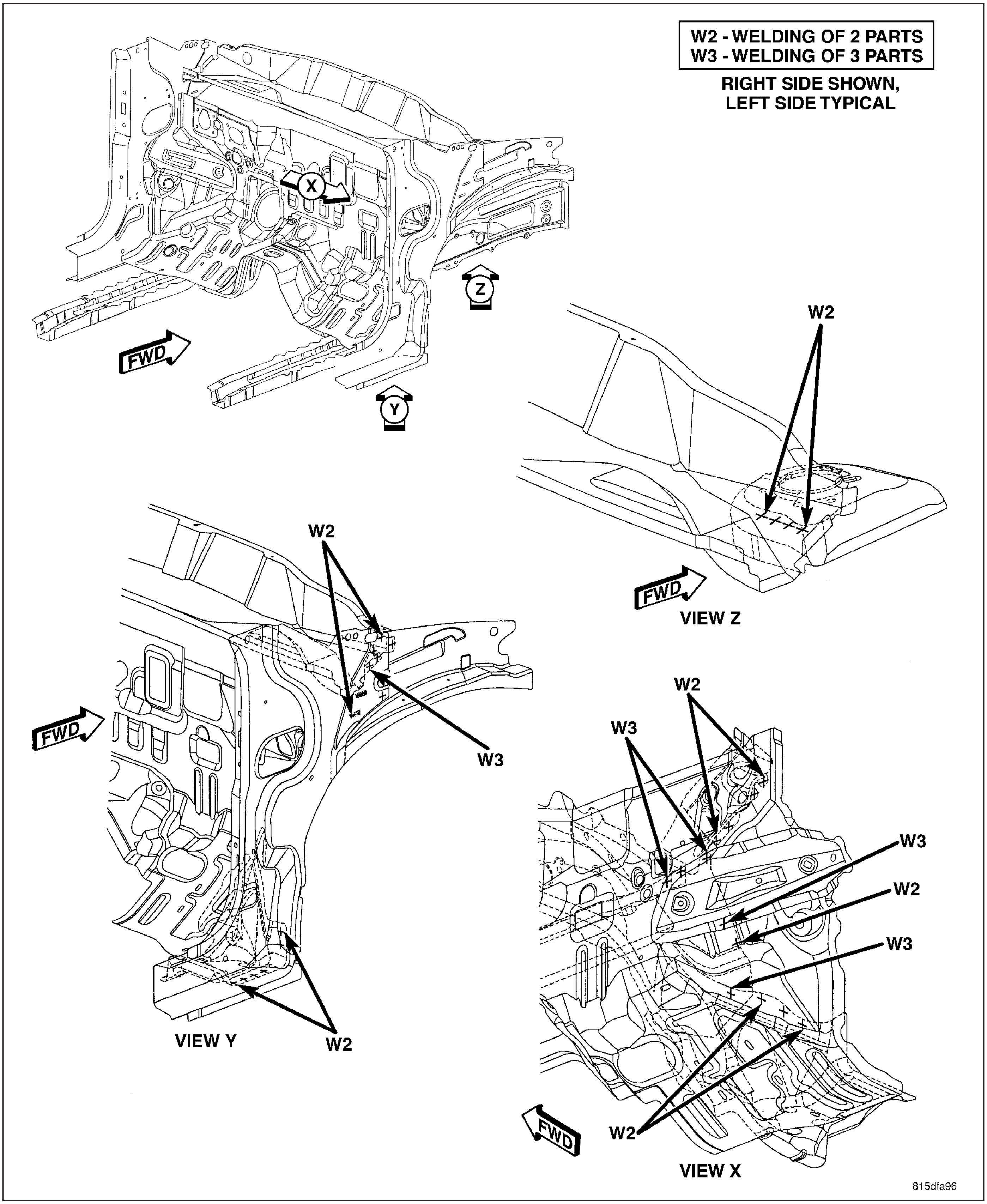


Fig. 154 ENGINE BOX - COMPLETE (1 OF 4)

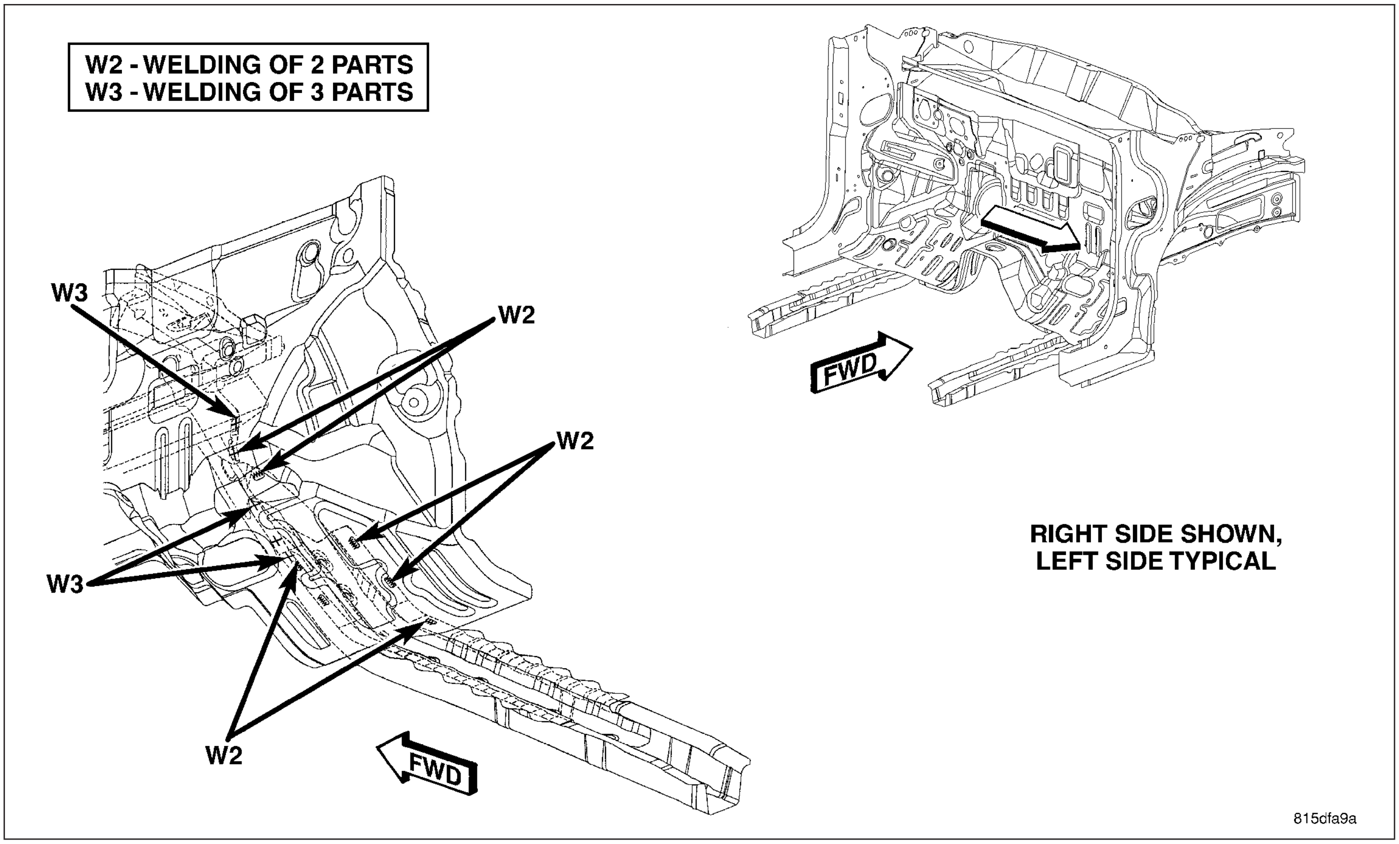


Fig. 155 ENGINE BOX - COMPLETE (2 OF 4)

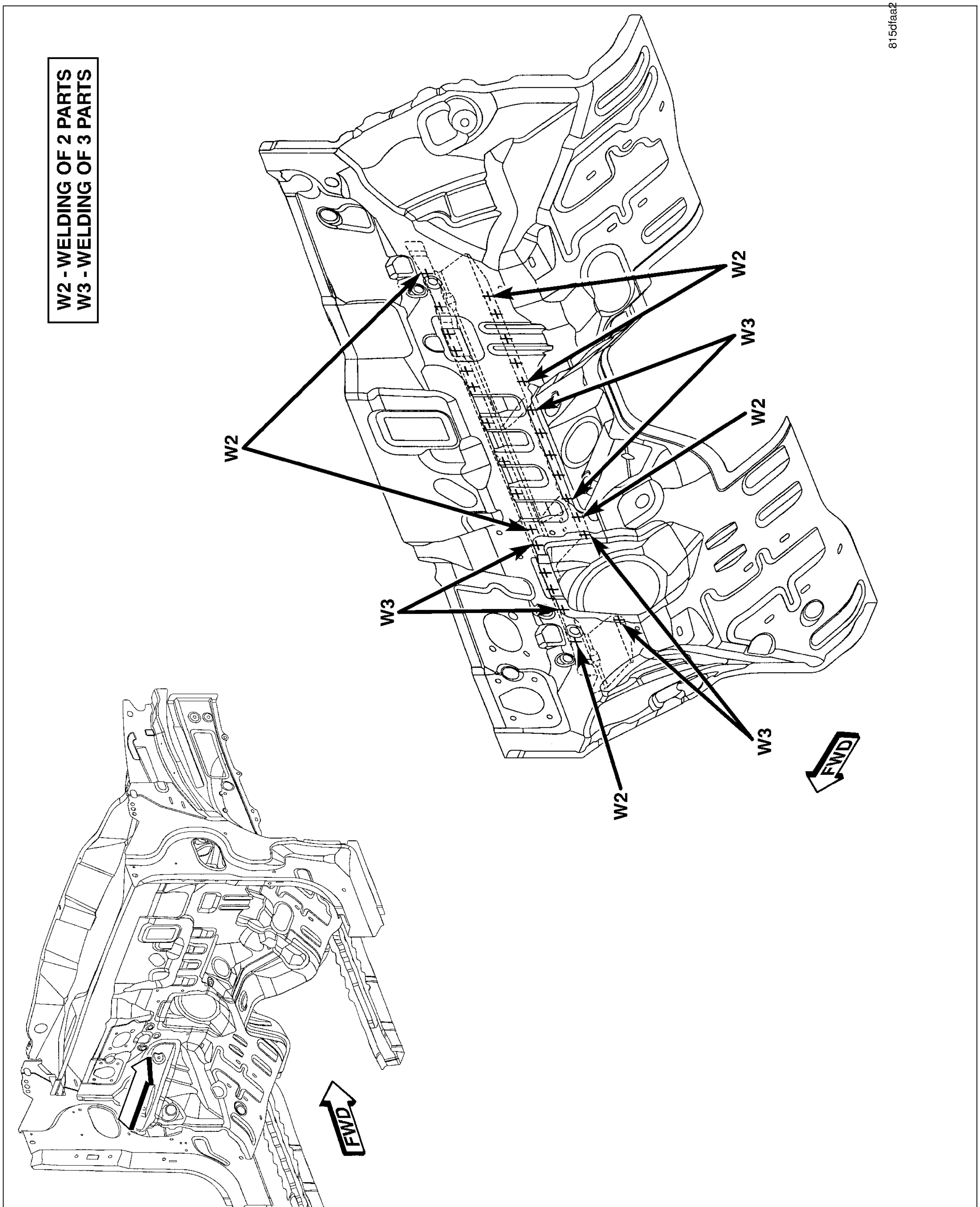


Fig. 156 ENGINE BOX - COMPLETE (3 OF 4)

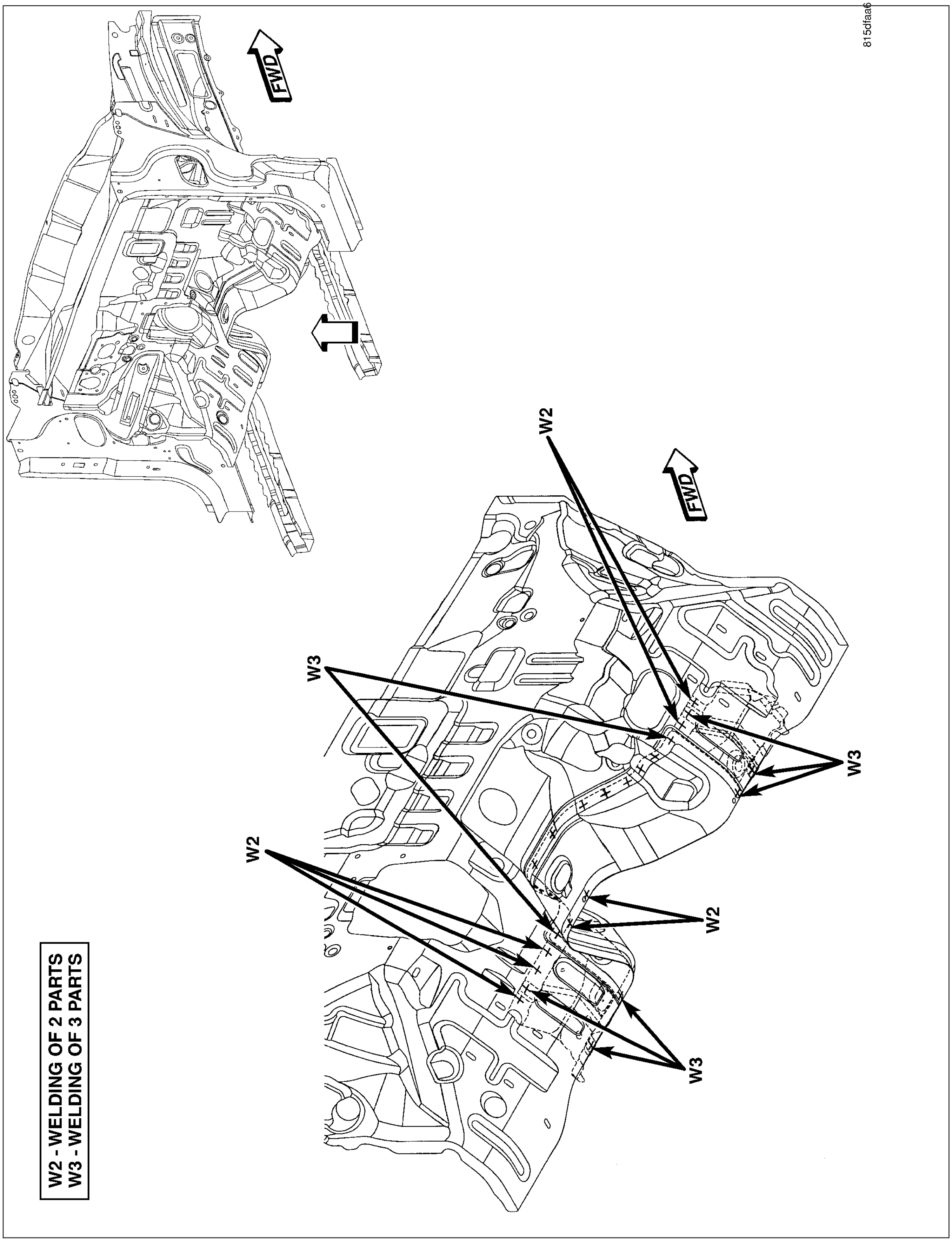


Fig. 157 ENGINE BOX - COMPLETE (4 OF 4)

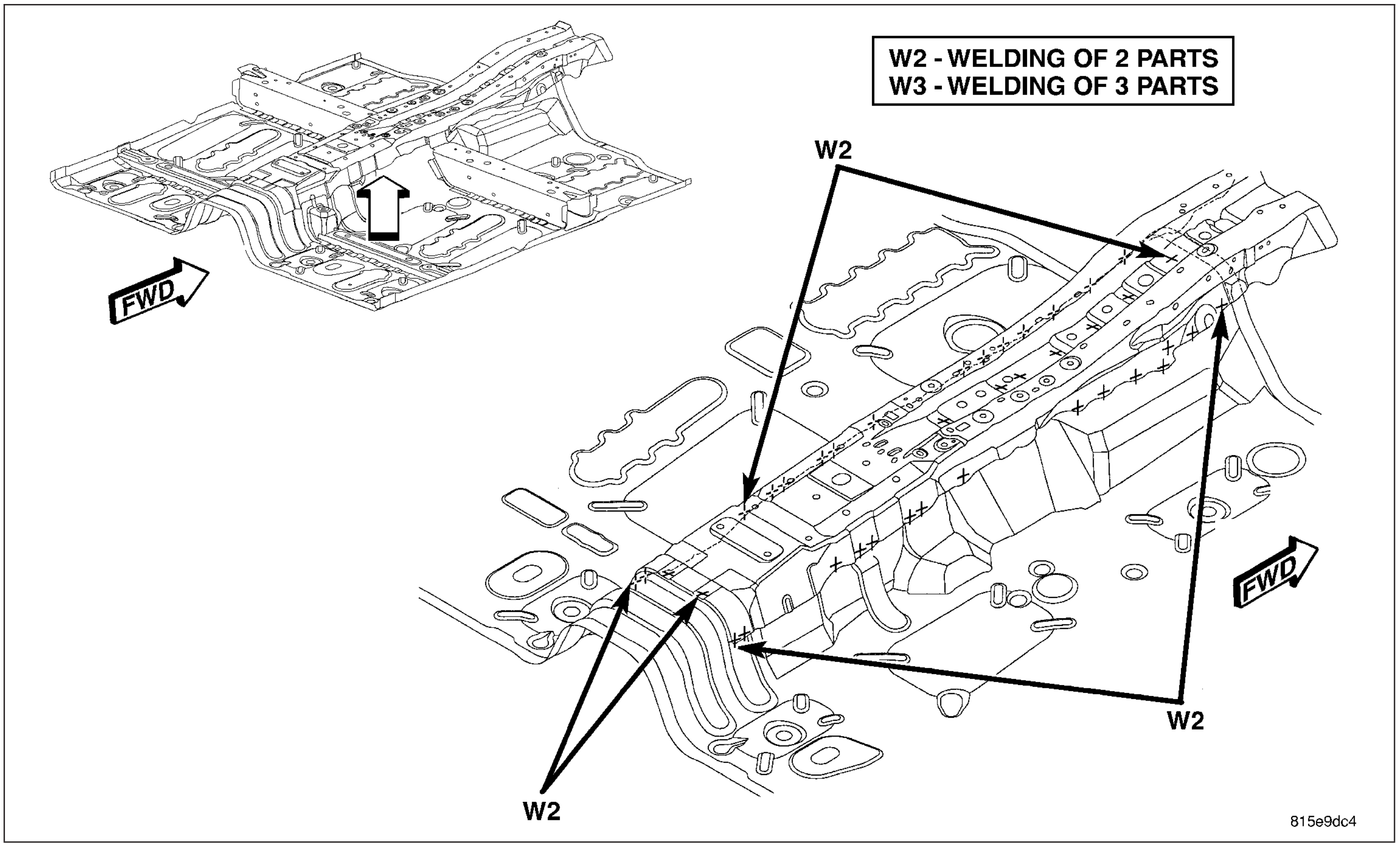


Fig. 158 FRONT FLOOR ASSEMBLY (1 OF 4)

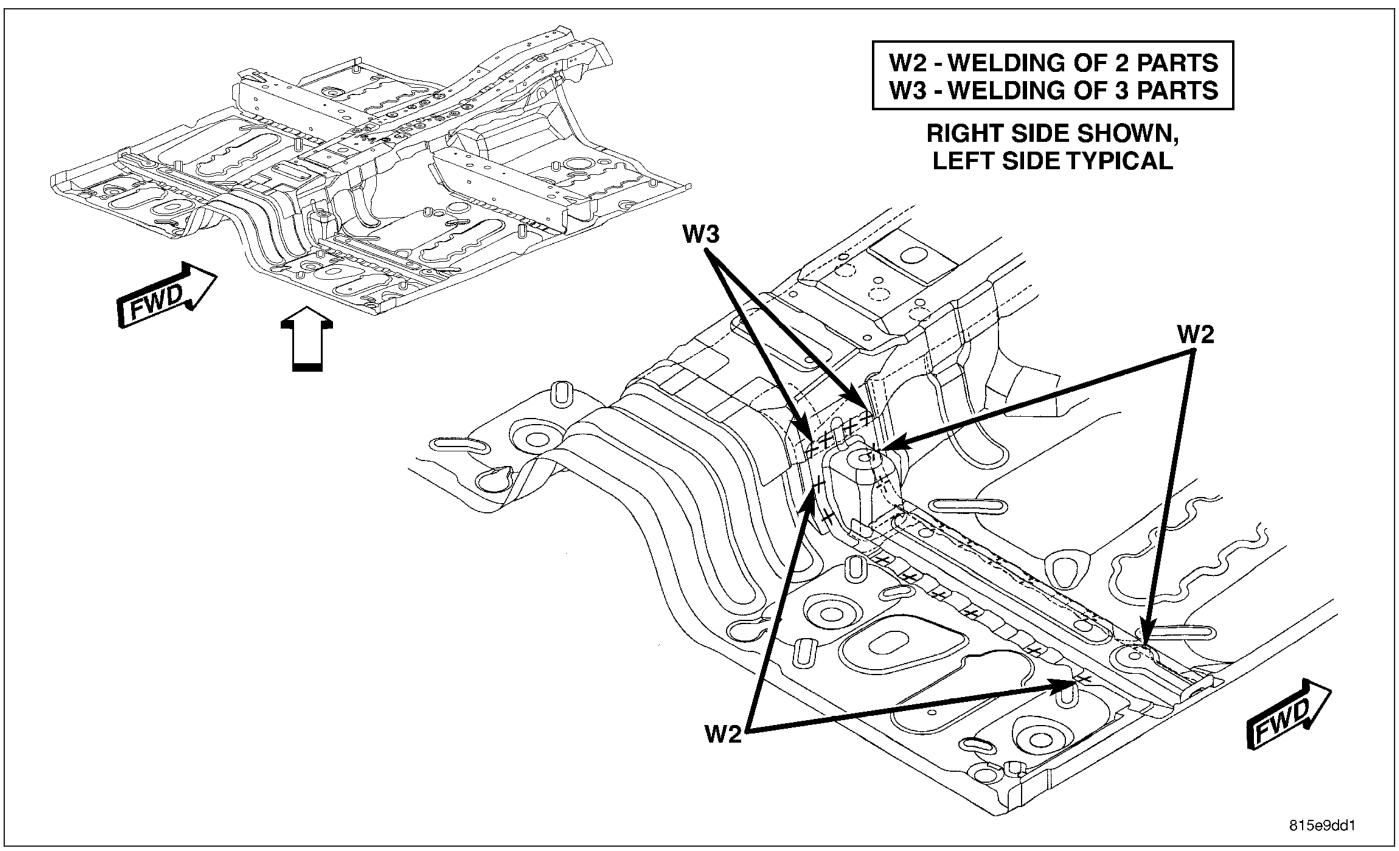


Fig. 159 FRONT FLOOR ASSEMBLY (2 OF 4)

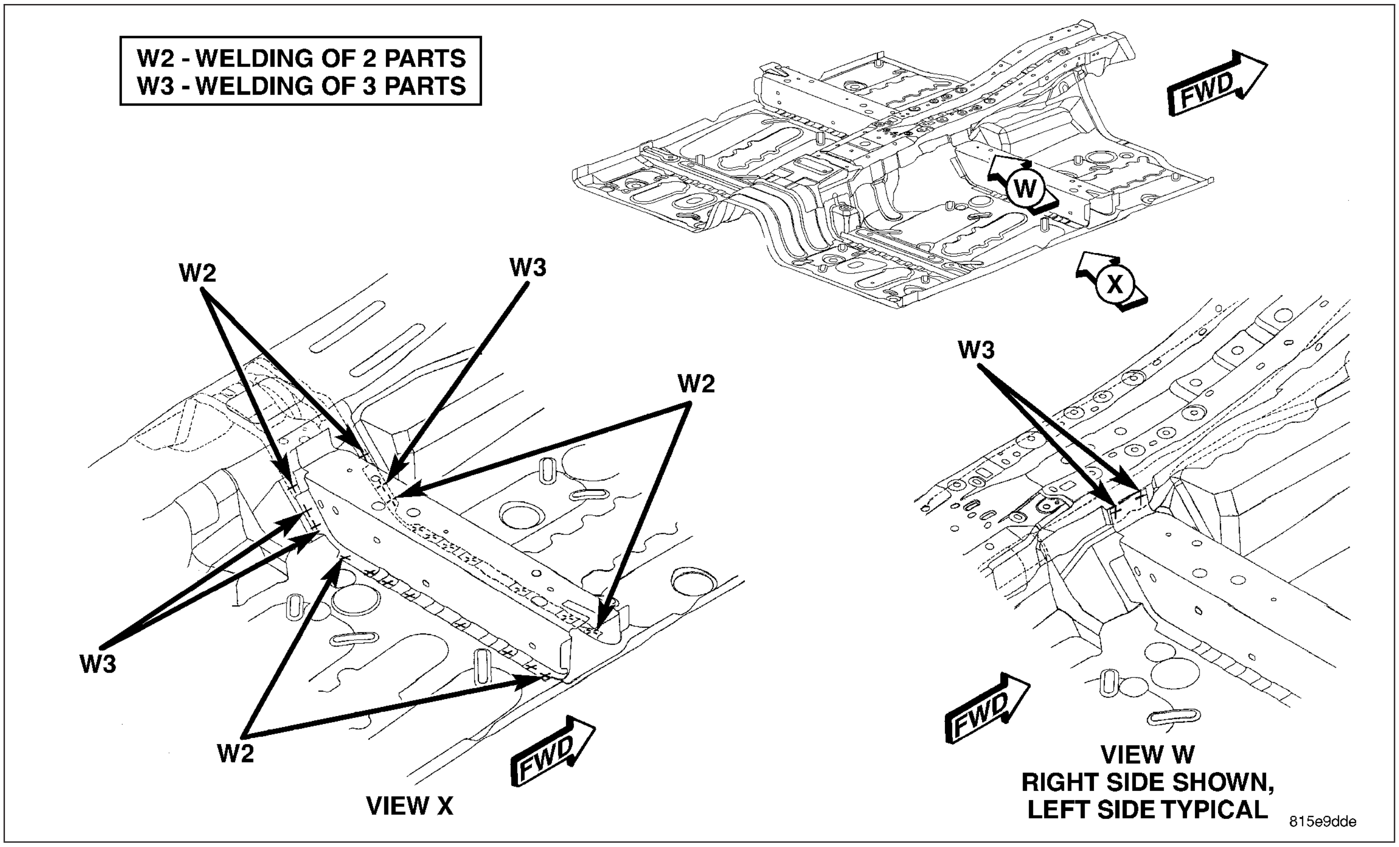


Fig. 160 FRONT FLOOR ASSEMBLY (3 OF 4)

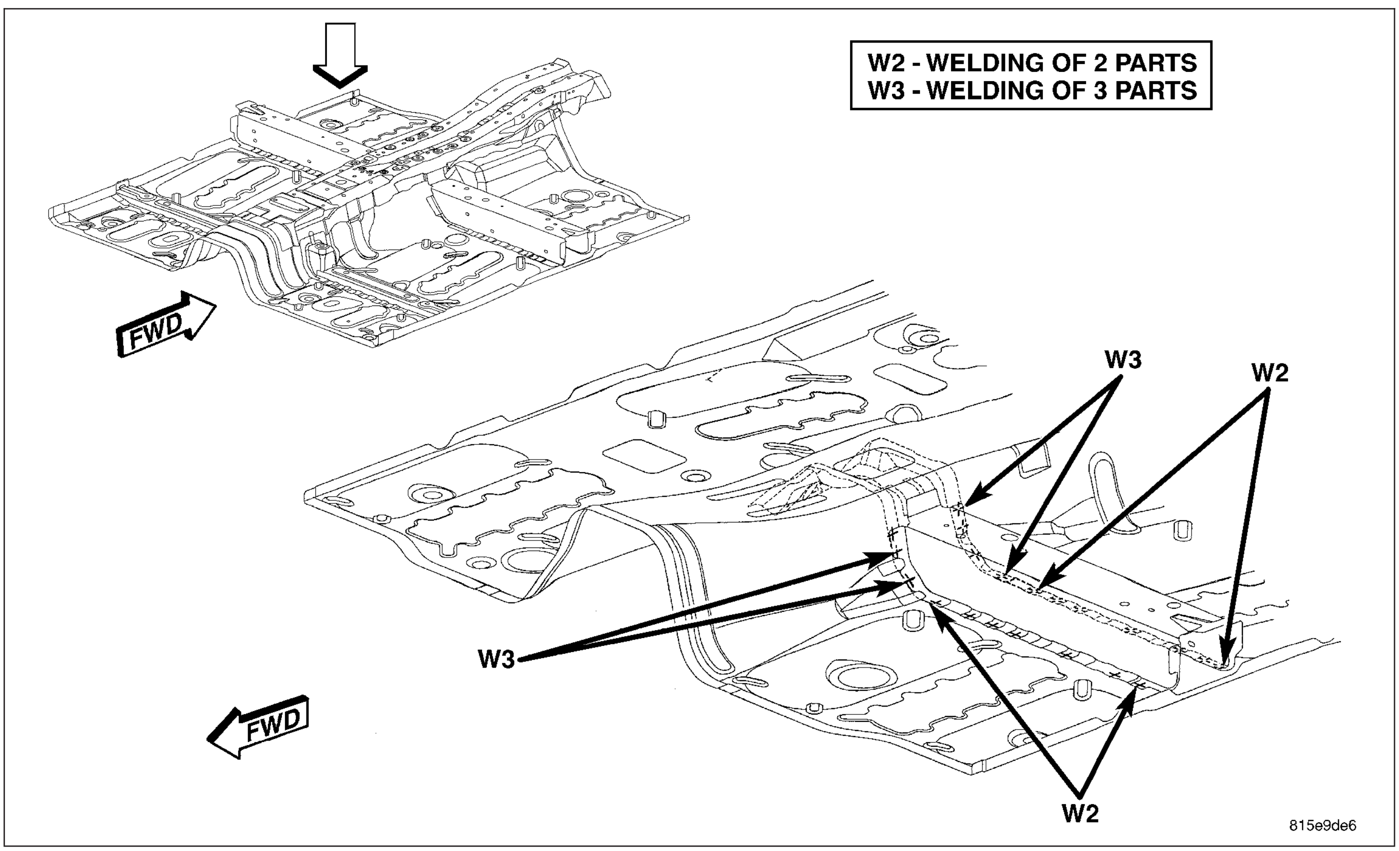


Fig. 161 FRONT FLOOR ASSEMBLY (4 OF 4)

HEATING & AIR CONDITIONING

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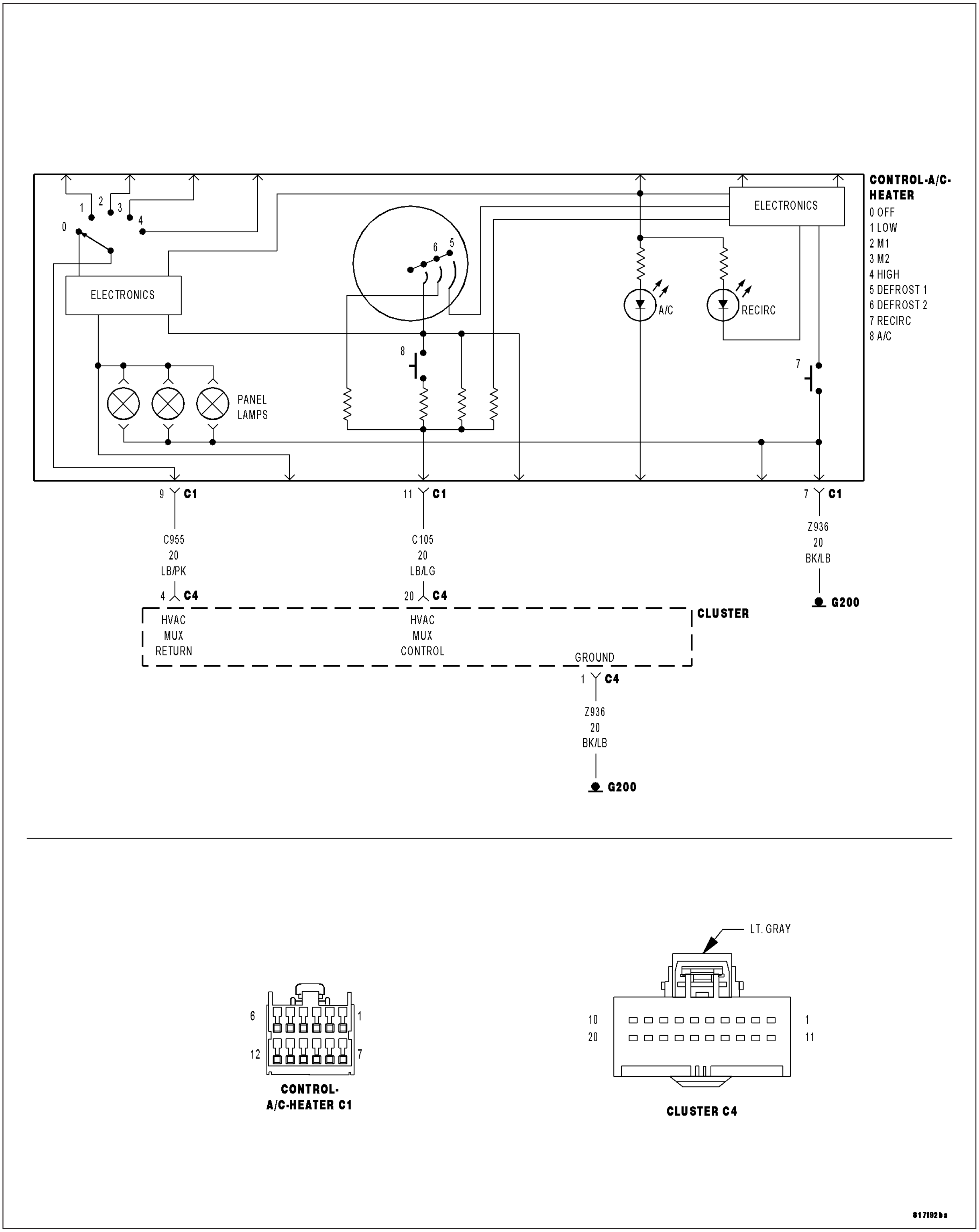
HEATING & AIR CONDITIONING ELECTRICAL DIAGNOSTICS

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HEATING & AIR CONDITIONING ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW (CCN)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Instrument Cluster (CCN) detects voltage below 0.55 volts for 10 seconds on the (C105) HVAC MUX Control circuit.

Possible Causes
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO GROUND
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO (Z936) GROUND CIRCUIT
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO (C955) HVAC MUX RETURN CIRCUIT
INSTRUMENT CLUSTER (CCN)
A/C HEATER CONTROL

Diagnostic Test

1. VERIFY DTC B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW IS ACTIVE

Turn the ignition on.
With the scan tool, erase DTCs.
Turn the ignition off, wait 10 seconds, and turn the ignition on.
With the scan tool, read DTCs.

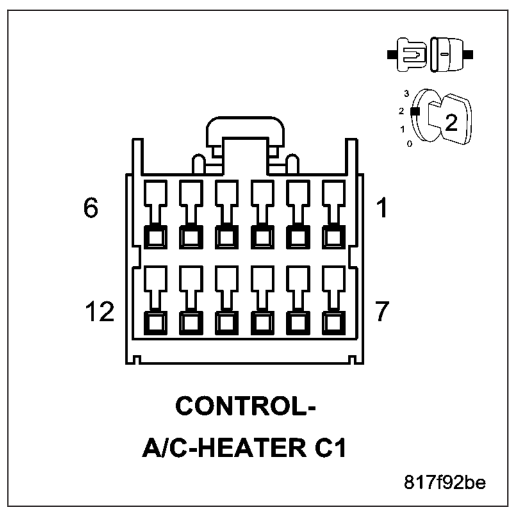
Does the scan tool display active: B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW WITH A/C HEATER CONTROL C1 HARNESS CONNECTOR DISCONNECTED

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
With the scan tool, erase DTCs.
Turn the ignition off, wait 10 seconds, and turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display: B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. CHECK THE (C105) HVAC MUX CONTROL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C4 harness connector.

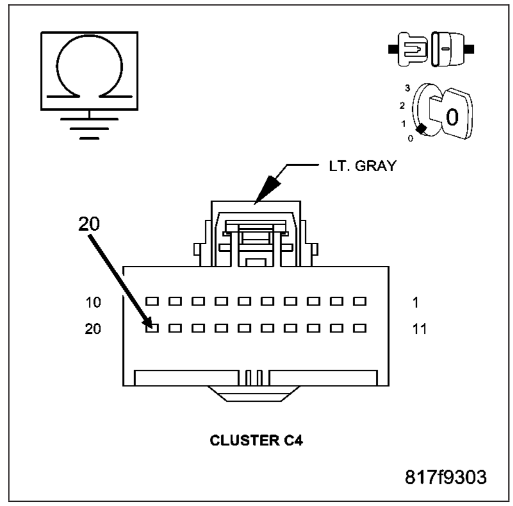
Measure the resistance of the (C105) HVAC MUX Control circuit between ground and the A/C Heater Control C4 harness connector.

Does the ohm meter read open circuit?

Yes >> Go To 4

No >> Repair the (C105) HVAC MUX Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



4. CHECK THE (C105) HVAC MUX CONTROL CIRCUIT FOR A SHORT TO THE (Z936) GROUND CIRCUIT & THE (C955) HVAC MUX RETURN CIRCUIT

Measure the resistance between the (C105) HVAC MUX Control circuit and the (Z936) Ground circuit in the A/C Heater Control C1 harness connector.

Measure the resistance between the (C105) HVAC MUX Control circuit and the (C955) HVAC MUX Return circuit in the A/C Heater Control C1 and C4 harness connectors.

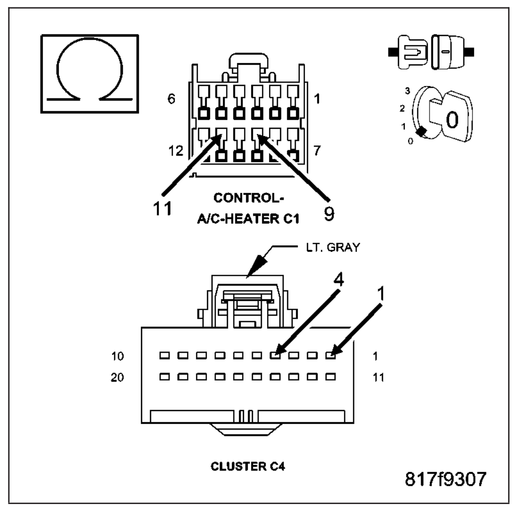
Does the ohm meter read open circuit?

Yes >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.

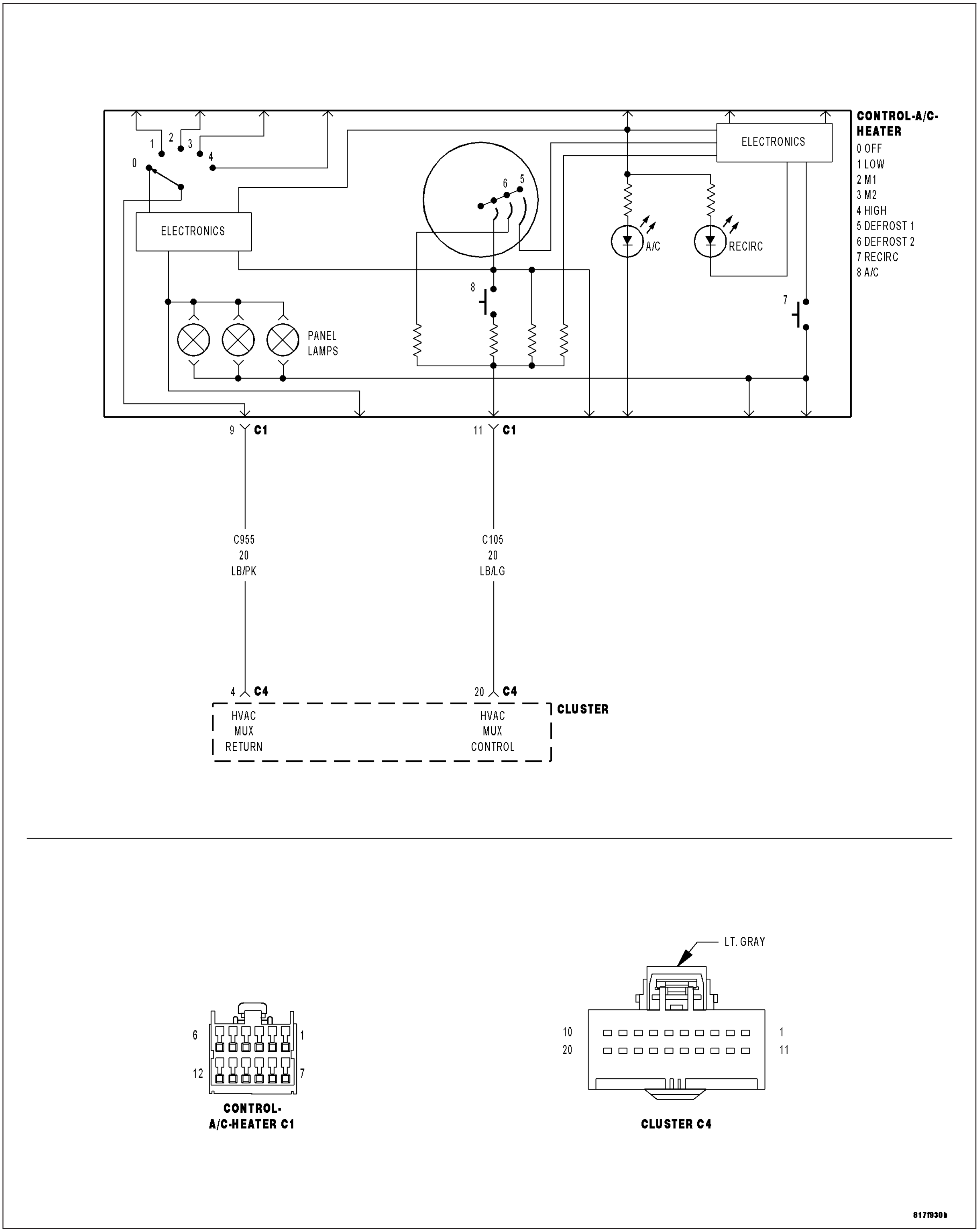
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair any circuits that are shorted to the (C105) HVAC MUX Control circuit.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).



B1002–A/C SWITCH REQUEST INPUT CIRCUIT HIGH (CCN)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Instrument Cluster (CCN) detects voltage above 4.5 volts for 10 seconds on the (C105) HVAC MUX Control circuit.

Possible Causes
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO VOLTAGE
(C105) HVAC MUX CONTROL CIRCUIT OPEN
(C955) HVAC MUX RETURN CIRCUIT OPEN
A/C HEATER CONTROL
INSTRUMENT CLUSTER (CCN)

Diagnostic Test

1. VERIFY DTC B1002–A/C SWITCH REQUEST INPUT CIRCUIT HIGH IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display active: B1002–A/C SWITCH REQUEST INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

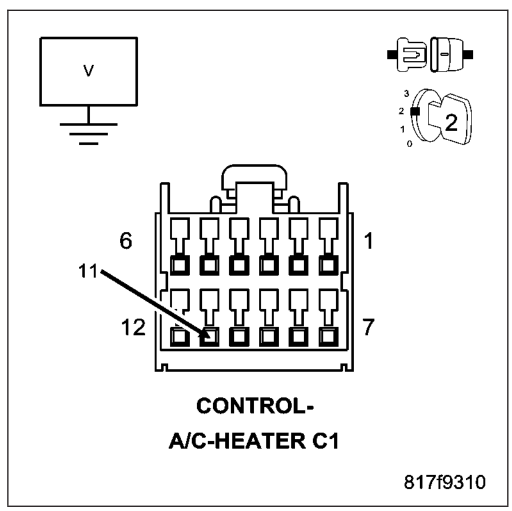
2. CHECK THE (C105) HVAC MUX CONTROL CIRCUIT VOLTAGE AT A/C HEATER CONTROL C1 HARNESS CONNECTOR

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C105) HVAC MUX Control circuit.



What is the voltage?

Below 4.8 Volts
Go To 3

4.8 to 5.2 Volts
Go To 4

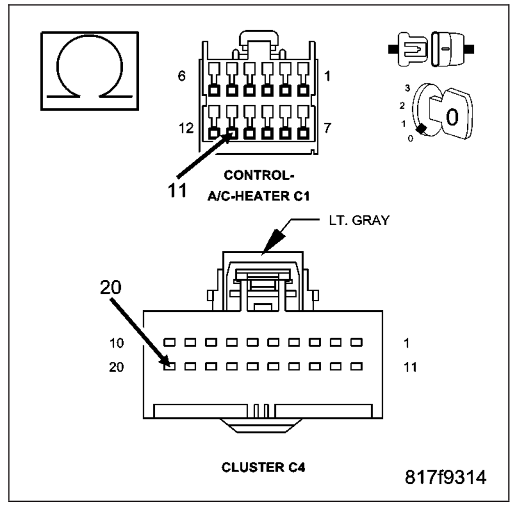
Above 5.2 Volts
Go To 6

3. CHECK THE (C105) HVAC MUX CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Instrument Cluster (CCN) C4 harness connector.

Measure the resistance of the (C105) HVAC MUX Control circuit between the A/C Heater Control C1 harness connector and the Instrument Cluster C4 harness connector.



Does the ohm meter read open circuit?

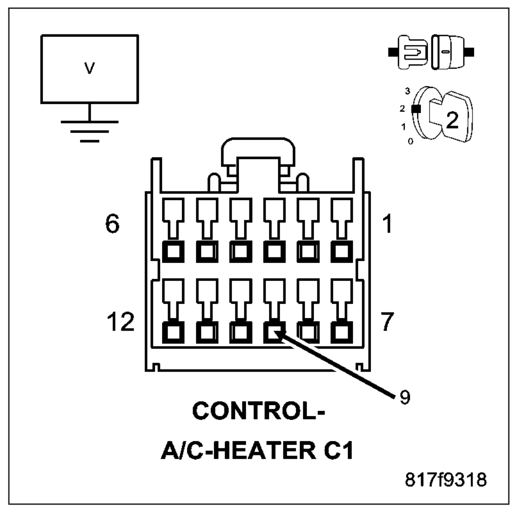
Yes >> Repair the (C105) HVAC MUX Control circuit for an open.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK THE (C955) HVAC MUX RETURN CIRCUIT OPERATION

Turn the ignition on.

Using a volt meter, measure the voltage of the (C955) HVAC MUX Return circuit in the A/C Heater Control C1 harness connector.



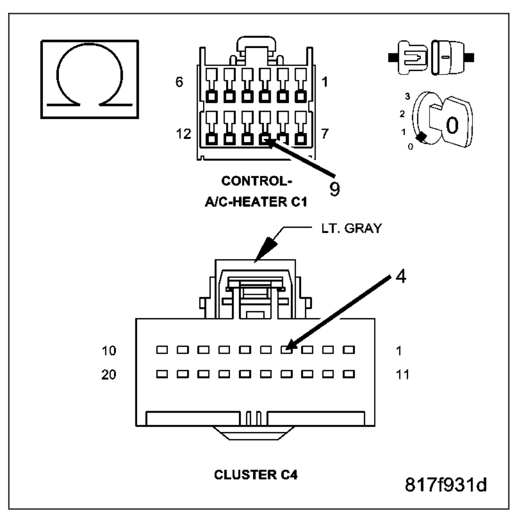
Does the volt meter read above 4.5 volts?

Yes >> Replace the A/C-Heater Control in accordance with the Service Information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 5

5. CHECK THE (C955) HVAC MUX RETURN CIRCUIT FOR AN OPEN

Measure the resistance of the (C955) HVAC MUX Return circuit between the A/C Heater Control C1 harness connector and the Instrument Cluster C4 harness connector.



Does the ohm meter read open circuit?

Yes >> Repair the (C955) HVAC MUX Return circuit for an open.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Instrument Cluster in accordance with the Service Information.
Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

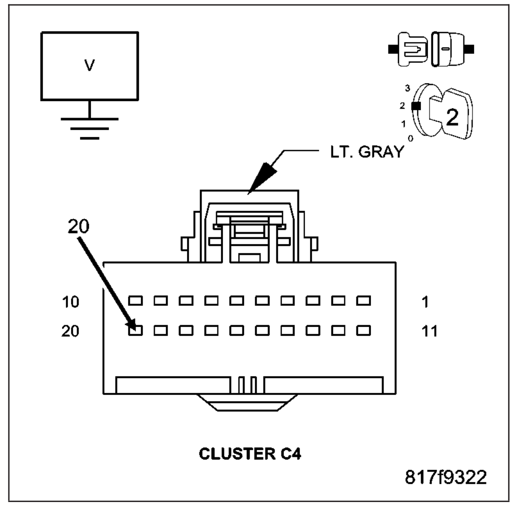
6. CHECK THE (C105) HVAC MUX CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Instrument Cluster C4 harness connector.

Turn the ignition on.

Measure the voltage of the (C105) HVAC MUX Control circuit.



Is the voltage above 1.0 volts?

Yes >> Repair the (C105) HVAC MUX Control circuit for a short to voltage.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B10C1–A/C SELECT SWITCH STUCK (CCN)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Instrument Cluster (CCN) detects that the A/C mode switch stays in a pushed position for more than 5 seconds.

Possible Causes
DTC B1001 OR B1002 ACTIVE IN THE CCN
OBJECT HOLDING A/C MODE SWITCH IN A PUSHED POSITION
SUBSTANCE CAUSING A/C MODE SWITCH TO GET STUCK IN A PUSHED POSITION
A/C HEATER CONTROL

Diagnostic Test

1. CHECK FOR ACTIVE DTC B1001 OR B1002 IN THE CCN

Turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display active: B1001 or B1002?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents in this Section.

No >> Go To 2

2. INSPECT THE A/C HEATER CONTROL FOR DAMAGE

Turn the ignition off.

Inspect the A/C Heater Control for damage.

Is the A/C Heater Control damaged?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Go To 3

3. INSPECT FOR OBJECT OR SUBSTANCE CAUSING THE A/C MODE SWITCH TO STAY OR STICK IN A PUSHED POSITION

Inspect the A/C Heater Control for anything that would cause the A/C mode switch to stay or stick in a pushed position.

Is anything present that would cause the A/C mode switch to stay or stick in a pushed position?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Go To 4

4. CHECK THE A/C MODE SWITCH AND STATUS INDICATOR FUNCTION

Start the engine.
Turn the blower control on.
Press the A/C mode switch on and off several times while observing the A/C status indicator.

Does the A/C status indicator turn on and off?

Yes >> Go To 5

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

5. VERIFY THAT DTC B10C1–A/C SELECT SWITCH STUCK IS STILL ACTIVE

Turn the ignition on.
With the scan tool, erase DTCs.
Turn the ignition off, wait 10 seconds, and turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display active: B10C1–A/C SELECT SWITCH STUCK?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW (CCN)

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The switch input changes when the switch is pushed down. A stored DTC B1016 indicates that the Electronic Back Light (EBL) mode switch was stuck in a pushed position for more than 10 minutes, but has since returned to its normal state. An active DTC B1016 indicates that the EBL mode switch is stuck in a pushed position. An active DTC B1016 will prevent proper EBL mode switch and status indicator function.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the EBL mode switch stays in a pushed position for more than 10 minutes.

Possible Causes
OBJECT HOLDING ELECTRONIC BACK LIGHT (EBL) MODE SWITCH IN A PUSHED POSITION
SUBSTANCE CAUSING EBL MODE SWITCH TO GET STUCK IN A PUSHED POSITION
A/C HEATER CONTROL

Diagnostic Test

1. INSPECT THE A/C HEATER CONTROL FOR DAMAGE

Inspect the A/C Heater Control for damage.

Is the A/C Heater Control damaged?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 2

2. INSPECT FOR OBJECT OR SUBSTANCE CAUSING THE EBL MODE SWITCH TO STAY OR STICK IN A PUSHED POSITION

Inspect the A/C Heater Control for anything that would cause the EBL mode switch to stay or stick in a pushed position.

Is anything present that would cause the EBL mode switch to stay or stick in a pushed position?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECK FOR NORMAL EBL MODE SWITCH AND STATUS INDICATOR FUNCTION

Turn the ignition on.

Press the EBL mode switch on and off several times while observing the EBL status indicator.

Does the EBL status indicator turn on and off?

Yes >> Go To 4

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

4. VERIFY THAT DTC B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW IS STILL ACTIVE

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on. Wait 10 minutes before proceeding.

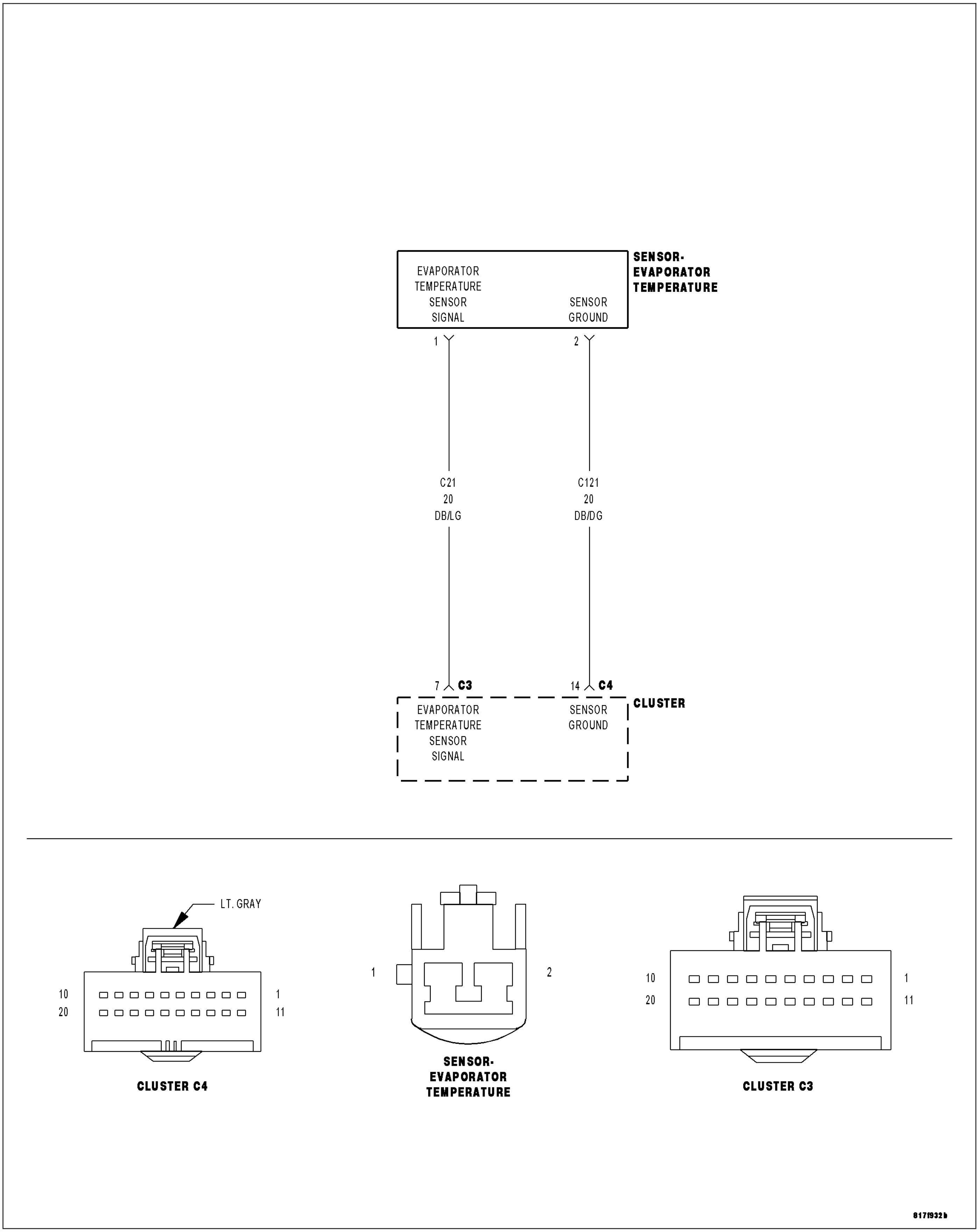
With the scan tool, read DTCs.

Does the scan tool display active: B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (CCN)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Evaporator Temperature Sensor input is out of range toward the low voltage threshold.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (C121) SENSOR GROUND CIRCUIT
EVAPORATOR TEMPERATURE SENSOR
INSTRUMENT CLUSTER (CCN)

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW WITH EVAPORATOR TEMPERATURE SENSOR HARNESS CONNECTOR DISCONNECTED

Turn the ignition off.

Disconnect the Evaporator Temperature Sensor harness connector.

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display: B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Cluster (CCN) C3 harness connector.

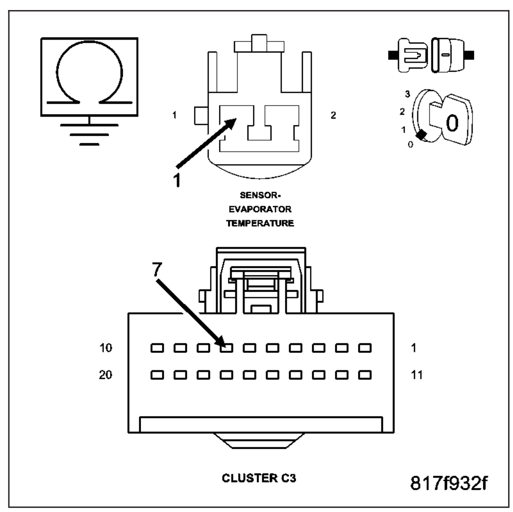
Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the Cluster (CCN) C3 harness connector.

Does the ohm meter read open circuit?

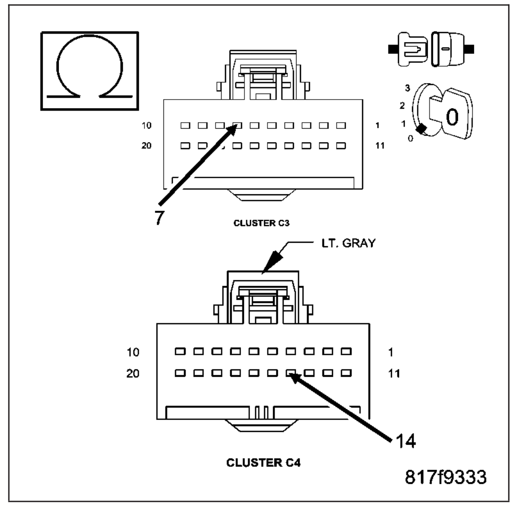
Yes >> Go To 3

No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).



3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND CIRCUIT



Disconnect the Cluster (CCN) C4 harness connector.

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit in the Cluster (CCN) C4 harness connector and the (C121) Sensor Ground circuit in the Cluster (CCN) C3 harness connector.

Does the ohm meter read open circuit?

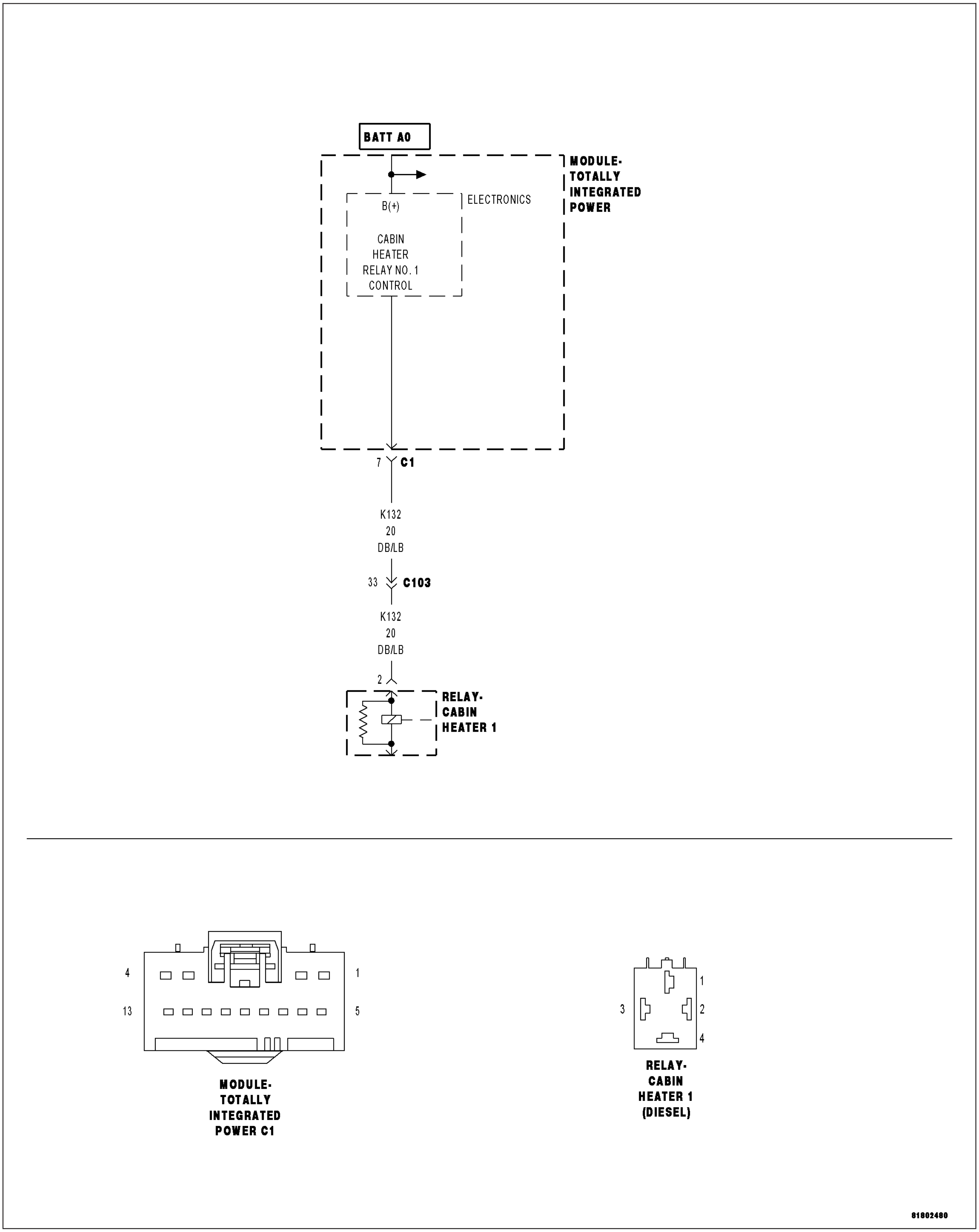
Yes >> Replace the Cluster (CCN) in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10B4–CABIN HEATER 1 CONTROL CIRCUIT LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, the Cabin Heater Relay 1 commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module detects the (K132) Cabin Heater Relay 1 Control circuit is shorted to ground.

Possible Causes
(K132) CABIN HEATER RELAY 1 CONTROL CIRCUIT SHORTED TO GROUND
CABIN HEATER 1 RELAY
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 1 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10B4–CABIN HEATER 1 CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

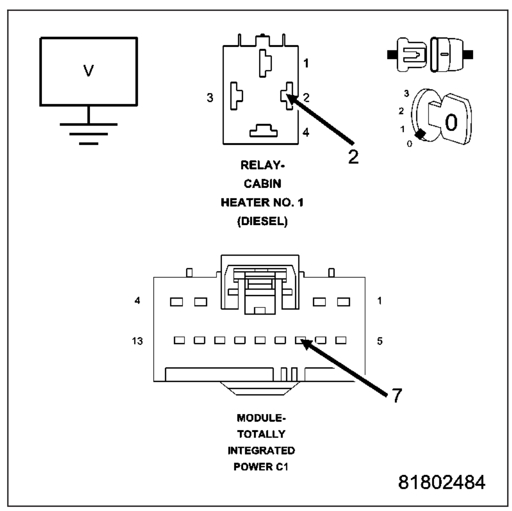
2. CHECK (K132) CABIN HEATER RELAY 1 OUTPUT CIRCUIT FOR SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 1.

Using an ohm meter measure the resistance between the (K132) Cabin Heater Relay 1 Output circuit and ground.



Does the ohm meter read open circuit?

Yes >> Go To 3

No >> Repair the (K132) Cabin Heater Relay 1 Output circuit for a short to ground.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

3. TOTALLY INTEGRATED POWER MODULE (TIPM)

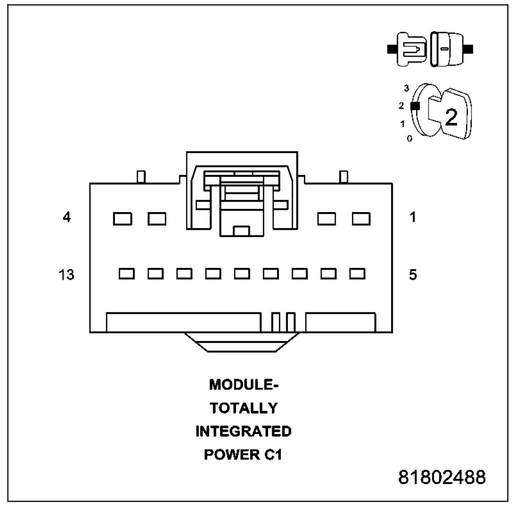
Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 1 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.



Does the scan tool display active: B10B4–CABIN HEATER 1 CONTROL CIRCUIT LOW?

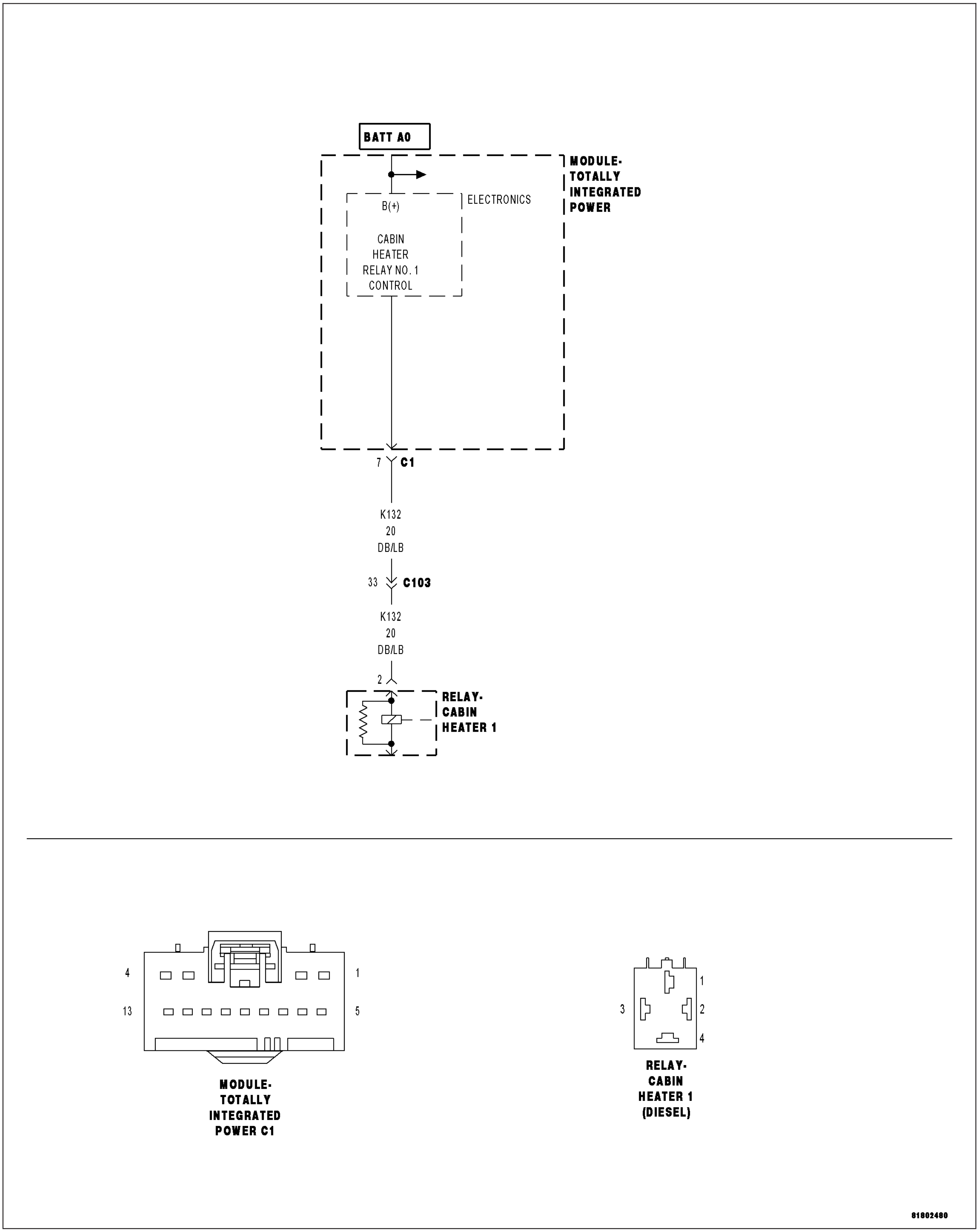
Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 1 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10B5–CABIN HEATER 1 CONTROL CIRCUIT HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, the Cabin Heater Relay 1 is commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module detects a short to voltage on the (K132) Cabin Heater Relay 1 Control circuit.

Possible Causes
(K132) CABIN HEATER RELAY 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
CABIN HEATER RELAY 1
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 1 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10B5–CABIN HEATER 1 CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

2. CHECK THE (K132) CABIN HEATER RELAY 1 CONTROL CIRCUIT FOR SHORT TO VOLTAGE

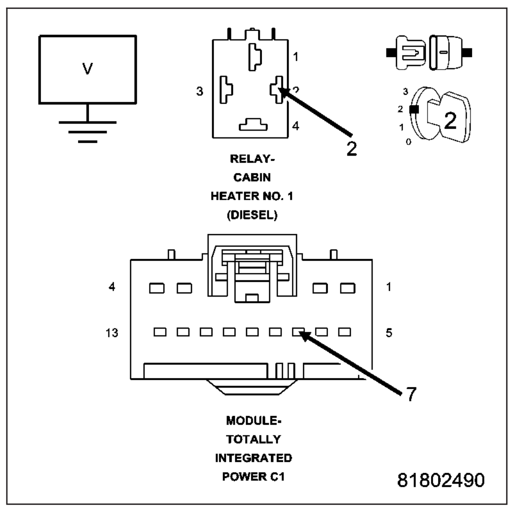
Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 1.

Turn the ignition on.

With a volt meter, measure the voltage on the (K132) Cabin Heater Relay 1 Control circuit.



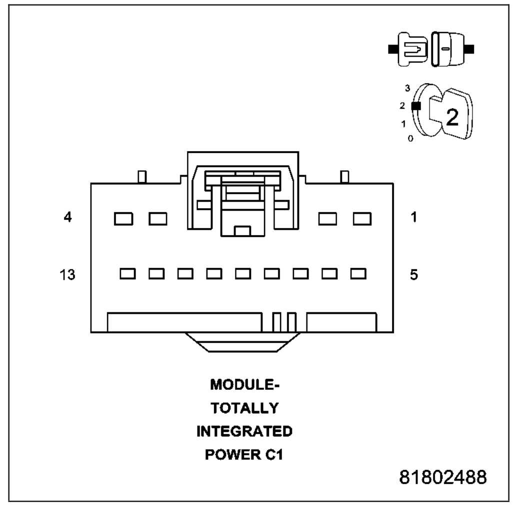
Does the volt meter read 1.0 volt or above?

Yes >> Repair short to voltage on the (K132) Cabin Heater Relay 1 Control circuit.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. TOTALLY INTEGRATED POWER MODULE



Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 1 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10B5–CABIN HEATER 1 CONTROL CIRCUIT HIGH?

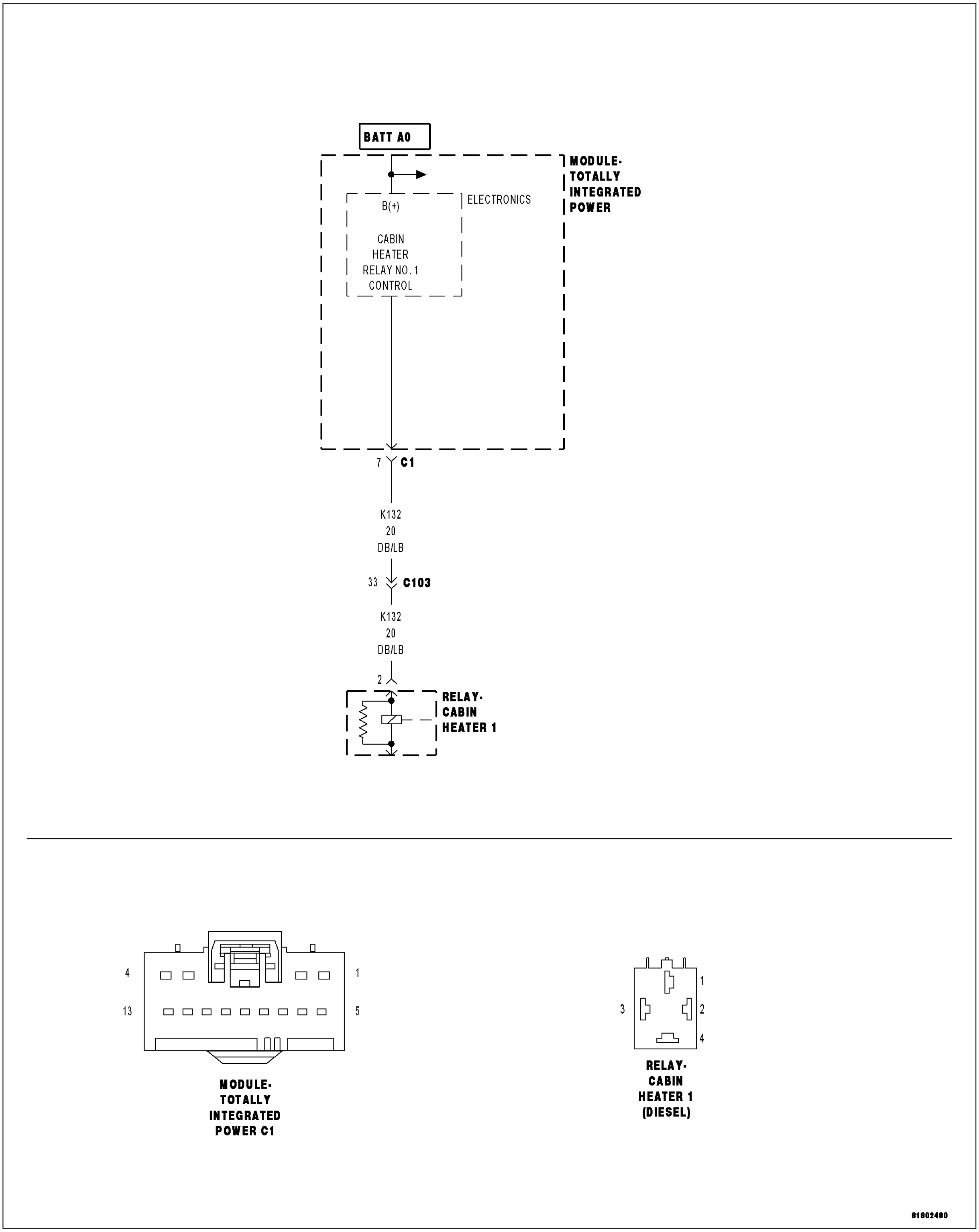
Yes >> Replace the Totally Integrated Power Module (TIPM in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 1 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10B6–CABIN HEATER 1 CONTROL CIRCUIT OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, and the Cabin Heater Relay 1 commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects that the (K132) Cabin Heater Relay 1 Control circuit is open.

Possible Causes
(K132) CABIN HEATER RELAY 1 OUTPUT CIRCUIT OPEN
CABIN HEATER RELAY 1
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater Relay 1.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10B6–CABIN HEATER 1 CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

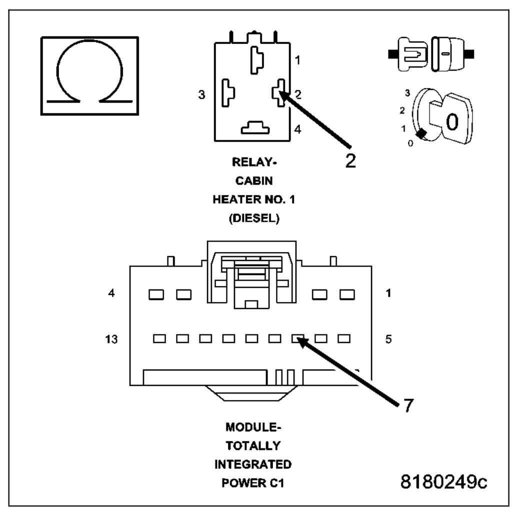
2. CHECK (K132) CABIN HEATER RELAY 1 CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 1.

Using an ohm meter, measure the resistance of the (K132) Cabin Heater Relay 1 Control circuit between the TIPM C1 harness connector, and the Cabin Heater Relay 1 harness connector.



Does the ohm meter read open circuit?

Yes >> Repair the (K132) Cabin Heater Relay 1 Control circuit for an open.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

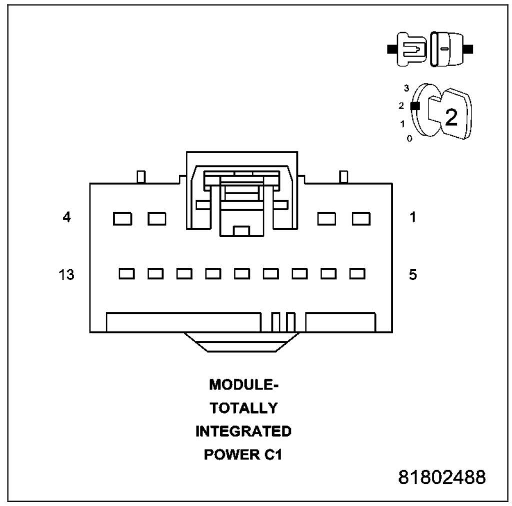
3. TOTALLY INTEGRATED POWER MODULE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater Relay 1.

With the scan tool, read DTCs.



Does the scan tool display active: B10B6–CABIN HEATER 1 CONTROL CIRCUIT OPEN?

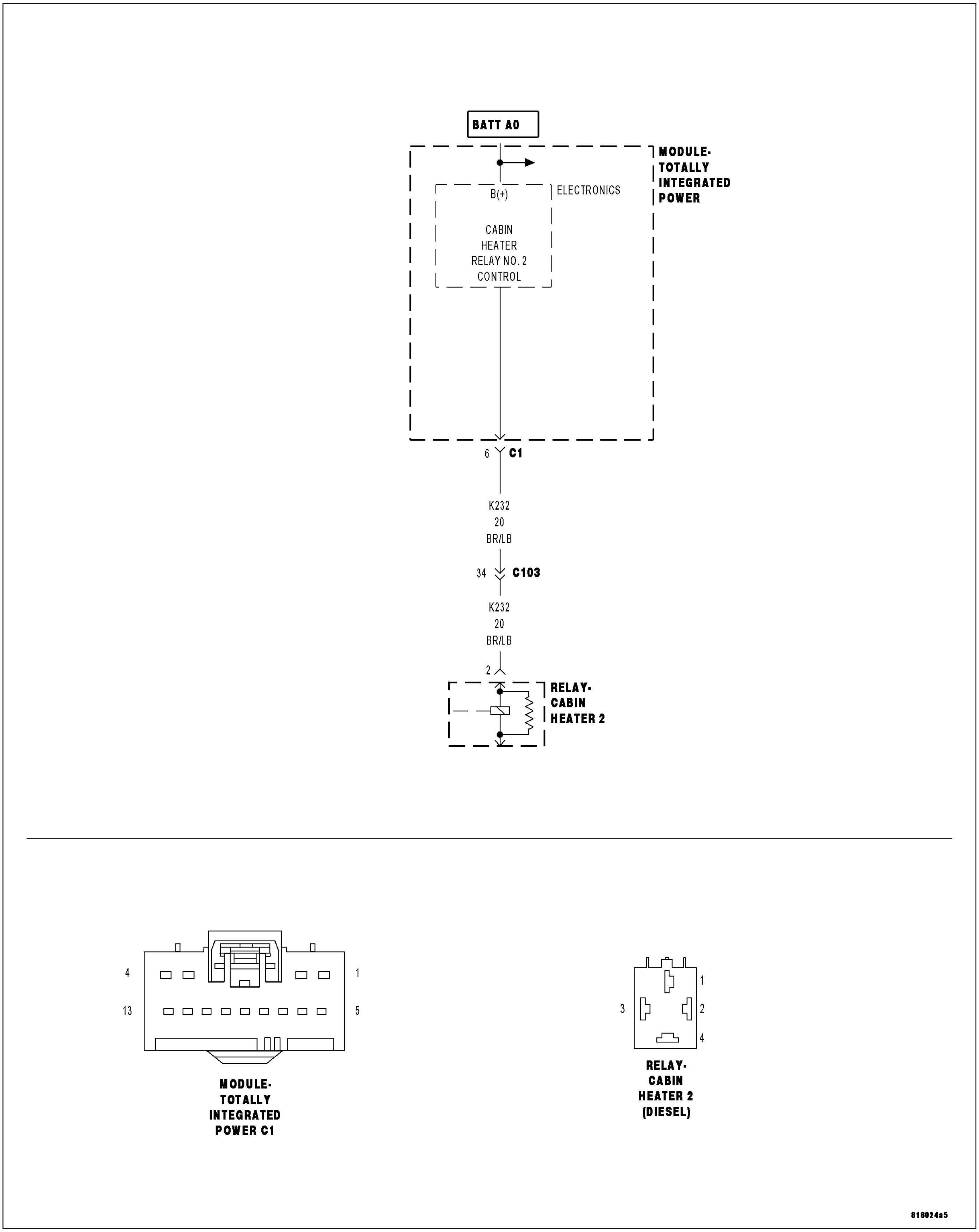
Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 1 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10B8–CABIN HEATER 2 CONTROL CIRCUIT LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, the Cabin Heater Relay 2 commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module detects the (K232) Cabin Heater Relay 2 Control circuit is shorted to ground.

Possible Causes
(K232) CABIN HEATER RELAY 2 CONTROL CIRCUIT SHORTED TO GROUND
CABIN HEATER 2 RELAY
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 2 Relay.

Monitor the scan tool, for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool, display active: B10B8–CABIN HEATER 2 CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

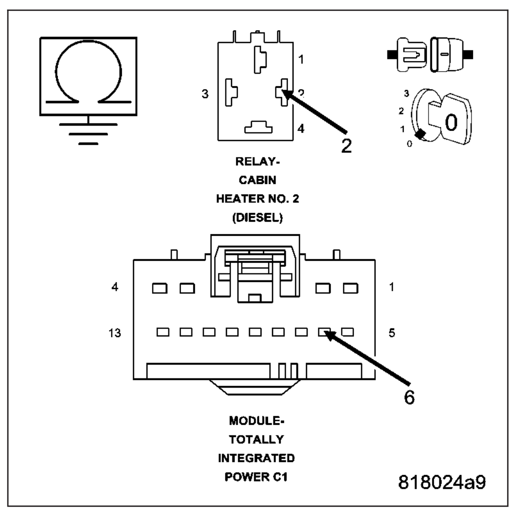
2. CHECK (K232) CABIN HEATER RELAY 2 OUTPUT CIRCUIT FOR SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 2.

Using an ohm meter measure the resistance between the (K232) Cabin Heater Relay 2 Output circuit and ground.



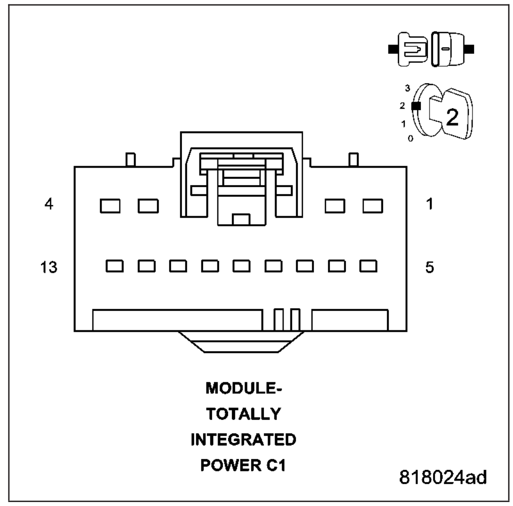
Does the ohm meter read open circuit?

Yes >> Go To 3

No >> Repair the (K232) Cabin Heater Relay 2 Output circuit for a short to ground.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

3. TOTALLY INTEGRATED POWER MODULE (TIPM)



Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 2 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10B8–CABIN HEATER 2 CONTROL CIRCUIT LOW?

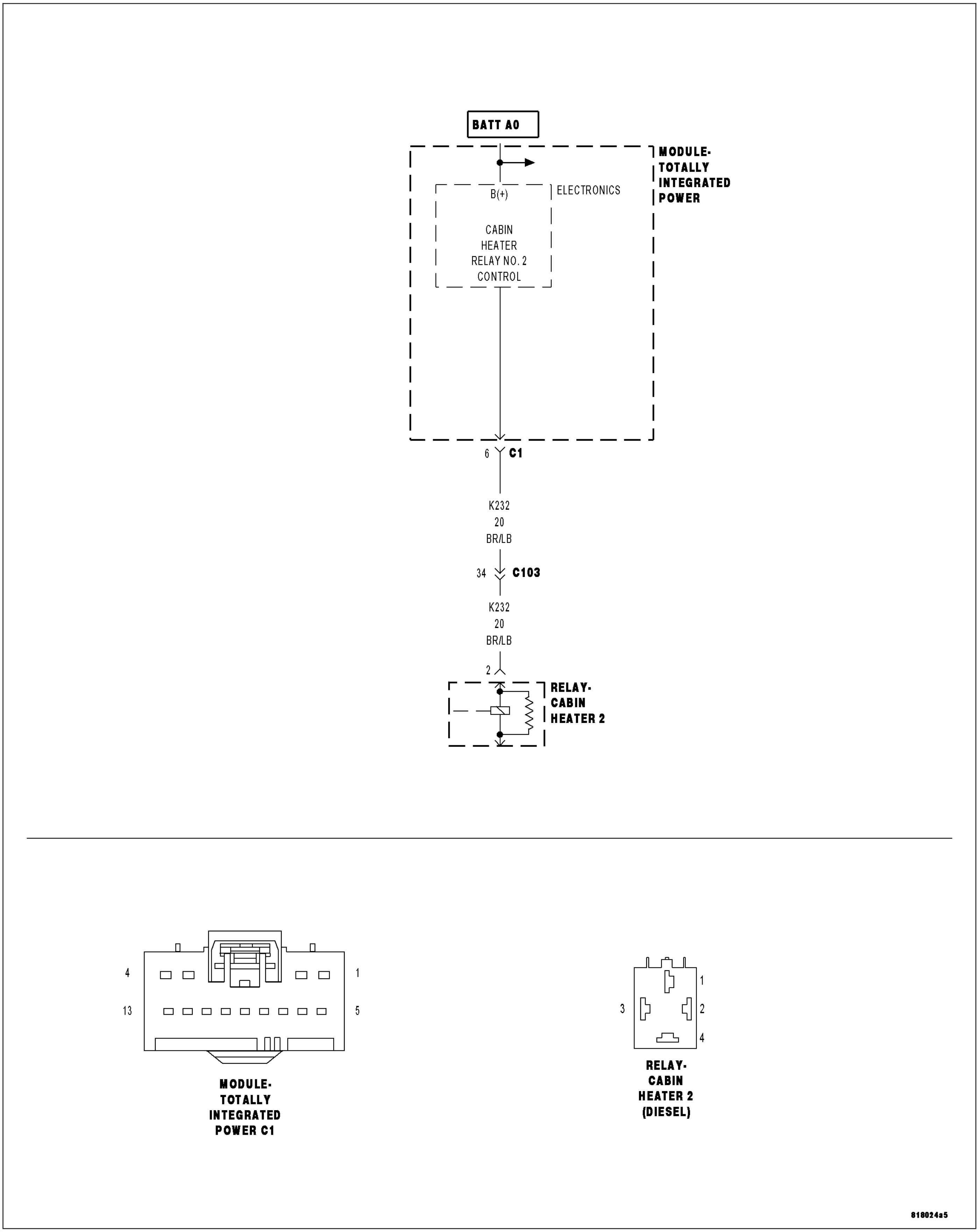
Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 2 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10B9–CABIN HEATER 2 CONTROL CIRCUIT HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, the Cabin Heater Relay 2 is commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module detects a short to voltage on the (K232) Cabin Heater Relay 2 Control circuit.

Possible Causes
(K232) CABIN HEATER RELAY 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
CABIN HEATER RELAY 2
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 2 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool, display active: B10B9–CABIN HEATER 2 CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

2. CHECK THE (K232) CABIN HEATER RELAY 2 CONTROL CIRCUIT FOR SHORT TO VOLTAGE

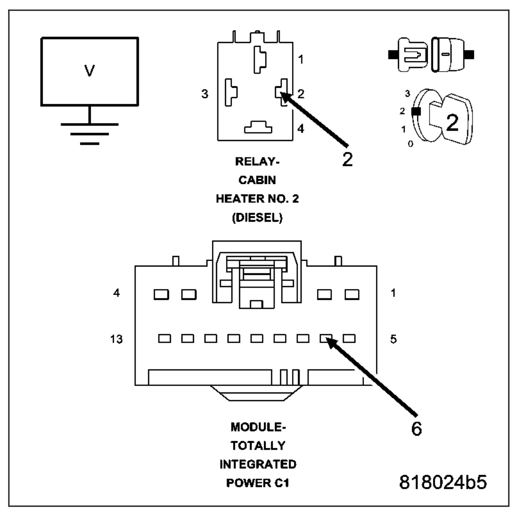
Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 2.

Turn the ignition on.

With a volt meter, measure the voltage on the (K232) Cabin Heater Relay 2 Control circuit.



Does the volt meter read 1.0 volt or above?

Yes >> Repair short to voltage on the (K232) Cabin Heater Relay 2 Control circuit.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

3. TOTALLY INTEGRATED POWER MODULE

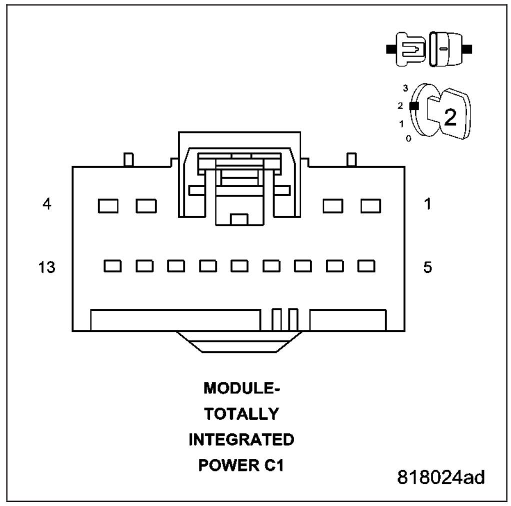
Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater 2 Relay.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.



Does the scan tool display active: B10B9–CABIN HEATER 2 CONTROL CIRCUIT HIGH?

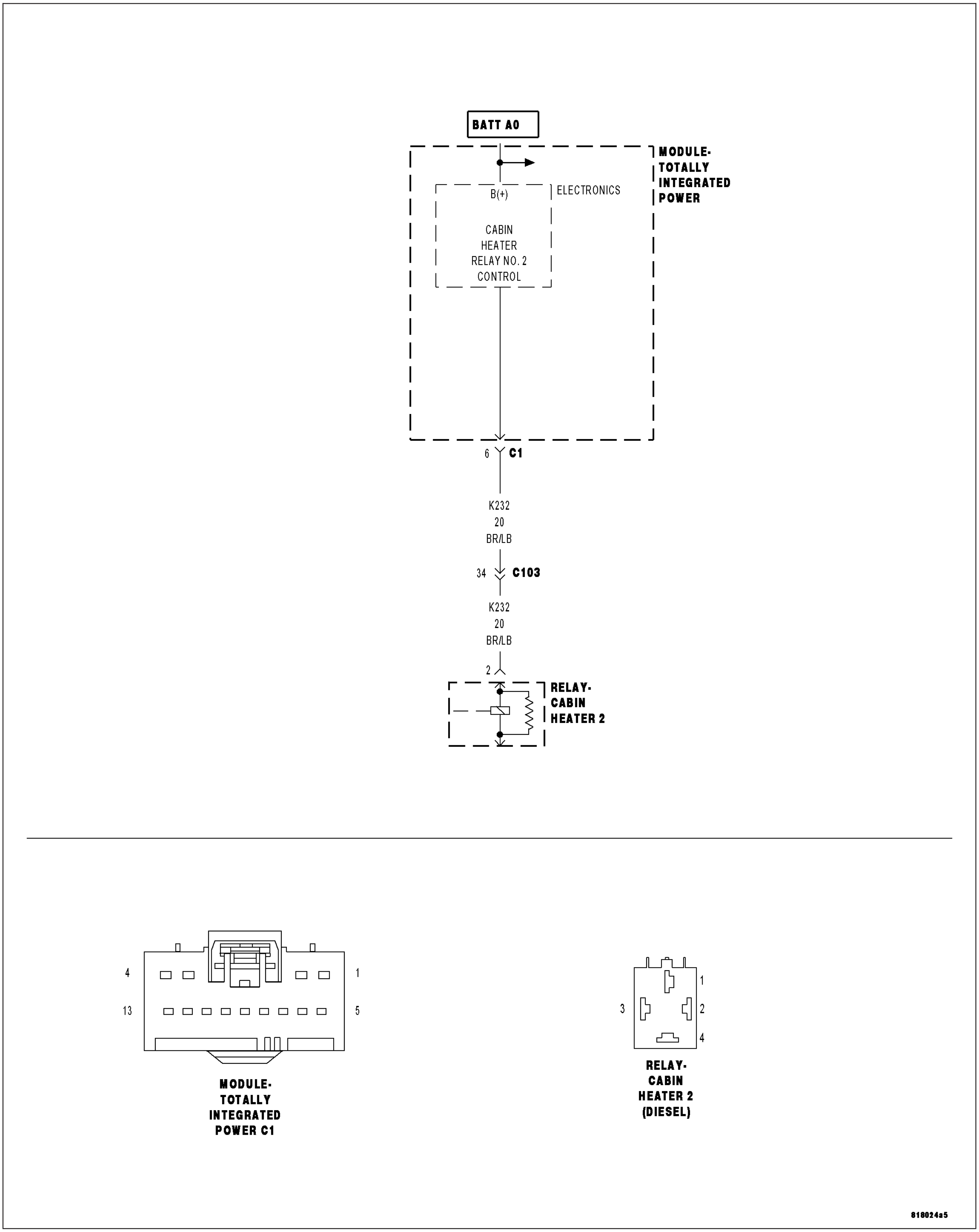
Yes >> Replace the Totally Integrated Power Module (TIPM in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 2 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10BA–CABIN HEATER 2 CONTROL CIRCUIT OPEN (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on, and the Cabin Heater Relay 2 commanded on.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects that the (K232) Cabin Heater Relay 2 Control circuit is open.

Possible Causes
(K232) CABIN HEATER RELAY 2 OUTPUT CIRCUIT OPEN
CABIN HEATER RELAY 2
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY THAT THE DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater Relay 2.

Monitor the scan tool for at least two minutes.

With the scan tool, read DTCs.

Does the scan tool display active: B10BA–CABIN HEATER 2 CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

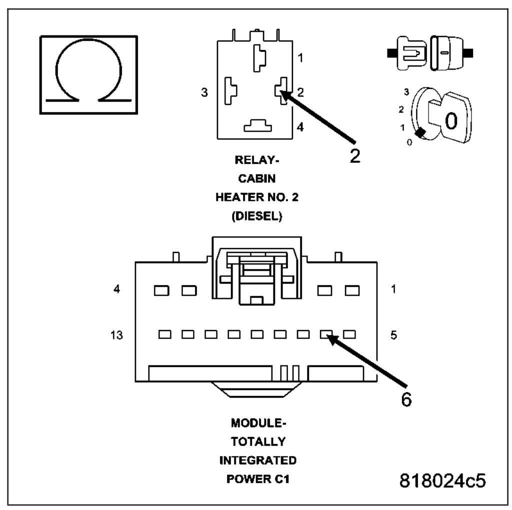
2. CHECK (K232) CABIN HEATER RELAY 2 CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the TIPM C1 harness connector.

Remove the Cabin Heater Relay 2.

Using an ohm meter, measure the resistance of the (K232) Cabin Heater Relay 2 Control circuit between the TIPM C1 harness connector, and the Cabin Heater Relay 2 harness connector.



Does the ohm meter read open circuit?

Yes >> Repair the (K232) Cabin Heater Relay 2 Control circuit for an open.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Go To 3

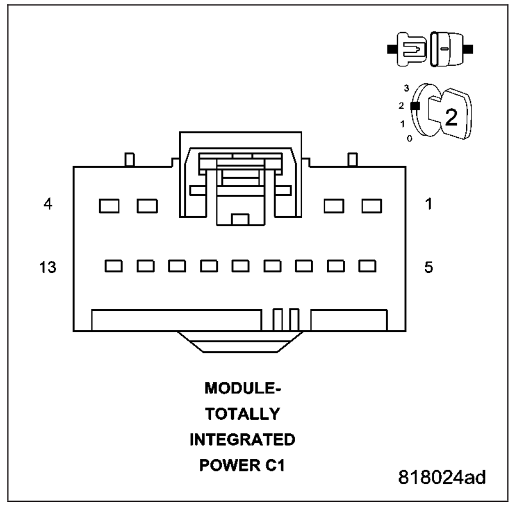
3. TOTALLY INTEGRATED POWER MODULE

Turn the ignition on.

With the scan tool, erase DTCs.

With the scan tool, actuate the Cabin Heater Relay 2.

With the scan tool, read DTCs.



Does the scan tool display active: B10BA–CABIN HEATER 2 CONTROL CIRCUIT OPEN?

Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

No >> Replace the Cabin Heater Relay 2 in accordance with the service information.

Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING).

B10C0–CONDENSER FAN CONTROL CIRCUIT OPEN (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts. TIPM requesting Condenser Fan operation.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects an open condition in the (C123) Condenser Fan Control circuit.

Possible Causes
(C123) CONDENSER FAN CONTROL OUTPUT CIRCUIT OPEN
CONDENSER FAN MOTOR
TIPM

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase TIPM DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, actuate the Condenser Fan.

With the scan tool, read TIPM DTCs.

Does this DTC reset?

Yes >> With the scan tool, de-actuate the Condenser Fan. Then, Go To 2

No >> With the scan tool, de-actuate the Condenser Fan. Then, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, corroded, and contaminated terminals.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK (C123) CONDENSER FAN CONTROL OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Disconnect the Condenser Fan harness connector.

Measure the resistance of the (C123) Condenser Fan Control Output circuit between the TIPM C8 harness connector and the Condenser Fan harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (C123) Condenser Fan Control Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

3. CHECK CONDENSER FAN MOTOR

Reconnect the TIPM C8 harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Condenser Fan.

Using a 12-volt test light connected to ground, probe the (C123) Condenser Fan Control Output circuit at the Condenser Fan harness connector.

Does the test light illuminate brightly and flash on and off?

Yes >> With the scan tool, de-actuate the Condenser Fan. Then, replace the Condenser Fan Motor in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> With the scan tool, de-actuate the Condenser Fan. Then, Go To 4

4. INSPECT RELATED WIRING

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

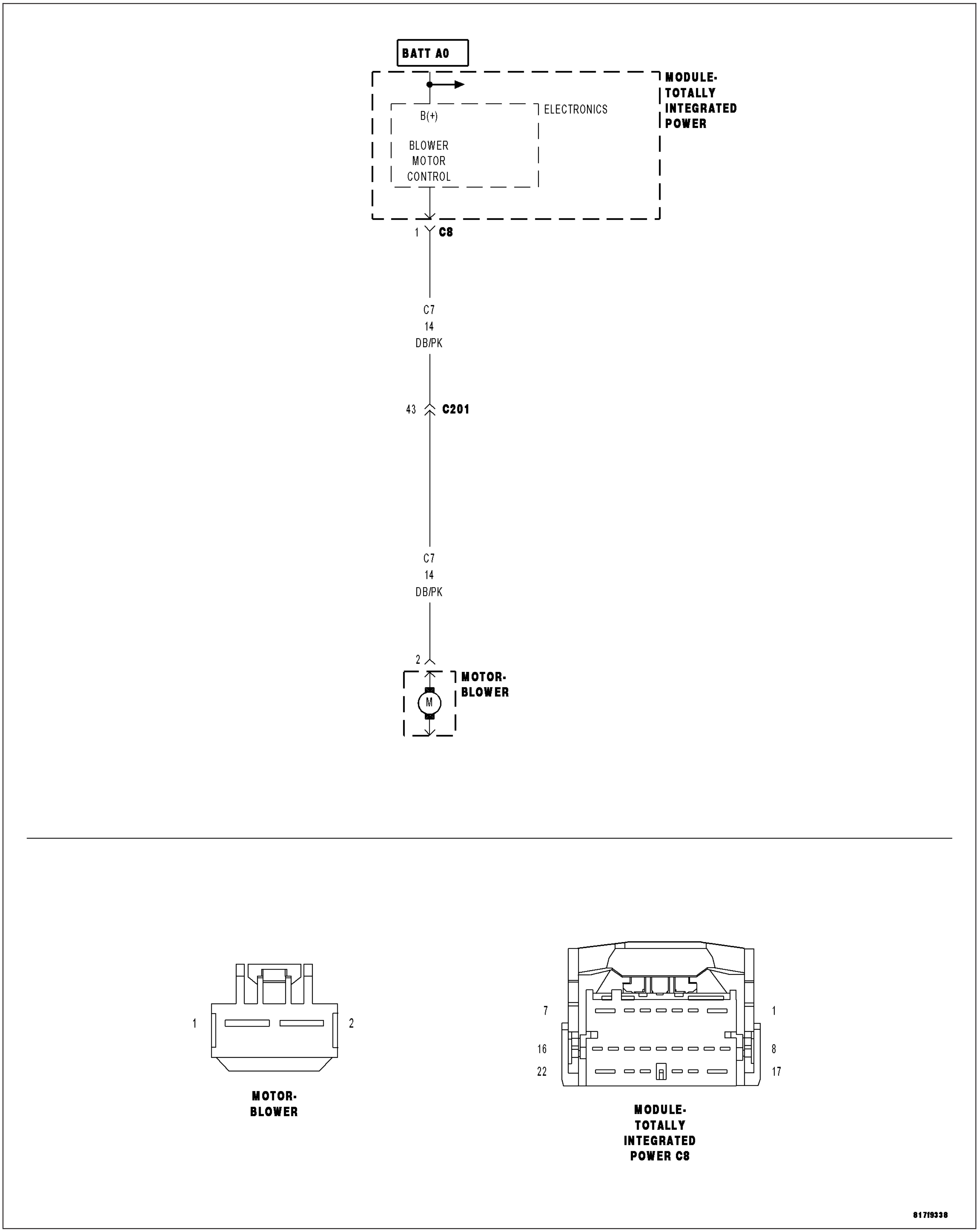
Yes >> Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Totally Integrated Power Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects a short to ground on the (C7) Blower Motor Control circuit, when blower motor operation is requested.

Possible Causes
(C7) BLOWER MOTOR CONTROL CIRCUIT SHORTED TO GROUND
BLOWER MOTOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the blower control switch to off.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Turn the blower control switch to on.

With the scan tool, read DTCs.

Does the scan tool display active: B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR ACTIVE DTC B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW WITH BLOWER MOTOR HARNESS CONNECTOR DISCONNECTED

Turn the blower control switch to off.

Disconnect the Blower Motor harness connector.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Turn the blower control switch to on.

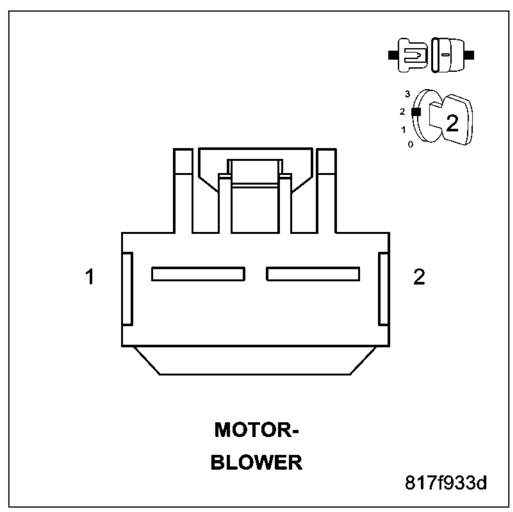
With the scan tool, read DTCs.

Does the scan tool display active: B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Blower Motor in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

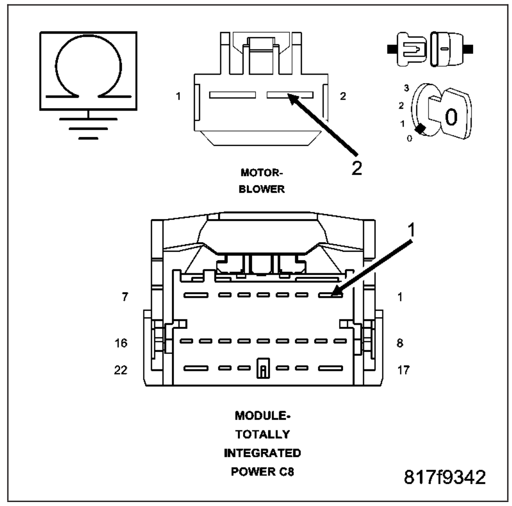


3. CHECK THE (C7) BLOWER MOTOR CONTROL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Measure the resistance of the (C7) Blower Motor Control circuit between ground and the Blower Motor harness connector.



Does the ohm meter read open circuit?

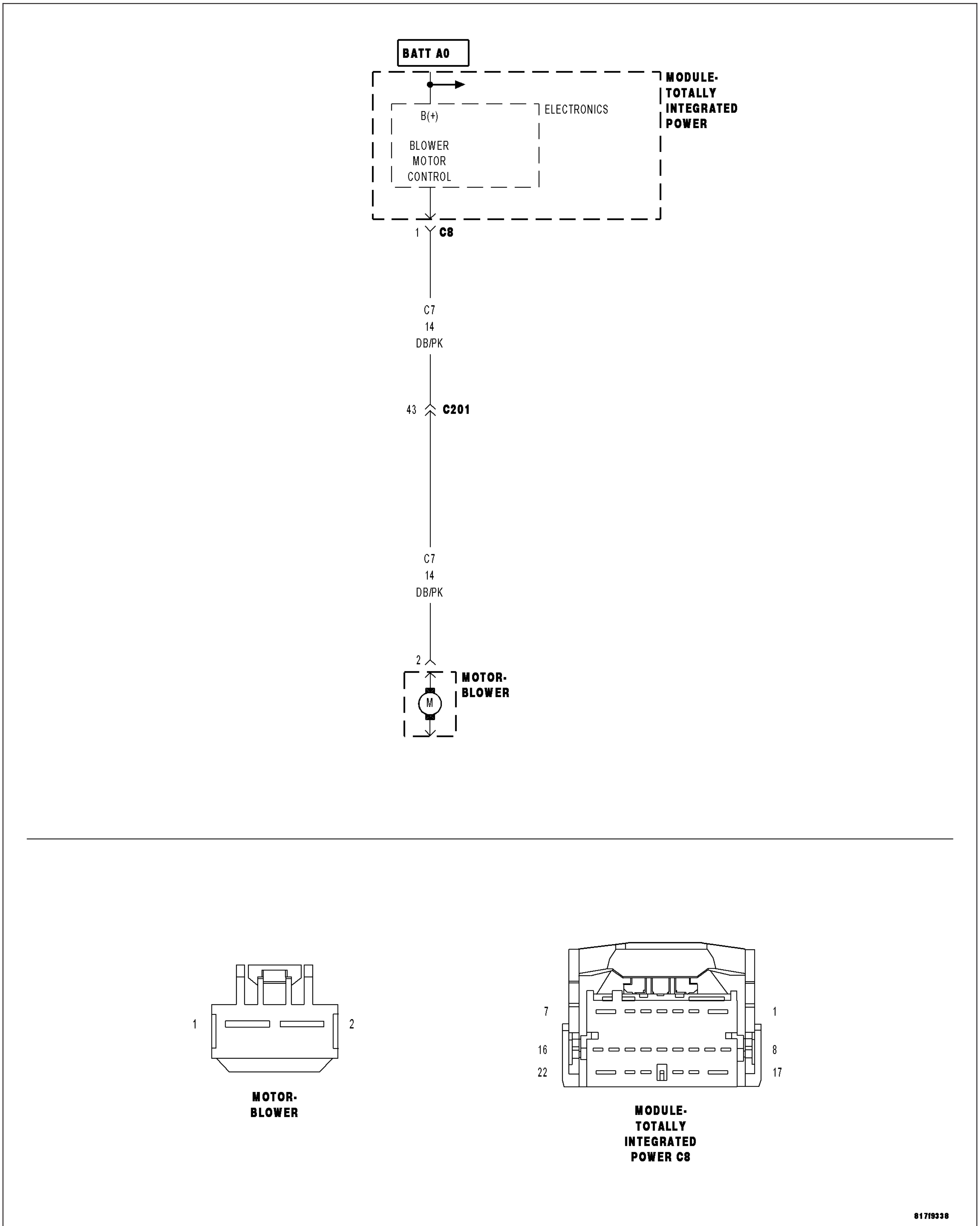
Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Repair the (C7) Blower Motor Control circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B10EA-BLOWER MOTOR CONTROL CIRCUIT HIGH (TIPM)



For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts. TIPM requesting Blower Motor operation.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects a short to voltage condition on the (C7) Blower Motor Control circuit.

Possible Causes
(C7) BLOWER MOTOR CONTROL CIRCUIT SHORTED TO VOLTAGE
(C7) BLOWER MOTOR CONTROL CIRCUIT OPEN
BLOWER MOTOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the a/c control, turn on the Blower Motor.

With the scan tool, read DTCs.

Does the scan tool display active: B10EA-BLOWER MOTOR CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

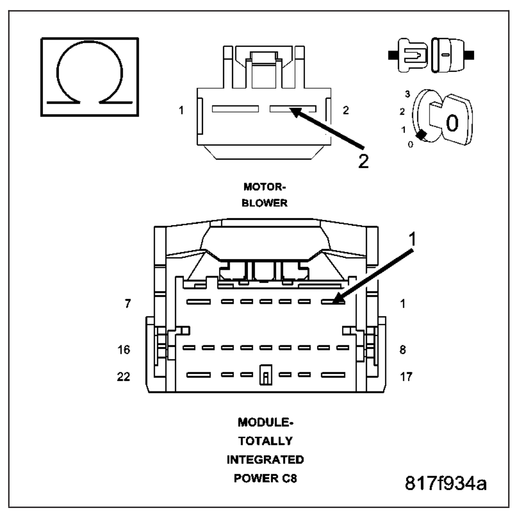
2. CHECK (C7) BLOWER MOTOR CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Disconnect the Blower Motor harness connector.

Measure the resistance of the (C7) Blower Motor Control circuit between the TIPM C8 harness connector and the Blower Motor harness connector.



Does the ohm meter read open circuit?

Yes >> Repair the (C7) Blower Motor Control circuit for an open.

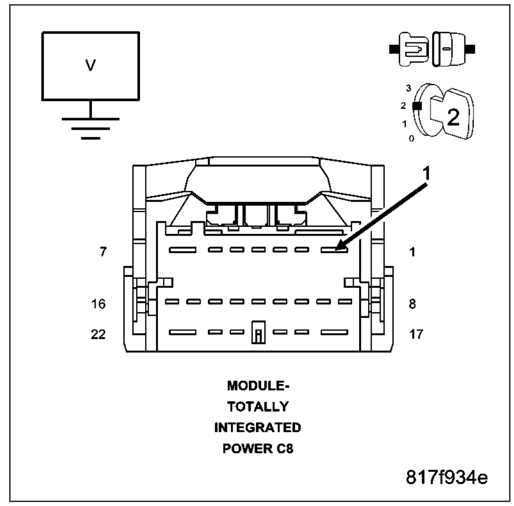
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK (C7) BLOWER MOTOR CONTROL CIRCUIT FOR SHORT TO VOLTAGE

Turn the ignition on.

With a volt meter measure the voltage on the (C7) Blower Motor Control circuit.



Does the volt meter read above 10.0 volts?

Yes >> Repair the (C7) Blower Motor Control circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. TOTALLY INTEGRATED POWER MODULE

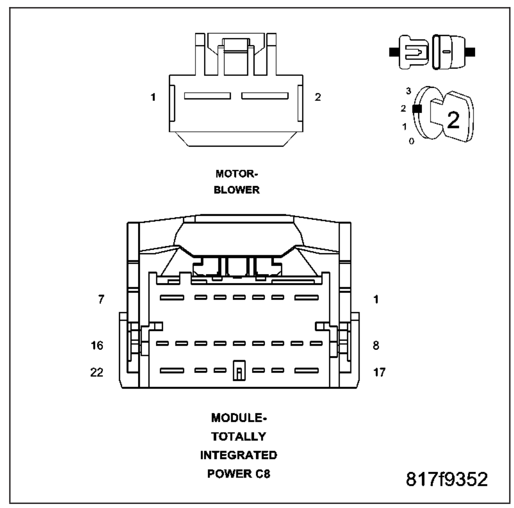
Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the a/c control, turn on the Blower Motor.

With the scan tool, read DTCs.



Does the scan tool display active: B10EA-BLOWER MOTOR CONTROL CIRCUIT HIGH?

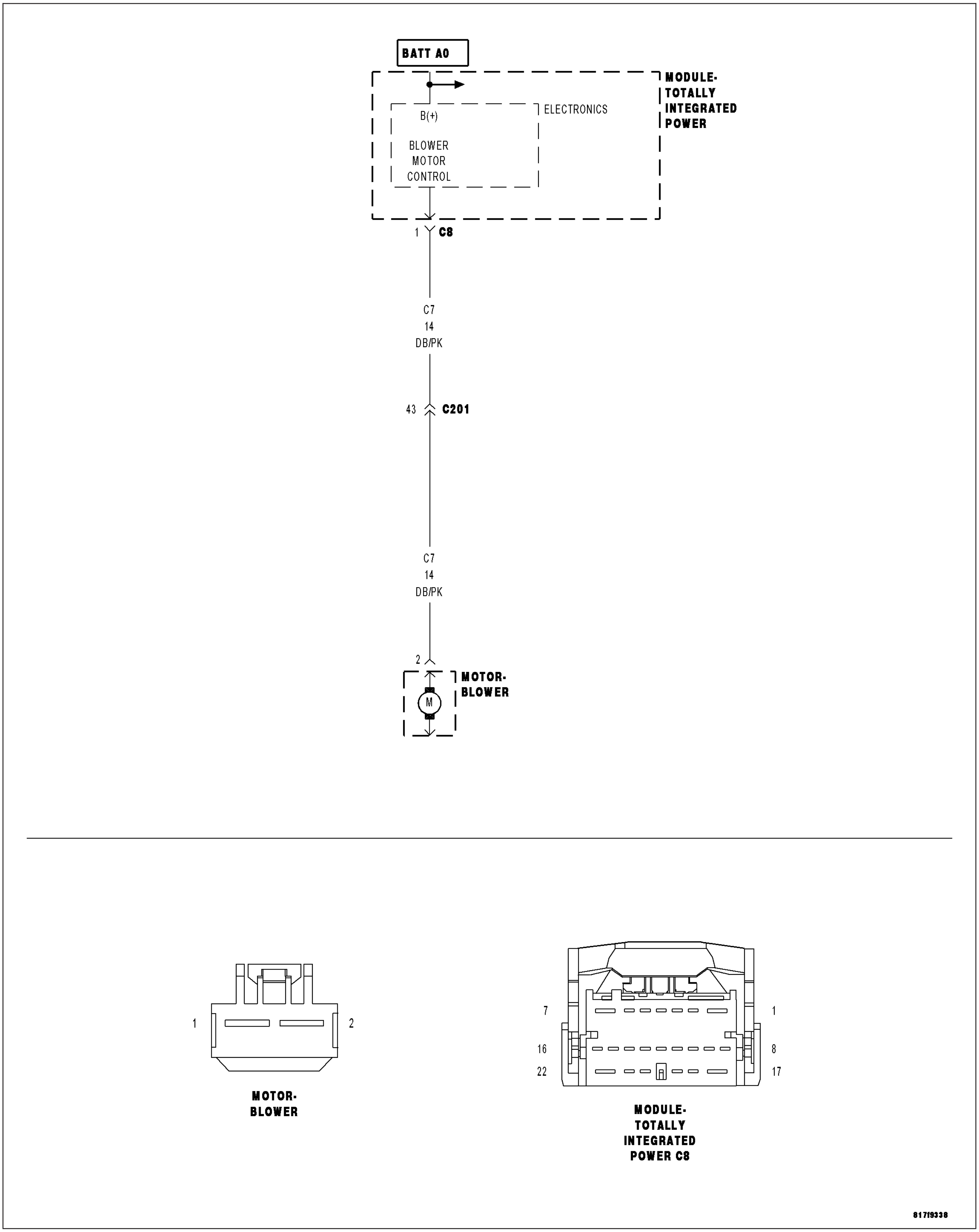
Yes >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Blower Motor in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B10EC–BLOWER MOTOR CONTROL CIRCUIT OVERCURRENT (TIPM)



For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Totally Integrated Power Module (TIPM) will set this DTC if it detects an overcurrent condition on the (C7) Blower Motor Control circuit for more than 500 ms when blower motor operation is requested.

Possible Causes
BLOCKAGE STALLING BLOWER MOTOR
BLOWER MOTOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY DTC B10EC-BLOWER MOTOR CONTROL CIRCUIT OVERCURRENT IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display active: B10EC-BLOWER MOTOR CONTROL CIRCUIT OVERCURRENT?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR PROPER BLOWER MOTOR OPERATION

Turn the ignition on.

Turn the Blower Motor on.

Does the Blower Motor operate normally?

Yes >> Go To 4

No >> Go To 3

3. CHECK FOR ACTIVE: B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Turn on the Blower Motor.

With the scan tool, read DTCs.

Does the scan tool display active: B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW?

Yes >> Follow the diagnostics for Code B10E9–BLOWER MOTOR CONTROL CIRCUIT LOW.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK FOR 12 VOLTS TO THE BLOWER MOTOR

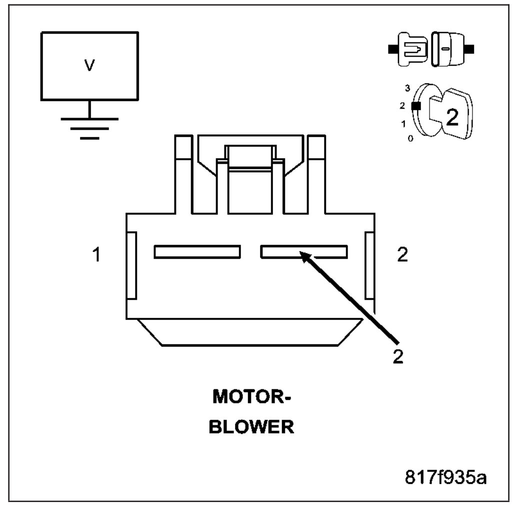
Turn the ignition off.

Disconnect the Blower Motor harness connector.

Turn the ignition on.

Turn the Blower Motor control on.

Using a volt meter measure the voltage on the (C7) Blower Motor Control circuit in the Blower Motor harness connector.



Does the volt meter read 12 volts?

Yes >> Go To 5

No >> Go To 6

5. CHECK FOR A BLOCKAGE STALLING THE BLOWER MOTOR

Turn the ignition off.

Remove the Blower Motor from the HVAC housing assembly.

Look for anything on the Blower Motor and in the HVAC housing that is physically preventing Blower Motor operation.

Is anything physically preventing Blower Motor operation?

Yes >> Repair as necessary. Also, check Blower Motor for proper operation. Reinstall, or replace the Blower Motor as necessary in accordance with the service information.

No >> Replace the Blower Motor in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

6. CHECK FOR CHAFING IN THE (C7) BLOWER MOTOR CONTROL CIRCUIT

Turn the ignition off.

Check the (C7) Blower Motor Control circuit for wire chaffing.

Is any wire chaffing present?

Yes >> Repair the wire chafing on the (C7) Blower Motor Control circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

B10BF–CONDENSER FAN CONTROL CIRCUIT HIGH (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects a shorted high condition in the (N112) High Speed Radiator Fan Control circuit.

Possible Causes
(N112) HIGH SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
RADIATOR FAN MOTOR
TOTALLY INTEGRATED POWER MODULE (TIPM)

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, actuate the Radiator Fan.

With the scan tool, read DTCs.

Does the scan tool display active: B10BF-CONDENSER FAN CONTROL CIRCUIT HIGH?

Yes >> With the scan tool, de-actuate the Radiator Fan. Then, Go To 2

No >> With the scan tool, de-actuate the Radiator Fan. The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK (N112) HIGH SPEED RADIATOR FAN CONTROL CIRCUIT FOR A SHORT TO BATTERY VOLTAGE

Turn the ignition off

Disconnect the TIPM C11 harness connector.

Disconnect the Radiator Fan Motor harness connector.

Turn the ignition on.

Using a volt meter, measure the voltage on the (N112) High Speed Radiator Fan Control circuit at the Radiator Fan Motor harness connector.

Does the volt meter read 10 volts, or above?

Yes >> Repair the (N112) High Speed Radiator Fan Control circuit for a short to battery voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK (Z823) GROUND CIRCUIT FOR AN OPEN

Turn the ignition off.

Reconnect the TIPM C8 harness connector.

NOTE: The test light should illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Using a 12-volt test light connected to 12 volts, probe the (Z823) Ground circuit at the Condenser Fan Motor harness connector.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance in the (Z823) Ground circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

4. CHECK RADIATOR FAN MOTOR

Ignition on, engine not running.

With the scan tool, actuate the Radiator Fan.

Using a 12-volt test light connected to ground, probe the (C123) Condenser Fan Control Output circuit at the Condenser Fan Motor harness connector.

Does the test light illuminate brightly and flash on and off?

Yes >> With the scan tool, de-actuate the Condenser Fan. Then, replace the Condenser Fan Motor in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> With the scan tool, de-actuate the Condenser Fan. Then, Go To 5

5. INSPECT RELATED WIRING

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the related wiring harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the TIPM in accordance with the Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

B10BE–CONDENSER FAN CONTROL CIRCUIT LOW (TIPM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  If the Totally Integrated Power Module (TIPM) detects a shorted low condition in the (C123) Condenser Fan Control circuit.

Possible Causes
(C123) CONDENSER FAN CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
CONDENSER FAN MOTOR
TIPM

Diagnostic Test

1. VERIFY DTC IS ACTIVE

Turn the ignition on.

With the scan tool, erase TIPM DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, actuate the Condenser Fan.

With the scan tool, read TIPM DTCs.

Does this DTC reset?

Yes >> With the scan tool, de-actuate the Condenser Fan. Then, Go To 2

No >> With the scan tool, de-actuate the Condenser Fan. Then, check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, corroded, and contaminated terminals.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK (C123) CONDENSER FAN CONTROL OUTPUT CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the TIPM C8 harness connector.

Disconnect the Condenser Fan Motor harness connector.

Measure the resistance of the (C123) Condenser Fan Control Output circuit between ground and the Condenser Fan Motor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the (C123) Condenser Fan Control Output circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 3

3. CHECK FOR A SHORTED CONDENSER FAN MOTOR

Reconnect the TIPM C8 harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Condenser Fan.

Using a 12-volt test light connected to ground, probe the (C123) Condenser Fan Control Output circuit at the Condenser Fan Motor harness connector.

Does the test light illuminate brightly and flash on and off?

Yes >> With the scan tool, de-actuate the Condenser Fan. Then, replace the Condenser Fan Motor in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> With the scan tool, de-actuate the Condenser Fan. Then, Go To 4

4. INSPECT RELATED WIRING

NOTE: Before continuing, check the TIPM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Turn the ignition off.

Using the schematics as a guide, inspect the related wiring harness and connectors.

Pay particular attention to all Power and Ground circuits.

Were any problems found?

Yes >> Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the TIPM in accordance with the Service Information.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE)

B10EE-CONDENSOR FAN CONTROL CIRCUIT OVERCURRENT (TIPM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Totally Integrated Power Module (TIPM) will set this DTC if it detects an overcurrent condition on the (N112) High Speed Radiator Fan Control circuit for more than 500 ms when Radiator Fan operation is requested.

Possible Causes
BLOCKAGE STALLING RADIATOR FAN
RADIATOR FAN
TIPM

Diagnostic Test

1. VERIFY DTC B10EE-CONDENSER FAN CONTROL CIRCUIT OVERCURRENT IS ACTIVE

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, read DTCs.

Does the scan tool display active: B10EE-CONDENSER FAN CONTROL CIRCUIT OVERCURRENT?

Yes >> Go To 2

No >> The condition that caused this symptom is currently not present. Check for an intermittent condition by inspecting the related wiring harness for chafed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals. Repair as necessary.

Perform the BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

2. CHECK FOR PROPER RADIATOR FAN OPERATION

Turn the ignition on.

With the scan tool, activate the Radiator Fan.

Does the Radiator Fan operate normally?

Yes >> Go To 4

No >> Go To 3

3. CHECK FOR ACTIVE: B10BE–CONDENSER FAN CONTROL CIRCUIT LOW

Turn the ignition on.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Use the scan tool, to activate the Condenser Fan.

With the scan tool, read DTCs.

Does the scan tool display active: B10BE–CONDENSER FAN CONTROL CIRCUIT LOW?

Yes >> Follow the diagnostics for Code B10BE–CONDENSER FAN CONTROL CIRCUIT LOW.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Go To 4

4. CHECK FOR 12 VOLTS TO THE RADIATOR FAN

Turn the ignition off.

Disconnect the Radiator Fan harness connector.

Turn the ignition on.

With the scan tool, activate the Radiator Fan.

Using a volt meter measure the voltage on the (N112) High Speed Radiator Fan Control circuit in the Radiator Fan harness connector.

Does the volt meter read 12 volts?

Yes >> Go To 5

No >> Go To 6

5. CHECK FOR A BLOCKAGE STALLING THE RADIATOR FAN

Turn the ignition off.

Look for anything that may be physically preventing the Radiator Fan from operating normally.

Is anything physically preventing Blower Motor operation?

Yes >> Repair as necessary. Also, check the Radiator Fan for proper operation. Reinstall or replace the Radiator Fan as necessary in accordance with the service information.

No >> Replace the Radiator Fan in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

6. CHECK FOR CHAFFING IN THE (N112) HIGH SPEED RADIATOR FAN CONTROL CIRCUIT

Turn the ignition off.

Check the (N112) High Speed Radiator Fan Control circuit for wire chaffing.

Is any wire chaffing present?

Yes >> Repair the wire chaffing on the (N112) High Speed Radiator Fan Control circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

No >> Replace the Totally Integrated Power Module (TIPM) in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE).

HVAC - SERVICE INFORMATION

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HVAC - SERVICE INFORMATION

DESCRIPTION

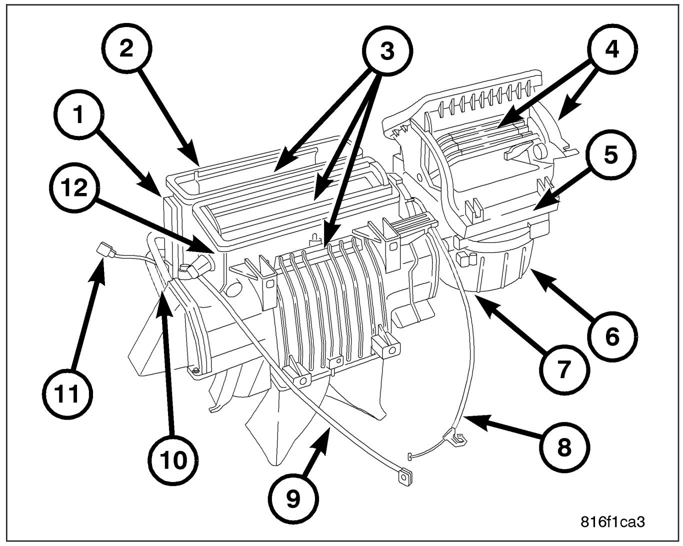
A manual temperature control (MTC) single zone type heating-A/C system or a manually controlled heater-only system is standard equipment on this model, depending on market.

To maintain the performance level of the heating, ventilation and air conditioning (HVAC) system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.

The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. Refer to 7 - Cooling for more information before opening or attempting any service to the engine cooling system.

All vehicles are equipped with a common heater, ventilation and air conditioning (HVAC) housing (1). The heating-A/C system combines A/C, heating, and ventilating capabilities in a single HVAC housing mounted within the passenger compartment beneath the instrument panel. The HVAC housing includes:

- A/C evaporator (A/C system only) (2)
- Mode-air doors (3)
- Recirculation-air door and actuator (4)
- Particulate air filter (when equipped) (5)
- Blower motor (6)
- Blower motor resistor (7)
- Mode control cable (8)
- Temperature control cable (9)
- Heater core (10)
- Evaporator temperature sensor (A/C system only) (11)
- Blend-air door (12)



On heater-only systems, the A/C evaporator is omitted from the HVAC housing and is replaced with an air restrictor plate.

NOTE: An electric positive temperature coefficient (PTC) heater is used on vehicles when equipped with the 2.0L diesel engine. The PTC heater unit compensates for the lower engine coolant temperatures produced by the diesel engine. The PTC heater unit is mounted in the HVAC air distribution housing, downstream of the heater core. For more information, (refer to 24 - HEATING & AIR CONDITIONING/CABIN HEATER/ HEATER UNIT - DESCRIPTION).

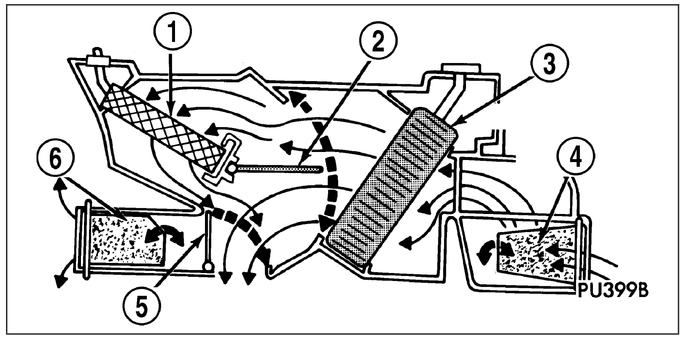
Based upon the system mode selected, conditioned air can exit the standard heater-only or optional heater-A/C housing through one or a combination of the three main housing outlets: defrost, panel or floor. The defrost and panel outlets are located on the top of the HVAC air distribution housing and the floor outlets are located on each side of the distribution housing. Once the conditioned air exits the HVAC housing, it is further directed through molded plastic ducts to the various outlets within the vehicle interior. These outlets and their locations are as follows:

- **Defroster Outlet** - A single large defroster outlet is located in the center of the instrument panel, near the base of the windshield.
- **Side Window Demister Outlets** - There are two side window demister outlets, one is located at each outboard end of the instrument panel top cover, near the belt line at the A-pillars.
- **Panel Outlets** - There are four panel outlets in the instrument panel, one located near each outboard end of the instrument panel facing the rear of the vehicle and two located near the top of the instrument panel center bezel.
- **Front Floor Outlets** - There are two front floor outlets, one located on each side the floor panel center tunnel behind the instrument panel.
- **Rear Seat Floor Outlets** - There are two rear seat floor outlets, one located on each side of the floor panel near the front of each rear seat foot well.

OPERATION

Both the manual temperature control (MTC) heating-A/C system and the heater-only system are blend-air type systems. In a blend-air system, a blend-air door controls the amount of conditioned air that is allowed to flow through, or around, the heater core. The temperature control determines the discharge air temperature by operating the blend door cable, which moves the blend-air door. This design allows almost immediate control of output air temperature.

NOTE: Typical blend-air type HVAC system shown.



The heating-A/C system pulls outside (ambient) air through the cowl opening at the base of the windshield, then into the air inlet housing above the heating, ventilation and air conditioning (HVAC) housing. On models equipped with A/C, the air passes through the A/C evaporator (3). Air flow can be directed either through or around the heater core (1). This is done by adjusting the blend-air door (2) with the temperature control located on the A/C-heater control in the instrument panel. The air flow can then be directed from the panel, floor and defrost outlets in various combinations using the mode control located on the A/C-heater control. Air flow velocity can be adjusted with the blower speed control located on the A/C-heater control.

The outside (fresh) air intake can be shut off by pressing the Recirculation button on the A/C-heater control. This will operate an electrically actuated recirculation-air door (4) that closes off the fresh air intake and recirculates the air that is already inside the vehicle.

The A/C compressor can be engaged by pressing the A/C (snowflake) button on the A/C-heater control. It will automatically engage when the mode control is set in any Mix to Defrost position. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-heater control is used to direct the conditioned air to the selected system outlets. The mode control uses a control cable to operated the mode-air doors (5 and 6).

The defroster outlet receives airflow from the HVAC housing through the molded plastic defroster duct, which is secured to the top of the instrument panel. The airflow from the defroster outlet is directed by fixed vanes in the defroster outlet grille and cannot be adjusted.

The side window demister outlets receive airflow from the HVAC housing through the defroster duct and molded plastic demister ducts. The airflow from the side window demister outlets is directed by fixed vanes in the demister outlet grilles and cannot be adjusted. The side window demister outlet grilles are integral to the instrument panel cover and direct air from the HVAC housing through the outlets on the top corners of the instrument panel. The demisters operate when the mode control is set in any Floor to Defrost position.

The panel outlets receive airflow from the HVAC housing through the center air distribution duct and molded plastic panel outlet ducts. The airflow from each of the panel outlets is adjustable. A thumbwheel located at the bottom of each panel outlet grille is used to adjust a center diffuser that changes the airflow direction, and a knob on the outer edge of each panel outlet grille opens or closes a shutter to turn airflow on or off through that outlet.

The front and rear floor outlets receive airflow from the HVAC housing through the front and rear floor ducts. The front floor outlets are integral to the molded plastic front floor ducts, which are secured to each side of the HVAC housing. Two molded plastic rear seat ducts are attached to the two molded plastic rear floor ducts, which are secured to the rear of the HVAC housing. The rear seat ducts direct airflow beneath the carpet to the outlets located near the front of each rear seat foot well. None of the floor outlets can be adjusted.

DIAGNOSIS AND TESTING

A/C PERFORMANCE

The A/C system is designed to provide the passenger compartment with low temperature and low humidity air. The A/C evaporator, located in the HVAC housing is cooled to temperatures near the freezing point. As warm damp air passes over the fins of the A/C evaporator, the air transfers its heat to the refrigerant in the evaporator coils and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an A/C system will be more effective in the Recirculation mode (max-A/C). With the system in the Recirculation mode, only air from the

passenger compartment passes through the A/C evaporator. As the passenger compartment air dehumidifies, the A/C system performance levels rise.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the A/C system. When humidity is high, the A/C evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and coils. This reduces the amount of heat the A/C evaporator can absorb from the air. High humidity greatly reduces the ability of the A/C evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their A/C system on humid days. A performance test is the best way to determine whether the system is performing up to design standards. This test also provides valuable clues as to the possible cause of trouble with the A/C system. The ambient air temperature in the location where the vehicle will be tested must be a minimum of 21° C (70° F) for this test.

A/C PERFORMANCE TEST

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Check for diagnostic trouble codes using a scan tool. If no DTCs are found in the powertrain control module (PCM) or engine control module (ECM) (depending on engine application), gateway module or the totally integrated power module (TIPM), go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Connect a tachometer and a manifold gauge set or an A/C recycling/charging station.
3. Operate the heating-A/C system under the following conditions.
   - Engine at idle and operating temperature
   - Doors or windows open
   - Transaxle in Park or Neutral with parking brake set (depending on application)
   - A/C-heater controls set to Recirculation mode (max-A/C), full cool, panel mode, high blower and A/C on.
4. Insert a thermometer in the driver side center panel air outlet and operate the vehicle a minimum of ten minutes to allow the thermometer temperature stabilizes.
5. Compare the air temperature at the center panel outlet and the A/C system pressures to the A/C Performance Temperature and Pressure chart.

A/C PERFORMANCE TEMPERATURE AND PRESSURE

Ambient Temperature	21° C (70° F)	27° C (80° F)	32° C (90° F)	38° C (100° F)	43° C (110° F)
Air Temperature at Center Panel Outlet	6 -15° C (42 - 59° F)	7 -18° C (45 - 64° F)	9 - 21° C (48 - 69° F)	11 - 22° C (52 - 72° F)	13 - 24° C (56 - 75° F)
A/C High Side Pressure	1034 - 1896 kPa (150 - 275 psi)	1207 - 2068 kPa (175 - 300 psi)	1379 - 2241 kPa (200 - 325 psi)	1551 - 2413 kPa (225 - 350 psi)	1724 - 2241 kPa (250 - 375 psi)
A/C Low Side Pressure	214 - 365 kPa (31 - 53 psi)	248 - 407 kPa (36 - 59 psi)	283 - 476 kPa (41 - 69 psi)	317 - 483 kPa (46 - 70 psi)	359 - 496 kPa (52 - 72 psi)

6. If the air outlet temperature or the A/C system pressures are not within specifications, refer to the A/C System Diagnosis chart.

A/C SYSTEM DIAGNOSIS

Condition	Possible Causes	Correction
Equal refrigerant pressures	1. No refrigerant in the refrigerant system.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Faulty A/C compressor.	2. See A/C Compressor in this group. Test the compressor and replace, if required.
	3. Improperly installed or faulty A/C pressure transducer.	4. See A/C High Pressure Transducer in this group. Test the transducer and replace, if required.
	4. Faulty A/C-heater control, cabin compartment node (CCN), totally integrated power module (TIPM), gateway module or PCM/ECM (depending on engine application).	4. Refer to the appropriate Electrical Diagnostic Procedures for testing of the A/C-heater control, CCN, TIPM, gateway module or PCM/ECM. Test the module and replace, if required.
Normal refrigerant pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system.	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Temperature control cable improperly installed or faulty.	2. See Temperature Control Cable this group. Inspect the cable for proper operation. Replace the cable as required.
	3. Blend door inoperative or sealing improperly.	3. See HVAC Housing in this group. Inspect the blend door for proper operation and sealing. Repair if required.
	4. Blend door not in full cold position.	4. See Temperature Control Cable this group. Inspect the cable for proper operation. Replace the cable as required.
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the A/C evaporator is restricted.	2. See A/C Evaporator in this group. Replace the restricted A/C evaporator, if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the compressor, if required.

Condition	Possible Causes	Correction
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. A/C condenser air flow restricted.	1. Check the A/C condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Clean, repair, or replace components as required.
	2. Refrigerant flow through the accumulator is restricted.	2. See Accumulator in this group. Replace the restricted accumulator, if required.
	3. Inoperative radiator cooling fan.	3. Test the radiator cooling fan and replace, if required. Refer to Group 7.
	4. Refrigerant system overcharged.	4. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	5. Air in the refrigerant system.	5. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	6. Engine overheating.	6. Test the engine cooling system and repair, if required. Refer to Group 7.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping.	1. Inspect the accessory drive belt condition and tension. Replace the accessory drive belt or tensioner, if required. Refer to Group 7.
	2. Faulty A/C orifice tube.	2. See A/C Orifice Tube in this group. Replace A/C liquid line if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines.	1. See Liquid Line, Suction Line and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required.
	2. Restricted refrigerant flow through the A/C orifice tube.	2. See A/C Orifice Tube in this group. Replace A/C liquid line if required.
	3. Restricted refrigerant flow through the A/C condenser.	3. See A/C Condenser in this group. Replace the restricted condenser, if required.

HEATER PERFORMANCE

Before performing the following tests, refer to Group 7 - Cooling for the procedures to check the engine coolant level and flow, engine coolant reserve/recovery system operation, accessory drive belt condition and tension, radiator air flow and the fan drive operation.

WARNING: Do not remove radiator cap when engine is hot, personal injury can result.

If vehicle has been run recently, wait 15 minutes before removing the radiator cap. Place a rag over the cap and turn it to the first safety stop. Allow pressure to escape through the overflow tube. When the system pressure stabilizes, remove the cap completely.

MAXIMUM HEATER OUTPUT

Engine coolant is delivered to and from the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control to the full hot position, the mode control to the floor position, and the blower motor control to the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the front floor outlets. Compare the test thermometer reading to the Heater Temperature Reference chart.

HEATER TEMPERATURE REFERENCE

Ambient Temperature		Minimum Floor Outlet Temperature	
Celsius	Fahrenheit	Celsius	Fahrenheit
16°	60°	54°	130°
21°	70°	56°	132°
26°	80°	57°	134°
32°	90°	58°	136°

If the heater outlet air temperature is below the minimum specification, refer to Group 7 - Cooling. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Group 7 - Cooling for more information.

OBSTRUCTED COOLANT FLOW

Possible locations or causes of obstructed coolant flow are as follows:

- Low coolant level
- Faulty water pump
- Faulty thermostat
- Pinched or kinked heater hoses
- Improper heater hose routing
- Plugged heater hoses or supply and return ports at the cooling system connections
- Plugged heater core

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is low, a mechanical problem may exist.

MECHANICAL PROBLEMS

Possible causes of insufficient heat due to mechanical problems are as follows:

- Obstructed cowl air intake
- Obstructed heater system outlets
- Faulty engine thermostat
- Faulty blower motor system
- Faulty A/C-heater control
- Faulty temperature control cable
- Faulty, obstructed or improperly installed blend-air door

TEMPERATURE CONTROL

If the heater outlet air temperature cannot be adjusted with the temperature control on the A/C-heater control, the following could require service:

- Faulty A/C-heater control
- Faulty temperature control cable
- Faulty, obstructed or improperly installed blend-air door
- Improper engine coolant temperature

SPECIFICATIONS

A/C SYSTEM

Item	Description	Notes
A/C Compressor	Denso 5SE12C	ND-8 PAG oil
Freeze-up Control	Evaporator temperature sensor	Input to A/C-heater control, HVAC housing mounted, sets compressor to destroke 2° C below evaporator target temperature (minimum 5° C (41° F)) and activates compressor when within 1° C of evaporator target temperature
Low psi Control	A/C pressure transducer	Input to PCM/ECM, discharge line mounted, sets compressor to destroke below 200 kPa (29 psi), activates compressor above 234 -262 kPa (34 - 38 psi)
High psi Control	A/C pressure transducer	Input to PCM/ECM, discharge line mounted - compressor to destroke above 3130 kPa (454 psi) and below 200 kPa (29 psi)
Refrigerant Charge Capacity	Refer to the A/C Underhood Specification Label located in the engine compartment.	R-134a refrigerant

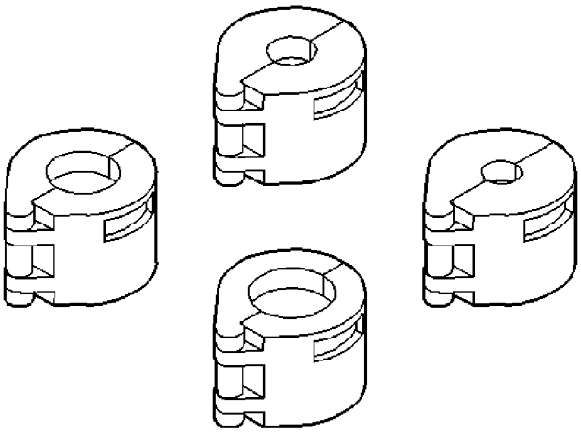
TORQUE

Description	N·m	Ft. Lbs.	In. Lbs.
All Screws NOT Listed Below	2	—	17
A/C Accumulator Bracket Bolts	15	11	—
A/C Accumulator Retaining Band Bolt	8	—	71
A/C Compressor to Engine Bolts	25	18	—
Air Distribution Housing Halves Screws	1.2	—	10
Air Distribution Housing to HVAC Housing Screws	1.2	—	10
Air Inlet Housing to HVAC Housing Screws	1.2	—	10
Blend Door Lever Screw	0.6	—	5
Blower Motor Screws	1.2	—	10
Center Duct Screws	2.2	—	20
Defroster Duct Support Screws	3	—	27
Defroster Duct Screws	2.2	—	20
Demister Duct Screws	2.2	—	20
Flange to HVAC Housing Screw	1.2	—	10

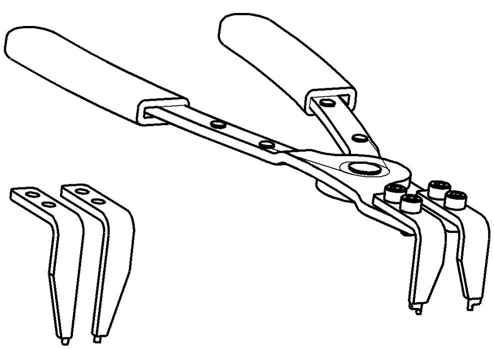
Description	N·m	Ft. Lbs.	In. Lbs.
Heater Core Tube Retaining Bracket Screw	1.2	—	10
Heat Shield to Dash Panel Nuts	1	—	10
HVAC Housing Halves Screws	1.2	—	10
HVAC Housing to Dash Panel Nut	4.5	—	40
Lower Condenser Bracket to Radiator Bolts	4.5	—	40
Mode Door Cam Screw	0.6	—	5
PTC Heater Unit to Housing Screws	1.2	—	10
Rear Seat Floor Duct Screw	2.2	—	20
Refrigerant Lines to A/C Evaporator Bolt	12	—	105
Refrigerant Lines to Compressor Nuts	20	15	—
Refrigerant Lines to A/C Condenser Nuts	5	—	44
Refrigerant Line Bracket to Strut Tower Nut	4.5	—	40
Suction Line to Accumulator Nut	5	—	44

SPECIAL TOOLS

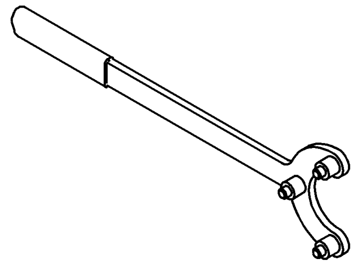
HEATING-A/C SYSTEM



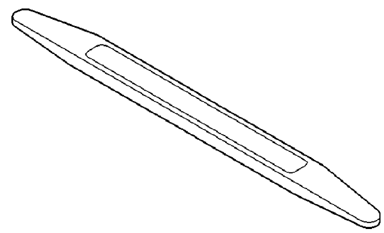
A/C Line Disconnect Tools 7193



Snap Ring Pliers 9764



A/C Spanner Wrench 9907



Trim Stick C-4755

CONTROLS

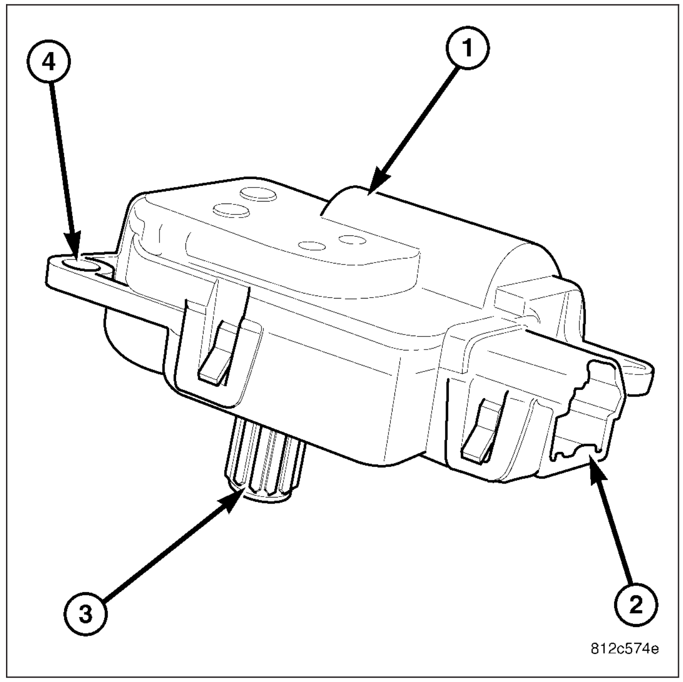
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ACTUATOR-RECIRCULATION DOOR

DESCRIPTION

The recirculation door actuator (1) is a reversible, 12 volt direct current (DC), servo motor. The recirculation door actuator is located on the right side of the HVAC air inlet housing and is directly connected to the pivot shaft lever of the recirculation-air door.

The recirculation door actuator is contained within a black molded plastic housing with an integral wire connector receptacle (2), an output shaft with splines (3) that connect it to the recirculation door and three integral mounting tabs (4) that allow the actuator to be secured to the air inlet housing. The recirculation door actuator does not require mechanical indexing to the recirculation-air door, as it is electronically calibrated by the A/C-heater control.



OPERATION

The recirculation door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the instrument panel wire harness. The recirculation door actuator can move the recirculation-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the recirculation-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the recirculation-air door moves in the opposite direction. Once the A/C-heater control makes the voltage to both connections high or both connections low, the recirculation-air door stops and will not move.

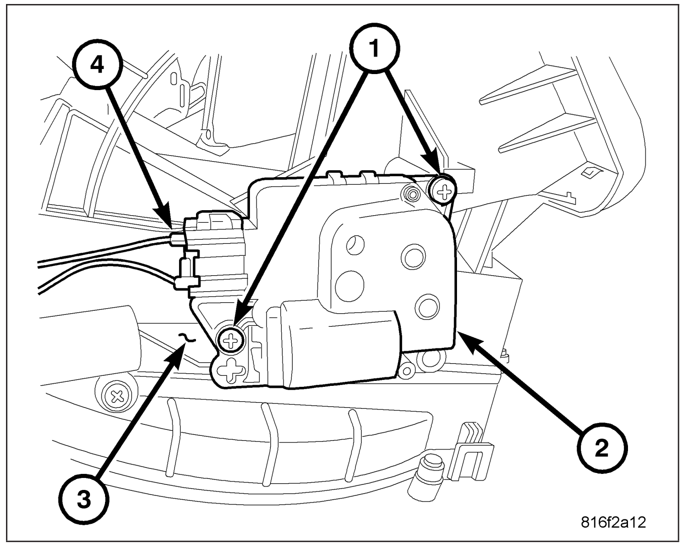
The recirculation door actuator cannot be adjusted or repaired and, if faulty or damaged it must be replaced.

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

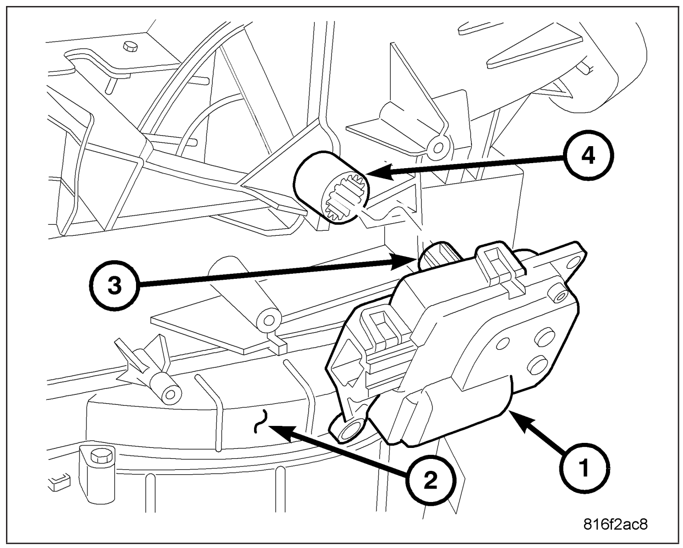
NOTE: Illustration shown with instrument panel removed for clarity.

1. Disconnect and isolate the negative battery cable.
2. Remove the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - REMOVAL).
3. Reach through glove box opening in the instrument panel and remove the screws (1) that secure the recirculation door actuator (2) to the right side of the HVAC air inlet housing (3).
4. Remove the recirculation door actuator from the air inlet housing and disconnect the wire harness connector (4) from the actuator.
5. Remove the recirculation door actuator from the vehicle.

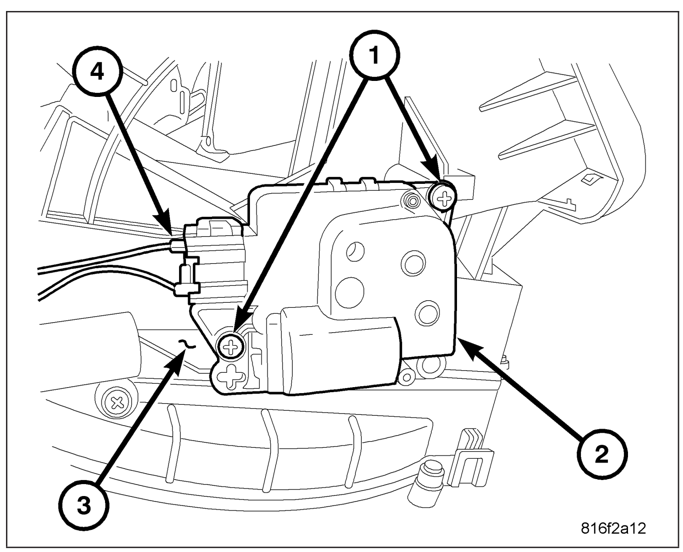


INSTALLATION

1. Position the recirculation door actuator (1) to the right side of the HVAC air inlet housing (2).
2. Install the recirculation door actuator onto the air inlet housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the recirculation door pivot shaft adapter (4).



3. Install the screws (1) that secure the recirculation door actuator (2) to the air inlet housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
4. Connect the instrument panel wire harness connector (4) to the recirculation door actuator.
5. Install the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - INSTALLATION).
6. Reconnect the negative battery cable.



CABLE-MODE DOOR

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

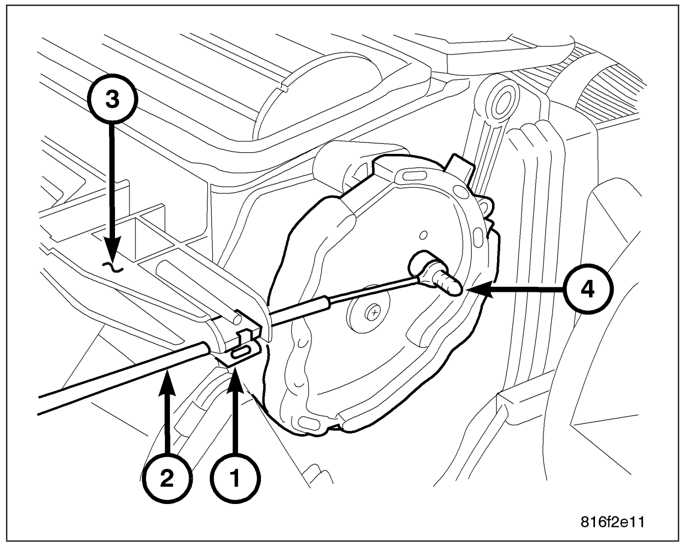
NOTE: Illustration shown with instrument panel removed for clarity.

NOTE: LHD model shown. RHD model similar.

1. Disconnect and isolate the negative battery cable.

NOTE: To aid in reinstallation, note the installed position of the mode control cable to the A/C-heater control prior to removal of the cable.

2. Remove the instrument panel center bezel and disconnect the mode control cable from the A/C-heater control (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).
3. On LHD models, remove the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - REMOVAL).
4. Disengage the metal retaining clip (1) that secures the mode control cable (2) from the right side of the HVAC air distribution housing (3).



NOTE: To aid in reinstallation, note the position of the mode control cable as it passes through the instrument panel support prior to removal of the cable.

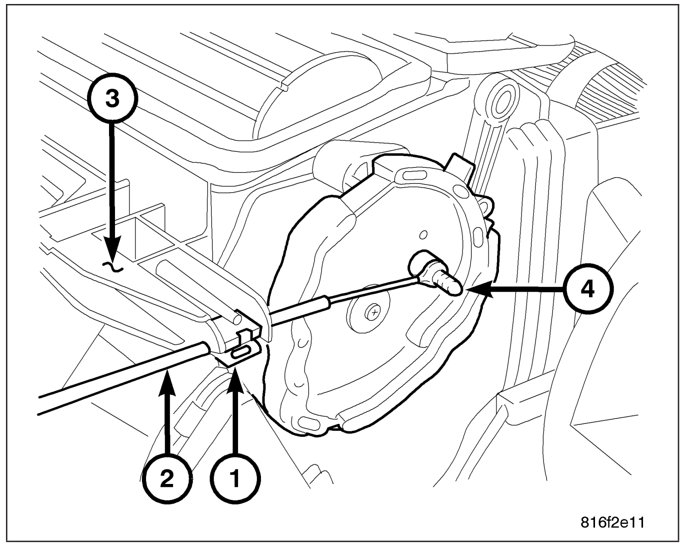
5. Disconnect the mode control cable from the mode door cam (4) and remove the cable from the vehicle.

INSTALLATION

NOTE: Illustration shown with instrument panel removed for clarity.

NOTE: LHD model shown. RHD model similar.

1. Position the mode control cable (2) to the right side of the HVAC air distribution housing (3) through the opening in the instrument panel support.
2. Connect the mode control cable to the mode door cam (4).
3. Engage the metal retaining clip (1) to the right side of the HVAC air distribution housing. Make sure the retaining clip is fully engaged to the housing.
4. Connect the mode door control cable to the A/C-heater control and install the instrument panel center bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - INSTALLATION).
5. Visually verify the mode door cam moves from the full defrost position to the full panel position and then back to the full defrost position using the mode control knob on the A/C-heater control. If OK, go to step 10. If not OK, proceed to step 6.



CAUTION: Failure to adjust the mode control cable when required can result in operating modes not being properly obtained.

6. Disengage the mode control cable from the metal retaining clip located on the right side of the HVAC housing.
7. Turn the mode control knob on the A/C-heater control to the full defrost position.
8. Reach behind the instrument panel and turn the mode door cam clockwise until it stops in the full defrost position and engage the mode control cable to the metal retaining clip. Make sure the cam is in the full defrost position and that the cable is fully engaged to the retaining clip.
9. Verify the mode door cam moves from the full defrost position to the full panel position and then back to the full defrost position as selected with the mode control knob on the A/C-heater control. If not, repeat steps 6 thru 9.
10. On LHD models, install the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - INSTALLATION).
11. Reconnect the negative battery cable.

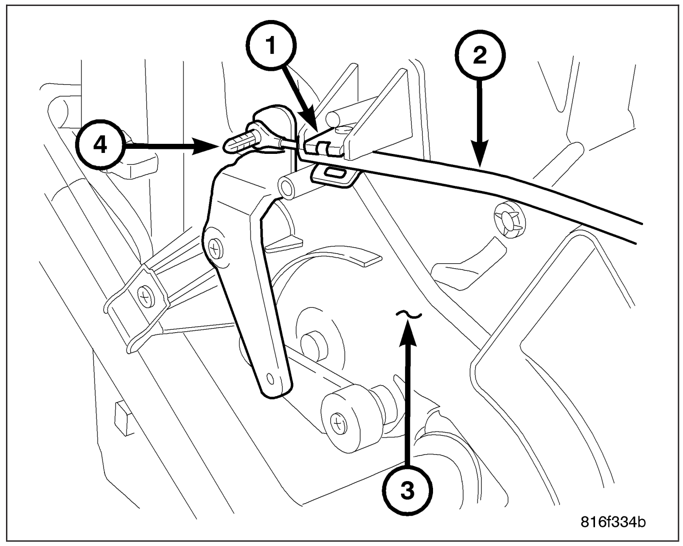
CABLE-TEMPERATURE CONTROL

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: Illustration shown with instrument panel removed for clarity.

NOTE: LHD model shown. RHD model similar.



1. Disconnect and isolate the negative battery cable.

NOTE: To aid in reinstallation, note the installed position of the temperature control cable to the A/C-heater control prior to removal of the cable.

2. Remove the instrument panel center bezel and disconnect the temperature control cable from the A/C-heater control (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).
3. On RHD models, remove the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - REMOVAL).
4. Disengage the metal retaining clip (1) that secures the temperature control cable (2) from the left side of the HVAC air distribution housing (3).

NOTE: To aid in reinstallation, note the position of the temperature control cable as it passes through the instrument panel support prior to removal of the cable.

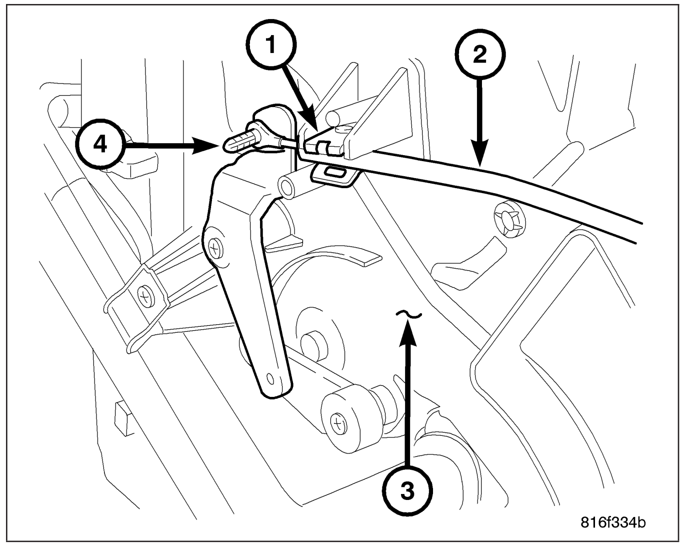
5. Disconnect the temperature control cable from the blend door pivot lever (4) and remove the cable from the vehicle.

INSTALLATION

NOTE: Illustration shown with instrument panel removed for clarity.

NOTE: LHD model shown. RHD model similar.

1. Position the temperature control cable (2) to the left side of the HVAC air distribution housing (3) through the opening in the instrument panel support.
2. Connect the temperature control cable to the blend door pivot lever (4).
3. Engage the metal retaining clip (1) to the left side of the HVAC air distribution housing. Make sure the retaining clip is fully engaged to the housing.
4. Connect the temperature door control cable to the A/C-heater control and install the instrument panel center bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - INSTALLATION).
5. Visually verify that the blend door pivot lever moves from the full hot position to the full cold position and then back to the full hot position using the temperature control knob on the A/C-heater control. If OK, go to step 10. If not OK, proceed to step 6.



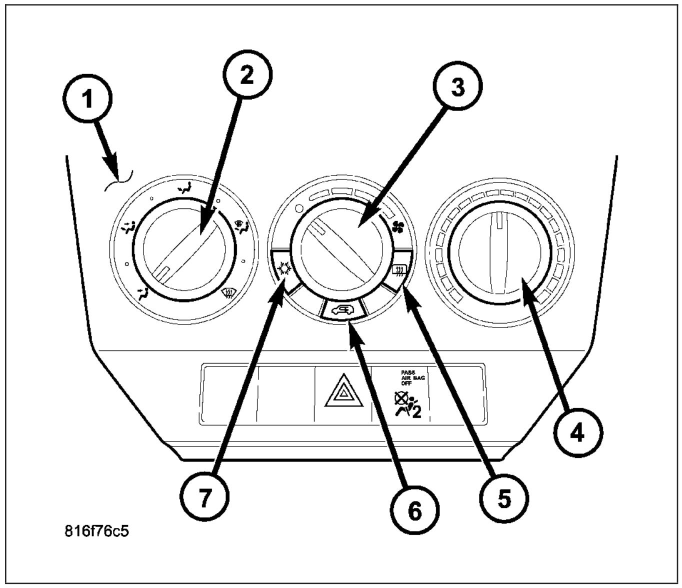
CAUTION: Failure to adjust the temperature control cable can result in full heating or cooling capabilities not being obtained.

6. Disengage the temperature control cable from the metal retaining clip located on the left side of the HVAC housing.
7. Turn the temperature control knob on the A/C-heater control to the full hot position.
8. Reach behind the instrument panel and move the blend door pivot lever forward until it stops in the full hot position and engage the temperature control cable to the metal retaining clip. Make sure the lever is in the full hot position and that the cable is fully engaged to the retaining clip.
9. Verify that the blend door pivot lever moves from the full hot position to the full cold position and then back to the full hot position, as selected with the temperature control knob on the A/C-heater control. If not, repeat steps 6 thru 9.
10. On RHD models, install the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - INSTALLATION).
11. Reconnect the negative battery cable.

CONTROL-A/C HEATER

DESCRIPTION

NOTE: Typical A/C-heater control shown.



The A/C-heater control (1) for the manual temperature control (MTC) single zone system allows one temperature setting for the entire vehicle. All controls are identified by ISO graphic symbols.

The heating-A/C system uses a combination of electrical and cable operated controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle.

The A/C-heater control is located in the instrument panel and contains:

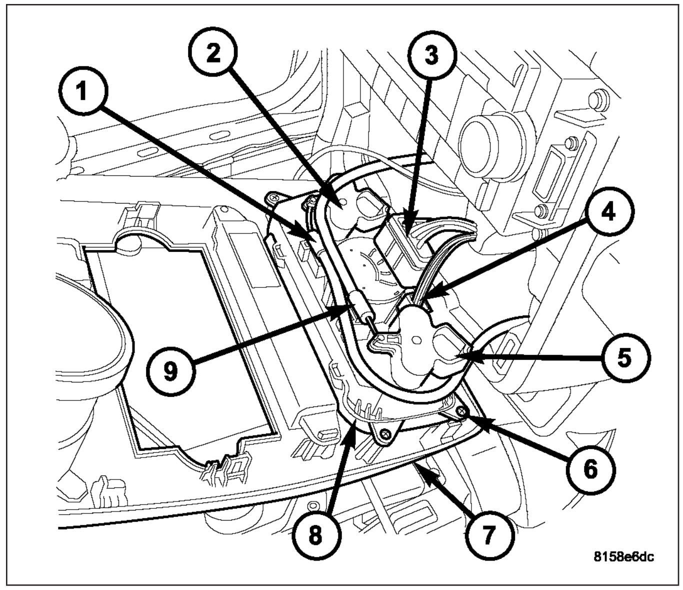
- a rotary control for mode control of the discharged air (2).
- a rotary control for blower motor speed selection and to turn the blower motor off (3).
- a rotary control for temperature control of the discharged air (4).
- a push-button control to turn the rear window defogger system on and off (5).
- a push-button control for recirculation control of the discharged air (6).
- a push-button control to turn the A/C system on and off (7).

The A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced. The control knobs for the A/C-heater control are available for service replacement.

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: Typical A/C-heater control and center bezel shown.



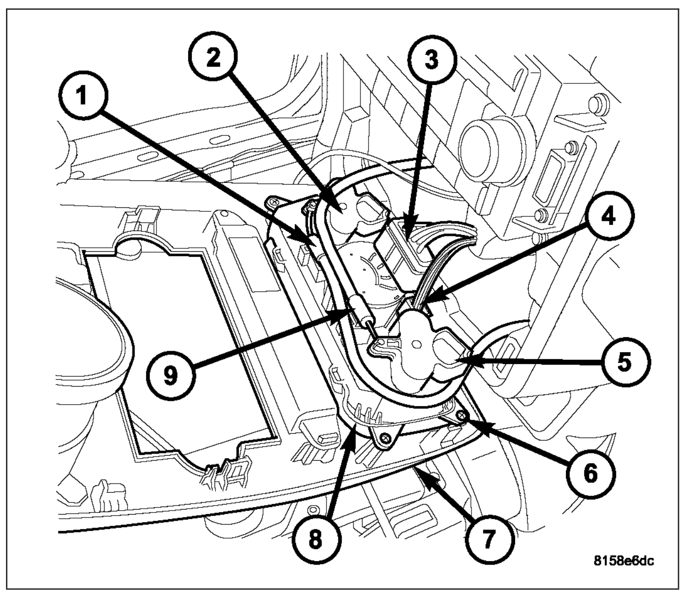
1. Disconnect and isolate the negative battery cable.
2. Remove the center bezel (7) from the instrument panel and disconnect the wiring connector for the clock, power window switches and the accessory switches, as equipped (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).

NOTE: To aid in reinstallation, note the installed positions of the control cables prior to removal.

3. Using a small screwdriver or similar tool, disengage the retaining clips that secure the control cables (1 and 9) to the back of the A/C-heater control (8).
4. Using a small screwdriver or similar tool, disengage the retaining clips that secure the control cables to the mode control sector gear (2) and the temperature control sector gear (5).
5. Disconnect the wire harness connectors (3 and 4) from the rear of the A/C-heater control and place the center bezel on a work bench.
6. Remove the four screws (6) that secure the A/C-heater control to the back of the center bezel and remove the control.

INSTALLATION

NOTE: Typical A/C-heater control and center bezel shown.



1. Install the A/C-heater control (8) into the instrument panel center bezel (7).
2. Install the four screws (6) that secure the A/C-heater control to the center bezel. Tighten the screws to 2 N·m (17 in. lbs.).
3. Position the center bezel to the instrument panel and connect the wire harness connectors (3 and 4) to the back of the A/C-heater control.

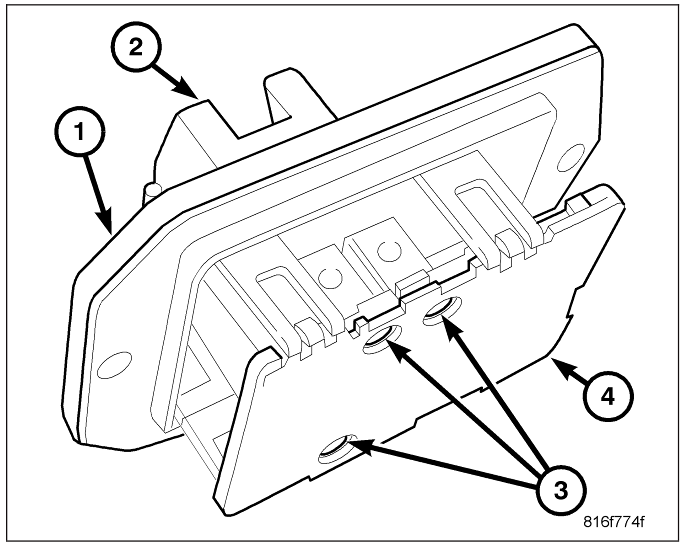
NOTE: Install the mode control cable onto the A/C heater control first. Then install the temperature control cable.

4. Connect the control cables (1 and 9) to the mode door control sector gear (2) and the temperature control sector gear (5) and fully engage the retaining clips. Make sure the retaining clips are fully engage to the sector gears.
5. Connect the control cables to the back of the A/C-heater control and fully engage the retaining clips. Make sure the retaining clips are fully engage to the back of the A/C-heater control.
6. Connect the wire harness connectors to the accessory switches, power window switches and clock, as equipped and install the center bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - INSTALLATION).
7. Reconnect the negative battery cable.

RESISTOR-BLOWER MOTOR

DESCRIPTION

The blower motor resistor is mounted to the bottom of the HVAC housing on the passenger side of the vehicle. The blower motor resistor consists of a molded plastic mounting plate (1) with an integral wire connector receptacle (2). Concealed behind the mounting plate are resistors (3) located between a two-piece stamped steel base (4).



OPERATION

The blower motor resistor is connected to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness. The blower motor resistor has three resistors, each of which will reduce the current flow through the blower motor to change the blower motor speed.

The blower motor control for the heating-A/C system directs the ground path for the blower motor through the correct resistor to obtain the selected speed. With the blower motor control in the lowest speed position, the ground path for the blower motor is applied through all of the resistors. Each higher speed selected with the blower motor control applies the blower motor ground path through fewer of the resistors, increasing the blower motor speed. When the blower motor control is in the highest speed position, the blower motor resistor is bypassed and the blower motor receives a direct path to ground.

The blower motor resistor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

BLOWER MOTOR RESISTOR

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the blower motor resistor (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/RESISTOR-BLOWER MOTOR - REMOVAL).
3. Using an ohmmeter, check for continuity between all of the blower motor resistor terminals. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor speed control and the blower motor resistor or blower motor as required. If not OK, replace the faulty blower motor resistor.

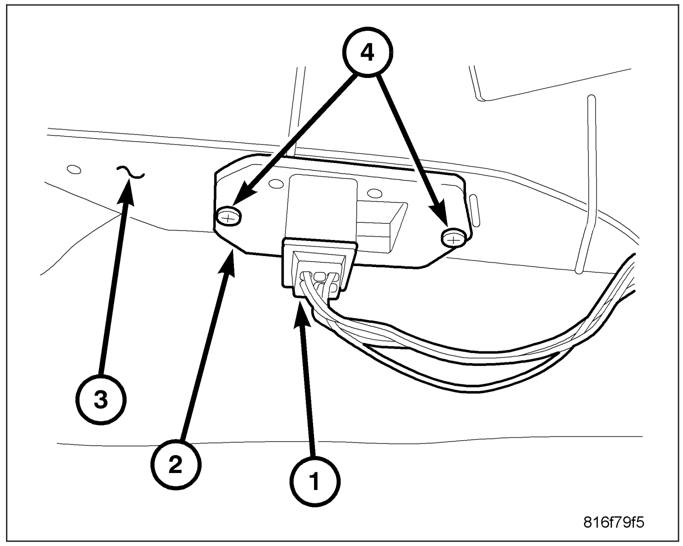
REMOVAL

WARNING: The blower motor resistor may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor resistor, wait five minutes to allow the blower motor resistors to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

CAUTION: Do not operate the blower motor with the blower motor resistor removed from the circuit. Failure to take this precaution can result in vehicle damage.

NOTE: LHD model shown. RHD model similar.

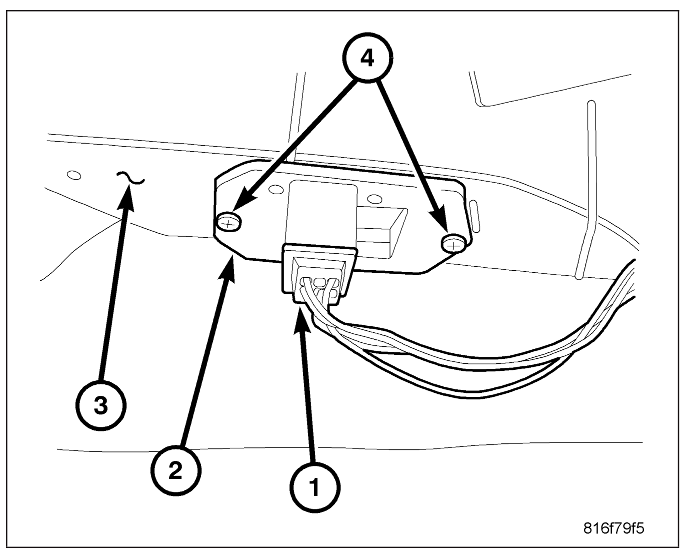
1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector (1) from the blower motor resistor (2) located on the bottom of the passenger side of the HVAC housing (3).
3. Remove the two screws (4) that secure the blower motor resistor to the HVAC housing and remove the resistor.



INSTALLATION

NOTE: LHD model shown. RHD model similar.

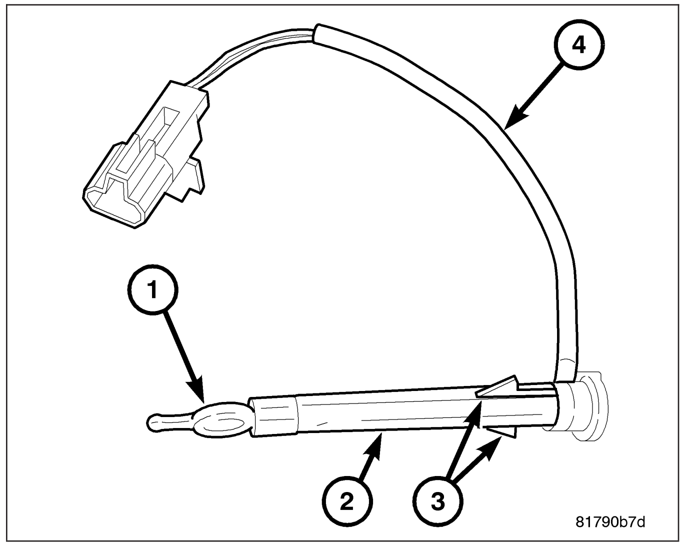
1. Position the blower motor resistor (2) onto the bottom of the passenger side of the HVAC housing (3).
2. Install the two screws (4) that secure the blower motor resistor to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).
3. Connect the wire harness connector (1) to the blower motor resistor.
4. Reconnect the negative battery cable.



SENSOR-EVAPORATOR TEMPERATURE

DESCRIPTION

The evaporator temperature sensor measures the temperature of the conditioned air downstream of the A/C evaporator. The evaporator temperature sensor is an electrical thermistor (1) mounted on the end of a molded plastic housing (2) that is inserted into the driver side of the HVAC housing near the coldest point of the A/C evaporator. The evaporator temperature sensor is retained in the HVAC housing by two integral retaining tabs (3) and is connected to the vehicle electrical system by use of a wire lead and connector (4) with two terminals.



OPERATION

The evaporator temperature sensor monitors the surface temperature of A/C evaporator and supplies an input signal to the A/C-heater control. The A/C-heater control uses the evaporator temperature sensor input signal to optimize A/C system performance and to protect the A/C system from evaporator freezing. The evaporator temperature sensor will change its internal resistance in response to the temperatures it monitors and is connected to the A/C-heater control through sensor ground circuit and a 5-volt reference signal circuit. As the temperature of the A/C evaporator decreases, the internal resistance of the evaporator temperature sensor decreases.

The A/C-heater control uses the monitored voltage reading as an indication of evaporator temperature. The A/C-heater control is programmed to respond to this input by requesting the powertrain control module (PCM) or the engine control module (ECM) (depending on engine application) to adjust the compressor swash plate angle as necessary to optimize A/C system performance and to protect the A/C system from evaporator freezing (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - OPERATION for more information).

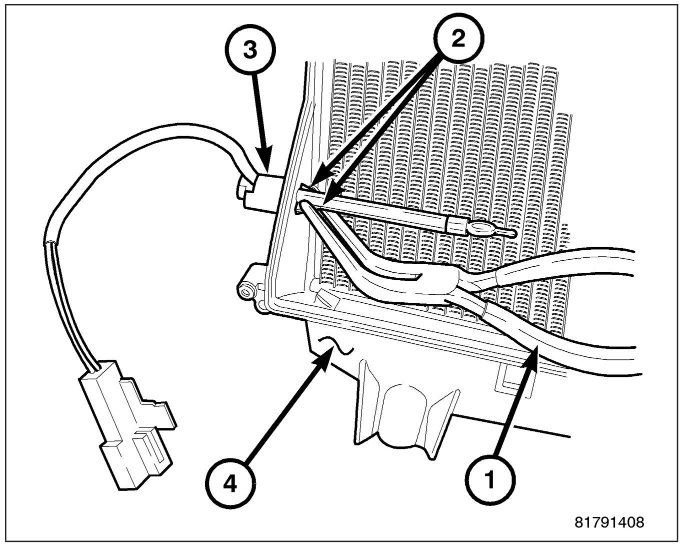
The evaporator temperature sensor is diagnosed using a scan tool (refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The evaporator temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REMOVAL

NOTE: LHD model shown. RHD model similar.

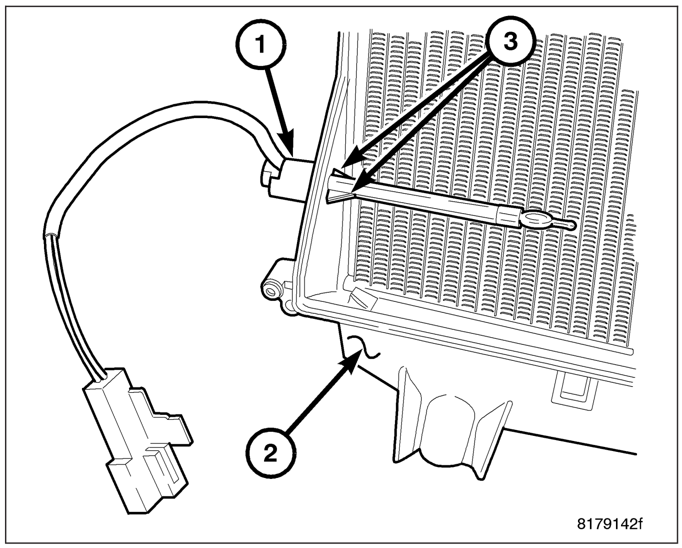
1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove the air distribution housing from the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - REMOVAL).
3. Using needle nose pliers (1) , disengage the two retaining tabs (2) that secure the evaporator temperature sensor (3) to the driver side of the HVAC housing (4) and remove the sensor.



INSTALLATION

NOTE: LHD model shown. RHD model similar.

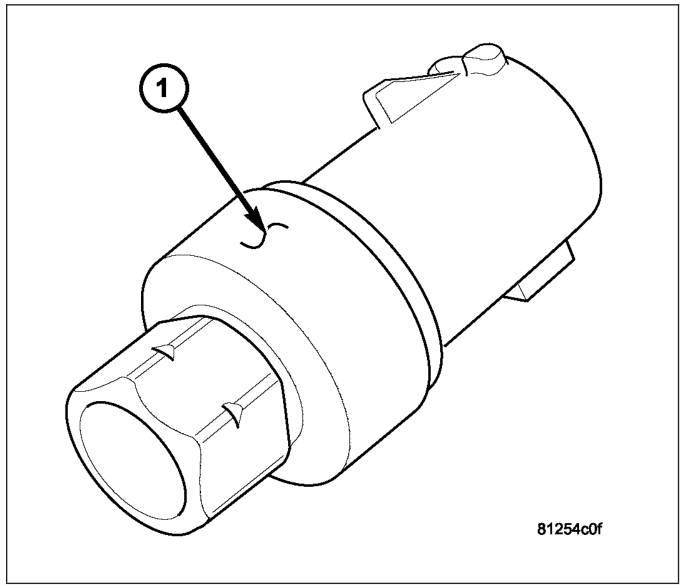
1. Install the evaporator temperature sensor (1) into the driver side of the HVAC housing (2). Make sure the retaining tabs (3) are fully engaged to the housing.
2. Install the air distribution housing onto the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - INSTALLATION).
3. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).



TRANSDUCER-A/C PRESSURE

DESCRIPTION

The A/C pressure transducer (1) is a switch that is installed on a fitting located on the A/C discharge line. An internally threaded fitting on the A/C pressure transducer connects it to the externally threaded Schrader-type fitting on the A/C discharge line. A rubber O-ring seals the connection between the A/C pressure transducer and the discharge line fitting. The A/C pressure transducer is connected to the vehicle electrical system by a molded plastic connector with three terminals.



OPERATION

The A/C pressure transducer monitors the pressures in the high side of the refrigerant system through its connection to a fitting on the A/C discharge line and its internal resistance changes in response to the pressures it monitors. The powertrain control module (PCM) or the engine control module (ECM) (depending on engine application) provides a five volt reference signal and a sensor ground to the A/C pressure transducer, then monitors the output voltage of the transducer on a sensor return circuit to determine refrigerant pressure. The PCM/ECM is programmed to respond to this and other sensor inputs by controlling the operation of the swashplate within the A/C compressor and the radiator cooling fan to help optimize A/C system performance and to protect the system components from damage. The PCM adjusts the swashplate to nearly a zero degree angle (low compressor displacement) when high side pressure rises above 3130 kPa (454 psi) and re-adjusts the swashplate to a greater angle (higher compressor displacement) when high side pressure drops below 1999 kPa (290 psi). The A/C pressure transducer also reduces the swashplate angle if the high side pressure drops below 200 kPa (29 psi) and will increase the swashplate angle when the high side pressure rises above 234 -262 kPa (34 - 38 psi). When the refrigerant pressure rises above 1655 kPa (240 psi), the PCM will actuate the cooling fan.

A Schrader-type valve in the A/C discharge line fitting permits the A/C pressure transducer to be removed or installed without disturbing the refrigerant in the A/C system.

The A/C pressure transducer is diagnosed using a scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

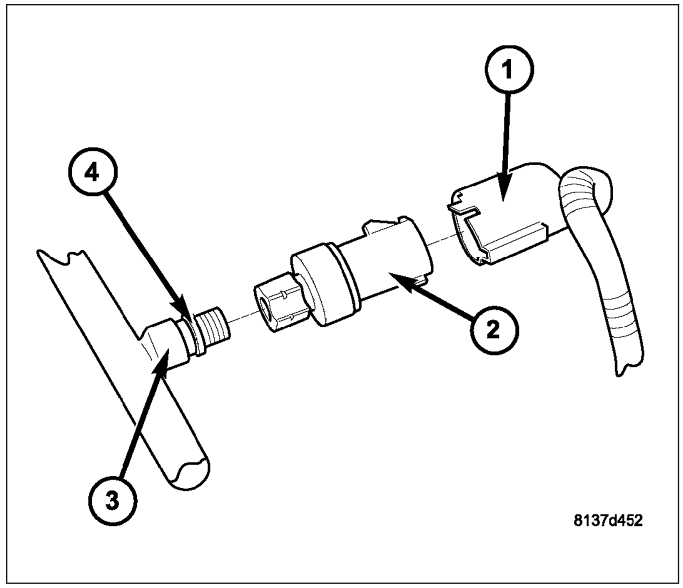
The A/C pressure transducer cannot be adjusted or repaired and, if faulty or damaged it must be replaced.

REMOVAL

NOTE: It is not necessary to discharge the refrigerant system to replace the A/C pressure transducer.

NOTE: Typical A/C pressure transducer shown.

1. Disconnect and isolate the negative battery cable.
2. Remove the upper radiator closure panel and carefully pull the top of the fascia forward to gain access to the A/C pressure transducer (2) (refer to 23 - BODY/EXTERIOR/CLOSURE PANEL-UPPER RADIATOR - REMOVAL).
3. Reach down through the opening between the A/C condenser and the front fascia and disconnect the wire harness connector (1) from the A/C pressure transducer located on the A/C discharge line (3).
4. Remove the A/C pressure transducer from the fitting on the A/C discharge line and remove and discard the O-ring seal.

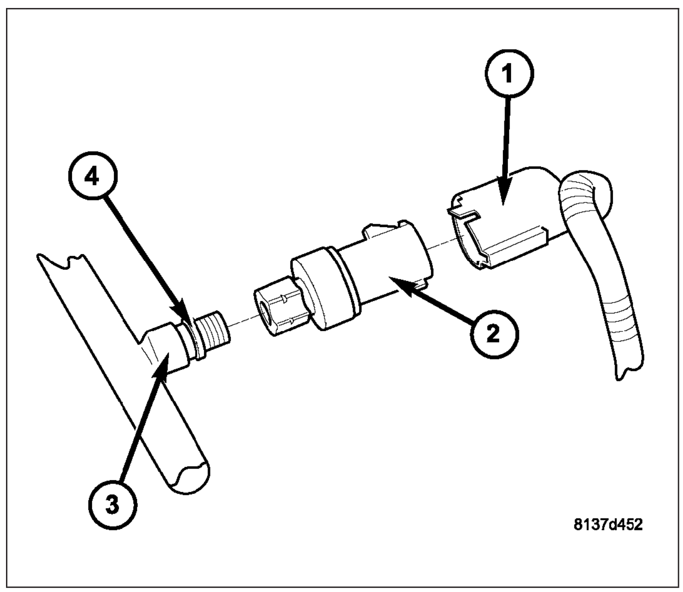


INSTALLATION

NOTE: Use only the specified O-ring as it is made of special material for R-134a. Use only refrigerant oil of the type required for the A/C compressor.

NOTE: Typical A/C pressure transducer shown.

1. Lubricate a new rubber O-ring seal (4) with clean refrigerant oil and install it onto the discharge line fitting (3).
2. Install the A/C pressure transducer (2) onto the A/C discharge line. Tighten the A/C pressure transducer securely.
3. Connect the wire harness connector (1) to the A/C pressure transducer.
4. Install the upper radiator closure panel (refer to 23 - BODY/EXTERIOR/CLOSURE PANEL-UPPER RADIATOR - INSTALLATION).
5. Reconnect the negative battery cable.



DISTRIBUTION

TABLE OF CONTENTS

DUCT-DEFROSTER

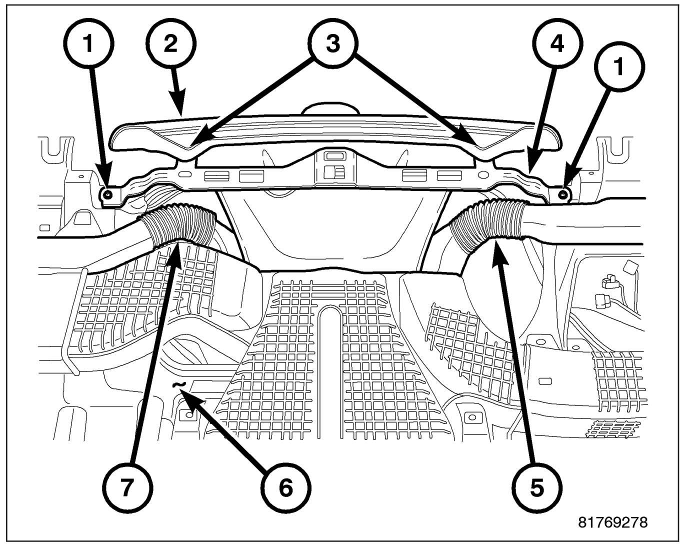
REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: LHD model shown. RHD model similar.

NOTE: Illustration shown with instrument panel removed from vehicle for clarity.

1. Remove the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
2. Disconnect the left demister duct (7) and the right demister duct (5) from the defroster duct (2).
3. Remove the two screws (3) that secure the defroster duct to the defroster duct support (4).
4. Remove the two screws (1) that secure the defroster duct support to the instrument panel (6) and position the support out of the way.
5. Remove the defroster duct from the instrument panel.

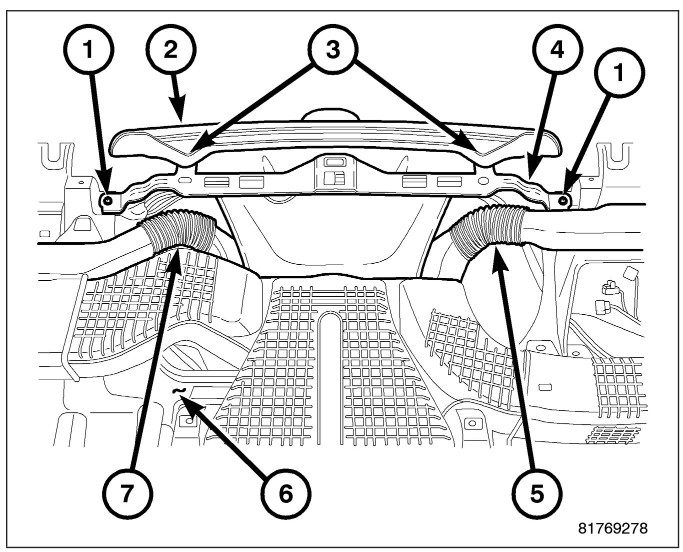


INSTALLATION

NOTE: LHD model shown. RHD model similar.

NOTE: Illustration shown with instrument panel removed from vehicle for clarity.

1. Position the defroster duct (2) to the front of the instrument panel (6).
2. Reposition the defroster duct support (4) to the instrument panel and install the two retaining screws (1). Tighten the screws to 3 N·m (27 in. lbs.).
3. Install the two screws (3) that secure the defroster duct to the defroster duct support. Tighten the screws to 2.2 N·m (20 in. lbs.).
4. Connect the left demister duct (7) and the right demister duct (5) to the defroster duct.
5. Install the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).



DUCTS-FLOOR DISTRIBUTION

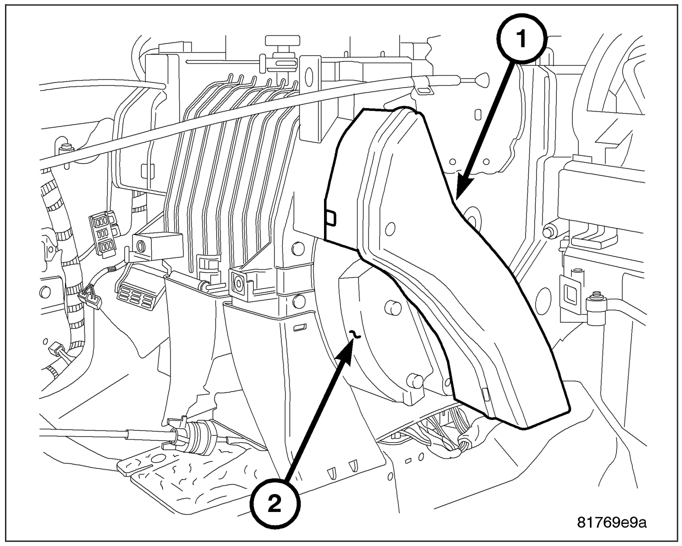
REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in an accidental airbag deployment and possible personal injury or death.

RIGHT FRONT FLOOR DUCT

NOTE: LHD model shown. RHD model similar.

1. Remove the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - REMOVAL).
2. Disconnect the right floor duct (1) from the right side of the HVAC housing (2) and remove the duct.

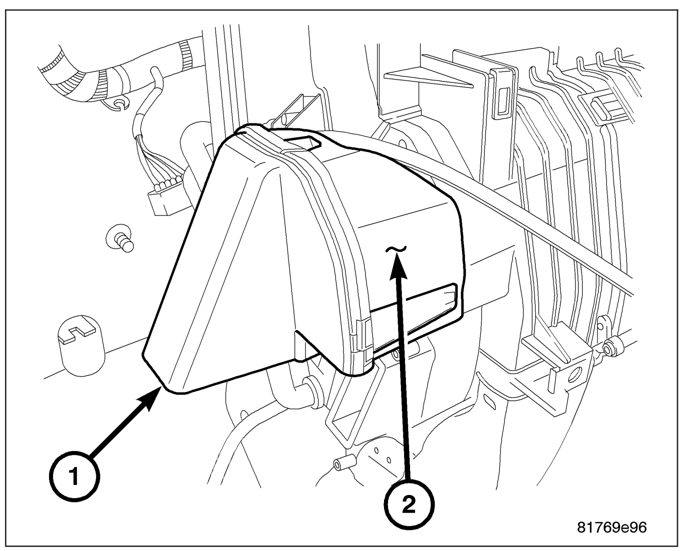


LEFT FRONT FLOOR DUCT

NOTE: Illustration shown with instrument panel removed for clarity.

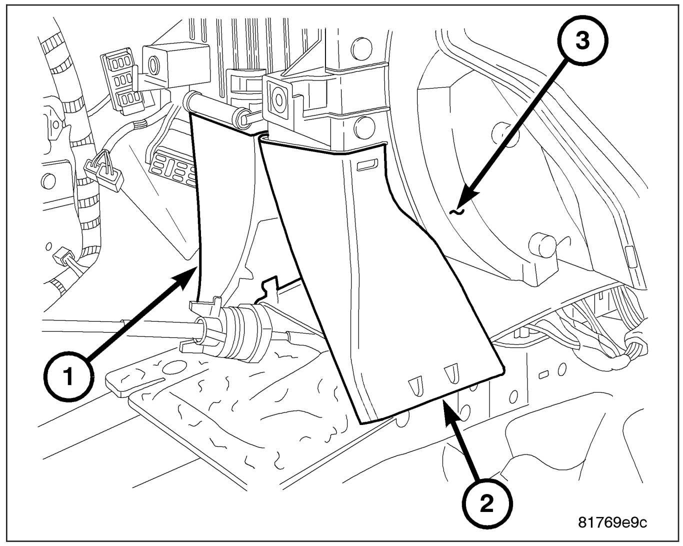
NOTE: LHD model shown. RHD model similar.

1. On LHD models, remove the steering column opening cover (refer to 23 - BODY/INSTRUMENT PANEL/COVER-STEERING COLUMN OPENING - REMOVAL).
2. On RHD models, remove the instrument panel cover (refer to 23 - BODY/INSTRUMENT PANEL/COVER-INSTRUMENT PANEL - REMOVAL).
3. Remove the screw that secures the left floor distribution duct (1) to the left side of the HVAC housing (2) and disconnect the duct from the housing outlet.



REAR FLOOR DISTRIBUTION DUCTS

1. Remove the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - REMOVAL).
2. Remove the rear seat floor ducts (refer to REAR SEAT FLOOR DUCTS in this group).
3. Disconnect the left rear floor distribution duct (1) and the right rear floor distribution duct (2) as required from the HVAC housing (3) and remove the duct(s).

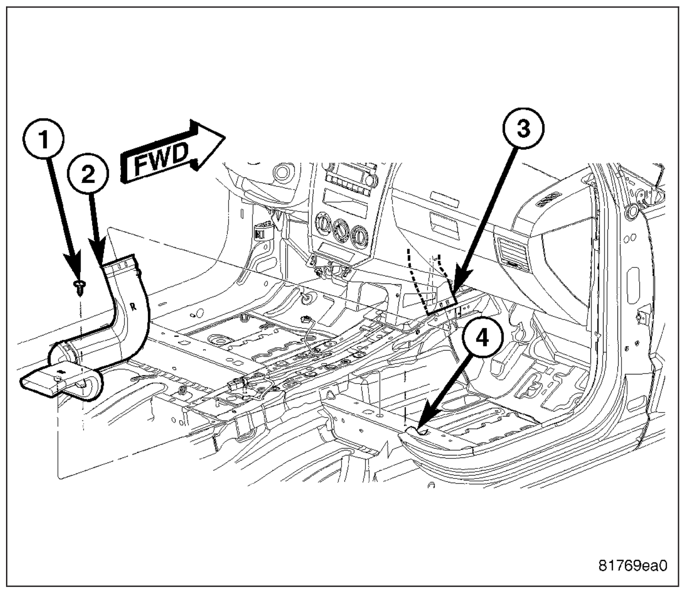


REAR SEAT FLOOR DUCTS

NOTE: Right side rear floor duct shown. Left side duct similar.

NOTE: LHD model shown. RHD model similar.

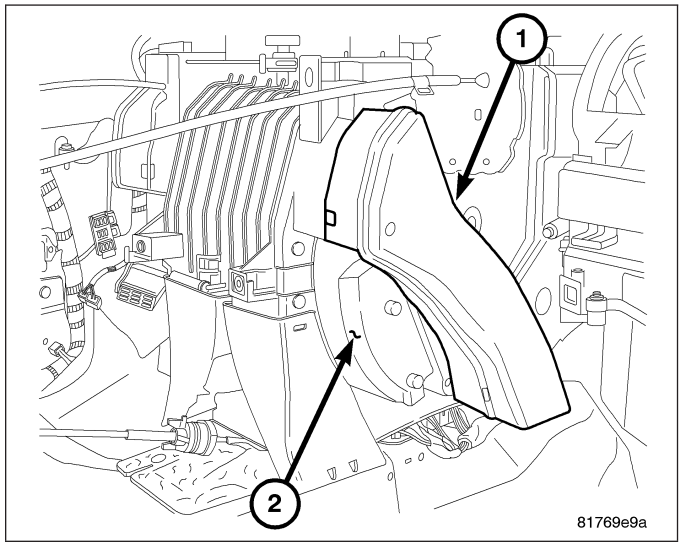
1. Remove the center floor console (refer to 23 - BODY/INTERIOR/CONSOLE-CENTER - REMOVAL).
2. Remove the front seat from the side of the vehicle being serviced (refer to 23 - BODY/SEATS/SEAT-FRONT - REMOVAL).
3. Pull the carpet back to gain access to the rear seat floor duct (2) (refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - REMOVAL).
4. Remove the screw (1) and disengage the retainer that secures the rear seat floor duct to the floor support (4).
5. Disconnect the rear seat floor duct from the rear floor distribution duct (3) and remove the rear seat duct(s).



INSTALLATION

RIGHT FRONT FLOOR DUCT

NOTE: LHD model shown. RHD model similar.

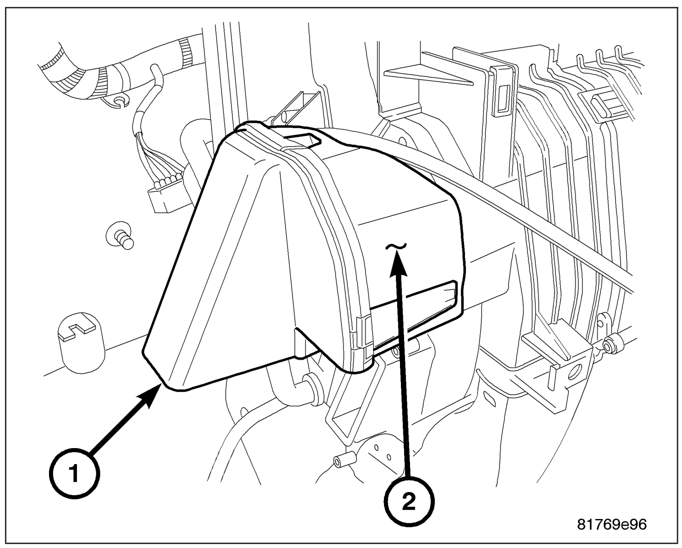


1. Connect the right front floor duct (1) to the right side of the HVAC housing (2). Make sure the duct is fully engaged to the housing.
2. Install the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - INSTALLATION).

LEFT FRONT FLOOR DUCT

NOTE: Illustration shown with instrument panel removed for clarity.

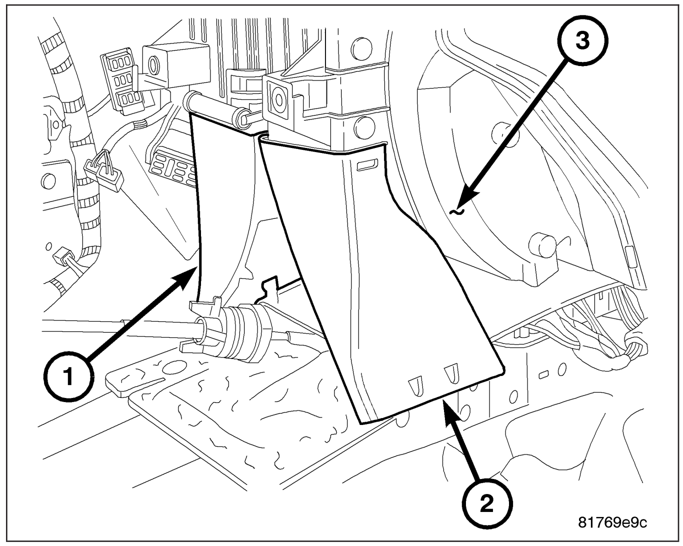
NOTE: LHD model shown. RHD model similar.



1. Connect the left front floor duct (1) to the left side of the HVAC housing (2). Make sure the duct is fully engaged to the housing.
2. Install the screw that secures the left front floor duct to the left side of the HVAC housing. Tighten the screw to 2 N·m (17 in. lbs.).
3. On LHD models, install the steering column opening cover (refer to 23 - BODY/INSTRUMENT PANEL/COVER-STEERING COLUMN OPENING - INSTALLATION).
4. On RHD models, install the instrument panel cover (Refer to 23 - BODY/INSTRUMENT PANEL/COVER-INSTRUMENT PANEL - INSTALLATION).

REAR FLOOR DISTRIBUTION DUCTS

1. Connect the left rear floor distribution duct (1) and the right rear floor distribution duct (2) as required to the HVAC housing (3). Make sure the ducts are fully engaged to the housing.
2. Install the rear seat floor ducts (refer to REAR SEAT FLOOR DUCTS in this group).
3. Install the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - INSTALLATION).

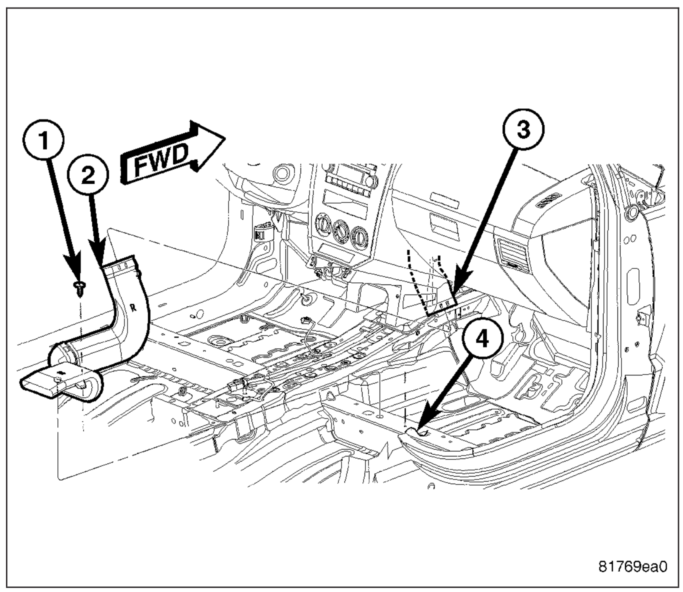


REAR SEAT FLOOR DUCTS

NOTE: Right side rear floor duct shown. Left side duct similar.

NOTE: LHD model shown. RHD model similar.

1. Connect the rear seat floor duct (2) to the rear floor distribution duct (3). Make sure the ducts are fully engaged to each other.
2. Engage the retainer that secures the rear seat floor duct to the floor support (4) and install the retaining screw (1). Tighten the screw to 2.2 N·m (20 in. lbs.).
3. Reinstall the carpet (refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION).
4. Install the front seat to the side of the vehicle being serviced (refer to 23 - BODY/SEATS/SEAT-FRONT - INSTALLATION).
5. Install the center floor console (refer to 23 - BODY/INTERIOR/CONSOLE-CENTER - INSTALLATION).



DUCT-INSTRUMENT PANEL

REMOVAL

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

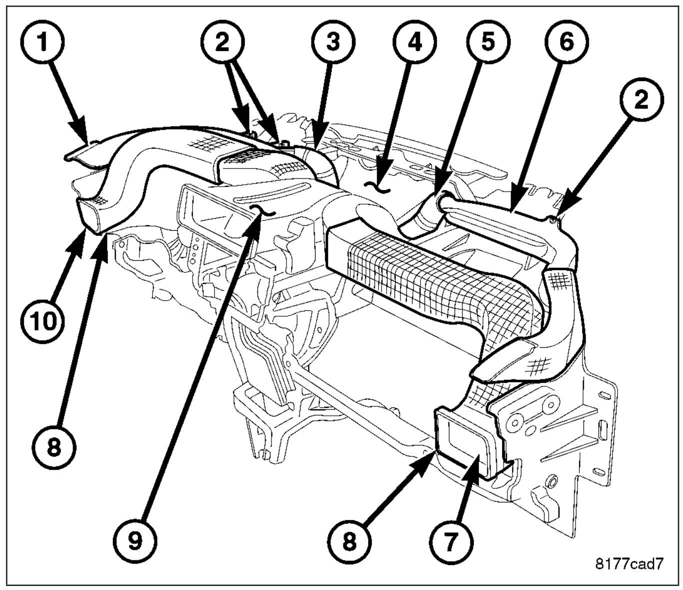
NOTE: Illustrations shown with instrument panel removed from vehicle for clarity.

LEFT AND RIGHT SIDE DUCT

NOTE: The left and right side instrument panel ducts are serviced only as an assembly with the left or right side demister duct.

NOTE: LHD model shown. RHD model similar.

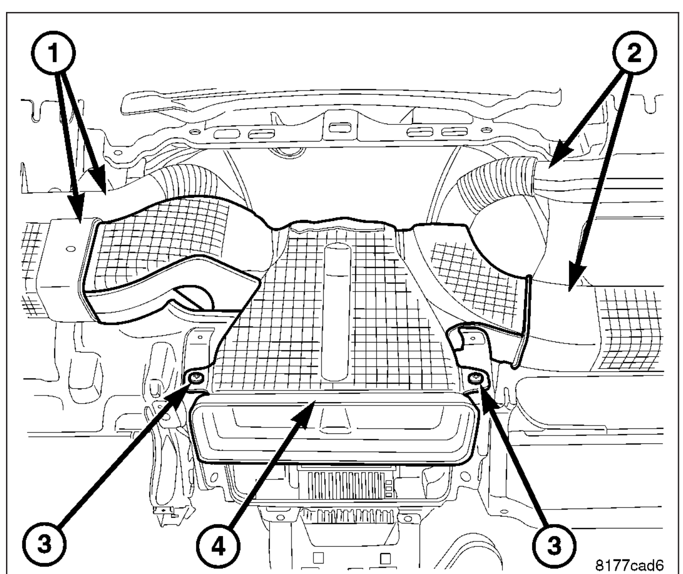
1. Remove the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
2. Disconnect the left side demister hose (3) and right side demister hose (5) from the defroster duct (4).
3. Remove the screws (2) that secure each demister duct (1 and 6) to the instrument panel support.
4. Remove the push-pin fastener (8) that secures each instrument panel duct (7 and 10) to the instrument panel support.
5. Disconnect the left and right side instrument panel ducts from the center duct (9).
6. Remove the each instrument panel duct and demister duct as an assembly from the instrument panel.



CENTER DUCT

NOTE: LHD model shown. RHD model similar.

1. Remove the left and right side instrument panel and demister ducts (1 and 2) (refer to LEFT AND RIGHT SIDE DUCT).
2. Remove the two screws (3) that secure the center instrument panel duct (4) to the instrument panel support.
3. Rotate and tilt the center duct as necessary to remove it from the instrument panel.



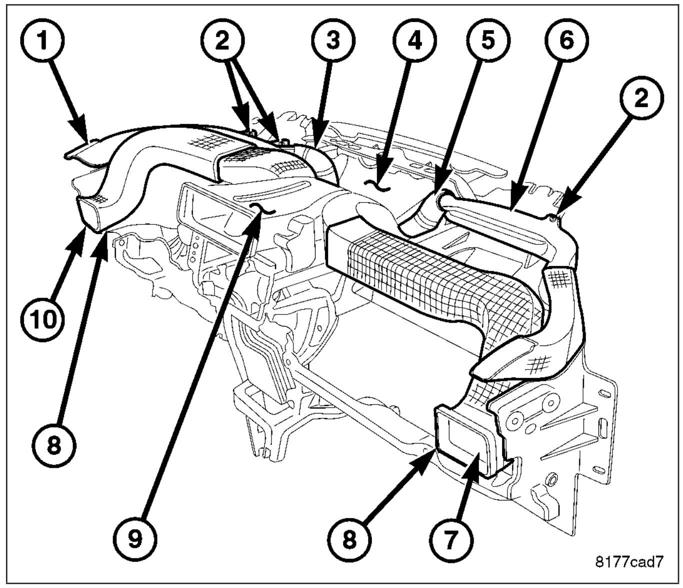
INSTALLATION

NOTE: Illustrations shown with instrument panel removed from vehicle for clarity.

LEFT AND RIGHT SIDE DUCT

NOTE: The left and right side instrument panel ducts are serviced only as an assembly with the left or right side demister duct.

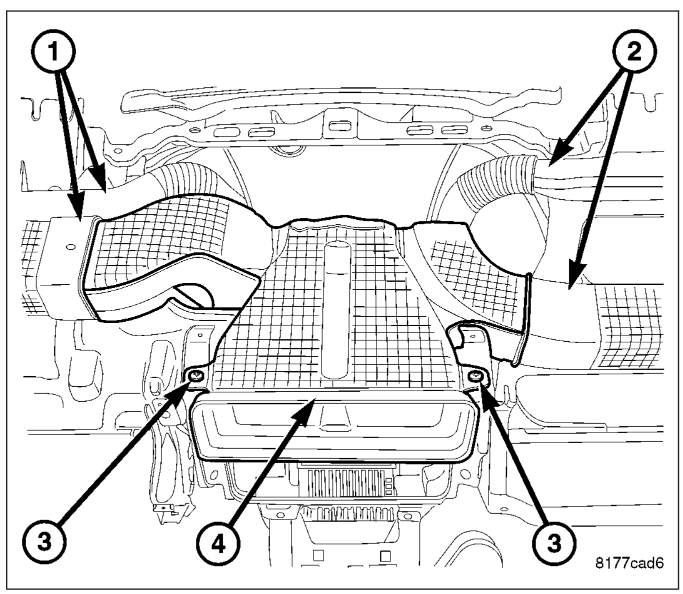
NOTE: LHD model shown. RHD model similar.



1. Position the left and right side instrument panel ducts (7 and 10) and the left and right side demister ducts (1 and 6) onto the top of the instrument panel as assemblies.
2. Connect the left and right side instrument panel ducts to the center duct (9). Make sure the ducts are fully engaged to each other.
3. Install the push-pin fastener (8) that secures each instrument panel duct to the instrument panel support.
4. Install the screws (2) that secure each demister duct to the instrument panel support. Tighten the screws to 2.2 N·m (20 in. lbs.).
5. Connect the left and right side demister hoses (3 and 5) to the defroster duct (4). Make sure the hoses are fully engaged to the defroster and demister ducts.
6. Install the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

CENTER DUCT

NOTE: LHD model shown. RHD model similar.



1. Position the center instrument panel duct (2) onto the top of instrument panel. Rotate and tilt the duct as necessary.
2. Install the two screws (3) that secure the center duct to the instrument panel support. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Install the left and right side instrument panel and demister ducts (1 and 2) (refer to LEFT AND RIGHT SIDE DUCT).

DUCT-INSTRUMENT PANEL DEMISTER

REMOVAL

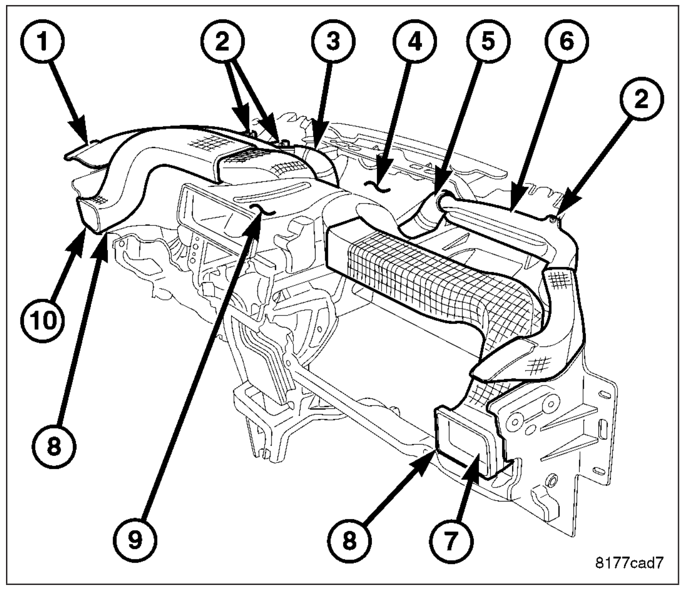
WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: The left and right side demister ducts are serviced only as an assembly with the left or right side instrument panel duct.

NOTE: Illustration shown with instrument panel removed from vehicle for clarity.

NOTE: LHD model shown. RHD model similar.

1. Remove the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
2. Disconnect the left side demister hose (3) and right side demister hose (5) from the defroster duct (4).
3. Remove the screws (2) that secure each demister duct (1 and 6) to the instrument panel support.
4. Remove the push-pin fastener (8) that secures each instrument panel duct (7 and 10) to the instrument panel support.
5. Disconnect the left and right side instrument panel ducts from the center duct (9).
6. Remove the each demister duct and instrument panel duct as an assembly from the instrument panel.

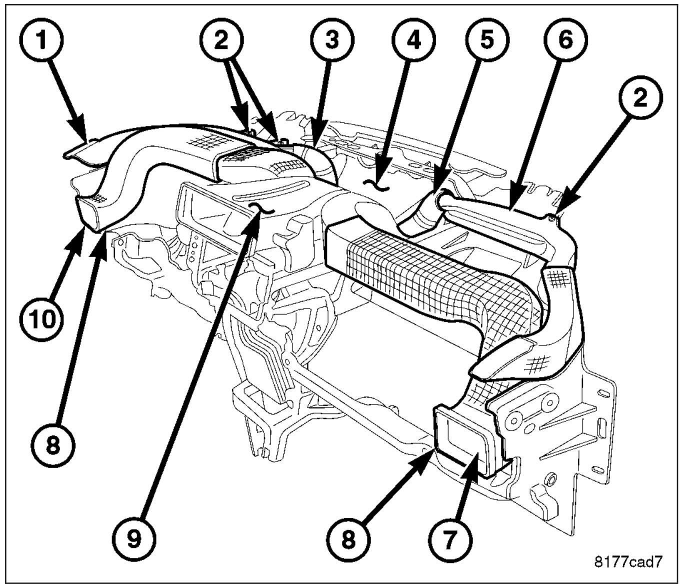


INSTALLATION

NOTE: The left and right side demister ducts are serviced only as an assembly with the left or right side instrument panel duct.

NOTE: Illustration shown with instrument panel removed from vehicle for clarity.

NOTE: LHD model shown. RHD model similar.



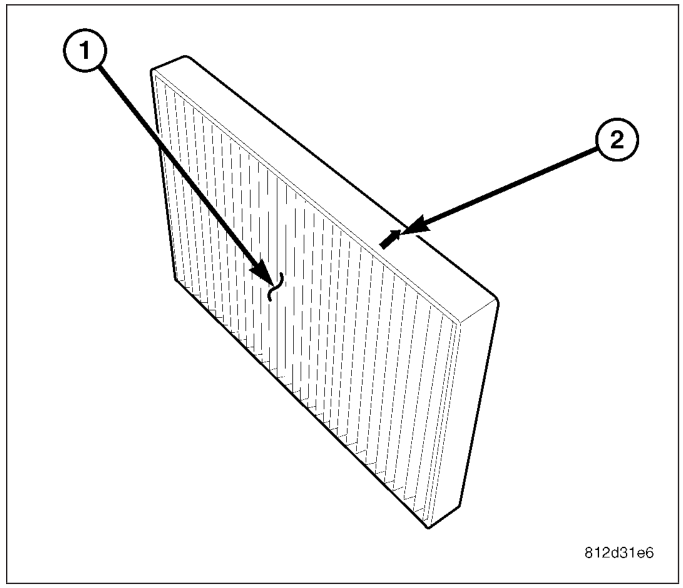
1. Position the left and right side demister ducts (1 and 6) and the left and right side instrument panel ducts (7 and 10) onto the top of the instrument panel as assemblies.
2. Connect the left and right side instrument panel ducts to the center duct (9). Make sure the ducts are fully engaged to each other.
3. Install the push-pin fastener (8) that secures each instrument panel duct to the instrument panel support.
4. Install the screws (2) that secure each demister duct to the instrument panel support. Tighten the screws to 2.2 N·m (20 in. lbs.).
5. Connect the left and right side demister hoses (3 and 5) to the defroster duct (4). Make sure the hoses are fully engaged to the defroster and demister ducts.
6. Install the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

FILTER-PARTICULATE AIR

DESCRIPTION

Some models are equipped with a particulate air filter (1) that helps purify the outside air entering the HVAC housing. The filter is mounted in the passenger compartment, behind the glove box bin.

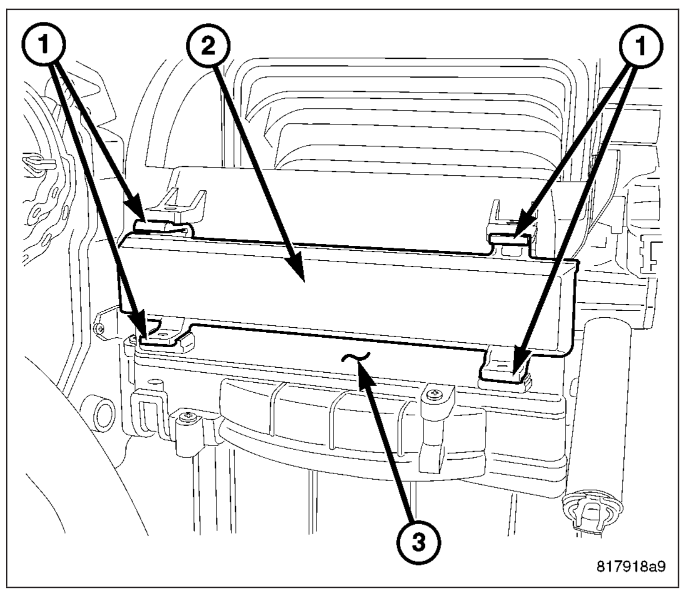
The filter should be replaced at least once a year or every 24,000 km (15,000 miles) and checked if heating-A/C system performance seems lower than expected. The particulate air filter is labeled with an arrow (2) to indicate the direction of air flow through the filter.



REMOVAL

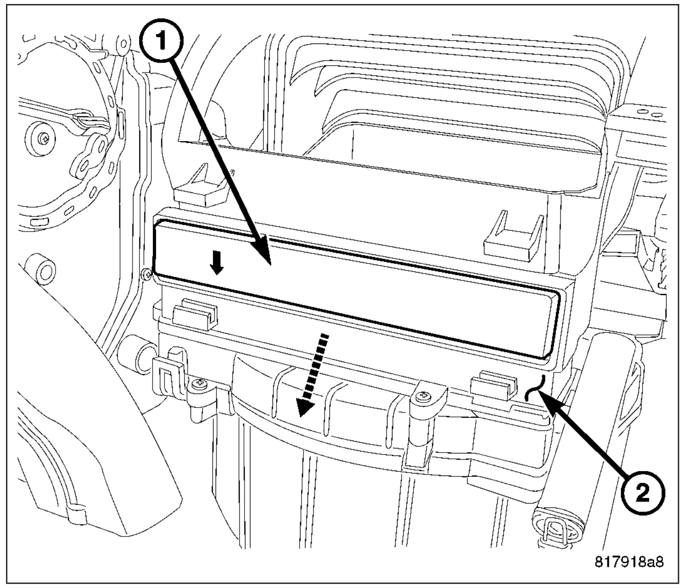
NOTE: LHD model shown in illustrations. RHD model similar.

NOTE: Illustration shown with instrument panel removed for clarity.



1. Remove the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - REMOVAL).
2. Disengage the four retaining tabs (1) that secure the particulate air filter cover (2) to the passenger side of the HVAC housing (3) and remove the cover.

3. Remove the particulate air filter (1) from the HVAC housing (2) by pulling the filter element straight out of the housing.

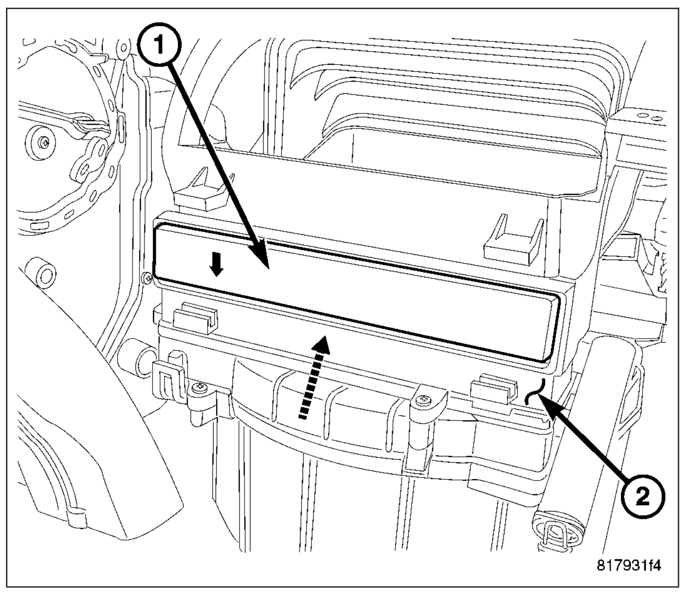


INSTALLATION

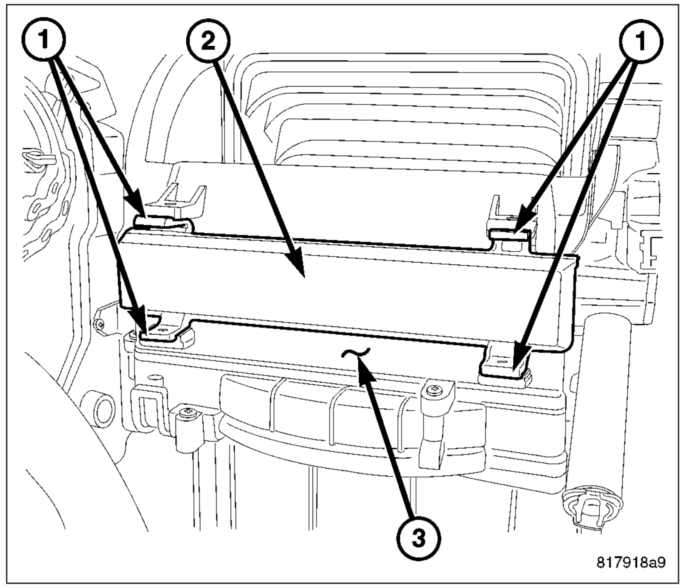
NOTE: The particulate air filter is labeled with an arrow to indicate air flow direction through the filter. Make sure to properly install the particulate air filter. Failure to properly install the filter will result in the need to replace the filter sooner than required by design.

NOTE: LHD model shown in illustrations. RHD model similar.

1. Install the particulate air filter (1) into the filter opening in the HVAC housing (2). Insert the particulate air filter directly into the housing with the arrow on the filter pointing to the floor.



2. Position the particulate air filter cover (2) to the HVAC housing (3) and engage the four retaining tabs (1) that secure the cover to the housing. Make sure the retaining tabs are fully engaged.
3. Install the glove box bin (refer to 23 - BODY/INSTRUMENT PANEL/BIN-GLOVE BOX - INSTALLATION).

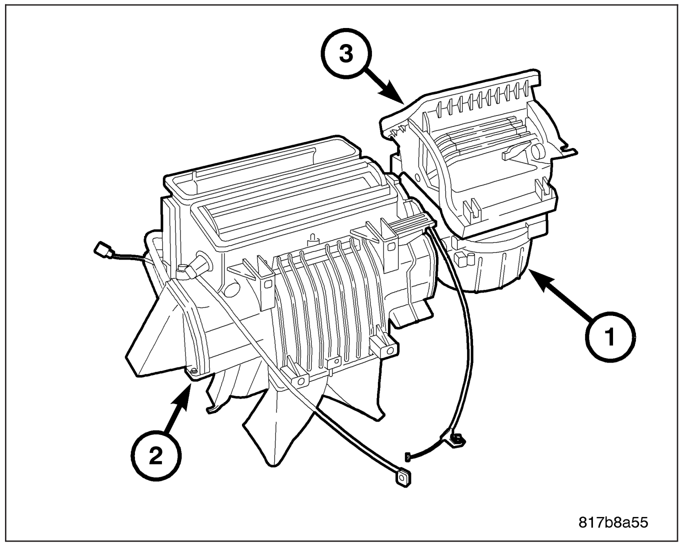


HOUSING-HVAC

DESCRIPTION

NOTE: LHD model shown RHD model similar.

All models are equipped with a common HVAC housing assembly that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The HVAC housing assembly consists of three separate housings:



- **HVAC housing** — The HVAC housing (1) is mounted to the dash panel behind the instrument panel and contains the A/C evaporator. The HVAC housing consists of a upper and a lower housing that are attached together and has mounting provisions for the air inlet housing, blower motor and the air distribution housing.
- **Air distribution housing** — The air distribution housing (2) is mounted to the rear of the HVAC housing and contains the heater core, blend-air and mode-air doors and door linkage.
- **Air inlet housing** — The air inlet housing (3) is mounted to the passenger side end of the HVAC housing. The air inlet housing contains the recirculation-air door and actuator when equipped with A/C.

The heating-A/C system is a blend-air type system. The blend-air door controls the amount of conditioned air that is allowed to flow through, or around, the heater core.

The A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. A temperature control determines the discharge air temperature by operating the temperature control cable, which moves the blend-air door. This allows an almost immediate control of the output air temperature of the system. The mode door cable operates the mode-air doors which direct the flow of the conditioned air out the various air outlets, depending on the mode selected. When equipped with A/C, the recirculation door actuator operates the recirculation-air door which closes off the fresh air intake and recirculates the air already inside the vehicle. The electric recirculation door actuator and the blower motor are connected to the vehicle electrical system by the instrument panel wire harness. The blower motor controls the velocity of air flowing through the HVAC housing assembly by spinning the blower wheel within the HVAC housing at the selected speed by use of the blower motor resistor, which is located in the dash panel in the engine compartment.

The air distribution housing must be removed from the HVAC housing and disassembled for service of the blend-air and mode-air doors. The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door. The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

REMOVAL

HOUSING-HVAC

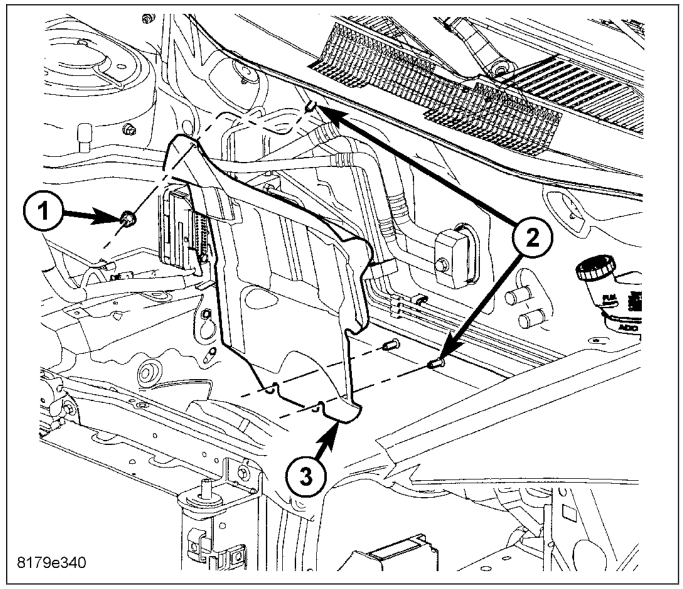
WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in an accidental airbag deployment and possible personal injury or death.

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

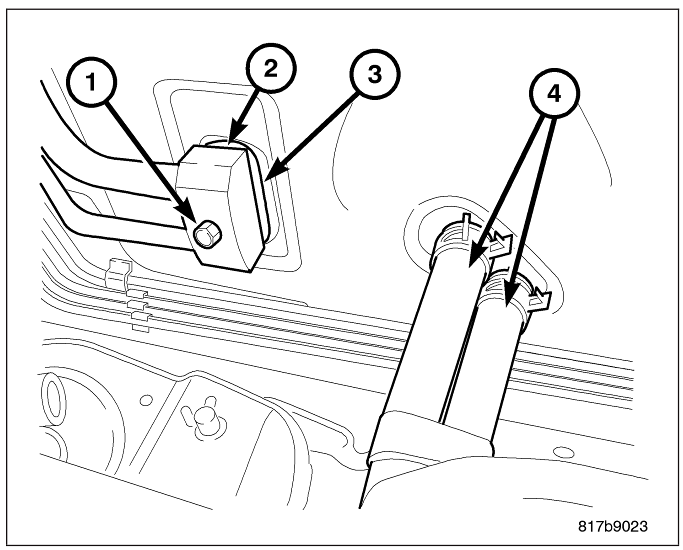
NOTE: The HVAC housing must be removed from the vehicle and disassembled for service of the heater core, A/C evaporator, air intake housing and the mode-air and blend-air doors.

NOTE: LHD model shown in illustrations. RHD model similar.

1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Partially drain the engine cooling system (refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE - DRAINING COOLING SYSTEM).
4. Remove the three nuts (1) that secure the heat shield (3) to the studs (2) located on the dash panel in the engine compartment and remove the heat shield.

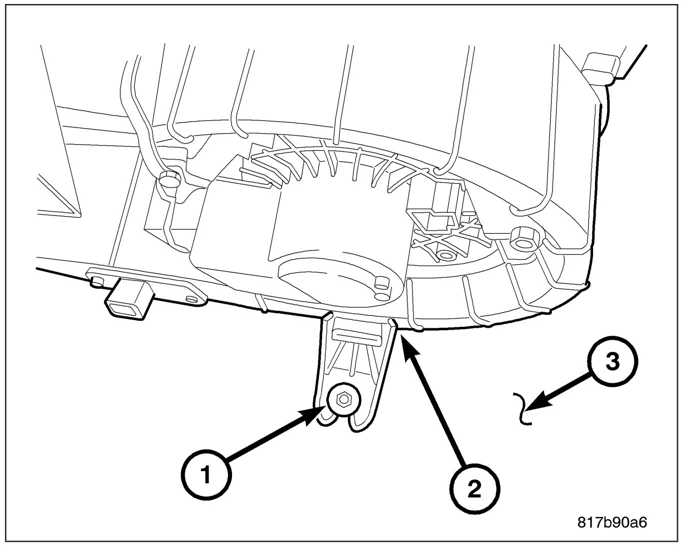


5. Remove the bolt (1) that secures the A/C liquid and suction line assembly (2) to the A/C evaporator (3).
6. Disconnect the A/C liquid and suction line assembly from the A/C evaporator and remove and discard the dual-plane seals.
7. Install plugs in, or tape over the opened refrigerant line fittings and the evaporator ports.
8. Disconnect the heater hoses (4) from the heater core tubes. Install plugs in, or tape over the opened heater core tubes to prevent coolant spillage during housing removal.



NOTE: Make sure to remove the five bolts that secure the HVAC housing to the instrument panel support prior to removing the instrument panel from the vehicle.

9. Remove the instrument panel (refer to 23 - BODY/ INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - REMOVAL).
10. Remove the rear floor ducts (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ DUCTS-FLOOR DISTRIBUTION - REMOVAL).
11. Remove the condensation drain tube (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ TUBE-CONDENSATION DRAIN - REMOVAL).
12. Remove the nut (1) that secures the passenger side of the HVAC housing (2) to the dash panel (3).



NOTE: Use care to ensure that the interior is covered in case of loss of residual fluids from the heater and evaporator cores.

13. Pull the HVAC housing rearward and remove the HVAC housing assembly from the passenger compartment.

HOUSING-AIR DISTRIBUTION

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

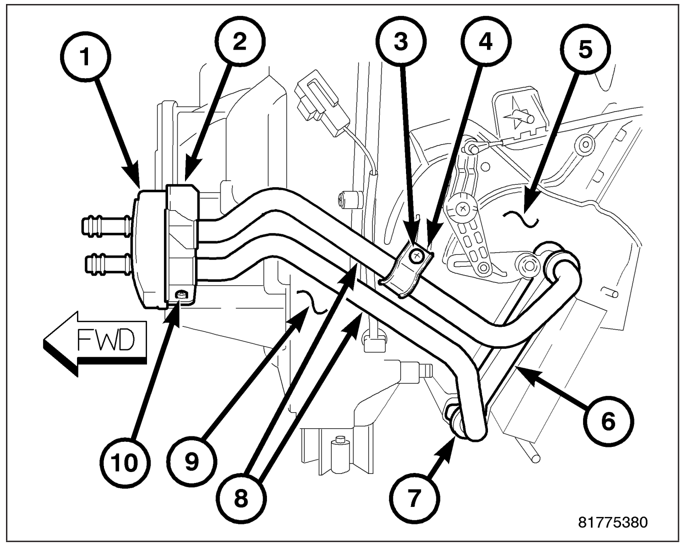
NOTE: The air distribution housing must be removed from the HVAC housing and disassembled for service of the blend-air and mode-air doors.

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove all of the floor distribution ducts from the air distribution housing (5) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR DISTRIBUTION - REMOVAL).

NOTE: If the foam seal for the flange is deformed or damaged, it must be replaced.

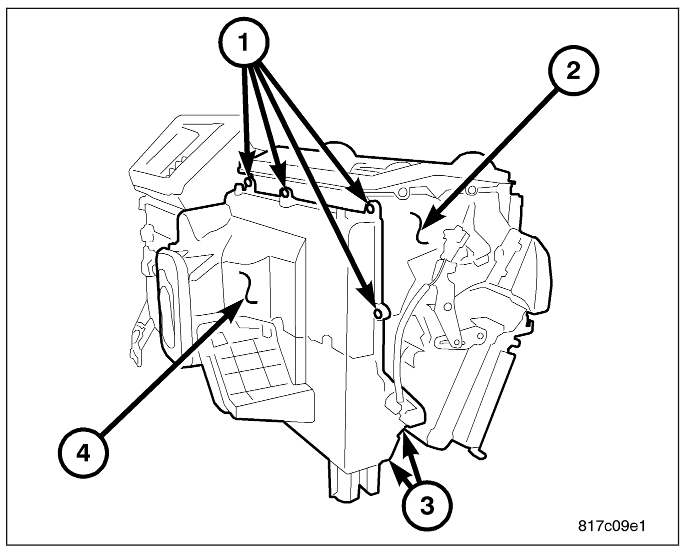
3. Remove the foam seal (1) from the flange (2) located on the front of the HVAC housing (9).
4. Remove the screw (10) that secures the flange to the front of the HVAC housing and remove the flange.



5. Remove the screw (3) that secures the retaining bracket (4) for the heater core tubes (8) to the left side of the air distribution housing.
6. On RHD models, remove the air distribution housing from the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - REMOVAL)
7. Carefully pull the heater core (6) out of the driver side of the air distribution housing.

NOTE: Illustration shown with heater core and tubes removed from view for clarity.

8. Remove the two metal retaining clips (3) that secure the bottom of air distribution housing (2) to the HVAC housing (4).
9. Remove the seven screws (1) that secure the air distribution housing to the rear of the HVAC housing.
10. Remove the air distribution housing from the rear of the HVAC housing.
11. If required, disassemble the air distribution housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - DISASSEMBLY).



HOUSING-AIR INLET

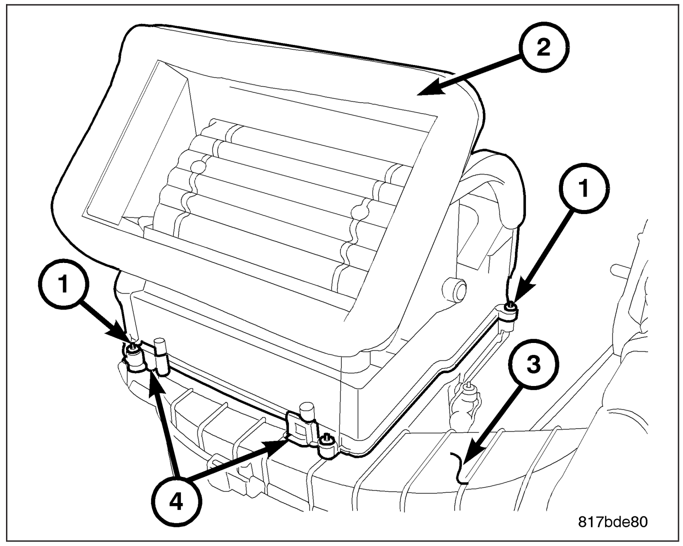
WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.

NOTE: LHD model with A/C shown. RHD and heater-only models similar.

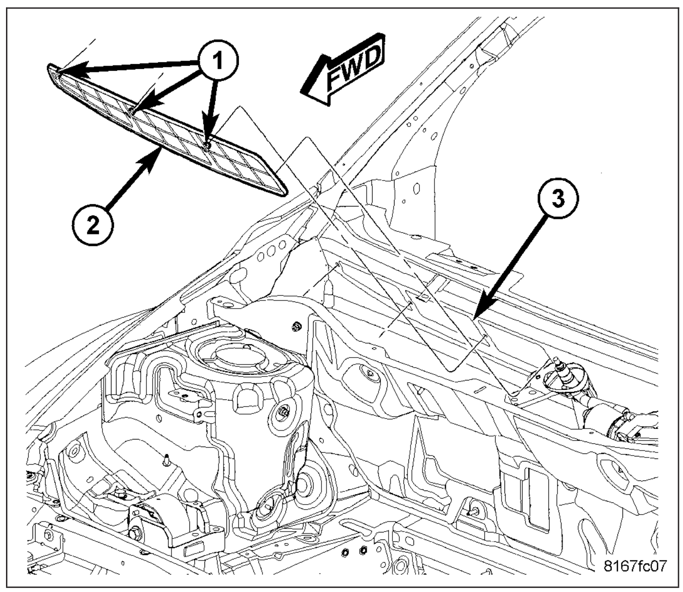
1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. If equipped, remove the particulate air filter (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FILTER-PARTICULATE AIR - REMOVAL).
3. Remove the four screws (1) that secure the air inlet housing (2) to the top of the HVAC housing (3).
4. Disengage the two plastic retaining tabs (4) that secure the air inlet housing to the HVAC housing and remove the inlet housing from the HVAC housing.
5. If required, disassemble the air inlet housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR INLET - DISASSEMBLY).



SCREEN-AIR INLET

NOTE: LHD model shown. RHD model similar.

1. Remove the cowl grille screen (refer to 23 - BODY/EXTERIOR/SCREEN-COWL GRILLE - REMOVAL).
2. Disengage the three push-in retainers (1) that secure the HVAC housing air inlet screen (2) to the cowl panel (3) and remove the screen.



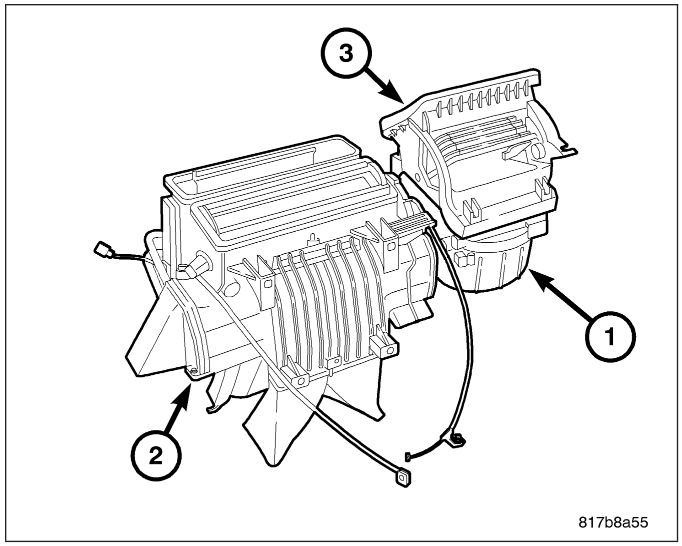
DISASSEMBLY

HOUSING-HVAC

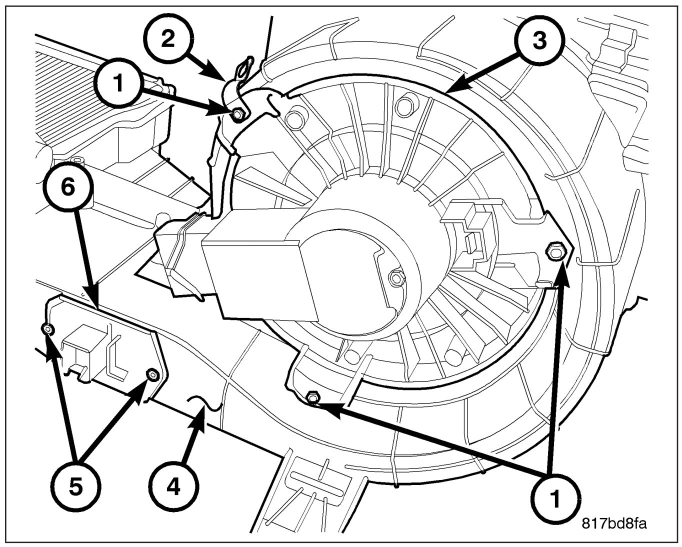
NOTE: The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

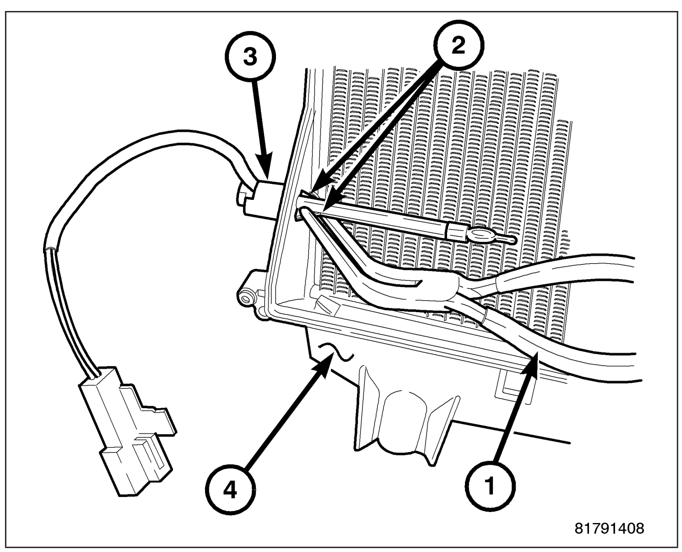
1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove the air distribution housing (2) from the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - REMOVAL).
3. Remove the air inlet housing (3) from the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR INLET - REMOVAL).



4. Remove the three screws (1) that secure the wire lead bracket (2) and the blower motor (3) to the bottom of the HVAC housing (4) and remove the blower motor and wire lead bracket.
5. Remove the two screws (5) that secure the blower motor resistor (6) to the bottom of the HVAC housing and remove the resistor.

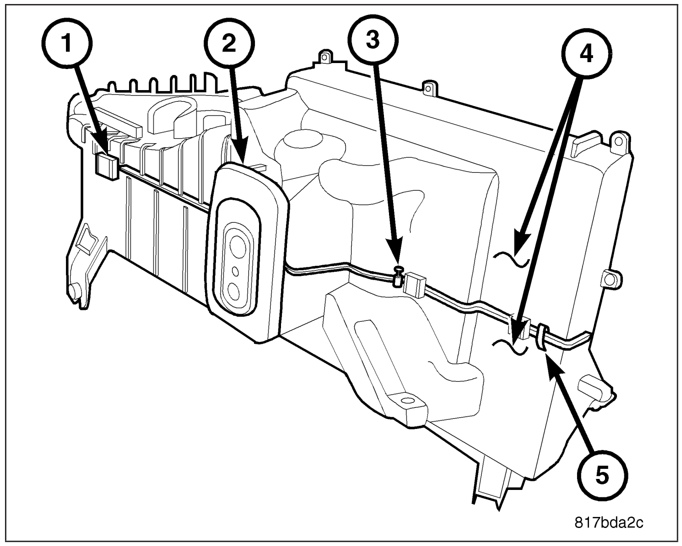


6. Using needle nose pliers (1), disengage the two retaining tabs (2) that secure the evaporator temperature sensor (3) to the driver side of the HVAC housing (4) and remove the sensor.



NOTE: If the foam seal for the flange is deformed or damaged, it must be replaced.

7. Carefully remove the foam seal (2) from the front of the two halves of the HVAC housing (4). If the seal is deformed or damaged, it must be replaced.
8. Remove the nine screws (3) and three metal clips (5) that secure the two halves of the HVAC housing together.
9. Disengage the nine plastic retaining tabs (1) that secure the two halves of the HVAC housing together and separate the housing.

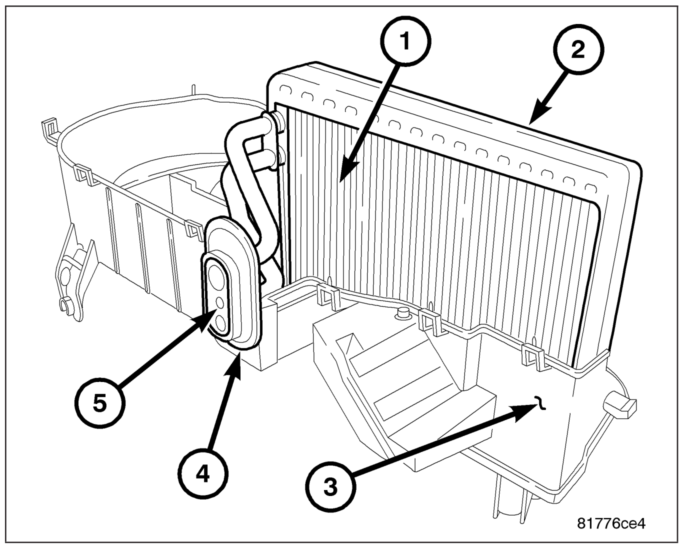


NOTE: If the foam insulator around the A/C evaporator is deformed or damaged, the insulator must be replaced.

10. Carefully lift the A/C evaporator (1) and the foam insulator (2) out of the lower half of the HVAC housing (3).

NOTE: If the seal around the evaporator tube tapping block is deformed or damaged, the seal must be replaced.

11. If required, remove the seal (4) from around the evaporator tube tapping block (5).

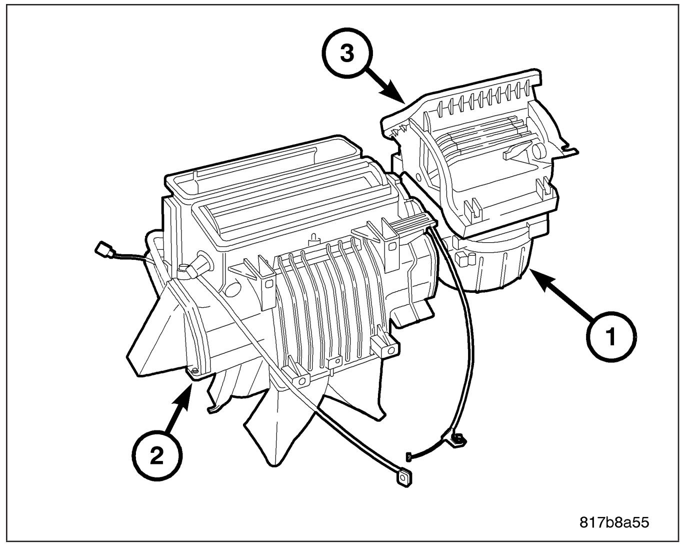


HOUSING-AIR DISTRIBUTION

NOTE: The air distribution housing must be removed from the HVAC housing and disassembled for service of the blend-air and mode-air doors.

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

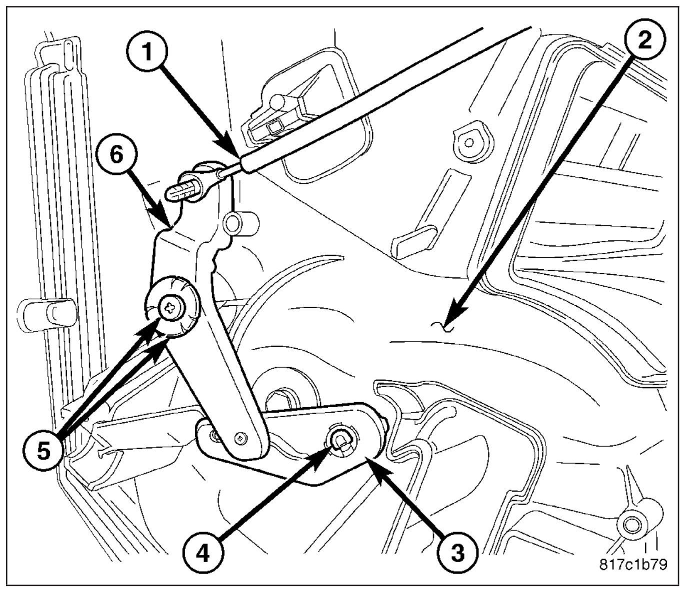
1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove the air distribution housing (2) from the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - REMOVAL).
3. If equipped with the 2.0L diesel engine, remove the electric positive temperature coefficient (PTC) heater unit from the air distribution housing (refer to 24 - HEATING & AIR CONDITIONING/CABIN HEATER/HEATER UNIT - REMOVAL).



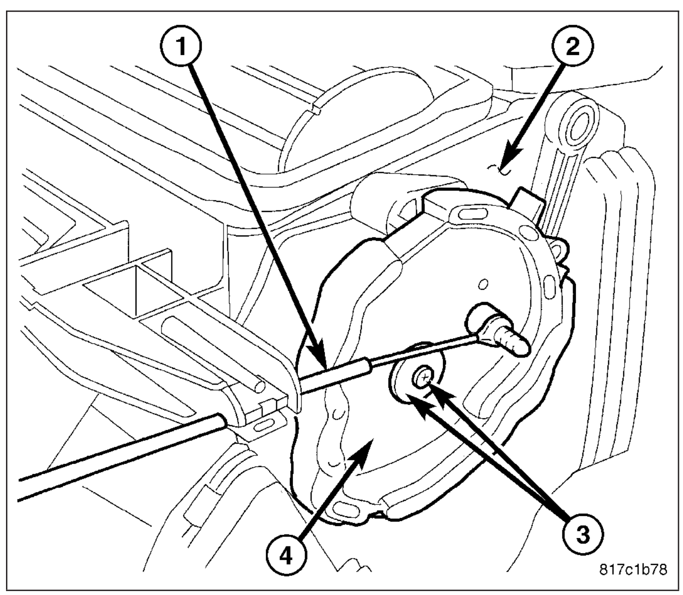
4. Remove the heater core from the air distribution housing (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/CORE HEATER - REMOVAL).
5. Remove the temperature control cable (1) from the left side of the air distribution housing (2) (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CABLE-TEMPERATURE CONTROL - REMOVAL).
6. Remove the screw and washer (5) that secures the blend door cable lever (6) to the air distribution housing and remove the cable lever.

NOTE: To remove the blend door pivot lever, disengage the retaining tab and pull the lever straight out of the air distribution housing.

7. Remove the blend door pivot lever (3) from the end of the blend door pivot shaft (4) and remove the pivot lever.

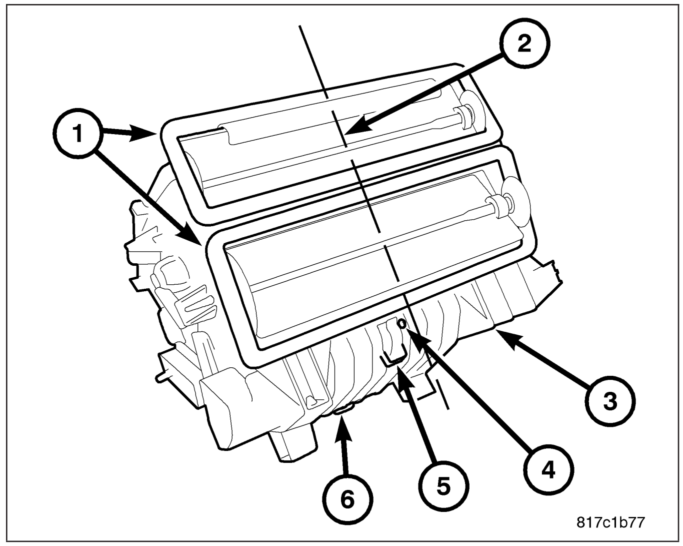


8. Remove the mode door cable (1) from the right side of the air distribution housing (2) (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CABLE-MODE DOOR - REMOVAL).
9. Remove the screw and washer (3) that secure the mode door cam (4) to the air distribution housing and remove the cam.



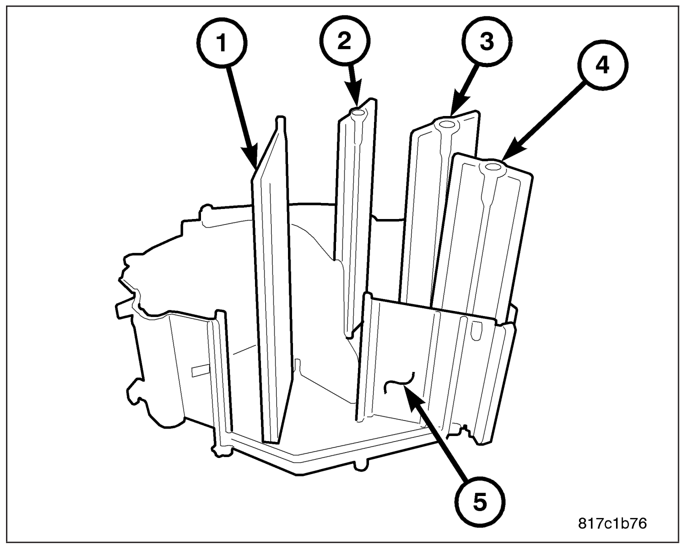
NOTE: If any foam seal on the air distribution housing outlets is deformed or damaged, the seal must be replaced.

10. Carefully cut the two foam seals (1) along the parting line (2) of the two halves of the air distribution housing (3). If either seal is deformed or damaged, it must be replaced.
11. Remove the five screws (4) and one metal clip (5) that secure the two halves of the air distribution housing together.
12. Disengage the three plastic retaining tabs (6) that secure the two halves of the air distribution housing together and carefully separate the housing.



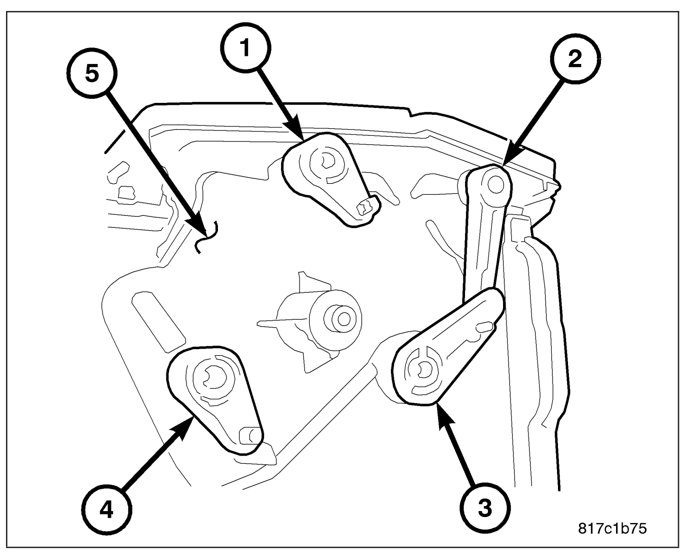
NOTE: If a seal on an air door is deformed or damaged, the air door must be replaced.

13. Disengage the air door(s) (1, 2, 3 and 4) from the mode door levers and remove the air doors from the air distribution housing (5).



NOTE: To remove the mode door levers, disengage the retaining tabs on the inside of the air distribution housing and pull the levers straight out of the housing.

14. Remove the four mode door levers (1, 2, 3 and 4) from the right side of the air distribution housing (5).

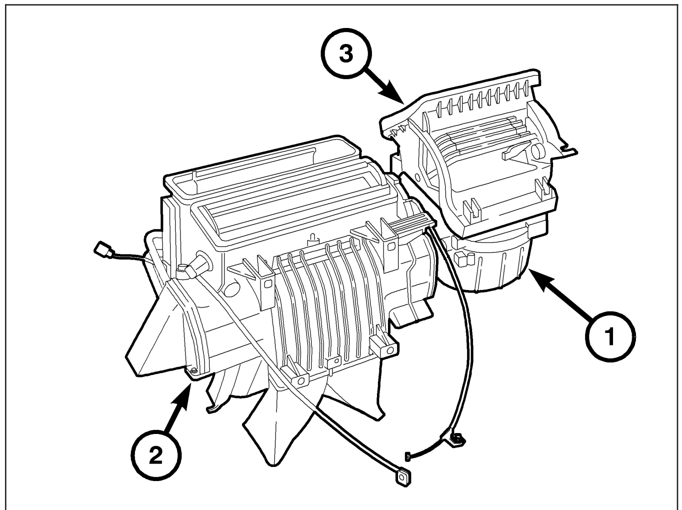


HOUSING-AIR INLET

NOTE: The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.

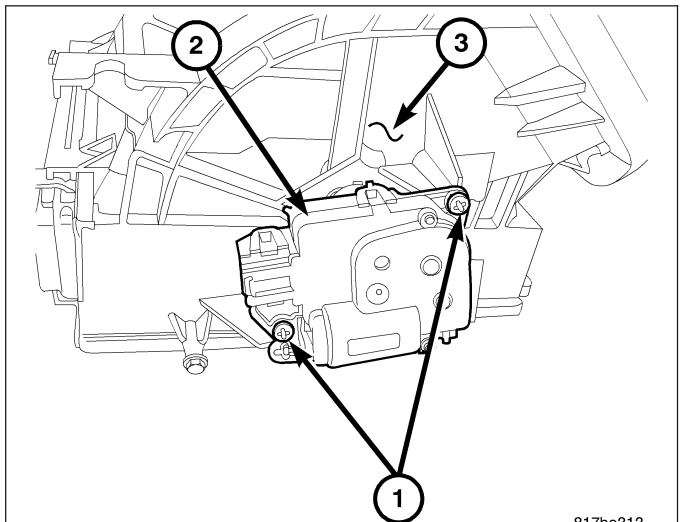
NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove the air inlet housing (3) from the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR INLET - REMOVAL).



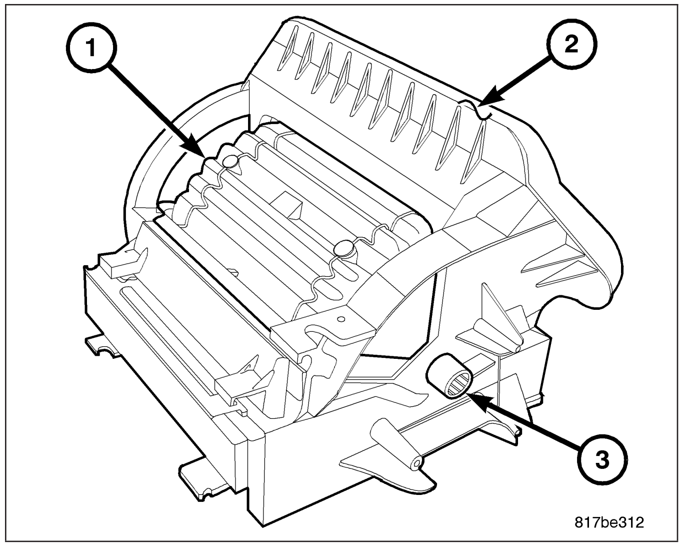
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3. Remove the two screws (1) that secure the recirculation door actuator (2) to the right side of the air inlet housing (3) and remove the actuator.



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4. To remove the recirculation door pivot shaft adapter from the right end of the recirculation-air door, first carefully push down on the tab of the door lever pivot shaft adapter located inside of the air inlet housing, then pull the pivot shaft adapter straight out of the end of the recirculation-air door pivot shaft.



NOTE: If the foam seal on the air inlet housing is deformed or damaged, the seal must be replaced.

NOTE: If a rubber seal on the recirculation air-door is deformed or damaged, the air-door must be replaced.

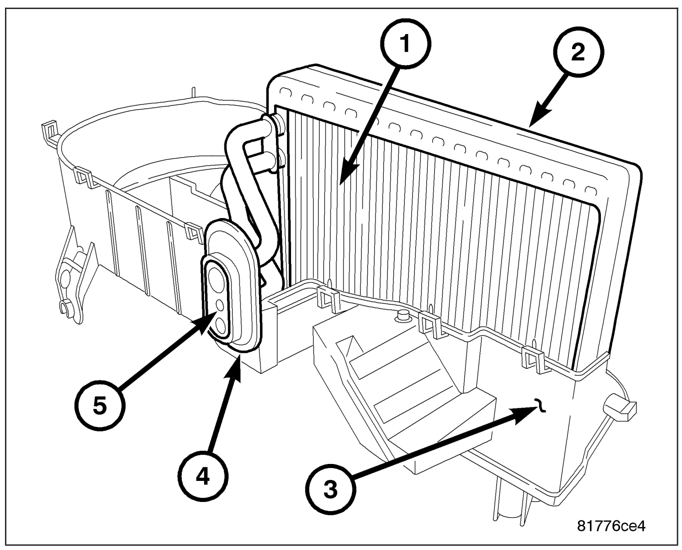
5. Carefully pinch the two ends of the recirculation air-door together and remove the air-door from the air inlet housing. If the seal on the recirculation air-door is deformed or damaged, the air-door must be replaced.

ASSEMBLY

HOUSING-HVAC

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

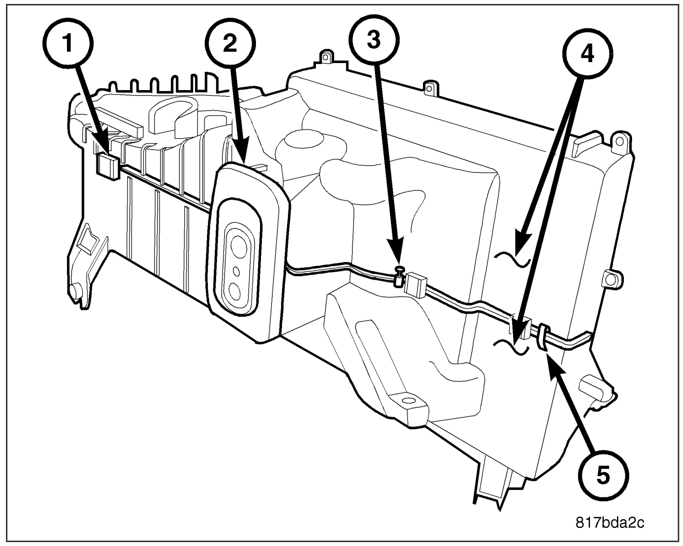
1. If removed, install the seal (4) onto the evaporator tube tapping block (5).



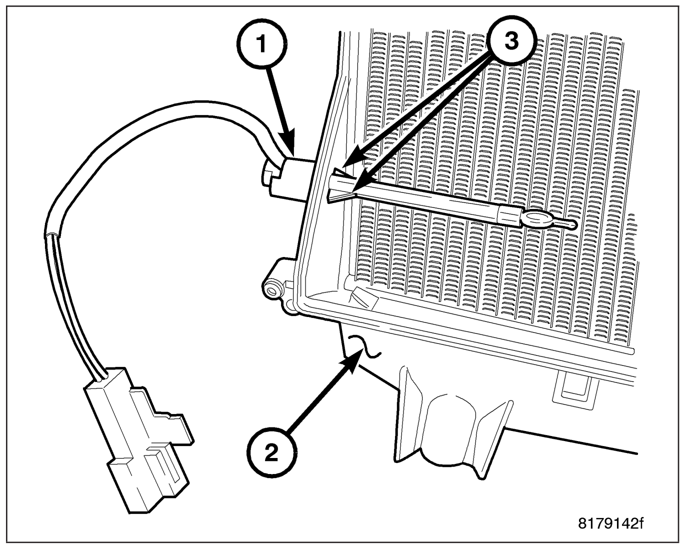
NOTE: Make sure that the foam insulator is properly positioned in the HVAC housing.

2. Carefully install the A/C evaporator (1) and foam insulator (2) into the lower half of the HVAC housing (3).

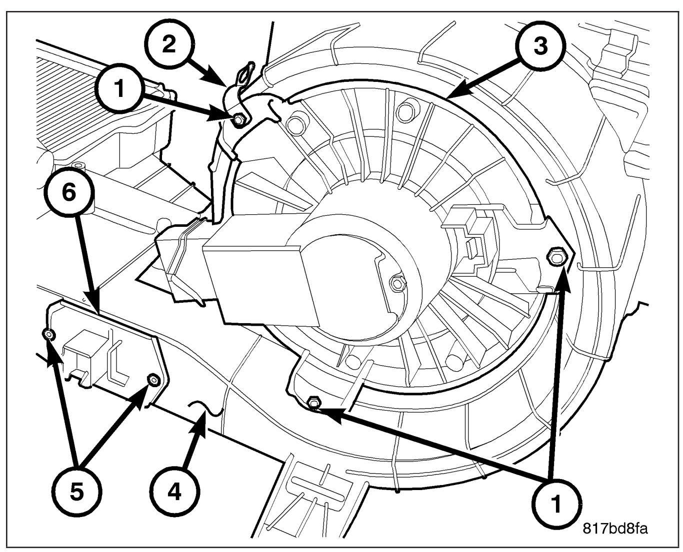
3. Install the two halves of the HVAC housing (4) together and engage the nine plastic retaining tabs (1). Make sure the retaining tabs are fully engaged.
4. Install the nine screws (3) and three metal clips (5) that secure the two halves of the HVAC housing together. Tighten the screws to 1.2 N·m (10 in lbs.). Make sure the metal clips are fully engaged to the housing halves.
5. Install the foam seal (2) onto the front of the two HVAC housing halves.



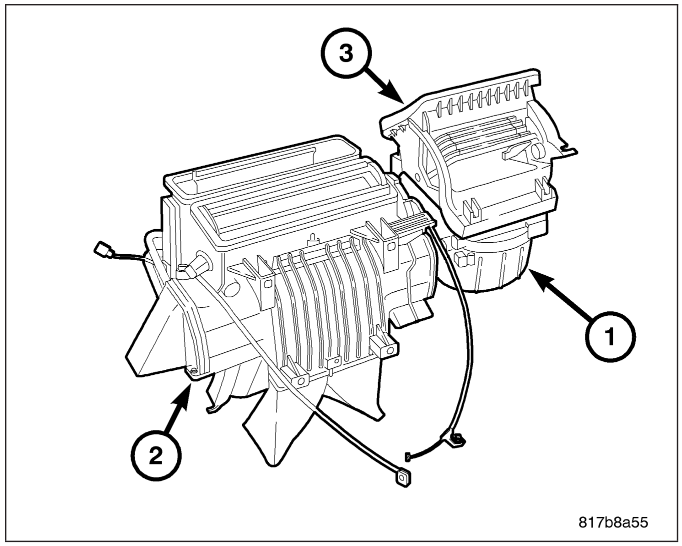
6. Install the evaporator temperature sensor (1) into the driver side of the HVAC housing (2). Make sure the retaining tabs (3) are fully engaged to the housing.



7. Position the blower motor (3) into the bottom of the HVAC housing (4).
8. Install the wire lead bracket (2) and the three screws (1) that secure the blower motor to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).
9. Position the blower motor resistor (6) into the HVAC housing.
10. Install the two screws (5) that secure the blower motor resistor to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).



11. Install the air inlet housing (3) onto the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING- AIR INLET - INSTALLATION).
12. Install the air distribution housing (2) onto the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - INSTALLATION).



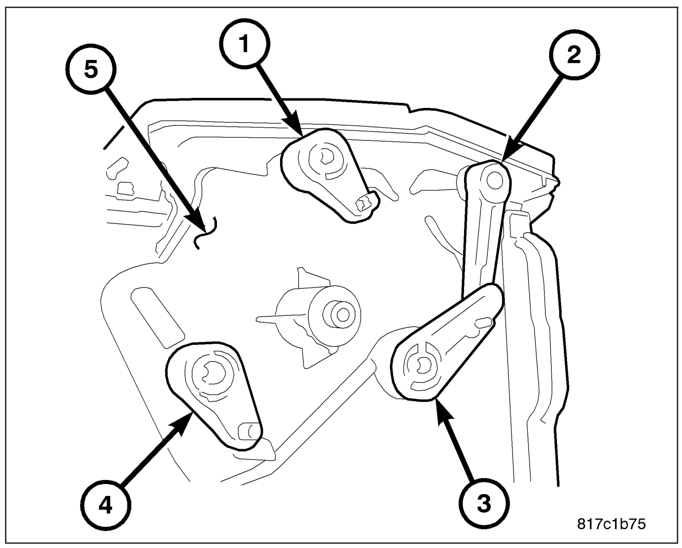
NOTE: If the heater core is being replaced, flush the cooling system (refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).

13. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).

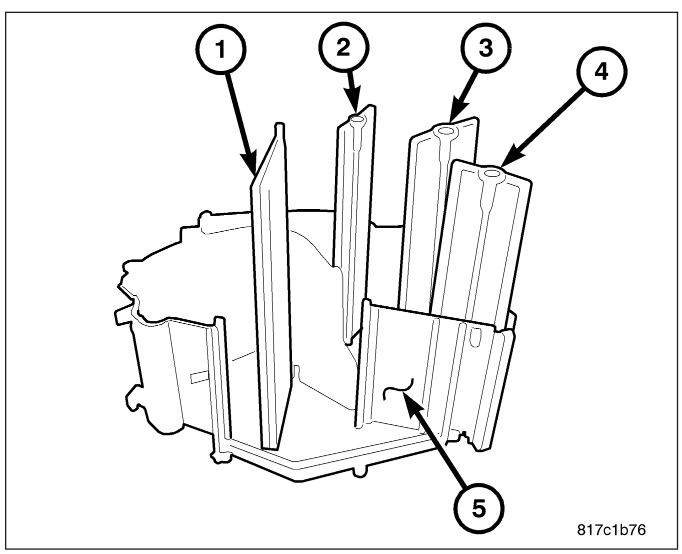
HOUSING-AIR DISTRIBUTION

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

1. Install the four mode door levers (1, 2, 3 and 4) onto the right side of the air distribution housing (5) Make sure the lever retaining tabs are fully engaged to the housing.



NOTE: Properly position the air doors within the air distribution housing by first aligning the four mode door levers to the scribe lines located on the right outer side of the air distribution housing. Then, install the air doors onto the mode door levers with the UP mark on each air door facing toward the top of the housing.

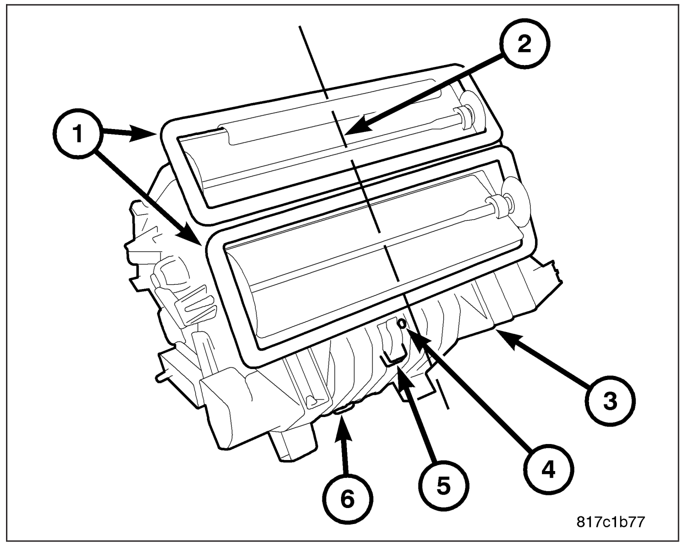


NOTE: If a seal on an air door is deformed or damaged, the air door must be replaced.

2. Align the four mode door levers to the scribe lines on the right outer side of the air distribution housing (5) and install the air door(s) (1, 2, 3 and 4)

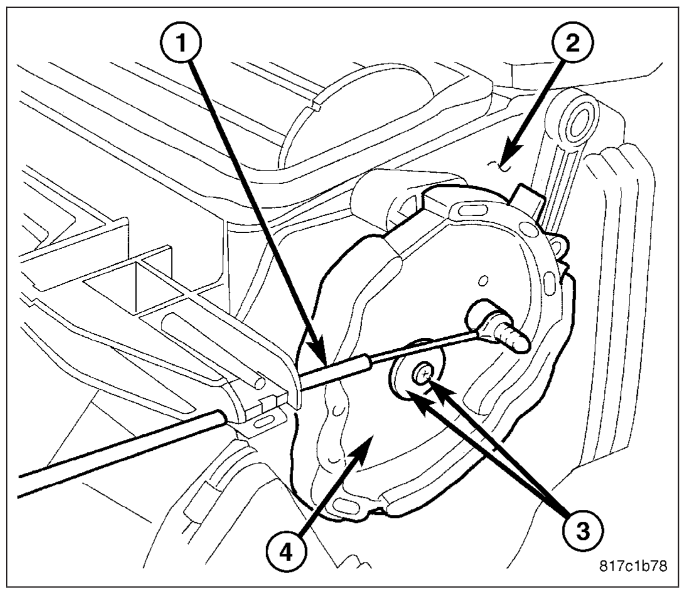
onto the mode door levers with the UP mark on each air door facing toward the top of the housing.

3. Align the air door(s) with the pivot shaft hole(s) in the air distribution housing (3) and install the two halves of the housing together. Make sure the three plastic retaining tabs (6) are fully engaged.
4. Install the five screws (4) and one metal clip (5) that secure the two halves of the air distribution housing together. Tighten the screws to 2.2 N·m (20 in lbs.). Make sure the metal clip is fully engaged to the housing halves.



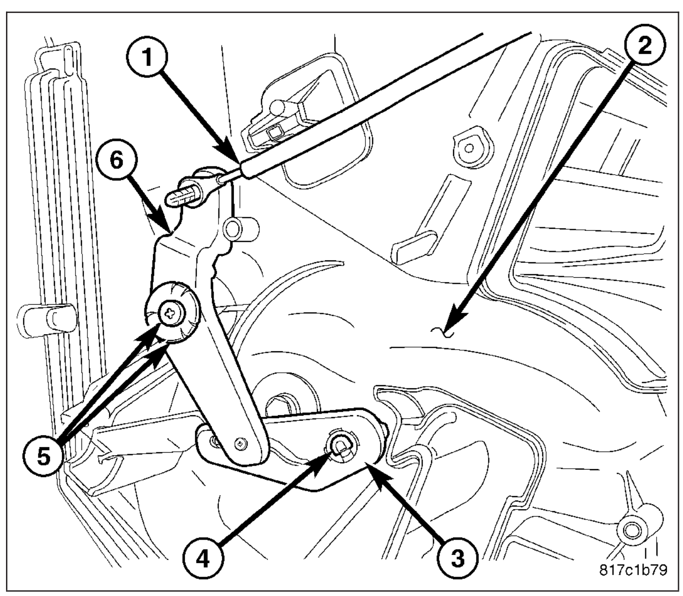
NOTE: If any foam seal on the air distribution housing outlets is deformed or damaged, the seal must be replaced.

5. Inspect the foam seals (1), especially at the parting line (2). If a foam seal is deformed or damaged, it must be replaced.



NOTE: Align the pins on the mode door levers with the grooves in the back of the mode door cam prior to installation of the cam.

6. Align the mode door levers on the right side of the air distribution housing (2) to the mode door cam (4) and install the cam onto the housing. Make sure the levers are correctly engaged to the cam.
7. Install the screw and washer (3) that secure the mode door cam to the air distribution housing. Tighten the screw to 0.6 N·m (5 in. lbs.).
8. Install the mode door cable (1) (refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CABLE-MODE DOOR - INSTALLATION).



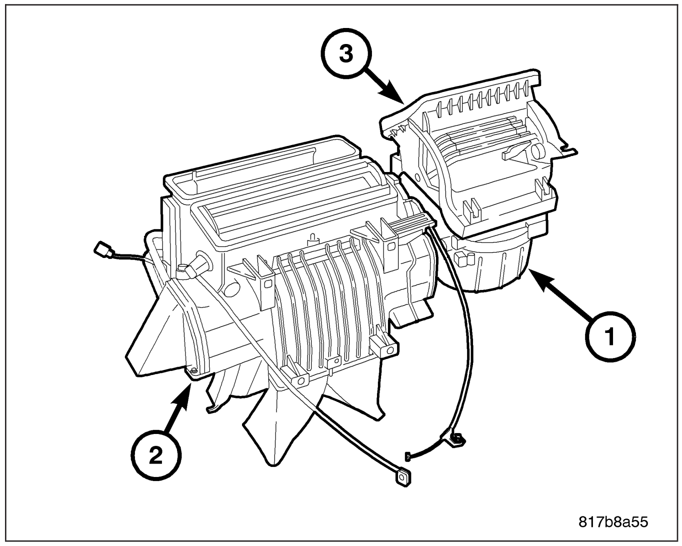
9. Install the blend door pivot lever (3) onto the end of the blend door pivot shaft (4) located on the left side of the air distribution housing (2). Make sure the lever retaining tab is fully engaged to the pivot shaft.

NOTE: Align the pin on the blend door lever with the groove in the pivot lever prior to installation of the blend door lever.

10. Install the blend door lever (6) onto the air distribution housing. Make sure the levers are correctly aligned to each other.
11. Install the screw and washer (5) that secure the blend door lever to the air distribution housing. Tighten the screw to 0.6 N·m (5 in. lbs.).
12. Install the temperature control cable (1) (refer to 24 - HEATING & AIR CONDITIONING/CON-

TROLS/CABLE-TEMPERATURE CONTROL - INSTALLATION).

13. If equipped with the 2.0L diesel engine, install the electric positive temperature coefficient (PTC) heater unit into the air distribution housing (refer to 24 - HEATING & AIR CONDITIONING/CABIN HEATER/HEATER UNIT - INSTALLATION).
14. Install the heater core into the air distribution housing (2) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/CORE HEATER - INSTALLATION).
15. Install the air distribution housing onto the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - INSTALLATION).
16. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).



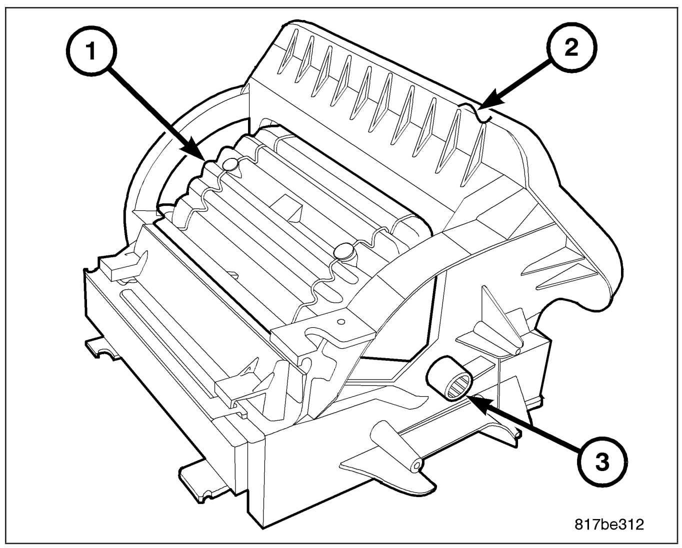
HOUSING-AIR INLET

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

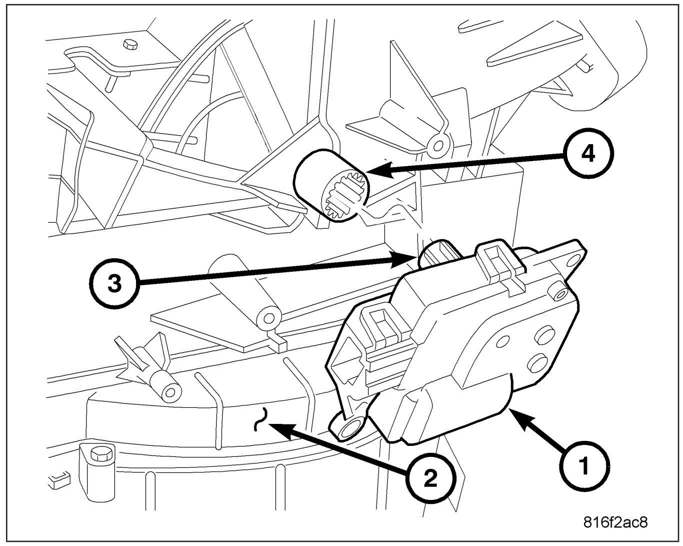
1. Carefully install the recirculation-air door (1) into the air inlet housing (2) by pinching the two ends of the air-door together and aligning the pivot shafts of the air-door to the pivot shaft holes in the air inlet housing.

NOTE: Install the recirculation door pivot shaft adapter by carefully pushing it straight into the end of the recirculation door pivot shaft.

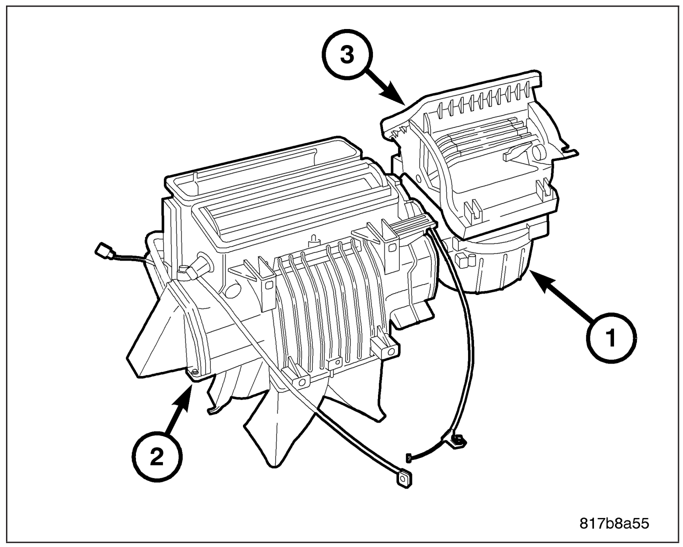
2. Install the recirculation door pivot shaft adapter (3) into the right side pivot shaft of the recirculation air-door. Make sure the adapter is fully engaged to the pivot shaft.



3. Install the recirculation door actuator (1) onto the right side of the air inlet housing (2). If necessary, rotate the actuator slightly to align the splines of the actuator output shaft (3) with those on the recirculation door pivot shaft adapter (4).



4. Install the air inlet housing (3) onto the HVAC housing (1) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR INLET - INSTALLATION).
5. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).

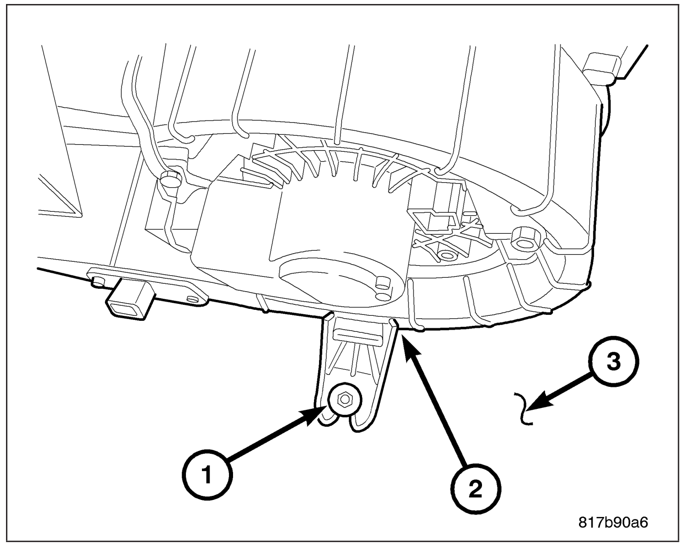


INSTALLATION

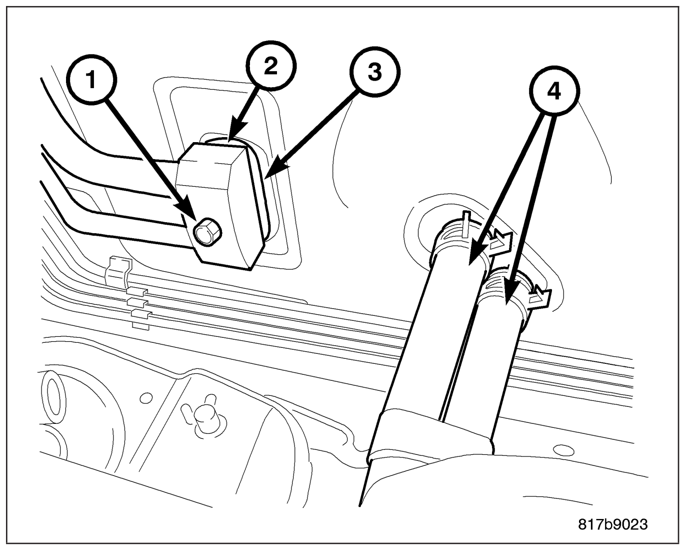
HOUSING-HVAC

NOTE: LHD model shown in illustrations. RHD model similar.

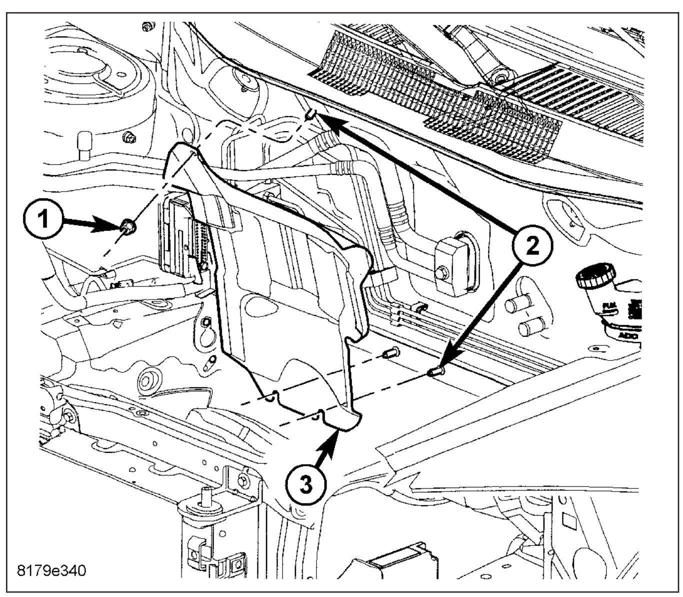
1. Position the HVAC housing assembly (2) to the dash panel (3). Be certain that the passenger side of the HVAC housing is correctly located over the dash panel mounting stud.
2. Install the nut (1) that secures the HVAC housing to the passenger compartment side of dash panel. Tighten the nut to 4.5 N·m (40 in. lbs.).
3. Install the condensation drain tube (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ TUBE-CONDENSATION DRAIN - INSTALLATION).
4. Install the rear floor ducts (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR DISTRIBUTION - INSTALLATION).
5. Install the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/ASSEMBLY-INSTRUMENT PANEL - INSTALLATION).



6. Remove the previously installed plugs or caps and connect the heater hoses (4) to the heater core tubes.
7. Remove the tape or plugs from the refrigerant line fittings and the evaporator ports.
8. Lubricate the rubber O-rings on new dual-plan seals with clean refrigerant oil and install the seals onto the liquid and suction line fittings. Use only the specified seals as they are made of special materials compatible to the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
9. Connect the A/C liquid and suction line assembly (2) to the A/C evaporator (3).
10. Install the bolt (1) that secures the A/C liquid and suction line assembly to the A/C evaporator. Tighten the bolt to 12 N·m (105 in. lbs.).



11. Position the heat shield (3) onto the studs (2) located on the dash panel in the engine compartment.
12. Install the three nuts (1) that secure the heat shield to the dash panel. Tighten the nuts to 1 N·m (10 in. lbs.).
13. Reconnect the negative battery cable.
14. If the heater core is being replaced, flush the cooling system (refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).
15. Refill the engine cooling system (refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE - COOLING SYSTEM FILL).
16. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
17. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

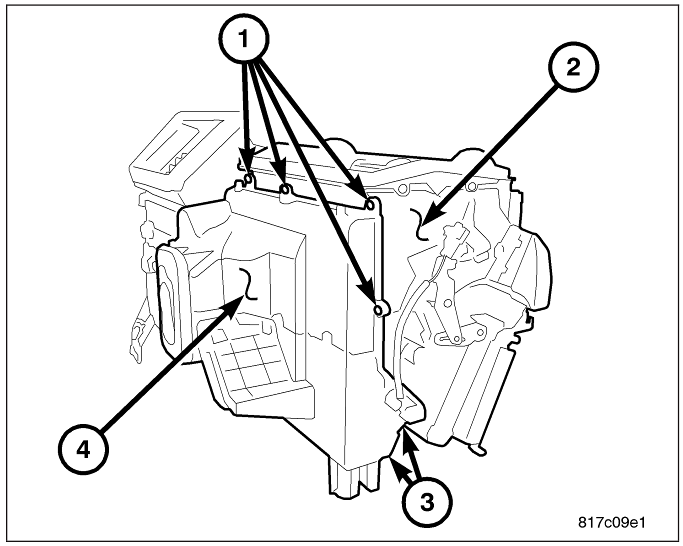


HOUSING-AIR DISTRIBUTION

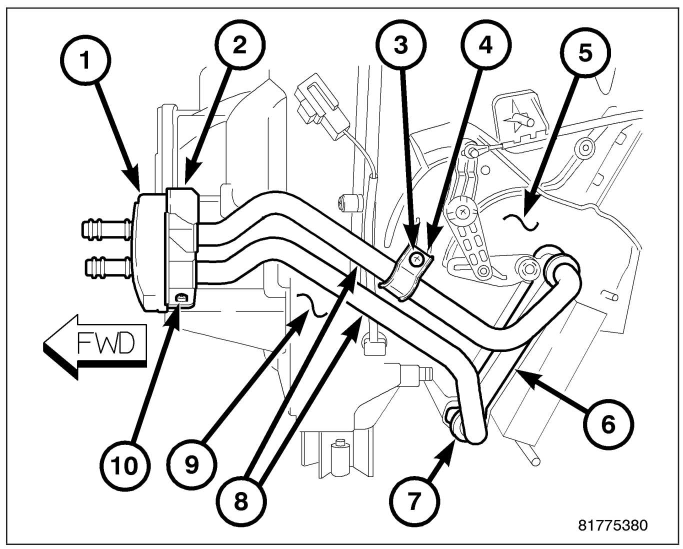
NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

NOTE: Illustration shown with heater core and tubes removed from view for clarity.

1. Position the air distribution housing (2) onto the rear of the HVAC housing (4).
2. Install the two metal retaining clips (3) that secure the bottom of the air distribution housing to the HVAC housing.
3. Install the seven screws (1) that secure the air distribution housing to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).



4. Carefully install the heater core (6) into the left side of the air distribution housing (5).
5. On RHD models, install the air distribution housing onto the HVAC housing (9) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - INSTALLATION).
6. Install the retaining bracket (4) and screw (3) that secure the heater core tubes (8). Tighten the screw to 1.2 N·m (10 in. lbs.)
7. Install the flange (2) that secures the heater core tubes to the front of the HVAC housing.
8. Install the screw (10) that secures the flange to the HVAC housing. Tighten the screw to 1.2 N·m (10 in. lbs.).



NOTE: If the foam seal for the flange is deformed or damaged, it must be replaced.

9. Install the foam seal (1) onto the flange.
10. Install all of the floor distribution ducts onto the air distribution housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR DISTRIBUTION - INSTALLATION).

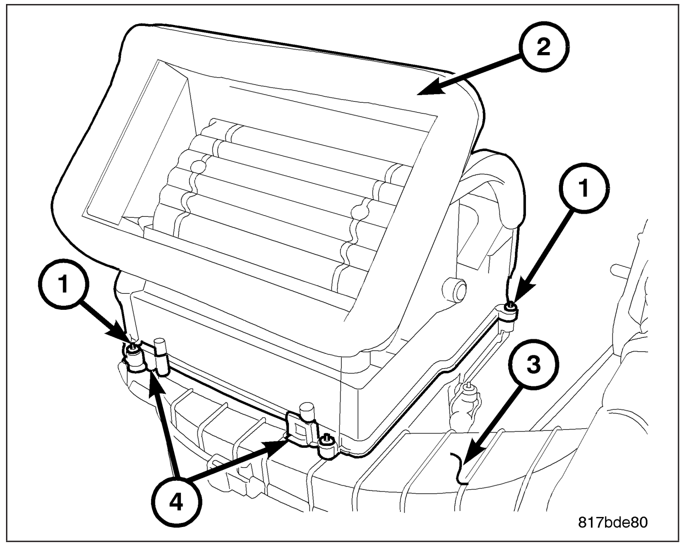
NOTE: If the heater core is being replaced, flush the cooling system (refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).

11. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).

HOUSING-AIR INLET

NOTE: LHD model with A/C shown. RHD and heater-only models similar.

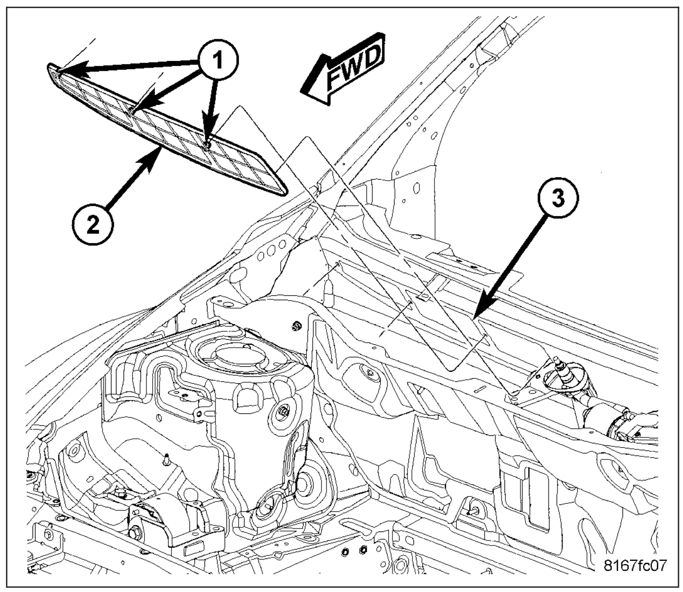
1. Install the air inlet housing (2) onto the top of the HVAC housing (3) and engage the two plastic retaining tabs (4). Make sure the retaining tabs are fully engaged.
2. Install the four screws (1) that secure the air inlet housing to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).
3. If equipped, install the particulate air filter (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FILTER-PARTICULATE AIR - INSTALLATION).
4. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).



SCREEN-AIR INLET

NOTE: LHD model shown. RHD model similar.

1. Position the HVAC housing air inlet screen (2) to the cowl panel (3) and fully engage the three push-in retainers (1) that secure the screen to the panel.
2. Install the cowl grille screen (refer to 23 - BODY/EXTERIOR/SCREEN-COWL GRILLE - INSTALLATION).

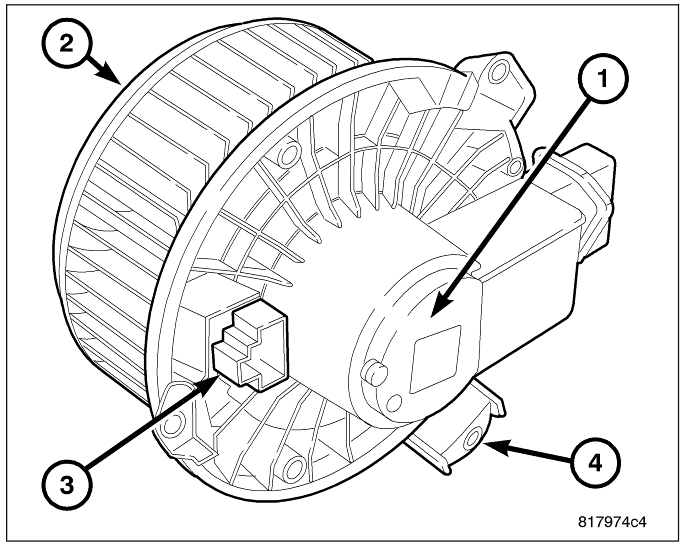


MOTOR-BLOWER

DESCRIPTION

The blower motor (1) is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel (2) within the HVAC air inlet housing at the selected speed.

The blower motor is a 12-volt, direct current (DC) motor mounted within a plastic housing with an integral wire harness connector (3) and three mounting tabs (4). The squirrel cage-type blower wheel is secured to the blower motor shaft and is positioned within the air inlet housing on the passenger side of the HVAC housing.



OPERATION

The blower motor is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel within the HVAC air inlet housing at the selected speed.

The blower motor will operate whenever the ignition switch is in the Run position and the blower motor control is in any position except Off. The blower motor receives battery current through the totally integrated power module (TIPM) whenever the ignition switch is in the Run position.

Blower motor speed is controlled by regulating the ground path through or around the blower motor resistor and through the blower motor control located within the A/C-heater control.

The blower motor can be accessed for service from underneath the instrument panel.

NOTE: The blower motor is supplied with a 12V feed from the TIPM, through the blower motor resistor, whenever the ignition switch is in the RUN position. Due to an open circuit condition within the blower motor control switch the TIPM is UNABLE to detect an OPEN circuit for the blower motor.

The blower motor control system is diagnosed using a scan tool (refer to 24 - HVAC Electrical Diagnostics for more information).

The blower motor and blower wheel are factory balanced and cannot be adjusted or repaired. If faulty or damaged, the blower motor and wheel must be replaced as an assembly.

DIAGNOSIS AND TESTING

BLOWER MOTOR

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: The blower motor is supplied with a 12V feed from the TIPM, through the blower motor resistor, whenever the ignition switch is in the RUN position. Due to an open circuit condition within the blower motor control switch the TIPM is UNABLE to detect an OPEN circuit for the blower motor.

To determine if an open condition exists within the blower motor circuit wiring, it is necessary to disconnect the negative battery cable and check for continuity within the blower motor circuits using an ohmmeter. For circuit descriptions and diagrams, refer to Air Conditioning/Heater in Group 8W - Wiring Diagrams.

OPERATION

Possible causes of the blower motor not operating include:

- Faulty blower motor
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor control

Possible causes of the blower motor not operating in one or more speeds include:

- Faulty blower motor resistor
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor control

VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Deformed blower wheel
- Out of balance blower wheel due to foreign material in the wheel
- Faulty blower motor

NOISE

To determine if the blower motor is the source of the noise, simply switch the blower motor from Off to On. To verify that the blower motor is the source of the noise, unplug the blower motor wire harness connector and operate the heating-A/C system. If the noise goes away, possible causes include:

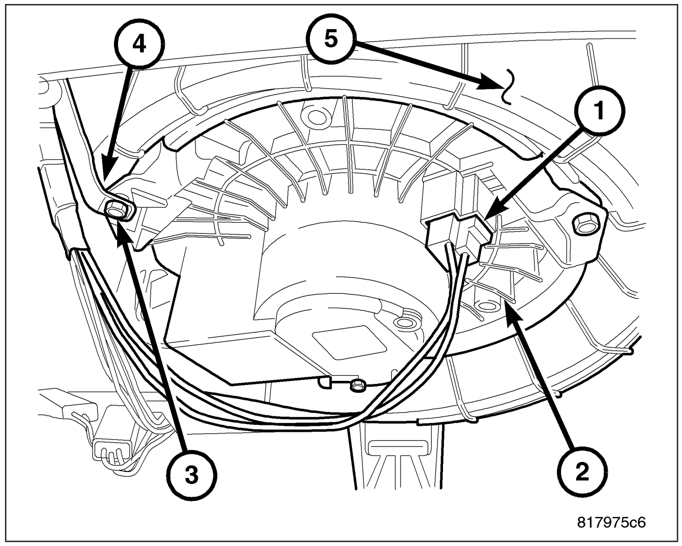
- Foreign material in the HVAC air inlet housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Faulty blower motor

REMOVAL

NOTE: The blower motor is located on the bottom of the passenger side of the HVAC housing. The blower motor can be removed from the vehicle without having to remove the HVAC housing.

NOTE: LHD model shown. RHD model similar.

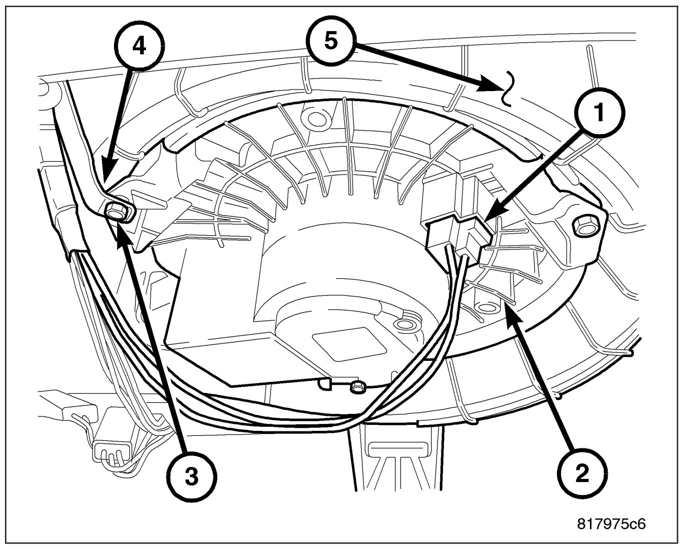
1. Disconnect and isolate the negative battery cable.
2. If equipped, remove the silencer from below the passenger side of the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/SILENCER-INSTRUMENT PANEL - REMOVAL).
3. From underneath the instrument panel, disengage the connector lock and disconnect the instrument panel wire harness connector (1) from the blower motor (2).
4. Remove the three screws (3) that secure the blower motor and the wire lead bracket (4) (if equipped) to the bottom of the HVAC housing (5) and remove the blower motor.



INSTALLATION

NOTE: LHD model shown. RHD model similar.

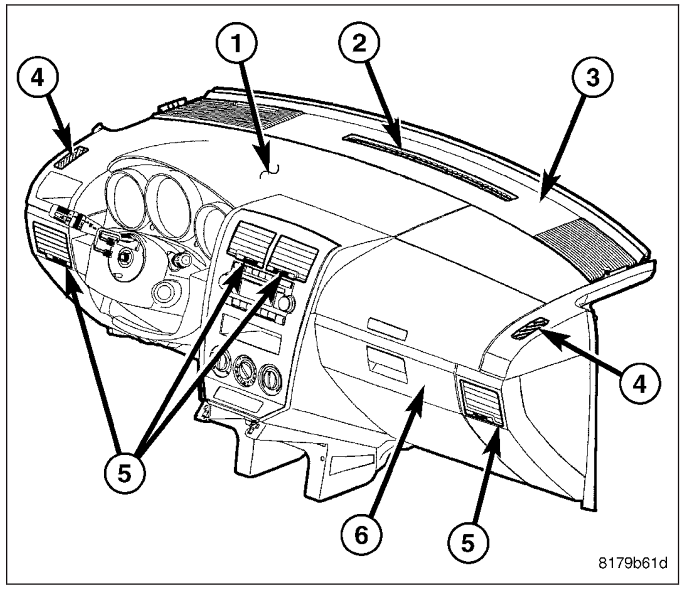
1. Position the blower motor (2) into the bottom of the HVAC housing (5).
2. Install the three screws (3) that secure the blower motor and the wire lead bracket (4) (if equipped) to the HVAC housing. Tighten the screws to 1.2 N·m (10 in. lbs.).
3. Connect the instrument panel wire harness connector (1) to the blower motor and engage the connector lock.
4. If equipped, install the silencer below the passenger side of the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/SILENCER-INSTRUMENT PANEL - INSTALLATION).
5. Reconnect the negative battery cable.



OUTLETS-AIR

DESCRIPTION

NOTE: LHD model shown. RHD model similar.



There is one defroster air outlet (2) located on the top of the instrument panel (1). The airflow from the defroster outlet is directed by fixed vanes in the outlet and cannot be adjusted. The defroster air outlet is not serviceable from the instrument panel defroster grille (3) (refer to 23 - BODY/INSTRUMENT PANEL/ GRILLE-DEFROSTER - REMOVAL).

There are two side window demister air outlets (4). One located on each end of the instrument panel top cover. The airflow from the side window demister air outlets is directed by fixed vanes in the outlets and cannot be adjusted. The side window demister air outlets are not serviceable from the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/ COVER-INSTRUMENT PANEL TOP - REMOVAL).

There are four rectangular instrument panel air outlets (5). One air outlet is located near each outboard end of the instrument panel facing the rear of the vehicle and two air outlets are located at the top of the instrument panel center bezel. Each of the instrument panel air outlets contain movable vanes that can direct or shut off the flow of the conditioned air leaving each of the instrument panel outlets. The driver and passenger side air instrument panel air outlets can be serviced separately. The center outlets are only serviced with the center bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CENTER - REMOVAL).

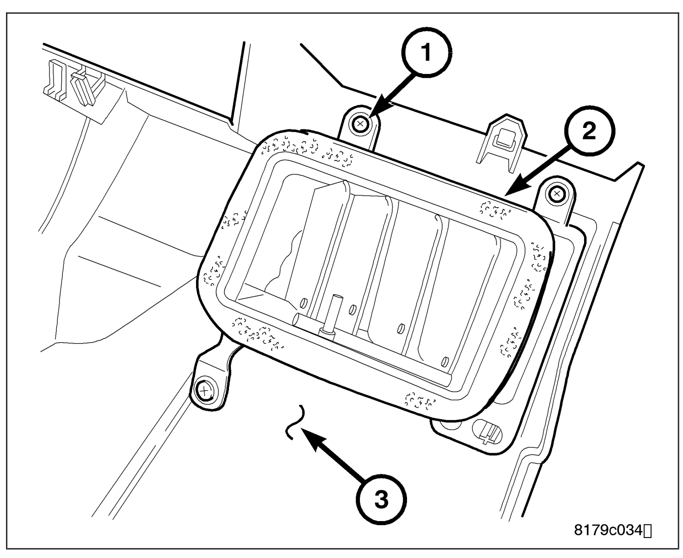
A cooled beverage storage bin, located in the top of the glove box (6) is standard on vehicles equipped with A/C. Vehicles so equipped have an outlet which, when opened with the A/C on, allows cooled air to flow into the bin.

REMOVAL

INSTRUMENT PANEL

NOTE: Driver side air outlet shown. Passenger side outlet similar.

NOTE: LHD model shown. RHD model similar.



1. Depending on the air outlet being serviced, remove the instrument cluster bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CLUSTER - REMOVAL) or the passenger side IP bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-IP PASSENGER SIDE - REMOVAL).

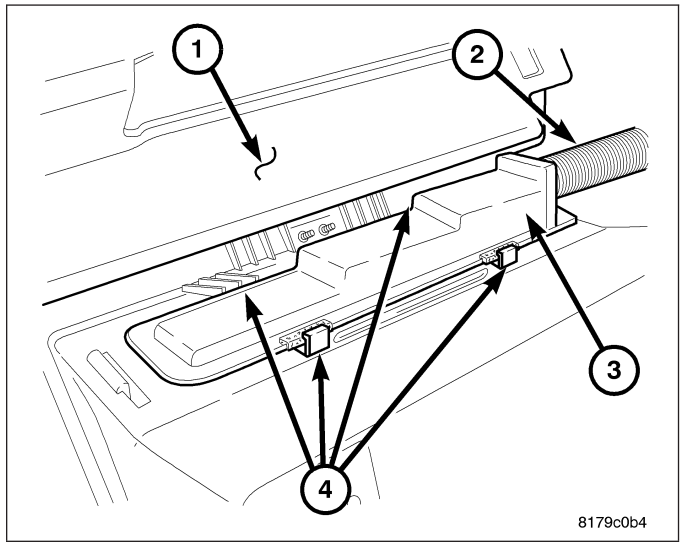
NOTE: If the foam seal on the air outlet is deformed or damaged, it must be replaced.

2. Remove the four screws (1) that secure the air outlet (2) to the bezel (3) and remove the outlet.

BEVERAGE COOLER

NOTE: LHD model shown. RHD model similar.

1. Remove the instrument panel top cover (1) (refer to 23 - BODY/INSTRUMENT PANEL/COVER-INSTRUMENT PANEL TOP - REMOVAL).
2. Disconnect the hose (2) from the beverage cooler outlet (3).
3. To disengage the four retaining tabs (4), slide the beverage cooler outlet toward the center of the cover and remove the outlet.



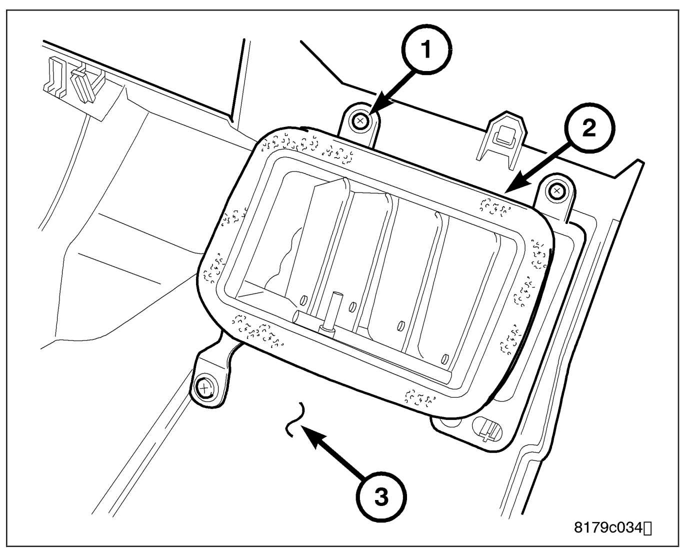
INSTALLATION

INSTRUMENT PANEL

NOTE: Driver side air outlet shown. Passenger side outlet similar.

NOTE: LHD model shown. RHD model similar.

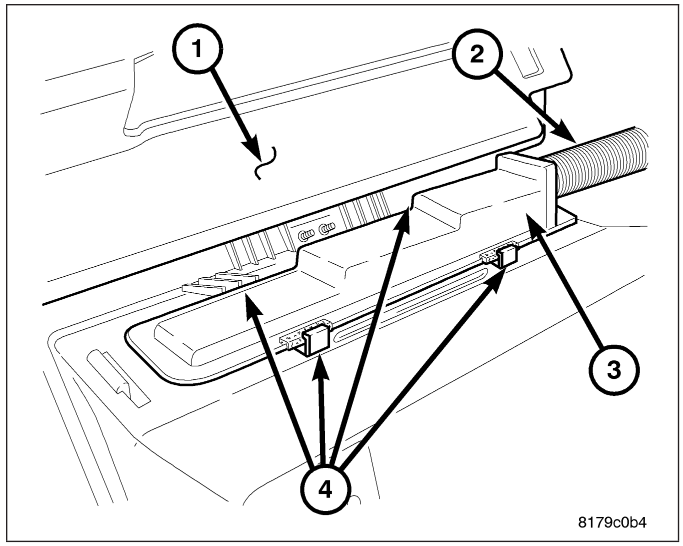
1. Position the air outlet (2) onto the bezel (3).
2. Install the four screws (1) that secure the air outlet to the bezel. Tighten the screws to 2 N·m (17 in. lbs.).
3. Depending on the outlet being serviced, install the instrument cluster bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-CLUSTER - INSTALLATION) or the passenger side IP bezel (refer to 23 - BODY/INSTRUMENT PANEL/BEZEL-IP PASSENGER SIDE - INSTALLATION).



BEVERAGE COOLER

NOTE: LHD model shown. RHD model similar.

1. Position the beverage cooler outlet (3) to the top of the storage bin and engage the four retaining tabs (4) by sliding the outlet toward the center of the instrument panel top cover (1). Make sure the tabs are fully engaged.
2. Connect the hose (2) to the beverage cooler outlet.
3. Install the instrument panel top cover (refer to 23 - BODY/INSTRUMENT PANEL/COVER-INSTRUMENT PANEL TOP - INSTALLATION).



PLUMBING

TABLE OF CONTENTS

PLUMBING

DESCRIPTION

The A/C refrigerant lines and hoses are used to carry the refrigerant between the various A/C system components. The refrigerant lines and hoses for the R-134a system on this vehicle consist of a barrier-hose design with a nylon tube sandwiched between rubber layers. The nylon tube helps to contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant lines are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant lines and hoses will reduce the capacity of the entire A/C system and can reduce the flow of refrigerant in the system. The radius of all bends in the flexible hose refrigerant lines should be at least ten times the diameter of the hose and the refrigerant lines should be routed so they are at least 80 millimeters (3 inches) away from the exhaust manifold(s) and exhaust pipe(s).

OPERATION

High pressures are produced in the refrigerant system when the A/C compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

Depending on vehicle, model and market application, refrigerant lines are connected to each other or other A/C system components with block-type or quick-connect type fittings. To ensure the integrity of the refrigerant system, flat gaskets and O-rings are used to seal the refrigerant system connections.

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

WARNING

WARNING: The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Severe personal injury or death may result from improper service procedures.

WARNING: Avoid breathing the refrigerant and refrigerant oil vapor or mist. Exposure may irritate the eyes, nose, and/or throat. Wear eye protection when servicing the A/C refrigerant system. Serious eye injury can result from direct contact with the refrigerant. If eye contact occurs, seek medical attention immediately.

WARNING: Do not expose the refrigerant to open flame. Poisonous gas is created when refrigerant is burned. An electronic leak detector is recommended. Severe personal injury or death may result from improper service procedures.

WARNING: If accidental system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and death.

WARNING: The evaporation rate of R-134a refrigerant at average temperature and altitude is extremely high. As a result, anything that comes in contact with the refrigerant will freeze. Always protect the skin or delicate objects from direct contact with the refrigerant.

WARNING: The R-134a service equipment or the vehicle refrigerant system should not be pressure tested or leak tested with compressed air. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures. These mixtures are potentially dangerous, and may result in fire or explosion causing property damage, personal injury or death.

WARNING: The engine cooling system is designed to develop internal pressures up to 145 kilopascals (21 pounds per square inch). Do not remove or loosen the coolant pressure cap, cylinder block drain plugs, radiator drain, radiator hoses, heater hoses, or hose clamps while the engine cooling system is hot and under pressure. Allow the vehicle to cool for a minimum of 15 minutes before opening the cooling system for service. Failure to observe this warning can result in serious burns from the heated engine coolant.

CAUTION

CAUTION: Never add R-12 to a refrigerant system designed to use R-134a. Do not use R-12 equipment or parts on an R-134a A/C system. These refrigerants are not compatible and damage to the A/C system will result.

CAUTION: Never use R-12 refrigerant oil in an A/C system designed to use R-134a refrigerant oil. These refrigerant oils are not compatible and damage to the A/C system will result.

CAUTION: The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/recharging equipment and/or A/C system. Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. DaimlerChrysler recommends the detection of A/C system leaks through the use of approved leak detectors and fluorescent leak detection dyes. Vehicles found with A/C system sealers should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners voids the warranty for the A/C system.

CAUTION: Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

CAUTION: The internal parts of the A/C system will remain stable as long as moisture-free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability. This may cause operational troubles or even serious damage if present in more than very small quantities. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system. Keep service tools and the work area clean. Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug. This will prevent contamination from entering the A/C system.

CAUTION: Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

CAUTION: Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause compressor noise and A/C system failure.

DIAGNOSIS AND TESTING

REFRIGERANT SYSTEM LEAKS

WARNING: R-134a service equipment or vehicle A/C system should not be pressure tested or leak tested with compressed air. Mixture of air and R-134a can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing property damage, personal injury or death.
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved service equipment meeting SAE requirements to discharge an R-134a system. If accidental system discharge occurs, ventilate work area before resuming service.

NOTE: If the A/C refrigerant system charge is empty or low, a leak in the A/C system is likely. Visually inspect all A/C lines, fittings and components for an oily residue. Oil residue can be an indicator of an A/C system leak location.

NOTE: The only way to correctly determine if the refrigerant system is fully charged with R-134a is to completely evacuate and recharge the A/C system.

Connect a suitable manifold gauge set and determine if the static A/C system pressure is above or below 345 kPa (50 psi) (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT). If less than 345 kPa (50 psi), proceed to SYSTEM EMPTY . If greater than 345 kPa (50 psi), go to SYSTEM LOW .

SYSTEM EMPTY

1. Evacuate the refrigerant system to the lowest degree of vacuum possible (approximately -88 kPa (- 26 in. Hg) or greater vacuum) (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE). Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed to Step 2.
2. Prepare and dispense 0.284 kilograms (10 ounces) of R-134a refrigerant into the evacuated refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE) and proceed to Step 1 of the System Low procedure.

SYSTEM LOW

1. Position the vehicle in a wind-free work area. This will aid in detecting small leaks.
2. Operate the heating-A/C system with the engine at idle under the following conditions for at least 5 minutes.
   - Doors or windows open
   - Transaxle in Park or Neutral with the parking brake set (depending on application)
   - A/C-heater controls set to outside air, full cool, panel mode, high blower and with A/C compressor engaged

CAUTION: A leak detector only designed for R-12 refrigerant will not detect leaks in an R-134a refrigerant system.

3. Shut the vehicle Off and wait 2-7 minutes. Then use an electronic leak detector that is designed to detect R-134a refrigerant and search for leaks. Fittings, lines or components that appear to be oily usually indicate a refrigerant leak. To inspect the A/C evaporator for leaks, insert the leak detector probe into the drain tube opening or an air outlet. A dye for R-134a is available to aid in leak detection. Use only DaimlerChrysler approved refrigerant dye.

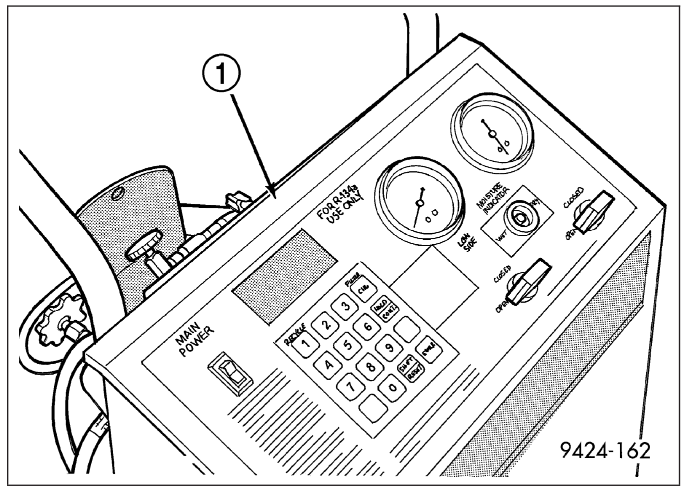
STANDARD PROCEDURE

REFRIGERANT SYSTEM SERVICE EQUIPMENT

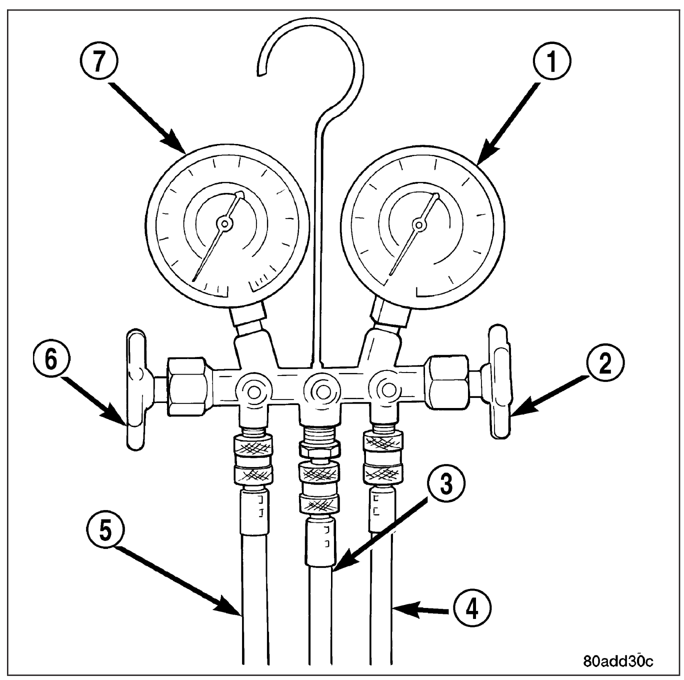
WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

WARNING: Eye protection must be worn when servicing an air conditioning refrigerant system. Turn off (rotate clockwise) all valves on the equipment being used, before connecting to or disconnecting from the refrigerant system. Failure to observe these warnings may result in personal injury or death.

When servicing the A/C system, an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 must be used (1). Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.



A manifold gauge set (1) may be needed with some recovery/recycling/charging equipment. The manifold gauge set should have manual shut-off valves (2 and 6), or automatic back-flow valves located at the service port connector end of the manifold gauge set hoses (4 and 5). This will prevent refrigerant from being released into the atmosphere.



MANIFOLD GAUGE SET CONNECTIONS

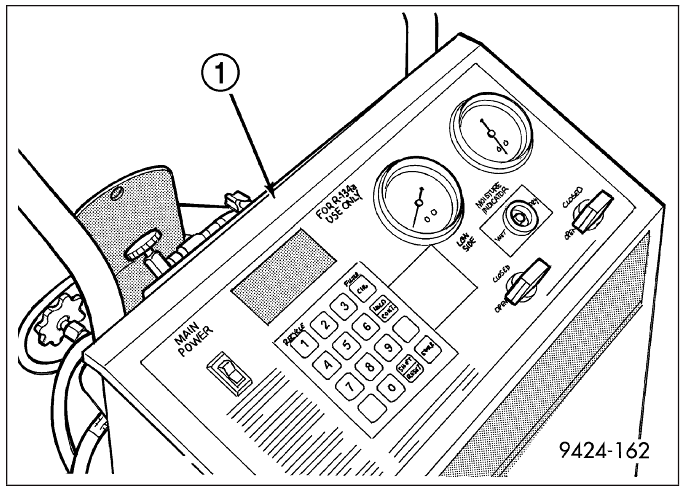
CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

- **LOW PRESSURE GAUGE HOSE** - The low pressure hose (Blue with Black stripe) attaches to the low side service port. This port is located on the A/C liquid line near the right front strut tower.
- **HIGH PRESSURE GAUGE HOSE** - The high pressure hose (Red with Black stripe) attaches to the high side service port. This port is located on the A/C discharge line near the A/C condenser.
- **RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE** - The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

REFRIGERANT SYSTEM RECOVERY

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

An R-134a refrigerant recovery/recycling/charging station (1) that meets SAE standard J2210 must be used to recover the refrigerant from the R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.



REFRIGERANT SYSTEM EVACUATE

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

NOTE: Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the A/C compressor.

If an A/C compressor designed to use R-134a refrigerant is left open to the atmosphere for an extended period of time. It is recommended that the refrigerant oil be drained and replaced with new oil or a new A/C compressor be used. This will eliminate the possibility of contaminating the refrigerant system.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum. To evacuate the refrigerant system:

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Recover the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. With the engine OFF, connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT). Do not operate the engine with a vacuum on the A/C system.

3. Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads to the lowest degree of vacuum possible (approximately -88 kPa (- 26 in. Hg) or greater) for 30 minutes, close all valves and turn off vacuum pump. If the system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.
4. Close all valves. Turn off and disconnect the vacuum pump.
5. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

REFRIGERANT SYSTEM CHARGE

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: Always refer to the Underhood HVAC Specification Label for the refrigerant fill specification of the vehicle being serviced.

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected into the system. For the proper amount of the refrigerant charge, refer to the Underhood HVAC Specification Label.

An R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

CHARGING PROCEDURE

CAUTION: A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. Refer the equipment manufacturer instructions for more information.

1. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
2. A manifold gauge set and an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 should be connected to the refrigerant system.
3. Measure the proper amount of refrigerant and heat it to 52° C (125° F) with the charging station. See the operating instructions supplied by the equipment manufacturer for proper use of this equipment.
4. Open both the suction and discharge valves, then open the charge valve to allow the heated refrigerant to flow into the system.
5. When the transfer of refrigerant has stopped, close both the suction and discharge valves.
6. If all of the refrigerant charge did not transfer from the dispensing device, open all of the windows in the vehicle and set the heating-A/C system controls so that the A/C compressor is operating and the blower motor is running at its lowest speed setting. Run the engine at a steady high idle (about 1400 rpm).
7. Open the low-side valve to allow the remaining refrigerant to transfer to the refrigerant system.

WARNING: Take care not to open the discharge (high pressure) valve at this time. Failure to follow this warning could result in possible personal injury or death.

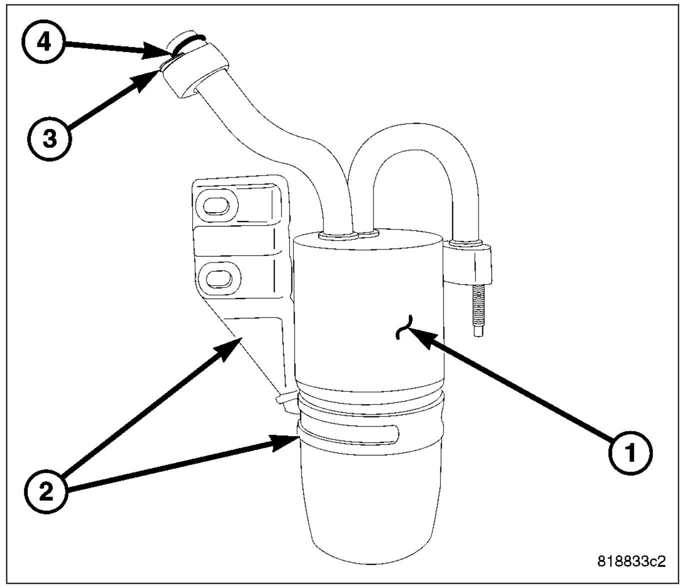
8. Disconnect the charging station and manifold gauge set from the refrigerant system service ports.
9. Reinstall the caps onto the refrigerant system service ports.

ACCUMULATOR-A/C

DESCRIPTION

The A/C accumulator (1) is mounted below the engine compartment behind the right side of the front fascia. A band and mounting bracket (2) secures the A/C accumulator to the right front frame rail.

The A/C accumulator has no serviceable parts except for the metal gaskets (3) and rubber O-rings (4). The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals and gaskets must be replaced whenever the A/C accumulator is removed and installed.

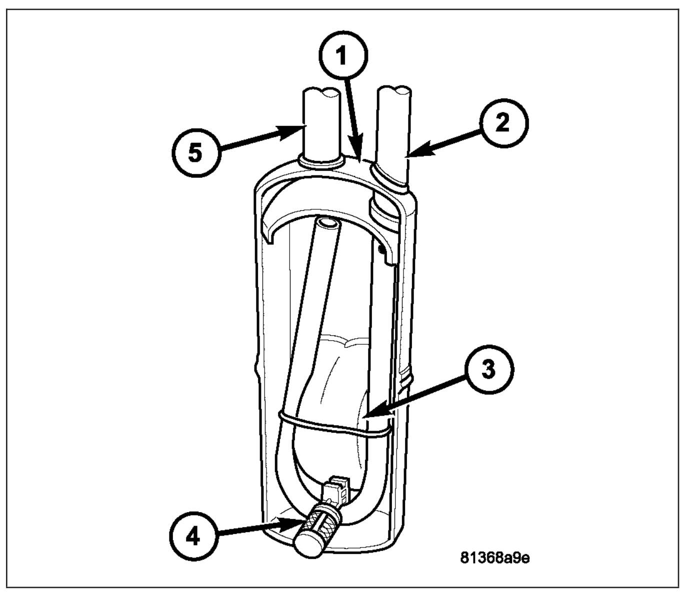


OPERATION

NOTE: Typical A/C accumulator shown.

Refrigerant enters the A/C accumulator (1) mostly as a low pressure vapor through the inlet tube (2). Any liquid, oil-laden refrigerant falls to the bottom of the canister, which acts as a separator. A desiccant bag (3) is mounted inside the accumulator canister to absorb any moisture which may have entered and become trapped within the refrigerant system. A filter (4) is also mounted inside the canister to trap any foreign material that may have entered the refrigerant system during assembly. The low pressure vapor exits the A/C accumulator through the outlet tube (5).

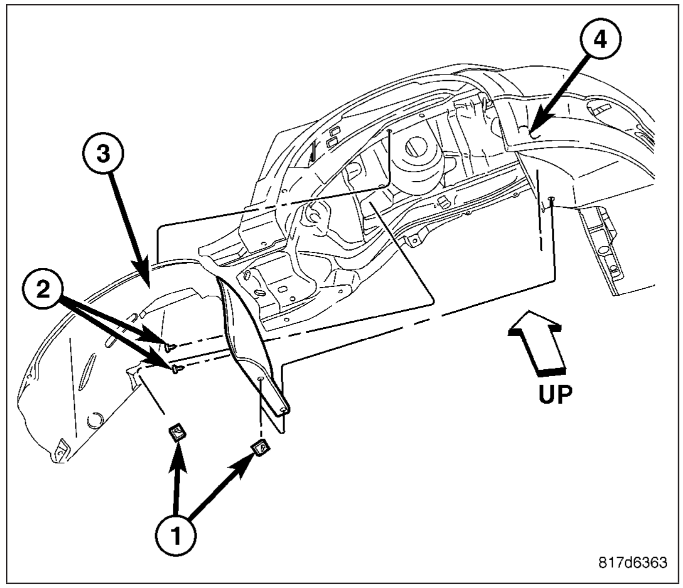
The A/C accumulator cannot be repaired. If the A/C accumulator is faulty or damaged, or if an internal failure of the A/C compressor has occurred, the A/C accumulator must be replaced.



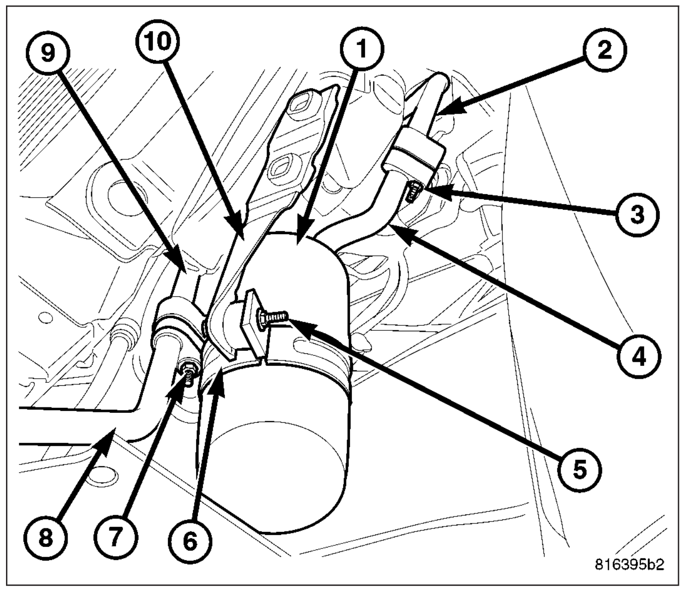
REMOVAL

WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the right front wheel (refer to 22 - TIRES/ WHEELS - REMOVAL).
5. Remove the three push-pin retainers (1) and three screws (2) that secure the front portion of the right front wheelhouse splash shield (3) to body (4) and position the front of the wheelhouse splash shield out of the way to gain access to the A/C accumulator (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - REMOVAL).



6. Remove the nut (7) that secures the lower A/C suction line (8) to the accumulator outlet tube (9) and disconnect the suction line from the accumulator tube.
7. Remove the bolt (5) and retaining band (6) that secure the A/C accumulator to the mounting bracket (10).
8. Remove the nut (3) that secures the upper A/C suction line (2) to the accumulator inlet tube (4) and disconnect the suction line from the accumulator tube.
9. If necessary remove the accumulator mounting bracket from the body.
10. Remove and discard the O-ring seals and gaskets and install plugs in, or tape over the opened refrigerant line fittings and the accumulator ports.

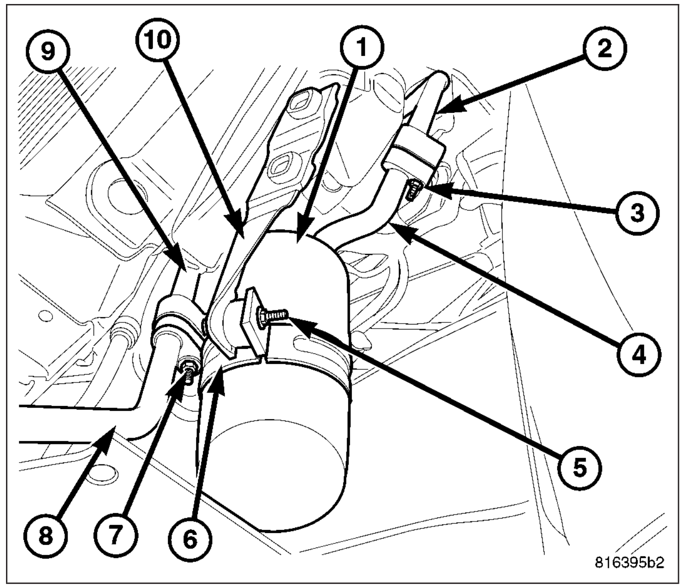


INSTALLATION

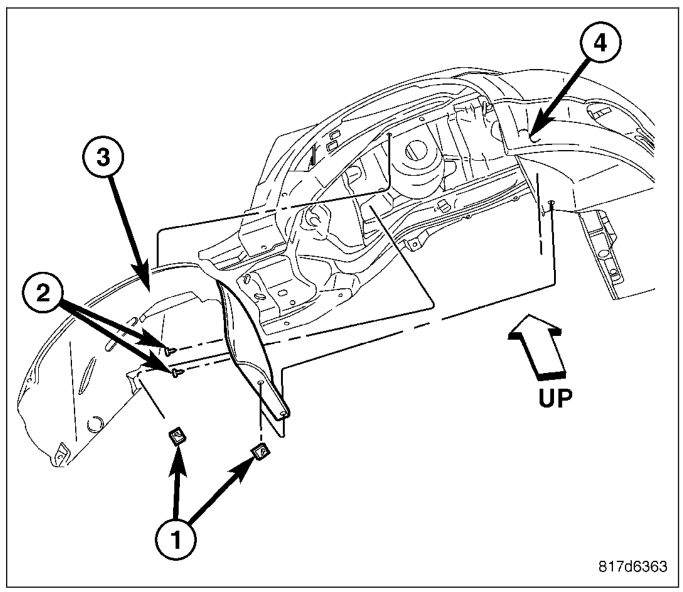
NOTE: If the A/C accumulator is being replaced, add 20 milliliters (0.7 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

NOTE: Replacement of the refrigerant line O-ring seals and gasket is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and gasket could result in a refrigerant system leak.

1. If removed, install the accumulator mounting bracket (10). Tighten the retaining bolts to 15 N·m (11 ft. lbs.).
2. Remove the tape or plugs from all of the opened refrigerant line fittings and the accumulator ports.
3. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the suction line and accumulator fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the upper A/C suction line (2) to the accumulator inlet tube (4) and install the retaining nut (3). Tighten the nut to 5 N·m (44 in. lbs.).
5. Install the retaining band (6) and bolt (5) that secure the A/C accumulator to the mounting bracket. Tighten the bolt to 8 N·m (71 in. lbs.).



6. Connect the lower A/C suction line (8) to the accumulator outlet tube (9) and install the retaining nut (7). Tighten the nut to 5 N·m (44 in. lbs.).
7. Reposition the front of the right front wheel house splash shield (3) to the body (4) and install the three push-pin retainers (1) and the three screws (2). Tighten the screws securely (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - INSTALLATION).
8. Install the right front wheel (refer to 22 - TIRES/WHEELS - INSTALLATION).
9. Lower the vehicle.
10. Reconnect the negative battery cable.



CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

11. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
12. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

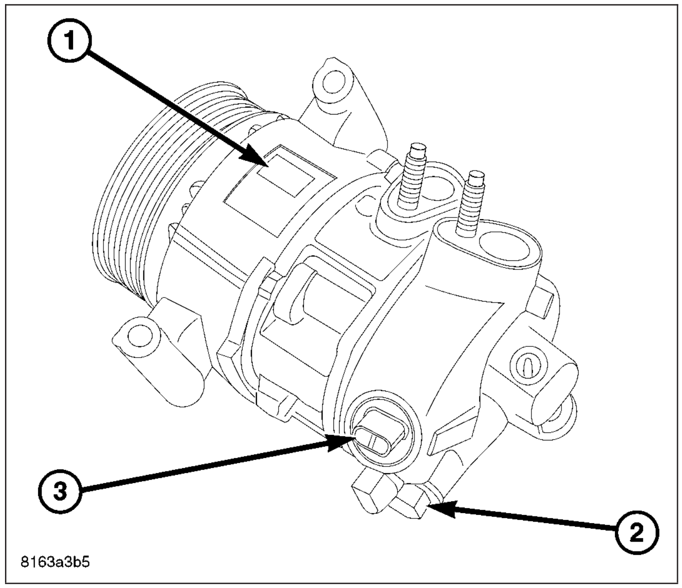
COMPRESSOR-A/C

DESCRIPTION

A/C COMPRESSOR

The A/C system uses a Denso 5SE12C clutchless, five cylinder, variable displacement swashplate type A/C compressor (1). This A/C compressor has a total displacement of 126 cubic centimeters (7.6 cubic inches) and a high pressure relief valve (2) and a control valve (3) located on the back cover. The A/C compressor is secured with three bolts to the compressor bracket located near the oil pan at the front of the engine.

A label identifying the use of R-134a refrigerant is located on the A/C compressor.



HIGH PRESSURE RELIEF VALVE

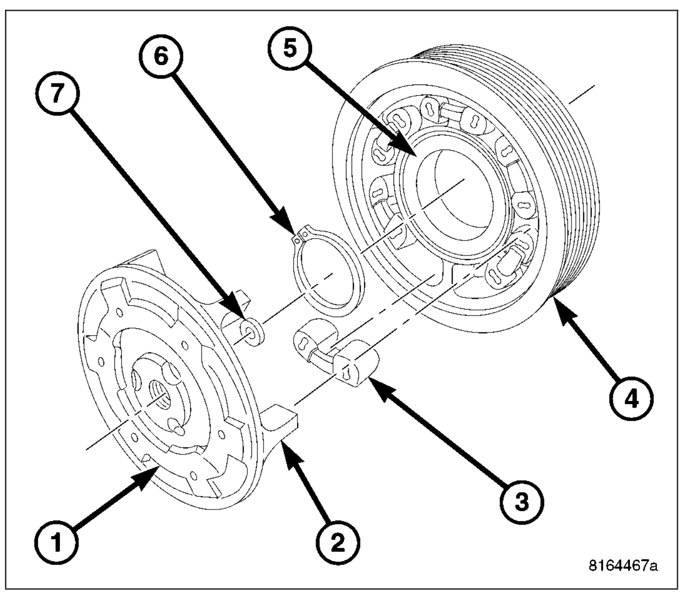
A high pressure relief valve is located on the compressor cylinder head, which is at the rear of the A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - DESCRIPTION). This mechanical valve is designed to vent refrigerant from the A/C system to protect against damage to the A/C compressor and other A/C system components, caused by condenser air flow restriction or an overcharge of refrigerant.

HUB AND PULLEY

NOTE: Typical A/C compressor pulley and drive hub shown.

The A/C compressor hub and pulley assembly provides the means to drive the A/C compressor using the engine accessory drive belt. The hub and pulley assembly consists of an aluminum drive hub (1) with composite tabs (2) that are positioned between rubber dampeners (3) which are located inside of a composite pulley (4).

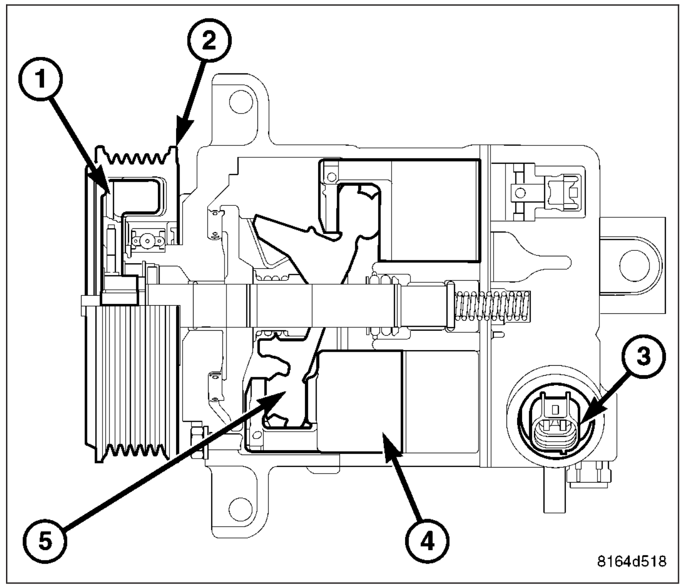
The A/C pulley has a non-servicable bearing (5) which is retained to the nose of the A/C compressor with a snap ring (6). The drive hub and shim (7) are retained to the compressor shaft by use of left handed threads.



OPERATION

A/C COMPRESSOR

The 5SE12C A/C compressor is a variable displacement compressor (VDC) which is driven by the engine through a drive hub (1) and pulley (2). This A/C compressor does not require the use of an electromagnetic clutch, as the compressor uses an integral control solenoid (3) to reduce or increase the stroke of the five pistons (4) within the compressor by automatically adjusting the angle of the swashplate (5).



The A/C compressor draws in low-pressure refrigerant vapor from the A/C evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the A/C condenser through the compressor discharge port. The A/C compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION).

The A/C compressor is controlled by the powertrain control module (PCM) or engine control module (ECM), depending on engine application. The PCM/ECM calculates compressor displacement required by A/C system load and demand by monitoring vehicle speed, A/C high side pressure, engine speed, evaporator temperature, accelerator pedal position, ambient temperature and A/C-heater request signals. The PCM/ECM then sends a pulse width modulated (PWM) signal to the A/C compressor control solenoid to increase or decrease refrigerant flow through an orifice located within the compressor housing. The amount of refrigerant allowed to pass through the orifice in the compressor determines the head pressure which controls the angle of the swashplate, which in turn, determines the amount of compressor displacement. When there is no demand for A/C, the swashplate is adjusted to nearly a zero degree angle, which removes compressor torque drag from the engine.

This A/C compressor will reduce the displacement of the compressor based on ambient air temperature. For example; as the outside temperature falls from 27° C (80° F) to 19° C (66° F), the amount of refrigerant flow required through the A/C orifice valve to keep the A/C evaporator cool becomes less, and the swashplate is adjusted to a lower angle, which reduces compressor displacement. However, due to the lower outside air temperature, panel air outlet temperature will not noticeably change.

The A/C compressor control system is diagnosed using a scan tool (refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

CAUTION: Be certain to check and adjust the refrigerant system oil level when replacing an A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL). Failure to properly adjust the refrigerant oil level can prevent the A/C system from operating as designed and can cause serious A/C compressor damage.

NOTE: The A/C compressor pulley and bearing assembly can be serviced separately in the event of damage or wear to the pulley or bearing. However, the compressor drive hub itself is not serviceable. In the event of drive hub failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

The A/C compressor cannot be repaired and, if faulty or damaged it must be replaced. If an internal failure of the A/C compressor has occurred, the A/C accumulator must also be replaced (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR-A/C - DESCRIPTION).

HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents refrigerant from the A/C system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The high pressure relief valve closes with a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the A/C system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the A/C system. If the high pressure relief valve vents refrigerant, it does not mean the valve is faulty.

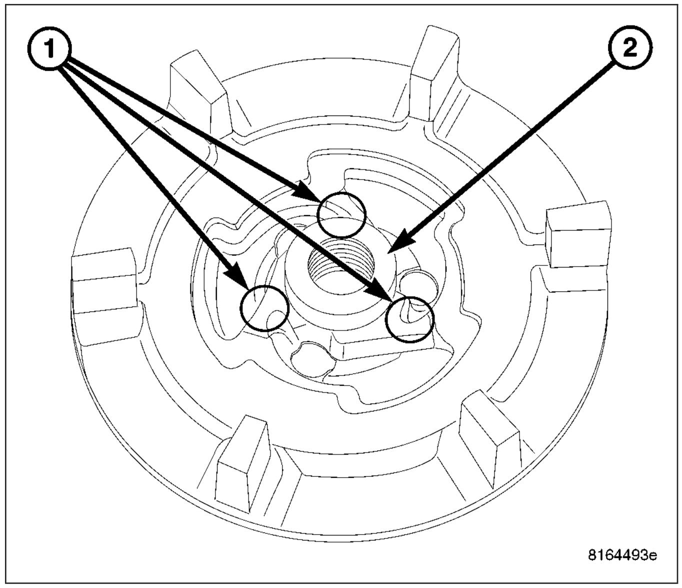
The high pressure relief valve is factory-calibrated and cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the A/C compressor.

HUB AND PULLEY

NOTE: Typical A/C compressor pulley drive hub shown in illustration.

This compressor design does not require the use of an electromagnetic clutch, as the compressor is controlled by an integral control valve that allows refrigerant to bypass within the compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - DESCRIPTION).

The three bridges (1) located on compressor drive hub (2) are designed to break away in the event of compressor seizure. This action prevents damage to the serpentine accessory drive belt (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/HUB AND PULLEY-A/C COMPRESSOR - INSPECTION).



NOTE: The A/C compressor pulley and bearing assembly can be serviced separately in the event of damage or wear to the pulley or bearing. However, the compressor drive hub itself is not serviceable. In the event of drive hub failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

The A/C compressor pulley and bearing cannot be repaired and, if faulty or damaged it must be replaced. The A/C compressor pulley and bearing is available for service in the event of pulley damage or pulley bearing failure. If an internal failure of the A/C compressor has lead to compressor seizure, the compressor, hub and pulley must be replaced as an assembly.

DIAGNOSIS AND TESTING

A/C COMPRESSOR NOISE TESTING

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed bearing, may be caused by loose bolts, nuts, mounting brackets or a loose compressor assembly.

NOTE: The A/C compressor must be replaced if any unusual noise is heard from the compressor itself.

1. Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Turn the A/C system On and Off several times to clearly identify any compressor noise. Listen to the A/C compressor while it is operating at maximum and minimum displacement. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise. To duplicate high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to be certain that the discharge pressure does not exceed 2600 kPa (377 psi).

NOTE: Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the compressor is operating at maximum displacement, which may not occur when the compressor is at minimum displacement.

2. Check the condition of the accessory drive belt (refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING).

NOTE: The A/C compressor must be replaced if the drive hub is broken or if the compressor shaft does not rotate smoothly.

3. Check the compressor hub and pulley and bearing assembly. Be certain that the hub and pulley are properly aligned and that the pulley bearing is mounted securely to the A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C-HUB AND PULLEY - INSPECTION).

NOTE: The A/C compressor must be replaced if any debris or unusually discolored oil is found on the A/C compressor manifold.

4. Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DESCRIPTION - REFRIGERANT LINES).
5. Loosen all of the compressor mounting hardware and retighten.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

6. If the noise is from opening and closing of the high pressure relief valve, recover, evacuate and recharge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY), (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE). If the high pressure relief valve still does not seat properly, replace the A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - REMOVAL).
7. If the noise is from liquid refrigerant slugging in the A/C suction line, replace the A/C accumulator (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR-A/C - REMOVAL) and check the refrigerant oil level and the refrigerant system charge (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL).
8. If a slugging condition still exists after replacing the A/C accumulator, then replace the A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - REMOVAL).

REMOVAL

PULLEY AND BEARING

WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: The A/C compressor pulley and bearing assembly can be serviced separately in the event of damage or wear to the pulley or bearing. However, the compressor drive hub itself is not serviceable. In the event of drive hub failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

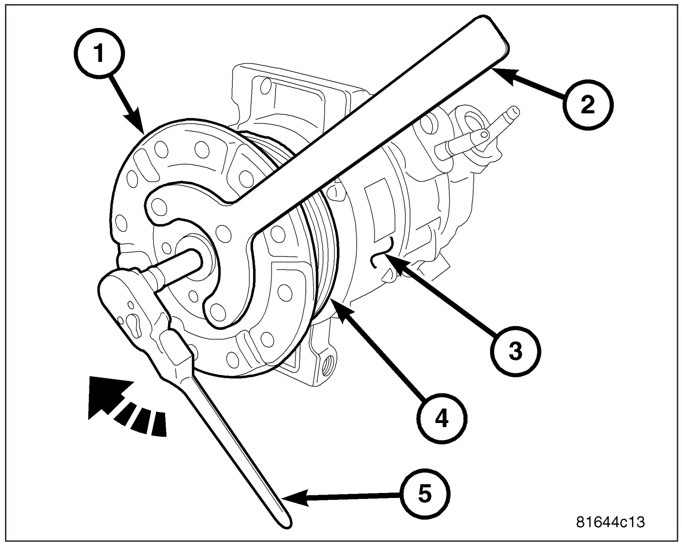
NOTE: The A/C compressor pulley and bearing assembly can be serviced in the vehicle. The refrigerant system can remain fully charged during pulley and bearing replacement.

NOTE: Illustrations shown with A/C compressor removed from engine for clarity.

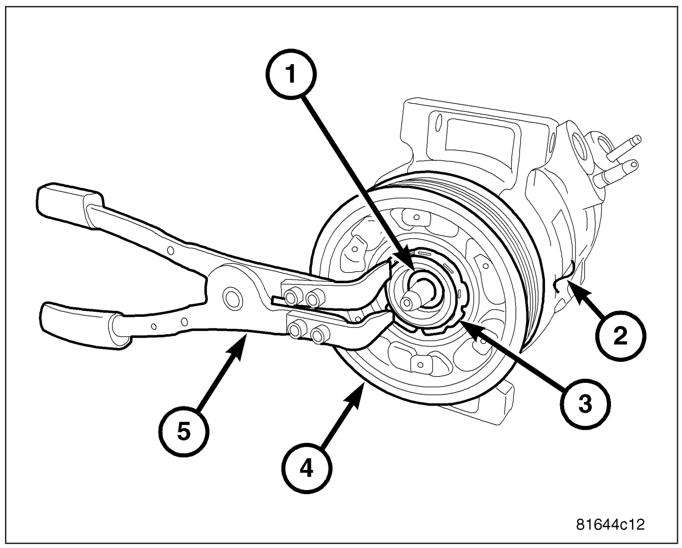
NOTE: Gasoline engine model A/C compressor pulley and drive hub shown. Diesel model similar.

1. Raise and support the vehicle.
2. Remove the splash shield from the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - REMOVAL).
3. Remove the accessory drive belt (refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

NOTE: The drive hub on the gasoline engine model A/C compressor is removed using special tool 9907. The drive hub on the diesel engine model is removed using an open end wrench.



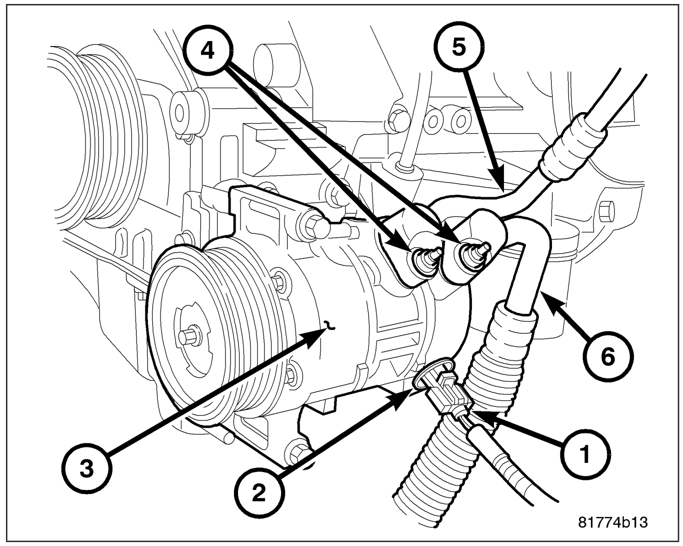
4. Using spanner wrench (Special Tool 9907 or equivalent) (2) or an open end wrench (depending on engine application), hold the drive hub (1) while rotating the shaft of the A/C compressor (3) clockwise using a 7 mm (9/32 in.) deep well socket and a ratchet (4) and remove the drive hub from the compressor.
5. Remove the shim (1) from the shaft of the A/C compressor (2).
6. Using snap ring pliers (Special Tool 9764 or equivalent) (5), remove the external snap ring (3) that secures the pulley and bearing assembly (4) to the front of the A/C compressor and remove the pulley and bearing assembly from the compressor.



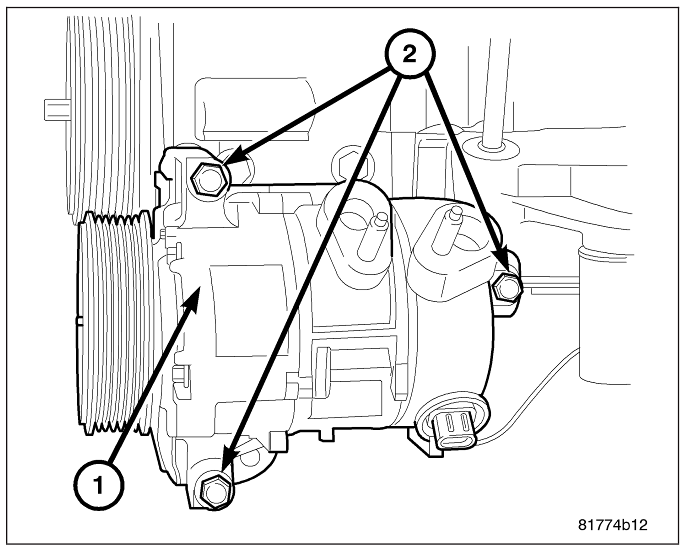
A/C COMPRESSOR

WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the splash shield from the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - REMOVAL).
5. Remove the accessory drive belt (refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
6. Disconnect the engine wire harness (1) from the compressor control valve (2).
7. Remove the nuts (4) that secure the A/C discharge line (5) and the A/C suction line (6) to the A/C compressor (3).



8. Disconnect the A/C discharge and suction lines from the A/C compressor and remove and discard the O-ring seals and gaskets.
9. Support the A/C compressor (1) and remove the three bolts (2) that secure the compressor to the engine and remove the compressor.
10. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.



INSPECTION

HUB AND PULLEY INSPECTION

NOTE: The A/C compressor pulley and bearing assembly can be serviced separately in the event of damage or wear to the pulley or bearing. However, the compressor drive hub itself is not serviceable. In the event of drive hub failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

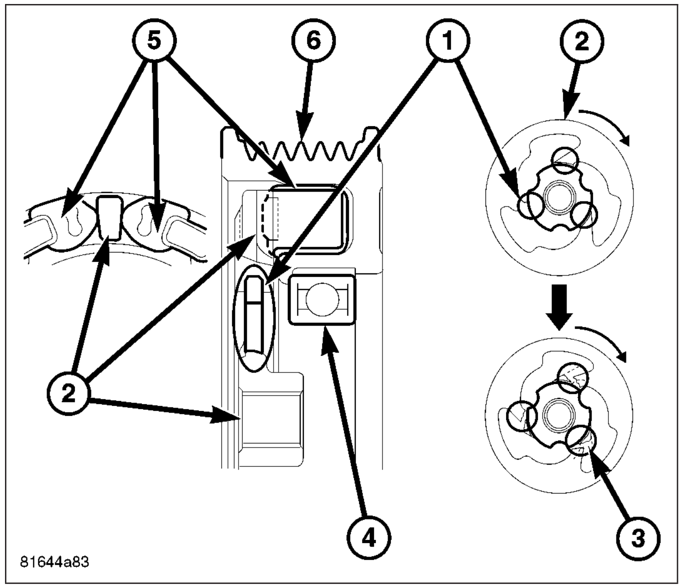
NOTE: The A/C compressor hub and pulley and bearing assembly can be serviced in the vehicle. The refrigerant system can remain fully charged during pulley and bearing replacement.

NOTE: Typical A/C compressor pulley drive hub shown.

The bridges (1) located on the compressor hub (2) are designed to break away in the event of compressor seizure. Examine the bridges for separation or cracks (3). Damage to the bridges are an indication of excessive compressor torque, which is most likely caused by compressor failure.

Check the pulley bearing (4) for roughness or excessive leakage of grease. Examine the pulley dampeners (5) for deterioration or damage. Inspect the belt surfaces of the pulley (4) for wear. The pulley should be replaced if there is excessive wear or scoring. If the pulley surfaces are oily, inspect the shaft and nose area of the A/C compressor for refrigerant oil. If refrigerant oil is found, the compressor shaft seal is leaking and the A/C compressor must be replaced.

Replace the A/C compressor pulley and bearing assembly if wear or damage is found.



INSTALLATION

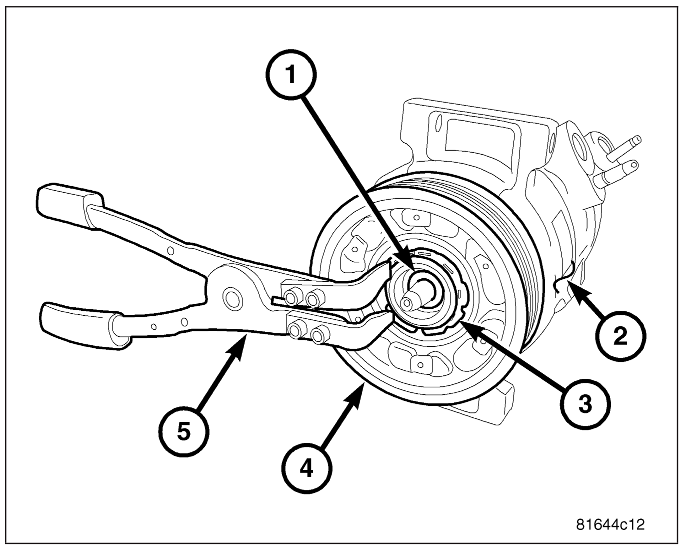
PULLEY AND BEARING

NOTE: Illustrations shown with A/C compressor removed from engine for clarity.

CAUTION: The pulley and hub are both constructed from composite materials and can be easily damaged if not properly installed. Always use care when installing the pulley and hub onto the A/C compressor.

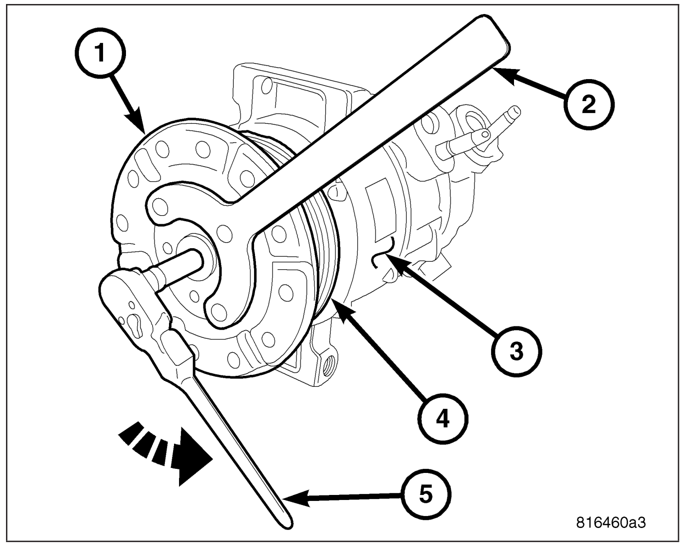
1. Install the pulley and bearing assembly (4) onto the front of the A/C compressor (2). If necessary, place a block of wood over the pulley surface and gently tap on the wood with a light weight hammer.

CAUTION: The snap ring must be fully and properly seated in the groove or it will vibrate out, resulting in a pulley failure and possible severe damage to the A/C compressor.



NOTE: A new snap ring must be used to secure the pulley and bearing assembly to the A/C compressor. The bevel side of the snap ring must face outward.

2. Using snap ring pliers (Special Tool 9764 or equivalent) (5), install the external snap ring (3) that secures the pulley and bearing assembly to the front of the A/C compressor. Be certain that the snap ring is fully and properly seated in the groove.
3. Install the shim (1) onto the shaft of the A/C compressor.



NOTE: Gasoline engine model A/C compressor pulley and drive hub shown. Diesel model similar.

4. Align the tabs of the drive hub (1) between the rubber dampers of the pulley and bearing assembly (4) and position the drive hub onto the shaft of the A/C compressor (3) (for more information, refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ COMPRESSOR-A/C-HUB AND PULLEY - DESCRIPTION).

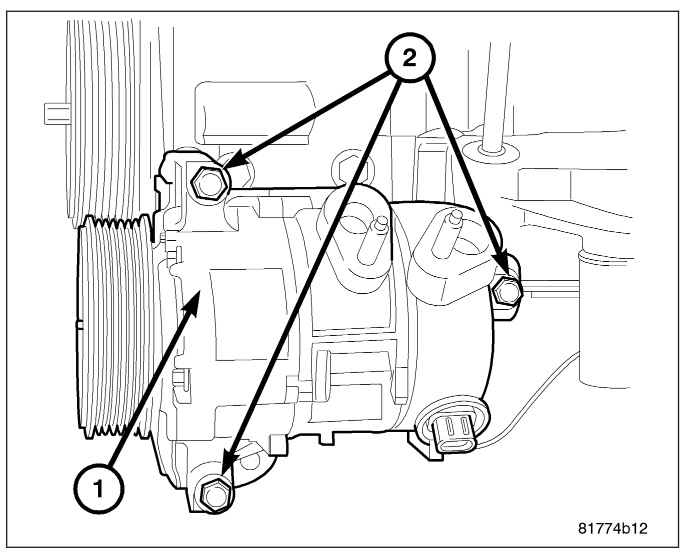
NOTE: The drive hub on the gasoline engine model A/C compressor is installed using special tool 9907. The drive hub on the diesel engine model is installed using an open end wrench.

5. Rotate the shaft of the A/C compressor counterclockwise using a 7 mm (9/32 in.) deep well socket and a ratchet (5) while holding the drive hub using spanner wrench (Special Tool 9907 or equivalent) (2) or an open end wrench (depending on engine application). Tighten the drive hub securely onto the compressor shaft.
6. Install the accessory drive belt (refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
7. Install the splash shield onto the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - INSTALLATION).
8. Lower the vehicle.

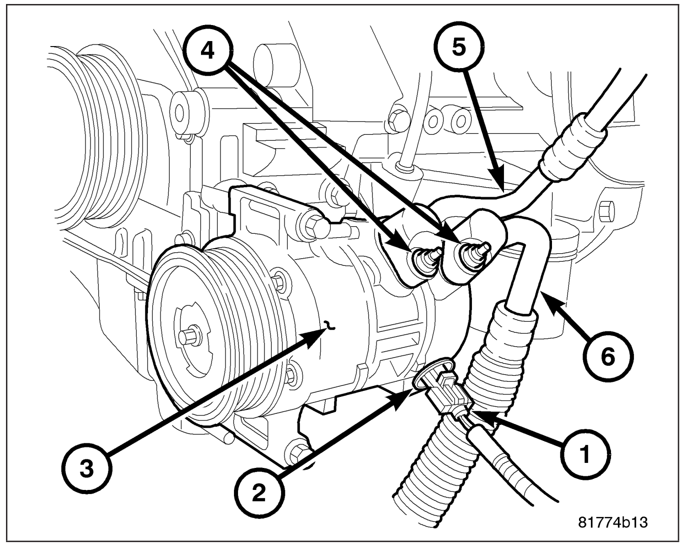
A/C COMPRESSOR

CAUTION: When replacing an A/C compressor, be certain to check and adjust the refrigerant system oil level (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL). Failure to properly adjust the refrigerant oil level can prevent the A/C system from operating as designed and can cause serious A/C compressor damage.

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.



1. If the A/C compressor (1) is being replaced, the refrigerant oil in the old compressor must be first drained and measured. Then drain all of the oil from the new A/C compressor and fill the new compressor with the same amount of new refrigerant oil that was drained out of the old compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL). Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
2. Position the A/C compressor into the engine compartment.
3. Install the three bolts (2) that secure the A/C compressor to the engine. Tighten the bolts to 25 N·m (18 ft. lbs.).



4. Remove the tape or plugs from the compressor ports and the refrigerant line fittings.
5. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
6. Connect the A/C discharge line (5) and the A/C suction line (6) to the A/C compressor (3).
7. Install the nuts (4) that secure the A/C suction and discharge lines to the A/C compressor. Tighten the nuts to 20 N·m (15 ft. lbs.).
8. Connect the engine wire harness (1) to the compressor control valve (2).
9. Install the accessory drive belt (refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
10. Install the splash shield onto the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - INSTALLATION).
11. Lower the vehicle.
12. Reconnect the negative battery cable.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

13. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
14. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

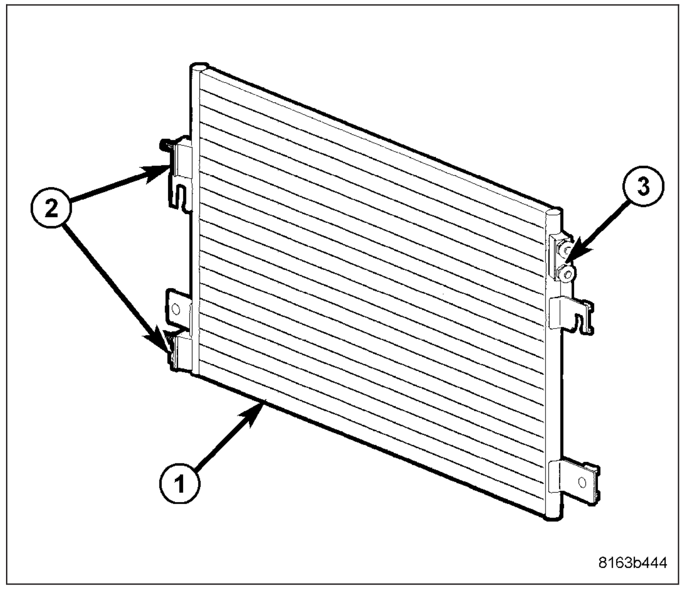
CONDENSER-A/C

DESCRIPTION

NOTE: A/C condenser with automatic transmission cooler shown. A/C Condenser without cooler similar.

The A/C condenser (1) is located in the front of the engine compartment behind the grille. The A/C condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the A/C compressor to give up its heat to the air passing over the condenser fins, which causes the refrigerant to cool and change to a liquid state.

The A/C condenser is equipped with tapping blocks for the A/C discharge line and the A/C liquid line (2) and an integral automatic transmission cooler (3), when equipped with an automatic transaxle.



OPERATION

When air passes through the fins of the A/C condenser, the high-pressure refrigerant gas within the A/C condenser gives up its heat. The refrigerant then condenses as it leaves the A/C condenser and becomes a high-pressure liquid. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the A/C system. Therefore, it is important that there are no objects placed in front of the radiator grille openings at the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or A/C condenser service.

The A/C condenser cannot be repaired and, if faulty or damaged it must be replaced.

REMOVAL

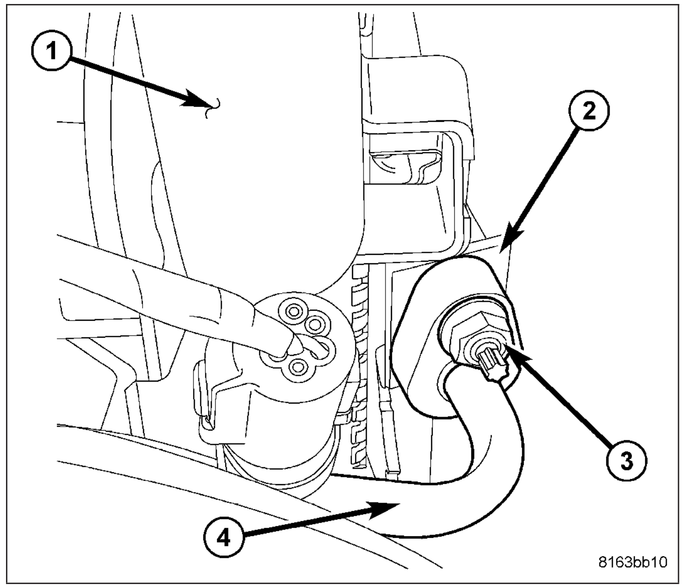
WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

CAUTION: Before removing the A/C condenser, note the location of each of the radiator/condenser air seals. These air seals are used to direct air through the A/C condenser and radiator. The air seals must be reinstalled in their proper locations in order for the A/C and engine cooling systems to perform as designed.

1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. If equipped with the 2.2L diesel engine, remove the front fascia (refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - REMOVAL).

NOTE: It is not necessary to remove the hood latch from the upper radiator support on gasoline engine equipped models for A/C condenser service.

4. If equipped with a gasoline engine, remove the upper radiator support and position it out of the way (refer to 23 - BODY/EXTERIOR/SUPPORT-UPPER RADIATOR - REMOVAL).



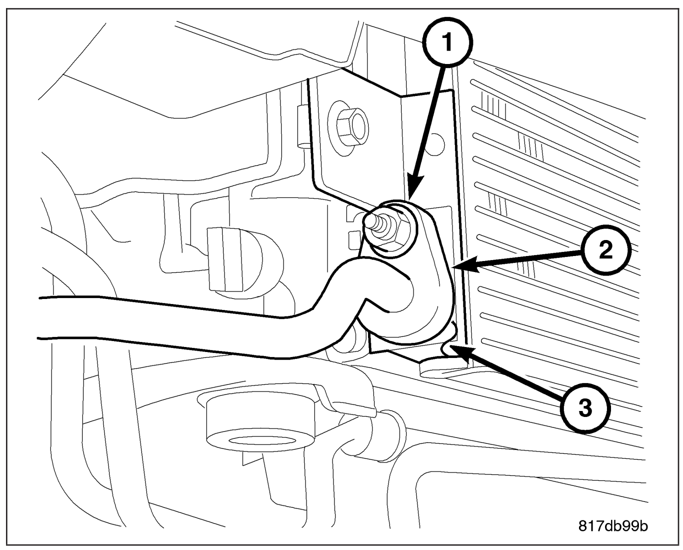
5. On gasoline engine equipped models, carefully push the radiator (1) slightly rearward to gain access to the A/C condenser (2).
6. Remove the nut (3) that secures the A/C discharge line (4) to the right side of the A/C condenser and remove and discard the O-ring seal and gasket.
7. Install plugs in, or tape over the opened discharge line fitting and the condenser inlet port.

NOTE: Illustration shown with front fascia removed for clarity.

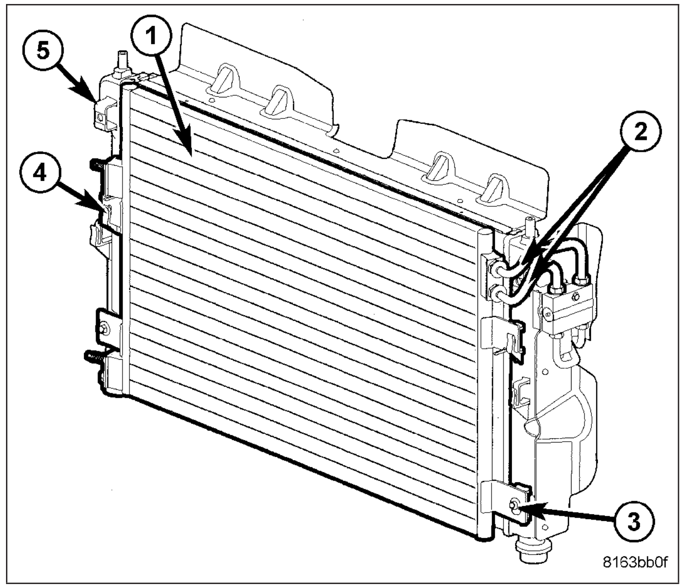
8. Raise and support the vehicle.

NOTE: On gasoline engine equipped models, reach up through the opening in the bottom of the front fascia located in the right front corner of the vehicle to gain access to the A/C liquid line.

9. Remove the nut (1) that secures the A/C liquid line (2) to the right side of the A/C condenser (3).
10. Disconnect the A/C liquid line from the A/C condenser and remove and discard the O-ring seal and gasket.
11. Install plugs in, or tape over the opened liquid line fitting and the condenser outlet port.



NOTE: Illustration shown with front fascia and diesel engine charge air cooler (CAC) (when equipped) removed for clarity.



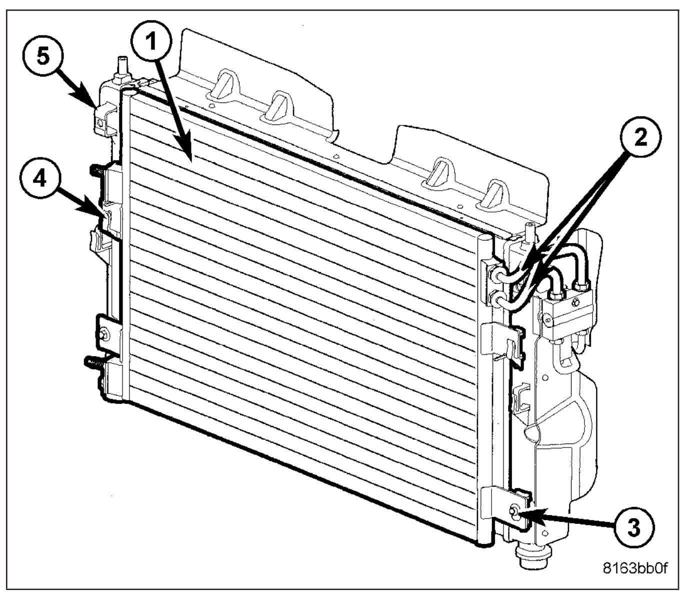
12. Remove the two bolts (3) that secure the lower condenser brackets to the radiator (5).
13. Lower the vehicle.
14. If equipped, disconnect the automatic transmission cooler lines (2) from the left side of the A/C condenser (1) (refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING).
15. If equipped with the 2.2L diesel engine, remove the charge air cooler (CAC) (refer to 7 - COOLING/ENGINE/CHARGE AIR COOLER - REMOVAL).
16. Carefully lift the A/C condenser straight up and disengage the two upper condenser brackets (4) from the radiator and remove the condenser from the engine compartment.

INSTALLATION

NOTE: If the A/C condenser is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

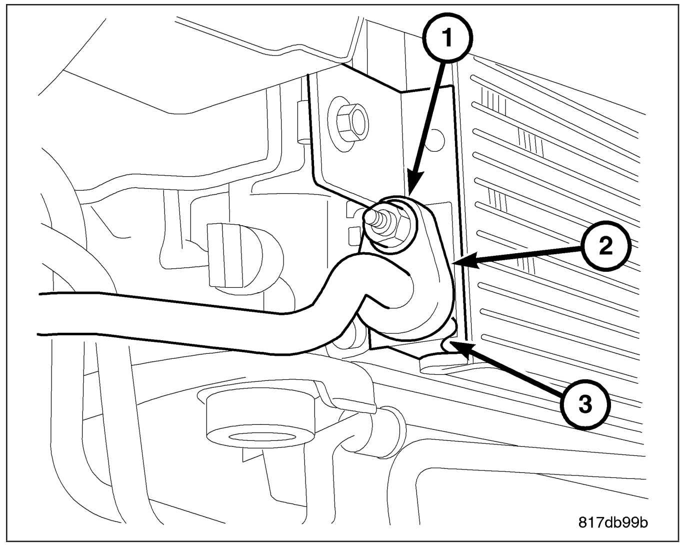
NOTE: Illustration shown with front fascia and diesel engine charge air cooler (CAC) (when equipped) removed for clarity.



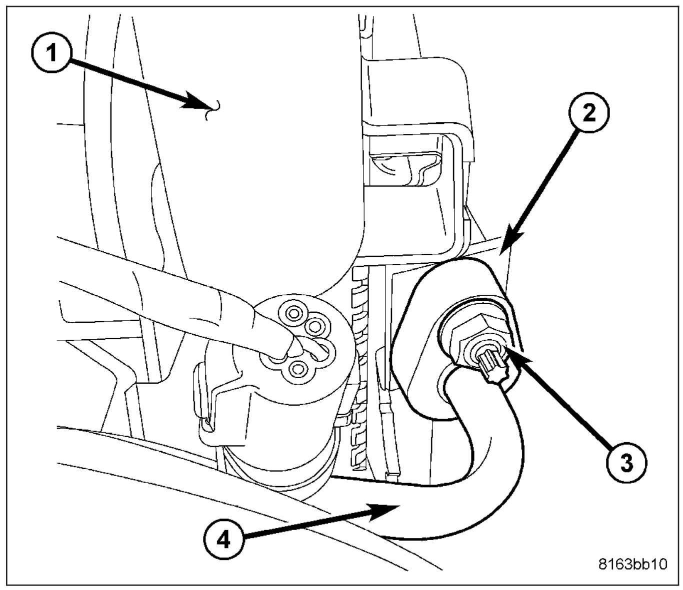
1. Carefully lower the A/C condenser (1) straight down in front of the radiator (5) and engage the upper condenser brackets (4) to the radiator.
2. If equipped with the 2.2L diesel engine, install the charge air cooler (CAC) (refer to 7 - COOLING/ENGINE/CHARGE AIR COOLER - INSTALLATION).
3. If equipped, connect the automatic transmission cooler lines (2) to the left side of the A/C condenser (refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING).
4. Raise and support the vehicle.
5. Install the two bolts (3) that secure the lower condenser brackets to the radiator. Tighten the bolts to 4.5 N·m (40 in. lbs.).

NOTE: Illustration shown with front fascia removed for clarity.

NOTE: On gasoline engine equipped models, reach up through the opening in the bottom of the front fascia located in the right front corner of the vehicle to gain access to the A/C liquid line.



6. Remove the tape or plug from the liquid line fitting and the condenser outlet port.
7. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Connect the A/C liquid line (2) to the A/C condenser (3) and install the retaining nut (1). Tighten the nut to 5 N·m (44 in. lbs.).
9. Lower the vehicle.



10. Remove the tape or plug from the discharge line fitting and the condenser inlet port.
11. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
12. On gasoline engine equipped models, carefully push the radiator (1) slightly rearward to gain access to the A/C condenser (2).
13. Connect the A/C discharge line (4) to the A/C condenser and install the retaining nut (3). Tighten the nut to 5 N·m (44 in. lbs.).
14. If equipped with a gasoline engine, reposition and install the upper radiator support (refer to 23 - BODY/EXTERIOR/SUPPORT-UPPER RADIATOR - INSTALLATION).
15. If equipped with the 2.2L diesel engine, install the front fascia (refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
16. Reconnect the negative battery cable.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

17. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)
18. Charge the A/C system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

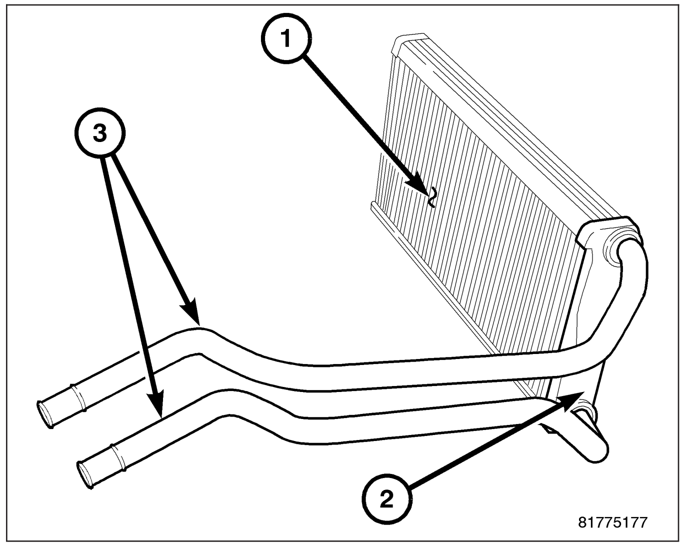
CORE-HEATER

DESCRIPTION

NOTE: LHD model shown. RHD model similar.

The heater core (1) for the heating-A/C system is mounted within the HVAC air distribution housing, which is located behind the instrument panel. The heater core is a heat exchanger made of rows of tubes with fins and is positioned within the air distribution housing so that only the selected amount of air entering the housing passes through the heater core before it is distributed through the heating-A/C system ducts and outlets. One end of the heater core is fitted with a tank (2) that includes the fittings for the heater core tubes (3).

The heater core can only be serviced by removing the HVAC housing from the vehicle.



OPERATION

Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core tubes and fins. Air directed through the heater core picks up the heat from the heater core fins. The blend-air door(s) allows control of the heater output air temperature by regulating the amount of air flowing through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and, if faulty or damaged it must be replaced.

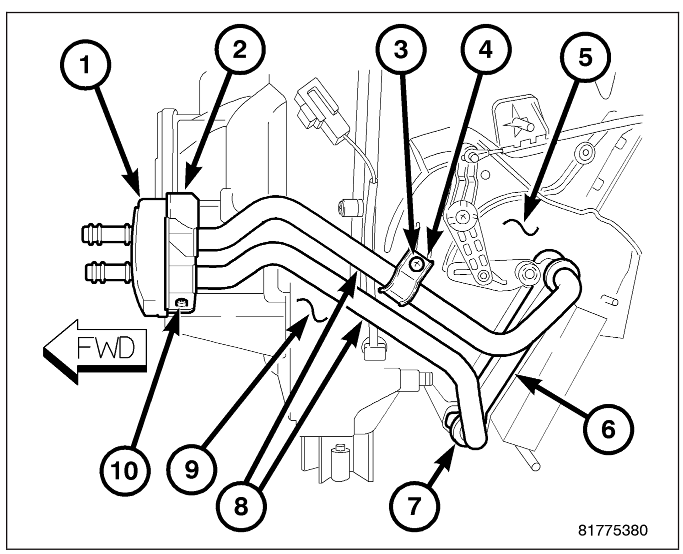
REMOVAL

NOTE: The HVAC housing assembly must be removed from vehicle for service of the heater core.

NOTE: LHD model with A/C shown. RHD and heater-only models similar.

1. Remove the HVAC housing assembly and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - REMOVAL).
2. Remove the left side front floor duct (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ DUCTS-FLOOR DISTRIBUTION - REMOVAL).

NOTE: If the foam seal for the flange is deformed or damaged, it must be replaced.

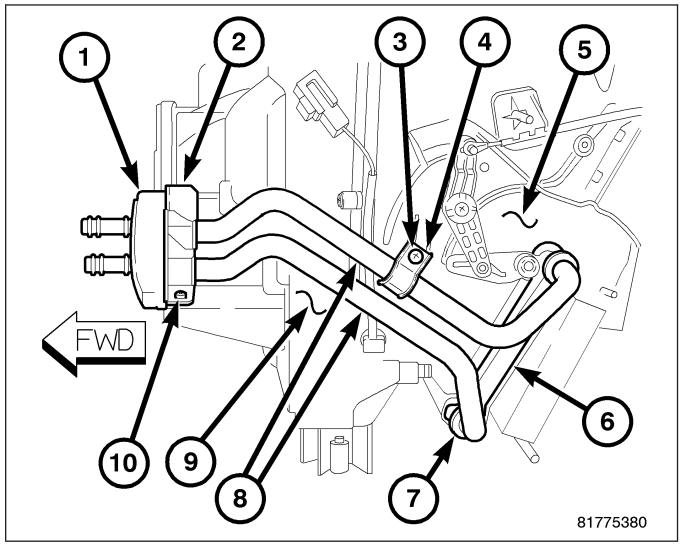


3. Remove the foam seal (1) from the flange (2) located on the front of the HVAC housing (9).
4. Remove the screw (10) that secures the flange to the front of the HVAC housing and remove the flange.
5. Remove the screw (3) that secures the retaining bracket (4) for the heater core tubes (8) to the left side of the air distribution housing (5).

6. On RHD models, remove the air distribution housing from the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - REMOVAL)
7. Carefully pull the heater core (6) out of the driver side of the air distribution housing.

INSTALLATION

NOTE: LHD model with A/C shown. RHD and heater-only models similar.



1. Carefully install the heater core (6) into the left side of the air distribution housing (5).
2. On RHD models, install the air distribution housing (5) onto the HVAC housing (9) (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-AIR DISTRIBUTION - INSTALLATION).
3. Install the retaining bracket (4) and screw (3) that secure the heater core tubes (8). Tighten the screw to 1.2 N·m (10 in. lbs.)
4. Install the flange (2) that secures the heater core tubes to the front of the HVAC housing.
5. Install the screw (10) that secures the flange to the HVAC housing. Tighten the screw to 1.2 N·m (10 in. lbs.).

NOTE: If the foam seal for the flange is deformed or damaged, it must be replaced.

6. Install the foam seal (1) onto the flange.
7. Install the left side front floor duct (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR DISTRIBUTION - INSTALLATION).

NOTE: If the heater core is being replaced, flush the cooling system (refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).

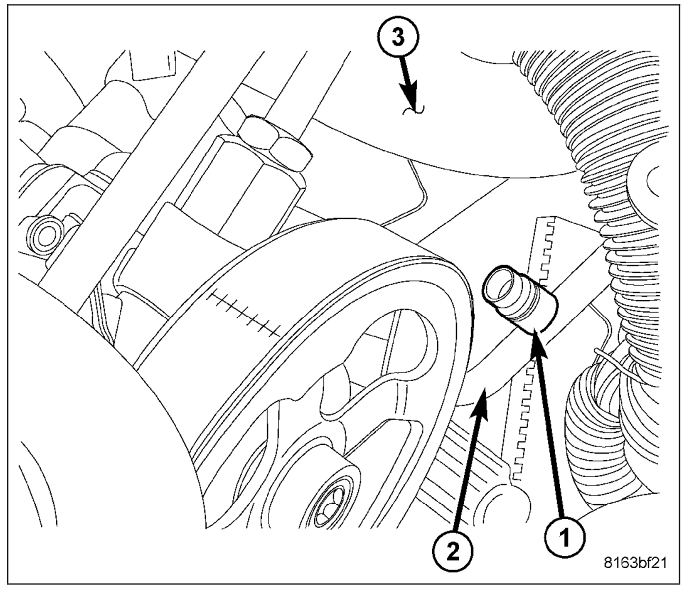
8. Install the HVAC housing assembly (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HOUSING-HVAC ASSEMBLY - INSTALLATION).

CORE-VALVE-SERVICE PORT

DESCRIPTION

Refrigerant system service ports are used to recover, recycle, evacuate, charge and test the A/C refrigerant system. Unique sizes are used on the two service ports for the R-134a refrigerant system to ensure the system is not accidentally contaminated with R-12 refrigerant or by service equipment used for R-12 refrigerant.

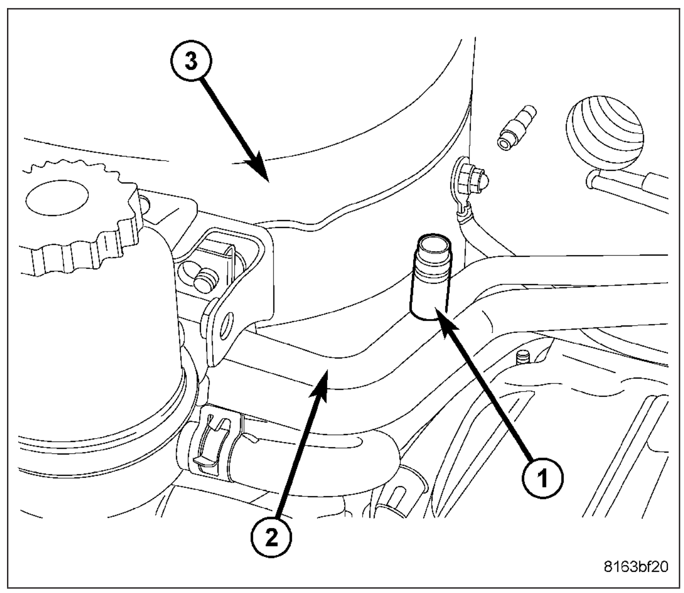
The high side service port (1) is located on the A/C discharge line (2) in front of the engine, below the upper radiator hose (3).



The low side service port (1) is located on the A/C liquid line (2) near the right front strut tower (3). Both the high side and low side A/C service port valve cores are serviceable.

NOTE: The protective cap aids in service port sealing and helps protects the refrigerant system from contamination. Remember to always reinstall the protective cap onto the service port when refrigerant system service is complete.

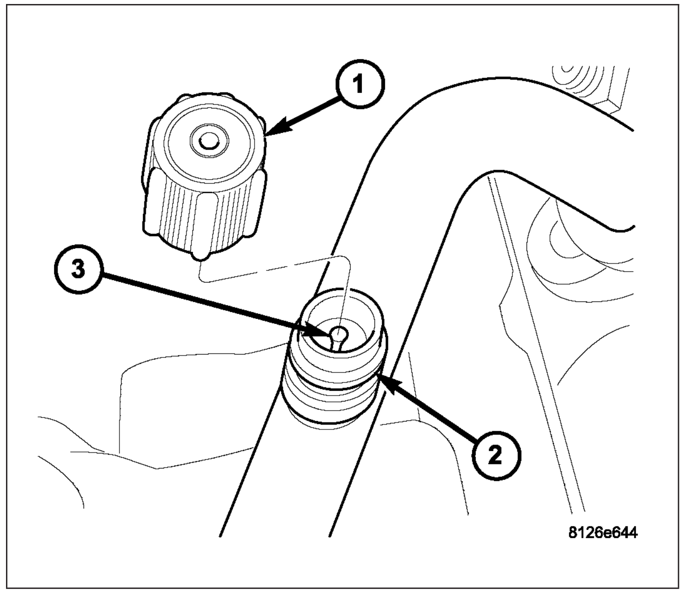
Each of the service ports has a threaded plastic protective cap installed over it from the factory. The service port caps are serviceable items.



REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

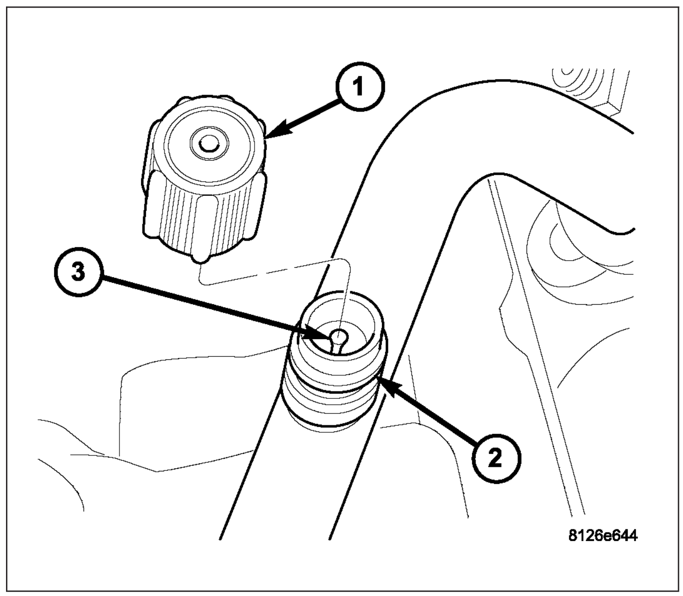
NOTE: Typical A/C service port shown.



1. Remove the protective cap (1) from the service port (2).
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Using a Schrader-type valve core tool, remove the valve core (3) from the service port.
4. Install a plug in, or tape over the opened service port(s).

INSTALLATION

NOTE: Typical A/C service port shown.



1. Lubricate the valve core (3) with clean refrigerant oil prior to installation. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
2. Remove the tape or plug from the service port (2).

CAUTION: A valve core that is not fully seated in the A/C service port can result in damage to the valve during refrigerant system evacuation and charge. Such damage may result in a loss of system refrigerant while uncoupling the charge adapters.

3. Using a Schrader-type valve core tool, install and tighten the valve core into the service port(s).

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

4. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
5. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

NOTE: The protective cap helps aid in service port sealing and helps protect the refrigerant system from contamination. Remember to always reinstall the protective cap onto the service port when refrigerant system service is complete.

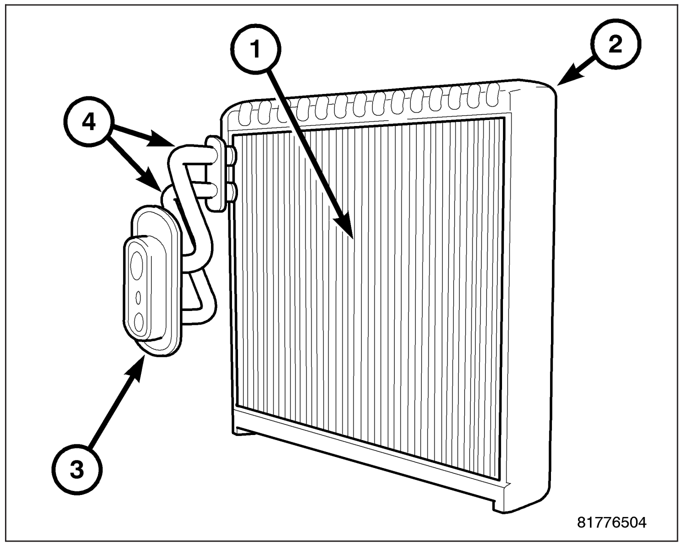
6. Install the protective cap (1) onto the service port.

EVAPORATOR-A/C

DESCRIPTION

NOTE: LHD model shown. RHD model similar.

The A/C evaporator (1) for the heating-A/C system is mounted in the HVAC housing, which is located behind the instrument panel. The A/C evaporator and its insulator (2) are positioned within the HVAC housing so that all air entering the housing must pass over the evaporator fins before it is distributed through the heating-A/C system ducts and outlets.



A tapping block (3) and O-ring seals are used to connect and seal the A/C evaporator tubes (4) to the underhood refrigerant lines.

The A/C evaporator can only be serviced by removing and disassembling the HVAC housing assembly.

OPERATION

Refrigerant enters the A/C evaporator through the A/C orifice tube as a low-temperature, low-pressure mixture of liquid and gas. As air flows over the fins of the A/C evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the A/C evaporator.

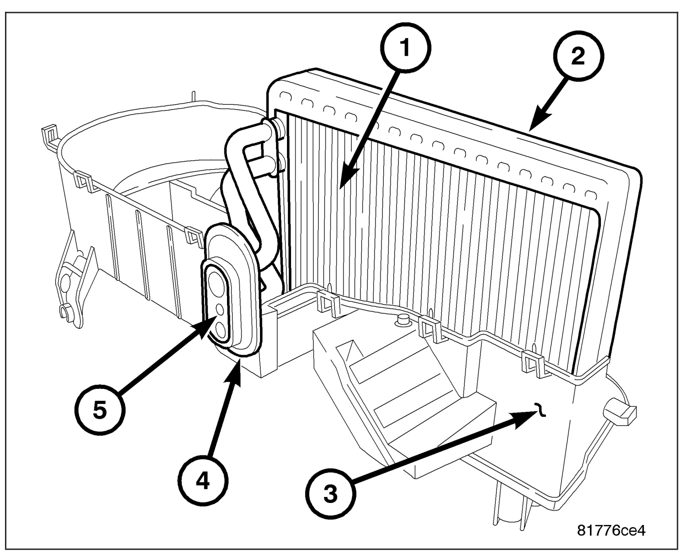
The A/C evaporator cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

NOTE: The HVAC housing assembly must be removed from vehicle and disassembled for service of the A/C evaporator.

NOTE: LHD model shown. RHD model similar.

1. Remove the HVAC housing and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - REMOVAL).
2. Disassemble the HVAC housing to gain access to the A/C evaporator (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - DISASSEMBLY).



NOTE: If the foam insulator around the A/C evaporator is deformed or damaged, the insulator must be replaced.

3. Carefully lift the A/C evaporator (1) and the foam insulator (2) out of the lower half of the HVAC housing (3).

NOTE: If the seal around the evaporator tube tapping block is deformed or damaged, the seal must be replaced.

4. If required, remove the seal (4) from around the evaporator tube tapping block (5).

INSTALLATION

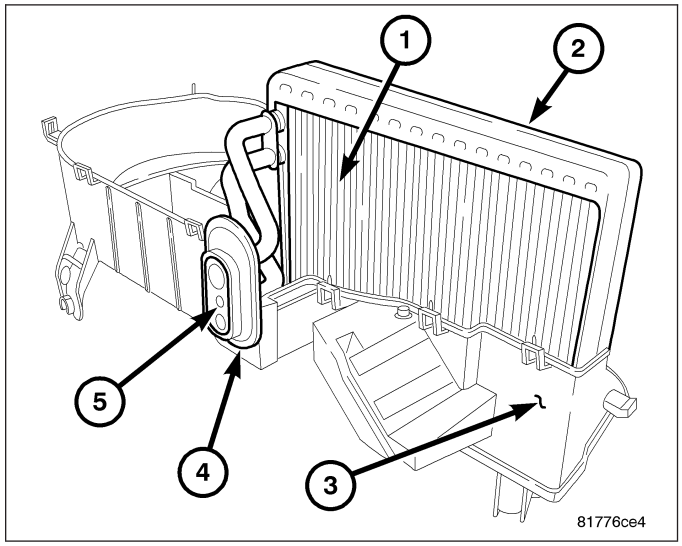
NOTE: If the A/C evaporator is being replaced, add 20 milliliters (0.7 fluid ounces) of refrigerant oil to the refrigerant system.

NOTE: LHD model shown. RHD model similar.

1. If removed, install the seal (4) onto the evaporator tube tapping block (5).

NOTE: Make sure that the foam insulator is properly positioned in the HVAC housing.

2. Carefully install the A/C evaporator (1) and foam insulator (2) into the lower half of the HVAC housing (3).
3. Assemble the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - ASSEMBLY).
4. Install the HVAC housing (refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - INSTALLATION).

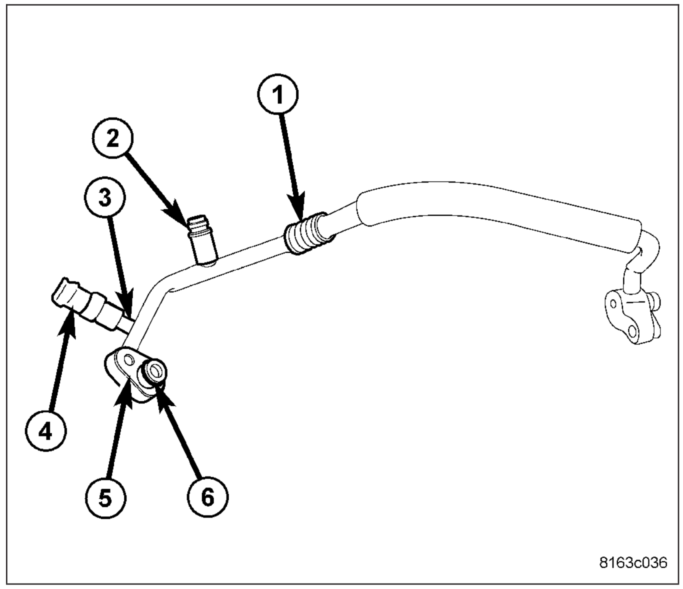


LINE-A/C DISCHARGE

DESCRIPTION

NOTE: A/C discharge line for gasoline engine shown in illustration. A/C discharge line for diesel engine similar.

The A/C discharge line (1) is the refrigerant line that carries refrigerant from the A/C compressor to the A/C condenser and includes the high side service port (2) and a fitting (3) for the A/C pressure transducer (4).



CAUTION: Use only the O-ring seals specified for the vehicle. Failure to use the correct O-ring seals will cause the refrigerant system connections to leak.

The A/C discharge line has no serviceable parts except for the metal gaskets (5) and rubber O-ring seals (6) and the high side service port valve core. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals and gaskets must be replaced whenever the A/C discharge line is removed and installed.

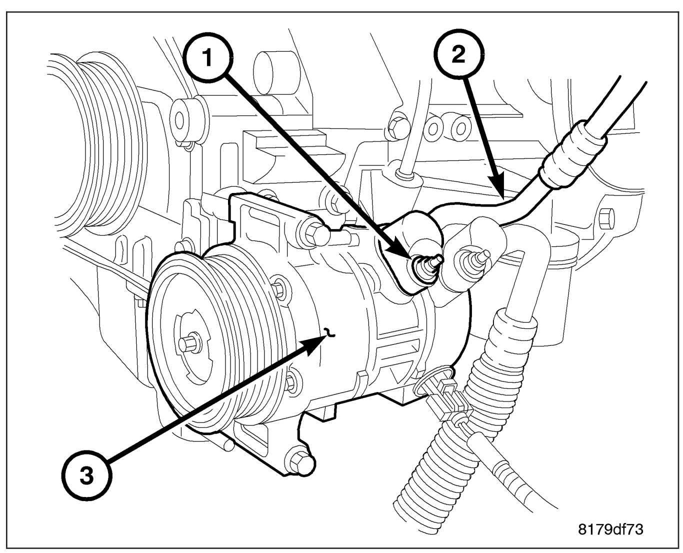
The A/C discharge line cannot be repaired and, if leaking or damaged it must be replaced.

REMOVAL

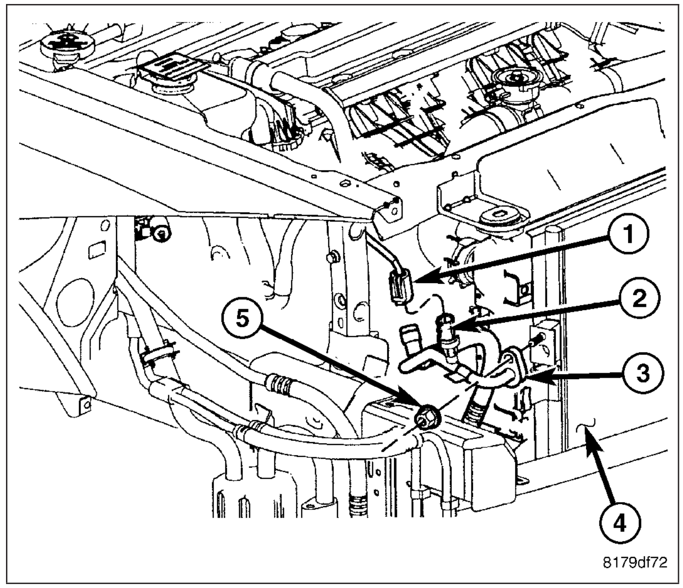
WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: It is not necessary to completely remove the front fascia for A/C discharge line service.

1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the splash shield from the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - REMOVAL).
5. Remove the nut (1) that secures the A/C discharge line (2) to the A/C compressor (3).
6. Disconnect the A/C discharge line from the A/C compressor and remove and discard the O-ring seal and gasket.
7. Install plugs in, or tape over the opened discharge line fitting and the compressor port.
8. Lower the vehicle.



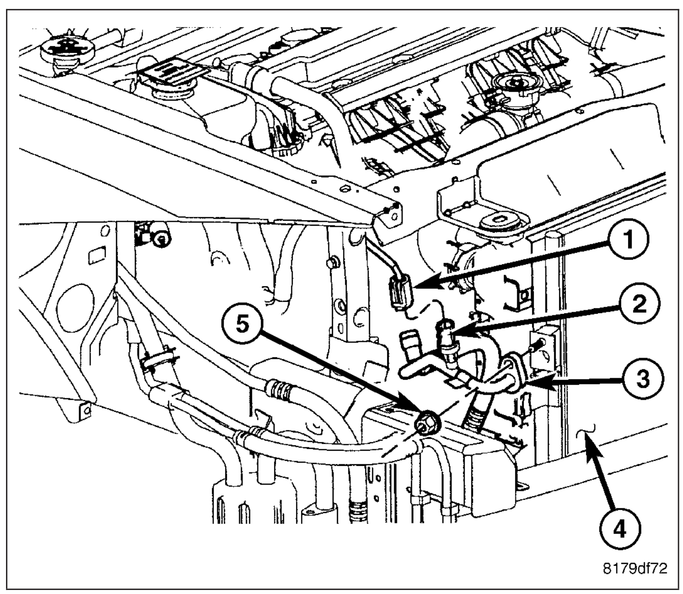
9. Remove the upper radiator closure panel and carefully pull the top of the fascia forward to gain access to the A/C discharge line (3) (refer to 23 - BODY/EXTERIOR/CLOSURE PANEL-UPPER RADIATOR - REMOVAL).
10. Reach down through the opening between the radiator and the front fascia and disconnect the wire harness connector (1) from the A/C pressure transducer (2).
11. Remove the nut (5) that secures the A/C discharge line to the right side of the A/C condenser (4).
12. Disconnect the A/C discharge line from the A/C condenser and remove and discard the O-ring seal and gasket.
13. Install plugs in, or tape over the discharge line fitting and the condenser port.
14. If necessary, remove the A/C pressure transducer from the A/C discharge line.



INSTALLATION

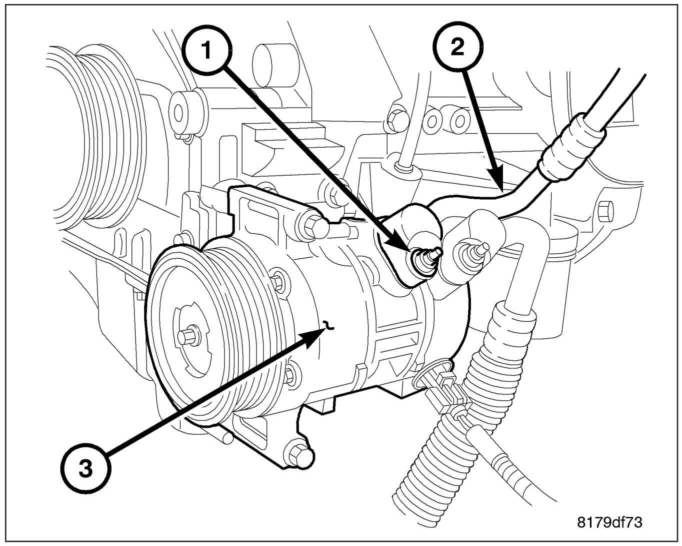
NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

1. If removed, install the A/C pressure transducer (2) onto the A/C discharge line (3). Tighten the A/C pressure transducer securely.
2. Position the A/C discharge line into the engine compartment.
3. Remove the tape or plugs from the discharge line fitting and the condenser port.
4. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
5. Reach down through the opening between the radiator and the front fascia and connect the A/C discharge line to the A/C condenser (4).



6. Install the nut (5) that secures the A/C discharge line to the A/C condenser. Tighten the nut to 5 N·m (44 in. lbs.).
7. Connect the wire harness connector (1) to the A/C pressure transducer.
8. Install the upper radiator closure panel (refer to 23 - BODY/EXTERIOR/CLOSURE PANEL-UPPER RADIATOR - INSTALLATION).

9. Raise and support the vehicle.
10. Remove the tape or plugs from the discharge line fitting and the compressor port.
11. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
12. Connect the A/C discharge line (2) to the A/C compressor (3).
13. Install the nut (1) that secures the A/C discharge line to the A/C compressor. Tighten the nut to 20 N·m (15 ft. lbs.).
14. Install the splash shield onto the right side frame rail (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-RIGHT SIDE RAIL - INSTALLATION).
15. Lower the vehicle.
16. Reconnect the negative battery cable.



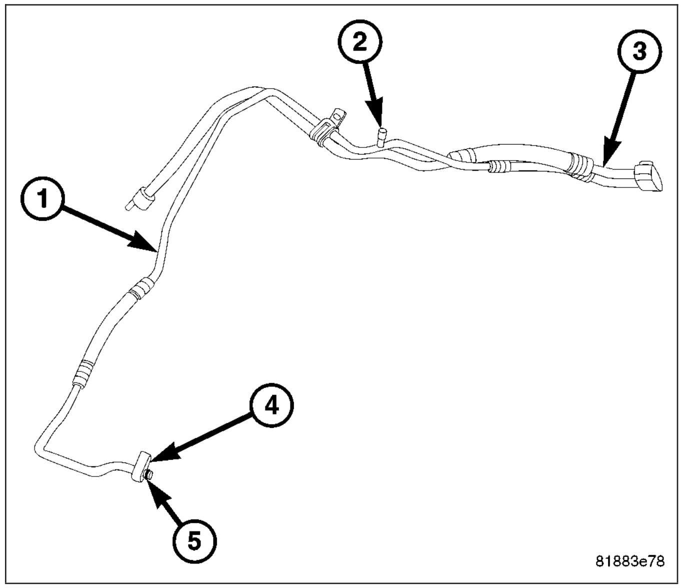
CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

17. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
18. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

LINE-A/C LIQUID

DESCRIPTION

The A/C liquid line (1) is the refrigerant line that carries refrigerant from the A/C condenser to the A/C evaporator. The A/C liquid line contains the low side service port (2) and the variable A/C orifice tube. The A/C liquid line is only serviced as an assembly with the upper A/C suction line (3).



CAUTION: Use only the O-ring seals specified for the vehicle. Failure to use the correct O-ring seals will cause the refrigerant system connections to leak.

The A/C liquid/suction line assembly has no serviceable parts except for the metal gaskets (4) and rubber O-ring seals (5) and the low side service port valve core. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals and gaskets must be replaced whenever the A/C liquid/suction line assembly is removed and installed.

The A/C liquid/suction line assembly cannot be repaired and, if leaking or damaged it must be replaced.

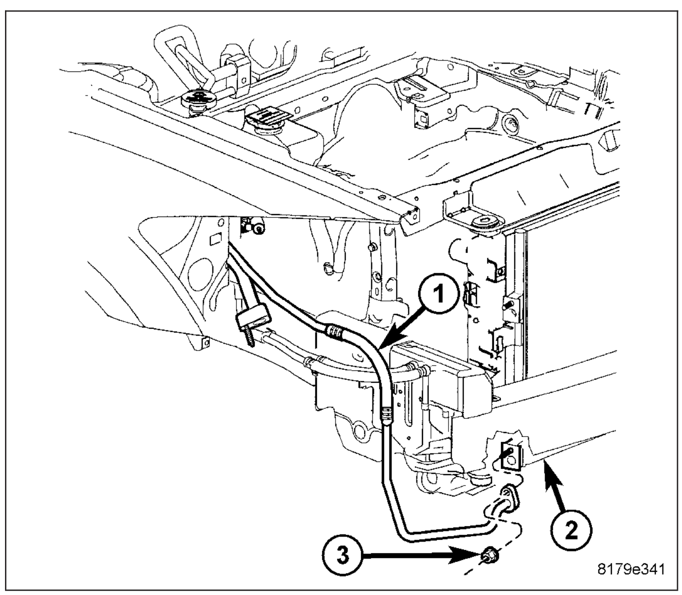
REMOVAL

WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: The A/C liquid line is only serviced as an assembly with the upper A/C suction line.

NOTE: LHD model shown in illustrations. RHD model similar.

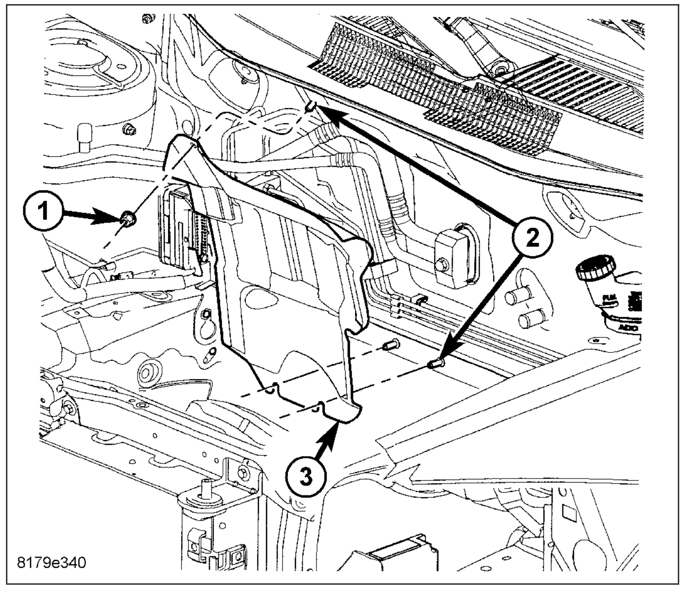
NOTE: Illustration shown with front fascia removed for clarity.

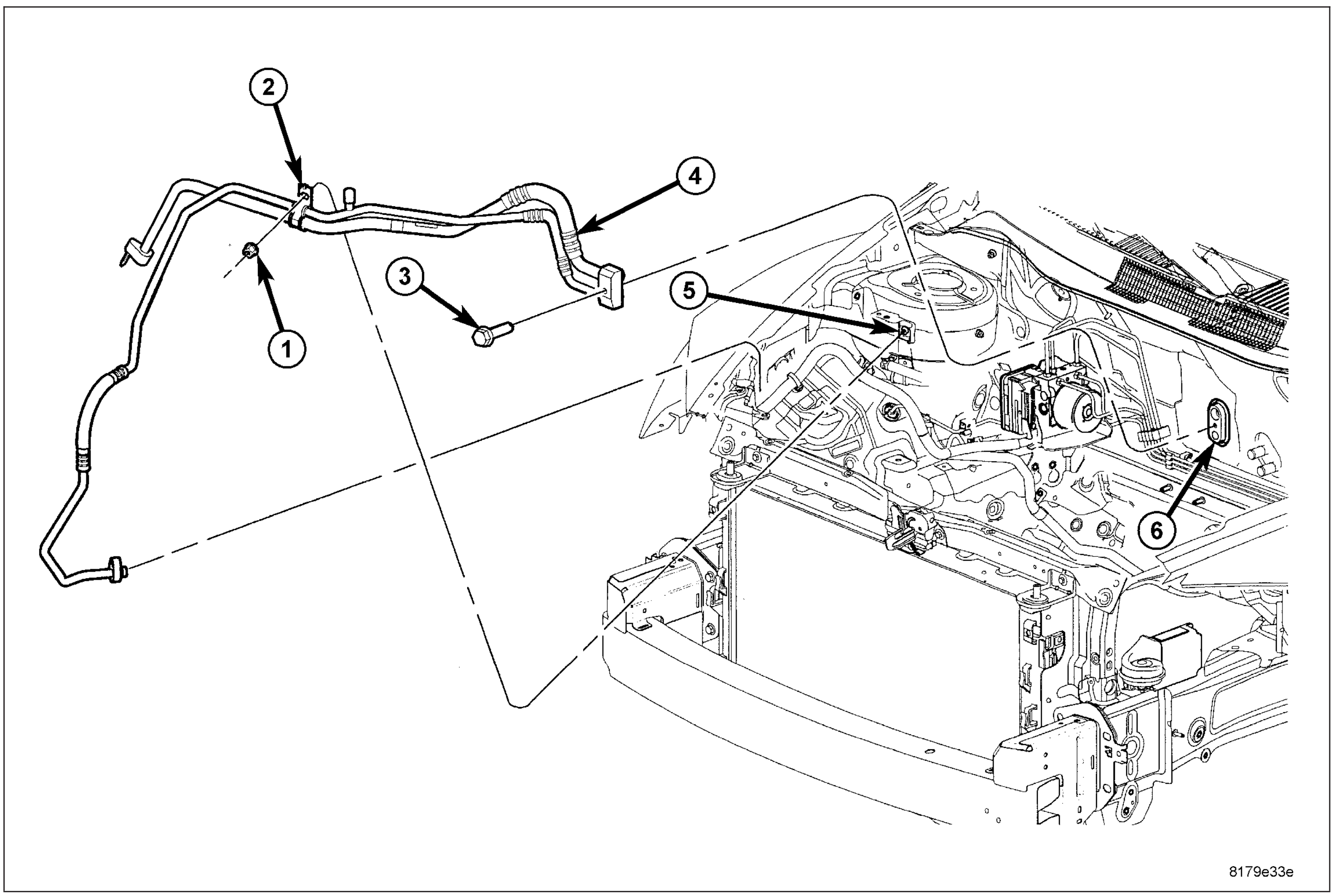


1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the A/C accumulator (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR-A/C - REMOVAL).
5. Reach up through the opening in the bottom of the front fascia located in the right front corner of the vehicle and remove the nut (3) that secures the A/C liquid line (1) to the A/C condenser (2).
6. Disconnect the A/C liquid line from the A/C condenser and remove and discard the O-ring seal and gasket.

7. Install plugs in, or tape over the opened refrigerant line fittings and the condenser and accumulator ports.

8. Lower the vehicle.
9. Remove the three nuts (1) that secure the heat shield (3) to the studs (2) located on the dash panel in the engine compartment and remove the heat shield.





NOTE: It is only necessary to position the engine coolant reservoir and the power steering fluid reservoir out of the way. Draining of the coolant and brake fluid is not required when servicing the washer bottle.

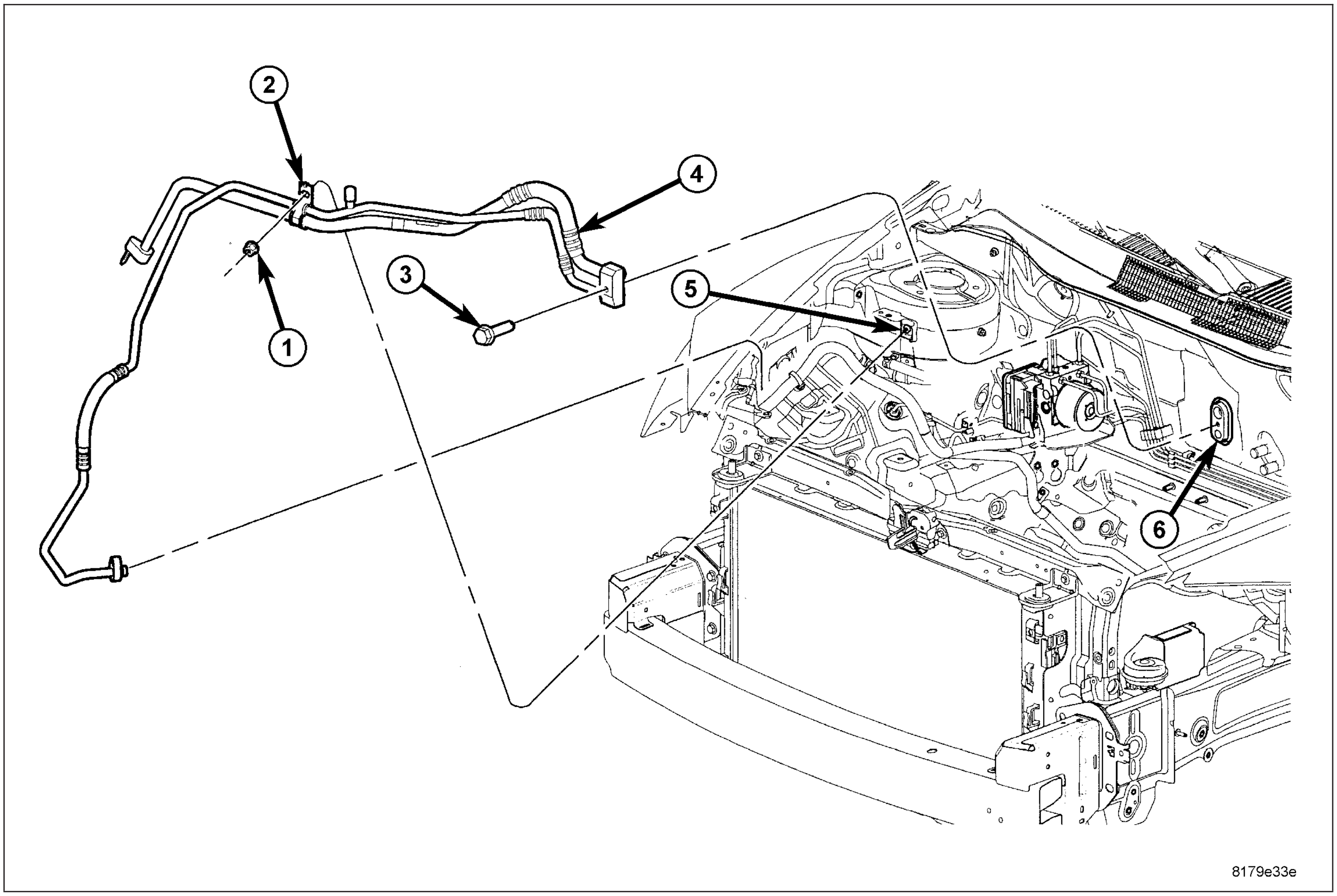
10. Remove the windshield washer reservoir (refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).
11. Remove the nut (1) that secures the refrigerant line retaining bracket (2) to the right front strut tower (5).

12. On RHD models, disengage the retainers that secure the power brake booster vacuum supply hose to the dash panel and position the vacuum line out of the way.
13. Remove the bolt (3) that secures the A/C liquid and suction line assembly (4) to the A/C evaporator (6).
14. Disconnect the A/C liquid and suction line assembly from the A/C evaporator and remove and discard the dual-plane seals.
15. Install plugs in, or tape over the opened refrigerant line fittings and the evaporator ports.
16. Remove the A/C liquid and suction line assembly from the engine compartment.

INSTALLATION

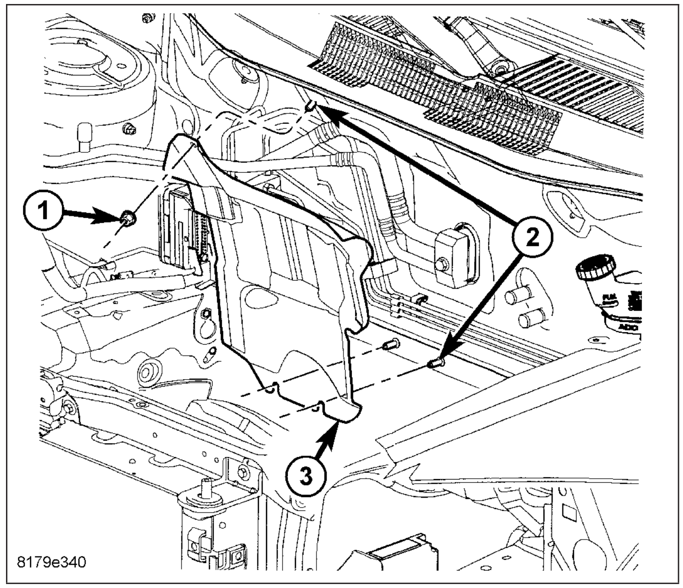
NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

NOTE: LHD model shown in illustrations. RHD model similar.



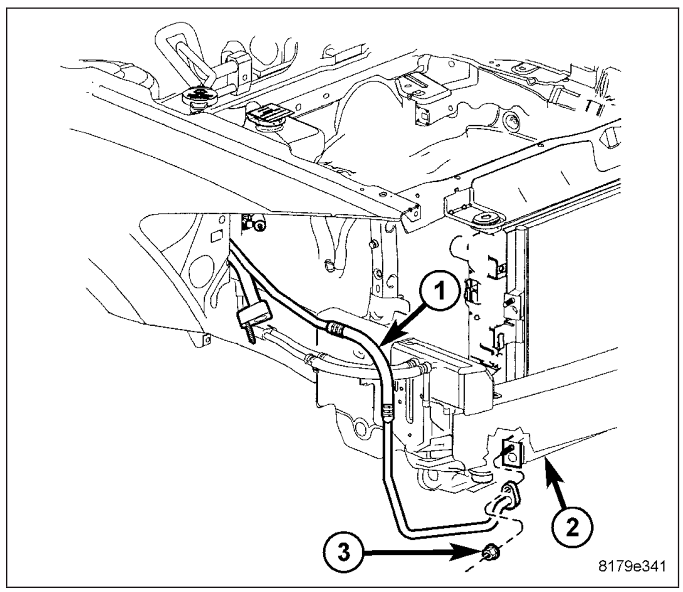
1. Position the A/C liquid and suction line assembly (4) into the engine compartment.
2. Remove the tape or plugs from the refrigerant line fittings and the evaporator ports.
3. Lubricate the rubber O-rings on new dual-plan seals with clean refrigerant oil and install the seals onto the liquid and suction line fittings. Use only the specified seals as they are made of special materials compatible to the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the A/C liquid and suction line assembly to the A/C evaporator (6).
5. Install the bolt (3) that secures the A/C liquid and suction line assembly to the A/C evaporator. Tighten the bolt to 12 N·m (105 in. lbs.).
6. On RHD models, engage the retainers that secure the power brake booster vacuum supply hose to the dash panel.

7. Install the nut (1) that secures the refrigerant line bracket (2) to the right front strut tower (5). Tighten the nut to 4.5 N·m (40 in. lbs.).
8. Install the windshield washer reservoir, power steering reservoir and the engine coolant reservoir (refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).
9. Position the heat shield (3) onto the studs (2) located on the dash panel in the engine compartment.
10. Install the three nuts (1) that secure the heat shield to the dash panel. Tighten the nuts to 1 N·m (10 in. lbs.).



NOTE: Illustration shown with front fascia removed for clarity.

11. Raise and support the vehicle.
12. Remove the tape or plugs from the liquid line fitting and the condenser port.
13. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
14. Reach up through the opening in the bottom of the front fascia and connect the A/C liquid line (1) to the A/C condenser (2) and install the retaining nut (3). Tighten the nut to 5 N·m (44 in. lbs.).
15. Install the A/C accumulator (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR - INSTALLATION).
16. Lower the vehicle.
17. Reconnect the negative battery cable.

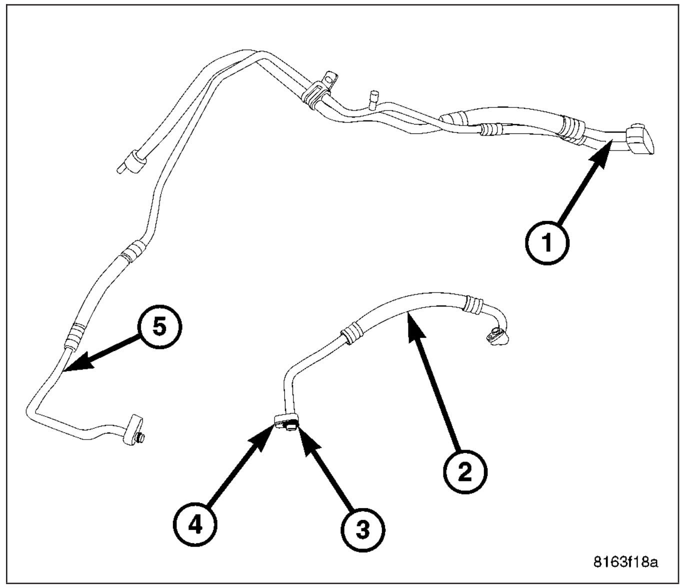


CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

18. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)
19. Charge the A/C system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

LINE-A/C SUCTION

DESCRIPTION



The A/C suction line is serviced in two sections. The upper section of the A/C suction line (1) is the refrigerant line that carries refrigerant from the A/C evaporator to the A/C accumulator. The lower section of the A/C suction line (2) carries refrigerant from the A/C accumulator to the A/C compressor. The upper portion of the A/C suction line is only serviced as an assembly with the A/C liquid line (5).

CAUTION: Use only the O-ring seals specified for the vehicle. Failure to use the correct O-ring seals will cause the refrigerant system connections to leak.

The lower A/C suction line and the A/C liquid/suction line assembly has no serviceable parts except for the rubber O-ring seals (3) and metal gaskets (4) and the low side service port valve core. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals and gaskets must be replaced whenever the lower A/C suction line and/or the A/C liquid/suction line assembly is removed and installed.

The lower A/C suction line and the A/C liquid/suction line assembly cannot be repaired and, if leaking or damaged they must be replaced.

REMOVAL

WARNING: Review safety precautions and warnings in this group before performing this procedure (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

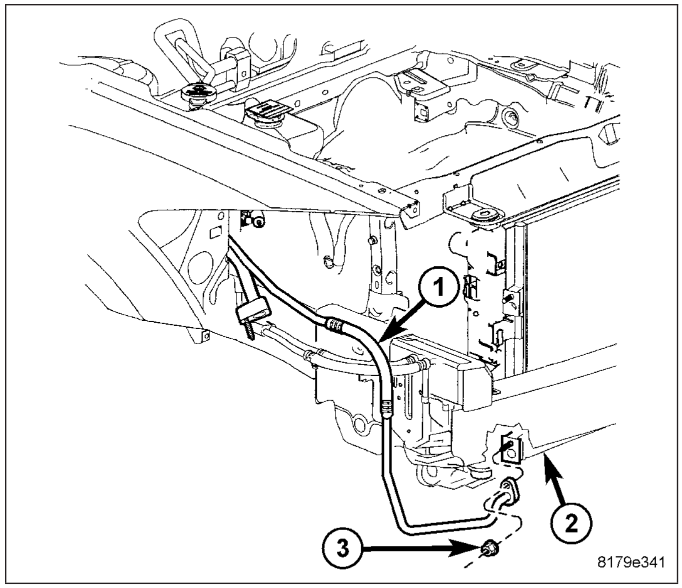
NOTE: The A/C suction line is serviced in two sections. The upper section of the A/C suction line is the refrigerant line that carries refrigerant from the A/C evaporator to the A/C accumulator. The lower section of the A/C suction line carries refrigerant from the A/C accumulator to the A/C compressor.

NOTE: LHD model shown in illustrations. RHD model similar.

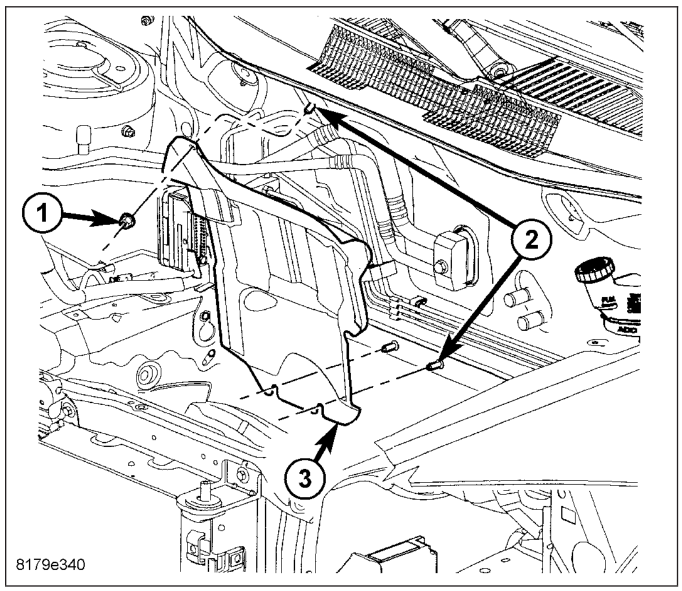
Upper A/C Suction Line

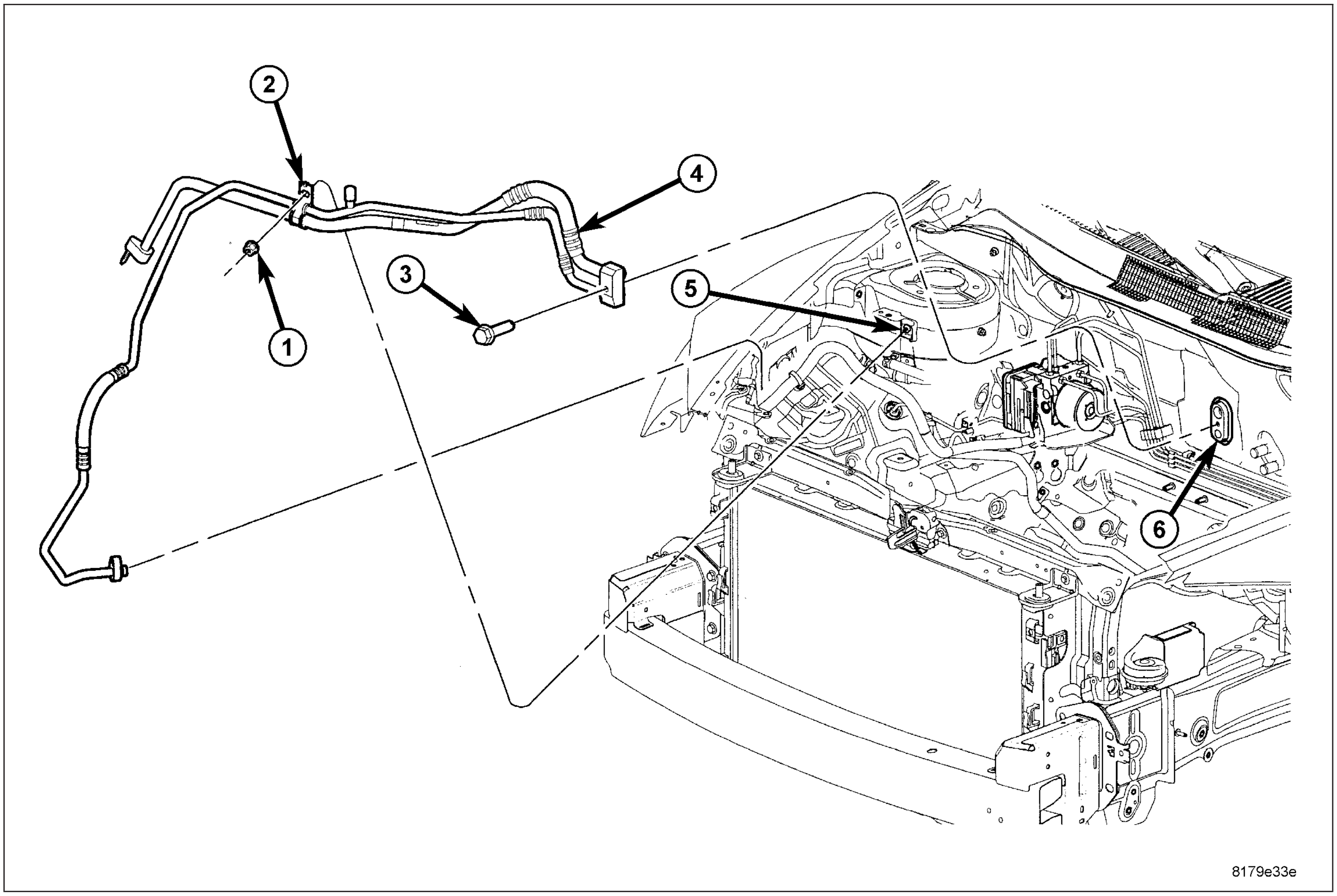
NOTE: The upper portion of the A/C suction line is only serviced as an assembly with the A/C liquid line.

NOTE: Illustration shown with front fascia removed for clarity.



1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the A/C accumulator (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR-A/C - REMOVAL).
5. Reach up through the opening in the bottom of the front fascia located in the right front corner of the vehicle and remove the nut (3) that secures the A/C liquid line (1) to the A/C condenser (2).
6. Disconnect the A/C liquid line from the A/C condenser and remove and discard the O-ring seal and gasket.
7. Install plugs in, or tape over the opened refrigerant line fittings and the condenser and accumulator ports.
8. Lower the vehicle.
9. Remove the three nuts (1) that secure the heat shield (3) to the studs (2) located on the dash panel in the engine compartment and remove the heat shield.



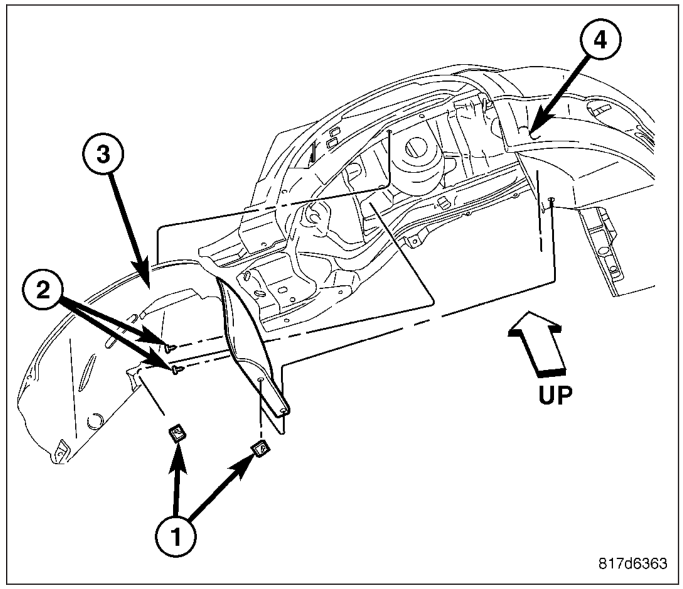


NOTE: It is only necessary to position the engine coolant reservoir and the power steering fluid reservoir out of the way. Draining of the coolant and brake fluid is not required when servicing the washer bottle.

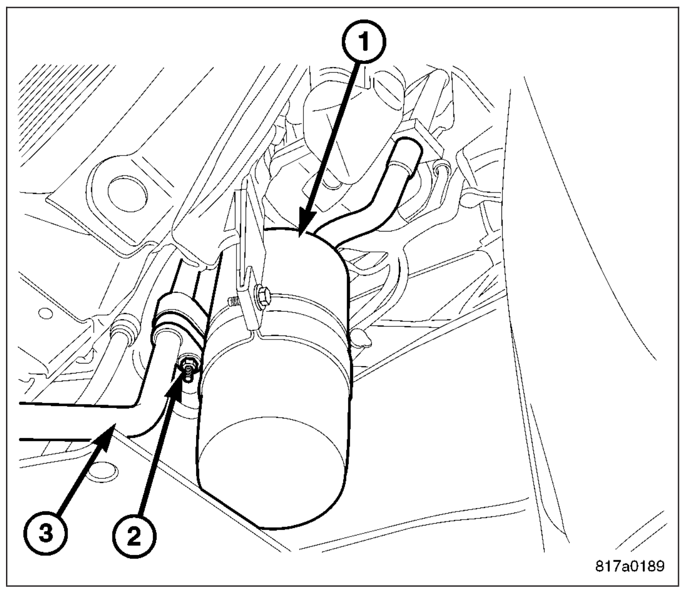
10. Remove the windshield washer reservoir (refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).
11. Remove the nut (1) that secures the refrigerant line retaining bracket (2) to the right front strut tower (5).
12. On RHD models, disengage the retainers that secure the power brake booster vacuum supply hose to the dash panel and position the vacuum line out of the way.
13. Remove the bolt (3) that secures the A/C liquid and suction line assembly (4) to the A/C evaporator (6).
14. Disconnect the A/C liquid and suction line assembly from the A/C evaporator and remove and discard the dual-plane seals.
15. Install plugs in, or tape over the opened refrigerant line fittings and the evaporator ports.
16. Remove the A/C liquid and suction line assembly from the engine compartment.

Lower A/C Suction Line

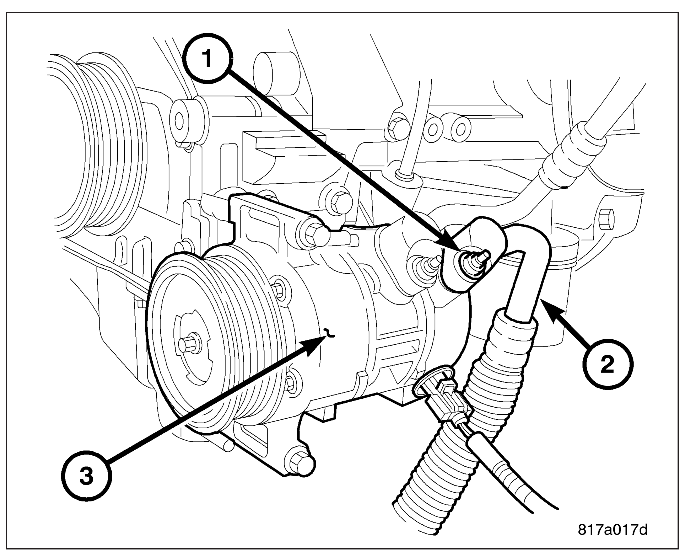
1. Disconnect and isolate the negative battery cable.
2. Recover the refrigerant from the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Raise and support the vehicle.
4. Remove the right front wheel (refer to 22 - TIRES/ WHEELS - REMOVAL).
5. Remove the three push-pin retainers (1) and three screws (2) that secure the front portion of the right front wheelhouse splash shield (3) to body (4) and position the front of the wheelhouse splash shield out of the way to gain access to the A/C accumulator (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - REMOVAL).



6. Remove the nut (2) that secures the lower A/C suction line (3) to the A/C accumulator (1).
7. Disconnect the lower A/C suction line from the A/C accumulator and remove and discard the O-ring seal and gasket.
8. Install plugs in, or tape over the opened suction line fitting and the accumulator port.



9. Remove the nut (1) that secures the lower A/C suction line (2) to the A/C compressor (3).
10. Disconnect the lower A/C suction line from the A/C compressor and remove and discard the O-ring seal and gasket.
11. Install plugs in, or tape over the opened suction line fitting and the compressor port.
12. Remove the lower A/C suction line from the engine compartment.

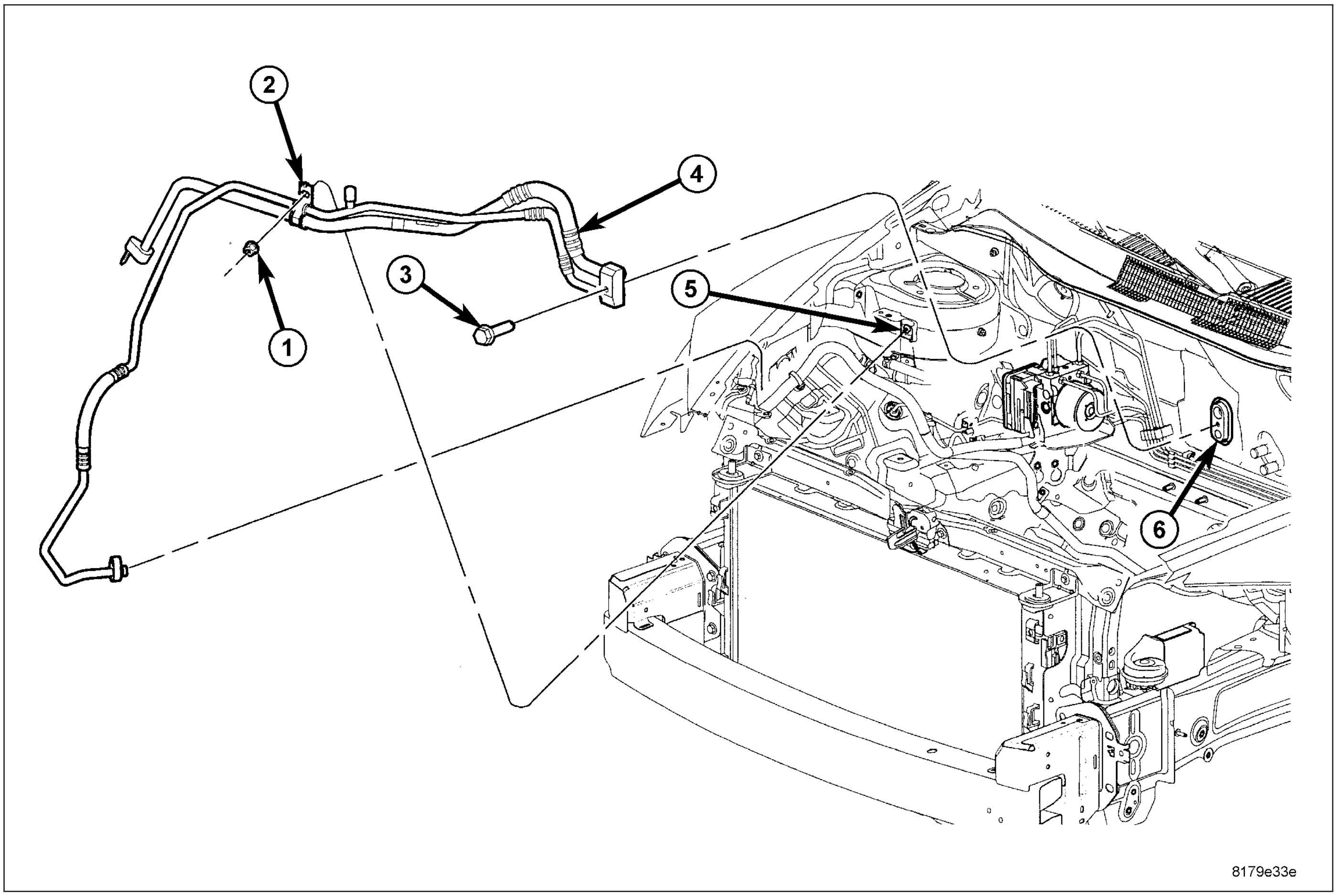


INSTALLATION

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

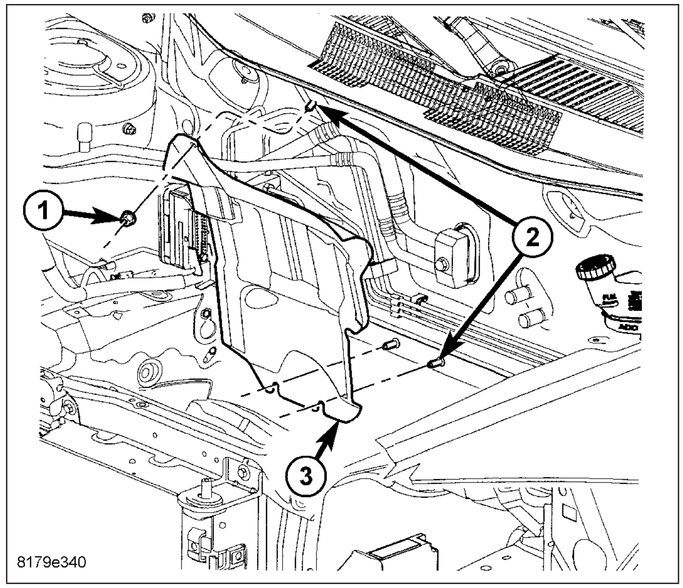
NOTE: LHD model shown in illustrations. RHD model similar.

Upper A/C Suction Line

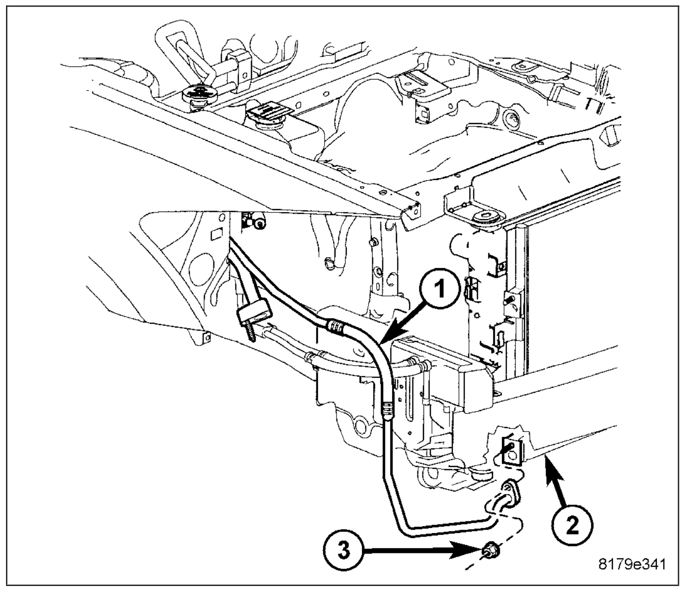


1. Position the A/C liquid and suction line assembly (4) into the engine compartment.
2. Remove the tape or plugs from the refrigerant line fittings and the evaporator ports.
3. Lubricate the rubber O-rings on new dual-plan seals with clean refrigerant oil and install the seals onto the liquid and suction line fittings. Use only the specified seals as they are made of special materials compatible to the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the A/C liquid and suction line assembly to the A/C evaporator (6).
5. Install the bolt (3) that secures the A/C liquid and suction line assembly to the A/C evaporator. Tighten the bolt to 12 N·m (105 in. lbs.).
6. On RHD models, engage the retainers that secure the power brake booster vacuum supply hose to the dash panel.
7. Install the nut (1) that secures the refrigerant line bracket (2) to the right front strut tower (5). Tighten the nut to 4.5 N·m (40 in. lbs.).
8. Install the windshield washer reservoir, power steering reservoir and the engine coolant reservoir (refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).

9. Position the heat shield (3) onto the studs (2) located on the dash panel in the engine compartment.
10. Install the three nuts (1) that secure the heat shield to the dash panel. Tighten the nuts to 1 N·m (10 in. lbs.).



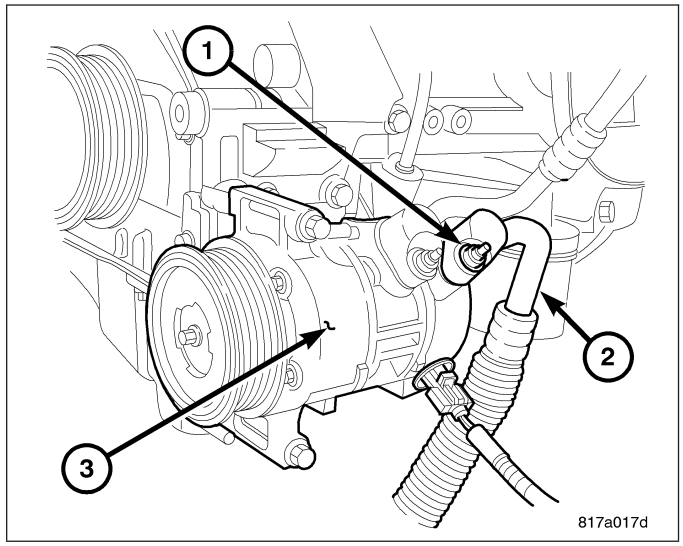
NOTE: Illustration shown with front fascia removed for clarity.



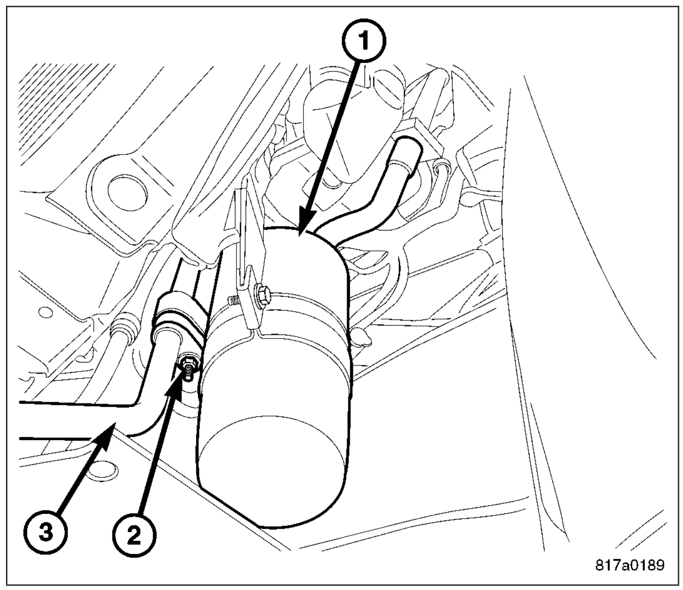
11. Raise and support the vehicle.
12. Remove the tape or plugs from the liquid line fitting and the condenser port.
13. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
14. Reach up through the opening in the bottom of the front fascia and connect the A/C liquid line (1) to the A/C condenser (2) and install the retaining nut (3). Tighten the nut to 5 N·m (44 in. lbs.).
15. Install the A/C accumulator (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ACCUMULATOR - INSTALLATION).
16. Lower the vehicle.
17. Reconnect the negative battery cable.
18. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)
19. Charge the A/C system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

Lower A/C Suction Line

1. Position the lower A/C suction line (2) into the engine compartment.
2. Remove the tape or plugs from the suction line fitting and the compressor port.
3. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and new gasket onto the suction line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the lower A/C suction line to the A/C compressor (3).
5. Install the nut (1) that secures the A/C suction line to the A/C compressor. Tighten the nut to 20 N·m (15 ft. lbs.).



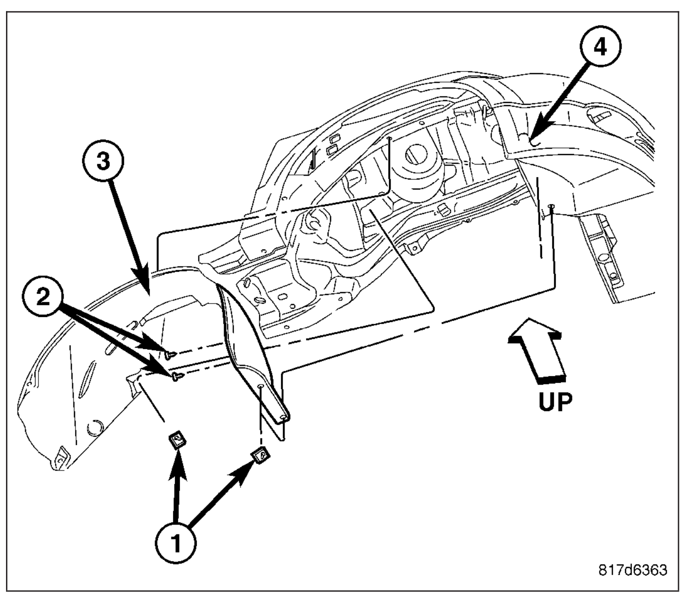
6. Remove the tape or plugs from the suction line fitting and the accumulator port.
7. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and new gasket onto the suction line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Connect the lower A/C suction line (3) to the A/C accumulator (1).
9. Install the nut (2) that secures the lower A/C suction line to the A/C accumulator. Tighten the nut to 5 N·m (44 in. lbs.).



10. Reposition the front of the right front wheel house splash shield (3) to the body (4) and install the three push-pin retainers (1) and the three screws (2). Tighten the screws securely (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - INSTALLATION).
11. Install the right front wheel (refer to 22 - TIRES/WHEELS - INSTALLATION).
12. Lower the vehicle.
13. Reconnect the negative battery cable.

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

14. Evacuate the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -



STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).

15. Charge the refrigerant system (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

OIL-A/C REFRIGERANT

DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, polyalkylene glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available and each contain a different additive package. Always use only the type of refrigerant oil recommended for the A/C compressor in the vehicle.

CAUTION: Be certain to check and adjust the refrigerant system oil level when replacing an A/C compressor (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL). Failure to properly adjust the refrigerant oil level can prevent the A/C system from operating as designed and can cause serious A/C compressor damage.

The Denso 5SE12C A/C compressor used in this vehicle is designed to use ND-8 PAG refrigerant oil. Use only this type of refrigerant oil in the refrigerant system.

OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause A/C compressor damage, and too much can reduce A/C system performance.

PAG refrigerant oil is more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

STANDARD PROCEDURE

REFRIGERANT OIL LEVEL

When an A/C system is assembled at the factory, all components except the A/C compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the A/C compressor is dispersed throughout the refrigerant system. The A/C accumulator, A/C evaporator, A/C condenser and the A/C compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of refrigerant oil in the A/C system. This ensures proper lubrication of the A/C compressor. Too little oil will result in damage to the A/C compressor, while too much oil will reduce the cooling capacity of the A/C system and consequently result in higher discharge air temperatures.

CAUTION: ND-8 PAG refrigerant oil is used in the Denso 5SE12C A/C compressor. Only refrigerant oil of the same type should be used to service this R-134a A/C system. Do not use any other refrigerant oil. The refrigerant oil container should be kept tightly capped until it is ready for use and then tightly capped after use to prevent contamination from moisture and dirt. Refrigerant oil will quickly absorb any moisture it comes in contact with, therefore, special effort must be used to keep all R-134a system components moisture-free. Moisture in the refrigerant oil is very difficult to remove and will cause a reliability problem with the A/C compressor.

NOTE: Most reclaim/recycling equipment will measure the amount of refrigerant oil being removed during the recovery process. This amount of refrigerant oil should always be added back into the refrigerant system. Refer to the reclaim/recycling equipment manufacturers instructions.

It will not be necessary to check the oil level within the A/C refrigerant system or to add oil, unless there has been an oil loss. A refrigerant oil loss may occur due to component replacement or a rupture or leak from a refrigerant line, connector fitting, component or component seal. If a leak does occurs, add 30 milliliters (1 fluid ounce) of the recommended refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when an A/C accumulator, A/C evaporator or A/C condenser is replaced. Refer to the Refrigerant Oil Capacities chart.

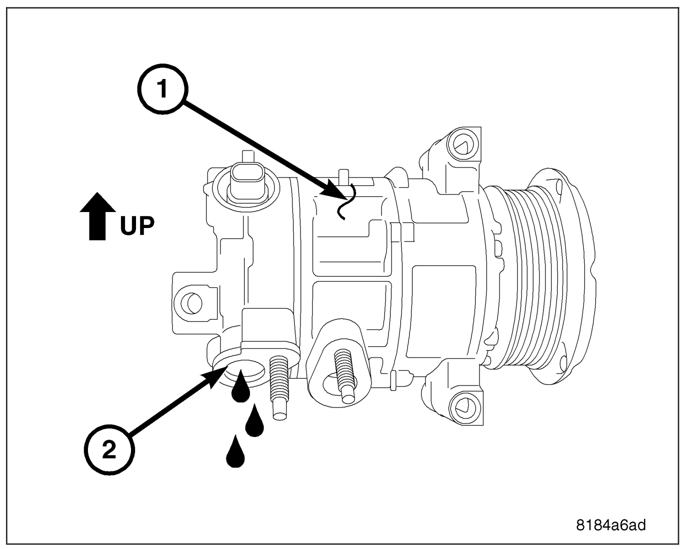
REFRIGERANT OIL CAPACITIES

Component	ml.	oz.
Total System Fill	100	3.4
A/C Accumulator	20	0.7
A/C Condenser	30	1.0
A/C Evaporator	20	0.7
A/C Compressor	Drain and measure the oil from the old compressor - see following text.	

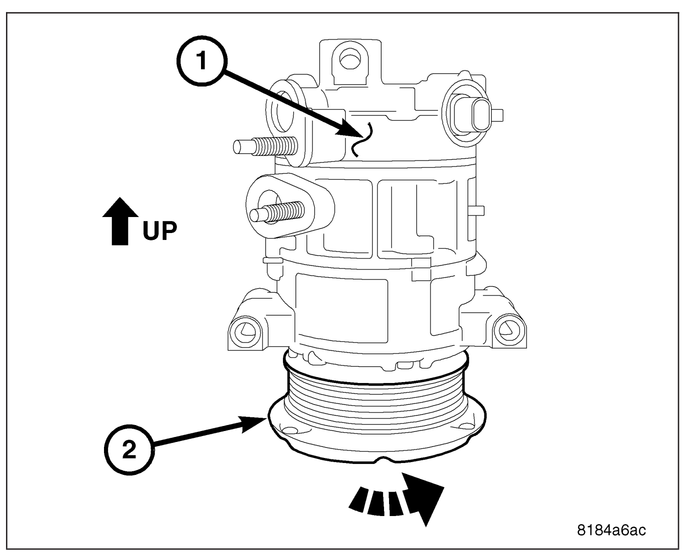
CAUTION: Be certain to check and adjust the refrigerant system oil level when replacing an A/C compressor. The refrigerant oil in the Denso 5SE12C A/C compressor can only be drained using the procedure described below. Failure to properly drain the refrigerant oil from the A/C compressor can prevent the A/C system from operating as designed and cause serious compressor damage.

When an A/C compressor is replaced, the refrigerant oil must first be drained from the old compressor and measured. Then the refrigerant oil from the new A/C compressor must be completely drained. Finally, the new A/C compressor must be refilled with the same amount of refrigerant oil that was drained from the old compressor. Use the following procedure to drain and measure the refrigerant oil in the Denso 5SE12C A/C compressor.

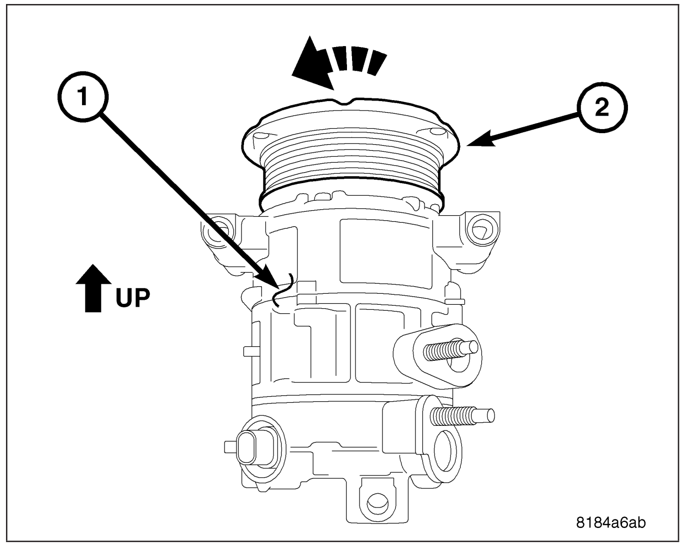
1. Remove the original A/C compressor (1) and place it on a workbench (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - REMOVAL).
2. Using a suitable clean measured container, position the A/C compressor so that the refrigerant oil can drain out of the suction port (2). Hold the A/C compressor in this position until no more oil comes out of the compressor port.



3. Reposition the A/C compressor (1) so that the pulley (2) is facing downward and rotate the compressor pulley clockwise ten full turns. Make sure that each rotation of the pulley is performed within two seconds.



4. Reposition the A/C compressor (1) so that the pulley (2) is facing upward and slowly rotate the compressor pulley clockwise one full turn.
5. Repeat steps 2 thru 4 at least five times.
6. Determine the amount of oil removed from the original A/C compressor.
7. Repeat steps 2 thru 4 with the new A/C compressor at least five times.
8. Using fresh ND-8 PAG refrigerant oil, place the same amount of oil that was removed from the original A/C compressor into the new A/C compressor.
9. Install the new A/C compressor onto the engine (refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/COMPRESSOR-A/C - INSTALLATION).



REFRIGERANT-A/C

DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

OPERATION

R-134a refrigerant is not compatible with R-12 refrigerant in an A/C system. Even a small amount of R-12 refrigerant added to an R-134a refrigerant system will cause A/C compressor failure, refrigerant oil sludge or poor A/C system performance. In addition, the polyalkylene glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

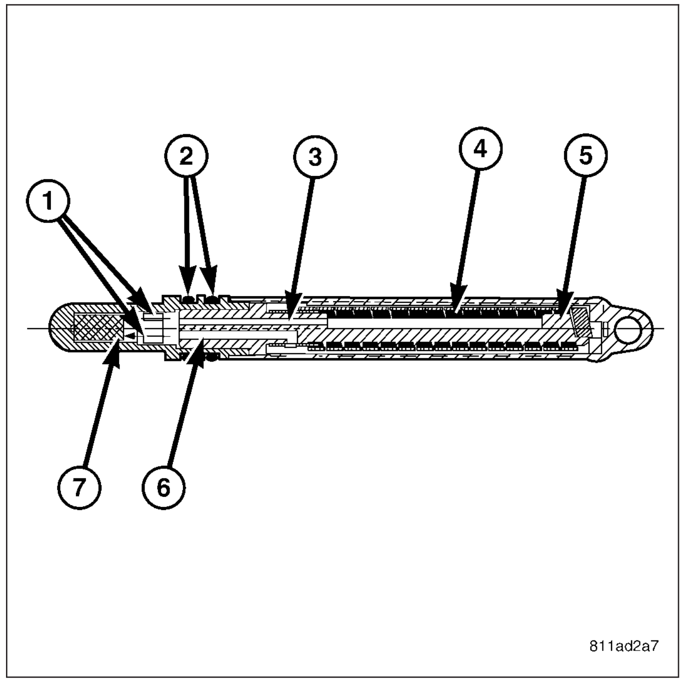
R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a refrigerant system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the A/C compressor to identify that the A/C system is equipped with R-134a refrigerant.

TUBE-A/C VARIABLE ORIFICE

DESCRIPTION

The A/C orifice tube establishes the pressure differential between the high and low pressure sides of the A/C system by providing a restriction between the A/C condenser and the A/C evaporator. The A/C orifice tube in this vehicle is installed in the A/C liquid line and is of a variable orifice valve (VOV) design.

The variable A/C orifice tube consists of the inlet filter screen (5), the bi-metal coil (4), the fixed port (3), the variable port (6), metering orifices (1), a nylon mesh diffuser screen (7) and two rubber O-rings (2) which seal the tube to the inside of the A/C liquid line to prevent refrigerant from bypassing the metering orifices.



OPERATION

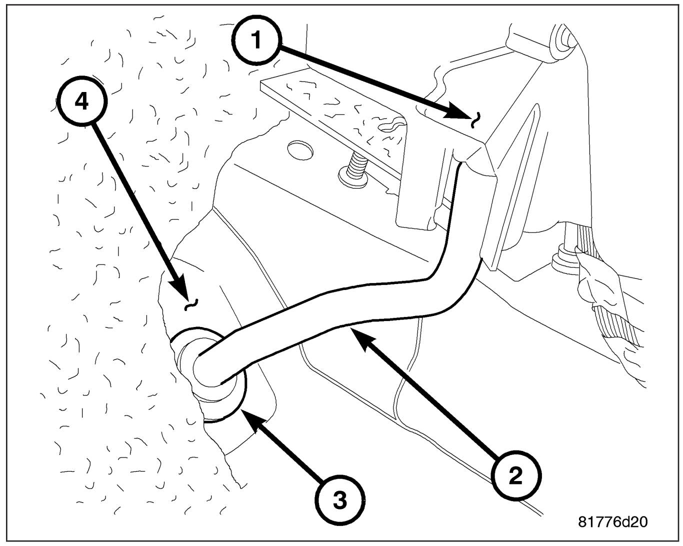
The variable A/C orifice tube provides improved A/C system cooling during city driving and when under heavy loads by controlling refrigerant flow through the two parallel flow paths integral to the orifice tube. Under normal loads, the refrigerant flows through the inlet filter screen, the fixed and variable ports and both metering orifices. As the load on the A/C system increases, the temperature of the refrigerant leaving the A/C condenser increases, which causes the bi-metal coil to expand and restrict the flow of refrigerant through the variable port of the tube. Restricting the flow of refrigerant through the variable port and its orifice provides a greater pressure differential between the high and low pressure sides of the A/C system, resulting in colder refrigerant vapor traveling through the A/C evaporator to help remove the heat from the conditioned air flowing into the passenger compartment.

The variable A/C orifice tube is not serviceable and cannot be repaired and, if faulty or plugged, the A/C liquid line must be replaced (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C LIQUID - DESCRIPTION).

TUBE-CONDENSATION DRAIN

DESCRIPTION

Condensation that accumulates within the HVAC housing is drained through a port located at the bottom of the HVAC housing (1). A rubber condensation drain tube (2) is installed onto the drain port and protrudes through a rubber grommet (3) in the left side floor panel (4) to ensure that any condensate completely drains out of the HVAC housing and to the ground.



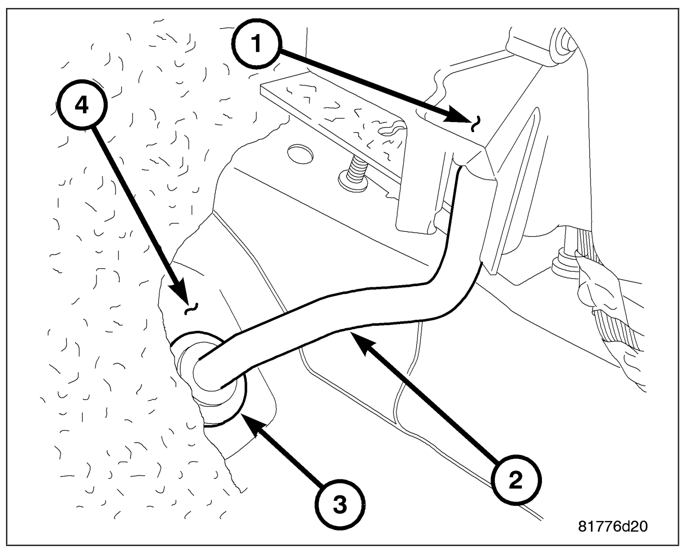
NOTE: The condensation drain tube must be kept open to prevent water from collecting in the bottom of the HVAC housing.

The drain tube is designed to keep contaminants from entering the HVAC housing. If the tube is pinched or blocked, condensate cannot drain, causing water to back up and spill into the passenger compartment. It is normal to see condensation drainage below the vehicle in warm weather.

If the condensation drain tube is damaged or missing, it must be replaced.

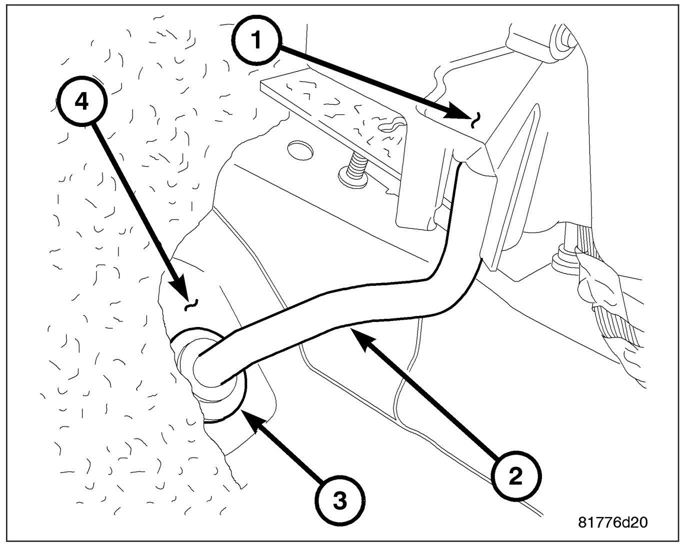
REMOVAL

1. Pull back the floor carpet to gain access to the condensation drain tube (2) located on the left side of the vehicle at the front right of the foot well.
2. Disconnect the condensation drain tube from the bottom of the HVAC housing (1).
3. Remove the condensate drain tube from the rubber grommet (3) in the front floor panel (4).
4. If required, remove the rubber grommet from the floor panel.



INSTALLATION

1. If removed, install the rubber grommet (3) onto the driver side front floor panel (4). Make sure the grommet is fully engaged to the floor panel.
2. Connect the condensation drain tube (2) onto the drain port located on the bottom of the HVAC housing (1).
3. Install the condensation drain tube into the rubber grommet.
4. Reinstall the floor carpet (refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION).



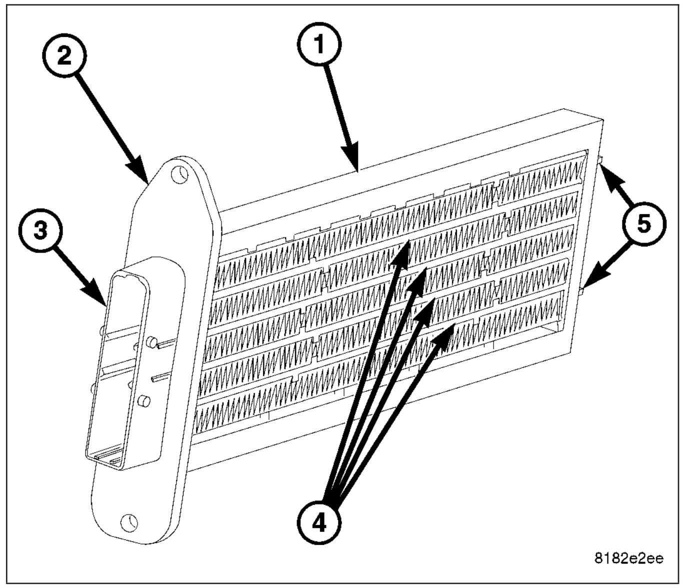
HEATER-CABIN

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HEATER UNIT

DESCRIPTION

NOTE: LHD model shown. RHD model similar.



An electric positive temperature coefficient (PTC) heater unit (1) is used on vehicles when equipped with the 2.0L diesel engine. The PTC heater unit aids in passenger compartment heating by compensating for the lower engine coolant temperatures produced by the diesel engine. The PTC heater unit is mounted in the HVAC air distribution housing, downstream of the heater core and is controlled by the diesel engine control module (ECM) and the totally integrated power module (TIPM) through two relays in diesel accessory fuse/relay block located below the left front fender.

The PTC heater consists of a molded plastic mounting plate (2) with an integral wire connector receptacle (3). Concealed behind the mounting plate are four heating elements with fins (4) that transfer the heat produced by the PTC heater to the conditioned air flowing within the air distribution housing. Two retaining tabs (5) are molded onto the opposite end of the heater unit to support the heater unit inside the air distribution housing. The PTC heater unit is connected to the vehicle electrical system through the instrument panel wire harness.

The PTC heater unit is accessed for service by removing the instrument panel.

OPERATION

The positive temperature coefficient (PTC) heater unit dissipates 1 kW of electrical power through 4 heating bars. The totally integrated power module (TIPM) operates the two relays for the PTC heater unit. The PTC heater unit is split into two ″banks″. Each bank is driven separately based on alternator load. This allows for lower in-rush current and optimum battery charging. After a bank has been turned on, another bank can only be turned on 10 seconds after the previous. On average, the PTC banks are not switched more than 25 times for each vehicle start. Electrical power output is between 900-1050 W.

The control system for the PTC heater unit is diagnosed using a scan tool. Prior to replacing a PTC heater unit, check for any diagnostic trouble codes (DTCs) related to the ECM, TIPM and heating-A/C system (refer to 24 - HVAC Electrical Diagnostics for more information).

The PTC heater unit cannot be adjusted or repaired and, if faulty or damaged it must be replaced.

DIAGNOSIS AND TESTING

POSITIVE TEMPERATURE COEFFICIENT (PTC) HEATER UNIT

WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

Prior to replacing the positive temperature coefficient (PTC) heater unit, check for any diagnostic trouble codes (DTCs) related to the engine control module (ECM), totally integrated power module (TIPM) and the heating-A/C system and repair as necessary (refer to 24 - HVAC Electrical Diagnostics for more information).

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the PTC heater unit (Refer to 24 - HEATING & AIR CONDITIONING/CABIN HEATER/HEATER UNIT - REMOVAL).
3. Using an ohmmeter, check for continuity between all of the PTC heater unit terminals. In each case there should be continuity. If OK, repair the wire harness circuits between the PTC heater unit and the TIPM. If NOT OK, replace the PTC heater unit.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

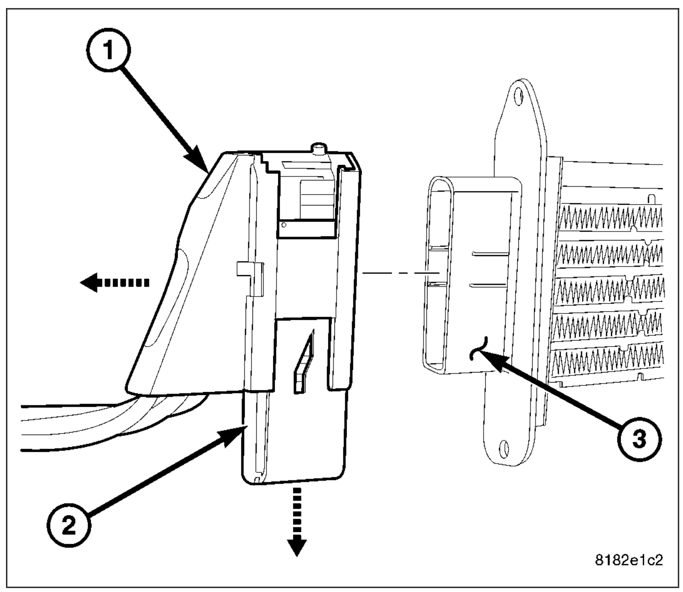
WARNING: Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: PTC heater shown removed from distribution housing for clarity.

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).

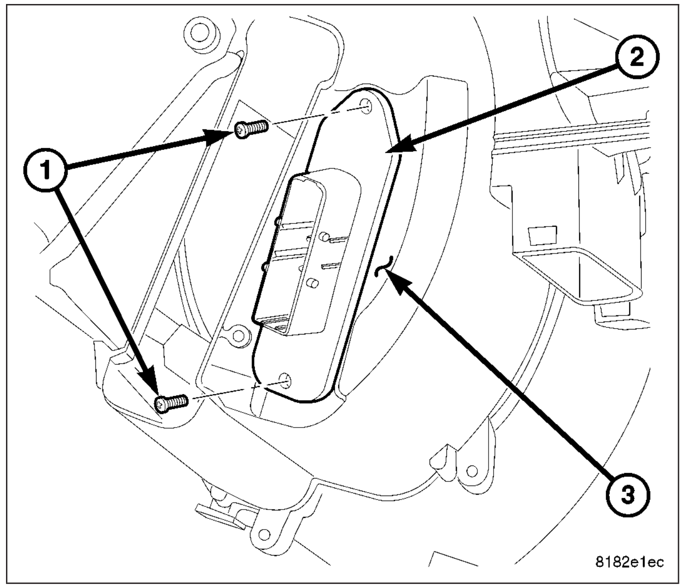
NOTE: To disconnect the wire harness connector from the heater unit, pull downward on the connector lock while pulling the connector away from the heater unit.

3. Disengage the wire connector lock (2) that secures the wire harness connector (1) to the positive temperature coefficient (PTC) heater unit (3) located on the left side of the HVAC air distribution housing and disconnect the connector from the heater.



NOTE: LHD model shown. RHD model similar.

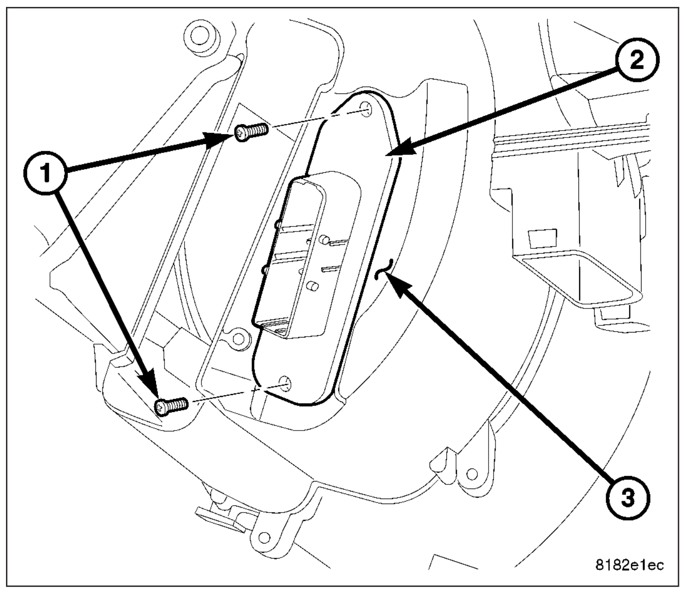
4. Remove the two screws (1) that secure the PTC heater unit (2) to the left side of the HVAC air distribution housing (3).
5. Carefully remove the PTC heater unit from the air distribution housing by pulling it straight out of the housing.



INSTALLATION

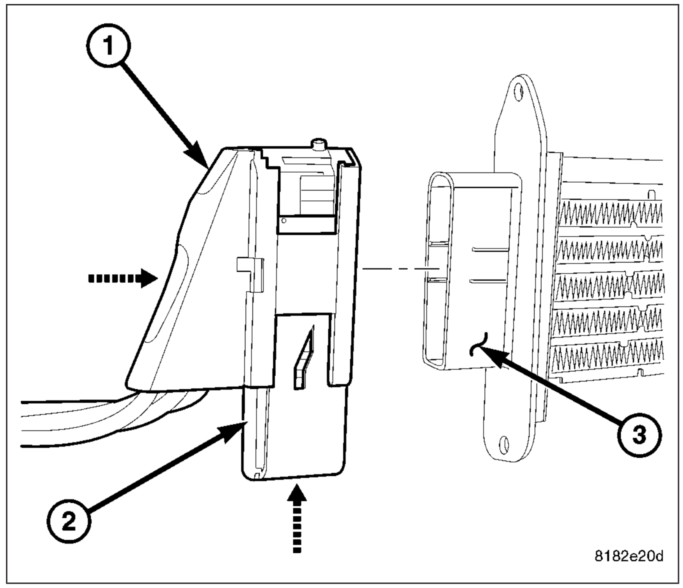
NOTE: LHD model shown. RHD model similar.

1. Carefully install the positive temperature coefficient (PTC) heater unit (2) into the left side of the HVAC air distribution housing (3). Make sure to position the two locator tabs on the end of the heater unit into the molded locator indentations on the right side of the air distribution housing.
2. Install the two screws (1) that secure the PTC heater unit to the air distribution housing. Tighten the screws to 1.2 N·m (10 in. lbs.).



NOTE: PTC heater shown removed from distribution housing for clarity.

3. Connect the wire harness connector (1) to the PTC heater unit (3) while pushing upward on the connector lock (2). Make sure the wire harness connector and lock are fully engaged.
4. Install the instrument panel (refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).
5. Reconnect the negative battery cable.

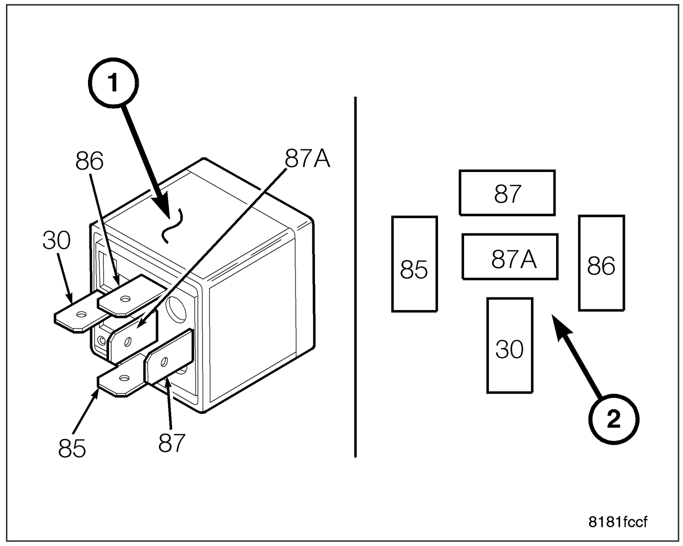


RELAY-HEATER UNIT

DESCRIPTION

Two relays (1) are used for the electric positive temperature coefficient (PTC) heater system when equipped with the 2.0L diesel engine. The relays are International Standards Organization (ISO)-type relays. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The PTC relays are electromechanical devices that switch fused battery current directly to the heating elements of the PTC heater unit. The PTC relays are energized by control circuits of the totally integrated power module (TIPM).

The two PTC relays are located diesel accessory fuse/relay block located below the left front fender.



OPERATION

The two ISO-standard relays (1) used for the electric positive temperature coefficient (PTC) heater system are electromechanical switches that use a low current ASD power input to control the high current fused battery power output to the PTC heater unit. On each relay, the movable, common feed relay contact is held against the fixed, normally closed relay contact by spring pressure. When the electromagnetic relay coil is energized, it draws the movable common feed relay contact away from the fixed, normally closed relay contact and, holds it against the fixed, normally open relay contact. This action allows high current to flow to one or more of the heating elements of the PTC heater.

When the relay coil is de-energized, spring pressure returns the movable relay contact back against the fixed, normally closed contact point. The resistor or diode is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The terminals for the PTC relays are connected to the vehicle electrical system through receptacles in the diesel accessory fuse/relay block. The inputs and outputs of the PTC relays include:

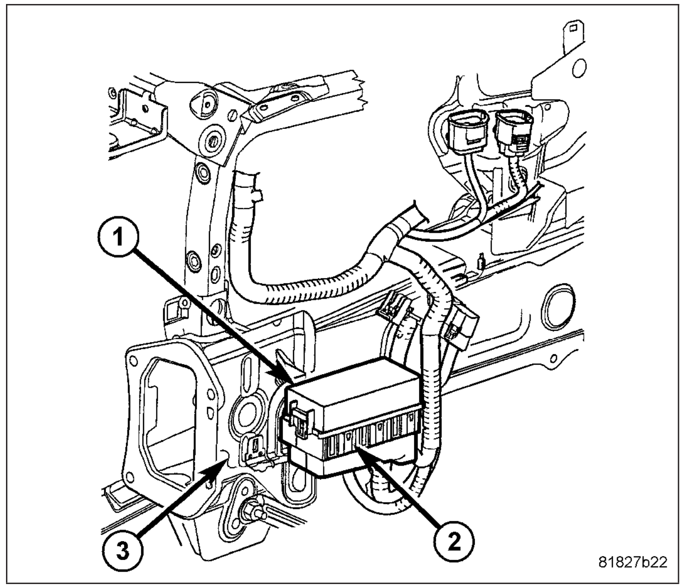
- Terminals (30) receive battery current through a fusible link at all times.
- Terminals (85) are connected to a ground circuit.
- Terminals (86) are connected to control circuits of the totally integrated power module (TIPM).
- Terminals (87) provide fused battery current to the PTC heating elements through the PTC relays only when the PTC relay coil is energized.
- Terminals (87A) are not connected to any circuit in this application, but provide battery current output only when the PTC relay coil is de-energized.

The two PTC relays cannot be repaired and, if faulty or damaged they must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relays and for complete TIPM and HVAC wiring diagrams.

REMOVAL

NOTE: LHD model shown. RHD model similar.

NOTE: Illustration shown with left front fender removed for clarity.

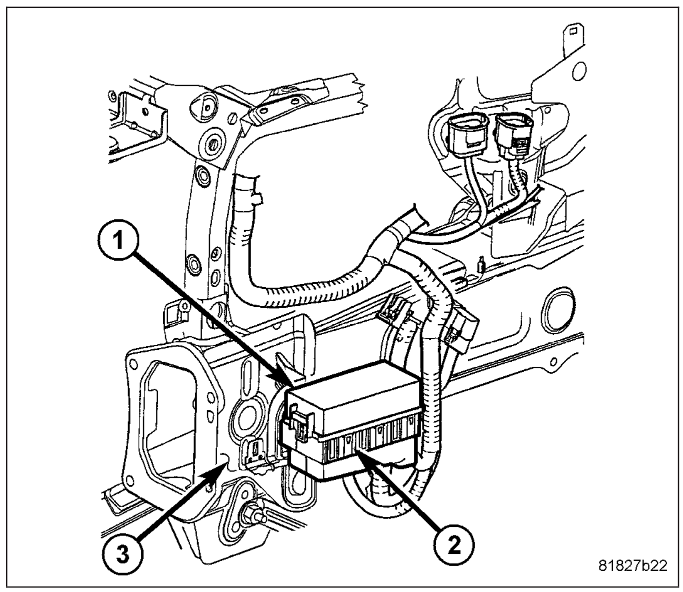


1. Disconnect and isolate the negative battery cable.
2. Remove the left front wheelhouse splash shield (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - REMOVAL).
3. Open the cover (1) of the diesel accessory fuse/relay block (2) located on the left front frame rail (3).
4. Remove the positive temperature coefficient (PTC) relays as necessary from the fuse/relay block.

INSTALLATION

NOTE: LHD model shown. RHD model similar.

NOTE: Illustration shown with left front fender removed for clarity.



1. Position the positive temperature coefficient (PTC) relays as necessary into the proper receptacle of the diesel accessory fuse/relay block (2) located on the left front frame rail (3).
2. Align the PTC relay terminals with the terminal cavities in the fuse/relay block and push down firmly on each relay until the terminals are fully seated.
3. Close the cover (1) of the diesel accessory fuse/relay block.
4. Install the left front wheel house splash shield (refer to 23 - BODY/EXTERIOR/SPLASH SHIELD-FRONT WHEELHOUSE - INSTALLATION).
5. Reconnect the negative battery cable.

EMISSIONS CONTROL

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EMISSIONS CONTROL

DESCRIPTION

MONITORED COMPONENT

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (Check Engine) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks as well as continuity tests (opens/shorts). Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum and 1600 rpm.

Any component that has an associated limp in will set a fault after 1 trip with the malfunction present.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

The following is a list of the monitored components:

- Catalyst Monitor
- Comprehensive Components
- EGR (if equipped)
- Fuel Control (rich/lean)
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Purge
- Misfire
- Evaporative System Integrity Monitor (ESIM)

COMPREHENSIVE COMPONENTS

Along with the major monitors, OBD II requires that the diagnostic system monitor any component that could affect emissions levels. In many cases, these components were being tested under OBD I. The OBD I requirements focused mainly on testing emissions-related components for electrical opens and shorts.

However, OBD II also requires that inputs from powertrain components to the PCM be tested for **rationality**, and that outputs to powertrain components from the PCM be tested for **functionality**. Methods for monitoring the various Comprehensive Component monitoring include:

1. Circuit Continuity
   - Open
   - Shorted high
   - Shorted to ground
2. Rationality or Proper Functioning
   - Inputs tested for rationality
   - Outputs tested for functionality

NOTE: Comprehensive component monitors are continuous. Therefore, enabling conditions do not apply. All will set a DTC and illuminate the MIL in 1- trip.

Input Rationality—While input signals to the PCM are constantly being monitored for electrical opens and shorts, they are also tested for rationality. This means that the input signal is compared against other inputs and information to see if it makes sense under the current conditions.

PCM sensor inputs that are checked for rationality include:

- Manifold Absolute Pressure (MAP) Sensor
- Oxygen Sensor (O2S) (slow response)

- Engine Coolant Temperature (ECT) Sensor
- Camshaft Position (CMP) Sensor
- Vehicle Speed Sensor
- Crankshaft Position (CKP) Sensor
- Inlet Air Temperature Sensor
- Throttle Position (TPS) Sensor
- Power Steering Switch
- Oxygen Sensor Heater
- Engine Controller
- Brake Switch
- Evaporative System Integrity Monitor (ESIM)
- P/N Switch
- Trans Controls

Output Functionality—PCM outputs are tested for functionality in addition to testing for opens and shorts. When the PCM provides a voltage to an output component, it can verify that the command was carried out by monitoring specific input signals for expected changes. For example, when the PCM commands the Idle Air Control (IAC) Motor to a specific position under certain operating conditions, it expects to see a specific (target) idle speed (RPM). If it does not, it stores a DTC.

PCM outputs monitored for functionality include:

- Fuel Injectors
- Ignition Coils
- Torque Converter Clutch Solenoid
- Purge Solenoid
- EGR Solenoid (if equipped)
- Radiator Fan Control
- Trans Controls

OXYGEN SENSOR (O2S) MONITOR

DESCRIPTION—Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. When there is a large amount of oxygen in the exhaust caused by a lean condition, misfire or exhaust leak, the sensor produces a low voltage, below 450 mV. When the oxygen content is lower, caused by a rich condition, the sensor produces a higher voltage, above 450mV.

The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR, Catalyst and Fuel Monitors, and purge.

The O2S may fail in any or all of the following manners:

- Slow response rate (Big Slope)
- Reduced output voltage (Half Cycle)
- Heater Performance

Slow Response Rate (Big Slope)—Response rate is the time required for the sensor to switch from lean to rich signal output once it is exposed to a richer than optimum A/F mixture or vice versa. As the PCM adjusts the air/fuel ratio, the sensor must be able to rapidly detect the change. As the sensor ages, it could take longer to detect the changes in the oxygen content of the exhaust gas. The rate of change that an oxygen sensor experiences is called 'Big Slope'. The PCM checks the oxygen sensor voltage in increments of a few milliseconds.

Reduced Output Voltage (Half Cycle)—The output voltage of the O2S ranges from 2.5 to 5 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value. Many times the condition is only temporary and

the sensor will recover. Under normal conditions the voltage signal surpasses the threshold, and a counter is incremented by one. This is called the Half Cycle Counter.

Heater Performance—The heater is tested by a separate monitor. Refer to the Oxygen Sensor Heater Monitor.

OPERATION—As the Oxygen Sensor signal switches, the PCM monitors the half cycle and big slope signals from the oxygen sensor. If during the test neither counter reaches a predetermined value, a malfunction is entered and a Freeze Frame is stored. Only one counter reaching its predetermined value is needed for the monitor to pass.

The Oxygen Sensor Signal Monitor is a two trip monitor that is tested only once per trip. When the Oxygen Sensor fails the test in two consecutive trips, the MIL is illuminated and a DTC is set. The MIL is extinguished when the Oxygen Sensor monitor passes in three consecutive trips. The DTC is erased from memory after 40 consecutive warm-up cycles without test failure.

Enabling Conditions—The following conditions must typically be met for the PCM to run the oxygen sensor monitor:

- Battery voltage
- Engine temperature
- Engine run time
- Engine run time at a predetermined speed
- Engine run time at a predetermined speed and throttle opening
- Transmission in gear (automatic only)
- Fuel system in Closed Loop
- Long Term Adaptive (within parameters)
- Power Steering Switch in low PSI (no load)
- Engine at idle
- Fuel level above 15%
- Barometric pressure
- Engine RPM within acceptable range of desired idle
- Closed throttle speed

Pending Conditions—The Task Manager typically does not run the Oxygen Sensor Signal Monitor if overlapping monitors are running or the MIL is illuminated for any of the following:

- Misfire Monitor
- Front Oxygen Sensor and Heater Monitor
- MAP Sensor
- Vehicle Speed Sensor
- Engine Coolant Temperature Sensor
- Throttle Position
- Engine Controller Self Test Faults
- Cam or Crank Sensor
- Injector and Coil
- EVAP Electrical
- EGR Solenoid Electrical (if equipped)
- Intake Air Temperature
- 5 Volt Feed

Conflict—The Task Manager does not run the Oxygen Sensor Monitor if any of the following conditions are present:

- A/C ON (A/C clutch cycling temporarily suspends monitor)
- Purge flow in progress

Suspend—The Task Manager suspends maturing a fault for the Oxygen Sensor Monitor if an of the following are present:

- Oxygen Sensor Heater Monitor, Priority 1
- Misfire Monitor, Priority 2

OXYGEN SENSOR HEATER MONITOR (NGC)

DESCRIPTION—If the Oxygen sensor (O2S) DTC as well as a O2S heater DTC is present, the O2S Heater DTC MUST be repaired first. After the O2S Heater is repaired, verify that the sensor circuit is operating correctly.

The voltage reading taken from the O2S are very temperature sensitive. The readings taken from the O2S are not accurate below 300° C (572°F). Heating the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly. Starting with the introduction on the NGC module the strategy for checking the heater circuit has changed. The heater resistance is checked by the NGC almost immediately after the engine is started. The same O2S heater return pin used to read the heater resistance is capable of detecting an open circuit, a shorted high or shorted low condition.

CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a high oxygen condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (check engine lamp) will be illuminated.

Monitor Operation—To monitor catalyst efficiency, the PCM expands the rich and lean switch points of the heated oxygen sensor. With extended switch points, the air/fuel mixture runs richer and leaner to overburden the catalytic converter. Once the test is started, the air/fuel mixture runs rich and lean and the O2 switches are counted. A switch is counted when an oxygen sensor signal goes from below the lean threshold to above the rich threshold. The number of Rear O2 sensor switches is divided by the number of Front O2 sensor switches to determine the switching ratio.

The test runs for 20 seconds. As catalyst efficiency deteriorated over the life of the vehicle, the switch rate at the downstream sensor approaches that of the upstream sensor. If at any point during the test period the switch ratio reaches a predetermined value, a counter is incremented by one. The monitor is enabled to run another test during that trip. When the test fails three times, the counter increments to three, a malfunction is entered, and a Freeze Frame is stored. When the counter increments to three during the next trip, the code is matured and the MIL is illuminated. If the test passes the first, no further testing is conducted during that trip.

The MIL is extinguished after three consecutive good trips. The good trip criteria for the catalyst monitor is more stringent than the failure criteria. In order to pass the test and increment one good trip, the downstream sensor switch rate must be less than 80% of the upstream rate (60% for manual transmissions). The failure percentages are 90% and 70% respectively.

Enabling Conditions—The following conditions must typically be met before the PCM runs the catalyst monitor. Specific times for each parameter may be different from engine to engine.

- Accumulated drive time
- Enable time
- Ambient air temperature
- Barometric pressure
- Catalyst warm-up counter
- Engine coolant temperature
- Accumulated throttle position sensor
- Vehicle speed
- MAP
- RPM
- Engine in closed loop
- Fuel level

Pending Conditions—

- Misfire DTC
- Front Oxygen Sensor Response
- Front Oxygen Sensor Heater Monitor
- Front Oxygen Sensor Electrical
- Rear Oxygen Sensor Rationality (middle check)
- Rear Oxygen Sensor Heater Monitor
- Rear Oxygen Sensor Electrical
- Fuel System Monitor
- All MAP faults
- All ECT sensor faults
- Purge flow solenoid functionality
- Purge flow solenoid electrical
- All PCM self test faults
- All CMP and CKP sensor faults
- All injector and ignition electrical faults
- Vehicle Speed Sensor
- Brake switch
- Inlet air temperature

Conflict—The catalyst monitor does not run if any of the following are conditions are present:

- EGR Monitor in progress
- Fuel system rich intrusive test in progress
- EVAP Monitor in progress
- Time since start is less than 60 seconds
- Low fuel level
- Low ambient air temperature

Suspend—The Task Manager does not mature a catalyst fault if any of the following are present:

- Oxygen Sensor Monitor, Priority 1
- Upstream Oxygen Sensor Heater, Priority 1
- EGR Monitor, Priority 1
- EVAP Monitor, Priority 1
- Fuel System Monitor, Priority 2
- Misfire Monitor, Priority 2

VEHICLE EMISSION CONTROL INFORMATION LABEL

All models have a Vehicle Emission Control Information (VECI) Label. DaimlerChrysler permanently attaches the label in the engine compartment. It cannot be removed without defacing information and destroying the label.

The label contains the vehicle's emission specifications and vacuum hose routings. All hoses must be connected and routed according to the label.

TRIP DEFINITION

A "Trip" means vehicle operation (following an engine-off period) of duration and driving mode such that all components and systems are monitored at least once by the diagnostic system. The monitors must successfully pass before the PCM can verify that a previously malfunctioning component is meeting the normal operating conditions of that component. For misfire or fuel system malfunction, the MIL may be extinguished if the fault does not recur when monitored during three subsequent sequential driving cycles in which conditions are similar to those under which the malfunction was first determined.

Anytime the MIL is illuminated, a DTC is stored. The DTC can self erase only after the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles (80 warm-up cycles for the Fuel System Monitor and the Misfire Monitor). A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 4.4° C (40°F) in engine temperature must occur from the time when the engine was started
- Engine coolant temperature must crossover 71° C (160°F)
- A "driving cycle" that consists of engine start up and engine shut off.

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Due to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made, all DTC's be erased and the repair verified by running 1–good trip.

NON-MONITORED CIRCUITS

The PCM does not monitor all circuits, systems and conditions that could have malfunctions causing driveability problems. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code.

The major non-monitored circuits are listed below along with examples of failures modes that do not directly cause the PCM to set a DTC, but for a system that is monitored.

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor, fuel system, or misfire diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables. The misfire will however, increase the oxygen content in the exhaust, deceiving the PCM in to thinking the fuel system is too lean. Also see misfire detection. There are DTC's that can detect misfire and Ionization shorts in the secondary ignition circuit, refer to the Powertrain Diagnostic manual for more information

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression. Low compression lowers O2 content in the exhaust. Leading to fuel system, oxygen sensor, or misfire detection fault.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system. It may set a EGR (if equipped) or Fuel system or O2S fault.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

THROTTLE BODY AIR FLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, including when diagnostics are performed.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator (Check Engine) Lamp will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the a scan tool.

The following is a list of the system monitors:

- EGR Monitor (if equipped)
- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Evaporative System Leak Detection Monitor (if equipped)

Following is a description of each system monitor, and its DTC.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. The

PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR (if equipped), Catalyst and Fuel Monitors.

The O2S may fail in any or all of the following manners:

- Slow response rate
- Reduced output voltage
- Dynamic shift
- Shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt (voltages are offset by 2.5 volts on NGC vehicles). A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S heater fault MUST be repaired first. After the O2S fault is repaired, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S are very temperature sensitive. The readings are not accurate below 300°C (572 °F) Heating of the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly.

The O2S circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S output voltage from the other effects.

EGR MONITOR (if equipped)

The Powertrain Control Module (PCM) performs an on-board diagnostic check of the EGR system.

The EGR monitor is used to test whether the EGR system is operating within specifications. The diagnostic check activates only during selected engine/driving conditions. When the conditions are met, the EGR is turned off (solenoid energized) and the O2S compensation control is monitored. Turning off the EGR shifts the air fuel (A/F) ratio in the lean direction. The O2S data should indicate an increase in the O2 concentration in the combustion chamber when the exhaust gases are no longer recirculated. While this test does not directly measure the operation of the EGR system, it can be inferred from the shift in the O2S data whether the EGR system is operating correctly. Because the O2S is being used, the O2S test must pass its test before the EGR test. Also looks at EGR linear potentiometer for feedback.

MISFIRE MONITOR

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic convertor damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

FUEL SYSTEM MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the air fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio. This is done by making short term corrections in the fuel injector pulse width based on the O2S output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual air-fuel ratio with the O2S (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, drive-ability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (Check Engine lamp) will be illuminated.

EVAPORATIVE SYSTEM INTEGRITY MONITOR (ESIM)

The ESIM (Evaporative System Integrity Monitor), while physically different than the NVLD system, performs the same basic function as the NVLD does – controlling evaporative emissions. The ESIM has been simplified because the solenoid used on the NVLD is not used on the ESIM. In most cases the ESIM mounts directly to the vapor canister. In the event that the ESIM can not be mounted directly to the canister, an adaptor is used. It is important to ensure the ESIM is mounted vertical due to the operation of the ESIM design. (Note: The electrical connector on the ESIM will be at the 3 o'clock position if mounted correctly.)

The ESIM consists of housing, two check valves (sometimes referred to as weights), a diaphragm, a switch and a cover. The larger check valve seals for pressure and the smaller one seals for vacuum.

During refueling, pressure is built up in the evaporative system. When pressure reaches approximately .5 inches of water, the large check valve unseats and pressure vents to the fresh air filter.

Conversely, when the system cools and the resulting vacuum lifts the small check valve from its seat and allows fresh air to enter the system and relieve the vacuum condition. When a calibrated amount of vacuum is achieved in the evaporative system, the diaphragm is pulled inward, pushing on the spring and closing the contacts.

The ESIM conducts test on the evaporative system as follows: An engine off, non-intrusive test for small leaks and an engine running, intrusive test for medium/large leaks.

The ESIM weights seal the evap. system during engine off conditions. If the evap. system is sealed, it will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. When the vacuum in the system exceeds about 1" H20, the vacuum switch closes. The switch closure sends a

signal to the GPEC1. In order to pass the non-intrusive small leak test, the ESIM switch must close within a calculated amount of time and within a specified amount of key-off events.

If the ESIM switch does not close as specified, the test is considered inconclusive and the intrusive engine running test will be run during the next key-on cycle. This intrusive test will run on the next cold engine running condition.

Conditions for running the intrusive test are:

- After the vehicle is started, the engine coolant temperature must be within 10_C of ambient to indicate a cold start.
- The fuel level must be between 12% and 88%.
- The engine must be in closed loop.
- Manifold vacuum must be greater than a minimum specified value.
- Ambient temperature must be between 39 F and 98 F or 4 C and 37 C and the elevation level must be below 8500 feet.

The test is accomplished by the GPEC1 activating the purge solenoid to create a vacuum in the evaporative system. The GPEC1 then measures the amount of time it takes for the vacuum to dissipate. This is known as the vacuum decay method. If the switch opens quickly a large leak is recorded. If the switch opens after a predetermined amount of time, then the small leak matures. If the switch does not close, then a general evaporative failure is recorded. The purge monitor tests the integrity of the hose attached between the purge valve and throttle body/intake. The purge monitor is a two stage test and it runs only after the evaporative system passes the small leak test.

Even when all of the thresholds are met, a small leak won't be recorded until after the medium/large leak monitor has been run. This is accomplished by the GPEC1 activating the purge solenoid to create a vacuum in the evaporative system. The GPEC1 then measures the amount of time it takes for the vacuum to dissipate. This is known as the vacuum decay method. If the switch opens quickly a large leak is recorded. If the switch opens after a predetermined amount of time, then the small leak matures. If the medium/large leak test runs and the ESIM switch doesn't close, a general evaporative test is run. The purge solenoid is activated for approximately 10 seconds, increasing the amount of vacuum in the system. IF the ESIM switch closes after the extended purge activation, a large leak fault is generated. If the switch doesn't close, a general evaporative system fault is generated.

The purge monitor tests the integrity of the hose attached between the purge valve and throttle body/intake. The purge monitor is a two stage test and it runs only after the evaporative system passes the small leak test.

Stage one of the purge monitor is non-intrusive. GPEC1 monitors the purge vapor ratio. If the ratio is above a calibrated specification, the monitor passes. Stage two is an intrusive test and it runs only if stage one fails. During the stage two test, the GPEC commands the purge solenoid to flow at a specified rate to force the purge vapor ratio to update. The vapor ratio is compared to a calibrated specification and if it is less than specified, a one-trip failure is recorded.

The ESIM switch stuck closed monitor checks to see if the switch is stuck closed. This is a power down test that runs at key-off; when the GPEC1 sees 0 rpm's, the purge solenoid is energized for a maximum of 30 seconds, venting any vacuum trapped in the evaporative system. If the switch opens or was open before the test began, the monitor passes. If the switch doesn't open, the monitor fails. This is a two-trip MIL. The star scan tool can be used to force the ESIM switch stick closed monitor to run.

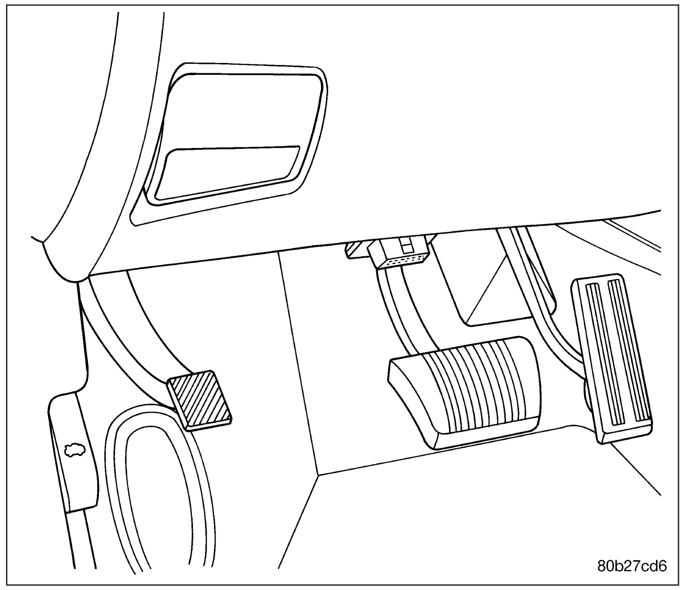
The GPEC1 also uses the ESIM to detect a loose or missing gas cap. The GPEC1 controller looks for a change in the fuel level (25% minimum) and then gas cap is loose or missing. If a medium/large leak is detected, a loose gas cap light illuminates and a pending one-trip fault code is set. On the GPEC1, this is a three-trip fault before the code matures

HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

OPERATION

SYSTEM



The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warmup cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example**, assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, use the scan tool to erase all DTC's and extinguish the MIL.

Technicians can display stored DTC's. For obtaining the DTC information, use the Data Link Connector with the scan tool.

EVAPORATIVE EMISSIONS

TABLE OF CONTENTS

EVAPORATIVE EMISSIONS

DIAGNOSIS AND TESTING

OBD II MONITOR INFORMATION

Comprehensive Components Monitor (Includes All Engine Hardware Sensor, Switches, Solenoids, etc.)	Major Monitors Non Fuel Control & Non Misfire (Monitors Entire Emission System)	Major Monitors Fuel Control & misfire (Monitors Entire System)
Most are one trip Faults	Most are Two Trips Faults	Two Trip Faults
Usually Turns on The Mill and Sets DTC After One Failure	Turns On The Mil and Sets DTC after Two Consecutive Failure	The Mil and Sets DTC After Two Consecutive Failure
Priority 3	**Priority 1 or 3**	**Priority 2 or 4**
All Checked For Continuity	Done Stop Test = Yes	**Fuel Control Monitor**
Open Short To Ground Short To Voltage	Oxygen Sensor Heater Oxygen Sensor Response Catalytic Converter	Monitors Fuel Control System For: Fuel System Lean
Inputs Checked For Rationality	Efficiency Except EWMA	Fuel System Rich
Outputs Checked For Functionality	up to 6 test per trip and a one trip fault (SBEC) and two trip fault on (JTEC)	Requires 3 Consecutive Fuel System Good Trips to Extinguish the MIL
	EGR System	**Misfire Monitor**
	Evaporative Emission System (purge and leak) Non-LDP LDP	Monitors for Engine Misfire At: 4 X 1000 RPM Counter (4000 Revs) (Type B) **200 X 3 (600) RPM counter (Type A)
Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL
*40 Warm Up Cycles are required to erase DTCs after the MIL has been extinguished		** Type A misfire is a one trip failure on pre-1999, 2 trip failure on 1999 and later. The MIL will illuminate at the first or second failure, based on MY.

OBD II MONITOR RUN PROCESS

The following procedure has been established to assist Daimler Chrysler Dealer Technicians in the field with enabling and running OBD II Monitors. The order listed in the following procedure is intended to allow the technician to effectively complete each monitor and to set the CARB Readiness Status in the least time possible.

NOTE:
Once the monitor run process has begun, do not turn off the ignition. By turning the ignition key off, monitor enabling conditions will be lost. NVLD Monitor runs after key off. By performing a Battery Disconnect, or Selecting Erase DTCs, the CARB Readiness and all additional OBD II information will be cleared.

Monitor Preliminary Checks:

1. Plug a scan tool into the vehicle's Data Link Connector (DLC).
2. Turn the ignition, KEY ON - ENGINE OFF. Watch for MIL lamp illumination during the bulb check. MIL lamp must have illuminated, if not, repair MIL lamp.
3. Using a scan tool check for Powertrain related DTCs..
   - Verify that No Emissions Related DTCs are Present.
   - * If an Emissions DTC is Present, the OBD II Monitors may not run and the CARB Readiness will not update.
   - The Emissions related DTC, will need to be repaired, then cleared. By clearing DTCs, the OBD Monitors will need to be run and completed to set the CARB Readiness Status.

Using the scan tool check the CARB Readiness Status.

Do all the CARB Readiness Status Locations read YES?.

- *YES, then all monitors have been completed and this vehicle is ready to be I/M or Emission Tested.
- *NO, then the following procedure needs to be followed to run/complete all available monitors.

NOTE:
Only the monitors, which are not YES in the CARB Readiness Status, need to be completed. Specific criteria need to be met for each monitor. The most efficient order to run the monitors has been outlined below, including suggestions to aid the process.

Evaporative Emission System Leak Detection with Purge Monitor

This monitor requires a cool down cycle, usually an overnight soak for at least 8 hours without the engine running. The ambient temperature must decrease overnight - parking the vehicle outside is advised. To run this test the fuel level must be between 15-85% full. For the monitor run conditions select the EVAP MON PRE-TEST in the scan tool, OBD II Monitors Menu. The Purge monitor will run if the small leak test reports a pass. Criteria for EVAP monitor:

- Engine off time greater than @ one hour.
- Fuel Level between 15% and 85 %.
- Start Up ECT and IAT within 10° C (18° F).
- Vehicle started and run until Purge Monitor reports a result.

NOTE: If the vehicle does not report a result and the conditions where correct. It may take up to two weeks to fail the small leak monitor. DO NOT use this test to attempt to determine a fault. Use the appropriate service information procedure for finding a small leak. If there are no faults and the conditions are correct this test will run and report a pass. Note the Small leak test can find leaks less than 10 thousands of an inch. If a small leak is present it takes approximately one week of normal driving to report a failure.

Catalyst / O2 Monitor

With NGC, Catalyst and O2 Monitor information are acquired and processed at the same time. Most vehicles will need to be driven at highway speed (< 50 mph) for a few minutes. Some vehicles run the monitor at idle in drive. If the vehicle is equipped with a manual transmission, using 4th gear may assist in meeting the monitor running criteria. For the monitor run conditions, select the BANK 1 CAT MON PRE-TEST in the scan tool, OBD II Monitors Menu.

EGR Monitor

The EGR monitor now runs in a closed throttle decel or at idle on a warm vehicle. However, it is necessary to maintain the TPS, Map and RPM ranges to allow the monitor to complete itself. For the monitor run conditions, select the EGR PRE-TEST in the scan tool, OBD II Monitors Menu.

O2 Sensor Heater Monitor

This monitor is now continuously running once the heaters are energized. Pass information will be processed at power down. For the monitor run conditions, select the O2S HEATER MON PRE-TEST in the scan tool, OBD II Monitors Menu.

Mis-Fire Monitor

The NGC Misfire Monitor is a continuous two-trip monitor. The monitor uses two different tests/counters:

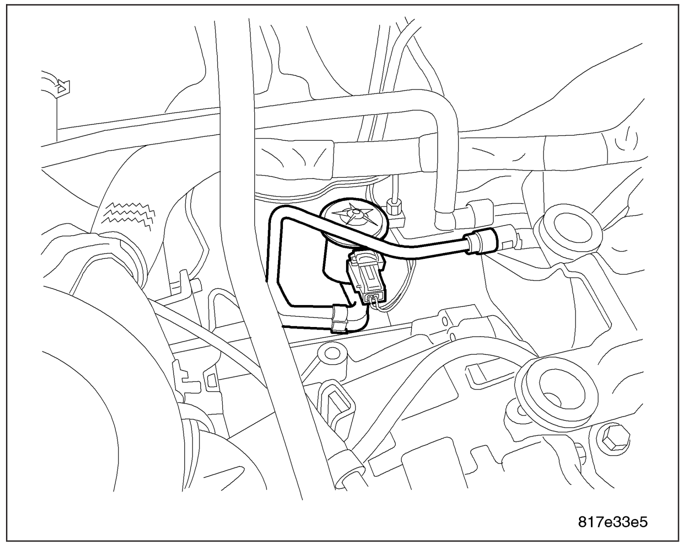
NOTE: The Adaptive Numerator must be learned before the PCM will run the Mis-Fire Monitor. The PCM updates the Adaptive Numerator at every key-ON, and is relearned after battery disconnect. The Misfire Monitor will not run until the Adaptive Numerator has updated since the last battery disconnect. If the Adaptive Numerator is equal to the default value then the PCM knows that the Adaptive Numerator has not been learned and does not permit the Misfire Monitor to run. If the Adaptive Numerator exceeds a calibrated percentage, the PCM sets a DTC for CKP NOT LEARNED and illuminates the MIL.

- 200 Revolution Counter - Looks for misfire that can cause immediate catalyst damage.
- 1000 Revolution Counter - Looks for misfire that can cause emissions to increase 1.5 times the Federal Test Procedure (FTP) standards. This test must also identify misfire percentages that might cause a “durability demonstration vehicle” to fail an Inspection and Maintenance Program tailpipe emissions test.

EVAP/PURGE SOLENOID

DESCRIPTION

All vehicles use a proportional purge solenoid (1). The solenoid regulates the rate of vapor flow from the EVAP canister to the intake manifold. The PCM operates the solenoid.



OPERATION

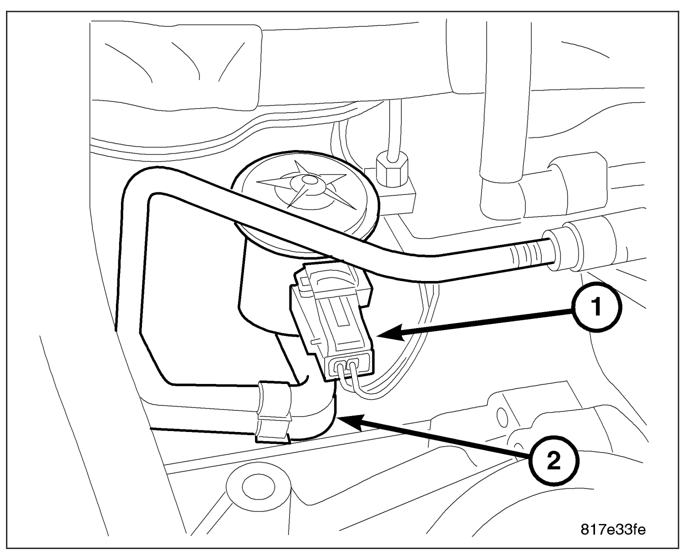
All vehicles use a proportional purge solenoid. The solenoid regulates the rate of vapor flow from the EVAP canister to the intake manifold. The PCM operates the solenoid.

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged.

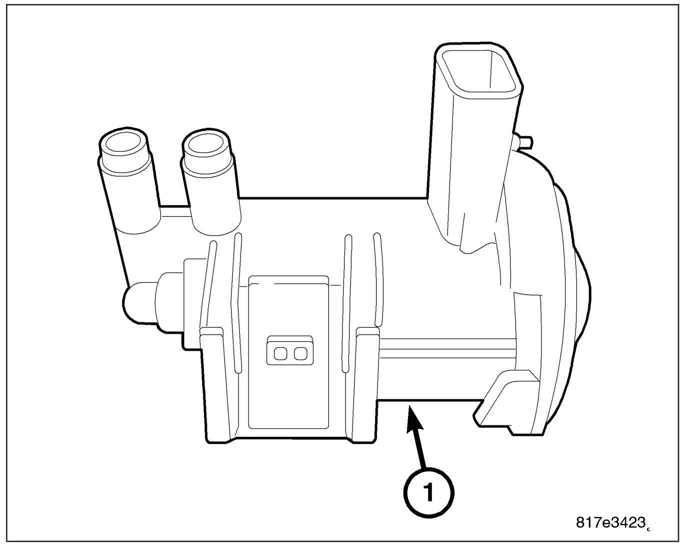
The proportional purge solenoid operates at a frequency of 200 hz and is controlled by an engine controller circuit that senses the current being applied to the proportional purge solenoid and then adjusts that current to achieve the desired purge flow. The proportional purge solenoid controls the purge rate of fuel vapors from the vapor canister and fuel tank to the engine intake manifold.

REMOVAL

1. Remove air inlet resonator assembly.
2. Remove the air cleaner box.
3. Disconnect negative battery cable.
4. Unlock and disconnect electrical connector from solenoid (1).
5. Disconnect vacuum tubes from solenoid (2).



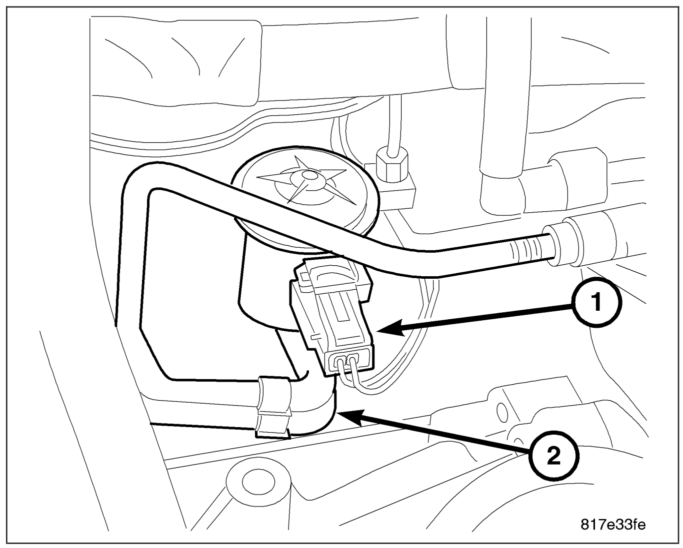
6. Remove solenoid (1) from bracket by depressing clip and pulling solenoid from bracket.



INSTALLATION

The top of the solenoid has TOP printed on it. The solenoid will not operate unless it is installed correctly.

1. Connect vacuum tube to solenoid (2).
2. Connect electrical connector to solenoid and lock (1).
3. Install solenoid on bracket.
4. Install the negative battery cable.
5. Install air cleaner box.
6. Install resonator assembly.



FUEL FILLER CAP

DESCRIPTION

The plastic fuel fill cap is threaded/quarter turn onto the end of the fuel filler tube. It's purpose is to retain vapors and fuel in the fuel tank.

OPERATION

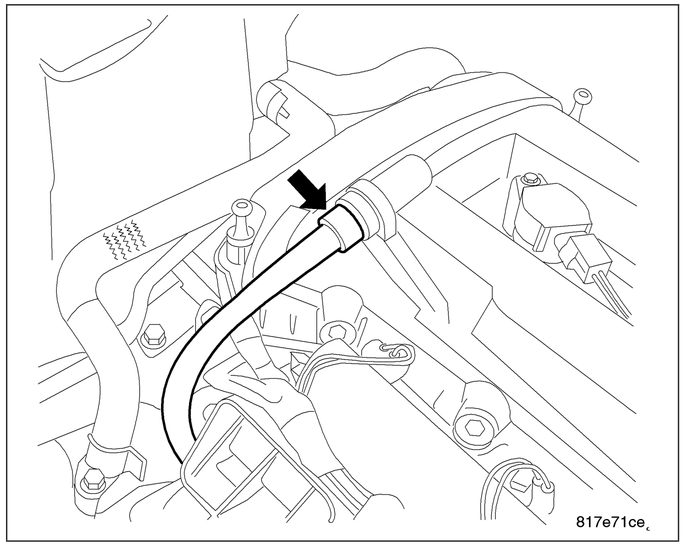
The fuel filler cap incorporates a two-way relief valve that is closed to atmosphere during normal operating conditions. The relief valve is calibrated to open when a pressure of 17 kPa (2.5 psi) or vacuum of 2 kPa (0.6 in. Hg) occurs in the fuel tank. When the pressure or vacuum is relieved, the valve returns to the normally closed position.

CAUTION: Remove the fuel filler cap to release fuel tank pressure before disconnecting any fuel system component.

PCV VALVE

DESCRIPTION

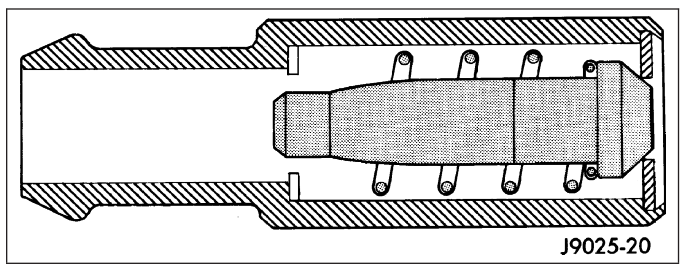
It threads into the valve cover.



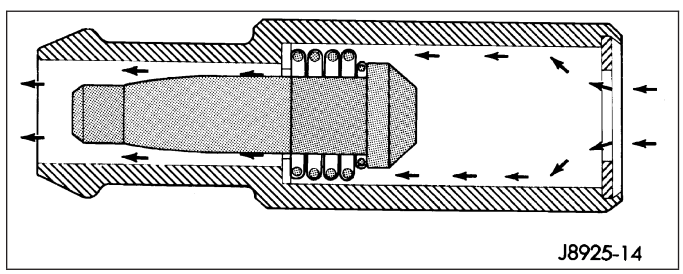
OPERATION

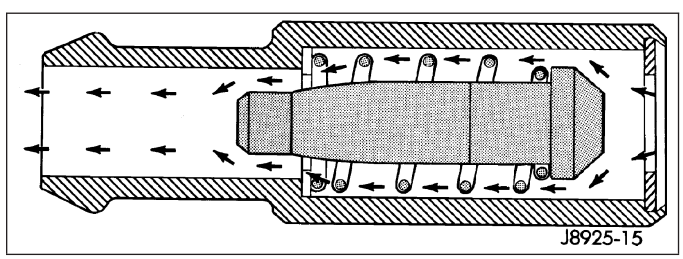
When the engine is not operating or during an engine backfire, the spring forces the plunger back against the seat. This prevents vapors from flowing through the valve.

When the engine is at idle or cruising, high manifold vacuum is present. At these times manifold vacuum is able to completely compress the spring and pull the plunger to the top of the valve. In this position there is minimal vapor flow through the valve.



During periods of moderate intake manifold vacuum the plunger is only pulled part way back from the inlet. This results in maximum vapor flow through the valve.





DIAGNOSIS AND TESTING - PCV SYSTEM

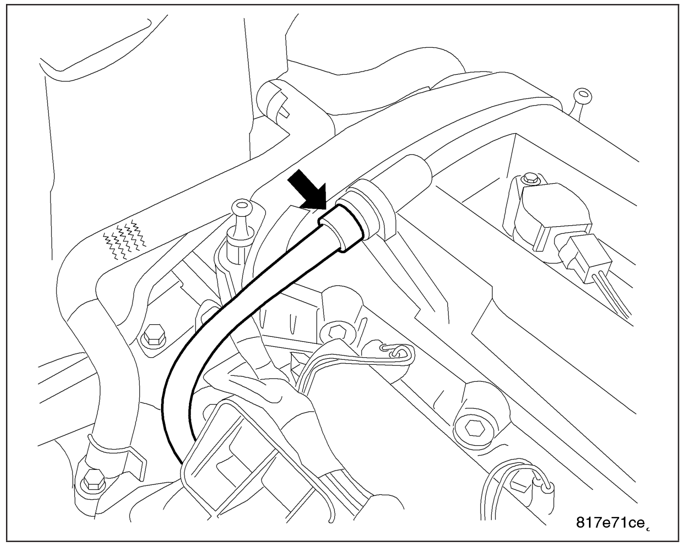
WARNING: apply parking brake and/or block wheels before performing any test or adjustment with the engine operating.

1. With engine idling, remove the hose from the PCV valve. If the valve is not plugged, a hissing noise will be heard as air passes through the valve. A strong vacuum should also be felt when a finger is placed over the valve inlet.
2. Install hose on PCV valve. Remove the make-up air hose from the air plenum at the rear of the engine. Hold a piece of stiff paper (parts tag) loosely over the end of the make-up air hose.

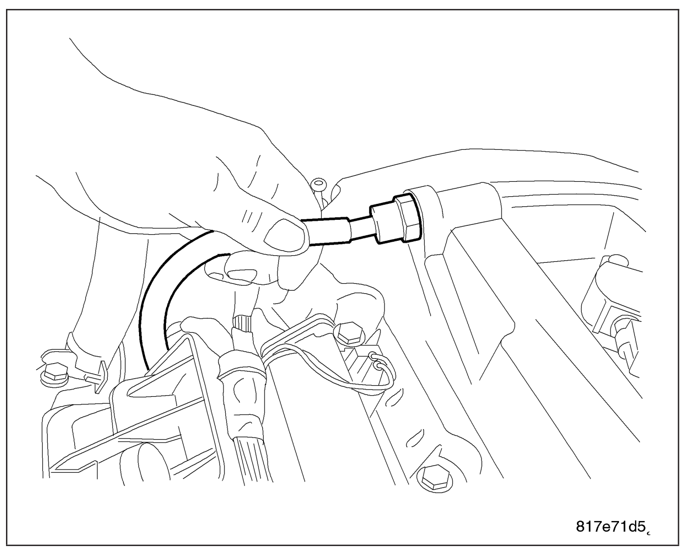
3. After allowing approximately one minute for crankcase pressure to reduce, the paper should draw up against the hose with noticeable force. If the engine does not draw the paper against the grommet after installing a new valve, replace the PCV valve hose.
4. Turn the engine off. Remove the PCV valve from intake manifold. The valve should rattle when shaken.
5. Replace the PCV valve and retest the system if it does not operate as described in the preceding tests. **Do not attempt to clean the old PCV valve.**

REMOVAL

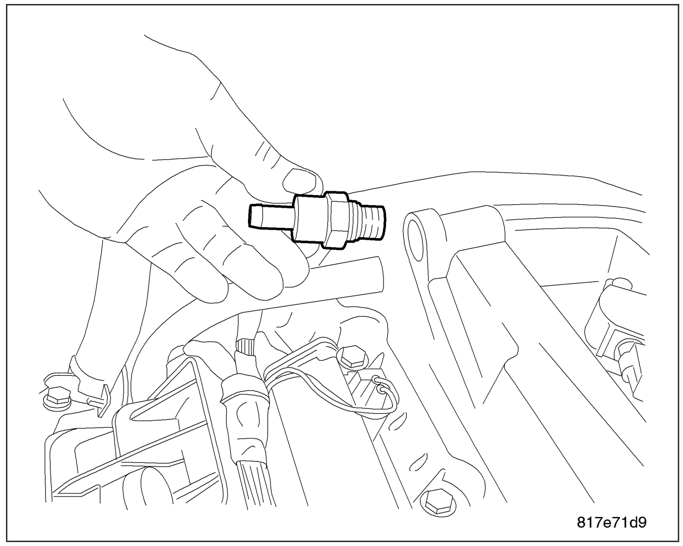
1. Remove the engine cover.



2. Remove the hose from the PCV valve.

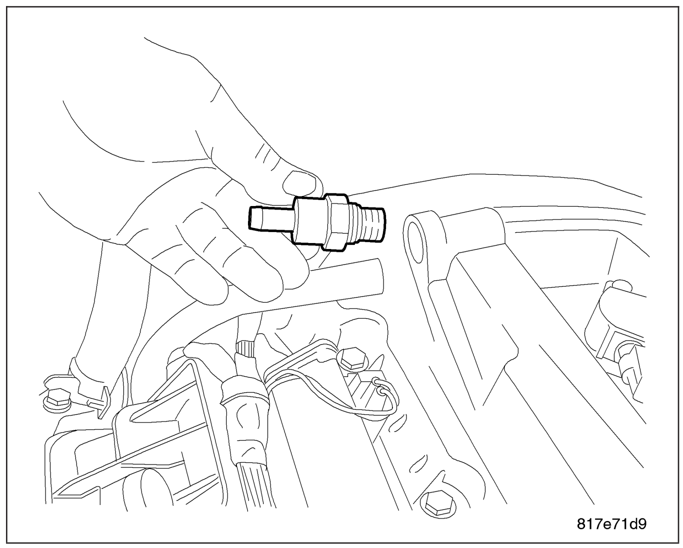


3. Unscrew the PCV valve.

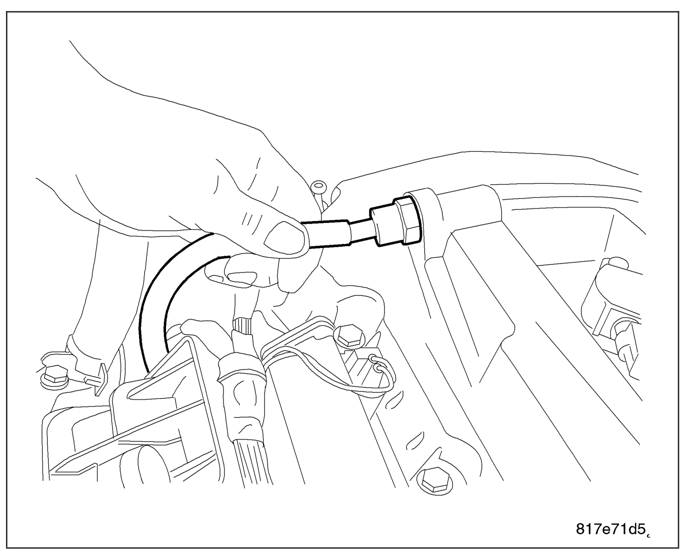


INSTALLATION

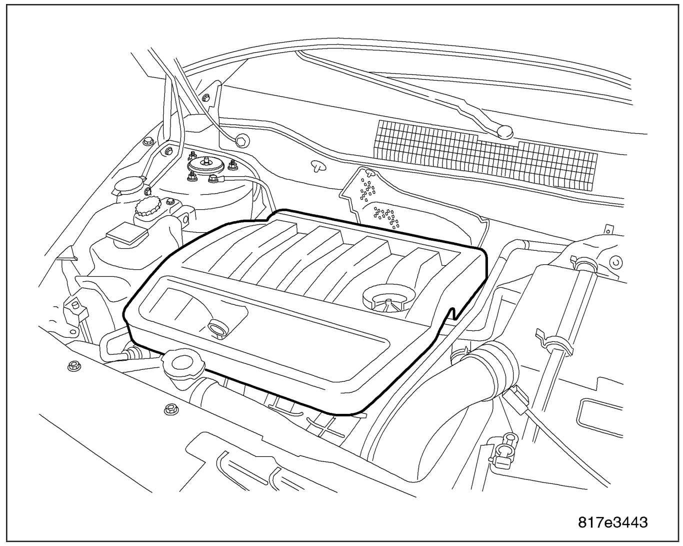
1. Lubricate the O-ring on the valve.
2. Install the PCV valve and tighten the valve to 8.1 N·m (72 in. lbs.).



3. Install the hose.



4. Install engine cover.



VAPOR CANISTER

DESCRIPTION

The canister mounts (1) to a left rear rail in the rear of the vehicle. The vacuum and vapor tube connect to the top of the canister.

OPERATION

All vehicles use a maintenance free, evaporative (EVAP) canister. Fuel tank vapors vent into the canister. The canister temporarily holds the fuel vapors until intake manifold vacuum draws them into the combustion chamber. The Powertrain Control Module (PCM) purges the canister through the proportional purge solenoid. The PCM purges the canister at predetermined intervals and engine conditions.

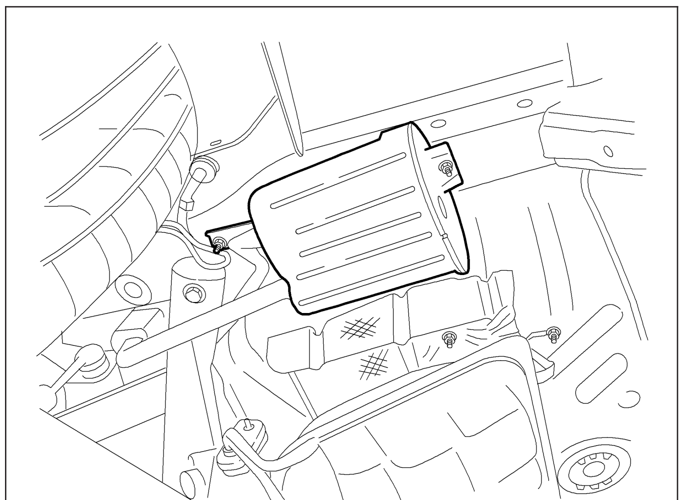
Purge Free Cells

Purge-free memory cells are used to identify the fuel vapor content of the evaporative canister. Since the evaporative canister is not purged 100% of the time, the PCM stores information about the evaporative canister's vapor content in a memory cell.

The purge-free cells are constructed similar to certain purge-normal cells. The purge-free cells can be monitored by the scan tool. The only difference between the purge-free cells and normal adaptive cells is that in purge-free, the purge is completely turned off. This gives the PCM the ability to compare purge and purge-free operation.

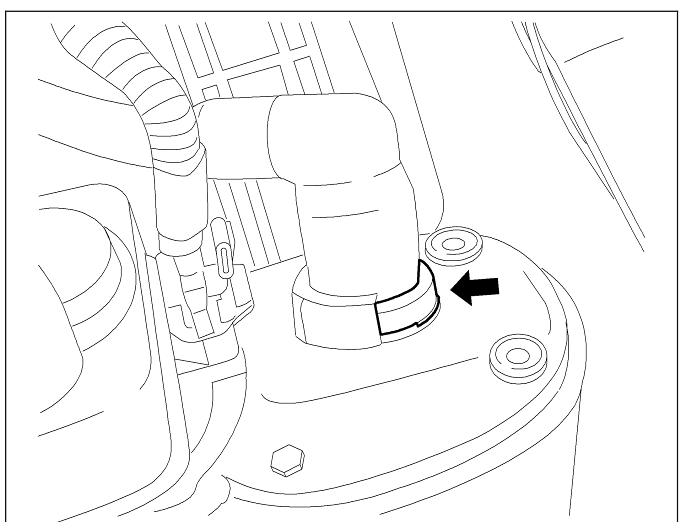
REMOVAL

1. Disconnect negative battery cable.
2. Raise and support vehicle.



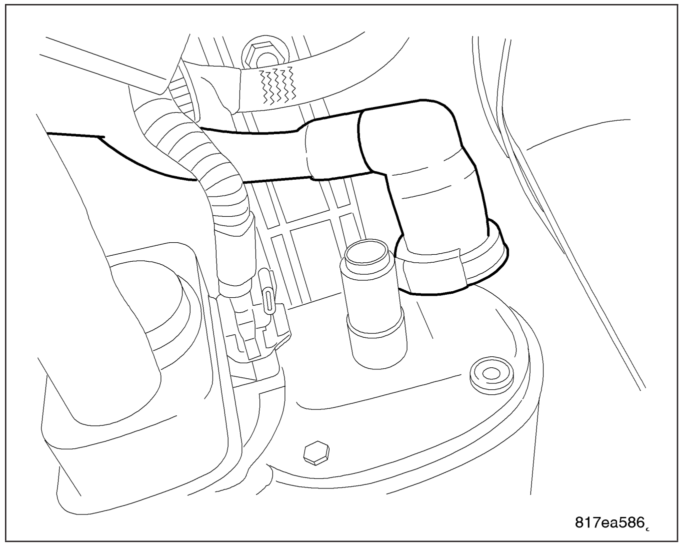
817ea370

3. Depress locking tab on vapor hose connector and pull off of canister.

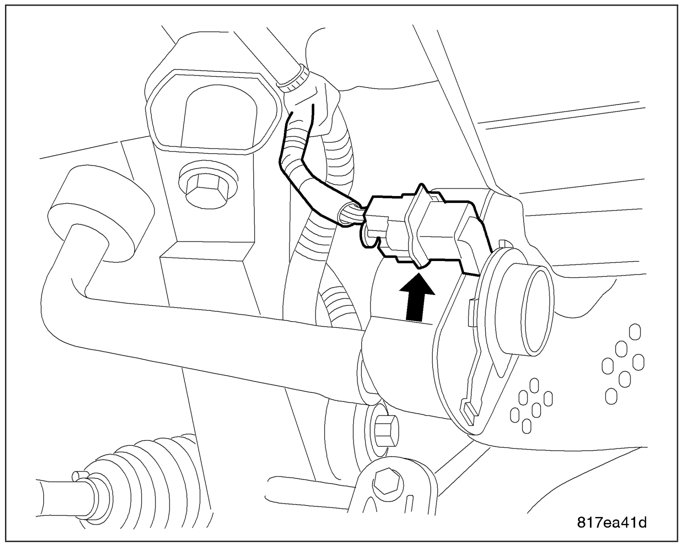


817ea582

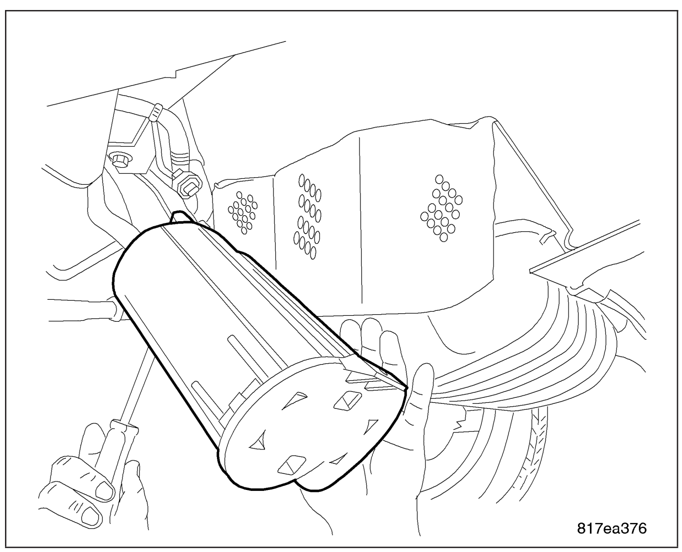
4. Remove hose from ESIM module.
5. Vapor hose removed.


817ea586

6. Disconnect the electrical connector from ESIM module.

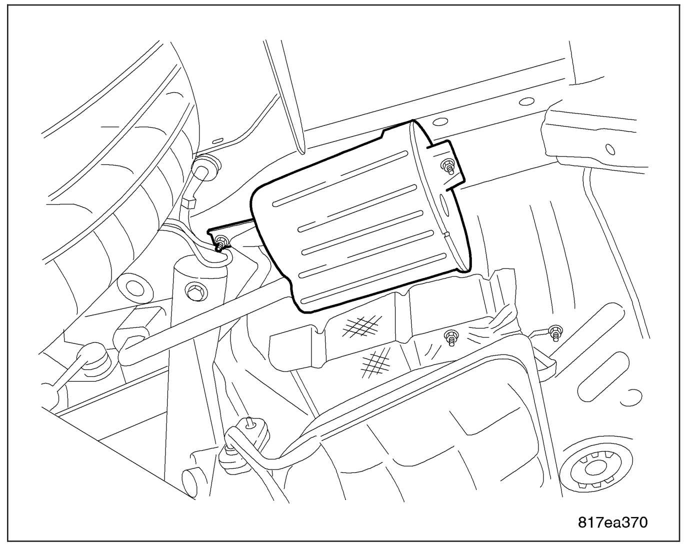

817ea41d

7. Remove two vapor canister mounting bolts.
8. Remove assembly.

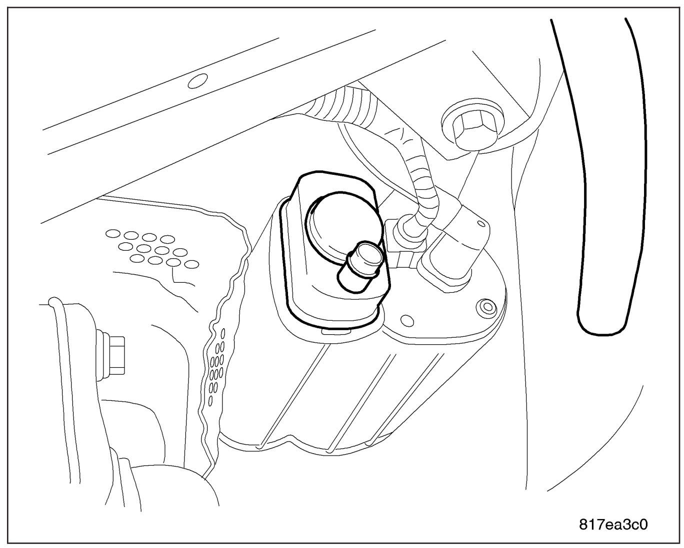

817ea376

INSTALLATION

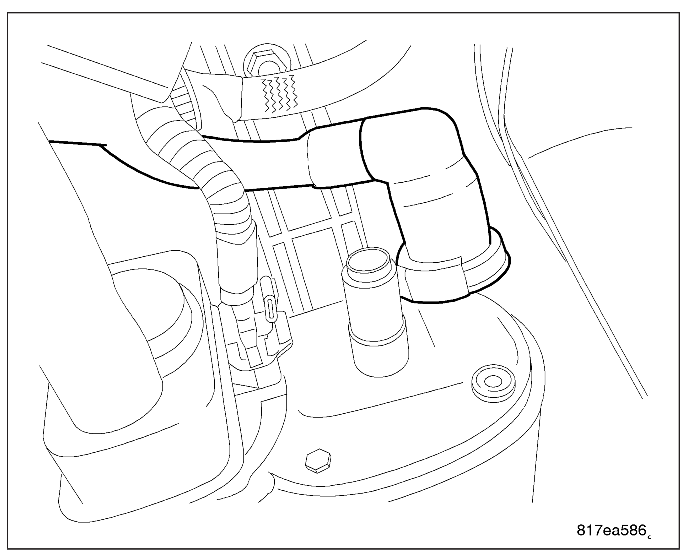
1. Install canister and bracket.



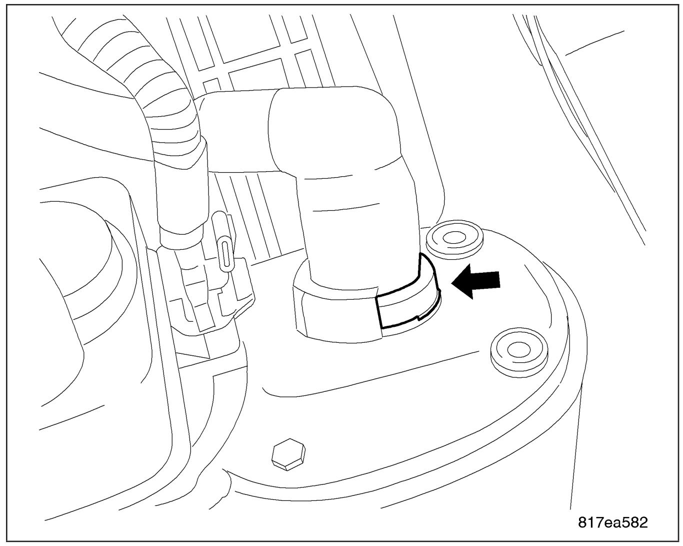
2. Connect filter hose to ESIM.



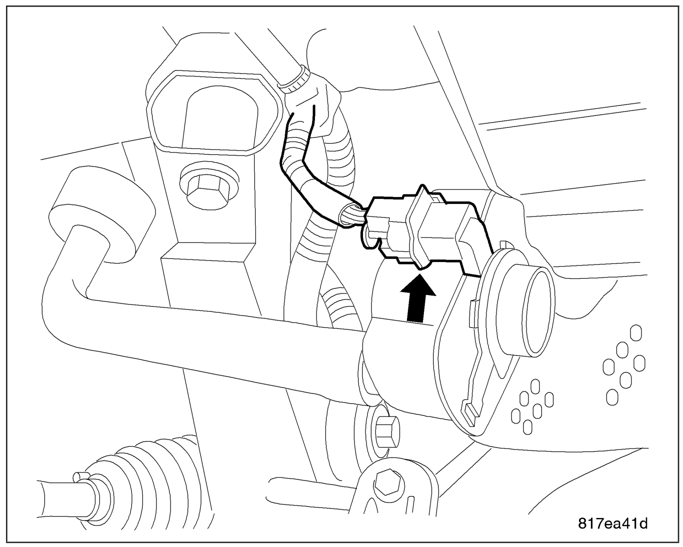
3. Connect vapor hose.



4. Make sure locking tab on hose connector locks in place.



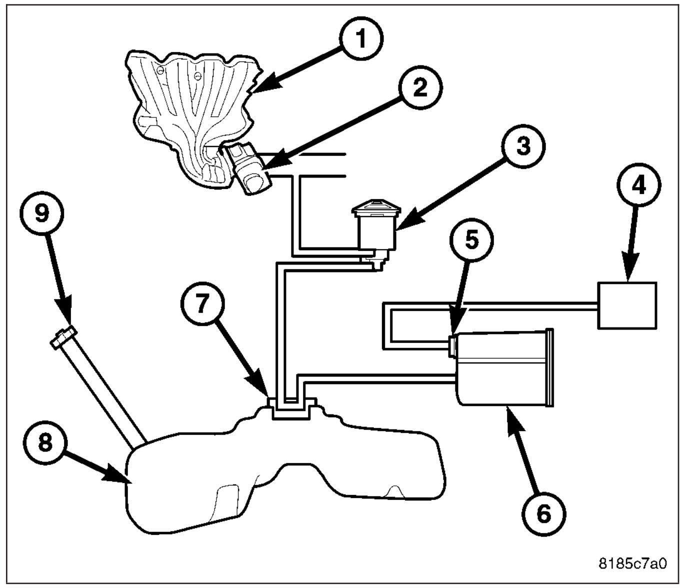
5. Connect electrical connector to ESIM module.
6. Lower vehicle.
7. Connect negative battery cable.



SWITCH-EVAP SYSTEM MONITOR

OPERATION

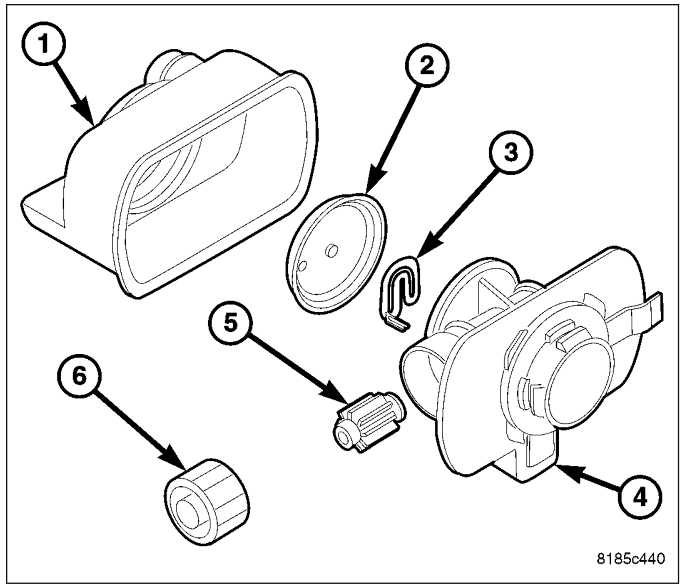
The ESIM (Evaporative System Integrity Monitor) is very similar to the NVLD. However, the design of the ESIM has been simplified and unlike the NVLD the ESIM does not require a solenoid. The ESIM mounts directly to the canister, eliminating the need for a mounting bracket. It is critical that the ESIM is mounted vertically. On vehicles where the canister is mounted on an angle, the ESIM requires an adaptor to maintain a vertical position. When the ESIM is installed vertically, the electrical connector is in the 3 o'clock position.



SYSTEM

1 - Intake Manifold
2 - Throttle Body
3 - Purge Solenoid
4 - Filter
5 - ESIM
6 - Vapor Canister
7 - Control Valve
8 - Fuel Tank
9 - Gas Cap

The ESIM assembly consists of a housing, a small weight and a large weight that serve as check valves, a diaphragm, a switch and a cover. There is one large weight and one small weight check valve in the ESIM assembly. A seal is attached at the end of each weighted check valve. The large weight check valve seals for pressure. The small weight check valve seals for vacuum. The weighted check valves are contained within the ESIM housing.



EXPLODED VIEW

1 - ESIM Housing
2 - Diaphragm
3 - Switch
4 - Cover
5 - Small Check Valve
6 - Large Check Valve

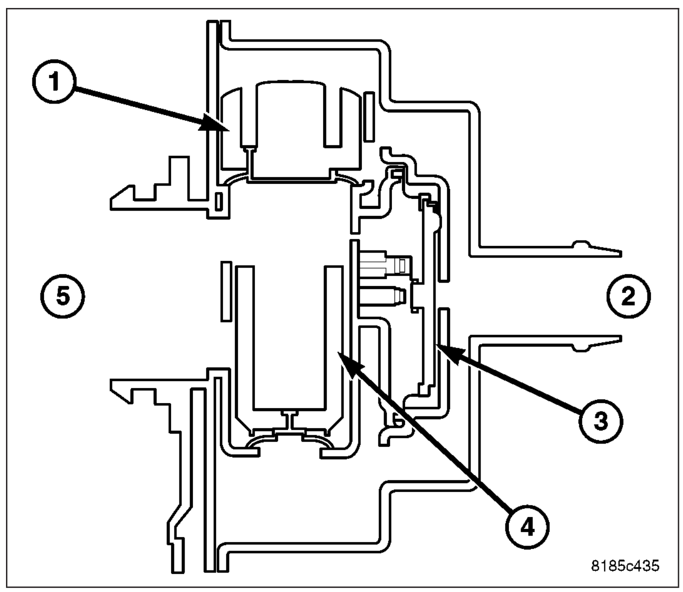
The ESIM (Evaporative System Integrity Monitor), while physically different than the NVLD system, performs the same basic function as the NVLD does – controlling evaporative emissions. The ESIM has been simplified because the solenoid used on the NVLD is not used on the ESIM.

The ESIM consists of housing, two check valves (sometimes referred to as weights), a diaphragm, a switch and a cover. The larger check valve seals for pressure and the smaller one seals for vacuum.

During refueling, pressure is built up in the evaporative system. When pressure reaches approximately .5 inches of water, the large check valve unseats and pressure vents to the fresh air filter.

Conversely, when the system cools and the resulting vacuum lifts the small check valve from its seat and allows fresh air to enter the system and relieve the vacuum condition. When a calibrated amount of vacuum is achieved in the evaporative system, the diaphragm is pulled inward, pushing on the spring and closing the contacts.

The ESIM conducts test on the evaporative system as follows: An engine off, non-intrusive test for small leaks and an engine running, intrusive test for medium/large leaks.



CUT AWAY OF MODULE

1 - Large Check Valve
2 - Fresh Air Inlet
3 - Diagram
4 - Small Check Valve
5 - Vapor Canister

The ESIM weights seal the evap. system during engine off conditions. If the evap. system is sealed, it will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. When the vacuum in the system exceeds about 1” H20, the vacuum switch closes. The switch closure sends a signal to the GPEC1. In order to pass the non-intrusive small leak test, the ESIM switch must close within a calculated amount of time and within a specified amount of key-off events.

If the ESIM switch does not close as specified, the test is considered inconclusive and the intrusive engine running test will be run during the next key-on cycle. This intrusive test will run on the next cold engine running condition.

Conditions for running the intrusive test are:

- After the vehicle is started, the engine coolant temperature must be within 10_C of ambient to indicate a cold start.
- The fuel level must be between 12% and 88%.
- The engine must be in closed loop.
- Manifold vacuum must be greater than a minimum specified value.
- Ambient temperature must be between 39 F and 98 F or 4 C and 37 C and the elevation level must be below 8500 feet.

The test is accomplished by the GPEC1 activating the purge solenoid to create a vacuum in the evaporative system. The GPEC1 then measures the amount of time it takes for the vacuum to dissipate. This is known as the vacuum decay method. If the switch opens quickly a large leak is recorded. If the switch opens after a predetermined amount of time, then the small leak matures. If the switch does not close, then a general evaporative failure is recorded. The purge monitor tests the integrity of the hose attached between the purge valve and throttle body/intake. The purge monitor is a two stage test and it runs only after the evaporative system passes the small leak test.

Even when all of the thresholds are met, a small leak won't be recorded until after the medium/large leak monitor has been run. This is accomplished by the GPEC1 activating the purge solenoid to create a vacuum in the evaporative system. The GPEC1 then measures the amount of time it takes for the vacuum to dissipate. This is known as the vacuum decay method. If the switch opens quickly a large leak is recorded. If the switch opens after a predetermined amount of time, then the small leak matures. If the medium/large leak test runs and the ESIM switch doesn't close, a general evaporative test is run. The purge solenoid is activated for approximately 10 seconds, increasing the amount of vacuum in the system. IF the ESIM switch closes after the extended purge activation, a large leak fault is generated. If the switch doesn't close, a general evaporative system fault is generated.

The purge monitor tests the integrity of the hose attached between the purge valve and throttle body/intake. The purge monitor is a two stage test and it runs only after the evaporative system passes the small leak test.

Stage one of the purge monitor is non-intrusive. GPEC1 monitors the purge vapor ratio. If the ratio is above a calibrated specification, the monitor passes. Stage two is an intrusive test and it runs only if stage one fails. During the stage two test, the GPEC commands the purge solenoid to flow at a specified rate to force the purge vapor ratio to update. The vapor ratio is compared to a calibrated specification and if it is less than specified, a one-trip failure is recorded.

The ESIM switch stuck closed monitor checks to see if the switch is stuck closed. This is a power down test that runs at key-off; when the GPEC1 sees 0 rpm's, the purge solenoid is energized for a maximum of 30 seconds, venting any vacuum trapped in the evaporative system. If the switch opens or was open before the test began, the monitor passes. If the switch doesn't open, the monitor fails. This is a two-trip MIL. The star scan tool can be used to force the ESIM switch stick closed monitor to run.

The GPEC1 also uses the ESIM to detect a loose or missing gas cap. The GPEC1 controller looks for a change in the fuel level (25% minimum) and then gas cap is loose or missing. If a medium/large leak is detected, a loose gas cap light illuminates and a pending one-trip fault code is set. On the GPEC1, this is a three-trip fault before the code matures

ON-BOARD DIAGNOSTICS

TABLE OF CONTENTS

TASK MANAGER

DESCRIPTION

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is call the “Task Manager”.

OPERATION

The Task Manager determines when tests happen and when functions occur. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are known as ’two trip monitors.’ Other tests that turn the MIL lamp on after a single failure are known as ’one trip monitors.’ A trip is defined as ’start the vehicle and operate it to meet the criteria necessary to run the given monitor.’

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- **Pending**
  Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.
  For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.
- **Conflict**
  There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.
  For example, if the Fuel System Monitor is in progress, the Task Manager does not run the catalyst Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.
- **Suspend**
  Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **suspend** the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precise diagnosis.
  For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the catalyst monitor, the Task Manager may still run the catalyst Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the catalyst system is actually failing or if an Oxygen Sensor is failing.

MIL Illumination

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a good trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the thirdgood trip) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MIL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

Diagnostic Trouble Codes (DTCs)

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

Priorities

- Priority 0 —Non-emissions related trouble codes.
- Priority 1 — One trip failure of a two trip fault for non-fuel system and non-misfire. (MIL Off)
- Priority 2 — One trip failure of a two trip fault for fuel system (rich/lean) or misfire. (MIL Off)
- Priority 3 — Two trip failure for a non-fuel system and non-misfire or matured one trip comprehensive component fault. (MIL On)
- Priority 4 — Two trip failure or matured fault for fuel system (rich/lean) and misfire or one trip catalyst damaging misfire. Catalyst damage misfire is a 2 trip MIL. The MIL flashes on the first trip when catalyst damage misfire levels are present. (MIL On)

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

DTC Self Erasure

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within ±375 RPM and load is within ±20% of when the fault occurred.

NOTE: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.

DTCs can be erased anytime with a scan tool. Erasing the DTC with the scan tool erases all OBD II information. The scan tool automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

Trip Indicator

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

Good Trip

The Good Trip counters are as follows:

- Global Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on scan tool)
    - Comprehensive Components

  - Major Monitor
- Warm-Up Cycles

Global Good Trip

To increment a Global Good Trip, the Oxygen sensor and Catalyst efficiency monitors must have run and passed, and 2 minutes of engine run time.

Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

Alternate Good Trip

Alternate Good Trips are used in place of Global Good Trips for Comprehensive Components and Major Monitors. If the Task Manager cannot run a Global Good Trip because a component fault is stopping the monitor from running, it will attempt to count an Alternate Good Trip.

The Task Manager counts an Alternate Good Trip for Comprehensive components when the following conditions are met:

- Two minutes of engine run time, idle or driving
- No other faults occur

The Task Manager counts an Alternate Good Trip for a Major Monitor when the monitor runs and passes. Only the Major Monitor that failed needs to pass to count an Alternate Good Trip.

Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the scan tool. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 71° C (160° F)
- Engine coolant temperature must rise by 4.5° C (40° F)
- No further faults occur

Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.

CAUTION: Erasing DTCs, either with the scan tool; or by disconnecting the battery, also clears all Freeze Frame data.

Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

FUEL SYSTEM

- **Fuel System Similar Conditions Window** — An indicator that ’Absolute MAP When Fuel Sys Fail’ and ’RPM When Fuel Sys Failed’ are all in the same range when the failure occurred. Indicated by switching from ’NO’ to ’YES’.
- **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.
- **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.
- **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor must stay below that threshold for a calibrated amount of time.
- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 71° C 160° F).
- **In Similar Misfire Window** — An indicator that ’Absolute MAP When Misfire Occurred’ and ’RPM When Misfire Occurred’ are all in the same range when the failure occurred. Indicated by switching from ’NO’ to ’YES’.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.

Description	Group-Page

BODY DIAGNOSTICS

CHASSIS DIAGNOSTICS

POWERTRAIN DIAGNOSTICS

TRANSMISSION DIAGNOSTICS

SERVICE MANUAL COMMENTS

What errors(s) have you found?

____

____

____

____

In order for us to assist you, please include as much details as possible when reporting an error

Comments / Suggestions

____

____

____

____

☐ **Dealership Technician**
Dealer Code: __________

Retail Customer ☐

Manual Title, Year, Number and Page: __________________________

____

Your Name: ________________________________

Address: ________________________________

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